

# Integrated solutions for a better life

2018 Integrated Report of Doosan Heavy Industries & Construction



## About this Report

### Characteristics of the Report

This is an integrated report which introduces the system and activities for value creation at Doosan Heavy Industries & Construction. This report includes the business strategies and activities of Doosan Heavy Industries & Construction as well as economic, environmental, and social responsibilities and their outcomes. Doosan Heavy Industries & Construction publishes this integrated report each year to be utilized as a communications channel with stakeholders.

### Criteria for Writing the Report

This report has been written in accordance with the Core Option of the GRI (Global Reporting Initiative) Standards, and third-party verification has confirmed that the requirements have been met. We are also applying the UNGC Communication on Progress (COP) principle. The status of the detailed application of GRI Standards can be found in the GRI Index in the Appendix.

### Period and Scope of Reporting

This report was written based on financial and non-financial performance from Jan. 1 to Dec. 31, 2018, and important items which may influence decision-making by stakeholders include the performance of the first half of 2019. For some of the quantitative outcomes, data collected over 3 years was reported in order to confirm trends, while financial outcomes were recorded based on K-IFRS. Also, if any information suggested in previous reports has been revised or re-written, detailed information can be found in the footnotes. The scope of reporting covers 100% of the headquarters as well as domestic and international projects, and activities and performances of overseas subsidiaries have been included as needed.

### Verification of the Report

To increase reliability and enhance the quality of this report, non-financial information was verified by an independent, external agency. As for financial information, an accounting audit was performed by an independent audit corporation, and the report reflects these results. The verification results can be found in the verification statement in the Appendix.

### Additional Information

This report is to be published and distributed in Korean and English, and may also be downloaded in PDF format from the website of Doosan Heavy Industries & Construction ([www.doosanheavy.com](http://www.doosanheavy.com)). For any inquiries regarding this report, please refer to the contact information provided at the bottom of the page.

## Cover Story



Doosan Heavy Industries & Construction maintains a consistent and representative design by utilizing the square, our brand identity motif, which clearly expresses our present and future competitiveness. We express confidence in our business portfolio transformation through images, such as gas turbines and wind turbines, which will form the foundations of the new energy age that we are entering.

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**Phone** 055-278-3058  
**Team in charge** Credo/CSR Team

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# Doosan Group

## Introducing the Doosan Group

### Korea's Longest-Running Company

As Korea's very first modern corporation, Doosan has undergone several transformations in its long 123-year history. From its humble beginnings as the Park Seung-jik Store in 1896 in the neighborhood of Baeogae, what is now Jongno 4-ga in Seoul, Doosan has ceaselessly strived to transform and develop itself over the past century.

### World-Recognized ISB (Infrastructure Support Business) Leader

Doosan is a brand name recognized worldwide in the power industry for its first-class competitiveness, and it is also expanding its foothold as global leader in the seawater desalination sector, backed by its outstanding technology and performance. In addition, Doosan maintains the highest standards for construction equipment, such as skid steer loaders and attachment equipment. While boasting of as many as seventeen product lines known for their world-class quality. Having as many as seventeen product lines known for their world-class quality and superior technologies, Doosan has solidified its status as market leader in the ISB industry, which covers sectors such as power generation, seawater desalination and construction machinery.

### Rewriting the History of a World-Class Brand

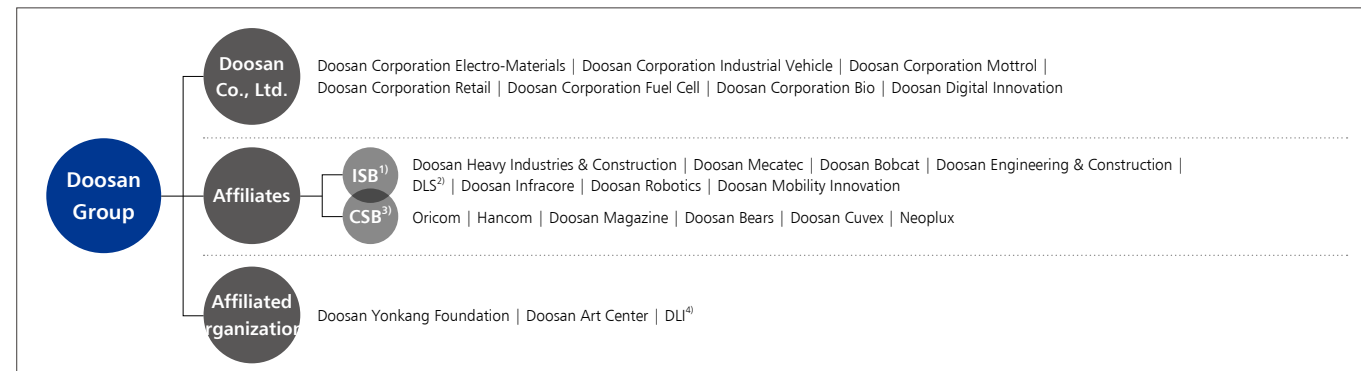
Doosan is active in 15 countries centering around 23 affiliates. Never satisfied with its remarkable performance record, the company continues on its journey of ceaseless development, while the provision of differentiated products and services that engender pride and trust in customers catalyzes Doosan's growth as a global enterprise together with its customers.

## Group Vision

We will become a Proud Global Doosan through people-oriented management and the establishment of processes that live up to world-class standards, which is the source of our global competitiveness.



## Overview of Affiliates



1) Infrastructure Support Business 2) Doosan Logistics Solution 3) Consumer & Service Business 4) Doosan Leadership Institute

## Doosan Credo

### Our belief and philosophy



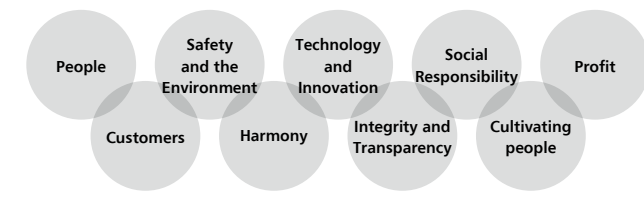
The Doosan Credo is a set of prescribed principles developed from Doosan's philosophy and unique way of doing business, which have been the foundation of Doosan's success for the past century. The Doosan Credo includes nine core values. It is integral to every aspect of our company and people, a standard that clearly guides our decisions and the way we conduct business. It is by realizing these values that Doosan can accomplish its ultimate goal. The Doosan Credo consists of Doosan's "Aspiration" and "Core Values."



Doosan's ultimate goal is to create a 'Proud Global Doosan.' It represents our vision that all of our employees and stakeholders will not only benefit from Doosan but also take pride in their association with us. We envision every employee being proud as a member of Doosan; every customer recognizing and appreciating our high quality goods and services and every shareholder taking pride in the fair and high levels of profit that we generate.



Doosan people practice the nine core values of the Doosan Credo wherever they operate, every day, in order to build a Proud Global Doosan. These values guide our business conduct, the manner in which we treat one another, and the way we work with all of our partners. Doosan's nine core values are as follows.



## CSR Value System

<b>Doosan Aspiration</b>	Proud Global Doosan
<b>CSR Goal</b>	To Rank Among the Global 100 Most Sustainable Corporations by 2025 * Based on the announcement of World Economic Forum (Davos Forum)
<b>CSR Mission</b>	Supporting Responsible and Sustainable Growth
<b>CSR Pillars</b>	<ul style="list-style-type: none"> <li>People-centric</li> <li>Reliable Operations</li> <li>Responsible Engagement</li> <li>CSR Value Creation</li> </ul>
<b>CSR Priorities</b>	<ol style="list-style-type: none"> <li>Nurture a culture of respecting human rights</li> <li>Fair employment</li> <li>Establish a safe work environment</li> <li>Enhance fair operations and supply chain CSR</li> <li>Green management and climate change mitigation/adaptation</li> <li>Strengthen product/ service responsibility</li> <li>Incorporate business value to sophisticate community involvement activities</li> <li>Reinforce disclosure of corporate information (CSR)</li> <li>Implement businesses that create CSR value</li> <li>Improve CSR performance monitoring</li> </ol>
<b>Enabler</b>	Develop strong CSR governance (execution system/ commitment of management and employees)
<b>Doosan Values</b>	The 9 Core Values (People, Cultivating People, Integrity and Transparency, Inhwa, Customers, Technology and Innovation, Profit, Social Responsibility, Safety and Environment)
<b>Demand of Society</b>	Global CSR Initiative (UN SDGs · ISO 26000 · UN Global Compact · GRI)

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## CEO Message



Dear Esteemed Stakeholders,

We at Doosan Heavy Industries & Construction thank you for your continued support and encouragement. I am extremely delighted to report to all of you on the changes and accomplishments that Doosan Heavy Industries & Construction has been pursuing through this year's integrated report.

**Doosan Heavy Industries & Construction is striving for change and innovation in today's rapidly changing global market environment.**

Amidst the continuing trend of low growth in the global power generation market, Doosan Heavy Industries & Construction is devoted to restructuring the business portfolio we have been pursuing, expanding into new businesses and strengthening the profitability and competitiveness of our existing businesses. Last year, Doosan Heavy Industries & Construction officially commenced the Samcheok POS Power project, and was selected as the preferred bidder for Indonesia's Jawa 9 and 10 1,000MW power plants and also signed a construction contract for a thermal power plant with Van Phong Power Company Limited, a Vietnamese power generation company. New achievements have come from Japan and Oman as well. We entered the Japanese market for the first time by winning an order for a biomass-fired power plant located in Sodegaura, Japan. As our first entry into Oman, we participated as a developer in the Sharqiyah Seawater Desalination project. Also, our internally developed digital solutions were applied to a 4,000MW power plant operated by Sasan Power, India's largest IPP (Independent Power Producer), while DTS, our gas turbine service-specializing subsidiary located in the United States, signed a long-term service agreement with a local IPP through which the position of Doosan Heavy Industries & Construction in the American gas turbine aftermarket has been further reinforced. In line with demands for corporate social responsibility, we have also constantly stepped up our efforts for effective energy and carbon management. We have also sought to contribute to local communities and also facilitated our entry into overseas markets by working together with our partner companies. As a result, we received the Korean Green Climate Award and earned the highest grade in the Shared Growth Index, and we have also been continuously enlisted in DJSI Korea, being recognized for our achievements in sustainable management both internally and externally.

**We will realize tangible accomplishments and continuous business growth based on our fundamental competitiveness and portfolio of new growth.**

Doosan Heavy Industries & Construction is pursuing a shift in its business portfolio to place more emphasis on gas turbines, new and renewable energy and the services business in line with changes in the managerial environment, of which we have already accomplished tangible outcomes.

Large-sized gas turbines, which are presently being developed with commercialization planned for 2021, are nearing the prototype production stage. We will soon proceed with a demonstration at a domestic combined cycle power plant, and for wind power, we have been selected as the prime contractor for a government 8MW offshore wind energy project and are set to complete development by 2022. In the domestic and overseas power generation markets, opportunities for the service business such as O&M on existing power plants are expected to gradually increase, and Doosan Heavy Industries & Construction continues to expand its services into wind energy and water. In addition, we will actively seek opportunities to take part in hydrogen and 3D printing technology, which are highly related to our existing businesses, and turn them into our new growth drivers. Simultaneously, we will accelerate our digital transformation in all areas of business and continue to improve our competitiveness across the entire value chain of the company through the commercialization of digital solutions, as well as the introduction of integrated design, RPA (Robotic Process Automation) and AI technology.

**We ask for your continued interest and support in the efforts of Doosan Heavy Industries & Construction to improve social value and the world.**

Doosan Heavy Industries & Construction will fulfill ESG (Environmental, social, and governance) regulations, preemptively meet industry standards, and fully comply with principles of sustainability in every sector. We seek to solve the issues facing society and, naturally, through our commitment to implementing the 2030 UN Sustainable Development Goals (SDGs) with projects related to sustainable energy and clean water, we aim to contribute to the betterment of society and the world. Furthermore, to meet this period of change, we will continue with our transformation into an organization that promotes creativity through dialogues built on the basis of mutual trust between labor and management, employees, and our supply chains.

We ask our stakeholders for your continued interest in and undivided support for the ceaseless endeavors of Doosan Heavy Industries & Construction in the realization of a sustainable society.

Chairman & Chief Executive Officer **Geewon Park**

# Company Profile

## Revenue

Unit: KRW 100 million  
**147,611**

## Operating profit

Unit: KRW 100 million  
**10,016**

## No. of Employees

Unit: persons  
**7,294**

## Korean Meisters

Unit: persons  
**31**

As of Dec 31, 2018

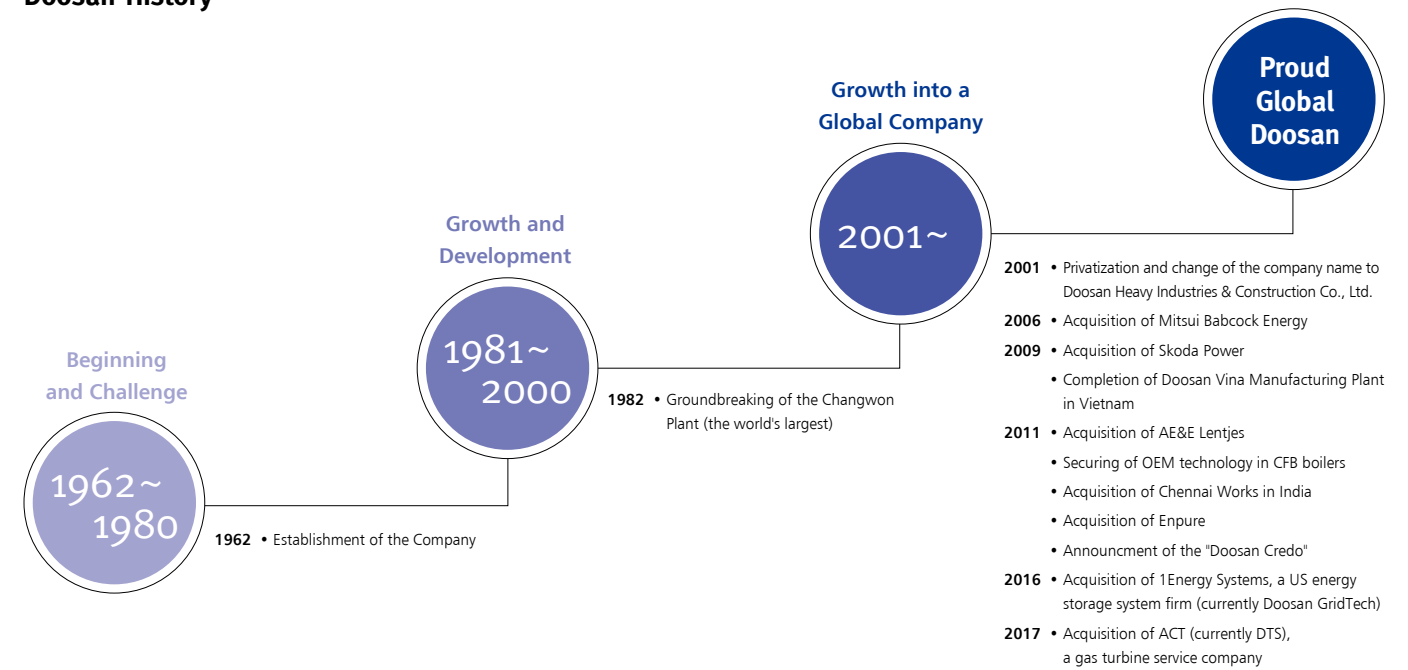
## Global Leader in Power & Water

"Global Leader in Power & Water," the vision of Doosan Heavy Industries & Construction, represents our commitment to becoming the market leader in the global power generation and water business. Based on the Doosan Credo, which portrays our aim to build Doosan into a proud and innovative leader that provides customers with life-enriching services, we seek to offer the best of technology, cost competitiveness, quality products and services, scalable sales and profitability, talent cultivation and an optimal corporate culture. By establishing our position as a global leader, we will lead the market change in response to rapidly changing global technology trends and become an advanced global company.

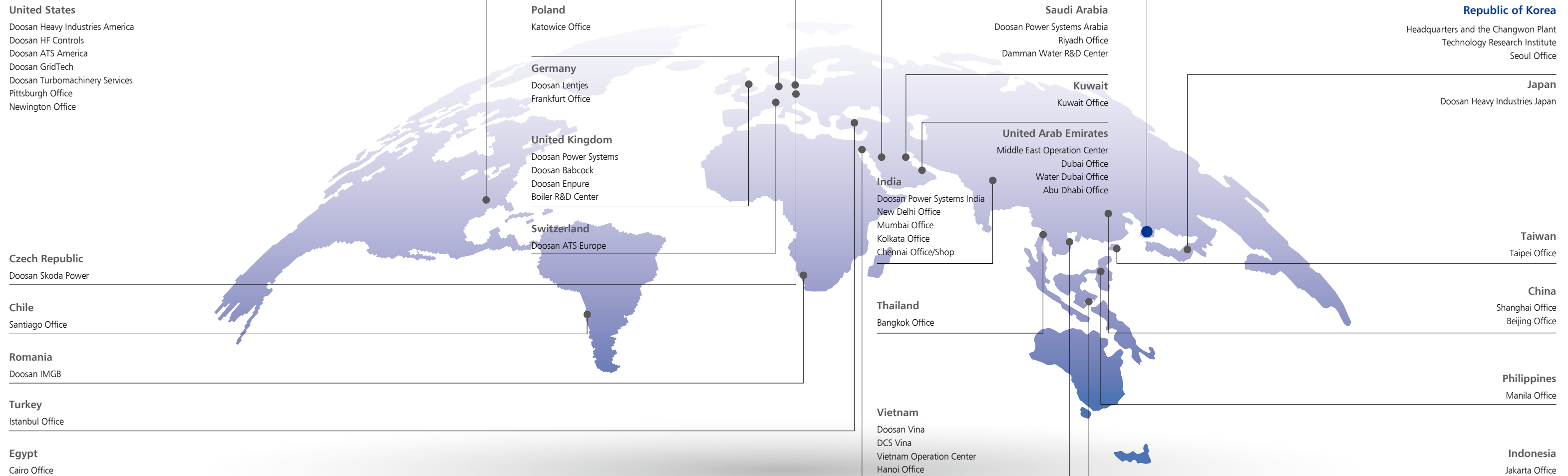
### Overview of Doosan Heavy Industries & Construction

<b>Date of Establishment</b>	September 20, 1962
<b>Representative Directors</b>	Geewon Park, Hyounghee Choi, Yeonin Jung
<b>Area of Business</b>	Machinery and equipment manufacturing
<b>Location of headquarters</b>	Headquarters: 22, Doosan Volvo-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do Seoul Office: 456, Gangnam-daero, Seocho-gu, Seoul

## Doosan History



## Global Network





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# Business Strategy & Portfolio

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# Business Strategy & Portfolio for Sustainable Growth

## Global Market Trend

As was the case since 2017, new and renewable energy is forecasted to be the leading trend for the global power market, and the demand for gas-fired power plants is expected to gradually rise again. Owing to Korea's new energy transition plan, we expect to see more renewable energy and hydrogen economy opportunities being explored and detailed plans being set up in Korea. Furthermore, the introduction of new business models are expected for the power market based on the convergence with ICT, such as Internet of Things (IoT), artificial intelligence and 3D printing technology.



Strategic Direction	Strengthening of new growth portfolio	Strengthening competitiveness of existing business	Strengthening of profitability and organizational efficiency by improving business operations
Promotion activities	<ul style="list-style-type: none"> <li>Gas turbines</li> <li>New and renewable energy</li> <li>Development of digital solution technologies</li> </ul>	<ul style="list-style-type: none"> <li>Equipment of plant and service</li> <li>Plant EPC</li> <li>Nuclear power</li> </ul>	<ul style="list-style-type: none"> <li>Strengthening of design competitiveness through digital transformation</li> <li>Improvement of production efficiency</li> <li>Strengthening of manufacturing competitiveness</li> <li>Optimization of market-based portfolio by region</li> <li>Efficiency of business operation</li> </ul>

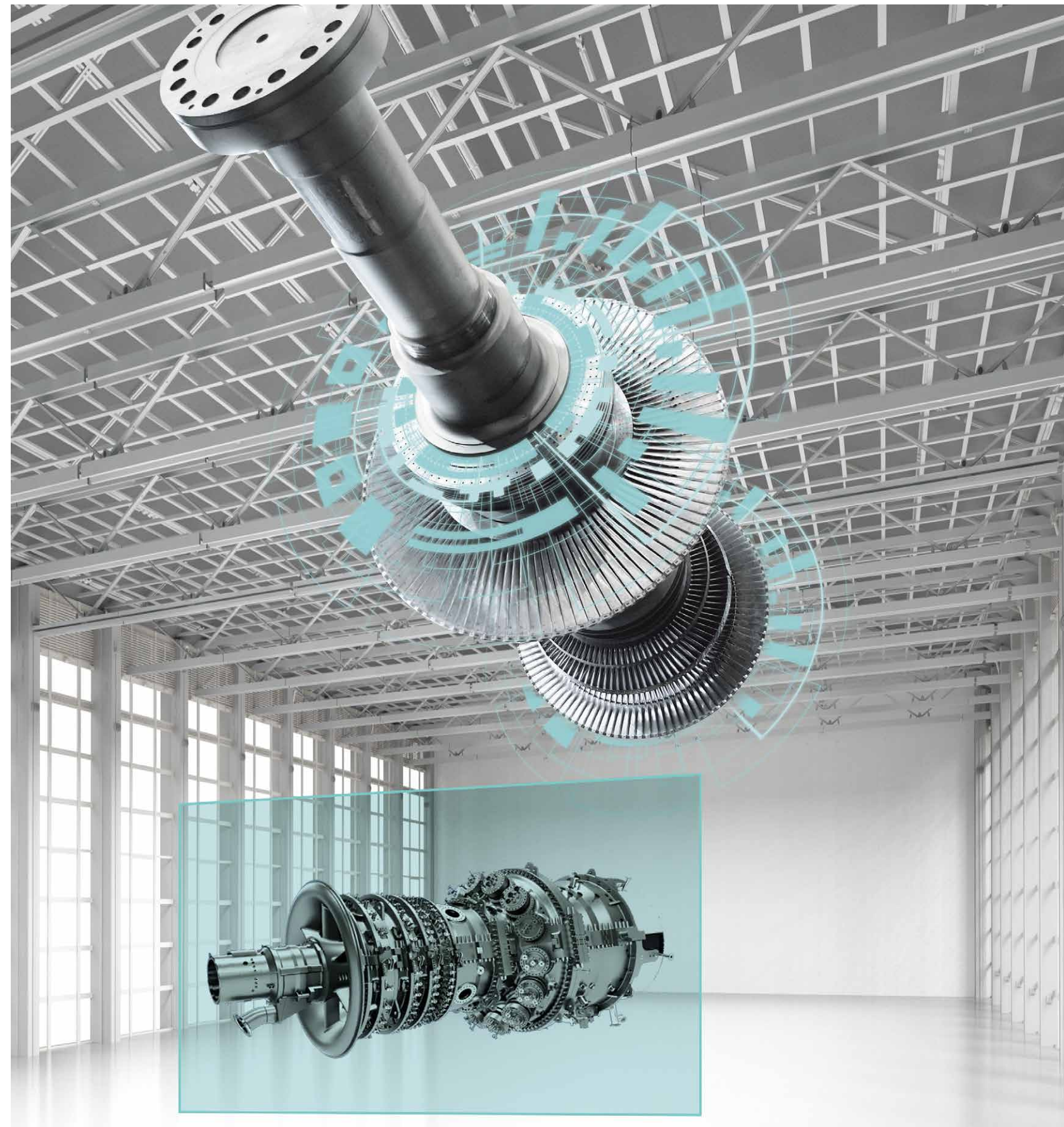
## Business Strategy Direction

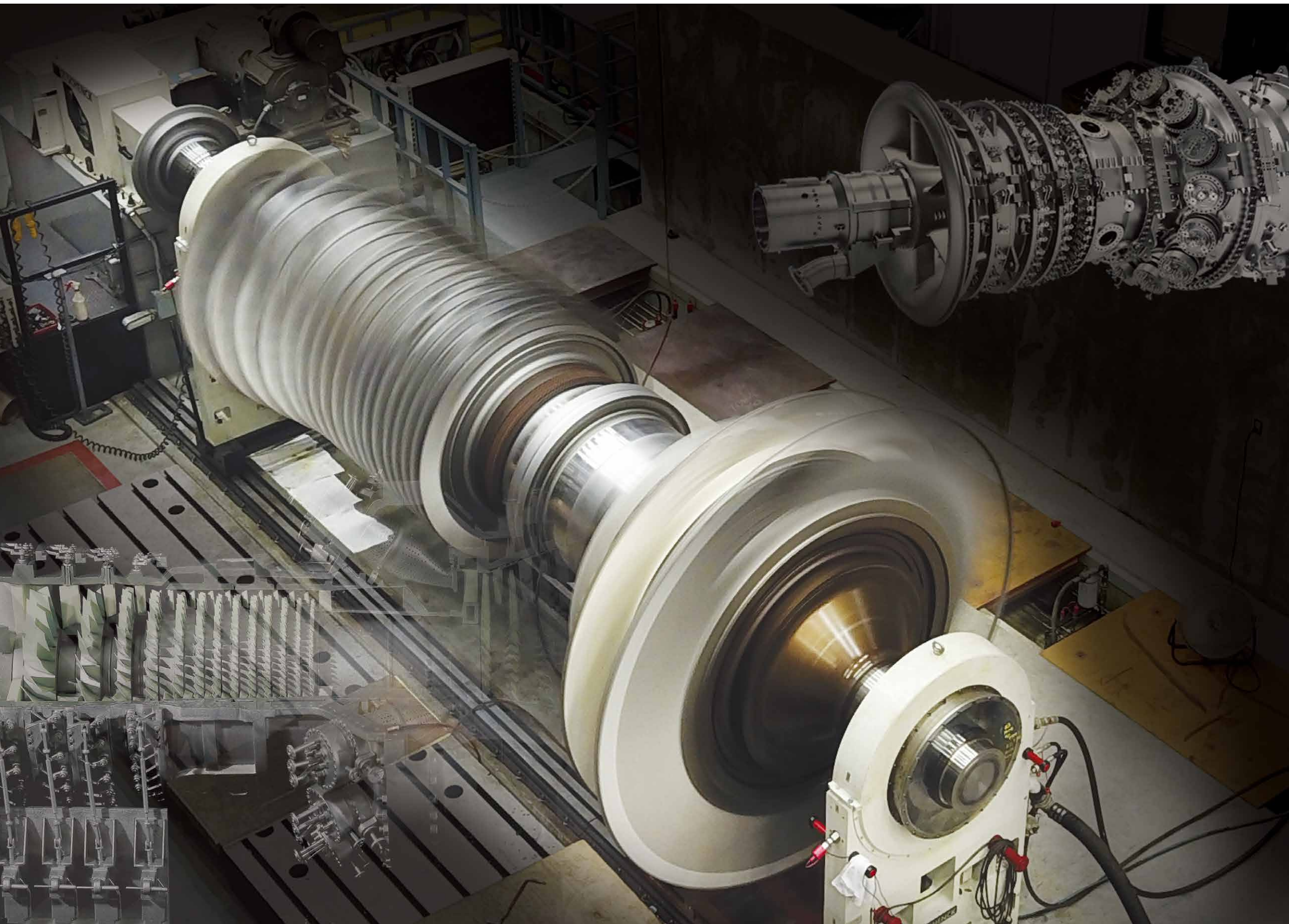
### Strengthening of new growth portfolio and competitiveness of existing business

Doosan Heavy Industries & Construction concentrates its efforts on strengthening its new business portfolio by developing gas turbines, new and renewable energy, and digital solution technology as new growth engines to cope with rapid changes in the global power generation market which have arisen due to energy conversion policies around the world. We have achieved excellent results in our construction, EPC, and water businesses through the production and supply of thermal and nuclear power plants, seawater desalination plants, and wind power generators.

### Strengthening of profitability and organizational efficiency by improving business operations

By continuously expanding the application of digital-based integrated design systems to minimize the quality failure costs, and by expanding the use of the Digital Factory in the mid and long term, thereby enhancing production efficiency and manufacturing competitiveness, we improve business operations. In addition, while the global economic downturn is prolonged, Doosan Heavy Industries & Construction, which has a high current account deficit and debt ratio to GDP, strengthens its project management in major regions, and minimizes any risks that might be incurred in advance. We will maximize business profitability by strengthening organizational restructuring through portfolio conversion and design, production, and execution to improve and streamline business operations as a whole.





## New growth engine

### Gas Turbine

With growing interest in eco-friendly power generation stemming from strengthened environmental regulations, global demand for gas turbines is expected to grow steadily along with new and renewable energy, with new orders exceeding 30GW/year. Under the Paris Agreement, the gas turbine market will grow more rapidly if greenhouse gas emissions are limited. Currently, all of the gas turbines for power generation used in Korea are imported from foreign countries, as gas turbine technology has only been mastered in a few advanced countries such as the US, Germany and Japan.



Maintenance Service of US DTS Gas Turbine

Doosan Heavy Industries & Construction selected high-capacity, high-efficiency gas turbines as a future new business in 2013 in response to demand for high-efficiency, eco-friendly power generation. Doosan Heavy Industries & Construction completed the basic design in July 2017. Since finishing our detailed design in 2018, we have been working on the production of gas turbine primary products, and we plan to carry out a full speed full load test (FSFL) after the completion of large-scale assembly in 2019. Doosan Heavy Industries & Construction completed the construction of a hot parts factory of an area size of approximately 5620m<sup>2</sup> in 2017, and has built in-house infrastructure such as a turbine shop and FSFL test facility for the production, inspection and repair of high temperature components, which are core parts of gas turbines. We are also equipped with various high-tech manufacturing equipment, such as 3D printing devices, which are applied to the core components of the combustor. The FSFL test facility was built to verify the performance and reliability of Doosan's GT, and is equipped with a real-time data acquisition system and over 3,500 sensors. We plan to use the successful demonstration the Gimpo cogeneration project in 2022 to advance into the domestic gas turbine market, currently heavily which depends on imports, as well as overseas market.



## Wind Power

Doosan Heavy Industries & Construction is concentrating its efforts on R&D and commercialization to cope with the overabundance of domestic and overseas energy conversion policies for new and renewable energy. In particular, Doosan Heavy Industries & Construction is accelerating the development of existing wind turbine technology while also building domestic and overseas onshore and offshore wind complexes. We plan to lead the domestic wind power generation market, having been selected as the prime contractor of a national development project for a 8MW offshore wind farm.



8MW offshore wind power generation system

Providing a customized solution for each customer By performing comprehensive services in the field of wind power generation, including selection and review of the location of onshore and offshore wind farms, analysis of project feasibility study and provision of materials and equipment and EPC and O&M services we will establish ourselves as a Wind Power Total Solution Provider offering a customized solution for each customer. In 2011, we developed WinDS3000/91, the first 3MW wind turbine system in Korea. We have been supplying wind turbines for Yeongheung Wind Power Complex 2, and have received orders for Sangmyeong Onshore Wind Power (21MW) and Jeonnam Onshore Wind Power (42MW), thereby successfully establishing our domestic base. In 2015, we signed a contract to supply equipment for a KRW120 billion of offshore wind turbine project (60MW) off the southwest coast of Korea. In September 2017, we completed construction of the Tamra offshore wind turbine project (30MW) by EPC. In 2018, we also signed a 15-year maintenance and repair contract for the offshore wind farm in the southwest. We are also diversifying our operations into businesses that can secure stable sales. We are continuously expanding our business overseas. In March 2018, we signed an agreement with the Vietnam Electricity Corporation (EVN) to build a 3MW offshore wind power complex linking the energy storage system (ESS) with the Vietnam General Construction Company CC1 (with a total of 105MW wind power). We are also promoting the establishment of overseas business bases, such as by signing business agreements for the development of power generation complexes.





## ESS

In recent years, with the development of renewable energy technologies, distributed power generation such as solar power and wind power are drawing attention. The ESS business is expected to grow rapidly with an increase in the renewable energy market. Doosan Heavy Industries & Construction acquired a US ESS S/W company in 2016 and actively pursued the market as an energy solution provider that can offset unstable power supply and reduce power purchase cost.



Beacon ESS installation in California, USA

In 2016, Doosan Group launched Doosan GridTech by acquiring 1Energy Systems, a company that had the core technology of ESS control system software, to enter the global energy storage system (ESS) market, including North America. Since then, Doosan GridTech's ESS control system technology and Doosan Heavy Industries & Construction's EPC capability have enabled the company to expand and accelerate the ESS business. In 2017, the company received a large-scale ESS project from LADWP, located in Los Angeles, USA. In 2018, Doosan GridTech successfully installed a 20MW/10MWh ESS near Bakersfield, California. We also continued to receive orders for the 5MWh Nabb and Atterbury projects from Duke Energy, a major utility company in North America, further strengthening the market presence in North America. As the policy to convert conventional energy into renewable energy continues in Korea, the company installed a 70MWh Demand Management ESS at Doosan Heavy Industries & Construction's Changwon Plant and the 10MWh SK Innovation Demand Management ESS in 2018. In 2018, our order receipts increased fourfold from the previous year to KRW 97.3 billion. Domestic and overseas ESS business growth will accelerate in 2019 due to the expansion of Doosan GridTech's software platform.

## Digital Innovation

With the rapid progress of digital innovation in the business world accompanying the fourth industrial revolution, Doosan Heavy Industries & Construction actively conducts research and development in various digital technology to cope with trends. In particular, the AI-based boiler combustion optimization and boiler tube management solution supplied to a 4,000MW power plant of Sansan Power, the largest private power generation company in India, was awarded the "Pinnacle Award" by SAP, the world's largest enterprise application software company. It was the first win as a Korean company in Pinnacle Award. In addition, we will develop operation and efficiency optimization solutions for seawater desalination, gas turbines, and wind power generation systems and will introduce them in sequence.

### Won SAP Pinnacle Award\* 2019

#### First in Korea for a manufacturing company, not an IT company



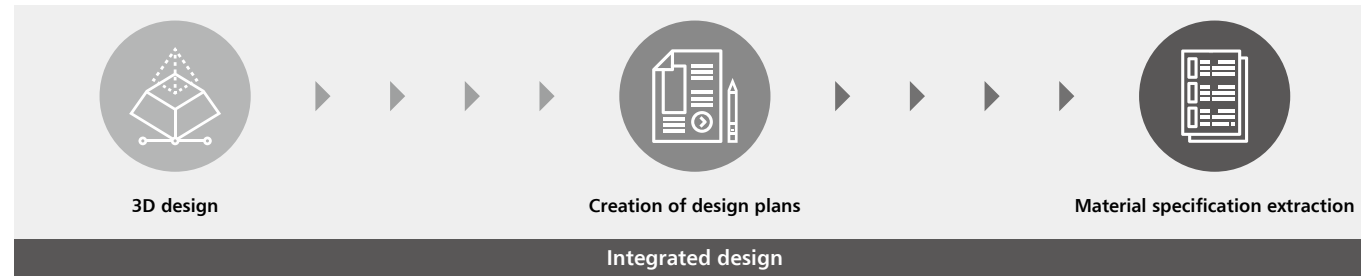
**\* Pinnacle Awards**  
Doosan Heavy Industries & Construction won the award for outstanding value and achievement out of some 18,800 SAP's partner companies around the world. ISV (Independent Software Vendor) Partner (ISV Partner of the Year)¹.

Doosan Heavy Industries & Construction promotes digital innovations in all of its business domains to stay in sync with the rapidly changing market environment. The company developed Prevision, a solution for power plant failure prediction, collaborated with Korea East-West Power in 2018 to stabilize plant operation using big data and plans to apply the solution to a wide range of customers. DHIC applied a combustion optimization solution to the Sasan project in India, which resulted in a 37% reduction in NOx emissions, and plans to build on this performance in expanding business to potential customers in emerging markets, such as Southeast Asia. For its desalination plant business, the company plans to develop an energy management system (EMS) to reduce the energy used by power plants and secure demonstration plants in the Middle East market to solidify its leading position in the desalination industry. Moreover, we conduct research and development in various digital solutions to optimize the operation and power generation efficiency of gas turbines that the company is currently in the localizing process. The company plans to develop and apply a wide range of solutions for the efficient operation of new and renewable energy by building wired and wireless networks in wind farms, which are continuously expanding, to implement an ICT convergent monitoring system for early online warning and data analysis, O&M management, and integrated controls.



## Operational Excellence for Improved Business Operations

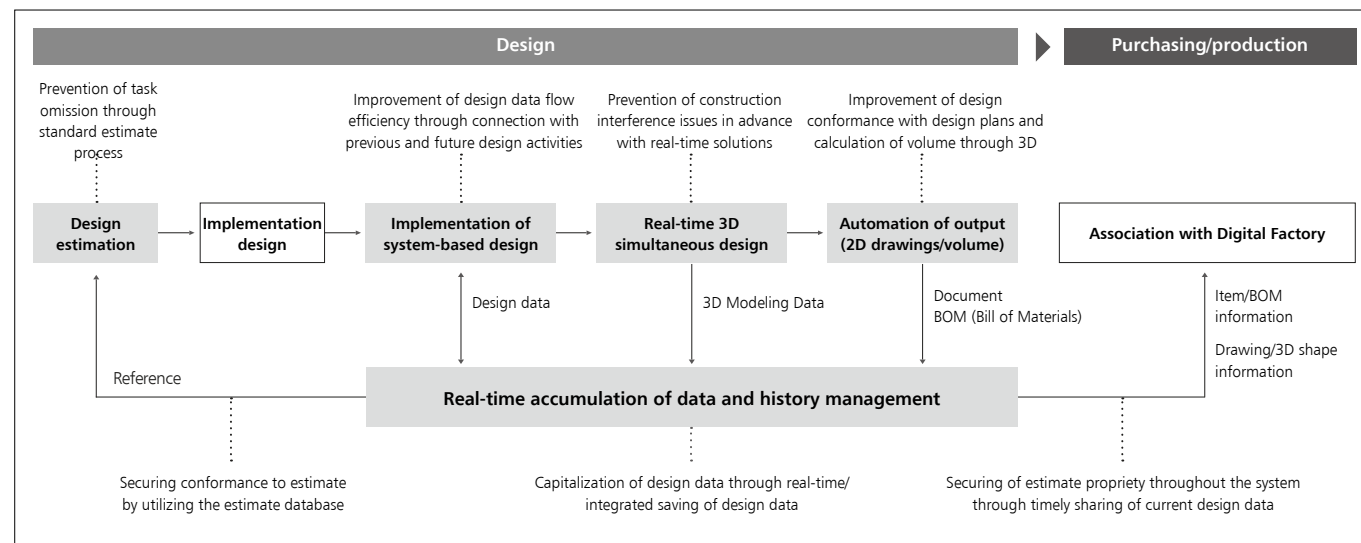
An integrated design environment based on 3D models is being used and Industry 4.0 is being achieved in the heavy industries through Digital Factory, which combines digital technology with production sites to improve the competitiveness of the manufacturing industry.



