OSPAR COMMISSION

Assessment of the discharges, spills and emissions from offshore oil and gas operations on the United Kingdom Continental Shelf 2009 – 2013

Offshore Industry Series

2015

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. The Contracting Parties are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. Les Parties contractantes sont l'Allemagne, la Belgique, le Danemark, l'Espagne, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède, la Suisse et l'Union européenne.

Contents

Executive Summary

This report presents the discharge, spill and emission data for UK offshore oil and gas operations during the period 2009 – 2013 and provides an assessment of that data. The annual data on which the assessment is based is provided in Annex 1.

a. Level of activity

The United Kingdom Continental Shelf (UKCS) is a mature oil and gas province within the OSPAR region which is experiencing declining production. Despite this there is a high level of oil and gas activity to maintain production levels and maximise economic recovery of reserves, which is reflected in the increasing number of subsea developments and the high level of drilling activity, at least up until 2012.

The total production of hydrocarbons from the UKCS decreased by 36% during the period 2009 – 2013. Despite this there has been a 23% increase in the number of oil and gas installations, with the greatest increase in the number of subsea installations.

b. Discharges & spills of oil

The total quantity of dispersed[1] oil (aliphatic oil) discharged to the sea from produced water and displacement water decreased during the period 2009 – 2013, from 2900 tonnes in 2009 to 2176 tonnes in 2013, a decrease of 25%.

As in previous years, produced water and displacement water are the main contributors to the oil discharges from offshore oil and gas activities, representing 97-98% of the total amount of oil discharged to the sea during the period 2009 – 2013. Flare drop-out is a minor source of oil discharge and is not covered by OSPAR measures, though it is reported in the UK as a spill should it occur.

It should be noted that dispersed oil in displacement water contributes only 1 – 4% of the total.

The annual average dispersed oil content in produced water has remained relatively stable over the period from 14.8mg/l in 2009 to 14.6 mg/l in 2013, with a peak in 2010 of 15.2 mg/l, but all well below the current performance standard for dispersed oil of 30 mg/l for produced water discharged into the sea.

Despite efforts made to reduce the number of installations which exceed the standard, there are still 14 installations which raise concern; however, the amount of oil discharged from 12 of these installations in excess of the performance is less than 2 tonnes. In total the discharge of dispersed oil in excess of the standard is 3.5% of the total discharge of dispersed oil in the UKCS.

Spills of oil to sea have varied over the period as might be expected ranging from 23 tonnes to 101 tonnes. There is no apparent trend in the data.

c. Chemicals

The use and discharge of chemicals have been regulated by OSPAR and UK national legislation since 2001, with the first national reports provided for 2003. The total quantity of chemicals used offshore

[1]. “Aliphatics” and “aromatics” are defined by the reference method set in OSPAR Agreement 1997-16 (Solvent extraction, Infra-Red measurement at 3 wavelengths). In that context, “aliphatics” and “dispersed oil” mean the same thing.

decreased during the period 2009 – 2013. On average, significantly less than 1% (by weight) of the total amount of chemicals used contains either substances on the OSPAR List of Chemicals for Priority Action (LCPA) or substances which are candidates for substitution.

The total quantity of chemicals discharged into the sea during the period 2009 – 2013 decreased from 127 509 tonnes to 82 813 tonnes and, on average 84% (by weight) of the chemicals discharged are on the OSPAR PLONOR list[2]. Less than 2% (by weight) of the chemicals discharged contain LCPA substances or candidates for substitution.

OSPAR Recommendation 2005/2 set environmental goals for the reduction of discharges of LCPA substances, and discharges were to be phased out by 2010. This was achieved in the UK by 2012. This compares well with the 97% reduction over the same period across the OSPAR area.

OSPAR Recommendation 2006/3 set environmental goals on the phasing out of discharges of chemicals that are, or which contain, substances identified as candidates for substitution[3] by 2017. In the UK the discharge of such substances reduced by over 42% during the period up to 2012; however, discharge increased in 2013 presumably due to drilling and well intervention activities.

The reductions in the amounts of LCPA and substitution chemicals discharged are indicative of the success of the relevant OSPAR measures.

d. Atmospheric emissions

Atmospheric emissions from offshore oil and gas activities are not regulated by OSPAR measures, but are reported annually by operators. Emissions to the atmosphere have generally decreased or remained stable with the exception of SO_2 which continues to vary greatly year on year due to a variety of factors. Reductions in CO_2 emissions have been noted when compared with the previous 10 year period, which is possibly linked to the introduction of EU measures.

[2] Pose little or no risk to the environment - PLONOR

[3] Except for those chemicals where, despite considerable efforts, it can be demonstrated that this is not feasible due to technical or safety reasons. Demonstration of those reasons should include a description of the efforts.

Récapitulatif

Le présent rapport présente les données sur les rejets, les déversements et les émissions pour les opérations pétrolières et gazières offshore au Royaume-Uni durant la période 2009 – 2013 et fournit une évaluation de ces données. Les données annuelles à partir desquelles l'évaluation a été préparée sont présentées en Appendice 2.

a. Niveau d'activité

Le plateau continental du Royaume-Uni (UKCS) est une province pétrolière et gazière parvenue au stade de la maturité au sein de la région OSPAR et dans laquelle la production est en déclin. Malgré cela, on observe un niveau élevé d'activités pétrolières et gazières, pour maintenir les niveaux de production et maximiser la récupération économique des réserves, une situation qui se reflète dans le nombre croissant de développements sous-marins et dans le niveau élevé des activités de forage, du moins jusqu'en 2012.

La production totale d'hydrocarbures en provenance de l'UKCS a diminué de 36 % durant la période 2009 – 2013. Malgré cela, il y a eu une augmentation de 23 % du nombre d'installations pétrolières et gazières, la plus forte augmentation étant notée dans le nombre d'installations sous-marines.

b. Rejets et déversements d'hydrocarbures

La quantité totale d'hydrocarbures dispersés[4] (hydrocarbures aliphatiques) rejetée en mer dans l'eau de production et l'eau de ballast a diminué durant la période 2009 – 2013, de 2 900 tonnes en 2009 à 2 176 tonnes en 2013, soit une diminution de 25 %.

Comme cela a été le cas lors des années précédentes, ce sont l'eau de production et l'eau de ballast qui contribuent le plus aux rejets d'hydrocarbures provenant des activités pétrolières et gazières offshore, représentant 97-98 % de la quantité totale d'hydrocarbures rejetée en mer durant la période 2009 – 2013. Les pertes au niveau des torches représentent une source mineure de rejets d'hydrocarbures et ne sont pas visées par des mesures OSPAR, bien qu'elles soient déclarées en tant que déversement au Royaume-Uni si elles se produisent.

On notera que les hydrocarbures dispersés dans l'eau de ballast apportent une contribution de seulement 1 – 4 % au total.

La quantité moyenne annuelle d'hydrocarbures dispersés présente dans l'eau de production est restée relativement stable durant cette période, de 14,8 mg/l en 2009 à 14,6 mg/l en 2013, avec un pic de 15,2 mg/l en 2010, toutes ces valeurs restant néanmoins largement en dessous de la norme de performance actuelle pour les hydrocarbures dispersés, soit 30 mg/l pour l'eau de production rejetée en mer.

Malgré les efforts réalisés pour réduire le nombre d'installations dépassant la norme, il reste encore 14 installations préoccupantes ; toutefois, la quantité d'hydrocarbures rejetée par 12 de ces installations au-delà de la norme de performance est inférieure à 2 tonnes. Au total, le rejet

[4]. Les composés « aliphatiques » et « aromatiques » sont définis par la méthode de référence énoncée dans l'Accord OSPAR 1997-16 (Extraction par solvant, mesure par infrarouges à 3 longueurs d'onde). Dans ce contexte, les termes « aliphatiques » et « hydrocarbures dispersés » ont le même sens.

d'hydrocarbures dispersés au-delà de la norme représente 3,5 % du rejet total d'hydrocarbures dispersés dans l'UKCS.

Les déversements d'hydrocarbures en mer ont varié durant cette période comme l'on pourrait s'y attendre, de 23 tonnes à 101 tonnes. Aucune tendance n'apparaît dans les données.

c. Substances chimiques

L'utilisation et le rejet de substances chimiques sont réglementés par OSPAR et par la législation nationale du Royaume-Uni depuis 2001, les premiers rapports nationaux ayant été présentés pour 2003. La quantité totale de substances chimiques utilisée offshore a diminué durant la période 2009 – 2013. En moyenne, bien moins de 1 % (en poids) de la quantité totale de substances chimiques utilisée contient soit des substances figurant sur la liste OSPAR de substances chimiques devant faire l'objet de mesures prioritaires (LPCA), soit des substances candidates pour une substitution.

La quantité totale de substances chimiques rejetée en mer durant la période 2009 – 2013 a diminué, de 127 509 tonnes à 82 813 tonnes, et en moyenne, 84 % (en poids) des substances chimiques rejetées figurent sur la liste PLONOR d'OSPAR[5]. Moins de 2 % (en poids) des substances chimiques rejetées contiennent des substances LCPA ou candidates pour une substitution.

La Recommandation OSPAR 2005/2 fixe des objectifs environnementaux pour la réduction des rejets de substances LCPA, et les rejets devaient être progressivement éliminés d'ici à 2010. Ce résultat a été obtenu au Royaume-Uni dès 2012 – une comparaison favorable avec la réduction de 97 % au cours de la même période à travers la zone OSPAR.

La Recommandation OSPAR 2006/3 fixe des objectifs environnementaux pour l'élimination progressive des rejets de substances chimiques qui sont, ou qui contiennent, des substances identifiées comme candidates pour une substitution[6] d'ici à 2017. Au Royaume-Uni, les rejets de ces substances ont diminué de plus de 42 % durant la période jusqu'en 2012 ; toutefois, les rejets ont augmenté en 2013, probablement en raison d'activités de forage et d'interventions au niveau des puits.

Les réductions des quantités de substances chimiques LCPA et de substances chimiques concernées par la substitution qui ont été rejetées témoignent du succès des mesures OSPAR pertinentes.

d. Émissions amosphériques

Les émissions atmosphériques provenant des activités pétrolières et gazières offshore ne sont pas réglementées par des mesures OSPAR, mais elles sont déclarées une fois par an par les opérateurs. Les émissions dans l'atmosphère ont généralement diminué ou sont restées stables, à l'exception du SO_2, qui continue de varier considérablement d'une année à l'autre dû à divers facteurs. On a noté des réductions dans les émissions de CO_2 par comparaison avec la période de 10 ans précédente, ce qui pourrait correspondre à l'introduction de mesures UE.

[5] Présentant peu ou pas de risques pour l'environnement - PLONOR

[6] Sauf dans le cas des substances chimiques pour lesquelles, malgré des efforts considérables, on peut démontrer que cela n'est pas possible pour des raisons techniques ou de sécurité. La démonstration de ces raisons comprendra une description des efforts.

