FY 2009

Reports on

Research Activities

Settlement of Accounts

From April 1, 2009

To March 31, 2010

June 2010

Central Research Institute of Electric Power Industry

Contents

Reports on Research Activities in FY2009

Reports on Research Activities
FY2009

Research Activities' Outline

Business recession in advanced countries resulting from financial crisis in the United States in September 2008 has spread all over the world to attack Japanese economy and reduce export and capital investment in FY2009. As a result, the industrial electric demand for major customers showed the largest decline and the energy sales in the electric power industry was reduced for two consecutive years. The power demand tended to recover in the second half of the fiscal year by the effect of economic measures, but in the medium and long terms trends, several negative factors including decrease in population, maturation of economy, and de-industrialization of the domestic industry by escalation of international competition are predicted to progress, thus the large increase of the electricity demand is not anticipated.

On the other hand, the policy was delivered to reduce emission of the global warming gas by 25% in 2020, compared with 1990. The policy raises the still more necessity of steady promotion of the nuclear power generation. Concurrently, the electric power industry has been strongly required to promote proliferation and utilization support of the renewable energy electrical power source such as photovoltaic generation, as well as taking measures for aged electric power infrastructure and long-term increase of energy resource price. These new cost generations and its burden causes significant problem to the electric power industry in the low growth of the electric power demand.

The electric power industry should respond short and long-term various problems described above, under the present social and economic maturation, and solve the problems through cost reduction and promotion of electrification to maintain energy security and environmental conservation. CRIEPI was engaged in researches to the subjects for the electric power industry and the society, viewing Japan's energy policy and the associated changes in future electric power utilization and supplying form, and promoted research activities aiming at timely and properly resolution.

Upon planning and promotion of research plans, we decided to promote by clearly positioning each research item from the following three viewpoints; (1) researches necessary into the future even though the society greatly changed, (2) prospective researches preparing future significant risk, and (3) researches enabling to defeat by technical breakthrough.

Research Activities

CRIEPI conduct researches related to "nuclear technology", "stable electric power supply", and "environmental and energy utilization technology to achieve "ensuring energy security and responding to the global environmental problem", as follows.

1. To support the nuclear power generation as foundations of a stable supply, we promoted research and development steadily including technologies for plant life management of light water reactors and for supporting the nuclear fuel cycle backend project.
2. Aiming at stable power supply into the future, we continuously conducted research and development such as operation and maintenance technology of the power generating facilities and the power distribution facilities for cost reduction with keeping reliability, and the next generation thermal technology for highly utilization of fossil fuel.
3. We recognize that not only global warming prediction and its influence assessment research, and the next generation gird, but also energy saving and electrification at the demand side are expected to be effective measures for CO_2 reduction. Therefore we were engage in demand side technical development for advanced water heater using a natural refrigerant heat pump and integrated silicon carbide (SiC) power semiconductor production technology.

Management and Application of Intellectual Property and Research Promotion

For research promotion, we work on the base technology subjects steadily as well as engaged in deepening individual expertise at the special organization* arranged by base technology, which are indispensable for the electric power industry. We integrate and practical use an ability of base technology within CRIEPI, such as the subjects related to the number of base technology, as well as resolve comprehensive overall problems by coordinating with external organizations. We also conducted research activities including researches from micro to macro such as ranging from material research to device and component development, and power plant assessment. We also researches with keeping various technologies and social systems in mind, such as research at each stage ranging from construction, operation, and maintenance of the power plant as well as, disposal, and recycling of wastes.

* CRIEPI's Socio-economic Research Center, System Engineering Research Laboratory, Nuclear Technology Research Laboratory, Civil Engineering Research Laboratory, Environmental Science Research Laboratory, Electric Power Engineering Research Laboratory, Energy Engineering Research Laboratory, Materials Science Research Laboratory

To cultivate top-level of research ability in researches related to the electric power industry, we conducted continuously joint research and research cooperation with research institutions in the Europe and North America for those are having research environment, which is unavailable in Japan. Moreover, in the Asia area, we tried to promote cooperation with relating electric power organizations

viewing for future wide expansion. Also we standardized CRIEPI's technology and promote international collaboration research activity.

For the purpose of maximizing "outcome", that is, academic, social, and economical impacts affected by research output to the electric power industry and society, we tried to apply research management strongly conscious, from each research planning stage, of how research output is effectively applied to the electric power industry and society. We applied CRIEPI's intellectual property created through research activity in formulating codes and standards, and extended horizontal development of the past outcome creation success examples.

Business Management

The business management was mainly conducted as follows.

1. To provide scientific and rationalized information related to energy and environment to the society, we emitted our research accomplishments and its resultant presentation applying various media such as CRIEPI-held forum and each publication, and mass media.
2. To enhance the governance, we strengthened monitoring function nominating newly full-time general auditor to clarify a mission of the vice president to individual research institute of CRIEPI. For response to innovation for the public-service corporation system, we prepared for the shift to the new corporation not only for the shift to new public-service corporation but also to the general corporation for analysis of influence by the shift to CRIEPI.
3. On the basis of the land utilization regulation by the city planning law and other rules and infrastructure foundation for water and electricity, we studied the application plan at each area of CRIEPI. In particular, for the Yokosuka area expecting as a key location of industrial technical research related to energy field in the future, we concluded basic concept for development and maintenance to start detailed planning of land acquisition and infrastructure foundation plan.

Settlement of Accounts

FY 2009 revenue was 35,620 million yen including balance carried from the previous fiscal year and expenditure was 34,720 million yen.

The balance at the term end of the net property was 36,830 million yen up 2,220 million yen to the end of previous fiscal year.

I. Research Activities

To realize the low carbon society and sustainable society, we conducted technical development under the three basic principles of “nuclear technology”, “stable electric power supply technology” and “environmental and energy utilization technology”.

Upon promoting researches, we defined subjects with higher needs for the power industry and the society, requiring to acquire timely accomplishment and application as a project subject, and those aiming at maintaining and improving of the fundamental technical force into the future as a base research subject. This obtained major research accomplishments as shown below.

Table 1 shows the number of reports for FY2009 research accomplishment and Table 2 indicates the number of papers reported. The total number of reports was 506, and the total number of papers reported to home and abroad was 1,696 (papers with referee reading was 496 up 36 to previous fiscal year). As a result, we steadily restored research accomplishment to the power industry and the society.

1. Project Subjects

Specifying 37 subjects for the project subjects, we arranged 11 groups such as “nuclear power plant life measure” from the viewpoints of exerting integral force to promote researches. Outline of the major research accomplishments in the project subjects is as follows.

(1) Nuclear technology

We actively promoted technical development related to “plant life management of light water reactors” for the high reliable long-term operation. We were engaged in researches to establish “nuclear fuel cycle backend technology” and to improve “evaluation technology of seismic reliability” in order to contribute to the promotion by the government and power industry, “next generation light water reactors and advanced fuel cycle technologies” aiming at supply of future option, and “radiation safety” to contribute to establishment of a rationalized radiation safety system.

Plant life management measures: Along with the research development road map related to plant life management in Japan, we promoted research development including irradiation embrittlement, stress corrosion cracking (SCC), pipe wall thinning. In particular, we obtained prospect of practical application of high accurate embrittlement monitoring method using the micro hardness test equipment to detect changes in hardness along with irradiation embrittlement of the pressure vessel steel. On the basis of experimental results in the simulated PWR secondary coolant, we reviewed the pipe thinning assessment model to improve the prediction accuracy.

Backend project support: We verified the reducing equipment for the salt inflowing from sea wind, which was developed as SCC measure technology of the metallic canister in the intermediate storage concrete cask. For high-level waste disposal, we started a large-scale centrifugal loading experiment aiming at clarification of long-term deformation behavior of the base rock around the disposal hole. In addition, we clarified gas permeability mechanism in bentonite of gas generated for corrosion of metallic wastes and alteration mechanism of deterioration for cementitious and bentonitic materials.

Improvement of seismic reliability: To formulate rationalized design earthquake motion for seismic design of the nuclear power plant, we extracted an index to represent the segment-coupling rupture in active fault system based on geological survey and micro earthquake observation. We also promoted a seismic assessment flow for sliding failure of the rock surrounding slope behind the reactor building.

Next generation light water reactors and advanced fuel cycle technology: Aiming at engineering verification as a most important step in the practical realization of the dry recycling technology, we designed and fabricated a test equipment to study processing speed of the major components and its reliability related to a reduction process of oxides to metals, a purification process to remove unnecessary elements such as fission products, and a fabrication process of metallic fuel.

Radiation safety: To expand applicability of the CRIEPI's methodology of metal waste measurement for compliance with clearance level to large concrete wastes, we evaluated the effect of natural radioactivity (Potassium 40) contained in concrete and found that its contribution was small.

