



North Sea Region

2017 Annual Environmental Statement



17



Introduction

This is the annual environmental statement for the BP entities which operated in BP's UK North Sea Region in 2017. This includes operating facilities by way of offshore installations and onshore terminals and also data which relates to installations owned and operated by third parties in the course of providing services to BP entities.^{1, 2, 3, 4}

Environmental impacts

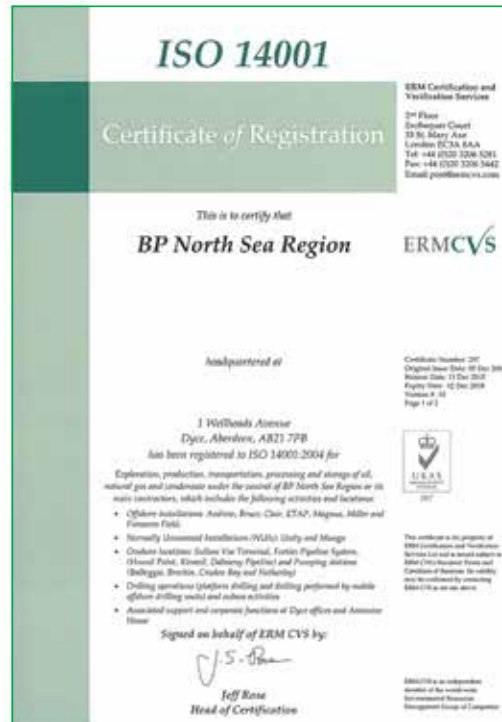
We are committed to minimising our impact on the environment and, while environmental challenges and opportunities differ depending upon the lifecycle stage of each operating facility, our overarching goal of "no damage to the environment" remains the same.

The North Sea oil and gas sector is subject to strict environmental regulation, with which we strive to comply at all times. We work closely with regulators to constantly review what we do, how we do it, and how we can do it better. Our Operating Management System is designed to drive continuous improvement in our regulatory, compliance and environmental performance. This System is certified to the international environmental management standard ISO 14001.

Our goal

To cause no damage to the environment by:

- systematically identifying environmental impacts and seeking to avoid or minimise them;
- improving environmental performance;
- putting plans in place to reduce environmental risks associated with our projects and operations;
- working to understand developments in future environmental legislation and ensuring our continued compliance.



¹ To fulfil the requirements of OSPAR Recommendation 2003/5, all operators of offshore installations on the United Kingdom Continental Shelf (UKCS) are required to produce an annual environmental statement which is made available to the public and the Department for Business, Energy & Industrial Strategy (BEIS), previously the Department of Energy and Climate Change (DECC).

² DECC Guidance and Reporting Requirements: Environmental Management System Requirements in relation to OSPAR Recommendation 2003/5 to Promote the Use and Implementation of Environmental Management Systems by the Offshore Industry.

³ Changes to scope of reported data from 2016 are as follows:

- Data is not reported for Miller due to transition of operatorship to Petrofac at the end of third quarter 2016.
- Data is reported for Magnus and Sullom Voe Terminal (SVT) until 1st December 2017 when operatorship transitioned to EnQuest PLC
- Data is reported for Forties Pipeline System (FPS) until 1st November 2017 when operatorship transitioned to INEOS FPS Ltd.

⁴ Full year data for the Foinaven FPSO and Foinaven Field are reported although Golar Nor (UK) Ltd are the Installation Operator and as such from 1st March 2017 hold the environmental permits for the Foinaven FPSO. Britoil Limited, as Foinaven Field Well Operator, retains the EU-ETS permit, Flare and Production Consent.

Our **portfolio**



Our portfolio

We have refreshed and refocused our portfolio; selling interests in assets that were no longer consistent with our strategy, investing in those that are, acquiring interest in new assets and bringing new fields into production.

Our portfolio today is smaller but stronger, with less operating complexity, reduced risk, and better potential to increase and sustain returns.

Schiehallion Area

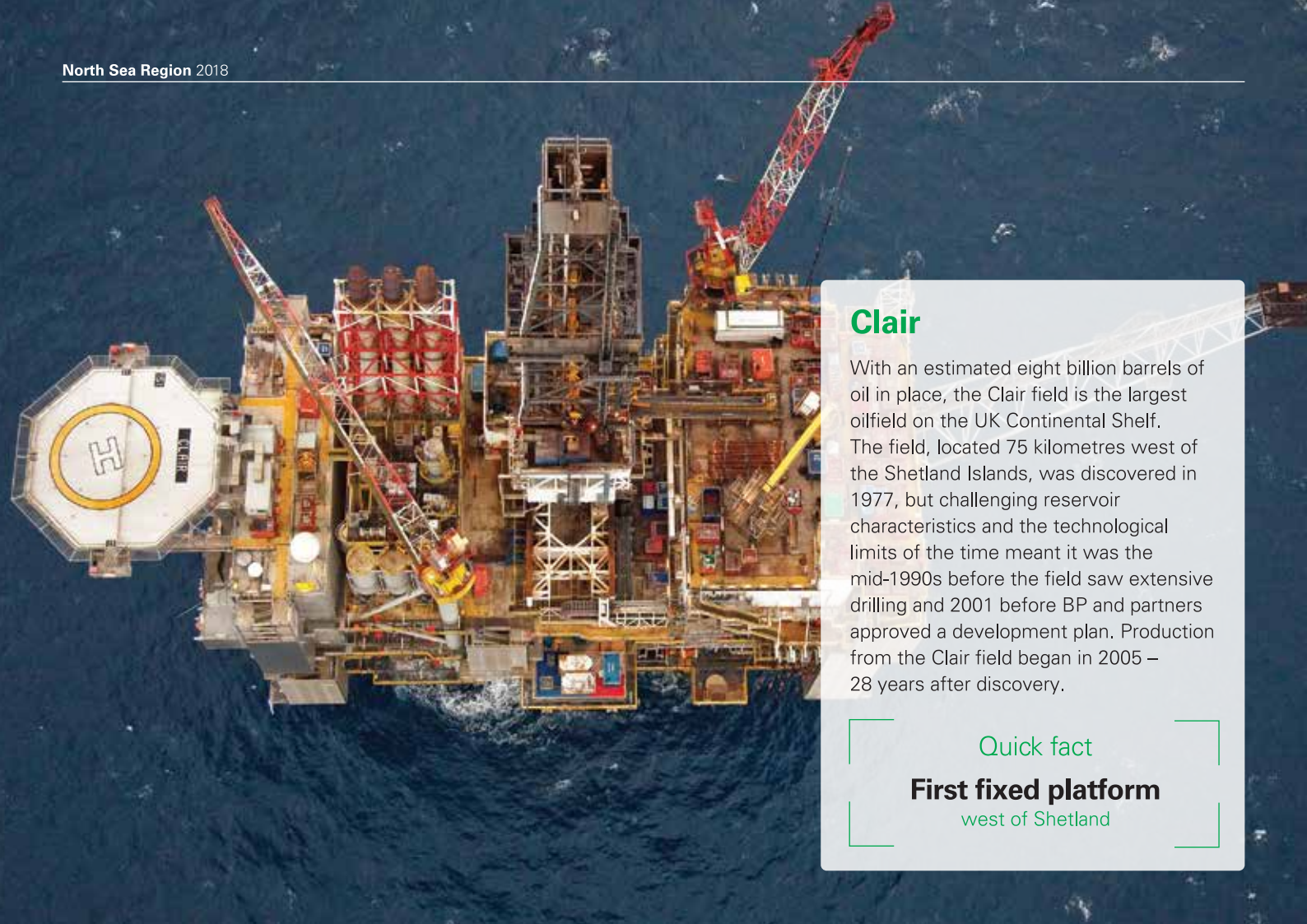
The multi-billion-pound Quad 204 project was designed to completely redevelop and maximise production from the Schiehallion and Loyal fields, located 175 kilometres west of Shetland. After 15 years of operating in harsh conditions and producing nearly 400 million barrels of oil, the original Schiehallion floating, production, storage and offloading (FPSO) vessel required replacement to enable continued production and recovery of a further estimated 450 million barrels from the fields.

From this, the Quad 204 project was born and saw the construction of a new state-of-the-art FPSO, the Glen Lyon; renewal of much of the subsea infrastructure network; and a seven-year drilling campaign, comprising up to 20 new wells. Glen Lyon will enable production from this key hub to be extended beyond 2035. First oil from Quad 204 was achieved in May 2017.

Quick fact

Glen Lyon has 800,000 barrels
of oil storage capacity





Clair

With an estimated eight billion barrels of oil in place, the Clair field is the largest oilfield on the UK Continental Shelf. The field, located 75 kilometres west of the Shetland Islands, was discovered in 1977, but challenging reservoir characteristics and the technological limits of the time meant it was the mid-1990s before the field saw extensive drilling and 2001 before BP and partners approved a development plan. Production from the Clair field began in 2005 – 28 years after discovery.

