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NEDO's activities toward Carbon Neutrality Hydrogen-related projects and others

New Energy and Industrial Technology Development Organization

Bangkok Representative Office

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About NEDO



NEDO is Japan's largest funding agency focusing on technology innovation.

Mission:

- Address energy and global environmental problems
- Enhance industrial technology development

Organization: Established in 1980

Minister in Charge: the Ministry of Economy,
Trade and Industry of Japan

Head Office: Kawasaki City, Japan

Personnel: 1,464 (as of April 1, 2023)

Budget: Approximately 1.14 billion US dollars (FY 2023)
(*In addition, total 42.5 billion US dollars funding programs are also being implemented.)



Demonstration Projects in Thailand



NEDO has implemented more than 30 model projects related to renewable energy, energy conservation and environmental technology.

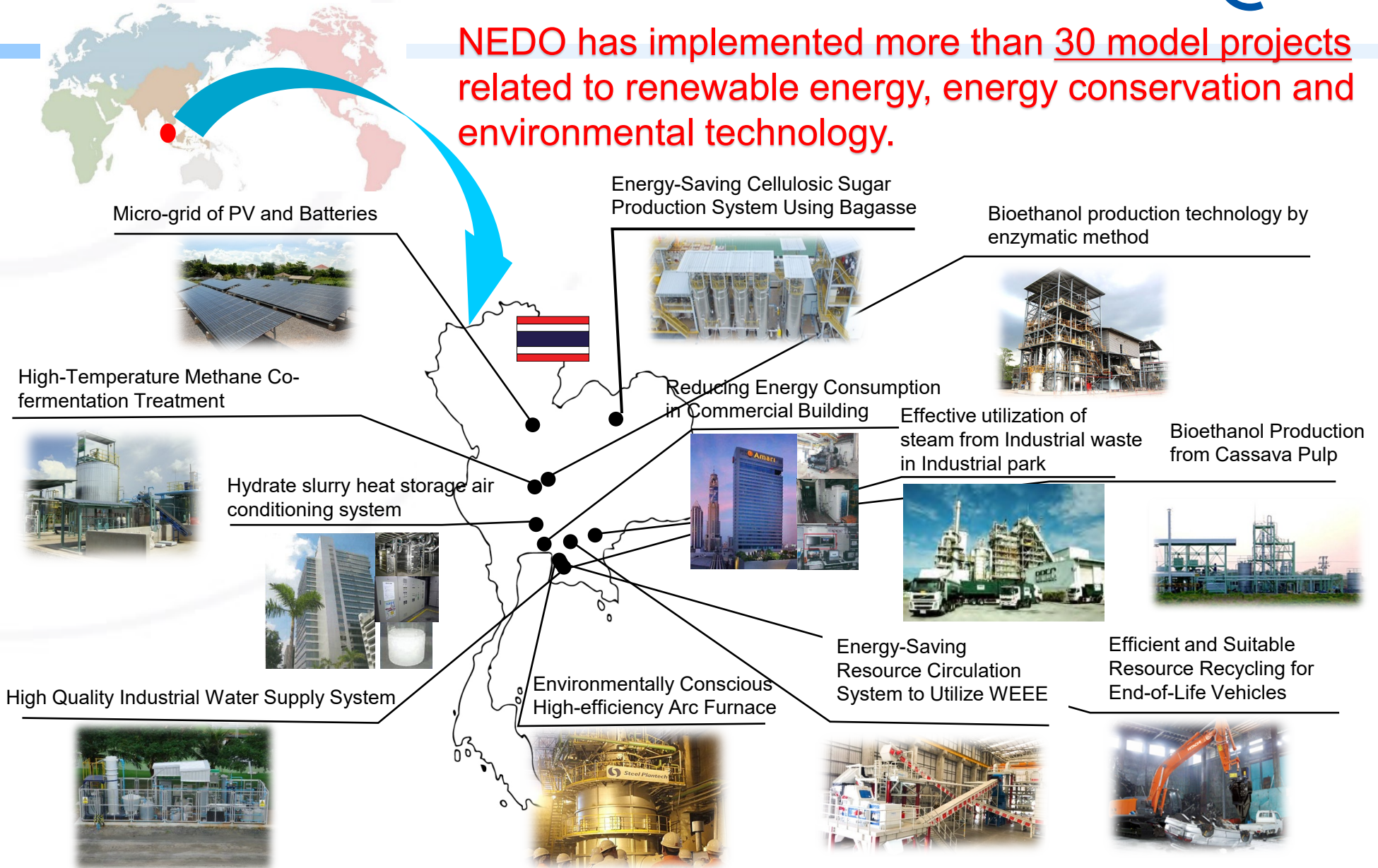
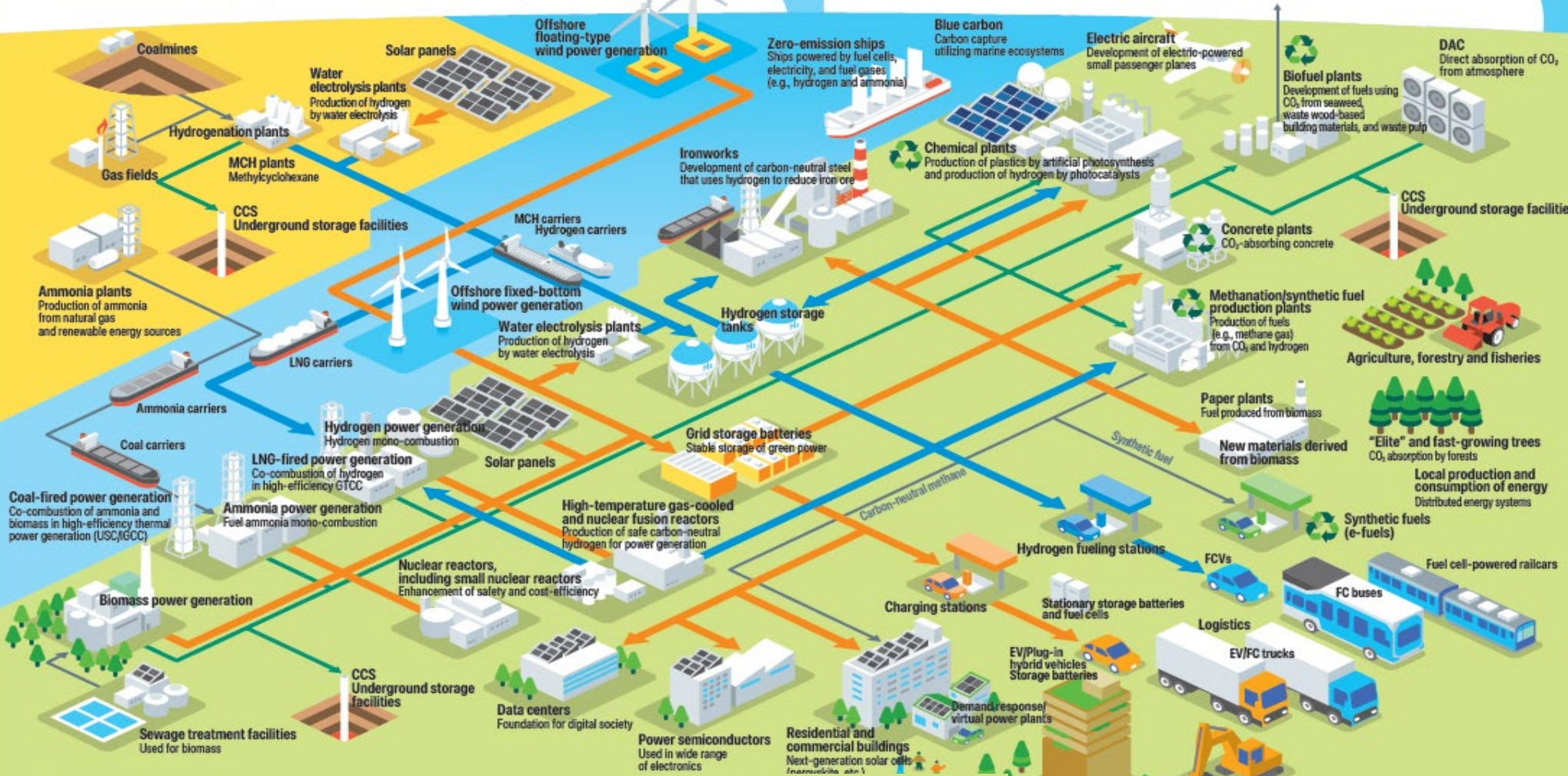


