Cause Analysis
Hydrocarbon Leaks 2012 - 2017

Norwegian Oil and Gas Association - Project for Hydrocarbon Leak Reduction

Presentation Package

Background

- GaLeRe, later renamed to Gas Leak Reduction Project was established by OLF in 2003 and completed in 2006
- "Project Hydrocarbon Leak Reduction" was started in 2011 and revitalized in 2017 with a new mandate and new project group.
- The mandate and plan for the cause analysis of hydrocarbon leaks in the period 2012 – 2017 was approved by the project group in April 2018.
- Specific focus was to be made on underlying causes and preventative measures for all causes.

Relevant reports/analyses/initiatives

Cause relationships and preventative measures associated with hydrocarbon leaks on the Norwegian Continental Shelf. A study for the Petroleum Safety Authority by SINTEF in 2011

Follow up of companies' activities for reduction of hydrocarbon leaks, PSA report 2018

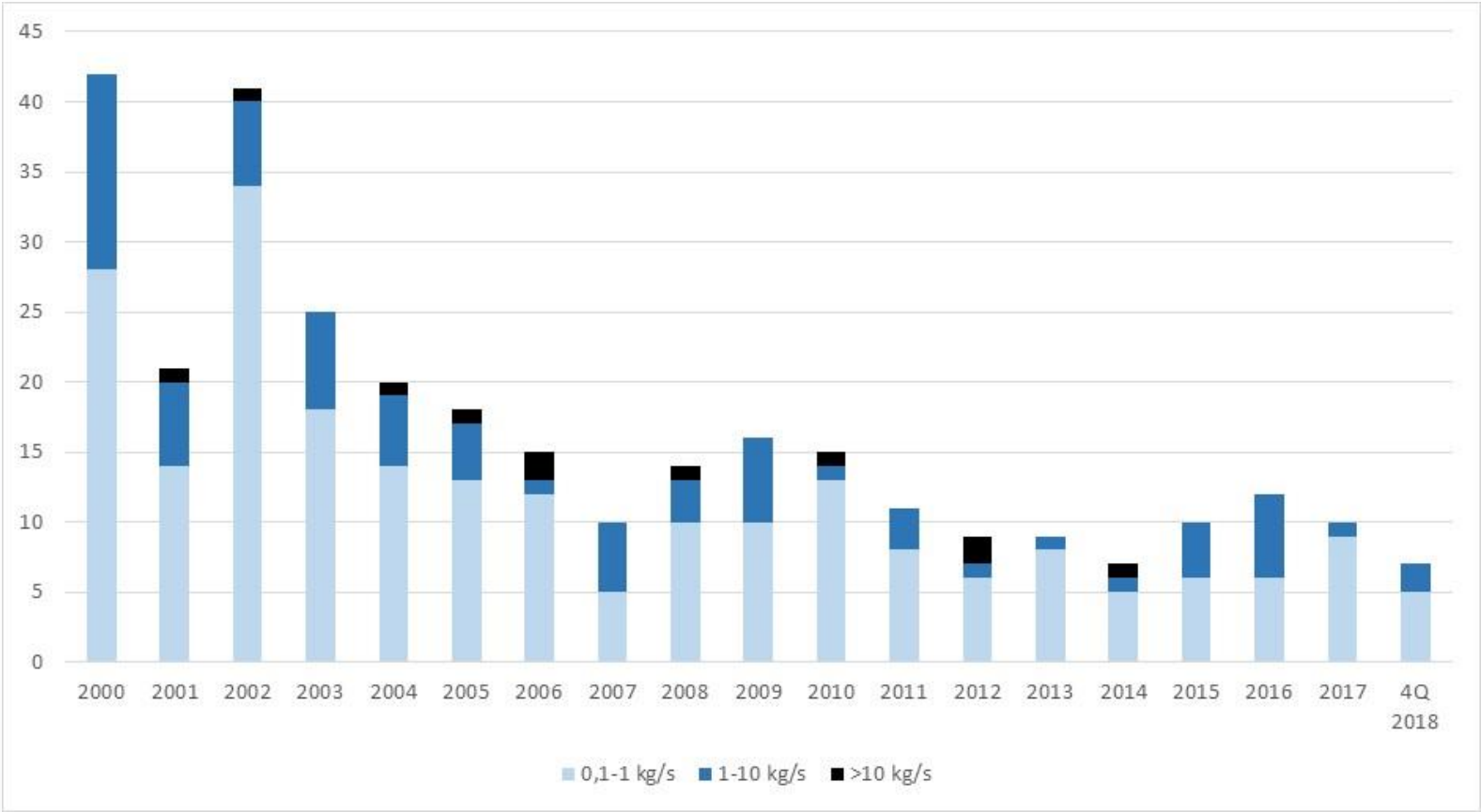
OLF hydrocarbon leak reduction project - Analysis of causes of hydrocarbon leaks in 2008 – 2011, Preventor rapport

