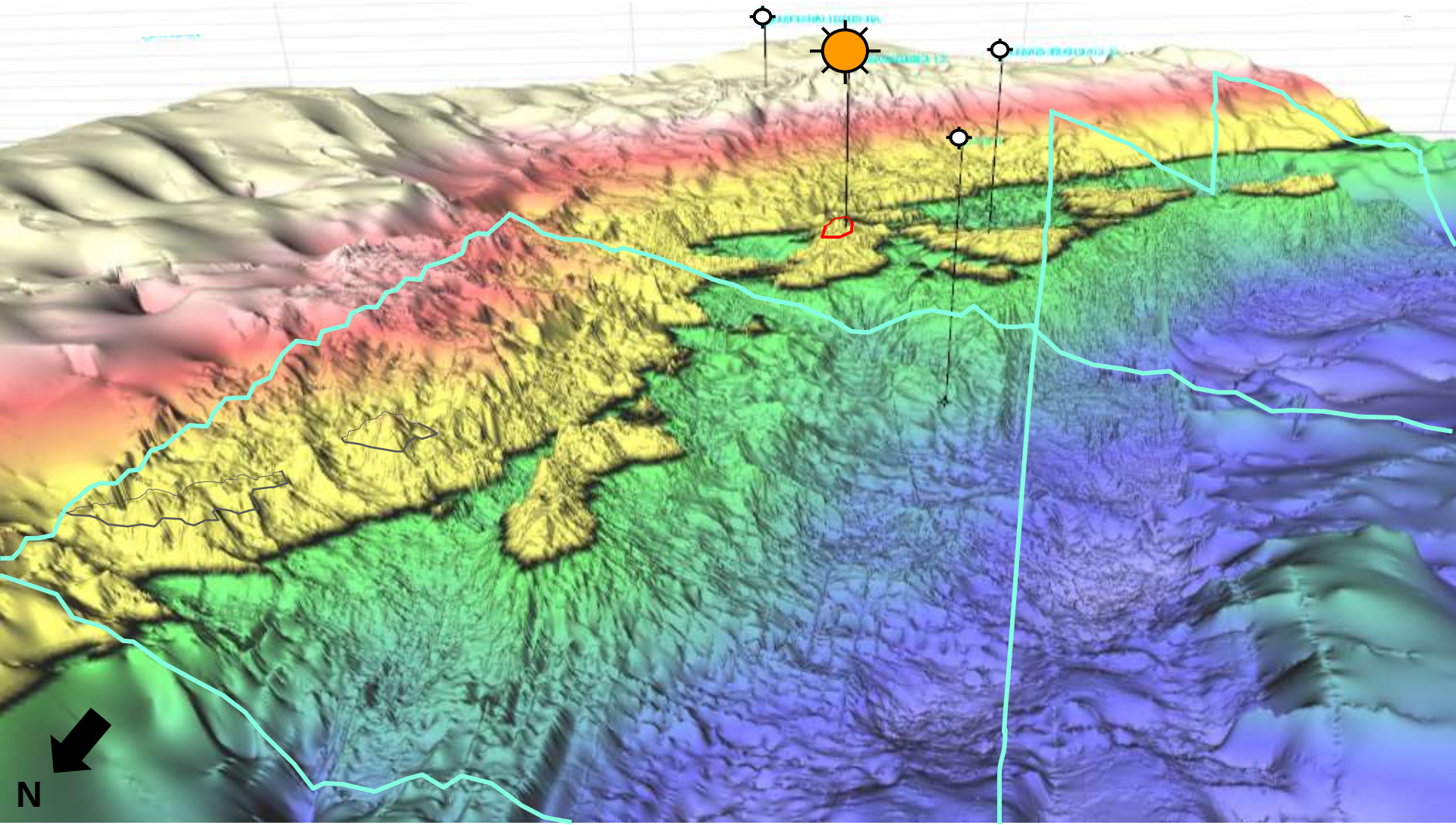
Petroleum Potential of the Irish Atlantic Margin

SERICA ENERGY



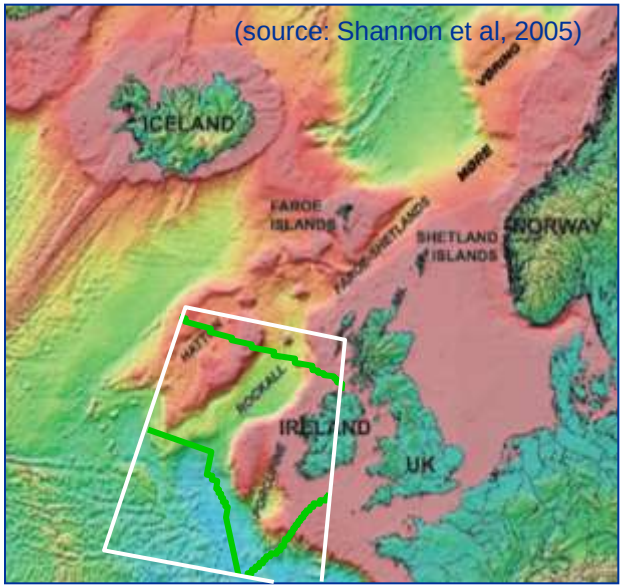
Ian Vann and Graham Pritchard

Finding Petroleum, Tuesday October 30th 2012

THE IRISH ATLANTIC MARGIN

Location & Bathymetry

SERICA ENERGY



Bathymetry

Equivalent of UK Quad

Serica FEL 1/09 & LO 11/1

Serica FEL 1/06

(source: PAD / Ternan, 2006)

- Wide shelf down to the oceanic / continental boundary at the 4000m bathymetric contour
- Dominant bathymetric features:
  - the shallow water Irish Platform, Porcupine Bank and Goban Spur,
  - and the deep water Rockall Trough and Porcupine Seabight

THE IRISH ATLANTIC MARGIN

Wells & Discoveries

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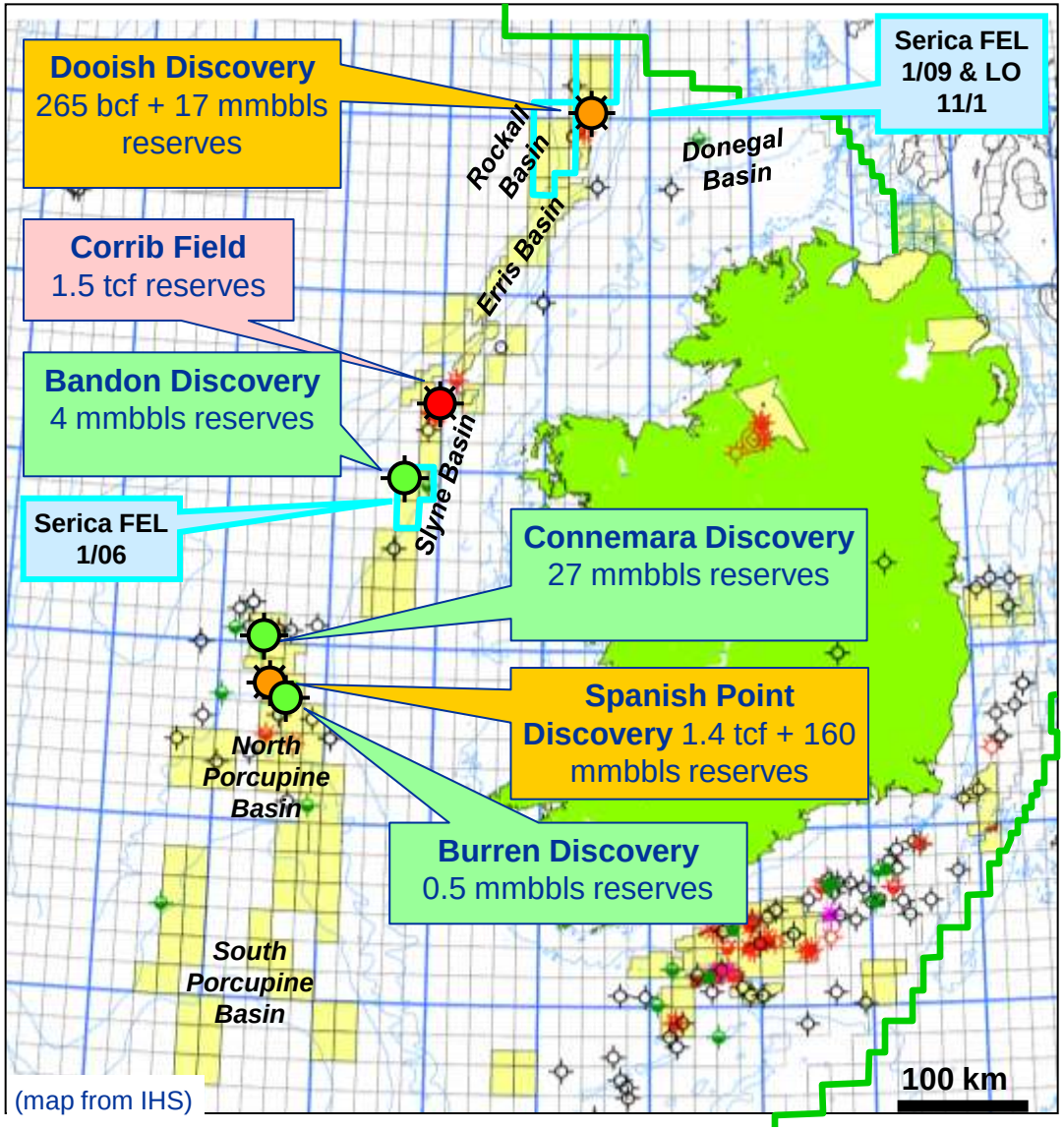


(map from IHS)

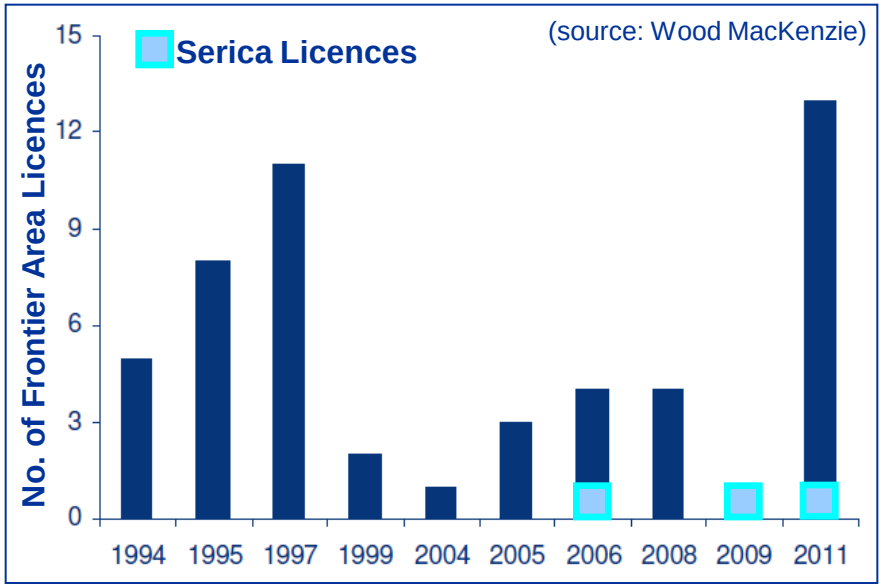
- Just 50 wells drilled along the Irish Atlantic Margin to date (includes appraisal wells but not sidetracks)
- One commercial gas field:
  - **Corrib** 1.5 tcf
- Two potentially commercial gas / condensate fields:
  - **Dooish** 265 bcf + 17 mmbbls
  - **Spanish Point** 1.4 tcf + 160 mmbbls
- Three sub-commercial oil discoveries:
  - **Bandon** 4 mmbbls
  - **Connemara** 27 mmbbls
  - **Burren** 0.5 mmbbls
- Numerous oil and gas shows in other wells

