



# Australian Energy Market, Grid Integration and Storage

35TH JOINT CONFERENCE OF ATBC AND ROCABC

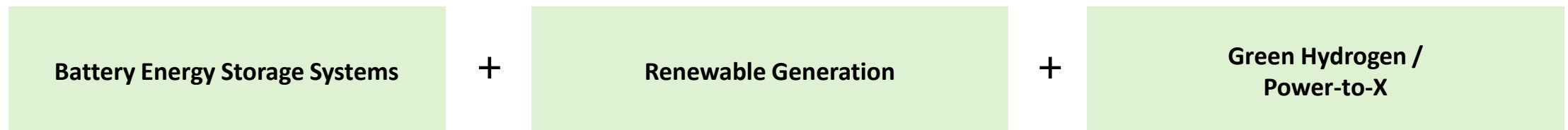
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# A Storage-led Energy Transition

*The energy system of the future will be built on **100% decarbonised renewable electricity**, with the need for **significant growth when coupled with demand from industries across residential, heating, industrial and transportation***

*The core prerequisite for this energy revolution is the **storage and optimised use of energy in its various forms***

*Akaysha Energy is building a storage-led integrated clean energy platform in the Asia-Pacific built around:*



# About Akaysha

Akaysha is building an integrated BESS, renewables and hydrogen platform of operating assets and development pipeline across Australia and other key APAC markets

## Management Team



**Nick Carter | Managing Director**

*Ex-Macquarie, Ex-Tesla, Ex-AGL, Ex-Toyota, Ex-General Motors*

**Focus areas:** Energy Technology Engineering; Techno-economics; Project Development and Delivery; Autonomous Bidding Software

**Qualifications:** MSc (Eng); BEng (Mech); Design for Six Sigma



**Andrew Wegman | Director, Finance and Investments**

*Ex-Macquarie*

**Focus areas:** Commercial and financial structuring; Business case development and economics analysis; Capital solutions, including project finance

**Qualifications:** B Eng (Hons); B Comm (Hons)



**Tony Fullelove | Director, Development and Delivery**

*Ex-Blueleaf Energy; ex-AGL; ex-Alcan (Rio Tinto)*

**Focus areas:** Renewable asset Development and Construction; Community engagement; WHSE; Microgrid development and strategy

**Qualifications:** BEng (Power Elec); PostGrad (Renewable Energy); PostGrad Dip (Applied Finance)



**Paul Curnow | Director of Strategy & General Counsel**

*Ex Global Co-Head of Energy, Ashurst; ex Head of Renewables APAC, Baker McKenzie*

**Focus areas:** Policy, Regulatory and Market Strategy; PPA and offtake products; Legal and Compliance

**Qualifications:** BA (Hons); LLB; Master of Public Policy & Environmental Law

## Additional Leadership Team

- **Pan Galanis** – Head of Energy Markets
- **Nick Finch** – Head of Grid Connections and Engineering
- **Feri Hamori** – Director – Asset Management & COO

## Akaysha “Four Pillars”

- 1. Energy Markets and Analytics**
  - Deep energy market analytics and forecasting expertise
  - In-house dispatch optimization simulation software
  - Techno-economic modelling, technology selection and optimisation
- 2. Finance and Investment**
  - Business case development and optimization
  - Capital solutions covering equity and debt financing
- 3. Project Development and Delivery**
  - Greenfield development for BESS and VRE projects
  - Project delivery across the NEM and APAC for BESS and VRE
  - Grid connection and asset management
- 4. Asset Management and Performance Optimisation**
  - Market operations
  - Technical operation and Autonomous bidding
  - Asset Management

