



# KEPCO's Carbon Neutrality Strategies

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ByoungDoo Kong





- ✓ Countries need customized CO<sub>2</sub> reduction measures to achieve carbon neutrality, and they are commonly face **Energy Trilemma**\*

\* Energy security, Energy equity and Environmental sustainability

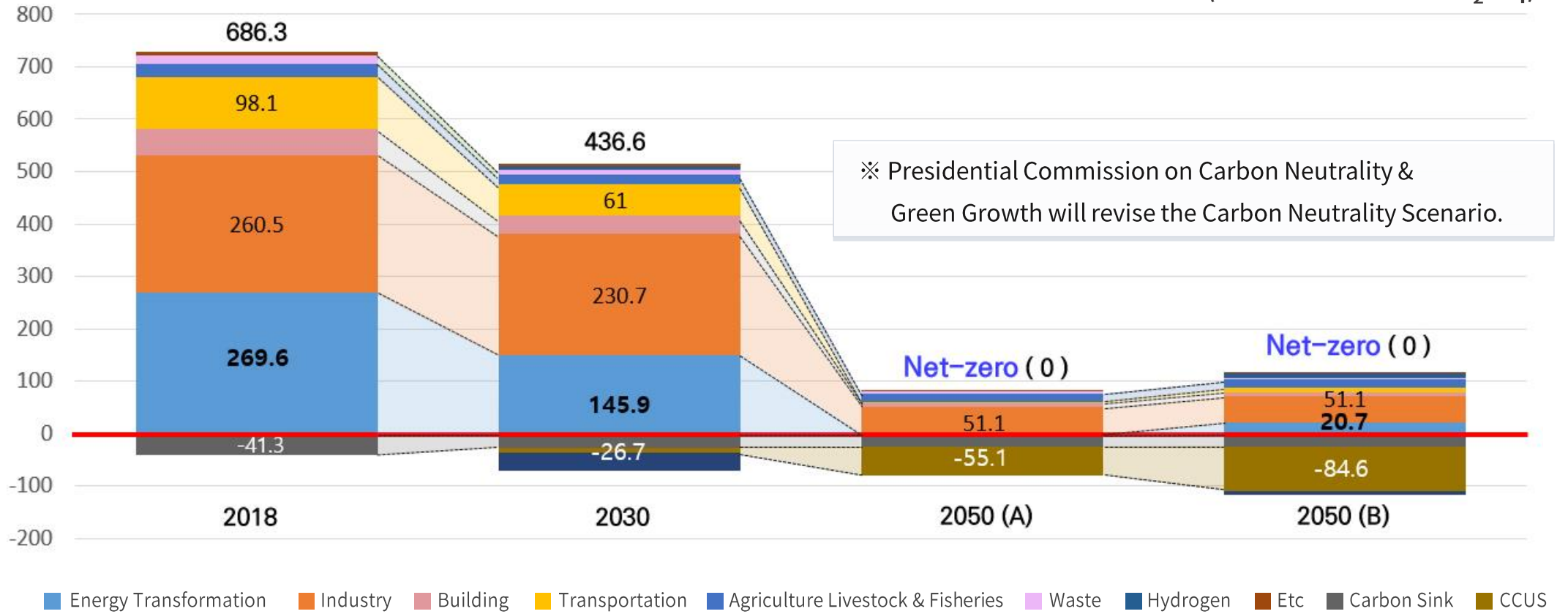
- 
- ✓ Korea plans to decarbonize **Energy Transformation**, Industry, Transportation and Building sectors, which account for the majority of GHG emission, to achieve carbon neutrality by 2050



# Carbon Neutral Scenario



(Unit : Million ton CO<sub>2</sub>-eq)



# CO<sub>2</sub> Reduction Plan



## Energy Transformation

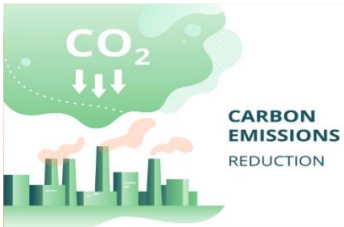
- Increase the portion of renewable power
- Low-carbon fuel & nuclear energy

[Unit : Million tonCO<sub>2</sub>eq]

**269.6**  
( '18)



**0**  
( '50)



## Industry

- Steel : HyREX(Hydrogen Reduction)
- Cement : Plastic Waste Pyrolysis and Hydrogen

