FY 2011

Reports on Research Activities Settlement of Accounts

From April 1, 2011

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Central Research Institute of Electric Power Industry

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On the Publication of the Research Activities Reports for Fiscal 2011

The Great East Japan Earthquake and Fukushima Daiichi nuclear accident had great effects on the Japanese economy and society. Although the Fukushima Daiichi Nuclear Power Plant is past the worst days following the accident and efforts are now focused on stabilization, the plant faces many medium- to long-term issues, such as decontamination of the surrounding area and decommissioning the reactor. Although the electric utility industry is doing everything in its power to restore trust and ensure the safe supply of energy, the public is taking a severe line on the industry's business framework and rate system. Coupled with pressures on energy supply and demand and a deteriorating bottom line resulting from the prolonged idling of nuclear power reactors, this makes for a harsh business environment.

In light of these conditions, during this fiscal period CRIEPI has drastically revised its initial business plan and budget.

Accordingly, CRIEPI focused on the following areas in fiscal 2011.

- Research with the aim of building a solid and flexible new electric power supply/demand structure
- Research and development enabling prompt technical support in responding to disasters and nuclear power plant accidents and the resolution of medium- and long-term issues
- Extensive cost-cutting based on budget constraints resulting from compensation reductions, and redevelopment of research bases

CRIEPI will become a general incorporated foundation in fiscal 2012, a transition that will signal our commitment to make even greater strides in conducting our business autonomously in line with the spirit that motivated our founding. We will contribute to the electric power industry and society by reinforcing our research system and publicizing and making available our scientifically objective research results.

Key Initiatives in Fiscal 2011

■ Research with the aim of building a solid and flexible new electric power supply/demand structure

We have designated research pillars that outline the direction of our research over the medium term with the aim of building a new electric power supply/demand structure that will be solid yet flexible. Using these research pillars to revise the existing research issues and set new research issues, we have focused our resources in our priority areas. Below, we have laid out representative results achieved in research pursued under these three new research pillars.

(1) Establishment of optimal risk management

CRIEPI grappled with a rational aseismic design method, including reviewing and developing steps to accommodate aseismic back-checks and stress tests on nuclear power plants; research on the health effect of low-dose radiation; and the development of technologies to predict the damages caused to distribution facilities by natural phenomena such as earthquakes, wind and rain and to support recovery efforts.

- Development of methods for assessing the simultaneous rupture of inland faults to appropriately estimate scale of earthquakes
- Assessment of health effect of long-term low-dose rate radiation through epidemiological studies
- Further improvements to accuracy of system supporting disaster recovery of power distribution equipments used in the devastating earthquake

(2) Further improvement of facility operations and maintenance technologies

CRIEPI promoted research on irradiation embrittlement of pressure vessels to operate light-water reactors with greater safety and stability, and development of rational operations and maintenance technologies for thermal and hydro power facilities.

- Identification of embrittlement mechanisms for improving the prediction accuracy of embrittlement correlation method
- Development of creep life evaluation method for high-chromium steel piping at thermal power plants
- Development of a real-time forecast system for dam reservoir and river flooding

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

CRIEPI developed next-generation thermal power technology enabling the effective use of low-grade fuel resources and greater efficiency in power generation and next-generation grid technology that facilitate the adoption of renewable energy sources such as solar energy

in power systems, and heat pumps with high energy conservation.

- Development of combustion methods to increase the blend rate of low-grade coal with the aim of the diversification of coal type used in coal-fired thermal power generation plants
- Development of analytical tools for distribution systems helpful in understanding issues such as voltage rises along distribution lines during high-volume introduction of solar power
- Development of CO_2 heat pump for a central heating system that demonstrate high performance even in cold areas

■ **Research and development enabling prompt technical support in responding to disasters and nuclear power plant accidents and the resolution of medium- and long-term issues**

CRIEPI formed a special team involving all research centers immediately after the earthquake and responded promptly with research related to the disaster recovery and technical support, starting with the Fukushima Daiichi Nuclear Power Plant accident. Using the specialized knowledge it acquired, we produced the following highly effective output in the following areas, thus helping to solve problems on the frontline.

- Contributed to the development of technology for establishment of highly stagnant contaminated water treatment system and its stable operation
- Presented countermeasures against the corrosion of spent fuel pools into which sea water was injected
- Implemented fine monitoring to contribute to the identification of the status of contamination resulting from the release and leakage of radioactive material and the environmental remediation

CRIEPI also began to introduce strong shake generator, which enables tests under the world's highest accelerations, and tsunami physical simulator, which can recreate the characteristics of high-speed and sustained tsunami to evaluate the force of impact on structures. This is part of our effort to strengthen research on the earthquake-proof safety of light-water reactors in the future.

In addition, we published our research results via a wide range of media outlets, academic seminars and lectures in a timely manner, held a forum on restoration and recovery efforts following the earthquake, and introduced some of CRIEPI's activities to address the Fukushima Daiichi Nuclear Power Plant accident.

■ **Extensive cost-cutting based on budget constraints resulting from compensation reductions, and redevelopment of research bases**

- Given budget constraints resulting from compensation reduction during the current fiscal year, CRIEPI reduced costs extensively across operations and also cut personnel expenses, starting with compensation for executive officers and managerial employees annual salaries. Moreover, we decided to overhaul long-term measures such as the retirement pension system and bring the current approximately 840 employees down to an equilibrium point of about 800.

- Consolidating and rebuilding our research bases will not only strengthen our future research capacity but also lead to reductions in operating costs. Accordingly, we continued these efforts with a close eye on income and expenditures. Moreover, we made preparations to sell part of the land CRIEPI owns in Komae to raise money for upgrades to research bases and new research and development.

- CRIEPI established articles of incorporation and a public interest expenditures plan and received authorization for the transfer to the status of general incorporated foundation from the prime minister. We also set up an internal audit office as part of our efforts to establish a highly effective internal control system.

I. Research Activities

In fiscal 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 medium-term direction of the institute’s research activities, which seek to build both a robust and flexible energy supply-demand structure in Japan. Working in line with these directive principles, CRIEPI has focused its attention on select research projects to address the changes in the electric power industry and society, as well as the challenges of 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.

Table 1 shows the number of reports issued and Table 2 shows the number of papers presented, which illustrates our research results in fiscal 2011. We issued a total of 595 reports and presented 1,407 papers both in Japan and overseas (of which 383 were papers with referee readings).

1. Project Subjects

CRIEPI set 38 project subjects, selected as those most needed by the electric power industry and society and those requiring timely delivery of results and planning for implementation. The institute put all of its efforts into this research, and the main research results are outlined below.

(1) Establishment of Optimal Risk Management

CRIEPI pursued research on assessing the impact of natural phenomena and social and economic change on the electric power industry and proposing responses to this impact, including social systems and frameworks.

In particular, CRIEPI accelerated its research on the formulation of rational aseismic design methods for nuclear power plants and risk assessments of low-dose radiation, and also pursued research on the new topic of proliferation impact assessment of radioactive material. Moreover, the institute developed prediction methods, countermeasure techniques and recovery support technology to address natural disasters affecting distribution facilities.

Energy Policies Analysis

- CRIEPI studied trends of regulatory reform in the electric power industry of Japan and foreign countries since the Great East Japan Earthquake and identified systematic responses to issues occurring in the deregulated power market and the use of renewable energy sources is promoted.
- We laid out the roles of power systems, disaster prevention products and dispersed

generation in disaster preparedness measures, based on the results of surveys on the restoration status of infrastructure such as electricity, gas and water, as demonstrated in an energy use survey conducted in the regions affected by the Great East Japan Earthquake.

Improvement of Seismic Reliability

- In order to properly estimate the scale of earthquakes used in nuclear power plants' seismic assessment, we identified indicators to assess the simultaneous rupture of inland active faults based on the results of surveys such as geomorphological surveys of areas around active faults, numerical analysis and model experiments.
- We demonstrated that damping factors for the ground, needed when forming design basis earthquake ground motions, can be evaluated from the ground characteristics measured using a borehole and the results of material tests on the rock core, without having to rely on records of earthquake observations.

Radiation Safety and Evaluation of Environmental Impact

- We closely monitored with Tokyo Electric Power Company the areas in which residents are not allowed to return and the deliberate evacuation areas under the national "Comprehensive Monitoring Plan" in order to contribute to the identification of contamination caused by the release and leakage of radioactive material as a result of the Fukushima Daiichi Nuclear Power Plant accident and the review of environmental remediation. These results were publicized.
- We used the regional ocean dispersion model to carry out simulations on the radioactive substances released into the ocean from the Fukushima Daiichi Nuclear Power Plant, and identified the status of the dispersion of such substances along the coast. The amount of radioactive substances released directly into the ocean was also estimated using monitoring data.
- In order to assess the health risks due to long-term exposure to low-dose rate radiation, an epidemiological study of residents living in high natural background radiation areas in Guangdong, China was conducted over a period of 20 years. This study revealed that exposure to low-dose rate radiation equivalent to three to five times greater than the average natural background radiation does not significantly raise health risks.

Backend Management in Nuclear Fuel Cycle

- We developed a salt particle collection device in order to prevent stress corrosion cracking (SCC) in inner metal canisters caused by salinity intrusion from the concrete cask's cooling duct. This concrete cask is considered to be promising as a next-generation storage method for spent nuclear fuel.
- As a part of our efforts to facilitate the low-level radioactive waste disposal, we developed a model for assessing the long-term swelling behavior for bentonite materials,

an engineered barrier that prevents the leakage of radioactive substances, and examined its validity in laboratory experiments.

Natural Disaster Countermeasures at Power Transmission and Distribution Facilities

- We developed new methods for determining snow accretion based on snow quality by collating and analyzing observational data on snow accretion on power lines and climate data at the site, collected with cooperation from power companies, to improve our understanding of snow damage at electric power transmission and distribution facilities.
- We improved the Risk Assessment and Management system for Power lifeline (RAMP) used for distribution facilities after the Great East Japan Earthquake based on damage suffered in the earthquake and damage estimated from the 2011 Typhoon No. 12, and enhanced the estimation accuracy of seismic intensity distribution and wash-out damage of utility poles during typhoons.
- We have developed new modules that can evaluate the lightning risk of power distribution systems and wind power generation systems. based on data such as lightning frequency in each area and enhanced the functions of the Lightning Risk Assessment Program (LIRAP).

Global Warming Projections and Impact Assessment

- We improved the setting methods for sea ice and sea surface temperature and methods for calculating soil and lake surface temperatures in the Numerical Weather Forecasting and Analysis System (NuWFAS) that CRIEPI developed. We also calculated the average wind speed during typhoons throughout Japan for a recurrence interval equivalent to 50-300 years, which was needed to the wind-resistant design of power transmission facilities.
- We confirmed that temperatures would decline and the climate would recover in the future through the analysis of a scenario, in which emissions are cut over the low term while increase at one point in the near future, using the institute's Simple climate model to Examine Emission Pathways Leading to Updated Scenarios (SEEPLUS).

(2) Further Improvement of Facility Operations and Maintenance Technologies

We addressed technical development issues in order to raise the sophistication of our technologies for operating and maintaining electric power facilities and continue to stably supply electric power.

In particular, we continued with research development necessary to continue operating light water reactors and the development of operations and maintenance technologies related to thermal and hydro power facilities and power transfer equipments such as power transmission and distribution facilities.

Development of Plant Life Management Technology for Light Water Reactors

- We characterized the microstructural changes in neutron-irradiated steels using atom probe tomography to identify the mechanisms of the effect of irradiation temperature on the embrittlement of reactor pressure vessel steels and the crack growth behavior of stress corrosion cracking (SCC) in components and pipings.
- We developed a software (FALSET) that was able to predict the pipe wall thinning rate caused by flow acceleration corrosion and liquid droplet impingement erosion. It also predicts the remaining life of pipes for wall thinning management.
- In order to develop to assess the mechanical strength of electric power and control cables, we developed a model to assess insulating material deterioration when they are subjected to radiation and thermal stresses, taking into account the concentration distribution of the antioxidants in the insulating materials.

