

Renewable Integration Study Information Sheet

AEMO is working to facilitate Australia's transition towards greater use of renewable energy. AEMO's **Renewable Integration Study** will identify:

- **Technical barriers to the operation of the power system with higher proportions of renewable generation projected out to 2025.**
- **In combination with AEMO's *Integrated System Plan*, a roadmap to address those barriers, working towards affordable, secure, reliable, and sustainable energy supply for all Australians.**

Australian electricity generation has been dominated by conventional sources (coal, gas, and hydro) since its beginning over a century ago. For the last decade, the amount of renewable electricity generation (wind and solar) connected to the power system has been increasing rapidly.

This rapid uptake of renewables has been driven by technological innovation, reducing cost, and government support to reduce the environmental impact of electricity production. Household consumption is also changing, with big increases in home solar and battery systems and changing consumer behaviour through access to information and "smart" enabling devices.

The production, supply and consumption of electricity in Australia is undergoing unprecedented change, and AEMO is committed to facilitating this transition.

AEMO's Renewable Integration Study will investigate the technical implications of a greater reliance on renewable electricity generation in the National Electricity Market (NEM) out to 2025. It will make recommendations to facilitate the transition to a secure and sustainable electricity system in Australia. This study will complement AEMO's Integrated System Plan (ISP) for the NEM.

The future of electricity supply

Electricity is an essential service and access must be available universally at an affordable price. Given the highly technical nature of the system, it is essential that changes are managed with the benefit of independent engineering and evidence-based planning and operational processes.

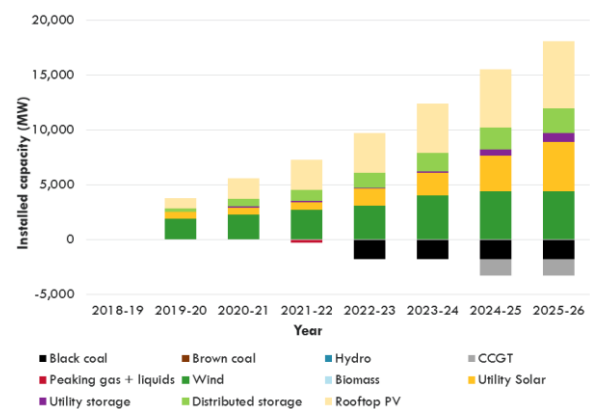
In 2018, AEMO's first ISP¹ found that following the retirement of existing coal-fired generators, the least-cost replacement of energy currently produced by coal is projected to be met through an efficient combination of:

- **Renewable energy** – a diversity of renewable generation (largely solar and wind), including Distributed Energy Resources (DER).

- **Energy storage** – a portfolio of energy storage types to smooth the production of variable renewable energy and provide backup supply and peaking.
- **Backup supply and peaking** – gas-powered generation (GPG) to complement renewable energy production.
- **Increased transmission, including interconnection in well targeted locations** – facilitating the efficient sharing of renewable energy, storage, and backup supply.

The 2018 ISP projected that wind and solar generation capacity in the NEM could double from 15 GW in 2018-19 to 30 GW in 2025-26.

Figure 1 Relative change in NEM installed capacity (Neutral case), demonstrating shift from coal to renewable energy



Source: 2018 ISP database, Generation and transmission outlooks.

The NEM power system is planned and operated to maintain a secure supply of electricity to all customers. A comprehensive understanding of the technical limits and requirements of the power system under plausible future scenarios is critical to achieving this objective.

Why AEMO is acting

In planning for a variety of potential futures, AEMO and policy-makers must have regard to the national electricity objective (NEO). The NEO seeks outcomes that are in the

¹ AEMO, 2018 ISP, July 2018, at <http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan>.

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long-term interests of electricity consumers with respect to price, quality, reliability, and security of supply of electricity. The projected future generation mix means there will be more operational periods where renewables are the largest portion of generation on the power system.

This requires new perspectives for planning and operating the grid, because renewable sources:

- Have different physical characteristics compared to conventional sources.
- Have variable output based on the weather.
- Are connecting in remote areas of the grid, which has implications for system design and operation.

Renewable Integration Study

AEMO's **Renewable Integration Study** is the first stage of a multi-year plan to support a secure and reliable NEM with a high share of renewables.

The study will focus on quantifying the technical renewable penetration limits of the power system for a projected generation mix and network configuration in 2025.

Work will focus on expanding AEMO's understanding of high-penetration renewable power systems through:

- Leveraging leading local and international experience.
- Detailed analysis of phenomena specifically related to renewable energy technologies, including:
 - Managing rapid changes in wind and solar output.
 - Assessing the adequacy of frequency control in the power system.
 - Analysing potential limits to distributed energy resources (DER).
 - Assessing the impacts of system strength on generation dispatch.
- Incorporating ongoing analysis from AEMO, Transmission Network Service Providers (TNSPs), and Distributed Network Service Providers (DNSPs), about power system limits and requirements related to increasing levels of renewable generation.
- Providing a roadmap of priority actions required to support increasing levels of renewable generation in the NEM.

The insights from the Renewable Integration Study will complement existing ISP processes and form a basis for future work, including Western Australian system planning and

operation. This will include any ultimate physical limits on renewable penetration, potential technology options to allow system operation up to these limits, and the regulatory and operational improvements that would be required to facilitate these changes.

Key linkages

The Renewable Integration Study:

- Builds on the concepts from AEMO's former **Future Power System Security Program**², which sought to identify opportunities and challenges to power system security and promote solutions.
- Uses relevant information and scenario analysis from the **ISP**, while providing insights into future focus areas for AEMO's integrated system planning.
- Links with several important AEMO and industry work programs. This includes leveraging the ongoing work within AEMO's **DER Program**³, and drawing upon the assessment of localised system limits in **Transmission Annual Planning Reports (TAPRs)**.
- Will feed into future AEMO publications and provide a prioritised roadmap of activities to inform ongoing work by AEMO, regulatory bodies, and policy-makers.

Communication

Proposed timing

The Renewable Integration Study report is currently planned for Q1 2020, with industry updates to be provided in the interim.

How to get involved

AEMO will engage with industry on the Renewable Integration Study in parallel with its ISP consultation processes. Detailed engagement will occur once the study results become available. As the work progresses, AEMO will post any relevant engagement information on its website.

Where can I find more information?

Information on the Renewable Integration Study, supplementary resources, and links to other related projects are available on the AEMO website.⁴

For any further enquiries, please contact AEMO's Future Energy Systems team at FutureEnergy@aemo.com.au.

² AEMO, Future Power System Security – Reports and Analysis, at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/FPSSP-Reports-and-Analysis>

³ AEMO, Distributed Energy Resources Program, at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/DER-program>

⁴ AEMO, Renewable Integration Study, at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Future-Energy-Systems/Renewable-Integration-Study>