

1. Outline of Research Activities

To struggle “ensuring energy security and responding to global environmental problems”, we define "nuclear technology", "stable electric power supply technology" and "environment and energy utilization technology" as three basic principles to conduct technical development at the supply sides for maintenance and improvement of power supplying force as well as technical development leading to low carbon society through high effective energy utilization at demand sides, biomass utilization, use of renewable energy and others.

Among the numerous research subjects of CRIEPI, we define “Project subjects”, for which there is an extremely high need by the electric power industry and the society, for which timely achievements and utilization are required. Research activities on these project subjects are surging ahead interdisciplinary under the lateral promotion organization combining eight professional research laboratories* of CRIEPI. Another group of research subjects is called “base technology subjects” where strenuous efforts are being made to develop and improve elemental technologies for future application. Those under development making the best use of the special expertise of the eight excellent laboratories include technologies to maintain and pass down, technologies to be further developed and technologies of which new research development is required, such as highly efficient energy utilization on the user side.

In FY 2009, intensive research activities were conducted for 37 project subjects and 35 base technology subjects as shown by the "CRIEPI's R&D Portfolio in FY2009" on the opposite page. There was one "general project" on the plant life management of light water reactors. This research project was given priority status in view of the aging of existing light water reactors and was promoted across various research fields.

The principal research results in FY 2009 are described in Chapter 2 by each subject in the case of project subjects and by each laboratory in the case of base technology subjects along with the objectives of each research subjects. New research facilities were installed to support research activities.

These includes an "updated large capacity short-circuit test device", "light water reactor materials analysis station", "piping corrosion wastage evaluation test device" and "enhanced large computer system for scientific computation". These facilities/equipments are briefly described in Chapter 3. The overall business activities of the CRIEPI are compiled in Chapter 4.

*These are the 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 Material Science Research Laboratory.

Ensuring energy security & responding to global environmental problems

Project Subjects

Nuclear Technology

Plant Life Management Research of Light Water Reactors (General Project)

- Irradiation Embrittlement and Structural Integrity of Reactor Pressure Vessel
- Stress Corrosion Cracking in Light Water Reactors
- Pipe Wall Thinning Evaluation & Seismic Evaluation of Thinned Pipeline
- Deterioration Diagnosis of Instrumentation and Electrical Equipment

Nuclear Fuel Cycle Backend Research Project

- Transport and Storage for Recyclable Nuclear Fuel
- High-Level Radioactive Waste Management
- Low Level Radio Active Waste Disposal

Improvement of Seismic Reliability

- Seismic Margin Evaluation of Civil-engineered Structures at Nuclear Power Plants

Advanced Fuel Cycle Technology

- Development of Metal Fuel Cycle Technology for Practical Application

Radiation Safety

- Elucidation of the Mechanisms of Low Dose Radiation Effects
- Rational Radiation Safety Technology

Stable Power Supply Technology

Maintenance and Operation Management of Electricity Supply Facilities

- Diagnosis and Operation of Aged Transmission and Distribution Facilities
- Evaluation of Damages to Electric Transmission Facilities Caused by Wind, Snow and Salt
- Development of a Simple PCB Removal Method for Contaminated Transformers and a Rapid PCB Measurement Method
- Strategic Disaster Restoration Support Technology for Electric Power Distribution and Substation Equipment
- Lightning Protection for an ICT Oriented Society

Maintenance and Operation of Power Generating Facilities

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

Next Generation Thermal Power Technology

- Expansion of fuel types and improvement of efficiency in IGCC
- Utilization of Low Grade Fuels
- Advanced Utilization Technology of Biomass and Waste
- Thermal Power Generation Systems with CO₂ Capture
- CO₂ Storage Technology

Environment and Energy Utilization Technology

Global Warming Projection and Impact Assessment

- Long-term Global Warming Projection and Support for Adaptation
- Severe Storm Prediction and Impact Assessments of Electric Facilities Under Global Warming

Electrification and Energy Conservation Technologies

- Design Support for Electric Kitchen
- Highly-Efficiency Heat Pump
- Low-loss Power Semiconductor
- Low loss Compact Inverter Applied Equipment
- Secondary Battery Utilization Technology
- R&D for Safe and Reliable Solvent-free Lithium-Ion Polymer Batteries

Next Generation Grid Technology (TIPS)

- Integrated Operation and Control Techniques of Supply and Demand Sides in Autonomous Demand Area Power System
- Next-Generation Communication Network System
- Evaluation of Demand Response Programs
- Trunk Power System Planning and Operation Under Large Penetration of Intermittent Generations
- Next Generation Electric Power Equipments for Distribution System

- Energy Technology Strategy

Base Technology Subjects

Socio-economic Research Center

- ◆ Energy Utility Policy
- ◆ Regional Policy
- ◆ Energy Technology Policy
- ◆ Human Factors Research

Nuclear Technology Research Laboratory

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

Environmental Science Research Laboratory

- ◆ Atmospheric and Marine Environment
- ◆ Hydrospheric Environment
- ◆ Biological Environment
- ◆ Environmental Risk Assessment
- ◆ Biotechnology

Energy Engineering Research Laboratory

- ◆ High Efficiency Power Generation
- ◆ Advanced Fuel Utilization
- ◆ Energy Conversion Engineering
- ◆ Numerical Analysis of Turbulent Heat Transfer and Reacting Flows

System Engineering Research Laboratory

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

Civil Engineering Research Laboratory

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

Electric Power Engineering Research Laboratory

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

Materials Science Research Laboratory

- ◆ Materials for Nuclear Power Plants
- ◆ Materials for Fossil Power Plants
- ◆ Batteries and Electrochemical Materials
- ◆ Materials with Innovative Functions
- ◆ PD Center