Atlantic Ireland 2019

# Significance of the new offshore Ireland stratigraphic framework for exploration within the province and internationally



#### Dr Tim Wright & Dr Philip Copestake

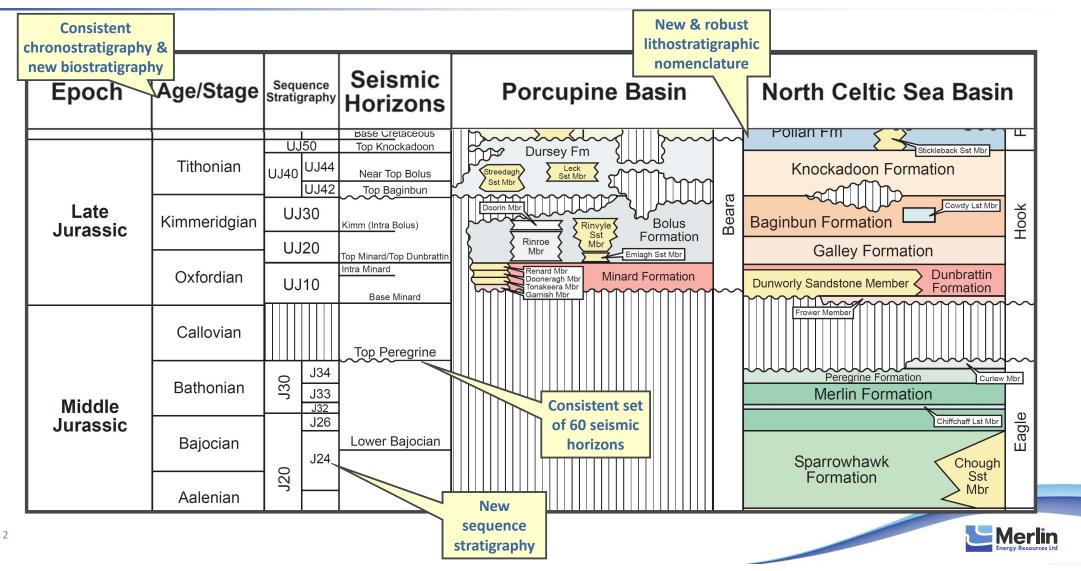
Merlin Energy Resources Ltd

October 29th 2019



**Roinn Cumarsáide, Gníomhaithe ar son na hAeráide & Comhshaoil** Department of Communications, Climate Action & Environment

#### What does the new framework contain?

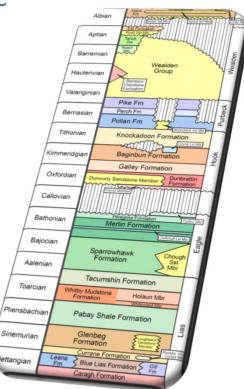


## How does this type of study help us as explorers and academics?

- Stakeholders recognised a need for a consistent stratigraphic nomenclature
  - Reduces uncertainty & improves understanding of geological risk factors for explorers
  - Promotes consistent reporting between Operators, Governments & Academics
  - Potential to open up new plays
  - Old names inconsistent

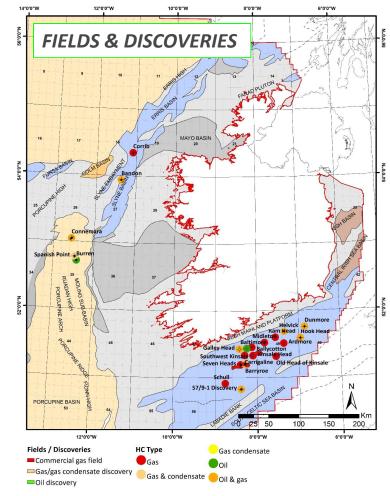
"is my rock really the same as your rock?"

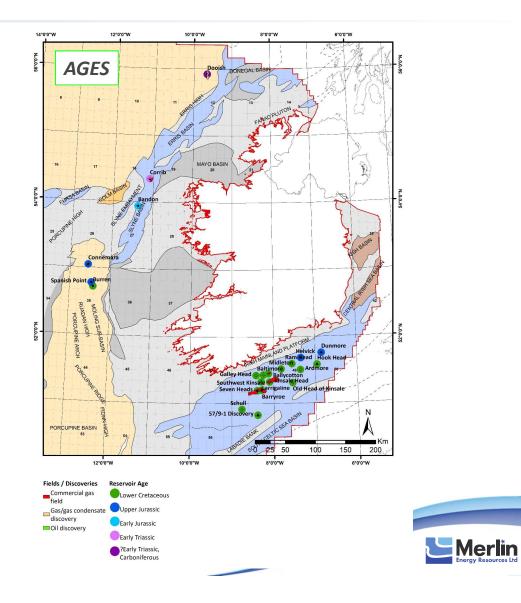
- Standardised scheme- Gradstein
- Global relevance e.g. major tectonic and climate signatures
- Improved understanding of key petroleum system elements









