

# ESS

## Energy Storage System





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## INZI e-Solution

INZI e-Solution Co., Ltd. Is the leading Lithium pack integrated solution company in Korea. INZI Group possesses the most advanced technology of lithium pack, supplying vehicle parts and lithium pack for electric vehicles including 40 affiliates in Korea and overseas with \$24 billion and automobile company 'Mercedes Benz'.

INZI e-Solution Co., Ltd. develops/produces/supplies lithium pack that is required for various industries such as SLI · Motive Power · Industrial · Mobility · ESS · EV. We are the leading company in the industry with delivery performance over 200MWh as in 2023.

**10%**

**Investment cost of R&D over 10%**

We develop a differentiated lithium battery based on ICT & AI with the characteristic of high safety & lifespan by investing R&D cost of over 10% based on the annual sales. We participate in government R&D projects such as Ministry of SMEs and Startups, Ministry of Science and Technology, Ministry of Commerce, Industry and Energy. We also execute lithium battery development for major companies.

**Wide Experience of Battery Development**

We have wide experience of development and broad operational data through R&D, production, and sales of battery system over 13 years. Through this, we provide the most reliable, safe, and optimized battery to our customers.

**13yr**

**Introduction of ICT & AI based defect projecting system**

INZI e-Solution, leading the development of "lithium battery with high safety" with wide experience and technology, has introduced the first prior defect projecting system through ICT remotely monitoring system and AI analysis in the industry.

**1st**

**Large Cumulative Sales**

We have supplied products for starting, driving, industrial use, and ESS based on our differentiated technology to various industries. As a result, we have reached 200MWh of cumulative sales, becoming the leading position of lithium battery market.

**200MWh**

**No.1 amount of lithium pack development**

We have reached the top for development item quantity by selling lithium pack required for SLI · Motive Power · Industrial · Mobility · ESS · EV · etc. after commercialization. We, now, have been recognized as a leading company that leads the industry with differentiated technology.

**No.1**

**Top-class of BMS in the industry**

We are committed to R&D of high functioning BMS with the leading experts of BMS. With the experience over 13 years and broad operational data, we own a massive amount of high performing BMS that can be used instantly in various industries

**30+**



# INZI e-Solution creates carbon neutrality with Lithium Pack



**Eco-Friendly  
Net Zero**  
WITH  
INZI e-Solution

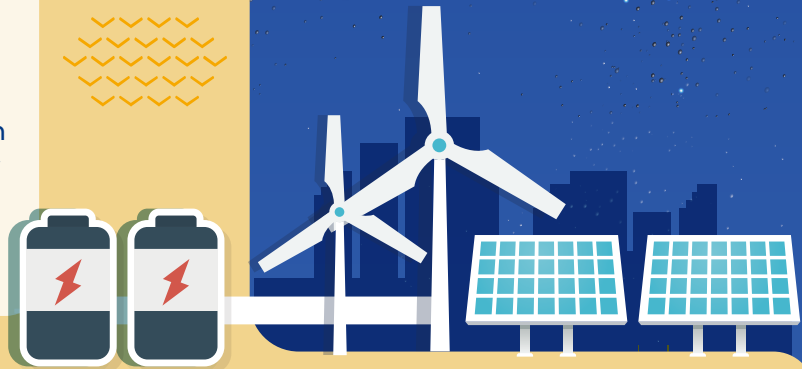


### Eco-Friendly Lithium Battery

The world has been dedicated to greenhouse gas reduction since Paris Climate Agreement in 2015. The rapid changing field is the automation of an internal combustion engine such as electric vehicles and power-train technology. INZI e-Solution participates in 'zero' greenhouse gas emissions, which is the main cause of environmental pollution by applying lithium battery to equipment using lead, Ni-Cd, Ni-MH or internal combustion engine.