Quick fact

First fixed platform

west of Shetland

Clair Ridge

The physical size of the Clair field dictates development via a phased approach and Clair Ridge is the second phase of development. It has involved the construction and installation of two new bridge-linked platforms, the jackets (legs) of which were installed in 2013 followed by the topside modules in 2015. Hook-up and commissioning offshore is well under way as we gear up for first oil in 2018. Clair Ridge is expected to be producing beyond 2050. With our partners, we have also completed an appraisal drilling programme to help define a possible third phase of development of the Clair field

Quick fact

Targeting an 640 million barrels

of recoverable resource



Foinaven

The Foinaven field is located 190 kilometres west of Shetland in water depths of between 350 and 520 metres. The field was discovered in 1990 and sanctioned in 1994. It was the first deepwater development on the UKCS and the first west of Shetland. First oil from the field was in November 1997. The pioneering fast-track development was based on a network of subsea wells linked via a subsea network of pipelines, control umbilicals and risers to the Petrojarl Foinaven FPSO.

Quick fact

First west of Shetland
producer



Eastern Trough Area Project (ETAP)

ETAP ranks as one of the largest and most commercially complex North Sea oil and gas developments of the past 20 years; multiple fields with varying ownership sharing a central processing facility (CPF). BP operates six of the seven ETAP fields; Machar, Madoes, Mirren, Mungo, Monan and Marnock. The other field is Heron.

A multi-million-pound life extension project as part of the overall field development strategy got under way in 2015 and has breathed new life into this vital resource. We see significant potential and remaining field life in ETAP and, through our investments, expect it to produce into the 2030s.

Quick fact

2018 marks ETAP's
20th anniversary



Andrew Area

The Andrew Area includes the Andrew, Arundel, Cyrus, Farragon and Kinnoull fields which all produce through the Andrew platform. The Andrew field started production in 1994 followed by Cyrus in 1990 and Farragon in 2005. Andrew, Cyrus and Farragon were shut in in mid-2011 to allow for the multi-million-pound Andrew Area Development (AAD), a major brownfield project enabling the Kinnoull field, located 28 kilometres to the north, to be developed through the existing facilities. The AAD also included extensive new subsea infrastructure, a new 750-tonne process module and structural strengthening of the platform. In 2017, the Arundel field came on stream - only 18 months after project sanction. The Andrew Area is expected to produce into the 2020s.

Quick fact

Kinnoull field connected

to Andrew platform by 28 kilometre pipeline



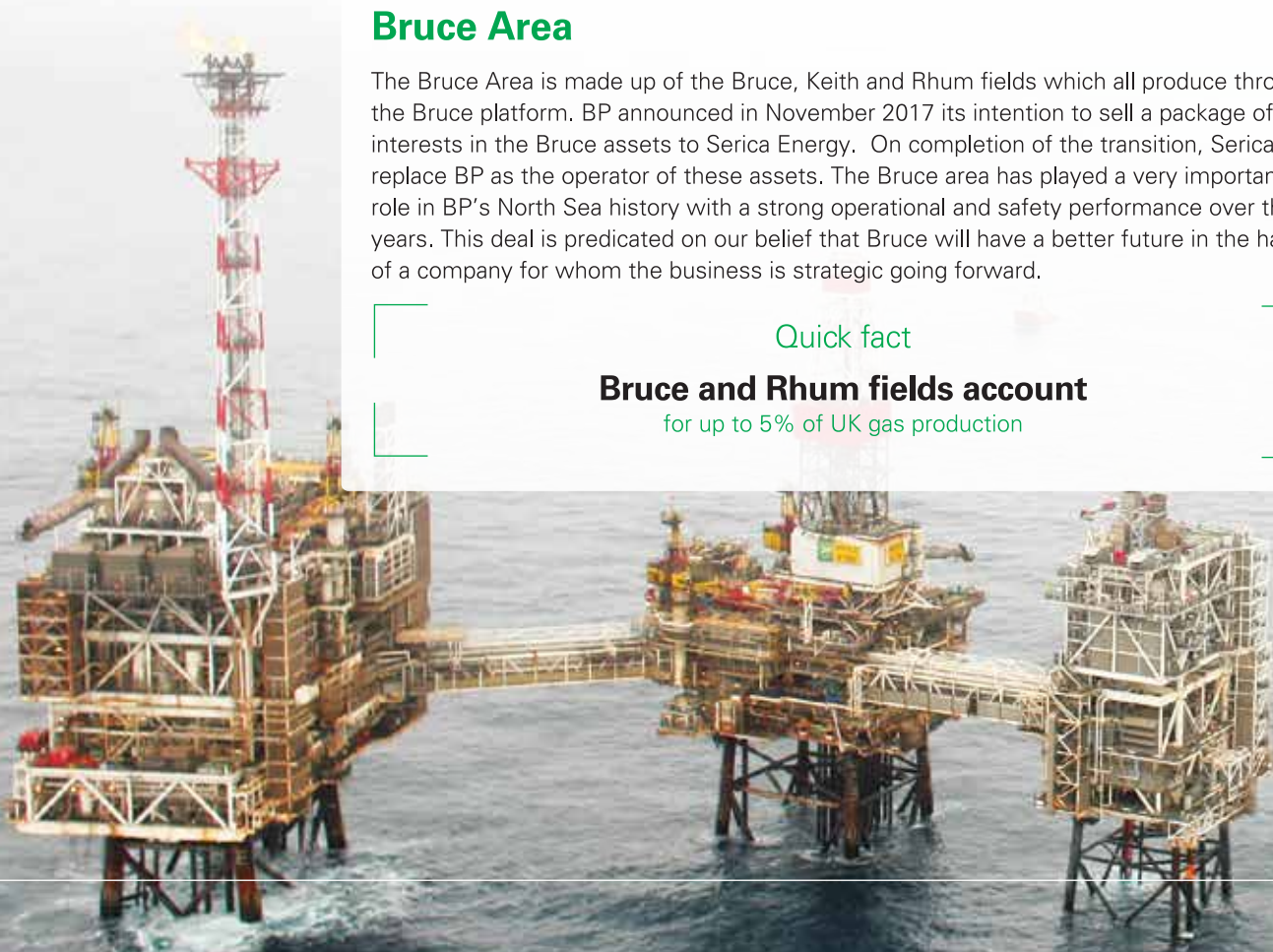
Bruce Area

The Bruce Area is made up of the Bruce, Keith and Rhum fields which all produce through the Bruce platform. BP announced in November 2017 its intention to sell a package of its interests in the Bruce assets to Serica Energy. On completion of the transition, Serica will replace BP as the operator of these assets. The Bruce area has played a very important role in BP's North Sea history with a strong operational and safety performance over the years. This deal is predicated on our belief that Bruce will have a better future in the hands of a company for whom the business is strategic going forward.

Quick fact

Bruce and Rhum fields account

for up to 5% of UK gas production



Forties Pipeline System (FPS)

FPS is an integrated oil and gas transportation and processing system serving the Central North Sea with a nominal capacity in excess of one million barrels per day. It is a key piece of UK oil and gas infrastructure, bringing a significant proportion of North Sea production to the mainland. It has been operated by INEOS since November 2017.

Quick fact

80+ fields
served by FPS

Sullom Voe Terminal (SVT)

SVT is one of the largest oil and gas terminals in Europe. It was built between 1975 and 1981 and covers 1000 acres. Its main purpose is to act as a buffer between the producing fields offshore and tankers waiting to ship oil to refineries worldwide. SVT has been operated by EnQuest since December 2017 and handles production from the east and west of Shetland.

Quick fact

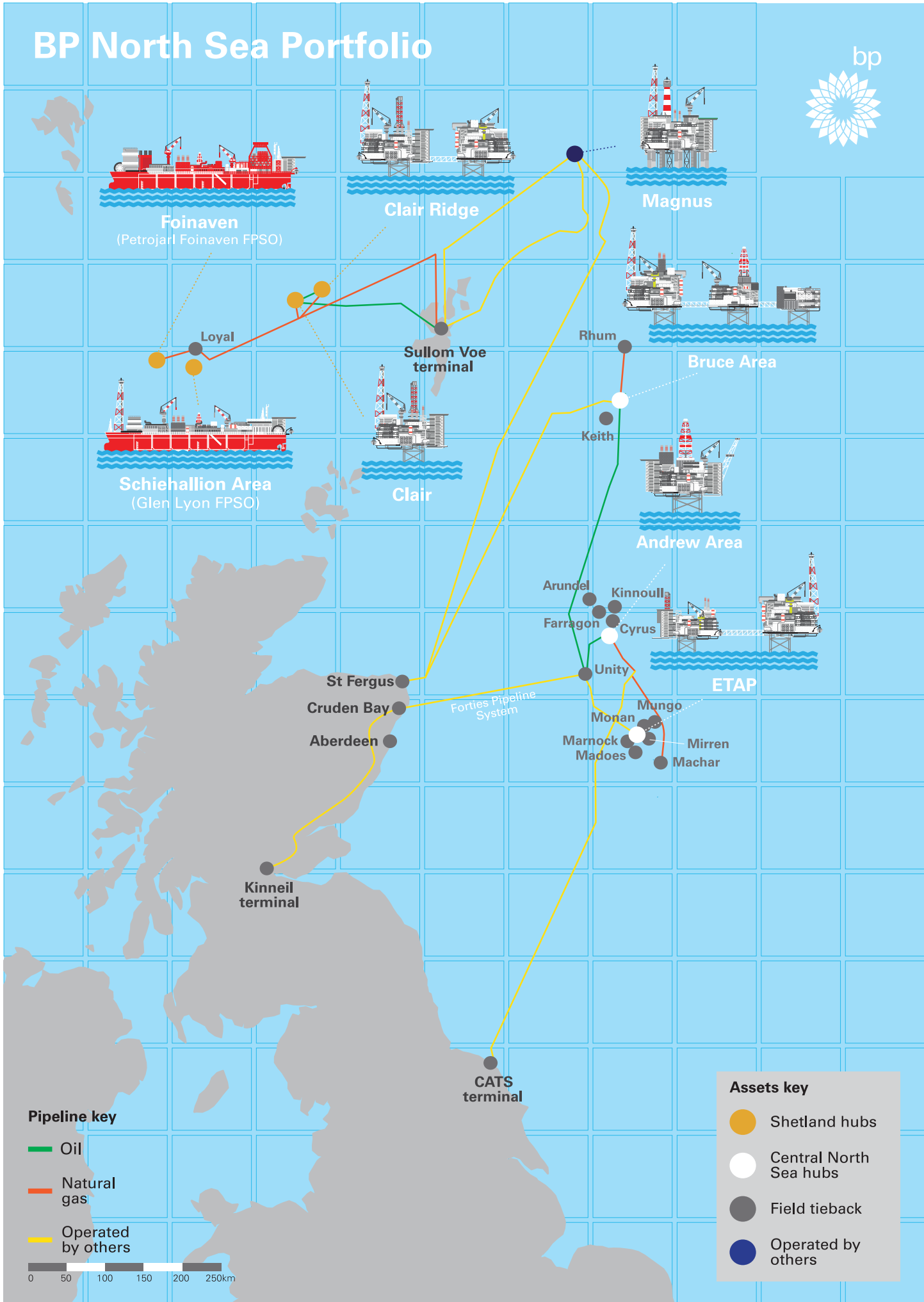
One of the largest
oil and gas terminals in Europe

