

Renewable Energy - Solar Farms

A solar farm is a large-scale installation that generates electricity from sunlight. There are two main types of solar farms.

Photovoltaic (PV) Solar farms use large arrays of solar panels to generate electricity directly through the photovoltaic effect. This energy is then sent to the power grid, or can be stored in batteries until it is needed.

Click [here](#) to learn how PV panels generate electricity.

The Kidston Solar Project (KS1):

- has 540,000 solar panels
- powers up to 26,000 homes
- generates up to 145GWh/yr
- offsets 120,000 tonnes of CO₂/yr
- has a 30yr lifespan
- cost \$115M
- is situated in the highest radiation zone in Australia.



Concentrated Solar Thermal Power (CST or CSP) Farms use mirrors or lenses to concentrate sunlight on a receiver, creating high temperatures. This heat is captured using a fluid (such as oil, or molten sodium), which is then used to heat water, create steam, and power a turbine. CST is used widely in Spain, but is a newer technology for Australia. Compared to PV Solar, it has a higher set up cost, however it can store the energy as heat, without the need for batteries with very little energy loss. This technology has been prototyped in **Goodna, Queensland**.

These two types of solar farms can work together, with the PV Farms providing energy during daylight hours, and the CST farms collecting heat energy during the day, and converting it to electricity at night.

If you want to learn more about solar energy check out the '[Discover Solar](#)' course from the Clean Energy Council.



Solar - Case Studies



Helping build solar farms has taken Jamie Lyon across the country.

His work as a **quality assurance and quality control engineer** has seen him involved in projects from Wyalong in New South Wales to Kingaroy and Munna Creek in Queensland. [Read more here.](#)

A blue sea of solar panels sits atop a Mackay Isaac Whitsunday landscape, close to Collinsville. It's here that 830 sheep can be found, grazing happily between the rows of panels.

This is **Hamilton Solar Farm** where partners Edify and Gentari are working with the landowner to find **sustainable collaborations between agriculture and renewable energy**. [Read more here.](#)



Melinee Leather and her family have become champions of sustainable agriculture, running 5,000 head of cattle while nurturing the health of the land and climate.

As well as enhancing their soil carbon storage they use **agrivoltaics** - placing solar panels on their farmland to ensure renewable energy developments can coexist with agriculture. [Read more here.](#)



Renewable Energy - Small-scale Solar

Small-scale solar is often called rooftop solar, and is installed at the point of demand - where people live and work. This has the added benefit of not needing to transfer electricity over long distances. There are three types of small scale systems:

Grid-connected solar	Grid-connected with battery back-up	Stand-alone solar system
Electricity is made by solar panels and either used by the household, or transferred to the grid. When the panels are not generating enough electricity it is drawn from the grid.	In this system, excess electricity is first put into a battery, before being put into the grid. When insufficient electricity is being generated the battery is used first, before drawing from the grid.	Stand-alone systems are not connected to the grid and require batteries or a generator (usually petrol or diesel) to provide electricity at night.

Click [here](#) to learn how the Feed-in Tariff (FiT) scheme works!



Challenges of small scale solar include:

- **Grid congestion:** when increased solar is fed into the grid this 'traffic jam' needs to be managed.
- **Voltage instability:** old inverters weren't able to manage voltage increases caused by solar however inverters have had this capability since 2015
- **Weather events:** extreme weather can impact solar output and increase customer load on the grid.
- **Battery storage:** low rates of solar with battery storage means there's less control over when energy is sent back to the grid

If you want to learn more about solar energy check out the '[Discover Solar](#)' course from the Clean Energy Council.



Small-scale Solar - Case Studies



Becoming an Accredited Installer was a smart career choice for Naomi Bourke.

“With renewable electricity, it’s ever-changing and evolving,” says the **electrician** from Townsville, Queensland, who is accredited to install home battery storage systems as well as rooftop solar panels.

[Read more here.](#)

When Mark McClurg paddles out for a surf and looks back at solar panels dotted on roofs, he sees more than the work of his small business.

Mark is the **Managing Director** of a company with a staff of 15, and they have installed over 2700 solar systems. Given his affinity for nature, working in clean energy “just made sense,” he says. [Read more here.](#)



A record number of Queensland schools have had solar panels installed to help **slash electricity costs** and **cut carbon emissions**.

