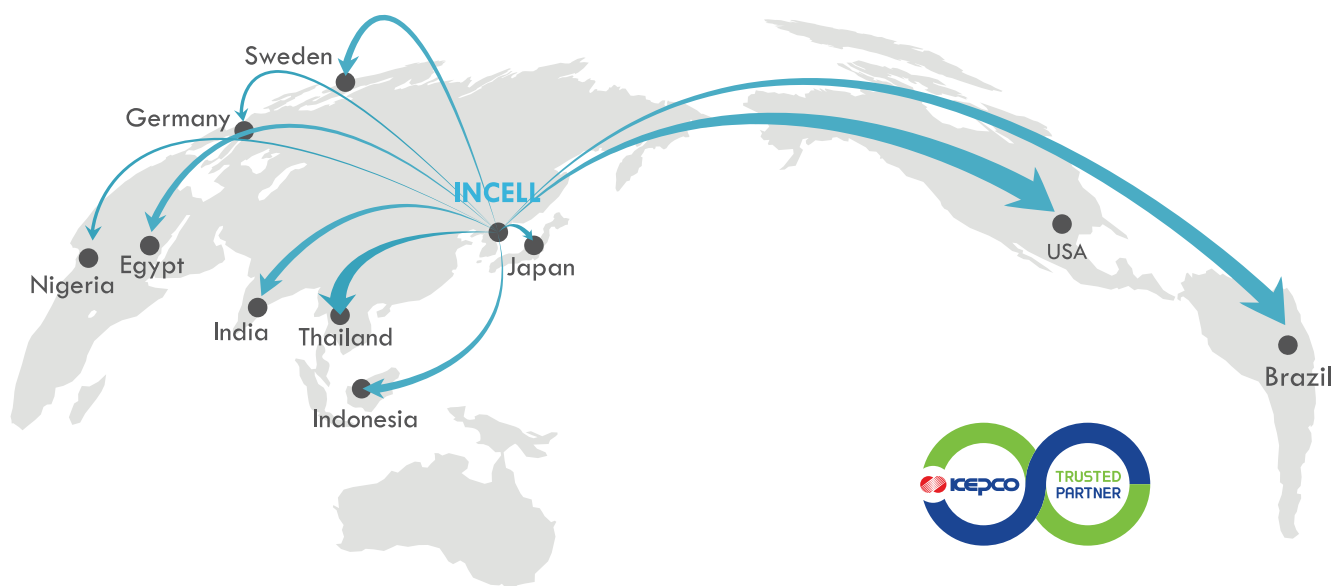


# 2020 Energy Storage System Solution & Product Guide

# INCELL

INCELL develops and produces ESS (Energy Storage System) based on excellent energy & battery solution technology to solve the energy and environmental problems of the earth. As a member of KEPCO Trust Partnership (KTP), KEPCO is doing its best to develop into a global enterprise in the ESS field from the energy valley led by KEPCO.



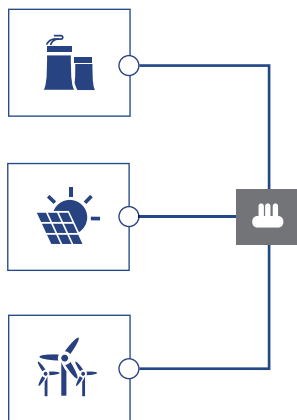
## History

- |             |   |             |  |
|-------------|---|-------------|--|
| <b>2019</b> | .01 Youth-friendly company selection (3 sections)   | <b>2014</b> | .06 Supplied ESS in Samma Energy independent Island (1,2MWh)                                   |
|             | .04 Philippines Power Agency Supplier Selection   |             | .06 Supplied Lithium Batteries for UPS Power failure Compensation to East-West Power Co., Ltd. |
|             | .05 Italy Enel Group Supplier Registration  |             | .08 Exported industrial lithium battery to Germany, USA  |
| <b>2018</b> | .04 KEPCO Gwangju Star company selection  |             | .12 Smart Grid Support Project 3MWh Installation   |
|             | .12 Minister prize awarded by Ministry of Science and ICT as a commercialization              | <b>2013</b> | .04 Installed lithium battery in KEPCO Seoul headquarters                                      |
|             | .12 Minister prize awarded by Ministry of SMEs and Startups as a local specialization project |             | .04 Exporting ESS monitoring and control equipment for Mozambique solar PV                     |
| <b>2017</b> | .10 Supply LIB for Doosan Forklift  | <b>2012</b> | .07 Exported 2MWh solar street ramp to Nigeria   |
|             | .12 Installation of solar connection ESS 50MWh  |             | .08 Exported lithium battery system for communication to India                                 |
|             | .12 Investment by POSCO Capital Co., LTD  |             | .12 Installed the first SG Project in Korea  |
| <b>2016</b> | .04 Signed export contract with ESS of KRW 270 billion and MOU with KEPCO                     | <b>2011</b> | .02 Certified CE, ISO 9001/14001   |
|             | .11 Shinsung solar energy solar connection ESS 1MWh installation                              | <b>2010</b> | .01 Installed the first ESS with solar power plant of KEPCO in Korea                           |
|             | .11 Mass production of lithium battery for Samsung Electronics medical equipment              |             | .03 Installed ESS of KHNP  |
|             | .11 Certified as KEPCO Trusted Partner of KEPCO   | <b>2009</b> | .07 Exported ESS to Japan  |
|             | .12 Credit Guarantee Fund selected as Star Enterprise   | <b>2008</b> | .06 Joint development of KPX   |
| <b>2015</b> | .06 Telecom ESS export to Egypt   | <b>2007</b> | .07 Development BMS  |
|             | .07 Received order for 3 KEPCO SG stations  | <b>2006</b> | .07 Established R&D Center   |
|             | .12 Install 3MWh of smart grid distribution business  | <b>2004</b> | .01 Established company  |
|             | .12 Installation of ESS (24MW) for Korean power frequency adjustment                          |             |  |

