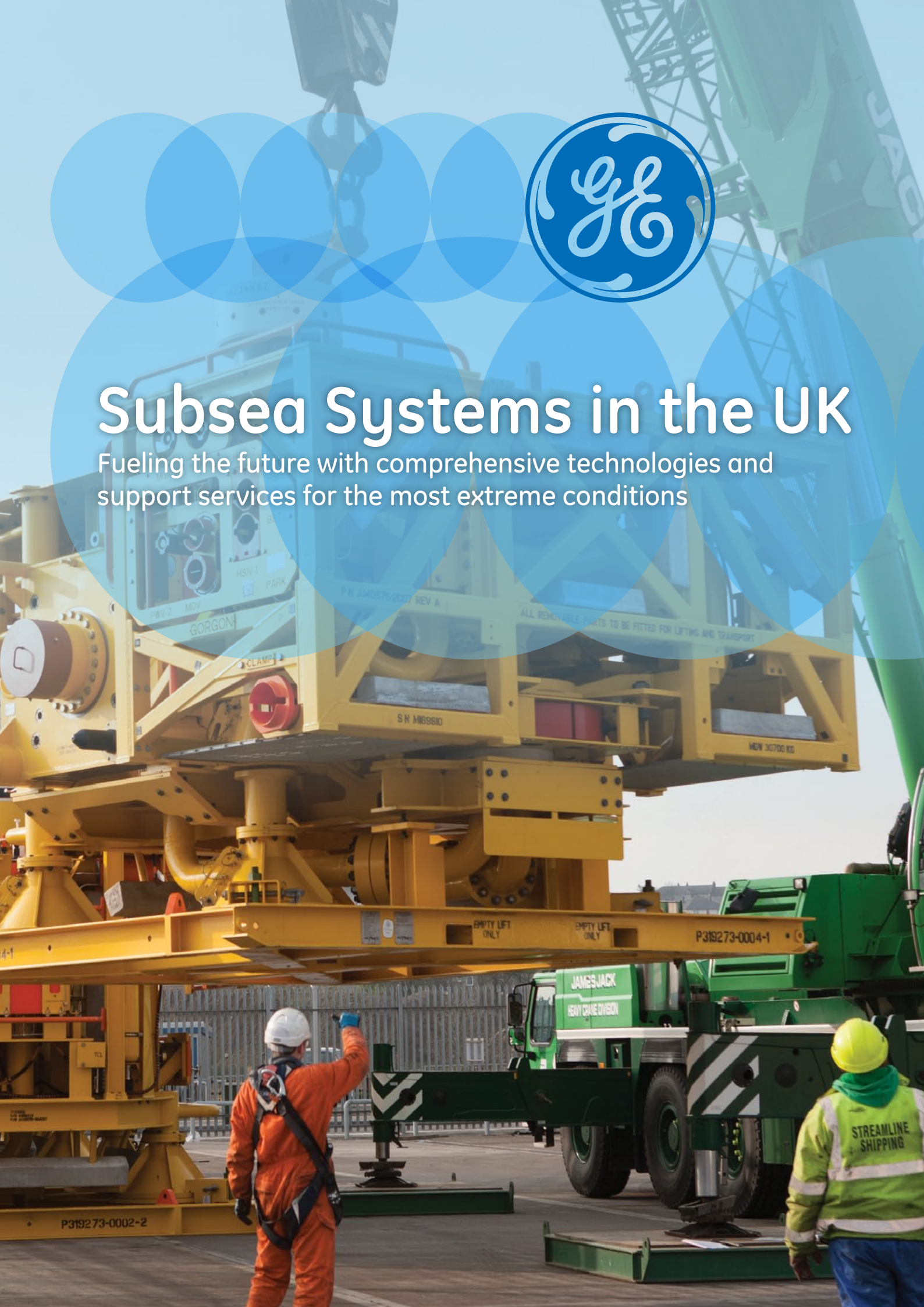
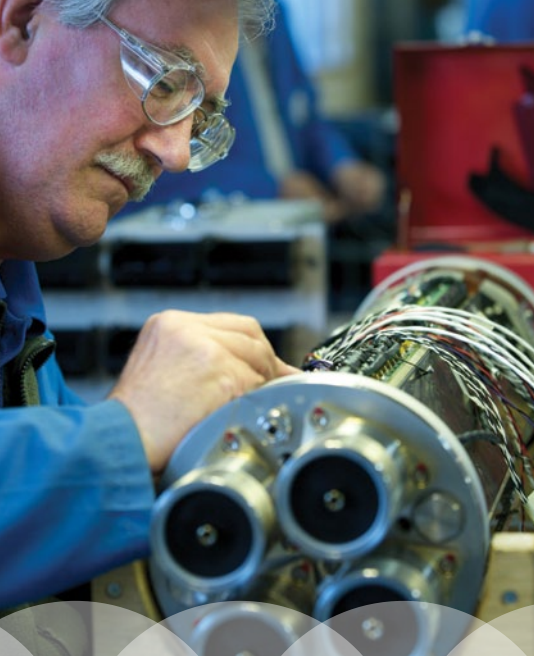




