

Tokyo Zero-emission Innovation Bay

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< Hub introduction ③ The Background and Future Outlook of Institutional Technology >

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I am MATSUHASHI from University of Tokyo. I am very grateful to be able to speak at this symposium. Please allow me to take off my mask.

Next please.

I would rather talk about society as a whole than the organization of University of Tokyo. I will speak while considering the connection with the presentations by President KASHIWAGI and Deputy Director-General KIHARA.

Next please.

As you have heard from other presenters, we are aware that combating climate change is a challenge for all of humanity. Former Prime Minister SUGA gave a speech "Realization of a Carbon Neutral Society by 2050". With this opportunity, both measures to address climate change and the realization of a carbon neutral society must be considered.

After the Russian invasion of Ukraine, with the realization of a carbon neutral society, we now have a strong awareness of energy security.

This is not just a European problem. Japan also imports a large amount of natural gas through Sakhalin 2. We depend on Sakhalin 2 for a lot of energy like electricity and gas. It is also a very important issue for Japan. Therefore, in order to realize a carbon neutral society, it is necessary to consider innovation with ensuring energy security and the stability of the energy supply.

Next please.

I will talk about what is fundamentally necessary to achieve a carbon neutral energy system.

Of course, the expansion of renewable energy sources and the promotion of electrification are the most important measures.

At the same time, promoting CCUS is an effective way to reduce CO2 emissions. It was talked about earlier. Another important issue is the possibility of using nuclear energy after ensuring safety and security.

I visited the Fukushima Daiichi Nuclear Power Station this April. Seeing is believing, and I clearly understood the cause of the accident. What can be done to prevent accidents. I noticed that we have a good understanding of how to deal with it. So the three strategies I talked about are a solid solution.

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To ensure energy security, Naturally, considering the “country risk” of import partner countries, not only Russia, reducing fossil fuel imports will become one of the most important issues. Even before the outbreak of war, our country had considered the portfolio of our import partners. Once again, with country risk in mind, we have no choice but to consider reducing resource imports. Increasing domestic energy resources, including renewable energies, is an important measure not only for climate neutrality but also for the security of energy systems.

Mr. MAEDA said that it is not decarbonization but carbon neutrality. I totally agree with him. Recognizing the practicality and importance of carbon neutral methane, e-fuel and element called carbon, to promote carbon neutrality, e-fuel and carbon neutral methane were developed. It's a national project. Not decarbonization, to achieve carbon neutrality, hydrocarbons will be synthesized from CO₂ and hydrogen. Using very traditional, old and already established technologies such as FT synthesis, MTG, and Sabatier reaction, It is necessary to focus on economic efficiency and think about how to obtain hydrogen and CO₂ cheaply. Synthesizing fuels in this way will help ensure carbon neutrality and security.

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In short, to achieve carbon neutrality while ensuring energy security, many policies are working together. I think it is possible to promote both at the same time. Some policies, especially the complete overlap between security and carbon neutrality, can be promoted simultaneously. E-fuel, carbon neutrality, and increasing renewable energy are all being promoted simultaneously, so I believe that the diffusion of these technologies will be accelerated by the government, by the country, and of course, by industry and universities.

Next please.

Many researchers have referred to Geels and Schot's famous paper, “The Regime Shift”, to learn about the transition of the socio-technical regime. The "Socio-technical regime" is a stable structure in which industry, market, science, policy, culture, technology, etc. are interdependent. For example, there are some international landscapes involved, or at Niche-innovations, where technological change comes in through the gaps, and at some point, this stable regime transitions into a completely different regime. That is what the authors say. I have been involved with the issue of global warming energy and global warming for over 30 years, and sometimes I feel these turning points.

Next please.

Arrhenius was the first to mention in the late 19th century that warming was a greenhouse effect caused by CO₂. This was the beginning of scientific research. As you know, Professor MANABE developed the physical modeling of climate change and won the Nobel Prize in Physics in 2021. As a Japanese person, I am very proud of him. These are the results of more than 100 years of painstaking scientific research into climate change and global warming. However, this does not mean that the regime has changed.

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988. Toronto Summit declared the reduction of CO₂ emissions. This was the first time among developed countries. Before that, the issue of global warming was not discussed at Summits. But talking about carbon neutrality and global warming at a Summit or G7 has become common these days.

I feel that this was an epoch-making event. I was a doctoral student at that time. I still remember what Professor KAYA, my former teacher, told me when I returned from Europe. "The world changed a lot while you were away from Japan". Since then, global warming has become an issue of international politics around the world. In the case of Japan, however, the regime has not changed significantly. We want to protect industry somehow. Won't global warming countermeasures have a negative impact on industry? In the midst of this struggle, policy, industry, science and researchers were involved in controversy. In a way, we couldn't make much progress.

And I assume that this regime has maintained a kind of stable structure in the midst of that struggle. The Great East Japan Earthquake in 2011 changed it drastically. There was a nuclear power accident. There was a purchase of all renewable energy and this has led to a significant increase in renewable energy. The reform of the power system became an urgent task. That was one major event.

And in former Prime Minister SUGA's policy speech in 2020, he spoke forcefully that he would realize a carbon neutral society. I believe this had a significant impact on industry.

I later heard from people who work in the energy sector and in energy-intensive industries that our industries are also working to achieve a carbon neutral society with our survivors. Between 2010 and 2020, I think the regime changed. As Geels and Schot say, the regime changed mainly due to landscape pressures. Our country will never see the negative impact of a carbon-neutral society on its industry and economy, by creating innovations that benefit the economy, toward the great transformation of a carbon neutral society, we believe that policy, industry, culture, markets and researchers will move together. Unfortunately, there was a Russian invasion of Ukraine. I think this incident added to the seriousness of energy security.

