

The Kansai Electric Power Group
Zero Carbon Roadmap

Revised in April 2024

The Kansai Electric Power Co., Inc.



Take action together toward zero carbon.

The Kansai Electric Power Group, as a responsible utility company group, is committed to helping society achieve zero carbon in addition to making its operations carbon-free while ensuring a stable supply of electricity.

This involves cooperation with all stakeholders, including customers, business partners and municipalities. We, therefore, have developed the Zero Carbon Roadmap with our commitment represented in the slogan

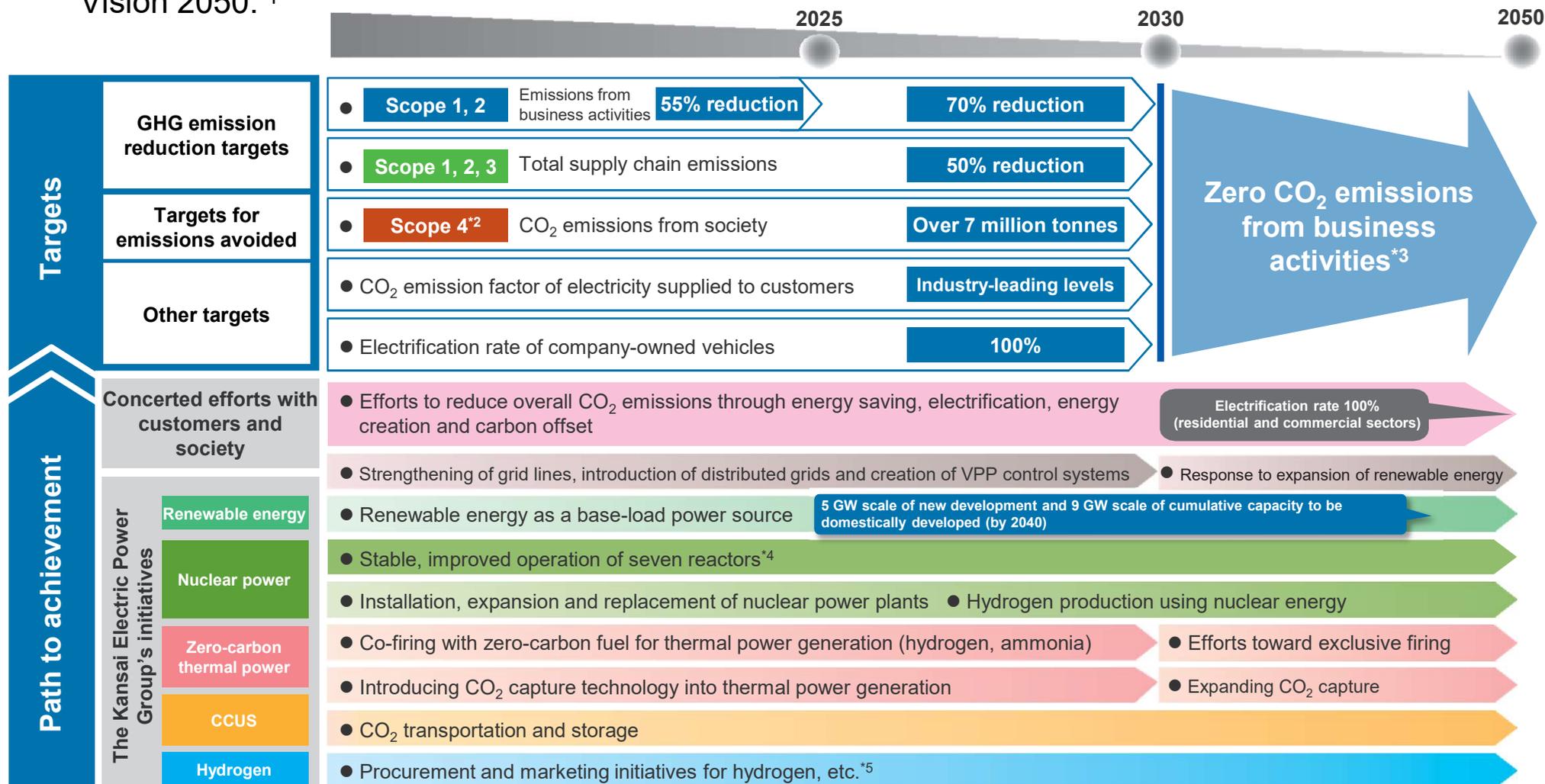
“Take action together toward zero carbon.”

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Roadmap overview

- New targets, including those for supply chain emissions, have been set to reduce overall greenhouse gas (GHG) emissions.
- We will make continuous efforts in line with the Zero Carbon Roadmap to achieve the Zero Carbon Vision 2050.*1



*1 The vision's three key approaches (on the demand, supply and hydrogen sides) are divided into two categories: concerted efforts with customers and society, and the Kansai Electric Power Group's initiatives (including on hydrogen).

*2 Aside from emissions based on the GHG protocol, the Kansai Electric Power Group's contributions to reduction of emissions from society through its products and services are recategorized as Scope 4.

