



Smart LV/MV

CONTENTS

01 Overview

02 Why? Smart LV/MV Panel!

03 Smart LV/MV System

04 Key Advantage

05 Application Case

1. Overview

Increasing needs of end-point management on LV/MV panel, in the purpose of equipment protection, operational efficiency and energy saving



Protection
(Electrical System, Facility)



Operational Efficiency
(Crews, Equipment)



Management & Saving
(Energy)



Needs of End-point Management on LV/MV Panel



Process Plant
(Chemistry & Oil)



Data Center



Manuf. Factory



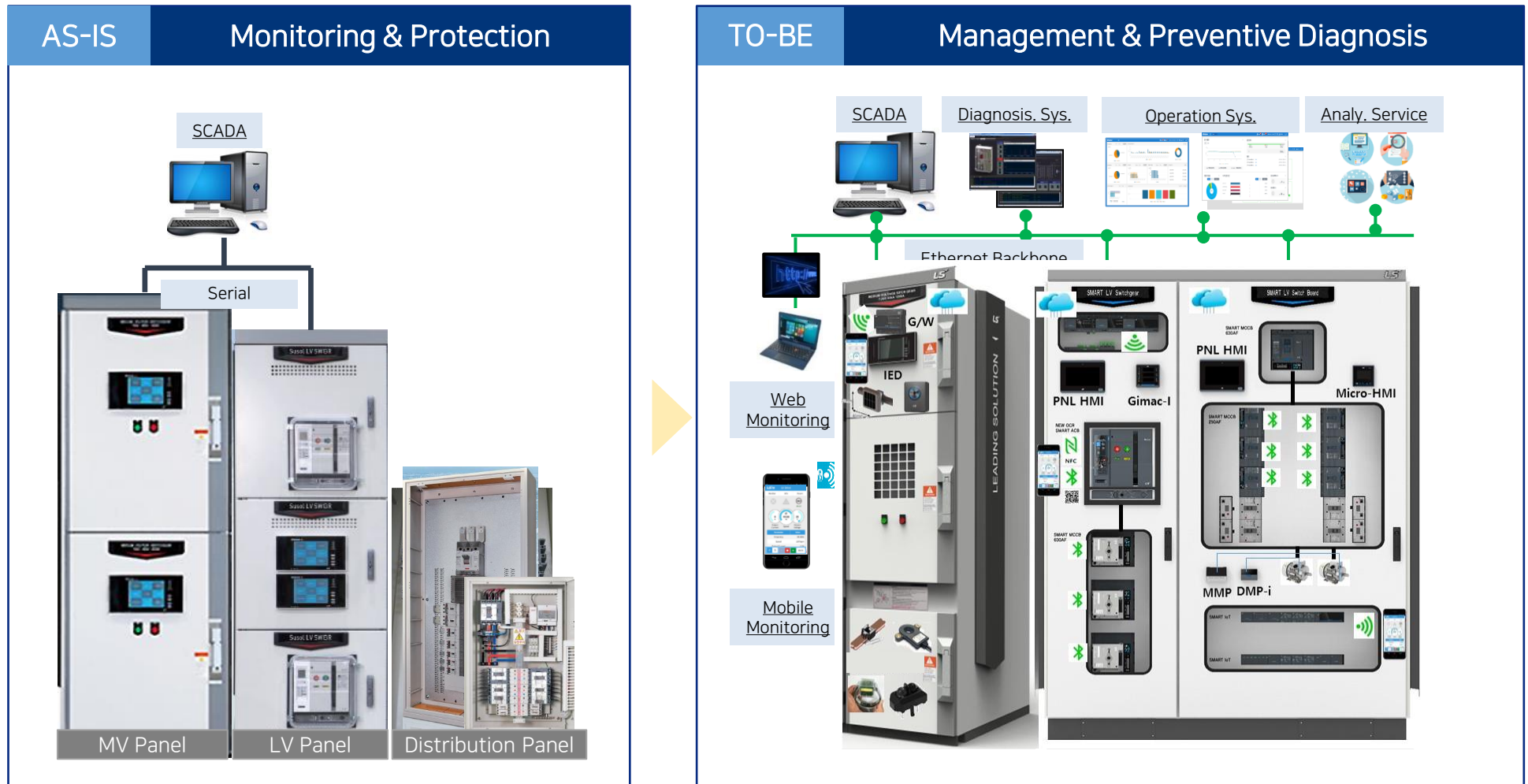
Large Hospital



...

