

Oil & Gas Decommissioning Scottish Capability



DECOMMISSIONING: PLANNING. PIONEERING. SCOTLAND.

This capability statement demonstrates Scotland's geographic and technical strengths in oil and gas decommissioning. It provides examples of companies active in the sector including those pioneering new technologies and approaches in Scotland to meet decommissioning challenges. It highlights the current investment in onshore infrastructure and provides information on support available to companies for research and innovation and more broadly across the sector.



DECOMMISSIONING: CHALLENGE AND OPPORTUNITY

The UK Continental Shelf (UKCS) has been successfully producing oil and gas since 1970. As there is still an estimated 10-20 billion barrels remaining, 'Maximising Economic Recovery' remains our primary objective.

At the same time, the region is a mature basin with many assets or fields nearing the end of their economic life. Once production has ceased the next natural step is to decommission the infrastructure and with activity forecast to take place on 214 fields on the UKCS from 2017 to 2025 (1), the region is the first in the world to decommission at scale in deep waters.

The challenges this presents includes how to safely plug and abandon thousands of oil and gas wells and remove the massive structures in the North Sea that were designed for structural integrity, not ease of removal.

Oil and gas operators spend many years preparing and planning these activities to ensure their assets are decommissioned safely and in compliance with regulations. They also need to deliver decommissioning projects efficiently and cost effectively.

In the UKCS, £470m was spent decommissioning oil and gas infrastructure in 2013, growing to £1.1bn in 2015 and £1.2bn in 2016 (2). Expenditure is forecast to remain consistent at £1.2-2bn over the next five years, with cumulative values from 2017 to 2025 of £17 billion (1).

In June 2017, the Oil & Gas Authority (OGA) produced cost estimates for decommissioning all UKCS infrastructure, taking into account a wide range of uncertainties. The outcome was a cost range of £44.5bn to £82.7bn. The minimum cost reduction target of 35% was applied to the median (P50) figure of £59.7bn, resulting in an industry target to decommission at a cost less than £39bn (3).

Opportunities abound to increase efficiency and reduce costs, for example, Well Plugging & Abandonment represents 49% (1) of estimated expenditure, so this is an area of particular emphasis. Other areas include new solutions and innovative techniques to reduce reliance on heavy lift vessels and improving cutting methods, particularly for large diameter and subsea application.

Decommissioning provides opportunities to deliver solutions in partnership. Our supply chain companies are forming strategic alliances to offer integrated solutions. Our ports and onshore yards are developing their infrastructure and capability to provide integrated services to handle decommissioned materials.

Innovation is crucial. Scottish expertise has delivered innovative solutions for the oil and gas industry for decades. The future is no different. We are at the forefront, planning and developing expertise to deliver safe and cost-efficient decommissioning.



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SCOTLAND: LEADING THE WAY

After half a century of prosperous exploration and production in our waters, Scottish companies have been in the oil and gas industry for longer than most. They have overcome some of the most challenging conditions in the world. The deep and turbulent waters of the North Sea is a harsh environment for extraction which presents hazardous conditions.

Our success is due to an unerring focus on safety, reliability and efficiency. Our companies continually test and refine their technologies and processes to maintain success and constantly strive to be at the top of their game in an environment that does not leave room for error.

The result: a knowledgeable supply chain and expertise that is trusted all around the world.

As decommissioning requires many of the same skills and expertise as exploration and production, our supply chain is already delivering much of the work. The huge amount of planning undertaken to prepare decommissioning programmes and execute scopes of work has led to a considerable body of knowledge and experience being amassed.

More than 100 companies in the North East of Scotland have already been involved in work to decommission Shell's Brent Field, one of the most significant UK decommissioning

projects to date. Several other operators have also indicated that UK supply chain companies will deliver more than 80% of activity on other decommissioning projects.

Scotland is ideally located to serve the North Sea decommissioning market, with a network of ports sited close to the offshore oil and gas infrastructure, and Aberdeen is a true global oil and gas hub. It hosts dozens of multi-nationals and hundreds of Scottish supply chain companies and is the home of **Decom North Sea**.

The Department for Business, Energy and Industrial Strategy (BEIS) regulates decommissioning in the UK, supported by the Oil and Gas Authority (OGA). Together these organisations provide a strong legislative framework and a clear decommissioning strategy and delivery programme.

The Scottish Government and its economic development agencies, Scottish Enterprise (SE), Highlands and Islands Enterprise (HIE) and Scottish Development International (SDI), provide a range of support to Scottish based companies. We help foster collaborative ventures, both domestic and international, and innovation alongside the Oil & Gas Technology Centre (OGTC), the Oil & Gas Innovation Centre (OGIC) and Scottish universities.

DECOM NORTH SEA

Decom North Sea is the dedicated single topic, multi region membership organisation focused on the oil and gas late life and decommissioning sector. Decom North Sea has grown since its inception in 2010 to over 370 members representing operators, contractors, service specialists and technology developers.

They provide knowledge transfer and facilitate collaborative activities to maximise business opportunities for their members. They have established a **Late Life Planning Portal** (L2P2) (4) to enable regulators, operators and the supply chain to share knowledge to help plan and execute decommissioning projects.



BUILDING AN INTERNATIONAL CENTRE OF EXCELLENCE FOR DECOMMISSIONING

Our aim is to establish Scotland as an international centre of excellence for decommissioning.

The oil and gas supply chain in Scotland has excelled in development, engineering and new technology solutions over 50 years of operations. The application of this expertise shows companies in Scotland have experience and capability across the range of decommissioning related activities.

