INCHEON & ALMERIA
BEST PRACTICES ON

HYDROGEN ENERGY ECONOMY

ICP INTERNATIONAL CITY PARTNERSHIPS
ACTING FOR GREEN AND INCLUSIVE RECOVERY

Incheon Metropolitan City

ALMERÍA CIUDAD

INTERNATIONAL CITY PARTNERSHIPS:
ACTING FOR GREEN AND INCLUSIVE RECOVERY (ICP-AGIR)

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ICP INTERNATIONAL CITY PARTNERSHIPS
ACTING FOR GREEN AND INCLUSIVE RECOVERY
A EUROPEAN UNION PROGRAMME

Project implemented by
RAMBOLL

CITYNET
THE REGIONAL NETWORK OF LOCAL AUTHORITIES FOR THE MANAGEMENT OF HUMAN SETTLEMENTS

contents

Introduction

The International City Partnerships: Acting for Green and Inclusive Recovery is a project of the European Union and managed by the Directorate-General for Regional and Urban Policy (DG REGIO) of the European Commission. The project is being implemented from October 2021 to March 2023 and originates in a pilot project of the European Parliament that seeks to contribute to the delivery of international commitments articulated in the 2030 Agenda for Sustainable Development and the UN New Urban Agenda.

The aim of the project is to contribute to the improvement of quality of life in participating cities, by promoting sustainable and integrated urban development, through the identification of innovative policies and programmes. In particular, the project seeks to develop policy and practice in four key priority themes of the Urban Agenda of the EU: circular economy, energy transition, air quality and inclusion of migrants and refugees.

CITY INTRODUCTION

Incheon Metropolitan City

Incheon Metropolitan City is the third largest city in the Republic of Korea. It is an international city that hosts the country's largest airport and serves as a major port city. Incheon is a centre of industrialization and hosts large local companies and global enterprises in the Incheon Free Economic Zone (IFEZ), such as Samsung. The Songdo International Business District, located in the IFEZ, is a ubiquitous smart city and the home to the UN Green Climate Fund. Incheon boasts expertise in smart city technology and integration, with a strong focus on circular economy and energy transition.

CITY INTRODUCTION

Almeria City Council

Almeria is a city and municipality of Spain, located In Andalusia. Currently the city is carrying out its 2030 Strategy Plan in a push towards more sustainable development. Their strategies and expertise fall within these nine work vectors: Mobility and Communication Infrastructure, Agro-Industry and Bio-Industry, Culture, Sustainable Tourism, Blue Economy, Innovation and Smart City, Employment and Education, Diversity and Social Inclusion, and Climate Change.

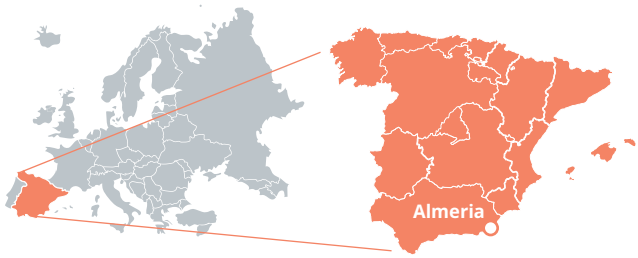
Cooperation between Almeria and Incheon

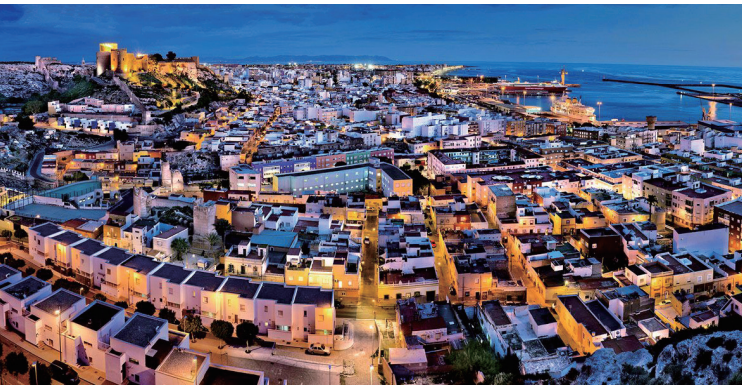
Incheon Metropolitan city and Almeria City Council mainly cooperated on the topic of New and Renewable Energy and Hydrogen Solutions under the theme of Energy Transition. To establish strong relationship and expand cooperation to academic and business sector, universities, research institutes, chamber of commerce, and private companies in the NRE field from both cities also participated ICP-AGIR Programme as main stakeholders. In the duration of the programme, Incheon and Almeria conducted series of bilateral meetings and study visits on Green Hydrogen Energy and Strategy on Hydrogen Energy Based City. In October 2022, the Solar Energy Research Center (CIESOL) at University of Almeria and Hydrogen-based Next-Generation Mechanical System KIURI Research Center at Inha University signed MOU to consolidate the cooperation between two institutes and collaborate further on research projects on hydrogen solutions. Based on this agreement, collaborative research and the exchange of researchers, students, and professors will take place. Furthermore, both cities expect the partnership established during the project will generate mutual learning experiences to government officials in both cities and more research opportunities to the researchers in the Energy Transition field.

