Case Study in the Decommissioning of the Jabiru and Challis Oilfields in the Timor Sea, Australia

Dr. Robin Wright
Safety Security Health and Environment Manager
PTTEP Australasia
Introduction

- Australia’s largest offshore oilfield decommissioning to date
- 19 subsea wells, 160 kms. flowlines, 2 FPSOs
- Approval process began in 1998, decommissioning occurred 2011-13
- Approach taken to decide the decommissioning method
- Regulatory approvals that were obtained
- The decommissioning that occurred, cleanly and safely
Location Of Timor Sea Facilities
Challis Oilfield

Wells  2 subsea producers, 1 water injector shut-in, 5 producers shut-in, 6 P & A wells, and 3 abandoned wells with WH

Challis Venture FPSO - permanently moored to SALRAM
- HC processing unit: - single train of 3 stages oil&gas separation
  - gas lift
  - gas flaring
- produced water separation facilities & water injection

Flowlines (production, water injection, gas lift and control umbilicals) flexible F/L tied back to subsea wells
Challis SALRAM
Jabiru Oilfield

Wells: 4 subsea producers, 1 shut-in, 10 P & A wells, and 1 suspended well
Jabiru Venture FPSO - Moored via RTM system

- HC processing unit: - single train of 3 stages oil & gas separation
  - gas lift
  - gas dehydration
  - gas flaring
  - produced water facilities

Flowlines (production, gas lift and control umbilicals) flexible F/L tied back to subsea wells
• 1986 - Jabiru production commenced
• 1989 - Challis production commenced
• 2010 - Production ceased from both Jabiru and Challis
Legal Framework in Australia

- **Environmental Protection and Biodiversity Conservation Act 1999**
  Requires an Environmental Impact Assessment if the project has potential to impact a matter of “National Environmental Significance”

- **Environment Protection (Sea Dumping) Act 1981**
  Permit required to dump materials at sea

- **Offshore Petroleum and Greenhouse Gas Storage Act 2006**
  Petroleum activities (inc decommissioning) to be undertaken in accordance with an accepted Environment Plan and Safety Case.
International Law

- UN Convention on Law of Sea allows for non-removal of offshore installations
- London Convention considers disposal of offshore installations
  - 1996 Annex provides details
- IMO Resolution A672(16) provides guidance on what is allowable
- IMO Scientific Group guidance on how to assess proposals to leave offshore installations on seabed
IMO Resolution A672(16)

Dumping conditions:

- Less than 75m water depth and 4000 tonnes in air must be removed where practicable
- Must not create ongoing risk to safety of shipping or other users
- No significant adverse effects to marine environment or shipping from abandonment
- Safety and cost of removal must be considered
- May be left partially or wholly in place

IMO Resolution A672(16)
Strategy for Obtaining Regulatory Approval

• Analysis of options based on consideration of:
  - Safety
  - Environment
  - Cost
• Review precedents worldwide
• Present case for proposed decommissioning
• Demonstrate environmental suitability of proposed decommissioning
• Consult widely
## Environmental Implications Of Options

<table>
<thead>
<tr>
<th></th>
<th>Leave on Seabed</th>
<th>Re-use</th>
<th>Dispose Onshore</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reef Effect</strong></td>
<td>Positive</td>
<td>Negative (Existing habitat</td>
<td>Negative (Existing habitat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>destroyed)</td>
<td>destroyed)</td>
</tr>
<tr>
<td><strong>Conflict with Fishing/Navigation</strong></td>
<td>Slight Risk</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Contamination Risk</strong></td>
<td>Negligible</td>
<td>Slight spill risk</td>
<td>Slight spill risk</td>
</tr>
<tr>
<td><strong>Resource Utilisation</strong></td>
<td>None</td>
<td>Saves some materials</td>
<td>None</td>
</tr>
<tr>
<td><strong>Landfill Utilisation</strong></td>
<td>None</td>
<td>Some</td>
<td>Considerable</td>
</tr>
<tr>
<td><strong>Greenhouse Gas Emission</strong></td>
<td>Negligible</td>
<td>Increased</td>
<td>Increased</td>
</tr>
<tr>
<td><strong>Overview</strong></td>
<td>Neutral</td>
<td>Slight Negative</td>
<td>Slight Negative</td>
</tr>
</tbody>
</table>
Environmental Implications Of Leave On Seabed Option

- Deep water (106m), no seabed sensitivity
- Supports biodiversity
- No conflicts with fishing / navigation
- Nearest sensitive area
  - Submerged shoal 80kms away (Vulcan Shoal)
  - Coral reef 140km (Cartier Island)
- All other options have environmental implications
Safety Implications

- Removal involves prolonged use of divers
- Removal involves complex engineering
- Dismantling onshore is labour intensive
- Safety implications assessed by examining historical databases
- Potential Loss of Life (PLL) = Number of potential fatalities over the duration of the decommissioning activity
## Example Of PLL Calculation

<table>
<thead>
<tr>
<th>Option</th>
<th>1. Re-sale</th>
<th>2. Scrap</th>
<th>3. Leave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of lifts</td>
<td>48</td>
<td>267</td>
<td>0</td>
</tr>
<tr>
<td>Time per lift (minutes)</td>
<td>5</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Duration per hour</td>
<td>4.00</td>
<td>22.25</td>
<td>N/A</td>
</tr>
<tr>
<td>Drop probability per hour</td>
<td>$3.10 \times 10^{-4}$</td>
<td>$3.10 \times 10^{-4}$</td>
<td>N/A</td>
</tr>
<tr>
<td>Probability of personnel hit</td>
<td>0.1</td>
<td>0.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of fatalities</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
</tr>
<tr>
<td>PLL</td>
<td>$2.48 \times 10^{-4}$</td>
<td>$1.38 \times 10^{-3}$</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Safety Implications Of Options - Challis Riser Base & Riser Column

