

ESCRI-SA

Ongoing performance

ESCRI Knowledge Sharing Reference Group

12 June 2019

In partnership with:



ARENA
Australian Government
Australian Renewable
Energy Agency



Advisian
WorleyParsons Group

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Presentation outline

- > General asset performance
- > Examples of normal BESS operations
- > System events (e.g. faults) and incidents
- > General operational issues
- > Safety performance and learnings
- > What O&M is occurring?

The 4 key services

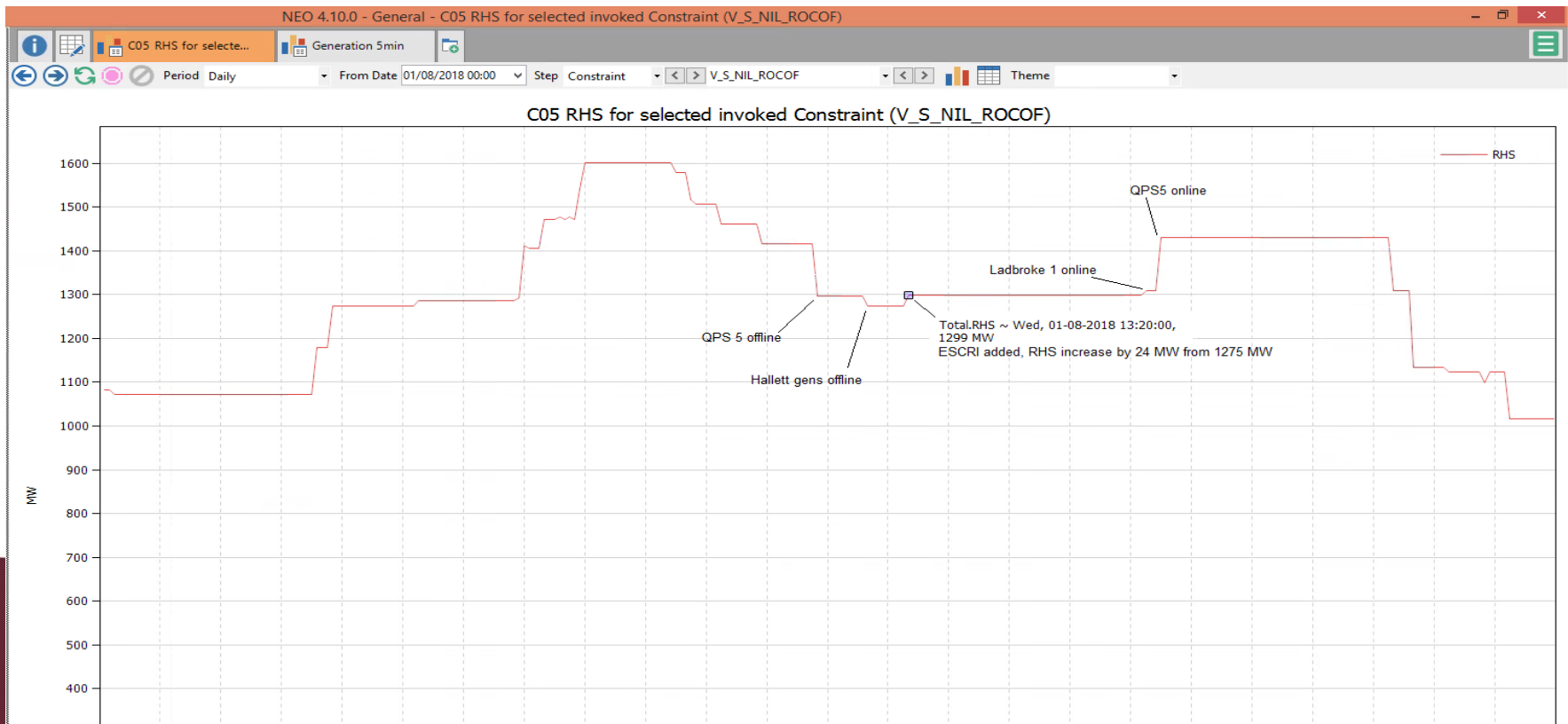
- > Dalrymple BESS provides 4 key services:
- > Regulated (ENet)
 - Reduction in unserved energy
 - Heywood interconnector benefit (uplift)
- > Unregulated (AGL)
 - FCAS
 - Cap Trading

Reduction in Unserved energy

- > 29 March – Islanding Detection System (IDS) failure, incorrect detection and creation of island
- > 7 April - Planned outage for maintenance work to the line protection and isolators in the Ardrossan West and Hummocks substations.
- > Dalrymple BESS was able to provide approximately seven hours of the required supply during a seven and a half hour outage.

