

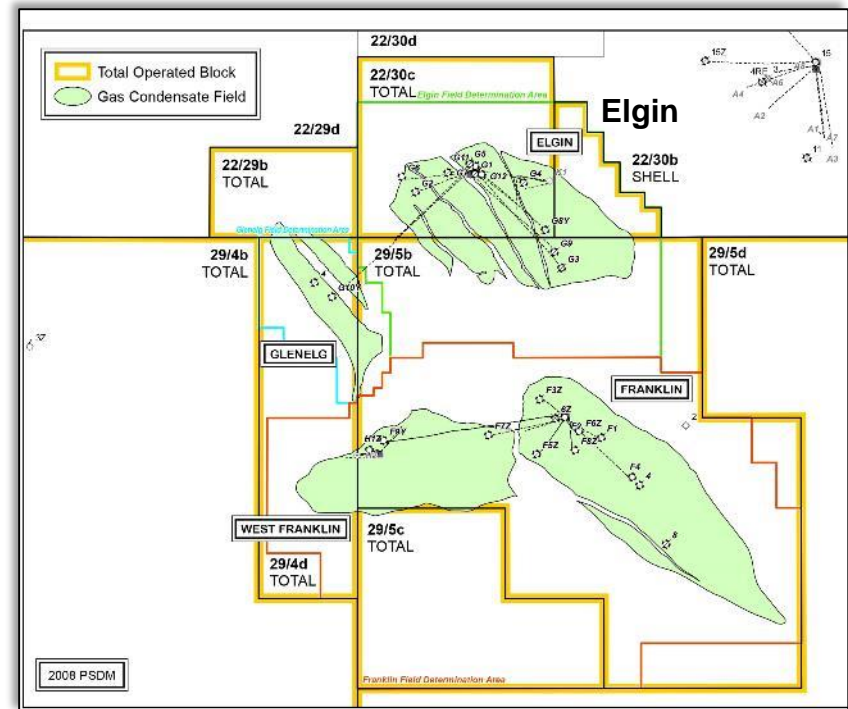
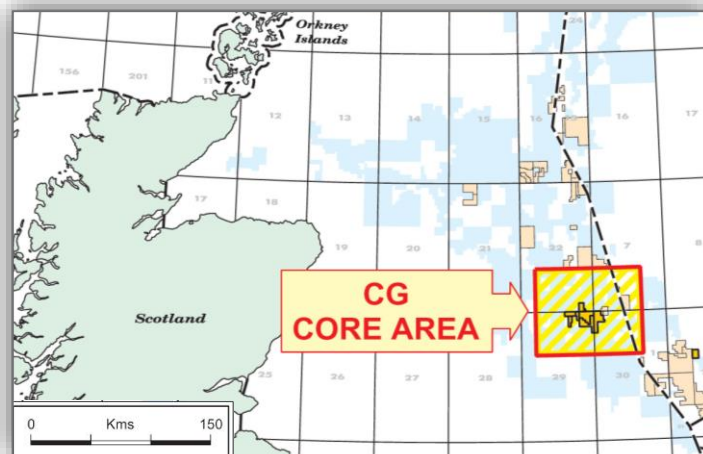


