Integrated offshore production solutions
Reducing investment and contractual risks, enhancing reliability and improving production performance
A large portion of global oil and gas reserves are found offshore. To exploit these reserves, fixed platforms, semi-submersibles, and floating production and offloading vessels (FPSOs) are employed. The latter are becoming increasingly important as oil and gas production moves toward deep-sea regions, harsher offshore environments and difficult-to-recover hydrocarbons. Siemens has extensive experience in offshore projects, providing solutions for all offshore environments.
Competent, cost-effective, and comprehensive
On board, a modular, space-saving design for all topside solutions and maximized availability and operating efficiency are imperative. Offshore production solutions from Siemens are built to meet tough challenges, with concepts that optimally fulfill the specific needs of construction and operation – with a focus on:
- Reliable technology offering maximized performance
- Integrated solutions, complete packages and modules designed, engineered, managed and tested in-house

Solutions for the entire lifecycle
Siemens boasts the most extensive portfolio on the market for topside installations for new-build, fixed and floating facilities as well as brownfield upgrades and conversions. Customers profit from our leading technological expertise, CAPEX and OPEX savings, and qualified services along the entire lifecycle of their assets. Our lifecycle services support offshore production design companies, engineering procurement and construction contractors (EPCs), operators, owners and end users. Our offer comprises feasibility studies and the clarification of financing issues as well as engineering, construction, and commissioning of the requisite system packages to deliver reliable project execution and system operations with maximized performance.

Advantages from a single source
While complex offshore production plants require the interfacing of numerous processes, each interface represents a potential cost and execution-time risk to EPCs, operators and end users alike. Integrated OEM and turnkey solutions from Siemens transfer these risks to the system provider, making system performance and troubleshooting the OEM’s responsibility. This may be enhanced by an uptime guarantee, optionally on a project-specific risk/reward basis for Siemens’ entire scope of delivery.

As offshore project experts with over 35 years of experience in the field, we integrate our solutions into any platform or vessel design in compliance with all major international and local codes. We have acquired significant expertise in all major offshore operating regions, from fit-for-purpose to high-spec, complex requirements from the most demanding end customers. In addition, all core components of our solutions come from our Siemens world-renowned in-house manufacturing facilities for better quality control. We are able to handle local content through our broad manufacturing base, including facilities from Brazil to China. In addition, our global organization provides reliable service support anytime, anywhere.

Siemens has extensive experience in equipping and servicing offshore production facilities with world-leading technologies:
- Complete power generation and distribution systems
- Drives and integrated process solutions for gas and water
- Integrated operation-ready automation and safety systems
- Integrated telecom and marine systems
- Comprehensive services for reliable operation with maximized performance
Automation and safety systems
Page 14
Automation control and safety are essential for a reliable offshore operation. As a global leader in these fields, Siemens can offer products and solutions to cover all offshore production and marine applications.

Water treatment
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Siemens offers a broad range of products, systems and services for produced-water treatment and water treatment for enhanced oil recovery.

Power distribution
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Power generation and distribution are essential to maintain the reliability and safety of all offshore operations. In Siemens’ comprehensive power distribution solutions, all systems and products can be modularized and standardized, and are fully tested prior to assembly.

Find out more about Siemens’ revolutionary BlueDrive propulsion system and dynamic positioning solutions.
Made-to-order services along the entire lifecycle of offshore assets guarantee optimal performance, minimized downtimes, and highest productivity at the lowest possible costs.

Gas can be compressed for lift or reinjection after treatment or exported with Siemens’ fixed-speed motor, VSD, or turbine-driven compression trains.

Siemens is the world’s leading supplier of energy-efficient electrical motors and variable-frequency drive (VFD) products, systems, and services for the oil and gas industry.

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Siemens’ lightweight gas turbines are the perfect fit for demanding offshore applications, with fast core engine exchanges in the range of 5 to 50 MW per set. Low-emission technology with no water injection and high efficiency are standard, and meet the strictest safety and reliability requirements.

The systems can be deployed on different types of platforms and FPSOs.
As one of the world’s technology leaders in power generation, power transmission, distribution, and electrical drives, Siemens is the right partner for your entire power supply. Our complete power packages exploit Siemens’ wealth of experience in solving the special challenges in the offshore sector. The individual systems are pretested and can be installed throughout the offshore facility or as part of complete single-lift modules. In either case, the complete power system can be designed and engineered by Siemens in the concept or FEED project phase working in close collaboration with our customers.