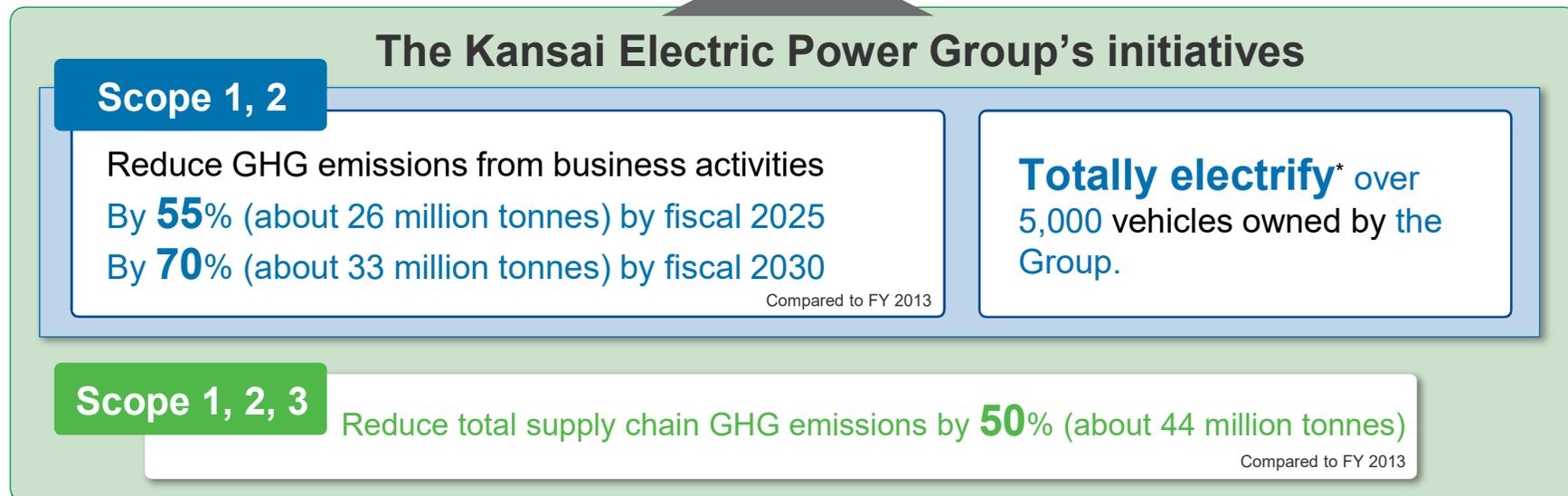
*3 The Zero Carbon Roadmap will be revised as needed to achieve zero emissions by 2050.

*4 All seven reactors successfully resumed operation, following the full-scale restart of Unit 2 of Takahama Nuclear Power Station in October 2023.

*5 Including ammonia

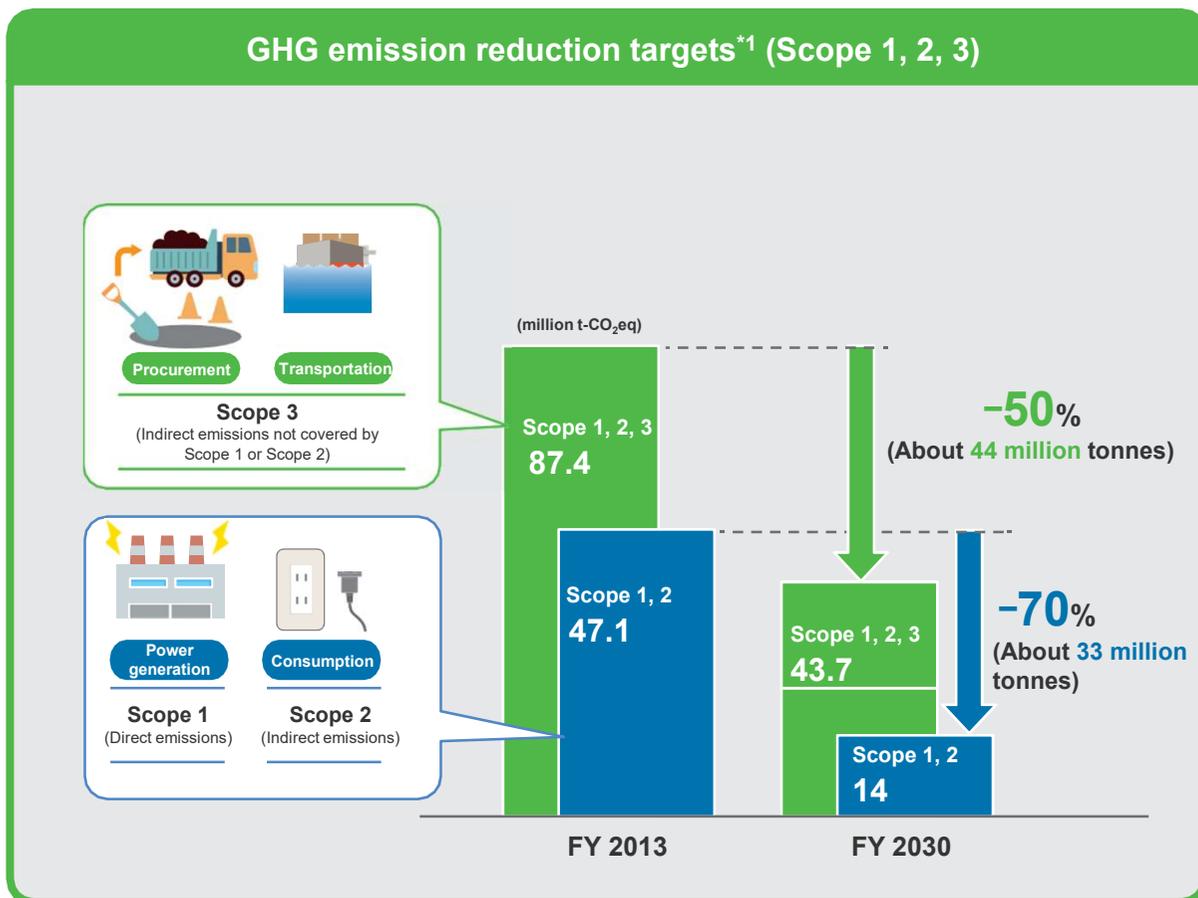
Reduction targets toward fiscal 2030

- Toward fiscal 2030, steadily **reduce GHG emissions from the Kansai Electric Power Group's business activities** while stepping up efforts to **reduce total supply chain emissions**.
- Based on the above, **help customers and society reduce CO₂ emissions**.
- Accordingly, strengthen the resilience of power grid networks while modernizing them in the transmission and distribution business.



