



# CCUS and Low Carbon Fuels

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11 – 12 March 2025 | Tokyo, Japan

## Establishment of a liquid hydrogen Supply Chain

Nobuaki Ebisaka

The Kansai Electric Power Co., Inc.



# Company Overview – Our History

*One of the biggest utility companies in Japan with a track record of innovation and leadership in the industry*

## History of Kansai - Milestones

- 1951 Kansai Electric Power established
- 1957 Nuclear Power Department launched, R&D on nuclear power begins  
*First entry into nuclear by Japanese utility*
- 1963 Construction of Kurobe River No.4 Power Station (335MW) completed  
*One of the largest plants in Japan at the time*  
*The highest dam in Japan*  
*Awarded the IEEE Milestone (in 2010)*
- 1998 Joined San Roque hydroelectric power generation project in the Philippines  
*First overseas generation project by a Japanese utility*
- 2000 Anan - Kihoku DC main-line  
*250kV direct current power transmission line in Japan*
- 2011 Sakai Solar Power Station fully operational  
*First mega-solar project by a Japanese utility*
- 2021 “Zero Carbon Vision 2050”  
*Declaration for a sustainable society as a leading company of zero-carbon energy.*

**1963~ Kurobe No.4**



**1998~ San Roque**



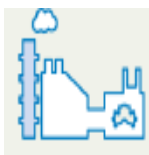
# Company Profile of Kansai Electric Power

## 4 Business segments



■ Energy, Life/Business Solution,  
Information and Telecommunications,  
Transmission and Distribution

28GW



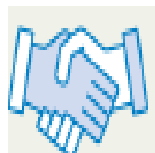
■ Capacity under  
Operations

USD  
28Billion



■ 2023 Total Revenue

A3



■ Moody's rating

## Company Data (Year Ended 31 Mar 2024)

|                           |                                 |                  |
|---------------------------|---------------------------------|------------------|
| Establishment             | May 1,1951                      |                  |
| Moody's Rating            | A3                              |                  |
| Capital                   | USD 3.4 billion (Consolidated)  |                  |
| Total assets              | USD 62.3 billion (Consolidated) |                  |
| Power Generation Capacity | Hydropower                      | 8,259 MW         |
|                           | Thermal                         | 13,001 MW        |
|                           | Nuclear                         | 6,578 MW         |
|                           | Renewable                       | 11 MW            |
|                           | <b>Total</b>                    | <b>27,849 MW</b> |
| Power Grid                | Transmission Line               | 18,829 km        |
|                           | Distribution Line               | 133,459 km       |
| Total electricity sales   | 117 TWh                         |                  |
| Total revenue             | USD 28.0 billion (Consolidated) |                  |
| Employees                 | 31,628 (Consolidated)           |                  |

# Overview of Japan's 7th Strategic Energy Plan

- Since the revision of the Strategic Energy Plan in October 2021, Japan's energy situation has changed dramatically. In response, the Ministry of Economy, Trade and Industry (METI) has set a new target to reduce greenhouse gases by 73% by FY2040, compared to FY2013, and revised the Strategic Energy Plan accordingly.

|                                                   | 2023 Preliminary | 2040 Outlook       |
|---------------------------------------------------|------------------|--------------------|
| <b>Electric power generation</b>                  | 985.4 TWh        | 1,100-1,200 TWh    |
| <b>Power generation composition:</b>              |                  |                    |
| <b>Renewable energy</b>                           | 22.9%            | <b>40~50%</b>      |
| Solar                                             | 9.8%             | 23~29%             |
| Wind                                              | 1.1%             | 4~8%               |
| Hydro                                             | 7.6%             | 8~10%              |
| Geothermal                                        | 0.3%             | 1~2%               |
| Biomass                                           | 4.1%             | 5~6%               |
| <b>Nuclear</b>                                    | 8.5%             | <b>20%</b>         |
| <b>Thermal</b>                                    | 68.6%            | <b>30~40%</b>      |
| <b>Final energy consumption</b>                   | 3.0 billion kL   | 2.6-2.7 billion kL |
| <b>GHG reduction rate</b><br>(compared to FY2013) | 22.9%            | <b>73%</b>         |



## Points recognized by Kansai

- The 2040 energy mix is set to 40-50% renewable energy, 30-40% thermal power, and 20% nuclear power.
- The goal is to have nuclear power constitute approximately 20% of the energy mix by 2040, removing the expression reduce dependence on nuclear power as much as possible.
- Renewable energy will become the largest power source, surpassing thermal power for the first time.
- Thermal power will still provide 30-40% of the supply, and its decarbonization is key to meeting overall targets.**