**260.5**  
( '18)



**51.1**  
( '50)



## Transportation

- Expansion of EV & FCEV charging stations
- Cargo transportation (road → rail and ship)

**98.1**  
( '18)



**2.8**  
( '50)



## Building

- Zero-energy Building 100%
- Supply of high efficient equipment

**52.1**  
( '18)



**6.2**  
( '50)



# Vision of the Power industry



	Present (2020)	Future (2050)
Power Generation	<p>Fossil fuel Power Generation</p> <ul style="list-style-type: none"><li>- Coal • LNG : 62.0%</li><li>- Renewable energy : 6.6%</li></ul>	<ul style="list-style-type: none"><li>➤ <b>Zero-emission fuel</b><ul style="list-style-type: none"><li>- Renewable energy (60.9 ~ 70.8%)</li><li>- Zero emission fuel gas turbine (13.8 ~ 21.5%)</li><li>- CCUS (55.1 ~ 84.6 million tons)</li></ul></li></ul>
Power Grid	<p>One-way &amp; centralized power grid</p>	<ul style="list-style-type: none"><li>➤ <b>Bi-directional &amp; distributed power grid</b></li><li>➤ <b>Distributed power system</b></li></ul>
Energy Consumption	<p>Power consumption : 509.3TWh</p> <p>Low Efficiency of Energy Consumption</p>	<ul style="list-style-type: none"><li>➤ <b>Power consumption : 1,213.7TWh</b></li><li>➤ <b>Society that is self-sufficient and highly efficient in terms of energy</b></li></ul>

“  
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## INDEX

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01

Chapter I

### KEPCO's Key Roles for Carbon Neutrality

02

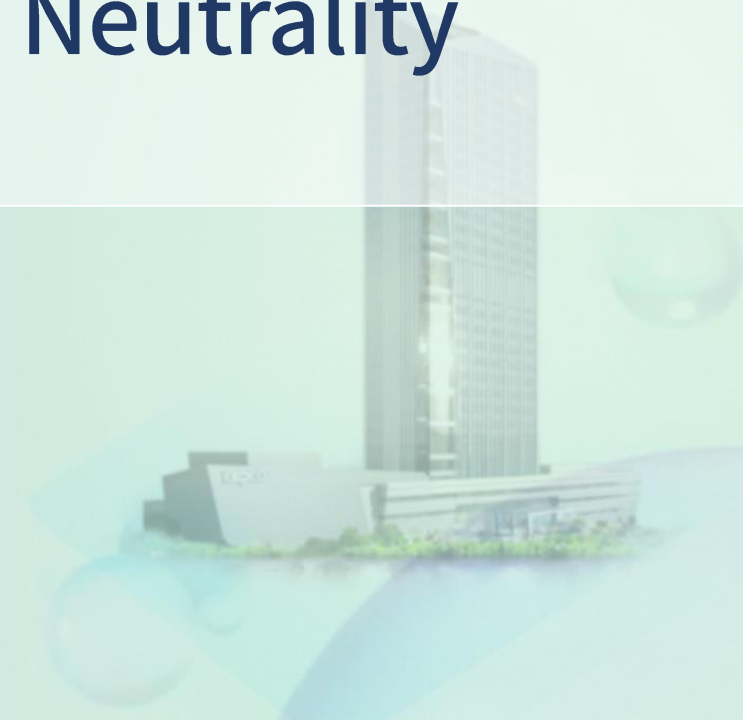
Chapter II

### Cooperation Model

01

Chapter I

# KEPCO's Key Roles for Carbon Neutrality



# KEPCO's Key Roles for Carbon Neutrality



Vision

## Lead the decarbonization of the energy sector by 2050

<b>Strategy I</b> Decarbonization	<b>Strategy II</b> Decentralization	<b>Strategy III</b> Research & Development
<p><b>Decarbonization of electricity production</b></p> <ul style="list-style-type: none"><li>✓ Promote <b>decarbonization in electricity production</b> by expanding the renewable energy and hydrogen power generation</li></ul>	<p><b>Building a futuristic Electrical Grid for Green Energy</b></p> <ul style="list-style-type: none"><li>✓ Play a major role in achieving carbon neutrality by reinforcing the <b>electricity grid and optimizing its operation</b></li><li>✓ Promote <b>decentralization</b> of electricity <b>production and demand</b></li></ul>	<p><b>Development of carbon-neutral core technology</b></p> <ul style="list-style-type: none"><li>✓ Lead the <b>development of core technologies</b> for carbon neutrality by forming solidarity and cooperating with others</li></ul>





## Strategy I

### “Decarbonization of electricity production”

#### Renewable Energy

- ▶ **Take the lead in expanding the renewable energy**
  - ☑ Large-scale project development, such as offshore wind farms and floating solar panels.