** figures are proven recoverable reserve estimates from IHS and other publicly available sources*

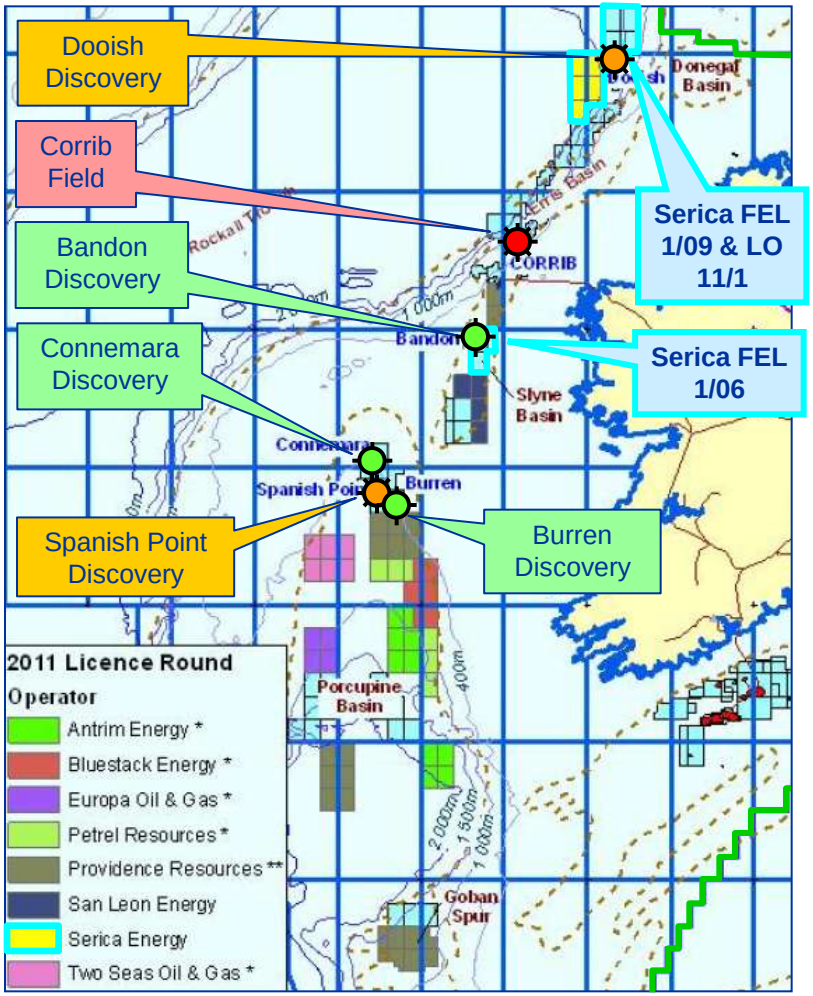
THE IRISH ATLANTIC MARGIN

Current Acreage Position

SERICA ENERGY



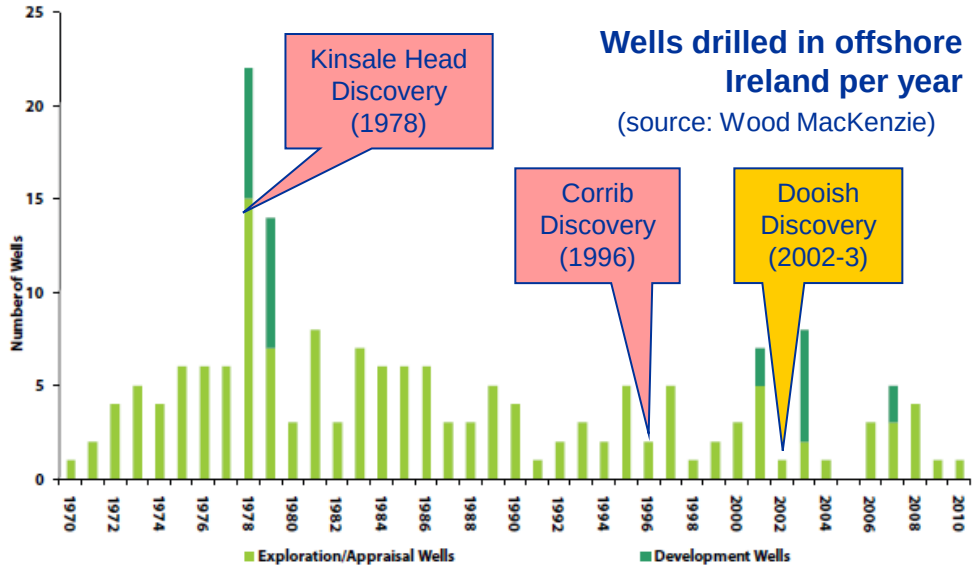
- Despite proven hydrocarbons, few blocks licensed over the last 15 years
- Huge areas remain unlicensed and unexplored
- Recent surge in interest by independent E&P companies (2011 Frontier Round)

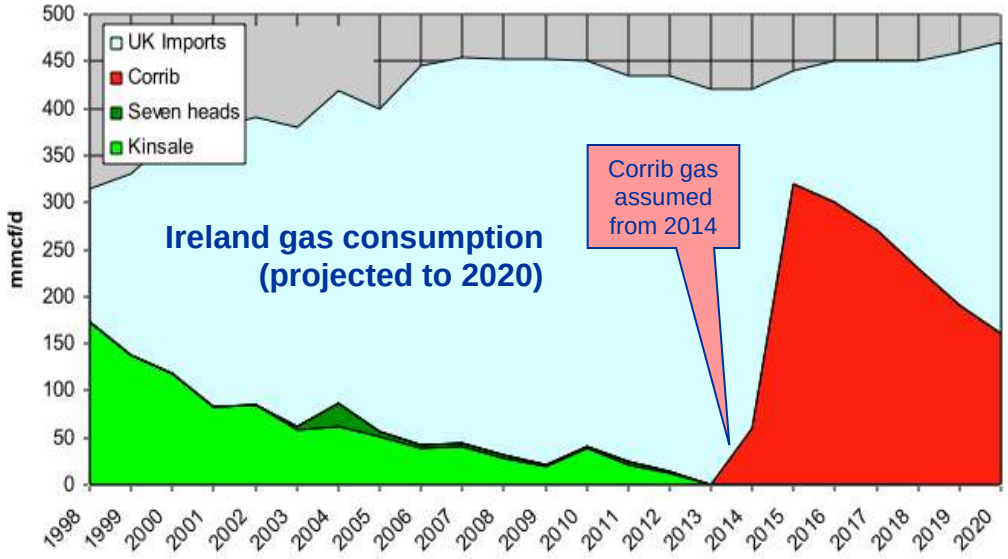


(source: Wood MacKenzie)

WHY IRELAND?
Commercial Factors

SERICA ENERGY





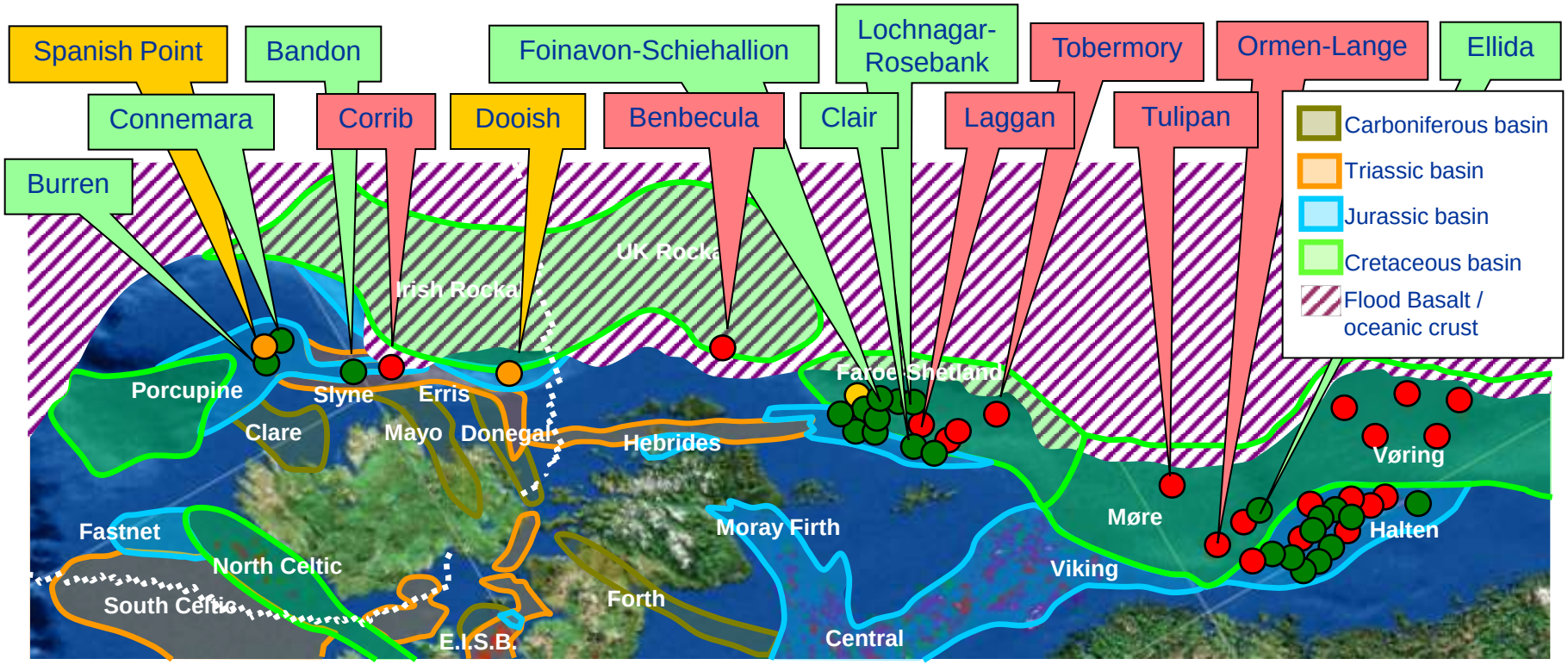
- Strong market for domestic oil and gas production (Ireland imports 95% of it's gas and 100% of it's oil)
- Good onshore Irish gas distribution network
- Access to UK and European oil and gas markets
- Stable politically and economically
- Corporation tax regime (25%) one of the best in the world
- Yet-to-find: 3 bboe in Porcupine Basin, and 5 bboe in Rockall Basin (PAD estimate, 2006)

WHY IRELAND?

Geological Factors

SERICA ENERGY

- Shared geology with UK, Faroe & Norwegian Atlantic margins
- Numerous overlapping basins and multiple phases of rifting
- More than one proven play
- Six oil and gas fields / discoveries
- Numerous wells with oil shows
- Numerous pre, syn and post-rift reservoirs & seals
- Several proven source rocks
- Salt locally enhances structure
- Many large undrilled structures
- Significant stratigraphic upside
- Indications of gas on seismic



WHY NOT IRELAND?

