Leader of BoT

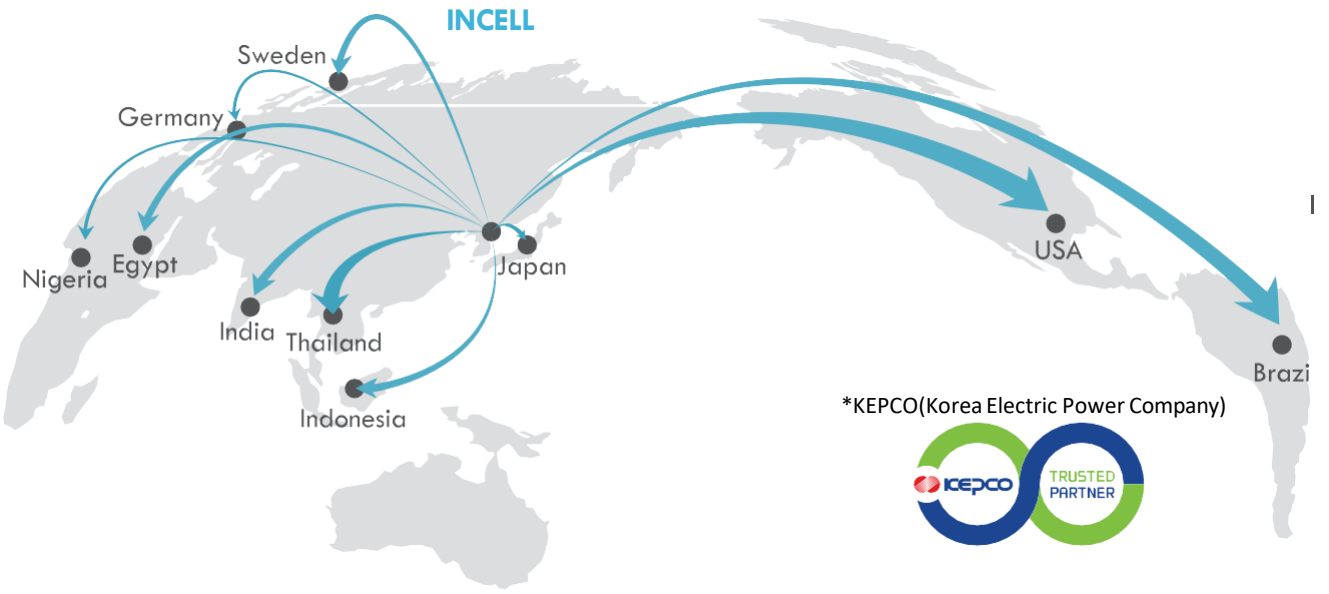
INCELL strives to solve energy and environmental problems by developing and producing Energy Storagy System and Lithium Battery Pack based on its outstanding Energy & battery Solution Technology