Subsea Systems in the UK

Fueling the future with comprehensive technologies and support services for the most extreme conditions





Fueling the future with subsea systems

Technology

GE Oil & Gas is a world leader in advanced technologies and services with 43,000 employees in more than 100 countries. We work closely with customers across the industry's entire value chain – planning and developing solutions that respond to their real operating needs. In collaboration, we address today's toughest challenges, push the boundaries of technology and fuel the future.

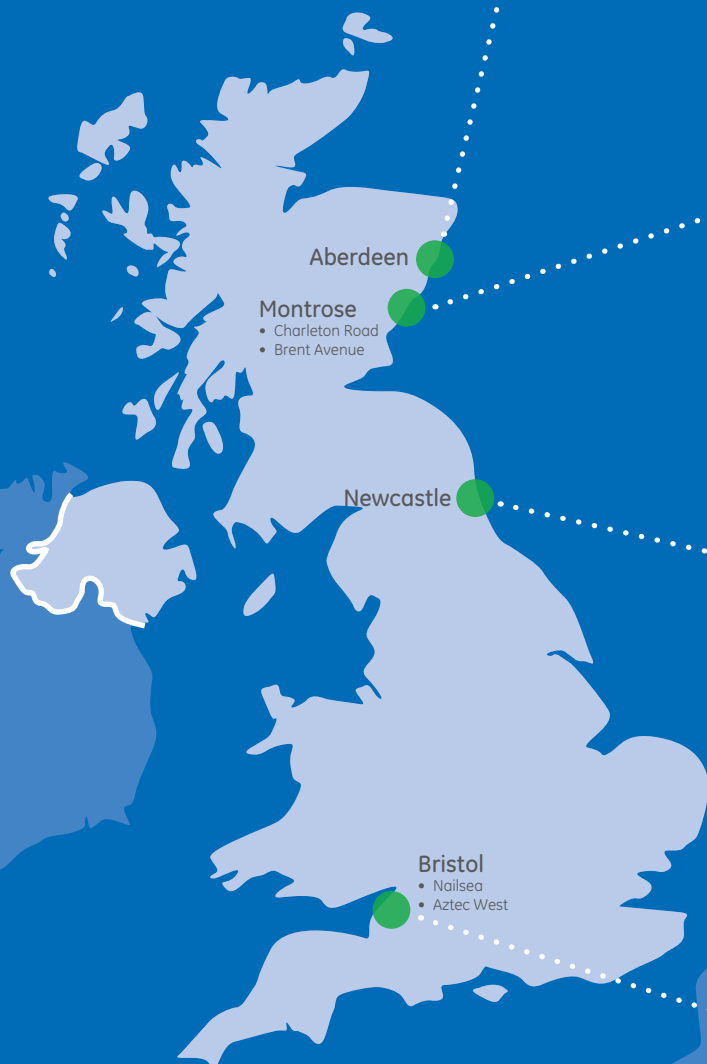
We invest significant research and development resources every year and maintain Centers of Excellence (COE) around the world, each dedicated to delivering the highest quality for its particular technology area.

