



脱炭素に
技術と叡智

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IHI's Solution to Achieve Carbon Neutrality

IHI

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Resources, Energy and Environment Business Area,

I H I Corporation

Medium-term Management Plan

• Group Corporate Strategy

Social Issues to be tackled

DECARBONATION
Achieving Carbon
Neutrality in Industry

RESILIENCE
Realization of a global ecosystem
resilient to climate change

ECOSYSTEMS
Building and improving
industrial ecosystems

SECURITY
Economic, National
and Energy Security



**Providing value chain
throughout the Lifecycle of
customer's business**

**Building up the
entire value chain**

Technology

Insight

• Key points for the 'Group Management Policies 2023'

- Leaping forward to become a sustainable high-growth company through a **bold shift of management resources to growth areas**



Allocating management resources
(cash and human resources)



• Capability of realizing transformation

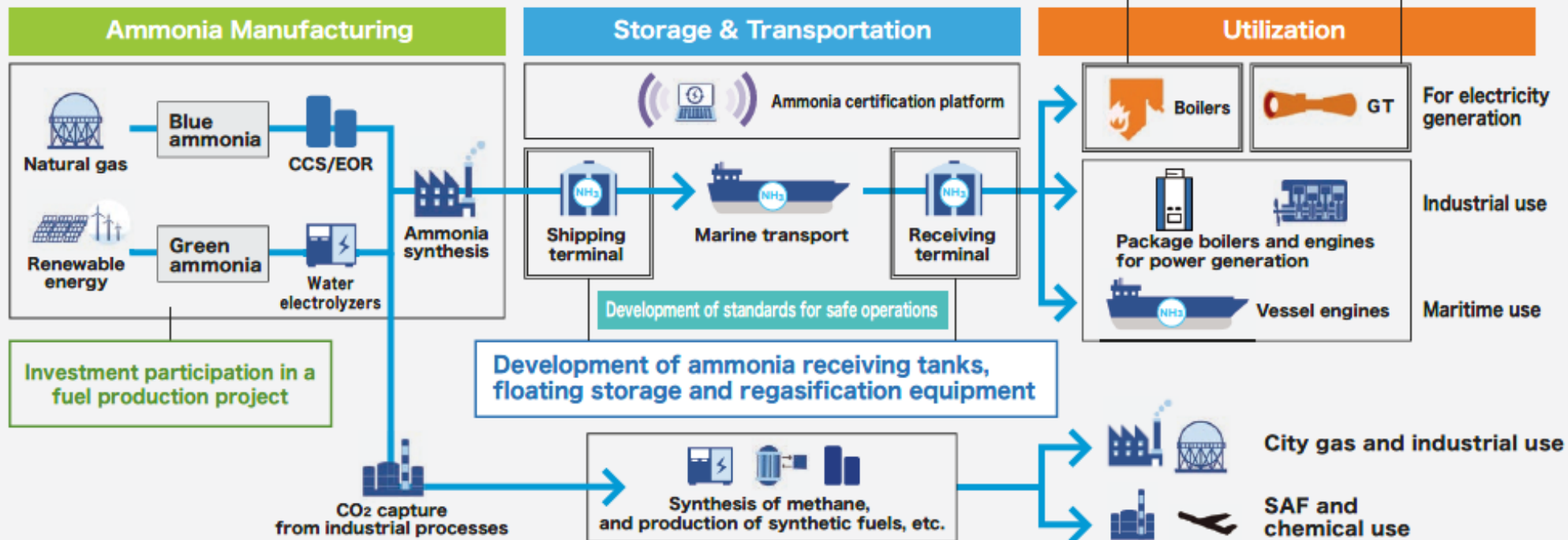


Medium-term Management Plan

- **Building it into** a business that will be main pillar.
- We will work to **create and improve our entire value chain**. This includes power generation equipment such as Gas Turbine that utilizes world-leading ammonia combustion technology, as well as our storage and receiving terminals with top-tier performance.
- While investigating investment in fuel manufacturing projects, we will utilize our engineering capabilities **to build a new business model**.

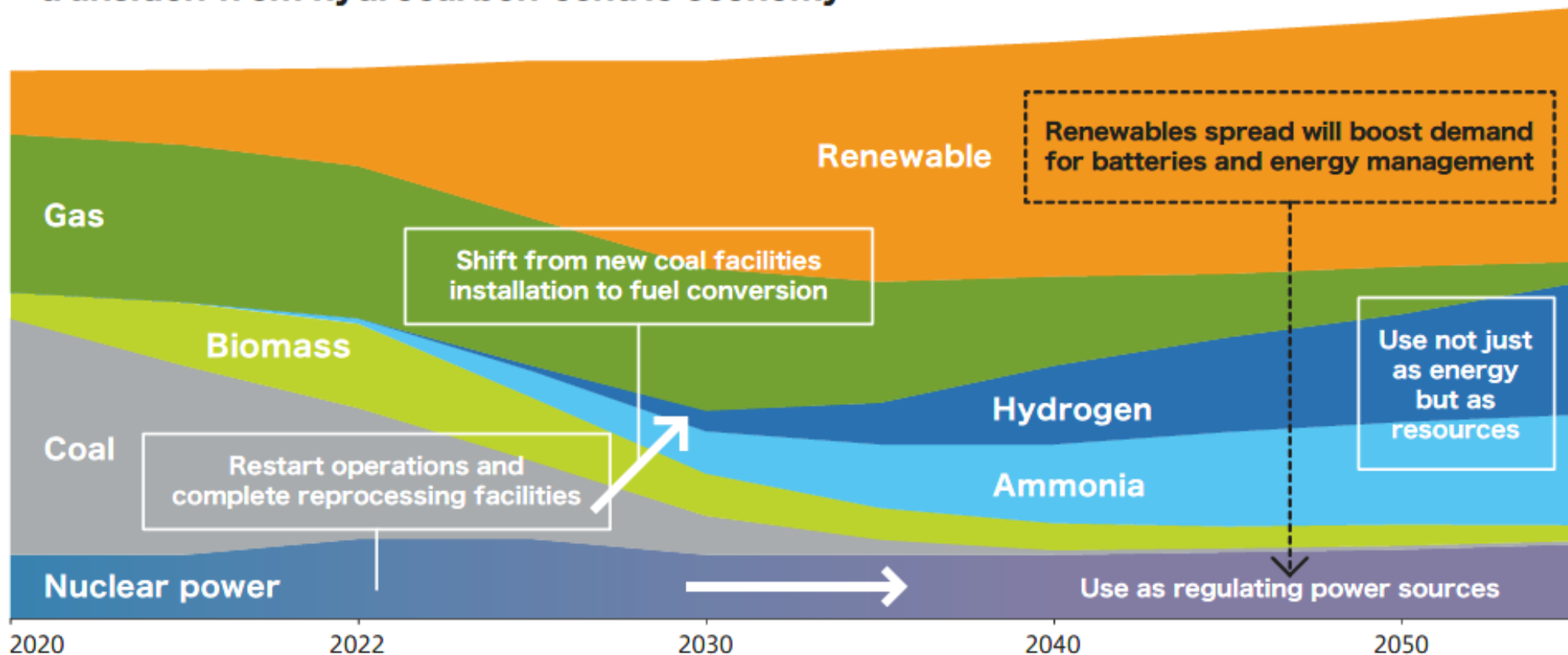
Demonstration of ammonia co-firing in thermal power plants around the world
 Demonstration of co-firing ratio increase from 20% to >50%

