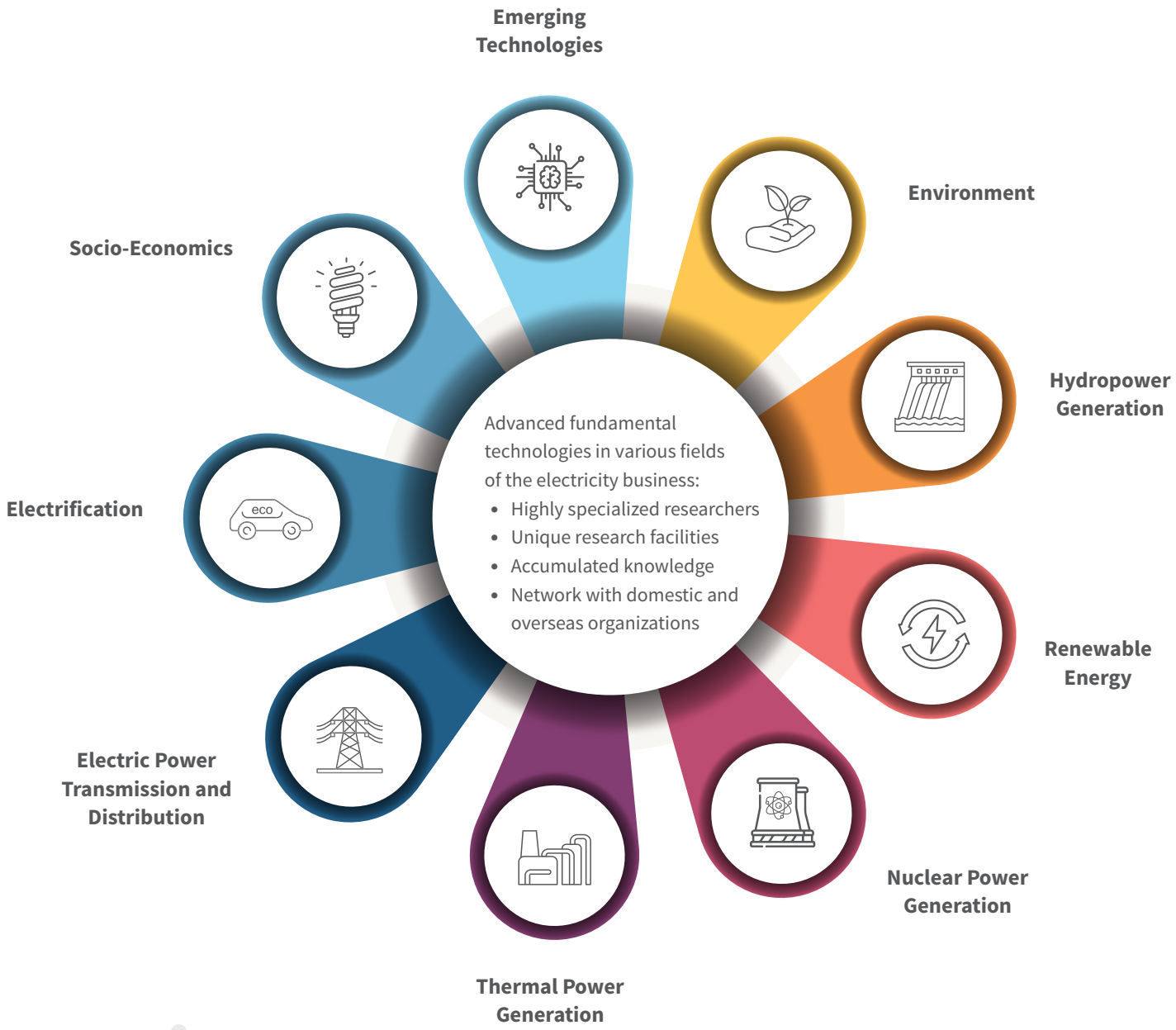
OUR EXPERTISE

Wide-Ranging Research Areas



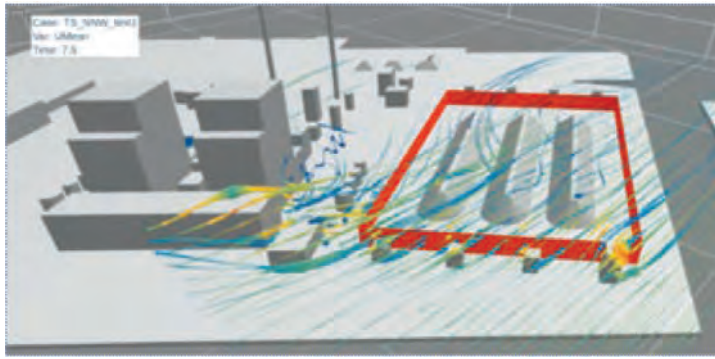
Environment

It is imperative to develop technologies that supply low-cost and reliable electricity while internalizing environmental externalities to achieve a sustainable society. We will contribute to the development of sustainable energy systems by examining the role of electricity in climate change mitigation, developing decarbonization technologies to achieve circular economy, and developing simulation and monitoring technologies to ensure harmonious co-existence of generation, transmission & distribution facilities with the surrounding environment.

