EEP - New England BESS

Public Project Knowledge Sharing Report

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1 Executive Summary

The New England Battery Energy Storage System (NEBESS) is a 200 MW/400 MWh (2 hour) battery energy storage system (BESS) developed and owned by ACEN Australia, co-located with the New England Solar Farm approximately 6 km east of Uralla, NSW. The NEBESS connects to TransGrid's 330 kV network at the Uralla Switchyard.

The NEBESS was constructed using an Energy Vault B-VAULT battery system with Siemens SINAMICS grid forming inverters. The project received support from the NSW Government's Emerging Energy Program (EEP) in the form of capital grant funding.

2 General Project Information

2.1 Technology

2.1.1 Battery System

NEBESS uses Energy Vault B-VAULT battery containers - an integrated battery energy storage unit combining lithium iron phosphate (LFP) battery cells, power conversion and thermal management systems within a single containerised solution. Battery modules are manufactured by REPT, with each B-VAULT housing 42 or 45 modules split 50/50 across the facility.

A summary of the key technical characteristics of the NEBESS facility is shown in Table 1.

Table 1: NEBESS Technical Characteristics

Characteristic	Specification
Battery Technology	Energy Vault B-VAULT (LFP)
EEP-Supported Capacity	50 MW/100 MWh (2 hours) (Section 1)
Location New England Solar Farm	Approximately 6 km north-east of Uralla, NSW
Grid Connection	TransGrid 330 kV Uralla Switchyard (new dedicated 330kV bay)
Inverter Type	Siemens SINAMICS (Grid Forming)
NEM Registration	Integrated Resource Provider (IRP) - two DUIDs

2.1.2 Grid Forming Inverter Technology

The NEBESS uses Siemens SINAMICS S120 grid forming inverters operating in Virtual Synchronous Generator (VSG) mode. Grid forming inverters provide advanced system strength and synthetic inertia services to the network, offering frequency and voltage stabilisation with faster response times than conventional grid following technologies. NEBESS was the first project in NSW to be approved with advanced grid forming inverters through the NEM connection process, establishing important precedents for the assessment of Generator Performance Standards (GPS) for future grid forming projects across Australia.

2.1.3 Control Software

The BESS and substation are controlled through a tiered approach, with various control software controlling elements of the overall facility under a supervisory control and data acquisition (SCADA) software package. A battery management software (BMS) is responsible for managing the charging and discharging down to the cell level, ensuring that state of charge (SOC) is balanced across cells, and modules, within a given battery container. Inverters are controlled by a power plant controller (PPC), which is responsible for taking dispatch requirements and scheduling inverters to meet the dispatch target, among various other operating mode requirements, including automatic generation control (AGC) and voltage control. The Energy Management System (EMS) is responsible for the high level SCADA of the facility, and is responsible for integrating the overall control between the BMS and the PPC.

2.2 Business Model and NEM Participation

2.2.1 Operating Strategy

ACEN Australia engaged an EPC Contractor (Energy Vault) for the construction and operations of the NEBESS project. Energy Vault will operate the asset through an Operations and Maintenance agreement (15 years plus option for additional 5 years) following practical completion of the EPC contract. The facility is registered in the NEM as an Integrated Resource Provider (IRP) with two DUIDs. The BESS will operate in the NEM as well as Frequency Control Ancillary Services (FCAS) markets.

2.2.2 NEM Trading Pattern and Bids

The BESS is currently undergoing testing and commissioning activities, and as such the NEM trading pattern and associated bids have been solely for the purpose of testing and commissioning. In commercial operations, the trading pattern will generally see the BESS charging and discharging following the daily market spot price cycle in addition to any NEM requirements to maintain grid stability. Additionally, NEBESS will be participating in FCAS markets once FCAS registration has been achieved.

2.3 Ownership Model and Funding

2.3.1 Corporate Structure

ACEN Australia is the project developer and asset owner of the NEBESS project.