These widespread oil and gas specific resources have the unique advantage of drawing on GE's strengths in other key transferable-technology areas like aviation, energy and healthcare. We cast a much wider net than most for identifying and applying solutions to improve performance in subsea applications.

Talent

We cast a similarly wide net for innovative thinkers. In addition to recruiting top graduates in every region where we do business, we also have programs focused on closing the demographic 'talent gap' that the oil and gas industry is currently facing. By attracting trained and experienced engineers and managers from other high-tech industries, and tailoring training to their already advanced levels, their new perspectives and approaches to problem-solving bring tremendous value to all aspects of our business.

Because of these unparalleled training and career development programs, as well as the high integrity through all other aspects of the way we work, GE Oil & Gas is recognized as an employer of choice around the world and, in particular, in the exciting and challenging subsea sector.



Aberdeen

Montrose

- Charleton Road
- Brent Avenue

Newcastle

Bristol

- Nailsea
- Aztec West

Subsea excellence for the world

Our UK operations play a crucial role in GE's forward-reaching strategy for subsea technologies, with four Centers of Excellence serving the worldwide subsea industry.

The Aberdeen COE is continually pushing depth and distance boundaries through advanced engineering for all three lines of GE subsea trees.

Our Bristol COE focuses on subsea control systems, most notably our SemStar5 subsea electronics module and ModPod designs.

The Montrose COE specializes in master value block (MVB) components and subsea connector parts.

Finally, our Newcastle COE is the global headquarters for design and manufacturing of all our Wellstream flexible pipe technologies.

Aberdeen

This state-of-the-art manufacturing facility is our Center of Excellence for Subsea Systems and the primary location for design, assembly, testing and integration of industry-leading subsea equipment.

We manufacture, fabricate and test the complete line of VetcoGray equipment. In-house technical support includes quality assurance, engineering, manufacturing, planning, procurement and logistics.

Aberdeen is also a key research and development center, focused on helping operators meet the most complex challenges, today and in the future. Our technical experts are responsible for many of the incredible advances in subsea applications over the past 20 years.

Footprint

Area	m ² (ft ²)
Total site	37,310 (401,630)
Covered space	10,390 (111,750)
Office	2,917 (31,400)
Warehouse storage	929 (10,000)
Maintenance shop	153.3 (1,650)
Test & assembly #1	2,044 (22,000)
Test & assembly #2	1,700 (18,300)
General yard area	26,940 (290,000)

Key technologies

- Subsea trees and production systems
- Subsea chokes and valves
- Rental of subsea systems equipment and tools