(2) Technology for the stable electric power supply

To ensure electric power long-term stable supply, we promoted researches of "operation and maintenance of power generating facilities" on aged facilities measure and "operation and maintenance of power supply facilities" on the facility deterioration diagnosis, natural hazard measure, and disaster recovering support. To ensure stable resource reservation, effective utilization, and CO_2 reduction, we developed "next generation thermal technology" on expansion of fuel type and advanced efficiency in the thermal power generation.

Operation and maintenance of power generating facilities: Ensuring operational reliability of hydraulic power generating facilities and cost reduction, we promoted development of seismic assessment method for the concrete gravity dam structure. Targeting the thermal power generating facilities, we focused on construction of rationalized facility maintenance technology integrating inspection, prediction, and monitoring and developed a

creep damage assessment system of welded joints by combining stress analysis program of entire steam piping system in a plant and a growth simulation program of voids which cause creep damage.

Operation and maintenance of power transmission and distribution facilities: Aiming at application to the field site of deterioration diagnostic technology of the transmission and distribution facilities, we presented a diagnosing method of equipment state using an external unit to adsorb minute amount of sulfur hexa fluoride (SF_6) decomposition gas generated at abnormal phenomenon inside gas insulation switchgear. To establish technologies for economical treatment process of power transformer containing low-level PCB-contaminated insulation oil, we experimentally demonstrated that, after draining of original contaminated oil, flushing or energizing with circulation of heated PCB-free insulation oil was available for removing PCBs remained in the core and coil assembly of transformers. For snow related failures of the transmission lines, we adopted a scheme to simulate vertical, horizontal, and torsion behavior of electric cable to clarify cable vibration phenomenon (galloping) generated by wind blowing to snow-accumulated cable. As disaster recovery supporting technology of the power distribution facilities, we developed a recovery supporting system packaging simulation tools for prediction of typhoon and earthquake, facility damage, and system restoration to apply to the field site.

Next generation thermal power technology: For fuel type expansion of the thermal power generation, we clarified possibility through combustion tests to raise the mixed combustion ratio of subbituminous coal from the present 30% to 50% level at the pulverized coal power generation. Aiming at construction of storage safety management guide in biomass utilization, we conducted storage heating acceleration test of waste solid fuel to clarify automatic heat generation and CO producing performance at heat generation. For CO_2 capture and storage(CCS) technology, we presented high accurate numerical model of gasification reaction in the high efficient Integrated coal Gasification Combined Cycle (IGCC) system with CO_2 capture, newly proposed by CRIEPI.

(3) Environmental and energy utilization technology

Aiming at realization of future low carbon society, we actively promoted the following technical development: “global warming prediction and impact assessment” to assess the impact by global warming to the power generating facilities; “electrification and energy conservation technology” contributing to promotion of effective energy utilization at the demand side and improving living environment, and “next generation grid technology” targeting smooth introduction of renewable energy such as photovoltaic power generation (PV) to the power system.

Global warming prediction and impact assessment: To raise accuracy in the long-term global scale warming prediction around for one hundred years, we reviewed carbon circulation process in the global system model. Aiming at detailed and high accurate global warming prediction over Japan region around thirty years ahead, we improved the ground surface sub-model in the climate prediction analysis system. To provide scientific knowledge for emission reduction argument through the Internet to the society, we developed software to calculate in short time climate response to CO_2 emission defined by users to indicate its results.

Electrification and energy conservation technologies: To accelerate electrification at demand sides, we established long-term performance assessment technology of Eco Cute for further high performance and compactification. For advanced thermal environment assessment for buildings including electrical kitchen, we improved the indoor thermal environment design tool (CADIEE), which acquired qualification by the minister of land, infrastructure and transportation, by adding ventilation effect among rooms. To accelerate diffusion of electric vehicle (EV), we developed a simulation tool available for optimum arrangement of EV rapid charging stand. In addition, to improve production technology of SiC power semiconductor with excellent energy saving ability, defect initiation mechanism in a SiC crystal film was clarified and this makes possible to produce a high quality SiC single crystal film with less defects. Aiming at practical production of all-solid-state lithium polymer secondary battery with high safety, we improved discharge and charge performance of a single electrode approaching to the stationary liquid type lithium secondary battery by selecting appropriate electrode composing material.

Next generation grid technology: Considering the needs for comprehensive study on the entire power system, we prepared a road map for technological development covering both supply demand sides. As a measure to reduce surplus power expected by massive integration of PV we developed the next day operation planning method of heat pump type water heater. For information communicating infrastructure necessary for the next generation grid, we assessed the data transmission performance of applying an international standard (IEC) into the dedicated communication line connecting customers and power industry.

In “energy technical strategy” as a common foundation of researches conducted by CRIEPI, we planned to propose future vision based on change in the situation in the entire society. In FY2009, we clarified cost-benefit performance of popularization support policy for renewable energy and disincentive for applying energy saving promotion policy. We also analyzed international trend of global warming policy to transmit to the society.

2. Base research subjects

Specifying 35 subjects for the base research subjects, we applied features and specialty of eight professional laboratories to promote the following researches at each laboratory aiming at deepening and expansion of fundamental technology and resolution of related problems including succeeding and maintaining technology, developing technology, technology required for new research extension.

Socio-economic Research Center: We surveyed and analyzed management problems around the energy and power industry, including global environment problems, changes in regional economic and energy technical trends to propose clarification of problems and its solution. For example, contributing to planning for electric power project management and energy environmental policy, we re-estimated life cycle CO_2 emission by fuel type based on recent data (at the FY2009) for CO_2 emission unit for every materials used at the plant construction as well as the progress of power generating technology and clarified the fact that CO_2 emission basic units of the thermal power and nuclear power generations were reduced.

System Engineering Research Laboratory: We promoted researches to enhance the fundamental technology related to planning, operation, control, and analysis of electrical power transmission and distribution system, communication system, and information system as well as development, test, assessment of customer service technology for effective power utilization. For instance, we verified effectiveness of the watching system of solitary old people through demonstration tests at Komae City in Tokyo. We also added PV power converter and PV simulator to the existing power system simulator.

Nuclear Technology Research Laboratory: We were engaged in improvement of fundamental technology for application of risk information, fuel integrity and core assessment, thermal hydraulics, and safety analysis. We executed the research and development concerning advanced utilization of the light water reactors by using these results. For example, we developed a subcriticality (margin to criticality) measuring technology for the spent fuel assemblies by combination of detailed analysis using three dimensional nuclide composition distribution and neutron measurement.

Civil Engineering Research Laboratory: We were engaged in increase in the fundamental technology related to geology, seismic engineering, structural engineering, and fluid dynamics required for civil engineering technology related to power facilities, natural disaster hazard reduction, and nuclear fuel cycle backend project support. For instance, we investigated the source characteristics of the 2009 Suruga-Bay earthquake using strong-motion records on rock outcrops near the source area, and obtained results were applied to reassessment of the design basic ground motions at Hamaoka nuclear power plant.

Environmental Science Research Laboratory: Aiming at resolution of various environmental problems from region scale to global scale related to the power industry, we were engaged in increase in fundamental technology related to atmosphere, marine, hydrosphere, biology, environmental risk, biotechnology. For example, responding to changes in future energy utilization at city area and strengthening of environmental regulation, we developed a new numerical fluid dynamics model combining high accurate climate model to properly predict and assess impact of thermal environment and trace substance at city area.

Electric Power Engineering Research Laboratory: We were engaged in maintenance and development of the fundamental technology of electrical insulation, lightning protection, fault current control technology for the power transmission and distribution facilities and conducted basic and fundamental research related to new power technology including development of the next generation power equipment, laser application and arc plasma application, and power electronics technology. For instance, we improved an expandable transient analysis program (XTAP) to analyze power quality at installation of many power electronics devices in the power system.

Energy Engineering Research Laboratory: Aiming at development of high efficient, clean and low cost power generation system and construction of high efficient system at demand sides using a heat pump, we were engaged in maintenance of the fundamental technology related to biomass utilization, environmental load reduction, facility diagnosis, operation and maintenance, and energy conversion/storage/utilization. For example, aiming at support of energy saving promotion at demand sides, we expanded function of universal program (ECEP) available for assessment of energy demand and supply system based on energy load data.

Materials Science Research Laboratory: We were engaged in the fundamental technology related to material problems in the electric power industry ranging from clarification of damage and deterioration mechanism, development of advanced lift assessment methods and non-destructive inspection methods of structural materials in nuclear and thermal power plants, to development and assessment for functional materials used for secondary battery, semiconductor, and superconductivity. For example, we succeeded in growing FeSe-based superconducting thin films in situ with rather high critical temperature by choosing two suitable substrates among many substrate materials commercially available.