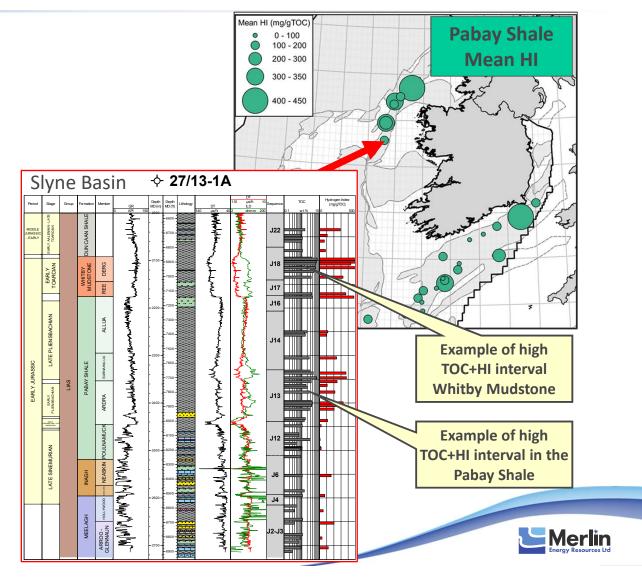


#### Play Elements: Source Rocks

- 21 formations with source potential identified (See talk by Gehlen *et al*.)
- Range from Carboniferous to Paleogene in age.
- Data included in the new framework
- New source intervals positive for exploration potential
- Tied to sequences

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- Potential next step map the source intervals in detail on seismic data & identify sweet spots?
- Incorporate results into basin modelling?

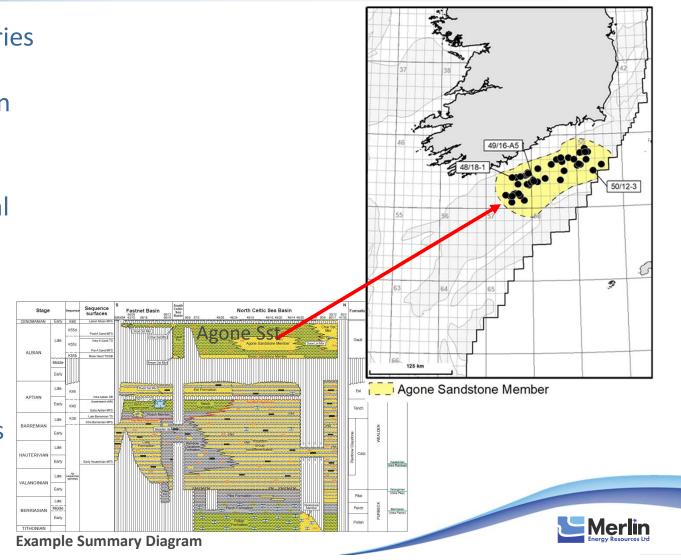


#### Play Elements: Reservoirs

- 4 producing fields and 11 discoveries offshore Ireland
- New naming scheme for all proven and potential reservoirs
- Removes naming duplication
- Enhanced understanding of spatial distribution, facies and ages
- Start to predict reservoir prone intervals e.g. "this interval is sand prone or not"
- Map key units away from penetrations

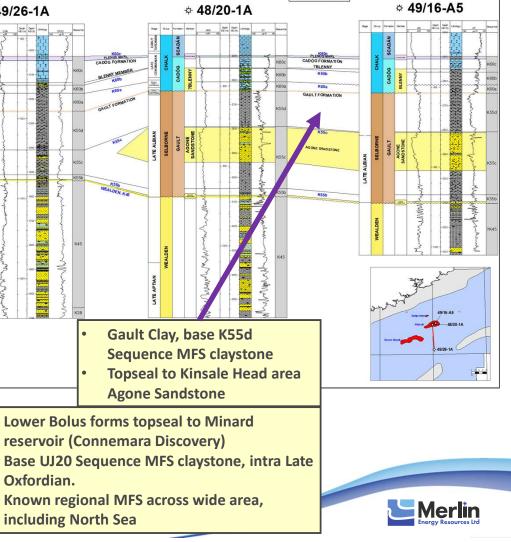
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• Create accurate play fairway maps



