Port Decarbonization Plan of RoK

30 Sep., 2022

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Contents

1. Maritime Decarbonization Plan(Sep. 2022)

1. Maritime Decarbonization Plan (Sep. 2022)

◆ (Background) Response to global change owing to climate change and carbon neutrality related requirements of the global society

- ➢ Warming (~year 2040, 1.5 degrees ↑) → rise in sea level (~21 century, min 0.25~max 1.01m ↑) → sea level temperature 1.4~3.7 degree increase → fishery catch potential 20.5~24.1% ↓ → 2~3 times increase in coastal flooding owing to thawing sea ice
- ➢ Lower green house gas emissions by 50% until 2050 compared to 2008 (IMO), adopt ship rating system (IMO), strengthen demand of international organizations for carbon neutrality such as 2050 carbon neutrality-global energy sector roadmap (IEA)

◆ (Vision) Marine fishery carbon neutrality change and equipped preparation for climate crisis

◆ (Strategic Goal)

- ➢ (Carbon Neutral) Marine fishery field greenhouse gas emission 70% reduction in 2030 (compared to 2018)
- ➢ (Adopt & Prepare) Minimizing property/life loss owing to coast/ ocean climate disasters.
- ➢ (Implementation & Check) Enhancing public sensitivity

1. Maritime Decarbonization Plan (Sep. 2022)

◆ (Strategic Implementation Plan)

➢ (Reducing greenhouse gas emissions)

- ✓ Implementing Port to Port carbon neutrality shipping and distribution networks: low carbon/carbon free ship technology advancement and spreading eco-friendly ship supplies, push forward with low carbonization and smart harbor unloading equipment/facilities.
- ✓ Present low carbon model for each model of fishing industry value chain: improvement of fishery energy use base, promote smart fishing industries such as smart aqua farm/processing technology development and cluster creation.
- ✓ All cycle management of marine waste from perspective of greenhouse gas reduction: establishing management/recovery system of marine waste, activating reduction governance, improving recycling rate and energization of marine waste.

1. Maritime Decarbonization Plan (Sep. 2022)

◆ (Strategic Implementation Plan)

➢ (Greenhouse gas absorption and change)

- ✓ Global society pioneer of blue carbon expansion/management technology: blue carbon expansion, organizing management/conservation-related policy, establishing absorption calculation system and statistical base.
- ✓ Promoting marine energy and CCS commercialization: accelerating marine energy commercialization, developing marine energy/marine bio base green hydrogen production technology.
- ✓ Spread of renewable energy/hydrogen economy utilizing marine and fishery industry infrastructure: discover renewable energy-related energy resources, improve policy and establish program, build hydrogen energy distribution/logistics hub(harbor), establish production base of renewable energy such as hydrogen

1. Maritime Decarbonization Plan (Sep. 2022)

◆ (Strategic Implementation Plan)

➢ (Climate Crisis Preemptive Action)

- ✓ Equip preemptive prevention system for coastal climate disaster: upgrade basic investigation, reorganizing response system, adopt marine climate disaster forecast/alarm system, improve coastal maintenance/regeneration system by means such as eco-friendly coastline redesign, securing buffer zones
- ✓ Announcing fishery industry's climate crisis response system: creating and establishing climate crisis related marine/fishing policies, develop technology for climate change risk response
- ✓ Detailed analysis/response to effect of marine ecosystem climate change.
- ✓ Strengthen responsiveness of shipping/harbor climate crisis: preparing long-term plan for establishing a disaster safety port, supporting domestic and international environmental regulations for the shipping industry

1. Maritime Decarbonization Plan (Sep. 2022)

◆ (Strategic Implementation Plan)

➢ (Securing ability to respond to climate crisis)

- ✓ Observation/prediction of data-based ocean climate change
- ✓ Strengthen achieving reduction of greenhouse has emissions in marine and fishery sector: promote calculation/verification of emissions in marine and fishery sector, improve policy support system for implementation of Paris Agreement
- ✓ Establish cooperative governance for response to climate crisis in marine fisheries: expand strategic cooperation with international organizations and conferences related to marine affairs

2. Hydrogen Port Development Plan (Nov. 2021)

2. Hydrogen Port Development Plan (Nov. 2021)

◆ (Background & Needs)

➢ Review newly required-role of ports in the hydrogen economy era and implement policy

- ✓ Establish roadmap for revitalizing hydrogen economy (Jan. 2019)
- ✓ Establish basic plan for implementation of hydrogen economy (Nov.2021)

(Unit : mill. tonnage/year)

Year	Target Supply Volume	Production of Blue Hydrogen	Production of Green Hydrogen	Imported Volume	Production of Gray Hydrogen
2030	3.9	0.75	0.25	1.96	0.94
2050	27.9	2	3	22.9	0

Source : National Plan for Implementation Plan of Hydrogen Economic, Nov., 2021.

