www.powertos.com

POWERTOS will guard your electric power facilities

Leading Company
in the Electrical Engineering Field!

POWER TOS
Power Total System Engineering

Power Total System Engineering

POWERTOS will guard your
electric power facilities

Be more safety

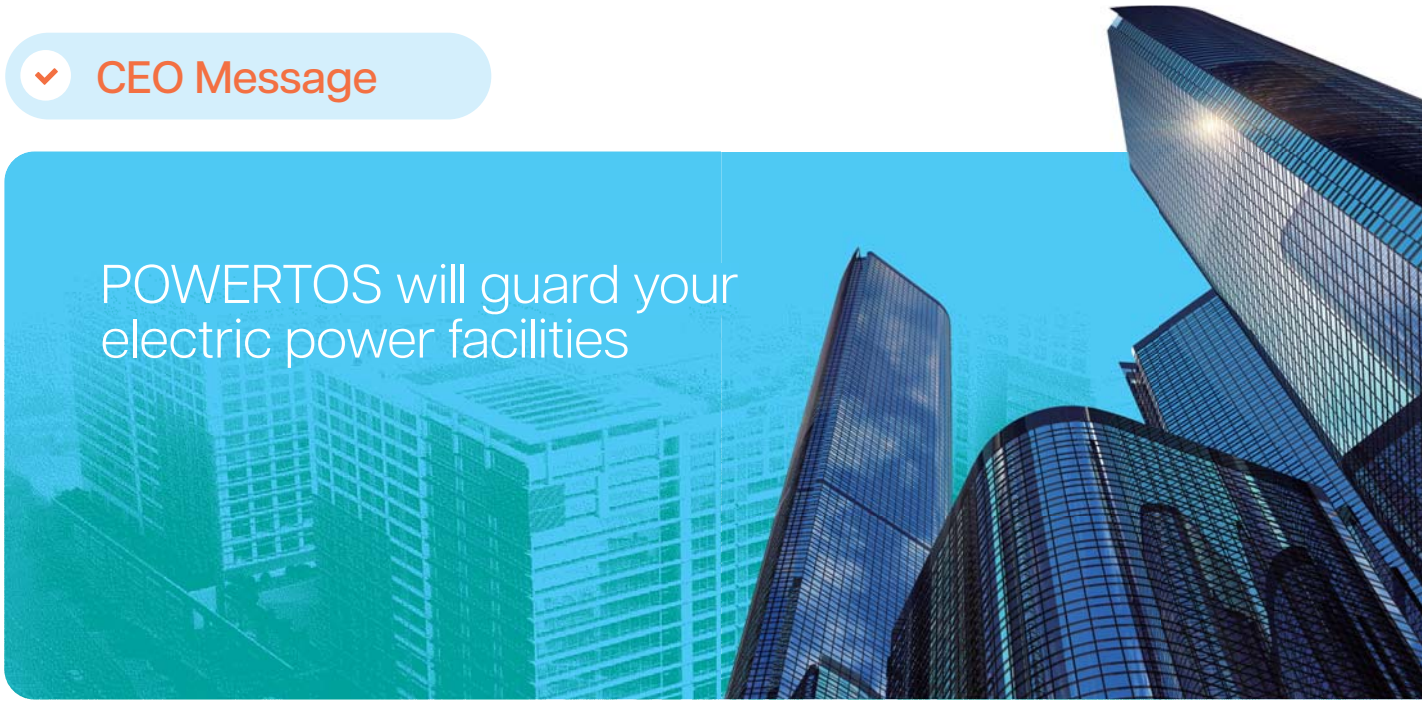
Electric power field

Engineering

First class company

Contents

CEO Message



For our co-prosperity with our customers!

Since the establishment in 2001, we, POWERTOS, have been committed in contributing to our society through the services of reviewing the technologies of power systems and consulting power systems, based on our corporate motto of “Innovation, Communication, and Passion”.

Further, we have participated in the projects of designing and manufacturing protective relay panels and in the projects of developing and applying high-tech digital facilities that are essential for power systems.

Moreover, we have led the electric power industry by advancing into the projects of diagnosing the power systems in the Middle East, Asia, and Africa.

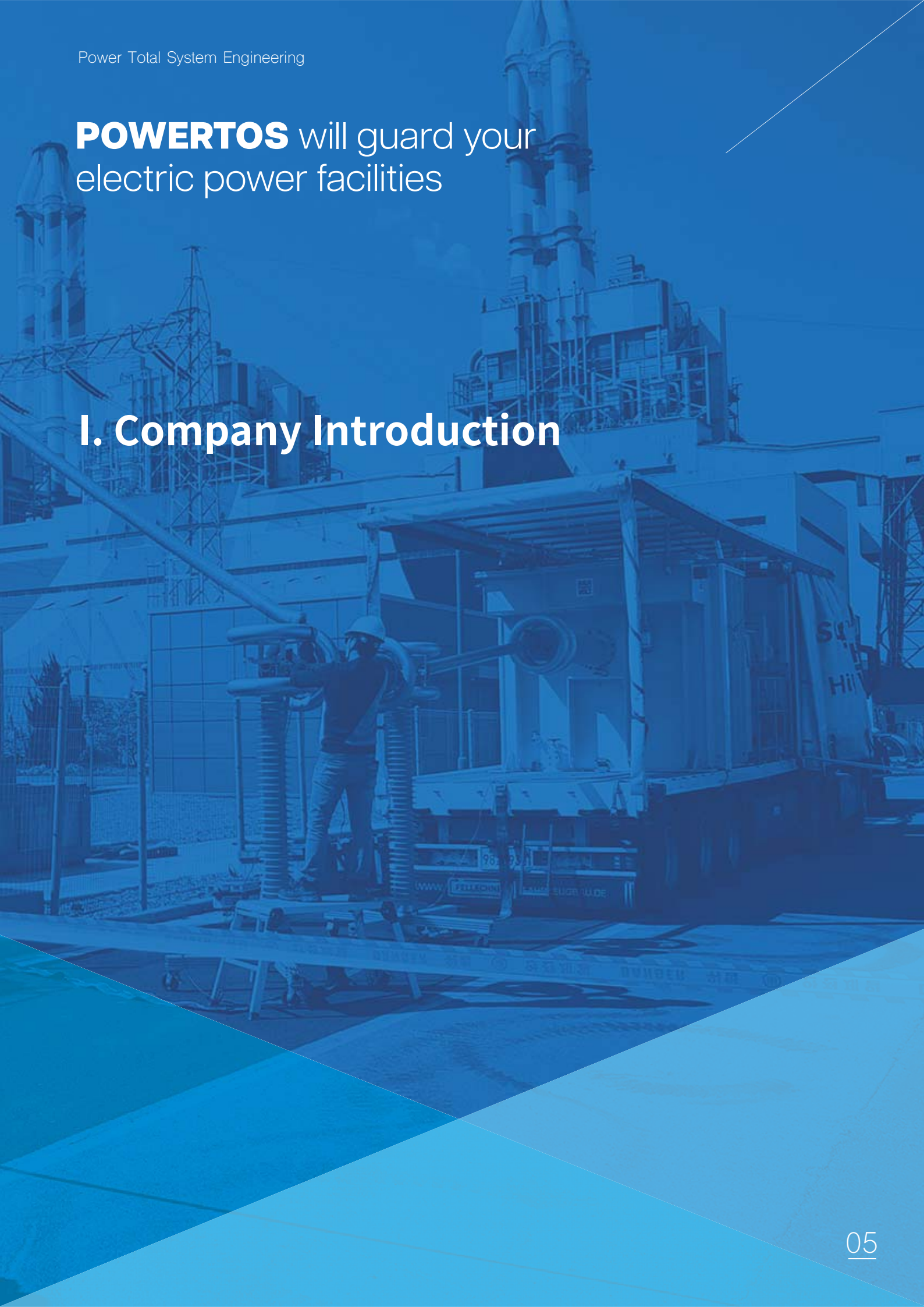
With the extremely tough competition, changes and innovation to meet global standards are the only keys to the survival of a company. We will continuously strive to stand high in the industry, creating a blue ocean and fostering electrical engineers. Also, we will remain as your most reliable business partner with the best quality and perfect services, increasing value to your company and catering to your needs.

Thank you for your unwavering support. We wish you success and prosperity.

CEO Yoo Keun-soo

POWERTOS will guard your electric power facilities

I. Company Introduction



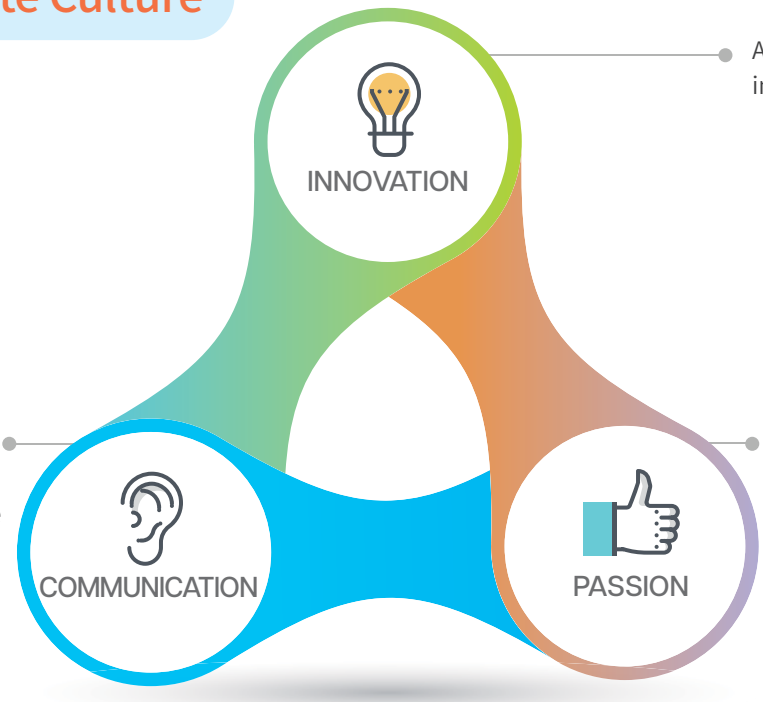
Vision

Leading engineering company in the power generation and electric power system fields

Mission

- Co-prosperity of POWERTOS and our clients
- Total Power System Service
- Creating New Blue Ocean

Corporate Culture



Aim to achieve our goal, innovation, and changes

Openly communicate to each other and carry out tasks through active participation

Dedicate passionate efforts to solve given tasks on our own under any circumstances

Code of Conduct

Be creative

- Be aware of safety issues and share them.
- Do not fear failure, set a goal, and continually go for it.
- Explore an issue and seek its proper solution.

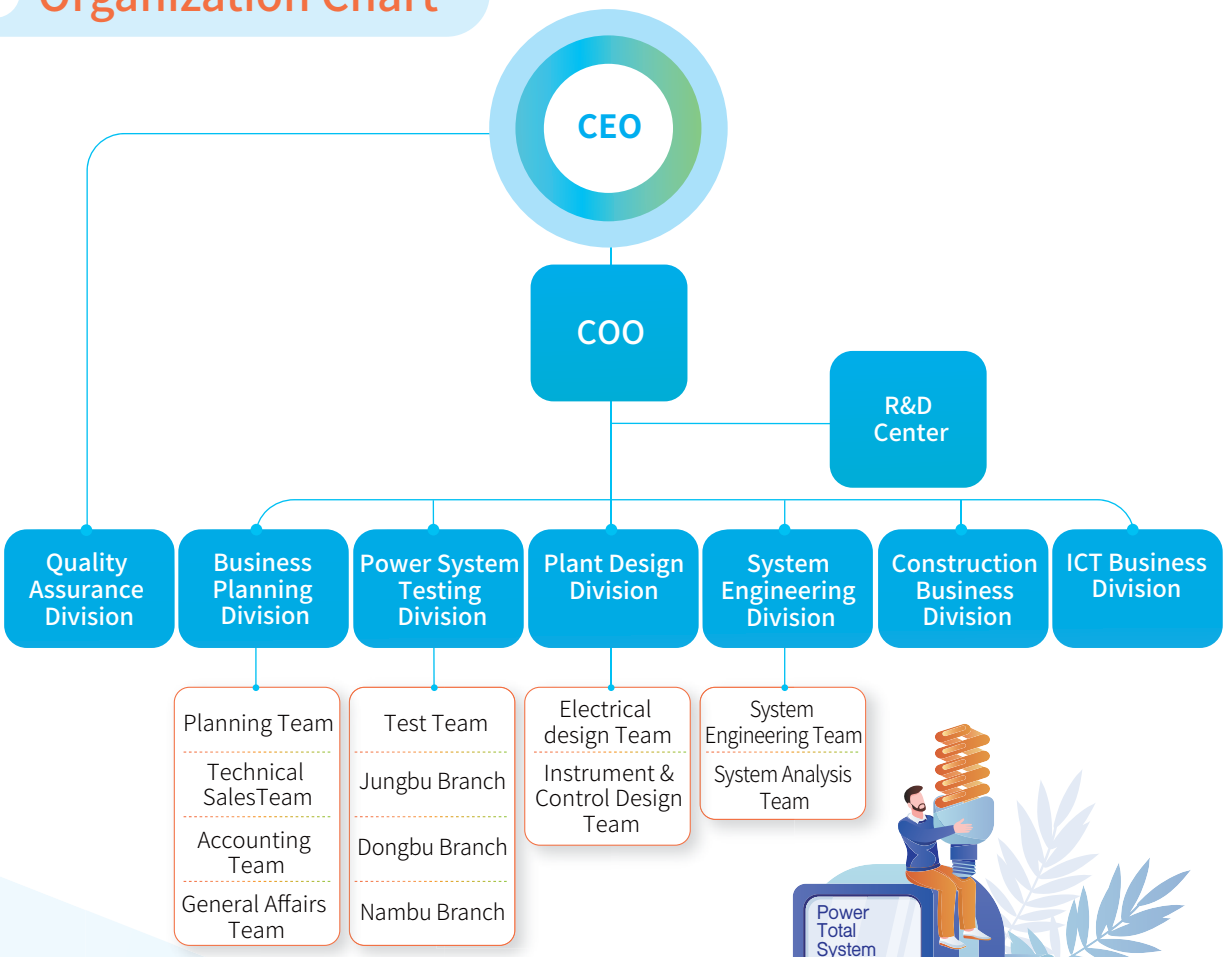
Be positive

- Give a chance to maximize the potential of each other.
- Do not hide or avoid a problem. Take a crisis as another opportunity.
- Do not stop learning. Expand your knowledge required in your job. Try to be the best engineer.