* MV: Middle Voltage, LV: Low Voltage

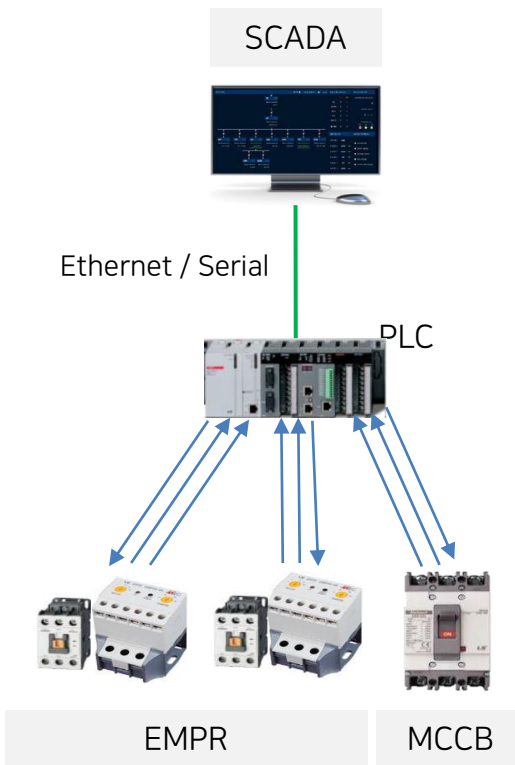
Improving of reliability, convenience and efficiency on LV/MV panel based on DT(Digital Transformation).



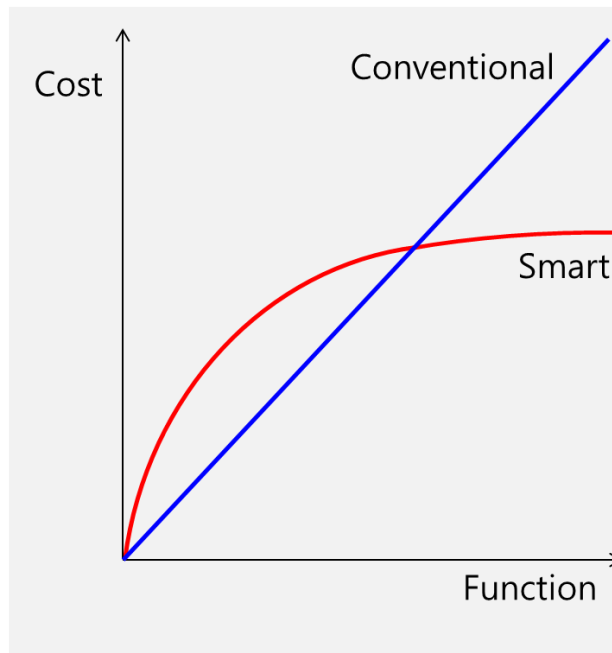
2. Why? Smart LV/MV Panel!

Conventional

System monitoring, Fault analysis

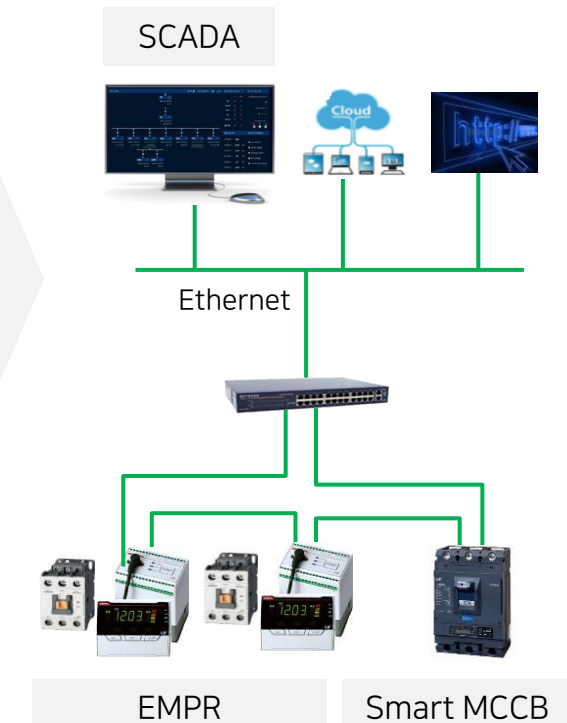


Equipment status,
Fault & Energy Data



Smart

System monitoring, Fault analysis
Fault prediction, Alarm
Energy analysis/management/control



Equipment status, Fault & Energy Data,
More valuable data (PF, Freq, P, Q, S),
Power quality, Various data(temp, humid, etc.)

3. Smart LV/MV System

GridSol CARE

Connectivity & Analysis for Reliability & Efficiency

Service (Operation & Maintenance)

Analysis of digital data, and providing the valuable information via various app. & service

System (Software & Controller)

Convenient and reliable management of the digital data from IoT device and sensor at the end-point field

Product (IoT devices)

IoT device and sensor for generating the valuable digital data



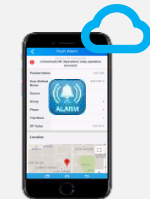
Smart HMI



SCADA



Smart LV/MV SW



Smart Viewer App.



