

# II Research Activities in Fiscal 2005

## 1. Method of Conducting Research

In FY 2005, we engaged in research activities with the three objectives described below, centering on the eight research institutes according to specialized fields.

The main research subjects addressed in FY 2005 included 17 Promotive Subjects involving high-level needs of the power industry and community, and we quickly extended our research accomplishments, practical applications and 58 Base Research Subjects to support technology and management in the power industry, thus contributing to its preservation and development. We concentrated our basic research capabilities on research requested by the power industry and overseas organizations, solving problems in a proactive and flexible manner.

To carry out research, we identified the needs of the power industry and community to offer results applicable to the fields in question, when they were needed. In particular, in Promotive Subjects we focused on achieving all planned targets and applying the results of research by evaluating research progress and research evaluation by external authorities. We conducted an extensive review of research subjects for a new research promotion system starting in FY 2006, clarifying customers, uses for results, and timing.

In addition, we introduced a hybrid dynamic testing system for use in full-scale seismic tests, by linking mechanical tests using shaking table and structural analysis by numerical models to establish large fundamental research facilities to support research activities.

The following is an overview of major research for the period.

### 1. Promotive Subjects

Based on our three research objectives, we applied our combined research capabilities employing technologies accumulated by CRIEPI and a high level of expertise to proceed with work in 17 Promotive Subjects. Of these, three subjects continued and 14 subjects achieved their initial objectives and was completed in FY 2005.

#### (1) Cost reduction and ensuring reliability

Research conducted included work on life extension technologies for electricity delivery facilities, light water reactor plants, gas turbines and aged thermal power plants; rationalized operation and maintenance management technologies, and seismic hazard risk assessment technologies for electricity delivery facilities.

Of these, for advanced operation and maintenance technologies for LWR components, we developed a new correlation method for the reactor pressure vessel embrittlement based on the CRIEPI embrittlement model, and prepared technical basis and outline of the maintenance codes for the embrittlement correlation as well as flaw evaluation of the class 2 & 3 pipings.

#### (2) Creation of integrated energy services

We conducted research from a customer's viewpoint on comprehensive assessment in preparation for the introduction of distributed power generation, establishment of demand area network technologies, and development of SiC power diodes as the key technology for these.

In particular, there was significant progress in large diameter thick film SiC single crystal growing technology for the development of high voltage SiC semiconductor devices for power customers. High-speed and uniform film thickness growth at a practical diameter equivalent to four inches was achieved.

#### (3) Harmonization of energy and environment

In this field we conducted research aimed at solving environmental problems related to global warming and mitigation options, and clarifying the dynamic behavior of trace elements. To facilitate energy security, we engaged in research on the nuclear fuel cycle, the aim being to support nuclear power generation as an essential resource, evaluate low-dose radiation effects, and aid advanced utilization of pulverized coal combustion and biomass energy, a key to diversifying energy sources.

Of these, for the development of methods to project global warming, we performed long-term projections using the Earth Simulator to determine CO<sub>2</sub> stabilization level and analyzed global warming impacts such as increase of the atmospheric temperature. For the development of effective utilization technology of the biomass energy, the target performance for the gas-engine power generation using the wood biomass was achieved by using the carbonizing gasification test facility that CRIEPI had originally developed.

## 2. Base Research Subjects

We conducted work on 58 Base Research Subjects in ten research fields to support the technology and management of the electric power industry, including research on socioeconomic issues, the environment, energy services to customers, power delivery, nuclear power generation, fossil fuel power generation, new energy, information and communication, construction and preservation of power facilities, and advanced basic research.

We also took an active approach to cultivating and incubating research such as research on titanium oxide coating technology for high temperature parts, based on creative ideas.

## 3. Government Funded Researches

Using the research capability of the CRIEPI, we engaged in funding research by actively proposing the research themes that will make a major contribution to society and require major research funds, in addition to those themes currently faced by electric utilities. Consulting activities have also been conducted in response to the needs of local public bodies and the private sector.

Major government funded research projects are as

follows:

- Technical survey on environmental impact of power reactor decommissioning works
- Technical survey, etc. on recycled nuclear fuel storage
- Environmental impact survey of electromagnetic fields from electric power facilities
- Geological disposal technical survey, etc.
- Information security measures promotion business
- Development of practical elementary technology of metal electrolytic method dry reprocessing process equipment
- Development of damage prevention technology for welding structures in next generation high temperature nuclear plant
- Development of multi-element and multi-component simultaneous instrument technology for atmospheric nano particles
- Demonstration research of new electric power network system and electric power network technical demonstration research
- Technical development of solid oxide fuel cell system