Challenges

Almeria

Nowadays, there is an increasing concern for the future of our environment, that is engaging citizens to become more and more involved in behaviours like sustainability, recycling and limiting contamination. Unfortunately, all these behaviours could be only palliative, unless we find a 100% clean energy source that can maintain our current lifestyle. Also, it must be considered that the amount of energy consumption in the world has increased in parallel with the country's wealth, existing a clear relationship between energy consumption and gross domestic product. The world's primary energy source remains petroleum (34%), then coal (27%) and finally the natural gas (24%), meaning that 85% of the world's energy sources come from fossil fuels, producing a dangerous escalation of the atmospheric levels of carbon dioxide [https://ourworldindata.org/fossil-fuels]. Among the final consequences of the increase of CO2, there is the rise of temperature on our planet, which leads to a vast mass of ice melting and many other weather problems. Additionally, the consumption of fossil fuels increases also environmental pollution that gives rise to health concerns [Cardiovasc. Res. 2020, 116, 1910–1917]. Hydrogen has been proposed as a valuable and clean alternative energy source due to the fact that the final product of its combustion is just water. Additionally, the H2 molecule is light, storable and has the highest gravimetric energy content of known fuels (120 MJ kg-1). For these reasons, hydrogen has been proposed to be an energetic vector that can lead to a circular green economy. Nevertheless, before using hydrogen as fuel extensively, there are two major challenges: the sustainable production of H2 and its efficient storage. More than 95% of hydrogen is produced from fossil fuel via steam reforming, coal gasification, or the steam methane reforming (SMR) process [Conference Papers in Energy 2013, 2013, 1–9]. These processes produce 5.5 tons of CO2 per ton of H2. Alternatives have been proposed such as the pyrolysis of methane and biomass, which also produce CO2 [Biomass Gasification, Pyrolysis and Torrefaction: Practical Design and Theory; Elsevier: 2018; pp 1–564]. For this reason, electrolysis of water is the most attractive source of hydrogen but is thermodynamically unfavourable (H2O→H2 + 1/2O2; ΔG° = 237.24 kJ/mol;





ΔH° = 285.83 kJ/mol) and requires a substantial energy input (50–55 kWh of electricity/kg of H2), being therefore dependent of the cost of the electricity. In 2020, only 0.6 % of the industrial hydrogen was produced by this procedure [https://www.iea.org/reports/hydrogen].

The city of Almeria is located at the south of Spain and built several features that may it ideal to transform their old infrastructure, which is based on fossil fuel, to that supported by the hydrogen production and consumption. Almeria has a safe port, airport and the gas from Argelia arrives to its shorts. Also is a small city, which can be transformed easily. So the implementation of an energetic economy based on the hydrogen could be largely wellness for the city and province. The natural gas coming from Argelia is easily transformed into hydrogen that can be used to supply the new ships and airplane using hydrogen. The proximity of the gas pipeline to the city facilitates the connexion with the hydrogen source as well as the possibility of disposal of free space to implement the transformation and hydrogen storage plant, making this city the optimal candidate to become a hub based on hydrogen energy. The infrastructure created to canalise and use hydrogen produced from the natural gas can be used when technology to generate green hydrogen, by using solar light (a wellness of Almeria) and water, is ready to be used. Nevertheless, Almeria needs to learn from other cities that have experienced this transformation, being Incheon one of the most important references. Therefore, the project facilitates and helps the transformation of the city of Almería to a new more green future.

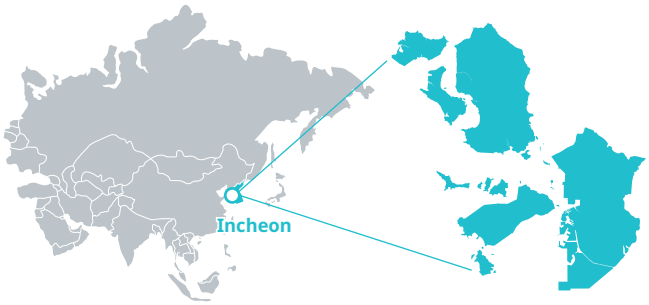
Incheon

Today, the world is joining the effort to respond to climate change driven by global warming and the availability of stable energy supply has emerged as the key factor to consider when opting for a source of energy. We are now gearing up in the renewable energy transition, so-called 'the era of energy revolution'.

Already, countries around the world, mainly advanced economies, have competitively built and announced the policies based on their own strengths to occupy a dominant position in the future hydrogen market.

