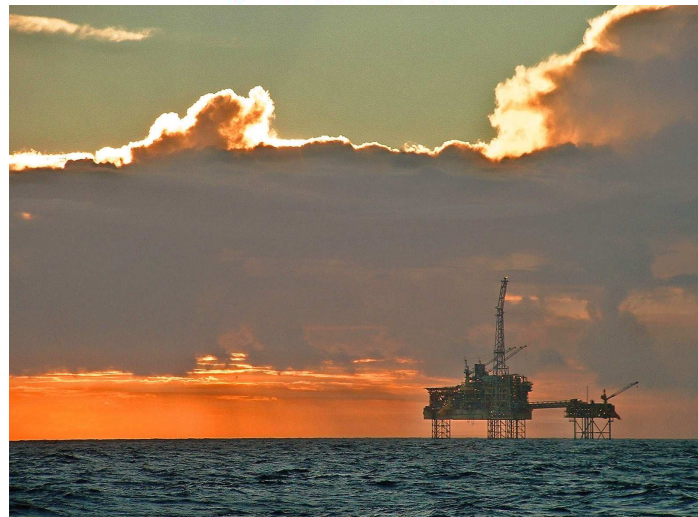




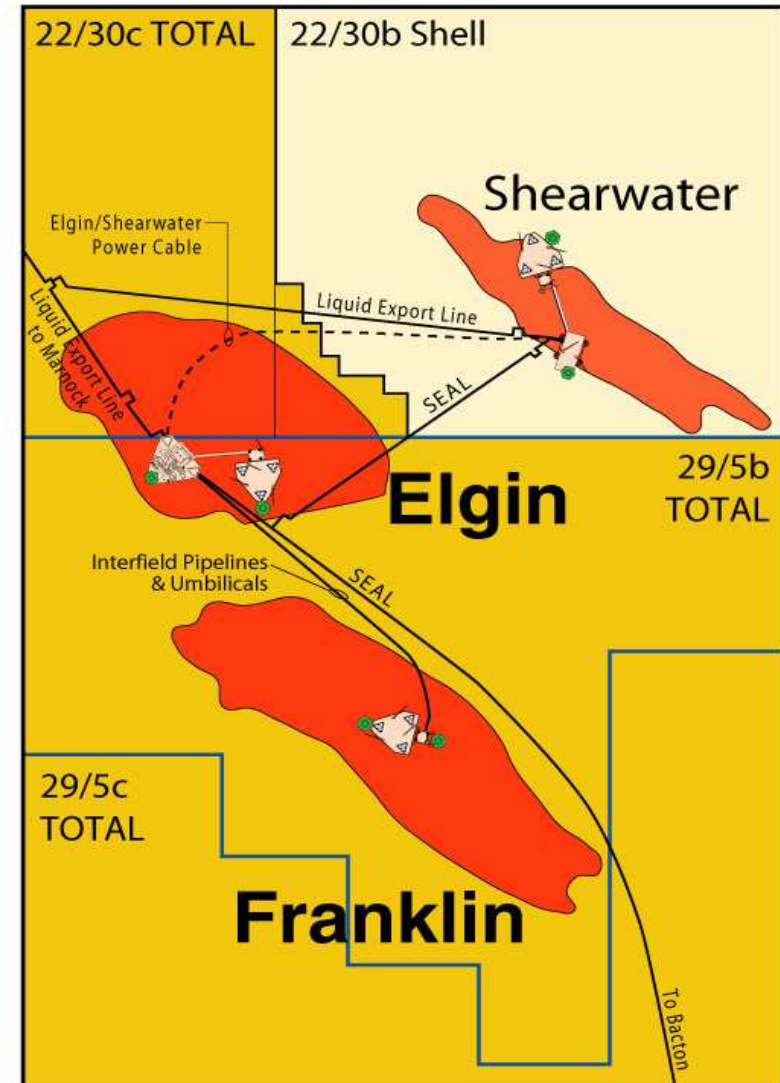
