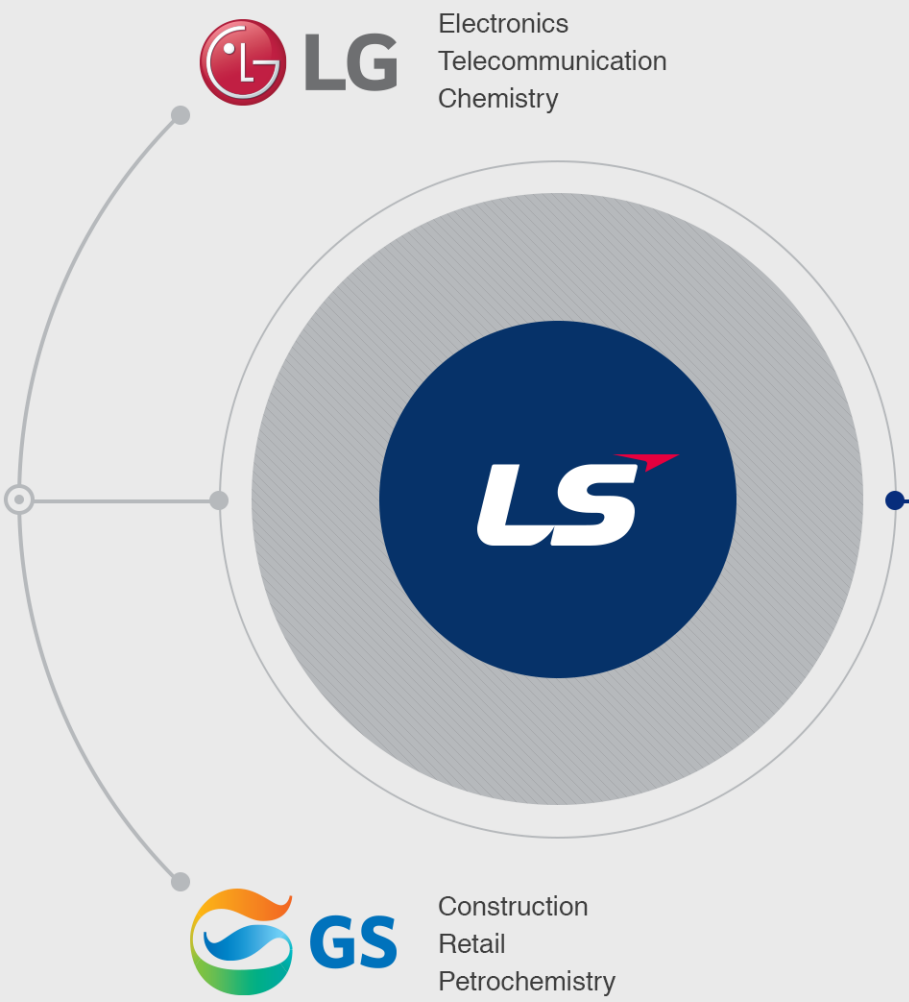
LS ELECTRIC

FUTURING SMART ENERGY

CONTENTS

LS Group is a conglomerate based in South Korea. It spun off from LG Group in 2003.
LS is leading in the field of electric power, automation, machinery, materials and energy.



- LS Cable & System [1962]
- LS Mtron [2008]
- LS - Nikko Copper [1936]
- LS ELECTRIC [1974]
- yesco [1981]
- GAON [1947]
- E1 [1984]

LS Group

EMPLOYEES	12,700
AFFILIATES	48
SALES	22.9 B USD
TOTAL ASSET	22.6 B USD

LS ELECTRIC

EMPLOYEES	3,500
SALES	1.9 B USD
OPERATION INCOME	150 M USD

* Financial figures in 2019

LS ELECTRIC is the pioneer of electric power system, automation, and green energy industry in South Korea.

Company Name	LS ELECTRIC CO., LTD.
Founded	1974
Employees	3,500
Total Assets	2,170(In millions of USD, 2019)
Headquarters	LS Tower, LS-ro 127, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
Seoul office	LS Yongsan Tower, Hangang-daero 92, Yongsan-gu, Seoul, Korea
Plants	4 in Korea, 2 in China and 1 in Vietnam

Global Manufacturing Footprint

Global manufacturing footprints and top-notch R&D centers allows LS ELECTRIC to produce global top level products with unparalleled cost competitiveness

Dalian factory, China

Wuxi factory, China

Cheong-ju factory, Korea

Busan factory, Korea

Busan HVDC factory, Korea

R&D centers, South Korea

- Convergence Technology R&D Center
- Electro Technology R&D Center
- Automation R&D Center
- Power Testing & Technology Institute

Cheon-an factory, Korea

Hanoi factory, Vietnam

FUTURING SMART ENERGY

We open up a brighter future through efficient and convenient energy solutions.

FUTURING

We are leading the way towards a new future through innovations that exceed our customers expectations.

SMART

We are creating an efficient convenient future through ICT convergence and the integration of sophisticated technologies.

ENERGY

We are creating an abundant future by delivering safe clean energy.

Power / Automation Sector
Total Solution Provider

Smart Grid, Smart Factory, Smart Building
Solution Leading Company

Smart Energy Global Leader
including ESS, EMS, HVDC, PV

"Great Company Prospering for 100 years"

Our goal is to go beyond global standard through constant quality improvement and innovation.

Clarivate Analytics

Top 100 Global Innovator
for 9 consecutive years
[2020]

R&D Campus_Anyang

R&D Campus is consistently developing differentiated technologies and software in new business sectors as a future growth engine. We sharpen our competitive edge by developing next generation platform, to provide total energy solution service.

Electronic Power R&D Center_Cheongju

R&D Center is the main laboratory for electrical power solution business of LS ELECTRIC. Our focus is to lead smart energy & smart factory industry from transformation to distribution, which is the core business value of LS ELECTRIC.

PT&T

POWER TESTING &
TECHNOLOGY INSTITUTE

The first private lab in South Korea to be equipped with 2000 MVA short-circuit testing facilities like high voltage testing and reliability testing equipment. The main goal of this lab is to promote technological development and to improve product performance through fair and precise test evaluation process.
Through on-site tests, PT&T is trying to maximize customer satisfaction by securing the best quality of products.

- Power Test
- Standard Calibration
- Reliability
- Renewable Energy Test
- Activities and Agency Accreditation

Quality and Service

PT&T has earned its reputation in power testing field with its uncompromising principles for perfection. One of the main goals of PT&T is to enhance customer satisfaction by performing verifications of on-site condition and comparative tests, to ensure the best-quality and performance of products.

PT&T

POWER TESTING &
TECHNOLOGY INSTITUTE

13th largest testing capacity lab in the world

Short circuit test capacity :
2,000MVA

Resolute investment for development & competitiveness

22.5 million USD investment plan
for the 2nd short circuit generator

GLOBAL 8th Capacity

Global standard activities with IEC

IEC TC :
Technical Committee activities

Rigorous performance test for credibility of products

MV/LV (~36kV)
MV test & Direct test for short-circuit generator

Ultra high voltage (~170kV)
Composite test

Credibility test considering real-use situation
EMC, environment/proof test

Perusing global reputation with international certificate associations

ILAC-MRA	KOLAS Testing	KOLAS Calibration
UL	Intertek (ASTA)	DEKRA(KEMA)
CESI	ANCE	KERI

* KOLAS : Korea Laboratory Accreditation Scheme

* ILAC-MRA : International Laboratory Accreditatio Cooperation - Mutual Recognition Arrangement

Global expansion through more than 20 overseas branches and subsidiaries

Overseas Subsidiary Companies

LS Energy Solutions (Formerly Parker EGT Division)	**Core Biz** ESS Power solution provider Charlotte, USA
LS Metal	**Core Biz** Copper tubes and STS steel pipes Yongsan-gu, Seoul
LS Mecapion	**Core Biz** Industrial electronic equipment Dalseo-gu, Daegu
LS-Sauter	**Core Biz** BAS/IBS and GBS systems Anyang-si, Gyeonggi-do

Overseas Subsidiaries

Chicago(USA), Tokyo(Japan), Dubai(U.A.E),
Hanoi(Vietnam), Wuxi/Dalian(China),
Amsterdam(Netherland)

Overseas Branches

Irvine(USA), Moscow(Russia), Tokyo(Japan),
Bangkok(Thailand), Hochiminh(Vietnam), Jakarta(Indonesia)
Shanghai/Beijing/Guangzhou/Qingdao/Chengdu/Shenyang/Jinan(China)

Presence Internationally

77 Countries

01 Smart Factory

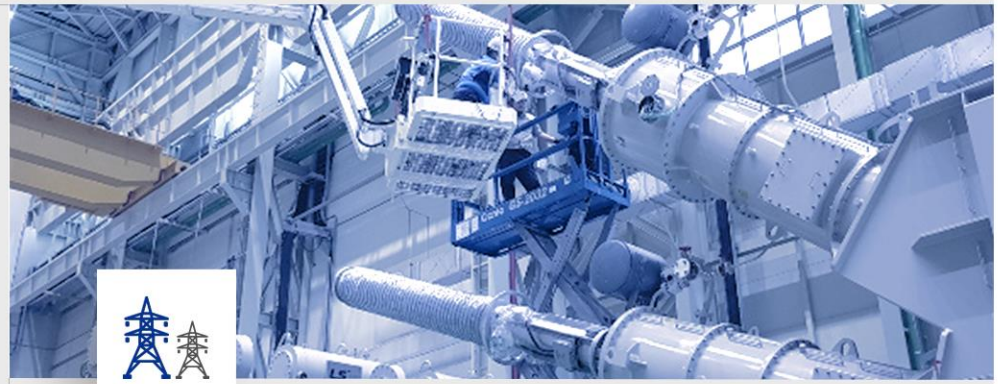
LS ELECTRIC has established the smart factory solution with IoT technologies in Cheongju Plant, where low voltage circuit breakers and switches are manufactured.

The solution has been applied to the production lines and has completed the automation of entire process from assembly, inspection to packaging.

02 Incheon/Gimpo Airport Boarding Bridge Control System

LS ELECTRIC established the boarding bridge control automation systems in the two largest airports in South Korea.
(Incheon International Airport and Gimpo International Airport, 2015)

The project helps the airport central monitoring offices to monitor/ manage airplane data and control boarding bridges through high-speed links and long-distance communication system under the applications of LS ELECTRIC's SCADA and XGT PLC.



03 HVDC/FACTS Project

LS ELECTRIC established the HVDC manufacturing plant in Busan(2011).

Its competitiveness and quality have been recognized by winning contracts of the HVDC facility conversion projects of North Dangjin ~ Godeok (2014) and Eastern Coast ~ Shingapyeong (2018) in South Korea.

First and Largest Mega Solar Project of Japan 04

In 2009, LS ELECTRIC entered the Japanese photovoltaics market as a first Korean company.

- The largest 40MW Mito New Town mega solar power station in Ibaraki Prefecture
- The first 39MW solar power station with ESS in Chitose, Hokkaido
- 18MW Hanamizuki mega solar power station in Ishikawa Prefecture
- Won the Morioka Solar Plant 50MW contract in 2019

World's Largest DC Island Project 05

LS ELECTRIC has built the largest DC island in the world (2019). Through this project, this new renewable energy system which generates direct current such as photostatic power generation can be linked directly to the energy storage system and other battery facilities of mainland.