Operation and Maintenance Support for Electric Power Generating Facilities

- We developed a method to assess the safety of gravity dams during earthquakes by using nonlinear finite element analysis, which is able to analyze the damages at the dams and their foundations.
- We developed movable current and topography measuring systems in dam reservoirs at hydro electric plants, as well as a real time forecast system for river flooding using simultaneous forecast of weather and floods, in order to support the optimal operation of dams and flooding countermeasures.
- We conducted internal pressure creep tests of high chromium steels using longitudinal welded specimens of both an actual piping and a tube sizes to examine the strength of the welded parts of the materials in thermal power plants. Based on the test results and creep analysis results obtained using a finite element method, we developed a creep life assessment model of the materials.

Operation and Maintenance Support for Electric Power Transmission and Distribution Facilities

- In order to support the rational operation and maintenance of aged power transformers, we developed a method of diagnosing thermal deterioration in insulating paper used in power transformers based on the thermal history calculated from their load histories, as well as a method to diagnose internal winding wire abnormalities of power transformers using frequency response analysis (FRA).
- We are currently developing a cleaning procedure that will serve as a simple removal technique that can be used on-site to process large-scale transformers contaminated with PCBs (heat compulsion circulating cleaning). Tests carried out with electric power companies indicated that this method could efficiently remove PCBs.

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

CRIEPI endeavored to enhance the efficiency of power supply and power use, reinforce the power supply/demand foundation that enables energy security, and worked to develop prospective technology that would conserve energy and reduce carbon emissions.

In particular, we pursued the development of next-generation thermal power generation technology with the aim of effectively using low-quality resources and enhancing the efficiency of power generation. We developed technology for next-generation power grids to facilitate the use of renewable energy such as solar power in power systems, and also developed technology for the efficient use of energy, such as high-efficiency heat pumps low-loss power semiconductors.

Next-generation Thermal Power Technologies

- As part of our supporting research on the operation of IGCC (Integrated coal Gasification Combined Cycle) demonstration plant, the three-dimensional numerical simulation of the gasifier was applied to a various operating conditions, such as coal blending, to determine its relevance.
- To diversify the types of fuel used in pulverized coal-fired boilers, we conducted the combustion experiments of blends of high-moisture sub-bituminous coal and bituminous coal using a burner for bituminous coal, and found that the blend rate of sub-bituminous coal could be raised up to 75% by adjusting air injection conditions of a burner.
- As the development of the highly efficient IGCC systems with CO_2 capture using O_2-CO_2 blown gasifiers that we have proposed, gasification experiments demonstrated the effect that CO_2 injection has in raising the gasification performance. This makes it possible to predict the gasification characteristics of actual equipment through numerical simulation.

Next-generation Grid Technologies

- In order to address the issue of voltage rise along distribution lines when high-volume distributed power supply, such as solar power and wind power, are introduced, we developed analytical tools able to elucidate phenomenon and evaluate methods of curbing voltage in distribution systems that power companies can use on-site.
- We developed a communications network that makes it possible to develop high-performance power system protection and control systems at low cost and that combines the ease of connection characteristic of all-purpose IP (Internet protocol) technology with real-time performance and reliability.
- We evaluated a load control method for use with air conditioning and lighting that is effective at demand response, intended to curb peak demand, and demonstrated that it users are receptive to reductions in lighting in common areas in office buildings, and that this also has a significant effect in load reduction.

Electrification and Energy Conservation Technologies

- Using the modified two-stage cascade heating cycle, we collaborated with an electric power company and a manufacturer to develop a CO_2 heat pump for a central heating system for cold districts that can heat water to 70℃ even when it is －20℃ outside.
- We succeeded in growing SiC epitaxial films with a sufficient thickness and a low current-conduction loss applicable to high-voltage systems equivalent to 13 kV voltage lines as part of the development of high-performance SiC insulated gate bipolar transistors (SiC-IGBT).
- We succeeded in separating the effects of operation pattern and aging time on the capacity decrease of lithium-ion batteries. This result suggests a possibility of utilizing a constant current charge-discharge test to evaluate the degradation of lithium-ion batteries.

2. Basic Technology Subjects

We designated 36 basic technology subjects in fiscal 2011 to guide our research. Capitalizing on the strengths and specialized skills of the eight laboratories with specific research fields, we pursued research to maintain, sustain and develop technology that helps to resolve issues facing the electric power industry on the front lines, and as well as groundbreaking technology leading to new research breakthroughs. Moreover, we helped resolve issues that emerged as a result of the earthquake and the accident at the Fukushima Daiichi Nuclear Power Plant rapidly and accurately. Our main achievements are outlined below.

Socio-economic Research Center:

The Socio-economic Research Center conducted multi-faceted analysis and evaluation, such as technical assessments and economic analysis, on changes in the society affecting the power industry and policy trends related to the industry as well as their impact on business management in order to contribute to the efficient and stable power supply.

- Through cost structure analysis using the financial data of electric power utilities, we demonstrated that the cost savings of vertical integration (cost-savings effect compared to having each power transmission and distribution company carry out these functions individually) amounts to about 30% of current costs on average for the nine utilities.
- We analyzed the legal issues posed by compensation for damage in the Fukushima Daiichi Nuclear Power Plant accident and their factors, and laid out the direction for institutional reform and the available options.

System Engineering Research Laboratory:

The System Engineering Research Laboratory conducted research on planning, operation, control and analysis methods for electric power transmission systems, distribution systems and information and communication systems to ensure a stable supply of electricity. The laboratory also pursued research on the development, testing and assessment of customer

service technologies that promote the efficient use of electricity.

- In order to support relay settings and to verify coordination between protection relays through the spread of dispersed generation, we improved the method ever developed for estimating coordination between protection relays, which enables us to verify coordination between short-circuit protection relays or between ground fault protection relays in distribution systems.
- In accordance with on-site needs, we developed a method in which multiple operating procedures with a minimum unrestored total loads and number of switching operations are grouped according to the differences in restoration policy in order to support pre-examination of restoration operations in the event of an accident in the sub-transmission system.

Nuclear Technology Research Laboratory:

The laboratory worked to address urgent issues posed by the Fukushima Daiichi Nuclear Power Plant accident, and also began researches on long-term issues related to stabilization of the fuel debris. In addition, the laboratory pursued fundamental researches related to improving the safety and supporting the maintenance of existing light water reactors, technologies for fuel cycles for both light water and fast reactor, and measures to prevent human error.

- The laboratory evaluated the adsorption performance of cesium using a zeolite, as an urgent issue in cleaning up the stagnant contaminated water after the Fukushima Daiichi Nuclear Power Plant accident. This contributed to the development of technology for the establishment and stable operation of the treatment systems.
- In order to evaluate the safety of existing light water reactors, we analyzed equipment failures happened in nuclear power plants in Japan and developed a method for calculating the failure rate in cases of common cause failures in which multiple equipments malfunction at the same time due to the same cause, which has a major impact on probabilistic risk analysis.

Civil Engineering Research Laboratory:

This laboratory conducted fundamental research on geosphere science, earthquake engineering, structural engineering and fluid dynamics needed to civil engineering technology and natural disaster measures for power facilities, as well as to backend management in nuclear fuel cycle.

- The laboratory analyzed the viscosity of erupted magma based on data both within Japan and overseas, and quantitatively determined the relationship between viscosity and eruption potential in order to assess the possibility of large-scale pyroclastic eruptions from volcanoes.
- In order to assess the structural soundness of underground reinforced concrete structures

in thermal and nuclear power plants that have experienced damages by earthquakes, we developed estimation methods for the maximum deformation response of members using residual flexural crack width and for the corrosion progress of reinforcing steel. We also demonstrated the recovery effect of structural performance as a result of epoxy resin repairs to cracked areas.

Environmental Science Research Laboratory:

The laboratory worked to promote basic research on atmosphere, river, coastal and marine environments, as well as on biology, chemistry and biotechnology for the construction and stable operation of electric power facilities, the establishment of a low-carbon society, and reduction in various environmental risks associated with the electric power industry.

- With the aim of supporting stable operations at coastal power plants, the laboratory have developed an acoustic monitoring system and a molecular-based quantitative detection method using genetic information to assess population dynamics of moon jellyfish and fouling organism larvae, such as barnacles, respectively, which influx and clog water cooling systems of the power plants.
- In order to appropriately manage the selenium contained in the desulfurized waste water from coal-fired power plants, the laboratory developed and tested the selenium monitor that automatically measure the concentration in wastewater, and also confirmed the effectiveness of the biological wastewater treatment method for selenium at the laboratory level using microbes that was developed by CRIEPI.

Electric Power Engineering Research Laboratory:

The Electric Power Engineering Research Laboratory was engaged in maintaining and advancing fundamental technologies related to electric power transmission and distribution facilities, including electrical insulation, lighting protection and high power testing technologies. The laboratory also conducted fundamental research on next-generation electric power equipment, laser application and arc plasma application, and power electronics technology.

- We have published "Application guide for transmission Line surge arresters" and "Guide to lightning protection design of power stations, substations and underground transmission lines (rev. 2011)" in cooperation with electric power companies. With these guides and other guides on lightning protection design which have been already published, we have established practical methods of lightning protection design for entire power systems.
- We developed a non-contact method for measuring the concentration distribution of multiple chemical elements, an indicator for degradation caused by salt damage to concrete structures, in a short period at the same time using laser breakdown spectroscopy.

Energy Engineering Research Laboratory:

The laboratory worked to develop technology to manage the hot gas path components of gas turbines, develop a highly efficient, clean low-cost thermal power generation technology, such as establishing measuring techniques for trace components in exhaust gas, and develop fundamental technology related to systems and equipment used by the demand side at high temperatures.

- To improve film cooling performance of gas turbine blades, effects of internal rib orientations and film cooling hole geometries on film cooling effectiveness and heat transfer coefficient were investigated. The results showed the innovation of rib and hole geometry strongly improves film cooling performance of turbine blades. The laboratory also developed the method for measuring gaseous boron and selenium contained in the flue gas of coal combustion gas using absorbing solutions and proposed this method as a standard to JIS for boron and to ISO for selenium.
- The laboratory also developed the method for measuring gaseous boron and selenium contained in the flue gas of coal combustion gas using absorbing solutions and proposed this method as a standard to JIS for boron and to ISO for selenium.

Materials Science Research Laboratory:

The laboratory conducted research on various material-related problems faced by the electric power industry. These range from identification of damage and aging mechanisms of structural materials in nuclear power and thermal power plants, improvements in life prediction, nondestructive evaluation, and development of new materials used for energy saving device.

- In order to take a measurement on the corrosion problems of metallic structures of Fukushima Daiichi nuclear power plant induced with sea water injection, we evaluated the corrosion rate of materials in chloride solution. As a result, we proposed a counter measures on the corrosion problems in spent nuclear fuel storage pool.
- We demonstrated that nondestructive tests using the ultrasonic wave phased array method could be applied to detect fatigue cracks in headers and tube joints of open rack vaporizers, a key supply device for LNG thermal fuel.

