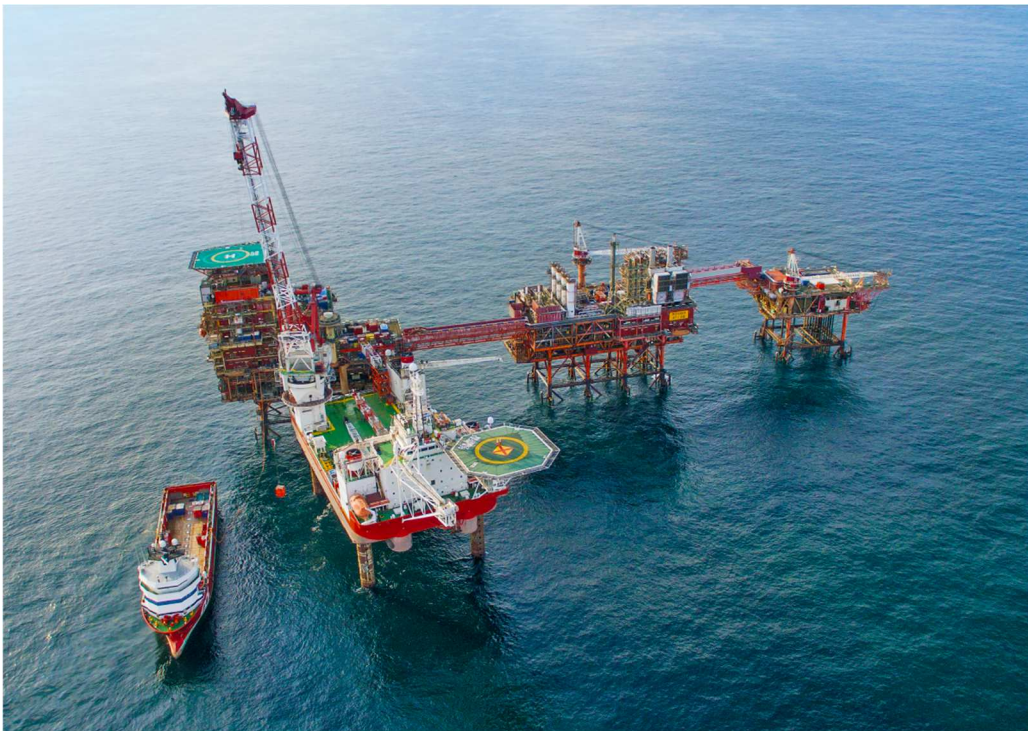


2018 Annual Environmental Performance – Rough Offshore Facilities



OLP/72/6

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1 Forward

In 2016, Centrica Storage Limited (CSL) conducted testing and verification work on all of the Rough field wells. After experiencing several issues associated with the integrity of the wells, during 2017 CSL made the decision to no longer operate the Rough field as a storage facility. CSL submitted a Field Development Plan Addendum and received approval to permanently cease Storage Operations and operate the Rough field as a Production Facility.

CSL now produces gas from the Rough field under a Production Licence. From Q4 2017 until November 2018, gas was extracted from the Rough field under its own pressure (High Pressure mode). From November 2018, the Rough Compressor at the Easington Gas Terminal has been used to extract gas from the Rough field (Medium Pressure mode). It is planned to operate in this mode until the end of 2019, then CSL will extract gas in a Low Pressure mode until the Cessation of Production.

After the decision was made to permanently cease Storage Operations, it was also decided to permanently withdraw the Rough 47/8 Alpha platform from service and start the preparations to decommission the platform. During 2018, Well Plug and Abandonment (P&A) work was initiated. The 47/8A wells are currently mechanically plugged. During 2019, a jack-up vessel will support Non-Permanently Attended Installation (NPAI) enabling works to enable the de-manning of 47/8A platform. Completion of decommissioning of the 47/8A platform will occur when the 47/3Bravo platform is decommissioned.

For all the above mentioned activities, environmental aspects and impacts were assessed prior to commencement of the work and monitored throughout, giving consideration to the whole life cycle impacts on resources to prevent pollution, reduce waste and ensure their efficient use.

Throughout 2018, as per the Centrica Environmental Policy (Appendix 1), CSL have continued to place a huge importance on their environmental responsibilities and continue to be committed to understanding, managing and reducing the environmental and ecological impacts of our activities through innovation, technology and cultural change. As part of this, CSL successfully transitioned from ISO 14001:2004 to the updated ISO 14001:2015 standard.

2 Executive Summary

Centrica Storage Limited owns and operates the Rough Gas Facilities which is located approximately 29 kilometres off the east coast of Yorkshire. The platforms are permitted to undertake regulated activities under a Production Licence, Consent to Vent, OPPC Permit, Chemical Permit, Greenhouse Gas Permit, PPC Permit and Consent to Locate. Under these permits and consents, CSL have the requirement to monitor, record and report emissions released to air and water. The amount and classification of waste is also required to be reported.

Throughout 2018, the Rough Offshore Facilities operated for 307 days. During this time, 1853.06 Mscm of gas was produced. There were three planned maintenance outages on the 47/3B platform during 2018; 18 May – 20 May, 1 September – 17 October and 1 November – 8 November. These outages allowed the Medium Pressure mode enabling works to be conducted and essential maintenance to be carried out to ensure the safety and integrity of the asset.

Releases to Air

Under the Greenhouse Gas Emissions Permit (UK-D-IN-13143) the Rough Gas Facilities released 17,814.8 tCO₂e during 2018. This is a 32 tonne increase on 2017 emissions, caused by greater diesel consumption in 2018 due to the outages.

Releases to Water

The 47/3 Bravo generated Produced Water on 307 days, with a total of 2907.6 m³ of Produced Water discharged to sea and 352.4 kg of associated oil.

The Produced Water was analysed for radioactivity on a quarterly basis. With no radiation detected from these analysis, it is considered that the Produced Water generated in 2018 was not radioactive.

All chemicals used were within permitted limits. Throughout 2018, the Rough Gas Facilities discharged a total of 490 Kg (permit limit - 2,556 Kg) of chemicals into the sea. All other chemicals used were returned to shore through the sealine.

Waste

The Rough Gas Facilities generated a total of 353 tonnes of waste throughout 2018, of which 67.8% (239.5 tonnes) was recovered (recycled or sent for treatment). From the total amount of waste generated, 202.9 tonnes was categorised as non-hazardous and 150.08 tonnes as hazardous waste.

Non-Conformities

CSL exceeded the maximum concentration for Oil in Water on 88 occasions and exceeded the Monthly Average Oil in Water concentration 5 times.

CSL submitted 19 PON1's in 2018 for the non-regulated release of oil to sea.

Throughout 2018, apart from the non-conformities mentioned above, all releases to the environment have been within the permitted limits set out by the various Permits and Consents under which the Rough Gas Facilities operate.

3 Introduction

3.1 Site Location & Operation

The Rough offshore gas field is located approximately 29 kilometres off the east coast of Yorkshire. The Rough Offshore Facilities comprises of the Rough 47/8 Alpha (two bridge-linked platforms) and Rough 47/3 Bravo (three bridge-linked platforms) complexes. The complexes are approximately 2 kilometres apart and are designed to produce gas from the reservoirs 30 wells.

During production, the nature of the reservoir results in some contamination with water and indigenous hydrocarbons, necessitating treatment (separation and dehydration) on the offshore platforms. Water and condensed hydrocarbons are removed by the offshore process prior to transmission via the 36-inch sealine to shore. The small quantities of produced water are discharged to sea and the condensed hydrocarbons are re-injected into the pipeline and carried ashore with the gas.

Corrosion inhibitor is injected on the 47/3B platform to prevent corrosion of the sealine. Hydrate inhibitor is also injected into the sealine pipe to prevent the build-up of hydrates. Effluent from the wet gas operation is received at the Terminal and tankered offsite to an effluent treatment plant.

3.2 Environmental Permits

The Rough Gas Facilities operate under the following permits.

3.2.1 Production Licence

At the beginning of 2018, CSL was operating under an Increase in Production Licence (IP/1273/0 (Version 2)), allowing CSL to remove an additional 34 BCF of native gas from the Rough field under the storage licence.

On 17 January 2018, CSL obtained and are now operating under a Long Term Production Consent (PCON/4517/0 (Version 2)) which permits CSL to extract gas from the Rough Gas Field until 31 December 2020.

3.2.2 Consent to Vent

The Consent to Vent (VCON/4652/0) permits CSL to dispose of unignited natural gas into the atmosphere won under the Rough Gas Field Petroleum Production Licence.

The purpose of venting under this consent is to

- facilitate the planned start-up, shut-down or maintenance of plant and equipment, or to ensure its efficient operation, or
- to protect plant, equipment or persons.

As venting is a loss of primary product, CSL endeavour to limit the amount of gas lost through venting.

3.2.3 OPPC Permits

The Rough Offshore Facilities operated under two Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 permits. These permits allow the discharge of oil in accordance with the arrangements described within the permit for the Rough AD platform (OLP/74/5 (Version 1)) and the Rough BD platform (OLP/72/6 (Version 1)).