Lithium Battery for ESS

Solution & Product Guide

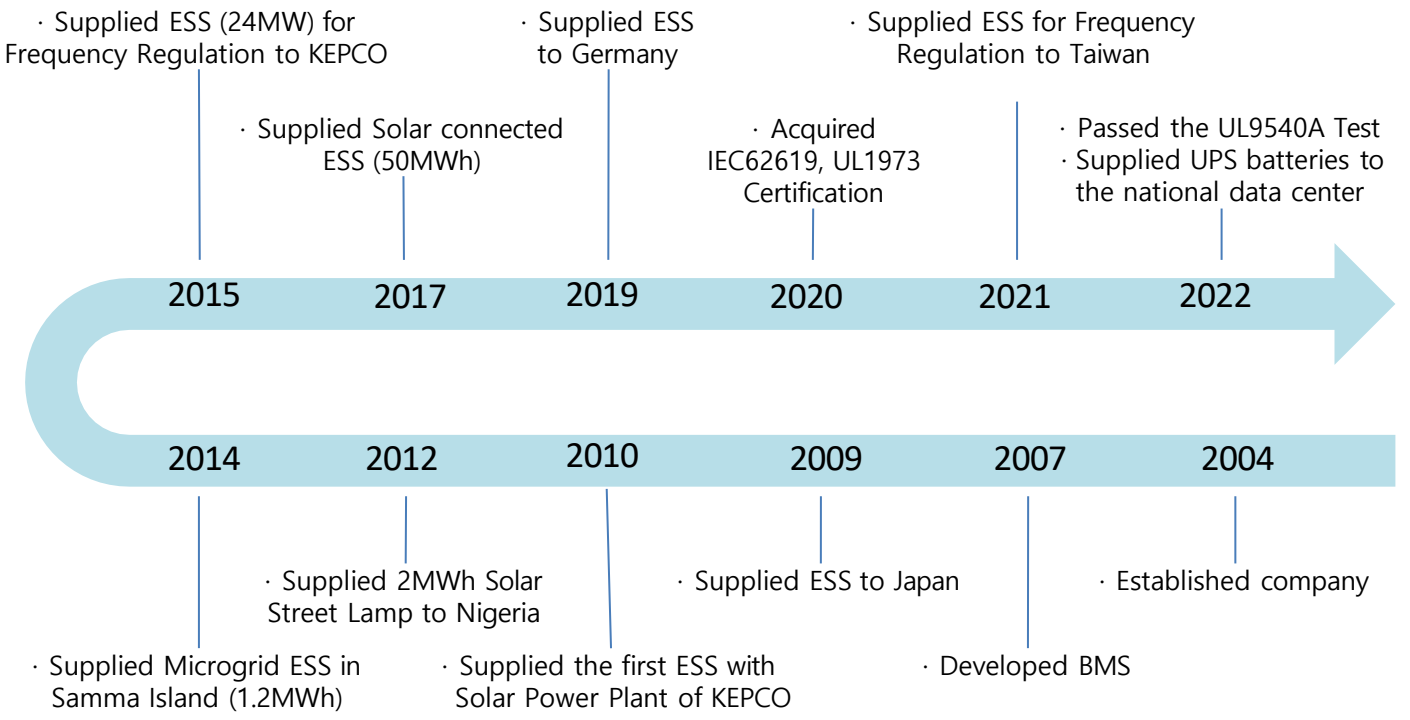
INCELL

INCELL develops and produces Energy Storage System (ESS) based on its excellent energy & battery solution technology to contribute to solving global energy and environmental problems. As a member of KEPCO Trust Partnership, INCELL is growing into a global leader in the energy business field.



History

Cumulative ESS installed capacity since 2009: 350MWh



ESS(Energy Storage System)

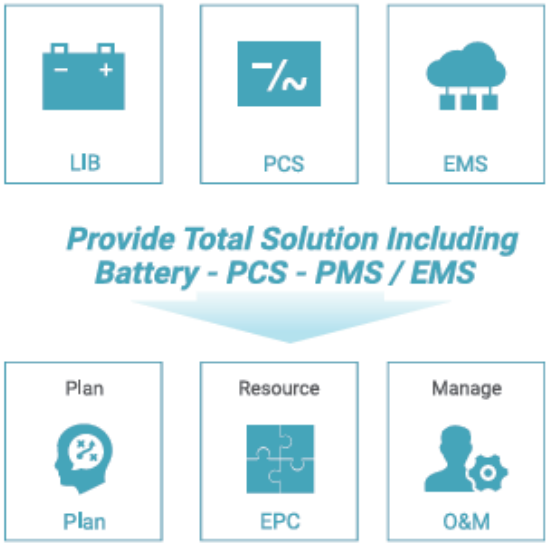
ESS (Energy Storage System) is an energy storage device that can contribute to the improvement of energy utilization efficiency, the utilization of new and renewable energy, and the safety of the power supply system by storing and supplying when using less electric energy when needed.