3. Research Promotion

(1) Promotion of Initiatives for research to support the recovery from the disaster throughout CRIEPI

- A Disaster Support Research Manager was assigned to the Head Office Planning Group to coordinate with the electric power industry and the government on earthquake-related research, such as the accident at the Fukushima Daiichi Nuclear Power Plant. Special teams were formed throughout CRIEPI integrating all of its resources under the supervision of the executive officer in charge to rapidly respond to a wide range of requests.
- In particular, we utilized the knowledge built up throughout our history to produce highly effective results and help resolve issues on the frontlines in response to urgent requests and issues, including technical support for a system for the disposal of radioactive standing water, support in ascertaining conditions and restoring the environment with radiation measurements in contaminated areas, and diversified assessment of radioactive substances in the atmosphere, ocean and underground water.
- We considered a research promotion system to be adopted from fiscal 2012 for “Research to Enhance Safety” and “Research Supporting Preservation” at light water reactors, essential in operating nuclear power reactors safely and reliably. This is a step toward strengthening programs to apply the knowledge that CRIEPI has built up thus far to the frontlines in a timely and accurate manner.

(2) Exercising comprehensive strengths

- We exercised our comprehensive strengths by promoting cross-cutting research by coordinating with the eight professional research institutes in our search for resolutions to issues related to the earthquake. In addition, we held workshops on various risks that could arise in the electric power industry in light of the risks that emerged as a result of the earthquake, and studied and analyzed risks and the phenomena that could result from these risks. Based on these results, the electric power industry and CRIEPI identified the issues that should be researched further in the future.
- We pursued research in affiliation with domestic and overseas university and research institutions with impressive knowledge in specific fields (the Institute for Transuranium Elements [ITU] of the European Commission, the Japan Atomic Energy Agency, and the Marine Ecology Research Institute, among others). Such collaboration will enable scientific knowledge to mutually complement each other and to sustainably improve fundamental research strengths. In particular, we entered into joint research agreements with the Electric Power Research Institute (EPRI), USA and Électricité de France (EdF), France with aim of strengthening relationships with foreign institutions to identify irradiation embrittlement mechanisms in the pressure vessels of aged light water reactors.

(3) Promotion of funded research

- Applying CRIEPI's fundamental research skills, we proactively engaged in research that met the needs of the electric power industry, and also received government funding for research on issues related to the electric power industry.

  Table 3 shows the main research projects for which CRIEPI received government funding.
- We also facilitated 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

- In light of conditions following the earthquake, we rigorously selected, introduced and upgraded large-scale research facilities, which are indispensable in supporting the technological foundation of the electric power industry and supporting and enhance CRIEPI's foundational technical strengths.
- We introduced a "carbon dioxide removal atmosphere air-tight room" to use in assessing the long-term soundness of cementitious materials used in the low-level radioactive waste disposal and a "field observation system of a steel transmission tower" to measure reaction of the tower in a range of environments such as wind, earthquakes, and snow accretion.
- We updated the "impulse current generator" in the High Power Testing Facility, used to perform short-circuit test on electric power equipment.
- Moreover, we continued construction on the Facility for Experiments on Advanced Carbonizing Gasification of Low-grade Resources, used to improve low-grade resources such as brown coal into high-grade fuel through carbonizing gasification. We also began introducing strong shake generator, which enable tests to be conducted at the world's highest accelerations, and tsunami physical simulator, which can recreate the characteristics of high-speed and sustained tsunami to evaluate the force of impact on structures, as well as "the Test Facility to Assess Insulation Deterioration in Aged CV Cable Systems" and "Heat Pump Development Testing Facility."

(5) Management and Application of Intellectual Property

- We continued to make intellectual property more visible by assessing value with a focus on outcome and publishing The Intellectual Property Report. We have nearly completed digitizing and microfilming research reports issued since CRIEPI's founding and expanded our download services for disclosed materials. The number of downloads by various organizations and members of the general public both within Japan and overseas amounted to about 110,000 a year, contributing to the broad use of research results.

- We raised the quality of patent applications by strengthening the Center for Intellectual Property & Technology Licensing's function supporting patent searches and utilizing invention consultation meetings.
  Table 4 shows the number of patents and software license applications we submitted and the number registered.

- We not only utilized the intellectual property we have built up to promptly resolve issues in the electric power industry, such as research to support the recovery from the disaster, but also worked to spread technology to businessmen working on the frontlines of society through technology exchange courses and technology lectures. Moreover, we actively introduced patents and software through forums and seminars hosted by CRIEPI, external exhibits and technology transfer organizations.
  Table 5 shows the number of patent licenses and software licenses that CRIEPI authorized.

- We capitalized on our strengths as an academic research organization to participate in national and academic committees, thus contributing to the establishment of specifications, standards and technical standards for the energy and environment.
  Table 6 shows contributions to the formation of major codes, standards and technical guides.

(6) Steady Implementation of Fundamental Activities

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

[1] Collection of Literature, Materials and Statistics

We secured and maintained a wide range of literature, materials and statistics and collected 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 was used in research activities, and also given back to society at large through publications such as research reports.

[2] Establishment and Use of Mainframe

We used the institute's mainframe to conduct research effectively and generate a wide range of results. Moreover, we endeavored to ensure the wide use of software, such as the mathematic simulation program that we developed, by the electric power industry. We examined detailed specifications and selected a model as we upgrade our mainframe in fiscal 2012 in order to carry out more sophisticated research using climate analysis and material analysis.

[3] Issuance of Publications

We gathered research reports and public relations media in line with the progress made on our research and disclosed information on our research activities and results effectively. We disclosed this information to society at large via our website.

Table 1: Number of Reports

	Research reports, etc.	Funded research	Total
Socioeconomics	45	4	49
Environment	65	21	86
Customer energy services	34	5	39
Power delivery	71	25	96
Nuclear power generation	88	31	119
Fossil fuel power generation	36	10	46
New energy	9	4	13
Information & communication	36	6	42
Construction and maintenance of electric power facilities	62	19	81
Advanced basic technologies	18	6	24
Total	464	131	595

(Number in previous fiscal year)	405	157	562

Table 2: Number of Papers Reported

	Papers(Peer reviewed papers included above)
Socioeconomics	150 (33)
Environment	198 (52)
Customer energy services	82 (15)
Power delivery	145 (40)
Nuclear power generation	300 (76)
Fossil fuel power generation	88 (43)
New energy	24 (3)
Information & communication	41(13)
Construction and maintenance of electric power facilities	178 (40)
Advanced basic technologies	195 (67)
others	6 (1)
Total	1,407 (383)

(Number in previous fiscal year)	1,605 (444)

Table 3: Major Funded Researches from the National Government and Others

Research Title	Consigner	CRIEPI's name for subject
Survey of geologic disposal technology (Joint Technology Study on Geologic Disposal: Development of Advanced Boring Technology)	METI	Processing of high-level radioactive waste
Survey of geologic disposal technology (Joint Technology Study on Geologic Disposal: Development of Advanced Techniques for Assessment of Groundwater Travel Time in Bedrock)	METI	Processing of high-level radioactive waste
Study on technology for storage of recycled fuel resources (experiments on long-term soundness of intermediate storage facilities)	METI Nuclear and Industrial Safety Agency	Transport and Storage Technology for Spent Nuclear Fuel
Research development on engineering technical demonstration of metal fuel cycle for practical application	MEXT	Advanced Nuclear Fuel Cycle
Development of analysis techniques using computer simulation of morphological evolution for nuclear fuel	MEXT	Advanced Nuclear Fuel Cycle
Commission for Concentration Calculations of Artificial Radioactive Nuclides in Ocean using Ocean Circulation Model	MILT Meteorological Research Institute	Assessment of Radioactive Material Diffusion in Environment and its Remediation
Evaluation of Validity and Predictability of Air Quality Modeling for Urban PM2.5 in Japan	MOE	Atmospheric and Marine environment
Development of technology for next-generation high-performance electricity storage system for autos/Fundamental technology development/Research and development of fundamental technology for next-generation high-performance secondary batteries for autos	NEDO	Lithium Secondary Battery with Reliable Safety
Innovative zero-emission coal gasification power generation project, fundamental research project on innovative gasification technology, development of high efficiency oxy-fuel IGCC	NEDO	Thermal Power Generation Systems with CO_2 Capture
New-material synthesis by thin-film growth technique, and growth of high-quality bulk single-crystals of iron-pnictide superconductors	Japan science and Technology Agency	Advanced Functional Materials
Examination of microbial impact at Horonobe Underground	Japan Atomic Energy Agency	Processing of high-level radioactive waste
Study on downstream effects relating to sump screen clogging issues	JNES	Nuclear power materials

Table 4: Number of applications and registrations of patent, and software in FY 2011

	Patent		Software Registration
	Application	Registration	
Socioeconomics	0	3	7
Environment	10	27	9
Customer energy services	11	5	10
Power delivery	16	20	22
Nuclear power generation	8	11	11
Fossil fuel power generation	17	19	8
New energy	9	5	6
Information & communication	5	10	5
Construction and maintenance of electric power facilities	5	14	13
Advanced basic technologies	16	56	1
Total	97	170	92
(Number in previous fiscal year)	133	120	85

Note: Number of patents held as of end-FY 2011: 606

Table 5: Number of licensed patents and licensed software applications in FY 2011

	Total	(Number in previous fiscal year)
Number of licensed patents	11	15
Number of licensed software applications	299	385

Table 6: Contribution to Formulation of Major Codes, Standards, and Technical Guidelines in FY 2011

Code, Standard, Technical Guideline, etc.	Organizations and Groups Concerned
The Guidelines to Protect Hot Spring Resources (in relation to geothermal power generation)	Ministry of the Environment
ISO/IEC 29155-1: Framework for IT Project Performance Benchmarking, Part 1: Concepts and Definitions: 2011	Information Processing Society of Japan, International Organization for Standardization / International Electrotechnical Commission (ISO/IEC)
AESJ-SC-RK004: The Tsunami Probabilistic Risk Assessment of Nuclear Power Plants: 2011	Atomic Energy Society of Japan
AESJ-SC-F019: Facility Inspection Method for Processing Facilities Disposing of Waste Below the Generally-Used Depth: 2010 (issued in May 2011)	Atomic Energy Society of Japan
Specifications for Thermal Power Facilities for Power Generation: Basic Regulations (2011 edition)	The Japan Society of Mechanical Engineers
JIS C 2143-1: 2011 Electrical insulating materials: Properties of thermal endurance; Part 1: Aging procedures and evaluation of test results JIS C 2143-2: 2011 Electrical insulating materials −Thermal endurance properties; Part 2: Determination of thermal endurance properties of electrical insulating materials −Choice oftest criteria	The Institute of Electrical Engineers of Japan Japanese Standards Association
JIS K 0105 Methods for determination of fluorine compounds in flue gas JIS K 0107 Methods for determination of hydrogen chloride in flue gas (revised in February 2012)	Japan Environment Measurement and Chemical Analysis Association
JEAC4216-2011 Test method for determination of reference temperature T0 of ferritic steels	Japan Electric Association

II. Administration

1. Further cost-cutting and efficient use of assets based on changes in revenue and expenditures

- We reviewed our initial plan across operations in light of changes in revenue and expenditures, taking into account the need to maintain high-quality research and ensure the safety of operations. Based on this, we revised the plan and put off non-urgent programs until future fiscal years as part of our efforts to concentrate resources in priority areas. Moreover, we ensured that our subcontracting was competitive and cultivated new business partners, to cut operating costs.

- In addition to a 10% cut in executive salaries, we took steps to reduce managerial employees' annual salaries as we curbed salaries across the ranks of employees. CRIEPI also decided to increase the cut to executive salaries to 20% in fiscal 2012, and also reduce annual salaries for managerial employees by a certain percentage when salaries come up for review. Moreover, we revised medium- to long-term measures affecting the retirement system, effectively combining pay reductions with ongoing restrictive measures.

- We continued to consolidate and rebuild our research bases to lower operating costs, fixed asset taxes and other costs in the future, while monitoring revenue and expenditures. Moreover, we began a land survey in preparation for a partial sale of the Komae area in order to raise money to upgrade research bases and new research development.

