



Benchmarking Spills Incidents

December 3, 2019

Overview

- Benchmarking outline
- United Kingdom
 - Spill statistics and identifying incidents, trends and direct causes
- Norway
 - Spill statistics and industry/regulator work on prevention
- Australia
 - Spill statistics and paths for prevention
- Comparison of Offshore Newfoundland and Labrador with other jurisdictions

Benchmarking Outline

- Consider only accidental crude oil releases
 - Did not include produced water, drill cuttings, chemicals or atmospheric emissions
- Compared data from United Kingdom, Norway and Australia
 - Last ten years of oil spill data
- In terms of spill data litres (not barrels, tonnes, kg/s, scm)
- Understanding the focus of action items to prevent future spills, when looking at incidents

Cautionary Note

International comparisons are not straightforward, as differences in the legislative and cultural norms in the industry worldwide can lead to different reporting behaviors

United Kingdom

Data for this review came from three sources

- Annual Environmental Report 2019 Report (OGUK)
- 2018 HSE Offshore Statistics and Regulatory Activity report
- Annual Oil and Gas Authority 2018 report from Oil Gas Authority



Offshore Statistics & Regulatory Activity Report 2018

Full-year details and explanatory notes

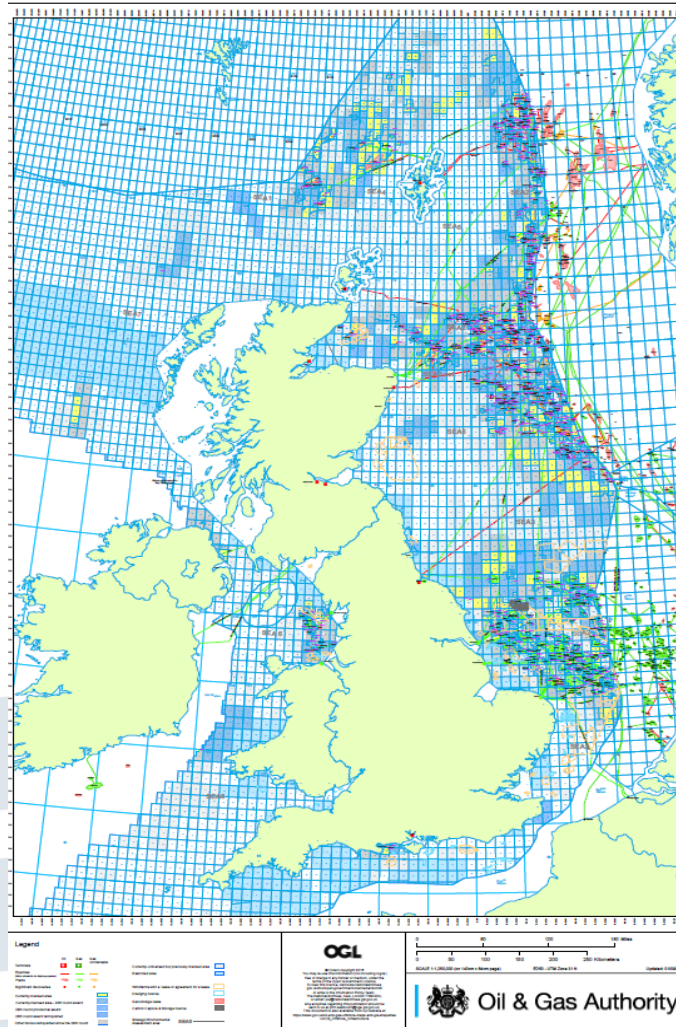
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This document is available from www.hse.gov.uk/offshorestatistics.htm Page 1 of 18



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Infrastructure

10,000+ wells

250+ subsea systems

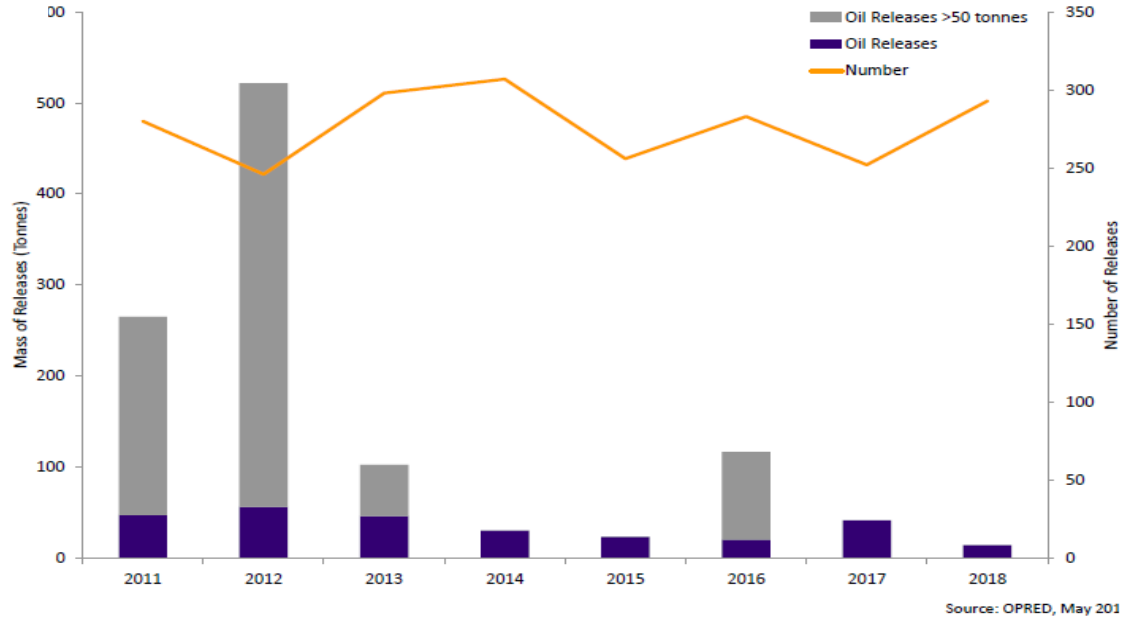
3,000+ pipelines

250 fixed installations

Total Production in 2018 was 619 million barrels of equivalent (boe)