3. Research promotion

(1) Exerting comprehensive strength

Organically and systematically combining wide-ranging fundamental technology forming the strength of CRIEPI, we promoted researches in cooperation of eight professional research laboratories. For instance;

- For nuclear plant life measure, we promoted researches ranging from the fundamental technology to practical application including clarification of ageing degradation mechanism, development of assessment method, demonstration using in-situ data taken in NPPs, codes standardization, knowledge feedback based on operation. Upon promoting the researches, we exerted comprehensive force under the integrated research system related to professional fields including material, structure, fluid, seismic, and measurement.
- For the next generation grid technology, combining various fundamental technologies, we resolved problems from the viewpoint of the entire power system ranging from the power distribution to transmission systems as well as information and communication systems. Since social impact of massive integration of distributed generation such as PV should be assessed, we promoted researches cooperating with experts in socio economy field.

(2) Strengthening collaboration with the power industry and home and abroad research organizations

Upon research promotion, we closely cooperated with the power industry to conduct researches in cooperation with home and abroad organizations for cultivation of top level research performance, experiments using research environment not obtained in CRIEPI, and for international standardization of self holding technology.

For example, for subjects related to high level radioactive waste disposal, we conducted researches to establish survey, design, and assessment technology through cooperation with the power industry, national government, and Nuclear Waste Management Organization of Japan as well as collaboration research with home and abroad organizations (geology groundwater environmental performance assessment with Japan Atomic Energy Agency at Horonobe area, collaboration tests using actual base with Sweden Nuclear Fuel and Waste Management Company and Switzerland Radioactive Waste Control Cooperative Association) available for field tests not to proceed CRIEPI only.

Continuing research cooperation with European organizations, in rapidly growing Asian region we also strengthened cooperation with power relating organizations bringing future broad development into view.

(3) Promotion of outcome management

- Upon promotion of researches, we promoted researches clearly considering outcome, that is, academic, social, and economical propagation effect of research accomplishment to the power industry and society. For examples succeeded in creating past outcome in CRIEPI, we provided information shared with personnel to establish outcome management and expanded knowledge horizontally to future research development.
- We analyzed changes in external environment surrounding CRIEPI and present situation including strength and weakness of research resources in CRIEPI to enhance PDCA cycle in the management.

(4) Promotion of funded research

- Applying the fundamental technology in CRIEPI, we actively promoted researches responding request from the field site of the power industry to strategically accept on trust researches for the subjects on energy and environment related to the power industry from the national government and others. Table 3 shows major funded research conducted in FY2009.
- On the basis of high-grade research, technology, and test ability accumulated in CRIEPI, we conducted qualification test for reliability improvement in large capacity shortage test business and ultrasonic nondestructive inspection in the nuclear power plant.

(5) Systematic introduction and renewal of large capacity research facilities

To strengthen the research power of CRIEPI, in FY2009 we introduced and renewed the following large capacity research facilities.

- To ensure reliability of the high power test facility, we renewed “buck-up circuit breaker” to break the short circuit current.
- To contribute to aged light water reactor measure research, we introduced the high resolution field emission electron scanning microscope as “light water material analysis station (second term)” to enhance and develop nano systematic analyzing technology of irradiated light water reactor materials.
- To demonstrate the effects of massive integration of distributed generation into subtransmission systems, we installed power conditioner for PV and solar simulator to renovate “power system simulator”.
- To realize high speed large scale analysis such as global warming prediction at the global scale, we added parallel scalar processing computer (theoretical computing performance 45.8TFLOPS) into the present large computing system mainly involving the vector type

computer.

Table 1 Number of Reports in FY 2009

	Socioeconomics	Environment	Customer energy services	Power delivery	Nuclear power generation	Fossil fuel power generation	New energy	Information & communication	Construction and maintenance of electric power facilities	Advanced basic technologies	Total
Research reports, etc.	**34**	**36**	**27**	**56**	**73**	**37**	**5**	**27**	**38**	**21**	**354**
Funded research	**4**	**24**	**5**	**38**	**32**	**19**	**9**	**3**	**15**	**3**	**152**
Total	**38**	**60**	**32**	**94**	**105**	**56**	**14**	**30**	**53**	**24**	**506**

Table 2 Number of Papers Reported in FY 2009

	Socioeconomics	Environment	Customer energy services	Power delivery	Nuclear power generation	Fossil fuel power generation	New energy	Information & communication	Construction and maintenance of electric power facilities	Advanced basic technologies	others	Total
Papers	**175**	**259**	**77**	**215**	**300**	**140**	**51**	**43**	**205**	**213**	**18**	**1,696**
(Peer reviewed papers included above)	**(42)**	**(65)**	**(21)**	**(83)**	**(90)**	**(61)**	**(19)**	**(12)**	**(54)**	**(47)**	**(2)**	**(496)**

Table 3 Major Funded Researches from the National Government and Others

Research Title	Consigner
FY2009 expenses for commission in geological disposal technical survey, etc. (Geological disposal common technical survey: boring technology-upgrading development)	METI
FY2009 expenses for commission in geological disposal technical survey, etc. (Geological disposal technical survey: ground water in rock transfer assessment upgrading development)	METI
FY2009 recycled fuel resource storage technical survey, etc (Long-term integrity of storage facility among long-term integrity test for intermediate storage facilities)	METI
FY2009 thermal and nuclear relating environmental review survey (Trace substance environmental affect assessment method)	METI
Research development on engineering technical demonstration of metal fuel cycle for practical application	MEXT
Research development for cathode/anode treatment of molten salt electrore-fining of metallic fuel	MEXT
Research on combined influence assessment of atmospheric temperature and ozone concentration rise to productivity of wet-rice and its adaptation research (No.1)	MOE
Innovative zero emission coal gasification power generation project / Fundamental research project for innovative gasification technology / CO_2 recovery next generation IGCC technical development	NEDO
Development of High-performance Battery System for Next-generation Vehicles (Li-EAD Project) / Fundamental Technology / Development of Fundamental Technology for High-performance Batteries for Next-generation Vehicles	NEDO
“System linkage smoothed charging system technical development” common base research	NEDO
Strategic technical development for practical application of polymer electrolyte fuel cell / Technical development on basic and common targets / Deterioration mechanism analysis of polymer electrolyte fuel cell and development of residual life assessment method	NEDO
Microscopic structure observation related to irradiation embrittlement prediction of FY2009 to FY2010 high irradiation region	JNES

II. Management and Application of Intellectual Property

As a research laboratory serving to the power industry and the society, we maximally accumulated intellectual property including reports, papers, patents, software and various know-how of accomplishments in research activity and applied them widely under proper management.

Table 4 shows the number of patent applications and registrations and software registered in the internal management system.

(1) Visualization of intellectual property

To promote visualization of the intellectual property of CRIEPI and its application in the society, we published intellectual property reports introducing creation and application situation of the intellectual property. In a download service of research reports to the public, 86,000 items were downloaded in FY2009 full business year by the power industry and various organizations and persons for wide application.

(2) Promotion of technology succession and transfer activity

Aiming at application of intellectual property of CRIEPI in the power industry and the society, we held technology exchange courses and technical seminars and introduced intellectual property at the forum hosted by CRIEPI. We also applied technology transfer organizations, took part in an external exhibition, and cooperated to “Power Academy” activity for further development of electric engineering in the electric power industry.

Table 5 shows the number of patent licenses and software licenses.

(3) Contribution to formation of codes and standards

Applying our features as an academic research organization, we contributed to formation of various codes, standards and technical guidelines related to energy and environmental fields through participation to committees by the government and academic societies.

Table 6 shows contribution to forming of major codes, standards, and technical guides.