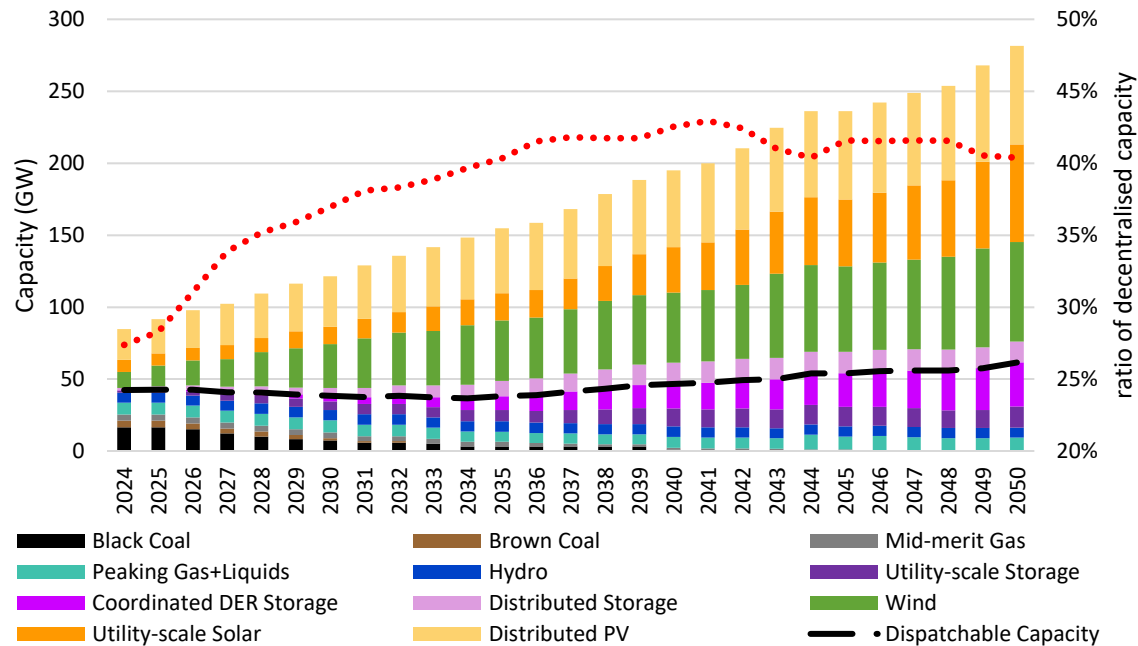
# Agenda

- Energy Transition in Australia – Key drivers
- Market and Grid Impacts with high Renewable Energy Penetration
- Role of Battery Storage Solutions in Energy Transition
- Waratah Super Battery

# Energy Transition Australia – Key Indicators

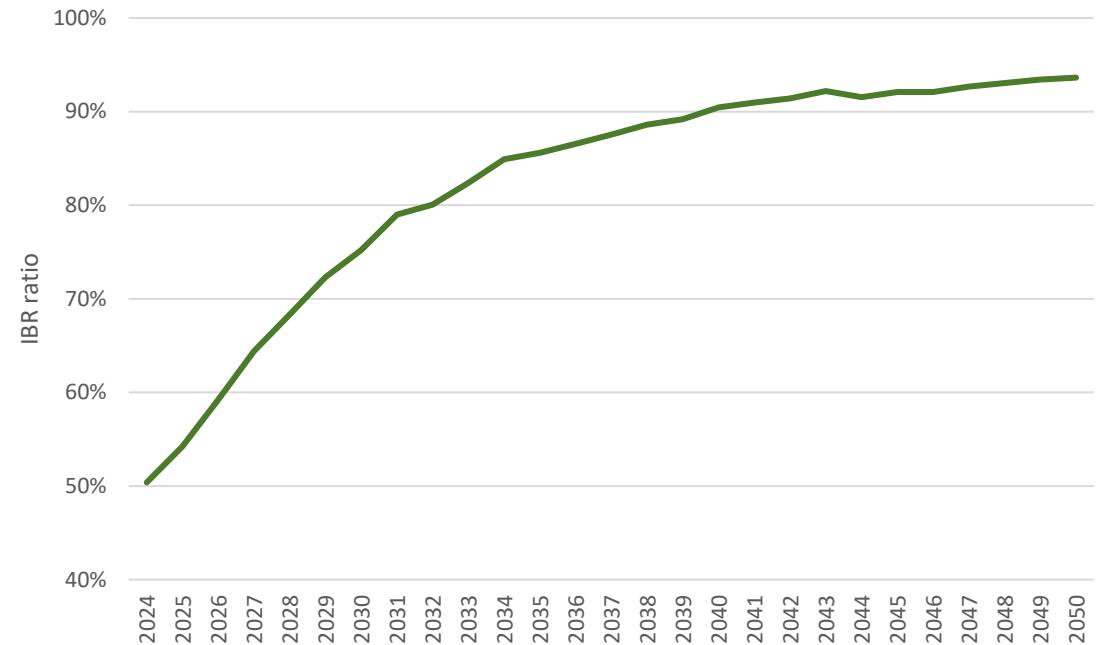
A once in a century transformation is occurring in Australia’s electricity market with legacy coal and gas generation assets being replaced by low-cost rooftop and grid-scale renewables firmed with storage and with the reconfiguration of the grid to support two-way energy flows