#### Hydrogen Power Generation

- ▶ **Transition to Zero-Carbon energy (Hydrogen & Ammonia) by 2050**
  - ☑ Replacement of coal and natural gas with those mixed respectively with ammonia and hydrogen to produce electricity.

# ① Offshore Wind Farm Projects

## Strategy I

### Southwestern Test Bed

Capacity	60MW
Status	<ul style="list-style-type: none"> <li>• In Operation</li> <li>• Fully commissioned in 2020</li> </ul>

### Southwestern offshore Wind Farm

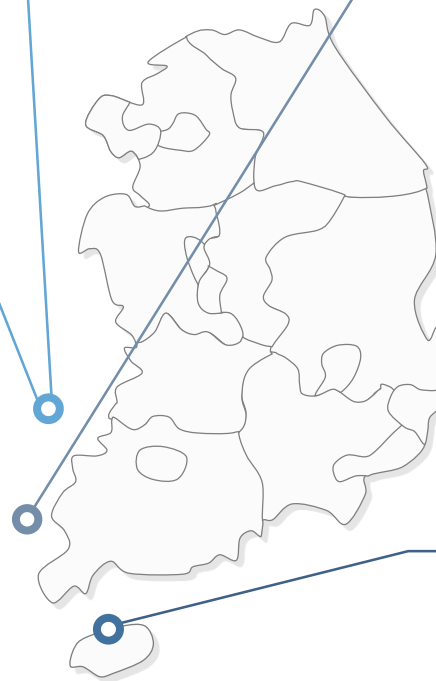
Capacity	1.2GW	
Status	Under development	
Milestones	2022 - 23	Wind Measurement Campaign
	2024 - 25	F/S, Design, Contract Signing
	2026 - 30	Construction
	2029 - 30	Commencement of Commercial Operation

### Shinan offshore Wind Farm

Capacity	1.5MW	
Status	Under development	
Milestones	2021 - 23	Wind Measurement Campaign
	2024 - 27	F/S, Design, Contract Signing
	2028 - 32	Construction
	2031 - 32	Commencement of Commercial Operation

### Jeju Hanlim offshore Wind Farm

Capacity	100MW
Status	<ul style="list-style-type: none"> <li>• Under Construction</li> <li>• Plan to achieve COD in 2024</li> </ul>



## ② Renewable Power Generation on Idle Sites

### Strategy I

#### Concept

- Photovoltaic generation using idle sites for efficient use of the land and promotion of renewable energy

