

New Zealand Wind Energy Association Conference.  
Rydges Hotel, Wellington.

## Grid Scale Energy Storage & Application for Wind Energy.

April 12<sup>th</sup>, 2017.  
Industrial Use Battery Team,  
Mitsubishi New Zealand Ltd.

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## Alliance between Mitsubishi Corporation & AES Energy Storage

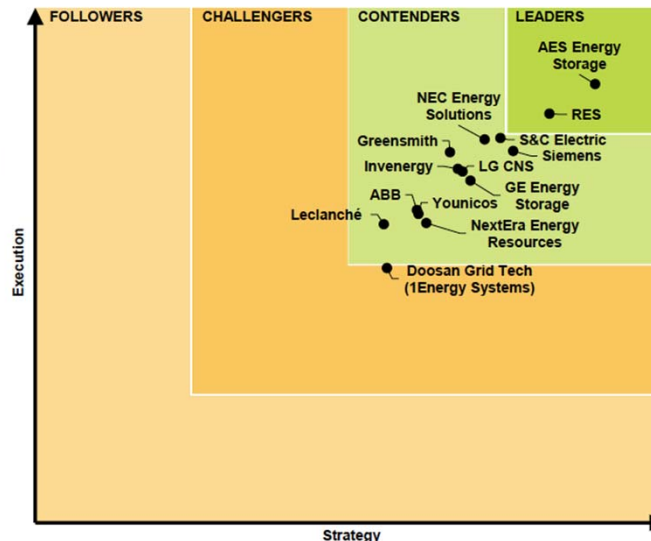
AES and Mitsubishi Corporation to Sell Advancion® Energy Storage Solutions in Asia and Oceania



- Mitsubishi Corporation is AES' Advancion® Alliance partner.
- Combining the capabilities the partnership will offer customers access to one of the most reliable and proven energy storage solutions with on-going operations support from trusted partners.



# AES and Energy Storage: leading the industry as an owner, integrator and solutions provider



“AES earned the International Edison Award for its Advancion<sup>®</sup> 4 energy storage technology, which was first deployed in 2015. The next-generation battery-based energy storage system was designed to accelerate the growth and integration of clean energy...”

“AES has led the market in terms of innovative offers—it was the first company to connect a utility-scale Li-ion battery to the grid in 2008 and the first to offer energy storage as a service to utilities.”  
-Navigant Research 2016

#1 Energy Storage Systems Integrator – 2015 & 2016



# Advancion<sup>®</sup> is a complete and modular solution



Industry leading battery, power conversion, and control system technology.

## KEY DIFFERENTIATORS

1. Nodal architecture
2. Proprietary and patented controls
3. Supply chain and Advancion Certification Program
4. AES operational experience