Updated results from hydrocarbon leak cause analysis 2008 – 2015, Preventor presentation

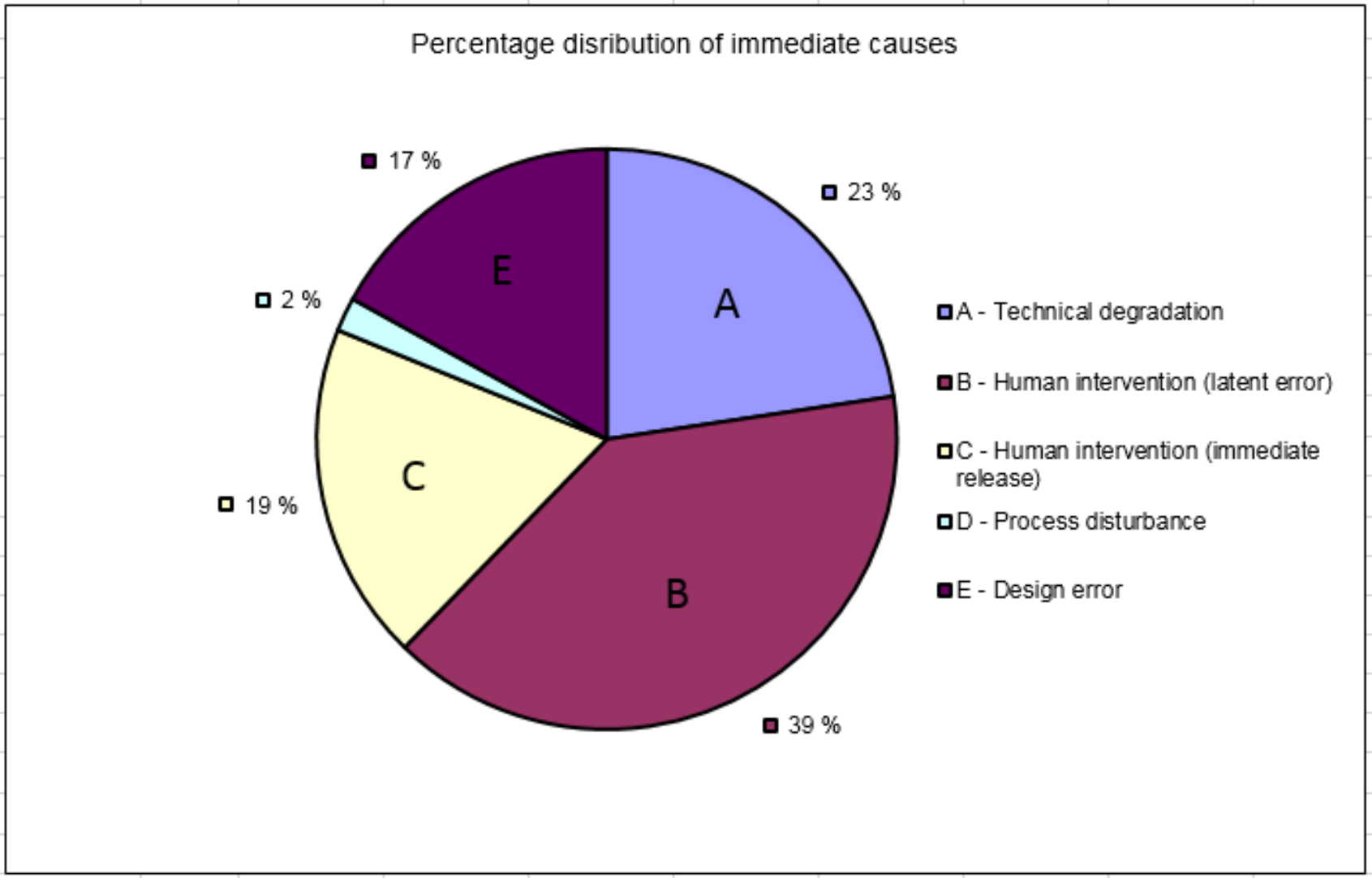
