Alternative Solutions for Riser Base Gas Lift

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Overview

- Introduction
- Gas Lift Solutions
- Impact on Riser System
- Cost Comparison
- Summary
Introduction

- Gas lift at base of Production Risers
- Reasons for riser base gas lift
  - Line activation
  - Flow stabilisation (slugging)
- Key Issues
  - Control flow from surface or from seabed
  - Variation in requirements for each production riser
  - Variation in gas lift volume requirements over time
Two Gas Lift Solutions

- **Primary Solution**
  - Individual gas lift line to each riser
  - Gas lift integrated into an umbilical
  - Gas lift manifold at interface between umbilical and production riser

- **Alternative Solution**
  - Combined gas lift line for multiple risers – standard riser (e.g. 6” SCR, flexible, etc.)
  - Seabed GL-SDU
  - Flying leads/jumpers from GL-SDU to each production riser
Combined Gas Lift for Two Riser Solutions

Single Leg Hybrid Riser (SLHR)

Steel Catenary Riser (SCR)
Typical Layouts - SCRs
Key Decisions Factors

- Complexity of Solution
  - Requirements for subsea equipment
- Impact on Field Layout
  - Number of lines / vessel slots
- Gas Lift / Production Riser Interface
- Insulation Requirements
- Installation / Schedule
- Costs
# Riser Solutions

## Feasibility of Combined Solutions Versus Riser Solutions

<table>
<thead>
<tr>
<th>Riser Solution</th>
<th>Feasibility</th>
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</thead>
<tbody>
<tr>
<td>Flexible Risers</td>
<td>√</td>
</tr>
<tr>
<td>IPB</td>
<td>X</td>
</tr>
<tr>
<td>SCRs</td>
<td>√</td>
</tr>
<tr>
<td>SLHR</td>
<td>√</td>
</tr>
<tr>
<td>PIP SLHR</td>
<td>√ √</td>
</tr>
<tr>
<td>Riser Towers</td>
<td>X</td>
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</tbody>
</table>
## Economic Comparison – SLHR

<table>
<thead>
<tr>
<th>Costs</th>
<th>Individual Gas Lift Lines</th>
<th>Combined Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement</td>
<td>$95m</td>
<td>$75m</td>
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<tr>
<td>Installation</td>
<td>$85m</td>
<td>$75m</td>
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<tr>
<td>Miscellaneous</td>
<td>$35m</td>
<td>$30m</td>
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<tr>
<td>Total</td>
<td>$215m</td>
<td>$180m</td>
</tr>
</tbody>
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**Potential $35m Savings**
Further Enhancement of Combined Solution

- Combined Solution with Control from Surface
  - Choke on surface
- Multi-bore Umbilical
  - Simplified GL-SDU on seabed
- Large umbilical
Conclusions

- Riser base gas lift – common requirement for deepwater developments
- Current Solution – Individual Gas Lift Lines
- Alternative Solution – Combined Gas Lift System + GL-SDU
  - Potential for significant cost savings with SLHR riser solution
  - Potential application also for SCR/flexible risers
- Further Enhancements Possible
Thanks for Listening