Optimal Generation of PV/ESS

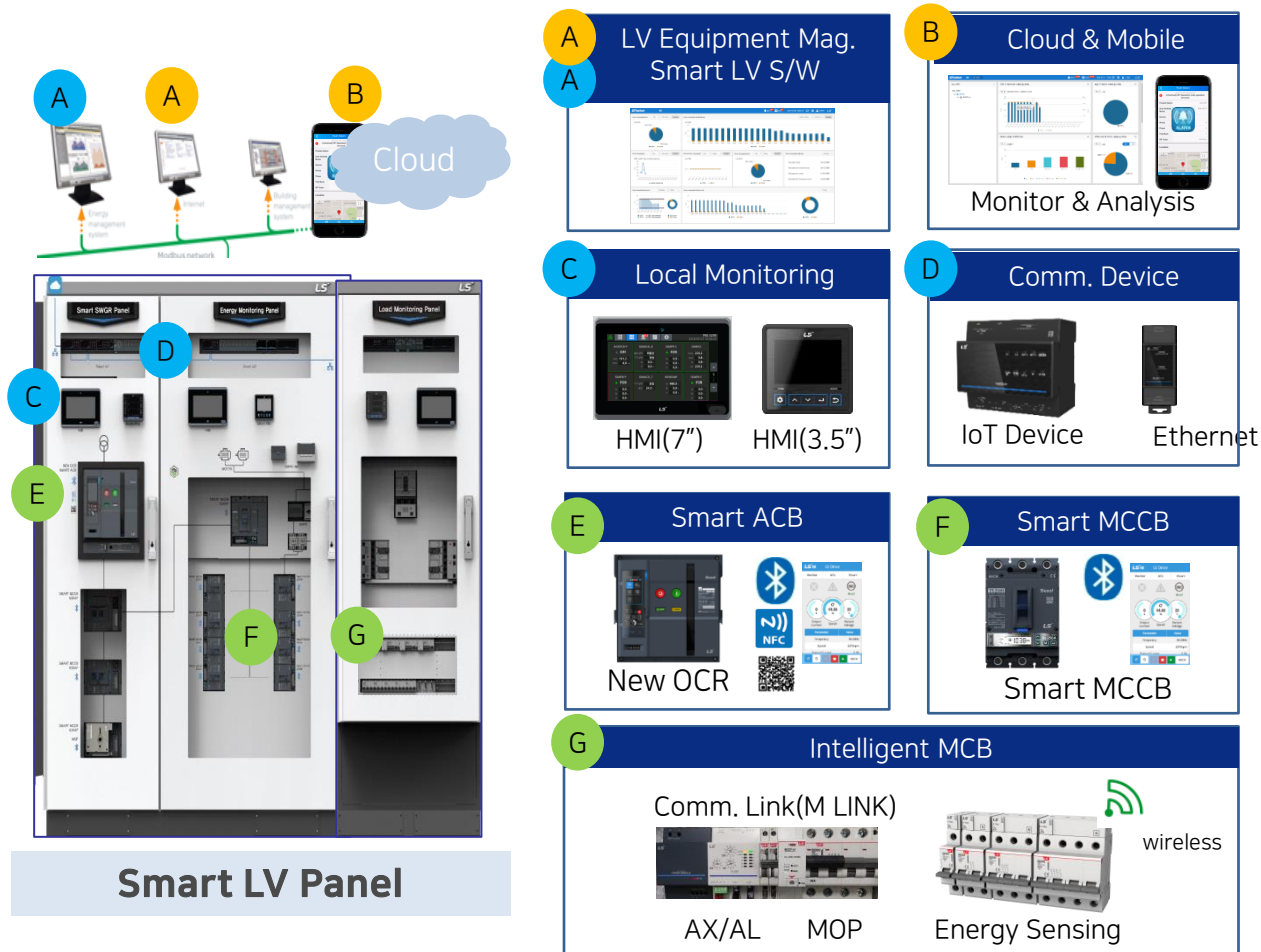


Management of Electrical Facility

* PV: Photo-Voltanics, ESS: Energy Storage System

Smart LV Panel and key Product

Providing of energy management and operational efficiency on the basis of smart LV Panel consisting of smart device, sensor and communication device



➤ Service

- Management of LV equipment
 - energy management, operational efficiency
- Inter-connection with others
 - SCADA, FEMS, PMS, etc.
- Cloud & Mobile (optional)

➤ System

- Smart LV S/W
 - monitoring, displaying, reporting
- HMI
 - local display of energy and status

➤ Product

- Smart ACB & Smart MCCB
 - system Protection, self-diagnosis
 - energy measuring (high accuracy)
- Intelligent MCB
 - monitoring & control of status(On/Off)
 - energy measuring via wireless comm.