Heywood interconnector benefit - ROCOF

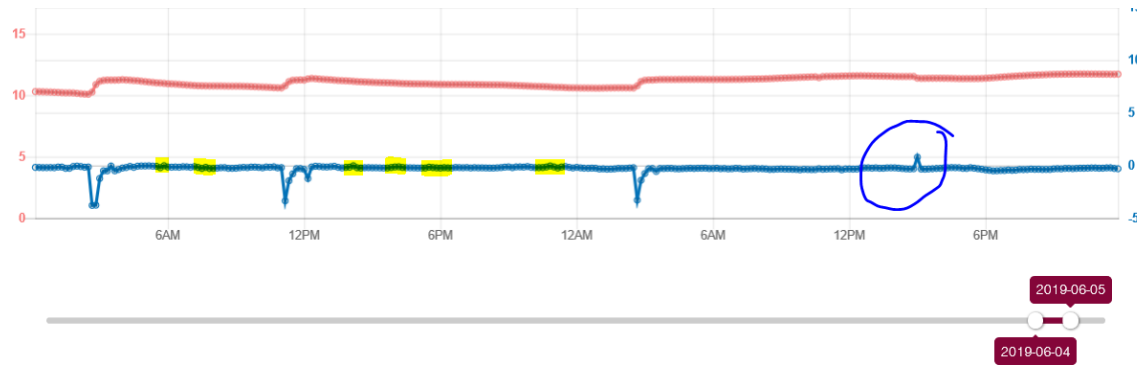
- > Note other generators coming on and off, BESS “always there”.
- > Binding hours for the ROCOF constraint have been lower than expected due to AEMO directing generators on for system strength. However we expect this to constraint to come back into play.



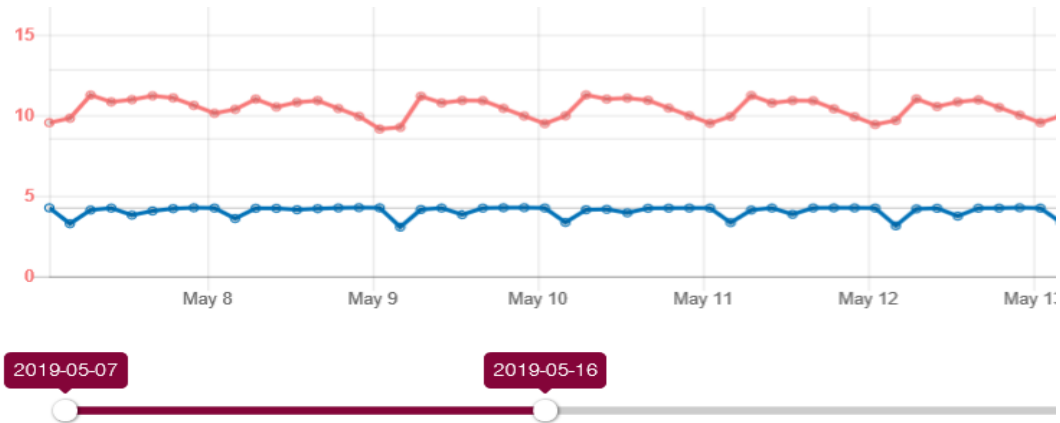
Examples of normal operations

- > FCAS operation
- > Periodic recharging
- > Occasional cap trading
- > https://www.escri-sa.com.au/data/?indicatorA=DALR_N.GEN.DALR_N.MWER&indicatorB=DALR_N.GEN.BESS.MW

FCAS operation



Periodic recharging



Occasional cap trading



System events (e.g. faults) and incidents

- > System Incident on 29 March 2019
- > System Incident on 7 April 2019
- > Various network faults and how the BESS performs under fault conditions
- > Lesson learnt from system incident and events