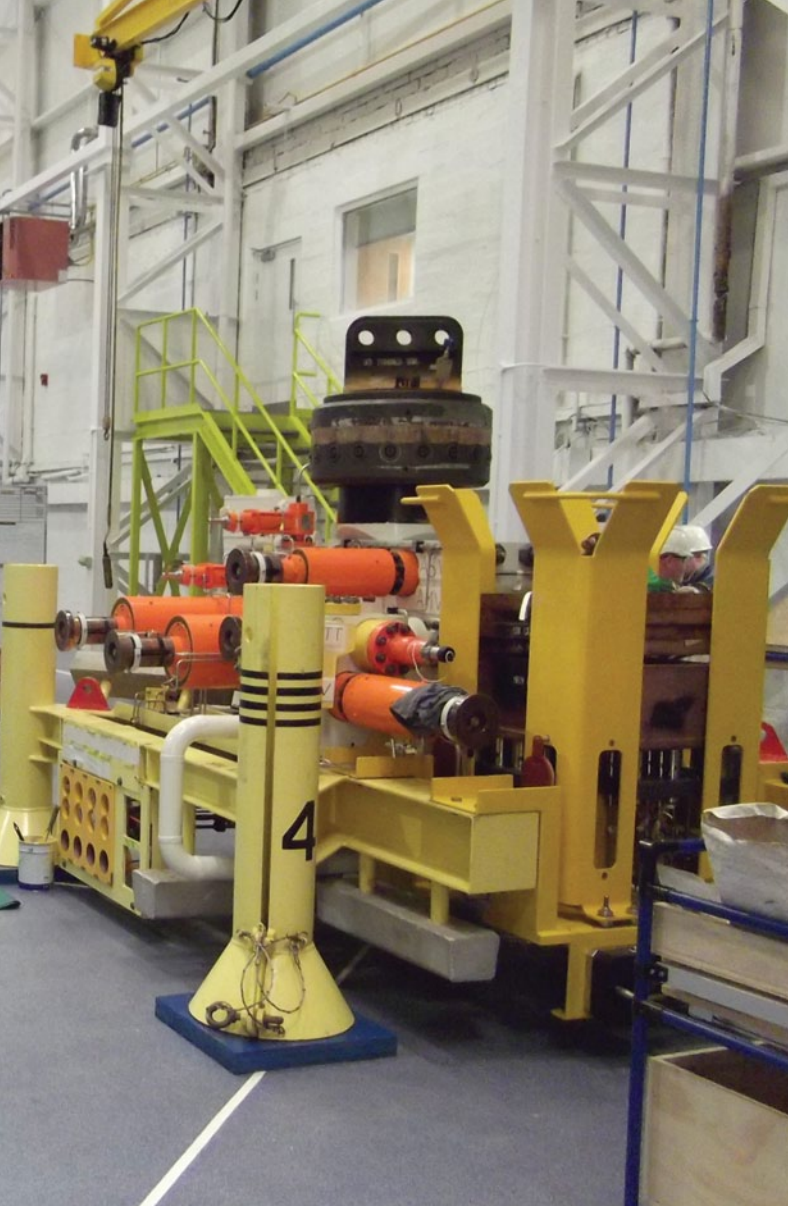
Significant assets

- Welding/cladding equipment
- Heavy lift overhead cranes

Testing

- Advanced test and assembly facility incorporating test pits and high pressure test bays
- Fully-equipped laboratory facility