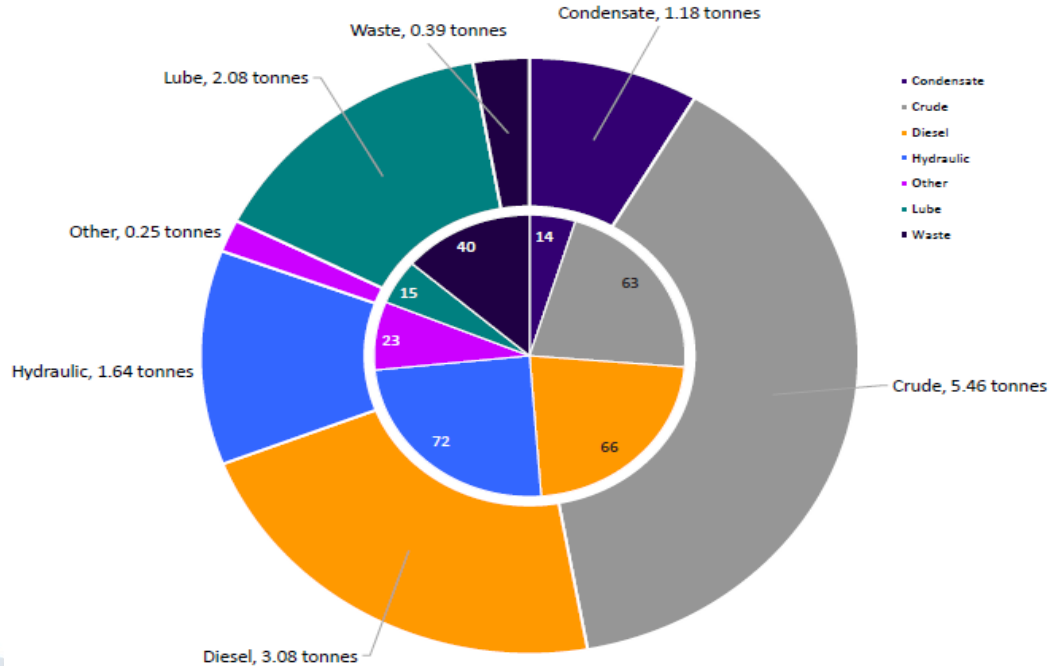
Oil Production is 935,000 bbls/d

Figure 32: Oil Release Mass and Number



- In 2018 there was 293 incidents in which 14.2 tonnes of oil (16,315 litres) was accidentally released into marine environment
- The number of incidents has been in the range of 250-300 a year
- Decrease in oil release in (> 50 tonnes) size since 2012

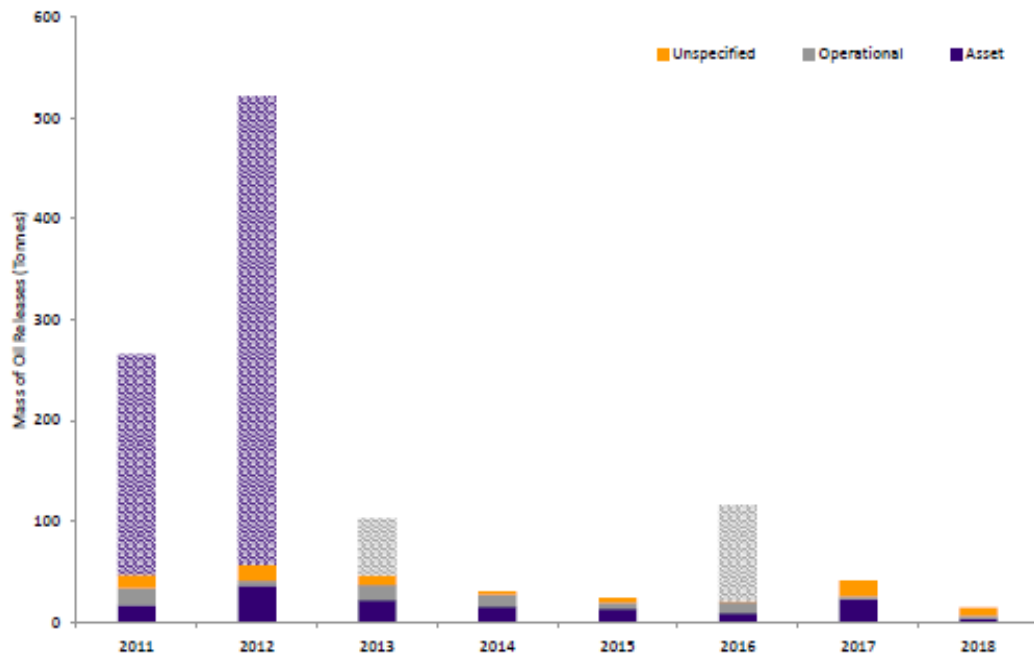
Figure 33: Mass and Number of Oil Releases by Product Type, 2018



- Understanding the oil product type is an important part of spill response
- In 2018, there were 63 incidents of crude oil releases which amounted to 5.46 tonnes (6273 litres) of oil released