3.2.4 Chemical Permits

During 2018, the Rough Offshore Facilities operated under two Offshore Chemicals Regulations 2002 permits, the 47/8A (CP/300/9) and the 47/3B (CP/197/12). The permits require that all chemicals used or discharged during the course of the operations are listed on the permit. Where chemicals are discharged to sea, the discharge is undertaken in accordance with the conditions detailed within the permit and appropriate measures are taken to minimise discharge.

For the P&A works, under a Well Intervention Operation, a third chemical permit (CP/1766/7) was applied for and approved. The chemical permit was valid between 9 October 2018 and 31 March 2019, with chemical usage to be reported by 30 April 2019.

3.2.5 Greenhouse Gas Permit

The Greenhouse Gas Emissions Permit (UK-D-IN-13143) authorises CSL to emit Carbon Dioxide through the combustion of natural gas, diesel, and Liquefied Petroleum Gases (LPG) from listed regulated activities. CSL are subjected to several conditions, including the monitoring and reporting of such emissions, and the surrendering of allowances and notification requirements.

3.2.6 PPC Permit

The Rough BD Platform operates under the Offshore Combustion Installations (Pollution Prevention and Control) Regulations 2013 Permit (PPC/70/3). The permit authorises the use of listed combustion equipment, ensuring that appropriate measures are taken to minimise discharges, emissions and waste. The permit sets limits on the total annual emissions of air polluting substances (Nitrogen Oxides, Sulphur Oxides, Carbon Monoxide, Methane and Non-Methane Volatile Organic Compounds) from the listed combustion equipment.

3.2.7 Consent to Locate

The Consent to Locate designates the geographic location of the platforms (47/8A – CP/151/1 and 47/3B – CL/150/6) and the aids required to ensure safe navigation of vessel at sea.

3.3 Environmental Management System

CSL have a certified ISO 14001 Environmental Management System which demonstrates our commitment and responsibility to understand, manage and reduce the environmental impact of our operations in a manner which protects the environment and its resources. The environmental management system is integrated within health and safety, as well as the business management activities. Central to the environmental management system is strong leadership, continuous enhancement and good performance baselines. Annual environmental improvement plans are developed to measure and report improvements. The environmental management system is audited internally and externally.

4 Emissions Monitoring

A condition of all the permits described in Section 3.2 is the monitoring and recording of emissions from the activities undertaken by the Rough Offshore Facilities. Throughout 2018, CSL have undertaken the required monitoring of all emission sources and ensured that all reporting requirements have been fulfilled. The following sections discuss the monitoring of each of these activities.

4.1 Releases to Air

Releases to air are emissions of Carbon Dioxide (CO₂), Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), and Methane (CH₄). The quantities of the above gases are calculated from the total volume of fuel gas used, diesel usage, gas vented, and an estimated release of fugitive emissions. The monitoring of emissions includes those from routine, non-routine and abnormal operations, and includes start-up, shut-down and emergency situations.

4.1.1 Fuel Gas Consumption

4.1.1.1 47/8 Alpha

There is no qualifying combustion equipment on the 47/8A platform therefore the platform is exempt from the EU Emissions Trading Scheme.

4.1.1.2 47/3 Bravo

The total fuel gas consumption and calculation factors for the 47/3B platform are metered at one fuel gas metering point. This metering point consists of two dual Micro Motion CMF300 coriolis meters and transmitters (FE562260 A & B) operating in duty/stand-by parallel configuration. Secondary pressure (PT562259) and Temperature (TT562262) are also used to calculate flow at reference conditions to provide compensation to raw mass flow rates for the ISO 6976/AGA8 flow calculations. Data from the meter is transferred to a dedicated FloBoss S600+ flow computer on a 5-minute cycle.

Gas composition is taken from continuous online gas chromatographs for AGA8 and ISO6976, NCV calculations, and a site-specific emission factor which are certified annually by an ISO17025 approved organisation. Monthly manual samples of Rough Fuel Gas, taken from the Terminal, are analysed by an ISO17025 certified laboratory. Uncertainty analysis of emissions factors is undertaken to ensure that the flow weighted monthly analysis is within the +/- 0.5% uncertainty threshold for EU ETS top tier monitoring of NCV and emissions factor.

The total CO₂ emissions is calculated using the ISO6976 methodology and is a product of gas combusted, a net calorific value (NCV), an emissions factor (EF) per unit of fuel used, and a standard oxidation factor (OF).

4.1.2 Diesel Consumption

Diesel is used for Power Generation during routine maintenance shutdown, the Heating Medium heater, firewater pumps and crane activities. Diesel on the platform is consumed in relatively small quantities compared to fuel gas usage. Consumption of diesel is considered to be equal to the amount of diesel bunkered on the platforms, therefore equal to the quantities recorded on the

bunker delivery notes. The density factor (0.8540 t/m³) used to convert litres to tonnes is obtained from the most recent Digest of UK Energy Statistics (DUKES), Annex A, Average conversion factors for petroleum found at: <https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes>

The NCV factor (42.5688 GJ/t) and Emissions Factor (74.9375 tCO₂/TJ) for diesel are taken from the UK GHG Latest UK inventory factors. These factors are sourced from the GOV.UK website at <https://www.gov.uk/guidance/participating-in-the-eu-ets#complying-with-the-eu-ets>

The total CO₂ emissions is calculated using the ISO6976 methodology and is a product of diesel combusted, a net calorific value (NCV), an emissions factor (EF) per unit of fuel used, and a standard oxidation factor (OF).

4.1.3 Venting

Venting of natural gas represents a loss of primary energy and the largest source of unburnt hydrocarbon emissions from the platforms. Venting of natural gas is required as a result of planned maintenance or blowdown situations. The amount of gas vented is recorded on the IMAC system.

4.1.4 Fugitive Emissions

Fugitive emissions are emissions of gas from pressurized equipment due to leaks, weeps and seeps, and other unintended or irregular releases from operating activities. These emissions cannot be measured; therefore it is considered that 48 tonnes of fugitive emissions are released every six months from the platforms.

4.2 Releases to Water

The releases to the surrounding sea are subject to the OPPC and Chemical permits. The discharge of these substances is controlled and emitted through dedicated emission points that are specified on the above mentioned permits.

4.2.1 Produced Water

4.2.1.1 47/8 Alpha

The Alpha platform does not generate Produced Water; therefore there are no requirements to monitor and sample Produced Water.

4.2.1.2 47/3 Bravo

Produced Water is water which is generated from the reservoir and is extracted along with the extraction of the gas. The water can be contaminated with hydrocarbons and Naturally Occurring Radioactive Material (NORM). The OPPC permit requires the sampling and reporting of oil content at least monthly, an analysis for NORM quarterly, and the in-depth bi-annual analysis of the water. The equipment used on 47/3B to process Produced Water before sampling and discharging to sea are described below.

- An Inlet Separator – this is a vertical 2-phase separator which acts as a sand trap to minimise sand erosion and blockage of the downstream equipment.
- An Injection Separator – this provides hold-up and separation for bulk liquids.

- Test Separator – allows liquid separation. Condensate will separate from the water phase and is then routed off.
- Off-Spec Condensate Vessel - a horizontal three phase separator with recently-installed baffles and inclined plate pack to assist oil-water separation.
- Oily Water Separator - is an inclined plate separator that separates hydrocarbons from the produced water.
- Oil Absorption Media Filter Package - removes any residual hydrocarbon from the water phase prior to discharge. The water samples for the required permitted analysis are taken from a sample point after the Oil Absorption Media Filter Package prior to discharge.

4.2.1.3 Oil in Water

Analysis of Oil in Water should use the OSPAR reference methodology for oil in produced water. However, this methodology requires the use of gas chromatography using a flame ionisation detector and n-pentane as an extraction solvent, which is unavailable on the platform. CSL use a simpler BEIS approved analytical methodology which is correlated against the OSPAR Reference Method.

4.2.1.4 Radioactivity

There is a requirement under the Radioactive Substances Act 1993 to determine whether produced water is radioactive as defined in Schedule 1 of Radioactive Substances Act 1993. For each Quarter, while generating Produced Water, a sample is taken and sent to Public Health England to undertake the analysis and detection of Polonium-210 (Pb-210), Actinium 228 (Ac-228) and Radium 226 (Ra-226). The analysis follows the fully documented procedures contained in CRCE Glasgow Radiochemistry Group Technical Manual.

4.2.1.5 Bi-annual Water Analysis

The bi-annual water analysis includes testing for the presence of Polycyclic Aromatic Hydrocarbons (PAH), BTEX chemicals (benzene, toluene, ethylbenzene and xylene), heavy metals, Phenols and Alkyl Phenols, Organic Acids, Oil in Water, NPD's (Napthalenes, Phenanthrenes, Dibenzothiophenes) and Inorganic compounds.

The purposes for undertaking the bi-annual water analysis is to build-up a regulatory database of information on the amounts of various constituents of produced water discharged to sea.

4.2.2 Chemical Permits

Under the Chemical Permits, all chemicals used are to be monitored and their usage recorded. The chemicals used are essential to the operation and are used sparingly and responsibly to ensure limited impact on the environment.

Apart from ZOK MX GS and Offshore Degreaser EF, which are discharged to sea, all other chemicals permitted and used on the Rough Offshore Facilities are returned through the 36-inch sealine pipe to Easington, to be treated ashore.

