

JGC Group Medium-Term Business Plan
Building a Sustainable Planetary Infrastructure 2025
(BSP 2025)

Full Text

July 7, 2021
JGC Holdings Corporation

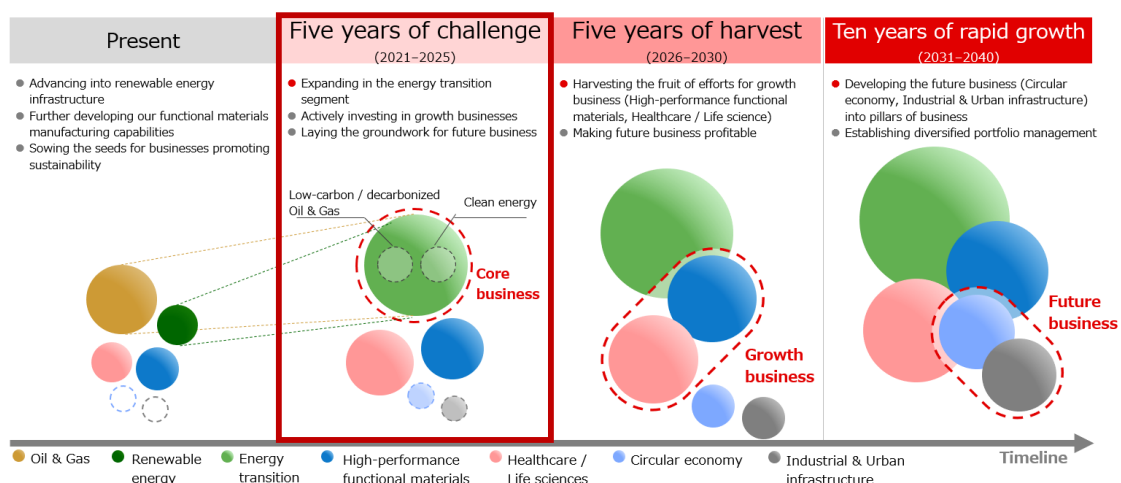


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Executive Summary

Under the JGC Group's newly established 2040 Vision, the Group will seek to contribute to enhancing planetary health in five (5) business areas. Over the next five years through to FY2025, the Group will be taking on the challenges of “Building a Sustainable Planetary Infrastructure 2025”, which the Group is positioning in its new medium-term business plan, “BSP 2025”.



1. Review of previous medium-term business plan

Achievements during the previous medium-term business plan (FY2016–2020) include strengthening risk management and raising the operating income ratio from 3.0% in FY2017 to 5.3% in FY2020. The positioning of high-performance functional materials manufacturing as a core business came into clearer focus, and efforts in EPC operations, such as establishing a track record in infrastructure, steadily laid the groundwork for future growth. To provide a more robust framework for implementing its growth strategies, the Group also adopted a holding company structure.

2. Awareness of business environment

In this medium-term business plan, the business environments in the areas defined in the 2040 Vision are as follows:

- **Energy transition:** LNG, promoted as a cleaner, lower-carbon fossil fuel, is expected to keep growing steadily amid higher demand in emerging economies. Additionally, traditional renewable energy business such as solar power, energy storage, and biomass power generation as well as new fields including offshore wind power and hydrogen/fuel ammonia are also poised to offer significant opportunities in the energy transition to a low-carbon or decarbonized society.
- **High-performance functional materials manufacturing:** Existing applications of this manufacturing are likely to thrive, driven by a recovery in demand following the impact of the pandemic on semiconductor and telecommunications products and chemical/environmental products. Greater demand is also expected in new applications such as high thermal conductivity silicon nitride substrates for the power units of EVs, as well as polishing

nanoparticles used in CMP for semiconductors.

- **Healthcare/Life sciences, Circular economy, Industrial & Urban infrastructure:**

Healthcare and Life science markets in Japan as well as elsewhere are expected to expand as people live longer and standards of living improve. Significant business opportunities will also emerge as value chains are formed to recycle plastic waste and economic growth in Asia spurs further development of water treatment and railway markets.

3. Key strategies

From this awareness of the business environment, the medium-term business plan sets the stage for the Group to transform EPC operations, expand high-performance functional materials manufacturing, and establish future engines of growth. Two of the strategies are aimed at securing and expanding revenue in existing operations, and the third strategy seeks long-term growth towards 2040.

1) Transformation of EPC operations

(1) Increasing profitability and competitiveness in EPC megaprojects

Having targeted ¥350 billion in net sales from mega-sized overseas EPC projects in FY2025, the Group will take its core competencies to the next level. Stricter risk management and project negotiations will improve the gross profit ratio, and optimized joint venture strategies, digital technologies, and construction methods will provide a competitive edge in securing orders.

(2) Taking on EPC growth markets and segments

In addition, by expanding EPC operations into growth markets and segments, and by seeking a diversified portfolio, the Group will pursue a net sales target of ¥300 billion from EPC business in growth markets and segments in FY2025. Increased revenue will be sought by strengthening operations to secure some of the many projects anticipated for LNG receiving terminals, gas-fired thermal power, solar power, and biomass power plants, pharmaceutical plants and hospitals, as well as chemical facilities. Moreover, the Group will reinforce regional management in Asia, which is growing rapidly, and bolster the workforce with the domestic market also in mind.

2) Expansion of manufacturing business for high-performance functional materials

High-performance functional materials manufacturing will be scaled up as the Group seeks net sales of ¥60 billion in FY2025. The Group will work to broaden its revenue base in its primary business by offering an increased line-up of JGC-developed chemical catalysts, hard disk polishing nanoparticles, semiconductor manufacturing equipment materials, and other products. Another engagement will be strategic investment for the future and development of next-generation business. Investments will target development of fine chemical product silicon nitride substrates facilities, among other applications. Development will also include carbon recycling catalysts, electrolytes for all-solid-state batteries, and bone regeneration materials.

3) Establishment of future engines of growth

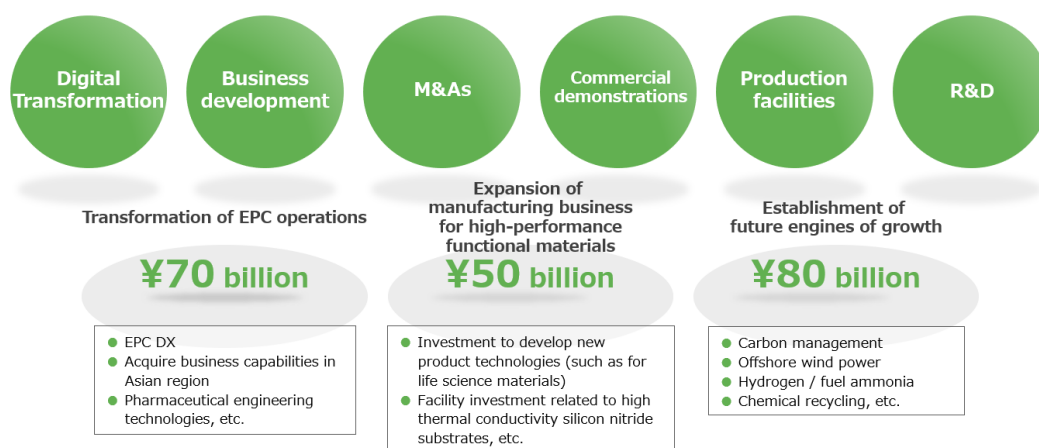
The Group will establish the following five (5) business areas defined in the 2040 Vision, which are especially promising as future growth engines. Net sales of ¥50 billion in FY2025 are projected, to be developed over the next decade to ¥500 billion.

- **Energy transition:**
Carbon management support, offshore wind power, smart O&M, hydrogen / fuel ammonia, small modular reactors (SMRs) for nuclear power generation
- **Healthcare/Life sciences:**
Smart hospitals, smart factories, digital healthcare
- **Circular economy:**
Recycling of plastic and fiber waste, production of SAF (sustainable aviation fuel)
- **High-performance functional materials:**
Carbon/Chemical recycling catalysts, bone regeneration materials, etc
- **Industrial & Urban infrastructure:**
Water treatment, railways

4. Investment strategy

The path to success through these key strategies will call for a total of ¥200 billion in investment during the medium-term business plan in areas such as digital transformation, M&As, production facilities, business development, commercial demonstrations, and R&D. Specifically, ¥70 billion will be allocated to transformation of EPC operations, ¥50 billion to expansion of manufacturing business for high-performance functional materials, and ¥80 billion to establishing future engines of growth.

