

1. Outline of Research Activities

In FY 2011, the devastating earthquake brought drastic change to the electric power industry and Japanese society. In response to these changes, CRIEPI specified three areas as its main “pillars of research” for governing the mid-term direction of the institute’s research activities, which seek to help build both a robust and flexible energy supply-demand structure in Japan. The first area is the Establishment of Optimal Risk Management, the second is the Further Improvement of Facility Operations and Maintenance Technologies, and the third is the Development of a Supply/Demand Infrastructure for Next-Generation Electric Power. Working in line with these directive principles, CRIEPI has focused its research resources on select research projects to address the challenges of adjusting to the changes in the electric power industry and society, ensuring a stable supply of electricity, and establishing an energy supply-demand infrastructure for the future. CRIEPI utilized its expertise and the broad range of base technologies it owns to rapidly respond to some of the most urgent issues, including those related to earthquakes, tsunamis, and nuclear power plant accidents.

CRIEPI selected the “Project Subjects” as the most needed by the electric power industry and society, and for which the timely delivery of results and planning for implementation were required. The R&Ds on these subjects were conducted, drawing upon the collective strength derived from the cross-sectional collaboration of eight research laboratories.* In addition, CRIEPI efforts were also made to addressing future challenges, conducting research on key base technologies that serve as a source of solutions to problems, such as technologies that need to be maintained and passed on, those that need to be further developed, and those required for new research operations. To address these “Basic Technology Subjects,” CRIEPI has utilized the distinctive features and expertise of each research laboratory to prepare and improve these technologies.

In FY 2011, CRIEPI conducted research on 38 project subjects and 36 basic technology subjects, as shown in the “Breakdown of Research Projects.” It also placed a high priority on the research of the Plant Life Management Project which brought together four project subjects covering the aging of materials used in light-water reactors.

The principal research results in FY 2011 are described in Chapter 2. This chapter lists the different challenges addressed by each project subject, the basic technology subjects addressed by each specialized research laboratory, and the respective aims of each subject.

To facilitate the efficient generation of research results, we introduced new research equipment in FY 2011, including a field observation system consisting of a steel transmission tower exposed to wind and seismic forces, multicolor cell-sorting and electrical signal measurement system for ips cell analysis, and high-power testing facilities containing impulse current generators and small zeolite column test equipment. Chapter 3 provides an overview of these equipments. Chapter 4 summarizes the main track record of CRIEPI’s research activities.

*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 FY2011 (31st March, 2012)

Project Subjects

Establishment of Optimal Risk Management

Energy Policies Analysis

- Sustainable Structures and Regulations for Electric Utilities
- Energy Technology Strategy

Improvement of Seismic Reliability

- Seismic Margin Evaluation of Civil Engineering Structures in Nuclear Power Plants

Radiation Safety and Evaluation of Environmental Impact

- Assessment of Radioactive Material Diffusion in the Environment and its Remediation
- Elucidation of the Mechanisms of Low-dose Radiation Effects
- Rational Radiation Safety Technology

Backend Management in Nuclear Fuel Cycle

- Storage and Transport Technology for Spent Nuclear Fuel
- High-level Radioactive Waste Management
- Low-level Radioactive Waste Disposal

Natural Disaster Countermeasures at Power Transmission and Distribution Facilities

- Evaluation of Damage to Overhead Transmission Facilities Caused by Wind, Snow, and Salt
- Strategic Disaster Restoration Support Technology for Electric Power Distribution and Substation Equipment
- Lightning Protection for an ICT-oriented Society

Global Warming Projections and Impact Assessment

- Long-term Global Warming Projection and Support for Adaptation
- Severe Storm Prediction and the Impact Assessment of Electric Power Facilities under Global Warming

Further Improvement of Facility Operations and Maintenance Technologies

Development of Plant Life Management Research for Nuclear Reactors

- Irradiation Embrittlement and Structural Integrity of Reactor Pressure Vessels
- Stress Corrosion Cracking in Light-water Reactors
- Wall Thinning and the Seismic Evaluation of Piping
- Deterioration Diagnosis of Instrumentation and Electrical Equipment

Operation and Maintenance Support for Electric Power Generating Facilities

- Disaster Prevention and Maintenance for Hydropower Facilities
- Integrated Remaining Life Assessment Technology for Inspection, Prediction, and Monitoring

Operation and Maintenance Support for Electric Power Transmission and Distribution Facilities

- Operation and Diagnosis of Aged Power Apparatuses for Substations and Underground Power Transmission Lines
- Development of Simple Method for the Cleaning of PCB-contaminated Transformers

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

Next-generation Thermal Power Technologies

- Expansion of Fuel Types and the Improvement of Efficiency in IGCC
- Utilization of Low-grade Fuel
- Advanced Utilization Technology of Biomass and Waste
- Thermal Power Generation Systems with CO₂ Capture
- Basic CO₂ Storage Technology Development Considering Geological Structure in Japan

Next-generation Grid Technologies

- Integrated Operation and Control Techniques for Supply and Demand in Autonomous Demand Area Power Systems
- Next-generation Communications Network Systems
- Evaluation of the Feasibility of Demand Response Suitable for Japan
- Operation of Trunk Power Systems in a Coordinated Manner with Autonomous Demand Area Power Systems
- Next-generation Electric Power Equipment for Distribution and Transmission Systems

Electrification and Energy Conservation Technologies

- Design Support for Electric Kitchens
- High-efficiency Heat Pumps
- Low-loss Power Semiconductor
- Low-loss Compact Inverter Applied Equipment
- Acceleration of Electrification with Electric Vehicles and Secondary Battery Systems
- Lithium Secondary Batteries with Reliable Safety

Basic Technology Subjects

Socio-economic Research Center

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

System Engineering Research Laboratory

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

Nuclear Technology Research Laboratory

- ◆ Nuclear Power Generation Technology
- ◆ Advanced Nuclear Fuel Cycle
- ◆ Reactor Systems Safety
- ◆ Human Factors Research
- ◆ Nuclear Power Technology Applications/Innovative System Assessments

Civil Engineering Research Laboratory

- ◆ Geosphere Science
- ◆ Earthquake Engineering
- ◆ Structural Engineering
- ◆ Fluid Dynamics

Environmental Science Research Laboratory

- ◆ Atmospheric and Marine Environment
- ◆ River and Coastal Environment
- ◆ Biological Environment
- ◆ Environmental Risk Assessment
- ◆ Biotechnology

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 Energy
- ◆ Materials for Thermal Power Plants
- ◆ Batteries and Electrochemical Materials
- ◆ Advanced Functional Materials
- ◆ PD (Performance Demonstration) Certification System