ELGIN FIELD

AN EXAMPLE OF SUCCESSFUL INTEGRATED MODELING TO SUPPORT RESERVOIR MANAGEMENT

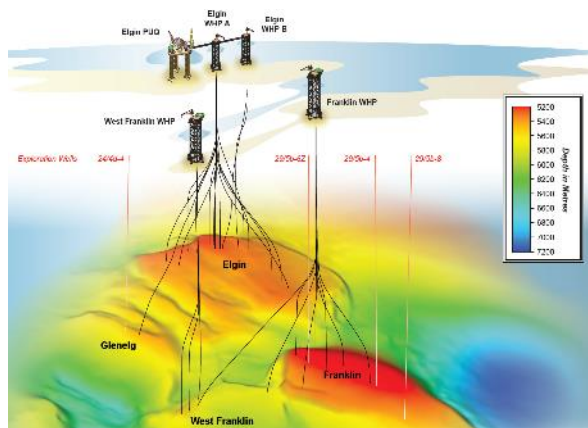
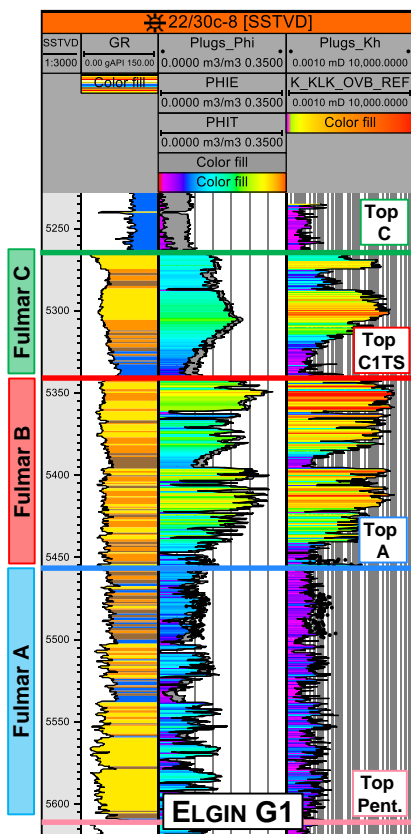
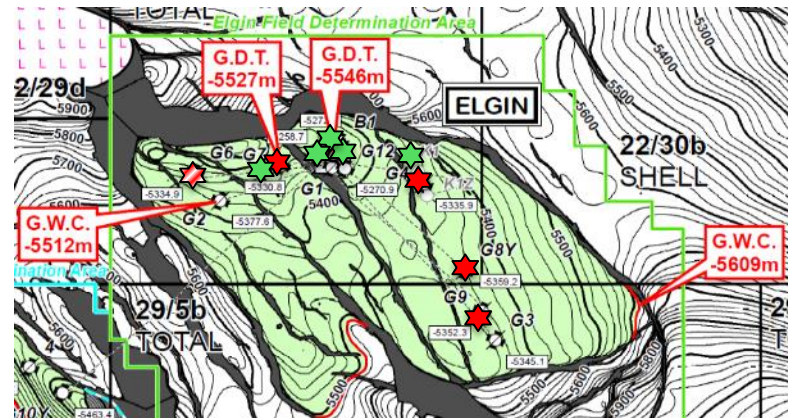
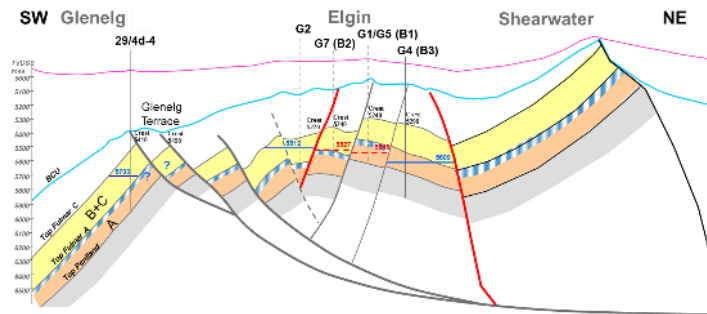
Devex

9th May 2018



ELGIN OVERVIEW

- Discovered in 1991
- 1st gas in April 2001
- Upper Jurassic Fulmar B&C completed (shore-face)
- Rich gas condensate (GOR ~ 800 Sm³/m³)
- HP/HT under virgin conditions (1100 bar, 190 deg C)
- Good reservoir 10 – 500 md sandstones



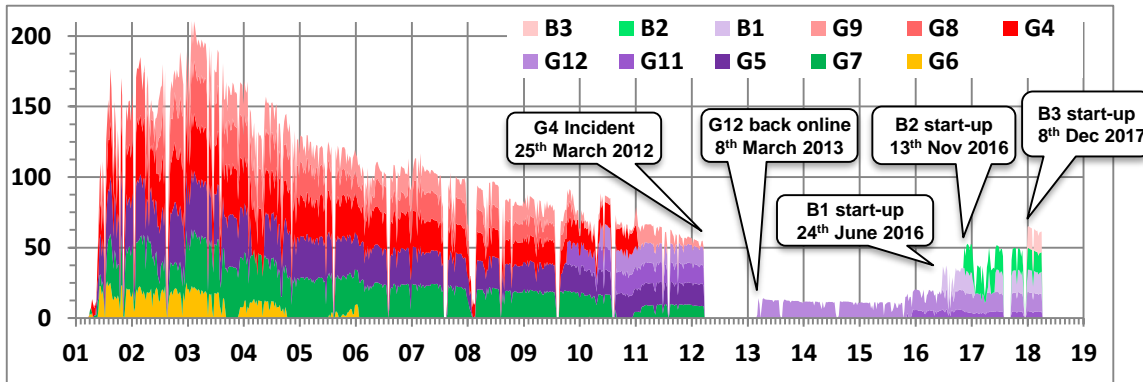
- **Elgin:** PUG (Process, Utilities and Quarters) and 2 wellhead platforms (A and B)
- 240 km away from the shore
- 90 m of water depth
- Condensate exported via **FPS** line
- Gas exported via **SEAL** line