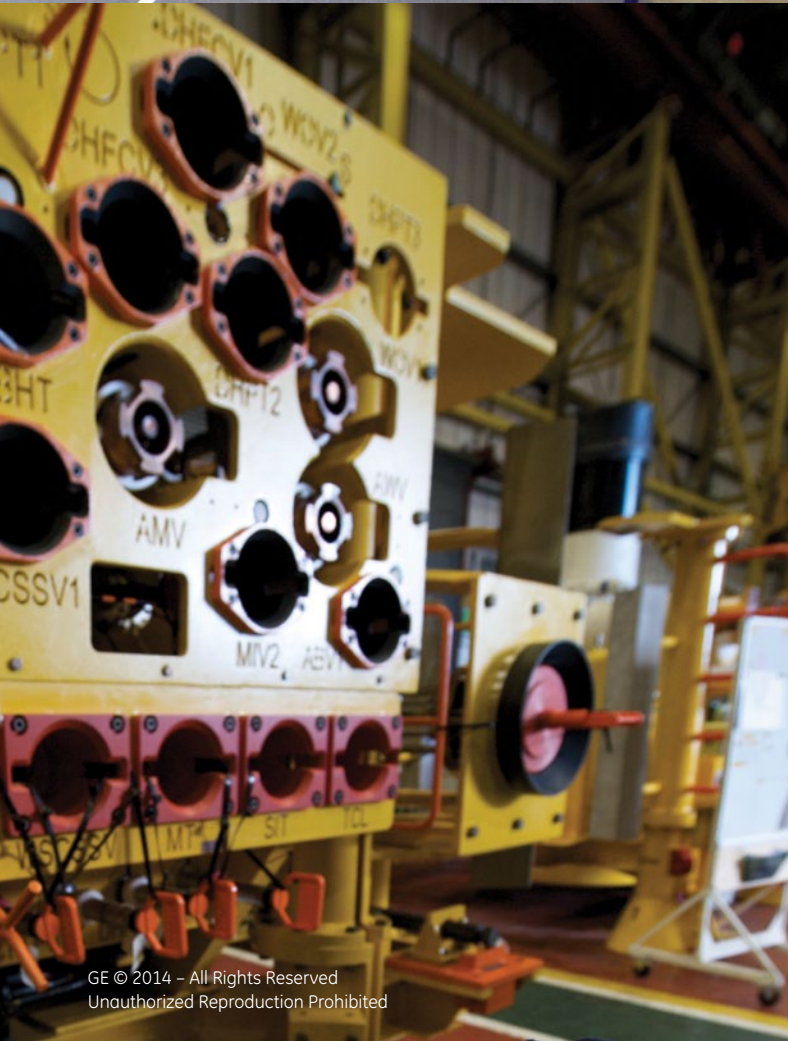


TECHNOLOGY SPOTLIGHT:

Deepwater tree systems

Since 1961, we have installed 1,400 tree systems operating in all water depths across every major production basin in the world. Our field-proven designs include a standard foundation for each tree series, to which pre-engineered modular components are configured to best meet specific project needs.

Our VetcoGray D-Series deepwater tree systems come in horizontal and vertical orientations, are optimized for flow assurance and qualified for up to 1,035 bar (15,000 psi) and 3,000 m (10,000 ft). The highly reliable DHXT horizontal tree offers lowest installed cost through minimized rig and ROV operations. It includes the field-proven, integral VetcoGray 'ModPod' control module powered by the award-winning SemStar5™ subsea electronics system. Highly flexible and configurable for water, gas or alternating injection, DHXT systems are available for standard, enhanced and gas-lift production with a full-bore drill-through option for each.



Bristol

Naisea

Established over 35 years ago, our Naisea facility continues providing leading-edge design, manufacturing and testing of subsea production control systems – including concept definition and FEED studies. This is the primary location for project management, engineering, procurement, and R&D activities for our Subsea Controls projects worldwide. The team also designs smart applications for remote monitoring, diagnostics and flow integrity control of subsea facilities.

Footprint

Area	m ² (ft ²)
Total Site	5 acres
Offices	13,000 (139,900)
Workshops	13,500 (145,300)
Yard	16,398 (176,500)
Assembly & Integration	2,896 (31,170) & Test (AIT)
SIT Area	2,896 (31,170)
Electrical Assembly	1,646 (17,720)
MCS Assembly	76 (818)
ESS	549 (5,909)

Significant assets

- Proof pressure bay for SCMs
- 2 Fixed stands for flushing and 4 for SCM testing
- 5 Environmental stress screening (ESS) chambers
- Hyperbaric chamber (270-bar)
- P-SPIICE and Hypac design stations for analysis
- Clean room (Assembly SCMs, DCVs, HPIs)

Aztec West

This recently expanded facility is our Center of Excellence for Engineering, Procurement & Construction – a major hub for all our subsea installation and intervention activities around the world. The local team includes some of our most experienced project managers, application engineers and logistics experts, and is involved at all stages of the subsea field lifecycle – from FEED studies and system design, to installation, service, expansion and intervention.

Footprint

Area	m ² (ft ²)
Subsea Systems	2,444 (26,307)
GE Capital	1,846 (19,875)





TECHNOLOGY SPOTLIGHT:

VetcoGray SemStar5™

Our fifth-generation subsea electronics module draws on field-proven technologies and over 30 years of subsea experience. Ruggedized to exceed ISO 13628-6 2006 requirements, the radical new design optimizes flexibility, durability, reliability and obsolescence mitigation. It's been critically acclaimed by industry leaders and media alike, including receipt of an OTC Spotlight on New Technology Award.

With ambitious expansion plans for the Tordis and Vigdis fields in the North Sea, Statoil became the first company in the world to use SemStar5. Although the fields have produced over 629 million barrels of oil – roughly 300 million more than expected – this upgrade will enable nearly 400 million more barrels in the next 15 years.

