

FOREWORD



The Institute of Advanced Energy (IAE) was established in May 1996 to explore the energy systems for next generation by going back to the basic principles of nature, and to create new energy theories for the next generation and advanced technologies to lead and realize these theories. Currently, 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 institute has set up the Laboratory for Complex Energy Processes with five research sections, which supports and stimulates collaborative research to address issues related to complex energy processes.

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 use by living organisms, which have built the biosphere on earth with solar energy. In addition to actively promoting the internationalization of research and the return of research results to society through industry–academia–government collaboration, we educate students of Liberal Arts and Science Courses and the Graduate School of Energy Science as the Cooperating Chair, foster young researchers in a front-line research environment.

The institute has been certified as a “Zero-Emission Energy” Joint Usage/Research Center by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 2011, and has held this status for the third time, starting from the fiscal year of 2022. As the research hub of Zero-Emission Energy, we collaborate with domestic and overseas researchers over a broad spectrum of academic fields, as well as promote the share-use of cutting-edge research equipment to strengthen the foundation of academic research and to accelerate novel scientific research.

In Japan, too, the goal of “virtually eliminating greenhouse gas emission by 2050” has been set, and carbon neutrality is now a goal for societies worldwide. IAE has been committed to pursue a wide range of research aimed at Zero-Emission Energy, which will play an increasingly important role in achieving carbon neutrality and providing a variety of new energy technology options.

This annual report summarizes the key research findings at each research section of IAE for FY2021 (April 2021–March 2022). I hope you enjoy the ongoing research of our institute in a wide array of scientific disciplines that will certainly create innovative solutions to satisfy the demands to realize carbon neutrality.

March 2022

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

Takashi MORII
Director
Institute of Advanced Energy
Kyoto University