Investment for the three key strategies



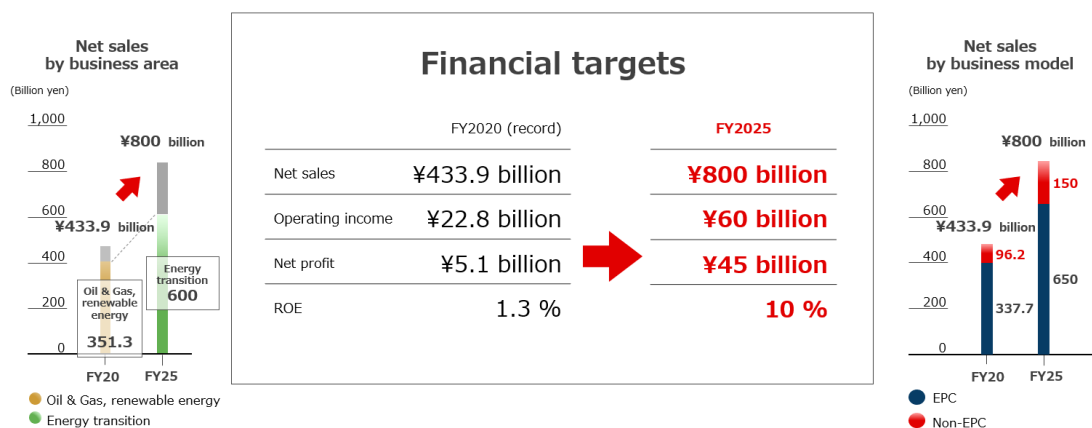
Over five years, make strategic investments totaling ¥200 billion

5. Financial targets

Net sales of ¥800 billion are targeted in FY2025, with operating income of ¥60 billion, net profit of

¥45 billion, and ROE of 10%.

A diversified business portfolio will ensure that the energy transition area is not the only source of revenue. Transformation will also be sought from the standpoint of business models, where the Group will expand from an EPC-focused model.



6. Capital and shareholder return policies

Disciplined investment and fund allocation will support its goal of reaching an ROE of 10%. The Group will respond flexibly in its strategic investments for sustainable growth and stable revenue. In making strategic investments, the Group will use cash in hand effectively and maintain sound finances, with the intention of keeping the shareholders' equity ratio at or above 50%.

As for shareholder return, as before, the basic policy is directed at steady annual cash dividends aimed at a payout ratio of 30%. The Group will also introduce a minimum ¥15 dividend per share. Share buybacks will be considered as necessary in light of business situation.

7. Commitment to carbon neutrality by 2050

The core domain of the Group has long been Oil & Gas, but the Group have taken the opportunity of this transformation for “enhancing planetary health” to commit to the ambitious target of carbon neutrality by 2050 as a sign of its dedication to sustainably incremental corporate value. The Group will work toward the following targets:

- 1) **Net-zero Scope 1 and Scope 2 CO2 emissions by 2050**
- 2) **Thirty percent (30%) reduction in Scope 1 and Scope 2 CO2 emissions per unit of production by 2030** in support of (1)
- 3) **Reduction in Scope 3 CO2 emissions as determined with stakeholders**

To reduce Scope 3 emissions, the Group will leverage technologies cultivated by itself to provide energy transition solutions to stakeholders.

In responding to climate change, the Group will disclose relevant information in line with

recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

Under the JGC Group's 2040 Vision, forecasting future 20 years, the Group will seek to contribute to enhancing planetary health in five business areas. Over the next five years through to FY2025, we will be taking on the challenge of “Building a Sustainable Planetary Infrastructure 2025”, which we are positioning in this medium-term business plan, BSP2025.

Details of the plan are presented in this document.

1. Review of previous medium-term business plan

1.1 Summary

Although the Group did not achieve its financial targets during the previous medium-term business plan from FY2016 to FY2020, management measures were taken to stabilize EPC operations and lay the groundwork for the future growth.

Higher operating income

The Group attained a higher operating income ratio and stabilized income as a whole. In FY2016 a loss was posted, stemming mainly from a mega-sized EPC project in North America. However, subsequent tightening of project risk management was successful and improved the operating income ratio, which rose from 3.0% in FY2017 to 5.3% in FY2020.

Groundwork for growth

High-performance functional materials manufacturing was positioned as a core business, laying the groundwork for sustainable growth. The Group also took on EPC in infrastructure to expand the business in this area, part of efforts to build second and third pillars of businesses. A framework for commercializing sustainable technologies linked to clean energy and circular economies was also established.

Holding company structure

In October 2019, the JGC Group adopted a holding company structure. This has reinforced management of the business portfolio of the Group as a whole and, through delegation of authority, more proactive and agile operations by each operating companies. The Group believe the framework is now in place for more effective promotion of future growth strategies.

1.2 Business results

Results in total engineering business and functional materials manufacturing show that in the total period of the previous medium-term plan, the Group's business was on a firmer footing pursuing strategies and measures for growth.

1.2.1 Total Engineering business

In total engineering business, the Group strengthened project execution capabilities, expanded business regions in Oil & Gas EPC, as well as diversified business areas, and promoted digitalization.

Strengthening of project execution capabilities

Project risk management was strengthened, and its specialized modular construction was established through projects in Australia, Russia, and Canada. This has made it possible to execute mega-sized EPC projects with less risk and cost.

Expansion of type of plant and business region in Oil & Gas EPC

A new track record was established in offshore LNG plants through several projects. Regarding business regions, Canada, Russia, East Africa, Iraq, and other areas were added to the regions where the Group has done business.

Diversification of business areas

In the domestic market, the Group actively pursued renewable energy projects such as solar and biomass power plants, as part of business area diversification. In the global market, its position in the renewable energy segment was strengthened through EPC projects for Solar power plants in Vietnam and Mongolia. Through investment in U.S.-based NuScale, a foothold was also gained in small modular reactors (SMRs).

Promotion of digitalization (digital transformation: DX)

The Group's long-term information strategy "IT Grand Plan 2030" was formulated in 2018. Since then, various measures have been taken in each phase of EPC project execution through digital technologies such as AI and IoT, aiming at greater improvement in operation and project management, including project forecasting capability.

The EPC DX Department was established in 2020 to promote digital transformation in EPC. Efforts here have included EPC project digitalization, centralized data management, and, to streamline EPC, work unit standardization with Advanced Work Packaging (AWP). To promote the implementation of AWP, the Group also invested in U.K.-based MODS as a strategic partnership.

1.2.2 High-performance functional materials manufacturing

In high-performance functional materials manufacturing, the Group has conducted investment for growth, expanded sales and strengthened frameworks for new product development.

Growth investment, sales expansion

The fine chemicals business of JGC Catalysts and Chemicals was expanded, and in the fine ceramics area, production began at new factories serving the growth segment of high thermal conductivity silicon nitride substrates for electric vehicle power modules, following investment in these facilities.

Strengthening of frameworks for the development of new products

In catalyst business, R&D centers were consolidated for higher efficiency, and human resources for sales and development were expanded. In overall manufacturing business, the Group strengthened overall development framework for improvement of product development efficiency through

reassignment of personnel and closer R&D collaboration within the Group.

2. Awareness of business environment

The business environment outlook is described, by segments, for this medium-term business plan.

2.1 Energy transition

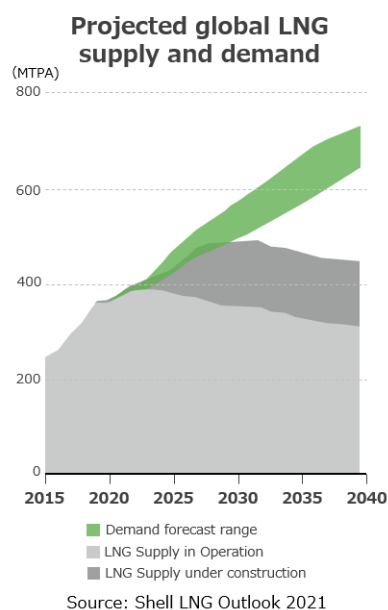
Since LNG is positioned as a relatively clean fuel, a fossil fuel with a lighter carbon footprint, higher LNG demand is expected that drives steady plant demand. Besides the LNG segment, new business opportunities are also anticipated in other segments as the energy transition¹ toward a low-carbon or decarbonized society accelerates.