Magnus

The EnQuest-operated Magnus field (**BP ownership share 75%**) is the UK's most northerly field, located 160 kilometres north-east of the Shetland islands. First oil from the field was achieved in August 1983.



BP North Sea Portfolio



1. Releases to the Environment

Our goal is “no damage to the environment”, which includes seeking to avoid unpermitted releases to the environment. However, during the course of conducting operations, hydrocarbons and chemicals can be accidentally released. We monitor the number and volume of such releases closely and investigate the causes, so we can avoid similar events in the future. In 2017, we reported 98 unpermitted releases from offshore facilities to the Regulator compared to 90 in 2016 as shown in Figure 1 below.

Number of spills of chemicals and hydrocarbons

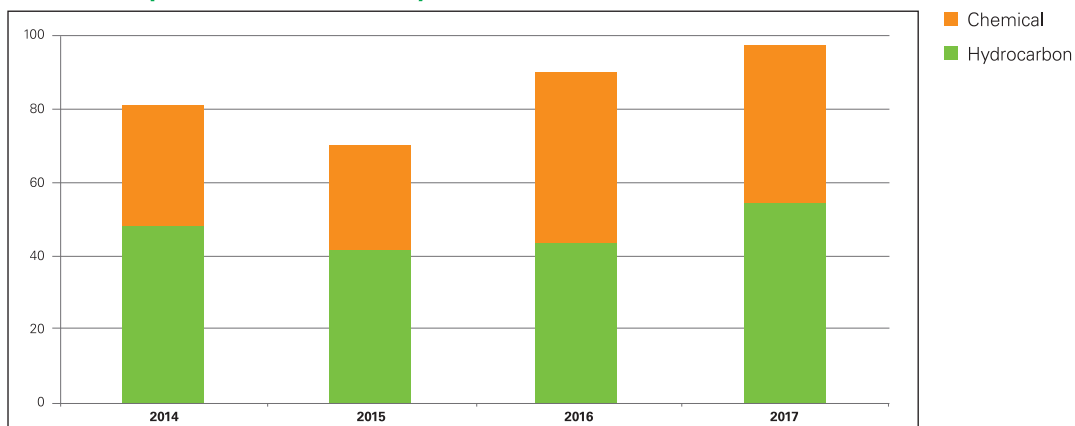


Figure 1: Total number of spills of chemicals and hydrocarbons between 2014 and 2017

More than 70% of the 98 releases in 2017 were less than 10 litres in volume. There were 46 chemical releases in 2017, the same as 2016. The number of hydrocarbon releases increased from 44 in 2016 to 52 in 2017. Of the 52 releases in 2017, 46% were hydraulic oils, 15% diesel, 10% crude oil (including produced water containing trace quantities of crude), and 4% mineral oils. The remaining 11 releases were classified as waste, other, or unknown hydrocarbon product.

The increase in the number of reported chemical and hydrocarbon releases during 2017 was due to the number of individually reported releases from the Bruce, Clair and Clair Ridge Installations, as well as the Glen Lyon FPSO, as shown in Figure 2 below. For all these installations, this was predominantly due to an increase in hydraulic and lube oil releases, such as from hydraulic manifolds. On Clair Ridge there were also three releases of diesel, during the construction and commissioning of the new installation. There is higher than normal usage of diesel during construction and commissioning when the installation is not in operational mode. At Andrew the number of reported chemical and hydrocarbon releases fell from 7 in 2016 to 1 release in 2017.

Total number of hydrocarbon and chemical spills reported to the regulator

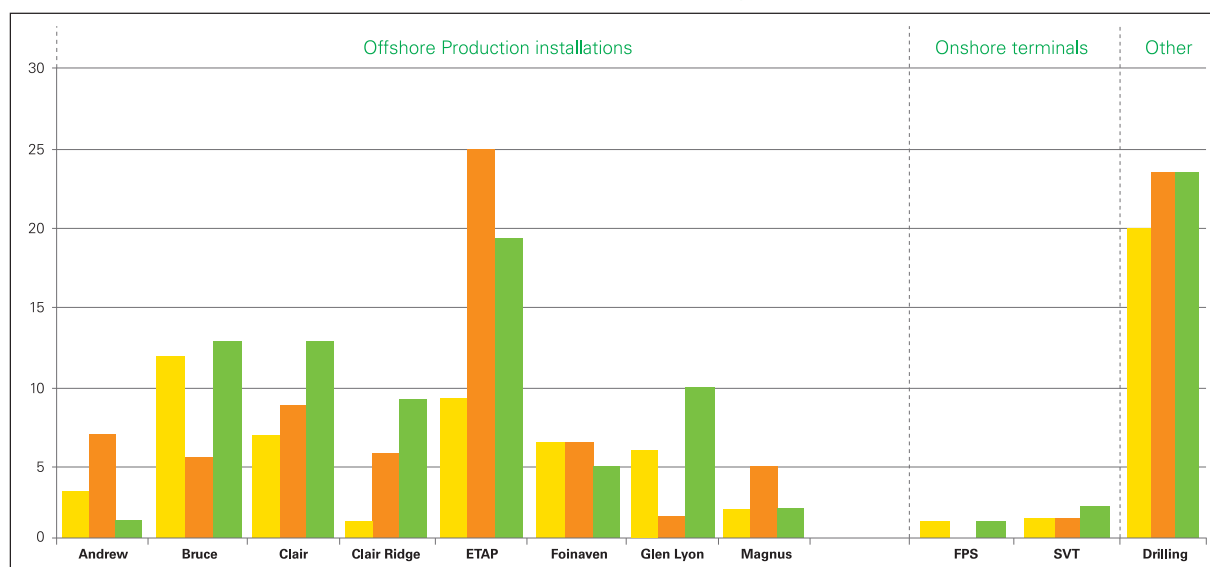


Figure 2: Number of hydrocarbon and chemical releases reported to the regulator between 2015 and 2017 for individual operating facilities and mobile drilling rig activities

NOTE The vast majority of emissions and spills reported in this Statement under the category “drilling” relate to operations undertaken by third parties such as drilling contractors from installations owned and operated by those third parties in the course of providing services to BP entities.

1. Releases to the Environment (cont'd)

In 2017, whilst the number of accidental releases increased, the quantity of hydrocarbons and chemicals released and unrecovered decreased by 64%, as shown in Figure 3 below.

Quantity of chemicals and hydrocarbons unrecovered (tonnes)

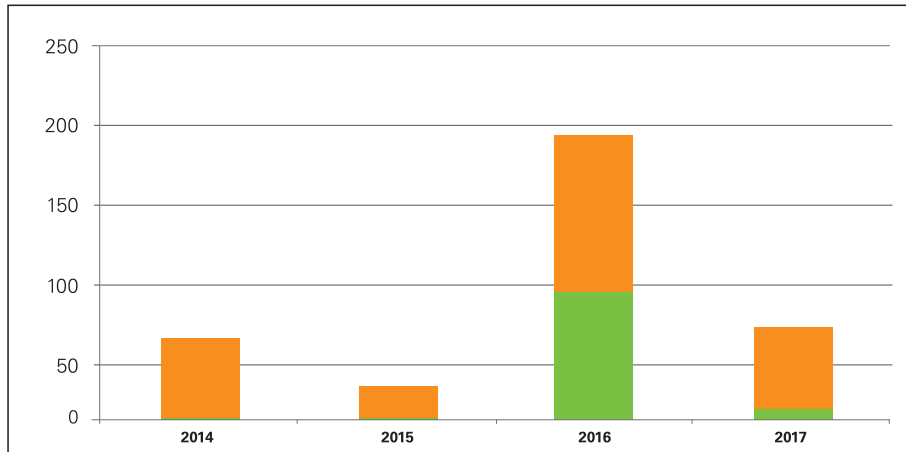


Figure 3: Total quantity (tonnes) of unrecovered chemicals and hydrocarbon releases between 2014 and 2017

Table 1 shows the number of oil and chemical releases greater than 2 tonnes in 2017. The reduction in the total quantity of hydrocarbons and chemicals released and unrecovered was primarily due to a decline in the number of releases of 10 tonnes or greater from 5 in 2016 to 2 in 2017.