* AX/AL: Auxiliary/Alarm, MOP: Motor Operator

Smart MV Panel, key Product

Providing of preventive diagnosis and operational efficiency on the basis of smart MV Panel consisting of intelligent VCB, various sensor and communication device



➤ Service

- Management of LV equipment
 - preventive diagnosis, optimal operation, energy efficiency
- Inter-connection with others
 - SCADA, FEMS, PMS, etc.
- Cloud & Mobile (optional)

➤ System

- Smart LV S/W
 - monitoring, displaying, reporting
- HMI
 - local display of energy and status

➤ Product

- Intelligent VCB (+5 Sensors)
 - waveform, temp., wearing, etc.
- MV Panel (+2 Sensors)
 - thermal image cam., temp
- IED (protective, measuring, APR)
 - protection of power system & panel, self-diagnosis

* APR: Arc Protection Relay, DAU: Data Acquisition Unit

4. Key Advantage

Reliability

maximizing power availability, preventing equipment failure & human accident

Preventive diagnosis

Temp. monitoring (busbar, panel)

Real-time temperature monitoring (temp. sensor, thermal image camera)



Power quality & harmonics monitoring

THD, TDD, Voltage Swell & Dip



Switchgear life cycle diagnosis & prediction

Thermal aging, contact wearing, No. of trip, etc.

Device Life		
Operation time	On time of CB	Electrical open/close count
2,382 Hours	2,354 Hours	2 times
Mechanical open/close count	Trip Count	CB Contact wear
47 times	0 times	0%

⋮

Less repair time

Critical event analysis & waveform recording

Profile of power system fault, fault waveform



Alarm service via mobile phone

Notification of fault type, location to customer



Minimizing Arc fault damage -human security

Arc fault detection, and fast trip



⋮

Convenience

reducing engineering work, increasing convenient maintenance

Easy engineering

Auto Discovery, Auto Time Sync. function

Less commission time using auto discovery tech.



Less engineering work (HMI & SW)

Ready-made Panel HMI, S/W interface



Simple device setting: remote, batch setting

Remote and local setting of device installation



⋮

Convenient maintenance

Local and remote monitoring (HMI & SW)

Real-time monitoring (electricity quantity, status, etc..)



Mobile App. monitoring (Mobile phone)

Mobile device anytime anywhere



Device SW upgrade & testing tool of switchgear

Remote upgrade of device SW, Local testing of switchgear



⋮

Efficiency

analyzing and managing energy, reducing electricity bill

Energy analysis & management

End-to-End energy monitoring

Energy monitoring from MV panel to LV panel, visibility



End-to-End PF & harmonics monitoring

PF(Power Factor), Harmonics analysis



Peak power management via remote control

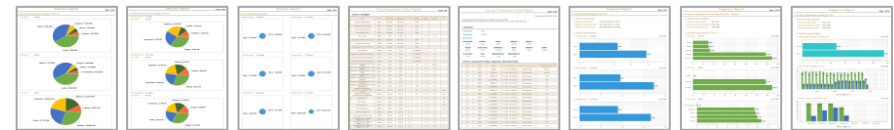
Active operation for control peak load (smart switchgear)



■
■
■

Reporting (various electricity data)

15min., hourly, daily and monthly reporting & Pattern analysis of energy consumption.



Demand management on prediction & scheduling

Prediction the demand, and scheduling the load



Electrical equipment energy efficiency analysis

Analysis of equipment (TR, Inverter, ESS, UPS, etc.) energy efficiency



■
■
■

5. Smart LV/MV Application Case

- Smart LV panel (6 board) on the FEMS station in LS ELECTRIC factory (2020. 4)
- In the purpose of demonstration for smart LV panel solution (energy management)