In a bid to invigorate the hydrogen economy, the government of the Republic of Korea has established the roadmap for facilitating the hydrogen economy and enacted the 'Hydrogen Economy Promotion And Hydrogen Safety Management Act'. With the measures and strategies to boost the competitiveness of hydrogen industry ecosystem, Korea has been expanding investment in the related industries.

The city of Incheon with the large-scale hydrogen production infrastructure well as great demand for large volumes of hydrogen energy, retains the optimal foundation to meet the hydrogen demand in the greater capital area and to lead the hydrogen growth in the country. The city also features favorable conditions and environment for green hydrogen production and demonstration as the base of the renewable energy production-related industries (major offshore wind power complex, etc.) and research institutes.



Transition to the green hydrogen energy serves as not just the opportunity to create the sustainable environment and economy but also the starting point to ensure the very survival of our next generations.

In this sense, Incheon Metropolitan Government is committed to making bold investment and embracing new challenges based on its advantageous environment for the hydrogen industry. To this end, under the vision of 'Happy Citizens, Clean Environment and Sustainable Future City with New Growth Engines Developing in Harmony', Incheon has set its policy direction and key tasks in six areas, toward becoming a city of coal-exit and carbon neutrality.

Spain is widely known as the country that has achieved both energy security and environmental improvement through its active renewable energy development. It adopted the policy to support the renewable energy development earlier than other countries to allow for its early establishment, which has been recognized as a success model across the world.

By cooperating with Almeria - the leader of solar energy industry - as part of the ICP-AGIR programme, Incheon has shared best practices with Almeria, such as the strong hydrogen energy infrastructure of Incheon, excellent solar power and solar thermal energy industry of Almeria, both governments' commitment, advanced flagship industries, and so on.

Through online meetings on six occasions and reciprocal study visits, both Almeria and Incheon shared the status of renewable energy development and their key strategies, and agreed to further strengthen exchange and cooperation between cities, research institutes and private sectors. To initiate such a move, Inha University's KIURI (Korea Initiative for fostering University of Research & Innovation) and Almeria's CIESOL research center signed the Memorandum of Understanding in October 2022 when the Almeria delegation conducted the study visit in Incheon.

The two institutes agreed on research cooperation for sustainable energy sources through joint hosting of a hydrogen forum and exchange programmes for faculty, researchers, and students.

As the renewable energy leaders and cooperation partners, the two cities will build a new partnership that connects the present and the future and continue discussions to deepen their bilateral cooperation.

Hydrogen Energy Solutions

Almeria

Almeria has a powerful and remarkable network of local stakeholders working on renewable energy and hydrogen energy research and solutions, so this scenario gets them to be experts in green hydrogen energy solutions.
The best practices of two of them, CIESOL and ISE, are shown next.

CIESOL

The development of new technologies targeted to generate hydrogen is accomplished in the CIESOL (Centre of research on solar energy), where efforts are focused on the production of hydrogen from water by using it as an energy source the solar light.

CIESOL (www.ciesol.es) is a joint research centre, between the University of Almeria and the Center for Energy, Environment and Technology (CIEMAT) attached to the Ministry of Science and Innovation. Is a research centre with a marked interdisciplinarity vocation: physicists, chemists, biologists, industrial engineers and chemical engineers are together with the only objective of promoting synergy, a strategy that has been shown as an adequate strategy to optimize time and funds in research. The research lines aborded in CIESOL have aimed to various industrial sectors: photochemical reactions; hydrogen production by solar irradiation; medium and high temperature solar thermal energy; design and optimization of solar thermal cooling and heating systems; water treatment (desalination, decontamination, microalgae); integration of the solar thermal and photovoltaic energy in buildings.

Development of new strategies for producing energy requires clearly the use of hydrogen as an energy vector but only it is going to be possible if this gas is obtained by an eco-benign procedure. Earth, our planet, is energised by solar light that drives most of the processes on its surface. Therefore developing a procedure that leads to a practical generation of hydrogen by solar light will solve most of the energetic current problems. Production of hydrogen by solar light is aborded by two different strategies: a) the use of a metal catalyst that by harvesting the solar light promotes the electronic evolution into different energetic levels that produce the cleavage of the water molecules. The second procedure (b) is to split the water molecule by the high temperature (> 100 °C) generated by a solar concentrator. Despite both procedures can be successful, another important problem to solve is how to store the hydrogen. Targeting this objective, new chemist storage cells are in development.

H2 ISE GREEN HYDROGEN PLAN

INGENIA SOLAR ENERGY (ISE) is a Spanish engineering and consultancy company, based in Almería, that specializes in a full range of services for solar photovoltaic projects and green hydrogen.

ISE brings 15 years of worldwide experience in utility-scale photovoltaic plants to large energy consumers which means an extensive international experience acting as a technical advisor to both financial institutions and developers. HAVING designed and built 105 photovoltaic projects in 25 countries with a total installed power capacity of 4.5GW. ISE is aligned with SDG 7, SDG 9, SDG 11 and SDG 13.