- Leave
- Remove & Reuse
- Dispose Onshore

Onshore Risk
Offshore Risk
# Capital Cost Of Options - Challis Field

<table>
<thead>
<tr>
<th></th>
<th>Leave in Place ($M)</th>
<th>Take to shore &amp; reuse ($M)</th>
<th>Take to shore &amp; scrap ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPSO</td>
<td>2.4</td>
<td>4.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Riser Tower</td>
<td>0</td>
<td>34.6</td>
<td>34.6</td>
</tr>
<tr>
<td>Riser Base</td>
<td>3.0</td>
<td>18.1</td>
<td>7.9</td>
</tr>
<tr>
<td>Flowlines</td>
<td>0</td>
<td>20 - 32</td>
<td></td>
</tr>
<tr>
<td>Wellheads</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Summary Of Options - Challis Riser Turret Mooring

1. Leave on Seabed
   - Contamination
   - Landfill use
   - Recycling
   - GHG emissions
   - Reef effects

2. Remove & Re-use
   - Contamination
   - Landfill use
   - Recycling
   - GHG emissions
   - Reef effects

3. Dispose Onshore
   - Contamination
   - Landfill use
   - Recycling
   - GHG emissions
   - Reef effects
# Precedents In Australia

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>NUMBER</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body/Human burial</td>
<td>16</td>
<td>• Off various locations</td>
</tr>
<tr>
<td>Chemical</td>
<td>5</td>
<td>• Spent caustic soda from LPG production</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Black liquor from paper making plant</td>
</tr>
<tr>
<td>Dredge spoil &amp; variations</td>
<td>144</td>
<td>• &gt; 168 million tonnes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mostly port authorities</td>
</tr>
<tr>
<td>Jarosite</td>
<td>10</td>
<td>• All in Hobart, Tasmania</td>
</tr>
<tr>
<td>Obsolete equipment</td>
<td>35</td>
<td>• Includes 38 vessels, munitions, concrete, steel structures and scrap metal</td>
</tr>
<tr>
<td>Artificial reef</td>
<td>31</td>
<td>• Includes 19 +vessels, tyres, concrete pontoons, car bodies, steel/concrete pipe and steel structures</td>
</tr>
<tr>
<td>Variations</td>
<td>3</td>
<td>• Variations of existing permits</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>• 1 vessel, 1 unknown</td>
</tr>
</tbody>
</table>

Environment Australia Sea Dumping Database, 1999
Oil Industry Precedents Worldwide

Platforms - Shallow water - mostly all removed
- Gulf of Mexico “rigs to reef” programme

FPSOs - Generally re-used or refurbished and reused

Risers/RTM - Some removed, some partly left in place

Pipelines - Mostly left on seabed

Flex Flowlines - Few precedents, some removed

Wellheads - Normally removed
Best Practicable Environmental Option

- Remove & sell FPSO
- Leave Riser Base and Riser Column
- Leave Flowlines
- Plug wells, remove tree and leave wellhead
Regulatory Approvals Timeline

- 1998  Discussion commenced with government agencies
- 1999  Studies of decommission options commenced
- 2003  EIA submitted to government under EPBC Act
- 2004  Approval granted under EPBC Act
- 2004  Sea dumping permit for Challis SALRAM granted
- 2010  Production ceased from both Challis and Jabiru
- 2011  Sea dumping permit for Jabiru RTM granted
Other Approvals (OPGGSA)

- Safety Case for the oilfield (suspended state)
- Well Operations Management Plan for P&A
- Safety Case Revision for the Ocean Patriot
- Environment Plan for the decommissioning activity
- Environment Plan for the decommissioned state
Conditions of Approval

- **EIA Approval (EPBC Act)**
  - Remove any flowlines containing NORM
  - Plug and abandon wells and remove wellheads
  - Dispose of SALRAM in situ

- **Sea Dumping Permits**
  - Challis SALRAM to be dumped in situ
  - Jabiru RTM and MWBs to be dumped at Challis
  - Post dumping survey to record resting position
  - Location marked on navigation charts
Decommissioning Operations (1)

- **Well plugging and abandonment**
  - Ocean Patriot MODU (June 2011 to May 2012)
  - Multiple rig moves (every 3 weeks)
  - Skandi Hawk CSV picks up “wet stored” items

- **FPSO removal**
  - Flushing flowlines, cleaning, removal hazardous materials from risers
  - Jabiru FPSO disconnect and tow away (Nov 2011)
  - Challis yoke severed and FPSO tow away (March 2012)

- **Challis SALRAM sunk**
  - Skandi Singapore CSV in support (March 2012)
CHALLIS SALM Sinking
CHALLIS SALM Sinking (cont.)
Jabiru RTM
Decommissioning Operations (2)

- March 2013 - Jabiru RTM sunk on location, one month before planned removal
- April 2013 - Jabiru MDBs towed to Challis and dumped as per sea dumping license
- May 2014 - Amended Jabiru Sea Dumping License approved to allow Jabiru RTM to remain in situ at sunk location
- May 2014 - EIA approval conditions amended to allow flowlines containing low level NORM scale to remain in situ
Summary

- Australia’s largest offshore oilfield decommissioning to date
- 19 subsea wells, 160 kms. flowlines, 2 FPSOs
- Well P&A, wellhead removal with no significant incident
- The leaving of in situ of risers and flowlines was well justified on the basis of safety, cost and environmental considerations in accordance with IMO guidance
- The Australian regulatory approval decisions were made in a manner consistent with this guidance
- The sinking of the riser structures and laying on the seabed occurred safely and cleanly without significant incident