

BIG SOLAR HIGHLIGHTS QUEENSLAND'S PATH TO ENERGY FUTURE



Image: Genex Power Limited

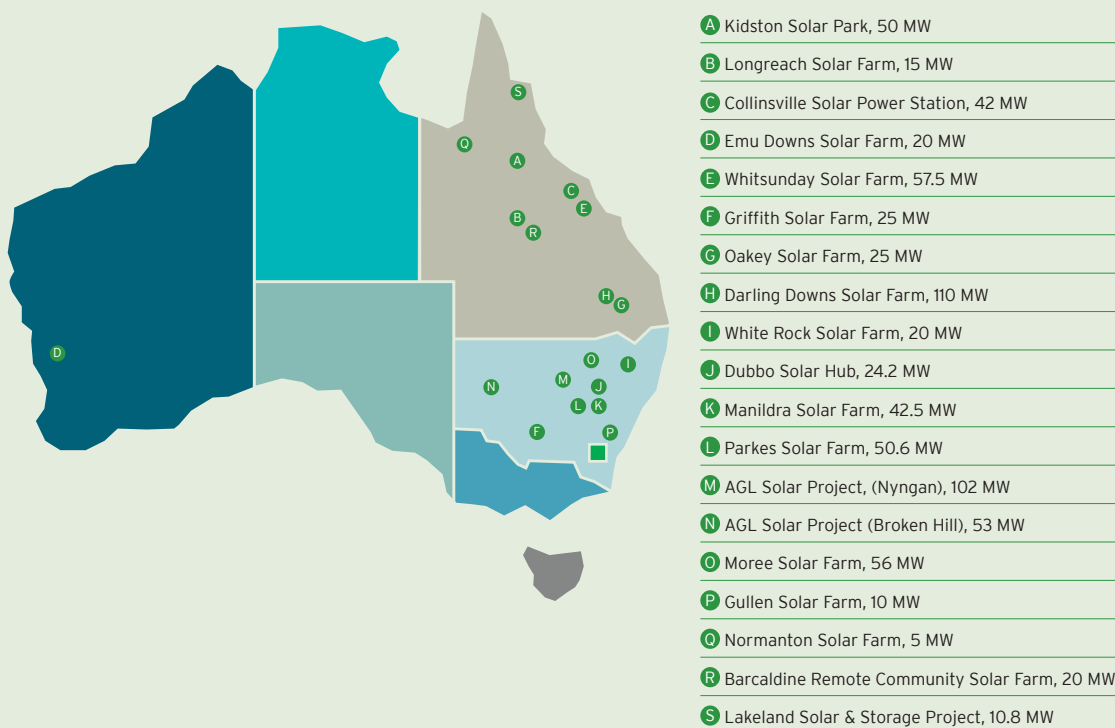
In the six years since it was created, ARENA's grant funding has contributed to the creation of 19 new grid-connected large-scale solar farms across Australia. Twelve of these were funded through the large-scale solar (LSS) competitive funding round in 2016, which helped to slash the cost of big solar projects to the same level as wind energy projects.

The trend has continued, with Australian utility-scale solar projects now being announced without the need for government grant support.

ARENA now has 19 projects involving big solar in its portfolio (see Figure 6). Having helped to bring down the cost and increase the development of large-scale solar projects in Australia, ARENA widened its focus this year to explore the best ways of integrating large amounts of solar energy into the grid while keeping energy costs low and the grid stable.

Three of ARENA's big solar projects in regional and remote Queensland are demonstrating that potential to deliver stability and affordability. Each project is unique in its own right, as well as being very different from most standard solar farms.

FIGURE 6: ARENA'S LARGE-SCALE SOLAR PORTFOLIO



KENNEDY ENERGY PARK

Lead organisation: Windlab, Eurus Energy

Size: 15 MW solar PV, 43.2 MW wind, 2 MW / 4 MWh battery storage

ARENA funding: \$18.0 million

Total project cost: \$160.0 million

CEFC debt finance: \$93.5 million

Location: Kennedy, QLD

The Kennedy Energy Park is a trailblazing project being developed by Windlab and Eurus Energy that will not only provide reliable and affordable power for its local community but demonstrate how to achieve around-the-clock renewable energy.

As the first grid-connected power plant in Australia to combine large-scale solar and wind with battery storage, it will test the technologies working together to see if the plant can provide dispatchable power over a 24-hour period.

The north Queensland location of the Kennedy Energy Park, about 20 kilometres from Hughenden, features one of the best and largest wind resources in Australia, alongside one of the best solar resources. This allows the two energy sources to complement each other, with solar generating electricity during the day and wind producing mainly at night. By storing the electricity in an onsite battery, the combined power plant is able to smooth out any variability, making it possible to provide more continuous generation of electricity.

If the combination of technologies proves to be viable, the project will lay the foundations for a planned second phase, 'Big Kennedy', which would be 20 times the size of the first facility. The success of the first phase will greatly assist with securing capital, debt finance and approvals for the following phase.

LAKELAND SOLAR AND STORAGE PROJECT

Lead organisation: Lakeland Solar & Storage Pty Limited, a subsidiary of Conergy

Size: 10.8 MW solar PV, 1.4 MW / 5.3 MWh battery storage

ARENA funding: \$17.4 million

Total project cost: \$42.5 million

Location: Lakeland, QLD

ARENA is supporting the Lakeland Solar and Storage Project to examine how solar farms with energy storage can help to overcome power reliability problems for electricity users living and working on the fringes of grids.