Image of Carbon-neutral Industries

Promoting carbon-neutral electrification in the industrial sector
 Hydrogen-related technologies are vitally important for utilization in power generation, industry, transportation and other sectors
 CO₂ is recovered for carbon recycling and other activities related to CO₂ capture and storage (CCS)



Legend

- Hydrogen (Blue arrow)
- Electricity (Orange arrow)
- CO₂ (Green arrow)
- Carbon recycling (Recycling symbol)

Working to make CO₂ reusable resource for everyday necessities such as fuels, plastics, and concrete

Thailand's LT-LEDS states that green hydrogen will be important in energy, industry and transport sectors

Hydrogen in Thailand's LT-LEDS



Long-Term mitigation actions related to hydrogen in energy sector

- Research and development of hydrogen can be one of the key mitigation actions
- technologies related to hydrogen and green hydrogen are considered to achieve GHG emissions by 2065
 - From the net zero GHG timeline presented in the LT-LEDS, green hydrogen fuel will likely be used in Thailand in 2045



Long-Term mitigation actions related to hydrogen in industry sector

- Green hydrogen will be important in sectors like iron, steel, aluminum and cement



Long-Term mitigation actions related to hydrogen in transport sector

- Decarbonization opportunities in the transport sector include hybrid, plug-in hybrid, electric and FCEV
- Cost of hydrogen-powered FCEV is expected to be lower in the near future, similar to costs of EVs