Table 4 Number of applications and registrations of patent, and software in FY 2009

Type \ Field		Socioeconomics	Environment	Customer energy services	Power delivery	Nuclear power generation	Fossil fuel power generation	New energy	Information & communication	Construction and maintenance of electric power facilities	Advanced basic technologies	Total
Patent	Application	0	38	4	18	19	22	5	3	16	17	142
	Registration	0	11	1	11	8	9	2	3	6	13	64
Software registration		4	7	13	29	3	15	3	8	18	0	100

Table 5 Number of licensed patents and licensed software applications

(Newly licensed)

	Total
Number of licensed patents	72
Number of licensed software applications	319

Table 6 FY 2009 Contribution to Formulation of Major Codes, Standards, and Technical Guidelines

Code, Standard, Technical Guideline, etc.	Organizations and Groups Concerned
Technical study results for introduction of the clearance system into Radiation Hazard Prevention Law	Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Long-term integrity of metal cask and its content at the spent fuel intermediate storage facility using metal dry cask	Ministry of Economy, Trade and Industry (METI)
Safety reservation measure of transportation after storage related to spent fuel intermediate storage	Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
Deliberation and formulation of various IEC international standard codes IEC 61968-9 System interfaces for distribution management (and another 1 item)	International Electrotechnical Commission (IEC)
IEC 60644 Ed.2.0 Specification for high-voltage fuse-links for motor circuit applications (and another 1 item)	IEC domestic committee (The Institute of Electrical Engineers of Japan(IEEJ))
Practice standard related to parameter estimation of probabilistic safety assessment for nuclear power plants (and another 6 items)	Atomic Energy Society of Japan (AESJ)
Code cases of metal cask structure standard JSME S FA-CC-001 Standards related to boron-added aluminum alloy for the basket (and another 4 items)	The Japan Society of Mechanical Engineers(JSME)
Deliberation and formulation of various JEAC and JEAG codes JEAC 4601-2008 Technical Codes for Seismic Design of Nuclear Power Plants (and another 7 items) JEAG 4625-2009 Technical Guidelines for Evaluation of Volcanic Phenomena for Nuclear Power Plants (and another 8 items)	Japan Electric Association (JEA)
Revision on explanation of technical standards for electric power facilities (Article 29)	Japan Electric Association (JEA)
PSA peer review guidelines	Japan Nuclear Technology Institute

III. Business Management

(1) Promotion of application plans at each area

On the basis of land utilization regulation based on the city planning law and others and infrastructure foundation including water and electric power, we studied application plans at each area as follows.

- **Yokosuka area**: Concentrating a research division of nuclear field, electric power field, and energy field, we organized the basic concept of development and maintenance at Yokosuka area to construct a large research center of engineering technology and started to establish the infrastructure maintenance execution plan including the electric power. Based on the contract at the previous fiscal year, we obtained a part of neighboring land.
- **Komae area**: We investigated smooth relocation of research facilities to Yokosuka area and effective utilization of land resources.
- **Abiko area**: On the authority of the policy to apply scientific knowledge obtained from nature including landsphere, aerosphere, hydrosphere, and biosphere for problem dissolution at the power industry, we started to formulate the maintenance and application plan.

(2) Reduction of expenditure and priority resource allocation

We reviewed research and management business on its content, method, and timing for further cost reduction. For facility environmental maintenance, we restrained expenditure by screening carefully items contributing to business streamline and energy saving. We also promoted sellout facility vacant lot as a result of rationalization of welfare facilities and enriched cash flow to inject resource to the focused research items and to acquire land at Yokosuka area.

(3) Awareness-building of executives and regular personnel and effective utilization of work force

- Aiming at re-verifying future research direction of each professional field based on the future trend of the power industry, we actively conducted field discussion with the management layer to create and raise awareness of executives and regular personnel for future evolution of research and business.
- Contributing to new research evolution, we actively dispatched mainly younger researchers to home and abroad research organizations having recent knowledge for material science and others. Employing external capable manpower as a temporary basis employment contract researcher to problems to be enforced for a short period, we promoted researches effectively.

(4) Transmission of wide information

To raise visibility level for CRIEPI research development force, we actively transmitted to the public through our publications and each mass media on objective research accomplishments based on self-research and experiments as well as presentation for energy and environmental problems.

- Under the theme of "CRIEPI's approach to realize the low carbon society" we held "CRIEPI Forum 2009" to clarify existence of barrier caused by consumer's misunderstanding due to lack of information at energy saving promotion, and presented its coping method. In addition, we introduced recent research accomplishments.
- For further understanding energy and environmental problems, we participated as an instructor to regional social activity including seminars for school personnel and science handcraft room for pupils in the elementary and middle schools.

(5) Response to new corporation system and governance reinforcement

We analyzed an impact of legislation, tax system, and accounting system in the new corporation system to CRIEPI for both cases of shifting to new public corporation and to the ordinary corporation, and prepared shifting to new corporation system based on survey and analysis of external information related to operational situation of the system and shifting by other corporations.

In addition, to enrich the governance, we newly staffed a full-time general auditor with supporting staffs to strengthen auditing function. We also clarified the vice president's duty for the individual research laboratory. To cultivate compliance awareness, we conducted e-learning training on the internal regulation for entire executives and regular personnel.

IV. Workforce

Workforce configuration as of March 31, 2010 is as follows.

Item	Numbers	Percentage distribution (%)
1. Research	724 * Including 41 research members with employment contract limited	87.8%
[Breakdown]		[100.0]
(1) Electricity	112	15.5%
(2) Civil engineering and construction	91	12.6%
(3) Mechanical	86	11.9%
(4) Chemistry	76	10.5%
(5) Biology	62	8.5%
(6) Nuclear engineering	52	7.2%
(7) Environmental science	46	6.3%
(8) Information & communication	39	5.4%
(9) Socioeconomics	44	6.1%
(10) Research support & management	116	16.0%
2. Office work	101	12.2%
Total	825	100.0%

V. General Affairs

1. Board of Directors

Held Date	Agenda
June 4, 2009 (No. 215)	1. Approval of reports on research activities in FY 2008 2. Approval of reports on settlement of accounts in FY 2008
June 4, 2009 (No. 216)	1. Mutual election of President, Executive Vice President, and others 2. Presentation of retirement bonus with Vice President retirement 3. Counselor request 4. Approval of alternate of President duty in case of emergency
August 31, 2009 (No. 217)	1. Selection of member of Advisory Council
March 11, 2010 (No. 218)	1. Approval of Research Plans in FY 2010 2. Approval of Settlement of Accounts in FY2010 3. Selection of member of Advisory Council

2. Advisory Council

Held Date	Agenda
May 22, 2009 (No. 29)	1. Reports on Research Activities in FY 2008 2. Reports on Settlement of Accounts in FY 2008 3. Election of Vice president and General Auditor by termination of a term
August 31, 2009 (No. 30)	1. Appointment of Vice President
February 19, 2010 (No. 31)	1. Research Plans in FY 2010 2. Settlement of Accounts in FY2010

Settlement of Accounts

Outline of Settlement of Accounts

Business scale in FY2009 was 34,720 million yen down 1,450 million yen to the budget. The net property at the end of FY2009 was 36,830 million yen up 2,220 million yen to the end of previous fiscal year.

1. Financial statements

   (1) Assets condition

   Gross amount of asset was 49,820 million yen up 1,060 million yen to the end of previous fiscal year. Increase in the asset was originated from 6,150 million yen for new acquired fixed asset including 2,400 million yen (construction temporary account) acquiring neighboring land at Yokosuka area and 1,800 million yen of special asset accumulation for lodgment preparation. Decrease in the asset was 5,410 million yen at progression of depreciation.

   (2) Liability condition

   Gross amount of liability was 12,980 million yen down 1,150 million yen to the end of previous fiscal year. The decrease was caused by large accrued liability related to acquirement of large research facility at the end of previous fiscal year.

   (3) Net property condition

   Final balance of net property was 36,830 million yen, the breakdown was 36,090 million yen of general net property and 730 million yen of designated net property.

2. Net property increase/decrease financial report

   (1) Increase/decrease of general net property

   - Ordinary revenue was 34,370 million yen up 1,980 million yen to the previous fiscal year. Resulting from rise in electricity costs in FY2008 along with escalation of fossil fuel price, received current benefit was 30,800 million yen up 1,580 million yen to the previous fiscal year. Revenue of the funded research project from the government was 2,640 million yen up 410 million yen to the previous fiscal year.
   - Ordinary expenditure was 32,020 million yen up 890 million yen to the previous fiscal year. The result was caused by 590 million yen increase in the retirement benefit by expanding difference in amortization of actuarial calculation resulting from malfunction in the pension assets operation in FY2008 as well as increase in expenditure by the funded research operation.

- As a result, the current increase and decrease was 2,340 million yen up 1,090 million yen to the previous fiscal year.
- Nonrecurring increase and decrease was △70 million yen down 200 million yen to the previous fiscal year. The result was caused by large amount of the fixed asset donating income related to research facilities purchased by "demonstration research of electric power network technology" funded research from NEDO at the previous fiscal year.
  As a result, the current increase and decrease in the general net property was 2,270 million yen up 880 million yen to the previous fiscal year.

(2) Increase and decrease in the designated net property

Current increase and decrease was △40 million yen up 20 million yen to the previous fiscal year. The increase was caused by the fact that revenue from received subsidy by the government and others was increased for depreciation of the designated net property.