*Including electric vehicles (EVs), plug-in hybrid vehicles (PHVs), fuel cell vehicles (FCVs) and hybrid vehicles (HV) but excluding special-purpose vehicles

Targets for GHG emission reductions and contributions



Targets for emissions avoided (Scope 4)

Over **7 million tonnes**

Promoting electrification

Promoting renewable energy

Scope 4
(Avoided emissions*)

*The Kansai Electric Power Group's contributions through its products and services to reduce emissions from society, aside from emissions based on the GHG protocol



As a member of the GX League, the Kansai Electric Power Company set and submitted voluntary emission reduction targets, following the carbon emissions trading system GX-ETS, which was launched in fiscal 2023.

Reduction target levels*2

[1] FY 2023-2025 total	70.66 (million t-CO ₂ eq)
[2] FY 2025	21.35 (million t-CO ₂ eq) (-55% from FY 2013 levels)
[3] FY 2030	14.00 (million t-CO ₂ eq) (-70% from FY 2013 levels)

*1 Emissions shown include those from the Kansai Electric Power Co., Inc., Kansai Transmission and Distribution, Inc., Kanden Energy Solution Co., Inc., Kanden Realty & Development Co., Ltd. and OPTAGE Inc.

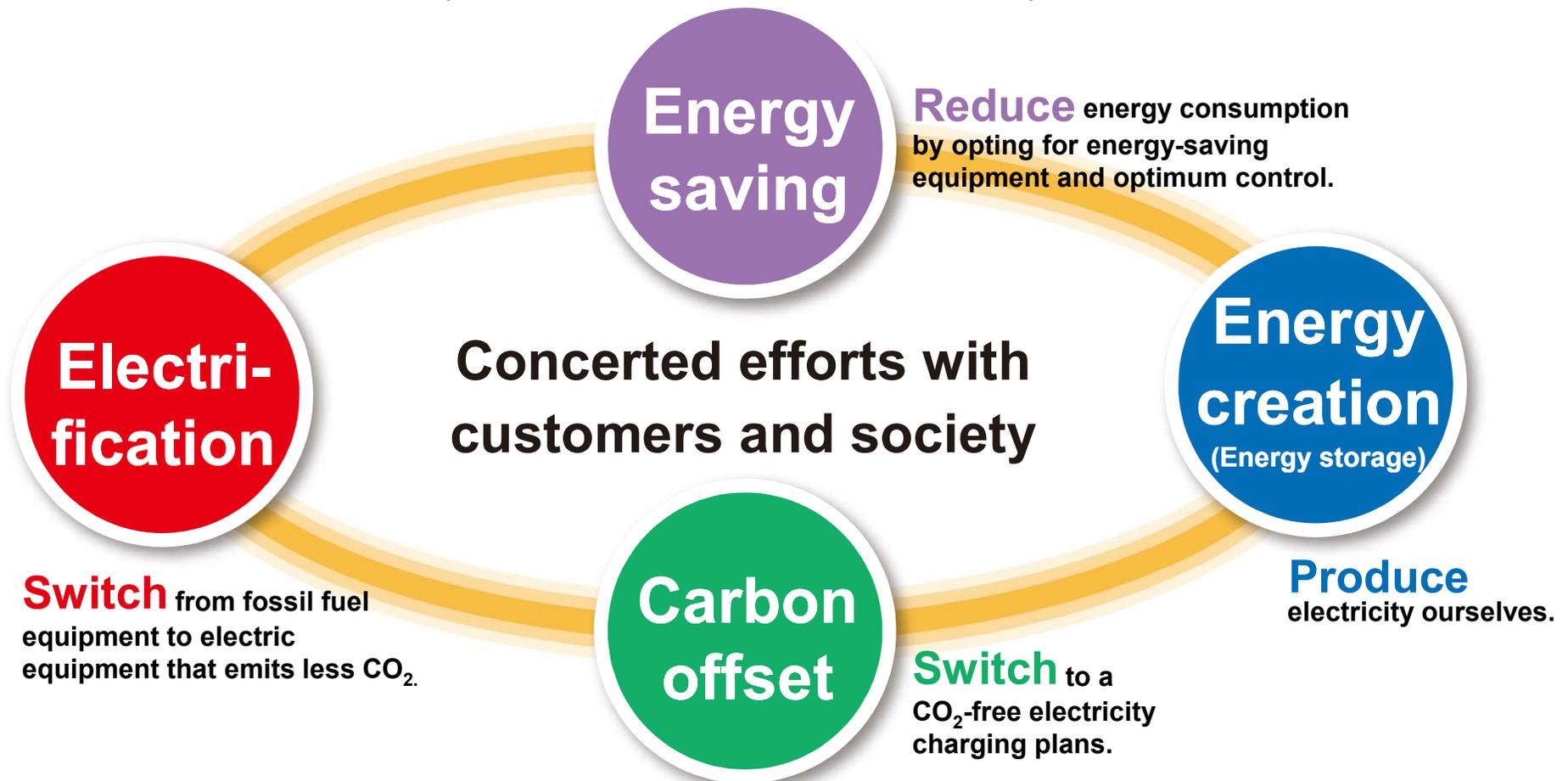
*2 Total of annual direct (Scope 1) and indirect (Scope 2) emission targets submitted to the GX League

