Subsea Standardisation Project
Adopting a Fit for Purpose and Optimised Approach

Oil & Gas UK Efficiency Task Force
Share Fair 2016 – Innovation Hub Sessions
Steve Duthie – ETF Subsea Standardisation Project Industry Lead

2nd November 2016
Aberdeen AECC
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Overall Project Objectives Summary

- The Oil & Gas UK executive formally launched the Efficiency Task Force (ETF) in September 2015, to drive a pan-industry improvement in efficiency – with the aim of creating a sustainable industry in a lower oil price world.
- While recognising that some behavioural change will be company-specific, Oil & Gas UK is taking the lead to help drive pan-industry initiatives to achieve efficiency improvements and transformational change, formalising those initiatives under the ETF.
- The task force is taking a three pronged approach under the themes:
  - Industry Behaviours Charter
  - Rapid Efficiency Exchange
  - Efficiency Roadshows
  - Compression Systems
  - Inventory Management
  - Procurement
  - Logistics
  - Maintenance
  - Subsea Technology
  - Valves
  - Well Plugging & Abandonment
Key Stakeholder and Companies Involved

Industry Driven
Subsea Standardisation Project
Organisational Structure

Steve Duthie – Industry Lead

**Working Group**
- Alan Black
- Graham Whitehead
- Guy Trumper
- Matt Corbin
- Martin Fowlie
- Neil Kirkbride
- Patrick Duggan
- Rebecca Borresen
- Richard Hinkley
- Stuart Buchan
- Stephen Marco Jones

**Scopes**
- Literature Review
- Case Studies
- Strawman Theoretical Exercise
- Efficiency Scopes

**Prospect Review**

**Develop Theory**

**Apply Theory**

**12 Sub Groups from across Industry**
- Detailed Design
- Pre-Commissioning
- Fabrication
- SPS
- Flexibles
- Survey
- IVB
- Trenching, Backfill & Rockdump
- Installation
- Umbilicals
- Pipelines, LinePipe & Coatings
- Valves, Flanges & Fittings

Input from:

- Oil & Gas Authority
- Subsea UK
1. UKCS Prospects economically challenging
2. “Here and now” solutions required to stimulate investment and developments
3. Need to make a difference today!
4. Majority of Small Pools are within tie back range – new technology not essential
5. Industry led initiative with voluntary support
Standardisation Themes

Optimisation and Alternative Methods
These could include:
- Field layout optimisation
- Pre-commissioning philosophy
- Alternative designs, fabrication, manufacturing and installation methods and technology.
- Hot Taps to Host Pipeline
- Schedule optimisation, Vessel Sharing and cluster development strategy (Mass Centralisation).

Simplified Process
These could include:
- Reducing documentation requirements,
- Acceptance of contractor documentation.
- Reduced inspection requirements,
- Acceptance of contractor quality control procedures.
- Reduces reporting
- Interface management.
- Risk Review Profile
- Industry Proforma documents

Functional vs Prescriptive
These could include:
- Working to industry standards as opposed to prescriptive customer specification requirements,
- Use of pre-qualification and testing information,
- Material requirements and traceability
- Simplified design and installation analysis

Standardised Hardware
These could include:
- Catalogue of Components
- Re-Use of Equipment
- Envelope for Design Components
- Standard Classifications
- Interchangeability
- Standard Interfaces
- Plug and Play
- Modularised and building block approach
UKCS Case Studies - Results

Early indication of the potential savings that could be realised

- Four previously executed projects revisited applying the standardisation themes

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<thead>
<tr>
<th>Case Study 1</th>
<th>Case Study 2</th>
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<tr>
<td>FPSO riser system</td>
<td>Subsea pipeline tieback</td>
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<tr>
<td>Total Savings: £7.75m = 25%</td>
<td>Total Savings: £13m = 18%</td>
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<th>Case Study 3</th>
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<tr>
<td>Subsea manifold &amp; bundle</td>
<td>Subsea pipeline tieback</td>
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<tr>
<td>Total Savings: £26m = 15%</td>
<td>Total Savings: £14.5m = 28%</td>
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Strawman Theoretical Exercise