Successful development of ammonia-based Gas Turbine
 Joint development with GE to apply this technology to large gas turbines



Scenario for becoming carbon neutral by 2050

- Assume transition to **economy reliant on hydrogen and ammonia and renewable energy**
- Focus on **fuel usage of ammonia**, making whole ammonia supply chain carbon-neutral
- Undertake **carbon capture and storage and carbon dioxide valorization to streamline transition from hydrocarbon-centric economy**



Anticipated energy source balance by around 2050

- Foundational and empirical research in Japan
- Joint R&D on catalyst in Singapore and biomass in Singapore

Development & Demonstration Park

- Ammonia combustion, Biomass pulverization and combustion, CO₂ capture



D&D Park

Soma Labo / Soma IHI Green Energy Center

- Demonstration of CS-related products, H₂-related research, Aquaponics, EMS Methanation, DAC, etc.



Soma Labo



Methanation



City Bus

Technology Development Division / IHI connecting Lab

- Foundation research
- Manufacturing
- Intellectual property
- Technical training



Agency for Science, Technology and Research

- Joint R&D on Catalyst

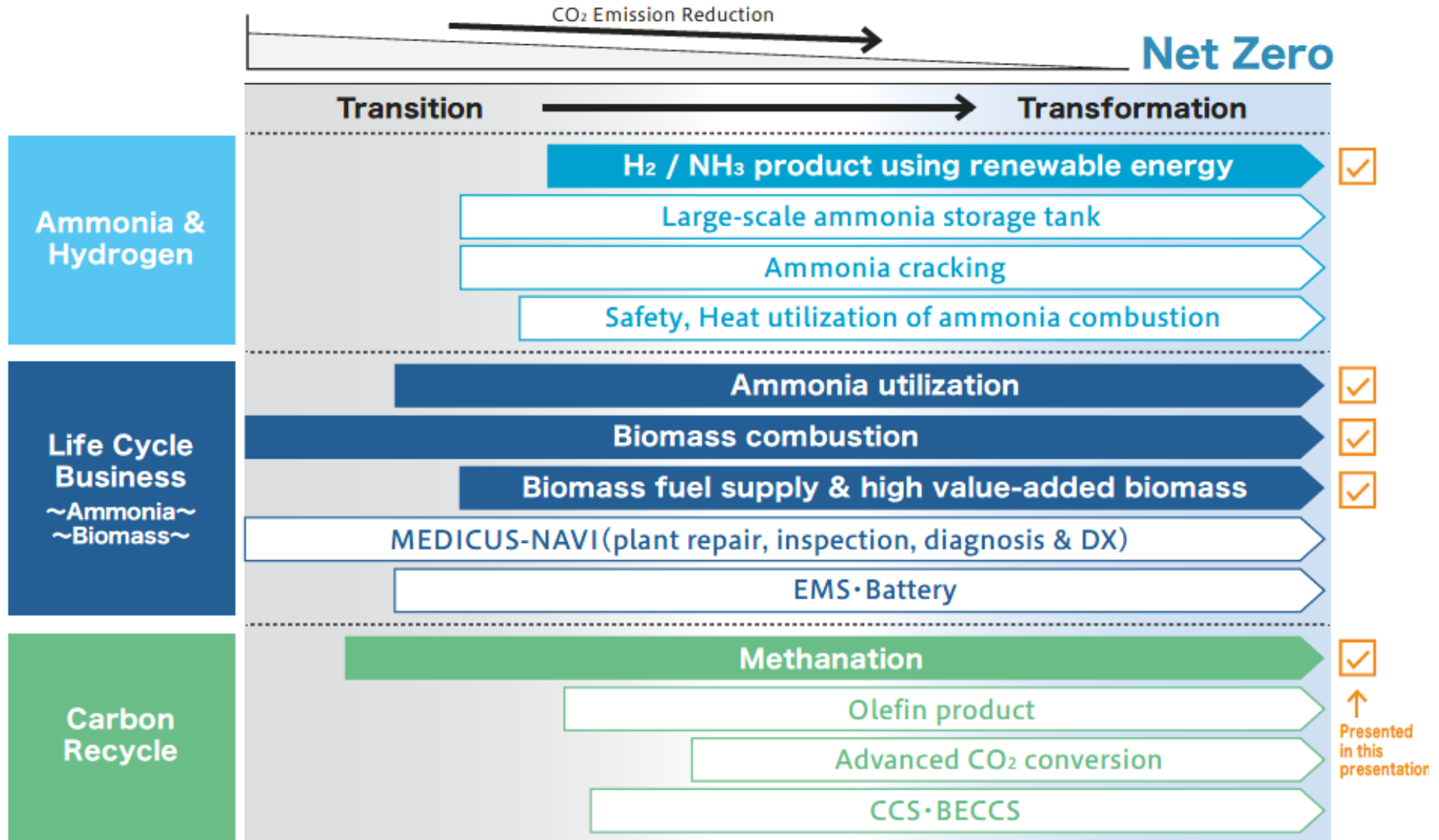


Institute Teknologi Bandung

- Joint R&D on Biomass fuel



Efforts to realize Carbon Neutral Society





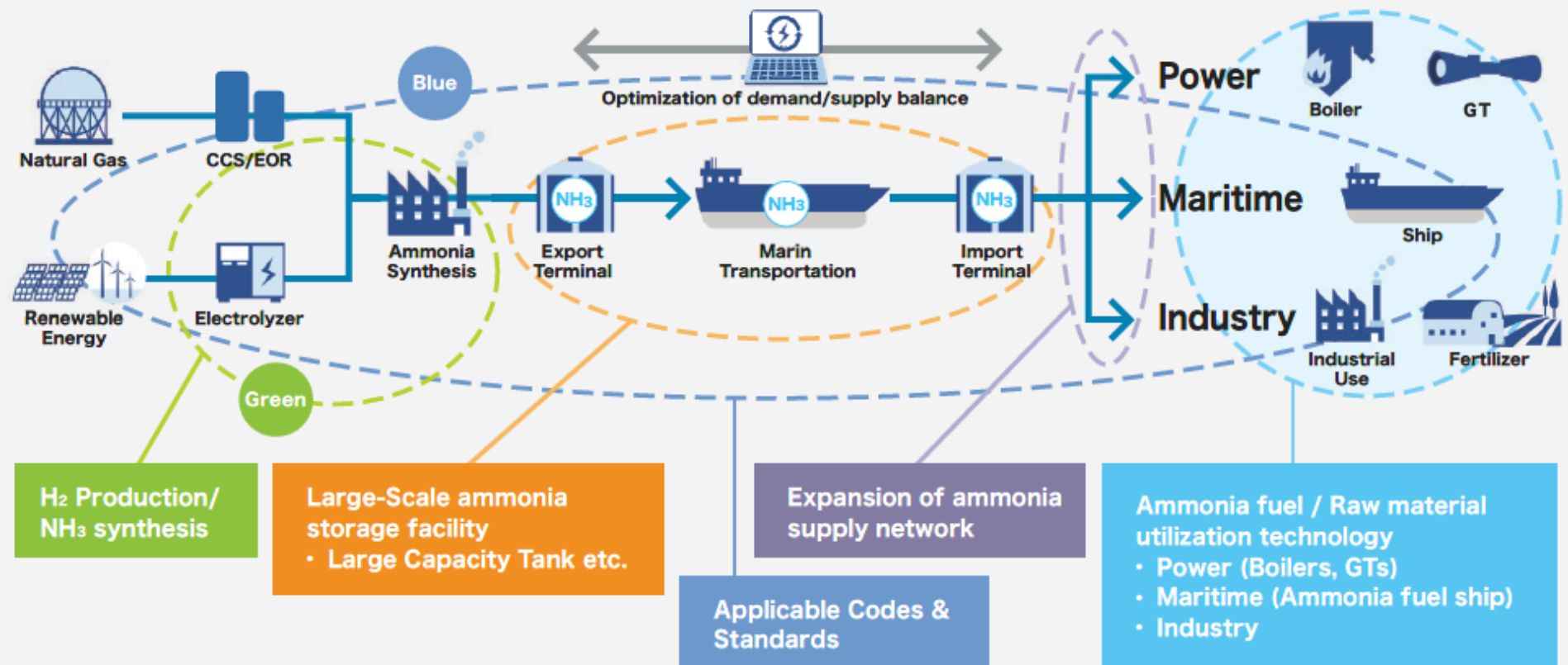
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Decarbonizing Energy with Life-Cycle-Business Approach ~Ammonia & Hydrogen~

