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 129 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

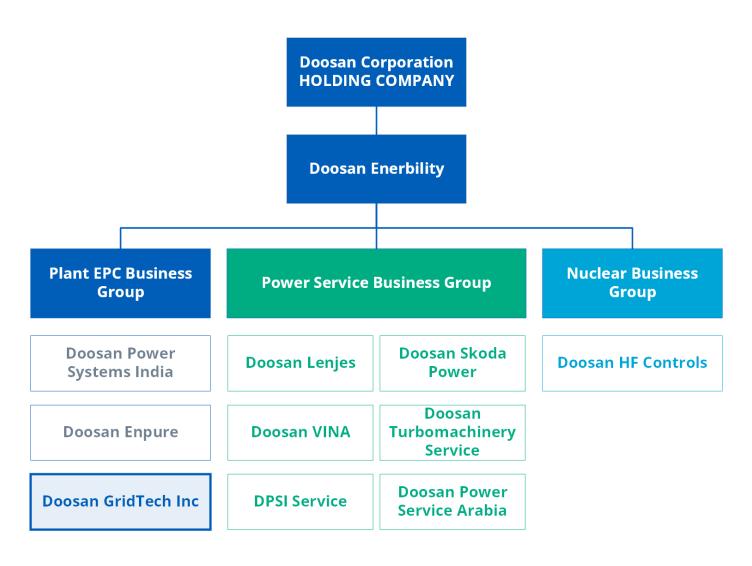
Affiliates

- 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

Put intelligence where it's needed

Develop interoperable solutions

Provide end-to-end services

Optimize renewable energy integration

Develop a multi-tiered software platform to make the right decisions at the right places on the grid

Embrace open standards and flexibility to lower customer costs and preserve their choice as they adopt distributed resources Expertise at all stages
of the Distributed
Energy Resource (DER)
and renewable
lifecycle, capturing the
resource's full potential

Find ways to optimize
the integration of
renewable energy on the
grid, lowering costs to
deliver it and maximizing
its consumption

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 leadingedge Typhoon HIL (hardware-inthe-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 precommissioned 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

Cindy Rodham

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
- 70 employees





Sutton

Young if Operations Officer







1Energy Systems founded in Seattle, WA



1st MESA-based ESS installed at Snohomish PUD

DOOSANGridTech

1Energy acquired by Doosan Enerbility, Doosan GridTech formed

· **-** · 2011

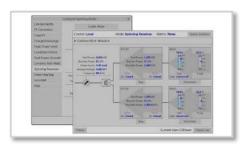
2012

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 Tailem 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



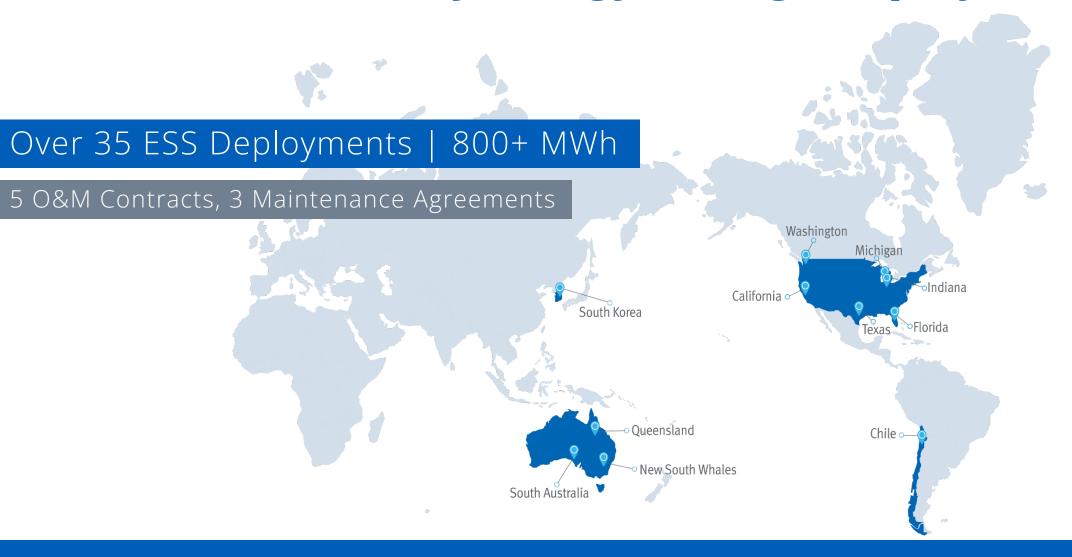
- Power plant controller is fully flexible operating at site and fleet dispatch
- Control intelligence needed to maximize the value of an ESS system
- Our software has over 12 years of successful field installations

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



Our Client Partnerships

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



















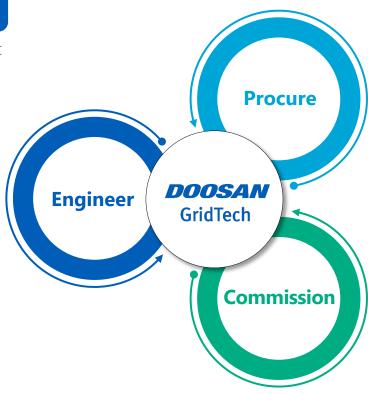




Solid SI Capabilities and Supplier Network

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:



- Key global PCS suppliers:







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

High-Fidelity HIL: Precision Testing for Complex Energy Systems

Doosan GridTech partners with Typhoon HIL to deliver high-fidelity, real-time simulation testing for utility-scale BESS and PV projects. Through this partnership, clients can:

