Decommissioning Financial Planning & Analysis

Presented by

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Agenda – With some insights on

- Specific Costs in the Decommissioning Process
- Financial planning for Decommissioning Phase
- How to gain control over decommissioning costs???
- How to produce realistic cost estimates?

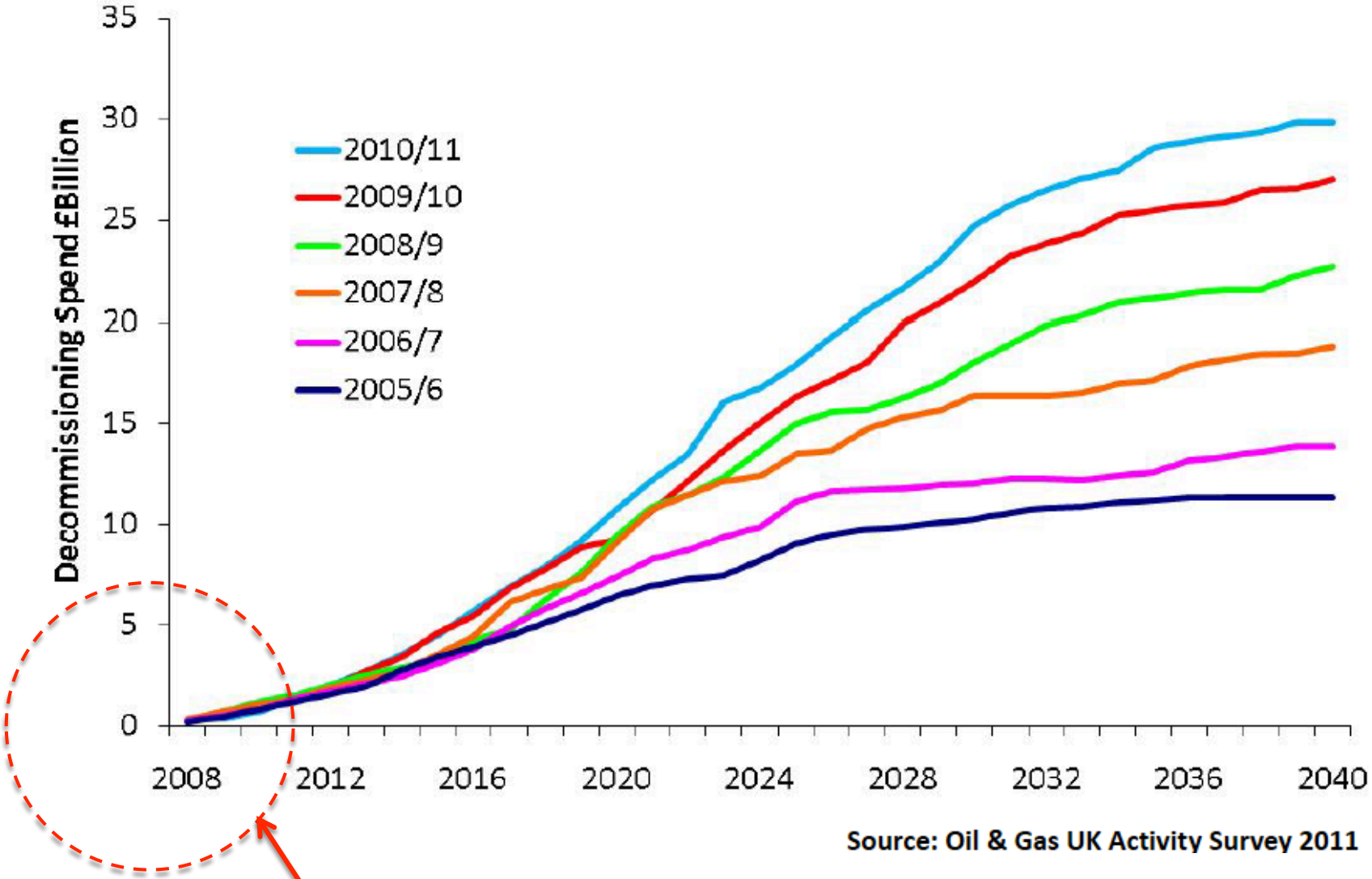
Specific Costs in Decommissioning Process

Worldwide Offshore Decommissioning Experience & Reference Data

Region	Remaining Facilities	Decommissioned	% of Total Decommissioned	Reefed/ Left on Sea Bed/Derrogation	% Reefed/ Left on Sea Bed/Derrogation	Offshore Facilities > 6000 st	Years
GOM	3450	3759	52%	398	11%	0	1942 - 2010
California (Federal Waters)	23	0	0%	0	0%	0	
North Sea (Europe)	630	78	11%	6	8%	14	1974 - 2010
Other Europe (Approx.)	100+	14	14%	4	29%	0	1986 - 2010
Asia & Australia & NZ (Approx.)	1733	99	5%	31	31%	1	1985 - 2010
Totals (Approx.)	**5936**	**3950**		**439**	**11%**	**15**	

- In GOM only "small" installations have been removed (Total Weight < 6000 st)
- **Some** GOM operators have accurate decommissioning data for platforms < 6000 st
- In California State waters 4 structures have been removed (i.e. 4-H platforms)
- GOM & California **no** decommissioning experience for larger offshore facilities or deepwater facilities.

The Size of the UK Decommissioning Market



Track Record Looks Predictable
How good was the cost estimating?

Decommissioning Cost Escalation Using Public Domain Data

Examples of the Escallation in Decommissioning Cost Estimates for Offshore Oil & Gas Installations 1996 to 2010 From Public Domain

REVERSE ENGINEERING SERVICES LTD

Project	Facilities	Weight (mt)	1996 Estimate* (Million $)	Notes	Removal Dates (Excluding Well P&A)	Removal Contract Value (Million $)	% Escallation	Cost increase for inflation @3% per year	% Escallation Corrected for Inflation
Maureen	Steel Gravity Base Platform	110,000	$60	Well P&A Excluded	1998 to 2001	$225**	375%	$64	354%
Frigg	7 platforms, 1 concrete GBS (topsides only), subsea cleanup	85,000	$328	Well P&A Excluded	2002 to 2010	$635**	194%	$387	164%
Ekofisk CAT 1 & CAT 2	9 platforms, 7 flare towers & bridges	112,000	$391	Well P&A Excluded	2005 to 2013	$1000**	256%	$496.57	201%
Ekofisk 2/4T	Topsides only	25,000 (Topsides)	$103 Total Topside only **$38m**	Includes GBS & wall	2005 to 2007 (Topsides only)	$90** (GBS Base & wall left on seabed)	237% on Topside	48.26	186% (Topside Only)
Indefatigable	6 platforms	13,000	$78 (Ex wells $48)	Includes wells	2009 to 2011	$100 excluding wells	208%	$67	150%

* **REF:** "A Technical Review of the possible Methods of Decommissioning and Disposing of Offshore oil and gas Installations", Prepared for the European Commission DG XI and DG XVII, November 1996. CO-Authored by John Brown E&C BV; Kvaerner-John Brown UK Ltd; Kvaerner Installasion a.s.; Moret Ernst & Young; Netherlands Energy Research Foundation (ECN); RF-Rogaland; Cordah Environmental Management Consultants Ltd; GOPA Consultants; Advi-Safe etc.

