



CORPORATE PROFILE

Power Stability Expert



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 4000 high tech employees across the globe formulate. NR, a worldwide 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 **1,500+** digital substation projects

High reliable LCC-HVDC transmission solutions upto **±1100kV**

State-of-the-art VSC-HVDC transmission solutions supporting **world's first** 5-Terminal HVDC project

Field proven SVC solution with 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.

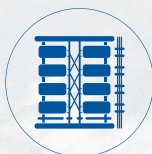
As a leading system solution provider, NR has gained solid experiences in cooperating with utilities to help them solve troublesome and emergent situations. We commit to realize customers' success and contribute to significant projects.

OUR BUSINESS

NR is one of the largest & ambitious 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**



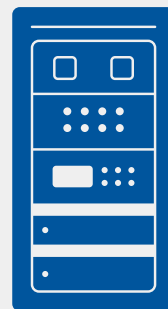
**Engineering,
Consulting & Service**

Protection, Automation & Control (PAC)

Built upon decades' of research and development excellence with field proven application experience in power system. NR' s intelligent PAC with ease of use and utility to make deployment, operation and maintenance of protection systems as smart, flexible and reliable as possible. The utility 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



Innovation Highlight

Protection Relay with DPFC

A revolutionized footprint in the history of China power grid.

In 1980' s, China power grid was encountered with frequently regional blackouts. To solve this technical dilemma, Mr. Guorong Shen, the founder of NR Electric (former as Nari-Relays) has developed Deviation of Power Frequency Component (DPFC) principles, effectively speeding up fault clearance time by 30% and improving relay protection detection time by 100%.

Late 2010' s, the digital substation concept became trendy in the whole world. NR blend IEC61850 technology with DPFC principles, creating new PCS series protection, automation and control devices to safeguard the operation of digital substations. So far, NR' s PCS series products have been applied to over thousands of substations all over the world and its performance is upto the record levels.



Power Stability Control System

A breakthrough principle that resists power system from frequent blackouts.

China Southern Grid (CSG) invests, constructs and operates power networks in Guangdong, Guangxi, Yunnan, Guizhou and Hainan Provinces. The main power grid of CSG transmits power from Yunnan and Guizhou grids to load centers in Guangdong. The grid is operating close to stability margin all the year. Transient stability problems, such as transient power angle instability and voltage fluctuations, had become major issues that threatened the safe operation of whole southern grid.

In the year 2003, CSG joined hands with NR to build a customized stability control system to deal with stability issues. After a deep research on the situation that CSG faced with, in the year 2004, experts from NR have developed PCS-992 series Power Stability Control System (PSCS), the world's most complex stability control system for HVAC & HVDC interconnecting. Totally, the whole system covers the control of 150 substations. Since then, the PSCS has correctly operated many times that it has created a reliable protective barrier for CSG.

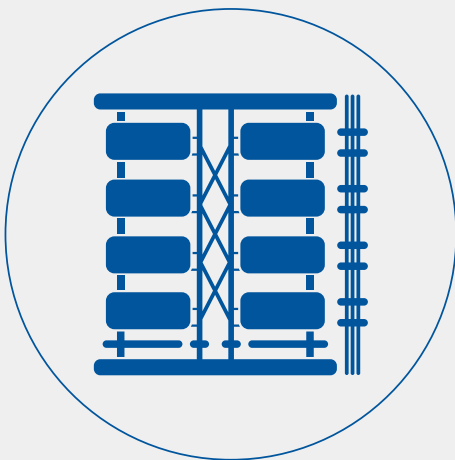


HVDC & FACTS

NR trendsetting field proven HVDC and FACTS solutions to solve reliability and efficiency problems in power system. Efficient bulk transmission of electricity over long span for special purpose of application by HVDC links that are justified based on combination of technical, economic and environmental advantages. NR is also reforming the conveyance of AC power over prolong ranges with flexible AC transmission system (FACTS) by improving voltage stability, grid reliability and energy security. The complete HVDC and FACTS solution, along with high quality equipment, will help to increase transfer capacity and ensure quality of your next generation smart grid.