ELGIN PRODUCTION OVERVIEW

- Elgin:

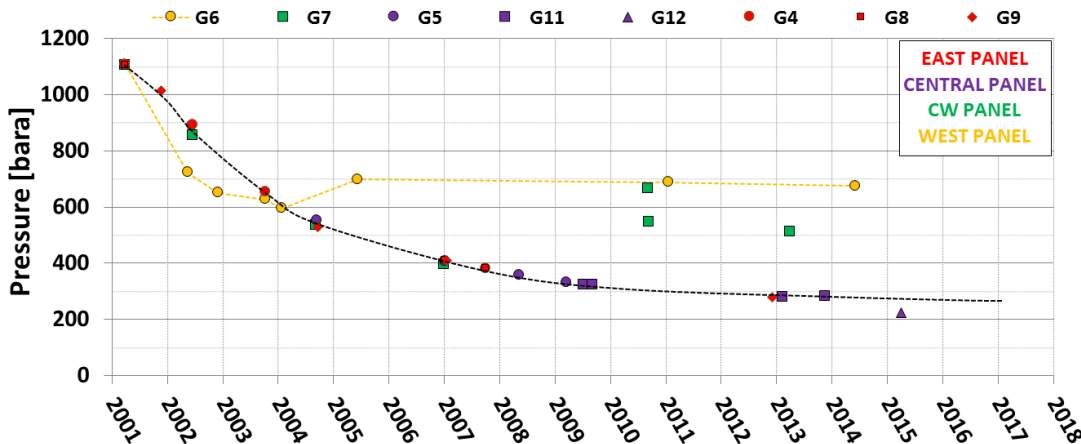
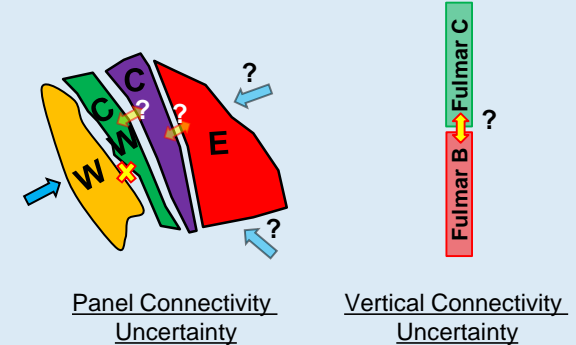
- Mature Field with 17 years of production
- 5 wells on production today
- Last infill: B3Z
- Water Production: G6 only (West Panel)

HC Prod. (kboe/d)