1. Introduction

This report provides an assessment of the discharges, spills and emissions to the environment from 1 of this report is to assess increasing or decreasing trends in the quantities of such discharges, spills and emissions, taking account of the level of oil and gas activity in the UK sector, with the aim of demonstrating the effectiveness of OSPAR measures in the UKCS. Trends have been assessed using expert judgement and not by statistical analyses.

This report does not seek to assess the impact on the environment of these discharges, spill and emissions.

This assessment is based on data submitted by operators on the UKCS to the UK authorities, and reported by the UK in the annual OSPAR report on discharges, spills and emissions from offshore oil and gas installations. Data used in this assessment report are the best available data at the time of preparing the report, and are appended to this report for information at Annex 1.

Where relevant, the performance on the UKCS has been compared to the overall performance in the OSPAR area, using the following sources:

“OSPAR report on discharges, spills and emissions from the offshore oil and gas activity in 2012” (OSPAR Commission 2014)

“Assessment of the OSPAR report on discharges, spills and emissions from the offshore oil and gas activity 2010-2012” (OSPAR Commission 2014)

“Draft OSPAR report on discharges, spills and emissions from the offshore oil and gas activity in 2013” (EAP Meeting 2015)

The operators have used procedures for sampling and analysis detailed by the Department for Energy & Climate Change (DECC), and quality assurance procedures described by DECC and Oil & Gas UK. Accredited or accepted laboratories have been used.

Quality assurance of the data is undertaken by the UK before the data is submitted to the OSPAR Secretariat. Transparency and harmonisation of the reported data are achieved through the use of:

- harmonised sampling and analysis procedures;
- accredited or accepted laboratories;
- harmonised data collection format; and
- review by an Expert Assessment Panel.

Further details on UK QA/QC procedures are discussed in section 7 of this report.

2. Setting the Scene

2.1 Level of Activity

The UK is one of the larger producers of oil and gas in the OSPAR region but the UKCS is a maturing basin with declining production. Despite this there is still significant investment in the UKCS, including investment in exploration in new areas to the west of Shetland.

Production in the UK decreased by 36% during the period 2009 - 2013, with the reduction occurring during the period 2010 – 2012. Although new fields are in development, this trend of declining production will continue in future years, though the level of decline is uncertain. The reduction is similar to the overall production decline across the OSPAR region which over the same period was approximately 34%.

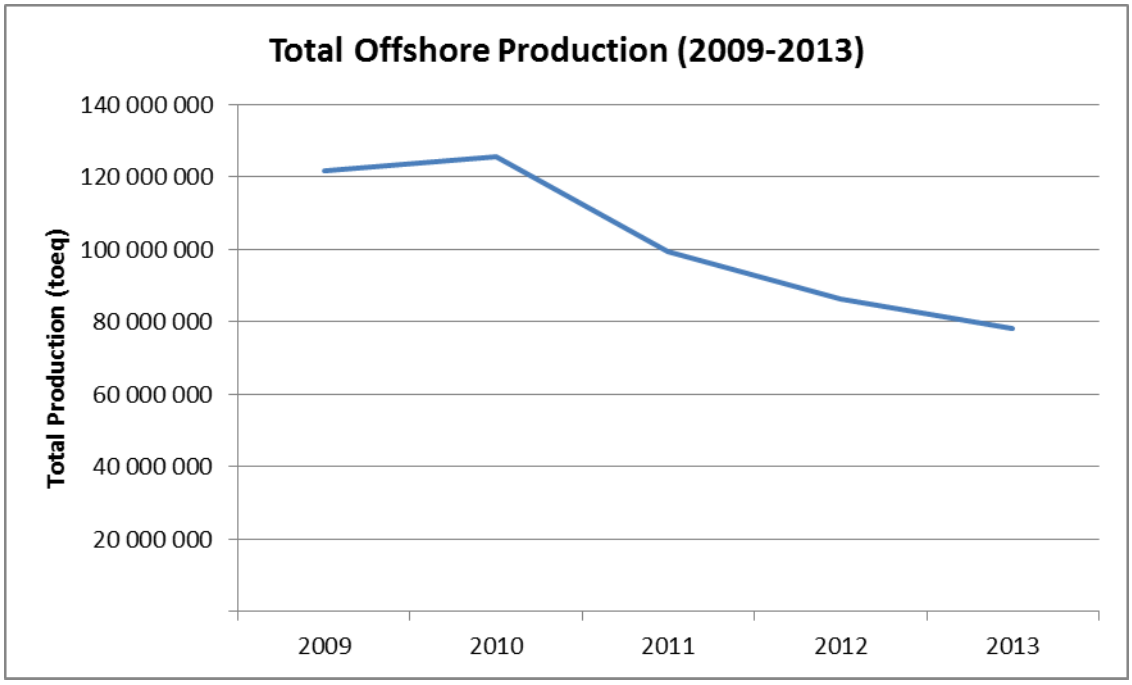


Fig. 1: *Total offshore oil & gas production in the UKCS, 2009 – 2013*

The number of installations with emissions and discharges in the UK sector of the OSPAR Maritime Area increased during the period 2009 – 2013. The sharp rise in the number of installations between 2009 and 2010 resulted from a change in the way that the UK counted installations. From 2010 to 2013 there has been an increase in the total number of installations, excluding drilling, from 482 to 496. However, only 3 of these are surface installations compared to 11 new subsea installations. During the period 2009 – 2013, 13 surface production installations and 4 subsea installations have also been decommissioned. The trend of an increasing number of installations in the UK differs to other Contracting Parties (CP's) in the OSPAR region where the number of installations are decreasing. This is possibly related to the way the UK counts installations, in particular subsea installations (refer to section 7 for a description on how UK counts installations).

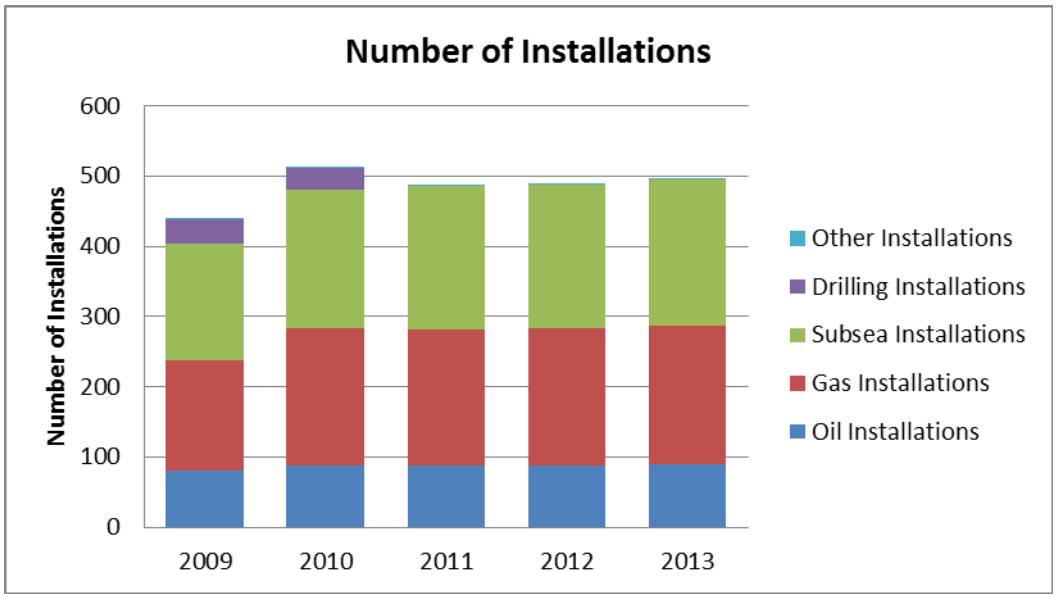


Fig. 2: *Number of Installations on the UKCS, 2009 – 2013*

There was also a change in the manner in which OSPAR recorded and reported drilling activity during the study period. Up to the year 2010 'drilling years' were determined on the basis of time spent drilling, rather than the number of wells drilled, *e.g*. a Mobile Offshore Drilling Unit (MODU) was counted as active for every ¼ of a year spent undertaking drilling activity, irrespective of the number of wells drilled. To better reflect drilling activity, since 2011 the number of wells drilled in each calendar year is reported. The number of geological sidetracks is also included in the report. Wells drilled data had not been reported to OSPAR previously, but data held by DECC confirms that 195 wells were drilled in 2009 and 192 wells were drilled in 2010. Over the 2011 – 2013 period reported to OSPAR, the number of wells drilled peaked at 191 wells in 2012, and dropped to 128 wells in 2013, reflecting increasing costs and other challenges within the UKCS. The number of MODU's operating in the UKCS varies year on year, but is currently around 30 installations.

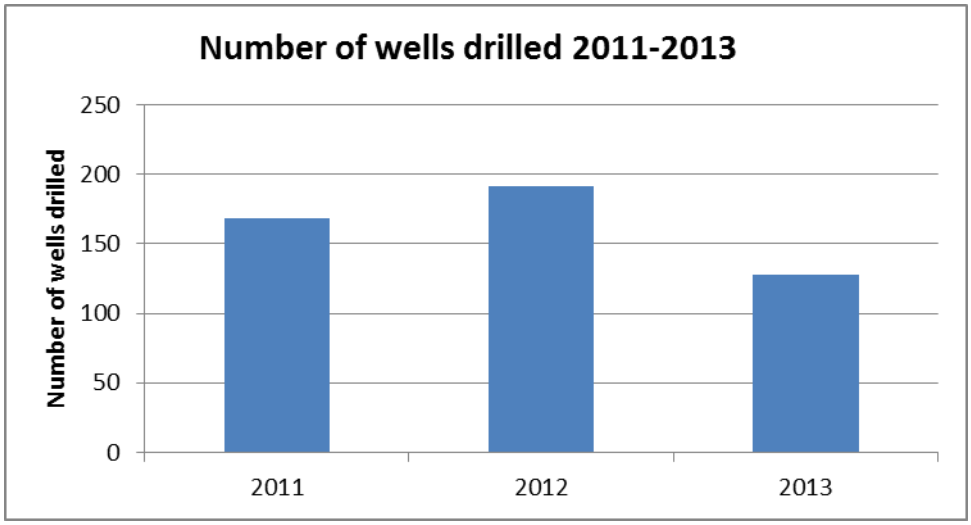


Fig. 3: *Number of wells drilled on UKCS, 2011 – 2013*

3. Environmental Management

OSPAR Recommendation 2003/5 to Promote the Use and Implementation of Environmental Management Systems by the Offshore Industry was introduced in 2003, with the goal that by the end of 2005 all operators within Contracting Parties jurisdiction should have in place an Environmental Management System that is in accordance with the principles of an internationally recognised standard (ISO14001 or EMAS). The UK implemented this administratively by requiring all licence operators in the UK to have an EMS in place prior to undertaking any offshore oil and gas operations. Operators could either have a certified EMS (ISO14001 or EMAS) or an EMS that was in accordance with the principles of such a standard and was independently verified by a UKAS accredited certification body on a two yearly basis. Operators without a certified or verified EMS would not be granted relevant permits and consents to undertake any offshore oil & gas operations. Since 2006 all operators have had an EMS which meets the UK requirements. Of the 53 licence operators in the UKCS currently undertaking offshore oil & gas operations, 31 are certified to ISO14001 while the remaining 22 have an EMS which has been verified to conform to the principles of ISO14001. In the majority of cases operators with production installations have ISO14001, while the smaller exploration operators have a verified EMS.

