

FOREWORD



“The times have finally caught up with us.” We at the Institute of Advanced Energy believe this, even if it sounds arrogant. Fifteen years ago, in 2011, our institute launched the Joint Usage/Research Center Program, “Zero-Emission Energy Research Center,” with the mission of researching energy sources that minimize emissions of harmful substances, such as carbon dioxide. It’s hard to imagine now, but there was considerable skepticism about the significance of this mission at the time. This program has consistently earned an A rating in all interim and final evaluations over its three phases, from fiscal 2011, 2016, and 2022, reflecting widespread recognition of our mission’s significance, and we remain determined to stay ahead and advance our cutting-edge research. In 2022, we established the affiliated center, Integrated Research Center for Carbon Negative Science (ICaNS), to study “carbon negative energy,” a step beyond “zero-emission energy.” ICaNS was established for a five-year period, with 2026 being its final year. Having already achieved the KPIs promised at the time of its establishment, we aim to win core funding and continue to de-

velop our activities as a center with no time limit.

The Institute of Advance Energy was established in 1996 with the aim of exploring the nature of energy by returning to natural laws and principles, creating new energy theories for the next generation, and developing cutting-edge technologies to realize them. The Institute consists of three departments covering energy generation, transformation, and utilization, encompassing 14 research fields. Additionally, it includes the “Laboratory for Complex Energy Processes” that provides shared equipment for the aforementioned joint use and collaborative research project, and the previously mentioned ICaNS. The Institute has established two key interdisciplinary research areas as its cornerstone: one aimed at realizing nuclear fusion, called “Plasma and Quantum Energy,” and the other aiming for efficient energy utilization and transformation based on biological energy utilization principles and material science, called “Soft Energy.”

Each research field of this Institute serves as a cooperative course of the Graduate School of Energy Science, Kyoto University, with a considerable number of master’s and doctoral students from that Graduate School assigned, doing education in a cutting-edge research environment. We also contribute to undergraduate education through university-wide common subjects at Kyoto University.

“Rather than asking what the Institute can do for you, I would like you to consider what you can do for the Institute.” When I became the director last April, I made this greeting at a meeting of all faculty and staff. This carries my sentiments based on the famous speech of the late President Kennedy. When I first heard his speech, I thought, “What a terrible demand to say, ‘The country does nothing for you, but I want you to serve the country.’” However, as I encountered this phrase a few more times, I began to feel it was quite a good word. I came to understand that the country is not something to depend upon but is to be developed through the strength of each individual. Furthermore, this phrase seems to envision a country where each person can shine. An Institute where each member can shine is certainly a wonderful thing, isn’t it? With this thought, I made the aforementioned greeting.

Kyoto University is a candidate for accreditation as an International University of Excellence. Various reforms are currently underway to remove the “candidate” status and receive official accreditation. While these reforms will require effort, we hope that an even better research environment awaits us at the end.

This annual report summarizes the major research achievements of each of IAE’s research divisions for FY2025 (April 2025–March 2026). I hope you will enjoy our Institute’s ongoing research in a wide range of scientific disciplines, which will surely provide innovative solutions toward achieving carbon neutrality.

March 2026

A handwritten signature in dark ink that reads "M. KATAHIRA". The signature is fluid and cursive, with the first name "Masato" and the last name "KATAHIRA" clearly distinguishable.

Masato KATAHIRA
Director
Institute of Advanced Energy
Kyoto University