3. Statement of revenues and expenses

(1) Balance of business activity

- Business activity revenue was 34,300 million yen up 770 million yen to the budget. During the term, the funded research, "research development related to demonstration of metal fuel cycle" from MEXT was conducted to increase 830 million yen of funded research revenue. The power demand was reduced over prediction at the fourth quarter year in FY 2008, resulting in the current benefit income down 190 million yen to the budget.
- Business activity expenditure was 26,760 million yen up 150 million yen to the budget. Manpower cost in the operating cost was 10,340 million yen up 460 million yen to the budget resulting from the fact that the expenditure from retirement allowance and retirement pension contributions increased over prediction. Project expenditure was 14,310 million yen down 350 million yen to the budget caused by saving on expenses for commission.

(2) Investment activity balance

- Investment activity revenue was 740 million yen down 1,280 million yen to the budget. The revenue resulted from carry-over of 550 million yen of virement of special assets because a part of the short-circuit test facility was not constructed due to an accident at receiving and from the fact that a part of the welfare housing land vacant lot at Abiko area was not sold.
- Investment activity expenditure, which constituted by the fixed asset acquiring expenditure and special assets acquiring expenditure, resulting from research facilities

of 2,400 million yen for neighboring land of Yokosuka area and 490 million yen for large computer enhancement for global warming prediction on a global basis, was 7,950 million yen down 1,610 million yen to the budget. The decrease resulted from carry-over to the next fiscal year on acquirement of the short-circuit test facility.

(3) Financial activity balance

No income and expenditure related to financial activity.

As stated above, the current revenue was 35,040 million yen and the carry-over from the previous fiscal year was 580 million yen, and total revenue was 35,620 million yen down 550 million yen to the budget. On the other hand, the current expenditure was 34,720 million yen down 1,450 million yen to the budget. As a result, the balance to be carried over to the next term was 900 million yen.

I. Financial Statements

Balance Sheet

As of March 31, 2010

(Unit: yen)

Account	Current fiscal year	Previous fiscal year	Increase/decrease
I. Assets section			
1. Current assets			
Cash and deposit	4,643,218,904	5,161,117,918	Δ 517,899,014
Securities	4,120,128	4,116,395	3,733
Account receivable	687,314,155	862,106,035	Δ 174,791,880
Suspense payable	37,557,108	47,079,156	Δ 9,522,048
Advance payment	5,718,761	5,183,895	534,866
Total current assets	5,377,929,056	6,079,603,399	Δ 701,674,343
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	325,662,429	341,305,357	Δ 15,642,928
Structures	1,254,781	1,412,564	Δ 157,783
Machine and equipment	418,351,215	448,039,133	Δ 29,687,918
Tools and furniture	26,497,628	16,209,700	10,287,928
Intangible fixed asset	6,084,382	3,126,227	2,958,155
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	3,650,000,000	2,200,000,000	1,450,000,000
Total special assets	7,863,750,435	6,445,992,981	1,417,757,454
(3) Other fixed assets			
Land	4,881,494,620	4,940,509,920	Δ 59,015,300
Building	13,274,013,125	13,977,753,889	Δ 703,740,764
Structure	1,020,156,297	1,170,941,669	Δ 150,785,372
Machine and equipment	10,758,793,345	11,580,192,706	Δ 821,399,361
Tools and furniture	1,964,271,032	2,010,750,353	Δ 46,479,321
Intangible fixed asset	987,211,341	1,099,199,741	Δ 111,988,400
Construction in process account	3,302,072,859	828,250,000	2,473,822,859
Long-term prepaid expenses	385,539,013	613,750,554	Δ 228,211,541
Total other fixed assets	36,573,551,632	36,221,348,832	352,202,800
Total fixed assets	44,444,302,067	42,674,341,813	1,769,960,254
Total assets	49,822,231,123	48,753,945,212	1,068,285,911
II. Liability section			
1. Current liability			
Accrued liability	4,256,493,218	5,403,738,342	Δ 1,147,245,124
Money entrusted	92,367,059	92,315,808	51,251
Advance receipt	123,496,676	2,203,720	121,292,956
Accrued bonus	392,000,000	385,000,000	7,000,000
Total current liability	4,864,356,953	5,883,257,870	Δ 1,018,900,917
2. Fixed liabilities			
Allowance for retirement benefits for directors	221,000,000	482,000,000	Δ 261,000,000
Accrued retirement benefits for employees	7,900,000,000	7,780,000,000	120,000,000
Total fixed liabilities	8,121,000,000	8,262,000,000	Δ 141,000,000
Total liabilities	12,985,356,953	14,145,257,870	Δ 1,159,900,917
III. Net assets section			
1. Designated net assets			
Special benefits	619,315,958	686,079,855	Δ 66,763,897
Cash subsidy	73,300,205	48,244,550	25,055,655
Cash contribution	45,443,404	49,100,336	Δ 3,656,932
Total designated net assets	738,059,567	783,424,741	Δ 45,365,174
(Including appropriation to fundamental property)	(7,000,000)	(7,000,000)	(0)
(Including appropriation to special assets)	(731,059,567)	(776,424,741)	(Δ 45,365,174)
2. General net assets	36,098,814,603	33,825,262,601	2,273,552,002
(Including appropriation to fundamental property)	(0)	(0)	(0)
(Including appropriation to special assets)	(3,696,790,868)	(2,233,668,240)	(1,463,122,628)
Total net assets	36,836,874,170	34,608,687,342	2,228,186,828
Total of liability and net assets	49,822,231,123	48,753,945,212	1,068,285,911

Net Assets Increase/Decrease Calculation Sheet

From Aril 1 2009 to March 31 2010

(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	30,804,474,000	29,221,600,000	1,582,874,000
[2] Operating revenue	(3,299,468,972)	(2,850,524,440)	(448,944,532)
Funded research operating revenue	2,649,135,933	2,229,302,668	419,833,265
Other operating revenue	650,333,039	621,221,772	29,111,267
[3] Other revenue	(151,652,567)	(166,662,449)	(Δ 15,009,882)
Interest received	27,845,025	38,989,676	Δ 11,144,651
Facility usage fee received	92,131,353	84,412,175	7,719,178
Miscellaneous revenue	31,676,189	43,260,598	Δ 11,584,409
[4] Transfer from designated net assets	117,939,265	145,560,797	Δ 27,621,532
Total current revenue	34,373,534,804	32,384,347,686	1,989,187,118
(2) Current expenditure			
[1] Project cost			
Personnel expenditure	(10,463,682,673)	(9,878,378,775)	(585,303,898)
Salary and benefit	7,716,885,559	7,678,509,971	38,375,588
Retirement benefit expenditure	1,802,637,947	1,242,380,378	560,257,569
Welfare expenditure	944,159,167	957,488,426	Δ 13,329,259
Expenditure	(19,656,633,186)	(19,262,214,743)	(394,418,443)
Supplies expenses	2,285,001,109	1,827,988,795	457,012,314
Printed material expenses	511,667,766	525,044,022	Δ 13,376,256
Fuel, light, and water expenses	627,115,727	689,393,946	Δ 62,278,219
Expenses for commission	6,490,778,745	6,325,091,057	165,687,688
Collaboration research contribution	665,617,670	711,152,727	Δ 45,535,057
Repair expenses	1,261,991,351	1,251,371,611	10,619,740
Rental rate	211,046,411	184,548,215	26,498,196
Tax and public charge	119,408,627	96,641,301	22,767,326
Travel and transport expenses	731,921,086	852,879,653	Δ 120,958,567
Communication and transportation expenses	121,402,728	117,943,113	3,459,615
Other expenditure	1,267,211,255	1,470,564,353	Δ203,353,098
Depreciation allowance	5,363,470,711	5,209,595,950	153,874,761
Subtotal of project cost	30,120,315,859	29,140,593,518	979,722,341
(2) Administrative expenses			
Personnel expenditure	(1,086,342,137)	(953,003,339)	(133,338,798)
Board members' compensation	167,450,000	165,648,000	1,802,000
Salary and benefit	614,418,866	549,212,000	65,206,866
Retirement benefit expenditure	119,150,903	89,217,022	29,933,881
Welfare expenditure	62,632,368	59,926,317	2,706,051
Allowance for retirement benefits for directors transfer	122,690,000	89,000,000	33,690,000
Expenditure	(820,725,940)	(1,041,662,426)	(Δ 220,936,486)
Supplies expenses	13,251,175	17,020,178	Δ 3,769,003
Printed material expenses	59,263,613	50,388,419	8,875,194
Fuel, light, and water expenses	28,617,852	28,885,344	Δ 267,492
Expenses for commission	132,418,514	284,725,221	Δ 152,306,707
Repair expenses	6,449,165	6,773,622	Δ 324,457
Rental rate	370,307,249	363,926,620	6,380,629
Tax and public charge	6,744,957	7,283,008	Δ 538,051
Travel and transport expenses	46,354,733	71,263,159	Δ 24,908,426
Communication and transportation expenses	8,863,433	10,416,577	Δ 1,553,144
Other expenditure	95,313,340	133,786,022	Δ 38,472,682
Depreciation allowance	53,141,909	67,194,256	Δ 14,052,347
Subtotal of administrative expenses	1,907,068,077	1,994,665,765	Δ 87,597,688
Total current expenditure	32,027,383,936	31,135,259,283	892,124,653
Current ordinary increase/decrease	2,346,150,868	1,249,088,403	1,097,062,465