Main Remaining Uncertainties

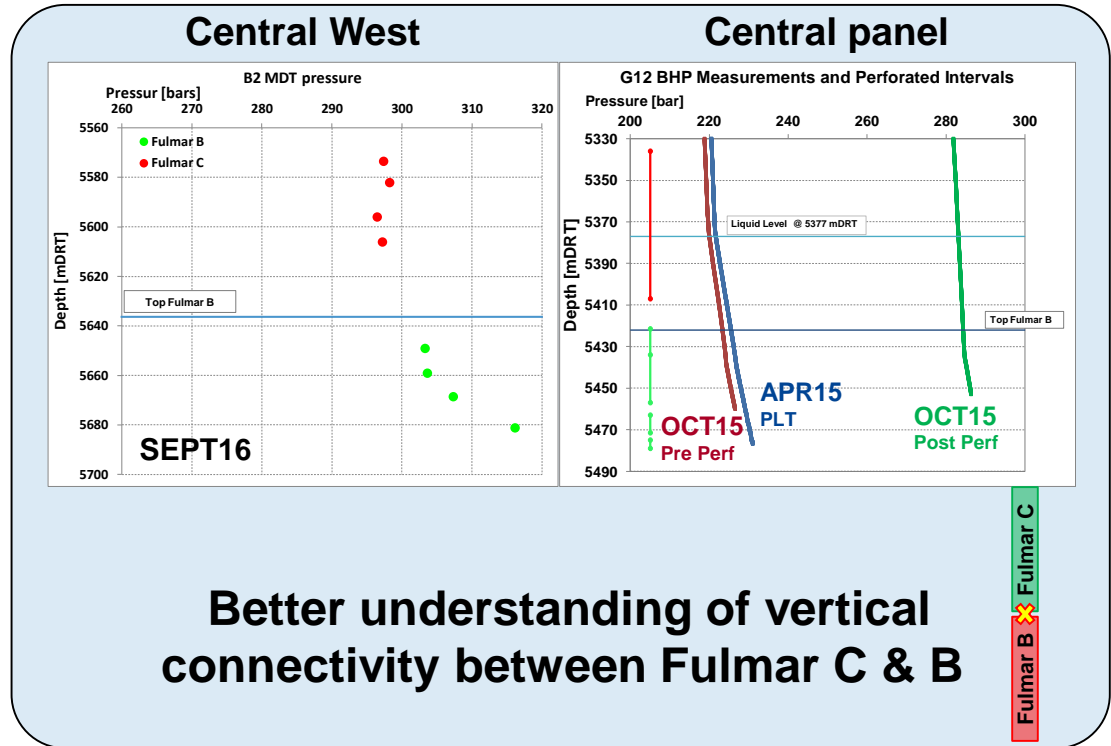
- Lateral Compartmentalization
- Vertical Communication
- Water support



FIELD MONITORING

VALUE OF DATA ACQUISITION

- Several Challenges
 - HP/HT conditions
 - High well potential
- Available Pressure Data:
 - Several MDT, PLT & SGS
 - Real time down hole gauges since 2016 (quartz sensors or fibre optic) on the last infills (B1, B2 & B3Z)



SEISMIC ACQUISITION

FOR BETTER IMAGING & RESERVOIR CHARACTERIZATION

2008 PSDM

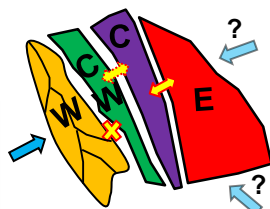
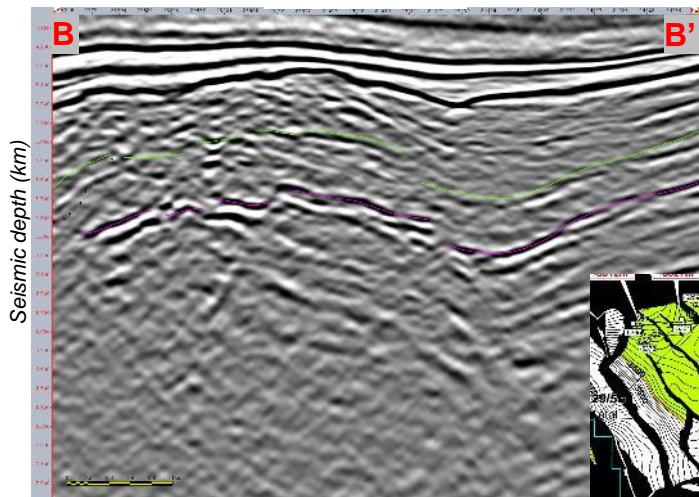
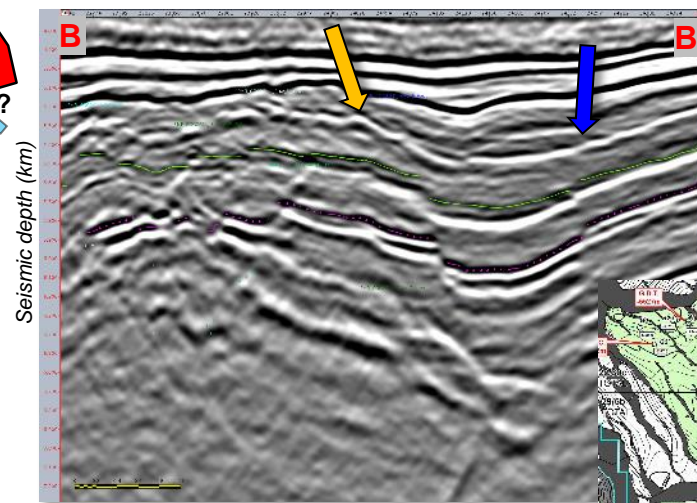


