SUBMISSION TO THE AEMC

Improving the NEM Access Standards — Package 2

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Executive summary

Syncline Energy welcomes the AEMC's draft determination introducing disturbance ride-through requirements for large inverter-based loads. The proposed three-tier framework, alignment with international precedent (ERCOT NOGRR 282, EirGrid MPID345, Fingrid grid code), and elevation of the large-load threshold to +30 MW are appropriate responses to the system security risks AEMO has identified.

Syncline Energy is the engineering and development entity behind Victorian AI Hub (**VAIH**), a 1,000 MW Stage 1 (extending to ~2,000 MW Stage 2) AI focussed high-performance data centre under development in outer Melbourne. The site is adjacent to the Melbourne Renewable Energy Hub (**MREH**) an operating 600MW/1,600MWh BESS that was originated and developed by Syncline Energy, with a subsequent sell down to Equis and then the SEC Victoria.

VAIH will consist of four large data centres (with different technologies and ownership) connected via a single co-located power facility to a single point-of-connection (**PoC**) into the Declared Shared Network (**DSN**) at the Sydenham Terminal Station (**SYTS**) 500 kV bus. The situation is analogous to, say, different generators with different ownership and technology connecting via a ‘private wire’ arrangement to the DSN at single PoC.

For our engineering design of VAIH, we have completed a stochastic model of the planned IT work load (AI training and inference mix) across all data centres and then modelled this back to the energy demand and RoCoF that will be seen at the PoC. This submission is intended as a case study to provide background on how compliance with the new rules can be achieved.

We support the draft rule in principle and recommend amendments in five areas before the final determination is made:

1. Single-PoC integrated compliance assessment for facilities with co-located grid-forming reactive support and synchronous generation, rather than fragmented compliance across each plant element.

2. Explicit recognition of net system strength positive loads and clarification of the interaction with the System Strength framework under NER Chapter 5 Part C.
3. Adoption of the EirGrid MPID345 voltage envelope as baseline, with NEM-specific RoCoF withstand provisions reflecting the lower system inertia of the Australian grid.
4. Distinction in active power recovery requirements between electrical restoration (PSU and UPS recovery, sub-second) and computational restoration (workload re-establishment, seconds to minutes).

Each recommendation is set out in detail in the sections that follow.

1. About Syncline Energy and Vic AI Hub

Syncline Energy is an Australian engineering and development firm specialising in integrated energy and water infrastructure and the development of clean energy infrastructure. We are the lead engineer and developer for the Vic AI Hub project, working with infrastructure capital sponsors and hyperscaler tenants on a phased 1,000–2,000 MW data centre development.

VAIH's relevance to this consultation arises from its electrical architecture, which differs materially from the conventional data centre archetype the draft rule appears to contemplate. The single VAIH PoC at SYTS contains:

- In front of the meter (provider equipment): 5 large-frame F-class heavy-duty dual-fuel gas turbines (~329 MW each, 50 Hz) with synchronous self-shifting (SSS) clutches, operable as either gas turbines or synchronous condensers, expanding to 8 units in Stage 2 (final unit count subject to detailed grid stability sizing); and 5 × ±200 MVAr modular grid-forming STATCOMs to be called the 'Arcline Power Facility **(Arcline PF)** and providing 1,000 MVAr nominal nameplate with N-1 module redundancy. Each unit in synchronous condenser mode contributes approximately 2,820 MW·s of inertia (H = 6.0 s × 470 MVA generator).
- Behind the meter (customer equipment): two co-located data centre campuses (Melton DC and Holden DC), inverter-based PSU loads, and lithium-ion UPS systems.

The Arcline PF compensation kit will materially increase three-phase fault level at SYTS and provide synthetic inertia at the PoC. This is a deliberate engineering decision: VAIH has been designed from inception to be a net positive contributor to local system strength, not a passive load. Co-locating the equipment into one location delivers very material economies of scale benefits and substantially improves our ability to mitigate noise, site lines, traffic and heat impacts for the local community.

