A Next-Generation Intelligent Power Grid for the Green Future

SMART GRID
LS Industrial Systems (LSIS) has long been the industry frontrunner in electric and automated solutions, providing innovative technologies that bring convenience to humankind. Now, LSIS is laying the foundations for a happier future by building the infrastructure named SMART GRID, a next-generation power grid for green growth. LSIS is turning your dreams into reality.
NOW LEADING
SMART GRID SOLUTION!

A world that exceeds your dreams in cutting-edge convenience.
A solution that exceeds our clients’ expectations in pure satisfaction.
Move toward a new future with LSIS’ s “leading solution.”
“LSIS’s Smart Grid aspires to be the world’s very best.”

**What Is “Smart Grid”?**

- Smart Grid is an infrastructure that allows suppliers and consumers to acquire in real time the energy information they need, and uses this information to enable the supply, storage, consumption, and transaction of energy in the right amount at the right time.

- Keywords: Real-time signal, real-time measuring, demand response

   1) Includes operators and managers

**Smart Grid Components**

- **Power Network**
  A hardware infrastructure network that enables energy sharing between suppliers and users

- **Communication Network**
  A network that enables the sharing of information about energy supply and demand

- **Financial Network**
  A network that enables precise transaction by quantifying energy value into price

**Why Is Smart Grid Necessary?**

- **Maximizing energy efficiency**
  Ensures maximum efficiency in energy usage by enabling two-way, real-time sharing of power information between supplier and consumer.

- **Motivating voluntary energy conservation**
  Naturally diffuses energy demand by channeling it toward low-rate hours, and encourages voluntary energy conservation by showing consumers usage volume and rate in real time.

- **Building the foundation for the diffusion of new and renewable energy**
  Contributes to the stable supply and distribution of new and renewable green energy, such as wind, solar, and nuclear power, which is prone to irregular generation volumes.

- **Improving the quality and reliability of electric power**
  Dramatically improves the quality of electricity by using an intelligent power grid for the advance detection and control of anomalies and malfunctions

**Smart Grid Diagram**
Always dedicated to our customers, LSIS will use its superior services and technology to take convenient information sharing to a whole new level.

There is no more reason to hesitate before change. LSIS’s “Smart Grid” solution will be there to shine the way.
THE BEST POSSIBLE GREEN SOLUTION FOR THE ENVIRONMENT, ECONOMY, AND YOU!

A comprehensive Smart Grid solution optimized for the environment, the economy, and the client! All the world’s eyes are now on LSIS.
Industry-leader LSIS is providing a comprehensive Smart Grid solution focused on new and renewable energy, superconductors, energy storage, eco-friendly electrical machines, green cars, LED, power efficiency enhancement systems, and power semiconductors. We are also working to make the vision of a Green Town built on Smart Grid technology a reality, by building the necessary infrastructure for tomorrow's Smart Green Homes, Smart Green Buildings, and Smart Green Factories.
SMART GRID SOLUTION

SMART PLACE

SMART GREEN HOME
An Environment-friendly home that provides everything necessary to maintain complete comfort in a residential environment through application of low-carbon green energy resources and AMI to maximize the energy efficiency.

SMART GREEN BUILDING
A Green Building that maximizes the energy efficiency through low-carbon green energy resources and energy efficiency system and reduces the greenhouse gas emission and minimizes the environmental pollution by applying the environment-friendly devices.

Advanced Metering Infrastructure (AMI)
- AMI, a demand response system based on the bi-directional communication, is a key infrastructure for Deployment of Smart Grid.
- AMI manages total electric power resources on demand side and provides the information and services that enables the efficient energy use for electric company and customers.

SMART ENERGY NETWORK

- Generation by Renewable Resources
  - Wind Power Generation
  - Photovoltaic Generation
  - Hydro Power Generation

- Power Transmission & Distribution
  - Transmission & Distribution Line
  - Superconducting Cable
  - Underwater HDVC Cable

- Decentralized Power Resources
  - Energy Storage
  - Fuel Cell
  - CHP
SMART GREEN FACTORY

A factory that applied low-carbon energy resources, AMI, Environment-friendly devices and energy efficiency system to minimize the greenhouse gas emission, a waste of energy, and environmental pollution.

SMART GREEN SCHOOL

A school that maximizes the energy efficiency through the application of renewable energy, energy efficiency system, rain-water detention system and provides environment-friendly education with environment-friendly construction materials.
LSIS’s EV Charge Solution consists of charging devices, stations, and operating systems for electric vehicles.