### Integrated Design System

The integrated design system provides a work environment centered on standard design procedures defined for each team, as well as an environment in which all organizations and affiliates can perform 3D-based simultaneous design. It also offers an engineering database with various functions and promotes projects to systematically manage the design data and can be utilized by non-design teams. Through this, we aim to strengthen our design competitiveness and reduce costs from quality failure occurring due to design.

### Concept of integrated design



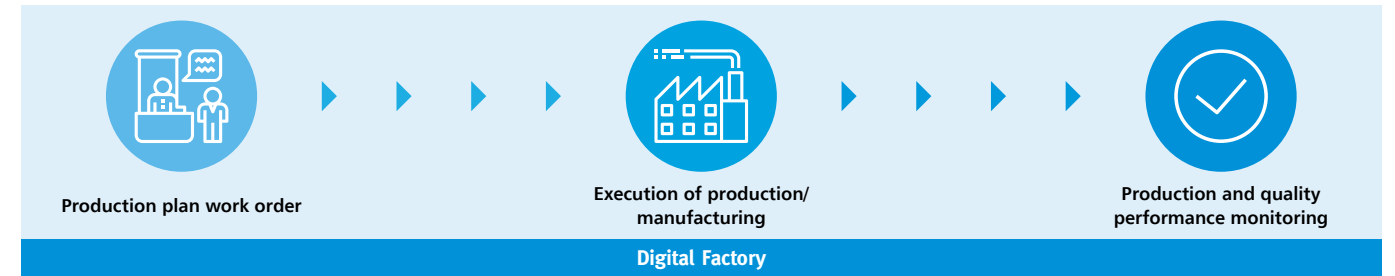
### Progress and outcomes

After its establishment, the integrated design system has been applied to and is being utilized in several EPC projects (10, as of May 2019), and is being used to estimate projects through an integrated estimate planning system that utilizes the database and a standardized estimate process. It has also continuously improved the work environment for turbine, generator, and boiler design in association with the Digital Factory.

### Future plans

In 2019, we plan to internalize the integrated design process by changing management and focus on digital transformation activities in those operational aspects that can utilize the accumulated design data of other parts of the value chain.

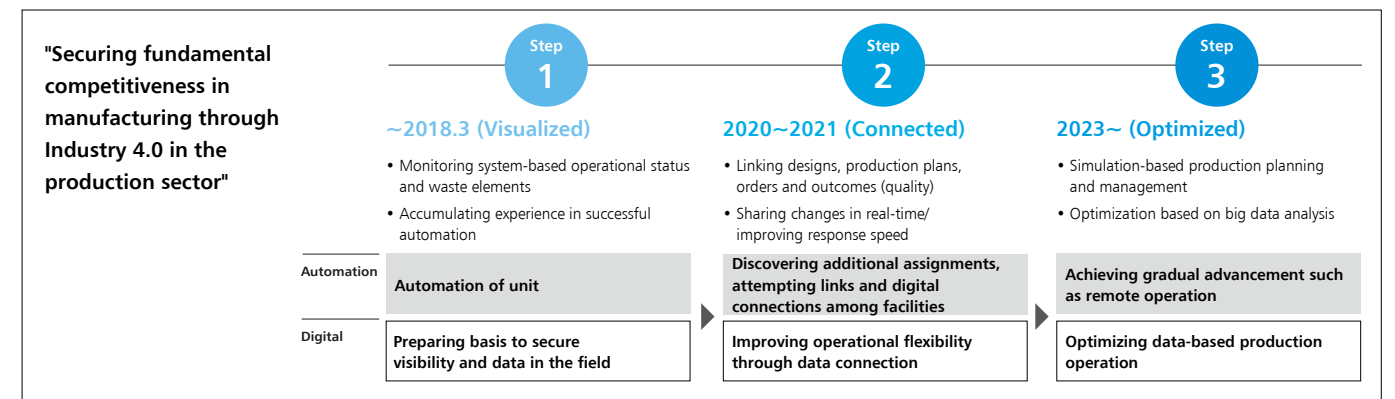
Manufacturing innovation that utilizes digital technology enhances competitiveness in quality, production costs and delivery, which will lead to improved profitability and help secure fundamental competitiveness for Doosan Heavy Industries & Construction.



### Digital Factory

Digital Factory is the unique smart factory of Doosan Heavy Industries & Construction that visualizes, collects, and analyzes all sorts of production data using ICT technology, such as sensors and automation equipment, to realize an optimized production process and environment. Since it was first established in June 2016, it has been conducting various tasks in the areas of automation and digitalization and, in the mid- to long-term, the company aims to apply the Digital Factory in three stages throughout the entire production process to reinforce production efficiency and manufacturing competitiveness.

### Progress and roadmap of the Digital Factory

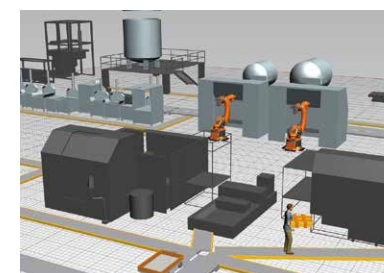


### Progress and outcomes

Task automation has completed field application in 37 out of a total 51 cases centered on the 1st stage of unit automation, and achieved the expected effects. Task digitization is the stage in which a basic system is developed with the goal of securing visibility in the field of the 1st stage and a foundation to obtain data. In addition, Doosan Heavy Industries & Construction has established a work system capable of digitizing information and document quality and visible management (production status and materials tracking) in the production process. Starting in January 2019, 14 systems have been utilized in everyday work. In addition, we introduced 'Digital Lean' activities to optimize operational processes by utilizing data. As an example, we have secured cost reductions at existing plants through virtual factory construction (process simulation) and have optimized plans to increase the capacity of new plants (wind turbine, gas turbine).

### Future plans

We will continuously invest in core tasks of the Digital Factory and internalize an established system, while consistently promoting manufacturing innovation through changes in the way we work and "Digital Lean," an activity that eliminates waste and excess by utilizing digital technology such as IoT Connectivity, AI and Data Mining.



Digital Factory

## R&D of Doosan Heavy Industries & Construction to lead Future Business

Doosan Heavy Industries & Construction is continuing to pursue the transformation of its R&D portfolio along with new business/new technology acquisition strategies. In response to energy policy and environmental changes, R&D is focused on new and renewable energy, digital services, and future innovation technologies. We plan to secure the technological competitiveness to prepare our future business and lead industrial trends.

### Renewable Energy - Hydrogen

Under the direction of the current Government, policy moves to introduce a hydrogen-based economy are on the rise, including the announcement of a roadmap for a hydrogen-based economy. Doosan Heavy Industries & Construction is paying special attention to the field of hydrogen in response to these coming changes in the future fuel mix and we are entering the market with a proposed project targeting central / local governments. Additionally, the company has formed a TFT (task force team) to analyze the value chain and key technologies in each field in preparation for the full force of the emerging hydrogen industry and to establish strategies for securing fundamental technologies for Doosan Heavy Industries. We are considering moving into related fields by investing in either a large-scale hydrogen extraction and production facility or liquefaction technology, or exploring the hydrogen supply businesses and businesses related to fuel cells/ renewable energy. We are also in the process of pursuing an energy self-sufficient island using our P2G business and clean energy hydrogen station business at Incheon International Airport. In April 2019, we signed an MOU with Changwon City and the Changwon Industry Promotion Agency to promote a hydrogen liquefaction and storage vessel development project. We will construct the hydrogen liquefaction plant according to EPC standards.



Signed MOU for hydrogen-hydrogen liquefaction and storage device development project

### Eco-friendly Facilities

In 2016, we successfully completed the development of CDI (Capacitive De-ionization) technology and secured a new eco-friendly water treatment technology which is not based on traditional reverse osmosis (RO) membranes. This technology utilizes ions to significantly reduce the amount of chemicals used in conventional processes and improve the efficiency of cooling and circulating water treatments, thereby minimizing the negative environmental impact. We performed two pilot evaluations for the Korea District Heating Corporation. After testing a system with a commercial capacity of 500 tons/day, we will roll it out to 16 branches of the the Korea District Heating Corporation by 2020 and expand the project to domestic co-generation plants. In addition to our water treatment technology, we have developed our own EME (Electrostatic Mist Eliminator : a wet particulate matter electrostatic precipitator) technology and particulate matter integrated environmental facility (AQCS (Air Quality Control System) : EME + NL-GGH (Non-leakage Gas-Gas Heater) + Advanced FGD integrated facility) we are currently applying these technologies to actual plants. In the future, we will secure PQ by constructing and operating an EME demonstration plant, and contribute to strengthening the competitiveness of environmentally friendly facilities at standard thermal power plants.



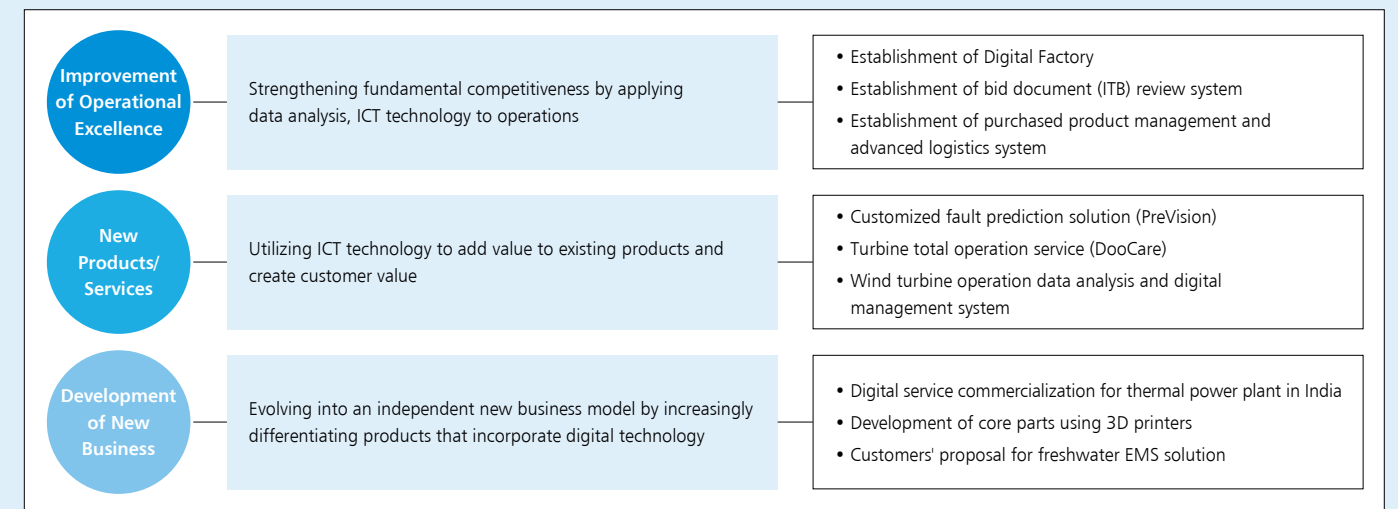
Signed MOU between Doosan Heavy Industries & Construction and Korea District Heating Corporation for the commercialization of eco-friendly water treatment technology

### Digital Services

Doosan Heavy Industries & Construction is strengthening its fundamental competitiveness by applying data analysis and ICT technology to its operations, and is developing a new independent business model by accumulating product differentiation that incorporates digital technology. Last year, we developed digital solutions and explored prior-technologies in the field of digital plants. In 2019, we are focused on accelerating digital transformation through content enhancement. We are expanding our existing digital service package 1.0, which includes combustion optimizer and a boiler tube monitoring system, to the GHECO thermal power plant and other plants.

In addition, we are developing add-on service packages (DooCare, turbine vibration solutions, and more) targeting GT/ST with the aim of expanding digital solution products. We are developing solutions for renewable energy and water O&M, too. Along with all this, we conducted TFT activity for the commercialization of AI, formed a company AI committee to seek out areas for technological development and potential business applications, commercialized AI using digital solutions, and built an in-house AI ecosystem.

#### Status of Ongoing Digital Transformations at Doosan Heavy Industries & Construction



#### Status of ongoing strategies to secure new business and new technology

Field	Areas of Interest	Status
Hydrogen economy	<ul style="list-style-type: none"> <li>Large scale hydrogen extraction/production, liquefaction technology and hydrogen supply business</li> <li>Fuel cell/new and renewable energy project</li> </ul>	<ul style="list-style-type: none"> <li>Technological analysis and technology acquisition strategy based on value chain</li> </ul>
Wind power generation	<ul style="list-style-type: none"> <li>Re-powering</li> <li>Large-scale wind power generation complex control system</li> </ul>	<ul style="list-style-type: none"> <li>Establishment and execution of technical competitiveness of new &amp; renewable O&amp;M (Operating &amp; Maintenance) business</li> </ul>
Digital solutions	<ul style="list-style-type: none"> <li>Expansion of line-up of existing digital solution products</li> <li>New service business associated with new technology such as AI</li> </ul>	<ul style="list-style-type: none"> <li>Development of digital service package for major power plant equipment</li> <li>Development of business solution for renewable energy and water O&amp;M (Operating &amp; Maintenance)</li> <li>Operation of AI experts training program</li> </ul>
3D printing	<ul style="list-style-type: none"> <li>Expansion of high value/high quality product application</li> </ul>	<ul style="list-style-type: none"> <li>Expansion of applied products such as GT service and defense, and reinforcement of equipment/personnel</li> </ul>
New materials	<ul style="list-style-type: none"> <li>Lightweight, high-strength materials for space/aerospace/defense applications</li> </ul>	<ul style="list-style-type: none"> <li>Development of technology and mass production technology for the production of Korean launch vehicle Ti container</li> <li>Feasibility review of aviation Ti material parts</li> </ul>
Eco-friendly water treatment (CDI*)	<ul style="list-style-type: none"> <li>Substitution of cogeneration/combined-cycle water treatment system</li> </ul>	<ul style="list-style-type: none"> <li>Pilot Test Completed (20 tons/day, 100 tons/day)</li> <li>Development and demonstration of technology for commercialization (500 tons/day)</li> </ul>
Fine dust reduction equipment	<ul style="list-style-type: none"> <li>Improvement of standard thermal power environment facilities</li> </ul>	<ul style="list-style-type: none"> <li>Development of independent integrated environmental facilities solution (AQCS **)</li> </ul>

\* CDI : Capacitive De-ionization, Electro-absorption desalination technology

\*\* AQCS (Air Quality Control System) : EME + NL-GGH + Advanced FGD integrated facility

## Strengthening the Competitiveness of Existing Businesses

### Power Plant & Service

Doosan Heavy Industries & Construction is a global corporation with original technology and performance in boilers, turbines, and generators, all of which are essential equipment in power generation. Based on our outstanding technology, we are successfully operating various power plant projects including coal-fired thermal power plants, combined cycle power plants, and nuclear power plants.

Sipat Thermal Power Plant in India



#### 2018 Highlights

- Won the supplier contract for Samcheok POS Power Plant
- First exporting of power plant main components to Japanese market
- Received order for Yeongdong #2 biomass fuel conversion project
- Signed a contract for demonstration of Digital Solution and started full-scale business
- Strengthened business by entering the US Steam Turbine service market
- Completed development of service selling package

#### 2018 Business Performance

##### Boilers

Doosan Heavy Industries & Construction won construction orders for Samcheok Thermal Power Plant Units 1 and 2 at KRW 3.5 trillion in 2018, supplying boilers and AQCS. The Samcheok POS Power Plant will be a coal-fired power plant with an ultra-supercritical pressure system that has a steam pressure of 246kg/cm<sup>2</sup> or more and a steam temperature of 593°C or higher, which will increase power generation efficiency. In addition, Doosan Heavy Industries & Construction made its first entry into the Japanese power generation market by exporting core components of power plants to Sodegaura Biomass Power Plant in 2018. Doosan Heavy Industries & Construction will supply its environmentally friendly CFB (circulating fluidized bed) boiler and high efficiency steam turbine, scheduled to be completed in June 2022. Based on the performance of the Sodegaura power plant, we will actively pursue the biomass power generation market, which is expected to grow continuously.

##### Turbines/Generators

Recently, interest in environmentally-friendly power generation has been increasing as a solution to the problem of CO<sub>2</sub> emissions and fine dust, which are emerging as global problems. Doosan Heavy Industries & Construction has selected gas turbines as its key future growth engine, as the company expects to see an increase in the market demand for combined cycle power plants. As such, the company completed the detailed design phase in 2018 and started on production in 2019. The plan is to complete the manufacturing, assembly and performance testing of the gas turbines by the end of 2019. In addition, despite the downturn in the domestic coal-fired power generation market, we have succeeded in winning orders for Samcheok POS Power Plants #1, 2 and STG for coal-fired power plants based on our existing experience and technology. In addition, Skoda Power, a subsidiary in the Czech Republic, has entered the US turbine market for the first time, winning the US Steam Turbine supply project Lansing PJT.

##### Services

In 2018, Doosan Heavy Industries & Construction successfully completed the conversion of Yeongdong Thermal Power Plant Unit 1 into the first and largest capacity biomass plant in Korea. In addition, in November 2018, we won an order for the fuel conversion of Yeongdong Thermal Power Plant #2 worth about KRW 70 billion. This project will convert the 200MW Yeongdong Thermal Power Plant No.2, which was completed in 1979, from coal fuel to biomass fuel. Doosan Heavy Industries & Construction received orders for Yeongdong Thermal Power Plant 1 and 2 in succession as the demand for fuel conversion from aging coal-fired power plants was increasing. In addition, Doosan Heavy Industries & Construction began development of digital technology-based power plant services in 2017 and completed development of a Boiler Digital Solution (BTMS, Combustion Optimization) in June 2018. A contract for the pilot project of Sasan #1 in India was signed and the demonstration project will be completed in 2019. DTS, a gas turbine service subsidiary in the US, won a large gas turbine service project in 2019, and successfully ventured into the Mexican market for the first time. In addition, it has strengthened its position in the US market by winning a long-term rotor service PJT in Michigan, USA.

#### 2019 Forecast and Business Strategies

Large boiler orders are expected from Southeast Asia. In order to secure cost competitiveness in the Southeast Asian market, we will transfer our production and design capabilities to Vina Vietnam and expand our market share in Southeast Asia by utilizing Vina personnel and production bases. In addition, orders for 100-500MW boilers are expected to expand in Europe, Japan, Indonesia, and the Philippines, and we plan to strengthen our capacity to design and manufacture medium-and small-sized boilers such as CFB and biomass boilers. As the WtE (waste to energy) market is expected to expand due to increased demand, we are planning to build an optimized WtE business model. Since the AQCS market is expected to grow steadily in the global environment, we will actively pursue domestic and overseas markets based on our references.

As the demand for large steam turbines has been reduced due to the changes in domestic energy policies and the Paris Climate Change Agreement, Doosan will increase the cost competitiveness of its Czech subsidiary Doosan Skoda Power to boost market share and secure profitability by offering competitive small- to mid-sized steam turbines and generators. In addition, we are devoting ourselves to the development of gas turbines in order to cope with the demand for combined-cycle power plants, which is expected to increase proportionately as coal-fired power generation shrinks. We are working on the production of a gas turbine for 2019, and are going to carry out performance tests after assembly in 2019. Following the successful demonstration of our gas turbine project, we intend to expand our share of the domestic LNG power generation market and advance into overseas markets. We will develop various gas turbine models in succession to expand into the 60Hz and 50Hz markets.

Demand for AQCS is growing in new markets, such as Russia, as is the demand for R&M (Renovation & Modernization) services in Southeast Asia. The need for individual products replacements and maintenance are increasing in Southeast Asia and Korea. In response, Doosan Heavy Industries & Construction will actively open up new markets through local partnerships. We will take on more orders for individual products and O&M through pre-sales using our OEM technology and various package products utilizing our subsidiaries' capabilities.

## Introduction of Business

### Boiler

We retain competencies in design, manufacturing, and installation for the core components of boilers, and since our first order intake for power generation equipment in 1976 (Yeongwol Combined Cycle Power), we have accumulated a proud history of order intake in thermal power generation that totals approximately 82GW. By acquiring Babcock in 2006, a company with original boiler technology, we were able to obtain the capabilities to design and produce boilers in-house, and a number of our products, such as oil-fired boilers and 1000MW USC boilers, have been selected as top global products. Moreover, we acquired Lentjes of Germany to secure technical competencies in AQCS and CFB boilers, thus reinforcing of domestic and overseas capabilities in the equipment and materials business. We currently operate design groups and production sites in Changwon, India (Doosan Power Systems India), and Vietnam (Doosan VINA), and through efforts to improve the technology and cost competitiveness of subsidiaries under the management of headquarters, we continue to maximize the synergy of global operations.

#### Major products and services

- Pulverized coal-fired boiler (PC boiler)
- Lignite Boiler
- Oil Boiler
- Downshot Boiler
- Circulating fluidized bed boiler (CFB Boiler)

#### Major project portfolios

- Rabigh PP2/Oil (Saudi, 700MW x 4)
- Bulk Order II (India, 800MW x 5)
- Shinboryeong #1,2 (South Korea, 1,000MW x 2)
- Mong Duong II (Vietnam, 600MW x 2)
- Vinh Tan #4 (Vietnam, 600MW x 2)
- Song Hau #1 (Vietnam, 600MW x 2)
- Gangneung Anin #1,2 (South Korea, 1,000MW x 2)
- Gosung Hai #1,2 (South Korea, 1,040MW x 2)
- Samcheok POSPower #1,2 Boiler, Environmental Equipment (South Korea, 1,050MW x 2)
- Sodegaura Biomass CFB (Japan, 75MW x 1)

## Introduction of Business

### Turbine | Generator



Doosan Heavy Industries & Construction is a world-class turbine and generator original equipment manufacturer that can design, manufacture and install core power plant equipment such as steam turbines, generators and heat exchangers/condensers. We provide steady power solutions that are optimized not only for new power plants in Korea and abroad but also for the improvement of aging power plants. Through ongoing technological development and innovation we are able to provide our customers with economical and high-quality products. Turbine is a state-of-the-art machine. High-pressure steam generated from boilers, steam generators, or HRSGs (heat recovery steam generator), rotates its blades, and the resulting rotational force is

used to activate the generator for producing electricity. Starting with the Seocheon Thermal Power Plant's 200MW steam turbine in 1978, we now supply steam turbines designed and manufactured in-house to more than 50 countries around the world. In addition, we are developing Korea's first gas turbine as part of a national project. Generator is a key component of power plants which generates electricity by turning the rotational force of the turbine into electromotive force. We are currently producing generators, ranging from the 100MW to 1,500MW-class, for large capacity steam turbines, gas turbines and diesel engines of 50 and 60 Hz.

#### Major products and services

##### Steam turbines

- DST-V (for industrial purposes)
- DST-G10 (for industrial/ power generation purposes)
- DST-G20 (for industrial / power generation purposes)
- DST-S10 Single/Double casing (for power generation purposes)
- DST-S20 (for power generation purposes)
- DST-S30 (for power generation purposes)
- DST-N (for nuclear power purposes)

##### Generators

- DGen-A (air cooling)
- Dgen-H (hydrogen cooling)
- Dgen-W (water cooling)
- DGen-N (water cooling, nuclear power)

##### Thermal exchangers

- Water Cooled Condenser
- District Water Heater
- High & Low Pressure Heater
- MSR (Moisture Separator & Reheater)
- Steam Jet Ejector
- Vent Steam Condenser
- Air Cooled Condenser

#### Major project portfolios

- Shinboryeong #1, 2 TPP 1,019MW x 2
- Shin Hanul \$1, 2 NPP 1,455MW x 2
- Vinh Tan #4 (Vietnam, 600MW x 2)
- Gangneung Anin #1,2 (South Korea, 1,000MW x 2)
- Goseong Hai Thermal Power Plant #1,2 TPP (1,040MW x 2)
- Songhau TPP 600MW x 2
- Hwaseong Dongtan 2 CHP 800MW x 1
- Fadhili CHPP 176MW x 2
- Muara Tawar CCPP 150MW x 1, 250MW x 2
- Assuit & Cairo west 650MW x 2
- Boryeong 3 R&M 550MW x 1
- Shin Kori #3,4 NPP 1,400MW x 2
- Samcheok POSPower #1, 2, Boiler, Environmental Facility (South Korea (1,050MW x 2)



## Introduction of Business

### Service

Based on our existing capabilities in new build sales, design, and PJT management, we began targeting the power generation service market in 2017 for the performance improvement, repair, maintenance, fuel conversion, etc., of power plants, and currently boast a range of domestic and overseas project references including the biomass fuel conversion of Yeongdong Thermal Power Plants #1 and 2, Eraring Power Station Upgrade Project (Australia), Bandel #5 R&M Project (India), and Morupule A Retrofit Project (Botswana). In addition, we are actively leveraging Doosan Babcock, which possesses long-term experience and know-how acquired over the years on the service industry, thereby creating organizational and personal synergy. Doosan Babcock also has a foothold in Europe and we operate regional hubs in the U.S. (DPSA), Middle East (DPSAr), and India (DPSI) to focus on not only the stable operation of and support for Korean power plants but also on extending our foundation for overseas businesses. In addition, we have developed a service package that provides digital-based services to customers in the power plant sector and concluded a pilot contract for Sasan #1 in India, completing the demonstration in 2019. In the future, we expect to maximize the performance and efficiency of the power plants through digital solutions, which will provide customers with significant additional profits.

#### Major products and services

- R&M
- O&M (Operating&Maintenance)
- Fuel conversion
- Diagnoses/evaluations
- Asset management
- Digital Solution
- RMS (Remote Monitoring Service)

#### Major project portfolios

- Eraring Power Station Upgrade (Australia, 660MW x 4)
- Bandel #5 Plant R&M (India, 210MW x 1)
- Morupule A Retrofit (Botswana, 30MW x 4)
- Sabarmati E&F (India, 110MW x 2)
- Performance improvement construction for Boryeong Thermal Power Plant Unit 3 (516MW x 2)
- Biomass fuel conversion for Yeongdong Thermal Power Plant Unit 1 (125MW x 1)
- Biomass fuel conversion for Yeongdong Thermal Power Plant Unit 2 (200MW x 1)

Eraring Thermal Power Plant in Australia



## 2018 Business Performance

### Export of core equipment to Sodegaura power plant in Japan

Doosan Heavy Industries & Construction first entered the Japanese power generation market by exporting core equipment to the Sodegaura biomass power plant in Japan. The contract for the design and supply of equipment such as boilers and turbines ordered by Chiyoda Corporation of Japan was concluded on November 2018 and based on the performance of this project, we are planning to push into the biomass market in Japan.

### Acquisition of contract for fuel conversion of Yeongdeong Thermal Power Plant #2

Doosan Heavy Industries & Construction won a KRW 70 billion contract for fuel conversion of the Yeongdong Thermal Power Plant #2, which was ordered by KOSEP in 2018. This is a project to convert the 200MW coal-fired power plant, which was built in 1979, into a biomass power plant. Doosan Heavy Industries & Construction plans to complete the project by replacing existing components, such as the boilers, by June 2020. Lignite biomass, which will be used at the Yeongdong Thermal Power Plant after the fuel conversion is completed, can help reduce air pollutants such as sulfur oxides and nitrogen oxides by 65-75% compared to existing coal fuels and eliminate 1.35 million tons of CO<sub>2</sub> per year. This will contribute to improving the environment.

### Contract signing for digital solution demo project and full commencement of business

Doosan Heavy Industries & Construction has been promoting commercialization of our Digital Solution since 2017. As such, we developed a combustion optimization/boiler tube monitoring system, a key solution needed for the commercialization of our services package 1.0 in 2018. This technology is currently under trial at Sasan Plant #1 in India and is expected to be completed in April 2019. After the completion of the demonstration, additional consultations are underway the possible extension of the Sasan #1 contract and rolling this out to additional units. Based on our performance at Sasan, we plan to expand our digital solution business to India, Vietnam, Indonesia and Chile.

### Entry into the North American steam turbine market and strengthening of our gas turbine business

Skoda Power, Doosan Heavy Industries & Construction's Czech subsidiary, concluded a contract for US Lansing PJT October 2018, achieving its first STG supply PJT in the US market. Lansing PJT won in 2018 is worth KRW 11 billion, and SKODA Power successfully won the orders for STG Scope by actively providing technical supports for the client. Doosan Turbomachinery Services (DTS) also acquired new gas turbine rotor supply and long-term rotor service PJTs from MCV, Michigan, USA. After recognizing the necessity of replacing MCV's rotor, DTS successfully won the order by proposing differentiated solutions such as new rotor replacement and extended rotor life. This PJT was awarded due to our gas turbine organization and support from Skoda Power, and we plan to further expand our gas turbine service business through our global network.

### Completion of Service Selling Package

Doosan Heavy Industries & Construction completed its Selling Package in 2018 to provide systematic services to power generation customers. The Selling Package includes 8 Business Modules, about 90 tech solutions and six customer-oriented KPIs. The Selling package was produced in catalog form and posted on the official website of Doosan Heavy Industries & Construction to provide an easy access to customers who are curious about the company's service business.





## Plant EPC

Doosan Heavy Industries & Construction has become a global EPC leader by maximizing customer satisfaction and providing total solutions based on its business portfolio, from power plants to general construction.



Mong Dung 2 Thermal Power Plant in Vietnam

### 2018 Highlights

- Contracted with JAWA 9,10 thermal power plant in Indonesia
- Received order for construction of Samcheok Thermal Power Plant

### 2018 Business Performance

Doosan Heavy Industries & Construction is promoting diversification into new markets and expansion of business areas based on its EPC performance capabilities. We have signed contracts for the transformation of the Grati combined-cycle thermal power plant, in 2016, conversion of the Muara Tawar combined-cycle power plant, in March 2017, and with JAWA 9 and 10 thermal power plants, in March 2019, thereby consolidating our position in Indonesia successfully. As a result of continuous efforts to expand into new markets and grow our business, we signed a contract with Sodegaura Biomass of Japan in November 2018 for the design and supply of equipment. In the domestic market, a consortium between Doosan Heavy Industries & Construction and POSCO E&C won an order for the 1,000 MW Samcheok Thermal Power Plant. In addition, large projects such as Song Hau1 in Vietnam and Fadhili in Saudi Arabia are under construction, and our EPC performance has been recognized.

### 2019 Forecast and Business Strategies

As the proportion of coal-fired power plants is expected to decrease due to the trend of Powering Past Coal in the power generation market, EPC projects are expected to meet with difficulties. In response to this trend, Doosan Heavy Industries & Construction will continue its efforts to enhance price competitiveness and competency in the combined-cycle power plant market, in which the scale of projects is expected to stay flat. In terms of our business portfolio, we plan to secure business opportunities through product diversification. We will continue to make incursions into new businesses including the biomass business, and maximize our potential to win contracts by expanding domestic construction business opportunities, especially those related to power generation projects such as the construction of nuclear power plants overseas, general construction, and projects related to national policy. In terms of implementation, we plan to reflect the successful experiences we had with Rabigh 2 in Saudi Arabia and Vinh Tan 4 in Vietnam, while enhancing competitiveness through advanced outsourcing of management and systematic operation of manpower. In addition, we will continue to be a leader in power plant EPC projects by integrating digital technology into power plant construction, reflecting the digital needs of customers.



Vinh Tan 4 Coal-fired Thermal Power Plant in Vietnam



Gheco Oae thermal power plant, Thailand



Jebel Ali M Combined Cycle Power Plant, UAE

## Introduction of Business

Doosan Heavy Industries & Construction holds competency in EPC (Engineering, Procurement and Construction) with which we can execute the entire process, from power plant design and supply of equipment to construction and trial operation, and we have completed a number of successful domestic and overseas projects. Customer satisfaction is achieved by meeting performance, delivery period, and quality objectives and offering a comprehensive solution through the provision of in-depth services from the initial stage to the completion of a project. We conduct various projects in domestic and overseas general plants, civil engineering, and construction industries based on our broad spectrum of experience and technology, and continue to lead changes in social infrastructure and residential environments.

## Major products and services

- Power plant
  - Thermal power plant
  - Combined-cycle power plant
- General plant
- Civil engineering
- Architecture

## Major project portfolios

- Rabigh Power Plant No.2 TPP (Saudi Arabia): 700MW x 4
- Mong Duong II TPP (Vietnam): 600MW x 2
- Vinh Tan 4 TPP (Vietnam): 600MW x 2
- Song Hau 1 TPP (Vietnam): 600MW x 2
- Vinh Tan 4 Extension TPP (Vietnam): 600MW x 1
- Sipat TPP (India): 660MW x 3
- Mundra TPP (India): 800MW x 5
- Raipur TPP (India): 685MW x 2
- Obra 'C' TPP (India): 660MW x 2
- Jawaharpur TPP (India): 660MW x 2
- Gheco One TPP (Thailand): 700MW x 1
- Saemangeum TPP (Korea): 152MW x 2
- Samcheok TTP (Korea): 1,050MW x 2
- UAE Jebel Ali M CCPP : 2,000MW
- Qurayyah (Add-on) CCPP (Saudi Arabia): 1,330MW
- Fadhili CCPP (Saudi Arabia): 1,519MW
- Karabatan CCPP (Kazakhstan): 310MW
- Grati Add-on (Indonesia)
- Muara Tawar Add-on (Indonesia)
- Sodegaura Biomass (Japan): 75MW
- Hwaseong Dongtan CCPP (Korea): 800MW
- Seoul Combined Cycle Power Plant(CCPP) (Korea) : 800MW
- Shin Kori#3, 4 nuclear power plant construction (Korea)
- Shin Kori#5, 6 nuclear power plant construction (Korea)
- Samcheok LNG #5, 6, 7 storage facility (Korea)
- Noibai-Laocai Highway (Vietnam)
- Incheon-Gimpo Expressway (Korea)
- Wonju-Gangneung railroad construction (Korea)
- Samcheok Green Power ground work (Korea)
- Suncheon Doosan We've (Korea)
- Trimage (Korea)
- Doosan Alf-heim (Korea)

## Main Performance and Results of 2018

### Signed contract with JAWA 9, 10 thermal power plant in Indonesia

We signed a contract to construct JAWA 9 and 10 thermal power plants, totaling about KRW 1.9 trillion (Doosan Heavy Industries & Construction Co., Ltd.: KRW 1.6 trillion), which will be constructed in West Java, Indonesia. The project will be executed with HK, a local state-owned construction company in consortium. Following the success of the Grati combined-cycle power plant in 2016 and the Muara Tawar combined-cycle power plant in 2017, the company is consolidating its position in the Indonesian market. The company will supply two 1,000MW class power plants that adhere to global environmental standards, and will complete EPC in 2024.

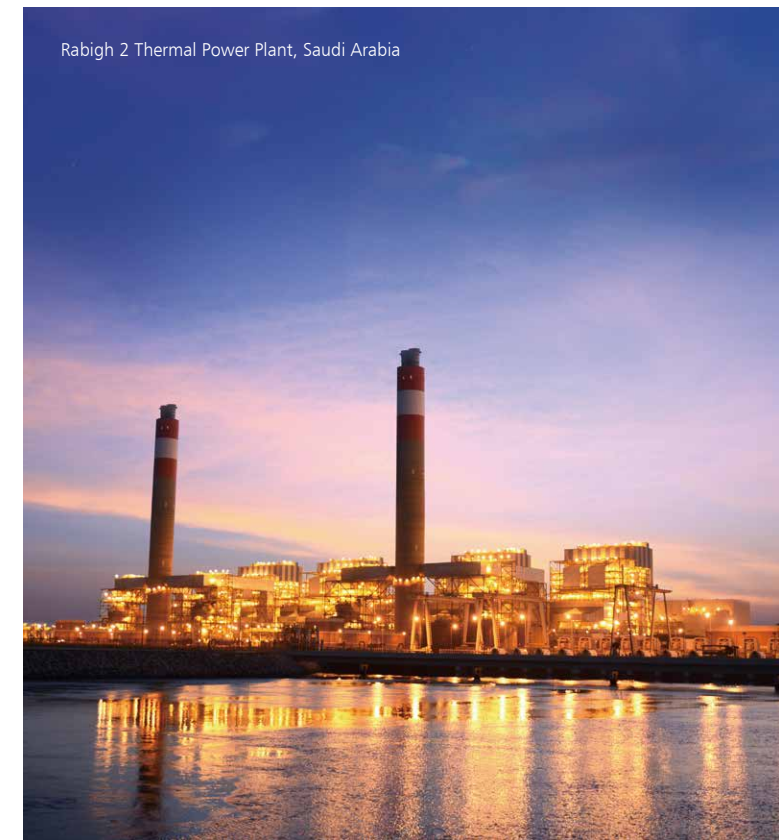
### Contract won for Samcheok Thermal Power Plant Project

Doosan Heavy Industries & Construction won the order for the construction of the Samcheok Thermal Power Plant, the fifth 1,000MW thermal power plant in Korea. The total construction cost is about KRW 3.5 trillion, and Doosan Heavy Industries & Construction (KRW 1.8 trillion) will work in consortium with POSCO E&C (KRW 1.7 trillion). The power plant will be built in Samcheok, Gangwon-do, and the total power generation capacity will be 2,100MW (1,050MW X 2 units). Following the USC method, the first is scheduled to will be completed in 2023 and the second unit in 2024. At this time, we will have built a world-class eco-friendly power plant and secured the construction of a unique domestic 1,000MW thermal power plant. We will actively pursue overseas markets based on this achievement.

### First entry into the Japanese power market

We signed a contract in November 2018 for the design and supply of core equipment such as boilers and turbines for the Biomass power plant to be built in Sodegaura City, Chiba Prefecture, Japan. Doosan Heavy Industries & Construction will supply its own CFB (Circulating Fluidized Bed) boiler and high efficiency steam turbine to the power plant. Biomass is a wood-based fuel made from wood, grains and plants. It has been attracting attention as an eco-friendly energy source because it contains almost no sulfur oxide, which is the main cause of pollution, and its nitrogen oxide emissions are only about 30% those of coal. It is meaningful that this contract has provided the basis for further advancement of the biomass power generation market and the conservative growth of the Japanese power generation market.

Rabigh 2 Thermal Power Plant, Saudi Arabia



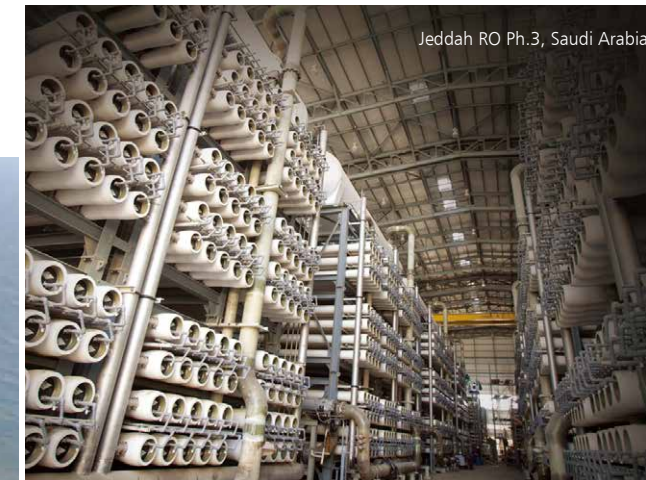
### Major construction site achieves accident-free hours

The Fadhili construction site (15 million hours) and Jawaharpur construction site (6 million hours) have reached accident-free operational status. This is only possible without a single LTI (Lost Time Incident) for a certain period after the start of construction. These achievements are the result of the steady development of autonomous safety activities with our partners based on a systematic EHS (Environmental Health and Safety) system.