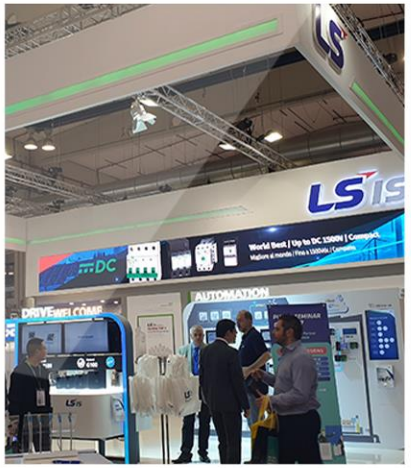
LS ELECTRIC strives to create communication channels with current and potential customers by regularly participating in domestic and international exhibitions and seminars.

▼ The Battery Show, Europe

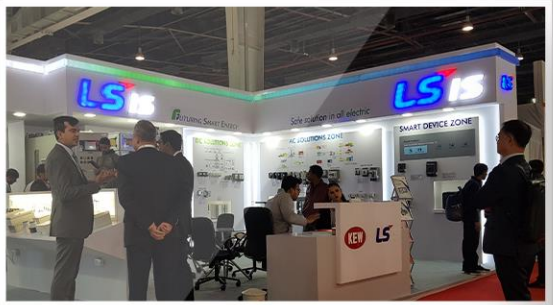
▼ CIGRE Technical Exhibition, France

▼ Hannover Messe, Germany

▼ SPS IPC DRIVES, Italy



▲ International Smart Grip EXPO, Japan



▲ ELECRAMA, India

▲ ASHRAE Winter Conference, USA

▲ IEEE PES T&D Exposition, USA

2015~
Value Management
Opening up the future of smart energy

2020.03 Changed the company name to LS ELECTRIC

2020.02 Selected as a Top 100 Global Innovator for ninth consecutive year

2018.12 Take over ESS unit of North America's ESS leader Parker-Hannifin

2017.03 Named one of the world's top 100 businesses in patent applications in Europe (European Patent Office)

2016.04 Acquired the MW ESS PCS North America UL certification for the first time in the world

Awarded the Korea National Quality Grand Award (39th National Quality Competition) 2013.11

Completed Busan HVDC factory 2011.10

Established Europe's Amsterdam subsidiary 2009.10

2008~2014
Growth and Innovation
Takeoff as a global leader

1996~2007
Era of Challenge
Became the leader in the Korean power and automation sectors

2007.11 Awarded the Best Korean Company Award for the first time

2006.11 Awarded the Korea National Quality Grand Award (32nd National Quality Competition)

2003.11 Spun off into LS Corporate Group

2000.08 Power Testing & Technology Institute(PT&T) accredited as a Testing and Calibration Laborator

1997.06 Established Vietnam's Hanoi subsidiary

Changed the company name to LG Industrial Systems 1995.02

Changed the company name to Goldstar Industrial Systems Co., Ltd. 1987.03

Established Lucky Packing Co., Ltd. 1974.07

1974~1995
Era of Beginning
Pioneered the power and automation industries in Korea

FUTURING SMART ENERGY

LS ELECTRIC

SMART ENERGY SOLUTION

Power Solution | Solutions | Power IT Solutions

The advanced technology and solutions ensure stable power supply management throughout the whole power system.

DCS

Distributed Control System

System optimized for the most high-level process industries
→ App. P/P, Plant such as Chemical, Steel...

EMS

Energy Management System

Core system of the power supply system
→ App. Power Exchange/Utility

DMS

Distribution Management System

Distribution automation operating system
→ App. Distributing S/S

xEMS

Factory/Building/Home Energy Management System

Customized solutions for energy generation, storage and consumption to customers

SCADA

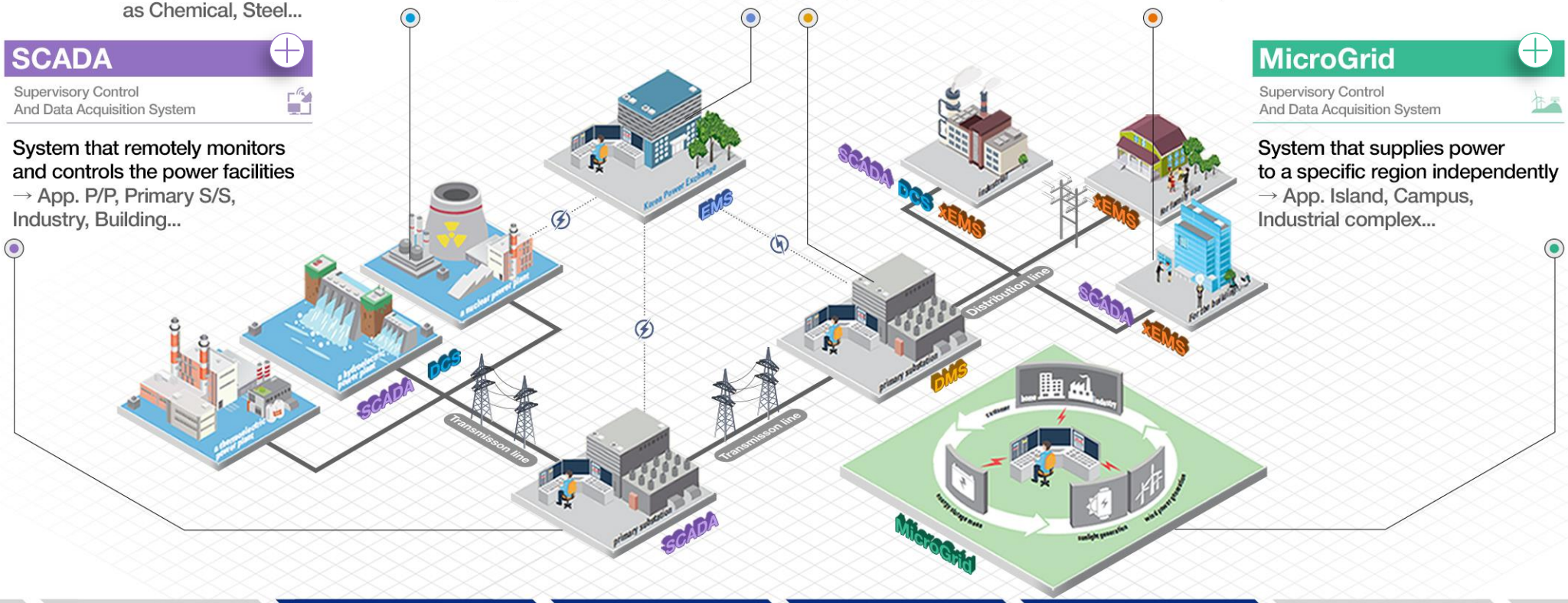
Supervisory Control And Data Acquisition System

System that remotely monitors and controls the power facilities
→ App. P/P, Primary S/S, Industry, Building...

MicroGrid

Supervisory Control And Data Acquisition System

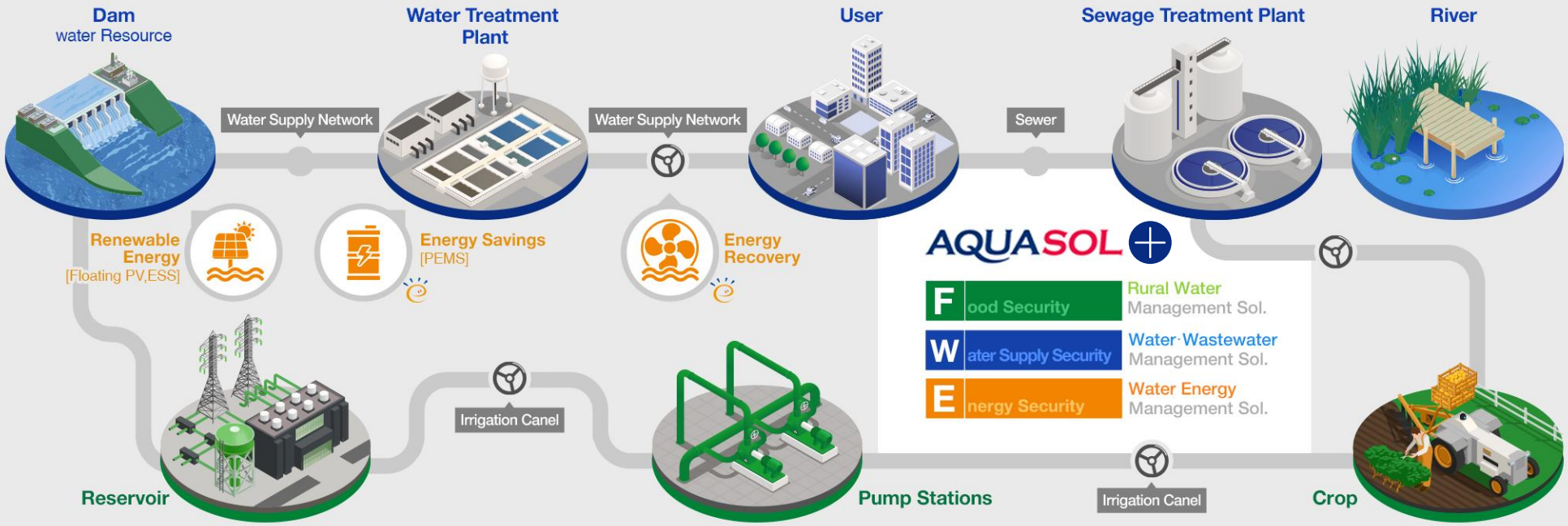
System that supplies power to a specific region independently
→ App. Island, Campus, Industrial complex...



Power generation → Transmission → Distribution → Consumer

Power Solution | Solutions | Water Solutions (AQUASOL)

LS ELECTRIC will offer the automation & ICT-based water management solutions in order to solve a variety of water-related issues.



Delivery performance

Power Solution | Systems | HVDC/FACTS

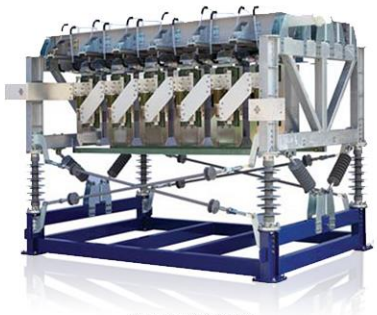
LS ELECTRIC provides total HVDC & FACTS solution from system design, equipment design, manufacture & tests, commissioning, and maintenance. Proposal is optimized by customer's needs, use condition, and location.

