



Power Stability Expert



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NR ELECTRIC CO., LTD.





ABOUT NR ELECTRIC

NR Electric (NR), as a power stability expert, is dedicated to provide smart, reliable and environmental friendly solutions for power generations, power grid and industries. The products and solutions covers protection, automation & control, HVDC & FACTS, renewable & microgrid and engineering consulting & services.

Based on more than 20 years of professional experience of high-tech innovations, NR provides a wide spectrum of electrical and power electronics solutions to enable its worldwide customers to meet the growing challenges of quality and safety. We also offer turnkey and specialist electrical services provided by more than 6000 high tech employees across the globe. NR, a recognizable multinational company has expanded its hand to over 100 countries & regions.

Our power solutions with distinctive expertise that bridges both AC & DC power technology and spans both conventional & renewable energy platforms, serves power systems from mega power generations, long distance high capacity HVAC and HVDC transmissions, sub-transmissions, medium & low voltage distribution, energy-intensive industry to eco-friendly renewable wind and solar farms. Our feedback oriented approach and non-stop innovation helps clients to maximize investment efficiency, safety and reliability. NR's valuable mission, innovative technology, high quality products and practical experience permit the company to expand for more contributions to the power utilities and industrial needs.



Mature and intelligent protection, automation and control solutions proven by over **18,000+** substations worldwide with highest voltage level of **1,000kV**

Vast experience from implementing **2,000+** digital substation projects

State-of-the-art VSC-HVDC transmission solutions supporting **world's first** $\pm 500\text{kV}$ DC grid and $\pm 800\text{kV}$ hybrid multi-terminal HVDC

High reliable LCC-HVDC transmission solutions upto **$\pm 1100\text{kV}$**

Field proven SVC solution with single project installed capacity up to **900Mvar**





Mission >

To enhance the security and reliability of power system with technical innovation, high-quality products, and dedicated services.

Core Value >

Built on cutting-edge technology, NR Electric serves for power utilities, industrial enterprises with all-around solutions, best-in-class products and superior services. Our comprehensive innovations and proven solutions improve the safety, reliability, efficiency & productivity of all categories of power systems with environmental friendly atmosphere.

Non-Stop Innovation

NR believes that technology innovations make world wonderful and effective. Since establishment, we never stop researching new technologies and seeking better solutions to serve power grids all over the world. As a technology-oriented company, NR Electric has own many creative technologies and patents.

Cooperation with Clients

For a long time, NR is dedicated to solving practical complexities in the operation of power system with our down-to-earth attitude. NR insists on working intently with customers to support them solve existing problems and find advance approaches to prevent potential risks.

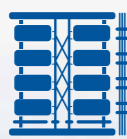
As a leading system solution provider, NR has gained solid experiences in cooperating with utilities to help them solve troublesome and emergent situations. We commit to realize customers' success and customer satisfaction.

OUR BUSINESS

NR is one of the largest protection and control manufactures and leads to one of the best protection & control solution providers across the world. It occupies a distinct position in FACTS & HVDC system and renewable energy generation. With complete focus on research and development of innovative products and solutions, NR Electric provides comprehensive solutions to utility and industry customers.



Protection, Automation & Control



HVDC & FACTS



Renewable Energy & Microgrid



Engineering, Consulting & Service

Protection, Automation & Control (PAC)

Power System Safe & Stability Expert for Your New Life

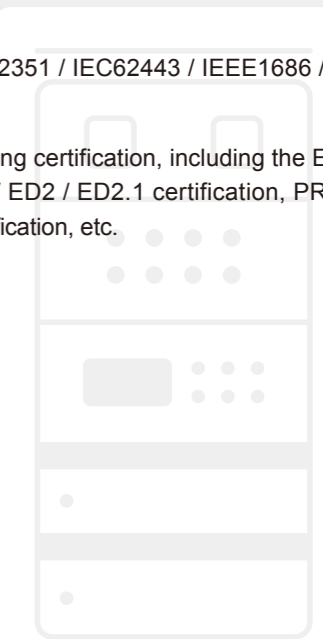
Built upon decades' of research and development excellence with field proven application experience in power system. NR's intelligent PAC make deployment, operation and maintenance as smart, flexible and reliable as possible. The consumers can benefit from NR's PAC solution to optimize energy generation, transmission, distribution and utilization.

