Special Feature

World-Leading Hydrogen Energy Research

Professor
Kazunari Sasaki
Director of the International Research Center for Hydrogen Energy

The problem of global warming is escalating further with each year that passes. If warming continues at its present pace, we run the risk of increasingly frequent typhoons and other natural disasters, a decrease in land area due to rising sea levels, and the destruction of ecosystems and food shortages due to extreme weather conditions. We need to reduce carbon dioxide emissions for the sake of our planet's future. Accordingly, attention has focused on hydrogen as the energy source of the future.

Professor Sasaki, who has been involved in hydrogen energy research for many years, says,
Japan is very advanced in the field of hydrogen energy. Ene-Farm home fuel cells went on sale in 2009, while commercial sales of the fuel cell vehicle (FCV) "MIRAI" began in December 2014. In 2017, large-scale fuel cells for office and factory use are due to become commercially available. One day, hydrogen energy will likely be used for buses and other modes of public transport. Carbon dioxide is generated when hydrogen gas is made from fossil fuels, but fuel cells have a high generating efficiency, so they can reduce the amount of fuel required to generate the same amount of electricity, ultimately enabling carbon dioxide emissions to be reduced.

Professor Sasaki also talked about the need for hydrogen energy from an economic perspective.
The annual cost of Japan's energy imports is around 27 trillion yen. 1% of the consumption tax that we pay on day-to-day purchases is 2.7 trillion yen, which means that we are paying ten times that amount each year to the foreign countries that export energy to us. Furthermore, most of the heat generated as a by-product when our domestic power plants generate electricity goes to waste. In the future, it will be crucial to look at how we can reduce this waste of energy.

Our Mission as a University is to Continuously Generate the Seeds of New Ideas in the Field of Hydrogen Energy and Other New Technologies

Realizing and Visualizing A Hydrogen Society

Installation of a water electrolyzer
(In the hydrogen refueling station; includes hydrogen tanks and other ancillary equipment)

Installation and connection of solar cells for manufacturing renewable hydrogen
(Roof of the hydrogen refueling station and roof of the HY30 building)

Refurbishment of the hydrogen refueling station wind power generation network and connection to a water electrolyzer
(alternating current)

Energy visualization system
(Installed in front of the hydrogen refueling station, visualizing the interior of the hydrogen refueling station and showing the power generation status of the fuel cells in operation)

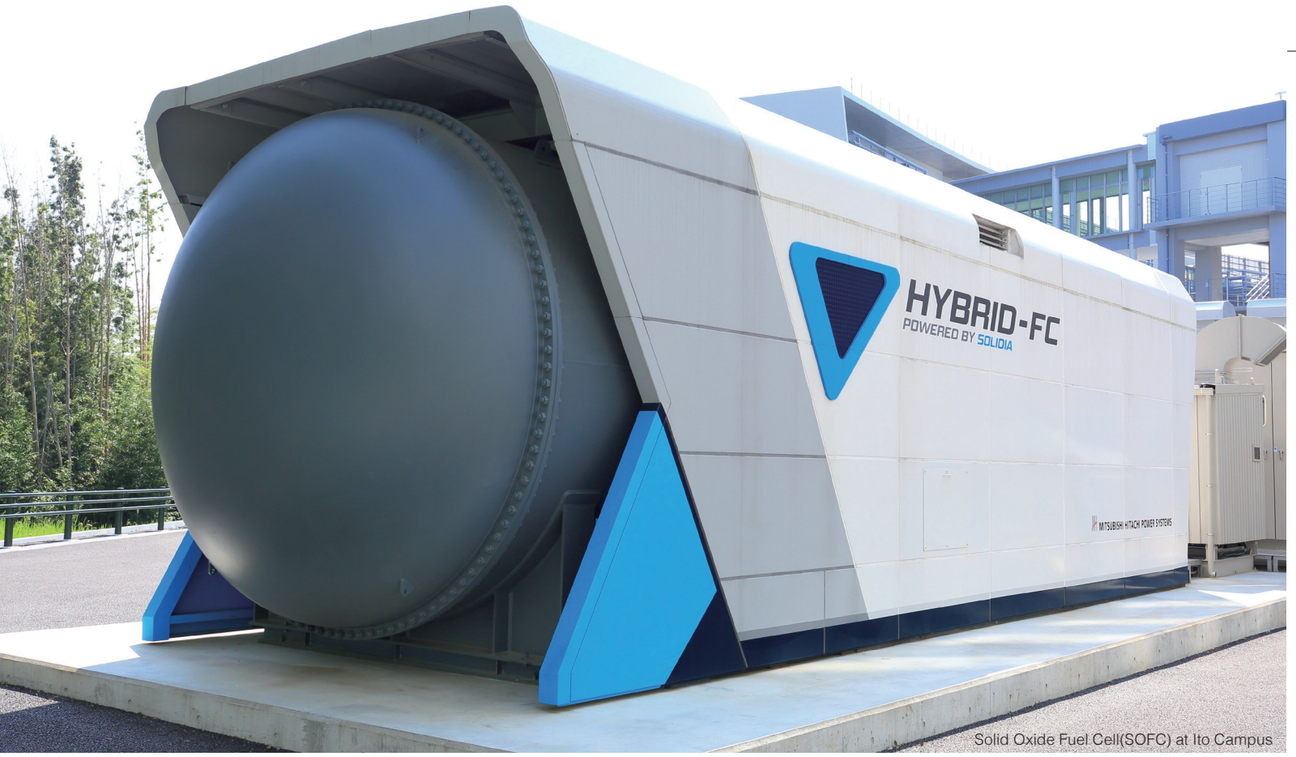

Display monitor

- Generates power from renewable energy using solar cells or wind turbines
- Uses power generated from renewable energy to electrolyze water, to create renewable hydrogen
- FCVs are filled with the renewable hydrogen (zero-emission mobility)

Fuel cell vehicle for demonstrating mobility

MIRAI's LCD panel showing the energy balance while running

MIRAI does not produce any fumes thus emit nothing but water.



