Research Plans
&
Statement of Budget

FY 2011

[Revised version]

October 2011

Central Research Institute of Electric Power Industry

Contents

Research Plans

Revisions to Fiscal 2011 Research Activities and Statement of Budget

In the fiscal 2011 research plan established on March 10, 2011, Central Research Institute of Electric Power Industry (CRIEPI) aims to focus its Research on Nuclear Technology, Stable Power Supply Technology, and Environment and Energy Utilization Technology, as well as present solutions to issues such as the maturation of the electric power industry and various rising risks and issues that will lead to the creation of a future society by advanced electrification.

The Great East Japan Earthquake that struck east Japan on March 11, just after CRIEPI had established this plan, shook up trust in society and the economy, as well as trust in the science and technology that support them.

In particular, the accident at Fukushima Daiichi nuclear power plant did wide-ranging and severe damage with a grave impact on the plant's surrounding area and beyond. Restoring the environment in this region and returning the evacuated residents to their homes as soon as possible is the most important issue here. Resolving this means that the accident must be brought under control immediately and measures taken over the long term. This requires that we take up challenges that go beyond the traditional research framework and revise the conventional concept of safety and other issues in the research and development that will support the recovery from the earthquake, including these activities.

In this situation, since the earthquake CRIEPI has invested in its human resources and technology basis across a wide range of research fields to meet the diverse requests from the electric power industry and national government and utilized its knowledge to provide as much support as possible. Moreover, we have reviewed our medium to long-term research expansion from this point and revised the direction of our research so that CRIEPI is better able to contribute to the resolution of issues resulting from the earthquake and issues requiring new measures. Specifically, we have identified three new research pillars: "the establishment of optimal risk management," "Further improvement of facility operations and maintenance technology" and "development of a supply/demand infrastructure for next-generation electric power." With research to support the recovery from the disaster as the greatest priority, we scrutinized our research plans thus far, bearing in mind the changes in social values, and drastically revised our research activities overall. Going forward, we will focus on technology development related to these research pillars with the aim of building a safer and more stable society for the future.

In addition to these revisions to our research activities, we revised the administrations and budget that support these activities in line with the current external conditions and budget status. Accordingly, based on these changes, we have revised our fiscal 2011 Research Plans and Statement of Budget.

All CRIEPI employees will work together on the research activities outlined in this plan to generate results that can be utilized and contribute to the electric power industry and society.

Overview of Fiscal 2011 Research Activities

〈Research Activities〉

Since the Great East Japan Earthquake and the accident at the Fukushima Daiichi nuclear power plant, we have mobilized our knowledge and technology as well as our staff, ranging across various research fields such as earthquakes, tsunami, nuclear power, radiation, and atmospheric and marine diffusion, to provide the maximum amount of support in response to urgent demands from the electric power industry and the national government.

Moreover, we have established the "research pillars" described below. These represent the medium and long-term direction of our research, so that we may solve the issues posed by the earthquake and the issues that require new responses from the electric power industry, build a more flexible and resilient society and accurately respond to society's demands, which have changed dramatically since the earthquake.

We believe that we must identify and evaluate the risks associated with the stable supply of electric power, the foundation of society, and build technology that can reduce and manage these risks. Accordingly, our first pillar is the establishment of optimal risk management.

It is the responsibility of the electric power industry to support the Japanese economy with a stable supply of electric power as it tries to recover. So that CRIEPI may provide the technical support for this endeavor, the second pillar of our research is the further improvement of technology for the operation and maintenance of power generation facilities and transmission and distribution facilities.

To prepare for future risks, minimize these risks and overcome them, developing the supply/demand infrastructure for the next-generation electric power that will enable greater efficiency of electric power supply as well as energy security is an issue that should be aggressively addressed by research institutes supporting the electric power industry. Accordingly, this is our third pillar.

Under these research pillars, we thoroughly revised all research activities by focusing resources on issues with the greatest urgency and delaying some initiatives with future technologies. The structure of our research activities is as follows.