Products & Solutions

- Substation Automation
- Hydropower Automation
- Digital Substation
- Disturbance Recording
- Energy Management
- Distribution Management
- Power Stability Control
- Phasor Measurement

Advantages

- NR provide comprehensive power system secondary integration solution, "three-defense-line" security protection solutions, and all related PAC products and SAS (Substation Automation System) related solutions. Global application of protection and control products have reached more than 1,700,000 units, 18,000+ substations of full-scale automation solution in 100+ countries.
- NR PAC products are based on unified high performance hardware and software system platform. Their functions can be selected and flexibly configurable. NR PAC products also provide a variety of terminal selection, a diversity of chassis configuration options, and various of installation options. They are widely used in the power system generation, transmission, distribution field and industrial control field.
- The PAC product support a variety of applications of traditional and digital substation, and they integrate a variety of advanced application functions, including traveling wave fault location, arc protection, PMU, power quality, etc.
- NR PAC products support cyber security functions based on IEC62351 / IEC62443 / IEEE1686 / NERC - CIP, and other international standards and cyber security applications.
- NR PAC products have obtained a number of global functional testing certification, including the European Union CE certification, WEEE / ROHS certification, IEC61850ED1 / ED2 / ED2.1 certification, PRP / HSR certification, IEEE1588 high-precision timing certification, DNP3.0 certification, etc.





- **Power Stability Control System (PSCS) with 250+ 220kV-500kV Stations, China Southern Power Grid, China**



- **Three-Gorges Hydro Generation, PAC and SAS, China**

Industrial Process Control

Flexible, Intelligent, Stable, Safe

NR Electric began to develop the first generation of industrial process control products in 2003. After continuous iterative upgrading, combined with the mainstream process control system functions, NR launched second generation of industrial process control products PCS-9150PRO process control system.