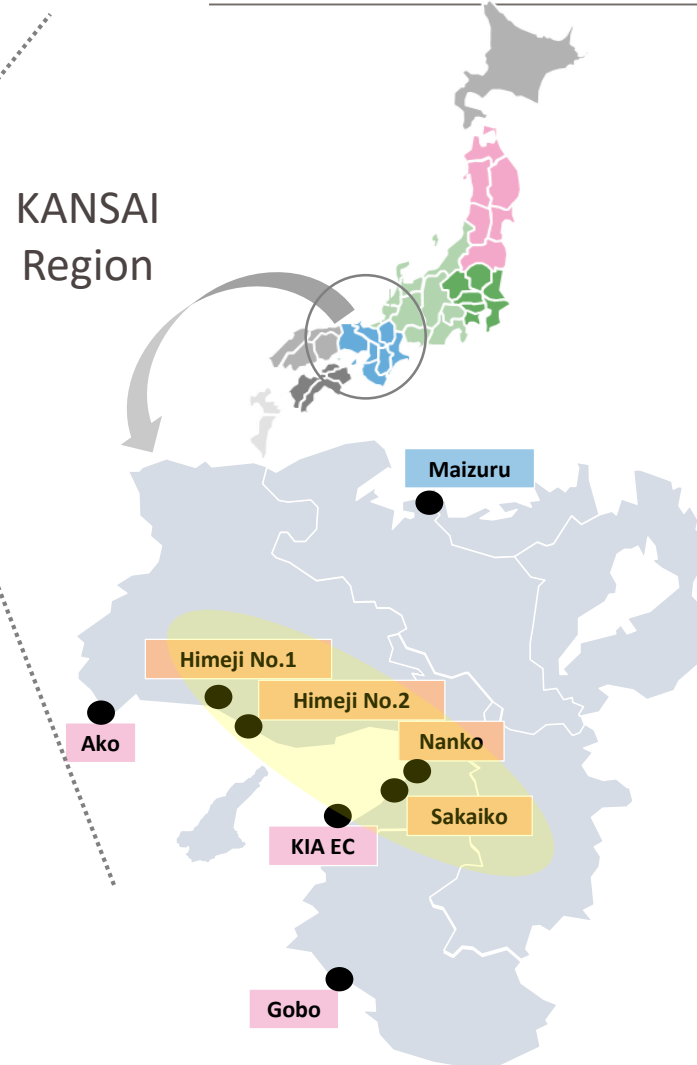
# Kansai's power generation portfolio

#/Cap of Power Plants ※1  
(Year Ended 31 Mar 2024)

| Method       | Max Power (MW) |
|--------------|----------------|
| Thermal      | 13,001         |
| Nuclear      | 6,578          |
| Hydro        | 8,259          |
| PV           | 11             |
| <b>Total</b> | <b>27,849</b>  |

※1 Excludes power plants and net capacity operated by KANSAI's subsidiaries (groups)  
Source: Kansai HP

## Location of Thermal Power Plants (Year Ended 31 Mar 2024)



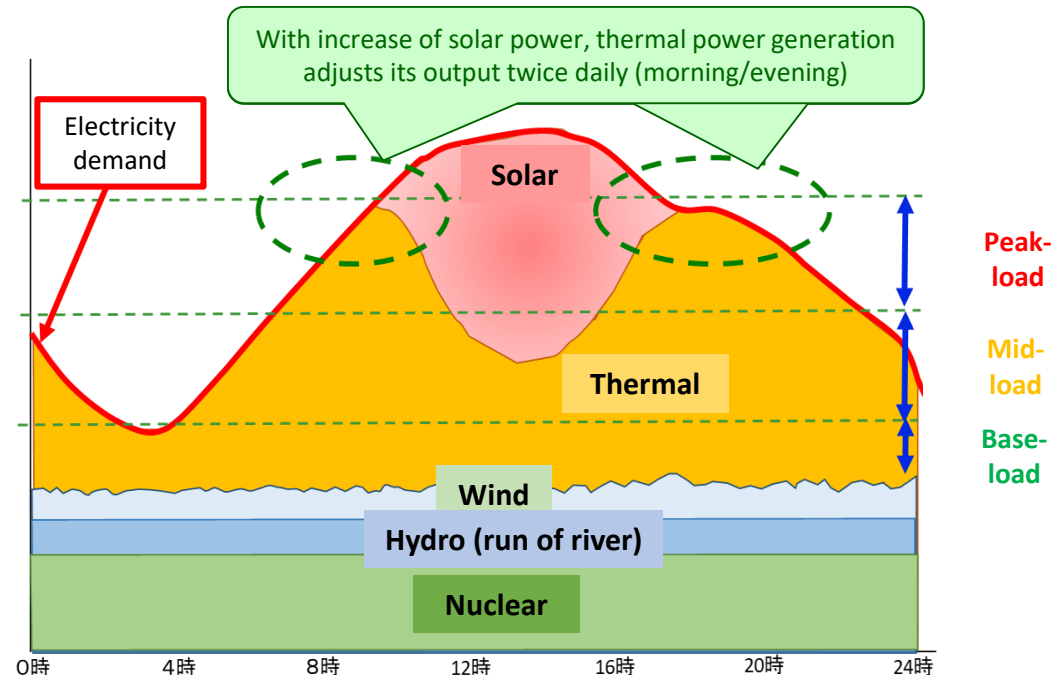
| Station           | Capacity (MW) | Method                    | Main fuel             |
|-------------------|---------------|---------------------------|-----------------------|
| Maizuru           | 1,800         | Steam                     | Coal                  |
| Sakaiko           | 2,000         | Combined Cycle            | LNG                   |
| Himeji No.1       | 1,442         |                           |                       |
| Himeji No.2       | 2,919         |                           |                       |
| Nanko             | 1,800         | Steam                     |                       |
| Ako               | 1,200         | Steam                     | Heavy Oil & Crude Oil |
| Gobo              | 1,800         |                           |                       |
| KIA Energy Center | 40            | Gas Turbine               |                       |
| <b>Total</b>      | <b>13,001</b> | <b>(total of working)</b> |                       |