2.3.2 Funding Model

The funding model comprises a mix of funding from the NSW Government's Emerging Energy Program (EEP) capital grant funding, corporate equity, and debt financing.

2.4 EPC Tender, Construction and Commissioning

2.4.1 EPC Tender Process

The delivery of NEBESS was through two separate EPC contracts; one for the BESS, and one for the substation works (HV Works). The BESS works were procured under an EPC contract with Energy Vault and the substation works separately procured through EPEC. The BESS works EPC contract was structured with two separately triggerable sections (Section 1 at 50 MW/100 MWh, and Section 2 at 150 MW/300 MWh), enabling the EEP-funded Section 1 to proceed to completion independently of Section 2.

Energy Vault was selected as the BESS Works EPC contractor following a competitive tender process. Key factors in the selection included track record, battery management software, long term performance guarantees, performance characteristics, and competitive pricing. The initial tender went to nine tenderers, each tender response was evaluated against a range of criteria and the top two tenderers were shortlisted. ACEN entered negotiations with each shortlisted tenderer and selected Energy Vault. EPEC was selected in a similar manner, with a competitive tender process for the HV Works.

The procurement timeline is summarised in Table 2.

Table 2: Procurement Timeline

Date	Procurement Event
6 September 2023	HV Works EPC Request for Tender issued
15 September 2023	BESS Works EPC Request for Tender issued
21 March 2024	HV Works EPC Contract signed
31 May 2024	BESS Works EPC Contract signed
12 April 2024	HV Works Notice to Proceed issued
31 May 2024	BESS Works Section 1 Notice to Proceed issued
17 March 2025	BESS Works Section 2 Notice to Proceed issued
12 December 2025	HV Works Practical Completion
1 April 2026	NEBESS Section 1 First Dispatch

2.4.2 Construction Process

Construction of NEBESS formally commenced upon issuance of the Notice to Proceed to Energy Vault on 31 May 2024. The multi-EPC contracting model, with BESS works and HV Works delivered in parallel by separate contractors, required disciplined interface management and coordination led by ACEN's construction team. The BESS works commenced with foundational infrastructure, including access roads, a levelled battery bench using a cut and fill methodology with near-zero net import, and reinforced concrete slabs designed for heavy equipment loading. Installation of the B-VAULT battery units and medium-voltage (MV) stations followed a tightly sequenced program, with units delivered directly to final position and installed using specialised lifting equipment, minimising laydown requirements and handling risks. In parallel, the HV Works, saw the construction of a new 330/33 kV substation bay and associated transformer infrastructure, which was energised ahead of BESS commissioning to de-risk the program.

2.4.3 Commissioning Process

Commissioning of the BESS commenced in December 2025, with cold commissioning (commissioning activities not requiring connection to the grid) of the B-VAULTs. Hot commissioning of the B-VAULTs began in January 2026, once MV cable terminations to the substation were complete. A 'notifiable exemption' was obtained to enable a +/- 5 MW dispatch/load limit ahead of the formal registration. Registration of the plant in the NEM was achieved on 14 February 2026, with hold point testing commencing on 26 February 2026. Commissioning remains in progress at the time of publication of this report.

2.4.4 Market Registration

The project progressed through the formal connection and registration framework under the NER, culminating in registration with AEMO as an integrated resource provider (IRP) in February 2026. The process commenced with the R0 connection application, involving submission of detailed PSSE models, negotiation of generator performance standard (GPS), and completion of a full impact assessment (FIA). This stage required multiple iterations and extensive due diligence, particularly due to the grid forming inverter technology. Subsequent progression through the 5.3.9 (modification of an existing GPS) process enabled expansion from 50 MW to 200 MW and was completed more efficiently due to improved model maturity and evolving rule frameworks. Final registration at R1 required validation of GPS, demonstration of compliance through testing and commissioning, and alignment with updated rule requirements, including system strength and inverter-based resource (IBR) performance provisions.

2.5 Offtake Agreements and Commercial Arrangements

ACEN Australia's current strategy is to secure a level of revenue certainty at the portfolio level. Proceeding with NEBESS provides ACEN with the ability to pursue a greater range of portfolio contracting opportunities.