Advancion Nodes in an Array | AES NETHERLANDS | Zeeland, The Netherlands



Batteries in a Advancion Node

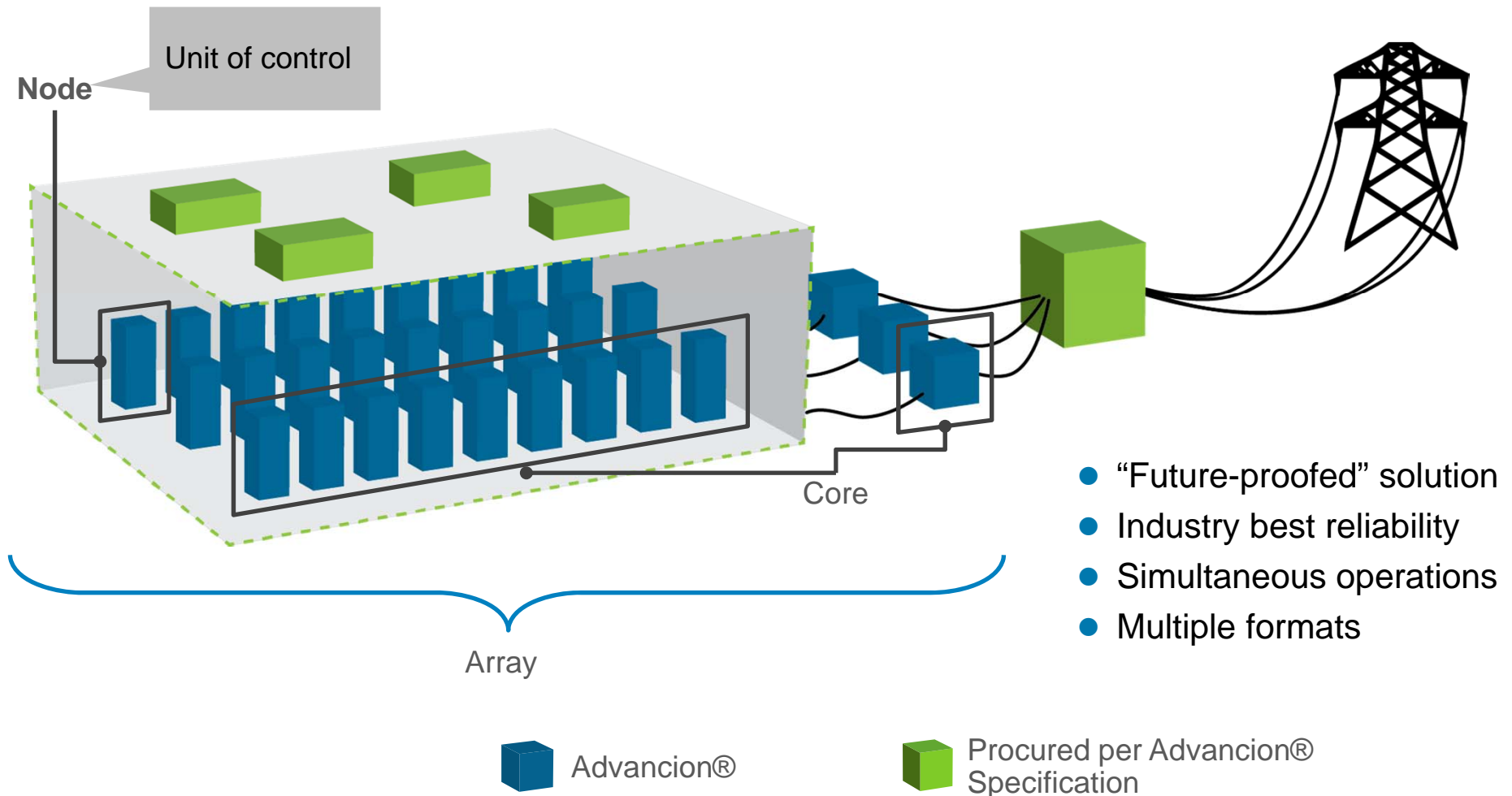
Advancion Node Controller

HMI Control Screen



# Advancion's® industry exclusive architecture delivers unique advantages

Each node is an independently dispatchable energy storage unit



## Case: San Diego Gas & Electric 37.5MW / 150MWh

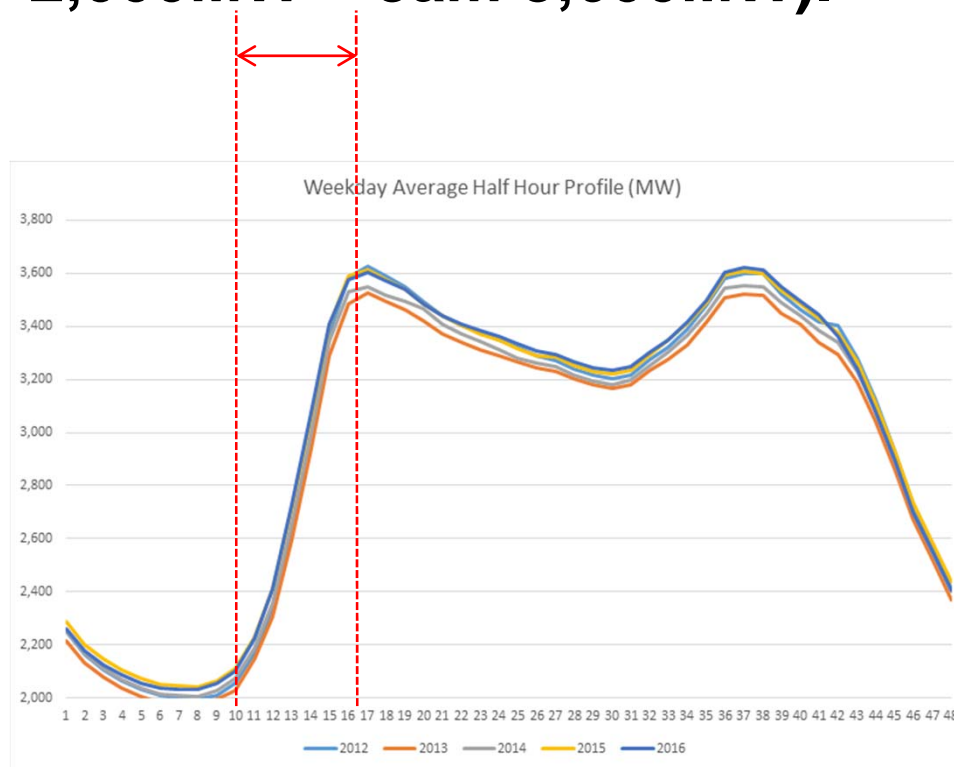
- 30MW/120MWh Escondido (world's largest\*).
- 7.5MW/30MWh El Cajon.
- To integrate wind and solar PV.
- Carbon-free alternative to gas peaking plant.
- Simultaneously address California 'Duck Curve' effect.