Offshore Installation/Field	Quantity Released (tonnes)	Hydrocarbon or chemical	Brief details
Foinaven Field	41.98	Chemical	Release from subsea tree master valve
Sullom Voe Terminal	10.00	Chemical	Firefighting foam release from bulk foam pod
Bruce Platform	4.73	Chemical	Release of water based hydraulic fluid from subsea SSIV
Foinaven FPSO	2.86	Chemical	Release from drill centre master valve
Foinaven FPSO	2.67	Chemical	Release from subsea tree wing bore pipe fitting
Glen Lyon FPSO	2.20	Chemical	Release from Subsea Control Module
Deepsea Aberdeen Drilling Rig	2.07	Hydraulic Oil	Release from topside BOP hydraulic system

Table 1: Details and quantity of chemical and hydrocarbon releases greater than 2 tonnes (chemicals and hydraulic oil released were of low toxicity to the environment)

1. Releases to the Environment (cont'd)

The quantity of hydrocarbons and chemical released in 2017 declined 96% and 31% respectively from 2016. Quantities of chemicals released in 2017 were principally due to the release of water-based hydraulic fluid from the subsea system in the Foinaven Field; water-based hydraulic fluid from a subsea isolation valve in the Bruce Field; and the single release of firefighting foam from a bulk foam pod to unmade ground at Sullom Voe Terminal (SVT). The release of firefighting foam at SVT was contained within the boundary of the terminal and there was no release to the surrounding environment. Full remediation of the impacted unmade ground was conducted.

The increase in the quantity of chemicals released from the Glen Lyon FPSO was principally due to hydraulic fluid releases during commissioning and start-up of the subsea control system (See Table 1 on previous page and Figure 4 below).

Total hydrocarbon and chemical unrecovered spills (tonnes)

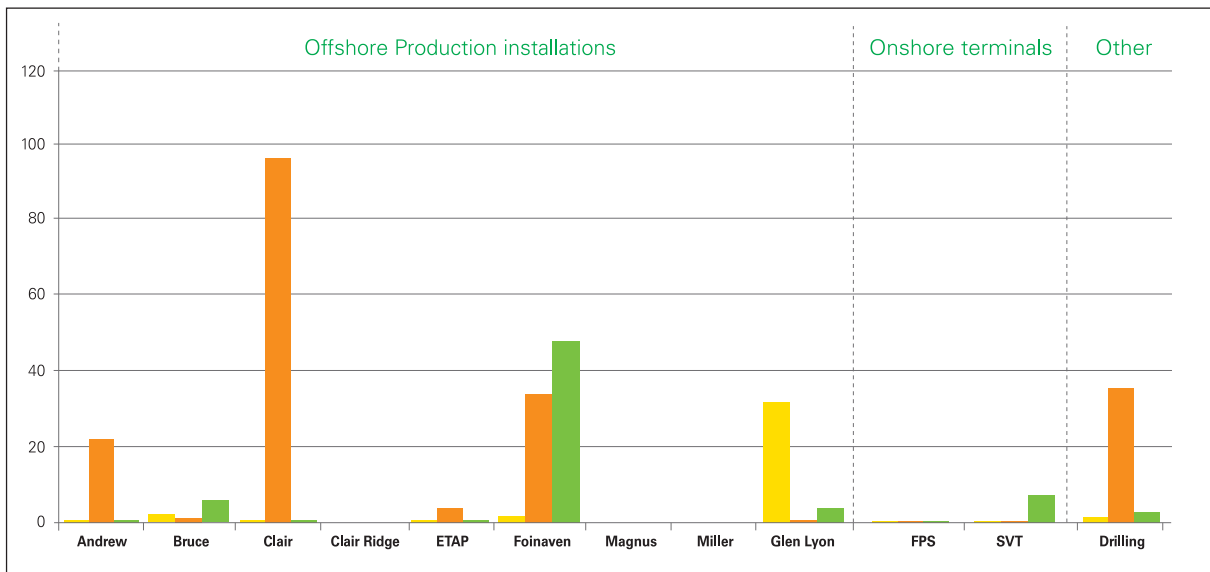


Figure 4: Quantity (tonnes) of hydrocarbon and chemical releases reported to the regulator between 2015 and 2017 for individual operating facilities and mobile drilling rig activities

2. Atmospheric emissions

Atmospheric emissions occur in our operations, mainly through combustion of fuel gas to generate power and through flaring. We track and report our greenhouse gas (GHG) emissions and non-GHG emissions and work to manage our emissions to air principally by focusing on plant reliability and energy efficiency. For example, we improved compressor reliability and gas management at the FPS and SVT terminals, significantly improving flaring performance and avoiding over 40 thousand tonnes of carbon dioxide reaching the atmosphere in 2017.

We report GHG emissions on a carbon dioxide (CO₂)-equivalent basis, including CO₂ and methane. Our GHG emissions increased around 8% in 2017 from 2016, as shown in Figure 5 below. This was primarily due to the start-up activities on Glen Lyon, which required increased flaring to enable the safe start-up of operations, as shown in Figure 6.

Total greenhouse gas emissions (millions of tonnes of CO₂ equivalent)

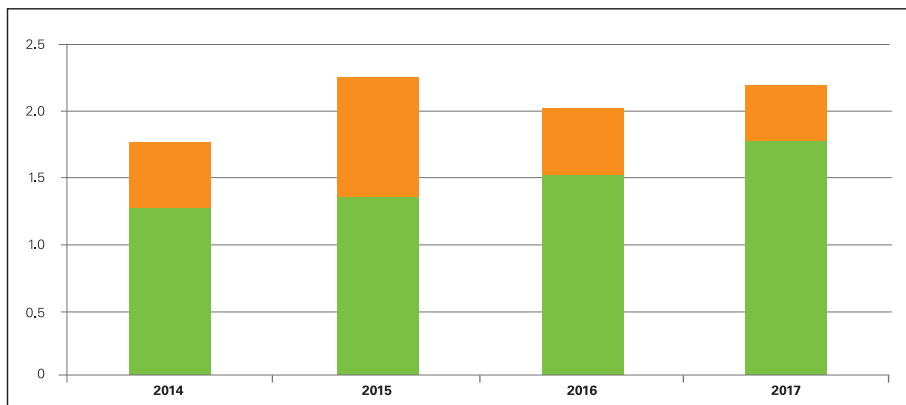


Figure 5: Total greenhouse gas (GHG) emissions (millions of tonnes of CO₂ equivalent) between 2014 and 2017

Greenhouse gas emissions by asset (tonnes of CO₂ equivalent)

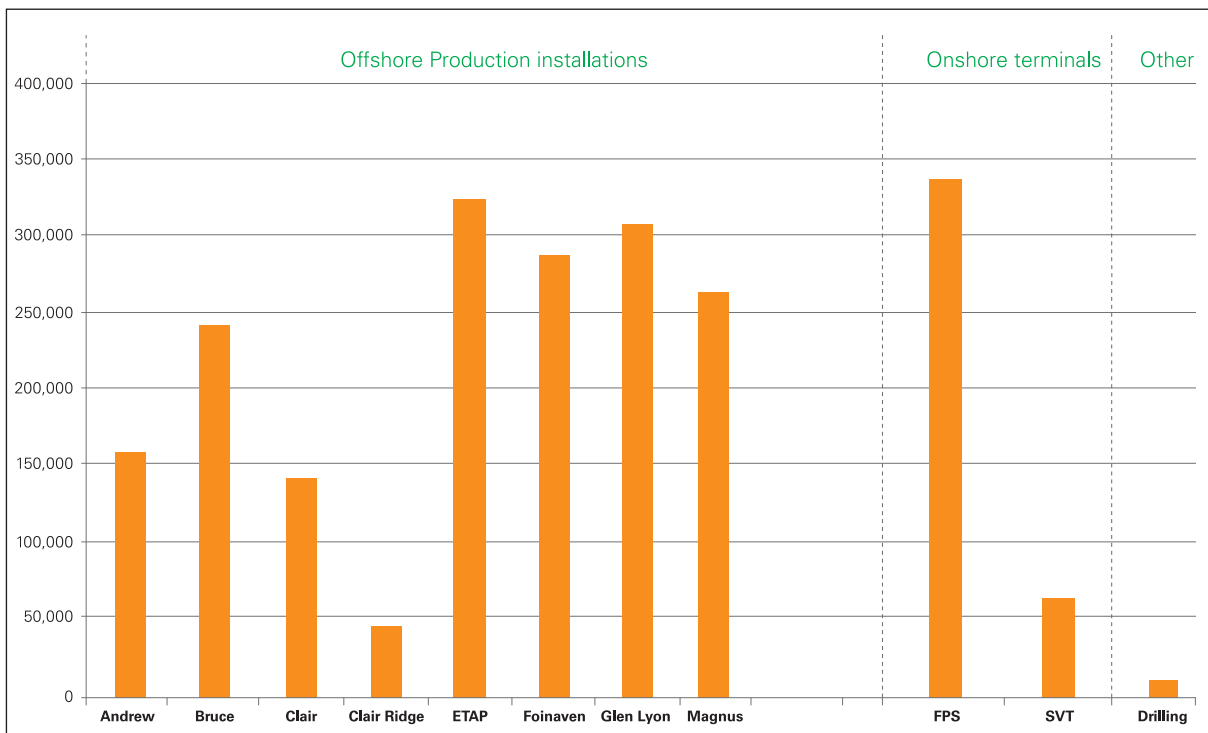


Figure 6: GHG emissions for individual operating facilities and drilling activities during 2017.

