

BIOTECH

WORKS

-H₂[®]

Turning Waste into Energy
A Visible Contribution to
the Environment

Waste to Energy: A Thoughtful Endeavor by Apparel Companies - Zero Waste Project

A large, textured tree trunk with green leaves in the background, serving as the backdrop for the text.

What We Can Do

What we can do to address environmental issues is a very simple action.

Currently, we use too much fossil fuels to make things, and we throw it away as soon as we're done with it. This is only worsening the earth's environment. "Reducing consumption and reusing" is easier said than done. People like things to be convenient and easy to throw away. So we have become complacent with environmental measures that make it seem like we are doing something, but are actually making no difference. It's the same with companies, where they overshadow their more negative points by emphasizing what's good about them. If things continue like this, there will be no future for the earth, and human society as a whole.

The actual problem is not the product itself, but the CO₂ (carbon dioxide) emitted during the process of making and disposing of the product. If we could replace the fossil fuels used in the production process with energy produced from waste, CO₂ emissions could be significantly reduced.

"What we can do" is very simple. "Participate in a project that reuses waste instead of throwing it away."

An aerial photograph of two people swimming in clear, shallow water. The water is a vibrant greenish-blue, and the swimmers are seen from above. One swimmer is in the foreground, and another is further back. The overall scene is bright and clear, suggesting a clean and healthy environment.

Decisions and Execution

"We are now facing a new challenge."

The environmental problems we face are getting worse by the day. How do we reduce CO₂? How do we build a sustainable society? How do we restore the Earth?

If we don't face these problems, society on Earth will disappear. If society disappears, neither human life nor the restoration of the earth will be possible. So we need to "use our business as a means of environmental protection, take the problem seriously, and implement solutions," not emotionalism. It's not empty talk, it's concrete action. It's simple, but never easy. As a business, we have decided to carry it out without hesitation.

The more we change, the more the future changes. The more action we take, the brighter the future becomes. We are serious about the future of our planet.

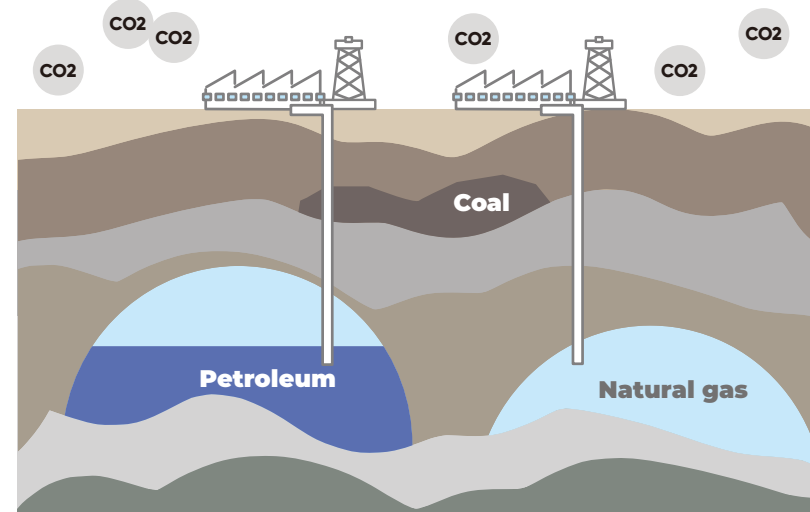
What is fossil fuel?

We enjoy the richness of many things, but this richness comes at a great cost. The destruction of life on Earth. The extreme heat caused by abnormal heavy rain and global warming has become a major issue. There are concerns about extreme heat waves, cold weather caused by changes in ocean currents, and the deforestation of rainforests due to development. Furthermore, desertification, increase in forest fires, worldwide pollution, and huge typhoons are some of the environmental issues we face.

The main cause of global warming is burning fossil fuels that are buried in the ground, which increases the amount of carbon dioxide in the atmosphere. Also, human society is currently dependent on fossil fuels, fuels that will run out by the end of the century, if we continue this way. Therefore, to stop global warming, we need to urgently shift to fossil fuel-free methods. This has become a world-wide movement.

*Fossil fuels are fuels made from nonrenewable resources like coal, oil, or natural gas. Under these terms, "fossil" doesn't pertain to that of prehistoric plants and animals, but rather that it is formed over periods of time like a fossil. (By the way, fossils of prehistoric creatures themselves are difficult to burn, so they cannot be used as fuel.)

Among fossil fuels, coal can be obtained as solids, petroleum (derived from animals) can be obtained as liquids, and natural gas (derived from animals) can be extracted as a gas. Influenced by the geological environment, these fuels were created over tens of millions to hundreds of millions of years.



