Decommissioning Subsea Components

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Marine Technology Society
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Decommissioning - Learning from “Comparative Assessment” of Alternatives

Decommissioning: A paradigm shift from installation?

Abandonment: What options are there, and for what parts?

Comparative Assessment: How to decide, and plan?

Regulatory: Future liability assessment….but due now
Decommissioning: A paradigm shift from installation?

Not “Reverse Install”
- Examples: Cut quickly
  - i.e. not disconnect carefully
- Abandon in place
  - i.e. removal is not default

Lowest Cost, not schedule driven

3 “Work Streams”, not a single project
- No first oil driver
- Host, subsea, wells

“As is”, not As-built
- Installation aids & running tools
  - accessible/available?
- Anticipate modifications since install
- Plan for deterioration, corrosion

Cleaning, not commissioning
- Pigging & flushing from/to topside
  - bullhead hydrocarbons down hole

Vessel driven, not procurement driven

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Decommissioning: Leverage installation expertise

Planning & preparation
– always key

• Any set of marine activities
• Decommissioning no exception

Execute safely
– same as installation

• Contingency planning
• Management of field change

Contracting strategies - flexibility

• Wide execution windows

• Bundling/campaigns/multi-field

• Lump sum
  – Some scope clear/documentated
  – Operator hands off

• Unit rates
  – where required resources clear
  – durations and/or scope variability

• Time & materials
Liability **Provision:** Neptune TLP & subsea

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Abandonment: What options are there, and for what parts?

**Topsides**
- Shore scrapping – *mostly a given*
- Vent hydrocarbons
- Contain vs. remove sludges/deposits
- Creative disconnects & seafastening
- Fewest lifts, move mhrs onshore

**Wells**
- Plug & Abandon – *a given*
- Well complexity drives vessel type
- “Intervention tool” dayrates vs. capability & duration tradeoffs
What efficient P&A’s look like in deepwater

Goals

• Well design caters for abandonment
• Rigless
• Completion cemented in place
• Horizontal tree and wellhead are not removed

Challenges

• Effective barriers with control lines in place
• Perforating multiple casing strings
• Verification of barriers through multiple casing strings
• Satisfy regulatory requirements
Abandonment: What options are there, and for what parts?

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**Subsea Components - optionality**

- **Jackets/hulls**
  - Reef in place, or designated areas
  - Onshore recycle

- **Moorings/Tendons**
  - Lay down to seabed
  - Onshore recycle

- **Risers/Umbilicals**
  - Pig/flush & lay down

- **Gathering system/subsea kit**
  - Flush, abandon in situ
  - Remediate, selective removal
Abandon DW subsea tree with 6” jumper

June 2014 Abandonment – actual:
- a) Disconnect 60’ tree jumper from PLET& tree
- b) Cut jumper into 3 sections
- c) Lift jumper sections to barge
- d) Disconnect tree, lift to barge
- e) Tow 4 components to shore

Duration: 5 days, 2 vessels
- Mob/demob allocated to other campaign work

Abandonment – future options:

Option – Relocate Tree:
- a) Cut 6” tree jumper one place at (6)
- b) Relocate subsea horizontal tree to seabed

Duration: <1 day, 1 vessel (150t crane/ROV)

Option – Abandon Tree in Situ: Flush only

Flying leads to tree disconnected by P&A rig

All other static components Abandoned in Situ
(Wellhead, PLET, UTA, pipeline & umbilical segments)

Water depth 6,200 ft
(>800m/2600 ft – BSEE no users of the sea)
Neptune Tension Leg Platform – future abandonment options
Neptune Tension Leg Platform – riser (& tendon) laydown

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Neptune – cut tendons seabed (contingency vs. “reverse install” unlatch)
Neptune – “reverse install” tendons (via original buoyancy modules)
Neptune option – flood tendon, lift out porch

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Subsea drill

Spreader bar lift from buoyancy module hang off collar
Neptune Tension Leg Hull - tow to designated reef (or scrap)
“Comparative Assessment”
- How to decide, and plan?

Alternatives, by component:

- Remove it
- Relocate it
- Remediate it
- Leave in situ

Must choose
- Lesser of evils exercise
- Unlike develop, or not

Comparative Assessment techniques

- Qualitative
  - Green/yellow/red risk assessment
  - Subjective

- Quantitative
  - More inputs and effort to analyze
  - Desktop study typically enough
  - Data gathering sometimes needed
  - Transparent to stakeholders
“Quantitative” comparative assessment

Net Environmental Benefits Analysis (NEBA)

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NEBA is consistent w/ federal guidance to agencies to incorporate Ecosystem Services into decision-making

October 7, 2015

M-16-01

MEMORANDUM FOR EXECUTIVE DEPARTMENTS AND AGENCIES

FROM:  Shaun Donovan, Director
        Office of Management and Budget

        Christina Goldfuss, Managing Director
        Council on Environmental Quality

        John Holdren, Director
        Office of Science and Technology Policy

SUBJECT:  Incorporating Ecosystem Services into Federal Decision Making

Overview. Nature provides vital contributions to economic and social well-being that are often not traded in markets or fully considered in decisions. This memorandum provides direction to agencies on incorporating ecosystem services into Federal planning and decision making.