RNNP 2017 summary report

UK Step change for Safety

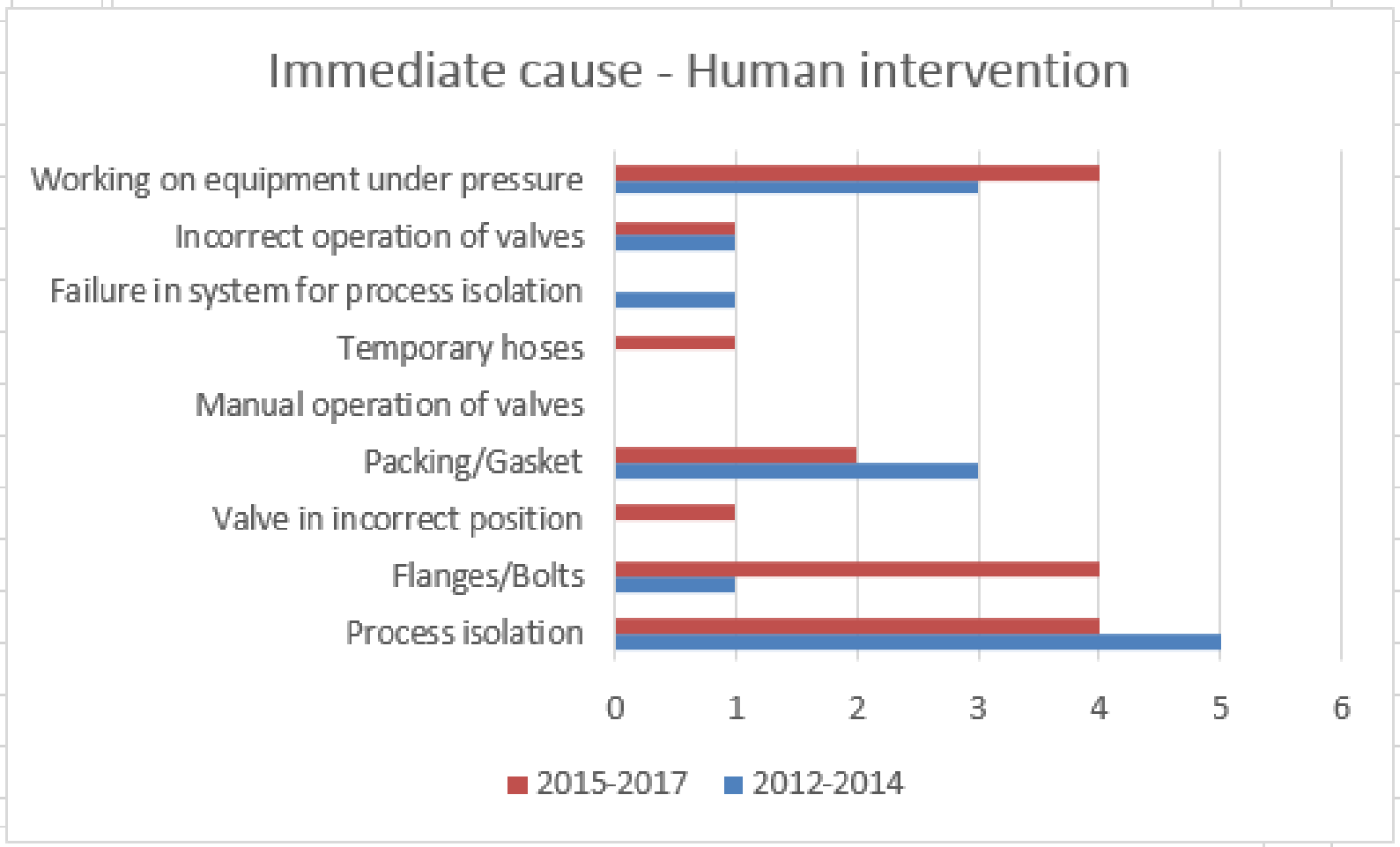
Hydrocarbon leaks per year in period 2000 - 2018