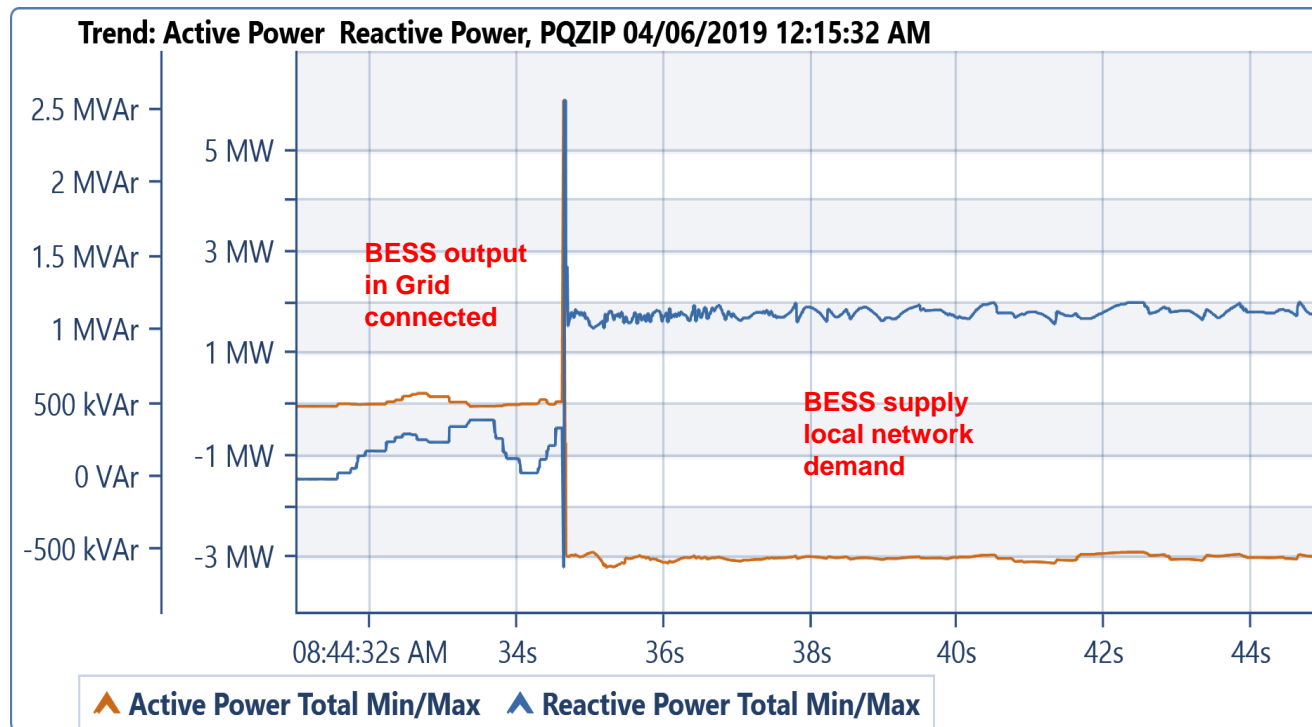
System Incident on 29 March 2019

> IDS mal-operation during network switching

- ElectraNet carried out line switching at Ardrossan West
- IDS operated due to incorrect logic in Ardrossan West IDS unit
- IDS operated cause tripping of 132 and 33 kV CB at Dalrymple
- Dalrymple BESS went to islanding operation to supply Dalrymple load for 30 minutes
- Dalrymple load at the time was approximately 3 MW
- No load was lost to the lower Yorke Peninsula region during the 30 minute outage
- Successfully re-synch with the system