Combined with ACEN's variable renewable energy assets in the portfolio, the dispatchable nature of the BESS will allow trading of firmer contracts, which will attract a higher value and market premium than the current run-of-plant offtakes for ACEN's solar plants. Trading of the BESS will maximise the value of shorter-tenor market opportunities, and the ability to layer multiple different contract types will enable some diversity of revenue and risk profile.

Consequentially, ACEN chose to build the NEBESS on an initial merchant basis and assess commercial opportunities once the plant is operational. It is expected that following full operations the commercial arrangements will involve a mix of spot market exposure, short-term contracting (1-3 years), and medium-term contracting (5-7 years).

2.6 Community Engagement and Benefits

Community engagement for the NEBESS formed part of ACEN's broader New England development, and was undertaken continuously from pre-development through construction. Engagement activities included public information sessions, a staffed local project office in Uralla, regular media releases, monthly updates in local publications, social media communications, and participation in community events such as shows and regional festivals. A formal consultation framework was implemented, including stakeholder databases, complaints registers, and a Community Reference Group, ensuring structured feedback mechanisms and transparency. Outcomes indicate generally low concern regarding the BESS component, with most feedback focused on solar and infrastructure elements, and no material community opposition identified. The project also delivered direct economic and social benefits through local procurement, employment during construction, and targeted community investment programs, including multiple funding rounds supporting local initiatives and events, alongside ongoing sponsorships and partnerships within the region.

2.7 Project Performance and Emissions

2.7.1 Energy Stored and Dispatched

The energy stored and dispatched to 24 April 2026 is shown in Table 3.

Table 3: Energy stored and dispatched to 24 April 2026

Time Period	Energy Charged	Energy Discharged
19/2/2026 – 24/4/2026	1,366 MWh	833 MWh

2.7.2 Market Bidding Parameters

At the time of this publication, market bidding has only been for the purpose of commissioning and testing. As such, market bidding is not representative of typical commercial operations. Generally bidding throughout testing and commissioning is at relatively low prices to ensure the BESS can operate at the required capacity for a given test.

Moving into commercial operations, the expectation is that bidding parameters will be such that the BESS can charge and discharge at times reflective of suitable market energy prices. Additionally, the BESS will be bidding into FCAS markets.

2.7.3 Emissions Intensity

The emissions intensity of the project was originally calculated using National Greenhouse Accounts Factors 2018 Scope 2 and 3 emissions for NSW of 0.92kgCO2-e/kWh and considering an assumed Round Trip Efficiency of 85%:

$$0.92 \times (1 - 0.85) = 0.138\text{kgCO2-e/kWh}$$

The emissions intensity of the project can now be updated to use that latest National Greenhouse Accounts Factors 2025 Scope 2 and 3 emissions for NSW of 0.67kgCO2-e/kWh and an actual Round Trip Efficiency of 81.7%:

$$0.67 \times (1 - 0.817) = 0.123\text{kgCO2-e/kWh}$$

This reduction has been primarily driven by the overall reduced emissions intensity of electricity supplied to the NSW network since 2018. However, the project will indirectly reduce emissions further in the following ways:

1. Encourage and support additional renewable energy generation by providing system strength, stability and security services to the network, particularly in the New England Region of NSW.
2. Compete with fossil fuel generators to output energy in periods of high prices, reducing the energy provided by fossil fuel generators.

3 Analysis of System Performance

3.1 NEM Market Participation

NEBESS has been a NEM market participant since registration on 14 February 2026. To date, engagement with the market has been limited to testing and commissioning. NEBESS is not currently registered for FCAS and as such has not been participating in FCAS markets.

3.1.1 AEMO Compliance

NEBESS continues to operate during testing and commissioning activities in compliance with AEMO requirements. Typical of testing and commissioning activities, NEBESS is required to troubleshoot and resolve issues encountered to satisfy each agreed R2 hold point test activity.