(1) Establishment of optimal risk management

Activities that assess the impact and risk posed by changes in natural phenomena and the society and economy to the electric power industry, and propose solutions to these risks, including social systems and mechanisms

—Energy policy analysis, improvement of earthquake resistance assessment, evaluation of radiation safety and environmental impact, support for nuclear fuel cycle backend technology, development of natural disaster reduction measures for transmission and distribution facilities, global warming projections and impact assessment

(2) Further improvement of facility operations and maintenance technology

Activities that aim to refine operation and maintenance technology for electric power facilities and continue a stable supply of electric power

—Developing technology for plant life management of light water reactors, support for the operation and maintenance of electric power generating facilities, support for the operation and maintenance of electric power transmission and distribution facilities

(3) Development of a supply/demand infrastructure for next-generation electric power

Activities that lead to the establishment of power supply/demand infrastructure for next-generation electric power to enable greater efficiency in electric power supply and use and ensure energy security

—Development of next-generation thermal power technology, next-generation power grid technology, development of electrification and energy-saving technology

In pursuing our research, we will focus our efforts as follows.

(1) Developing an organizational structure to effectively pursue research to support the recovery from disasters, the most important near-term issue, in line with required content and timeframe
(2) Continuous improvements in our research capability and deepening and strengthening activities aimed at exercising our comprehensive strengths through internal and external cooperation
(3) Appropriate management and more constructive utilization of intellectual property with the aim of maximizing the outcome—the impact on the electric power industry and society

〈Administration〉

In order to make the research related to the disaster recovery our top priority, we will shift staff and funding and take the following steps to respond appropriately to the changes in conditions affecting CRIEPI's operating environment and build a framework for our future research expansion.

(1) Cut costs further and effectively use assets by reviewing the content and process of research activities in light of changes in revenues and expenditures, as well as internal administration
(2) Take steps to set up institutional design and internal control systems as part of our transition to a status as a non-profit general foundation to respond to the reformation of public interest corporation system
(3) Reexamine all activities such as improving work assignments and promotions to encourage individuals to exercise their unique skills and strengthening information dissemination and public relations activities to enhance CRIEPI's value

〈Income and Expenditure Budget〉

In light of the impact of the earthquake, we have revised our income and expenditure budget by reviewing benefit income and reexamining expenditures to reflect the prioritization of earthquake-related research and changes to plans to introduce large-scale research facilities. As a result of these revisions, our budget has been reduced by 1.64 billion yen compared to the initial budget to 32.27 billion yen.

Research Activities

I. Research Plans

In fiscal 2011, CRIEPI will conduct the research described below under the concept of three new research pillars and achieve the needed outcome in a timely and reliable manner. We will be aware of the conditions facing the electric power industry and society, including the earthquake's impact, and will utilize our knowledge, technology and staff to the maximum extent possible to respond flexibly and promptly to the new issues that emerge.

1. Project Subjects

We select issues on which the electric power industry and society have a great need for research and that require timely results and applications as our 38 project subjects. We then capitalize on CRIEPI's collective strength to promote research in these project subjects. The main research to be carried out is described below.

(1) Establishment of optimal risk management

We will steadily pursue research on issues that assess the impact and risk posed by the changes in natural phenomena and society and economy to the electric power industry, and propose solutions to these issues, including social systems and mechanisms.

In particular, we will accelerate our efforts to establish the method of adequate seismic design for nuclear power plants, evaluate environmental contamination by radioactive substances and assess various decontamination technologies, and evaluate the risk of low-dose radiation. In addition, we will work to develop forecasting methods for natural hazards and technologies helping to alleviate the damage caused by natural disasters on transmission and distribution facilities, and develop technologies supporting disaster recovery.

Energy Policy Analysis: From the academic and objective perspectives, we will propose a desired future for the electric power framework in Japan that can achieve social consensus. We will also provide various policy proposals by compiling information on and analyzing plausible approaches to energy technology policies such as the development of renewable energy and energy-conservation, and the technology transfer to developing countries, as well as the assessment of their impact on the electric power industry and society in Japan

Improvement of Earthquake Resistance Assessment: It is essential that qualified earthquake resistant design practices for nuclear power civil engineering structures are reconstructed, in light of the moment magnitude 9.0 earthquake occurred in the Tohoku region followed by offsets among several faults. These practices would provide indicators for the correlation among active faults that are important to establish reference seismic ground motions. Moreover, we will promote research on on-site slope failure, one of the sequences caused by extremely strong earthquakes, focusing on safety assessment and slope failure measures taking into account the realistic impact of three-dimensional terrain.