Every operator with an EMS must also publish a public statement to cover any offshore oil and gas operations undertaken in the previous year. These public statements are not verified as required by EMAS, but are available from the DECC website at:

https://www.gov.uk/oil-and-gas-ospar-ems-recommendation#ems-public-statements

4. Oil Discharges

4.1 Discharges of Oil to Sea

Dispersed oil is discharged in accordance with OSPAR Recommendation 2001/1 (as amended) which limits the dispersed oil concentration in produced and displacement water to 30 mg/l. The UK implements this Recommendation into UK law through the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 (as amended), which replaced the Prevention of Oil Pollution Act 1971. The 2005 regulations require that any discharge of oil to the marine environment is undertaken in accordance with a permit and makes it an offence to discharge oil without a permit or to spill any oil to sea. With regard to produced and displacement water discharges, operators are required to ensure that concentrations of dispersed oil do not exceed 30 mg/l as a monthly average. Samples are taken for analysis at least twice a day for installations discharging more than 2 tonnes of dispersed oil per year, or samples are taken at least monthly for installations discharging less than 2 tonnes of dispersed oil per year.

To determine the amount of dispersed oil discharged, operators are required to quantify the amount of produced and displacement water discharged from each installation. The overall measurement uncertainty must be within ±10%.

The Recommendation also requires that Contracting Parties should ensure that plans to construct new offshore installations, or to modify substantially existing offshore installations, should take as a point of departure the minimisation of discharges and, where appropriate, consider produced water reinjection (PWRI). All new installations have been required to consider this in their proposals to DECC and where PWRI has not been selected, operators are required to justify the proposals.

4.1.1 Produced & displacement water

The discharge of produced water and displacement water declined in the UKCS from a peak of 196 million cubic metres in 2009 to 149 million cubic metres in 2013, a 24% decrease attributed to a decline in production. Over the same period, although the amount of produced water injected remained relatively stable at approximately 40 million cubic metres per year, the proportion of water injected increased from 17% in 2009 to 21% in 2013. The decline in UK produced and displacement water discharges over the period is greater than the OSPAR average of 16% and this is likely due to the reduced production from the more mature UKCS. The UK increase in the proportion of water injected during the period 2009 – 2013 is lower than the OSPAR average of 27%. There will be a number of factors contributing to this difference, including the greater number of older installations in the UKCS with large produced water discharges, where retrofitting PWRI facilities is more challenging / costly than installing such facilities at the design and construction stage.

The number of installations injecting produced water increased from 36 in 2009 to 66 in 2013. However, it is not possible to determine what proportion of installations re-injecting produced water are new installations and what proportion are older installations that have had PWRI facilities retrofitted.

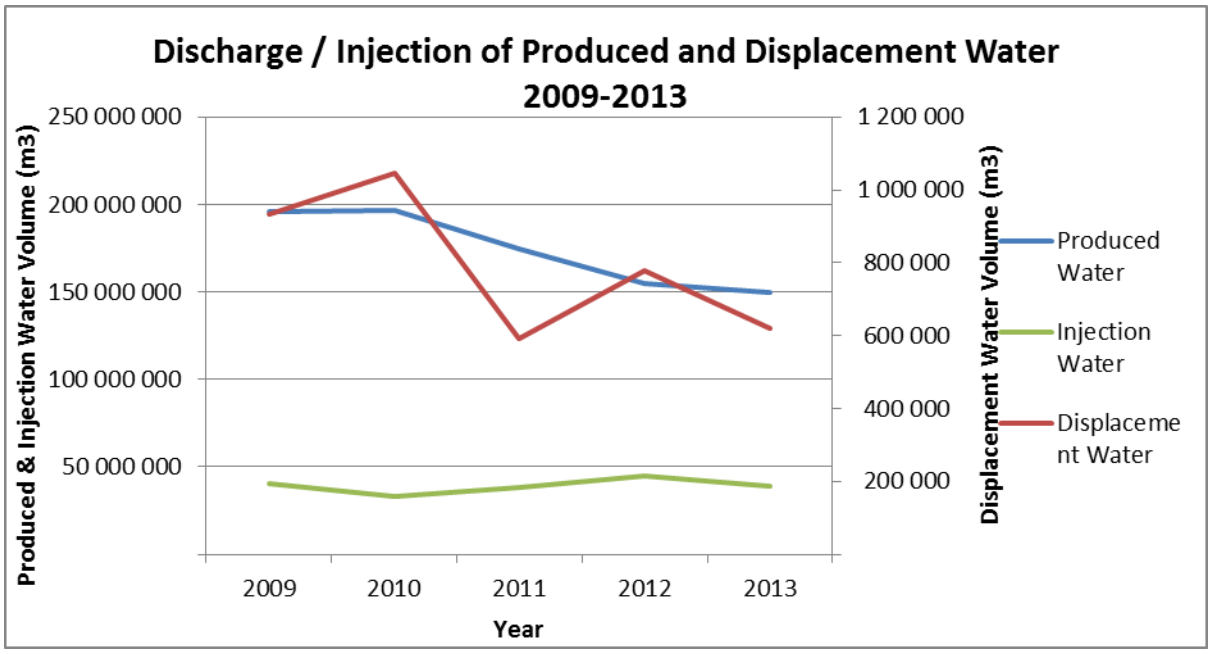


Fig. 4: *Discharge / Injection of produced and displacement water, 2009 – 2013*

4.1.2 Dispersed oil discharged

The total quantity of dispersed oil discharged with produced and displacement water decreased from 2 900 tonnes in 2009 to 2 176 tonnes in 2013, a reduction of 25%. This reduction in total dispersed oil discharged is primarily as a result in the similar reduction in the amount of produced and displacement water discharged, as the average concentration of dispersed oil in produced and displacement water has not significantly changed over the period, decreasing from 14,8mg/l in 2009 to 14.6 mg/l in 2013. The reduction in the UK compares favourably with the OSPAR average of an 18% reduction in the amount of dispersed oil discharged to sea, though the UK average concentration is higher than the OSPAR average which decreased slightly from 12.2 mg/l in 2009 to 11.9 mg/l in 2013.

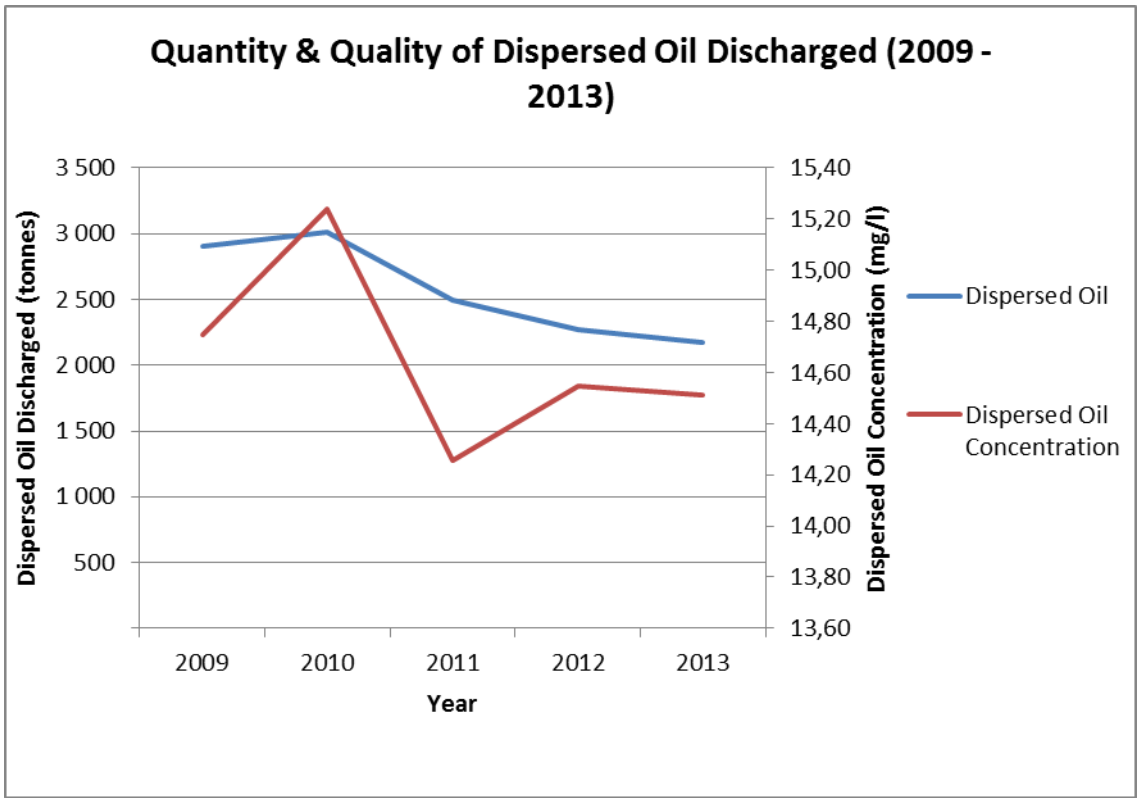


Fig. 5: *Quantity and quality of dispersed oil discharged on UKCS, 2009 – 2013*

Recommendation 2001/1 sets a performance standard for the discharge of dispersed oil in produced water. Since 2007 OSPAR has set the performance standard at 30 mg/l. For regulatory purposes in the UK this is calculated as a monthly flow weighted average of all samples, or monthly result where only a single sample is taken. However, for reporting to OSPAR the UK calculates an annual average. While the majority of installations in the UK sector meet the performance standard, a small number of installations fail to meet this performance standard on an annual basis. The number of installations which failed to meet the performance standard decreased from 22 in 2009 to 14 in 2013.

The quantity of dispersed oil discharged by installations that failed to meet the performance standard has reduced during the period 2009 – 2013, but since 2011 the quantity of dispersed oil has increased, and there we also more installations that failed to meet the performance standard in 2013 than in 2012.