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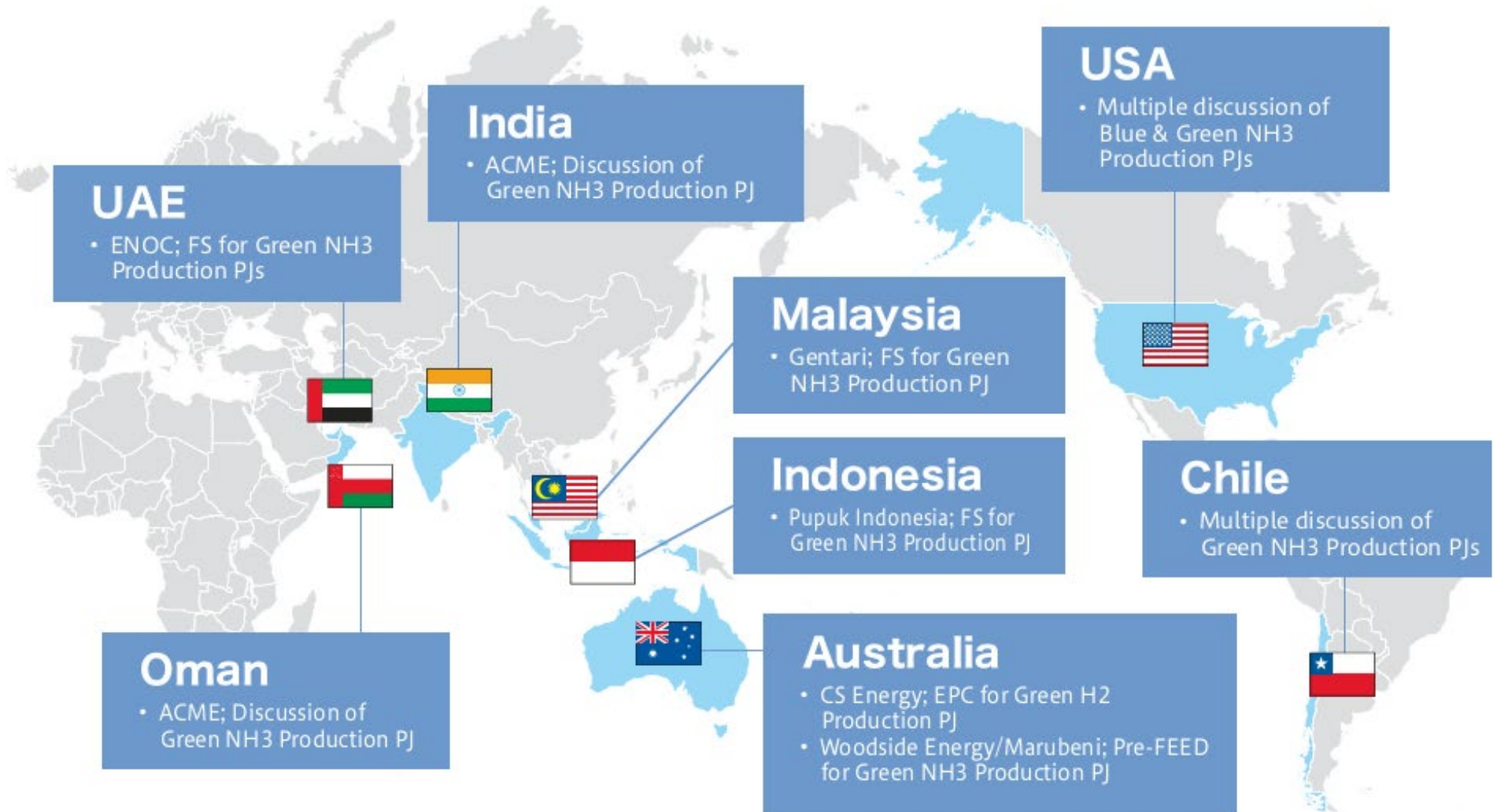
Ammonia Value Chain -IHI's Mission-

IHI's mission is to provide “Advanced ammonia utilization technology” and “Reasonable price of ammonia” to customers who are working on achieving carbon neutrality, which is one of the most important social issues, and to build an ammonia value chain at an early stage.









Green Ammonia Production Projects

IHI is exploring the investment opportunity for Green Ammonia Production Projects.