SERICA ENERGY

- Herd instinct?
  - the herd is currently grazing elsewhere…
    … in Africa!
- Perceived lack of exploration success?
  - Despite very few wells, the Irish Atlantic is similar to the UK & Norway in terms of drilling success rates
- Lack of geological understanding?
  - Diversity of play types and similarity to other North Atlantic Margin basins is not appreciated
- Hostile operating environment?
  - But similar to other proven North Atlantic basins
  - Many plays are not in deep water
- Remote location?
  - Large HC volumes needed to establish commerciality
  - But the potential for large HC volumes is proven
- The “Corrib Factor”?
  - Well-publicised local opposition to the gas landfall and processing facility for the Corrib Field
  - A perception that Ireland is a difficult place to conduct E&P business

ATLANTIC MARGIN NW EUROPE

gCOS & cCOS (at 2011)

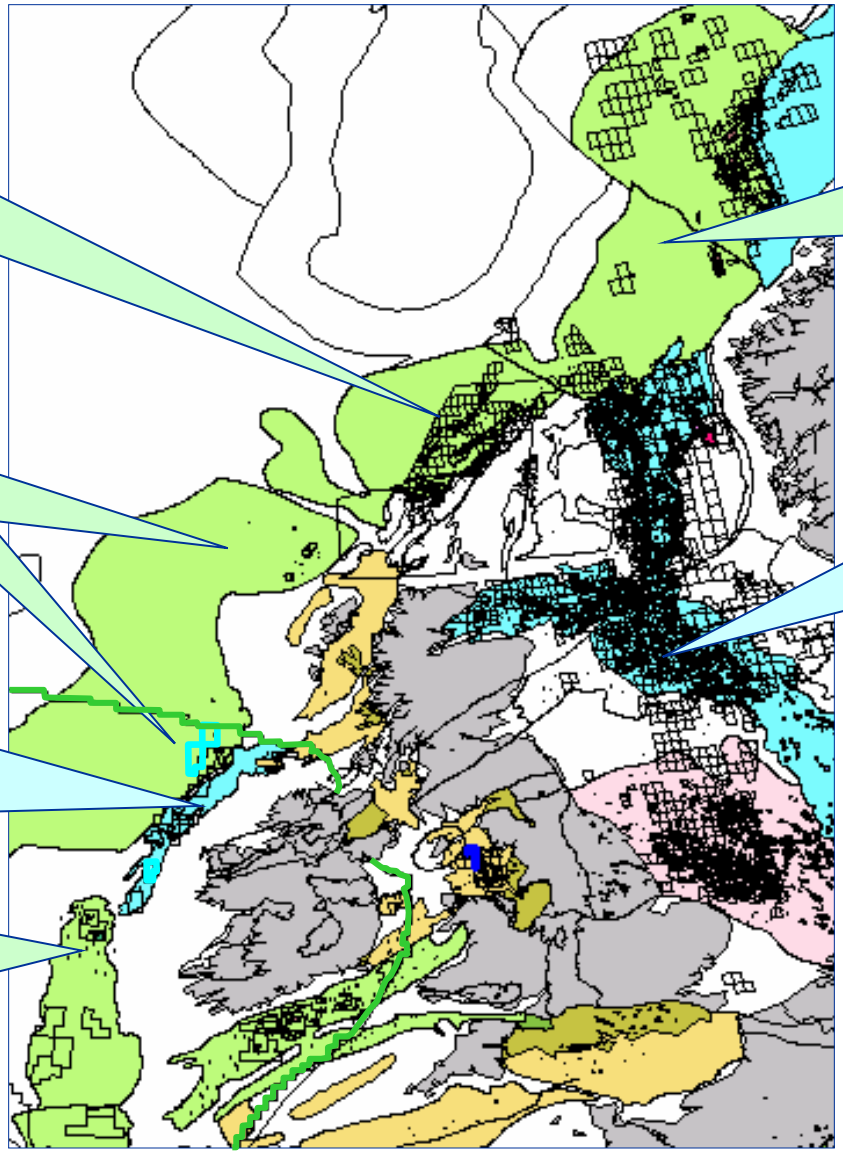
SERICA ENERGY

Faroe-Shetland
102 wells
14 discoveries
6 fields
gCOS 18%
cCOS 6%

Rockall (UK/Ire)
17 wells
3 discoveries
0 fields
gCOS 18%
cCOS 0%

Slyne-Erris-Donegal
11 wells
2 discoveries
1 field
gCOS 18%
cCOS 9%

Porcupine
26 wells
3 discoveries
0 fields
gCOS 11%
cCOS 0%



Møre/Vøring
65 wells
14 discoveries
1 field
gCOS 23%
cCOS 2%

Central Graben
856 wells
117 discoveries
125 fields
gCOS 28%
cCOS 15%

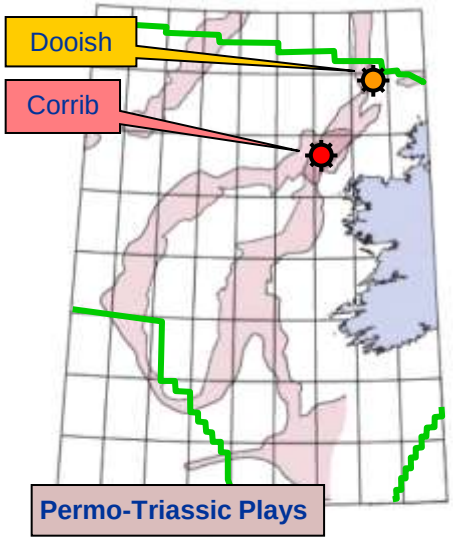
- Ireland gCOS and cCOS comparable to UK and Norway Atlantic basins

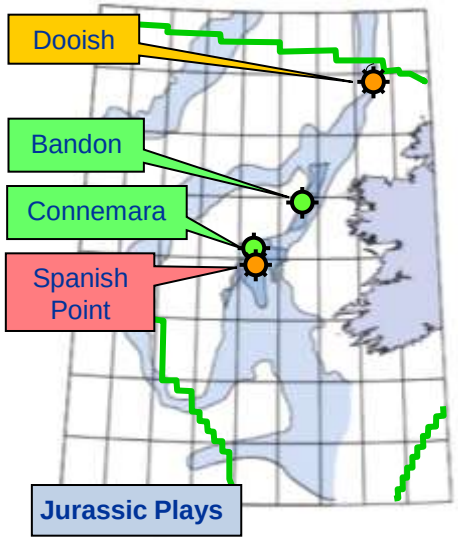
IRELAND ATLANTIC MARGIN

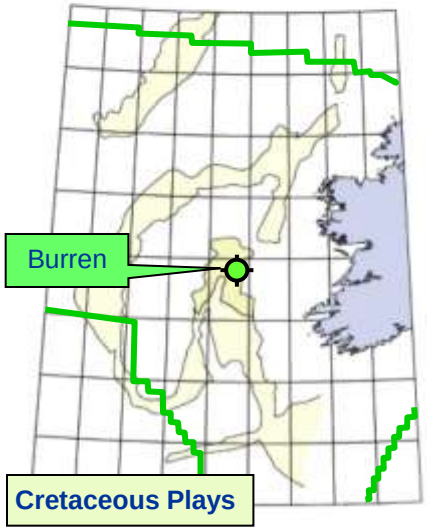
Play Fairways

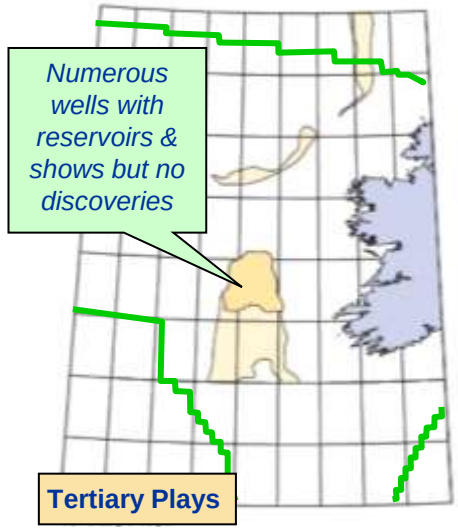
SERICA ENERGY

	Reservoir	Source	Seal
Eocene	possible	none	probable
Palaeocene	Probable	none	probable
Upper Cretaceous	Possible	none	probable
Lower Cretaceous	PROVEN	possible	PROVEN
Upper Jurassic	PROVEN	PROVEN	PROVEN
Middle Jurassic	PROVEN	PROVEN	PROVEN
Lower Jurassic	PROVEN	PROVEN	PROVEN
Triassic	PROVEN	none	PROVEN
Permian	PROVEN	none	probable
Carbonif-erous	Probable	PROVEN	none









darker shading = proven areas

(source: PAD / Ternan, 2006)