- In order to reduce fixed management costs such as maintenance costs and fixed asset taxes, we surveyed idle research facilities to determine whether they would be used on an ongoing basis, and sought to use and reorganize assets effectively by changing their use or retiring them.

- We conserved power, including in research departments, in light of the pressures on power supply and demand. As a result, we succeeded in cutting electricity use by more than 25%, which is the target for maximum electric power.

2. Reconstruction of research bases for new research development

- We assigned the person in charge of the reconstruction of research bases to the Head Office Planning Group and worked together to flesh out the details for the concept behind the base upgrade with the aim of utilizing our research bases in Yokosuka, Abiko and

Komae more effectively as we expand our research endeavors and smoothly rebuild our research bases.

- In the Yokosuka region, we continued the work started in fiscal 2010 to develop infrastructure such as power sources, and also began developing newly acquired land and began construction work on part of the new research facility (laboratory to carry out experiments on high-performance carbonizing gasification of low-grade resources). In addition, we devised a plan to transfer and consolidate laboratories from the Komae region, such as the radiation safety facility, materials research facility, and thermal hydraulics research facility.

- We moved the Socio-economic Research Center from the Komae region to Otemachi with the aim of encouraging further collaboration with external organizations, including the electric power industry, increasing opportunities for intellectual exchanging, and promptly meeting diverse needs.

3. Appropriate response to reformation of public interest corporation system

- We carried out the designated procedures for the transfer to the status of a general incorporated foundation, such as devising articles of incorporation and a public interest expenditures plan and received authorization for the transfer from the prime minister in fiscal 2011 so that we can transition to the new status from fiscal 2012 as planned.

- We revised executive officer regulations and other rules so that they more closely conform to the contemporary standards. We also considered revising rules for executive compensation to ensure that business is operated appropriately after the transition.

4. Educating and utilizing personnel as the key to organization's sustainable development

- We pursued initiatives centered on personal support in order to maintain and enhance employees' motivation. Specifically, the head office's human resources department took a central role in carrying out individual interviews with each employee and responding in a detailed manner to identify each employees' research and job interests and future goals and desires so that the right employee can be assigned to the right position.

- We also considered a new framework for special contract researchers as a form of employment with a fixed term as a way of securing research staff who can contribute to a wide range of research efforts adapted to the changing face of the electric power industry and society. Specifically, we examined a system in which the employment contract period

can be set flexibly for a period as long as five years and compensation and benefits can be made equivalent to those of a full-time employee.

5. Promoting information transmission and public relations activities to raise CRIEPI's value

- We endeavored to accurately ascertain external conditions, such as trends in the electric power industry and society after the earthquake, and actively sought stakeholders' requests and views of CRIEPI by exchanging views with the electric power industry and mass media.

- We disseminated information on the expertise and research results across a wide range of specialized fields that we have gained thus far, through various public relations media and lectures in a timely manner. In particular, we proactively responded to interviews, inquiries and requests for lectures on earthquakes and tsunami, the diffusion of radioactive substances, the effect of low-dose radiation and the stable supply of electricity since the earthquake.

- In place of "the CRIEPI Forum" typically held every year, we held a forum on restoration and recovery efforts following the earthquake in November, at which we introduced some of the institute's activities supporting the response to the nuclear power plant accident.

6. Establishing a system to ensure optimal operations

- We established an internal control office in June in order to ensure more appropriate and efficient operations, and set up a more effective internal control system.

- An outline of our decisions on the establishment of systems to ensure that managements' job performance is in line with laws and articles of incorporation, as stipulated in Article 10, Clause 2, Number 2 of the Establishment Law* is provided below.

Note: Act on the Revision, etc. of Related Acts that Accompany the Enforcement of the Act on General Incorporated Association and General Incorporated Foundation and the Act on the Authorization, etc. of Public-interest Incorporated Associations and Public-interest Incorporated Foundation

Basic Principles on Internal Controls

CRIEPI has established the following basic principles for its internal control system in order to ensure that its operations are managed appropriately and efficiently.

(1) Management system for administration

- The Board of Directors will hold meetings regularly and will also hold special meetings as necessary, and will discuss and make decisions on important issues related to the performance of operations in accordance with laws and articles of incorporation as well as decisions by the Board of Councillors. In addition, Vice Presidents' job performance will be supervised.

- A committee concerned with management and research strategies and consisting of Vice Presidents and other the executives carrying out operations (below, "Management Committee") will be held regularly and important issues involved in conducting operations will be discussed with a flexible and multidisciplinary approach.
- The operations that executives are in charge of performing will be clarified and business will be conducted in an appropriate and prompt manner.
- Responsibilities and authority in exercising professional duties for Vice Presidents will be clarified in internal regulations, and efforts made to ensure that Vice President and employees perform their jobs appropriately and efficiently.
- Minutes for important committees such as the Board of Councillors, Board of Directors and Management Committee and other information related to Vice Presidents' execution of professional duties will be appropriately prepared, saved and managed in accordance with the articles of incorporation and internal regulations.
- An Internal Audit Division will be set up under the jurisdiction of the President and the job performance of each division will be regularly monitored in order to ensure that operations are conducted appropriately and efficiently.

(2) System for risk management

- A risk management system and internal regulations will be established.
- Risks related to business activities in carrying out professional duties will essentially be managed with a self-governing approach, based on laws and internal regulations.
- General risk management will be carried out by the Internal Audit Division in a centralized manner, with audits to ensure that important risks are appropriately managed without omission; the results will be reported to the President and Management Committee.
- Important risks that could potentially have a substantial effect on management will be discussed in the Management Committee and the necessary countermeasures will be discussed as required.
- In order to prepare for emergency disasters, internal regulations on the support organization and information system will be stipulated in internal regulations, and disaster prevention training will be carried out.

(3) Management system for compliance

- Action guidelines for compliance will be established and put into practice with the Vice Presidents taking the lead. In addition, employees will receive ongoing training on the prevention of improprieties via CRIEPI's website for internal users.
- A whistleblowing hotline will be permanently established with both internal and external access so that employees can discuss issues anonymously.
- The Internal Audit Division will audit employees' performance of professional duties in terms of compliance and report the results to the Management Committee. Executives will make the necessary improvements in light of the audit results.

(4) Audit system

- The General Auditor will audit Vice Presidents' and other the executives' performance of professional duties to ensure that they conform to the law and are appropriate by attending important meetings such as the Board of Directors meetings and perusing important documents. A full-time auditor will be appointed.
- The Internal Audit Division will provide staff to assist in the auditor's work. During the periods when the General Auditor's support staff are working exclusively with the General Auditor, they will not receive instructions or guidance from executives, and the General Auditor's wishes will be respected as regards transfers and evaluations.
- When Vice Presidents and/or employees discover anything that could significantly harm CRIEPI or detect acts that violate laws, articles of incorporation and other internal regulation, they should report directly to the President General Auditor and/or the Internal Audit Division.
- The Vice Presidents and employees will report to the auditor regarding the status of the execution of professional duties when requested to do so.

III. Workforce

We enhanced the capacity of current staff and assigned staff to appropriate positions in line with our basic policy to reduce the current staff of about 840 to an equilibrium point of about 800 by the end of fiscal 2015.

The workforce as of March 31, 2012, was as follows.

Item	Numbers	Percentage distribution (%)
1. Research	736*[1]	88.1
[Breakdown]		〔100.0〕
(1) Electricity	116	15.8
(2) Civil engineering and construction	92	12.5
(3) Mechanical	100	13.6
(4) Chemistry	71	9.6
(5) Biology	61	8.3
(6) Nuclear engineering	47	6.4
(7) Environmental science	45	6.1
(8) Information & communication	41	5.5
(9)Socioeconomics	47	6.4
(10) Research support & management	116	15.8
2. Office work	99	11.9
Total	835*[2]	100

Note*[1] This includes 39 Visiting Researchers.

Note*[2] There were 845 employees as of April 1, 2011.

IV. Meetings Held

1. Board of Directors

Date held	Agenda
June 9, 2011 (No. 223)	1. Approval of report on research activities in FY2010 2. Approval of report on settlement of accounts in FY2010 3. Approval of changes to maximum loan amount 4. Approval of method for selection of first councillors following transition to status as a new general incorporated foundation
June 9, 2011 (No. 224)	1. Mutual election of President and Executive Vice President 2. Presentation of retirement bonus on retirement of executive officers
August 17, 2011 (No. 225)	1. Election of Councillors 2. Committee for election of councillors 3. Recommendations for first councillors following transition to status as a new general incorporated foundation
October 28, 2011 (No. 226)	1. Donations establishment of administrative detailed regulations 2. Decrease in ongoing donations in FY2011 from Tohoku Electric Power Company and Tokyo Electric Power Company 3. Changes to FY2011 research plans and statement of budget 4. “Changes to Articles of Incorporation (plan)” and “Memorandum on Replacement of Agreement Including Donations” 5. Changes to Articles of Incorporation (plan), establishment of administrative detailed regulations 6. “Request for Authorization of Transition” and FY2011 statement of budget (P&L basis)
March 8, 2012 (No. 227)	1. Approval of Research Plan in FY2012 2. Approval of statement of budget in FY2012 and statement of budget in FY2012 (P&L basis) 3. Selection of councillors

2. Board of Councillors

Date held	Agenda
May 20, 2011 (No. 37)	1. Reports on research activities in FY2010 2. Reports on settlement of accounts in FY2010 3. Changes to maximum loan amount 4. Selection of vice presidents and general auditors when terms have expired 5. Method for selection of first councillors following transition to status as a new general incorporated foundation
August 17, 2011 (No. 38)	1. Election of vice presidents and general auditors 2. Committee for election of councillors 3. Recommendations for first councillors following transition to status as a new general incorporated foundation
October 21, 2011 (No.39)	1. Donations, establishment of administrative instructions 2. Decrease in ongoing donations in FY2011 from Tohoku Electric Power Company and Tokyo Electric Power Company 3. Changes to FY2011 research plans and statement of budget 4. “Changes to Articles of Incorporation (plan)” and “Memorandum on Replacement of Agreement Including Donations” 5. Changes to Articles of Incorporation (plan), establishment of administrative detailed regulations 6. “Request for Authorization of Transition” and FY2011 statement of budget (P&L basis)
February 17, 2012 (No. 40)	1. Research plans in FY2012 (Plan) 2. Statement of budget in FY2012 (Plan) and statement of budget in FY2012 (P&L basis, Plan)

Settlement of Accounts

Outline of Settlement of Accounts

The business scale in fiscal 2011 was 31.04 billion yen, 1.22 billion yen less than budgeted. Net property at the end of fiscal 2011 was 37.55 billion yen, 200 million yen higher than the end of the previous fiscal year.

1. Financial statements

(1) Assets condition

Total assets amounted to 50.64 billion yen, 1.11 billion yen higher compared to the end of the previous fiscal year. This increase in assets is attributable to a 1.09 billion yen in cash and deposits, 3.45 billion yen in newly acquired fixed assets for research, and 3.30 billion yen in reserves for special assets to establish a research base in Yokosuka. At the same time, assets decreased due to 5.73 billion yen depreciation and 700 million yen reduction in special assets.

(2) Liabilities condition

Total liabilities amounted to 13.08 billion yen, up 900 million yen compared to the end of the previous fiscal year. This was due to a 1.19 billion yen rise in accrued liabilities resulting from an increase in the acquisition of research facilities at the end of the fiscal year compared to the previous fiscal year.

(3) Net assets condition

The year-end balance of net assets was 37.55 billion yen, including 36.36 billion yen in general net assets and 1.19 billion yen in designated net assets.