LNG

In the market outlook over the next decade, a tight balance of LNG supply and demand is expected in the late 2020s globally due to economic growth. FIDs for LNG projects on a scale of tens of millions of tons are expected in 2022 and beyond. Several new projects are expected to start in North America, East Africa, Russia, and elsewhere.

In the LNG segment, the Group recognizes that it must respond not only to the greater demand but also to the transition to low-carbon/zero-carbon energy, as the shift to carbon-neutral LNG.²

Business opportunities are also expected to expand as more LNG receiving terminal projects and LNG thermal power plants are expected on the demand side of emerging economies.



Renewable energy

Growing needs are expected in both biomass power in Japan (which will benefit from an ongoing FIT³ program) and solar power overseas. The need for energy storage technologies is expected to grow globally due to the fluctuating output associated with renewable energy.

Carbon management⁴

As the trend toward low carbon and decarbonization continues, the Group anticipates having to meet greater support needs in carbon management at new and existing plants in industries with significant CO₂ emissions such as refining, gas, LNG, or petrochemical operations, the chemical industry, and others. Technically, these services may involve adding CCS facilities, saving energy, switching to

¹ 2040 Vision defines the energy transition as a change in the industrial structure of the energy industry, as global carbon neutrality is sought by 2050 through carbon reduction/decarbonization in oil and gas consumption and expansion of clean energy.

² LNG free of CO₂ emissions from the well to the stage of combustion. Currently this term lacks a clear definition. Our interpretation is broad and includes not only LNG in a decarbonized supply chain from production to consumption but also net-zero LNG for which emissions are offset by tree-planting or carbon credits.

³ Feed-in tariff

⁴ Broadly refers to continuous efforts by groups and organizations including national and local governments and companies to understand, curb, and reduce greenhouse gas emissions thought to contribute to global warming. In reference to support services provided by the JGC Group, refers to specific solutions to curb and reduce GHGs, as described later in this document.

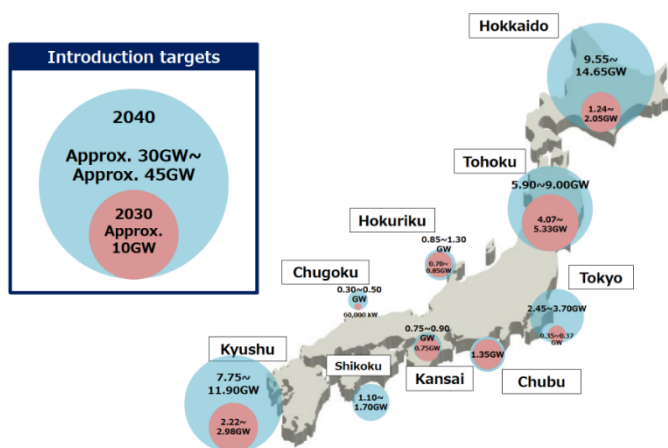
electric power, or introducing clean external power and, economically, services may involve carbon credits or transactions in the power market.

Offshore wind power

A legal framework is being developed in Japan to introduce offshore wind power generation.

One example of this is the Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities, enacted in 2019. The Japanese government's Vision for Offshore Wind Power Industry calls for 10 GW

of capacity to be introduced by 2030. Accounting for conditions as rules and relevant policies are established, the Group anticipates that the related domestic EPC market will truly begin to form in the early 2020s. ⁵



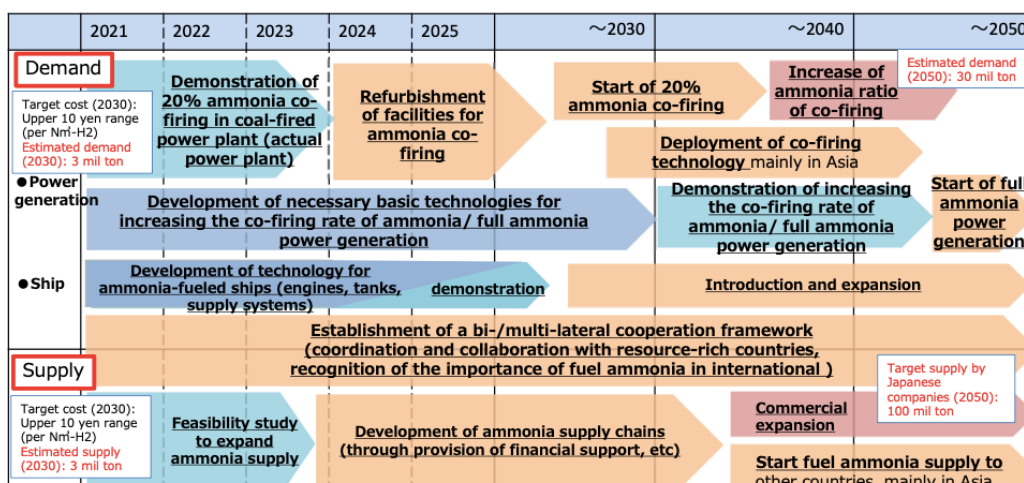
Source: *Offshore Wind Industry Vision (1st; provisional translation)*, METI

Hydrogen/fuel ammonia

Domestic ammonia demand is projected to stand at 3 million tons per year in 2030, and 30 million tons per year in 2050, according to an interim report by the Public-Private Fuel Ammonia Promotion Council.⁶ Progress in building value chains is expected during the period of this medium-term business plan, in anticipation of significant market growth in 2030 and later.

⁵ Ministry of Economy, Trade and Industry, *Vision for Offshore Wind Power Industry (1st; provisional translation)*, Public-Private Council on Enhancement of Industrial Competitiveness for Offshore Wind Power Generation (December 2020)

⁶ Ministry of Economy, Trade and Industry, interim report of the Public-Private Fuel Ammonia Promotion Council (February 2021)



Source: Interim report of the Public-Private Fuel Ammonia Promotion Council, METI



2.2 High-performance materials manufacturing

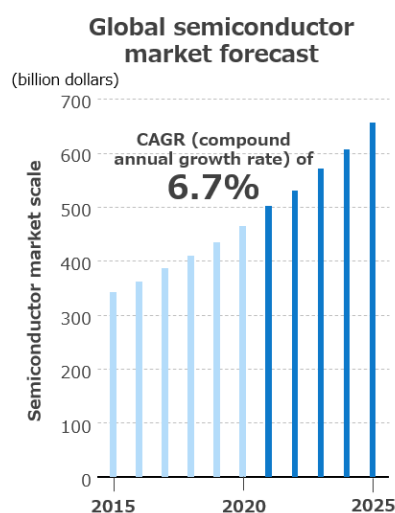
Existing segments are likely to recover demand sapped by the pandemic. In particular, growth is expected in markets involving semiconductors, telecommunications, and chemical/environmental applications. In new segments, growth is expected for materials used in electric vehicles and in semiconductor applications.

Catalysts

Although demand in the petroleum catalyst market will remain sluggish, the Group anticipate a steady increase in needs for chemical and environmental catalysts, driven by demand from refineries switching to chemicals, as well as chemical recycling demand in support of a circular economy.

Fine chemicals

Greater demand for hard disk polishing nanoparticles is expected as more data centers are sought to meet increased data traffic. Needs are also increasing for display materials such as hollow silica sol, as used in telecommunication and automotive applications. Additionally, it is anticipated that keener interest in microplastic alternatives will drive demand in silica beads as a cosmetics material.



Source: SEMI

Fine ceramics

The Group foresees favorable demand for materials used in semiconductor manufacturing equipment and in communication circuit board substrates, supported by greater investment in the semiconductor market (which is expected to grow at an average annual rate of about 7%) and facilities used in IoT applications.

High thermal conductivity silicon nitride substrates

Widespread adoption of electric vehicles around the world makes sharp growth likely in high thermal conductivity silicon nitride substrates used as heat-dissipating substrates for power semiconductors.