### Advancement of Efficiency of New

Did you know the fact that energy development is being suspended (power restrictions) due to oversupply of new renewable energy in Jeju Island, where new renewable energy is on the rise? INZI e-Solution reduces carbon emission by storing evoked power and effectively using it when needed without restricting development of new renewable energy using ESS



### Extension of life span using ICT & AI

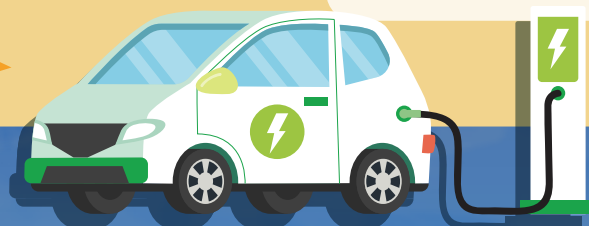
INZI e-Solution has applied ICT real-time remotely monitoring technology and AI analyzing technology to lithium battery through constant R&D investment. Through such technologies, it enables safe usage with long lifespan by predicting the remaining lifetime of lithium battery and preventing fire. INZI e-Solution strives to reach Net-Zero emission by optimizing the lifespan of lithium battery.



### Recycle of Resource

64kg of Carbon Dioxide that is emitted by production of lithium battery for 1 electric vehicle  
 15kg of Carbon Dioxide that is emitted when reusing

We can reduce over 49kg of Carbon Dioxide through reusing & recycle of lithium battery resources.  
 INZI e-Solution strives to reach Net-Zero emission by advancing the technology of battery reusing & recycling.

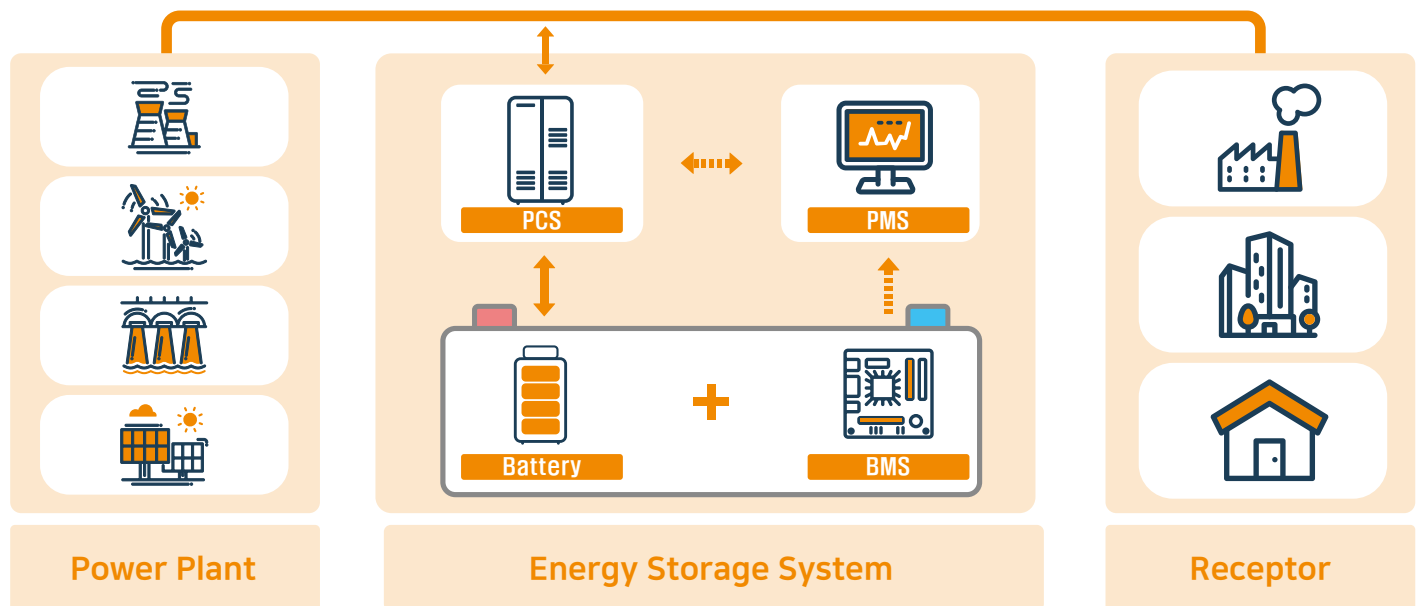


## What is ESS [Energy Storage System]?

ESS(Energy Storage System) is a system that supplies electrical energy effectively to various fields after storing general output.

