



***DOOSAN* GridTech**



END-TO-END FLEXIBLE & SCALABLE ENERGY STORAGE SYSTEMS

01

**DOOSAN GROUP
OVERVIEW**

Doosan Group

Oldest Company Incorporated in Korea

- **One of top 10 conglomerates in Korea**, active in engineering and manufacturing of power plants, construction equipment, industrial facilities, engines, construction.
- Doosan is the oldest conglomerate in Korea with over **126 years of history**.
- Strong aspiration for accelerated global-scale growth, **with focus on Infrastructure Support Businesses**.

Doosan Corporation

- Electro-Materials
- Fuel Cell Power
- Digital Innovation
- Retail

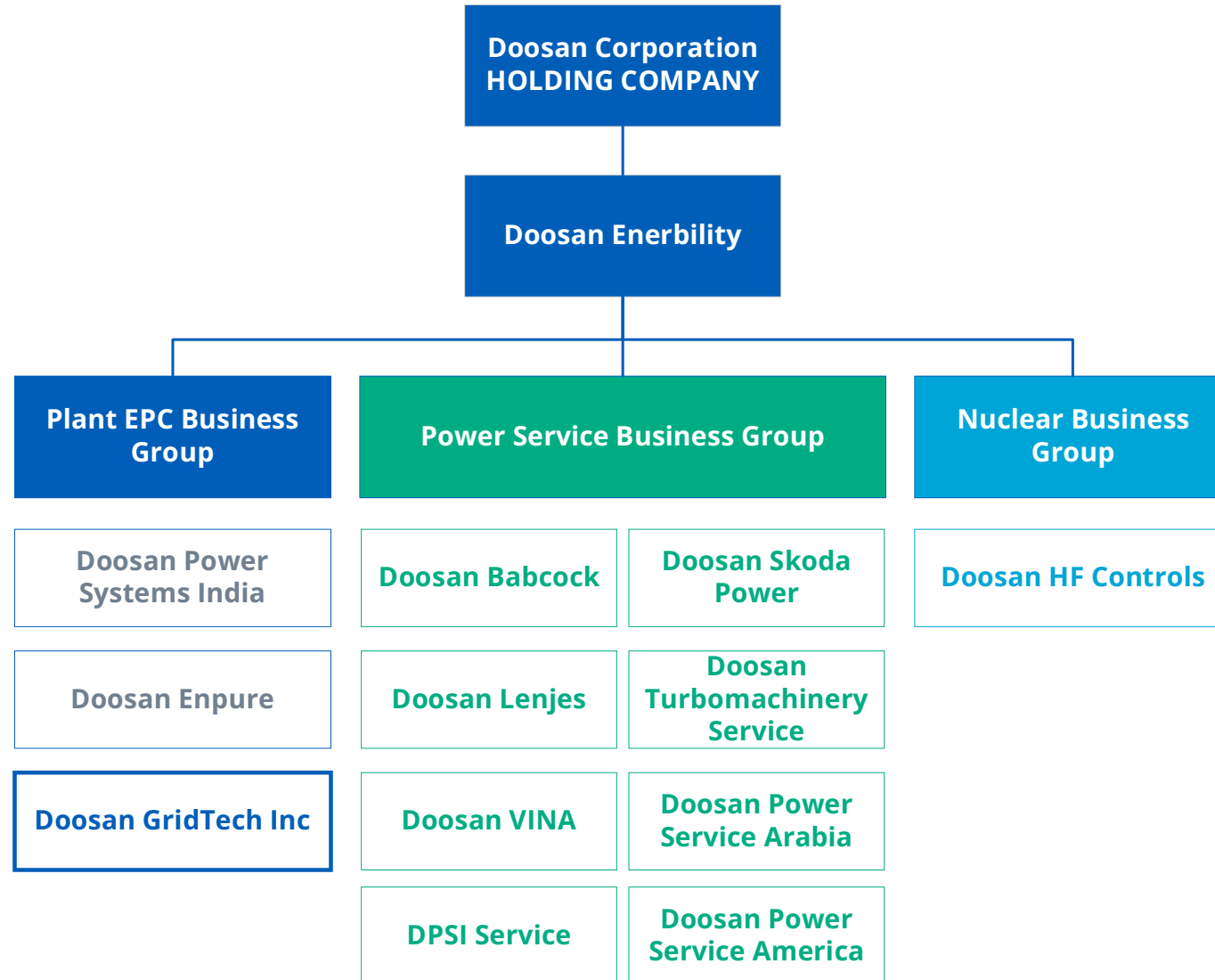
Affiliates

- Doosan Enerbility
 - New energy solutions
 - Power plant equipment / Services
 - Plant EPC / Construction
 - Material manufacturing
- Doosan Bobcat
- Doosan Industrial Vehicle
- Doosan Fuel Cell
- Doosan Mecatec
- Doosan Robotics
- Doosan Mobility Innovation
- Doosan Logistics Solutions
- Oricom
- Hancomm
- Doosan Magazines
- Doosan Bears
- Doosan Cuvex