Former Education Minister Grace Grace said the Advancing Clean Energy Schools (ACES) program was expanded in February 2022 and had exceeded targets to deliver more panels at more schools than originally planned. [Read more here.](#)



Renewable Energy - Wind

Harnessing wind energy isn't a new concept! In the Neolithic period, humans developed **winnowing**, where wind energy is used to separate grain from chaff. Boats with **sails** to take advantage of wind energy first appeared in Ancient Egypt in 3,200 BCE. **Vertical axis windmills** were developed in Persia (Iran) in the 7th century and used to grind grain and pump water. In the 12th century **horizontal axis windmills** were widely implemented in Europe. In 1987 **wind turbines** were first used to generate electricity, with the modern wind energy industry taking off in the 1980s.



Click [here](#) to learn how wind turbines generate electricity.

Wind Power in Australia

- in 2023, 13.7% of electricity was generated by wind power.



Benefits of wind farms include:

- low operating costs
- able to co-exist with current farm practices
- renewable energy source that does not release emissions or pollution
- suitable for remote areas

Challenges include:

- misconceptions about wind turbines
- recycling of parts at end-of-life
- require strong winds and 'smooth air' (low turbulence)
- inconsistent wind supply

If you want to learn more about wind energy check out the '[Discover Wind Power](#)' course from the Clean Energy Council.



Wind - Case Studies

Tracy, of the Western Wakka Wakka people, is the **Cultural Heritage Manager** at Wambo Wind Farm, working with her team to recover and preserve Indigenous artefacts on the construction grounds.

[Watch her story here.](#)



Alice is a **site engineer** at ACCIONA Energía's MacIntyre Wind Farm Project, near Warwick in Queensland.

"I feel like I'm making history. I'm really passionate about sustainability and the environment, so getting to work on such an influential project in the renewables industry is a big tick," she says. [Watch her story here.](#)

For those who are happy at heights and like the idea of a job that can take you around the world, **blade technicians** get a truly unique view of the energy transition. "I love what I do, and you'll get a job anywhere with these skills."

Darren Smith is a renewable energy veteran, someone with huge experience in and around wind energy across the globe. [Read more here.](#)



Traditionally host to agriculture, forestry and tourism, the Mt Gellibrand wind farm has brought economic diversity to Victoria's Western District. Alex McKenzie, Vice President of the Colac Chamber of Commerce, says that large renewable projects bring **multiple benefits to regional economies.** [Read more here.](#)

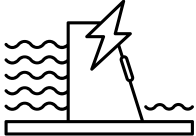

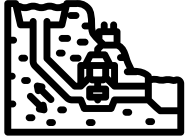


Renewable Energy - Hydropower

Hydropower has been a key element of the Australian power system for more than 100 years. There are more than 100 hydroelectric power stations in Australia with a total installed capacity of about 7800 megawatts (MW).

Click [here](#) to learn how hydropower generates electricity.

There are three types of hydropower plants that use both the **potential energy** and the **kinetic energy** of water.

Impoundment 	Diversion 	Pumped Storage 
When water is held in a reservoir such as a dam and slowly released through a canal to run a turbine.	When a portion of a river is diverted to run through the turbine.	When water is pumped uphill to a reservoir when extra energy is available, and released through a turbine when energy is needed.
Barron Gorge, QLD Hydroelectric Powerstation	Poatina Power Station, Tas	Kidston, QLD Pumped Storage Hydro

Genex Kidston Pumped Hydro

The Kidston Project, located 270kms north of Townsville, is the first pumped hydro energy storage scheme in the world to be developed in an abandoned gold mine. The project is co-located with solar energy projects.

This projects buys power from the National Electricity Market when it is cheap and plentiful in off-peak periods. It is the third largest energy storage device in the county at 250MW.



If you want to learn more about hydro energy check out the '[Discover Hydropower](#)' course from the Clean Energy Council.



Hydropower - Case Studies

Meet Alyssa, a **cadet hydrographer** with **Hydro Tasmania**.

As a Cadet Hydrographer, Alyssa travels around Tasmania **taking water readings at our rivers and lakes, reporting the data** back to head office. [Find out more here.](#)



Kyle is one of the **Jumbo Operators** working at the **Kidston Hydro Project**.

At Kidston he **helps out with the drill and blast projects and operating different machinery**. Coming from an underground mining background he is loving the diversity of opportunities the job is providing. [Find out more here.](#)

Stephen Burt's **drilling business** grew almost overnight thanks to the the geotechnical contract for early exploratory works for the proposed **Pioneer-Burdekin Pumped Hydro Project**.

Prior to this contract, Stephen's business had been 100% focussed on the coal industry for the past 17 years. Now, 50% of his fleet are dedicated to working in the renewable energy sector. [Read more here.](#)



Gurpinger Mand, or G as she's called at work is a **site engineer** for **Genex Power's Kidston underground team**.

She is one of many dedicated workers that are busy building the underground infrastructure and tunnels crucial for water transfer. [Find out more here.](#)