INCELL's Energy Storage System (ESS) uses Samsung SDI's high-performance ESS dedicated cell to ensure high efficiency, long life and excellent safety.

Energy Storage System

Total Solution

Incell manufactures all components, including Lithium battery, which is the core of ESS, and can offer than 15years of economic and stability required for ESS by carrying out from feasibility analysis, design, construction and after-management.

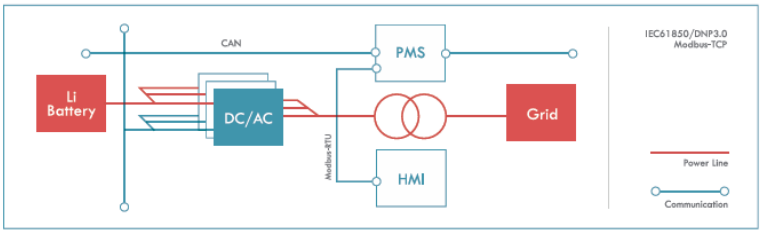


- Solar Power Plant
- Wind Power Plant
- Frequency Regulation
- Emergency Generator
- Building and Factory Power Demand Control

Industrial Battery

As a backup power source for industrial facilities,
lithium batteries are the most efficient and economical.
INCELL has provided lithium batteries for various industrial
backup power supplies and meets customer requirements.

PCS | Power Conditioning System



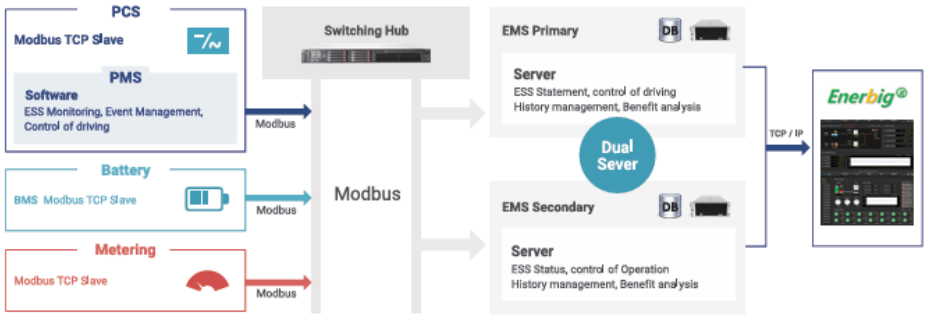
PCS

Item	Specification
Power	50/80/100/200/250/500/750/1000kW 0.4/0.8/1.2/1.6/2.0/2.5MW
Voltage Range	L : DC 550V ~ 830V / H : DC 740 ~ 1,100V
Rated efficiency	98% ~ 99%
Rated AC Voltage	350, 380, 400, 440V / ± 10% (Operating Range)
Grid Frequency	50 / 60Hz

* Specifications are subject to change without notice.