2. New assets increase/decrease calculation sheet

(1) Changes in general net assets

- Ordinary revenue was 30.08 billion yen, down 470 million yen over the previous fiscal year. Current donation fell 100 million yen over the previous fiscal year to 27.27 billion yen as a result of a decrease in current donation from Tohoku Electric Power Company and Tokyo Electric Power Company, which suffered the negative impact of the Great East Japan Earthquake. Revenue from research projects funded by the government fell 250 million yen to 1.79 billion yen.
- Ordinary expenditure fell 1.6 billion yen compared to the previous fiscal year to 29.73 billion yen. This can be attributed to reductions in expenses for commissions since CRIEPI revised its research plans to adapt to lower revenue as a result of the earthquake and other factors.
- As a result, the change in net assets returned to positive levels from a net decrease of

780 million yen in the previous fiscal year to an increase of 340 million yen.

- The non-recurring change was down 680 million yen over the previous fiscal year to 9 million yen. This was due to the decision to put off sales in the current fiscal year, in contrast to the sale of public housing sites in the previous fiscal year.

As a result, the current change in general net assets returned to positive levels from a net decrease of 80 million yen in the previous fiscal year to a net increase of 350 million yen in the current fiscal year.

(2) Change in designated net assets

The change in designated assets was a net decrease of 140 million yen, down 750 million yen over the previous fiscal year. This was primarily due to significant revenue from subsidies received by the government and others and depreciation of special assets funded by designated net assets.

3. Statement of revenues and expenditures

Revenues and expenditures were revised as a result of a decrease in revenue from donations and changes in research plans due to the impact of the Great East Japan Earthquake. The Statement of Revenues and Expenses was corrected with the approval of an extraordinary board of directors meeting (held on October 28, 2011).

(1) Balance of business activities

- Revenue from business activities was 29.83 billion yen, 60 million yen higher than the budget.
- Business activity expenditures amounted to 24.28 billion yen, 1.06 billion yen lower than the budget. Project expenditures were down 1.21 billion yen over the budget to 12.35 billion yen due to savings on expenses such as expenses for commissions, supplies expenses, and light and fuel expenses.

(2) Investment activity balance

- Revenue from investment activity was 790 million lower than the budget at 10 million yen.
- Expenditures on investment activities were 6.75 billion yen lower than the budget at 160 million yen. While reserves of specific assets to establish a research base in Yokosuka increased, the acquisition of fixed assets decreased due to balances brought forward to the next fiscal year.

(3) Financial activities

There were no income or expenditures related to financial activities.

As outlined above, current revenue totaled 30.63 billion yen, the carry-over from the previous

fiscal year was 1.69 billion yen, and total revenue was 32.32 billion yen, down 50 million yen compared to the budget. On the other hand, current expenditures were 31.04 million yen, down 1.22 billion yen over the budget. As a result, the balance to be carried over to the next fiscal period was 1.28 billion yen.

4. Other

The discount rate used to calculate retirement benefit obligations was lowered from 2.0% to 1.0% in accordance with regulations. As a result, retirement benefit obligations increased 3.82 billion yen compared to the end of the previous fiscal year.

I. Financial Statements

Balance Sheet

As of March 31, 2012

(Unit: yen)

Account	Current fiscal year	Previous fiscal year	Increase/ decrease
I. Assets section			
1. Current assets			
Cash and deposit	4,721,708,937	3,624,861,993	1,096,846,944
Securities	4,126,281	4,123,405	2,876
Account receivable	711,972,714	1,066,894,406	△ 354,921,692
Suspense payable	66,226,736	26,318,513	39,908,223
Advance payment	9,404,455	9,058,530	345,925
Total current assets	5,513,439,123	4,731,256,847	782,182,276
2. Fixed assets			
(1) Fundamental property			
Cash and deposit	7,000,000	7,000,000	0
Total fundamental property	7,000,000	7,000,000	0
(2) Special assets			
Buildings	278,386,661	298,740,222	△ 20,353,561
Ancillary buildings	3,941,228	5,254,937	△ 1,313,709
Structures	3,359,079	4,132,523	△ 773,444
Machine and equipment	1,217,615,256	1,525,809,040	△ 308,193,784
Tools and furniture	36,921,060	39,741,215	△ 2,820,155
Lump-sum depreciable assets	665,284	560,701	104,583
Intangible fixed asset	772,436	578,776	193,660
Special assets for retirement lump sum grants benefits package allowance	3,435,900,000	3,435,900,000	0
Special assets for research facility acquiring allowance	7,900,000,000	5,300,000,000	2,600,000,000
Total special assets	12,877,561,004	10,610,717,414	2,266,843,590
(3) Other fixed assets			
Land	8,698,562,302	8,698,562,302	0
Building	9,375,268,070	9,724,652,268	△ 349,384,198
Ancillary buildings	2,525,915,941	2,750,947,449	△ 225,031,508
Structure	770,384,127	912,705,600	△ 142,321,473
Machine and equipment	7,475,601,504	8,888,142,326	△ 1,412,540,822
Tools and furniture	1,479,673,988	1,830,267,644	△ 350,593,656
Rolling stock and vehicles	16,538,076	22,696,244	△ 6,158,168
Lump-sum depreciable assets	36,689,190	34,130,833	2,558,357
Intangible fixed asset	632,377,769	845,534,411	△ 213,156,642
Construction in process account	1,175,744,733	314,295,500	861,449,233
Long-term prepaid expenses	60,133,599	157,382,419	△ 97,248,820
Total other fixed assets	32,246,889,299	34,179,316,996	△ 1,932,427,697
Total fixed assets	45,131,450,303	44,797,034,410	334,415,893
Total assets	50,644,889,426	49,528,291,257	1,116,598,169
II. Liability section			
1. Current liability			
Accrued liability	4,137,465,605	2,937,704,713	1,199,760,892
Money entrusted	88,335,782	98,267,226	△ 9,931,444
Advance receipt	1,352,356	3,430,466	△ 2,078,110
Accrued bonus	359,000,000	396,000,000	△ 37,000,000

Account	Current fiscal year	Previous fiscal year	Increase/ decrease
Total current liability	4,586,153,743	3,435,402,405	1,150,751,338
2. Fixed liabilities			
Allowance for retirement benefits for directors	302,000,000	309,000,000	△ 7,000,000
Accrued retirement benefits for employees	8,199,000,000	8,433,000,000	△ 234,000,000
Total fixed liabilities	8,501,000,000	8,742,000,000	△ 241,000,000
Total liabilities	13,087,153,743	12,177,402,405	909,751,338
III. Net assets section			
1. Designated net assets			
Special benefits	496,031,710	554,354,915	△ 58,323,205
Cash subsidy	556,185,259	712,393,988	△ 156,208,729
Cash contribution	142,369,208	75,178,399	67,190,809
Total designated net assets	1,194,586,177	1,341,927,302	△ 147,341,125
(Including appropriation to fundamental property)	(7,000,000)	(7,000,000)	(0)
(Including appropriation to special assets)	(1,187,586,177)	(1,334,927,302)	(△ 147,341,125)
2. General net assets	36,363,149,506	36,008,961,550	354,187,956
(Including appropriation to fundamental property)	(0)	(0)	(0)
(Including appropriation to special assets)	(8,254,074,827)	(5,839,890,112)	(2,414,184,715)
Total net assets	37,557,735,683	37,350,888,852	206,846,831
Total of liability and net assets	50,644,889,426	49,528,291,257	1,116,598,169

Net Assets Increase/Decrease Calculation Sheet

From Aril 1 2011 to March 31 2012

(Unit: yen)

Account	Current fiscal year	Previous fiscal year	Increase/decrease
I. General net assets increase/decrease section			
1. Current increase/decrease section			
(1) Current revenue			
[1] Benefit received			
Current benefit received	27,273,319,000	27,377,598,000	△ 104,279,000
[2] Operating revenue	(2,185,207,898)	(2,656,575,986)	(△ 471,368,088)
Funded research operating revenue	1,795,474,568	2,048,775,266	△ 253,300,698
Other operating revenue	389,733,330	607,800,720	△ 218,067,390
[3] Other revenue	(125,038,944)	(233,416,168)	(△ 108,377,224)
Interest received	7,505,683	13,055,313	△ 5,549,630
Facility usage fee received	88,650,006	93,962,393	△ 5,312,387
Miscellaneous revenue	28,883,255	126,398,462	△ 97,515,207
[4] Transfer from designated net assets	499,390,249	293,414,978	205,975,271
Total current revenue	30,082,956,091	30,561,005,132	△ 478,049,041
(2) Current expenditure			
[1] Project cost			
Personnel expenditure	(9,848,071,443)	(10,186,585,439)	(△ 338,513,996)
Salary and benefit	7,555,291,324	7,778,192,907	△ 222,901,583
Retirement benefit expenditure	1,238,540,416	1,361,052,460	△ 122,512,044
Welfare expenditure	1,054,239,703	1,047,340,072	6,899,631
Expenditure	(18,043,295,781)	(19,264,442,805)	(△ 1,221,147,024)
Supplies expenses	1,429,855,378	1,820,446,373	△ 390,590,995
Printed material expenses	411,064,778	444,415,073	△ 33,350,295
Fuel, light, and water expenses	560,085,523	651,287,539	△ 91,202,016
Expenses for commission	5,317,031,970	6,070,417,727	△ 753,385,757
Collaboration research contribution	814,989,270	723,845,270	91,144,000
Repair expenses	1,445,649,445	1,317,834,906	127,814,539
Rental rate	300,475,526	189,414,624	111,060,902
Tax and public charge	95,659,307	103,036,518	△ 7,377,211
Travel and transport expenses	634,977,439	764,566,108	△ 129,588,669
Communication and transportation expenses	89,437,589	128,875,073	△ 39,437,484
Other expenditure	1,258,764,410	1,287,220,541	△ 28,456,131
Depreciation allowance	5,685,305,146	5,763,083,053	△ 77,777,907
Subtotal of project cost	27,891,367,224	29,451,028,244	△ 1,559,661,020
[2] Administrative expenses			
Personnel expenditure	(1,064,456,016)	(1,043,947,585)	(20,508,431)
Board members' salary	170,720,000	151,110,000	19,610,000
Salary and benefit	622,949,075	638,203,041	△ 15,253,966
Retirement benefit expenditure	81,865,144	97,739,020	△ 15,873,876
Welfare expenditure	74,191,797	68,895,524	5,296,273
Allowance for retirement benefits for directors transfer	114,730,000	88,000,000	26,730,000
Expenditure	(782,867,068)	(850,828,480)	(△ 67,961,412)
Supplies expenses	21,196,949	10,723,157	10,473,792
Printed material expenses	57,046,487	57,816,376	△ 769,889
Fuel, light, and water expenses	28,363,081	29,645,780	△ 1,282,699