Make

GridSol PV



- PV Gen. Capa.: 495kW
- PV PCU Capa.: 500kW

Save

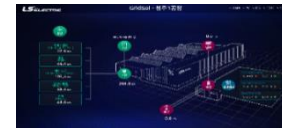
EnGather ESS



- ESS Battery Capa.: 1.78MWh
- ESS PCS Capa. : 500kW

Smart Use

GridSol FEMS



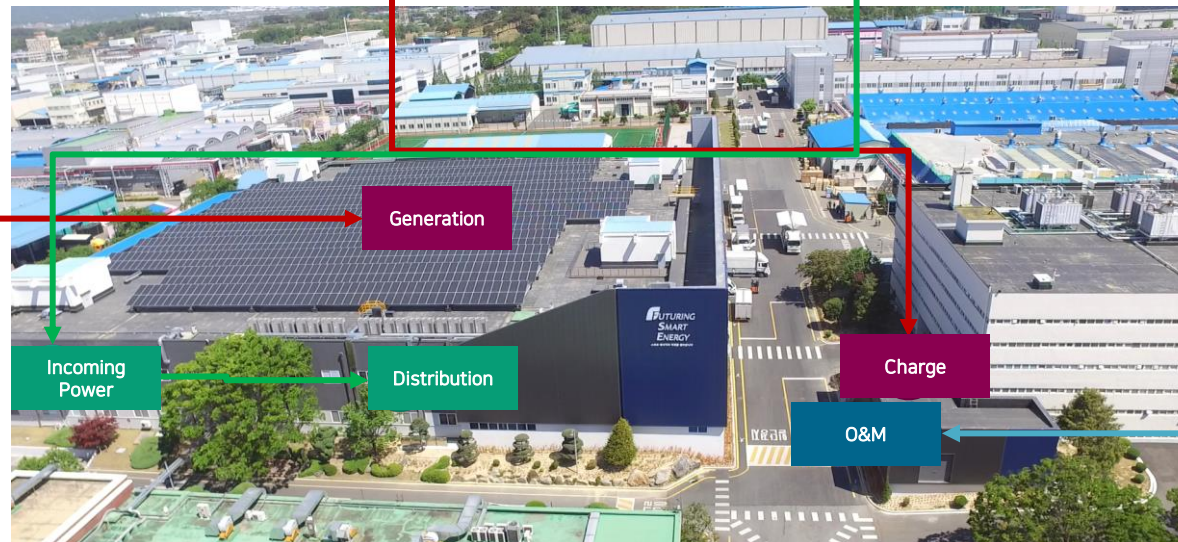
- Energy Consumption ; Lighting, HVAC ; IT equipment, etc.