Construction of PV Power Plant in Idle Sites

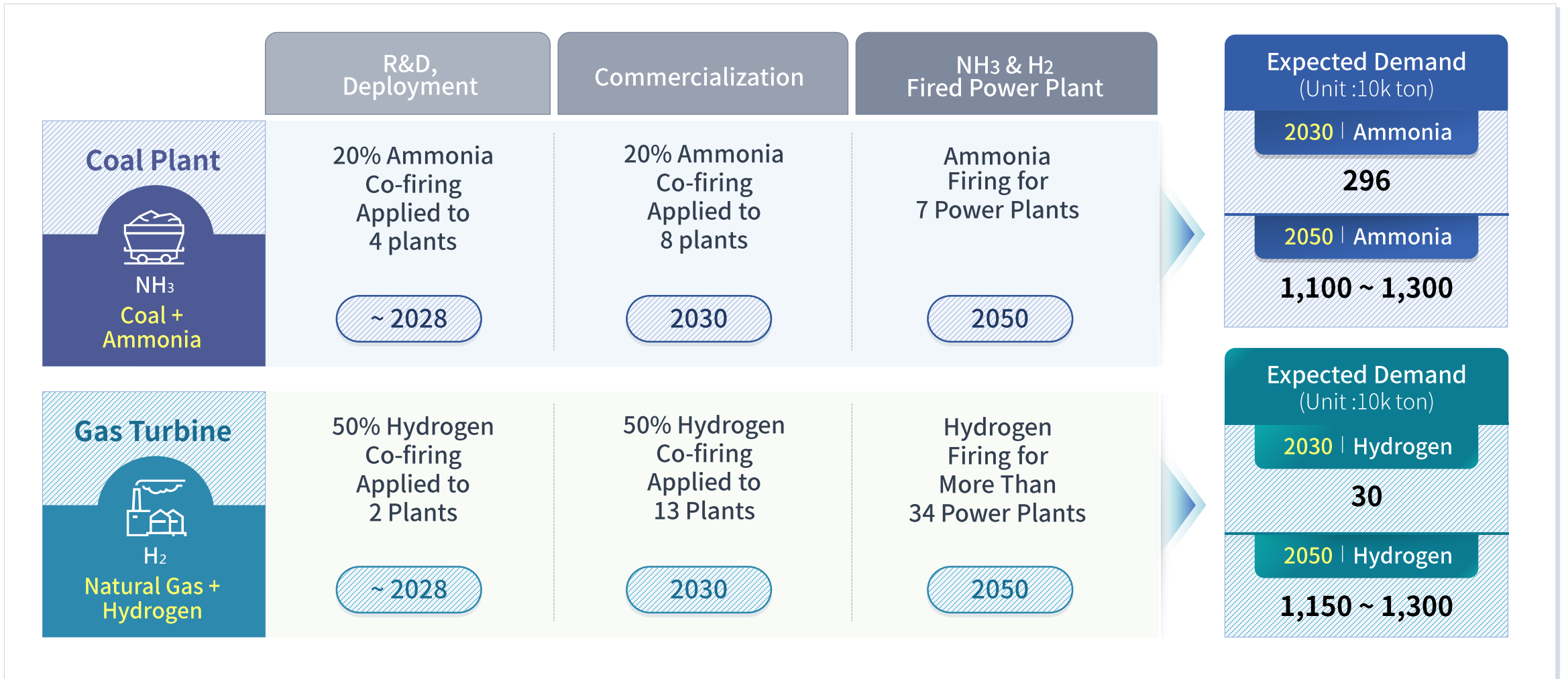


PV Generation Complex in an Abandoned Salt Pond



# ③ H<sub>2</sub> and NH<sub>3</sub> Power Generation Projects

## Strategy I





## Strategy II

### “Building a futuristic electrical grid for green energy”

#### Construction of Transmission Network

- ▶ Pursuing legislation of Planned Site Selection System
  - ☑ Prevent disorderly and inefficient land development and promote efficient use of renewable energy

#### Renewable Energy Operation

- ▶ Establish the measures to strengthen the system stability
  - ☑ Establishment of integrated control system (forecast, monitoring and control) for renewable energy, etc.

# ① Planned Site Selection System



## Strategy II

### Concept

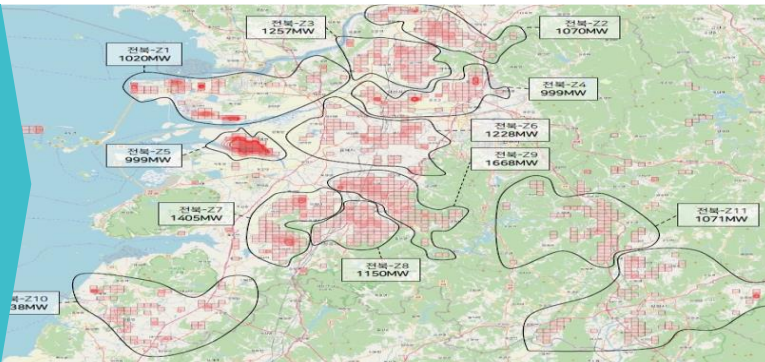
- Build a planned site that fully considers the system and location conditions for an orderly and scalable distribution of renewable energy

Stage 1 **Zone** Comprehensive consideration of electricity demand and renewable energy potential

