Registering a Hybrid System in the NEM

Fact Sheet

This fact sheet provides a simplified explanation of potential approaches to registering multiple technology integrated resource systems or generating systems—hybrids—in the National Electricity Market (NEM) as of 3 June 2024 (implementation date of IESS Rule[1]). It looks at how the different classification types are managed within hybrid systems, and it covers situations where an Integrated Resource Provider registration is required.

While AEMO has taken all reasonable care in the preparation of this document, the information should not be construed as advice, and you should consult the Network Service Provider (NSP) and AEMO regarding individual proposals.

If you intend to operate an integrated resource system or a generating system (system) within the NEM, you will need to read and understand the National Electricity Rules (NER) and associated procedures, guidelines and standards relevant to your connection, registration and ongoing operational requirements.

This fact sheet will not give you all the information you need to register successfully. You can get more information on registration from the AEMO Guide to Registration Exemptions and Production Unit Classification and other registration fact sheets on the AEMO website.

Legend for pictorials in this fact sheet are:

Production Unit Classification

Unless an exemption applies, anyone who owns, operates or controls a system connected to the NEM grid must register as an integrated resource provider or a generator and 'classify' each production unit in that system. Classification is required for both dispatch (scheduling) and energy market settlement.

Each NEM production unit must be classified as either bidirectional or generating and scheduled, semi-scheduled or non-scheduled based on its size and technical characteristics.

Each production unit must also be classified as market or non-market, depending on whether the participant registering the system is classifying the connection point as one of its market connection points or a third party participant is doing so. The third party, e.g., a Market Customer, will become the Financially Responsible Market Participant (FRMP) for the energy at the connection point.

Only non-scheduled production units are eligible for classification as non-market.

This fact sheet does not cover further information on non-market classification.

A hybrid system with a bidirectional unit and/or consumption at the connection point, other than for the supply of auxiliary load to a generating system, must be registered as an integrated resource system by an integrated resource provider. A generator or an integrated resource provider may register with respects to a generating system.

Single Technology Market Generating or Integrated Resource Systems

Before considering hybrid systems, it is useful to explain the classifications as they apply to non-exempt single technology systems. Each production unit making up a system connected to the grid through a single connection point is classified as either semi-scheduled, scheduled or non-scheduled:

[1] https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem

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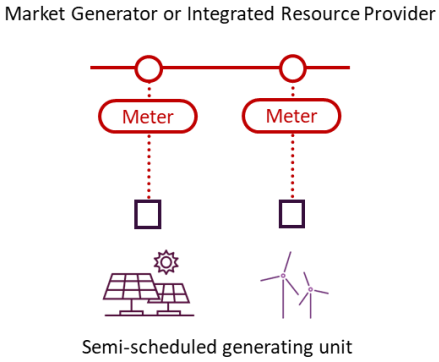
Semi-Scheduled Generating Unit

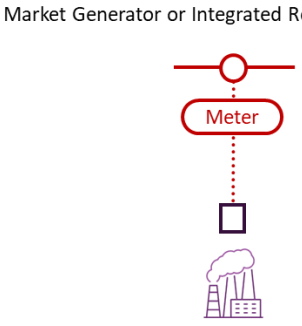


Semi-scheduled generating unit

A solar or wind farm with a nameplate capacity of ≥30 MW would be classified as semi-scheduled (due to its intermittent nature) and be connected to the NEM via a single connection point with its own metering installation represented by a NMI (National Metering Identifier). Generating systems <30 MW may also be required to register as semi-scheduled and/or be subject to central dispatch processes in some circumstances. Prior to registration, wind and solar farms need to provide an Energy Conversion Model (ECM); more detail can be found via the AEMO Solar and Wind Energy Forecasting webpage.

Units within a semi-scheduled generating system are typically aggregated for dispatch under NER 3.8.3. Appropriate SCADA metering is required.