Doosan Enerbility

Core Business Organization





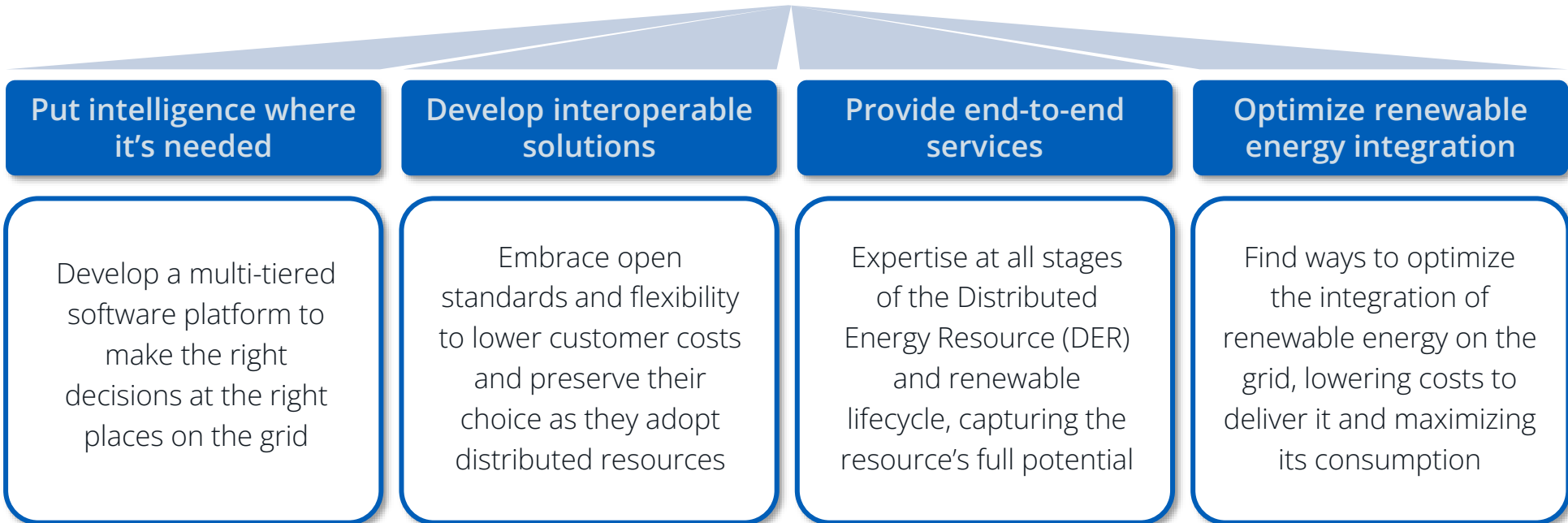
02

ABOUT US



Supporting a **flexible, low-carbon, digital grid** of the future

DOOSAN GridTech



Personalized Project Approach

- DG-IC is a highly configurable PPC platform that is hardware agnostic, allowing it to work with your preferred hardware.
- DGT has made a significant investment in building a leading-edge Typhoon HIL (hardware-in-the-loop) site simulation lab equipped with C-HIL representations of many Tier 1 BESS and inverter units.
- Thorough C-HIL testing before site installation ensures that the PPC and ancillary equipment are pre-commissioned to closely simulate real-life conditions. This helps in reducing commissioning times, costs, and risks.
- A “Digital Twin” of your facility in HIL form can be maintained for post-COD simulations and support

Leadership Team

Our dedicated leadership team possesses a depth and breadth of knowledge and experiences that are unmatched in the battery storage and clean energy industry.

- Seasoned leadership team with decades of experience in the software and energy space
- Leadership experience at technology, energy, and industrial companies
- 80+ employees

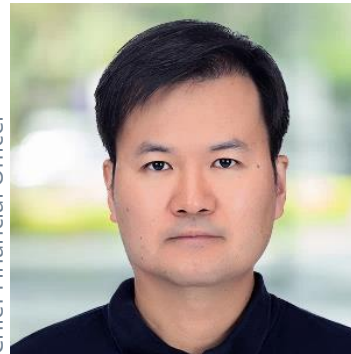
Steve Levy
Chief Executive Officer



Jen Young
Chief Operations Officer



Ilmo Kim
Chief Financial Officer



Steve Hummel
Chief Technology Officer



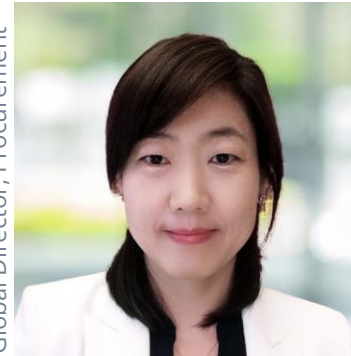
Lori Sutton
Chief Marketing Officer



Paul Mazlin
Managing Director, Australia



Yuna Kim
Global Director, Procurement



Sarah Davis
Director of Operations



Cindy Rodham
Director, Human Resources



Ingrid Lehnert
Secretary, General Counsel



Dawn Sprague
Marketing Manager





1Energy Systems
founded in
Seattle, WA



1st MESA-based
ESS installed at
Snohomish PUD

DOOSAN
GridTech

1Energy acquired by
Doosan Enerbility, Doosan
GridTech formed



2011

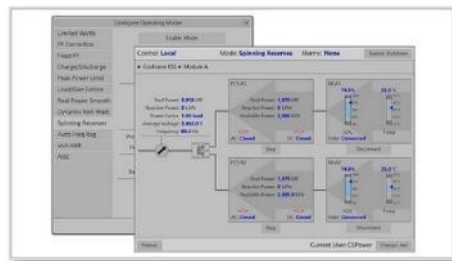
2012

2013

2015

2016

1st DG-IC
installed at a
utility substation



Austin Energy
receives DOE
SHINES Award



1Energy wins
2016 Grid
Edge Award





Doosan GridTech wins 2018 Grid Edge Innovation Award



Vena Energy selects Doosan GridTech as EPC for 100MW Wandoan South BESS



Vena Energy selects Doosan GridTech as EPC for 41MW Taillem Bend 2 BESS

2017

2018

2019

2020

2021

2022

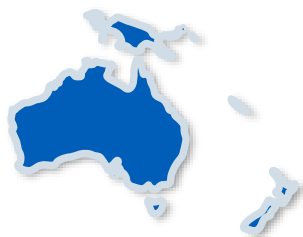
2023

Doosan GridTech chosen to install LADWP's first ESS

Doosan GridTech opens office in Australia

Doosan GridTech chosen to install Neoen's Capital BESS

Tampa Electric selects Doosan GridTech as System Integrator for 100MW Wave 1 BESS



