Lessons learned from oil and gas field decommissioning

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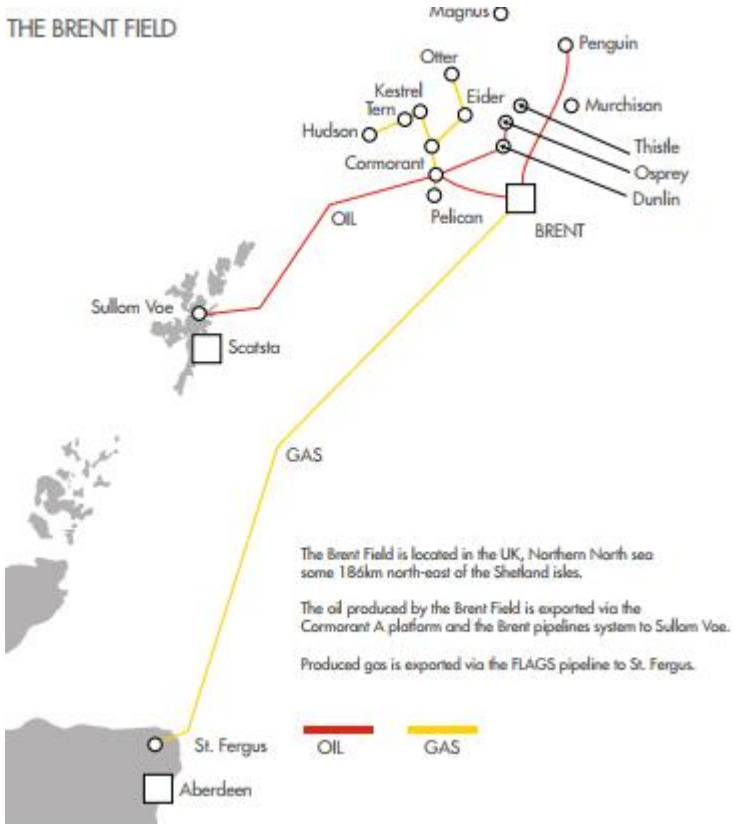
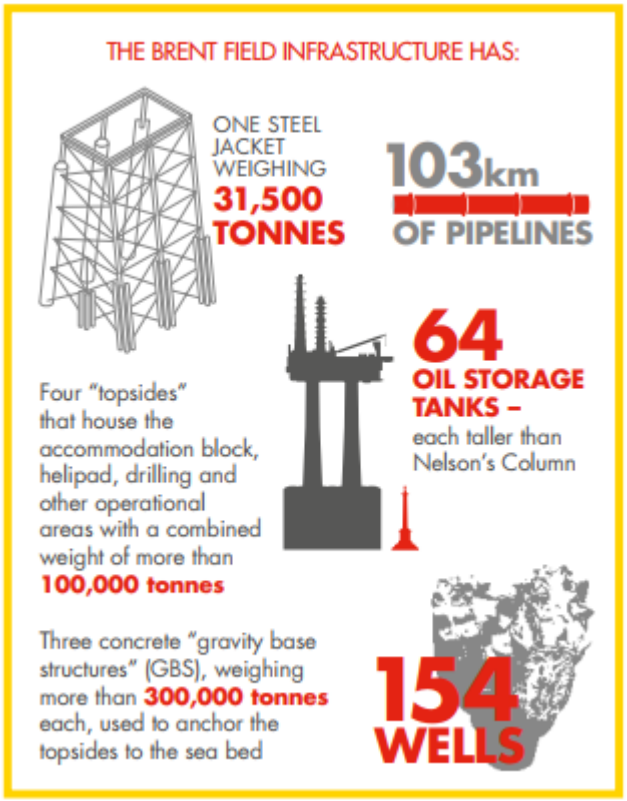
DECOMMISSIONING
THE BRENT FIELD
The Brent oil and gas field lies off the north-east coast of Scotland, midway between the Shetland Islands and Norway. It is one of the largest fields in the North Sea and has four large platforms called **Alpha, Bravo, Charlie and Delta.**
BRENT DECOMMISSIONING 1