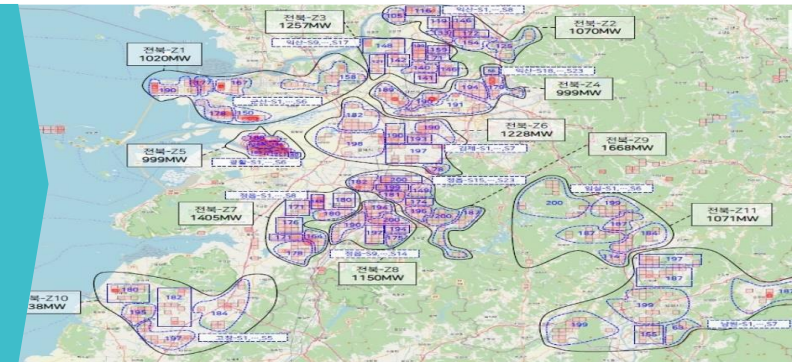
Stage 2 **Site** Discovery of candidate sites in connection with the local public electricity grid

Stage 3 **Tender** Contest for transmission rights(capacity and time) linked to KEPCO's grid construction

1 Candidate Site for Renewable Energy District  
**Zone**



2 Candidate Site for integrated complex  
**Site**



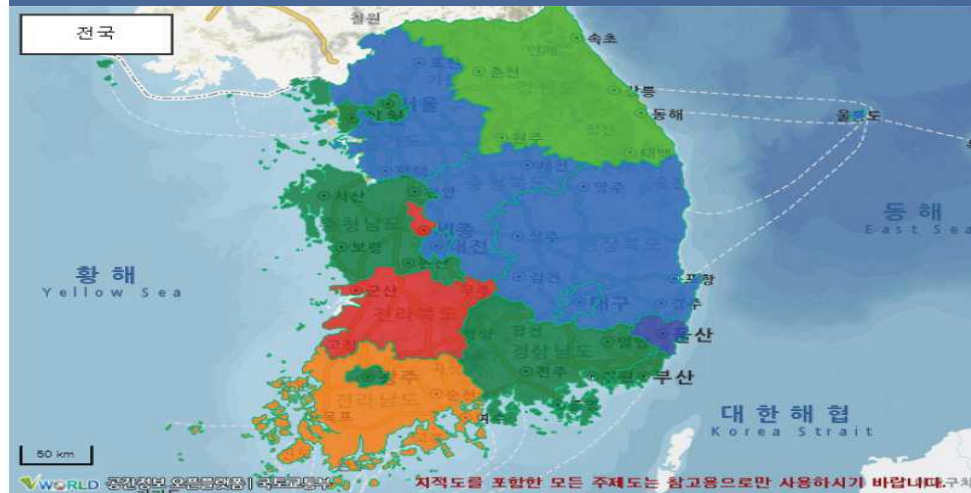
## ② Distribution of Regions in Electricity Demand

### Strategy II

#### Concept

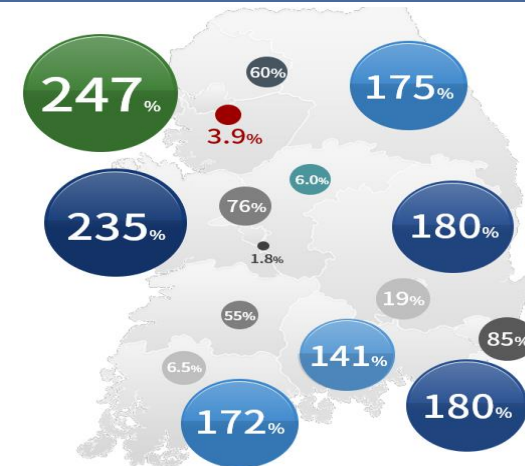
- Prevent inefficient investment in the infrastructure and optimize the electricity consumption by distributing the demand for electricity in the metropolitan areas

#### Map of Renewable Energy Sufficiency



- Provides data on the grid's regional availability to accept the renewable energy power generators and information on the connection facilities

#### Energy Independence



- Provide comprehensive incentive packages, such as a broader voltage options and reduced cost especially for the newly established data centers