03

**END-TO-END ENERGY
STORAGE SOLUTIONS**

What We Do

Integration of energy storage systems, employing our advanced control software platform, DG-IC[®], with a hardware-agnostic approach

BESS Design & Delivery



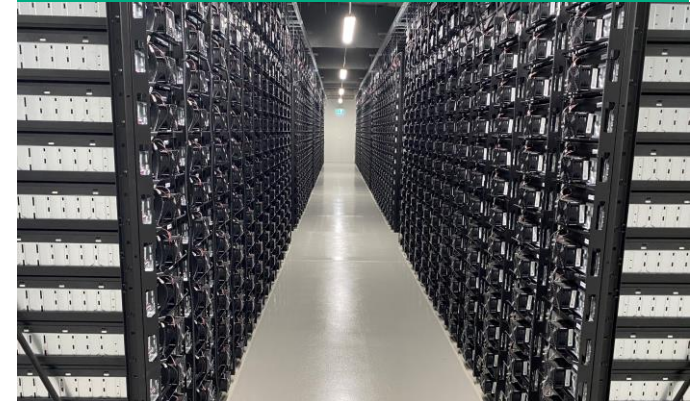
- Off-balance sheet design/delivery services as systems integrators
- Reliable, high-performance systems are developed
- Flexibility for technology options and adaptation to meet future network needs
- Customize and optimize energy storage investment

Energy Storage System Control Software



- Power plant controller is fully flexible operating at site and fleet dispatch
- Control intelligence needed to maximize the value of an ESS system
- Our software has over 12 years of successful field installations

System Integration & Maintenance Support

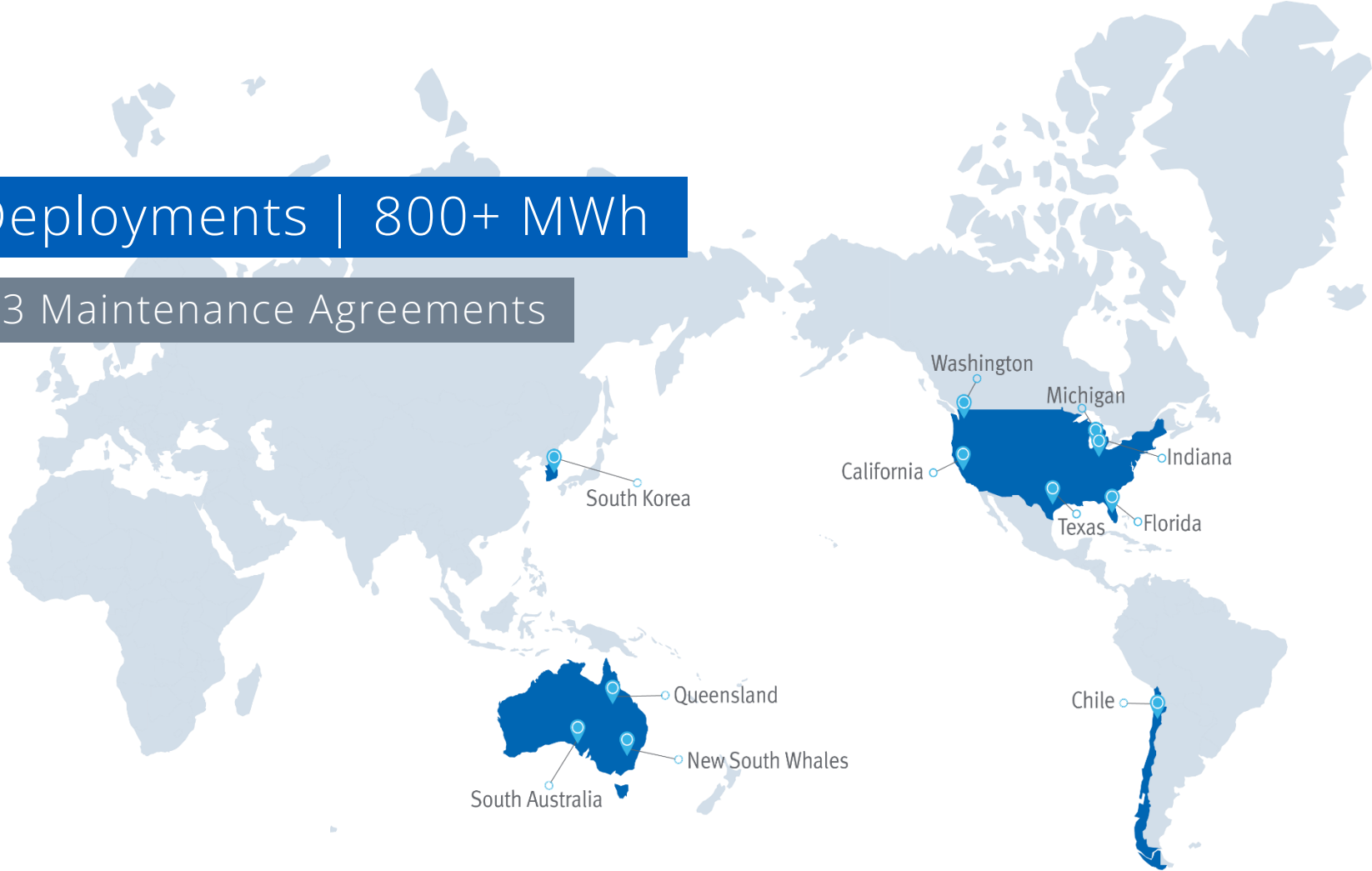


- Installation and commissioning services
- Responsibility for network and software integration, installation, and performance
- Maintenance and long-term service agreements throughout the warranty period