**Main electrical vendor concept**

Our main electrical vendor concept optimizes the cost/benefit ratio of a plant’s power supply and minimizes risks. The concept is based on a carefully coordinated portfolio of high-quality products and services that is grounded in a strategic partnership between the Siemens and our customer. As part of the concept, we define the best possible solutions, including future maintenance, environmental safety and operational features.
Power generation systems

A safe and reliable power supply is vital for production processes. Our comprehensive gas-turbine power generation trains from 5 to 50 MW designed for offshore fixed and floating applications are provided complete as pretested single-lift skids or with multiple trains in a single pre-tested module. The module is designed by our in-house team to suit the specific requirements of each project and is managed by Siemens using yards under Siemens control. Siemens gas turbines are the perfect fit for the most demanding offshore applications.

Siemens gas turbines are suitable for the roll-and-pitch requirements imposed on floating production facilities. Modularized support systems are located in the base of the gas turbine packages for ease of maintenance and core engine exchanges are achieved with minimal downtime. The packages are designed in line with stringent HSE specifications and their compact layout meets our customers’ need to save space. In addition, Siemens gas turbines offer broad fuel flexibility with a variety of standard burner configurations for high H₂S, crude and heavy fueloids, for example.

We are able to work in the early phase of projects with end users, operators and EPCs to find the best solution for all applications including complex fuel requirements. Because most offshore production facilities require initial and after-shutdown operation on liquid fuel, pending gas production, the Siemens gas turbines are equipped as standard with dual-fuel systems. All engines also have dry low NOₓ systems for gas fuel as standard, with nominal emissions as low as 15 ppm NOₓ. In addition to long intervals between overhauls for high availability and maximized uptime, our global presence offers unique services for all equipment supplied.
Full scope of power distribution products

- MV and LV switchgear
- MV gas- and air-insulated switchgear
- Power and distribution transformers
- Uninterruptible power supply
- Motor control center
- Protection and energy automation
- Fixed- and variable-speed drives
- Planning, construction, and installation
- Integration into Siemens-supplied E-house

Power distribution systems

The power supply’s quality and reliability must meet all process demands in offshore production, whether fixed or floating. Power distribution systems from Siemens are comprehensive, perfectly matched and balanced solutions covering the entire single-line diagram, from generation through MV gas- or air-insulated switchgear, LV switchgear, power and distribution transformers, cable connections, and bus ducts to fixed- or variable-speed drives and other consumers. All protection and energy automation functions are also provided.

E-house

E-houses (or local equipment rooms) are designed, engineered and managed using Siemens in-house resources from concept through onshore commissioning and load out. An E-house may contain all switchgear, transformers, and power automation systems for the fixed or floating facility. It provides a low-risk approach for the EPC and owner, with Siemens assuming the full scope of responsibility. Installation and hook-up time on the facility is minimized after delivery. Once in operation, the E-house meets every requirement for safe and reliable power.

Power management system

For many power consumers on board, a reliable and stable energy supply is a prerequisite. To ensure that this requirement is met all the way from power generation to distribution, the Siemens Power Control concept integrates modular functions for load management, generator control, and power monitoring as well as for monitoring and control.

In this concept, four functions define effective system transparency:

- Overview of all events, conditions, and measured quantities from the power distribution system at a glance
- Stable networks through fast load-shedding of prioritized consumers
- Efficient power generation by means of load-dependent, open- and closed-loop control of generators
- Sustainable reduction of energy costs through intelligent prevention of consumption peaks
Main Motors and Drives Contractor
As part of our complete supply and as one of the leading partners of the oil and gas industry for drive solutions, including variable-frequency drives for compressors and pumps, Siemens offers a Main Motors and Drives Contractor (MMDC) solution concept. It is based on our unprecedented and comprehensive range of motors, variable-frequency drives, gear units, couplings, and control systems combined with our unique power-train expertise for the optimal integration with compressors and pumps.

