Lesson Learnt Report #1

2020/ARP013 TransGrid Wallgrove Battery

Contents

1. Project Details

Project Name	Wallgrove Grid Battery
Recipient Name	NSW Electricity Networks Operations Pty Limited (ACN 609 169 959) as trustee for NSW Electricity Networks Operations Trust (ABN 70 250 995 390) trading as TransGrid
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Reporting Period	Dec 2020 - Apr 2021

This Project received funding from ARENA as part of ARENA's Advancing Renewables Program.

2. Executive Summary

TransGrid is developing the Wallgrove Grid Battery to pilot synthetic inertia services using Battery Energy Storage System (BESS) technology. TransGrid expects that an inertia gap will be declared in NSW as existing sources of inertia, predominantly coal fired generators, are progressively withdrawn from the market. In preparation for this event, TransGrid is investigating alternate technology solutions to establish technically viable, lower cost solutions to address the inertia gap.

The Wallgrove Grid Battery will pilot inertia services from a BESS as a network service using both synthetic inertia and Fast Frequency Response services.

The project has received funding from both NSW Government and ARENA. Contracts were signed in October 2020, with the BESS expected to be operational in October 2021.

The Wallgrove Grid Battery is currently in construction phase. This lessons learnt report is focussed on the lessons gained through the tendering and contracting phases of this project along with the development of the commercial models required for a commercially viable pilot project. Specific technical lessons learnt on this project will be shared in future reports.

The lessons learnt explored in this report focus on three key learnings:

- There is a lack of market maturity for battery projects in the NEM. Particularly, there is limited depth of BESS providers in Australia able to demonstrate a comprehensive understanding of a battery connecting to and operating with the NEM, while meeting AEMO's requirements.
- The commercial model and contracting will be complex for pilot projects with multiple revenue sources.
- New market entrants may find the gap between warranty limitations and the allocation of financial and technical responsibilities difficult to overcome, excluding them from entering the grid scale BESS market.

3. Project Overview – commercial model

TransGrid is implementing a commercial model which allows the BESS to be used for both network services and market services. Funding has been sourced from both grants and the regulatory framework to support the network service pilot, as well as a market participant for the market services.

Pilot projects demonstrating new technology for network services can be challenging to implement under the National Electricity Rules prior to a network need being declared or a RIT-T being undertaken. Consequently, the network component of the battery is supported by grant funding. TransGrid expects that this project will demonstrate the ability for BESS to provide inertia network services, and will thus support future BESS providing similar inertia services to be assessed under the regulatory framework, negating the need for support grants.

Even though a BESS has the ability to participate in the energy market, TransGrid being a Transmission Network Service Provider (TNSP) is unable to participate in the market. TransGrid has entered into contract with a third party, Infigen Energy, enabling them to utilise the BESS for market services while TransGrid utilises the BESS for network services.

At the time of developing this project, all BESS operating in Australia are underpinned by substantial grant funding from state governments and/or ARENA. Securing funding from networks, for network services, will be a key factor in underpinning the commerciality of future BESS. Battery cost reductions, longer asset lives and increasing familiarity with market revenue streams for BESS are also expected to remove this reliance on grants.

The Wallgrove Grid Battery is reliant on grant funding from both NSW Government and ARENA. The resulting commercial framework and contract structure to fund this battery is therefore complex and took considerable time and resources to finalise. The costs for this project progressively increased through the development journey as all parties gained a better understanding of the capability of the BESS and the roles associated with key stakeholders. Funding was also reduced through the development journey making the final business model quite different from the original concept.

4. Key Learnings

4.1 Lesson learnt No. 1: Lack of market maturity for battery projects in the NEM

Category: Commercial

Objective: Improving supply chains

Detail:

TransGrid recognised that it had limited experience relating to BESS technology and sought a supply partner who could bring technical expertise to the project, related not only to the physical supply and installation of the battery but also to the connection and interface with the National Electricity Market (NEM). Whilst a number of suppliers were able to respond to a tender process for supply of the battery, few could demonstrate a comprehensive understanding of how the battery would connect to, and operate in the NEM while meeting AEMO's requirements. Selecting a supplier which could not adequately demonstrate the ability to provide a complete solution presented a significant risk to the project success.

