FOREWORD

The Institute of Advanced Energy was established in May 1996 for the purpose of exploring the next-generation energy by probing into the laws and basic principles of nature, and of developing the state-of-the-art technologies to utilize them for practical applications. For this purpose, 14 sections of research areas are organized as three divisions, each dedicated to one of the three basic kinds of energy processes: generation, conversion, and utilization of energy. On top of this, we set up the Laboratory for Complex Energy Processes which also includes 3 sections of research areas. This laboratory organically integrates all the disciplines to enable us to tackle complex energy related issues. Furthermore, we actively promote the internationalization of research and return the fruits of our research back into society incorporating with industry–academia–government collaboration. The institute is also in charge of the Graduate School of Energy Science's Cooperating Chair, which conducts student education and trains researchers in a leading-edge research environment.

The Institute of Advanced Energy focuses on two core research areas: "Plasma and Quantum Energy Science" and "Soft Energy Science". The first topic deals with the generation of energy by nuclear fusion on Earth, which is equivalent to that created in the Sun. The second topic addresses the development of methods for highly efficient energy based on the principles of biology and materials science, which has created the biosphere in the Earth's environment.

The Institute has coordinated these phenomena in the wide energy range to create a new energy philosophy incorporated with that referred to as "Zero-Emission Energy". We collaborate with researchers across a broad range of academic fields in Joint Usage/Research Center programs. We hope to develop the breakthrough of energy that will lead the 21st century through the active merging of research in the wide energy range, like the creation of beautiful patterns of fabric interwoven from threads of various forms and shapes.

This annual report summarizes the IAE's research findings for FY2020 (April 2020-March 2021). Due to the space limitation, only key results including publication and presentation performed in the year in each division and research section, and also in Laboratory for Complex Energy Processes are edited. Please contact to each researcher for more detail information.

This year, the spread of COVID-19 has caused confusion in society and severely restricted research activities at the university. However, in spite of this tough situation, we have achieved many results. I would like to thank all of you for your cooperation and support. We hope that we will overcome COVID-19 next year and greatly promote exchanges with everyone.

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