Global Decarbonization and the Significance of Hydrogen Utilization

[Characteristics of Hydrogen]

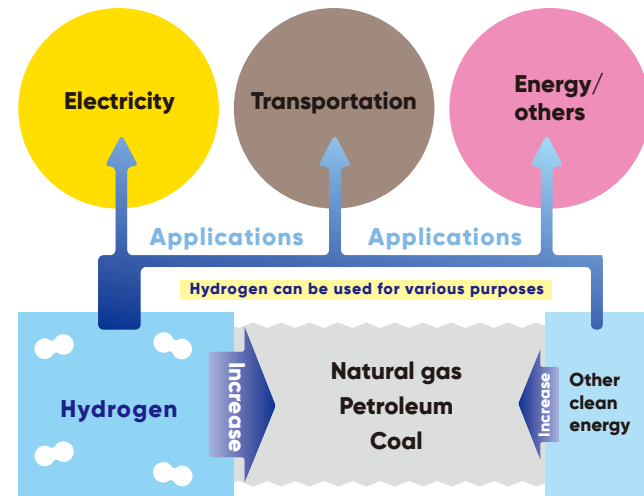


To reduce global warming, we need to moderate the use of fossil fuels, and aim for carbon neutrality. To meet these ends, hydrogen energy is attracting attention around the world. Hydrogen has the following characteristics.

- Can generate electricity
- Is generated by water power, so there is no need to worry about it being depleted as a resource
- Does not emit carbon dioxide or other air pollutants during use
- Can be stored for extended periods of time, in large quantities, and used for emergencies such as natural disasters
- Can be transported in various methods, so it can be used wherever it is needed
- There are many application examples such as fuel cell vehicles (FCV)

The EU, Germany, France, China, and other countries have announced national hydrogen strategies. Japan is positioning hydrogen energy as an important technology for achieving carbon neutrality. Therefore, it is working on realizing a hydrogen society as a national project, and aims to achieve hydrogen energy that is competitive with fossil fuels by 2050. In addition, the government provides subsidies to promote hydrogen activities.

Achieving carbon neutrality



What can BIOTECHWORKS-H2 do?

"Project 'BiotechWorks H2': Converting Nearly All Organic Waste into Renewable Energy

The 'BiotechWorks H2' project, aimed at replacing most waste with renewable energy and achieving a circular economy, finally kicked off this July, three years after its inception. Yamagin Co., Ltd., a company specializing in the development and sale of sustainable fabric materials located in Shibuya, Tokyo, successfully utilized a special technique in concept verification to hydrogenate discarded clothing without the need for sorting. In order to further advance their circular economy efforts, Yamagin established a related company, 'BIOTECHWORKS-H2 Co., Ltd.' in Shibuya, Tokyo, which acts as an intermediary for a system that chemically recycles organic waste, not limited to clothing but including all types of organic waste, into clean hydrogen energy, connecting businesses and individuals. Simultaneously, the project seeks to address environmental challenges and pave the way for a true circular economy without grey areas.

On the other hand, the American corporate entity, BIOTECHWORKS-H2 Inc., entered into an agreement with a plant company in the United States. Utilizing the plant as a base, they have adopted a gasification method that can convert over 99% of organic waste into renewable energy without the need for incineration.

The company has already completed concept verification, confirming their ability to hydrogenate 6-7% of waste from textile products and 7-8% of food residuals. This provides a significant advantage over similar projects, as it avoids the need for detailed grinding and incineration, allowing for relatively small-scale plants with reduced costs. The mixed gas generated in the gasification furnace can be separated into hydrogen and CO₂ (carbon dioxide). Hydrogen is recommended for generating renewable energy through fuel cells and hydrogen Co-generation. Meanwhile, CO₂ is not released into the atmosphere but rather supplied to companies that consume large quantities of CO₂, such as beverage manufacturers, dry ice producers, and welding operations. An additional advantage is the ability to measure and visualize the energy recovered, the amount of CO₂ reduction, and the environmental contribution. This means that participating companies can manage the waste recovery and hydrogenation process. For regular clothing items, measuring CO₂ reduction and environmental contribution values is possible even before they hit the shelves, and the data can be utilized as ESG indicators. We will provide a traceability platform and application for visualizing the recovery and hydrogenation process of endorsing companies, as these require specialized technology.

Considering their capability to convert 99% of organic waste into renewable energy, not limited to clothing but also including food residuals, office waste, and the like, the project plans to provide a platform for collection in the future. With the inclusion of food residuals, this model is expected to become even more effective. We are already advancing proposals to shopping mall developers and local authorities, aiming to establish an era by 2030 where 'all waste becomes a resource, and waste is reduced to zero.'