1. Home-based EV charging
   Infrastructure consisting of 220V power sources installed in individual homes and home communities for easy and convenient charging
   - Slow charge method

2. Battery rental/replacement
   Infrastructure for renting and changing batteries to instantly re-supply power, thus complementing the lengthy charging time required for EVs
   - Battery change method

3. Office-based EV charging
   Infrastructure for those who drive to work, with small chargers installed in company parking lots for recharging during work hours
   - Slow charge method

4. EV quick charging
   Infrastructure for rapid charging at EV quick-charge stations and short-term parking lots at restaurants, stores, theatres, etc.
   - Quick charge method
SMART GRID SOLUTION III

SMART POWER GRID / SMART RENEWABLE

- **Power Plant**
  - ECM
d- **Transmission**
  - SCADA
- **Substation**
  - SAS / SCADA
- **Distribution**
  - DAM / AMI
- **Customer**
  - FST / AMI

**Advanced Metering Infrastructure**

- **EMS**
  - Energy Management System
  - A large-scale power system control center that carries out economic load dispatch via effective system management
- **ECMS**
  - Electrical Equipment Control & Monitoring System
  - Operational management and control of electrical equipment using digital relay
- **SAS**
  - Substation Automation System
  - Real-time monitoring and unmanned automatic operation of substations using digital relay
- **SCADA**
  - Supervisory Control And Data Acquisition System
  - Real-time monitoring of distant on-site equipment from the control center using a remote terminal unit (RTU)
- **DAS**
  - Distribution Automation System
  - Monitoring of distribution line switchgears, identification and recovery of malfunctions
- **PMS**
  - Power Monitoring System
  - Monitoring of electrical equipment in individual factories and buildings
- **PQMS**
  - Power Quality Monitoring System
  - Real-time management and analysis of power quality through the installation of PQ meters in main power supply systems
- **AMI**
  - Advanced Metering Infrastructure
  - Core infrastructure for the realization of a bidirectional communication-based information supply system and Smart Grid demand response (DR)
- **PDPS**
  - Power Equipment Diagnosis & Preventive System
  - A system that prevents malfunctions and accidents by constantly monitoring the functions of main facilities, and enables efficient equipment maintenance through the management of device-specific histories and databases

**Renewable Power Generation**

- Decentralized power generation system comprising photovoltaic, fuel cell, and wind power, linked to the power distribution network
### Photovoltaic Energy
- Commanding more than 20 years of wide-ranging experience and technologies
  - Began Korea’s first solar energy enterprise in 1986
  - Independent production of high-efficiency, high-quality photovoltaic modules
  - Differentiated tech support for customers (consulting, engineering, technical sales) and turnkey solution capacity (from design to installation) for MW-class photovoltaic projects
  - Actively carrying out photovoltaic inverter projects on the basis of actual experience in cutting-edge power electronics technology and photovoltaic systems

### Fuel Cells
- Heightened cost competitiveness via independent development and mass production capacity
- Providing a total solution—from system installation and operation to maintenance—based on the utilization of client-specific applications

### Core equipment for constructing and operating smart and green buildings
- Intelligent digital circuit box capable of energy demand management, power quality monitoring, electrical safety monitoring, and equipment monitoring for buildings and other large-scale consumers
- Aimed at real-time integrated control and demand response (DR)

### Photovoltaic Module & System
- Photovoltaic Inverter
- Smart Meter System of SCP
- SCP Local Monitoring & Control System

### Smart Cabinet Panel (SCP)
- Core equipment for constructing and operating smart and green buildings
- Intelligent digital circuit box capable of energy demand management, power quality monitoring, electrical safety monitoring, and equipment monitoring for buildings and other large-scale consumers
- Aimed at real-time integrated control and demand response (DR)

### Photovoltaic Energy

<table>
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<th>SCP Local Monitoring &amp; Control System</th>
<th>SCP</th>
<th>Smart Meter System of SCP</th>
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### EV Charging
- Providing EV operating solutions including slow and quick charge stations
- Providing information on charging station locations and prices
- Monitoring and protection of vehicle charge/depletion conditions via the Battery Management System (BMS)

### Electrical Components for Power Control Unit
- Providing core electrical components for green cars based on over 20 years of accumulated technologies in power electronics and electrical devices
  - PCU (Power Control Unit): Green car motor control
  - On-Board Charger: Charging device equipped on PHEVs, EVs, etc.
  - EV-Relay: Power on-off between battery and PCU
  - PDU: Power distribution unit comprising the EV-relay, fuse, etc.

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SF6 (sulfur hexafluoride): Powerful greenhouse gas with 23,000 times the GWP of carbon dioxide

GIS: Gas Insulated Switchgear
S-LBS: Solid Load Break Switch
e-MOF: Eco-Friendly / Economic Metering Out Fit
DAIS: Dry Air Insulated Switchgear
SIS: Solid Insulated Switchgear
G-LBS: Gas Load Break Switch

Oil-MOF: Oil Metering Out Fit

Electrical devices that use eco-friendly technologies, including non-SF6 alternative insulation technologies, in response to international environmental regulations (Kyoto Protocol, REACH, WEEE)

R&D and business projects for ensuring eco-friendliness across all categories of electrical devices (transmission, supply, reception) currently completed or underway

- SF6: Sulfur hexafluoride: Powerful greenhouse gas with 23,000 times the GWP of carbon dioxide
- GIS: Gas Insulated Switchgear
- S-LBS: Solid Load Break Switch
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Oil-MOF: Oil Metering Out Fit

- Switching device for power conversion and control, capable of handling high voltages and large currents—New/renewable energy inverters, green PCUs and motor drives, core components for high-efficiency home appliances
- Capable of manufacturing products, including AC Drives, tailored to the needs of customers who utilize power semiconductors

