Amec Foster Wheeler
Connected excellence in all we do

Bob Churchill
Learning and Experience from the UK’s Civil Nuclear Industry
UK Civil Nuclear Late Life Operation and Decommissioning

Amec Foster Wheeler

- Time Line
- Strategic Approach
- Lifetime Plans
- Programme Management
- Re-purposing Organisations
UK Civil Nuclear Late Life Operation and Decommissioning

First – a challenge to your view of who Amec Foster Wheeler is…..
Amec Foster Wheeler

Markets
- Oil & Gas
- Clean Energy
- Environment & Infrastructure
- Mining

Offerings
- Consultancy
- Engineering
- Programme & Project management
- Project delivery
- Ongoing asset support
- Specialised power equipment
Revenues by business unit

- Americas: 47%
- Northern Europe & CIS: 28%
- Africa, Middle East, Asia & Southern Europe: 17%
- Global Power Group: 8%

Revenues by market

- Oil & Gas: 54%
- Clean Energy / Power: 28%
- Environment & Infrastructure: 10%
- Mining: 8%

Figures based on 2014 proforma
Upstream Oil & Gas – Full Lifecycle Offering

<table>
<thead>
<tr>
<th>Consulting &amp; Front End</th>
<th>Design &amp; Construct</th>
<th>Hook-Up &amp; Commission</th>
<th>Operate</th>
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<td>Front End Consultancy</td>
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# O&G Late Life & Decommissioning Experience

Experience across the late life / decommissioning life cycle from early FEED studies and environmental comparative reporting, through to structure removal and seabed study work post removal.

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<tr>
<th>Project</th>
<th>Description</th>
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<td>Shell Inde</td>
<td>Decommissioning of the J, K, L, M, N Platforms</td>
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<td>Shell Brent</td>
<td>Decommissioning, Lift and Structural assessment</td>
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<td>Hamilton Brothers</td>
<td>Esmond/Forbes/Gordon Management of platform removal</td>
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<td>Shell North Sea</td>
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<td>BG Queensland Curtis LNG</td>
<td>Ecology and cultural heritage Services &amp; biodiversity offsets</td>
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<td>Supervision &amp; engineering support Platform removal workscope</td>
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<td>Mobil Camelot CB</td>
<td>Cost and technical feasibility studies</td>
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<td>Shell/BP Marine Shuttle</td>
<td>Feasibility study</td>
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<td>ExxonMobil Sable Island</td>
<td>Pre-FEED decommissioning of 7 offshore platforms and pipelines</td>
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<td>Estimate - Topsides decomm, Jacket, Wells &amp; Pipelines</td>
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<td>D&amp;E for removal of Albuskjell 2/4F topsides</td>
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<td>Shell Tunisia</td>
<td>Metouia GMBH Environmental, Social, Health Impact Assessment</td>
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<td>Frigg Field FEED for removal of 6 offshore installations</td>
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<td>Shell Brent BCD Module Removal</td>
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Amec Foster Wheeler has been a partner to the UK Nuclear Industry for 60 years.
UK Civil Nuclear Late Life Operation and Decommissioning

Nuclear Decommissioning Authority (NDA) Sites:
• Sellafield
• Magnox Power Stations
• Research and Development Sites
UK Civil Nuclear Late Life Operation and Decommissioning

EDF Sites (Advanced Gas Cooled Reactors)
Amec Foster Wheeler has been a partner to the UK Nuclear Industry for 60 years.
Time Line

1990’s through to 2000
• British Nuclear Fuels Ltd (BNFL)
• United Kingdom Atomic Energy Authority (UKAEA)
• British Energy (BE)
• Great uncertainty over legacy and decommissioning costs
• Revenue uncertainty – when will stations stop generating, when will fuel reprocessing revenue cease?

2004
• Nuclear Decommissioning Authority (NDA) created
• Liability uncertainty
• Revenue uncertainty
• UK wide strategy needed
Time Line

2005 - 2015
• £25bn spent on operations and decommissioning
• £12bn revenue (excluding AGR’s)
• Liabilities much better understood and defined
• Much greater clarity over future liabilities and cost – although still some challenging areas at Sellafield
Strategy

- UK wide strategy has been developed, consulted on and updated
- Reviewed every 5 years (a legal requirement under the Energy Act 2004)
  - 2006
  - 2011
  - 2016
- Current Strategy is ‘complete’ and widely accepted by multiple Stakeholders
- Consultation process is time-consuming but essential to gain wide support for the Strategy
Strategy

Site Decommissioning and Remediation
• Decommissioning, Land Quality Management, Site Interim and End States, Land Use.

Spent Fuels
• Spent Magnox Fuel, Spent Oxide Fuel, Spent Exotic Fuel.

Nuclear Materials
• Plutonium, Uranics.

Integrated Waste Management

Critical Enablers
Strategy for UK Civil Nuclear Late Life and Decommissioning is proving to be effective in Quantifying and Scoping, Simplifying, Coordinating and Engaging

Worked with UK Government, NDA and Industry over 15 years to develop Strategy

Ready to bring learning to support the North Sea LL&D
Life Time Plans - Objectives

• Create a clear understanding and acceptance of the mission

• Political, financial and stakeholder support is sustained over a (very) long period of time

• Assembles and shares learning and focus it on specific requirements

• Enables and secures long term funding

• Workforces are re-focussed onto new missions – from operations to decommissioning

• Enabler to Re-purposing each organisation
Life Time Plans

• The Lifetime Plan is a **Credible, Underpinned** and **Deliverable** plan for a single site or a series of sites with common characteristics.