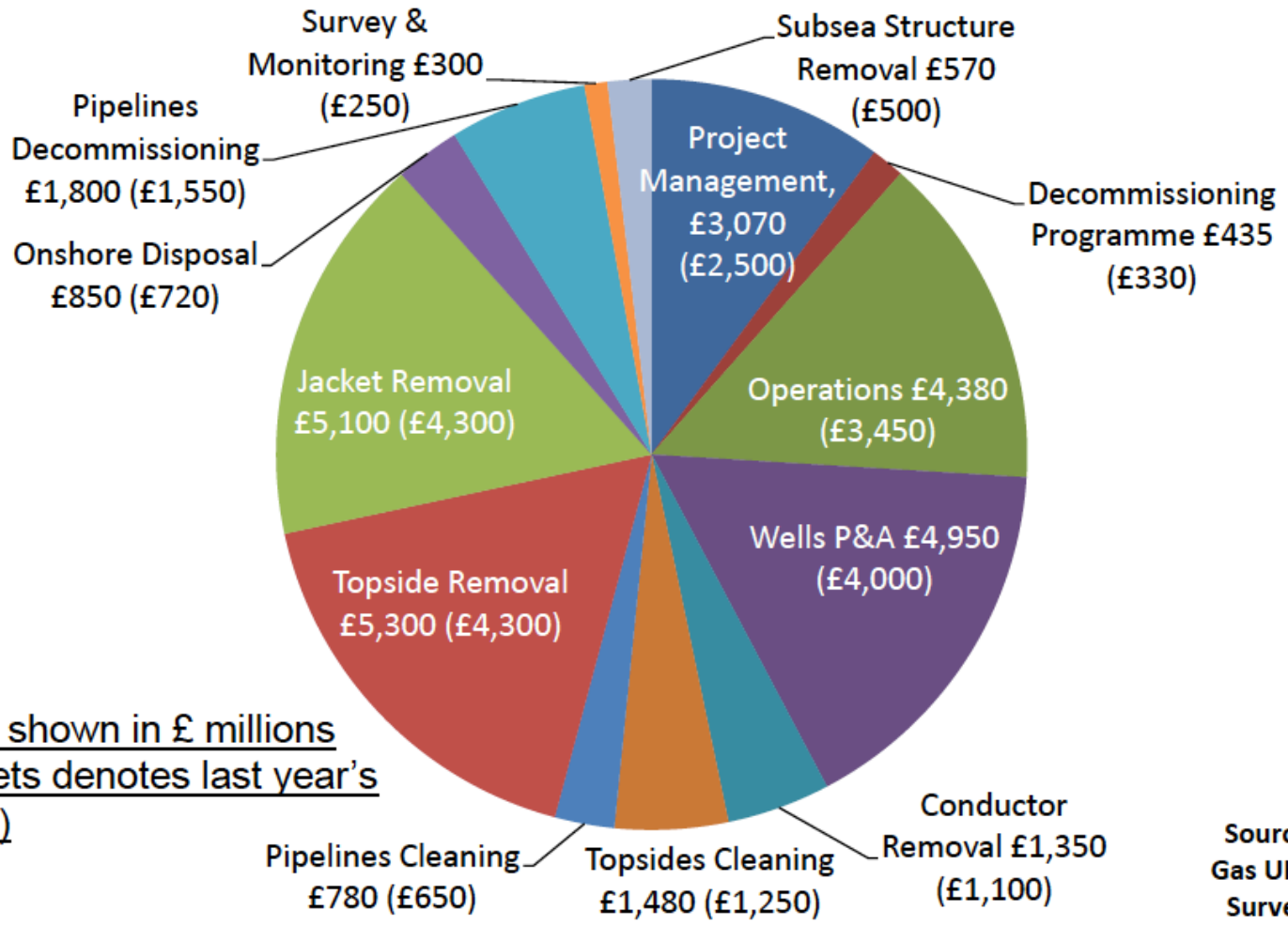
** REF: not converted to 2010 costs

But the actual Escalation is ***higher*** as in many of the above projects the contractors lost money on the work

How Good Are Out Public Domain Cost Estimate Numbers?

UK Public Domain Decommissioning Cost Breakdown

Total Estimated in 2011 is £30.4 Billion



Values shown in £ millions (brackets denotes last year's figures)

Source: Oil & Gas UK Activity Survey 2011

How Good Is This Estimate?

- What is the Accuracy/Class of estimate?
  - What international cost estimation standard was used?
  - What is the range of the estimate?
  - An AACE Class 5 range is between -50% to +100%
- Sources/ References?
- Format of Data
  - Assumptions
  - Inclusions & Exclusions
  - Contingency
  - Methods of cost estimation
  - Apples with Oranges or/and Bananas?
  - Granularity of data
  - Is there a Basis Of Estimate document

	Primary Characteristic	*Secondary Characteristic*			
ESTIMATE CLASS	**LEVEL OF PROJECT DEFINITION** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges [a]	**PREPARATION EFFORT** Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/ Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

Notes: [a] The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

[b] If the range index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

Another Recent Estimate of £19 Billion Based on ????

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5 October 2010 Last updated at 08:17

70 Share

£19bn to dismantle aged North Sea oil platforms

The cost of dismantling North Sea oil and gas platforms is forecast to reach £19bn over the next 30 years.

A new report by industry specialists said there were about 260 platforms to be decommissioned.

Consultants Deloittes and Douglas-Westwood said the work presented "big opportunities" for those in the industry.

They estimate the value of contracts to process the aged structures could be worth $1bn (£630m) a year.

