

1. Outline of Research Activities

CRIEPI's R&D Portfolio in FY2012

(Pillars of research and eight research laboratories)

1. Outline of Research Activities

In FY 2012, CRIEPI conducted research aimed at developing a robust and flexible energy supply/demand infrastructure in order to provide a stable supply of electric power, which is the foundation of Japan's economic activity. This research was conducted under the "Three Pillars of Research", which govern our mid-term directives; namely "Establishment of Optimal Risk Management", "Further Improvement of Facility Operations and Maintenance Technologies" and "Development of a Supply/Demand Infrastructure for Next-generation Electric Power". CRIEPI also leveraged our collective strength and took priority action to address the pressing issues of nuclear power plant safety and natural disaster reduction on transmission and distribution facilities.

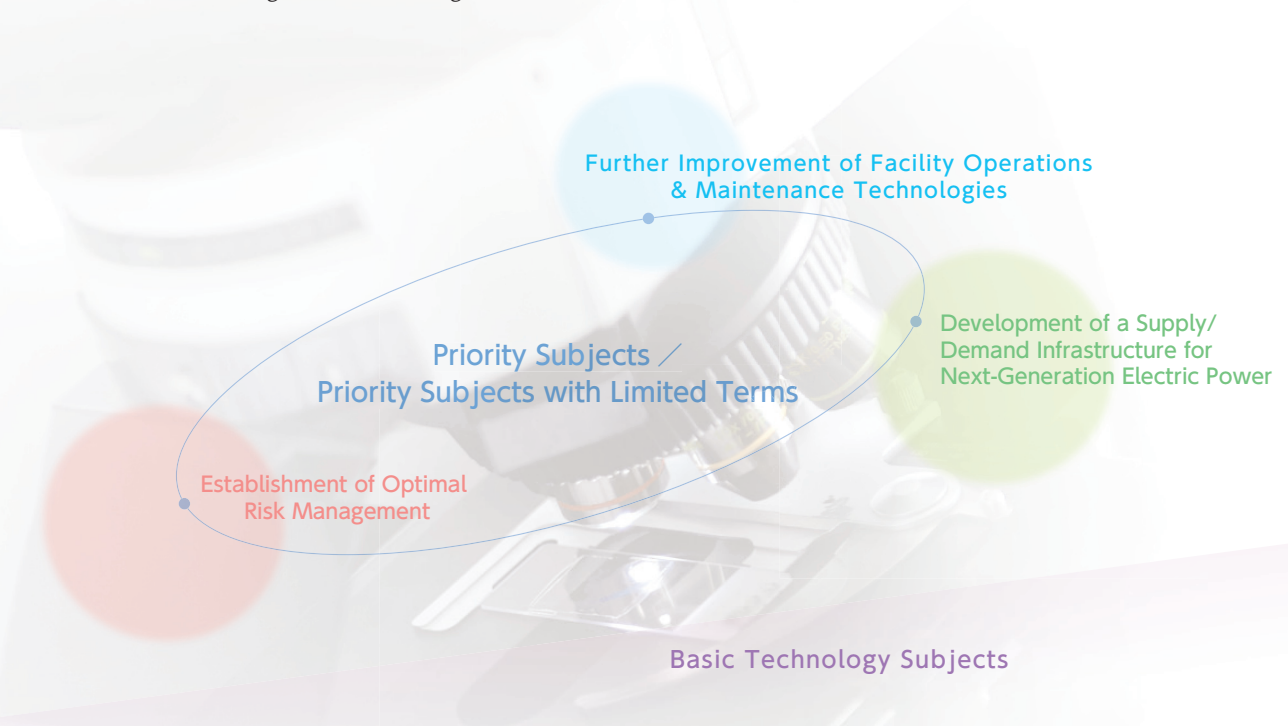
CRIEPI has selected 33 priority subjects to maintain and develop the technologies which are considered to be essential to current and future electric power industry. CRIEPI particularly concentrated on 9 priority subjects with limited terms, recognizing their urgency, and consequently produced solid results. 24 priority subjects and 9 priority subjects with limited terms were grouped into 11 technology categories, and research within the same area was conducted effectively. Furthermore, we launched 37 basic technology subjects and, through action leveraging the characteristics and expertise of 8 specialized research laboratories*, we strengthened our research capability by basic technological strength and areas of specialty, which is the source of solving problems faced by the electric power industry. In concrete terms, by accumulating data and know-how through field investigations and

experiments and the development, maintenance and improvement of analytical techniques, basic research was conducted to conceive new ideas.

The major research results produced in FY 2012 are described in Chapter 2. The chapter lists the respective goals and results of both the priority subjects addressed by each subject and the basic technology subjects addressed by each specialized research laboratory.

To support the technology infrastructure of the electric power industry as well as maintain and strengthen CRIEPI's basic research capability, the following core research facilities were installed; several Power Conditioning System (PCS) test facilities to contribute to resolutions when large volumes of PV are introduced; a testing facility for long CV cable insulating properties to examine the insulating properties of aged CV cables; a short-wavelength laser device for atom probe devices that enables infinitesimal chemical elements to be analyzed in metal crystal grain boundaries; Electron Probe Micro Analyzer (EMPA) devices used in wide-field surface elemental analysis of radioactive materials; and an outdoors disconnect switch for use with large-capacity short-circuit testing facilities that enable a maximum of 100kA in continuous current.