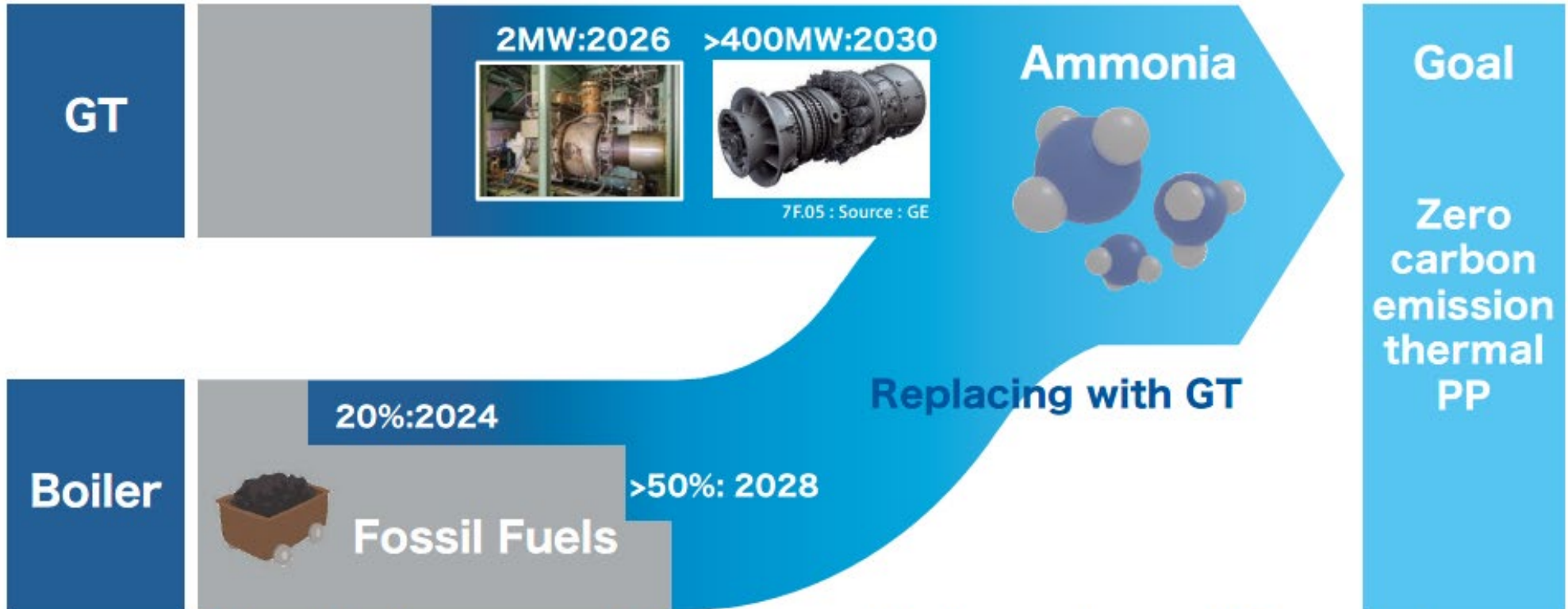


IHI's Ammonia Utilization Technologies



Sector	Equipment		Note
Power	Boiler		JERA and IHI cooperates on the demonstration of 20% ammonia co-combustion at a large-scale commercial coal-fired power plant.
	Heavy Duty GT	 7F.05 : Source : GE	IHI and GE is collaborating on the development of retrofittable ammonia combustion technologies for GE's 6F.03, 7F and 9F systems to fire up to 100% ammonia.
Industry	Small GT		IHI has achieved CO ₂ -free power generation with the world's first gas turbine using 100% liquid ammonia.
	Package Boiler		IHI and IHI Boiler K.K. is developing ammonia combustion technologies for packaged boilers (once-through boilers, fire-tube boilers).
	Furnace		IHI plans to convert existing fuel for various industrial furnaces (naphtha cracking furnace etc.) to ammonia fuel.