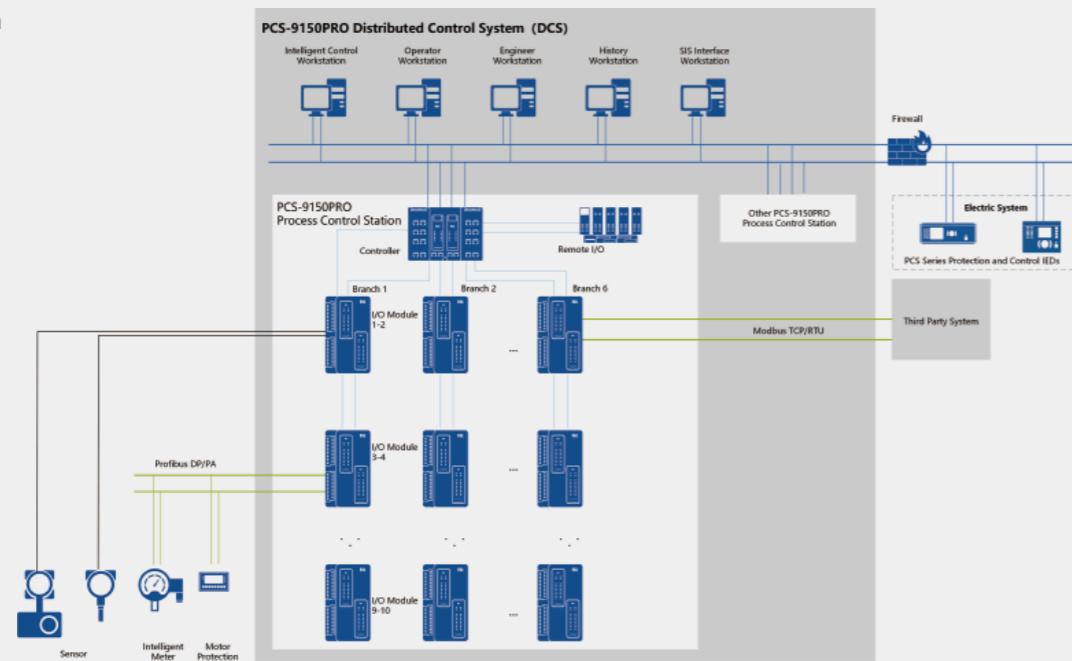
Products & Solutions

- DCS solution
- PLC solution
- SIS solution
- PCS-9150Pro Process Control System
- PCS-9150Mini Process Control System
- PCS-9150S Safety Instrumented System

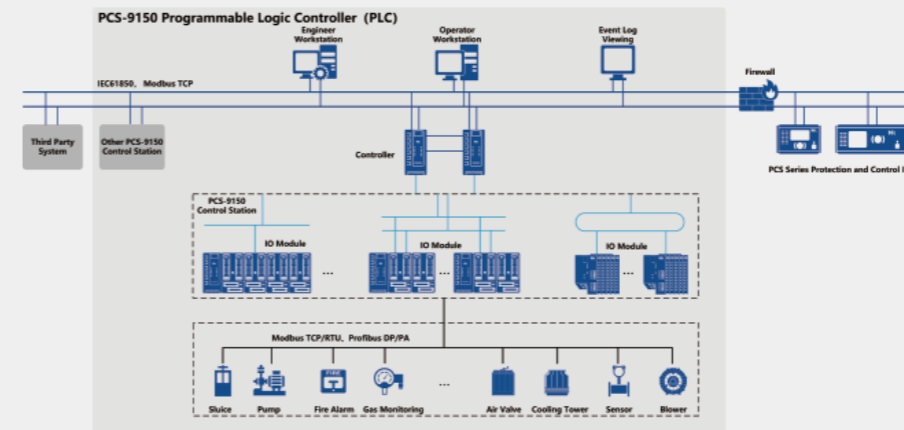
- PCS-9000 EMS
- PCS-9700 SCADA
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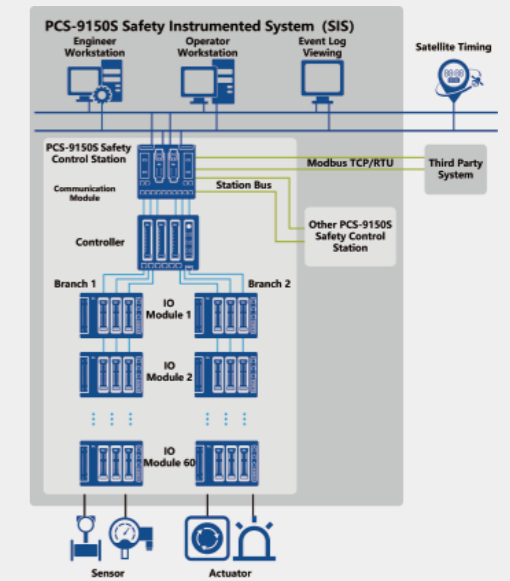
• DCS solution



• PLC Solution



• SIS Solution



Advantages

• Complete solution

"Process Control Technology +" builds the whole life cycle system integration and engineering total contract capability of industrial control projects, simple and easy to use logic configuration tools, standardized design of DCS, PLC, SIS product family, professional process control process, adapts to different industry needs, and provides one-stop service for users.

• Variety of scenarios

The product + solution combination adapts to market requirements at different levels and supports multi-scenario applications such as thermal power generation, water conservancy and hydropower, metallurgy and chemical industry, integrated pipeline corridor, rail transit, and equipment manufacturing. The fully redundant architecture system and online no disturbance switching meet the requirements of high security and high reliability in various business scenarios.

• Common technology platform

Relying on the fully independent intellectual property rights of the UAPC hardware platform, SOPHIC software platform and SophiCloud industrial Internet platform, directly inherit the field engineering test of the mature design, to achieve the integration of electrical system and process control system management and control, comprehensively improve the enterprise comprehensive information integration ability.