# Energy Storage System

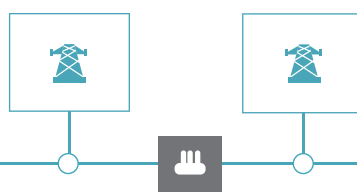
## Application

### Generation



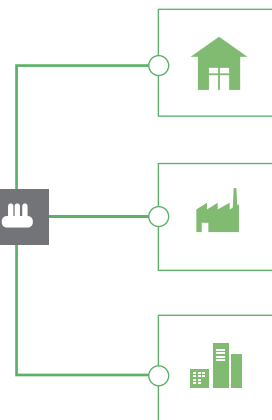
**Generation**  
Renewable energy  
Peak Shifting

### Grid



**Transmission & Distribution**  
Frequency Regulation  
Peak Shifting

### Consumption



**Consumption**  
Peak Shifting  
Backup




# Lithium Battery System


## for Utility / Industrial

INCELL's Lithium battery system uses Samsung SDI high performance ESS dedicated cells to achieve high efficiency longevity and provide **multi-stage fire protector** features to guarantee excellent safety.

Features

- Using ESS-only cells
- Low charging rate ensures safety and longevity
- Off-gas and humidity sensor built into the module to prevent fire
- Module and rack design to prevent fire spread
- IEC 62619 Certification

Battery Module	Model	SP44-33-195	SP44-41-235	SP44-30T-60
	Voltage	43.6Vdc	43.8Vdc	43.2Vdc
	Energy	8.6kWh	10.8kWh	2.6kWh
	Capacity	198Ah	246Ah	60Ah
	Size(WHD)mm	459x90x895	472x90x915	472x90x320
	Weight	About 65kg	About 68kg	About 25kg
* Specifications are subject to change without notice.				

Battery Rack	Model	LIB-R-06	LIB-R-07	LIB-R-09
	Voltage	872Vdc	876Vdc	864Vdc
	Energy (Design/Useable)	172kWh / 155kWh	215kWh / 195kWh	51.8kWh / 46.6kWh
	Capacity	198Ah	246Ah	60Ah
	Voltage Range	756 ~ 996Vdc (For ESS 768~972Vdc)		
	Size(WHD)mm	545x2244x1065	575x2297x973	575x2297x559
	Weight	About 1500kg	About 1600kg	About 750kg
	Model	LIB-R-06-1	LIB-R-07-1	LIB-R-09-1
	Nominal Voltage	741.2Vdc	744.6Vdc	734.4Vdc
	Energy (Design/Useable)	147kWh / 132kWh	183kWh / 166kWh	44kWh / 39.8kWh
	Capacity	198Ah	246Ah	60Ah
	Voltage Range	642 ~ 846Vdc (For ESS 652~826Vdc)		
	Size(WHD)mm	545x1994x1065	575x1974x973	575x1974x559
	Weight	About 1300kg	About 1400kg	About 650kg
* Specifications are subject to change without notice.				
* Certification and operational capacity is 95% of the installed capacity.				

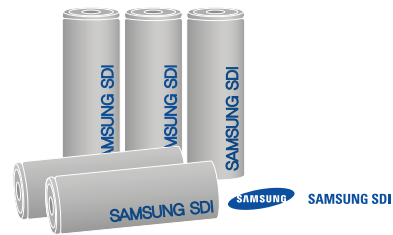
# Battery Safety Technology

## New Safety Algorithm

ESS is operated in a harsh environment due to charging/ discharging daily and it requires higher safety measures to protect the system from fire. Incell offers new and enhanced safety technologies to protect the system from fire and prevent fire spread from cell to system.

