Guidance note – Network conditions and requirements for generator commissioning December 2021

Commissioning of generators in the NEM is increasingly impacted by network constraints in electrically bound regions, which need to be managed in addition to energy source availability for intermittent plant. Increasing numbers of connections in constrained areas necessitates improved coordination requirements for outage and testing activities.

This guidance note is intended as a practical reference document and further resource guide for generators planning commissioning activities, to evaluate current conditions and network outages that may affect commissioning. It also sets out expectations of minimum notice periods and key contacts.

Commissioning is governed by rule 5.8 of the National Electricity Rules (NER) and the Commissioning Requirements for Generating System Process[1] document published by AEMO, at https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/participate-in-the-market/network-connections/victorian-transmission-connections/stage-6-completion.

Current system congestion

AEMO publishes congestion information on its website in the interactive maps feature at https://www.aemo.com.au/aemo/apps/visualisations/map.html. The infographics give participants a high-level guide on where congestion and constraints are likely to bind in a particular area.

Figure 1 2019-20 system normal congestion

Source: 2020 ISP.

Comprehensive information relevant to the understanding and management of transmission network congestion (constraint) risk is published at https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource.

AEMO in its Victorian function provides limits advice for outages affecting generators, up to date records of which are published at https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource/limits-advice.

Proponents should check with their connecting network service providers (NSPs) for advice in other areas.

Participants in the NEM should familiarise themselves with the area where their project is located and the likely impacts of commissioning activities on the network around them.

AEMO provides education courses on the operation of network and frequency control ancillary services (FCAS) constraints in the NEM. See https://aemo.com.au/learn/industry-courses/network-and-frequency-control-ancillary-service-fcas-constraints-in-the-nem-overview.

Network outage impacts

Review of planned network outages during commissioning planning may help identify windows in a particular region where network outages are likely to affect commissioning.

Planned outages are coordinated by the NSP and the latest information for the transmission network is stored in the Network Outage Schedule (NOS). This schedule is updated every 30 minutes and is available on the AEMO website at https://aemo.com.au/energy-systems/

[1] AEMO is preparing an update to this document at time of publishing this note.

electricity/national-electricity-market-nem/data-nem/network-data/network-outage-schedule.

Bookings may be made up to two years in advance or at short notice in response to an emergency.

Where outages are expected to affect registered plant, the NSP is responsible for informing the affected generators.

Where commissioning programs are provided by proponents, AEMO operations assess the outage bookings and the forecast demands for the period and provide feedback to the NSPs on the likelihood of testing proceeding on the proposed dates, with regard to other major outages, simultaneous commissioning of other plants or major forecast power system conditions. Refer to the following sections for the expected level of advice dependent on timeframe to commissioning.

For generators in the distribution network, the distribution NSP (DNSP) will provide advice on the scheduling impacts of the planned commissioning dates.

Dispatch

Dispatch of generators in the NEM during commissioning occurs in line with the NEM dispatch procedures, at https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/system-operations/dispatch-information.

AEMO has also released a NEM Operational Forecasting and Dispatch Handbook for Wind and Solar Generators (at https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/dispatch/policy_and_process/nem-operational-forecasting-and-dispatch-handbook-for-wind-and-solar-generators.pdf?la=en), which explains how semi-scheduled generators and non-scheduled intermittent generators with semi-scheduled obligations communicate current conditions and availability applicable to their plant.

AEMO, the NSP, and the commissioning generator are required by the NER to coordinate commissioning so as not to adversely affect other registered participants, power system security or quality of supply. Where one or multiple simultaneous commissioning tests in an electrical area could have these impacts in a given set of conditions, AEMO may look to reduce the amount of commissioning activity to the level necessary to avoid those impacts.

Inflexible bids

Where constraints are likely to bind, as long as commissioning test schedules are appropriately staggered, the use of inflexible bidding could be helpful if warranted given the nature of the test.

It is the participant's responsibility to determine whether an inflexible bid is permitted by the rules, and to remove the inflexibility as soon as it's no longer needed. The AER is responsible for compliance monitoring and enforcement of inflexible bids. The AER has published a guideline on bidding (at https://www.aer.gov.au/system/files/For%20publish%20-%20Rebidding%20and%20technical%20parameters%20guideline%20-%20final%20guideline%20%282019%20amendments%29.pdf) that participants may refer to while planning commissioning and dispatch.

Participants considering inflexible bidding are required to ensure the bid is consistent with the requirements, and to submit a valid reason with the bid to AEMO. Note that all commissioning schedules are to be sent to NSP and AEMO National Connections for prior review and approval of the commissioning plan, to coordinate commissioning of multiple generators and network conditions. More information is included below.