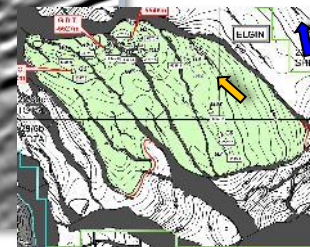
Image improving



2014 Bi-Azimuthal PSDM



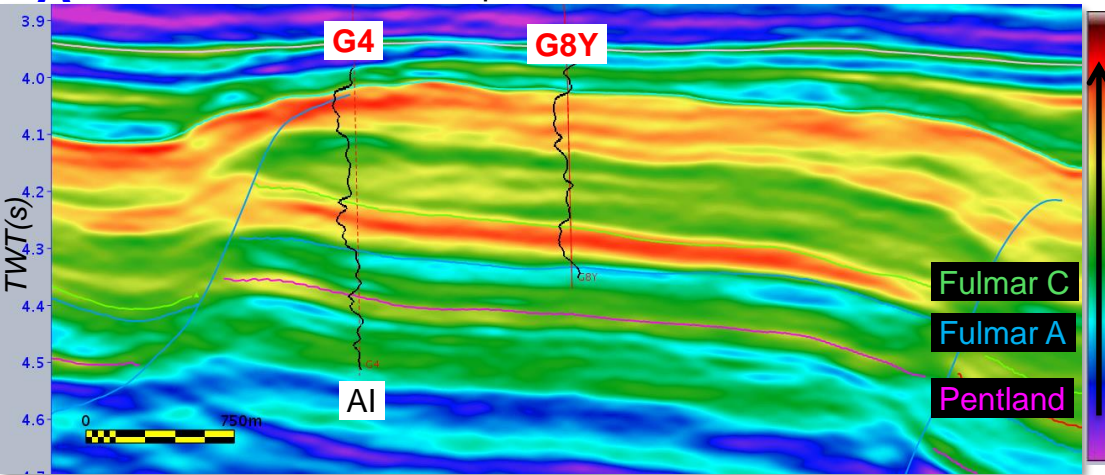
Top Fulmar C Depth Structure Map



Top Fulmar C Depth Structure Map

Reservoir heterogeneities – Diagenesis & Seismic

Acoustic Impedance on the East Panel



Decrease of AI
Porosity ↗

- Latest processing have improved faults mapping
- In Elgin good reservoir quality has been preserved by early HC migration which is discriminated by seismic inversion