## Water Plant

As a global leader in the water industry, we offer a full range of solutions, from seawater desalination to water treatment.



Shuaibah Ph.3 Seawater desalination plant, Saudi Arabia

### 2018 Highlights

- Received order for desalination plant in Oman
- Won contracts for eco-friendly water treatment facilities (mid-long term water treatment facilities in United Kingdom, zero-discharge waste water system in Southeast Asia)

### 2018 Business Performance

As a global leader in the water industry, we offer a full range of solutions, from seawater desalination to water treatment. Doosan Heavy Industries & Construction has solidified its position as a global water solution provider based on its stable technology and high customer trust despite difficulties in the global water market, leading to plant orders and efficiency demands. In particular, we won a privately-funded desalination project in Oman through equity participation, strengthened our position in the Middle East desalination market, and expanded our business scope to EPC and Developer. In the field of water treatment, we also signed a contract to supply large-scale water treatment facilities from the UK water service provider and completed a water treatment plant in Oman. In the water treatment field, we also reaffirmed the customer's trust in our technology and performance capabilities.

### 2019 Forecast and Business Strategies

In 2019, it is expected that the seawater desalination market will continue to be focused mainly on privately-funded projects primarily in the Middle East, which is a major buyer. With the recent shift in orders from privately-owned companies and aggressive sales activities of major competitors, competition in the market is expected to intensify, but Doosan Heavy Industries & Construction plans to secure competitiveness through pricing and technological development. In addition, we are actively participating in the private equity business and expanding to a long-term business linked to EPC, securing a stable source of income and, in particular, securing efficient plant operation technology using Digital Solution. By region, we plan to secure EPC orders through equity participation for large-scale privately-owned desalination projects in the Middle East, including Saudi Arabia and Kuwait. In particular, we are continuing to strengthen our competitiveness in efficient plant operation in conjunction with Digital Solution. In the Middle East and elsewhere, we expect to expand our business by focusing on new markets, such as Chile and Egypt. In addition, Doosan Enpure, a subsidiary in the UK, will accelerate the expansion of business through the acquisition of advanced water treatment facilities.



Water treatment facilities

## Introduction of Business

Possessing extensive of experience in supplying and operating seawater desalination and water treatment plants both in Korea and overseas, Doosan Heavy Industries & Construction seeks the maximum satisfaction of its customers through various business models that not only supply mere equipment and facilities, but also offer operation and maintenance services for private sector projects, including turnkey projects.

### Desalination equipment

Doosan Heavy Industries & Construction is one of the world's top seawater desalination players, owning independent patents related to the reverse osmosis (RO) method, which uses membranes to filter out salt, and thermal technology that evaporates the source water then condensates vapor, both of which are key technologies in seawater desalination. Doosan Heavy Industries & Construction has secured large-capacity facility technology for the RO method, which has recently been applied to various large desalination facilities, and also possesses world-class technology and experience as the leader of the field of thermal seawater desalination, represented by MSF (Multi-Stage Flash) and MED (Multi-Effect Distillation).

### Eco-friendly water treatment facilities

Along with Doosan Enpure, a U.K.-based affiliate and an expert in fresh water and sewage treatment, sludge treatment and the technology to turn sludge into energy, Doosan Heavy Industries & Construction possesses engineering competency and experience that encompass the entire field of water treatment. Through the advanced treatment technology utilizing membrane filtration and evaporation that it has been accumulating in the seawater desalination business, Doosan Heavy Industries & Construction supplies Reuse facilities and equipment tailored to different needs including the removal of specific harmful industrial substances, maintenance of rivers, landscaping, agricultural, industrial water, etc.

### Zero liquid discharge treatment facilities

Based on our know-how from existing desalination facilities, we have succeeded in developing ZLD (zero liquid discharge), which can totally block or minimize the discharge of wastewater and produce high-purity reusable water. With this technology, desulfurized wastewater from power plants at home and abroad is being supplied to the treatment industry, and we will expand its application in to the oil & gas market in the future.

### Major products and services

- Seawater desalination plant
  - Reverse osmosis (RO)
  - Multi-effect distillation (MED)
  - Multi-stage flash (MSF)
- Water treatment & sewage and waste water treatment plant
  - Drinking water treatment, power plant and industrial water treatment
  - Sewage treatment and reuse
  - Power plant and industrial waste water treatment
- Plant operation and maintenance
- Sludge treatment and resource recycling plant
- Eco-friendly Zero Liquid Discharge treatment facilities
- Pressure flotation equipment (Enflo-DAF™)
- Low-energy anaerobic MBR system (LENA MBR)
- Large-capacity fiber filter (Doosan Fiber Filter)

### Major project portfolios

- Shoaibah Ph.4, Saudi Arabia
- Yanbu Ph.3, Saudi Arabia
- Yanbu MED, Saudi Arabia
- Marafiq MED, Saudi Arabia
- Ras Al Khair Ph.1 (Hybrid), Saudi Arabia
- Jeddah SWRO Ph.3, Saudi Arabia
- Shuaibah RO Expansion, Saudi Arabia
- Shuaibah IWPP, Saudi Arabia
- Sohaiba Ph.2, Saudi Arabia
- Fujairah Ph.1 (Hybrid), United Arab Emirates
- Jebel Ali 'E', United Arab Emirates
- Sharqiyah IWP RO, Oman
- Sohar IWPP, Oman
- Al Ahnsab STP, Oman
- Ras Laffan B, Qatar
- BAPCO MED, Kingdom of Bahrain
- Doha RO Ph.3, Kuwait
- Shuwaikh SWRO, Kuwait
- Sabiya Ph.1&2, 3, Kuwait
- Az Zour South Ph.2, Kuwait
- Shoaibah Pumping Station 'C', Kuwait
- Benghazi, Libya
- AMP 7 water treatment business, United Kingdom
- Birmingham Resilience, United Kingdom
- Strongford THP, United Kingdom
- Horsley WTW, United Kingdom
- Woodmansterne, United Kingdom
- Bellozanne New STW Ph.3, United Kingdom
- Northumbrian Water, United Kingdom
- Southern and East Water, United Kingdom
- Escondida Water Supply, Chile
- Obra-C ZLD, India
- Song Hau ZLD, Vietnam
- Gijang SWRO, Republic of Korea
- Yeong-heung ZLD, Republic of Korea

## Main Performance and Results in 2018

### Expansion of business area with order of desalination plant in Oman and equity participation

Doosan Heavy Industries & Construction won an order for the "Sharqiyah RO" seawater desalination plant from OPWP. The company participated in the construction of a seawater desalination plant as well as a joint venture with Japanese and Omani companies. Doosan Heavy Industries & Construction is expanding its business scope to "developer" to develop and operate a seawater desalination project. We can expect additional revenue for 20 years. With this order, Doosan Heavy Industries is consolidating its position by re-entering the Oman market following Sohar seawater desalination and Al Anab sewage treatment plants.

### Order for a seawater desalination facility in Bahrain

Doosan Heavy Industries & Construction won an order for the "BAPCO MED" desalination plant in Bahrain. We successfully supplied the Yanbu Ph.2 Exp. (the world's largest single-capacity MED facility) and the Marafiq MED seawater desalination plant in Saudi Arabia. With this order, Doosan Heavy Industries & Construction secured MED technology and competitiveness in the desalination market.

### Contract to supply a long-term water treatment system to a UK-based water service company

Doosan Enpure, DHIC's overseas subsidiary, signed an 8-year agreement for water and sewer plant design, equipment supply, and construction and maintenance service in the midland region of the United Kingdom with Seven Trent Water, the water service utility in the Birmingham region.

### Contract to supply a desulfurized wastewater ZLD system to a thermal power plant in Southeast Asia

By commercializing its internally-developed ZLD (Zero Liquid Discharge) system, Doosan Heavy Industries & Construction won bids for desulfurized wastewater ZLD projects at thermal power plants in Obra-C, India and Song Hau, Vietnam. This system is the most advanced eco-friendly facility that can process not only suspended solids and heavy metal components filtered through existing water treatment facilities, but also nitrates and selenium, which have become regulated elements around the world. Through this project, the thermal power plants are now capable of purifying about 300m<sup>3</sup> (Obra-C) and 312m<sup>3</sup> (Song Hau) of desulfurized water every day. Doosan Heavy Industries & Construction's desulfurized wastewater desalination system has been expanding into the Southeast Asian market, following the Yeongheung Thermal Power Plant in Korea last year.

### Completed Al Ansab phase 2 sewage treatment plant in Oman

Doosan Heavy Industries & Construction successfully completed Phase 2 of the Al Ansab sewage treatment plant in Oman. The Al Ansab project is the largest-capacity sewage treatment plant in the Middle East and North Africa with an MBR (membrane bio reactor) and has proven its outstanding EHS capabilities by achieving 3 million hours of zero-accident time after the commencement of construction.



# Nuclear

Doosan Heavy Industries & Construction is the world leader in major components for nuclear equipment, having supplied the largest number in the world for the past 30 years. We are recognized for the design and manufacturing technology of the world's best nuclear power equipment, and will continue to make efforts to become a global leader in the nuclear power market by taking part in the development of projects and technology for small and medium-sized nuclear power plants, transport/storage containers for spent nuclear fuel, nuclear dismantling, etc.



Nuclear power plant steam generators

Nuclear power plant reactor vessel

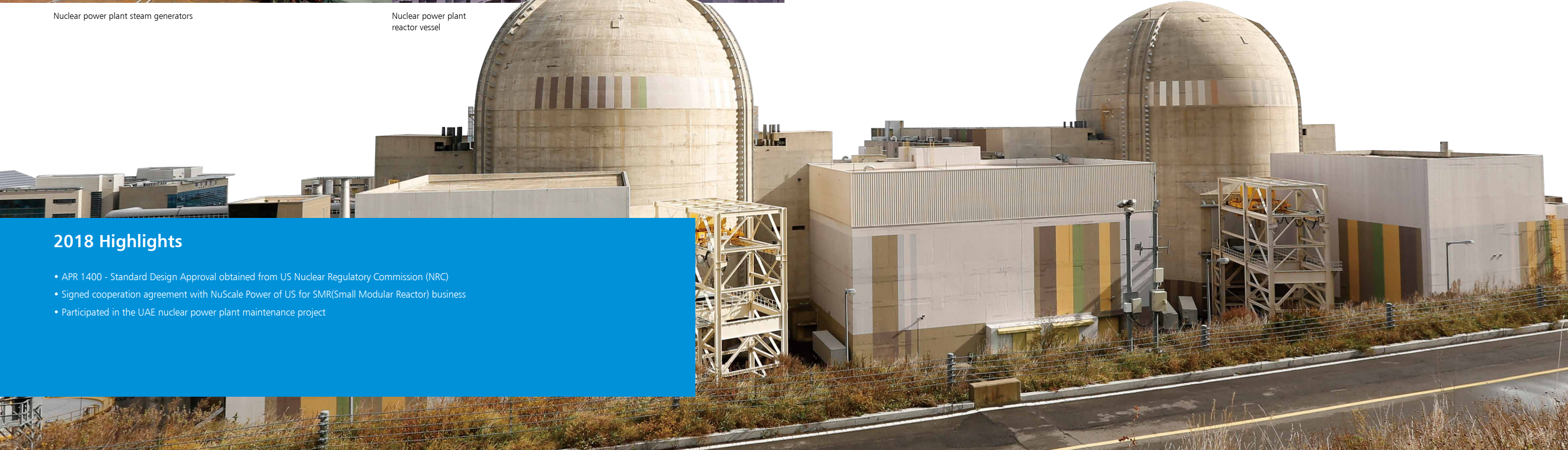
## 2018 Business Performance

DHIC carries out projects to strengthen the safety of nuclear power plants in order to conform to the national energy conversion policy. These include the Hanul #1&2 Replacement Reactor Vessel Head project that uses high-quality products with enhanced materials and the latest technologies, such as automatic welding, Hanul #3&4, and Hanbit #5&6 CEDM nozzle preventive maintenance project to help to maintain the nuclear ecosystem through joint project execution with small but competitive companies based on the proven technologies. Moreover, despite the governmental decision to suspend the construction of all new nuclear power plants in Korea, APR1400, which is Korea's nuclear reactor model, received to our advantages it's exports the US NRC Standard Design Approval in recognition for its technology and safety.



## Forecast and Business Strategy for 2019

In response to the government's policy to continue the energy conversion, DHIC is actively working to win major overseas nuclear power plant projects in countries like Czech Republic, Saudi Arabia, and India, as well as SMR (Small Modular Reactor) projects, such as NuScale in the United States and SMART in Saudi Arabia. Orders for transport and storage containers (cask) project is expected to be delayed due to another review of post-usage nuclear fuel processing plans and approval issues. Nevertheless, DHIC plans to implement its commercialization program by participating in new business and technological development to enhance the safety of existing nuclear power plants and complete decommissioning.



## 2018 Highlights

- APR 1400 - Standard Design Approval obtained from US Nuclear Regulatory Commission (NRC)
- Signed cooperation agreement with NuScale Power of US for SMR(Small Modular Reactor) business
- Participated in the UAE nuclear power plant maintenance project

## Introduction of Business

Starting with Hanbit Nuclear Power Plant Units 1 and 2 in 1986, Doosan Heavy Industries & Construction has been supplying major equipment and machines to all Korean nuclear power plants. We have participated in the development of OPR1000, the first-ever Korean model of a nuclear power plant, and have manufactured and supplied 12 units of OPR1000 primary equipment thus far. Our technology and quality have also been recognized worldwide for a contract with Qinshan Phase III 1 and 2, our first-ever major contract to supply steam generators for an overseas power plant, as well as for the supply of replacement steam generators to Sequoyah in the U.S. and AP1000 nuclear reactors and steam generators to China and U.S. The Barakah Nuclear Plant Units 1 through 4 in United Arab Emirates, an order obtained as a part of Team Korea in 2010, were successfully supplied "on time and within budget," and thus acknowledged by international customers as a reliable and economical nuclear power plant model. With the development of a nuclear reactor cooling pump and nuclear power plant measurement control system design and production technology in 2012, the complete domestication of nuclear power plants has now been accomplished. All of the major equipment and machines have been manufactured and supplied beginning with Shin Hanul Unit 1 and 2, but we continue to expand our areas of participation in domestic and foreign service markets through the acceleration of technical development in post-usage nuclear fuel transport/storage containers (casks) and nuclear power plant decommissioning. We aim to continuously develop technology and diversify our business areas in order to become a global leader in the nuclear power plant market, and actively support the discovery of local companies and technical transfers for reinforced competency in of countries aiming to introduce nuclear power plants.

### Major products and services

#### Major and auxiliary devices

- Nuclear reactors and internal structures
- Steam generators
- Nuclear reactor cooling pumps
- Measurement control for nuclear power plants

#### Providing an integrated package

- Control rod actuator
- Pressurizer
- Nuclear reactor upper structure
- Nuclear fuel handling devices
- Primary reactor containment post-tensioning system
- Condenser and thermal exchanger
- Pressure vessels and tanks
- Containment vessels for post-usage nuclear fuel

#### Service for operating nuclear power plants/measurement control

- Supply of replacement devices
- Maintenance and non-destructive tests
- Upgrades and improvements
- Technical support
- Upgrading measurement control at operating nuclear power plants

### Major project portfolios

- Wolsong #2, 3, 4 (Korea): 700MWe x 3
- Hanbit #1, 2 & Hanul #1, 2 (Korea): 950MWe x 4
- Hanbit #3, 4, 5, 6 & Hanul #3, 4, 5, 6 & Shin Kori#1, 2 & Shin Wolsong #1, 2 (Korea): 1,000MWe x 12
- Shin Kori #3, 4, 5, 6 & Shin Hanul #1, 2 (Korea): 1,400MWe x 6
- Replacement Reactor Vessel Heads for Kori #1, 2 (Korea): 600 Mwe x 2
- Replacement Reactor Vessel Heads for Hanbit #3, 4 (Korea): 1000 Mwe x 2
- Replacement Reactor Vessel Heads for Hanul #1, 2 (Korea): 950 Mwe x 2
- Replacement Steam Generator for Kori #1 (Korea): 600 Mwe x 1
- Replacement Steam Generators for Hanul #1, 2 (Korea): 950MWe x 2
- Replacement Steam Generators for Hanul #3, 4 (Korea): 1,000MWe x 2
- Replacement Steam Generators for Hanbit #3, 4 (Korea): 1,000 Mwe x 2
- Replacement Steam Generators for Hanbit #5, 6 (Korea): 1,000 Mwe x 2
- Replacement Steam Generators for Sequoyah #1, 2 & Watts Bar #1, 2 (United States): 1,200MWe x 4
- Replacement Reactor Vessel Heads for Arkansas Nuclear One (ANO) #2 (United States): 890 MWe x 1
- Replacement Reactor Vessel Heads for Palo Verde #1, 2, 3 (United States): 1,300 MWe x 3
- Replacement Reactor Vessel Heads for Waterford #3 (United States): 1,160 MWe x 1
- Replacement Reactor Vessel Heads for Virgil C. Summer #1 (United States): 971 MWe x 1
- Vogtle #3, 4 and Virgil C. Summer #2, 3 (United States): 1,150MWe x 4
- Barakah #1, 2, 3, 4 (United Arab Emirates): 1,400MWe x 4
- Qinshan Phase III #1, 2 (China): 700MWe x 2
- Qinshan Phase II #3 (China): 600MWe x 1
- Sanmen #1 & Haiyang #1 (China): 1,250MWe x 2
- Lufeng #1 Reactor Vessel Internal (China): 1,250MWe x 1

## Casting & Forging

We have established a total production facility for the manufacturing and processing of essential materials for various industries, including power generation, shipbuilding, steel and automotive. Furthermore, cast and forged products of outstanding quality have been supplied all over the world based on our excellent technology and deep experience.



### 2018 Business Performance

Based on the trust of customers, we have maintained our existing business, producing 100 million horsepower worth of crankshafts for vessels even as the global economic slump caused a reduction of demand in frontline industries. In the marine plant industry, we have become a major player globally by utilizing our existing core competencies and we have achieved visible achievements by successfully supplying various products through partnership with our customers. We have been recognized for our technological power by delivering nuclear fuel transport and storage containers (casks) to Europe. In addition, we have successfully advanced into the hydrogen market and the aerospace industry by supplying materials developed with our own technology and have been recognized for it.

### 2019 Forecast and Business Strategies

Though the volume of the domestic power generation industry is expected to decrease due to changes in domestic power source policies, major frontline industries related to casting and forging such as shipbuilding, automotive and steel are forecast to grow thanks to a turnaround in the economy. Thus, we aim to continuously maintain close-knit collaboration with major customers in shipbuilding, etc., to maintain our dominant position in existing markets while looking to grow our businesses through market expansion into overseas regions and the promotion of new product businesses such as marine plants, which will lead to improved business portfolios. Also, we will continue to strengthen our fundamental competitiveness by securing technology for new materials and processes with high added value including high-efficiency, high-specification, and high-strength materials, as well as by developing solutions technology optimized for major processes. We plan to maximize the productivity and business performance of the world's greatest 17,000 ton forging press, which has been newly activated, in order to maintain our rank as the leading global casting and forging company.



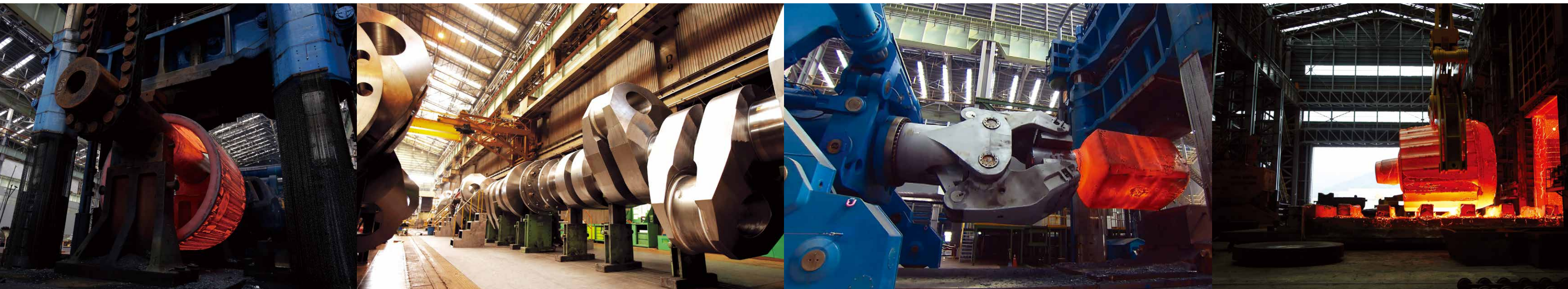
Shin Hanul nuclear power plants



Work Roll



Die steel



**Introduction of Business**

The casting and forging business of Doosan Heavy Industries & Construction started in 1973 and, based on technical knowledge and production experience accumulated since the foundation, the company manufactures and supplies castings and forgings products of the highest quality to its customers. Large-scale steel, casting, forging, and machining shops boast the latest automation facilities, digital-converged process optimization systems and strict quality assurance based on various quality certifications. The steel mill contains a 100-ton electric furnace, has 250,000 tons of annual production capacity, and can produce a maximum 650 tons of ingot.

The casting factory possesses a 17,000-ton press, 140,000 tons of annual production capacity, and can produce more than 350 tons of large-sized cast products. As demand industries continue to become more and more advanced, we aim to continue to secure a competitive edge through consistent investments in the establishment of an optimum infrastructure that can help produce high added-value, highly functional metal materials such as remelting equipment related to high-purity steel production, thus seeking to create the greatest value for the customers. In addition, by discovering new products capable of securing external growth and profitability, we are aggressively enhancing our business portfolio. Based on such capabilities, the company consistently exports products to China, Southeast Asia, Japan, Europe, and the U.S., and, after being acknowledged for its product manufacturing technology and competitiveness in exports by the Ministry of Trade, Industry and Energy, currently owns the distinction of the world's best for 9 products including mold steel, crankshafts for vessels, work rolls, and low-pressure turbine rotor shafts.



100-ton EAF      150-ton ESR      17,000 tons hydraulic forging press      4,200 tons press (max. 650-ton ingot)

**Major products and services**

- Shell and head for nuclear power generation
- Runner and crown for hydroelectric power generation
- Turbine rotor and casting for thermal power generation
- Wind power turbine generator materials
- Crankshaft for vessel engines
- Offshore plant materials
- Axial mooring shaft and rudder horn for vessels
- Mold steel and tool steel for cars and electronic products
- Roll for steel industry
- Shell for chemical engineering advancement equipment
- Large casting and forging materials for industrial use

**Major project portfolios**

- Shin Hanul Unit #3,4 nuclear power
- CASK nuclear power, Europe
- Anin Thermal Power STG, Gangneung
- Soldier Pond Hydroelectric Power turbine, Canada
- 2MW wind power turbine, Japan

**Shipbuilding/maritime**

- 20000TEU ultra-large container ships for Daewoo Shipbuilding & Marine Engineering
- European semi-submersible crane vessel

**Steel**

- POSCO board press roll
- Rolling stand at VOESTALPINE Steel Mill in Australia
- Rolling stand of NUCOR steel mill, USA

**Industry**

- USA LEHIGH HEAVY press facility
- Cement ROTARY KILN
- FLSMIDTH crushing and grinding equipment at Chilean mines
- Mold tool steels for cars and home appliances

**Key Performance Results & Accomplishments in 2018**

**Sustainable growth of the shipbuilding business**

(Total marine engine crankshaft production achieves 100 million horsepower)

The marine engine crankshaft business, which started in 1993, achieved the feat of producing 100 million horsepower within the span of 26 years. This would be equivalent to 3,300 units of ship engines, which equates to 10 percent of the large-sized ships operating globally. This accomplishment was achieved five years faster than that of competitors, owing to the company's continuous development of technology and productivity improvements. As the global shipbuilding economy is showing signs of improvement, we plan to continuously satisfy our customers' demands of delivering products of the finest quality.

**Increase in Orders from Offshore Plants**

(Increasingly winning contracts as parts supplier for world's largest offshore plant/ decommissioned ships and FPSO vessels)

The offshore plant business, which utilizes our existing core competencies, has been recognized for its technological prowess in successfully supplying various products through partnership with major clients. In addition, it has received additional orders for core components of dismantled vessels from the world's largest offshore plant and successfully won a contract for supplying the components for a FPSO(floating production, storage and offloading) unit to an offshore plant in Europe. Based on our successful supply of key components for offshore plants, we are seeing greater brand recognition in the offshore plant market, and we expect the company to win even more orders.

**Development of a new growth engine and successful entrance into a new market**

(Supply of hydrogen energy equipment tanks/aerospace industry materials)

We have completed the design of our own model of hydrogen energy equipment tanks developed with our own technology as a new growth engine. In addition, we have expanded product diversification to meet customer needs and plan to start mass production as the hydrogen energy market expands. In addition, we have successfully advanced into the hydrogen market and the aerospace industry by supplying aerospace industry materials developed with our own technology, which we have been recognized for its technology.





02

## Commitments to Sustainability

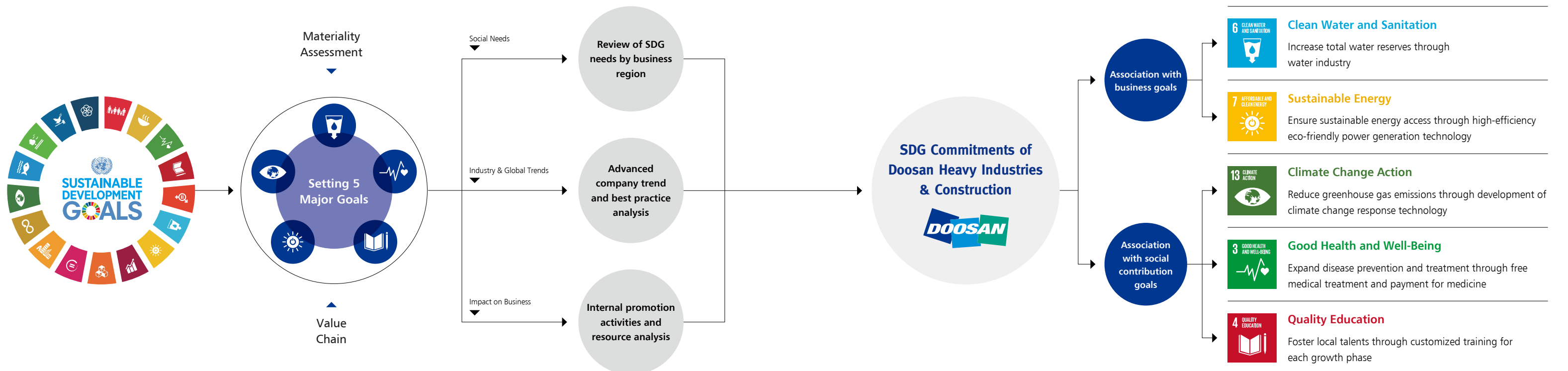
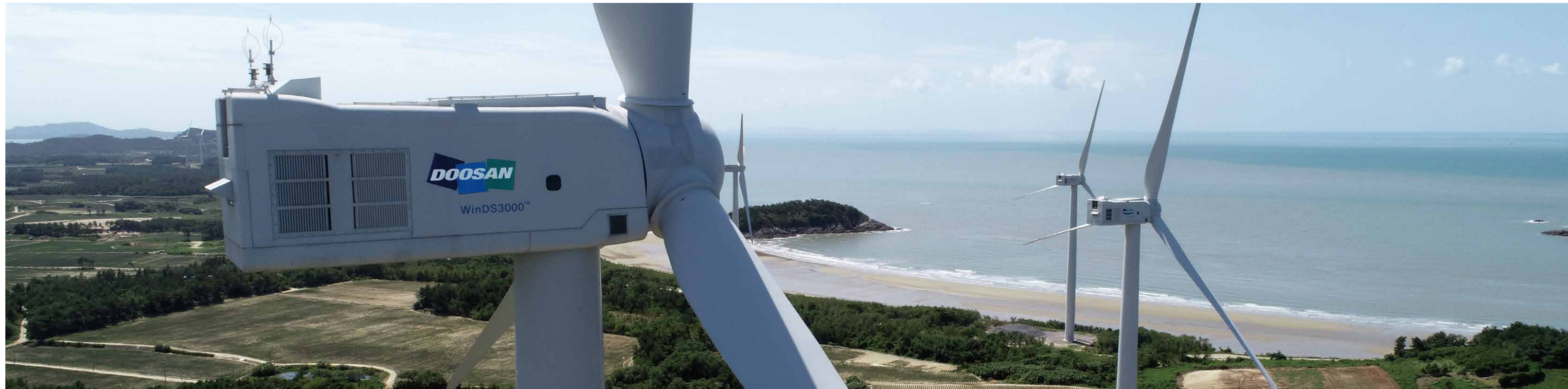
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## SDG Alignments






Doosan Heavy Industries & Construction is strengthening its social responsibility management activities based on SDGs (sustainable development goals). Social responsibility management activities are recognized as a major strategy for creating new business opportunities in accordance with social and environmental changes and contributing to society.

Doosan Heavy Industries & Construction selected 5 SDGs for the company by analyzing their relevance and importance to our business, and established Doosan Heavy Industries & Construction's 2030 SDG Commitment with a focus on those areas. We plan to further strengthen our activities as a global corporate citizen based on the 2030 SDG Commitment.



# 2030 SDG Commitments

Based on its business characteristics and sustainability activities, Doosan Heavy Industries & Construction has set up the following SDG commitments for itself in five key areas and is managing the related activities systematically. 1) Increase the size of water reserves; 2) Ensure access to sustainable energy; 3) Reduce greenhouse gas emissions; 4) Prevent diseases and expand access to treatment; and 5) Foster local talents.

	Link to SDGs	Commitments	Major Activities and Achievements in 2018	Future plans	
 <p><b>6</b> CLEAN WATER AND SANITATION</p>	<p><b>Commitment 1</b> Increase Size of Total Water Reserves</p>	<p><b>SDG 6.</b> <b>Clean Water and Sanitation</b> Ensure the availability and sustainable management of water and sanitation for all 6.1/6.3</p>	<p>"By 2030, through our water project, we will increase total water reserves in the Arabian Peninsula by 10% (2 billion tons) compared to BAU and continuously expand the supply of water resources in all regions around the world that face water shortages."</p>	<ul style="list-style-type: none"> <li>• Completion of seawater desalination plant in Yanbu, Saudi Arabia                     <ul style="list-style-type: none"> <li>- Production of 550,000 tons/day of water (Yanbu Ph.3)</li> </ul> </li> <li>• Acquisition of 'No Desulfurization System for Desulfurized Wastewater' for eco-friendly water treatment technology</li> <li>• Acquisition of UK water treatment project (Birmingham water treatment plant design/supply of equipment, 2017)</li> <li>• Acquisition of order for seawater desalination plant in Saudi Arabia</li> <li>• Acquisition of order for seawater desalination plant in Oman</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing production volume of fresh water through additional construction of large-capacity desalination facilities</li> <li>• Managing eco-friendly water through additional supply of sewage and waste water treatment facilities</li> <li>• Continuously developing water reuse technology</li> </ul>
 <p><b>7</b> AFFORDABLE AND CLEAN ENERGY</p>	<p><b>Commitment 2</b> Ensure Access to Sustainable Energy</p>	<p><b>SDG 7.</b> <b>Affordable and Clean Energy</b> Ensure access to affordable, reliable, sustainable and modern energy for all 7.1/7.2/7.3</p>	<p>"With our high-efficiency, eco-friendly power generation technology, we will increase the amount of eco-friendly coal-fired thermal power supplied to emerging markets around the world by 6% (40GW) compared to BAU by 2030, and by enhancing energy technology in high-efficiency gas turbines, wind power, ESS, etc., we will contribute to the diversification of the overall energy mix."</p>	<ul style="list-style-type: none"> <li>• Energy Fuel Conversion Project to Reduce Carbon Dioxide Emissions: received order for fuel conversion of Yeongdong Thermal Power Plant #2 (conversion from existing coal fuel system to biomass fuel system)</li> <li>• Wind power:                     <ul style="list-style-type: none"> <li>- Contract for maintenance and repair of offshore wind power demonstration complex in Southwest Sea</li> <li>- Signing of MOU for 'Offshore Wind Power Project' with Korea Western Power Co. / Korea South-East Power Co.</li> </ul> </li> <li>• ESS:                     <ul style="list-style-type: none"> <li>- Construction of large energy storage system for power demand management (12MW/70MWh system in Doosan Heavy Industries &amp; Construction Changwon Plant)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Continuous expansion of offshore wind power business</li> <li>• Continuous acquisition of orders for ESS to respond to load variations taking place due to expansion of new and renewable energy</li> <li>• Development of gas turbines</li> <li>• Demonstration of hydrogen liquefaction plant</li> </ul>
 <p><b>13</b> CLIMATE ACTION</p>	<p><b>Commitment 3</b> Reduce Greenhouse Gas Emissions</p>	<p><b>SDG 13.</b> <b>Climate Change Action</b> Take urgent action to combat climate change and its impacts 13.1</p>	<p>"By 2030, we will reduce the amount of greenhouse gas emissions that occur over the course of our business within Korea by 20% (70,000 tons) compared to BAU, and continue to develop climate change response technology to reduce greenhouse gases."</p>	<ul style="list-style-type: none"> <li>• Installation of 1.5MW + ESS 3MWh photovoltaics system in Changwon Plant parking lot</li> <li>• First in the industry to develop carbon emission facility real-time communication module NB-IOT system enabling, standardized response and contributing to emissions reduction through BIG DATA management</li> <li>• Completion of 12MW/70MWh large-scale energy storage system for power demand management</li> <li>• Winning the 2018 Korea Green Climate Award</li> <li>• Reduction of 5,500 tCO<sub>2</sub> through OE and process enhancement activities at Changwon Plant</li> <li>• Obtaining certification for the 2016-2018 Energy Champion site (selected as best place in the government review on energy efficiency and greenhouse gas reduction)</li> </ul>	<ul style="list-style-type: none"> <li>• Steel supply part of steelmaking plant is smart, big data management is used to reduce fuel costs by more than 30% and plans are in place to reduce greenhouse gas emissions by 2020</li> <li>• Overseas CDM project will be further explored, and 20,000 tons of high-efficiency stoves will be deployed in 2020 to develop 20,000 tons of overseas carbon credits through greenhouse gas reduction</li> </ul>
 <p><b>3</b> GOOD HEALTH AND WELL-BEING</p>	<p><b>Commitment 4</b> Prevent Diseases and Expand Treatment</p>	<p><b>SDG 3.</b> <b>Good Health and Well-Being</b> Ensure healthy lives and promote well-being for people of all ages 3.4</p>	<p>"By 2030, we will provide basic medical supplies and support local treatments for 80,000 members of minority groups residing in impoverished areas of Vietnam and India, thus contributing to the improvement of global health and sanitation."</p>	<ul style="list-style-type: none"> <li>• Local treatment activities by Doosan Vina and Chung-Ang University Hospital (Vietnam)                     <ul style="list-style-type: none"> <li>- Quang Ngai Province: 2,800 residents</li> <li>- Internal Medicine, Family Medicine, Orthopedic Surgery, Pediatrics</li> <li>- Donation of medical equipment such as sterilizer and rehabilitation equipment to Quang Ngai Women's Hospital</li> </ul> </li> <li>• Operation of a public elementary school health camp in Gurgaon by DPSI                     <ul style="list-style-type: none"> <li>- 100 elementary school students, including dental and vision screenings</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Executing local medical community services and surgery programs in Vietnam</li> <li>• Reviewing expanding health initiatives in new business areas of Southeast Asia including Philippines and Indonesia</li> </ul>
 <p><b>4</b> QUALITY EDUCATION</p>	<p><b>Commitment 5</b> Foster Local Talents</p>	<p><b>SDG 4.</b> <b>Quality Education</b> Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all 4.4</p>	<p>"By 2030, through the "Youth Energy Project," a renowned social contribution program, we will contribute to the fostering of local talents by providing opportunities for education and career exploration tailored to each growth stage for as many as 50,000 marginalized children and teenagers."</p>	<ul style="list-style-type: none"> <li>• "Doosan Class" technical training collaboration between industry and university                     <ul style="list-style-type: none"> <li>- 17 people recruited from 3 specialized high schools and 18 graduates employed (358 people recruited and 196 people employed since 2011)</li> </ul> </li> <li>• Technical education and training for the unemployed                     <ul style="list-style-type: none"> <li>- 36 people completed welding/processing course and 33 people recruited for affirmative employment (596 unemployed completed the training, 477 people recruited for affirmative employment)</li> </ul> </li> <li>• M.Y Dream youth career exploration classes                     <ul style="list-style-type: none"> <li>- Completed by 80 students from 4 middle schools in Changwon and 24 kinds of occupation group experiences (participation of 266 students from 14 middle schools in Changwon over 3 years)</li> </ul> </li> <li>• M.Y Dream youth engineer exploration classes                     <ul style="list-style-type: none"> <li>- Participation of 940 students from 14 shools including observation-practice for 120 students from 4 schools, field trip-special lecture for 820 students from 10 schools</li> </ul> </li> <li>• Local children's center themed programs                     <ul style="list-style-type: none"> <li>- Consists of 9 themed experiences including history, ecology, social science, and crafts</li> <li>- 160 times, 1,500 children from 62 centers in Changwon and 4 centers in Seoul</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Continuously operating vocational training consortium business group and Doosan Class technical training</li> <li>• M.Y Dream youth career/engineer exploration classes, more than 1,000 students per year</li> </ul>

## SDG Highlights

**In order to achieve our SDGs, we are actively promoting our eco-friendly business portfolio, resolving social problems, and contributing to local communities. We will not only enhance the management of the social and environmental aspects of our business operations, but will also identify projects that can contribute to our SDGs. We will continue to promote disease prevention and treatment, and we will continue to pursue activities for local human resource development.**



### Commitment 1 Increase the Size of Water Reserves



As a global leader in the water industry, Doosan Heavy Industries & Construction offers a full range of solutions, from seawater desalination to water treatment. Notably, we completed the construction of a desalination plant in Yanbu, Saudi Arabia, in 2018, supplying 550,000 tons per day of drinking water and continuing the expansion of water resources in this area which suffers from limited water supplies. We strive to increase water reserves in the Arabian Peninsula with our successful bid for the Oman Seawater Desalination project. Doosan Enpure, a UK subsidiary of Doosan Heavy Industries & Construction, has signed a contract to supply a sewage sludge -based biomass power plant, which is expected to be completed in 2019. Through heat treatment and pasteurization, the amount of sewage sludge is reduced. It is an eco-friendly facility that produces 1MW of household electricity and heat in the process of producing biogas. It is especially significant in that we have entered the sewage sludge-to-energy market, an eco-friendly renewable energy industry, while going beyond the existing desalination and water treatment plant businesses. Based on these technologies, we will strengthen our efforts in the eco-friendly water treatment field.



