

## **【Action Plan】**

### **1. New initiatives in accordance with the amendment to the JOGMEC law**

#### **(1) Providing equity capital and liability guarantees for the production and storage of decarbonized fuels (hydrogen, ammonia, and synthetic fuel)**

We have begun to provide equity capital and liability guarantees for overseas production-/ liquidization-/ storage- facilities and domestic facilities for receiving-/ storage- and production- of decarbonized fuels. The subjects that we will support are broadly expanded: we now support decarbonization of fossil fuel-derived (blue) hydrogen and ammonia by CCS conducted as usual, and will now also offer financial and technical support to facilities for producing renewable energy-derived (green) hydrogen and ammonia and synthetic fuel (which is a chemical compound of CO<sub>2</sub> and H). Furthermore, we will promote the utilization of various energy sources including relatively evenly distributed lignite-derived hydrogen and ammonia and we will conduct a social implementation study of hydrogen production using geothermal energy.

#### **(2) Providing equity capital/liability guarantees and geological/geophysical surveys for CO<sub>2</sub> storage**

We have begun to provide equity capital and liability guarantees for CCS projects both overseas and around the coastal waters of Japan. We will support CCS projects that are accompanied by resource development as well as industrial hubs and clusters of CCS projects which are globally promoted.

Simultaneously, in addition to existing oil- and natural gas-exploration, we will apply the 3D geophysical exploration vessel “TANSA”, which has been utilized only in Japan’s coastal waters until now, to conduct geological and geophysical surveys that search for CCS-suitable sites both overseas and in Japan’s coastal waters. We will also conduct geological and geophysical surveys, drilling, and evaluation of storage capacity. By implementing those surveys, we will conduct the selection of CO<sub>2</sub> injection sites and the estimation of storage capacity. Through these efforts we reduce subsurface risks, support operationalization of CCS projects with our technology and know-how, and thus contribute to securing a sustainable energy supply for Japan.

#### **(3) Providing equity capital and liability guarantees for domestic ore processing and smelting business**

We have begun providing equity capital and liability guarantees for domestic ore processing and smelting such as minor metals, etc. Despite an expected increase in demand for minor metals (such as rare-earth metals, lithium, cobalt, and nickel, which are necessary for renewable energy plants and batteries for energy storage) and base metals (such as copper, which is vital for electrically-conductive materials), supply risks owing to a high dependence on specific countries for processing

and smelting are of concern for some metals. We contribute to resilience in the mineral resources supply chain in Japan through strengthening financial support to the domestic ore processing and smelting business.

**(4) Providing equity capital for overseas geothermal exploration**

We will begin to provide equity capital for overseas geothermal exploration in FY 2023. Domestic experiences and actual achievements of major geothermal development are limited currently, but major projects and examples of advanced exploration and drilling technologies exist abroad. To fundamentally enlarge geothermal energy installations in Japan, we will support Japanese companies by providing equity capital to achieve technologies and know-how through participating in major geothermal development projects overseas. Furthermore, we will contribute to promote domestic projects by utilizing these technologies and know-how for domestic geothermal development.

**(5) Wind condition and geological surveys for domestic offshore wind development**

We have begun conducting wind condition and geological surveys for offshore wind projects. So far, several grid operators conducted initial surveys in potential areas, which led to inefficient surveying and became a burden on the local communities. Considering this situation, Japanese government empowered us to conduct the initial surveys by reference to the Centralized Model implemented in Europe. As part of the governmental public bid process, we will provide grid operators with wind condition data for wind energy evaluations and geological data for planning turbine layouts and selecting suitable foundation designs, utilizing our knowledge about existing offshore development. Through these efforts, we will help to promote project creation.

## **2. Strengthening support measures for achieving carbon neutrality, promoting new initiatives**

### **(1) Promoting fossil fuel development and decarbonization to tackle climate change**

Amid increasing geopolitical risks and escalating resource prices, the development of fossil fuels is still important for a stable energy supply, and decarbonization measures such as CCS are required more than ever for development of fossil fuels. We will strengthen the support to facilitate decarbonization efforts in oil and gas fields and coal development.

#### *Specific activities*

➤ **Financial support for upstream oil and natural gas development projects for decarbonization initiatives**

We will consider further strengthening support for climate change response efforts accompanied by upstream oil and natural gas development projects, for example, by introducing new preferential treatment in addition to reducing the liability guarantee fee rates (0.2%) for these projects.