	Gas Engine		IHI Power Systems is developing ammonia engines for ammonia tag boat scheduled to complete in 2024. IHI plans to utilize this ammonia gas engine for onshore applications from 2026.
Maritime			

Newbuild & Retrofit of Ammonia firing



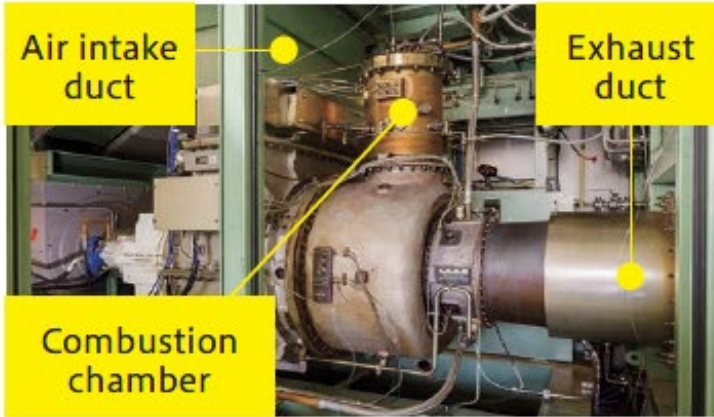
Stepwise increase of co-firing ratio toward zero CO₂ emission



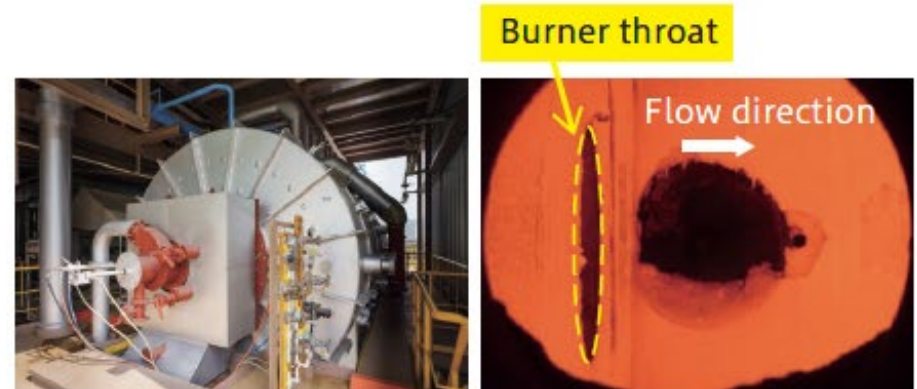
Development of Ammonia Combustion

CO₂ free power generation at 2MW class GT with 100% liquid ammonia combustion

(NEDO: JPNP21020)



Succeeded in ammonia single combustion at a large-scale combustion test facility



Development of ammonia combustion for heavy duty GT with GE

>400MW:2030



7F.05 : Source : GE

Demonstration project at Hekinan Thermal Power Station

(NEDO: JPNP16002)



20%:2024

>50%:2028



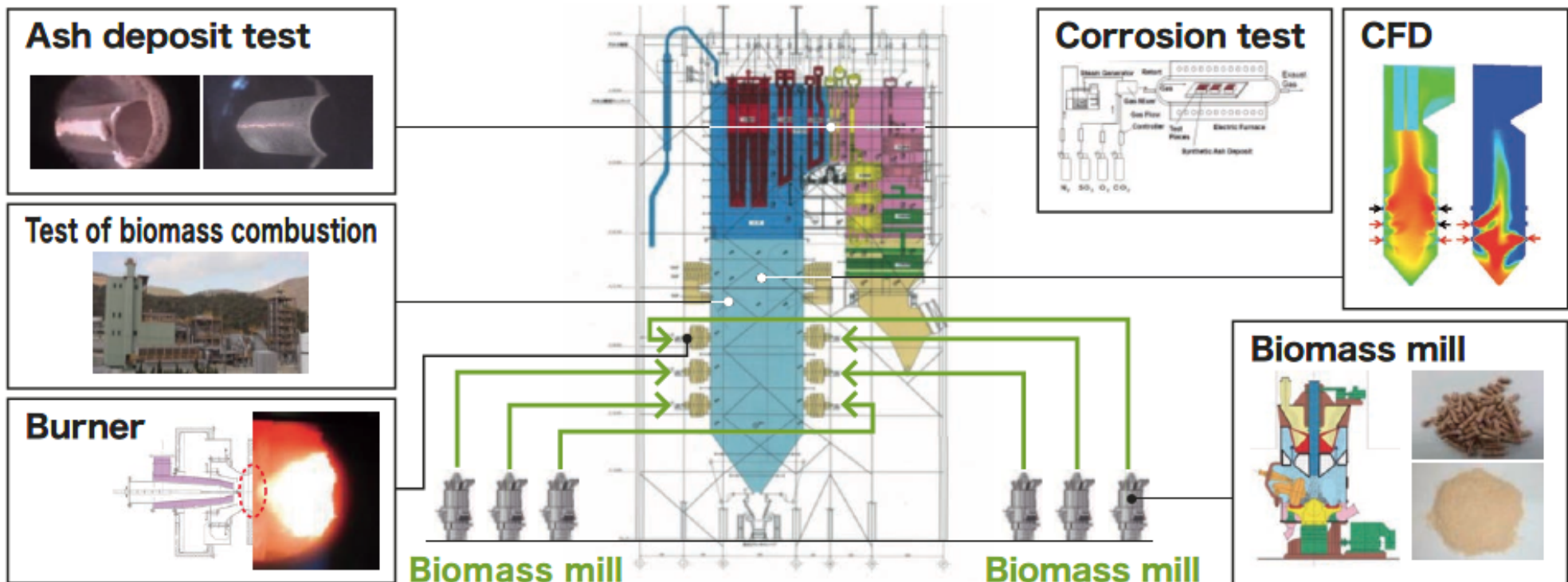
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Decarbonizing Energy with Life-Cycle-Business Approach ～Biomass～