### Commitment 2 Ensure Access to Sustainable Energy



Doosan Heavy Industries & Construction is striving to increase energy supplies in emerging markets around the world with high-efficiency eco-friendly power generation technologies, and to contribute to the diversification of the energy mix with high-efficiency gas turbine development, wind power generation, and ESS. In 2018, we entered the overseas wind turbine market, with the construction of an offshore wind power demonstration complex in Vietnam. In addition, we won an order for a fuel conversion project at Yeongdong Thermal Power Plant Unit 2 to reduce carbon dioxide emissions. We have been selected as the prime contractor for national projects to develop 8MW large capacity offshore wind power generation systems and are working hard to develop and distribute eco-friendly power generation technologies. We signed a contract in November 2018 for the design and supply of core equipment such as boilers and turbines for the biomass power plant to be built in Sodegaura City, Chiba Prefecture, Japan. Doosan Heavy Industries & Construction will supply its own CFB (Circulating Fluidized Bed) boiler and high efficiency steam turbine to the power plant. Biomass is a wood-based fuel made from wood, grains and plants. It contains almost no sulfur oxide, which is the main cause of pollution, and its nitrogen oxide emissions are only about 30% those of coal. It is meaningful that this contract has provided the basis for further advancement of the biomass power generation market and the conservative growth of the Japanese power generation market.



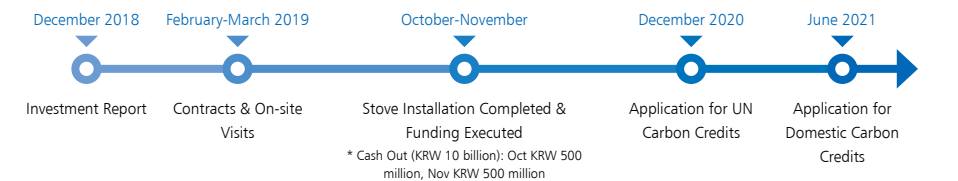
### Commitment 3 Reduce Greenhouse Gas Emissions



In order to prevent global warming, countries submit voluntary greenhouse gas reduction targets through the Paris Agreement, which has introduced a governance system for combating climate change. Doosan Heavy Industries & Construction is reducing greenhouse gas emissions through its Changwon Plant's OE(Operational Excellence) activities and smart factory process improvements. The company has obtained certification from the 2016-2018 Energy Champion Site thanks to a variety of efforts, including contributions to reducing greenhouse gas emissions through big data management techniques including the development and application of the NB-IOT method, a first for the industry. In addition, in order to actively participate in the government energy policy, we concluded the Green Growth Partnership with the Korea Energy Agency in 2019, and have supported energy efficiency and greenhouse gas reduction projects for SMEs. As part of its greenhouse gas reduction project, Doosan Heavy Industries & Construction is supplying high-efficiency stoves to low-income households in Myanmar with a supply of cooking tools that emit

less harmful substances. High efficiency cook stoves increase heat efficiency, shorten the cooking time and reduce smoke and carbon emissions. In 2019, we are making efforts to meet the UN's sustainable development goals by reducing fuel costs and greenhouse gas emissions through the supply of 35,000 high-efficiency cook stoves. Doosan Heavy Industries & Construction expects to reduce greenhouse gas emissions by about 100,000 tons (equivalent to KRW 27 billion) through the Cook Stove CDM project. Doosan Heavy Industries & Construction was able to secure carbon credits from the United Nations and it is expected that the company will be able to exchange and use such carbon credits domestically starting in 2021.

#### Doosan Heavy Industries & Construction's Myanmar Cook Stove CDM Project Implementation Plan



### Commitment 4 Prevent Diseases and Expand Treatment



By 2030, Doosan Heavy Industries & Construction will contribute to the prevention and treatment of diseases worldwide by improving the accessibility and health status of 80,000 underprivileged people in Vietnam and India. Doosan Vina, the Vietnamese subsidiary of Doosan Heavy Industries & Construction's, was awarded the "Social Contribution Achievement Award" by the Ministry of Health of the Central Government of Vietnam together with Chung-Ang University Medical Center. This award was given in recognition of the medical services actively provided to the local residents over the past decade from 2009 to the present year. Doosan Vina and Chung-Ang University Medical Center have been offering medical services and surgical treatment to severely ill patients in Vietnam ever since they signed a memorandum of understanding with the Quang Ngai government back in 2009. Doosan Vina and Chungang Medical Center have provided medical services to approximately 28,000 Vietnamese residents this year. Of these, 94 patients with congenital heart disease, cataracts, and obstetric and gynecological issues were treated in Vietnam. Twenty-three patients who had difficulties in local treatment were transported to Korea for surgery. In addition, in order to improve the level of healthcare in Vietnam, we donated 52 medical items, including cataract surgery equipment, physiotherapy equipment, and sterilizers. In addition, the Quang Ngai government, Doosan Vina and Chung-Ang University Medical Center signed an agreement to promote the mutual development of medical care in 2016, and since then, they have invited six Vietnamese doctors, including surgeons and obstetricians, to Korea for training.



### Commitment 5 Foster Local Talents



Doosan Heavy Industries & Construction is officially operating the "M.Y Dream (Make Your Dream) Youth Engineer Experience Class," a social contribution program providing in-depth career exploration opportunities for young people in the Changwon area. Since its pilot in 2017, we have created a program that will involve large numbers of people in 2018, as there is a constant call for expansion by the community and educational institutions. This program is designed to expand understanding of the machinery industry as a whole through the role of plant engineers. Doosan M.Y. Dream Youth Engineer Experience Class is a practical class on engineering careers where students visit Doosan Heavy Industries & Construction's Changwon Plant to experience and learn about plant design, welding, and other specialties from masters in each field. Doosan Heavy Industries & Construction employees voluntarily share talent to help local youths design their careers. Meanwhile, the company has been operating the "M.Y. Dream Youth Career Experience Class" since 2015, which is separate from the M.Y. Dream Youth Engineer Experience Class. Through personalized career experiences organized in three career path stages, exploration, experience, and design, students experience over 30 different career groups nine times during a semester, and also have time to discuss the rewards and hardships of each field. Doosan Heavy Industries & Construction is operating this program in the free semester of the second half of every year on a request basis from schools that are interested.



03

# CSR Management

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# Governance

Doosan Heavy Industries & Construction is making substantial efforts to establish transparent governance by maintaining a majority of outside directors' and meeting independence requirements under commercial law when appointing outside directors. Going forward, Doosan Heavy Industries & Construction will continue to strengthen institutional fairness in the election and management of board members to lay the foundation for transparent corporate management.

## Composition of the Board of Directors

- As of April 2019, the board of directors is composed of a total of seven directors: 3 executive directors and 4 outside directors.
- To improve efficiency in managerial judgments and realize responsible management, the role of the chairperson of the board is assumed by the CEO.
- When electing a director, there are no restrictions on or discrimination against a specific gender, religion, academic background, race, ethnicity, disability, origin, etc.

## Operation of the Board

- Meetings of the Board of Directors may be convened and held by the CEO or a director appointed by the board.
- They may also be held when more than one-third of the sitting directors jointly announce a meeting's purpose, date, etc., and request an assembly.
- To maintain fairness, the directors with conflicts of interest in regards to decisions made by the board will be restricted from their right to vote. Also, decisions of the board are reached by the attendance of the majority of the sitting directors and consent from the majority of the directors in attendance.

## Status of Board Operation

- For important issues regarding corporate management including economic, environmental and social aspects, the board shares details and opinions and seeks solutions.
- Information related to the composition and operation of the board of directors is posted on the company website, thus protecting the rights and interests of shareholders and any interested parties.

## Committees Under the Board

- For fast and efficient decision-making, committees have been established internally by the board of directors as specified by the articles.

### Status of Committees under the Board

 <p><b>Outside Director Candidate Recommendation Committee</b></p> <p>Nominates outside director candidates to be elected at the shareholders' meeting</p>	 <p><b>Audit Committee</b></p> <p>Performs audits on the company's accounts and business</p>	 <p><b>Internal Trade Committee</b></p> <p>Reviews and approves transactions with related parties</p>
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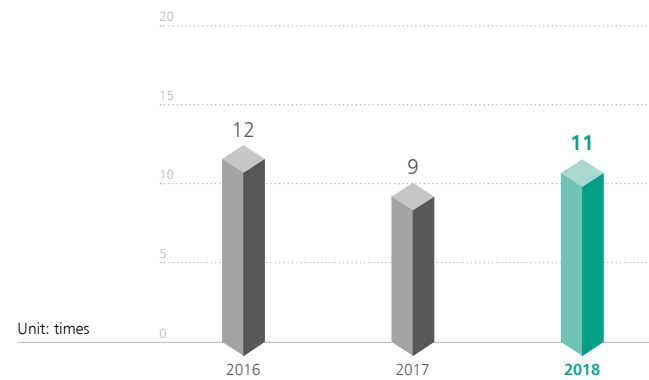
Composition of the Board of Directors as of April 30, 2019

Position	Name	Major experiences
Executive directors	Geewon Park	(Current) Chairman of Doosan Heavy Industries & Construction (Current) CEO (Chairman of the Board)
	Hyounghee Choi	(Current) Executive Vice President and Finance Management Division Head of Doosan Heavy Industries & Construction (Former) Executive Vice President of Doosan Infracore
	Yeonin Jung	(Current) Executive Vice President and Management Division Head of Doosan Heavy Industries & Construction (Former) Overseas President of Doosan VINA
Outside directors	Dongsoo Kim <sup>1)</sup>	(Current) Chair Professor, Korea University (Current) Head of Institute for Future Growth (Former) Chairperson of Fair Trade Commission
	Ickhyun Nam	(Current) Professor at Seoul National University(SNU) Business School (Former) Director, Graduate School of Business, Seoul National University
	Daeki Kim	(Former) Policy Director, Executive Office of the President, Republic of Korea (Former) Economic Administrator of Executive Office of the President
	Junho Lee	(Current) Lawyer of Kim and Chang Law Firm (Former) Judge of the Seoul District Court

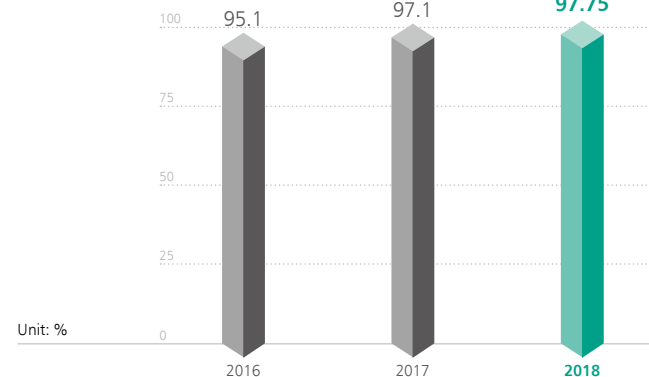
1) Elected as outside director

### Status of Board Meetings and Participation Rate of Outside Directors

#### Number of board meetings held



#### Participation rate of outside directors



## Board of Directors Operation

### Leadership & Accountability

- For mutual monitoring between internal and outside directors, 4 outside directors, accounting for 57% of the entire board, are appointed.
- Impartiality and transparency in electing outside directors at the general shareholders' meeting are reinforced through recommendations made by the Outside Director Candidate Recommendation Committee.

### Effectiveness

- To help increase the outside directors' level of understanding of the company and professionalism, shop tours at headquarters and the Changwon Plant are held for the appointed outside directors to brief them on the overview of the company.
- From June 23 to June 26, 2017, all outside directors visited Doosan VINA, the local office in Vietnam, and Vinh Tan 4, a construction site for a power plant, to not only predict the market, understand the construction status and encourage workers, but also have the opportunity to improve their understanding of overseas projects.

### Remuneration

- Remuneration of outside directors and internal directors is within the limits of directors' salaries approved by the general shareholders' meeting.
- Information on salaries of individual executives including outside directors and the CEO is made public through business and audit reports.

### Relationship with Shareholders

- To protect the rights of minority shareholders and independent shareholders, relevant laws including the Commercial Act are recognized.
- General shareholders' meetings are held each year to report on the management status and hear the opinions of minority shareholders.
- The electronic voting system was introduced in 2017 to safeguard the voting rights of minority shareholders.
- Major information about management issues is made public transparently through various communication channels including the corporate disclosure system and company website.

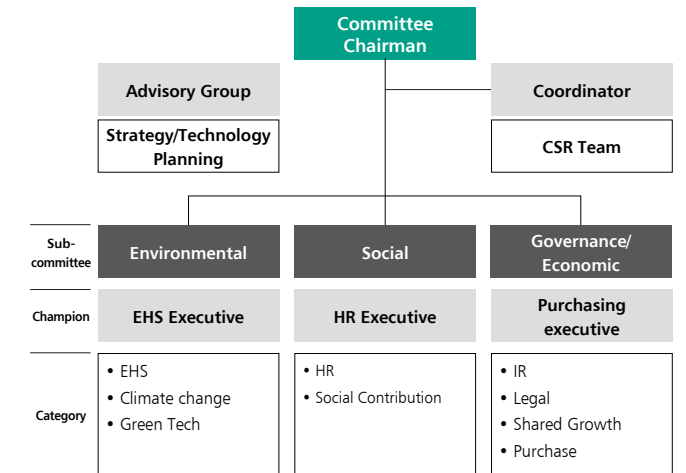
## CSR Committee

- Doosan Heavy Industries & Construction operates a CSR Committee to speedily respond to the latest global trends and regulations and hold in-depth discussions on socially responsible management.
- The CSR Committee is chaired by the CEO and has been restructured into three main areas of the environment, society and governance.

## Operation of Electronic Voting and Postal Voting System

- The electronic voting system allows a shareholder to exercise his/her right to vote via a computer or a smartphone with internet access without having to physically attend a general shareholders' meeting.
- Beginning with the "2016 annual general shareholders' meeting" held in March 2017, Doosan Heavy Industries & Construction introduced and implemented a electronic voting system to ensure the voting rights of minority shareholders.
- A postal voting system was introduced to ensure the voting rights of minority shareholders.

## Composition of CSR Committee

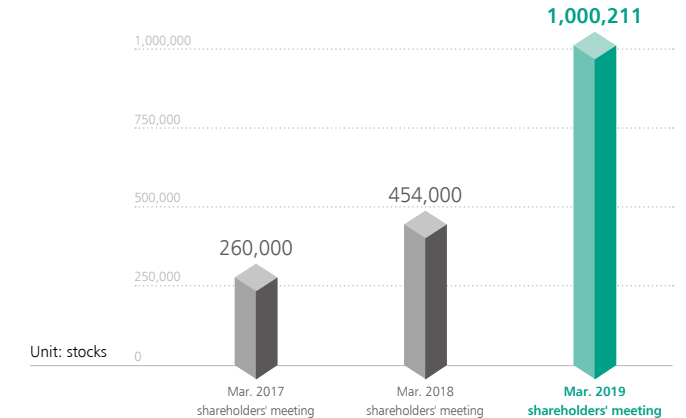


## Current Status of Stockholdings



## Result of Electronic Voting System

### Number of stocks



### Compared to total voting rights



# Ethics Management

Doosan Heavy Industries & Construction Co., Ltd. is establishing a healthy corporate culture based on ethical responsibilities that include honesty, transparency and impartiality throughout its corporate activities. We invigorate the law-abiding supporters system, strengthen activities to prevent any illegal activities in the management of the company, and improve the enterprise system such as through institutional measures to eradicate bribery among domestic and international companies for risk prevention.

## Strategies for the Pursuit of Ethical Management

- Based on management's commitment to ethics management, we have constructed infrastructure such as ethical principles, cyber reporting systems, and operating organizations.
- Based on the enterprise system, we have developed plan execution, inspection, and measurement to improve the sense of ethics and prevent unethical acts among employees.

## System for the Pursuit of Ethical Management

### Establishment of an Anti-corruption Management System

- In order to respond to the risks of corruption in a more proactive and preemptive manner, Doosan Heavy Industries & Construction held a meeting for the introduction of ISO 37001, an anti-bribery management system and an international standard.
- Doosan Heavy Industries & Construction has received anti-corruption risk assessment and diagnosis (from the Korean Foundation for Quality and Deloitte Anjin LLC).
- For the areas for improvement deduced from the results of the diagnoses, we conducted activities for anti-corruption management (stipulating prohibition of receipt of bribes and conformance to ethical principles in contracts with domestic and international trading partners).
- Doosan Heavy Industries & Construction is also actively engaged in the activities of UNGC Fair Player, to which it signed up in 2017.
- We participated in a "corporate anti-bribery management cooperation forum" sponsored by Transparency International Korea and UNGC Korea Association, and promoted anti-bribery management activities.

### Formation of a Research Security/Ethics Review Committee

- Doosan Heavy Industries & Construction has formed a research security and ethics review committee chaired by the CTO in order to strengthen its research ethics.
- With the Research Security/Ethics Review Committee as our center, we seek to establish research security and ethics inspection activities, thus setting up an honest and transparent R&D atmosphere and preventing any illegal activities in research.

## Expansion Activities for an Ethical Culture

### Education on Law-Abiding and Ethics

- To encourage members to improve their sense of ethics, the company requires all of its employees including new recruits and experienced recruits
- Employees at overseas offices and business partners in India, Vietnam, Europe and other countries to take training courses on ethical principles.
- Doosan Heavy Industries & Construction also conducts ethics education with timeliness (when the Improper Solicitation and Graft Act was enacted in 2016, it immediately hosted educational courses for all employees on prohibition of graft and bribery).
- The company aims to preemptively deal with unfair transactions, for which regulations have continued to become strengthened, by conducting education for its sales employees on the prevention of any unjust agreements.

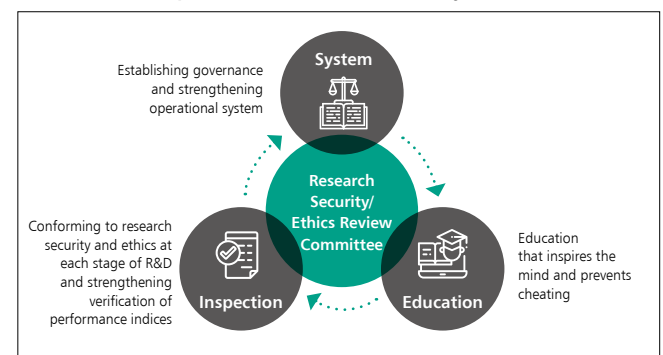
## Anti-Corruption Activities for Management

- Anti-corruption activities for overseas representatives
  - Strengthening of compliance regulations to standard contract conditions to prevent corruption in consultants/agents representing Doosan Heavy Industries & Construction overseas.
  - Strengthening of selection and management of consultants/agents by systemizing the contracting process.

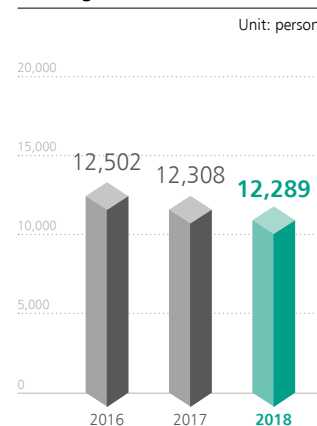
## Ethics Management Pursuing Strategies



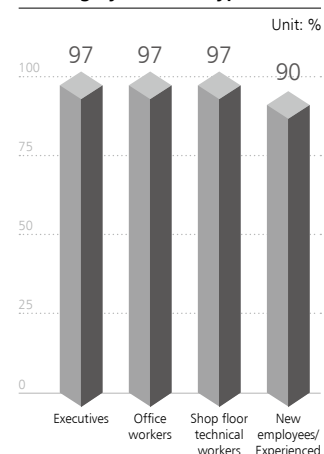
## Direction for the promotion of research security and ethics



Enrollment in Ethics Training



Percentage of Enrollment in Training by Position • Type in 2018



- Strengthen new business partners' compliance with ethical principles
  - Doosan Heavy Industries & Construction and new business partners established a means of checking the risk of corruption
  - Introduction of Doosan Heavy Industries & Construction's ethical principles and violation reporting
- Compliance activities
  - Distributing and presenting personal check lists to executives and employees in order to strengthen compliance with anti-trust laws prohibiting illegal cheating and bribery.

## Training on anti-corruption policies and procedures

Category	Unit	2016	2017	2018	
Employees	No. of people subject to education	person	7,728	6,969	6,611
	No. of people who completed education	person	7,550	6,701	6,404
	Percentage of education completion	%	97.7	96.17	97
Suppliers	Total no. of suppliers	companies	170	170	152
	No. of suppliers that completed education	companies	170	170	98
	Percentage of suppliers having completed education	%	100	100	65
	No. of programs held	time	4	0	1
	No. of people who have received education	person	680	0	0

## Preventative actions for conflicts of interest

- According to the detailed regulation of its ethics principles, Doosan Heavy Industries & Construction requires all employees who assume positions above Team Manager to submit unity of interest reports each year, in order to secure impartiality in performing tasks and to take proper measures if tasks entrusted to an individual within the company are financially and directly related to him/herself, his/her direct ascendants or descendants, spouse or spouse's direct ascendants, immediate relatives, or a company or an organization in which he/she was previously employed, or if he/she is placed under circumstances that would cause him/her difficulty in carrying out the tasks in an unbiased manner.

## Compliance management at global worksites

- Over the course of conducting an overseas business, compliance regulations have been set up within contracts signed with representatives who are consigned with local tasks in order to prohibit any illegal and/or manipulative actions.
- For risk management related to ethics at global workplaces, a regular cooperation system is in operation with the compliance organizations at international business partners.
- Sharing of knowledge and monitoring is carried out to reinforce competency in compliance.

## Prevent Unfair Trading and Support the Ethics Management of Business Partners

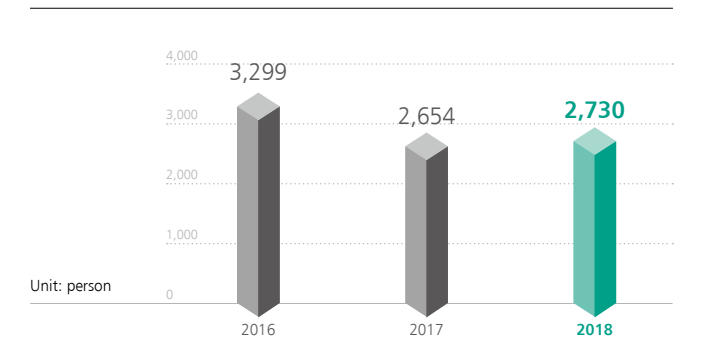
Doosan Heavy Industries & Construction implements ethical standards and regulations to strictly prohibit the acceptance of bribes from business partners with whom it conducts any form of transactions.

- It has added clauses requiring conformity to the ethical standards and regulations in all contracts signed with business partners.
- Doosan Heavy Industries & Construction plans to prepare measures to inspect the risk of corruption of new business partners it deals with.
- It consistently performs education on Fair Trade Act and Fair Transaction in Subcontracting Act for its employees to prevent any unfair transactions with business partners
- It supports them to spread and helps them conform to the ethical standards of Doosan Heavy Industries & Construction.

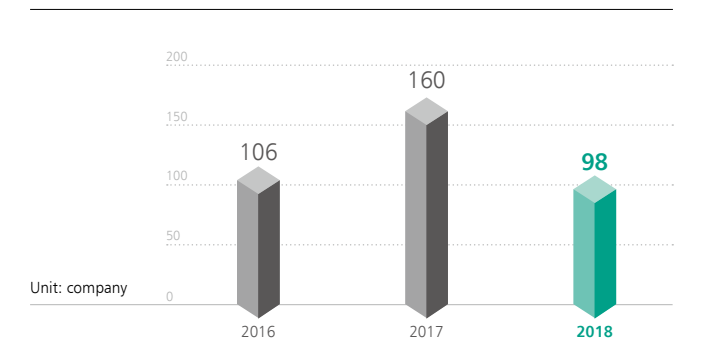
## Reporting and monitoring

- To easily report ethics violations from both inside and outside, a cyber reporting center and internal report box are in operation.
- For overseas subsidiaries, an internal report system run by a third party has been introduced to actively field reports of violations in matters regarding ethics.

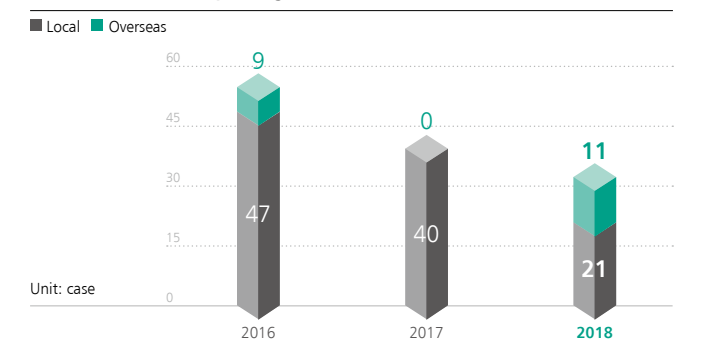
## Unfair trading prevention education for employees



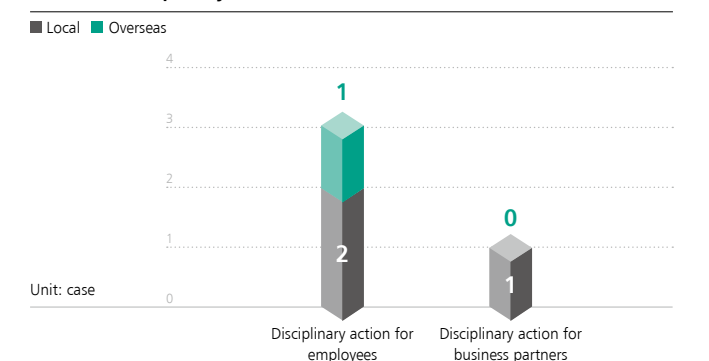
## CSR/ethics management education for the CEOs of business partners



## Status of internal reporting



## Status of Disciplinary Action in 2018



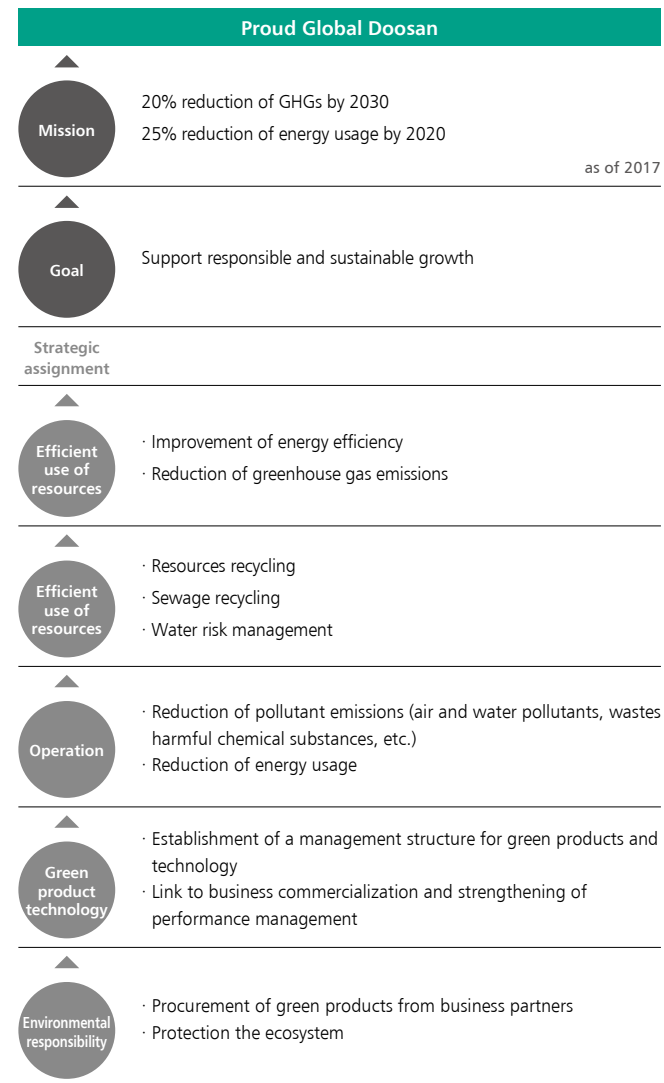
# Green Management

Doosan Heavy Industries & Construction has established a green management system to respond to and control environmental issues by actively reducing the environmental impacts of production processes and developing green technology, among many others.

## Green Management System

- Doosan Heavy Industries & Construction has established a green management strategies to identify environmental issues generated throughout business activities, from usage to disposal of resources, and is devising fundamental solutions.

### Green management strategies



## Response to Climate Change

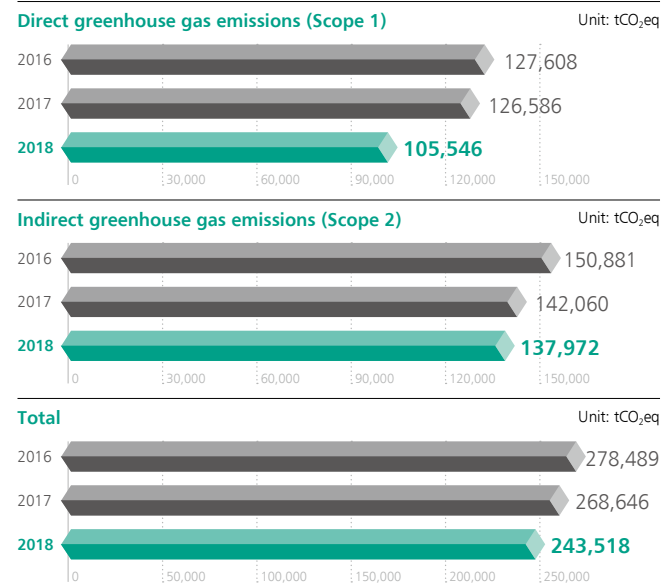
### Responding to the emissions trading system (ETS)

- Doosan Heavy Industries & Construction has organized committees with energy and greenhouse gas experts and executives to respond to the emissions trading systems and conduct risk monitoring on climate change.
- Based on detailed climate change risk factors and scenario analysis, we estimate greenhouse gas emissions and measure their financial burden.
- Taking into account the costs and benefits of ETS introduction, we derive priorities for each response plan and reflect this in management decision making.
- We carry out goal management per BG to meet carbon emission quota targets.
- For BG plant managers, we provide specialized training on energy management and carbon emission rights and strengthen internal capabilities.

### Reduction of Greenhouse Gas

- Doosan Heavy Industries & Construction has formed a dedicated team to reduce greenhouse gas emissions in order to preemptively respond to the government's greenhouse gas policy, such as the pilot project for the target management system and the emission rights trading system.
- We have improved factory facilities and conducted OE activities.
- Secured carbon credits are sold through the Korean Exchange to produce income.
- We establish the plan to cut 20% of BAU by 2030.

### Greenhouse gas emissions



### Best Practice

#### Creating profits through the sale of certified carbon emissions secured through the reduction of greenhouse gases

- Certified carbon emissions representing a 2% reduction in energy usage were allocated by the government.
- Doosan Heavy Industries & Construction has performed activities to reduce greenhouse gases by improving the efficiency of equipment within plants and eliminating elements where energy is being wasted.
- 104,000 tons of certified emission reductions saved through such efforts were sold to Korea South-East Power in December 2017, generating a profit of about 2.5 billion KRW.

### Improvement in energy efficiency

- A variety of energy saving activities are being carried out, including waste heat recovery, standby power shut-off, enhanced facility efficiency, and replacement of LED lights.
- The establishment of an energy integration system which fuses big data and ICT technology (in progress, via three stages, and to be completed by 2020).
- The integrated energy control system is scheduled to be established by 2020 with a total investment of 10 billion KRW.
- Once an energy control system with maximized efficiency is established, 6.7 billion KRW in annual energy cost savings and a greenhouse gas reduction of 20,000 tons of CO<sub>2</sub> are expected.

**2020 Energy Integration System Construction Initiative**

**Integration of Big Data technology and ICT technology**

1 <sup>st</sup> phase (~2017)	<ul style="list-style-type: none"> <li>Construction of integrated control system for heating and cooling supply</li> <li>After completing construction in 2017, we reduced energy costs by KRW 740 million and emissions by 1,736 tons of CO<sub>2</sub>.</li> </ul>
2 <sup>nd</sup> phase-3 <sup>rd</sup> phase (~2020)	<ul style="list-style-type: none"> <li>Construction of integrated control system for steam, compressed air and water</li> <li>Construction of integrated control system for electricity and gas</li> <li>Energy management system that maximizes efficiency by automatically connecting to production and real-time remote control with a sensor and control device for each energy source</li> </ul>

## Efficient use of resources

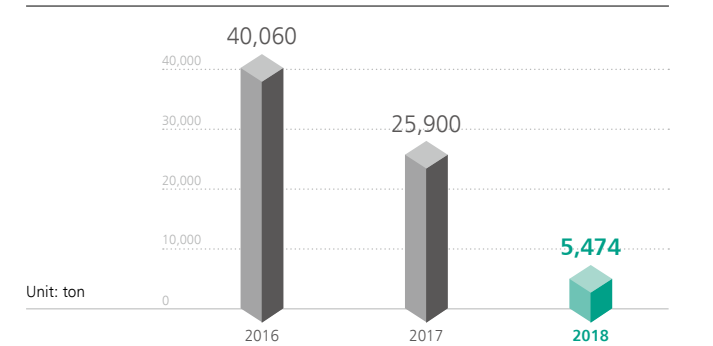
### Water risk management

- In an effort to reduce operational water at plants, Doosan Heavy Industries & Construction utilizes a monitoring system, which uniformly supplies water at a proper pressure, for constant management.
- Starting in 2018, an inspection is performed daily on multi-use facilities while in company dormitories, cafeteria, restrooms and shower rooms where water is used every day, a proper temperature of warm water is maintained and equipment such as decompression devices are installed to reduce 10% of the total usage.
- We will apply IoT technology to the water supply system, in which water is constantly stored through an internal storage tank, by 2020 to enhance the system into one that directly supplies water to locations of use, and also plan to establish a system that can preempt and waste of water through reduction of electricity costs consumed for the water supply as well as immediate response to leaks or any abnormal phenomena.

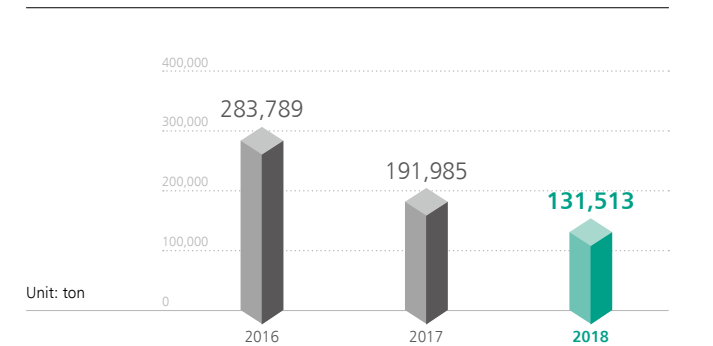
### Rainwater Non-Discharge (Reusing)

- Doosan Heavy Industries & Construction has combined its own water treatment technology to establish a rainwater non-discharge (reusing) system to fundamentally solve hazardous substance leaks.
- Through this system, it has enabled the recycling of rainwater and under emergency situations, the collection and processing of all the hazardous substances.
- The rainwater non-discharge (reusing) system was completed in December 2017 and went through an internal trial lasting until March 2018 before beginning to recycle rainwater generated in the company's large cooling tower.

### Recycled and reused water



### Amount of treated wastewater discharged



## Minimizing Environmental Effects

### Air pollutants

- Periodic pollution inspections are performed to check if additional pollutants are generated during production processes.
- For 1, 3-Butadiene, which was designated as a new pollutant in December 2017, we plan to acquire a licensing change, if needed, after investigating if it is discharged from environmental facilities.
- We will set up a process to automatically generate legal daily logs from manually written records on the operation of environmental facilities by utilizing sensors (a pilot test for this process was conducted in 2016 to complete internal verification and, by 2020 it will be applied extensively to all facilities).
- We have installed facility recognition sensors (beacons) in order to inspect the normal operation of environmental facilities in a more reliable manner, and also implemented inspections of the environmental facilities utilizing mobile devices and applications.
- General air quality and noise tests are conducted in nearby worksites each quarter to continuously monitor the changes in the impact that our worksites have on surrounding environments.
- We have acquired environmental liability insurance with a guaranteed limit of 30 billion KRW ensure compensation for damages in case physical and/or property damages occurs to a third party due to the installation and operation of environmental facilities such as air and water quality discharge facilities, thus minimizing the effect of environmental accidents on surrounding areas.

#### More than 400 on-site air pollution control facilities

- Air pollution management for air emission facilities and prevention facilities
- Establishment of self-standards that are stronger than legal standards (40% higher than legal emission standards)

#### Established a process for the systemic monitoring and management of environmental facilities

Pilot test in 2016 -> Expansion of the entire facility by 2020

- Development of a process that can automatically generate legal logs for the operation of environmental facilities by using sensors

### Harmful Chemical Substances

- In order to manage all chemicals used at Doosan Heavy Industries & Construction without administrative omission, we operate a monitoring system.
- To fundamentally eliminate legal risks from the usage of hazardous chemicals, we have replaced hazardous chemical substances currently used at the Changwon Plant with general chemicals.

#### Trained 8 professional administrators who are able to manage in-company chemicals

- Professional administrators dispatched to all work site before chemical substances are handled

#### Minimized the use of hazardous chemical substances, replace with regular chemical substances

- From 2016 to 2018, 12 hazardous chemical substances were replaced with regular chemical substances

### Water Pollutants

- About 400 tons of waste water comes into the waste treatment facility each day and is processed with various physical and chemical treatment methods including condensation, precipitation and filtration (maximum processing capacity of 1,590 tons/day).
- The final treated water is controlled for 17 items in order to discharge less than 30% of the limit stated in the legally permitted emission criteria.
- As a means to fundamentally solve potential leakage accidents of hazardous substances, we have installed a discharge route shutoff system and rainwater zero-discharge system, which can collect and process all hazardous materials in emergency situations.
- The sewage generated is directed into and additionally processed at comprehensive sewage treatment facilities run by Changwon, the local government, through sewage pipes.