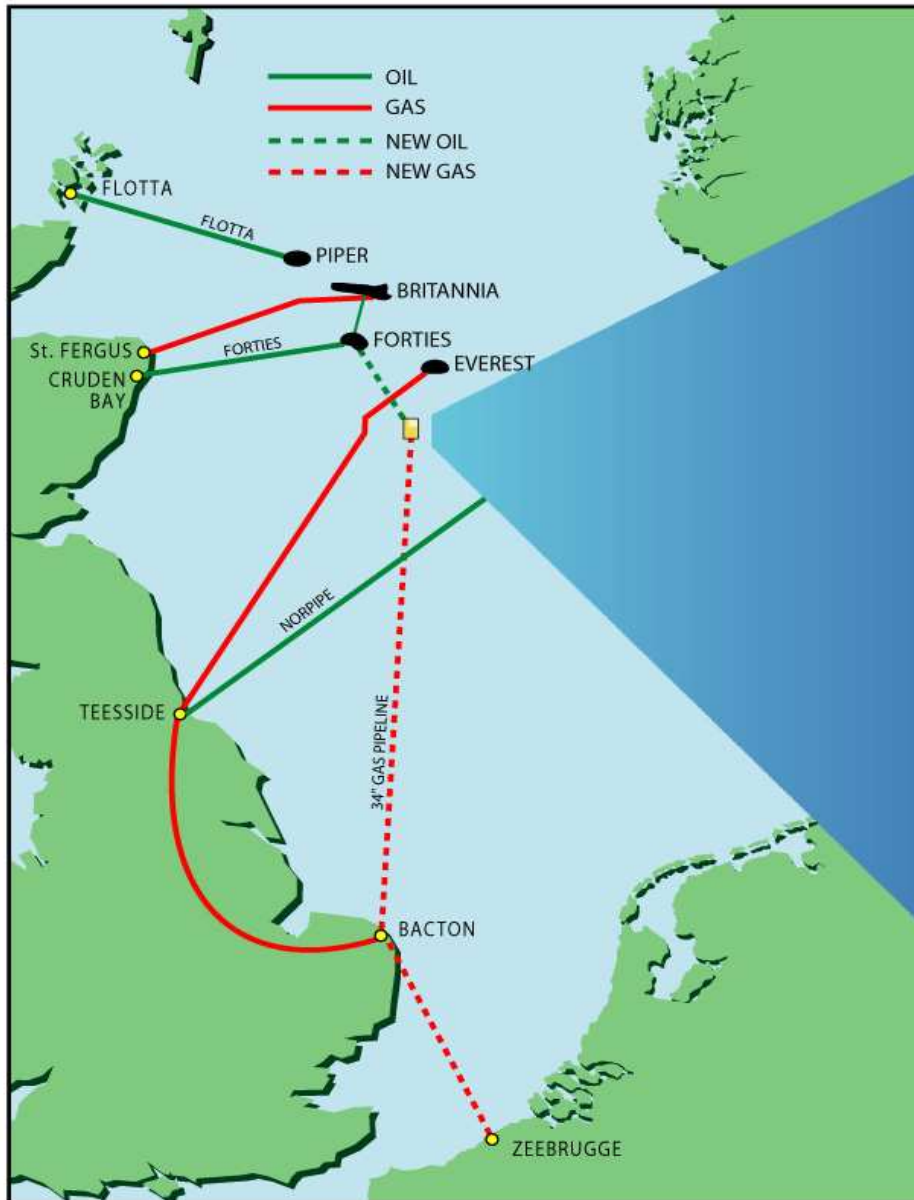
TOTAL