• Leading quality control

The original 8 quality control points achieve the whole process coverage from components to the whole system, and the series of automatic testing equipment independently developed and designed to build a perfect quality control process of primary and secondary equipment, with automatic detection, information comparison, the whole process can be traced and measurable characteristics.

Typical Reference

Thermal Power Plant DCS



- Jiangxi Ruijin Thermal Power Plant 2*1000MW DCS/DEH integration project



Other reference

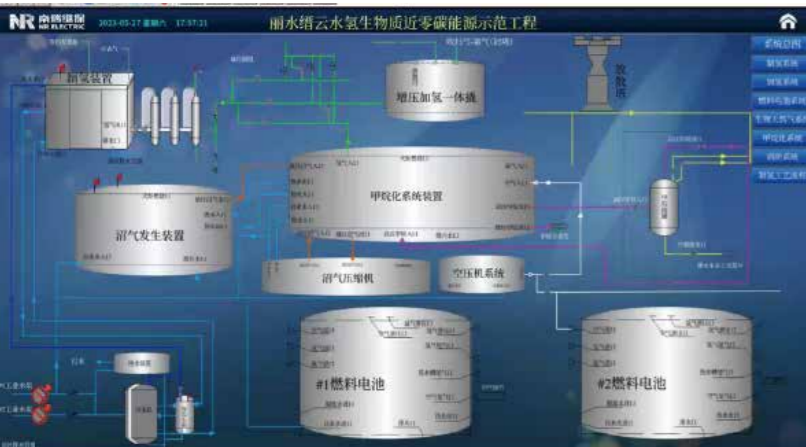


- Jiangsu 1000kV Sutong GIL integrated pipe & gallery monitoring and control system project

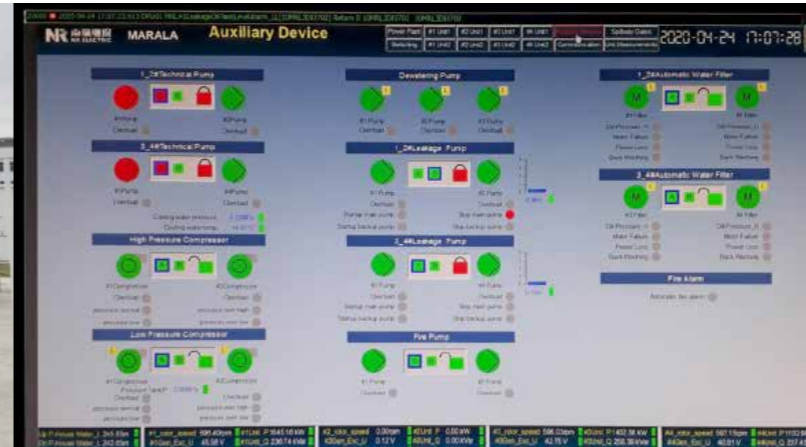


- Yunnan Huaneng Xiaowan Hydropower Station intelligent monitoring and control system of 6*700MW hydropower units

Chemical Industry DCS



- SGCC Zhejiang Lishui Water hydrogen biomass near zero carbon demonstration project



- The monitoring and control system of four hydropower stations in Pakpa, Marala, Chianwali and DegOutfall, Pakistan



- Shenzhen Airport satellite building equipment monitoring and control system



- Chongqing rail transit ring BAS building automation system, energy saving control system

Intelligent Patrol

Quadruped intelligent patrol robot

NR's new generation of power quadruped intelligent patrol robot integrates advanced technologies such as quadruped robot and unmanned driving to promote the development of robot power inspection to a more intelligent, more reliable and more efficient direction.

Compared with traditional robots, quadruped intelligent patrol robots have stronger cross-country obstacle overcoming ability, and can move quickly and reliably on non-paved roads such as stairs, gravel roads, and grass. In addition to performing routine inspection tasks, they can also meet the emergency needs of special scenes such as harsh environment detection and early fire inspection.