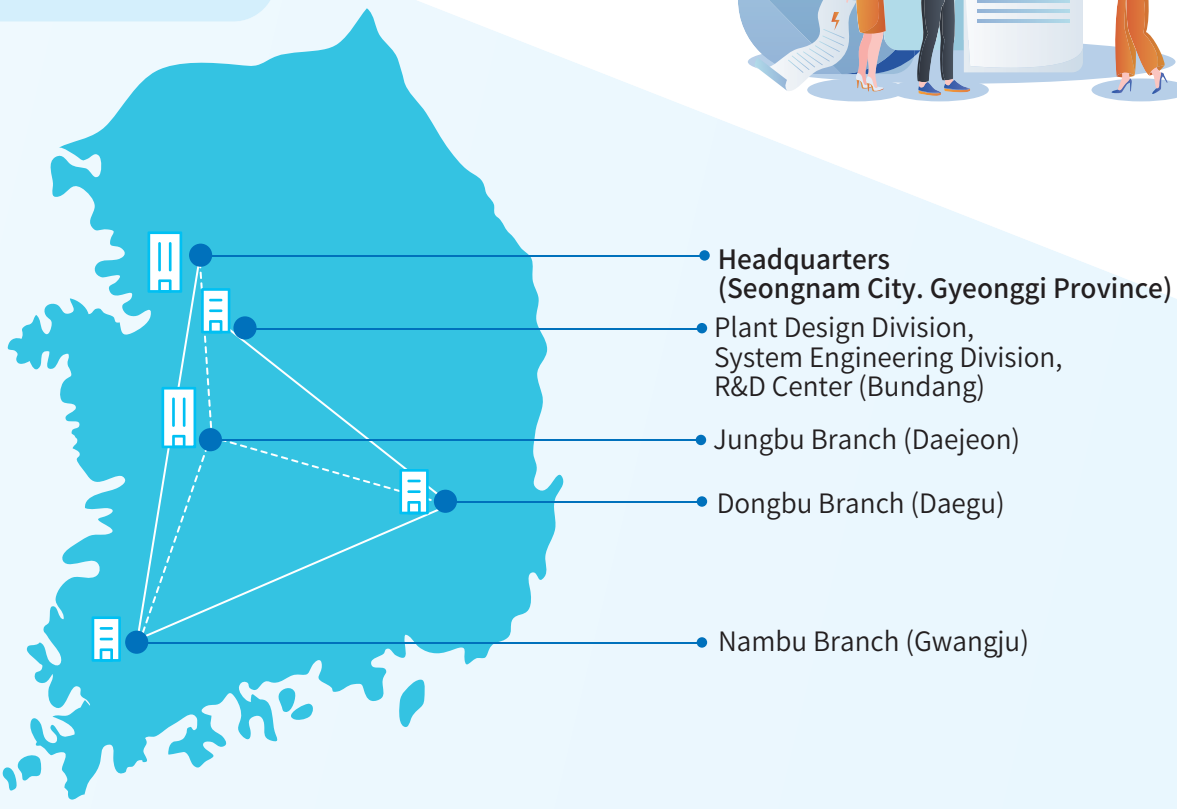
Be aggressive

- Act rather than speak. Actively participate in every task. Enjoy your work.
- Stay cautious. Don't be overconfident in your skills and experience.
- Know your client. Hear their voices and provide differentiated value.

Organization Chart



Office location



History

Be more safety

2001 ~ 2010

2001. 03 Established POWERTOS
2001. 04 Registered Corporation
2001. 05 Registered as Design Business Company
2001. 09 Registered as Engineering Business Company

2002. 04 Registered as Electrical Construction Company

2005. 07 Appointed as Expert of Protective Relay by Korea Hydro & Nuclear Power
2005. 11 Received ISO 9001:2000 Certification

2007. 02 Relocated the Office Building to Seongnam City
2007. 07 Registered the Factory

2008. 02 Received Certificate for Company with Affiliated Research Institute
2008. 03 Certified as Venture Company and INNO-BIZ Company
2008. 04 Joined Korea International Trade Association

2010. 05 Tested Electrical System Protection Equipmen at Korea Hydrot & Nuclear Power (Class Q)
2010. 11 Acquired ISO 14001-2004 Certification

2011 ~ Present

2011. 04 Registered General Design Business (Electrical Field)
2011. 07 Registered as KEPRI Engineering Center Partner
2011. 08 Registered Design Service for Electrical Equipment of Operating Nuclear Power Plant (Class A)
2011. 11 Registered Design Service for Protective Relay of Operating Nuclear Power Plant (Class A)
2011. 11 Registered as KEPCO E&C Partner in the Electrical Design Field

2012. 09 Registered Test Service for Class 1 Protective Relay of Nuclear Power Plant and Pumped -storage Hydroelectric Power Plant (Class A)

2013. 03 Registered as KEPCO E&C Partner in the Relay Control Field

2015. 01 Registered Design Service of Electrical Equipment of Operating Nuclear Power Plant (Class Q)

2016. 05 Certified as Qualified Maintenance Company for Five Korean Power Plants (Class 1 and 2 Protective Relay, CT and PT)

2017. 11 Acquired ISO 9001:2015 and ISO 14001:2015 Certifications

2018. 06 Participated in Work and Learning Dual System Project
2018. 12 Received Certificate of Excellence in Employee Invention Reward
2018. 12 Selected as Family Friendly Company by the Ministry of Gender Equality and Family

2019. 06 Appointed as Industry-University Research Collaboration Company
2019. 06 Appointed as SME with Outstanding Employee Development Program

2020. ~

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2. Business License & Certification

Business License & Certification

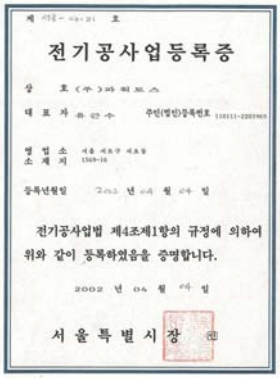
No.	Licenses and Certification	Registration Office	Registration No	Reg. Date
01	Business Registration	Seongnam District Tax Office	214-86-79508	2001-04-20
02	Engineering Business Registration	Korea Engineering & Consulting Association	E-5-107	2001-09-28
03	Electrical Construction Business Registration	Seoul metropolitan government	Seoul-03081	2002-04-04
04	Information and Communication Construction Business Registration	Gyeonggi Province	310351	2007-12-17
05	General Design Business (Electrical Equipment)	Seongnam City	Gyeonggi1-106	2013-01-22
06	Comprehensive Supervision Business (Electrical System)	Seongnam City	Gyeonggi Seongnam-2-14	2010-12-06
07	Software Business Registration	Korea Software Business Association	B10-33113-001	2010-06-10
08	Factory Registration (Distribution Panel and Automatic Control Panel Manufacturing Business)	Seongnam Industrial Complex Corporation Administration Office	28122	2009-10-14
09	Outstanding Company for Creating Employment	Seongnam City	28	2011-04-01
10	ISO 9001:2015	International Technology Standard Inc.	ITS-KQ-01306	2018-11-05
11	ISO 14001:2015	International Technology Standard Inc.	ITS-KE-00739	2018-10-30
12	Nuclear Power Plant Electrical Equipment Protection System Test Service Registration (Q Class)	Korea Hydro & Nuclear Power	Yong-26	2013-05-28
13	Operating Nuclear Power Plant Electrical Equipment Design Service Registration (Q Class)	Korea Hydro & Nuclear Power	Yong-60	2015-01-29
14	Operating Nuclear Power Plant Electrical Equipment Design Service Registration (A Class)	Korea Hydro & Nuclear Power	Yong-09	2014-06-19
15	Operating Nuclear Power Plant Protective Relay Design Service Registration (A Class)	Korea Hydro & Nuclear Power	Yong-07	2014-04-10
16	Nuclear & Hydroelectric Power Plant Class 1 Protective Relay Test Service Registration (A Class)	Korea Hydro & Nuclear Power	Yong-25	2012-09-06
17	Partnership Registration (Nuclear Power Plant Electrical Design Field)	KEPCO Engineering & Construction Company Inc	-	2011-11-03
18	Company-affiliated Research Institute Registration	Korea Industrial Technology Association	20081277	2008-01-28
19	Excellence in in-house Technical Training in SME	Korea Institute of Industrial Technology	2011-3790	2011-04-12
20	Qualified Maintenance Company for Five Korean Power Plants	Korea Southern Power, Korea East-west Power, Korea South-east Power, Korea Midland Power, and Korea Western Power	WITHU20160502099	2016-05-12
21	Certification of Excellence in Employee Invention Reward	Korean Intellectual Property Office	2018-00146	2018-12-04
22	Family Friendly Certification	Ministry of Gender Equality and Family	2018-0540	2018-12-01

Certificate of Registration

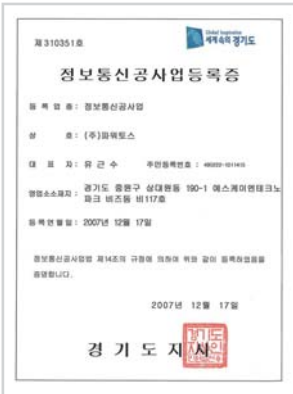
Certificate of Business Registration

Certificate of Company-affiliated Research Institute

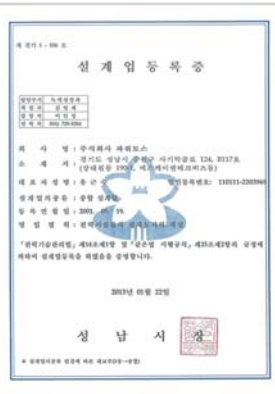
Certificate of Engineering Business Registration



Certificate of Electrical Construction Business



Certificate of Information and Communication Construction Business



Certificate of Design Business Registration

ISO 9001:2015

Certificate of Supplier with Korea Hydro & Nuclear Power

Certificate of Supplier with Korea Hydro & Nuclear Power

Certificate of Supplier with Korea Hydro & Nuclear Power

Certificate of Supplier with Korea Hydro & Nuclear Power

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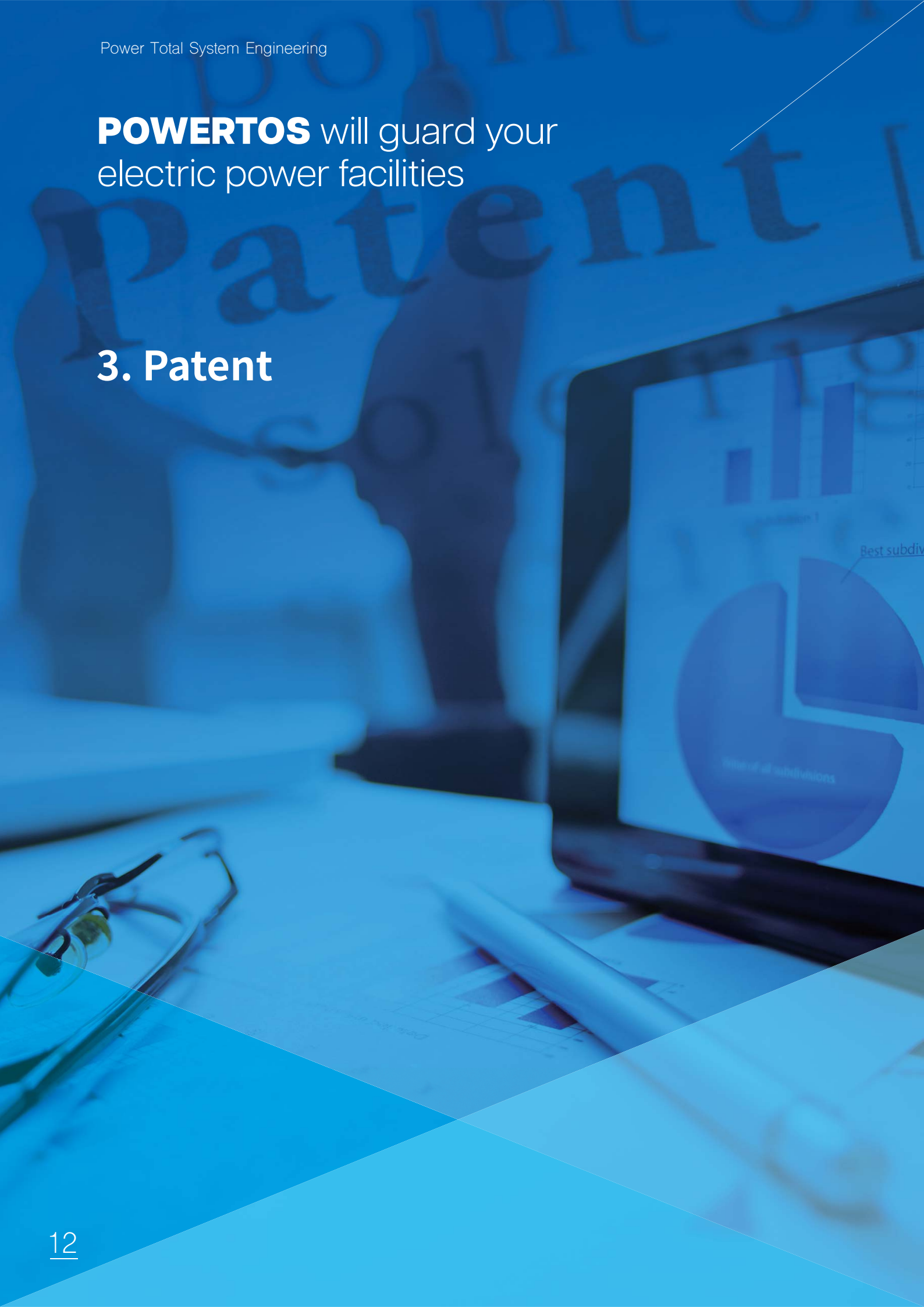
3. Patent



