Development in Regulation of FPSOs in AUSTRALIAN WATERS

Ian MacGillivray
Manager - Operational Strategy and Improvement

National Offshore Petroleum Safety and Environmental Management Authority
Outline

• Background to NOPSEMA
• FPSO health & safety performance
• Lessons from inspections
• Lessons from incidents
• Introduction of a Design Notification Scheme
National Offshore Petroleum Safety and Environmental Management

Areas of Regulation

- OHS
- Well Integrity
- Environmental Management
National Offshore Petroleum Safety and Environmental Management Authority

Legislated functions

Promote
Advise
Co-operate
Investigate
Monitor & Enforce
Report

A240365
# Regulatory Responsibilities

<table>
<thead>
<tr>
<th>Functions</th>
<th>Safety</th>
<th>Wells</th>
<th>Environment</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope</strong></td>
<td>People at facilities</td>
<td>Well integrity</td>
<td>Activity</td>
<td>Titles compliance</td>
</tr>
<tr>
<td><strong>Duty-holder</strong></td>
<td>Operator</td>
<td>Titleholder</td>
<td>Operator</td>
<td>Titleholder</td>
</tr>
<tr>
<td><strong>Permissioning document</strong></td>
<td>Safety Case</td>
<td>WOMP</td>
<td>Environment Plan</td>
<td>Licences, SZs</td>
</tr>
<tr>
<td><strong>Powers</strong></td>
<td>OHS related entry, seizure, Notices</td>
<td>OHS related entry, seizure, Notices</td>
<td>Entry Remedial Directions</td>
<td>Entry, Directions</td>
</tr>
<tr>
<td><strong>Funding</strong></td>
<td>Safety Levy</td>
<td>Well Levy</td>
<td>Environment Levy</td>
<td>Reimbursement from NOPTA</td>
</tr>
</tbody>
</table>

A240365
AUSTRALIAN INDUSTRY AND NOPSEMA PERFORMANCE
2011-12 Activities

**INDUSTRY**
- 34 Operators
- 210 Facilities
- 13 Activity Operators*
- 13 Titleholders*
*Based on EM and WI submissions

**NOPSEMA**
- 65 Regulatory Specialists
  (26 OHS, 4 WI, 26 EM, 9 Reg Div)
- 3 Technical Officers/Investigator
- 37 Support staff

**549 Assessment submissions**

**546 Assessments Notified**

**383 (Incident) Notifications**

**127 Facilities Inspected**

**20 Accidents**

**317 Dangerous Occurrences**

**10 EM Incidents**

**36 Other (Complaints, Exercises, NRs)**

**5 Investigations**

**10 Minor Investigations**

**368 Incident reviews**

**70 Enforcement actions**
Facility Types and Numbers

<table>
<thead>
<tr>
<th>Facility Group</th>
<th>No. of Facilities at June 2012</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platforms</td>
<td>32</td>
<td>21%</td>
</tr>
<tr>
<td>FPSOs / FSOs</td>
<td>10</td>
<td>6%</td>
</tr>
<tr>
<td>MODUs</td>
<td>11</td>
<td>7%</td>
</tr>
<tr>
<td>Vessels</td>
<td>13</td>
<td>8%</td>
</tr>
<tr>
<td>Pipelines</td>
<td>88</td>
<td>57%</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>154</td>
<td>100%</td>
</tr>
</tbody>
</table>

~ 60 facilities no longer in regime after WA removed conferral of powers in designated coastal waters from 1 January 2012.

Numbers fluctuate as MODUs and Vessels enter or leave the regime (i.e. become or cease to be facilities).
FPSO Age Distribution

Age Distribution of FPSOs
Active 2011-12

Number

0 - 5 years  5-10 years  10-15 years  15-20 years  >20 years

A240365
## Statistics for FPSOs
for the financial year 2011-12

<table>
<thead>
<tr>
<th>Activity</th>
<th>ALL Facilities</th>
<th>FPSOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities Inspected</td>
<td>127</td>
<td>18</td>
</tr>
<tr>
<td>Accidents and Dangerous Occurrences</td>
<td>337</td>
<td>123</td>
</tr>
<tr>
<td>Complaints</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>OHS Assessments notified</td>
<td>254</td>
<td>23</td>
</tr>
<tr>
<td>Enforcement Actions issued</td>
<td>70</td>
<td>25</td>
</tr>
</tbody>
</table>