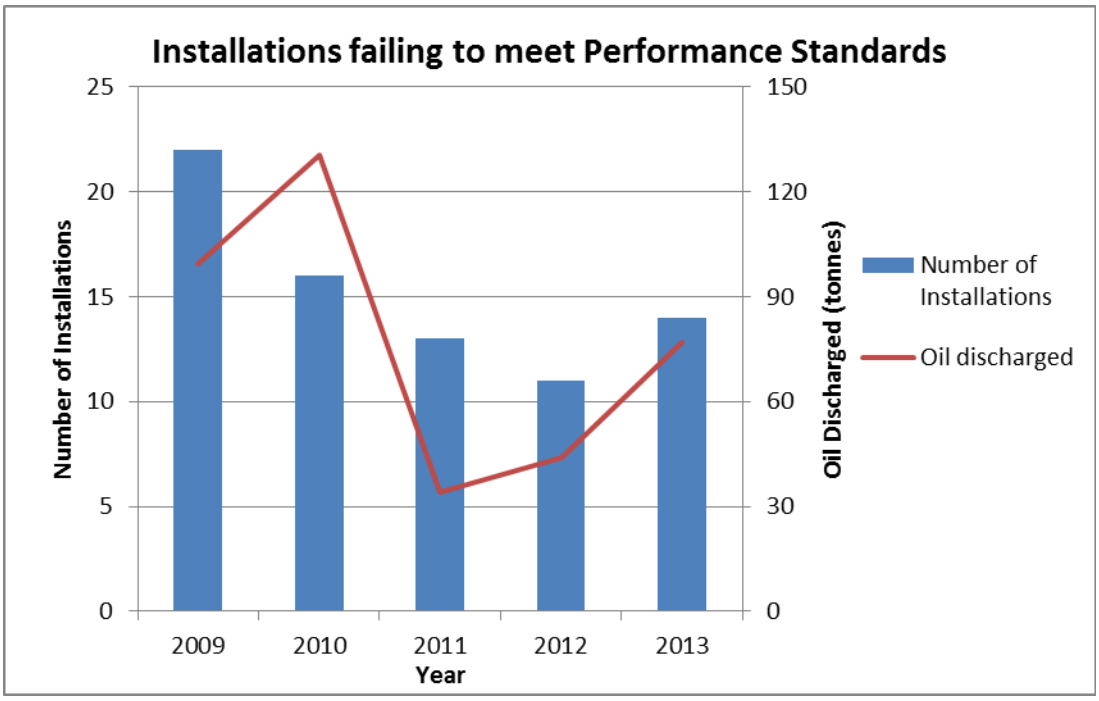


Fig. 6: *Installations failing to meet the 2001/1 Performance Standard, 2009 – 2013*

It should be noted that, when PWRI stops working, some installations with a high PWRI uptime may discharge produced water overboard in excess of the performance standard. This is generally for very short periods of time, but if the average of the analyses fails to meet the performance standard for the year they are still reported to OSPAR.

The total quantity of hydrocarbons discharged in excess of the performance standard varies year on year depending upon the particular installations and as a result of a change in operations, *e.g*. new wells coming online, malfunctions in separating equipment. It should also be noted that of the 14 installations discharging in excess of 30mg/l during 2013, only 2 discharged greater than 2 tonnes of dispersed oil during the year and that over 85% of the oil discharged in excess of the performance standard relates to a single installation and the UK entered into discussion with the operator to resolve this situation.

The UK also reports the dissolved oil content (as represented by BTEX components) in produced water and displacement water discharges. OSPAR does not regulate these discharges as the components rapidly biodegrade in seawater once discharged. The discharge of dissolved oil[7] (BTEX) has remained reasonably stable during the period 2009 - 2012 ranging between 2178 to 2619 tonnes per year, though it increased significantly to 4010 tonnes in 2013. It is suspected that this significant increase results from sampling or analytical errors during the period.

[7] "Aliphatics" (or "dispersed oil") are regularly and frequently measured, while the sampling is much less frequent for "aromatics". Therefore data on "aromatics" may be less reliable.

4.2 Risk-based Approach (RBA)

In 2012, OSPAR Recommendation 2012/5 for a risk-based approach to the management of produced water discharges from offshore installations was adopted. The UK has drafted guidance for industry and adopted a phased implementation plan to allow the additional assessments to be evenly spread over the 2014 – 2018 period. The UK will use a substance level and whole effluent toxicity approach for the RBA assessments, commencing in 2014, with approximately 20 installations undertaking an assessment each year through to 2018. The UK has requested that operators undertake the full assessment process, including dispersion modelling, so as to be able to determine a baseline for all installations with a produced water discharge.

4.3 Spills of Oil to Sea

The number of oil spills to sea during the period 2009 – 2013 has varied year on year from as low as 245 spills in 2012 up to 319 spills in 2013. The quantity spilled has also varied from as low as 23 tonnes in 2010 up to 101 tonnes in 2012. Less than 3% of the total number of spills are greater than 1 tonne, but they have contributed 58% to 89% of the oil spilled from offshore oil and gas installations in the UKCS. The number of spills and quantity spilled varies greatly across the OSPAR region and comparison of performance is not possible.

It should be noted that in 2012, when 101 tonnes of oil was spilled, this represented only 4.3% (by weight) of the total dispersed oil discharged or spilled to the UKCS.

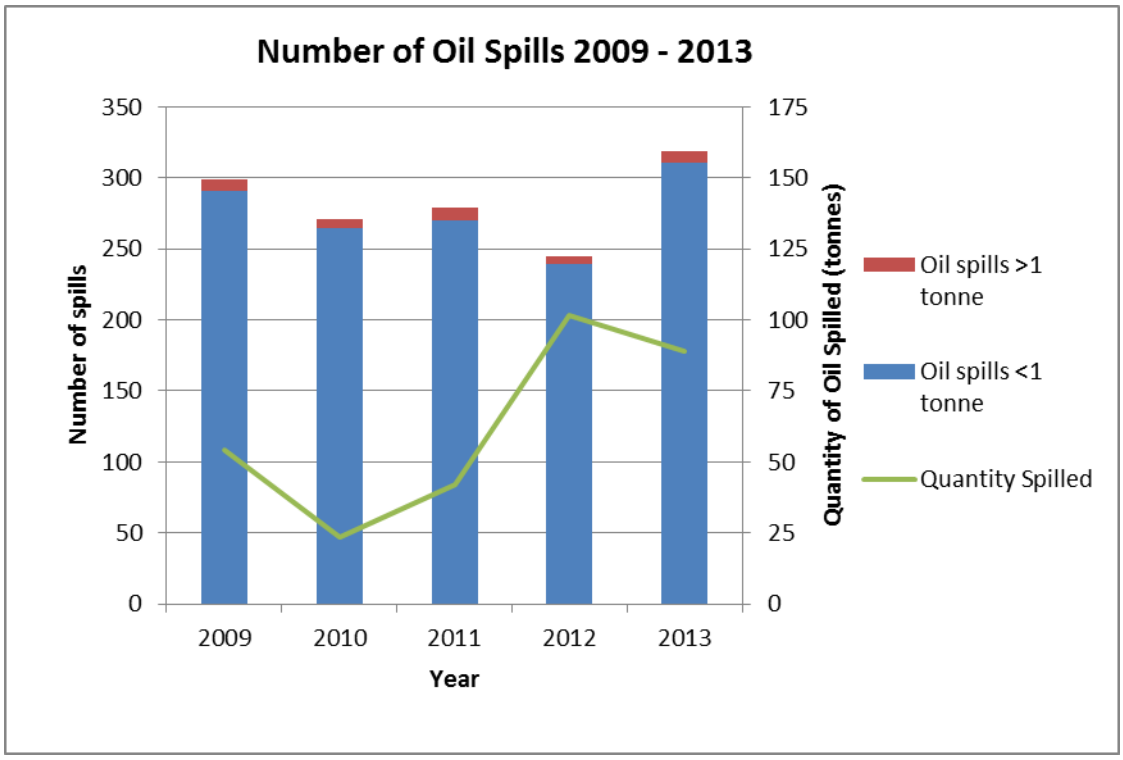


Fig. 7: *Number of oil spills and quantity of oil spilled in UKCS, 2009 – 2013*

It should be noted that some oil spill data has not been included in the above data or this report, as the incidents are still under investigation by the UK regulator.

4.4 Discharges of Organic Phase Fluids

OSPAR Decision 2000/3 aims to prevent and eliminate pollution resulting from the use and discharge of OPF and OPF-contaminated cuttings[8] and prohibits the discharge of cuttings contaminated with OBF[9] at a concentration greater than 1% by weight on cuttings. The UK implements this Decision under The Offshore Chemical Regulations 2002 (as amended), which controls the use and discharge of all offshore chemicals. The regulations prohibit the discharge of OPF and OPF contaminated cuttings and the discharge of OBF contaminated cuttings, except in accordance with the terms and conditions of a permit issued under the regulations. The development of thermal desorption technologies (Roto-mill, hammer mill, *etc*), which readily achieves less than the 1% concentration limit, has resulted in a small number (<10%) of wells being drilled using OBF with treated cuttings discharged to sea.

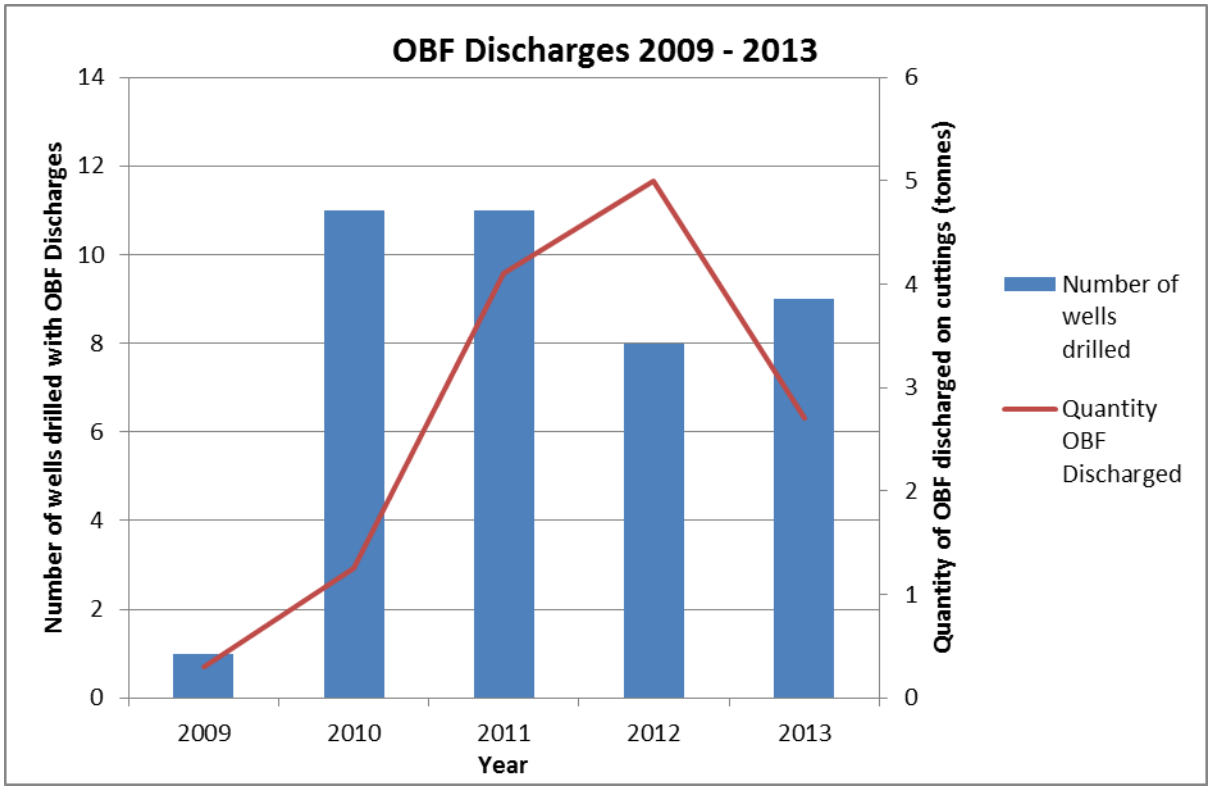


Fig. 8: *Discharges of OBF on UKCS 2009 – 2013*

The UK is currently the only CP discharging OBF contaminated cuttings treated using thermal desorption technologies. Discharge concentrations must be reported and are usually less than 0.1%.