10 Sub Groups

16 Scopes

Strawman Exercise

Define Theoretical Strawman Scope

Define Reference Case

Define Metrics and Score

Produce Time/ Cost/ Complexity Diagram

Aim: Provide a time/ cost/ complexity diagram comparing a standard project delivery versus project delivery with preferential requirements
Note: Impact of duration on project development cycle is not reflected in costs.
Strawman Theoretical Exercise – Cost and Schedule Impact
Efficiency Scope Selection – Case Study Example

- Through a series of workshops held by the Sub Groups, projects were selected that identified potential costs and schedule benefits
- 55 projects selected overall from 11 Sub Groups

SPS Sub Group applied one of their projects to a current subsea tree supply scope

- Simplified Process Applied
  - Inspection and Test Plan Savings
    - Witness and hold points tied to milestones
  - Approved Vendor Savings
    - Using only supplier approved vendors
    - Removal of independent verification and certification for safety critical equipment.
  - Documentation
    - Accepting standard supplier documentation, reduced review cycles
    - Reduce documents due to providing only functional requirements
      o 10,000+ man-hours reduced to 2,850 hours.
- 13% overall cost and 18% schedule savings were achieved
Summary of Research Findings

- The reviews and exercises undertaken to date have identified the potential for achieving significant efficiency savings when applying the Standardisation Themes to Subsea Developments:
  - Four UKCS case studies indicated 15-28% cost savings
  - The theoretical Strawman exercise identified potential savings in the range of 6 – 38%
  - Applying a simplified approach to the Process’s as part of a subsea tree manufacture demonstrated actual savings of 13%

- The overall savings and individual weighting of the standardisation themes will vary from project to project as influenced by the development and operators behaviours & culture where:
  - Codes, Standards & Specifications are generally influenced by the level of prescriptive requirements.
  - Process is influenced by the level of control applied and level of detail and information requested.
  - Alternative methods and technologies are influenced by the scope and level of early engagement from the supply chain.
  - Hardware standardisation offers limited savings in the short term but offers potential for achieving significant savings in the longer term – this will also be influenced by proprietary knowledge and commercial sensitivity.
Potential efficiencies that could be applied to subsea developments by adopting a fit for purpose and a more simplified approach to projects.

Objective:
To establish what cost savings could be realised when applying the findings identified to date to an existing prospect considered ‘economically challenging’.
Centrica Pegasus West Prospect Review

- Centrica was the first operator to offer a prospect for review. In this case, the West Pegasus field development, a potential three well gas tie-back in the Southern North Sea.

Several options with different “Host” Facilities were considered.
Key Efficiencies Identified

Revised Field Layout

- Field layout optimised by introducing a co-mingling manifold to replace the well daisy chain configuration this reduced the number of valves including number of actuated valves.
- Simplified pipework at trees avoided protection structure plus reduced dewatering methodology.

Umbilical Optimisation

- Substantial savings through material & manufacturing selection
- Further savings were realised through applying only the ISO standards
- Savings were also identified through reducing the level of documentation and accepting only manufacturer documentation.

SPS Controls

- Standard Designs
- Through measuring flow at the host rather than adopting a multiphase flow select meter.
- Opting for a single SEM with a dual power source realised substantial cost savings
### Key Efficiencies Identified continued

**Pipelines**
- Use of High Frequency Induction Line Pipe & optimised Wall Thickness
- ECA and AUT replaced with radiography
- Removal of Field Joint Coatings
- Optimised pipeline fabrication and lay rates

**Dropped Object and Over-trawlability**
- By trenching into the 500m zone there is an area between the dropped object cone and the boundary of the 500m zone where no matts would be required.
- Through applying the above, 208 matts were no longer required.
- The reduction of matts also has a significant cost and schedule saving from vessel duration.