FPSOs make up only 6% of all facility types
## FPSO submissions for assessment

<table>
<thead>
<tr>
<th>FPSO Assessment Types submitted per year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advice</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Diving Start-up Notice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Field Development Plan</td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Request for Exemption under OHS Regs</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Safety Case – New</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Safety Case – Revised</td>
<td>5</td>
<td>12</td>
<td>4</td>
<td>18</td>
<td>21</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>98</td>
</tr>
<tr>
<td>Scope of Validation</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10</strong></td>
<td><strong>13</strong></td>
<td><strong>21</strong></td>
<td><strong>30</strong></td>
<td><strong>31</strong></td>
<td><strong>20</strong></td>
<td><strong>18</strong></td>
<td><strong>24</strong></td>
<td><strong>167</strong></td>
</tr>
</tbody>
</table>

A240365
### FPSO Safety Cases

<table>
<thead>
<tr>
<th>FPSO Assessments - data on rejected safety cases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of New FPSO safety cases rejected since 2009</strong></td>
</tr>
<tr>
<td><strong>Number of Revised FPSO safety cases rejected since 2009</strong></td>
</tr>
<tr>
<td><strong>Reasons for FPSO safety case rejections:</strong></td>
</tr>
<tr>
<td>➢ Non-compliant Validation</td>
</tr>
<tr>
<td>➢ CONTENTS / SAFETY MEASURES / EMERGENCIES</td>
</tr>
<tr>
<td>➢ The safety case is not appropriate to the facility /activities conducted.</td>
</tr>
</tbody>
</table>

**NB:** A safety case can have multiple reasons for rejection
More than half of these incidents occur on FPSOs.
In 2011-12, 38% of all incidents reported to NOPSEMA occurred on FPSO/FSOs.
Injuries

TRC Rates

TRC = LTI + ADI + MTI
Hydrocarbon Releases

HCR Rates
All Facility Types vs FPSO/FSOs

HCRs - proportion from FPSOs

- Other Facilities
- FPSO/FSOs
Safety-Critical Equipment (SCE)

SCE = Control measures relied on to reduce the risk of one or more MAEs to ALARP
**Fires**

**Fire or Explosion Rates**
All Facility Types vs FPSO/FSOs

No fires on FPSOs during 2012 (up to 30 June)

- **All Facility Types**
- **FPSO/FSOs**
## Root Causes

### FPSO/FSOs Incidents Root Causes

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>YTD 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Equipment Parts / Defects</td>
<td>Procedures</td>
<td>Design</td>
<td>Design</td>
<td>Design</td>
<td>Design</td>
</tr>
<tr>
<td>33%</td>
<td>17%</td>
<td>25%</td>
<td>16%</td>
<td>20%</td>
<td>20%</td>
<td>17%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>13%</td>
<td>14%</td>
<td>17%</td>
<td>15%</td>
<td>15%</td>
<td>11%</td>
<td>14%</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>Procedures</td>
<td>Mgmt Systems - people</td>
<td>Equipment Parts / Defects</td>
<td>Design</td>
<td>Design</td>
<td>None</td>
<td>Equipment Parts / Defects</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>12%</td>
<td>14%</td>
<td>13%</td>
<td>14%</td>
<td>14%</td>
<td>11%</td>
<td>13%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Work Direction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A240365
LESSONS FROM INSPECTIONS

Design Issues
Commissioning Issues
Operational Issues
Design Issues

• Alarm management
  – Address during design / commissioning.

• Material selection
  – Sourcing of the reservoir is a common outcome of facilities that conduct produced water reinjection.
  – This generally results in a higher than anticipated H₂S content in well, process & rundown streams.

