THE CULZEAN FIELD:
FROM DISCOVERY TO FIRST GAS AND BEYOND

DEVEX 2020
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CULZEAAN FIELD OVERVIEW & CONTEXT

- uHPHT ~930 bar and ~170ºC at 4500m
- Discovered 2008, 240km East of Aberdeen
- Licence P.111, Block 22/25a
  - TOTAL 49.99% (operator)
  - Britoil (BP) 32.00%
  - JX Nippon UK 18.01%
- Development drilling started Aug 2016
- First gas 7th June 2019 from C6
  - First gas export (CATS) on 11th July 2019
- Reservoirs on production:
  - Triassic Joanne – currently producing (C2, C4, C5 and C6)
  - Jurassic Pentland – C3
- Gas properties
  - CGR: 19 Stb/MMscf Pentland, 26 Stb/MMScf Joanne

- Culzean represented one of the largest UKCS hydrocarbon discoveries in the last 15 years.
- Culzean estimated to contribute 5% of UK gas supply in 2020
- Currently producing ~100,000 boed
- More than 300Mboe of recoverable HC
TIMELINE FROM DISCOVERY TO DEVELOPMENT

- **2008**: Discovery
- **2009-11**: Appraisal Wells
- **2014**: Concept Development
- **2015**: Project Sanction
- **2016**: Wellhead jacket installation
- **2016**: Commence Drilling Wells
- **2017**: Key subsea pipelines, structures & FSO mooring installation
- **2018**: Riser bases installation and subsea tie-ins
- **2018**: Topsides installation
- **2019**: First three wells complete
- **2019**: Hook-up and commissioning
- **2019**: FSO installation
- **2018**: Central processing facility and utilities & living quarters jackets installation

**1st gas**
7th June 2019
THE CULZEAN DEVELOPMENT

- Central Processing Facility
- Well Head Platform (14 slots)
- Utilities and Living Quarters
- Floating Storage & offloading
**BASIC GEOLOGY OF CULZEAN**

- **Culzean reservoirs**
  - **Jurassic Pentland**
    - Coastal plain meandering fluvial system
  - **Triassic Skagerrak (Joanne + Judy Members)**
    - Semi arid continental fluvial system
  - Exceptional petrophysical quality for these depths
    - Joanne average porosity of 17%
    - Early porosity preservation
A number of data sets cover the Culzean area with the key ones being:

- Cornerstones towed streamer pre-stack depth migration survey (2011)
- Culzean specific High Density Ocean Bottom Cable (HDOBC) (2011)
Salt induced fault block dipping to the east with faults to the north and west
  - Structural closure to the South where BCU cuts into reservoir

Present day hydrocarbons sourced from coaly Pentland Fm.
  - Sealed by internal mudstones and ultimately sealed by Lower Cretaceous
REGIONAL CONTEXT OF CULZEAN

- NE of central graben HPHT domain (Winefield et al)
- Very high pore pressure relative to the depth of the field
- 936 Bar (13575 psi)
- Challenging drilling conditions – tight drilling margins at crest
- Precise placement of the casing shoe immediately above top reservoir is needed to overcome these challenges.
WELL ARCHITECTURE

● Key challenge to Culzean delivery has been narrow drilling window at the top of the structure

● Deep set casing strategy used to navigate complexity of narrow drilling window

● Section TD very close to top reservoir

● Lookahead VSP used in order to reduce uncertainty

● Get within 100ft of top reservoir
DEVELOPMENT STRATEGY

- Development comprises 6 production wells and 1 Forties PWRI

- 5 Joanne production wells and 1 Pentland production well

- Development wells spread geometrically across the field to mitigate against compartmentalisation risk

- ULQ and well platform offset from the field to mitigate subsidence/overburden issues
Development wells have come in slightly better than expected in terms of HCPV in both the Joanne and Pentland

- The Judy was drilled in the C7 well with poorer updip reservoir quality than expected
  - Flow trial was carried out
Early “teething issues” following commissioning but now at full plant potential
MONITORING STRATEGY

- All wells equipped with fibre optical cables
  - Down hole pressure gauges
  - Active DAS / DTS monitoring (including 4D DAS surveys)
- Hoping to use inwell tracer technology to reduce overall well interventions
- Overburden monitoring is a key aspect
  - Well integrity
  - Subsidence
  - Geomechanical changes
- Capitalising on the Elgin-Franklin HPHT experience
THANK YOU!!

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