

Intellectual Property Report 2006 Edition Summary

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Central Research Institute of Electric Power Industry

Summary

1. Introduction

The Central Research Institute of Electric Power Industry (CRIEPI) is a non-profit research organization that has been conducting diverse research activities relating to the electric power industry since its establishment in 1951. The results of our research have been directly applied to solve various problems on the electric power infrastructure, such as environmental assessment of thermal power plants, construction of nuclear power plants and the stabilization of electric power systems. In addition, we have been extending our field of research to the development of end-user products, such as EcoCute, a highly efficient CO₂ heat pump water heater.

CRIEPI is now putting great deal of effort into the management and application of intellectual properties. Especially, the creation of “outcome” is the most important concept among our strategies on intellectual properties. “Outcome” is defined as the social, economic, and academic impact of our research activities on the electric power industry, Japanese society and the global society. We believe that our contributions to society can be maximized by pursuing outcomes in both the planning and the evaluation of research.

In August 2006, we published our first “Intellectual Property Report” (2005 edition) in order to visualize the current status of CRIEPI from the perspective of intellectual properties and outcomes, for the easier and deeper understanding by the stakeholders who support us or benefit by our activities. Publishing an intellectual property report was a challenge for us since it may well be the first such report issued by a non-profit research institute in Japan. The report’s effectiveness in fulfilling our accountability to the stakeholders has prompted us to publish one annually.

This report, entitled “Intellectual Property Report 2006 Edition”, summarizes the current status of intellectual properties at CRIEPI focusing on activities conducted in FY2006. The report was edited by CRIEPI’s center for intellectual property and technology licensing. We hope this report will be instrumental in improving the stakeholders’ understanding and utilization of CRIEPI.

2. Topics in 2006

- Outcome strategy
 - In August 2006, we published the first intellectual property report, containing case studies of intellectual property valuation for three research projects that reflect outcomes benefiting stakeholders.
 - Starting in FY2006, “outcome management” has been implemented in our research process, providing for research evaluation in terms of outcomes, as well as the awareness of outcomes in research planning and goal setting.
- Technology transfer
 - From November 2006, ESiCaT Japan, a limited liability partnership established for the practical application of the joint research conducted by CRIEPI, the National Institute of Advanced Industrial Science and Technology (AIST), and Showa Denko K.K., began the production and the commercial supply of SiC epitaxial wafers, a next-generation semi-conducting material, which achieved a leading level of quality.
 - From January 2007, “The Online Boron Monitor”, an analyzer of boron in the drainage of plants, developed by CRIEPI and DKK-TOA Corporation, was introduced into the market.
- Other topics
 - The center for intellectual property and technology licensing was established in April 2006 for the integrated management of various intellectual properties at CRIEPI, such as research reports, industrial property rights, and software.
- The 2006 status of research projects that were valued in the intellectual property report 2005 edition
 - The continuing outcomes were observed in FY2006 for the three research projects, “Electric

power system stability analyzer (Y method)”, “Interim storage technology of spent nuclear fuel”, and “EcoCute (Home-use hot water supplier using a CO₂ coolant heat pump)”.

3. Intellectual property strategies

- Business outline (Fig. 1)
 - CRIEPI is a non-profit research institute that supports the Japanese electric power industry, through research and development activities. Our research covers a variety of subjects related to the electric power industry including generation, operation, maintenance, nuclear energy, management risks, consumer solutions, environment and natural hazards.