# Role and Characteristic of Thermal Power Plants in General

## Demand/Supply adjustment

- To ensure stable supply of electricity, it is necessary to constantly balance demand/supply
- Thermal power is flexible in adjustment of its generation, thus contributes to stable supply by operation based on actual demand.

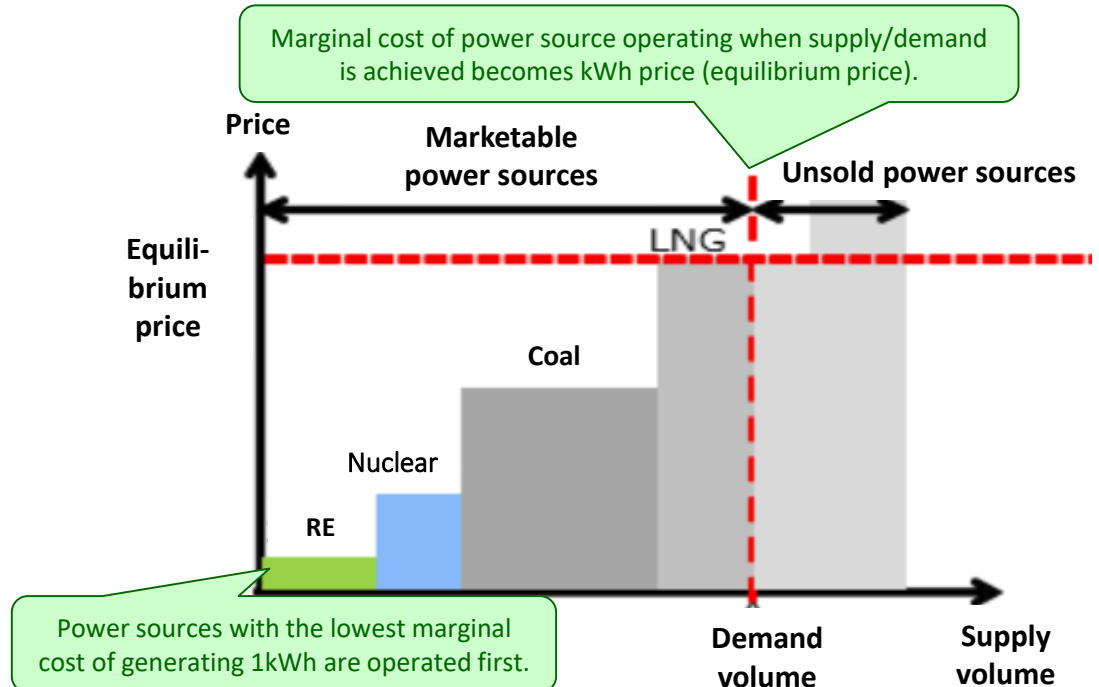
### <Combination of each type of power generation>



## Economic Management

- Economic efficiency is considered by prioritizing operation of power plants with lower fuel costs as base load of demand, and those with higher fuel costs are operated for middle to peak load.

