



I.R. Iran
Ministry of Energy Niroo Research Institute



Research, Knowledge, Improvement

Niroo Research Institute

Support and Development of Ideas to Technology
in the Power and Energy Innovation Ecosystem



www.nri.ac.ir



Niroom Research institute
International Affairs Office



About Us

Niroo Research Institute (NRI) is the main research organization in Electric Power industry of Iran, affiliated to the Ministry of Energy (MOE) of Islamic republic of Iran. NRI has played a leading role in developing new technologies and enhancing knowledge for Electric Power Industry of Iran since 1997. NRI is performing the dual task of meeting the present and future demands of electric power industry, while making a better use of available resources, preserving the environment and achieving its objectives. NRI Missions could be summarized as the following: Research management, cutting edge researches performing, implementation of strategic and high risk studies, development and implementation of commercialization of research results, acquiring new technologies, preparation standards, providing lab services and quality assessment of equipment or products. In line with its mission and key responsibilities, NRI has taken necessary steps to build required capacities



in order to realize scientific and technical map of the country and also strategic plans of MOE of Iran in the fields of Power Generation, Transmission, Distribution and Consumption, and also research management and supporting the establishment of new technical businesses, supporting and funding the research projects. Niroo Research Institute (NRI) has been ranked within the top 10 Iran research institutes, according to ISC Rankings 2020.

NRI Missions

- Research Management in Electric Power Industry
- Cutting Edge Researches performance in Electric Power Industry
- Implementation of Strategic, Macro, Long term & High risk Studies in Electric Power Industry
- Commercialization of Research Results
- Acquiring New Technologies in Electric Power Industry
- Preparation Standards, Providing Lab Services, Quality Assessment of Equipment/products used in Electric Power Industry





NRI Values

- Being resource of technologies in the area of electric power and energy industry
- Technology forecasting and innovating
- Being customer-oriented
- Learning sciences and improving continuously
- meritocracy and elitism consideration
- Having effective interaction with other science-research institutes



NRI Activities

- Performing basic, applied and developing research projects with the aim of achieving Ministry of Energy technical and required knowledge in the country regarding the stable development
- Recognizing different requirements of considered research plans in different fields of science and research and utilizing the facilities for the sake of planning research projects related to the Ministry of Energy requirements
- Performing necessary activities for the sake of applying research results
- Providing necessary facilities with the related research designs and plans
- Investigating, recognizing and settling the research requirements of Ministry of Energy
- Establishing active and constructive relations with other research and scientific institutes inside and outside the country by holding scientific conferences,



exchanging researchers and carrying out joint research projects for achieving to the most recent technology and science in the fields related to NRI objectives and policies

- Utilizing the latest results of research and scientific progresses for the sake of social, economical and scientific development in order to improve NRI research plans objectives
- Studying and investigating about the construction and providing the technical and basic requirements of Power Plants, Substations, Transmission lines, and other related problems to the Ministry of Energy and companies affiliated to it



Niroo Research Institute

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NRI Research Centers



Power Generation Research Center

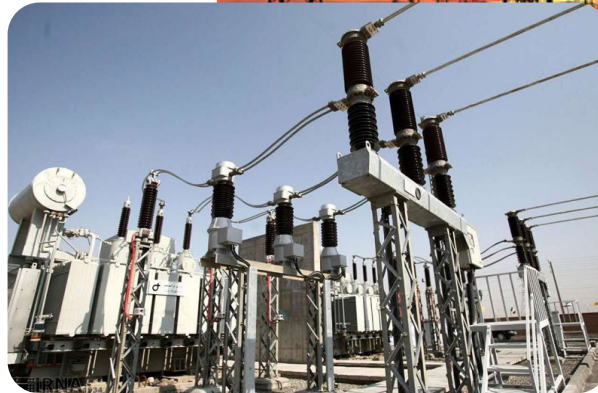
- Power plant thermal cycles
- Steam generators
- Condenser and heat exchangers
- Cooling towers
- Fluid transfer systems
- Identification and modeling of power plant processes
- Process control methods
- Status performance monitoring
- Control of thermal power plants
- Control of hydropower plants
- Control of distributed generation generators
- Power plant simulators
- Design and manufacture of rotary machines
- Design of thermal cycles
- Design and modeling of combustion chamber and boiler
- Design and manufacture of heat exchangers and cooling towers
- Acoustic vibrations and dynamic analysis
- Design and manufacture of distributed generation and CHP generators
- Design and manufacture of power plant equipment