TransGrid learnt from a previous BESS project (which never reached financial close) that the most effective way to determine the appropriate BESS solution would be to ask respondents to propose the specifications and commercial model of a BESS that would be able to trial inertia, while earning revenue indirectly through market revenue streams, rather than TransGrid specifying a specific solution. However, what was discovered through this approach was that the supplier market is still immature and only a limited number of suppliers had the capability and risk appetite to be able to provide a fully scoped proposal. Due to lack of mature contracting models in this space and limited supplier experience, the tender and contracting period was significant, compared to traditional technology solutions, causing significant project cost increases as the technical and commercial specification for the full solution was developed and confirmed.

Implications for future projects:

TransGrid expects this situation will change over time as new, and more mature, BESS suppliers enter the Australian market and expertise develops for BESS suppliers, TNSPs and DNSPs in connecting these assets and with AEMO in connecting, registering and operating BESS in the NEM. Future projects will be able to leverage the learnings and market developments that this project has enabled.

4.2 Lesson learnt No. 2: Complexity of commercial model and contracting

Category: Commercial

Objective: New commercialisation pathway

Detail:

The commercial model to fund this project is complex, given the pilot nature of the project and the four different revenue sources (ARENA, NSW Government, regulated revenue and lease revenue from Infigen). TransGrid negotiated twelve separate contracts with four counterparties with up to a 10-year term. TransGrid also undertook parallel discussions with the Australian Energy Regulator and Australian Energy Market Operator given the intended network use of the battery.

All contracts had to be finalised in parallel and drafted to align, whilst managing three separate companies' commercial interests as well as the priorities and expectations of two separate grant funding bodies. In parallel with these negotiations, technical changes in the solution caused project costs and expected market revenue to change, and the approved grant value also underwent changes. This proved to be highly time consuming, complex and costly to maintain consistency in contracting terms and ensure acceptable outcomes for all parties.

The lesson learnt for TransGrid is that pilot projects involving multiple revenue sources and stakeholders will involve complex contracting and commercial models. Each additional counter-party, including grant funding bodies, adds a significant layer of costs and complexity to a project and should be minimised to the extent possible.

Implications for future projects:

For the Wallgrove Grid Battery, the complexity in commercial model and contracting was perhaps unavoidable, however future network projects which are not pilots are expected to be supported by sufficient regulated network funding to avoid the need for grant funding. The removal of two sets of counterparties will reduce both the costs of the project and the uncertainty in the business model as the project approaches financial close. Future projects should seek to the extent as reasonably possible to minimise the number of counterparties to reduce the time, cost and complexity of reaching financial close.

Most of the pain points were associated with defining and allocating risks only discovered during the course of the negotiations. This was largely unavoidable due to the novelty and complexity of the technologies and commercial model deployed for the project. Other proponents of complex/novel projects should expect such "unknown unknowns", and allow additional time in the project development schedule to deal with them, considering strategies to discover these sooner so they can be dealt with earlier and efficiently.

4.3 Lesson learnt No. 3: Need to ensure financial and physical responsibility of assets is aligned

Category: Commercial

Objective: New commercialisation pathway

Detail:

TransGrid initially tendered for a fully wrapped EPC solution to minimise the risk of gaps in the technical solution. However, the contract terms from the BESS supplier limits warranty to the BESS units, leaving a substantial gap between the assets required for a fully operational BESS and those where performance is warranted. This would have created a mismatch in responsibility for the supply of fit for purpose assets, ongoing routine and defect maintenance and financial accountability for performance of the battery.

TransGrid recognised that this model was sub-optimal and the modified contract terms to take responsibility for supply and maintenance of more of the balance of plant to ensure the financial and physical responsibility of assets were closely aligned. For a company like TransGrid, this is a good outcome with the BESS supplier holding technical and financial responsibility for the BESS module performance and TransGrid holding responsibility for the balance of plant which sits within its core expertise.

For other companies with less expertise in transformer and other balance of plant specification and maintenance, this gap in warranty may prove more challenging. There is substantially more risk of a total BESS outage for an extended period arising from a balance of plant failure than there is from many individual BESS modules all simultaneously failing.

Implications for future projects:

Future BESS projects should seek to ensure that financial and physical responsibilities are aligned. For TransGrid, with strong capabilities in asset supply, operations and maintenance, it makes sense to take as much responsibility for balance of plant as possible, specifically since TransGrid's learnings from this project can be applied to future projects.