Note - Conversion 1 tonne equals 1149 litre of Oil

Figure 34: Accidental Release Breakdown by Direct Cause

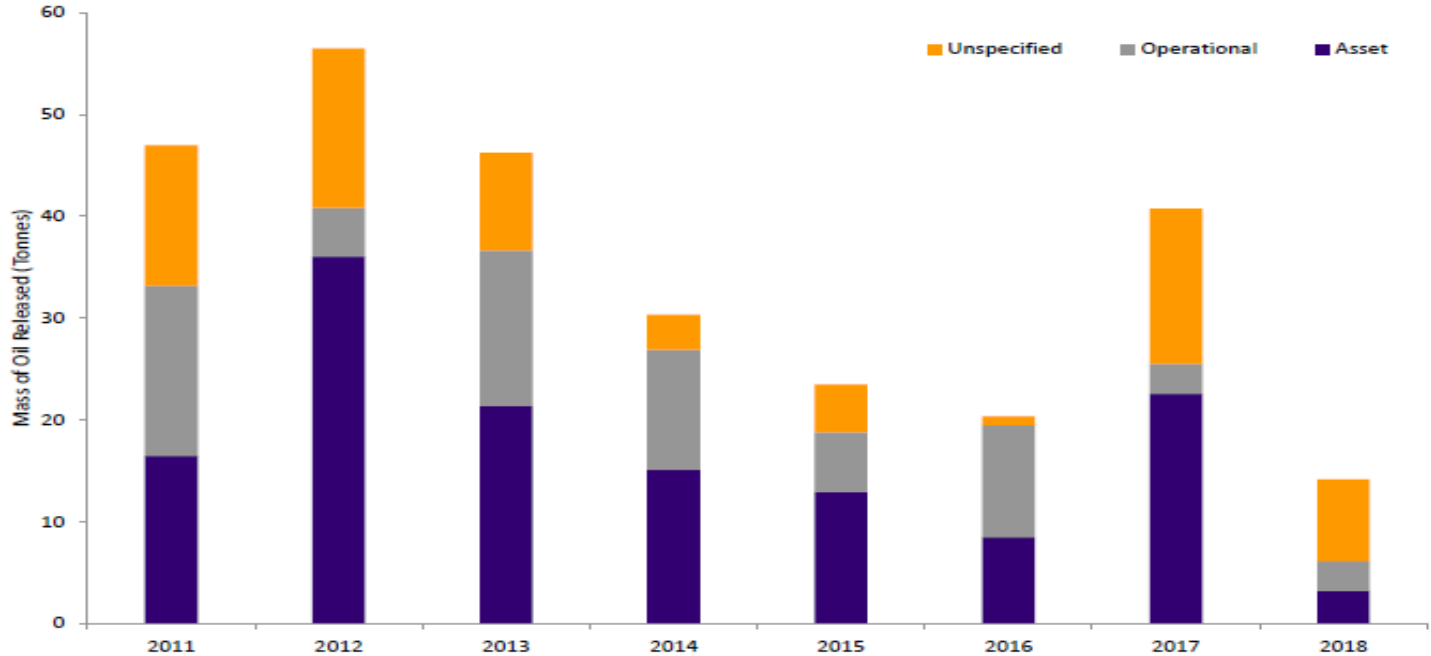


Source: OPRED, May 2019; OGUK

Direct causes were broken into three categories:

- Operational
- Asset integrity
- Unspecified cause

Figure 35: Accidental Release Breakdown by Direct Cause (Excluding Outliers)



Source: OPRED, May 2019; OGUK

- Asset integrity breaches were one of the major direct causes almost every year
- Trend was decreasing (except 2017)

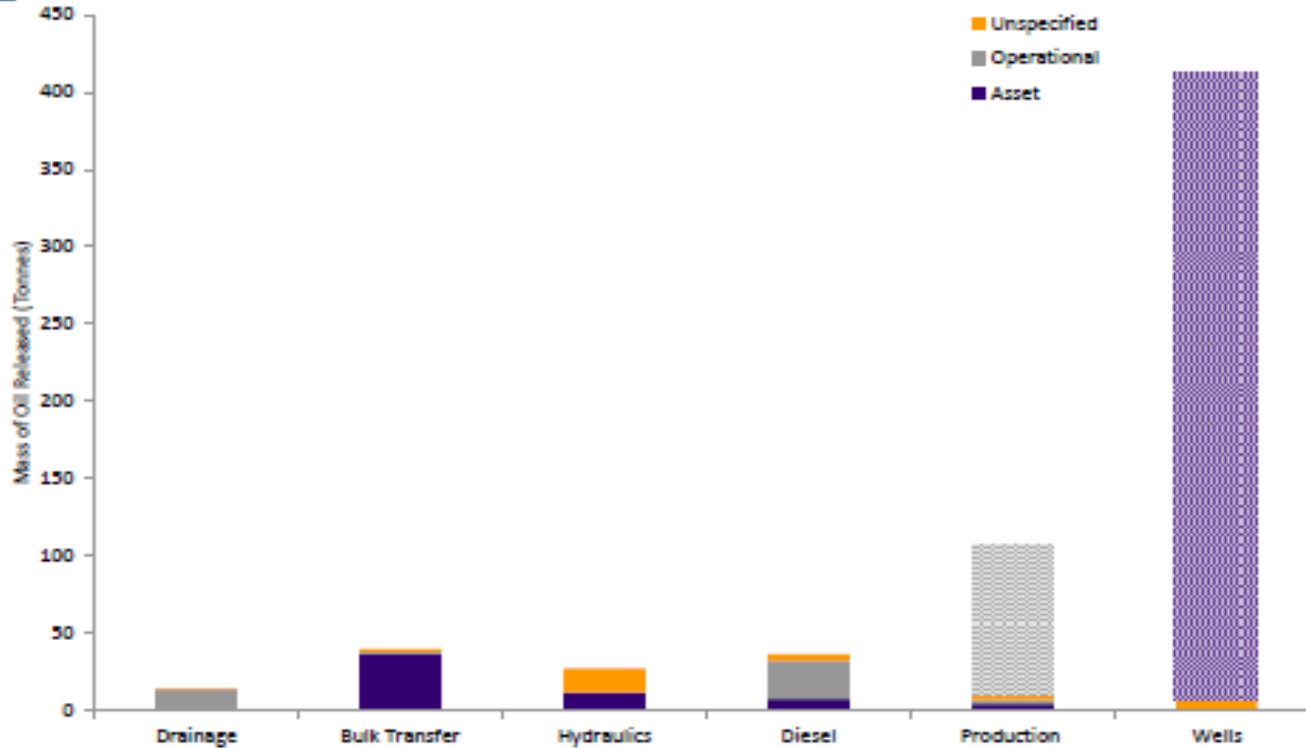
Figure 36: Top Ten Systems by Number of Releases