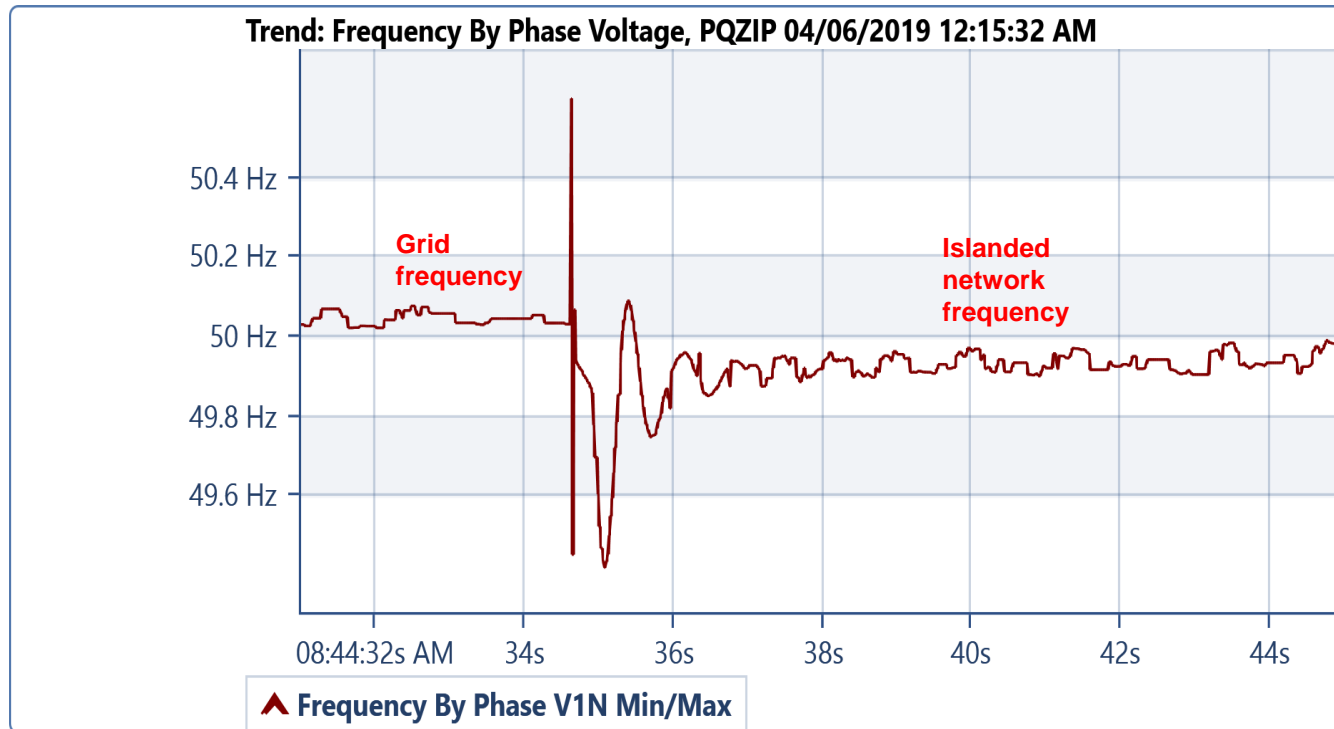
29 March 2019 Incident

> BESS PQ load



29 March 2019 Incident

> Islanded Network Frequency



System Incident on 7 April 2019

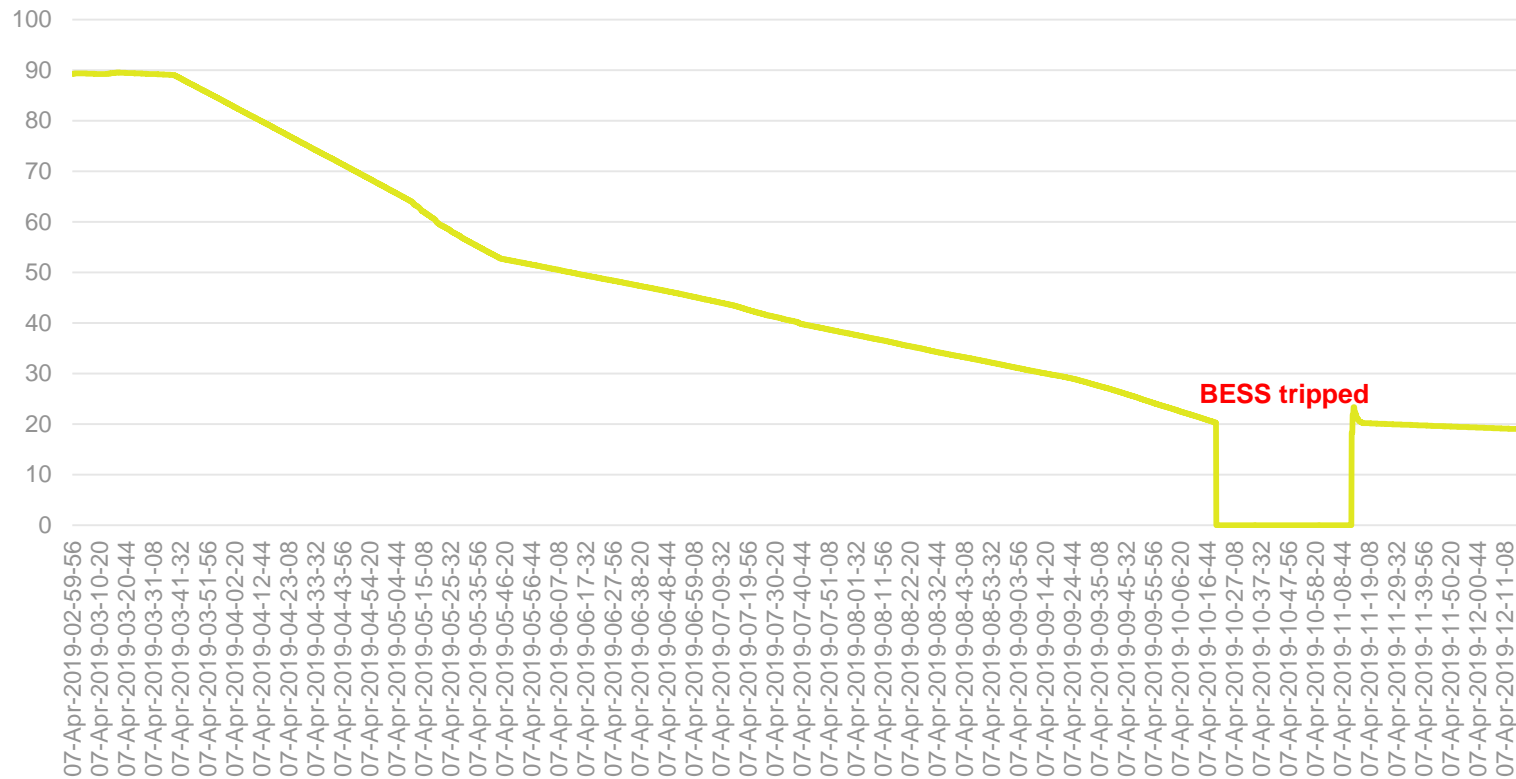
> Dalrymple BESS tripped by vector shift relay