[8] OPF = Organic-phase Drilling Fluids

[9] OBF = Oil-based fluids

5. Chemicals

Since 2001 the use and discharge of offshore chemicals have been covered by a number of OSPAR measures as listed in the Appendix 1, and these have been implemented in the UK through The Offshore Chemical Regulations 2002 (as amended). The regulations require that all use and discharge of offshore chemicals requires a permit, with the permit application setting out the circumstances of use and discharge of chemicals and the quantities of chemicals to be used and discharged.

The regulations and associated guidance requires that chemicals are assessed for their impact to the environment using the Offshore Chemical Notification Scheme (OCNS) which is managed on behalf of the UK regulator by the Centre for Environment, Fisheries & Aquaculture Science (CEFAS), which also undertakes a similar function for the Netherlands. The OCNS uses the OSPAR Harmonised Mandatory Control Scheme (HMCS) to rank chemical products according to Hazard Quotient (HQ), calculated using the Chemical Hazard and Risk Management (CHARM) model.

Details of the categories within HMCS are detailed in OSPAR Decision 2000/2 on a Harmonised Mandatory Control System for the Use and Reduction of the Discharge of Offshore Chemicals (as amended).

In this report the term *substitution chemical* refers to chemicals which are or contain substances that are candidates for substitution, according to OSPAR Recommendation 2010/4. This includes chemicals or substances which are:

- on the OSPAR LCPA;
- inorganic with LC_{50} or EC_{50} less than 1 mg/l;
- have biodegradation less than 20%; or
- meets two of three criteria:
  - biodegradation less than 60%;
  - BCF larger than 100 or Log $P_{ow} \geq 3$; or
  - LC_{50}/EC_{50} less than 10mg/L.

The goal of OSPAR Recommendation 2006/3 is for discharges of substitution chemicals to be phased out by 2017, although an exception can be made for chemicals with no identified alternative.

The goal of OSPAR Recommendation 2005/2 was that the discharge of chemicals on the OSPAR List of Chemicals for Priority Action (LCPA) would be phased out by 1 January 2010. The UK has now phased out these discharges although small amounts of lead based pipe dope are still used in the UK for certain drilling operations.

5.1 Chemical Use & Discharge

Total use and discharge of chemicals between 2009 and 2013 shows no obvious trend. While there was a significant decrease in use and discharge between 2009 and 2011, total usage subsequently increased, but the reason for this is not totally apparent, although it is likely that it will largely be due to the level of drilling and well intervention activity, which varies year on year.

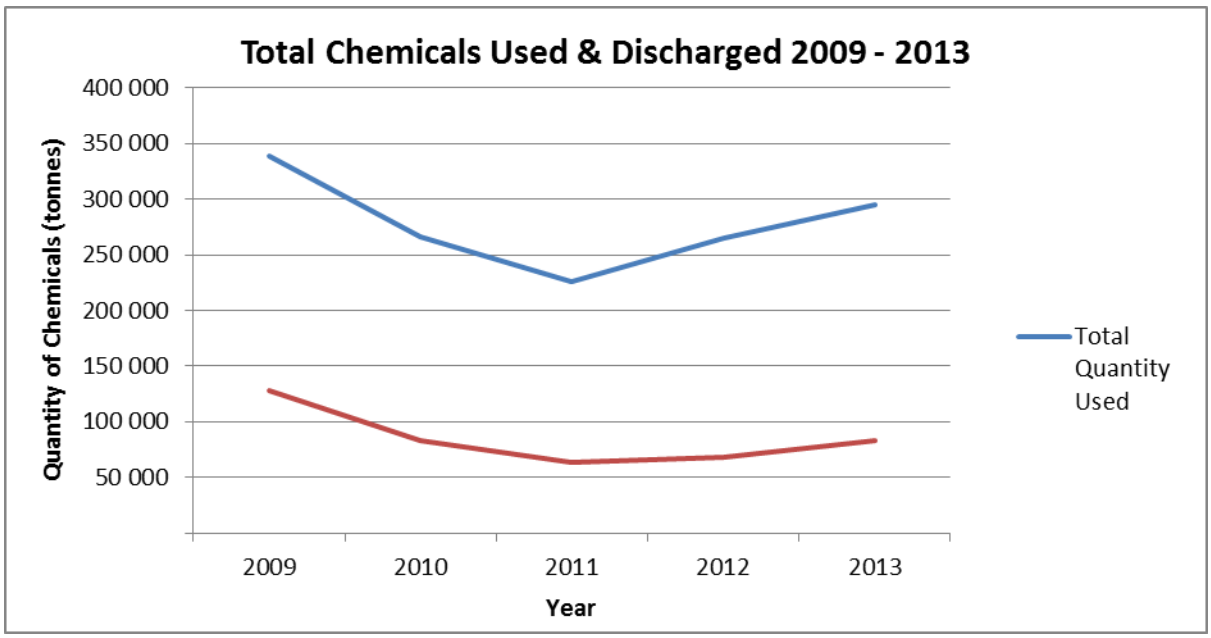


Fig. 9: *Total chemical use and discharge on UKCS 2009 – 2013*

5.1.1 Chemicals used

The total quantity of chemicals used offshore in 2013 was 294 725 tonnes. 70% (by weight) of the chemicals were on the PLONOR list and another 28% (by weight) contained no substances which are candidates for substitution. Less than 0.001% (by weight) of the chemicals used contained substances listed on the List of Chemicals for Priority Action (LCPA). Comparable OSPAR average figures for 2013 are that 66% (by weight) and 33% (by weight) of chemicals used were PLONOR or did not contain substances which are candidates for substitution respectively.

5.1.2 Chemicals discharged

The total quantity of chemicals discharged to the sea in 2013 was 82 813 tonnes, almost 85% (by weight) being included on the PLONOR list and another 13 % (by weight) being chemicals that do not contain candidates for substitution. Less than 2% (by weight) of the discharged chemicals contained substances which are candidates for substitution. Comparable OSPAR average figures for 2013 are that 75% (by weight) and 24% (by weight) of chemicals discharged were PLONOR or did not contain substitution chemicals respectively.

5.1.3 LCPA chemicals and candidates for substitution

The amount of LCPA substances used continued to decrease during the period 2009 - 2013, from 1 267 kg in 2009 to 496 kg in 2013. Similarly the amount discharged decreased from 89 kg in 2009 to 0kg by 2012. Across the OSPAR region while some LCPA chemicals are still used, their discharge has almost entirely ceased, with discharges reported by Norway for 2013 resulting from the misuse of a cleaning chemical. The discharge of substitution chemicals decreased from approximately 1 655 tonnes in 2009 to less than 956 tonnes in 2012, a 42% reduction in the discharge, though discharges subsequently increased in 2013 presumably due to particular drilling and well intervention activities. There has been a similar reduction across the OSPAR region with discharges decreasing from 1 735 tonnes in 2009 to 1 506 tonnes in 2013, a 13% reduction.