Global Battery Energy Storage Deployments

Over 35 ESS Deployments | 800+ MWh

5 O&M Contracts, 3 Maintenance Agreements



Our Client Partnerships

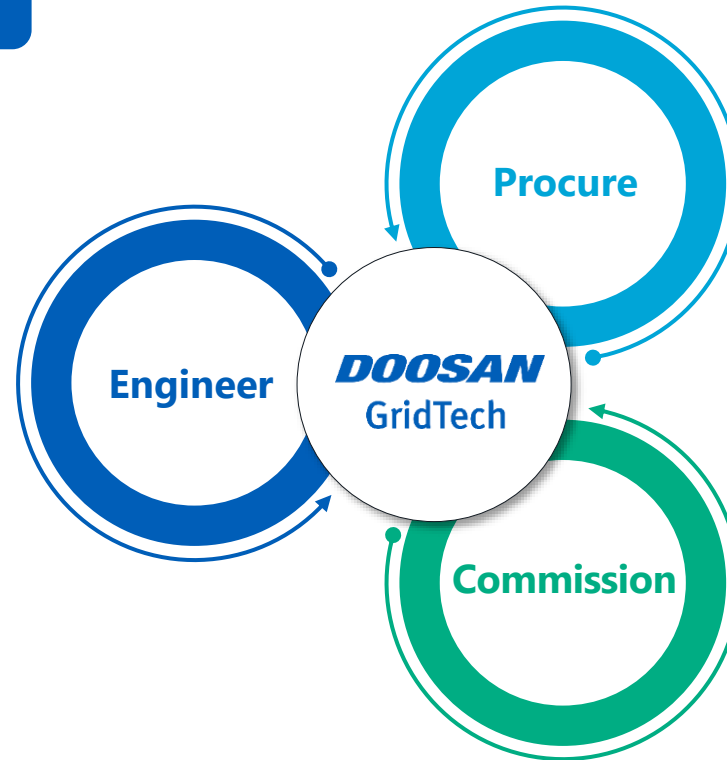
Trusted to be BESS and EMS provider on series of first BESS's for early market progressive utilities.



Solid SI Capabilities and Supplier Network

Engineering Excellence

- Engineering experts with diverse renewables project experience, including large-scale, standalone, hybrid (BESS+PV), inverters, and BESS systems
- Software, systems, power systems, network and control, applications, and commissioning engineers
- Customer-oriented services for end-to-end design and implementation of the balance of plant
- Strong understanding of grid systems
- Sophisticated software development capabilities for command-and-control
- Our powerful Typhoon hardware-in-the-loop (HIL) Voice of Customer Lab is utilized throughout the development, commissioning, and operational project phases to optimize the solution, minimize risks and enhance plant performance



Global Supply Chain

- Track record of collaborating with top-tier global manufacturers leveraging Doosan GridTech's hardware-agnostic software technologies

– Key global BESS system suppliers:

 **GOTION**  **CATL**  **SAMSUNG SDI**

 **HTHIUM**  **LG Energy Solution**

– Key global PCS suppliers:

 **epcpower**  **SMA**  **POWER ELECTRONICS**

Strong capabilities in project management and commissioning

- Strong cross-functional capabilities and industry best practices including full project management, site, delivery, quality control, and health, safety, environment management, commissioning, performance testing, operations, and maintenance

04

**ENERGY MANAGEMENT
SYSTEM**

Doosan GridTech's fully-optimized,
market-leading control platform
**places decision-making intelligence
where it is most effective**

DG-IC[®]
Intelligent Controller

Intelligent Controller (DG-IC) does the heavy lifting

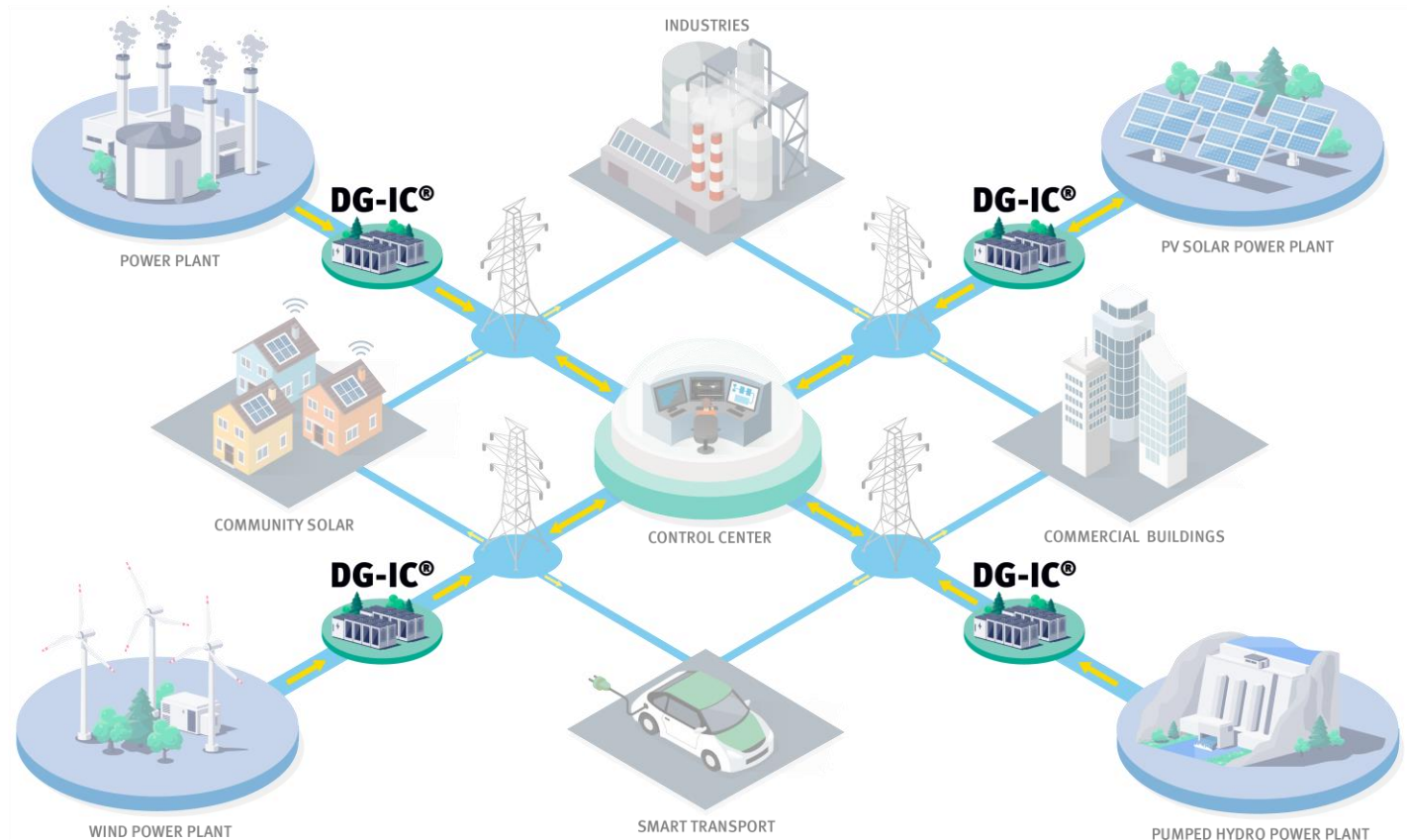
- Site dispatch controller for utility-scale and grid-integrated ESS
- Enables operator to monitor and control any device:
 - 1) Control modules and system controllers of storage devices and other energy resources
 - 2) Inverters and power conversion systems that manage the flow of AC and DC power
 - 3) Power and signal meters that provide the real-time data
 - 4) Operating modes to intelligently dispatch power and provide grid-stabilizing services