Patent

No.	Title of Patent	Registration Office	Registration No.	Reg. Date
01	Protective system to monitor and control protection panel	Korean Intellectual Property Office	10-0990736	2010.10.22
02	Grounding structure of gas-insulated bus	Korean Intellectual Property Office	10-1131992	2012.03.23
03	Peak electricity demand management device and its control method where power switch to generator is applicable during the peak time	Korean Intellectual Property Office	10-1157651	2012.06.12
04	Measurement method of discharge in high voltage cable of nuclear power plant, using discharge diagnosis device of extremely low frequency pressure device and high frequency current transformer	Korean Intellectual Property Office	10-1165298	2012.07.06
05	Selective over-current disconnecting system for pulse high power-receiving equipment	Korean Intellectual Property Office	10-1331398	2013.11.11
06	Substation automation system including fault location indication in distribution lines	Korean Intellectual Property Office	10-1720131	2017.03.21
07	Anomaly detector of trip circuit in circuit breaker	Korean Intellectual Property Office	10-1730397	2017.04.20
08	Fault location analysis system of electrical equipment	Korean Intellectual Property Office	10-2005231	2019.07.24
09	Power line equipment including its enclosure box and installation device	Korean Intellectual Property Office	10-2086653	2020.03.03









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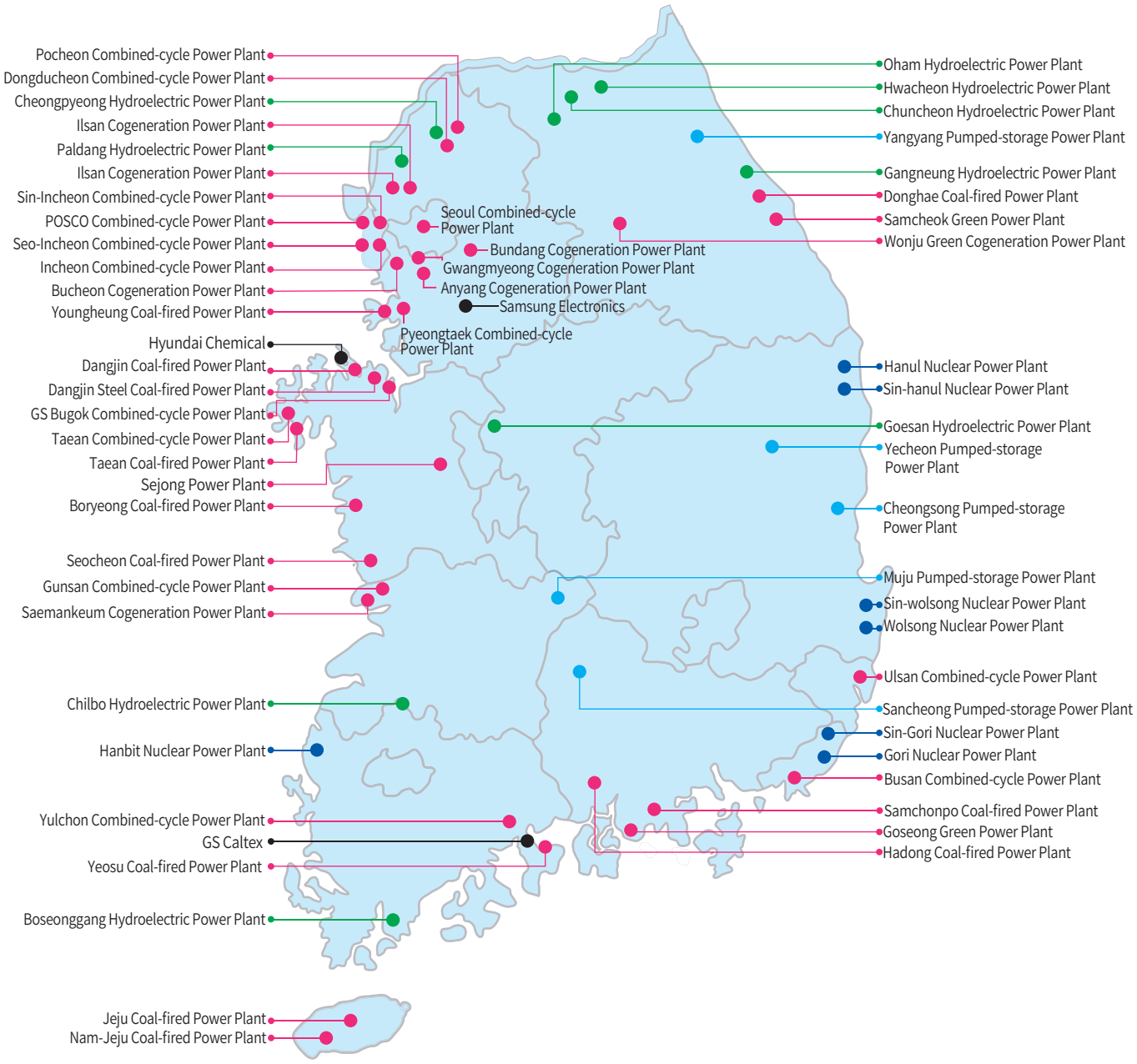
4. Electric Power Equipment Protection System Reliability Test

Project Site Mapping

POWERTOS strives to secure the stability of equipment and prevent failure by technical review and support with its excellent technology and rich experience across the country. Also, we plan to proceed with a strategic technical partnership for power facilities of our clients.

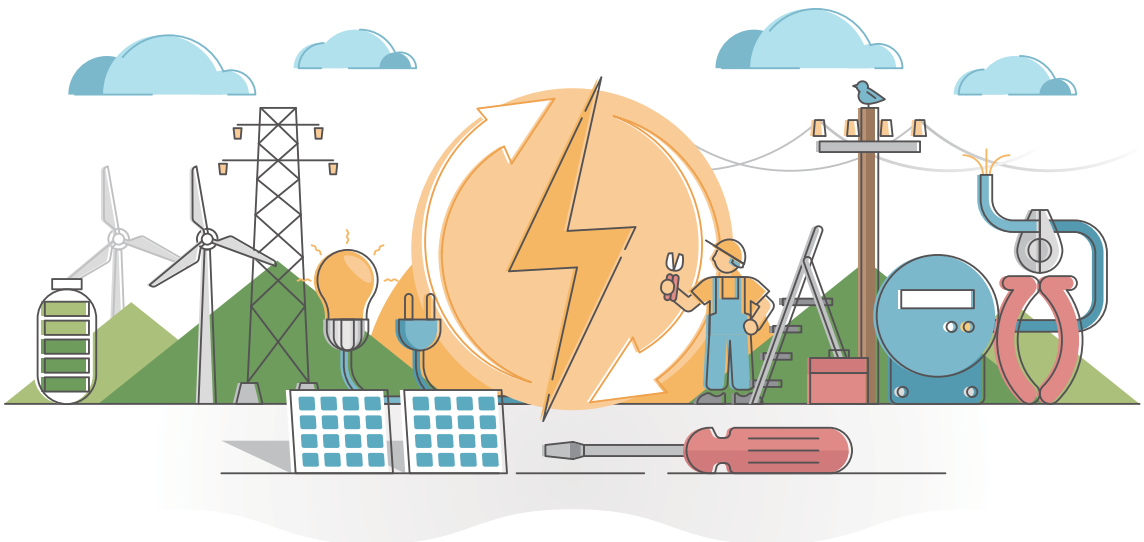


1 Field of Business

For the stability of electric power equipment, POWERTOS tests closely and analyzes equipment using the state-of-the-art automatic modular computerized test method for protective relay system.

Reliability Test for Electrical Equipment Protection System

Pre-Commissioning Test	Pre-commissioning test of protection system during its construction
Periodic Test	Diagnosis test for the stability of electrical equipment during its operation
Temporary Test	Test for protective relay readjustment or to identify the cause of its malfunction



CT & PT Test

CT& PT Commissioning Test(330kV SWYD)

CT& PT Test Equipment (CPC-100)

(7.2KV SWGR)

CT Analyzer OMICRON [VEG0650]

Test Item

1. Polarity Check
2. Ratio Test
3. Burden Test
4. Excitation Test
5. Winding Resistance Test
6. Insulation Test

Circuit Breaker Test

C.B Commissioning Test (330kV SWYD)

Advanced Circuit Breaker Test & Analyzer KOCOS [ACTAS P260]

(154KV GIS)

Test Item

1. Measurement of the Resistance of Contact
2. CB Closing Time and Tripping Time Test
3. Spring Charging time and Motor Current Check
4. Funcional Trip Test

Earthing Resistance Measurement

Earthing Resistance Test (330kV SWYD)

Digital Earth Resistor Tester CHAUVIN ARNOUX [TERCA-2]

Test Item

1. Measurement of the Resistance of earthing System

Power Transformer Test

Power Transformer

Power Quality Analyzer FLUKE [435]

DC Hi Pot Tester DADA ELECTRIC [DAHP-6020]

High Voltage Insulation Tester KYORITSU [3123]

Test Item

A. Insulation Resistance Measurement

B. No-load Characteristics Test

1. No-load Current
2. No-load Loss

C. Three-phase Short-circuit Test

1. Impedance Volt
2. % Impedance
3. Copper Loss
4. Voltage Regulation
5. Efficiency - Conventional Efficiency, Total Loss

D. Phase Rotation and Loop Test

1. Phase Rotation
2. Phase Difference
3. Voltage Difference

E. Voltage Ratio Measurement

F. Polarity Test or Displacement Test

G. Charging Test

Transducer Cal. Test

TD Panel(Station)

Handy Calibrator [TD]
YOKOGAWA [CA11E]

Secondary Injection Tester Sets
OMICRON [CMC 256][CMC 356]

Test Item

1. Control Power Measurement Test
2. Zero Adjustment Test
3. Span Adjustment Test
4. Error Test according to Power

Protective Relay Test

Old Version

(ABB Analog)

(Beckwith Digital)

New Version

Secondary Injection Tester Sets
OMICRON [CMC 256] [CMC 356]

LCR Hi TESTER
HIOKI [3511-50]

Optical Power Meter
[OPM-VFL]

Digital Multimeter
FLUKE [45]

Test Item 1. Generator Protection Panel 2. Transformer Protection Panel
3. Transmission Line Protection Panel 4. Bus Protection Panel 5. Other Protection Panels

DC Sequence Test

TRUE TMS Multi meter
FLUKE [179]

Insulation Tester
HIOKI [IR4052]

Digital Hi Tester
HIOKI [DT 4255]

- Test to check the sequence of the DC circuit in signal-blocking device and alarm circuit of protective relay

AC Sequence Test

Power System Multi meter/
Angle Meter ARBITER [928A]

Clamp On Hi Tester
HIOKI [3280-10]

Clamp Leaker
MULTI [140]

- Test to check the sequence of AC circuit according to the phase, polarity, and characteristics of CT and PT in protective relay