### <Concept of Merit-order>



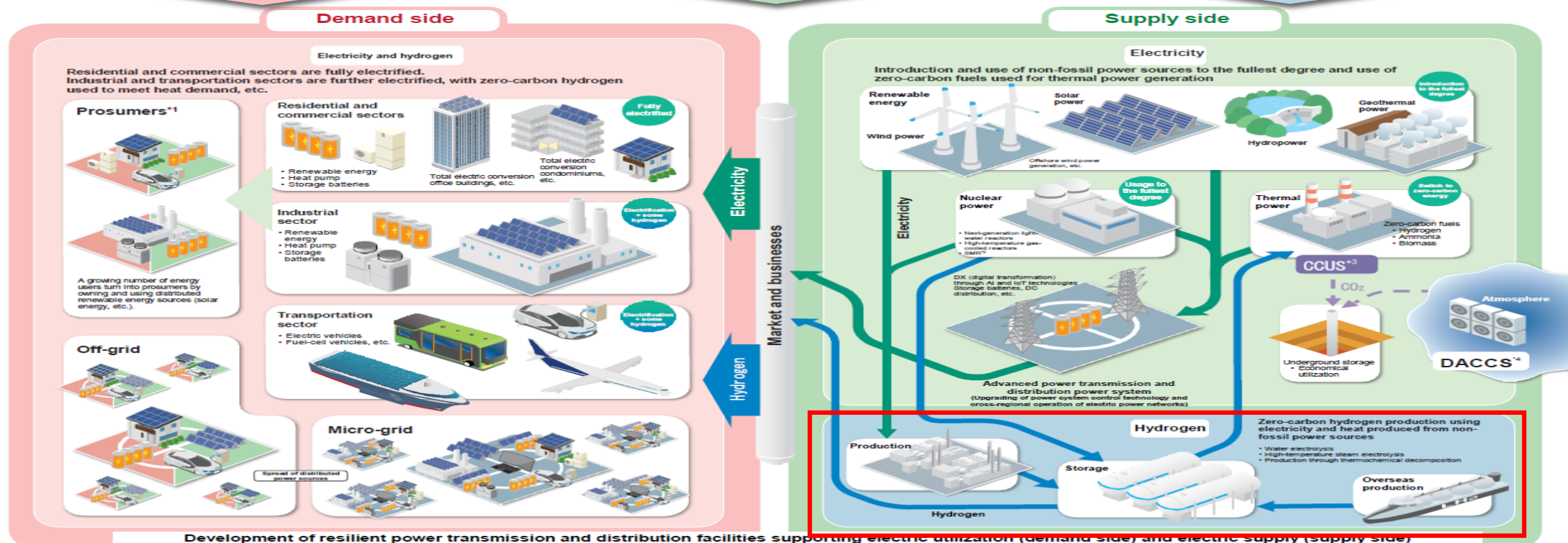
# Kansai's Zero Carbon Vision 2050 – Three key approaches

- Under the slogan "Set Net Zero by 2050", Kansai is working to promote electrification on the demand side with decarbonized power generation sources.
- Kansai plans to achieve de-carbonization by replacing our fossil fuels with hydrogen, in addition to renewables, nuclear power, CCS, etc.
- In addition, Kansai is willing to contribute to the de-carbonization of the society as a hydrogen supplier.

## ① Zero carbon emissions on the demand side

## ② Zero carbon emissions on the supply side

## ③ Creation of hydrogen-driven society



<sup>\*1</sup>. Prosumer: A consumer who consumes the electricity they generate while selling any surplus on the market.

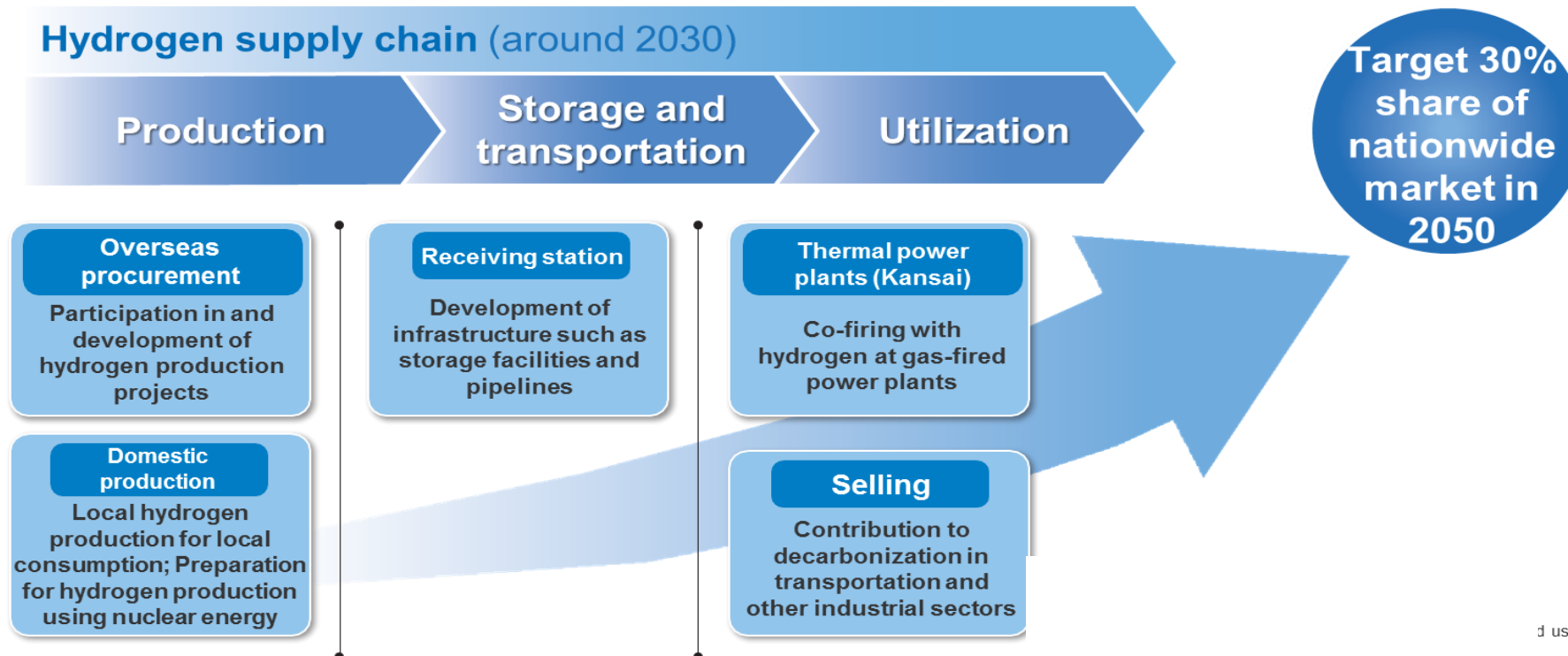
<sup>\*2</sup>. SMR: Small Modular Reactor