A total of 27 wells were upgraded including subsea control module retrofits, installation of a new electrical distribution system, and replacement of topside control systems. The field was greatly simplified by eliminating many of the original multiple-vendor control modules and using SemStar5 instead. The module enables complete operation from shore, including real-time monitoring and diagnostics of all seabed equipment. It also enhances safety and productivity with advanced sand-monitoring and leak-detection capabilities, and has the flexibility to integrate more features in the future.

Aside from being the first SemStar5 installation, it was also the first major brownfield subsea controls upgrade in the world.



Montrose



Charleton Road

This state-of-the-art facility was designed for flexible capacity and high efficiency to provide enhanced customer support through the entire product lifecycle. We manufacture, fabricate, repair, maintain and test the complete line of VetcoGray equipment. We also have extensive warehousing and storage facilities as well as full rental tool service capabilities. In-house technical support includes quality assurance, engineering, manufacturing and logistics.

Footprint

Area	m ² (ft ²)
Total site	51,000 (549,000)
Yard storage	35,571 (382,900)
Manufacturing & maintenance	8,121 (87,410)
Test & assembly	1,830 (19,700)

Test & assembly

- Fully serviced test bays with electronic recording for MWP and function testing
- 75-ton crane with 20-ton auxiliary hook high bay capable of performing full system stack-up
- Two 10-ton overhead cranes that run the full length of the test and assembly cell
- 20-ft deep test pit with full flooding capability for gas testing subsea trees
- Pressure testing capabilities to 22,500 psi

Fabrication

- Two 15-ton cranes that run the full length of the fabrication cell and that can be linked for tandem lifting
- Full roll-through line capability for tubular fabrication
- Manipulator and roller facilities
- Wide range of advanced welding capabilities including MIG, TIG and sub-arc
- Cladding and heat-treatment equipment

Machine shop

- Over 8,000 m² floor space
- 10-ton overhead crane capacity
- Phosphate cell
- Fronius 9000 cladding rig
- Hancock 9NC lathe
- Hyundai KIA HS630 machining center
- Hartford PBM 115A borer milling center
- Hancock VTC-160E APC lathe



Key technologies

- Subsea wellheads including HP and LP, SG-5 and MS-700
- Subsea trees, workover systems and running equipment
- Specialty connectors and pipe (16" to 48")
- Capital drilling equipment
- Marine risers, diverters and H-4 connectors
- Surface equipment
- Subsea production equipment
- Production control choke repair
- Production control systems



Brent Avenue

This modern facility is a GE Oil & Gas Center of Excellence for manufacturing, assembly and testing of subsea equipment, with a specialization in master valve block (MVB) components and associated subsea connector parts.

Our manufacturing portfolio spans some of the most impressive subsea developments in the world, including core technologies for the Kizomba Satellite and Gorgon projects.

The plant was established in 2001 and has been continually updated with the latest machining tools, cladding rigs and other sophisticated manufacturing technologies. We are currently increasing our machining and assembly capabilities for the next generation of MVBs and associated equipment.

Footprint

Area	m ² (ft ²)
Total site	3,902 (42,000)
Test pit	88 (947) 11 x 8 x 9 m deep
Storage yard	2,508 (27,000)

Significant assets

- 11 x 8 x 9 m deep gas test pit
- 5 state-of-the-art test bays;
- HS-2 block cell
- Large and medium envelope cells
- 5-axis MillTurn centers
- Fully automatic Inconel cladding systems
- Coordinate measuring machine
- Tacchi heavy-duty horizontal lathe
- Soraluze horizontal borer

Newcastle



Newcastle is the global Centre of Excellence for custom engineering design, manufacturing and testing of all GE's Wellstream flexible pipe products for subsea oil and gas production. This state-of-the-art facility is strategically located for its deepwater access and heavy lift load-out capability to enable global shipping. Wellstream products can be found in every major offshore production basin worldwide.

Wellstream flexible pipes are exponentially lighter and more adaptable to harsh sea conditions than rigid steel pipes, often the preferred solution due to the varied installation offerings available. Our portfolio draws on more than 20 years of research and development, material science and installation experience in some of the harshest conditions the industry has to offer – particularly where water depth and seabed conditions impose unusual restrictions.