Care

GridSol CARE

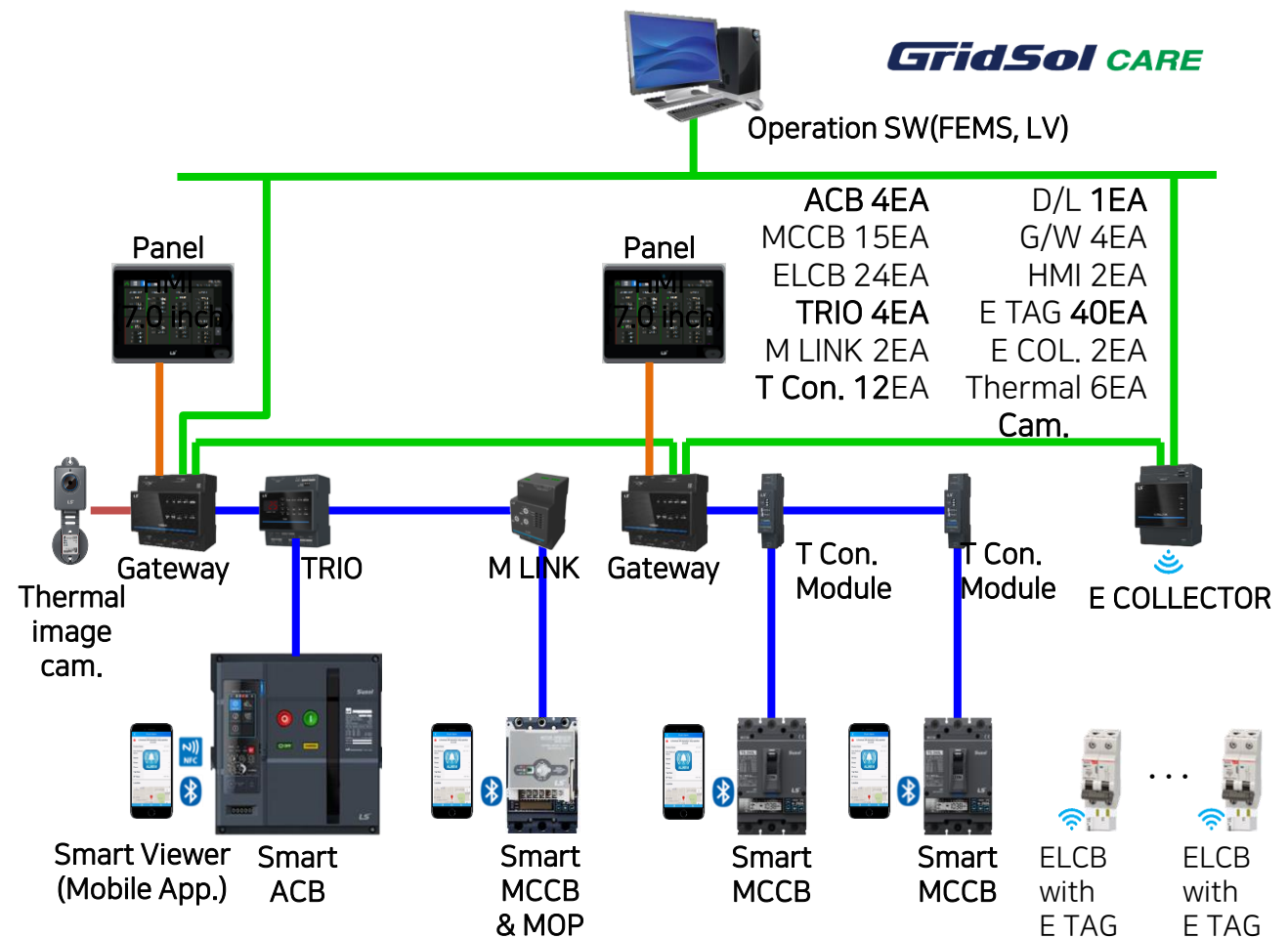


- Smart Product ; Smart ACB, MCCB, ; MCB + E TAG & M LINK → Protection & Energy mag.



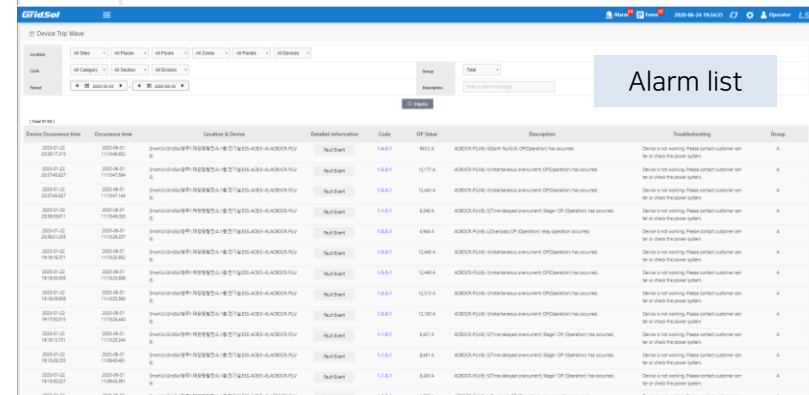
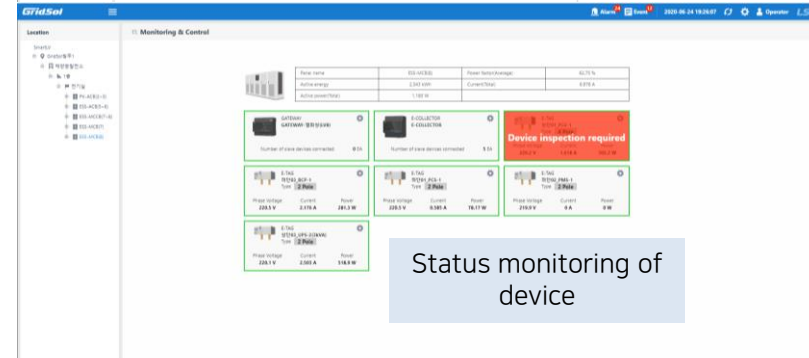
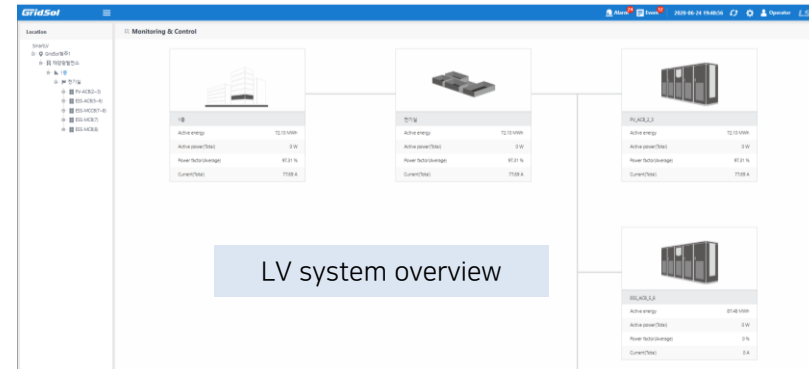
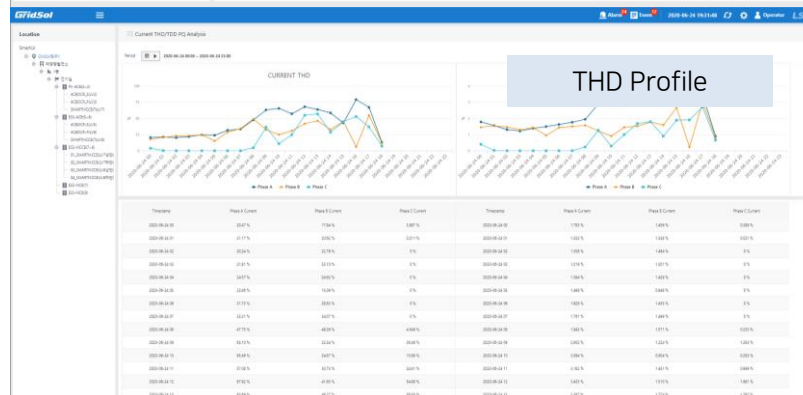
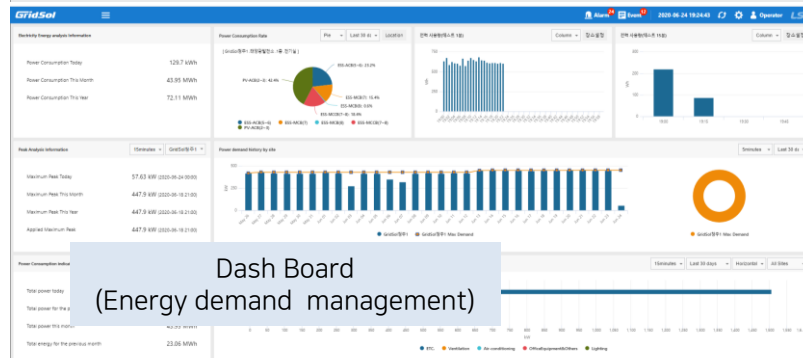
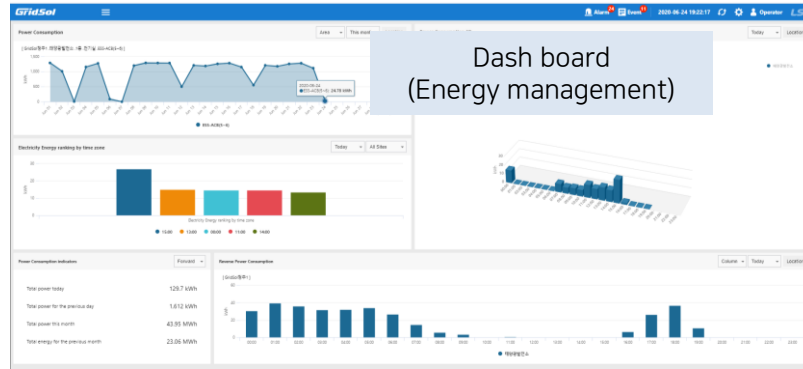
* HVAC: Heating, Ventilation, Air-Conditioning