Global warming

Environmental assessment

Environmental and health risks



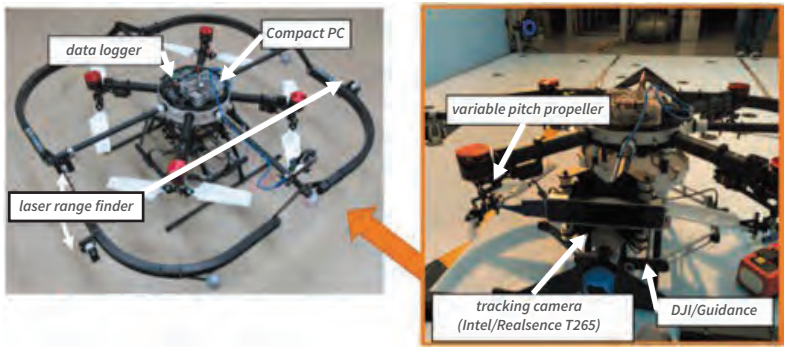
The prediction image of dust dispersion from a coal yard using a three-dimensional numerical fluid model

Hydropower Generation

Image: Kurobe Lake Dam In Toyama

To ensure proper maintenance and management of aging hydroelectric facilities and extend their lifespan and continued operation, we are developing technologies to maintain and monitor these facilities' condition. Furthermore, the development of preventing hydroelectric facilities' degradation, sediment management technologies to help solve sedimentation and muddy water in dams are currently in progress. We are also developing risk assessment methods as well as restoration and reinforcement technologies to minimize damage to assets and technologies to support the speedy recovery of hydroelectric power facilities in the event of natural disasters, such as earthquakes and floods. Through these efforts, we contribute to the continued use of hydropower, which is a valuable renewable energy source and has an essential role in stabilizing electricity supply and demand.

Operation, maintenance, and disaster prevention at hydropower facilities



Prototype drone for unmanned inspection of waterways

Renewable Energy (RE)

We are working to improve output estimation accuracy and forecasting technologies for solar and wind power, which is the key to creating a long-term generation model for the electric power system. We are also developing technologies to support the expansion of geothermal energy as a stable renewable energy generation source and the use of biomass as carbon-neutral fuels. Through these green initiatives, we are working to establish renewable energy as an indispensable power generation source in the future energy mix.

Expansion of low carbon power generation

Grid-system stabilization while initiating and expanding renewable energy

PV systems composed of various high-efficiency PV technologies

Nuclear Power Generation

To restart existing Light-Water Reactors (LWRs) and ensure stable operations of resumption, we are working on quantifying nuclear safety, including PRA implementation. We are also researching the appropriate management of spent nuclear fuel to complete the nuclear fuel cycle. Furthermore, we are working on radioactive waste disposal projects and the decommissioning of nuclear facilities to ensure sustainable and accountable nuclear power operations. By consolidating these technologies, we contribute to the realization of an extremely safe and cost-efficient nuclear power industry.

- **Utilization and stable operation of existing Light-Water Reactors (LWRs)**
- **Establishing rational safety measures**
- **Establishing technologies to complete the nuclear fuel cycle**
- **Supporting radioactive waste disposal operations**
- **Supporting decommissioning of nuclear power facilities**

Thermal Power Generation

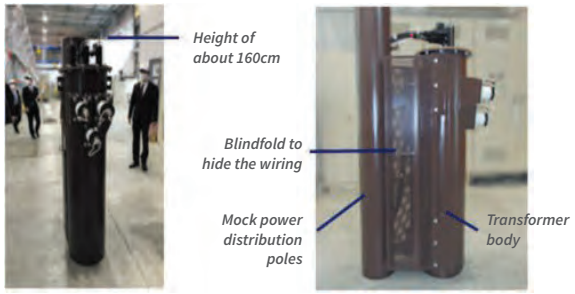
We are researching best practices in the operation and maintenance (O&M) of existing thermal power plants, and to improve facility performance in response to increasingly stringent environmental regulations. We are also developing technologies for the regulation and operation of thermal power plants and tools for analyzing their dynamic characteristics in response to the increasing renewable energy penetration into the grid. Additionally, we are developing new power generation technologies that reduce environmental impacts and high-efficiency energy conversion technologies for low-carbon initiatives to achieve zero-emission thermal power generation in the future.