Concerted efforts with customers and society

Four approaches for concerted efforts with customers and society

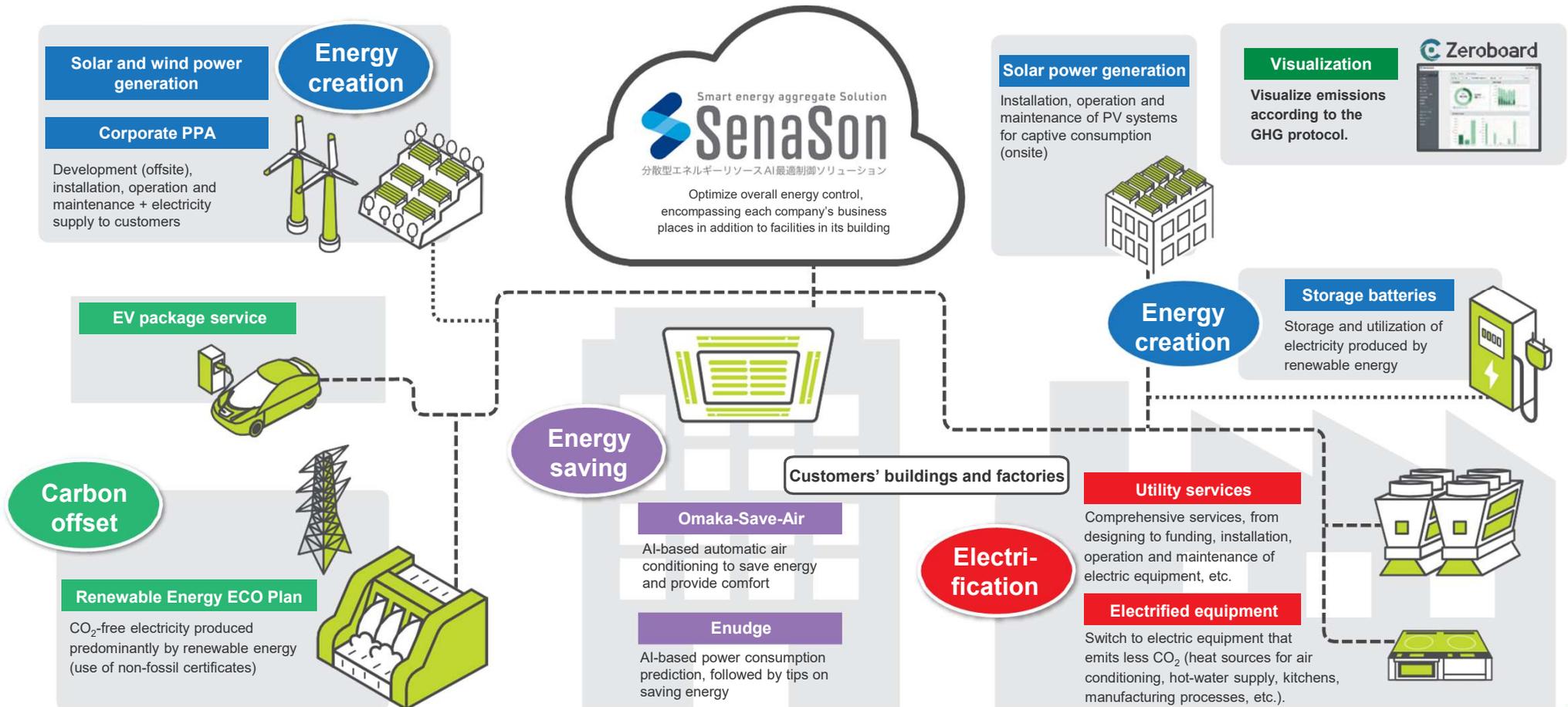
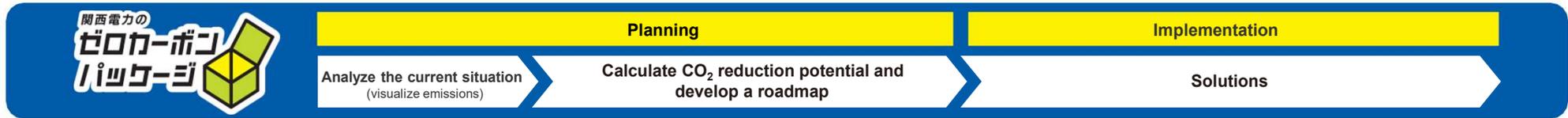
The Kansai Electric Power Group is committed to making concerted efforts with customers and society, focusing on **energy saving**, **electrification**, **energy creation (energy storage)** and **carbon offset**.

With new **targets for avoided emissions (Scope 4)** in place, the Group aims to reduce CO₂ emissions by **more than 7 million tonnes** by fiscal 2030.



Commercial and industrial sectors

- We offer a variety of services from planning to implementation of zero carbon measures as solutions customized according to customers' needs (Zero Carbon Package).