2 Test Equipment

No.	Name of Equipment	Rating	Quantity	Production Company
01	Secondary Injection Tester Sets Model = CMC 256-6	**Output** = 1φ37.5A,3φ25A, 6φ12.5A = 3φ300V, 1φ600V **Power** = 110~240Vac, 50/60Hz, 70VA	3	OMICRON
	Secondary Injection Tester Sets Model = CMC 356	**Output** = 1φ128A, 3φ64A, 6φ32A = 3φ300V, 1φ600V **Power** = 110~240Vac, 50/60Hz, 140VA	9	OMICRON
02	Multifunctional Primary Test Sys. Model = CPC 100	**Output** = AC 800A, AC 6A/130V, DC 6A = AC 2,000V, AC 130V **Power** = 100-240Vac, 50/60Hz, 3500VA	6	OMICRON
03	Current Transformer Test Sets CT Analyzer Model = VEG0650	**CT Ratio** = 0.2~10,000 **Accuracy** = 0.05%	2	OMICRON
04	Power System Multimeter/ Angle Meter Model = 928A	**Input** = AC 0V~400Vrms = AC 0.01A~1A, 100A(Clamp) **Power** = AC 220V	8	ARBITER
05	Power Quality Analyzer Model = 435	**Range** = AC/DC 1~600 Vrms, 0.1% = 0~20 kArms, 0.5% = 51.0~69.0Hz, 0.01Hz = 1~20MW, 0.03%	1	FLUKE
06	Digital Multimeter Model = 45	**Range** = AC/DC 1000V, 10A = AC 750V, 10A, 40MΩ	2	FLUKE
07	LCR Hi Tester Model = 3511-50	**Range** = 10~100Ω = 1nF~1μF = 1mH~1H	1	HIOKI
08	Handy Calibrator [Transducer] Model = CA11E	**Range** = 4~20mA, 4V(20mA), 20mA SINK	3	YOKOGAWA
09	Optical Power Meter Model = OPM-VF L	**Power Range** = 850~1300nm, 5~-50dBm = 1310~1550nm, 5~-60dBM **Accuracy** = 0.01%	3	FIBERPIA
10	Digital Earth Tester Model = TERCA2	**Range** = 1mΩ~10Ω, ±3mΩ, ±2% **Power** = 12V/1A	1	CHAUVIN ARNOUX
11	Circuit Breaker Test & Analysing Model = P260	**Rated voltage** = 110/265 V AC/DC Main & Aux Contact, Motor	1	KOCOS
12	High Voltage Insulation Tester Model = 3123	**Range** = DC 0~10,000[V] = 0~10GΩ/4~400GΩ	1	KYORITSU
13	DC HI POT TESTER Model = DAHP-60	**Power** = 1∅ AC220V, 10A, 50Hz/60Hz **Output** = DC 60kV, 20mA	1	DADA ELECTRIC
14	Clamp On Hi Tester Model = 3280-10	**Range** = AC 4.2~600V, DC 0.42~600V = AC 42A~1000A = 420Ω~42MΩ	11	HIOKI
15	Clamp Leaker Model = 140	**Range** = AC 30~300mA ±1.2% = AC 0~200A ±1.2% = AC 200~300A -5.0%	6	HIOKI
16	Digital Hi Tester Model = DT4255	**Range** = AC~1000V ±0.3% = DC~1000V ±0.9% = 600Ω~60MΩ	2	HIOKI
17	True RMS Multimeter Model = 179	**Range** = AC 0.6~600V ±1.0%, 0.6~600A ±1.0% = DC 6~600V ±0.09%, 0.06~10A ±1.5% = 600Ω~6MΩ ±0.9%	10	FLUKE
18	Insulation Tester Model = IR4051-10	**Range** = DC 50/125/250/500/1000V = 0.2~1000MΩ ±4% = 10.1~4000MΩ ±8%	12	FLUKE

Test Equipment Photo


CMC-256-6 / 356


CPC 100


CT Analyzer


Angle Meter


Power Quality Analyzer


Digital Multimeter


LCR Hi Tester


Handy Calibrator


Optical Power Meter


Digital Earth Tester


Circuit Breaker Test & Analyzing


HV Insulation Tester


DC Hi Pot Tester


Clamp On Hi Tester


Clamp Leaker


Digital Hi Tester


True RMS Multimer


Insulation Tester

3 Performance

Reliability Test for Protection System of Electrical Equipment

[**Metropolitan Area Gas Power Plant**] Electric Power Equipment Construction Test on Completion	'03.01 ~ '03.02	Sangwon E&C
[**POSCO Gwangyang Steel Mill**] 154kV T/L and Transformer Protective Relay Test	'04.04 ~ '06.03	POSCO Steel
[**Gwangyang Combined-cycle Power Plant**] 345kV S/S and Power Plant Test on Completion	'05.01 ~ '05.03	K Power
[**LG Philips Paju Plant**] 154kV T/L Test on Completion	'05.02 ~ '05.03	LG Phillips
[**Samsung Electronics**] H1 154kV Parallel Operation Design Review and Test	'06.06 ~ '06.08	Samsung Electronics
[**Samsung Electronics**] 154kV Electric Power Equipment Design Supervision, Technical Review and Protective System Test	'07.08 ~ '07.09	Samsung Electronics
[**Asan Baebang Substation for Concentrated Energy Supply Facilities**] Electrical Equipment Test on Completion	'08.07 ~ '08.08	SM Keangnam
[**Pangyo Cogeneration Power Plant**] Electrical Equipment Test on Completion	'09.03 ~ '09.06	Korea District Heating Corp
[**Uldolmok Tidal Power Plant**] Protective Relay Test on Completion	'09.02 ~ '09.03	Korea Institute of Ocean Science and Technology
[**Hyundai Green Power Dangjin Steel Coal-fired Power Plant # 1 - 4**] Electrical Equipment Test on Completion	'09.02 ~ '10.12	Daelim Construction
[**Boryeong #1 Small Hydro Power Plant**] Protective Relay Test on Completion	'09.08 ~ '09.09	Doosan Heavy Industry
[**HOU #3**] 154kV Electric Power System Analysis, Potective Relay Setting and Test on Completion	'09.03 ~ '10.12	GS E & C
[**Samsung Corning GIS**] Protective Relaying Device Test on Completion	'10.10 ~ '10.11	Samsung Engineering
[**Goyang Samsong Group Energy Facilities Construction**] Power Plant Protective System Test on Completion	'11.04 ~ '11.11	Hyundai Development Company
[**Samsung C&T**] H2, H2-1 Electric Power Equipment Protection System Test on Completion	'11.03 ~ '11.09	Samsung C&T
[**Oseong Combined-cycle Power Plant**] Electric Power Equipment Test on Completion	'11.08 ~ '11.09	ABB
[**S-Oil**] New SEP Project Test on Completion	'11.05 ~ '11.10	Samsung Engineering
[**Samsung C&T H2-1 Expansion**] Electric Power Equipment Protective System Test on Completion	'12.01 ~ '12.06	Samsung C&T
[**Hyundai Green Power #3 and 4**] Electric Power System Protective Relay Test on Completion	'12.04 ~ '12.10	Hyundai Green Power
[**Samsung SDI 154kV GIS**] Circuit Breaker Protective Relaying Device Test on Completion	'12.11 ~ '13.01	Samsung Engineering

3 Performance

Reliability Test for Protection System of Electrical Equipment

[**Pocheon CCPP**] Electric Power Equipment Test on Completion	'12.12 ~ '14.06	Daelim Construction
[**Hyundai Oil Bank HDOLBO Receiving and Distribution Equipment**] Test on Completion	'13.08 ~ '14.06	Hyundai Engineering
[**Dongducheon Dream Power**] – 345kV Electric Power Equipment Test on Completion	'13.11 ~ '14.12	Samsung C&T
[**Samsung Electronics**] Hwaseong S3 345kV Electric Power Equipment Test on Completion	'14.01 ~ '14.06	Samsung C&T
[**Dangjin Biomass Power Plant**] 154kV Electric Power Equipment Test on Completion	'14.10 ~ '15.05	GS O&M
[**Saemankeum SE Cogeneration Power Plant**] 154kV Receiving Equipment Test on Completion	'15.01 ~ '15.07	Doosan Heavy Industry
[**6 Development Electronics Company**] Test on Completion for Electric Power Equipment at Power Plant	'15.03 ~ '17.04	KEPCO (KEPRI)
[**Myeongpyum Osan Cogeneration Power Plant**] 154kV Electric Power Equipment Test on Completion	'15.07 ~ '16.04	Korea Power Engineering Service
[**Samsung Electronics Hwaseong Campus**] 345kV S3 Ph2 H3 S/S Electric Power Equipment Test on Completion	'15.07 ~ '15.10	Samsung C&T
[**Daewoo Pocheon Natural Gas Power Plant**] Test on Completion for Unit 1 345kV Electric Power Equipment	'15.11 ~ '17.02	Daewoo Construction
[**Samsung Electronics**] Godeok P1-Project Electric Power Equipment Test on Completion	'16.06 ~ '17.12	Semeng Engineering
[**POSCO Construction**] Chuncheon Concentrated Energy Supply Business Electric Power Equipment Test on Completion	'16.07 ~ '17.12	POSCO Construction
[**Ulsan S-Oil**] S Oil RUC Project Test on Completion	'17.04 ~ '17.09	Daewoo Construction
[**Samsung Electronics**] Hwaseong E-Project Electric Power Equipment Test on Completion	'18.10 ~ '19.06	Hyosung Heavy Industries
[**Korea South-East Power**] Class 1 Protective Relay Periodic Test and Test on Completion	'19.11 ~ '21.11	Korea South-East Power
[**Hanul Nuclear Power Plant**] 345kV Hanul Headquarters Class 1 and 2 Protective Relay Periodic Test	'20.06 ~ '22.06	Korea Hydro & Nuclear Power
[**Wolsong Nuclear Power Plant**] 345kV Wolsong Headquarters Class 1 and 2 Protective Relay Periodic Test	'20.09 ~ '22.09	Korea Hydro & Nuclear Power
[**Hanbit Nuclear Power Plant**] 345kV Hanbit Headquarters Class 1 and 2 Protective Relay Periodic Test	'20.12 ~ '22.12	Korea Hydro & Nuclear Power
[**Gori Nuclear Power Plant**] 345kV Gori Headquarters Class 1 and 2 Protective Relay Periodic Test	'19.08 ~ '21.08	Korea Hydro & Nuclear Power
[**Pumped-storage Hydro-electric Power Plant**] KHNP Hangang Headquarters Class 1 Protective Relay Periodic Test	'19.09 ~ '21.09	Korea Hydro & Nuclear Power
[**Korea East-West Power**] Class 1 Protective Relay Periodic Test	'20.06 ~ '22.06	Korea East-West Power
[**Korea Western Power**] Class 1 Protective Relay Periodic Test	'19.08 ~ '22.12	Korea Western Power
[**Korea Midland Power**] Class 1 Protective Relay Periodic Test	'20.06 ~ '22.06	Korea Midland Power

POWERTOS will guard your electric power facilities

5. Electric Power System Analysis and Protection Coordination Design

1 Field of Business

System Analysis and Technical Review

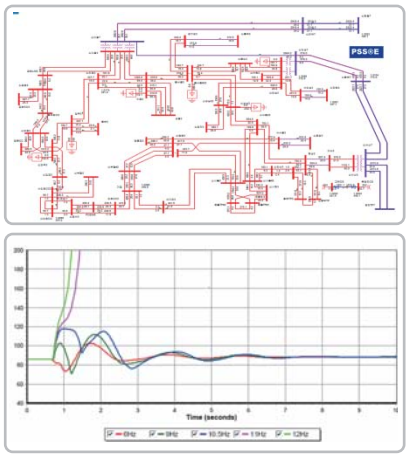
System analysis and technical review are done by analyzing the static and dynamic characteristics of power equipment and the system with an engineering software tool. Through this procedure, we can construct the best electric power system and find its most proper management method, securing the reliability and stability of the electrical equipment.

Field of Study

Field of Analysis	Description	Usage
Short Circuit Studies	Calculate voltage and current in the case of short circuit or earth fault occurrence in the electric power system	• Review the construction of electric power system • Decide circuit breaker's interrupting capacity as well as system rating and its mechanical strength • Review grounding method • Set protection system • Establish countermeasures against fault current
Load Flow Studies	Calculate active power, reactive power, voltage, and current of electric power system	• Construct electric power system and simulate with an operation model • Basic material for voltage adjustment • Conduct overload investigation and establish countermeasures • Decide the location of condenser for power and its capacity • Decide the capacity of electric power equipment
Transient Stability Analysis	Analyze load follow and frequency characteristics to determine the stability of the system in the case of change in load of electric power system, generator rejection, or accident (voltage and frequency of each bus, speed of generator and its angle difference, and exciter dynamic characteristics)	• Construct electric power system and simulate with an operation model • Establish an equipment operation method • Establish measures to stabilize electric power system • Setting protection system • Establish load-blocking method
Motor Starting Studies	Calculate voltage, current, speed, power factor, and torque, when a motor starts	• Analyze the problem of a motor when it operates • Establish a motor maneuver method • Select an economical transformer
Arc Flash Hazard Studies	Evaluate the hazard of arc flash caused by the short circuit in the electrical system and establish proper protection standards	• Check the specification of electrical equipment and fault clearing time in terms of arc flash hazard • Determine the class of PPE based on the result of the study
Harmonics Studies	Calculate the voltage and current of harmonics in the electrical system and chance of resonance	• Analyze the impact of harmonics • Establish the electrical system configuration method to reduce harmonics • Analyze the cause when the condenser bank fails
Transient Overvoltage Analysis	Analyze the abnormal voltage such as transient recovery voltage, switching surge, lightning surge	• Determine the proper specification of circuit breaker and arrester • Review insulation coordination • Analyze the Ferranti effect and ferro resonance
Grounding Calculation	Calculate grounding resistance, tough voltage, and step voltage which are required to design grounding network	• Design grounding network

Grid Connection and Operation Optimization Review

- Establish optimal electrical system configuration method
- Analyze power generation availability and transmission loss factor
- Review solutions to existing power generation constraints and optimal distribution method
- Establish a plan for power generation equipment efficiency enhancement and its stable operation
- Establish the most effective equipment investment method
- Establish a method to improve the electric power quality such as power system voltage or frequency

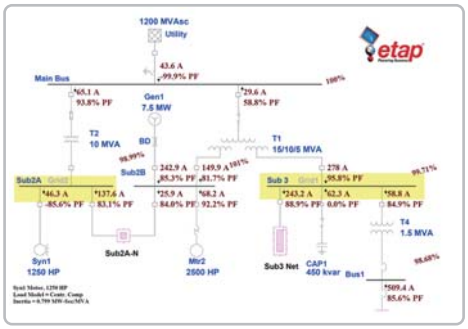


Protective System Application and Setting Review

When a fault occurs in the electric power system or equipment, the protective system detects it, sends out alarm or opens circuit breaker thus, isolating the fault section. This prevents the expansion of breakdown and protect the power equipment as well as the people in the area. What we do is to review the best protective system application and optimal setting to ensure the reliability of power system.