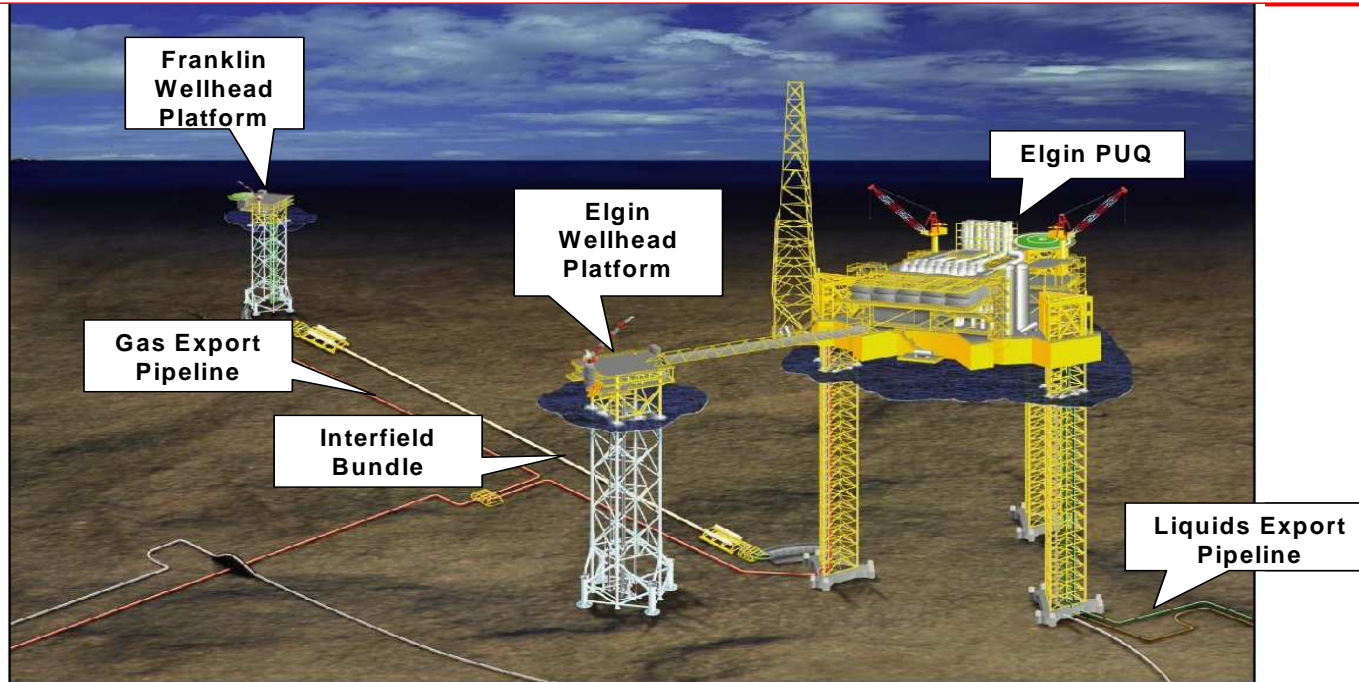
ELGIN/FRANKLIN: 5 YEARS ON

L Hardiman, K Boyne, A Humphreys, C King, I McKendrick, N Taylor

Elgin-Franklin generalities and overview



Elgin-Franklin generalities and overview



9,000 9,500 10,000 10,500 11,000 11,500 12,000 12,500 13,000 13,500 14,000 14,500 15,000 15,500 16,000 16,500 17,000 17,500 18,000

Pressure Psi

• **Discoveries :** Franklin 1986 (Ultramar) and Elgin 1991 (Elf UK)

• **Development sanction in 1996**

Technical reserves:	1.8 TCF + c.400 MMbbl Elgin+Franklin
HP/HT conditions:	1100 Bars /190°C
Gas Export @ Sales spec:	14.6 Mscmd
Condensate Export:	175,000 bbls/d
Expected Field Life:	22 years

• **First gas :** March 2001 (Elgin & PUQ) October 2001 Franklin unmanned platform

• **Additional projects:** Glenelg onstream March 2006 ; West Franklin 2 wells 2006/07; Franklin infill 1 well 2006