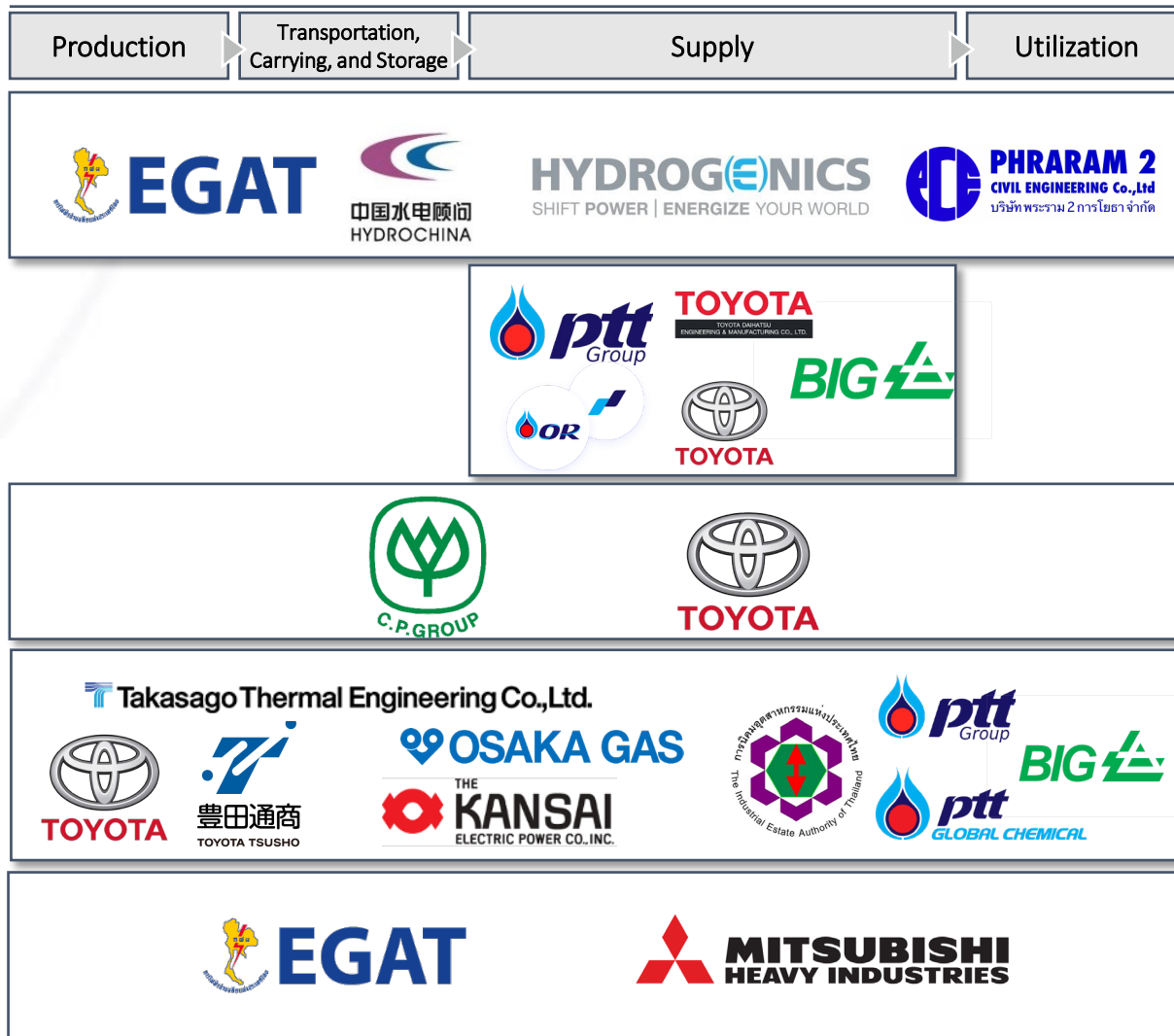
Hydrogen projects in Thailand



■ : Demonstration/operation
 ■ : Agreement/study

Project Name & Description

Supply Chain Coverage & Players



1 Lam Ta Khong Wind Turbines
 ■ Produce hydrogen from wind power and use it for **stationary fuel cells**

2 Hydrogen Refueling Station
 ■ Operate the first **HRS** prototype in Thailand

3 Hydrogen Fuel Project
 ■ Study on production of hydrogen from farm waste and usage for **hydrogen-powered vehicles**

4 TH-JP: Carbon Neutral Smart Park Project
 ■ Study on construction of carbon-neutral industrial park in Rayong using hydrogen

5 Clean Energy Development
 ■ Develop and share knowledge on clean energy technologies such as CCUS, hydrogen, and ammonia fuels

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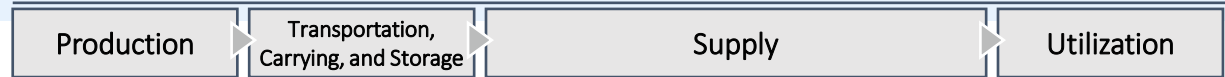
Hydrogen projects in Thailand

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Project Name & Description

Supply Chain Coverage & Players



6 **Investment Opportunity in Carbon Neutral Roadmap on Hydrogen, Ammonia, and CCUS**
 ■ Study on CCUS and its implication in Thailand for decarbonization of EGCO

7 **Feasibility Study of Ammonia Co-firing Power Generation**
 ■ Study on technical, economic and environmental aspects ammonia co-firing

8 **Green Hydrogen and Derivatives Development project**
 ■ Establish large-scale green hydrogen and derivatives production facilities in Thailand

9 **Investment Opportunity in SOFC and SOEC Technology Exploration**
 ■ Develop power plants in Thailand using SOEC and SOFC technology

10 **Fuel Cell Forklift Project**
 ■ Feasibility study on the Optimal Hydrogen Distribution Method in Amata City Chonburi Industrial Estate to Promote the Use of Fuel Cell Forklift(FCFL)

11 **Fuel Cell Truck Project**
 ■ Feasibility study on fuel cell truck technology for low carbon medium and long-distance land cargo transportation