CMP slurry materials

Growth in the semiconductor industry is expected to drive demand in polishing nanoparticles such as silica sol used in the semiconductor production process of chemical mechanical polishing (CMP).

2.3 Healthcare/Life sciences, Circular economy, Industrial & Urban infrastructure

In the Healthcare/Life sciences segment, market expansion in Japan and overseas is expected with the higher standards of living and the aging population. As for the Circular economy, progress in forming recycling value chains (such as for chemical recycling of plastic waste) will be made in developed economies and elsewhere during the time frame of the medium-term business plan. Meanwhile, amid Asian economic growth, expansion is also expected the segment of Industrial & Urban infrastructure.

Pharmaceuticals, hospitals: Global

In Asia, greater medical demand is likely as economic growth improves living standards, expands the middle class, and helps people live longer. Demand is especially high for biopharmaceuticals, and the market in the Asia-Pacific region is expected to expand at an average annual rate of about 17%.

Pharmaceuticals, hospitals: Japan

The trend toward stronger domestic pharmaceutical capital investment has been driven by factors such as a shift from small-molecule drugs to biopharmaceuticals, the outbreak of global pandemics and associated problems, and concerns about the quality of active pharmaceutical ingredients produced overseas. A steady increase in demand is also expected in hospital construction, amid greater medical needs from an aging population and more sophisticated treatment as personalized medical care becomes common.

Chemical recycling of plastic waste

As global plastic demand continues to grow at an average annual rate of about 3%, there will be greater demand in advanced economies and elsewhere for recycling technologies with low environmental-impact to replace conventional incineration and thermal recycling. Demand for

recycled materials is expected to expand, at an average annual growth rate of 10% or more.⁷

Water treatment, railways

Emerging Asian countries face an urgent need to improve water and sewage infrastructure in meeting the needs of urbanization as their economies grow, with driving the demand for such infrastructure. As electrification spreads, hopes are also higher for railways to serve as low-carbon transportation networks. The associated EPC market is expanding at an average annual rate of about 3.6%. Since Japanese railway manufacturers tend to focus on the equipment supply business, there is a need for project management contractors capable of managing overseas construction projects where demand is growing.

⁷ Thomas Hundertmark et al. (2018), *How Plastics Waste Recycling Could Transform the Chemical Industry*, <https://www.mckinsey.com/industries/chemicals/our-insights/how-plastics-waste-recycling-could-transform-the-chemical-industry>.

3. Key strategies

From an awareness of the business environment and achievement of the previous medium-term business plan, this new Plan sets the stage for the Group to transform EPC operations, expand high-performance functional materials manufacturing, and establish future engines of growth. Two of the strategies are aimed at securing and expanding revenue in existing operations, and the third strategy seeks long-term growth towards 2040.

Transformation of EPC operations	<ul style="list-style-type: none">● Increase competitiveness and profitability in mega-sized EPC projects● Take on EPC growth markets and segments
Expansion of manufacturing business for high-performance functional materials	<ul style="list-style-type: none">● Offer more product line-ups in existing business for increased revenue● Expand sales of strategic products● Explore and develop next-generation business
Establishment of future engines of growth	<ul style="list-style-type: none">● Offshore wind power● "Blue" hydrogen / fuel ammonia● Chemical recycling, etc.

3.1 Transformation of EPC operations

As a first key strategy, the Group will take on transformation of EPC operations.

3.1.1 Increasing competitiveness and profitability of mega-sized EPC projects

By taking JGC Group core competencies in the sphere of mega-sized EPC projects such as LNG plants to the next level, the Group seeks to improve the gross profit ratio of projects, as well as its competitiveness in securing orders.

1) Improve project gross profit ratios

By strengthening risk management and negotiations throughout projects, the Group will seek a higher gross profit ratio for EPC business and ensure a steady ratio of at least 10% overall.

Risk management

Using the Group's own, independently developed, risk profiling, we will formulate and implement reliable execution plans for a variety of risks in EPC projects, with a balance of avoidance, mitigation, transfer, and retention.

Project teams

Business management skills of engineers will be raised to a higher standard. Client communication will also be honed, as all members of project teams become more effective communicators. These efforts will include seeking out qualified global leaders for managerial roles.

2) Improve competitiveness in securing orders

To maintain a competitive edge in securing orders, the Group will implement joint venture partnering strategies, apply digital technologies, and streamline and optimize construction methods. Through these initiatives, we are targeting ¥350 billion in net sales from international mega-sized EPC projects in FY2025.

Joint venture strategies

Joint venture partnerships are a key strategic factor in receiving orders for mega-sized EPC projects. For greater competitiveness in securing these orders, optimal partnerships will be forged by leveraging its status as a tier-one contractor to put together optimal JV partnerships for each project, and through partnerships based on long-term alliances.

Digital technologies

Project delivery will be accelerated, and design/execution quality improved by implementing AI design and AWP for execution. For this purpose, development of EPC DX technologies will be instrumental. Establishing a track record with EPC DX technologies will further strengthen competitiveness in securing orders.

Optimal construction methods

Competitiveness will also be enhanced through optimal construction methods that reduce on-site costs, including automated welding robots, digital radiographic testing (RT) and AI judgment of welding quality, high-frequency induction bending for pipes, and remote site management to reduce on-site personnel.

Examples:

Promoting EPC DX utilizing AI for design and AWP for project execution

Shifting to AI design

The AI design program in the JGC Group started from recording the skills and experience-based insights of senior engineers as knowledge. This was followed by automating input checking and optimal design selection, and then automatic generation of optimal design, as AI was gradually introduced to automate the entire design process. A specific example is plot planning. In contrast to the weeks of study by senior engineers that is traditionally required, the Group recently developed a new system applying AI-based multi-objective optimization that can generate several cases and perform comparative evaluation much faster. It will be incorporated in a system we are building to reduce the lead time for proposing optimal plot planning.

Applying AWP

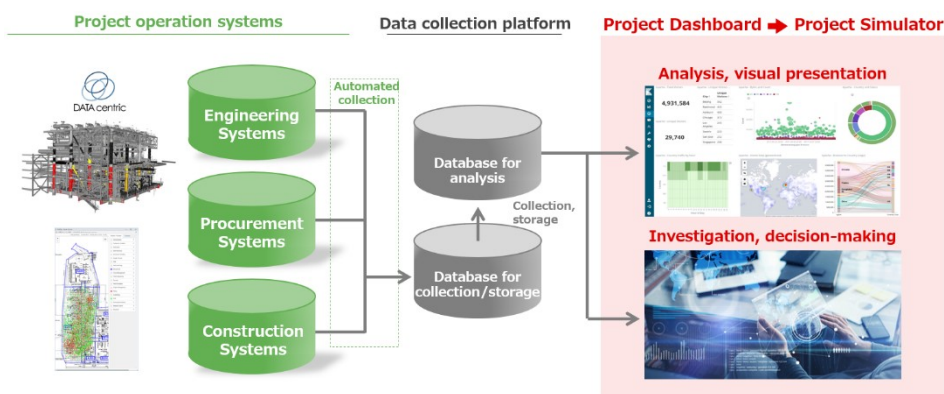
Advanced work packaging (AWP) is an approach to project planning and management that has attracted much attention in recent years. With AWP, an entire project is first subdivided into work packages. Inputs, outputs, and dependencies of each package are then clarified. Scheduling, costs, and the required resources of packages are determined based on those of the construction stage. This enables detailed, quantitative schedule and cost control in EPC execution. To respond to the need for accurate management of much larger volumes of project data than before, the Group will develop a means of efficient data collection and analysis by leveraging digital technologies throughout EPC processes.

Promoting EPC DX

The JGC Group is transforming business processes from document-centric to data-centric for faster, higher-quality project execution. For this purpose, the framework under construction will link each EPC support system via a flexible data hub, automatically collect data on a data collection platform, and display it in real time with various KPIs on the project dashboard. Conditions at construction sites can be visually represented even at remote sites, which enables more accurate investigation and decision-making. Moreover, the collected performance data can accelerate processes and reduce costs, yielding a competitive edge in securing orders. The Group plans to develop a predictive project simulator that will apply the ample performance data acquired.

