Regional Co-creation and Cross-sectoral Carbon Neutral Technology Research and Development Program

Ministry of the Environment R&D Program

2024

環境省

Ministry of the Environment R&D Program

What is the Regional Co-creation and Cross-sectoral Carbon Neutral Technology Research and Development Program?

Objectives of the Program

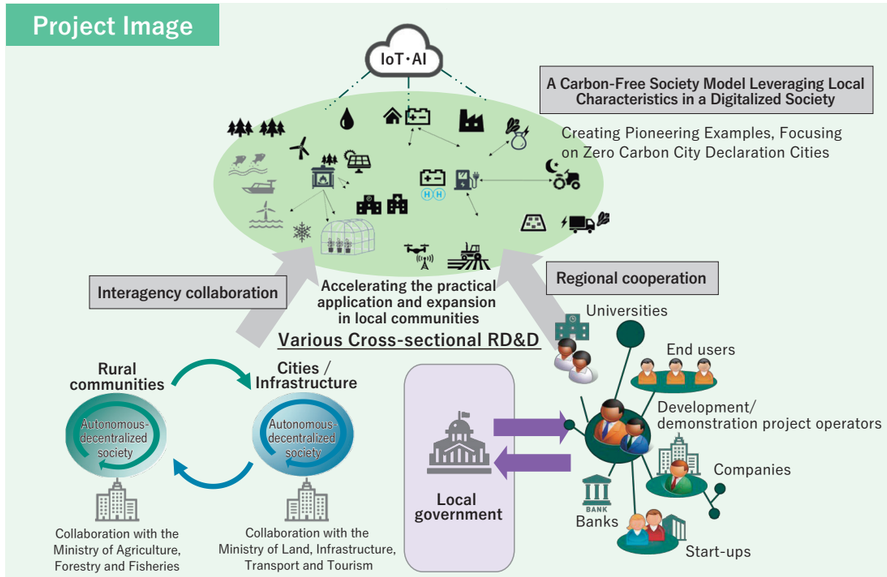
To achieve a 46% reduction of greenhouse gas emissions by fiscal 2030 and realize a decarbonized society by 2050, it is necessary to develop and demonstrate technologies for implementation in society, including the renewal of existing infrastructure. It is also important to support pioneering initiatives in cities that have announced zero-carbon city declarations, and to build vibrant and resilient communities that are decarbonized and sustainable, and capable of coexisting with nature, by taking advantage of local characteristics. In light of these circumstances, the program aims to implement technology research and development projects of cross-sectoral regional co-creation technologies that are rooted at the regional level and contribute to the realization of a decarbonized society, working across multiple disciplines and through the collaboration of various stakeholders.

About the Program

The following initiatives will be implemented to promote technology research and development in collaboration with local governments, to help build models of a decarbonized society that make use of the characteristics of each region, to support the simultaneous achievement of regional revitalization and a decarbonized society, and to induce a decarbonization domino effect.

- **Regional Co-creation and Cross-sectoral Themes Category**
- **Bottom-up Type Area-Specific RD&D Category**
- **Award-based Innovation Discovery and Social Implementation Acceleration Category (Award Category)**
- **Business Promotion Support for Start-ups (Start-Up Category)**

Project Image



Sector Image

- **Transportation** — The sector focused on RD&D for reducing carbon emissions in the transportation sector.
- **Housing and Building** — The sector focused on the RD&D of technologies for reducing carbon emissions in buildings across residential, commercial, and other categories.
- **Renewable Energy** — The sector focused on RD&D of technologies for promoting the introduction of renewable energy such as solar, wind, small-scale hydropower, and geothermal energy.
- **Biomass and Resources Recycling** — The sector of RD&D of waste-based biomass utilization and resource recycling to promote decarbonization.
- **Societal System Innovation** — The sector of RD&D of technologies for innovating social systems that are sources of CO_2 emissions, such as energy infrastructure, information infrastructure, and logistics, to reduce their carbon footprint.

Regional Co-creation and Cross-sectoral Themes Category

While considering national policies, issues that are mutually interconnected with the needs of local communities and initiatives in each sector are set as themes. Various stakeholders participate as innovation partners to implement regional co-creation and cross-sectoral initiatives. Through this initiative, the program aims to address the needs of regions striving for decarbonization by solving unique and common challenges specific to each area, while leveraging the characteristics of each region. At the same time, the program aims to foster awareness of decarbonization among the public, starting from local communities, and support the rapid social implementation of innovation.

Climate Change × Housing and Buildings

Aiming to introduce renewable energy and improve energy efficiency, the program supports developing and demonstrating next-generation solar cells and CO_2 reduction technologies. Additionally, the program provides focused support for developing technologies that contribute to the efficient use of electricity and the expansion of renewable energy adoption in the region through grid coordination.

Climate Change × Agriculture, Forestry, Fisheries, and Nature

The program supports the RD&D of technologies aimed at introducing renewable energy in rural communities, including efficiency technologies tailored to local characteristics, stable procurement technologies for biomass raw materials, high-efficiency heat utilization technologies, and CO_2-reducing technologies inspired by biomimicry.

Climate Change × Local Transportation

The program supports the RD&D of technologies to address climate change, including the introduction of zero-emission vessels (ZEVs) in local transportation, the development of biofuels, and the development of electricity supply infrastructure.

Bottom-up Type Area-Specific RD&D Category

To build a "regional circulation and symbiosis sphere" and achieve a "decarbonized society," the program supports RD&D projects crucial for strengthening future climate change measures. While the CO_2 reduction effects in various sectors are relatively significant, these efforts are not progressing sufficiently through voluntary private sector initiatives alone, due to challenges such as development risks.

▶ **Budget Scale** Approximately 30 to 500 million yen on a total project cost basis (with the subsidy covering up to half, ranging from 15 to 250 million yen).