ATLANTIC MARGIN OIL & GAS FIELDS
Hydrocarbons & Source Rocks

SERICA ENERGY

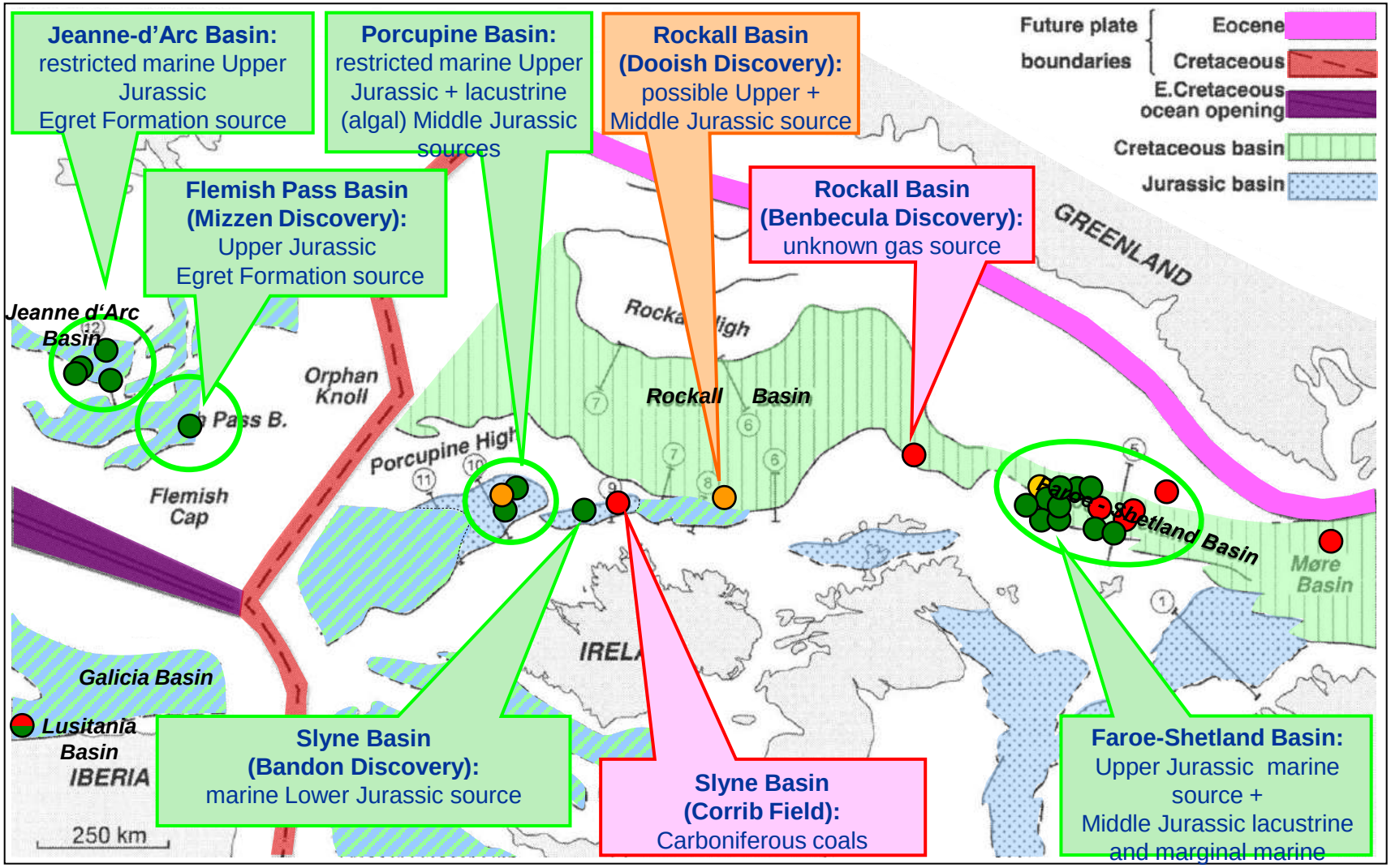


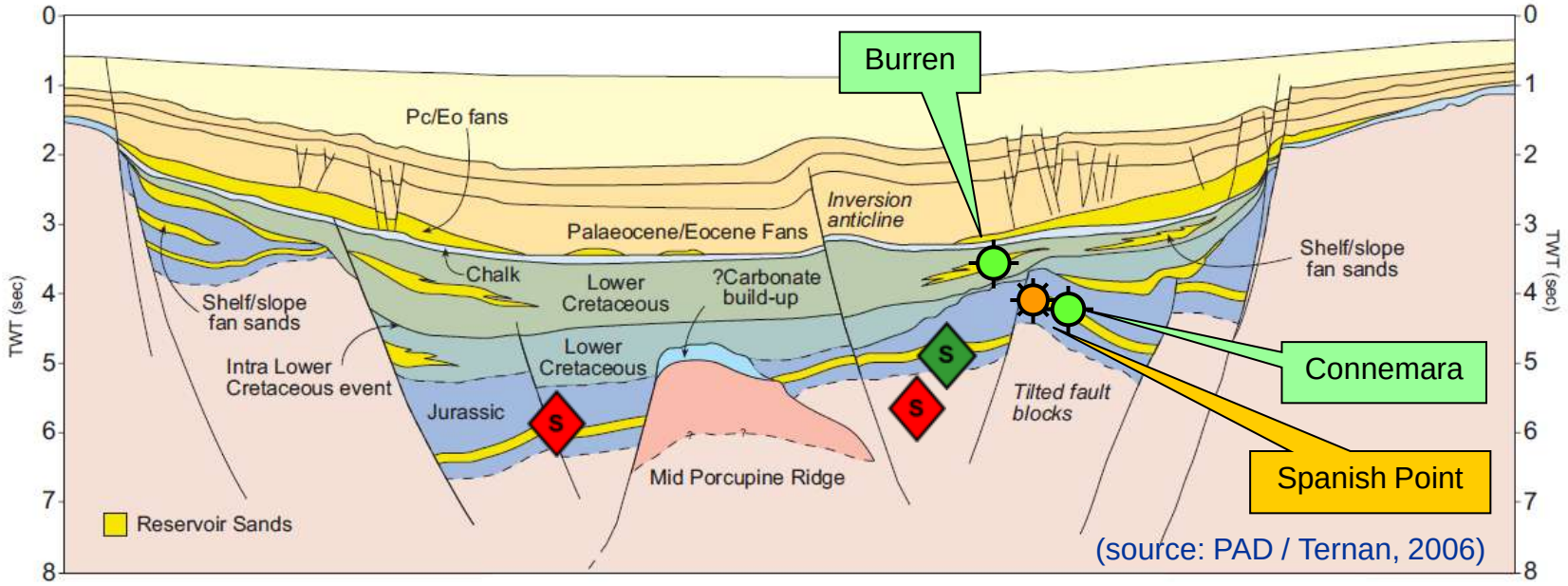
Plate Reconstruction at Barremian , 130 Ma

(After Spencer & MacTiernan, 2001)

PORCUPINE BASIN

Geoseismic Section illustrating Key Plays

SERICA ENERGY



(source: PAD / Ternan, 2006)

Reservoir

- Permo-Triassic continental sandstones
- Jurassic shallow to deep marine sandstones
- Cretaceous shelf/slope turbidite fan sandstones
- Cretaceous carbonate build-ups (un-proven)
- Tertiary fan sandstones

Trap

- Jurassic conventional tilted fault blocks
- Cretaceous to Tertiary Stratigraphic pinch-outs
- Localized inversion anticlines
- Carbonate build-ups over palaeo-relief (un-proven)

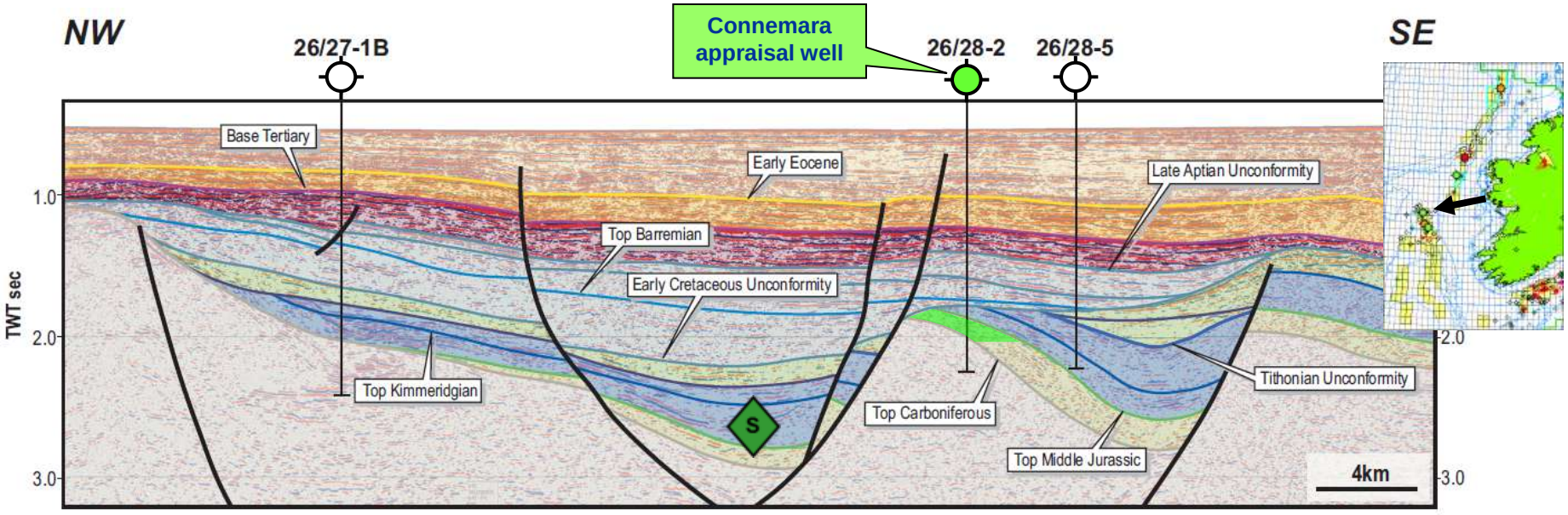
Source

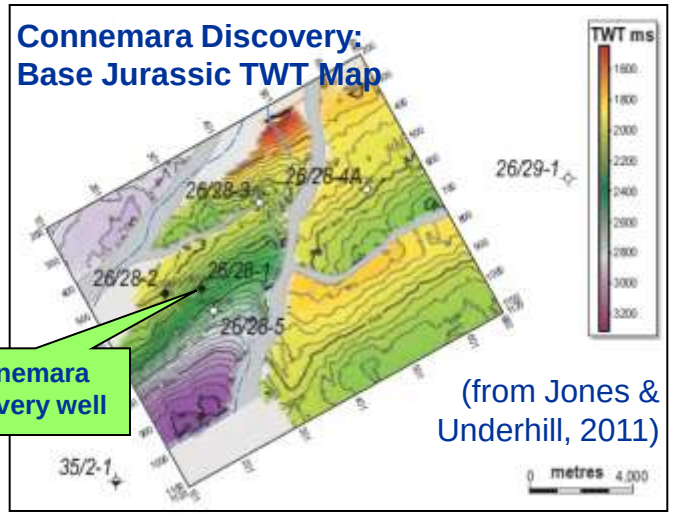
- Upper Jurassic restricted marine oil shales (Kimmeridge Clay equivalent)
- Middle Jurassic lacustrine (algal) oil shales
- Possible Carboniferous coals & oil shales

PORCUPINE BASIN

Structural Traps – The Connemara Discovery

SERICA ENERGY



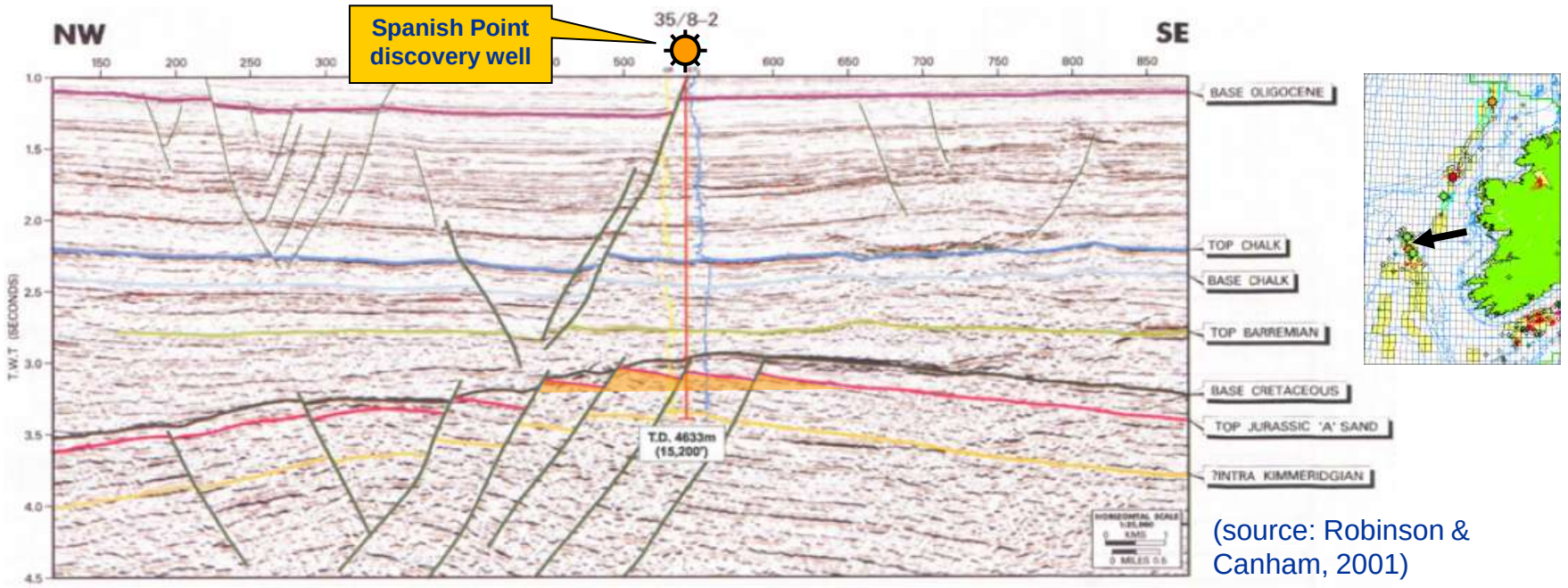


- Connemara discovery well 26/28-1 (Phillips, 1979): 5589 bopd 32 to 38 °API oil from high quality Middle and Upper Jurassic fluvial to shallow marine sandstones
- Fault and dip-closed trap, depth 1900 to 2200 mSS
- STOIIP reportedly 200 mmbo (MacDonald *et al*, 1987)
- Appraisal drilling by Statoil in 1997-98: low flow-rates and rapid decline in pressures
- Complex reservoir heterogeneity implicated
- Recoverable reserves currently reported at 26.5 mmbo