HVDC System Up to DC 500kV

High Voltage Direct Current Transmission System

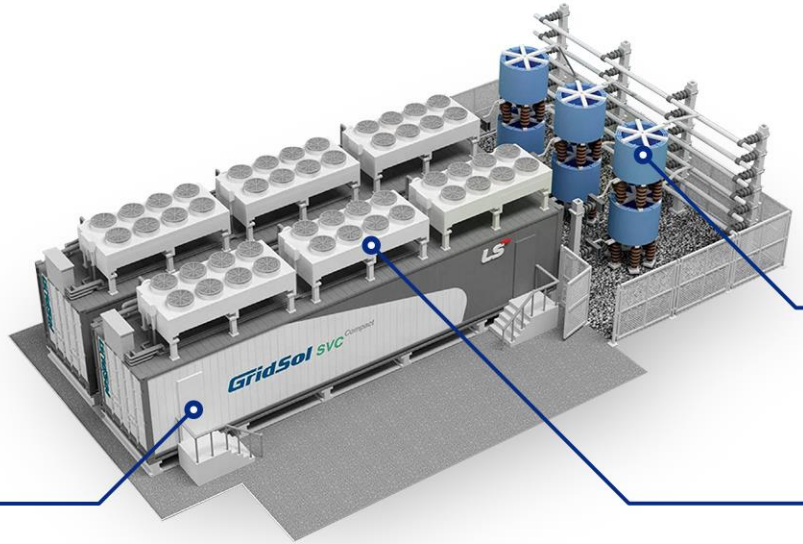
FACTS SVC / STATCOM (50MVar, 100MVar)

Flexible AC Transmission System



STATCOM
submodule & valve tower

STATCOM
control & protection system

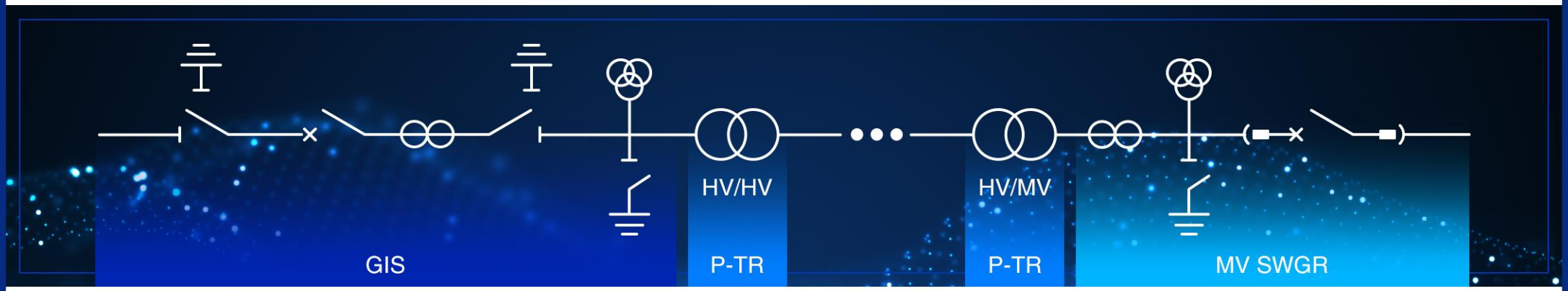


Arm reactors

STATCOM
valve cooling system

Power Solution | Systems | HV S/S System

LS ELECTRIC manufacture the PDPS which constantly monitors the functions and performances of major power facilities including GIS and HV TR of HV power systems.

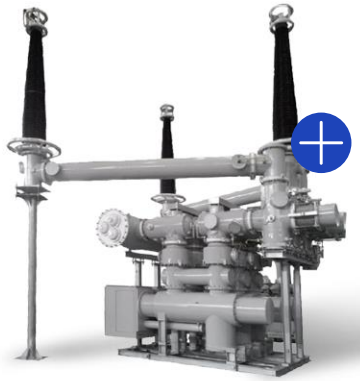


Management S/W Platform

- SCADA system (PQMS, PDPS, SAS, ECMS)
- Integrated on-line diagnosis system
- Substation Automation Sys.

Gas Insulated Switchgear

- Up to 420kV / 63kA / 6300A
- IEC 62271-200



HV Power Transformer

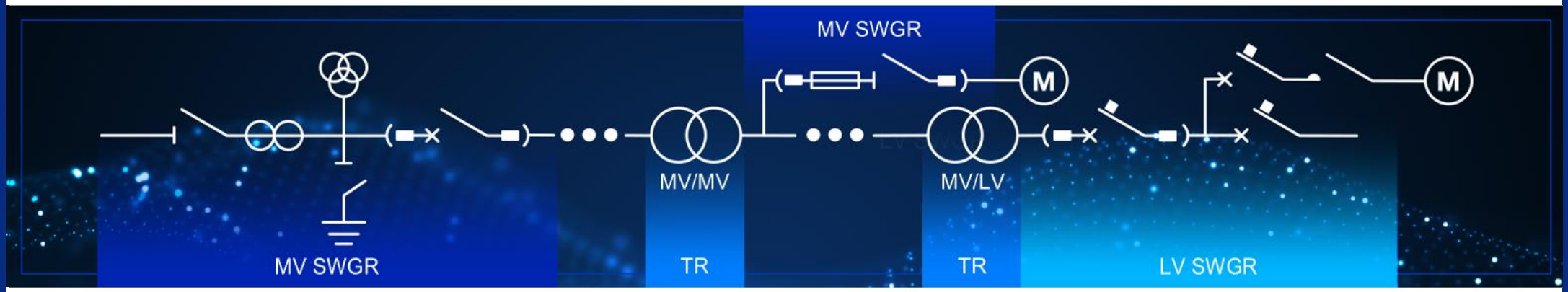
- Up to 550kV 800MVA
- IEC 60076, ANSI/IEEE C57
- Special purpose : Scott connection, Electric furnace, Shunt reactor, HVDC converter transformer

MV Switchgear (MCSG)

- Up to 36kV / 50kA / 5000A
- IEC 62271-200, ANSI/IEEE C37

Power Solution | Systems | Distribution S/S System

LV & MV systems are designed/manufactured from Low voltage of 1000V or less to 36kV in accordance with various international specifications such as IEC, ANSI.



Management S/W Platform

- SCADA system (PQMS, PDPS, SAS, ECMS)
- Integrated on-line diagnosis system
- Substation Automation Sys.

MV Switchgear

- Up to 36kV(RMU)/24kV(C-AIS)
- Up to 36kV/50kA/5000A(MCSG)
- IEC 62271-200

Distribution Transformer

- Up to 33kV 3150kVA
- IEC 60076, IEEE C57
- Special-purpose : Subway power supply / Ground / Ship / VVVF etc.

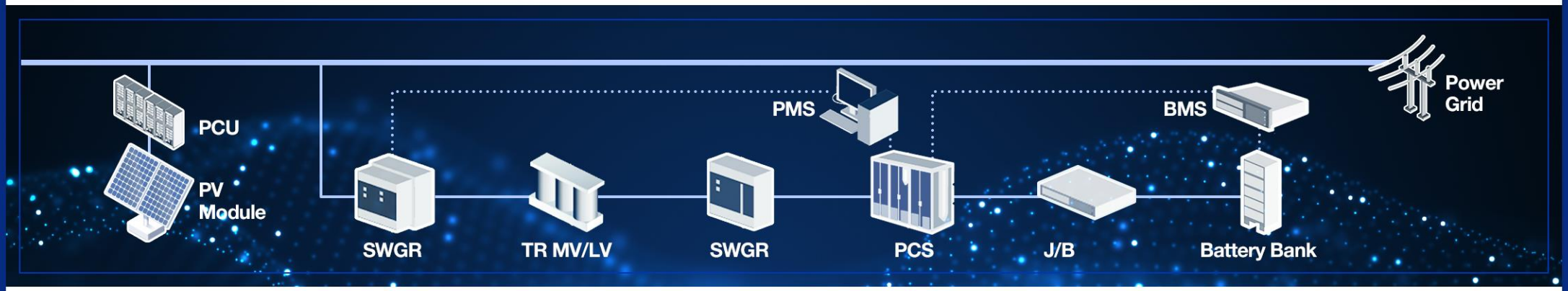
LV Switchgear

- Up to 100kA/Form 4b/IP54
- IEC 61439-1 & 2
- Smart Switchgear

Busway

Power Solution | Systems | PV-ESS

LS ELECTRIC has secured the core competencies of ESS by smart energy buildings in various application fields based on its profound experience in energy industry.



Management S/W Platform

- Web monitoring system
- PMS (Power Management)
- BMS (Battery Management)

Photovoltaic System

- Land / Floating / Rooftop type
- PV Tracker
- PCU from 13kW to 2MW 315Vac

Energy Storage System

- Up to 2MW 380V/440V
- 125kW PEBB Module type

Power Conditioning System : PCS

DC Component


▲DC ACB/DSU


▲DC MCCB


▲DC MS


▲DC Relay


▲DC MCB


▲DC SPD

Power Solution | Devices

LS ELECTRIC is proving its competitive edge through various products developed and produced based on technology of electric power supply in both domestic market and overseas market.

Protection·Measurement·Meter


GIPAM 115


GIPAM 3000


X-GIPAM


GIMAC 1000


GIMAC II Plus


GIMAC-V


GIMAC-B


Digital WHM


AMRS


GMP


DMPi


IMP


MMP

Data Device


Gateway


M LINK


E TAG

Low Voltage

SPD


DIN Type


Box Type


MCB


CP


Metasol Contactor


Soft Starter


Metasol MCCB/ELCB


Susol MCCB


RCB


Metasol ACB


Susol ACB


Susol Compact ACB


DC Devices

Medium Voltage


Susol VCB / Susol VCS


LBS / ASS


Power Fuse


ALTS


GLBS / SLBS

Automation Solution

LS ELECTRIC offers various automation solutions from unit devices to process control. Its major products include, among others, PLC that effectively controls devices, AC Drive that converts motor speed, Servo that meticulously controls devices, and HMI that provides real-time monitoring of devices.

PLC

Providing optimized network solution
with market-proven XGT PLC

HMI

High-performance HMI
with improved convenience

DRIVE

Provide customized functions
for each application
[Up to 800kW]

Automation Solution

LS ELECTRIC offers various automation solutions from unit devices to process control. Its major products include, among others, PLC that effectively controls devices, AC Drive that converts motor speed, Servo that meticulously controls devices, and HMI that provides real-time monitoring of devices.

SERVO

EtherCAT-based efficient Motion Controller

MOTION

Drive with high resolution serial encoder based on EtherCAT network

GEARBOX

Helical gear reducer to reduce TCO

Automation Solution | Network

From production facility to information system, LS ELECTRIC is creating on core automation solution.
We are not only providing integrated solutions for factory and process automation, but also support various communication protocols to create optimal system integration.

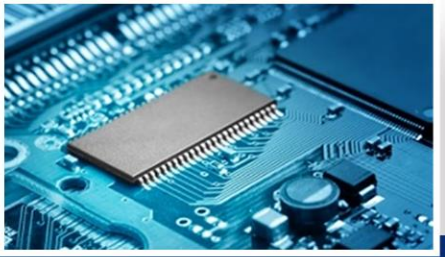
- RAPIEnet + (Hybrid network supporting RAPIEnet, Ethernet/IP and Modbus TCP/IP)
- PROFIBUS, DeviceNet, BACnet, EtherCAT, EtherNet/IP
- CANopen, Cnet, etc.

Automation Solution | Applications

From process automation to machines, LS ELECTRIC makes industry smart, safe, efficient, and productive.
We focus on providing the most optimized solution to diverse industrial fields.


Machine Tools


Food & Beverage

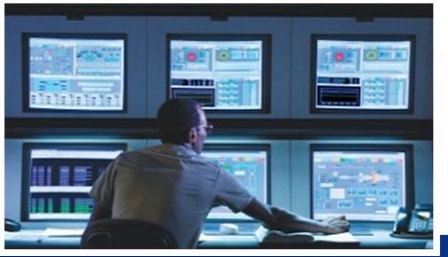

Semiconductor


Pharmaceutical


Printing


Automotive


Elevator


BMS


Textile


LCD/PCB


Rubber & Plastics


Water & Wastewater treatment

Railway Solution

Based on the technology for railway signaling, communication and power T&D solution,
the railway business of LS ELECTRIC is equipped with the expertise to carry out system engineering and project management in the entire fields of E&M for railway implementation projects.