Scheduled Generating Unit

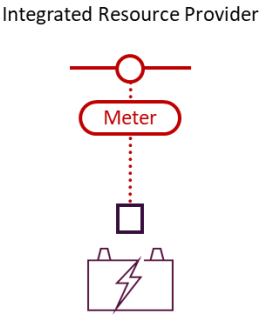


Scheduled generating unit

A synchronous generating system, for example, open cycle or combined cycle gas turbines, hydro or coal-fired power stations, with a nameplate capacity of ≥30 would be classified as scheduled and be connected to the NEM via a single connection point with its own metering installation represented by a NMI.

These can be generating units dispatched individually, or multiple generating units aggregated for dispatch under NER 3.8.3. Appropriate SCADA metering is required.

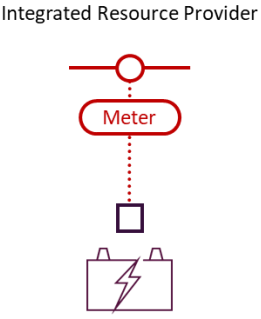
Scheduled Bidirectional Unit



Scheduled bidirectional unit

A battery, with a nameplate capacity ≥5 would be classified as a scheduled bidirectional unit. It would be connected to the NEM via a single connection point with its own metering installation represented by a NMI. Multiple battery storage units are typically aggregated for dispatch under NER 3.8.3. Appropriate SCADA metering is required.

Non-Scheduled Bidirectional Unit



Non-scheduled bidirectional unit

A battery <5 MW is typically exempt from registration but can be classified as a non-scheduled bidirectional unit. This is the case if a <5 MW battery is part of a hybrid system which is ≥5 MW. Other generating technologies (including wind, solar and synchronous) are usually

classified as non-scheduled if the generating units in the system are in aggregate <30 MW.

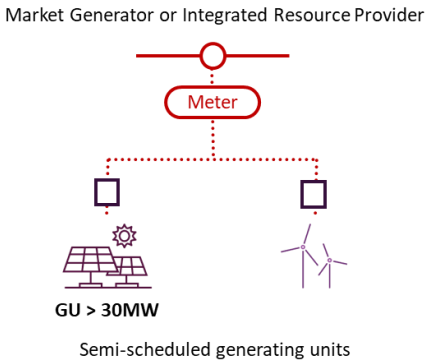
Registration Scenarios – Hybrid

When a hybrid system is proposed, the aggregate value of the system determines the classification of the component production units. For example, a 20 MW wind farm and a 20 MW solar farm connected at the same point will be registered as a semi-scheduled unit because in aggregate, they are ≥30 MW. A 20 MW gas fired turbine and a 20 MW solar farm will require registration under the scheduled and semi-scheduled classifications respectively.

Bidirectional units and generating units in a hybrid system can be assessed separately against their respective <5 MW and <30 MW limits for non-scheduled classification. For example, a 4 MW battery and a 28 MW solar farm may be registered as non-scheduled. A 6 MW battery and a 25 MW wind farm will be registered as scheduled and non-scheduled respectively. If a 10 MW solar farm were added in this example, both the wind farm and the solar farm, which in aggregate are 35 MW, would be classified semi-scheduled.

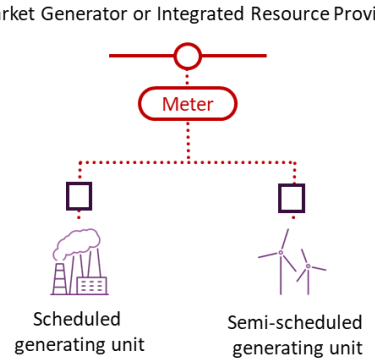
Hybrid systems can be registered under a single application but will incur higher registration fees due to the additional assessment required.

a) Scenario: Two semi-scheduled generating units (≥30 MW in aggregate).