▶ **Implementation Period** In principle, within 3 years (*2-year extension available)

Award-based Innovation Discovery and Social Implementation Acceleration Category (Award Category)

Through the implementation of feasibility studies and RD&D, initiatives in this category aim to help realize the ideas of organizations that have won the Minister of the Environment's Award for Climate Action (Innovation Discovery and Acceleration of Social Implementation Category).

▶ **Budget Scale** Up to approximately 30 million yen

▶ **Implementation Period** 1 Year

The award recognizes organizations whose innovative ideas align with the theme on the right, contribute to building a decarbonized society, and demonstrate solid capabilities and a track record of rapid and sustained social implementation of these ideas.

Theme

Ideas related to the transition to renewable energy as the main source of energy, to accelerate the transition to a decarbonized and decentralized society, while strengthening societal resilience.

*Minister of the Environment Awards for Climate Action HP: https://www.env.go.jp/earth/ondanka/min_action_award/

Business Promotion Support for Start-ups (Start-up Category)

By supporting research and development projects carried out by small and medium-sized enterprises (SMEs), mainly start-ups, that contribute to the reduction of energy-related CO_2 emissions, initiatives in this category aim to contribute to the realization of a decarbonized society through the creation and growth of new industries.

▶ **Target Projects** Phase 1 (POC, FS) Support
Projects conducting proof of concept (POC) activities and feasibility studies (FS) necessary for commercializing technology seeds that contribute to reducing energy-related CO_2 emissions.

▶ **Budget Scale**
Fixed amount (up to 10 million yen)

▶ **Implementation Period**
Within 1 year

Executing Organization (FY2024):
Shizuoka Environment Resources Association (SERA)
HP : https://siz-kankyou.com/2024startup/
Email : kankyou@siz-kankyou.or.jp

Examples of Technology Seeds Applicable to this Project

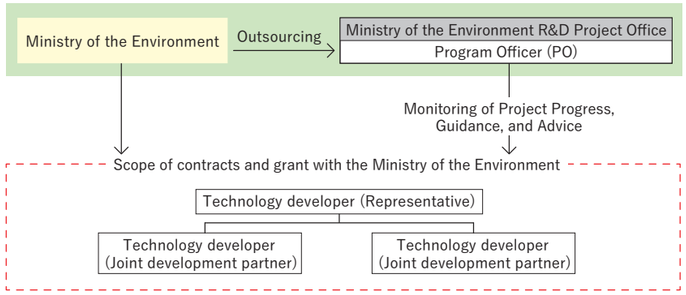
- Devices and equipment that contribute to the realization of renewable energy systems or improve the efficiency of renewable energy utilization.
- Technologies that contribute to the promotion of new renewable implementations using unutilized resources.
- Technologies that contribute to the realization of equipment and devices that achieve significant CO_2 reduction and energy savings.
- Technologies such as fast charge/discharge, energy management, and other solutions that promote the use of renewable energy through energy storage systems.
- Technologies that contribute to the production and use of hydrogen, ammonia, and other substances using renewable energy.

*However, only technology seeds related to renewable energy, energy efficiency, and other technologies that contribute to the reduction of energy-related CO_2 emissions in Japan are targeted.

Implementation Structure

A dedicated Program Officer with experience in technology development and commercialization will be assigned to each project. From the perspective of project management, the Program Officer monitors the progress of the project and how evaluation results are being reflected, and provides guidance and advice on project planning, etc., as required. Therefore, it is necessary to cooperate with the Program Officer in the implementation of the project by sharing information about the project on an ongoing basis.

*For the Startup Category, the Shizuoka Prefecture Environmental Resources Association handles the public offering and subsidy disbursement.
For more details, please visit: https://siz-kankyou.com/



Application/Project Implementation Schedule

*The schedule for FY2024 is provided here for reference purposes.

Applications

Application Period — Phase 1: Jan. - Feb.; Phase 2: May. - Jul.
After the announcement of application guidelines, the application documents and procedures will be accepted via email.

Pre-evaluation

Document Review — Feb. / Jul.
Document reviews are carried out by each expert committee comprised of specialists.

Interview-based Evaluation — Feb. - Mar. / Aug. - Sep.
Interview-based evaluation will be conducted by each expert committee for the issues that pass the document review.

Selection

Decision on Contract Conclusion and Issuance

Technology development and project implementation

Mid-term Evaluation — Oct. - Nov.: Interview (carried out as a general rule)
The evaluation will assess the appropriateness of the implementation details, the achievement of planned goals, the potential for commercialization and dissemination, and the CO_2 reduction effect.

Post-evaluation* — Sep. - Oct.: Interview (carried out as a general rule)
Evaluation of the appropriateness of the implementation and the level of achievement of the technical development goal.
*To be implemented in the fiscal year following the completion of the project

Follow-up Survey — For 5 years after the completion of the project
After the completion of the project, document surveys, interviews, and other evaluations will be conducted in the second fiscal year and beyond.

Application Consultation

We are happy to assist businesses and other organizations considering applying for the Regional Co-creation and Cross-Sector Carbon Neutral Technology Research and Development Program. Our personnel provide consultation focusing on “novelty,” “management of CO_2 reduction,” and “prospects for commercialization,” which are key points in the implementation of any proposed RD&D program.

Scan the code to the right to schedule a consultation

Results Presentation Meeting

The Ministry of the Environment shares the efforts of the "Regional Co-creation & Cross-sectoral Carbon Neutral Technology Research and Development Program" with the public through the presentation of outstanding project results. Once a year, we hold an online (pre-registration required) presentation of the results of the project to give prospective applicants an opportunity to learn about the details of the project and the key points of its implementation.

*Development and Demonstration Examples https://www.env.go.jp/earth/ondanka/cpttv_funds/outline/case.html

Project Example of the Bottom-up Type Area-Specific RD&D Category

Transportation

Wideband gap semiconductors based high performance on-board charging systems for EV

Representative Implementer:
Nagoya University, Tokai National Higher Education and Research System
Joint Implementation Partner:
Panasonic Automotive Systems Co., Ltd.
Implementation Period:
FY2023 to FY2025

1 Outline and Purpose

In order to promote the widespread adoption of the EV market, we are contributing to CO_2 reduction by developing and commercializing a compact, high-efficiency (98%) 800V-compatible in-vehicle charging system through the development of GaN device technology with high voltage tolerance, high-frequency driving, and low loss, high-speed switching control technology, and high output and miniaturization technology, all aimed at reducing transmission and conversion losses during charging.