Radiation Safety and Environmental Impact Assessment: The release of radioactive substances due to the Fukushima Daiichi nuclear power plant accident led to serious environmental contamination (atmosphere, marine, groundwater and soil). In order to resolve this environmental contamination, we will use recently developed evaluation methods to ascertain the situation in detail and assess the effect of various decontamination technologies. We will obtain scientific data on the impact of low-dose radiation and clarify the mechanisms involved. Moreover, we will proactively disclose the information with the aim of reflecting the research results in international radiation protection standards and proactively disclosing this information.

Nuclear Fuel Cycle Backend Technology: We will develop technology designed to mitigate SCC in the metal canister in the storage concrete casks which offer such promise as a next-generation storage method for spent fuel. The results will then be reflected in a specification for concrete cask storage. Moreover, we will enhance the performance assessment of the engineering barrier materials that play an important role in the deep subsoil disposal of low level radioactive waste, and will develop methods for material durability resistance inspections using the Torrent air permeability test. Our research on the disposal of high level radioactive waste will include the long-term deformation estimation on the bedrock near the disposal hole and the engineering barriers by scaled tests using centrifugal loading apparatus.

Development of natural disaster recovery technology for transmission and distribution facilities: In order to contribute to effective measures of transmission and distribution facilities on the damage caused by natural disasters, we will endeavor to improve the existing disaster recovery systems on power distribution facilities based on

the measurements taken at the time of the Great East Japan Earthquake and thus enhance their reliability. We will strive to improve snow-related damage prediction technology based on field measurements, laboratory experiments and analysis results thus far, in order to refine evaluation of wind, snow and salt damage to transmission facilities, which is extremely important for the electric power industry. We will also clarify the effect of products on snow storm damage.

Global Warming Prediction and Its Impact Assessments: To support the examination of measures mitigating global warming caused by CO_2 emissions, we will develop a support tool for global warming countermeasures that incorporates information on the energy and economic impact, in addition to the simple assessment tool for climate change that we have already developed. Moreover, we will predict changes such as typhoons and heavy rain consequent with the global warming climate and identify the impact of these changes on hydroelectric power generation facilities and transmission facilities. This eventually promotes discussions on adaptation issues for global warming in the electric power industry.

(2) Further improvement of facility operations and maintenance technology

We will address technology development issues that aim to improve operations and maintenance technology of electric power facilities and sustain a stable supply of electricity.

In particular, we will carry out the R&D needed to continue operations of light-water reactors and develop operations and maintenance technology for other power generation facilities and transmission and distribution facilities in order to support the Japanese economy after the earthquake with a stable power supply.

Research on Plant Life Management of Light Water Reactors: To ensure the safe and stable operation of light water reactors, we must ascertain the characteristics of aging degradation following long-term use, such as irradiation embrittlement, Stress Corrosion Cracking (SCC) and pipe wall thinning, and carry out appropriate maintenance and management in these areas. We will conduct research to identify the mechanism of irradiation embrittlement at high neutron fluences, with the aim of expanding the application of the prediction method that we developed. We will also promote research to clarify the mechanism of SCC propagation in components and piping, and the wall thinning mechanism of steam-water two-phase flow piping, as well as continue to

develop prediction methods and evaluate the seismic reliability of thinned piping. Moreover, we will develop an advanced non-destructive inspection method for SCC and a method for diagnosing and assessing the deterioration of electric power cables caused by radiation and thermal stress in a nuclear power plant.

Operation and Maintenance of Electric Power Generating Facilities: We will establish guidelines for a seismic performance verification to be used for the dam embankment and spillway gate of gravity dams to make practical the seismic performance evaluations for aged dams, since stable operation of hydroelectric power generation will continue to be important. In addition, in order to develop a life assessments method for the welded part of high-chrome steel piping, which is essential for the appropriate operation and maintenance of high efficiency coal-fired power plants, we will carry out long-term material property evaluation tests of the circumferential welded pipe same as used in an actual boiler and collect the material strength data.

Operation and Maintenance of Electric Power Transmission Facilities and Substations: To establish proper operation methods of fast-increasing highly aged transmission facilities and substations, as the first step we will compile and accumulate data on the deterioration of highly aged 22kV-66kV class XLPE power cables. Moreover, we will develop a method an on-site analysis method in order to apply the cleaning technology to onsite processing of large transformers contaminated with low levels of PCB.

