

FOREWORD



The Institute of Advanced Energy (IAE) was founded in May 1996 to explore the energy systems for the next-generation by going back to the fundamental principles of nature, and to create new energy theories for the next generation and advanced technologies to guide and implement these theories. At present, the faculty members belonging to the Faculty Consort of Advanced Energy in the Natural Science Platform are engaged in 14 research sections in three divisions, each of which investigates one of the following three basic processes of energy: generation, conversion, and utilization. The Laboratory for Complex Energy Processes supports and stimulates collaborative research to address issues related to complex energy processes. The Integrated Research Center for Carbon Negative Science (ICaNS) was established in 2022.

Through extensive collaboration with researchers in the Graduate Schools of Energy Science and Engineering, the Center is actively developing new concepts, academic foundations, and science and technology for the effective use of carbon dioxide to realize a carbon-neutral society.

The two core research areas of the Institute are “Plasma and Quantum Energy Science” and “Soft Energy Science”. The former aims to realize nuclear fusion to generate solar energy on Earth. The latter aims to achieve highly efficient energy utilization and conversion based on the principles of materials science and energy utilization by living organisms that have built the biosphere on Earth with solar energy. It also actively promotes the internationalization of research and the transfer of research results to society through cooperation between industry, academia and government.

Certified as a “Zero-Emission Energy” Joint Usage/Research Center by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 2011, the Institute is entering its third phase of operation and continues to contribute to the zero-emission energy research community. As a Zero-Emission Energy research center, we collaborate with domestic and overseas researchers in a wide range of academic fields and promote the shared use of cutting-edge research equipment to strengthen the foundation of academic research and to accelerate new scientific research.

Japan has also set a goal of “virtually eliminating greenhouse gas emissions by 2050,” and carbon neutrality is now a goal for societies worldwide. The IAE is committed to a wide range of research into zero emission energy, which is certain to play an increasingly important role in achieving carbon neutrality and providing a variety of new energy technology options.

This annual report summarizes the major research achievements of each of IAE’s research divisions for FY2023 (April 2023-March 2024) to represent IAE’s research activities. I hope you will enjoy our Institute’s ongoing research in a wide range of scientific disciplines, which will surely provide innovative solutions to meet the demands of achieving carbon neutrality.

March 2024

A handwritten signature in black ink, appearing to read 'T. MORII', written in a cursive, flowing style.

Takashi MORII
Director
Institute of Advanced Energy
Kyoto University