2 Details of RD&D

A1 Development of High-Power GaN Device Technology

Development of 1200V rated GaN on GaN HEMT for high output/high voltage on-board charging systems.

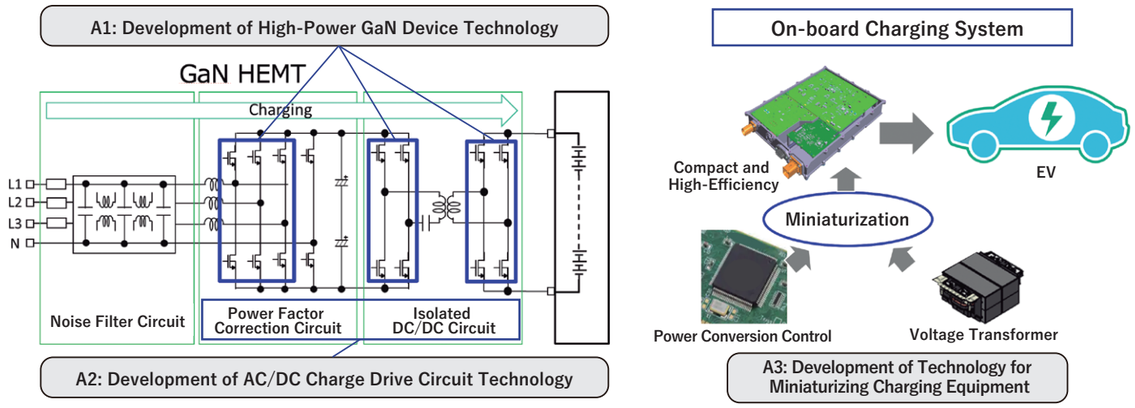
A2 Development of AC/DC Charge Drive Circuit Technology

Establishing 800V/22kW/500kHz-class drive circuit technology through GaN device drive circuit technology and high-power/high-voltage power conversion technology.

A3 Development of Technology for Miniaturizing Charging Equipment

Application of GaN Devices to on-board vehicles charging systems, and development of miniaturization technology through High-Frequency Conversion.

3 System Configuration



4 RD&D Objectives

▶ **Potential Users and Benefits**

Improving Convenience for EV Users by Reducing Charging Time

▶ **Target Specifications and Performance**

- Development of 1200V Rated 10A Class Devices and Implementation Technology for 40A Class Devices
- Maximum power conversion efficiency of 98% or higher (compared to the conventional 95%, reducing power loss by 60%)
- Power density of 2.2kW/L or higher (compared to the conventional products at 1.3kW/L)

5 Major Achievements to Date

A1 Conducted device structure design of 1200V breakdown voltage, enhancement-Type GaN HEMT through simulation

A2 Formulated target specifications formulation for the GaN HEMT and selected topology method candidates for the AC/DC charge drive circuit

A3 Completed the system design for principle verification of the GaN HEMT device charging system, and verified the power factor correction circuit’s charging operation from low to high load

6 Implementation Structure

Project Representative

Nagoya University, Tokai National Higher Education and Research System

▶ **Overall Management and Device Development**
Development of GaN power devices based on high-quality crystal growth technology for GaN devices, and evaluation of their application to charging systems.

Supply of GaN Devices

Joint Implementation Partner

Panasonic Automotive Systems Co., Ltd.

▶ **Development of Charging Systems**
Development of on-board charging systems, as well as commercialization and sales after project completion.

Project Example from the “Climate Change × Buildings” field of the Regional Co-creation and Cross-sectoral Themes Category

Housing and Building

Utilization of perovskite solar cells in harsh environments such as harbors

Representative Implementer:
Macnica, Inc.
Joint Implementation Partner:
Reiko Co., Ltd. & Peccell Technologies, Inc.
Implementation Period:
FY2023 to FY2025

1 Outline and Purpose

Perovskite solar cells (PSCs) are expected to provide additional renewable energy to buildings where existing conventional solar cells are difficult to install due to issues such as load-bearing capacity and flat geometry. This demonstration will achieve performance requirements capable of withstanding harsh environments with high humidity and salt damage risks, and also develop PSCs that can be applied to a wide range of shapes.

2 Details of RD&D

A1 Establishment of a cell manufacturing and coating method to meet cost requirements based on the premise of replacement

Establishment of PSC manufacturing technology that meets cost requirements based on the premise of replacement, using a bar-coating method capable of producing high-quality PSC films even under atmospheric conditions.

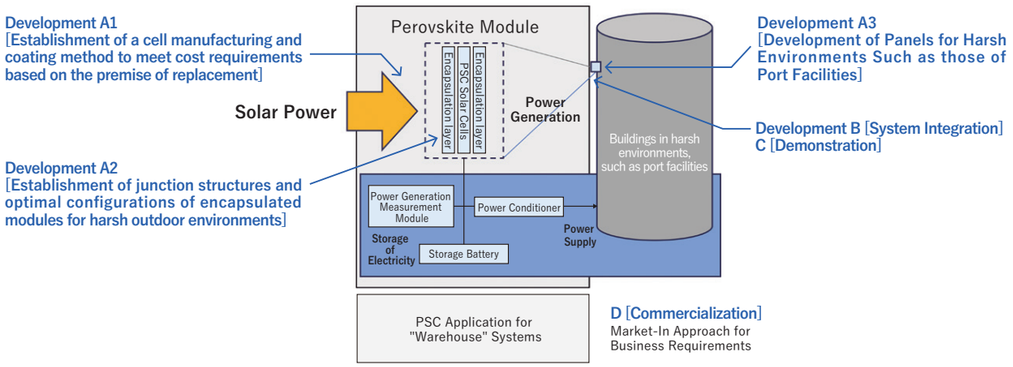
A2 Establishment of junction structures and optimal configurations of encapsulated modules for harsh outdoor environments

Design of junction structures and encapsulation configurations taking into account the degradation of various films due to ultraviolet light, salt damage, and high temperature and humidity.