### Responding to Fine Dust Regulations

- Doosan Heavy Industries & Construction controls the amount of emissions 40% below the limit as stated in the legally permitted emission criteria.
- VOCs (Volatile Organic Compounds) removal facilities have been installed for operation in all large painting facilities since 2015.
- We are adjusting and reducing the working time of our fine dust induction process, and also manage the operation continuously through the real-time monitoring between the head office and the domestic construction site.
- We continuously pay attention to trends in the government's detailed guidelines in order to prepare in advance, and when replacing aging facilities, long-term countermeasures on fine dust are established to reflect environment-friendly conditions.

### Waste Management

- To establish a culture of separate waste collection among employees, we currently carry out collection in accordance with the separate waste collection criteria, and separated waste is processed by certified waste treatment companies after being transferred to storage sites through exclusive means of collection.
- For all waste contracts, only companies that have been verified as suitable through early legal conformance assessments may participate in the bidding process, an attempt to prevent in advance any issues regarding illegal processing of waste.
- In 2018, 94% of the ordinary waste generated at the Changwon Plant was recycled, and about 943,000 tons of incinerated waste from a fire that occurred during construction of the Vinh Tan 4 Thermal Power Plant in Vietnam was disposed of legally.
- We will continue to expand recycling in the future through the professional recycling of waste refractories.

### Best Practice

#### "2018 Korea Green Climate Award" – No. 1 in company category, Minister of Trade, Industry and Energy Award

- Doosan Heavy Industries & Construction received the Minister of Trade, Industry and Energy Award hosted by the National Assembly Forum on Climate Change. I was selected No. 1 in the company category of the '2018 Korea Green Climate Awards'.
- We focus on new and renewable energy projects, which include a land and sea wind power generation system and energy storage system.
- We contribute to the reduction of the country's greenhouse gas emissions through technology to reduce the generation of NOx, a kind of environmental pollutant, and eco-friendly power plant combustion technology.
- Since the establishment of our energy efficiency roadmap in 2013, we have conducted activities to improve facility efficiency and manage smart energy, receiving broad recognition for our contribution to the spread of low-carbon corporate culture.

### Environmental Clean-Up in Masan Bay

- As a community engagement activity, Doosan Heavy Industries & Construction has commemorated the annual Ocean Day and performed environment clean up underwater and by the shores of Masan Bay for 12 consecutive years.
- More than 90 people from the Seongsan-gu Office and private organizations in Changwon as well as 20 divers from our in-house scuba diving club participated to process 20 tons of waste nets, buoys and ropes.

## Strengthening of Environment Management Capacity at Construction Sites

### Improvement Training for Construction Site Environment Management Capacity

- Doosan Heavy Industries & Construction Plant EPC BG conducted environment manager training for environment managers in domestic construction sites in 2018 to improve the environment manager's ability in order to maintain zero environmental accidents, set up an environment management system and strengthen implementation capacity.
- In 2018, we conducted training on the evaluation of the EHS Management System (ISO 14001) and on the waste disposal contribution system related to the Resource Circulation Law and response method.

### OJT for New Environment Managers of Construction Sites

- Doosan Heavy Industries & Construction employs new environment managers to strengthen environmental management at each construction site and conducts an OJT program for environmental management in accordance with the EHS Academy.

### Biodiversity management at Doosan Heavy Industries & Construction construction sites

Region	Project list	Areas of primary control	Number of managed species	Details of managed species
Saudi Arabia	Fadhili Combined Heat and Power Plant	Soil: Sand Sea, Swamp	1	Amphibia: spiny-tailed Lizard - classified as VU
	Shoiba RO	Water: Red Sea	X	There is no influence on plants and animals to be managed under the EIA, but there is a list of 25 plant species in all of Saudi Arabia.
Oman	Sharqiyah RO	Water: Sea	9	Turtle, whale, dolphin, fox, lizard (35), gazelle, camel, goat, bird (94 species including eagle, gull)
Vietnam	Vinh Tan 4	Soil: Grass/ forestland, coastal sandy plain Water: Sea (Cost of Cana)	X	The ecosystem types identified in the EIA are as follows, but there is no mention of management targets in the EIA Report. Plants 56, animals 53, fish species 76,
	Song Hau 1 TPP	Soil: Agricultural land (farm land) Water: River, canal	X	The following EIA types are identified in the EIA, but there are no types of plants to be managed under the EIA Report. no mention of controls on animals and species. Plants (154 species): no precious plants species in the Red Book of Vietnam and the IUCN (See Resources) Animals (53), fish species (35)
India	Obra C	Soil: Soil, Forest, Jungle Water: Rihand River, Son River	X	The ecosystem types identified in EIA are as follows: the EIA Report mentions that there are no categories of control (see Resources). - The IUCN Risk of Extinction states that there are no flora and fauna. Plants (255), animals (287), fish species (21)
	Jawaharpur	Soil: Agricultural land (farm land) or Non-agricultural land	X	The EIA Report mentions that there are no categories of control
Korea	Changwon-Dongjeup-Gimhae-Hallim Route	Soil, Water	5	Korean buzzard, kestrel, Asiatic sparrow hawk, grey frog hawk, mandarin duck
	Samcheok Green Power #1, 2	Swamps	4	Otter, kestrel, mandarin duck, whooper swan
	Changnyeong-Miryang Highway	Soil, sky	6	Leopard cat, mandarin duck, Asiatic sparrow hawk, eagle, kestrel
	Shin Kori Nuclear Power #5, 6	Water	55	Conger eel, horse mackerel, Korean rockfish, thornback ray
	Jeokseong-Duil Road	Soil, Water	8	There is mention about management of land animals, land flora, marine biota, and statutory protection species in the environmental effects evaluation. Wildcat (13), eagle, kestrel (42), salamander (13), macromia daimoji okumura (24), common Korean bitterling, spotted barbell, gobiobotia macrocephala (9)
	Bongdam-Songsan Highway	Soil, Water	12	There is mention about management of land animals, marine biota, and statutory protection species in the environmental effects evaluation. Wildcat, mandarin duck, goshawk, sparrowhawk, grey frog hawk, kestrel, eagle-owl, black-capped kingfisher, salamander, narrow-mouthed toad, Korean frog, yellow-spotted serpent, meat on short ribs

- In 2018, through practical business case training B/M, as well as other environmental laws and regulations, three new environment managers were deployed to worksites. They established an annual environmental management plan at each site and an environmental management system such as the EHS management system (ISO 14001).

### Preservation of Biodiversity at Local and Overseas Construction Sites

- By conducting local surveys prior to the start of projects, Doosan Heavy Industries & Construction notifies details on the living species to be protected through environmental effect assessment reports and fulfills its duty to execute measures to safeguard local ecosystems.
- To preserve the ecosystem and minimize changes to the environment in the construction phase, we perform periodic monitoring of the atmosphere, water quality, noise and vibrations, and share the results with ordering bodies for systematic management.
- As of 2018, living organisms controlled at three sites consist of a total of 10 species, which are fauna. In Korea, we systematically control environmental elements such as atmosphere, water quality, soil, noise, and vibration at six project sites in an attempt to minimize the impact on the ecosystem.

### Status of Environmental Regulation Violation

- There have been no violations, fines, dispute resolutions or environmental liabilities related to environmental regulation for three years.



# Health & Safety

Doosan Heavy Industries & Construction recognizes the health and safety protection of employees as a major project to continuously manage. Thus, Doosan Heavy Industries & Construction applies an advanced, scientific safety and health management system in local and overseas worksites and consistently discovers potential elements of hazard and risks, which are thoroughly and preemptively handled. In the future, Doosan Heavy Industries & Construction is planning to expand its support to interested parties such as business partners, customers as well, employees and more so that interested parties can enjoy a comfortable environment and healthy life.

## Health and Safety System

### Strengthening of health and safety system based on global EHS management system

- For domestic production sites, domestic and overseas construction sites, and service sites, we assess all hazardous risk factors of EHS, prepare measures, and thoroughly train all workers.
- We perform continuous monitoring of this activity.
- We acquired ISO 14001 certification in 1998 and OHSAS 18001 certification in 2004 for advanced and scientific EHS management, and in 2018 we changed to ISO 45001 to reinforce the leadership of managers and to strengthen employees' participation.

### Enhancement of Risk Process Management and Inspection

#### Management Safety Leadership Tour (MSLT)

- To demonstrate commitment to the safety of executives and managers, and to systematically implement Visual Safety Management by identifying and solving problems at work sites, we conduct periodic MSLT for hazardous processes and operations at manufacturing, construction and service sites (BG director: more than once a month, executive: more than twice a month, field manager/factory manager: more than once a week).
- In case of particularly dangerous construction sites, the site director conducts MSLT to check the performance of TBM, operation of Golden Safety Time, management of three major risks, results of weekly Site Cleaning Day, and compliance with 10 Golden Safety Rules. MSLT was implemented 942 times in 2018.



#### High-risk process management

- To eliminate the major risks of falling or jamming, handling of heavy-loads is conducted in accordance with the work plan.
- Safety work procedure is enacted for easy utilization of heavy items.
- Monthly specialization training is conducted to secure professional skills and enhance the competency of workers.
- For work in high locations, a tag system is introduced at safety facilities along with experiential training on falling.

- Regarding hazard risk facilities (cranes, etc.) at which major disasters may occur, special precision diagnoses such as non-destructive inspection on parts where stresses are concentrated are performed to secure the safety of the facilities.
- By reporting high-risk work plans and outcomes of safety activities at local and overseas worksites weekly to executives, elements of potential danger are controlled.

#### Reinforcement of safety and health inspection during vulnerable periods

- Internal inspections were conducted via a checklist on peak processes and high-risk worksites as well as during holidays including New Year's Day, Chuseok, and summer and winter vacations.
- Improvement measures and 28 special safety inspections were carried out to enhance the level of safety at sites that may have been overlooked.

### Expand Effective Safety and Health Education

#### EHS Leadership education for executives and plant directors

- Education programs are provided periodically to foster EHS Leadership.
- For production executives and plant directors on EHS participation, communication, risk management capabilities, etc.
- The company has made it obligatory to install safety experience facilities at all local and overseas construction sites, conducting education for all employees since 2016.
- A pool of professional safety experience facility provides training on the proper use of the facilities.

#### Expansion of education for the enhancement of work competency in safety and health

- Training to improve competency in safety and health work was implemented for all employees working at or related to construction sites (for the enhancement of EHS Mindset and Leadership).

Completed training safety and health leader class for 30 executives, team managers and site directors
Completed training for 36 business partner site directors
Completed training for 324 local managers and supervisors
Completed training for 264 Korean managers at 6 worksites overseas and 262 EHS staff at Doosan and its business partners
Completed training for 62 local safety and health managers
Completed training for 147 Seoul office employees

#### Development of safety education contents (video)

- For the diversification of safety education contents, we have produced safety education videos and used them as EHS manuals for various workers at domestic and overseas construction sites. In particular, we translated them into 5 languages for the education of overseas workers.
- Created Doosan Heavy Industries & Construction's 10 Golden Safety Rules of Construction Sites video
- Created TBM Implementation Guide video to drive worker participation

### Zero accident hours achieved in construction projects

Classification	Unit	2018
Local	Jeju LNG Combined-cycle Power Plant	hours 1,820,000
	Obra C, India	hours 8,000,000
	Jawaharpur, India	hours 6,000,000
Overseas	Fadhili, Saudi Arabia	hours 15,000,000
	Shoiba Ro, Saudi Arabia	hours 4,600,000
	Doha RO, Kuwait	hours 4,500,000

 **Doosan Heavy Industries & Construction achieved 6 disaster-free construction sites domestically and overseas.**

### Establishment of a Safety Management Culture

#### Strengthening of autonomous execution of safety and health by business partners

- We executed a safety and health coexistence cooperation program for business partners
- 53 business partners conducted autonomous risk assessment activities to discover and fix risk factors at worksites
- Through certification of risk assessment, we received the benefits of an industrial accident insurance fee exemption and 25 companies acquired KOSHA 18001 certification.
- To provide mind enhancement education for presidents and supervisors of domestic and overseas business partners, we established an autonomous safety management system and strengthened voluntary improvement.





#### Personal health and safety activities by workers

- Moving beyond health and safety activities mainly performed by managers and supervisors, we now allow the workers themselves to take the leading role in participating in and implementing such activities.

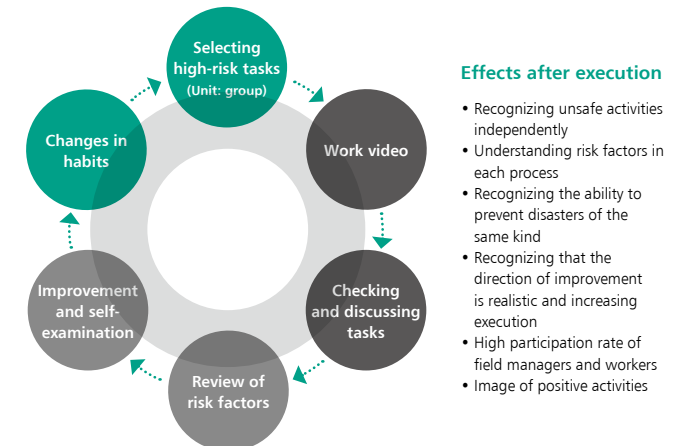
#### Crane and forklift drivers' license system

- As the transport or loading and unloading of heavy items by crane or forklift represents a significant risks, our Changwon plant operates our own crane and forklift licensing system for driving.
- Workers must pass an internal qualification program to be able to work on site and drive the aforementioned equipment, and program consists of professional theory education and exercises to minimize any unstable and unsafe activities of drivers.
- For those who fail, another opportunity to take the test will be given only after enrolling in the education again.

#### Performance of Health and Safety Management for Business Partners

-  Acquired "A grade" in the 2017 safety and health coexistence cooperation program
-  Pursued the safety and health coexistence cooperation program for 53 business partners (49 internal, 4 outside)
-  Through this program, 46 business partners conducted autonomous risk assessment activities to discover and fix risk factors at worksites
-  Acquired KOSHA 18001 certification for 24 companies

Category	Description	2017 results
Video risk assessment	Making a video of the progress of work and discovering and improving risk factors during each process by the workers themselves	Performing risk assessments in which actual workers participate by utilizing the videotaped work situations: 92%



### Emergency Response System

#### Operating a BCM (Business Continuity Management) system

- Doosan Heavy Industries & Construction has established its BCM system to secure the safety of employees and their families under various disaster situations.
- With consideration of the characteristics of different worksites, a response manual and processes have been created and training sessions in which all employees participate are held twice a year.

#### Performing emergency response training

- We have organized detailed response measures for emergency situations such as unexpected accidents or disasters.
- Emergency drills (60 times) are performed on site.
- Considering the risk characteristics at different sites, the training is carried out not only with the purpose of securing competency in initial responses for the protection of human lives and property but also in the form of field exercises for potential earthquakes, fires and explosions, environmental accidents, utility shutoffs, evacuation from office buildings, etc.



**Conducting safety talks**

- We internally produce videos specialized for the company including evacuation measures for emergency situations, response methods in the case of earthquakes, and an introduction to firefighting facilities and how to use them.
- We play them before any meeting or event, just like at a movie theater, and all relevant information is provided via a smartphone application.

**Operation of an in-company fire department**

- We operate our own fire brigade to promptly respond during the golden time to fire accidents and emergency that may occur at the company.
- We have 10 specialists with fire/emergency related majors and qualifications, as well as 2 fire trucks and 1 ambulance.

**Implementation of EHS work optimization at domestic and overseas construction sites**

- As reducing major disasters by half and the 52 hour work week are now government policy tasks, EHS work optimization measures that we pursued have been implemented and are operating at domestic and overseas construction sites.
- Formal and customary but ineffectual EHS activities have been abolished or integrated and revised: provided simplified and standardized formatting.
- We have simplified or abolished integrated safety inquiries (voluntary implementation on site) and converted them to TBM (Tool Box Meeting)-based activities (participation of Doosan/partner employees) using a safety work binder.
- Optimization of construction and safety cycle: improved by carrying out on-site preventive activities and participation by class (by director, Doosan/cooperation supervisor, and safety manager) from EHS system-based operation
- Minimization of receiving time for new workers/construction equipment: reduced training time and simplified attendance forms and inspection procedures
- Improvement of formal risk assessment and simplification of integration of Permit To Work (PTW) forms: increased safety measures in safety work procedures for each work group (minimization of risk assessment/PTW review time)
- We secure safety work binders on-site to ensure immediate review compliance and step-by-step improvements during on-site patrols (Configuration of safety work binder: Safety Work Procedures, PTW, JSEA, Risk Assessment, Lifting Plan, TBM Daily Log, Theme Checklist).



Safety work binders

**EHS performance evaluation at domestic and overseas construction sites**

- We operate an EHS activity participation program in which all of our field employees participate, particularly the site directors, and it is reflected in performance evaluation (10% of the KPI).

**Overseas site security**

- Crisis management and emergency care plans are in operation to protect the personal safety for sojourning employees who are dispatched to overseas sites as well as their family members in case of war, terrorism, riots, epidemics, or natural disasters.
- We monitor the current status of overseas sites, and any issues in relevant countries receive constant communication so that necessary actions are taken.



**Health Management**

**Health Management Program**

- We operate a "Total Health Care Program" for all of our employees, their families and subsidiaries' employees.
- A variety of healthcare programs to take care of physical and mental health are being conducted such as diet improvement activities, aquarobics classes, anti-smoking classes and medical counseling.
- Medical support is also provided to employees of Doosan, ordering bodies and subsidiaries who currently work at overseas sites with poor medical facilities.

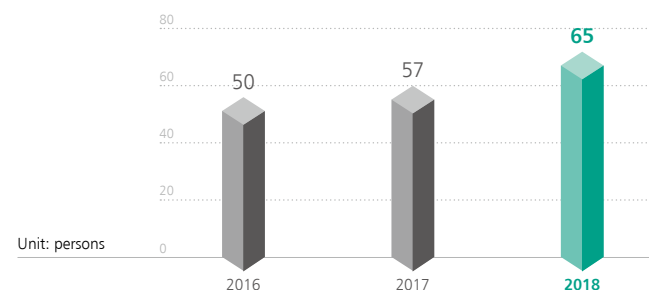
**On-the-job training for new health managers and education to improve competency in health work**

- We have been electing health administrators at our construction sites, and in 2018, as on-the-job training program was conducted for 3 newly recruited health managers.
- The OJT program is for new health managers to benchmark cases of success and failure of site health management by being deployed to well-managed sites before new sites.
- The training is carried out to help managers apply real know-how to new sites.

**Management of patients with musculoskeletal diseases**

- As a means of alleviating symptoms in musculoskeletal disease patients, therapy was carried out.
- We have hosted aquarobics classes every year since 2011, and 65 people participated in 2018.
- Moreover, results of efficacy analysis performed through VAS (Visual Analogue Scale) and isokinetic devices showed that more than 54% of the participants experienced alleviation of pain.

**Management status of musculoskeletal disease patients**

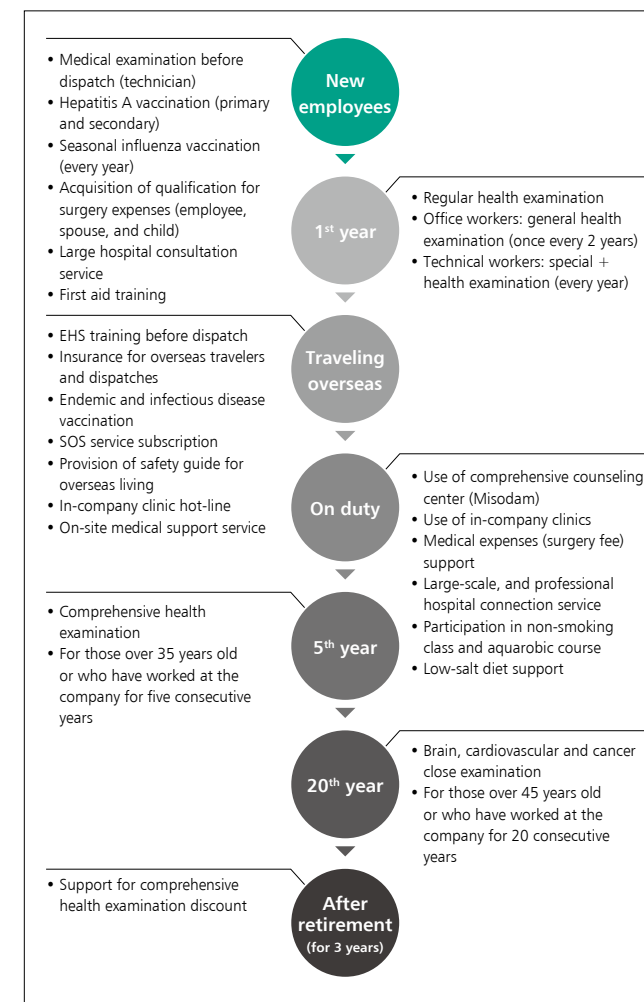


**Operation of a smoking cessation program**

- To promote the health of its employees and their families, Doosan Heavy Industries & Construction has operated a smoking cessation program through which 231 people successfully stopped smoking over the past three years.
- In 2018, training in Seoul was carried out for 15 people in five sessions in association with the Seocho-gu Community Health Center. It included a training on how to quit smoking, individual counseling, and provision of supplements.

**Healthcare programs for each recruitment cohort**

- From the entry of employees to their retirement, we offer a health management program tailored to different age groups.
- Upon joining the company and prior to being stationed for specific work, newly recruited employees are subject to not only a basic health examination but also medical treatment at large hospitals.
- All employees have access to a mental health program that offers counseling with professional counselors on stress and problems they face in their everyday lives.



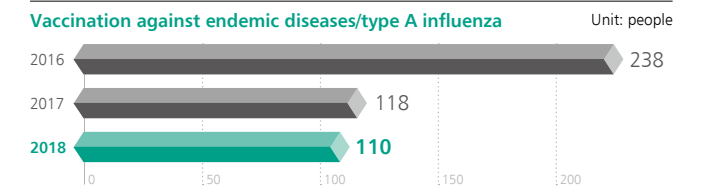
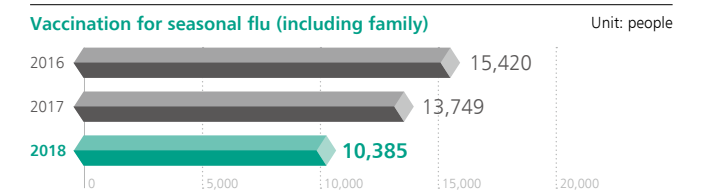
**Sanitary Control**

- We conduct a sanitary diagnosis on the nine canteens within Changwon through a professional sanitary diagnosis company three times per year in addition to more than six internal inspections.
- A total epidemic prevention system has been established to ensure that our employees are free of infectious diseases, and in-company affiliated clinics are in operation.

**Prevention of infectious diseases and operation of in-company affiliated clinics**

- We offer regular flu vaccinations for not only employees but also their families and members of business partners.
- While conducting safety education for employees dispatched to or on business trips to worksites overseas, we support vaccinations for malaria and more prior to their departure in order to prevent endemic diseases prevalent in local regions.
- Our medical staff including professional doctors visit overseas worksites which lack proper medical infrastructure on a regular basis to assist in health management through counseling and on-site treatment.
- An in-company clinic has been established where doctors, nurses, physical therapists and sports physicians are stationed to offer a one-stop treatment service, medical prescriptions, physical treatment and sports treatment.

**Status of vaccination and usage of affiliated clinics**



# Talent Management

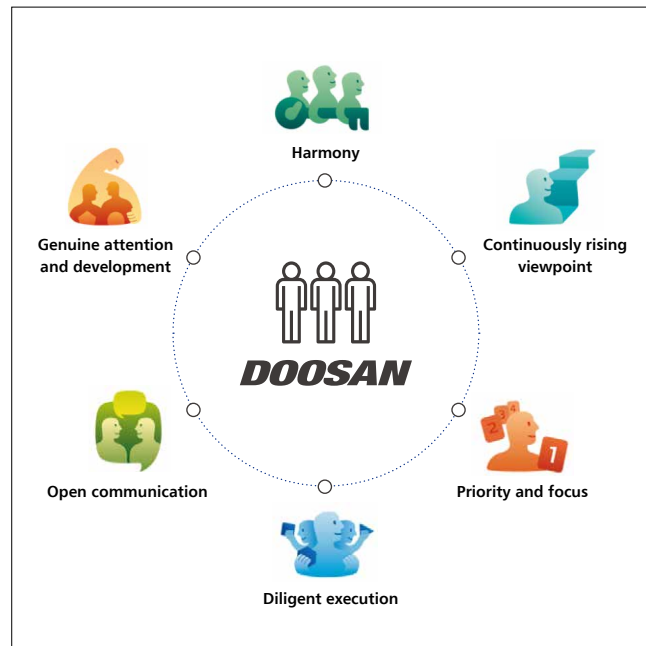
Doosan Heavy Industries & Construction recognizes human resources as an important source of revenue for the growth and development of the company. We seek to discover talented individuals and establish a corporate culture in which they can unleash their utmost capabilities, while promoting in-house training programs to further employee development and subsequently secure a competitive edge. Through improvements to the work environment, such as implementing the 52-hour work week, encouraging the use of annual leave, and adopting the 5 days-a-week Casual Day dress code, Doosan Heavy Industries & Construction has strengthened employees' work and life balance and maximized production efficiency in 2018. Doosan Heavy Industries & Construction will continue with its efforts to improve the work environment in 2019 by enhancing the internal reporting culture and adopting a flexible work start & end time system in consideration of the time difference with overseas offices. We are also aiming to strengthen work time management by adopting the PC-off system during off-hours.

## Principles of Talent Management

### The Desired Employee Traits Defined in "Doosan People"

- "Doosan People" refer to all the Doosan members, who are committed to contributing to the organization, and as such, continuously strive to improve their competency.
- Doosan People are those who regard our company's core values and desired employee traits as being of utmost importance and manifest them in their everyday actions.

### Doosan People



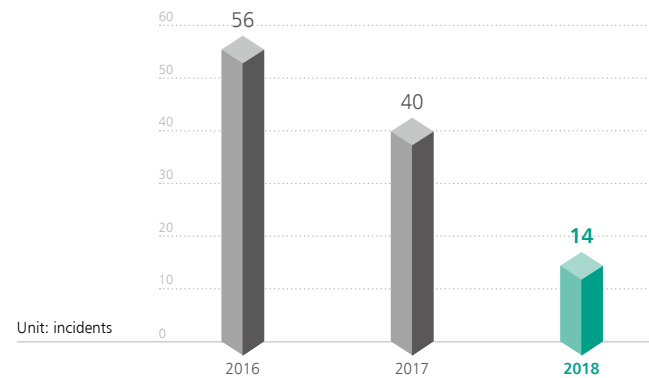
### Fair Selection of Talents

- To recruit individuals with the desired traits, Doosan Heavy Industries & Construction handpicks competent personnel every year through a strict screening process for the selection of new recruits and experienced workers.
- Recruiting is done in an open and fair manner without prejudice regarding academic background, age, gender, ethnicity, and/or region.

### Respecting the Human Rights of Employees

- All local and global worksites of Doosan Heavy Industries & Construction recognize employee's human rights as being crucial.
- We strictly prohibit the employment or forced labor of children and youth under the age of 18 (in case a violation occurs, we immediately investigate to take necessary measures).
- We also operate a human rights management program in an attempt to resolve human rights blind spots and are working to gradually expand it to all of our global worksites.
- We plan to develop and utilize a human rights investigation and self-assessment tool to advance human rights management.

### Officially filed complaints related to human rights<sup>1)</sup>

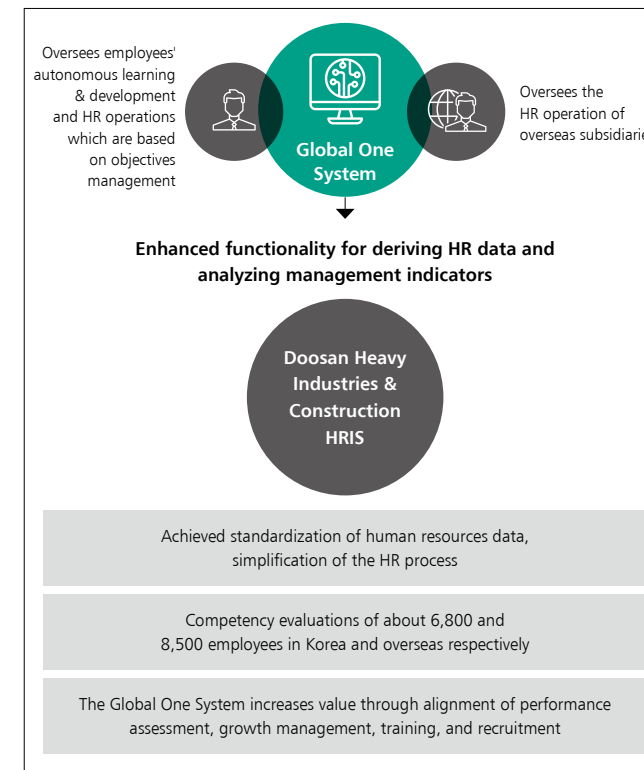


Unit: incidents  
1) Including the number of reports from partners

### HR Development-Oriented Evaluations

- Instead of an assessment for short-term compensation, we run an evaluation system focused on the long-term development of each employee.
- We understand the characteristic strengths and development needs of each individual employee and perform fact-based assessments on employees to satisfy the employee traits desired by Doosan Heavy Industries & Construction. Through this, we assist in the establishment of a detailed HR development plan and Career Development Plan (CDP).
- Doosan Heavy Industries & Construction has improved its HR information system by setting up a consolidated HRIS (Human Resource Information System).

### Human Resource Information System

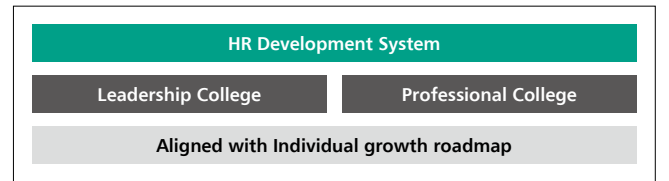
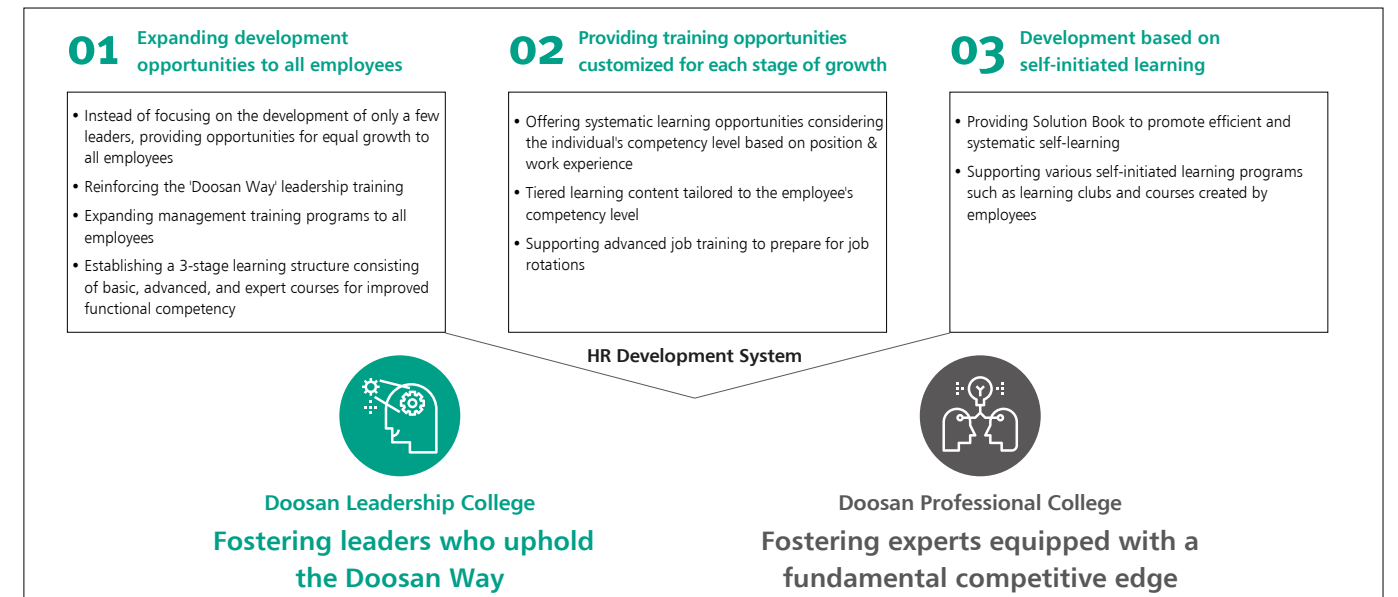


### Fostering Talents

#### Strategy for Fostering Talents

- We believe that the greatest asset in a company's growth and development is its "people", and as such, we develop strategies based on the balanced growth of talents instead of focusing on just a select few.
- We actively encourage various learning activities in workplaces to establish a self-initiated learning culture that enables voluntary improvement of one's competency.

#### Strategy for Fostering Talents



### Enhanced Functional Competency Training Programs & In-house Faculty Support

- As a means to strengthen the the functional competency of all our employees, we have developed and implemented Learning Academies for Job Functions based on the value chain.
- Each academy consists of a three-stage learning structure, Basic > Advanced > Expert, based on the capabilities required for each position and the level of seniority.
- Employees may select and enroll in functional competency training that suits their needs and level of competency accordingly.
- To provide practical educational content that is closely related to everyday tasks, a handful of employees participate as lecturers to teach and share their professional knowledge and experiences.
- We aim to improve the quality of our in-house faculty and instill pride in them by providing opportunities for them to develop speaking skills or paying lecture fees, and we are running various programs such as an annual Faculty Day event.

### Employee Training

Unit: hours

Category	2016	2017	2018	
Total no. of training hours	633,835	401,986	79,576	
No. of training hours per person	Male	86.4	58	11.7
	Female	87.2	128	22.7
hours per person	White Collars			15.5
	Blue Collars			5.4
Total	82	53	12.2	

### Innovative Leadership Development Programs

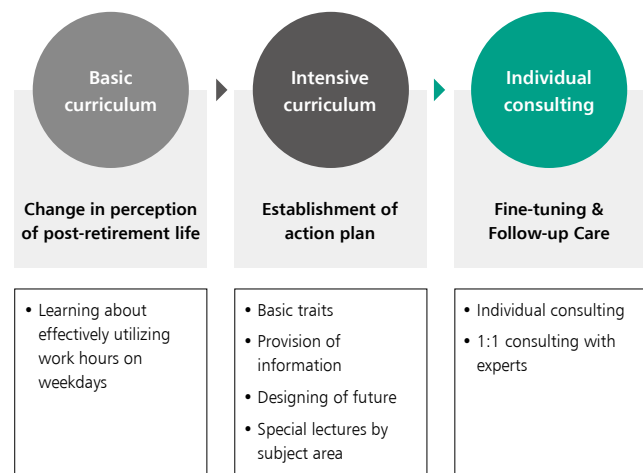
- For executive-level employees who lead innovation, Innovation School is being offered to assist them with seeking new businesses and new growth engines for the company.
- We are seeking to improve our skills for devising and implementing countermeasures for issues encountered in our everyday work through the Innovation Workshop, which was set up to discover and materialize real innovative items based on a thorough understanding of new trends and advanced digital technology in the age of the fourth industrial revolution.
- We plan to extend this curriculum to team managers and workers in the digital field as well in 2019. We will continue to introduce "innovative ways of doing business" and spread the idea company-wide in order to deal with changes in business in a smarter, more agile manner.



### STEPS Program

- We operate the STEPS (Strategic Thinking Enhancement Problem Solving) curriculum to improve employees' strategic thinking and logical problem-solving capabilities.
- We provide a framework for all employees to solve problems based on the same process and standards, so when issues arise, we can increase productivity and reduce unnecessary costs by making quick and accurate decisions.

### Learning & Development Process



### Establishment of Advanced Corporate Culture

#### Internalization of the Doosan Credo

- Doosan executives and employees, led by leaders and CAs (change agents), implement the Doosan Credo, Doosan's very own philosophy and decision-making criteria, in their work as they continuously strive to create results.
- Every year, we identify outstanding examples of our core competitiveness, business/scientific advancement, and our core values being practiced, and by sharing these examples throughout the company, we emphasize and spread the Doosan Credo.

#### Operation of Change Agents

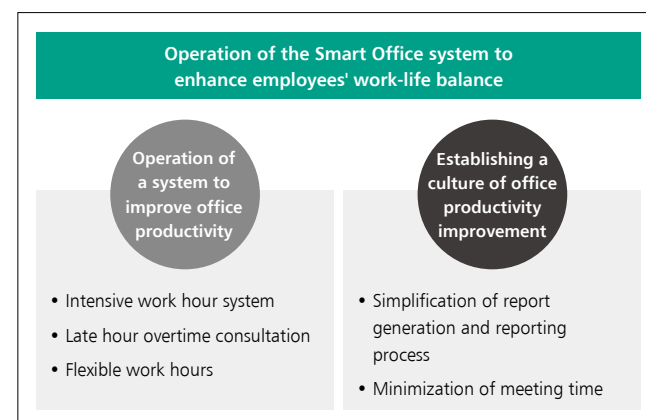
- The CAs of each executive-led organization, act as a bridge of communication between executives and employees and strive to secure a working culture and organizational culture that upholds the Doosan Credo.
- The CA continuously monitors whether its affiliated organization is working in an effective manner based on the Doosan Credo and regularly communicates the voice of the workers to the management and executives, and effectively leads the Doosan Credo efforts by promoting discussions aimed at devising and implementing improvements.



CEO-sponsored CA conference

### Smart Office

- We encourage members to enjoy a work-life balance by improving productivity through the efficient use of work hours and the Smart Office system (PC Off system, intensive work system, flexible work system).
- To improve office productivity, we cultivate an effective and purposeful reporting culture that is not tied to any form or formality.



### Open Communication Survey

- The "Open Communication Survey," where the top executives listen to questions and suggestions from employees and answer them directly, is being implemented every month from April 2018. So far, over 3,200 questions and suggestions have been received and it has become a meaningful communication channel between the company and employees.
- The company responds to employees' questions to appease their curiosity while also trying to share the company's vision by actively explaining the business status and strategies.
- We also seek to improve the work environment of employees and enhance work & life balance by actively accepting employee's constructive suggestions and ideas.