There are about 260 platforms that need to be decommissioned

Related Stories

Financial Planning For Decommissioning

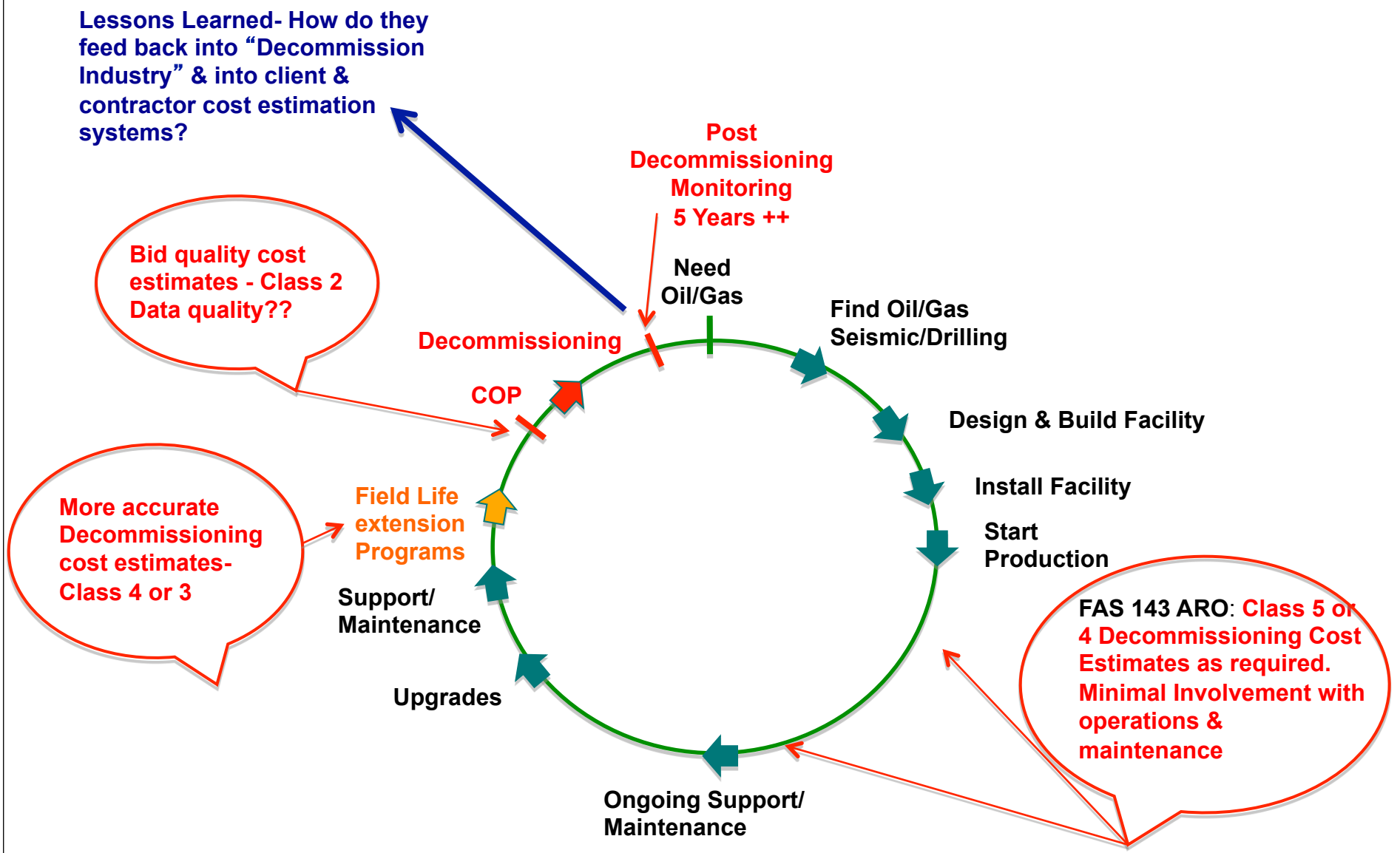
Financial Planning For Decommissioning

- Purpose of decommissioning cost estimation
- Financial Planning, Decommissioning & Life Cycle of an Oil/Gas field
- Effect of inaccurate cost estimates
- Timing of Decommissioning

Purpose Decommissioning Cost Estimation

- Part of business case to build & install facility (life cycle cost)
- During installation phase: be cognizant of potential effects of actions on decommissioning costs (i.e. do not remove lifting lugs)
- Production phase: Developing annual decommissioning cost estimates for future decommissioning provision/escrow (FAS 143 ARO)- Asset Retirement Obligations
- Assisting to determining the economic end of the production phase
- Planning decommissioning up to 5 years before decommissioning
- Negotiations with partners
- Sale to other operator
- Concept definition (Bid quality) cost estimate of the decommissioning cost
- Execution phase: Managing decommissioning process

Financial Planning, Decommissioning & Life Cycle of an Oil/Gas field



Effect Of Inaccurate Decommissioning Cost Estimates

- Quality of Decommissioning cost estimating for FAS 143 requirements and equivalents
  - More detail required to achieve estimate class
- What happens when a facility is decommissioned and there is a large discrepancy
- How do we manage the bad news gently onto our books?
- Do we want to know the real answer?
- Worldwide Issue
- Denial culture
  - No training or coaching on decommissioning
  - "Not on my watch" or "Not my business, I produce oil"
  - Life cycle culture not part of operators culture- decommissioning is the end game
  - Many offshore workers will lose there "second home"

Timing of Decommissioning

- COP decision- very difficult to balance without very accurate decommissioning cost estimate (AACE Class 4 to 3)
  - Cost estimation is critical in the decommissioning phase as often there are not sufficient funds accrued for decommissioning
  - The late-life the asset does not have the capability to fund the decommissioning hence the funds must come from somewhere making money
- Look for windows of opportunity- (Senior management awareness)
  - Sync with suppliers of major equipment (HLV,s etc.)
  - Sell to low cost producer
  - Artificial Reef (An option available in the sane part of the world)
  - Etc.

How do you Manage Decommissioning Costs?

How Do you gain control over decommissioning costs?

- Understand that decommissioning is ***not reverse construction***
- You manage the process by
  - Starting early
  - Getting experienced consultants on board early
  - In-House training- top down awareness
  - Built senior management support (critical)
- Build accurate data sets
  - The quantity & accuracy of decommissioning reference data **effects the method and accuracy** of future decommissioning cost estimation
- Operators & contractors sharing of actual decommissioning costs at in WBS format to increase granularity of future cost estimating
  - Sources held confidentially to protect contractors & operators
  - Verification Data in a meaningful format
- During installation phase: be cognizant of potential effects of actions on decommissioning costs (i.e. do not remove lifting lugs)

How Do you gain control over decommissioning costs?

- Use experienced (minimum 10 years) ***decommissioning*** cost estimators
  - Understand the difference in data granularity and data quality requirements between cost estimating for construction, brownfield & decommissioning
  - Know the decommissioning "hot-spots"
  - Know and understand the ***practical application*** of the rules, regulations and laws that effect decommissioning in your country
- Setting up Decommissioning Data capture system
  - Work Group 4 (Infrastructure) has a remit to "Develop guidelines and standards for the industry, which are cost effective and comply with legislation and capture the lessons and experience of recent activities"
  - Decommissioning Cost Estimating Guidelines 2006 and 2010 -Work Group 4
  - Intention is to capture lessons learned in the period, provide clarification and to make the Guidelines more user friendly

How to Improve Decommissioning Cost Estimation Accuracy?

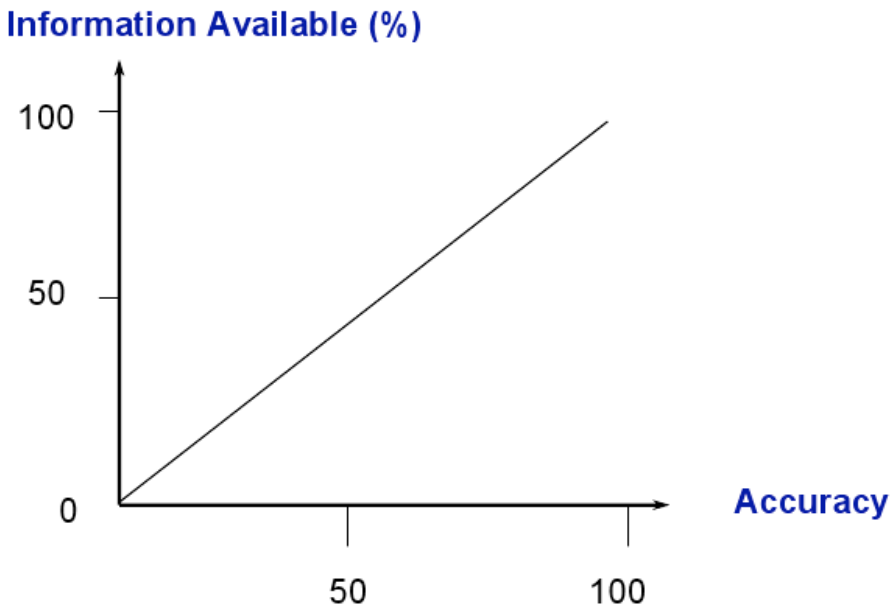
How to Improve Decommissioning Cost Estimation Accuracy

- Decommissioning should be treated as a ongoing part of the operation of an offshore field.
- During the life of an oil/gas field there should be three parallel tacks: running operations, maintenance and decommissioning
- At every CAPEX and OPEX decision gate in the life cycle of the field, the consequences of the decision on future decommissioning costs and ongoing decommissioning accrual costs should be examined and considered
- **This would minimize the impact of a short term gain which may create a major decommission cost in the long term**
- This process would also create an early and continuous awareness of decommissioning as a significant part of the offshore oil & gas business

Issues with Current Interaction between Decommissioning & Life Cycle of an Oil/Gas Field