Functions & Features



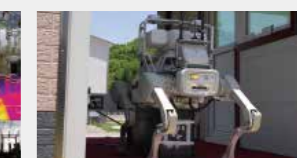
Quadruped Intelligent Patrol Robot



Voiceprint Patrol



Infrared Ray Patrol



Auto-charge



Meter Recognition



Emergency Surveillance



Remote Control



Real-time Data & Image Monitoring

Reference

- Jiangsu Nanjing 500kV Dongshanqiao substation robot patrol system.
- Zhejiang Hangzhou 500kV Pingyao substation smart patrol system.
- Shanxi Weinan 330kV Lingquan substation integrated intelligent operation and maintenance system.
- Hubei Yichang power supply company centralized inspection system.

HVDC & FACTS

Leading-edge and well-proven solution provider for transmitting bulk power and integrating clean energy in stable and efficient way

NR has employed state-of-art proven technology based on power electronic and leveraging many-years in-depth experience in power system to effectively integrate the power grid, boost the transmission power and enhance the power supply in the most flexible and cost-effective way. High Voltage Direct Current (HVDC), based on thyristor and IGBT semiconductors, is one of the most practical way to transmit the bulk power and integrate the renewable power while drive the flexible control in DC grid /multi-terminal way. Flexible Alternating Current Transmission System (FACTS), based on thyristor / IGBT semiconductor, is one of the cost-effective measures in an AC way for the quality power transmission and the effective power integration with better production.

Products & Solutions

- Line Commutated Converter HVDC (LCC HVDC)
- Voltage Sourced Converter HVDC (VSC HVDC)
- Static Var Compensator (SVC)
- Static Synchronous Compensator (STATCOM)
- Synchronous Condenser
- Series Compensation (SC)
- Unified Power Flow Controller (UPFC)
- Directly Connected Power Flow Controller (DPFC)
- Controllable Shunt Reactor (CSR)
- Magnetically Controlled Shunt Reactor (MCSR)
- Fault Current Limiter (FCL)
- DC De-icing
- Electronic Load Device (ELD)
- Static Synchronous Condenser (SSC)

Advantages

- NR has professional system study team to verify the solution, accommodate the customer' s situation, validate the control functions and determine the control parameters by means of the global wide-applied system software simulation and the real-time close-loop digital simulation.
- NR has committed to high power converter application with lower power loss, such as thyristor stack valves and IGBT power modules, together with enclosed water circulation cooling system for high reliability availability and maintainability.
- NR developed protection & control platform-UAPC is based on standardized hardware, high level functional programming tools and open interfaces. UAPC is a field-proven important assurance to reach controllable regulation functions, such as AC/DC active & reactive power control, voltage control & power oscillation damping control and frequency control in fast response especially during and after contingency events.
- Dedicated design philosophy and manufacturing capability, professional project management team and global technical service centers guarantee NR' s quality project delivery. Factory/on-site training and aftersales services are friendly supplied during project implementation and operation & maintenance.

Typical Reference



Stable HVDC transmission of bulk power in long distance of 2092km in Brazil

Requirements

- Robust active power control
- High reliable transmission with special protection scheme

Project Details

- $\pm 800\text{kV}$ 4000MW LCC HVDC
- Commissioned in 2018



Supply power oscillation damping and enhance dynamic voltage performance and improve power grid in 500kV Holeta Substation, Ethiopia.

Requirements

- Reinforce the 500kV transmission corridor capacity
- Damp power oscillation

Project Details

- 900Mvar rated at 500kV
- Commissioned in 2015



Bulk hydropower transmission with Hybrid HVDC from Yunnan to Guangxi and Guangdong, in China

Requirements

- Flexible active power and reactive power control
- Fast voltage control and stable power supply near load center

Project Details

- ± 800 kV with LCC HVDC of 8000MW at Yunan, VSC HVDC of 3000MW at Guangxi and VSC HVDC of 5000MW at Guangdong
- Commissioned in 2020

