The Ministry of Environment utilizes outflowing groundwater as a key water resource to achieve carbon neutrality.

10:30 AM, Tuesday, July 05, 2022, Kim Dong-gu, Director General of the Integrated Water Policy Bureau (Ministry of Environment)

Hi, I am the Director-General of the Integrated Water Policy Bureau.

I will review the Ministry of Environment's comprehensive plan to utilize outflowing groundwater for today's briefing.

Outflowing groundwater has been recognized as wastewater. However, the Ministry will improve the current system to make outflowing groundwater a key water resource to respond to the climate crisis and contribute to the urban water circulation system.

The Ministry of Environment has established a "comprehensive plan to utilize outflowing groundwater" as a new business type to create future value.

The annual outflowing groundwater nationwide was around 140 million tons as of 2020; this is about 60% of the storage capacity of Paldang Dam.

Of this, only 11% is used for spraying water on the roads; the rest is discharged for sewage or river maintenance water.

The Ministry has piloted a project to use outflowing groundwater for spraying water on the roads, heating, and cooling at four subway stations, etc., for the past two years

since 2020. Last January, we revised the Groundwater Act to require local governments to report any occurrence of groundwater runoff. Based on the pilot project results, the Ministry established a comprehensive plan to utilize outflowing groundwater and create future value by achieving carbon neutrality, improving the management system for outflowing groundwater, and comprehensively using groundwater.

The comprehensive plan to utilize outflowing groundwater consists of four strategies and nine core tasks. The details are as follows:

The first strategy is to create the future value of groundwater using outflowing groundwater.

We will utilize outflowing groundwater for heating and cooling, micro-hydropower generation, and spraying water on the roads to achieve carbon neutrality and reduce fine dust.

We plan to introduce the concept of groundwater heat that has the potential to be used as renewable energy in the Groundwater Act by 2023. We will also select eleven places that generate runoff to pilot a project utilizing groundwater heat from 2023 through 2027.

In addition, we will establish a business model to achieve carbon neutrality by utilizing outflowing groundwater and lay the foundation to use outflowing groundwater in the public and private sectors.

The government plans to support for registration of external GHG emissions reduction business methodologies to recognize the GHG emissions reduction performance of heating and cooling businesses using outflowing groundwater. The government will also create a new category for the companies that utilize outflowing groundwater so

relevant companies can enter the emission trading market by 2050.

Secondly, the Ministry will improve the management system of outflowing groundwater.

We will supplement systems related to outflowing groundwater and strengthen the management system.

We will manage groundwater runoff from the planning and design phases by designating subways and tunnels as facilities to be managed and enhancing the measurement of groundwater level fluctuations, etc. Meanwhile, we will develop a basis of artificial recharge in areas prone to water level drawdown by 2023.

In addition, we plan to establish a system for utilizing outflowing groundwater.

The Ministry of Environment will expand the scope of aboveground buildings that are obligated to use groundwater runoff to buildings with an excavation depth of 10 m or more by 2027. Previously, groundwater runoff could be used only for living purposes. However, The Ministry will improve relevant regulations to use it for broader purposes.

We will provide incentives to induce the utilization of groundwater runoff.

We will establish a legal basis in the by-law for reducing or waiving sewerage fees when using groundwater runoff by 2023 and push ahead with collaboration with the relevant ministries for local tax reduction and exemption, revitalization of zero-energy building certification, and other incentives.

We will continue to provide technical support, PR, and education related to groundwater runoff for local governments.

Third, the Ministry of Environment will establish best practices for the utilization of

groundwater runoff.

After establishing a National-led best practice for the complex multi-purpose use of groundwater runoff, we plan to expand it to the private market with full effort.

We plan first to introduce an integrated business model to the public sector where the outflowing groundwater could be used for heating and cooling and fine dust reduction at one time. The Ministry of Environment will also present examples of public-private convergence using underground and aboveground connections by 2027.

In addition, we will discover and spread best practices that are used in subway stations, etc.

We will carry out a leading pilot project by 2027 for 11 of the 30 candidate sites for groundwater runoff found through the subway section survey and promote a full-scale project to utilize them.

When implementing the project, we will provide water-friendly spaces such as streams using groundwater runoff and contribute to urban water circulation in linkage with micro-hydropower, rainwater reuse, treated water supply, and smart cities.

Finally, we plan to advance the technology to utilize outflowing groundwater.

The government and local governments plan to systematically collect basic data, such as topography, geology, and groundwater level and quantity, to utilize information on areas generating outflowing groundwater.

We will disclose the information on the current status of groundwater runoff, water quantity, and water quality through the national groundwater information system. We will also promote R&D projects to secure basic technologies such as removing foreign

substances in groundwater runoff and efficient heating and cooling.

The Ministry of Environment plans to raise the utilization rate of groundwater runoff to 20% of the amount generated by 2030 and 40% by 2050 and to create an ecosystem that utilizes groundwater runoff in the public and private sectors.

In addition, we plan to secure a driving engine to implement these measures by including them in the "4th National Groundwater Management Master Plan" currently being established.

The comprehensive measures established this time are a starting point for creating new values and opening a healthy future for groundwater. With these creative and flexible environmental policies, we will continue to provide a sustainable and healthy society in the future through the effort to combat the climate crisis, efficient use of limited water resources, and contribution to the urban water circulation system.