CAPABILITY EXISTS ACROSS THE SPECTRUM OF ACTIVITY



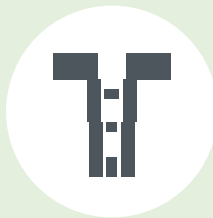
**PROJECT
MANAGEMENT**



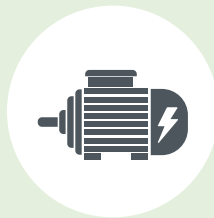
**ENVIRONMENTAL/
SITE STUDIES**



**TECHNICAL/
ENGINEERING STUDIES**



**WELL PLUGGING
& ABANDONMENT**



**FACILITIES
RUNNING**



**CLEANING/
WASTE MANAGEMENT**



**TOPSIDES PREPARATION/
REMOVAL**



**SUBSEA PREPARATION/
REMOVAL**



**PIPELINES/
RISERS/FLEXIBLES**



**PORT
INFRASTRUCTURE**



**ONSHORE
RECYCLING/REUSE**



**VESSELS/
LOGISTICS**



**SITE REMEDIATION/
MONITORING**

The following list provides a snapshot of just some of those companies delivering decommissioning activity and pioneering solutions in Scotland, as well as internationally. Most companies are active across a range of activities but only highlighted once for illustrative purposes.



PROJECT MANAGEMENT

- Aker Solutions
- Babcock International
- Costain
- Lloyds Register
- Rigmar Group
- Petrofac
- Project Development International (Pdi)
- Turner & Townsend



ENVIRONMENTAL / SITE STUDIES

- Aberdeen Radiation Services
- BMT Cordah
- DNV GL
- Fugro
- Intertek
- Ramboll Environ



TECHNICAL / ENGINEERING STUDIES

- Apollo Offshore Engineering
- Atkins
- Axis Energy Projects
- Cadherent
- Infinity Oilfield Services
- Genesis Oil & Gas Consultants
- Xodus Group



WELL PLUGGING AND ABANDONMENT (P&A)

- Archer
- Ardyne
- Aubin
- Baker Hughes
- Coretrax
- Exceed
- Halliburton
- Specialised Oilfield Services
- SPEX Group
- Weatherford
- Well-Safe Solutions
- Zenith Energy



FACILITIES RUNNING

- Aggreko
- Aquaterra Group
- Centurion
- Enermech
- ScanTech Offshore
- Sparrows Group
- Tayside Diesel Engineering



CLEANING / WASTE MANAGEMENT

- Augean North Sea Services
- Centrifuges Un-Limited
- MSIS Group (Stemic)
- NRC (Sureclean)
- NORM Solutions
- Romar International
- Scotoil Services
- STEP Oiltools
- TWMA



TOPSIDES PREPARATION / REMOVAL

- Bilfinger Salamis
- Cape
- Derrick Services (DSL)
- Global Energy Group
- Seaway Heavy Lifting
- Saipem
- Stork
- Wood



PORT INFRASTRUCTURE

- Aberdeen Harbour Board
- Forth Ports
- Kishorn Port Ltd
- Lerwick Port Authority
- Montrose Port Authority
- Peterhead Port Authority
- Port of Cromarty Firth
- Stornoway Port Authority



SUBSEA PREPARATION / REMOVAL

- Aquatic Group
- Canyon Offshore (Helix)
- Coda Octopus
- Cutting Underwater Technology
- Enpro Subsea
- Flowline Specialists
- Kongsberg Maritime Ltd
- Proserv
- ROVOP
- Oceaneering International Services
- Underwater Cutting Solutions
- Utility ROV Services
- Whittaker Engineering



ONSHORE RECYCLING / REUSE / DISPOSAL

- Alba Power
- Control Valve Solutions
- DH Marine
- Hawk Enviro
- John Lawrie Group
- Lerwick Engineering & Fabrication
- Malakoff Engineering
- Ocean Kinetics
- Oilfield Machinery
- Veolia / Peterson



PIPELINES / RISERS / FLEXIBLES

- Flexlife
- Flowline Specialists
- Intermoor
- JEE
- Paradigm Flow Services
- Pipelines 2 Data
- STATS Group



VESSELS / LOGISTICS

- ASCO Group
- Bibby Offshore
- Helix Well Ops
- Peterson
- NorSea Group (UK)
- Subsea 7
- TechnipFMC



SITE REMEDIATION / MONITORING

- James Fisher Offshore
- Teledyne Marine

A selection of company case studies follows to demonstrate the depth and breadth of decommissioning experience both offshore and onshore.

BIBBY OFFSHORE: Strategic Partnership for Category 1 and 2 Well Abandonment

For more than a decade, Bibby Offshore, as part of their extensive integrated service delivery, has supported clients across the basin with varied and complex decommissioning projects. They have built on this decommissioning experience to extend their service offering into plugging and abandonment for category 1 and 2 wells.

The plugging and abandonment of the reservoir can be the most technically challenging and expensive stage in the decommissioning programme, mainly due to the risk, procedures and assets required. Traditionally the industry has relied on costly and complex mobile offshore drilling units (MODU) or Light Well Intervention Vessels (LWIV) to support category 1 or 2 well abandonment. Bibby Offshore has built a strategic partnership combining Baker Hughes' Well Abandonment Straddle Packer 'WASP' tool and the Proserv Multi-String Cutting Tool. This solution safely reduces costs, increases effectiveness and improves economies of scale.



BIBBY 
OFFSHORE
because we love this business™

CENTRIFUGES UN-LIMITED: Wellbore Cleaning

Centrifuge's mechanical separation division specialises in dealing with all varieties of oily waste and slop encountered during plug and abandonment or decommissioning. The company is experienced in oily water separation, diesel fuel cleaning, rig drains treatment, well testing activities and well completions.

Centrifuges have worked on well decommissioning with a number of major North Sea Operators. During plugging and abandonment and decommissioning, wellbores need to be cleaned before wellhead casing can be cut and removed. Brine is circulated around the wellbore casing to remove any drilling fluids or slop. This is generally contaminated with oil, water and solids and cannot be discharged offshore.

