The Net-Zero Game Changer Initiatives

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Incheon Port Authority (IPA)?

IPA was established in 2005 based on the Port Authority Act as a public enterprise under the Ministry of Oceans and Fisheries in South Korea, with the aim of developing Incheon Port into a competitive maritime logistics hub.

**Infrastructure construction**
- (International Ferry Terminal and etc)

**Port hinterland development and supply**
- 3 Division, 5 Office
- 13 Department
- 290 Employee

**Port management and operation**
- Asset: About 2.7B $ ('22Y)

**Location**: Songdo (Incheon city)

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**I. Introduction**
1. Introduction

Incheon Port Overview

Accessibility
- (Kyung-In Exp.) Within 20 Mins.
- (OuterRing Exp.) Within 30 Mins.
- (Airports) Within 15~30 Mins.
- Easy Connection with 1st/2nd/3rd Kyung-In Exp. and Young-Dong Expressway

Nearest Industrial Zone
- 290 National / Local Ind. Zones
- Easy Access To Incheon Port
- Within 90minutes
  - Incheon Port to all Ind. Zones
  - At Metropolitan Area

Refrigerated Warehouses
- 98(30%) Refrigerated warehouses
  - At Metropolitan Area
- Within 90minutes
  - Connection to Incheon port
  - And Refrigerated warehousers
II. Background and Strategy for Green

① Background for Net-Zero

Diamond The Paris Climate Agreement
- Established during the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Paris, France in 2015, aimed to pursue efforts to maintain the global average temperature rise by the end of the 21st century to below 2°C and to strive for 1.5°C or lower.
- Countries worldwide submitted Long-Term Low-Emission Development Strategies (LEDS) containing greenhouse gas reduction targets until 2050 by 2020, as well as Nationally Determined Contributions (NDC) every five years.

Carbon Neutrality refers to achieving net-zero emissions of CO₂ among the six major greenhouse gases, while Climate Neutrality aims at net-zero emissions of all six major greenhouse gases. Net-Zero denotes the neutralization of net emissions from any entity. GHG (Greenhouse Gas) commonly refers to the six major greenhouse gases.

However, the Korean government defines “Carbon Neutrality” practically as “Climate Neutrality” (net-zero emissions for all six major greenhouse gases).

The Basic Law on Carbon Neutrality and Green Growth aims to address climate crisis through carbon neutrality and green growth strategies.

Source: IPCC Special Report on Global Warming of 1.5°C

[Timeline for Achieving Carbon Neutrality by Temperature Targets]
II. Background and Strategy for Green

② Incheon Port’s Net-Zero Strategy

Reduce GHGs by 50% in 2035
Exceeded the target emission reduction goal by 43% in 2023
III. Net-Zero Initiatives

III-1. MARITIME
1.1 Vessel Speed Reduction
1.2 AMP Vitalization
1.3 LNG Powered Vessels

III-2. VEHICLE/PORT EQUIPMENT
2.1 Aged Vehicle Management System
2.2 Reduction of Emissions
2.3 Equipment Conversion

III-3. RENEWABLE ENERGY
3.1 Solar Power Plant
3.2 Cold Chain Cluster
Ⅲ Net-Zero Initiatives
① Maritime: 1.1 Vessel Speed Reduction

A Container Ship can achieve up to a **60% reduction** in maximum Fine dust emissions as of December 2020, according to the Ministry of Ocean and Fisheries.

< Vessel Speed Reduction Program >

- Vessels entering ports navigate at speeds below the recommended speed in slow-speed navigation zones
  - Container ships & Car Carriers Operates at 12 Knots
  - Other Vessels Operates at 10 Knots

Participating vessels receive incentives equivalent to reduced port fees, with a **15-30% discount**.
Vessels operating their own fuel-powered generators (B.C., diesel) to meet essential electricity needs even while docked,

Resulting in significant emissions of air pollutants (SOx, NOx, fine dust, etc.) and greenhouse gases (CO2, etc.) compared to conventional vessel fuel generators.

**Sulfur Oxides**

**Nitrogen Oxides**

**Fine Dust**

Fine dust can be reduced to mitigate air pollution.

**Reduction Effect With the use of AMP (Alternative Maritime Power)**

- Up to 97% reduction in SOx
- 40% reduction in CO2
- 40% reduction in NOx

**Air Pollutants**

**Greenhouse Gas**

*AMP (Alternative Maritime Power):* Facilities for supplying power from shore to meet the power needs of docked vessels.
• Introduction and operation of the first LNG-powered vessel in Northeast Asia, the 'Eco-Nuriho', which has been utilized as an Incheon Port guide ship since 2013.

• The construction of the first domestically produced LNG-powered pilot vessel (2019–2021), the 'Songdo-ho'.

• The Aged pilot vessel was replaced with an eco-friendly pilot vessel (LNG-fueled vessel).