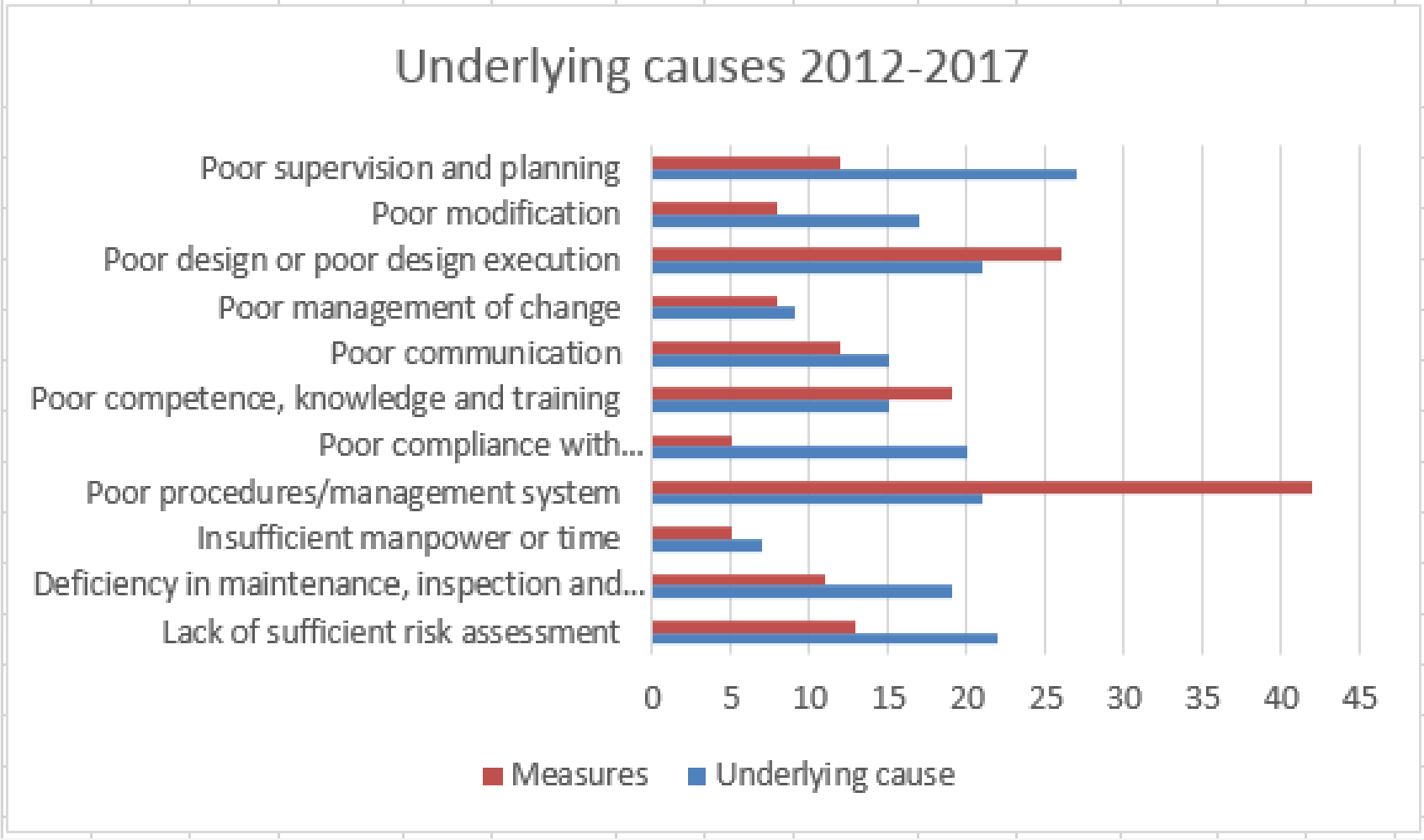
CAUSE ANALYSIS 2018 IMMEDIATE CAUSES



- HUMAN INTERVENTION - BREAKDOWN



