ANNUAL PERFORMANCE REPORT

FOR 2018 REPORTING YEAR

SEPTEMBER 2019

CENTER FOR OFFSHORE SAFETY

NOTICE

Data published in the Center for Offshore Safety's (COS) Annual Performance Report for the 2018 Reporting Year are based on data voluntarily reported by exploration and production Operators and Contractors operating in the United States. Although COS reviews reported data to identify internal inconsistencies and unusual period-to-period changes, in general COS is not able to verify the accuracy of reported data. COS, API, and any of their employees, subcontractors, consultants, or other assigns make no warranty or representation, either express or implied, with respect to the accuracy, completeness, or utility of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication, or represent that its use would not infringe upon privately owned rights.

API is not undertaking to meet the duties of employers, manufacturers, or suppliers to warn and properly train and equip their employees, and others exposed, concerning health and safety risks and precautions, nor undertaking their obligations to comply with authorities having jurisdiction.

CHARLIE WILLIAMS

Executive Director
Center for Offshore Safety

DEAR COS MEMBERS AND PARTNERS,

The Annual Performance Report for 2018 is a strong reminder of the industry's steadfast commitment and willingness to share safety data to improve the safety of offshore operations in the Outer Continental Shelf.

In releasing this performance report, the Center for Offshore Safety (COS) marks six years of leadership in safety and transparency.

COS Members' continued commitment to sharing information is a testament to the dual goals of meeting our energy needs while striving to keep our workers safe and the environment clean.

Companies in partnership with COS continue to see the value in voluntarily disclosing safety incidents and events in order to learn from experience and pursue continual improvement.

Our work at COS couldn't come at a better time. Production is on the rise in the U.S.; but, with more work also comes the need for a continued vigilance on safety. As the report shows, while the number of work hours has increased in the past year, the occurrence of major safety events remains low. No major oil spills were reported in 2018, but that has not stopped the industry from reporting because even the smallest incidents are the ones we want to prevent.

As industry convenes in Houston for the COS Annual Safety Forum, I look forward to re-emphasizing our mission to our members, regulators, nonprofits, and affiliated partners.

Safety is our core value, with continual improvement our highest aim.

I thank all COS Members for their commitment to and participation in this annual report and for their ongoing dedication to continual improvement through safety and environmental management systems.

Sincerely,

Charlie Williams

Charlie R. Williams

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COMMONLY USED ACRONYMS

API – American Petroleum Institute

APR – Annual Performance Report

ASP – Audit Service Provider

ASQ – American Society for Quality

BSEE – Bureau of Safety and Environmental Enforcement

COS – Center for Offshore Safety

DART – Days Away from Work, Restricted Work, and Job-Transfer Injury and Illness Frequency

GoM – Gulf of Mexico

HVLE – High Value Learning Event

IADC – International Association of Drilling Contractors

IMCA – International Marine Contractors Association

LFI – Learning from Incidents and HVLE

LFIP – Learning from Incidents and HVLE Program

LOPC – Loss of Primary Containment

MIT – Maintenance, Inspection, and Testing

MOC – Management of Change

MSRC – Marine Spill Response Corporation

NOIA – National Ocean Industries Association

OCS – Outer Continental Shelf

OMSA – Offshore Marine Service Association

OOC – Offshore Operators Committee

PRD – Pressure Relief Device

PSE – Process Safety Event

RIIF – Recordable Injury and Illness Frequency

SEMS – Safety and Environmental Management System

SPI – Safety Performance Indicator

SPIP – Safety Performance Indicator Program

WCI – Well Control Incident

WPCS – Well Pressure Containment System

1.0 2018 COS MEMBERS AND PARTICIPANTS

COS MEMBERS

Operators	Rig Contractors	Service Companies	Associations
Anadarko	EnscoRowan	Baker Hughes, GE	ASQ
BHP	Helmerich & Payne	Halliburton	IADC
BP E&P	Seadrill Americas	Oceaneering	IMCA
Chevron USA, Inc.		Schlumberger	MSRC
ExxonMobil		SubSea7	NOIA
Equinor			OMSA
Fieldwood			OOC
Hess			
Murphy E&P			
Shell International E&P			

10 Operators and 6 Rig Contractors and Service Companies shared SPI data for use in this APR.

COS members listed above as Associations do not provide data.

2.0 INTRODUCTION

The Center for Offshore Safety (COS) promotes the highest level of safety for offshore drilling, completions, and operations through leadership and effective management systems addressing communication, teamwork, and independent third-party auditing and certification. COS enables industry to continually improve safety and environmental performance through auditing of safety and environmental management systems, developing good practice, and capturing and sharing industry learnings. In the context of this report, the term safety is inclusive of personal safety, process safety, health, security, and environmental protection.

This COS Annual Performance Report (APR) provides information shared by its members under the following COS programs:

- Safety Performance Indicators (SPI), and
- Learning from Incidents and High Value Learning Events (LFI)

The COS member data provided through the LFI and SPI programs enable continual improvement of performance-based management systems

The SPI originated from major hazard bow ties, developed within COS, that cover both process safety and personal safety. The information can be used for driving improvement and, when effectively acted upon, contribute to reducing risk of major incidents by identifying weaknesses in barriers intended to prevent the occurrence or recurrence of incidents and mitigate consequences. The scope of the SPI data covers COS member wells, projects, production and decommissioning facilities and operations in the U.S. Outer Continental Shelf (OCS).

The Learning from Incidents and High Value Learning Events Program (LFIP) covers the same scope, but also allows for the submittal of data for incidents and events which occur outside the OCS.

Publication of SPI and LFIP data began in 2014, reflecting 2013 performance. Reporting is voluntary and data confidentiality is maintained through a process administered by an independent 3rd-party before submittal to COS.

2.1 SPI PROGRAM

The objectives of this program are twofold. First, it provides a means for sharing data related to key safety performance indicators. Second, it assesses past performance to identify potential opportunities which could lead to improvements in future performance.

The SPI used in this program were selected from assessments of major hazards in the offshore industry. Most of the SPI are outcomes or consequences of the failure of prevention and/or mitigation barriers. Over time, the intent of this program is to better identify Safety Performance Indicators (SPI) that will help detect potential problems prior to the occurrence of a major consequence.

Publications by the American Petroleum Institute, UK Health and Safety Executive, Center for Chemical Process Safety, International Association of Oil and Gas Producers, and the Organization of Economic Cooperation and Development, as well as the experience shared by COS members, were valuable to the development of this program.

2.2 LEARNING FROM INCIDENTS AND HIGH VALUE LEARNING EVENTS (LFIP)

The main objective of the program is to provide COS members a mechanism for sharing information from incidents that meet the criteria for an SPI 1 or SPI 2, as well as High Value Learning Events (HVLE). The LFIP also serves to complement the SPI Program by collecting additional information on SPI 1 and SPI 2 events, which are described in more detail in Section 4. This information is analyzed and shared to enable industry learning and reduce the risk of recurrence.

The effectiveness of this program is dependent on active participation by COS members to facilitate maximum learning opportunities through:

- Timely sharing of quality information from incidents and HVLE that meet the reporting criteria; and,
- Reviewing submitted incidents and HVLE, along with other aspects of this report, to identify and implement applicable learnings appropriate to different levels and functions within their own organizations.

3.0 EXECUTIVE SUMMARY

ABOUT THE REPORT

The Center for Offshore Safety (COS) Annual Performance Report for 2018 provides an accounting of safety-related incidents and events at facilities operating in the U.S. Outer Continental Shelf (OCS).

Members voluntarily present data for the annual performance report, to support the mission of COS to provide the highest level of safety for the U.S. offshore oil and natural gas industry. Through the report, COS can identify areas of improvement in the management of risk through safety management systems for the operation of offshore wells, projects, and production facilities in the OCS.

Data in the report comes from two key COS programs: the Safety Performance Indicators (SPI) program and the Learning from Incidents and High Value Learning Events Program (LFIP). Both programs identify and monitor areas where the industry can improve safety in the OCS.

Specifically, the SPI data is intended to help identify potential weaknesses that can be mitigated through the development of preventative measures to stop the occurrence or recurrence of major offshore incidents. This yearly performance report is an example of the commitment of COS to open communication and transparency of safety information, to building collaboration, communication, and sharing regarding safety in and between the industry, regulators, and the public.

KEY FINDINGS FROM 2018 DATA

- The overall trend of Tier 1 Process Safety Events (PSE) is improving from 2014 to 2018.
- None of the three Tier 1 PSEs reported in 2018 involved fatalities or injuries.
- In addition to there being no incidents reported for the 2018 reporting year involving fatalities or significant injuries, there were also no incidents resulting in major costs for damages, no significant offshore oil spills greater than or equal to 10,000 gallons, and no Level 1 well control incidents.
- Twenty-five SPI 2 incidents were reported in 2018, marking a sizable drop from the previous year when 38 incidents were reported.
- The consequences cited for SPI 2 were: 11 Tier 2 PSEs, nine of which involved non-toxic material; two collision damage incidents of at least $25,000 each; eight Mechanical Lifting or Lowering incidents that involved cranes; three incidents involving Loss of Station Keeping; and two incidents involving lifeboats and/or rescue boats.
- The eight reported lifting incidents marked a significant decrease from the 16 reported in 2017.
- Of the 28 SPI 1 and SPI 2 incidents reported for 2018, 21%, or six incidents, involved an equipment failure as a contributing factor. This is the lowest percentage reported to COS in its six years of collecting data.
- For the 27 incidents reported to the LFIP, the three areas most frequently identified for improvement were: Task Planning and Preparation; Operating Procedures or Safe Work Practices; and Individual or Group Decision-Making.

The effectiveness of this voluntary program is dependent on the active participation by COS members in sharing information on incidents in the U.S. OCS. COS encourages members to share their information in a timely manner, while continuing to provide the material capacity to do so.

3.1 SPI DATA SUMMARY

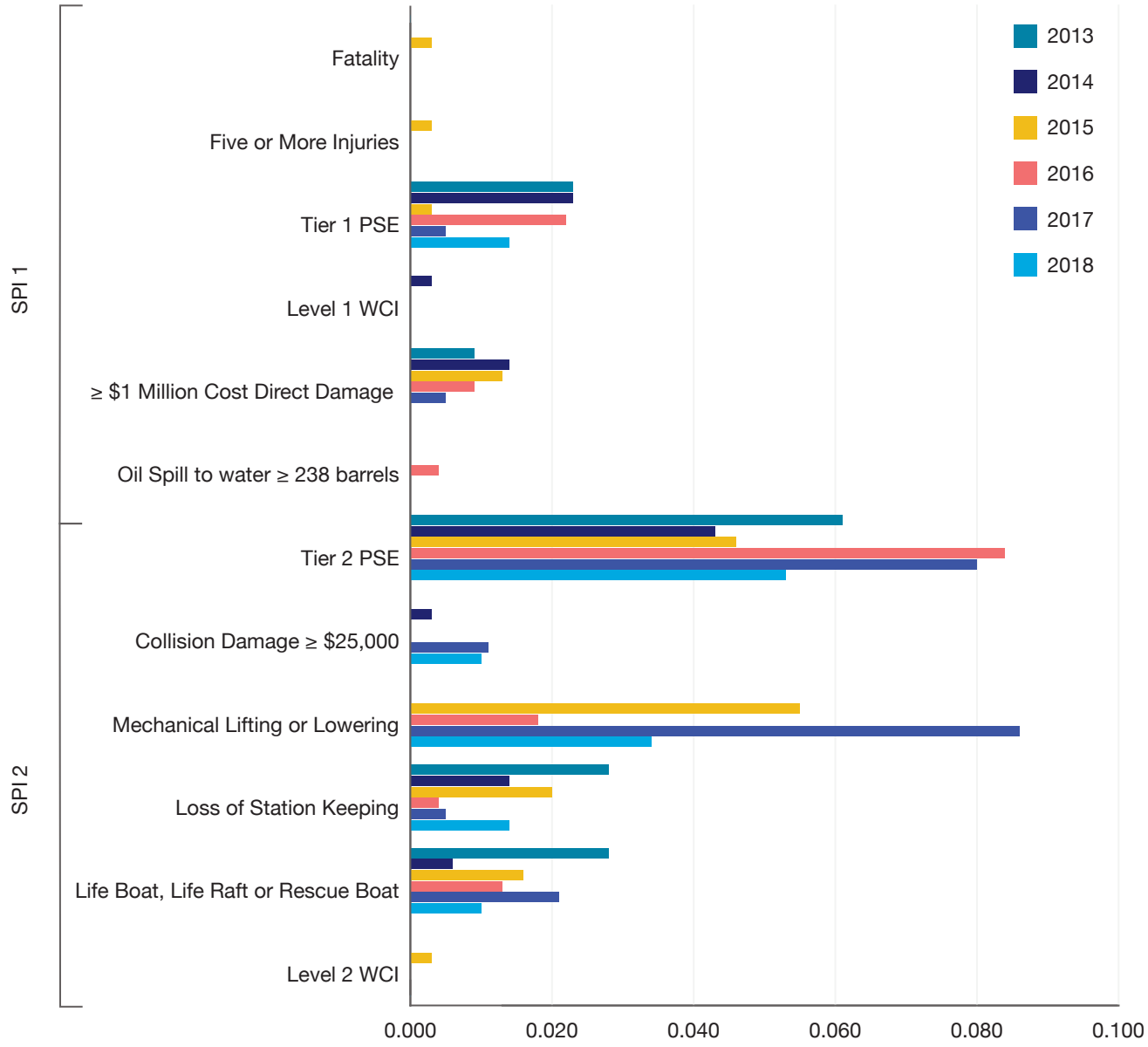
The data reported for 2018 represents over 41 million work hours in the OCS. This is an approximate increase of 10% from the hours reported for 2017 and reverses the declining trend of the past three years. Work hours for both Operators and Contractor are reported only by Operators for work occurring within 500 meters of their facilities.

Reporting Year	COS OCS Work Hours (Millions)
2013	43
2014	69
2015	61
2016	45
2017	37
2018	41

Unless otherwise specified, all frequencies stated in this report are normalized by total work hours multiplied by 200,000. Work hours are reported based on a 12-hour workday offshore.

The frequency of all SPI 1 and SPI 2 incidents are shown in Figure 3.1; specific definitions for the SPI are presented in Appendix 2.

Figure 3.1: SPI 1 and SPI 2 Incident Frequency



Participating members reported three (3) **SPI 1** incidents for 2018, as compared to one (1) for 2017. All three (3) **SPI 1** incidents were **Tier 1 PSE**. Zero (0) **SPI 1** incidents involving **Fatalities, Incidents ≥ 5 Injuries, ≥ $1 Million Cost Direct Damage, Oil Spill to Water ≥ 238 bbl., and Level 1 Well Control Incident (WCI)** were reported for 2018.

Though the 2018 **Tier 1 PSE** frequency was higher than reported for 2017, the overall trend from 2014 to 2018 continues to show improvement.

Participating members also reported twenty-five (25) **SPI 2** incidents for 2018, as compared to thirty-eight (38) for 2017. The reported consequences were eleven (11) **Tier 2 PSE**, two (2) **Collision Damage ≥ $25,000**, eight (8) **Mechanical Lifting or Lowering Incidents**, three (3) **Loss of Station Keeping Resulting in a Drive Off or Drift Off Incidents**, and two (2) **Life Boat, Life Raft, or Rescue Boat Events**. No incidents resulting in a **Level 2 WCI** were reported for 2018.

Eleven (11) **Tier 2 PSE** were reported in 2018, down from fifteen (15) in 2017. The frequency trend from 2013-18 indicates declining performance, however, an improvement trend is evident from 2016 to 2018.

Two (2) incidents were reported for 2018 involving **Collision Damage ≥ $25,000** which was the same number for 2017. An increasing trend in frequency is evident, influenced primarily by the last two years' data.

There were eight (8) incidents involving **Mechanical Lifting or Lowering**; a significant decrease from the sixteen (16) reported for the 2017 reporting year. An improvement trend in frequency is not evident for this indicator for 2015-18. The definition for this SPI was changed for the 2015 reporting year; therefore, both the frequency and count of these types of incidents are provided for only the 2015-2018 reporting years. The data presented in the first two APR (2013 and 2014 reporting years) have been reassigned to **SPI 4**.

Three (3) **Loss of Station Keeping Resulting Drive Off or Drift Off** incidents were reported in 2018 compared to one (1) in 2017. A declining performance trend in frequency is evident from 2016-2018 after previously showing three years of improvement.

There were two (2) **Life Boat, Life Raft, or Rescue Boat Events** compared to four (4) in 2017. However, an improvement trend in frequency is not evident for this indicator for 2014-2018, although performance has improved from the 2013 baseline.

Of the twenty-eight (28) **SPI 1** and **SPI 2** incidents reported for 2018, six (6) (21%) involved **failure of equipment as a contributing factor (SPI 3)**. This is the lowest percentage reported to COS in the six years of reporting. The largest contributor for 2018 is the "Process Equipment /Pressure Vessels/Piping" category.

The 2018 frequency of **incidents involving cranes or personnel/material handling (SPI 4)** was the lowest reported from 2013-2018.

For the Operators that shared **SPI 5 data (critical Maintenance, Inspection, and Testing (MIT) tasks completed as per plan)**, the combined average for 2018 was 97.3%, ranging from 71.1% to 100%. This is an increase from the data reported for 2017 (average 93.3%, ranging from 80.9% to 100.0%).

Additionally, for the Contractors that shared **MIT data (SPI 5)**, the combined average for 2018 was 93.9%, ranging from 60.3% to 100%, which represents a decrease from the data reported for 2017 (average 97.1%, ranging from 90.2% to 100%).

Zero (0) fatalities **(SPI 6)** were reported for 2018. One (1) fatality has been reported to COS in six years of reporting.

The combined **Days Away from Work, Restricted Work, and Transfer of Duty Rate (DART SPI 7)** reported for 2018 was 0.268, which is an increase as compared to the 0.214 reported for 2017. This continues a decline in performance since 2016 following an improvement trend from 2013-2016.

The combined **Recordable Injury and Illness Frequency (RIIF SPI 8)** reported for 2018 was 0.474, which is a decrease as compared to the 0.488 reported in 2017, but maintained the decline in performance seen in 2017 following the improvement trend from 2013-16.

Five (5) **Oil Spills to Water ≥ One Barrel (SPI 9)** were reported, compared to two (2) in 2017. The frequency was 0.024 in 2018, compared to 0.011 in 2017. This is a decline in performance compared to an improving trend from 2013-2017.

3.2 LFI DATA SUMMARY

This section provides a high-level summary of the LFI data. More detail is presented in Section 5 of the report.

The effectiveness of this program is dependent on active participation by COS members to facilitate maximum learning opportunities through:

- Timely sharing of quality information from incidents and HVLE that meet the reporting criteria; and
- Reviewing submitted incidents and HVLE, along with other aspects of this report, to identify and implement applicable learnings appropriate to different levels and functions within their own organizations.

The LFI data presented in this report includes information from thirty-one (31) LFI submittals received for the 2018 reporting year*, with twenty-seven (27) of the reported incidents and HVLE occurring in the U.S. and four (4) at U.S. Onshore/State Waters (refer to Figures 3.2 below). The twenty-seven (27) OCS events all occurred in water depths > 1,000 feet. To support COS' mission to promote the highest level of safety for the U.S. offshore oil and natural gas industry, the findings presented in this report are focused on incidents and events that occurred in the OCS.

* *Note – Four (4) LFI Submittals included in this COS Annual Performance Report for the 2018 Reporting Year had incident dates in early 2019.*

Figure 3.2: Incident Location (All Submittals)

Location	2013	2014	2015	2016	2017	2018	TOTAL
OCS	46	51	47	43	33	**27**	**220**
U.S. Onshore/ State Waters*	0	0	2	1	12	**4**	**15**
International	2	1	0	17	8	**0**	**28**
TOTAL	**48**	**52**	**49**	**61**	**53**	**31**	**263**

* *Note – The U.S. Onshore/State Waters category was new beginning with the 2017 reporting year. U.S. Onshore/State Waters statistics for prior years were generated from submittal content.*

A review of the 2018 reporting year LFI data (OCS only) identified the top three activity types as:

- Mechanical Lifting or Lowering
- Maintenance, Inspection, and Testing
- Normal, Routine Operations – Drilling and Production

In addition to the topics mentioned above, the top three Areas for Improvement (AFI) identified for 2018 were:

- Quality of Task Planning and Preparation
- Operating Procedures or Safe Work Practices
- Individual or Group Decision-Making

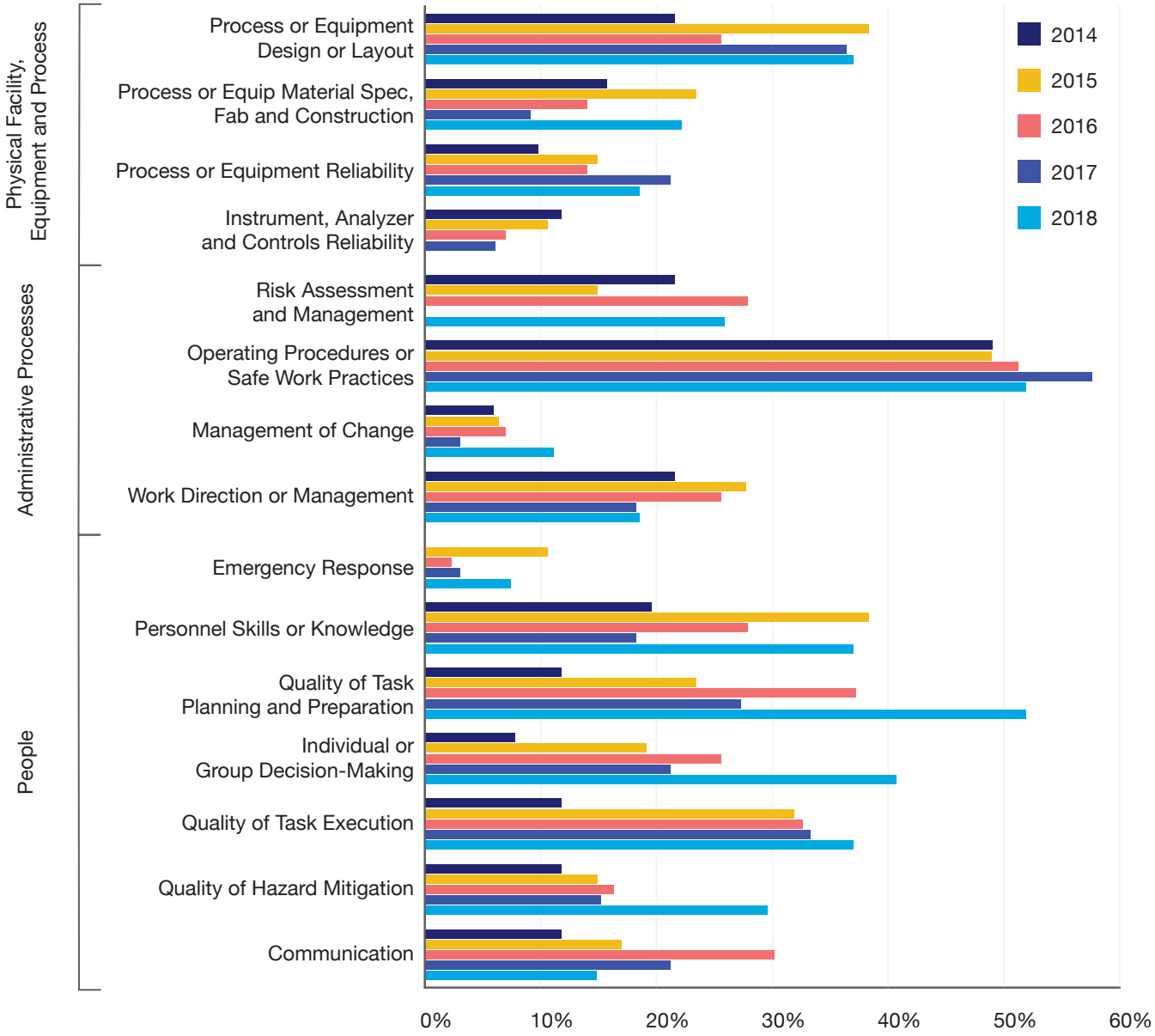
Additional review of the 2018 data identified the following as the most frequent incident consequences:

- Loss of Primary Containment (LOPC) (Process Safety and Non-Process Safety Events)
- Dropped Objects

In the 2017 RY APR, LOPC was identified as a broader category to include both Process Safety and Non-Process Safety Events. Learnings from these consequences are presented in section 5.3.