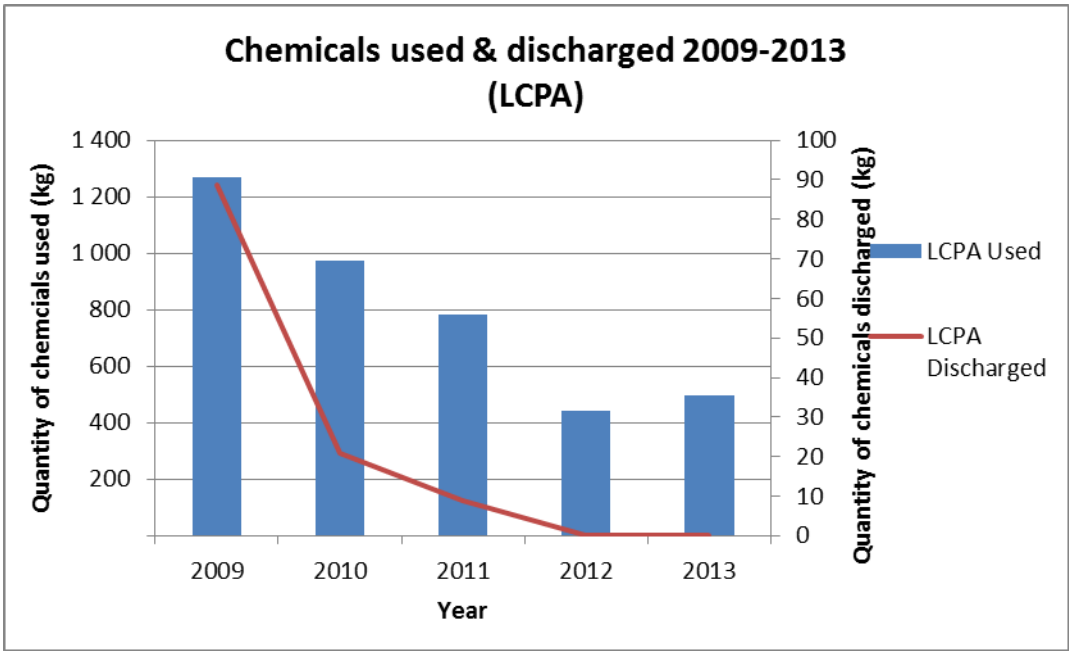


Fig. 10: *LCPA chemicals used and discharged on UKCS 2009 – 2013*

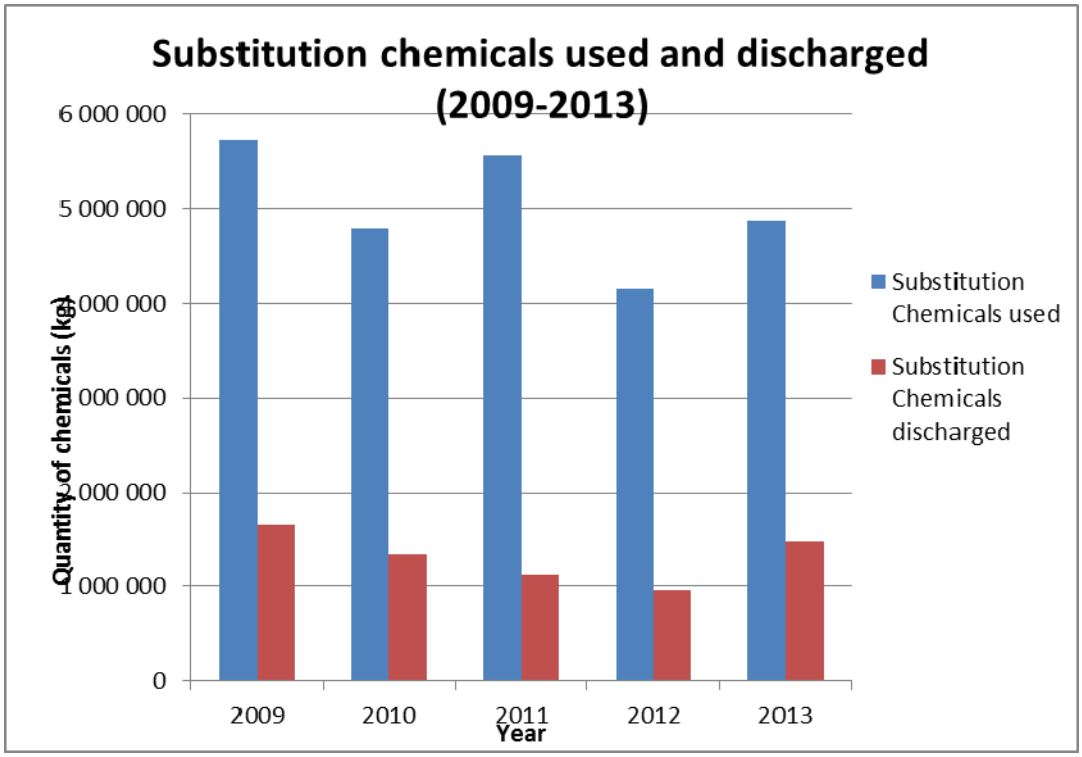


Fig. 11: *Use and discharge of chemicals which are candidates for substitution 2009 – 2013*

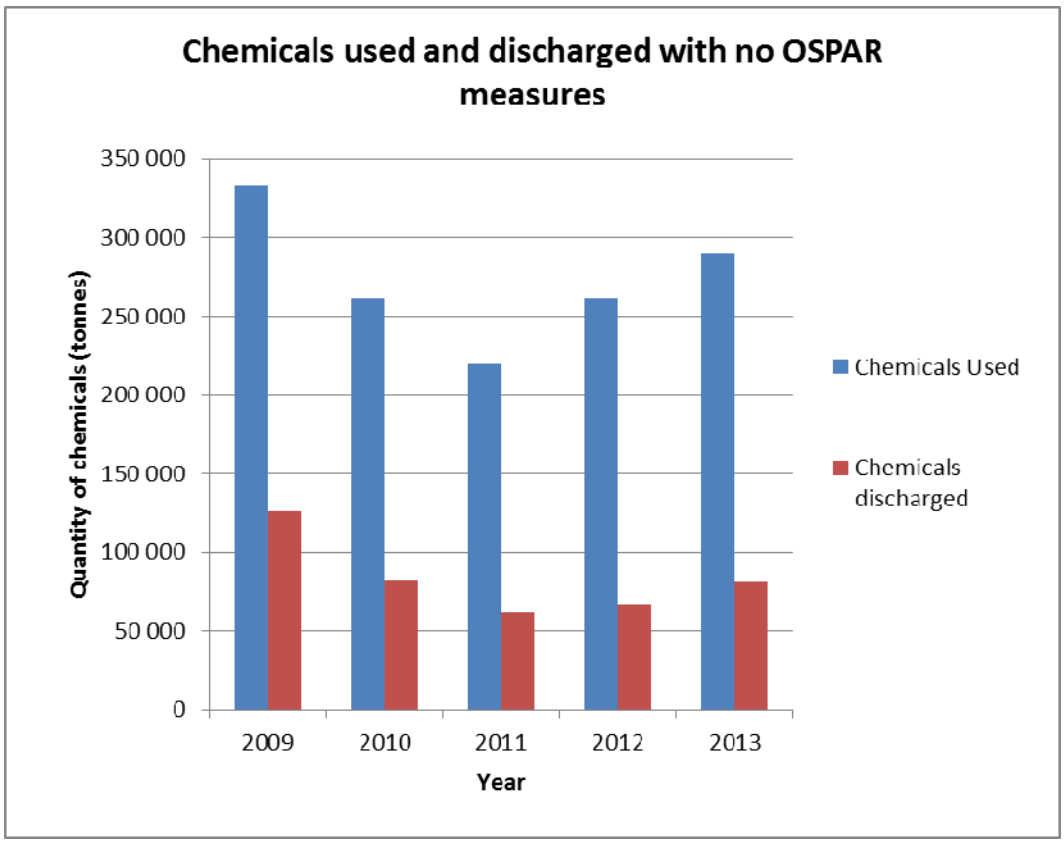


Fig. 12: *Use and discharge of chemicals with no OSPAR measures, 2009 – 2013*

5.2 Chemical Spills

The number of chemical spills to sea during the period 2009 – 2013 ranged from 175 to 272. The total quantity spilled also ranged from 505 tonnes up to 1 355 tonnes. 15% – 32% of the total number of spills were greater than 1 tonne, but they contributed up to 98% of all the chemicals spilled from offshore oil and gas installations in the UKCS. No conclusions can be drawn from the frequency or quantity of spills, either in the UK or across the OSPAR region.

The vast majority of chemicals spilled were either on the PLONOR list or were chemicals that did not contain candidates for substitution (92-99%) and during the period 2009 – 2013 there were no spills of LCPA chemicals.

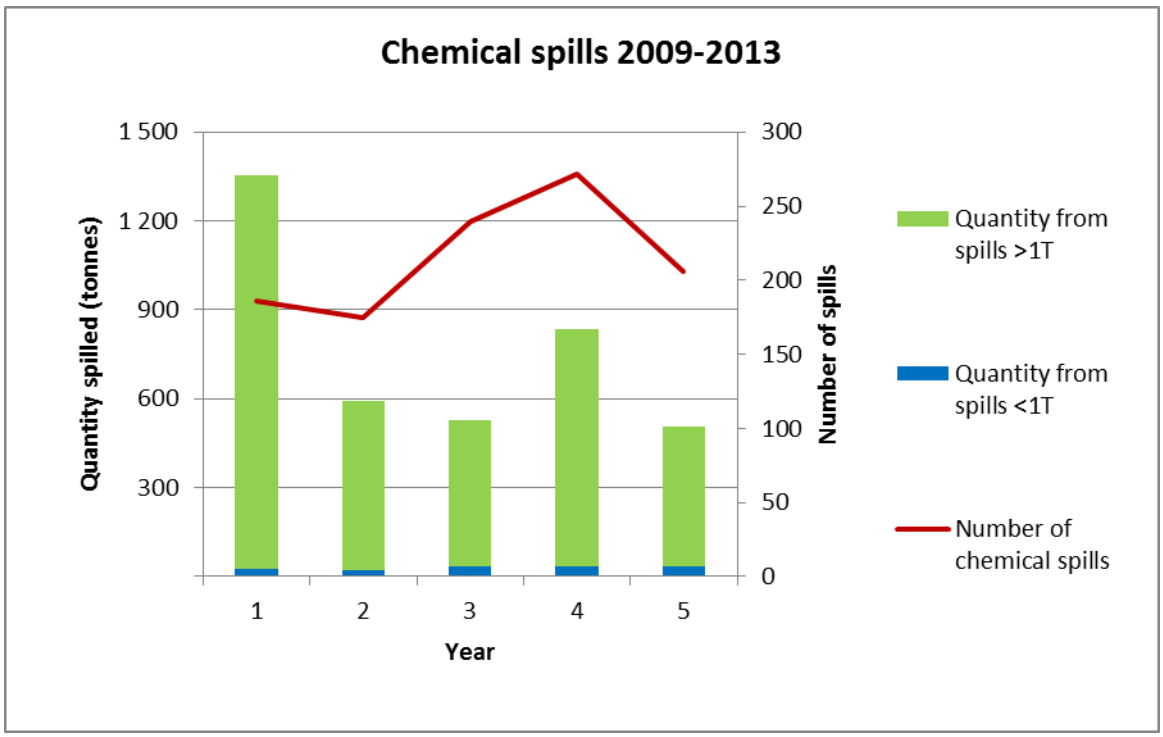


Fig. 13: *Chemical spills on UKCS 2009 – 2013*

The large spill volume in 2009 was due to a small number of large spills. It should be noted that some chemical spill data has not been included in the above data or in this as the incidents are still under investigation by the UK regulator.

6. Emissions to Air

Atmospheric emissions are not covered by OSPAR measures or harmonised measuring methodologies, but atmospheric pollutants are reported to OSPAR and, for larger installations, are regulated under relevant EU Directives that have been transposed into UK legislation. Consistency and quality of the data reported have undoubtedly improved over the past few years, particularly with regard to CO_2 emissions that are independently verified as required under of the EU ETS Directive.

