

Japan's Green Growth Strategy

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Background

In October 2020, Prime Minister Yoshihide Suga announced the aim of carbon neutrality in 2050. The international community has entered a new era in which the response to climate change is seen not as a constraint or a cost imposed on the economy but as an opportunity for further growth. The Green Growth Strategy is a set of industrial policies to create a “virtuous circle between the economy and the environment”. Catchphrases such as “a new mindset” and “reforms” come easily to mind, but “carbon neutral” will not be easy to achieve. The role of the government is to provide full support to private companies which see this as a chance to be the leaders of this new era by investing boldly to generate innovation.

CO₂ Emissions from the Power Sector

Decarbonizing the power sector is important, since it accounted for 37% of all CO₂ emissions in 2020. Renewable energy sources will be introduced to the maximum possible for this purpose. Electric power systems will be developed to reduce costs and storage batteries will be utilized to accommodate output fluctuations, while harmonizing with the surroundings. Accordingly, it is necessary to cultivate offshore wind power industries and storage battery industries as part of this growth strategy.

Thermal power generation in combination with the recovery of the CO₂ will be pursued as an option. Specifically, a minimal use of thermal power generation will be unavoidable worldwide, mainly in Asia. Therefore, the government will pursue decarbonization of thermal power generation as an option by developing technologies of hydrogen/ammonia thermal power generation. In order to prepare for such a future, it is necessary to create a hydrogen industry to meet an increase in its supply and demand, develop infrastructure, and reduce costs. Similarly, it is necessary to develop carbon recycling, which recovers carbon emitted from thermal power generation and uses it as a resource, as a technology and establish it as an industry. It is also necessary to create an industry capable of supplying fuel ammonia.

Nuclear power is an established decarbonization technology. While making efforts to improve its safety and reducing reliance on it as much as possible, the Japanese government will continue to seek making the most of nuclear power. It is necessary to proceed with

restarting of reactors by placing utmost priority on safety, as well as to develop safer next-generation reactors.

CO₂ Emissions Beyond the Power Sector

Beyond the power sector, the electrification of the energy source will be the core of the response. To meet heat demands, it will be necessary to incorporate the use of decarbonized fuels, e.g. hydrogen, as well as of fossil fuels combined with CO₂ recovery and reutilization. As this electrification will lead to increased electricity demand, it will be necessary to help businesses engaged in improving energy efficiency.

Specifically, the industrial sector will require innovations in the manufacturing process, e.g. hydrogen reduction steelmaking. The transportation sector has to use decarbonized fuels, for example biofuel and hydrogen fuel, while promoting electrification. The business and household sectors anticipate net-zero energy houses/buildings, electrification, hydrogen-powered systems, and use of storage batteries. All this means that it will be necessary to nurture the hydrogen industry, electric vehicle and storage battery industries, transportation-related industries, and housing- and building-related industries as growth sectors.

Establishing Digital Infrastructure

To achieve the 2050 carbon neutral goal, it will be necessary to deal with issues regarding the digital control of electric power networks, in addition to responding to these challenges in achieving a desirable energy supply/demand structure. A resilient digital infrastructure is the foundation of the Green Growth Strategy; green and digital are an inseparable and indispensable pair. Thus, it is necessary to nurture the semiconductor and information and communication industries as growth sectors, to strengthen the digital infrastructure.

For example, the electricity sector requires digital technology for smart grids; supply/demand adjustment for solar power and wind power generation whose outputs vary with weather conditions; maintenance and inspections of infrastructures. In the transportation sector, automatic driving of cars, drones, aircraft, and railways through the use of digital technology not only enhances convenience for the public but also efficiency in energy use. In factories, factory

automation, robots, and other digital technology automate the manufacturing process. In office and household sectors, comfortable life as well as energy efficiency will be realized with the introduction of smart houses which optimize reusable energy sources and storage batteries, and service robots.

Green Growth Strategy Based on Existing Initiatives

The technological seeds for achieving these goals are already being discovered through ongoing research and development. In January 2020, the Japanese government released the Environment Innovation Strategy, which aims to establish innovative technologies for achieving the notion of “beyond zero” to reduce the CO₂ emissions that have accumulated in our atmosphere since the Industrial Revolution. The issues laid out there are being studied in further depth by the government. When these innovative technologies are established, the challenge of deployment and implementation is the next issue to be solved and reducing costs by large-scale production is considered a key to resolving it.