A common hybrid registration involves two semi-scheduled generating units; one wind and one solar (each aggregated for dispatch under NER 3.8.3). Both the wind farm and solar farm require an independent ECM, and separate dispatchable units each with a dispatchable unit identifier (DUID) and appropriate SCADA metering. A single generator performance standard (GPS) would be established at the connection point. A conformance cap would be applicable to the solar farm and the wind farm unless aggregate conformance applies[2]. Auxiliary load, when the generators are not running, is settled as consumption. The combined facility is settled under a single FRMP.

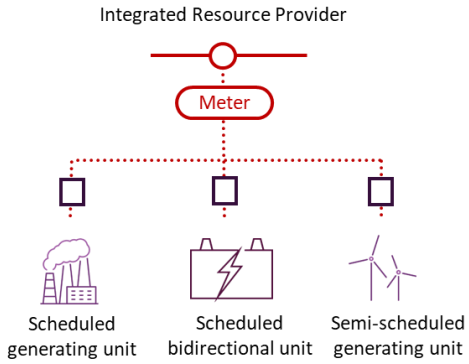
b) Scenario: A scheduled generating unit and a semi-scheduled generating unit (≥30 MW in aggregate).



This scenario includes a scheduled generator and a semi-scheduled generator: one gas fired turbine and one wind farm. The wind farm requires an ECM, there would be separate dispatchable units each with a DUID and appropriate SCADA metering. A single GPS would be established at the connection point. The scheduled unit would be required to follow dispatch instructions. A single conformance cap would be applicable to the wind farm and target applicable to the gas fired turbine unless aggregate conformance applies[2]. Auxiliary load, when the generators are not running, is settled as consumption.

[2] https://aemo.com.au/-/media/files/initiatives/integrating-energy-storage-systems-project/aemo-factsheet-aggregate-dispatch-conformance.pdf

c) Scenario: A scheduled generating unit and a semi-scheduled generating unit (≥30 MW in aggregate) and a bidirectional unit (≥ 5 MW)



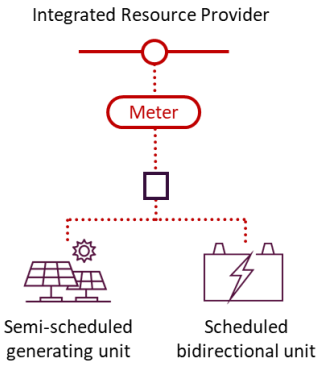
This scenario includes a scheduled generating unit, a scheduled bidirectional unit and a semi-scheduled generating unit: one gas fired turbine, one battery and one wind farm. In this case, the wind farm requires an ECM, there would be three separate dispatchable units each with a DUID and appropriate SCADA metering. A single GPS would be established at the connection point (covering both generation and consumption). The scheduled units would be required to follow dispatch instructions. A single conformance cap would be applicable to the wind farm and targets applicable to the battery and gas fired turbine unless aggregate conformance applies[3].

The requirement for the battery to be classified as a bidirectional unit occurs even if the battery does not charge from the grid.

Registration Scenarios – Coupled Production Unit

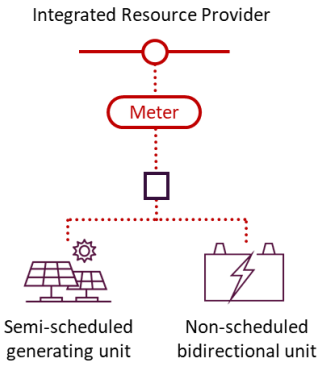
In a coupled production unit two technologies share an inverter. Each technology is typically represented by a DUID and each classification is assessed against the respective limits. For example, a 40 MW solar farm coupled to a 10 MW battery will be classified as a semi-scheduled generating unit and a scheduled bi-directional unit.

d) Scenario: A coupled semi-scheduled generating unit (≥30 MW) and scheduled bidirectional unit (> 5 MW)



In this scenario there would be separate dispatchable units each with a DUID, the solar farm requires an ECM, and appropriate SCADA metering for each technology. A single conformance cap would be applicable to the solar farm and target applicable to the battery unless aggregate conformance applies[4].