\* Feb'17, 2017: <http://www.utilitydive.com/news/sdgc-aes-bring-worlds-largest-lithium-ion-battery-storage-online-in-cal/436832/>

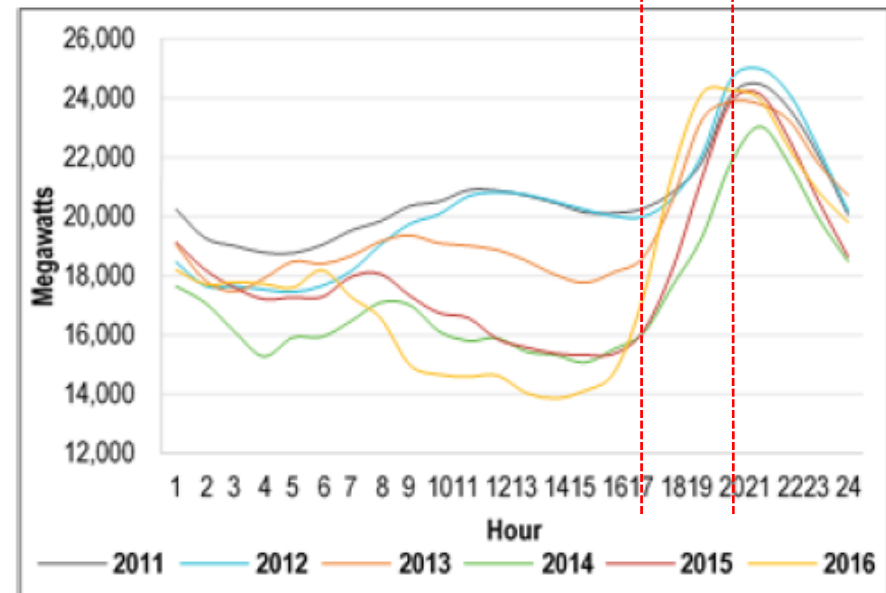
## Wind and New Zealand's morning ramp rate.

**New Zealand morning ramp rate: +80% in 3 hours (5am 2,000MW – 8am 3,600MW).<sup>1</sup>**



**California evening ramp rate: +89% (13,000MW) in 3 hours.**

Figure 2: Lowest March Daytime Net Load, 2011–2016



<sup>1</sup> Data courtesy of Energy Link Ltd, Greg Size, for Mitsubishi New Zealand.

# Case: Frequency regulation, Integrating renewables in PJM

Serving PJM Interconnection – Worlds largest power market.

“If you like wind, you’ve got to love storage!” - PJM President, Terry Boston.



98 MW Laurel Mountain Wind Farm  
with 64 MW Storage Resource  
West Virginia, USA





## Case: Frequency regulation: Storage to serve TenneT

Initial 10MW storage online at end of 2015, providing 20MW of flexibility

- Primary Control Reserve (frequency regulation) for integrated market (DE, NL, CH, AU)

### Impact:

- ✓ Reduce total reserve cost
- ✓ Fast, accurate reserves
- ✓ Increased system flexibility
- ✓ Opportunity to explore fast resource benefits



**20 MW Zeeland Resource**  
Vlissingen, Netherlands

## Case: Flexible peak capacity: SCE contracts 100MW/400MWh

*100 MW Interconnection (rendered)  
200 MW of flexibility (discharge + charge)*

### Project Description:

- 2x50 MW advanced battery array
- Provides local capacity reliability
- 4 hour duration
- 24x7 power resource
- No emission or water
- Tolling PPA



## How can storage add value for NZ wind generators?

Some 'food for thought' – value proposition case by case.

Energy systems (wind + battery) integration can;

- Make wind dispatchable (time displacement value, enable wind to operate as peaking plant as renewable alternative to gas).
- Facilitate wind's participation in ancillary services markets (add new revenue streams to base model).
- Overcome local lines peak constraints (monetise curtailed energy value, enable site location without lines upgrade).
- Assist with increase in penetration of wind, avoid related curtailment and to provide frequency support.
- Aid development - great wind locations have poor network connections - Advancion® can stabilize the voltage and frequency at that area of the network offering a new opportunity for previously unusable land.

## How can storage add value for NZ wind generators?

Future scenario: wind displacing more thermal. But could result in lower system inertia<sup>2</sup>.

- EPICentre study into the role of wind energy to help reach or surpass the government target of 90% renewable electricity by 2025.
- Concluded that significant increase in use of wind (+4 GW) will result in reduction of system inertia. 40% reduction in ability to 'keep' 50hz.
- Resulting difficulty to manage under-frequency events.
- Current generator governor control has 3.83 seconds to respond.
- Falls to about 1.5 seconds once 2.5GW of wind is added.
- Current fast instantaneous reserves timed at 6 seconds.
- But Advancion® storage can respond in **milliseconds**.
- Nothing does frequency-keeping like Advancion® storage.
- Combined this with arbitrage and minimisation of curtailment = value.

<sup>2</sup>EPECentre, Green Grid project, PHD student Josh Schipper,, Energy News, 17<sup>th</sup> February 2017 "Reserves Market Key to Wind Growth".

**Thank you.**

For more information:

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