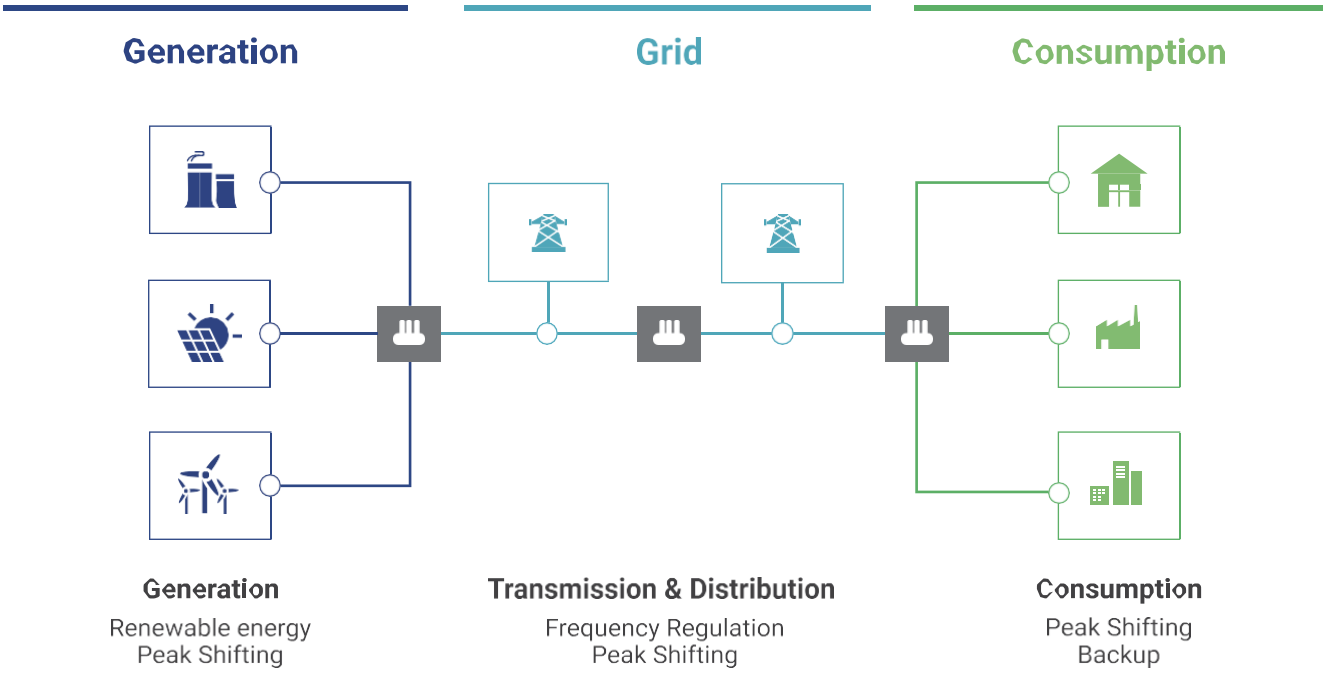
EMS / PMS | Energy Management System Power Management System

Enerbig® is designed based on optimal operation algorithm through big data analysis which is core of power IoT, maximize operating efficiency.



Energy Storage System

Application



ESS (KEPCO Ulju S/S) for 24MW Frequency Regulation installed by Incell

Lithium Battery System

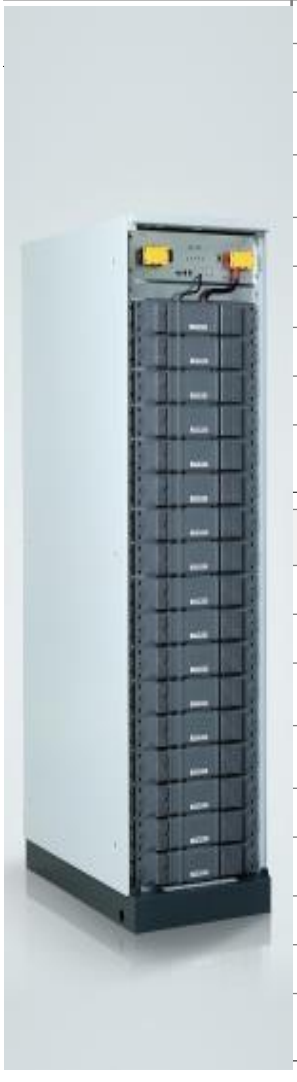
For Utility / Industry

INCELL's lithium battery system uses SAMSUNG SDI high-performance ESS dedicated cells to achieve high efficiency and longevity, and also provides multi-level protection barriers to ensure excellent safety.