The ELVOS® system cleans slop from the wellbore, removing oil and solids before discharging the clean water to sea in line with regulatory IMO limits (<30 ppm). This provides an offshore treatment alternative to shipping this waste back to shore. ELVOS also cleans the brine for further use on the next wellhead, and as it is portable, it can be used on or offshore.




CORETRAX: Innovative Products for Wellbore Abandonment

Coretrax has specialist expertise in wellbore abandonment, developed since 2012 on the IVRR/FFFA campaign for Hess and supporting the abandonment of over 140 wells in the UKCS to date. By understanding the challenges facing operators, Coretrax focuses on designing and manufacturing products to deliver rig time and cost savings.

Coretrax were awarded a contract with a Danish operator in the UKNS in July 2017 to provide abandonment services including bridge plugs, drillable scrapers and wellbore clean up fluids. Prior to contract award, Coretrax demonstrated their ability to save the operator time by running hybrid CX-2 bridge plug and scraper runs, saving up to 14 hours rig time. They also introduced a specialist wellbore clean up fluid with a super high carrying capacity, reducing the volume required and fluid interface, therefore reducing the amount of slops to be treated.

This innovative approach to well abandonment has saved significant rig time with Coretrax delivering over £10m of savings to customers in 2016-17. Coretrax continue to invest in the research and development of new technology to streamline the abandonment process.






EXCEED: Performance Improvement for Well Abandonment

Exceed specialise in delivering well management and well performance improvement solutions for the upstream Oil & Gas industry supporting clients to safely deliver projects that meet their objectives.

The company has been at the forefront of large scale well abandonment operations with its well management division providing well plugging and abandonment engineering services to Fairfield Energy for its Dunlin 45 platform well and Osprey/Merlin 16 subsea well campaigns. Its performance improvement division has provided support offshore to Centrica on the A field abandonments (7 x SNS Subsea wells), Repsol Sinopec on its Beatrice Bravo & Charlie campaign (13 wells) and Maersk on its Janice and Leadon abandonments.

This ongoing portfolio has exposed Exceed to most decommissioning environments which has included 45 Platform wells, 16 Subsea wells from Semi Subs, 14 subsea wells from Jack-ups and 14 wells from NUI platforms using Jack-ups.

Engineering cost and feasibility studies covering several international basins have also been completed including asset transaction due diligence focussing on decommissioning liability.

Being involved in multiple projects in an industry where no two wells are the same, and where most wells were designed without longer term consideration to final well abandonment has provided Exceed with the ability to assess this risk and evolve its well decommissioning service, ensuring maximum efficiency and adequate resource is utilised. It has also enabled Exceed to attain an in-depth understanding of the current field proven and new and emerging technology on offer, review performance and work with suppliers to improve efficiency.





HELIX ENERGY SOLUTIONS: Rigless Well Plugging and Abandonment

Helix Energy Solutions Group operate two business units in Scotland. Helix Well Ops UK Limited – a light well intervention (LWI) provider operating the world’s only integrated LWI/Dive Support Vessels, the Seawell and Well Enhancer; and Canyon Offshore Limited – a robotics and trenching division that own and operate multiple ROV and trenching systems from Helix’s own vessels as well as chartered assets such as the Grand Canyon and Grand Canyon III. Together, Helix provides an end-to-end decommissioning service from before Cessation of Production to final seabed clearance.

In 2015, Helix, One Subsea and Schlumberger formed the **Subsea Services Alliance** to develop technologies and deliver equipment and services to optimize the value chain of subsea well intervention systems. The Alliance combines the expertise and capabilities of the three companies to provide a new offering, integrating marine support with well access equipment and control technologies.

Helix experience in decommissioning includes BP’s Don and North West Hutton fields, Hess’s Ivanhoe and Rob Roy fields, its own asset at Camelot and projects for ConocoPhillips. Scopes involved well intervention, diving, ROV, trenching and pipeline recovery; to recent P&A cementing thru-tubing, avoiding another DSV commitment and only requiring a rig for the final stage of the upper abandonment. Two operators have also recently awarded contracts to Helix to prepare wells for abandonment prior to rig arrival; ‘de-risking’ the rig scope by removing uncertainty and saving time and money by completing much of the rig scopes in advance. Helix expects to add to its fleet with its newest asset, the Q7000, to perform rig scopes to enable full field decommissioning and abandonment.





JOHN LAWRIE: Maximising Reuse and Recycling

John Lawrie is an international group of companies with a presence throughout the UK, and in USA, Canada and Europe. The Group is one of the largest reproprocessors and exporters of scrap metal in Scotland with established quayside dismantling and licensed waste treatment facilities in Aberdeen, Montrose and Invergordon, as well as a recent assets and licensed site acquisition in Shetland They also purchase and supply new and used tubing, casing, drill pipe and related products, dealing with most of the world's major oil and gas operators and service companies.

John Lawrie's decommissioning activity spans two decades, having successfully processed a range of subsea infrastructure including flexible risers and flowlines, umbilicals, protection structures, mooring systems, concrete mattresses, riser bases, coated steel pipework and NORM contaminated spools, sensors and valves. Clients include Premier Oil, Maersk, Centrica, BP and HESS. They have also dismantled and processed a 500-tonne offshore module for Transocean.

Handling, processing and exporting around 200,000 tonnes per annum, the primary objective is to maximise reuse and recycling, and minimise disposal. Their processing methods result in high recovery and recycling rates for a wide range of materials, in most cases up to 100%. Moreover, the company's approach to innovation has resulted in around 40% of materials being sold for reuse. Anchor chains have been used to weigh down subsea pipelines, or cut up and used as weights for fish farm cages and nets. Well tubulars have been cut, repurposed and used in piling, for example, 25km of pipes have been used in the construction of the new Aberdeen Exhibition and Conference Centre.