**Reduction Effect**

With the introduction of LNG-powered vessels, compared to existing vessels (based on MDO 1% S standard):

- **92-100%** air pollutants
- **100%** sulfur oxides
- **92%** nitrogen oxides
- **99%** fine dust
- **23%** Greenhouse gas

**Eco-Nuriho CO2 reduction** = 100 TON

**Carbon absorption per year by 20,000 pine trees**
During the government’s seasonal management period (December to March), the operation of grade 5 aged vehicles is restricted

**BUT! Ports remain a blind spot in this management**

Among the three major emission sources at ports (ships, handling equipment, vehicles), there is an increasing need to strengthen the management of vehicles

* **Aged vehicles:** grade 5 emission vehicles (vehicles corresponding to Euro1 to Euro3 standards)

The First Nationwide Port Access Aged Vehicle Management System


1. Identification of regulatory improvements for expansion and normal operation across all ports
2. Notification and access history tracking for aged vehicles entering ports
3. On-site guidance activities for drivers of aged vehicles and information on government support programs
III Net-Zero Initiatives

② Vehicle/Port Equipment: 2.2 Reduction of Emissions

To reduce fine dust emissions from diesel vehicles, IPA is promoting the installation of emission reduction devices

But! To maintain the performance of emission reduction devices (DPF),

Post-maintenance such as filter cleaning is necessary

Joint Performance Inspection and Filter Cleaning Service for DPF-Equipped Vehicles Accessing Incheon Port by Related Agencies

Encouraging Participation in Post-Maintenance for DPF equipped Vehicles Guidance Activities and Information on government Support Programs

* DPF (Diesel Particulate Filter): An exhaust gas aftertreatment device that can reduce particulate matter (PM) by over 80%
Net-Zero Initiatives

Vehicle/Port Equipment: **2.3 Equipment Conversion**

- **Gantry Crane**
- **Transfer Crane**
- **Top Handler**
- **Straddle Carrier**
- **Yard Tractor**
- **Reach Stacker**

**Completed**

- **80% Reduction in fine dust emissions**

<table>
<thead>
<tr>
<th>Eco-Friendly Measures</th>
<th>Fine Dust Reduction</th>
<th>Nitrogen Oxide Reduction</th>
<th>Greenhouse Gas Reduction</th>
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</thead>
<tbody>
<tr>
<td>a Diesel Equipment with DPF</td>
<td>0</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>b Diesel Equipment with SCR</td>
<td>X</td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td>c Fuel Conversion (Diesel → Electricity)</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

**Completed**

- **Eco-Engine**
- **Eco-Fuel**

- **Non-possession**

**Completed**

**over 80%** Fine dust NOx

**DPF+SCR attached**
cf. conventional diesel equipment

**Reduction effect**

**100%** Fine dust NOx CO₂

**Fuel Conversion**
(Diesel → Electricity)

* Based on direct emission standards, without considering emissions from non-exhaust machinery and indirect emissions.
Electricity generated from the solar plants is capable of providing power for more than 3,400 households.

<table>
<thead>
<tr>
<th>Category</th>
<th>Solar Power (MW)</th>
<th>ESS (WMh)</th>
<th>Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPA solar power plant</td>
<td>0.88 (0.57/0.31)</td>
<td>-</td>
<td>1st Phase 2013  2nd Phase 2020</td>
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<tr>
<td>Naum solar power plant</td>
<td>0.08</td>
<td>-</td>
<td>2018</td>
</tr>
<tr>
<td>IPA north port solar power plant</td>
<td>0.99</td>
<td>3</td>
<td>2019</td>
</tr>
<tr>
<td>IPA 2nd solar power plant</td>
<td>0.72 (0.55/0.17)</td>
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<td>1st Phase 2021  2nd Phase 2022</td>
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<tr>
<td>Marine solar power plant</td>
<td>0.35</td>
<td>1.6</td>
<td>2021</td>
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<tr>
<td>IPA inner port berth 6 solar power plant</td>
<td>0.05</td>
<td>0.4</td>
<td>2020</td>
</tr>
<tr>
<td>IPA north port 2nd solar power plant</td>
<td>0.61</td>
<td>-</td>
<td>2022</td>
</tr>
<tr>
<td>IPA north port 3rd solar power plant</td>
<td>0.90</td>
<td>-</td>
<td>2023</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.58</strong></td>
<td><strong>5</strong></td>
<td></td>
</tr>
</tbody>
</table>
Ⅲ Net-Zero Initiatives
③ Renewable Energy: 3.2 Cold Chain Cluster

Establishment of Cold Chain Cluster
(Refrigerated Logistics Centers)

- Utilization of discarded LNG cooling energy (-162°C)
- Min. 30% reduction in maintenance costs including electricity fees

Diagram of cold heat Utilization

<table>
<thead>
<tr>
<th>Temperature control</th>
<th>10~25°C</th>
<th>Food &amp; Beverage, Agricultural, and Fisheries product, Pharmaceuticals, Cosmetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigeration</td>
<td>0~10°C</td>
<td>Fresh Produce, Refrigerated Seafood</td>
</tr>
<tr>
<td>Freezing</td>
<td>-25°C</td>
<td>Frozen Meat Products, Frozen Seafood</td>
</tr>
<tr>
<td>Ultra-Low</td>
<td>-60°C</td>
<td>Premium Seafood(Tuna), Hospital Blood</td>
</tr>
<tr>
<td>Quick Freezing</td>
<td>-80°C</td>
<td>Premium Meats, Pharmaceuticals, Seafoods</td>
</tr>
</tbody>
</table>

Incheon New Port
Cold chain Specialized Zone (231,822㎡)

KOGAS
New port Hinterland

- Cold heat Supply Facility
- Cold storage facility
- Demand Facilities
- Refrigerant
Incheon Port will continue to carry out The innovative Net-Zero businesses
As a Game Changer
Thank you!