Communication

- Communication Management System
- Passenger Information System (PIS)
- Automatic Fare Collection (AFC)

Power Supply System

- AC High-Voltage System
- AC Medium & Low Voltage System
- DC System
- Super Capacitor Energy Storage System
- SCADA System

Signaling & Control

- Centralized Traffic Control (CTC)
- Automatic Train Control (ATC) / Integrated Onboard Train Control
- Communication Based Train Control (CBTC)
- Electronic Interlocking System (EIS)
- AF Track Circuit
- Platform Screen Door (PSD)

Delivery performance

LEADING SOLUTION

THANK YOU

LS ELECTRIC

FUTURING SMART ENERGY

PT&T with IEC

IEC standardization activities of PT&T

Major agenda items of IEC Review using the NC voting system

- Participifation in international meetings
- Hosting international conventions
- Suggestion of major agenda items
- Discussion over major agenda items

Switchgear & Controlgear	TC17/SC17A MT28,MT34,MT36,MT37,MT45
	TC17/SC17C MT14,MT16,MT24,MT28
EMC	CISPR/CIS/B/WG2

IEC standards research activities of PT&T

No	IEC technical committee activities we are involved in	
1	TC 13	Electrical energy measurement and control
2	TC 14	Power transformers
3	TC 28	Insulation co-ordination
4	TC 42	High-voltage and high-current test techniques
5	TC 56	Dependability
6	TC 70	Degrees of protection provided by enclosures
7	TC 77	Electromagnetic compatibility
8	TC 82	Solar photovoltaic energy systems
9	TC 95	Measuring relays and protection equipment
10	TC 104	Environmental conditions, classification and methods of test
11	TC 109	Insulation co-ordination for low-voltage equipment
12	TC 17 / SC 17A	High-voltage switchgear and controlgear assemblies
13	TC 17 / SC 17B	Low-voltage switchgear and controlgear assemblies
14	TC 17 / SC 17C	High-voltage switchgear and controlgear assemblies
15	TC 17 / SC 17D	Low-voltage switchgear and controlgear assemblies
16	TC 23 / SC 23E	Circuit-breakers and similar equipment for household use
17	TC 32 / SC 32A	High-voltage fuses
18	SC 77A	Low frequency phenomena
19	SC 77B	High frequency phenomena
20	SC 77C	High power transient phenomena
21	CISPR	International special committee on radio interference
22	CISPR / SC A	Radio-interference measurements and statistical methods
23	CISPR / SC B	Interference relating to industrial, scientific and medical devices
24	CISPR / SC D	Interference relating to vehicles and components
25	CISPR / SC F	Interference relating to household appliances tools
26	CISPR / SC I	Electromagnetic compatibility of multimedia equipment and receivers

EMS Energy Management System

The efficient operation/management of large-scale power system and economic dispatch system had been implemented in technology of LS ELECTRIC

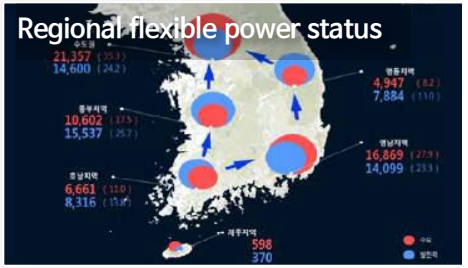
Building EMS of next generation of KPX ('11-'14)

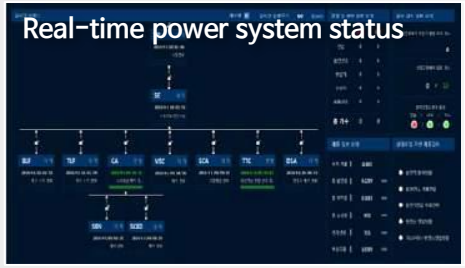
- Power control centers that plan, operate and manage real-time power supply throughout Korea
- Three-tiered power control platform (Naju, Cheonan, Seoul), and Jeju

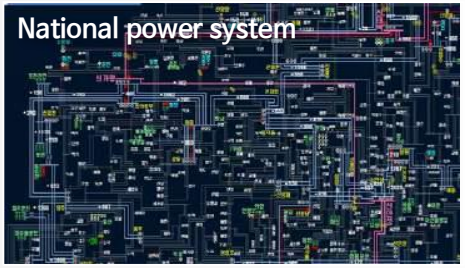
Functions

SCADA	·····	Supervisory Control and Data Acquisition
GC	·····	Generation Control
NA	·····	Network Analysis
DTS	·····	Dispatcher Training Simulator

* RDBMS; Relational DataBase Management System * KPX; Korea Power Exchange





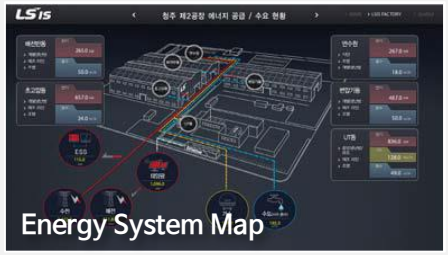


xEMS Factory/Building/Home Energy Management System

In order to provide customized solutions and various customer values, LS ELECTRIC will be closer to you

xEMS Operating screens


Smart Convergence Tech. Map


Energy System Map


Energy Consumption Analysis


Saved Energy Status

Features

Energy monitoring
- Usage by heat source, grid, space, and facility
- Trend/forecast/cumulative graph
- Equipment information management
- Comparison of energy utilization status by time and space

Energy management
- Set energy usage targets by energy sources and Alarm setting
- Load control / Peak control
- Economic operation of ESS
- Diagnosis and maintenance support function of major facilities

Energy analysis
- Facility operation cycle diagnosis / analysis
- Energy usage prediction
- Energy-optimized operation based on weather information, previous year usage, and energy use requirement

Energy saving

Efficient operation

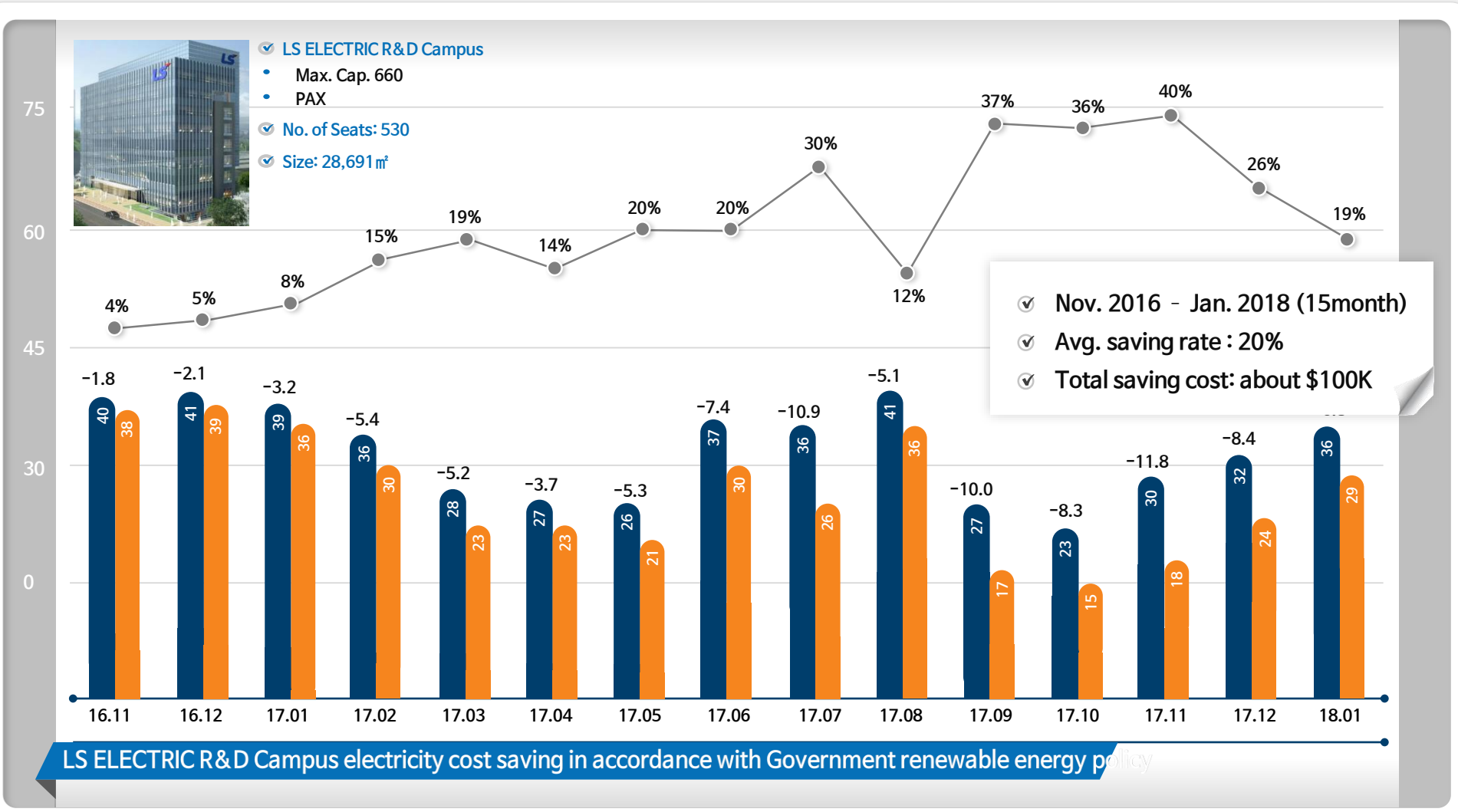
Demand management

Replacement of emergency generator.

BIM Example

xEMS Factory/Building/Home Energy Management System

BEMS Example



DMS Distribution Management System

Distribution management system that optimizes the distribution system is provided by LS ELECTRIC with a leading technology

Features

Visualization

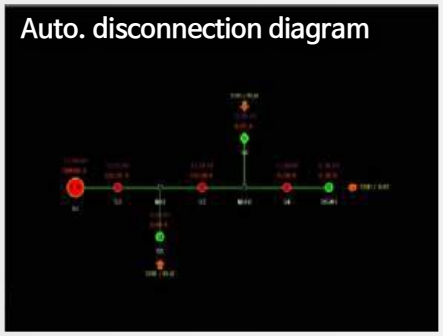
- Unified user interface / Various operating screen (Full disconnection diagram, Automatic Disc. diagram, GIS Disc. Diagram)
- Apply familiar configurations including toolbar, tree view & Data vie

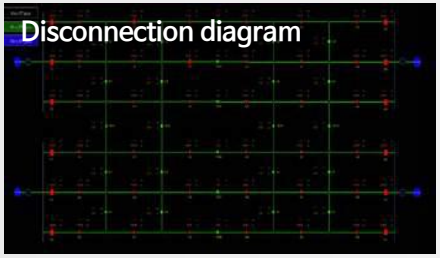
Connectivity

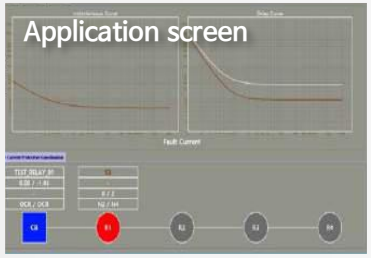
- Easy linked with G-Builder, SCADA drawing tool
- Easy to connect external system according to international standards

Application

- Network Connectivity Processor
- Distribution State Estimation
- Distribution Fault Section
- Voltage-Var Optimization
- Distribution Load Estimation
- Real-time Power Factor
- Distribution Service Restoration
- Distribution Network Re-configuration







SCADA Supervisory Control And Data Acquisition System

Highly reliable monitoring and control system for stable power supply comes with accumulated know-how of LS ELECTRIC

Features

User-Orented

- GUI configuration of familiar Windows Technologies and environments
- Support various applications such as power equipment diagnosis, power quality monitoring, facility protection, and substation automation.

