# **GLOBAL NETWORK**

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# DOOSAN

Integrated solutions for a better life **Doosan Enerbility** 

# DOOSAN

**Doosan Enerbility Bundang Doosan Tower** 155, Jeongjail-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea (13557)

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DUBAI OFFICE Office Unit No. 2202/2203, 22nd Floor



# Doosan creates value for the world with its advanced technology and capabilities.

Doosan Enerbility has been supplying specialized products and services for power plants and desalination plants in 40 countries around the world. It has now grown to become an energy solution provider that helps create value for the world.

At Doosan, we have the technology for manufacturing the main components of power plants, such as boilers, turbines and generators. Having expanded into the Services business, we also offer performance upgrades and life cycle extension for power plant equipment and implement various environmental control systems and self-developed digital solutions to help reduce the emission of pollutants.

We are a globally recognized leader of seawater desalination and have also been cultivating the nuclear power business by leveraging our unrivalled expertise in this field. We have delivered more nuclear power plant equipment than any other company worldwide over the last two decades, and have recently ventured into the Small Modular Reactor business in the U.S. The SMRs are receiving worldwide attention these days as an effective alternative for reducing carbon emissions. We have also completed development of a cask for transporting and storing nuclear spent fuel and are now branching out into the nuclear decommissioning business.

Our business focus is shifting toward eco-friendly energy solutions, such as gas turbines, wind power, solar energy and hydrogen power. Doosan is the first in Korea and fifth in the world to succeed in developing a H-class gas turbine, and we expect to soon have our gas turbine model commercialized. As Korea's leading offshore wind turbine manufacturer that holds superior technology and a solid track record, Doosan is solidifying its position as a key player in the wind power market.

Doosan Enerbility's energy technologies will ultimately help enrich people's lives and make Earth a cleaner planet.

# POWER PLANTS

Doosan Enerbility is a global company that holds the core technologies and a solid track record for manufacturing key components of power plants - boilers, turbines and generators. Doosan is also making substantial inroads into the eco-friendly energy business, including the areas of wind power, ESS (Energy Storage System) and hydrogen energy. software, to form Doosan GridTech, through which we are now playing a leading role in stabilizing power supply in the renewable energy market. With hydrogen now gaining attention as a new energy source, Doosan is exploring the hydrogen energy business these days. We are carrying out Korea's first hydrogen liquefaction plant project, and pursuing numerous green hydrogen projects that involve using renewable energy to produce hydrogen.

With our eyes on the future, we are leading the efforts to make the planet we live on cleaner and our future brighter, with technologies designed to achieve greener coal-fired power plants, such as those installed with circulating fluidized bed (CFB) and ultra-supercritical (USC) boilers, and eco-friendly facilities that include desulfurizing, deNOxing dry and wet electrostatic precipitators.



## **Nuclear Power Plants**

Doosan Enerbility is Korea's nuclear plant equipment manufacturing specialist. We supply not only the core components of nuclear power plants, such as reactors, evaporators, turbines and generators, but also nuclear fuel handling facilities, nuclear fuel casks, and most of the auxiliary equipment for nuclear reactor systems.

Our competitiveness lies in our one-stop production system, which enables us to handle all processes from materials handling to assembly of the finished product at a single manufacturing facility, our large-size nuclear materials handling technology and our independent procurement capability. In 2008, we won the contract to supply the main components for six nuclear power plant projects in the US, which resumed nuclear new build projects after a 30-year hiatus. Doosan is participating as the main equipment supplier for a UAE nuclear power plant project, the one to which Korea made its very first export of a Korean-standard nuclear reactor, and it has also signed on as a plant maintenance service provider, all of which reveals the level of recognition Doosan is gaining in the field of nuclear power technology.

We also signed a memorandum of understanding with a US company specializing in small modular reactors (SMR) to cooperate on business in this field and have teamed up with local investors to make an equity investment, a move that has helped to effectively secure equipment orders worth billions of dollars. We plan to further expand our business in order to effectively meet the global market demand for SMRs. Doosan Enerbility also aims to continuously implement projects successfully to produce and replace main equipment for nuclear power plants and expand its services business, at the same time stepping up efforts to develop technologies for nuclear power plants decommissioning, a market that is forecast to grow to the size of USD 374 billion by 2050.



## Thermal Power Plants / Combined Cycle Power Plants

Based on our proprietary technologies for manufacturing the core components of power plants, such as boilers, turbines and generators, we have been supplying such core equipment to thermal power plants at both home and abroad. We have also been conducting numerous EPC (engineering, procurement and construction) projects, covering the entire process from plant engineering, equipment manufacturing & installation, construction to the commissioning of power plants.

