

Paris Session  
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# Applications of Grid Forming Inverters in BESS and Contribution to System Strength Improvements

SC B3 Substations  
PS1 / Q1.2

Crina Costan - Australia

# Grid Scale BESS in the NEM

According to AEMO there are:

- **6 large scale BESS in operation in the NEM**
- **85 large BESS are in the planning phase**

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## #01

First large-scale BESS in the NEM was built in 2017 in SA 100 MW and then upgraded to 150 MW

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## #02

Dalrymple BESS in SA 30 MW

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## #03

Ballarat ESS in Victoria 25 MW

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## #04

Gannawarra ESS in Victoria 25 MW

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## #05

Lake Bonney in SA 25 MW

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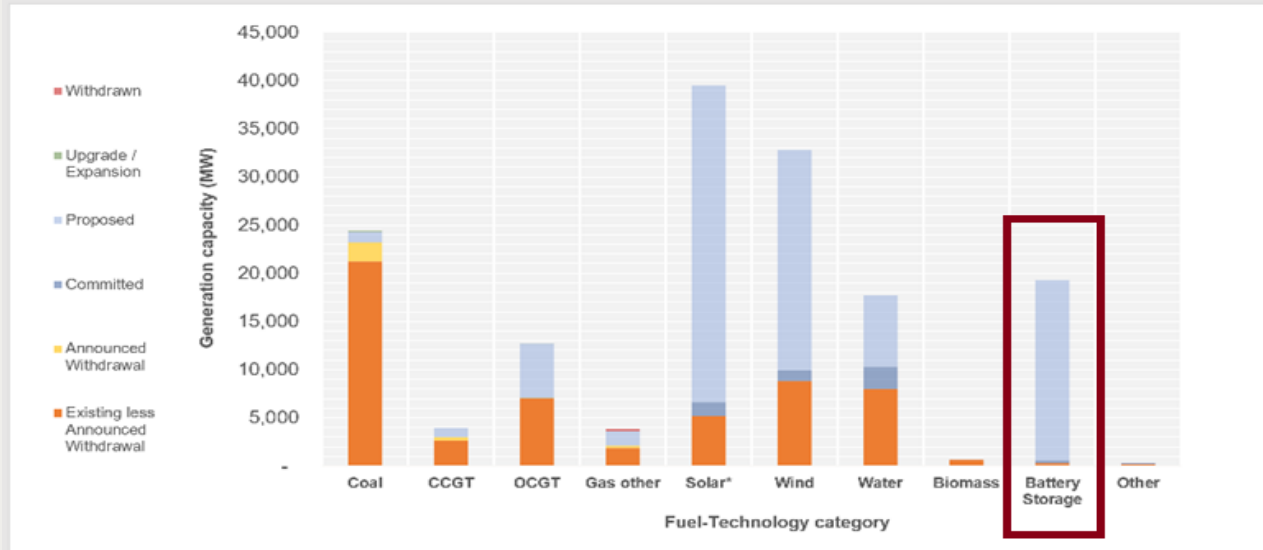
## #06

Geelong – Victorian Big Battery 300 MW

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# Grid Scale BESS Registration in the NEM Current and Future

Summary Chart: NEM Scheduled, Semi-scheduled & Non-scheduled Generation (MW) - Existing and New Developments by Fuel-Technology Category



According to AEMO in the recent Integrated System Plan:

- **30 GW of large-scale BESS to replace 63 % of coal fired generation by 2040**
- **85 BESS applications are in the planning phase**

## **BESS – Types of Inverters**

### **Current Source Inverters:**

- Typically used for Solar and Wind Farm applications as Grid Following Inverters

### **Voltage Source Inverters:**

- Typically used for BESS with Grid Forming Capability

**The design of the two types of inverters is quite different**

**This is due to the differences in the controller functionality**

## **BESS – Impact of Using Different Types of Inverters in Substations Applications**

- BESS with grid forming inverters are preferred for transmission type applications
- BESS with grid forming inverters contribute to the improvement of system strength
- When connected to substations at the end of a radial line they can supply the load downstream in an islanded mode
- Can provide Black Start support to the transmission network
- They are connected to transmission network substations
- There are multiple design aspects of connecting a BESS such as: AC supplies, earthing, UPS requirements, extensive new SCADA signals

# Comparison of Grid Following (GFI), Grid Forming(GFMI) and Grid Forming in Virtual Synchronous Generator Mode (VSG)

	GFI	GFMI	VGS
Cap Trading	√	√	√
Energy Time Shifting	√	√	√
Synthetic Inertia			√
Spinning Reserve	√	√	√
Fast voltage control and reactive power support		√	√
FCAS (Frequency Control Ancillary Services)	√	√	√
FFR (Fast Frequency Response)	√	√	√
Spinning Reserve	√	√	√
Fault Level Contribution		√	√
Black Start Capability		√	√
SRAS (System Restart Ancillary Services)		√	√