# ③ Integrated Control System for Renewable Energy

## Strategy II

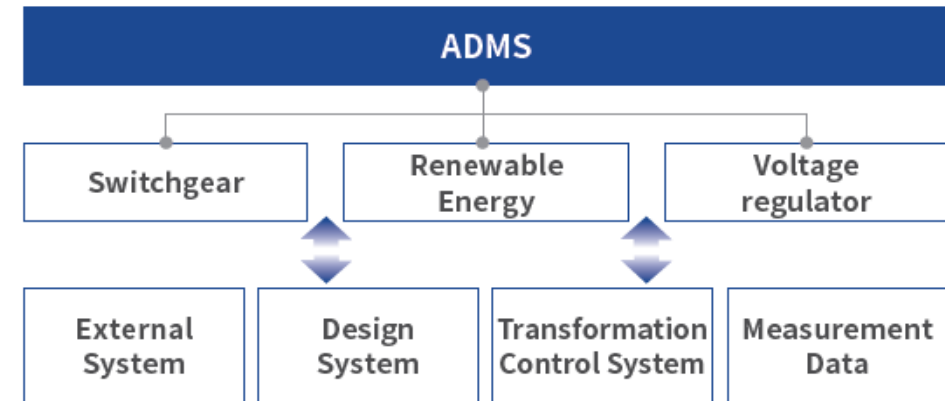
### Concept

- ▶ Increase the stability of the power system by resolving the volatility of renewable energy through real-time information sharing between renewable energy generators, integrated renewable energy monitoring system operator and KEPCO, the transmission and distribution manager



- ✓ Manages PV and Wind power plants and accumulates facility data for the prediction of renewable energy output

### Advanced Distribution Management System(ADMS)



- ✓ Integrated control system for distribution grid and renewable energy





## Strategy III

### “Development of Carbon-neutral core technology”

#### R&D for Carbon Neutrality

##### ▶ Initiate the development of core technology

- ☑ Efficient energy use, expansion of renewable energy, transition to zero carbon fuel, intelligent electricity grid, etc.

##### ▶ Innovate the R&D process

- ☑ Expansion of open innovation and challenging task selection, etc.

Energy efficiency	Renewable energy expansion	Fuel transition	Intelligent power grid
<ul style="list-style-type: none"><li>☑ High-efficient low-loss technology, such as HVDC</li><li>☑ Provision of customized xEMS solution</li></ul>	<ul style="list-style-type: none"><li>☑ Expansion of wind power plants and reduction in costs of operation</li><li>☑ Expansion of green hydrogen using the surplus renewable energy</li></ul>	<ul style="list-style-type: none"><li>☑ Mixed and single firing of hydrogen and ammonia for power generation</li><li>☑ Commercialization of CO<sub>2</sub> capture and utilization technology</li></ul>	<ul style="list-style-type: none"><li>☑ Expansion of renewable energy and development of optimized ESS</li><li>☑ Digital transition of transmission and distribution management system</li></ul>

# R&D for Carbon Neutrality



## Energy Efficiency

- ✓ **Distributed electricity supply chain** Monitoring and control of the broad area system, electricity grid by the region, AC/DC composite network
- ✓ **High efficient transmission system** HVDC, MV·LVDC, superconductivity
- ✓ **Building efficiency** xEMS platform, demand data inspection and prediction
- ✓ **Industry efficiency** Integrated system for energy saving, electrification
- ✓ **Transport efficiency** Technology to advance EV charging stations and P2G

## Expansion of Renewable energy

- ✓ **Offshore wind power** Low cost and large-scale complex technology
- ✓ **Photovoltaic power** Manufacture highly efficient PV cell elements
- ✓ **Production/storage/use of hydrogen** Production by electrolysis, mass storage and fuel cell technology

## Fuel Transition

- ✓ **Hydrogen power generation** Technology to improve dual fuel rate of hydrogen and dual fuel and firing technology
- ✓ **Ammonia power generation** Ammonia dual fuel and firing technology using existing coal power plants
- ✓ **CCUS** CO<sub>2</sub> Capture, Utilization and Storage technology

## Establishment of Intelligent Grid

- ✓ **Increasing penetration of renewable energy** Monitoring, prediction, and control of renewable energy, and technology related to power system inertia
- ✓ **Large capacity ESS** By assisting the frequency adjustment, ESS to ease renewable energy output variation

02

Chapter II

# Cooperation Model



# Joint development of Global hydrogen business



## Background

- ✓ **Southeast Asian countries** have a favorable renewable energy environment but need to develop technologies
- ✓ **Korea and Japan** have a limited renewable energy environment but possess sufficient technologies
  - ☞ A significant demand for green hydrogen is anticipated in Korea and Japan