Example Promoting EPC DX utilizing AI for design and AWP for project execution

Enable 1) visual representation of plan and progress for project execution and 2) remote management of site activity
 Also, apply EPC DX technology for project simulation in forecasting



3.1.2 Taking on EPC growth markets and segments

Currently, mega-sized EPC projects still dominate JGC Group income, and the result of the related bids, as well as the timing of the FIDs,⁸ are the main cause of fluctuations of the Group's overall business performance. Hence, stable orders must be sought without necessarily relying at all the times on mega-sized EPC contracts. The Group will therefore take measures to expand into small and midsize projects in markets and segments where future growth is expected.

Specifically, EPC operations will be expanded into the following growth markets and segments as its portfolio is diversified over the five years of this medium-term business plan. Through these initiatives, the Group is targeting ¥300 billion in net sales from growth EPC markets and segments in FY2025.

1) Expanding into growth markets

An increase in small and midsize projects is expected in the Asia region, where high economic growth is expected. In response, while utilizing the Group's existing base of operations, the Group will strengthen its framework for regional management in Asia. This will enable project proposals and execution from an approach closely aligned with clients that emphasizes "local project by national workforce" based on current regional levels of development and demand.

In reinforcing this framework through a larger workforce, the Group will implement the following measures:

- **Establish a regional headquarters serving the bases (sites) of operations in Asia**
- **Strengthen each site's business development and project execution capabilities**
- **Centralize engineering functions for projects in Asia**

To attain these objectives, the Group's workforce in Asia will be increased from 2,600 to 3,100.

2) Expanding into growth segments

In Japan and elsewhere in Asia, market growth in the following segments is expected during this medium-term business plan. Through a more robust collaboration framework for sales and project execution, the Group will seek higher revenue by seizing opportunities in these segments.

Asia region

LNG receiving terminals, gas-fired thermal power, solar power and biomass power plants, pharmaceutical plants and hospitals, chemical facilities

Japan

Biomass power plants, pharmaceutical plants and hospitals, chemical facilities

The workforce at domestic offices will also be increased by the following measures:

- Increase the Group's pharmaceutical EPC workforce
- Establish a business unit focused on chemical projects

⁸ Final investment decision

3.2 Expansion of manufacturing business for high-performance functional materials

As the second key strategy of the medium-term business plan, the Group will take on expansion of manufacturing operations for high-performance functional materials.

3.2.1 Offering more product lines in existing core business

Existing core business in high-performance functional materials manufacturing will be scaled up, targeting net sales of ¥50 billion in 2025. To reach the planned target, product lines in existing business will be expanded through steady efforts toward a broader revenue base.

In the catalysts segment, increased income will be sought by supplying catalysts jointly developed with the client by jointly developing catalysts used in chemical refining to improve yields of chemical products from refineries that serve as chemical raw materials, and by expanding sales of JGC-developed chemical catalysts.

In fine chemicals, in addition to boosting production capacity for wafer-polishing nanoparticles to meet higher demand for data center hard disks, the Group will focus on expanding sales of materials for high-speed telecommunication applications, which are expected to grow.

In fine ceramics, the Group will focus on expanding sales of ceramics for semiconductor manufacturing equipment, where continuous growth is expected, MMCs⁹ for liquid crystal manufacturing equipment, and thin-film circuit substrates used in high-speed telecommunications. Examples of specific measures the Group's in existing core business are as follows:

Catalysts

Development of catalysts offering high-bottom cracking performance (high-bottom cracking catalysts, high-performance additives)

Expansion of joint development with clients

Strengthening of catalytic support (such as zeolite) business

Development of catalysts for chemical refineries

Expansion of development of original chemical catalysts

Early development of low-temperature denitration catalysts (for biomass power generation)

Fine chemicals

Expansion of sales of nanoparticles for hard disk polishing

Expansion of sales of cosmetics materials (microbead alternatives), optical materials

Development of optical film materials for automotive display applications

Expansion of sales of materials for semiconductor/ high-speed telecommunication applications (fine materials with low/ high dielectric constants)

⁹ Metal-matrix composites, consisting of metal and ceramic materials

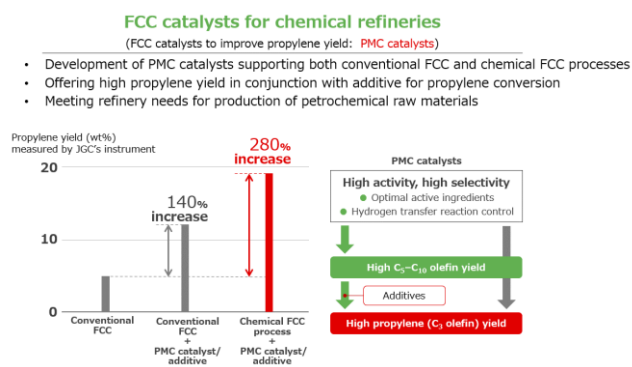
Fine ceramics

Expansion of sales of products used in semiconductor manufacturing equipment
 Expansion of business from contract manufacturing of thin-film circuit substrates to design and supply of original products

Example:

**FCC catalysts for chemical refineries
 (FCC catalysts to improve propylene yield – PMC catalysts)**

To improve propylene yield, the Group has developed FCC catalysts (PMC catalysts) for both conventional FCC and chemical FCC processes. In conjunction with an additive for propylene conversion, the catalyst offers high propylene yield. It represents new technology to meet refinery needs for the production of petrochemical raw materials.



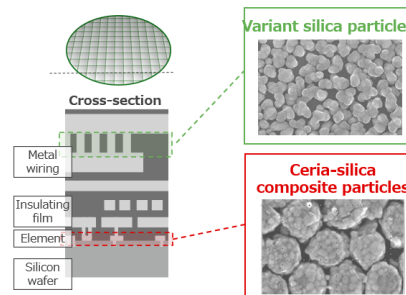
3.2.2 Expanding sales of strategic products

The medium-term plan calls for the Group to develop new fine chemical products (including polishing nanoparticles for CMP), work to rapidly expand the market, and strategically invest in high thermal conductivity silicon nitride substrates, targeting net sales of ¥10 billion in FY2025. For the substrates in particular, production capacity will be increased to meet market growth as automotive products are further introduced and certified at new factories that went online in January 2021. The Group also intends to become a leading supplier of next-generation products by responding to growing demand for materials with high thermal conductivity, as the industry shifts to silicon carbide (SiC) in power semiconductors.

Example:

Semiconductor CMP (chemical mechanical polishing)

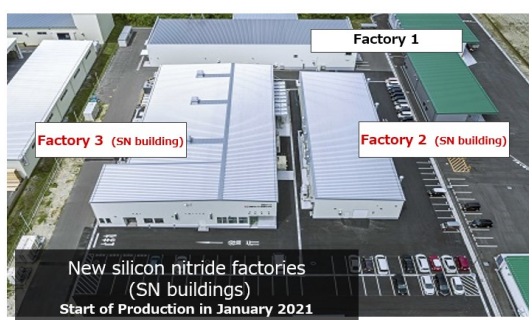
The Group will offer ceria-silica composite particles and variant silica particles as low-defect, high-speed polishing slurry for STI and ILD applications developed using morphology, composite and nanoparticle impurities control techniques.



Example:

High thermal conductivity silicon nitride substrate for power semiconductor

Production capacity will be expanded for high thermal conductivity silicon nitride substrates that improve heat dissipation (indispensable for higher performance in power semiconductors) to meet increasing demand as electric vehicles become more widespread.



3.2.3 Exploration and development of next-generation business

Additionally, exploration and development in the segments of catalysts, fine chemicals, and fine ceramics will support the objective of expanding the Group's product portfolio in the future. Besides improving the Group's original technologies, the Group will move quickly to expand the portfolio in the environment, energy, and life sciences segments by cultivating growth businesses, including by acquiring external technologies and resources. For its portfolio expansion, themes to be explored and developed are as follows.