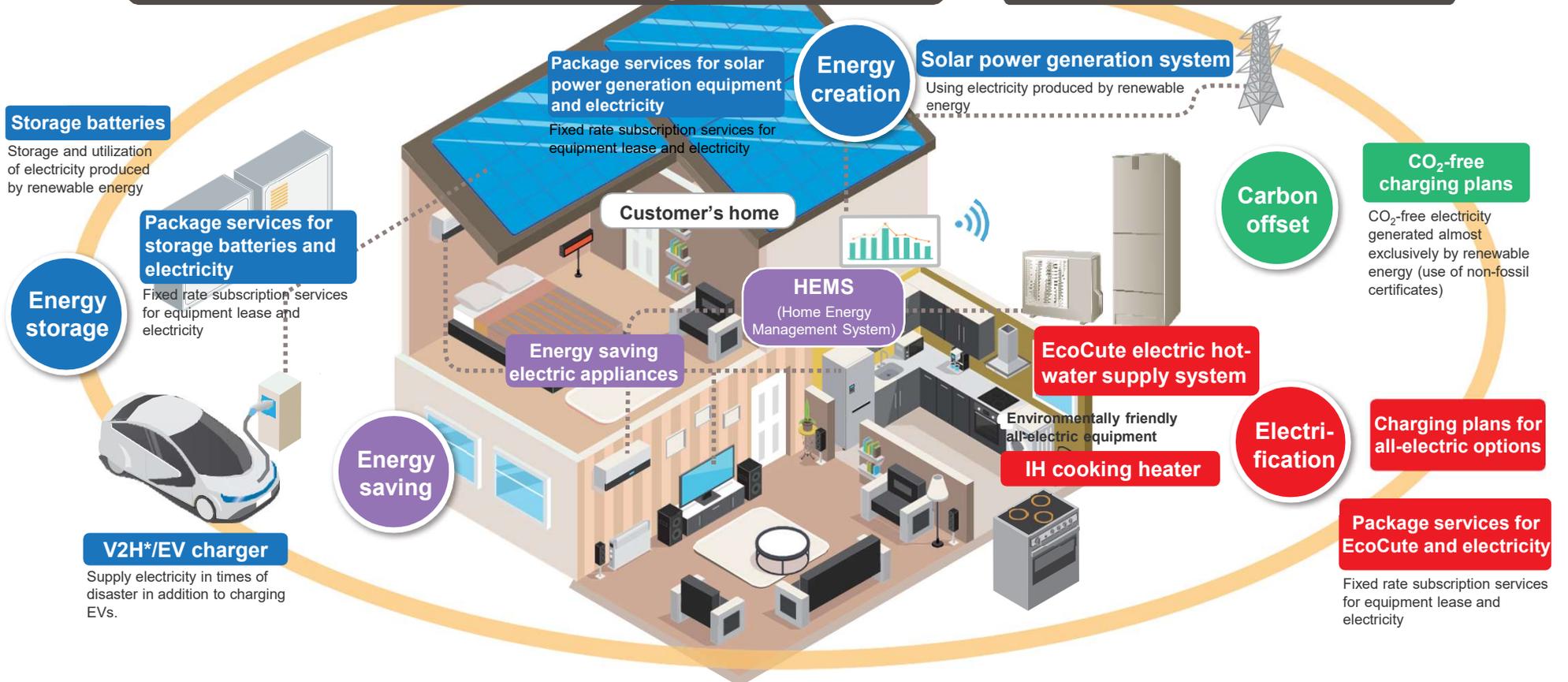
Residential sector

- With a focus on electrification through the promotion of charging plans for all-electric homes and for housing equipment designed to conserve, produce and store energy, we offer CO₂-free charging plans and flat-rate charging services for housing equipment and electricity, thereby providing solutions that contribute to zero carbon plans.

Housing equipment incorporating energy saving, creation and storage

+

Charging plans



*V2H: Vehicle to Home, where the electricity stored is used to power housing equipment in addition to charging EVs.

Transportation sector

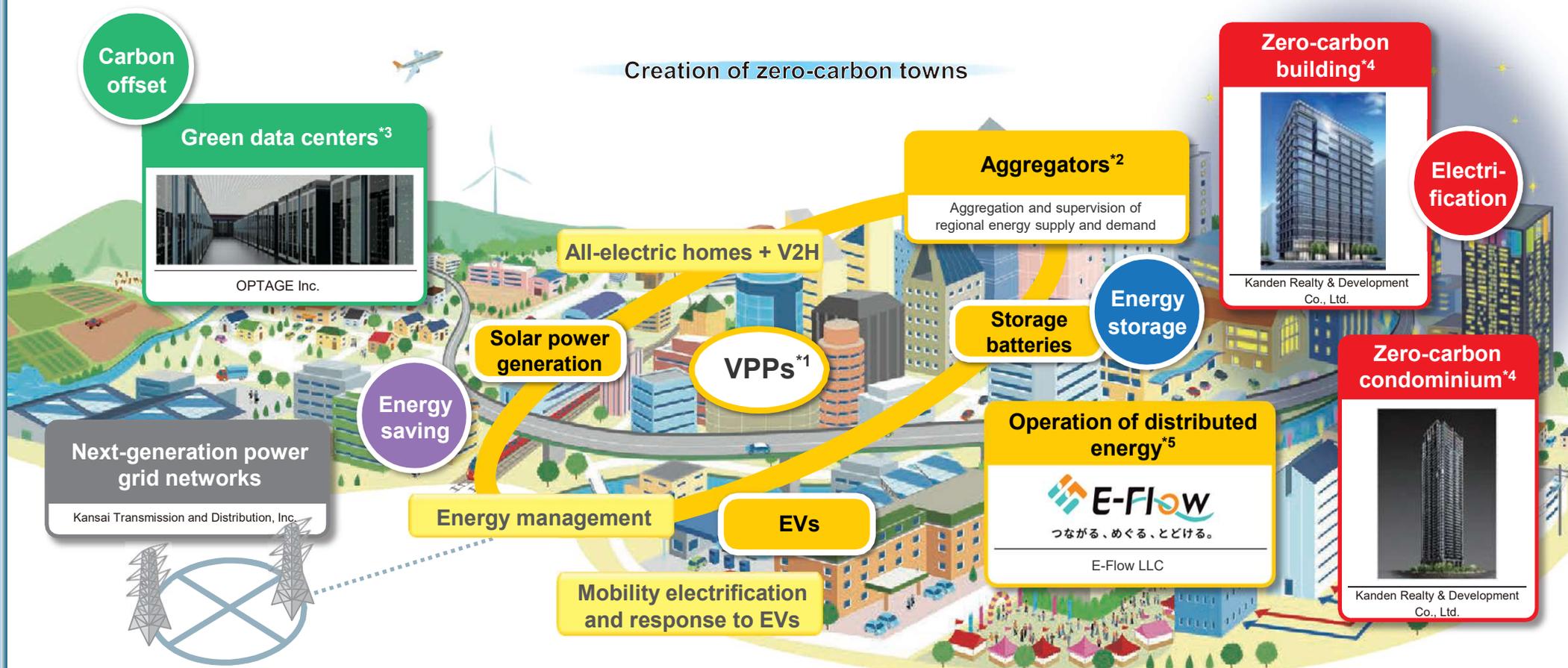
- We offer electric vehicle introduction together with charging services and energy management services.
- We promote electrification of land, sea and air forms of mobility by installing public chargers and supporting the introduction of electric vessels and flying vehicles.



