Subsea Cost Estimation

Presented by

Oseghale Lucas Okohue  BEng. MSc. CIPMP

www.chesssubseaengineering.com
Course Instructor

Name: Oseghale Lucas Okohue

Position: Subsea Engineer – Production Systems | Drilling Systems Specialist

Website: www.chesssubseaengineering.com

Email: oseghaleokohue@chesssubseaengineering.com
oseghaleokohue@gmail.com

Phone: 08139340494
Outline

Lecture 1: Subsea Capital Expenditure (CAPEX)

Lecture 2: Cost Estimation Methodologies
- Cost Capital Estimation
- Factored Estimation
- Work Breakdown Structure
- Cost Estimation Process

Lecture 3: Subsea Equipment Costs
- Overview of Subsea Production System
- Subsea Trees
- Subsea Manifolds
- Subsea Flowlines
Outline

Lecture 4: Testing and Installation Cost
  - Testing Cost
  - Installation Cost

Lecture 5: Project Management & Engineering Costs

Lecture 6: Subsea Operations Expenditure (OPEX)

Lecture 7: Life Cycle Cost of Subsea Systems

Lecture 8: Case Study – Subsea System CAPEX Estimation
Lecture 1: Introduction to Subsea Cost Estimation

Presented by
Oseghale Lucas Okohue  BEng. MSc. CIPMP

www.chesssubseaengineering.com
Introduction

- Subsea cost refers to the cost of the whole project, which generally includes the capital expenditures (CAPEX) and operation expenditures (OPEX) of the subsea field development.
Feasibilities Studies on each Phase of Subsea Development Life Cycle

<table>
<thead>
<tr>
<th>Strategy Selection</th>
<th>Exploration &amp; Production</th>
<th>Project Execution</th>
<th>Abandonment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Bids**
- **Feasibility Studies**
- **Production & Maintenance**

<table>
<thead>
<tr>
<th>CAPEX</th>
<th>OPEX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**2 – 3 years**

**5 to 80 years**

**Note:** Expenditures are incurred during each period of the whole subsea field development project.
Subsea Cost estimation Feasibility Studies

- The feasibility studies are performed before execution of the project.

- Feasibility studies typically involve 3 phases:
  - Pre-field development;
  - Conceptual/feasibility study;
  - Front-end engineering design (FEED)
Subsea Cost estimation Feasibility Studies

❖ Pre-field development Work Flow Chat

✓ HSE Plan
✓ QA Plan
✓ Reservoir Characterization
✓ Geo Physical and geotechnical survey
✓ Subsea Production System requirement study
✓ Host facility data
✓ Subsea Separation Process system requirement etc.
Subsea Cost estimation Feasibility Studies

- **Conceptual Feasibility Studies Work Flow Chat**

  - Preliminary Flow Assurance Analysis
  - Preliminary field architecture (including locating of subsea hardware etc.)
  - Preliminary Subsea production system basis of design
  - Preliminary cost estimation
Subsea Cost estimation Feasibility Studies

**Front End Engineering Design Work Flow Chat**

- Process Flow Diagram
- Updated field architecture
- Updates subsea production system basis of design
- Subsea system operating philosophy
- Subsea Inspection, maintenance and repair (IMR) Philosophy
- Risk and reliability study
- Subsea Intervention Philosophy etc.
## Cost Estimation Classification Matrix based on AACE

<table>
<thead>
<tr>
<th>Estimate Class</th>
<th>Level of Project Definition</th>
<th>End usage</th>
<th>Methodology</th>
<th>Estimate Accuracy Range</th>
<th>Preparation Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 5</td>
<td>0 to 2%</td>
<td>Screening or feasibility</td>
<td>Stochastic or judgment</td>
<td>4 to 20</td>
<td>1</td>
</tr>
<tr>
<td>Class 4</td>
<td>1 to 15%</td>
<td>Concept Study Or feasibility</td>
<td>Primarily stochastic</td>
<td>3 to 12</td>
<td>2 to 4</td>
</tr>
<tr>
<td>Class 3</td>
<td>10 to 40%</td>
<td>Budget, authorization &amp; control</td>
<td>Mixed but primarily stochastic</td>
<td>2 to 6</td>
<td>3 to 10</td>
</tr>
<tr>
<td>Class 2</td>
<td>30 to 70%</td>
<td>Control or bid / tender</td>
<td>Primarily deterministic</td>
<td>1 to 3</td>
<td>5 to 20</td>
</tr>
<tr>
<td>Class 1</td>
<td>50 to 100%</td>
<td>Check estimate or bid / tender</td>
<td>Deterministic</td>
<td>1</td>
<td>10 to 100</td>
</tr>
</tbody>
</table>
Subsea Cost estimation cont...

- Cost estimations are made for several purposes, and the methods used for the estimations as well as the desired amount of accuracy will be different.

Note:

“preliminary cost estimation” for a “project feasibility study,” the accuracy will normally be ±30%.
According to Association for the Advancement of Cost Engineering (AACE) the following terms are defined as follows:

- Level of project definition: expressed as percentage of complete definition;
- End usage: typical purpose of estimation
- Methodology: typical estimating method
- Expected accuracy range: typical range relative to best index of 1 (if the range index value of “1” represents ±10/–5%, then an index value of 10 represents ±100/–50%)
Subsea Cost estimation cont...

• Preparation effort: typical degree of effort relative to least cost index of 1 (if the cost index of “1” represents 0.005% of project costs, then an index value of 100 represents 0.5%).

This course provides guidelines for cost estimation during a project feasibility study, where the accuracy range is between ±30% for subsea field development projects.