ESS is normally used to provide ①safety of electrical grid ②utilization of power through the integration of new renewable energy ③cost reduction through electric power demand management(DR) and peak management and ④emergency power source service.

## Concept of ESS



## Composition of ESS

### Battery



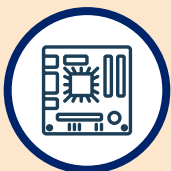
- Lithium battery for power storage (NCM, LFP, etc)
- Power conversion by PCS
- Long lifespan
- High safety
- High efficiency

### PMS (Power Management System)



- Integrated monitoring/control system for stable operation and function of ESS system
- Power quality control

### BMS (Battery Management System)



- Stabilization through cell balancing
- Condition inspection of cell & module unit
- Share of PMS of inspection data
- Safety management by BPU control at emergency
- Safety control with duplex structure of KC62619 functional safety

### PCS (Power Conditioning System)



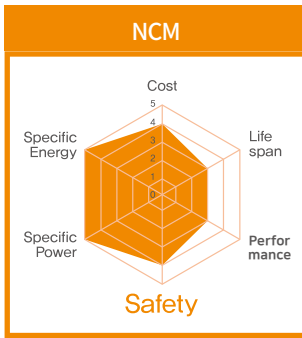
- Device that converts power from AC ↔ DC when in/output of power between the batteries with different system of battery structure
- Battery storage after converting AC→DC
- Power supply to system and demand device after converting DC→AC

# CELL

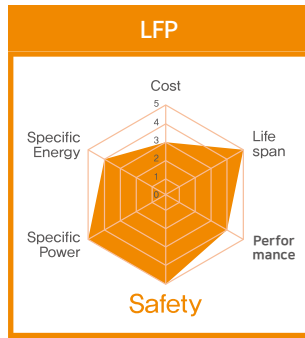
## Lithium-Ion Phosphate Battery(LFP, LiFePO4)

The optimal cell of ESS that requires high safety and long lifespan

### The Safest Li-ion Cell

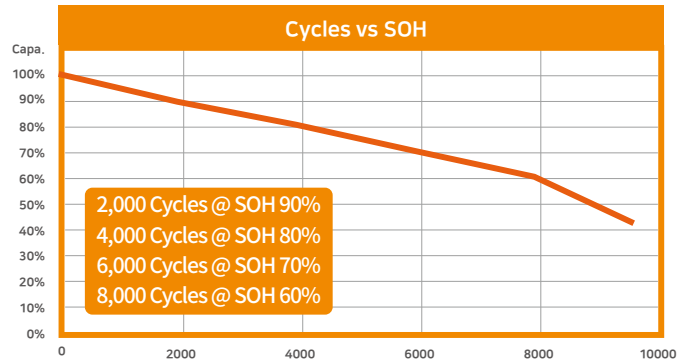


High-power · small volume · lightweight  
Electric vehicle · tool · appliance · industrial use



Long lifespan · safety · low temperature  
Driving · industrial · energy storing purpose

### Cell with excellent lifespan (1.2-2 times of NCM)



Test Condition :  
Charging 1C · Discharging 1C · DOD 100%

## Prismatic Cell

Multiple protecting tool

## Excellent Cooling System (Cooling System)

Effective thermionic emission & cooling function with an excellent heat conduction of Aluminum Case

# Module · BPU(Battery Protection Unit) · Rack

## Wide Application

Standard ESS Module applicable to various fields  
Platform low power ~ high power Power Solution