Standard-ization

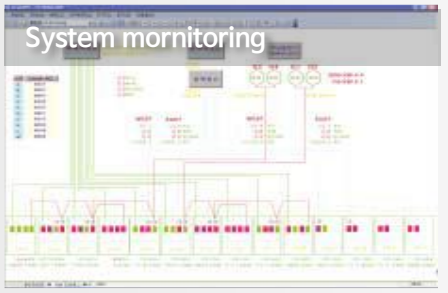
- Data access and presentation through the same interface
- Supports industry standards such as 3rd party ActiveX,Excell, and reports
- Operate a unified interface between operator and system
- Supports system integration engineering tool

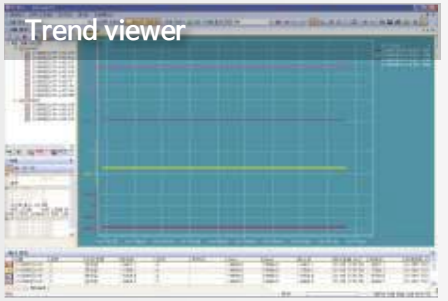
Intuitive analysis and operation

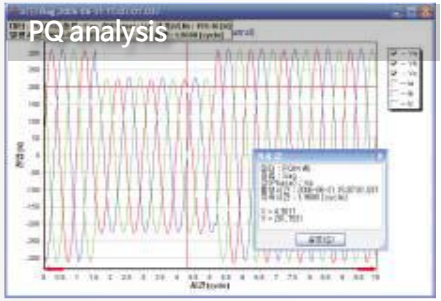
- On-screen Help menu
- Visual system resource management for network, CPU and disk
- Support for trends by providing a variety of chart styles and grids
- Analysis of various intuitice information with Chart 3D

Stable power system monitoring

- Rapid recognition of accidents
- Reduced recovery time with immediate response
- Peak control,planned power use







SCADA Supervisory Control And Data Acquisition System

Highly reliable monitoring and control system for stable power supply comes with accumulated know-how of LS ELECTRIC

SCADA power generation / transmission application.

PQMS

Power Quality Monitoring System

PQMS analyzes the primary cause of power quality decline and suggests solutions for this problem by gathering power quality information from the PQ meter installed in major power facilities and analyzing the information in real time. In particular, this is a useful sysrem for produciton facility systems requiring a high quality of power

PQ data acquisiton and application

- PQ data acquisition, real time events
- PQ event occuring trend analysis

PQ analysis

- 3D voltage event analysis
- Sag / Swell analysis
- CBEMA and other statistical analysis
- On/Off Line power quality analysis

PDPS

Power Equiment Diagnosis & Preventive System

The PDPS (Power Equiment Diagnosis and Preventive System) monitors the functions and capabilities of major power facilities to precen breakdown and accident in advance and supports efficient power facility management through equiment records and DB management

On-line monitoring diagnosis

- Indication of abnomality for each diagnosis category of TR and GIS for each Bay
- GIS PD measurment and 2D/3D analysis screen
- Real time event and information screen indication
- Real time communication condition

Convenience of operator

- Monitoring screen editing
- Communication device On-line setting

Preventive diagnosis analysis

- Precise diagnosis of gas in liquid for specialized DB base

SAS

Substation Automation System

The Substation Automation System provied remote control and monitoring functions in real time, promptly acquiring the information of facilities for all kinds of unmanned substaions ranging from distribution to extra high voltage substations, which may be applied to Intelligent Electronic Devices [IEs] for protection and control and to the facility security devices of the unmanned substation.

Automatic control

- Automatic interlocking, Synchronous-check, balanced voltage regulation [Tap-changer control], transformer load balance control, Automatic power failure /return control, load shedding, automatic re-closing function, power factor control

Facility protection

- Generator protection, bus protection, bay protection, transformer protection, power line protection, motor protection

Data acquisition and application

- Remote data acquistion and decision, event alarm report, accident waveform capture

Facility status monitoring

- GIS gal malfunciton condition, circuit breaker condition, transformer condition

ECMS

Electric Equipment Control & Monitoring System

The ECMS (Electircal Equipment Control & Monitring System) carries out generator operation, management and control by applying multi-functional integrated digital relay to the power-generating facilities and the power equiment within the power plants.

Remote monitoring and control

- Operating status of circuit breakers/relays·Circuit breakers remote control
- Multi-level fluctuaion control of the power generator

IED analysis/coreection

- Relay/Logic operational status
- Multi-level fluctuation control of the power generator
- Relay remote setting

Protective function [IED]

- Power generator
- Bay and line
- Transformer
- Breaker
- Motor protection

DCS Distributed Control System

LS ELECTRIC' control technology for high difficulty process will be recognized as many delivery results.

01 High Performance

- Application of product structure for high-speed control, Such as turbine control Supports HART communication Which is widely-used for plant monitoring and control
- Web Monitoring

02 High Reliability

- Fully redundant system
- Fail-safe function
- RCS self-diagnosis function

03 Easy Maintenance

- Hot swap of system
- SMS Service
- Online diagnosis

04 Convenient Operation

- Integrated management of different controllers with various communication mathod Management of the change history Of the control logic Enginerring data synchronization Sequence of Event [SOE] data management

05 Open Architecture

- Based on the latest Windows operating system Supports international standard(IEC61131-3)control language :FBD, LD, SFC
- Provides industrial standard interface : OPC C/S,PROFIBUS,HART

06 Reference

- Power plant boiler main control system algorithm Power plant integrated(boiler+turbine)main control system algorithm

GS Power Bucheon HRSG, S/T Integrated Control System ('11)

Ilsan Cogeneration Power Plant S/T main control system #1 ('06), #2 ('13)

Main control system for Peongtaek P/P's Boilers #1~4 ('04)

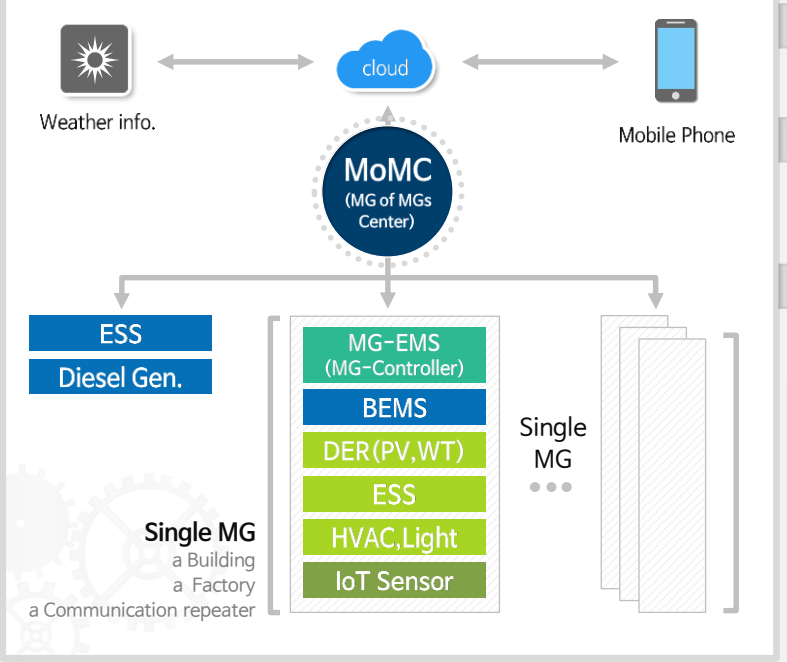
Main control system for Honam P/P's Boiler #2 ('01), #1 ('03)

* HRSG: Heat Recovery Steam Generator

MicroGrid

LS ELECTRIC will lead the micro grid, a new paradigm of the power grid.

Multi MG Industrial complex Campus Island



•• MoMC

Multi-MG operating system with single-MG power flexibility and integrated peak management

•• MG-EMS

Single-MG energy management system with including uninterruptible power, generation / load prediction, peak management, distributed power management

•• MG-Controller

Economical operation and efficient operation control solution of distributed energy resource of single MG

Economics

Reduce energy costs and reduce transmission and distribution

Environment

Reduce greenhouse gas emissions and protect the environment by utilizing renewable and dispersed power sources

Reliability and PQ

Provide uninterrupted power capability and uniform quality For the critical load

Delivery performance

SCADA System (~'13)

Incheon International Airport Terminal 2 Power Control System ('13 ~ '17)

Honam High Speed Rail Integrated SCADA Project ('14 ~)

- LG Chem Poland factory SCADA ('16)
- Hanwha Q CELLS Jincheon #2 154kV SCADA ('16)
- Kuwait Causeway main link SCADA ('16)
- Samsung Electro-Mechanics integrated power and utility monitoring system ('16)
- Ghana Kumasi 330kV SCADA ('16)
- LG Chemical Nanjing SCADA ('16)
- Kazakstan Karabatan CCPP PJT SCADA ('15)
- Incheon International Airport Terminal 2 Power Control System ('15)
- LGD Guangzhou 120K SCADA ('15)
- Honam High Speed Rail Integrated SCADA PJT ('14)
- Jordan EDCO SCADA ('13)

DCS, EMS, DMS, xEMS, MG (~'11)

KPX power grid operation system ('11 ~ '14)

Ilsan Cogeneration 2 Power Plant S/T main control system ('13)

- Honam thermal power boiler denitrification / desulfurization facility main control system ('17)
- Seogeocha-do DC-based Island Micro Grid ('16)
- Nigeria Gas Turbine Control System ('15)
- Iraq 108NT (Bismillah)-DMS ('15)
- Seoul Univ. Campus Micro Grid ('15~)
- Vietnam Hoa Khanh Tay Water Supply Project ('14)
- Dangjin Thermal Power Units #1~#4 Desulfurization main control system ('14)
- Ilsan Cogeneration 2 P/P S/T main control system ('13)
- GS Power Bucheon HRSG, S/T Integrated Control System ('11)
- K-water Metropolitan Area Integrated Operation System ('11)
- KPX power grid operation system ('11)

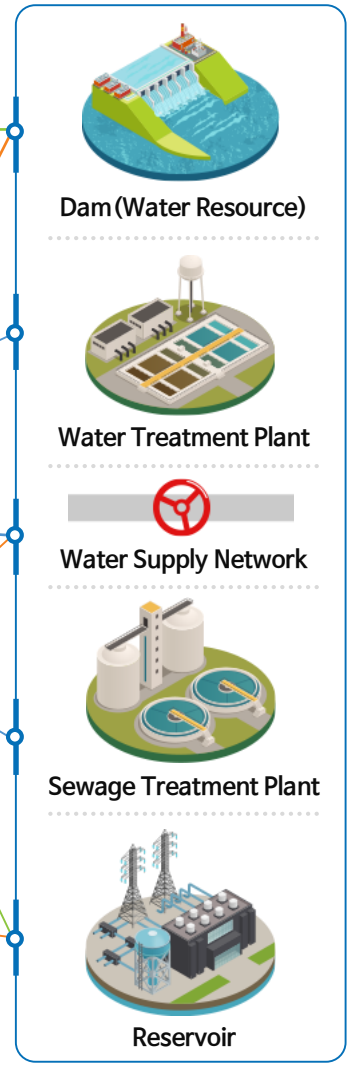
Power Solution 〉Solutions 〉Water Solutions(AQUASOL)

LS ELECTRIC will offer the automation & ICT-based water management solutions in order to solve a variety of water-related issues.

F ood Securiy
Rural Water Management Sol.

W ater Supply Security
Water/Wastewater Management Sol.

E Nergy Security
Water Energy Management Sol.

