



**OFFSHORE**

ENERGY. COMMITTED.



# ANNUAL REPORT 2019

## 2.9 TECHNOLOGY

### MANAGEMENT APPROACH

To develop its technology strategy, SBM Offshore first engages externally with its clients and internally with Product Line divisions to identify and analyze the key technical and business trends in the offshore industry. Armed with this market-based information and clients demands, the Company predicts future technology gaps and strives to find innovative, safe, sustainable, reliable and cost-effective solutions to meet these challenges. SBM Offshore's technology team actively works towards this goal by transforming and innovating to ensure that the Company is well positioned for future projects as clients' needs evolve.

In 2019, the Company continued to meet the needs of an evolving energy mix by increasingly diversifying its efforts into emerging technologies associated with gas, power and renewable energies. There is also an increased focus on developing zero-emissions solutions.

The Company operates a robust technology development process, which ensures that investment in each new project or innovation is justified against a business case. Moreover, SBM Offshore develops its new technology through a structured stage-gate process to ensure that it is fully mature before being offered for sale or introduced into projects. This Technology Readiness Level (TRL) process includes full-scale prototype testing of new proprietary components and full FEED level definition of new systems as part of the qualification requirements.

The Business Readiness Level (BRL) system, which manages business maturity, measuring the readiness of functions such as construction and operations to adopt the new technology, acts as a complement to the TRL process and both processes endeavor to reach maturity at the same pace.

### 2019 PERFORMANCE

#### Competitive Advantage through Technology

SBM Offshore strives to deliver high performance solutions that meet or exceed clients' expectations and go beyond what is available in the market.

The major development projects undertaken in 2019 include:

- The design of the Floating Offshore Wind TLP concept has been further developed to suit an increased range of water depths and environmental conditions.
- The S3<sup>®</sup> WEC project continues towards pilot tests at sea.
- Development of renewable energy storage systems to complement Floating Offshore Wind and WEC developments.

- Development of floating renewable energy production solutions with a focus on hydrogen.
- Significant progress on the journey towards unmanned and autonomous FPSO operations.
- Further roll-out of digital solutions within the fleet to improve operational performance.
- Progress on the development of a Seawater Intake Riser system to capture cold water from 600m-1000m water depths to cool FPSO topsides equipment, augmenting the unit's energy efficiency and, subsequently, reducing GHG emissions.
- Launch of the Additive Manufacturing program, with the aim of printing a set of certified polymer spare parts to be supplied to the FPSO fleet, positively impacting the sustainability of the supply chain.
- First FPSO void tank visual inspection by drone, setting the basis for the unmanned inspection and maintenance technology roadmap.
- Continued development of floating gas solutions with conversion and new build options targeted at mid-scale capacities.
- Development of FLNG topsides concepts jointly with a LNG contractor.
- Continued development of enhanced performance swivels with designs of new state-of-the-art swivel test rigs completed and due for delivery in 2020.

#### Intellectual Property

The Company maintains a significant Intellectual Property (IP) portfolio, including patents, trademarks, and copyrights. The IP portfolio contains 154 patent families, each registered in many countries around the world, and covers a wide range of technologies, including FPSO mooring and turret systems, semi-submersible and tension leg FPU's, hydrocarbon transfer and processing systems (including LNG and gas processing), drilling and riser technologies, offshore installation and also covering digital and renewable technologies like wind floaters and wave energy systems. During 2019, the Company divested several non-core patents and filed 14 new patent families applications for new and innovative technologies, in particular renewables and digital.

#### Renewable energy

The Company supports the transition to renewable energies; 29% of the research and development spending in 2019 was on low-carbon technologies. SBM Offshore considers low-carbon technologies as those that have the potential to replace oil with less polluting alternatives, to capture/reuse CO<sub>2</sub>, to reduce emissions in SBM Offshore normal/future fleet operation. They include investments in wind energy, wave energy and energy storage, as well as LNG investments and other energy recovery methods that may find application to SBM Offshore businesses. This year,

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the Company has continued development of its innovative S3® WEC, with a prototype planned to be deployed at sea.

In addition to wave energy, SBM Offshore continues to develop its floating offshore wind solution to suit an increased range of water depths and environmental conditions to cater for clients' future fields. The industrialization of the product is a key area of development and enables wind farm deployment with an optimized schedule and cost.

### KEY TARGETS

Technology development continues to be guided by three principles:

1. To embed the Fast4Ward® principles in all Technology development programs.
2. To embrace Digital Transformation to differentiate technology solutions.

3. To embed the SDGs into the Company's technology solutions.

The success of SBM Offshore's Technology division is measured by the capacity to innovate and develop differentiated solutions ready for application within the Product Lines. The method of measurement applied is the quantity of TRL gates passed, which signify progress on the technology development program. In 2019, over 60 TRL stage gates were passed.

### FUTURE

In order to achieve its goal to develop new low-carbon technological solutions, SBM Offshore has set a target that:

- 30% of Research & Development (R&D) investments should go towards low-carbon technologies, such as renewables, gas and emissions reduction.