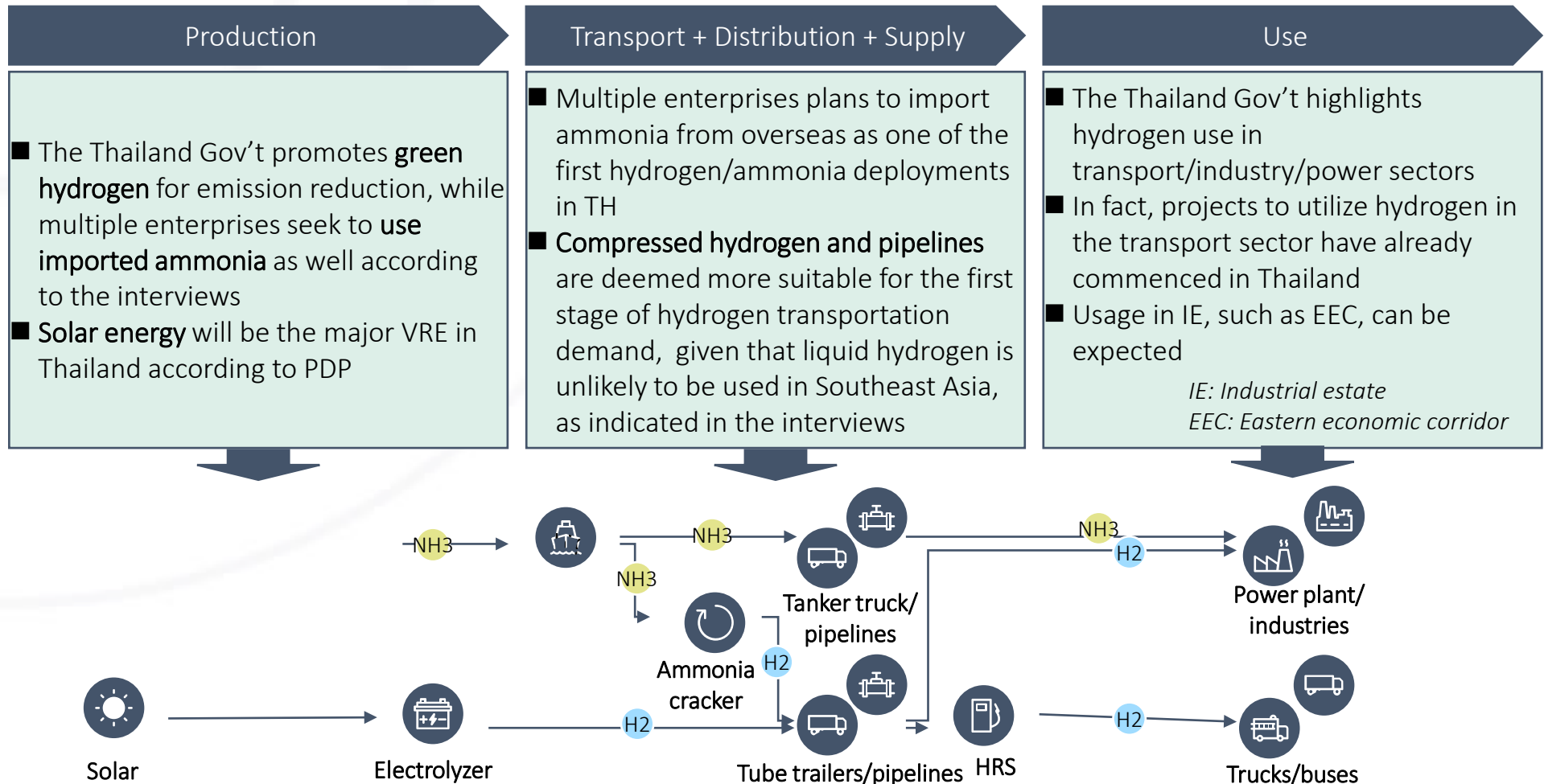
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Supply chain would be established by replacing fossil fuel in industry and transport sectors with green hydrogen from solar PV