Features

- High performance and longevity
- Module level built-in detectors for battery protection
- Specially designed enclosure to prevent fire spread

Battery Module	Model	SP44-50-300	SP44-48-223	SP44-30T-60
	Voltage	43.56Vdc	43.68Vdc	43.20Vdc
	Energy	12.80kWh	9.74kWh	2.46kWh
	Capacity	294Ah	223Ah	57Ah
	Size(WHD)mm	498x90x915	776x94x495	498x90x357
	Weight	About 71kg	About 57kg	About 27kg

Battery Rack	Model	R50-20-300	R48-21-223T	LIB-R-09
	Battery Module	SP44-50-300	SP44-48-223	SP44-30T-60
	Voltage	871.20Vdc	917.28Vdc	864.00Vdc
	Energy(Design/Useable)	256kWh / 215kWh	204kWh / 163kWh	49kWh / 40kWh
	Capacity(Design/Useable)	294Ah / 246Ah	223Ah	57Ah / 47Ah
	Voltage Range	756~984Vdc	756~1033Vdc	720~996Vdc
	Max. C-rate(Cha./Discha.)	0.3C / 0.5C	1C / 1C	1C / 4C
	Size(WHD)mm	575x2297x973	855x2338x560	575x2297x565
	Weight	About 1625kg	About 1400kg	About 750kg
	Certification	IEC62619, UL1973, UL9540A	IEC62619	IEC62619

Model	R50-17-300	R48-17-223T	LIB-R-09-1
Battery Module	SP44-50-300	SP44-48-223	SP44-30T-60
Voltage	740.52Vdc	742.56Vdc	734.40Vdc
Energy(Design/Useable)	217kWh / 182kWh	165kWh / 132kWh	41kWh / 34kWh
Capacity(Design/Useable)	294Ah / 246Ah	223Ah	57Ah / 47Ah
Voltage Range	642~836Vdc	612~836Vdc	612~846Vdc
Max. C-rate(Cha./Discha.)	0.3C/ 0.5C	1C / 1C	1C / 4C
Size(WHD)mm	575x2011x973	855x2050x560	575x1974x565
Weight	About 1420kg	About 1160kg	About 565kg
Certification	IEC62619, UL1973, UL9540A	IEC62619	

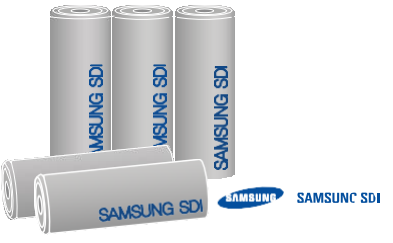
Battery Safety Technology

Battery Protection > TR Propagation Prevention > Fire Suppression

ESS goes through a charge/discharge cycle every day. Such a harsh operation condition requires higher safety measures to protect the system from potential incidents. INCELL offers innovative multi-level protection barriers to ensure safety from cell to system.