Products & Solutions

- Line Current Commutated (LCC) HVDC
- Voltage-Sourced Converter (VSC) HVDC
- Static Var Compensator
- STATCOM
- Series Compensation
- Unified Power Flow Controller
- Controllable Shunt Reactor
- Fault Current Limiter
- DC De-Icing



Innovation Highlight

DC De-Icer with SVC Function

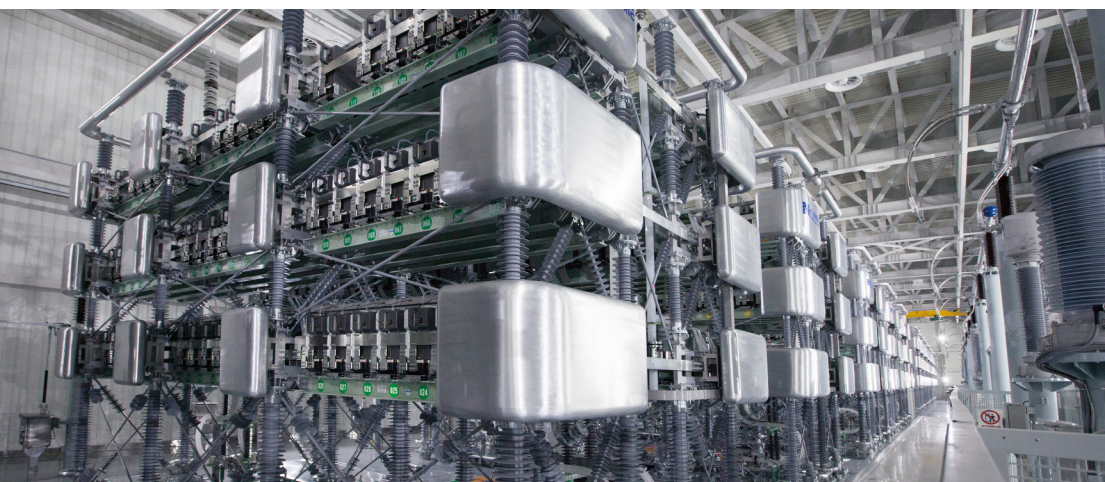
Technology inspiration makes life different.

In January 2008, Southern China was deteriorate from frozen rain disaster. Many transmission lines and towers were damaged which have led to large area blackouts and huge amounts of commercial losses. Faced with this emergent situation that never happened in Southern part of China, CSG worked closely with NR to find out a solution to defend power grid from ice disaster in half-year time. NR organized an expert team to tackle this problem. In three-month time, NR has completed the research and development work of PCS-9590 DC De-Icer. In the year 2009, the DC De-Icer passed all the tests and put into service. In the year 2010, when CSG was experiencing large area frozen rain disaster again, the PCS-9590 DC De-Icer operated normally that it successfully melted the ice coating on towers and transmission lines, avoiding a large area blackout and saving millions of money for CSG. In order to fully use the DC De-Icer during warming time, NR integrated SVC function in the DC De-Icer. Now, the updated PCS-9590 DC De-Icer can work as a SVC to increase the transmission capability of the transmission line during the normal weather.



World's First 500kV/750MVA Unified Power Flow Controller (UPFC) Project Powered by NR Technology

On December 19th 2017, NR has successfully launched commercial operation of the world's first 500kV/750MVA UPFC project, awarded by State Grid Corporation of China (SGCC). This UPFC project is located in the southern part of Suzhou city, Jiangsu, China. In the scope of supply, NR delivered all core equipment inclusively UPFC converter valves, valve cooling systems, thyristor bypass switches, electronic measurement transformers and executed more than 190 comprehensive and strict test features.



VSC-HVDC Technology for Multi-Terminal HVDC Application

An advanced solution to lighten isolated islands.

NR brought its VSC-HVDC solution to solve the grid interconnection problem for the world's first 5-terminal VSC-HVDC transmission project. The advanced solution includes VSC-HVDC valves, DC electronic CTs/VTs, and control & protection system.

In June 2014, Zhoushan multi-terminal VSC-HVDC project was successfully commissioned by NR. The connection has established an important link between the mainland and isolated islands, enhancing grid reliability and security of electricity supplies between Zhoushan and its associated islands.