In Korea, we have won contracts to deliver core equipment for combined cycle power plants in Seoul and Pocheon, as well as cogeneration power plants like the one in Gimpo. We are also establishing a name for ourselves in the global market, as can be seen in how our company has won numerous contracts overseas, such as the Qurayyah and Fadhili Combined Cycle Power Plant projects in Saudi Arabia and a combined cycle power plant project in Guam.

Having been recognized for our technological prowess as the first Korean company to manufacture and deliver gas turbines, we aim to make the leap forward as a top-tier original equipment manufacturer of gas turbines in the global power sector. Furthermore, we have been spearheading the technology development efforts for hydrogen gas turbines since 2020, such as by participating in the "Development of Hydrogen Dual-Fuel, Eco-Friendly Combustor for Hydrogen Gas Turbines," which is a local industry-academia-research sector collaboration project being jointly pursued with organizations like the Korea Institute of Machinery & Materials (KIMM), as well as the state-led project titled "Development of 5MW 100% Hydrogen-Fueled Gas Turbine."

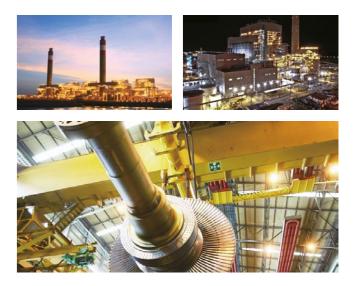


## **Eco-Friendly Energy Business**

As Korea's leading offshore wind turbine manufacturer that holds superior technology and a solid track record, we developed Korea's first 3MW-class onshore/offshore wind power system WinDS3000<sup>™</sup>. We successively won related projects that added up to be a total installed capacity of 339.5MW (97 units), starting with the order won in 2010 for a 9MW wind turbine at a wind farm in Korea's Sinan-gun, Jeollanam-do region, followed by an EPC contract for the 30MW Tamra Offshore Wind Farm (Korea's first offshore wind farm) which was won in 2012 and the contracts for the Southwest Offshore Wind Farm project and Jeju Hallim Offshore Wind Farm project.

Adding on to these achievements, we introduced a 5.5MW wind turbine in 2017, and subsequently started on the development of a 8MW wind power system in 2018, which is scheduled to undergo a demonstration run in 2022 prior to commercialization.

In 2016, we acquired 1Energy Systems, a US-based company that owns proprietary technology in the field of energy storage systems (ESS) control



## **Hydro Power Plants**

Doosan is the only company in Korea with the capacity to manufacture and supply pump turbines, generators and I&C equipment for large hydro power plants. Doosan has a fully-integrated one-stop production system, one that is capable of handling the entire manufacturing process from the castings and forgings used in turbines and generators to the finished product. Since supplying the main equipment for Gangneung Hydro Power Plant (41 MW x 2 units), Doosan has participated in all the hydro power plant and pumped storage power plant projects in Korea, including the Muju (300 MW x 2 Units), Samrangjin (300 MW x 2 Units), Sancheong (350 MW x 2 Units), Yangyang (250 MW x 4 Units) and Yecheon (400 MW x 2 Units) projects. Doosan has accumulated abundant experience and expertise from the new build and modernization projects it performed for domestic hydro power plants and pumped-storage power plants, and plans to apply this expertise to its future projects going forward. Following on the heels of the Upper Trishuli-1 Hydro Power Project in Nepal that the company won, Doosan plans to continue with its efforts to expand its global reach by participating in numerous overseas projects, including hydro power plant projects in Pakistan and Laos.



# WATER PLANTS

Doosan Enerbility is one of the leading providers of seawater desalination solutions. Our proven portfolio of Multi-Stage Flash (MSF), Multi-Effect Distillation (MED), and Reverse Osmosis (RO) technologies enables us to deliver reliable and cost-effective turnkey solutions with the shortest lead times in the industry. We continue to expand into various sectors of the water market as we pursue our vision of becoming a global leader in water. MED project, the world's largest in terms of unit capacity, once again consolidated our place as the world's No. 1 company in the seawater desalination sector. We are also rising as a leader in reverse osmosis desalination, having won the contract to construct the Doha Phase 1 RO seawater desalination plant in 2016.