Power Transmission Research Center

- Transformer
- high voltage
- Transmission substations
- Ground and overhead transmission lines
- Operation, control and telecommunications
- Transmission network protection and automation
- Power Electronics
- Electricity planning and economics
- Power transmission structures



Power Distribution Research Center

- Smart distribution network, micro grid (micro/nano) and virtual power plant
- Information security and digital transformation in the electricity distribution network
- New customer service systems
- Design and manufacture of equipment located in areas with special climate
- Design and operation of future distribution networks
- Design and manufacture of electronic power and power quality equipment
- Distribution network infrastructure to supply and exchange energy between the electric vehicle and the network
- Manufacture and operation of distribution transformers
- Design and development of distribution automation system
- Design and manufacture of new power supply equipment in the power distribution network
- High efficiency electric motors with general use
- Application software for distribution network and integration of data and information
- The use of nanotechnology in the distribution industry





Energy and Environment Research Center

Development of Renewable Energy

- Potential studies of renewable energies in the country
- Technology development of renewable energy production and conversion systems
- Consultation and cooperation in the expansion and development of technical, economic and legal infrastructures
- energy performance
- Research in the field of network peak load management
- Research in the field of productivity and optimization of energy consumption
- Cooperation and participation in the development of efficient equipment technologies
- Management of the environmental effects of the electricity industry
- Identifying, monitoring and controlling the emission of environmental pollutants
- Studies on the effects and social costs of the emission of pollutants in the electric energy cycle
- Research in the field of correlation between energy, water and environment

Energy and Environment Research Center

Renewable Energy

- Energy Management
- Energy planning and policy
- Energy efficiency
- Electrical load management and energy consumption
- the environment
- Management and trading of emission of pollutants and greenhouse gases
- Monitoring and control of pollutants
- Health, safety and environment management





Policymaking Studies and Governance Research Center

- Scientific and specialized support for decision-making and policy-making at the macro level of the electricity industry using the scientific and specialized capacities of the country
- Streamlining knowledge and scientific discourse in the specialized field in the electricity industry and effective stakeholders
- Foresight and research policy
- Management and implementation of applied research needed by the beneficiaries
- Strategic studies of the management of large plans and projects
- Energy economy and environment
- Determining the optimal arrangement of production in the electricity market
- Investment and financial markets
- Social dimensions of the development of the electricity and energy industry
- Social studies and consumption management
- Energy supply and demand planning (energy planning)
- Map of key technologies
- Scientific and technological diplomacy
- Human resources in the electricity industry
- Management and sociology of science, technology and innovation in electricity and energy industry
- Intellectual Property Rights
- Environmental rights
- General accounting
- Governance and strategic studies in the electricity industry
- Law of contracts, international trade and investment
- Foresight and future research



Research Departments





NRI Research Departments

- Renewable Energy Research Department
 - Energy Management Research Department
 - Environment Research Department
 - Energy and Electricity Economics Research Department
 - Power Systems Operation and Planning Research Department
 - Transmission Line and Substation Equipment Research Department
 - High Voltage Studies Research Department
 - Power Electronics Research Department
 - Electrical Machines Research Department
 - Power Plant Monitoring and Control Research Department
 - Electronic and Instrumentation Research Department
 - Information and Communication Technology Research Department
 - Smart Control Systems Research Department
 - Mechanical Rotary Equipment Research Department
 - Thermal Cycles and Heat Exchangers Research Department
 - Non-Metallic Materials Research Department
 - Metallurgy Research Department
 - Chemistry and Process Research Department
- Power Industry Structures Research Department
 - Accounting and Financial Sciences Research Department
 - Management and Social Sciences Research Department
 - Foresight and Policy Research Department
 - Law Research Department