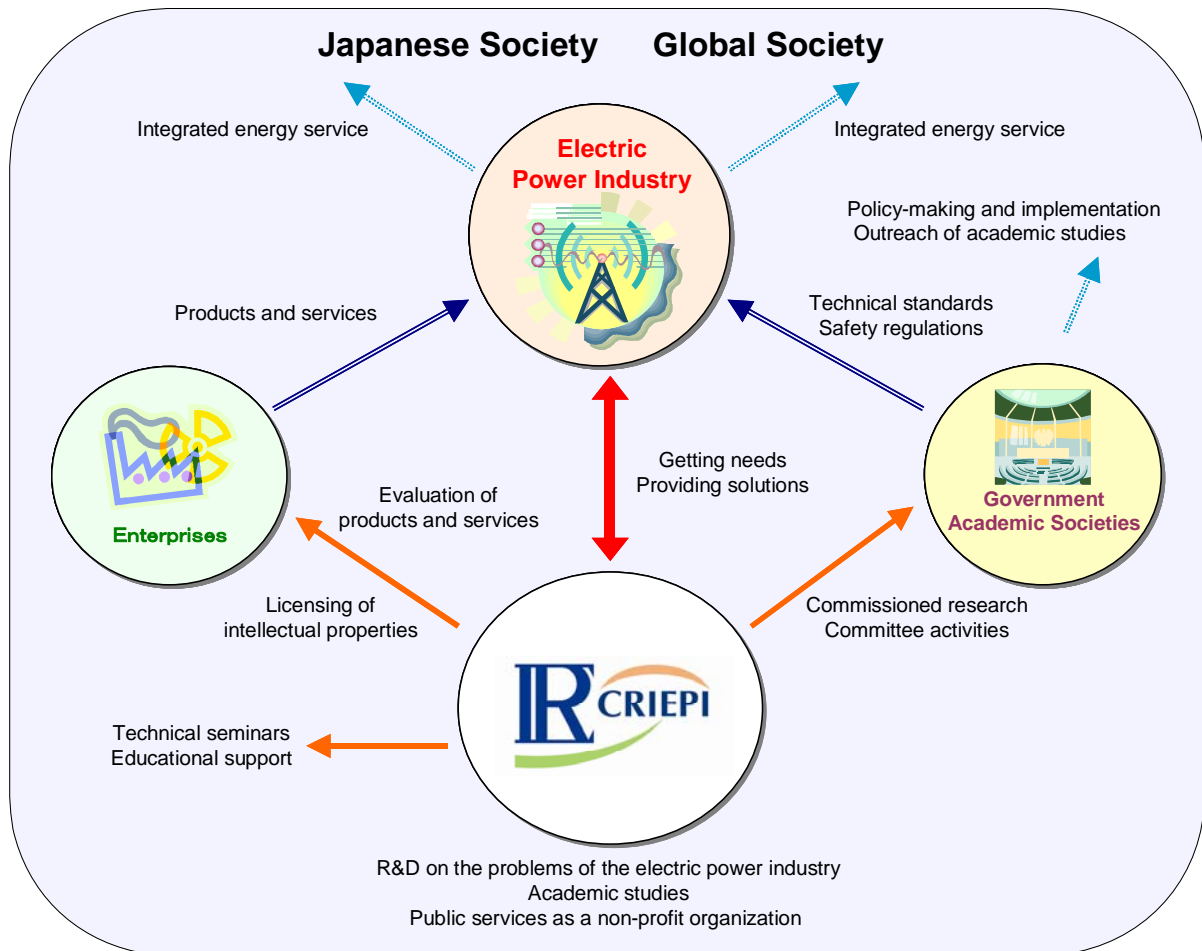


Fig. 1: Relations between CRIEPI and the stakeholders

- Overview of intellectual property activities:
 - The majority of CRIEPI study results have been made publicly accessible through the publication of reports and academic papers.
 - CRIEPI is active in joint development with various enterprises and promotes the licensing of patents and software.
 - CRIEPI performs commissioned research projects and provides technical seminars for the electric power industry, the government and other stakeholders.
 - Our knowledge and findings are reflected in technical standards and design criteria through our close cooperation with the government, academic societies and industrial societies.
 - Our public relation activities provide knowledge and awareness on energy and environment to the general public.
- Intellectual property strategies are summarized as follows.
 - As a non-profit research organization, CRIEPI will utilize its research results for public benefit. We focus on interests common to the electric power industry.