• A Hydrogen Business Model in Thailand in 2030s-40s

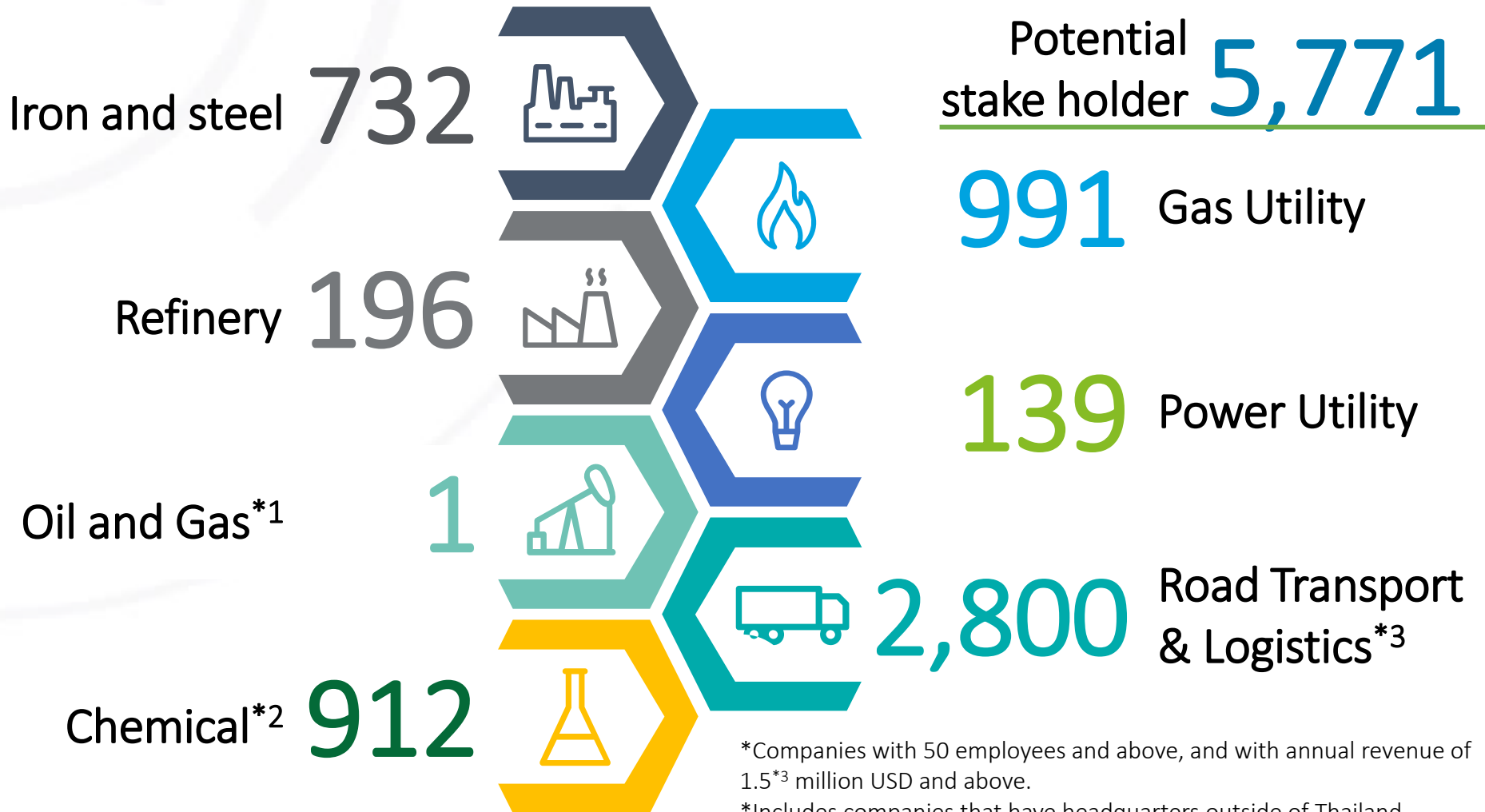


- Reduce emission from transport/industry/power sectors by taking advantage of renewables in Thailand such as solar, which cannot be fully utilized through power grids

There is large potential in Thailand hydrogen market; 5,771 medium-to-large enterprises



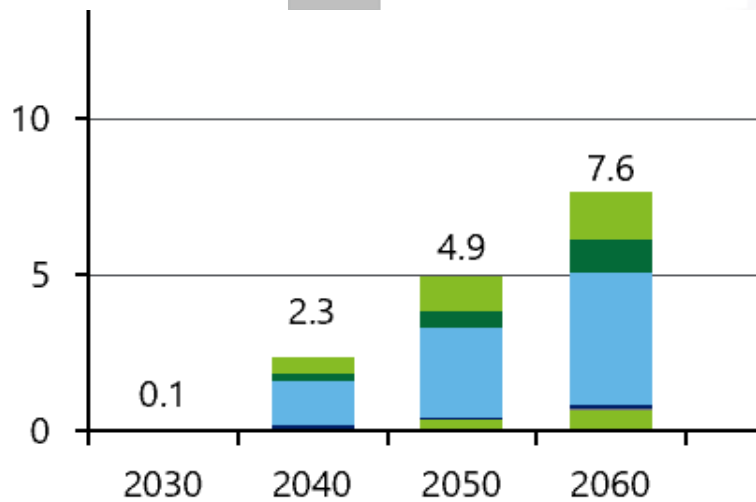
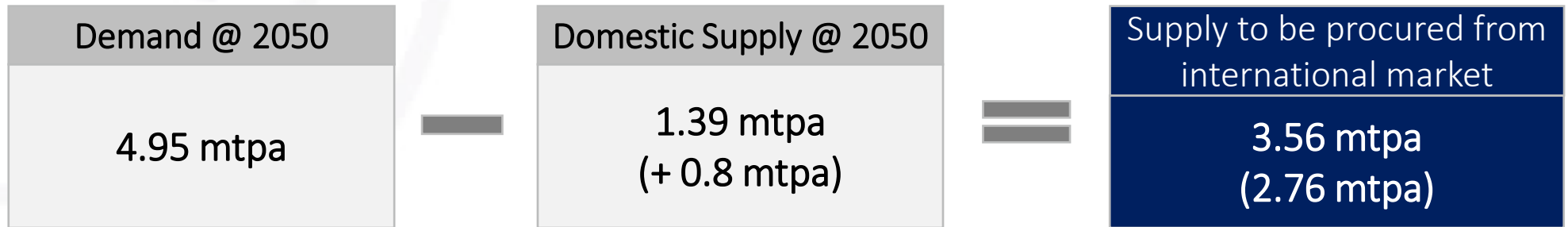
- The potential number of companies in Thailand