'BioTechWorks H2' is an unprecedented project that supports stakeholder development while being environmentally conscious."

Current waste treatment issues

- Collection and incineration are costly
- Will be disposed of in landfill due to lack of facilities
- Emits a lot of CO₂ when incinerated



**BIOTECH
WORKS**
-H2®

廃棄物ZEROプロジェクト
ごみから水素へ



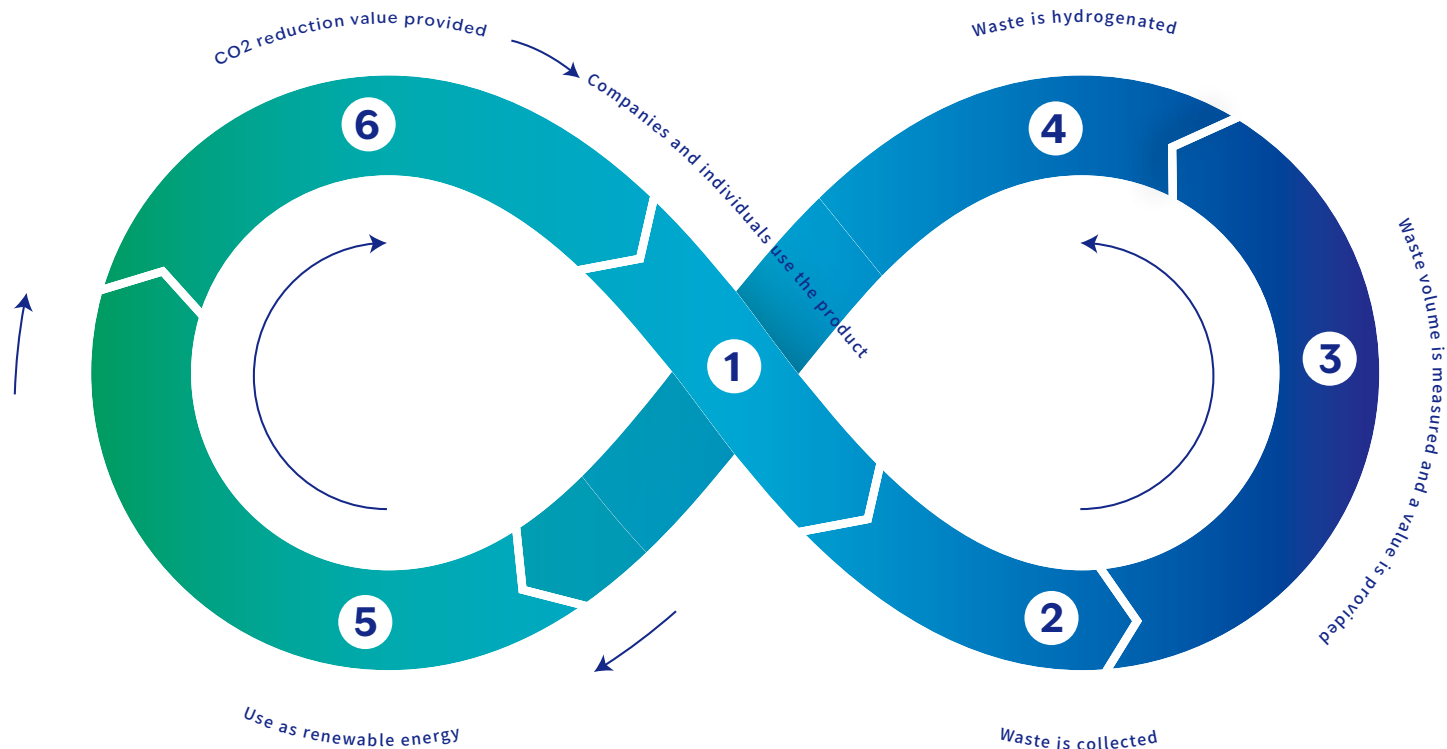
BIOTECHWORKS™
Created in Silicon Valley.



BIOTECHWORKS-H2 affiliated
hydrogen plant

BIOTECHWORKS-H2[®] Circular Economy

Simply place your items in the designated collection box, and that's it. Leave the rest to us. You can participate in sustainable practices without completely altering your current lifestyle.



1 Companies and individuals use products

Use products as usual. When doing so, let's choose environmentally friendly options.



2 Waste is collected

Waste is taken to the nearby BiotechWorks collection point.



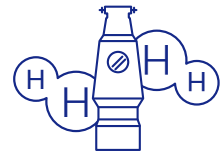
3 The amount of waste is measured, and values are provided

The amount of waste sent is aggregated for each company. Recyclable items are recycled, and non-recyclable ones are sent to the plant.



