

FACT SHEET:

VISIBILITY OF THE POWER SYSTEM



AEMO is responsible for overseeing the vital system operations and security of the [National Electricity Market \(NEM\)](#) power system across Queensland, New South Wales (including the Australian Capital Territory), Victoria, Tasmania, and South Australia. From July 2016, that responsibility has extended to the South West interconnected system in Western Australia. This means operating the power systems within safe and technical limits to manage the secure and reliable transmission of power through the electricity supply chain from generators to consumers.

HOW DOES AEMO MAINTAIN POWER SYSTEM SECURITY?

Maintaining power system security involves the constant balancing of electricity supply and demand to ensure power flows remain within the technical limits of the grid. Reactive plant must also be deployed to ensure voltages across the grid meet the required profile. The risks associated with the power system operating outside its technical limits range from disruption of the electricity market through to disconnection of power stations and other plant, electrical separation of networks, blackouts of parts of the power system, and damage to plant.

To maintain power system security, AEMO needs accurate and up to date information including:

- Real-time data on the status of critical power system components, outputs from generation, power flows on transmission elements, and voltages across the grid.
- Performance standards, information, and models for all key elements of the system including transformers, lines, generation, and reactive power plant, allowing AEMO to analyse the plant's static and dynamic performance as part of the overall power system.
- Information to assist in forecasting customer demand and understanding the expected customer response to particular conditions.

To maintain a secure power system, AEMO continuously determines and revises the limitations on the system, taking into account the prevailing power system and plant conditions, and predicting the impacts of expected or potential unexpected events. This requires access to sufficient information and data about the power system and its components to effectively model how the power system might respond to system events.

The operational processes to maintain power system security include:

• Central dispatch process

AEMO is responsible for matching supply and demand through a centrally-coordinated dispatch process. The dispatch process operates on a five minute cycle, and includes AEMO forecasts of non-scheduled generation and semi-scheduled generation, to achieve the supply-demand balance. The central dispatch process aims to efficiently match electricity supply to demand while ensuring the system will remain secure.

• Network flow management

AEMO seeks to ensure the power flows through the network remain within technical limits by constraining generation in the market. AEMO can only do this with dispatchable (scheduled and semi-scheduled) generation.

• Frequency control

AEMO procures Frequency Control Ancillary Services (FCAS) from market participants to manage minor and major frequency deviations in line with the frequency operating standards. To date, these services have generally been provided by scheduled, synchronous generation.

• Voltage control

AEMO coordinates the voltage profile across the main transmission grid to remain within technical limits.

THE CENTRAL DISPATCH PROCESS

Below is a snapshot of the current and emerging supply and demand side elements AEMO must consider in the dispatch process.

SUPPLY SIDE

Scheduled generation



- A generating system with an aggregate nameplate capacity over 30 megawatts (MW) is usually classified as scheduled.
- Scheduled generation is currently predominantly made up of coal and gas-fired generation, and hydro.
- Scheduled generators offer their generation for dispatch.
- AEMO has ability to control this generation if required for system security.
- AEMO is informed of the technical properties of scheduled generation and receives real-time data from the generators.

Semi-scheduled generation



- Since 2008, generating systems with intermittent output (such as wind or solar farms) and an aggregate nameplate capacity of 30 MW, or more, are usually classified as semi-scheduled.
- AEMO forecasts wind and solar generation and includes this in the dispatch process.
- AEMO can constrain semi-scheduled generation down if required for system security reasons.
- AEMO is informed of the technical properties of semi-scheduled generation and some real-time data on performance.

Non-scheduled generation



- Non-scheduled generating systems generally have an aggregate capacity between 5–30 MW and do not participate in the central dispatch process.
Most generation less than 5 MW is not required to register with AEMO, and is generally considered as part of the demand side.
- AEMO forecasts non-scheduled generation to determine what remaining demand needs to be met by scheduled and semi-scheduled generation.
- Through the registration process, AEMO has some information of its electrical properties but may not have information about real-time output.

DEMAND SIDE

Very large load



- Some large load consumers, such as pumped hydro, may bid their required load into AEMO's dispatch.
- Some large load consumers may participate in demand management, meaning that AEMO can ask them to reduce load (i.e. their consumption) during a power system event to help maintain system security.

Residential and business



- AEMO forecasts residential and business consumption from the grid using information from previous five minute dispatch periods, and historical behaviour in relation to variables such as weather, time of day, and day of week.

Rooftop solar photovoltaic (PV)



- AEMO uses data from the Clean Energy Regulator to monitor the size and location of new rooftop PV installations.
- However AEMO has access to only a limited sample of system generation output from rooftop PV which it uses to forecast expected generation.

Battery storage, electric vehicles and other technology



- Despite their potential impacts on demand forecasts, AEMO presently has no visibility of devices such as battery storage or electric vehicles within the power system, and therefore does not currently include these new technologies in its operational demand forecasts.



HOW DOES THIS CHANGING GENERATION MIX AFFECT POWER SYSTEM SECURITY?

To effectively operate the power system and maintain a secure operating state, AEMO requires an informed view of the power system all the way from generation to the end user.

We know that consumers are more actively managing their energy supply and consumption, including installing solar PV on their roofs. Even though, individually, each PV system is small, as at June 2016 there were around 1.4 million households with rooftop PV installed across the NEM. In aggregate, that is over 4 gigawatts (GW) of PV capacity. This is more than the single largest power station in the NEM (Eraring in New South Wales which has 2.9 GW of capacity). However, unlike other generation sources such as large scale wind or solar, gas-fired generation, hydro or coal, the 1.4 million households generating rooftop PV in the NEM power system are not required to register with AEMO, or to operate to a strict set of performance standards within the technical limits of the power system. Even changes in how appliances such as refrigerators and air conditioners are connected to the network, can in aggregate affect characteristics of the power system such as system strength.

The NEM was designed at a time where customers' demand and the requirements for ancillary services were primarily provided by large, centrally dispatched generators. The mix of generation in the market and the technical requirements of the grid are constantly changing. In recent years, small-scale, distributed energy resources that are less visible to AEMO have been progressively displacing this generation, removing some of AEMO's levers of operational control, such as dispatch. This is impacting AEMO's ability to operate the power system within its technical limits on a continuous basis.

With increasing levels of localised, individual generation coming into the power system, the continued safe, secure and reliable supply of electricity to consumers becomes more dependent on AEMO's visibility of these components. To plan for and adapt to the changing technical requirements of the power system of the future, AEMO requires information about new and emerging plant characteristics to be used as critical inputs into new plant models and modelling tools.

ABOUT AEMO

AEMO is responsible for operating Australia's largest gas and electricity markets and power systems, including the National Electricity Market and interconnected power system in Australia's eastern and south-eastern seaboard, and the Wholesale Electricity Market and the South West interconnected power system in Western Australia. AEMO also operates the Victorian Declared Wholesale Gas Market and the Victorian gas transmission system; the wholesale gas Short Term Trading Market hubs in Adelaide, Sydney and Brisbane; the Wallumbilla Gas Supply Hub in Queensland; and the Moomba Gas Supply Hub in South Australia. As Australia's independent energy markets and power systems operator, AEMO provides critical planning, forecasting and power systems security advice and services to deliver energy security for all Australians.

FURTHER INFORMATION

AEMO Information & Support Hub: 1300 236 600
Media enquiries: 0409 382 121
www.aemo.com.au