A recognised industry leader, John Lawrie was awarded the highly coveted Queen's Award for Enterprise in 2006 for sustained growth in international trade and was the winner of the Circular Economy Award at the 2017 VIBES Scottish Environment Business Awards.



PROSERV: An Innovative Approach to Well Severance

Proserv has 40 years' experience in providing bespoke technology solutions and services to remove and recover topsides, subsea infrastructure and wells for the global oil and gas sector.

Proserv recently conducted a well severance campaign in the Gulf of Thailand utilising their Multi-String Cutting Tool (MSC2.0) for conductor-cutting in conjunction with water abrasive cutting technology. This powerful combination is more efficient than conventional mechanical cutting methods and more environmentally friendly than explosives.

The advanced tool is configured to deploy into topside or subsea wells with inner casing sizes of 7" to 20" maximum and will cut through any number of internal grouted (or ungrouted) casing strings out to 42" conductor. The tool can also test and prove the cut without recovering and de-rigging the tool and deployment system.



This single trip deployment into the wellbore minimises the risks associated with multiple runs in one hole.

Once the well-services provider had started plugging the well, Proserv operated 'offline' and began cutting operations simultaneously, off the critical path of the jack-up rig. They successfully severed eight dual bore and three tie-back wells 15ft below the mudline saving the operator crucial time.



RIGMAR GROUP: Project Management and Support for FPU Removal

The Rigmar Group provides support services to clients throughout the asset lifecycle, providing an integrated solution from installation, operational maintenance to decommissioning.

Rigmar Group company, Interocean Marine Services, played a major role in the project management, engineering and marine operations to decommission the Janice Alpha Floating Production Unit (FPU)

and is now engaged in projects involving floating production systems and drilling rigs. Rigmar provides efficiencies and cost-effective proposals to remove and dispose of equipment from the seabed and offshore structures.





SPARROWS GROUP: Mechanical Handling Solutions for Platform Decommissioning

The Sparrows Group, based in Aberdeen, delivers specialist lifting and mechanical handling equipment, technology and integrated engineering services to the global energy industry.

The company provides advice and solutions to ensure the performance, reliability and safety of critical equipment for lifting operations. With over 40 years' experience in operations and maintenance in the North Sea, Sparrows have applied their expertise to decommissioning projects including Brent, Viking, Murchison and Dunlin.

Sparrows also undertook mechanical handling for BP's North West Hutton platform. At the end of the two-year maintenance period the lifting equipment specialists removed the cranes as planned, but the project timeline was subsequently extended by a further two years. Sparrows then supplied BP with a range of mechanical handling solutions to work alongside the heavy lift vessel to provide effective and complementary solutions.





SUBSEA 7: Single Well to Full-field Abandonment

Subsea 7 is a world-leading seabed-to-surface engineering, construction and services contractor to the offshore energy industry, with an active fleet of 31 multi-purpose vessels. Having successfully completed over 20 decommissioning projects – from piece-small to management of complete field removal – their track record provides the ability to identify challenges, and through early engagement, help define solutions for safe, efficient and best value project delivery.

Projects executed include FFFA (Hess), Stamford & Rose (Centrica), Ardmore (Acorn Oil) and Linnhe (Exxon Mobil); and include

safe christmas tree isolation, pipeline degassing, cutting and recovery of rigid and flexible flowlines, risers and mid-water arches, umbilicals, piles, wellheads, protection structures, concrete mattresses and debris.

Subsea 7's wholly owned subsidiary Seaway Heavy Lifting offer synergies that enable them to optimise vessel schedules and minimise interface risks.





WOOD: Decades of Experience

Wood has an unrivalled track record (over 2.5 million man-hours of decommissioning scope in the last decade), an in-depth understanding of the assets on which they operate, and strong strategic alliances which facilitate the provision of complete solutions. They leverage their global strength and expertise from their offshore engineering, operations, maintenance, projects, subsea and duty holder services to provide safe, effective and environmentally responsible solutions which protect their customers' reputation. They support all aspects from strategic planning through to the late life phase of the asset, managing the process of change and optimising the operational and preparatory phases to ensure the most efficient and cost-effective outcome.

In 2017 Shell awarded Wood the topside preparatory scope for the Brent Bravo. This followed the successful completion of a similar scope on the Brent Delta that culminated in the largest offshore

lift ever undertaken. The project team is truly collaborative in its approach with an integrated team aligned on the objective of completing the scope in the safest and most effective way. This reinforces the decommissioning mind-set, removes complexity and supports continuous improvement. Whilst the method of lift has remained, with the Pioneering Spirit also scheduled to remove Bravo's topsides, the learning from Delta has been combined with innovative solutions – the strengthening and lifting point solutions on Bravo will benefit from the insight and experience gained on Delta. Grout will be poured into prefabricated lifting boxes, rather than the traditional complex steel structures normally deployed. This will save time, money and most importantly reduce exposure hours to personnel, providing a safer and more efficient solution.

The Wood logo, consisting of the word "wood." in a bold, lowercase, sans-serif font, enclosed within a thin black rectangular border.



ZENITH ENERGY: Management of Well Plugging and Abandonment

Aberdeen based well management firm Zenith Energy successfully planned and supervised a multi-well subsea abandonment campaign in the Central North Sea for Antrim Energy. They completed the planning, permitting, well examination and supervision of operations for the Canadian based operator. The rigless plug and abandonment campaign included three suspended wells on the Fyne license and one on the Erne license.

Zenith also worked overseas on the permanent abandonment of a production well on the Ombrina Mare Platform for Rockhopper Exploration in the Adriatic Sea.