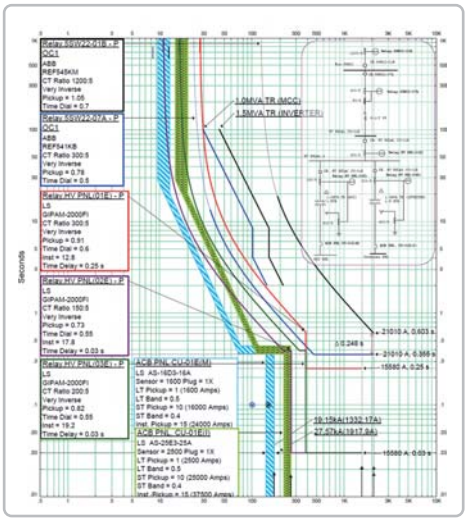
Protection System Application Review

- Extra high-voltage, high-voltage transmission line and distribution line protection methods
- Generator, transformer, bus, phase-modifying equipment, and motor protection methods
- Power plant and plant system protection methods etc.



Electrical Equipment Protection System Setting

- Extra high-voltage, high-voltage transmission line and distribution line protection methods
- Generator, transformer, bus, phase-modifying equipment, and motor protection methods
- Power plant and plant system protection methods etc.



Current Transformer and Voltage Transformer Calculation

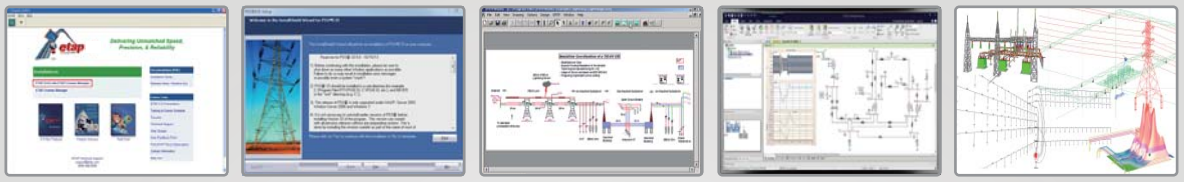
- Determination of proper CT specification and current transformer ratio for protection system and equipment
- Determination of proper VT specification and transformer ratio for protection system and equipment

Review for Electrical Equipment Failure and Countermeasures

- Analysis of power generation, transmission and distribution line equipment or plant failure
- Identification of the cause of protection system malfunction
- Review for countermeasures against failure

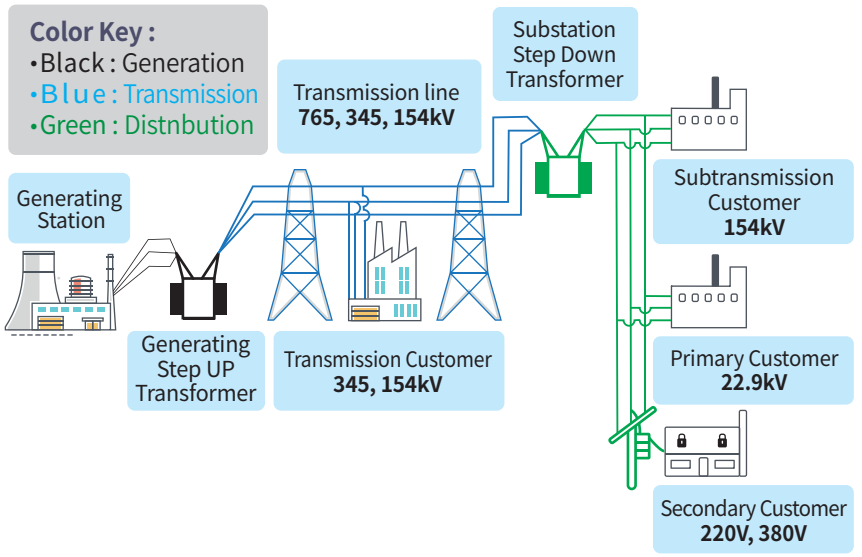
2 Electric Power System Design Software

No.	Name of Software	Version	Set	Production Company
1	ETAP	Latest Version (V20) (1,000Bus)	2	OTI
2	PSS/E	Latest Version (V33)	1	SIEMENS PTI
3	EMTP	Latest Version (31. October 1999)	1	ATP
4	PSCAD	Latest Version	1	MHI
5	CDEGS	Latest Version	1	SES



ETAP PSS/E EMTP PSCAD CDEGS

- Network Analysis
- Panel Systems
- Protective Device
- Ground Grid System
- Motor Starting
- Cable System
- Transformer



POWERTOS will guard your electric power facilities

3 Performance

Technical Calculation and Analysis for Electrical System

Project	Period	Client
[**Seo-Incheon Power Generation**] General Review of Electrical Equipment Protection System	'08.04 ~ '08.10	Korea Western Power
[**Ansan Combined-cycle Power Plant**] Unit 1 and 2 Construction Preliminary Feasibility Study	'08.07 ~ '08.12	POSCO Construction
[**HOU**]154kV #3 PJ Electrical System Analysis, Protective Relay Setting and Field Test	'09.03 ~ '10.02	GS E&C
[**Ansan Combined-cycle Power Plant**] Power Generation Business Construction Feasibility Study (Transmission Condition Review)	'09.05 ~ '09.07	POSCO Construction
[**Korea Silicon**] PS-2PJ Power Stability Analysis	'11.06 ~ '12.05	Korea Silicon
[**Samchonpo T/P**] Reliability Analysis of Electrical System in Unit 1 and 2	'11.05 ~ '12.01	Korea South-East Power
[**Uljin Nuclear Power Plant**] Review for Electrical System Protection Coordination Improvement in Unit 1 and 2	'11.06 ~ '11.07	Korea Hydro & Nuclear Power
[**Taean T/P**] Technical Review for Electrical Equipment Protection System in Plant 1 and 2	'11.09 ~ '13.03	Korea Western Power
[**Samcheok Coal-fired Power Plant**] Grid Connection Method Establishment	'11.11 ~ '12.12	POSCO Energy
[**KOTC UM AL ALSH LPG New Filling Plant PJ**] Electrical System Diagnosis	'12.01 ~ '12.03	Daeshin Engineering
[**Gori Nuclear Power Plant**] Nuclear Power Plant Electrical System Analysis in Unit 3 and 4	'12 03 ~ '12.12	Korea Hydro & Nuclear Power
[**Samsung Total**] G2 PJT Electrical Design Consulting (Supervision)	'12.11 ~ '13.06	Hanshin Engineering
[**Korea South-East Power**] On-site Power System Reliability Analysis Consulting	'13.03 ~ '14.03	Korea South-East Power
[**KHNP**] Power System Analysis and Protective Relay Trade-off Study	'13.04 ~ '13.06	Korea Hydro & Nuclear Power
[**Coal-fired Power Plant**] Fly Ash Resource Recovery Facilities Protection System Technical Review Test on Completion	'14.02 ~ '14.05	O-Sung Electric Machinery
[**Yeoju Combined-cycle**] Yeoju Combined-cycle Power Plant Grid Connection Method Review	'14.05 ~ '14.11	SK E&S

3 Performance

Technical Calculation and Analysis for Electrical System

Project	Period	Client
[**Korea South-East Power**] Power System Reliability Analysis	'14.10 ~ '16.10	Korea South -East Power
[**Hanbit Nuclear Power Plant**] Stability Analysis for the Operation of Bus in Plant 2 and 3 and Withdrawal Change	'15.07 ~ '15.10	Korea Hydro & Nuclear Power
[**Hanul Nuclear Power**] Hanul Headquarters Off-site Electrical System Stability Test	'15.11 ~ '16.02	Korea Hydro & Nuclear Power
[**Yeosu Green Energy**] Analysis of the Impact on the Power System by Connecting to Transmission Line	'15.12 ~ '16.03	YS Green
[**Dangjin Biomass**] Analysis of the Impact on the Power System and the Grid Connection Method Establishment for GS EPS Biomass Power Generation Equipment Expansion	'16.06 ~ '16.09	GS EPS
[**Dangjin Combined-cycle**] GSEPS Unit 4 Equipment Improvement regarding the Change in Transmission Connection	'16.12 ~ '17.03	GS EPS
[**Gori Nuclear Power Plant**] Analysis of the Impact on the Power System regarding the Connection to Combined-Cycle Power Plant (Nuclear Power and Renewable Energy)	'17.04 ~ '17.09	Korea Hydro & Nuclear Power
[**Korea South-East Power**] On-site Power Protection SystemReview regarding the Replacement of Samchonpo 345kV Switchyard	'17.04 ~ '21.12	Korea South -East Power
[**GS E&R**] Analysis of the Impact on the Power System regarding Sihwa LNG Combined-cycle Power Plant Construction	'18.03 ~ '18.05	GS E&R
[**Seo-Incheon Power Plant**] Incheon Electrical System Analysis	'18.04 ~ '18.06	Korea Western Power
[**GS E&R**] Counselling regarding SH LNG Combined-cycle Power Plant Construction	'19.03 ~ '19.05	GS E&R
[**Korea South-East Power**] Gwangyang CC - Sin-Yeosu 345kV Transmission of Line Construction Electrical System Reliability Analysis	'19.05 ~ '19.08	Korea South -East Power
[**KHNP**] Analysis of Electrical System Characteristics according to Region considering Renewable Energy Operation	'20.02 ~ '20.06	ESP
[**Cheongsong Myeongbongsan Wind Power**] 345kV Switching Station Electrical System Analysis and Protective Relay Setting	'20.07 ~ '21.07	Dream Engineering
[**Wolsong Nuclear Power Plant**] **Plant 1 and 2 Off-site Power System Stability Analysis**	'20.09 ~ '20.12	Korea Hydro & Nuclear Power
[GS EPS] 54kV Bus Protection Panel Change and its Operation Review regarding HVDC Operation	'20.09 ~ '20.10	GS EPS

POWERTOS will guard your electric power facilities

6. Plant Design

1 Field of Business

POWERTOS has carried out technology-intensive works such as design engineering and comprehensive supervision of power plants, substations, and energy-related facilities in Korea. We have dedicated our effort into research and development for operation automation and design quality improvement based on our experience with tests and review service.

Moreover, we have tried to enhance the stability and economic efficiency of power equipment with a proper design change, technical review, and technical support at the right time and focused on the best quality design performance result by implementing appropriate quality assurance plans based on the quality class.

Scope of Work

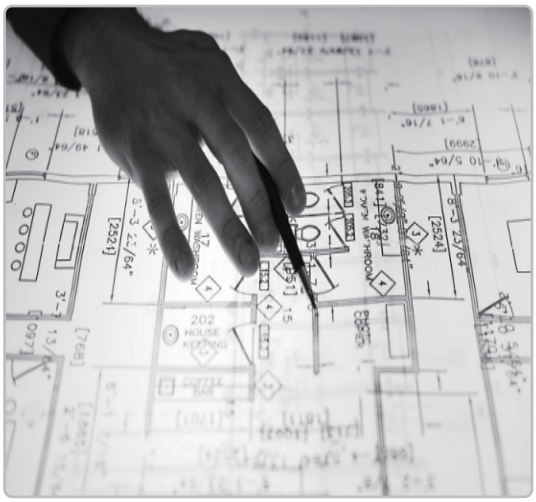
- Preliminary Business Plan and Feasibility Review
- Detailed Engineering and Design
- Engineering Consulting
- Power Plant and Substation Test and Pre-commissioning test
- Facility Diagnosis and Improvement
- Supervision Business

Field of Work

- Nuclear Power Plant
- Hydroelectric/coal-fired Power plant
- Plant Electrical Facilities
- Renewable Energy Electrical Facilities
- Cogeneration/district Heating Power Generation
- Transmission and Substation Facilities
- Environment Facilities

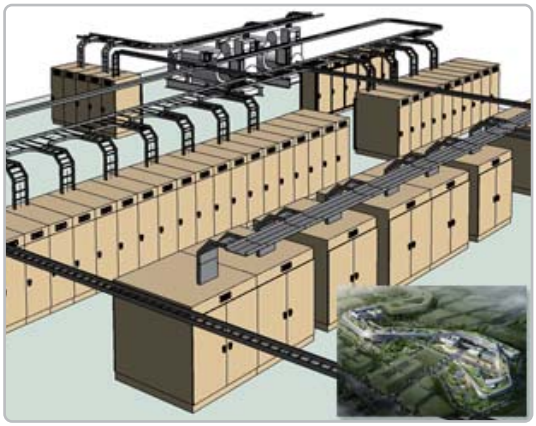
2 Electrical Equipment & Instrumentation Engineering

Electrical Equipment Field



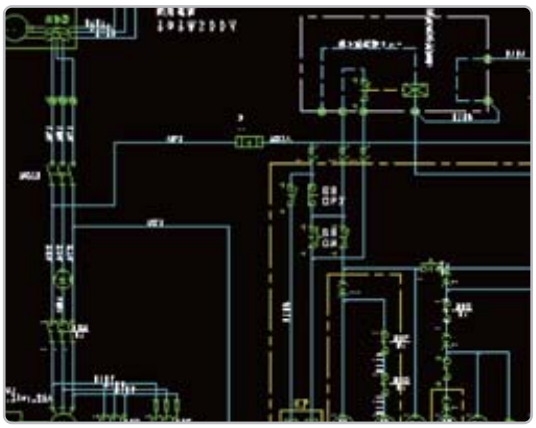
- Single Line Diagram
- Control Logic Diagram
- Schematic & Block Diagram
- Elementary Wiring Diagram
- Connection Diagram
- Grounding & Lightning System
- Lightning System
- Communication System
- Security System
- Elec. Heat Tracing System
- Cathodic Protection System
- Raceway & Conduit Plan

Instrumentation Field



- Control & Instrument Diagram
- Loop/Process Control Block Diagram
- Control Logic/Functional Diagram
- Loop Wiring Diagram
- Level Setting Diagram
- Instrument Location Drawing
- Instrument Air Distribution Drawing
- Level Instrument Bridle Drawing
- Main Control Complex Equipment Arrangement
- Main Control Panel Layout Drawing
- Functional Interconnection Diagram