Total number of participating employees	Questions	Suggestions	Systems introduced through surveys
1,883	1,267	1,290	<ul style="list-style-type: none"> <li>• Introduction of Casual Day</li> <li>• Introduction of a quarter day off system</li> <li>• Improvement of the compensation package offered to domestic and overseas site workers</li> <li>• Improvement of congratulations and condolences system</li> </ul>

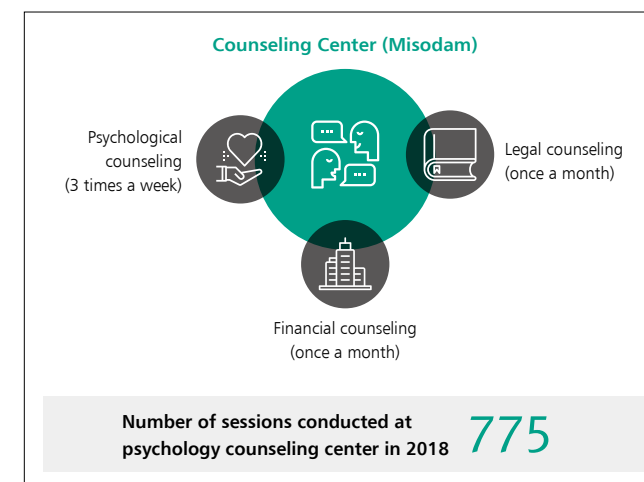
### Establishment of Excellent Workplaces

#### Retirement Assistance Program

- Customized retirement support programs are provided for employees whose retirement is imminent, as well as their spouses, to guide them in the post-retirement phase.
- They are composed of basic and intensive curriculums. Information on individual concerns is provided, and discussions and consulting are supported especially near the time of retirement.

#### Operation of Misodam

- We have opened and are operating a general counseling center, Misodam, an integrated center offering services ranging from mental care to legal and real estate counseling, as well as psychological, legal, and real estate counseling for our employees.
- For psychological counseling services in particular, we conduct counseling related to oneself, family, and children's education help improve employees' mental stability and maximize work efficiency.



### Support of Club Activities

- We support club activities for our employees' work and life balance. (leisure activities in various areas including sports, hobbies and self-development).
- More than 2,000 employees are currently signed up in 51 clubs in Changwon, Seoul and Yongin.

### Consortium Education

- We operate national HR development consortium programs that are aimed at enhancing the technical competency of power sector customers, business partners, and employees.
- Through such efforts, we are leading the shared growth between the company, customers, and business partners, and thereby achieving increased productivity through the enhancement of employees' technical skills.



### Meister System

- The company selects and nurtures in-house 'meisters' to pass down their skills and expertise accumulated through decades of experience at production sites and to foster technical talents.
- 19 meisters have been raised since 2014 and serve the role of improving productivity through technical training and process standardization.
- We run a systematic curriculum aimed at technical competency enhancement for our employees to help them grow as meisters.

#### Fostering Technical Talents "Meisters"

- **19** meisters have been raised for technical training and process standardization (2014-)

Category	Purpose	Target Group	2018 Outcome
National human resource development consortium program	Seeking shared growth of large corporations and SMEs through support for personnel development	Current employees and new recruits at partner companies	<b>673 people</b> (637 current employees, 36 new recruits)
Training Programs for Power Sector Clients	Providing clients with customer satisfaction	Current employees of power sector clients	<b>159 people</b>
Technical training for current employees	Functional competency enhancement of current employees	Company's current employees	<b>451 people</b>

### Technology Management School

- We operate the Technology Management School, with a technical management curriculum, to improve the competencies of the technical staff.
- We promote a culture of communication by delivering a value-creating business cycle and accounting knowledge and by conducting leadership programs.
- Since 2014, training has been conducted with 1,575 people (76%) with a total of 58 waves being conducted thus far.

### In-house University

- In collaboration with Changwon National University, we are currently running the Department of Energy Fusion Engineering to promote the development and growth of the technical staff.
- Employees who are interested can apply for undergraduate and transfer courses and use weekdays and weekends to study. They will be obtaining a degree in engineering upon graduation.
- 86 employees have graduated thus far and 20 employees are currently enrolled in the transfer curriculum.



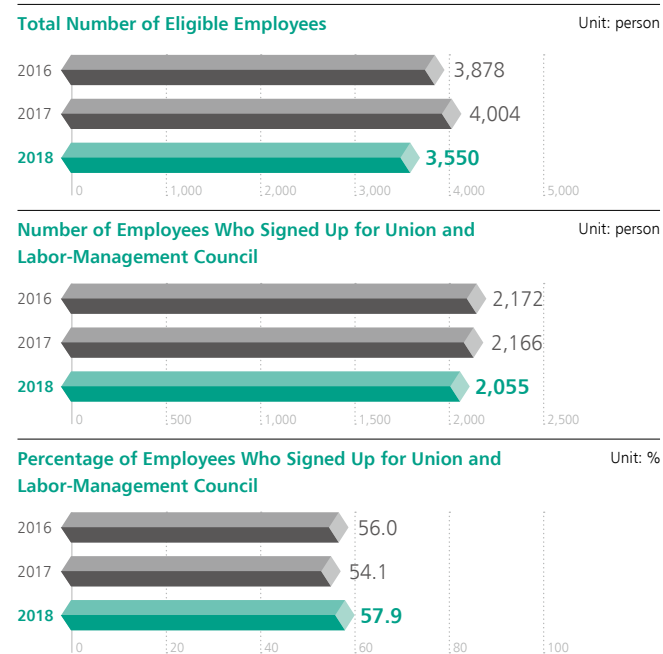
### 13 Consecutive Years Free of Labor Dispute

- We have established stable and rational labor-management relations based on strong mutual trust.
- This has led to the settlement of negotiations without any complications for 13 consecutive years.

### Labor-management communication and Engagement

- Opportunities for employees to freely participate in the decision-making process are provided through corporate labor-management meetings, such as collective bargaining, the labor-management council and system & policy improvement committee.
- We have prepared communication channels for the employees, such as an ombudsman office at each BG, to ensure our employees' opinions can be reflected in the company management. For each BG in order to actively reflect our employees' opinions in corporate management.

### Overview of Employees Covered Under Collective Bargaining Agreement



## Shared Growth

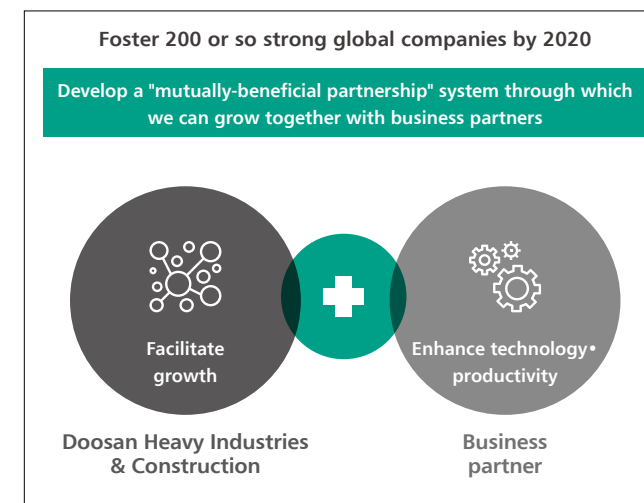
Doosan Heavy Industries & Construction is building up its competitiveness through synergetic partnerships with its business partners. The company will foster shared growth with its business partners to establish a long-term cooperative system and is seeking to improve the effectiveness of partner management by adopting upgraded development programs that reinforce partners' competitiveness and assist with overseas market entry.

### Shared Growth Promotion System

#### Shared Growth Strategy

- Doosan Heavy Industries & Construction's managerial, quality management, and technology systems, including its technical capabilities and business systems, are being shared with business partners to further increase their competitiveness.
- By establishing synergetic partnerships with its business partners, Doosan Heavy Industries & Construction has been playing a positive role in the local and national economy.

#### Shared growth promotion strategies



### Building Up the Competencies of Business Partners

#### Shared Growth Academy

- Shared Growth Academy is a program devised to promote cooperation between large corporations and small-to-medium sized partners and to expand the culture of shared growth even to secondary and tertiary business partners.
- Run by the government and the Korea Foundation for Corporation of Large and Small Business, Rural Affairs, over 100 employees from 98 business partners participated in the event in 2018.
- Various information is shared to help partners build up their competitiveness. e.g. Necessity of CSR activities for sustainable development, special lecture on "the common denominator between basketball and business management" given by KISWEL Vice Chairman Hee-Am Choi, the former star basketball coach who became a successful entrepreneur, and presentations on EHS cooperation programs.
- By providing the stage for discussions with each department, we get the chance to listen to our partner's voices directly and come up with solutions

#### Reinforcing Competitiveness

- Doosan Heavy Industries & Construction offers consulting services for its business partners to reinforce their competitiveness, and professional consultants from an external consulting firm visit the company's business partners to help deduce and execute assignments for improvement.
- A total of 26 business partners have received such assistance since 2014. Through these consultations, they experienced improvements in purchasing, productivity and design, and also achieved an average cost reduction of 10.4%.
- Participated in the Industrial Innovation Movement for the 5th year to support the competitiveness enhancement of 11 business partners in productivity innovation, and two of them won the Excellent Enterprise Award:
  - Taejun Industrial Co. (Minister of Trade, Industry and Energy Award), Ilwol Packaging & Logistics (Korea Commission for Corporate Partnership Chairman Award)
- In addition to the ongoing program, the company conducted professional consulting for 11 business partners in 2017 regarding entry into the Vietnamese and Indian markets, which has resulted in five of them establishing local offices and beginning construction of factories.

#### Capacity-Building Training

- Providing opportunities to develop functional competencies for employees at our business partners, including those expected to be recruited.
- Training expenses are fully supported by Doosan Heavy Industries & Construction for our business partners and additional training allowances are provided to encourage participation in training.
- 633 employees from 95 affiliate companies participated in and were trained through the competency enhancement programs in 2018.

#### Management Consulting and Quality Improvement Activities for Partners

- Customized consulting is implemented by matching a business partner in need of effective consulting with a retired Doosan Heavy Industries & Construction executive who can share his expertise.
- In 2018, we completed management consulting for four business partners, and consulting on the enhancement of quality control for an additional four business partners. Quality meisters of Doosan Heavy Industries & Construction helped support the establishment of a quality system.
- In 2017, 13 meisters provided assistance for two business partners to contribute to their quality improvement.

## Establishment of a Culture of Shared Growth

### Communication

- Doosan Heavy Industries & Construction Cooperative Association is a consultative group launched for the fulfillment of shared growth and communication between Doosan Heavy Industries & Construction and its business partners.
- With Doosan Heavy Industries & Construction Cooperative Association at the center, long-term, productive cooperative relationships based on mutual trust are established.
- With the Cooperative Association, Doosan Heavy Industries & Construction implements various shared growth programs including competitiveness reinforcement support, financial assistance, joint advancement overseas, and strengthened communication.
- To discuss major issues that arise between Doosan Heavy Industries & Construction and its business partners, regular meetings are held as well as executive visits to the business partners.
  - In 2018, BG-specific meetings were held 13 times, the purchasing executives including the CEO visited 23 business partners.
  - To spread the shared growth culture to secondary business partners, and identify and resolve problems, we visited 34 secondary business partners.
- The Win-Win Call Center is also being operated for consultations and feedback regarding difficulties, complaints, and recommendations from business partners, while cultural events such as family festivals and family music concerts, hosted by Doosan Heavy Industries & Construction, are held for affiliate employees and their families. This is just a couple of examples showing the many ways the company is using to communicate with its business partners.

### Fair Trade Compliance Program

- As a fair trade compliance organization, Doosan Heavy Industries & Construction has designated compliance administrators and compliance managers for each BG and a team responsible for fair trade compliance.
- To prevent any legal violations in advance, work processes and computer systems have been improved.
- Education on fair trade and the shared growth mindset is carried out for employees who work directly with the business partners.
- Education on subcontract law especially is being implemented throughout the company and reinforces executing regulations on personnel transfer for law breakers.

#### Visiting secondary business partners





- Doosan Heavy Industries & Construction visited 34 secondary business partners, concluding a fair trade agreement between primary and secondary business partners from October 22, 2018 to the end of November 2018.
- During the visits, we showed guidance on the SME factory support business of small and medium enterprises of small venture business department and the meister's quality improvement support program of Doosan Heavy Industries & Construction.
- In addition, we listened to the difficulties and suggestions of secondary business partners and proposals for the shared growth of large corporations. We introduced shared growth support programs for partner companies and suggested various issues.

## Supply Network Management

### CSR Guideline of Business Partners

- Doosan Heavy Industries & Construction has enacted and enforces the "Doosan Heavy Industries & Construction CSR Guidelines for Business Partners," the fundamental criteria with which all of its business partners must comply (<http://www.doosanheavy.com/kr/csr/guideline/>).
- These guidelines were written based on the 10 principles of the United Nations Global Compact, which includes human rights, labor, environment, and anti-corruption.
- Doosan Heavy Industries & Construction encourages all business partners to follow such criteria.

#### Major contents of CSR guidelines for business partners

	Human rights	Health and safety, working conditions and wages, etc
	Labor	Freedom of association, child labor, forced labor, etc.
	Environment	Environmental protection and pollution control
	Anti-corruption	Prevention of corruption, compliance with law
	Conflict minerals	Conflict minerals, response status, etc.

### Distributors of Doosan Heavy Industries & Construction

- Doosan Heavy Industries & Construction has selected strategic items and cooperation items by considering price, quality, delivery time, entry barriers, etc., and defines companies who maintain long-term supply relationships as business partners.
- When selecting a new business partner, Doosan Heavy Industries & Construction performs an assessment of its financial and governance structure through a credit evaluation, and the selection criteria include items of environment, safety, and fair trade.
- A company that has caused social or moral disturbance is strictly prohibited from applying as a new affiliate, and the entire selection process is carried out in an unbiased and transparent manner.

### Risk Management of Business Partners

- Doosan Heavy Industries & Construction conducts a business partner registration assessment through which costs, delivery, quality, collaboration, CSR, environmental safety, etc., are evaluated based on annual transaction results.
- Other items evaluated include credit rating, reputation and sales volume. Companies exhibiting high risks as indicated by the evaluation results are excluded from the pool of potential business partners.
- An assessment is conducted by a representative or an auditor designated by Doosan Heavy Industries & Construction who visits the workplaces of business partners.
- The assessment is conducted with a focus on the state of compliance with the CSR guideline, and business partners maintain all documents and data needed to prove their conformance to the guideline at all workplaces related to Doosan Heavy Industries & Construction.

### Purchase status of local and overseas supply chains (size of the supply chain/purchase cost)

Classification	2018
 Korea	10,995 (KRW 1.68 trillion)
 Japan	164 (KRW 170.4 billion)
 China	148 (KRW 31.3 billion)
 Saudi Arabia	119 (KRW 132.8 billion)
 United States	353 (KRW 51.9 billion)
 Italy	90 (KRW 14.2 billion)
 Czech	12 (KRW 100 million)
 Germany	294 (KRW 57.1 billion)
 Romania	10 (KRW 36 billion)
 Others	1,069 (KRW 81.6 billion)

### Major negative impacts on society and measures implemented within the supply chain

Category	Unit	2016	2017	2018
No. of suppliers that have been evaluated for social impact	companies	743	324	376
No. of suppliers that have been verified to actually or potentially have a negative social effect	companies	2	0	0
improvements based on the evaluation results	%	100	100	100
No. of corruption cases in which penalties have been imposed on business partners	case	4	2	1

### Policies regarding conflict minerals

- Doosan Heavy Industries & Construction publicizes its policies to eliminate the use of conflict minerals (tin, tantalum, tungsten, gold) when manufacturing its products to resolve any risks related to human rights violations or delivery practices (<http://www.doosanheavy.com/kr/csr/guideline/>).
- Though the act of extracting or mining minerals is not directly related to its areas of business, Doosan Heavy Industries & Construction still implements this system to fulfill its social responsibilities and to protect human rights throughout the value chain.
- The system related to conflict minerals is being executed through the application of company regulations related to the CSR guidelines for its suppliers and diverse efforts are undertaken to listen to the opinions of interested parties.

### Responses to conflict minerals

- Since 2012, Doosan Heavy Industries & Construction has maintained a process to determine country-of-origin and established a system to support it.
- To verify the country of origin for each project, item categorization of original materials is requested to an external professional agency (customs firms, etc.) to secure reliability.
- Through a simulation feature of the system, materials or companies necessary to satisfy the country of origin are selected and relevant business partners are required to submit country-of-origin verification documents.
- Doosan Heavy Industries & Construction revised the content of purchasing contracts signed with suppliers to include the prohibition of conflict minerals, and had all of its suppliers comply.

#### "Scrap iron", a primary raw material for mold tool steel manufactured by Doosan Heavy Industries & Construction

- 7 country-of-origin determinations are made on average every month
- We manage alloy additives added to the steelmaking process by suppliers by identifying the origin of raw and subsidiary materials for manufacturing products.

# Customer Satisfaction

Customer satisfaction management of Doosan Heavy Industries & Construction aims to assign innovative momentum to customer relations improvement by "respecting and listening carefully to customers' voices [VOC]", "fulfilling customers' expectations [Wants]", and "providing superior value to customers [Value]," escaping one-dimensional meaning found in simple customer service. In 2019, we will develop and operate advanced information management systems in order to improve customer satisfaction and reliability of quality.

## Activities to Improve Customer Satisfaction

- With customers as the priority of our corporate management, we promote service innovation to enhance customer value.
- Through diverse and systematic activities aimed at satisfying customers, including periodic customer satisfaction surveys, lifecycle management of supplied equipment, and the operation of technical support centers at power generation companies, we seek to continue positive partnerships.

### Customer Satisfaction Survey

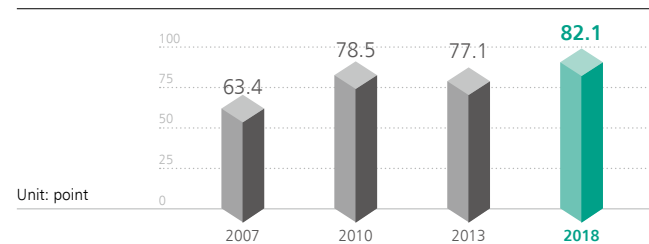
<b>Customer Satisfaction Survey</b>	<ul style="list-style-type: none"> <li>• Long-term customer satisfaction surveys</li> <li>• Annual satisfaction surveys</li> <li>• Continuous collection of VOC</li> </ul>
<b>Lifecycle management of supplied equipment</b>	<ul style="list-style-type: none"> <li>• Operation of expedited support team for power plant shut down</li> <li>• Lifecycle management of supplied equipment</li> <li>• Power plant remote control system</li> </ul>
<b>Technical support centers at power generation companies</b>	<ul style="list-style-type: none"> <li>• Online technical support</li> <li>• Call center</li> <li>• Trend analyses requested as technical support for each client company and provision of proper feedback</li> </ul>
<b>Technical cooperation with client companies</b>	<ul style="list-style-type: none"> <li>• Technical exchange meetings by Visiting</li> <li>• Technical cooperation agreements with power generation companies</li> <li>• Inviting client companies for field trips to Doosan power plant facility in Changwon.</li> </ul>
<b>Establishment of customer management procedures</b>	<ul style="list-style-type: none"> <li>• Customer management procedures</li> <li>• Customer inquiry and complaint processing procedures</li> <li>• Customer satisfaction survey procedures</li> </ul>

### Customer Satisfaction Survey

- To provide better services for its customers, Doosan Heavy Industries & Construction requests an external research agency to conduct customer satisfaction surveys to measure the level of customer satisfaction regarding the quality of its products and services.
- Through these surveys, we listen to the customers' opinions and speedily reflect them in the improvement of products and services.

Category	Direction of customer satisfaction survey
Previous (1 <sup>st</sup> to 3 <sup>rd</sup> )	1 <sup>st</sup> (2007) Reinforcing rapid response system 2 <sup>nd</sup> (2010) Strengthening technical capabilities 3 <sup>rd</sup> (2013) Reinforcing mutual exchanges and relations
2017	Model upgrade
2018	Conducting Annual On-line Survey · Continuously understanding trends in customer satisfaction · Securing talking points with customers
2019	Conducting Annual On-line Survey · Continuously understanding trends in customer satisfaction through expansion of customer targets

### Trend of customer satisfaction surveys



### Best Practices of Customer Satisfaction

#### Receive Letter of Appreciation from Customer for Vinh Tan 4 Coal fired Thermal Power Plant.

- We received a letter of appreciation from EVN (Vietnam Electricity), the ordering client, for the successful completion of Vinh Tan 4 project three months ahead of schedule.
- It was the first time since the company was awarded a letter of appreciation from EVN that they acknowledged our contribution to the early operation of the power plant and the stabilization of the Vietnamese electricity market. As a result, customer satisfaction is creating a positive impact on future projects in Vietnam.

### Establishment of customer management procedures

- In order to improve the needs of customers and interested parties, customer management procedures have been prepared.
- Customer inquiry and complaint procedure and customer satisfaction survey procedure documents for efficiently dealing with the needs and dissatisfaction of customers in order to ensure customer satisfaction.

### Lifecycle management of supplied equipment

#### Power plant remote-control service

- Based on ICT, a remote-control system has been established to monitor operational data of power plants in real-time.
- Doosan Heavy Industries & Construction has opened its RMSC (Remote Monitoring Service Center) and, through constant support operating systems such as real-time surveillance of operation data, can monitor abnormalities.

Category	Details
Emergency Support Team	Operating a specially configured support team during peak power usage periods and generation emergencies to offer expedient customer support
Lifecycle management of supplied equipment	Providing service on supplied generation equipment until the closing of the plant, and continuously offering lifecycle support for equipment whose assurance periods have elapsed.

### Technical cooperation with client companies

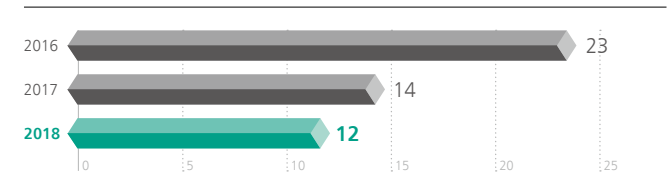
#### Technical exchange meetings by visiting

- "Technical exchange meetings by visiting" are carried out by visiting client companies to provide information on the latest technology and trends and share the data on the client's facility enhancement and operation.
- A form of proactive participation from client companies has been encouraged through a combination of seminars and discussions.

### Changwon plant field trip invitation program for client companies

- We invite newly recruited and experienced employees of client companies on field trips to Doosan Heavy Industries & Construction's Changwon Plant.
- In 2018, there were 2 field trips.

### Status of technical exchange meetings by year



## Customer Communication Channels

### Technical support center for power generation companies

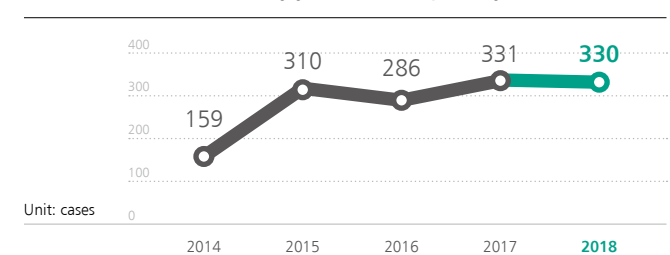
#### Online customer technical support

- We strive to provide more accurate and faster replies to the technical support requests of our customers, which are received online.
- The time it takes to reply is gradually getting shorter from 12 days in 2013 to 4.6 days in 2017, and to 3.3 days as of 2018.
- In order to provide better service, we have received customer satisfaction feedback for the answering service since 2018 (an average of 9.1 points out of 10 in 2018).

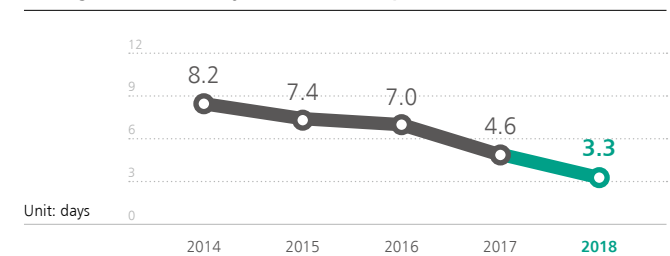
#### Call center

- In the event of an emergency at a power plant, we operate a call system that can support urgently.
- Along with online technical support, faster replies and assistance are offered.

### Number of cases received by year (over the past 5 years)



### Average number of days taken for a response



## Quality Management

### Quality policy

- Doosan Heavy Industries & Construction regards the provision of comprehensive customer satisfaction and contribution to the creation of customer value as its greatest competitiveness in quality.
- To ensure the quality desired by customers and to guarantee no defects, we maintain a quality assurance system of the highest level that is organized, systematic, and meets global standards.
- All organizations and employees within the company strictly comply with the base conditions required by the quality policies.

### Quality certifications

- For external confirmation of competitiveness in quality and to secure customers' confidence, we acquired and maintained 61 external certifications in the fields of nuclear power, thermal power, and desalination.

### Status of external certifications

Category	Types of certifications	2018
Nuclear power project	ASME N type, KEPIC	16
Thermal power/desalination/wind power businesses	ASME U type, ISO	15
Others	PED, KR, NK, BV, and etc.	30
Total		61

### Quality meisters

- As Doosan Heavy Industries & Construction has turned out 21 Meisters of National Quality and 10 Meisters of Korea, we have the world best technicians in the welding, machining, non-destructive, steel making, and casting and molding fields [the Human Resources Development Service of Korea and Korean Standards Association select technicians and engineers with the highest level of experience and skills in industries as Meisters.]
- The council formed by these meisters conducts various activities such as talent development and support to strengthen the competitiveness of business partners among others.

### Gold medal win in the National Quality Circle Team contest for 9 consecutive years

- Gold prize (Presidential prize) at the 44th National Quality Circle Team contest [the National Quality Circle Team contest is a prestigious contest in which team members strive to innovate and improve the quality at industrial sites across the country.]
- The circle team "Yeomyeong", Doosan Heavy Industries & Construction's Power Service Quality Control Team 2, participated in the on-site improvement category, announcing the theme of "reducing lost time by improving the boiler module hardness testing method." Inspection time was drastically shortened and the accuracy of the inspection was improved by eliminating the inefficiency of the standard specimen setting process.

### Digitalization of quality information documents

- Through the launch of the DQMS (Doosan Quality Management System), we manage digital quality information and documents and have established a preventive quality management system.
- By digitalizing quality information from all phases of the inspection plan to the results, we have secured quality management provision visibility for the progress of quality management activities and enhanced quality execution capabilities and preventive quality control using real-time quality performance information.

### Establishment of a new business quality system

- In order to ensure the stable operation of new businesses (ESS, Digital Solution) in the renewable energy and plant service fields, a quality system has been implemented wherein quality control procedures that conform to international standards are run in advance to prevent quality failure from the start of business.

# Social Contribution

By proposing a blueprint to improve the future competitiveness of the community, Doosan Heavy Industries & Construction has become respected in local communities and, at the same time, is striving to form a social contribution identity for Doosan of which all Doosan People may be proud. By restructuring the social community service group and adjusting of social contribution programs, we aim to increase operational efficiency and focus our competencies on more effective programs. Moreover, we will continue to discover and promote policies centered on local communities, such as career path education and urban regeneration, and social contribution programs that meet the social needs, thus maintaining our network and contributions to the local community.

## Social Contribution Strategy

### Social contribution promotion system

- With the goal of increasing the future competitiveness of the community and company value, Doosan Heavy Industries & Construction has three basic principles: Business Oriented, Community Focused and Employee Engagement. Based on these, three domains of activity have been set up, talent cultivation, support for the underprivileged and community-based, and these promote a variety of social contribution activities for the local community.

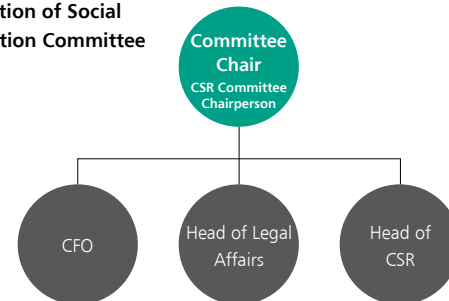
### Operation of Social Volunteer Group

- The Social Volunteer Groups of Doosan Heavy Industries & Construction, comprising 91% of our employees and totaling 5,300 members, participates in social contribution activities mainly in the Changwon and Seoul areas by helping the marginalized members of our society.
- At the company level, we support the social contribution activities of employees through policies such as matching grants, weekday volunteering activities, computer systems, and awards for outstanding volunteers.

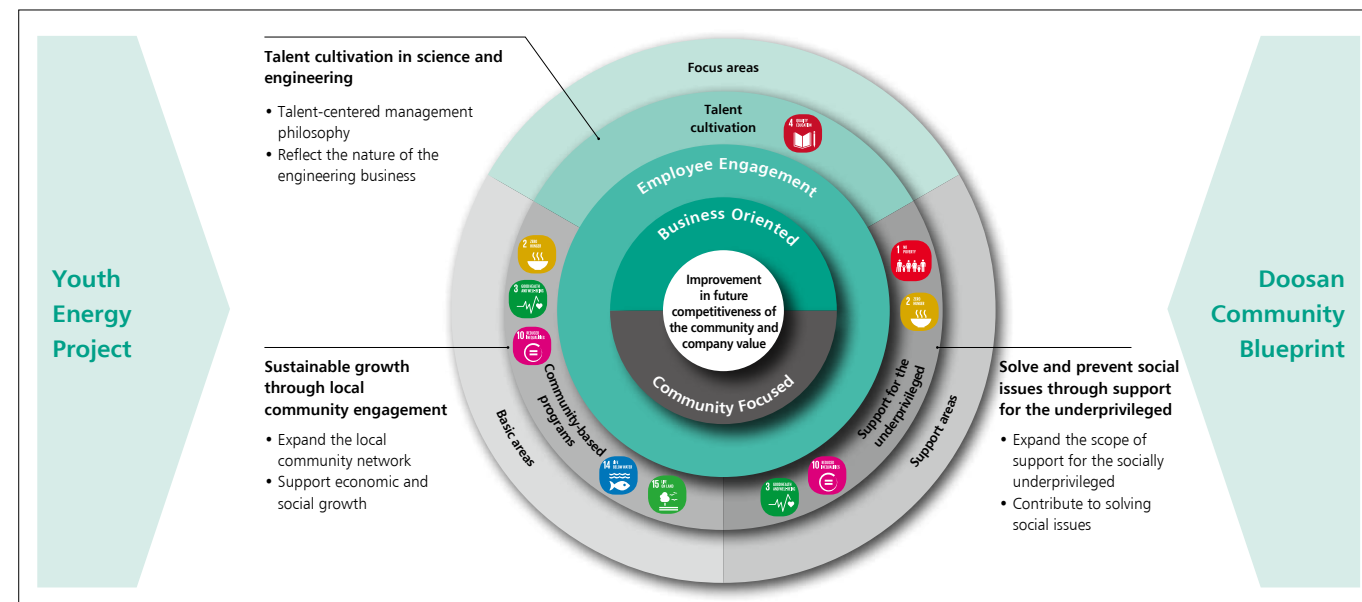
### Social Contribution Committee

- Doosan Heavy Industries & Construction has installed and operates a social contribution committee, which serves as the highest decision-making group, to reinforce transparency of the donations provided to local communities.
- The social contribution committee is chaired by the head of the CSR Committee and its members are executives of related departments who come together to review public interest aspects and the suitability of donations to local communities.
- Each review comprehensively determines not only the transparency and propriety of the supported agencies but also whether or not the purpose and details of the donations comply with the company's direction in social contribution and are in the public interest.

### Composition of Social Contribution Committee



## Social Contribution Promotion Strategy



## Talent Cultivation

- Based on Doosan Group's talent-centered management philosophy, social contributions to nurture the outstanding talents of the future is specified as an area of focus.
- Considering the nature of the engineering industry, we have a high proportion of individuals from the fields of science and engineering. Therefore, we feel the importance of nurturing talents in engineering and also concentrate on related social contribution activities.

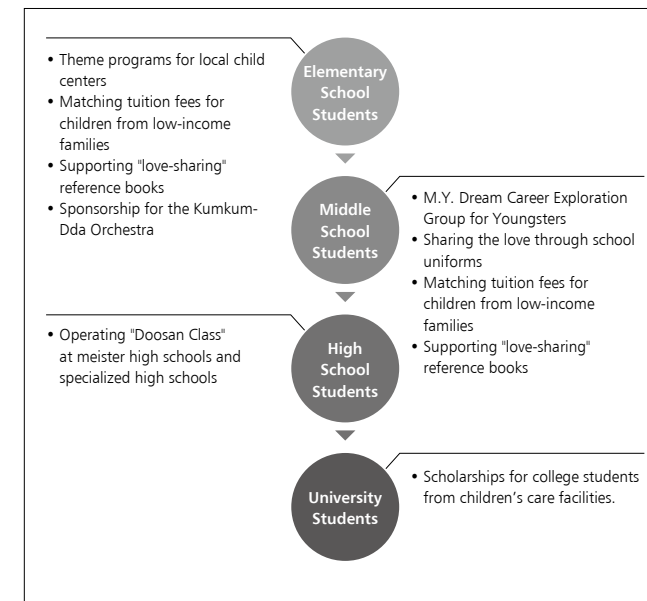
### Major achievements of talent cultivation in 2018

- Carrying out of themed programs for 1,500 children at local children's centers
- Recruitment of 18 Doosan class student as technical workers
- Recruitment connection for 33 unemployed of technical education and training

## Youth Energy Project

- Youth Energy Project is Doosan Heavy Industries & Construction's social contribution program, which aims to support future talents to grow into self-reliant, balanced individuals with various abilities.
- All programs included in the youth energy project are tailored to the growth stage of the talent.

### Major programs of the Youth Energy Project



### M.Y. Dream (Make Your Dream) Career Exploration Group for Youngsters

- The Career Exploration Group for Youngsters is a program through which teenagers are encouraged to develop interests in different professions and ultimately determine their own career paths in advance.
- In line with implementation of the free semester system in middle schools, a career education MOU was signed with Changwon Office of Education to install the program in middle schools in the city of Changwon. It comprises three activity stages: career path exploration, experience and design.

### M.Y. Dream ("Make Your Dream") Youth Engineer Experience Class

- The Youth Engineer Experience Class is a new experiential class that allows teenagers to experience engineering jobs by utilizing the company's engineering capabilities.
- In 2018, 940 students from 14 middle schools in the Changwon area participated in the first program.



## Local Children's Center theme programs

- Since 2014, we have been operating 10 themed programs including history exploration, ecological experience, woodworking, practical crafts, cooking classes, social studies, science, and history education for 76 local children's centers in Seoul and Changwon with whom we have sisterhood relations.
- In 2018, we conducted 160 activities for each social volunteer group to contribute to the social development and emotional cultivation of 1,500 marginalized children.

## Academic-industrial collaboration, Doosan Class

- Doosan Heavy Industries & Construction has been providing support to engineers through the academic-industrial collaboration, "Doosan class".
- We have formed academic-industrial collaborations with Changwon Machine Industry High School, Busan Automotive High School and Sudo Electric Technical High School to provide technical and competency training tailored to Doosan Heavy Industries & Construction.
- In 2018, 18 students from Doosan Class were recruited as a part of the plan to acquire competent engineering talents.



### Provision of reference books to children's welfare facilities

- Every semester, we provide reference books to 81 children's welfare facilities with whom we maintain sisterhood relations for the purpose of improving the practical learning abilities of marginalized children.
- In 2018, we provided 11,612 reference books in two semesters for 2,031 beneficiaries, and the total number of books that have been donated since 2011 is about 70,000.

### Youth Dream Up Project

- For teenagers who have outstanding gifts and talents but cannot dream big due to financial difficulties, we provide support through the "Youth Dream Up Project" hosted by ChildFund Korea.
- We support five students in three sports – one in archery, two in shooting and two in Taekwondo – to enable them to pursue their dreams.

### Support for the Underprivileged

- We take the lead in social contributions that support better lives for underprivileged neighbors in our society, including children, youths, senior citizens, and the disabled.
- We continue to expand the scope of targets to include more people from marginalized classes located in the blind spots of welfare policies.

#### Major achievements of Support for the Underprivileged in 2018

- 10 social welfare center programs targeted at the elderly, children, and youth were implemented.
- The results of the performance measurement showed that the psychological and mental health of 90 beneficiaries improved to 81.3% post-treatment from the normal range of 53.6%.

### Programs associated with community welfare centers

- With an aim to reflect the needs of the local community, programs are planned with community welfare centers, which are in direct contact with socially marginalized groups in our society, to carry out volunteering activities in which our employees participate.
- Together with six community welfare centers in Changwon and four in Seoul, emotional support and social development programs are in operation for teenagers, senior citizens, the disabled and multicultural families.



### Clean House

- Technical volunteer group consisting of talent-sharing employees.
- Through this program, house repair programs are implemented on a regular basis to check electric equipment and perform papering and painting for the underprivileged, farming villages and child welfare centers.

### Dasarang Dream

- Dasarang Dream Program started in 2011 with the Korea National Red Cross Gyeongnam Branch to support underprivileged youth in the region.
- In 2018, we conducted community service in which we purchased daily necessities from a social company and packaged and delivered them to 300 underprivileged households in the region.
- We regularly donate and serve bread and noodles to children at welfare facilities that are in sisterhood relations with the company.

### Community-Based

- We seek community-based social contributions in which various interested parties can join and grow together with the local community.
- We continue to expand our cooperation network for the growth of local communities with various interested parties, such as local governments, NGOs, social welfare agencies, and farm villages.

#### Major community-based achievements in 2018

- Talent sharing activities with local stakeholders including Changwon-si were carried out 48 times.
- Through farming village exchange activities, the income of 130 households was increased by KRW 69 million.

### Kimchi Sharing Event

- Doosan Heavy Industries & Construction conducts the 'Kimchi Sharing Event' activity with the local community to share its love with neighbors every year.
- In 2018, about 400 people from civil servant family social volunteer groups, voluntary service organization associations and Danuri Social Volunteer Groups, consisting of multicultural families as well as business partners of Doosan Heavy Industries & Construction, participated in this event.
- Prepared 5,000 heads of kimchi at the Changwon headquarters, which were delivered to nearly 3,000 people at Changwon child welfare centers, underprivileged groups, social welfare centers and multicultural households.



### Offering a helping hand to seven farming villages

- Doosan Heavy Industries & Construction has formed sisterhood relationships with 7 farming villages (Gwisan in Changwon, Janggi in Goseong, Misan in Haman and others), enabling employees to participate during farming and harvesting seasons by lending a helping hand.
- During the fall 2018 harvest, 450 Doosan employees along with members of the Changwon Volunteer Service Organization Association visited the sister farm villages to assist with the kiwi and sweet persimmon harvest.



### Firefighting safety experimental education with Safety Sharing Community Service Group

- The "Safety Sharing Community Service Group", launched in 2017 to spread a safety-first culture throughout local communities, consists of executives and employees with expertise in the fields of disaster response, firefighting safety, health and sanitation.
- The community service group signed a social contribution agreement with Changwon city and conducted education for children at children's welfare centers and employees of social welfare centers twice a year from 2018.
- The participants can learn what to do in the event of a disaster such as a fire or earthquake and theoretical training on first aid methods. They can experience how to use fire extinguishers and fire hydrants, how to perform CPR (cardiopulmonary resuscitation) and how to use an AED (automated external defibrillator) directly.