Our flexible, autonomous, scalable, reliable, and secure platform provides powerful, extensible control and communications for energy storage systems and other distributed energy resources

BESS Applications

Control platform to serve any ESS use-case

Bulk power system applications, remote community backup support, integrating renewable power on a circuit using multiple ESS



Intelligent Software



Distributed Generation



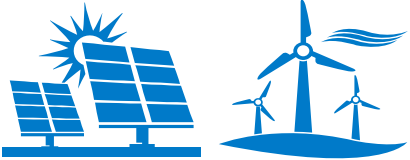
Grid Energy Storage

Software Applications and Benefits

Key energy storage value streams to satisfy objectives in various environments

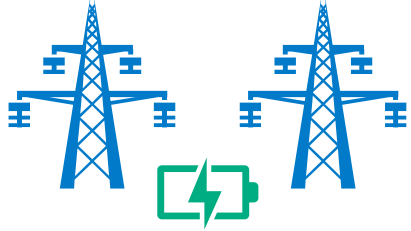
Renewable integration service
 Utility system services
 Ancillary services

Renewable integration



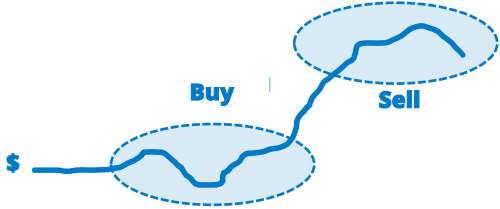
- Enables separation between energy generation and utilization, which stabilizes the volatility of renewable energy and makes it dispatchable

Transmission upgrade deferral



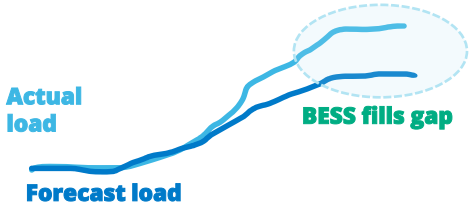
- Avoids or delays the need for transmission asset upgrades by reliably shifting peak consumption to off-peak times

Energy arbitrage




- Takes advantage of the price gap between light and high load period, by charging at lower price and discharging at higher price

Load shifting



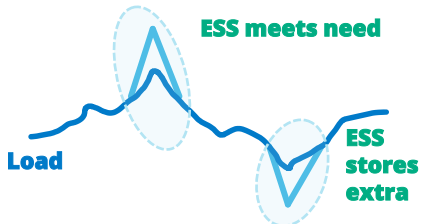
- Fills the gap between the power demand and supply by intelligently charging and discharging energy

Frequency regulation



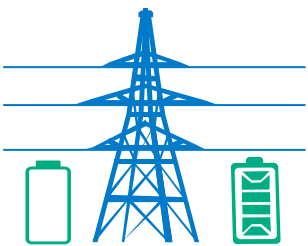
- Stabilizes the grid's frequency from fluctuation by its prompt response

Non-spin / spin reserve



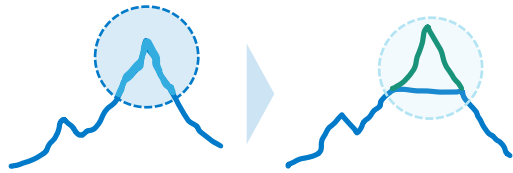
- By using BESS as a power reserve, the conventional power plant can utilize its full capacity without any reserve allocated