2. Atmospheric emissions (cont'd)

Figure 7 below shows the significant improvement in offshore GHG intensity compared with 2014. This was a result of improved plant reliability and reduced flaring. The slight increase in 2017 is primarily due to the start-up of operations on the Glen Lyon FPSO, which required increased flaring to enable the safe start-up of operations.

Greenhouse gas emissions (tonnes of CO₂ equivalent per 1,000boe)

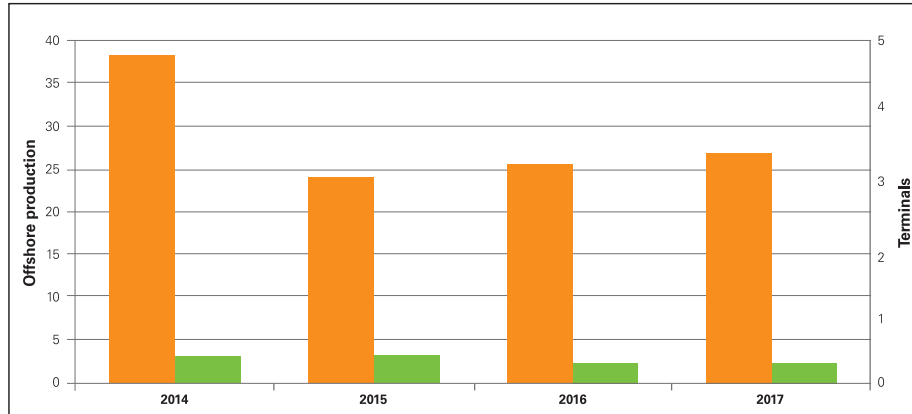


Figure 7: GHG intensity (tonnes of CO₂ equivalent per 1,000 boe) for offshore installations and onshore terminals between 2014 and 2017

Flaring of gas offshore and onshore is essential for safety reasons. We seek to minimize flaring from our operations to maximise resource recovery and ensure compliance with consented flaring limits. In 2017, around 225,000 tonnes of gas was flared, an increase of about 10% from the previous year. This was principally due to start-up flaring on Glen Lyon, which was required to enable the safe start-up of operations - see Figure 8 below.

Total production gas flared (tonnes)

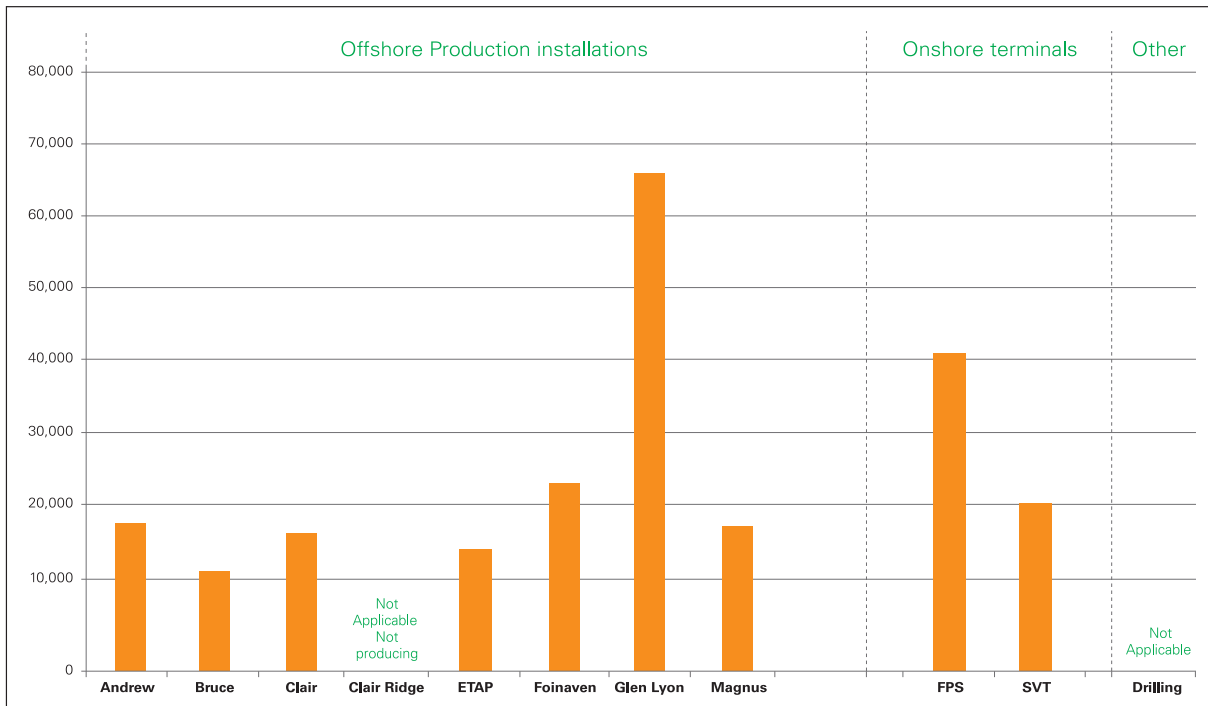


Figure 8: Total production gas flared (tonnes) for individual operating facilities during 2017.

2. Atmospheric emissions (cont'd)

The non-GHG emissions we track include nitrogen oxides, sulphur oxides, carbon monoxide and volatile organic compounds. The emissions of these substances are shown in Figure 9 below.

The onshore terminals, FPS and SVT, process unstabilised crude oil produced from around 80 fields in the UKCS. Due to the level of activity involved in processing significant quantities of oil, FPS typically has higher emissions levels than smaller terminals, such as SVT, or individual offshore installations. See Figure 6, Figure 8 and Figure 9

Total non-greenhouse gas emissions (tonnes)

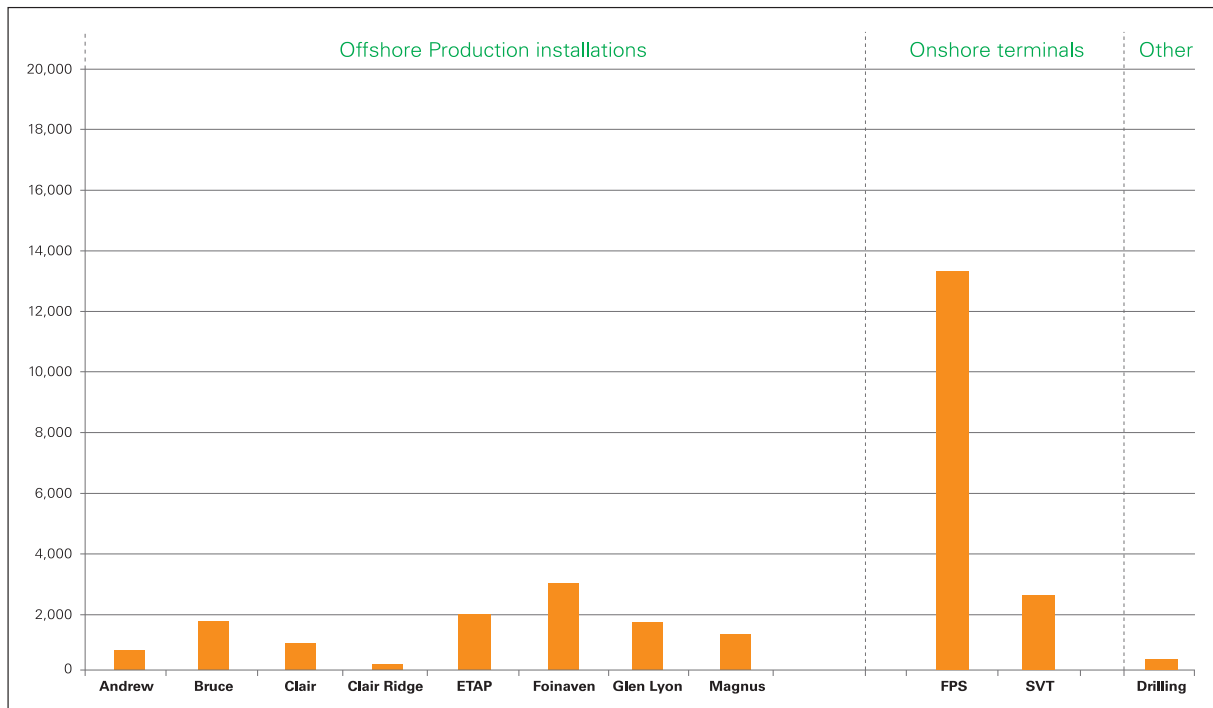


Figure 9: Total Non-GHG emissions (tonnes) for individual operating facilities and drilling activities during 2017.