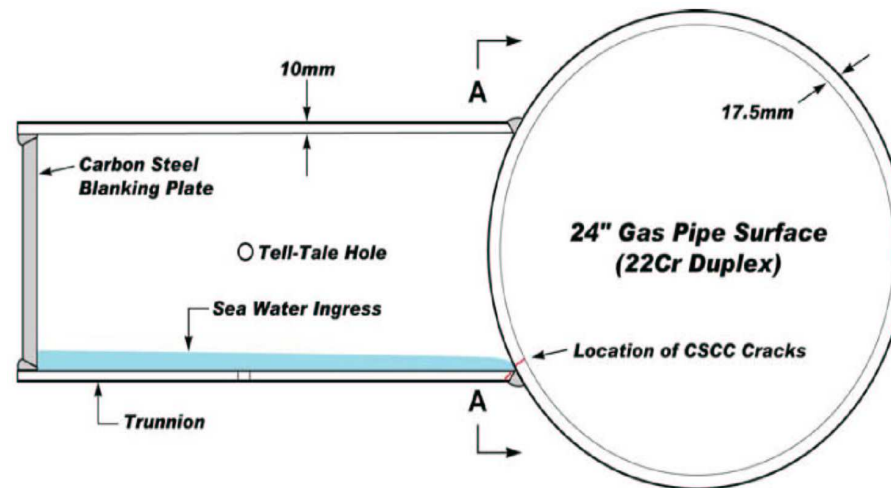
23rd World Gas Conference, Amsterdam



TOTAL

Lessons Learned

- Alliance Contract
- Offshore Accommodation
- Risk Mitigation
- **Material Selection**
- TPG500 Piling Operations

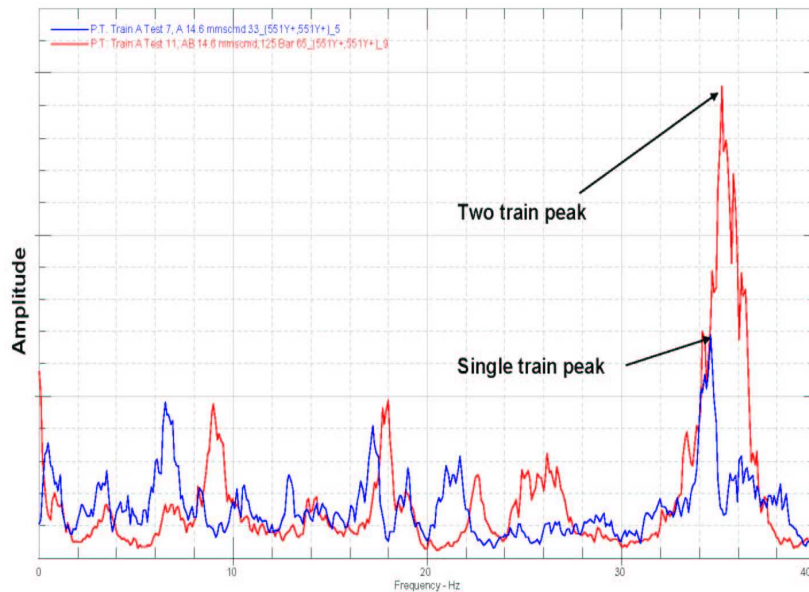


**SIDE VIEW OF TRUNNION AND GAS PIPING
SHOWING LOCATION OF CSCC CRACKS**

- *Duplex selected over Carbon Steel for long term integrity*
 - *Formation water properties acceptable for 22Cr*
 - *Localised evaporation susceptible to internal SCC*
 - *Salt water accumulation at trunnions leads to external SCC*
- Entire Process should be considered & all areas of Duplex pipework are at risk of external SCC & should be monitored**

Major Challenges

- **Annulus Management**
- **Well Growth**
- **Vibrations**
- **Gas Plant Optimisation**
- **Compact Heat Exchangers (CHEX)**