- ✓ Respond accordingly to increase in demand for hydrogen production, logistics, and consumption that use ports

2. Hydrogen Port Development Plan(Nov. 2021)

◆ (Background & Needs)

➢ Active utilization of port opportunity as hydrogen producer

- ✓ Blue hydrogen production using port-based LNG supply chain
  - Import 40 million tons per year from Incheon, Pyeongtaek/Dangjin, Boryeong, Gwangyang, etc.
  - LNG bunkering terminals currently being built in Busan and Ulsan
  - Blue hydrogen production possible through CCS technology
- ✓ Produce green hydrogen using renewable energy
  - Produce green hydrogen using pedaling wind poser in Gyeonggi, Jeonnam, Gyeongnam, Busan, etc. (Apply water electrolysis technology)

2. Hydrogen Port Development Plan(Nov. 2021)

◆ (Background & Needs)

➢ Supply port logistics functions for overseas hydrogen imports and domestic distribution (year '30~)

- ✓ Promote establishment of overseas hydrogen production bases (1 in 2020 and 15 in 2040)
- ✓ Supply hydrogen to inland industrial complexes and cities (hydrogen logistics hub function)

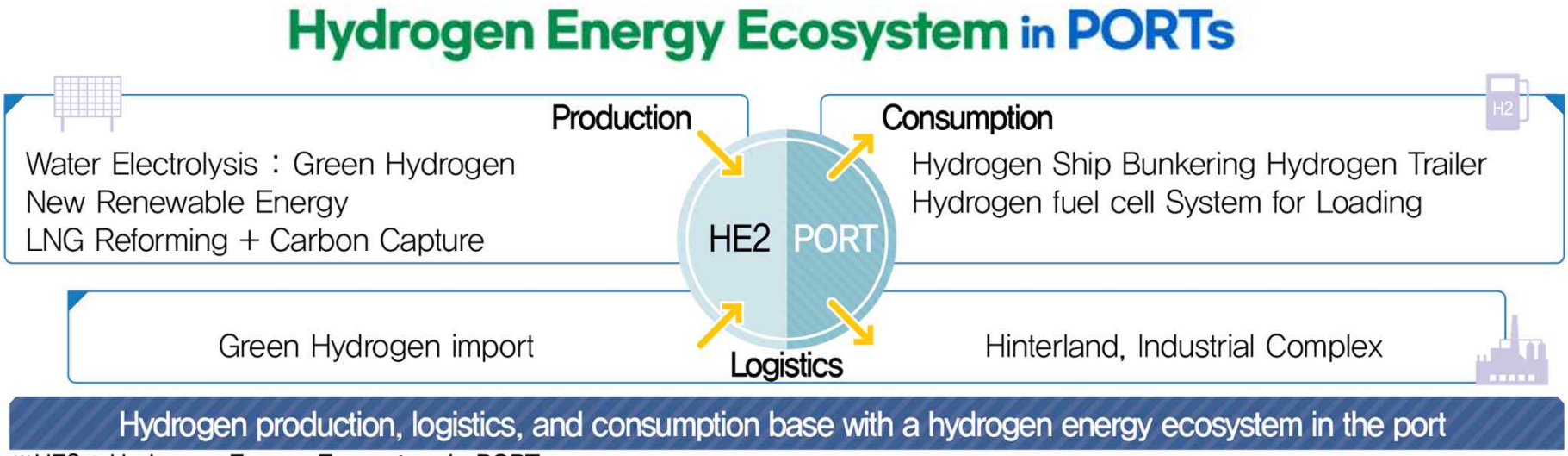
➢ Enhance potential of hydrogen energy consumption in ports

- ✓ Supply hydrogen for port logistics mobility (vessels, trucks, etc.)
- ✓ Hydrogen supply in connection with port background complex
  - 198 companies moving into port backgrounds nationwide, handle 3.3M TEUs annually, and employ 6,740 people

2. Hydrogen Port Development Plan(Nov. 2021)

◆ (Background & Needs)

➢ Promote hydrogen port construction by linking hydrogen economy policies, establishing hydrogen energy ecosystem in ports, establishing public-private cooperation system, and improving system through step-by-step project



※HE2 : Hydrogen Energy Ecosystem in PORTs

Source : Plan for Hydrogen Port Development, Nov., 2021.