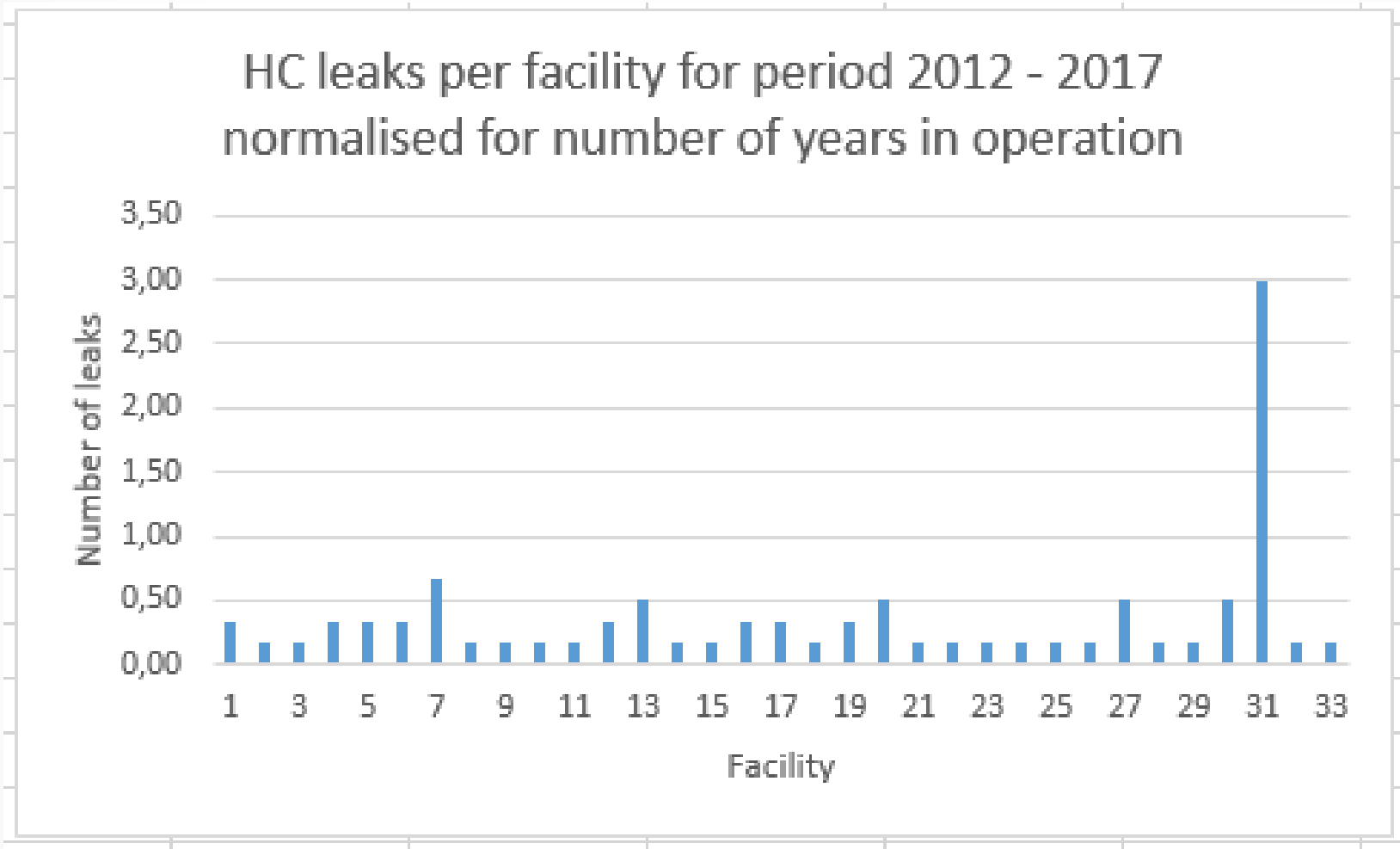
- UNDERLYING CAUSES AND IDENTIFIED REMEDIAL MEASURES



DESIGN