**Crossing Design**
- Reduced rock quantities and subsequent installation time, through challenging specification and applying industry standards

**Single Pipeline and Umbilical Trench**
- Combining the umbilical and the pipeline in the same trench realised significant savings.
Dropped object and over-trawlability
Crossing design – rock quantities
SEM redundancy
Reduce trench transition from 75m to 50m
Remove ECA and AUT requirements
Pre-qualified welding and welder qualifications
No FJC
22%Cr instead of 25%Cr Duplex for valve bodies
Part cladding instead of full cladding for valves
Pre-qualified valves
Manufacturers standard FAT for valves
3.1 certification for valves
Apply industry standards (ISO – Umbilicals/ API – Valves/ASME – Fabrication)
Umbilical hose and cable dimension optimisation
Manufactures SIT applied to manifold
Epoxy paint coatings for spools and structures

Optimised pipeline fabrication and lay rates
Optimised line pipe WT for reel lay
Application of HFI Line Pipe
Single Trench for Pipeline and Umbilical
Revised field layout and co-mingled manifold with simplified tree pipework, valves and necessity for protection cover.
Simplified de-watering philosophy
Combined leak and strength test
Multi-phase flow meter selector to single flow selector.
Crossing Design – Concrete plinths used
Replace steel tubes with thermoplastic hoses for Umbilicals
Overall installation schedule optimisation

Apply contractor documentation
Inspection
Review cycles
Interface and sub contractor management
Reporting
Combined FEED and detailed design

Application of standard designs for:
- Valves
- SPS
- Manifold
## Overall Efficiency Savings

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<tr>
<th>Group</th>
<th>Range*</th>
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<td>Project Management and Engineering</td>
<td>20.4% – 24.7%</td>
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<tr>
<td>Procurement, Manufacture and Fabrication</td>
<td>14.8% – 28.3%</td>
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<tr>
<td>Transportation and Installation</td>
<td>16.3% – 33.6%</td>
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*The above % indicates the savings achieved within these groupings.*

| Overall Percentage Savings | 20.4% – 24.7% |

* Dependant on Field Option
Conclusion

- Sustainable Savings of 20-24% were achieved applying the Standardisation Themes
- The overall savings & individual weighting of the Standardisation Themes will vary from project to project and by the cultures and behaviours adopted by the Operators and Supply Chain
- The prospect review has highlighted that applying a functional and non-prescriptive approach will provide an optimised solution
- Early engagement of the supply chain will increase the potential to apply alternative methods & technology
- Savings attributed to improvement of the overall prospect delivery schedule have not been determined within this work but expected to provide further cost savings

This unique industry driven initiative, supported by a large number of companies applying collective behaviours, has demonstrated that cost savings of 20-24% were achievable. Wider adoption of the Standardisation Themes to other prospects including the “small pools” will provide “Sustainable Savings” going forward.
The Centrica Pegasus project team is very pleased with the positive outcome achieved from the ETF work group subsea review and standardisation study case;

- Identified a series of optimisations in the base case subsea concept,
- Led to noticeable potential cost reductions, which increased our confidence in the economically viability of the prospect.

The ETF work group demonstrated a high level proactive approach and professionalism;

- An excellent level of collaboration between the Pegasus project team and ETF work group with one-team spirit maintained at all times.

Pegasus partners (Centrica and Third Energy) remain optimistic with regard to achieved results at the given level and look forward towards further improvement opportunities.

Pegasus partners will evaluate in more detail before a decision on whether and how we progress with Pegasus.
# Acknowledgements

- **12 members of the Working Group**

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<thead>
<tr>
<th>Working Group</th>
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- **57 members involved across 12 Sub Groups**

## Detailed Design

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<th>Wood Group Kenny</th>
<th>Craig Jamieson</th>
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## Fabrication

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