Mechanical drive gas turbines
Siemens gas turbines are proven units for mechanical drive applications and offer outstanding reliability, efficiency, and maintainability. Due to their high fuel flexibility and great power-to-weight ratio, they are widely used in the oil and gas industry. For example, the ability of the Siemens SGT-500 gas turbine to operate on crude oil fuels, including heavy crude oil, offers a reliable, compact, lightweight solution for power generation and mechanical drive applications at heavy oilfields where there is insufficient associated gas available.

Drives for compressors and pumps
Siemens is one of the leading partners of the oil and gas industry for drive solutions. It offers a comprehensive portfolio of mechanical and electric drives and the requisite couplings, gearboxes, converters, and control systems. Backed by its global engineering capabilities, Siemens offers the solutions concept of a main motors and drives contractor, and assumes responsibility throughout all project phases.

Extensive drive solutions portfolio
- Gas turbines from 7 to 37 MW for offshore mechanical drives
- Full range of steam turbines from 110 kW up
- Motors and electric drives from 100 W to 100 MW
- Services over the complete lifecycle
- Main Motors and Drives Contractor concept
- One contact person throughout all project phases
Process solutions

Siemens offers offshore compression and water systems. Compression solutions manage tasks including reinjection and gas lift to enhance oil recovery, reduce flaring or to provide gas export. Seawater treatment and reinjection systems from Siemens provide another way to enhance oil recovery, while our complete produced-water treatment systems help improve water quality for production use or prior to discharge.

**Gas compression**

Compression and reinjection offers a very attractive solution to compensate for depleting well pressure. In addition to water injection, gas lift and gas reinjection are the methods of choice. Siemens offers a broad portfolio of field-proven compressors driven by gas turbines or electric motors, including the required controls and instrumentation. Our STV-SV barrel-type compressors are deployed to meet gas compression requirements for offshore production. In addition, our sealless compressor provides an updated solution for unmanned or high H₂S environments. Our machinery competence in many industrial applications enables us to offer optimized package solutions for offshore applications. For topside installations, we offer gas turbines and electric motors as drive concepts for compressors. If the gas flow or pressure is expected to change over time during operation, Siemens will design a suitable solution for future flows or process condition changes from the start. As with gas turbine gensets or E-houses, Siemens compressors can be modularized into a complete compression system on a single-lift basis, including process scrubbers, coolers, piping and valves, by our in-house design, engineering and project team.
Produced-water treatment and water-based EOR

Siemens is a synonym for total water management, comprehensively meeting the oil and gas industry’s water treatment needs with a complete range of equipment, process solutions, operations, and maintenance services for produced-water treatment and water treatment for enhanced oil recovery. An all-Siemens installation ensures that the components will work together as a complete system, with consolidated controls and minimized costs.

For fixed and floating applications, Siemens delivers produced-water treatment as well as seawater treatment and injection to enhance recovery from the reservoir. The seawater injection system is provided as an individual packaged system or a complete module that includes Siemens’ ultra-filtration technology, sulfate removal, deaeration, and forwarding as well as injection pumps. Feasibility studies can be performed to facilitate the proper design of produced-water treatment or reinjection systems and raw or seawater injection systems – and this can be combined with lab or pilot-scale testing.

The treatment options can include oil/water separation, clarification, filtration, softening, ultrafiltration, membrane sulfate removal and desalination. Whether the requirements are for a single process unit or a complete process plant, Siemens can address water treatment challenges including water/steam flood, flowback and produced-water treatment for discharge or reuse/recycle. We also offer RO services, all of which contribute to greater economic efficiency and profitability of upstream processes.
Seawater injection
Injection of seawater or reinjection of produced water increases the recoverable reserves from oil and gas reservoirs. Whatever your injection or reinjection needs, Siemens has the experience and technologies to meet your water-quality requirements, enhance oil production, and protect your reservoir.

Produced-water treatment
Siemens’ product portfolio includes a complete range of solutions for cleaning produced water for discharge overboard or reinjection into the reservoir. Produced-water treatment is commonly divided into three optional steps.

Primary produced-water treatment is required in order to remove sand and separate oil and water. Siemens’ liquid/liquid hydrocyclones are field-proven for efficient, optimized de-oiling of produced water. For sand cleaning, Siemens’ solid/liquid hydrocyclones remove solids down to five microns. All Siemens hydrocyclones are offered in a variety of sizes and materials.