SEISMIC ACQUISITION

FOR BETTER IMAGING & RESERVOIR CHARACTERIZATION

2008 PSDM – existing Model

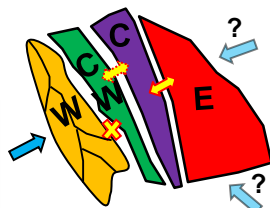
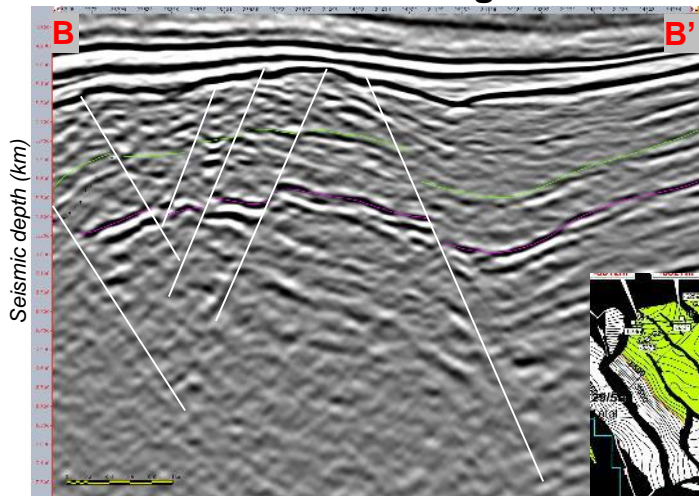
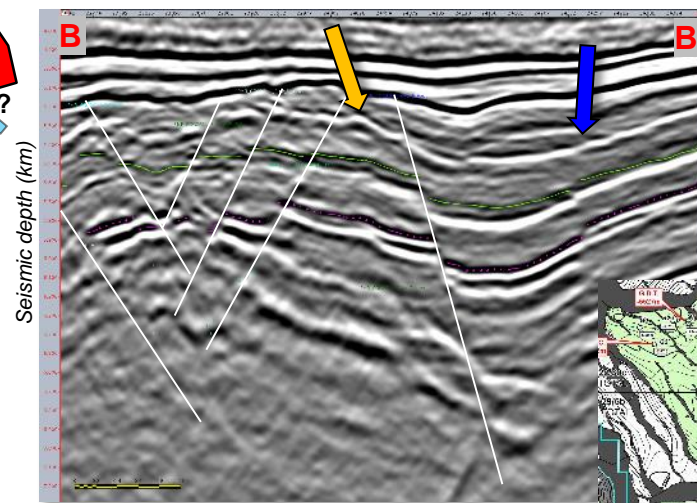
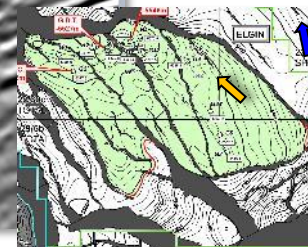