PORCUPINE BASIN

Structural Traps – The Spanish Point Discovery

SERICA ENERGY

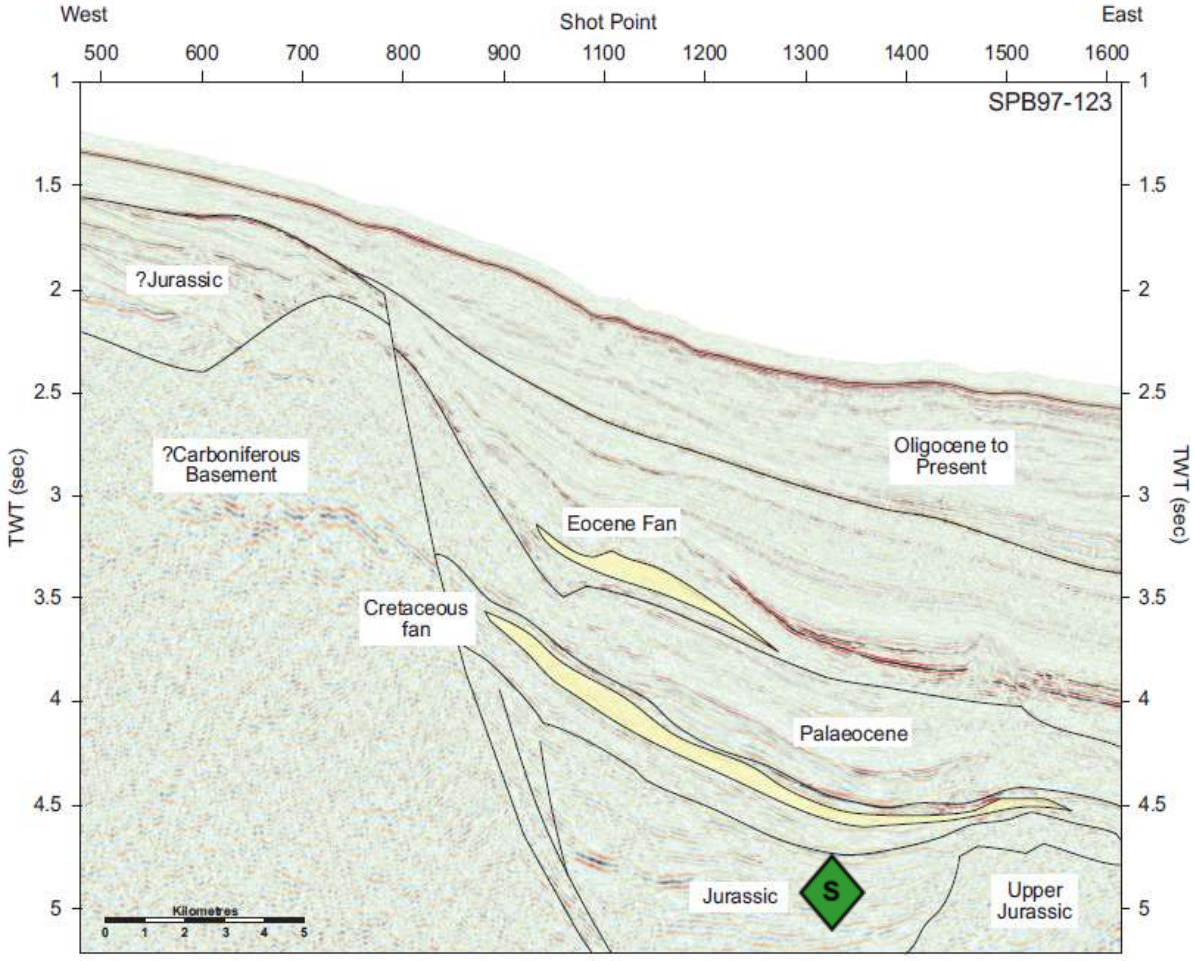


(source: Robinson & Canham, 2001)

- Spanish Point discovery well 35/8-2 (Phillips, 1981): over 300m gross hydrocarbon column within stacked Upper Jurassic turbidite channel-lobe sands
- “Brent-style” fault and dip closed terraces; depth to top reservoir approximately 4000 mSS
- Despite over-pressure, flowed only 925 bpd 40 °API condensate + 4.85 mmscfg/d
- Low permeability – lithic sandstones suffering deep burial and diagenetic cementation
- In-place resource of up to 1.4 tcf + 280 mmbbls condensate (200 mmboe recoverable)
- Planned appraisal drilling in 2013 – horizontal drilling and fracture stimulation?

PORCUPINE BASIN
Stratigraphic Traps

SERICA ENERGY



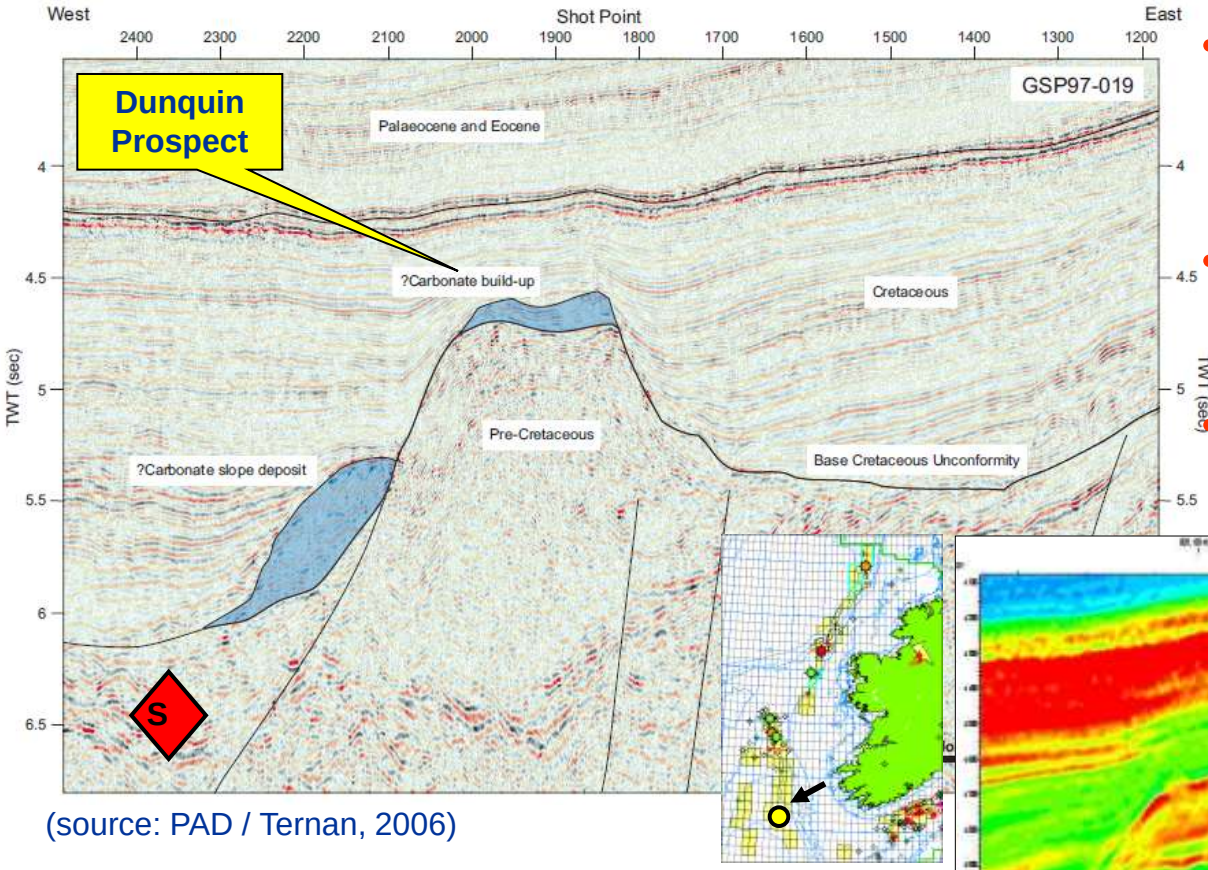
(source: PAD / Ternan, 2006)

- Lower Cretaceous stratigraphic play proven by Burren Discovery
- Burren discovery well 35/8-1: 730 bopd from Barremian marine sandstones, 3850 mSS depth
- Thin, poor-quality reservoir at this location and depth
- Current estimated recoverable oil 0.5 mmbbls
- Palaeogene stratigraphic play concept proven by 200 bcf Benbecula Discovery (UK Rockall Basin)

PORCUPINE BASIN

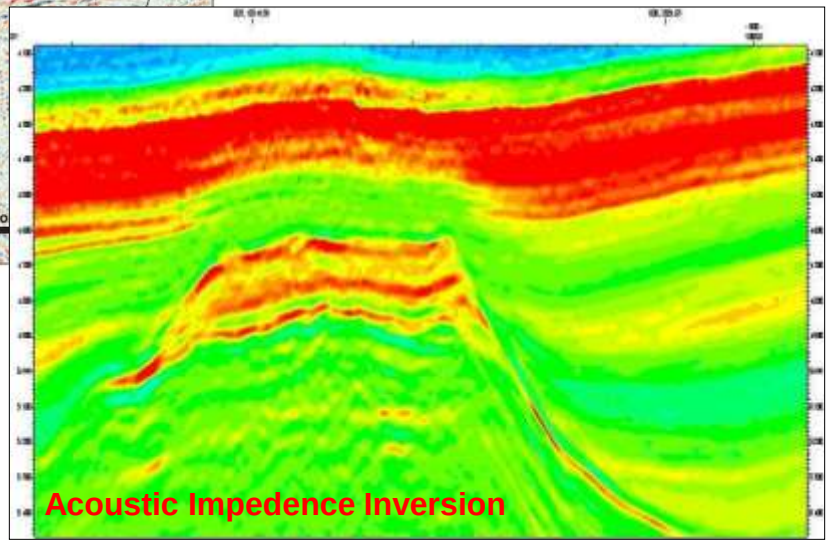
Undrilled Carbonate Play

SERICA ENERGY



(source: PAD / Ternan, 2006)

- Multi-tcf Dunquin Prospect located on median ridge of South Porcupine Basin, drilling 1Q 2013
- Seismic interpretation is consistent with a carbonate build-up
- P50 resource reported as 1.7 Bboe



(source: Jones, Hardy & O'Sullivan, 2010)