Catalysts

Catalysts for carbon recycling and chemical recycling

Fine chemicals

Materials for high-speed communications (balloon silica low dielectric constant materials, high dielectric constant nanomaterials)

Antibacterial and dental materials and materials used in the life sciences segment (such as diagnostic agents and sustained release materials)

Fine ceramics

All-solid-battery/Li recovery electrolytes

CMCs¹⁰ for engineering ceramic parts


¹⁰ Ceramic-matrix composites

OCP¹¹ for bone regeneration

Bone regeneration materials/OCP

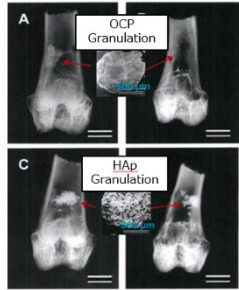
Greater demand is expected for highly biocompatible bone regeneration material such as this very effective OCP developed by Tohoku University. Development by the JGC Group will lay the groundwork for venturing into orthopedics, as we apply technical expertise for commercial viability.

OCP powder produced by Japan Fine Ceramics



➔

Comparison of biocompatibility (OCP, HAp*)



Source: Data of Professor Suzuki of Tohoku University
 *HAp: Hydroxyapatite

3.3 Establishment of future engines of growth

The third key strategy of the medium-term business plan is to establish new business as engines for future growth. Among the business areas defined in the 2040 Vision, the following are especially promising as future growth engines.

Business areas	Potential growth engines
Energy transition	<ul style="list-style-type: none"> • Carbon management • Offshore wind power • Hydrogen/fuel ammonia • SMRs¹² (Small Modular Reactors) • Smart O&M
Healthcare/Life sciences	<ul style="list-style-type: none"> • Smart hospitals • Smart factories • Digital healthcare
High-performance functional materials	<ul style="list-style-type: none"> • Catalysts for carbon recycling, chemical recycling • Bone regeneration materials/OCP, etc.
Circular economy	<ul style="list-style-type: none"> • Recycling of plastic and fiber waste • SAF¹³
Industrial and urban infrastructure	<ul style="list-style-type: none"> • Water treatment • Railways

By developing operations in these areas into profitable new pillars of business, the Group targets net sales of ¥50 billion in FY2025. Assuming rapid market expansion in the segments thereafter, business will be potentially expanded to a scale of ¥500 billion in FY2030.

In the following sections, the Group’s stance on business segments of particular interest are

¹¹ Octacalcium phosphate Example:

¹² Small modular reactors

¹³ Sustainable aviation fuel, produced from sustainable sources with low CO₂ emissions

described for offshore wind power, hydrogen/ fuel ammonia, and chemical recycling (of plastic and fiber waste).

3.3.1. Offshore wind power

The offshore wind sector is in the limelight as the next major renewable energy sector to be developed in pursuit of global carbon neutrality by 2050. Japan has seen projects of this kind emerge especially in the Tohoku region, with more offshore wind power generation expected to be introduced in the 2020s.

In this medium-term business plan, the Group seeks to establish a record by being awarded and executing EPC projects for domestic offshore wind power, as the Group become a leading contractor in this sector.

For this purpose, the Group will strengthen partnerships with other companies to secure orders and execute EPC projects. The Group may participate from a business perspective if required. Capital investment is also planned to support acquiring relevant technologies and establish a track record in this new segment.

Engagements in the medium term will focus on domestic fixed bottom offshore wind power projects. In anticipation of venturing into floating facilities over the medium to long term, the Group will continue to acquire technologies and build partnerships to overcome technical challenges. The Group targets sales of ¥30 billion in 2025 and ¥100 billion in 2030.

Much attention is focused on this sector, which many competitors (mainly general contractors) have stated their intention to enter. Unique qualifications of the Group include expertise in the design and installation of offshore structures for FLNG projects, worldwide networks of partners and vendors, and management capabilities proven in mega-sized EPC projects. Moreover, while focusing on EPC in this sector, we will also undertake related O&M and serve as a business partner.

3.3.2. Blue hydrogen/fuel ammonia

Hydrogen/fuel ammonia are recently attracting attentions as next-generation CO₂-free fuels. Fuel ammonia in particular is expected to be in much greater demand, with annual domestic demand projected to grow to about 30 million tons by 2050. Energy value chains for existing power systems can be utilized, and mixed combustion enables reduced CO₂ emissions at thermal power plants. Economical large-scale production of ammonia poses an urgent need for expanded production of blue hydrogen/fuel ammonia which is hydrocarbon-derived and the widespread adoption of transport value chains.

During this medium-term business plan, the Group seeks to acquire relevant technologies and participate in construction of blue hydrogen/fuel ammonia value chains. It will develop as well as acquire relevant technologies (including process licenses), demonstrate the technologies in Japan and

overseas, fund and participate in blue and green hydrogen/fuel ammonia projects, conduct M&As, and form strategic partnerships.

Business expansion through these efforts will introduce blue hydrogen/fuel ammonia in society. The Group will also work to popularize green hydrogen/fuel ammonia from renewable energy, with significant progress toward practical adoption to be seen by seen around 2040.

A sales target of ¥50 billion in 2030 has been set in segments related to blue hydrogen/fuel ammonia. Many manufacturers and engineering firms developing supporting technologies. Unique qualifications of the Group include process engineering capabilities from refining and petrochemicals, a record of CCS facility design and construction (for blue hydrogen/fuel ammonia), and facility expansion expertise gained from LNG plants. While focusing on EPC in this sector, the Group are also planning for business expansion with a combination of business models, including process licensing, providing consulting services, and serving as a business partner.

3.3.3. Chemical recycling

The environmental impact of plastic waste has become a serious global issue in recent years, calling for urgent action around the world. Needs for reduction of plastic and fiber waste become greater, mainly chemical companies and apparel manufacturers worldwide.

During this medium-term business plan, the Group will develop business as a technology licensor and operator in the chemical recycling segment, with new markets for recycled products internationally.

The Group will gain a firmer foothold by tapping strategic partnerships with upstream and downstream players in the recycling value chain, besides identifying and acquiring licensed technologies worldwide. The Group will also acquire and then market operational knowledge through commercial demonstrations as key capabilities for actual recycling operations. The Group will be engaged in talent development dedicated to the early and start-up phases of business development in this segment.

Through these initiatives, the Group will pursue commercialization by 2025, working toward target sales of ¥50 billion in 2030.

Unique qualifications of the Group include process engineering capabilities from refining and petrochemicals, worldwide networks of clients and partners, and a record of executing projects. While focusing on EPC in this sector by acquiring relevant technologies during this medium-term business plan, the Group is also planning for business expansion founded on a combination of business models, including process licensing, marketing operational knowledge, and serving as a business partner, including in commercial demonstrations.

4. Investment strategy

A total ¥200 of strategic investment is planned over the period of this medium-term business plan to ensure sustained growth and stable revenue for the Group.

¥70 billion will be allocated to the transformation of EPC operations, ¥50 billion to the expansion of manufacturing business for high-performance functional materials, and ¥80 billion to establishing future engines of growth, specifically in digital transformation, M&As, production facilities, business development, commercial demonstrations, and R&D, as described in the below:

Transformation of EPC operations

Information technologies focusing on EPC DX (for innovative execution of EPC projects through digital transformation), expansion into healthcare and life sciences in Asia, acquisition of business capabilities in industrial & urban infrastructure, and acquisition of engineering technologies relevant to medical care.

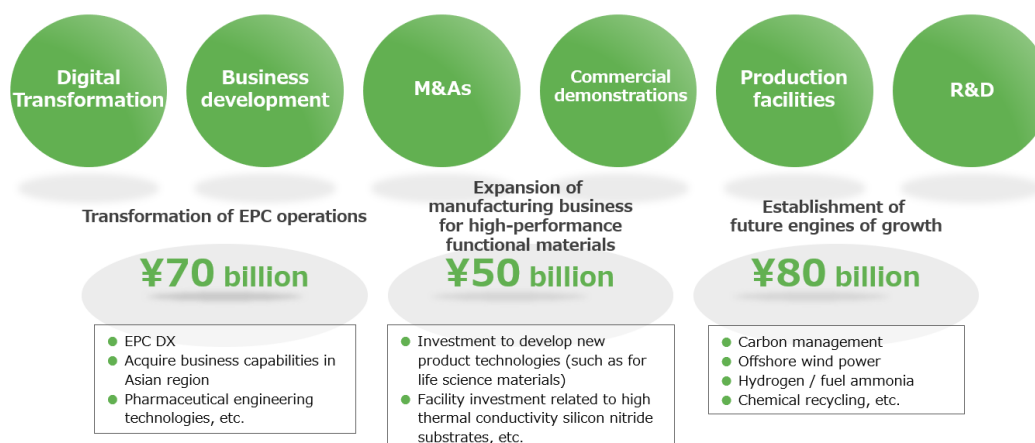
Expansion of manufacturing business for high-performance functional materials

Development of new product technologies, such as for the life sciences, and core business expansion, as in facilities used for products such as polishing nanoparticles for CMP or high thermal conductivity silicon nitride substrates.