Account	Current fiscal year	Previous fiscal year	Increase/decrease
Expenses for commission	137,162,820	140,419,753	△ 3,256,933
Repair expenses	12,706,481	8,016,470	4,690,011
Rental rate	365,958,834	364,797,337	1,161,497
Tax and public charge	6,385,028	7,497,388	△ 1,112,360
Travel and transport expenses	25,793,655	46,862,168	△ 21,068,513
Communication and transportation expenses	8,050,321	9,309,477	△ 1,259,156
Other expenditure	72,754,234	114,228,878	△ 41,474,644
Depreciation allowance	47,449,178	61,511,696	△ 14,062,518
Subtotal of administrative expenses	1,847,323,084	1,894,776,065	△ 47,452,981
Total current expenditure	29,738,690,308	31,345,804,309	△ 1,607,114,001
Current ordinary increase/decrease	344,265,783	△784,799,177	1,129,064,960
2. Nonrecurring increase/decrease section			
(1) Nonrecurring profit			
[1] Gain from sale of fixed assets			
Gain from sale of land and building	0	821,932,611	△ 821,932,611
[2] Fixed asset donated profit			
Facility donated profit	175,112,423	31,820,000	143,292,423
Total nonrecurring profit	175,112,423	853,752,611	△ 678,640,188
(2) Nonrecurring expenses			
[1] Loss on sale of fixed assets			
Loss on sale of tools and furniture	156,013,501	158,806,487	△ 2,792,986
[2] Losses on impairment of fixed assets			
Losses on impairment of equipment	9,176,749	0	9,176,749
Total nonrecurring expenses	165,190,250	158,806,487	6,383,763
Current nonrecurring increase/decrease	9,922,173	694,946,124	△ 685,023,951
Current ordinary net asset increase/decrease	354,187,956	△89,853,053	444,041,009
Ordinary net asset beginning balance	36,008,961,550	36,098,814,603	△ 89,853,053
Ordinary net asset final balance	36,363,149,506	36,008,961,550	354,187,956
II. Designated net asset increase/decrease section			
[1] Cash subsidy received			
Subsidy received	254,983,425	868,968,943	△ 613,985,518
[2] Fixed asset donated profit			
Facility donated profit	97,065,699	28,313,770	68,751,929
[3] Transfer to ordinary net assets	499,390,249	293,414,978	205,975,271
Current designated net assets increase/decrease	△ 147,341,125	603,867,735	△ 751,208,860
Designated net assets beginning balance	1,341,927,302	738,059,567	603,867,735
Designated net assets final balance	1,194,586,177	1,341,927,302	△ 147,341,125
III. Net assets final balance	37,557,735,683	37,350,888,852	206,846,831

Notes for Financial Statements

1. Important accounting policy

Public-Service Corporation Accounting Standard (October 14, 2004, understood thing at the concerned government ministries meeting related to teaching and direction of public-service corporations) was employed.

(1) Assessment standard and assessment method of valuable stock certificates

For other valuable stock certificates without market price, the cost method by the moving-average method has been applied.

(2) Depreciation method of fixed assets

- For tangible fixed assets, building (excluding building attached structures) has been managed by the equal installment method, small fixtures have been by the three-year uniform extinguishment, and other tangible fixed assets including machine and equipment have been by the constant percentage method.
- Intangible fixed asset has been managed by the equal installment method.
- Lease assets from finance lease trade other than ownership transfer was calculated for the lease period of expiration year and based on the equal installment method with zero residue prices.

(3) Allowance allocating standard

Allowance for doubtful debts: To prepare for doubtful debts including account receivable and loan receivable, uncollectible amount is individually estimated to account for allowance.

Bonus payment reserve: To prepare for doubtful debts including account receivable and loan receivable, uncollectible amount is individually estimated to account for allowance.

Allowance for retirement benefits for vice presidents: To prepare payment of vice presidents special service bonus, estimation at the end of period is account for allowance based on the private regulation to pay allowance for retirement benefits for vice presidents.

Accrued retirement benefits for employees: To prepare for payment of retirement allowance and annual pension, amount deducting the pension asset amount assessed from the present value method based on future estimated retirement benefit is account for allowance. And retirement benefits for counselors are accounted for the estimation at the end of period based on the related private regulation and expressed in the combined form.

(4) Processing method of the finance lease trade other than ownership transfer before beginning of initial fiscal year applying the lease account standard

Lease assets from finance lease trades other than ownership transfer with contracts arranged by March 31, 2008 continued to be accounted for according to the ordinary lease contract, but were concluded as of March 31, 2011.

(5) Account processing of consumption tax, etc.

Account processing of consumption tax, etc. is controlled by the before tax method.

2. Change in important account policy

There were no changes in important account policy.

3. Increase, decrease and its balance of fundamental asset and special asset

Increase, decrease and its balance of fundamental asset and special asset are as follows.

(Unit: yen)

Subject	Balance at the end of previous period	Current increased amount	Current decreased amount	Balance at the end of current period
Fundamental asset				
Cash and deposit	7,000,000	0	0	7,000,000
Subtotal	7,000,000	0	0	7,000,000
Special asset				
Building	298,740,222	0	20,353,561	278,386,661
Ancillary buildings	5,254,937	0	1,313,709	3,941,228
Structures	4,132,523	0	773,444	3,359,079
Machine and equipment	1,525,809,040	189,050,000	497,243,784	1,217,615,256
Tools and furniture	39,741,215	30,069,533	32,889,688	36,921,060
Lump-sum depreciable assets	560,701	858,566	753,983	665,284
Intangible fixed assets	578,776	877,600	683,940	772,436
Special assets for reserves for lump-sum retirement benefits	3,435,900,000	0	0	3,435,900,000
Special assets for acquisition of research facilities	5,300,000,000	3,300,000,000	700,000,000	7,900,000,000
Subtotal	10,610,717,414	3,520,855,699	1,254,012,109	12,877,561,004
Total	10,617,717,414	3,520,855,699	1,254,012,109	12,884,561,004

4. Breakdown of financial resources for fundamental assets and special assets

Breakdown of financial resources for fundamental assets and special assets is as follows.

(Unit: yen)

Subject	Balance at the end of current period	(Including appropriation from designated net asset)	(Including appropriation from general net asset)	Including liability relating item)
Fundamental asset				
Cash and deposit	7,000,000	(7,000,000)	-	-
Subtotal	7,000,000	(7,000,000)	-	-
Special asset				
Building	278,386,661	(278,386,661)	-	-
Ancillary buildings	3,941,228	(3,941,228)	-	-
Structures	3,359,079	(2,117,232)	(1,241,847)	-
Machine and equipment	1,217,615,256	(864,782,276)	(352,832,980)	-
Tools and furniture	36,921,060	(36,921,060)	-	-
Lump-sum depreciable assets	665,284	(665,284)	-	-
Intangible fixed assets	772,436	(772,436)	-	-
Special assets for reserves for lump-sum retirement benefits	3,435,900,000	-	-	(3,435,900,000)
Special assets for acquisition of research facilities	7,900,000,000	-	(7,900,000,000)	-
Subtotal	12,877,561,004	(1,187,586,177)	(8,254,074,827)	(3,435,900,000)
Total	12,884,561,004	(1,194,586,177)	(8,254,074,827)	(3,435,900,000)

5. Assets offered as collateral

No asset offered as collateral is recorded.

6. Acquisition value, accumulated depreciation and balance at the end of current period for fixed assets

Acquisition value, accumulated depreciation and balance at the end of current period for fixed assets are as follows.

(Unit: yen)

Subject	Acquisition value	Accumulated depreciation	Balance at the end of current period
Special asset	(5,769,608,429)	(4,227,947,425)	(1,541,661,004)
Building	621,962,762	343,576,101	278,386,661
Ancillary buildings	131,372,924	127,431,696	3,941,228
Structures	28,268,470	24,909,391	3,359,079
Machine and equipment	4,903,123,324	3,685,508,068	1,217,615,256
Tools and furniture	82,552,173	45,631,113	36,921,060
Lump-sum depreciable assets	1,451,176	785,892	665,284
Intangible fixed asset	877,600	105,164	772,436
Other fixed asset	(99,867,043,108)	(77,554,594,443)	(22,312,448,665)
Building	18,472,695,929	9,097,427,859	9,375,268,070
Ancillary buildings	12,177,718,917	9,651,802,976	2,525,915,941
Structures	5,334,545,105	4,564,160,978	770,384,127
Machine and equipment	49,861,184,033	42,385,582,529	7,475,601,504
Tools and furniture	9,725,680,424	8,246,006,436	1,479,673,988
Rolling stock and vehicle	78,247,067	61,708,991	16,538,076
Lump-sum depreciable assets	112,357,605	75,668,415	36,689,190
Intangible fixed asset	4,104,614,028	3,472,236,259	632,377,769
Total	(105,636,651,537)	(81,782,541,868)	(23,854,109,669)

7. Claimable assets, balance of allowance for doubtful debts at the end of period, and balance of claimable assets at the end of period

Claimable assets, balance of allowance for doubtful debts at the end of period, and balance of claimable assets at the end of period are as follows.

(Unit: yen)

Subject	Claimable assets	Balance of allowance for doubtful debts at the end of period	Balance of claimable assets at the end of period
Account receivable	711,972,714	0	711,972,714
Housing loans and welfare loans among special assets of accrued retirement benefits	24,005,000	0	24,005,000
Total	735,977,714	0	735,977,714

8. Contingent liabilities such as guarantee liabilities

A guarantee liability to employees housing loans is 2,233,000,114 yen.

9. Breakdown of held-to maturity bond certificates and book values, actual values, and appraisal profit or loss

No held-to-maturity bond certificates are recorded.

10. Breakdown of subsidies, etc. and delivers, current increase/decrease, and balance.

Breakdown of subsidies, etc. and delivers, current increase/decrease, and balance are as follows.

(Unit: yen)

Name of subsidies	Deliverer	Balance at the end of period	Current increase	Current decrease	Balance at the end of period	Describing division in balance sheet
Subsidies						
・ Subsidy for projects assessing impact on power systems of mass adoption of destributed generation	Ministry of Economy, Trade and Industry	509,171,528	0	181,774,214	327,397,314	Designated net assets
・ Subsidy for projects demonstrating optimization control technology on next-generation power transmission and distribution systems	Ministry of Economy, Trade and Industry	0	3,833,773	3,833,773	0	—
・ Subsidy for demonstrations of next-generation two-way communication output control	Ministry of Economy, Trade and Industry	0	987,624	987,624	0	—
・ Subsidy for costs of project for development and demonstration of solar power output projection technology	Ministry of Economy, Trade and Industry	0	4,481,102	4,481,102	0	—
・ Subsidy of costs for development of cutting-edge technology for energy use rationalization	Ministry of Economy, Trade and Industry	0	2,080,000	2,080,000	0	—
・ Subsidy for cost of promoting technology for coal use (research on technology for the efficient use of coal ash)	Ministry of Economy, Trade and Industry	0	13,340,000	13,340,000	0	—
・ Project to promote the introduction of solar power generation system at CRIEPI's laboratories in the Yokosuka area in fiscal 2008	New Energy and Industrial Technology Development Organization	14,657,478	0	1,861,499	12,795,979	Designated net assets
・ Project to promote introduction regional new energy in fiscal 2009	New Energy Promotion Council	3,412,000	0	501,564	2,910,436	Designated net assets
Grant						
・ R&D for SiC innovative power electronics to create a low-carbon society (super-thick membrane and multi-layer SiC epitaxial wafer technology)	Japan Society for the Promotion of Science	182,637,180	216,906,600	190,672,381	208,871,399	Designated net assets
・ Research on impact of forest's watershed characteristics on hydroelectric power generation volume (fiscal 2010 portion)	National Land Afforestation Promotion Organization	877,917	998,943	1,547,641	329,219	Designated net assets
・ Research on impact of forest's watershed characteristics on hydroelectric power generation volume (fiscal 2011 portion)	National Land Afforestation Promotion Organization	0	12,355,383	9,838,830	2,516,553	Designated net assets
・ Fiscal 2010 grant for project to subsidize costs of development of dual analog/digital equipment to alleviate poor reception	Association for Promotion of Digital Broadcasting	1,637,885	0	273,526	1,364,359	Designated net assets
Total		712,393,988	254,983,425	411,192,154	556,185,259	

11. Breakdown of transfer from designated net assets to general net assets

Breakdown of transfer from designated net assets to general net assets is as follows.

(Unit: yen)

Content	Amount of money
Transfer to balance of current account	
Depreciation allowance related to designated net assets	365,074,155
Transfer by exception from specification as designated net asset	3,122,669
Transfer by implementing of project for which subsidy was received	131,193,425
Total	499,390,249

12. Trading content to related parties

No trading to related parties is recorded.