4.3 Waste

CSL have a Duty of Care and takes measures to ensure that all controlled waste generated on the Rough Offshore Facilities are treated, segregated, stored, and disposed in an appropriate manner to prevent the likelihood of pollution or harm to health. The Offshore 47/8 Alpha Garbage Management Plan (DOC-CSL-HSE-ENV-006a) and the Offshore 47/3 Bravo Garbage Management Plan (DOC-CSL-HSE-ENV-006b) provides a detailed description of how waste is managed on the platforms.

The waste generated on the platforms are separated into various waste streams but can be categorised into General/Industrial waste and Hazardous waste. The waste is transferred to the support vessel before been sent to shore to a treatment or disposal facilities. The transfer of waste is accompanied with appropriate transfer documentation.

5 Emissions Reporting

A condition of the Permits is the reporting of emissions from the regulated activities undertaken at the Rough Offshore Facilities. CSL have fulfilled its responsibility to report the 2018 emissions and below is a discussion of the Rough Offshore Facilities performance against the permit conditions. Trends, using historical data, have also been discussed.

5.1 Performance

Throughout 2018, the Rough Offshore Facilities operated for 307 days. During this time 1853.06 Mscm of gas was produced. Between 1 September 2018 and 16 October 2018, the Rough stream was offline which allowed an extended period of essential maintenance to be carried out to ensure the safety and integrity of the assets. Between 1 November – 8 November, the Rough stream was offline to enable works to be conducted in preparation for the commencement of Medium Pressure mode gas extraction.

5.1.1 Environmental Observations

CSL run an HSE Observation system which allows all employees and contractors to report activities which they may consider to be unsafe or may cause an incident which is harmful to personnel, the environment or plant. The observations are reviewed in a daily meeting by the OIMs, Supervisors, and HSE advisors. These meetings allow opportunity for discussions on safety and environmental themes and include any significant learning from monitoring activities, accidents and near misses.

During 2018, there were 8,818 observations raised on the platforms, of which 945 were directly related to environmental concerns. CSL consider that the number of observations raised in 2018 has had a direct contribution to the prevention of potential incidents.

5.2 Releases to Air

5.2.1 EU ETS Emissions

Through the combustion of fuel gas, diesel and LPG, Rough Gas Facilities released 17,814.80 tCO₂e during 2018.

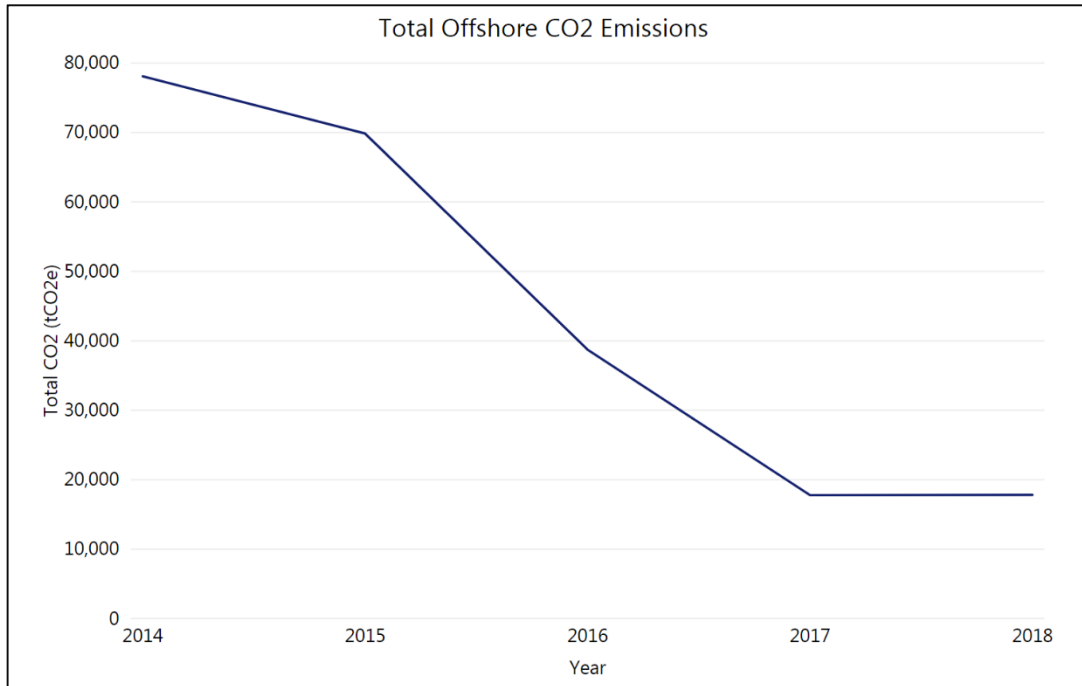


Figure 1: Annual CO₂ emissions from Rough Offshore Facilities.

There has been a reduction in CO₂ emissions since 2014, with the CO₂ emissions now plateauing (slight increase of 32 tonnes in 2018 from 2017 emissions). Due to large amounts of fuel gas combusted for inject operations, the trend in CO₂ emissions and gas injected was directly proportional. With the amount of gas injected reducing from 2014 until the cessation of storage operations in mid-2016, CO₂ emissions also reduced. Now that injection operations have ceased, it is now expected that CO₂ emissions will stay constant at 2017 & 2018 levels, however CSL are continuing to look for opportunities to further reduced CO₂ emissions.

Although overall CO₂ emissions have remained constant for the past two years, the amount of CO₂ emissions from the combustion of diesel as increased (Figure 2). From 2016 to present, there has been an increase in the number of days the RGT's have operated on diesel, instead of fuel gas.

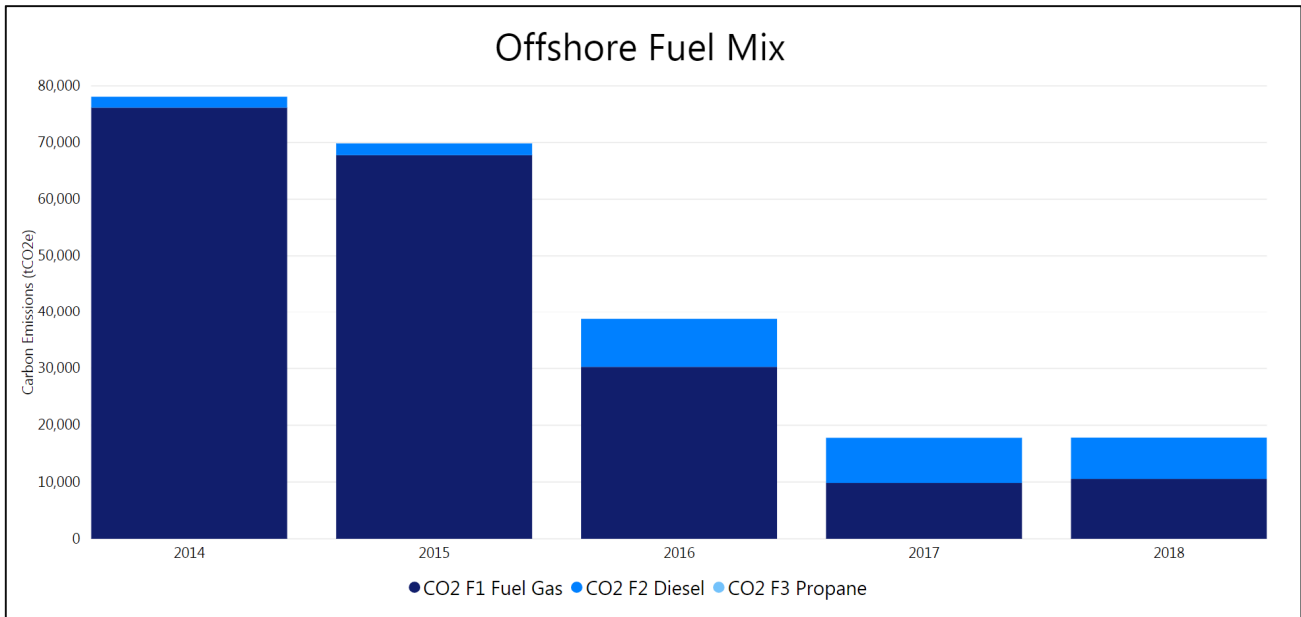


Figure 2. CO₂ emissions from the different fuel types.

5.2.2 Non-Greenhouse Gas Emissions

Through the operations on the Rough Gas Facilities the following releases were calculated.

5.2.2.1 Nitrogen Oxides (NOx)

There was a total of 54.15 tonnes of Nitrogen Oxides (NOx) released during 2018. The amount of NOx being released from the Rough Gas Facilities has declined since 2014. This is in line with the reduced use and removal of the RR Avon 1535-161 Gas Turbines, used for gas injection operations.