A3 Development of Panels for Harsh Environments Such as those of Port Facilities

Development of 100W-scale PSC panels with a structure that facilitates easy installation and replacement, suitable for the installation locations and shapes expected in port facilities and other similar environments.

3 System Configuration



4 RD&D Objectives

▶ Potential Users and Benefits

Port facility managers, manufacturers of greenhouse exteriors, transportation companies

▶ Target Specifications and Performance

- Power generation efficiency: 15.0% (Development target of Sekisui Chemical, Japan's leading manufacturer: 15% by 2025)
- Module size: 30 cm × 100 cm, power generation cost: 17 yen/kWh
- Weathering test: Confirmation that 90% of the initial power generation efficiency is maintained over 30 days of demonstration
- Panel output scale: 100W scale, demonstration unit scale: 1.5kW

5 Major Achievements to Date

A1 Examination of the optimal condition of perovskite layer concentration for bar coating under atmospheric conditions has been conducted, and a 10 cm square cell with a power generation efficiency of about 10% has been created through manual bar coating in atmospheric conditions.

A2 Examination and verification of a wide variety of Encapsulants have been conducted, and 85° C/85% tests on a wide variety of types are under way.

A3 A methodology to extract more than 85% of the lead contained in a PSC has been established, a 10cm square module has been created for use in durability studies which has been confirmed for 10V power generation, and a durability test in conjunction with A2 is under way.

6 Implementation Structure

Project Representative
Macnica, Inc.

▶ **B, C System Development and Overall Coordination**
Responsible for commercialization and sales after project completion as a specialized trading company specializing in technology incubation, product development, and dissemination.

Joint Implementation Partner
Peccell Technologies, Inc.

▶ **A3, A-C Overall Supervision**
Responsible for commercialization and sales after project completion as a specialized trading company specializing in technology incubation, product development, and dissemination.

Joint Implementation Partner
Reiko Co., Ltd.

▶ **A1, A2 Element Development**
Ample experience of OEM development in the field of thin film crystal product manufacturing.

Project Example from the “Climate Change x Agriculture” field of the Regional Co-creation and Cross-sectoral Themes Category

Renewable Energy

Field trial of carbon neutral irrigation supply systems adapting pumped storage hydropower and surplus water pressure in pipeline

Representative Implementer:
National Agricultural and Food Research Organization (NARO)
Joint Implementation Partner:
IHI Corporation, IHI Construction Service Co., Ltd., Ebara Corporation, and Toyokawa Comprehensive Irrigation and Land Improvement District
Implementation Period:
FY2023 to FY2025

1 Outline and Purpose

In agricultural water management systems, energy efficiency is achieved by operating pumps efficiently according to water demand. Renewable energy sources, such as solar power and small hydropower, are newly introduced for self-consumption or local consumption. In this way, the system balances supply and demand between local water storage and renewable energy generation. This integrated water-energy system helps to achieve carbon neutrality in rural areas.

2 Details of RD&D

A1 Introduction of a pumped irrigation system to adjust the supply and demand of renewable energy

Development of a pumped irrigation system that efficiently utilizes power generation from renewable energy sources for pump operation.

A2 Small hydropower utilization system using surplus pressure in the pipeline system

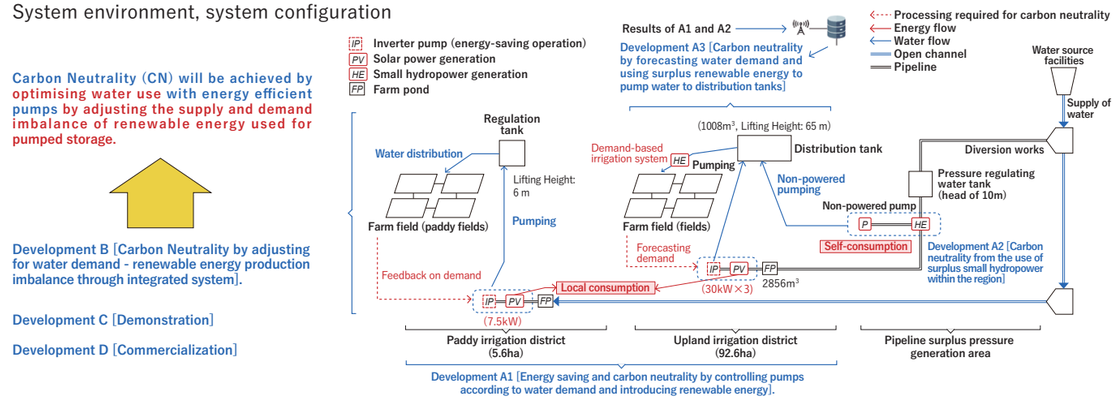
Development of small hydropower generation technology using a pressure-reducing facility to maximize the utilization of surplus pressure in the pipeline system as well as technology for non-powered pumps.

A3 Water and energy management systems that coordinate power and irrigation water operations

Development of a water and energy management system that predicts the agricultural water demand, and manages and forecasts the electricity generated from renewable energy. Carbon neutrality will be achieved through the precise adjustment of the use of irrigation water and electricity for the entire region.

3 System Configuration

System environment, system configuration



4 RD&D Objectives

▶ Potential Users and Benefits

Land improvement districts that manage pumping stations: The rising electricity prices are one of the issues related to maintenance and management. There are high expectations for research and development aimed at reducing electricity costs.