Secondary produced-water treatment is performed with compact dissolved-gas flotation or induced-gas floatation in various configurations. The vertical or horizontal dissolved-gas flotation units offer increased treatment efficiency and reduced float volume compared to induced-gas floatation.

Tertiary produced-water treatment is performed with walnut-shell filters, media filters, adsorption filters, or other compact cartridge filters.
Integrated modular designs – for minimized on-site downtime

Plug-and-play solutions from a single source

With our solution modules, customers profit from our experienced in-house team for complete design, engineering, and project execution – from concept study through construction, mechanical completion, commissioning, testing and load out. In addition, we offer maximum yard flexibility, with key yards under Siemens’ control or one of several partner yards in key locations around the world and typical module weights ranging from 400 to 1,500 tons.

In addition, we accept complete responsibility for a lump-sum price and/or a specified delivery date for our solution module offering. Dedicated modules from a single source are available for:

- FPSO conversions
- Newly-built fixed or floating applications
- Brownfield extensions and upgrades

*Power module*  
*Seawater treatment module*  
*Compression module*  
*E-house*
Designed to ensure full interoperability on the business and operational levels, visibility for fast decision-making and complete integration of all operations, Siemens automation solutions seamlessly integrate all automation levels on each offshore facility. The systems deliver comprehensive and dependable real-time and historic operations intelligence.

Leading offshore automation solutions
Siemens is a worldwide leader in the field of automation systems. The product and solution portfolio covers all key applications for offshore production requirements.

These include:
- Process automation
- Information management
- Power management
- Marine system control
- Emergency shutdown and safety
- Telecommunications integration
- Integrated operations
- Electrical integration

Automation systems
The safety, reliability and availability of all systems on board are key concerns for owners and operators. Automation systems play a major role, and with its world-renowned automation products and systems Siemens is the right partner to meet your most exacting requirements. With our integrated automation solutions, you can design, install, commission, operate, and maintain your assets throughout their entire lifecycle, from concept through operations. We cover all systems in offshore environments from process to safety to marine systems.
The leading Simatic PCS 7 control system consistently delivers powerful state-of-the-art technologies and internationally established standards. As an open system, Simatic PCS 7 covers all levels and applies equally to automation systems, process I/O and field devices, operator and engineering systems, and communications networks. Siemens acts as the main automation provider for all field developments.

The results:
- Transparent processes and real-time enterprise
- Maximized plant availability and safety
- Optimized operating efficiency and increased production
- Common automation platform over multiple assets

**Integrated operations**
Optimized operation of an fired or floating production is increasingly being undertaken using automation systems that enable online collaboration between suppliers, operators and end users. Advanced information and communications technology as well as appropriate IT tools make this possible. Siemens provides the appropriate software and competent support in addition to complete integrated operations-ready automation systems. Integrated operations creates greater transparency, helps produce faster decisions and contributes to higher productivity. Most importantly, integrated operations plays a strong role in improving offshore safety through better planning of offshore tasks, remotely located expert assistance, and a consequent reduction in offshore staffing.

**Plant lifecycle management with COMOS**
COMOS is a Siemens-owned system used by a number of major oil companies and EPCs. It enables a real-time information exchange between all project stakeholders (suppliers, consultants, EPCs, and end users), ensuring that all parties involved have access to the same up-to-date information. This single system is used seamlessly in all stages of the life of a project, from the concept phase through operation.

**Complete EIT solutions from Siemens – with reduced risk**
Combining the complete electrical, automation (sometimes referred to as the integrated control and safety system) and telecom under a single contract has a number of advantages:
- Reduced risk in the EPC phase with clear responsibility on one provider for the entire system
- Commonality of systems throughout the electrical, automation and telecoms scope
- A single design philosophy
- Application of common standards and correct regulations to the entire system assured
- Inclusion of the latest cyber-security requirements

In addition, the ability to integrate process, safety, power management, and vessel automation with interfaces that are integrated operations-ready helps improve uptime and safety through optimized planning of offshore activity, resulting in a reduction in costs and the required number of offshore staff. Siemens is an experienced provider of completely integrated EIT system for a number of key customers.
Safe maneuvering and stability is realized with specialized marine systems from Siemens.