Across all six reporting years, Operating Procedures or Safe Work Practices was the most frequently identified AFI, as shown in Figure 3.3 below.

Figure 3.3: Areas for Improvement Distribution (OCS only)



NOTE - LFI submittals typically identified more than one AFI. The graph above illustrates the% of times an AFI was identified relative to the number of LFI forms submitted for OCS events. Because the number of AFI exceeds the number of LFI forms, the sum of the percentages will be > 100%.

3.3 OTHER NOTABLE COS ACCOMPLISHMENTS FOR 2018-2019

3.3.1 SEMS AUDIT SERVICE PROVIDER (ASP) ACCREDITATION PROGRAM

In accordance with the Memorandum of Understanding signed in 2015, COS is currently the only accreditation body authorized by BSEE to accredit SEMS ASP pursuant to 30 CFR 250, Subpart S.

As of the writing of this report, six (6) ASP have been fully accredited:

(1) ABS Quality Evaluations

(2) CICS-Americas

(3) DNV GL Business Assurance

(4) ERM Certification and Verification Services

(5) Gulf Tech

(6) M&H Auditing

A list of accredited ASP is maintained at https://accreditation.centerforoffshoresafety.org/accreditation/accreditations

3.3.2 SEMS AUDIT AND CERTIFICATE PROGRAM

SEMS Certificates demonstrate that an organization has satisfactorily completed a Safety and Environmental Management System (SEMS) audit conducted by an accredited ASP and meets the requirements of API Recommended Practice 75.

As of the publication of this APR, the following COS Member Companies have successfully attained or re-attained a COS SEMS Certificate:

- Anadarko Petroleum Corporation
- BHP Billiton Petroleum
- BP E&P, Inc.
- Cameron International
- Chevron USA, Inc. (Deepwater Assets)
- Cobalt International Energy, LP
- ConocoPhillips Co.
- ExxonMobil
- Helmerich & Payne International Drilling Co.
- Hess Corporation
- Marathon Oil Company
- Murphy E&P, Co.
- Noble Energy
- Shell E&P Co.
- Pacific Drilling Services, Inc.
- Schlumberger
- Statoil Gulf Services, LLC.

A list of COS Member certificates is maintained at https://www.centerforoffshoresafety.org/sems-certificates

3.3.3 COS AT 2019 OFFSHORE TECHNOLOGY CONFERENCE (OTC)

COS hosted its seventh-annual SEMS ½-day at the 2019 Offshore Technology Conference. The theme of the SEMS ½ day was *Digitalization and New Technology*. Keynote speakers included:

- Director Scott Angelle, Bureau of Safety and Environmental Enforcement
- Rear Admiral Paul Thomas, United States Coast Guard

- Brittany Benko, Anadarko
- Dave Payne, Chevron

3.3.4 COS SAFETY LEADERSHIP AWARD

The winners of the 2018 COS Safety Leadership Awards were:

ExxonMobil – SSH&E Sharing and Learning App

Baker Hughes, a GE Company – Threat Response Drills Program

For 2019, COS will be announcing the winners of the 2019 COS Safety Leadership Award at the 7th Annual COS Safety Forum, September 17 – Houston, TX. Finalists for the award are:

Operator Finalists	
BP	*Robotic Inspection – Taking Safety to New Heights*
ExxonMobil	*Safe Choice: Empowering Workers to Enhance Human Performance*
Shell	*Conditional Rate of Change (CROC) Alarm for Detection of Large Subsea Leaks*

Contractor Finalists	
BHGE	*Enhanced Augmented/Mixed Reality and Process Safety Applications*
BHGE	*RiskGuard – Operationalizing Upstream Process Safety in Drilling Operations*
Schlumberger	*HSE Training, the Learner's Journey*

3.3.5 COS SAFETY SHARES

As part of the COS commitment to the mission of promoting safe operations by sharing industry knowledge, COS created the COS Safety Shares Program. A complete list of COS Safety Shares are publicly available at www.centerforoffshoresafety.org, with more under development:

- COS2013002 Breathing Welding Gas Instead of Air
- COS2014006 Blind Skillet in Mud Gas Separator Vent Line
- COS2014039 Stop Work Authority Used to Prevent Serious Incident
- COS2015015 Unexpected High Pressures in Depleted Zone
- COS2016043 Bosun Trapped Between Cargo on Vessel
- COS2016046 Subsea Leak from Well Jumper
- COS2016055 Inadvertent Activation of Critical BOP Function Results in Subsea Release
- COS2016056 Compressor Fire
- COS2016057 EDS vs ESD

4.0 SAFETY PERFORMANCE INDICATORS

4.1 INTRODUCTION

COS members share Safety Performance Indicator (SPI) data with COS through the SPI Program. Reporting is voluntary and data confidentiality is maintained through a process administered by a 3rd-party before submittal to COS. This is the sixth year that COS members have shared SPI data.

While the data for 2013 was limited to reporting of COS member deepwater (> 1,000 feet water depth) activity only, the data for 2014-2018 includes all COS member activity on the OCS. A normalization factor for work hours is utilized to enable year-to-year comparisons. The summary of the SPI is presented in Figure 4.1 below.

Figure 4.1: Safety Performance Indicators (SPI)

SPI 1 is the frequency of incidents that resulted in one or more of the following:

A. Fatality
B. Five or more injuries in a single incident
C. Tier 1 Process Safety Event
D. Level 1 Well Control Incident - Loss of Well Control
E. ≥ $1 million direct cost from damage to or loss of facility/vessel/equipment
F. Oil spill to water ≥ 10,000 gallons (238 barrels)

SPI 2 is the frequency of incidents that do not meet the SPI 1 definition but have resulted in one or more of the following:

A. Tier 2 Process Safety Event
B. Collision resulting in property or equipment damage ≥ $25,000
C. Mechanical Lifting or Lowering Incident
D. Loss of Station Keeping Resulting in a Drive Off or Drift Off
E. Life Boat, Life Raft, Rescue Boat Event
F. Level 2 Well Control Incident - Multiple Barrier Systems Failures and Challenges

SPI 3 is the number of SPI 1 and SPI 2 incidents that involved failure of one or more pieces of equipment as a contributing factor.

SPI 4 is a crane or personnel/material handling operations incident.

SPI 5 is the percentage of planned critical Maintenance, Inspection, and Testing (MIT) completed on time. Planned critical MIT deferred with a formal risk assessment and appropriate level of approval is not considered overdue.

SPI 6 is number of work-related fatalities.

SPI 7 is the frequency of days away from work, restricted work, and job-transfer injury and illnesses (DART).

SPI 8 is the frequency of recordable injuries and illnesses (RIIF).

SPI 9 is the frequency of Oil Spills to Water ≥ 1 Barrel.

As referenced above, SPI 1-5 are based on structured assessments of major hazards facing the offshore industry. SPI 6-9 are indicators historically reported by industry and are not directly related to the structured assessment work.

Certain characteristics of the data reported for SPI 1 and SPI 2 incidents limit some aspects of the analysis and trending. An incident may have consequences that meet both SPI 1 and SPI 2 definitions but is not counted in both classifications. The higher consequence drives the classification. For example, a collision that results in ≥ $1 million direct damage cost meets the SPI 1E definition, but also meets the SPI 2B consequence of collision resulting in ≥ $25,000 in damage. However, per the SPI Program structure, it is only counted as an SPI 1E incident and not an SPI 2B collision.

Although definitions used for some of the SPI are the same or similar to regulatory definitions, the numbers in this report will not necessarily match regulatory data due to this report being based on COS participating member company data and not all companies operating in the OCS.

4.2 SUMMARY

This report provides COS member data for 2013-2018. The data reported for 2018 represents over 41-million operator and contractor work hours in the OCS. This is a slight increase of over 10% from the hours reported for 2017 and reverses the declining trend of the past three years. Work hours are reported only by Operators for work occurring within 500 meters of their facilities.

Reporting Year	COS OCS Work Hours (Millions)
2013	43
2014	69
2015	61
2016	45
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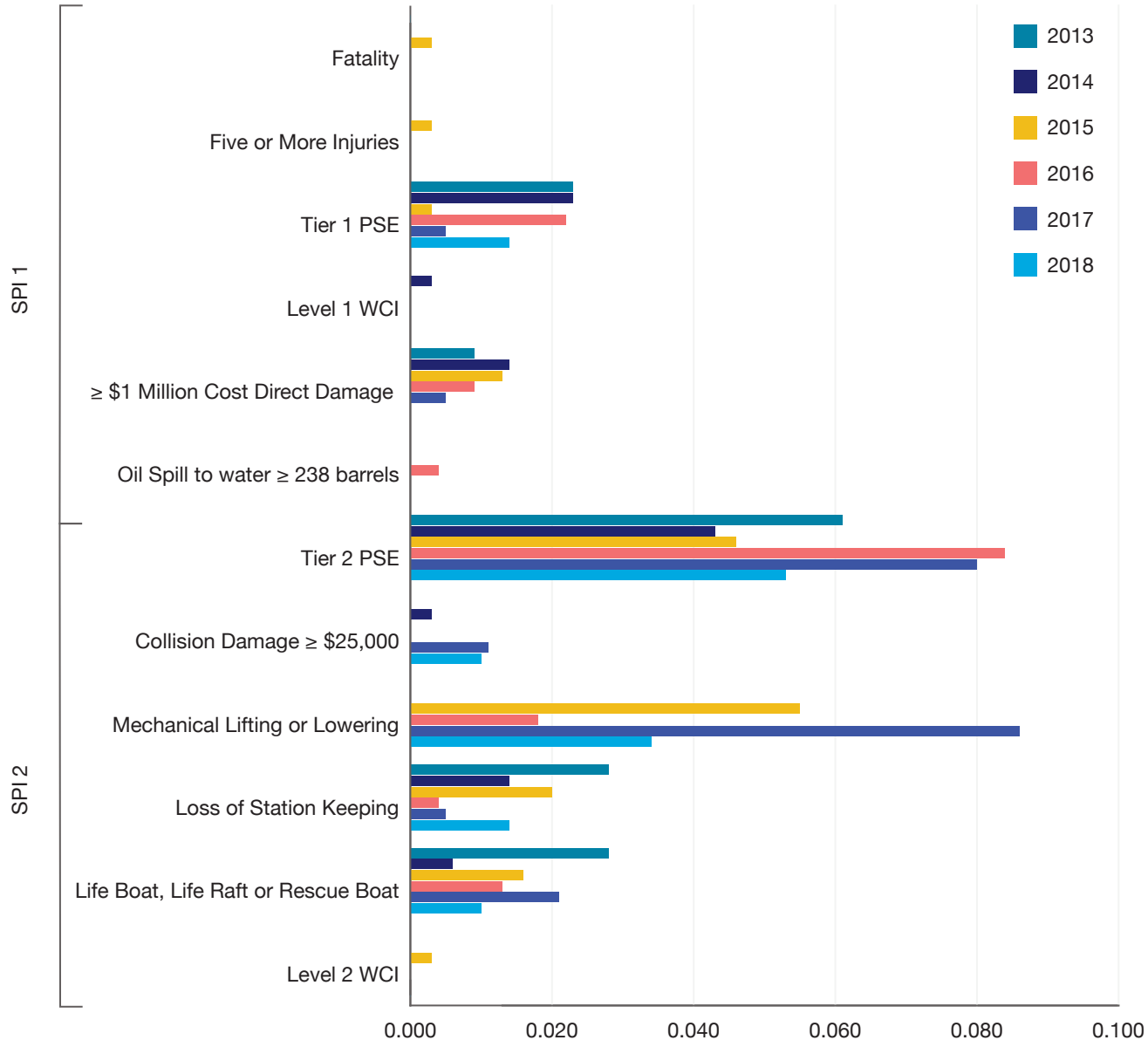
The frequency of all SPI 1 and SPI 2 incidents are shown below in Figure 4.2; specific definitions for the SPI are presented in Appendix 2.

Figure 4.2: SPI 1 and SPI 2 Incident Frequency



Participating members reported three (3) **SPI 1** incidents for 2018, as compared to one (1) for 2017. All three (3) **SPI 1** incidents were **Tier 1 PSE**. Zero (0) **SPI 1** incidents involving **Fatalities, Incidents ≥ 5 Injuries, ≥ $1 Million Cost Direct Damage, Oil Spill to Water ≥ 238 bbl., and Level 1 Well Control Incident (WCI)** were reported for 2018.

Though the 2018 **Tier 1 PSE** frequency was higher than reported for 2017, the overall trend from 2014 to 2018 continues to show improvement.

Participating members also reported twenty-five (25) **SPI 2** incidents for 2018, as compared to thirty-eight (38) for 2017. The reported consequences were eleven (11) **Tier 2 PSE**, two (2) **Collision Damage ≥ $25,000**, eight (8) **Mechanical Lifting or Lowering Incidents**, three (3) **Loss of Station Keeping Resulting in a Drive Off or Drift Off Incidents**, and two (2) **Life Boat, Life Raft, or Rescue Boat Events**. No incidents resulting in a **Level 2 WCI** were reported for 2018.

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There were eight (8) incidents involving **Mechanical Lifting or Lowering**; a significant decrease from the sixteen (16) reported for the 2017 reporting year. An improvement trend in frequency is not evident for this indicator for 2015-18. The definition for this SPI was changed for the 2015 reporting year; therefore, both the frequency and count of these types of incidents are provided for only the 2015-2018 reporting years. The data presented in the first two APR (2013 and 2014 reporting years) have been reassigned to **SPI 4**.

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There were two (2) **Life Boat, Life Raft, or Rescue Boat Events** compared to four (4) in 2017. However, an improvement trend in frequency is not evident for this indicator for 2014-2018, although performance has improved from the 2013 baseline.

Of the twenty-eight (28) **SPI 1** and **SPI 2** incidents reported for 2018, six (6) (21%) involved **failure of equipment as a contributing factor (SPI 3)**. This is the lowest percentage reported to COS in the six years of reporting. The largest contributor for 2018 is the "Process Equipment /Pressure Vessels/Piping" category.

The 2018 frequency of **incidents involving cranes or personnel/material handling (SPI 4)** was the lowest reported from 2013-2018.

For the Operators that shared **SPI 5 data (critical Maintenance, Inspection, and Testing (MIT) tasks completed as per plan)**, the combined average for 2018 was 97.3%, ranging from 71.1% to 100%. This is an increase from the data reported for 2017 (average 93.3%, ranging from 80.9% to 100.0%).

Additionally, for the Contractors that shared SPI **SPI 5 MIT data**, the combined average for 2018 was 93.9%, ranging from 60.3% to 100%, which represents a decrease from the data reported for 2017 (average 97.1%, ranging from 90.2% to 100%).

Zero (0) fatalities **(SPI 6)** were reported for 2018. One (1) fatality has been reported to COS in six years of reporting.

The combined **Days Away from Work, Restricted Work, and Transfer of Duty Rate (DART SPI 7)** reported for 2018 was 0.268, which is an increase as compared to the 0.214 reported for 2017. This continues a decline in performance since 2016 following an improvement trend from 2013-2016.

The combined **Recordable Injury and Illness Frequency (RIIF SPI 8)** reported for 2018 was 0.474, which is a decrease as compared to the 0.488 reported in 2017, but maintained the decline in performance seen in 2017 following the improvement trend from 2013-16.

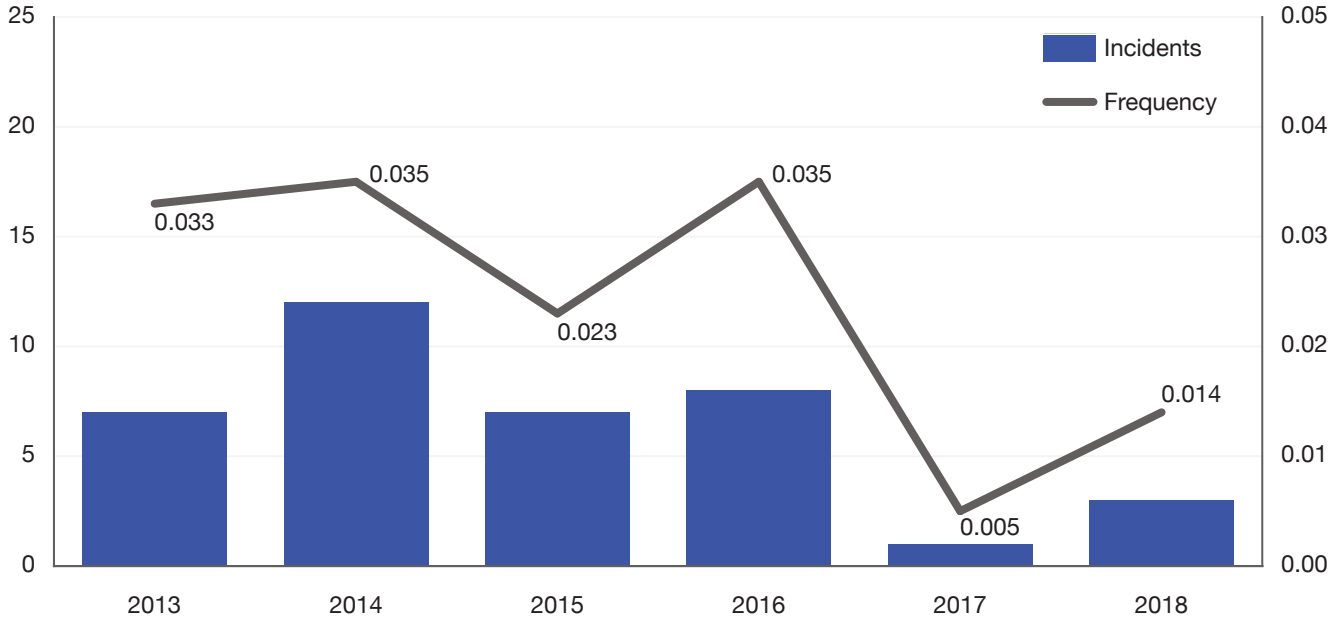
Five (5) **Oil Spills to Water ≥ One Barrel (SPI 9)** were reported, compared to two (2) in 2017. The frequency was 0.024 in 2018, compared to 0.011 in 2017. This is a decline in performance compared to an improving trend from 2013-2017.

4.3 SPI 1 RESULTS AND TRENDS

SPI 1 is the frequency of incidents that resulted in one or more of the following:

A. Fatality
B. Five or more injuries in a single incident
C. Tier 1 Process Safety Event
D. Level 1 Well Control Incident - Loss of Well Control
E. ≥ $1 million direct cost from damage to or loss of facility/vessel/equipment
F. Oil Spill to Water ≥ 10,000 gallons (238 barrels)

Figure 4.3: SPI 1 Incident Count and Frequency



- Participating members reported three (3) **SPI 1** incidentsfor 2018, as compared to one (1) for 2017. All three (3) **SPI 1** incidents were **Tier 1 PSE**.
- Though the 2018 **SPI 1** frequency was higher than reported for 2017, the overall trend from 2014 to 2018 continues to show improvement.

