

Northeast Asian Energy Hub with Hydrogen

# UFEZ

Ulsan Free Economic Zone Authority



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## What is Free Economic Zone?

Free Economic Zone is a specially designated area which is created to enhance national competitive power and to revive local economy by improving the business and living environment for foreign investment firms

## Ulsan Free Economic Zone

UFEZ was launched in 2021 to encourage hydrogen-based energy industries in Ulsan. It has 3 districts(total area of 4.7km<sup>2</sup>), which are mainly located in industrial complex, UNIST and Ulsan KTX station area. UFEZ provides the best business environment for the green energy industries such as hydrogen industry





Northeast Asian Energy Hub  
with Hydrogen

# Ulsan Free Economic Zone



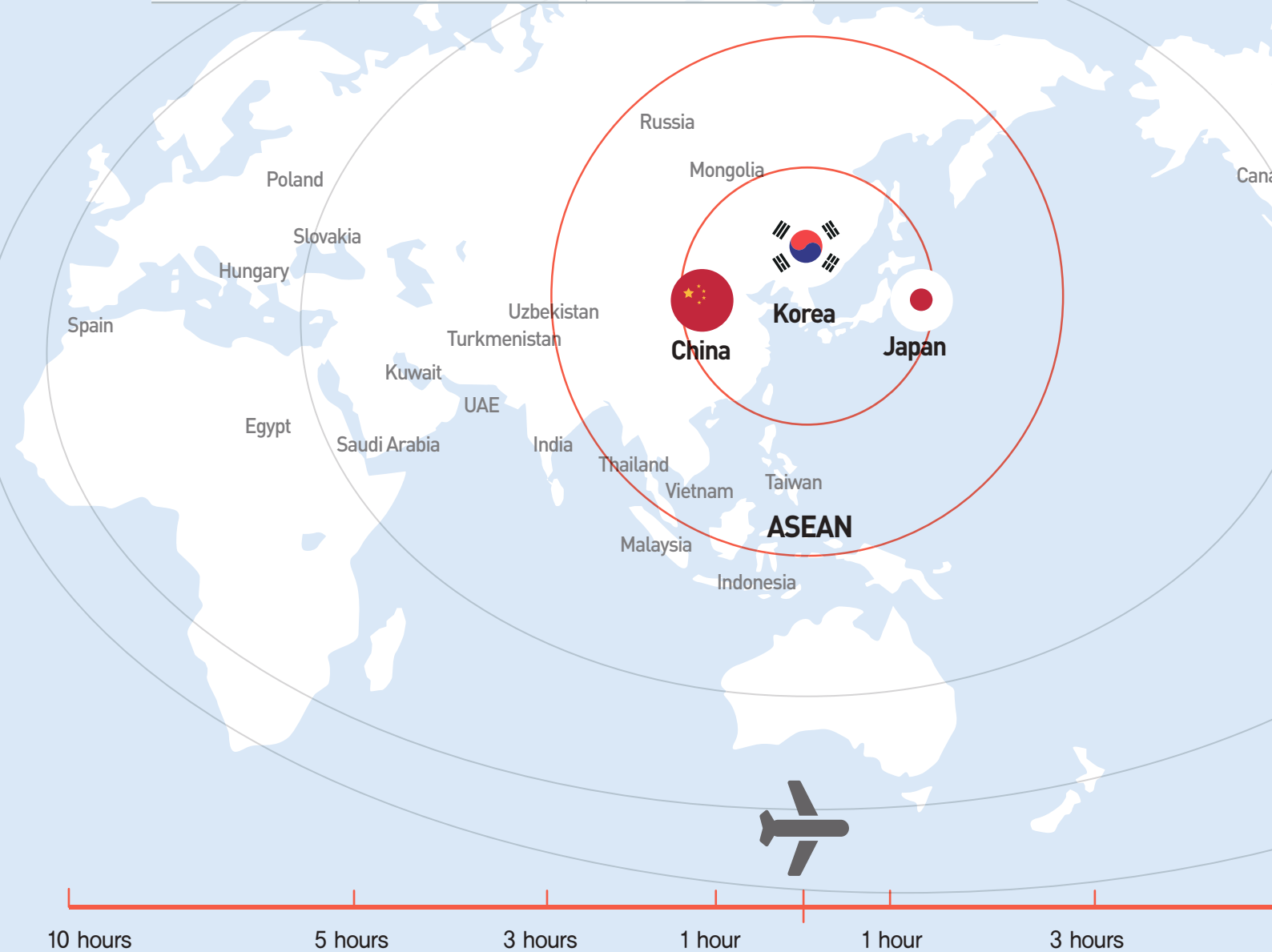
# Status of Korea

## Korea in the World

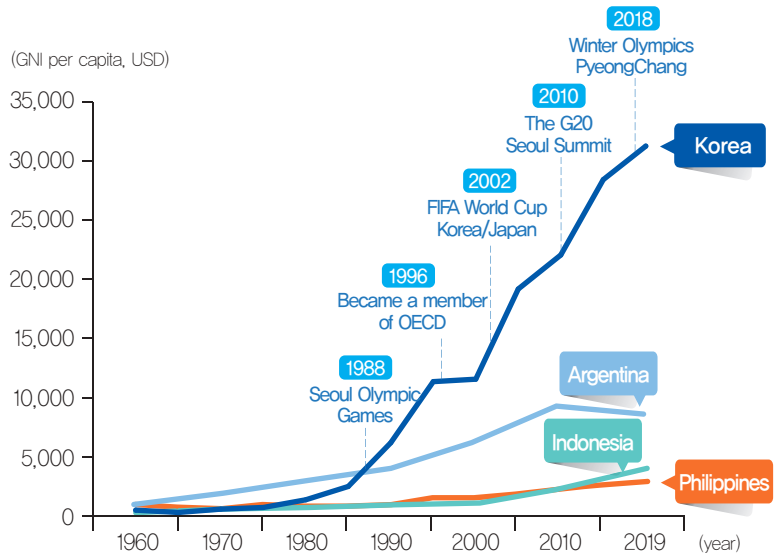
- Korea can be an excellent strategic foothold for the investors targeting the Northeast Asian market which has a total of 1.6 billion population as it is located at the center of the Northeast Asia.
- Being close to the ASEAN market with 0.6 billion people, Korea also offers a major advantage to target this large market.

(Dec. 2020)

	China	Japan	ASEAN
Population	1.41 billion	0.12 billion	0.66 billion
GDP	USD 14.34 trillion(No. 2)	USD 5.8 trillion(No. 3)	USD 3 trillion
Economic growth rate	6.11%	0.65%	4.4%
Annual trade volume	USD 4.6 trillion	USD 1.3 trillion	USD 2.6 trillion



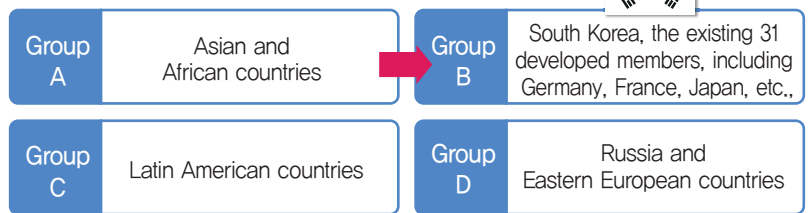
# Korea, the Miraculous Economic Success



The Only Country Whose Status Has Changed from Group A to Group B



UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT



## From a War-Torn Country to a Model of Economic Growth

Seoul after the Korean War(1953)



General Douglas MacArthur  
 “It would take more than 100 years for Korea to reconstruct itself.”