▶ Target Specifications and Performance

- Pumping irrigation systems using renewable energy can be applied to both rice paddies and farmlands if the pumping stations are of the distribution tank system
- Small hydropower generation systems and non-powered pumps can also widely be used on their own
- A PM motor system with a built-in inverter to save energy in pumped irrigation systems can be applied up to 7.5 kW

5 Major Achievements to Date

A1 Based on the results of a field survey on the operational status of the pumps, the pump control method was estimated. Then an irrigation method using water distribution tanks that can effectively use the power generated by PV (photovoltaic) systems was proposed.

A2 To develop a small hydro-power generation technology, a hydraulics experiment was conducted on an in-line water turbine, and an output of 2.6 kW was confirmed.

A3 The cropping conditions in the Waji district and the water use were clarified. A prototype of the water demand model has been developed.

6 Implementation Structure

Project Representative
National Agricultural and Food Research Organization (NARO)

▶ **Development and integration of A2 and A3 systems**
Has a proven track record in the development of irrigation systems, and the diagnosis and analysis of agricultural water management systems.

Joint Implementation Partner
IHI Corporation

▶ **Development of A2 and A3**
Has extensive experience in water management control systems both in Japan and overseas. It also has a strong track record in energy management systems. Responsible for commercialization and sales after project completion.

Joint Implementation Partner
IHI Construction Service Co., Ltd.

▶ **Development of A2 and A3**
Responsible for the construction and implementation of water management control systems and energy management systems.

Joint Implementation Partner
Ebara Corporation

▶ **Development of A1**
Has extensive experience in pumping operations in Japan and overseas. Responsible for commercialization and sales at retail sales after the completion of the project.

Joint Implementation Partner
Toyokawa Comprehensive Irrigation and Land Improvement District

▶ **Provision of demonstration fields**
Management of key water facilities that supply agricultural water to the A1, A2, and A3 demonstration fields.

Project Example of the Bottom-up Type Area-Specific RD&D Category

Biomass and Resource Recycling

Next-generation low-concentration aluminum dross effective utilization technology for carbon neutrality

Representative Implementer:
Suzuki Shokai Co., Ltd.
Joint Implementation Partner:
Asahi Seiren Co., Ltd., Maeda Industry Co., Ltd., Sumiko Air Co., Ltd., Waseda University, Tokushima University, NTT Data Institute of Management Consulting, Inc.
Implementation Period:
FY2022 to FY2024

1 Outline and Purpose

The technology enables the production of green aluminum, green hydrogen, and ammonia without CO_2 emissions associated with discarded or landfilled aluminum ash. This project aims to not only greatly contribute to securing the international competitiveness of Japan's aluminum products toward achieving carbon neutrality by 2050, but also contributes to the reduction of CO_2 emissions in the manufacturing supply chain by producing energy sources such as hydrogen and ammonia.

2 Details of RD&D

A1~A3 New treatment process for aluminum dross

Optimization of aluminum smelting conditions through the sorting of scrap aluminum based on LIBS (laser-induced breakdown spectroscopy) analysis, separation of aluminum dross into high- and low-grade dross by optimizing selective grinding of the dross, and establishment of an analysis system for these dross components.

A4 Production of aluminum hydroxide

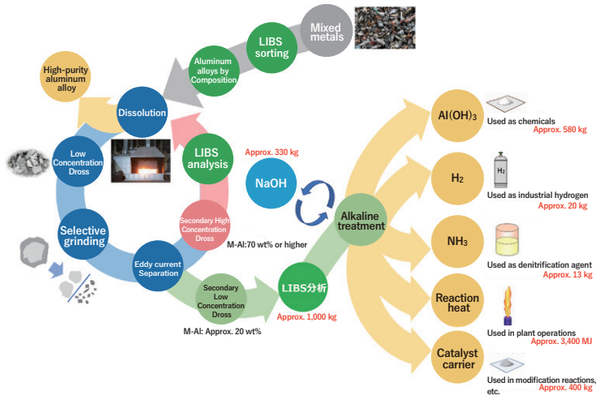
Converting all metallic aluminum in aluminum dross into aluminum hydroxide or aluminum oxide through complete hydroxylation or oxidation.

A5 Separation and recovery, as well as purification of hydrogen and ammonia

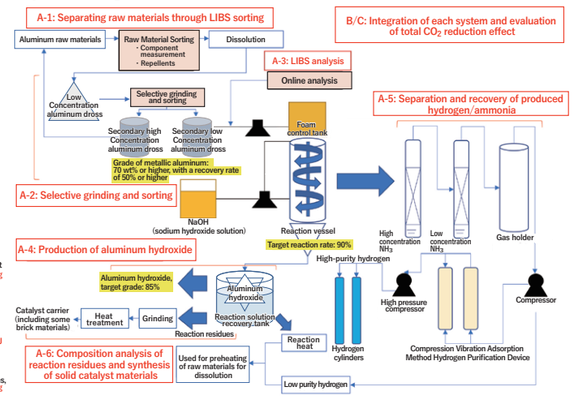
Hydrogen and ammonia generated during the production of aluminum hydroxide are recovered and purified into high-purity hydrogen and ammonia solution which do not emit CO_2, and their use in various industrial applications is verified.

3 System Configuration

System environment



System configuration



4 RD&D Objectives

▶ Potential Users and Benefits

25 secondary alloy manufacturers
34 aluminum die casting manufacturers
56 aluminum rolling manufacturers

▶Target Specifications and Performance

- Grade: 70wt.% for metallic aluminum, 85% or higher for aluminum hydroxide
- Capacity: CO_2 Reduction Effect of 51,950 t-CO_2/year with a 5,000 t/year Processing Line

5 Major Achievements to Date

A1 ~ A3 New treatment process for aluminum dross

In particular, in the separation of high-concentration and low-concentration dross through the optimization of selective pulverization of aluminum dross, the metallic aluminum grade of secondary high-concentration dross is expected to be: 70 wt.% or higher, with a 50% or more expected collection rate for the same.