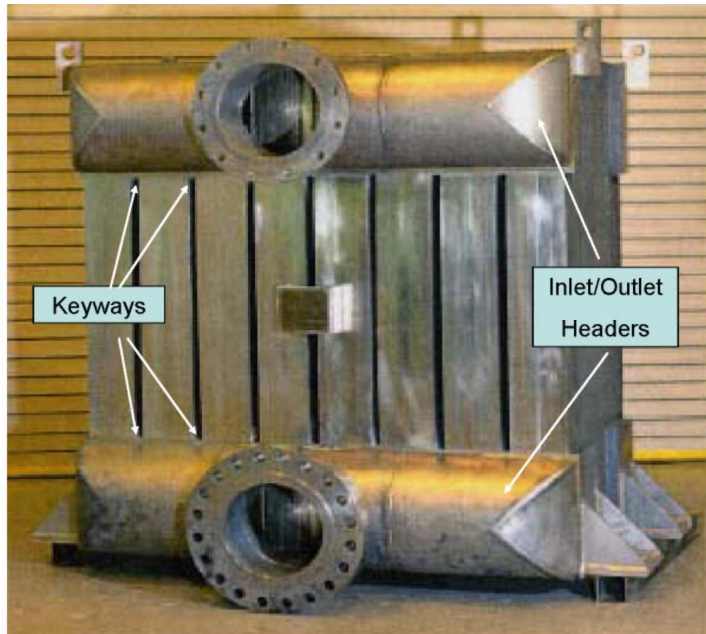


- *At design production rates (14.6 Mscmd) significant vibrations observed*
- *On increase in plant throughput to 15.5 Mscmd small bore pipework failure occurred due to fatigue cycling*
- *Epicentre of main vibrations identified as gas export metering stream due to:*
 - *Turbulence*
 - *Pipework geometry*
- *Export metering stream pipework diameter required increasing*
- *Alternative actions to manage vibrations:*
 - *Operation on single metering stream*
 - *Maintain metering stream pressure above 140 barg*
 - *Reduce length of small bore connections*
 - *Installation of clamps*
 - *Strengthening of deck structure to prevent transmission*



Major Challenges

- **Annulus Management**
- **Well Growth**
- **Vibrations**
- **Gas Plant Optimisation**
- **Compact Heat Exchangers (CHEX)**