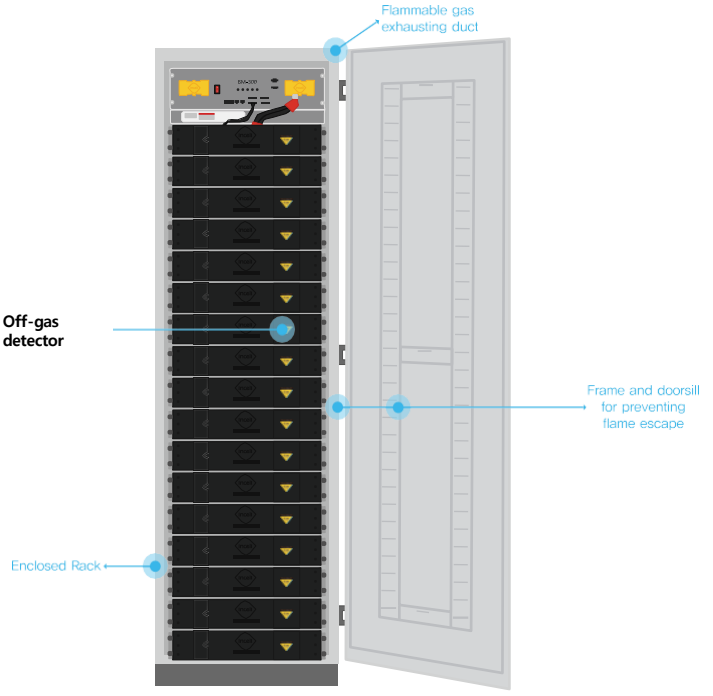
Cell

- SAMSUNG SDI ESS dedicated cells
- Cylindrical cell with long production history and proven record
- Inherent safety features such as Current Interrupt Device



Module

- Built-in off-gas early detection system for battery protection
- Monitoring condensation for battery protection
- Passive thermal runaway (TR) propagation prevention design



Rack

- Enclosed rack design for preventing rack to rack fire spread
- Specially designed door and frame for preventing flame escape
- Duct for exhausting off-gas
- Safe separation distance between racks

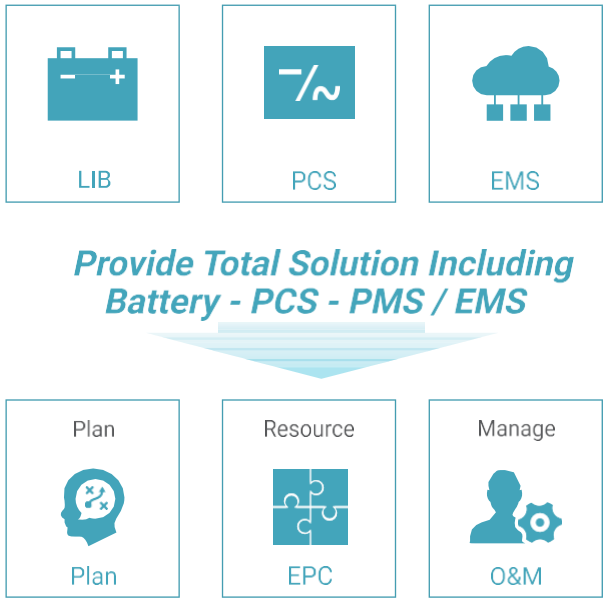
Integral Fire Suppression System

- Early detection and early response system
- Integrated system with battery
- Targeting sprinkler with local injection method
- Passed UL9540A large-scale fire test

Energy Storage System

Total Solution

INCELL develops all parts, including lithium batteries which are the core of ESS, and offers a total energy solution from product development to energy consulting service for maximizing the value for customers and achieving sustainability.



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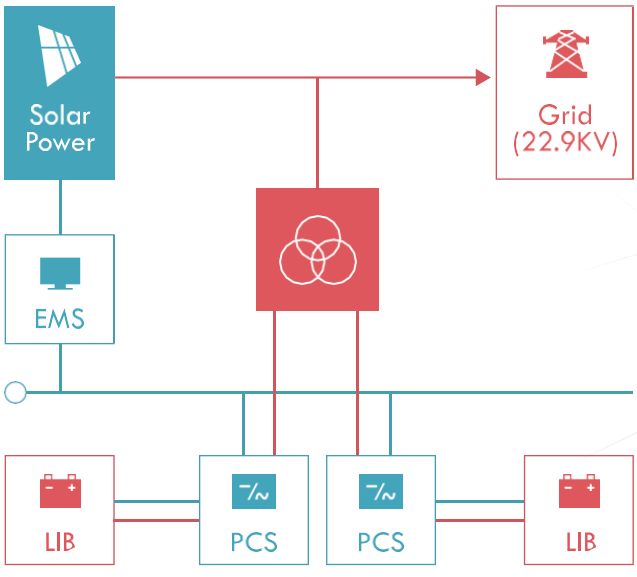
- Wind Power Plant
- Frequency Regulation
- Emergency Generator
- Building and Factory Power Demand Control

Solar-linked ESS scheme



Safety

As our ESS may operate in harsh environments with extremes of temperature and frequent charge/discharge cycles,
it is important to have "Safety-In-Design" to prevent the risk of accidents.
INCELL has a number of unique safety technologies that can prevent an initial fire and reduce the risk of it spreading from the cell to other parts of the ESS.