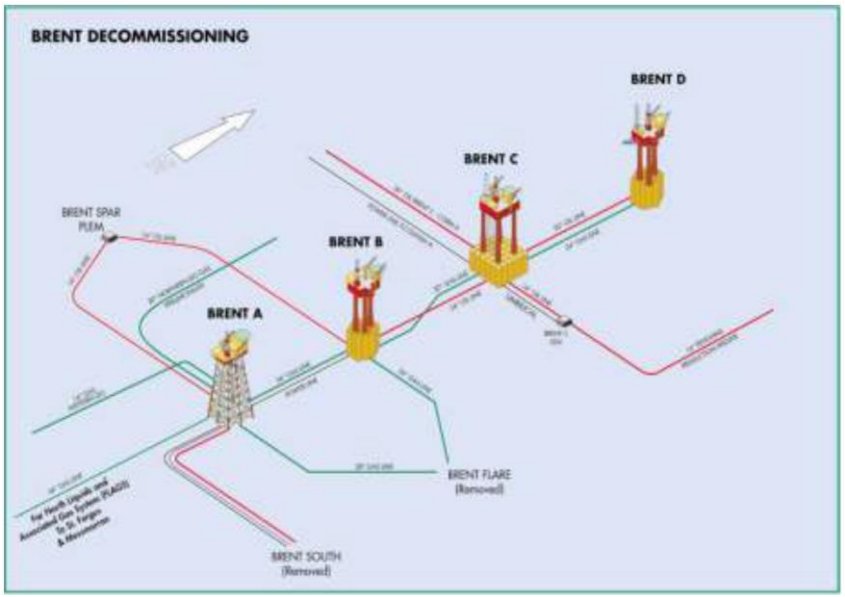
Overview of Brent

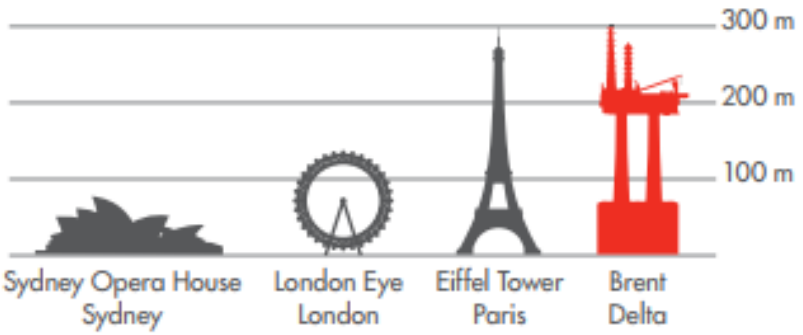
- Brent was discovered in 1971
- First production in 1976
- Peak production achieved in 1982 when it supplied enough energy to meet the annual energy needs of half of UK homes
- It has contributed £20 billion in tax to the UK government
- Decommissioning project began in 2006



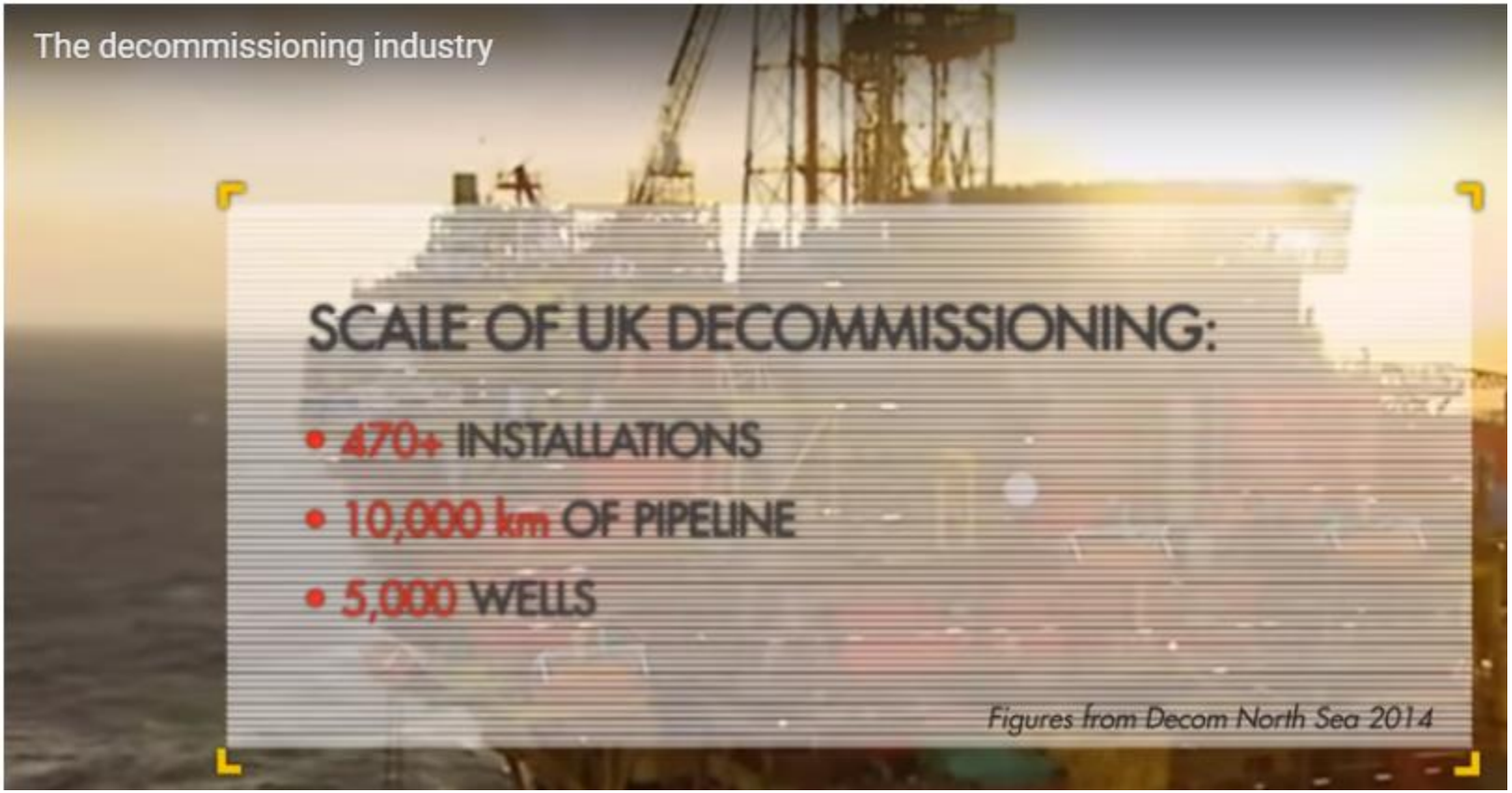
Size of the task (Brent)