- CRIEPI will establish outcome management methodologies in the planning and the evaluation of research activities in order to maximize outcomes of its intellectual properties from the perspective of their social, economic and academic impacts.
- Typical intellectual properties created by CRIEPI include the followings:
 - Literature: CRIEPI reports, software and multimedia contents.
 - Industrial property rights: Patents, utility model rights, trademark rights and design rights.
 - Know-how and methods: Unique experimental techniques and assessment formulae.
- The features of these intellectual properties are as follows:
 - Our intellectual properties are based on knowledge gained in on-site studies of actual problems encountered by the electric power industry.
 - CRIEPI develops various evaluation methodologies in order to assess and improve the performance, efficiency, reliability, safety, and environmental impact of electric power facilities.
 - We support the establishment of national policies on energy, as well as technical standards, criteria and guidelines, by performing commissioned research studies requested by the government and by various activities in academic and industrial societies.
 - We contribute to academic studies by the publication of reports and papers and participation in the management of academic societies.
- Philosophy of intellectual property utilization:
 - Resources to improve the social value of CRIEPI
 - Right to protect CRIEPI research activities
 - Generation of new knowledge
 - Capital for research activities
- Organization of activities related to intellectual properties:
 - The center for intellectual property and technology licensing is in charge of the overall management and technology transfer of CRIEPI's intellectual properties.
 - All the research laboratories that comprise CRIEPI are staffed with intellectual property managers who closely cooperate with the center for intellectual property and technology licensing.
 - Communication with the Japanese public and the global society is maintained through publications, press releases, web sites, and media coverage.
 - To promote the transfer of technology, we maintain the web site, "CS-Web Communication".
 - We offer a private technical seminar, "Techno consortium", to various industries.
 - We present our technologies at various technical exhibitions.

4. Creation and utilization of intellectual properties in 2006

- Research publications: 281 research reports and 204 commissioned reports. The total number of copies of the publications made available for open access is approximately 47,000.
- Research papers: 1,599 papers.
- Patents: 155 applications, 35 registered and 24 new licenses.
- Software: 115 registered and 424 new licenses.
- Standards and criteria: 28 contributions to standards, criteria and guidelines of the government, academic societies and industrial societies.
- Commissioned research projects and consulting activities: 528 for the electric power companies, 95 for the government and public organizations, and 41 for general enterprises.
- Seminars and training programs: 21 courses for electric power companies (550 participants) and three courses for general enterprises (341 participants).
- Educational support: 105 activities for educational programs in primary, junior high and high schools.
- Public relations: Publication of the Annual Research Report 2006 and 15 CRIEPI News releases. Mass media coverage included 946 published articles.

5. Case studies of intellectual property valuation

Case studies of intellectual property valuation were performed targeting on three CRIEPI research projects. The valuation was performed on the input (the resources which were invested in the research), the output (the intellectual properties which were created by the research), the income (CRIEPI's profit by providing the output), and the outcome (the economic, social, and academic impacts of the output which

benefit the electric power industries, Japanese society, and the global society). The following three research projects were the targets of the valuation:

- Clearance level inspection system: The Clearance Automatic Laser Inspection System (CLALIS) along with the rational criteria were developed for a clearance level inspection that classifies waste released when decommissioning nuclear facilities into radioactive waste and materials which do not need to be handled as radioactive substances.
- Atmospheric diffusion prediction: Practical evaluation methodologies were developed for atmospheric diffusion prediction for stack gas and fugitive coal dust from thermal power plants and gaseous radioactive waste from nuclear power plants. Our methodologies include wind tunnel experiments, atmospheric observations, and numerical simulations, which have been applied to environmental impact assessment and safety regulations for power plants.
- Lightning protection design: Design guidelines and simulation tools were developed for the lightning protection design of transmission lines, distribution lines, power stations and substations. The lightning protection design guidelines reflect CRIEPI research results, as well as global research and practice.