Figure 4.4: SPI 1 Incident Count per Sub-Group

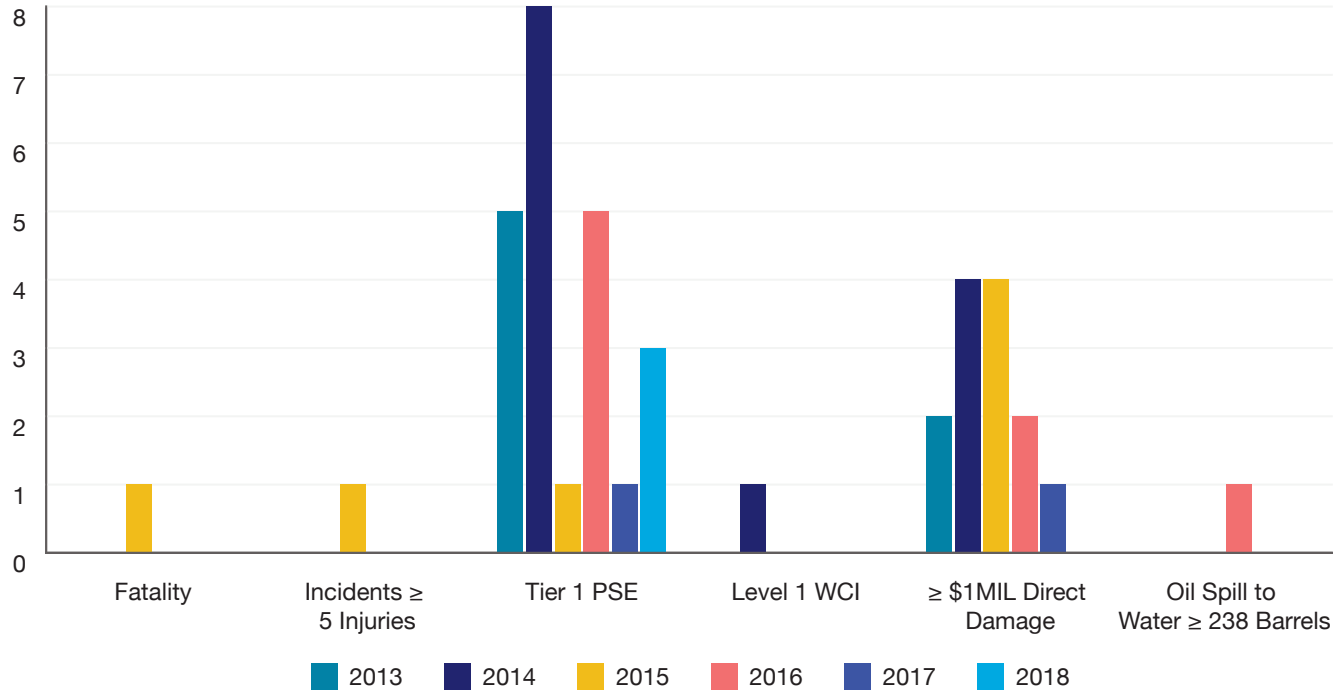
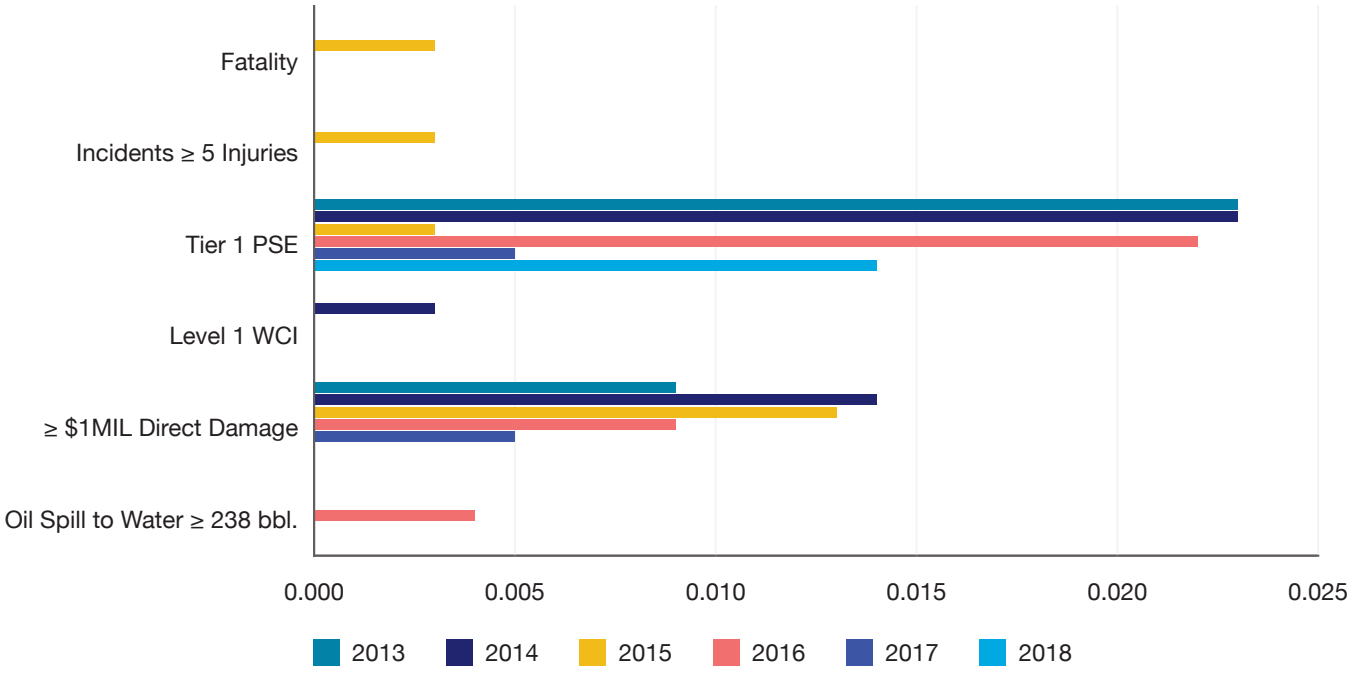


Figure 4.5: SPI 1 Incident Frequency per Sub-Group



- Zero (0) incidents resulting in a **Fatality, Incidents ≥ 5 Injuries, Level 1 WCI, ≥ $1 Million Direct Damage, or Oil Spill to Water ≥ 238 bbl.** were reported for 2018.
- There were three (3) **SPI 1** incidents reported for 2018. All three (3) **SPI 1** Incidents were **Tier 1 PSE**, for a frequency of 0.014.
- Though the 2018 **Tier 1 PSE** frequency was higher than reported for 2017, the overall trend from 2014 to 2018 continues to show improvement.

4.4 SPI 2 RESULTS AND TRENDS

SPI 2 is the frequency of incidents that do not meet the SPI 1 definition but have resulted in one or more of the following:

A. Tier 2 Process Safety Event

B. Collision resulting in property or equipment damage ≥ $25,000

C. Mechanical Lifting or Lowering Incident

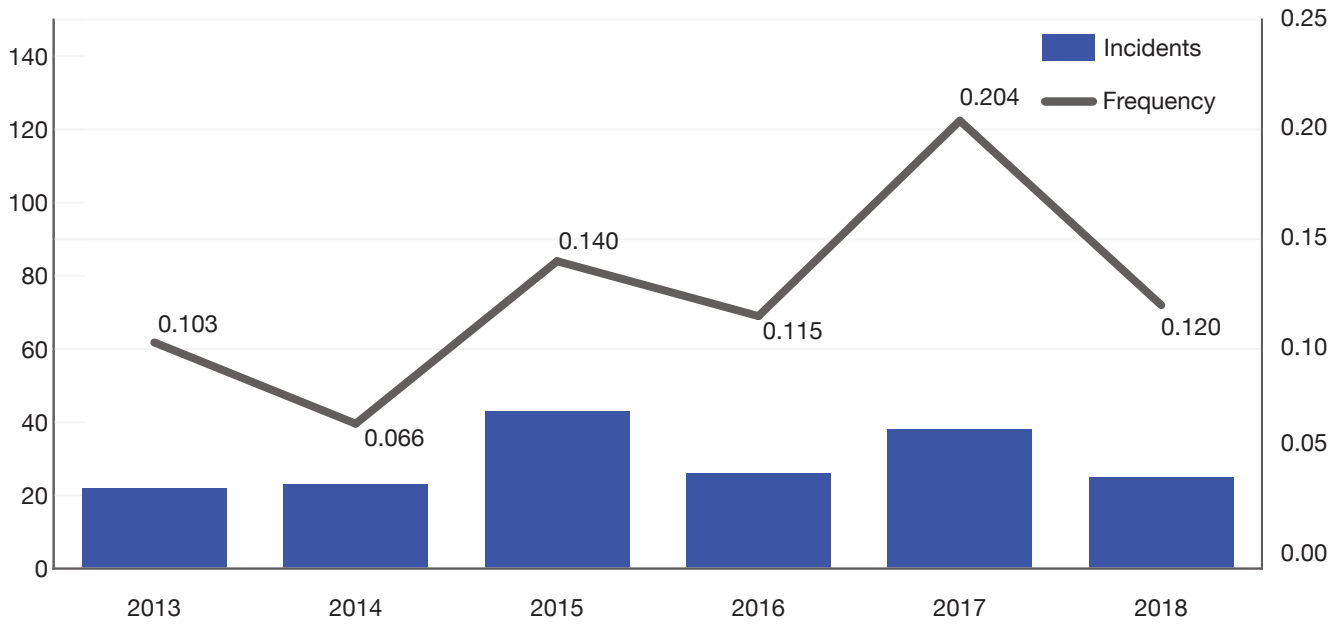
D. Loss of Station Keping Resulting in a Drive Off or Drift Off

E. Life Boat, Life Raft, Rescue Boat Event

F. Level 2 Well Control Incident - Multiple Barrier Systems Failures and Challenges

G. Oil Spill to Water ≥ 10,000 gallons (238 barrels)

Figure 4.6: SPI 2 Incident Count and Frequency



- Participating members reported twenty-five (25) **SPI 2** incidents for 2018, as compared to thirty-eight (38) for 2017.
- 2018 frequency of **SPI 2** incidents reversed the declining performance trend from 2013-2017.

Figure 4.7: SPI 2 Incident Count per Sub-Group

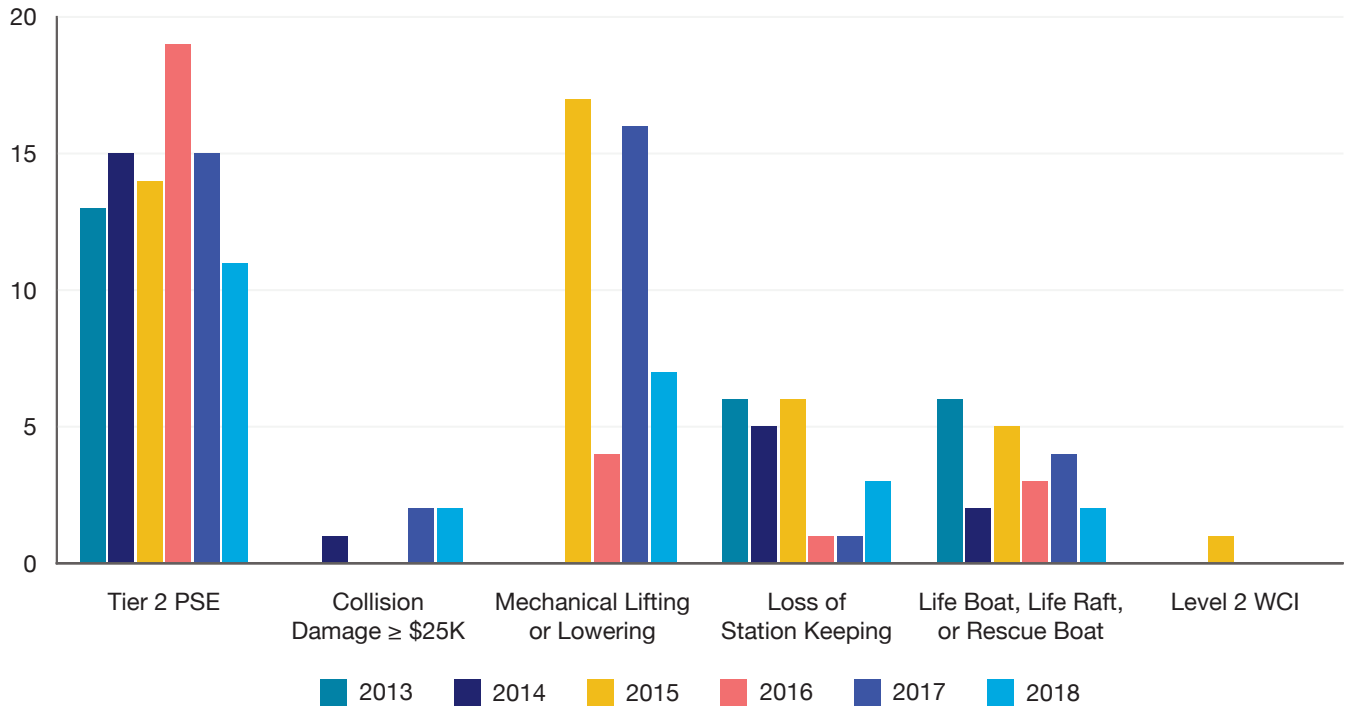
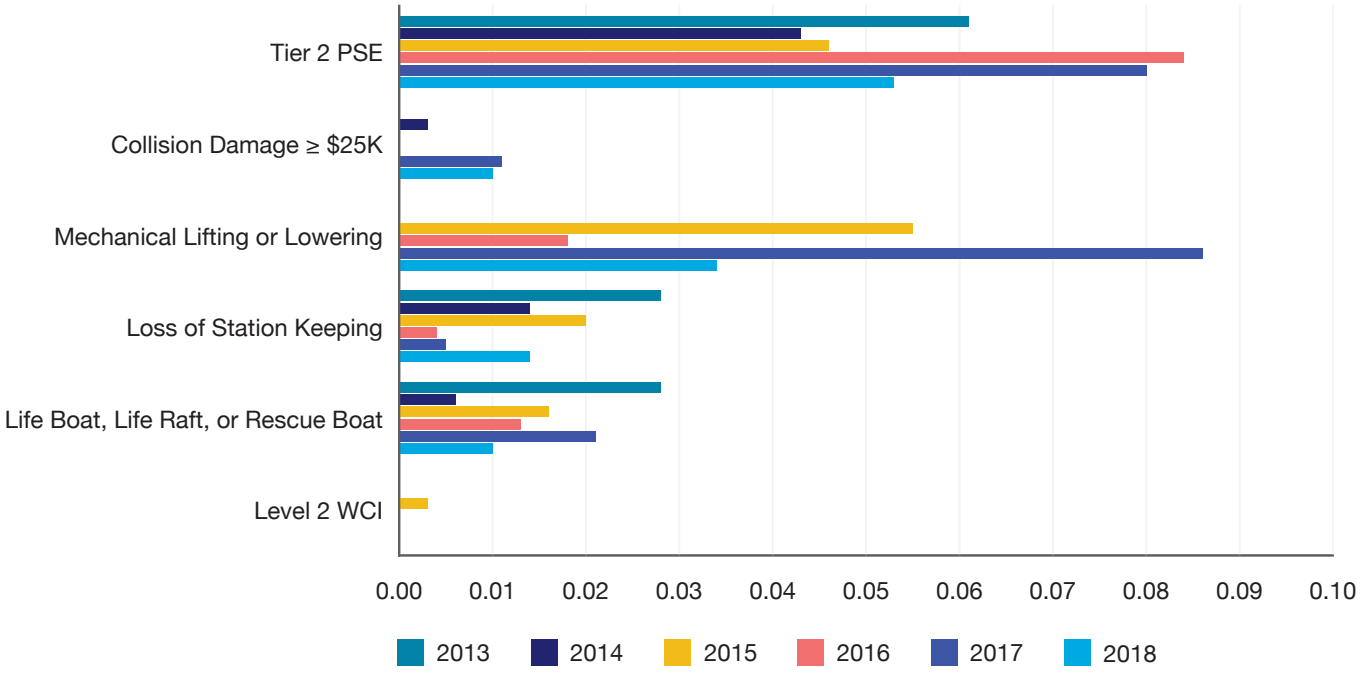


Figure 4.8: SPI 2 Incident Frequency per Sub-Group



NOTE - The definition of SPI 2C "Incidents involving Mechanical Lifting or Lowering" was modified for reporting years 2015 and beyond to include minimum thresholds to qualify as an SPI 2C. The previous broader definition has been retained as SPI 4.

- Zero (0) incidents resulting in a **Level 2 WCI** were reported for 2018.
- Of the twenty-five (25) **SPI 2** reported for 2018, the consequences were eleven (11) **Tier 2 PSE**, two (2) **Collisions Damage ≥ $25,000**, eight (8) **Mechanical Lifting or Lowering Incidents**, three (3) **Loss of Station Keeping Resulting in a Drive Off or Drift Off Incidents**, and two (2) **Life Boat, Life Raft, or Rescue Boat Events**.
- Eleven (11) **Tier 2 PSE** were reported in 2018, down from fifteen (15) in 2017. The frequency trend from 2013-2018 indicates declining performance, however, an improvement trend is evident from 2016 to 2018.
- Two (2) incidents were reported for 2018 involving **Collision Damage ≥ $25,000**, which was the same number for 2017. The increasing trend in frequency is influenced primarily by the last two years' data.
- Eight (8) incidents involving **Mechanical Lifting or Lowering** were reported for 2018; a significant decrease from the sixteen (16) reported for the 2017 reporting year. An improvement trend in frequency is not evident for this indicator for 2015-2018. The definition for this SPI was changed for the 2015 reporting year; therefore, both the frequency and count of these types of incidents are provided for only the 2015-2018 reporting years. The data shown in the first two APR (2013 and 2014 reporting years) have been reassigned to **SPI 4**.
- Three (3) **Loss of Station Keeping Resulting Drive Off or Drift Off** incidents were reported in 2018, as compared to one (1) for 2017. A declining performance trend in frequency is evident from 2016-2018 after previously showing three years of improvement.
- Two (2) **Life Boat, Life Raft, or Rescue Boat Events** were reported for 2018, compared to four (4) for 2017. However, an improvement trend in frequency is not evident for this indicator for 2014-2018.

4.5 TIER 1 AND TIER 2 PROCESS SAFETY EVENT CONSEQUENCES

Tier 1 and Tier 2 PSE are determined by assessing the consequences of a loss of primary containment (LOPC) event against defined thresholds (see Appendix 2). If it meets or exceeds a threshold, then it is classified as either a Tier 1 PSE or a Tier 2 PSE, but not both. In 2014, participating COS members began sharing consequence data for reported Tier 1 and Tier 2 PSE. PSE consequence data reported for 2018 is presented below.

Consequence data was collected for the three (3) Tier 1 PSE shared for 2018, with the following consequences:

- Two (2) PSE Resulting in a Non-Toxic Material Release
- One (1) PSE Resulting in a Toxic Material Release
- Two (2) PSE Resulting in an Outdoor Release

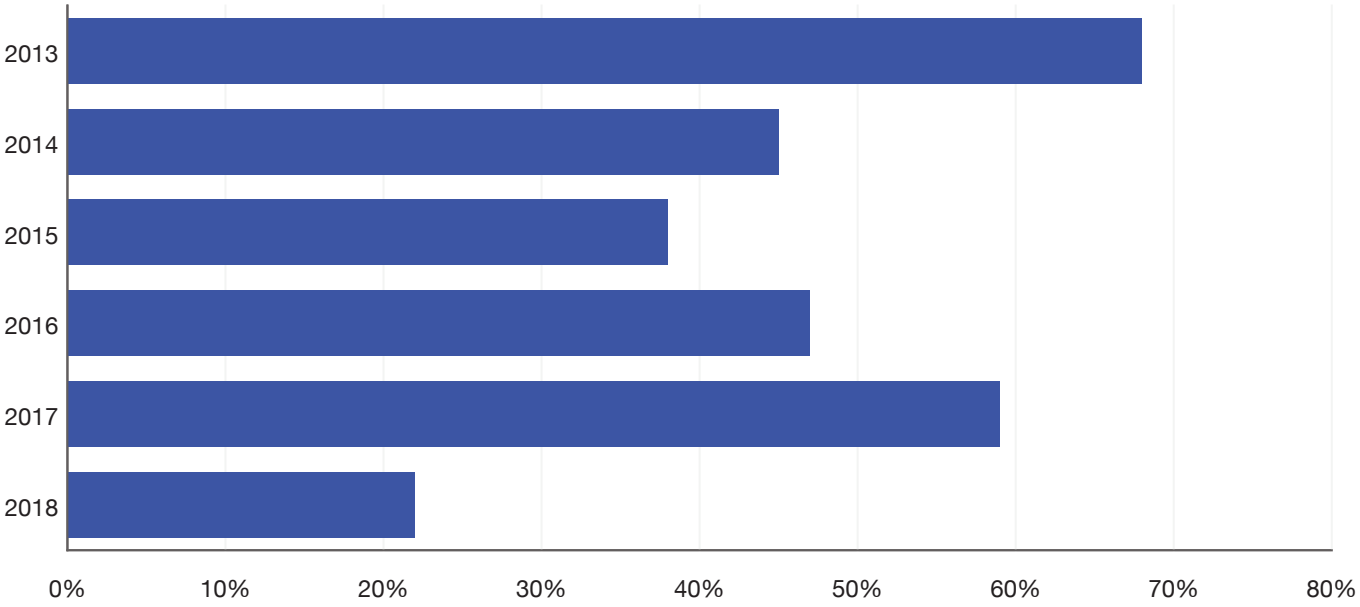
Consequence data was collected for 9 of the 11 Tier 2 PSE reported for 2018, with the following consequences:

- Nine (9) PSE Resulting in a Non-Toxic Material Release
- Nine (9) PSE Resulting in an Outdoor Release

4.6 SPI 3 RESULTS AND TRENDS

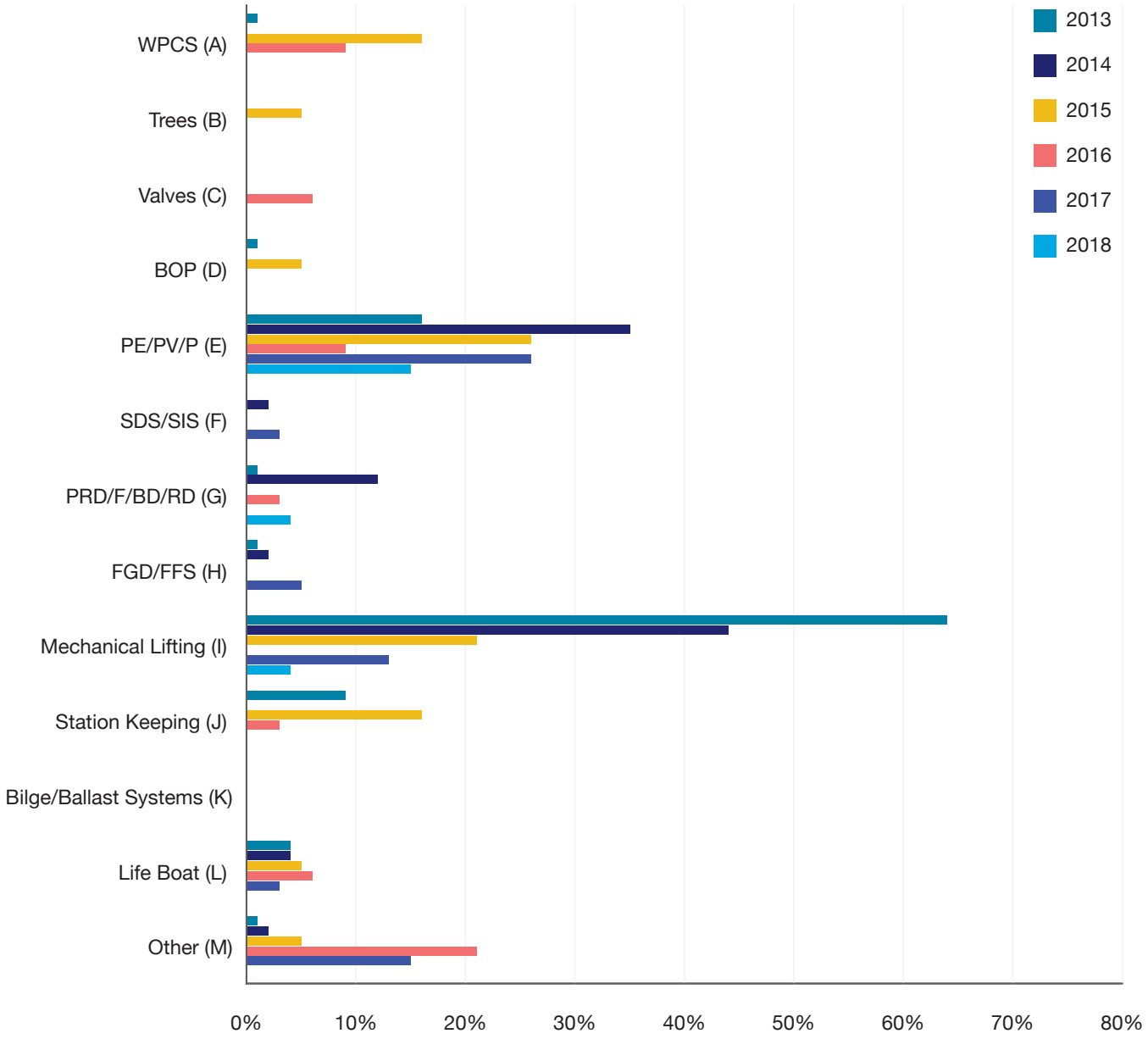
SPI 3 is the number of SPI 1 and SPI 2 incidents that involved failure of one or more pieces of equipment as a contributing factor:

Figure 4.9: Equipment Failure as Contributing Factor



- Of the twenty-eight (28) SPI 1 and SPI 2 incidents reported for 2018, six (6) (21%) involved failure of equipment as a contributing factor (SPI 3). This is the lowest percentage reported to COS in six years of reporting.