With Doosan Enpure, a UK subsidiary that specializes in water purification/sewage treatment, sludge treatment and conversion into energy, we boast of having exemplary engineering capabilities and experience in far-reaching areas encompassing the entire scope of water treatment. We are working to expand our business in the water treatment industry, having won projects to construct water treatment plants in Oman and the UK in 2015, and a project to provide zero liquid discharge (ZLD) technology, a green water treatment method, for Korea South-East Power in February 2017, as well as a project to deliver facilities for the UK Birmingham Water Treatment Plant in June 2017.

While continuing to expand our market, which is currently concentrated in the Middle East region, to the entire world, including North America, Latin America, Southeast Asia, India and China, we will seek to provide integrated solutions for the water business.

# **DIGITAL INNOVATION | DIGITAL SOLUTIONS**

We are constantly striving to keep pace with the innovations of the fourth industrial revolution, while driving the efforts for digital transformation and preparing for market changes. We are applying advanced IT technology, such as artificial intelligence, IoT and big data, to develop various digital solutions like the prediction & diagnostics solution, plant optimizer, data analysis and digital twin solutions, all of which will help improve our business competitiveness.

By introducing industrial robots to our processes, we are transforming our facilities into "digital factories." We operate the remote monitoring service center (RMSC) to remotely control the operation of power plants in real time without the constraints of time and space, collect big data on plant operations and utilize this to enhance the plant availability and efficiency.

We are now planning a rollout into other additional areas, expanding from power generation to also include water treatment and renewable energy.

## **Desalination & Water Treatment Plants**

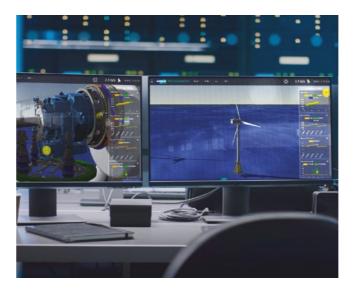
We are the recognized global leader of seawater desalination, providing integrated solutions in the water business, not only for seawater desalination through MSF (Multi-Stage Flash), MED (Multi-Effect Distillation), and RO (Reverse Osmosis) methods, but also for water treatment.

Owing to our proactive R&D efforts, we have been winning diverse large-scale RO projects since 2007 and have been demonstrating our technological prowess in the constantly growing market for RO desalination.

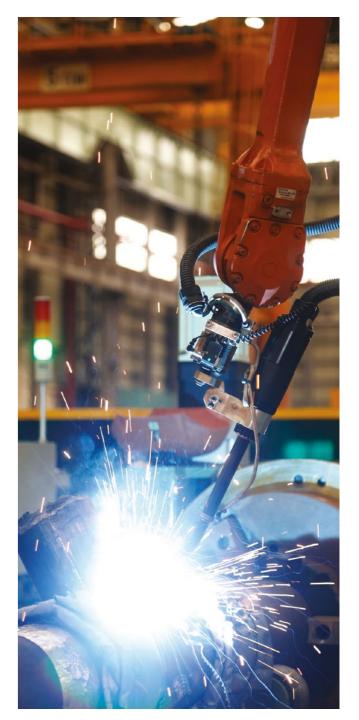
In 2010, we secured the contract for the world's largest-capacity desalination plant – the 228 MIGD scale Ras Al Khair project in Saudi Arabia, cementing our position as the world's leading MSF technology provider. And our successful bid in 2011 for the Yanbu











# CASTINGS & FORGINGS

Boasting systematized production facilities and superior technology, Doosan Enerbility provides extra-large casting and forging products for power plants, marine vessels, iron and steel forging, mold and tool steel, and other industrial facilities all around the world.

# **Castings & Forgings**

Equipped with the most advanced casting and forging facilities in the world, we specialize in the manufacturing of power plant materials, as well as large-sized casting and forged products for vessels, steelwork, tool & mold steel, and diverse types of industrial equipment. Our technical excellence in manufacturing forged products for the main equipment of nuclear power plants, as well as ultra-large cast and forged products, is evident in the sheer number of products we have supplied to our customers worldwide. At present, we produce eight world-class products, including crankshafts for vessels, tool & mold steel, work rolls and low-pressure turbine rotor shafts and we have completed installing the world's largest 17,000-ton forging press in 2017 as part of our efforts to secure a new future growth engine.

In February 2022, backed by our casting and forging expertise that was accumulated over the past 40 years, we had a casting & forging joint venture company established in Saudia Arabia. We also have plans to build Saudi Arabia's largest casting & forging facility by 2025 and will be providing technical support and operational services to the joint venture company.