<sup>\*3</sup>. CCUS: Technologies of Carbon Dioxide Capture, Utilization and Storage

<sup>\*4</sup>. DACCS: Technologies that capture CO<sub>2</sub> directly from the atmosphere

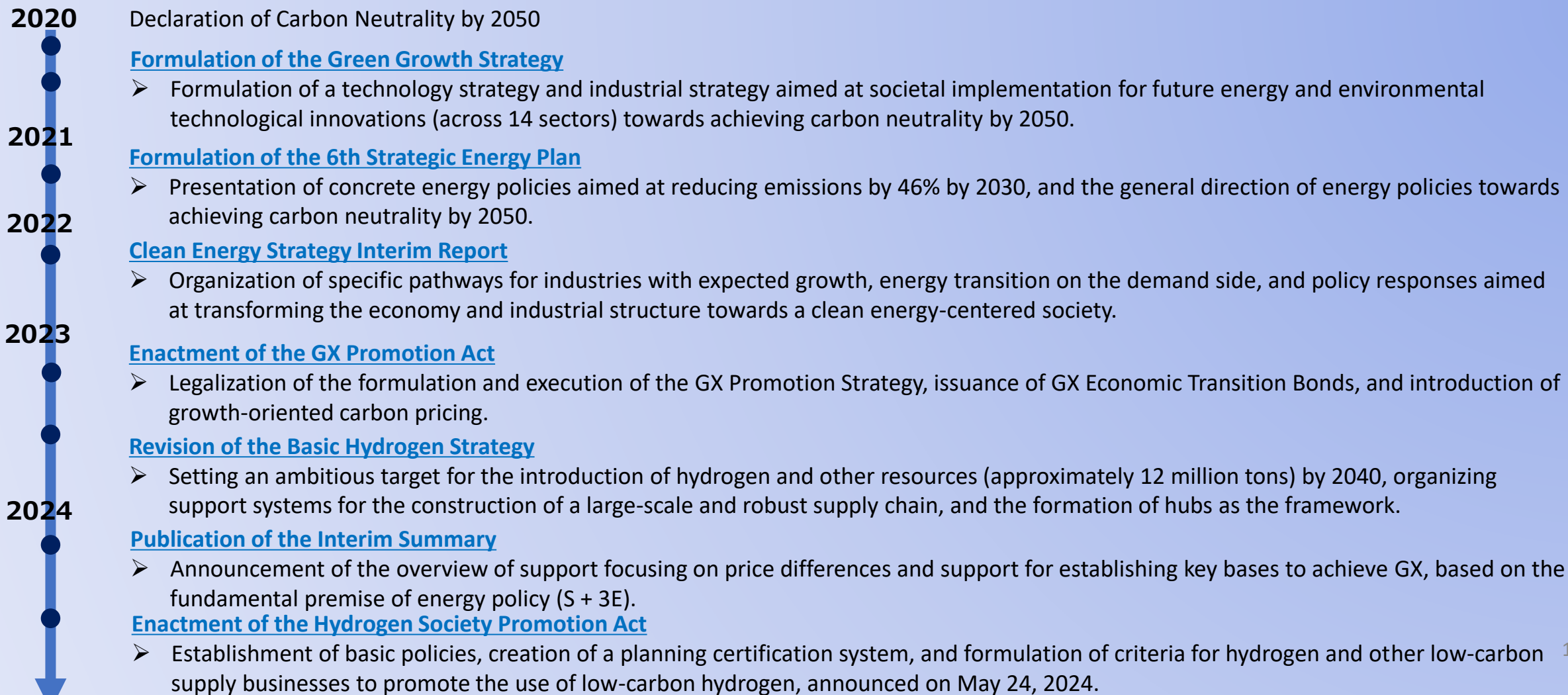
# Kansai's ambition to establish hydrogen supply chain

