Case study: Keeping power within Cowra

Clean Energy Knowledge Sharing Initiative

Summary

Cowra is a hub for agriculture, industry and tourism in the Central West region of NSW. Community energy group Cowra Low Emissions Action Network (CLEAN Cowra Inc.) is implementing a $14 million bioenergy project that will use local, renewable resources. Once the plant is at its full capacity of 12 MW, it will be able to meet over 60 per cent of Cowra's energy needs. As part of the project, CLEAN Cowra is looking to install Australia's first community–owned and operated solar and battery microgrid.

A $30,000 grant from the NSW Government's Clean Energy Knowledge Sharing Initiative helped fund a study into the technical and financial feasibility of the microgrid. The study included a concept design, cost estimates and preliminary grid inquiries to the local network provider, Essential Energy. CLEAN Cowra aims to increase the region's access to locally produced renewable energy and improve the region's energy self-sufficiency with the microgrid.

The next phase of the project will focus on securing approvals from Essential Energy and sourcing additional streams of funding, installing the microgrid by 2020-21.

Microgrid fast facts

Annual consumption within the microgrid	3.4 gigawatt-hours
Estimated annual savings for participants	10% bill savings
Potential reductions in emissions	12% during stage 1 (solar and battery only)

Background

The CLEAN Cowra project is a $14m bioenergy plant that will power most of Cowra with electricity generated from biomethane fuel. Waste streams from the water treatment plant, local agriculture and horticulture will be used to create the fuel, using materials that would otherwise go to waste.

The CLEAN Cowra microgrid project is a small part of the wider bioenergy project. Once the microgrid is up and running, bioenergy will become a more viable source of fuel for the region.

How will the microgrid work

A microgrid is a small energy network that can disconnect from the main grid and run on locally generated electricity. Industrial customers connected to CLEAN Cowra's microgrid will be powered initially by solar energy, with any excess energy stored in the shared battery system. The microgrid will then be powered by bioenergy, in addition to solar, when the wider bioenergy project is complete.

In this project, CLEAN Cowra investigated the technical and financial feasibility of a solar and battery microgrid with the grant from the NSW Government. The microgrid will share renewable energy that is locally produced, stored and distributed, allowing Cowra to be more energy independent and sustainable. Microgrid consumers may also save money by avoiding some network fees, as power being consumed close to where it is generated.

Once the bioenergy plant is operating, CLEAN Cowra can sell electricity from the bioenergy plant to the microgrid at a better price than if it sold to the main grid, creating a win-win situation for all. This unique project will empower the local agriculture community to generate power from organic waste material, creating a sustainable source of energy and reducing emissions.

Journey

To begin the study, CLEAN Cowra recruited four customers from Cowra's industrial precinct to join the microgrid. The CLEAN Cowra team consulted these customers on their energy needs and built a picture of their weekly electricity use behaviour to establish an average electricity demand.

CLEAN Cowra engaged engineering consultants, Sustainable Energy Design, to prepare a microgrid concept design. The concept design was vital to ensure the project met its aim of increasing the region's energy independence using renewables. The concept design was also required to cost the project, and was submitted as part of the connection inquiry to the network provider.

The engineer's first challenge was to determine whether the microgrid should run a high or low-voltage system. The voltage level determines all the electrical components of the connection to the main grid. To determine the voltage level for the system, the engineer studied the microgrid site and the surrounding infrastructure.

The CLEAN Cowra team then needed to consider whether to power the microgrid by one shared solar system located in the precinct, or to have individual solar systems at each customer's site. The technology and costs of each option were researched and shape the concept design.

On completion of the concept design, CLEAN Cowra submitted it to Essential Energy as part of the preliminary connection inquiry.

To finalise the study, the CLEAN Cowra team compiled a detailed financial model to determine the microgrid's economic feasibility. The team calculated project costs, estimated returns and the savings for the customers.

"The project is still in preliminary stages, but thanks to the Knowledge Sharing Initiative it has a concept design, preliminary connection details, project estimates and a financial model."