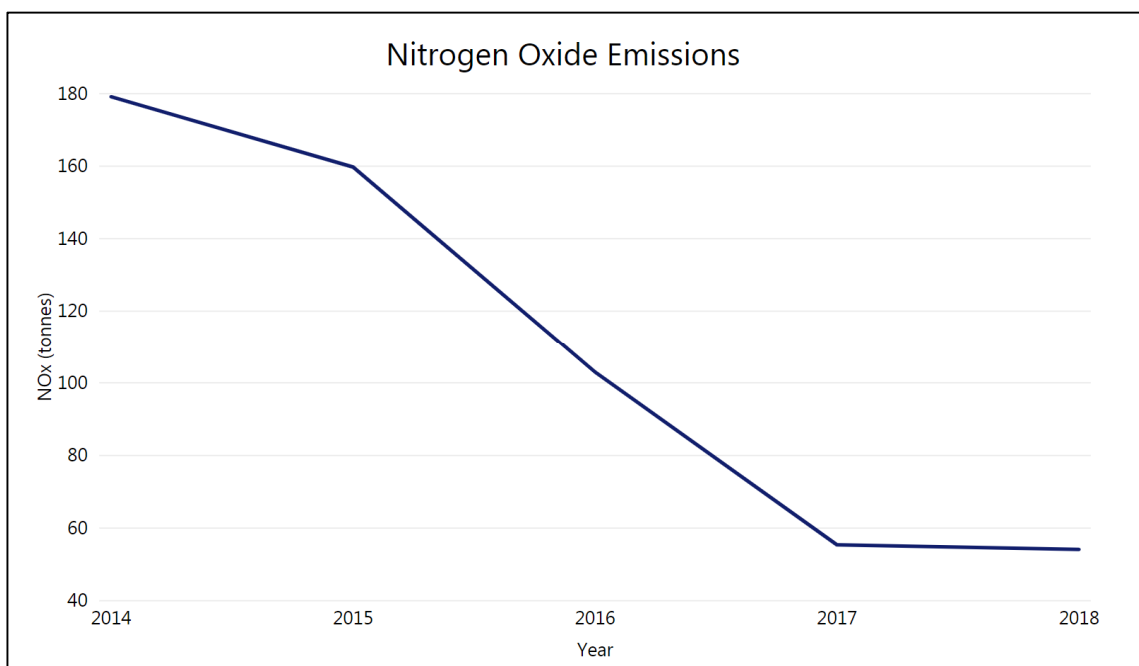


Figure 3. Nitrogen Oxides (NOx) released to the atmosphere in 2018.

5.2.2.2 Sulphur Dioxide (SO₂)

There was a total of 9.13 tonnes of Sulphur Dioxides (SO₂) released during 2018. The increase in SO₂ emissions in 2016 can be related to the increase in diesel usage previously discussed.

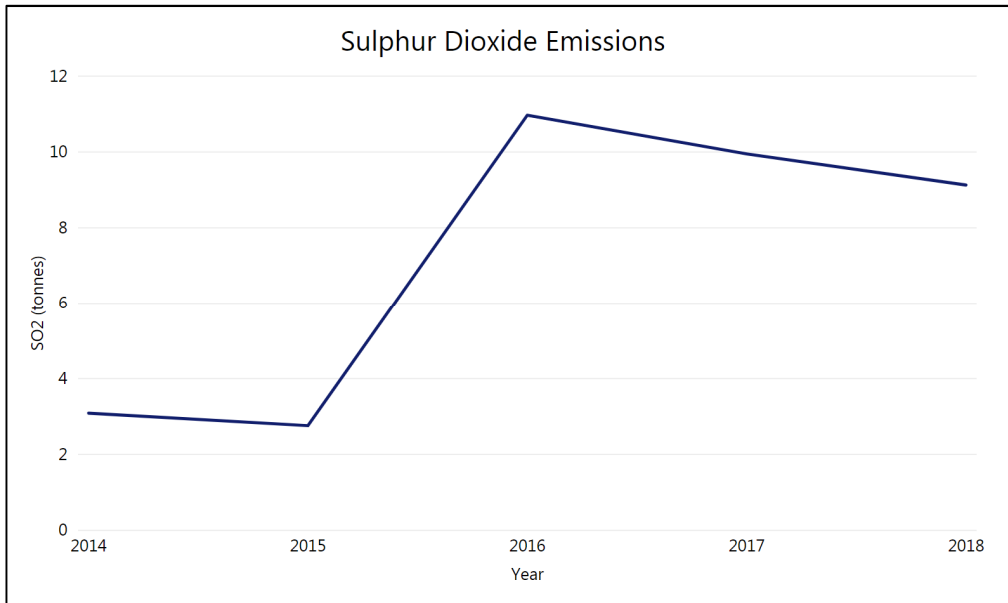


Figure 4. Sulphur Dioxide (SO₂) released to the atmosphere in 2018

5.2.2.3 Carbon Monoxide (CO)

There was a total of 13.53 tonnes of Carbon Monoxide (CO) released during 2018. The CO emissions continue to follow a downward trend following a spike in CO emissions in 2015.

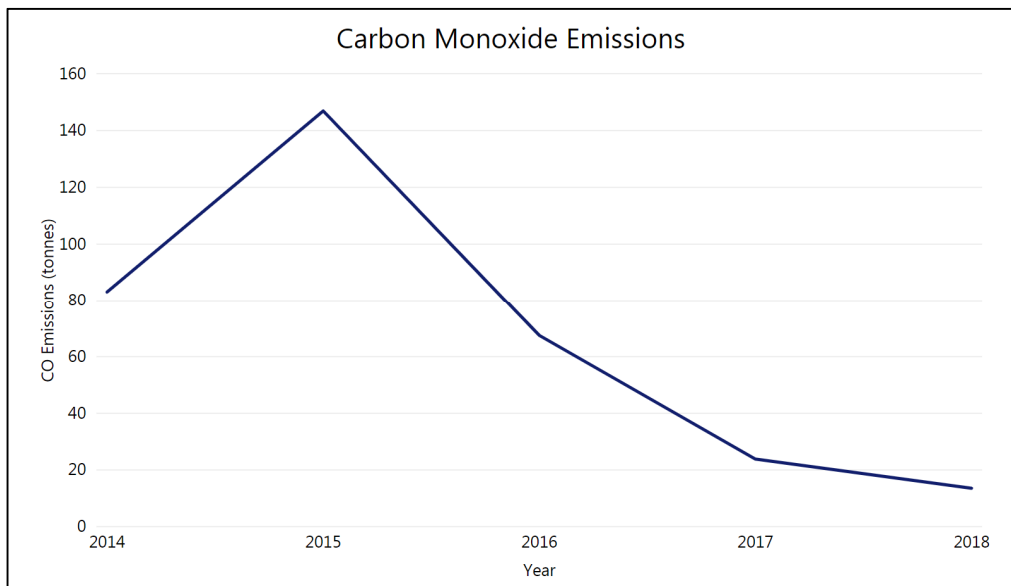


Figure 5. Carbon Monoxide (CO) released to the atmosphere in 2018

5.2.2.4 Volatile Organic Compounds (VOCs)

There was a total of 0.81 tonnes of Volatile Organic Compounds (VOCs) released during 2018. There has been a downward trend in VOC emissions since 2014, which is in line with overall reduction in fuel usage since 2014.

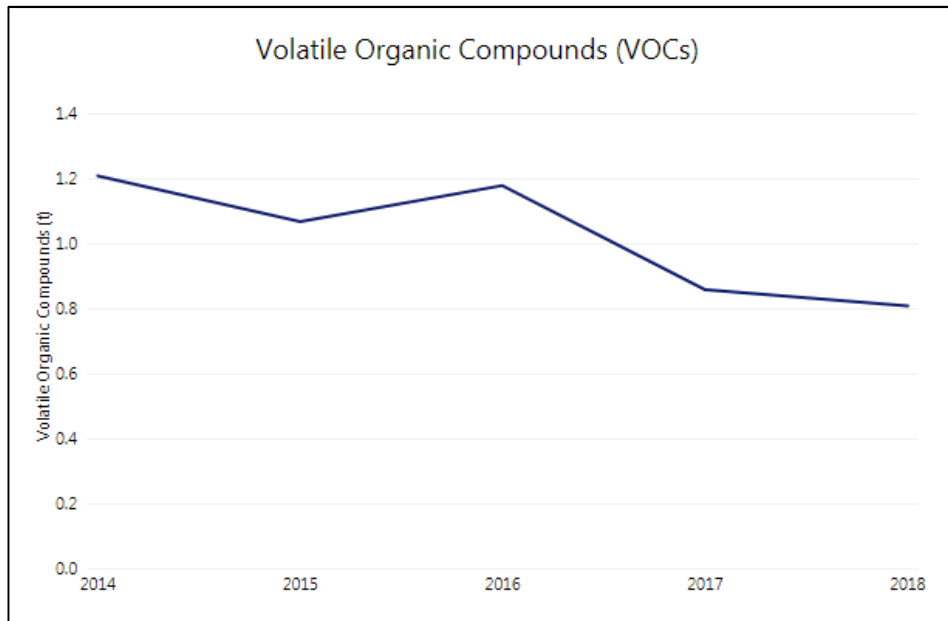


Figure 6. Volatile Organic Compounds (VOCs) released to the atmosphere in 2018

5.2.3 Methane Releases

Methane released is calculated by the amount of gas vented and the estimated amount of fugitive gas. During 2018 it was calculated that 363.47 t of methane was released into the atmosphere.