➤ **On-site technical support for decarbonization initiatives in coal mine development and operation**

Considering the importance of decarbonization in the entire process of utilizing coal resources from exploration to rehabilitation, we will offer technical development and on-site support by further strengthening cooperation with industry-academic-government and coal-producing countries and by conducting joint surveys to evaluate coal bed structure and properties suitable for CO<sub>2</sub> storage.

➤ **Implementation of surveys on biomass production, modification, and fuel conversion technologies**

We will consider efficient and appropriate utilization of biomass in coal-fired power plants and the steel industry including by examination in actual equipment. We will also conduct surveys contributing to the reduction of GHG in coal mines, such as by afforestation of non-operational and abandoned coal mines with the grass plant which can be used in biomass-combustion, is highly efficient in land use, and grows rapidly.

### **(2) Securing a stable supply of LNG and promoting market expansion**

With the lowest CO<sub>2</sub> emissions among the fossil fuels and steadily advancing energy transitions, LNG continues to play an important role as a power source for the conversion of other fossil fuels and regulated power supply for renewable energy. It is also an energy resource that is expected to face increasing demands as a raw material for hydrogen and ammonia. LNG is an especially vital energy resource for Asian countries where economic development is expected to dramatically increase in

future. JOGMEC will promote the securing of a stable LNG supply through financial support and strengthening of information provision functions.

### *Specific activities*

#### ➤ **Financial support for gas development and project creation of LNG**

In the changing landscape of gas supply, we provide support such as geological and geophysical surveys, equity capital for exploration prior to prospect extraction/ development/ asset acquisition, and liability guarantees to Japanese companies. We also act as a bridge between governmental organization/local companies in gas-producing-countries and Japanese companies, by hosting seminars and conferences about specific LNG projects.

#### ➤ **Mid-downstream business support for expanding the LNG market in Asia (financial support through equity capital and liability guarantees for storage and receiving terminal construction)**

Considering that expansion and growth of the LNG market in Asia is essential to maintain and improve the energy security of Japan, we added investment and liability guarantee services related to storage businesses such as LNG transshipment and acceptance conducted overseas by Japanese companies to strengthen support for the entire LNG supply chain in June 2020. We will further utilize this business to strengthen cooperation with Japanese companies and LNG-demanding countries, while actively promoting activities such as value chain survey proposals and encouraging storage/receiving terminal construction through JOGMEC financial support.

#### ➤ **Strengthening information provision functions regarding the LNG market**

We continue to strengthen the provision of information on the LNG market through the JOGMEC website to improve information transparency and liquidity in the LNG market to strengthen LNG security. Specifically, we will continuously conduct surveys on spot LNG prices, destination flexibility for term contracts and LNG handling volume in cooperation with Japanese companies to understand the current status of the LNG market in Japan and provide timely information on the LNG market. In these ways we will contribute to effective policy to enhance LNG security and maintain Japan's influence on the international LNG market.

### **(3) Further promotion of geothermal development**

Geothermal energy is a clean and renewable energy source that emits almost no CO<sub>2</sub> during power generation. It is a base-load power source that can generate power in a stable manner regardless of natural conditions such as the weather. We will steadily proceed with projects under investigation, exploration, and development, while accelerating the efforts and technological development for starting new projects to achieve carbon neutrality by 2050.

### *Specific activities*

#### ➤ **Promoting domestic development of geothermal resources**

We will strengthen efforts to promote geothermal development in natural parks where development has not been advanced despite the existence of geothermal potential. Specifically, we accelerate the identification of potential geothermal projects in natural parks through focusing surveys on domestic geothermal potential. Based on the results of this activities, we lead project creation by Japanese companies. In the surveys, we acquire and analyze data on subsurface geology and temperature structure, to assess geothermal prospectivity in promising domestic areas.

#### ➤ **Promoting support for reducing financial risk**

When applying the conditions of financial support of subsidy for high-risk initial surveys (geological, geophysical, and well-drilling surveys to confirm promising geothermal resources), equity capital for exploration projects, and liability guarantees for development projects, we will be flexible by reconsidering subsidy rates and examining standards of equity capital and liability guarantees. This will encourage and strengthen support for accelerating surveys in natural parks and geothermal developments.

#### ➤ **Expanding the potential for geothermal development**

We will strengthen the development of geothermal reservoir exploration, drilling, and evaluation/management technologies to shorten the development period and reduce costs of geothermal development undertaken by Japanese companies. We will also steadily conduct evaluation for the practical use of the Enhanced Geothermal Systems (EGS).

#### ➤ **Strengthening geothermal resource surveys overseas**

We will work to improve geothermal survey technologies and promote the development of domestic geothermal resources by providing accumulated knowledge from surveys in volcanic belts overseas (that are similar to Japan) to Japanese companies.