Figure 4.10: SPI 3 Failure Rates Contributing to SPI 1 and SPI 2 Incidents – by Equipment Category[1]



- The most frequently cited category for SPI 3 for 2018 was Process Equipment/Pressure Vessels/Piping (E).
- The other two equipment types reported as contributing factors for 2018 were Pressure Relief Devices/Flares/Blowdown/Rupture Disks (G) and Mechanical Lifting Equipment/Personnel Transport Systems (I).

[1] Specific definitions and descriptions of the equipment categories are presented in Appendix 3.

Figure 4.11: SPI 3 Incident Counts by Equipment Type

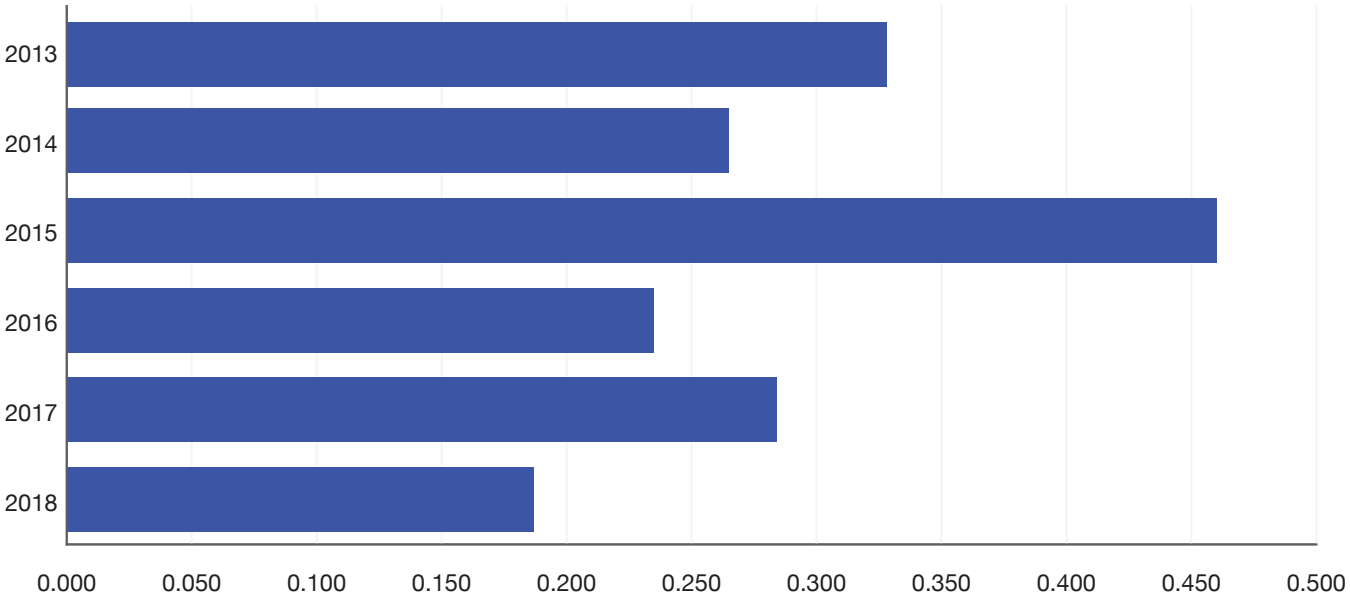
Equipment	2013 Failures (Count)	2014 Failures (Count)	2015 Failures (Count)	2016 Failures (Count)	2017 Failures (Count)	2018 Failures (Count)
A - Well Pressure Containment System (WPCS)	1	0	3	3	0	0
B - Christmas Trees	0	0	1	0	0	0
C - Downhole Safety Valves (Valves)	0	0	0	2	0	0
D - Blowout Preventers and Intervention Systems (BOP)	1	0	1	0	0	0
E - Process Equipment/Pressure Vessels/Piping (PE/PV/P)	11	20	5	3	10	4
F - Shutdown Systems/Automated Safety Instrumented Systems (SDS/SIS)	0	1	0	0	1	0
G - Pressure Relief Devices/Flares/Blowdown/Rupture Disks (PRD/F/B/RD)	1	7	0	1	0	1
H - Fire/Gas Detection and Fire Fighting Systems (FGD/FFS)	1	1	0	0	2	0
I - Mechanical Lifting Equipment/Personnel Transport Systems	44	25	4	0	5	1
J - Station Keeping Systems	6	0	3	1	0	0
K - Bilge/Ballast Systems	0	0	0	0	0	0
L - Life Boat/Life Raft/Rescue Boat/Launch and Recovery Systems	3	2	1	2	1	0
M - Other	1	1	1	7	6	0

NOTE - The total count of SPI 3 equipment categories in the table above may be greater than the total percentage of SPI 3 reported, as one incident can have multiple types of equipment fail.

4.7 SPI 4 RESULTS AND TRENDS

SPI 4 is a crane or personnel/material handling operations incident.

Figure 4.12: SPI 4 Crane or Personnel/Material Handling Incident Frequency



- The 2018 frequency of incidents involving cranes or personnel/material handling (SPI 4) was the lowest reported from 2013-18 and reinforces a continuing improvement trend.

Note – The definition of SPI 2C "Incidents involving Mechanical Lifting or Lowering" was modified for reporting years 2015 and beyond to include minimum thresholds to qualify as an SPI 2C. The previous broader definition has been retained as SPI 4.

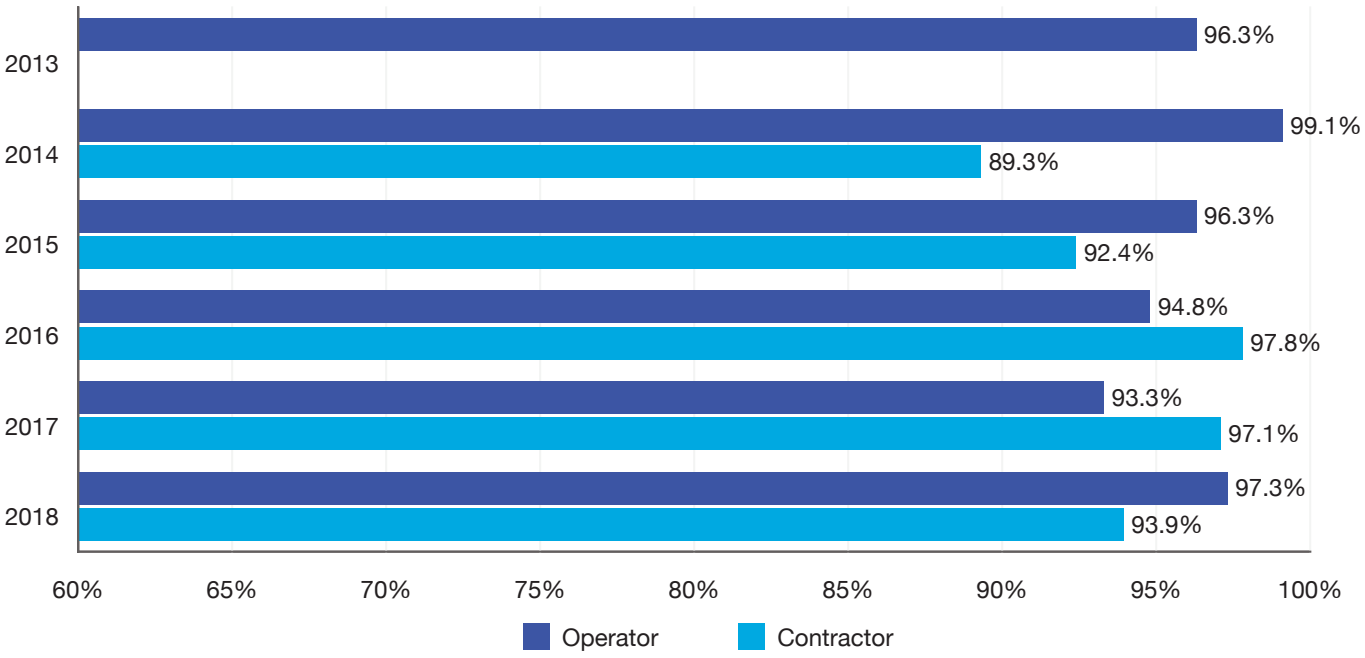
Figure 4.13: SPI 4 Crane or Personnel/Material Handling Count and Rate

	2013	2014	2015	2016	2017	2018
Count	70	82	108	53	53	39
Rate	0.328	0.265	0.460	0.235	0.284	0.187

4.8 SPI 5 RESULTS AND TRENDS

SPI 5 is the percentage of planned critical Maintenance, Inspection, and Testing (MIT) completed on time. Planned critical MIT deferred with a formal risk assessment and appropriate level of approval is not considered overdue.

Figure 4.14: Percentage of Planned Critical MIT Completed on Time



Note: Contractor data was not collected for the 2013 reporting year.

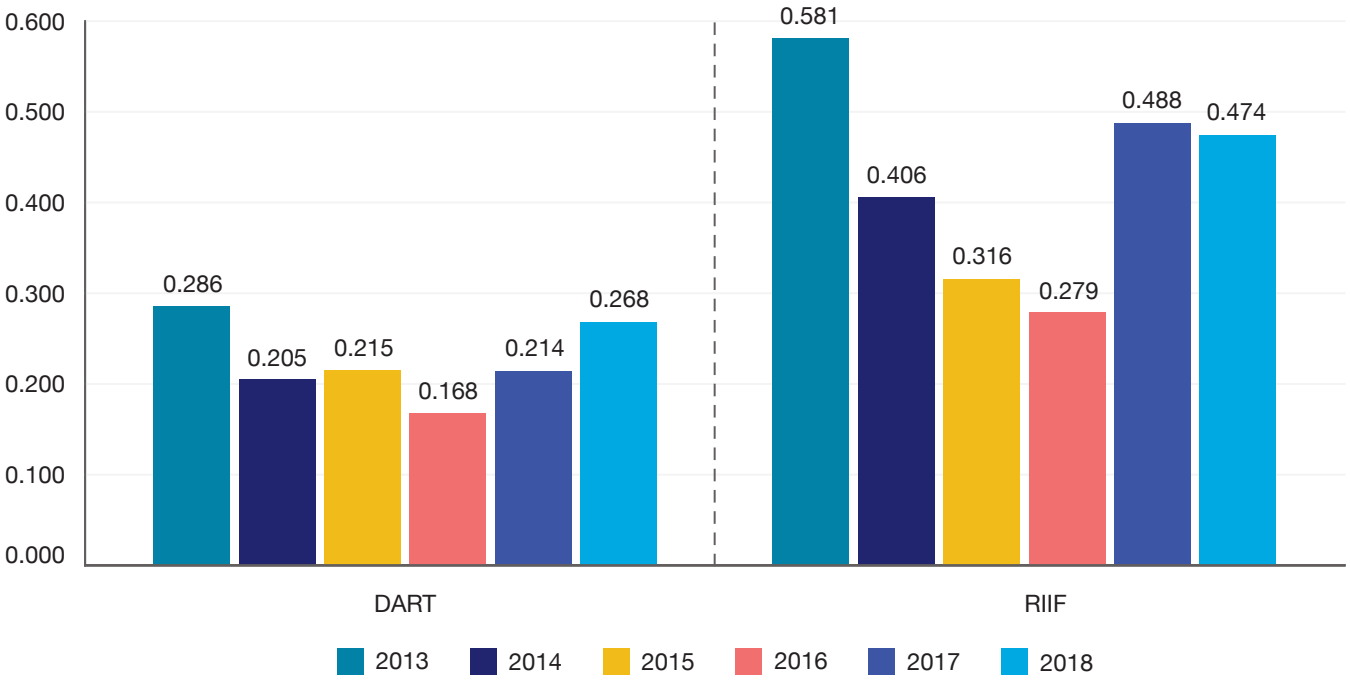
- Of the Operators that shared SPI 5 data (MIT tasks completed as per plan), the combined average for 2018 was 97.3%, ranging from 71.1% to 100%. This is an increase from the data reported for 2017 (average 93.3%, ranging from 80.9% to 100.0%).
- For Contractors, the combined average for 2018 was 93.9%, ranging from 60.3% to 100%, which represents a decrease from the data reported for 2017 (average 97.1%, ranging from 90.2% to 100%).
- Overall SPI 5 data, when combined for Contractors and Operators, was 96.7% for 2018, which represents an increase from 94.7% for 2017.

Note – Each company defines what Maintenance, Inspection, and Testing tasks qualify as "critical".

4.9 SPI 6–9 RESULTS AND TRENDS

- **SPI 6 is number of work-related fatalities**
- **SPI 7 is the frequency of Days Away from Work, Restricted Work, and Job-Transfer Injuries and Illnesses (DART)**
- **SPI 8 is the frequency of recordable injuries and illnesses (RIIF)**
- **SPI 9 is the frequency of Oil Spills to Water ≥ 1 Barrel**

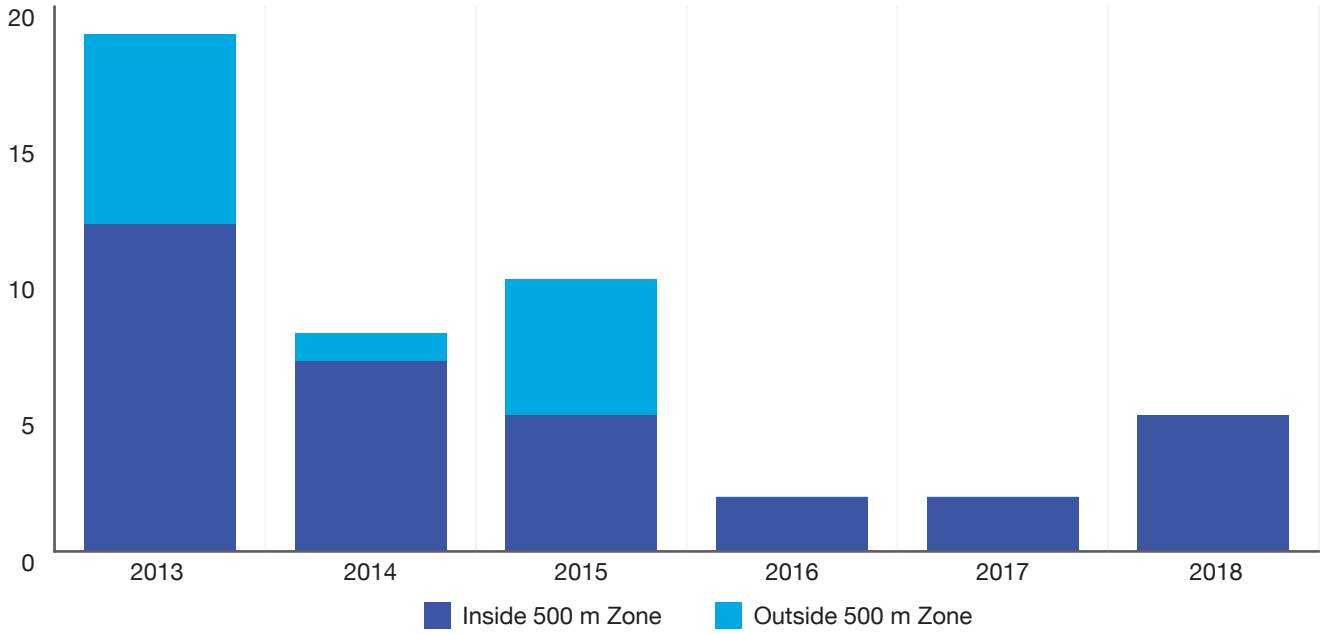
Figure 4.15: SPI DART and RIIF Chart[2]



- Zero (0) fatalities (SPI 6) were reported for 2018. One (1) fatality has been reported to COS in the six years of reporting.
- The combined Days Away from Work, Restricted Work, and Transfer of Duty Rate (DART) reported for 2018 was 0.268, which is an increase as compared to the 0.214 reported for 2017. This continues a decline in performance since 2016 following improvement trend from 2013-2016.
- The combined Recordable Injury and Illness Frequency (RIIF) reported for 2018 was 0.474, which is a decrease as compared to the 0.488 reported in 2017 but maintained the decline in performance seen in 2017 following the improvement trend from 2013-2016.

[2] NOTE – For 2017, although 10 operators submitted both DART and RIIF data, the chart only reflects the data from 9 operators. There was an unresolved discrepancy in one operator's data where the RIIF was lower than the DART, which is an impossibility (as all DART are also RIIF). Including this data would not change the rates significantly and do not affect the conclusions in this report.

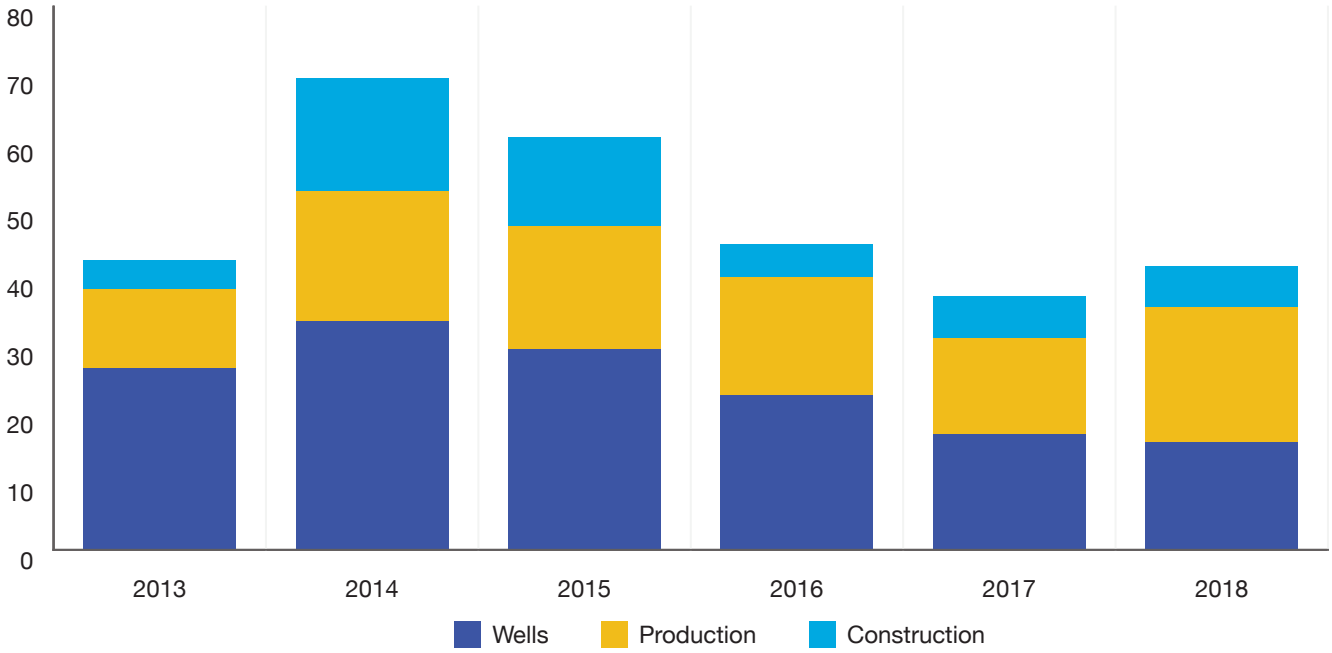
Figure 4.16: Oil Spill to Water Count



- Five (5) Oil Spills to Water ≥ One Barrel were reported compared to 2 in 2017. The frequency was 0.024 in 2018 compared to 0.011 in 2017. This is a decline in performance compared to an improving trend from 2013-2017.

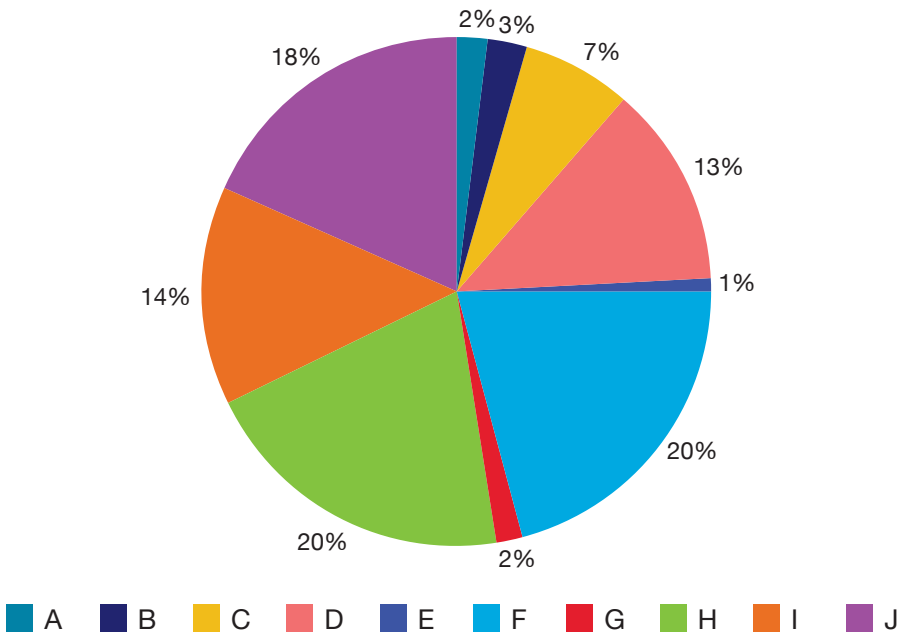
4.10 NORMALIZATION FACTOR (WORK HOURS)

Figure 4.17: Work Hours (Millions) by Operation Type



- The scope of the COS SPIP expanded in 2014 to all of the OCS vs. deepwater only for 2013.
- The data reported for 2018 represents over 41-million operator and contractor work hours in the OCS which are comparable to 37-million, 45-million, 61-million, and 69-million reported for 2017, 2016, 2015, and 2014, respectively. This is a slight increase of over 10% from the hours reported for 2017 and reverses the declining trend of the past three years.
- Work hours, for both Operators and Contractor, are reported only by Operators for work occurring within 500 meters of their facilities.

Figure 4.18: Work Hours by Company



- Previously, two to three operators dominated the number of work hours. In 2018, four operators account for 72% of the total work hours.
- To maintain data confidentiality, letters used to designate member companies are uniquely assigned for individual companies.

5.0 LEARNING FROM INCIDENTS AND HIGH-VALUE LEARNING EVENTS

5.1 INTRODUCTION

The Learning from Incidents and High Value Learning Events Program (LFIP) was established to provide a means for COS members to share and learn from incidents and High Value Learning Events (HVLE) that occur in offshore operations. Reporting is voluntary and data confidentiality is maintained through a process administered by a 3rd-party before submittal to COS.

The LFI section of this report provides an analysis and comparison of the SPI 1, SPI 2, and HVLE LFI data submitted for reporting years 2013 to 2018 and includes learnings that can be shared within companies to potentially prevent recurrence of similar or more severe incidents.

