All-Electric – An Enabling Technology for Cost Efficient Field Developments

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Opportunities With All-Electric

- **Higher flexibility**
  - During early system design phase
  - Simpler expansion of field (tie-back)
  - Plug-and-play integration of control loops

- **Lower CAPEX investment**
  - Reduced umbilical scope
  - Reductions in Subsea hardware component cost
  - Less equipment topside (weight and envelope)

- **Lower OPEX cost**
  - Reduced SURF scope
  - Hydraulic fluid is removed
  - More potential for predictive services and planned intervention

- **Higher reliability and availability**
  - Easier to monitor the functionality
  - Higher degree of condition monitoring

- **HSE**
  - No risk of hydraulic fluid release to sea
  - High pressure units removed topside
  - Less handling of tote tanks
Areas of Potential Optimization

Reducing the SURF cost by reducing need for subsea umbilicals:

Reducing the size (and cost) of subsea & topside hardware:

Simplify controls and distribution system:

Opens up for automated testing and reduced time spent

Enabling advanced predictive services and planned intervention

More reliable, maintainable and available system
How to Achieve the Solution Dependent Benefits

- Technology benefits
  - Safety and environmental enhancement
  - Increased flexibility in area and field development
  - Easier field expansion

- Solution dependent benefits
  - Overall system CAPEX and OPEX reduction
  - Increased reliability and availability
  - Advanced predictive services
How can we make a CAPEX optimized all-electric SPS?
Key Requirements

- Best possible CAPEX competitiveness
- Maintain current functionality, or better
- Increase condition monitoring, enabling predictive services
- Reduce equipment size – smaller, lighter, easier to handle
- Enable less testing
- Standardized interfaces
  - Communication
  - Mechanical
- Maintain critical hardware as is; valves, sealing systems, etc*

*(additional future potential with new innovative solutions)
Case Study: Implementation of All-Electric

- The main controls related cost contributors in All-Electric SPS developments
  - Large control modules (various kinds)
  - Distribution system (connection system)
  - Electrical actuators

- Two different systems types explored
  - Cluster
  - Template with manifold

- Two Control architectures explored
  - Conventional implementation
  - Less centralized using intelligent actuators
Ability To Be Used Independently On System Deployment

Cluster topology

Template with manifold
All-Electric Control System Implementation

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<thead>
<tr>
<th></th>
<th>(1) Centralized</th>
<th>(2) Decentralized</th>
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<tbody>
<tr>
<td>Perceived implementation risk</td>
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<tr>
<td>TQP need</td>
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<tr>
<td>Cost impact</td>
<td>Small increase in cost</td>
<td>Small cost saving</td>
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<td>Safety solution options</td>
<td>Spring or battery</td>
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Summary

- Less topside equipment
- Reduced size of umbilicals
- XMTs smaller and lighter
- Distributed controls architecture and removal of hydraulic distribution
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