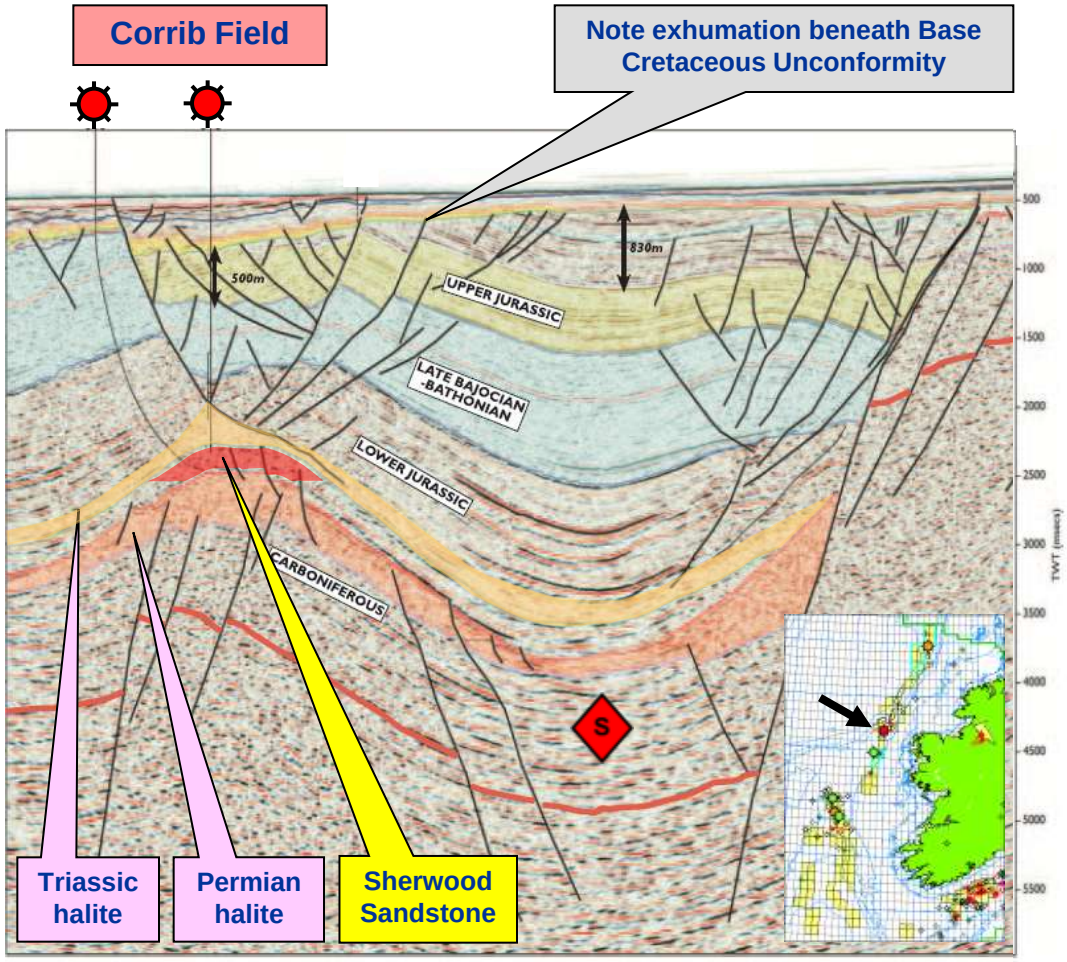
- Regional seismic mapping & geological studies suggest Upper Jurassic Kimmeridge Clay source will be in the gas window in this part of the basin

SLYNE BASIN

Structural Traps – The Corrib Field

SERICA ENERGY

- Corrib discovery well 18/20-1 (Enterprise, 1996): 61m gas column in continental Triassic Sherwood Sandstone
- Appraisal well 18/20-2z: 63 mmscfg/d dry gas from 185m gas column
- Good quality reservoir despite deep burial (~3500 mSS current depth)
- Simple anticlinal trap, with complex faulted overburden structurally detaching into Triassic Mercia halite top-seal
- Carboniferous gas source proven within Slyne Basin (Coal Measures in 27/5-1) but not penetrated locally

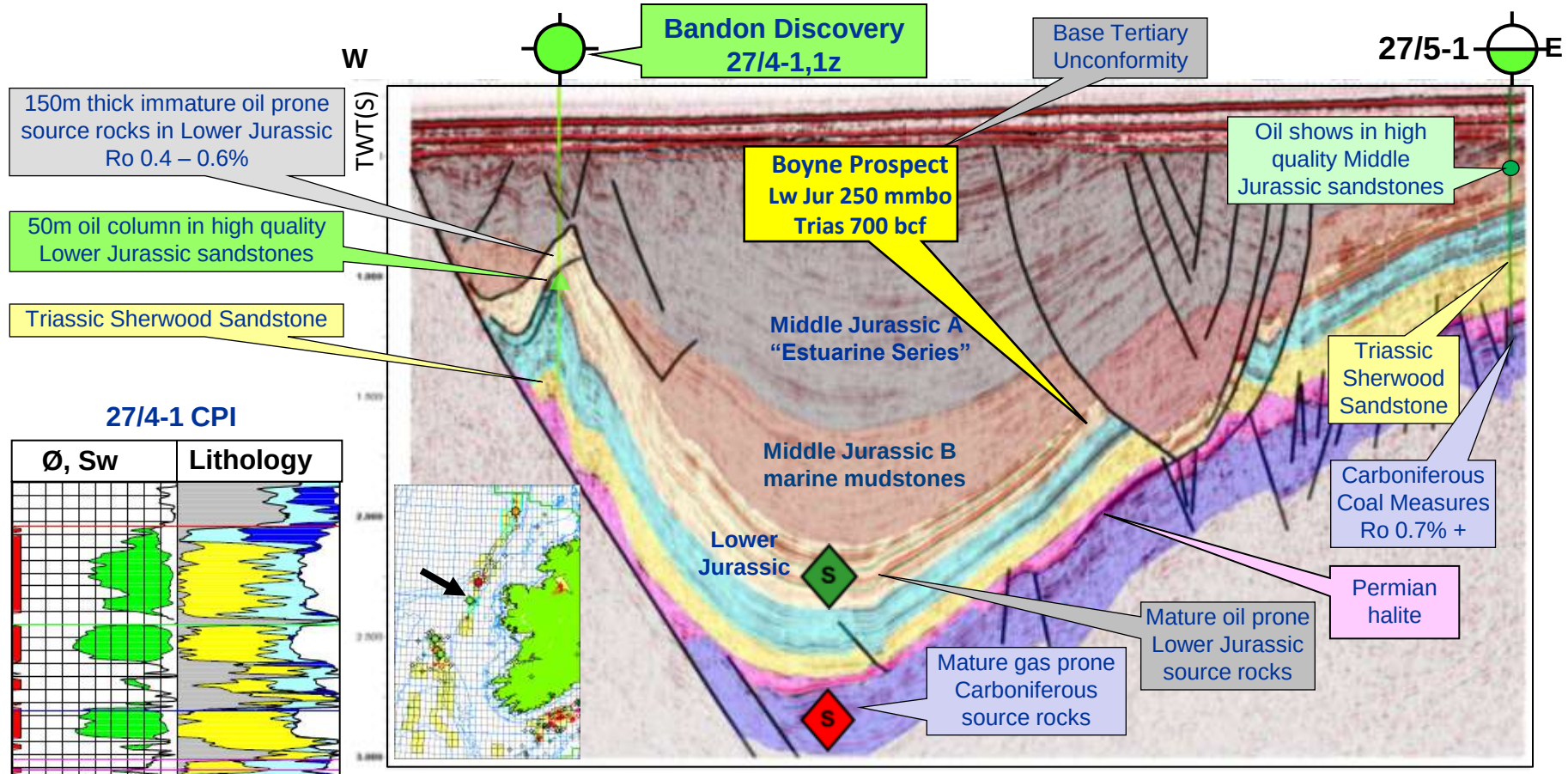


(source: Corcoran & Meckelenburgh, 2005)

SLYNE BASIN

Structural Traps – The Bandon Discovery

SERICA ENERGY



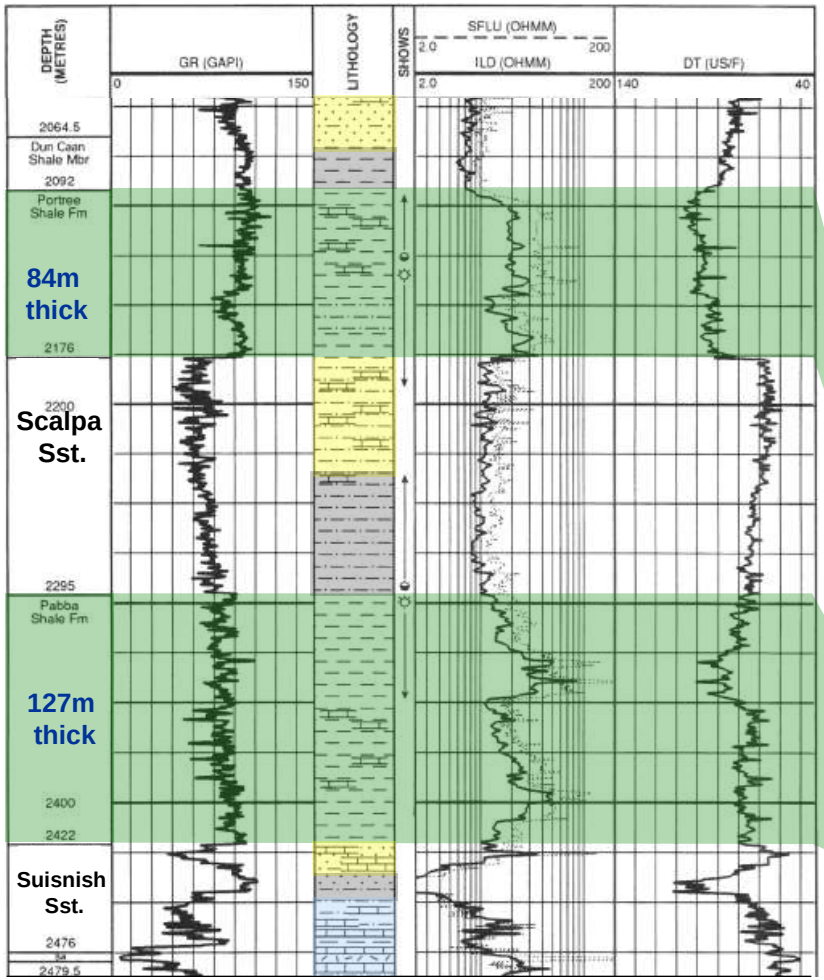
- Bandon discovery well 27/4-1,1z (Serica, 2009) encountered a 50m gross oil column (15 °API) in excellent-quality shallow marine to estuarine Lower Jurassic sandstones, at ~1100 mSS depth
- Oil geochemically typed to Lower Jurassic (Liassic) marine shales
- Bandon discovery (STOIIP 12 mmbbls) has proven a new play