### **(4) Promotion and decarbonization of mineral resource development**

Due to the promotion and demand for electric vehicles and renewable energy power plants, demand for carbon-neutral-relevant minerals (hereafter “CN-relevant minerals”) is expected to increase. We will actively provide financial support for the exploration and development of CN-relevant minerals, and steadily conduct exploration overseas. We will also strengthen support for the development of production technology and metal recycling of CN-relevant minerals.

### *Specific activities*

#### ➤ **Promoting financial support for carbon neutrality**

After appropriate and sufficient risk assessment of a project, we provide equity capital up to a maximum of 75% for high-risk minerals (rare-earth, cobalt, lithium, nickel and PGM) essential for batteries (which are a key for electricity and greening). Doing this will lead to stable supply amid recent dramatically escalating prices and increasing supply risks.

➤ **Support for the development of metal recycling technology**

Demand for lithium is expected to increase due to the uptake of electric vehicles. We will promote domestic recycling businesses contributing to decarbonization by supporting the development of efficient and economical technology for recovery of high-purity lithium from used lithium-ion batteries.

➤ **Promoting production technology development for CN-relevant minerals**

We will work on utilizing unused resources with the objective of diversifying the supply sources of CN-relevant minerals, and developing lower cost and more efficient production technology with the objective of strengthening the supply chain for crucial minerals which rely heavily on specific producing countries.

➤ **Promoting exploration of overseas mineral resources**

We will secure potential resources by organizing new exploration projects that focus on rare-earth elements, nickel, and cobalt, contributing to carbon neutrality and economic security. We will keep on transferring the exploration results to Japanese companies to develop while continuing to explore for new deposits.

➤ **Investigation of mineral-specific activities based on material flow and supply chain analysis**

We will analyze the supply chain issues faced by each of the CN-relevant minerals and identify issues to be resolved, to secure a stable resource/raw material supply and strengthen the international competitiveness of the Japanese industry. We will determine not only the minerals (primary resource) from mines but also the material flow of the recycled raw materials (secondary resource) in these analyses and extraction of issues. This provides information and data that will contribute to the investigation of the construction of a recycling-oriented society.

➤ **Support for CO<sub>2</sub> reduction efforts in projects related to mine pollution prevention for abandoned mines**

To reduce CO<sub>2</sub> in abandoned mines, we will further promote the spread of passive treatment technologies (technologies for mine drainage treatment utilizing natural energies to a maximum extent, such as gravity and microbiological processes) which we have been working on. Furthermore, we will promote joint surveys of development of low-carbon neutralization reagents used in the treatment of drainage from abandoned mines and CO<sub>2</sub> mineralization using waste rock from abandoned mines. In doing so, we will progress towards a low-carbon society while also controlling mine pollution.

## **(5) Support for hydrogen and ammonia production etc.**

Hydrogen and ammonia must be supplied in a stable and affordable manner like other energy resources such as oil and natural gas in order to build a hydrogen and ammonia supply system for achieving carbon neutrality by 2050. Furthermore, to achieve stable supply and decarbonization, it is important to make consistent efforts in the entire value chain, from production, storage, and shipping to utilization. In this regard, we will conduct a feasibility study of the hydrogen and ammonia value chain and support a feasibility study of a lignite-derived hydrogen and ammonia production project, contributing to reducing production costs.

### ***Specific activities***

#### **➤ Support for feasibility evaluations through value chain surveys on hydrogen and ammonia and others**

We will support feasibility evaluations by conducting commercialization surveys of international value chains that produce hydrogen and ammonia etc. overseas and import and store them in Japan. Finding solutions to technical and institutional challenges are necessary for the construction of an international value chain. We will develop a favorable business environment for Japanese companies operating internationally by having dialogues about technical cooperation with local companies and about institution/support measures with government/local government, thus applying our relationships cultivated so far with oil-, gas- and coal-producing countries. In doing so, we will support the launch of hydrogen and ammonia etc. projects by Japanese companies.

#### **➤ Support for feasibility evaluations of hydrogenation of unused resources, including lignite**

We will focus on utilizing unused resources, such as lignite, which is an affordable energy resource, towards establishing low-cost hydrogen utilization and support the evaluation of the feasibility of unused resources-derived hydrogen projects. We will conduct surveys identifying potential areas of lignite-derived hydrogen and ammonia production in Asia, including Japan, in addition to a CCS project that is part of a lignite-derived hydrogen production project in the state of Victoria, Australia.