During the last year ISE has developed a project called H2-ISE, which includes the installation and commissioning of a 100% of a green hydrogen production plant, including a hydrogen refuelling station. Our Pilot plant is based on the Technology Park in Almería.

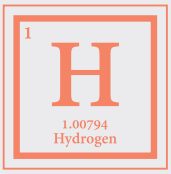
The main objective of H2-ISE project is to initiate the use of sustainable electric mobility with fuel cell vehicles (FCVs) by putting a hydrogen-powered vehicle into circulation. In parallel, the production of renewable hydrogen is promoted through the use of photovoltaics in a self-consumption regime and the development and introduction to the market of new electrolyser developments.

Our pilot project was thought for the use of INGENIA SOLAR ENERGY staff. Nevertheless, this project is easily replicated anywhere.

Almeria has a powerful and remarkable network of local stakeholders working on renewable energy and hydrogen energy research and solutions, so this scenario gets them to be experts in green hydrogen energy solutions.

The most relevant technical aspects of ur pilot plant are described as follow:

- PV Production installed
  19.25 kWdc in a canopy which use is destined exclusively to power the hydrogen production block.
- Environmental water generator
  capable of extracting the necessary water from the environment to cover the production of hydrogen. In this way, the installation will be able to operate in isolation from the supply network.
- Green hydrogen production block
  including a new 10kW alkaline electrolyser designed by E22 (Energy Storage Solutions) with KOH electrolyte, according to the BOP (balance of Plant).
- Dispensing block
  composed of a compressor, cascade pressurized storage system and dispensing hose. The set is capable of storing a total of 15kg of hydrogen in three (3) pressure scales: 300 bar, 500 bar and 1,000 bar, including the required arrangement that allows vehicles to be recharged at 700 bar or 350 bar depending on the model of vehicle to be refuelled.



The main target of our project was to test the feasibility of on-site production and refuelling of light vehicles with green hydrogen looking for a sustainable mobility powered by alternative fuels.

The origin of the hydrogen will be 100% renewable since all the energy necessary for electrolysis comes from the photovoltaic installed in the canopy of the car park where the recharging point will be located.

Taking solar self-consumption into account, in this project is ensured the electrolyser is capable of operating in isolation from the grid, reaching a load factor close to 23% and producing an average of 1.5 kg of green hydrogen per day, capable of supplying a vehicle with a daily range of about 167 km.

H2-ISE supposes a production of hydrogen totally isolated from the network from energy point of view. The production and consumption of hydrogen will take place in the same location, both being integrated into maritime containers or skids.

The project not only contributes to the promotion of the use of green hydrogen for mobility, proving the maturity of mobility with fuel cells, but it also proves the efficiency of the production and consumption of hydrogen on site and will contribute to national, European and global objectives. referring to the installation of hydrogen recharging points for mobility or "hydrogens".

Supporting the lines of work aimed at reducing the price of green hydrogen and the development of cheaper electrolysers, this new development of an alkaline electrolyser with KOH electrolyte is included, which could be scaled up its development and technology.

The project works in the R+D lines of the renewable gas sector, emphasizing the technological improvement of high-pressure hydrogen supply points, proposing a high-pressure refuelling infrastructure with an approved connection interface between the hydrogenator and the tank of the vehicle.

The dispensed gas will be certified as 100% renewable since it is powered by a photovoltaic installation which belongs to the project.

In order to monitor the project, given its high rate of innovation, specific KPIs have been designed for the annual evaluation of the whole project. These KPIs are described in the following table.

These indicators will be calculated periodically and included in annual reports that identify factors for improvement and an overall energy assessment.

Reference	Name	Description
KPI_Gen	H2 Production	Measure the daily production of hydrogen in order to evaluate the performance of the electrolyser
KPI_Cal	H2 Quality	Air Purity QC 5.0 (99.999%)
KPI_Uso	Concurrence	Count FCV's recharges
KPI_Res	Residual Consumption	Count the residual energy consumed by the equipment in the absence of solar resources
KPI_Deg	Degradation	Control equipment degradation
KPI_Cnv	Energetic Convergency	Evaluates the percentage of PV energy converted to hydrogen
KPI_Opi	Experience	Evaluate the degree of user satisfaction in the use of FCV

With all these indicators and others having developed throughout the useful life of the plant. It is monitored how the hydrogen mobility sector evolves, helping to anticipate future needs for expansion of the facility as well as the number of vehicles powered by hydrogen on the roads.

The control and evaluation system of the project is "alive", susceptible to changes over the years and the use of the facility, modifying or defining new, more effective indicators.

Due to all of the above, this project has full incidence in the promotion of the hydrogen-powered vehicle, because, this subsector of mobility is in a phase of development and maturity. Currently, there is not a considerable number of this kind of vehicles circulating on the roads.