Jonathan Prendergast, Lead Project Developer, Prendergast Projects

Challenge	Solution
The complicated and lengthy Essential Energy approval process to connect the microgrid.	Early engagement with Essential Energy by the engineers will be crucial to help CLEAN Cowra navigate the connection process to reduce time and costs.
The distance between microgrid customers means a low-voltage system within the microgrid is not feasible.	The microgrid will adopt a high-voltage system, although this may require additional costs and steps such as an earthing study.
Low return on investment may present challenges in terms of finding investors and getting the project off the ground.	The team can seek additional financing streams from grant funding and socially responsible funding.

Outcomes

The technical and financial feasibility study showed that the Cowra microgrid will increase the energy self-sufficiency of the region and reduce reliance on the main grid. By using local, renewably generated power, the microgrid could also reduce emissions and reduce costs for its customers.

The technical feasibility part of the study determined the energy usage of the microgrid customers and set out the concept design. The study found that the microgrid's four customers consumed 3.4 gigawatt-hours of energy per year, with an average demand of 384 kilowatts. The study concluded that the microgrid would need a high-voltage system given the long distances between each customer. A high-voltage solution comes with additional requirements including a protection study, earthing design, and a high-voltage management plan.

Based on the high-voltage system, CLEAN Cowra designed a microgrid system with a single shared 250-kilowatt solar system, 300-kilowatts of battery storage, 13 power poles, one high-voltage gate meter, two transformers and four electricity meters.

The concept design was received positively by Essential Energy. Engaging the network provider early was helpful to understand any perceiving challenges regarding connection of the microgrid to the main grid. It also allowed Essential Energy to set out the requirements needed to achieve the final network connection, streamlining the process going forward and reducing time and costs for the project.

The financial model was a key piece of the study. It showed that the microgrid would cost $2.5 million to build, and could deliver a 10 per cent energy savings for customers while providing a 3 per cent return for investors. To improve returns and gain additional funding for the project, CLEAN Cowra could seek support from both grant and socially responsible funds. Both grant funding and socially responsible funding recognise the non-financial benefits of a project such as this and are more likely to contribute and invest. The project can also look at reducing upfront costs for approvals or bringing new customers into the precinct to spread the fixed cost of the project.

Takeaway points

- Locally produced energy can deliver financial savings for businesses, such as lowering network costs.
- Microgrids are a way to increase the energy self-sufficiency of the community by using locally generated, renewable power.
- Microgrid design and approvals can be complex and timely. To streamline, it is essential to engage early and work closely with the network service provider and other stakeholders.
- There could be multiple sources of funding for the next stage including the socially responsible funding.

Next steps

CLEAN Cowra hope the microgrid project will pave the way for more microgrids in regional communities. Through this project they have identified the risks and developed solutions for a renewable microgrid, giving regional communities an example they can follow.

CLEAN Cowra is now focused on progressing the project from concept design to detailed design. The team will also seek to establish an agreement between CLEAN Cowra and the network provider, and work towards achieving a full network connection. CLEAN Cowra are planning on installing the microgrid by 2020-21.

As CLEAN Cowra's wider bioenergy project develops, this clean energy will supplement the solar electricity in the microgrid. The bioenergy and solar will lead to the microgrid being 100 per cent renewable.

At full capacity, the bioenergy project will generate up to 30 new operational roles and reduce Cowra's greenhouse gas emissions by 50 kilotonnes per annum.

Richgro bioenergy plant – Jandakot, WA

Remote regional communities face numerous energy challenges including affordable and reliable energy and self-sufficiency. The microgrid and bioenergy project present an innovative, renewable solution to these wider energy challenges.

About the Initiative

The NSW Clean Energy Knowledge Sharing Initiative supports the NSW Government's objective to achieve net zero emissions in the state by 2050. The Initiative gives innovators and early adopters an opportunity to test and trial new clean energy solutions. To find out more or learn about similar projects, visit www.energy.nsw.gov.au/clean-energy-initiative.