*Companies with 50 employees and above, and with annual revenue of 1.5^{*3} million USD and above.

*Includes companies that have headquarters outside of Thailand

Thailand shall procure 3.56 mtpa from international market to fulfill the difference between domestic supply and demand in 2050.

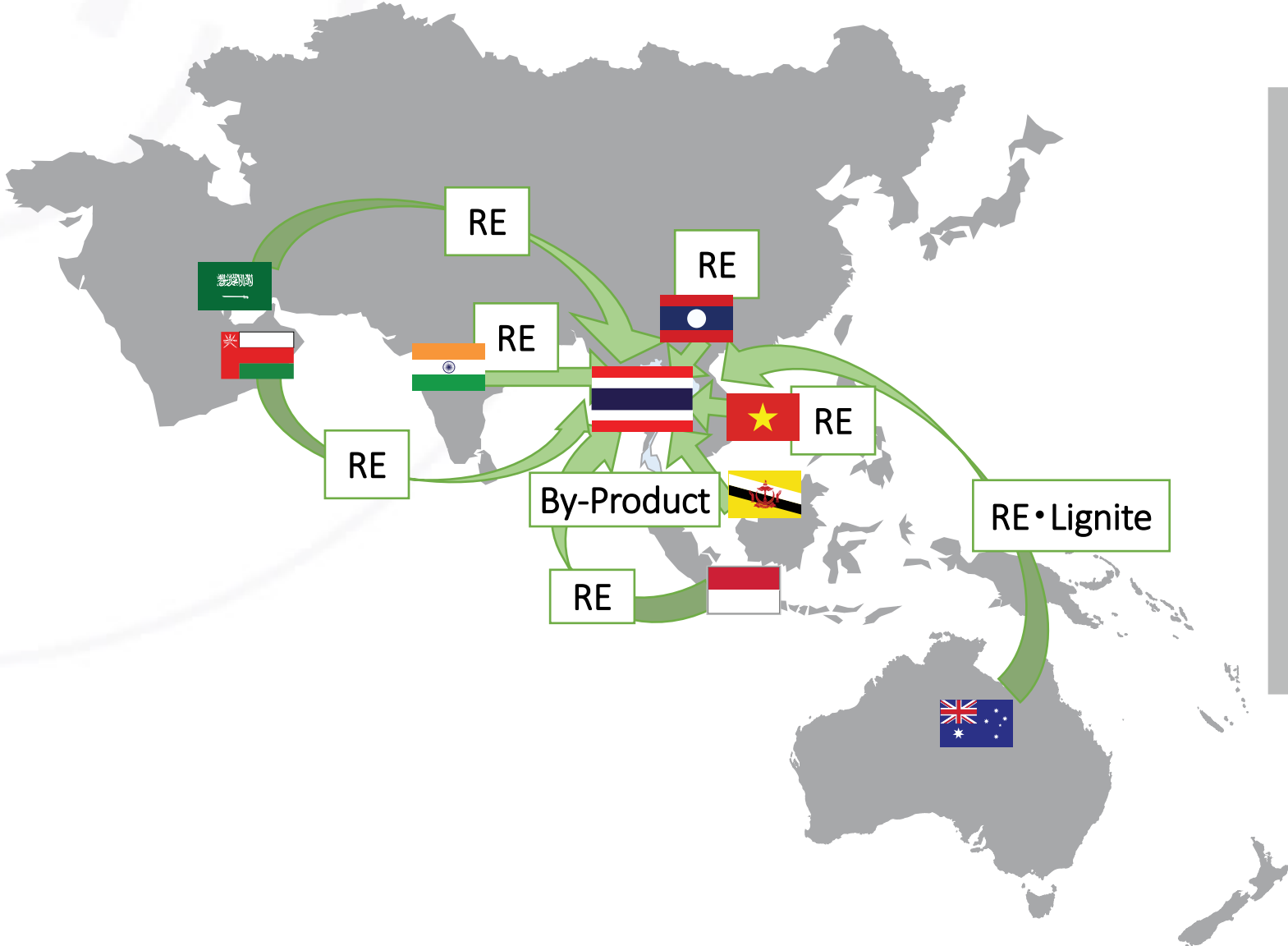


■ Vehicle
 ■ Heat
 ■ Power Plant
■ Refinery
 ■ Ammonia
 ■ Steel
 ■ Ethylene

Unit: mtpa

	2022	2030	2040	2050
Domestic Hydrogen Production	0.2156	0.2702	0.7028	1.3937
Electrolysis	0	0	0	0.34
Steam Methane Reforming- Biogas	0.1849 (+0.8: crop residue0.8)	0.2392 (+0.8: crop residue0.8)	0.3116 (+0.8: crop residue0.8)	0.3923 (+0.8: crop residue0.8)
Byproduct	0.0307	0.0310	0.0312	0.0314
Lignite	0	0	0.36	0.63

International Hydrogen Supply –Potential Trading Counterparts



- Australia
- Oman
- Kazafstan
- Saudi Arabia
- UAE
- India
- Vietnam
- Brunei
- Indonesia
- Malaysia
- Pakistan
- New Zealand
- Laos

In Asian and Oceania region, 38 projects have been announced in 12 countries, which makes sum of 38.35 mtpa of H2 and 34.61 mtpa of NH3 in the future



International Supply – Total amount planned in Potential Trading Counterparts


12 Countries

38 Projects







H2
38.35 mtpa

NH3
34.61 mtpa

Unit: tpa

Country	Project number	H2 Production	NH3 Production
 Australia	16	6,373,840	29,290,000
 Brunei	1	100	n/a
 India	6	17,545,000	1,240,000
 Indonesia	3	40,037	1,000,000
 Kazakhstan	1	2,000,000	n/a
 Malaysia	2	107,000	1,230,000

Unit: tpa

Country	Project number	H2 Production	NH3 Production