# **Doosan Enerbility Headquarters and Changwon Plant**

Doosan's Changwon Plant is a 4-million square meter industrial complex that accommodates large-scale work shops, such as a casting & forging shop, turbine & generator shop, nuclear shop, boiler shop and wind turbine shop, in addition to major facilities for gas turbines, a R&D center and even a private dock. It is equipped with a complete set of production facilities that enable it to cover the entire production process, from the manufacturing of materials to the assembly of finished products.







# **Overseas**

#### Doosan Power Systems

Doosan Power Systems S.A. is the holding company of Doosan's European subsidiaries. Doosan Power Systems offers a wide range of shared services such as finance, IP and legal services to support the operations of Doosan Skoda Power in the Czech Republic, and Doosan Lentjes in Germany, and also provides support on the sales & marketing activities in the European power markets, including Turkey and Poland.



#### Doosan Škoda Power

Boasting of a history that dates back to over 150 years ago, Doosan Skoda Power is a Czech-based company that designs, manufactures and provides services for steam turbines. The company has provided 65GW worth of steam turbines for thermal, combined cycle and nuclear power plants in over 70 countries around the world. By acquiring Skoda Power in 2009, Doosan obtained the capability to produce boiler-turbine-generator packages. In 2014, the company established a global R&D center in the Czech Republic, which has helped to sharpen its technological competitive edge.



#### Doosan Lentjes

Doosan Lentjes, which was formed when Doosan acquired AE&E Lentjes in 2011, is a Germany-based global provider of technologies and processes for energy generation, from both renewable sources and fossil fuels. The company is recognized for its eco-friendly advanced power generation technologies, such as for circulating fluidized bed(CFB) boilers, flue gas cleaning systems for power plants (e.g. FGD, SCR, Filter) and waste-to-energy(WtE) plants, all of which are applied to provide customers with effective environmental control systems.



#### Doosan Enpure

In 2012, Doosan acquired Enpure, a company recognized for its expertise in water and wastewater treatment. The British engineering company is equipped with advanced process design and engineering technology, particularly in the fields of reverse osmosis(RO), water pretreatment and water & wastewater treatment, and boasts of having an extensive and diverse track record. This acquisition reinforced Doosan's capabilities in the RO area and provided a platform for advancing further into the water treatment market and providing customers with optimal solutions to address their specific needs.



#### Doosan Power Systems India

Our four Indian subsidiaries, which includes Chennai Works, were merged into a single entity called Doosan Power Systems India. By adopting a localization strategy, DPSI's competencies are being strengthened in the areas of supercritical boiler pressure parts production, design and engineering, project management, procurement, construction work and process/quality control. DPSI's goal is to maximize growth and profitability by securing competitiveness in the Indian market over the mid to long term

#### Doosan Vina

Doosan Vina is a global production base located inside the Dung Quat Industrial Complex in Vietnam. It was established in May 2009 after more than two years of construction. Doosan Vina has a total of five manufacturing plants and is fully equipped with its own port and harbor facilities. These plants produce boilers, desalination plants and transportation facilities. Local engineers are now being cultivated and efficiency is being raised to match the productivity of the Changwon plant.

#### Doosan HF Controls

Doosan HF Controls specializes in the design and construction of digital instrumentation and control(I&C) systems for diverse power and industrial applications. The company has obtained the US Nuclear Regulatory Commission Safety Evaluation Report and Germany's TUV Safety Integrity Level-3 certification, ensuring that precise and safe control of nuclear power plants and other large-scale industrial plants is provided for its customers.

#### Doosan GridTech

In 2016, Doosan Enerbility acquired 1Energy Systems, a US company with proprietary technologies in energy storage systems (ESS) software, to found Doosan Grid-Tech. With the establishment of the new company, Doosan has secured one of the best systems in the ESS industry, as well as the capability to seamlessly carry out the entire ESS process from design and installation to commissioning.

### **Doosan Turbomachinery Services**

Doosan Turbomachinery Services (DTS) was established in 2017 when Doosan Enerbility acquired ACT Independent Turbo Services, a US company recognized for its world-class expertise in gas turbine services. With DTS, Doosan Enerbility has been able to secure a strong foothold to penetrate America's 16GW gas turbine market, and by leveraging Doosan Enerbility's extensive global network, the company aims to target not only North America and the Korean market, but to also expand into new markets such as the Middle East and Europe.

10

Our

**Subsidiaries** 