- In the early hours of 7 April, ElectraNet carried out protection and isolator maintenance at Hummocks substation that required to have planned outage of the Yorke Peninsula 132 kV network
- IDS was in non auto
- Dalrymple BESS successfully transited to islanding operating condition
- BESS supply local load 7 hours
- Dalrymple local was approximately 1 MW
- BESS tripped by vector shift relay when SAPN restored one of the 33 kV feeders resulting in a loss of supply for the last 30 minutes of the 7.5 hour outage

7 April 2019 Event

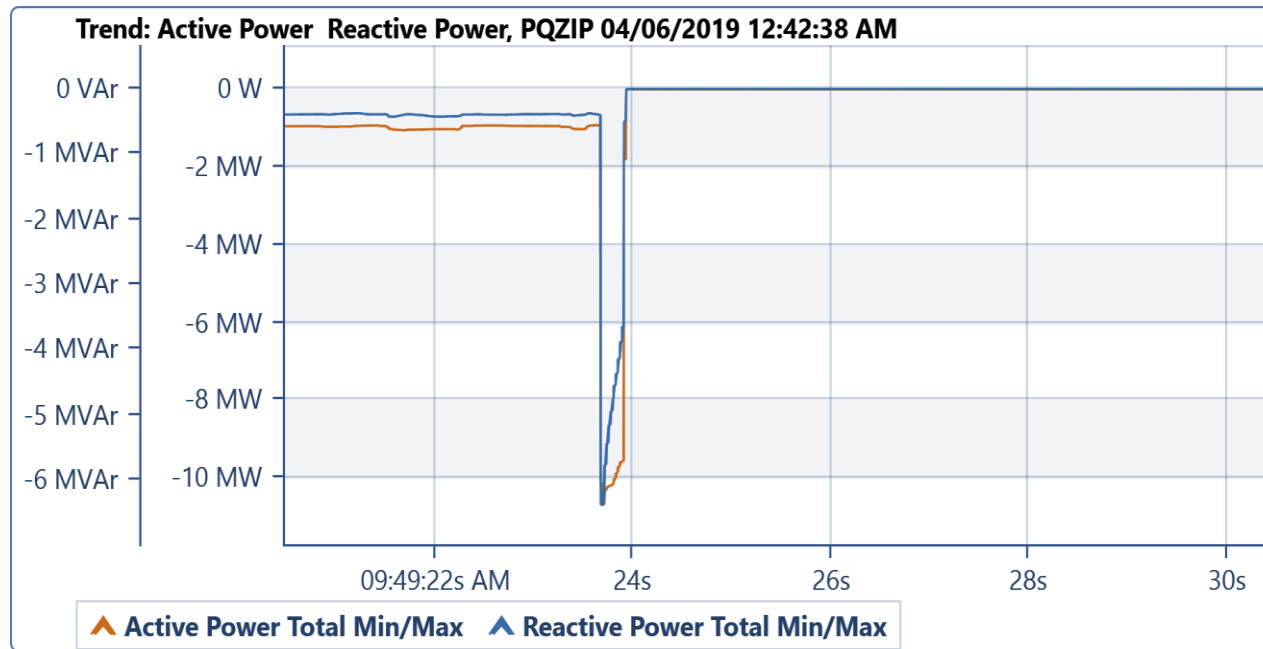
> BESS State of Charge (SOC)