2. Single-PoC integrated compliance assessment

The draft determination structures compliance obligations around discrete plant categories: generators meeting Schedule 5.2 GPS, large IBR loads meeting the proposed Schedule 5.3 ride-through standards, and reactive plant meeting separate connection requirements. For a conventional facility with these elements at separate physical sites, this fragmentation is appropriate.

But, for a facility like VAIH where load, dispatchable generation, and grid-forming reactive support all sit at a single registered connection point with a common protection scheme and a coordinated control system, fragmented compliance produces three problems:

5. Duplicated dynamic modelling. Each plant element is required to lodge its own PSCAD/EMT model with AEMO, when the relevant compliance question is the integrated response of the connection point.
6. Conservative double-counting of disturbances. A voltage dip at SYTS produces a coordinated response across the GTs, SCs, STATCOMs, and load — fragmented compliance forces each element to assume worst-case of the others, when in reality they are co-controlled.
7. Misallocation of compliance margin. The on-site reactive support can carry the load through dips that the load alone could not, but separate compliance does not credit this.

Recommended drafting amendment: Insert a new clause in Schedule 5.3 permitting AEMO to accept a single integrated compliance package — covering generation GPS, load ride-through, and reactive plant performance — for facilities where all elements are co-located at a single registered connection point and share a coordinated protection and control scheme. The integrated package would be assessed against the most stringent applicable element-level standard. And, for a staged development like VAIH, approval would be available for both Stage 1 and Stage 1+2 with pre-conditions specified for the Stage 1+2 compliance.

3. Recognition of net system strength positive loads

The draft rule and the existing System Strength framework under NER Chapter 5 Part C were both developed primarily to manage the impact of new inverter-based generators reducing system strength in low-SCR regions. The case where a large IBR load arrives with sufficient on-site grid-forming compensation to be net positive at the PoC is not clearly addressed in either framework.

VAIH's proposed 1,000 MVAr of grid-forming STATCOMs and continuous Gas turbine operation in Synchronous Condenser (**GT-SC**) mode will increase three-phase fault level at SYTS by an amount that materially exceeds the load's IBR system strength impact. On AEMO's published methodology this is a net positive contribution.

The current System Strength Charge mechanism appears to charge such facilities for the load impact, while not crediting the compensation contribution. The AEMC's emerging draft determination on Efficient Provision of Inertia and System Strength contemplates payments to providers but the boundary between "impact connection" and "service provider" for facilities that are simultaneously both is unclear. Similarly, the Arcline PF is at a scale that could offer Black Start capability back to AEMO.

Recommended drafting amendment: Insert an interpretive provision clarifying that, for facilities with co-located grid-forming reactive support, the net system strength impact at the PoC is the basis for the System Strength Charge calculation. Where the net contribution is

positive, the facility is eligible for treatment as a System Strength Service provider rather than a System Strength Impact Connection.

4. Voltage and frequency envelope — alignment and AU adaptation

Syncline Energy supports the AEMC's adoption of the EirGrid MPID345 voltage ride-through envelope as the baseline for Tier 3 facilities, including the requirement to restore at least 90% of pre-fault demand within 500 ms of fault clearance and voltage recovery to 90% nominal. This is an achievable performance target for properly engineered hyperscale data centres with modern UPS and PSU equipment.

We note however that the NEM operates with structurally lower system inertia than the synchronous-dominated European grids from which EirGrid MPID345 is drawn. RoCoF events in the NEM have historically exceeded 1 Hz/s during major contingencies (for example the 2016 South Australia black system event and the 2019 Queensland-NSW separation). The draft rule should specify expected facility behaviour above the 1 Hz/s envelope rather than leaving this unaddressed:

- Below 1 Hz/s (rolling 500 ms): full ride-through with no load reduction.
- 1 Hz/s to 2 Hz/s: graceful load reduction permitted, with at least 50% of pre-disturbance demand maintained for 1 second.
- Above 2 Hz/s: facility may trip in coordinated stages, with no single block exceeding 100 MW per 100 ms to avoid cascading.