The data are comprised of the reported learnings from SPI 1 and SPI 2 incidents, as well as those from HVLE. A summary of the definitions for SPI 1, SPI 2, and HVLE are presented in Figure 5.1 below.

Figure 5.1: Description of SPI 1, SPI 2 and HVLE

SPI 1 is the frequency of incidents that resulted in one or more of the following:

A. Fatality
B. Five or more injuries in a single incident
C. Tier 1 Process Safety Event
D. Level 1 Well Control Incident - Loss of well control
E. ≥ $1 million direct cost from damage to or loss of facility/vessel/equipment
F. Oil spill to water ≥ 10,000 gallons (238 barrels)

SPI 2 is the frequency of incidents that do not meet the SPI 1 definition but have resulted in one or more of the following:

A. Tier 2 Process Safety Event
B. Collision resulting in property or equipment damage ≥ $25,000
C. Mechanical Lifting or Lowering Incident
D. Loss of Station Keeping Resulting in a Drive Off or Drift Off
E. Life Boat, Life Raft, Rescue Boat Event
F. Level 2 Well Control Incident - Multiple Barrier Systems Failures and Challenges

HVLE is an event that may be considered by a COS member or the industry for use as a reference in process hazard analyses, management of change, project design, risk assessment, inspection, operating procedures review, and/or training.

The submitted data include 3 key fields:

- **Description of the Incident or HVLE:** A brief explanation of activities, conditions, and acts leading up to, during, and after the incident or HVLE, including sufficient details to facilitate clear understanding.
- **Areas for Improvement:** A selection of pre-determined general categories and subcategories. Submitters had the option to add comments to provide further clarity and content.
- **Lessons Learned:** Companies outlined their incident investigation conclusions with the goal of reducing the likelihood of similar incidents.

Within the Areas for Improvement (AFI) fields, submitters choose from three general categories and 15 sub-categories. Multiple AFI can be selected for a single incident or event. The three general categories are:

- **Physical Facility, Equipment, and Process:** Enhancements in the quality of the physical process and equipment design, layout, material specification, fabrication, or construction were highlighted for improvement.
- **Administrative Processes:** Enhancements in the quality, scope, or structure of administrative processes for managing various aspects of work execution were highlighted for improvement.
- **People:** Enhancements to the personnel actions linked to the execution of work tasks were highlighted for improvement.

5.2 SUMMARY

The effectiveness of this program is dependent on active participation by COS members to facilitate maximum learning opportunities through:

- Timely sharing of quality information from incidents and HVLE that meet the reporting criteria; and
- Reviewing submitted incidents and HVLE, along with other data in this report, to identify and implement applicable learnings appropriate to different levels and functions within their own organizations.

The LFI data presented in this report includes information from thirty-one (31) LFI submittals received for the 2018 reporting year, with twenty-seven (27) of the reported incidents and HVLE occurring in the OCS and four (4) at U.S. Onshore/State Waters (refer to Figures 5.2 and 5.3 below). The twenty-seven (27) OCS events all occurred in water depths > 1,000 feet. To support COS' mission to promote the highest level of safety for the U.S. offshore oil and natural gas industry, the findings presented in this report are focused on incidents and events that occurred in the OCS.

Figure 5.2: Incident Location (All Submittals)

Location	2013	2014	2015	2016	2017	2018	TOTAL
OCS	46	51	47	43	33	**27**	**248**
U.S. Onshore/ State Waters*	0	0	2	1	12	**4**	**18**
International	2	1	0	17	8	**0**	**28**
TOTAL	48	52	49	61	53	**31**	**294**

NOTE - The U.S. Onshore/State Waters category was new for 2017 data reporting. U.S. Onshore/State Waters statistics for prior years were generated from submittal content.

Figure 5.3: Incident Category Distribution per Submittal Type (OCS Only)

Year	2013	2014	2015	2016	2017	2018	TOTAL
COS SPI 1	2	5	7	5	0	**2**	**21**
COS SPI 2*	38	38	21	17	8	**11**	**133**
HVLE	6	8	19	21	25	**14**	**93**
TOTAL	46	51	47	43	33	**27**	**247**

**NOTE - The definition of SPI 2C "Incidents involving Mechanical Lifting or Lowering" was modified for reporting years 2015 and beyond to include minimum thresholds to qualify as an SPI 2C. The previous broader definition has been retained as SPI 4.*

A review of the 2018 reporting year LFI data (OCS only) identified the top three activity types as:

- Mechanical Lifting or Lowering
- Maintenance, Inspection and Testing
- Normal, Routine Operations – Drilling and Production

In addition to the topics mentioned above, the top three AFI identified for 2018 were:

- Quality of Task Planning and Preparation
- Operating Procedures or Safe Work Practices
- Individual or Group Decision-Making

Across all 6 reporting years, Operating Procedures or Safe Work Practices was the most frequently identified AFI, as shown in Figures 5.4 and 5.5 below.

Additional review of the 2018 data identified the following as the most frequent incident consequences:

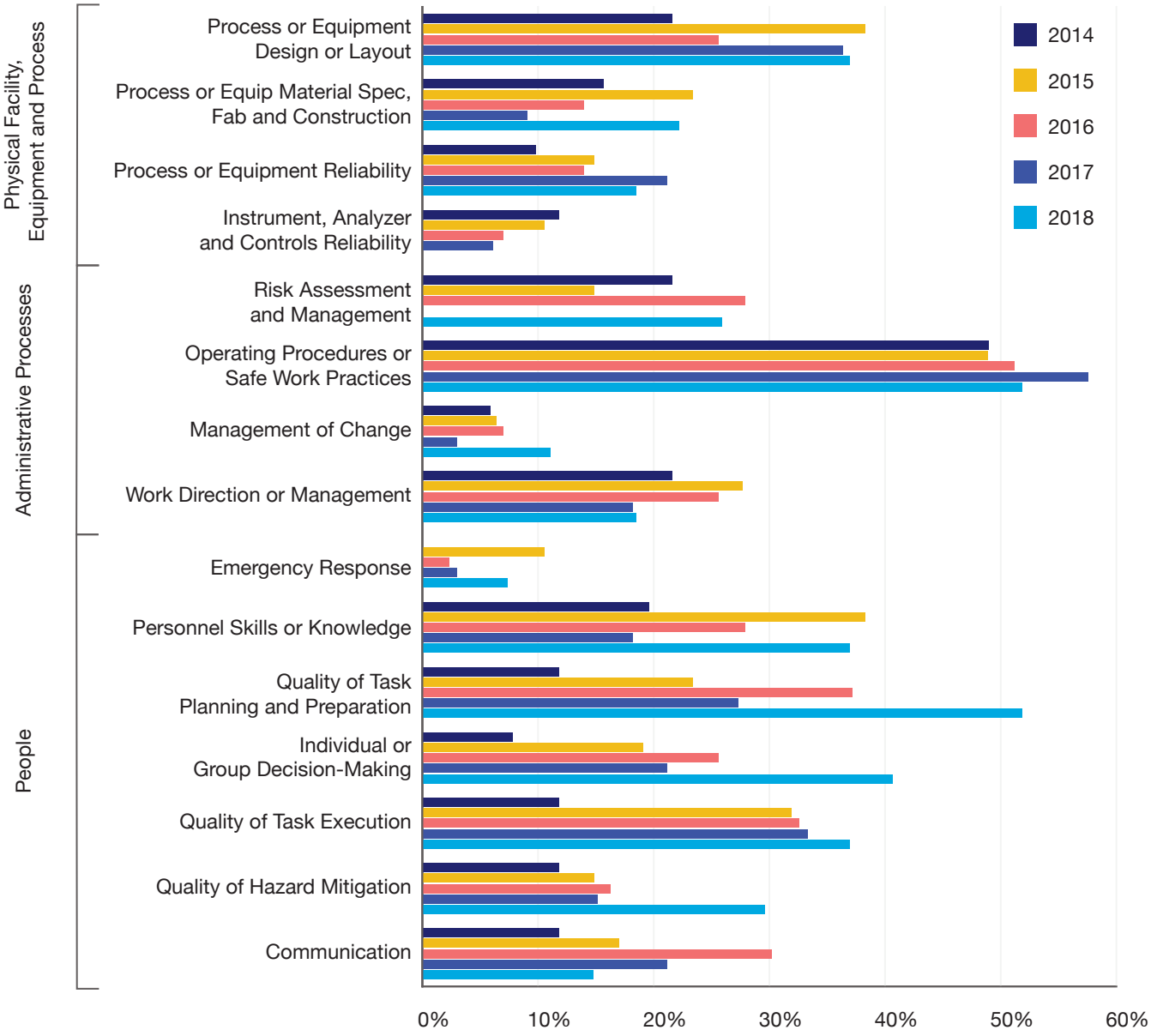
- Loss of Primary Containment (LOPC) (Process Safety and Non-Process Safety Events)
- Dropped Objects

Similar to the 2017 RY APR, for this year's report, LOPC was identified as a broader category to include both Process Safety and Non-Process Safety Events. Learnings from these consequences are presented in section 5.3.

Figure 5.4: Area for Improvement Distribution (OCS Only)

Area for Improvement	2013	2014	2015	2016	2017	2018	6-yr Avg
Operating Procedures or Safe Work Practices	54.3%	49.0%	48.9%	51.2%	57.6%	51.9%	**51.0%**
Process or Equipment Design or Layout	26.1%	21.6%	38.9%	25.6%	36.4%	37.0%	**29.5%**
Quality of Task Planning and Preparation	30.4%	11.8%	23.4%	37.2%	27.3%	51.9%	**27.9%**
Personnel Skills or Knowledge	19.6%	19.6%	38.3%	27.9%	18.2%	37.0%	**25.9%**
Quality of Task Execution	10.9%	11.8%	31.9%	32.6%	33.3%	37.0%	**24.3%**
Work Direction or Management Process	10.9%	21.6%	27.7%	25.6%	18.2%	18.5%	**20.3%**
Risk Assessment and Management Process	23.9%	21.6%	14.9%	27.9%	0.0%	25.9%	**19.1%**
Communication	15.2%	11.8%	17.0%	30.2%	21.2%	14.8%	**17.9%**
Individual or Group Decision-Making	4.3%	7.8%	19.1%	25.6%	21.2%	40.7%	**17.5%**
Process or Equipment Material Specification, Fabrication and Construction	19.6%	15.7%	23.4%	14.0%	9.1%	22.2%	**17.1%**
Quality of Hazard Mitigation	8.7%	11.8%	14.9%	16.3%	15.2%	29.6%	**14.7%**
Process or Equipment Reliability	15.2%	9.8%	14.9%	14.0%	21.2%	18.5%	**14.7%**
Instrument, Analyzer and Controls Reliability	4.3%	11.8%	10.6%	7.0%	6.1%	0.0%	**7.2%**
Management of Change Process	2.2%	5.9%	6.4%	7.0%	3.0%	11.1%	**5.6%**
Emergency Response Process	0.0%	0.0%	10.6%	203%	3.0%	7.4%	**3.6%**

Figure 5.5: Areas for Improvement Distribution (OCS only)



NOTE - LFI submittals typically identify more than one AFI for any given incident. The graph above illustrates the% of times an AFI was identified relative to the number of LFI forms submitted for OCS. Because the number of AFI exceeds the number of LFI forms, the sum of the percentages will be > 100%.

For 2018, the largest changes in AFI selection from the prior reporting year were:

- Communication decreased from 21.2% to 14.8%
- Operating Procedures and Safe Work Practices decreased from 57.6% to 51.9%
- Risk Assessment and Management Process increased from 0.0% to 25.9%
  - Although this was a statistically significant increase from 2017 data, this year's percentage is in-line with 2013-2016, as seen in Figure 5.4.
- Quality of Task Planning and Preparation increased from 27.3% to 51.9%
- Individual or Group Decision-Making increased from 21.2% to 40.7%
- Personnel Skills or Knowledge increased from 18.2% to 37.0%
- Quality of Hazard Mitigation increased from 15.2% to 29.6%
- Process or Equipment Material Specification, Fabrication and Construction increased from 9.1% to 22.2%

5.3 2018 LEARNINGS

As noted in Section 5.2, Loss of Primary Containment (Process Safety and Non-Process Safety Events) and Dropped Objects were the most frequent incident consequences reported in 2018 LFI data. Selected learnings from this data are excerpted below.

5.3.1 LOSS OF PRIMARY CONTAINMENT (PROCESS SAFETY AND NON-PROCESS SAFETY INCIDENTS)

A total of eleven (11) LFI forms including LOPC as an actual or potential consequence were reported for 2018. For these incidents, the most frequently cited AFI were:

- Quality of Task Execution
- Quality of Task Planning and Preparation
- Operating Procedures and Safe Work Practices
- Personnel Skills and Knowledge

The following incident descriptions and learnings are excerpted examples relating to LOPC:

LOPC Lessons Learned

- **Incident Description** – "A production technician was conducting walk downs on a subsea chemical injection system and observed two spectacle blinds installed on the relief headers that tie into the top of the chemical tanks. Upon discovering that there was pressure on the two tanks, the production team slowly relieved the pressure. The tanks have visible bulging and deformation as viewed from the top. The subsea injection system was installed by a third party working on behalf of a partner operated subsea well tie-back to another operator's host asset."

  Learnings: "Once installed, the skillets were not recorded into the project database. The commissioning subject matter expert signed off a check sheet indicating the skillets had been removed but did not verify in the field that the work was completed."

- **Incident Description** – "The control room was notified by an inspection crew of a gas release from a compromised seal in a high pressure sales gas meter assembly owned and operated by a third party pipeline operator. A 36-minute high pressure gas release resulted, estimated at approximately 793 kg. The duration

of the release was impacted by limited knowledge and skills of the asset team to assess the situation and respond effectively. Throughout the release, gas detection did not reach a level to trigger an alarm or activate the Emergency Shutdown (ESD). The asset was shut down with no harm to people or damage to the asset."

Learnings: "The immediate cause was likely uneven torqueing of the manifold flange resulting in extrusion of the seal. The installed Teflon seals were out of specification per procedure.

Previous similar incidents found that improper seal material and torqueing contributed to seal failure in high pressure gas service. Procedures were modified to require use of rapid decompression resistant Viton (or equivalent material) seals instead of Teflon (or equivalent material) seals.

Eighteen days prior to the gas release, third party pipeline operator technicians doing maintenance work installed Teflon seals and were unaware of a procedure that required use of Viton (or equivalent material) seals.

Third party owned equipment and activities on an asset requires interface management and oversight. Personnel should plan and execute work in accordance with requirements agreed in an interface document. This incident demonstrates the need for detail in this document as it related to a specific requirement in a procedure. Companies should regularly verify personnel's capability to activate emergency shutdown in emergency situations. Training should be provided to all personnel accountable for major emergency response. Assessments and periodic drills should be rigorous and apply realistic scenarios to enable decision-making under pressure."

- **Incident Description** – "In July 2017, methanol was observed leaking through the methanol change pump seal thermocouple. In order to remove the hazard, the thermocouple was removed and a temporary Management of Change (MOC) created and the methanol pumps locked out until new seal monitoring system was installed. Change pumps were critical equipment and despite lock out were still required to be run to start wells and facilities following trips. In January 2018 lock out was removed per temporary procedure, and pumps were run for platform/well restart. While running pump and after the pump was stopped, ½" bleed valve was left open. Over the next 28 hours, the contents of the methanol tank drained to a skidpan that discharges to the emergency sump."

  Learnings: "The bleeder was a needle valve, the true position of the valve at the time and environment of the incident may have been difficult to visually decipher. In addition, the bleed point was below deck and not visually apparent.

  Multiple temporary procedures that required human intervention in place of automation were in place without taking into account the cumulative effect of the resource draw.

  The equipment was not locked out since it was not 'Out of Service' per definition. The methanol pumps are considered to be critical equipment since they are needed to restart wells after a trip.

  Prior to the implementation of 'temporary' equipment operating procedures, staffing models should be reviewed to determine if there are adequate personnel in place to effectively execute the proposed procedures."

- **Incident Description** – "During regulatory testing over 2 days 11.5 bbls of methanol (MeOH) was pumped to the Gulf of Mexico (GOM) from via open ended Steel Flying Lead (SFL) on a subsea well. The drillship disconnected the SFL from well and left it open to the GOM several days prior. After operations personnel recognized the condition during troubleshooting for the regulatory testing, the drillship deployed their remote operated vehicle (ROV) to the SFL to investigate and saw indications of a liquid coming from the SFL which was identified to be methanol. The pumping operations were stopped and all associated valves at the trees were disabled in the operator console to ensure that they would remain closed until the situation was rectified."

  Learnings: "Confusion existed between the different groups about who was responsible for approving deviations from the documented procedures.

  Procedures for executing the activity were created by different groups to manage their portion of the work. However, no oversight existed to ensure that all procedures were understood by all parties involved in particular where interfaces existed.

  Develop formal recommendations for interface requirements between host facilities and Intervention vessels during Subsea Interventions."

- **Incident Description** – "During the Pre-Startup Safety Review (PSSR) of Temporary Subsea Corrosion Inhibitor (CI) Checkpoint pumps, a release of corrosion inhibitor occurred into the skidpan. A worker passing through the area noted a stronger than normal odor of corrosion inhibitor. The worker investigated and noted corrosion inhibitor releasing under the grating level via the tubing that ran from the sight glass vent. The worker immediately stopped the release. All fluid was contained in our system."

  Learnings: "Deviations to MOC's was believed to be an accepted practice. Often what is specified in the MOC is different from what the field believes will work best and the bulkiness of the MOC process does not lend itself to expedited changes so decisions are made in the field.

  The leak test walkdown and PSSR walkdown were completed and believed to have been successful while the CI was draining through the sight glass drain line. Both walkdowns were focused on the connections and piping downstream of the tie-in point.

  The individual that changed the tie-in point believed they had the authority to make deviations from an approved Management of Change (MOC) and did so without notifying their supervisor, MOC owner or MOC approver.

  The pumps were tied into a valve that was common with an open ended sight glass. When the valves were opened to allow flow to the pump during the leak test walkdown a flow path was created through the sight glass vent to the skid pan.

  Have clear approval process for deviations from approved MOC's in place at each asset.

  Ensure that all personnel understand that process and what to do in case a deviation is needed.

  Ensure that line walkdowns ensure understanding of the complete system and how manipulating a valve will affect both upstream and downstream of it."

- **Incident Description** – "While pressure testing the subsea well gas lift line, a leak was found. It was decided to bleed the pressure off the gas lift line to make the necessary repairs. IP (Injured Person) bled line and had assumed all pressure was bled off since the gauge read zero. IP proceeded to remove the plug from the line and at that point the plug blew out of the line, IP was out of the line of fire but the pressure struck the IP on his left wrist."

  Learnings: "Engineering Oversight During Installation. A blind flange should have a needle valve installed which would allow an operator to check for pressure. This particular flange had a plug only.

  Survey platform and replaced all blind flange plugs on the facility with an isolation valve and plug to allow pressure bleed off. In addition to double block and bleed, modify applicable HSE (Health, Safety, & Environmental) program documents to verify pressue bled off with secondary pressure reading/bleed point. Review JSA for the task and modify if necessary."

5.3.2 DROPPED OBJECTS

A total of twelve (12) LFI forms including dropped objects, as an actual or potential consequence, were reported for 2018. For these incidents, the most frequently reported AFI were

- Operating Procedures and Safe Work Practices
- Quality of Task Planning and Preparation
- Individual or Group Decision-Making

The following incident descriptions and learnings are excerpted examples of learnings for dropped objects:

- **Incident Description** – "Remote Operated Vehicle (ROV) vessel reported to platform that during the recovery of the Electrical Flying Lead (EFL) frame, the rigging failed causing the frame to drop to the sea floor. The wave height had gotten to 5-7 ft during the subsea recovery operations. During this transit there were some 20 instances where the crane heaved and the EFL deployment frame was not able to keep up with the movement like the subsea basket. This caused the rigging to slacken and then snap tighten. The ROV confirmed that the EFL did not land on or strike anything during descent."

  Learnings: "The crew relied on the success of a prior job to give them assurance they could handle the EFL frame lift. Rigging configuration and drag characteristics of the frame were different.

  The decision to have only one Offshore manager to cover 24 hours resulted in reduced oversight, coinciding with the event. The lack of experience and judgement when it was evident the rigging was being shock-loaded negated last line of defense. Stop Work Authority was not executed.

  On all LCV scopes, institute a practice of creating a register of standard risks to act as a starting point to cover operations to supplement the contractor procedures.

- **Incident Description** – "After nippling down and removing the Blow Out Preventer (BOP) stack, contract employees were disconnecting the lateral support frame and the high pressure riser spool from the well. The lateral support frame was not secured to the deck before disconnecting from the high pressure riser spool. This resulted in the lateral support frame falling to the mezzanine deck below coming to rest on the handrails. The two individuals disconnecting the frame fell to the mezzanine deck below. Both individuals were sent in via medical helicopter to [city redacted]."

  Learnings: "Stop work authority was not executed with regards to this activity. Procedure was available but was not used for this activity."

- **Incident Description** – "Auxiliary drill crew were building #34 6 5/8" drill pipe stands. At 02:34hrs a double of drill pipe was picked up from the forward skate. As the driller was transitioning from pickup to tailing double to rotary, a 2.5lb pin dropped to the rig floor from a 120 feet. The pin rotated and compromised the integrity of the retaining plate, allowing the pin to back out and drop to the rig floor. No injuries, nearest person 41 feet away."

  Learnings: "Potential dropped object not identified during design or drops prevention rig surveys.

  Proactively seek out an independent engineering assessments of derrick/cranes/sub structure to help identify components subject to high wear/rotation/pivot/forces/vibration for equipment fatigue management.

  Install torque seal on pin/retaining plate bolts to allow for easy indication of pin movement.

  Implement weekly verification checklist to ensure insp./greasing is being performed as per schedule.

  Design and review Engineered solution to prevent pin rotation and reduce stresses on retaining plate.

  Install bracket stiffeners. Install secondary retention on clevis pins.

  Update weekly greasing procedure to include new moly-based grease."

- **Incident Description** – "Two contractor employees were utilizing the service basket on the rig floor to manually hang a 41 pound wireline sheave to a derrick beam pad eye plate that was 35 feet above the rig floor. As they attempted to pin the sheave to the shackle in the beam pad eye plate, the employee holding the sheave lost his grip on the sheave swivel. The sheave fell to the rig floor. There were no injuries, and no employees in the immediate cone of exposure at the time of the incident and the nearest employee was 30 feet away. However, 49 seconds before impact, a floorhand entered the cone of exposure to retrieve a nylon sling."

  Learnings: "Because the limited access chain around the drill floor was in place, there were no enforcement of the use of a red tape barrier to restrict access to the cone of exposure while working at heights with the service basket on the drill floor. Ineffective zone management process for working at heights. (Reliance on generic "Red Zone").

  The critical steps were not identified on the JSA. Task supervisor failed to check "erection of barriers or barricades" in the precaution required section of the working at height permit.

  Contractors third party equipment checklist to be revised to emphasize review of equipment for drops prevention.

  Contractor to update their working at height procedure to more explicitly require temporary barriers and signage ("Buffer Zone") to be utilized to prevent entrance into the cone of exposure for all working at heights activities."