4 Waste is hydrogenated

Waste arrives at the plant! It is gasified and converted into hydrogen without burning. Finally, hydrogen is produced!



5 Utilized as renewable energy

The generated hydrogen is used as renewable energy, primarily for electricity and as fuel for cars and buses.

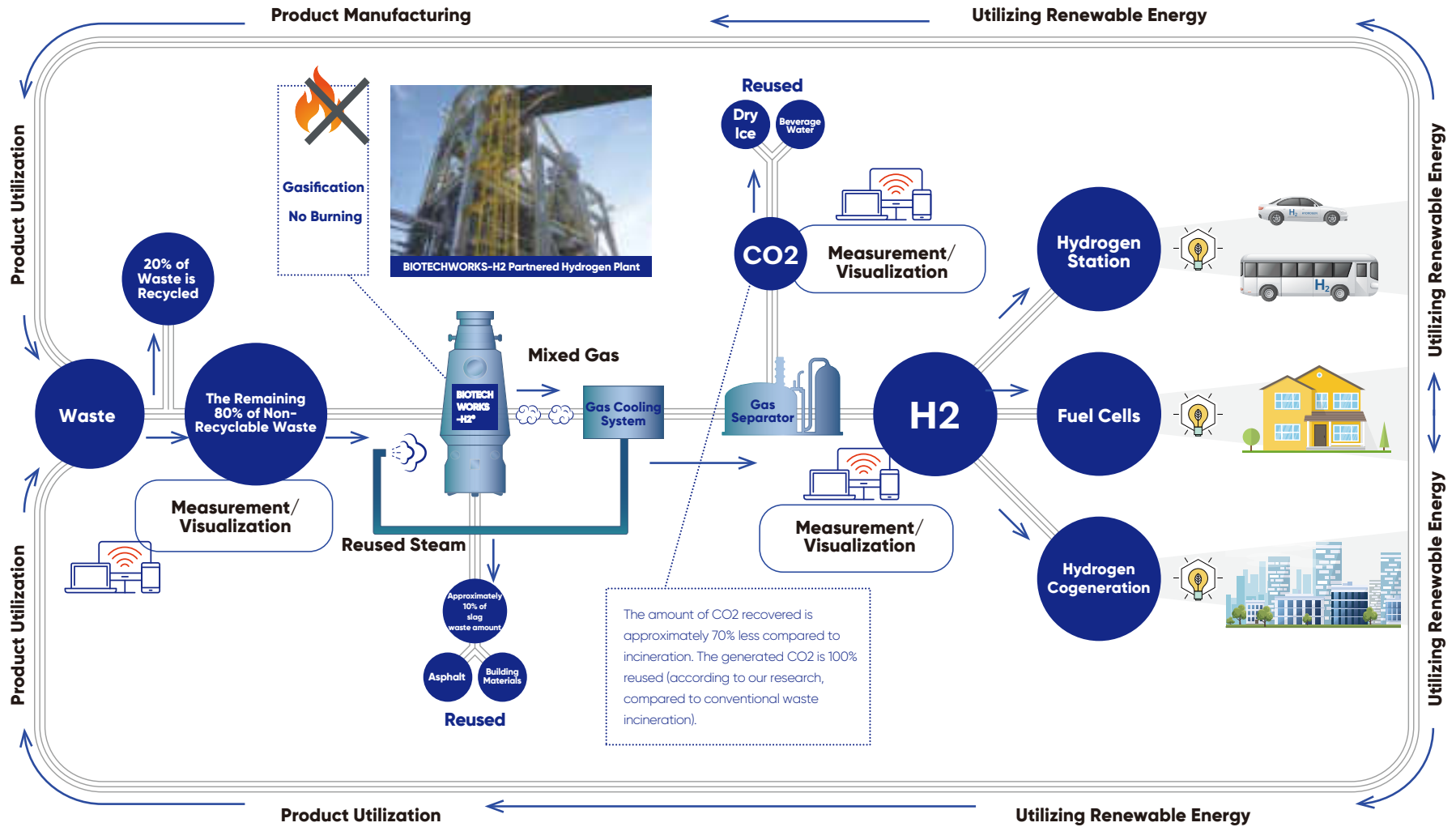


6 Values of CO₂ reduction are provided

We will quantify and provide CO₂ reduction values to our supporting companies. This is not 'fake sustainability' where the fate of waste is unclear!



How BIOTECHWORKS-H2® creates a circular economy*



Circular Economy: Refers to a resource-cycling economic model that minimizes waste and reduces environmental impact. This approach transforms the conventional 'linear economy' model (extract, manufacture, use, dispose of resources in a one-way process) and emphasizes the circulation of resources and products.