• Process vs Tanker
  – Interfaces between topsides and existing marine tanker systems
Design Issues

• Hazardous Area Electrical Equipment
  – Non compliant & Poor installation
• Vibration and fatigue failures.
  – account for high proportion of Loss of Containment.
• Design for Africa vs Australian manning levels
• Trend to retaining pump rooms
  – lower cost of conversion vs higher risk.
Design Issues

• Critical Function Testing (CFT)
  – SCEs not meeting performance standards.
  – SCE often requires a production shutdown to CFT with frequency implications.
  – Systems should allow for performance tracking / reporting of SCE during unscheduled shutdowns.
Commissioning Issues

• Safety-critical elements: performance non-compliance: BDVs / SDVs

• Incomplete commissioning
  – construction debris
  – excessive punch list items
  – lack of Quality Assurance/Quality Control
Operational Issues

- Inadequacies in competency / training
  - Restart of plant and processes
  - Cyclone disconnection

Complex tasks requiring technical skills and experience.

- Operators must ensure sufficient time for required competencies to be acquired
Operational Issues
• Procedures Incorrect / Not Followed
  – Procedures take time to achieve and should be considered as dynamic.
  – Procedures should be validated or reviewed to reflect the current, best practice.
  – Use Management of Change (MOC), otherwise procedures can be undermined, resulting in shortcuts and risk taking.
Operational Issues

• Failure to complete Corrective Actions
  – "Case to Operate", "Deviations”, "Temporary Operating Procedures”, and the like are used to justify continued operations
  – Such permissions to operate should be time-limited and tracked to ensure permanent rectification is applied and maintained
TOPIC BASED INSPECTIONS
Maintenance management

- Variation between documented maintenance system and how maintenance is actually conducted
- Formal deferrals process not used – risks not assessed
- Auditing – inadequate
Emergency Management

• Drills being undertaken with limited number of scenarios
• PA systems ineffective, emergency escape routes not clearly marked or obstructed
• Response times – not subject to performance standards and not tested
• Inadequate debriefs
• Auditing - inadequate
Early Regulatory Engagement
Context: Legislative framework (Safety)

Stages in the life of a facility

- Exploration & Appraisal
- Concept Evaluation
- Conceptual Design
- FEED
- Detailed Design
- Overseas Construction
- Field Construct & Install
- Operate (Production) and Maintain
- Modify
- Decommission

Legislative Framework:
- P(SL)A Schedule
- P(SL)A MoSoF Regulations
- OPS Regulations
- OPGGS(S) Regulations

- Exploration & Appraisal
- Concept Evaluation
- Conceptual Design
- FEED
- Detailed Design
- Overseas Construction
- Field Construct & Install
- Production and Maintain
- Modify
- Decommission

SoV Flexibility

Fee for assessment of a safety case for a proposed Facility

Submission for Assessment, Scope, Feedback
Early Engagement Today: Participants

- Concept Evaluation
- Conceptual Design
- FEED
- Detailed Design
- Overseas Construction
- Field Construct & Install
- Production

Early Engagement Safety Case Assessments to-date
Early Engagement Today: Experiences

• Positive feedback regarding process
• Useful introduction for new operators
• A limited opportunity to question:
  – Safety & design philosophies
  – Concept selection
  – Design choices
  – ALARP demonstration
Early Engagement Today: Challenges

- No provisions for Concept Selection & Design
- Dialog constraints (requests for further information)
- Decision making focus of the regulations
- Optional process, no submission trigger

= Sub-optimal arrangements with limited potential to improve safety outcomes.
Drivers for change
Reasonable Practicability

Cost to avert

Risk
Reasonable Practicability: Passage of time

Time

Reasonable opportunity to challenge

Cost to change

Concept
Conceptual Design
FEED
Detailed Design
Overseas Construction
Field Construct & Install
Production Starts

Concept Evaluation
Concept Selected
FID
SC
SC

Reasonable opportunity to challenge

Cost to change

Time
Where we are headed?
Future Directions: work in progress

• Research & evaluation of options
• Design notification:
  – Focus on concept selection & design
  – Required for production facilities
  – Submitted no later than a Field Development Plan
  – Basis for ongoing dialog transitioning into submission of a safety case
Conclusion

*Effective provisions for early engagement:* increasing the likelihood that future production facilities are safer and with lower risk to the health of any person at or near them.
Thank you