e) Scenario: A coupled semi-scheduled generating unit (≥30 MW) and non-scheduled bidirectional unit (< 5 MW)

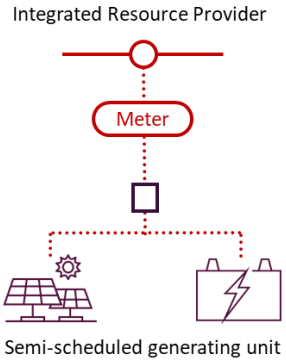


In this scenario only the solar farm would receive dispatch instructions, although for systems configuration the battery would also be assigned a DUID. The solar farm requires an ECM, and appropriate SCADA metering would be required for each technology. A single conformance cap would be applicable to the solar farm.

[3] https://aemo.com.au/-/media/files/initiatives/integrating-energy-storage-systems-project/aemo-factsheet-aggregate-dispatch-conformance.pdf

[4] https://aemo.com.au/-/media/files/initiatives/integrating-energy-storage-systems-project/aemo-factsheet-aggregate-dispatch-conformance.pdf

f) Scenario: A coupled semi-scheduled generating unit



In this scenario the coupled bidirectional production unit is classified as a semi scheduled generating unit. This single classification is only accepted under limited circumstances and requires the following:

- Battery < 5 MW
- Battery capacity < 2.5% solar farm capacity or participant commits to self-forecast
- The integrated resource system may not consume energy at the connection point to charge the battery
- The maximum generation is limited to the output of the solar farm.

The solar farm requires an ECM, and appropriate SCADA metering would be required for each technology. A single conformance cap would be applicable to the solar farm.

The registration fact sheet on coupled production units provides more information on these scenarios.

Registration Scenarios - Multiple Financially Responsible Market Participants (FRMPs)

All the scenarios above assume a single connection point to the grid and a single hybrid system. There are occasions, for commercial reasons, where participants may want to establish separate responsibilities across what AEMO would normally consider to be a single system (typically identified by a single point of connection into the grid). This can only be supported with an appropriate technical and metering configuration.

Each market connection point may only have a single FRMP. If the financial responsibilities need to be split between multiple parties then multiple connection points are required. At each connection point there will be a separately registered system, Market Participant, metering installation, GPS, ECM as applicable, etc. The designated network asset framework has been developed to manage this requirement. However, under exceptional circumstances, and in Victoria where the designated network asset framework does not apply, a private network model may be required.

In order to create multiple connection points behind the grid connection point, you may choose to establish a private network with a network connection to the grid or have the existing Network Service Provider (NSP) own the connection point transformer. One person must be registered as the NSP for this network (this may be the same entity as one of the established FRMPs). The private network cannot be exempt from Chapter 5 of the NER due to the need for a GPS to be enforceable at each connection point into the private network.

The private network's connection point to the grid will be established as a parent connection point. This connection point will have an NSP-to-NSP connection agreement which will reflect the performance of all assets connected to the private network.

The connection points into the private network will require NSP-to-generator or NSP-to-integrated resource provider connection agreements which will reflect the performance standard of the connecting asset. These connection points will be child connection points for the purpose of settlement. This means there must be an integrated resource provider or a market customer registered at the parent connection point to allow settlement of losses from the network. The child metering installations are also required to differentiate each generating system's load consumption and generation and allow the calculation of marginal loss factors (MLFs).

The nameplate rating of each of the individual generating or integrated resource systems will be aggregated for technical and classification purposes at the parent connection point. This means that if any of the systems at the child connection point could normally be granted exemption (for example, <5 MW generating system) it may instead be required to be classified and registered with AEMO as if it were part of a generating system at a single connection point.

