Tokyo Zero-emission Innovation Bay
https://unit.aist.go.jp/gzr/zero_emission_bay/en/index.html

**＜Hub introduction ①　Activity Report on the Zero-emi Vision Study Working Group＞**

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Thank you for the introduction. I am MAEDA from Hydrogen Business Department of ENEOS. I am a manager at the Zero-emi Vision Study Working Group. I will give you an activity report today.

Next please.
In this first slide, you can see the outline of Tokyo Zero-emission Innovation Bay. The council is aiming to make the council the first innovation area, something like Silicon Valley in Japan. The wisdoms from industry, academia, and government come together to work toward the goal. Various 134 sectors, including companies, universities, and research institutes are involved in the council, breaking the boundaries between them to reach zero emissions. Under Professor KASHIWAGI's strong leadership, we are actively working with the support of GZR as a secretariat.

Next please.
My presentation today is roughly divided into three parts.
Firstly, the introduction of the Zero-emi Vision Study Working Group. Secondly and thirdly, I will describe what we have done in the working group for the past one year, including about CCUS in the item two, digital infrastructure in the item three, and summary in the last item four.

I point out in yellow that, the objective of the working group had been to build a decarbonized model till last year, however, we modified it last year to deal with carbon by skilfully recycling it to make the carbon neutral society a reality. As a result, we have revised the model's name to "Carbon neutral model". We started all over again after changing the name, and have discussed selected themes. Today, I would like to introduce the activity of the working group following the carbon neutral model.

Next please.
Firstly, the introduction of the Zero-emi Vision Study Working Group. Here, you can see three objectives of the working group. First, we put together a vision that we share in the industry toward realization of carbon neutrality, and disseminate the vision.

Secondly, we gather knowledge from member companies in various fields to develop carbon neutral models and put issues in order, toward realizing carbon neutrality.

Thirdly, we aim to create demonstration projects that accelerate carbon neutral models to lead to the social

implementation over time.

From a private company perspective, We try to bring the whole industry together to represent the whole vision, although companies tend to get together in the same field. Then, we would like to share the industry's vision with stakeholders such as governments, universities, and research institutes to promote collaborative innovation. If we disseminate our vision through this place of collaborative creation, it will be easier to obtain government support for funding and system aspects, which is our intention.

Next please.
The slide shows the structure of the working group. Under the aegis of the executive board, we have three working groups. One of them is the Zero-emi Vision Study Working Group. When we launched the working group last year, four companies attended the group and we had more companies joined us in the middle of last year. Now, we have fifteen companies in the working group. We hold workshops once or twice a month to bring together the visions of the members.

Next please.
This slide shows the working group's detailed outcomes. The outcomes orient approaches in about three ways, which are pathways to build reality-based infrastructure leading to a carbon neutral society. We try to find the combination of each company's knowledge toward a better technology that cannot be achieved through the effort of a single company. Because it is difficult to realize carbon neutrality only by our efforts, we have to share a sense of commitment with the society as a whole, which we have discussed in the working group. These are the major themes of the working group.

We have four carbon neutrality models that we also mentioned last year. Items two and four are CCUS as carbon recycling and digital infrastructures. We went deeper into new development models with the new members.

Next please.
This slide shows the complete structure of our carbon neutral model. The structure shows the production, transport, and use of energy and, here it comes, the skilful recycling of CO2. As Deputy Director-General mentioned, the ordinal grid for energy or heat is used for hydrogen and CO2. First, I would like to introduce CCUS on the lower left, which is the model that we capture CO2 and utilize it effectively.

Next please.
It is very important when we talk about CCUS. I divided the important points into five items. Firstly, we will specify a chemical chain that will be applied to CCUS for carbon recycling. Secondly, it is CO2 balance quantification. If we get closer and closer to carbon neutrality, carbonic acid gas gets less and less and what we would like to show here in numbers is what the best balance is. This is the second item. Thirdly, we would like to make GHG reduction visible. Through this working group, we examined the potential of concrete to capture CO2. Fourthly, it is about technology. We are trying to find a capture technology for

each emission source. Finally in the fifth, we bring together possible issues in applying the social implementation, in terms of systematically and technologically. Based on those five points, we compile CCUS models.

Next please.
I will talk about chemical chain first. This slide shows the source of CO2 supply. The industry is emitting huge amounts of CO2 and will continue to do so in the future. In this situation, the source of the carbonic acid gas emitted by the steel industry becomes important. I bring this slide to you with the intention of that. The steel industry is trying to decarbonize itself by replacing blast furnace gas with CO2 free hydrogen, and methane through methanation. With the residual coal, we expect it to a certain extent and use wisely, which is the basic assumption.

Next please.
The slide describes the utilization of emitted CO2. Please take a look at the chemical chain image on the slide, where CO2 emitted by an industrial complex, and hydrogen from renewable sources, are synthesized by FT synthesis or methanation, to produce value added chemicals or heat. That is how we share emitted CO2 to utilize in Tokyo Bay area through a combination of two chemical chains toward carbon neutrality.