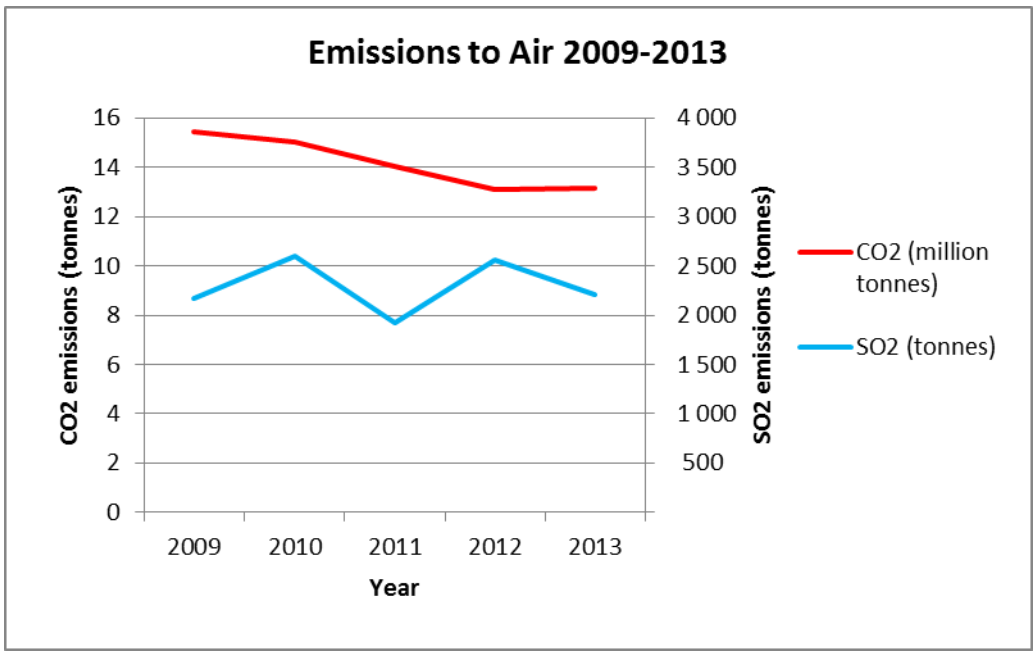


Fig. 14: *Emissions to air on UKCS (CO_2 & SO_2), 2009 – 2013*

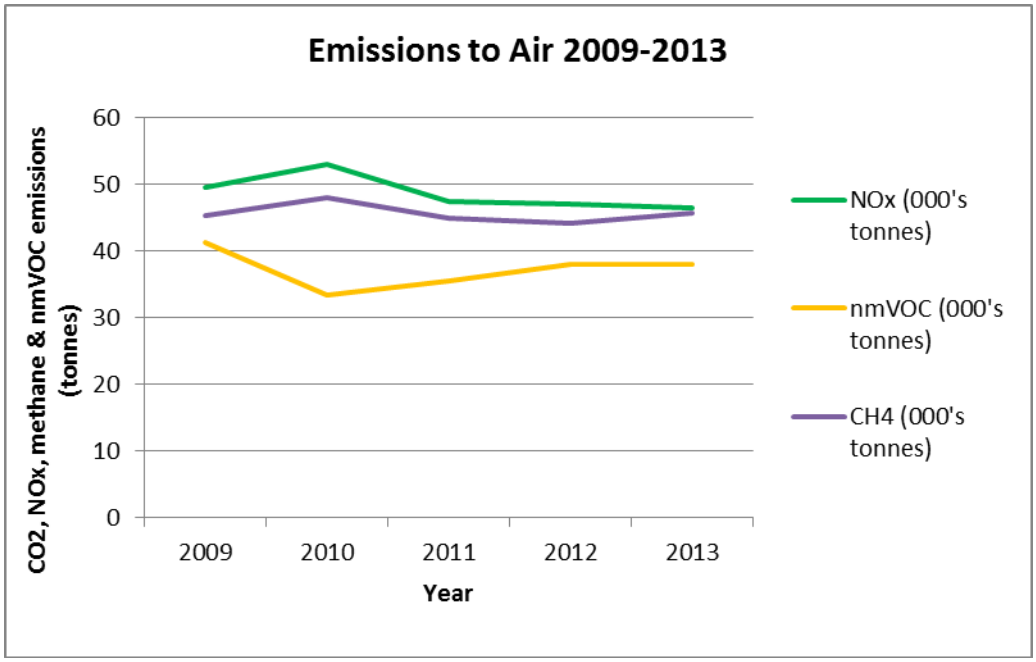


Fig. 15: *Emissions to air on UKCS (NOx, nmVOC, CH_4), 2009 – 2013*

The majority of atmospheric emissions were generally stable, or showed a slight downward trend between 2009 and 2013, with the notable exception of methane and SO_2 emissions. CO_2 emissions reduced by 15%, NOx reduced by 6%, nmVOC's by 8%, but methane and SO_2 increased by 1% and 2% respectively. By comparison, across the OSPAR region reductions have been 10%, 17% and 8% for CO_2, nmVOC's and methane respectively since 2009 and a 2% increase in NOx emissions. However across the OSPAR region SO_2 emissions have increased by 26% since 2009, with all CP's seeing an increase.

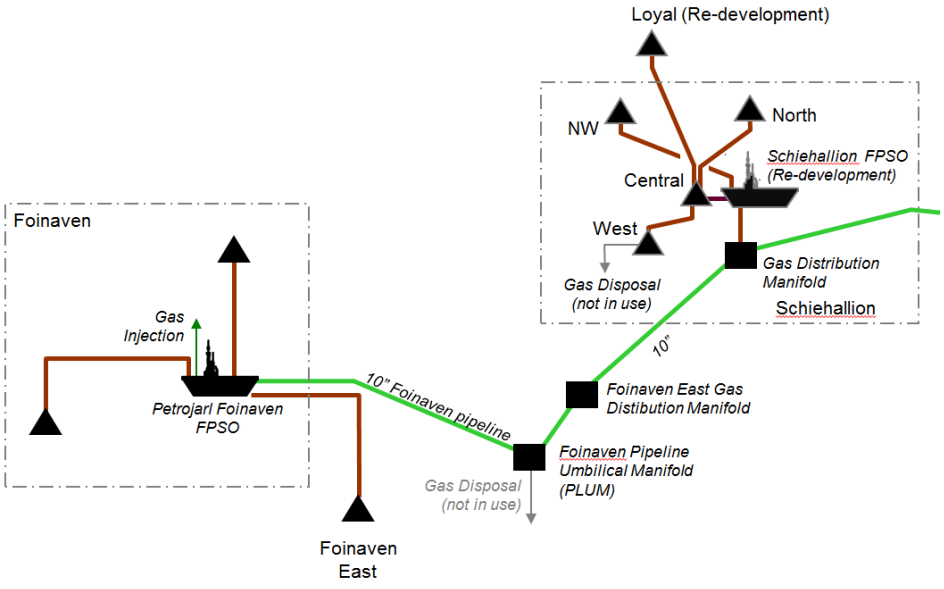
Sulphur dioxide emissions have varied greatly in the UK over the study period from 1 923 tonnes up to 2 600 tonnes. There is no apparent reason for the variability in SO_2 emissions, although the depletion of available gas for fuel requiring additional usage of diesel for power generation, and increased diesel use during extended shutdown periods and drilling activity will be relevant factors.

7. Summary of Counting & QA Procedures in UK relating to OSPAR Data

7.1 Counting of Installations

There are some differences in the manner in which Contracting Parties count installations. The UK counts installations as follows:

All installations are counted, irrespective of whether there is a local discharge, on the basis that surface installations will always have emissions to air and drainage discharges to sea, and there could also be unscheduled discharges such as oil or chemical spills from all surface and subsea installations. Installations which are connected by walkways or bridges are also each counted separately. For subsea installations, rather than reporting one installation per well or cluster of well heads, the UK considers that all the subsea wells or well clusters serving a single field should be reported as one installation. For example if a field has been developed solely as a subsea facility it will be reported as a single subsea installation, even if it has more than one well or more than one cluster of wells. It is recognised that in some cases a field can also consist of a surface facility and a number of subsea wells or well clusters that are remote from the surface facility. In such cases the UK reports the surface and subsea facilities separately. The UK uses nodal diagrams to summarise information relating to subsea fields. For example, the Foinaven Field consists of a Floating Production facility and three subsea drill centres (see diagram below). The UK reports this as one surface oil installation and two subsea installations (one for the two groups of wellheads associated with the main field and the other for the group associated the separate Foinaven East field), rather than one surface oil installation and three subsea installations (*i.e*. one for each cluster of well heads). In a similar manner Schiehallion would be counted as one surface oil installation and 2 subsea installations (Schiehallion and Loyal) rather than one surface oil installation and five subsea installations.



7.2 Reporting of Dispersed Oil

In the UK operators are required to both quantify the amount of produced and displacement water discharged and determine the concentration of dispersed oil in the discharge.

Quantification of the discharge is required to meet a +/-10% uncertainty measurement which must be verified through a measurement uncertainty calculation. Measurement is typically undertaken using meters (ultrasonic, magflow or orifice meters) which must be calibrated on a regular basis to ensure the accuracy of the measurement. In some cases where it is not possible to install a meter, well test data or other mass balance approaches are used. However, these should also seek to achieve the +/-10% measurement uncertainty, for example by suitably maintaining other measurement devices and undertaking frequent well flow testing.

The concentration of dispersed oil is determined by sampling the discharge stream on a routine basis and analysing the samples in accordance with UK Guidance. Operators are required to sample discharge streams a minimum of twice per day for discharges of greater than 2 tonnes dispersed oil per year or at least monthly for installations with discharges of less than 2 tonnes dispersed oil per year. The sampling frequency for discharges of greater than 2 tonnes dispersed oil per year is greater than the minimum required under the OSPAR Recommendation 2001/1 and some installations sample up to 4 times daily. Where operations result in process upsets sampling is undertaken more frequently.

Although spot sampling provides an indication of discharge quality, it is recognised that there can be significant variation in water quality over short periods of time and that there is a great deal of uncertainty associated with the sampling regime. Operators of installations with large discharges, and operators of new installations, are therefore encouraged to use online analysers for process monitoring to provide a real time indication of produced water quality so that any deterioration in quality can be responded to more quickly.

While operators are required to report analysis results in accordance with the OSPAR Reference method the majority of UK installations continue to undertake onsite analysis using infra-red techniques and the results are then converted to an OSPAR Reference Method result using correlation graphs, which are updated at least every 6 months.

Dispersed oil discharges are reported every month using the UK Environmental and Emissions Monitoring System (EEMS) and reports are regularly checked, including at the end of each year, to identify any anomalies. The audit trail of results from offshore analysis to reporting via EEMS is also checked during offshore inspections.

7.3 Reporting of Chemical Use & Discharge

Operators in the UK are required to record the use and discharge of all offshore chemicals included in their chemical permits, in accordance with the terms and conditions of the permit. Operators are required to report the use and discharge to the UK regulator upon completion of specific activities or on a quarterly basis. Quantification methods for chemical use and discharge vary greatly from operator to operator. Some report the quantities shipped from suppliers which may only provide a rough estimate over the quarter but will average out over the year or longer periods, while others record daily consumption from stock tanks on board the installation which provides a more accurate

and consistent measurement. There is no measurement uncertainty requirement, but it is likely that this would be within +/-10% where measurement is based on stock tank levels onboard the installation.

Chemical use and discharge is reported via EEMS, and the UK regulator can run reports to compare permitted use and discharge against reported use and discharge to check for any significant variations, breaches or obvious transcription errors. The operators' chemical management systems and methods of reporting are also reviewed during offshore inspections.

7.4 Reporting of Atmospheric Emissions

Operators are required to report atmospheric emissions via EEMS on an annual basis. For larger installations, the determination of CO_2 emissions is undertaken in accordance with the installation's monitoring and reporting plan submitted under The Greenhouse Gas Emissions Trading Scheme Regulations 2012, which sets requirements for measurement uncertainty of +/-2.5 for combustion equipment fuel sources and +/-5% for flare fuel sources. Measurement varies depending upon the type of emission, for example fuel gas used for combustion equipment and flare will usually be metered, although installations that are not included in the EU ETS may use a mass balance approach based on the amount of gas produced vs the amount exported, flared and consumed. For diesel consumption this is typically quantified by the measured reduction in tank levels on a daily basis. Atmospheric emissions are determined using standard emission factors based upon the fuel used, with samples taken to determine the composition of fuel gas on a quarterly basis.