Black start



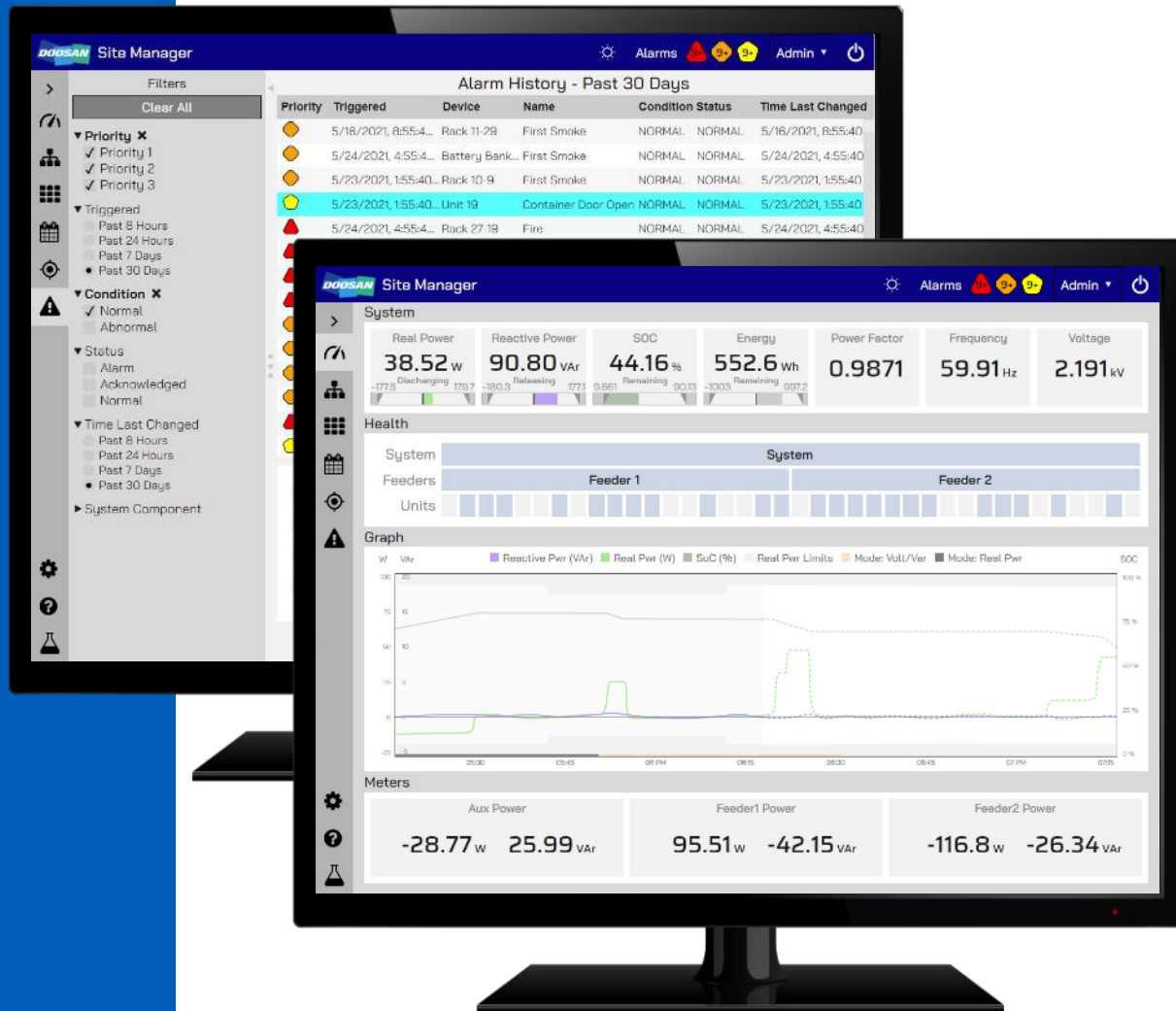
- Provides reserved power to restore the grid when blackout happens

Peak shaving/asset optimization



- Using the power stored in BESS, end users can cut their peak load and save energy cost

Benefits at a Glance



01

Responds Quickly

Quick response to your pressing needs, **Prioritized operating modes with sub-second response** to variations in real or reactive power, voltage, and frequency

02

Adapts Readily

Configurable parameters, constraints, and settings and a commitment to **open standards-based communications** ensure the systems can meet your specifications in AC and DC coupled applications.

03

Delivers Safely & Reliably

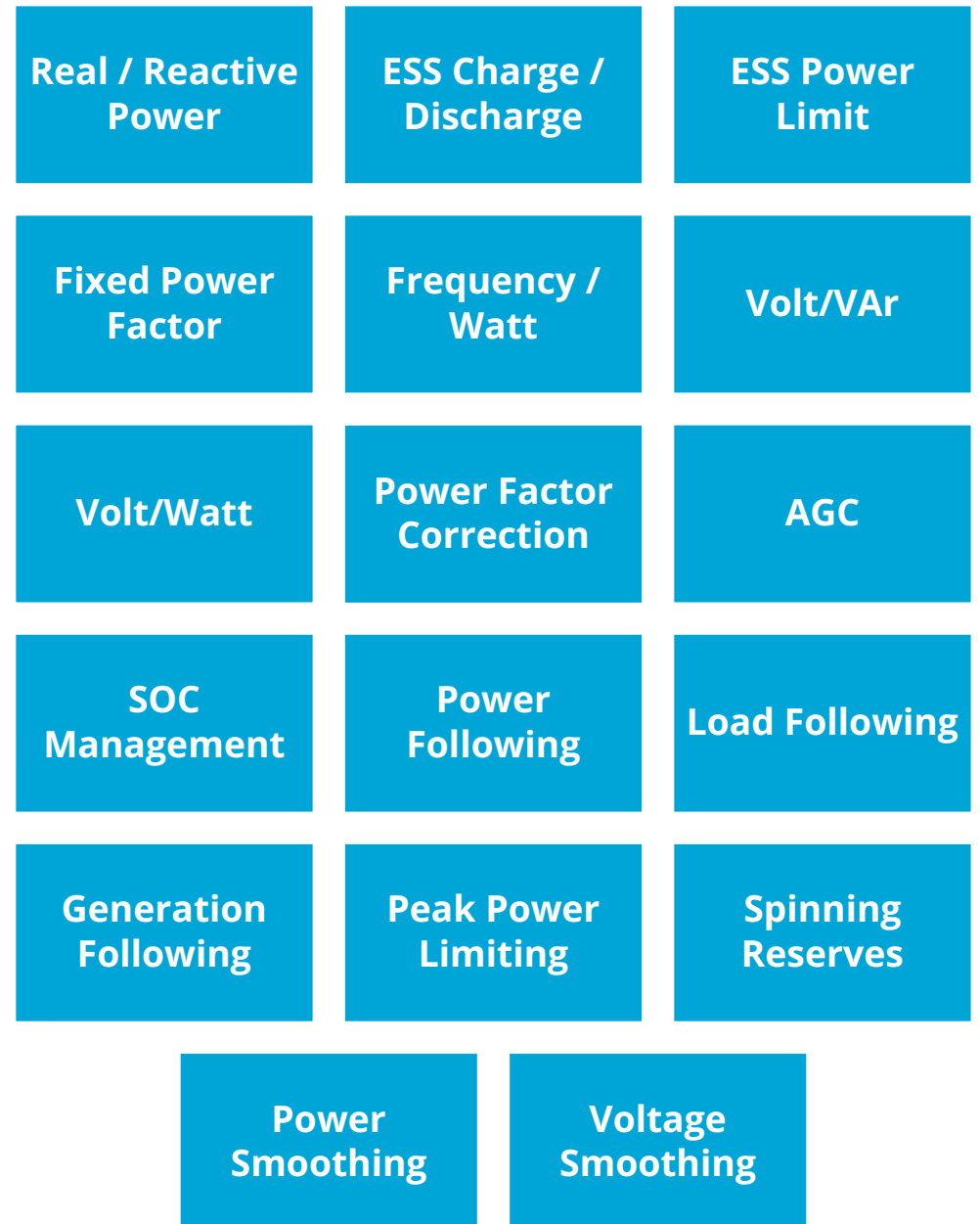
Built-in features - maintenance mode, **three-tier alarm system**, failsafe shutdown - ensures personnel, the grid, and the system are safe.