3. Permitted discharges

We use chemicals offshore to improve the flow of fluids; to facilitate the separation of materials; and prevent the degradation and fouling of process equipment and in control systems. The composition of these chemicals is diverse and their usage and discharge are permitted by the Regulator. Our use of production chemicals decreased by around 9% in 2017, whilst production chemicals discharged increased by around 5% in 2017, as shown in Figure 10 below. The decrease in production chemical use was primarily due to lower use on Clair and in subsea systems. The increase in chemicals discharged is associated with produced water discharged from the Glen Lyon FPSO having commenced production during the year.

Total production chemicals used and discharged by offshore facilities (tonnes)

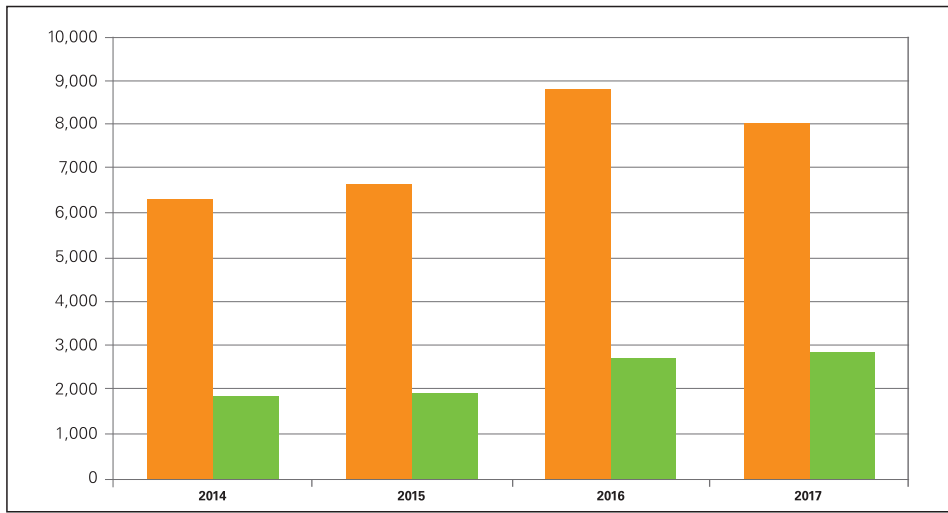


Figure 10: Total permitted production chemical use and discharge (tonnes) between 2014 and 2017 ■ Total Used ■ Total Discharged

Figure 11 below shows the total use and discharge of production chemicals by operating facility in 2017. Chemical use for Clair and the Foinaven FPSO is primarily related to the management of naturally occurring hydrogen sulphide which can corrode process equipment. Subsea chemical use and discharge relates to flushing of pipelines to remove hydrocarbons before maintenance and inspection activities are undertaken and use in hydraulic control systems. A significant proportion of chemical use on the Glen Lyon FPSO was related to additive use in water-injection systems as part of microbiological control.

Total production chemicals used and discharged by offshore facilities (tonnes)

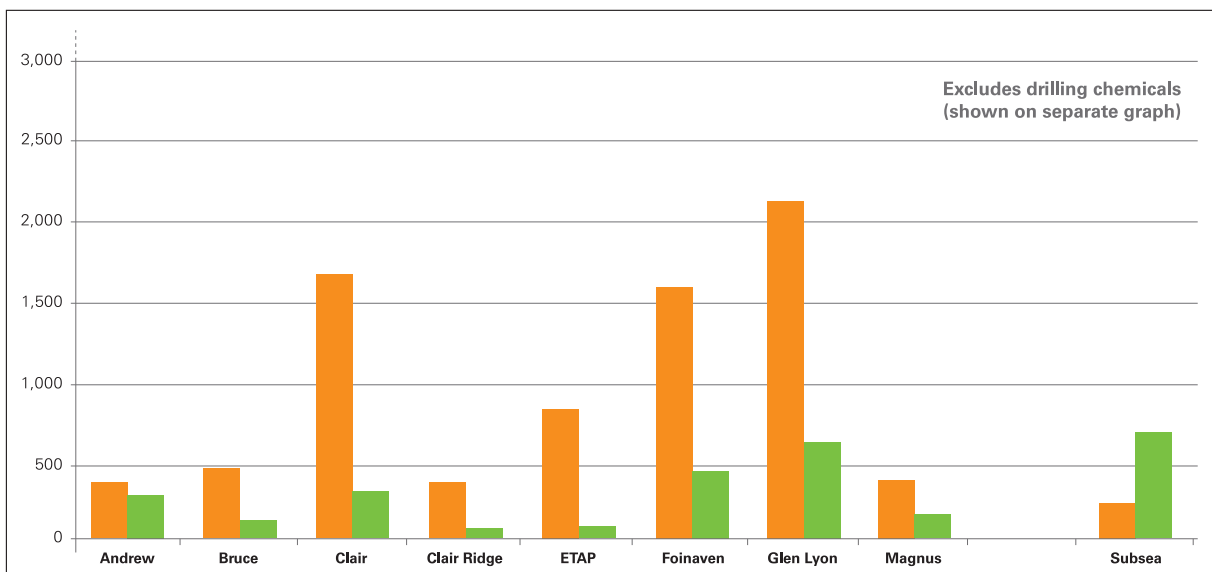


Figure 11: Total permitted production chemical use and discharge (tonnes) for operating facilities during 2017 ■ Total Used ■ Total Discharged

3. Permitted discharges (cont'd)

Fluids produced from oil producing wells often contain large quantities of water as well as hydrocarbons. The water and hydrocarbon are separated during processing. Hydrocarbons are exported and the remaining produced water, which contains trace amounts of oil, is either reinjected into the wells or discharged to sea in accordance with environmental permits. In order to minimise oil discharges, the majority of offshore installations have been designed to reinject some or all produced water.

Our total produced water discharged decreased by around 3% in 2017 as shown in Figure 12 below. This was primarily due to reduced produced water discharge from Clair and the Foinaven FPSO. For Clair the decline in produced water discharged was due to an increase in the overall percentage of produced water reinjected. The decline in produced water for the Foinaven FPSO was due to a decline in production during 2017.

Total produced water discharged (millions of tonnes)

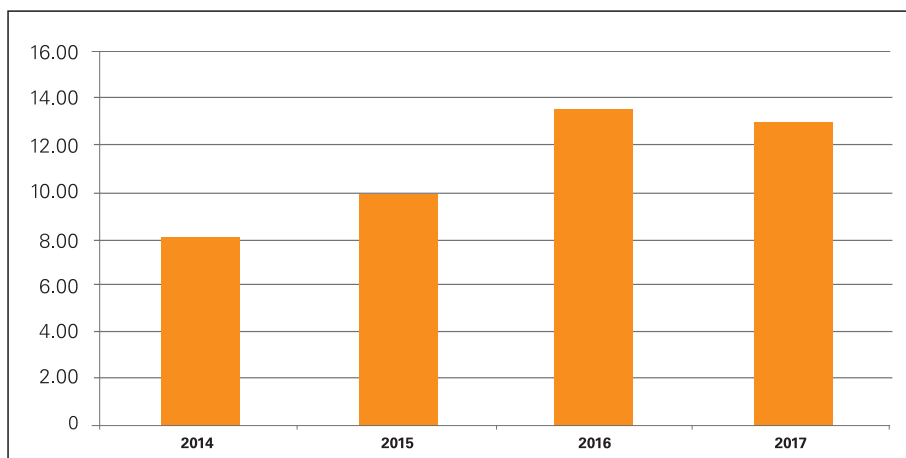


Figure 12: Total produced water discharged (millions of tonnes) between 2014 and 2017

Figure 13 below shows total quantities of produced water discharged by installation in 2017. There was an increase in produced water being discharged from the Magnus offshore installation which, in addition to being a mature field handling large quantities of water, returned to two train operations in 2016. The introduction of additional wells at the Andrew offshore installation in both 2016 and 2017 has led to an increase in produced water. The ETAP offshore installation re-injects all of its produced water.

Total produced water discharged (millions of tonnes)

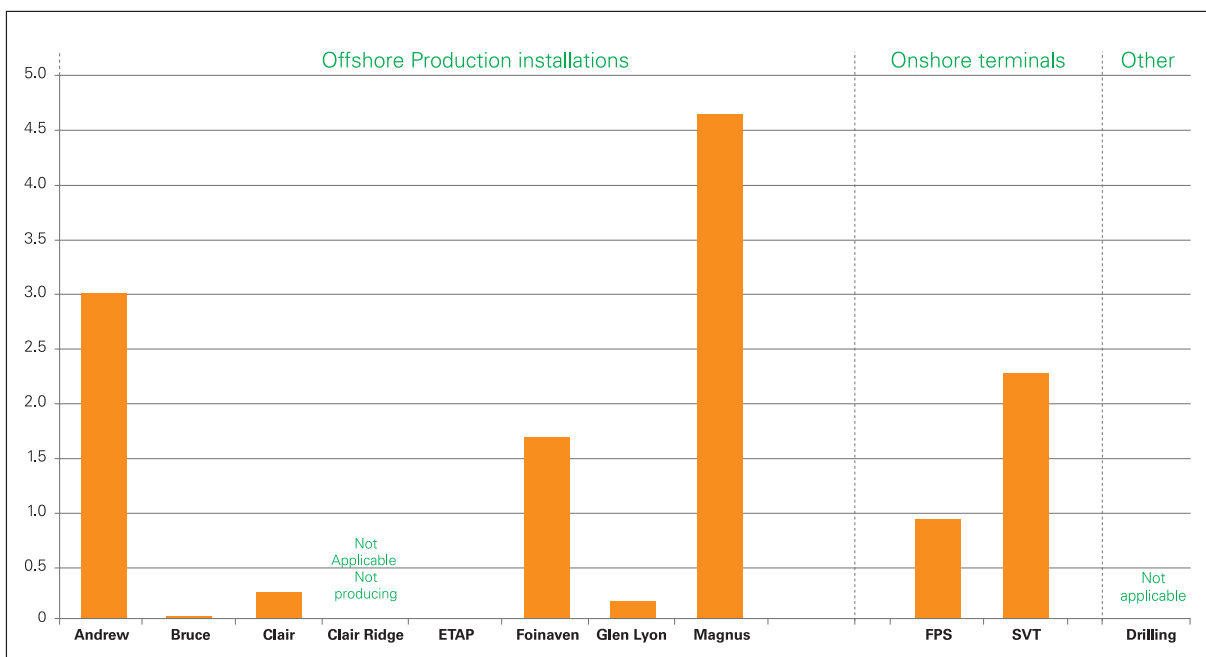


Figure 13: Total produced water discharges (millions of tonnes) for our operating facilities during 2017.

