# DMIA Case Study

***Centralised Energy Storage System (CESS) Stage 2***

Part of Energy Queensland

## Project outline

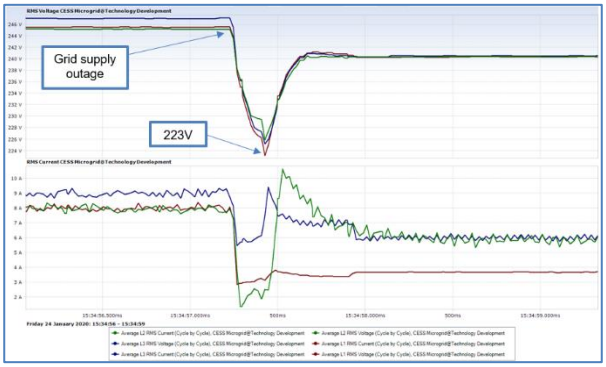
The focus of CESS is understanding how centralised energy storage can be integrated into distribution networks and isolated systems, to enable greater renewable energy penetration and reduce cost of electricity supply.


The CESS Stage 1 project was completed in 2017 and involved the development of a centralised inverter and energy storage test platform (83kVA/200kWh). The CESS Stage 2 is an application of the CESS platform using advanced control systems. The project investigated applications for the distribution network and isolated systems, considering the challenges and benefits of DER solution to power quality, capacity and renewable enablement.

The project targeted microgrid technology (i.e. grid-forming and virtual synchronous machine) using modern inverter systems, including the demonstration of the technology, the challenges with implementation and the potential benefits to the business and customers.

## Project outcomes / findings

- Demonstration of a seamless microgrid of an LV installation, which includes seamless transition between off-grid and on-grid, black start capability and seamless disturbance ride through.




- Implementation of virtual synchronous machine using inverter technology, to enable a seamless LV microgrid.
- Consideration of how technology can be used in distribution networks and isolated systems to support the network and increase renewable penetration.
- Implementation of a novel protection scheme for a LV microgrid installation considering both off-grid and on-grid scenarios.
- Identified challenges and risks with electrical installation supplied solely by inverter-based system. These risks relate to LV customers governed under AS/NZ 3000. A white paper has been developed for peer review.
- Development of computer simulation models of the microgrid installation for

network analysis, such as RMS dynamic simulations and short-circuit analysis.

Based on the findings, the project recommends:

- Further development of protection philosophies in relation to LV electrical installations supplied solely by inverter-based generation. This applies to microgrids and standalone applications. This needs to consider limitations of existing standards to develop a new way forward.
- Development of a microgrid connection standard considering all network levels, from LV customers to HV connections. This should consider grid-forming and grid-paralleling capabilities of inverters (i.e. grid-forming but also grid-connected).
- Further investigation of how grid-forming inverter technology can be used to increase renewable penetration, improve network stability and provide a cost-effective solution for traditional network issues.

## Next steps

Ergon Energy Network and Energex are continuing to pursue development and implementation of inverter and energy storage technology for distribution network and isolated system applications.

There is also a new facility being construction in Cairns called the Microgrid and Isolated Systems Test (MIST) facility, which is to enable high power testing of large DER, renewable energy systems and synchronous machines (up to 1MVA).

## More information

- For more project information, contact Alan Louis, alan.louis@energyq.com.au
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MIST FACILITY

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