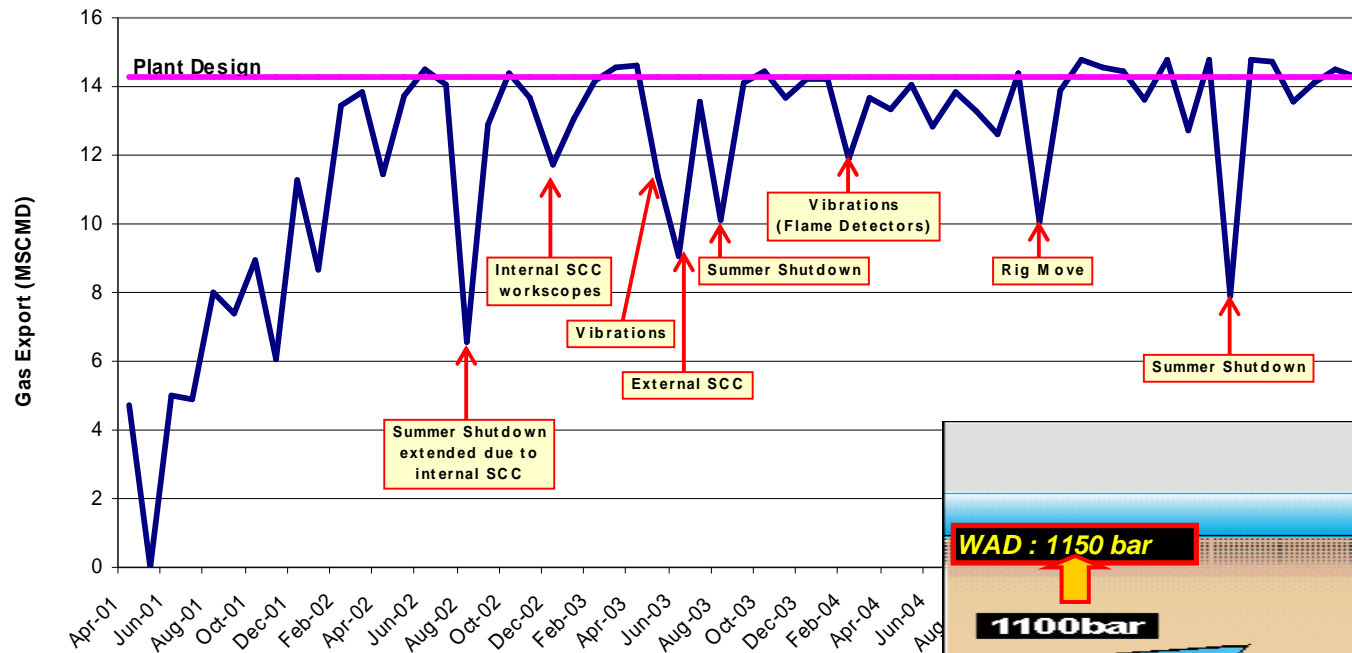


- *Titanium CHEXs were enabling technology due to size & weight*
- *Oxidisation of Grade 5 Titanium welds caused cracks during manufacturing & testing*
- *Similar cracking observed during production managed by:*
 - *Reduction in temperature differential between panels*
 - *Rolling overhaul schedule due to installation of spare units*
 - *Removal of oxidised surface*
- *Contingent possibility for replacement with shell & tube technology*
- *CHEXs performance is outstanding & space/weight savings can be used for future projects*

Present Status

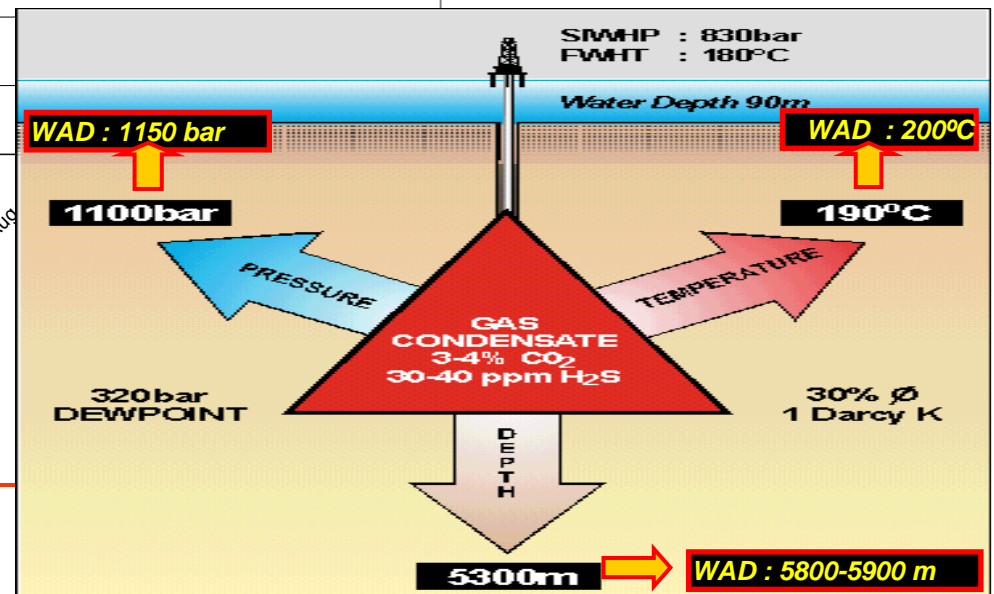
- Maximum Gas Export Rate increased to 15.5 Mscmd
- High availability- efficiency of 95% in 2005 (excluding planned SSD)

Elgin/Franklin Average Daily Production History



Over 300 Mboe produced to date

- Glenelg field onstream March 2006
 - Increasing HP/HT envelope
 - Highly deviated HP/HT drilling >4km



The Future

- First infill well drilling operations in progress with depletion of up to 500 bar
 - Infill wells will enable draining of untapped reserves
 - Infill drilling also allows replacement of wells following failure
 - No sand or compaction failures to date but ever present risk
 - 4D seismic reprocessing
 - Identify new reserves
 - Optimise well placement
- Elgin/Franklin has:
Achieved the original project objectives,
and,
is now surpassing them**
- West Franklin Field onstream late 2006
 - Subsea HP/HT tiebacks under appraisal:
 - Release reserves
 - Reduce OPEX
 - Technical/Economic Life extended to 2034