The developers of the project were the first in the world to combine a large-scale smart controller and battery system with a large-scale solar farm to identify how the technologies can best work together at a fringe-of-grid location.

As part of the project's Knowledge Sharing Program, Lakeland will be separated from the grid and powered solely by solar and battery storage for several hours at a time, essentially becoming an 'island' during test periods. This will demonstrate that the combination of big solar and big battery storage with a smart controller system will not only provide communities with protection from network failures, but also make it possible to supply renewable energy overnight and at peak demand periods.

PROJECT DEVELOPMENT ACTIVITIES FOR KIDSTON STAGE TWO HYDRO-SOLAR PROJECT

Lead organisation: Genex Power Limited

ARENA funding: \$5.0 million (up to \$4.5 million convertible)

Total cost of activities: \$12.8 million

Location: Kidston, QLD

With support from ARENA, the world's first integrated solar and pumped hydro project is being developed by Genex Power in Kidston, Queensland. That support has been provided in three stages: \$4 million towards a \$6.2 million feasibility study for the pumped hydro energy storage (PHES) component, \$8.9 million towards the \$126 million Kidston Stage One solar farm (as part of ARENA's LSS round), and \$5 million to help the combined project reach financial close in 2018.

The hybrid solar and hydro project, known as Kidston Stage Two, is expected to comprise a 250 megawatt pumped hydroelectricity storage facility using two decommissioned mine pits and a 270 megawatt solar farm. It will be capable of generating around 783 gigawatt hours of renewable energy each year, which is enough to meet the average annual power needs of 140,000 Australian homes.

The project will demonstrate the benefits of a solar PV and PHES hybrid generating reliable, dispatchable and affordable renewable energy. The PHES will also be able to provide stability and support to the grid, including FCAS.

In addition to repurposing two decommissioned mine pits for the pumped storage component, the project developer Genex is using infrastructure left from the previous mining operation to save time and money as well as minimise any environmental impact. These include the mine's accommodation camp, airstrip, road access and an electricity substation and transmission line.

WHAT IS DISPATCHABLE ENERGY?



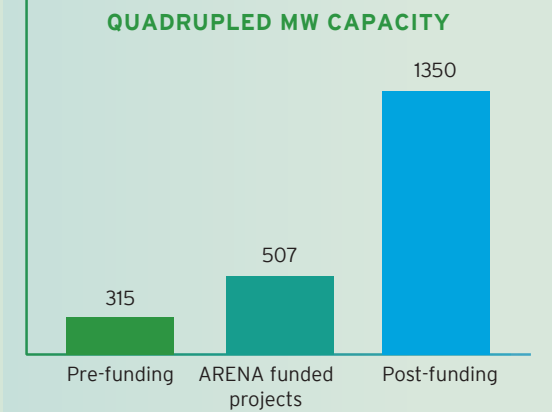
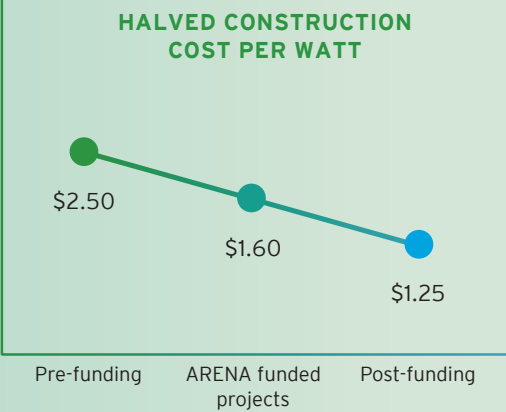
Dispatchable energy is electricity that can be made available - or dispatched - by a power generator or energy system whenever it is needed, or switched off when it is not needed. It can also include batteries (large and small) as well as demand response, where energy customers can be paid to reduce their electricity use during peak times or emergencies.

Dispatchable energy systems that can respond very quickly to changes in the grid are also known as flexible capacity.

In addition to meeting spikes in demand for electricity, dispatchable energy can help to smooth out electricity supply when the amount of renewable energy in the grid increases or decreases.

Australia's energy future will involve increasing amounts of variable renewable energy, increasing the importance of flexible capacity in stabilising the grid.

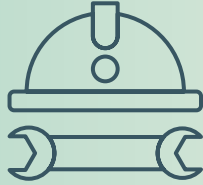
LARGE-SCALE SOLAR FUNDING ROUND



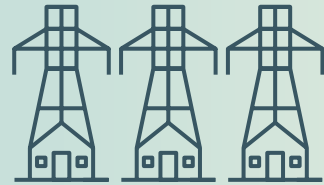
\$92M →
COMMITTED

12 →
PROJECTS

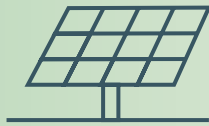
\$1.1B
COST



2300
JOBS



POWER FOR
150,000
HOMES



GENERATION CAPACITY
507 MW



21+ SOLAR FARMS
BUILT SINCE LSS
ROUND WITHOUT
ARENA SUPPORT



INVESTMENT LEVERAGE
1:10



ADVANCED COMMERCIALITY BY
5 YEARS