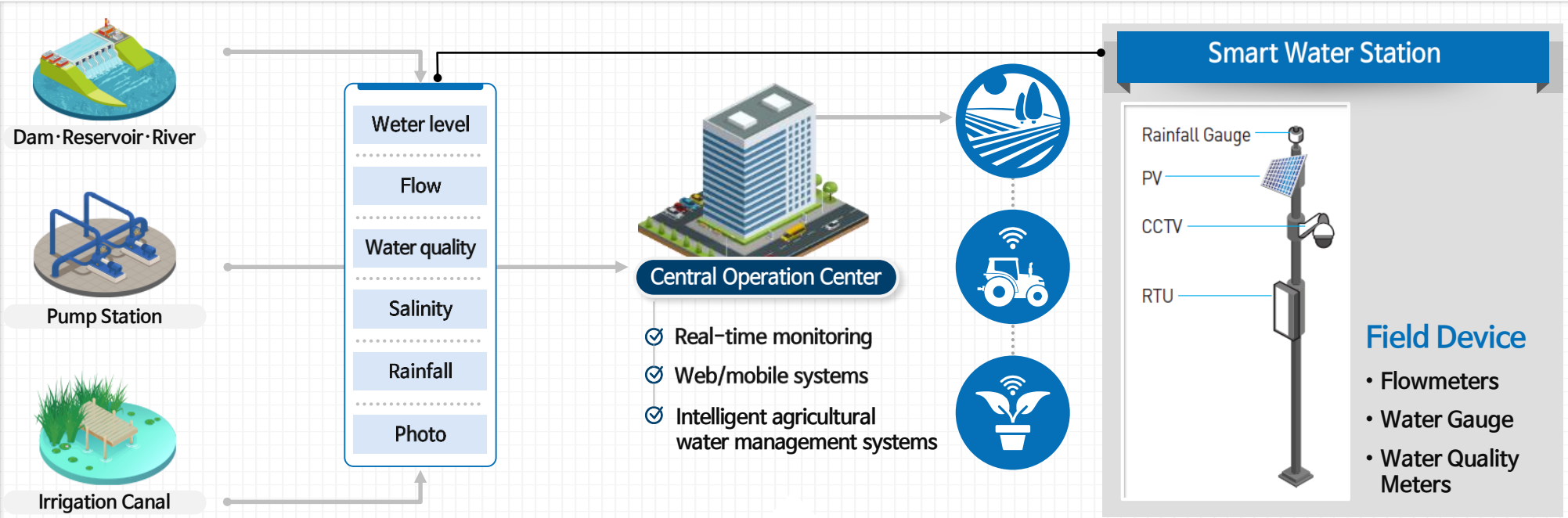


- **F** Disaster prediction and damage minimization due to climate change.
- **E** Complementing energy required for water intaking via installing floating PV generator using the space in dam or reservoir.
- **W** Integrated water management from all sectors to stabilize supply and improve water quality.
- **E** Power energy savings through monitoring real-time efficiency of pump operation (PEMS)
- **W** NRW reduction and systematic facility maintenance via pipeline network diagnosis/leakage analysis.
- **E** Energy recovery by applying micro hydro power generator to the pressure reducing valves.
- **W** Environmental pollution prevention through quality management for treated water in real time.
- **F** Optimized utilization of water through integrated management of real time operating information on the reservoir.
- **E** Establishing Smart Water Station powered with solar energy to minimize power consumption.

* PV : Photovoltaic | * PEMS: Pump Energy Management Sys. | * NRW : None-Revenue Water

F ·· Rural Water Management Solution

When exact 'understand' of the water reserves in the country or region is required or in an attempt to alleviate water shortages and damage from disaster with optimal management for water resource, Rural Water Management will help.



Identify water reserves

Investigating and understanding of national water reserves
by the Smart Water Station

Efficient use

Optimizing allocation equal to regions on limited water resources
by Intelligent Agricultural Management

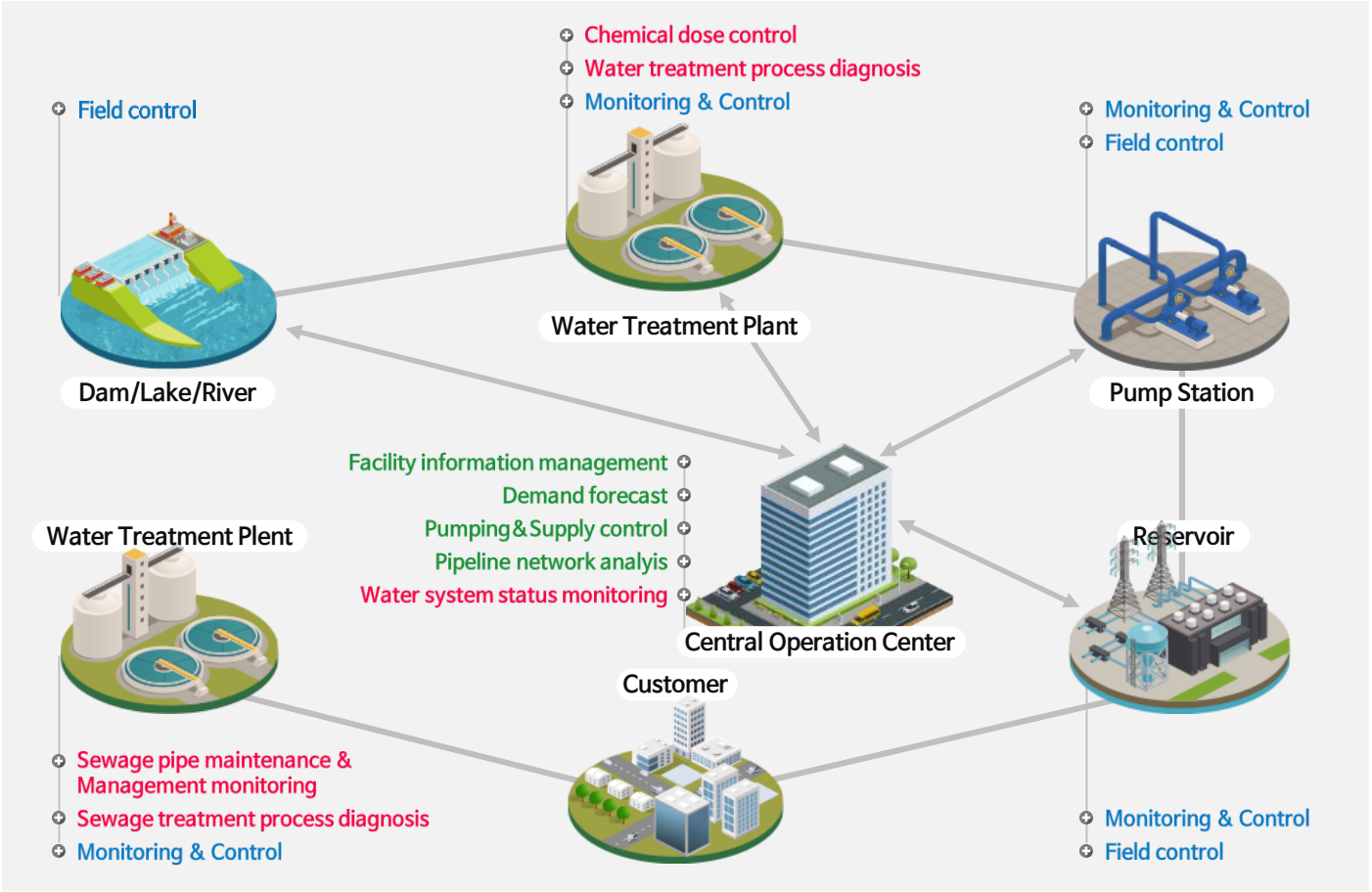
Minimize disaster damage

Rainfall, water level, water flow, image information
by disaster warning

W ·· Water/Wastewater Management Solution

If you want to improve the water quality and supply reliability of water supply from disruptive accidents, minimize energy consumption required in the production and supply process, reduce the water leakage rate, and reduce NRW the LS ELECTRIC Water/Wastewater Management Solution will help.

Level 1 ● Automation Level 2 ● Integration Level 3 ● Advanced



Improved water/sewage quality

Real-time monitoring and control for water management
by Automation Solution

Stabilized water supply

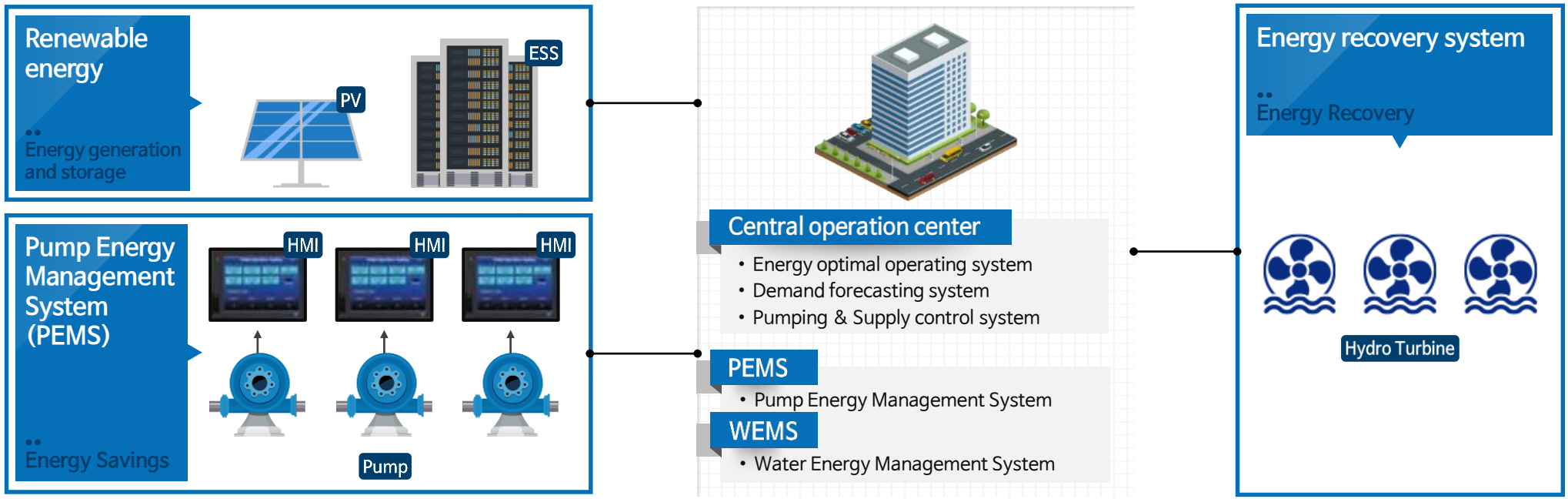
Metropolitan waterworks system management
by Integration Solution

Reduced energy costs

Optimal pump operation and NRW management
by Advanced Solution

E ·· Water Energy Management Solution

When it is required to manage energy use in overall water treatment and supply process and save energy cost in order to reduce CO2 emission to the ultimate, water energy management solution will give an answer.