Under the Green Growth Strategy, the government will mobilize every policy tool, including budgetary expenditures, tax incentives, finance, regulatory reform and standardization, and international collaboration, to channel the cash equivalent of 240 trillion yen in the hands of business sectors towards active investment.

According to an automatic preliminary calculations, it is expected to generate a positive yearly economic impact of around 90 trillion yen in 2030 and of 190 trillion yen in 2050 by this strategy, respectively.

Framework of Green Growth Strategy

It is important to make significant economic growth through the reform of industrial structure and economic systems, in the course of tackling the challenges of the 2050 carbon neutral goals. The Green Growth Strategy is expected to produce employment and growth by encouraging private investment to mobilize 240 trillion yen in cash and deposits domestically and attract the 3,000 trillion yen in funds available abroad for environment-related investment. The government will take all policy tools to realize that.

The relevant ministries and agencies are working together and the

government is developing “action plans” in each of the priority sectors critical to achieving the 2050 carbon neutral goals, which includes (1) goals with specific time frames, (2) research and development and demonstration, (3) establishment of the institutional framework including regulatory reform and standardization, and (4) international collaboration.

These action plans for the priority sectors provide concrete processes until 2050, referring to current circumstances and challenges, and the policy direction, clearly. The focus is on demand creation through regulatory reform, standardization and the financial markets, and price reduction through private-sector investment.

Each process chart sets forth specific measures for priority technologies crucial to achieving growth in that sector to enhance the international competitiveness of Japan and generate self-sustaining market growth, and will in principle consist of the following four phases.

- (1) The “research and development” phase, driven by funds created by the government and by R&D investment from the private sector.
- (2) The “demonstration” phase, driven by public-private cooperative investment aimed at inducing private-sector investment.
- (3) The “introduction and expansion” phase, in which the aim will be to increase demand through public procurement and the establishment of the institutional framework including regulatory reform and standardization and reduce costs through the large-scale production.
- (4) The “self-sustaining commercial” phase, in which commercial use grows without public support on the basis of an institutional framework consisting of regulation, standards, and other elements.

Note that the duration of each phase will differ from sector to sector. Some sectors may even jump directly from the “research and development” phase to the “broadening adoption” phase, skipping the “demonstration” phase altogether.

Cross-Cutting Measures to Support the 2050 Carbon Neutral Goal

The budget: The government will take a major step forward in environmental investment, establishing a 2 trillion-yen fund to provide consistent support over the next 10 years to businesses that undertake ambitious innovations.

Tax system: Private-sector investment will be encouraged with the aim of carbon neutrality through an investment promotion tax system, expansion of the R&D tax systems, and creating a special elevation of the carryover loss deduction limit for businesses that undertake business restructuring, business reorganization, and the like.

Financing: The government will attract financing to innovative technologies aimed at carbon reduction and decarbonization through rulemaking for financial markets including information disclosure and valuation standards.

Regulatory reform and standardization: Regulatory reform regarding hydrogen stations, review of power system operation rules to prioritize the use of renewable energy sources, utilization of fuel efficiency regulation to promote electrification of passenger cars, public procurement of concrete which absorbs CO₂, and others will be considered with a view to creating demand and reducing costs.

Inducing private-sector funding: Rulemaking on e.g. information disclosure and valuation standards for financial markets will be promoted in cooperation with the international community.

International collaboration: The domestic and international are two sides of the same coin for the industrial policy promoting the development of innovative technologies and their social adoption aimed at achieving the 2050 carbon neutral goals. The international competitiveness of Japanese industries will be enhanced through cost reduction achieved through economies of scale by securing markets not only at home but also in emerging economies and elsewhere abroad. Through inbound direct investment, international collaboration and M&A, overseas technologies, sales networks, and management will be taken in and learned. To this end, collaborations with other countries in innovation and technology development in the priority sectors will be sought and overseas demonstration projects aimed at social adoption and overseas markets, support for the formation of overseas infrastructure projects and reinforcement of the functions of the export credit system will be conducted as well.

In addition, active participation in the international rulemaking process including the market mechanism under the Paris Agreement and information disclosure and valuation standards in financial markets and the development of standards will be implemented.

Cooperation with Major Countries

The government will work with the United States, Europe, and other major countries on collaboration on innovation policies; promotion of individual projects in critical areas including support for decarbonization efforts in emerging countries and other third-party countries; standardization of elemental technologies in priority critical industrial fields; and rulemaking (e.g., removal of trade barriers).