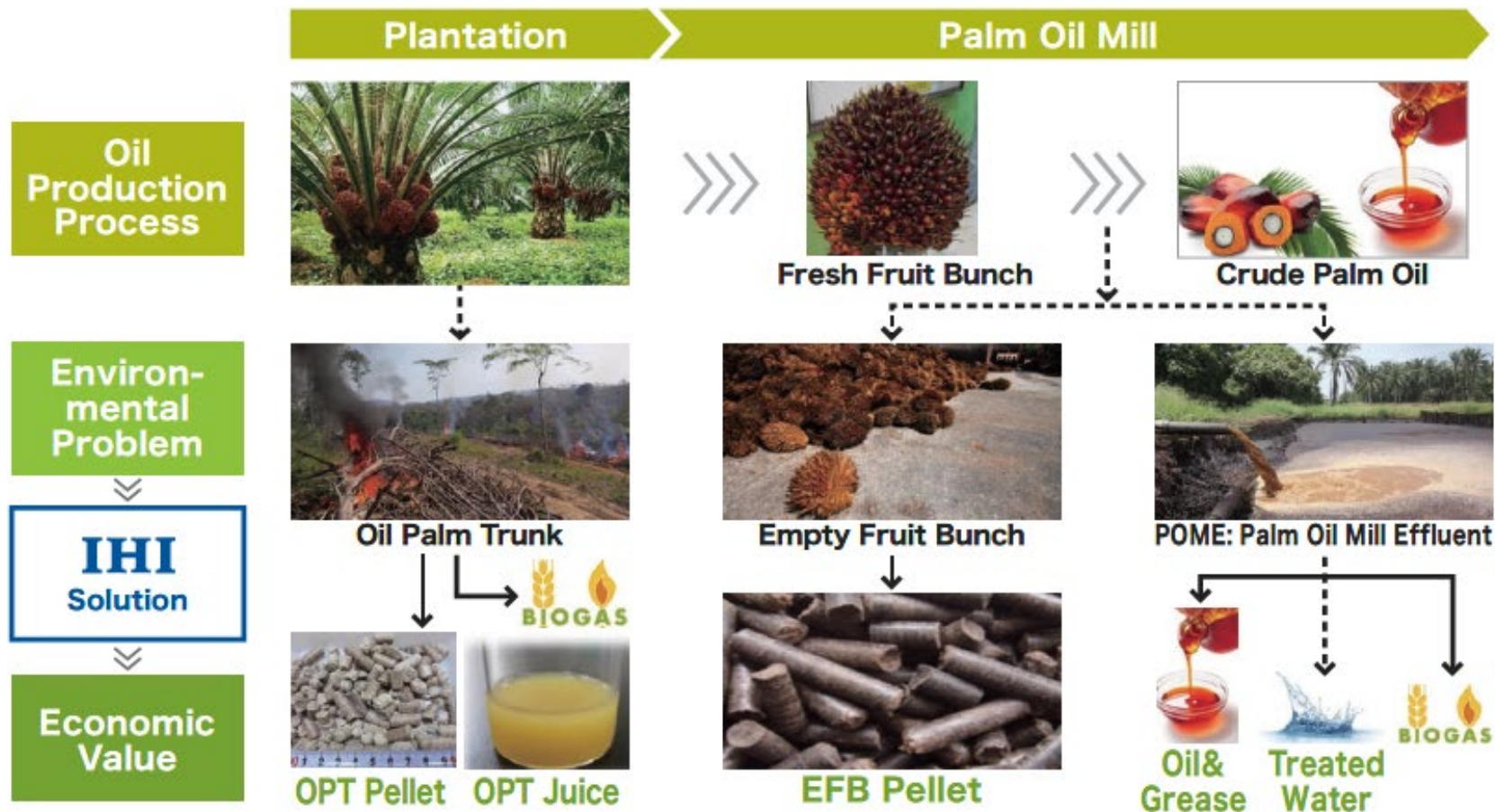
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In order to achieve carbon neutrality at coal-fired power station, IHI is focusing on fuel conversion partially or fully into biomass fuel

- A coal mill is converted into a biomass mill.
- A coal burner is reused for biomass fuel.
- Possible to burn biomass fuel in the furnace.
- Pre-study and testing to confirm the impact of conversion to biomass fuel.



There is a quantitative uncertainty factor in the biomass fuel supply, and IHI is also focusing on fuel production initiatives while taking into account the evidence that it is carbon neutral.





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Utilization of CO₂ with Carbon Recycle Technology

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IHI's Solutions for Carbon Neutral Society

CCUS technology will be targeted at industries where CO₂ capture is required as a decarbonization measure and where carbon-neutral fuels and feedstocks are required.