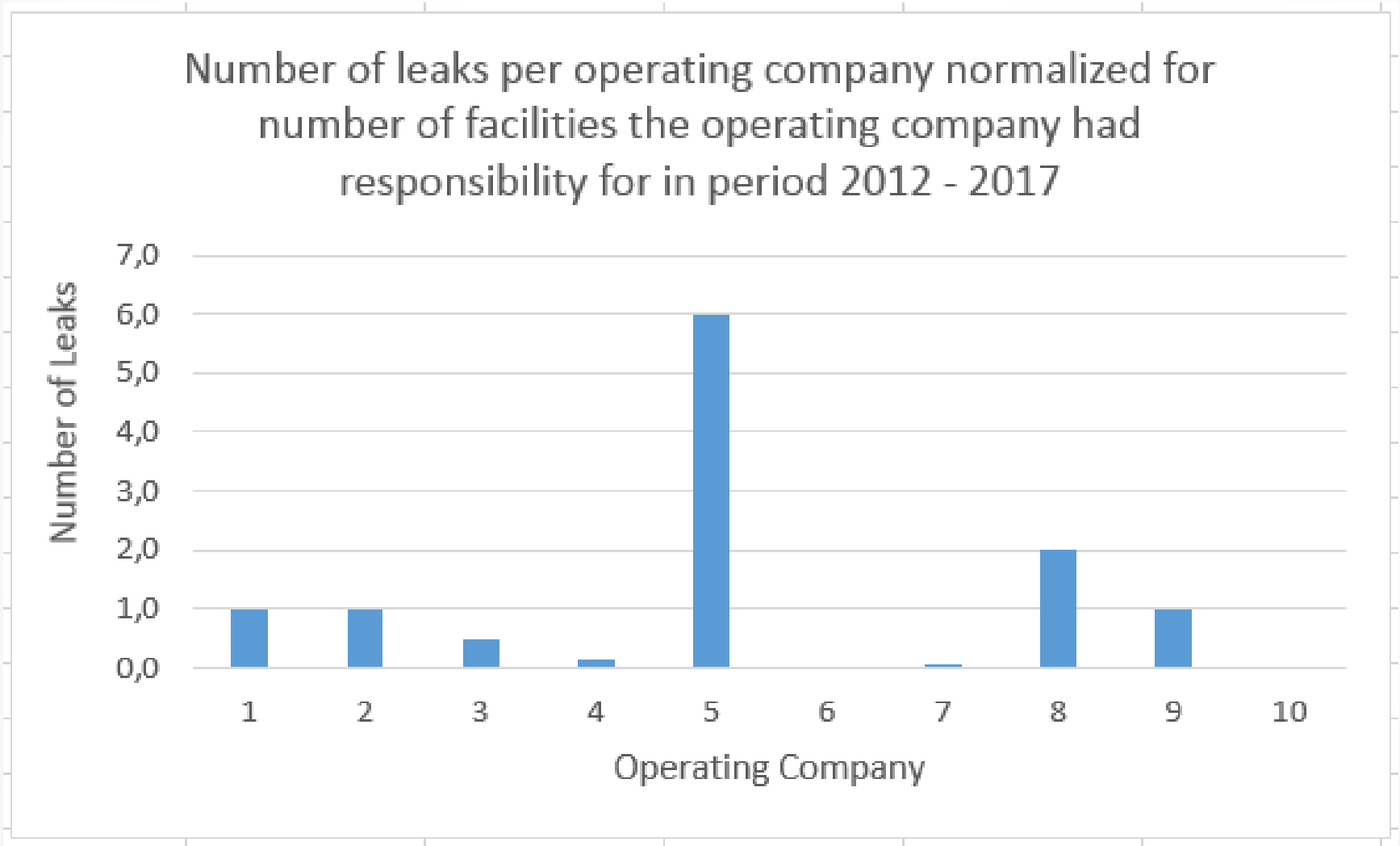
About 40% of hydrocarbon leaks are related to design as an immediate or an underlying cause.