System / Equipment	Number of Releases
Drainage Systems	283
Bulk Transfer Systems	248
Hydraulic Systems	183
Diesel Systems	150
Production Systems	112
Cranes	98
ROV	97
Wells and Associated Systems	92
Pumps and Turbines	58
Tanks / Storage Systems	58

Figure 37: Top Ten Systems by Mass of Releases

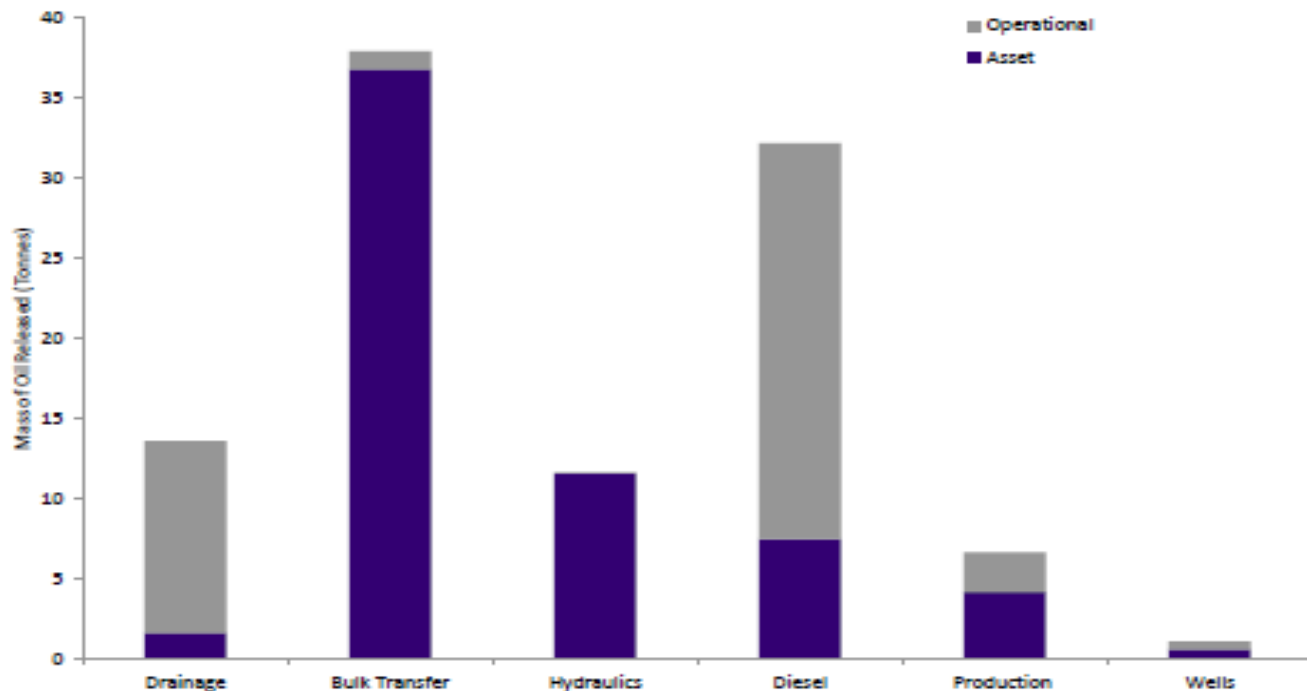
System / Equipment	Mass of Oil (Tonnes)
Wells and Associated Systems	412.52
Pipelines, umbilicals and flowlines	259.73
Production Systems	106.14
Compressors	57.15
Bulk Transfer Systems	39.59
Diesel Systems	36.39
Hydraulic Systems	26.90
Produced Water System	15.60
Drainage Systems	13.93
SCM	8.71

Figure 38: Direct Cause by System/Equipment Type



- By keeping the large oil releases in the data sets, wells and production systems are the direct cause

Figure 39: Direct Cause by System/Equipment Type (Excluding Outliers)



Source: OPRED, May 2019; OGUK

Direct Cause

- For operational integrity - drainage systems and diesel equipment
- For asset integrity – bulk transfer, hydraulics, production and wells

Summary of UK's Trends in Oil Spill Incidents and Direct Causes with Spills

- Since 2010, UK's oil and gas offshore sector has been working to improve on reducing the number of spill incidents
- The number of oil spill incidents has remained relatively the same each year since 2010
- But the number of large spills have dropped as the focus was on asset integrity
- The total mass of oil release of 14 tonnes is the lowest in seven years
- Industry and regulatory agencies were working together partly to improve overall efficiencies, but also, because it was mandated by EU in 2015
- Focus has been on:
 - Barriers through maintenance programs to ensure integrity
 - Multiple physical barriers (downhole safety valves, closed drains, bundling)
 - Training and competence management to understand risk
- There have also been more forums and working groups created to share experiences and lessons learned

Norway

Data for this review came from three sources:

1. Annual Report 2018 Norsk Oil/Gas Group
2. Annual Report 2018 Petroleum Safety Authority (PSA)
3. RNNP which is a subgroup of PSA which looks at the trends of risk levels in petroleum activity

Data is derives from a joint database of:

- Norwegian Environmental Agency
- Operators
- Petroleum Safety Authority (PSA)
- Norwegian Petroleum directorate (NPD)



