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Transpower New Zealand Ltd
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Via email: system.operator@transpower.co.nz

Consultation Paper – Connected Asset Commissioning, testing and Information Standard (CACTIS)

The WEL Networks appreciates the opportunity to provide feedback on the drafting of the CACTIS documents

WEL Networks (WEL) is New Zealand's sixth largest electricity distribution company and is 100% owned by our community through our sole shareholder WEL Energy Trust. Our guiding statement of strategic intent is to be leading Waikato's energy future, and we work to ensure that our customers have access to reliable, affordable, and environmentally sustainable energy.

Overall WEL Networks has supported the introduction of CACTIS as a standalone document, and we make the following comments on the drafting of CACTIS document.

Clarification of application to assets	The Introduction section should identify what assets are subject to the requirements in the CACTIS (i.e. grid assets, generation assets that are grid connected and embedded generation assets. The CACTIS should consistently identify in each section what size of assets that the various requirements in the CACTIS apply.
Clarification of differentiation of synchronous generation and generating unit	Is the differentiation meant to be for synchronous and inverter-based generation or does intermittency play a factor? We note solar thermal generation can be synchronous and that wind generation can be induction, asynchronous and inverter-based. Testing and modelling requirements will depend more on technology than intermittency.
State of Charge of a BESS	The CACTIS has a new requirement for a measurement of the State of Charge (SoC) of BESS (expressed as a percentage of nameplate capacity). Battery Management Systems determine SoC in a variety of ways. The SoC of a battery represents the stored energy relative to its full capacity, typically expressed as a percentage. There are several methods to estimate SoC. (each with its own trade-offs in terms of accuracy, complexity, and suitability for different battery chemistries and applications). These methods include: • Coulomb Counting (Ah Counting). Measures the current flowing in/out of the battery over time and integrates it to estimate charge.

- Open Circuit Voltage (OCV) Method. Uses the battery's voltage when it is at rest (no load) to estimate SoC based on a known voltage-SoC curve.
- Impedance Spectroscopy / Electrochemical Impedance Measures the battery's impedance at various frequencies and correlates it with SoC.
- Kalman Filtering / Model-Based Estimation. Combines a battery model (e.g., equivalent circuit) with measurements (voltage, current, temperature) and uses filtering techniques (e.g., Extended Kalman Filter) to estimate SoC.
- Machine Learning / Data-Driven Methods. Uses historical data and real-time measurements to train models that predict SoC.

Accuracy of SoC calculation depends heavily on:

- Battery chemistry (e.g., Li-ion vs. lead-acid),
- Temperature effects,
- Aging and degradation,
- Sensor precision,
- Calibration and initial conditions.

The CACTIS should lay out in which situations, which method should be used to meet the measurement requirement. WEL believes that measuring SoC in MWh makes the most sense.

CACTIS Definitions

We believe the following terms should be altered:

> **unencrypted** means a control system model in which all the control…..

separated into

> ***Encrypted control system model*** *means a control system model in which the control block(s) and signal flow are accessible, but the logic, mathematical equations, and programming code are not accessible to the system operator.*

and

> ***Unencrypted control system model*** *means a control system model in which all the control blocks, logic, mathematical equations, signal flows, and programming code are accessible to the system operator*.

Change

> **State of Charge** means the amount of energy stored in a BESS expressed as a percentage of its nameplate energy rating

to

> …the amount of energy stored in a BESS *expressed in MWh*.

The CACTIS has bolded terms that are not defined elsewhere:

- 5.13 PSS, POD,
- 5.14 ESCR
- 5.15 CFCT

We see no need for these acronyms to be bolded or even included as the acronyms are not used thereafter in the document.

	scaling factor and **shunt** definitions in Part 1 of the Code should be updated to include reference to CACTIS:
Para. 1.13 (c)	This is a new requirement that is not supported by the AOPOs and Technical Codes. In practice the distributor will carry out a protection coordination assessment at the grid interface and for each point of connection on the distributed network of every DER connected to the distribution network. It is not possible for every participant connected to the distribution network to confirm protection coordination at the grid interface without involving the distributor. It is more efficient to have the distributor confirm protection coordination at the grid interface.
Para. 2.3 (a)	should the "and" be an "or". Altering an embedded generator is not like to change anything at the grid interface
Para. 3.3	Should explicitly state the size of an asset for which an ACS is required.
Para. 5.16	Is this for intermittent IBR generation or IBR generation in general?
Para. 5.22	There is a fundamental problem here as asset owners with existing generation can prevent new entrants from being able to complete the connection process by refusing to share their encrypted models. We suggest changing "Shunt Capacitors and Reactive Power Control Systems" to "Shunt reactive power plant and Reactive Power Control Systems".
Para. 7.12	need to specify size (>5 MVAr). What about reactors?
Para. 7.14 (f)	Is this not a requirement on the connected party at the grid interface rather than embedded generation?
Para. 8.10	"in writing" should be "in written form" as physically writing on paper and sending to the other party is not intended.
Table A	Suggest "Shunt capacitors MVAr" be changed to "Shunt reactive power plant MVAr"
Table B	Station HV bus voltage and Circuit Amps and Circuit MW and Circuit MVAr are new requirements. WEL questions the need for these indications for embedded generation.
Table D	Is this for IBR based generation? What does station MV bus mean? It is not clear from Appendix A
Table E	Surely it is simpler to provide state of charge in stored energy (MWh).
Table J	Controllable load available MW: The required accuracy is not realistically achievable. Controllable load available value is a calculated value based on historical measurements and can be variable at the time depending on time of day, season, social activities and cannot account for other aggregators or traders who have control of IL in the network not visible to WEL