2. Hydrogen Port Development Plan(Nov. 2021)

◆ (Vision & Strategic Goals)

➢ (Vision) create an eco-friendly, hydrogen port ecosystem that leads the world.

➢ (Strategic Goals)

Classification		2028	2030	2040
Hydrogen Port	Total	2	9	14
	L2G	2	7	7
	G2G	Tech. Innovation	2	5
	P2G	Tech. Innovation		2
Volume of Hydrogen (10,000Ton/Y)		27	220	1,300
Consuming Volume in Mobility (10,000Ton/Y)		2	20	50
Generate Capacity for Fuel Cell		400MW	1.6GW	4GW
Charging & Bunkering Station		5	20	50
Investment (1billion.USD)		1.4	10.5	21

Note : L2G(LNG to Gas), G2G(Gas to Gas), P2G(Power to Gas)
Source : Plan for Hydrogen Port Development, Nov., 2021.

2. Hydrogen Port Development Plan(Nov. 2021)

◆ (Implementation Plan)

➢ (Establish ecosystem of hydrogen energy in port)

- ✓ Vessels (30years~): hydrogen fuel (bunkering), provide power supply system (AMP)
- ✓ Vehicle (~25years): construct charging facilities for hydrogen-powered vehicles
- ✓ Port equipment (26years~): transition to eco-friendly power system based on hydrogen energy
- ✓ Establish basic plan for mid- to long-term hydrogen ports (~23years)

➢ (Promote public-private cooperation leading project for hydrogen port)

- ✓ Create hydrogen energy ecosystem in ports for Ulsan, Gwangyang, Busan, Pyeongtaek/Dangjin, and Gunsan (~40years)

➢ (Prepare sustainable system foundation)

- ✓ Promote creation of hydrogen energy ecosystem in ports through designation of a special hydrogen port area (~23 years)
- ✓ Establish legal basis for creating sustainable ecosystem (22 years~)

3. Carbon Neutral Port Development Plan (~2023)

3. Carbon Neutral Port Development Plan (~2023)

◆ (Scope of Project)

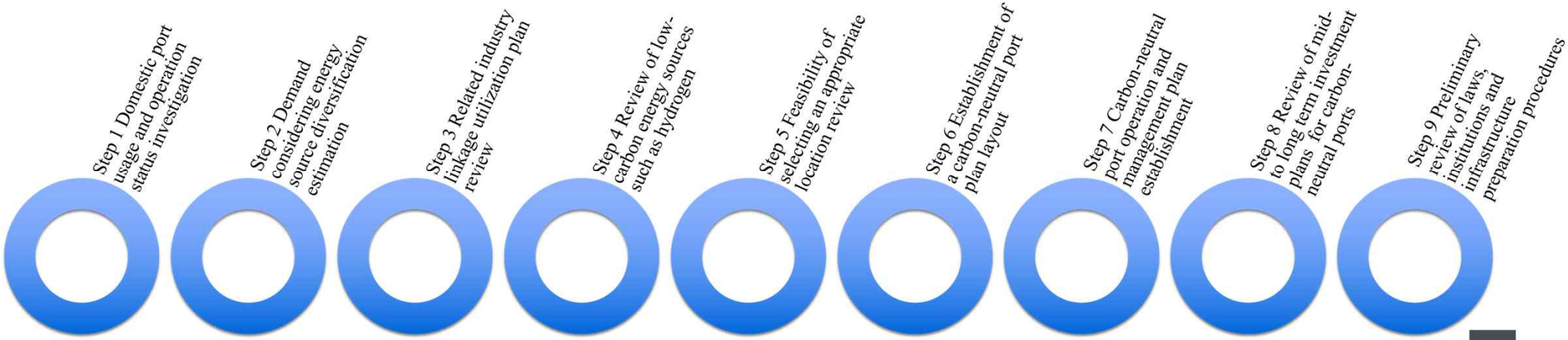
➢ Task Purpose

- ✓ Establishing port functions for 2050 carbon neutrality
- ✓ Establishing specialized strategy and basic plan for carbon-neutral port construction for each port

➢ Task Scope

- ✓ Special scope : 〈Port Law〉 trade ports and coastal ports under Article 3
- ✓ Time scope : target year 2050

➢ Task Period : 2022.05.17.~2024.05.15.



3. Carbon Neutral Port Development Plan (~2023)

◆ (Definition of Carbon Neutral Port)

What is Net Zero Port?