**National Energy Market capacity forecast**



AEMO’s ISP 2022 Step change

**Inverter Based Resource Ratio (IBR) – Akaysha Estimate**



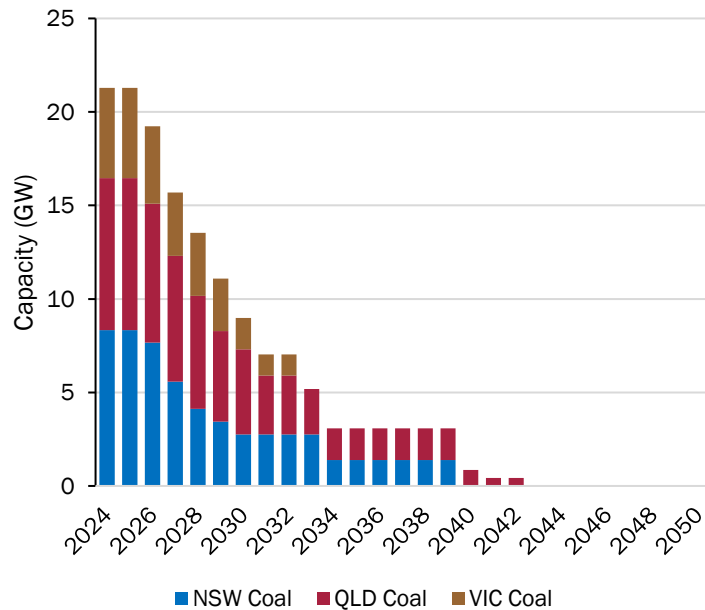
Note: The ratio does not include interconnector capacity

# Energy Transition Australia – Key Indicators (Continued)

A once in a century transformation is occurring in Australia’s electricity market with legacy coal and gas generation assets being replaced by low-cost rooftop and grid-scale renewables firmed with storage and with the reconfiguration of the grid to support two-way energy flows

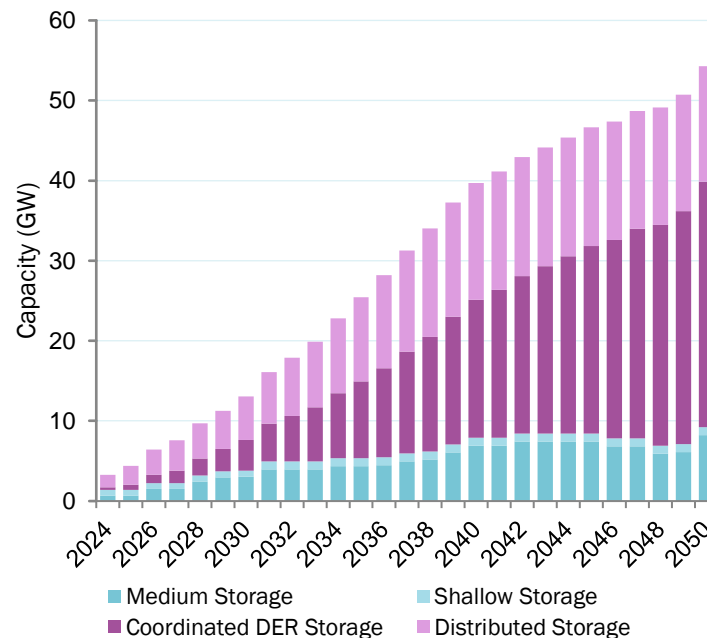
## Coal Closures

Coal is projected to retire much sooner than previously expected with 14,000 MW likely to withdraw by 2030 and all coal assets out of the system in the early 2040’s.