*Versatile, eco-friendly land/air/sea mobility provides seamless and comfortable transportation inside and outside the Expo venues.

Community sector

- Taking into account various community challenges (regional economic revitalization, resilience improvements, etc.), we cooperate with stakeholders such as municipalities and developers and provide wide-ranging services incorporating the Group's various solutions and new technologies.



*1 VPP (Virtual Power Plant): A system to integrate and control distributed energy sources for electricity supply/demand management, designed to simulate the function of a power plant.

*2 Aggregators: Business operators who aggregate power demand from single or multiple customers to create Virtual Power Plants (VPPs).

*3 Green data centers: Energy-efficient, eco-friendly data centers that use renewable energy and incorporate high-efficiency equipment and air-conditioning systems.

*4 Zero-carbon buildings and condominiums: Energy-efficient, all-electric buildings and condominiums (ZEB oriented/ZEH-M oriented or greater) powered by decarbonized energy sources to achieve zero carbon.

*5 E-Flow LLC, which specializes in operation of distributed energy resources, was established in April 2023.

The Kansai Electric Power Group's initiatives

The Kansai Electric Power Group's initiatives

- Take various initiatives to achieve zero carbon emissions, focusing on **renewable energy**, **nuclear power**, **zero-carbon thermal power**, **hydrogen** and transmission and distribution.

Renewable energy

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- Investment target of 1 trillion yen in domestic renewable energy, focusing on off-shore wind power generation by 2040
- New development of renewable energy at a 5 GW scale and achievement of a 9 GW scale of cumulative capacity by 2040

Nuclear power

P. 13

- Improving the operation of nuclear power plants
- Installation, expansion and replacement
- Hydrogen production using nuclear energy

Zero-carbon thermal power

P. 14

- Co-firing with or exclusive firing of zero-carbon fuels for thermal power generation
- Introduction and expansion of CO₂ capture technology

CCUS

P. 15

- Development of value chains for CO₂ liquefaction, transportation and storage

Hydrogen

P. 16

- Full-scale procurement of cost competitive hydrogen and development of receiving stations
- Sales to customers in transportation and other industrial sectors

Transmission and distribution

P. 17

- Strengthening of grid lines, operation of distributed grids, and creation of VPP control systems
- Introduction of equipment designed to reduce GHG emissions

Renewable energy

- The Kansai Electric Power Group, as a leading company in zero-carbon energy, is committed to strengthening its development system, including engineering and marketing capabilities, with a focus on offshore wind power generation that has great growth potential.
- Through investment of a total 1 trillion yen in domestic projects, we aim to develop 5 GW* scale of new development and to achieve 9 GW scale of cumulative capacity by 2040.

Toward the goal

- Promote development of bottom-fixed offshore wind projects
- Promote demonstration and development of floating offshore wind projects for planned expansion of development area into exclusive economic zones

5 GW scale of new development

9 GW scale of cumulative capacity

to be domestically developed by 2040

Accelerate development toward 2050

- Development efforts made so far

We are one of Japan's premier developers and operators of hydropower in terms of capacity, and we are also developing a range of other renewable energy resources

Hydropower



Nam Ngiep 1

Offshore wind



Akita Port and Noshiro Port Project (Bottom-fixed) (Source: Akita Offshore Wind Corporation)



Triton Knoll Project (Bottom-fixed)



DemoSATH Project (Floating)

* Results as of the end of fiscal 2023: Domestic installed capacity increased by about 520 MW.

Nuclear power

- Giving top priority to safety, the Kansai Electric Power Group will leverage nuclear energy as much as possible.
- While improving the operation of nuclear power plants, we will focus on tapping the full potential of nuclear power such as for hydrogen production, in addition to considering new installation, expansion and replacement with advanced light water reactors, etc.

Extracting the full potential of nuclear power

Approach 1

Improving the operation of nuclear power plants

- Referencing measures at nuclear power plants overseas, discuss our initiatives to improve the operation rate (flexible operation period, optimization of the timing, period of inspections, and more).

Approach 2

Installation, expansion and replacement

- Work with plant manufacturers to design advanced light-water reactors that outperform existing reactors in safety and cost efficiency.
- Gather knowledge on new reactors being developed at home and abroad (such as SMRs and high-temperature gas-cooled reactors with great potential) to study technical feasibility.