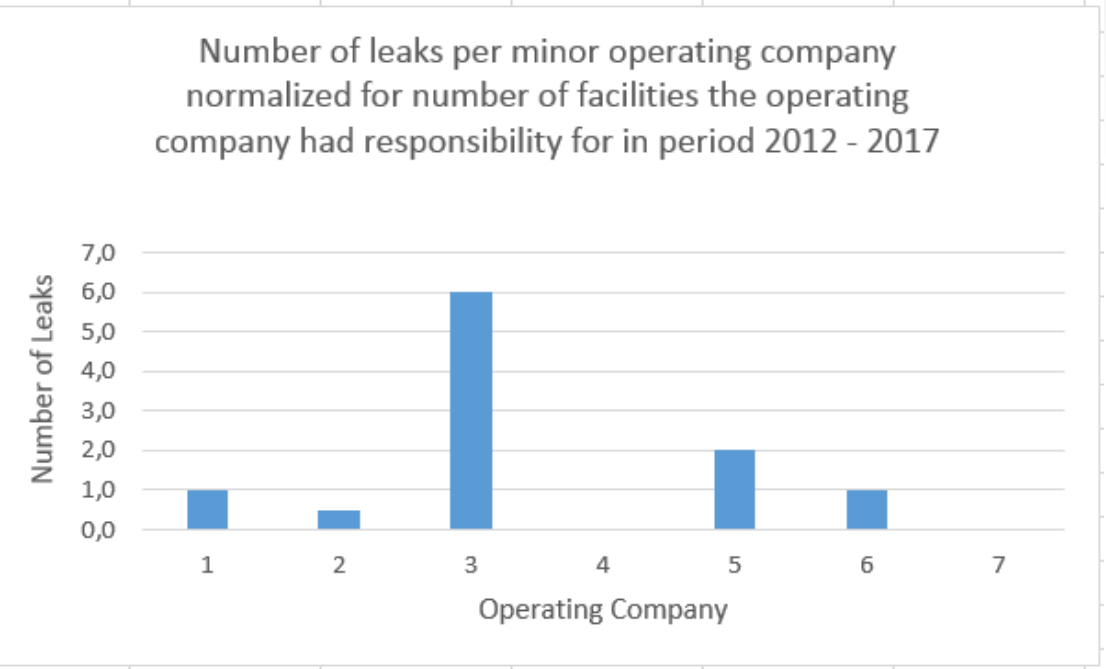
CAUSE ANALYSIS 2018

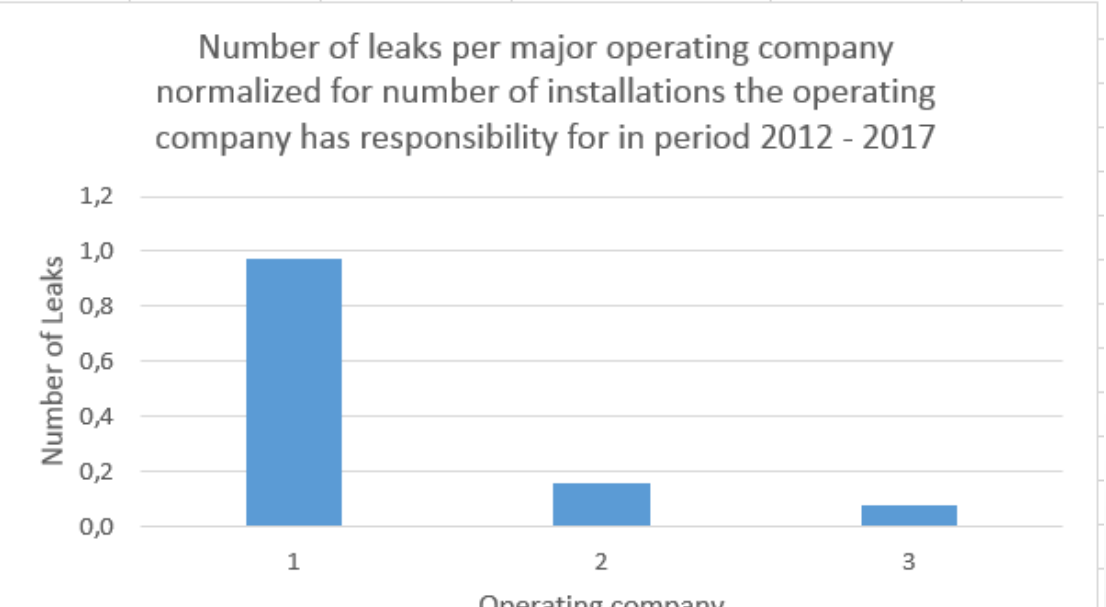


Y- axis is the number of HC leaks per year in operation for facilities that had HC leaks in the period 2012 to 2017