## Safety

Safety system of external short-circuit dual block  
Insulation of high voltage sensing  
Multi-channel temperature sensing (Measures all cells)

## Easy Maintenance

Real-time Data logging (SD memory storage)  
Provides own GUI SW  
(Monitoring battery condition & real-time diagnosis)

## Expandability

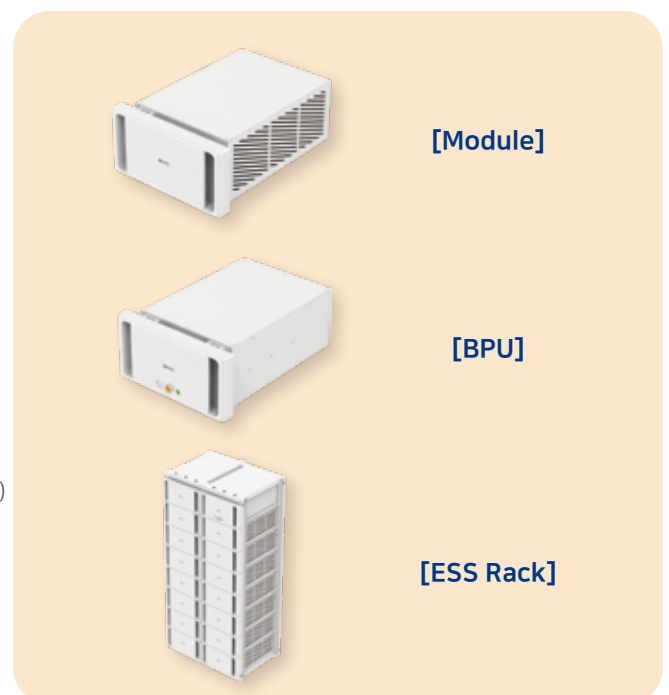
Supports multi-channel network protocol (CAN, TCP/IP, RS-232/485)

## National Standard Certificate of KC62619

Certification of national safety standard for industrial secondary battery

## NFSC 607 Fire Safety Function certified

NFSC 607, national fire safety code passed



## ESS (Energy Storage System)

Energy Storage System that stores energy and uses it to increase efficiency of energy supplies



### KC62619 National Standard Certification

Acquired Safety certification for batteries at International Standard Level

### NFSC 607 Fire Safety Function certified

NFSC 607, national fire safety code passed



### Design

Differentiated design that fits anywhere through professional industrial design development

### Wide application

Standard ESS Module Platform applicable to various fields

### Safety

Redundant safety protection design

High-voltage isolation sensing

Multi-channel temperature sensing (measurement of every cell temp.)

### Diversity



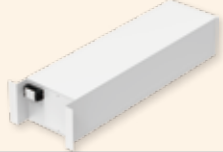
Multi-channel communication protocol support (CAN, TCP/IP, RS-232/485)

### Easy Maintenance



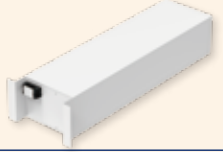
Real-time data logging (SD memory storage)

Exclusive GUI & LCD (real-time battery monitoring and diagnosis)




# Specification

Model		M768A	M605A	M288A
Module	Appearance			
	Nominal Voltage [V]	51.2	57.6	57.6
	Total Energy [kWh]	7.68	6.05	2.88
	Usable Energy [kWh]	6.91	5.44	2.59
	Capacity [Ah]	150	105	50
	Size (W*D*H) [mm]	459*589*230	366.8*570*231.6	284*800*161
	Weight [kg]	About 72	About 50	About 45




  

Model		B768A	B605A	B288A
BPU	Appearance			
	Size (W*D*H) [mm]	459*589*230	741.4*570*330	284*800*161
	Weight [kg]	About 25	About 32	About 20
	Configuration	OV / OC / OT / Short circuit Protection circuit breaker, power switch, status display LED, CAN 2.0A, TCP/IP		