Common Field



- Construction Design Document
- Purchase Specification
- Various Specifications and Technical Calculations
- On-site Pre-commissioning and Construction Supervision
- Various Permit Document Preparation
- Obsolete Equipment Diagnosis Technique Counselling
- Power Generation Facilities Parallel Connection Feasibility Review

3 Performance

Design Engineering

Project	Period	Client
[KEPCO 345kV Substation] Seongdong S/S-Migeum S/S Construction - Control Design	'01.06 ~ '02.05	KEPCO
[3.38 MW Power Generation Equipment Expansion] Electrical Design	'02.09 ~ '02.09	Sangwon E&C
[KEPCO 345kV Substation] Yangju S/S Main Transformer 4 Expansion Construction	'02.10 ~ '03.09	KEPCO
[Gori Nuclear Power Headquarters 345kV Nuclear Power Plant 1] Circuit Breaker Replacement Design	'03.06 ~ '03.10	Korea Hydro & Nuclear Power
[KEPCO 345kV Substation] Uijeongbu S/S GIS Replacement and 23kV GIS Design	'03.07 ~ '03.10	KEPCO
[LCD Paju P8] Electrical Construction Design and Production	'08.07 ~ '08.08	Youngin Engineering
[Ansan Combined-cycle Power Plant Unit 1 and 2] Preliminary Feasibility Study	'08.07 ~ '08.12	Kones Corporation
[Reactor Coolant Pump Test Equipment Construction] Design	'08.09 ~ '09.09	Hyundai Engineering
[Ansan Combined-cycle Power Plant] Construction Feasibility Study regarding Transmission Condition Review	'09.05 ~ '09.07	Kones Corporation
[Incheon Unit 7 and 8 Expansion] Grid Connection Method Review	'10.05 ~ '11.01	POSCO Energy
[Yanbu 2 PKG 3 Power & Water Project] Electrical Design	'11.09 ~ '13.08	Hanwha Construction
[Operating Nuclear Power Plant Class 2 Protective Relay] Triple Modular Redundancy Improvement Design	'11.12 ~ '20.06	Korea Hydro & Nuclear Power
[Gori Unit 2 Main Control Room] Ceiling Reinforcement Design	'12.01 ~ '12.11	Korea Hydro & Nuclear Power
[Operating Nuclear Power Plant Relay Field] Detailed Design	'12.04 ~ '12.10	KEPCO E&C
[Yonggwong Nuclear Power Plant Headquarters Unit 3 and 4 Condenser Water Level Transmitter] Type Change Design	'12.06 ~ '12.09	Korea Hydro & Nuclear Power
[Seoul Combined-cycle Power Plant Unit 1 and 2 Construction] Electrical Field Detailed Design	'12.06 ~ '15.03	Youngin Engineering
[Operating Nuclear Power Plant] TMR Improvement Electrical Field Detailed Design	'12.10 ~ '19.10	KEPCO E&C
[Moroco Jorf Lasfar Coal-fired Power Plant] Electrical Field Detailed Design	'12.08 ~ '14.04	Youngin Engineering
[Bukpyung Coal-fired Power Plant Unit 1 and 2 Power Block] Electrical Field Detailed Design	'12.11 ~ '16.07	Youngin Engineering
[JSTPP Power, Lighting & Grounding] Electrical Field Detailed Design	'13.02 ~ '17.03	Youngin Engineering
[Dangjin Biomass Power Plant Construction Unit 4] Electrical Design (Detailed Design)	'13.05 ~ '15.10	Bumchang Engineering

Performance

Project	Period	Client
[Chungnam Provincial Government Relocation District Heating System] Construction Cost Estimation and Design	'13.06 ~ '13.10	Bumchang Engineering
[Samsung Everland 154kV S/S Dual Construction] Design and Construction Estimation	'13.10 ~ '13.12	Youngin Engineering
[345kV Cheongsong Myeongbongsan Wind Power Generation SWYD] Design	'13.10 ~ '15.12	Youngin Engineering
[Boryeong Coal Treatment Facilities Performance Improvement] Basic and Detailed Design (Electrical Field)	'13.11 ~ '15.10	Youngin Engineering
[345kV Hanul Plant 2 and 3 Switchyard] Control Design	'13.11 ~ '16.10	Youngin Engineering
[Gori Power Plant 1 and 2 Emergency Equipment Construction] Electrical and Instrument Field Detailed Design	'14.02 ~ '14.12	KEPCO E&C
[Seoul Combined-cycle PJT Steam Turbine] Electrical and Instrumentation Design	'14.02 ~ '16.10	Doosan Heavy Industry
[POSCO Combined-cycle Power Plant] Unit 7, 8, and 9 Construction General Pipe & Fitting Design	'14.01 ~ '14.02	Youngin Engineering
[Gori Nuclear Power] Plant 1 and 2 Emergency Equipment Construction Electrical and Instrument Field Detailed Design	'14.02 ~ '18.02	KEPCO E&C
[Hanul Nuclear Power Plant] Unit 3 and 6 Transmission and Receiving Equipment Improvement Electrical Field Detailed Design	'14.07 ~ '18.09	KEPCO E&C
[Wolsong Nuclear Power Plant] Plant 1 Fire Fighting System Earthquake Resistance Classification Electrical Field Detailed Design	'14.07 ~ '20.12	KEPCO E&C
[Hanul Nuclear Power Plant] Hanul Headquarters General Maintenance Building Construction Detailed Design	'16.01 ~ '21.01	KEPCO E&C
[Operating Nuclear Power Plant General Design] Relay Field Detailed Design	'16.08 ~ '17.08	Korea Hydro & Nuclear Power
[Hanbit Power Plant Unit 3 and 4 Main Transformer Replacement] Electrical Field Detailed Design	'17.01 ~ '20.04	KEPCO E&C
[Sin-Hanul Power Plant Unit 3 and 4] Main Building Electrical Equipment Design	'17.02 ~ '23.12	KEPCO E&C
[Nuclear Power Headquarters Emergency Equipment Storage Building Construction] Electrical Field Detailed Design	'17.08 ~ '18.07	Korea Hydro & Nuclear Power
[Operating Nuclear Power Plant] General Design – Relay Field Detailed Design	'17.09 ~ '18.09	Korea Hydro & Nuclear Power
[Operating Nuclear Power Plant] General Design – Relay Field Detailed Design	'19.07 ~ '20.07	Korea Hydro & Nuclear Power
[Hanbit Nuclear Power Plant] Unit 5 and 6 SWYD GIS Equipment Improvement Design	'20.04 ~ '22.05	KEPCO E&C
[Nuclear Power Headquarters] Gori, Wolsong, Hanbit Headquarters Emergency Building Design	'20.10 ~ '23.02	KEPCO E&C
[Gori Plant 3 and Wolsong Plant 3] Class 1 and 2 Protective Relays Improvement Detailed Design	'20.07 ~ '24.09	KEPCO E&C

POWERTOS will guard your electric power facilities

7. Construction Business

1 Field of Business

1. Power Generation Electrical Field

- Nuclear power generation
- Hydroelectric/pumped storage/tidal power generation
- Thermal power generation
- Combined-cycle power generation
- Cogeneration
- District heating power generation

2. Power Transmission Business

- Overhead line construction
- Underground line construction

3. Power Transformation Business

- GCB, GIS, CGIS, MCSG, VCB construction
- Transformer construction
- Phase-modifying equipment

4. Power Distribution Business

- Overhead line construction
- Underground line construction

5. Renewable Energy Business

- Solar power construction
- Wind power construction
- Fuel cells
- Biomass construction

6. Plant Business

- Petrochemical /environmental/recourse recovery facilities/ water treatment facilities/sewage treatment facilities

7. Protection Panel Business

- Transmission line protection panel design/production/installation
- Distribution line protection panel design/production/installation
- Transformer protection panel design/production/installation
- Generator protection panel design/production/installation
- Bus protection panel design/production/installation
- Motor protection panel design/production/installation
- SPS protection panel design/production/installation
- Other special protection panels design/production/installation

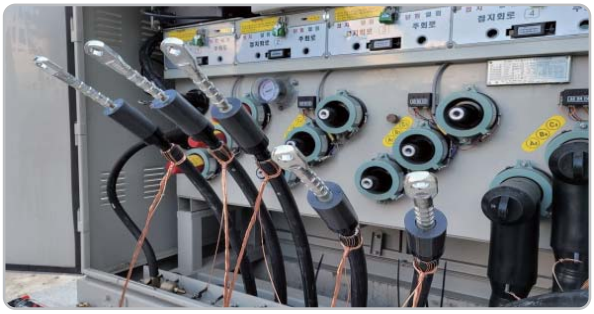
2 Construction Photo

Overhead Line Pipeline Construction

Manhole Installation Construction

Cable Laying Construction

Cable Connection Construction



2 Construction Photo

Cable Tray Installation Construction

Grounding Construction

GIS Installation Construction

154kV Cable Installation Construction

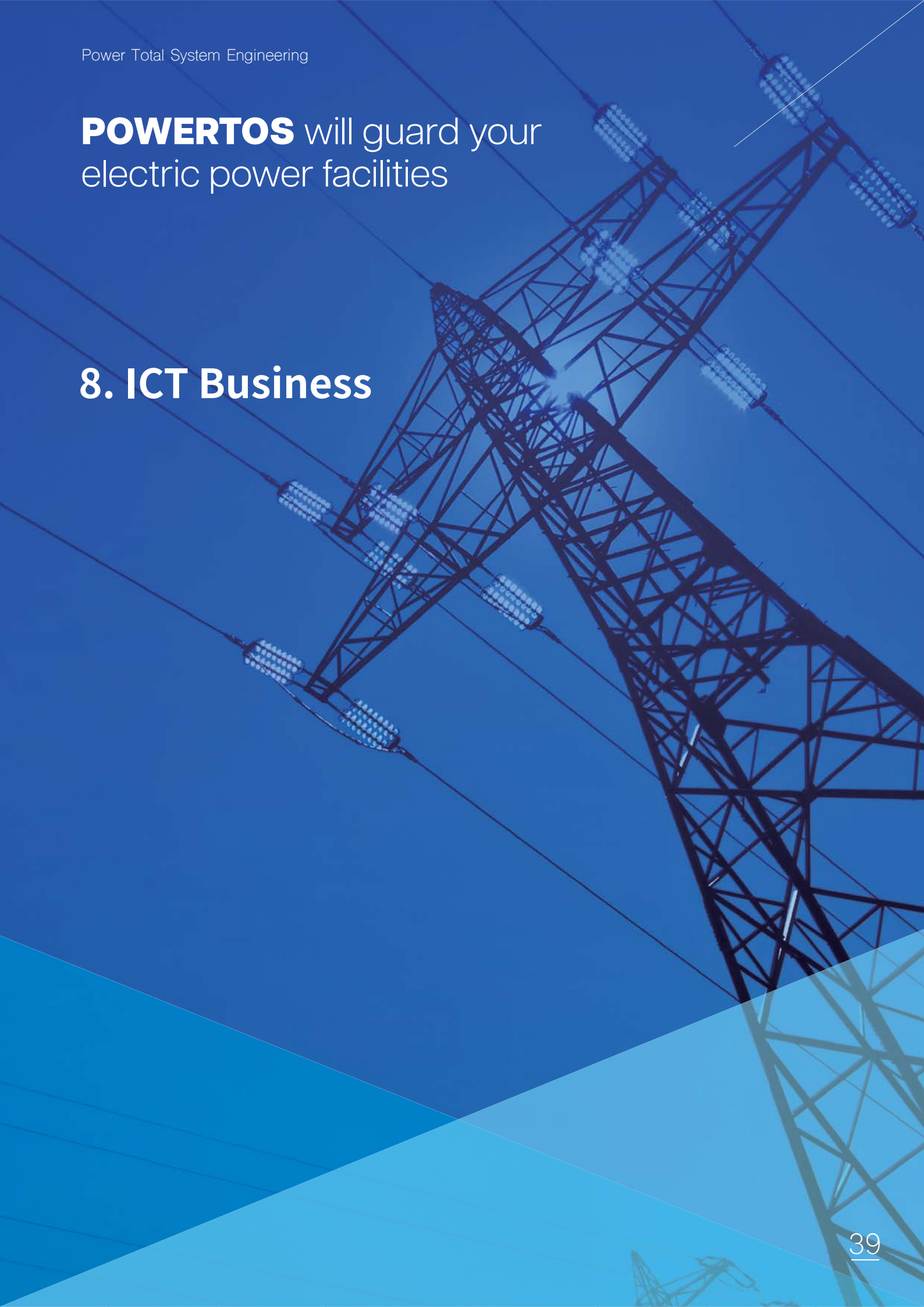
3 Performance

Construction Business

Project	Period	Client
On-site Power Protection System Equipment Construction regarding Samchonpo 345kV SWYD Replacement	'17.04 ~ '21.06	Korea South-east Power
Samchonpo Power Plant Unit 1 and 2 Common Facilities and Load Power Connection Construction	'19.12 ~ '20.02	Korea South-east Power
Samchonpo Power Plant Unit 5 and 6 Environment Facilities Improvement Construction	'19.07 ~ '20.12	BDI
Samchonpo Renewable Energy Power System Installation Construction for Transmission	'19.07 ~ '20.02	KMEC
Samchonpo Ash Treatment Plant 4] Ash Treatment Project Facilities Construction	'19.08 ~ '20.06	Soyang E&C
Noise Reduction Telecommunication Construction	'19.06 ~ '20.03	Air Force 10th Fighter Wing
Streetlight Equipment Improvement Construction	'20.04 ~ '20.06	Air Force 10th Fighter Wing
GS EPS-SPS Installation Construction	'20.04 ~ '20.04	GS EPS
Gulpo Sewage Treatment Facilities Phase 1 and 2 Sludge Pipe Electrical Construction	'20.05~ '20.08	Bucheon City
Goseong Green Power – Solar Energy Distribution Line Facilities Construction	'20.05 ~ '20.12	SK Construction
Samchonpo Small Hydro Power Electrical Cable Pipe Equipment Construction	'20.09 ~ '20.12	Nexpo
Samchonpo Power Plant 2 Ash Transfer Equipment Switchgear Modification Construction	'20.05 ~ '20.08	Soyang E&C
Samchonpo Unit 5 and 6 Organic Solid Fuel Co-firing Facilities Modification Construction	'20.05 ~ '20.08	Everone E&T
SPS Installation Construction	'21.01 ~ '21.04	Goseong Green Power