Optimization of Sorting Process Based on LIBS Analysis of Dross Pulverized Fragments

A4 Production of aluminum hydroxide

An aluminum hydroxide conversion rate of 90% for metallic aluminum in dross is expected, and a purity of 85% for the produced aluminum hydroxide.

A5 Separation and recovery, as well as purification of hydrogen and ammonia

Expected to achieve separation and purification of 99.999% hydrogen with no CO_2 emissions, and 25% ammonia solution.

6 Implementation Structure

Project Representative
Suzuki Shokai Co., Ltd.
Has a secondary aluminum alloy plant optimized for demonstration scale, which it has been operating for 20 years with the technical support of Asahi Seiren Co., Ltd. Manufacturer Representative for aluminum hydroxide production line.

Joint Implementation Partner	
Asahi Seiren Co., Ltd.	The leading domestic manufacturer of secondary aluminum alloys with more than 50 years of industry experience in the manufacturing process.
Maeda Industry Co., Ltd.	Has a track record of selling cosmetics (approx. 4,000 tons/month) and carries out the evaluation of aluminum hydroxide.
Sumiko Air Co., Ltd.	Manufacturing and Sales of a wide range of gases, including industrial gases, electronics gases, and fine gases. Carries out recovery and high-purity purification of hydrogen and ammonia.
Waseda University	Has state-of-the-art knowledge in the field of recycling engineering.
Tokushima University	Has expertise in the field of catalytic materials. Carries out the adaptation of reaction residues into catalyst carriers.
NTT Data Institute of Management Consulting, Inc.	Calculates the amount of CO_2 emission reductions, compiles reports and manages the progress of the plan.

Project Example of the Bottom-up Type Area-Specific RD&D Category

Societal System Innovation

Optimization of renewable power generation based on real-time CO_2 emission intensity of electricity

Representative Implementer:
Pacific Power Co., Ltd.
Joint Implementation Partner:
Tsukishima Aqua Solution Co., Ltd., Pacific Consultants Co., Ltd., Kobelco Eco-Solutions Co., Ltd.
Implementation Period:
FY2022 to FY2024

1 Outline and Purpose

This project will develop optimal control methods for renewable energy generation using time-varying CO_2 emission factors as control indicators. To maximize the control range and CO_2 reduction effect, algorithms developed for biogas and waste power generation will be demonstrated.

2 Details of RD&D

A1 Formulation and short-term forecasting of real-time CO_2 emission factors

Development of a method for calculating CO_2 emission factors by time of day, for which a calculation method is yet to be established, followed by the utilization of machine learning to make highly accurate forecasts.

A2 Development of output control methods for biogas and waste-to-energy power generation

Development of a control system that maximizes the CO_2 reduction effect by considering various constraints pertaining to waste and sewage treatment, such as transport and storage capacities.

A3 Medium- to long-term forecasting of the CO_2 reduction effect of renewable energy generation, taking into account the grid structure

Development of a medium- to long-term forecasting system for CO_2 emission factors by time of day, considering factors such as increased power control due to grid congestion.

3 System Configuration

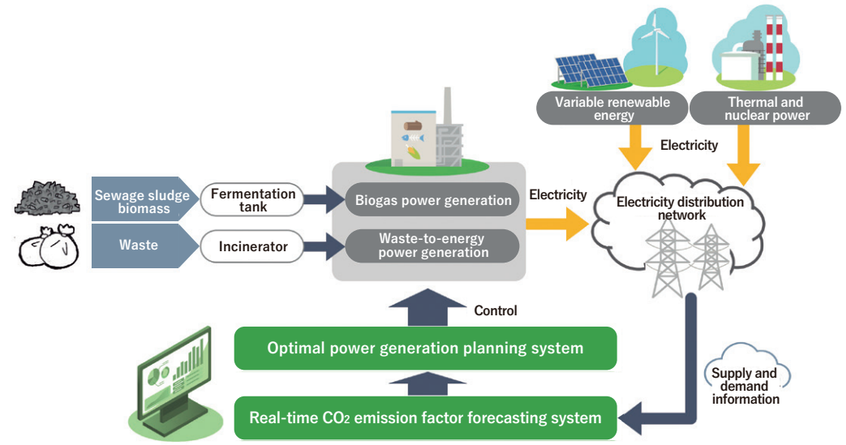
Forecast future real-time CO_2 emission factors based on supply and demand information and weather information.

▼

Create optimal daily operation schedules and control renewable energy generation based on the forecasts.

▼

Calculate medium- to long-term CO_2 reduction effects and contribute to the system's optimization at locations where it has been installed.



4 RD&D Objectives

▶ Potential Users and Benefits

Maximize the revenue and CO_2 reduction effect of electricity sales from our companies to renewable energy power generation business operators (including through license agreements via municipal power aggregators).

▶Target Specifications and Performance

- Improve real-time CO_2 reduction effects by at least 3% compared to conventional operation control methods
- Calculation errors of 10% or less between the previous day's forecast and the actual results
- Average calculation errors of 10% or less between the previous day's planned values and the actual results
- Calculation error of 10% or less between the forecast and actual results

5 Major Achievements to Date

A1 A short-term forecasting method for real-time CO_2 emission factors has been established, and a certain level of forecasting accuracy has been achieved.

A2 The basic planning and control algorithms for biogas and waste-to-energy power generation have been completed and verification testing has been underway since FY2023.

A3 The medium- to long-term forecasting algorithms have also been completed and the reduction of forecasting errors in simulations will be carried out in the future.