Dispatch targets will be limited to the minimum of the inflexible bid (Fixed Load Bid) and the Dispatch Forecast (UIGF).

Note that if the dispatch outcomes result in a constraint violation, the AEMO control room can cancel the test and request the participant to remove the fixed load OR apply a system security constraint.

Timeframes and expectations

AEMO's National Connections team coordinates the testing of generators in conjunction with multiple groups within AEMO and the connecting NSP. The following stages of planning for commissioning should be followed.

Commissioning programs

- AEMO provides test templates for non-synchronous and synchronous generators[2] which include guidance on the expected elements of Generator Performance Standards related commissioning programs.
- Commissioning program submission is required, not later than:
  - Three months prior to commencement of commissioning for transmission connections, and
  - One month prior to commencement of commissioning for distribution connections.
- NSP and AEMO respond within 15 business days as per NER 5.8.4(c). This may also include advice at high level on major power system, outage, or concurrent commissioning project impacts of program.

[2] See https://aemo.com.au/-/media/files/electricity/nem/network_connections/transmission-and-distribution/generating-system-test-template-for-non-synchronous-generation.docx?la=en and https://aemo.com.au/-/media/files/electricity/nem/network_connections/transmission-and-distribution/generating-system-test-plan-template-for-conventional-synchronous-machines.pdf?la=en respectively.

- Further review and negotiation of the program detail will likely be required post the initial 15 business day feedback between the proponent, NSP and AEMO

Submit the commissioning program to AEMO and NSP commissioning support engineers and NEM.Connections@aemo.com.au.

Prior to each hold point

- Submission of updated test schedules and generation profiles, including any requirements for inflexible bids, required preferably one week but at least three business days prior to testing. This allows AEMO to complete outage assessment and verify the commissioning program's effects on the power system. Note: the connecting NSP may have other requirements.
- AEMO and the NSP will review and approve the test schedules, and approve any inflexible bidding.
- Amendments of approved test schedules later than three business days prior to scheduled commencement will normally only be considered to change timing. Changes to testing parameters will likely be rejected.
- Agreement may be made for the following by prior agreement with the NSP and AEMO within the commissioning program depending on the situation
  - Which testing activities are permitted when hold point (HP) specific preconditions cannot be met due to energy source availability; and
  - how long these activities can be carried out before a decision to revert to the old HP or HP staging level is taken.

Submit updated test schedules to AEMO and NSP commissioning support engineers and NEM.Connections@aemo.com.au. Note: test schedules are not to be sent directly to operational control rooms and submission should be completed within business hours per the notice requirements outlined.

Prior to test

- Submit bids and update limits and availability reflecting the test requirements.
- Before proceeding with each commissioning test, seek approval from the NSP control room and AEMO control room.
- AEMO will invoke and revoke constraint equations based on the HP level and NSP and Generator advice on commissioning testing.

Post testing

- The Generator test coordinator must update AEMO and NSP commissioning support engineers on progress of the commissioning tests on a daily or weekly basis, as required.
- AEMO and NSP commissioning support engineers must approve the current HP report before the next HP tests commence or before release for commercial operation (as applicable).
- Where there is enough data provided to the NSP and AEMO to provide reasonable confidence of compliance and stable operation, conditional operation at the tested HP may be allowed until the full HP report is provided. This is at AEMO's and the NSP's absolute discretion.
- AEMO and the NSP release HP capacity for commissioning testing only. Plant is not expected to operate for an extended period without tests being undertaken. If tests are not completed or reports are not submitted to AEMO and the NSP within the agreed timeframes, AEMO will constrain the generating system output to the previously approved HP level.
- Where applicable tests have not been completed at full HP output, AEMO and the NSP will be unable to assess or approve HP compliance. Commissioning program will not be considered as complete until the final HP is complete and approved by the NSP and AEMO.

Tips for success

- Early engagement and education are critical to understanding both the network around the generating system and the likely power system impacts during windows for commissioning. With advanced notice, NSPs and AEMO will be able to give early feedback on commissioning programs with regard to the likely impact of simultaneous commissioning of other plants as well as network outages and forecast power system conditions.
- Where constraints are likely to bind, as long as commissioning test schedules are appropriately staggered, consider whether the use of inflexible bidding is permitted given the nature of the test, to reduce competition with all others in the constraint.
- Last minute changes to testing are likely to be rejected based on coordination requirements of the power system for commissioning. Communication protocols with AEMO and NSP commissioning support engineers should be established early and maintained throughout all stages of the process.

Where can I find more information?

For any further enquiries, please contact AEMO's NEM Connections Team at NEM.Connections@aemo.com.au.