(3) Development of a supply/demand infrastructure for next-generation electric power

We will actively pursue the development of prospective technology in order to strengthen the electric power supply/demand infrastructure and develop energy-saving, low-carbonization technology, which will enable greater efficiency of electric power supply and use and ensure energy security.

In particular, we will actively pursue the development of next-generation thermal power generation technology, which is a more effective use of low-grade resources and can reduce the emission of greenhouse gases through more efficient power generation. Moreover, we will develop next-generation power grid technology to facilitate the introduction of renewable energy such as photovoltaic power generation to the electrical grid, as well as technologies that promote the efficient use of energy such as high-performance heat pumps and low-loss power semiconductor devices.

Development of Next Generation Thermal Power Technology: We will develop technology that will effectively use low-grade resources and reduce CO_2 emissions through greater efficiency of power generation using fossil fuels. In pulverized coal power plant, we will propose operation guidelines for the use of subbituminous coal blended with 50% or more bituminous coal. Moreover, we will examine the test data of IGCC (Integrated coal Gasification Combined Cycle) demonstration plant to optimize operations in IGCC and develop basic O_2-CO_2 gasification technology for the IGCC system with CO_2 capture developed by CRIEPI. We will ascertain the basic carbonizing properties of wood and waste biomass and improve the accuracy of modeling technology for their carbonization characteristics, which is a key technology for more advanced use of low-grade resources.

Establishing Next-generation Power Grid Technology: The required regulating power will increase in a power system with massive introduction of photovoltaics (PVs) and other renewable energy sources. Accordingly, we will propose a coordinated operation methods of customer's electrical appliances to relieve the burden on generation plants. We will also provide a detailed design of the customer gateway that will centrally handle the control information for PV and storage battery as well as the household energy use information in order to develop practical communication infrastructure required for the next-generation electricity grids.

Development of Electrification and Energy-saving Technologies: To promote energy conservation through electrification, we will evaluate the energy-saving performance of commercial electric kitchens in order to support optimal design of electric kitchens, and ascertain the performance of compact heat-pump water heaters (Eco Cute) in field tests. In our efforts to develop low-loss power semiconductor devices, we will work on technology for SiC crystal growth with a higher growth rate and low defect density. Moreover, in the development of all-solid-state lithium polymer secondary batteries for home use, which are extremely safe, we will make prototypes of batteries and examine technology to extend battery cycle life. In addition, to popularize electric vehicles, we will develop techniques to assess the impact of electronic vehicles and technology to improve their convenience.

2. Base Technology Subjects

Base Technology Subjects are those that we address for the primary objective of creating, maintaining, expanding and sustaining the technology that serves as the important foundation for strengthening research capability in each field. These include basic research, field studies, regular observations and the creation of databases based on these findings, the development of analytical methods and algorithms, and the formulation and refinement of analytical models.

In fiscal 2011, we will designate 36 base technology subjects, while capitalizing on the strengths and specialized skills of eight laboratories with specific research fields*. This system will enable us to foster the base technology strengths that are the source of solutions to the issues faced by the electric power industry and accurately and swiftly resolve the issues that emerged with the earthquake and the Fukushima Daiichi nuclear power plant accident.

CRIEPI research to support the recovery from the disaster of the Great East Japan Earthquake particularly focuses on the following initiatives.

- Proposals for the desired electric power industry regulation framework in Japan based on the drastic socio-economic developments after the earthquake on March 11, 2011
- Analysis and evaluations of energy demand based on the economic outlook, including possible recovery and reconstruction scenarios
- Development of technologies to maintain secure operation of a power system with massive integration of distributed generation
- Quantitative evaluation of effectiveness of measures countering risk of loss of offsite power, based on a review of scenarios following a severe accident caused by external events in light water reactors
- Stagnant contaminated water treatment at the Fukushima Daiichi power plant as an urgent issue, and evaluation of characteristics of fuel debris and development of processing technology for its stabilization as long-term issues
- Preparation of basic technology, such as the development of tools to evaluate severe accidents at light water reactors
- Development of an epicenter model to evaluate ground motions with a wide range of periods or frequencies based on the characteristics of the epicenter off the Pacific Coast in the Tohoku earthquake
- Investigation and evaluation on seismic performance of a steel transmission tower, based on analysis of the records obtained during the 2011 Tohoku earthquake

*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.