> Note: SCADA reading zero when BESS tripped offline



7 April 2019 Event

> PQ load of the BESS

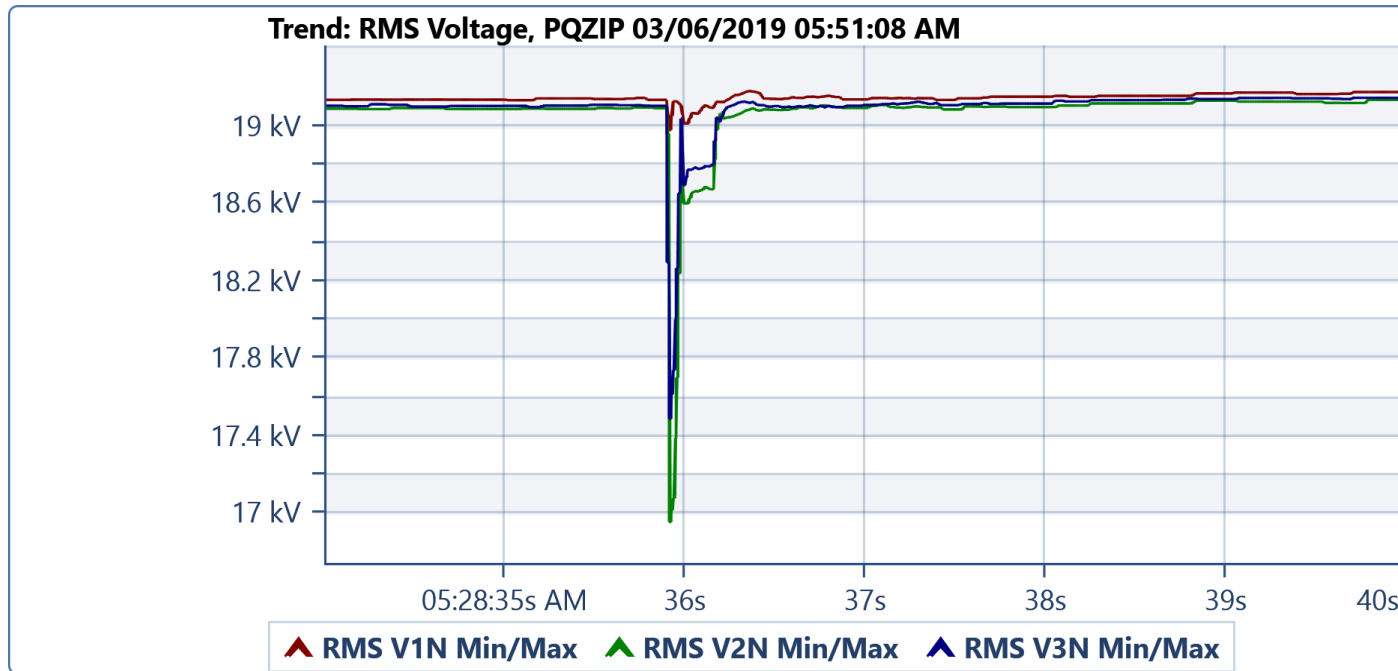


System Faults

- > Since being in operation the Dalrymple BESS has successfully rode through a number of system faults such as:
 - 2 Phase fault on the Para – Angas Creek 132 kV line at 3:19 on 4/3/2019
 - 2 Phase fault on the Mintaro – Waterloo 132 kV line at 5:29 on 4/3/2019
 - 1 Phase fault auto reclose on the Clare North – Mintaro 132 kV line at 6:20 on 4/3/2019
 - 2 Phase fault on the Templers West – Brinkworth 275 kV line at 2:06 on 2/4/2019
- > BESS operated as expected during system faults