APPENDIX 1 – DEFINITIONS

Note: Please reference **Appendix 2: SPI Definitions and Metrics** for detail on the SPI, their minimum-release threshold values and specific normalization factors for each SPI. Please reference Appendix **3: Equipment Definitions** for specific definitions of equipment.

Barrier: A constraint on a hazard that reduces the probability of an incident or its consequences. There are two types of barriers: Prevention and Mitigation.

Consequence: The harm that could result from an incident.

Contractor: An individual, partnership, firm or corporation retained by the Owner or Operator to perform work or to provide supplies or equipment. The term Contractor shall also include subcontractors.

Deepwater: Exploration and production activity occurring in 1000 feet or deeper water depth.

Facility: All types of offshore structures permanently or temporarily attached to the seabed (mobile offshore drilling units, floating production systems, floating production, storage and offloading facilities, tension-leg platforms, and spars) used for exploration, development, production, and transportation activities in the OCS, including pipelines regulated by the Department of Interior (DOI).

Formation Fluid: The subterranean fluid trapped by a reservoir formation; can include natural gas, liquid and vapor petroleum hydrocarbons, and interstitial water.

Hazard: Types of chemical, thermal, toxic, kinetic, or potential energy with the ability to cause harm to people, the environment, or facilities.

High Value Learning Event: An event that may be considered by a COS member or the industry for use as a reference in process hazard analyses, management of change, project design, risk assessment, inspection, operating procedure review, and/or training. An HVLE should meet one or more of the following criteria:

A. Identify a previously unknown risk, situation, operational or mechanical hazard, or critical equipment failure.
B. Identify a previously unknown combination of factors that resulted in an unexpected condition or event.
C. Identify a routine operation or activity that created a previously unidentified risk or consequence.
D. Identify a situation where established industry designs, controls, or procedures failed to prevent an event (e.g. well kick, loss of wall thickness).
E. An event that is part of a pattern in industry events which could indicate that certain hazardous conditions are not well understood.

Incident: A work-related event that has one or more consequences.

Loss of Primary Containment (LOPC): An unplanned or uncontrolled release of material from primary containment.

Major Hazard: A Hazard that can reasonably be foreseen as having the potential to cause a SPI 1 consequence.

Mitigation Barrier: Barrier to the right of the top event in a bow tie that can reduce or minimize the probability of a consequence. For example, active fire protection is a mitigation barrier.

Operator: The individual, partnership, firm, or corporation having control or management of operations on the leased area or a portion thereof. The Operator may be a lessee, designated agent of the lessee(s), or holder of operating rights under an approved operating agreement.

Prevention Barrier: Barrier to the left of the top event in a bow tie that can prevent or reduce the probability of a top event occurrence. For example, a safety instrumented system is a prevention barrier.

Production: Offshore oil and gas production activities including flow lines and pipelines.

Projects: All offshore construction activities.

Safety Performance Indicator: A measurement that provides insights into the strength of barriers. SPI are inclusive of those that measure performance with respect to protection of personnel, the environment, and offshore facilities and property.

Safety Performance Indicator Program: A program developed, implemented, and continually improved through which SPI are established, collected, analyzed, and reported for specific safety issues of concern so that actions can be taken by relevant stakeholders to improve safety performance.

Wells: Wells include all offshore exploration, appraisal, and production drilling, wireline, completion, workover, and intervention activities.

APPENDIX 2 – SPI DEFINITIONS & METRICS

SPI Number	SPI Definition	SPI Metric	Reporting Entity
SPI 1	Frequency of work-related incidents resulting in one or more of the following consequences: A. Fatality: One or more fatalities. B. Injury to 5 or more persons in a single Incident C. Tier 1 Process Safety Event: (API RP 754 Tier 1 Process Safety Event) An unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO2, compressed air), from a process that results in one or more of the consequences listed below: ▪ An employee, contractor or subcontractor "days away from work" injury and/or fatality; ▪ A hospital admission and/or fatality of a third-party; ▪ An officially declared community evacuation or community shelter-in-place; ▪ A fire or explosion resulting in greater than or equal to $25,000 of direct cost to the Company; ▪ A pressure release device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences: ▪ Liquid carryover ▪ Discharge to a potentially unsafe location ▪ An onsite shelter-in-place ▪ Public protective measures ▪ And a PRD discharge quantity greater than the threshold quantities in Table A-C in any one-hour period; or ▪ A release of material greater than the threshold quantities described in Tables A-C in any one-hour period.	# of SPI 1 incidents/ total work hours * 200,000	COS Operator for all incidents within the 500-meter zone and for incidents to direct employees while offshore COS Contractor for incidents outside the 500-meter zone while offshore

SPI Number	SPI Definition	SPI Metric	Reporting Entity
	D. Level 1 Well Control Incident: Loss of well control ▪ Uncontrolled flow of formation or other fluids resulting in: ▪ Seabed/surface release ▪ Underground communication to another formation or well ▪ Includes shallow water flows that result in damage or loss of facilities/equipment ▪ Excludes planned shallow gas mitigation operations E. $1 million or greater direct cost from damage to or loss of facility/vessel/equipment (excludes costs associated with downtime or production loss). F. Oil spill to Water ≥ 10,000 gallons (238 barrels)		
SPI 2	Frequency of work-related incidents that do not meet the definition of a SPI 1 incident but have resulted in one or more of the following: A. Tier 2 Process Safety Event: (API RP 754 Tier 2 Process Safety Event) An unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO2, compressed air), from a process that results in one or more of the consequences listed below and is not reported as a Tier 1 PSE: ▪ An employee, contractor or subcontractor recordable injury; ▪ A fire or explosion resulting in greater than or equal to $2,500 of direct cost to the Company; ▪ A pressure release device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following five consequences: ▪ Liquid carryover ▪ Discharge to a potentially unsafe location ▪ An onsite shelter-in-place ▪ Public protective measures	# of SPI 2 incidents/ total work hours * 200,000	COS Operator for all incidents within the 500-meter zone and for incidents to direct employees while offshore COS Contractor for incidents outside the 500-meter zone while offshore

SPI Number	SPI Definition	SPI Metric	Reporting Entity
	▪ And a PRD discharge quantity greater than the threshold quantity in Tables D-F in any one-hour period; or ▪ A release of material greater than the threshold quantities described in Tables D-F in any one-hour period. B. Collision that results in property or equipment damage ≥ $25,000 C. Incident Involving Mechanical Lifting (Mechanical lifting includes lifts of an asset or personnel, i.e. personnel transfer and man-riding): A mechanical lifting (or lowering) incident that results in one or more of the following consequences: ▪ Four or less recordable injuries in a single incident that occurs during the lift ▪ Between $25,000 and $1 million direct damage to or loss of an asset (including the load itself) ▪ A loss of primary containment of a material meeting a Tier 2 Process Safety Event threshold quantity ▪ A dropped load that strikes live process equipment ▪ Not included: ▪ Lifting incident resulting only in a first aid injury ▪ Lifting incident resulting only in direct damage to an asset (including the load itself) < $25,000 ▪ Lifting incident resulting only in a slipped load ▪ Dropped load or object into the water valued at < $25,000 ▪ Manual lifting incidents D. Loss of Station Keeping Resulting in Drive Off or Drift Off defined as a malfunction or improper operation of the dynamic positioning system		

SPI Number	SPI Definition	SPI Metric	Reporting Entity
	E. Life Boat, Life Raft, or Rescue Boat Event that resulted in a recordable injury or equipment damage or malfunction during life boat, life raft, or rescue boat operations or that take it out of service F. Level 2 Well Control Incident: One barrier system within the well design failed and other barrier system(s) either failed or were challenged beyond design capacity resulting in an influx without uncontrolled flow		
SPI 3	Number of SPI 1 and SPI 2 incidents that involved failure of one or more of equipment as a contributing factor. COS Equipment categories: A. Well pressure containment system B. Christmas trees C. Downhole safety valves D. Blow out preventer and intervention systems E. Process equipment/pressure vessels, piping F. Automated safety instrumented systems/shutdown systems G. Pressure relief devices, flare, blowdown, rupture disks H. Fire/gas detection and fire-fighting systems I. Mechanical lifting equipment/ personnel transport systems J. Station keeping systems K. Bilge/ballast systems L. Life boat, life rafts, rescue boats, launch and recovery systems M. Other	Number of SPI 1 and 2 incidents involving failure of equipment/ total number of SPI 1 and 2 incidents * 100	COS Operator for all incidents within the 500-meter zone and for incidents to direct employees while offshore COS Contractor for incidents outside the 500-meter zone while offshore
SPI 4	Crane or personnel/material handling incidents defined as a failure of the crane itself (e.g., the boom, cables, winches, ball ring), other lifting apparatus (e.g., air tuggers, chain pulls), the rigging hardware (e.g., slings, shackles, turnbuckles), or the load (e.g., striking personnel, dropping the load, damaging the load, damaging the facility). Reference MMS NTL 2008-G17.	Number of incidents as defined by MMS NTL 2008-G17/ total work hours * 200,000	COS Operator for all incidents within the 500-meter zone and for incidents to direct employees while offshore

SPI Number	SPI Definition	SPI Metric	Reporting Entity
SPI 5	Number of planned critical maintenance, inspections, and tests completed on time. A planned task can be deferred if a proper risk assessment was completed and approved, and a new due date set. It is up to each company to define critical equipment.	Number of critical maintenance, inspections, and tests tasks completed on time/ number of critical maintenance, inspections, and tests tasks planned (expressed as a%)	COS Owner of Equipment
SPI 6	Number of work-related fatalities	Number of work-related fatalities	COS Operator when within the 500-meter zone and for direct employees while offshore COS Contractor when outside the 500-meter zone while offshore

SPI Number	SPI Definition	SPI Metric	Reporting Entity
SPI 7	Number of DART injuries and illnesses: BSEE defines DART injuries or illnesses as those that resulted in "Days Away from Work, Restricted Duty, and Job-Transfer" outcomes.	DART/total work hours * 200,000	COS Operator when within the 500-meter zone and for direct employees while offshore (same as reported on BSEE-0131 Form)
SPI 8	Number of recordable injuries and illnesses	Number of recordable injuries and illnesses/ total work hours * 200,000	COS Operator when within the 500-meter zone and for direct employees while offshore (same as reported on BSEE-0131 Form)
SPI 9	Number of spills greater or equal to 1 barrel that enter the water	Number of spills ≥ 1 barrel/total work hours * 200,000	COS Operator for all spills within the 500-meter zone COS Contractor for spills outside the 500-meter zone while offshore

SPI Number	SPI Definition	SPI Metric	Reporting Entity
Work Hours	For offshore workers, the hours worked are calculated on a 12-hour work day. Work hours are collected in the following categories: • Total OCS construction workforce hours inside 500 meters • Total OCS well workforce hours inside 500 meters • Total OCS production workforce hours inside 500 meters • Total OCS workforce hours inside 500 meters	Total Workforce Hours for the various categories	COS Operator when within the 500-meter zone (same as reported on BSEE-0131 Form)

Table A – Tier 1 Process Safety Events - Non-toxic Material Release Threshold Quantities for LOPC

LOPC is a recordable when release is "acute," i.e. equals or exceeds a threshold quantity in any one-hour period.

Material Hazard Classification (with examples)	Outdoor Release	Indoor Release
Flammable gases – includes: • methane, ethane, propane, butane, • natural gas, • ethyl mercaptan	500 kg (1,100 lb)	250 kg (550 lb)
Flammable liquids with boiling point < or equal to 35˚C (95˚F) and Flash Point < 23˚C (73˚F) – includes: • liquefied petroleum gas (LGP), • liquefied natural gas (LNG), • isopentane	500 kg (1,100 lb)	250 kg (550 lb)
Flammable liquids with boiling point > 35˚C (95˚F) and Flash Point < 23˚C (73˚F) – includes: • gasoline, toluene, xylene, • condensate, • methanol, • > 15 API Gravity crude oils (unless actual flashpoint available)	1,000 kg (2,200 lb) or 7 barrels	500 kg (1,100 lb) or 3.5 barrels
Combustible liquids with flash point > 23˚C (73˚F) and < or equal to 60˚C (140˚F) – includes: • diesel, most kerosenes, • < 15 API Gravity crude oils (unless actual flashpoint available)	2,000 kg (4,400 lb) or 14 barrels	1,000 kg (2,200 lb) or 7 barrels
Liquids with lash point > 60˚C (140˚F) released at a temperature at or above its flash point – includes: • asphalts, molten sulphur, • ethylene glycol, propylene glycol, • lubricating oil	2,000 kg (4,400 lb) or 14 barrels	1,000 kg (2,200 lb) or 7 barrels
Liquids with flash point > 60 ˚C (140˚F) released at a temperature below its flash point – includes: • asphalts, molten sulphur, • ethylene glycol, propylene glycol, • lubricating oil	Not Applicable	Not Applicable

Table B – Tier 1 Process Safety Events - Toxic Material Release Threshold Quantities for LOPC

LOPC is a recordable when release is "acute," i.e. equals or exceeds a threshold quantity in any one-hour period.

Material Hazard Classification (with examples)	Outdoor Release	Indoor Release
TIH Hazard Zone A materials - includes • acrolein (stabilized) • bromine	5 kg (11 lb)	2.5 kg (5.5 lb)
TIH Hazard Zone B materials - includes: • hydrogen sulphide (H2S) • chlorine (Cl2)	25 kg (55 lb)	12.5 kg (27.5 lb)
TIH Hazard Zone C materials - includes: • sulphur dioxide (SO2) • hydrogen chloride (HCl)	100 kg (220 lb)	50 kg (110 lb)
TIH Hazard Zone D materials - includes: • ammonia (NH3) • carbon monoxide (CO)	200 kg (440 lb)	100 kg (220 lb)
Other Packing Group I materials – includes: • aluminum alkyls • some liquid amines • sodium cyanide • sodium peroxide • hydrofluoric acid (> 60% solution)	500 kg (1,100 lb)	250 kg (550 lb)
Other Packing Group II Materials – includes: • aluminum chloride • phenol • calcium carbide • carbon tetrachloride • some organic peroxides • hydrofluoric acid (< 60% solution)	1,000 kg (2,200 lb) or 7 barrels	500 kg (1,100 lb) or 3.5 barrels

Table C – Tier 1 Process Safety Events - Other Material Release Threshold Quantities for LOPC

LOPC is a recordable when release is "acute," i.e. exceeds a threshold quantity in any one-hour period.

Material Hazard Classification (with examples)	Outdoor Release	Indoor Release
Other Packing Group III Materials – includes: • sulphur • lean amine • calcium oxide • activated carbon • chloroform • some organic peroxides • sodium fluoride • sodium nitrate	2,000 kg (4,400 lb) or 14 barrels	1,000 kg (2,200 lb) or 7 barrels
Strong Acids or Bases - includes: • sulphuric acid, hydrochloric acid • sodium hydroxide (caustic) • calcium hydroxide (lime)	2,000 kg (4,400 lb) or 14 barrels	1,000 kg (2,200 lb) or 7 barrels
Moderate Acids or Bases- includes: • diethylamine (corrosion inhibitor)	None	None

Table D – Tier 2 Process Safety Events - Non-toxic Material Release Threshold Quantities for LOPC

LOPC is a recordable when release is "acute," i.e. equals or exceeds a threshold quantity in any one-hour period.

Material Hazard Classification (with examples)	Outdoor Release	Indoor Release
Flammable Gases – includes: • methane, ethane, propane, butane • natural gas • ethyl mercaptan	50 kg (110 lb)	25 kg (55 lb)
Flammable Liquids with Boiling Point < or equal to 35˚C (95˚F) and Flash Point < 23˚C (73˚F) – includes: • liquefied petroleum gas (LGP) • liquefied natural gas (LNG) • isopentane	50 kg (110 lb)	25 kg (55 lb)
Flammable Liquids with Boiling Point > 35˚C (95˚F) and Flash Point < 23˚C (73˚F) – includes: • gasoline, toluene, xylene • condensate • methanol • > 15 API Gravity crude oils (unless actual flashpoint available)	100 kg (220 lb) or 1 barrel	50 kg (110 lb) or 0.5 barrel
Combustible Liquids with Flash Point > 23˚C (73˚F) and < or equal to 60˚C (140˚F) – includes: • diesel, most kerosenes • < 15 API Gravity crude oils (unless actual flashpoint available)	100 kg (220 lb) or 1 barrel	50 kg (110 lb) or 0.5 barrel
Liquids with flash point > 60˚C (140˚F) released at a temperature at or above its flash point – includes: • asphalts, molten sulphur • ethylene glycol, propylene glycol • lubricating oil	100 kg (220 lb) or 1 barrel	50 kg (110 lb) or 0.5 barrel
Liquids with flash point > 60 ˚C (140˚F) released at a temperature below its flash point – includes: • asphalts, molten sulphur • ethylene glycol, propylene glycol • lubricating oil	1,000 kg (2,200 lb) or 10 barrels	500 kg (1,100 lb) or 5 barrels

Table E – Tier 2 Process Safety Events - Toxic Material Release Threshold Quantities for LOPC

LOPC is a recordable when release is "acute," i.e. exceeds a threshold quantity in any one-hour period.

Material Hazard Classification (with examples)	Outdoor Release	Indoor Release
TIH Hazard Zone A materials - includes: • acrolein (stabilized) • bromine	0.5 kg (1 lb)	0.25 kg (0.5 lb)
TIH Hazard Zone B materials- includes: • hydrogen sulphide (H2S) • chlorine (Cl2)	2.5 kg (5.5 lb)	1.3 kg (2.8 lb)
TIH Hazard Zone C materials- includes: • sulphur dioxide (SO2) • hydrogen chloride (HCl)	10 kg (22 lb)	5 kg (11 lb)
TIH Hazard Zone D materials- includes: • ammonia (NH3) • carbon monoxide (CO)	20 kg (44 lb)	10 kg (22 lb)
Other Packing Group I Materials – includes: • aluminum alkyls • some liquid amines • sodium cyanide • sodium peroxide • hydrofluoric acid (> 60% solution)	50 kg (110 lb)	25 kg (55 lb)
Other Packing Group II Materials – includes: • aluminium chloride • phenol • calcium carbide • carbon tetrachloride • some organic peroxides • hydrofluoric acid (< 60% solution)	100 kg (220 lb) or 1 barrel	50 kg (110 lb) or 0.5 barrel

Table F – Tier 2 Process Safety Events - Other Material Release Threshold Quantities for LOPC

LOPC is a recordable when release is "acute," i.e. exceeds a threshold quantity in any one-hour period.

Material Hazard Classification (with examples)	Outdoor Release	Indoor Release
Other Packing Group III Materials – includes: • sulphur • lean amine • calcium oxide • activated carbon • chloroform • some organic peroxides • sodium fluoride • sodium nitrate	100 kg (220 lb) or 1 barrel	50 kg (110 lb) or 0.5 barrel
Strong Acids or Bases - includes: • sulphuric acid, hydrochloric acid • sodium hydroxide (caustic) • calcium hydroxide (lime)	100 kg (220 lb) or 1 barrel	50 kg (110 lb) or 0.5 barrel
Moderate Acids or Bases- includes: • diethylamine (corrosion inhibitor)	1,000 kg (2,000 lb) or 10 barrels	500 kg (1,000 lb) or 5 barrels

APPENDIX 3 – EQUIPMENT DEFINITIONS

Equipment	Equipment Definition
Well Pressure Containment System	The casing and wellhead (with cement support and isolation where applicable), tubing, tubing hardware, and tubing hanger represent the equipment are located below the BOP or Christmas Tree, and comprise the "well pressure containment system," and as such represent the ability to contain pressure when a BOP or Christmas Tree has been closed.
Christmas Trees	Equipment attached to the uppermost connection of the wellhead or tubing spool to contain wellbore fluids in both the tubing and in the annular space between the casing and tubing during producing operations. The subsea tree may provide locations where nitrogen and chemical additives can be injected into the annulus or tubing string. The tree consists of assembled equipment that includes a wellhead connector, valves, choke, tree cap, and control system to operate the various components.
Downhole Safety Valves	• Downhole safety valve: A device installed in a well below the wellhead with the design function to prevent uncontrolled well flow when actuated, e.g., SSCSV or SCSSV. • Subsurface controlled subsurface safety valve (SSCSV): An SSSV actuated by the pressure characteristics of the well. • Surface controlled subsurface safety valve (SCSSV): An SSSV controlled from the surface by hydraulic, electric, mechanical, or other means.
Blow Out Preventer and Intervention Systems	Equipment installed on the wellhead or wellhead assemblies to contain wellbore fluids either in the annular space between the casing and the tubulars, in the tubulars, or in an open hole during well drilling, completion, and testing operations. For the purposes of SPI data collection, this also includes pressure control equipment used in intervention operations, such as wireline and coiled tubing BOPs, lubricators, etc.
Process Equipment, Pressure Vessels, and Piping	• Process Equipment/Pressure Vessel: A container associated with drilling, production, gathering, transportation, and treatment of liquid petroleum, natural gas, natural gas liquids, and associated salt water (brine) designed to withstand internal or external pressure above ambient conditions. This definition includes containers used for pressurized storage of toxic and hazardous chemicals. • Piping System: An assembly of interconnected pipes that are used to convey, distribute, mix, separate, discharge, meter, control, or snub flows of hydrocarbons or toxic and hazardous chemicals.

Equipment	Equipment Definition
Automated Safety Instrumented Systems/Shutdown Systems	• Automated Safety Instrumented System: A system implementing one or more safety functions, with specified safety integrity level(s), that detect abnormal process conditions and take automatic, necessary actions to achieve or maintain a safe state for the process with respect to a hazardous event. • Shutdown Systems: A system of manual stations that, when activated, will initiate the shutting in (isolation and cessation) of all process stations of a platform production process and all support equipment for the process. May also be integrated with Fire and Gas Detection systems for automatic initiation.
Pressure Relief Devices, Flare Systems, Blowdown Systems, Rupture Disks	• Pressure Relief Device: A device actuated by inlet static pressure and designed to open during emergency or abnormal conditions to prevent a rise of internal fluid pressure in excess of a specified design value. The device also may be designed to prevent excessive internal vacuum. The device may be a pressure relief valve, a non-reclosing pressure relief device, or a vacuum relief valve. • Flare System: Used to safely dispose of relief gases in an environmentally compliant manner through the use of combustion. • Blowdown System: A collection of controls, valves and pipes that allow controlled depressurization of liquid or gas pressure contained within a process, piping, or pressure vessel to reduce or eliminate pressure induced stresses during a time of potential heat weakening of vessels and piping, as well as a reduction of the inventory of fuel present on the facility. • Rupture Disk: A pressure containing, pressure, and temperature sensitive element of a rupture disk device. A rupture disk device is a non-reclosing pressure relief device actuated by static differential pressure between the inlet and outlet of the device and designed to function by the bursting of a rupture disk. A rupture disk device includes a rupture disk and a rupture disk holder.