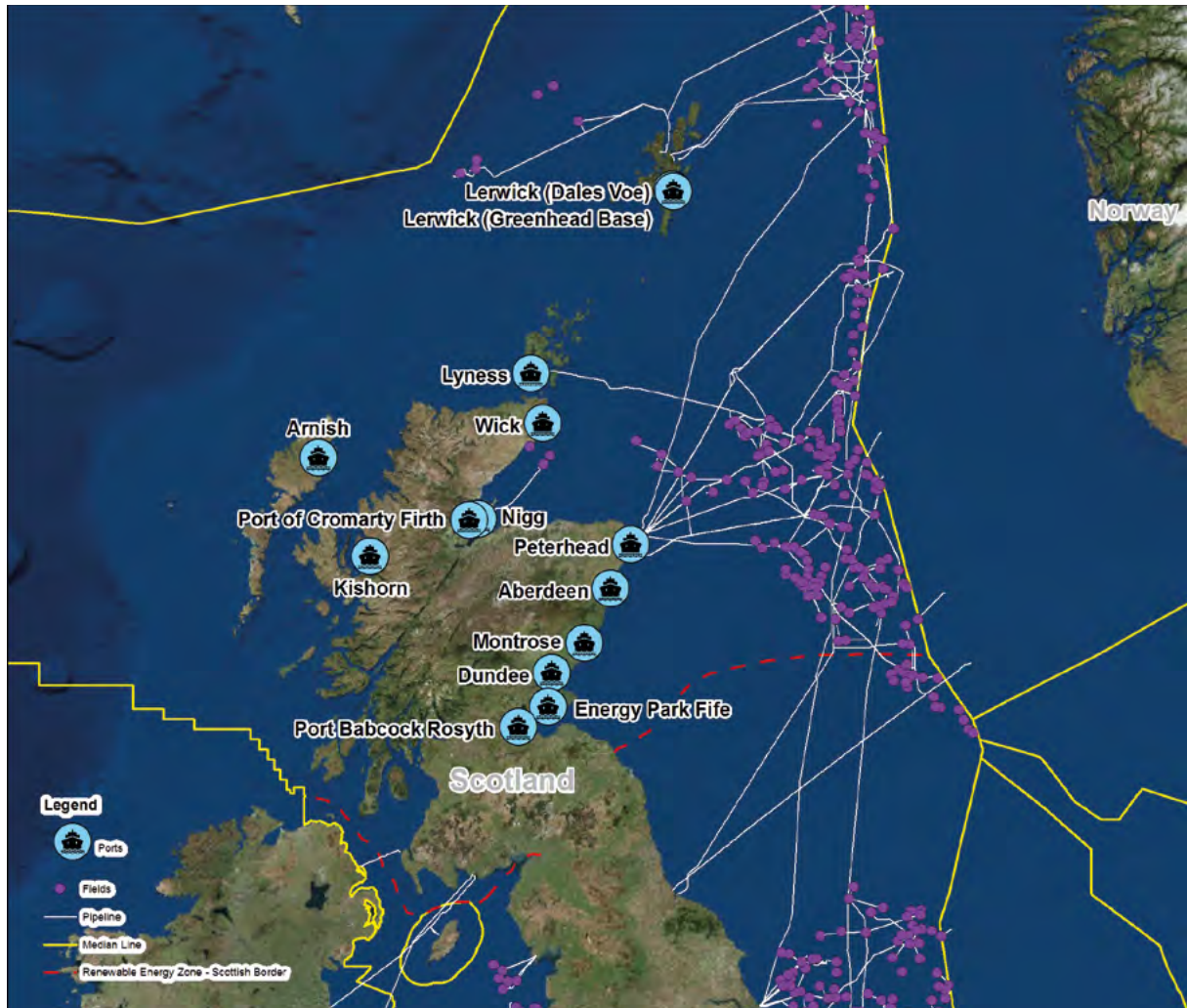
The 2600m deviated well had high H₂S and 'A' Annulus pressure. They prepared the Abandonment Programme and tendered for rig and all services contracts; bringing the project from high level through detailed planning and permitting to execution in 4 months. Zenith integrated with the Rockhopper team and provided engineers to deliver the project safely and within budget.



ONSHORE INFRASTRUCTURE

Scotland boasts a wide selection of ports and harbours that service the oil and gas industry. Their proximity to North Sea oil and gas infrastructure means they are ideally located to support decommissioning activity.

Scottish Ports and Proximity to UKCS Fields



Source: Scottish Enterprise, 2017

The ***Scottish Energy Ports Capability Directory*** (5) provides detailed information on infrastructure and facilities at Scottish ports.

Scottish Enterprise and Highlands and Islands Enterprise also published an ***Onshore Facilities Consents and Waste Disposal Licences Guide*** (6) to promote understanding of requirements for onshore activity.

Most Scottish ports have already received infrastructure removed from offshore fields with local supply chains processing the material. As activity is forecast to increase markedly, a number of Scottish ports are making significant investments in infrastructure and creating strategic alliances to service the decommissioning market.

SCOTTISH PORT INVESTMENTS



Lerwick in Shetland is one of the first ports in the UK to handle significant offshore decommissioning projects and is ideally placed to deliver an onshore centre of excellence for decommissioning. The port has a strategic location, sheltered deep waters, the ability to accept single lifts direct to the quayside and accommodate heavy-lift vessels and rigs, and the flexibility to handle both large heavy lift and piece-small decommissioning operations between Greenhead Base and Dales Voe.

The **Veolia-Peterson** joint venture at **Greenhead Base** has over 10 years experience and provides the full range of decommissioning services including decontamination, deconstruction and waste management along with associated logistics, marine and quayside operations.