Image improving

2014 Bi-Azimuthal PSDM



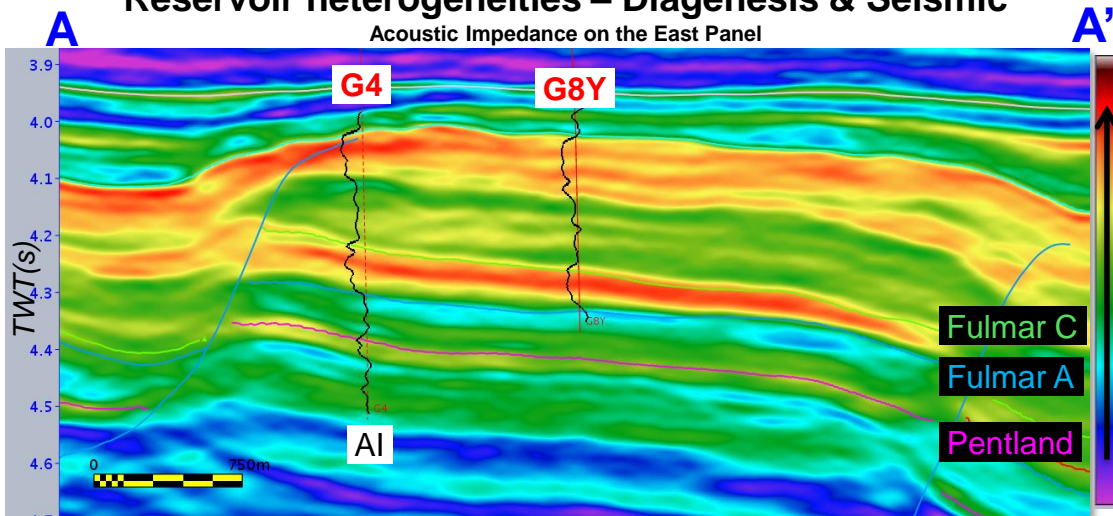
Top Fulmar C Depth Structure Map



Top Fulmar C Depth Structure Map

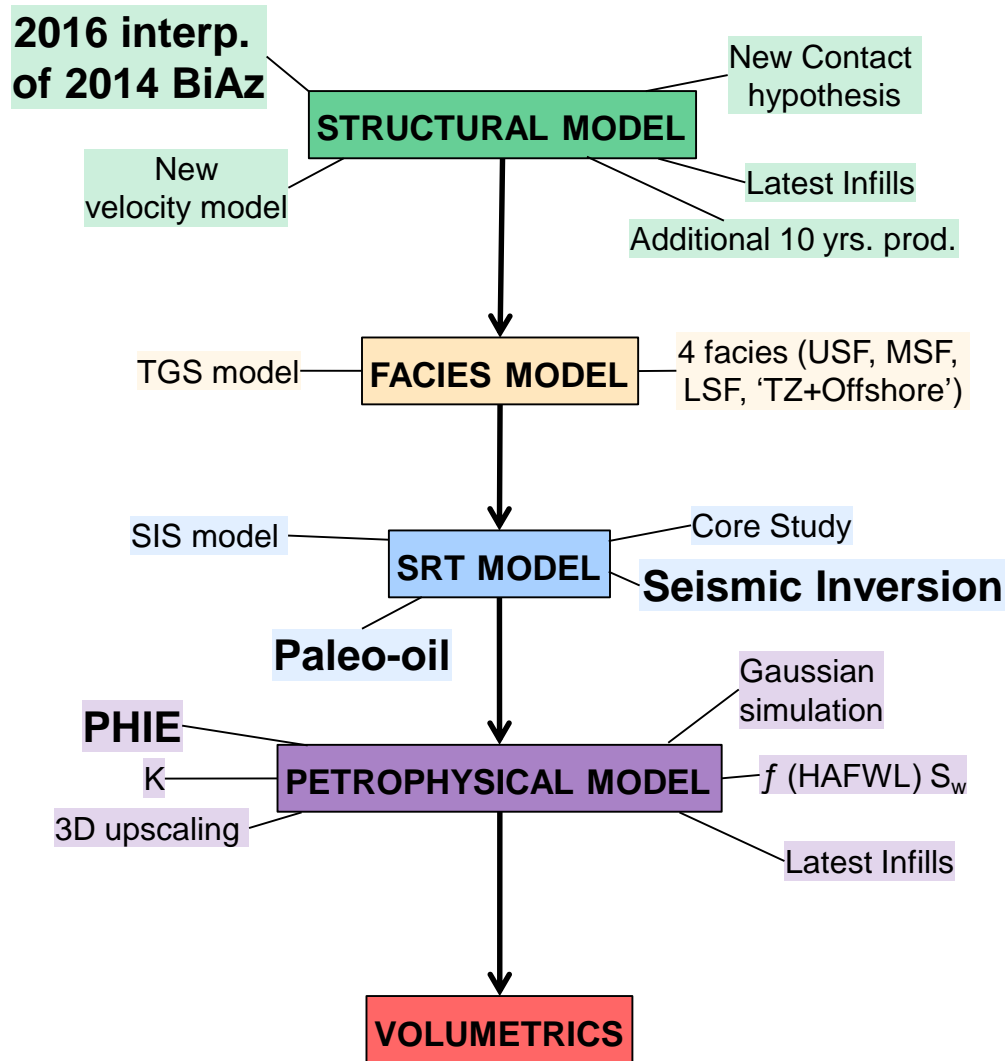
Reservoir heterogeneities – Diagenesis & Seismic