One of the facts that motivate this situation is the scarcity of recharging points or hydrogen generators. In Spain, there is only one 700-bar hydrogen generator located in Madrid, therefore, since there is no vehicle recharging infrastructure, it is not possible for them to circulate.

With this project there is a direct impact on this limiting factor, not only by establishing a recharging point at 700 bar, but also by being the only existing facility nationwide that generates and refuels 100% renewable hydrogen on site.

Further information of this solution can be provided by reaching **Mela García-Pérez** at *mgarciap@ingenia-se.com*.

Incheon

To respond to international issues such as climate change and become the global mecca of hydrogen industry, Incheon has promoted the strategies to build the hydrogen ecosystem, including the hydrogen generation cluster establishment, green hydrogen mobility expansion, and dispersed blue hydrogen production.

STRATEGY
01

Incheon Hydrogen Economy Hub

To supply mass hydrogen in a stable manner and build the hydrogen public transport system, Incheon will produce 30,000 tons of byproduct hydrogen each year (SK Incheon Petrochem), build the hydrogen fuel cell research and production cluster (Hyundai Mobis), build the hydrogen fuel cell production facility (Plug Power), and attract hydrogen-specialized businesses including the Hydrogen Industry Support Center, thereby creating the ecosystem for hydrogen industry.

Hydrogen Production Cluster Construction

From 2023 to 2027, Incheon will invest EUR 190 million to build the Hydrogen Production Cluster with an annual capacity of 31,400 tons.

- Facilities: byproduct and clean hydrogen production plant, hydrogen business support center, testbed, business cluster complex, etc.

EUR 400 million will be mobilized to build a liquid hydrogen plant in Wonchang-dong, Seo-gu, Incheon by the end of 2023.

- Facilities: high purity hydrogen facility (PSA), hydrogen liquefaction facility, storage tank, etc.

SK Incheon Petrochem

Hydrogen Industry Support Center

Aerial View of Liquid Hydrogen Production SK E&S Plant

Hydrogen Liquefaction Plant Site

STRATEGY
02

Supplying of Eco-friendly Hydrogen Mobility

For the citizens to feel the difference in their every lives, Incheon will replace all city buses with hydrogen-fueled vehicles and over 80% of public agency automobiles will be purchased as hydrogen cars by 2030 with the supply of hydrogen trucks and cleaning vehicles across the city.

Hydrogen Mobility Supply System

Solar Energy Generation

Wind Energy Generation

Hydrogen Tube Trailer

Piping Supply

Hydrogen Station

Hydrogen Combined Transfer Center

Hydrogen Bus

Hydrogen Garbage Truck

All City Buses (2,204) in Incheon will be converted to hydrogen buses by 2030.

- **Automobile**
  More than 80% of new vehicles will be purchased as hydrogen cars
- **Forklifts etc.**
  Introducing Korea's first hydrogen truck
- **Hydrogen Station**
  15 Station by the end of 2023(40 station by 2030) Reachable in 20 minutes

