ESCRI-SA Dalrymple Battery Storage Project - Status Update

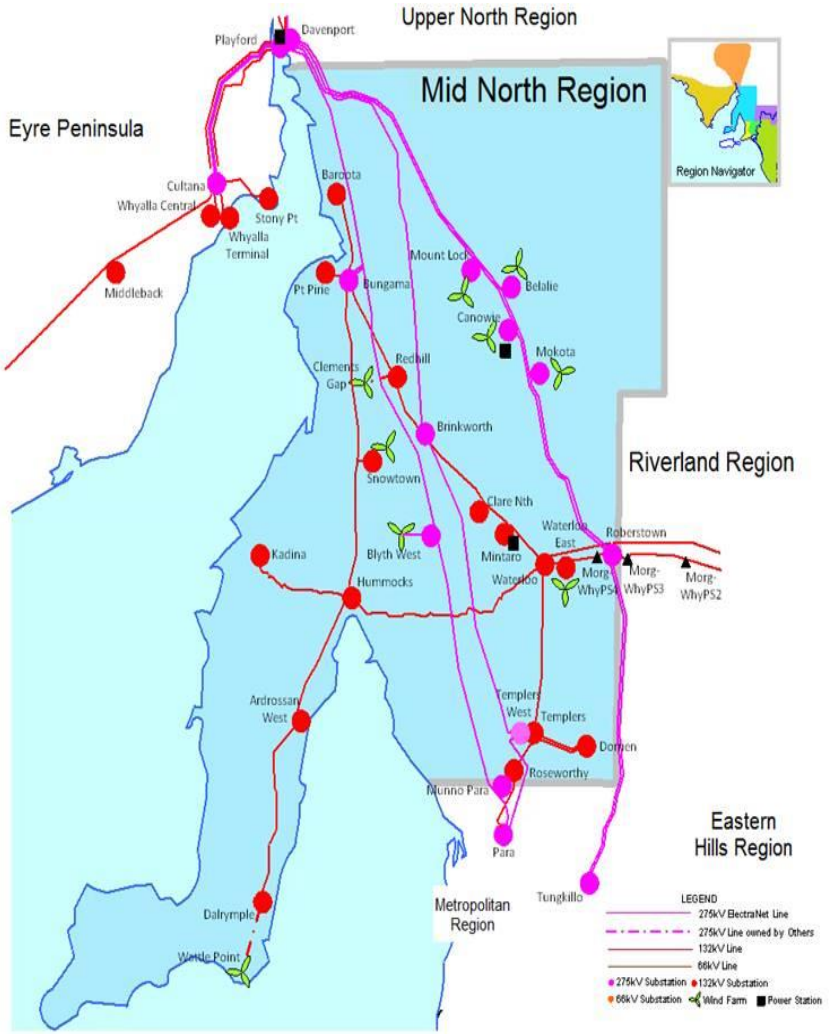
ESCRI Knowledge Sharing Reference Group

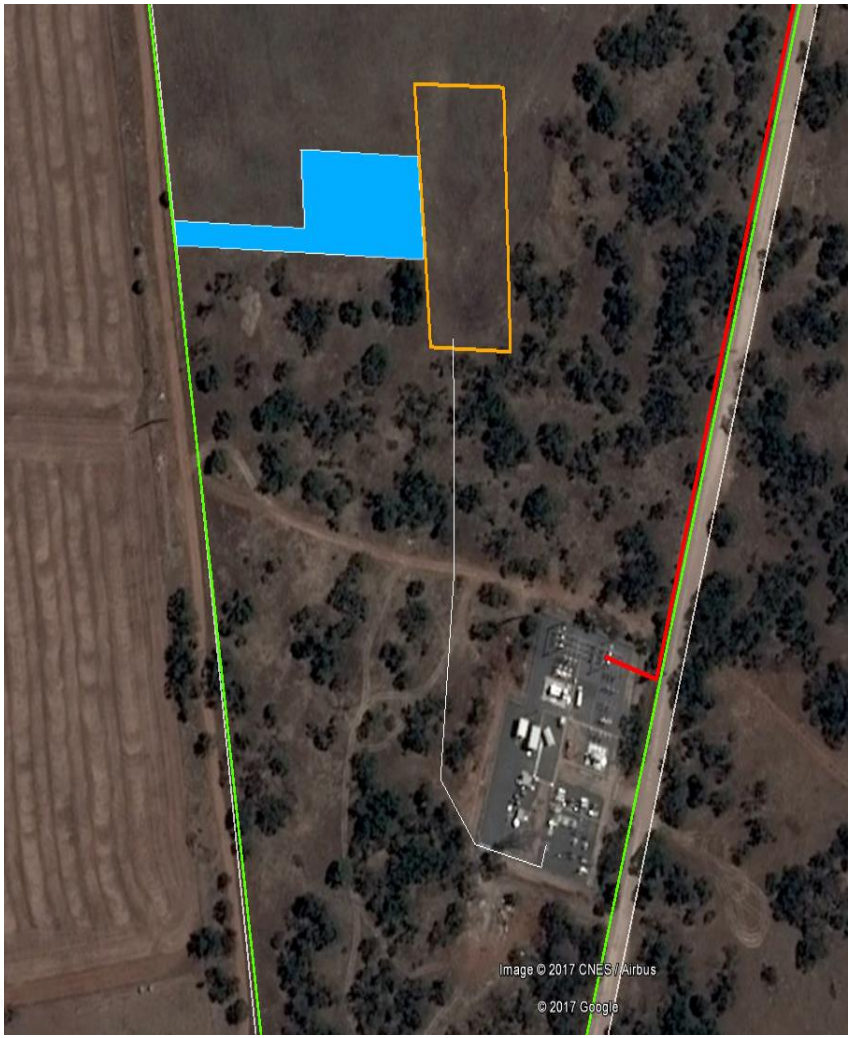
8 May 2018

In partnership with:

This activity received funding from ARENA as part of ARENA's Advancing Renewables Programme

LOCATION


Upper North Region
Mid North Region
Eyre Peninsula
Riverland Region
Eastern Hills Region
Metropolitan Region
Region Navigator
Playford
Davenport
Cultana
Whyalla Central
Stony Pt
Whyalla Terminal
Middleback
Baroota
Pt Pirie
Bungama
Mount Lock
Belalie
Canowie
Mokota
Clements Gap
Redhill
Brinkworth
Snowtown
Clare Nth
Waterloo East
Roberstown
Kadina
Blyth West
Mintaro
Waterloo
Morg-WhyPS4
Morg-WhyPS3
Morg-WhyPS2
Hummocks
Templers West
Templers
Dorrien
Roseworthy
Munno Para
Para
Ardrossan West
Dalrymple
Wattle Point
Tungkillo
LEGEND
275kV ElectraNet Line
275kV Line owned by Others
132kV Line
66kV Line
275kV Substation
132kV Substation
66kV Substation
Wind Farm
Power Station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Dalrymple North – Completed Site

SCOPE

- Project Goals
  - Integrating intermittent renewable energy in an interconnected power system by coordinating the Battery Energy Storage System operation with the Wattle Point Wind Farm operation;
  - Provision of a range of regulated and competitive market services e.g.:
    - *Unserved Energy Reduction;*
    - *Fast Frequency Response;*
    - *FCAS; and*
    - *Cap Trading*
  - Support of the Dalrymple load under islanded conditions;
  - Wattle Point Wind Farm integration in an islanded system (aspirational goal);
  - Dissemination of knowledge as part of a Knowledge Sharing Program.

DESIGN