- **Rational usage of existing thermal power facilities**
- **Responding to increasing introduction of renewable energy**
- **Reducing CO^2 emissions**

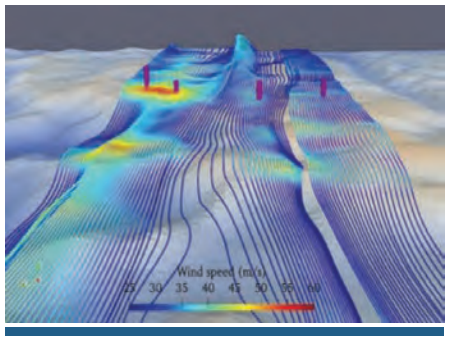
Electric Power Transmission and Distribution

We are developing technologies to support the rational maintenance, modernization, and O&M of aging power distribution facilities. Growth in renewable energy capacity and ongoing power sector reforms have necessitated the development of technology to cope with sudden fluctuations of these intermittent sources and maintain grid stability by isolating specific power sources in the power system during a disaster. In response to natural disasters, we are developing technology to support disaster mitigation and restoration by designing wind-, snow- and earthquake-resistant power distribution facilities, thus strengthening their resiliency. As we embark on this journey, we strongly envision a stable and a novel power supply system in the future.

- **Rationalization of the formation and O&M of facilities**
- **Supporting power system operation**
- **Utilization of demand-side assets**
- **Addressing disaster risks and human risks at power transmission and distribution facilities**



Prototype medium-low capacity soft grounding transformer



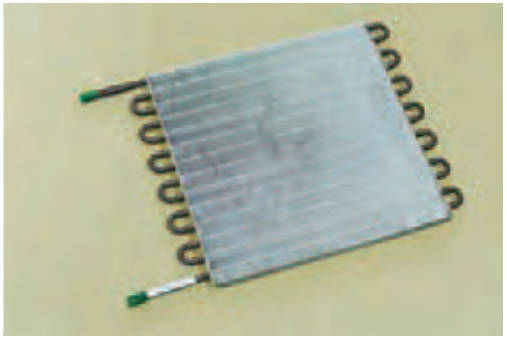
Local wind simulation result

Image: Marunouchi office street

Electrification

To achieve a decarbonized society, we contribute to the improvement of performance and promotion of energy-efficient technologies, such as heat-pump water heaters, heating systems, and electric vehicles (EVs). The aim is to promote energy conservation and electrification leading to customer benefits in consumer, industrial, and transportation sectors.

Promoting electrification and increasing customer satisfaction



A heat exchanger for frost-free heat pumps

Socio-Economics

To ensure consistency between the design of energy market systems and the Strategic Energy Plan aiming at large-scale introduction of renewable energy sources, CRIEPI analyzes desirable institutional framework of power utility industry, whose results have been documented in a series of reports and proposals. Knowing the importance of nuclear power for carbon neutrality, we survey international trends and developments for nuclear power generation to reflect to Japan's policies. Furthermore, we examine and evaluate the diversifying strategies of electric power industry from multiple angles and present opportunities of novel value creation.

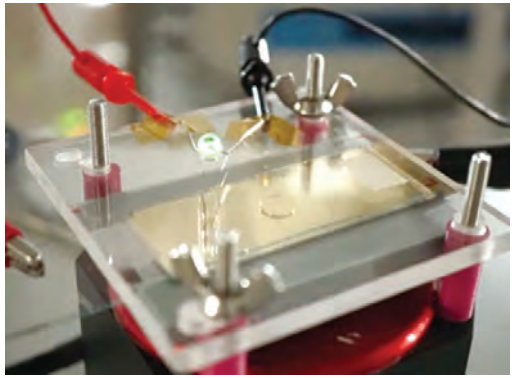
Ensuring consistency of the Electricity System Reform and energy policies

Emerging Technologies

Amid the expanding introduction of renewable energy and the increasing use of EVs and storage batteries, we are working to build power supply and demand management technologies to improve energy efficiency and economy in the overall supply and demand paradigm. Moreover, we are developing innovative technologies, such as IoT, AI, big data, and novel sensors, for the electric power industry and other sectors to provide highly valuable energy services to electricity consumers. These technologies will assist the optimization of supply-demand management and the maintenance of plant equipment and social infrastructure.

Overall optimization through supply/demand coordination

Development of technologies for applications in various fields



Vibrational energy harvester using an electric double-layer electret