Emissions reported to EEMS are reviewed to identify any unusual results and reports can also be run to cover a number of years to review trends. Transcription errors are often identified at this stage.

Appendix 1: OSPAR Measures associated with Offshore Oil and Gas industry

Discharges contaminated with oil

PARCOM Recommendation 86/1 of a 40 mg/l Emission Standard for Platforms[10];

OSPAR Reference Method of Analysis for the Determination of the Dispersed Oil Content in Produced Water (OSPAR Agreement number: 2005-15);

OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations (as amended);

OSPAR Recommendation 2012/5 for a risk-based approach to the Management of Produced Water Discharges from Offshore Installations

Use and discharge of drilling fluids and cuttings

OSPAR Decision 2000/3 on the Use of Organic-phase Drilling Fluids (OPF) and the Discharge of OPF-contaminated Cuttings;

Guidelines for the Consideration of the Best Environmental Option for the Management of OPF-Contaminated Cuttings Residue (OSPAR Agreement number: 2002-8);

Chemicals used and discharged offshore

OSPAR Decision 2000/2 on a Harmonised Mandatory Control System for the Use and Reduction of the Discharge of Offshore Chemicals (as amended);

OSPAR Recommendation 2010/4 on a Harmonised Pre-Screening Scheme for Offshore Chemicals;

OSPAR Recommendation 2010/3 on a Harmonised Offshore Chemical Notification Format (HOCNF) (as amended);

OSPAR Recommendation 2006/3 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that Are, or Which Contain Substances Identified as Candidates for Substitution;

OSPAR Recommendation 2005/2 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that Are, or Contain Added Substances, Listed in the OSPAR 2004 List of Chemicals for Priority Action.

[10] PARCOM Recommendation of a 40 mg/l Emission Standard for Platforms, 1986 was revoked for produced water only by OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations. However, this measure is still applicable in relation to ballast water, drainage water and displacement water from offshore installations.

Annex 1: Data Annexes

Table 1a: Number of installations in the UK maritime area with discharges to the sea, or emissions to the air 2009-2013

2009	2010	2011	2012	2013
439	484	487	489	496

Table 1b: Number of installations by type of installation in the UK maritime area with discharges to the sea, or emissions to the air, 2009-2013

	2009	2010	2011	2012	2013
Oil	80	87	88	88	89
Gas	157	196	194	196	197
Subsea	166	198	204	204	209
Drilling	35	30	-	-	-
Other	1	1	1	1	1
Total	**439**	**512**	**487**	**489**	**496**
Wells	0	0	168	191	128

Table 2: Oily aqueous discharges to the maritime area*

Table 2a: Oil discharged in displacement and produced water (in tonnes), 2009-2013

2009 (GC-FID)	2010 (GC-FID)	2011 (GC-FID)	2012 (GC-FID)	2013 (GC-FID)
Dispersed	Dispersed	Dispersed	Dispersed	Dispersed
2 900	3 008	2 493	2 267	2 176

Table 2b: Dissolved oil discharged in displacement and produced water (in tonnes), 2009-2013

2009	2010	2011	2012	2012
Dissolved	Dissolved	BTEX	BTEX	BTEX
2 619	2 115	2 477	2 178	4 010*

* Suspected sampling or analytical error resulting in significant increase in result.

Table 2c: Quantity of displacement and produced water discharged daily to the sea (in m^3/day), 2009-2013

2009	2010	2011	2012	2013
538 690	540 766	479 100	426 940	410 861

Table 2c: Total volume of produced water and displacement water discharged, and produced water injected (in m^3/year), 2009-2013

	2009	2010	2011	2012	2013
PW*	195 689 502	196 333 229	174 280 183	155 054 739	149 342 962
DPW**	932 525	1 046 491	591 433	778 417	621 196
IPW***	40 351 452	32 987 087	38 290 957	44 814 833	39 143 588
Total	**236 973 479**	**230 366 807**	**213 162 573**	**200 647 989**	**189 107 746**

* Produced water

** Displacement water

*** Injected produced and displacement water

Table 3: Installations which do not meet OSPAR performance standard for dispersed oil in aqueous discharges

Table 3b: Number of installations with discharges exceeding the 30 mg oil/l performance standard, valid from 2007 onwards, and quantity of oil discharged by these installations (in tonnes)

	2009	2010	2011	2012	2013
Number of installations exceeding 30 mg/l	22	16	13	11	14
Quantity of dispersed oil discharged	99.4	130.4	33.9	44.1	77

Table 3d: Number of installations with discharges exceeding the 30 mg oil/l performance standard, valid from 2007 onwards and quantity of oil discharged by these installations (in tonnes), in excess of the 30 mg/performance standard

2009		2010		2011		2012		2013	
Number of installations	Amount discharged	Number of installations	Amount discharged	Number of installations	Amount discharged	Number of installations	Amount discharged	Number of installations	Amount discharged
22	99.4	16	130.4	13	33.9	11	44.1	14	77

Table 4: Use and discharges of organic-phase drilling fluids (OPF) and cuttings

Table 4a: Quantities of oil and other organic-phase fluids discharged via cuttings (in tonnes), 2003-2012

2009	2010	2011	2012	2013
Total OPF	Total OPF	Total OPF	Total OPF	Total OPF
0	1	4	5	3

Table 4b: Number of wells drilled with OPF, with discharge of contaminated cuttings to the maritime area, 2003-2012

2009		2010		2011		2012		2013	
OBF	non-OBF OPF	OBF	non-OBF OPF	OBF	Other OPF	OBF	Other OPF	OBF	Other OPF
1	0	11	0	11	0	8	0	9	0

Table 5: Spillage of oil and chemicals

Table 5a: Number of oil spills, 2009-2013 - Spills less than 1 tonne (≤ 1 T) and spills above 1 tonne (> 1 T)

2009		2010		2011		2012		2013	
≤ 1 T	> 1 T	≤ 1 T	> 1 T	≤ 1 T	> 1 T	≤ 1 T	> 1 T	≤ 1 T	> 1 T
291	8	265	6	270	9	239	6	311	8

Table 5b: Total quantity of oil spilled, in tonnes, 2003-2012

2009		2010		2011		2012		2013	
≤ 1 T	> 1 T	≤ 1 T	> 1 T	≤ 1 T	> 1 T	≤ 1 T	> 1 T	≤ 1 T	> 1 T
15.0	39.1	9.8	13.6	12.8	29.1	11.4	90.0	17.43	71.64

Table 5c: Number of spills of chemicals and amount of chemical spills in tonnes/year, 2006-2012

	2009	2010	2011	2012	2013
Number of spills of chemicals	186	175	240	272	206
Tonnage of spilled chemicals	1 355	593	526	837	505

Table 6: Emissions to air, 2009-2013

CO_2 (in millions of tonnes)

2009	2010	2011	2012	2013
15.44	15.00	14.02	13.08	13.17

NOx (in thousand of tonnes)

2009	2010	2011	2012	2013
49.50	53.00	47.49	47.01	46.40

nmVOCs (in thousands of tonnes)

2009	2010	2011	2012	2013
41.30	33.30	35.43	37.96	38.08

CH4 (in thousand of tonnes)

2009	2010	2011	2012	2013
45.30	47.90	44.86	44.12	45.69

SO2 (in tonnes)

2009	2010	2011	2012	2013
2 170	2 600	1 923	2 561	2 208

Table 7: The use and discharge of offshore chemicals, 2009-2013

Table 7a: Quantity of offshore chemicals used in kg/year

Prescreening category	2009	2010	2011	2012	2013
List of Chemicals for Priority Action	1 267	974	783	440	496
Inorganic LC50 or EC50 < 1 mg/l*	856	1 155	365	1 848	253
Biodegradation < 20%*	2 581 413	1 924 708	2 881 197	1 784 069	2 042 658
Substance meets two of three criteria*	3 142 275	2 862 101	2 685 217	2 370 810	2 826 647
PLONOR	255 518 585	188 510 604	155 542 997	189 057 474	207 602 076
Inorganic, LC50 or EC50 > 1 mg/l	1 657 961	2 478 527	1 181 268	2 313 743	3 146 799
Ranking Substances	75 977 678	70 401 312	63 098 455	69 690 462	79 106 416
Total	**338 880 035**	**266 179 381**	**225 390 282**	**265 218 846**	**294 725 346**

* Chemicals for substitution

Table 7b: Quantity of offshore chemicals discharged in kg/year

Prescreening category	2009	2010	2011	2012	2013
List of Chemicals for Priority Action	89	21	9	0	0
Inorganic LC50 or EC50 < 1 mg/l*	0	137	345	1 643	90
Biodegradation < 20%*	608 549	404 545	375 566	305 385	576 846
Substance meets two of three criteria*	1 046 561	930 855	738 516	648 520	896 187
PLONOR	113 184 172	69 422 728	52 216 290	56 070 241	70 139 373
Inorganic, LC50 or EC50 > 1 mg/l	594 504	676 648	439 121	384 226	858 274
Ranking Substances	12 074 628	11 446 089	10 005 461	10 609 116	10 341 731
Total	**127 508 503**	**82 881 023**	**63 775 308**	**68 019 131**	**82 812 501**

* Chemicals for substitution

Table 7c: Chemicals spilled in kg per year

Prescreening category	2009	2010	2011	2012	2013
List of Chemicals for Priority Action	0	0	0	0	0
Inorganic LC_{50} or EC_{50} < 1 mg/l*	0	863	0	3	0
Biodegradation < 20%*	5 271	733	1 090	294	90
Substance meets two of three criteria*	244	31 079	920	14 274	60
PLONOR	1 216 434	292 312	450 711	259 283	339 983
Inorganic, LC_{50} or EC_{50} > 1 mg/l	3 164	55	328	548	62
Ranking	70 259	111 618	80 915	51 632	49 874
Total	**1 295 372**	**436 660**	**533 964**	**326 034**	**390 069**

* Chemicals for substitution

Table 8: UK total production in oil equivalents, (toeq)

2009	2010	2011	2012	2013
121 700 000	125 612 217	99 391 433	86 480 357	78 304 262

OSPAR COMMISSION

Victoria House
37-63 Southampton Row
London WC1B 4DA
United Kingdom

t: +44 (0)20 7430 5200
f: +44 (0)20 7242 3737
e: secretariat@ospar.org
www.ospar.org

OSPAR's vision is of a clean, healthy and biologically diverse North-East Atlantic used sustainably

ISBN: 978-1-909159-90-7
Publication Number: 659/2015