Footprint

Area	m ² (ft ²)
Total site	64,592 (695,200)

Engineering & manufacturing

Our systems are currently operating in depths well beyond 2,000 m and are being qualified up to 3,000 m, our products offer proven reliability, structural robustness and corrosion resistance from both the external marine environment and internal pressures. Every Wellstream product is customized to meet the specific requirements of each project.

Our facility is designed for sequential manufacturing to deliver the most efficient material usage and workflow. Our annual manufacturing capacity is currently 300 km of 8-inch normalized pipe, with a product range from 2-inch ID to 24-inch OD.

Testing & lifecycle optimization

Newcastle also has comprehensive testing capabilities including prototype testing, qualification procedures for new flexible pipe materials and structures, and a full range of monitoring and inspection services.

Using specialized magnetic technologies, we can deliver a detailed description of the service history, future performance and remaining service life of flexible pipeline structures. Key benefits include reduced operational, safety and environmental risk, as well as extended asset service life and cost optimization.

Key technologies

- **Risers** – dynamic lines suspended in the water column, connecting production facilities to subsea infrastructure
- **Flowlines** – static pipelines that carry fluids along the seabed
- **Fluid transfer lines** – typically large diameter pipelines connecting two structures which are often dynamic
- **Jumpers** – short pipes connecting static structures either above or below water



TECHNOLOGY SPOTLIGHT:

Wellstream flexible pipes

Wellstream's unbonded dynamic flexible risers, static flowlines, fluid transfer lines and jumpers ensure maximum versatility when connecting subsea structures and surface production units. Our designs comprise the helical application of metallic wires and tapes, along with extruded thermoplastics to form a flexible pipe structure that can address field-specific pressure, temperature, water depth and fluid characteristics.

Our products are ideal for new field developments that are of continually higher complexity as well as mature fields being upgraded for much-needed increased recovery rates.

The Troll offshore development is one of the world's largest offshore gas discoveries, with an estimated production life of over 50 years. In 1996, Wellstream products were incorporated as to help exploit the highly fragmented reserves via Troll B and C. Over six years, we supplied large-diameter flowline and riser products to support the subsea system tying clusters of wells back to the FPU's via central manifolds.

Our project scope of supply includes:

- 220 km of 8/10-inch production flowlines
- 17 km of 10-inch dynamic production risers
- 2 km of 15-inch dynamic export risers & jumpers
- 10 km of dynamic service umbilicals (hydraulic/electric/optics/dosing/methanol)
- 3.5 km of 4 & 6 hose gas-lift umbilicals (gas/methanol)

GE Oil & Gas

Global Headquarters

Via Felice Matteucci, 2
50127 Florence, Italy
T +39 055 423 211
F +39 055 423 2800
customer.service.center@ge.com
Nuovo Pignone S.p.A.
Nuovo Pignone S.r.l.

Aberdeen

Broadfold Road
Bridge of Don Industrial Estate
Aberdeen, Scotland AB23 8EY
T +44 1224 852 000
F +44 1224 852 434

Bristol, Aztec West

2630 The Quadrant
Aztec West
Bristol, England BS32 4GQ
T +44 (0) 870 241 8899

Bristol, Nailsea

2 High Street
Nailsea
Bristol, England BS48 1BS
T +44 1275 810100
F +44 1275 851467

Montrose, Brent Avenue

Forties Industrial Estate, Brent Avenue
Montrose, Scotland DD10 9PB
T +44 1674 643000
F +44 1674 643020

Montrose, Charleton Road

Charleton Road
Montrose, Scotland DD10 9EB
T +44 1674 643111
F +44 1674 643127

Newcastle

Wellstream House, Wincomblee Road
Walker Riverside
Newcastle upon Tyne, England NE6 3PF
T +44 1224 852 000
F +44 1224 852 434

For complete contact information,
please refer to our website.

geoilandgas.com

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