It concludes the announcement.

[Q&A]

<Q> Hello. There is a difference between the amount of occurrence and the reported amount. My first question is why this difference occurs even though the Ministry runs a system of reporting and identifying the generations. It seems there are unreported generations.

It says that "the government will recognize a heating and cooling business using groundwater runoff as an effort to reduce greenhouse gas emissions." I wonder if this includes micro hydropower or is only related to groundwater.

I would also like you to explain the part where the groundwater runoff utilization

business enters the emission trading system market.

And my last question is about the expansion of facilities subject to the mandatory use of groundwater runoff because I did not understand your release clearly. It only says '"special/metropolitan cities" in 2024 and "over 21 stories in level 2 or total floor area..." I don't understand this.

Please explain the current facilities subject to the mandatory use, including how they will be expanded in 2024 and 2027 and whether the mandatory use refers to the current compulsory reporting of a groundwater use plan under the Groundwater Act.

<A> Let me answer your questions. The difference between the amount of occurrence and the reported amount is that, from our understanding, the amount of groundwater runoff is reported when the amount exceeds a certain level. There are also omitted reports, as you said.

Regarding your second question on recognizing the GHG emissions reductions, we are under discussion with experts to determine the scope and extent to which they can be recognized more in detail. We are now pushing forward to make it happen for heating and cooling or even micro-hydropower if possible.

Since it is difficult to require the private sector to do it, we at the government promote the registration of external GHG emissions reduction business methodology. To that end, we plan to conduct research this year via an external research agency.

Third, we are also discussing entry into the emission permit market with the relevant ministries. We cannot provide a detailed plan for now, but I have said that the ME would improve the system to support those involved in a business using groundwater runoff to enter the emission permit market.

During our discussion with experts, we found that their common opinion was that "energy saving using groundwater thermal energy is considerably more efficient by 20 to 30% than using LNG." We will proactively consult with the relevant ministries to reflect our measures.

Fourth, we may have misunderstood the table and the figure we provided. The Ministry will expand it from the current special and metropolitan cities to the whole country by 2024. According to the current law, the scope of mandatory groundwater use is limited to buildings with 21 stories or more and a total floor area of 100,000 m2 or more, excavated with a depth of 10 m or more. In fact, an excavation into a depth of only 10 m to construct a building can drill into a groundwater well. To be sure, it is important to utilize groundwater to do this. However, we need to consider the risk of sinkholes or other things. Thus, we are promoting a plan for reusing groundwater in a circulatory water supply system and other measures.

<Q> You said the Ministry has been doing a pilot project for two years. We would appreciate it if you could tell us any problems or limitations found during the pilot project.

After that, you said the Ministry would achieve a 40% utilization rate by 2050. Please tell me the cost, utility value, and benefits data when that goal is achieved in figures if you have any modeling numbers.

<A> First of all, to answer your question on problems and limitations, as we have said, groundwater runoff has been limited to simple purposes such as foot baths or toilet cleaning until now. This is not significantly cost-effective based on our cost analysis. However, there are cases wherein companies with some technology in the private sector use groundwater runoff for heating and cooling, as I mentioned earlier.

In such a case, when using groundwater runoff, small debris or foreign substances may remain in the heat pump or similar machinery for heating and cooling. The limitations refer to this issue: how we can remove such foreign substances. In my presentation, I meant that the Ministry would solve these issues through R&D and prepare complementary measures.

We have not performed a cost analysis for the utilization rate of 40% yet. As I just said earlier, the Ministry is using hydrothermal energy as well as groundwater thermal energy. Compared to other energy sources, these have at least 30% higher efficiency. Indeed, they have high economic values. However, there are many regulatory obstacles to the entry of the private sector because of the limitations mentioned above. There are regulations concerning other ministries as well. Therefore, the most important thing is to try to improve the system in a range of areas that are difficult to address, even for the Ministry of Environment.

<Q> You said the economic value was more than 30% before. What is the reference to that 30%, over 30%?

<A> As far as I remember, it is 30% of LNG efficiency. I will give you the exact data or figures later. I don't know if my memory is accurate, but I'm telling you because I remember seeing data on efficiency comparison to LNG.

<Q>(Host) At this point, we have one online question. This question came from a reporter of Hankook Ilbo. You said that groundwater runoff will be used for heating and cooling and micro hydropower. Could you please explain the specific method and examples?

<A> We are already using hydrothermal energy for heating and cooling. In theory, using groundwater runoff has the same concept as hydrothermal energy using a

metropolitan water system used by ME. Because groundwater always maintains a temperature of 15 to 16°C, we can use the temperature difference in different seasons to generate heat using a heat pump and use it for heating and cooling.

We usually define small hydropower as more than 10,000 kW of power generation in this part. Since this groundwater outflow is not so large, we are aiming for about 100 kW and trying to meet the goal while conducting R&D. As you can see in this picture, one way of using groundwater runoff is to use water-friendly spaces among many. In addition, we believe we can generate micro hydropower by using a hydropower head that occurs when groundwater runoff is used for heating and cooling and road sprinkling or is discharged to the river afterward. We are at the stage where we are exploring candidate sites to promote this idea under a pilot project along with R&D.

Thank you.

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