- No linkage between operations, maintenance, life extension and decommissioning
- Not considered at every decision gate in life cycle
- No continuity in building of facility specific data & knowledge for operator or contractor
- Does not address the quality of "data risk" element in cost estimation
- Does not get the contractor involved early enough in the process
- Does not identify "Hot Spots" until to late
  - "unknown unknowns"
  - "Known Unknowns"
- Poor data results in a poor cost estimate

Relationship between Data Accuracy versus Cost Estimate Accuracy



Accurate Current Data is <u>one</u> of the Foundation Stones of a Good Cost Estimate

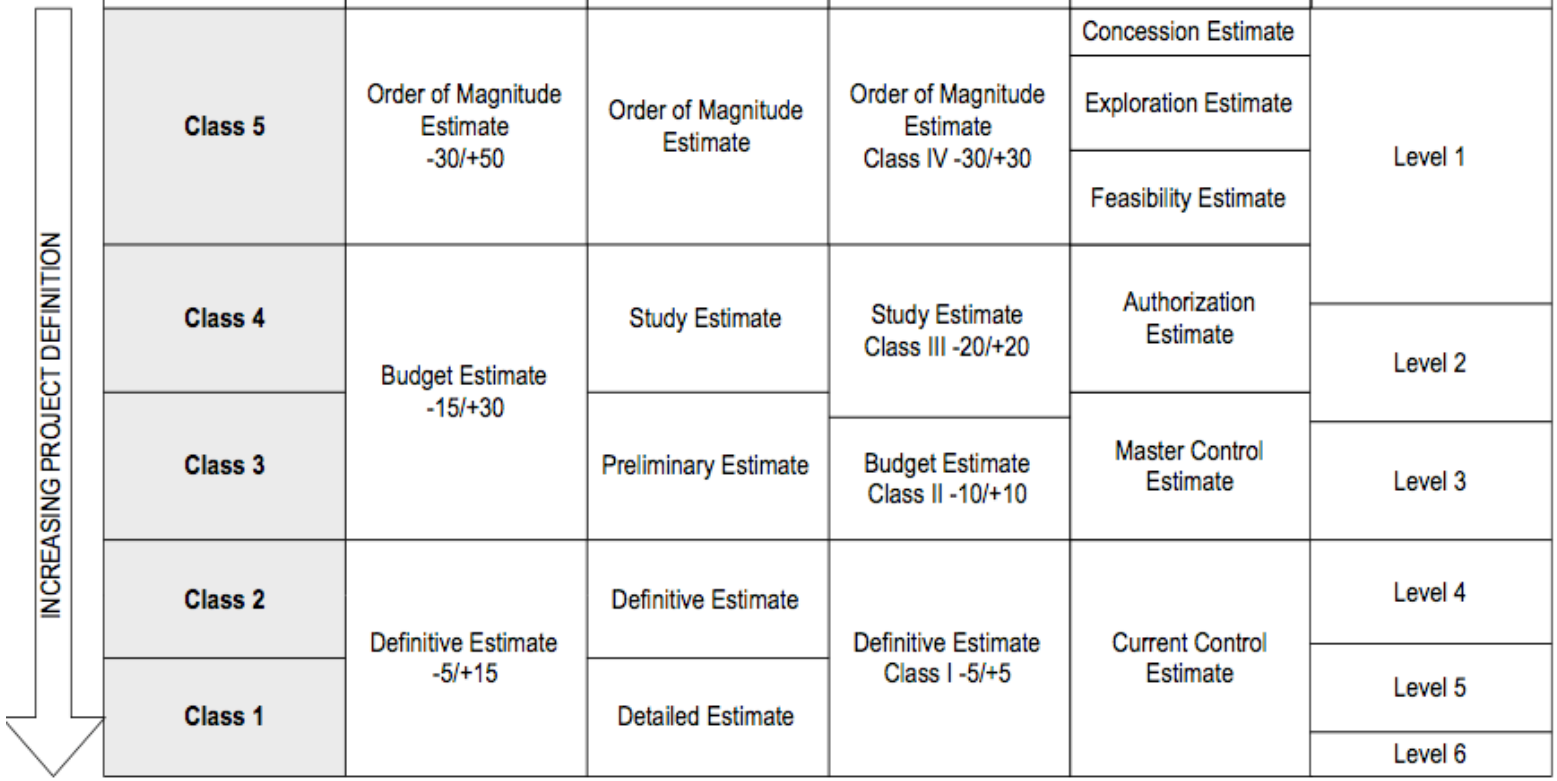
What is a Good Cost Estimate??

- A good cost estimate must be adequate for the required phase of the project
  - A clear definition of scope of work is required
  - A Basis of Estimate (BOE) of suitable definition for the project phase is prepared

- Qualities of a High Quality Cost Estimate
  - Accuracy
  - Comprehensive
  - Auditable
  - Repeatable
  - Credible
  - Upgradable

Quality of Cost Estimate
International Cost Estimation Standards Applied to Decommissioning

International Cost Estimate Standards



AACE Classification Standard	ANSI Standard Z94.0	AACE Pre-1972	Association of Cost Engineers (UK) ACostE	Norwegian Project Management Association (NFP)	American Society of Professional Estimators (ASPE)
Class 5	Order of Magnitude Estimate -30/+50	Order of Magnitude Estimate	Order of Magnitude Estimate Class IV -30/+30	Concession Estimate	Level 1
				Exploration Estimate	
				Feasibility Estimate	
Class 4	Budget Estimate -15/+30	Study Estimate	Study Estimate Class III -20/+20	Authorization Estimate	Level 2
Class 3		Preliminary Estimate	Budget Estimate Class II -10/+10	Master Control Estimate	Level 3
Class 2	Definitive Estimate -5/+15	Definitive Estimate	Definitive Estimate Class I -5/+5	Current Control Estimate	Level 4
Class 1		Detailed Estimate			Level 5
					Level 6

Accuracy Range of Cost Estimate

	Primary Characteristic	*Secondary Characteristic*			
ESTIMATE CLASS	**LEVEL OF PROJECT DEFINITION** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges [a]	**PREPARATION EFFORT** Typical degree of effort relative to least cost index of 1 [b]
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Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/ Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

Notes: [a] The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

[b] If the range index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

Class & Purpose of Cost Estimate

	Primary Characteristic	*Secondary Characteristic*			
ESTIMATE CLASS	**LEVEL OF PROJECT DEFINITION** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical +/- range relative to best index of 1 [a]	**PREPARATION EFFORT** Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Screening or Feasibility	Stochastic or Judgment	4 to 20	1
Class 4	1% to 15%	Concept Study or Feasibility	Primarily Stochastic	3 to 12	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Mixed, but Primarily Stochastic	2 to 6	3 to 10
Class 2	30% to 70%	Control or Bid/ Tender	Primarily Deterministic	1 to 3	5 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Deterministic	1	10 to 100

Notes: [a] If the range index value of "1" represents +10/-5%, then an index value of 10 represents +100/-50%.
[b] If the cost index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%.