2. Nonrecurring increase/decrease section			
(1) Nonrecurring profit			
[1] Gain from sale of fixed assets			
Gain from sale of land and building	85,323,106	25,997,144	59,325,962
[2] Fixed asset donated profit			
Facility donated profit	13,870,000	401,320,000	Δ 387,450,000
[3] Amount transferred from designated net property	33,054	189,854	Δ 156,800
Total nonrecurring profit	99,226,160	427,506,998	Δ 328,280,838
(2) Nonrecurring expenses			
[1] Loss on sale of fixed assets			
Loss on sale of tools and furniture	3,850,933	0	3,850,933
[2] Loss on retirement of fixed assets			
Loss on retirement of facilities	167,974,093	292,634,705	Δ 124,660,612
Revised amount of past fiscal year along with application of the new account standard	0	0	0
Total nonrecurring expenses	171,825,026	292,634,705	Δ 120,809,679
Current nonrecurring increase/decrease	Δ 72,598,866	134,872,293	Δ 207,471,159
Current ordinary net asset increase/decrease	2,273,552,002	1,383,960,696	889,591,306
Ordinary net asset beginning balance	33,825,262,601	32,441,301,905	1,383,960,696
Ordinary net asset final balance	36,098,814,603	33,825,262,601	2,273,552,002
II. Designated net asset increase/decrease section			
[1] Cash subsidy received			
Subsidy received	51,763,412	47,838,022	3,925,390
[2] Fixed asset donated profit			
Facility donated profit	20,843,733	25,378,440	Δ 4,534,707
[3] Transfer to ordinary net assets	117,972,319	145,750,651	Δ 27,778,332
Current designated net assets increase/decrease	Δ 45,365,174	Δ 72,534,189	27,169,015
Designated net assets beginning balance	783,424,741	855,958,930	Δ 72,534,189
Designated net assets final balance	738,059,567	783,424,741	Δ 45,365,174
III. Net assets final balance	36,836,874,170	34,608,687,342	2,228,186,828

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 assists

- 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 years 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 employee's bonus expense, current obligation fees of expected bonus pay are account for allowance.

Allowance for retirement benefits for directors:

To prepare for 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 directors.

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

The finance lease trade other than ownership transfer concluding contract by March 31, 2008 should be account processed continuously according to the ordinary lease contract.

(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

The current period newly applied "partial revision (No. 3) of Account Standard on Retirement Benefit" (business accounting standard No. 19, July 31, 2008, revision) and changed to specify a determining method of discount rate to be used in actuarial calculation of retirement benefit liability based on the rate of return of long-term government bonds (ten years) at the end of term.

There is no impact by the change in the accounting 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	341,305,357	0	15,642,928	325,662,429
Structure	1,412,564	0	157,783	1,254,781
Machine and equipment	448,039,133	35,107,000	64,794,918	418,351,215
Tools and furniture	16,209,700	20,371,233	10,083,305	26,497,628
Intangible fixed asset	3,126,227	4,472,500	1,514,345	6,084,382
Special asset for accrued retirement benefits for employees	3,435,900,000	0	0	3,435,900,000
Special asset for acquiring research facility	2,200,000,000	1,800,000,000	350,000,000	3,650,000,000
Subtotal	6,445,992,981	1,859,950,733	442,193,279	7,863,750,435
Total	6,452,992,981	1,859,950,733	442,193,279	7,870,750,435

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	325,662,429	(325,662,429)	-	-
Structure	1,254,781	(1,254,781)	-	-
Machine and equipment	418,351,215	(371,560,347)	(46,790,868)	-
Tools and furniture	26,497,628	(26,497,628)	-	-
Intangible fixed asset	6,084,382	(6,084,382)		-
Special asset for accrued retirement benefits for employees	3,435,900,000	-	-	(3,435,900,000)
Special asset for acquiring research facility	3,650,000,000	-	(3,650,000,000)	-
Subtotal	7,863,750,435	(731,059,567)	(3,696,790,868)	(3,435,900,000)
Total	7,870,750,435	(738,059,567)	(3,696,790,868)	(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	(4,406,439,342)	(3,628,588,907)	(777,850,435)
Building	753,335,686	427,673,257	325,662,429
Structure	25,095,620	23,840,839	1,254,781
Machine and equipment	3,467,573,909	3,049,222,694	418,351,215
Tools and furniture	151,472,707	124,975,079	26,497,628
Intangible fixed asset	8,961,420	2,877,038	6,084,382
Other fixed assets	(99,362,024,467)	(71,357,579,327)	(28,004,445,140)
Building	30,822,341,960	17,548,328,835	13,274,013,125
Structure	5,315,228,439	4,295,072,142	1,020,156,297
Machine and equipment	50,145,130,221	39,386,336,876	10,758,793,345
Tools and furniture	9,260,535,540	7,296,264,508	1,964,271,032
Intangible fixed asset	3,818,788,307	2,831,576,966	987,211,341
Total	(103,768,463,809)	(74,986,168,234)	(28,782,295,575)

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	687,314,155	0	687,314,155
Housing loans and welfare loans among special assets of accrued retirement benefits	42,256,739	0	42,256,739
Total	729,570,894	0	729,570,894

8. Contingent liabilities such as guarantee liabilities

A guarantee liability to employees housing loans is 2,726,587,750 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 of advanced technical development cost for rationalized energy application (high efficient gas turbine practical application technical development)	Ministry of Economy, Trade and Industry	0	2,530,000	2,530,000	0	—
• Subsidy of operating cost for impact assessment foundation due to mass introduction of distributed power	Ministry of Economy, Trade and Industry	0	21,439,561	8,236,061	13,203,500	Designated net assets
• Super thick membrane and multi-layer SiC epitaxial wafer technology	Japan Society for the Promotion of Science	0	113,866	113,866	0	—
• Research for the effect of forest watershed characteristics on hydro power output (Conducted in FY 2008)	National Land Afforestation Promotion Organization	0	5,386,091	5,386,091	0	—
• Research for the effect of forest watershed characteristics on hydro power output (Conducted in FY 2009)	National Land Afforestation Promotion Organization	0	16,293,894	12,293,894	4,000,000	Designated net assets
• Research of accelerating factor and disincentive of energy efficient improvement	Pollution Control Cooperating Foundation	0	1,000,000	1,000,000	0	—
• Clarification of cleaning mechanism of super difficult treatment PCB pollution sludge particles	Hosokawa Power Engineering Promotion Foundation	0	1,000,000	1,000,000	0	—
• Introducing project of FY2009 regional new energy	New Energy Introduction Promotion Conference Foundation	0	4,000,000	0	4,000,000	Designated net assets
Total		0	51,763,412	30,559,912	21,203,500	

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 on designated net asset	86,730,453
Transfer by exception from designated net asset	648,900
Transfer by implementation of objective business of received subsidy	30,559,912
Transfer to nonrecurring profit	
Transfer by retirement of designated net assets	33,054
Total	117,972,319

12. Trading content to related parties

No trading to related parties is recoded.

13. Important subsequent event

No important subsequent event is recorded.

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

(1) Equivalent transaction prices, equivalent accumulated depreciation, and equivalent balance at the end of period for lease objects

(Unit: yen)

	Machine and equipment	Tools and furniture	Total
Equivalent transaction prices	148,002,000	22,621,500	170,623,500
Equivalent accumulated depreciation	140,601,900	22,141,500	162,743,400
Equivalent balance at the end of period	7,400,100	480,000	7,880,100

(2) Equivalent balance at the end of period of prepaid lease revenue

(Unit: yen)

	Within one year	Over one year	Total
Equivalent balance at the end of period of prepaid lease revenue	0	0	0

(3) Current paid lease revenue, equivalent depreciation

(Unit: yen)

Paid lease revenue	31,040,400
Equivalent depreciation	33,610,800

(4) Equivalent depreciation is calculated on a straight-line basis.

(5) Equivalent interest is not accounted.

15. Retirement benefit related

(1) Summary of employed retirement benefit
As a defined-benefit system, retirement pension system and termination allowance plan are employed.