In working with emerging countries in Asia and elsewhere, which are of particular importance from the viewpoint of promoting decarbonization globally, it is necessary to collaborate with international organizations such as the International Energy Agency (IEA) and the Economic Research Institute for ASEAN and East Asia (ERIA) and to take a realistic approach in encouraging their commitment to decarbonization, since emerging countries in Asia face greater social and economic restrictions than developed countries. The government will present a wide range of solutions for decarbonization, from the perspective of the IEA concept “all-fuels, all-technologies”, starting from renewable energy sources, CO₂ recovery, nuclear power, hydrogen/biofuels, and ammonia/hydrogen mixed fuel or single fuel firing that uses existing infrastructure, including financial aspects. In addition, from the viewpoint of market acquisition, the government will promote bilateral and multilateral cooperation.

Action Plans in Key Sectors

To respond to the challenges of the 2050 carbon neutral goals with a growth strategy, Action Plans were established for priority sectors that have potential for growth as industries in the future and are essential to the reduction of greenhouse gas emissions. Fourteen sectors were taken up with different development schedules. Some are forecast for markets to emerge from now through 2030, while other will show markets emerging later around 2050.

There is a great variety among these sectors, such as energy-

related industries, manufacturing and transportation-related industries, and housing and office-related industries. Some sectors urgently require measures in the immediate “introduction and expansion” phase while others do so in the future-oriented “research and development” phase. We will take up specific measures that match the characteristics of the respective sectors to enhance Japan’s competitiveness and generate self-sustaining market expansion.

The government will further consider the steady implementation of the Action Plans in these sectors as well as the further elaboration of goals and measures with a view to revising the Green Growth Strategy in the future.

Exhibit 1: The Hydrogen Industry

Hydrogen is a key carbon-neutral technology that will be featured in a wide variety of areas including power generation, transportation, and industry. Japan was the first country in the world to establish a basic plan for hydrogen and holds the technological lead in multiple areas. However, European nations, South Korea, and others have also adopted basic strategies and are stepping up their efforts. Going forward, dealing in hydrogen as a new resource, not limited to vehicle use, a wide range of players will be involved. In order to promote decarbonization as well as industrial competitiveness, the government will take measures under a certain premise, in such areas as transportation and manufacturing.

Regarding the price, we will aim at levels that make hydrogen fully competitive with fossil fuels by reducing the cost of supplying it to 30 yen/Nm³ (less than one-third of current level) by 2030 and reducing the cost of hydrogen power generation below gas-fired power generation (20 yen/ Nm³) by 2050. As for volume, while we are aware that the potential for renewable energy sources, market size, and other factors vary among countries and regions, intending to make a jumpstart, the domestic hydrogen market with the goal of reaching a maximum supply of 3 million tons by 2030 and 20 million tons by 2050 will be set as goals.

Exhibit 2: The Fuel Ammonia Industry

We consider ammonia, which emits no CO₂ when burned, to be the mainstay decarbonization fuel in the transition phase to a

hydrogen society. 20% co-firing of ammonia (on a calorie basis) translates to a 20% reduction in CO₂ emissions for a thermal power plant – 20% co-firing at all coal-fired power plants of main power generation companies in Japan would reduce CO₂ emissions from Japan’s electric power sector by 1/10th.

In terms of usage, since technology to stabilize combustion so as not to emit NO_x has already been completed for 20% co-firing, the demonstration with actual equipment of 20% co-firing will be conducted from around FY 2021 to FY 2023. Practical application will start in the late 2020s, and its introduction will be expanded in the 2030s. In the future, 1) improvement of co-firing ratio and 2) realization of single fuel firing of ammonia as well as 3) expansion of power generating burners (for co-firing and ammonia single fuel) to the world including mainly Southeast Asia, and 4) expansion of applications, are aimed for. On the supply side, we intend to take the lead in the global ammonia fuel market through the rapid buildup of an international supply chain through the construction of new ammonia plants in natural gas producing countries including the US. We will also look into other decarbonization fuels with the aim of using them. Through these measures, annual domestic demand for ammonia is expected to reach 3 million tons (500,000-ton hydrogen equivalent) in 2030 and 30 million tons (5 million-ton hydrogen equivalent) in 2050. The global market is expected to reach 1.7 trillion yen annually by 2050. We intend to build a global procurement supply chain of 100 million tons of fuel ammonia by Japanese companies in 2050.

Conclusion

While we start implementing what we can already do, revision of the Action Plans is on-going. Looking at other cross-sectoral discussions in our government, e.g. a review of the Strategic Energy Plan, we will move forward toward the 2050 carbon neutral goals.

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