## Cell

- SAMSUNG SDI's cell for ESS application
- Enhanced safety feature by adopting CID
- Over 80% of SOC maintained after 15 years

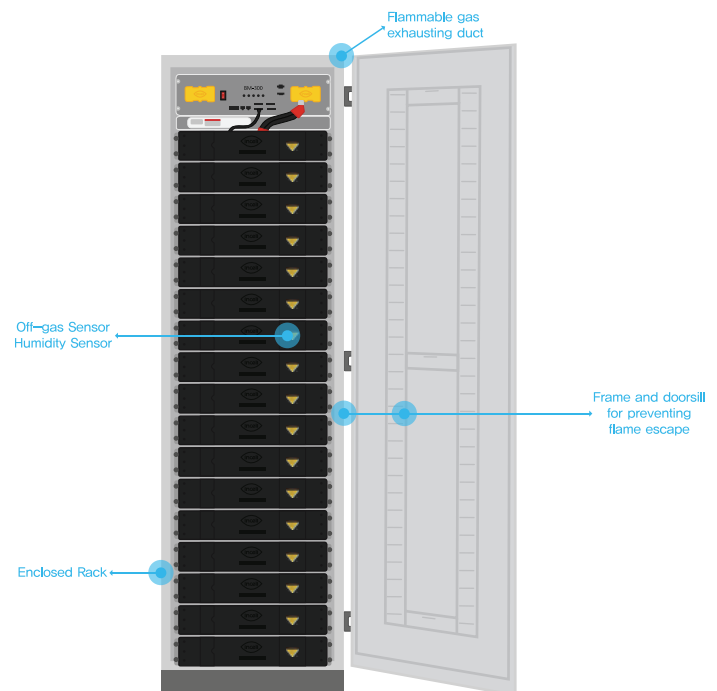


## Module

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

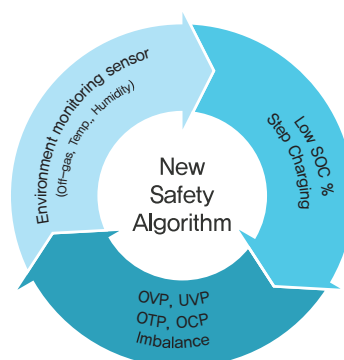
## Rack

- 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



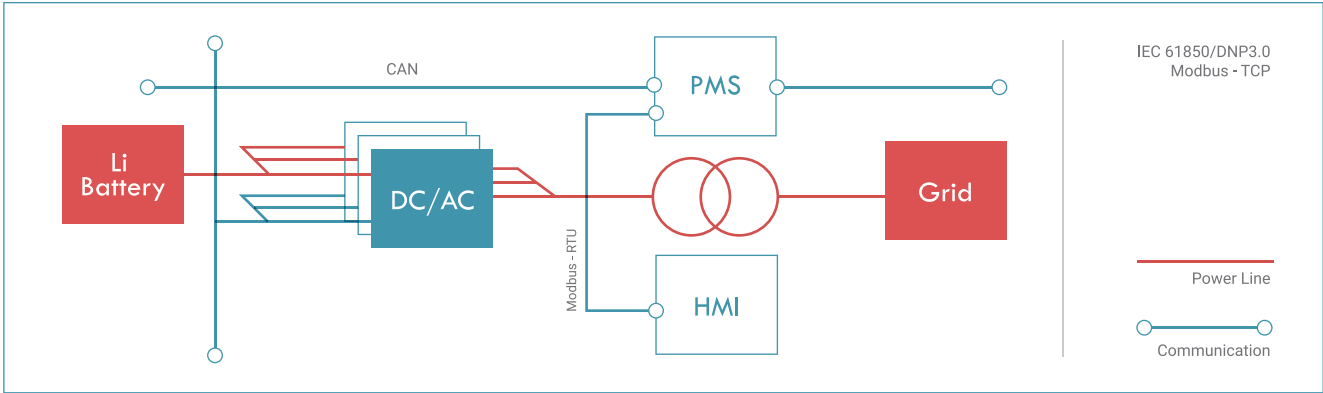
## BMS & Safety Algorithm

- Full charge rate at relatively low SOC for a higher safety and longer life (87.5% compared to competitors)
- Overcharge protection with low charge voltage (4.075V) and step charging scheme.
- Environment monitoring systems and algorithms to enhance the safety and longevity in addition to existing battery safety features