NRI Laboratories





NRI Reference Laboratories

NRI enjoys extensive facilities along with 29 equipped laboratories including 18 reference lab and 11 research lab certified by ISO/IEC 17025:2005.

Considering the important role of reference laboratories of NRI are responsible for providing an orderly and functional and regarding to the process of its research implementation and effectiveness and development programs related to the reference laboratories following objectives in providing superior laboratory services in Power Industry according to the customer as its epigraph is placed.

Goals

- Increased reliability of supply in the country and reduced to silence and its subsequent.
- Assuring the accuracy and performance of standard equipment to be used in different sectors of power industry
- Possibility of providing activities for domestic producers to increase the power equipment quality built into the equipment through the creation of competitive markets and in their target markets abroad with the aim of developing export
- Avoid spending considerable foreign exchange for the standard tests on equipment made in the reference laboratories abroad
- Prevent the import and installation of poor quality equipment in power network.
- Currently, goods and equipment imported in different parts sometimes because of inadequate delivery instructions, leading to lack of quality goods and equipment with international standards to the country.

NRI Reference Laboratories

- Short Circuit Laboratory
 - Reference High Voltage Laboratory
 - Relay and Protection Reference Laboratory
 - Salt Fog Laboratory
 - Miniature Circuit Breaker Laboratory
 - Tower Test Station
 - Power distribution and lightning poles laboratory
 - Reference Electric Power Industry Communication Laboratory
 - Quality test and smart meter Reference Laboratory
 - Electric Machine Laboratory
 - Industrial Electronics Laboratory
 - Gas Fuel Analysis laboratory
 - Wire and Cable Reference Laboratory
 - Water And Steam Reference Laboratory
 - Paint and Coating Reference Laboratory
 - Oil and Fuel Reference Laboratory
 - Metallurgy And Materials Laboratory
 - Ceramic and Polymer Laboratory
- Electrical Hardware Laboratory
 - Air and Physical Pollution Laboratory
 - Fuel cell Fabrication and Testing Laboratory
 - Calibration laboratory
 - Industrial Automation Laboratory
 - Manufacturing Workshop
 - Performance Test Laboratory
 - Thermo hydraulics Laboratory
 - Vibration and Acoustic Laboratory

NRI Educational and Research Complexes:

1. Tehran
2. Isfahan
3. Fars
4. Khorasan
5. Azerbaijan
6. Kermanshah
7. Mazandaran
8. Gilan

Two test/pilot site:

1. Arak (First 1 MW Solar pilot powerplant/Tower Test Station)
2. Zanjan(Wind Turbine Site)



ABANiroo Standards, Tests & Inspection Research Center

Standards:

- Establishment of joint commissions to develop international standards
- Interaction in the application of common standards in the electricity network
- Establishment of a database and development of a network of standard specialists

Laboratories

- Providing mutual laboratory services in the field of electricity industry
- Establish a joint laboratory network and test chain management in the network
- Joint cooperation in equipping, developing and setting up laboratories in the electricity industry
- Provide mutual services in calibration of laboratory equipment
- Provide mutual services in evaluating and certifying laboratories

Technical Inspection of Equipment in the Electricity Industry

- Development of mutual services for technical inspection of specialized equipment of the electricity industry
- Establishing mutual interaction between technical inspection centers of specialized equipment of electricity industry
- Establishment of a joint database and network of technical inspection specialists
- Assess the qualifications of suppliers and compliance with the standards of specialized goods in the electricity industry