Source: AACE International Recommended Practice No. 18R-97, "Cost estimation classification system as applied in engineering, procurement and construction for the process industries"

AACE International Standard in Used by Many Operators

INCREASING PROJECT DEFINITION

AACE Classification Standard	Major Consumer Products Company (Confidential)	Major Oil Company (Confidential)	Major Oil Company (Confidential)	Major Oil Company (Confidential)
Class 5	Class S Strategic Estimate	Class V Order of Magnitude Estimate	Class A Prospect Estimate	Class V
			Class B Evaluation Estimate	
Class 4	Class 1 Conceptual Estimate	Class IV Screening Estimate	Class C Feasibility Estimate	Class IV
			Class D Development Estimate	
Class 3	Class 2 Semi-Detailed Estimate	Class III Primary Control Estimate		Class III
			Class E Preliminary Estimate	
Class 2	Class 3 Detailed Estimate	Class II Master Control Estimate	Class F Master Control Estimate	Class II
Class 1		Class I Current Control Estimate	Current Control Estimate	Class I

Source: AACE International Recommended Practice No.18R-97, "Cost estimation classification system as applied in engineering, procurement and construction for the process industries"

AACE Encompasses Input Checklist & Maturity Index

Accuracy →

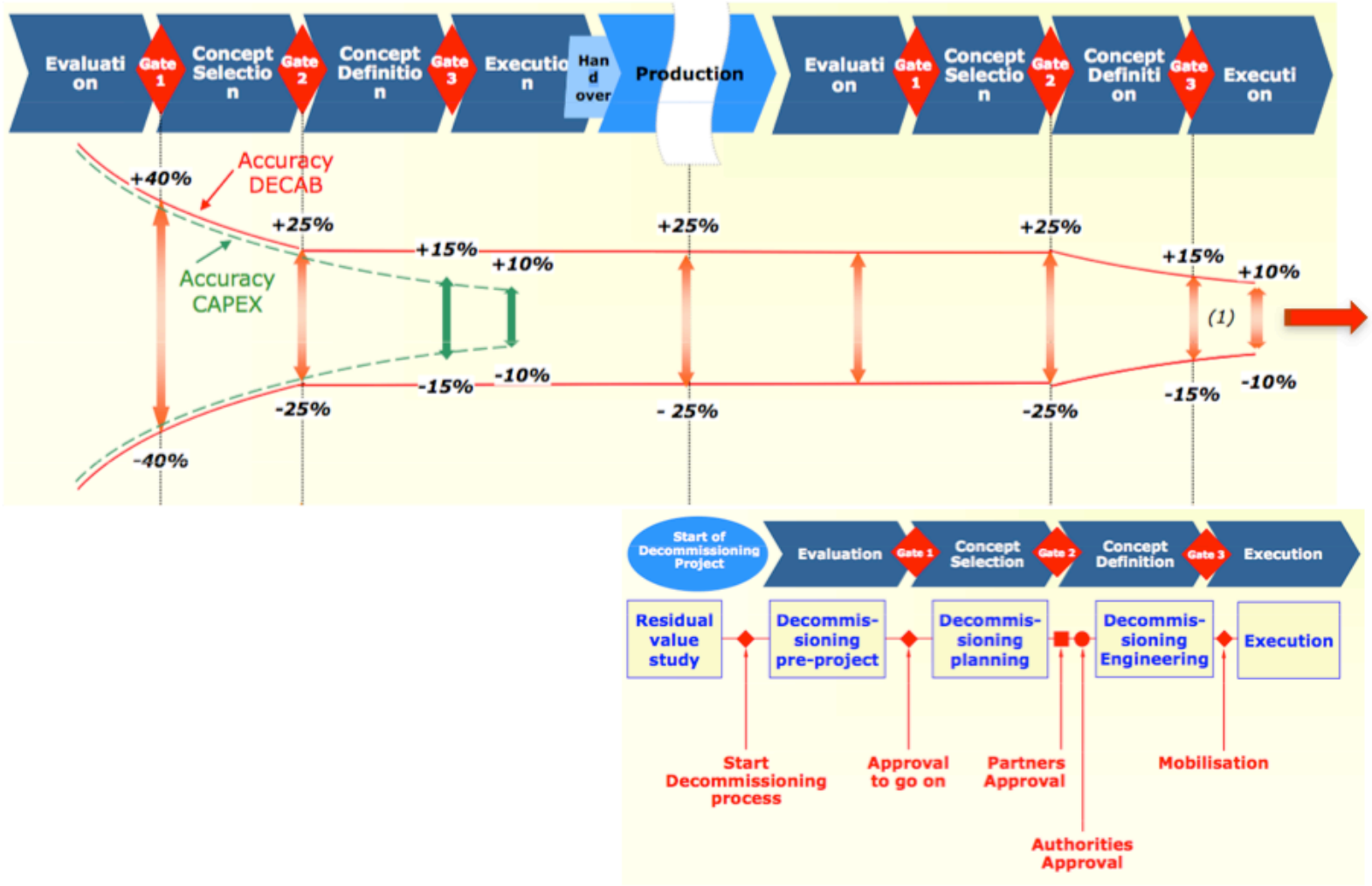
General Project Data:	ESTIMATE CLASSIFICATION				
	CLASS 5	CLASS 4	CLASS 3	CLASS 2	CLASS 1
Project Scope Description	General	Preliminary	Defined	Defined	Defined
Plant Production/Facility Capacity	Assumed	Preliminary	Defined	Defined	Defined
Plant Location	General	Approximate	Specific	Specific	Specific
Soils & Hydrology	None	Preliminary	Defined	Defined	Defined
Integrated Project Plan	None	Preliminary	Defined	Defined	Defined
Project Master Schedule	None	Preliminary	Defined	Defined	Defined
Escalation Strategy	None	Preliminary	Defined	Defined	Defined
Work Breakdown Structure	None	Preliminary	Defined	Defined	Defined
Project Code of Accounts	None	Preliminary	Defined	Defined	Defined
Contracting Strategy	Assumed	Assumed	Preliminary	Defined	Defined
Engineering Deliverables:					
Block Flow Diagrams	S/P	P/C	C	C	C
Plot Plans		S	P/C	C	C
Process Flow Diagrams (PFDs)		S/P	P/C	C	C
Utility Flow Diagrams (UFDs)		S/P	P/C	C	C
Piping & Instrument Diagrams (P&IDs)		S	P/C	C	C
Heat & Material Balances		S	P/C	C	C
Process Equipment List		S/P	P/C	C	C
Utility Equipment List		S/P	P/C	C	C
Electrical One-Line Drawings		S/P	P/C	C	C
Specifications & Datasheets		S	P/C	C	C
General Equipment Arrangement Drawings		S	P/C	C	C
Spare Parts Listings			S/P	P	C
Mechanical Discipline Drawings			S	P	P/C
Electrical Discipline Drawings			S	P	P/C
Instrumentation/Control System Discipline Drawings			S	P	P/C
Civil/Structural/Site Discipline Drawings			S	P	P/C

Effects cost!
No contract Strategy
No accurate cost estimate

- None (blank): development of the deliverable has not begun.
- Started (S): work on the deliverable has begun. Development is typically limited to sketches, rough outlines, or similar levels of early completion.
- Preliminary (P): work on the deliverable is advanced. Interim, cross-functional reviews have usually been conducted. Development may be near completion except for final reviews and approvals.
- Complete (C): the deliverable has been reviewed and approved as appropriate.