First Hydrogen Low-floor CityBus

First Hydrogen High-floor Metropolitan Bus

First Hydrogen Charter Bus

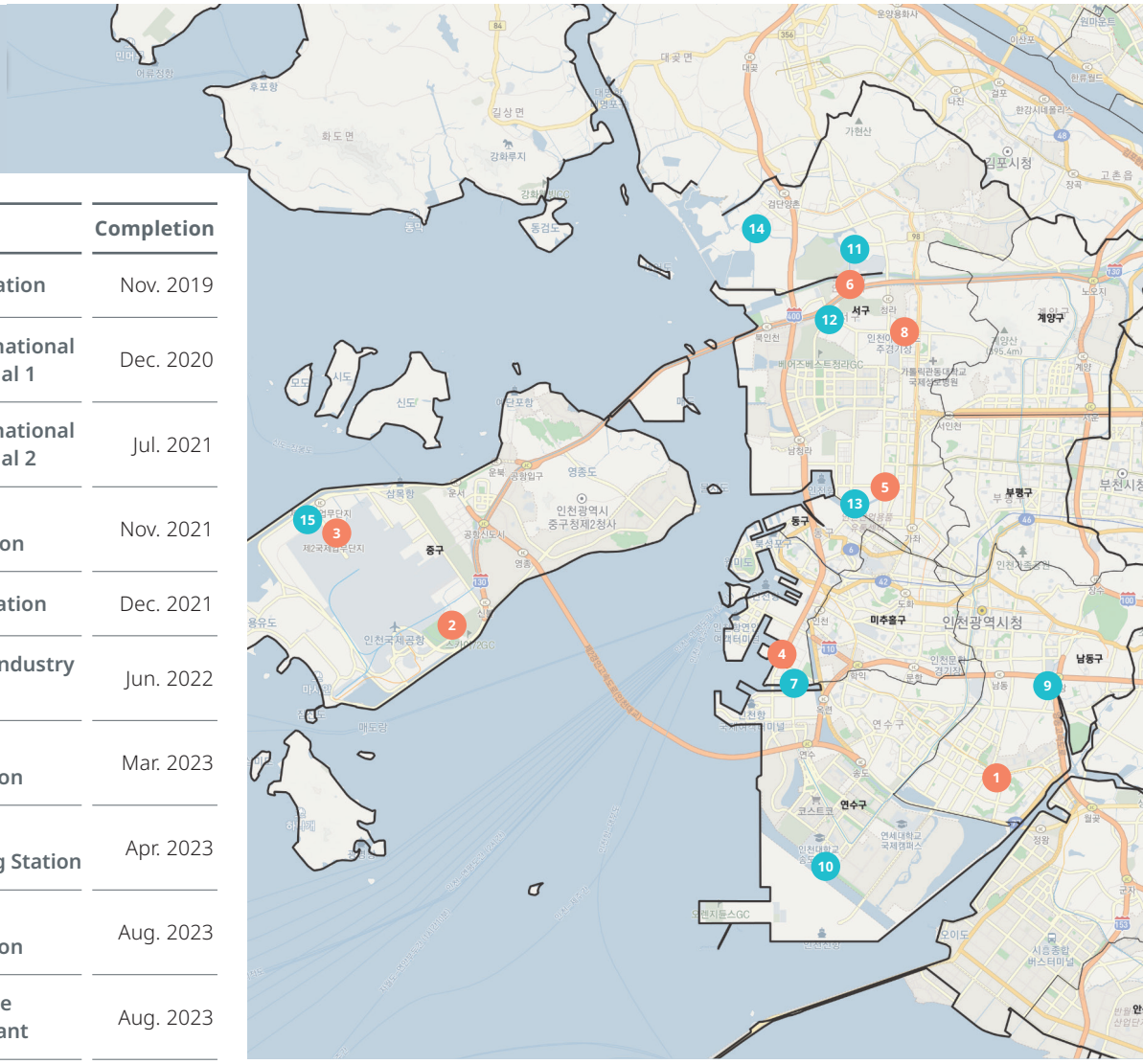
Hydrogen Fuel Cell Truck

H2 Station

Green Energy H2 Station

Hydrogen Mobility Supply Status

No.	Name	Completion
1	Incheon H2 Station	Nov. 2019
2	Incheon International Airport Terminal 1	Dec. 2020
3	Incheon International Airport Terminal 2	Jul. 2021
4	Incheon Green H2 Station	Nov. 2021
5	Taeyang H2 Station	Dec. 2021
6	Environment Industry Science Park	Jun. 2022
7	Yeonhui-dong Charging Station	Mar. 2023
8	Incheon Truck Charging Station	Apr. 2023
9	Susan-dong Charging Station	Aug. 2023
10	Songdo Sewage Purification Plant	Aug. 2023
11	Wanggil-dong Charging Station	Aug. 2023
12	Shinbaekseung Tour Corp.	Nov. 2023
13	Sewoon Industry	Nov. 2023
14	Geomdan Indus Park Garage	Dec. 2023
15	Hydrogen Transport Complex	Dec. 2024



《 Hydrogen Vehicles Supply Plan 》

Category	by 2020	2023	2025	2027	2030
Total	495	3,666	10,056	22,674	59,239
Passenger car (cumulative)	488	3,488	9,488	21,488	57,488
Bus (cumulative)	7	178	568	1,186	1,751

Major transition to hydrogen-fueled city buses (city-led project)

To become a leading city in transition to hydrogen buses, Incheon Mayor Yoo Jeong-bok, Minister for Environment and Minister for Land, Infrastructure and Transport signed the agreement to cooperate in providing administrative and financial support for the hydrogen bus conversion. Incheon also signed the MOU with SK E&S and Hyundai Motor Company to produce and supply liquid hydrogen and build the charging infrastructure in a timely manner.

Project: Covert 700 out of 2,035 city buses into hydrogen-powered vehicles
Cost: KRW 441 billion

중부일보 2023년 2월 23일 목요일 009면 인천

'수소 대중교통 체계' 기반 구축 빨라진다

인천 액화수소 포럼 개최
정부기관-기계硏-현대차 등 참석
사업용차량 수소차 전환계획 수립
시, 내년까지 수소버스 700대 확대
보급 확산 위해 정부 등 협력 강화

정부는 2030년까지 약 50만 대의 사업용차량을 전기·수소차로 전환할 계획이다.

이에 따라 인천시도 수소경제의 핵심 수단 중 하나인 수소모빌리티의 보급 확산을 위해 정부, 산업계, 유관기관과의 협업 네트워크를 강화한 방침이다.

22일 인천 연수구 송도컨벤시아에서 '2023 인천 액화수소 포럼'이 개최됐다.