Niroo Research Institute

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Cooperations



NRI International Affairs Office

NRI intends to cooperate with foreign research institute toward the internationalization of research and technology development in accordance with mutual interest in undertaking collaboration and for the purpose of establishing academic-industry relationships, and more specifically in order to extend the effective and mutually beneficial cooperation research and technology development in the Electric Power Industry. The areas of cooperation may include any program to promote the above-mentioned goals according to mutual consent, availability of funds and the approval of both parties. NRI with more than 500 research staff provides services in the following fields:

- Research
- Consulting
- Design and know-how transfer
- Software
- Training
- Lab services





NRI International Cooperation

Niroo Research Institute is interested in cooperating and interacting extensively in international projects and welcomes joint projects in related fields:

- Joint research projects
- Co-funding Projects
- Research Services
- Human resource training and exchange
- Short-term and long-term scholarships
- Workshops and training courses
- Sharing infrastructures
- Laboratory Services
- Knowledge sharing
- Commercialization
- Joint conferences and publications
- Matchmaking between research institutes and industrial companies.



Joint Cooperation Potentialities of NRI



- Power Generation Research Center
- Power Transmission Research Center
- Power Distribution Research Center
- Energy and Environment Research Center
- policymaking Studies and Governance Research Center





Power Generation Research Center

- Upgrading of power plant units including basic upgrade of gas and steam turbines to increase power, efficiency and life
- Design, development and implementation of operation and maintenance management system for power plant units aiming performance optimization
- Development of distributed generation power plants
- Providing laboratory reference services related to the field of electricity production



Power Transmission Research Center

- Design and construction of high power Static VAR Compensator (SVC)
- Design and implementation of power marketing software
- Design and implementation of general planning software
- Design and construction of High voltage switch life estimating (aging) device
- Design and construction of oil transformer monitoring device





Power Distribution Research Center

- Develop master-plan for energizing the urban areas, rural areas or off-grid regions regarding to climatic and environmental condition
- Determine accurate energy loss amount and propose optimal energy loss reduction solutions
- Design and implementation of electrical distribution network automation, smart grid and micro grid
- Design and production of modern power electronic devices like active power filter, electronic tap changer, etc.
- Operation and Maintenance (O&M) of electrical distribution network equipment based on their critical function in electrical network
- Feasibility study, optimal placement and apply renewable energies as well as define grid connection constraints and procedures



Energy and Environment Research Center

Renewable Energy

- Performing quality assurance test for PV Modules (Items related to solar simulator and EL tester)
- Wind turbine design, design review, load calculation, wind farm design, issuing of performance and conformity certificates and farm monitoring
- Solid Oxide Fuel Cell (SOFC), scientific and technical services and consultancy
- Future study and consultancy in potential assessment and executing Renewable Energy systems (Solar Energy, Wind Energy, Biomass and waste management, Geothermal resource exploration and so on)

Technology Development & Pollutants Management in the Power Sector

- Air pollutants dispersion modeling based on the integrated WRF-CALPUFF model for thermal power plants
- Pollution mapping of air pollutants emitted from thermal power plants.
- External cost estimation of electricity generation.
- Source apportionment of air pollutants for air quality management.

Energy Planning Projects

- Optimal long-term capacity expansion mix for different energy sectors including electricity, oil and gas, renewables, nuclear and coal
- Determination of energy shadow prices, required investment for different energy sectors, export and import of energy carriers, etc.
- Forecasting Long-term final and useful energy demand in different sectors including residential, service, industry, transportation and agriculture
- Determination of the effects of energy management policies and energy price increases on energy demand
- Determination of the effects of interaction between macroeconomic sectors and the energy sector through soft- linking



Energy and Environment Research Center

Energy Audit of Buildings

- Determination of energy consumption components based on different approaches (end-use, primary, natural gas and electricity)
- Determination of energy consumption pattern for current state
- Reduction of energy consumption in the buildings
- Preparation of operating guidelines for office buildings







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