Decommissioning of Offshore Production Systems

Eduardo Hebert Zacaron Gomes

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Agenda:

• Context
• National Outlook
• Decommissioning at Petrobras
• Main Areas
• Main Activities
• Challenges
• Well Abandonment
• Platform Deactivation
• Subsea System Decommissioning
• Some Initiatives and Actions
• Conclusions
Context:

- Fall of oil barrel price / anticipation of economic cut
- End of concession and leasing contracts
- Life cycle
- New regulations (SGSS e SGIP)

Concentration of decommissioning demand
National Outlook:

Highlights:
• Nearly 160 offshore production installations (other 20 until 2022)
• More than a half of the installations has more than 25 years in operation

Main regulatory framework:
• Resolution ANP nº27/2006
  Facilities decommissioning guidelines
• Resolution ANP nº43/2007 - SGSO
  Operational Safety Management System
• Resolution ANP nº41/2015 - SGSS
  Subsea Safety Management System
• Resolution ANP nº46/2016 – SGIP
  Well Integrity Management System

Age distribution of Brazilian offshore production installations:

Source: ANP presentation at FGV Energy Workshop of Decommissioning – set/2017
Decommissioning System at Petrobras:

Example of influence factors affecting portfolio management:

- Macroeconomic scenario;
- New exploratory opportunities;
- Facilities life extension;
- Revitalization / Field Redevelopment Projects;
- Extension of concession contracts;
- Decommissioning costs.
Main Areas:

- Different levels of information maturity for planning / evaluation of alternatives;
- Specific chronologies;
- Risk mitigation and gain of scale by separating the phases.
Main Activities:

**Wells**
- Cleaning and flowline disconnection from X-trees
- X-tree closure and monitoring
- Permanent abandonment (P&A)

**FPUs**
- CoP (Cessation of Production)
- Topside cleaning & conditioning
- Pull-out of risers, Disanchor and Towing

**Fixed Platforms**
- Wells P&A
- Topside cleaning & conditioning
- Comparative assessment of jackets destination alternatives

**Subsea Systems**
- Comparative assessment of subsea systems decommissioning options: full recovery, partial recovery or leave in-situ
- Topside destination
- Jacket destination
- Environmental monitoring

**Destination**
- Environmental monitoring
Challenges:

**WELLS**
- Large number of P & A. Integrated risk-based portfolio management
- Definition, agreed with IBP, of guidelines with best practices on well abandonment and monitoring
- Reduce the cost of abandonment with new technologies, alternative techniques of abandonment, optimized logistics and specific business models

**PLATFORMS**
- Minimize the time between production ceasing and the towing of floating units from the location.
- Identify, treat and dispose waste from the production process and decommissioning.
- Optimize destination of topside and jackets of fixed units.
- Logistics for final destination.

**SUBSEA SYSTEM**
- Definition of methodology of comparative assessment of alternatives, considering multiple criteria.
- Conduct case-by-case analysis to define the alternative that better balances environmental protection, operational risks and technical and economic feasibility.

**OPERATIONAL RISK MANAGEMENT**

**STAKEHOLDER ENGAGEMENT**

**DECOMMISSIONING COST ESTIMATION**
Well Abandonment:

Guidelines and Best Practices
# Platform Deactivation:

<table>
<thead>
<tr>
<th>Cleaning</th>
<th>Preparation</th>
<th>Disconnection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Tanks</td>
<td>Structural reinforcements</td>
<td>Risers</td>
</tr>
<tr>
<td>Process vessels</td>
<td>Equipment repairs or upgrades</td>
<td>Umbilicals</td>
</tr>
<tr>
<td>Topside equipment</td>
<td>Towing accessories installation</td>
<td>Mooring</td>
</tr>
<tr>
<td>Engine Room</td>
<td>Isolation of equipment/pipelines</td>
<td>Final Shut Down</td>
</tr>
</tbody>
</table>

Most of them are part of the operational routine.
Subsea System:
Comparative Assessment

Resolution ANP nº41/2015 – SGSS (Subsea Safety Management System)

26.2 – Permanent Decommissioning Plan

26.2 – The Permanent Decommissioning should consider the legal, technical, economic, safety, environmental protection and industry best practices.


<table>
<thead>
<tr>
<th>ASSESSMENT CRITERIA</th>
<th>Complete removal to land</th>
<th>Partial removal to land</th>
<th>Leave wholly in place</th>
<th>Disposal at sea</th>
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<tbody>
<tr>
<td><strong>Safety</strong></td>
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<td>risk to personnel</td>
<td>HIGH</td>
<td>MEDIUM</td>
<td>LOW</td>
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<tr>
<td>risk to other users of the sea</td>
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<td>LOW</td>
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<tr>
<td>risk to those on land</td>
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<td>MEDIUM</td>
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<tr>
<td><strong>Environmental</strong></td>
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<tr>
<td>marine impacts</td>
<td>HIGH</td>
<td>MEDIUM</td>
<td>LOW</td>
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<tr>
<td>other environmental compartments (including emissions to the atmosphere)</td>
<td>HIGH</td>
<td>MEDIUM</td>
<td>LOW</td>
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<tr>
<td>energy/resource consumption</td>
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<td>MEDIUM</td>
<td>LOW</td>
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<tr>
<td>other environmental consequences (including cumulative effects)</td>
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<td>LOW</td>
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<tr>
<td><strong>Technical</strong></td>
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<tr>
<td>risk of major project failure</td>
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<td>fisheries impacts</td>
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<tr>
<td>amenities</td>
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<tr>
<td>communities</td>
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<td><strong>Economic</strong></td>
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</table>
Subsea System:

Several comparative assessment methodologies and tools are used in other countries!

Guideline for Comparative Assessment in Decommissioning Programmes

What do we need?

Technical Guidelines for Risk-Based Comparative Assessment of Alternatives for Decommissioning of Subsea Installations in Brazil

The elaboration of this document requires the participation of all stakeholders (regulatory bodies / agencies, industry, scientific community etc).
Some Initiatives and Actions:

Seek an approach between industry and regulators to develop solutions that balance environmental protection, operational safety and technical and economic feasibility.
Conclusion:

• Methodologies for comparative assessment of alternatives must be adapted to the Brazilian scenario and must consider all factors and stakeholders.

• Wells, platforms and submarine systems decommissioning projects have different chronologies and can be evaluated separately.

• Decommissioning requires differentiated operational solutions.

• Paradigms must be broken with risk analysis.

• The projects require long-term planning and execution and should be evaluated as early as possible in order to seek synergy and cost reduction.

• High decommissioning costs can make new projects unfeasible and anticipate the devolution of mature fields.
Thank you!

Questions?

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