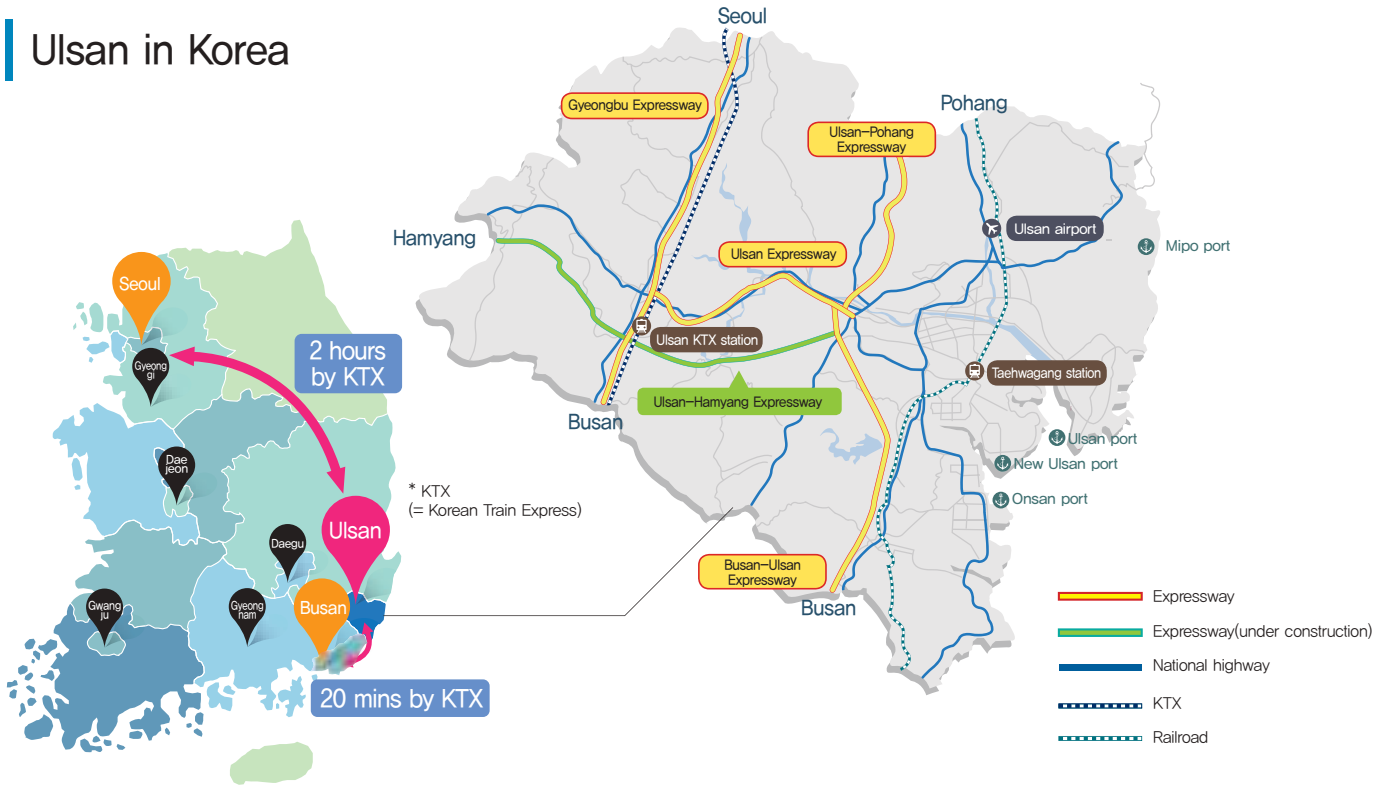
A night view of Seoul(2021)



# About Ulsan

## Status of Ulsan

### Ulsan in Korea

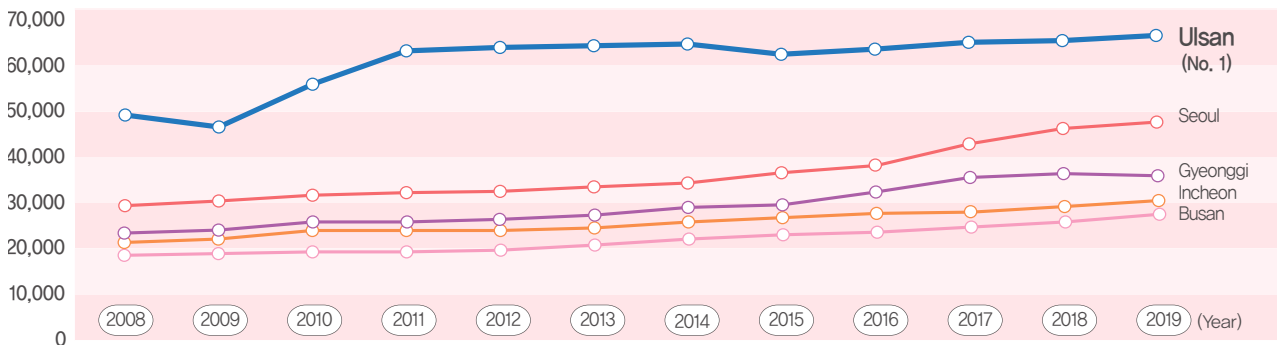


### Ulsan's Economy

Ulsan has been driving the Korean economic growth as a base for industrial production

#### Gross Regional Domestic Product (GRDP)

(per capita, USD)



#### Population



Total **117** million people

2.2% of the total national population

#### Annual Budget



USD **5.3** billion

#### Universities (including nearby ones)



**54** universities and colleges

Annual number of graduates : 83,000 persons

#### Young City



**40.2** years of average age

Korea's 2<sup>nd</sup> youngest city

#### Abundant Skilled Workers



**7,227** manufacturing companies

with a total of 177,427 registered employees

# About Ulsan

## Industry of Ulsan

Number of Companies in Ulsan by Size	Total	Major	Medium	Small	Total Volume of Export
	8,245	94	1,595	6,556	USD 56 billion (No.3 in Korea)

※ Classification of company(average annual sales for 3 years) : Major company(over USD 130 million)/ Medium company(USD 10 to 130 million)/ Small company(under USD 10 million), (2020)

### Domestic Company



### Foreign Company



# Industry of Ulsan

## Automobile Industry - One of the Global Auto Makers : Hyundai Motors



- Annual turnover('20) : USD 45.2 billion
- Ranking in global car sales('20) : 6.52 million cars(5th)
- Taking 70% of the world hydrogen vehicle production