- Protection and energy management of FEMS station and inter-connection with LV and FEMS
- Key product
 - Smart ACB & MCCB, ELCB + E TAG & M LINK
 - LV S/W, mobile App., HMI, gateway, data Logger, thermal image camera, trio.



Remote Monitoring

LV S/W: management (dash board, profile, alarm, reporting, ...)



Remote Monitoring

LV S/W: detailed information of smart device

Monitoring & Control



Device Status

Comm. Status

Product code	SMARTMCCB		
Product name	SMARTMCCB	IP Port	502
Manufacturing number	P010100300D9FF010K01	Manufacturer Name	LSIS
HW Version	10.00.11	SW Version	01.00.01
Install date	2018-09-26		

Device status and measurement

Power/Amount of power

Power Quality

Input/Output

Relay Setting

Device Information / Setting

Event information

System event

Fault Event

Trip Wave

System Event Rollover Count	7
Fault Event Rollover Count	0
Last System Event Index	11
Last Fault Event Index	2
Last Trip Wave File Number	1
Demand Number	133
Number of system info settings	2
Number of relay info settings	1
Wiring	4W

Device Operation Status

LR Status	LOCAL
Device Restart	NO
Current Direction	FORWARD
Unlock key	LOCK
Demand Update	NORMAL
Need time Synchronization	NORMAL

Device Operation Status

UL_CPU Register Error	NORMAL
UL_Program Counter Error	NORMAL
UL_Watchdog Error	NORMAL
UL_Clock Error	NORMAL
UL_RAM Error	NORMAL
UL_ROM Error	NORMAL
MTD Status	NORMAL
Over Device Internal Temperature	RELEASE
Contact Life Alarm	NORMAL
Electrical open/close count alarm	NORMAL
Mechanical open/close count alarm	NORMAL
RTC Error Alarm	NORMAL
Memory Error	NORMAL