## Cooperation Model

### Southeast Asia

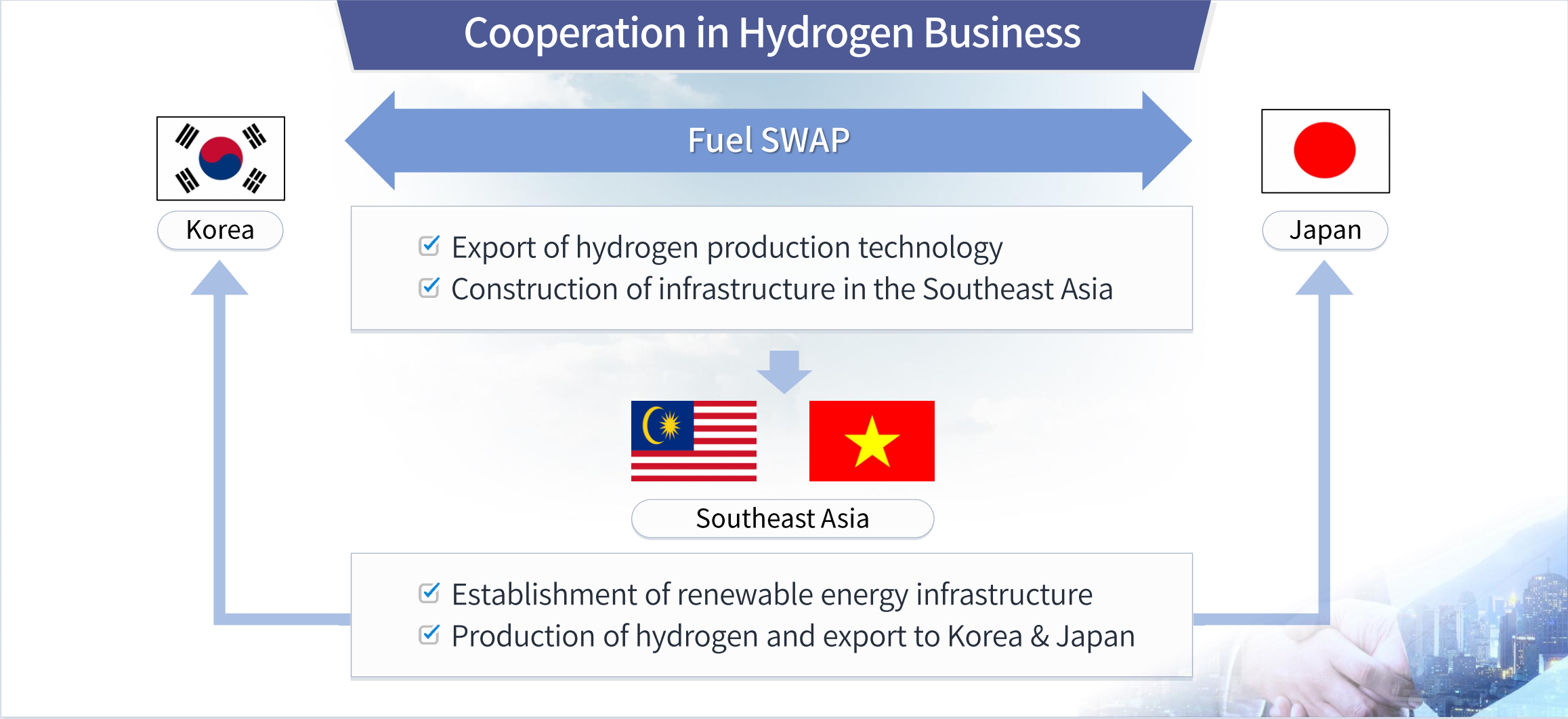
- 1 Establishment of renewable energy infrastructure by importing the hydrogen-related technology and exporting the fuel (hydrogen)
- 2 Foundation of a basis for application of renewable energy and vitalization of carbon neutrality



### Korea and Japan

- 1 Securing the fuel (green hydrogen) from overseas and diversifying the source countries
- 2 Minimize transportation costs and carbon intensity (CO<sub>2</sub> emissions per a unit of hydrogen produced) by importing the clean hydrogen from neighboring countries

# Joint development of overseas hydrogen business



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# Thank You