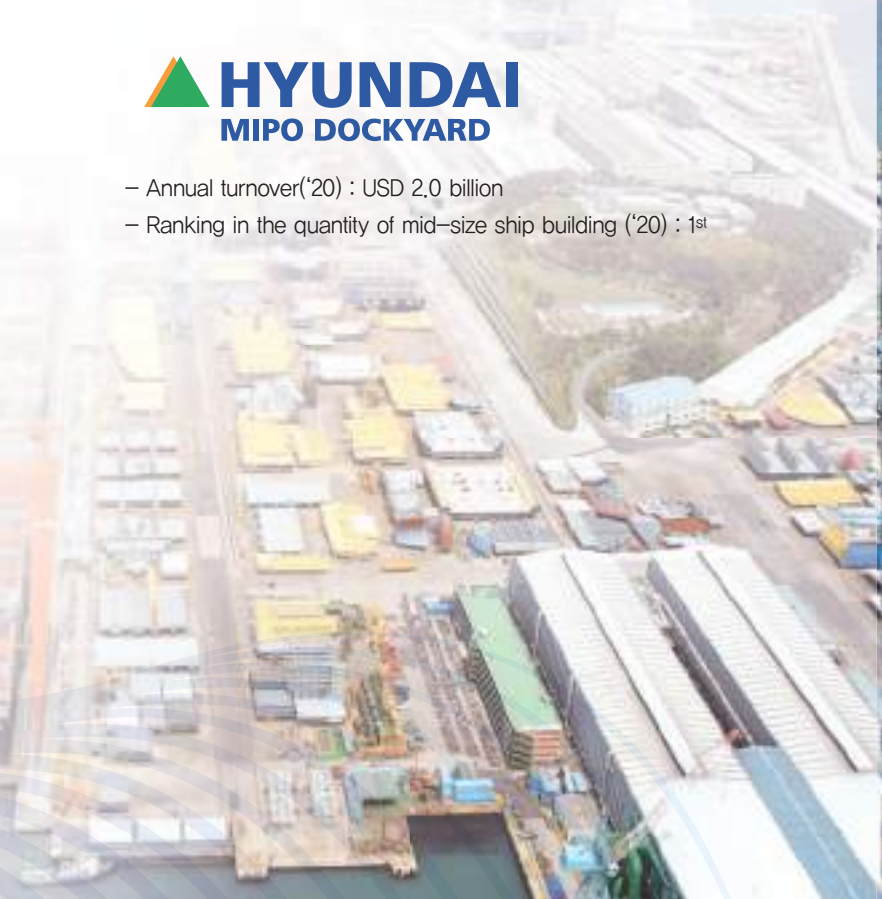
## Shipbuilding Industry - The Globally Largest Shipbuilding Companies : Hyundai Heavy Industries and Hyundai Mipo Dock Yard



- Annual turnover('20) : USD 7.4 billion
- Ranking in ship order('20) : 1st



- Annual turnover('20) : USD 2.0 billion
- Ranking in the quantity of mid-size ship building ('20) : 1st



## Petrochemical Industry – Global Petrochemical Companies : SK Energy and S-Oil



- Annual turnover('20) : USD 28,8 billion
- Capacity of crude oil processing : 840,000 barrels per day



- Annual turnover('20) : USD 15 billion
- Capacity of crude oil processing : 680,000 barrels per day



## EV Battery Pack – One of the Leaders in Global Battery Industry : Samsung SDI

### SAMSUNG SDI

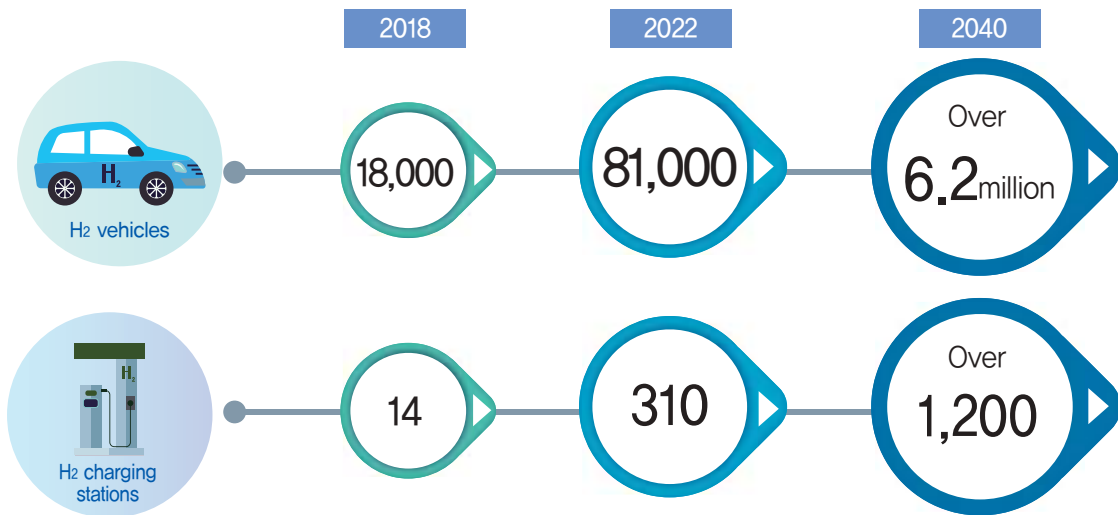
- Annual turnover('20) : USD 10,1 billion
- Ranking 5<sup>th</sup> in the global market share of EV battery pack



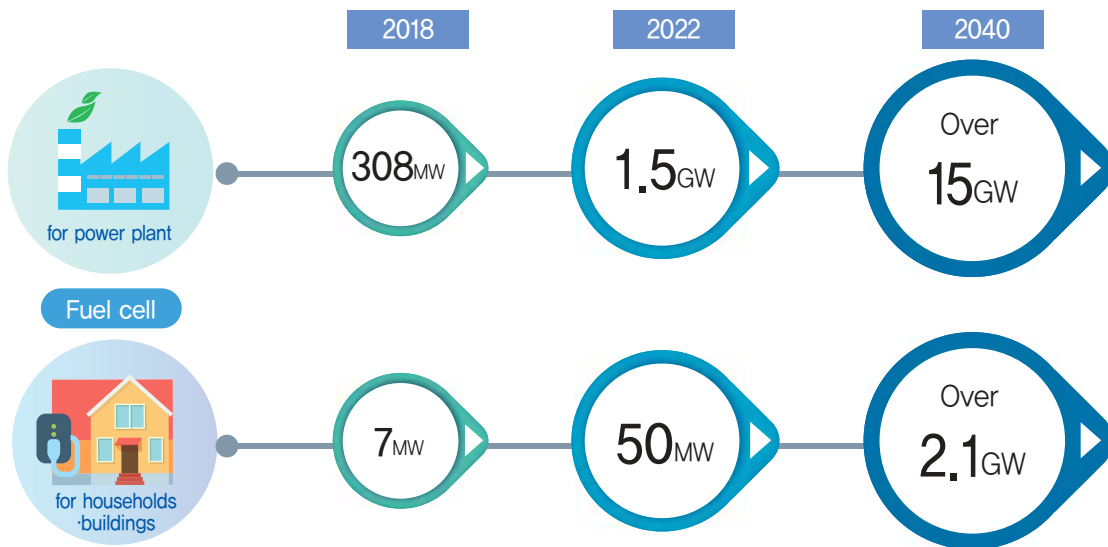
# H<sub>2</sub> Road Map

The Korean Central Government has been planning to make active investments in hydrogen economy