Effective Energy Management

Optimizing energy management required in water treatment and supply
by Demand Forecast, Supply Analysis

Operating Cost Down

Economic Usage of Energy
by Energy Saving and Management

CO2 Reduction

Renewable Energy Generation
by Solar & Micro Hydro Power

Delivery performance

Water & Wastewater Management System


Kwangam water treaxtment plant (’13)

- SCADA / Process diagnosis
- Facility information management

- Mongolia, Yarmag water supply PJT (’14)
- Jordan, Supply and installation of System Control and Data Acquisition of Disi water Drawing project (’14)
- Kwangam water treatment plant (’13)
- Seongnam water treatment plant (’12)
- Geum river section No.6 of 4 river project (’12)
- Kyungpook water intake plant (’11)
- Seogwipo City sewer system (’09)
- Cheongju sewage advanced treatment (’05)
- Busan Duksan water treatment plant (’04)
- Step 6 metropolitan area PJT (’02)
- Vietnam, Thien Thenh water treatment plant (’02)

Integrated water management system


K-Water Seoul Metropolitan Area (’05)

- Integrated management system and water resources integrated management solution

- Gyeongnam water integrated management (’09)
- Amsa water treatment plant (’06)
- Seoul Metropolitan Area integrated management (’05)
- Geum River Northern Area water treatment plant integrated management (’05)

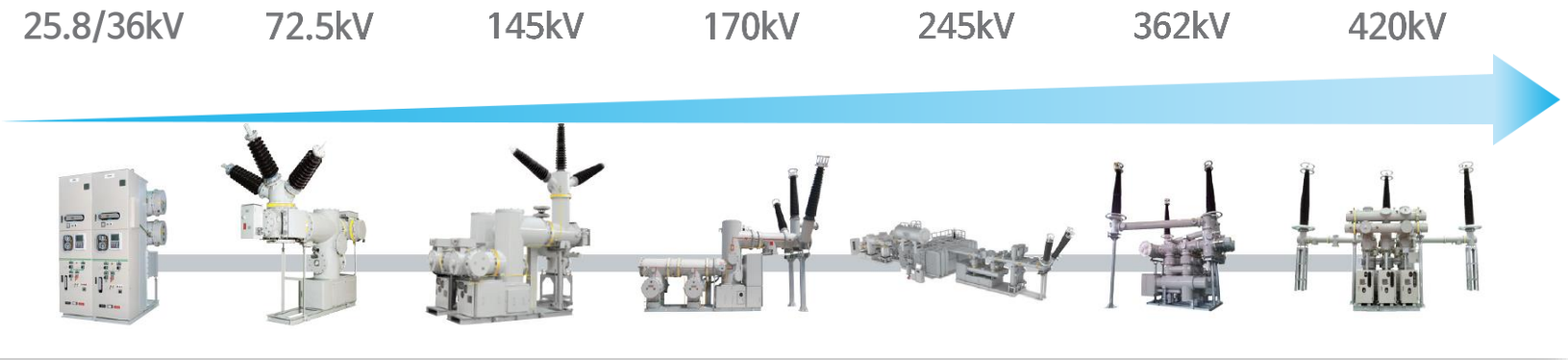
Others



- Angye small hydro (’14)
- Hapcheon Dam floating PV system 500kW (’12)
- Gabuk small hydro (’12)

Gas Insulated Switchgear

LS ELECTRIC's GIS complies with the latest international standards & requirement by performing global test laboratory within the range from 25.8kV to 420kV.



Rated Current (A)	Up to 3150	2000	Up to ~3150	Up to 4000	Up to 3150	4000~6300	4000
Rated Breaking Current (kA)	Up to 40	20 / 31.5	40	50	40 / 50	50 / 63	50
Power Frequency Withstand Voltage (kV)	70	140	275	325	460	520	650
Lightning Impulse Withstand Voltage (kV)	Up to 170	325	650	750	1050	1175	1425

Compact Design

- Suitable for dense areas of cities or places where it is difficult to secure a site through Compact Design and Modular Design.

High Reliability & Safety

- Securing reliability through seismic design
- Clean Manufacturing System (Cleaness ≤ 7,000 class)

Minimal Maintenance Cost

- Can be expanded without disconnecting power of neighboring module
- Built to last over 30 years, it provides long service life at the lowest maintenance

Power Transformer

Power transformers are produced on a clean, zero-defect production line, and come in capacities up to 550kV and 800MVA for three phase. (Up to 500MVA for Single Phase)

33kV 69kV 132kV 220kV 400kV 550kV




Applicable Standard	IEC 60076 / ANSI(IEEE) C57	Winding Temp. Rise [K]		65	Oil Preservation System	Conservator type N2 Sealing type Air Seal Cell type
Installation Location	Outdoor / Indoor	Oil Temp. Rise [K]		60		
Frequency [Hz]	50/60	Cooling Method	Internal	ON / OF / OD		
7Insulation	Oil type		External	AN / AF / WF	Base	Skid , Roller
Thermal Class [°C]	105 (A)	Capacity (MVA)		Up to 800 for 3 Phase	Special purpose	Next page ⊕

Customer friendly

- Production and supply of products for various uses / specifications

High Reliability & Safety

- Securing reliability through seismic design
- High-reliability design technology that combines advanced technologies from Europe and Japan

Eco-friendly

- High-efficiency / Noise reduction TR design through optimization and analysis

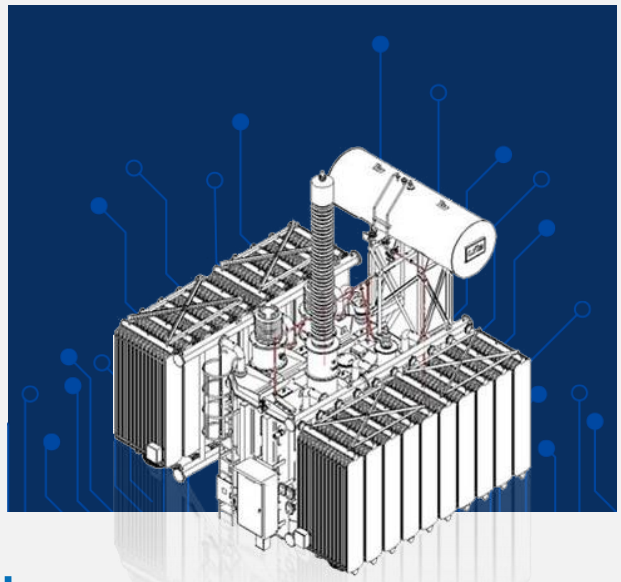
Special Purpose Power Transformer

LS ELECTRIC provides not only Power Transformers for general power system, but also various special purpose transformers to meet customer needs.

Converter Transformer

- A transformer used in HVDC system that changes the existing High-Voltage AC (HVAC) transmission system to HVDC transmission system.

Static Var Compensator TR



- The core equipment of the SVC which improves the electric quality and stability by supplying or absorbing the reactive power inevitably present In the AC transmission system.

Scott Connection TR

- A transformer that can obtain 2 phase (90° phase difference) output from 3 phase (120° phase difference) power supply.
- Using a large-capacity single-phase load as a three-phase power supply such as railway AC Power supply.

Reference

More than 660 numbers of LS ELECTRIC power transformers are delivered and used in Korea and overseas as of 2019.

KOREA

345KV 690MVA Dangjin Thermal Power plant

KOREA

154KV 125MVA LG Display Paju

SUDAN

110KV 100MVA

USA

345KV 42MVA/AMP

USA

230KV 250MVA/WAPA

Signaling & Control

From High Speed Rail to automatically operated LRT, LS ELECTRIC provides the most appropriate signaling solutions for each site environment.

CTC : Centralized Traffic Control

A system monitors and controls overall train and passenger operations.

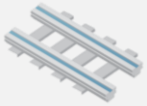
- Train Operation Management
- Operation / Route / Delayed Train Control
- Management of Public Announcement System and Recording System, and etc.

EIS : Electronic Interlocking System

A system that interlocks and controls trackside equipment for railway operator to determine train operation route.


Railway Singals


Point Machine


Track Circuit


SIL4 Certificate

ATC : Automatic Train Control

On-board System

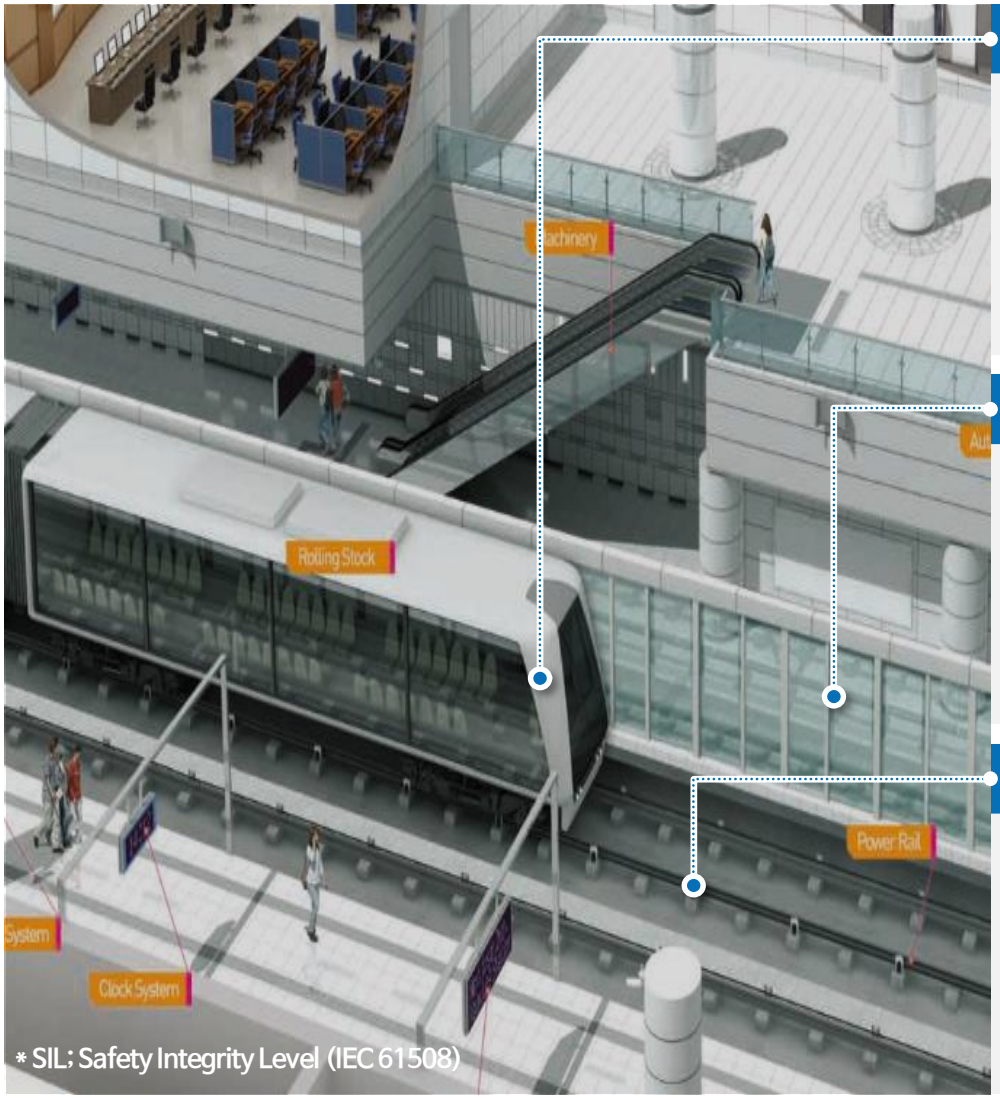
- Automatic Train Speed Control
- Optimal Speed Display
- Train Condition Monitoring
- Self-diagnosis Function

Wayside Equipment

- Obtaining Speed Information on a Real-time
- Delivering Speed Information to Train Device
- Controlling Train Operation
- Monitoring Field System Status

Signaling & Control

From High Speed Rail to automatically operated LRT, LS ELECTRIC provides the most appropriate signaling solutions for each site environment.