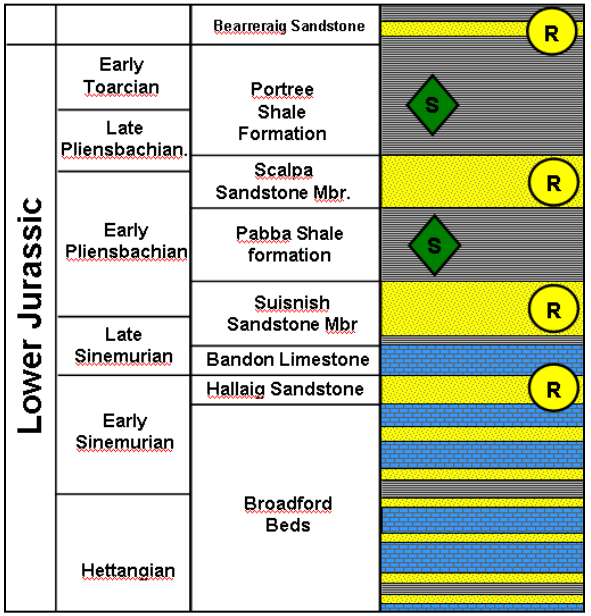
SLYNE BASIN

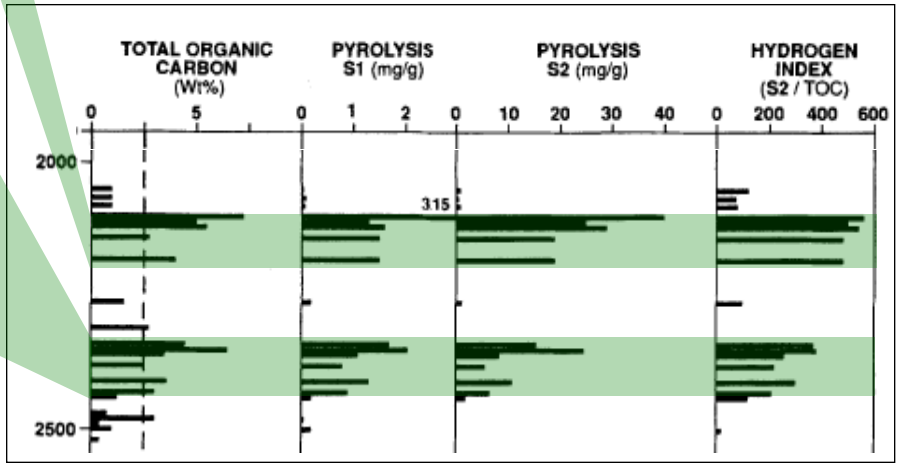
Lower Jurassic Source & Reservoir

SERICA ENERGY

Lower Jurassic (Liassic); 27/13-1







Geochemistry data after Scotchman & Thomas (1995)

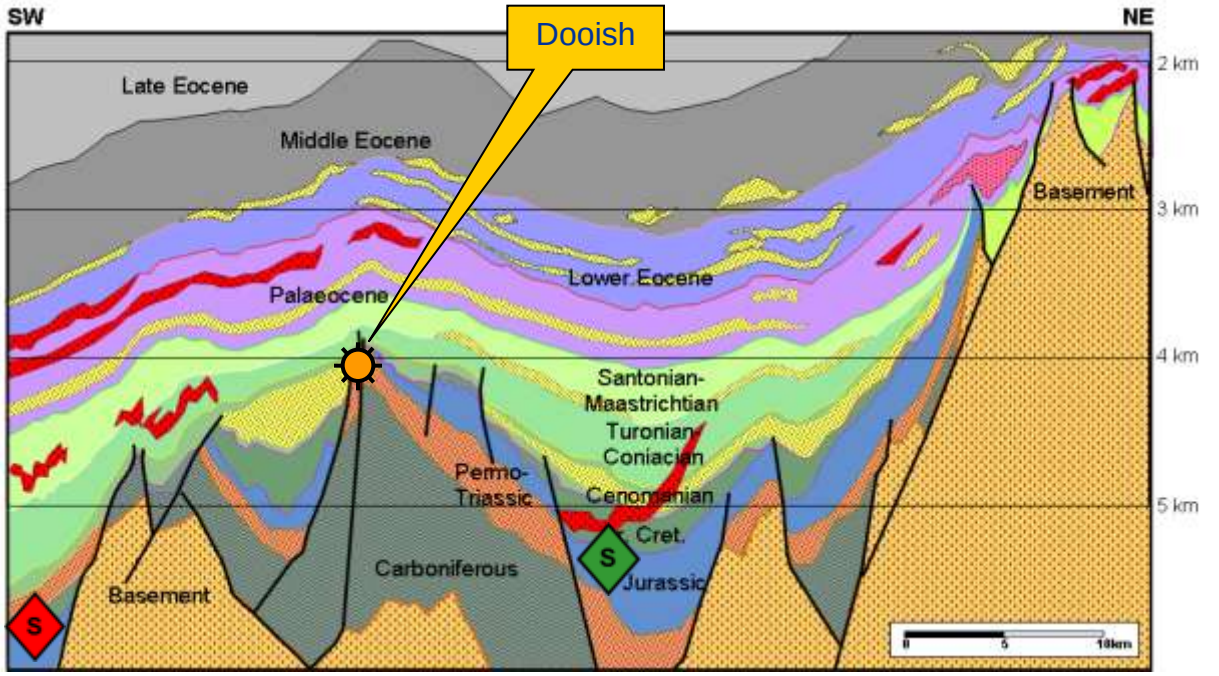
SLYNE-ERRIS BASIN

Geoseismic Section illustrating Key Plays

SERICA ENERGY

Reservoir

- Fractured basement play?
- Carboniferous fluvio-deltaic sandstones
- Permian/Triassic continental sandstones
- Lower Jurassic marine shallow marine sandstones
- Middle Jurassic continental / fluvial sandstones
- Upper Jurassic shallow to deep marine sandstones
- Cretaceous shelf/slope turbidite fan sandstones
- Palaeocene & Eocene turbidite fans



Trap

- Pre-Cretaceous conventional tilted fault blocks
- Post-Cretaceous drape anticlines
- Cretaceous to Tertiary stratigraphic pinch-outs

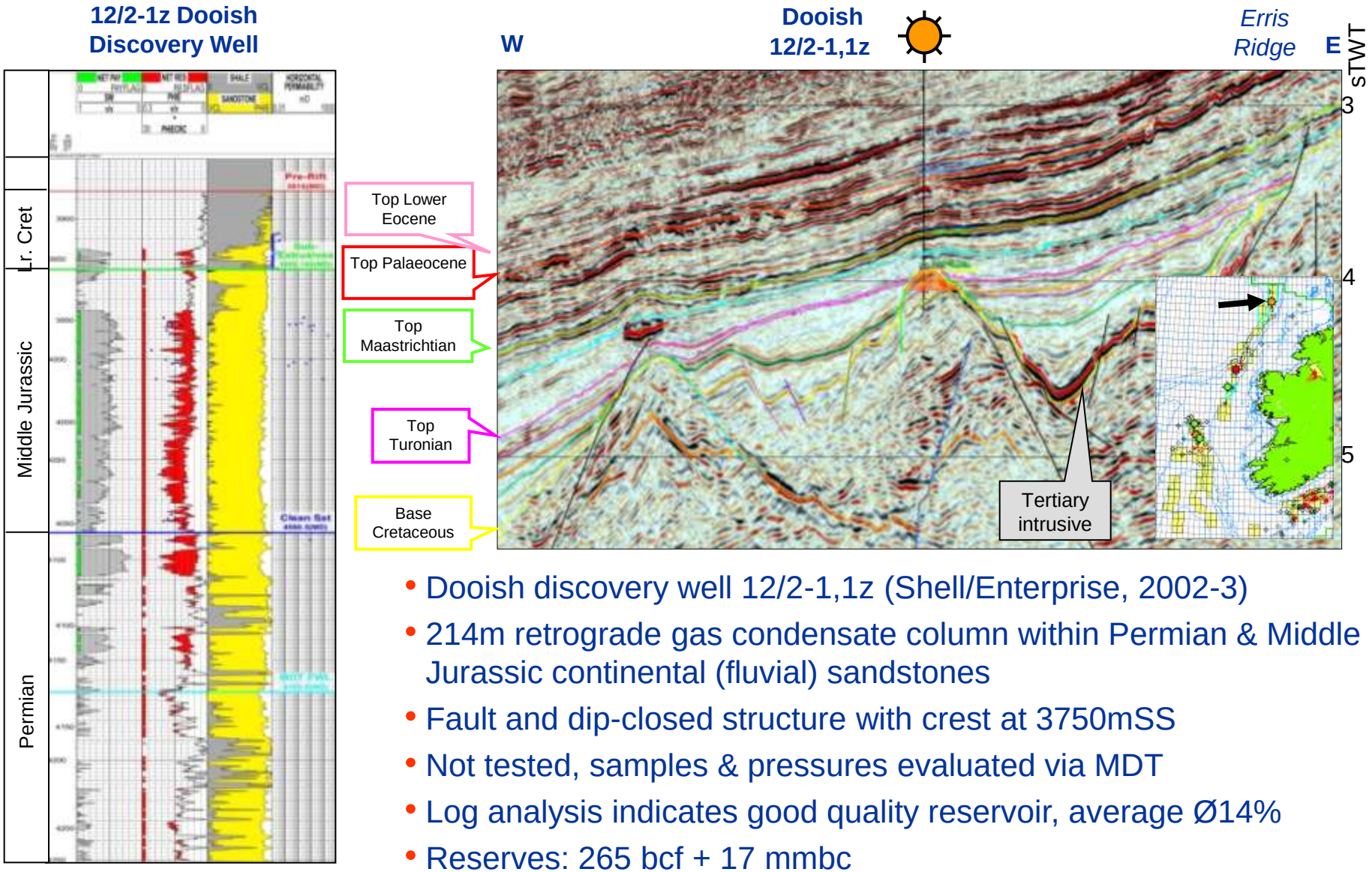
Source

- Upper Jurassic oil shales (Kimmeridge Clay equivalent)
- Middle/Lower Jurassic oil shales
- Carboniferous coals & oil shales

SLYNE ERRIS BASIN

Structural Traps – The Dooish Discovery

SERICA ENERGY

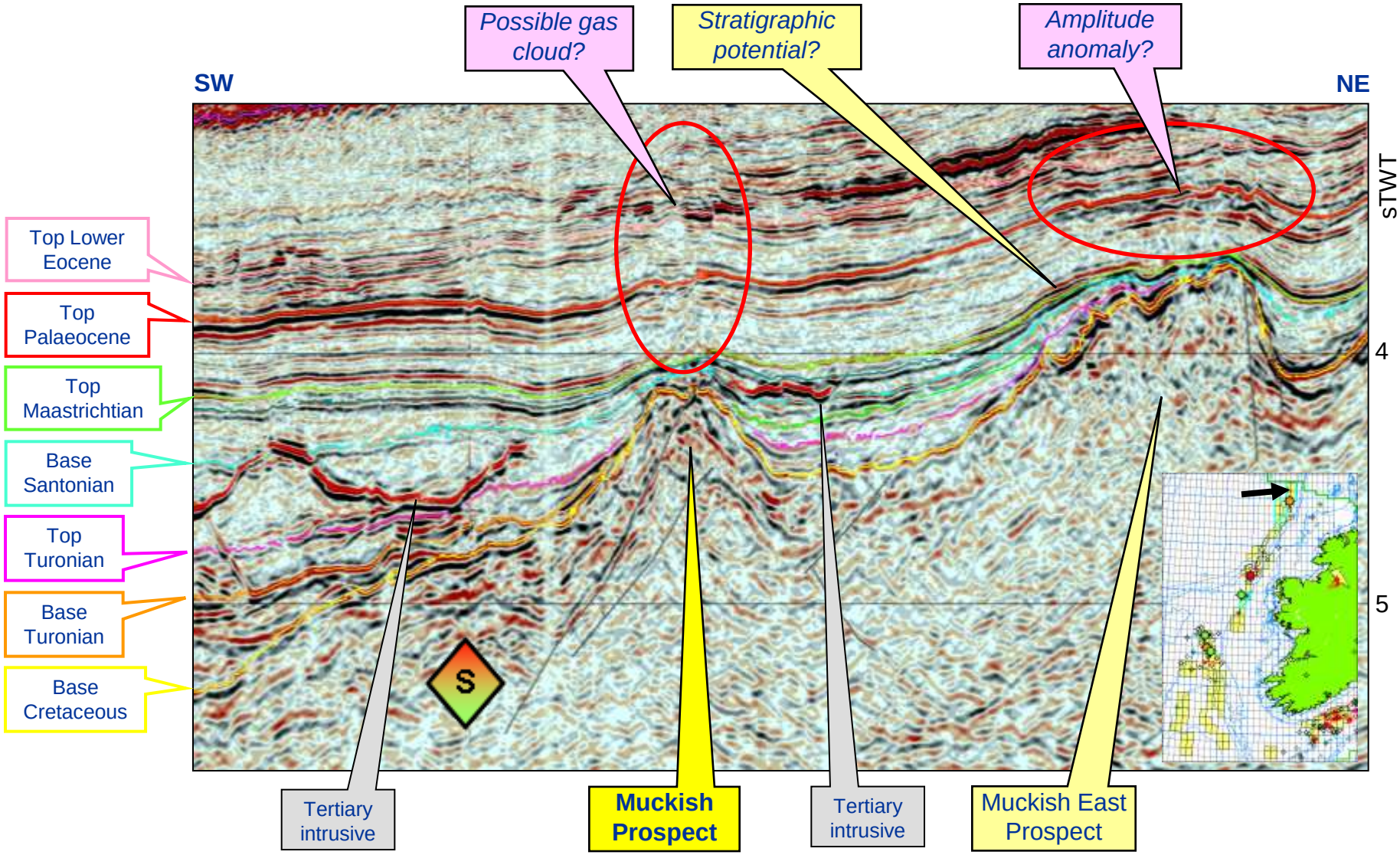


- Dooish discovery well 12/2-1,1z (Shell/Enterprise, 2002-3)
- 214m retrograde gas condensate column within Permian & Middle Jurassic continental (fluvial) sandstones
- Fault and dip-closed structure with crest at 3750mSS
- Not tested, samples & pressures evaluated via MDT
- Log analysis indicates good quality reservoir, average Ø14%
- Reserves: 265 bcf + 17 mmbc