3. Permitted discharges (cont'd)

Figure 14 below shows the annual average oil in produced water concentrations for each operating facility in 2017.⁵ The high average oil in produced water for Bruce was the result of process upsets coinciding with trips to the Produced Water Reinjection (PWRI) System and issues with a flow control valve. Despite this, 80% (73.17 tonnes) of produced water from Bruce was still reinjected. As can be seen in Figure 15, the total quantity of oil discharged to sea was relatively low.

Annual average oil concentration in produced water discharged (mg/l)

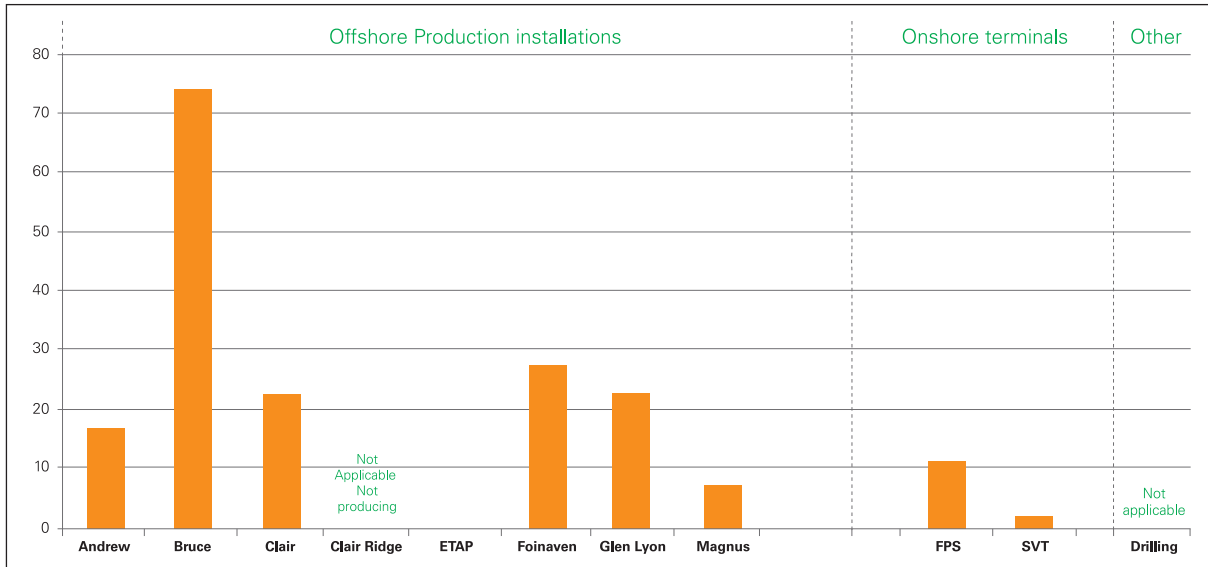


Figure 14: Annual average oil in produced water discharge (mg/l) for operating assets during 2017

Of all the produced water discharged by our operating facilities, oil makes up less than 0.01 % of the total mass. (Figure 15). Higher volumes of total oil in produced water discharged from Andrew, the Foinaven FPSO and Magnus were a consequence of the higher total produced water discharged by these facilities (Figures 13 and 15).

Total oil in produced water discharged (tonnes)

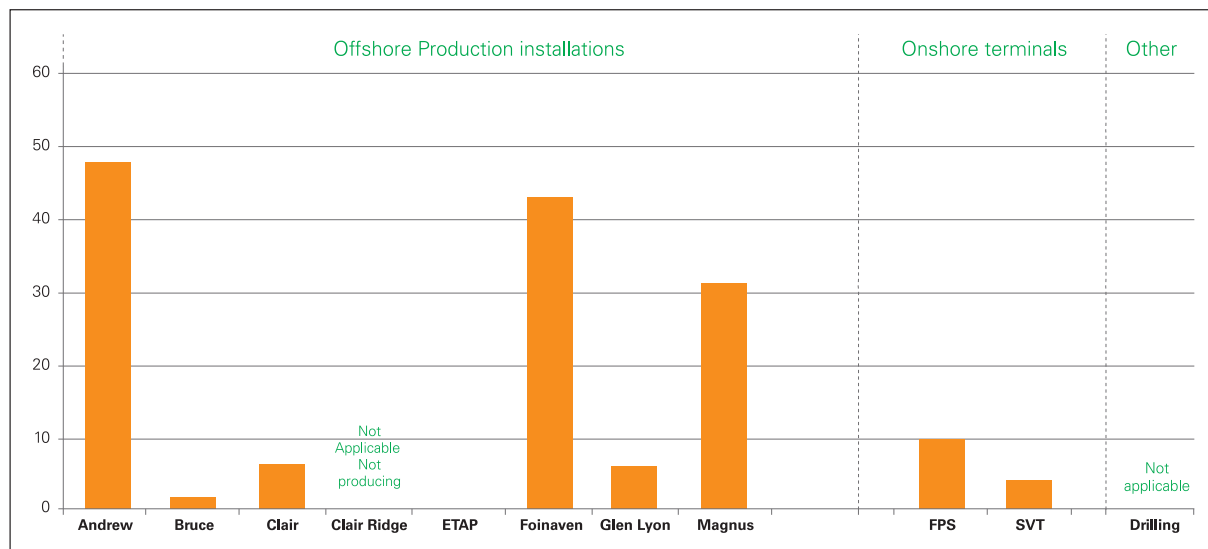


Figure 15: Total oil in produced water discharged (tonnes) within total produced water discharged (Figure 13) for our operating facilities during 2017.

⁵ The total amount of oil in produced water that can be discharged and concentrations of oil in produced water are governed by the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 as amended and specified in the permits for each operating facility. Where such facilities discharge produced water, the permits require the concentrations of oil to be below 30 milligrams (mg) of oil per litre.

4. Waste

Waste from our operations is segregated and, where possible, reused or recycled. Special waste includes paints, hazardous chemicals, oils, batteries, aerosols, heavy metals, wax from pigging operations and oily waste. Quantities of special waste generated by the operating facilities are shown below in Figure 16. Clair had higher than normal quantities of special waste due to the completion of four wells and associated removal of slops and sludge. SVT also had higher than normal quantities of special waste due to onsite cleaning of crude oil storage tanks.

Special waste from operating facilities (tonnes)

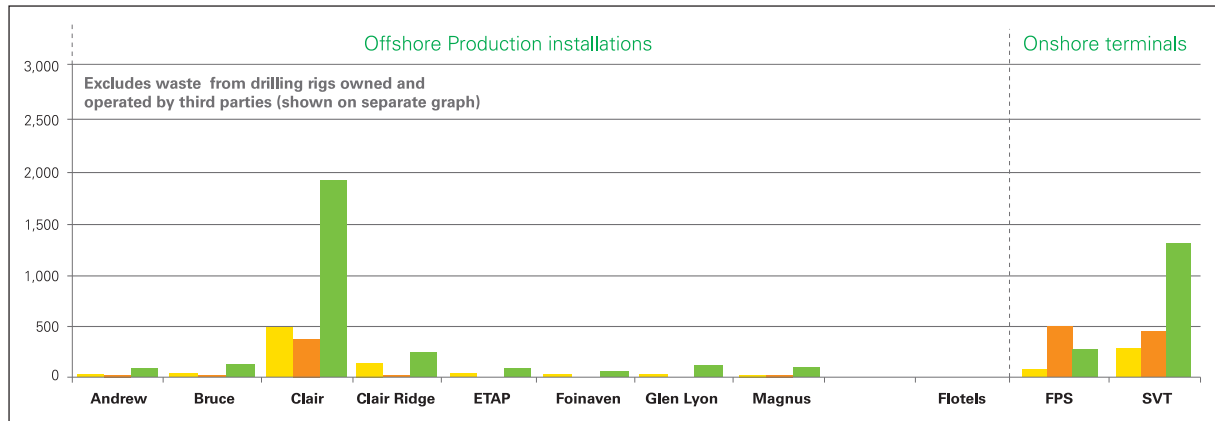


Figure 16: Special waste (tonnes) reported for operating facilities during 2017.