 New Zealand	2	180	500,000
 Oman	1	500,000	n/a
 Pakistan	1	55,000	n/a
 Saudi Arabia	1	219,000	1,200,000
 UAE	2	180	n/a
 Vietnam	2	11,514,000	150,000

NEDO's hydrogen-related projects in Thailand and the surrounding countries



Green Ammonia Production

Technical analysis and pilot plant operation of high-pressure type PEM electrolyzer for the production and supply of green ammonia (Hitachi Zosen, RENOVA)



Ammonia co-firing thermal power generation

Demonstration of Ammonia firing to achieve decarbonization at anthracite coal fired power plant in Vietnam (IHI)



Fuel Cell Truck

Demonstration project of fuel cell truck technology for low-carbon medium and long distance load cargo transportation (Toyota Tsusho, Denso)



Fuel Cell Bus

Feasibility study on fuel cell truck technology for low carbon medium and long-distance land cargo transportation (Toyota Tsusho, Takasago Thermal Engineering)



Fuel Cell Forklift

Feasibility study on the Optimal Hydrogen Distribution Method in Amata City Chonburi Industrial Estate to Promote the Use of Fuel Cell Forklift(FCFL) (Toyota Tsusho)



Ammonia co-firing thermal power generation

Demonstration of Ammonia firing to achieve decarbonization at coal fired power plant in Thailand (Planning)



Geothermal Hydrogen

Demonstration of Hydrogen technology that utilizes surplus electricity and exhaust heat from geothermal power generation to achieve economically viable hydrogen production and transportation (Tokyo Electric Power)

