West Franklin
Re-development of a partially depleted ultra HPHT field

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West Franklin – The Context

**West Franklin**
- 2 producing wells (from Franklin WHP)
- Discovered in 2003, start-up end 2007
- Temperature 190-210°C
- Initial Pressure ~ 1100 Bar
- Hyper-critical fluid (GOR ~1200 m³/m³)

**Elgin-Franklin**
- Hub consists of 4 HPHT fields (16 wells)
- Deepest (6km+) production wells in the North Sea
- First discovery in 1986 (Franklin)
- Start-up in 2001
- Total production >600 Mboe
- Plateau rate ~230Kboe/d
- Expected to produce for another 20 years
West Franklin Development – The Timeline

**Phase 1 – 2003-2008**
*From a Franklin satellite ‘dead-end’…*
- 2003 – F7z nearby exploration well
- 2004 – Sanction of WFB, future F9y (dev/app well)
- 2007 – F7z production start-up
- 2008 – F9y drilling and production start-up, with excellent results (~40 Kboe/d)

**Phase 2 – 2009-2013**
*…to a full-blown field development…*
- 2009 – Validation of more than 100 Mboe additional reserves
- 2010 – WFC (H1) drilled
- 2011 – Jacket installation, 4D seismic and drilling of a second infill well (WFD)
- 2012 – Drilling of a third infill well (WFE)
- 2013 – Topside installation and first gas from the new platform

**Phase 3 – 2014 onwards**
*…with further growth potential*
- Further Infill drilling …
- Deepening to lower undeveloped reservoir (Fulmar A)
- Appraise downthrown panels (Northern terraces)
- Synergy with nearby fields or exploration targets (Glenelg, Elgin)
- Use of the new platform as a hub for neighbouring opportunities

*How one very good well (F9y) has unlocked a new development and further opportunities*
West Franklin Phase 2 – The project in a nutshell

- 3 infill wells in Fulmar B+C
- From a new third well-head platform
  - Improved Franklin twin platform
  - 12 slots secured with nearby potential targets
- Project sanctioned in 2010
  - FID Partners and DECC authorisation in Q4 2010
- Drilling campaign started in June 2010
  - WFC pre-drilled in 2010
  - WFD pre-drilling on-going
- First Gas Oct 2013

An audacious development driven by the confidence in the depositional/structural model, F9y behaviour and a race against depletion
West Franklin Phase 2 – The Challenges

- On-going depletion from F7z and F9y
  - Could prevent access to these reserves
  - And possible resources beneath (Fulmar A)

- Elgin-Franklin production decline
  - Off-plateau in 2010 despite upwards revision of Elgin and Franklin reserves
  - And despite successful infill drilling on Franklin (F8) and Elgin (G11 and G12)
  - .... but no more slots!

- Liner deformation
  - Confirmed by later well failures
  - Phase 2 all the more important due to threat that integrity poses to existing production

The three “D’s”: Depletion, Decline, Deformation.... F9y excellent results came in the nick of time. Time is the principal opponent, so we had to be quick!
West Franklin Phase 2 – Geoscience challenges

- **Many uncertainties**
  - Data availability (only 2 wells, 1 core)
  - Connectivity between existing wells
  - No contact identified

- **But strong drivers**
  - F9y superior results
  - Confidence in sub-regional geological understanding
  - Quality seismic information
  - On-going dynamic appraisal (production) with regular WHP data

- **Ambitious time targets**

- **The solution**
  - A compact 2G&R uncertainty study
  - Tight integration with Drillers (well planning and acquisition program)
  - Continuous validation process (peers, Partners and DECC regularly updated)
West Franklin 2G&R workflow

- Distribution of HCIIP encompassing the main uncertainties using light statistical approach (Monte Carlo)
- Dynamic appraisal (F7z and F9y production and pressure data) constrained choice of mini case
- Continuous iteration between static and dynamic modelling throughout the process
- Experimental design and multiple dynamic realisations approach to define reserves distribution
- Optimisation of well count and location on base case model with robustness assessed on alternative mini and mode cases
West Franklin – Unknowns & how to get to know them

1. Fulmar A stakes (impact on Phase 2 development strategy)
   ➔ WFC or WFD results

2. Fluid contact(s)
   ➔ Infill well results, Reservoir performance, 4D Monitor 2?

3. Facies distribution (permeability, connectivity, trends)
   ➔ WFC cores, WFE results 4D Monitor 2

4. Dim Zone stakes
   ➔ L.O. 2009, 4D monitor 2

5. Northern terraces
   ➔ L.O. 2009, 4D Monitor 2, Appraisal branches?
Drilling Challenges

- **On-going depletion from F7z and F9y**
  - Vertical heterogeneous pressure profile (well control issues)
  - Need to drill reservoir as soon as possible
  - Pre-drilling utilising a template with later tie-back issues
  - Importance of iterations with Reservoir and Geomechanical models

- **On West Franklin, HPHT boundaries are pushed even further**
  - High temperatures have impact on data acquisition program (tools) and well and facilities design (ratings)

- **Anticipate future challenges: well integrity**
  - Re-enforced well architecture
  - Anticipate likely replacements (well lifetime, 12 slot jacket)

_Benefiting from Elgin and Franklin HPHT infill experience_
Development / Project Challenges

- With no more slots on Franklin, a new platform is required
  - Safety challenge
  - Early jacket installation to minimise number of pre-drills

- Complexity of ‘brown field’ operations

- Accelerated program means increased planning complexity
  - Multiple interactions between installation and drilling operations
  - And a 4D seismic acquisition in 2011!

- Flexible design to accommodate possible upsides
  - 12 slots to accommodate more wells
  - Fulmar A HT production encompassed as reasonably as possible in design

*Challenge was to optimise Phase 2 development while accelerating it*

*Lessons from past + Cross functionality + Work integration were key*
Conclusions

- Fast track re-development strategy essentially triggered by F9y results
- Driven by confidence in depositional / structural understanding....
- ... and ongoing depletion
- Main uncertainties
  - Contacts
  - Facies limits
  - Level of heterogeneity
- Promising further resource potential
  - Could be revealed as soon as 2011 with deepening into Fulmar A
  - Northern terraces
- A new WHP unlocking nearby and regional opportunities (slots + hub)

Continued investment in seismic data and new technologies, team integration and boldness will all help to ensure mature areas such as West Franklin remain in the spotlight
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