■ Recycled ■ Landfill ■ Treatment

Non-special waste includes segregated recyclables (paper, packaging, wood etc.), general waste (i.e. accommodation waste) and uncontaminated scrap metals. Quantities of non-special waste generated by our operating facilities are shown in Figure 17 below. Project and maintenance works at FPS continued to generate significant volumes of soil and rubble waste. In addition, SVT generated non-special waste in the form of concrete and scrap metal due to decommissioning activity, much of which has been reused or recycled. A higher volume of non-special waste at Clair was generated by disposal of slops, brines and sludge. The ongoing commissioning of Clair Ridge also continued to generate higher volumes of non-special waste, including scrap metal.

Non-special waste from operating facilities (tonnes)

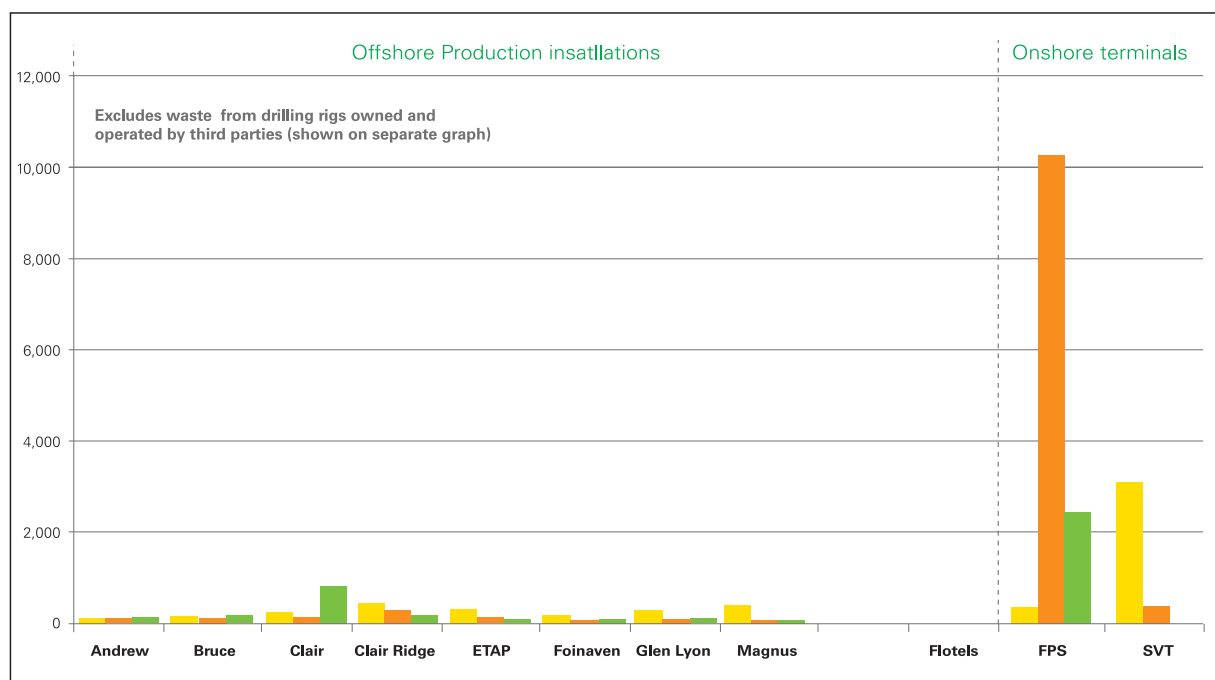


Figure 15: Non-special waste generated for operating facilities during 2017.

■ Recycled ■ Landfill ■ Treatment

5. Drilling specific environmental performance

The drilling of thirteen wells came to an end in 2017 and permit returns were filed with the regulator. This included, one well in the Arundel Field, six wells in the Schiehallion Field (West of Shetland) and four in the Clair Field (phase one). One exploration well was drilled in the Capercaillie Prospect in the Central North Sea, and one exploration well was drilled in the Achmelvich Prospect, West of Shetland.

As part of drilling and intervention operations, approximately 26,000 tonnes of chemicals were used of which, approximately 17,000 tonnes were discharged in accordance with environmental permits as shown in Figure 18 below. The majority of these chemicals were completion brines and water-based mud chemicals classified by OSPAR as posing little or no risk to the environment (PLONOR).

Drill cuttings and drilling chemicals (tonnes)

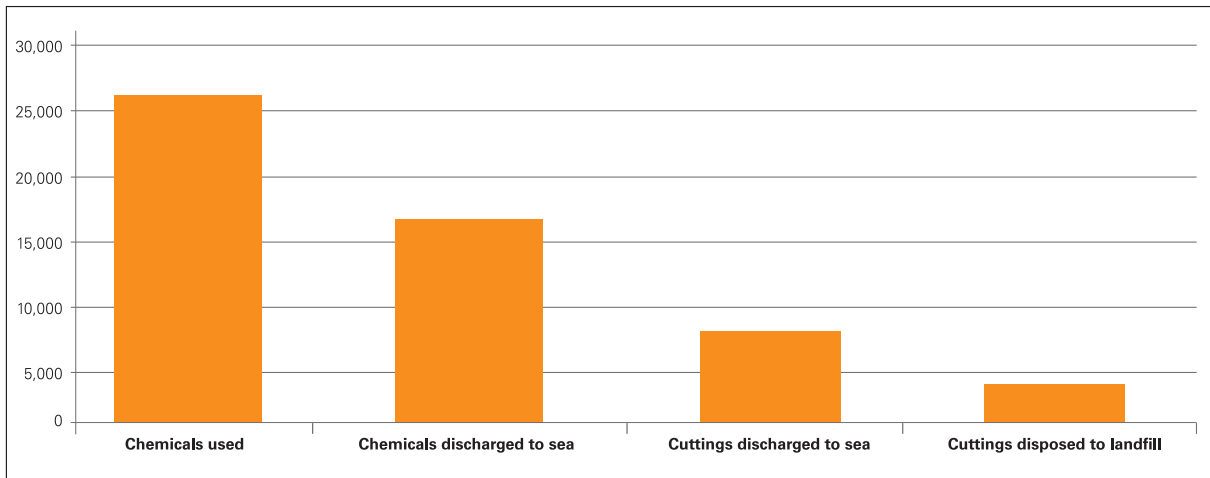


Figure 18: Total drill cuttings produced, and drilling chemicals used (tonnes). No drill cuttings were reinjected as part of our drilling activities during 2017

[Note: Includes drill cuttings and drilling chemicals associated with the completion of four wells on Clair]

Drilling waste includes special wastes such as hazardous completion, workover and drilling fluid additives. Non-special wastes are predominantly non-hazardous workover and completion drilling fluids and brines. In 2017, 56% of total drilling activity waste was either recycled or treated- see Figure 19 below.

Operational drilling waste from UK mobile drilling rigs owned and operated by third parties (tonnes)

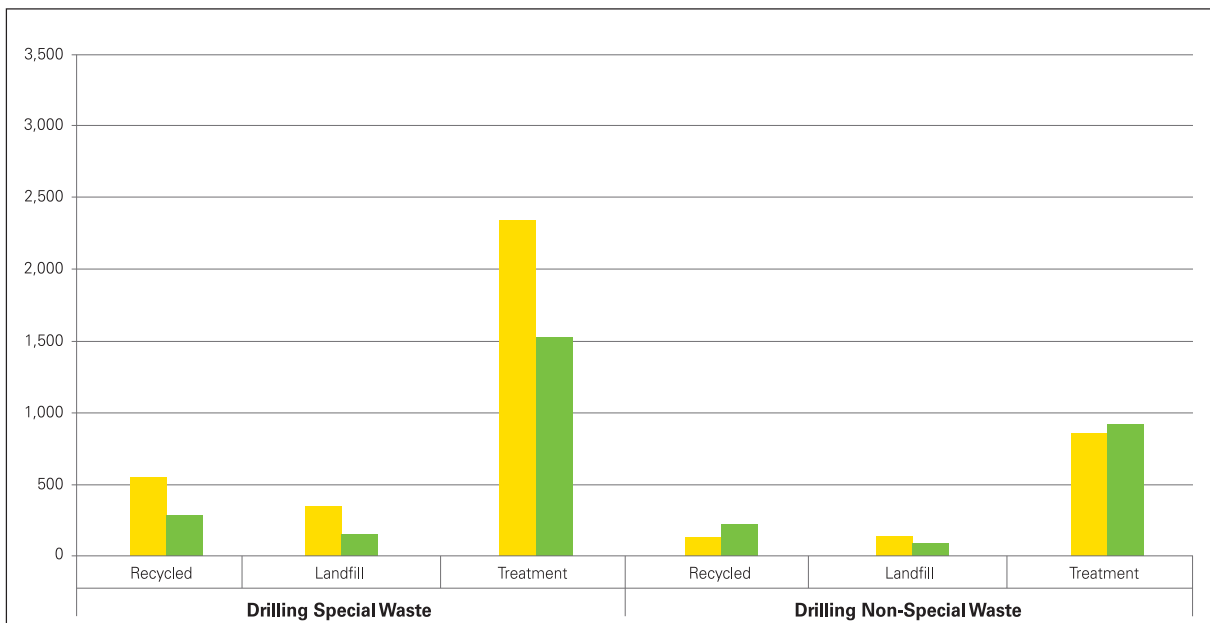


Figure 19: Special and non-special waste (tonnes) generated during drilling activity in 2017

■ Paul B Lloyd Jnr ■ Deepsea Aberdeen