3.2 Reliability

3.2.1 Planned Outages

ACEN's planned outages required for construction and commissioning works are shown in Table 4.

Table 4: Planned outages during construction and commissioning

Date	Reason
20/10/2025	Communications works. 330 kV remained connected
19/11/2025	Communications works. 330 kV remained connected
3/12/2025	Feeder termination works. 330 kV was isolated
19/2/2026 - 20/2/2026	Feeder termination works. 330 kV was isolated
5/3/2026 – 6/3/2026	Feeder termination works. 330 kV was isolated

These outages did not affect typical operations of NEBESS as the facility was in commissioning at the time and was not commercially operating. Ongoing yearly maintenance of the substation will require an outage of approximately two days, which can be expected to affect commercial operations. These outages are generally planned well in advance.

There have been no planned outages by AEMO or Transgrid applied or planned on NEBESS as at the publication of this report.

3.2.2 Unplanned Outages and Commissioning Issues

There have been no unplanned outages to date.

3.3 Grid Connection Performance

3.3.1 Connection Arrangement

The grid connection arrangement worked well for the project. Extension of the existing Transgrid switchyard minimised the cost of an additional point of connection. A change to the GPS was required to expand the BESS from 50 MW to 200 MW, of which the application was undertaken in parallel to other project works. This approach worked well considering the duration of the application. Undertaking the GPS modification sequentially would have resulted in substantial delays to the project.

3.3.2 Co-location with New England Solar

The co-location of NEBESS with the New England Solar Stage 1 project is expected to be beneficial for performance of the solar project. Typically, the solar project has encountered two types of constraints, those being a thermal constraint (a transmission line on the network is thermally constrained, limiting the active power generation of New England Solar) and an inverter constraint (number of inverters allowed to dispatch, due to a lack of system strength).

Given that NEBESS will be acting as a load (charging from the grid) during peak solar dispatch windows, it is expected that the thermal constraints on New England Solar will be reduced, as active power flows directly to the battery instead of along various transmission lines. Additionally, marginal loss factor (MLF) is likely to be improved as a result of the BESS load.

Transgrid is currently investigating the registering of certain assets in the NEM to provide system strength. The Siemens SINAMICS inverters used in the NEBESS are expected to be able to participate and provide local system strength, therefore reducing system strength constraints applied to New England Solar.

4 Findings, Outcomes and Lessons Learned

4.1 Lessons Learned from Financial Close

One of the original goals of developing NEBESS as a co-located asset with the New England Solar Stage 1 and Stage 2 projects was to increase the utilisation of the solar project infrastructure and related approvals and increase the economic efficiency of the investment in the overall facility. This goal has been realised successfully, and as a result, is a model ACEN has adopted across its broader portfolio, with all its development stage solar and wind projects, either co-located or hybridised with BESS.

ACEN's intention was to construct NEBESS and the Stage 2 Solar projects concurrently. Several complexities of this intention were identified early in the financial close process for NEBESS, particularly that the NEBESS construction contractors would require interfaces with the Stage 1 Solar operations contractor and the Stage 2 Solar construction contractors. In most construction contracts, the contractor that is responsible for the works (such as the NEBESS works, or a substation) is legally required to act in the role of Principal Contractor. This is an important role and has significant implications for workplace health and safety, and responsibility for design, construction and commissioning. As a result, the Principal Contractor of a project will try to carefully limit their responsibility to works within their control. Interfaces between contractors, physical and design, blur these lines of responsibility and increase the risk of disputes should any issues arise.

At this time, ACEN's view was that there were no contractors in the market with sufficient experience and capability to act in the role of Principal Contractor for a substation, a solar project and a BESS project of this scale, over $1billion of works in total. ACEN determined it would require multiple construction contracts, and therefore multiple Principal Contractors, to complete all the works.

ACEN identified that the greatest number of interfaces would occur in the substation, which was a shared area with separate bays for each HV to MV transformer and related infrastructure such as switchrooms. This area is high risk due to the high voltage equipment and the relatively small area the work is to be conducted in.