Next please.
The slide shows the balance between demand and supply. This is a little old data, but the upper figure shows the present. The total amount of CO2 emitted in Japan is 9.8 hundred million tons. If you look at the breakdowns, the industry accounts for almost half. The lower figure shows the estimate for 2050. If CO2 emissions are reduced by 60% compared to 2030, the demanded CO2 as a feedstock in the chemical chain would be supplied entirely by CO2 emissions. If we cover town gas, ethylene, propylene, diesel, jet gas and gasoline with synthetic fuels, 2.2 million tons will be needed. We have just discussed that it is likely to be balanced like that.

Next please.
Now, I will talk about the issue item three. In addition to the use of carbon in the chain, I will show you alternative technology to absorb CO2 and its efficiency on the slide. As you may know, concrete is the source of CO2 emissions.

However, a private company discovered a technology called “CO2-SUICOM” that absorbs carbonic acid gas. This pie chart shows how much we absorb and fix CO2 potentially if we replace ordinal concrete by CO2-SUICOM. According to the chart., if the replacement takes place across Japan, 31.5 million tons of carbonic acid gas would be absorbed annually. This innovative technology fixes up to 18 million tons of CO2 in the air, which would be of great importance for the CO2 offset in the future carbon neutral society, especially if unavoidable CO2 is emitted. Afforestation is one way to absorb CO2 and concrete absorption would be another good option and we have just translated it into quantification.

Next please.
The slide outlines five key CO2 capture technologies for each source. It is essential to have innovative technology in various capture methods that would efficiently and inexpensively capture carbonic acid gas of relatively medium density.

Next please.
Let's get on to the last issue that is about technology and system. First, I would like to talk about technology issues, which are about cost reductions across the CCUS. The CO2 separation and capture technology must be so innovative that the final products will not be expensive. High-cost solutions include strengthening innovative research infrastructure for people, goods, and money, and adopting a comprehensive scheme from research and development phase to social implementation.

In terms of securing stability of the raw materials mentioned in the table, as presented by the Deputy Director-General, it would be necessary to build an infrastructure for CO2 credit system that is mutually accommodate with different industries, which implies the necessity of CO2 grid in the future. The bottom in the table shows LCA and certification system. We will establish an appropriate LCA methodology, and certification system that certifies individual effectiveness in reducing carbonate acid gas. We have to make a link between reducing CO2 emissions and contributing to the reduction, and those who have contributed it should be treated well financially as a system. We find it necessary to support the standardization of international method, the establishment of a standard certification system through effective use of digital infrastructure, which I will talk about later, and the increase in participating countries for the Joint Crediting Mechanism from the perspective of the system.

Next please.
Next, I would like to talk about the progress of digital infrastructure. Digital infrastructure is an infrastructure shared by all carbon neutral models. That is why have placed the figure with the carbon neutral model in the background on the slide. Key words are Mutual Data Transfer, Decision Making Support, and Adding Economic Value. Such infrastructure will be supported by the digital infrastructure models.

Next please.
We address four requirements for the digital infrastructure in this carbon neutral era. The very bottom shows the requirement. The infrastructure architecture must be both sustainable and resilient as it requires large capacity electric power. This is the requirement. Based on the requirement, we must meet three roles, which are Information distribution by data interoperability, Adding Economic Value to contributors to carbon neutrality, and Information complimenting on decision making support. We conclude that these three are important conditions.

Next please.
The slide shows the use case, which is the digital infrastructure image of CO2 capture and utilization

system toward carbon neutrality. We hierarchized the real society, work system, IT platform, and services like shown on the slide. If we actualize the use case and meet four requirements for each group, we would create ecology credit and international system collaboration, which means adding new value.

Next please.
The time roadmap shows that in the short term, we must create visibility, data interoperability, and sustainability. In the medium term, our target is to add economic value and decision making support, to lead to a long-term model.

Next please.
Please take a look at the slide for specific solutions to each issue. Regarding the data interoperability, We are building up a collaborative platform that encourages effective system interoperation to avoid repetitive developments that each company should make on its system from time to time. When we build a platform for adding economic value process, we must ensure the reliability of each carbon neutral information, which is the way to avoid greenwashing. We should fully understand KPI of CO2 emissions through cross-sectoral collaboration for better grid control, operation, and design.

Next please.
Now, it is time to wrap up my presentation on the working group. For this fiscal year, We have added studies on CCUS and digital infrastructure as new models. The slide lets you know the issues and their solutions. In terms of CCUS written on the upper, we will use the CO2 left to reduction, which is emitted from the industrial complex, by constructing a CO2 grid so that we can turn CO2 into chemical fuels on the grid with a view to the 2050 goal. In terms of the adoption of chemical chain contributing to carbon neutrality, keys to realizing the chemical chain are technology innovation and enhancement of the industrial collaboration platform with system establishment. A digital infrastructure connects all carbon neutral models. Therefore, the emissions certification system or something alike should make emissions value visible and add economic value to the reduction, which will also provide stakeholders with a common platform that can help their decision making. Standardization of interoperable data system and green-resilient system architecture hold the key.

Next please.
I will talk about our future activity. We will continue to work on the carbon neutral model, on top of it, each working group has planned various demonstration projects supported by GI Fund. In the future, we will form new combinations among member companies to boost inter-projects collaboration, including GI Fund projects, and create new demonstration projects toward carbon neutrality. We will cooperate with the PR Working Group while pursuing the collaborative innovations by sharing and disseminating the models with industry, university, and government.

That brings me to the end of my presentation. Thank you very much for your attention.