Equipment	Equipment Definition
Fire and Gas Detection and Fire Fighting Systems	• Manual fire alarms (pull stations), call stations, and audible alarms/beacons • Automatic Fire Detection Systems - The primary function of an automatic fire detection system is to alert personnel of the existence of a fire condition and to allow rapid identification of the location of the fire. The detection system(s) may be used to automatically activate emergency alarms, initiate Emergency Shutdown (ESD), isolate fuel sources, start fire water pumps, shut-in ventilation systems, and activate fire extinguishing systems such as gaseous agents, dry chemical, foam, or water. The types of fire detectors commonly used on offshore platforms are as follows: ▪ Flame Detectors: e.g., Infrared (IR) Detectors, Ultraviolet (UV) Flame Detectors, Combination (IR/UV) ▪ Heat Detectors: e.g., Fusible Plugs or links, Heat-pneumatic or Theronistor Sensors, Rate of Rise Detectors, Fixed Temperature Detectors ▪ Products of Combustion/Smoke Detectors – e.g., Ionization Detector, Photoelectric Detector • Gas Detection System: The primary function of a fixed gas detection system is to alert personnel to the presence of flammable gases, toxic gases, or a combination of both. ▪ Flammable Gas Detection: Designed to respond to a broad range of hydrocarbon gases/vapors (e.g., methane, ethane, propane and vapors from the evaporation of hydrocarbon liquids). The predominant sensors for flammable gas detection in general, normally occupied spaces are the infrared (IR) sensor or the catalytic bead sensor. ▪ Toxic Gas Detection: Many gas detection systems include both flammable gas and toxic gas detection for hydrogen sulfide, sulfur dioxide, and fluorine in the same system. The semiconductor and electrochemical sensors are most commonly used for the detection of the toxic gases. ▪ Excludes portable gas monitoring instruments. • Fixed fire-fighting systems include the following: fire water pumps & drivers, distribution piping, fire hoses, stations, and nozzles, water spray systems/ monitors, foam systems (fixed or portable), dry chemical systems, gaseous systems (e.g., CO2, Halon, FM-200 & FE-13, Inergen), and water mist/fine water spray systems. • Fire water systems are installed on offshore platforms to provide exposure protection, control of burning, and/or extinguishment of fires. The basic components of a fire water system are the fire water pump, the distribution piping, the hose/nozzle, and deluge/sprinkler system. Additives such as foaming agents may be included to aid in extinguishing flammable liquid fires. • Excludes portable fire extinguishers.

Equipment	Equipment Definition
Mechanical Lifting Equipment/ Personnel Transport Equipment	• Crane (includes base mounted drum winches): A type of machine, generally equipped with a hoist, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. Includes: ▪ Boom chords, foot pins, hoist (hydraulics and brakes), lift cylinder, sheave assembly, stops, tip extension or jib, pendant lines ▪ Counterweights ▪ Gantry, mast or A-frame pins ▪ Hook block ▪ Overhaul ball ▪ Main hoist (hydraulics and brakes) ▪ Auxiliary hoist (hydraulics or brakes) ▪ Pedestal or crane base ▪ Load management system (MIPEG, CCM-7000, etc.) ▪ Crane safety system (anti two block, high & low angle kick outs) • Top Drive: a device used on a drilling rig to actually rotate the drill pipe in order to drill the well. Includes main drill line hoist (hydraulics or brakes), crown-o-matic, top drive track, assembly rollers or wheels and bearings, hydramatics, or hydromatics. • Pipe racking system (PRS) including main hoist (hydraulics or brakes), track, hydraulic system, claws or fingers. • Drawworks, Air Hoists, Tuggers • Chain fall: A type of hoist with a chain attached to a fixed raised structure or beam and used to lift very heavy objects. Includes clutch, brake and sprocket. • Rigging accessories including hooks, chains, shackles, slings (below the hook), wire rope, D-ring, elevators, and bails.

Equipment	Equipment Definition
Station Keeping Systems	The station keeping systems for a floating structure are typically a single point mooring, a spread mooring, vertical tension legs, or a dynamic positioning (DP) system. • Single point mooring components may include but are not limited to: hoisting system, hawser, swivels, roller bearings, risers, u-joint connectors, counter weights, chain, chain table, wire rope, synthetic rope, connecting hardware, clump weight, buoy, and anchor. • Spread mooring components: winch/windlass, chain jack, brakes, power, fairlead, wire rope, synthetic rope, connecting hardware, clump weight, buoy, and anchor • Vertical tension leg moorings are used by tension leg platforms (TLPs) and are comprised of mooring tendons and seafloor foundations. • Dynamic positioning system consists of components and systems acting together to achieve reliable position keeping capability. The dynamic-positioning system includes the power system (power generation and power management), thruster system, and dynamic positioning control system.
Bilge/Ballast Systems	The vessel structure, machinery, piping, or controls related to ballast movement, watertight integrity, and stability.
Life Boat, Life Rafts, Rescue Boats and Launch and Recovery Systems	• A Life Boat/survival craft is a craft capable of sustaining the lives of person in distress from the time of abandoning the ship. • A Rescue Boat is a boat designed to rescue persons in distress and to marshal survival craft. • A Life Raft is an inflatable appliance which depends upon non-rigid, gas filled chambers for buoyancy and which is normally kept not inflated until ready for use. • Launch and Recovery Systems: Systems used to deploy or retrieve a life boat, life raft, or rescue boat. Components may include but are not limited to: winch, fall wire (lifting wire), sheaves (pulleys), davits, davit arms, connecting hardware, secondary securing method (gripes and safety pendants), cradle, lifting points, releasing hooks, brake, brake release, power source to winch/davit/davit arm, and free fall railing.

APPENDIX 4 – LIST OF FIGURES (BODY OF REPORT)

APPENDIX 5 – LFI CATEGORY DESCRIPTIONS

Site Type: The primary site where the incident or event occurred. Only one selection can be made.

- Aircraft
- Diving Vessel
- Drilling Rig on Production Facility
- Fixed Production Facility
- Floating Production Facility
- Floating Storage and Offloading Facility
- Mobile Offshore Drilling Unit
- Offshore Supply or Support Vessel
- Offshore Construction Vessel
- Seismic Vessel
- Subsea Production System
- Other

Operation Type: The primary operation that was underway at the time of the incident or event. Only one selection can be made.

- Aviation
- Marine-diving, seismic, transportation, rig moves, etc.
- Production-petroleum/natural gas production, flow lines, pipe lines
- Projects-includes offshore construction activities
- Wells-exploration, appraisal/production drilling, wireline, completion, workover, abandonment, intervention activities
- Other

Activity Type: The primary (most closely linked to incident or event) activity that was occurring at the time of the incident or event. Only one selection can be made.

- Confined Space Entry
- Diving
- Drilling Operations - normal, routine
- Energy Isolation
- Emergency Response (actual or drill)

- Helicopter Flight
- Helicopter Landing or Take-Off
- Hot Work
- Maintenance, Inspection, and Testing
- Marine Vessel - In-Transit
- Marine Vessel - Station Keeping
- Material Transfer or Displacement
- Mechanical Lifting or Lowering
- Production Operations - normal, routine
- Simultaneous Operations
- Start-up or Shut-down Operations
- Working at Height
- Other

Areas for Improvement: All of the Areas for Improvement that apply to the incident or event being shared. The Areas for Improvement cover three general categories: **Physical Process and Equipment**; **Administrative Process**; or **People**. Multiple Areas for Improvement can be selected across the general categories.

5.11.1 Physical Facility, Equipment and Process

Select one or more of the following AFI when enhancements in the quality of the physical process and equipment design, layout, material specification, fabrication, or construction were highlighted for improvement, including:

5.11.1.1 Process or Equipment Design or Layout: Select this AFI if the design or layout of the process or equipment was highlighted for improvement. Include cases where issues with the design or layout were significant contributors to subsequent human actions.

5.11.1.2 Process or Equipment Material Specification, Fabrication and Construction: Select this AFI if the quality and compatibility of the material specification, fabrication, or construction of the process or equipment, prior to its use was highlighted for improvement, including process or equipment provided by vendors or third parties on a permanent or temporary basis. This category includes the use of defective parts or equipment, or improper installation.

5.11.1.3 Process or Equipment Reliability: Select this AFI if the ability of the process or equipment to function without defects or breakdown was highlighted for improvement, including improvement in maintenance, inspection, testing, and operating requirements.

5.11.1.4 Instrument, Analyzer and Controls Reliability: Select this AFI if the ability of instrumentation, analyzers, and control systems, including software, to function without defects or breakdown was highlighted for improvement including improvement in maintenance, inspection, testing, and operating requirements.

5.11.2 Administrative Processes

Select one or more of the following AFI when enhancements to the quality, scope, or structure of administrative processes for managing various aspects of work execution were highlighted for improvement. **Note**: If the identified gap was related to "failure to follow" **Administrative Processes**, do NOT select these categories. Instead, use the appropriate category in Section 5.11.3 People.

5.11.2.1 Risk Assessment and Management: Select this AFI if the process for systematic identification and evaluation of potentially significant risks was identified for improvement. This includes hazard and operability study (HAZOPS), facility hazard assessments, and job safety analysis (JSA).

5.11.2.2 Operating Procedures or Safe Work Practices: Select this AFI if the improvement opportunity involves creating or modifying operating procedures or safe work practices to prevent recurrence. This includes specific operations, maintenance, testing, contractor selection, or other procedures and practices.

5.11.2.3 Management of Change: Select this AFI if the process for identifying, approving, and managing significant technical, administrative, or organizational changes was identified for improvement. Specific improvement areas may include MOC use not required (but should have been), MOC review incomplete or incorrect, or MOC actions not completed (e.g., drawings not updated).

5.11.2.4 Work Direction or Management: Select this AFI if the process for directing work activities or managing the number or types of work allowed at a given time or location was identified for improvement. This includes, but is not limited to, permit-to-work, simultaneous operations and supervision of the area or work team.

5.11.2.5 Emergency Response: Select this AFI if the capability or processes for responding to a situation to prevent the escalation of incident or event consequences was identified for improvement. This category includes opportunities related to emergency preparedness, such as access to equipment and trained personnel, insufficient, or absence of drills, etc.

5.11.3 People

Select one or more of the following AFI when enhancements to the personnel actions linked to the execution of work tasks were highlighted for improvement, including:

5.11.3.1 Personnel Skills or Knowledge: Select this AFI if personnel knowledge of the relevant tasks, or the ability of personnel to execute the task correctly and safely, was identified for improvement. This category includes gaps in training (e.g., not required, not completed, or training needs improvement), assessment/verification (not performed, needs improvement, etc.), or remediation (not required, not completed, etc.).

5.11.3.2 Quality of Task Planning and Preparation: Select this AFI if personnel planning and preparation of the task prior to initiating the activity were identified for improvement, including team actions such as reviewing procedures, and completing JSAs, toolbox talks, or job walkthroughs. **Note** – this category will most often apply when appropriate procedures were in place, but personnel failed to follow them in the pre-work planning phase.

5.11.3.3 Individual or Group Decision-Making: Select this AFI if decisions made by one or more people involved in the execution of the task were identified for improvement. This may be selected only if personnel involved in the task had sufficient skills and knowledge but chose to execute the task in a manner different than the documented procedure or practice.

5.11.3.4 Quality of Task Execution: Select this AFI if the quality or thoroughness of executing the intended task procedure or practice was highlighted for improvement. This applies where the person or personnel were attempting to follow the prescribed procedures or practices but errors or incomplete execution contributed to the incident or event.

5.11.3.5 Quality of Hazard Mitigation: Select this AFI if a person or personnel either failed to put in place barriers or the quality, number, or location of barriers were insufficient to mitigate the potential impacts of relevant hazards was highlighted for improvement.

5.11.4.6 Communication: Select this AFI if the effectiveness of communication was identified for improvement. This includes communication between team members and the team and other individuals or groups. Also included are difficulties with language or terminology.

5.12 Additional Comments

Enter Areas for Improvement that were identified in areas outside the **Physical Facility, Equipment and Process**; **Administrative Processes**; and **People** categories described above. A detailed description of the identified improvements should be included. Also, any additional description of "other" site, operation, or activity types could be included in the additional comments section. This input cell is limited to 750 characters. The first use of an acronym should always be preceded by the term for which it is used.

5.13 Lessons Learned

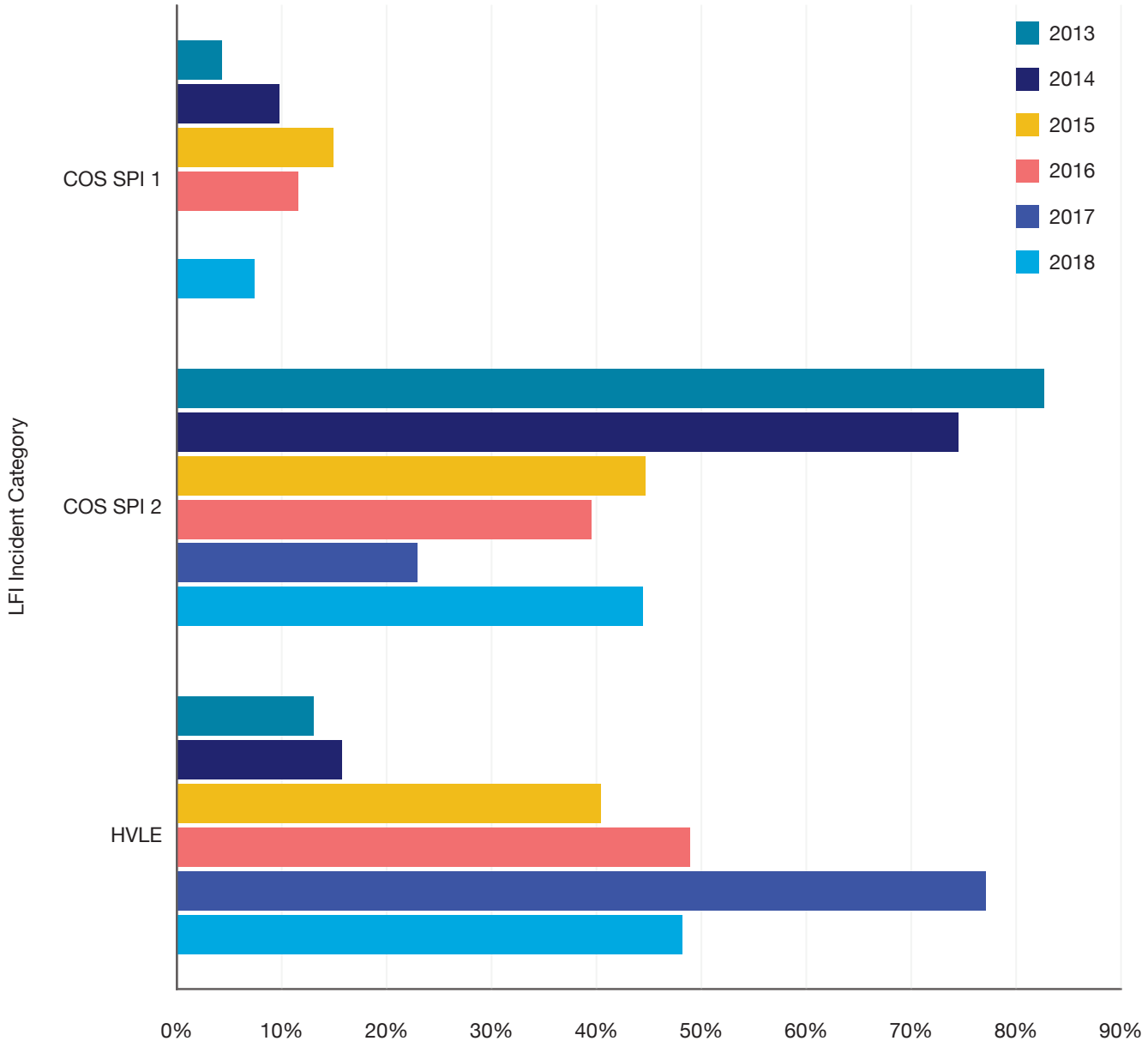
Enter a description with sufficient content to explain the context of the incident, lessons learned and actions taken to reduce the likelihood of a recurrence. These may include equipment, processes and/or human factors. Lessons learned and actions taken should be directly related to the areas for improvement listed above. This input cell is limited to 750 characters. The first use of an acronym should always be preceded by the term for which it is used.

APPENDIX 6 – LFI DATA CHARTS (OCS DATA)

Refer to the charts listed in this appendix for additional details on the distribution of incidents and HVLE across reporting fields contained in the LFI Report Form (and not previously displayed in the body of the report). The following charts are contained in this Appendix:

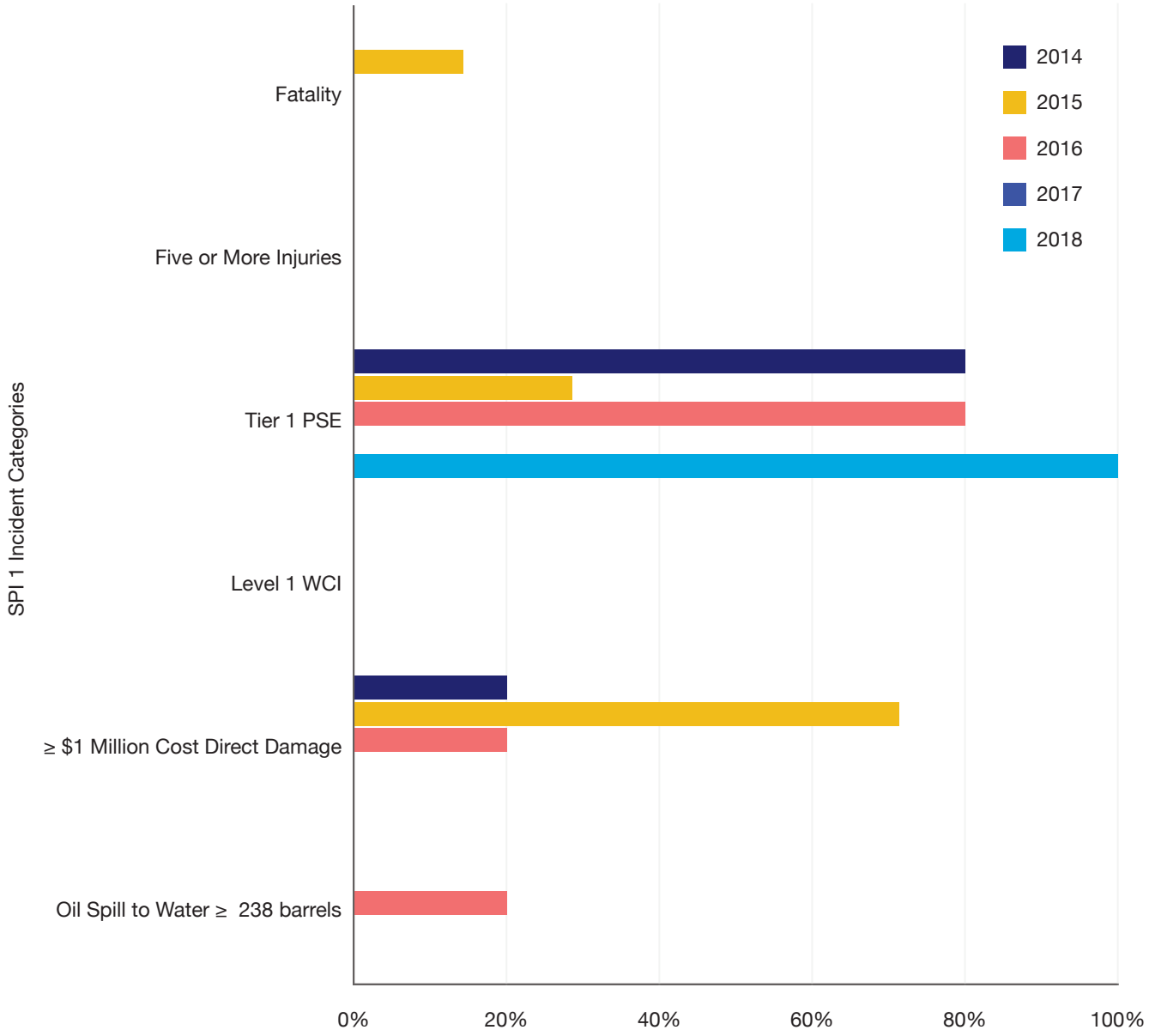
- Chart 1 – LFI Incident and HVLE Category Distribution
- Chart 2 – LFI SPI 1 Incident Distribution
- Chart 3 – LFI SPI 2 Incident Distribution
- Chart 4 – LFI Incident and HVLE Site Type Distribution
- Chart 5 – LFI Incident and HVLE Operation Type Distribution
- Chart 6 – LFI Incident and HVLE Activity Type Distribution
- Chart 7 – LFI SPI 2C (Mechanical Lifting or Lowering) AFI Distribution
- Chart 8 - Process Safety (Tier 1 and Tier 2) AFI Distribution

Chart 1 – LFI Incident and HVLE Category Distribution (OCS Only)



- Number of occurrences represented above (by year): 2013 = 46, 2014 = 51, 2015 = 47, 2016 = 43, 2017 = 33, 2018 = 27

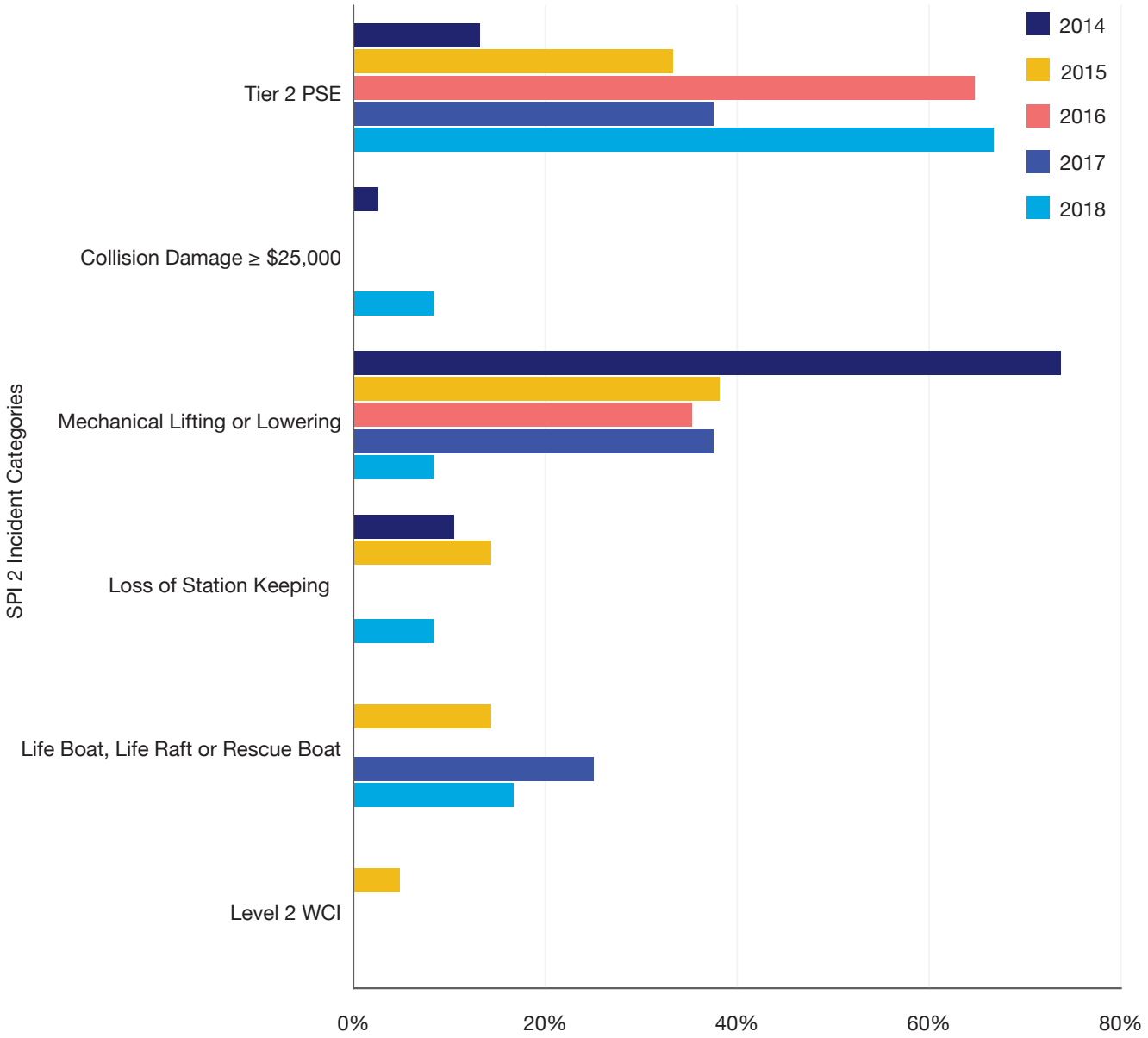
Chart 2 – LFI SPI 1 Incident Distribution



[1] This chart depicts the number of SPI 1 consequences divided by the total number of SPI 1 LFI submitted in the given year. The total percentage in a given year can exceed 100% when multiple consequences occur for one incident.