Furthermore, considering the ammonia supply to existing coal-fired power plants, we will evaluate the feasibility of the value chain of lignite-derived ammonia from mines to thermal power plants in Japan.

#### **➤ Efforts to apply existing tanks for storage of decarbonization fuels**

We will support the development of storage of decarbonization fuels in refineries and the import base of crude oil and LPG (liquefied petroleum gas) in Japan by formulating technical guidebook

for storage of methylcyclohexane (MCH) and ammonia in existing floating-roof crude oil tanks and low-temperature LPG tanks.

## **(6) Comprehensive support for CCS**

Utilizing CCS technology and securing suitable sites for CCS are the issues faced while building a hydrogen/ammonia supply system and decarbonizing thermal power generation to achieve carbon neutrality in 2050. JOGMEC will strengthen initiatives such as accumulating and strengthening technical knowledge and examination abilities relating to CCS, evaluating the feasibility of CCS projects that are integrated with research and development and resource development, and collaborating with domestic and overseas organizations. Additionally, we will strengthen joint research and technical studies of CCS projects and support CCS-suitable site surveys.

### ***Specific activities***

#### **➤ Implementing joint research and technical studies for CCS business feasibility evaluations**

We will promote the enhancement of subsurface evaluations and facility-related elemental technologies that contribute to the commercialization of CCS, such as improvement of CO<sub>2</sub> behavior simulation technologies and development of CO<sub>2</sub> sequestration and storage technology. We will also promote commercialization of CCS for specific fields, such as the development of high-concentration CO<sub>2</sub>-containing gas fields in Southeast Asia using CCS.

#### **➤ Strengthening cooperation with oil- and gas-producing countries and Asia**

We will strengthen relationships with oil- and gas-producing countries through implementing a training programme for energy transition and zero-emission for these countries where there exist potential CCS-suitable sites, and from where the supply of blue/green hydrogen and ammonia is expected. Specifically, this training programme is intended to deepen understanding of the need for fossil-fuel transition/decarbonization and knowledge of new fuels through knowing the latest trends in technology, the JOGMEC method of CCS institution/CO<sub>2</sub> reduction evaluation, market trends of hydrogen and ammonia, and site excursions to cutting-edge plants producing hydrogen and ammonia. We will strengthen and expand relationships with resource countries and conduct training projects with an expectation of future involvement in specific projects operating with Japanese companies and institutional design by people who participated in the training programme.

Furthermore, we will strengthen relationships with Asian countries that have increased demand for hydrogen/ammonia and a need for CCS. Specifically, we will contribute to achieving zero-emissions in Asia through an evaluation of CO<sub>2</sub> reduction amount in a CCS project and a system development for business implementation, and promoting development of human resources to take crucial roles in the hydrogen/ammonia market. Regarding evaluation of CO<sub>2</sub> reduction, we will contribute to establishing a common methodology in Asia by utilizing JOGMEC's guidelines

(see below for details), published in May 2022, to a maximum extent. Furthermore, using the relationships cultivated by these efforts we will promote the application of our equity capital and liability guarantees support to new projects by technical and feasibility evaluation through the entire supply chain including blue and green ammonia production in Asia.

➤ **Active involvement in and contribution to the construction of evaluation methods, methodologies, and certification frameworks for CO<sub>2</sub> reduction**

Verifying the long-term stability of stored CO<sub>2</sub> and improving its reliability are required for CCS commercialization. It is also important to quantitatively show improvement in the environment by evaluating the amount of CO<sub>2</sub> reduction through CCS and carbon intensity, such as LNG, hydrogen, and ammonia.

We formulated and published a “CCS guideline” and a “GHG/CI guideline” in May 2022. We will utilize these guidelines in our business. Furthermore, we will evaluate CCS projects and the amounts of CO<sub>2</sub> emissions reduction in a way that conforms to reality by advancing information exchange with related organizations. We continue to work on further improvement of the guidelines in terms of function and accuracy by enlarging the scopes (for example, inclusion of synthetic methane) and by considering the CO<sub>2</sub> storage amount calculations by CO<sub>2</sub>-EOR.

We will also investigate methane, whose greenhouse effect is greater than CO<sub>2</sub>, and actively participate in and contribute to the construction of decarbonization systems using an assessment method for carbon pricing systems such as credit systems.

**(7) Miscellaneous**

➤ **Reduction of CO<sub>2</sub> emissions in stockpiling bases**

We will consider further reduction of CO<sub>2</sub> emissions from JOGMEC control-facilities. Specifically, we promote efforts such as surveys of the possibility of utilizing hydrogen in stockpiling bases.