Recommended drafting amendment: Add a graceful degradation table to Schedule 5.3 specifying staged load reduction limits above the 1 Hz/s primary RoCoF withstand envelope. This avoids the binary trip/no-trip outcome and protects against the cascade risk AEMO has identified.

5. Active power recovery — electrical vs computational restoration

The draft rule sets a single recovery requirement (90% of pre-fault demand within 500 ms). For data centre loads this conflates two distinct restoration timescales:

- Electrical restoration: the time for PSU rectifiers and UPS bypass paths to return to rated input current. For modern equipment this is achievable within 200–400 ms, comfortably inside the 500 ms envelope.
- Computational restoration: the time for the IT workload (training jobs, inference services, transactional applications) to return to pre-disturbance throughput. This is a software-level concern with timescales ranging from seconds (web serving) to many minutes (large-language model training checkpoints).

From the power system's perspective, electrical restoration is the relevant metric — the grid sees the PSU input current, not the IT throughput. The draft rule should make this explicit to avoid confusion at the connection enquiry stage and to prevent unintended over-engineering of UPS sizing to mask software restart latency.

Recommended drafting amendment: Clarify in Schedule 5.3 that the 500 ms active power recovery requirement refers to the facility's electrical demand at the PoC (PSU and UPS input current), not to the IT workload throughput downstream of the PSUs.

6. Dynamic model submission and library models

We support the requirement for Tier 3 facilities to submit validated PSCAD/EMT dynamic models as a precondition for AEMO compliance assessment, consistent with current GPS practice for generators.

We note that key OEMs remain reluctant to provide either PSSE or PSCAD files for their plant without full IP protection at the AEMO end – and this should be addressed. Unlike modular BESS and Solar PV inverters, the models are not 'off the rack' and would need to be developed for large STATCOM and GT-SC plant following extensive design. That work often take place after project financial close – but financical close for a major data centre precinct can't be achieved without full gid connection approval

Similarly, PSU and UPS manufacturers do not consistently provide validated dynamic models for their equipment. Smaller OEMs and OEMs with less common equipment selections will face significant cost and schedule burden to develop and commission bespoke models before a full order is placed.

Recommended drafting amendment: Direct AEMO to develop and maintain a public library of validated dynamic models for common large-load equipment (STATCOMS, GT-SC, UPS topologies, PSU rectifier classes, inverter controllers from major OEMs). Facilities using equipment from the library should be permitted to reference the library model rather than commission a new validation study, subject to vendor confirmation that the deployed configuration matches the library reference. (Analogous to an Ro(generic) and R1(final) for generators)

7. Summary of recommended drafting amendments

The table below summarises the five amendments requested above:

§	Topic	Recommended amendment
2	Single-PoC integrated compliance	Permit AEMO to accept an integrated compliance package for co-located generation + load + reactive plant at a single PoC.
3	Net system strength positive loads	Calculate System Strength Charge on net PoC contribution; net-positive facilities to be treated as service providers.
4	Voltage envelope and RoCoF graceful degradation	Adopt EirGrid MPID345 baseline; add staged load reduction table for RoCoF events above 1 Hz/s.

§	Topic	Recommended amendment
5	Electrical vs computational restoration	Clarify that the 500 ms active power recovery applies to PoC electrical demand, not IT workload throughput.
6	Library dynamic models	Direct AEMO to maintain a public library of validated PSCAD/EMT models for common large-load equipment.

8. Engagement

Syncline Energy welcomes further engagement with AEMC staff and AEMO on any of the matters raised in this submission. We are willing to provide supplementary technical material on the VAIH electrical architecture, including indicative dynamic modelling outputs and the on-site reactive support system strength contribution analysis, on request.

We also offer to participate in any Tier 3-specific workshop or technical working group the AEMC establishes during the final determination phase or the post-final-rule implementation phase.

Yours sincerely,

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