Production efficiency enhancement and inventory minimization using RFID
Real-time monitoring system for integrated resources and energy efficiency enhancement
- Asset management/tracking system
- Distribution/logistics system
- USN-based real-time location system (RTLS)

Construction of Korea’s first mass production line for readers
Completion of Korea’s largest mass production line for tags (May 2006)
Providing RFID products that meet customers’ varying needs

AC Drive: Optimized control of AC motors at industrial sites and public/private facilities
- Energy conservation and efficiency enhancement
- Percentage of industry-emitted greenhouse gases: Approx. 34%
- Some 20 million industrial motors use up 65% of the world’s industrial power supply
- AC Drives can reduce energy consumption by pumps and fans to 60%
- LSIS: Maintains unique status with over 40% of the domestic market share and 20 years of industry experience

Protection system that rapidly reduces problem currents in case of damage to the power system due to short circuits, lightning, etc.

Development of a composite SFCL combining superconducting and high-speed switching technologies
- International patent acquired
- 2008: Field-tested at the KEPCO Gochang testing facility
- 2010: Scheduled for actual operation at Uiseong, Gyeongbuk Province
As a domestic pioneer in Smart Grid development with a decade of dedicated effort and experience in the power IT business, LSIS possesses the finest portfolio in Korea in the field of Smart Grid technology. We are ready to launch a wide variety of core products for Smart Grid, including smart meters, AMI systems, demand response (DR) systems, micro-grid solutions, power converters, and automated power distribution systems. Building on such innovative solutions, we also have the capacity to build green homes, green buildings, and green factories. Moreover, we have set out to create Korea’s first green village and green factory as model cases. LSIS is moving forward to realize tomorrow’s vision of a green business based on green growth engines, including power line communication and electric vehicle charging systems.
Korea is the No. 1 nation in semiconductors and shipbuilding. Now, LSIS will continue the legend in a new field.

**Electric Power | Electrical Equipment, Electrical Systems**
From low voltage to ultra high voltage, LSIS’s wide-ranging devices and systems have been recognized worldwide for their efficient design and superior quality. We have acquired not only ISO9001 and 14001 certification, but also accreditation from such testing agencies as KEMA, TUV, CESI, ASTA, and KERI. We offer only the finest quality products made in accordance with various international standards, including IEC, UL, ANSI, CCC, JIS, and KS. LSIS is a total-solution provider of electrical systems, from engineering, design, manufacturing, installation, and operation all the way to diagnosis and rationalization.

**Automation | Automated Equipment, Industrial IT**
LSIS is Korea’s first PLC, inverter, and DCS developer. A longstanding pioneer in Korea’s automation industry, LSIS uses its abundant experience in the industrial facilities sector to provide the very best control equipment and systems requiring state-of-the-art technologies. We offer total solutions in automation through the application of various products.

**Metal Manufacturing and Processing**
LSIS produces and supplies copper pipes made from 99.99% pure copper cathodes, used as basic materials in electronics and heavy chemical industries, as well as stainless steel pipes, used for heavy chemicals, construction, and machinery.

**New Businesses**
Set to play a key role in distribution innovation, our RFID business provides advanced technologies optimized for application in our clients’ fields. We operate a reader production line with an annual output of 100,000 units and a tag production facility with an annual capacity of 100 million. We are also building and operating a pilot production line for power semiconductors, a core component in power electronic devices. LSIS continues to uncover new business areas, including eco-friendly energy-saving automobile parts and electrical energy conversion devices.

**Power Testing & Technology Institute**
Our Power Testing & Technology Institute is a KOLAS-accredited facility providing world-class testing and evaluation services, with a wide range of testing equipment including Korea’s first privately-owned 1,600MVA short circuit tester. Our testing center offers international credibility through strategic alliances and mutual recognition of test results with the US’s UL, EU’s CE, the Netherlands’ KEMA, and Italy’s CESI.
TOTAL SOLUTION PROVIDER

Our customers can judge the feasibility of adopting the Smart Grid solution based on precise technological offerings. Let LSIS take care of everything from understanding your needs and analyzing installation environments and profitability, to providing thorough and prompt customer service.

- Monitoring and management of system operation
- Response to customer requests for modification
- System installation oversight and linkage with supersystem via middleware
- Optimal response to standard variation via remote upgrades
- Thorough and prompt customer service support

- Analysis and Design of Installation Environment
  - Cognitive environment analysis by the RF Analysis Team
  - Network environment analysis by the Network Design Team

- Analysis of Estimated Installation Costs
  - Estimation of installation costs and system integration costs based on analysis results

- Profitability Analysis
  - Accurate profitability analysis using calculation analysis tools

- Execution of Test/Pilot Projects
  - Testing of projected functions and screening of anomalies

- Support
  - Personal sessions for analyzing customers’ exact needs and requirements

- Analysis of Customer Needs
  - System installation oversight and linkage with supersystem via middleware
THE NEXT GLOBAL BEST LEADER IS LS INDUSTRIAL SYSTEMS

SMART GRID

The Key of Green Growth The Engine of Next Generation