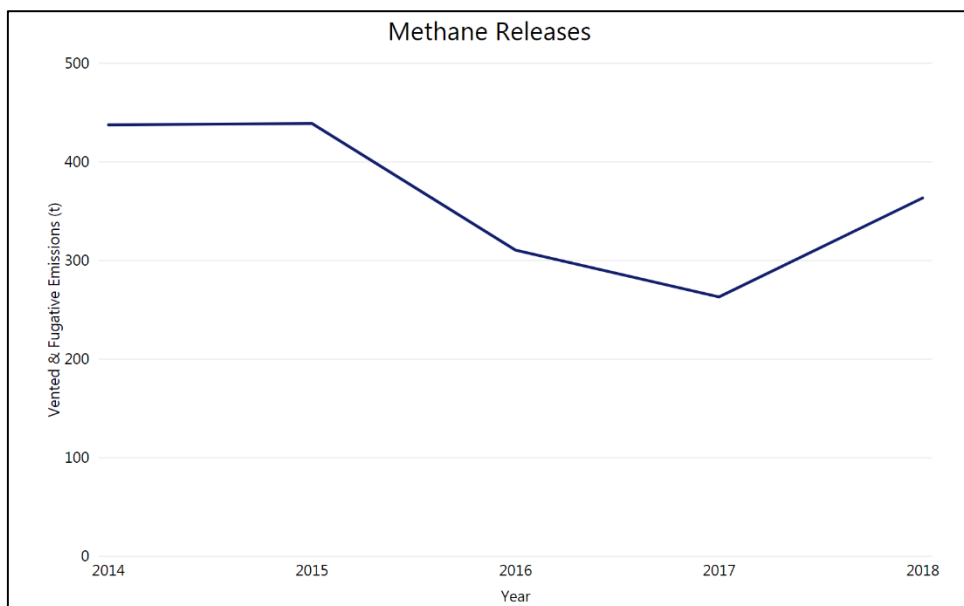


Figure 7. Methane released to the atmosphere in 2018

5.3 Releases to Water

5.3.1 Oil in Water Content

At the end of 2017, CSL applied for and obtained approval for a transition from storage to production operation licence. A review of the reservoir by a registered third party subsurface specialist, identified that with the production of native gas, produced water would continue to be generated at a rate which is constant to the gas production rate and it is considered very unlikely that there will be any significant influx of formation water. As production rates decrease throughout the life of the reservoir, so will the rates of produced water generated.

During 2018 the 47/3 Bravo produced gas on 307 days, of which, produced water was generated on 307 days. Throughout 2018, 2907.59 m³ of produced water was discharged to sea with 352.4 kg of associated oil.

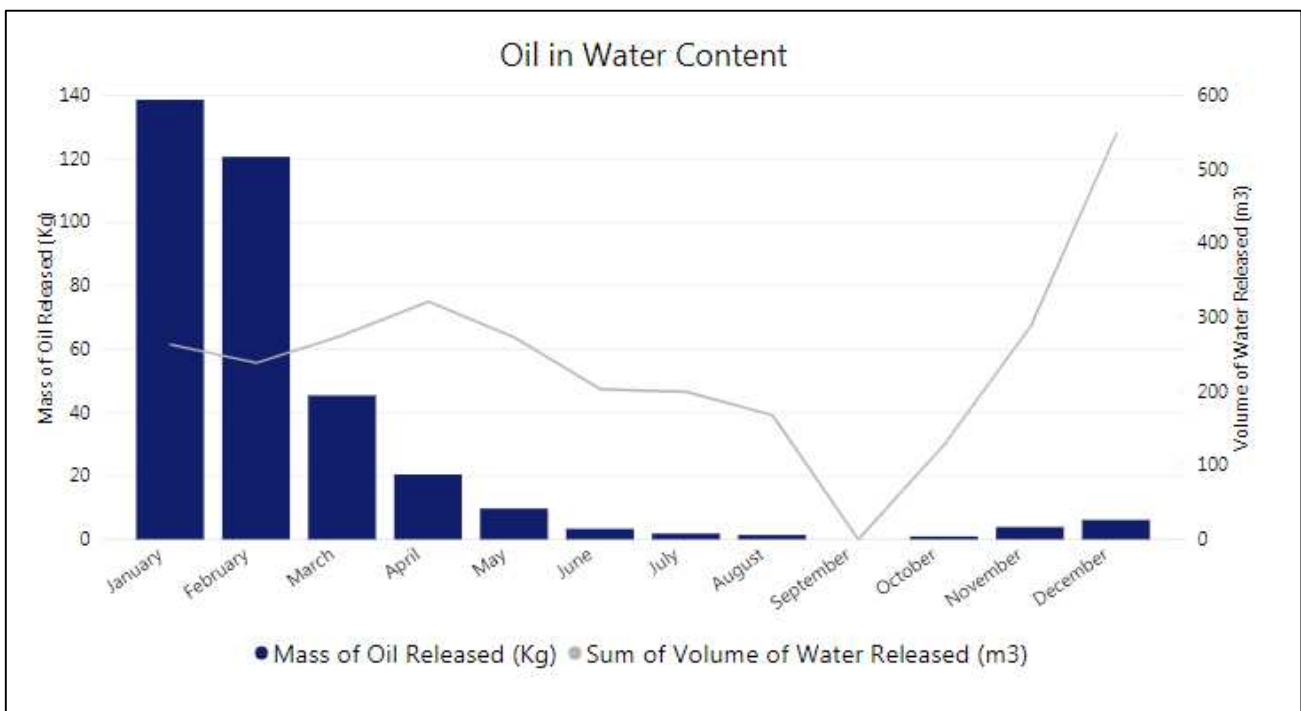


Figure 8. Monthly breakdown of Produced Water discharge and associated oil release.

When produced water was generated, samples were taken and analysed on the platform at least once per day by qualified production chemist. CSL have been compliant to the maximum concentration limit of 100mg/L since 3 April 2018 and compliant to the monthly concentration limit of 30mg/l since June 2018. For each exceedance, an OPPC non-conformance report was submitted to BEIS (see Section 6.1 for more details of the non-conformance).

5.3.2 Radioactivity

A Sample of Produced Water were taken once each quarter and sent to Public Health England to undertake analysis. Where radioactivity had been detected, the activity concentration was recorded. Where no radioactivity was detected, the laboratory limit of detection (LOD) was provided.

From the analytical results (Table 1), it can be seen that the LOD was recorded for all samples tested; therefore, produced water extracted from the Rough gas field in 2018 would not be considered to be radioactive.

Table 1. Summary of Radiation Analysis of Produced Water.

Quarter	Sample Date	Test Date	Tested Radioactivity Concentrations				
			Pb-210 (Bq/g)	Ac-228 in soluble (Bq/g)	Ra-226 in soluble (Bq/g)	Ac-228 in particulate (Bq/g)	Ra-226 in particulate (Bq/g)
Q1	14/01/18	31/01/18	0.0000050*	0.000040*	0.00040*	2.11*	8.52*
Q2	31/05/18	14/06/18	0.00000632*	0.000040*	0.00040*	2.57*	11.50*
Q3	28/07/18	13/08/18	0.00000501*	0.000040*	0.00040*	1.16*	4.79*
Q4	20/10/18	06/11/18	0.0000050*	0.000040*	0.00040*	0.146*	1*

*Laboratory Limit of Detection (LOD)

5.3.3 Bi-Annual Analysis of Produced Water

For the purposes of building up a regulatory database of information on the amounts of various constituents of produced water discharged to sea, for both halves of 2018, an accredited laboratory, on behalf of CSL, have undertaken a detailed analysis of Produced Water. The results of these analyses were reported on the UK Energy Portal.

5.3.4 Chemical Permits

5.3.4.1 47/8 Alpha

With the suspension of gas extraction on the 47/8 Alpha platform the only chemical used throughout 2018 was 45 Kg (permit limit – 1000 Kg) of Offshore Degreaser EF.

5.3.4.2 47/3 Bravo

Figure 9 shows the usage of Corrosion and Hydrate Inhibitors on the 47/3 Bravo platform. All chemicals were within the permit limit and were sent back to shore in the 36-inch sealine pipe. These chemicals are used to prevent the build-up of hydrates and corrosion in the pipeline.

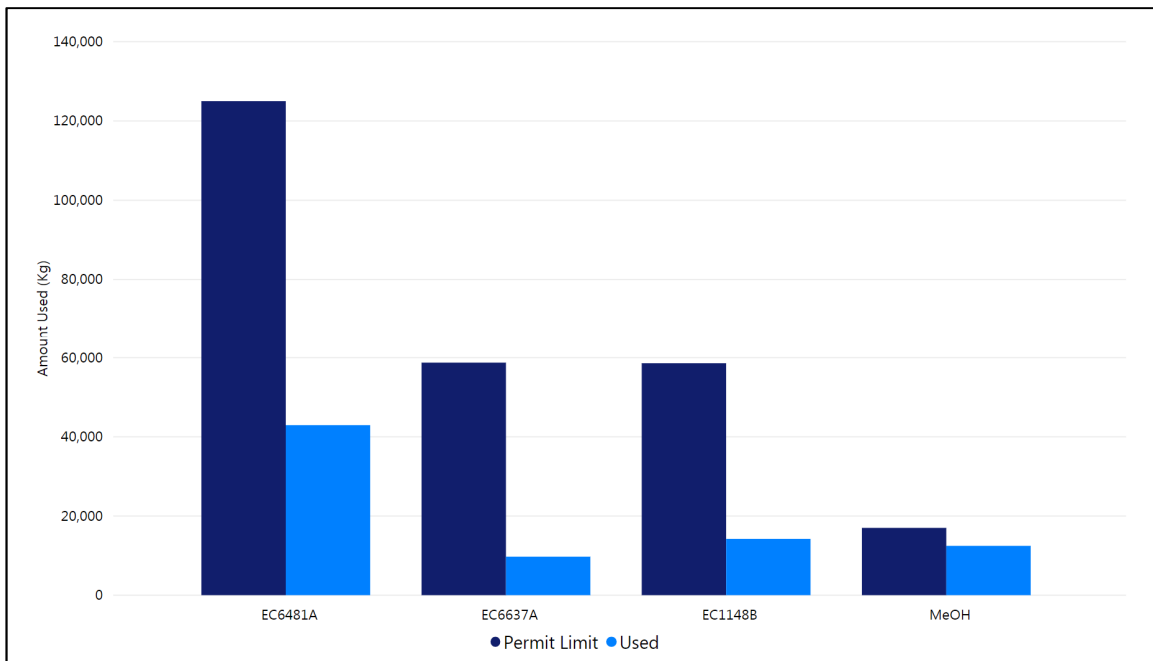


Figure 9. Corrosion and Hydrate Inhibitor usage on 47/3 Bravo.