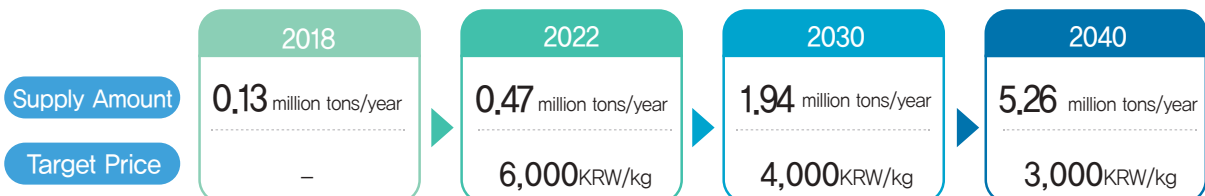
## Hydrogen Mobility(accumulated)



## Hydrogen Energy(accumulated)



## Hydrogen Supply Amount and Target Price



# H<sub>2</sub> Industry Cycle Road Map

Ulsan reorganized its fossil fuel based industry to be hydrogen centered in preparation for the carbon-neutral era

## 01 H<sub>2</sub> Production

### ■ Largest Volume of Hydrogen Produced in Korea

- Annual production of 820,000tons  
(= 50% of the total volume produced in Korea)

Present

### ■ Expanded Capacity for Hydrogen Production

- Additional construction of hydrogen producing factories
- Hydrogen production via water electrolysis based on floating wind power

Goal



## 02 H<sub>2</sub> Transportation

### ■ Longest Underground Pipeline in Korea

- Total length of 120km(= 60% of the total length in Korea)

### ■ Highest Number of Tube Trailers in Korea

- Total 400 under operations  
(= 60% of the total number in Korea)

Present



### ■ Land and Sea Transportation

- 200km of underground pipeline
- Development of hydrogen transportation ship

Goal

## 03 H<sub>2</sub> Storage

### ■ Highest Number of Hydrogen Charging Stations in Korea

- More than 10 stations under operation

Present

### ■ A Liquefaction Plant to be Completed by Hyosung & Linde in 2023

- Expected annual production of 13,000 tons(= world's largest scale)

### ■ Building More than 60 hydrogen Charging Stations

Goal



## 04 H<sub>2</sub> Application

### ■ World's First Mass Production of Hydrogen Vehicle Made by Hyundai Motors(2013)

- City of Ulsan has provided 1,686 hydrogen vehicles until 2020

### ■ Korea's First Hydrogen Taxis and Buses Operated in Ulsan

Present

### ■ Extended Application of Hydrogen in Various Industries

- Higher use of vehicles, fork lifts, drones and ships powered by hydrogen
- Plans to provide hydrogen fuel cell for power generation

### ■ Application of Hydrogen in People's Daily Lives

- Electricity from hydrogen fuel cells provided to households, hospitals, schools, etc.
- Hydrogen-powered trams and ferries to be introduced

Goal



# Investment in H<sub>2</sub> Economy

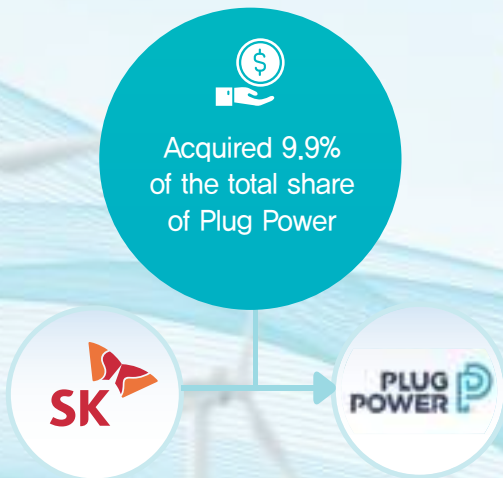
## Hydrogen Alliance



## Hydrogen Project



## Investment in Hydrogen Companies



## Construction of Hydrogen Factory



## Building the Model City of Hydrogen

– Realizing the future city that is powered by hydrogen

### SECTOR 1

#### Installing Hydrogen Mobility Hub (Around Taewhagang Station)

In this area, hydrogen transportation vehicles like buses, taxis, trams, drones, trucks, construction fork lifts and city tour buses will operate.



### SECTOR 2

#### Constructing H<sub>2</sub> Town

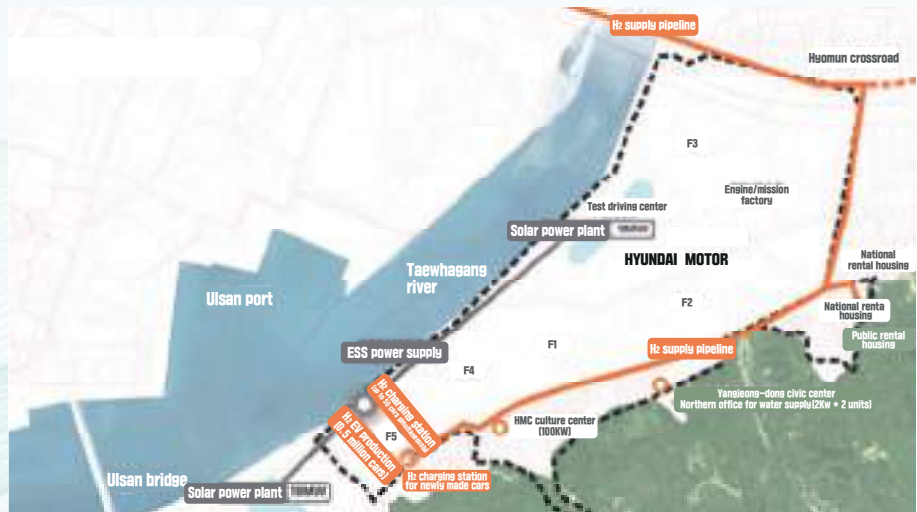
Hydrogen-powered electricity will be provided to households, care facilities, hospitals and high schools.



### SECTOR 3

#### Hydrogen Factory of Hyundai Motors

Hydrogen pipeline will be installed within Hyundai Motors production site to give the company direct access to hydrogen.



## Hydrogen Green Mobility Regulation Free Special Zone

- Establishing hydrogen-based innovative growth
- 5 special cases of demonstration and 1 regulation-free special case

### Special Cases of Demonstration

- Safety certificate permission on hydrogen-powered fork lift and unmanned transportation vehicle
- Allow indoor logistics transport machines to be charged using a mobile hydrogen charging station
- Preparing for minimal safety standards on hydrogen-powered ships and then permitting sailing demonstration
- Permitting charging hydrogen to hydrogen-powered ships