POWERTOS will guard your electric power facilities

8. ICT Business



1 ICT

SCADA System Design and Construction

Remote control regarding on/off status of substation electrical equipment

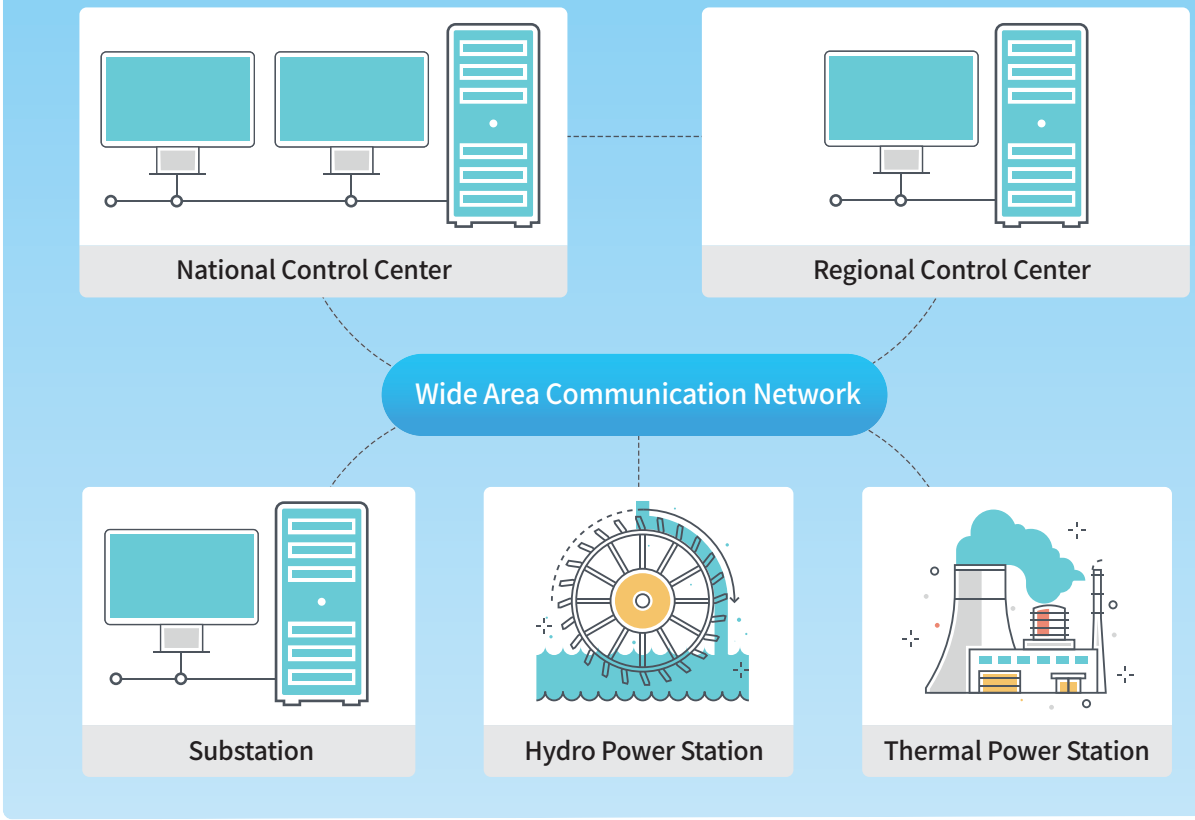
- Open/close state of circuit breaker and DS
- Operating state of protective relay
- Analysis of sequence of event
- Other alarm state

Remote Instrumentation

- Voltage, current, power, reactive power, and temperature

Remote Control

- Circuit breaker, DS on-off control
- Main transformer tap position voltage control



Data Record and Storage

- Regular automatic data record (timely, daily, weekly, or monthly basis)

Data Connection

- Data communication with RCC and NCC

Alarm

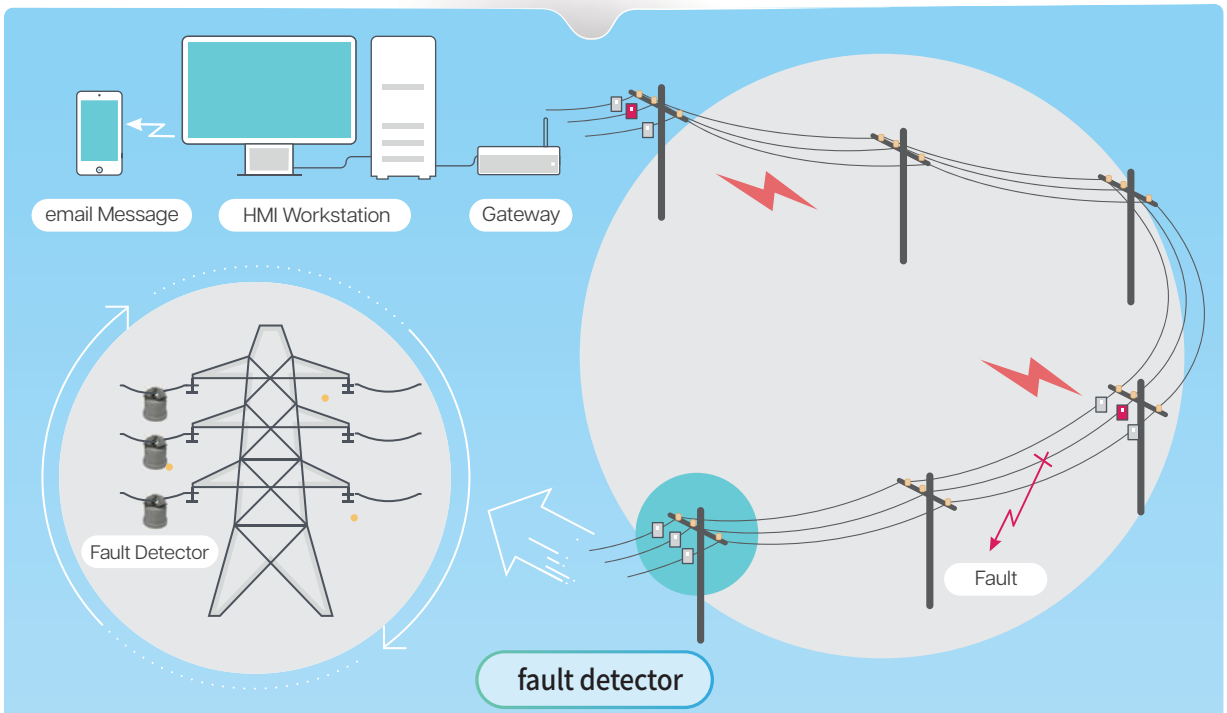
- Alarm goes off with flashing signs in case an instrument exceeds its preset value or changes its status

Database Management

- Database recording and changes

Distribution Line Fault detector

- Applicable to long-distance distribution line by wireless relay telecommunication method
- Send out mobile signal in case of fault
- Detection of line fault in multiple lines and branch lines
- Applicable to area without low voltage line, using magnetic-induced harvest power
- Able to install without the power outage of distribution line
- Indicate a fault location on the map with HMI
- Send out E-mail regarding a fault location (electric distribution pole no.) and alarm to line maintenance staffs



fault detector

fault detector

installation photo

2 Information and Communication Construction

SCADA RTU Construction and Expansion

- Construction of points of control and monitor for RTU
- Construction and expansion of various transducers for power
- LAN construction for PQVF and FRS in power plant and substation
- Safe construction through rich electrical system protection experience

General Information and Communication Construction

- Optical cable construction
- Construction of fire monitoring system for electric power conduit pipe
- Network terminal equipment construction
- Installation construction of remote monitoring and control device at telecommunication repeater site
- Construction of facilities for telecommunication in building

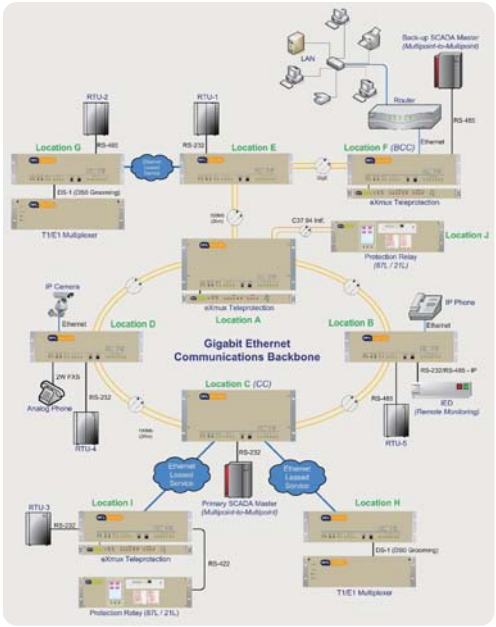
Peak Demand Management Device Installation Construction

The purpose of peak demand management device is to reduce the power charge by managing the peak demand of high-voltage users, based on which the basic charge is decided. It calculates power consumption based on pulse value of KEPCO electric meter and maintains its consumption under the target consumption by controlling the load.

Recently, the usage of the device was expanded as it introduced various controlling methods such as inverter or analog output which enables to reduce the usage power charge.

Distribution of Telecommunication Equipment of RFL- the United States

Highly reliable telecommunication equipment suitable for system protection and automation system in power plants and substations



Ethernet IP Multiplexer

- Voice, data, Ethernet, video, protection & utility interfaces
- TDMoIP access multiplexer for legacy devices

Multiplexer

- High bandwidth OC3/OC192 and STM1/STM64

Ethernet Switch

- Substation hardened Ethernet switches
- High-speed switching and compliant to substation standards

Power Line Carrier

- Programmable SSB power carrier
- Analogue and digital systems based on IMUX T1/E1 Mux
- Long haul voice and low speed data on EHV lines

Coupling Equipment

Control & Telemetering

- Analogue SCADA and Telemetry modems

CCTV (Video)

Digital to Fiber and Interfacing Converters

- T1/E1 and Ethernet

Satellite Communications

- Low-speed data and Ethernet communications

3 Performance

ICT Business

Project	Period	Client
SCADA Transducer(TD) Calibration Work	'08.05 ~ '08.06	KEPCO Changwon Electric Power Management Office
SCADA TD Calibration Work	'08.05 ~ '08.06	KEPCO Gumi Power Station
SCADA RTU Data Link Equipment Construction	'08.10 ~ '08.11	KEPCO Suwon Electric Power Management Office
SCADA RTU Expansion Construction	'09.03 ~ '09.04	KEPCO Gyeongin Construction Office
Telecommunication Equipment Improvement Construction for Electrical Equipment Technical Support System at Five Sites including Mangu Subway Station	'09.09 ~ '09.09	Korail Dongbu Branch
SCADA TD Calibration Work	'09.06 ~ '09.07	KEPCO Incheon Headquarters
SCADA TD Calibration Work	'09.11 ~ '09.12	KEPCO Gyeonggi Bukbu Headquarters
Anseong S/S SCADA RTU Reinforcement Construction	'09.11 ~ '09.12	KEPCO Gyeonggi Headquarters
Cheongwon Power TD Calibration Work	'10.06 ~ '10.06	KEPCO Cheongwon Power Station
Nam-Seoul Headquarters TD Calibration Work	'10.06 ~ '10.07	KEPCO Nam-Seoul Headquarters
154kV Bundang S/S SCADA RTU Reinforcement Construction	'10.08 ~ '10.11	KEPCO Gyeonggi Headquarters
Broadcasting System and Broadcast Equipment Replacement Construction	'10.08 ~ '10.11	Army Aviation School

3 Performance

ICT Business

Project	Period	Client
SCADA RTU TD Calibration Work	'10.09 ~ '10.09	KEPCO Incheon Headquarters
SCADA MTD TD Calibration Work	'10.11 ~ '10.12	KEPCO Kwangju-Jeonnam Headquarters
SCADA TD Calibration Work	'11.09 ~ '11.09	KEPCO Busan headquarters
154kV Yanggok S/S SCADA RTU Reinforcement Construction	'11.10 ~ '11.11	KEPCO Incheon headquarters
SCADA TD Calibration Work	'11.12 ~ '11.12	KEPCO Seoul Headquarters
Environmental Noise Automatic Measurement Network Relocation Project	'11.12 ~ '11.12	Korea Environment Corporation
SCADA TD Calibration Work	'11.12 ~ '11.12	KEPCO Seoul Headquarters
SCADA RTU Module Expansion Construction at 23 Sites including Seo-Suwon	'12.03 ~ '13.04	KEPCO Gyeonggi Headquarters
Yongin Wood Culture Experience Center Construction (Telecommunication)	'12.09 ~ '13.12	Yongin City
345kV System Fault Signal-blocking Device and Electric Power Monitor Device Installation	'12.12 ~ '13.02	GS EPS
SPS Installation	'13.04 ~ '13.05	GS EPS
Giheung City Development Business U-City Telecommunication Construction	'15.05 ~ '16.11	Yongin Urban Corporation