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With this point of view, I will move on to the question of institutional design, how energy security and carbon neutrality can be realized simultaneously.

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If we look at the international situation, like the First Movers Coalition (FMC) and carbon neutrality rule making, Japan is more likely to follow the rule making made by the West. I think for more than 30 years rule making has been led by the West. They are characterized by a strong desire and aspiration to lead the world, including Asia, by rule making.

The American FMC I mentioned earlier is one example. So does the British one called Glasgow Breakthrough. There was also a UK statement from 30 other countries to limit car fuels to electricity and hydrogen. Japan, the United States, China and Germany are not members of this. In many ways, there is international competition in rule making. In many cases we can see that the West has created and Japan has followed.

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There are many good and bad things in rule making. We just can't keep up. From now on, we should insist on proposing a novel system and rule making. I think we should avoid getting caught up in contradictory systems.

This quote is from a speech by Deputy Director-General KAWAGUCHI at the Japan Society of Energy and Resources. Which areas and technologies should we address from a multifaceted perspective? How should carbon intensity be achieved?

In addition, the question of how to put a carbon price on this issue is also becoming a point of contention. When something comes out from the West, we don't think it's good to just follow idolatrously.

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An important discussion, you may know that there is a European led taxonomy. This is to create a threshold and distinguish from here on that the top isn't green, the bottom is green, etc. Electricity as an example, the European taxonomy has a threshold of 100g-CO₂ / kWh. The same is for automobiles. Electric cars are green, but others are not. This is how the European taxonomy classifies it. They eliminate anything that is not green. I don't have enough time to elaborate on that contradiction. We have specialist techniques in life cycle assessment, so, we must argue against contradictions.

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I often speak of the duality monism. There are animations, so please show them. The EU taxonomy defines coal as ineligible by drawing a threshold based on dualism. Our carbon neutrality is to utilize all our energy

resources. Not eliminating coal. Mixing ammonia with coal or by adding CCUS. We are trying to achieve the zero-emission thermal technology that Deputy Director-General KIHARA mentioned earlier.

We believe that the exclusion of certain things, such as coal, should be avoided. We believe that this would create an unwise carbon neutrality. In terms of philosophy, it not enough just to follow Europe, by making a more flexible argument, I think that more flexible and sensible carbon neutrality will be achieved. The use of green hydrogen, carbon neutral methane, e-fuel and CCUS are also essential.

Of course, renewable energy also improves controllability and contributes to the stabilization of the power system. In the future, regarding the institutionalization of rule making and underlying philosophy, rather than simply following the West, it will be important for us to make Japan-led rule making. For basic technology, e.g., Life Cycle Assessment, we are competitive with the West. We need to state our opinion properly.

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This slide summarizes what I have already talked about.

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Let me explain more specific explanations. I will talk about a total model.

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This is also what Deputy Director-General KIHARA explained in his presentation. While considering the total chain of energy systems, we must move toward carbon neutrality.

Here I refer to an AIST paper, which is organizing this symposium today. When I was a student, I also did a total model analysis using the MARKAL model. After the Great East Japan Earthquake, I shifted to the electricity field, about 10 years ago. I've been analyzing power system innovation in a rather micro field. As for the total mode, I think it is necessary to reconsider the current carbon neutrality together with AIST.

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AIST papers described here have already produced results using MARKAL. I believe there is an important point to consider that an 80% reduction of CO₂ and carbon neutrality are fundamentally different.

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I think a very important issue in achieving carbon neutrality is how to make the most efficient use of infrastructure. Whether it's electricity, gas, or oil, the energy business has a huge infrastructure. In particular, the network section has more asset value than the place where energy is generated. If we lean towards a specific energy carrier, only the infrastructure of the network will be greatly expanded. And other energy infrastructure will not be used efficiently, or, it will be destroyed.

Society as a whole, especially in mature societies such as Japan, I think there will be a loss in realizing a carbon neutral system. We are consulting with AIST researchers in this matter. We will continue to promote our energy system model to the world. By doing so, Japan will achieve carbon neutrality. In further realizing it as a world, how to do it while making good use of infrastructure, I intend to transmit information together with in the industry and the government.

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Here's a summary.

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In our 30 to 40 year history, the regime of social technology has changed. At last, the whole society is getting serious and aiming for carbon neutrality. Many projects are ongoing. But I don't think industry, government, and academia have really gotten to the point of what to do. To tell you the truth, I have heard some anxiety that will this continue and it truly be realized? So again, philosophy is important. I do both holistic and individual discussions. I would like to advance discussions with industry and government officials. I believe that we must return to the essentialist theory and contribute to achieve carbon neutrality.

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University of Tokyo has established Collaboration Research Organization for Comprehensive Energy Sciences (CROCES). This is an organization of integrating liberal arts and natural science. More than 60 teachers in fields from philosophy to technology have already participated. The number of participants is increasing one after another. We also established the Energy Transformation EX Study Group. More than 30 companies have already joined as companies. Rather than a project that is already up or operating, if we take a step back and think about it, we are not really sure, we don't really know. No one knows. What should we really do in this situation? Honestly exchange opinions with people from various companies. Through sharing opinions, we will also learn from industry and administration.

As Japan, as a world, will transform energy. We will also contribute to Green Transformation (GX). We will create a prosperous, carbon neutral society where people can live with peace of mind. We intend to contribute to that. Time has already passed. Let me finish here.

That's all. Thank you very much.