### Painting murals to improve the environment

- Doosan Heavy Industries & Construction has been operating a mural painting program in run-down residential areas and crime-prone districts to ensure safe paths for women, children and teenagers as well as to prevent various forms of crimes. This has been operated with the help of the police department and the city of Changwon.
- In 2018, we transformed the underground pedestrian paths of Seochgu, Seoul, Bongsan Village and the Wolyeong Elementary School walkway located in Ungnam-dong, Changwon, and Yeojwa-dong, Jinhae, into mural streets.



### Environmental clean-up

- To prepare a clean environment in the local community and environmental protection for the future generation, we perform environmental clean-up activities on a regular basis over a broad region including coasts, islands, rivers and mountains.
- Particularly on the annual World Oceans Day, large-scale coastal and underground cleaning is performed at Masan Bay near the Changwon headquarters.
- Nearly 100 people, including members of the in-house scuba diving club, employee volunteers and Changwon's private-public joint social volunteer groups participate every year.



# Doosan Day of Community Service

To fulfill its corporate social responsibilities and contribute to the local community's sustainable growth, Doosan Heavy Industries & Construction has been hosting "the Doosan Day of Community Service" since 2014, an event that draws the voluntary participation of all employees from all worksites. In 2018, we conducted various community service activities in Korea as well as overseas such as "Clean Changwon with Doosan," a representative program jointly performed through an alliance of interested parties in private and government sectors, and "dream furniture making".

 **9** countries, **31** business sites, **2,798** employees participated in **76** programs



## Korea (Seoul, Changwon) Doosan Heavy Industries & Construction

39 programs including Clean Changwon (Secho), with Doosan, dream furniture making, Clean House, farm village cultivation, mural paintings to improve the environment, and environmental clean-up.



## United Kingdom Doosan Babcock-Enpure

Improving the environment at social welfare centers, children's center and local schools, providing food supplies through a food bank



## Germany Doosan Lentjes

Cleaning up the in Rhine River, improving the environment of elementary schools, food bank volunteering



## Czech Republic Doosan Skoda Power

Facility reinforcement of local animal shelters, incubation facilities, elementary schools, and social welfare centers and environmental improvement



## Vietnam Doosan Vina

School Day at sister elementary schools, clean house for local low-income families



## Doosan Power Systems India

School Day at sister elementary schools, medical camp at local public elementary school



## Saudi Arabia Doosan Power Systems Arabia, Oman

Cleaning up the environment



## United States Doosan HF Controls, GridTech, DHT

Cleaning up the environment, food bank volunteering










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# Stakeholder Engagement

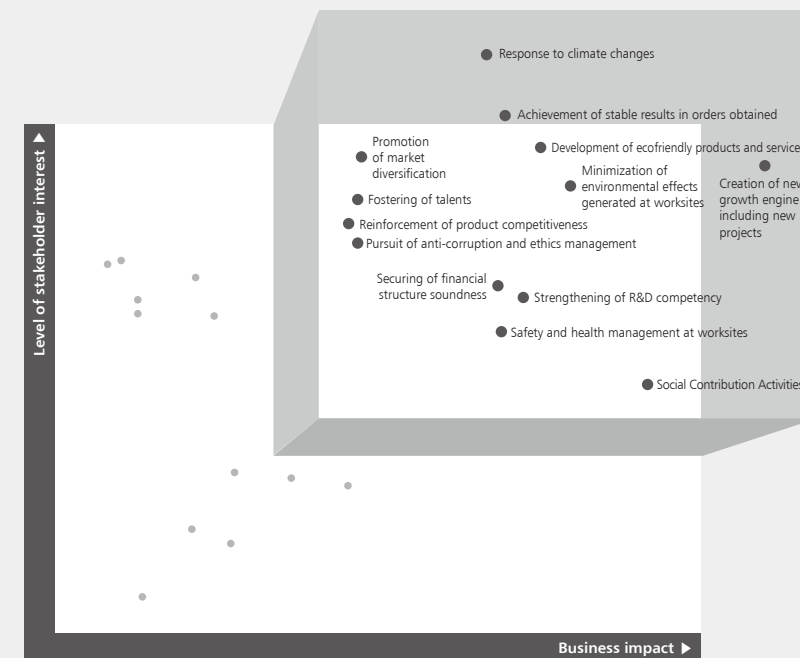
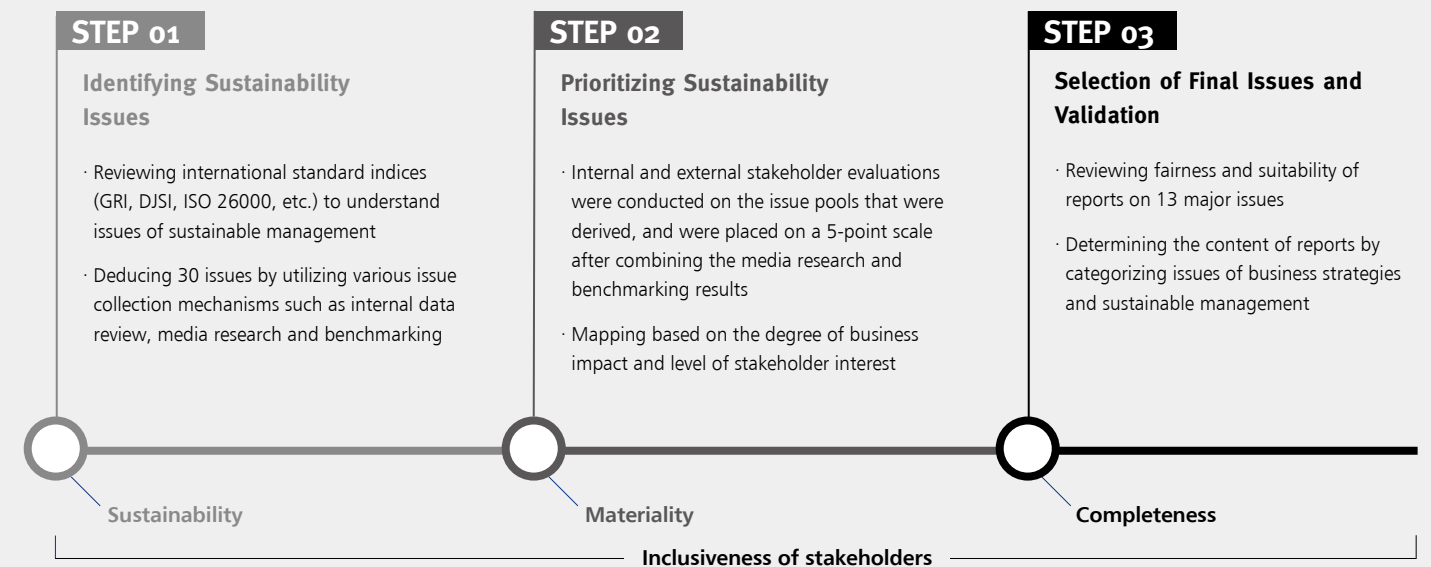
Doosan Heavy Industries & Construction defines shareholders, customers, employees, suppliers, local community, government, and competitors as primary stakeholder groups. For active communication with them, various communication channels are in place and valuable opinions are directly considered for corporate management.

Group	Definition	Communication channel	Frequency	
<b>Shareholders</b> 	Doosan Corporation,	Investment relations (IR) events	Regularly	
	Foreign investors,	Conferences	As needed	
	Institutional investors, Minority shareholders	Overseas NDRs (Non-Deal Roadshow)	As needed	
	Local public power generators, Local private power generators, Overseas clients	Roadshows	As needed	
<b>Customers</b> 	Local public power generators, Local private power generators, Overseas clients	Technology briefings	As needed	
		VOC (Voice of Customer)	Always	
		Participation in safety education for local private power generators	When held	
		Technical exchange meetings and seminars	At anytime	
		Technical support center (online)	Always	
		Power generation interruption special response team and call center	Always	
		Customer satisfaction surveys	Once a year	
	<b>Employees</b> 	Headquarter employees, Overseas branch offices' employees, Overseas subsidiaries' employees	Industrial Safety and Health Committee	4 times a year, at anytime
			Labor-Management Council	Once a quarter
			Education for employees dispatched to overseas worksites	Once a week
		Safety and health practical training	Once a year	
		Management status information session	Every quarter	
		CTO discussion meeting	At anytime	
		Communication with employees related to certified emissions reduction	More than 10 times a year	
		Consultative groups of Social Volunteer Group	Once a month	
<b>Local Community</b> 		Local residents, Academia, research institutes, NGOs	Social welfare center and local children's center connection program	Once a month
			Doosan Day of Community Service	Once a year
		Consultative groups of Social Volunteer Group of Doosan Heavy Industries & Construction	Once a month, At anytime	
		Community Communications Council (Woongnam-dong)	Twice a year, At anytime	
		Relevant agencies for social contribution activities (Gyeongsangnam-do, Changwon, beneficiary agencies)	At anytime, as needed	
		Gyeongnam corporate social contribution representatives workshop	Once a year	
		Local social contribution council	At anytime, as needed	
		Offshore factory design research society	Twice a year	

Group	Definition	Communication channel	Frequency	
<b>Suppliers</b> 	Tier 1 suppliers,	Representative consultative groups	Once a month	
	Tier 2 suppliers	Shared growth conference	Once a year	
		Tier 1 suppliers meeting on shared growth	Quarterly	
		Tier 2 suppliers meeting on shared growth	Once a year	
		Cooperation Council of Doosan Heavy Industries & Construction	As needed	
		Cooperation Council of Operations Committee	Half yearly	
	<b>Government</b> 	Central/local governments, Related organizations	Korea Commission for Corporate Partnership	At anytime
			Korea Foundation for Corporation of Large and Small Business, Rural Affairs	At anytime
			Fair Trade Commission	As needed
			Center for Large and Small Business Cooperation	As needed
		Korea Environmental Industry & Technology Institute	As needed	
		Health and Innovation Leader Forum	16 times a year	
		PSM Council	Quarterly	
		Voluntary agreement on fine dust reduction	4 times a year	
		Changwon City Sustainable Development Council	Once a year	
		Gyeongnam Climate Environment Network	Half yearly	
<b>Competitors</b> 	Power generation facility manufacturers, Desalination and water treatment plant companies	Council of Construction Safety Division	Quarterly	
		Construction Safety Workers' Council	Quarterly	
		Health administrators' Council	Quarterly	
		Construction company CEO safety and health leader meeting	Once a year	
		Construction Safety and Health Officer / Department Head Meeting	Quarterly	
		International Construction Association of Korea Counter-Terrorism Council	Twice a year	
		Technology exchange meeting	Once a year	

# Materiality Assessment

Doosan Heavy Industries & Construction's performance report disclosed in the Integrated Report is centered around issues garnering much interest from our stakeholders and issues deemed as having a huge business impact. We have conducted a materiality assessment to ensure that this can all be reflected in our decision-making, enabling us to effectively perform sustainability management. We referred to the GRI method of defining key issues for our materiality assessment, through which a total of 13 key issues were identified.



## Results of major issues deduced

Core issues	GRI	Report boundary	
		Internal	External
Creation of new growth engines such as new businesses	-		Shareholders
Safety and health management at worksites	Industrial safety and health		-
Response to climate changes	Energy, Discharge		Local community
Achievement of stable results in orders obtained	-		Shareholders
Development of ecofriendly products and services	Product and service		Customers
Social Contribution Activities	Indirect economic effect		Local community
Strengthening of R&D competency	-	Employees	Customers
Securing of financial structure soundness	-		Shareholders
Promotion of market diversification	-		Shareholders
Fostering of talents	Training and education		-
Minimization of environmental effects generated at worksites	Wastewater and waste		Local community
Reinforcement of product competitiveness	-		Customers
Pursuit of anti-corruption and ethics management	Anti-corruption		Shareholders

## Risk Management

### Our Approach

Doosan Heavy Industries & Construction operates an integrated risk management system to effectively manage risk factors which may potentially be generated in the midst of business operations. Risk factors are categorized into financial, business, compliance and CSR risks and are being properly managed by teams with expertise.

### 2019 Goals

We plan to continue to strengthen our comprehensive risk management and detect variabilities in the global economy in advance to avoid potential risk factors while actively taking advantage of opportunities. Through company-wide education on risks not only for employees in charge of different risk types but all employees, we aim to improve our level of risk management.

### Comprehensive Risk Management System

The types of risks at Doosan Heavy Industries & Construction are controlled and categorized into Financial Risk, Business Risk, and Compliance and CSR Risk, and executives and teams responsible for each risk factor are assigned for constant monitoring. It has set up a management system in which any issue generated is directly reported to the CEO, and for risks with significant impact on the company, the Board of Directors makes the final decisions. Four of the independent directors are experts on risks in different areas, and once elected, we provide relevant education to help them make optimal decisions based on their understanding and expertise on laws, internal transactions, etc. related to economy, environment and society.



### Financial Risk

We aim to minimize the financial risks as associated with accounting, finance, banking, public announcements, etc. As a global corporation, we have established the "Exchange Rate Risk Management Guideline" in order to avoid currency risks caused by exchange rate fluctuations while analyzing financial risks anticipated in the course of business and also actively managing them in accordance with response strategies. Such details are officially and publicly disclosed to stakeholders in a transparent manner to improve the company's credibility.

### Business Risk

Any risks related to new markets and businesses, quality and intellectual property rights are recognized as business risks. We establish a preemptive response system that encompasses risk factors in all stages of business from the procurement of raw materials to the provision and follow-up management of products and services in pursuit of business stability, and by recognizing

business risks in domestic and international market environments in advance, manage the risks based on clear response criteria and procedures.

### Compliance & CSR Risk

We recognize and manage various legal and non-financial risks related to the environment, safety, human rights, information security, local community, etc. as Compliance and CSR Risks. An immediate response and management system has been set up centered on teams in charge of each risk, and a sufficient amount of discussions are conducted through the CSR Committee to make proper decisions.

### Risk Analysis

The company checks both business opportunities and risks through step-by-step operating profit simulation over the course of a project. Standardized checklists are used to analyze the impact on business and response measures, and the results of such analyses are reported to the CEO every month.

<b>Finance</b>	Sensitivity analysis by scenario including cost, cash flow, taxes, etc.
<b>Environment</b>	Establishing mid-to long-term reduction plans such as discharge of greenhouse gas emissions, water scarcity, etc. as well as an emergency response system
<b>Others</b>	Utilization of a quality gate system on risks, human rights, transparent management, etc., which influence the performance of a project (clarifying major risk factors in each stage and establishing appropriate response measures)

### Company wide Risk Management Culture

Internal education is implemented for all employees on management principles, processes, recurrence prevention, etc. for each risk type in an effort to propagate a risk management culture throughout the company. Also, financial compensation is provided to all employees under the CEO based on their performance evaluated on the improvement of risks.

## Performance Summary

### Economy

#### Largest contributions and expenditures

2016		2017		2018		Unit : KRW million
Donated to	Amount	Donated to	Amount	Donated to	Amount	
Gyeongnam Center for Creative Economy and Innovation	2,239	Large and Small Business Cooperation Foundation	500	Gyeongnam Center for Social Economy and Entrepreneurs	50	
Large and Small Business Cooperation Foundation	500	Korea Technology Finance Corporation	208	Korean Nuclear Society	15	
Korea Nuclear Association for International Cooperation	367	Gyeongnam Center for Social Economy and Entrepreneurs	58			
Korea Credit Guarantee Fund	312	Korean Nuclear Society	30			
2015 World Water Forum Organizing Committee	250	Korean Society of Pressure Vessels and Piping	3			

\* DHIC is not engaged in donation or supportive activities for political campaigns, political organizations, lobbyists or lobbyist organizations according to legal regulations in Korea and the Code of Conduct.

#### Total contributions

Category	Unit	2016	2017	2018
Industry association, etc.	KRW million	8,962	8,699	652

\* There is no donation record on lobby/interest group, election, legislation, and voting.

#### R&D spending

Category	Unit	2016	2017	2018
R&D expenses	KRW 100 million	1,932	2,242	2,019
Sales	KRW 100 million	47,053	43,367	41,017
R&D spending as % of sales*	%	4.11	5.17	5.7

\* Calculated based on Doosan Heavy Industries & Construction Headquarters

### Environment

#### Usage and recycling of raw materials

In the case of environmental data, we collected data from domestic and overseas workplaces, but we limited some data to within our domestic workplaces.

Category	Items	Unit	2016	2017	2018	
Local	Non-renewable raw materials	Scrap iron	tons	134,461	114,308	110,589
		Recovered iron	tons	77,908	70,527	59,418
		Chip	tons	12,363	11,471	10,226
		Ferro alloy	tons	7,318	6,369	5,952
		Quicklime	tons	8,934	7,412	6,997
		Fluorspar	tons	950	949	404
		Lump coal	tons	5,788	4,601	4,370
Overseas	Renewable raw materials	Rebar	tons	0	0	934
		Concrete	tons	0	0	13,097
		Non-renewable raw materials	Scrap iron	tons	-	-
Overseas	Renewable raw materials	Rebar	tons	-	-	934
		Concrete	tons	-	-	13,097
Total material usage		tons	247,722	215,637	226,851	

\* Calculated by excluding the 2016 and 2017 overseas construction sector

#### Recycling of raw materials

Category	Unit	2016	2017	2018	
Recycled raw materials	Recovered iron	tons	77,908	70,527	59,418
	Chip	tons	12,363	11,471	10,226
Percentage	%	36%	38%	33%	

### Energy

#### Energy usage and purchase

Category	Items	Unit	2016	2017	2018		
Local	Non-renewable raw materials	LNG	Nm <sup>3</sup>	39,648,695	39,438,558	36,538,336	
		LPG	Nm <sup>3</sup>	196,049	171,407	145,076	
		Gasoline (car)	L	587,932	1,496,439	52,968	
		Diesel (car)	L	1,186,886	1,401,781	526,683	
		LPG (car)	L	12,582	-	-	
		Gasoline (generator)	L	6,119	4,237	5,186	
		Diesel (generator)	L	1,206,014	1,427,849	2,365,004	
		Kerosene (Heating)	L	16,750	304	178,520	
		Hi-sene	L	4,825,713	4,540,953	3,613,753	
		Other (anthracite)	kg	21,600	617	-	
Total			47,708,340	48,482,145	43,425,526		
Purchased energy	Electricity	Kwh	315,946,555	297,688,042	299,346,287		
Overseas	Non-renewable raw materials	LPG	Nm <sup>3</sup>	-	-	6,822	
		Gasoline (car)	L	-	-	1,297,610	
		Diesel (car)	L	-	-	7,446,863	
		Gasoline (generator)	L	-	-	3,986	
		Diesel (generator)	L	-	-	2,327,004	
		Total			-	-	11,082,285
		Purchased energy	Electricity	Kwh	-	-	5,236,875

\* Calculated by excluding the 2016 and 2017 overseas construction sector

#### Amount of energy reduction

Category	Unit	2016	2017	2018
Operation method improvement	tCO <sub>2</sub> eq	737	-	-
Introduction of high efficiency equipment	tCO <sub>2</sub> eq	3,730	1,872	1,412
Total	tCO <sub>2</sub> eq	4,467	1,872	1,412

#### Cost and reduction of energy consumption

Category	Unit	2016	2017	2018
Fossil fuel	MWh	283,690	278,129	225,287
Electricity	MWh	315,945	297,688	289,195
Total	MWh	599,635	575,817	514,482
Amount of energy usage	TJ	5,158	5,026	4,577
Energy cost	KRW million	73,400	72,800	61,659
Amount of cost reduction	KRW million	26,600	27,200	27,900

### Water

#### Total water intake by source

Category	Unit	2016	2017	2018	
Local	Surface water	tons	25,907	-	9,118
	Underground water	tons	110,251	98,509	5,052
	Rainwater	tons	40,000	40,000	18,000
	Wastewater from another site	tons	4,860	0	0
	Water supply system	tons	1,928,555	1,580,307	1,232,864
	Total	tons	2,109,573	1,718,816	1,265,034
Overseas	Surface water	tons	-	-	12,960
	Underground water	tons	-	-	171,548
	Water supply system	tons	-	-	91,207
Total		tons	-	-	275,715

\* Calculated by excluding the 2016 and 2017 overseas construction sector

**Recycled and reused water**

Category	Unit	2016	2017	2018	
Local	Landscaping Water	tons	40,060	25,900	<b>0</b>
Overseas	Landscaping Water	tons	-	-	<b>5,474</b>

**Emissions to atmosphere****Amount of air pollutant emissions**

Category	Unit	2016	2017	2018	
Amount of emission by type	VOC (volatile organic compounds)	Kg	10,200	9,400	<b>23,852</b>
	PM (particulate matter)	Kg	36,700	30,110	<b>22,060</b>
	NOx (nitrogen oxide)	Kg	0	0	<b>0</b>
	SOx (sulfur oxides)	Kg	0	0	<b>0</b>
	POP (persistent organic pollutants)	Kg	0	0	<b>0</b>
	HAP (hazardous air pollutants)	Kg	0	0	<b>0</b>

**Amount of hazardous chemical substances consumption**

Category	Unit	2016	2017	2018
No. substances	type	5	2	<b>2</b>
Amount of usage	tons	405	195	<b>190</b>

\* Goal for replacement of hazardous chemical substances: 6 types (2016), 2 types (2017), 1 type (2018)

**Wastewater and waste****Amount of discharged wastewater**

Category	Unit	2016	2017	2018	
Local	Final wastewater discharge site name	-	Masan Bay, etc.	Deokdong Water Treatment Center	<b>Deokdong Water Treatment Center</b>
	Masan Bay, etc.	-	Physiochemical treatment method, etc.	Physiochemical treatment method, etc.	<b>Physiochemical treatment method, etc.</b>
	Amounts of treated wastewater discharged (A)	tons	283,789	191,985	<b>131,513</b>
	Final rainwater discharge site name	-	Masan Bay, etc.	Masan Bay, etc.	<b>Masan Bay, etc.</b>
	Treatment method	-	Silt protector, etc.	Silt protector, etc.	<b>Silt protector, etc.</b>
	Rainwater discharge amount (B)	tons	3,473,779	1,283,258	<b>2,921,478</b>
Total amount of wastewater/rainwater (A+B)	tons	3,757,568	1,475,243	<b>3,052,991</b>	
Overseas	Amounts of treated wastewater discharged (A)	tons	-	-	<b>62,193</b>
	Rainwater discharge amount (B)	tons	-	-	-
	Total amount of wastewater/rainwater (A+B)	tons	-	-	<b>62,193</b>

**Amount of hazardous chemical substances consumption**

Category	Unit	2016	2017	2018
COD	mg/l	10.07	12.38	<b>9.63</b>
SS	mg/l	2.79	5.67	<b>3.14</b>
N-H	mg/l	0.10	1.20	<b>1.10</b>
Cr	mg/l	0.001	0	<b>0</b>
Zn	mg/l	0.02	0.03	<b>0.01</b>
Pb	mg/l	0	0	<b>0</b>
Fe	mg/l	0.03	0.21	<b>0.07</b>
T-N	mg/l	4.12	3.87	<b>2.68</b>
T-P	mg/l	0.08	0.15	<b>0.05</b>

**Rainwater discharge quality**

Category	Unit	2016	2017	2018
COD	mg/l	3.50	3.40	<b>3.10</b>
SS	mg/l	1.30	1.30	<b>1.70</b>
N-H	mg/l	0	0	<b>0</b>
Cr	mg/l	0	0	<b>0</b>
Zn	mg/l	0	0	<b>0</b>
Pb	mg/l	0	0	<b>0</b>
Fe	mg/l	0.01	0.02	<b>0.02</b>
T-N	mg/l	2.18	2.24	<b>0.31</b>
T-P	mg/l	0.06	0.05	<b>0.07</b>

**Amount of waste disposal**

Category	Item	Unit	2016	2017	2018	
Local	Hazardous waste	Recycled	tons	524	719	<b>762</b>
		Incinerated	tons	422	373	<b>363</b>
		Landfill	tons	3,974	2,944	<b>2,554</b>
		Others	tons	3,052	9	<b>0</b>
		Total	tons	7,972	4,044	<b>3,679</b>
	Reused	tons	269	0	<b>0</b>	
	Recycled	tons	68,711	52,923	<b>52,291</b>	
	Nonhazardous waste	Incinerated	tons	1,442	1	<b>0</b>
		Landfill	tons	4,747	11,401	<b>3,081</b>
		Stored at sites	tons	0	0	<b>60</b>
Others		tons	49,978	19,839	<b>638</b>	
Total		tons	125,147	84,164	<b>56,070</b>	
Overseas	Hazardous waste	Recycled	tons	-	-	<b>10</b>
		Fertilized	tons	-	-	<b>5</b>
		Incinerated	tons	-	-	<b>942,526</b>
		Landfill	tons	-	-	<b>1,351</b>
		Total	tons	-	-	<b>943,892</b>
	Nonhazardous waste	Recycled	tons	-	-	<b>1</b>
		Fertilized	tons	-	-	<b>44</b>
		Incinerated	tons	-	-	<b>36</b>
		Landfill	tons	-	-	<b>28,507</b>
		Total	tons	-	-	<b>28,588</b>

\* Calculated by excluding the 2016 and 2017 overseas construction sector

**Total environmental protection expenditures and investments****Total expenses regarding environment**

Category	Unit	2016	2017	2018
Investment	KRW million	3,000	1,900	<b>2,815</b>
Waste disposal cost	KRW million	1,293	1,092	<b>1,047</b>
Waste Test & Analysis cost	KRW million	5	5	<b>5</b>
Waste recycling earning	KRW million	425	649	<b>911</b>
Other costs	KRW million	1,480	1,254	<b>1,299</b>
Total	KRW million	6,203	4,900	<b>6,077</b>

**Eco-friendly purchasing**

Category	Unit	2016	2017	2018
Purchased cost	KRW million	25,864	9,756	<b>8,841</b>

**Environmental regulation violations**

Category	Unit	2016	2017	2018
Environmental regulation violations	KRW million (penalty)	0	0	<b>0</b>
Troubleshooting	Cases	0	0	<b>0</b>

**Society****Employees****Overview of employees**

Category	Unit	2016	2017	2018				
Total no. of employees	Person	7,728	7,610	<b>7,294</b>				
Local	Per employment contract	Permanent position	Male	Person	6,770	6,626	<b>6,376</b>	
			Female	Person	287	268	<b>213</b>	
		Contract position	Male	Person	591	624	<b>622</b>	
			Female	Person	80	92	<b>83</b>	
		Minority group	Men of national merit	Male	Person	167	134	<b>139</b>
	Female			Person	3	3	<b>2</b>	
	Total		Person	170	137	<b>141</b>		
	Overseas	Per employment contract	Permanent position	Male	Person	173	159	<b>162</b>
				Female	Person	6	5	<b>5</b>
			Contract position	Male	Person	179	164	<b>167</b>
Female				Person	305	384	<b>339</b>	
Total			Person	138	146	<b>174</b>		

**New recruitment**

Compliance with laws and regulations	Unit	2016	2017	2018
Legal actions for unfair trade practices	Person	-	-	<b>300</b>
Female	Person	-	-	<b>34</b>
Total	Person	-	-	<b>334</b>
Rate	%	-	-	<b>4.58</b>

**Employee Turnover**

Category	Unit	2016	2017	2018	
Corporate leavers	Male	Person	86	43	<b>199</b>
	Male (Statutory, Early Retirement)	Person	128	134	<b>213</b>
	Female	Person	14	7	<b>25</b>
Total	Person	228	184	<b>437</b>	
Turnover rate	%	2.95	2.74	<b>6.00</b>	
Voluntary turnover (net turnover)	Person	100	50	<b>159</b>	
Voluntary turnover rate	%	1.29	0.75	<b>2.2</b>	

**Parental leave**

Category	Unit	2016	2017	2018	
Employees on parental leave	Male	Person	8	15	<b>35</b>
	Female	Person	44	33	<b>34</b>
Employees who return to work after parental leave	Male	Person	2	7	<b>19</b>
	Female	Person	38	22	<b>23</b>
Return rate	Male	%	100	47	<b>55</b>
	Female	%	100	67	<b>68</b>
Employees who work continuously for 12 months after parental leave and return to work	Male	Person	-	7	<b>16</b>
	Female	Person	35	21	<b>18</b>
Retention rate after return	%	97	97	<b>81</b>	

**Performance evaluation and compensation**

All employees are assessed using fair and transparent evaluation guidelines. Employees' evaluation and compensation differs by person as it is dependent on the individual's performance and competency level. No discrimination can be made based on personal differences, such as gender, religion and academic background.

**Compliance with laws and regulations****Legal actions for unfair trade practices**

Category	Unit	2016	2017	2018
Legal actions for unfair trade practices	case	2	2	<b>0</b>

**Legal actions for unfair trade practices**

Category	Unit	2016	2017	2018
Total amount of imposed fines	case	3.6	100.6	<b>0</b>
Number of nonmonetary sanctions	case	-	-	<b>0</b>
Number of lawsuits	case	1	0	<b>0</b>

**Human rights and anti-corruption****Human rights and corruption risk assessment\***

Category	Unit	2016	2017	2018
Total no. of workplaces	ea	104	93	<b>102</b>
No. of workplaces that have been evaluated	ea	86	93	<b>102</b>
Percentage of workplaces	%	83	100	<b>100</b>

\* The number of workplaces is calculated including local and overseas workplaces, subsidiaries, and construction sites.

**Official reporting of complaints related to human rights\***

Category	Unit	2016	2017	2018
Official reporting of complaints related to human rights	case	56	40	<b>14</b>

\* Includes the number of reports from business partners

**Identified cases of corruption and mitigation measures**

Category	Unit	2016	2017	2018
No. of identified cases	ea	5	4	<b>2</b>
No. of employee disciplinary action case	ea	3	2	<b>3</b>
No. of supplier disciplinary action case	%	4	2	<b>1</b>

\* Data that includes cases of supplier corruption, excludes overlapping cases involving workers and suppliers

## Health &amp; Safety

Lost time incident rate (LTIR<sup>1)</sup>)

Category	Region	Gender	2016	2017	2018	
Headquarters	Local	Manufacturing Plant	Male	1.02	1.54	<b>1.25</b>
			Female	0	0	<b>0</b>
		Office	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
	Overseas	Construction site	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
		Office Branch	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
Sub total		0.22	0.36	<b>0.30</b>		
Business partners	Local	Manufacturing Plant	Male	1.80	0.48	<b>2.09</b>
			Female	0	0	<b>0</b>
		Office	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
	Overseas	Construction site	Male	0.54	0.44	<b>0.75</b>
			Female	0	0	<b>0</b>
		Office Branch	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	0.03	0.03	<b>0.02</b>
			Female	0	0	<b>0</b>
Sub total		0.15	0.10	<b>0.17</b>		
Total		0.17	0.20	<b>0.22</b>		

1) LTIR: Lost Time Incident Rate, U.S. OSHA Total No. of Lost Time Accidents X 200,000 / [Total Man-hours worked]

2) The Lost Time Incident standard is based on the US OSHA LTIR standard, which is based on a loss incidence of one day or more.

3) We classified the accident rates that have been calculated by business into employees, business partners, domestic and overseas, and recalculated accident rates for the last 3 years based on US OSHA LTIR, which is the most used internationally.

## Number of incidents

Category	Region	Gender	2016	2017	2018	
Headquarters	Local	Manufacturing Plant	Male	7	13	<b>10</b>
			Female	0	0	<b>0</b>
		Office	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
	Overseas	Construction site	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
		Office Branch	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
Sub total		7	13	<b>10</b>		
Business partners	Local	Manufacturing Plant	Male	4	1	<b>4</b>
			Female	0	0	<b>0</b>
		Office	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
	Overseas	Construction site	Male	4	4	<b>7</b>
			Female	0	0	<b>0</b>
		Office Branch	Male	0	0	<b>0</b>
			Female	0	0	<b>0</b>
			Male	1	1	<b>1</b>
			Female	0	0	<b>0</b>
Sub total		9	6	<b>12</b>		
Total		16	19	<b>22</b>		

## Social Contribution

## Participation in community service activities

Category	Unit	2016	2017	2018	
No. of activities	Case	621	501	<b>363</b>	
Employee participation	Participants	Person	4,201	3,633	<b>2,790</b>
	Participation rate	%	60	53	<b>42</b>
Amount of community service hours	Total	Hours	35,490	29,250	<b>20,691</b>
	Per person	Hours	5.93	5.13	<b>3.11</b>

## Expenses in local community

Category	Unit	2016	2017	2018	
Expenses	Cash	KRW 100 million	91.3	88.9	<b>8.4</b>
	Existing goods	KRW 100 million	0.4	0.8	<b>0.4</b>
	Operation expense	KRW 100 million	2	1.2	<b>0.5</b>
	Total	KRW 100 million	93.7	90.9	<b>9.3</b>
Expense details	Charitable donations	KRW 100 million	19.2	16.2	<b>0.3</b>
	Investment into local community	KRW 100 million	62.2	67.5	<b>8.9</b>
	Others	KRW 100 million	12.3	7.2	<b>0.1</b>
	Fostering of talent	KRW 100 million	52.7	35.9	<b>7.1</b>
Activity boundary	Supporting minority groups	KRW 100 million	14.2	21.4	<b>0.5</b>
	Community-based	KRW 100 million	26.8	33.6	<b>1.7</b>

## Participation in local community, impact assessment

Category	Unit	2016	2017	2018
Regions in which local community growth programs are run	%	29	30	<b>30</b>
Local development program operation region considering stakeholder needs	%	29	30	<b>30</b>
Operation of local community-wide consulting committees and processes, which includes minority groups	%	29	30	<b>30</b>
Official community grievance handling process workplace	%	100	100	<b>100</b>

## Financial Performance

## Our Approach

Doosan Heavy Industries & Construction aims to proactively and speedily deal with changes in the global power generation market to create business outcome and seek sustainable growth. In addition to the reinforced acquisition of orders in the existing market, we strive to show business performance by expanding into new business areas and cultivating sustainable abilities.

## 2019 Goals

We plan to enhance our business portfolio centered on new businesses including new and renewable energy, gas turbines, power generation services, etc. and prepare a turning point by achieving its target of orders through new large EPC projects obtained in existing markets and also advance into new markets such as Africa, Eastern Europe, and Middle East Asia.

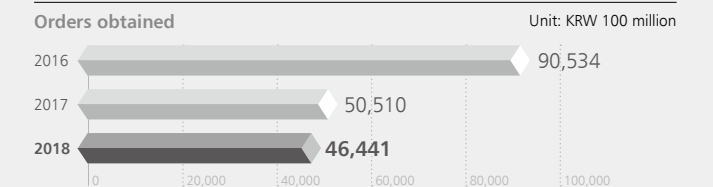
The amount of orders received on a consolidated management basis in 2018 recorded KRW 4,644.1 billion, a reduced figure from KRW 5,051 billion recorded in 2017 mainly due to the delay of some large projects.

Revenue based on consolidated financial statements in 2018 totaled KRW 14,761.1 billion, an increase of 7% (KRW 919.8 billion) from 2017, based on 18% of annual growth of Doosan Infracore. Operating profit exceeded KRW 1 trillion due to the increase in operating profit at Doosan Infracore. In particular, sales growth continued thanks to the growth of Heavy and Bobcat, and operating profit reached the highest operating profit.

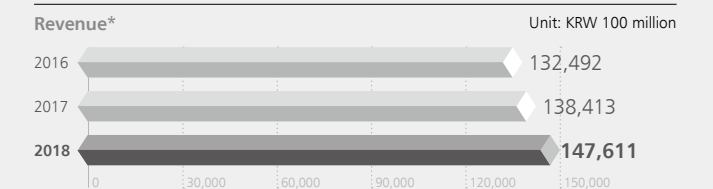
On a consolidated management basis in 2017, Doosan Heavy Industries & Construction recorded sales of KRW 5,477 billion, a slight reduction from 2017, and operating profit increased to KRW 205.4 billion, an increase of by KRW 15.1 billion from 2017, and the operating margin also improved. This is due to the fact that the construction of low-margin projects in the past has been completed and the construction of high-margin projects is actively in progress.

In 2019, Doosan Heavy Industries & Construction is forecasting KRW 7.9 trillion in orders obtained, KRW 6 trillion in sales and KRW 237.2 billion in operating profits on a consolidated management basis. We expect orders to be achieved by obtaining large domestic and overseas projects, which had been postponed from 2018, and service and equipment businesses. Sales is projected to be similar to that of 2018 due to reduced order receipts and order backlogs in 2018, while construction projects for orders received in 2018 are in full swing. Operating profit is expected to improve compared to 2018 through the full-scale progress of projects with relatively high profit margins and cost reduction efforts.

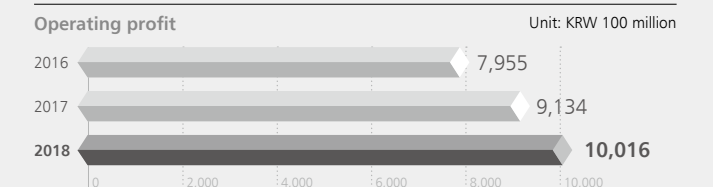
## Quantitative financial data



On a consolidated management basis



On a consolidated financial basis



On a consolidated financial basis

\* This data has recalculated due to withdrawing sales of Doosan Engineering & Construction's Vietnam Office and completing withdrawing Doosan Engine, and may vary slightly from the figures made public through the 2017 comprehensive report.