Figure 10 shows the usage of wells chemicals and deck cleaning fluids. All chemicals were within the permit limits. A total of 445 Kg of chemicals (ZOK MX GS, Offshore Degreaser EF) were discharge to sea throughout 2018. Under the permit, a maximum of 1,556 Kg of chemicals were permitted to be discharged to sea.

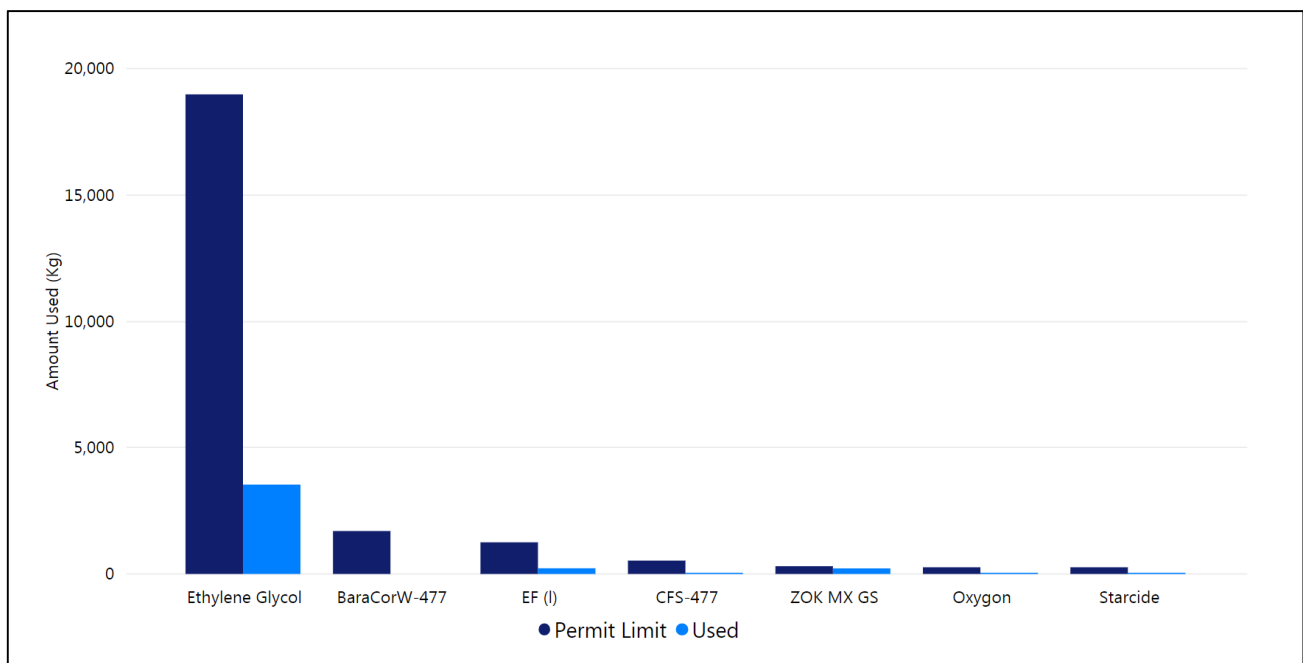


Figure 10. Wells and Deck Cleaning Fluids chemical usage on 47/3 Bravo.

5.4 Waste

5.4.1 Total Waste Generated

The total amount of waste generated offshore throughout 2018 was 396.63 tonnes. There has been an increase of waste generated in 2018 as a result of P&A work conducted on 47/8 Alpha.

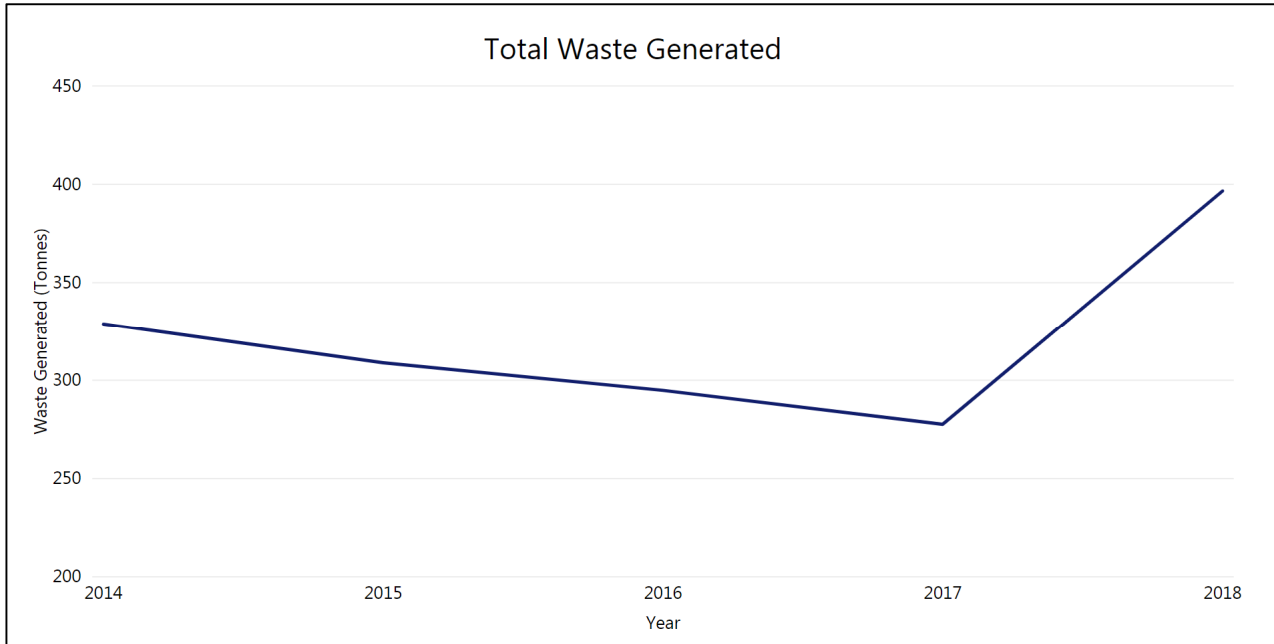


Figure 11: Total waste generated from the Rough Offshore Facilities (2014-2018)

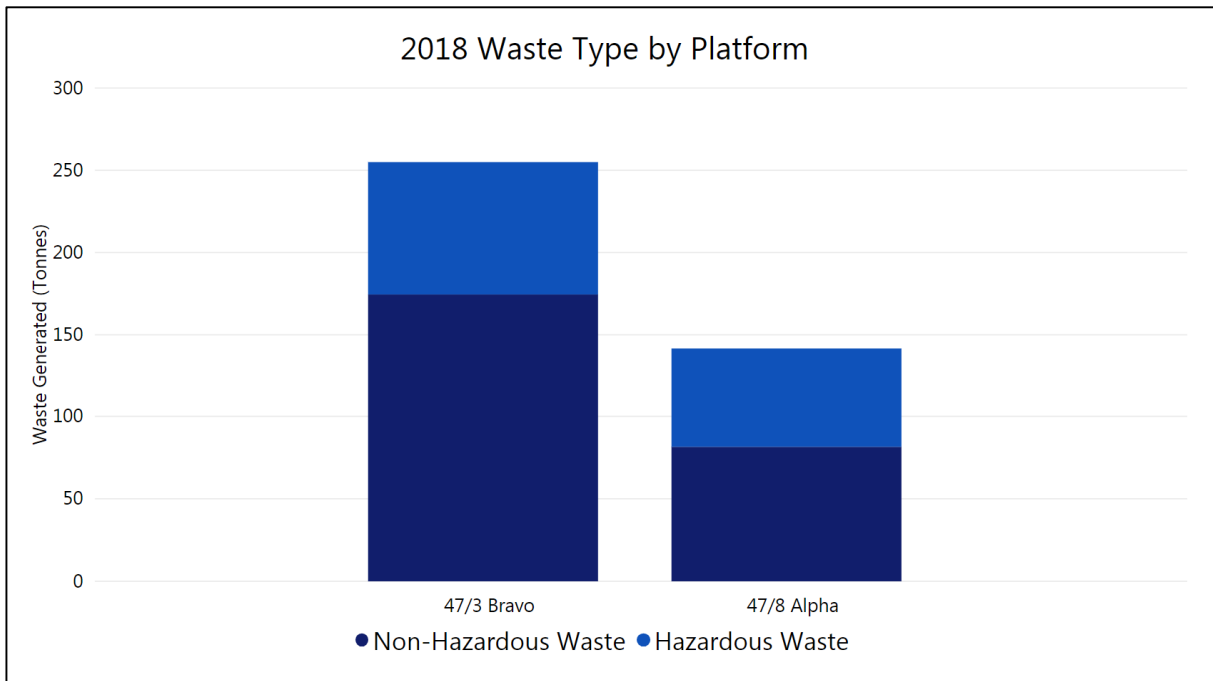


Figure 12: Hazardous waste and non-hazardous waste generated from the Rough Offshore Facilities (2018)

5.4.2 Final Disposal/Recycling

Waste generated on the platforms are transferred to the support vessel to be offloaded ashore where it then goes to appropriate waste facilities. This waste is separated into either final disposal or recycled. Of the total amount of waste generated, 362.93 tonnes was recycled (90%) in 2018.