Establishing future engines of growth

Carbon management (including CO₂ capture and storage), offshore wind EPC, small modular reactors (SMRs) already invested in, hydrogen/fuel ammonia applications, and commercial demonstration of chemical recycling of plastic and fiber waste.

Investment for the three key strategies



Over five years, make strategic investments totaling ¥200 billion

5. Talent and organization

5.1 Talent

Human resources will be realigned internally and expanded with talent in new occupational categories to attain the goals of the medium-term plan.

Specifically, the total workforce of the Group including holding company, EPC operating companies, high-performance functional materials manufacturing companies, and Japan NUS (JANUS) will be expanded from 10,800 in FY2021 to 12,000 in FY2025. New workforce will be mainly assigned for EPC growth segments, high-performance functional materials manufacturing, and future segments viewed as engines of growth.

For implementation of key measures, diverse talent will be sought in areas such as digital technologies, business development, and management.

The Group will also continue to encourage more diverse working styles.

5.2 Organization

1) Segments for commercialization in the medium-term business plan

Commercialization will be accelerated by establishing specialized business units at each company in segments targeted for commercialization and profitability during the period of this medium-term business plan. Examples of the segments include the recent establishment of units.

JGC Corporation

- Facility infrastructure (such as overseas LNG receiving terminals, gas power generation plants, and solar power)
- Nuclear energy
- Carbon reduction, CCS

JGC Japan Corporation

- Wind power
- Next-generation factories (discrete manufacturing of food, cosmetics, among others)

Japan Fine Ceramics

- Business involving high thermal conductivity silicon nitride substrates

2) Segments for commercialization over the medium to long term

Innovation processes, organizations, and systems will be strengthened to promote the Group's innovation environment as explained in the below sections, cultivating segments for future commercialization and promote business development. These measures are already under way. The Group will foster a more vibrant culture of innovation early in this five-year period.

Technology Commercialization Council

The Technology Commercialization Council was established in JGC Holdings in April 2021 to link technical development and business development and tie these efforts to future sources of revenue. The Technology Commercialization Officer manages the innovation process for new business, supports commercialization, and allocates resources depending on the progress of each program.

Sustainability Co-Creation Department

Established when JGC adopted a holding company structure in October 2019, the Sustainability Co-Creation Department has been promoting sustainability-oriented business development with the Group-owned environmental consulting company Japan NUS (JANUS). The department will be building up its framework to promote new business development, collaborating with relevant divisions of JGC Corporation (JGC) and JGC Japan Corporation (JGC Japan).

Engineering Solutions Center

April 2021 saw the integration of JGC Corporation's Process Technology and Design Engineering divisions into the Engineering Solutions Center (ESC). As a core technical expertise of JGC Corporation, ESC boasts about 700 engineers who can contribute to new business and establish a framework for project development.

Corporate Venture Capital

The JGC Mirai Innovation Fund, a corporate venture capital (CVC) fund on the scale of ¥10 billion, was established in April 2021 for collaboration between JGC Japan, which operates the domestic engineering business, and start-up companies. Under the supervision of the strategic planning office of JGC Japan, appropriate partners will be sought to create synergies with JGC Japan's core business.

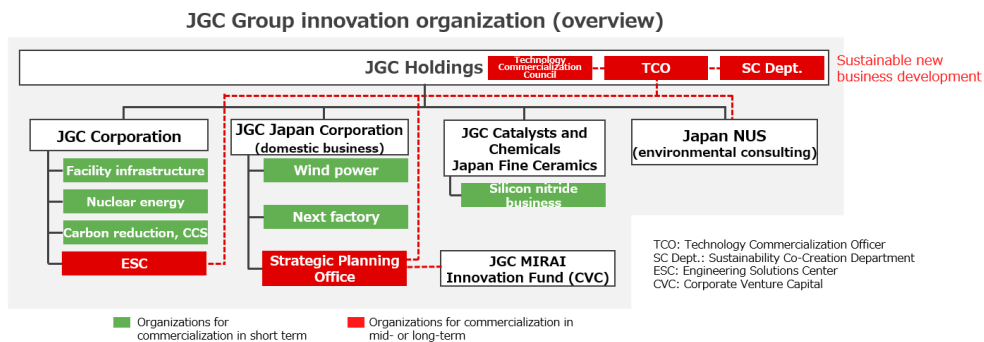
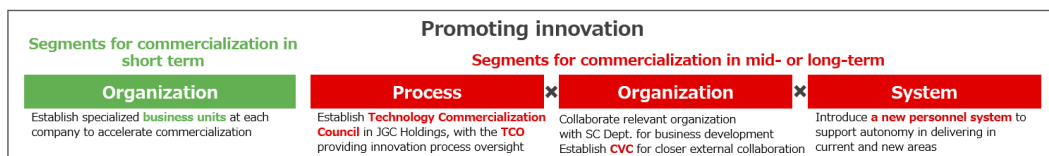
In addition to these measures, business units in each company focused on new enterprises will work with JGC Holdings in quickly establishing cycles of innovation while applying knowledge from its business sites in development of technologies and business.

New personnel system

To foster a corporate culture that encourages autonomy, initiative, and perseverance in delving into current and new areas, a new personnel system will be introduced by JGC Holdings, JGC Japan, and JGC around FY2022.

JGC Group Medium-Term Business Plan

Building a Sustainable Planetary Infrastructure 2025 (BSP 2025)



6. Financial targets

With these initiatives, the medium-term business plan sets net sales of ¥800 billion, operating income of ¥60 billion, net income of ¥45 billion, and ROE of 10% as financial targets in FY2025. As for individual business areas, expansion will be centered on energy transition (including clean energy) and also emphasize healthcare/life sciences, high-performance functional materials, and industrial & urban infrastructure. By business model, double the level of sales in non-EPC business is sought, as the Group grows beyond an EPC-focused model. Achievement of these targets will demonstrate that the Group is expanding and diversifying revenue over the next five years in line with the 2040 Vision.

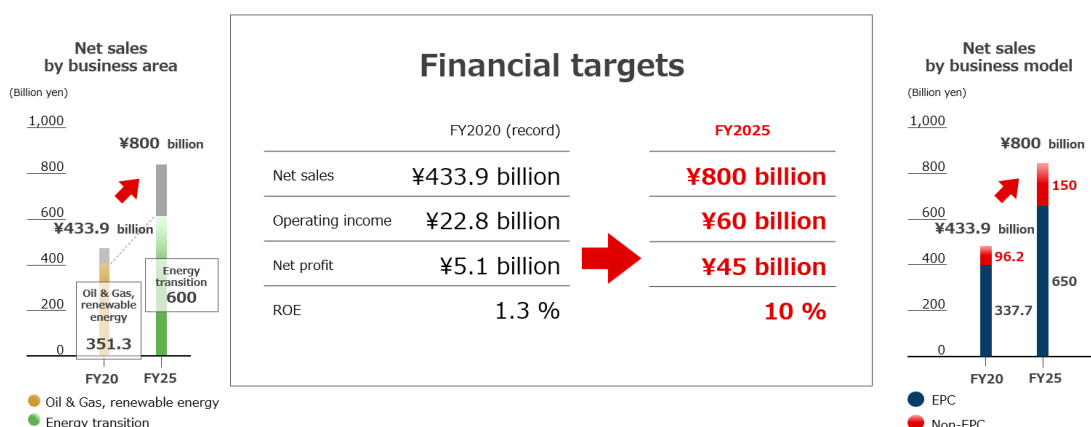


Table 1 Target Net Sales of BSP2025 by Category

Three key strategies	Category	Target Net Sales
Transformation of EPC Operation	Mega-sized international EPC	¥350 billion
	EPC in growth market and segment	¥300 billion
Expansion of manufacturing business for high-performance functional material	Product lines in Existing Core Business	¥50 billion
	Strategic Products	¥10 billion
Future engines of growth	Total of five areas	¥60 billion
Others	Maintenance, etc.	¥40 billion
	Total	¥800 billion

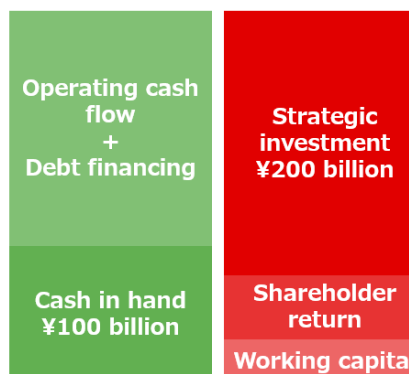
7. Capital and shareholder return policies

Basic capital policy: Strategic investments while maintaining sound finances

The period of this medium-term business plan is the first phase for transformation and growth toward the 2040 vision, positioned as "five years of challenge." While pursuing a basic policy of making strategic investments to expand future revenue, the Group will ensure disciplined investment and fund allocation to reaching or surpassing an ROE of 10%.