Source: AACE International Recommended Practice No.18R-97, "Cost estimation classification system as applied in engineering, procurement and construction for the process industries"

Cost Estimation Accuracy At Various Stages in Decommissioning



Source: Ing Cosumo Piccione, "Key drivers determination for offshore plants decommissioning & cost estimation", San Donato Minanese, 22-23rd Oct 2007

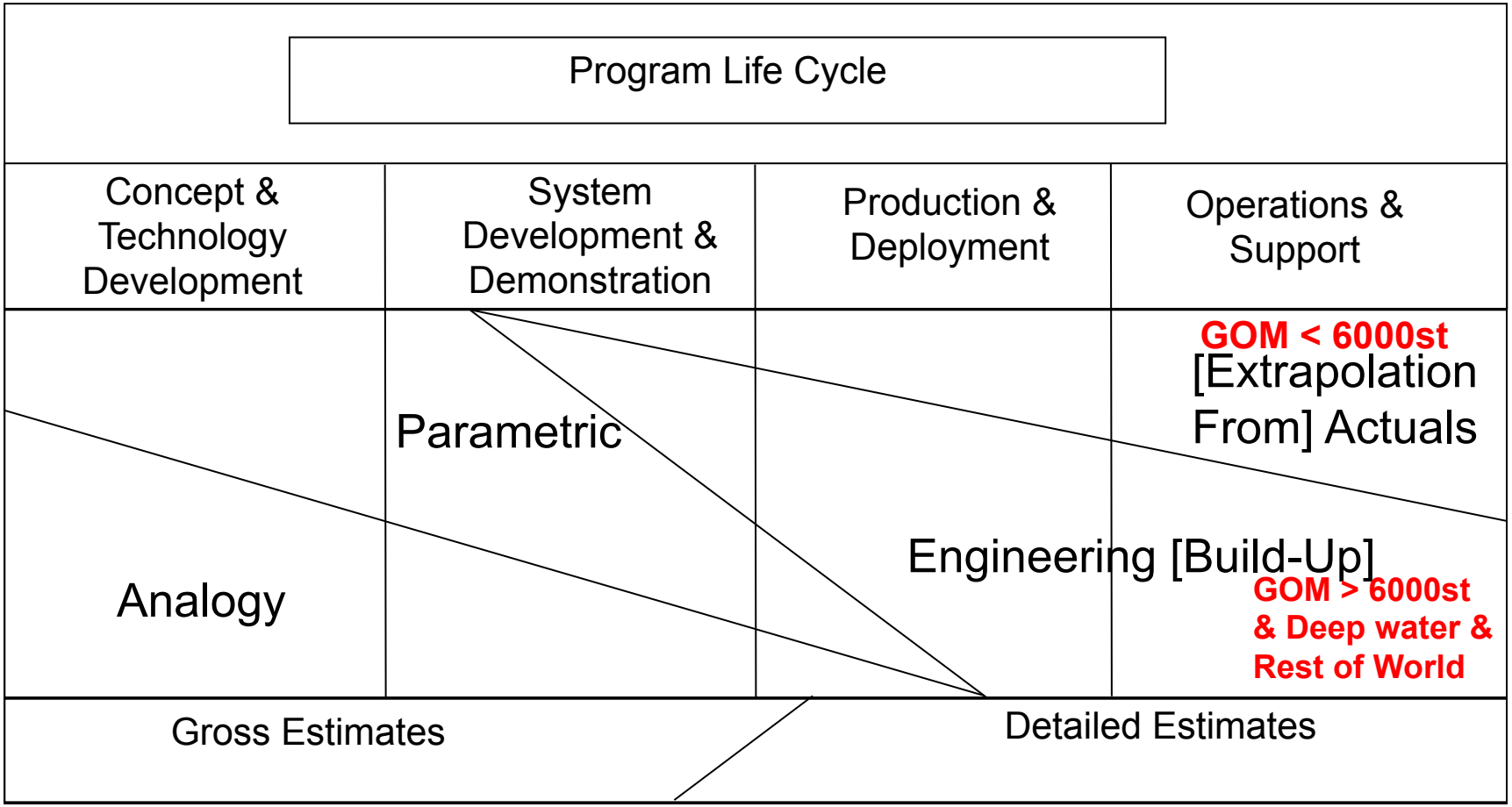
Cost Estimate Methodologies Applied to Decommissioning

Cost Estimate Methodologies

Three Most Commonly Used Cost Estimating Methods Compared			
Method	**Strength**	**Weakness**	**Application**
1. Analogy	• Requires few data • Based on actual data • Reasonably quick • Good audit trail	• Subjective adjustments • Accuracy depends on similarity of items • Difficult to assess effect of design change • Blind to cost drivers	• When few data are available • Rough-order-of-magnitude estimate • Cross-check
2. Engineering build-up	• Easily audited • Sensitive to labor rates • Tracks vendor quotes • Time honored	• Requires detailed design • Slow and laborious • Cumbersome	• Production estimating • Software development • Negotiations
3. Parametric	• Reasonably quick • Encourages discipline • Good audit trail • Objective, little bias • Cost driver visibility • Incorporates real-world effects (funding, technical, risk)	• Lacks detail • Model investment • Cultural barriers • Need to understand model's behavior	• Budgetary estimates • Design-to-cost trade studies • Cross-check • Baseline estimate • Cost goal allocations

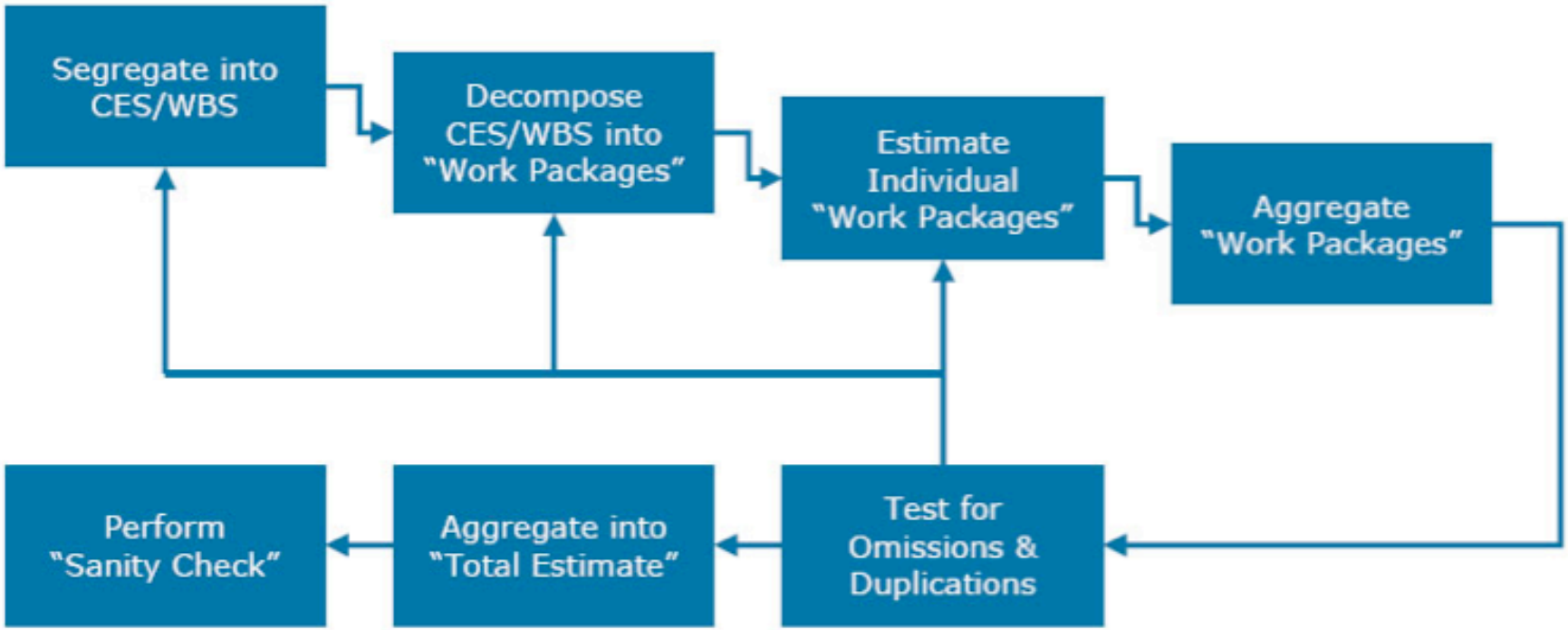
Source: Government Accountability Office, Cost Assessment Guide: Best Practices for Estimating and Managing Program Costs, GAO-07-1134SP (Washington, DC: July 2007)