Size of the task (UK)



Key challenges

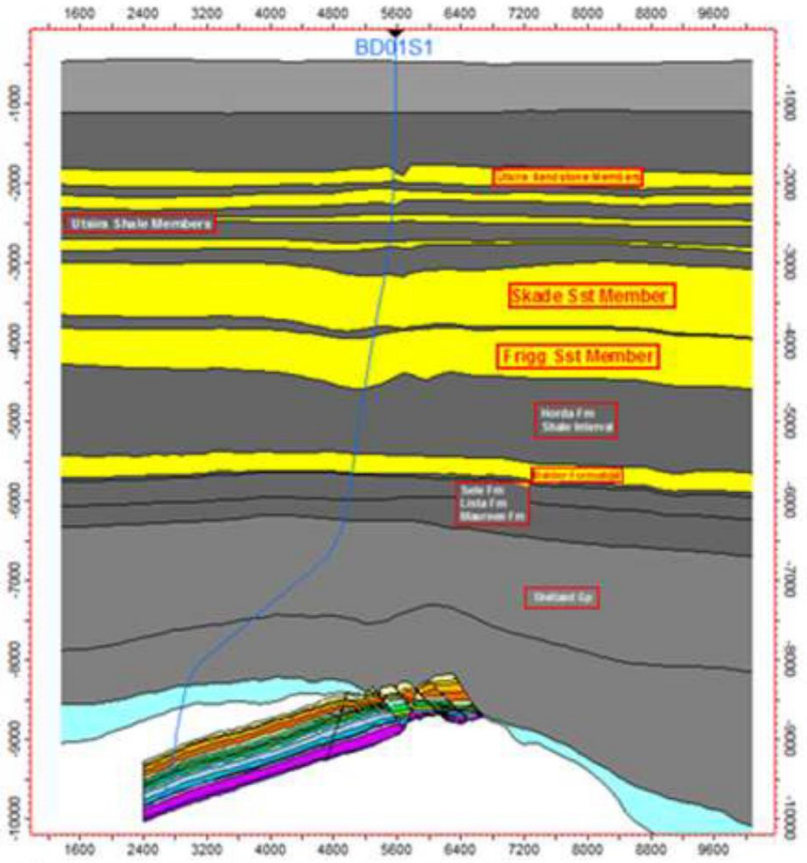
- The North Sea is a very harsh environment
- Water is deep (140 m)
- 154 wells to plug and abandon
  - Standard practise but expensive
- Gravity based concrete structures have 64 storage tanks
  - Contents of the tanks were unknown and possibly very toxic
  - Difficult to obtain samples as structures need to remain buoyant, they're in deep water and the concrete is 1 m thick
  - Disagreements between stakeholders regarding what to leave in place and what to remove (i.e. remove the whole structure, cut legs above or below sea level)

Key challenges

- Cuttings were often dumped over the side of the platforms
  - Should they be removed?
  - Could it cause more environmental damage than good?
  - What to do with the cuttings if removed?
  - No baseline survey so difficult to assess success
- Topsides are massively heavy (average 25,000 tonnes)
  - Requires the heaviest lifting operation ever performed at sea
- 103 km pipeline that has been buried in trenches
  - Should they be removed?
  - Could it cause more environmental damage than good?

Waste re-injection

- Injection waste from storage tanks into the subsurface was an obvious solution
- Costs greatly increased because:-
  - No longer possible to drill into the reservoir
  - Overburden not sampled or characterized



Shell Decommissioning Process

- Established project team
- Conducted a massive number of technical studies
- Established an independent review committee
- Established large stakeholder group
  - 400 individuals and 180 organizations
- Developed decommissioning plan
- Submit decommissioning plan to government for approval

Criteria used in decisions

- All decisions based on 5 criteria

Lessons learned

- **Think ahead**
- Design the infrastructure with decommissioning in mind
  - Since 1999 this has been a legal requirement
- Assess other potential uses at a very early stage (e.g. CO_2 storage)
- Continually assess the decommissioning process through the life time of the project
  - New concepts/information may impact initial plans
- Start technical studies very early

Lessons learned

- Make necessary measurements when measurements are possible
  - Conduct baseline environmental surveys
  - Characterize and sample overburden while appraising and developing the field
- Predrill wells if they're needed as part of the decommissioning process (e.g. for waste disposal)
- Early stakeholder engagement
- **Don't underestimate costs (multiply initial estimates by 3-5?)**

Any Questions?