II. Research Promotion

We will pursue research by utilizing the expertise we have acquired over our history and bring our research capabilities together to propose solutions to the issues that could emerge in the future and the issues that require long-term efforts, as well as the urgent issues we face since the earthquake.

With the aim of further extending and advancing our basic research capability, we carry out research in line with the approach of our new research pillars to maximize the academic, social and economic impact of our research results with a focus on the outcome on the electric power industry and society. We also consistently follow PDCA in our research on these issues and meet the power industry and society's expectations.

Our specific endeavors are described below.

(1) Promotion of research to support the recovery from the earthquake disaster with all research centers, CRIEPI

It is crucial that research to support the recovery from the earthquake disaster, the most important issue in the near term, is pursued effectively in line with the content and timeframe and that the results are utilized to the maximum extent possible. To this end, we have assigned a Nuclear Power coordinator and Disaster Support Research coordinator in the Planning Group which is located in the head office, and pursue research in the fields of earthquake and tsunami countermeasures, nuclear power and radiation safety, energy policy and business management environment under the supervision with the Vice Presidents as a coordinators and cooperate with all research centers. In particular, we will organically utilize the expertise that we have built up at the research centers to promptly address issues related to the Fukushima Daiichi nuclear power plant accident, and will endeavor to generate highly effective results that can be applied on site. Moreover, we will proactively provide on-site support with radiation measurements and other efforts.

(2) Enhancing Research Capability and Exerting Comprehensive Strength

The ability of researchers lies at the root of research capability, and CRIEPI's maximum asset is the knowledge and technique of our individual researchers. This means that extending and enhancing these research capabilities would further raise the potential of our research. Accordingly, we will unceasingly engage in trial and expeditious research activities based on the researchers' own concepts.

Moreover, we will exercise our comprehensive strengths by promoting cross-cutting research by

coordinating with eight professional research institutes in our search for resolutions to the increasingly complex and diverse issues we face. In particular, we will compile internal and external knowledge for study and analysis and designate prospective research topics in order to strategically promote the kind of research that the earthquake requires us to undertake and the kind of research that can impact the electric power industry and society. Moreover, we will integrate and combine CRIEPI's internal research capability by rebuilding a research base in the future and establishing an environment that promotes research with organic cooperation between researchers and administrative staff who support research. This will enable us to accurately meet the needs of the electric power industry and society.

In addition, we will carry out research in cooperation with domestic and overseas university and research institutions with impressive knowledge in specific fields (Institute for Transuranium Elements, Joint Research Centre, European Commission (ITU), National Center for Atmospheric Research (NCAR), Japan Atomic Energy Agency, and Marine Ecology Research Institute, among others). Such collaboration will enable scientific knowledge to mutually complement each other and more efficiently generate more advanced research results.

(3) Promotion of Funded Research

Applying CRIEPI's basic research capability, we will proactively engage in research that meets the needs of the electric power industry, and will also receive government funding for research that will help to clarify issues related to the electric power industry. As an objective testing center, we will also facilitate the projects of the PD Center, which gives certification exams for experts of ultrasonic inspection working with nuclear power plant components, as well as the projects of the High Power Testing Laboratory, which performs short-circuit tests on electric power equipment.

(4) Systematic Introduction and Upgrades of Large-scale Research Facilities

We will systematically introduce large-scale research facilities to support the technological foundation of the electric power industry in order to meet the pressing needs of the electric power industry and society and expand our research in new directions.

In fiscal 2011, we review of the priorities of our existing research plans carefully after the earthquake. We drastically revised our plan to introduce "the Experiments Facility of Reactor Transient", which was intended to lead to the more advanced utilization of light water reactors in the future, and decided to cancel its introduction in fiscal 2011. However, we decided to introduce a "Shaking Table with Resonant Effect" to qualify the seismic performance of equipment crucial to earthquake resistance of a nuclear power generation station, as well as to augment "the Light Water

Reactor Materials Analysis Station" in order to further promote research on the stable operation of light water reactors.

Moreover, we began constructing "the test facilities of insulation deterioration for aged XLPE power cable system", to be completed in fiscal 2012, and are also introducing the "Facility for Experiments on Advanced Carbonization technology of Low-grade Resources" and the "Heat Pump Development and Test Facility".

