

Message from the General Manager of Business Development Headquarters

Our Aim: Accelerate Commercialization in the Value Chain for New Energy, Drive Future Growth in Parallel with Aero Engines and Space



Director
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Could you please tell us about the role of the Business Development Headquarters?

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The functions of the original Solutions & Business Development Headquarters were strengthened to create the Business Development Headquarters, newly established in April 2022. The mission we have been assigned is to stimulate change and to create new businesses. We identify global social issues that need to be addressed, combine our "killer content" stemming from IHI technologies with regional and business strategies, and develop new growth business from the perspective of market entry. In addition to expanding Lifecycle Businesses, the business model aims to generate business opportunities from the perspective of a value chain for new energy and create new profitable business for the future that will drive future growth in parallel with Aero Engines and Space. We have roughly 350 personnel at present and Bahlke, IHI's first executive officer of foreign nationality, has been appointed deputy general manager. We are in the process of narrowing down global partners in spreading fuel ammonia.

Regional Strategy	Extracting social issues Identifying issues and solutions ×
Business Strategy	Providing Lifecycle value Value chain perspective ×
Killer Content	Killer content technology Killer content business

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What kind of social contribution does the IHI Group aim for by establishing the Ammonia Value Chain?

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The IHI Group has been combusting ammonia as an alternative fuel to coal for about 10 years, working towards the commercialization of fuel ammonia to achieve carbon neutrality in the boiler business.

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At the time, it was believed fuel conversion would create demand for combustion burner replacement, which is simply a product-oriented idea. A market-oriented perspective is indispensable for the expansion of ammonia, which does not emit CO₂ during combustion and is easy to handle. Since ammonia has long been widely used throughout the world such as for fertilizer, infrastructure including distribution for it is already established to a certain degree. However, upon realizing the Ammonia Value Chain, other issues still remain such as securing transport and storage technology that can handle large volumes of ammonia.

To solve these issues, The IHI Group's original technologies that we've held ahead of our competitors will be leveraged. Simultaneously, overseas sites will be central in identifying social issues and business opportunities of their region from a local perspective in the process of commercialization.

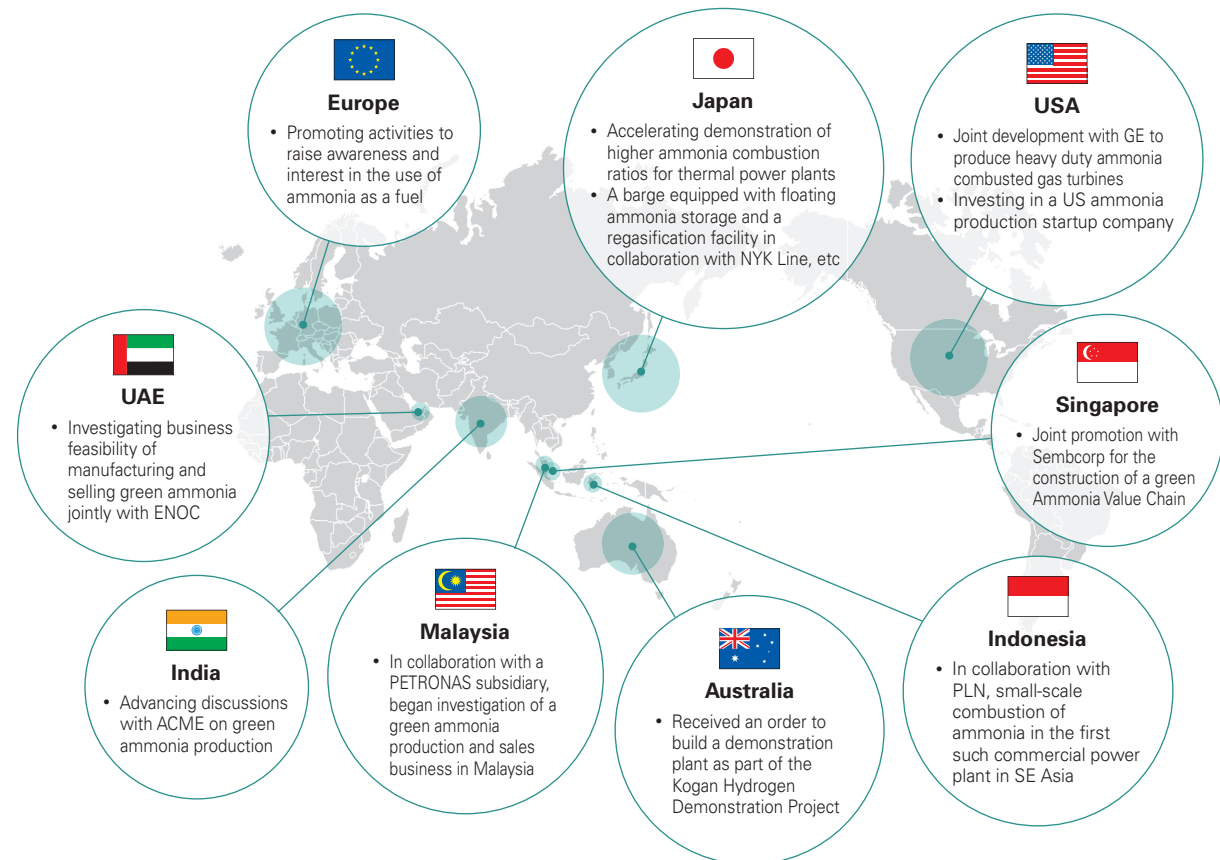
Taking the lead this way, with initiatives to construct the Ammonia Value Chain as a whole, will enable building a decarbonized, sustainable society.

necessary to expand the amount of ammonia produced while also enhancing the value of green ammonia. We will aim to enhance green ammonia value by conducting authentication using blockchain technology, for which we are working together with Fujitsu.