Rendering of the advanced light water reactor SRZ-1200
(source: Mitsubishi Heavy Industries)

Approach 3

Hydrogen production using nuclear energy

- Extract the full potential of nuclear energy, which constantly produces a massive amount of zero-carbon electricity, to use the electricity and heat it produces for hydrogen production in the future.

Zero-carbon thermal power

- With the goal of achieving 100% zero-carbon fuel power by 2050, feasibility studies are conducted to start co-firing in around 2030 by retrofitting and/or replacing our existing thermal power plants.
- We are investigating installation of CCUS technologies in existing thermal power plants in around 2030 to expand our capability to capture as much CO₂ as possible in 2050.

Co-firing with or exclusive firing of zero-carbon fuels

Hydrogen co-firing around 2030; Exclusive firing by 2050

Initiatives

- **Demonstration of power generation by co-firing with hydrogen at the Himeji No. 2 Power Station**
 - The detailed design for the demonstration using one power generation facility at the Himeji No. 2 Power Station started in fiscal 2023 (as part of NEDO Green Innovation Fund Projects).
 - The demonstration is to be conducted in fiscal 2025.



Introduction of CCUS

Introduction of CCUS to thermal power generation around 2030; Expansion of CO₂ capture by 2050

Initiatives

- **Feasibility studies for CO₂ capture, liquefaction and storage in the Sakai Senboku area**
 - Joint feasibility studies with Cosmo Energy Holdings started in October 2023 into the creation of a CCS value chain in the Sakai Senboku area.
 - Issues to be studied include feasibility and cost-effectiveness of capture, liquefaction, storage and shipment of CO₂ emitted from power plants, etc.



◆ Replacement at the Nanko Power Station for high-efficiency, zero-carbon operations

- Decided to replace the Nanko Power Station for high-efficiency operations and future CCS-incorporated or hydrogen exclusive firing operations.

2024–2025 Decommissioning of existing facilities

- Existing facilities will be decommissioned by the end of March 2025.

2026–2030 Facility upgrades for advanced operations

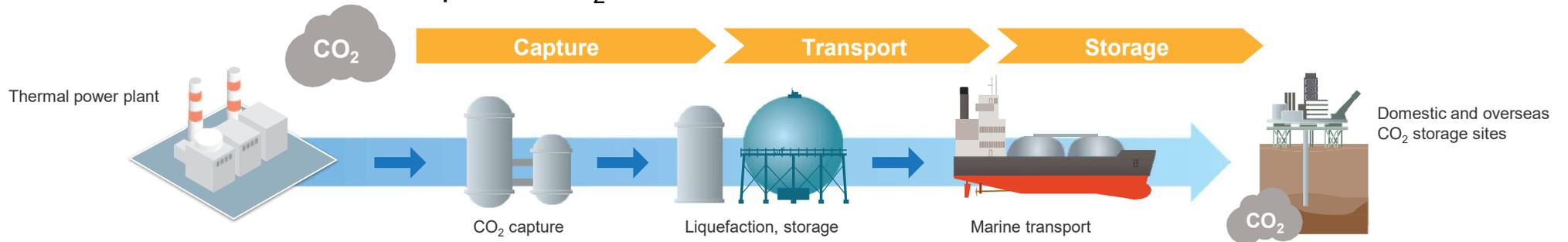
- Combined cycle units with higher efficiencies will start replacing existing units in fiscal 2026.
- Commercial operations are scheduled to start no earlier than fiscal 2029.

Late 2030s–2050 Zero-carbon operations

- Zero-carbon operations through the installation of CCS or hydrogen exclusive firing.

CCUS

- Our goal is to implement CCS technologies and develop a value chain for captured CO₂ from exhaust gases, including liquefaction, transportation and storage underground.
- We take a leading position in CCS initiatives for the Kansai region not only by transitioning thermal power generation to zero carbon but also by supporting regional customers to reduce their CO₂ emissions.
- In addition, we investigate the feasibility of CCU, a process that synthesizes chemical compounds such as methane from captured CO₂.



[Activities on CCUS]

Capture

Demonstration of CO₂ capture technology at the Himeji No. 2 Power Station

A pilot plant will be installed in cooperation with Mitsubishi Heavy Industries to demonstrate next-generation CO₂ capture technology and develop high-performance absorbent, etc.



Transport

Participation in development and demonstration of CO₂ marine transport technology

Safer and cost-effective CO₂ mass transport technology will be developed through a marine transport demonstration between Maizuru Power Station and Tomakomai base as a NEDO project.



Demonstration vessel EXCOOL (source: NEDO and Sanyu Kisen Co., Ltd.)

* NEDO: New Energy and Industrial Technology Development Organization
Project name: CCUS research and development/demonstration project / Large-scale CCS demonstration project in Tomakomai / Demonstration test related to CO₂ transport