- Number of occurrences represented above (by year): 2014 = 5, 2015 = 8, and 2016 = 6, 2017 = 0, 2018 = 2

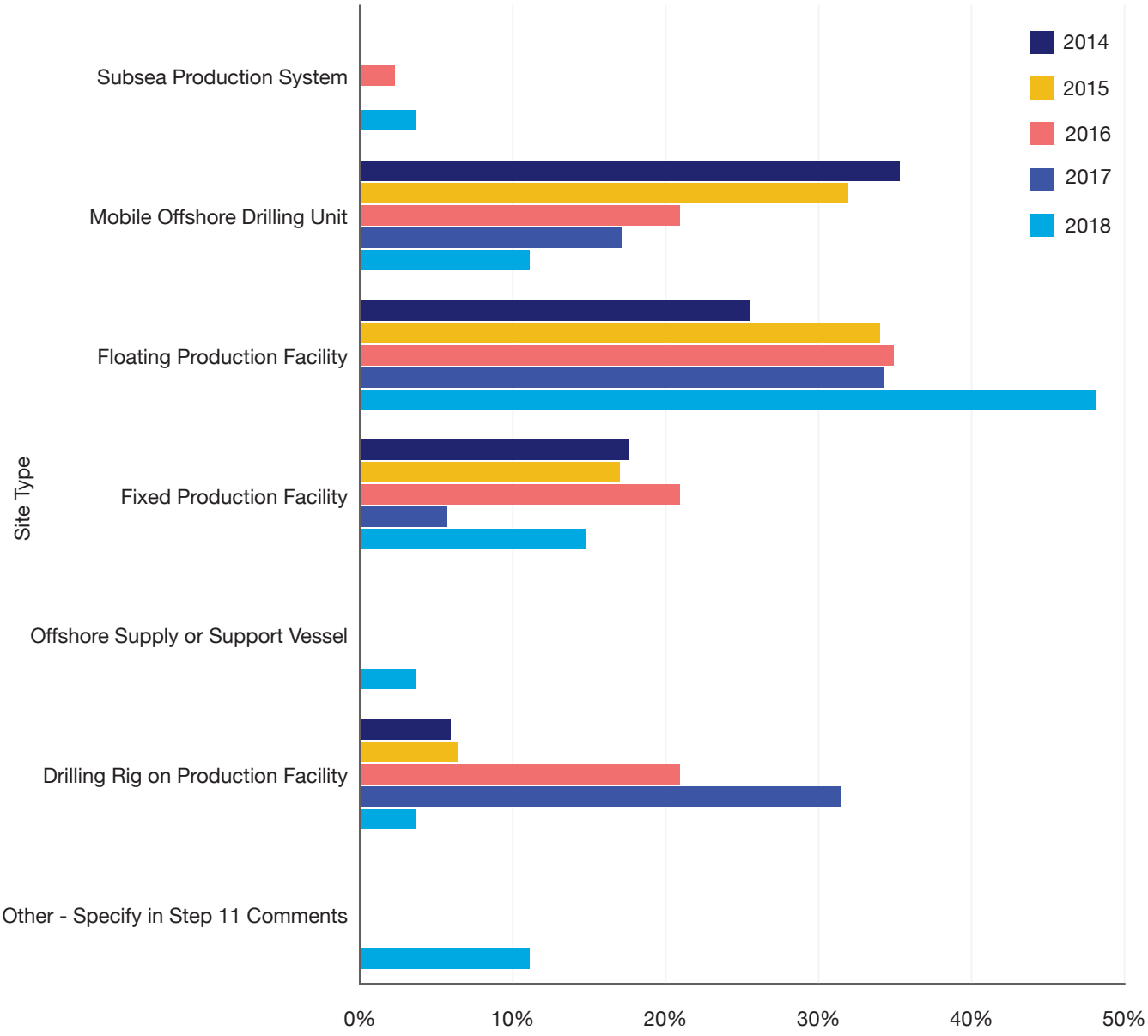
Chart 3 – LFI SPI 2 Incident Distribution



[1] This chart depicts the number of SPI 2 consequences divided by the total number of SPI 2 LFI submitted in the given year. The total percentage in a given year can exceed 100% when multiple consequences occur for one incident.

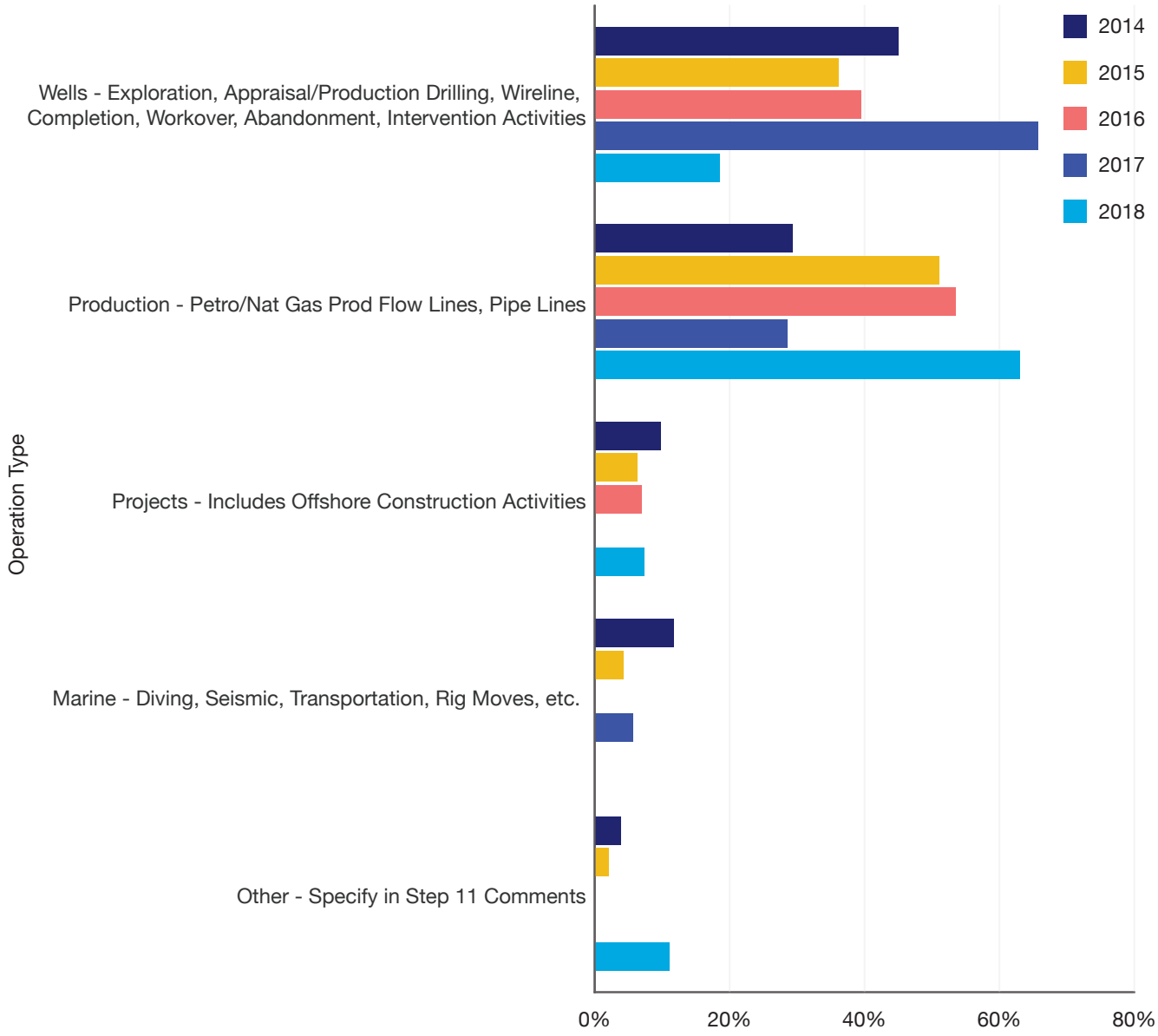
- Number of occurrences represented above (by year): 2014 = 38, 2015 = 22, 2016 = 17, 2017 = 8, 2018 = 11
- Mechanical Lifting or Lowering category definition was modified in 2015. As such the 2015 - 2017 data for this category can't be correlated to the corresponding data for 2013-2014.
- Level 2 Well Control Incident was a new category for 2015. As such the 2015 - 2017 data for this category can't be correlated to the corresponding data for 2013-2014.

Chart 4 – LFI Incident and HVLE Site Type Distribution



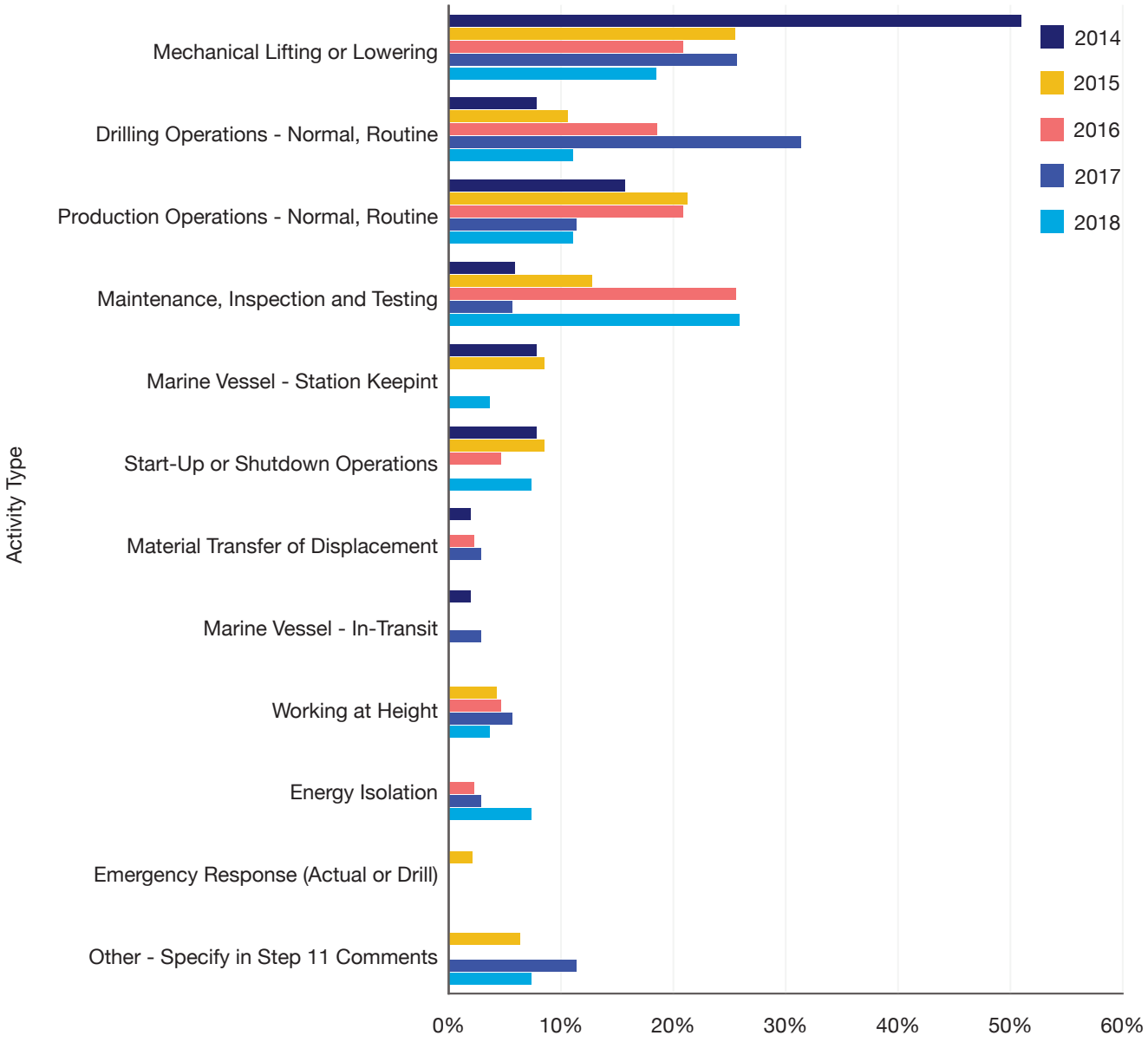
- Number of occurrences represented above (by year): 2014 = 51, 2015 = 47, 2016 = 43, 2017 = 33, 2018 = 27

Chart 5 – LFI Incident and HVLE Operation Type Distribution



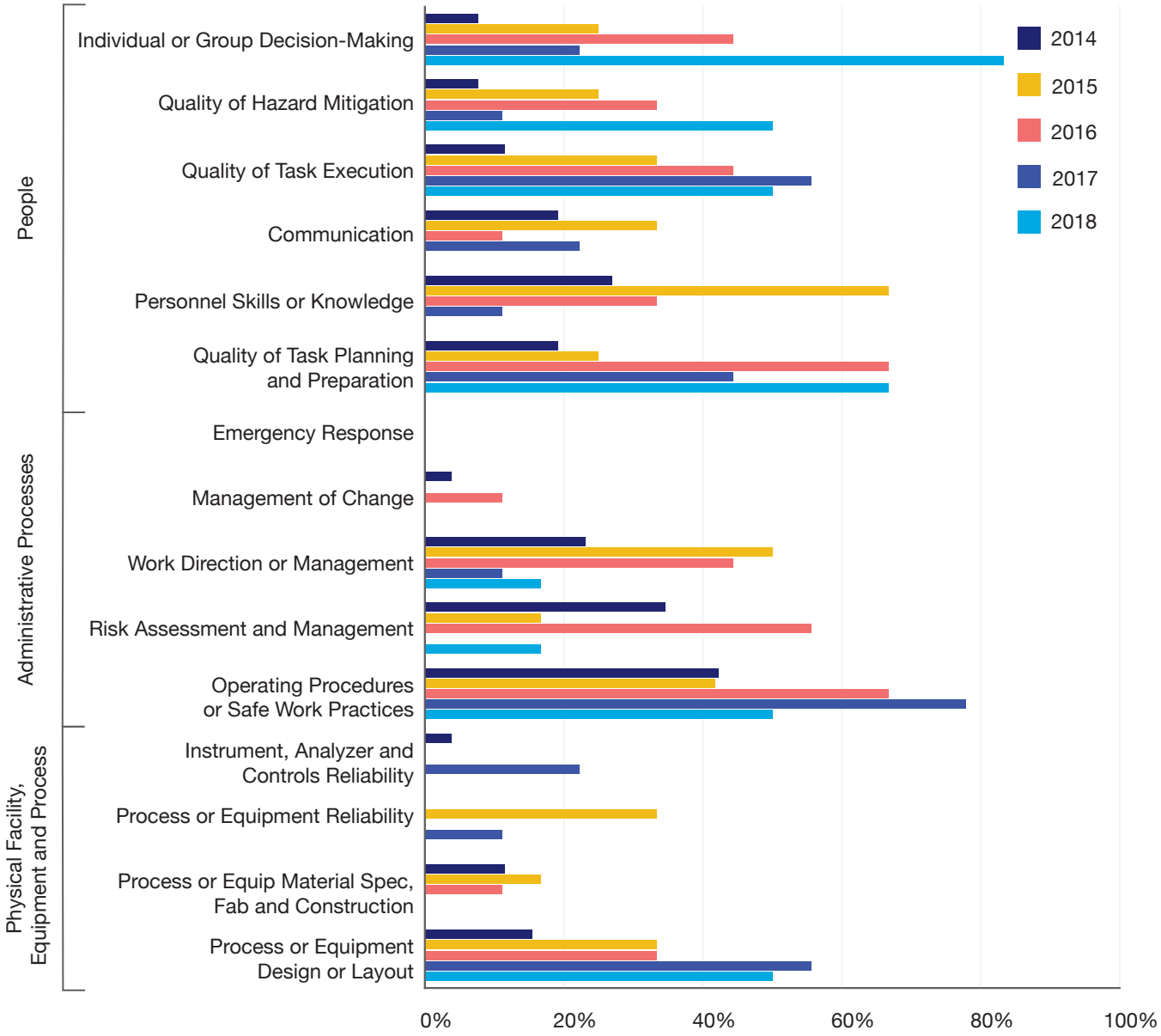
- Number of occurrences represented above (by year): 2014 = 51, 2015 = 47, 2016 = 43, 2017 = 33, 2018 = 27

Chart 6 – LFI Incident and HVLE Activity Type Distribution



- Number of occurrences represented above (by year): 2014 = 51, 2015 = 47, 2016 = 43, 2017 = 33, 2018 = 27
- This chart presents the primary activity for each event (LFI Submittals identify only one activity for each event). Secondary activities are not captured in this chart (e.g., Mechanical Lifting or Lowering during Maintenance Inspection and Testing).
- The decrease in mechanical lifting or lowering reported in 2015-2017 is due in part to the change in SPI 2C reporting thresholds made in 2015.

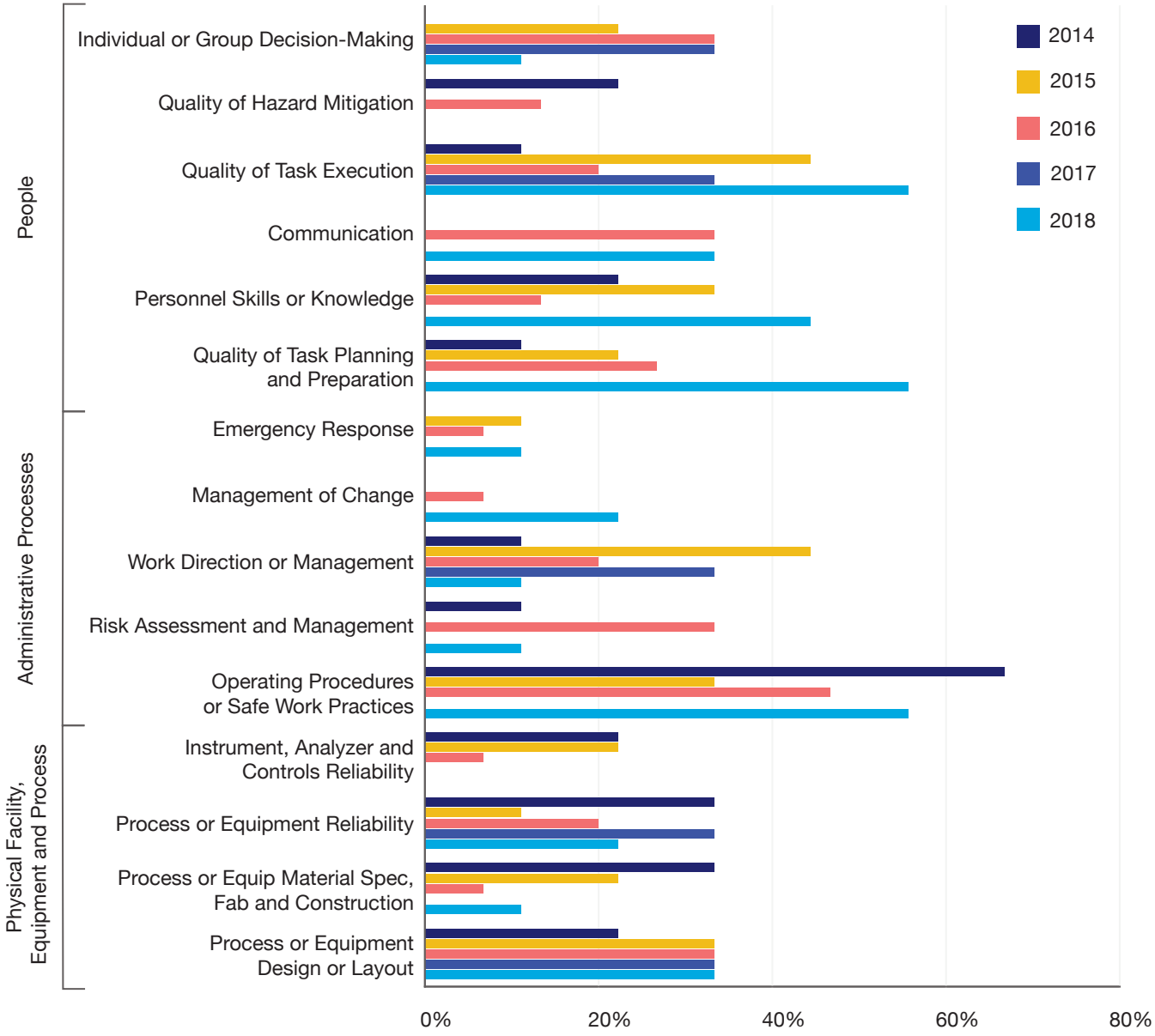
Chart 7 – Mechanical Lifting or Lowering AFI Distribution (AFI selection per total number of Mechanical Lifting or Lowering Activity submittals)



[2] *This chart depicts the number of Mechanical Lifting or Lowering Activity AFI selected divided by the total number of Mechanical Lifting or Lowering Activity LFI submittals in the given year.*

- Number of incidents represented above (by year): 2014 = 26, 2015 = 12, 2016 = 9, 2017 = 9, 2018 = 6

Chart 8 – Process Safety (Tier 1 and Tier 2) AFI Distribution (AFI selection per total number of PSE submittals)



[1] *This chart depicts the number of AFI selected divided by the total number of PSE submittals in the given year.*

- Number of Process Safety LFI Forms represented above: 2014 = 9, 2015 = 9, 2016 = 15, 2017 = 3, 2018 = 9