Norway Offshore Infrastructure

Source Petroleum Safety Authority Annual Report 2018

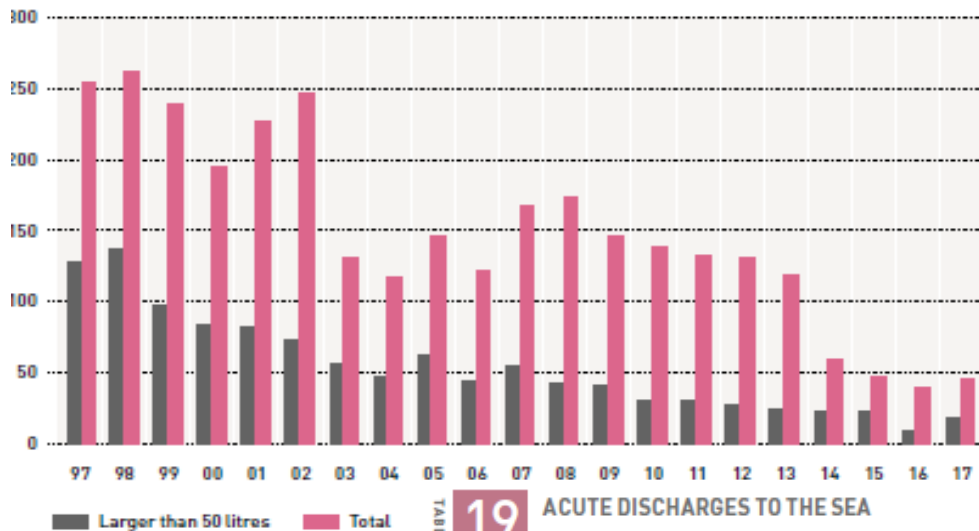


- Oil Production is around 1.6 million barrels a day
- Gas Production is 124 billion cubic meters

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Norway Offshore Oil Spill Statistics

15 UNINTENTIONAL OIL SPILLS TO THE SEA ON THE NCS

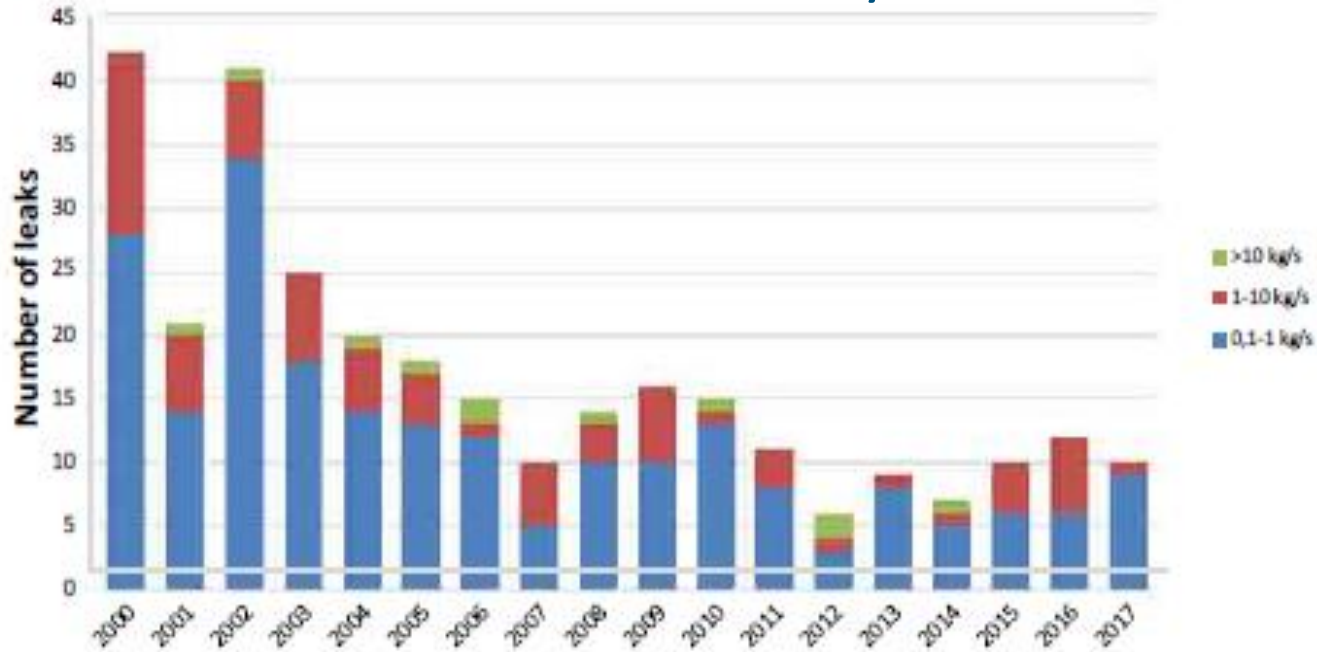


- 46 incidents in 2017, of which 18 incidents were larger than 50 litres
- In 2017, total combined spill volume was 12,200 litres
- Trend has been decreasing since 2008, but the number of incidents larger than 50 litres is about the same

19 ACUTE DISCHARGES TO THE SEA

Discharge type	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Number	173	147	140	133	131	119	59	47	39	46
Total Volume (litres)	195,000	113,000	110,000	24,000	17,000	47,000	162,000	40,000	17,000	12,200