- Kansai aims to establish hydrogen supply chain in 2030s by making proactive contributions through the entire supply chain.
- Kansai will gear up for procurement from overseas together with domestic production to source cost competitive hydrogen.
- Kansai 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.



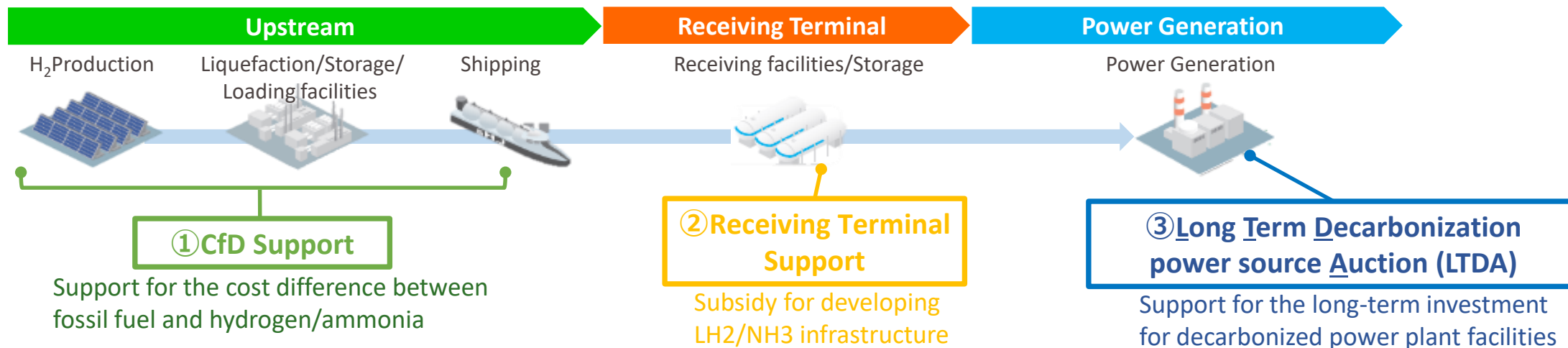
# Domestic Policy Developments in Decarbonization

- Since the declaration of carbon neutrality by 2050 in October 2020, the government has been actively exploring a range of policies to achieve this goal.

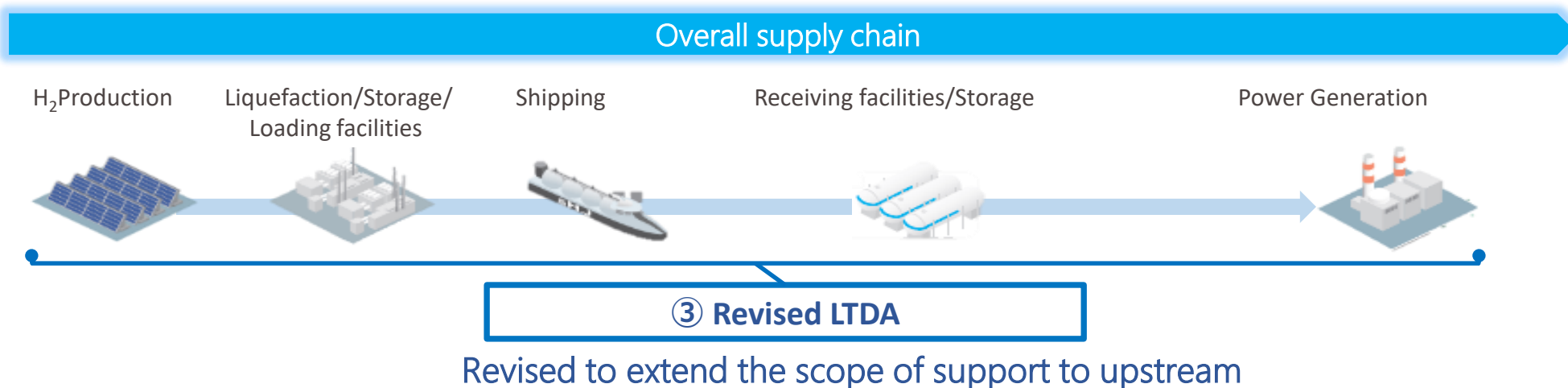


# Government Policy Support for Hydrogen Introduction

So far...