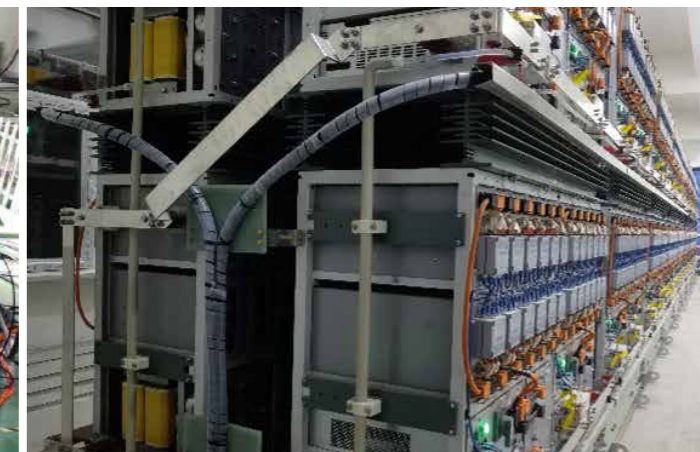
Stabilizing grid system voltage level by installation of STATCOM in TIMBDI substation, India

Requirements

- Dynamic voltage support to accommodate time-variant load scenario
- Improving grid voltage stability for high reliable operation

Project Details

- ± 120 Mvar rated at 220kV
- Commissioned in 2019



Huzhou 220kV DPFC in China
Power flow balance between double circuit lines

Requirements

- Power flow balance
- Line impedance compensation

Project Details

- 2X30MVA DPFC is installed for 220kV Xiangfu-Ganquan double circuit lines
- 100MW power flow is transferred after installation

JiLin Bamian SSC in China
Power strength enhancing for renewable park

Requirements

- Power strength enhancing
- Synchronized voltage support and short-time inertia support

Project Details

- 50Mvar/340MJ SSC is installed for 300MW wind farm
- 3pu/10s overload capability



Limiting fault current with fast mechanical switch paralleling reactor
in 220kV Huatai Xinhua Power Plant, China

Requirements

- Reduce the fault current level without network change
- Make existing circuit breakers able to interrupt the limited fault current

Project Details

- 2 sets of 220kV fault current limiter based on fast mechanical switch
- Commissioned in 2019

Fast balancing active power in islanding operation mode with electronic load device
in Qingdao Comprehensive Industrial Park Power Plant, Indonesia

Requirements

- Fast response in order of millisecond to frequency change due to nickel furnace load fluctuation
- Power balancing management in dynamic and timely way

Project Details

- 30 MW Static Watt Compensator
- Commissioned in 2022

Renewable Energy & Microgrid

The Leader of Green Energy Revolution for A Better World

NR has specialized in renewable energy and microgrid technology, offering clients customized solutions to meet their energy generation, grid resilience and efficiency needs. NR has designed and installed diverse renewable energy and microgrid projects across the globe with practical experience and an in-depth understanding. As a leading renewable and microgrid system provider, NR Electric offers various products and integrated solutions with high safety, reliability, availability and flexibility. NR will fully guarantee your green energy investment and make your microgrid as effective and sustainable as possible.

Products & Solutions

- Microgrid Controller
- BESS Controller
- Energy Management System (EMS)
- Power Plant Controller (PPC)
- Renewable Energy SCADA
- Static Frequency Converter (SFC)
- Load Commutated Inverter (LCI)
- Power Forecaster
- AGC/AVC
- PV Inverter
- Power Conversion System (PCS)
- Excitation System
- BESS Solution
- Microgrid System
- Grid-connection Solution
- Liquid Cooling Energy Storage Integrated Cabinet
(100kW/233kWh-AC400, 100kW/372kWh-AC400, 186kW/372kWh-AC690)

Certificate EN IEC 61000 / EN 62477 / UL1741 / IEC61683 / IEEE 519 / EN 50549 / German VDE / Poland NC RFG / South Africa - BESF and Grid Code / Thailand PEA / Israel SII / UN38.3