Acoustic Impedance on the East Panel



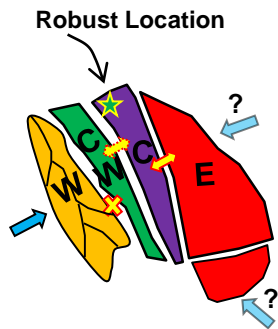
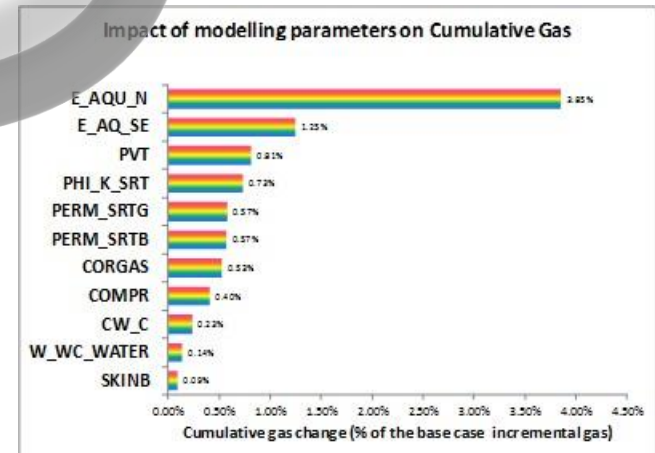
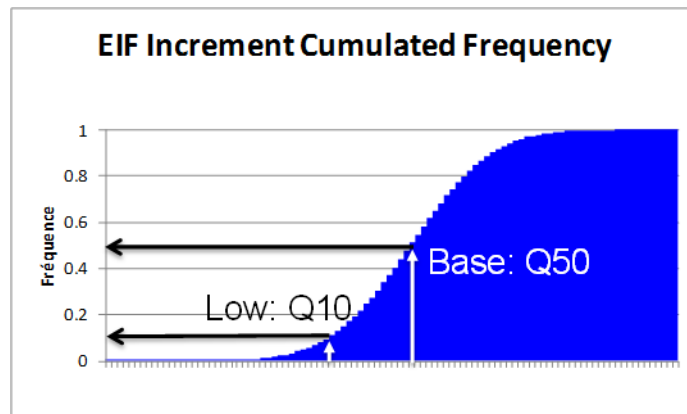
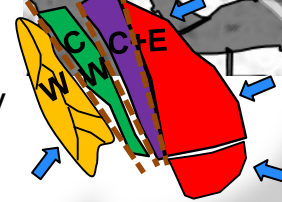
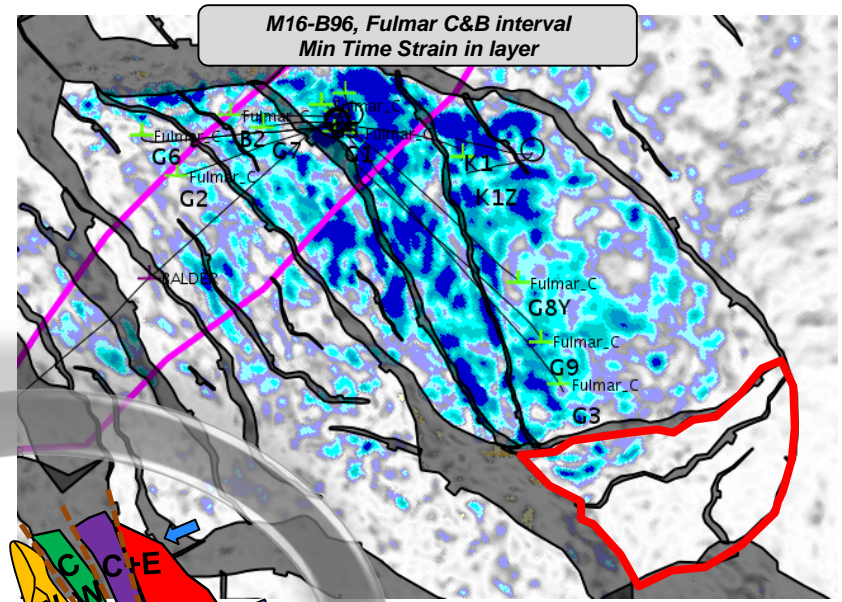
- Latest processing have improved faults mapping
- In Elgin good reservoir quality has been preserved by early HC migration which is discriminated by seismic inversion

2G INTEGRATED WORKFLOW



MULTI SCENARIO APPROACH & UNCERTAINTY ANALYSIS & FUTURE INFILL SCREENING

- Integration of 4D3D 2016
- Used of latest reservoir simulator (Intersect) allowed
 - Running high numbers of dynamic simulations
 - Mapping high number of uncertain parameters
- 2 different approaches:
 - Multi deterministic scenario (7 cases)
 - Uncertainty study: 70 runs selected
- Future Infill Screening
 - 5 different locations screened
 - Low, Base & High cases based on uncertainty study
 - Allow to find the most robust location



CONCLUSION

- Is never too late to take new data or to apply new technologies
 - Broadband data/Bi-azimuthal processing
 - Improved Field Structure Imaging
 - Inversion
 - Enhanced Reservoir Heterogeneities Characterization
 - 4D / PLT / Bottom Hole Gauges
 - Better Horizontal/Vertical Compartmentalization understanding
- Implementation of latest modeling methods to better represent reservoir heterogeneities and field behaviour
 - Better assess uncertainties and risks
 - Implement new development phases via infill well drilling

Future Elgin infill on sanction process