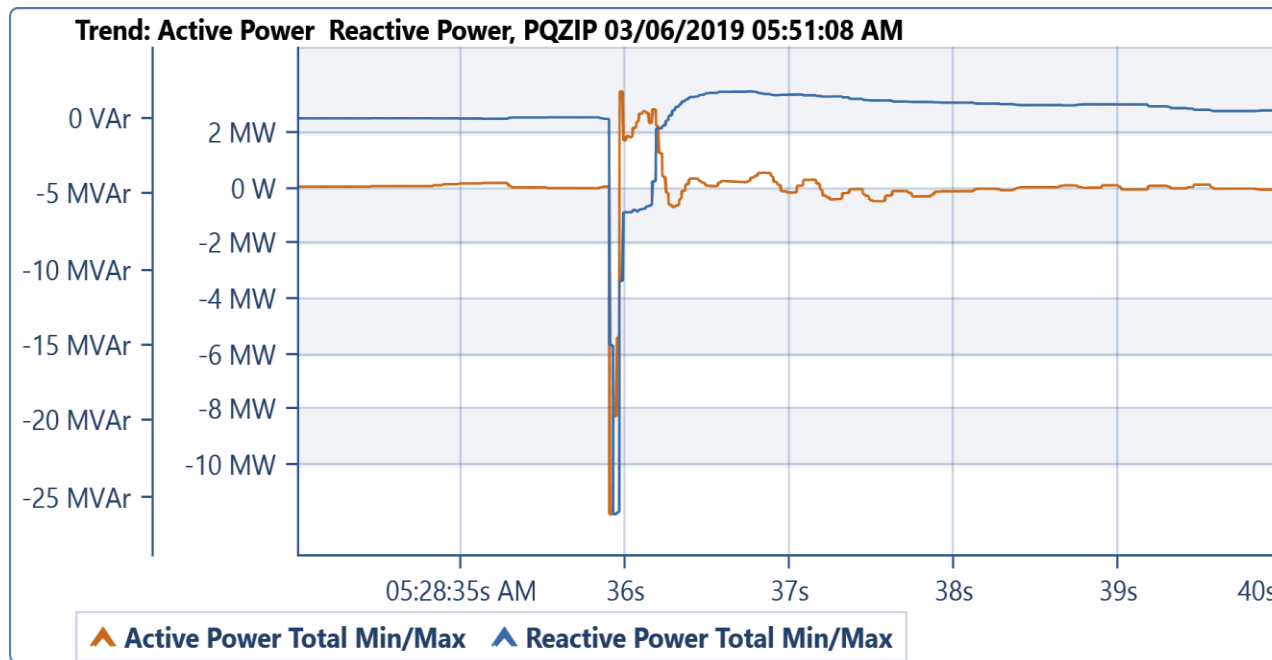
2 Phase fault on the Mintaro – Waterloo 132 kV line at 5:29 on 4/3/2019

> Dalrymple BESS RMS Voltage



2 Phase fault on the Mintaro – Waterloo 132 kV line at 5:29 on 4/3/2019

> Dalrymple BESS PQ Load



Lessons Learnt from System Incident and Events

- > IDS logic has been fixed after the incident on 29 March 2019
- > Backup vector shift relay operation confirmed by ElectraNet study – Vector shift relay operation has been isolated after the 7 April 2019 event.
- > The Dalrymple BESS successfully transitions from Grid connected to Islanded operation and supply local load without any issues.
- > The Dalrymple BESS can successfully ride through transmission network faults and provide significant reactive power to support network voltage during the fault.
- > The BESS is able to control islanded network voltage and frequency within the normal operating range.