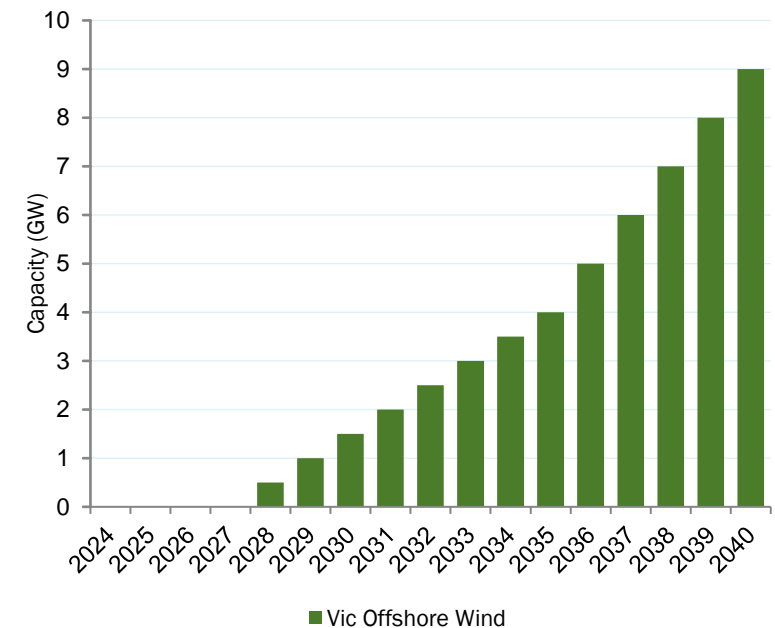
## Battery Storage Energy Systems (BESS)

Battery storage is considered a fundamental part of the future power system with the expected BESS capacity increasing from 1000 MW today to 13,000 MW in 2030 and 50,000 MW by 2050.



## Offshore Wind

The Victorian Government is spearheading Australia’s offshore wind sector by procuring an initial offshore wind tranche of at least 2,000 MW (from 2028) with targets of 4,000 MW by 2035 and 9,000 MW by 2040.



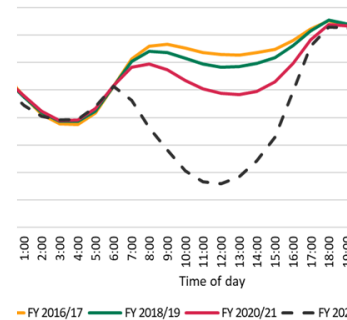
# Battery Energy Storage Solutions

BESS are able to address physical and market issues caused by high VRE penetration and high Inverter-Based Resource (“IBR”) ratio, with a number of key market challenges and BESS solutions outlined below

## Low Minimum Demand

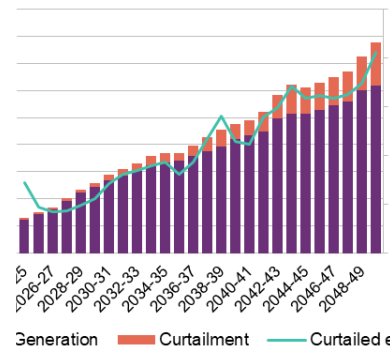
BESS address market challenges around low minimum demand by:

- Charging in the middle of the day when price and demand reach their minimum levels
- Providing voltage management services
- Providing security services such as system strength, inertia and frequency control