Location In Life Cycle Effect Selection Cost Estimate Methodologies



REF: Chart #300R4, Defense Systems Management College (DSMC), 2001

Summary of Engineering Build-Up Cost Estimating Methodology



Source: Nasa

UKOOA WG4: Guideline on Decommissioning Cost Estimation

WBS Applied

Sheets | Charts | SmartArt Graphics | WordArt

	A	B	C	D	E	F	G	H
1	WG4 Decommissioning WBS - May 06							
2	Development - Whole Life Cost	Phase	Scope	Facility	Element		Activity Level 1	Activity Level 2
3							Every Activity applies to all Elements in the corresponding Element group delineated by a blank row	
4		Decommissioning						
5			Preparation (for CoP)					
6				Method Selection	Method Studies		Engineering	
7				Platform	Platform		Surveys	
8				Floater	Floater		CoP Plan Prepn	
9				Subsea	Subsea		Decomm Plan Prepn	
10				Pipelines	Pipelines		Commercial/Contractual Considerations	
11				Offshore Loading	Offshore Loading			
12				Wells	Platform wells			
13					Sub-sea Wells			
14								
15				PM				
16					PM		Approval	
17							Client	
18								
19			Suspension (Live)					
20				Field				
21					Field		Method Studies	
22							Field Monitoring	
23				PPOS				
24					PPOS		Onshore Support	
25							Offshore Support & Maintenance	
26				PM				
27					PM		Approval	
28							Client	
29								
30			Well Abandonment					
31				Wells			*(Final Well Decommissioning)*	
32					Platform Wells		Engineering	
33							Logistic Support	
34							Rig Upgrade	
35							Mob-Demob Rig	
36							Rig Hire	
37							LSA Scale treatment & Decontamination	
38							P&A (Rig or Rigless)	
39							Conductor Cut/Removal (Rig or Rigless)	
40							Transport to Shore	
41							Reuse/Recycle/Disposal	
42								
43								
44					Subsea Wells		as Platform Wells plus :	
45							Surveys	
46							Site Preparation	
47							Wellhead & Equipment Removal	
48							Post Removal Survey & Trawl	
49								
50			Cleaning					
51				Method Selection				
52					Method Studies		Engineering	
53				Platform				
54					Topsides		Engineering	
55					Jackets		Surveys	
56							Hazardous Waste Management	
57							Shutdown & Depressurisation	
58							Isolation	
59							Flushing & Cleaning	
60							Accommodation	
61							Support Vessels	
62								
63					GBS		As above plus -	

Contents of Basis of Estimate (BOE)

- Purpose
- Project Scope Definition
- Design Basis
- Planning Basis
- Cost Basis
- Allowances
- Assumptions
- Exclusions
- Exceptions
- Risk & Opportunities
- Contingencies
- Management Reserve
- Reconciliation
- Benchmarking
- Estimate Quality Assurance
- Attachments
  - Estimate deliverables checklist
  - Reference documents

TYPICAL DATA REVIEWED

- Platform Safety Case
- Platform Weight Data
- Equipment Lists
- Topside Plot Plans
- Deck and Jacket Construction Drawings
- Platform Installation Manuals
- Inspection Reports
- Subsea Surveys
- Radiological Inspection Reports
- Pipeline Construction, Installation and Survey Records
- Hazardous Material Inventories
- Well Construction and Completion Information
- P&IDs
- Process Descriptions
- Certification / Environmental Data
- Etc.....+++++

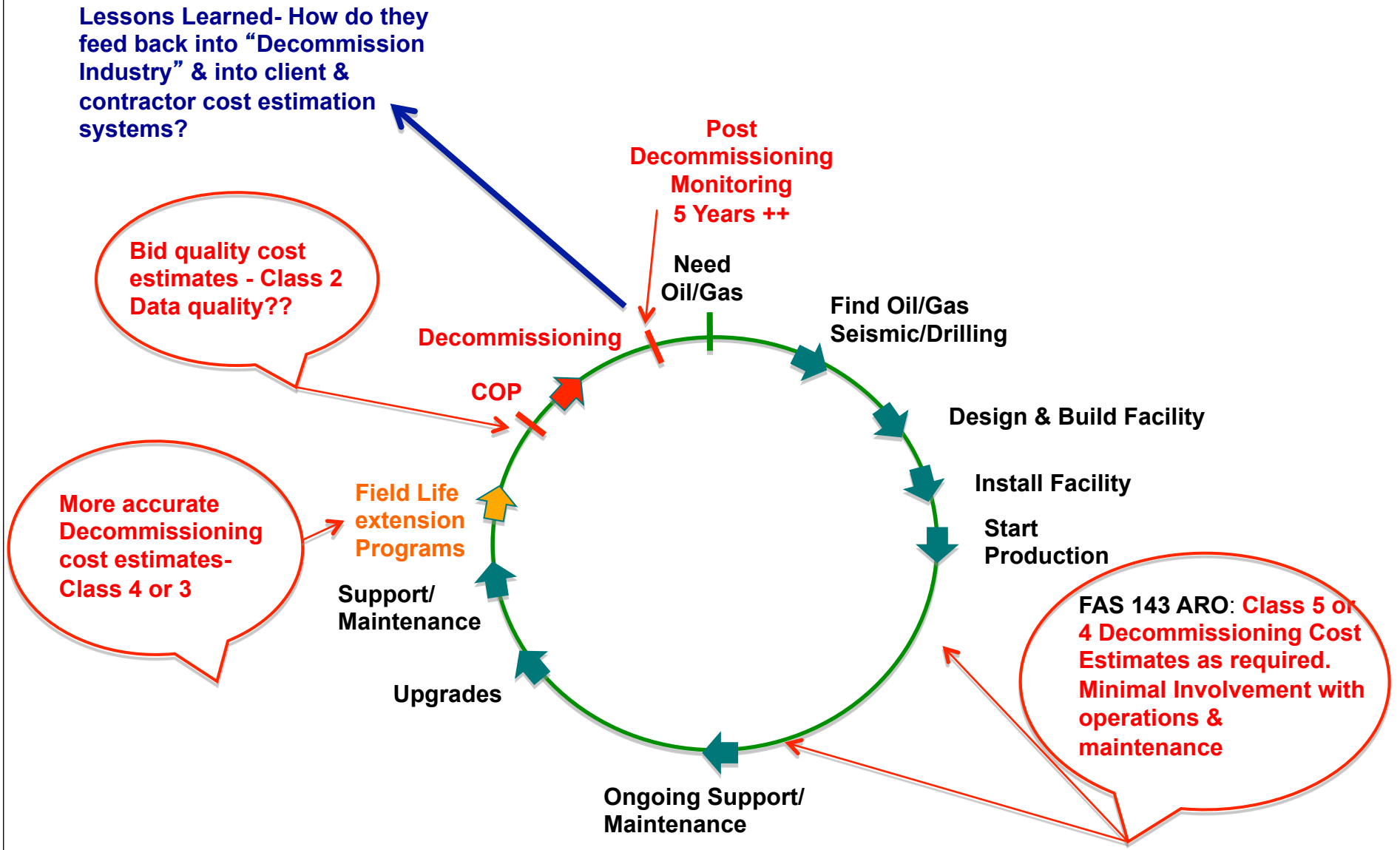
Cost Estimating Methodologies as Applied to Decommissioning

The cost estimation techniques are adequate if the most suitable methodology used for the correct phase of the life cycle of the oil/gas facility

How to Improve Decommissioning Cost Estimation Accuracy?