- Accelerated design process
- Staged design:
  - Civils / structural – so as site works could start as soon as DA received, relying mostly on usual ElectraNet approach (SDM)
  - Primary – so as equipment installation could start as soon as deliveries made and building available
  - Secondary / protection
  - For primary / secondary design – while normal (SDM-based) approach was preferred - where applicable or where it could be easily adapted, some matters required new approaches to be developed as part of the project. E.g. considerations re. equipment isolations and associated design implications.
- Two Safety in Design Assessments – civils / construction, respectively equipment / installation.

DESIGN

- Fire risk and consequence analysis, including subsequent design of fire detection and suppression systems
- BESS cooling system – air conditioning;
- Interaction between batteries / inverters / transformers for the case in which a fire would develop
- Consultation with Country Fire Services
  - Conditions of Development Approval
  - Local council requirements
  - CFS requirements
  - SAPN requirements

PROCUREMENT

- Concurrent procurement of essential / long lead equipment, with associated risks
- Staged deliveries so as to allow progressive equipment installation:
  - Batteries – 05.02.2018;
  - BCPs – 20.03.2018;
  - Inverters – 22.03.2018;
  - Power transformers – 20.03.2018;
  - Indoor switchgear – 15.01.2018;
  - Cables / bus duct – 15.01.2018.
- Suppliers from Korea, China, New Zealand, Europe – long distances, long delivery timeframes
- Little margin for error – for any long lead equipment characteristics (e.g. dimensions) mismatches / misunderstandings