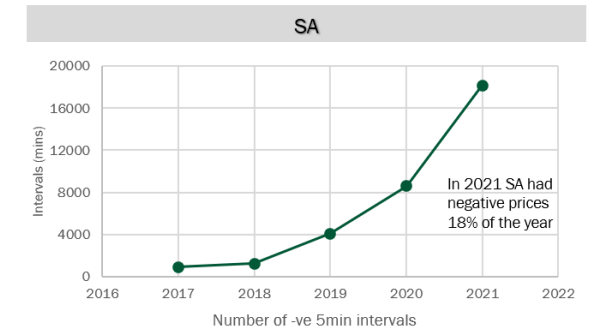
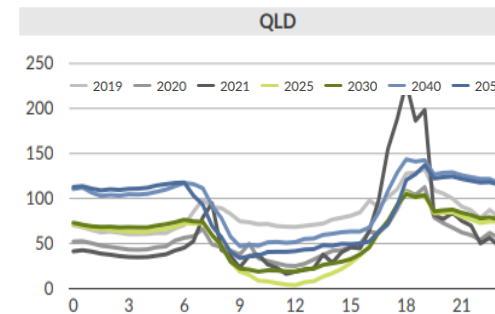


## Increased generation curtailment

- **Curtailment of VRE is expected to increase**
  - Most of the curtailment is projected to occur when utility-scale wind and solar compete for dispatch and there is not enough operational demand to utilize the available renewable resources
- Coupled with wind and/or solar can soak the excess generation when charging and release it when it is required
- Can alleviate inter- and intra-regional network constraints to allow for increased power flows

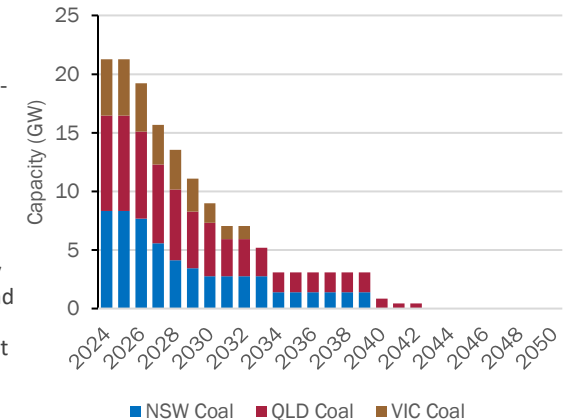


## Increased price volatility

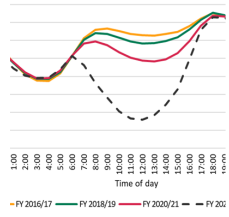


## Reduced grid strength

- Retirement of synchronous generators (i.e. brown and black coal) will materially reduce system strength and inertia via high inverter-based resource ratio
- High feature BESS inverters are able to improve grid strength and offer system security and virtual inertia
  - Additional variable renewable energy will result in reduced grid strength and more frequent high stress periods which BESS are able to protect against

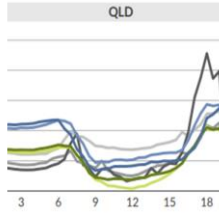


# Solutions - Advanced Battery Energy Storage Solutions



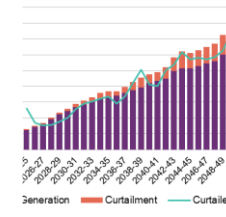
## Low Minimum Demand

- Charging in the middle of the day when price and demand reach their minimum levels
- Providing voltage management services
- Providing security services such as system strength, inertia and frequency control



## Increased price volatility

- Supporting the prices in the middle of the day through charging
- Shaving the peak prices through discharging
- Responding to rapid changes in price



## Increased generation curtailment

- Coupled with wind and/or solar can soak the excess generation when charging and release it when it is required
- Can alleviate inter- and intra-regional network constraints to allow for increased power flows



# Waratah Super Battery – Delivering the System Integrity Protection Scheme

The Waratah Super Battery will provide a rapid active power service in coordination with an advanced TransGrid network monitoring scheme to enable a higher utilization of existing transmission infrastructure, facilitating higher renewables penetration in New South Wales