4.4 Lesson learnt No. 4: Registration and connection process for a battery energy storage system via an intermediary

TransGrid undertook a significant amount of research to ascertain how to register the Wallgrove Grid Battery, especially given that as a TNSP, TransGrid would own the battery but would not have dispatch control of the BESS in the National Electricity Market. To assist with this process, TransGrid sought guidance from Electranet on the approach used to register and create a valid Connection Agreement for the Dalrymple ESCRI-SA Battery Project (ESCRI BESS). TransGrid was aware that Electranet had participated via ARENA's knowledge sharing process..

Electranet provided guidance on the approach taken to register the ESCRI BESS in the name of the third party, which operated the BESS in the market. Electranet advised TransGrid that this was a very nascent process and that each time a utility scale battery was registered, AEMO and industry learned and adapted the process.

TransGrid followed Electranet's advice and engaged AEMO at the early stages of the project ensuring a smooth process. Initially TransGrid had wanted to register the Wallgrove Grid Battery with TransGrid as the owner, operator and controller, but AEMO advised that this was inconsistent with the operations of the National Electricity Rules (NER) as TransGrid could not:

- enter into a Connection Agreement with itself
- operate the BESS in the NEM and
- Could not hold itself accountable for any non-compliances with the Generator and Customer Performance Standards agreed to under clause 5.3.4A of the NER.

TransGrid revised its approach and engaged an intermediary to trade in the NEM. As such, TransGrid was required to engage an intermediary to submit registration applications for the roles of a Generator and Customer in the NEM while TransGrid would submit an Exemption Application for its role as an owner and operator of the Wallgrove Grid Battery. The Exemption Application was to be submitted at the same time as the Generator and Customer applications were registered with AEMO.

In addition, for the registration applications to be valid, the Connection Agreement had to be between TransGrid as the network service provider and the intermediary, ensuring that TransGrid was not entering into a contract with itself for the operation of the BESS. The intermediary would be held accountable by AEMO for any operational non-compliances with any Generator and Customer Performance Standards that were agreed in accordance with clause 5.3.4A of the National Electricity Rules.

This process was complex, but simplified by the guidance provided by both Electranet and AEMO. TransGrid and Infigen (as TransGrid's intermediary) successfully submitted the Generator, Customer and Exemption applications to AEMO on 12 May 2021.

A summary of the roles of the various parties under the AEMO NEM registration applications is as follows:

Role	Party	Classification	Application Form
Generation Owner	TransGrid	Exemption	Generator Exemption Application
Generation Operator	TransGrid	Exemption	Generator Exemption Application
Generation Controller	Intermediary	Generator	Application for Registration as a Generator in the NEM
Intermediary	Intermediary	Generator	Application for Registration as a Generator in the NEM
Generator Classification – (1) Scheduled	Intermediary	Scheduled Generator	Application for Registration as a Generator in the NEM

Role	Party	Classification	Application Form
Generator Classification – (2) Market Generator	Intermediary	Market Generator	Application for Registration as a Generator in the NEM
Market Generator Classification	Intermediary	Ancillary Service Generating Unit	Application for Registration as a Generator in the NEM
Customer	Intermediary	Customer	Application for Registration as a Customer in the NEM
Customer/Load Classification – (1) **Scheduled**	Intermediary	Scheduled Customer	Application for Registration as a Customer in the NEM
Customer/Load Classification – (2) **Market Customer**	Intermediary	Market Customer	Application for Registration as a Customer in the NEM
Market Customer Classification	Intermediary	Ancillary Services Load	Application for Registration as a Customer in the NEM
NSP	TransGrid		Not required as TransGrid is already registered in this capacity
Metering Coordinator	TransGrid	TransGrid to be appointed as Metering Coordinator	Not required as TransGrid is already registered in this capacity
Metering Provider	TransGrid	TransGrid to be appointed as Metering Provider	Not required as TransGrid is already registered in this capacity
Meter Data Provider	TBA	To be appointed by AEMO or by the Financially Responsible Market Participant.	TBA
Financially Responsible Market Participant (FRMP)	Intermediary	Must be Registered Participant.	Intermediary's responsibility
FCAS Market	Intermediary	Must be Registered as a Market Generator, with Market Ancillary Generating Units. Must be Registered as a Market Customer	Application for Registration as a Generator in the NEM Application for Registration as a Customer in the NEM

Role	Party	Classification	Application Form
To facilitate operating in ancillary services market (including FCAS)	TransGrid	Must ensure BESS (including metering) is designed to be compliant with AEMO's requirements	Compliant with Market Ancillary Service Specification
Market Customer/Market Generator	Intermediary	Must apply for Austraclear for participation in the NEM	Intermediary's responsibility