Table 1 summarizes the results of the intellectual property valuations. The results show that CRIEPI research has produced outcomes that are of considerable benefit to the electric power industry and the general public. These results illustrate the social significance of our continuing long-term research in maintaining electric power facilities as critical elements of the infrastructure.

6. Conclusion

This report summarized the strategies and the accomplishments of CRIEPI in FY2006 from the perspective of intellectual properties. The case studies of intellectual property valuation were performed for three representative CRIEPI research projects.

CRIEPI will continue to play an active role in the creation and the utilization of intellectual properties in order to maximize outcomes that will benefit the electric power industry, Japanese society and the global society. We will continue our public relations efforts on intellectual properties, such as this report, for the purpose of maintaining accountability to the stakeholders.

Table 1: Results of the intellectual property valuation

	Clearance level inspection	Atmospheric diffusion prediction	Lightning protection design	
Input (Research expenses and personnel expenses)	• 0.15 billion yen	• 1.5 billion yen	• 1.0 billion yen	
Major outputs (Intellectual properties)	<ul style="list-style-type: none"> • Patents on the Clearance Automatic Laser Inspection System (CLALIS) • Computational code for probability distributions (PDCS) and the clearance tolerance setting method • Reports and papers 	<ul style="list-style-type: none"> • Experimental data and know-how on wind tunnel experiments • Know-how on performance evaluation data for the Doppler soder • Numerical simulation software for the prediction of atmospheric diffusion • Reports and papers 	<ul style="list-style-type: none"> • Lightning protection design guidelines • Software for lightning protection design • Nationwide lightning database • Reports and papers 	
Income* (Economic profit for CRIEPI)	• 0.2 billion yen (Net-present-value of license fees for patent and software)	• 0.09 billion yen (Net-present-value of consulting fees for wind tunnel experiments and licensing fees for software)	• 1.8 billion yen (Net-present-value of license fees for software)	
Major outcomes (Impacts on the electric power industry, Japanese society and the global society)	Electric power companies (Economic values represent CRIEPI contributions only)	• Net-present-value of cost reduction by introduction of CLALIS and the tolerance setting method: 34 billion yen	<ul style="list-style-type: none"> • Wind tunnel experiments related to the authorization of thermal power plants and nuclear power plants: 167 • Numerical simulations related to the authorization of thermal power plants: 41 • Net-present value of the cost and risk reduction related to the authorization of thermal power plants and nuclear power plants: 19 billion yen 	<ul style="list-style-type: none"> • Net-present-value of the reduction of maintenance costs for lightning protection: 29 billion yen • Technological inheritance, information sharing and human resource development on lightning protection design
	Manufacturers	• Net-present value of the operating profit: 0.07 billion yen	• Net-present value of the operating profit: 0.07 billion yen	• New demands for lightning protection equipments
	Academic and industrial societies	• Atomic Energy Society of Japan standard on clearance inspections	• Atomic Energy Society of Japan standard on wind tunnel experiments	• Standards and regulations of the Institute of Electrical Engineers of Japan and the Japan Electric Association: 4
	The Japanese government	• Contribution to the national policy on clearance inspections through the establishment of an AESJ standard	• Standard and criteria related to the authorization of thermal and nuclear power plants: 8	
	The Japanese public (Economic values represent CRIEPI contributions only)	<ul style="list-style-type: none"> • Safety and security of nuclear facilities • Reduction of electricity charges 	<ul style="list-style-type: none"> • Conservation of the atmospheric environment around thermal power plants • Safety and security of nuclear facilities • Stable supply of electric power 	• Net-present value of the economic effect of reductions in the incidence of power failure caused by lightning: 0.5 billion yen
	Overseas	• IAEA Safety Report	• Reduction and prevention of air pollution by the transfer of our atmospheric diffusion prediction technologies (for future development)	<ul style="list-style-type: none"> • Contribution to the International Conference on Lightning Protection • Contribution to the international standards (for future development)

* As the purpose of the calculations is to determine total intellectual property values, income values assume full fees from all licensing although some licenses that benefit the public are issued without charge.