Progress

01 STRESS
- Poor design
- Inadequate parts
- Manufacturing defects
- Faulty installation
- Overload operation

02 TR
- Off-gas
- Smoke/Dust
- Thermal runaway

03 FIRE
- Ignition

04 FIRE SPREAD
- TR propagation
- Fire spread

Strategies

Remove stressors	Detect TR early	Early suppression of fire	Mitigate propagation
▪ ESS dedicated cells ▪ Environment monitoring ▪ Conservative operation	▪ Detect Off-gas early	▪ Built-in fire extinguisher (Micro capsule fire extinguisher pad)	▪ TR propagation prevention design ▪ Fire spread prevention design

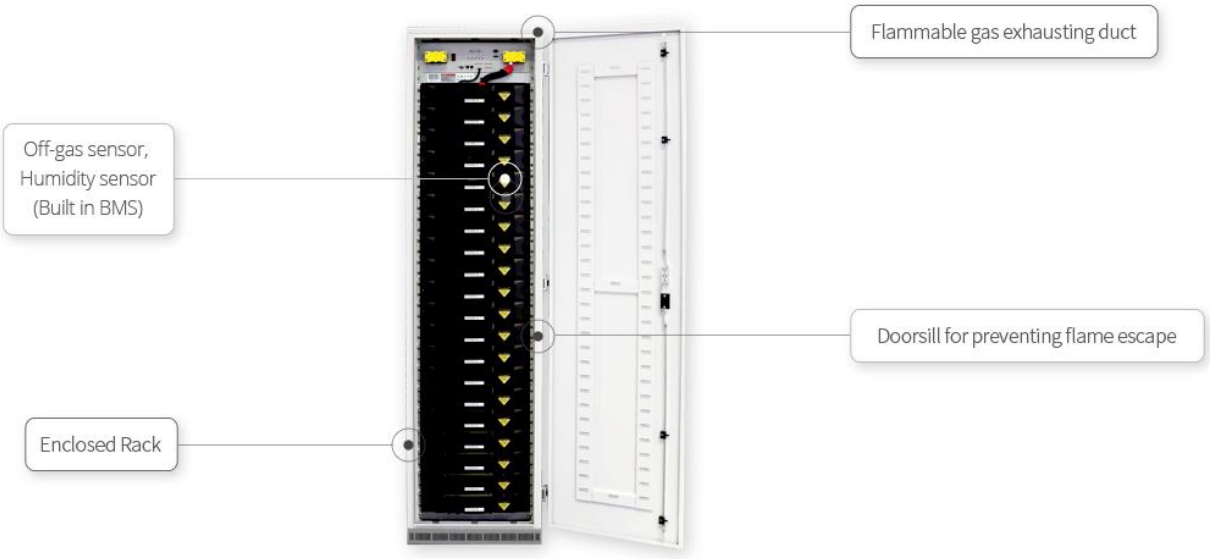
Safety

SAMSUNG SDI's Cell for ESS application
Enhanced safety feature by adopting CID
Over 75% of SOC maintained after 15 years (41J)
Various lineup: High Capacity, high power (6C), ultra high power (30C)