Smart MCCB

(Monitoring- status, voltage, current, PF, power, energy)

Monitoring & Control



Device Status

Comm. Status

Product code	00001052307	IP Address	192.168.100.183
Product name	SMARTMCCB	IP Port	502
Manufacturing number	P010100300D9FF010K01	Manufacturer Name	LSIS
HW Version	10.00.11	SW Version	01.00.01
Install date	2018-09-26		

Device status and measurement

Power/Amount of power

Power Quality

Input/Output

Relay Setting

Device Information / Setting

Current

Current THD			Current TDD			Current phase			
Ia	Ib	Ic	Ia	Ib	Ic	Ia	Ib	Ic	In
69.23 %	98.85 %	55.64 %	38.18 %	41.01 %	30.92 %	77.91 °	263.3 °	170.9 °	319.3 °

Voltage

Voltage THD						Voltage degree					
Va	Vb	Vc	Vab	Vbc	Vca	Va	Vb	Vc	Vab	Vbc	Vca
3.670 %	3.440 %	4.040 %	2.610 %	2.710 %	2.160 %	0 °	240.8 °	120.4 °	30.43 °	270.5 °	150.5 °

Smart MCCB

(Power quality- harmonics, unbalance etc.)

Smart MCCB

(Protection profile- fault type, date/time, location)

Device Occurrence time	Occurrence time	Location & Device	Detailed information	Code	OP Value	Description	Troubleshooting	Group
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-4-1	9.80 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) Trip out has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	820.1 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	61.11 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	61.03 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	66.10 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	74.82 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	62.87 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	62.11 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	78.12 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	62.33 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	65.43 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A
2018-09-30 19:04:28.89	2020-05-29 19:47:04.41	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)	1.3-3-1	63.78 A	SMARTMCCB(TOLV8): (Undercurrent overcurrent) OP(Operation) has occurred.	Device is not working. Please contact customer center or check the power system.	A

Device Fault Event

Device	2018-01-01	Occurrence time	2020-05-29
Occurrence time	01:01:00.035	Occurrence time	15:47:15.051
Occurrence path	SmartLV.GridSol/장구1.태양광발전소-1층 전기실 ESS-ACB(S-6).SMARTMCCB(TOLV8)		
Code	[1-3-3-1]	Trip Wave	
Source	-	Group	
Occurred phase	B	Occurrence Value	61.11 A
Detailed information			
Ia(A)	0	Va(V)	0
Ib(A)	61.11	Vb(V)	0
Ic(A)	0	Vc(V)	0
In(A)	0		
Iext(A)	0		
Iact/zct(A)	0	Rate(%)	0

Detailed Info.

- Providing more smart LV panel solution
 - smart LV panel (2 board) in University (2019.09)
 - smart LV panel (40 board+) in IDC (2019.11 and 2020.01)

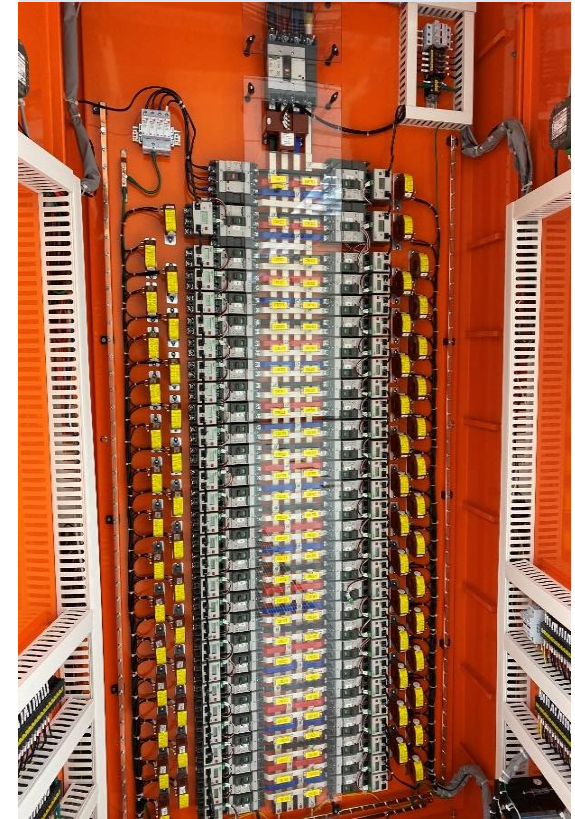
Smart LV on University



Smart LV on IDC



Smart LV on IDC



köszöni
 merci
 kiitos
 дакую
 tige tank
 obrigado
 dzieki
 paldies
 hvala
 obrigado
 dzieki
 paxmer
 ngiyabonga
 villmols merci
 tešekkürler