(2) Retirement benefit liability and its contents

(Unit: yen)

[1] Retirement benefit liability	△21,678,254,956
[2] Retirement pension asset	13,103,765,313
[3] Non-accumulated retirement benefit ([1] + [2])	△8,574,489,643
[4] Non-depreciated mathematical calculation difference	△674,489,643
[5] Accrued retirement benefits for employees ([3] – [4])	△7,900,000,000

(3) Items for retirement benefit expense

(Unit: yen)

[1] Working expense	960,632,416
[2] Interest expense	419,052,929
[3] Expectable operation benefit	△121,278,629
[4] Mathematical calculation difference depreciation	663,382,134
[5] Retirement benefit expense ([1] + [2] + [3] + [4])	1,921,788,850

(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: 2.0%
[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.

Lists of Assets

As of March 31 2010

(Unit: yen)

Subject	Amount of money			Memo
I. Assets section				
1. Floating asset				
Cash and deposit				
General deposit	4,540,688,986			Mitsubishi Tokyo UFJ bank, 4,289,737,991 yen and others
Fixed deposit account	100,000,000			Tokyo Tomin Bank, Limited, 100,000,000 yen
Postal savings	2,529,918			Ordinary deposit
		4,643,218,904		
Securities		4,120,128		Open-end bond investment trust
Account receivable		687,314,155		Funded research business income and others
Suspense payment		37,557,108		Temporary payment consumption tax on construction suspense account expense and others
Advance payment		5,718,761		The advance payment of optical circuit communication charge and others
Total floating asset			5,377,929,056	
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				
Steel structure	621,962,762			Yokosuka area, short circuit test house and others
Building attached structure	131,372,924			Komae area, WANO Tokyo center, air conditioner and others
Accumulated depreciation	△427,673,257			
Subtotal of building		325,662,429		
Structures				
Structures	25,095,620			Yokosuka area, short circuit test house, outdoor facility and others
Accumulated depreciation	△ 23,840,839			
Subtotal of structures		1,254,781		
Machine and equipment				
Research machine and equipment	78,116,667			Air electromagnetic flaw detector and others
General machine and equipment	3,389,457,242			Large capacity short circuit test facility and others
Accumulated depreciation	△ 3,049,222,694			
Subtotal of machine and equipment		418,351,215		
Tools and furniture				
Research tools and furniture	151,472,707			Nano particle instrument laser system and others
Accumulated depreciation	△124,975,079			
Subtotal of tools and furniture		26,497,628		
Intangible fixed asset				
Research software	8,961,420			GIS software and others
Accumulated depreciation	△2,877,038			
Subtotal of intangible fixed asset		6,084,382		
Accrued retirement benefits for employees special asset				
Housing loan	17,247,739			Personnel loan
Welfare loan	25,009,000			Personnel loan
Long-term official credit deposit	404,084,490			Caution money and guarantee deposit and others
Special deposit	2,989,558,771			General deposit: Mitsubishi Tokyo UFJ bank, 39,558,711 yen Fixed deposit account: Mitsubishi Tokyo UFJ bank, 2,950,000,000 yen
Subtotal of accrued retirement benefits for employees special asset		3,435,900,000		
Research facility acquiring benefits special asset		3,650,000,000		General deposit: Mitsubishi Tokyo UFJ bank, 550,000,000 yen Fixed deposit account: Mitsubishi Tokyo UFJ bank, 3,100,000,000 yen
Total special asset		7,863,750,435		
(3) Other fixed asset				
Land				
Komae area	1,858,713,231			Commercial land and welfare housing land□71,389.31 ㎡
Abiko area	1,526,111,289			ditto 177,277.75 ㎡
Yokosuka area	405,136,283			ditto 206,756.73 ㎡
Akagi area	651,429,826			ditto 1,005,572.32 ㎡
Others	440,103,991			Shiobara experimental land and others 53,986.44 ㎡
Land subtotal		4,881,494,620		

Subject	Amount of money			Memo
Building				
Reinforced concrete structure	12,316,018,572			Yokosuka area, administration building and others
Steel structure	6,203,119,951			Yokosuka area, high voltage insulation experiment building and others
Wooden structure	55,779,293			Ogatsu experiment field measuring house and others
Building attached structure	12,247,424,144			Yokosuka area, administration south building, air conditioner and others
Accumulated depreciation	△ 17,548,328,835			
Building subtotal		13,274,013,125		
Structure				
Structure	4,502,834,650			Yokosuka area, second switchgear and others
Greening facility	206,100,309			Akagi area, planting and others
Other structures	606,293,480			Yokosuka area, short circuit generator west side net, and others
Accumulated depreciation	△4,295,072,142			
Subtotal of structure		1,020,156,297		
Machine and equipment				
Research machine and equipment	47,776,910,521			Renewal of large capacity electric power short circuit test facility, and others
General machine and equipment	2,368,219,700			Short circuit test operation, control automatic system, and others
Accumulated depreciation	△39,386,336,876			
Subtotal of machine and equipment		10,758,793,345		
Tools and furniture				
Research tools and furniture	7,842,368,095			Wind field observation system within atmospheric boundary layer and others
General tools and furniture	996,694,558			Abiko, Yokosuka network component and others
Fixture and household furniture	349,376,382			Manual moving shelf and others
Car and vehicle	72,096,505			Elevated working vehicle and others
Accumulated depreciation	△7,296,264,508			
Subtotal of tools and furniture		1,964,271,032		
Intangible fixed asset				
Research software	2,644,348,804			Gasified simulation program, and others
Business software	1,037,246,175			ERP system and others
Facility utilization right	128,218,328			Payment for water service application, and others
Telephone right	8,975,000			Each area telephone rights
Accumulated depreciation	△2,831,576,966			
Subtotal of intangible fixed asset		987,211,341		
Building under construction		3,302,072,859		Deposit with acquisition of Yokosuka area neighboring land, and others
Long-term advanced payment		385,539,013		Equivalent facility construction expense in research contribution on research collaboration (coal gasification combined power demonstration plant research)
Other fixed asset total		36,573,551,632		
Fixed asset total			44,444,302,067	
Asset total			49,822,231,123	
II. Liability section				
1. Floating liability				
Accrued liability		4,256,493,218		Contract construction and purchased goods expense and others
Money entrusted		92,367,059		Consumption tax, inhabitant's tax and others
Advance receipt		123,496,676		Advance receipt related to next fiscal year implementation grant, and others
Accrued bonuses		392,000,000		Allowance for employee, etc. bonus
Floating liability total			4,864,356,953	
2. Fixed liability				
Allowance for retirement benefits for directors		221,000,000		Allowance for retirement benefits for vice presidents
Allowance for retirement pension benefits for employees				
Accrued retirement lump sum benefits for employees		7,900,000,000		Allowance for retirement benefits for employees, etc.
Total fixed liability			8,121,000,000	
Total liability			12,985,356,953	
Net asset			36,836,874,170	

Cash flow calculation sheet

From April 1, 2009 to March 31, 2010

(Unit: yen)

Subject	Current year	Previous year	Increase/ decrease
I Cash flow in business activity			
1. Current period ordinary net property increase/decrease	2,273,552,002	1,383,960,696	889,591,306
2. Adjust amount to cash flow			
(1) Depreciation allowance	5,416,612,620	5,276,790,206	139,822,414
(2) Fixed asset loss on retirement	167,974,093	292,634,705	Δ 124,660,612
(3) Transferred long-term advance payment	228,211,541	228,209,446	2,095
(4) Loss on fixed asset sale	3,850,933	0	3,850,933
(5) Profit on sale of fixed assets	Δ 85,323,106	Δ 25,997,144	Δ 59,325,962
(6) Facility donating profit	Δ 13,870,000	Δ 401,320,000	387,450,000
(7) Increase/decrease in allowance for retirement benefits for directors	Δ 261,000,000	89,000,000	Δ 350,000,000
(8) Increase/decrease in accrued retirement benefits for employees	120,000,000	64,000,000	56,000,000
(9) Increase/decrease in accrued bonus	7,000,000	Δ 14,000,000	21,000,000
(10) Increase/decrease in account receivable	174,791,880	990,003,985	Δ 815,212,105
(11) Increase/decrease in suspense payment	9,522,048	86,365,168	Δ76,843,120
(12) Increase/decrease in advance payment	Δ534,866	3,426,510	Δ 3,961,376
(13) Increase/decrease in accrued liability	99,931,085	Δ 44,230,769	144,161,854
(14) Increase/decrease in money entrusted	51,251	Δ 3,119,987	3,171,238
(15) Increase and decrease of advanced receipt	121,292,956	2,203,720	119,089,236
(16) Transferred amount from designated net property	Δ 117,972,319	Δ 145,750,651	27,778,332
(17) Others	0	Δ 150,000	150,000
Subtotal	5,870,538,116	6,398,065,189	Δ527,527,073
3. Increase/decrease in designated net property			
(1) Subsidy income	51,763,412	47,838,022	3,925,390
Cash flow by business activity	8,195,853,530	7,829,863,907	365,989,623
II Cash flow by investment activity			
1. Investment activity income			
(1) Long-term deposit repayment income			
(2) Transferred income from research facility acquiring special asset	350,000,000	980,000,000	Δ 630,000,000
(3) Fixed asset sale income	161,803,010	30,228,600	131,574,410
Total investment activity income	511,803,010	1,010,228,600	Δ 498,425,590
2. Investment activity expenditure			
(1) Special asset acquiring expenditure	1,800,000,000	1,800,000,000	0
(2) Fixed asset acquiring expenditure	7,425,551,821	6,306,235,417	1,119,316,404
Total investment activity expenditure	9,225,551,821	8,106,235,417	1,119,316,404
Cash flow by investment activity	Δ 8,713,748,811	Δ 7,096,006,317	Δ 1,617,741,994
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	Δ 517,895,281	733,857,090	Δ 1,251,752,371
VI Cash and cash equivalent balance at the beginning of a period (note 3)	5,165,234,313	4,431,377,223	733,857,090
VII Cash and cash equivalent balance at the end of a period (note 3)	4,647,339,032	5,165,234,313	Δ 517,895,281