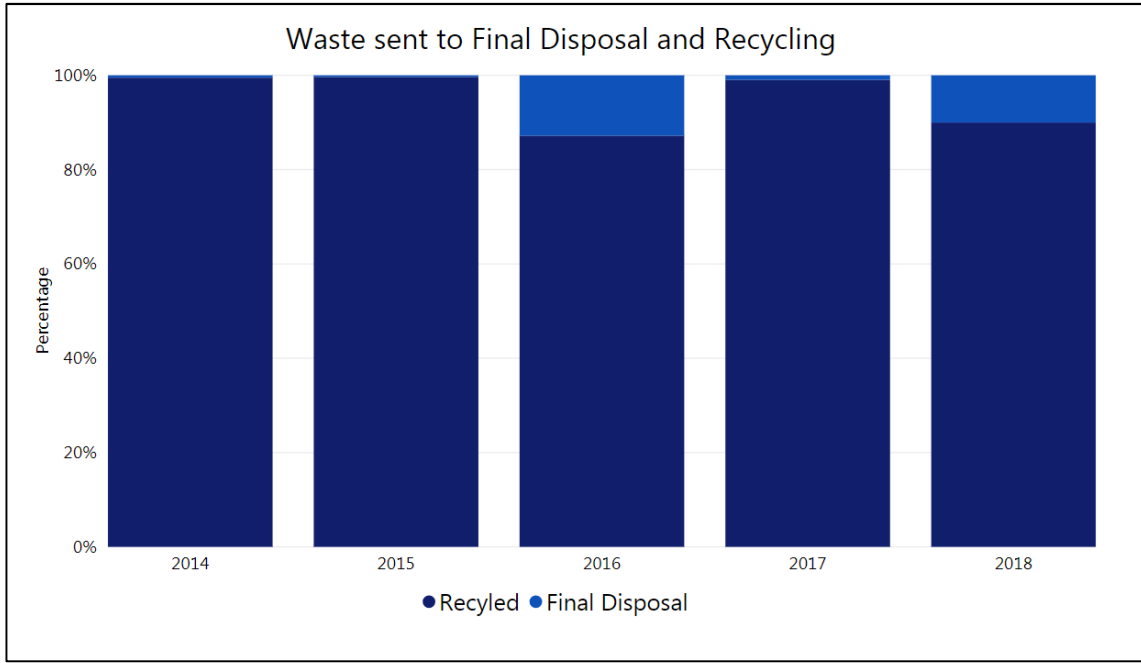


Figure 13: Breakdown of the final destination of generated waste from the Rough Offshore Facilities.

5.4.3 Non-Hazardous/Hazardous Waste

The waste which leaves the platforms can also be categorised as non-hazardous or hazardous waste. Out of the total waste generated, 256.59 tonnes was categorised as non-hazardous and 104.05 tonnes as hazardous waste. Since 2014, the amount of hazardous waste generated on the platforms has continued to decrease, however 2018 has seen a slight increase due to the P&A works.

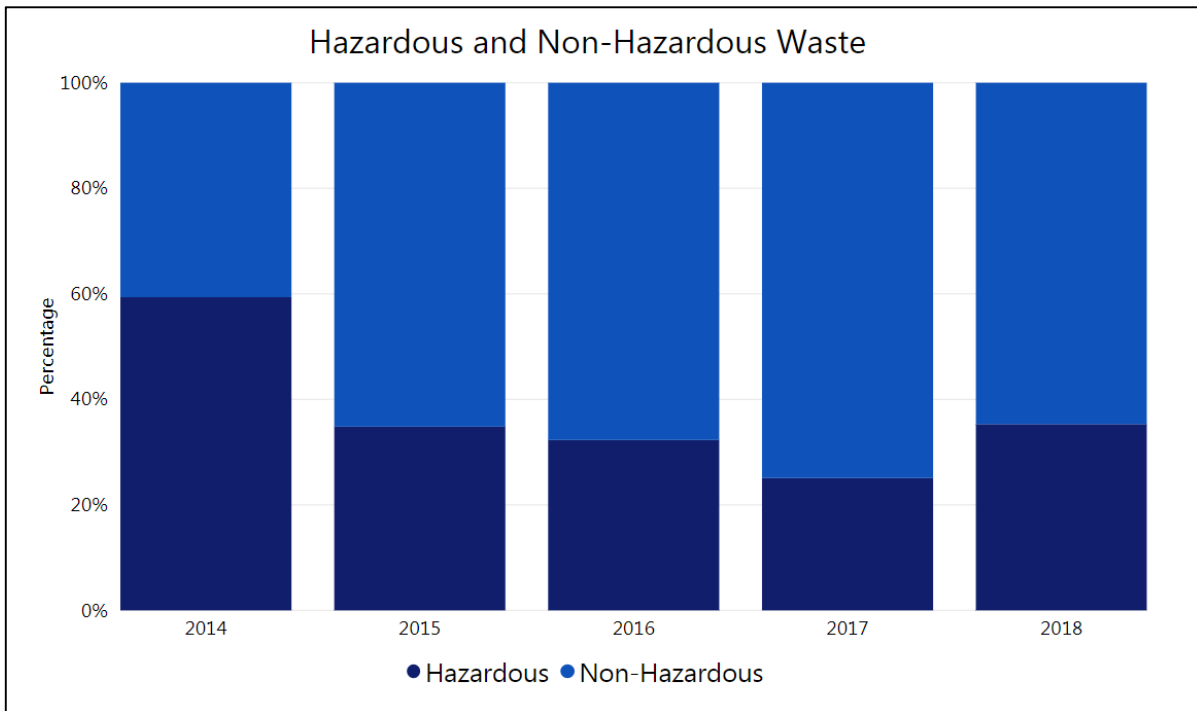


Figure 14: Historical Non-Hazardous and Hazardous Waste generated from the Rough Offshore Facilities.

6 Non-Conformities

Throughout 2018, CSL have reported a number of non-conformities to the Regulator and are discussed below.

6.1 Oil in Water

During 2018 the 47/3B platform produced gas on 307 days, of which, produced water was generated on 307 days. Out of the 307 days that produced water was generated, CSL exceeded the maximum concentration limit of 100mg/L on 88 days and monthly concentration limit of 30mg/l on 5 occasions. For each exceedance an OPPC non-conformance report has been submitted to BEIS.

Table 2 shows the monthly breakdown of the number of days produced water was generated, the number of maximum concentration non-conformities and the monthly oil in water average.

Table 2. Summary of Oil in Water non-conformities.

	No. of Days Online	No. of Days Produced Water Generated	No. of Days of Maximum Concentration Non-Conformities	Oil in Water	
				Monthly Average (mg/L)	Mass of Oil Released (Kg)
January	31	31	31	526.60	138.66
February	28	28	28	505.37	120.66
March	30	30	26	164.47	45.40
April	30	30	2	63.64	20.46
May	29	29	1	35.59	9.72
June	30	30	0	16.34	3.32
July	31	31	0	9.23	1.84
August	31	31	0	8.21	1.38
September	0	0	0	0	0.00
October	15	15	0	7.17	0.92
November	22	22	0	13.50	3.88
December	30	30	0	11.16	6.12
Annual Total	307	307	88		352.36

In January 2018, to try and ensure compliance to the OPPC permit limits, CSL engaged a third-party consultant who specialised in produced water treatment technology. In parallel with this, CSL undertook a wider review of treatment and disposal options by revisiting a previous 'Pre-Feed and BAT Assessment Study' carried out in August 2016. This was in light of the change in business direction from Gas Storage to Production. The review was to identify options that had become available as a Production facility, which were not available as a Storage asset.

During 2018, CSL saw a marked improvement in their OIW performance and have been consistently compliant to the maximum concentration emission limit of the OPPC permit since 3 April 2018, apart from on 20 May 2018 after a 60-hour shutdown. CSL have also been compliant to the monthly average emission limit since June 2018.

The improvement in performance was attributed to a number of factors.

Lower topsides operating pressure. With the reduction in Reservoir pressure, this has led to reduced shear and formation of a looser emulsion resulting in improved efficiency of the Off Specification Condensate Vessel plate pack. By November 2018, Medium Pressure Operations commenced, with the topsides pressure starting at 40 barg and been gradually reduced.