Highlands and Islands Enterprise provided £600,000 to Peterson to further expand its decommissioning capability and £2.38m alongside the Scottish Government to assist **Lerwick Port Authority** expand deep-water infrastructure at **Dales Voe**. This expanded quayside is now operational with a quay length of 127m and 12.5m water depth with heavy bollards for large vessels. The quayside can accept load bearing of 60t/m² which can enable the handling of single lift decommissioning projects from the Pioneering Spirit, and has 40,000m² of unrestricted laydown area directly alongside. Veolia-Peterson are currently decommissioning the 12,000 tonne Buchan Alpha Floating Production Unit at Dales Voe.





The **Port of Cromarty Firth** have successfully developed into one of Europe's leading port facilities for the energy sector and is now well positioned for North Sea decommissioning activity. The Port has the necessary experience, heavy-lifting capability and water depth to take advantage of this emerging opportunity and has recently invested £25m for a new 154m quay and hard standing. The Port of Cromarty Firth have also become Scotland's first port to secure a decommissioning Pollution Prevention Control (PPC) Permit from SEPA, under the latest environment legislation.

As a Scottish Trust port, the Invergordon site has been the first to adopt an 'Open Port' philosophy, which allows any reputable client, operator or contractor to use the port's decommissioning permit. This philosophy allows the Port of Cromarty Firth to offer customers more flexibility and choice. The Port will work with companies to ensure that all dismantling activities at the Invergordon Service Base are carried out to the highest standards – aiming to achieve the uppermost level (98%) of recovery, reuse or recycling in decommissioning materials coming onshore.

Port of Cromarty Firth have created an extensive and strategic **Decommissioning Alliance**, covering key activities and industry supply chain players such as:

Lifting Solutions:

ALE, Mammoet, Osprey HeavyLift, Weldex, James Jack Lifting Services

Waste & Environmental Management:

John Lawrie Group, Highland Waste Services, MSIS, NRC

Engineering & Support Services:

Port of Cromarty Firth Services, Rigmar Group, Semco Maritime





Forth Ports have invested £10m to construct a new 200m quay with heavy lift pad and will invest further in developing 25 acres of laydown area at the **Port of Dundee**. The provision of an integrated approach to the decommissioning of North Sea facilities and structures has been augmented by an on-site supply chain including **Augean North Sea Services, Oilfield Machinery, Motive Fabrication and Dundee Decom** to deliver waste management, deconstruction and demolition, heavy lift and reuse, fabrication and cable spooling, and recycling services. Oilfield Machinery recently invested £1.5m in a fixed dockside crane with support from the Scottish Government's Decommissioning Challenge Fund. Forth Ports has also signed a Heads of Agreement with Norwegian AF Offshore Decom UK to establish a new joint venture, **AF Dundee Limited**, to create an oil and gas decommissioning hub in the city of Dundee.



Other port investments in Scotland to upgrade facilities and facilitate decommissioning include:

- £33m by Peterhead Port Authority for Smith Embankment at Peterhead with further £6m invested by NorSea Group (UK) at Smith and Merchant Quays.
- £350m by Aberdeen Harbour to expand into neighbouring Nigg Bay by 2020
- £5.2m redevelopment by Montrose Port Authority of two berths on the north quay

RESEARCH AND INNOVATION

Innovation is crucial to achieving business growth and sustainable economic development.

Scotland has a long tradition of being an innovative nation and is particularly well known for engineering and technology development.

Companies operating in the oil and gas industry in Scotland maintain this reputation and continue to be at the forefront of developing new technologies and processes. Not only is our supply chain actively supporting decommissioning projects, but our innovative minds are developing innovative solutions to help solve global decommissioning challenges.

Our success is built on excellent connections between world-class research facilities, education providers, funding sources and international partners. This makes the perfect breeding ground for research and innovation.

There are many organisations in Scotland driving research and innovation; some prominent in decommissioning are highlighted below.

Oil & Gas Technology Centre

The Oil & Gas Technology Centre was established in October 2016 as an industry-led research and knowledge organisation with £180 million funding from UK and Scottish Governments.

Through Solutions Centres, Centres of Excellence, Technology Accelerator and Innovation Hub, OGTC can fund and direct projects to help unlock the full potential of the UK North Sea. As one of five solution centres, the Decommissioning Solution Centre is working with industry partners to bring innovative new technologies to market that will help to reduce decommissioning costs.

In January 2018, OGTC announced investment of £1.3 million in four projects to transform well plugging and abandonment, selected from 48 submissions to its Call for Ideas initiative. Successful applicants were BiSN, Strathclyde University, Heriot-Watt University and Baker Hughes, a GE company.



Oil & Gas Innovation Centre

The Oil & Gas Innovation Centre (OGIC) was established in 2014 to foster and fund technology innovation. OGIC helps businesses to find the right academic partner by working closely with 14 universities across Scotland to match industry requirements to the appropriate research capability, facilities or specialised equipment.

OGIC can also provide up to 70% grant funding for innovative projects that need university input and, ultimately, must be of benefit to the oil and gas industry. By the end of November 2017, OGIC had invested over £1.9m in over 50 collaborative projects with oil and gas companies and academic expertise in Scottish universities.

Most recently Resolute Energy Solutions and Oilfield Innovations have received OGIC support. Both companies are developing ways of lowering well plugging and abandonment costs and have been matched up with the Robert Gordon and Glasgow universities, respectively.



Robert Gordon University

The staff at the Oil & Gas Institute at Robert Gordon University (RGU) are thought leaders for offshore decommissioning and regularly contribute to the decommissioning debate through consultancy work, presentations at industry conferences and interviews with media.

RGU is also home to the recently launched state-of-the-art decommissioning simulator. The simulator which is a collaboration with funding partners The Oil and Gas Technology Centre, KCA Deutag and Drilling Systems, with technical support from Baker Hughes, a GE Company (BHGE) is used to develop the technical and non-technical skills and capabilities of rig crews for well plugging & abandonment (P&A) as well as associated research activities.