Model		ESS1152A	ESS998A	ESS484A
ESS	Appearance			
	Nominal Voltage [V]	768	665.6	460.8
	Operating Voltage [V]	674.4 ~ 830.4	584.5 ~ 719.7	404.6 ~ 498.2
	Total Energy [kWh]	115.2	99.8	48.4
	Usable Energy [kWh]	103.7	89.9	43.5
	Capacity [Ah]	150	150	105
	Size (W*D*H) [mm]	650*950*2012.4	650*950*1750.4	852.4*650*1546.1
	Weight [kg]	About 1,255	About 1,110	About 555
System configuration	M768A 15S + B768A	M768A 13S + B768A	M605A 8S + B605A	

Model		ESS363A	ESS432A	ESS374A
ESS	Appearance			
	Nominal Voltage [V]	345.6	864.0	806.4
	Operating Voltage [V]	303.5 ~ 373.7	758.7 ~ 934.2	657.5 ~ 809.6
	Total Energy [kWh]	36.3	51.84	37.4
	Usable Energy [kWh]	32.7	46.66	33.7
	Capacity [Ah]	105	60	50
	Size (W*D*H) [mm]	852.4*650*1546.1	600*855*1470	600*855*1470
	Weight [kg]	About 455	About 780	About 740
System configuration	M605A 6S + B605A	M288A 15S + B288A	M288A 14S + B288A	



## HESS (Home Energy Storage System)

Home energy storage system that stores eco-friendly renewable energy such as solar and wind power and uses to increase power utilization efficiency and ensure a stable supply

### Design

Simple and compact design through professional industrial design development

Apply the LED lighting logo to check the battery status immediately

### Safety

Redundant safety protection design

Multi-channel temperature sensing (measurement of every cell temp.)

### Diversity

User-selectable & scalable capacity (10kWh, 15kWh)

Multi-channel communication protocol support (CAN, TCP/IP, RS-232/485)

### Easy Maintenance

Real-time data logging (SD memory storage)

Exclusive GUI & LCD (real-time battery monitoring and diagnosis)



Model		HESS051A	HESS102A	HESS154A
HESS	Nominal Voltage [V]	51.2	51.2	51.2
	Operating Voltage [V]	48~56	44.96 ~ 55.36	44.96 ~ 55.36
	Total Energy [kWh]	5.12	10.24	15.36
	Usable Energy [kWh]	4.61	9.21	13.82
	Capacity [Ah]	100	200	300
	Size (W*D*H) [mm]	274*560*372	650*380*1526	650*380*1526
	Weight [kg]	About 55	About 135	About 165
	Configuration	OV / OC / OT / Short circuit Protection circuit breaker, power switch, status display LED, CAN 2.0A, TCP/IP GUI LCD		

## UPS (Uninterruptible Power Supply)

Uninterruptible power supplies with advantages such as space saving, long life, output performance, and eco-friendliness by replacing lead-acid batteries.

### Design

Battery & Control Module All-in-One Design

### Safety

Redundant safety protection design

Multi-channel temperature sensing  
(measurement of every cell temp.)

### Diversity






Multi-channel communication protocol support  
(CAN, TCP/IP, RS-232/485)

### Easy Maintenance

Real-time data logging (SD memory storage)

Exclusive GUI & LCD (real-time battery monitoring and diagnosis)



BPU		Module		UPS		
Appearance		Appearance				
Model	B605A	Model	M605A	ESS484A	ESS058D	ESS215E
Size (W*D*H) [mm]	741.4*570*330	Nominal Voltage [V]	57.6	460.8	115.2	358.4
		Operating Voltage [V]	50.6~62.3	404.6 ~ 498.2	108~127	336~392
		Total Energy [kWh]	6.05	48.4	5.76	21.5
Weight [kg]	About 32	Usable Energy [kWh]	5.44	43.5	5.18	19.35
		Capacity [Ah]	105	105	50	60
Configuration	OV / OC / OT / Short circuit Protection circuit breaker, power switch, status display LED, CAN 2.0A, TCP/IP	Size (W*D*H) [mm]	366.8*570*231.6	852.4*650*1546.1	800*450*1000	1000*600*2000
		Weight [kg]	About 50	About 555	About 220	About 530



## Mobile ESS

A Mobile Energy Storage System supplies power directly to various fields such as emergency dispatch of EV, event venues, construction sites, disaster sites and etc.