PCS

Power Conditioning System

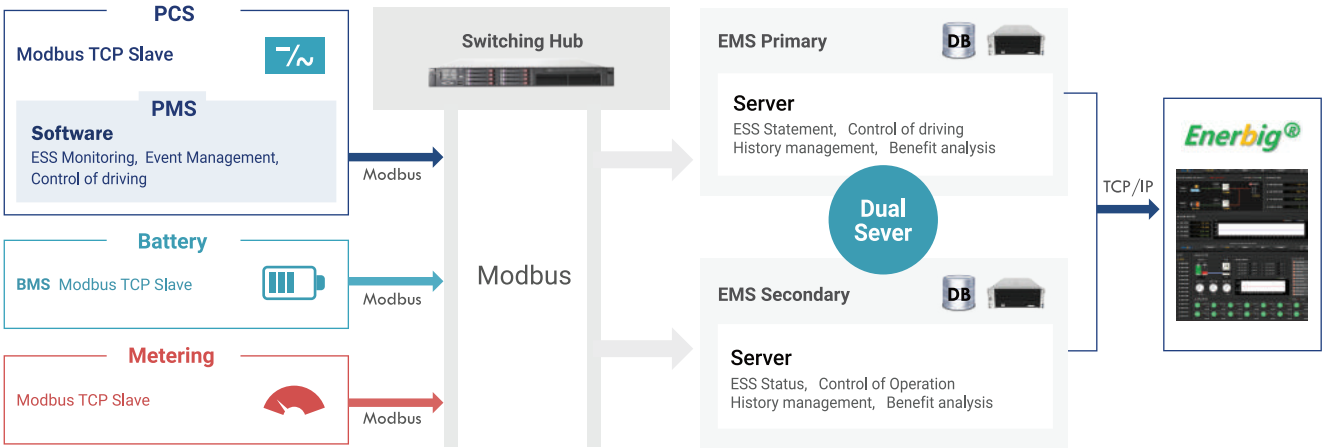


PCS	Item	Specification
	Power	50/80/100/200/250/500/750/1000kW 0.4/0.8/1.2/1.6/2.0/2.5MW
	Voltage Range	L : DC 550V ~ 830V, H:DC 740 ~ 1.100V
	Rated efficiency	98%~99%
	Rated AC Voltage	350,380,400,440V / ±10%(Operating Range)
	Grid Frequency	50 / 60Hz
	* Specifications are subject to change without 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.



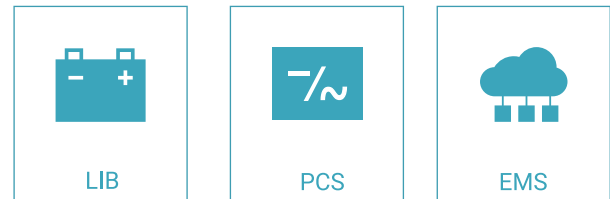


# Energy Storage System

## 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.

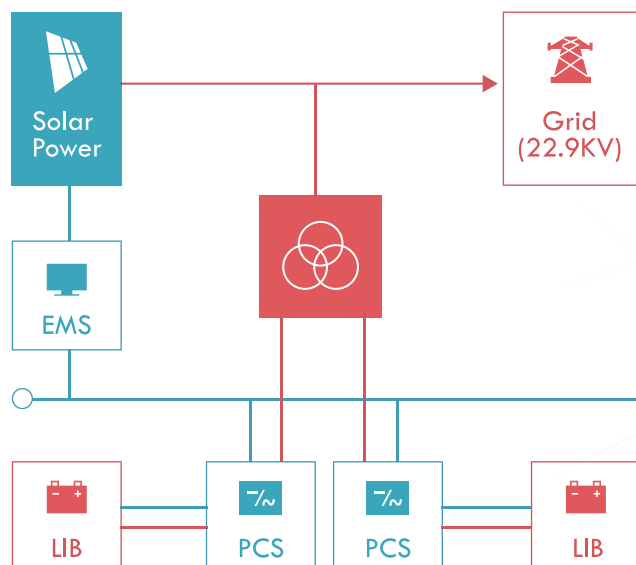
- Solar Power Plant
- Wind Power Plant
- Frequency Regulation
- Emergency Generator
- Building and Factory Power Demand Control



**Provide Total Solution Including Battery - PCS - PMS /EMS**



## Solar-linked ESS scheme





### Headquarters

**Tel :** +82-62-973-5993 , **Fax :** +82-62-973-5997  
#1-201 GJTP 333 Cheomdangwagi-ro Buk-Gu Gwangju, Korea 61008

### Seoul Office

**Tel :** +82-70-4272-2463~7  
280, Gwangpyeong-ro, Gangnam-gu, Seoul, Republic of Korea

### Overseas Office

#### Japan Branch

301 2-4-2 Shinjuku Shinjuku-ku Tokyo 160-0022 Japan  
**E-mail :** jrkim@nifty.com

#### European office

Kistagangen 16, 5tr 164 40 Kista Sweden  
**E-mail :** stefan.jansson@incellint.com