13. Important subsequent event

No important subsequent event is recorded.

14. Trading finance lease related before beginning of initial fiscal year applying the lease accounting standards

There were no finance lease trades prior to the start of the first fiscal year in which lease accounting standards were applied.

15. Retirement benefit related

(1) Summary of employed retirement benefit

As a defined-benefits system, retirement pension system and termination allowance plan are employed.

(2) Retirement benefit liability and its contents

(Unit: yen)

[1] Retirement benefit liability	△26,013,185,064
[2] Retirement pension asset	12,908,105,356
[3] Non-accumulated retirement benefit ([1]+[2])	△13,105,079,708
[4] Non-depreciated mathematical calculation difference	△4,906,079,708
[5] Accrued retirement benefits for employees ([3]-[4])	△8,199,000,000

(3) Items for retirement benefit expense

(Unit: yen)

[1] Working expense	1,001,696,475
[2] Interest expense	432,286,020
[3] Expectable operation benefit	△136,891,187
[4] Mathematical calculation difference depreciation	23,314,252
[5] Retirement benefit expense ([1]+[2]+[3]+[4])	1,320,405,560

(4) Items for calculation bases of retirement benefit liability

[1] Period allocation method of retirement benefit expectation: Period fixed amount standard based on the working period

[2] Discount rate: 1.0%

[3] Expectable operation benefit: 1.0%

[4] Processing year of difference on mathematical calculation: Five-year constant percentage method is applied for depreciation after next year of occurrence.

Supplementary Statement

1. Detailed Statement of Basic Assets and Special Assets

(Unit: yen)

Category	Type of asset	Book value at start of fiscal period	Increase in current fiscal period	Decrease in current fiscal period	Book value at end of fiscal period
Basic assets	Cash and deposits	7,000,000	0	0	7,000,000
	Total basic assets	7,000,000	0	0	7,000,000
Special assets	Buildings	298,740,222	0	20,353,561	278,386,661
	Ancillary buildings	5,254,937	0	1,313,709	3,941,228
	Structures	4,132,523	0		3,359,079
	Machines and equipment	1,525,809,040	189,050,000	497,243,784	1,217,615,256
	Tools and furniture	39,741,215	30,069,533	32,889,688	36,921,060
	Lump-sum depreciable assets	560,701	858,566	753,983	665,284
	Intangible fixed assets	578,776	877,600	683,940	772,436
	Special assets for allowances for lump-sum retirement benefits	3,435,900,000	0	0	3,435,900,000
	Special assets for allowance for acquisition of research facilities	5,300,000,000	3,300,000,000	700,000,000	7,900,000,000
	Total special assets	10,610,717,414	3,520,855,699	1,254,012,109	12,877,561,004

Note: The increase in special assets for allowance for acquisition of research facilities in the current fiscal period is due to reserves for special assets intended to build a testing facility in the Yokosuka district and update the mainframe; the decrease can be attributed to the liquidation of special assets to install infrastructure such as a power source and update the short-circuit testing facility in Yokosuka.

2. Breakdown of Allowances

(Unit: yen)

Category	Balance at start of fiscal period	Increase in current fiscal period	Decrease in current fiscal period		Balance at end of fiscal period
			Intended use	Other	
Allowance for employees	396,000,000	359,000,000	396,000,000	0	359,000,000
Allowance for retirement benefits for directors	309,000,000	114,730,000	121,730,000	0	302,000,000
Allowance for retirement benefits for employees	8,433,000,000	1,320,405,560	1,554,405,560	0	8,199,000,000

Lists of Assets

As of March 31 2012

(Unit: yen)

Subject	Amount of money			Memo
I. Assets section				
1. Floating asset				
Cash and deposit				
General deposit	4,619,773,816			Mitsubishi Tokyo UFJ Bank, 4,214,512,349 yen and others
Fixed deposit account	100,000,000			Tokyo Tomin Bank, Limited, 100,000,000 yen
Postal savings	1,935,121			Japan Post Bank, 1,935,121 yen
Subtotal of cash and deposits		4,721,708,937		
Securities		4,126,281		Open-end bond investment trust
Account receivable		711,972,714		Funded research business income and others
Suspense payment		66,226,736		Temporary payment consumption tax on construction suspense account expense and others
Advance payment		9,404,455		Advance payment of optical communication lines
Total floating asset			5,513,439,123	
2. Fixed asset				
(1) Fundamental property				
Case and deposit				
Fixed deposit account		7,000,000		Mizuho Trust Bank
Total fundamental property		7,000,000		
(2) Special asset				
Building				
Building	621,962,762			Short-circuit testing building in Yokosuka area, etc.
Accumulated depreciation	△ 343,576,101			
Subtotal of building		278,386,661		
Ancillary buildings				
Ancillary buildings	131,372,924			Short-circuit testing facility in Yokosuka area, etc.
Accumulated depreciation	△ 127,431,696			
Subtotal for ancillary buildings		3,941,228		
Structures				
Structures	28,268,470			Abiko area, Construction work for compatibility with terrestrial digital broadcasting
Accumulated depreciation	△ 24,909,391			
Subtotal of structures		3,359,079		
Machine and equipment				
Research machine and equipment	4,841,186,584			Komae area, power grid simulator, etc.
General machine and equipment	61,936,740			Yokosuka area, solar power generator equipment, etc.
Accumulated depreciation	△ 3,685,508,068			
Subtotal of machine and equipment		1,217,615,256		
Tools and furniture				
Research tools and furniture	82,552,173			Fluorescent x-ray analysis instruments, etc.
Accumulated depreciation	△ 45,631,113			
Subtotal of tools and furniture		36,921,060		
Lump-sum depreciable assets				
Lump-sum depreciable assets	1,451,176			Computers for research purposes, etc.

Subject	Amount of money			Memo
Accumulated depreciation	△ 785,892			
Subtotal of lump-sum depreciable assets		665,284		
Intangible fixed asset				
Research software	877,600			Science technology calculation library etc.
Accumulated depreciation	△ 105,164			
Subtotal of Intangible fixed asset		772,436		
Accrued retirement benefits for employees special asset				
Welfare loan	24,005,000			Personnel loan
Long-term official credit deposit	475,742,580			Caution money and guarantee deposit and others
Special deposit	2,936,152,420			General deposit: Mitsubishi Tokyo UFJ bank, 2,436,152,420 yen Fixed deposit account: Mitsubishi Tokyo UFJ Bank, 500,000,000 yen
Subtotal of accrued retirement benefits for employees special asset		3,435,900,000		
Research facility acquiring benefits special asset		7,900,000,000		Fixed deposit: Mitsubishi Tokyo UFJ Bank, 4,200,000,0 yen Fixed deposit: Mizuho Bank, 3,700,000,000 yen
Total special asset		12,877,561,004		
(3) Other fixed asset				
Land				
Komae area	1,803,423,271			Commercial land and welfare housing land: 68,812.45 m^2
Abiko area	1,483,961,669			Ditto: 173,608.27 m^2
Yokosuka area	4,319,643,545			Ditto: 251,774.71 m^2
Akagi area	651,429,826			Ditto: 1,005,572.32 m^2
Others	440,103,991			Shiobara experimental land and others: 53,986.44 m^2
Subtotal of land		8,698,562,302		
Building				
Building	18,472,695,929			Yokosuka area, administration building and high-voltage insulation laboratory, etc.
Accumulated depreciation	△ 9,097,427,859			
Subtotal of building		9,375,268,070		
Ancillary buildings				
Ancillary buildings	12,177,718,917			Komae area, exhaust facility in third wing, etc.
Accumulated depreciation	△ 9,651,802,976			
Subtotal for ancillary buildings		2,525,915,941		
Structure				
Structure	5,334,545,105			Yokosuka area, second switchgear and others
Accumulated depreciation	△ 4,564,160,978			
Subtotal of structure		770,384,127		
Machine and equipment				
Research machine and equipment	49,453,876,425			Large-capacity power short-circuit testing facility, etc.
General machine and equipment	407,307,608			Equipment parking facility, etc
Accumulated depreciation	△ 42,385,582,529			
Subtotal of machine and equipment		7,475,601,504		

Subject	Amount of money			Memo
Tools and furniture				
Research tools and furniture	8,446,162,975			.
General tools and furniture	1,279,517,449			Human iPS cell analyzer, etc.
Accumulated depreciation	△ 8,246,006,436			Telephone exchange system, etc.
Subtotal of tools and furniture		1,479,673,988		
Rolling stock and vehicles				
Rolling stock and vehicles	78,247,06			
Accumulated depreciation	△ 61,708,991			High-altitude work vehicle, etc.
Subtotal of rolling stock and vehicles		16,538,076		
Lump-sum depreciable assets				
Lump-sum depreciable assets	112,357,605			
Accumulated depreciation	△ 75,668,415			Experiment and research tools, research and work computers, etc.
Subtotal of lump-sum depreciable assets		36,689,190		
Intangible fixed asset				
Research software	2,941,495,946			
Business software	1,036,183,754			Communications network performance assessment system, etc.
Facility utilization right	126,218,328			ERP system and others
Telephone right	716,000			Payment for water service application, and others
Accumulated depreciation	△ 3,472,236,259			Each area telephone rights
Subtotal of intangible fixed asset		632,377,769		
Building under construction		1,175,744,733		
Long-term advanced payment		60,133,599		Construction work to install power-supply infrastructure in Yokosuka area, etc.
Other fixed asset total		32,246,889,299		Amount equivalent to the facility construction cost portion of the research costs for the joint research project, “Research on Integrated Coal Gasification Combined Cycle Experiential Plants”
Fixed asset total				
Asset total			45,131,450,303	
II. Liability section			50,644,889,426	
1. Floating liability				
Accrued liability		4,137,465,605		
Money entrusted		88,335,782		Contract construction and purchased goods expense and others
Advance receipt		1,352,356		Consumption tax, inhabitant’s tax and others
Accrued bonuses		359,000,000		Advance receipt related to next fiscal year implementation grant, and others
Floating liability total				Allowance for employee, etc. bonus
2. Fixed liability			4,586,153,743	
Allowance for retirement benefits for directors		302,000,000		
Allowance for retirement pension benefits for employees				Allowance for retirement benefits for vice presidents and general auditors.
Accrued retirement lump sum benefits for employees	7,603,000,000			

Subject	Amount of money			Memo
Allowance for retirement benefits	596,000,000			Allowance for lump-sum retirement benefits for employees
Sub-total for allowance for retirement benefits		8,199,000,000		Allowance for retirement benefits for employees
Total fixed liability			8,501,000,000	
Total liability			13,087,153,743	
Net asset			37,557,735,688	

Cash flow calculation sheet

From April 1, 2011 to March 31, 2012

(Unit: yen)