Hydrogen-powered fork lift



Unmanned hydrogen-powered transportation vehicle



Mobile hydrogen charging station



Hydrogen-powered ship



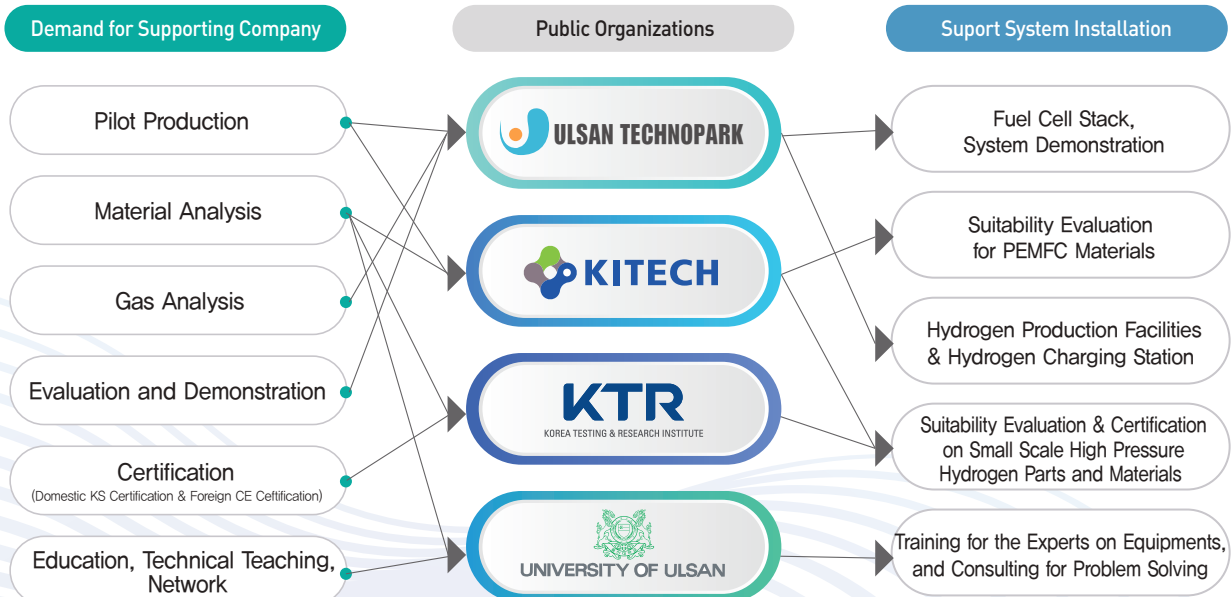
Hydrogen charging station for ship

### Regulation Free Special Case

- Permitting the demonstration for the establishment of ICT-based hydrogen supply pipeline

## Building Innovation Cluster to Support Hydrogen-Related Companies

- Installing technological support system for hydrogen industry combined with local advantages (such as infrastructures, companies, etc)
- systematic strategies for business activity



## Hydrogen Fuel Cell Demonstration Center

- The center supports the development and demonstration of hydrogen-based fuel cell
- It has a demonstration platform for 1MW of fuel cell and 3km of hydrogen pipeline that reaches the Ulsan petrochemical industrial complex

Research on the demonstration of PEMFC power generation system of the total 800kw scale using by-product hydrogen

- 4 generators for 25kw, 6 generators for 50kw, and 4 generators for 100kw



Popular hydrogen sensor development for demonstration complex and monitoring research

- Popular hydrogen sensor development for safety suitable for outdoor hydrogen-powered facility and production of hydrogen-sensing monitoring module



Setting up a roadmap for the demonstration complex business development using by-product hydrogen

- Finding out the business models on high value-added by-product hydrogen
- Reviewing the improvement methods on the economies of the hydrogen fuel cell power generation



Developing mass production technology on graphene catalyst supporting body for PEMFC



## UNIST, Marking a New Milestone for Hydrogen Research

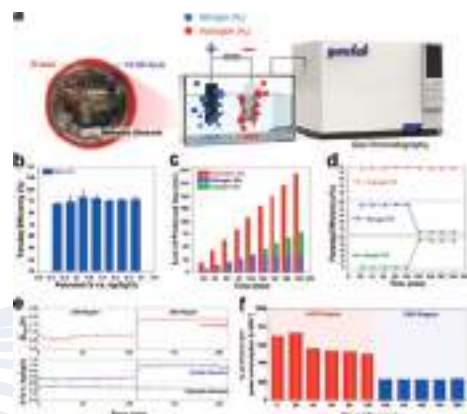


- ▶ **Ranking 6<sup>th</sup> in THE\*** World University Evaluation('21)
  - \* Times Higher Education, a university evaluation institute in the UK
- ▶ UNIST leads global science technology contributing to better human lives
- ▶ It provides various human resource pool through raising the best experts

- Opened on March, 2009
- 1 special graduate school /2 professional graduate schools /3 colleges & 2 faculties /15 departments
- 463 faculty members(44 years of average age, 11% of foreign faculties) /2,622 undergraduates /2,000 graduates
- Status of patent applications & registrations(from 2013 to Feb. 2021)
  - Number of patent applications in Korea : 3,094 cases in total
  - Number of patent registrations in Korea : 1,825 cases in total
  - Number of patent applications in foreign countries : 807 cases in total
  - Number of patent registrations in foreign countries : 202 cases in total
- Academic statistics(2013 to Jan. 2021)
  - 8,647 academic research papers, 7,885 SCI(E)-leveled papers, 4 SCI(E)-leveled papers on average per professor
  - **Ranking 1<sup>st</sup> in paper citation rate in Korea for 4 consecutive years**
- Installation of USD 200 million worth of high-tech research equipment

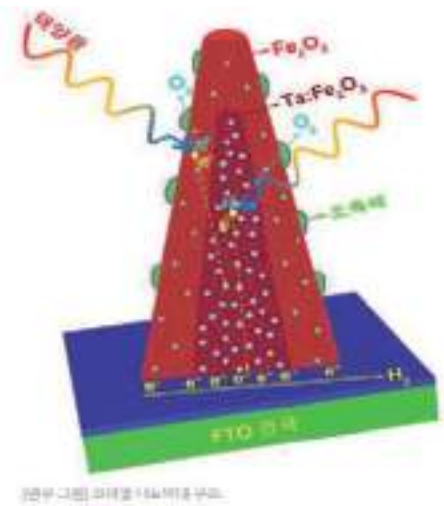
## Successful Production of Green Hydrogen through Electrolysis of Liquid Ammonia

- ▶ Electrolysis of liquid ammonia uses two thirds less electricity than electrolysis of water
- ▶ This is regarded as a leading green hydrogen and carbon-neutrality technology



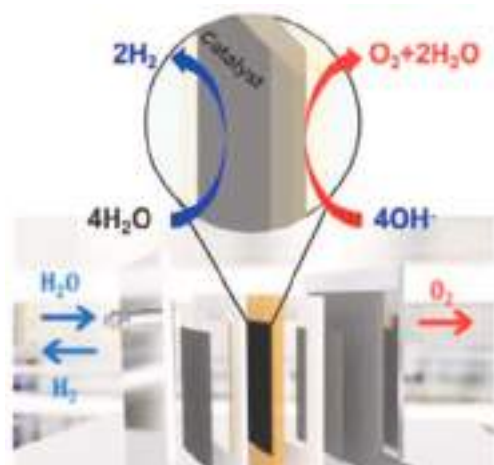
## Production of Green Hydrogen only with Water and Sunlight

- ▶ Dual-functional optically catalyzing electrode for solar hydrogen production system was also developed
- ▶ Less energy consumed and more hydrogen produced



## Development of a New Catalyst that Solves the Bottleneck in Hydrogen Production

- ▶ A new catalyst that promotes oxygen-generation reactions in water electrolysis technology was developed
- ▶ This solved the high cost and safety problems of existing commercial catalysts



# *Forward to Tomorrow*

We have been preparing ourselves for the tomorrow of Ulsan and Korea !