### Compliance with domestic safety standards

Safety assurance by developing domestic standards for mobile ESS in advance

### Wide application

Standard ESS Module Platform applicable to various fields

Wide range of output power capacity

### Diversity

Multi-channel communication protocol support (CAN, TCP/IP, RS-232/485)

### Safety

Nonvibration design structure approved

Fire extinguishing device mounted

Remote Monitoring

### KC62619 National Standard Certification

Acquired Safety certification for batteries at International Standard Level

### Easy Maintenance

Real-time data logging (SD memory storage)

Exclusive GUI & LCD (real-time battery monitoring and diagnosis)

### Convenience

Real-time monitoring system

Remote power supply billing system

### Main performance




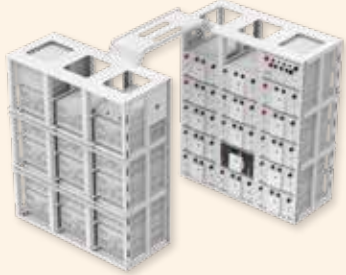
Rated Capacity : 115~230kWh

Rated Input : AC 380V (3P4W)

Rated Output : max. 100kW

- 1) AC 220V (1P3W)
- 2) AC 380V (3P3W)
- 3) DC 620~876V (2P2W)
- 4) DC 350~500V (2P2W)

## Specification

Model		M768M	Model		B768M	
Module	Appearance		BPU	Appearance		
	Nominal Voltage [V]	51.2		Size (W*D*H) [mm]	570*450*242	
	Total Energy [kWh]	7.68		Weight [kg]	About 25	
	Usable Energy [kWh]	6.91		Configuration	OV / OC / OT / Short circuit Protection circuit breaker, power switch, status display LED, CAN 2.0A, TCP/IP	
	Capacity [Ah]	150				
	Size (W*D*H) [mm]	570*450*242				
	Weight [kg]	About 72				
Model		ESS1152M/ESS1306M		ESS2304M/ESS2612M		
ESS	Appearance					
	Nominal Voltage [V]	768		729.6		
	Operating Voltage [V]	674.4 ~ 830.4		674.4 ~ 830.4		
	Total Energy [kWh]	115.2		230.4		
	Usable Energy [kWh]	103.7		207.4		
	Capacity [Ah]	150		300		
	Size (W*D*H) [mm]	1390*606.4*1668.4		2780*606.4*1668.4		
	Weight [kg]	About 1,255		About 2,510		
System configuration	M768M 15S + B768M		ESS1152M 2P			

# ESS Application

<p><b>FESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Smart Factory ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>EV Garage ESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> </ul>
<p><b>Power Pack(replacing diesel) ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>AMP ESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Construction site ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> </ul>
<p><b>Ship-ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Parking lot &amp; car-wash ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> </ul>	<p><b>Freezing Truck ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> <li>-Reduce fine dust</li> </ul>
<p><b>BESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Railroad detecting car ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Logistics center ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>
<p><b>EV-Charging Station ESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Heating &amp; Cooling EHP ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Industrial complex ESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Renewable output stabilization</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>
<p><b>Road electric sweeper ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> <li>-Reduce fine dust</li> <li>-Reduce noise</li> </ul>	<p><b>Hybrid forklift ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> <li>-Reduce fine dust</li> <li>-Reduce noise</li> </ul>	<p><b>Promotion Truck ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> <li>-Reduce fine dust</li> <li>-Reduce noise</li> </ul>