# Consolidated Statements of Financial Position

As of December 31, 2018

As of December 31, 2017

Doosan Heavy Industries &amp; Construction Co., Ltd. and its subsidiaries

Unit: KRW

Items	December 31, 2018	December 31, 2017
<b>Assets</b>		
I. Current assets	<b>9,782,244,096,431</b>	9,229,887,491,691
1. Cash and cash equivalents	2,075,328,693,318	1,970,147,004,768
2. Short-term financial instruments	392,294,778,458	237,662,748,168
3. Short-term investments in securities	35,673,839,601	133,975,273,587
4. Trade receivables	2,112,062,463,001	1,959,806,124,716
5. Due from customers for contract work	1,917,549,497,427	1,969,815,782,428
6. Other receivables	305,858,455,081	257,069,973,971
7. Prepayments	446,105,194,520	416,258,993,540
8. Prepaid expenses	152,773,582,677	124,074,003,045
9. Short-term loans	115,051,807,262	62,146,236,742
10. Derivative financial assets	21,477,357,030	72,312,481,305
11. Firm commitment assets	9,022,592,449	6,166,652,593
12. Inventories	1,891,576,145,991	1,737,966,743,195
13. Other current assets	307,469,689,616	282,485,473,633
II. Non-current assets	<b>15,032,667,467,135</b>	15,732,430,635,496
1. Long-term financial instruments	5,201,067,000	31,136,772,418
2. Long-term investments in securities	197,745,438,521	199,055,580,136
3. Share of investments in associates and joint ventures	100,927,082,338	78,667,176,602
4. Long-term loans	717,958,268,334	1,021,175,375,224
5. Property, plant and equipment	6,414,487,023,034	6,904,855,603,272
6. Intangible assets	6,683,116,364,942	6,475,671,479,962
7. Investment property	26,484,941,678	20,787,447,372
8. Derivative financial assets	21,777,431,040	56,693,678,457
9. Firm commitment assets	14,695,425,682	2,716,940,181
10. Guarantee deposits	326,955,808,824	363,203,456,821
11. Deferred tax assets	459,502,962,385	518,511,358,722
12. Other non-current assets	63,815,653,357	59,955,766,329
Total assets	<b>24,814,911,563,566</b>	24,962,318,127,187
<b>Liabilities and equity</b>		
I. Current liabilities:	<b>11,504,611,441,750</b>	11,746,546,311,844
1. Trade payables	3,082,932,725,599	2,827,162,503,355
2. Short-term borrowings	2,840,071,599,658	3,765,146,758,496
3. Asset-backed loan	491,371,402,314	597,624,558,295
4. Other payables	539,550,236,467	601,142,200,157
5. Advanced receipts	80,537,056,518	180,452,579,927
6. Due to customers for contract work	1,236,549,335,742	833,253,858,439
7. Withholdings	36,879,557,787	72,662,589,044
8. Accrued expenses	592,800,027,139	437,855,294,885
9. Current tax liabilities	29,347,652,878	32,583,825,150
10. Current portion of long-term debt	2,049,828,436,541	1,867,839,620,799
11. Derivative financial liabilities	39,356,944,771	89,201,468,110
12. Firm commitment liabilities	5,026,505,231	66,217,473,811
13. Estimated liabilities	188,331,847,398	167,447,557,810
14. Other current liabilities	292,028,113,707	207,956,023,566

Unit: KRW

Items	December 31, 2018	December 31, 2017
<b>II. Non-current liabilities</b>		
1. Debentures	<b>7,091,870,561,376</b>	6,649,823,755,291
2. Long-term borrowings	2,053,032,588,038	2,600,066,685,462
3. Long-term asset-backed loan	3,043,437,044,686	2,062,073,719,593
4. Long-term other payables	248,788,085,785	197,479,161,174
5. Defined benefit liabilities	30,921,614,985	31,625,142,612
6. Deposits received	611,283,884,965	678,559,199,568
7. Derivative financial liabilities	217,455,797,942	177,151,025,578
8. Firm commitment liabilities	48,643,743,663	107,297,507,265
9. Deferred tax liabilities	22,221,330,722	49,450,153,167
10. Estimated liabilities	373,209,052,064	302,709,107,586
11. Other non-current liabilities	233,563,821,406	236,907,011,231
Total liabilities	<b>209,313,597,120</b>	206,505,042,055
Equity	<b>18,596,482,003,126</b>	18,396,370,067,135
<b>I. Equity attributable to</b>		
owners of parent	<b>2,804,847,577,636</b>	3,386,808,328,894
1. Issued capital	650,255,065,000	596,836,515,000
2. Capital surplus	1,678,913,750,186	1,703,499,795,417
3. Other components of equity	(55,947,752,410)	(44,828,871,791)
4. Accumulated other comprehensive income (loss)	680,535,131,925	728,803,238,711
5. Retained earnings	(148,908,617,065)	402,497,651,557
II. Equity attributable to equity holders of the parent	<b>3,413,581,982,804</b>	3,179,139,731,158
1. Hybrid equity instruments	-	333,286,268,697
2. Other non-controlling interests	3,413,581,982,804	2,845,853,462,461
Total equity	<b>6,218,429,560,440</b>	6,565,948,060,052
Total liabilities and equity	<b>24,814,911,563,566</b>	24,962,318,127,187

## Consolidated Statements of Profit or Loss

As of December 31, 2018

As of December 31, 2017

## Doosan Heavy Industries &amp; Construction Co., Ltd. and its subsidiaries

Unit: KRW

Items	December 31, 2018	December 31, 2017
I. Revenue	14,761,064,155,393	13,841,325,827,432
II. Cost of sales	12,191,489,262,086	11,390,013,012,448
III. Gross profit	2,569,574,893,307	2,451,312,814,984
IV. Selling and administrative expenses	1,567,877,906,105	1,537,873,829,890
V. Operating profit	1,001,696,987,202	913,438,985,094
VI. Financial profit and loss	(549,576,415,154)	(493,673,949,794)
Finance income	530,600,823,201	1,041,726,934,395
Finance costs	1,080,177,238,355	1,535,400,884,189
VII. Other non-operating profit and loss	(527,648,212,472)	(272,296,950,115)
Other non-operating income	70,012,313,064	124,695,088,425
Other non-operating expense	597,660,525,536	396,992,038,540
VIII. Share of loss in associates and joint ventures	(29,701,600,000)	(16,598,961,587)
IX. Profit for the year before tax	(105,229,240,424)	130,869,123,598
X. Income tax expense (benefit)	219,871,719,919	173,005,867,878
XI. Loss from continuing operations	(325,100,960,343)	(42,136,744,280)
XII. Profit (loss) from discontinued operations	(96,624,151,242)	(67,551,266,482)
XIII. Net loss during the term	(421,725,111,585)	(109,688,010,762)
XIV. Reversion of net loss during the term		
Equity holders of the parent	(523,793,621,412)	(292,038,065,484)
Non-controlling interests	102,068,509,827	182,350,054,722
XV. Earnings per share:		
1. Basic loss per share	(4,807)	(2,908)
Loss for the year from continuing operations	(4,167)	(2,421)
Profit (loss) for the year from discontinued operations	(640)	(487)
2. Diluted loss per share	(4,807)	(2,908)
Loss for the year from continuing operations	(4,167)	(2,421)
Profit (loss) for the year from discontinued operations	(640)	(487)
I. Net loss during the term	(421,725,111,585)	(109,688,010,762)
II. Other comprehensive income	158,588,349,921	160,739,225,976
1. Items not subsequently reclassified to profit or loss:	2,111,687,567	323,282,331,414
Remeasurement of the net defined benefit liabilities	31,510,948,024	54,742,976,025
Gain on change in fair value of fair value through other comprehensive income ("FVOCI") financial assets	812,350,242	-
Asset revaluation profit and loss	(30,211,610,699)	268,539,355,389
2. Items that are subsequently reclassified to profit or loss:	156,476,662,354	(162,543,105,438)
Net change in unrealized fair value of available-for-sale financial assets	-	7,298,423,839
Effective portion of changes in fair value of cash flow hedges	22,300,154,503	(42,267,513,322)
Equity adjustments in equity method	(3,570,846,250)	3,471,444,554
Net gain (loss) on translation of overseas operations	137,747,354,101	(131,045,460,509)
III. Total comprehensive income (loss), net of tax	(263,136,761,664)	51,051,215,214
IV. Attributable to:		
Equity holders of the parent	(510,487,299,900)	(47,042,955,493)
Non-controlling interests	247,350,538,236	98,094,170,707

## Consolidated Statements of Changes in Equity

As of December 31, 2018

As of December 31, 2017

## Doosan Heavy Industries &amp; Construction Co., Ltd. and its subsidiaries

Unit: KRW

Items	Issued capital	Capital surplus	Other components of equity	Accumulated other comprehensive income (loss)	Retained earnings	Non-controlling interest	Total equity
2017.1.1 (beginning of previous term)	596,808,980,000	1,652,835,160,666	(17,273,121,037)	538,782,208,792	704,507,685,246	3,347,170,002,369	6,822,830,916,036
Total comprehensive profit and loss:							
Net loss during the term	-	-	-	-	(292,038,065,484)	182,350,054,722	(109,688,010,762)
Remeasurement of the net defined benefit liabilities, net of tax	-	-	-	-	56,964,808,378	(2,221,832,353)	54,742,976,025
Net change in unrealized fair value of available-for-sale financial assets	-	-	-	7,384,376,734	-	(85,952,895)	7,298,423,839
Effective portion of changes in fair value of cash flow hedges	-	-	-	(38,535,122,794)	-	(3,732,390,528)	(42,267,513,322)
Share of associates' other changes in net assets	-	-	-	3,194,208,671	-	277,235,883	3,471,444,554
Net loss on translation of foreign operations	-	-	-	(7,623,006,506)	-	(123,422,454,003)	(131,045,460,509)
Asset revaluation profit and loss	-	-	-	222,671,132,901	938,712,607	44,929,509,881	268,539,355,389
Subtotal	-	-	-	187,091,589,006	(234,134,544,499)	98,094,170,707	51,051,215,214
Dividends	-	-	-	-	(67,875,489,190)	-	(67,875,489,190)
Stock option	-	3,292,022,379	(3,292,022,379)	-	-	-	-
Issuance of bonds with stock warrants	-	49,492,056,640	-	-	-	-	49,492,056,640
Exercise of stock warrants	27,535,000	74,159,618	-	-	-	-	101,694,618
Proceeds from partial disposals of investments in subsidiaries	-	-	(2,199,240,446)	2,929,440,913	-	135,054,468,139	572,237,931
Capital increase by issuing new shares of subsidiaries	-	(7,649,371,531)	-	-	-	8,221,609,462	(15,397,465,480)
Acquisition of investments in subsidiaries	-	4,811,760,426	(726,269)	-	-	(20,208,499,637)	(47,792,407,120)
Dividends of the subsidiaries	-	-	-	-	-	(47,792,407,120)	-
Share option of subsidiaries	-	627,562,392	(627,562,392)	-	-	-	-
Issuance of convertible bonds by subsidiaries	-	(22,506,401)	-	-	-	33,249,710	10,743,309
Issuance of bonds with stock warrants of subsidiaries	-	19,520,648,285	-	-	-	25,088,768,344	44,609,416,629
Exercise of stock warrants of subsidiaries	-	(9,876,787,673)	-	-	-	14,283,874,945	4,407,087,272
Issuance of convertible preferred stock of subsidiaries	-	-	-	-	-	94,718,408,838	94,718,408,838
Repayments of hybrid equity instruments of subsidiaries	-	-	(21,436,199,268)	-	-	(545,728,397,732)	(567,164,597,000)
Adjustments of scope of connection	-	(9,604,909,384)	-	-	-	70,204,483,133	60,599,573,749
2017.12.31 (end of previous term)	596,836,515,000	1,703,499,795,417	(44,828,871,791)	728,803,238,711	402,497,651,557	3,179,139,731,158	6,565,948,060,052
2018.1.1 (beginning of current term)	596,836,515,000	1,703,499,795,417	(44,828,871,791)	728,803,238,711	402,497,651,557	3,179,139,731,158	6,565,948,060,052
Adjustment on initial application of K-IFRS	-	-	-	(18,235,068,737)	(54,579,385,933)	(17,756,498,132)	(90,570,952,802)
Adjustment balance at January 1, 2018	596,836,515,000	1,703,499,795,417	(44,828,871,791)	710,568,169,974	347,918,265,624	3,161,383,233,026	6,475,377,107,250
Total comprehensive profit and loss:							
Net profit during the term(loss)	-	-	-	-	(523,793,621,412)	102,068,509,827	(421,725,111,585)
Remeasurement of the net defined benefit liabilities, net of tax	-	-	-	-	(456,744,844)	31,967,692,868	31,510,948,024
Gain on change in fair value of FVOCI financial assets	-	-	-	289,110,073	5,575,159	517,665,010	812,350,242
Effective portion of changes in fair value of cash flow hedges	-	-	-	20,302,961,575	-	1,997,192,928	22,300,154,503
Equity adjustments in equity method (debit)	-	-	-	(3,235,402,591)	-	(335,443,659)	(3,570,846,250)
Net loss on translation of foreign operations	-	-	-	28,554,338,311	-	109,193,015,790	137,747,354,101
Asset revaluation profit and loss	-	-	-	(74,626,284,636)	42,472,768,465	1,941,905,472	(30,211,610,699)
Subtotal	-	-	-	(28,715,277,268)	(481,772,022,632)	247,350,538,236	(263,136,761,664)
Dividends	-	-	-	-	(14,904,860,057)	-	(14,904,860,057)
Stock option	-	3,415,208,689	(3,415,208,689)	-	-	-	-
Issuance of bonds with warrant	29,075,000	67,802,734	-	-	-	-	96,877,734
Divided combination	53,389,475,000	75,078,684,375	(135,234,686)	-	-	(146,605,694,270)	(18,272,769,581)
Partial disposal of subsidiaries	-	(10,366,230,493)	(7,159,271,062)	-	-	518,786,653,265	501,261,151,710
Capital increase by issuing new shares of subsidiaries	-	(9,009,211)	-	-	-	9,009,211	-
Acquisition of investments in subsidiaries	-	-	-	-	-	(35,796,000,000)	(35,796,000,000)
Dividends of the subsidiaries	-	-	-	-	-	(50,580,761,821)	(50,580,761,821)
Share option of subsidiaries	-	409,166,182	(409,166,182)	-	-	-	-
Issuance of bonds with warrant of subsidiaries	-	997,276,585	-	-	-	300,907,352	1,298,183,937
Exertion of preemptive rights of subsidiaries	-	(94,178,944,092)	-	-	-	133,446,438,610	39,267,494,518
Repayment of hybrid equity instruments of subsidiaries	-	-	-	-	-	(333,286,268,697)	(333,286,268,697)
Adjustments of scope of connection	-	-	-	(1,317,760,781)	-	(82,308,496,940)	(83,626,257,721)
Other	-	-	-	-	(150,000,000)	882,424,832	732,424,832
2018.12.31 (end of current term)	650,255,065,000	1,678,913,750,186	(55,947,752,410)	680,535,131,925	(148,908,617,065)	3,413,581,982,804	6,218,429,560,440



# Consolidated Statements of Cash Flows

As of December 31, 2018

As of December 31, 2017

## Doosan Heavy Industries & Construction Co., Ltd. and its subsidiaries

Unit: KRW

Items	December 31, 2018	December 31, 2017
I. Cash flows from operating activities	<b>989,560,098,943</b>	429,324,784,710
1. Cash generated from operations:	<b>1,479,138,134,144</b>	915,211,992,032
(1) Loss	<b>(421,725,111,585)</b>	(109,688,010,762)
(2) Adjustments	<b>1,977,140,965,216</b>	1,927,880,888,075
(3) Changes in operating assets and liabilities	<b>(76,277,719,487)</b>	(902,980,885,281)
2. Interest received	<b>44,527,025,788</b>	48,819,579,898
3. Interest paid	<b>(441,769,661,692)</b>	(450,278,642,618)
4. Dividends received	<b>2,527,971,414</b>	2,418,130,866
5. Income tax paid	<b>(94,863,370,711)</b>	(86,846,275,468)
II. Cash flows from investing activities	<b>(792,967,954,882)</b>	(457,137,175,002)
1. Cash inflows from investing activities:	<b>495,302,061,393</b>	529,247,917,065
(1) Decrease in short-term financial instruments	<b>28,514,477,910</b>	62,613,996,581
(2) Proceeds from disposal of short-term investments in securities	<b>171,575,839,650</b>	1,032,750,000
(3) Collection of short-term loans	<b>61,191,764,632</b>	22,682,497,753
(4) Decrease in long-term financial instruments	<b>26,541,592,648</b>	3,815,552,944
(5) Proceeds from disposal of long-term investments in securities	<b>13,933,825,504</b>	86,107,848,209
(6) Collection of long-term loans	<b>137,885,071,022</b>	171,467,917,148
(7) Proceeds from disposal of investments in associates	<b>4,400,000,000</b>	-
(8) Proceeds from disposal of investments in subsidiaries	<b>18,190,238,952</b>	7,681,720,761
(9) Proceeds from disposal of property, plant and equipment	<b>30,945,823,222</b>	65,618,637,439
(10) Proceeds from disposal of intangible assets	<b>2,123,427,853</b>	5,065,871,259
(11) Proceeds from disposal of investment property	-	13,088,324,900
(12) Proceeds from disposal of non-current assets held-for-sale	-	29,078,999,531
(13) Proceeds from acquisition/disposal of business unit	-	1,029,800,540
(14) Net cash flow from changes in scope of consolidation	-	59,964,000,000
2. Cash outflows for investing activities:	<b>(1,288,270,016,275)</b>	(986,385,092,067)
(1) Increase of short-term financial instruments	<b>(192,467,598,730)</b>	(74,714,189,155)
(2) Acquisition of short-term investments in securities	<b>(50,672,900,940)</b>	(146,271,516)
(3) Increase in short-term loans	<b>(20,760,428,199)</b>	(22,831,467,294)
(4) Increase in long-term financial instruments	<b>(73,854,397,933)</b>	(10,157,643,555)
(5) Acquisition of long-term investments in securities	<b>(39,283,294,056)</b>	(20,531,110,565)
(6) Increase in long-term loans	<b>(284,003,894,212)</b>	(265,483,561,847)
(7) Acquisition of investments in associates and joint ventures	<b>(74,122,234,188)</b>	(2,013,022,000)
(8) Acquisition of investments in subsidiaries	-	(33,901,864,924)
(9) Acquisition of property, plant and equipment	<b>(231,413,553,611)</b>	(277,268,881,055)
(10) Acquisition of intangible assets	<b>(309,784,390,949)</b>	(277,895,048,431)
(11) Acquisition of non-current assets held-for-sale	-	(1,442,031,725)
(12) Others	<b>(11,907,323,457)</b>	-
III. Cash flows from financing activities	<b>(110,115,948,599)</b>	703,612,291,698
1. Cash inflows from financing activities	<b>5,560,467,044,625</b>	6,141,673,819,344
(1) Increase in short-term borrowings, net	-	941,739,587,791
(2) Proceeds from asset-backed borrowings	<b>2,047,500,000,000</b>	1,492,932,369,119
(3) Proceeds from long term asset-backed borrowings	<b>337,112,406,111</b>	-
(4) Issuance of bonds	<b>542,739,813,997</b>	2,128,041,350,520
(5) Proceeds from long-term borrowings	<b>2,093,874,122,358</b>	1,350,379,324,151
(6) Proceeds from partial disposals of investments in	<b>507,593,227,099</b>	133,721,600,000
(7) Exercise of stock warrants	<b>16,332,469</b>	4,651,450
(8) Exercise of stock warrants of subsidiaries	<b>31,631,142,591</b>	108,178,950
(9) Issuance of convertible preferred stock of subsidiaries	-	94,746,757,363

Unit: KRW

Items	December 31, 2018	December 31, 2017
2. Cash outflows for financing activities	<b>(5,670,582,993,224)</b>	(5,438,061,527,646)
(1) Decrease in short-term borrowings, net	<b>(836,548,065,004)</b>	-
(2) Repayment of current portion of long-term debt	<b>(1,817,226,471,976)</b>	(2,713,376,372,308)
(3) Repayment of asset-backed borrowings	<b>(2,204,081,747,692)</b>	(1,386,950,000,000)
(4) Repayment of long-term borrowings	<b>(357,480,925,681)</b>	(636,148,293,548)
(5) Acquisition of treasury stock	<b>(135,234,686)</b>	-
(6) Expense of stock issuance	<b>(8,247,908,039)</b>	-
(7) Reduction of capital stocks of subsidiaries	<b>(35,796,000,000)</b>	(15,397,465,480)
(8) Payment of dividends	<b>(14,904,860,057)</b>	(67,875,489,190)
(9) Payment of dividends of subsidiaries	<b>(50,730,761,821)</b>	(47,792,407,120)
(10) Repayment of hybrid equity instruments	<b>(345,431,018,268)</b>	(570,521,500,000)
IV. Effect of exchange rate fluctuations on cash held	<b>18,705,493,088</b>	(78,198,076,995)
V. Net increase in cash and cash equivalents	<b>105,181,688,550</b>	597,601,824,411
VI. Cash and cash equivalents at January	<b>1,970,147,004,768</b>	1,372,545,180,357
VII. Cash and cash equivalents at December 31	<b>2,075,328,693,318</b>	1,970,147,004,768

# Independent Auditors' Report

The Board of Directors and Shareholders  
Doosan Heavy Industries & Construction Co., Ltd.:

## Opinion

We have audited the accompanying consolidated financial statements of Doosan Heavy Industries & Construction Co., Ltd. and its subsidiaries (the "Group"), which comprise the consolidated statements of financial position as of December 31, 2018 and 2017, the related consolidated statements of loss, comprehensive income (loss), changes in equity and cash flows for the years then ended, and notes to the consolidated financial statements, including significant accounting policies and other explanatory information. In our opinion, the accompanying consolidated financial statements present fairly, in all material respects, the consolidated financial position of the Group as of December 31, 2018 and 2017, and its consolidated financial performance and its consolidated cash flows for the years then ended in accordance with Korean International Financial Reporting Standards ("K-IFRS").

## Basis for Opinion

We conducted our audits in accordance with Korean Standards on Auditing. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Consolidated Financial Statements section of our report. We are independent of the Group in accordance with the ethical requirements that are relevant to our audit of the consolidated financial statements in the Republic of Korea, and we have fulfilled our ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

## Key Audit Matters

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements as of and for the year that ended on December 31, 2018. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters.

### 1) Recognition of revenue

As described in the Note 2 to the consolidated financial statements, the Group estimates percentage-of-completion by the input method and recognizes revenue over time depending on progress. Since the amount of revenue recognition over time based on input method depends on the measured percentage-of-completion, judgment of management on the method of measuring progress, estimated total contract cost and changes in construction is required. Therefore, due to exposure to the risk of overstatement of revenue due to error in judgment or intent, we identified the recognition of revenue under the input method as a key audit matter. The following audit procedures were performed regarding the recognition of revenue by the input method.

- Testing certain internal controls over the process of determination and changes of estimated total contract cost
- For major projects completed during current year, retrospective review by comparing between the actual cost incurred during the current year and construction cost estimated at the end of the prior year
- Inspection of documents to assess the appropriateness of the significant changes in estimated total contract cost
- Inquiries and analytical review of changes in the percentage-of-completion
- For major projects, inquiries and inspection of documents if there were a significant difference between the progress based on the respective monthly progress reports received from customers and the Group's percentage-of-completion calculated
- For selected samples, inspection of documents on existence of contract costs (including material costs and other expenses) incurred during current year
- Testing the appropriateness of cost transfer between projects by IT audit team
- Performing site visits for selected on-going construction sites and sites have equipment under construction
- Recalculation of the percentage-of-completion independently for each project
- Testing certain internal controls over the process of changes in contract terms
- For selected samples, inspection of documents (change order and others) to assess the appropriateness of the change in contract revenue
- Examined the contractual delivery date with the expected delivery date as of the end of the year. For those which the contractual delivery date has past, inquired of the basis, performed analytical review and agreed to underlying documents
- Assess the appropriateness of the estimation of penalty for delay

2) Assessment of recoverability of trade receivable and due from customers for contract work as described in the Note 2 to the consolidated financial statements, the Group calculates expected credit losses ("ECLs") based on the expected life of the ECLs and evaluates the recoverability of the trade receivable and due from customers for contract cost. In calculating ECLs, judgment of management is involved due to uncertainty over the collection of due from customers for contract work from delayed payment of the owner, changes in conditions or claims incurred. Therefore, we identified the assessment of the recoverability of trade receivable and due from customers for contract work as a key audit matter, as the risk of overstatement of trade receivable and due from customers for contract work due to error or bias in judgment.

The following audit procedures were performed regarding assessment of the recoverability of trade receivable and due from customers for contract work.

- Testing certain internal controls over the process of assessment of recoverability of trade receivable and due from customers for contract work
- Inquiries and inspection of documents to assess payment terms, penalty for delay, delivery time, and other obligations of contracts for the due from customer for contract work increased significantly
- Inquiries and analytical review of long-term due from customers for contract work and inspection of documents to evaluate of the reasonableness of the cause
- Inquiries and analytical review of recoverability of due form customers for contract work for the projects with bad debt allowance over trade receivables has been reserved
- Sending the confirmation letters to major customers

The procedures and practices utilized in the Republic of Korea to audit such consolidated financial statements may differ from those generally accepted and applied in other countries.

## Responsibilities of Management and Those Charged with Governance for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of the consolidated financial statements in accordance with Korean International Financial Reporting Standards ("K-IFRS"), and for such internal controls as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Group's financial reporting process.

## Auditors' Responsibility for the Audit of the Consolidated Financial Statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatements, whether due to fraud or error, and to issue an auditors' report that includes our opinion. 'Reasonable assurance' is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Korean Standards on Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As part of an audit in accordance with Korean Standards on Auditing, we exercise professional judgment and maintain professional skepticism throughout the audit.

We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Group's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, then we are required to draw attention in our auditors' report to the related disclosures in the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditors' report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of the entities of business activities with the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the group audit. We remain solely responsible for our audit opinion.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and communicate with them all relationships and other matters that may reasonably be thought to bear on our independence and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditors' report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

The engagement partner on the audit resulting in this independent auditors' report is Jeong Gu Kang.

Seoul, Korea

March 20, 2019

This report is effective as of March 20, 2019, the audit report date. Certain subsequent events or circumstances, which may occur between the audit report date and the time of reading this report, could have a material impact on the accompanying consolidated financial statements and notes thereto. Accordingly, the readers of the audit report should understand that the above audit report has not been updated to reflect the impact of such subsequent events or circumstances, if any.

## Third Party's Assurance Statement

### To the Readers of 2018 Integrated Report of Doosan Heavy Industries & Construction:

#### Foreword

Korea Management Registrar Inc. (hereinafter "KMR") has been requested by of 2018 Integrated Report of Doosan Heavy Industries & Construction to verify the contents of its 2018 Integrated Report (hereinafter "the Report"). Doosan Heavy Industries & Construction (hereinafter "DHIC") is responsible for the collection and presentation of information included in the Report. KMR's responsibility is to carry out assurance engagement on specific data and information in the assurance scope stipulated below.

#### Scope and standard

DHIC describes its efforts and achievements of the corporate social responsibility activities in the Report. KMR performed a type2, moderate level of assurance using AA1000AS (2008) and SRV1000 from KMR Global Sustainability Committee as assurance standards. KMR's assurance team(hereinafter "the team") evaluated the adherence to Principles of Inclusivity, Materiality and Responsiveness, and the reliability of the selected GRI Standards indices as below, where professional judgment of the team was exercised as materiality criteria.

The team checked whether the Report has been prepared in accordance with the 'Core Option' of GRI Standards which covers the followings.

- GRI Reporting Principles
- Universal Standards
- Topic Specific Standards
  - Management approach of Topic Specific Standards
  - Economic Performance: 201-1, 201-2
  - Indirect Economic Impacts: 203-1, 203-2
  - Procurement Practices: 204-1
  - Anti-Corruption: 205-1, 205-2, 205-3
  - Anti-competitive Behavior: 206-1
  - Materials: 301-1, 301-2
  - Energy: 302-1, 302-4, 302-5
  - Water: 303-1, 303-3
  - Biodiversity: 304-1, 304-2, 304-3, 304-4
  - Emissions: 305-1, 305-2, 305-5
  - Effluents and Waste: 306-1, 306-2, 306-3
  - Environmental Compliance: 307-1
  - Supplier Environmental Assessment: 308-1, 308-2
  - Employment: 401-1, 401-2, 401-3
  - Labor/Management Relations: 402-1
  - Occupational Health and Safety: 403-2, 403-3, 403-4
  - Training and Education: 404-1, 404-2
  - Diversity and Equal Opportunity: 405-1, 405-2
  - Freedom of Association and Collective Bargaining: 407-1
  - Child Labor: 408-1
  - Forced or Compulsory Labor: 409-1
  - Human Rights Assessment: 412-1, 412-2, 412-3
  - Local Communities: 413-1, 413-2
  - Supplier Social Assessment: 414-1, 414-2
  - Public Policy: 415-1
  - Socioeconomic Compliance: 419-1

This Report excludes data and information from joint corporates, contractor etc. which is outside of the organization, i.e. DHIC, from the report boundaries.

#### Our approach

In order to verify the contents of the Report within an agreed scope of assurance in accordance with the assurance standard, the team has carried out an assurance engagement as follows:

- Reviewed overall report
- Reviewed materiality test process and methodology
- Reviewed sustainability management strategies and targets
- Reviewed stakeholder engagement activities
- Interviewed people in charge of preparing the Report

#### Our conclusion

Based on the results we have obtained from material reviews and interviews, we had several discussions with DHIC on the revision of the Report. We reviewed the Report's final version in order to confirm that our recommendations for improvement and our revisions have been reflected. When reviewing the results of the assurance, the assurance team could not find any inappropriate contents in the Report to the compliance with the principles stipulated below. Nothing has come to our attention that causes us to believe that the data included in the verification scope are not presented appropriately.

#### • Inclusivity

Inclusivity is the participation of stakeholders in developing and achieving an accountable and strategic response to sustainability  
- DHIC is developing and maintaining stakeholder communication channels in various forms and levels in order to make a commitment to be responsible for the stakeholders. The assurance team could not find any critical stakeholder DHIC left out during this procedure.

#### • Materiality

Materiality is determining the relevance and significance of an issue to an organization and its stakeholders. A material issue is an issue that will influence the decisions, actions, and performance of an organization or its stakeholders.  
- DHIC is determining the materiality of issues found out through stakeholder communication channels through its own materiality evaluation process, and the assurance team could not find any critical issues left out in this process.

#### • Responsiveness

Responsiveness is an organization's response to stakeholder issues that affect its sustainability performance and is realized through decisions, actions, and performance, as well as communication with stakeholders.  
- The assurance team could not find any evidence that DHIC's counter measures to critical stakeholder issues were inappropriately recorded in the Report.

We could not find any evidence the Report was not prepared in accordance with the 'Core Option' of GRI standards.

#### Recommendation for improvement

We hope the Report is actively used as a communication tool with stakeholders and we recommend the following for continuous improvements.

- he report found that DHIC was engaged in a transparent communication with its stakeholders on the company's economic, social, environmental achievements and goals. In the future, we recommend to provide more detailed information including insights on the company's organizational strategies and their effect on the capabilities of creating short, medium, long-term values as well as capital and its use.

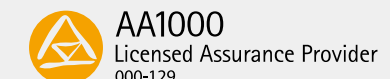
#### Our independence

With the exception of providing third party assurance services, KMR is not involved in any other DHIC's business operations that are aimed at making profit in order to avoid any conflicts of interest and to maintain independence.

June, 25<sup>th</sup>, 2019

CEO

*E. J. Hawang*



## Environmental Guidelines

Based on its people-centered management philosophy and technology that enhances the value of the earth, Doosan Heavy Industries & Construction has established environmental guidelines in accordance with the Doosan Credo, internal environmental management rules and regulations for the protection of the environment together with employees, suppliers, customers and the local community.

Thus, we are promoting the following activities to reduce environmental impact generated during the course of business, and continuing to expand the scope to supply networks and suppliers.

### 1. Production and workplace environment management

For efficient environmental management of production and business facilities, 10 procedures including objective management, educational training, document and records management and internal audit as well as 9 directives on, for example, environmental impact assessment, air environment control and waste control, are used for management.

### 2. Selection of suppliers, contractors and service providers and continuous assessments

Doosan Heavy Industries & Construction performs regular environment control assessments on subsidiaries within the company twice a year, and the results are utilized as the basis for incentives or penalties to be levied on the subsidiaries and as reference data for their development planning. Also, areas related to the environment are assessed when evaluating suppliers and supplier CSR guidelines including environmental control are distributed as a part of an effort to reduce environmental risks throughout the supply network.

### 3. Development of products and services

By recognizing the fact that various environmental issues related to climate changes pose both risks and opportunities for Doosan Heavy Industries & Construction, we have been conducting research and development that can minimize environmental impact when developing products or services.

### 4. Logistics

To minimize environmental pollution that may occur during transport, Doosan Heavy Industries & Construction manages it through guidelines, etc. Work standards are made and managed based on the best cases for each step, which includes transport quotes, preliminary surveys, transport company selection, contract signing, local transport (inland, barge, air, etc.) and cargo insurance.

### 5. Waste management

Doosan Heavy Industries & Construction specifies the entire work process from waste generation to final disposal and operates and manages it through a waste management order, which helps control the scope of application, definitions of terms, responsibilities and authorities, waste recycling and storage facilities, generation, collection, storage and disposal of waste, inspection, consignment contracts and monitoring.

### 6. Engineering and maintenance

To minimize environmental pollution generated during operation and maintenance of power plants, Doosan Heavy Industries & Construction provides an environmental guide to fundamentally prevent environmental pollution that would occur from irregular operations. By offering operation and maintenance manuals based on the characteristics of each power plant, a guide is provided to minimize the environmental impact generated during operations.

### 7. New projects

Prior to the start of a new project, Doosan Heavy Industries & Construction utilizes its Project Environment Plan, to which detailed means of environmental control are applied, to ensure environmental control in project sites. Primary items of the Project Environment Plan include Project Policy, water supply and waste discharge requirements, hazard substance management, air pollution control, etc.

### 8. Due Diligence of mergers and acquisitions

Doosan Heavy Industries & Construction conducts due diligence assessment on companies prior to mergers and acquisitions in order to examine environmental risks and respond in advance, if needed. Major aspects evaluated include soil and underground water contamination, asbestos, hazardous chemical substances, environmental pollution prevention facilities and greenhouse gas emission management, and the assessment results are utilized and managed as important factors to consider during acquisitions or mergers.

## GRI Content Index

### Universal Standards (GRI 100)

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	102-8	Information on employees and other workers	64-68	
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	102-10	Significant changes to the organization and its supply chain	-	No significant change
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	102-49	Changes in reporting	-	No reporting changes
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### Topic Specific Standards

#### Economic Standards (GRI 200)

TOPIC	No.	Description of the Indicators	Page	Remarks
Economic Performance	201-1	Direct economic value generated and distributed	87-93	
	201-3	Defined benefit plan obligations and other retirement plans	87-93	
Indirect Economic Impacts	203-1	Infrastructure investments and services supported	46-49	
Anti-corruption	205-1	Operations assessed for risks related to corruption	54-55	
	205-3	Confirmed incidents of corruption and actions taken	54-55	
Anti-competitive Behavior	206-1	Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	54-55	

#### Environment Standards (GRI 300)

TOPIC	No.	Description of the Indicators	Page	Remarks
Energy	302-1	Energy consumption within the organization	83-84	
	302-2	Energy consumption outside of the organization	83-84	
	302-4	Reduction of energy consumption	83-84	
Water	303-1	Water withdrawal by source	83-84	
	305-1	Direct (Scope 1) GHG emissions	83-84	
Emissions	305-2	Energy indirect (Scope 2) GHG emissions	83-84	
	305-3	Other indirect (Scope 3) GHG emissions	83-84	
Environmental Compliance	307-1	Non-compliance with environmental laws and regulations	83-84	

#### Social Standards (GRI 400)

TOPIC	No.	Description of the Indicators	Page	Remarks
Employment	401-1	New employee hires and employee turnover	85	
	401-3	Parental leave	85	
Labor/Management Relations	402-1	Minimum notice periods regarding operational changes	64-68	
Occupational Health and Safety	403-2	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	86	
Training and Education	404-1	Average hours of training per year per employee	64-68	
Diversity and Equal Opportunity	405-1	Diversity of governance bodies and employees	64-68	
Child Labor	408-1	Operations and suppliers at significant risk for incidents of child labor	71	
Forced or Compulsory Labor	409-1	Operations and suppliers at significant risk for incidents of forced or compulsory labor	71	
Human Rights Assessment	412-1	Operations that have been subject to human rights reviews or impact assessments	71	
	412-2	Operations that have been subject to human rights reviews or impact assessments	85	
Customer Health and Safety	416-1	Assessment of the health and safety impacts of product and service categories	60-63	
	416-2	Incidents of non-compliance concerning the health and safety impacts of products and services	60-63	
Socioeconomic Compliance	419-1	Incidents of non-compliance concerning the health and safety impacts of products and services	54-55	

## UN Global Compact

Doosan Heavy Industries & Construction has joined the UN Global Compact since 2004 and has complied with the ten principles of human rights, labor, the environment and anti-corruption. We are committed to fulfilling our social responsibilities and role as a global leader in sustainable management that represents Korea by reflecting international standards for social responsibility management and by solidifying our commitment to social responsibility management.

Ten principles		page
<b>Human Rights</b>		
Principle 1	Businesses should support and respect the protection of internationally proclaimed human rights	48-51, 74, 80
Principle 2	and make sure that they are not complicit in human rights abuses.	
<b>Labour</b>		
Principle 3	Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining	74, 77, 80, 102
Principle 4	the elimination of all forms of forced and compulsory labor	
Principle 5	the effective abolition of child labor	
Principle 6	and the elimination of discrimination in respect of employment and occupation.	
<b>Environment</b>		
Principle 7	Businesses should support a precautionary approach to environmental challenges	64-67, 98-102
Principle 8	undertake initiatives to promote greater environmental responsibility	
Principle 9	and encourage the development and diffusion of environmentally-friendly technologies.	41
<b>Anti-Corruption</b>		
Principle 10	Businesses should work against corruption in all its forms, including extortion and bribery.	60-61, 80, 103-104

## Overview of Association Memberships

Category	Associations for which memberships have been signed up	Category	Associations for which memberships have been signed up	Category	Associations for which memberships have been signed up
Common	Large & Small Business Agriculture & Fisheries Cooperation Foundation	Common	Korea Employer's Federation	Nuclear power	Korea Nuclear Society
	Korea Technology Finance Corporation		World Energy Council		Korea Nuclear Association for International Cooperation
	Korea Credit Guarantee Fund		WEC Korea		World Nuclear Association
	Gyeongnam Center for Social Economy and Entrepreneurs		Korea-Arab Society		Women Interested in Nuclear
	Gyeongnam Center for Creative Economy and Innovation		Korea Chamber of Commerce and Industry	Welding	Korean Welding & Joining Society
	Korea New & Renewable Energy Association		Fair Competition Federation		Construction Association of Korea
	Common	National Academy of Engineering of Korea	UNGC (UN Global Compact) Korea	EPC	Korea Housing Builders Association
		Korean Federation of Science & Technology Societies	Marine Rescue & Salvage Association		Korea Federation of Construction Contractors
		Korea Management Association	Power generation		Korea Electrical Contractors Association
		Korea International Trade Association		Korean Institute of Electrical Engineers	Korea Information Certificate Authority
		Korea Industrial Technology Association		Korean Society of Mechanical Engineers	International Contractors Association of Korea
		Korea Engineering & Consulting Association		Korea Electric Association	Korea Mech. Const. Contractors Association
		Korean Society of Combustion	Korea Association of Machinery Industry	Casting & forging	PEA (Plant Eng. Association)
		Korea Plant Industries Association	Korea Wind Energy Industry Association		Korean Institute of Metals & Materials
		Machinery Financial Cooperative	Korea Wind Energy Association	Nuclear power	Korea Foundry Society
Korean Society of Combustion			EPRI (Electric Power Research Institute) – WRTC		Korea Iron & Steel Association
Korea Management Association	Korea Radioactive Waste Society		Quality	Korean Standards Association	
Korea International Trade Association	Korea Nuclear Equipment Advancement Association	Korean Foundation for Quality (KFQ)			
	Machinery Financial Cooperative		Korea Atomic Industrial Forum		

# Integrated solutions for a better life

2018 Integrated Report of  
Doosan Heavy Industries & Construction

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