Storage

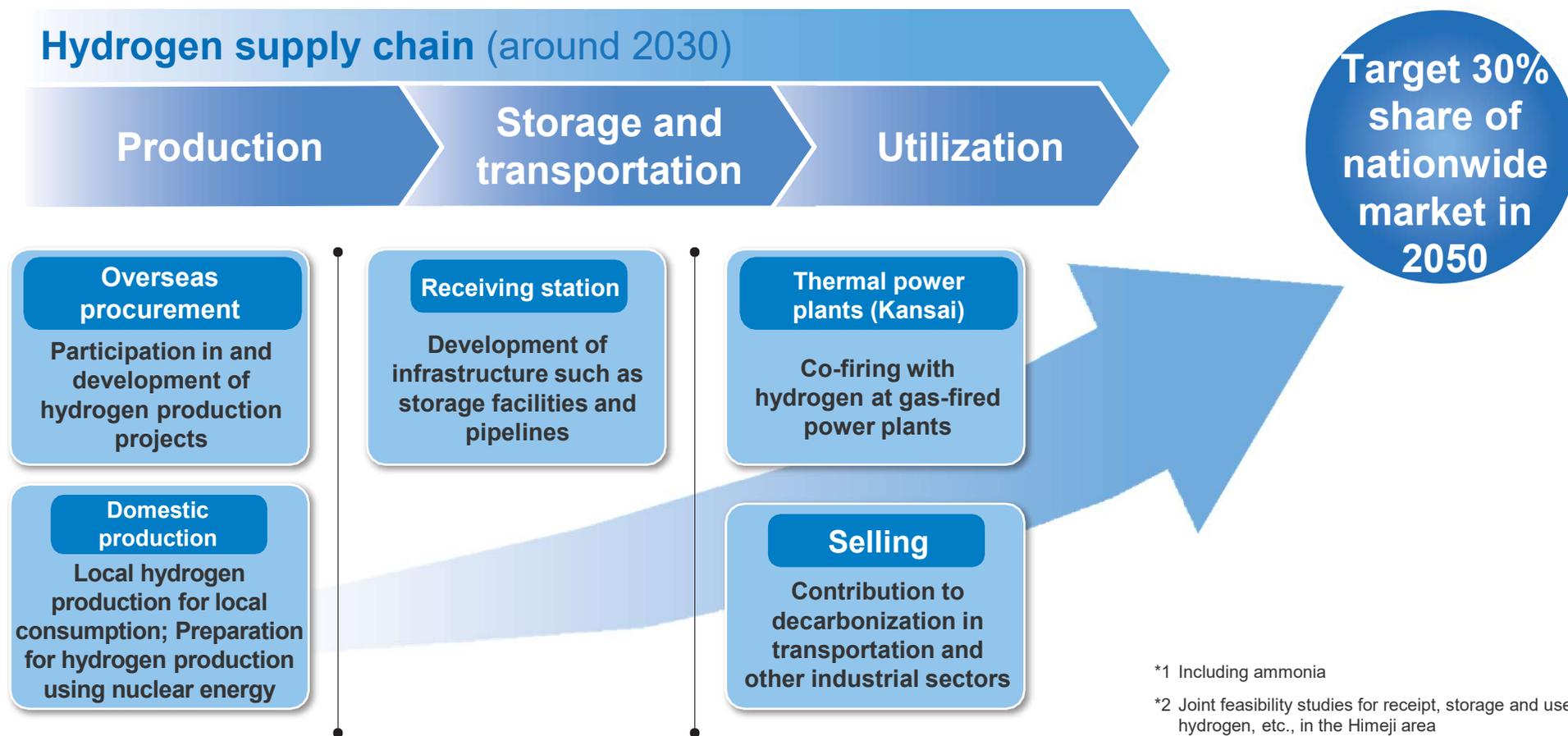
Research and feasibility studies for CCS with storage operators

Example:
Feasibility studies for an integrated CO₂ value chain with Mitsui & Co., Ltd.

Hydrogen

- We aim to establish a supply chain for hydrogen, etc.,*1 in around 2030, with a variety of options examined extensively.*2
- We will gear up for procurement from overseas and for production at home to source cost competitive hydrogen.
- We will use hydrogen as a fuel for thermal power generation while supplying hydrogen to customers in transportation and other industrial sectors to expand hydrogen business, looking ahead to 2050.

Hydrogen supply chain (around 2030)



*1 Including ammonia

*2 Joint feasibility studies for receipt, storage and use of hydrogen, etc., in the Himeji area

Transmission and distribution business

- As power grid networks, which connect power plants with various power grid users, including customers, play a pivotal role in realizing zero carbon, we are committed to ensuring a stable power supply by expanding and upgrading power networks while introducing distributed grids.
- We are also committed to reducing the environmental impact of our operations by decarbonizing every operation in the power transmission and distribution business. Specific measures include upgrading and strengthening grid lines and trunk power systems to tap renewable energy, expanding cross-regional grid networks, and introducing more equipment designed to reduce GHG emissions.
- We will develop a next-generation power network that serves as a basis for realizing zero carbon. Specific measures include developing VPP control systems for storage batteries and EVs, upgrading services using electricity data and shifting to advanced grid operations that make the most of renewable energy.

Stable supply

Connect power plants with various power grid users, including customers, while ensuring stable electricity supply.

To be implemented continuously

- Expand and upgrade power facilities steadily.
- Connect newly developed renewable energy sources to power grids promptly and steadily.
- Publicize Welcome Zones*1.
- Introduction of distributed grids

*1 Welcome Zones: Places where electricity is supplied in a relatively quick and cost-effective manner, located in six prefectures in the Kansai area.

Environmental load reduction

Leverage eco-friendly electricity.

Before 2030

- Upgrade and strengthen grid lines and trunk power systems.
- Expand cross-regional grid networks.
- Introduce equipment designed to reduce GHG emissions.
- Further upgrade trunk power systems.

After 2030

- Decarbonize every operation in the power transmission and distribution business*2

*2 Power transmission and distribution business: Managed by Kansai Transmission and Distribution Inc.

Next-generation services

Provide electricity and valuable services in a free and convenient manner.

Before 2030

- Develop VPP control systems for storage batteries and EVs, and upgrade services using electricity data
- Advanced grid operations, making the most of renewable energy.

After 2030

- Leverage a database that combines other industries' data.