이 자리에는 국토교통부와 환경부, 산업통상자원부 등 정부기관과 인천시, 한국기계연구원, 한국자동차연구원, H2 KOREA(수소융합얼라이언스), 현대자동차, SK E&S 등 수소경제를 이끄는 관계기관이 참여했다.

국토부는 여객자동차법 및 여객자동차법 등에 따라 운행 중인 사업용차량을 전기차보다는 수소차로 전환하는 계획을 수립하고 있다.

수소도시로 도약하는 인천시 유정복 인천시장이 22일 인천 연수구 송도컨벤시아에서 열린 '수소버스 선도도시 조성 실시협약식'과 '수소모빌리티 보급확산을 위한 인천공항 액화충전 인프라 조성 업무협약식'에서 협약을 마치고 참석자들과 기념촬영을 하고 있다. 정선식기자

수소차는 전기차에 비해 충전시간도 짧고 한번 충전시 운행가능거리수가 평균 450㎞로 내연기관차량에 비해 크게 뒤쳐지지 않기 때문이다.

이를 위해 국토부는 수소연료보조금 지원사업과 사업용차량별 운행형태에 따른 충전 인프라 구축, 수소차 전환 촉진을 위한 규제 완화 등을 수립하고 있다.

환경부도 대형 화물트럭 및 버스를 친환경차로 전환하는 방향을 수소차로 모색하고 있다.

이와 함께 환경부는 대규모 수소차 전환 수요 발굴 및 기술개발(R&D) 지원 등을 통해 수소차 시장을 형성하는 데 주력하고 있다. 또한 현재 경기 성남정 수장에서 구축 중인 그린수소 전주기(생산·유통·활용) 모델을 앞으로 타 지자체까지 확대할 계획이다.

산자부는 수소버스·트럭 등 수소상용차의 보급 확산을 위해 공영·기초단체를 대상으로 수소연료전지시스템 구매보조 시범사업을 실시한다.

이는 수소상용차를 40대 이상 대량 구매한 광역·기초단체를 대상으로, 수소버스 구매시 연료전지시스템 교체비용을 지원하고 보증기간을 연장하는 것이다.

산자부는 오는 3월께 지자체를 선정해 기존 5년·50만㎞ 미만이던 수소버스 보증기간을 9년·90만㎞로 늘리고 유지보수 서비스를 지원할 예정이다.

이에 발맞춰 인천시도 올해말까지 화석연료 기반의 버스를 수소버스로 대체하기 위해 200대를 도입하고, 내년까지 700대로 늘릴 방침이다.

수소버스의 충전 인프라를 구축하기 위해 현재 6개소로 운영되는 수소충전소를 올해 14개소로 확충도 할 계획이다.

시 관계자는 "특히 올해 하반기 서구 원창동에 조성 중인 액화수소생산 플랜트를 통해 대규모 수소를 안정적으로 공급할 수 있을 것"이라며 "이를 통해 지역 내 수소대중교통 체계 구축기반이 더 속도감 있고 탄탄해 질 것으로 기대하고 있다"고 했다. 전예준기자

2023 Liquid Hydrogen Forum (23 February, 2023)

Incheon Mayor Yoo Jeong-bok boarding the country's first hydrogen-powered commute bus

Laying the foundation for accelerating transition to hydrogen mobility

The project to build a complex hydrogen transport base at Incheon International Airport Terminal 2 has been selected as the state-funded project. A total of 13 billion Korean won (State: 7 billion, City: 3 billion, Private sector: 3 billion) will be injected and hydrogen city buses running in Yeongjong area and 450 hydrogen buses traveling in and out of the airport terminal all year round will complete the major transition to hydrogen mobility.

STRATEGY
03

Strategy-Establishing Dispersed Generation of Blue H2

The city plans to close the coal-fired power plant early by building a dispersed fuel cell generation plant with capacity of 646MW by 2030. Without transmission tower, fuel cells can provide electricity to the places in demand and generate electricity and heat simultaneously, which makes it possible to reach power generation efficiency of as high as 90%.

* Fuel cell strategy: Project cost of 3.6 trillion Korean won (privately financed), industrial complex, power generation plant, etc.
* Each Gu (district) and Gun (county) will build at least one such facility so as to establish the largest fuel cell power plant among all metropolitan cities in the country.

Dispersed Fuel Cell Power Plant

Fell cells

Raising public awareness and overcoming local residents' conflict

To enhance community acceptance regarding the safety concerns over hydrogen charging stations, the city has hosted public briefing sessions on fueling station building project and the Hydrogen Energy Forum (via YouTube and on-site briefing), run the citizen deliberation committee for the hydrogen ecosystem creation, promoted the citywide hydrogen policy via the official website, and revised the relevant rules and regulations.