Advantages

- Starting out as a leading manufacturer, based on the manufacturing of the core products, NR can supply one-stop solution for renewable generation and microgrid with strong flexibility to fit diversified customer needs and strict quality control procedure for each project.
- NR supplies all-around protection & control products portfolio for renewable generation & microgrid, adopting unified software & hardware platform with superiority of easy maintenance and expansion.
- NR' s well-proven and trusted PCS, is able to connect various battery type or energy medium such as Lithium-ion, Lead-acid, Sodium sulfur, Vanadium redox and Zinc-bromine, etc.
- Proprietary control algorithms with utility grade BESS & microgrid controller and energy management software supports to enable a variety of system applications & optimize system efficiency and performance.
- NR offers integrated and customized turnkey service package with certified third-party products to satisfy clients' needs and demands, especially based on reliable cooperative relationship with a variety of battery and PV manufacturers.
- NR' s solution makes your system more effective and sustainable based on precise system control and operation, maximize the use of renewable generation and energy storage system, and deliver exceptional recovery on investment.

Typical Reference



E'Ji'Na Wide-area Microgrid, Inner Mongolia, China

*(25MW/25MWh grid-forming energy storage as the voltage source, 20MW PV, 15MW wind, 4*1.8MW DG)*

Need

- On-grid/off-grid operation
- Long-term wide-area off-grid operation
- Black start
- Voltage/frequency regulation
- Peak shaving

Project Details

- New built 25MW/25MWh grid-forming energy storage and 4*1.8MW DG, with existing 20MW PV, 15MW wind constitute a wide-area microgrid, which can seamless switch over between on-grid and off-grid operation



UK 100MW/100MWh BESS Project, UK

(100MW/100MWh BESS project)

Need

- Voltage/frequency regulation
- Ancillary service to grid

Project Details

- 100MW/100MWh BESS engaging in British electricity market to provide ancillary service to grid



The first Smart Microgrid site of Thailand in Chiang Mai, Thailand
(100kW PV system, 100kW/100kWh Li-ion BESS and 90kW small Hydro)

Need

- Frequency & Voltage Regulation
- Microgrid Regulation

Project Details

- 100kW/100kWh lithium BESS, 100kW PV system
- NR supplied turnkey solution, including BESS, PV system
- Installed in 2017



40MW/40MWh Li-ion BESS project for wind farm in Mengcheng city, China
(40MW/40MWh Li-ion BESS)

Need

- Frequency & Voltage Regulation
- Renewable Power Smooth

Project Details

- 40MW/40MWh lithium BESS
- NR supplied turnkey solution
- Installed in 2020

Engineering, Consulting & Service

Power System Safe & Stability Expert for Your New Life

NR's engineering, consulting and services solutions will deliver the desired technological results and efficient production processes. NR's primary goal is to minimize the consumption of your resources, the amount of capital tied-up and our competent service organization is within easy reach and helps to ensure high operational efficiency and performance.

Products & Solutions

- System Analysis
- Engineering Design
- Protection Setting
- Operation & Maintenance
- Training

Advantages

- Proven, state-of-the-art equipments across voltage levels up to 1000 kV
- System analysis capability based on know-how of power system
- Original factory service for project implementation
- Full-Lifecycle project management



Typical Reference



275kV Substation in Malaysia



20MWp PV generation project in Qinghai



-200MVar ~ +200MVar SVC project in Korea



500kV substation secondary system in Vietnam



-50-150 Mvar SVC in Mexico



500kV 750MVA UPFC in Suzhou China

Top-Notch Quality

Strict Manufacturing Quality Control to Protect Power System & Operation Personnel.

NR believes the quality of products and services are essential to long-term safety and reliability of electricity delivery. We implemented stringent quality control processes through our procurement, manufacturing, configuration, delivery and services. Starting from board soldering, module inspection, to final equipment assembly, every step is performed by our professional technicians, verified by our testing engineers and monitored by our quality control managers.



Certified to International Safety and Functionality Standards

NR's solutions and products are fully complied with IEC and IEEE standards to guarantee well availability and compatibility. These are also approved and recognized in the type test and EMC test carried-out by independent third party organizations, such as TÜV SÜD and UL.