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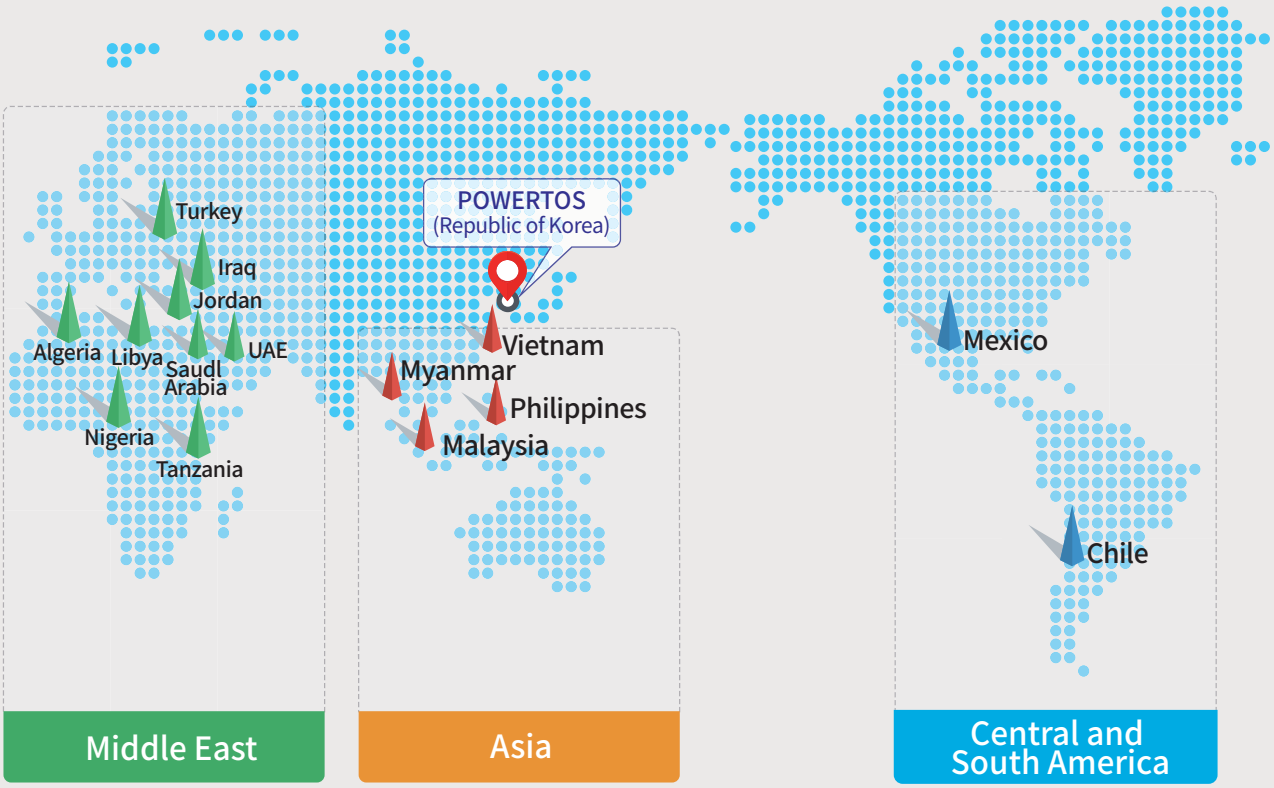
9. Overseas Business

1 Overseas Business



POWERTOS provides integrated electrical system to power plants and substation overseas through Test on Completion, fault detector, protective relay setting, electric power system design, and electrical system technical calculation.

- Electrical Equipment for Power Plant
- Electrical Equipment for Transmission Line
- Electrical Equipment for Substation
- Electrical Equipment for Distribution Line
- Switchgear
- Power-receiving Equipment
- Other Electrical Equipment

2 Performance

Overseas Business

[Mexico] Salamanca PM Refinery Electrical Equipment Test on Completion	'01 ~ '01	Samsung Engineering
[Nigeria] 330kV Afam 6 Power Station Test on Completion	'07 ~ '08	Daewoo Construction
[Libya] 420kV Misurata CCPP Test on Completion	'09 ~ '10	Daewoo Construction
[Saudi Arabia] 380kV Marafiq Unit 5 and 6 Test on Completion	'10 ~ '13	Hanwha Construction
[Myanmar] Yangon 66kV YESB Substation Test on Completion	'13 ~ '14	Youngin Engineering
[Turkey] Tufanbeyli Terminal Power Plant Test on Completion	'14 ~ '15	SK Construction
[Malaysia] TGAST Project Electrical System Test on Completion	'15 ~ '16	Samsung Engineering
[Myanmar] Mawlamyine CCPP 66kV IPP Switchyard Test on Completion	'13 ~ '14	Youngin Engineering
[Mexico] 230kV Intergen SLP Project Electrical Equipment Test on Completion	'14 ~ '15	Daelim Construction
[Myanmar] Yangon Amara Hotel Power-receiving Equipment Test on Completion	'16 ~ '17	Youngin Engineering
[Philippines] 66kV Mindanao SM 200 Phase 1 Power Generation Facilities Test on Completion	'14 ~ '15	Daelim Construction
[Vietnam] O-Mon Thermal Power Plant Project Test on Completion	'15 ~ '15	Daelim Construction
[Chile] KELAR Project Test on Completion	'15 ~ '16	Samsung Engineering
[Algeria] CAFC Project Electrical Equipment Test on Completion	'16 ~ '17	Hanwha Construction
[UAE] BNPP Unit 2 (1400 MW) Nuclear Power Plant Protection System Test on Completion	'17 ~ '18	KEPCO
[UAE] BNPP Unit 3 (1400 MW) Nuclear Power Plant Protection System Test on Completion	'17 ~ '18	KEPCO
[Myanmar] 230kV Namsam Substation Test on Completion	'18 ~ '18	Youngin Engineering
[Myanmar] Hlawa S/S Transformer Construction Test on Completion	'18 ~ '18	Youngin Engineering
[Myanmar] 230kV Keng Tong Substation Test on Completion	'18 ~ '19	Youngin Engineering
[Myanmar] NS, MP, KT Substation Test on Completion	'18 ~ '21	Youngin Engineering

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10. Training Program

1 Training of Electrical Engineers

Background and Purpose

- Technical training is required in the process of performance such as electric power equipment test on completion, protective relay period test, electric power system analysis and setting, and calculation.
- The purpose of the training, catered by POWERTOS, is to enhance the reliability of your company through the stable operation of equipment.

Training Program

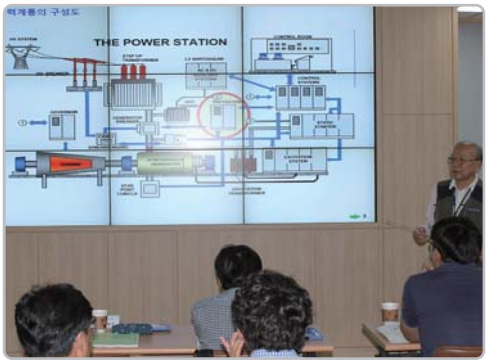
- **Training Type** : Entrusted course
- **Training Period** : Flexible
- **Venue** : Training center of POWERTOS in Seongnam
- **Registration** : Mass registration is applicable

Date	Training Scope
Day 1	• General Information on the Power System Protection • Transformer and Generator Protection
Day 2	• Protective Relay Characteristics Test • CT and PT Characteristics Test
Day 3	• Electric Power System Operation, Load flow, T/L Protection, Motor Protection • Fault Analysis and Stability analysis • Protective Relay Setting and System Protection Fault Analysis

Expected Outcome

- Technology exchange between POWERTOS and operators in power plants
- Improvement of equipment operation skills through training
- Enhancement of capacity to adjust in the rapidly-changing technical environment

2 Training Center



Lecture class

Practical class

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11. Technical Collaboration

Technical Collaboration

SEL	Protective Relay, Automation, Substation Integated System **www.selinc.com**

KEPCO	KHNP	EWP	KOSEP
KOMIPO	WP	KOSPO	KEPCO E&C
KEPCO KPS	SAMSUNG 삼성엔지니어링	SAMSUNG 삼성물산	SAMSUNG 삼성전자
HYUNDAI ENGINEERING & CONSTRUCTION	HYUNDAI ENGINEERING CO., LTD.	SK E&C	SK E&S
HYOSUNG	Hanwha E&C	DAELIM	DOOSAN
POSCO ENERGY	현대그린파워 hgp	삼천리	S-OIL Corporation
DAEWOO E&C	LOTTE E&C	GS E&C	GS EPS
Incheon Airport	한국지역난방공사 KOREA DISTRICT HEATING CORP.	Dream (주)드림엔지니어링	GS Power

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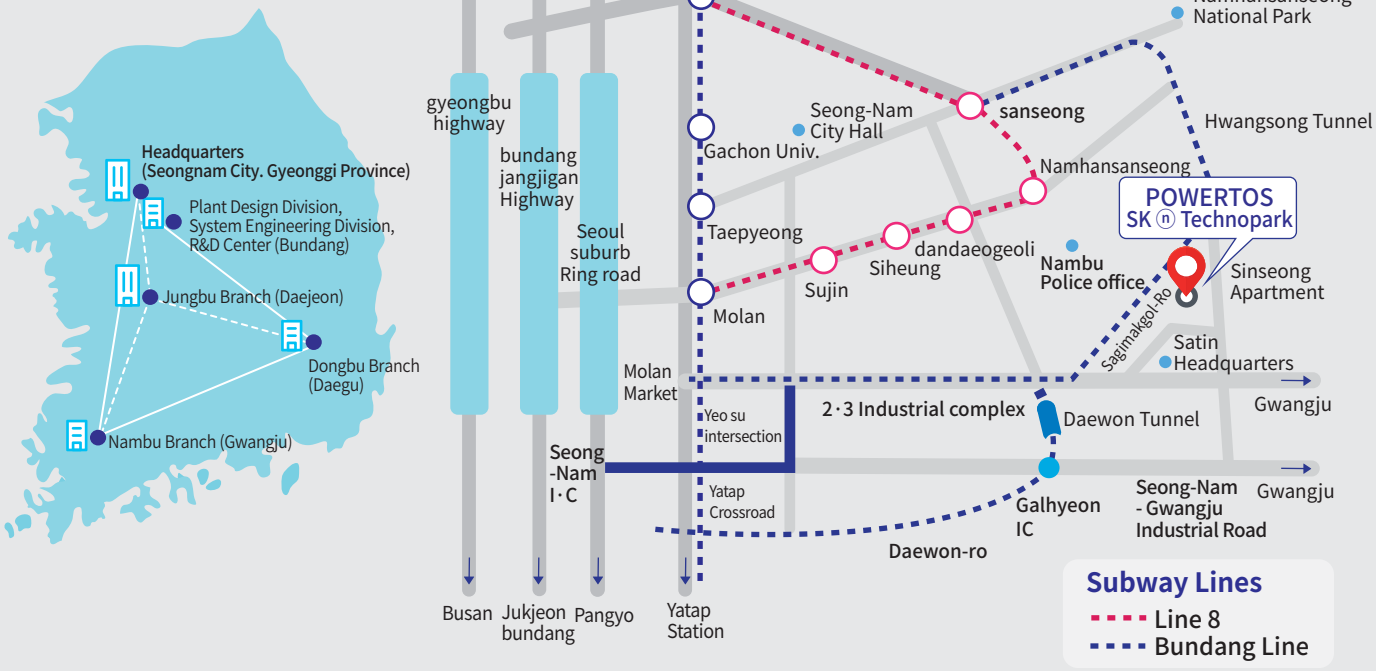

POWERTOS Bizdong B117, SKnTechnoPark, 124 Sagimakgol-ro(190-1 Sangdaewon-dong), Jungwon-gu, Seongnam-si, Gyeonggi-do, 13207 Republic of Korea

way to come

- **From Seoul** : Bokjeong Sageori → the far right road of Hwangsong Tunnel toward Namhansanseong → Kumkang Hitech Valley 1st → Go straight for about 0.5 km → SK ⓝ Technopark (Biz Center)

- **From Gangnam/Seocho**

  ① Guryong Tunnel → Seongnam/City Hall → Turn left at Yeosu Samgeori → To Gwangju (National Road No. 3) → Exit to Namhansanseong Circular Road → Go straight to a high-level road → SK ⓝ Technopark (Biz Center)

  ② Bundang-Jangji Highway → Exit to Seongnam/Gwangju → Turn right to Gwangju → Turn left to Industrial Complex 2 and 3 in front of Moran Market and go straight → Sagimakgol at the entrance of the Industrial Complex →Turn left to Car Inspection Center → SK ⓝ Technopark (Biz Center)

- **From Songpa :** Seongnamdaero → Turn left on Bokjung Sageori → toward Namhansanseong → to Industrial Complex 2 and 3 → Hwangsong Tunnel → SK ⓝ Technopark (Biz Center)

- **From Incheon and Anyang** : To Pangyo of Ring Expressway → Seongnam IC (to Seoul) → Jungwon-gu Office → To Car Inspection Center → Saimakgol Bus Terminal → Kumkang Hitech Valley 1st → Go straight for about 0.5 km → SK ⓝ Technopark (Biz Center)

POWERTOS will guard your electric power facilities

POWERTOS aims to become a leading company
in the power generation and electrical engineering fields,
contributing to the development of the country.

Power Total System Engineering

POWER TOS
Power Total System Engineering

Leading Company
in the Electrical Engineering Field!

Headquarters

POWERTOS Bizdong B117, SKnTechnoPark, 124 Sagimakgol-ro (190-1 Sangdaewon-dong), Jungwon-gu, Seongnam-si, Gyeonggi-do, 13207 Republic of Korea

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