Education and training provision for decommissioning is included in a number of relevant post-graduate programmes and RGU also offers an online short course on 'Planning for decommissioning'. RGU has partnered with University of Aberdeen to deliver the UK's first Masters degree for decommissioning.



Industry Technology Facilitator

Established in 1999, ITF (Industry Technology Facilitator) is an independent facilitator, prioritising the technology needs of the global oil and gas industry.

ITF has facilitated the launch of more than 220 joint industry projects from early stage concepts through to field trials and commercialisation. Operating across continents, ITF works with its members, its vast international network of technology developers and government bodies to tackle specific regional issues as well as defining areas of technology need from a global perspective to identify opportunities to transfer knowledge and expertise.



The Underwater Centre

The Underwater Centre at Fort William provides advanced subsea training, accreditation and test facilities for divers, ROV's and subsea technology. They offer a range of tailored support for the safe execution of diver operations in decommissioning projects including planning, competency and rehearsal of specific project critical tasks, as well as a specific course in oxy-arc cutting for decommissioning. Their world class subsea test facilities supported by a full suite of onsite ROVs and vessels, strong links with academia and with industry, make them an ideal partner for R,D&D of the subsea technology and processes required to continue the cost reduction trajectory of oil and gas decommissioning.



Xodus Decom provides innovative, strategic late life and decommissioning services to energy industries. Their vision is to generate value by minimising business erosion through a holistic approach applied at both corporate and individual asset level. They are at the forefront of providing environmental, engineering, stakeholder and turnkey management support to decommissioning projects around the world and have undertaken over 100 decommissioning projects to date.

Xodus worked with OGIC to develop analysis methods and guidance to reduce uncertainty in the removal of subsea structures. Research with the **University of Dundee's School of Science and Engineering** used small-scale models in a controlled laboratory environment. The results provide a more accurate prediction of breakout loads which will provide more reliable cost estimates and increase safety during lifting operations.



Aubin Group design, develop and supply chemistry-based, enabling technology to the global oil and gas industry, including innovative chemical solutions for use in cement additives, pipeline pigging, and the treatment of waste management.

One of their latest solutions, Xclude, targets significant cost reduction in relation to the plugging and abandonment of wells. Xclude generates a reaction that forms scale within the reservoir to create a solid stable material to isolate the formation – all without the need for a drilling rig or additional pumping equipment. Xclude was developed by Aubin chemists and was independently tested by **Heriot-Watt University** with support from **OGIC**. To promote industry adoption the company now has a working project with the **Oil & Gas Technology Centre** (OGTC) taking Xclude into field trials in early 2018.



SCOTTISH SUPPORT

Scotland has leading supply chain capabilities, onshore infrastructure and research and innovation programmes.

The industry is supported by the **Scottish Government** and its economic development agencies, **Scottish Enterprise (SE)**, **Highlands and Islands Enterprise (HIE)** and **Scottish Development International (SDI)**.

Together, we are committed to ensuring the oil and gas industry in Scotland is recognised internationally as a Centre of Excellence for Oil & Gas Decommissioning.

To achieve this, we consulted with industry and developed our **Oil & Gas Decommissioning Action Plan** (7) which was published in December 2016. Our focus since then has been on delivery against our six objectives and working together with industry partners.

We work closely with OGTC and OGIC and can help businesses access R&D funding of up to 70% of total project costs. Grants are available to support collaborative innovation between a company with an identified problem to solve, and solution providers. In 2016/17, SE supported 111 oil and gas projects with £15.9m of innovation funding.

Scottish Enterprise is also working in partnership with Opportunity North East (ONE) to help supply chain companies in Scotland prepare for decommissioning opportunities. Many small and medium size enterprises (SME's) find it difficult to access information or gain visibility of forthcoming projects and associated work packages. To help address these issues, this project will match SME capabilities to actual decommissioning project requirements by engaging directly with project owners, providing decommissioning project-specific insights, and delivering business growth expertise as appropriate.

WELL-SAFE SOLUTIONS

Well-Safe Solutions is an ambitious new company that will offer a fully integrated "Tier 1" well abandonment service.

The new start secured funding from Scottish Enterprise, through investment from the Scottish Investment Bank (SIB) and a Regional Selective Assistance (RSA) grant, in addition to the initial private funding from its major shareholders.

Well-Safe intend to create 400 jobs and attract £200m of investment to buy its own assets and equipment to carry out the work, including two rigs and an intervention vessel dedicated specifically to plugging and abandonment (P&A).

Bringing together a wealth of subsea oil and gas expertise and experience with dedicated

marine assets and equipment, Well-Safe will be the first-of-its-kind company with a complete P&A capability from front-end engineering and design to project execution.

Their campaign-based approach will enable sharing of knowledge across operating companies and remove the need for contracts with multiple service providers, instead offering a "one-stop-shop" for P&A requirements. Through a differentiated contracting strategy that will leverage economies of scale and challenge the norm, Well-Safe will manage projects efficiently and safely, while delivering savings.



We operate internationally through our sister organisation, **Scottish Development International** (SDI), which is a joint venture between SE, HIE and the Scottish Government. With a network of 40 offices in 20 countries across the globe, SDI assists Scottish companies to access international markets and to attract new inward investment to Scotland. SDI works with both Scottish-based and overseas companies and organisations.

Find out more about how we can help you to ***innovate in Scotland*** (8).

In February 2017, the First Minister announced the **Scottish Government's *Decommissioning Challenge Fund*** (9). This supports infrastructure upgrades at Scotland's ports and harbours, improving capacity, reducing potential barriers and helping even more decommissioning activity to take place in Scotland. It also supports innovation and investment that will drive cost reduction efforts and equipment, technology and materials to support growth and increase the competitiveness of Scotland's decommissioning supply chain.