Oxyfuel combustion



Chemical adsorption

CO₂ Capture

Carbon Recycle Technologies



Electrolysis



Gasification

Hydrogen, syngas production

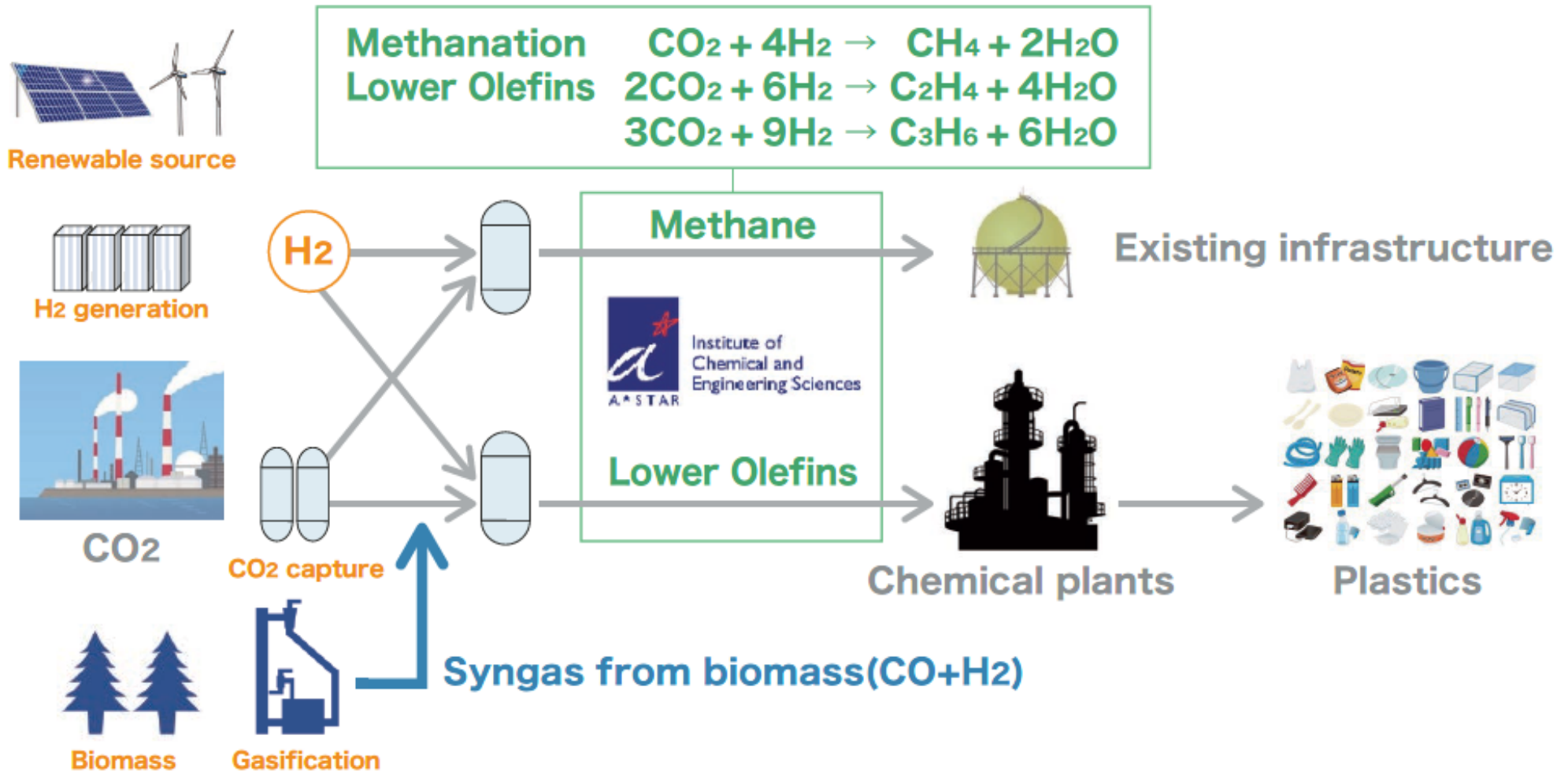


Catalyst technology
Design of reactor

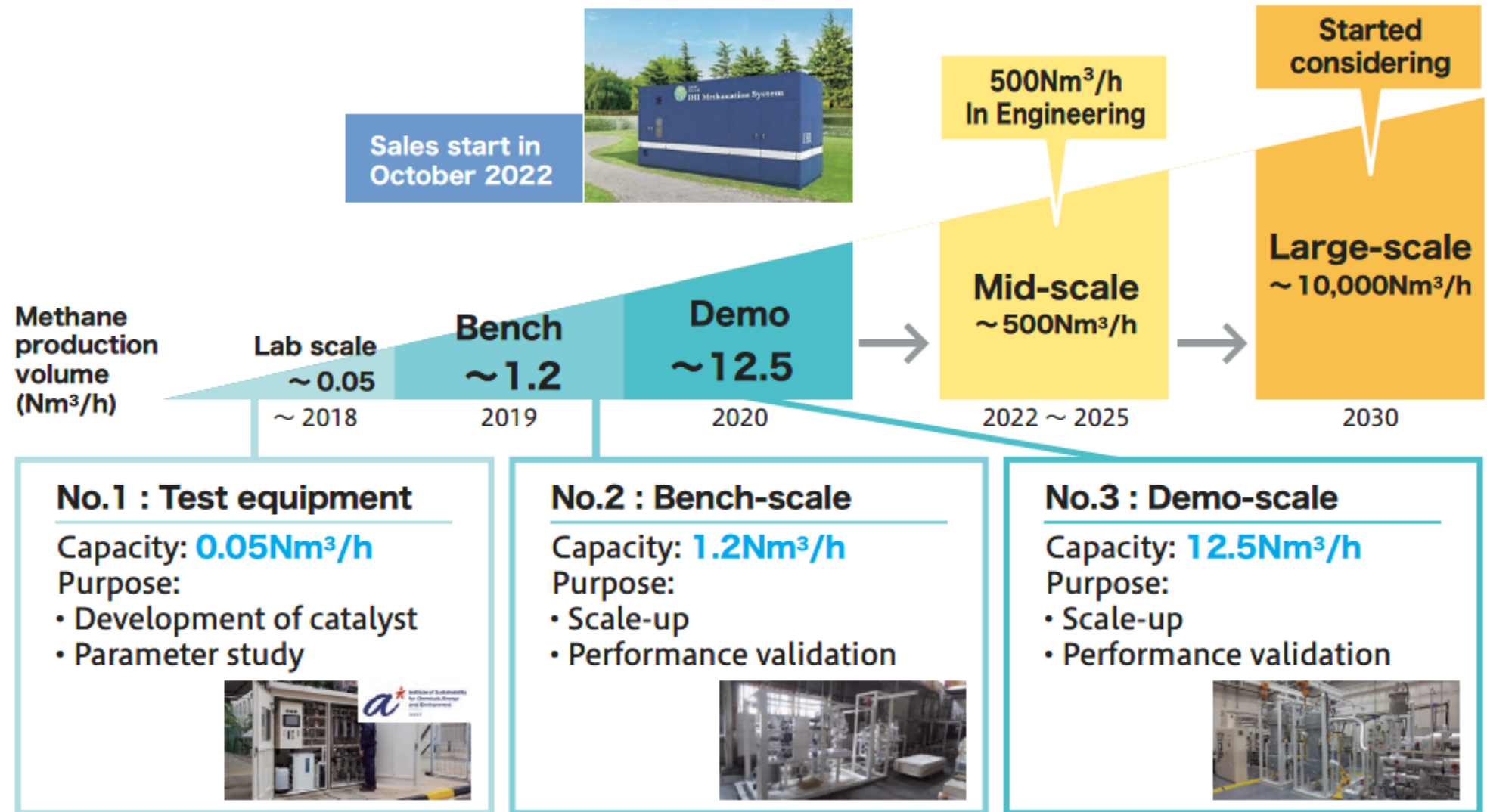
**Conversion to valuable resources
Methanation, Olefin production**

Concept

CO₂ is hydrogenated by H₂ from renewable sources to clean fuel such as methane and useful chemicals such as lower olefins as materials for plastics.



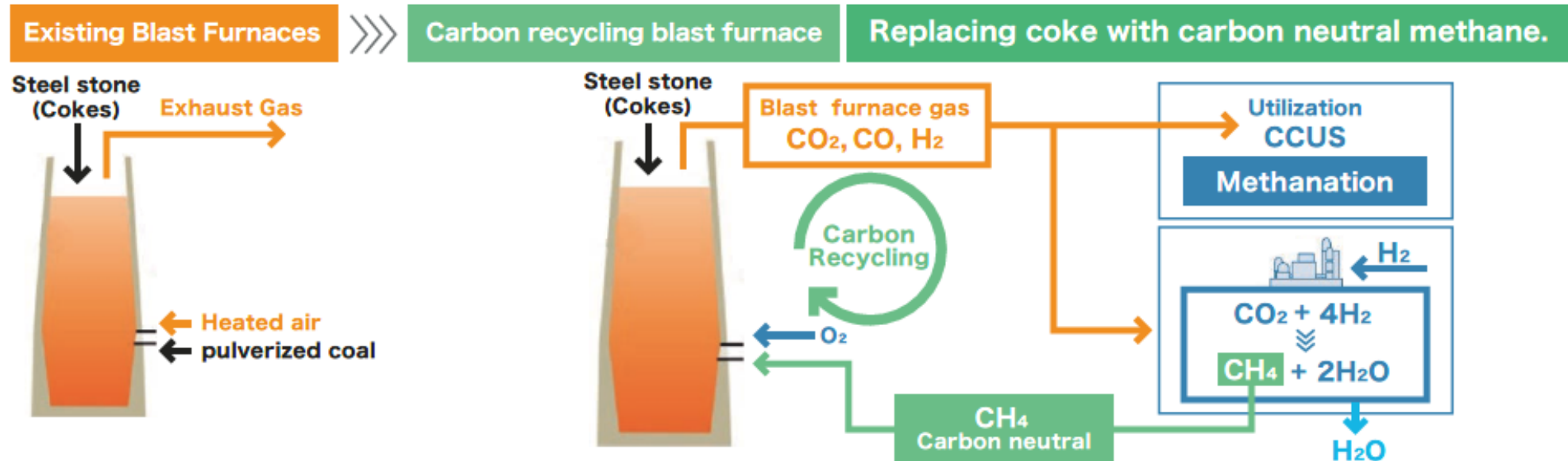
Scale up of Methanation Process



ISCE² : Institute of Sustainability for Chemicals, Energy and Environment, a national research institute in Singapore.
 SIGC: IHI-owned renewable energy research and demonstration center with solar panels, water electrolyzers and so on.

World's largest methanation facilities (500Nm³/h) and CO₂ Capture Utilizing reaction heat of methanation for CO₂ Capture

- Demonstration of technology to reduce CO₂ emissions by 50% compared to conventional in the blast furnace process in the steel industry.
- Realize carbon recycling by replacing coke with synthetic methane as the reducing agent in the blast furnace.
- The operation will be started in April 2025



Source : https://www.ihj.co.jp/en/all_news/2022/resources_energy_environment/1198177_3488.html



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Concluding Comment

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- With IHI's carbon solution technology, we will promote R&D and social implementation **toward the realization of a carbon-neutral society by 2050.**
- In the future, we will promote the development and social implementation of technologies related to **biomass, fuel ammonia, and carbon recycling** as an energy supply that does not rely on fossil fuels.
- In order to embody our management philosophy of "Contributing to the development of society through technology," we will cooperate with you.



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Realize your dreams