The Power of Ulsan, the Future of Korea

# Ulsan Free Economic Zone



## | Vision

Northeast Asian Energy Hub with Hydrogen

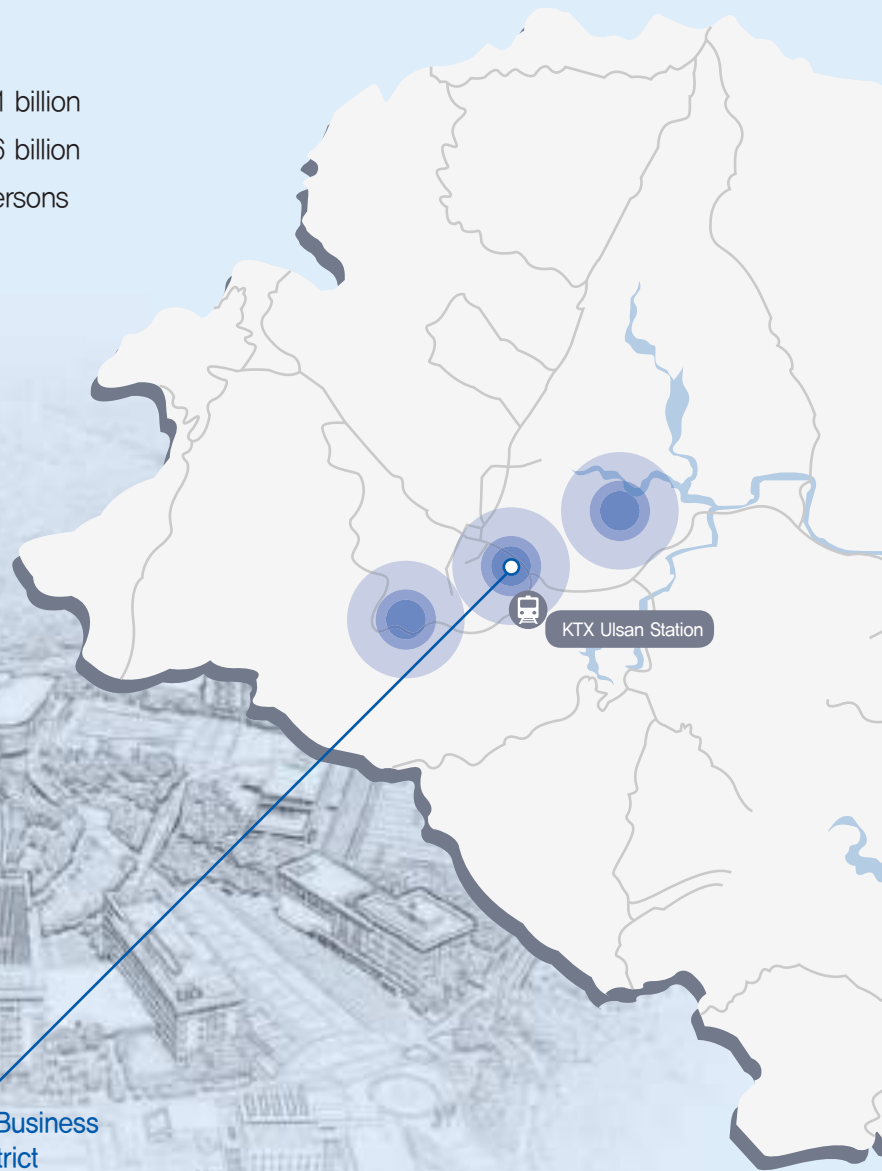
## | Mission

Fostering the Largest Energy-centered City in the Northeast Asia through Hydrogen Industry Hub

- ▶ Production Inducement Effect      USD 11,31 billion
- ▶ Value Added Inducement Effect      USD 4.46 billion
- ▶ Employment Creation Effect      76,712 persons

📍 **Total Area**      **4.70km<sup>2</sup>**

📍 **Number of Districts**      **3 Districts**



## **R&D Business Valley**

The Center of Hydrogen Fuel Cell related Business within and around Station Area & R&D District

- Area**      2.72km<sup>2</sup>(Including High Tech Valley, UNIST and KTX Station Area)
- Target Industries**      Hydrogen industry(Fuel cell, etc)
- Fostering Strategies**      R&D technology development, fostering business support

## Electrohydrogen Auto Valley

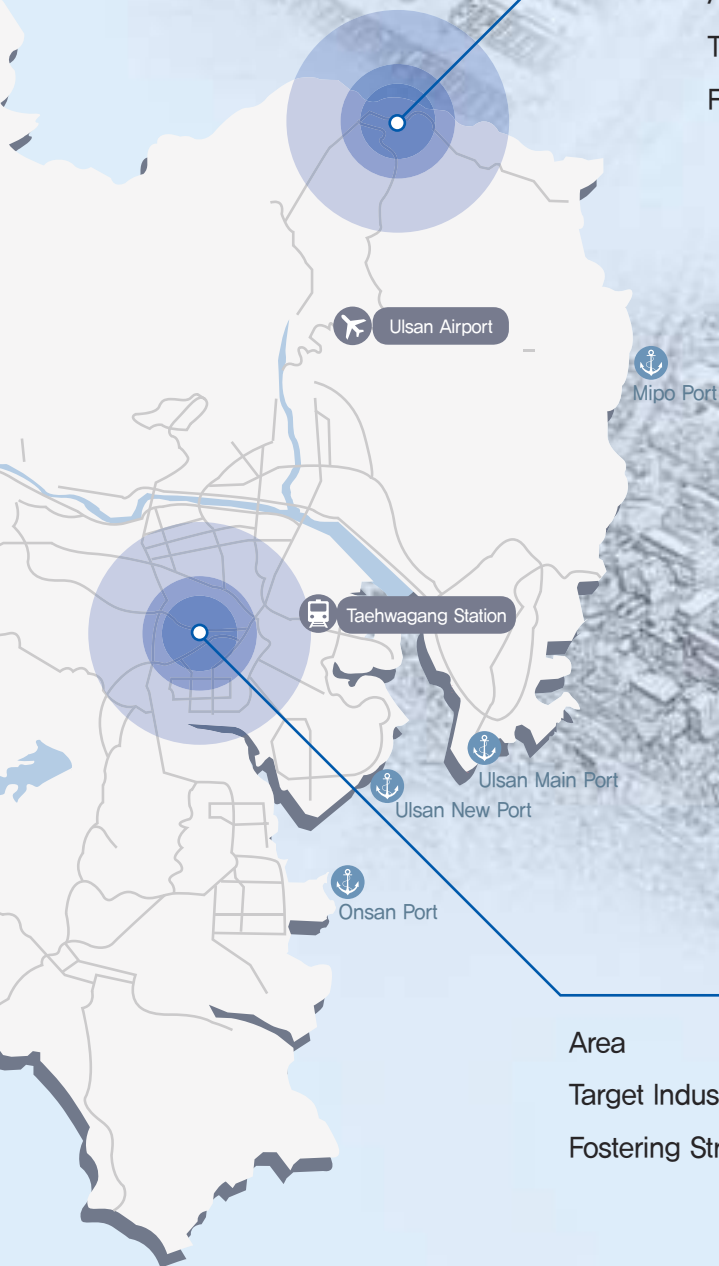
Key Area for Parts & Materials of the Hydrogen Vehicles

Area 0.69km<sup>2</sup>(Ehwa Industrial Complex)

Target Industries Hydrogen industry(Auto-parts)

Fostering Strategies

- Securing parts production facilities for hydrogen vehicles
- Installing parts cluster for eco-friendly vehicles