To manage this risk, ACEN adopted a split contract model in which one contractor would be responsible for designing and building the substations of both the NEBESS and Stage 2 Solar projects, and separate contractors would be required for the remaining BESS works and solar works. Additionally, the NEBESS project and Solar Stage 2 project had separate legal entities to increase financing flexibility for each project. This meant that while the substation works for each project could be completed by the same contractor, the project legal entity that would be the counterparty to the construction contract would need to be different. As a result, the full contract suite included two EPC contracts and two O&M contracts for the substation works, an EPC contract and O&M contract for the BESS works and an EPC contract and O&M contract for the solar works. Aligning the terms and interface points of all these contracts was a complex and intensive task that ACEN had not undertaken previously. In addition, administering these contracts and managing the interfaces during construction required additional internal resources than would otherwise be required.

The key lesson learned from this process was that financing a portfolio of projects, as opposed to financing individual projects separately, would simplify the legal structure of co-located projects and allow simpler construction models, and that if split contracts are required, then allowance should be made for additional contract and project management resources to manage not only the contracts but the interfaces between them.

4.2 Connection Agreements and Regulatory Approvals

Key lessons learned in relation to connection agreements, registration, and broader approvals for the NEBESS project centre on early definition, stakeholder alignment, and de-risking of compliance pathways.

A primary lesson is the importance of progressing GPS and connection agreement negotiations as early as possible, with sufficient preliminary design completed to support technically robust submissions. Interfaces between the BESS and substation, particularly MV cable scope and control system boundaries, required more upfront definition than initially anticipated. Where these interfaces were not fully resolved prior to EPC execution, they introduced rework and approval delays during the connection process. For complex arrangements such as the 2 DUID and single point of connection configuration, early engagement with both the network service provider and AEMO is critical to validate assumptions and avoid redesign.

Another key learning relates to approval dependencies. Certain approvals, such as the Fire Safety Study (FSS), sat on the critical path for both construction and connection registration. The project demonstrated value in negotiating conditional or staged approvals, allowing non-impacted works to proceed while higher-risk elements remained under assessment. This approach reduced schedule pressure but required clear agreement with regulators on hold points and compliance boundaries.

From a registration perspective, aligning commissioning strategy with AEMO requirements proved essential. Early energisation of the HV assets under an auxiliary load arrangement enabled preliminary testing and de-risked later stages of the registration process. However, this also highlighted the need for a well-structured commissioning and R1/R2 testing plan that is agreed in advance with AEMO and the TNSP, ensuring that data quality, modelling, and performance validation requirements are met without iterative re-submissions.

Finally, stakeholder coordination across multiple contractors and approval bodies emerged as a recurring theme. Connection and approval processes cut across EPC scopes, meaning that gaps in responsibility definition or inconsistent technical assumptions can delay approvals. Establishing clear ownership of connection deliverables, supported by integrated design management and regular alignment with approval authorities, is critical to maintaining programme certainty.

4.3 Program Contribution: Lowering Barriers to Investment

4.3.1 Grid Forming Inverter Precedent

The NEBESS project established a practical precedent for the successful connection of grid forming inverter technology within the NEM under existing GPS frameworks. At the time of initial application, there was limited regulatory and industry experience with grid forming systems, requiring additional modelling, stakeholder engagement, and iterative refinement of performance standards. The project demonstrated that grid forming capability can be accommodated within the existing Rules, and directly informed subsequent improvements to standards and guidance. This has contributed to reducing uncertainty for future proponents by clarifying expectations around modelling, performance validation, and compliance pathways, and by demonstrating that grid forming systems can meet or exceed GPS requirements without compromising system security.