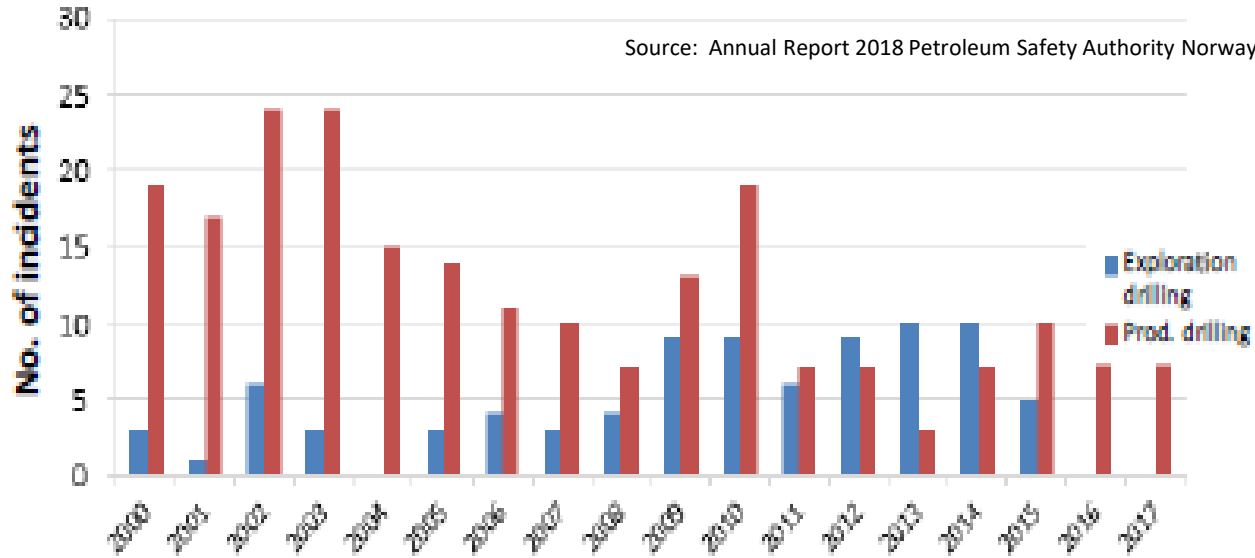
Hydrocarbon Leaks in Norway Offshore Sector



Source: Annual Report 2018 Petroleum Safety Authority Norway

- Trend downward from 2002 onward, with the PSA and industry putting emphasis on reducing the largest leaks through targeted projects and activities

Well Control Incidents in the NCS



- In 2014, a similar approach by the PSA and industry on activities to reduce the risk of well control and incidents and prevent acute pollution

These included:

- Audits on well control and barrier management
- Publishing information for all to benefit
- Supervision activity

Summary of Norway's Trends

- Norway's oil and gas offshore sector has yielded a downward trend in the number of acute hydrocarbon/oil spills since 2008.
- In 2018, the PSA focused on specialized audits - especially what companies are doing around robust planning, organizational and technical solutions that yield more knowledge and better systematic prevention.
- More focus by companies internally to prevent major spills, what follow-up was being done and then what knowledge-sharing was being done with industry and stakeholders.
- In PSA 2018 annual report, it states

“our experience and feedback from the participants indicate that our audits achieve the greatest effect when we address relevant topics over time on a broad scale with companies and influence them to initiate improvement process.

We have shown through our work together on hydrocarbon leaks, at-risk groups, barrier management we are capable of instigating long terms safety improvements in the industry over time”

Australia



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Australia's Offshore Infrastructure and Activity 2018

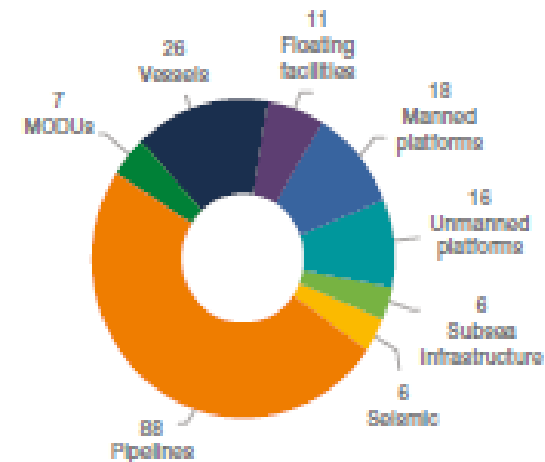
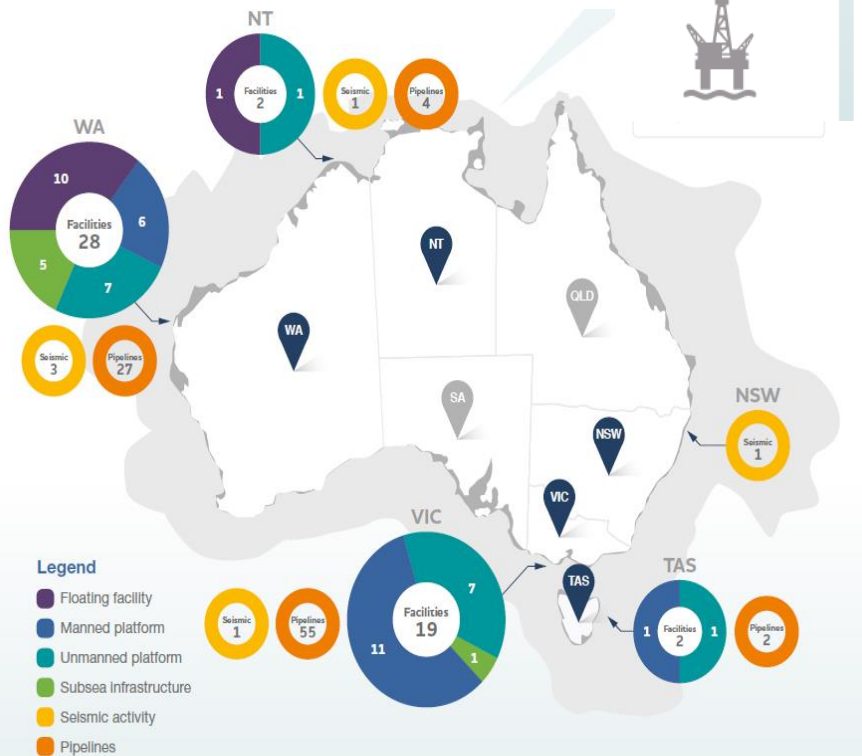
7 mobile offshore drilling units (MODUs)