# ESS Application

<p><b>Power plant ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply resource</li> <li>-Power reserve service</li> <li>-Power quality</li> <li>-Power reliability</li> </ul>	<p><b>Substation ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply resource</li> <li>-Power reserve service</li> <li>-Frequency adjustment</li> <li>-Voltage stabilization</li> </ul>	<p><b>Communication station ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> </ul>
<p><b>Power distribution station ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply resource</li> <li>-Power reserve service</li> <li>-Frequency adjustment</li> <li>-Voltage stabilization</li> </ul>	<p><b>Renewable energy ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply resource</li> <li>-output stability</li> <li>-Power quality</li> <li>-Power reliability</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>UESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> </ul>
<p><b>BIPV Home ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Renewable output stabilization</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Energy Community Town ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Renewable output stabilization</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Zero energy BESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>
<p><b>Mobile ESS for venue</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Electricity load move</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Home ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Emergency Call Charging ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> </ul>
<p><b>Multi-charging station ESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Fuel Cell ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Apartment FESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>
<p><b>Public Institution ESS</b></p>  <ul style="list-style-type: none"> <li>-Electricity demand management</li> <li>-Electricity load move</li> <li>-Peak reduction</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Micro Grid ESS</b></p>  <ul style="list-style-type: none"> <li>-Renewable output stabilization</li> <li>-Renewable output fluctuation control</li> <li>-Power supply resource</li> <li>-Power reserve service</li> <li>-Power quality /reliability</li> <li>-Reduce carbon emissions</li> </ul>	<p><b>Foodtruck ESS</b></p>  <ul style="list-style-type: none"> <li>-Power supply service</li> <li>-Reduce carbon emissions</li> <li>-Reduce fine dust</li> <li>-Reduce noise</li> </ul>



# INZI e-Solution Differentiated Technology of High Safety

A High safety solution of predicting the remaining lifespan & defects through AI analysis