Multiple production train operation. The number of separators operated has a correlation with Oil in Water (OIW) performance. There was a large decrease in OIW performance in March 2018 when operations transition from 1 to 2 separators and a further decrease in April 2018 when operations transition from 2 to 3 separators.

Well performance. Wells are likely to produce additional liquid and sand immediately after choke opening, as accumulated fluids around the wellbore are displaced. CSL have experienced stabilised well production throughout 2018 with all available wells been kept online for a number of months, therefore any major transient effects have been reduced. Minimising well shut-in duration, where possible, has also reduces liquid surges on restart. This has been further managed by gradual opening the choke on start-up.

Increasing water cut. Increased water cut (~50% to 70%) has led to lower viscosity and a less stable emulsion, resulting in a 5-fold decrease in emulsion viscosity leading to improved separator performance.

6.2 PON1's

In 2018, CSL submitted 19 PON1's to BEIS with regards to non-regulated oil releases to sea. A review of these submissions is below:

Table 3. Summary of submitted PON1's during 2018.

Date	PON1 Ref	Category	Description	Min Quantity Released	Max Quantity Released	BEIS Status
12-Mar-18	PON1/7169	Oil Release	Whilst discharging fuel to the CD platform it was noticed that a small amount of fuel was going into the spill saver from the vessels drain line. The valve had been checked before commencing fuel and as soon as the leak was noticed the fuel was stopped and the valve rechecked. After slightly opening and closing the valve a couple of times the leak stopped. The leak was into the vessels spill saver but due to the vessels movement a small amount splashed onto the deck and some of this got washed over the side	0.000019 tonnes	0.000001 tonnes	No Further Action Required
30-Mar-18	PON1/7218	Oil Release	Highly likely this is the "mystery sheen" due to the tide patterns, mode of operation being production as previously reported.	0.000001 tonnes	0.000021 tonnes	No Further Action Required
15-Apr-18	PON1/7263	Oil Release	Small leak of annuli fluid from C4	0.000025 tonnes	0.000249 tonnes	No Further Action Required
19-May-18	PON1/7370	Oil Release	AWH-15 Hydraulic Oil from CD East Brisco Panel Accumulator V-802210. At the time of the incident there was no spill of hydraulic oil to sea as was contained on the platform. 24 hours later residual oil from the structure was observed on the sea following rain / fog	0.000110 tonnes	0.000125 tonnes	No Further Action Required
20-May-18	PON1/7369	Oil Release	Broke connection on the annuli overboard drain / bleed pipework and residual oil drained and contained.	0.000220 tonnes	0.000235 tonnes	No Further Action Required
23-May-18	PON1/7382	Oil Release	Natural gas condensate drip from B9 production hydraulic actuator	0.000026 tonnes	0.00001 tonnes	No Further Action Required
02-Jun-18	PON1/7410	Oil Release	Bucket had become full of rain water, causing slow drip to sea. Oily/water waste sitting on top of bucket and spilling over.	0.001 tonnes	0.00 tonnes	No Further Action Required

26-Jun-18	PON1/7492	Oil Release	The source of the sheen/droplets was traced back to the BP crane upper gantry. At the time of the observation the platform was in thick fog, water droplets picked up residual diesel from the crane structure and fell to sea.	0.0001 tonnes	0.00001 tonnes	No Further Action Required
27-Jun-18	PON1/7496	Oil Release	A small leak of hydraulic oil from BP crane hydraulic pipework.	0.000049 tonnes	0.000005 tonnes	No Further Action Required
07-Jul-18	PON1/7544	Oil Release	Failure of hydraulic component on BP crane	0.000259 tonnes	0.000023 tonnes	No Further Action Required
21-Jul-18	PON1/7668	Oil Release	Loss of hydraulic oil from flushing equipment accumulating in the void space under gas turbines	0.000090 tonnes	0.000110 tonnes	In Review
13-Aug-18	PON1/7583	Oil Release	Minor subsea release, cause unknown	0.000077 tonnes	0.000005 tonnes	In Review
19-Aug-18	PON1/7687	Oil Release	Oily residue on the BD well bay decks has washed over the side during wet deluge testing and into the sea.	0.000306 tonnes	0.000041 tonnes	In Review
20-Aug-18	PON1/7692	Oil Release	A sheen was spotted on the west side of the platform running towards the BD jacket. The sheen passed under the BD jacket and away to the east.	0.000102 tonnes	0.000014 tonnes	In Review
23-Nov-18	PON1/7989	Oil Release	Unpermitted release of drainage water from the BD Drains Tank through operational activities	0.000536 tonnes	0.0 tonnes	In Review
26-Nov-18	PON1/7997	Oil Release	Unpermitted release of drainage water from the BD Drains Tank through operational activities.	0.0001857 tonnes	0.0 tonnes	In Review
28-Nov-18	PON1/8005	Oil Release	Unpermitted release of drainage water from the BD Drains Tank through operational activities.	0.0001857 tonnes	0.0 tonnes	In Review
22-Dec-18	PON1/8072	Oil Release	Unpermitted release of drainage water from the BD Drains Tank through operational activities.	0.0001857 tonnes	0.0 tonnes	In Review
22-Dec-18	PON1/8076	Oil Release	Deluge testing caused tank to overflow	0.000425 tonnes	0.000026 tonnes	In Review

7 2018 Audits

During 2018, a number of environmental audits were undertaken on the Rough Gas Facilities. An internal ISO 14001 audit was undertaken in September 2018. There were a number of findings found throughout the audit, mainly focusing on procedural improvements. Corrective actions have been identified and implemented to close out these findings.

An external ISO14001 audit to determine continued ISO 14001 Certification was completed in December 2018. From this audit there were three minor non-conformities observed and three observations documented which were specific to the offshore operations. The minor findings were based on procedural review and obsolete documents. Corrective actions to address all findings and observations have been identified and completed.

Both internal and external EU ETS verification audits were undertaken in November 2018 and December 2018 respectively. From the audits, it was observed that some procedural updates were required. The necessary corrective actions were identified for all findings and were implemented prior to the data submission.

8 Future Activities

In 2018, CSL received approval to permanently cease Storage Operations and operate the Rough field as a Production Facility. At the beginning of 2018, CSL extracted gas from the Rough field under its own pressure. From November 2018, gas has been extracted, with the assistance of the Rough Compressor at the Easington Terminal, in a Medium Pressure mode. This is due to continue until the end of 2019, when CSL will produce gas in a Low Pressure mode until the Cessation of Production, again with the assistance of the Rough Compressor.

After the decision was made to permanently cease Storage Operations, it was also decided to permanently withdraw the Rough 47/8A platform from service and start the preparations to decommission the platform. During 2018, Well P&A work was initiated, with the wells currently mechanically plugged. In May/June 2019, a jack-up vessel will support Non-Permanently Attended Installation (NPAI) enabling works. At the completion of this work, the 47/8A will be de-manned, with the plan to fully complete decommissioning at the same time as the 47/3B decommissioning.

9 Summary

During 2018, CSL produced 1853.06 Mscm of gas from the Rough Gas Facilities and exported it into the NTS. The production of gas was in accordance with the regulated activities described within the Permits and Consents under which CSL operate.

CSL have reported 93 OPPC permit non-conformances to the regulator during 2018. As part of the continuous investigation into the causes of these exceedences and exploring various options to resolve the issues, CSL engaged specialists (CETCO and Ingen) to identify improvement opportunities.

CETCO undertook a characterisation and treatability study and Ingen revisited the 2016 Pre-Feed and BAT Assessment Study. Recommendations were made from these studies, however, the changes made to operational conditions has a Production facility has led to improvements in OIW performance. CSL continue to monitor operations, and make the necessary adjustments to operations, to ensure OIW performance remains within the OPPC limits.

In 2019, CSL will continue to endeavour to operate within permitted limits and look for opportunities to improve their environmental performance and reduce their environmental impacts.

Appendix 1: Centrica Health, Safety, Environment and Security Policy

Centrica Health, Safety, Environment and Security Policy

At Centrica creating an incident free workplace is our top priority. All employees and business partners are required to comply with this policy and our commitments outlined below.

We are committed to:

- **Assessing**, understanding and managing our HSES risks and impacts
- **Enabling** the creation of a positive culture holding each other accountable, helping us to: achieve our HSES goals; support business growth; and realise our vision of an incident free workplace
- **Proactively** supporting employee health and safety, seeking ways to protect the environment, including the prevention of pollution, efficient use of resources and the reduction of waste and carbon emissions
- **Empowering and encouraging** personnel to work in a safe way
- **Helping our customers** to move towards a low carbon future through our products and services
- **Intervening** if we believe that the work environment or task is unsafe or may cause environmental damage, or we see an unsafe act
- **Learning** from our successes and incidents, and freely sharing lessons with business partners
- **Working with stakeholders**, suppliers and business partners in the pursuit of good practice in HSES
- **Continually improving** and setting measurable objectives and targets in business plans to enhance HSES performance
- **Developing** and testing prioritised incident response and recovery plans to protect our people, the environment and minimize business impact
- **Ethically conducting our business** and complying with regulatory and other applicable requirements

Our HSES management system enables the delivery of these policy commitments, is structured in line with recognised good practice, and is routinely assured. Independent certification to ISO 14001 is maintained for our environmental material operations.

Our performance is reviewed regularly and relevant results published.



Iain Conn
Group Chief Executive
January 2018