Another key organisation offering specific support is **Zero Waste Scotland** which aims to reduce waste and encourage reuse of materials within the Scottish economy through the application of circular economy principles. For decommissioning, circular economy includes design and deployment of reusable assets for use in small fields; and the reuse, refurbishment and remanufacture of redundant assets.

Zero Waste Scotland has established a ***Circular Economy Business Support Service*** (10) and ***Investment Fund*** (11) to help small and medium sized enterprises to develop circular economy business models. Companies can apply for up to £1m for transformational projects that support the circular economy.

Our Expertise Is Your Solution

Scotland's oil and gas supply chain companies work in more than 130 countries and are recognised for their part in exporting new technologies all around the world. It is no surprise that Scotland is universally known for our technology, our processes and our people.

We are here to help and will provide impartial advice to help you make the most of opportunities and support available. We can talk you through Scotland's capabilities and help you find suppliers or partners in Scotland, ready to deliver the quality of service that has made the Scottish oil and gas supply chain respected across the world.

Contact details for Scottish Enterprise, Highland and Islands Enterprise and Scottish Development International can be found on the back cover.

For further information on industry partners please visit their website:

Decom North Sea

www.decomnorthsea.com

Industry Technology Facilitator (ITF)

www.itfenergy.com/

Oil & Gas Authority (OGA)

www.ogauthority.co.uk

Oil & Gas Innovation Centre (OGIC)

www.ogic.co.uk

Oil & Gas Technology Centre (OGTC)

www.theogtc.com

Oil & Gas UK

www.oilandgasuk.co.uk/

Opportunity North East (ONE)

www.opportunitynortheast.com

Robert Gordon University (RGU)

www.rgu.ac.uk

Skills Development Scotland (SDS)

www.skillsdevelopmentscotland.co.uk

University of Aberdeen

www.abdn.ac.uk

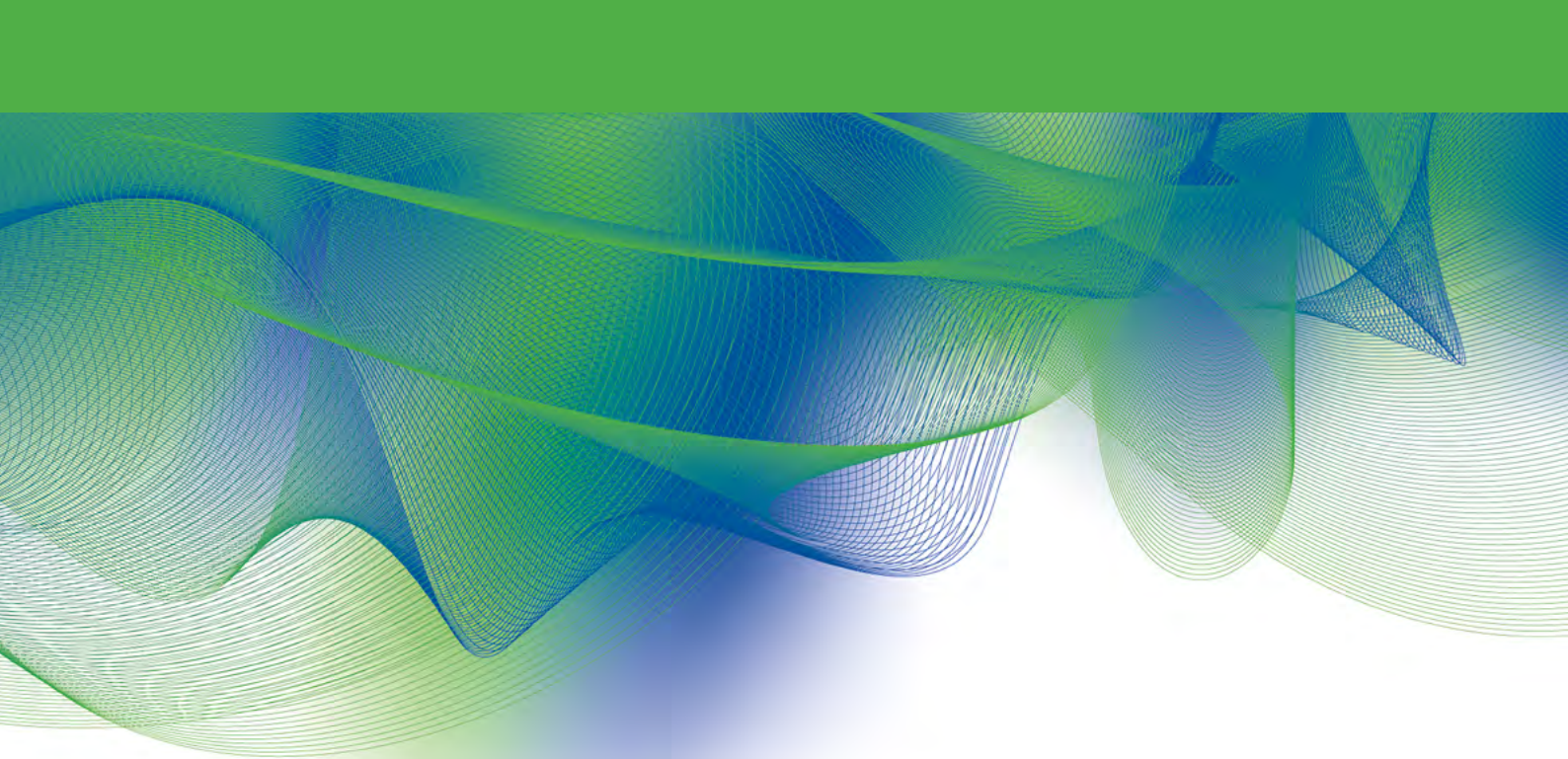
Zero Waste Scotland

www.zerowastescotland.org.uk

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