Note: Asset scope

Asset scope includes cash and cash equivalent.

Important non-asset trade

No important non-asset trade is reported.

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	5,161,117,918	4,643,218,904
Securities	4,116,395	4,120,128
Cash and cash equivalent	5,165,234,313	4,647,339,032

II. Statement of Revenues and Expenses

Statement of revenues and expenses

From April 1 2009 to March 31 2010

(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	31,000,000,000	30,804,474,000	195,526,000	
(2) Business income	2,390,000,000	3,351,232,384	Δ961,232,384	
Funded research business income	(1,810,000,000)	(2,649,135,933)	(Δ839,135,933)	
Other business income	(580,000,000)	(702,096,451)	(Δ122,096,451)	
(3) Other income	140,000,000	151,652,567	Δ11,652,567	
Total business activity income	33,530,000,000	34,307,358,951	Δ777,358,951	
2. Business activity expenditure				
(1) Business expense expenditure	24,550,000,000	24,662,771,067	Δ112,771,067	
Personnel expense expenditure	(9,880,000,000)	(10,347,905,092)	(Δ467,905,092)	
Expense expenditure	(14,670,000,000)	(14,314,865,975)	(355,134,025)	
(2) Management cost expenditure	2,060,000,000	2,103,703,749	Δ43,703,749	
Personnel expense expenditure	(1,220,000,000)	(1,336,119,718)	(Δ116,119,718)	
Expense expenditure	(840,000,000)	(767,584,031)	(72,415,969)	
Total business activity expense	26,610,000,000	26,766,474,816	Δ156,474,816	
Difference in business activity balance of payments	6,920,000,000	7,540,884,135	Δ620,884,135	
II. Investment activity balance of payments section				
1. Investment activity income				
(1) Special asset transferred income				
Research facility acquiring special asset transferred income	1,300,000,000	350,000,000	950,000,000	(1)
(2) Sale income of fixed assets	500,000,000	161,803,010	338,196,990	(2)
(3) Long-term advance payment transferred income	230,000,000	228,211,541	1,788,459	
Total investment activity income	2,030,000,000	740,014,551	1,289,985,449	
2. Investment activity expenditure				
(1) Special asset acquiring expenditure				
Research facility acquiring special asset expenditure	1,800,000,000	1,800,000,000	0	
(2) Fixed asset acquiring expenditure	7,770,000,000	6,156,672,112	1,613,327,888	(3)
Total investment activity expenditure	9,570,000,000	7,956,672,112	1,613,327,888	
Difference in investment activity balance of payments	Δ7,540,000,000	Δ7,216,657,561	Δ323,342,439	
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	Δ620,000,000	324,226,574	Δ944,226,574	
Difference in balance of payments transferred from previous period	620,000,000	581,345,529	38,654,471	
Difference in balance of payments transferring to next period	0	905,572,103	Δ905,572,103	

Note:

(1) The balance was carry-over of virement 550 million yen along with un-acceptance due to accident at receiving of the short-circuit test facility (input switch) and carry-over of virement 400 million yen along with partial postponement of land acquirement by the delay of neighboring land construction at Yokosuka area.

(2) The balance reason was due to the partial sellout of welfare housing vacant lot.

(3) Major reason of the balance includes carry-over of 550 million yen along with un-acceptance of the short-circuit test facility (input switch), carry-over of 550 million yen by the delay of neighboring land construction at Yokosuka area, and carry-over of 180 million yen by the delay of power system simulator establishment.

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	5,161,117,918	4,643,218,904
Securities	4,116,395	4,120,128
Account receivable	862,106,035	687,314,155
Suspense payment	47,079,156	37,557,108
Advanced payment	5,183,895	5,718,761
Total	6,079,603,399	5,377,929,056
Accrued liability	5,403,738,342	4,256,493,218
Money entrusted	92,315,808	92,367,059
Advance receipt	2,203,720	123,496,676
Total	5,498,257,870	4,472,356,953
Difference in balance of payments transferred to the next period	581,345,529	905,572,103

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)	7,425,551,821
Increase/decrease of accrued liability	△1,247,176,209
Acquisition of fixed asset by subsidy	△21,703,500
Final accounts of fixed asset acquisition expenditure	6,156,672,112

Audit Report by Third-Party Auditor

May 7, 2010

Central Research Institute of Electric Power Industry
President
Masahiro Kakumu

Certified public accountant, Wada Yoshihiro Office
Certified public accountant, Yoshihiro Wada
Certified public accountant, Tomikawa Masayuki Office
Certified public accountant, Masayuki Tomikawa

We audited the financial statements of the Foundation of Central Research Institute of Electric Power Industry (herein after referred to as CRIEPI) in the FY 2009 business term from April 1 2009 to March 31 2010, including balance sheets, net property increase/decrease calculation sheets, statement of cash flow, statement of flow property list and income and expenditure account statement (hereinafter referred to as "financial statements"). The responsibility to prepare these financial statements falls upon the executive board members, and our responsibility is to express an opinion on the financial statements from an independent standpoint.

We carried out the audit based on an auditing standard generally authorized to be public and acceptable in Japan. The auditing standard requires us to give reasonable assurance that no false expression is contained in financial statements. The audit is done based on audit tests to thoroughly check expressions in financial statements, including the account policy employed by the executive board members and its application method, and an assessment of estimations made by the members. We understand that reasonable basement was obtained to express our opinion as the audit result.

As the result of the audit, our opinion is as follows:

(1) We accept that the financial statement is based on the public-service corporation account standard generally authorized to be arm's length in Japan, and properly indicates in all important points the property, net property increase/decrease, and cash flow situation for the term related to this financial statement of the Foundation of CRIEPI.

(2) We accept that the income and expenditure account statement is prepared correctly based on "internal management items in the public-service corporation account" (March 23, 2005, mutual agreement at related government ministries and agencies liaison conference on guidance in public-service corporations) and expresses all important points for the balance of payments in the FY 2009 business term for CRIEPI.

Between CRIEPI and us, there is no interest to be describe based on certified public accountant law.

Audit Report

Audit Report

May 13, 2010

Central Research Institute of Electric Power Industry
President
Masahiro Kakumu

Central Research Institute of Electric Power Industry
General Auditor, Masatake Kadoyu
General Auditor, Katsutoshi Chikudate
GeneralAuditor, Koji Kaibe

We audited, on the basis of Central Research Institute of Electric Power Industry (hereinafter referred to as CRIEPI) auditor audit rule and FY2009 auditor audit plan, CRIEPI's business and financial conditions for the applicable fiscal year from April 1, 2009 to March 31, 2010 to report the results as follow.

1. Outline of the audit method

   We surveyed CRIEPI's business and financial conditions through communication with president, vice presidents and other employees, information collection and conditioning of audit environment, attendance to the board of director and other important meetings, browsing of important final decision documents, requiring explanation from vice presidents and other employees as needed.

   In addition, we surveyed and verified that the third-party auditor properly audited financial statements and received explanation from the auditor as needed.

2. Results of audit

   (1) We recognized that there was no serious fact violating laws or act of endowment of assignments for the president and the vice president.

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

   (3) We recognized that the audit by the third-party auditor was reasonable and settlement of accounts (balance sheet, net assets increase/decrease calculation sheet, cash flow calculation sheet and lists of assets, and Statement of revenues and expenses) properly indicated CRIEPI's property conditions.