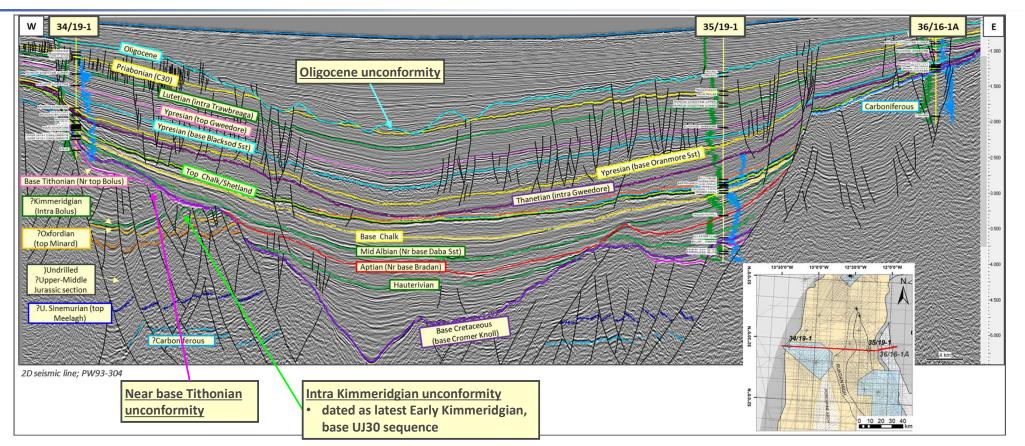
#### Play Elements: Top Seals

 Commonly equate to major transgressive **♦ 49/26-1A** claystones Mappable using sequence stratigraphy & • high quality seismic data LATE ALBIAN AULT • Map away from fields into untested areas + 26/28-2 · 26/28-5 + 26/28-1 またちちしてき 人もあまちと When for - the party - want to the we wan **Agone Sandstone** Lower Bolus forms topseal to Minard reservoir (Connemara Discovery) Oxfordian. including North Sea



KINSALE HEAD FIELD

#### Tectono-Stratigraphic Evolution: "Unmaking the cake!"



#### Project allows enhanced understanding of the structural evolution offshore Ireland

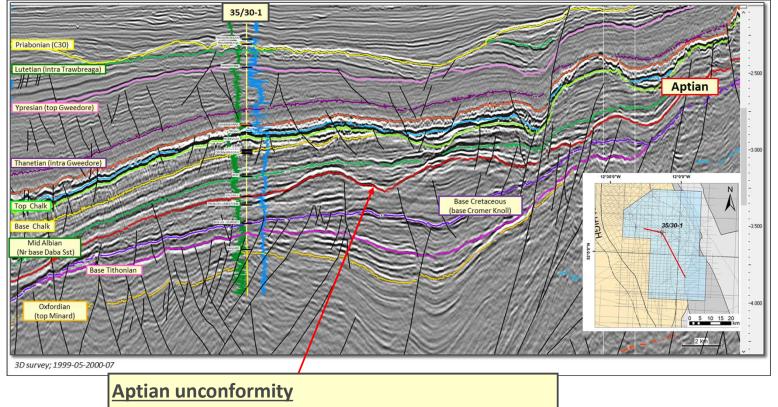
- Major unconformities relate to significant steps in tectono-stratigraphic evolution, e.g. Base Cretaceous, Aptian
- Date major tectonic phases, e.g. rifting + relate to truly regional sequences
- Relates to creation of structures and timing of hydrocarbon migration + basin modelling



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## Tectono-Stratigraphic Evolution: Next Steps

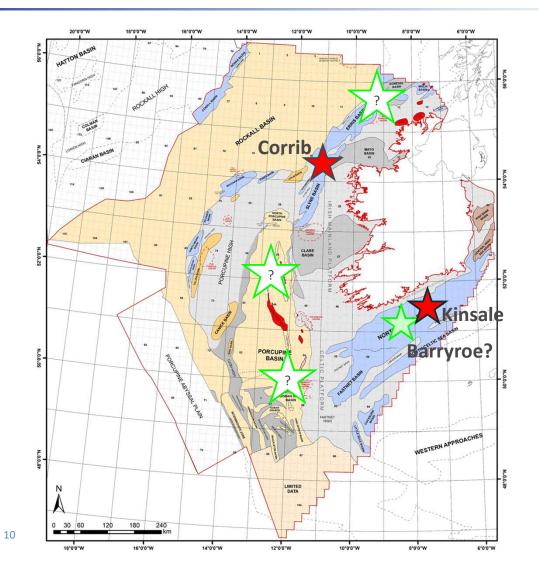
- Improve and enhance basin models
- Timing of structures relative to hydrocarbon migration
- Magnitude of uplift and erosion controls reservoir distribution & thermal history
- Map true extent of sand and shale prone sequences