CBTC : Communication Based Train Control

A train control system using a wireless communication between onboard system and wayside equipment.

- ATP (Automatic Train Protection)
- ATO (Automatic Train Operation)
  → Enable automatic or driverless train

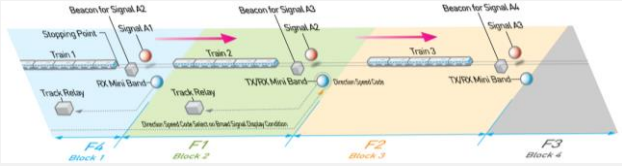
SIL4 Certificate

PSD : Platform Screen Door

Installed at the platforms of MRT / LRT stations, platform screen door is automatically opened and closed by train position information.

AF : Audio Frequency Track Circuit

A Track circuit that check locations of trains and transmits information from wayside to on-board devices for speed control of trains



SIL4 Certificate

Communication

LS ELECTRIC implements wired and wireless network environments for train operation and therefore facilitates information exchange between the complicated systems. LS ELECTRIC implements stable and convenient communication environment in train, station, tunnel and bridge.

PIS : Passenger Information System

- Provide train information to passengers such as train departure, arrival and destination
- Provide transfer information between connected routes for train transfer passengers

AFC : Automatic Fare Collection

Communication Management System

- Digital Fiber Optic Transmission
- Wireless communication between train crews and operating staffs
- Telephone hot-line communication
- Video surveillance and recording

Power Supply System

LS ELECTRIC, which has the best experience in the industry, has improved safety and reliability based on accumulated electrical, electronic, and information technology. We provide integrated Power Sol. by establishing a complete system from HV to distribution in the area of railway power transmission.

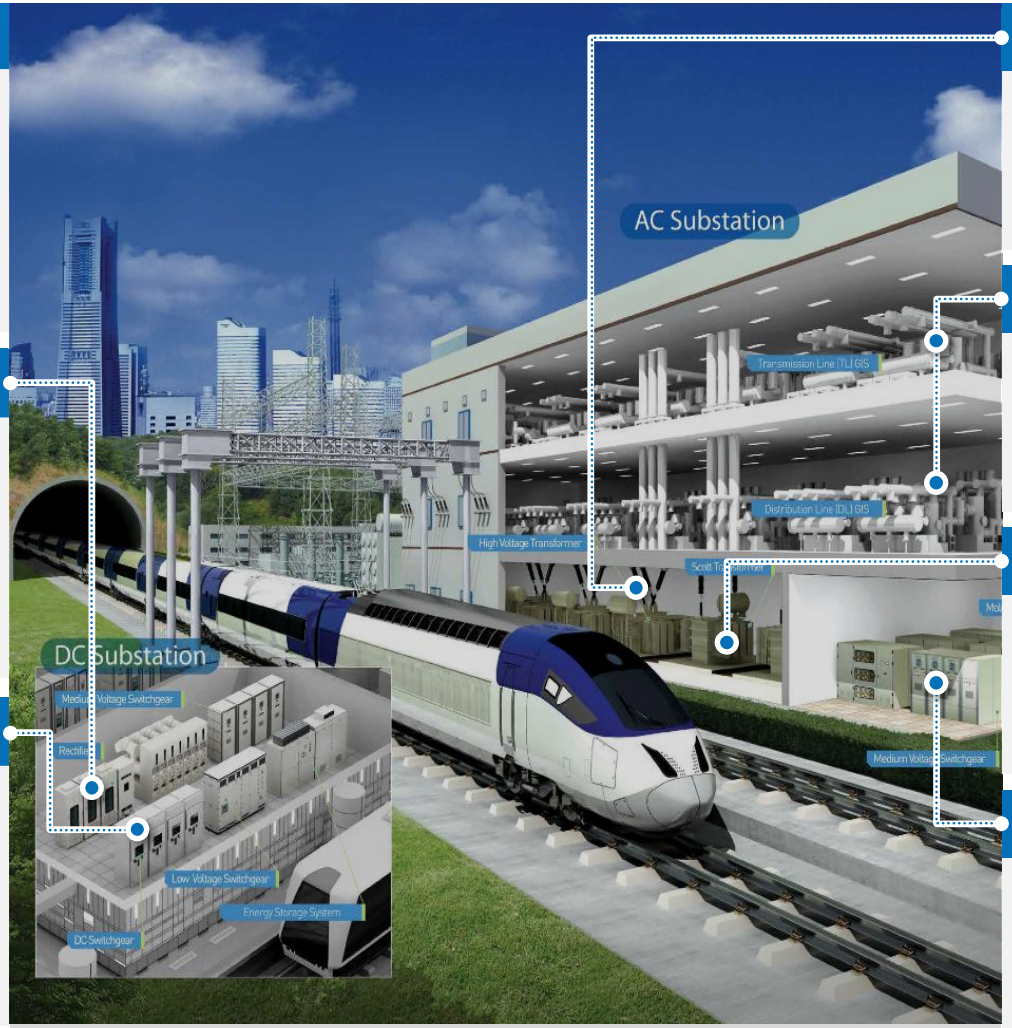
SCADA (Monitoring & Control)


DC Rectifier

- Up to 1500V
- Up to 400kW
- 3-phase double bridge series or parallel

DC SWGR

- DC 900V / 1500V
- 100kA 4000A / 6000A
- IEC 61992



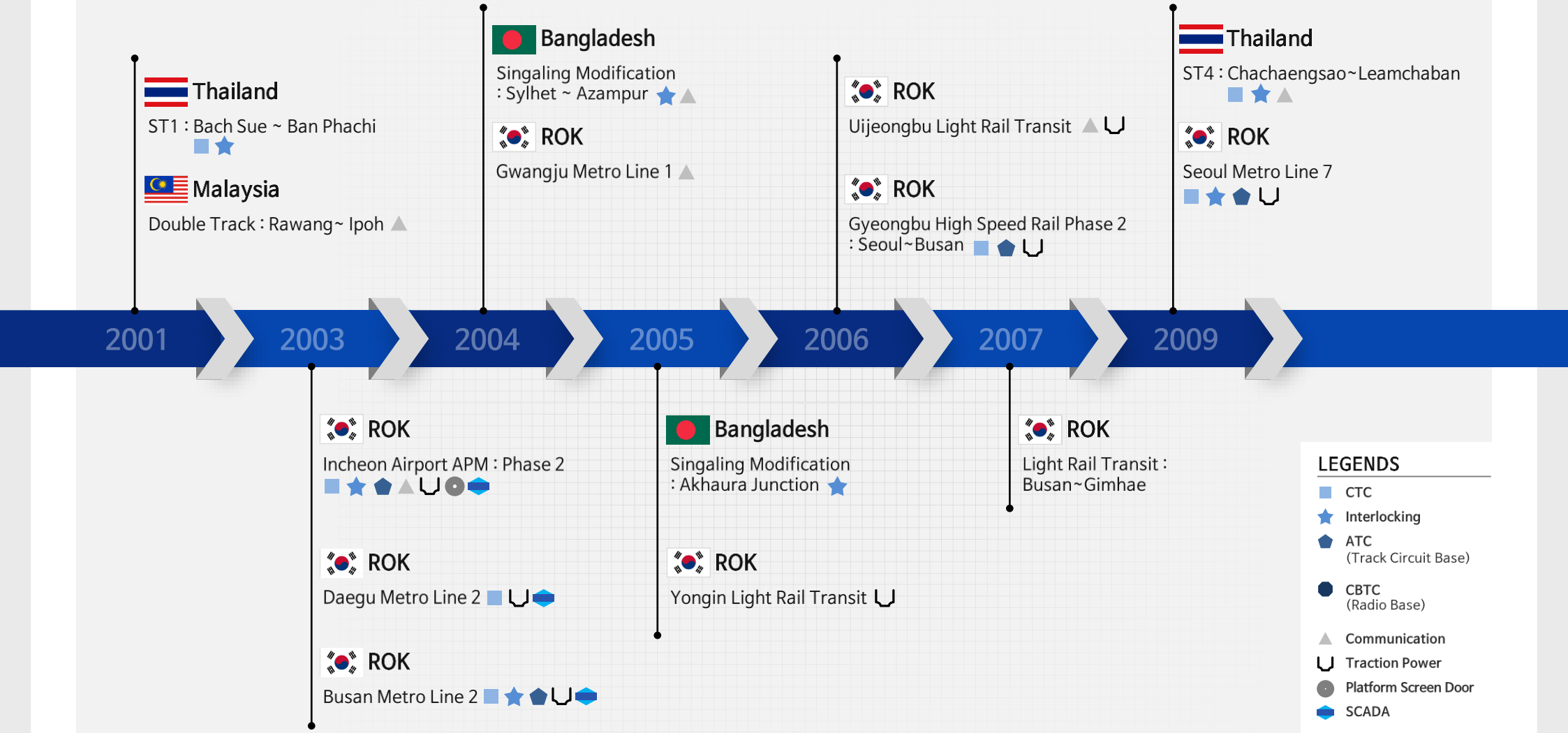
Power TR

GIS

Scott TR

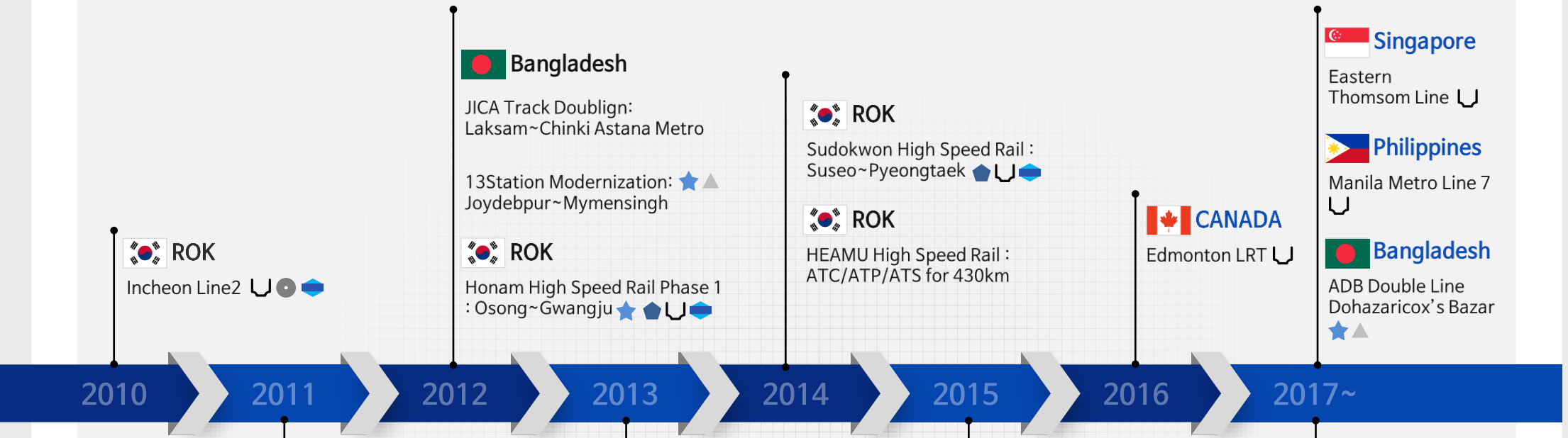
CRT & MV/LV SWGR


Delivery performance



Delivery performance

— On going



LEGENDS

- CTC
- Interlocking
- ATC (Track Circuit Base)
- CBTC (Radio Base)
- Communication
- Traction Power
- Platform Screen Door
- SCADA