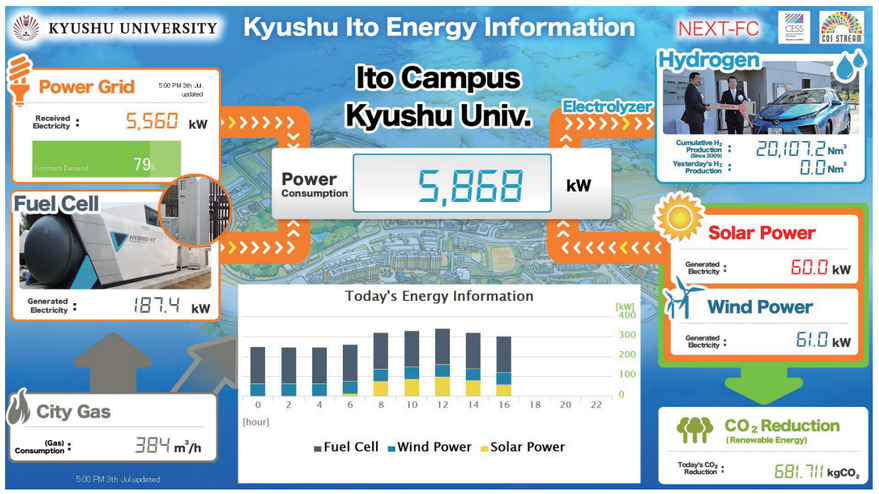
Solid Oxide Fuel Cell(SOFC) at Ito Campus

How Can We Fully Leverage Our Strengths as a University to Lead the Way to a Hydrogen Society?

Ene-Farms, which have become a widely adopted form of hydrogen energy, convert about 40% of the energy of town gas into electricity, while simultaneously using the heat generated to boil water, so Professor Sasaki describes them as “a groundbreaking system in which only 5% of the resource is wasted.”

So what part will universities have to play in the hydrogen society of the future?

Both Ene-Farms and FCVs are the product of technological seeds that emerged from research by universities, so we believe that our mission as a university is to continuously generate the seeds of new technologies. In doing so, academic-industrial collaboration is crucial. Another key mission of universities is to work with private sector companies to give shape to these new seeds (ideas) emerging from universities. Universities also have a part to play in cultivating engineers, engaging in international collaboration, and creating the science of the future.



Energy Information at Ito Campus shows energy consumption

Professor Sasaki also talks about the importance of human resource development.

Technology development in the field of energy takes 20 or 30 years. Even Toyota’s FCV took 23 years to come to market. To put it another way, people have to be cultivated in parallel with the technology development process, handing on the baton of the technology to successive generations of engineers before it comes to fruition as a commercial product. That is precisely why human resource development is vital in the energy field, and it is universities that can do this. In July, we established the Hydrogen Society Showroom at the International Research Center for Hydrogen Energy, to offer user-friendly explanations of hydrogen energy and a hydrogen society.

In addition, at Ito Campus, we are seeing progress in the development of smart energy functions.

An Ene-Farm has been installed in the canteen at Ito Campus, and the world’s newest large-scale fuel cells are also running there on a trial basis. In addition, we are utilizing electricity generated from sunlight and wind power, investigating how much electricity can be generated from them, as well as creating a system that shows at a glance the amount by which carbon dioxide emissions are being reduced across the whole of the campus. We have also added the production model of the MIRAI to our fleet of official vehicles and have established the Hydrogen Station at the campus to produce hydrogen using renewable energy. Thus, we are not only using Ito Campus as a venue for research, but also as a testing ground for a hydrogen society.

Hydrogen energy research is not merely a minority field of interest for a handful of our schools. Professor Sasaki says that common ground among all of Kyushu University’s schools will grow as we strive to bring the hydrogen society to fruition.

Energy and the economy are inextricably intertwined, so I believe that we need to create new rules and legislation in order to build new energy societies. It is likely that the cultures and resources of each individual country and region will also come into play. For Kyushu University to continue to lead the way to the hydrogen society of the future, it will be crucial for us to work out how we can fully leverage our strengths as a university. Going forward, I would like to collaborate with academics in the social sciences and humanities in order to create a range of examples of success. If this special feature has piqued your interest in the issue of global warming and the hydrogen society, why not think about what you can do in your own specialist field? There is bound to be something that you can do to help our planet and future generations.

Hydrogen Society Showroom showing the development of hydrogen energy technology from the past to the future

Professor

Kazunari Sasaki

After graduating from the School of Engineering at Tokyo Institute of Technology in 1987, obtained a doctorate in engineering from Swiss Federal Institute of Technology in Zurich. Became a Visiting Scholar at the Max Planck Institute in 1995. After 10 years in Europe, became an Associate Professor at Interdisciplinary Graduate School of Engineering Sciences, Kyushu University in 1999 and then Professor in the Faculty of Engineering, before being appointed Distinguished Professor in 2011. Currently also serving as Director of the Next-Generation Fuel Cell Research Center.