• Assembles all available knowledge, understanding and wisdom and presents it in an integrated and inter-related manner.

• Address the entirety of the requirements.

• Demands collaborative thinking, and enables innovation and simplicity to emerge.
Life Time Plans

LTP provides the basis for:

- higher levels of certainty regarding the **funding** requirements over the short, medium and long term

- definition of Supply Chain development activities – “**make versus buy**” decisions

- **research and development** planning

- managed **acceleration** (or slow down) of the programme (taking account of unknown factors)

- enable **business cases** for scopes
Life Time Plans

- **visibility of the resources** (financial and skills) required to achieve the outcomes
- creates a shared basis for the **Interim and Final End States**, aligning activities to deliver these outcomes
- drives effective application of logistical and supply chain work-streams
- enables **measurement and reporting** at all levels, from the daily tasks performed through to Government reporting
- re-skill / up-skill the workforce to create new missions and **equip the workforce** to excel in the new mission - re-purposing the organisation
Life Time Plans

2. People (values, leadership, skills, training and development)
3. Organisation and Operating Model
4. Culture change plan
5. Innovation plan
6. Technical and Engineering (which technologies – when and where?)
7. Research and Development, Technology Transfer and Laboratory Work
8. Socio-Economics
9. Supply Chain Strategy
10. Portfolio/Programme/Project Management
11. Governance
12. Stakeholder Engagement and Public Relations
13. Spent Fuel and Nuclear Materials Management
14. Asset Management
15. Integrated Waste Management
16. Interim and Final End States
17. Common Support Functions and Services
18. Specific Projects defined (including options and alternatives), for example:
   - Radioactive contaminated structures
   - Fuel dissolution plant
   - Reactor dismantling
   - Fuel storage ponds decontamination
   - Retrieval processing and packaging of historic Intermediate Level Waste
   - Management and treatment of active effluent
   - Head end operations upgrade and decommissioning
19. Scheduling Methodology
20. Estimating Methodology
21. Overall Schedule
22. Overall Cost Estimate
23. Resourcing Profiles
24. Contracting Strategy
25. Supply Chain Strategy
26. Measurement and Reporting Systems
Learning – LTP’s

Life Time Planning implemented in the UK’s Civil Nuclear LL&D Programme is creating value for the UK taxpayer

Leading in development of LTP’s for single and multiple sites across the UK. Experience now increasing sought Internationally

Bringing learning to support the North Sea LL&D
Programme Management

Definition:

The ultimate goal of a Programme is to realise outcomes and benefits of strategic relevance

"create, direct and oversee a set of related projects and activities to deliver outcome(s) and benefits related to the organisations strategic objectives"
Programme Management

Programme Management provides an effective way to align three critical organisational elements:

- Corporate strategy
- Delivery mechanisms for change
- Business-as-usual environment

Every Programme is different and requires emphasis on different elements.

Key learning is from:
- Parent Body Organisation – Sellafield Ltd and Magnox Ltd
- London 2012 Olympics
- Cross Rail
Outcomes

Activities which integrate and sustain successful delivery of Projects

From Strategic Objective to Outcome

Programme Management

Programme Management

Outputs

Project Management

Construction Management

Outputs

Project Management

Construction Management

Outputs

Project Management

Construction Management

Outputs

Project Management

Construction Management

Outputs

Project Management

Construction Management

Outputs
Delivering North Sea LL & D through a Programme Management approach is key.

Apply Programme Management, adopting an integrated and value adding approach to Late Life Operation, and seamless transition into Decommissioning Delivery.

Bringing learning to support the North Sea LL&D.
Culture and behaviour change are the greatest challenge in the nuclear industry.
Progress is being made, but there is no quick fix.
Site personnel are focused on plant operations – with little decommissioning knowledge or experience.
Steep learning curve, significant challenges and costs during the transition from operations to decommissioning status.
Change has to be accomplished while maintaining an engaged workforce.
An emotional period for all.
Management’s challenge is to keep site personnel focused on safe operations and work practices while performing day-to-day activities.
In the UK Civil Nuclear industry, a step change in Leadership and Management capability was created through the introduction of Parent Body Organisations (PBO’s):

- Business Optimisation and Re-purposing
- Innovation & Simplicity
- Market Development
- Value for Money

**Achievements**

- Sellafield circa £100m year on year efficiency savings for 6 consecutive years
- Magnox Sites circa 40% cost reduction (forecast)
- Research Sites circa 25 years reduction in programme
How we see the Offshore LL&D market evolving.....

Early engagement with the supply chain:
• Proactively developing solutions – not just responding to the problems
• Ingraining best practice from other Industries, Programmes and Projects

Strong link between Late Life Management & Decommissioning
• Integrated Life Time Plans - facilitating strong contract management
• Optimum solutions which stays the course
• Different mind-set (not a Greenfield project) and moving from Operation to Decommissioning
• Proactive approach creates and protects value
How we see the Offshore LL&D market evolving.....

Genuine collaboration to drive innovation

• Aligned though a Commercial Model which drives behaviours, simplification and collaboration

• Amec Foster Wheeler is already shaping the new horizon together.
• We are uniquely placed to bring the widest experience, to address the next steps boldly, and at pace.