4.3.2 Construction and Commissioning Knowledge

The project also provided valuable construction and commissioning learnings relevant to future large-scale BESS developments. The use of a multi-EPC delivery model highlighted the importance of clearly defined technical interfaces, particularly between BESS and HV scopes, and the need for early design alignment to avoid rework during execution. Construction methodologies such as direct-to-foundation installation of battery units, minimisation of laydown areas, and parallel delivery of substation and BESS works demonstrated opportunities to optimise schedule and logistics. From a commissioning perspective, the project reinforced the importance of aligning testing strategies with GPS and AEMO requirements early, including staged energisation and integration testing across multiple systems. These learnings provide a more mature delivery framework for subsequent projects, reducing execution risk and improving confidence for investors considering similar assets.

4.4 Policy Observations and Opportunities

Policy settings within the NEM are evolving to better accommodate technologies such as grid-forming BESS, but the NEBESS experience highlights both opportunities and ongoing barriers. A key opportunity is the continued refinement of GPS frameworks and connection processes, which are increasingly capable of capturing advanced inverter behaviour without requiring bespoke drafting. Earlier versions of the Rules required workarounds to fit grid-forming capability within inverter-based standards, increasing complexity and approval timelines, whereas more recent changes have introduced greater flexibility and improved standardisation.

At the same time, changing policy settings introduces transitional risk. Projects progressing through the connection process may be subject to evolving GPS requirements, modelling expectations, and system strength frameworks, which can drive redesign, additional studies, and re-submissions. The NEBESS project also highlighted that limited familiarity within the NEM with newer technologies such as grid-forming inverters can lead to a high volume of technical queries and extended due diligence during approvals.

Key policy barriers to broader uptake, therefore, include the complexity and duration of GPS negotiations, limited standardisation in connection requirements, and the need for alignment between AEMO, network service providers, and proponents. While recent rule changes have improved the framework, further streamlining of connection processes and clearer technical guidance would reduce development risk and support faster deployment of BESS technologies across the NEM.

4.5 Project Importance and Future Applicability

The NEBESS project represents a critical step in demonstrating the technical and commercial viability of large-scale battery energy storage within the NEM. By successfully delivering a complex, grid-connected BESS under a multi-EPC contracting structure, the project provides a replicable model for integrating storage with existing transmission infrastructure, managing contractor interfaces, and navigating the increasingly rigorous connection and registration requirements set by AEMO. The project also contributes to system reliability and flexibility by enabling firming of renewable generation and providing essential system services, supporting the broader energy transition.

Looking beyond the current contract, the methodologies, design standardisation, and approval pathways established through NEBESS have clear applicability to future BESS and hybrid energy projects. Lessons around early GPS definition, interface management, and staged commissioning can be directly applied to reduce risk and compress delivery timelines on subsequent developments. The project also establishes a foundation for scaling similar assets across ACEN’s portfolio, as well as informing industry best practice for integrating storage at transmission level. Future phases are likely to focus on optimising operational performance, leveraging market participation strategies, and applying the learnings from NEBESS to accelerate deployment of storage assets in other regions.

Appendix A – Glossary of Terms

Term / Abbreviation	Description
AEMO	Australian Energy Market Operator
BESS	Battery Energy Storage System
DUID	Dispatchable Unit Identifier
EEP	Emerging Energy Program (NSW Government)
EMS	Energy Management System
EPC	Engineering, Procurement and Construction
FCAS	Frequency Control Ancillary Services
FSS	Fire Safety Study
GFM / GFL	Grid Forming / Grid Following (inverter type)
GPS	Generator Performance Standards
HV	High Voltage
IRP	Integrated Resource Provider
LFP	Lithium Iron Phosphate (battery chemistry)
MCP	Master Controller for Plants (Siemens)
MV	Medium Voltage
NEM	National Electricity Market
NER	National Electricity Rules
NES / NEBESS	New England Solar / New England Battery Energy Storage System
NSP / TNSP	Network Service Provider / Transmission NSP
O&M	Operations and Maintenance
POC	Point of Connection
PPC	Plant Power Controller
SCADA	Supervisory Control and Data Acquisition
SPV	Special Purpose Vehicle
VSG	Virtual Synchronous Generator
SOC	State of Charge