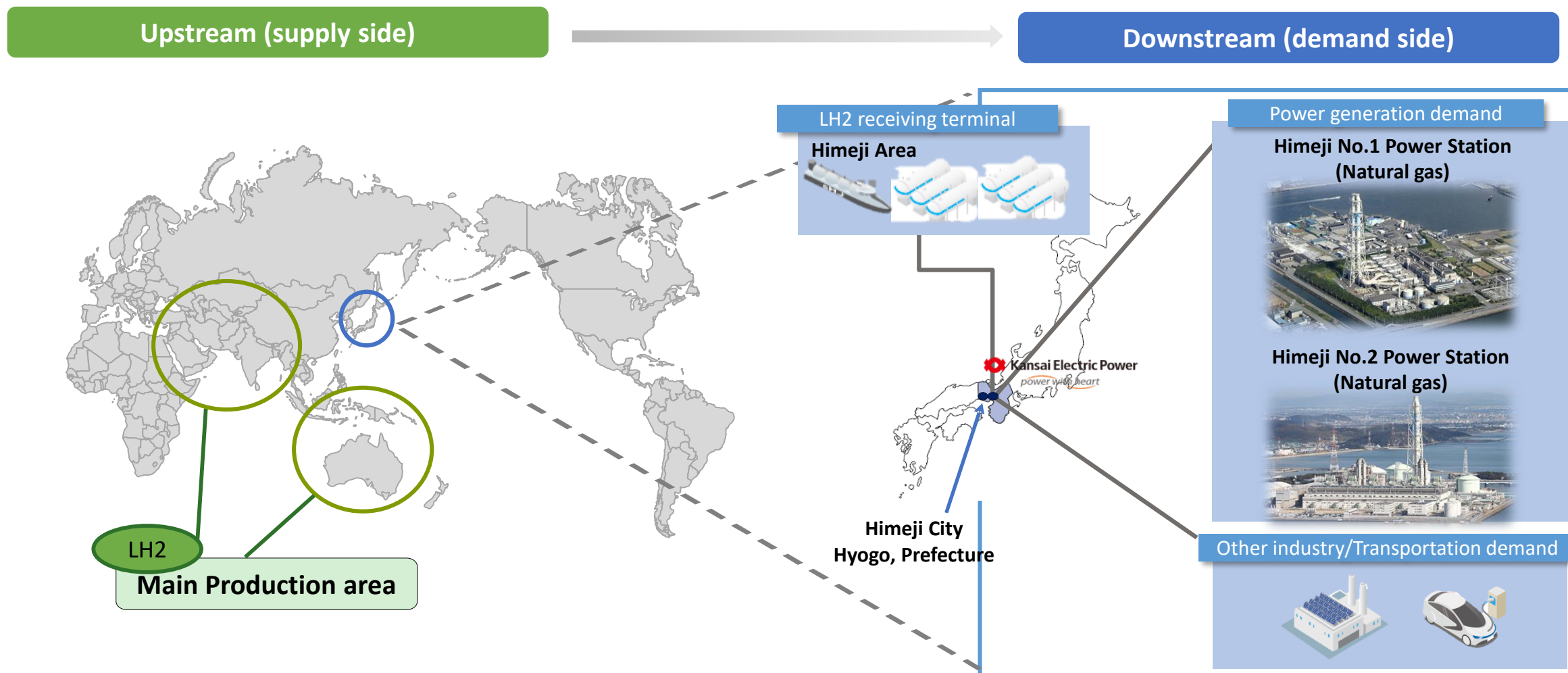


In the 2<sup>nd</sup> bid (scheduled in Jan. 2025) or later



# Kansai's efforts to develop LH2 supply chain

- Kansai aims to develop a liquid hydrogen supply chain between overseas and Himeji in Japan, aiming to supplying Kansai's own thermal power plants and surrounding industries.



# Addressing the Hurdles in the Liquid Hydrogen Supply Chain

- To overcome the identified challenges, various initiatives and strategies are being undertaken. These efforts aim to enhance the efficiency and reliability of the liquid hydrogen supply chain, ensuring its viability and sustainability for future needs.