The Plant Features

No Burning (Gasification)



Can Process with Attachments

Almost 100% of CO₂ can be collected

Compatible with Nearly All Organic

Compact and Low-Cost



Its small size is due to the low-temperature processing, which also makes construction cost-effective.

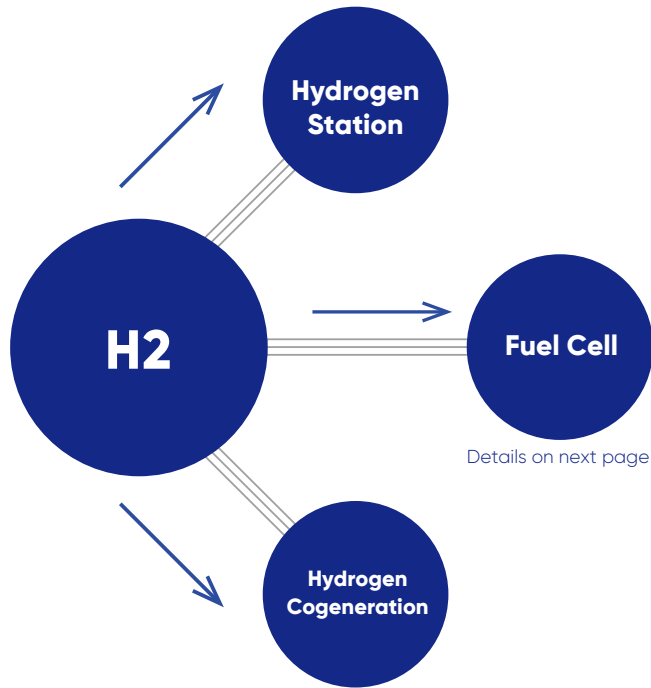
'No Burning' = 80% CO₂ Reduction*

'Capable of converting over 80% of non-recyclable waste into renewable energy' = Minimal Waste

It's said that 20% of waste is recycled.

*Based on Proof of Concept (POC) data. POC involves validating the development process in small functional cycles in an environment similar to actual operation before large-scale development is undertaken. This provides an assessment of whether the desired effects can be achieved and whether it can be a viable business, while identifying areas for improvement and issues.

Hydrogen Applications



Hydrogen stations are locations where hydrogen can be refueled, and their use extends beyond just vehicles.

For Vehicles: Hydrogen stations are primary sources for supplying hydrogen fuel to fuel cell vehicles (FCVs), which use hydrogen as fuel to generate electricity. They are known for being an exceptionally clean mode of transportation, emitting only water as a byproduct.

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Industrial Use: Hydrogen is used as an energy source in various industrial sectors, including industrial processes, manufacturing, and metalworking, with hydrogen stations playing a role in facilitating this.

Supply of Thermal Energy: Hydrogen can produce thermal energy using fuel cells, making it suitable for applications such as heating and industrial processes that require heat energy.

Backup Power: Hydrogen fuel cells are employed as backup power sources, especially during emergencies or disasters. In places where a continuous power supply is crucial, fuel cell power plants using hydrogen stations may be installed.

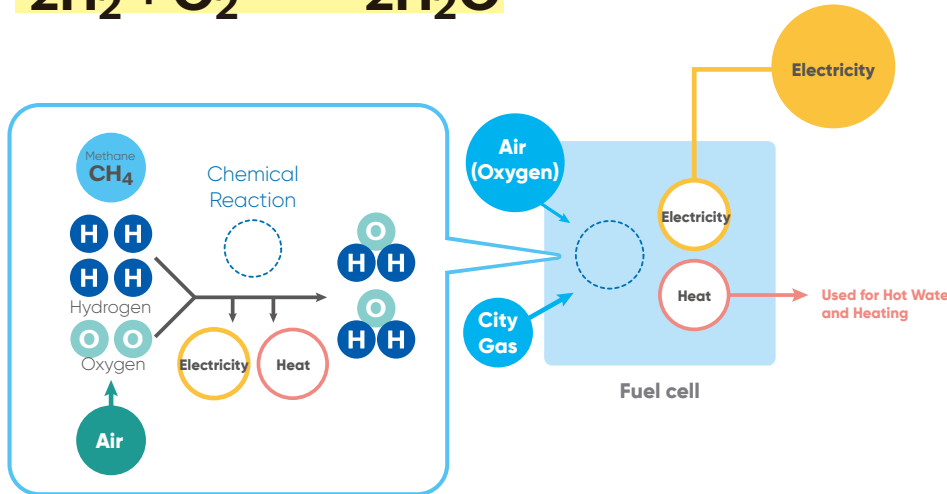
Hydrogen Cogeneration: This process utilizes hydrogen as an energy source to simultaneously generate electricity and heat, built on hydrogen fuel cell technology. It's an environmentally friendly, next-generation clean energy system that emits no CO2 and garners significant attention.