"***A Little knowledge is a dangerous thing***" **Alexander Pope (1688-1744)**

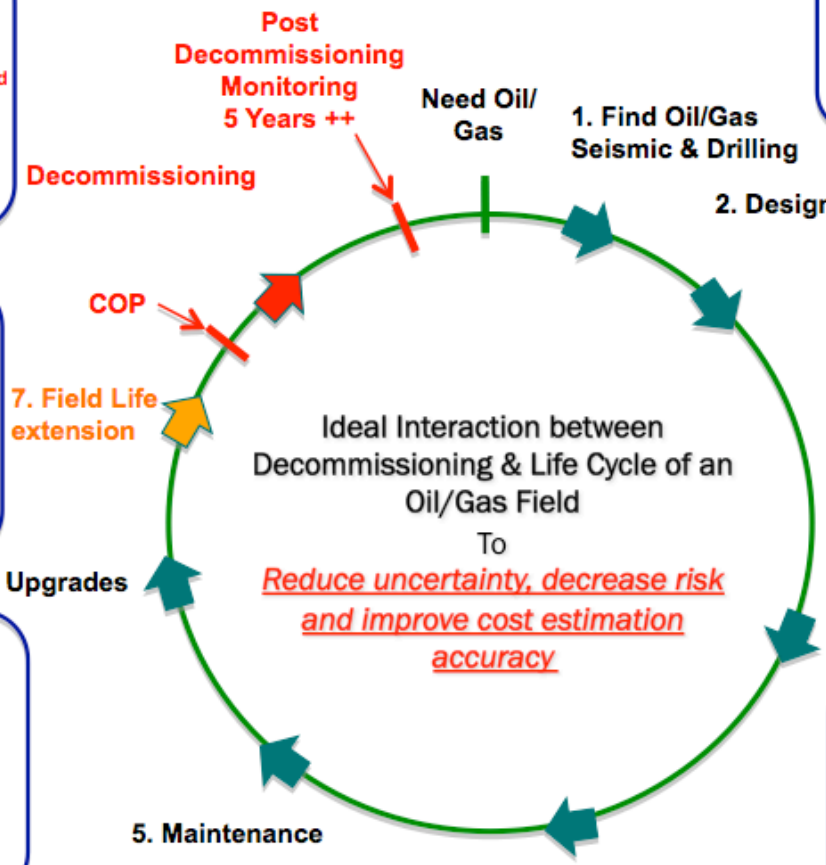
Typical Current Interaction between Decommissioning & Life Cycle of an Oil/Gas Field



How to Improve Decommissioning Cost Estimation Accuracy

- Decommissioning should be treated as a ongoing part of the operation of an offshore field.
- During the life of an oil/gas field there should be three parallel tacks: running operations, maintenance and decommissioning
- At every CAPEX and OPEX decision gate in the life cycle of the field, the consequences of the decision on future decommissioning costs and ongoing decommissioning accrual costs should be examined and considered
- **This would minimize the impact of a short term gain which may create a major decommission cost in the long term**
- This process would also create an early and continuous awareness of decommissioning as a significant part of the offshore oil & gas business

Ideal Interaction between Decommissioning & Life Cycle of an Oil/Gas Field to Improve Cost Estimation Accuracy



1. Design & drill wells with full consideration of future decommissioning, disposal & minimization of operating pollution, as stated in ISO 14040 "Life Cycle Management"
- Insure accurate "well files"

(Industry does a reasonable to good job as this is the "cash cow")
- Detailed as-built well records
- Design Details of each well

Design for removal is an IMO Jan 98 legal requirement

2. Facilities designed with full consideration of future decommissioning, disposal & operating pollution, as stated in ISO 14040 "Life Cycle Management"

- Lifting Lugs/pad-eyes to be usable in 30 years
- Built-in jacket cutting devices (Cold War bridges)
- Design documents to contain mandatory Decom section
- Material content marked on every item to assist disposal
- Reusable topside module shells
- Build in reinforced locations in modules for weighing
- Access panels in modules to ease removal of equipment
- Design conductors & risers to be removed with the jacket
- Gather full photographic & video records
- Data capture & storage system to have Decom front-end

...many more decommissioning friendly features possible

3. Facilities installed with full consideration of future decommissioning, disposal & operating pollution.

- Lifting Lugs/pad-eyes to be protected in situ
- Detailed as-built documentation prepared
- Detailed records of solids, liquids & gases on board
- Prepare an as-built weight report
- Keep seabed free of all debris
- Record of drill cutting pile location & contents

4. Production started with full consideration of future decommissioning, disposal & operating pollution

- Detailed damage records maintained
- Detailed modification records maintained
- Regular audit of records required for decommissioning
- Weight report annually reviewed & undated
- Records of solids, liquids & gases annual update
- Decommissioning Cost Estimates as required

5. Maintenance carried out with full consideration of future decommissioning, disposal & operating pollution

- Balancing, operations, maintenance & decommissioning
- Detailed damage records maintained
- Detailed modification records maintained
- Regular audit of records required for decommissioning
- Weight report annually reviewed & undated
- Records of solids, liquids & gases annual update
- Decommissioning Cost Estimates as required

6. Upgrades completed with full consideration of future decommissioning, disposal & operating pollution

- Class 3 Decom Cost Estimate required at least 5 years before earliest predicted COP date
- Upgrade design effects on future decom
- What can be removed during upgrade
- Detailed modification records maintained
- Weight report revised & undated
- Update records of solids, liquids & gases
- Carry out decommissioning data status audit

7. Field Life extension planned with full consideration of future decommissioning, disposal & operating pollution.

- Class 3 Decom Cost Estimate required pre & post work
- Effect of field extension on decommissioning
- What can be removed during modification
- Detailed modification records maintained
- Weight report revised & undated
- Update records of solids, liquids & gases
- Carry out decommissioning data status audit

8. Decommissioning planned with full consideration of future decommissioning, disposal & operating pollution.

- Class 2 Decom Cost Estimate required pre bid
- Accurate current data packs available for bidders as a result of this life cycle with decommissioning methodology
- Accurate current records of solids, liquids & gases as a result of this life cycle with decommissioning methodology etc

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Decommissioning Goals using Life Cycle Approach

Know your facility with "Trained Decommissioning Eyes"

This will enable you to

- Minimize "unknown unknowns"
- Manage the "Known unknowns"
- Improve Data sets for future bid packages and hence minimize contingency from bidders
- Minimize end of life "surprises" for operators, governmental bodies, the public and shareholders
- Enable more open discussion & Transparency between operators, governmental bodies, the public and shareholder

This will lead to improved accuracy of cost estimates

Linkage of Financial Analysis During Life Cycle of an Oil/Gas Field

- Part of business case to build & install facility (life cycle cost)
- During design phase to optimize the facility to reduce decommissioning cost
- During installation phase: be cognizant of potential effects of actions on decommissioning costs (i.e. do not remove lifting lugs)
- Production phase: Developing annual decommissioning cost estimates for future decommissioning provision/escrow
- Assisting to determining the economic end of the production phase
- Planning decommissioning up to 5 years before decommissioning
- Negotiations with partners
- Sale to other operator
- Concept definition (Bid quality) cost estimate of the decommissioning cost
- Execution phase: Managing decommissioning process

But Remember

"A good decision is based on knowledge and not on numbers".

Plato (427 BC – 347 BC)

Thank you for your attention

Any Questions ?

Component's of a Cost Estimation Process