Subject	Current year	Previous year	Increase/decrease
I. Cash flow in business activity			
1. Current period ordinary net property increase/decrease	354,187,956	Δ 89,853,053	444,041,009
2. Adjust amount to cash flow			
(1) Depreciation allowance	5,732,754,324	5,824,594,749	Δ 91,840,425
(2) Fixed asset loss on retirement	156,013,501	158,806,487	Δ 2,792,986
(3) Losses on impairment of fixed assets	9,176,749	0	9,176,749
(4) Transferred long-term advance payment	97,248,820	228,156,594	Δ 130,907,774
(5) Gains on sale of fixed assets	0	Δ 821,932,611	821,932,611
(6) Facility donating profit	Δ 175,112,423	Δ 31,820,000	Δ 143,292,423
(7) Increase/decrease in allowance for retirement benefits for directors	Δ 7,000,000	88,000,000	Δ 95,000,000
(8) Increase/decrease in accrued retirement benefits for employees	Δ 234,000,000	533,000,000	Δ 767,000,000
(9) Increase/decrease in accrued bonus	Δ 37,000,000	4,000,000	Δ 41,000,000
(10) Increase/decrease in account receivable	354,921,692	Δ 379,580,251	734,501,943
(11) Increase/decrease in suspense payment	Δ 39,908,223	11,238,595	Δ 51,146,818
(12) Increase/decrease in advance payment	Δ 345,925	Δ3,339,769	2,993,844
(13) Increase/decrease in accrued liability	450,607,567	Δ 756,238,449	1,206,846,016
(14) Increase/decrease in money entrusted	Δ 9,931,444	5,900,167	Δ 15,831,611
(15) Increase and decrease of advanced receipt	Δ 2,078,110	Δ 120,066,210	117,988,100
(16) Transferred amount from designated net property	Δ 499,390,249	Δ 293,414,978	Δ 205,975,271
(17) Others	Δ 286,428	Δ 26,800,000	26,513,572
Subtotal	5,795,669,851	4,420,504,324	1,375,165,527
3. Increase/decrease in designated net property			
(1) Subsidy income	254,983,425	868,968,943	Δ 613,985,518
Cash flow by business activity	6,404,841,232	5,199,620,214	1,205,221,018
II. Cash flow by investment activity			
1. Investment activity income			
(1) Revenue from liquidation of specific assets for allowances for acquisition of research equipment	700,000,000	950,000,000	Δ 250,000,000
(2) Fixed asset sale income	0	1,001,729,553	Δ 1,001,729,553
Total investment activity income	700,000,000	1,951,729,553	Δ 1,251,729,553
2. Investment activity expenditure			
(1) Special asset acquiring expenditure	3,300,000,000	2,600,000,000	700,000,000
(2) Fixed asset acquiring expenditure	2,707,991,412	5,569,703,401	Δ 2,861,711,989
Total investment activity expenditure	6,007,991,412	8,169,703,401	Δ 2,161,711,989
Cash flow by investment activity	Δ 5,307,991,412	Δ 6,217,973,848	909,982,436
III. Cash flow by financial activity			
1. Financial activity income	0	0	0
2. Financial activity expenditure	0	0	0
Cash flow by financial activity	0	0	0
IV. Difference in conversion of cash and cash equivalent	0	0	0
V. Increase/decrease in cash and cash equivalent	1,096,849,820	Δ 1,018,353,634	2,115,203,454
VI. Cash and cash equivalent balance at the beginning of a period (note 3)	3,628,985,398	4,647,339,032	Δ 1,018,353,634
VII. Cash and cash equivalent balance at the end of a period (note 3)	4,725,835,218	3,628,985,398	1,096,849,820

Notes 1. Asset scope: Asset scope includes cash and cash equivalent.

2. Important non-asset trade: No important non-asset trade is reported.

3. Relation between cash and cash equivalent balance at the end of a period and amount of money described in balance sheet

Subject	Beginning of current period	End of current period
Cash deposit	3,624,861,993	4,721,708,937
Securities	4,123,405	4,126,281
Cash and cash equivalent	3,628,985,398	4,725,835,218

II. Statement of Revenue and Expenditures

Statement of revenues and expenditures

From April 1 2011 to March 31 2012

(Unit: yen)

Subject	Budget	Account settlement	Difference	Remarks
I. Business activity balance of payments section				
1. Business activity income				
(1) Benefit income				
Current benefit income	27,270,000,000,	27, 273,319,000	Δ 3,319,000	
(2) Business income	2,390,000,000	2,439,904,895	Δ 49,904,895	
Funded research business income	(1,800,000,000)	(1,795,474,568)	(4,525,432)	
Other business income	(590,000,000)	(644,430,327)	(Δ 54,430,327)	
(3) Other income	110,000,000	125,038,944	Δ 15,038,944	
Total business activity income	29,770,000,000	29,838,262,839	Δ 68,262,839	
2. Business activity expenditure				
(1) Business expense expenditure	23,590,000,000	22,444,853,388	1,145,146,612	
Personnel expense expenditure	(10,020,000,000)	(10,086,862,753)	(Δ 66,862,753)	
Expense expenditure	(13,570,000,000)	(12,357,990,635)	(1,212,009,365)	(1)
(2) Management cost expenditure	1,760,000,000	1,839,082,596	Δ 79,082,596	
Personnel expense expenditure	(980,000,000)	(1,103,664,706)	(Δ 123,664,706)	
Expense expenditure	(780,000,000)	(735,417,890)	(44,582,110)	
Total business activity expense	25,350,000,000	24,283,935,984	1,066,064,016	
Difference in business activity balance of payments	4,420,000,000	5,554,326,855	Δ 1,134,326,855	
II. Investment activity balance of payments section				
1. Investment activity income				
(1) Special asset transferred income				
Research facility acquiring special asset transferred income	700,000,000	700,000,000	0	
(2) Long-term advance payment transferred income	110,000,000	97,248,820	12,751,180	
Total investment activity income	810,000,000	797,248,820	12,751,180	
2. Investment activity expenditure				
(1) Special asset acquiring expenditure				
Expenditures on special assets for allowances for acquisition of research equipment	2,800,000,000	3,300,000,000	Δ 500,000,000	(2)
(2) Fixed asset acquiring expenditure	4,120,000,000	3,457,144,737	662,855,263	(3)
Total investment activity expenditure	6,920,000,000	6,757,144,737	162,855,263	
Difference in investment activity balance of payments	Δ 6,110,000,000	Δ 5,959,895,917	Δ 150,104,083	
III. Financial activity balance of payments				
1. Financial activity income	0	0	0	
2. Financial activity expenditure	0	0	0	
Difference in financial activity balance of payments	0	0	0	
Difference in current balance of payments	Δ 1,690,000,000	Δ 405,569,062	Δ1,284,430,938	
Difference in balance of payments transferred from previous period	1,690,000,000	1,691,854,442	Δ 1,854,442	
Difference in balance of payments transferring to next period	0	1,286,285,380	Δ 1,286,285,380	

Notes:

(1) The difference is due to savings on expenses for commissions, supplies expenses, and light and fuel expenses.

(2) Reserves for special assets intended for infrastructure in the Yokosuka region increased by 500 million yen.

(3) The difference can be attributed primarily to the introduction of research equipment carried over to the following fiscal year.

Note for income and expenditure accounts

1. Scope of revenue

Scope of revenue includes cash and deposit, securities, account receivable, suspense payments, advanced payment and accrued liability, money entrusted, and advance receipt. Balances at the ends of previous and current periods are as shown in the following paragraph 2.

2. Breakdown of assets and liabilities included in difference in balance of payments transferred to next period.

(Unit：yen)

Subject	Balance at the end of previous period	Balance at the end of current period
Cash and deposit	3,624,861,993	4,721,708,937
Securities	4,123,405	4,126,281
Account receivable	1,066,894,406	711,972,714
Suspense payment	26,318,513	66,226,736
Advanced payment	9,058,530	9,404,455
Total	4,731,256,847	5,513,439,123
Accrued liability	2,937,704,713	4,137,465,605
Money entrusted	98,267,226	88,335,782
Advance receipt	3,430,466	1,352,356
Total	3,039,402,405	4,227,153,743
Difference in balance of payments transferred to the next period	1,691,854,442	1,286,285,380

3. Relation between the final accounts for the fixed asset acquiring expenditure and those indicated in the cash flow calculation sheet

(Unit：yen)

Expenditure by acquisition of fixed asset (cash flow calculation sheet)	2,707,991,412
Increase/decrease of accrued liability	749,153,325
Final amount of fixed asset acquisition expenditure	3,457,144,737

4. The final amount of expenditures for fixed asset acquisition includes 123,790,000 yen in fixed assets acquired with revenue from subsidies.

Audit Report by Third-Party Auditor

May 9, 2012

Central Research Institute of Electric Power Industry
President Masahiro Kakumu

Meisho auditors
Senior Partner — Certified Public Accountant, Yoshihiro Wada
Managing Partner
Managing Partner — Certified Public Accountant, Masayuki Tomikawa

<Audit of Financial Statements>

We audited the financial statements of the Foundation of Central Research Institute of Electric Power Industry (herein after referred to as CRIEPI) in the FY2011 business term from April 1, 2011, to March 31, 2012, including balance sheets, net assets increase/decrease calculation sheet, cash flow calculation sheet, notes on financial statements and list of assets.

Management's responsibility for financial statements

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with accounting principles generally accepted in Japan, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatements, whether due to fraud or error.

Auditor's responsibility

Our responsibility is to express an opinion on the consolidated financial statements based on our audit as independent auditor. We conducted our audit in accordance with auditing standards generally accepted in Japan. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, while the objective

of the financial statement audit is not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the net change in assets and cash flow for the period for which the financial statements were prepared, in accordance with accounting principles generally accepted in Japan.

<Opinion on balance sheets>

We conducted an audit of CRIEPI's balance sheets (including the notes for the balance sheets; same below) for the 2011 fiscal year from April 1, 2011 to March 31, 2012.

Management's responsibility for balance sheets

Management is responsible for preparing the statement of revenues and expenditures in accordance with the "Internal Controls in Accounting for Public Interest Corporations" (by arrangement of the board of the Liaison Council for Related Ministries and Agencies concerned with the guidance and supervision of public interest corporations dated March 23, 2005; hereinafter, "internal controls").

Auditor's responsibility

Our responsibility is to express an opinion on whether the balance sheets were prepared in accordance with internal controls.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Auditor's opinion on statement of revenues and expenditures

We believe that the statement of revenues and expenditures referred to above were prepared in accordance with the internal supervision matters, in all material respects.

Interests

Our firm and its employees have no interest in CRIEPI which should be disclosed pursuant to the provisions of the Certified Public Accounts Law of Japan.

Audit Report

Audit Report

May 16, 2012

Central Research Institute of Electric Power Industry
President Masahiro Kakumu

Central Research Institute of Electric Power Industry
General Auditor, Kouichi Nishi
General Auditor, Makio Fujiwara
General Auditor, Koji Kaibe

We audited management's execution of their professional duties and CRIEPI's financial assets and income and expenditures in the fiscal year from April 1, 2011 to March 31, 2012 and report the audit method and results as follows.

1. Outline of the audit method

In accordance with the audit standards and the fiscal 2011 audit plan, we sought to facilitate mutual understanding with directors, the Internal Auditing Department and other employees, gathered information and worked to improve the environment for conducting audits. In addition, we attended meetings of the Board of Directors and other important meetings, received reports from directors and other employees regarding the performance of their duties, and when deemed necessary, sought explanations, and perused important documents in surveying business and financial conditions.

We received reports on the establishment and administration of the system established to ensure appropriate and efficient business operations (internal control system) from directors and other employees, and sought explanations when deemed necessary.

Moreover, we examined whether the independent auditor was correctly performing the audit and also received reports from the independent auditor on the execution of these responsibilities and sought explanations when deemed necessary.

Based on the above methods, we examined the business reports and statements of revenue and expenditures (balance sheets, net assets increase/decrease calculation sheet, detailed statements on the balance sheets and net assets increase/decrease calculation sheet, cash flow calculation sheet and list of assets, and statement of revenues and expenditures).

2. Results of audit

(1) We recognized that the business reports properly indicated business contents of CRIEPI.

(2) We have determined that there were no serious occurrences of dishonest or false activity or violations of any laws, acts of endowment or the Articles of Incorporation by any of the directors in carrying out their duties.

(3) There are no points to note regarding the establishment and administration of the internal control system.

(4) The method of audit employed by Meisho auditors and the results thereof are proper and the statements of revenue and expenditures properly presents CRIEPI's financial assets and income and expenditures.