In addition, to address the conflict between local residents in Dong-gu and Namdong-gu and municipalities, the city government formulated the public-private consultative group and hosted 7 briefing sessions, 7 public-private consultations, 4 negotiations and 4 meetings, and drafted the public-private agreement. This city government-driven effort successfully resolved community conflict and eventually led to the completion of the 400 MW fuel cell power plant.

Hydrogen Energy Forum
(Hydrogen mobility)

Promoting Hydrogen Policy Via
YouTube Channel

Addressing Residents' Conflict
Through Public-private Consultations

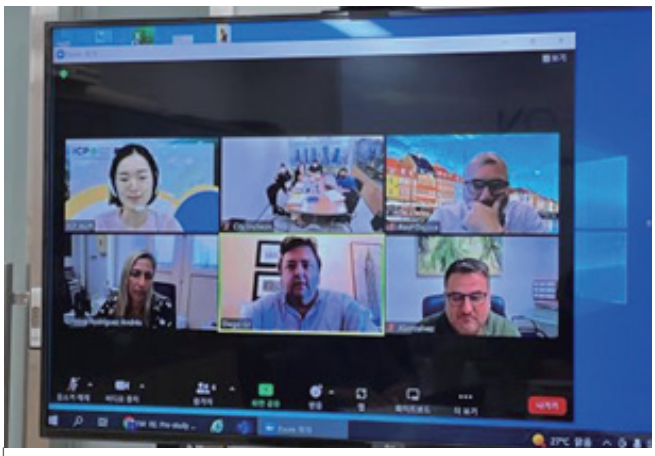
Building Completion Ceremony
for Incheon Fuel Cell

International Cooperation and Exchange on Hydrogen Industry(Incheon-Almeria)

From 27 April, 2022 through 1 February, 2023, Incheon and Almeria conducted six bilateral online meetings and reciprocal study visits.

As the leader of hydrogen energy industry and solar power and solar thermal energy industry respectively, Incheon and Almeria agreed to promote cooperation action plans focusing on four areas such as renewable energy policy sharing, cooperation and exchange in private and educational sectors, cooperation in hydrogen energy transition and cooperation in sustainable energy research activities.
Also, Inha University's KIURI and Almeria's CIESOL signed the MOU on research cooperation and pledged to take cooperative actions including invitation to the hydrogen energy forum as well as faculty, researcher and student exchange programms, which is expected to build a platform for mutual exchange on the renewable energy sector between Europe and the Asia-Pacific region.

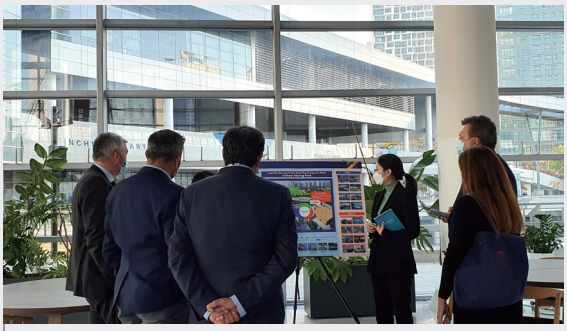
《 Incheon-Almeria Cooperation 》



Six bilateral online meetings(27 April, 2022 - 1 February, 2023)

Almeria Delegation's Study Visit to Incheon(24-28 Oct. 2022)

Incheon Chamber of Commerce and Industry



Incheon Start-up Park

IFEZ Smart City Operation Center 1

IFEZ Smart City Operation Center 2

Inha KIURI-CIESOL MOU Signing Ceremony

Incheon Fuel Cell

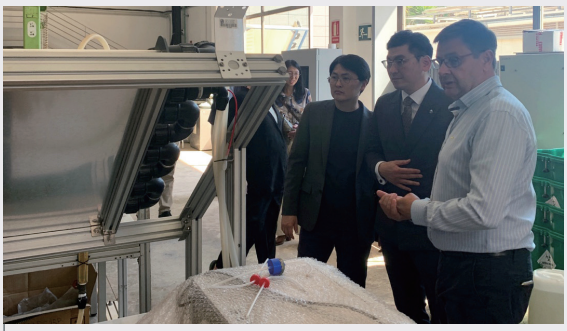
Incheon City Hall

Hanbok-wearing experience

Incheon's Delegation's Study Visit to Almeria(25-29 Sept. 2022)

Almeria University

PITA



CIESOL

Presentation by Dr. Cho Hyun-seok of KIURI at CIESOL

Almeria City Hall

Mobility Department of Almeria City Council

Municipal Desalination Plant

Cultural Visit

M E M O

M E M O

INCHEON & ALMERIA
BEST PRACTICES ON

HYDROGEN ENERGY ECONOMY

ICP INTERNATIONAL CITY PARTNERSHIPS
ACTING FOR GREEN AND INCLUSIVE RECOVERY

Incheon Metropolitan City

ALMERÍA CIUDAD