Turbine Drive: In this approach, thermal energy is transformed through high-temperature, high-pressure steam driving turbine blades, which, in turn, powers generators to produce electricity. This thermal energy can be harnessed for various purposes, including heating and hot water supply, enabling the dual utilization of energy and enhancing the overall system's efficiency.

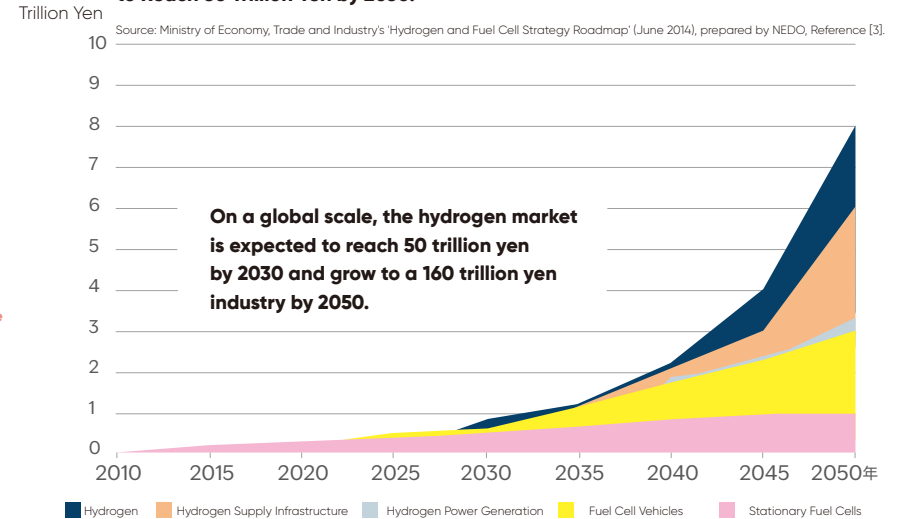


How Fuel Cells Generate Electricity and Heat Using Hydrogen

Hydrogen market will become a 50 trillion yen industry in 2030



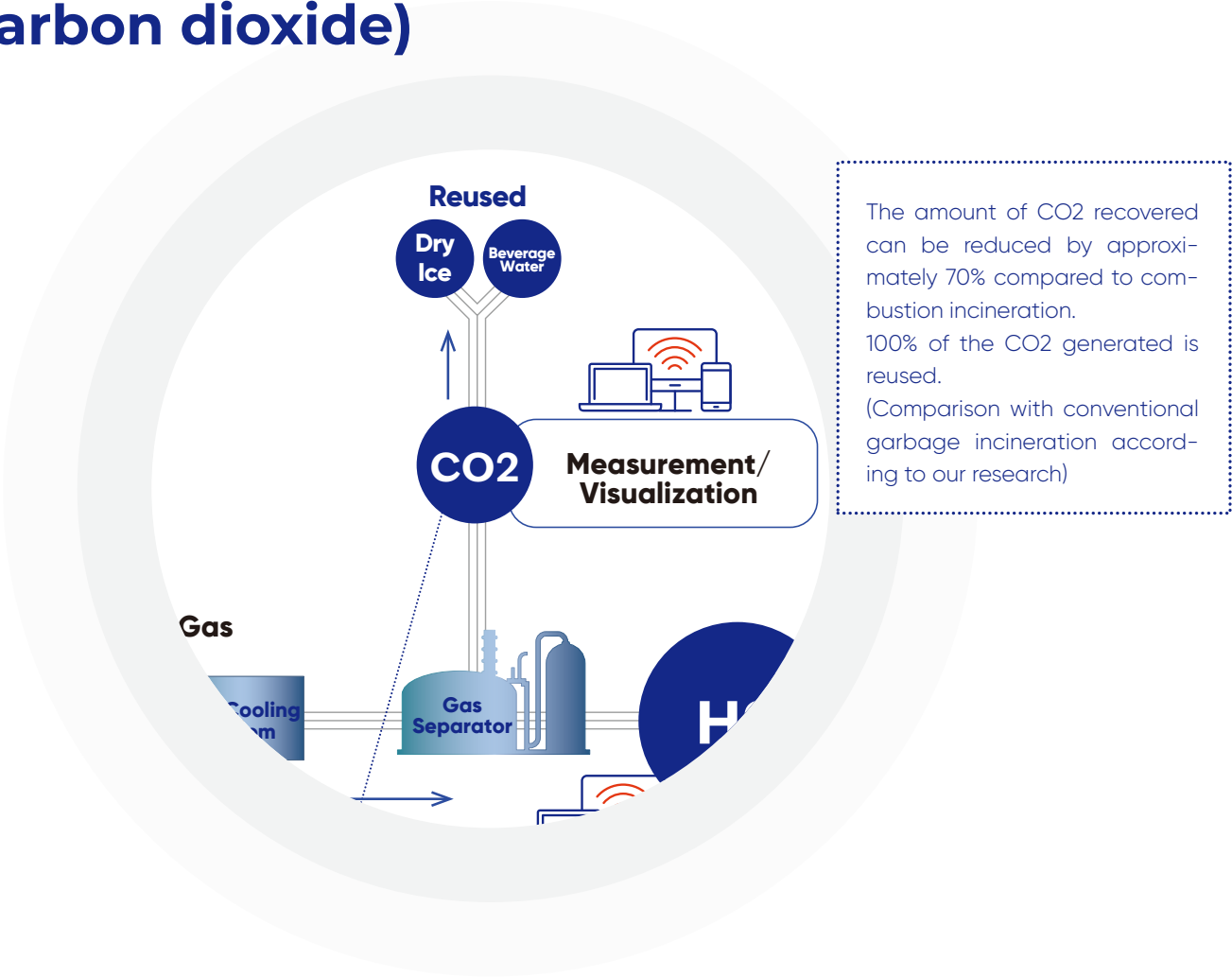
In Japan, the Forecasted Market Size for Hydrogen and Fuel Cells is Estimated to Reach 50 Trillion Yen by 2030.