	Controllable load currently off MW: Before and after GXP load snapshot can indicate value of load reduction when initiated however any post values will be estimates and required accuracy not achievable Controllable load armed for interruptible load MW: Again this is a calculated value and as more traders assume customer load control the accuracy of these values is reduced and not achievable
New indications and measurements	no cost benefit analysis appears to have been undertaken for inclusion of new requirements.
ICCP vs API	Clarification is needed on whether ICCP is mandatory, or if API-based data transmission is an acceptable alternative (Chapter 8, Section 8.13–8.15).
Use of DG High-Speed Data	Increasing amounts of DG will reduce the ability of distributors to demonstrate compliance with interruptible load offers as the under-frequency performance at the GXP will be affected by DG on the distribution network. High-speed data from DG installations could be used by Transpower assessing distributor interruptible load offer compliance during under frequency events, especially where net metering is used at GXP level and multiple DGs are connected (Chapter 9, Section 9.4–9.5).
Responsibility for Data Collection	In cases like WEL, it should not be the distributor's responsibility to gather DG high-speed data post-UF event to validate bid compliance (Chapter 9, Section 9.2–9.3).

Our responses to the specific questions sought by Transpower are attached but our comments above should be read as part of our submission overall. Should you require clarification on any part of this submission, please do not hesitate to contact me.

Yours sincerely

[redacted]

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E [redacted]

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 system operator's ability to meet the PPOs and dispatch objective?	Yes, but the cost-benefit or consequence of non-provision needs to be quantified.
Q2. Do you agree with the proposal to mandate minimum time frames for the activities in Chapter 1 of the proposed CACTIS?	There are both minimum time frames and maximum time frames in Chapter 1. Minimum time frames ("at least ...") as well as maximum time frames ("within ...") should be mandated. Just minimum time frames by themselves should not be mandated.
Q3. Do you agree with the proposed time frames for asset owners to submit a commissioning plan and for the system operator to review them?	Generally, but there may need to be some leeway when multiple assets are commissioned at same time with more complex requirements. Asset owners cannot comment on the system operator's ability to review a commissioning plan as there is no information about system operator resourcing or priorities.
Q4. Do you agree that requiring asset owners to use a standard commissioning plan template would help streamline the preparation and review process?	Yes.
Q5. Do you agree with the proposed time frames for asset owners to submit asset capability statements at the planning, pre-commissioning, and final stages of the commissioning process, and for the system operator to review them?	Generally, noting that specialist resources required to develop the models may be in short supply. Asset owners cannot comment on the system operator's ability to review a commissioning plan as there is no information about system operator resourcing or priorities.
Q6. Do you agree that formalising the asset capability statement assessment requirements will provide clarity for asset owners?	Yes.
Q7. Do you agree with the proposal to formalise requirements for asset owners to	Yes.

provide urgent or temporary changes to asset capability statements?	
Q8. Do you agree with the proposed time frames for asset owners to submit m1 and m2 models, and for the system operator to review them?	Generally, yes, noting that specialist resources required to develop the models may be in short supply.
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?	No. It is not obvious that the updated modelling requirements are necessary (e.g. no cost-benefit analysis has been carried out) or that better modelling techniques are available.
Q10. Do you agree that the system operator needs TSAT and PSCAD software models to conduct the studies needed to maintain power system security and meet the PPOs?	No. It is not obvious that the system operator should be using TSAT or PSCAD as no assessment of alternative software models has been carried out.
Q11. Do you agree with the proposed time frames for asset owners to submit a final connection study report, and for the system operator to review it?	Generally, noting that specialist resources required to develop the models may be in short supply. Asset owners cannot comment on the system operator's ability to review a commissioning plan as there is no information about system operator resourcing or priorities.
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?	No. Alternative measures and practices based on the characteristics of IBR should be considered to screen and access IBR performance.
Q13. Do you agree with the proposal to require asset owners to repeat fault ride through studies when control system parameters are modified during or after commissioning?	No. Any repeat of ride through studies should be based on consideration of the changes and if the changes might result in a materially difference performance of the asset.
Q14. Do you support the proposed process for accessing encrypted models from other	No. Access can be denied which will stop the connection process as fault ride through studies cannot be completed.

asset owners when needed for fault ride through studies?	
Q15. Do you agree with the proposed time frames for asset owners to submit a commissioning plan and for the system operator to review it?	Is this the same as Q3? It is not clear what relevance this question has for Test Plan Requirements. Assuming Test Plans are the intention: Generally, yes, Asset owners cannot comment on the system operator's ability to review a commissioning plan as there is no information about system operator resourcing or priorities.
Q16. Do you agree with the proposed time frames for asset owners to submit a final engineering methodology, and for the system operator to review it?	Generally, yes. Asset owners cannot comment on the system operator's ability to review a commissioning plan as there is no information about system operator resourcing or priorities.
Q17. Do you agree with the proposed testing requirements for wind, solar photovoltaic and BESS technologies?	No. It is not clear whether intermittency or inverter based is the basis for these requirements.
Q18. Do you agree that the system operator needs the additional data identified in this section to maintain power system security and meet the PPOs?	No. The system operator can always maintain power system security and meet the PPOs by operating the power system more conservatively. The real question is do the benefits of the system operator getting the additional information outweigh the costs of providing the information. Benefits and costs have not been quantified in any sense.
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?	Yes. Lower cost options for demonstrating compliance are desirable.
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?	No opinion.

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?	No. The required accuracy controllable load measurements is not realistically achievable, Controllable load are calculated value based on historical measurements and can be variable at the time depending on time of day, season, social activities and cannot account for other aggregators or traders who have control of IL in the network not visible to WEL. Likewise, the accuracy of the SOC measurement depends on the method of SOC calculation which is likely to not meet the accuracy requirements.