ESS

Data Collecting Cloud

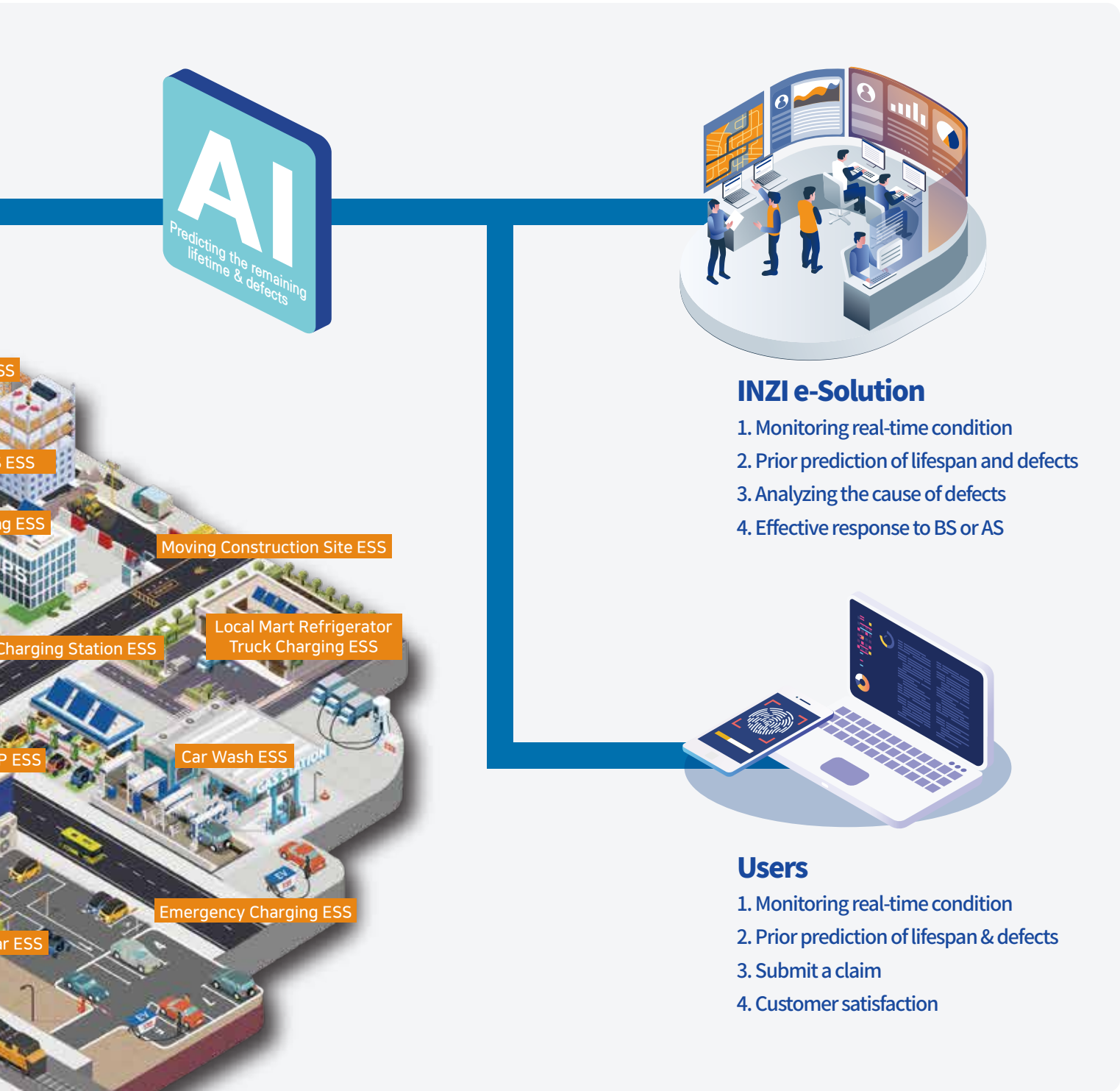


## High Safety Solution

ESS has suffered more than 32 cases of fire and accident due to various issues including operating environment, installation, insufficient integrated system, and DOD 80-90% charging/discharging conditions, which require the technology development of safety. INZI e-Solution has prepared high safety solution that predicts the remaining lifetime of ESS system and the occurrence of defects such as fire through AI analysis at the highest level in Korea.

AI [Predicting the remaining lifetime & defects]

INZI e-Solution·Users



### INZI e-Solution

1. Monitoring real-time condition
2. Prior prediction of lifespan and defects
3. Analyzing the cause of defects
4. Effective response to BS or AS

### Users

1. Monitoring real-time condition
2. Prior prediction of lifespan & defects
3. Submit a claim
4. Customer satisfaction

## Total Solution

We provide total solutions from domestic to overseas by establishing a consortium with the leading companies from each industry in terms of all factors that form the system including ESS, PCS, EMS, Container, firefighting, cooperation, environmental management system, and EPC.



## One Stop Process



### Consulting

- Review business requirements
- Propose budget formulation
- Propose designs
- Review licensing
- Propose blueprints

### Confirm

- Review business requirements
- Confirm budget formulation
- Confirm design
- Initiates planning
- Propose & confirm system

### System Integration & Manufacturing

- Confirm & plan SI
- Manufacture & evaluate
- Manufacture & test system

### Installation & Validation

- Construct total system
- Site construction activity
- Evaluate/verify trial run

### System Operation & Maintenance

- Operate system
- Support site technology
- Maintenance

### Warranty

- Quality guarantee
- A/S



# Lithium is the Answer!



Certificate of Venture Company



Corporate Annex Research Institute



Inno - biz certificate



Main - Biz certificate



Certificate of Material/Parts/Equipment Specialized Corporation



KC62619



Certification of ISO 9001



Certification of ISO 14001



Certification of Star Company of Daejeon 2020



Certificate of Promising Small Enterprise of Daejeon 2021