In the following two years, to conduct detailed system analysis and study fast fault recovery system, NR built an electromagnetic transient simulation system comprising of AC system, VSC-HVDC valves, bridge dampers, control & protection system, resonant DC switch. Based on the analysis results, NR successfully introduces resonant DC switch solution with patented high reliable bridge damper for VSC-HVDC application. The system will effectively isolate DC short-circuit and will restore it within a very short period of time, where switching on/off of single converter station is enabled to enhance the reliability and availability of the whole VSC HVDC.



Renewable Energy & Microgrid

NR has specialized in renewable energy and microgrid energy technology offering customers a solution to their energy generation and efficiency needs. NR has designed and installed numerous renewable energy projects across the globe with practical experience and an in-depth understanding of a wide range of renewable technologies. The solutions features inclusive of high flexibility, safety, availability and reliability. NR will fully protect your renewable energy station and make your microgrid as effective as possible.

Products & Solutions

- Microgrid Controller
- BESS Controller
- Energy Management System (EMS)
- Power Plant Controller (PPC)
- Renewable Energy Scada (RE SCADA)
- Static Frequency Converter (SFC)
- Load Commutated Inverter (LCI)
- Power Forecaster
- AGC/AVC
- PV Inverter
- Power Converter System (PCS)
- Excitation System
- BESS Solution
- Microgrid System
- Grid-connection Solution



Innovation Highlight

Centralized Monitoring of Renewable Energy

An advanced solution for enhanced operation efficiency.

We developed the culture of renewable energy integration for a sustainable world. The fast development of renewable energy generation causes grid integration and operation efficiency problems, such as wide area maintenance and monitoring information collection. Furthermore, the mass monitoring data is usually collected from renewable stations without any necessary analysis. To overcome the issues, NR combines power forecast and centralized monitoring & management in one automation system to improve the efficient management and optimize operation of renewable generation. In 2015, NR customized the PCS-9700 central SCADA system for Three Gorges Energy project in China. The project is composed of wind farms, solar farms and small hydropower plants. The PCS-9700 central SCADA system offers remote management of 87 renewable stations, including remote generation monitoring and management, comprehensive data analysis, unified operation and maintenance, etc. The real-time data processing function improves operation efficiency by enabling centralized control and remote monitoring of multi-million data points. A mobile app of monitoring system is developed based on live data models of PCS-9700 to obtain real-time and historic data of all 87 renewable stations.



Engineering, Consulting & Service

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.

Systems & Services

- Substation Turnkey
- Solar Power Turnkey
- HVDC Turnkey
- FACTs Turnkey
- BESS Turnkey
- System Analysis
- Engineering Design
- Protection Setting
- Operation & Maintenance
- Training





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.

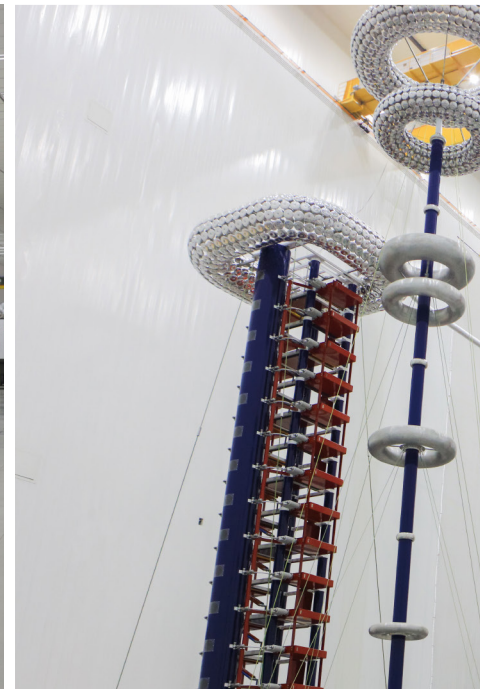
Certified to International Safety and Functionality Standards

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 Program Implementation

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 situated in Nanjing, China with four independent campuses for management, research & development, manufacturing and testing. With world class standards and systems, the IED and power electronic equipment factories are situated over 500,000 square-meters (5,400,000 square feet) of area with annual manufacturing capability of 1,600,000 IEDs, 37,000 panels and 1,300 power electronics equipment. The IED factory adopts intelligent manufacturing system with rooftop PV generation system, which helps to save around 865 tons of coal and ultimately reduce 2155 tons of CO₂ emissions each year.

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 20 years, NR has successfully fulfilled executed many mission 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.



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