**Dynamic positioning**

Siemens offers dynamic positioning systems that keep the floating production vessel within a tolerable range of movement using thrusters and an intelligent control system. Satellite information is used to determine the FPSO’s position combined with wind, weather, and other conditions. Accurate positioning is achieved through intelligent control of the thruster drives.

The propulsion drives are based on many proven references in the drilling sector and provide a safe and cost-efficient solution. They are selected from a range of standard offshore low-voltage drives from 75 to 4,400 kW, and ensure a high degree of standardization resulting in minimized maintenance costs.
Variable-speed drives for thruster systems
The BlueDrive propulsion system comprises AC drives with BlueDrive converters and special control and monitoring modules designed to satisfy the special needs of marine operations. They are delivered as separate drives to each motor, or as a multidrive system supplying two or more propulsion motors.

Marine control system
The powerful and reliable control systems from Siemens assume all alarm, monitoring, and control functions. Special strengths include their scalability and ability to process a large number of measuring points. The system communicates with other automation systems on board, and enables the integration of complex systems such as propulsion control and power management.

Siemens’ solutions employ proven, standard industrial components that are especially suitable for rugged environments – like Siemens Simatic controls – that ensure the highest level of operational reliability.

The HMI gives a quick and comprehensive overview of all processes on board under all possible operating conditions. The status of the measuring points and the real-time parameters of all processes are presented in an easy-to-view format by the system.

BlueDrive propulsion
- Designed for the special needs of marine operations
- Single drives from 800 kW up to 4,400 kW
- Based on field-proven, standardized Sinamics variable-frequency drive program
- BlueDrive converters with special control and monitoring modules
- Freshwater cooling for water temperatures up to 38° Celsius
Siemens is a reliable partner to the oil and gas industry and provides optimized services for the entire lifecycle of our products and solutions. To us, service is more than just modernizations and upgrades.

Lifecyle management: operations and support

Your equipment can only contribute to your bottom line when it is fully available and accessible to you. A solid Siemens concept of lifecycle management provides you with both equipment access and uptime.

Siemens offers solutions for the entire lifecycle – with the Siemens Lifecycle Management concept, we help our customers maintain the robustness of their equipment and adapt to the latest and ever-evolving technology developments.

Siemens’ services cover the spectrum, from basic service and spare-part concepts, modernizations, and upgrades to cyber-security concepts and advanced process control and loop tuning assistance. This spectrum of services can be offered in an integrated operations concept fully aligned with our customers’ operations, including remote control rooms and online collaboration.

Our capabilities, tools, and experience help ensure rapid, configurable, and auditable transitions from the concept stage to the EPC stage and then smoothly into operations. Our early involvement in the concept phase results in the best possible technical solutions and helps limit project risks. For example, COMOS – Siemens’ leading software tool for integrated lifecycle engineering – is implemented in the early project stages.
Customer support
Siemens enjoys an excellent reputation as a supplier of high-quality products, systems and solutions. Our technical reputation is firmly supported by Siemens Life Cycle Management with a best-in-class global customer support structure, with local support offices as well as remote services. This ensures a fully-fledged and qualified support even at the most remote location. Service Agreements with Siemens ensures availability of competent services 24/7 within a global set up.

Integrated Operations
Our broad service portfolio contributes to high customer satisfaction and ensures maximum productivity in their operations. Siemens can deliver a full integrated operations concept including technical infrastructure, people and processes. This scalable concept is adapted to fit our customers’ operations philosophies and needs.

Remote monitoring services
Siemens Global Service and Diagnostic Centers for continuous online performance monitoring and remote maintenance is an important factor for keeping your OPEX down and your equipment accessibility up. This allows us to develop condition monitoring-based maintenance strategies, which reduces downtime and ensures the highest possible performance.

Hands-on training and building local expertise
Building skills is essential for the effective use of new systems and in training of local staff for the long term benefit of the countries where our solution and products are in operation. Every contract offers comprehensive training of customer staff. In many cases, this includes training on real life simulators. Siemens offer tailor made training courses or standard equipment training either at Siemens premises, on site, or elsewhere to fit our customers’ needs.

Lifecycle services
- Services along the entire lifecycle
- Green- and brownfield projects
- Integrated operations
- 24/7 maintenance
- Advanced process control
- IT security concepts