6 Implementation Structure

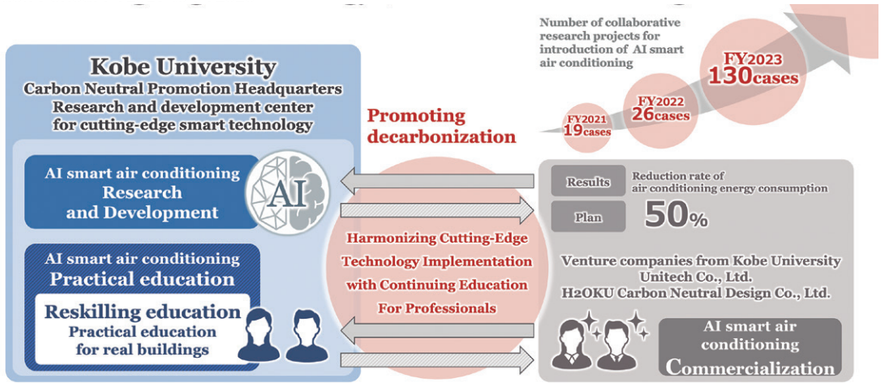
Project Representative
Pacific Power Co., Ltd.
▶ Development of each system and overall coordination

Joint Implementation Partner	
Tsukishima Aqua Solution Co., Ltd.	▶ Development support, provision of demonstration fields
Kobelco Eco-Solutions Co., Ltd.	▶ Development support, provision of demonstration fields
Pacific Consultants Co., Ltd.	▶ Development support, overall support

Ministry of the Environment R&D Project Example of an Initiative for Social Implementation and Dissemination (Completed Project)

Boosting air-conditioning efficiency using artificial intelligence with people and air-flow sensors for spaces with exterior openings

Representative Implementer: Kobe University
Implementation Period: FY2017 to FY2020



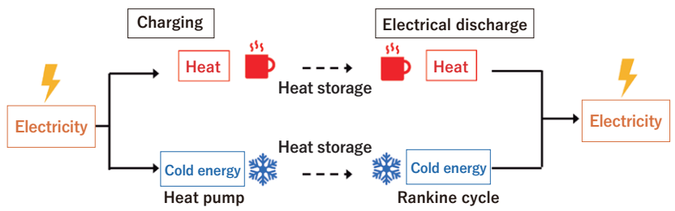
Underground malls were thought to require more energy to heat and cool than standard buildings because they have openings to the outside, so there was potential for energy savings. In conventional air conditioning systems, the focus has typically been on uniform control of heating and cooling within facilities from the supplier's perspective. In response, this R&D project of the Ministry of the Environment shifted the focus to users and developed AI technology that controls air conditioners by tracking both people's movements and airflow to predict air conditioning demand. Commercialisation of the technology began in FY2020. AI-based air conditioning technology is not limited to public spaces such as subway stations with open areas or airports with large areas. It is also being commercialised and introduced to commercial facilities such as supermarkets and department stores by a venture company originating from Kobe University, promoting the social implementation of the cutting-edge technology developed. Additionally, the launch of reskilling courses for working professionals, aimed at training personnel essential for social implementation, has significantly accelerated the commercialization and dissemination of foundational research and social implementation efforts through the contributions of participants and graduates.

Example of a Start-up Project

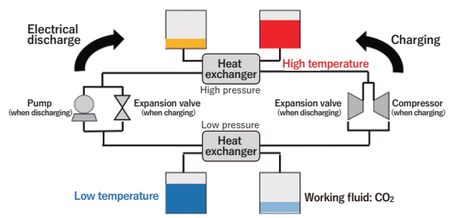
Demonstration of project related to the development of space-saving compressed CO_2 energy storage technology

Representative Implementer: ESREE Energy Co., Ltd.
Implementation Period: FY2023

Overview of the principles



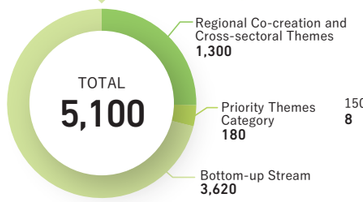
Basic configuration of PTES equipment



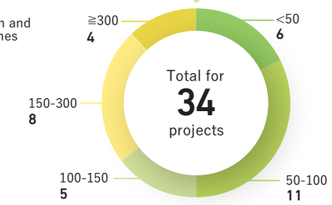
As the decarbonisation of the power sector progresses, it is expected that there will be a stage where we can no longer rely on thermal power generation in the event of a shortfall in renewable energy supply. As a result, Long Duration Energy Storage (LDES) technologies will be needed in the future to store large amounts of zero-emission electricity at low cost and for long periods of time. The space-saving compressed CO_2 energy storage technology developed in this project is also known as Pumped Thermal Electricity Storage (PTES). This technology is expected to enable low-cost, long-term energy storage by using inexpensive solids and water as the heat storage medium. As an energy storage technology whose components can be sourced domestically, it is also expected to contribute to energy security.
Since a proof-of-principle study using CO_2 as the working fluid would require a high pressure of 100 atmospheres or more, a prototype using air conditioning refrigerant was fabricated to carry out the study under the project. Going forward, the element technologies for the heat storage component will be developed, and a pilot plant following a proof of principle study using CO_2 will be demonstrated.

Share by Category in 2024

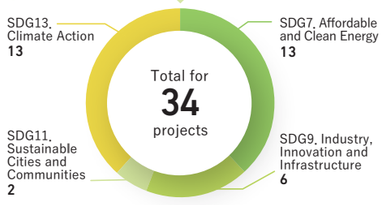
Budget allocation for each area (million yen)



Number of projects by budget size(million yen)