(5) Management and Application of Intellectual Property

We will strategically secure intellectual property related to our research results and disseminate information appropriately to ensure its broad use. Specifically, we will digitize and microfilm research reports issued since CRIEPI's founding (to be completed in fiscal 2011) and expand our download services for disclosed materials. We will also strive to create high-value intellectual property by reinforcing the Center for Intellectual Property & Technology Licensing's function supporting patent searches and raising the quality of patent applications by utilizing invention consultation meetings. Moreover, we will make intellectual property more visible by evaluating value of research results with a focus on outcome and publishing intellectual property reports.

We will not only promote the use of the intellectual property we have built up to promptly resolve issues in the electric power industry, but will also strive to spread technology to people do the actual working on the front lines of society through arrange for discussion to take place such as technology exchange courses and technology lectures. Moreover, we will actively introduce patents and software through seminars hosted by technology transfer organizations and CRIEPI and external exhibits, and will encourage the transfer of technology to companies and others. Moreover, applying features as an academic research institutes we will contribute to formulation of various rules, standards, and technical guides related to energy and environment through joining to various committees, such as national and academic committees and others. We have offered software held by CRIEPI free of charge to institutions interested in using it in the recovery from the Great East Japan Earthquake until the end of fiscal 2011.

(6) Steady Implementation of Basic Activities

We will steadily carry out the following basic activities to promote a wide range of research activities and effectively disseminate information on research activities and results.

a. Collection of Literature, Materials and Statistics

We will secure and maintain a wide range of literature, materials and statistics and collect high-quality information by, for example, collecting information utilizing our position as an

academic research institute and augmenting the collections at CRIEPI's various libraries. The compiled information will be used in research activities, and also given back to society at large through publications such as research reports.

b. Establishment and Utilization of Large-scale Computer System

We will examine detailed specification and select the precise model as we upgrade our large-scale computer system in fiscal 2012 to cope with the increasing sophistication and complexity of our research. We will use this large-scale computer system for general purposes in research activities, and it will help in generating superior research results. Moreover, we will actively obtain licenses for software, such as the mathematical simulation program that we developed, for wide use by electric power companies and manufacturers.

c. Issuance of Publications

We will gather research reports and public relations media in line with the progress made with our research issues and disclose them to society at large via our website.

Administration

We will build a new framework for our research centers in order to respond to the expectations of the electric power industry and society, as well as to continuously improve CRIEPI's research capability, in order to cut costs and improve efficiency in the changing business environment following the earthquake. To do so, we will rebuild our research bases over the next few years, primarily in the Yokosuka Area, and will steadily address the reformation of public interest corporation system, adjusting our organization's management system as necessary. This will establish a foundation for the future. We have outlined our plans in detail below.

(1) Further cost reductions and efficient utilization of assets based on changes in income/expenditures

We will strive to cut costs further and implement our research activities more efficiently, given the difficult financial environment resulting from changes in the electric power industry and society since the earthquake. While ensuring the safety and quality of our research activities, we will review our operations and change procedures. We will be particularly rigorous in our decisions on whether or not to implement projects with large budgets and that are expected to be costly in future fiscal years. We will continue to curb personnel expenses by making further cuts in executive officer compensation and employee salaries as well as reviewing long-term measures, including the retirement benefit system.

In addition, we will attempt to sell assets that we do not expect to use in the future and part of the land acquired in the Komae Area, and use the money thus generated to rebuild research centers, such as building in the Yokosuka Area, and expand new research. Moreover, we will strive to effectively utilize existing research facilities as well as to dispose of unused facilities as we rigorously operate and manage assets.

(2) Reconstruction of Research Bases for New Research Developments

We will flexibly rebuild our research bases in Yokosuka, Abiko and Komae as the situation demands, clarifying their role in future research development and laying out the concept behind the facility as part of CRIEPI. Specifically, we will build the Center for Research on Energy Industry Technology by consolidating the Nuclear Technology Research Laboratory and System Engineering Research Laboratory in Komae with the new research institute in Yokosuka, which has the Electric Power Engineering Research Laboratory, Energy Engineering Research Laboratory and Material Science Research Laboratory. This will strengthen our ability to resolve issues corresponding to the value

chain stretching from power generation, transmission and substation, distribution and sales in the electric power industry. At the same time, the Abiko Area, where the Civil Engineering Research Laboratory and Environmental Science Research Laboratory are located, will further extend their mission as the base for natural and environmental science research. This is intended to improve our social infrastructure management potential for natural disaster risk.