## Hydrogen Industry Base

Area 1.29km<sup>2</sup>(Techno Industrial Complex)

Target Industries Hydrogen industry(Anchor companies)

Fostering Strategies

- Demonstrating hydrogen industry
- Clustering hydrogen-related research facility
- Leading the hydrogen economy city

Ulsan Free Economic Zone  
**Hydrogen Industry Base**



Area 1,29km<sup>2</sup>(Techno Industrial Complex)

Target Industries Hydrogen industry(Anchor companies)

- Fostering Strategies
- Demonstrating hydrogen industry
  - Clustering hydrogen-related research facility
  - Leading the hydrogen economy city

✓ Designation of the Regulation Free Special Zone for Hydrogen Green Mobility

✓ Designation of the Regulation Free Special Zone for Genome Service Industry

**Fostering Public Organizations to Support Hydrogen Industry Demonstration**

- Demonstration research building for Hyundai Motors and evaluation building on fuel cell
- Ulsan Industry-University Convergence Institute (UNIST, University of Ulsan, etc)

**Building the Hydrogen City**

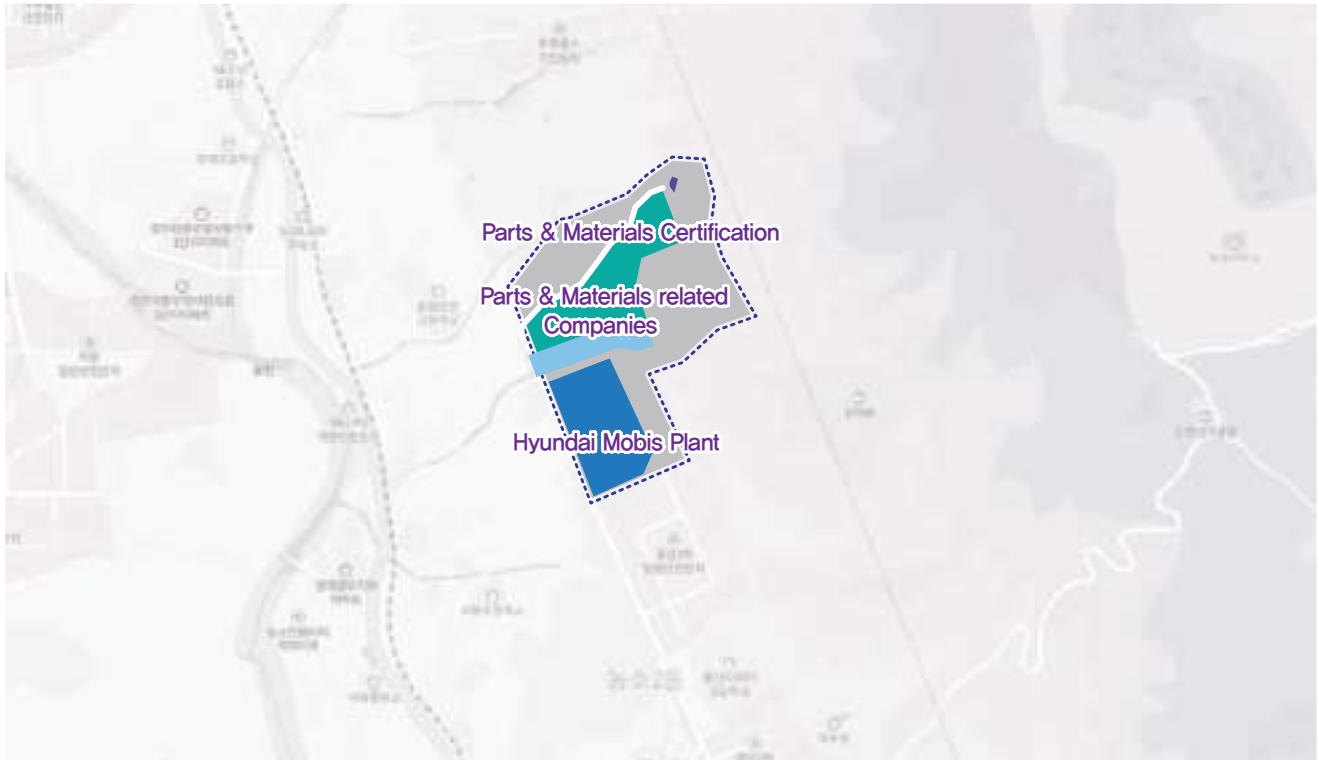
- Deregulations on hydrogen industry businesses and enlargement of the hydrogen demonstration businesses will be made
- Setting an example as a hydrogen city
- Use of the hydrogen pipeline

**Leading the Hydrogen Economy City**

- Expansion of the existing business district to attract companies
- Administrative and technical support to set up a hydrogen city



# Electrohydrogen Auto Valley



- Area** 0.69km<sup>2</sup>(Ehwa Industrial Complex)
- Target Industries** Hydrogen industry(Auto-parts)
- Fostering Strategies**
- Securing parts production facilities for hydrogen vehicles
  - Installing parts cluster for eco-friendly vehicles

## Securing Parts Production Facilities

- Hydrogen vehicle parts production
- Anchor companies and other related companies attraction



Aerial View for the New Construction Site of Hyundai Mobis Plant in Ulsan

## Stabilizing Parts Production

- Building hydrogen town(2nd)
- Demonstration business for hydrogen vehicle parts and inspection