**November 19, 2024**  関西電力 *power with heart*

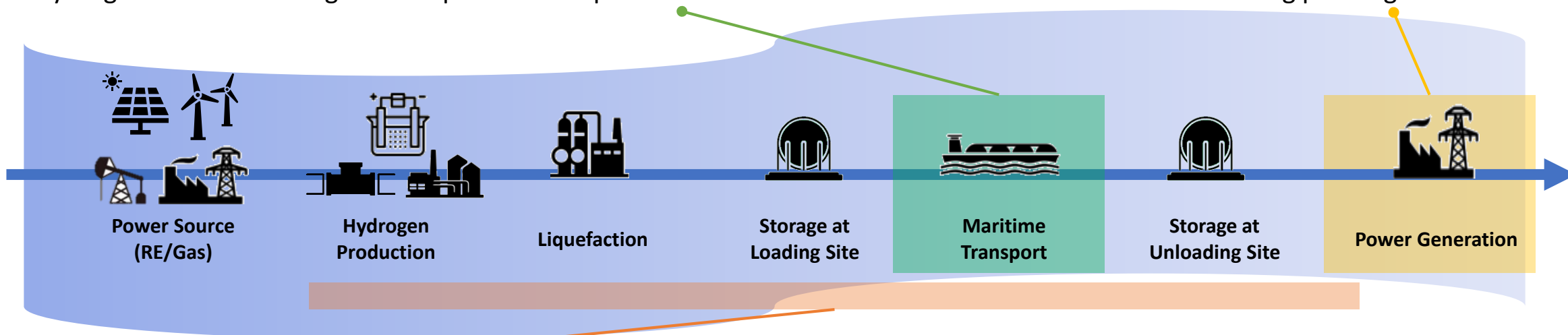


Kansai Electric Power and Mitsui O.S.K. Lines sign MOU for joint study on liquid hydrogen vessels focusing on the operational aspects

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Demonstration project of hydrogen co-firing power generation



**December 2, 2022**

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Kansai Electric Power and Kawasaki Heavy Industries sign MOU for collaboration in maritime transportation towards the establishment of a liquid hydrogen supply chain

## Kansai Electric Power and Mitsui O.S.K. Lines sign MOU for joint study on liquid hydrogen vessels focusing on the operational aspects

- Kansai have signed a Memorandum of Understanding (MoU) with Mitsui O.S.K. Lines, focusing on the operational aspects of liquid hydrogen vessels.
- This collaboration aims to enhance the feasibility of maritime transportation.

### The main areas of consideration include:

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- Technological and contractual considerations related to the vessels
- Examination of potential challenges in the supply chain, including necessary permits and approvals
- Analysis and review of cargo handling operations and ship shore compatibility
- Consultations with classification societies and regulatory authorities concerning this study
- Economic analysis of the liquid hydrogen supply chain, particularly related to transportation

### The roles of each company are as follows:

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Providing expertise in the supply and operation of LNG and receiving terminal management



Providing expertise in ship ordering, construction, maintenance, operation, ownership, and compliance with various regulations

## Demonstration project of hydrogen co-firing power generation

- Kansai is conducting a demonstration project of hydrogen co-firing power generation using an existing gas turbine unit in Himeji No.2 Power Plant.
- The project is aiming to start the demonstration during the EXPO 2025 in Osaka.

### Purpose of project

- In order to promote the social implementation of hydrogen, the establishment of the technology for hydrogen gas turbine power generation that can create large-scale hydrogen demand is needed.
- This demonstration project aims to establish an operational technology for hydrogen power generation.

### Project schedule



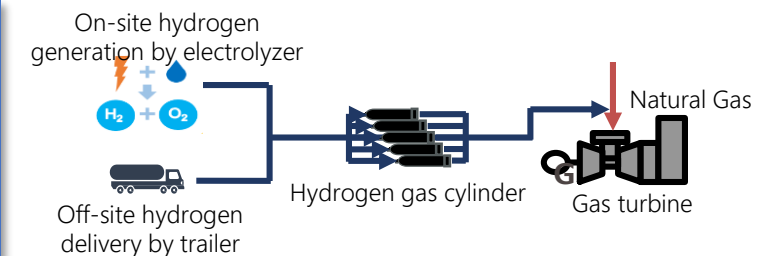
### Project outline

- In order to establish a comprehensive operational technology including maintenance and safety measurement required at the commercialization stage, The project will conduct the verification of reliability, safety etc.

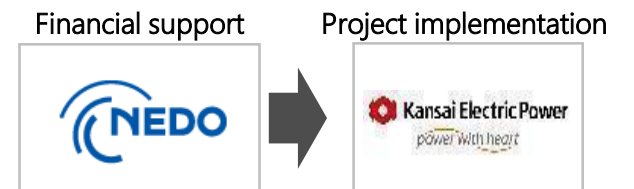
#### The detail of each phase is below

- 🕒 FS Phase : Study on project costs and schedule, identification of technical issues, etc.
- 🕒 FEED & Installation Phase : Detailed design, fabrication and installation of equipment
- 🕒 Demonstration Phase : Demonstration of hydrogen co-firing power generation for establishment of operational technology

### Project image



### Project organization



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