Professional Project Management to Ensure the Success of Projects

NR believes professional project management is a key factor to achieve project success. Our project management process executes from the project start-up to closer. The qualified project manager will be responsible for the program execution in a given time with a calculated budget, managing any changes in the scope that are driven by clients, taking care of customers satisfaction and risk limitations.

World-Class Facilities

NR Electric's headquarters is located in Nanjing, China . With world class standards and systems, the IED and power electronic equipment factories are situated over 944,000 square-meters.

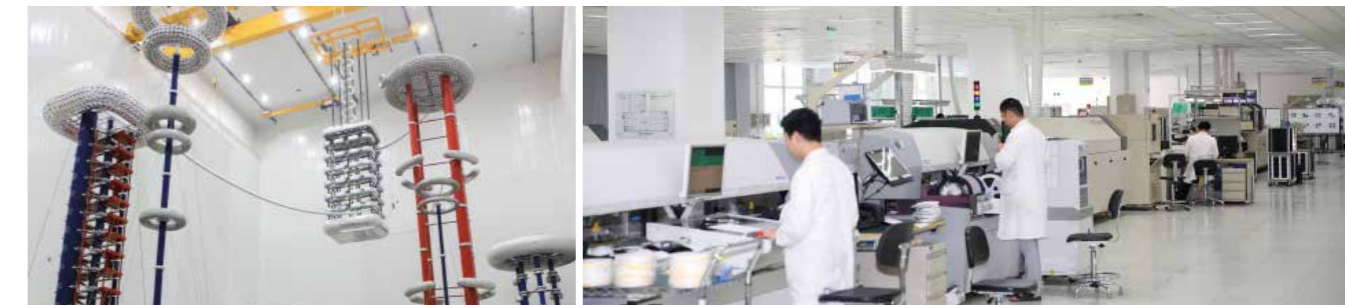
NR Intelligent Equipment Industrial Park has a number of production lines and intelligent testing and management system, realizing the intelligent and digital management of the production chain.

The IED factory adopts intelligent manufacturing system with green power rooftop PV generation system, which is environmentally friendly factory and ultimately reduce 4,500 tons of CO₂ emissions each year.

Focusing on power electronic products and solutions, the Changzhou manufacturing base is equipped with advanced printed circuit board production, power electronic device manufacturing and assembly capabilities, and a number of internationally leading automated production lines. The company also has an advanced power electronics test platform and a CNAS-accredited test center, capable of carrying out test inspections and technical research on a full range of high-voltage devices.

Hi-Tech Testing Laboratory

NR Electric has developed full series of strict testing processes to guarantee the device quality, starting from module inspection, to electrical and mechanism test. A full suite of in-house advance test laboratories are configured in the manufacturing plant to facilitate the analysis of device or system performance, including type test laboratory certified by ILAC and CNAS, HVAC & HVDC analog/digital simulation test laboratory , high voltage test laboratory and IEC 61850 Level B test laboratory certified by UCAIug. RTDS simulation Laboratory verifies the system functions and performances in the simulated final system conditions to ensure the delivered system meets the field quality standards.



Engineering Experiences

NR strives to offer a wide range of system and service solutions with the most updated techniques to our customers, assisting them to solve power system stability issues and develop to secure power supply. NR insists on working closely with power utilities and industrial enterprises, understanding their actual situations, and focusing on trouble shooting with down-to-earth attitude. With vast engineering experience gained from thousands of projects worldwide, NR is committed to customers' satisfaction and maximizing their benefits.

In the past 25 years, NR has successfully executed many critical projects all over the world. Through the implementation of these projects, NR has gained well reputation for its high quality products and superior services, including consulting, design, testing, supply, commissioning and training.

Service-Oriented Globalization

NR Electric has sets up fully owned subsidiary companies and technical service centers globally to better serve and deliver our customers worldwide. Via the local subsidiaries, our customers can access NR Electric's solutions and services promptly and easily with full understanding and compliance to the local legislation, culture, linguistic, and business requirement.

By localizing our operations and building a global value chain, NR helps local and global clients to maximize their global value and share win-win outcomes.