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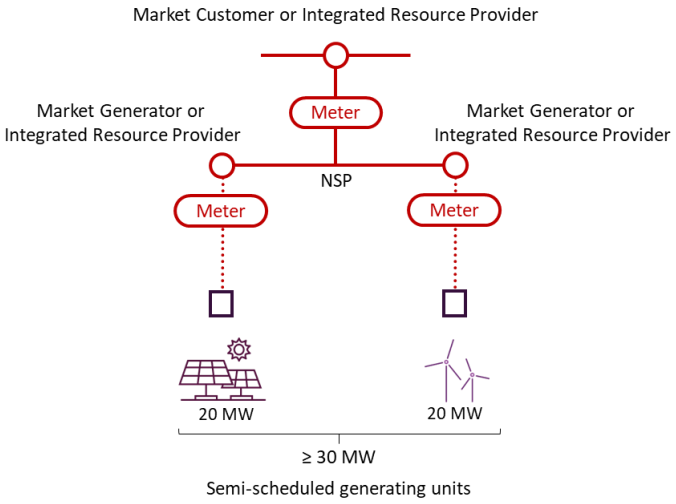
a) Scenario: Two semi-scheduled generating units (≥30 MW in aggregate)

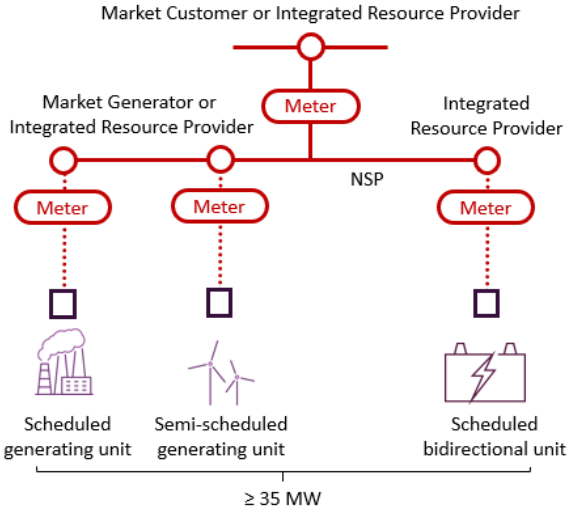


This registration would involve two semi-scheduled generating units; one wind and one solar (each aggregated under NER 3.8.3). The two systems are connected into the private network and operate independently of each other with individual registration, conformance cap, GPS (which need to consider each other in the modelling), dispatch, SCADA and ECM.

There are three metering installations for this configuration, one parent at the grid connection point and two children at the private network connection points. A market customer or integrated resource provider will need to be registered at the parent connection point to allow for the settlement of losses. Each metering installation will also have its own MLF.

The private network between the child and the parent NMIs will need to be registered to an NSP.

b) Scenario: Two scheduled production units and a semi-scheduled generating unit (≥30 MW generating unit in aggregate and bidirectional unit ≥5 MW)



This scenario includes a semi-scheduled generating unit, a scheduled generating unit and a scheduled bidirectional unit: one wind farm, one gas fired turbine, and one battery that charges from the grid. The three systems are connected into a private network and operate independently of each other with individual registration, conformance cap for wind farm, GPS (which need to consider each other in the modelling), dispatch, SCADA and ECM for the wind farm.

There are four metering installations for this configuration, one parent at the grid connection point and three children at the private network connection points. A market customer or integrated resource provider will need to be registered at the parent connection point to allow for the settlement of losses. Each metering installation will also have its own MLF.

If the battery is <5 MW it may be non-scheduled but not exempt as the aggregate at the parent connection point is ≥5 MW.

The private network between the child and the parent NMIs will need to be registered to an NSP.

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Applicants are advised to contact AEMO early in the design phase of their project to confirm the latest registration and technical requirements.

Where can I find more information?

See AEMO's website for battery and coupled production unit fact sheets, production unit registration and classification guides, the MASS and AEMO's power system security procedures and guidelines.

The NER are published on the AEMC's website.

For any further enquiries, please contact AEMO's Information and Support Hub via

- supporthub@aemo.com.au or
- call 1300 236 600