Module

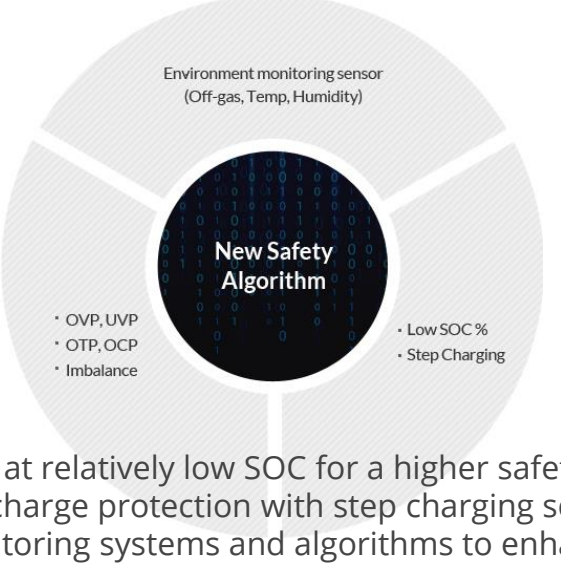
Off-gas sensor for early failure detection
Temperature & humidity sensor for electrical insulator degradation detection
TR propagation prevention design (*TR : Thermal Runaway)
Enclosed module to prevent flame from escaping

Rack



Six side enclosed rack for fire spread prevention
Door and frame designed for flame escaping prevention
Gas exhaust duct
Make safe separation distance for among racks installation

BMS & Safety



•OVP : Over Voltage Protection
•UVP : Under Voltage Protection
•OTP : Over Temperature Protection
•OCP : Over Current Protection

Full charge rate at relatively low SOC for a higher safety and longer life
Overcharge protection with step charging scheme
Environment monitoring systems and algorithms to enhance the safety and longevity in addition to existing battery safety features

ESS Reference

Building, Plant, Renewable Energy

► Gyeonggi-do City hall(1.9MWh)

► PV 1MW, ESS 3.6MWh

► PV 2MW, ESS 7MWh

ESS Reference

Building, Plant, Renewable Energy

ESS for buildings in Gumi City in 2023 (for peak reduction)
- Geumo Technical High School (150kWh)

ESS for buildings in Wanju-gun in 2023 (for peak reduction)
- High-risk plant disease and pest isolation research and testing building (200kWh)

2024 Pohang City Building ESS (for peak reduction)
- Gyeongsangbuk-do Eastern Office Building (160kWh)

2024 Incheon City Building ESS (for peak reduction)
- Incheon Integrated Business Center (300kWh)

2024 Seoul City Building ESS (for peak reduction)
- Yangjae AI Support Center (300kWh)

ESS for buildings in Cheongju city in 2023
(for peak reduction)
- Meteorological and Earthquake Equipment Certification Center (150kWh)

ESS Reference

Building, Plant, Renewable Energy

2024 Jeonju City Building ESS (for peak reduction)
- Hwasan Gymnasium (300kWh)

ESS for buildings in Busan city in 2023 (for peak reduction)
- National Pension Service Busan Regional Headquarters (200kWh)

ESS for buildings in Goyang City in 2023 (peak reduction)
- Goyang Sports Complex (200kWh)

ESS for buildings in Osan City in 2023 (for peak reduction)
- Osan Sports Center (100kWh)

ESS for buildings in Iksan City in 2023 (peak reduction)
- Korea Food Industry Cluster Promotion Agency (600kWh)

ESS for Uijeongbu buildings in 2022 (peak reduction)
Uijeongbu District Prosecutors' Office Namyangju Branch (150kWh)

ESS Reference

Building, Plant, Renewable Energy

ESS for Gangwon-do buildings in 2021 (peak reduction)
Gangwon-do Agricultural Research & Extension Services(250kWh)

ESS for building in Gyeonggi-do in 2021 (for peak reduction)
- Gyeonggi-do new office building (1992.54kWh)

2021 ESS for building in Incheon (peak reduction)
- National Institute of Environmental Research (1000kWh)

2021 ESS for building in Bundang, (peak reduction)
- Bundang Combined Cycle Power Plant (320kWh)

2021 2022 Taiwan FR ESS
ESS 17.4MWh

2021Y Hongseong Builiding ESS (peak reduction)
- Hongseong Automotive Certification Center (200kWh)