Fuel Cells, often mistaken for a type of battery due to their name, actually use the reverse principle of 'Electrolysis of Water' to generate electricity and water by reacting hydrogen with oxygen. While battery power requires recharging, fuel cells continue to generate power as long as the fuel (hydrogen and oxygen) is supplied. They have even been successfully used in spacecraft. As long as you have a source of hydrogen and access to oxygen from the air, you can continue generating power, and the resulting water can be used as drinking water. In other words, on Earth, where you have access to oxygen from the air, you can generate power as long as you have a source of hydrogen.

No waste until the end

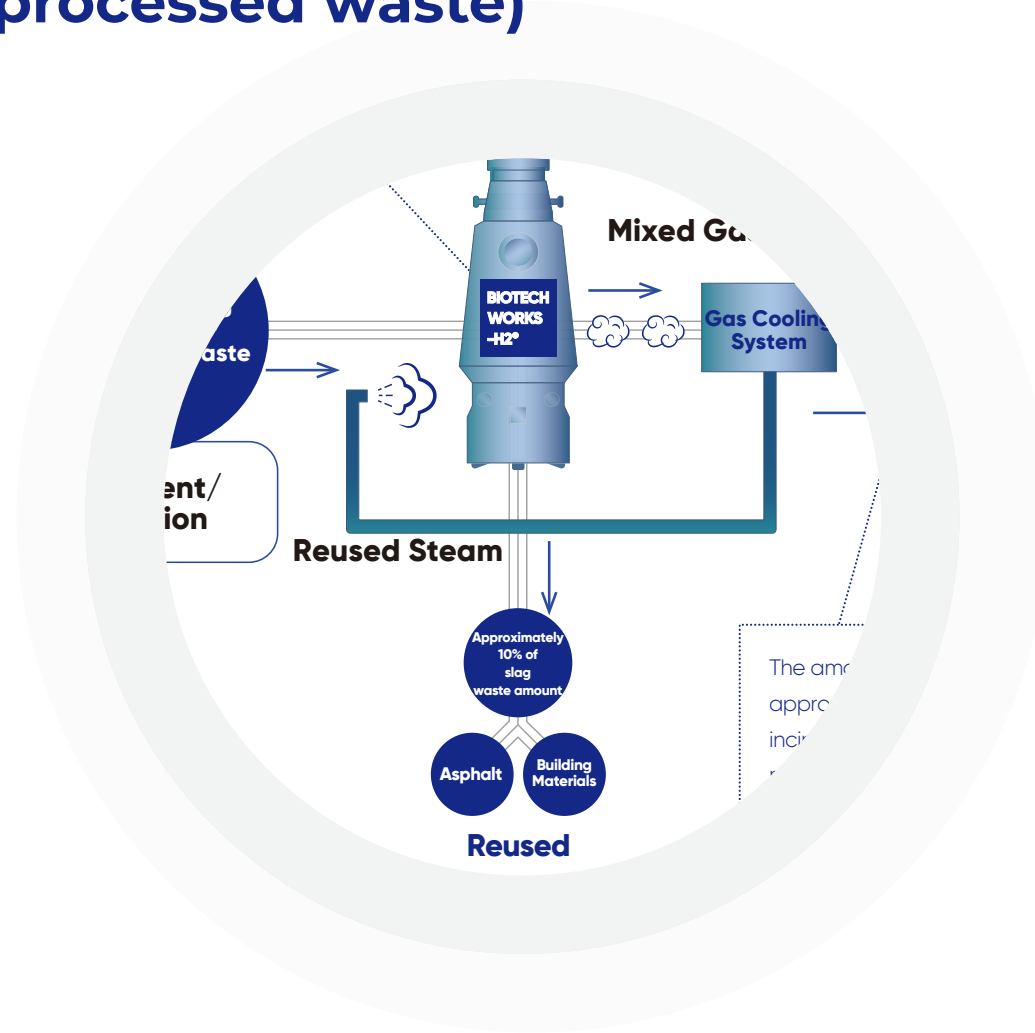
—— CO2 (carbon dioxide)