CAUSE ANALYSIS 2018




Number of leaks per minor operating company normalized for number of facilities the operating company had responsibility for in period 2012 - 2017
Number of Leaks
7,0
6,0
5,0
4,0
3,0
2,0
1,0
0,0
1
2
3
4
5
6
7
Operating Company


Number of leaks per major operating company normalized for number of installations the operating company has responsibility for in period 2012 - 2017
Number of Leaks
1,2
1,0
0,8
0,6
0,4
0,2
0,0
1
2
3
Operating company

Challenges for the petroleum industry - SINTEF report 2011

- The Petroleum Industry should have a more offensive attitude in relation changing design to remove poor technical solutions instead of accepting them and trying to work around them.

- The Petroleum Industry has a challenge with learning and experience transfer and ensuring that information from incident databases are used in the prevention of hydrocarbon leaks.

- The Petroleum Industry has a significant room for improvement in the definition of precise and concrete remedial measures.

- The Petroleum Industry has a significant room for improvement in relation to the evaluation and analysis of risk.

PSA – Follow up of companies activities in connection with reduction of HC leaks - 2018

Norsk olje&gass

Questions used in study

- What overview of hydrocarbon leaks do the companies have?
- Which hydrocarbon leaks are reported (internally/to the authorities)
- What are the companies doing o reduce HC leaks (both in project and operating phases)?
- Have the companies used specific measures that have had a positive effect on the reduction of HC leaks? (Success stories offshore and onshore)
- How do the companies focus on work on systems under pressure and activities that require opening of hydrocarbon systems?
- What competence requirements do the companies have that are relevant for the prevention of HC leaks?
- How do the companies use new or alternative technologies in the follow up and prevention of HC leaks?
- How have the companies used the four challenges from SINTEF in their work on prevention of HC leaks?

PETROLEUMSTILSYNET

Observations from the PSA study

- Some companies have had a focus on the prevention of HC leaks over a long period and have achieved results that have led to a reduction in HC leaks.
- All companies have measures directed at reduction of HC leaks and measures for ensuring prudent operation.
- The companies have similar guidelines and procedures for working on hydrocarbon systems.
- The companies have challenges on the quality of work carried out and the compliance with procedures.
- It is difficult to transfer the learning from HC leaks into the design phase of projects.
- The companies have processes in place to convey information on HC leaks.
- The companies have a focus on clear and concise measures from the investigation of HC leaks.

Step Change for Safety - UK

Steering Group – Asset Integrity

Working Group – Hydrocarbon leak Reduction Improvement and Implementation

Development of Hydrocarbon Release Reduction Toolkit

10 Peer Reviews carried out in2015 to form the basis for a 'Best Practice' for the prevention of HC leaks.

Hydrocarbon Release Prevention guidance

A review of the Step Change for Safety initiative for reduction of HC leaks indicates similar challenges to the challenges in Norway.

STEP CHANGE IN SAFETY

Recommendations from Cause Analysis on HC leaks 2012 - 2017

- Investigation methods

  Prioritize the identification of underlying causes and effective measures aimed at immediate and underlying causes

- Standardize the reporting format for HC leaks

  The format should include factors that can be relevant for future cause analyses and that are not reported today.

- Develop methods to measure the effect of measures to prevent HC leaks.

Recommendations from Cause Analysis 2012 – 2017 (cont.)

- Isolation in connection with work on hydrocarbon systems is an important focus area for the Operating Companies.

- There needs to be a continued focus on work with flanges and bolts. This include execution of work, verification and training of involved personnel.

- Design process and standards (e.g. NORSOK) should be improved to accommodate learning from HC leaks in operation.

  Focus on technical and operational measures and control of quality in the fabrication and construction processes.

Way Ahead

- The Cause Analysis report is available at the Norwegian Oil and Gas website. English version should be available by October 2019.

https://www.norskoljeoggass.no/drift/storulykkerisiko/hydrokarbonlekkasjer

- A presentation of the Cause Analysis is available at the Norwegian Oil and Gas web site. The presentation is available in Norwegian and English.

- The recommendations from the Cause Analysis will be followed up by the Norwegian Oil and Gas HC leak reduction project.