DEVELOPMENT APPROVALS

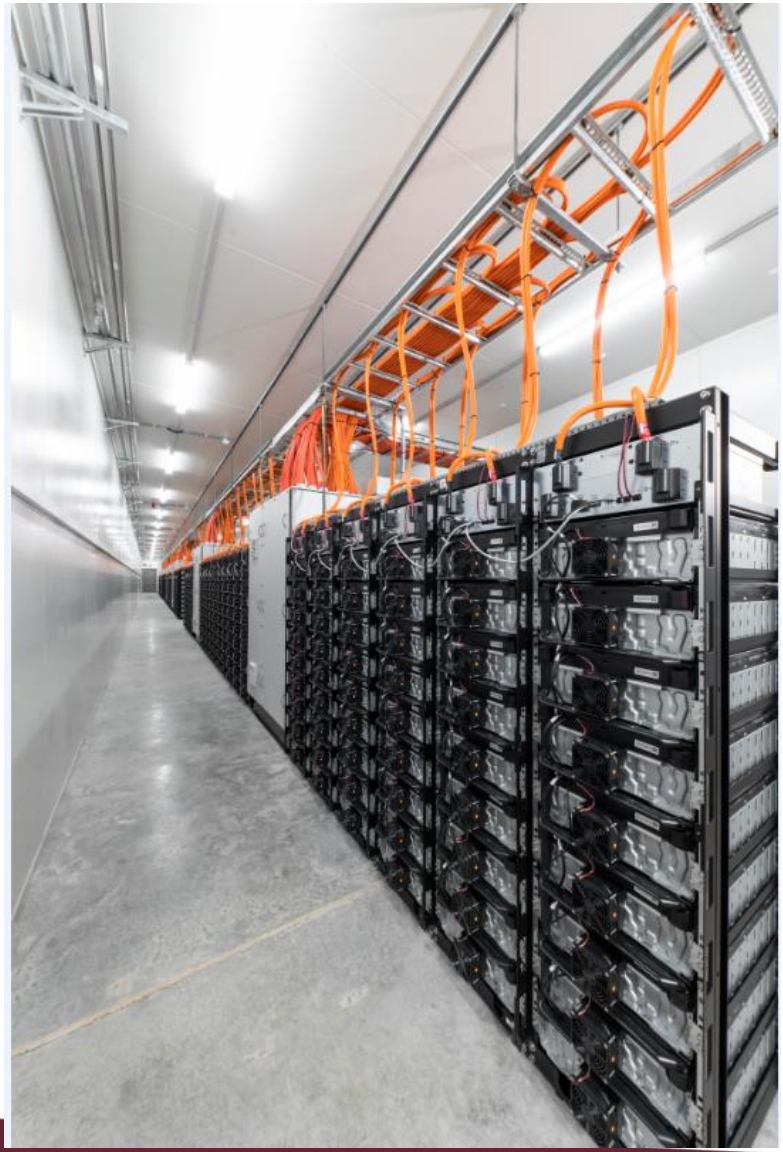
- Exemption request - declined
- Crown sponsorship request (seeking speedy referral process) – July 2017
- Development approval process
  - In accordance with the Development Act 1993, section 49 (Crown Development Sponsorship)
  - Submission: July 2017
  - Public notifications, no major opposition
  - Consultation with local landowners, as per stakeholder management plan
  - Development Approval – issued (with conditions) on 11 October 2017
  - ….no special favours for Development Approvals

Construction

- Concurrent works at Dalrymple and Dalrymple North
- Installation at Dalrymple North of free-issued equipment by ElectraNet – covering largely the BESS connection to the network.
- At Dalrymple
  - Civil works – all preparation done before DA;
  - Civil works continued after DA was issued (11.10.2017, rather than as planned for July 2017);
  - Building construction – completed before Christmas 2017;
  - Building internal walls / doors (some fire resistant);
  - Electrical fitout;
  - Equipment installation.
- Weather-related equipment delivery delays required on-the-run changes to equipment installation.

Dalrymple Substation

Dalrymple North - Batteries



Dalrymple North - Inverters

Dalrymple North - Transformers

Dalrymple North – Switchgear

Dalrymple North – Switchboard

Studies

- Network studies – Forteng
  - BESS mathematical model – challenges, compliance, complexity – i.e. able to operate in both ‘Connected to Grid’ and ‘Islanded’ condition;
  - BESS models due-diligence review – AEMO requirements compliance;
  - Network studies in support of GPS / CPS;
  - GPS / CPS assessment by AEMO and ElectraNet as a TNSP.
- Protection studies – protection settings
  - BESS connected to network;
  - Islanded condition.
- Registration process
- Regulatory framework – considering the dual nature of the BESS – behaving both as load / generator

OTHER WORKS

- Interfacing with local council – onerous requirements for local roads upgrades
- Interfacing with CFS
  - Fire risk and consequence analysis;
  - Creation of 50 m buffer around BESS site – no combustible vegetation in respective area;
  - Water tank – able to support fire fighting activities for 30 min, both for:
    - External fires potentially propagating inside the BESS compound; and
    - Internal fires potentially migrating outside of the BESS compound.

ISLANDING DETECTION

- SAPN requirements:
  - no local customers to be worse-off / no degradation of SAPN services reliability – as a result of BESS connection
  - Implementation of BESS anti-islanding capability
- BESS anti-islanding activation for:
  - Insufficient number of batteries / inverters online (insufficient fault current contribution under islanded condition)
  - Islanding detection system in-operational
- Topology-based islanding system
  - Monitoring circuit breakers / disconnectors statuses at various substations (via auxiliary contacts) ⇔ planned outages
  - Monitoring protection relays - i.e. CB imminent tripping under fault conditions detected via protection relays (even before the CBs would open) and transmitting trip signals via telecommunication systems ⇔ unplanned outages

TESTING & COMMISSIONING

- Equipment tests
- Protection tests
- Outages and energisation – energisation achieved on 30.04.2018
- Regulatory framework not developed yet for battery systems
- Implication for batteries charging (required for offline testing)
- Hold-point testing
- Combined WPWF / network testing – functionality tests
- Islanding operation testing

Dalrymple North – Aerial View

Questions

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Thank you

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