Operating Modes Align with Value Streams

DG-IC[®] covers
multiple use cases


Baseline programming:

- 6 core operating modes, over 30 field-proven options
- Prioritize the activation of each mode
- Choose up to 50 customizable schedules
- “Open standard” communications protocols



Optimizing Value

Across the application spectrum for new systems and retrofits.



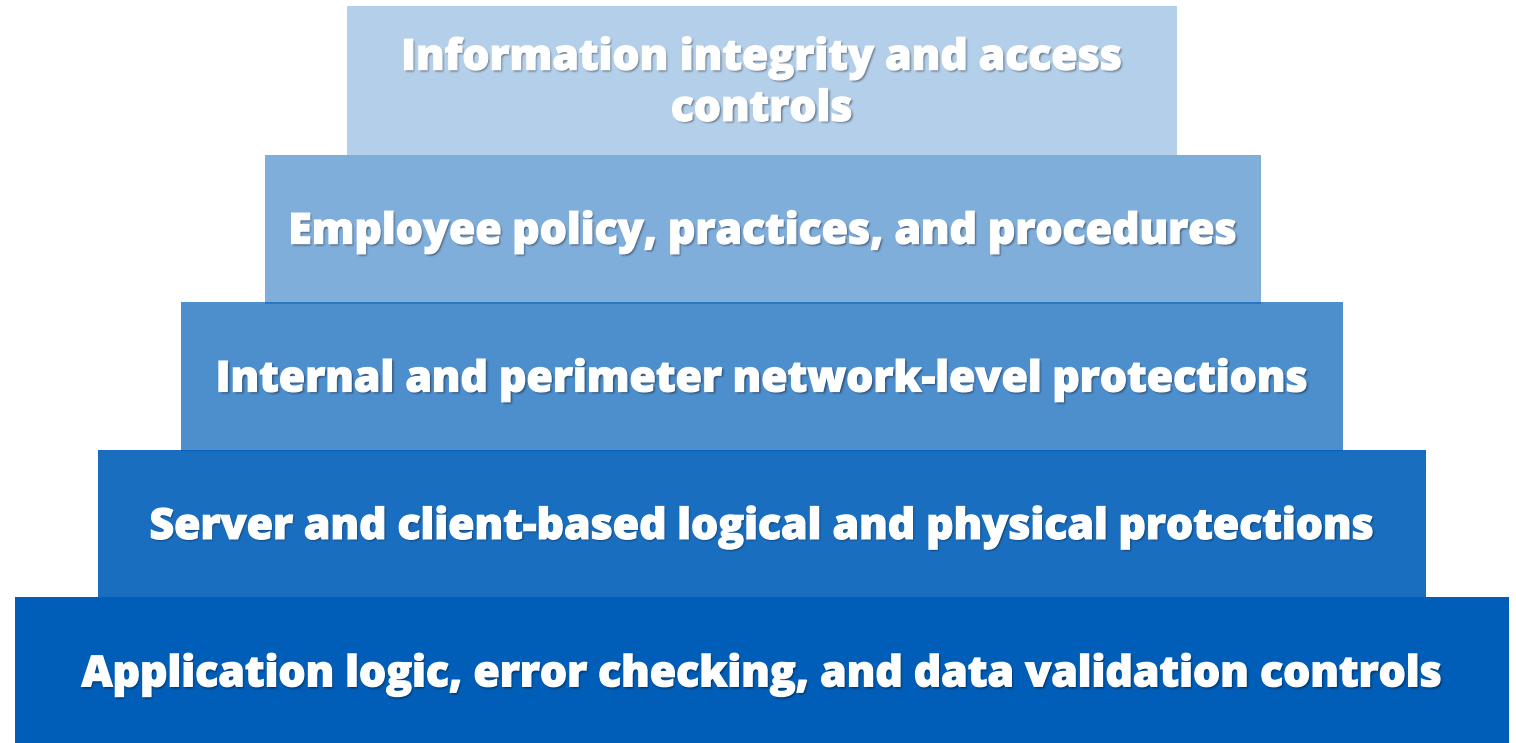
	APPLICATION	USE CASES	DG-IC OPERATING MODES
	Voltage Regulation	<ul style="list-style-type: none">• Renewable Power Integration• Remote community support	<ul style="list-style-type: none">• Voltage Smoothing• Dynamic Volt/VAr• Dynamic Volt/Watt
	Frequency Regulation	<ul style="list-style-type: none">• Ancillary services• Contingency reserves	<ul style="list-style-type: none">• Automatic Generation Control (AGC)• Frequency/Watt• Spinning Reserves
	Islanding	<ul style="list-style-type: none">• Outage Management• Non-wires Alternatives	<ul style="list-style-type: none">• SOC Management
	Solar + Storage	<ul style="list-style-type: none">• Power Firming• Energy Shifting	<ul style="list-style-type: none">• Generation Following• ESS Real Power
	Peak Management	<ul style="list-style-type: none">• Demand Charge Management• Peak Shaving	<ul style="list-style-type: none">• Demand Charge Management• Real Power Response
	Energy Arbitrage	<ul style="list-style-type: none">• Energy Market Participation	<ul style="list-style-type: none">• ESS Real Power

