Renewable Energy Integration Facility

Predicting how electricity networks will operate in the future and testing new technologies in a real-world environment has never been so important. CSIRO's Renewable Energy Integration Facility is a nationally significant facility that allows us to evaluate new grid technologies in an accurate development and testing environment.

The Renewable Energy Integration Facility is CSIRO's flagship renewable energy, microgrids and smart-grid testing and demonstration laboratory. Located at the CSIRO Energy Centre in Newcastle and established in 2009, the facility supports research, development and evaluation of emerging energy technologies.

In 2025, the facility underwent a major $3 million upgrade that more than doubles its power testing capacity, significantly expanding Australia's ability to test, validate and commercialise technologies for a more sustainable, reliable and secure electricity system.

The upgraded facility now provides:

- expanded battery testing capacity
- advanced load and grid simulation tools
- the ability to run complex real-world experiments at scale
- support for more efficient use of electrical infrastructure, helping improve energy affordability.

The facility can be used to simulate a household or commercial building with electric vehicles (EVs), solar and batteries. It demonstrates how the building could interact with a diverse mix of generation types on the electricity grid.

The facility combines renewable generation, emulators, storage and loads for distributed energy research.

Integrating renewable energy into the grid

As Australians embrace the energy transition for a more sustainable future in both commercial and residential environments, we need robust science to understand how electricity generated by these sources can be integrated into future grid designs.

Areas of research

Focus areas of research conducted in the Renewable Energy Research Facility include EV charging, vehicle-to-grid, integration of renewable generation and storage, inverter control and improving the stability of electricity networks.

Collaboration and external testing

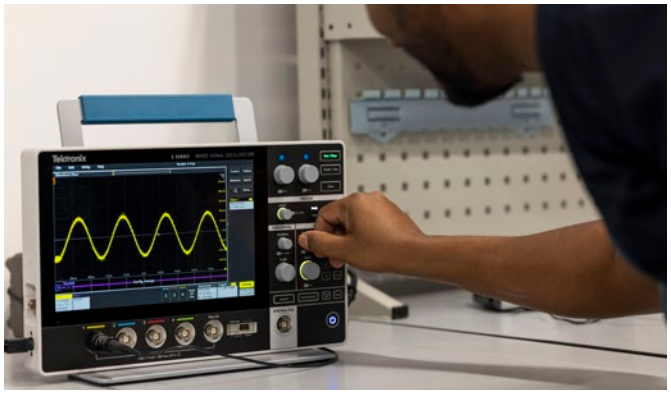
The facility is open to external industry and research organisations for collaboration and commercialisation projects that help address energy sector challenges. Expressions of interest should be directed to EnergyEOI@csiro.au

Australian start-ups and small to medium enterprises are encouraged to explore support through CSIRO's Kick-Start Program.

The facility upgrade was funded by the Department of Education's Trailblazer Universities Program.

Capability

- Power quality analysis
- Power electronics design and modelling
- Innovative inverter control methodologies development, testing and implementation
- IEE2030.5 and CSIP AUS testing
- Standards compliance testing
- Modelling and real world simulation of microgrids or specific grid conditions
- Simulation of solar PV, battery systems and building loads
- Battery characterising and cycle testing
- Distributed energy equipment testing including inverters
- OPAL-RT based power hardware in the loop (PHIL) testing
- Air conditioner, heat pump, and temperature sensitive equipment testing under variable power supply quality and temperatures
- Electric Vehicle (EV) and Electric Vehicle Supply Equipment (EVSE) emulation and performance testing for DC and AC charging and Vehicle-to-Load (V2L) systems
- ISO 15118-20 product development and verification testing for Vehicle-to-Grid (V2G) systems, which also includes ISO 15118-2/-3
- EV/EVSE protocol verification for DC and AC charging systems



Researcher collecting data during a power electronics experiment.

Engineers configuring the Electric Vehicle Supply Equipment (EVSE) emulator for a Vehicle-to-Home (V2H) experiment.

Equipment

- Grid simulator – up to 270kVA
- Programmable load – up to 360kVA
- PV simulator
- Battery simulator – 100kW
- Grid forming inverter – 100kW
- Hardware in the loop real time simulator
- Programmable inverter
- PV systems (up to 680kW)
- Battery systems (150kW, 700kWh)
- High speed data acquisition system
- AC and DC EV/EVSE emulation including V2X support
- Battery cycling tester
- Power quality and spectrum analyser
- Power system simulation
- Programmable inverter for rapid control prototyping solutions for power electronics, drives, smart grids
- Temperature controlled chambers accommodating up to 25kW thermal capacity and 32A line currents for equipment under test
- More than 15 electric vehicle charging stations from different Australian manufacturers and global suppliers

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For further information

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