19 vessels

910 wells



Total



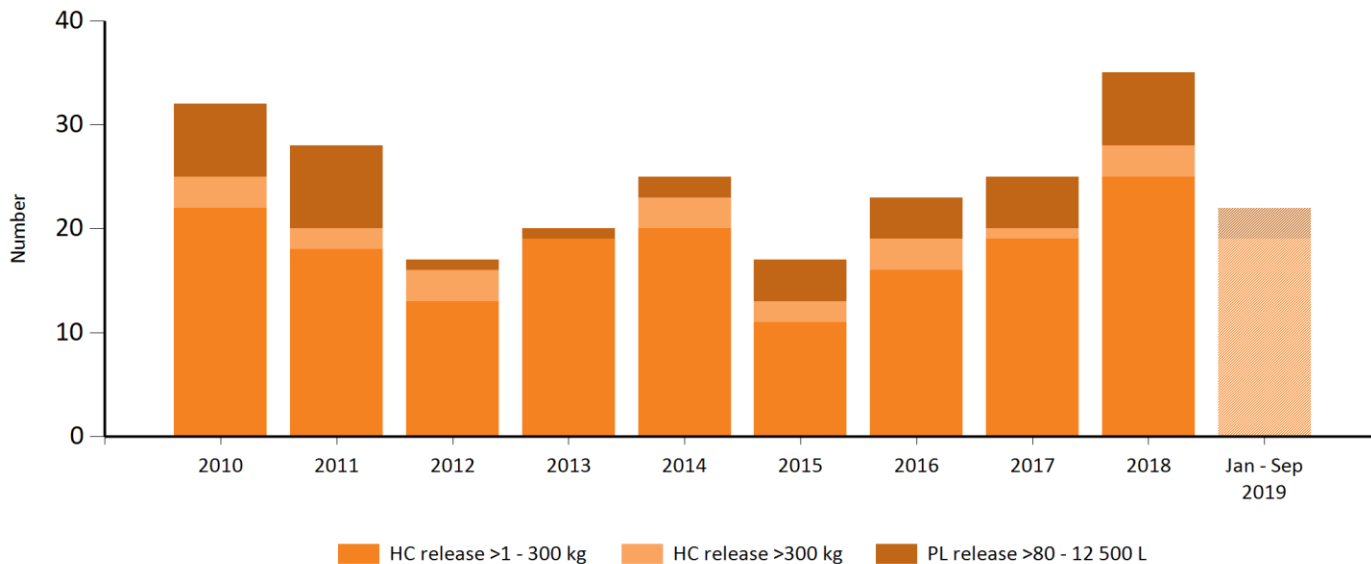
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Dramatic Shift in 2009

- Montara/West Atlas jackup wellhead platform incident in August 2009
- Spill that had a duration of 74 days
- Release rate of 63,600 litres a day
- Changed the regulatory and offshore operating environment in Australia going forward

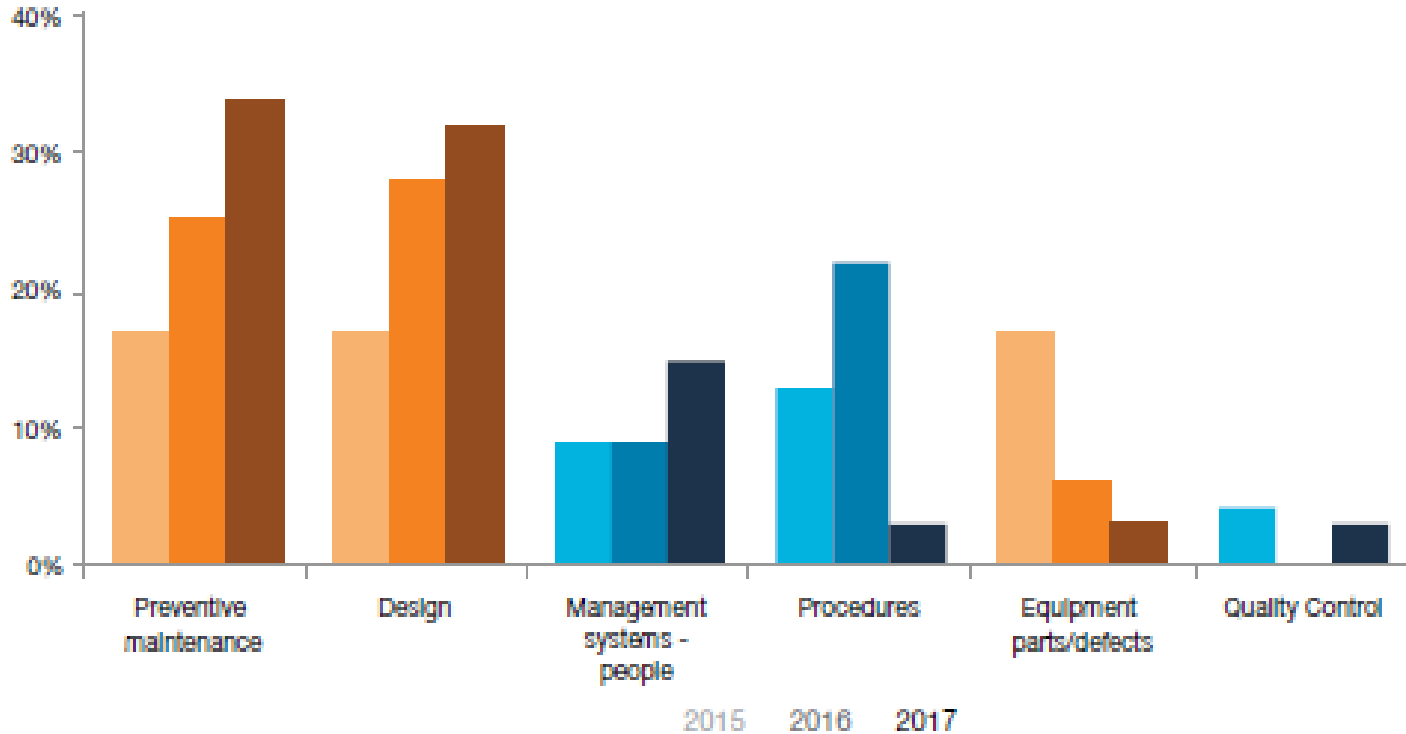


OHS hydrocarbon releases



Incident type	2010	2011	2012	2013	2014	2015	2016	2017	2018	Jan - Sep 2019	Total
Uncontrolled PL release >80 - 12 500 L	7	8	1	1	2	4	4	5	7	3	42

OHS hydrocarbon releases - basic causes



Pathways to improvement

NOPSEMA has selected these pathways to improvement in accordance with its Compliance strategy to facilitate improvements in industry performance across health and safety, well integrity and environmental management.