How We Cybersecure Your Investment

Uphold layers of protection

Ensure confidential and/or sensitive information is properly **protected against malicious attacks and accidental loss.**

Includes policy, security architecture modeling, and descriptions of current IT security services and control practices.



05

KEY EXPERIENCE

Tailem Bend 2 41MW Hybrid BESS with 100MW PV

Vena Energy



Location: Tailem Bend, Australia

Utility Offtaker: ElectraNet

Battery: CATL

Inverter: Power Electronics

Control Software: DG-IC®



Purpose:

To counter the intermittent nature of solar generation and maximize the solar plant's profit while providing ancillary services to the National Electricity Market.

Challenge:

Frequency and voltage support in 250ms

Doosan Role:

EPC Contractor, System Integrator & EMS Provider.
O&M included.

Doosan's Intelligent Controller energy management platform will orchestrate the entire hybrid power plant and employ its advanced PV+S controls to:

- Implement multiple operating modes during daily solar shift
- Smooth plant output
- Reduce system degradation and extend plant life

In Progress



Capital Battery 100MW Standalone BESS

Neoen



Location: Australian Capital Territory – Australia

Utility Offtaker: Neoen

Battery: CATL

Inverter: Power Electronics

Control Software: DG-IC®



Purpose:

Support and stabilize ACT's electricity grid by providing power to help avoid blackouts during periods of high demand and when large fossil fuel generators fail in heatwave conditions

Challenge:

Respond to frequency changes to prevent voltage and frequency collapse

Doosan Role:

EPC Contractor, System Integrator & EMS Provider.
O&M included.

Intelligent Controller will provide a predictable supply of electricity to the grid through its ability to dispatch energy during peak times of demand. The upgradeable software ensures long-term risk management flexibility for technology options and adaptation to meet future grid needs.

In Progress



Wandoan South 100MW Standalone BESS

Vena Energy



Location: Western Downs Region – Australia

Utility Offtaker: AGL Energy

Battery: Samsung SDI

Inverter: Power Electronics

Control Software: DG-IC®



Purpose:

To play a major role in improving grid stability and support the state's shift to renewable energy. Part of Wandoan South Project, approved to generate 1GW of solar energy and 450MW of energy storage

Challenge:

Frequency and voltage support in under 100ms

First registration of ESS into the Australian "*National Electricity Market*"

Doosan Role:

EPC Contractor, System Integrator & EMS Provider.

O&M included.

The Doosan GridTech Intelligent Controller® (DG-IC®) deploys advanced artificial intelligence to manage the system.

Commissioned



Wave 1 Portfolio

Three Standalone BESS Sites Totaling 100MW

Tampa Electric Company



Location: Multiple Locations, Florida (3 separate sites)

Utility Offtaker: Tampa Electric Company

Battery: Gotion Hi-Tech

Inverter: SMA

Control Software: DG-IC®



Purpose:

To meet system reliability needs, maximize solar energy production by minimizing solar clipping during low system peak periods and potentially avoid transmission and distribution investments.

Challenge:

Provide peak shifting, energy regulation, voltage support, reactive power support, ramp rate control, and fast frequency response.

Doosan Role:

Designing, commissioning, and programming a complete Li-ion Battery Energy Storage System (BESS) for three separate sites in Florida.

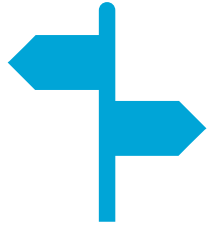
In Progress



06

**O&M SERVICE
EXPERIENCE**

O&M Experience



Operating 700+GWh of capacity



10 yrs



JFB BESS
0.2MW/0.8MWh

Maintenance and performance
guarantees



10 yrs



Beacon BESS
10MW/20MWh

Maintenance and performance
guarantees



25 yrs



Horn Rapids BESS
1MW/4MWh

Maintenance and performance
guarantees



12 yrs

**Atterbury BESS
5MW/5MWh**

Operations & Maintenance

12 yrs



**NABB BESS
5MW/5MWh**

Operations & Maintenance





20 yrs 

Tailem Bend 2
41MW/45MWh

Operations & Maintenance



20 yrs 

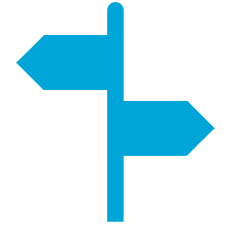
Capital BESS
100MW/200MWh

Operations & Maintenance

15 yrs 

Wandoan South
100MW/150MWh

Operations & Maintenance



O&M Experience
Operating 700+GWh of capacity



DOOSAN
GRIDTECH

THANK YOU

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