We will continue the work started in fiscal 2010 to develop infrastructure such as power sources in the Yokosuka Area, and will also start on development procedures to establish a research facility on the newly acquired site. We will also prepare for the transfer by devising a transfer plan for large research facilities from the Komae Area, such as the radiation safety facility, and a plan for the establishment of research laboratories to promote research exchanges exceeding researchers' individual fields.

Socio-economic Research Center, which was located in Komae, will be transferred to the Otemachi Area in early fiscal 2011* with the aim of encouraging further collaboration with a wide range of society, including the electric power industry, increasing opportunities for intellectual exchange and promptly meeting diverse needs.

* Carried out in April 2011.

(3) Appropriate Response to Reformation of Public Interest Corporation System

In order to transfer to the status of a non-profit general foundation in fiscal 2012, we will steadily carry out the designated procedures, such as devising articles of incorporation (draft) and selecting the first trustees for the period after the transition to our new status. We will also consider the establishment of regulations on executives as necessary

In addition to the full-time supervisors already appointed, we will further expand our internal control system by establishing a risk management and compliance system.

(4) Educating and Utilizing Personnel as the Key to Organization's Sustainable Development

We will establish measures that will enable researchers and administrative staff to perform their roles to their maximum ability and to maintain and enhance individuals' motivation and specialized skills as we prepare for the future expansion of our research institutes. Specifically, by strengthening the personal support functions by which the head office's human resource department directly draws upon employees' research interests and future goals and desires, the right employee can be assigned

to the right position, thus enabling each individual to maximize his/her own potential.

Moreover, in addition to the current methods of hiring researchers—full-time hiring, temporary employees (visiting researchers), employees on loan, and temporary staffing—we are studying and considering the adoption of new methods to flexibly hire the staff needed to meet the increasingly diverse research development going forward. This will also include a review of case studies in domestic and overseas research institutes.

(5) Promoting Public Relations Activities to Raise CRIEPI's Value

We will continue to disseminate information such as our scientifically objective research results to a wide range of stakeholders based on a clarification of CRIEPI's position and point of view. At the same time, we will actively seek stakeholders' requests and views of CRIEPI and strive to reflect them appropriately in business operations.

Specifically, we will make policy and technology proposals at the right time and opportunity, and disseminate information on research results through various public relations media and our website. At the same time, we will actively provide opportunities for the exchange of opinions with various levels of the electric power industry, hold sessions to exchange views with the mass media and we will use these opportunities as a way to hear the views of our stakeholders.

Workforce

Although we anticipate an increase in the workforce in fiscal 2011 as a result of a rise in the number of visiting researchers and employees on loan corresponding to the expansion of CRIEPI's research, as well as an increase in the number of reemployed employees through the part-time reemployment system, employment will reach an equilibrium point of about 800 in the medium to long term as a matter of basic policy. Accordingly, we will not only further enhance the skills of our current workforce, but also continue to streamline office work.

The workforce in fiscal 2011 is as follows.

(As of April 1, 2011)

Item	Number (people)	Percentage distribution (%)
1. Research	744 Including 38 Visiting Researchers	88.0
[Breakdown]		(100.0)
(1) Electricity	122	16.4
(2) Civil Engineering and Construction	91	12.2
(3) Mechanical	100	13.4
(4) Chemistry	74	10.0
(5) Biology	63	8.5
(6) Nuclear Engineering	47	6.3
(7) Environmental Science	47	6.3
(8) Information and Communication	41	5.5
(9) Socio-economics	46	6.2
(10) Research Support and Management	113	15.2
2. Office work	101	12.0
Total	845	100

Statement of Budget

Budget Change

In light of the impact of the Great East Japan Earthquake we have revised our fiscal 2011 income and expenditure budget by reviewing benefit income and reexamining expenditures. As a result of these revisions, our budget has been reduced by 1.64 billion yen compared to the initial budget to 32.27 billion yen. The main changes are outlined below.

1. Revenue and expenditure in business activity

(1) Current benefit income declined 1.53 billion yen compared to the initial budget to 27.27 billion yen.

・Benefit income from Tokyo Electric Power Company and Tohoku Electric Power Company, which were affected by the earthquake, decreased 1.48 billion yen.

(2)Business income decreased 130 million yen compared to the initial budget to 2.39 billion yen.

・Other business income decreased 130 million yen compared to the initial budget to 590 million yen due to payment of share of cost of joint research and others.