Meanwhile, in the field of power generation, we have achieved CO₂-free power generation with 100% combustion using only liquid ammonia in the IHI 2,000 kW-class gas turbine. This became a world-first

success. Going forward, we will aim to bolster demand for fuel ammonia with sales of small-scaled ammonia gas turbines. We will also work toward commercial use by around 2030 of heavy duty gas turbines that are being jointly developed with General Electric (GE). GE was initially working to develop hydrogen gas turbines, but they came to agree with IHI that ammonia gas turbines are more economical and advantageous technologically, which lead to the start of our joint development.

● Status of discussions with countries around the world on fuel ammonia production, transportation, and storage network development



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Could you talk about priority areas and a timeline with regard to constructing the Ammonia Value Chain?

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Application of combusting fuel ammonia is currently moving ahead at JERA's Hekinan Thermal Power Station, but it is simply a partial conversion of fuel, or a period of transition. Toward transformation, or a state in which change to a carbon neutral society is achieved, the IHI Group will focus upstream in the Ammonia Value Chain and large-scaled gas turbines that use ammonia as fuel. During the period of the "Group Management Policies 2023", we will actualize investment and finance the upstream value chain, and provide green ammonia on a full-scale basis around 2025-2027. After 2030, I believe it will be

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Which regions will IHI be focusing on?

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We will focus mainly on Southeast Asia and South Asia regions. Those regions have a high affinity with existing businesses that the IHI Group possesses which makes it possible to maintain a competitive advantage. We also plan to establish an actual model of the Ammonia Value Chain in regions such as the Middle East and Australia, in an attempt to create momentum for its spread. Creation of new demand is anticipated for ammonia storage tanks in areas such as Singapore, the Netherlands (specifically Rotterdam), and the East Coast in the U.S., which are prospective sites for ammonia supply bases. European and U.S. markets are being considered as candidates for investment in terms of technology, including investment and financing of startup companies. Europe, in particular, is the policymaker regarding the field of decarbonization. While green ammonia is considered as clean energy, they are aiming to create a decarbonized society mainly with hydrogen. Possibility remains in European regions that demand will be created for ammonia as a hydrogen carrier. We are considering reinforcing European sites for the purpose of deepening awareness of ammonia use.

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Can you talk about market size and earnings contribution of the Ammonia Value Chain?

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We believe scale of new business arising through constructing the Ammonia Value Chain will drive future growth in parallel with Aero Engines and Space. Revenue for 2040-2050 is targeted at roughly 900 billion yen. This target includes upstream business for ammonia, heavy duty gas turbines using ammonia as fuel, and equipment such as boilers and engines. Upstream business for ammonia will be launched with the IHI Group establishing an SPC (special purpose company)

and selecting a EPC contractor (engineering, procurement, construction). We will also focus on ammonia for fertilizer and marine vessel fuel. We believe that the scale for Ammonia Value Chain upstream companies will be greater than what is estimated by the Japanese government, which is domestic ammonia demand at 3 million tons in 2030 and 30 million tons in 2050. This is because we believe the number of customers wanting to utilize fuel ammonia is greater than projected which will cause more demand, and the idea that ammonia will be used not only as fuel ammonia but also be in demand as a hydrogen carrier. Additionally, business scale will expand as commercialization is actively carried out not only in Japan but in markets mainly in Asia.

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What are your thoughts about concerning risks surrounding commercialization and on risk management?

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Toward achieving carbon neutrality in 2050, the Agency for Natural Resources and Energy is expected to raise the power mix in 2030 to roughly 1% for hydrogen and ammonia, 20-22% for nuclear power (7% in 2021), and 36-38% for renewable energy (20% in 2021), while lowering figures to roughly 20% for natural gas (34% in 2021), 19% for coal (31% in 2021), and 2% for petroleum (7% in 2021). A situation where nuclear power generation becomes reevaluated and its composition ratio increases above what is forecasted would be a business risk for fuel ammonia. To mitigate the risk, we will proceed with business development for widespread use of ammonia including industrial and for fertilizer, marine vessel fuel, etc. In terms of business risks, we recognize that missing growth opportunities arising from solving social issues is the greatest loss of opportunity for the IHI Group. We will look for business

opportunities where we can make a contribution and aim for commercialization accordingly, factoring in a certain amount of failure and risks. Agility in decision-making will be required at times. Thus we will create a new forum for decision-making, discussing risks and returns from the planning stages, incorporating opinions of Finance & Accounting, Corporate Planning, and Technology & Intelligence Integration as well as of third-parties, while exploring investment opportunities in a proactive and bold manner.

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Lastly, can you talk about the advantages in the IHI Group focusing on ammonia?

A

The trend globally is in hydrogen, not ammonia, and is becoming the mainstream alternative fuel going forward. However, hydrogen is difficult to handle as infrastructure does not currently exist for hydrogen, substantial infrastructure facilities and investment will be needed, leaving challenges including the timeline toward achieving a carbon neutral society. The IHI Group will focus on ammonia which is easy to transport, low-cost, and available as a hydrogen carrier, with IHI's technology to suppress NOx (nitrogen oxide) emitted during combustion which is an issue. We will aim to construct the Ammonia Value Chain for building a safe, secure, and economical decarbonized society.