General Operational Issues

- > A selection of issues during the first months of operation that may be of interest to the Knowledge Sharing Reference Group
 - Losses
 - Availability
 - Cycle count
 - Voltage v PF mode
 - Communications loss

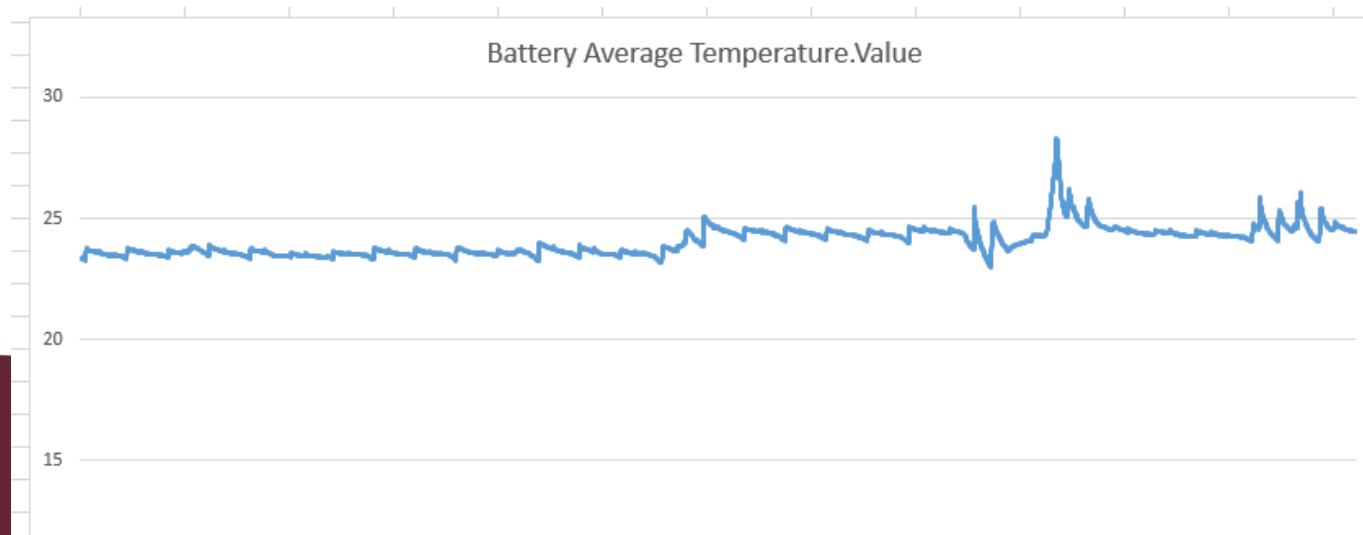
Losses

- > Standby power consumption for the BESS is higher than expected
- > However to ensure that the BESS is able to respond to events in a very short time frame, these losses accrue continuously

Availability

Month	1	2	3	4	5
Date From	14/12/2018	14/01/2019	14/02/2019	14/03/2019	14/04/2019
Date to	14/01/2019	14/02/2019	14/03/2019	14/04/2019	14/05/2019
Availability (%)	98.07	91.60	99.08	99.61	100

- > Contractual target of 96%
- > Actual performance has been good and improving
- > Month 2, poor performance due mainly to air conditioning issues during warm weather
- > Manual shutdown (full and part for a few days). Concerned that until the Air Con fault fixed, the additional heat load may impact the Air Cons or adversely impact the equipment in the battery/inverter rooms.



Safety & environment

- > Discussion of Safety items from R2 and final commissioning tests
 - Main safety areas – safety of personnel, network, equipment
 - During R2 testing and islanding testing – safety of personnel was less likely to be at risk, as the equipment is static
 - Safety of the network was addressed by modelling extensively the planned tests and thus ensuring that no unsafe network conditions occurred
 - Safety of equipment was covered in part through design and in part through system simulations - that predicted the conditions that would occur during normal operation, testing and foreseeable system events
- > Site is largely unmanned
- > Noise – measurements will be done to ensure design alignment with field noise levels; if necessary, additional noise mitigation measures to be implemented
- > Maintenance is planned to be performed by considering associated safety aspects – specifically isolating equipment so as various sources of energy could be isolated and associated hazards eliminated or reduced as far as possible

What O&M is occurring?

- > Maintenance/support contract with CPP for 12 years (they engage ABB/Samsung for specialist support)
- > Remote monitoring available to maintenance supplier, to allow BESS real-time performance monitoring and facilitate diagnosis prior to site interventions
- > A/C issues: Reoccurring A/C failure alarms
- > Remedial work / investigation with supplier of A/C units to change latching alarms to self-resetting
- > Additional A/C units to be procured and installed on site.
- > BESS wide & Inverter individual Urgent & Non-Urgent Alarms are Latching.
- > Communications failures
- > This makes up 90% of the maintenance effort, apart from those discussed in general operation issues

Questions?



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Thank you

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