To do so, the three objectives of maintaining sound finances for mega-sized EPC projects, remaining flexible in growth investment, and providing steady shareholder return will be met through a balanced approach supporting greater corporate value and shareholder's benefit.

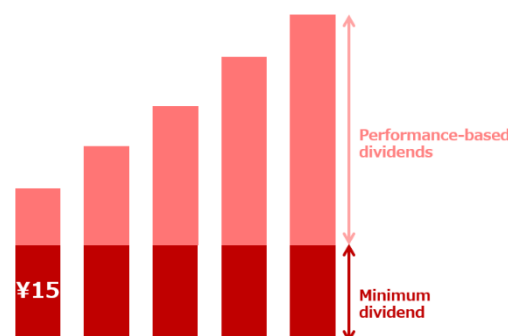
Anticipated fund allocation



Financial strategy: Secure strategic investment funds with effective use of cash in hand

In making strategic investments, the Group will use cash in hand effectively and maintain sound strategic finances. Keeping finances on a solid footing will entail maintaining a stable equity ratio of 50% or higher. Moreover, the Group will ensure liquidity in hand for business continuity even during market turmoil. The Group will also look to reduce effective tax rates as we work to maximize final profit.

Cash dividends (illustrative)



Along with allocating around ¥100 billion of cash in hand for investment, overall capital efficiency for the Group will be improved through debt financing and optimized cash management, as the Group strengthen the process management for prompt response and decision-making in strategic investment.

Steady shareholder return remains a priority, even as new policies are introduced.

Shareholder return policy

In the area of shareholder return, the basic policy remains to provide annual cash dividends aimed at a payout ratio of 30%, and the Group will also introduce a minimum ¥15 dividend per share. Share buybacks will be considered, as necessary in light of business conditions.

8. ESG initiatives

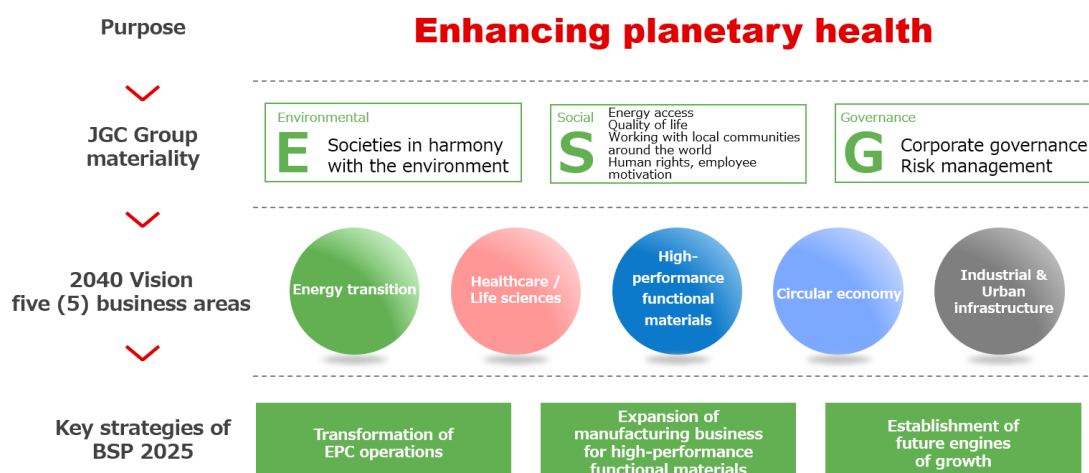
The corporate philosophy of the Group has been reconsidered from the perspective of environmental and social value that the Group will provide. This has led to the Group's newly redefined reason for existence: “Enhancing planetary health”.

Meanwhile, several goals have been treated as material issues for the Group. We are working toward society in harmony with the environment (that is, the “E” in ESG) and, in social aspects of ESG the Group contributes toward energy access and quality of life, works with local communities around the world, and respects human rights as well as promotes employee motivation. Governance aspects of ESG that make it possible to pursue the environmental and social goals are upheld through scrupulous corporate governance and risk management.

Guided by the new corporate purpose of enhancing planetary health, the Group has defined five business areas, including energy transition, as specific areas in which to address materiality under the vision for 2040.

As for specific ways the Group will engage in these five business areas during the medium-term business plan, engagement will support the three key strategies of transformation of EPC operations, expansion of manufacturing business for high-performance functional materials, and establishment of future engines of growth.

In this business, the Group will create environmental and social value while pursuing ESG.



9. Commitment to carbon neutrality by 2050

Though the Group business has long served the core domain of Oil & Gas, the Group has taken the opportunity of this transformation for enhancing of planetary health to commit to the ambitious target of carbon neutrality by 2050, attesting to its dedication to sustainable gains in corporate value.

Targets

- Net-zero Scope 1 and 2 CO₂ emissions by 2050
- Thirty percent (30%) reduction in Scope 1 and 2 CO₂ emissions per unit of production by 2030 in support of (1).
- Engaging in Scope 3 CO₂ emissions reduction as determined in collaboration with stakeholders.

Supporting initiatives

- For Scope 1 and 2 reductions, we will adopt low-carbon/decarbonization practices, such as by reducing energy consumed in business activities, using renewable energy, and other means.
- For Scope 3 reductions, we will leverage technologies cultivated by the Group to provide energy transition solutions to stakeholders. Some examples of CO₂-reducing solutions provided by the Group are as follows:
 - Reduction of plant energy consumption through smart O&M
 - CCS technology
 - Construction of environmentally conscious facilities as used for solar, biomass, and offshore wind power, as well as small modular reactors
 - Hydrogen/fuel ammonia operations
 - Chemical recycling (plastic and fiber waste, SAF, etc.)

Disclosure

- In responding to climate change, we will promote disclosure of relevant information in line with recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

Target	Net-zero initiatives	Disclosure
Scopes 1+2 2050 Net-zero CO ₂ emissions	For Scope 1 and 2 reductions, adopt low-carbon / decarbonized practices such as by reducing energy consumed in business activities, by use of renewable energy and by other means	In responding to climate change, disclose relevant information in line with TCFD recommendations
Scopes 1+2 2030 30% reduction in CO ₂ emissions per unit of production		
Scope 3 Reduction as determined in consultation with stakeholders	For Scope 3 reductions, leverage technologies cultivated by the JGC Group to provide energy transition solutions to stakeholders <ul style="list-style-type: none"> ● Reduction of plant energy consumption through smart O&M ● CCS technology ● Construction of environmentally conscious facilities such as solar power, biomass power, offshore wind power, and small modular reactors ● Hydrogen / fuel ammonia operations ● Chemical recycling (plastic and fiber waste, SAF, etc.) 	

JGC Group Medium-Term Business Plan
Building a Sustainable Planetary Infrastructure 2025 (BSP 2025)

This concludes the medium-term business plan (BSP2025) developed as the first step in achieving the 2040 Vision guided by the corporate purpose of enhancing planetary health.

The JGC Group will steadily implement the measures in this medium-term business plan over the next five years in meeting its financial targets and making the 2040 Vision a reality.