(3) Business activity expenditures decreased 660 million yen compared to the initial budget to 25.35 billion yen.

・As a result of revisions to research activity expenditures to respond to the decline in revenue due to the earthquake, business expenditures decreased 660 million yen compared to the initial budget to 23.59 billion yen.

2. Revenue and expenditure in investing activity

(1) Investing activity income decreased 1.33 billion yen compared to the initial budget to 810 million yen.

・Special asset virement income decreased 500 million yen compared to the initial budget to 700 million yen due to the postponement of the liquidation of reserves as a result of a delay in the introduction of the Facility for Experiments on Advanced Carbonizing Gasification of Low-grade Resources as a result of the earthquake's impact.

・Fixed asset acquiring expenditure decreased 830 million yen compared to the initial budget because the sale of public welfare assets was put off due to the stagnant real estate market.

(2) Investing activity expenditures decreased 980 million yen compared to the initial budget to 6.92 billion yen.

・Special asset acquiring expenditures increased 700 million yen compared to the initial budget to 2.8 billion yen in order to set aside reserves for the early introduction of the Next-Generation

Fuel Advanced Combustion Test Facility, which will help to reinforce the stable supply of power, and upgrades to the Electric Power System Simulator.

・Fixed asset acquiring expenditure decreased 1.68 billion yen compared to the initial budget to 4.12 billion yen as a result of the decision to cancel the introduction of the Reactor Thermal Hydraulics Transient Test Facility after revisions to our nuclear power research plans following the earthquake.

3. Difference between revenue and expenditure in the previous balance brought forward

As a result of the delay in the introduction of facilities due to the earthquake, the difference between revenues and expenditures in the previous balance brought forward increased 1.35 billion yen compared to the initial budget to 1.69 billion yen.

The revised budget for fiscal 2011 based on the above changes is as follows.

Fiscal 2011 Revised Budget for Revenues and Expenditures
From April 1, 2011 through March 31, 2012

(Unit: Million yen)

	Revised Budget	Initial budget	Up and down (△down)	Remarks
I. Revenue and expenditure in business activity				
1. Business activity income				
(1)Base property operation income	-	-	-	
(2)Benefit income				
Current benefit income	27,270	28,800	△1,530	
(3)Business income	2,390	2,520	△130	
Funded research business income	(1,800)	(1,800)	(-)	
Other business income	(590)	(720)	(△130)	
(4)Other income	110	110	-	
Business activity income total	29,770	31,430	△1,660	
2.Business activity expenditure				
(1)Business expenditure	23,590	24,250	△660	
Personnel expenditure	(10,020)	(10,020)	(-)	
Payment of expense	(13,570)	(14,230)	(△660)	
(2)Management charge expenditure	1,760	1,760	-	
Personnel expenditure	(980)	(980)	(-)	
Payment of expense	(780)	(780)	(-)	
Business activity expenditure total	25,350	26,010	△660	
Difference between revenue and expenditure in business activity	4,420	5,420	△1,000	
II. Revenue and expenditure in investing activity				
1. Investing activity income				
(1) Special asset virement income				
Special asset virement income to acquire research facilities	700	1,200	△500	
(2)Fixed asset acquiring expenditure	-	830	△830	
(3)Long-term advance payment diversion expenditure	110	110	-	
Investment activity income total	810	2,140	△1,330	
2. Investing activity expenditure, Investing activity expenditure total				
(1)Special asset acquiring expenditure				
Special asset acquiring expenditure to acquire research facilities	2,800	2,100	700	
(2)Fixed asset acquiring expenditure	4,120	5,800	△1,680	
Investment activity total	6,920	7,900	△980	
Difference between revenue and Expenditure in investing activity	△6,110	△5,760	△350	
III. Revenue and expenditure in financial activity				
1. Financial activity income	-	-	-	
2. Financial activity expenditure	-	-	-	
Difference between revenue and Expenditure in financial activity	-	-	-	
Difference between revenue and Expenditure in the current period	△1,690	△340	△1,350	
Difference between revenue and Expenditure in the previous balance brought forward	1,690	340	1,350	
Difference between revenue and Expenditure of balance carried forward	-	-	-	

Note: 1. The borrowing limit was 3,000million yen.
2. Liabilities will amount to 5,200 million yen in fiscal 2012 and 800 million yen in fiscal 2013.