☑ **A Port which carry out production, distribution and use of eco-friendly and low-carbon energy in order to realize Net Zero in Port area and Net Zero by 2050.**

Net Zero in Port area	· Reduction of carbon emission in port area by using eco-friendly, low-carbon and renewable energy
Net Zero by 2050	· Becoming zero of carbon emission by 2050 in all area such as energy, industry, transportation and building etc.
Plan for energy change	· Plan for reduction of dependence on fossil fuels and change to eco-friendly and low-carbon energy
Eco-friendly and low-carbon energy	· Hydrogen, ammonia and renewable energy etc. · Renewable energy: Solar, wind, ocean(tidal and wave) etc.
Function of Net Zero Port	· Production, distribution and use etc of eco-friendly and low-carbon energy in port area

Master plan for development of Net Zero Port :
Setting up the function of Net Zero Port, development plan for mid and long term and establishment of road map

3. Carbon Neutral Port Development Plan (~2023)

◆ (Functions of Carbon Neutral Port)

Production

· Securement of various eco-friendly and low-carbon energy (3rd Master Plan for Energy(2019~2040))

Hydrogen	· Hydrogen production(L2G, G2G, P2G) · Hydrogen import (appropriated port for Hydrogen) · CCUS (Carbon Capture, Utilization and Sequestration)
Ammonia	· Production and import of ammonia · Ammonia storage facility
LNG	· LNG Port · LNG storage facility
New Renewable Energy	· Complex for solar and wind generation · Ocean energy(wave and tidal)

Dedicated Pier	Hydrogen production Facility
CCUS	Liquid Hydrogen, LNG, Storage Facility
Power Plant	Water Electrolysis

Distribution

· Function for energy storage and supply for Port area or including nearby area

Ship	· LNG and Hydrogen bunkering · AMP (Alternative Maritime Power supply) · ESS (Energy Storage System)
Mobility	· Hydrogen station and fuel cell · ESS
Port Operation	· Hydrogen station and ESS · Microgrid
Hinterland	· Hydrogen storage and transportation · Supply facilities for other energy

LNG, Hydrogen Bunkering	AMP
ESS	Hydrogen Station
Microgrid	Hydrogen Supply Facilities

Utilization

· Utilization of eco-friendly and low-carbon energy in order to reduce carbon emission

Loading Equipment	· Electric equipment for loading and transportation · Change to Hydrogen fueled equipment for loading and transportation · Electric and Hydrogen station
Mobility	· Electric and Hydrogen truck · Hydrogen station and fuel cell
Port Operation	· Utilization of Hydrogen fuel cell · Utilization of renewable energy
Hinterland	· Supply of Hydrogen fuel cell · Supply of renewable energy

Change equipment for Loading	Change equipment for Mobility
Change Port Operation	Hydrogen Station
Hydrogen fuel cell	New Renewable Energy

3. Carbon Neutral Port Development Plan (~2023)

◆ (Functions of Carbon Neutral Port)

Division	Energy production(support)		Energy distribution		Energy Utilization		Carbon neutral port model
Introduction function	hydrogen receiving station	Hydrogen production facility (blue hydrogen)	hydrogen bunkering	AMP(land power supply)	Unloading/transport equipment conversion	Mobility shift	
	CCUS (blue hydrogen)	Renewable energy generation facility	ESS(Energy Storage System)	Hydrogen storage facility	Hydrogen refueling station	Electric charging station	
	Water electrolysis facility (connection of large scale renewable energy)		Hydrogen supply facility		Port operation transition	Microgrid	
A port	○	–	○	–	○	○	hydrogen import distribution
	–	–	–	○	○	○	
	–		○		–	–	
B port	–	○	–	–	○	○	blue hydrogen production distribution
	○	–	–	○	○	○	
	–		○		–	–	
C port	–		○	–	○	○	green hydrogen production and distribution
	–	○	–	○	○	○	
	○		○		–	–	
D port	–	–	–	–	○	○	energy optimization in the port
	–	–	–	–	○	○	
	–		–		○	○	

introduction of carbon-neutral port function considering the location of the target port

3. Carbon Neutral Port Development Plan (~2023)

◆ (Preparation for Policy Base)

1. Selection of Special Area for Hydrogen Port

- For acceleration of Hydrogen energy development, application of incentive and designation area
  - Designation selectively and in phase
  - Application of safe and efficient Hydrogen ecosystem

Incentive for Hydrogen energy in port area('23~)

- Incentive for Hydrogen Mobility
  (Exemption of Port usage pay)
- Privilege for tenant companies
  (additional points and reduction of rent for Port facilities etc.)
- Support for feasibility study
  (Support for basic investigation cost)

Duty for construction of eco-friendly port ('23~)

- Storage of Hydrogen for Port
- Installation of CO_2 treatment facility

2. Law and Regulation for Policy

- Preparation of law to secure Hydrogen ecosystem in Port
  - Change of existing laws(Hydrogen act, Harbor act, New Harbor Construction Promotion Act) 개정
  - Review for enact of new law