(Broadly defined, ecosystem services are the benefits that flow from nature to people, e.g., nature’s contributions to the production of food and timber, life-support processes, such as water purification and coastal protection; and life-fulfilling benefits, such as places to recreate.)
Net Environmental Benefits Analysis

NEBA

• A risk-benefit analysis applied to environmental management options
  - Understand the flow of value over time
  - Incorporates ecosystem service values (ecological & socioeconomic)

• Uses quantified values, incorporates non-monetary metrics

History of Use

• Oil Spill Response and Planning (nationally and internationally – Valdez, NOAA GOM, Australia, Arctic)

• Joe Nicolette co-authored the formalized NEBA framework recognized by the US EPA/EPA Science Advisory Board, NOAA, AMSA, others

• Expanded to alternative analyses for other actions that affect the environment
NEBA – A comparison of “Ecosystem Service” flows over time with each option
Marine mammal incentives for jackets as artificial reefs

“Image taken by animal-borne video camera on a female Australian fur seal foraging along a gas pipeline showing the sessile invertebrates and another fur seal.”

Dolphins swimming near “Dolphin” platform.
Marine mammal acoustic survey – N. Sea jackets

**Conclusions**

- Fish find new structures for shelter very quickly
  - Mammals follow the fish

- Existing platforms grow invertebrates over life
  - As they “reef”, jackets grow complete ecosystem

- Study of existing jacket seeking JIP funding
  - targeting jacket habitat
  - “value by depth”
  - support optimized cut off depth for topple in place – navigation vs. habitat
NEBA results: Risk, benefit and cost profile changes for options

There is a Break-Point
Value of NEBA within decommissioning comparative assessment

Provides a non-arbitrary, scientific, transparent and quantitative approach to compare between alternative actions

Helps stakeholders to manage site risks; maximize environmental, social and economic value; demonstrate the net benefit to the public; and manage safety and cost

Understanding “ecosystem service values” and how they change with actions is critical to differentiating between decommissioning options and in defending decisions to stakeholders
## NEBA applications to facilities decom.

### Step 1: Study Framing - Scope for Decommissioning Alternatives

### Step 2: Study Objectives - Considerations by Component

### Step 3: Compare Outcomes of Alternatives - Subsea system & Platform Jackets

### Step 4: Recommend "Holistic Least Harm" Alternative, including Remediations

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**Value Tradeoffs:**
- Lowest risk
- Enhance
- Remediate
- Retain
- Vessels
- Options
- NEBA Test

**Stakeholders:**
- Near shore
- Gather
- NEBA Test

**Regulations:**
- “Least Harm”
- Mitigate
- Value

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NEBA example: risers

Flexible Production Risers
Main Risk Driver: Safety Risk

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Decommissioning challenges => opportunities

One size does not fit all

- require case by case assessment / phased approach

Leave in place options

✅ Value opportunities
✅ Cost
✅ Habitat creation

❌ Approvals uncertainty
❌ Legacy / ongoing liability issues
Abandonment road map

Baseline
Environmental Studies & Data Gathering

Options key studies
• NEBA Study

Abandonment plan business case
• Scientifically sound

Regulatory approvals
• Robust base case for stakeholder engagement

Commence physical work
• Separate well P&A campaign
• Assess market for facilities synergies
Regulatory: Future liability assessment….but due now!

Deep water GoM pipeline portfolio – liability as assessed by BSEE
  • All installed segments (pipelines + umbilicals) x $1.6m each
  • Part of $33B total wells and facilities liability assessed by BSEE
  • Operators must provide financial coverage Mar17 onward

Future pipeline abandonment – proposed methods for assessment
  • Risers (P/L & umbilical) – pig clean, disconnect from hosts w/ Heavy Lift Vessel, abandon to seabed
  • Well jumpers – a) cut with ROV (multi service vessel), or b) leave in situ
  • Fraction of installed segments would incur abandonment activity
  • No segments removed to surface
  • Submit cancellations for future lines

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Subsea decommissioning – issues for JIP

NEBA (Net Environ. Benefits Analysis) for decommissioning
- How and why to use NEBA; demonstrate methodology
- Create a sample NEBA for shallow waters
- Generate NEBA for deep water equipment abandonment
- Pursue standardized NEBA utilization in multiple markets

Cost estimates for BSEE-mandated liability
- Use existing Decision Analysis modeling to estimate more accurate decom. costs for pipelines, risers, subsea equipment
- Compare to existing BSEE requirements, seek dialog on reasonable reductions in liability by use of proven estimating tools
- Challenge the use of mob / demob “by well;” propose “by lease”