Number of projects by Sustainable Development Goal



Ongoing Projects in 2024

Regional Co-creation and Cross-sectoral Themes Category			
Climate Change × Local Transportation			
	Imoto Lines, Ltd.	2024 - 2026	Development and Demonstration of a 2nd generation EV ship and a generic PHEV-platform for Cost reduction and Standardization
	JETconnect co.,Ltd.	2024 - 2026	Replacement type high-efficiency railcar electric drive system
Climate Change × Residential and Architectural			
	TAISEI CORPORATION	2022 - 2024	Renovation of existing buildings using Net Zero Energy Building model for realization of a circular and ecological economy
	MACNICA, Inc.	2023 - 2025	Utilization of perovskite solar cells in harsh environments such as harbors
	Tiger Corporation	2024 - 2026	Development and demonstration of stainless steel sealed long-life nonflammable vacuum insulated pane
Climate Change × Agriculture, Forestry, Fisheries, and Nature			
	National Agricultural and Food Research Organization	2023 - 2025	Field trial of carbon neutral irrigation supply systems adapting pumped storage hydropower and surplus water pressure in pipeline
	Higashiyama Film CO.,LTD.	2024 - 2026	Demonstration Project to Improve Power Generation Efficiency of Photovoltaic Panels in Snowy Areas by Using Innovative Anti-Icing/Snowing Film
	Toyohashi University of Technology	2022 - 2024	Semi-closed/all electric tunnel greenhouse with “speaking plant approach” environmental control system
	National Agricultural and Food Research Organization	2022 - 2024	Net zero energy greenhouse (ZEG) for the decarbonization of horticulture
	NanoSuit Inc.	2024 - 2026	The project to reduce food loss and waste and promote modal shift through the social implementation of innovative thin films inspired by biomimicry.
Priority Themes Category			
	TOYOTA ENERGY SOLUTIONS INC.	2021 - 2024	Zero-emission agriculture with cogeneration, using ammonia-fueled micro gas turbine
Bottom-up Type Area-Specific RD&D Category			
	Mitsubishi Corporation	2021 - 2024	Low-carbon approach to heavy truck logistics using a distributed network of small-scale LNG filling stations
	Nagoya University	2023 - 2025	Wideband gap semiconductors based high performance on-board charger systems for xEV
	Akasaka Diesels Limited	2024 - 2026	Development of Methanol injection and combustion system for marine methanol dual fuel engine
	Osaka Metropolitan University	2023 - 2025	Technology for absorbing surplus renewable energy electricity in aquifer thermal energy storage systems
	Sharp Corporation	2022 - 2024	Energy storage technology using zinc to achieve carbon neutrality
	Mitsui O.S.K. Lines, Ltd.	2022 - 2024	Ocean thermal energy conversion utilizing deep seawater on Kume-Jima for a circular and ecological economy
	Riamwind Co., Ltd.	2022 - 2024	200 kW mid-size wind lens turbine and multi-rotor system
	KOATSU GAS KOGYO CO., LTD.	2023 - 2025	Development of atmospheric pressure nitrogen acetylene gas carburizing method by direct control of acetylene gas
	AISIN CORPORATION	2023 - 2025	Pure hydrogen SOFC system technology development and demonstration to promote regional hydrogen utilization
	Toray Industries, Inc.	2024 - 2026	Development of Heat-tolerant membrane module for reducing CO_2 emission in beverage production
	Toshiba Energy Systems & Solutions Corporation	2024 - 2026	Development and field-test of lead-blocking layer technology for tandem type perovskite solar cells
	Toyota Tsusho Corporation	2024 - 2026	Development and demonstration of technology for optimal control using machine learning to improve wind power generation efficiency
	Toshiba Energy Systems & Solutions Corporation	2024 - 2026	Demonstration of rock bed thermal energy storage system technology and development of large-scale thermal energy management model suitable for local communities
	Suzuki Shokai Co., Ltd.	2022 - 2024	Next-generation low-concentration aluminum dross effective utilization technology for carbon neutrality
	Sumitomo Mitsui Construction Co., Ltd.	2022 - 2024	Energy recovery technology using only manure from egg-laying chickens
	Sumitomo Corporation	2023 - 2025	Functional materials optimizing the material flow of rice husks for energy use
	Aiken Kakoki K.K.	2024 - 2026	Research and development for the commercialization of a decentralized energy-generating water treatment system for textile factories
	Kawasaki Giken Co.,Ltd.	2024 - 2026	Development of a gasification reforming system with high carbon recovery rate and power generation facility for small and medium-sized waste treatment plant
	Pacific Power Co., Ltd.	2022 - 2024	Optimization of renewable power generation based on real-time CO_2 emission intensity of electricity
	Elephantech Inc.	2023 - 2025	Mass production technology for low-carbon PCB manufacturing using inkjet printing
	Saibu Gas Co., Ltd.	2023 - 2025	Methanation local production for local consumption model for cost reduction using various local raw materials
	FUJITSU Limited	2024 - 2026	Development of a Digitally Based Low-Distortion, High-Efficiency Transmitter for the Realization of an Advanced Network Society
	NTT DOCOMO, INC.	2024 - 2026	Development and demonstration of 1200V-class DC power feeding system for ICT equipment in the carbon-neutral age

Examples of Past RD&D in the Five Sectors

Tow Tractor

Project Title	Ammonia-fueled small internal combustion engines for decarbonization in various industries
Project Representative	Toyota Industries Corporation
Implementation Period	FY2021 to FY2022

New GREENMODEL

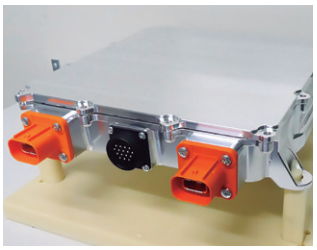
Project Title	RD&D of energy self-sufficient unit
Project Representative	Sekisui Chemical Co., Ltd.
Implementation Period	FY2021 to FY2022

Wind Turbine Generator

Project Title	RD&D of low-voltage wind turbine system
Project Representative	Zephyr Corporation
Implementation Period	FY2020 to FY2022

Coffee Pellets

Project Title	Creating solid fuel from coffee grounds and developing green roasting technology for coffee beans
Project Representative	Allied Coffee Roasters Co., Ltd. (Formerly, Kansai Allied Coffee Roasters Co., Ltd.)
Implementation Period	FY2021 to FY2022



Bi-directional On-board Charger

Project Title	Bi-directional EV charging system technology for autonomous distributed energy systems
Project Representative	Panasonic Holdings Corporation
Implementation Period	FY2019 to FY2021

環境省

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The information in this pamphlet is current as of October 2024.

Regional Co-creation and Cross-sectoral Carbon Neutral Technology Research and Development Program

https://www.env.go.jp/earth/ondanka/cpttv_funds/