All output of CO2 can be sold = 100% reused

No waste till the end

— slag (processed waste)



All slag output can be sold = 100% reused

Four Services Enabled by BIOTECHWORKS-H2®

1 Visualizing CO2 Reduction and Providing Evidence

The BIOTECHWORKS-H2® project empowers individuals and companies to achieve a groundbreaking circular economy without requiring them to make significant sacrifices or changes to their daily lives. We pledge to continuously offer cutting-edge sustainability and innovation to our supporters and stakeholders, with a commitment to addressing and resolving environmental issues for the future of our planet and the well-being of our children.

Scheduled to begin on January 1, 2025 (BIOTECHWORKS-H2 Inc.)



Reference

2 Visualizing CO2 Reduction during Product Collection

By promoting the environmental contributions of products to consumers even before production, companies can enhance their image and boost collection efforts. This approach not only supports BtoC but also provides robust assistance in proposals to BtoB clients, contributing to the carbon neutrality of those businesses.

Scheduled to begin on April 1, 2024 (BIOTECHWORKS-H2 Inc.)



Reference

3 Plant Construction Consulting and Royalty Agreements

BIOTECHWORKS-H2 Inc. has partnered with an American plant company, enabling advanced plant construction and consulting for facilities, including power generation equipment. Furthermore, the company can operate carbon-neutral facilities by recycling collected waste through its own plant for hydrogen production and power generation. Scheduled to begin on January 1, 2025 (BIOTECHWORKS-H2 Inc. US)



4 SDGs Consulting

SDGs are complex and challenging, but BIOTECHWORKS-H2® is here to simplify them. We make the dream of achieving SDGs a reality without significant disruptions to your daily routines. Scheduled to begin on September 1, 2023 (BIOTECHWORKS-H2 Inc. US)



BIOTECHWORKS-H2® Plan until 2030

2023

- ▶ Establishment of BIOTECHWORKS-H2 Inc. (July)
- ▶ BIOTECHWORKS-H2 Inc. US (July)
- ▶ Commencement of Supporter Membership Recruitment (August)
- ▶ SDGs Consulting

2024

- ▶ Full Launch of Services
- ▶ Visualization of CO2 Reduction during Product Collection Prior to Sales
- ▶ Plant Construction Consulting and Royalty Agreements

2025

- ▶ Planned Start of Plant Construction for Converting Waste to Renewable Energy
- ▶ Visualizing CO2 Reduction and Providing Evidence
- ▶ Commencement of Collection in Line with Plant Operation

2030

- ▶ Conversion of All Organic Waste to Renewable Energy
- ▶ Achieving Carbon Neutrality





Let's Join a Global Project for Decarbonization.

The establishment of the Paris Agreement in 2015 marked a groundbreaking global consensus aimed at achieving substantial zero emissions of greenhouse gases and has a profound impact on the future of our planet. Simultaneously, the transition to a decarbonized society, as envisioned by the Paris Agreement, also presents opportunities for new growth and development. Furthermore, these efforts towards decarbonization align with the shared vision set forth by the United Nations' Sustainable Development Goals (SDGs) adopted in 2015. As we collectively strive towards realizing a decarbonized society by 2050, the roles of businesses, local governments, and various organizations have become increasingly pivotal.

The potential of any single company is limited in isolation. We are seeking the participation of numerous companies, municipalities, organizations, NGOs, and all those who are genuinely committed to advancing efforts for a decarbonized society through the worldwide project of converting waste into renewable energy, known as 'BIOTECH-WORKS-H2'. Together, we can collectively address the challenge of achieving a decarbonized society.

**BIOTECH
WORKS
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Turning Waste into Energy A Visible Contribution to the Environment



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Supporter Registration: Join the Cause