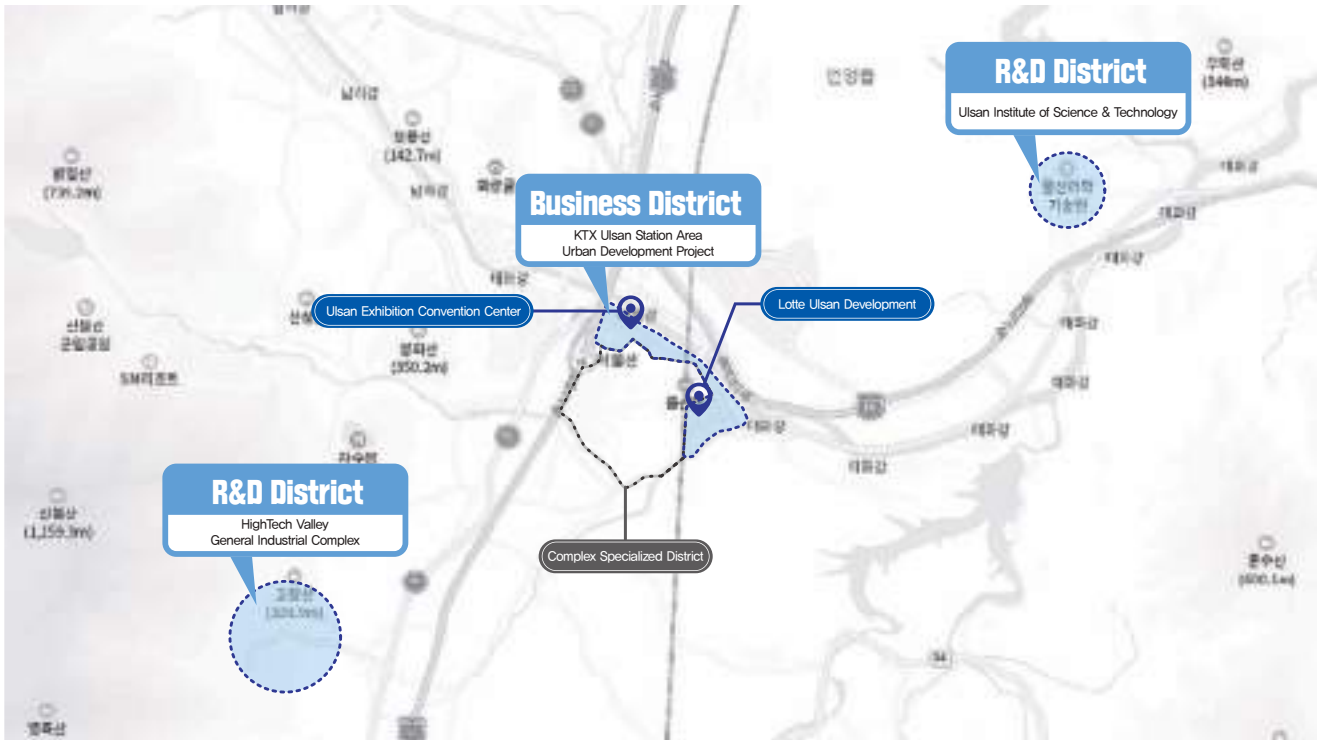
## Installing Parts Cluster

- Fuel cell
- Hydrogen fusion valley (Production, research, support facilities, etc)



Safety Certification Center and Inspection Station for Hydrogen Electric Vehicle

# R&D Business Valley



**Area** 2,72km<sup>2</sup>(High Tech Valley, UNIST and KTX Station Area)  
**Target industries** Hydrogen fuel cell  
**Fostering strategies** – R&D technology development  
 – Fostering business support industries  
 – Building mid&long term residential environment

## UNIST

- R&D technology development
- Technological advancement



Ulsan Exhibition Convention Center

## High Tech Valley(Phases 1 and 2 )

- Business and export of hydrogen products

## Exhibition & Convention

- Fostering industry exhibition specialization
- Promoting investment attraction for new industries

## Building Mid and Long-term Residential Environment

- KTX station area
- Compound specialized complex(Smart self-sufficient new city)



General Industrial Complex at High Tech Valley

## Feature and Advantage



### Major Companies and Public Organizations

- Major companies in automobile, shipbuilding, petrochemical, and many related small and mid-size companies are located.
  - Hyundai Motors, Hyundai Heavy Industries, SK Innovation, S-Oil, etc
- Many chemical & energy-related public organizations along with research institutions
  - Korea National Oil Corporation, Korea Energy Economics Institute, Korea Testing & Research Institute, and Korea East-West Power, ect



### A Variety of Economic Special Zones

- Regulation-Free Special Zone for Hydrogen Green Mobility, Ulsan Innovation Cluster, Convergence & Integration Complex Free Special Zone for Atomic and Atomic Power Plant Dismantling Energy Industries, etc



### Innovational Ecosystem Infrastructures

- Announcements on the vision for 2030 global top hydrogen city, and 10 Projects(Feb. 26, 2020)
- Annual by-product hydrogen productions : 820,000tons (50% of the total productions in Korea)
- Total length of 120km in hydrogen pipeline(60% of national hydrogen pipeline), and 10 hydrogen charging stations
- Building and running 140 houses from world's top hydrogen town



### R&D Supports through the Public Organizations

- Next Generation Hydrogen Convergence Technology Institute – Hydrogen-related R&D and demonstration
- Hydrogen Fuel Cell Demonstration Center – Hydrogen fuel cell development and demonstration
- Korea Institute of Energy Research – Hydrogen fuel cell technology development



### Training the Experts in the Fields of Energy through Public Organizations

- Expert trainings through UNIST, University of Ulsan, Ulsan Technopark, etc

# Incentives



## Incentives for the Tenant Companies within UFEZ

Based on the 「Special Law for the Designation and Operation of the Free Economic Zone」, Ulsan Free Economic Zone Authority provides a variety of incentives to the tenant companies so that they can actively focus on their businesses in a more free way.



### Tax Cuts

National Tax	Customs Duties	Exemptions for imported capital goods for 5 years	
	Local Tax	Acquisition Tax	Exemption for 15 years
Property Tax		Exemption for 3 ~ 15 years	<ul style="list-style-type: none"> <li>• Logistics /Medical Industries → More than USD 5 million</li> </ul>



### Cash Grants

Total Amount	More than 5% of Total Foreign Direct Investment(In general, around 30% of FDI)
Criteria	<ul style="list-style-type: none"> <li>• More than 30% of FDI Ratio</li> <li>– New growth engine /original source technology /high-tech parts&amp;materials /equipments</li> <li>– Job creations /research personnel* : more than 5 regular employees</li> <li>* with higher education than master's and 3 years of experience</li> </ul>
Contents	Land purchasing or renting costs /construction cost /cost for capital goods/ subsidies for employment and education/training costs



 Deregulations

Exclusion for Mandatory Employment	Exclusion of mandatory employment regulations to hire persons of national merits, the disabled, the aged, etc
Unpaid Leave	Unpaid leave allowed
Dispatched Employee	Exclusion of the regulations for dispatching period and task
Foreign Exchange Transaction	Unreported transactions allowed, in case of less than USD 20,000

 Rent Reductions for Public-owned Properties

Exemption	<ul style="list-style-type: none"> <li>• For businesses with more than USD 20 million of FDI or more than daily average employment of 300 persons</li> </ul>
75% Reduction	<ul style="list-style-type: none"> <li>• In case of the businesses whose FDI is between USD 10 million and USD 20 million or whose daily average employments are between 200 and 300 persons</li> </ul>
50% Reduction	<ul style="list-style-type: none"> <li>• In case of the businesses whose FDI is between USD 5 million and USD 10 million or whose daily average employments are between 100 and 200 persons</li> </ul>



## Integrating Energy Industries by Having UFEZ Designated as the Northeast Oil & Gas Hub

- By the year 2030, the Authority plans to have Ulsan become the Northeast Oil and Gas Hub with production volume of 24,3 million barrels from Ulsan New Port.
  - ▶ It will take around USD 2,5 billion of project cost, and 684,000 square meters of land.
- At a hinterland complex of the Northeast Oil & Gas Hub, hydrogen business will be expanded.
- At the hinterland complex, LNG terminal will be expanded and hydrogen business will be also performed using LNG thermal energy.
- The world's best energy trading market will be pioneered.
- In line with hydrogen and the Oil & Gas Hub, concerning trading companies, financial institutions, and a commodity exchange for hydrogen, oil and gas will be occupied.



## Creating Secondary Battery Ecosystem

- In connection with Hyundai Motors and Samsung SDI, the place is supposed to develop into secondary battery mecca.



### Linking with Floating Offshore Wind Power Plant for Renewable Energy

– By linking itself with the floating offshore wind power and hydrogen industry, UFEZ will develop into the future growth industry.



### Leading Atomic Power Dismantling Technology

– In preparation for the growth of atomic power plant dismantling industry across the world, UFEZ has been building the ecosystem in this field.

We prepare ourselves for the future of Ulsan and the tomorrow of Korea !

# The Power of Ulsan! The Future of Korea! Ulsan Free Economic Zone





**UFEZ**  
Ulsan Free Economic Zone Authority





With UFEZ  
Your dream will come true