Acceleration of production, distribution and us in Port area

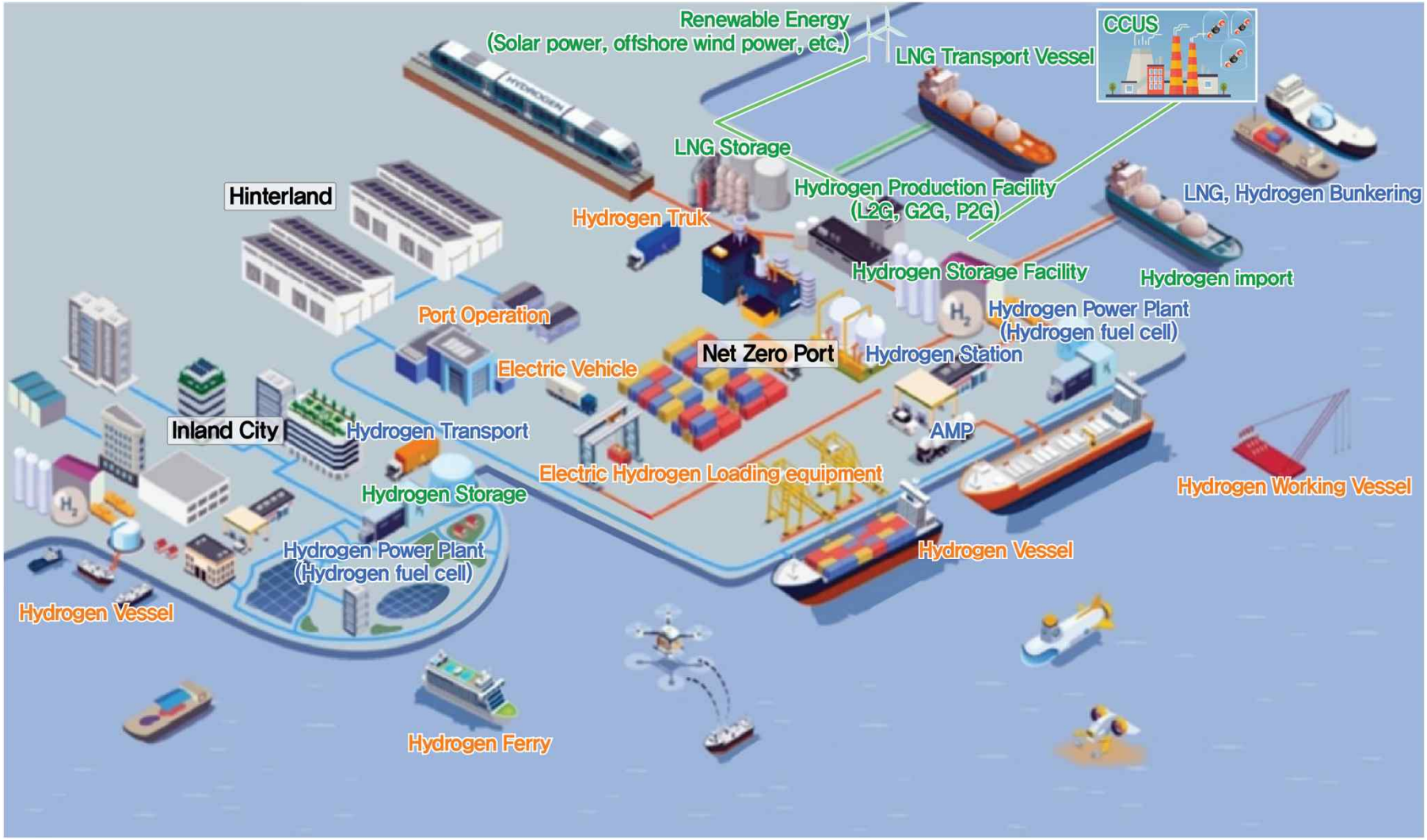
- Master Plan
  (Official Plan(every 5 years), implementation plan(every year))
- Area designation and application of incentive
- Development basis and progress for Hydrogen terminal
  (Facilities, contractor, license and approval etc.)
- Government support
  (Financial support for infrastructures, new technology and global market etc,)

Safety management and coexistent system for local development

- Standard for safety management
  (Regulation for facilities, technology and safety management etc,)
- Government support for prearranged area for Hydrogen Port

3. Carbon Neutral Port Development Plan (~2023)

◆ (Functions of Carbon Neutral Port)



Thank You

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