- Dated as latest Early Aptian, base K45 sequence
- Likely related to initiation of opening of Bay of Biscay & separation of Iberia and Grand Banks (Newfoundland)



#### Ireland's offshore basins; Remaining potential & Optimisation



- Optimise exploration of existing blocks to try and ensure positive outcomes for all stakeholders
- Potential to use knowledge gained from this study to help accelerate exploration efforts along the conjugate margin



#### **Orphan &** Jeanne D'Arc Rockall Sequence Stratigraphy Period Epoch Age/Stage Flemish Pass **Erris Basin** Slyne Basin Porcupine Basin North Celtic Sea Basin Basin\* Basin Basins\*\* Mangach Formation Sullom CENOZOIC Paleocene Danian C110 Formation Changeling Mbr langach Fm angach Trosc Trosc Trosc Maastrichtian Wyandot Formation Formation Formation Troso Fm Jorsalfare Formation Wvandot Formation Formation ₹ Fox Harbour Shetland Member Ronnach Fm Ronnach Fm Campanian Ronnach Fm Ronnach Fm ल्ली Chalk Santonian Chalk Chalk Chalk ≣̃\$ "Upper" Late ∑Dawson Leith Leith Leith Kyrre Cretaceous ≌≷ Canyon ` Formation Formation Formation Formation Leith **∃**SMember Coniacian Wyandot Fm Formation Turonian Petrel Macbeth Scadán Scadán Scadán CRETACEOUS Petrel Member Member Formation Formation Formation is Marl Mbr Formation Squid Sandstone "Lov "Lower" Dawson Gambo S ember Cadóg Cadóg Cenomanian Cadóg Formation Lst Blenny Member Blenny Pomfret Sst Mbr Membe Canyon Member Formation Formation Member Sheerie Mbr AAAAA Nautilus Shale er Nautilus Shale Spurdog Formation Gault / Rodby Formation K55c K55b K55a K55 valent Rodby Fm Megrim Sst Mbr Albian "Lower Nautilus S Shale" Dace Lst Mbr nbo Mbr Tope Sst Mbr K50 Ben Nevis Fm Carrack Sst Mbr Carrack R Equivalent Formation Fm K45 R Rudd Sst M Aptian Avalon Fm Equivalent Fischschiefer Tench Fm K40 Fischschiefer Sst Mbr Knoll Langa Lst Mbr Eastern Roach Mbr K38 Knoll Marker Member Wealden Barremian Valhall K36 K34 V3 V2 Cromer K30 Valhall Cromer Knoll Formation Wealden Early Formation Cromer Group Cretaceous "Gabriel 3 S Valhall K32 Whiterose Sandstone Member" Ż Leathóg Doingean Lst Member Fm S Hauterivian Scatálá Sst Mbr Shale Lst Mb K20 Rainbow Whiterose Claystone Catali Shale K14 Formatio Siorc Troscír Valanginian Equivalent Lst Mbr Sst Marker Mb K10 K12 Mbr Pike Fm Purbeck Upper Hibernia Mbr Equivalent Hibernia Sól Perch Fr Formati Valhall Sst Berriasian K11 ver Hibernia Memb Fm Mbr Equivalent' Pollan F É Fortune Bay Shale jp~ S ation Dawr Dursey Fp "Baccalieu JURASSIC Late Jurassic Tithonian **UJ44** Jeanne D'🎸 R **Knockadoon Formation** ndstone UJ4C Formatio Member" ~~mm $\mathcal{M}$ \*After McAlphine 1990, Deptuck et al. 2003 \*\*In part after Ainsworth et al. 2015

#### Linking Ireland's offshore basins with Eastern Canada

#### International significance

- To our knowledge, no similar study on the same scale has been carried out for any other petroleum province
- Helpful to align new scheme with recently published OGA/Lloyds Register UKCS mapping.
- Potential benefits for producing areas e.g. NE Canada and the UKCS



## Benefits of this study and the collaborative regional approach

- This stratigraphic study reduces uncertainty and improves geological understanding for *all* stakeholders
- Promotes consistent and efficient reporting
- If we are going to produce fossil fuels, it is best to do so efficiently and safely
- Useful for progressive applications e.g. Geothermal, CCS and energy storage



## Acknowledgements

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# **Thank you for listening**

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