*Socio-economic Research Center, System Engineering Research Laboratory, Nuclear Technology Research Laboratory, Civil Engineering Research Laboratory, Environmental Science Research Laboratory, Electric Power Engineering Research Laboratory, Energy Engineering Research Laboratory, and Materials Science Research Laboratory.



CRIEPI's R&D Portfolio in FY2012 (31st March, 2013)

Priority Subjects / Priority Subjects with Limited Terms

Priority Subjects: ● Priority Subjects with Limited Terms: ○ Basic Technology Subjects: ◆ Subject group: Frame enclosure
 ■: Society and economy □: Atomic power □: Power generation (except for atomic power)
 □: Electric power circulation □: Demand side

Establishment of Optimal Risk Management

Regulations for Energy and Environment policy

- Policy toward Sustainable Structures and Regulations for Electric Utilities
- Analysis for Energy Saving and Environmental Policy - A Harmonized View of Economic Rationality and Energy Security
- Scientifically and Economically Rational Scenarios to Reduce CO₂ Emissions

Advancement in LWR safety

- Safety Assessment of LWR Systems
- Improvement of Safety Assessment Technologies on External Natural Hazards for Nuclear Facilities
- Assessment of Radioactive Material Diffusion in the Environment and its Remediation Effectiveness
- Development of Fire Modeling Methodology for Nuclear Power Plant Applications

Radiation risk elucidation

- Quantitative Evaluation of Low-Dose Radiation Risk and its Reflection on Radiation Protection

Backend Management in Nuclear Fuel Cycle

- Development and Systematization of Long-Term Safety Assessments
- Development of Long-Term Storage Management Technologies for Spent Fuel

Measures against a natural disaster of electric power distribution facilities

- Development of a Prediction Method for Meteorological and Climatic Impact on Power Facilities
- Establishment of Protective Measure Technologies against Damages of Overhead Transmission and Distribution Facilities Caused by Wind and Snow
- Development of Lightning Risk Management Schemes

Further Improvement of Facility Operations and Maintenance Technologies

LWR preservation support

- Integrity Assessment of Aged LWRs

Construction and employment / preservation support of electric generating facilities

- Development of Life Assessment Technology for High Temperature Structural Components of High Chromium Steels
- Development of Techniques for Comprehensive Impact Assessment of Thermal Power on Atmospheric Environment
- Development of Technologies for Supporting Construction and Maintenance of Power Plants from the Viewpoint of Biodiversity Conservation
- Synthesis System of Numerical Analysis for the Currents and Sediments in Rivers and Reservoirs

Employment / preservation support of electric power circulation equipment

- Demonstration of a Simplified Treatment Technique for PCB Contaminated Transformers
- Development of a Maintenance Scheme for Aged Power Transmission and Distribution Facilities
- Development of Soundness Assessment Techniques for Aged Overhead Transmission Steel Towers

Development of a Supply/Demand Infrastructure for Next-Generation Electric Power

Advancement of thermal-power-generation technology

- Improvement of Operation and Control Technologies to Diversify Fuel Types for Pulverized Coal-Fired Power Plants
- Development of Upgrading Technology for Low-Grade Energy Resources
- Development of Enhanced IGCC and Low Carbon Technologies

Next-generation Grid Technologies

- Assessment of System Security with High Penetration of Photovoltaics
- Development of a Next-Generation Coordination System for Power Demand and Supply
- Next-Generation Communications Network Systems
- Evaluation of the Feasibility of Demand Response Suitable for Japan

Electrification and Energy Conservation Technologies

- Development and Evaluation of Advanced Heat Pumps
- Development of High-Performance SiC Power Semiconductors
- Establishment of Evaluation Technologies for High Performance Secondary Batteries
- Evaluation of Energy Efficiency in Commercial Kitchens
- Acceleration of Electrification with Electric Vehicles and Secondary Battery Systems

Basic Technology Subjects

Socio-Economic Research Center

- ◆ Utility Management and Policy
- ◆ Economic and Social Systems
- ◆ Energy Technology Assessment

System Engineering Research Laboratory

- ◆ Electric Power Systems
- ◆ Customer Systems
- ◆ Communications Systems
- ◆ Mathematical Informatics

Nuclear Technology Research Laboratory

- ◆ Reactor Systems Safety Technology
- ◆ Nuclear Fuel and Reactor Core
- ◆ Nuclear Fuel Cycle
- ◆ Human Factors Research

Civil Engineering Research Laboratory

- ◆ Geosphere Science
- ◆ Earthquake Engineering
- ◆ Structural Engineering
- ◆ Fluid Dynamics
- ◆ Underground Energy Utilization Technologies

Environmental Science Research Laboratory

- ◆ Atmospheric and Marine Environment
- ◆ River and Coastal Environment
- ◆ Biological Environment
- ◆ Biotechnology
- ◆ Environmental Chemistry

Electric Power Engineering Research Laboratory

- ◆ High-voltage and Insulation
- ◆ Lightning and Electromagnetic Environment
- ◆ Applied High Energy Physics
- ◆ Electric Power Application
- ◆ High Current Technology

Energy Engineering Research Laboratory

- ◆ High Efficiency Power Generation
- ◆ Advanced Fuel Utilization
- ◆ Heat Pump and Thermal Storage
- ◆ Energy Conversion Engineering
- ◆ Innovative Numerical Simulation Technology

Materials Science Research Laboratory

- ◆ Materials for Nuclear Power Plants
- ◆ Structural Materials
- ◆ Materials for Energy Conversion and Storage
- ◆ Advanced Functional Materials
- ◆ Nondestructive Inspection
- ◆ Materials Science Research Fundamentals