- Identify and resolve integration issues early in the development cycle
- Accelerate commissioning with pre-validated control system logic
- Improve software reliability through automated, real-time testing
- Enable efficient collaboration across engineering and commissioning teams
- Build stakeholder confidence with high-fidelity, lab-verified system performance







Powering Innovation with DGT's Typhoon HIL Systems









- DGT has 3 systems
 - Hybrid projects
 - BESS-only projects
 - Next-Gen DG-IC Software Development
- C-HIL hardware available or planned
 - Hithium BESS
 - Gotion BESS
 - EPC Power PCS
 - Power Electronics PCS
 - TMEIC PCS
- Surrogate models Generic PCS/BMS
 - SMA PCS
 - CATL BESS
- All SEL hardware available as CHIL
 - RTAC
 - Axion
 - 735, 751

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

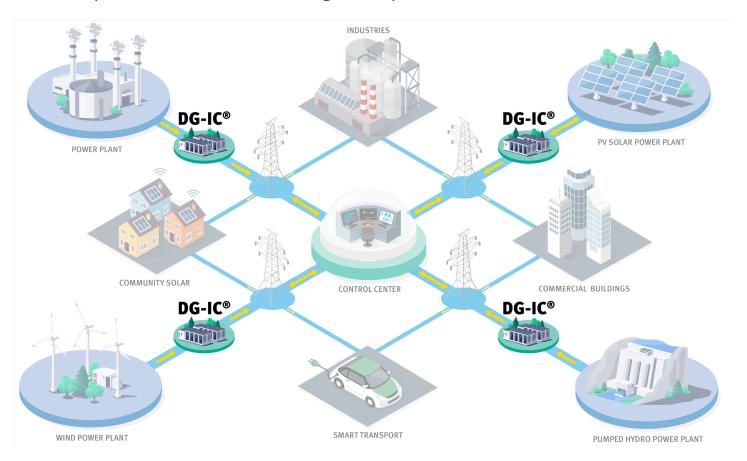
- Site dispatch controller for utility-scale and grid-integrated ESS
- Enables operator to monitor and control any device:
 - 1) Control modules and system controllers of storage devices and other energy resources
 - 2) Inverters and power conversion systems that manage the flow of AC and DC power
 - 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



Software Applications and Benefits

Key energy storage value streams to satisfy objectives in various environments



• 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

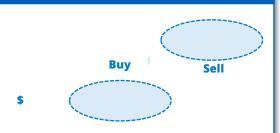
Renewable integration service

Utility system services



Ancillary services

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



Actual

load

Forecast load

• 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

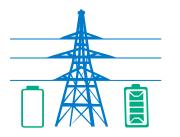
Non-spin / spin reserve



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

Load

Black start



• Provides reserved power to restore the grid when blackout happens

Peak shaving/asset optimization

Bottleneck

BESS meets need



BESS masks power fluctuations on a subcircuit

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

DG-IC® Benefits at a Glance



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

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.

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

Real / Reactive Power	ESS Charge / Discharge	ESS Power Limit
Fixed Power Factor	Frequency / Watt	Volt/VAr
Volt/Watt	Power Factor Correction	AGC
SOC Management	Power Following	Load Following
Generation Following	Peak Power Limiting	Spinning Reserves

Power Smoothing

Voltage Smoothing

Optimizing Value

Across the application spectrum for new systems and retrofits.

	APPLICATION	USE CASES	DG-IC OPERATING MODES
POWER	Voltage Regulation	 Renewable Power Integration Remote community support 	Voltage SmoothingDynamic Volt/VArDynamic Volt/Watt
	Frequency Regulation	Ancillary servicesContingency reserves	Automatic Generation Control (AGC)Frequency/WattSpinning Reserves
	Islanding	Outage ManagementNon-wires Alternatives	SOC Management
	Solar + Storage	Power FirmingEnergy Shifting	Generation FollowingESS Real Power
	Peak Management	Demand Charge ManagementPeak Shaving	Demand Charge ManagementReal Power Response
ENERGY	Energy Arbitrage	Energy Market Participation	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.

Information integrity and access controls

Employee policy, practices, and procedures

Internal and perimeter network-level protections

Server and client-based logical and physical protections

Application logic, error checking, and data validation controls

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



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.



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.



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®



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 for three separate sites in Florida.



06 08MSERVICE EXPERIENCE

J&M Experience

o f 700+GWh Operating

apacity

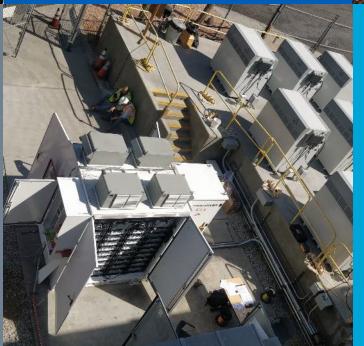


10 yrs



JFB BESS .2MW/.8MWh

Maintenance and performance guarantees





25 yrs



Horn Rapids BESS 1MW/4MWh

Maintenance and performance guarantees





Beacon BESS 10MW/20MWh

Maintenance and performance guarantees





Atterbury BESS 5MW/5MWh

Operations & Maintenance



NABB BESS 5MW/5MWh

Operations & Maintenance





20 yrs



Tailem Bend 2 41MW/45MWh

Operations & Maintenance



15 yrs



Wandoan South 100MW/150MWh

Operations & Maintenance



20 yrs



Capital BESS 100MW/200MWh

Operations & Maintenance





DOOSAN GRIDTECH

THANK YOU