Lenses



Past (preventing old accidents)

Analyse previous incidents and high potential events to test for risk to As Low As Reasonably Practicable in assessments and inspections.

- Analyses of databank of previous incidents and High Possibility scenarios to test for risk to ALARP in assessments and inspections
- Effective audits



Present (find one, fix many)

Examine and share learnings from current non-compliances, incidents and best practices to prevent future occurrences and enhance existing good practice.

- Prevent future events through examination and sharing learnings from current non-compliances, incidents and best practices
- Enhance existing good practice



Future (emerging trends)

Address transparency expectations. Remove unnecessary regulatory burden and improve efficiency. Look elsewhere for better practices and tools to apply.

- Address transparency expectations
- Looking elsewhere for better practices and tools to apply now

Collaborative approach needed

Oil spill response
organisations



Titleholders

Operators

Government

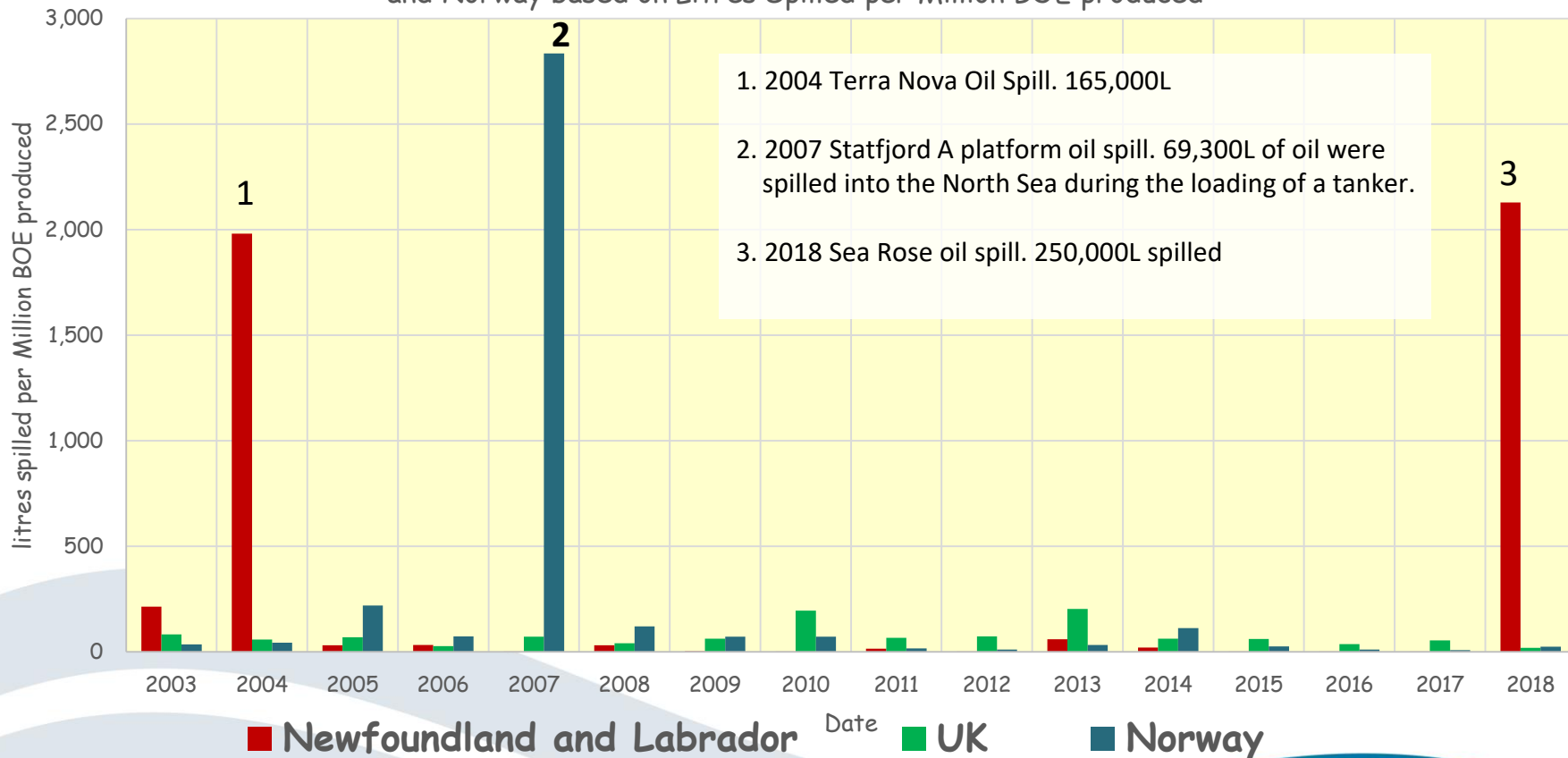
Well control
specialists

Regulators

Summary of Australia's Trends in Terms of Hydrocarbon Spills

- Australia's oil and gas offshore sector is seeing a trend of hydrocarbon spills that have increased over the last three years
- NOPSEMA in their annual report is attributing this trend to aging infrastructure which is related to preventive maintenance and design of offshore facilities
- They have seen this trend as one continuing into the future
- They selected a pathway of improvement that includes looking at previous incidents, collaborating and sharing learnings to prevent future events and try to get best practice

Comparison of Offshore Oil Spills between Canada Newfoundland and Labrador, United Kingdom and Norway based on Litres Spilled per Million BOE produced



Questions?