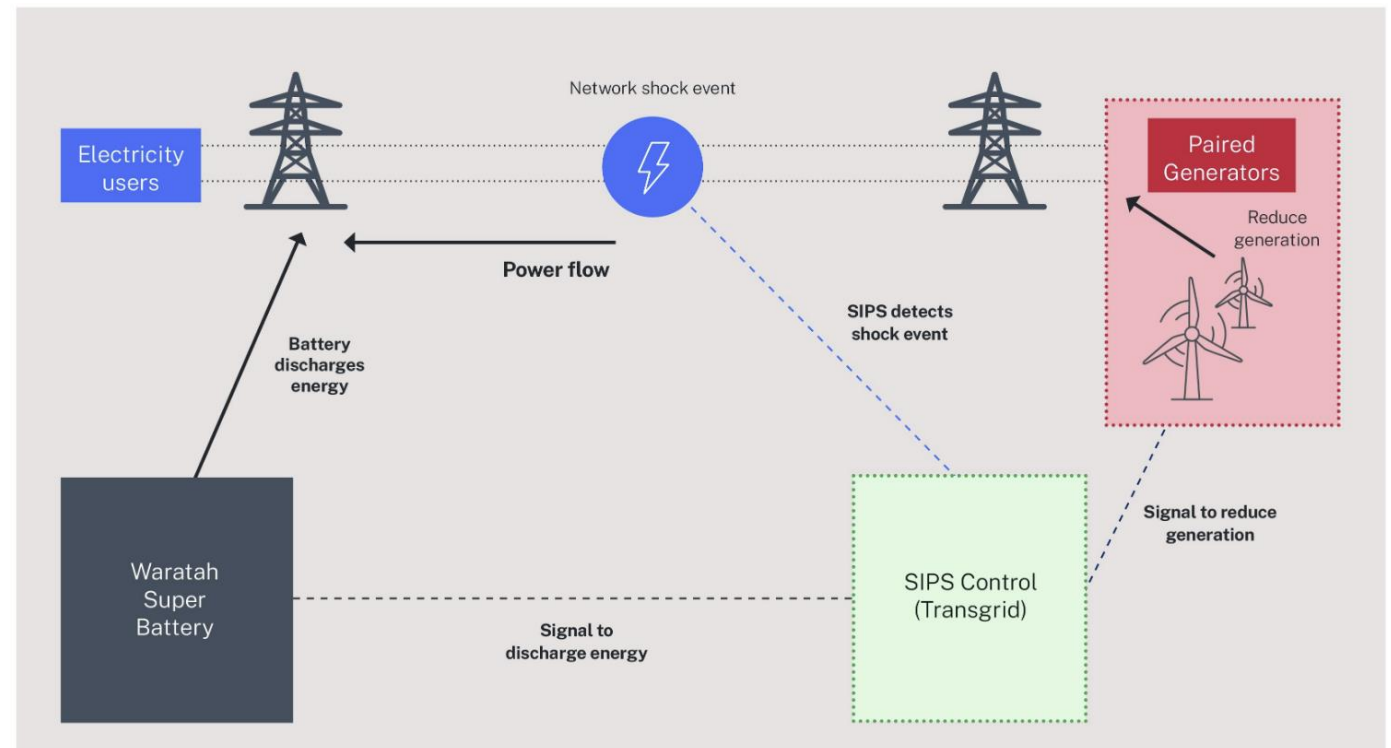
## SIPS – A Virtual Transmission service

- Large Coal generators in Syd/New/Woll region shutting down, system requires more renewable generation in Renewable Energy Zones (REZ) to be transmitted to Syd region
- Existing transmission lines run at 50% capacity to protect overloading for adjacent line trips – Poor network utilisation
- To increase transmission utilisation transmission lines can be run at a higher capacity with the WSB’s reserve power as ‘virtual transmission’

*Akaysha’s proposed Waratah Super Battery located at the Munmorah site in NSW will be rated at 850MW / 1650MWh and capable of delivering the SIPS Services’ required 700MW and 1400MWh for over 5 years.*

*WSB is the most powerful committed battery in the world*

## Illustration of SIPS Control Scheme



Thank You

Get in touch:

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