SLYNE ERRIS BASIN

Undrilled Structural Trap – The Muckish Prospect

SERICA ENERGY



SLYNE ERRIS BASIN

Undrilled Structural Trap – The Muckish Prospect

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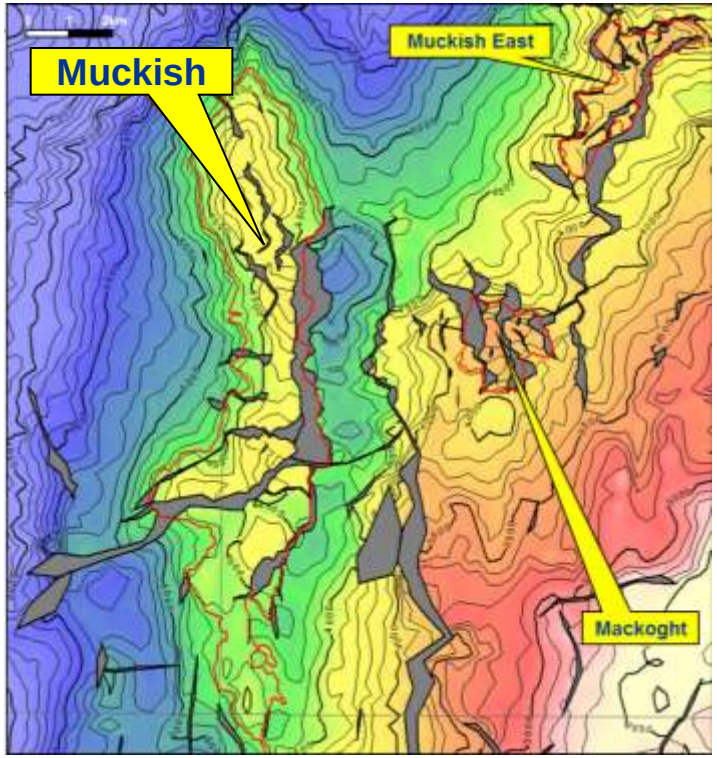
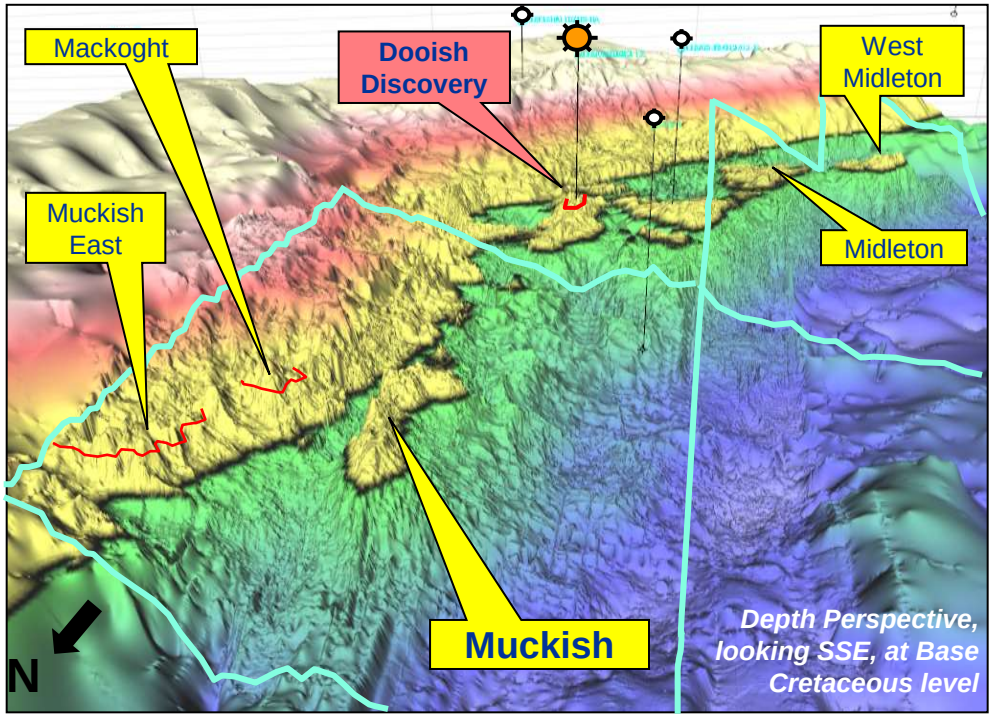
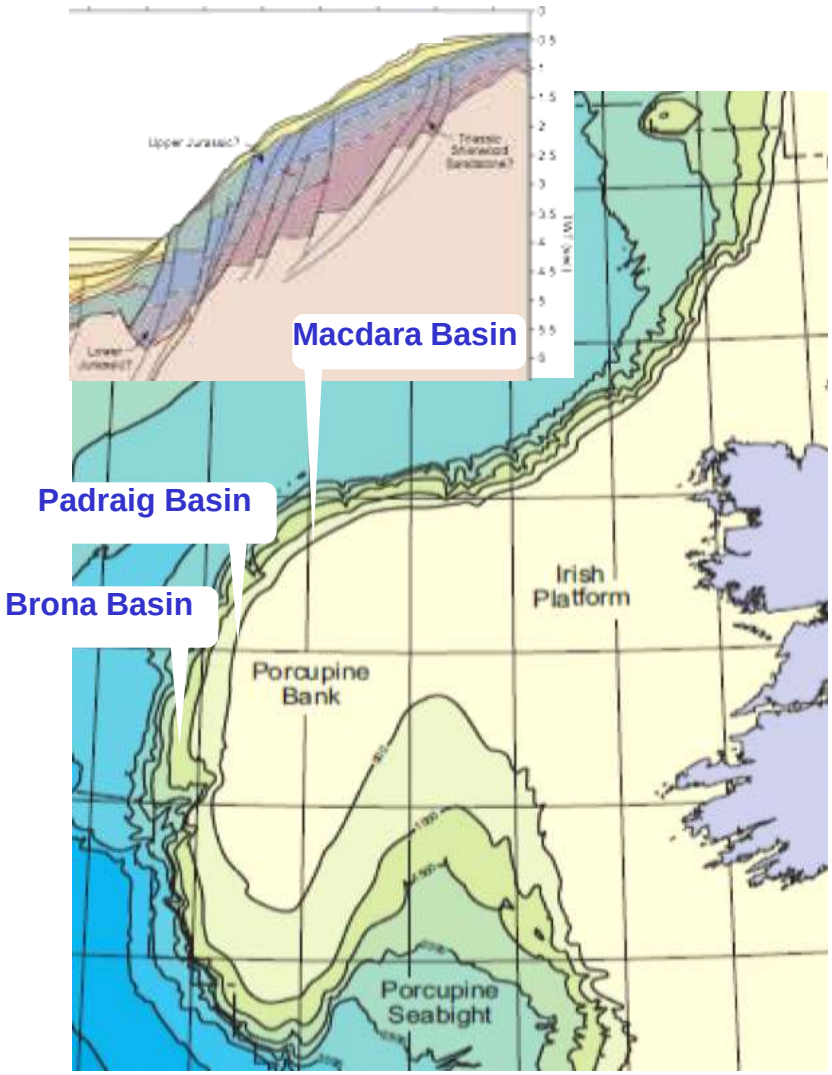


Muckish Prospective Reserves	P_{90}	P_{50}	P_{10}	COS
Gas bcf	250	1300	3500	20%
Condensate mmbbls	30	165	450	

- Large tilted fault block analogous to the Dooish Discovery
- Most likely depth of closure at 4650 mSS
- 31 km^2 areal closure and over 600 m of vertical closure



OTHER ROCKALL MARGINAL BASINS



Source; PAD/Ternan 2006

- Several wholly unexplored pre-Cretaceous basins occur along the Rockall Margin
- Water depths range from 500m 2500m on a steep continental slope
- Each has an areal extent of a few thousand square kilometres
- Typically they contain 3 to 6 km of pre-Cretaceous sediment
- Likely to be similar to Slyne-Erris Basin containing Permo-Trias to Upper Jurassic sediments
- Each basin is associated with thermogenic hydrocarbons in sea-bed gravity cores

Irish Atlantic Margin

Summary

SERICA ENERGY

STRENGTHS	OPPORTUNITIES
• Proven multiple play systems • Proven oil and gas fields, discoveries, shows in wells, surface seeps • Analogous geology to prospective UK, Norway and Canadian Atlantic Margins • Excellent fiscal regime and stable political climate	• Huge areas of Rockall and Porcupine basins remain virtually unexplored • Very large undrilled structures with significant commercial potential • Very strong demand for indigenous oil and gas production • Easy access to UK and European markets
WEAKNESSES	**THREATS**
• Limited well and seismic data control • Few 3D seismic surveys • Long distance from shore • Deep water and North Atlantic weather operating conditions	• The “Corrib Factor”: environmental opposition

Acknowledgements

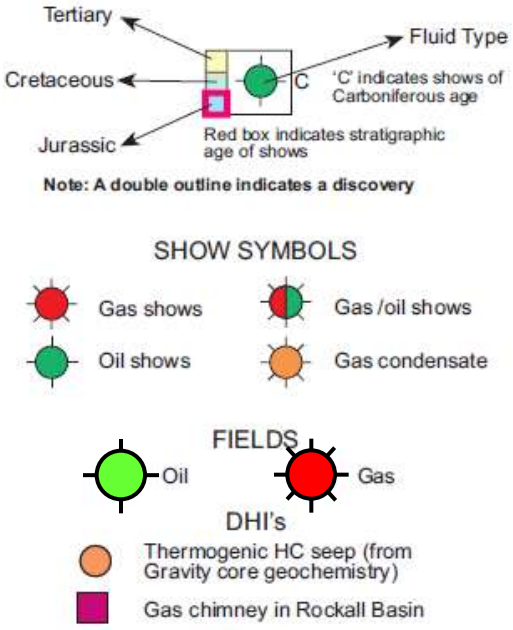
Serica Energy plc
TGS Nopec
PGS
Petroleum Affairs Division, Ireland

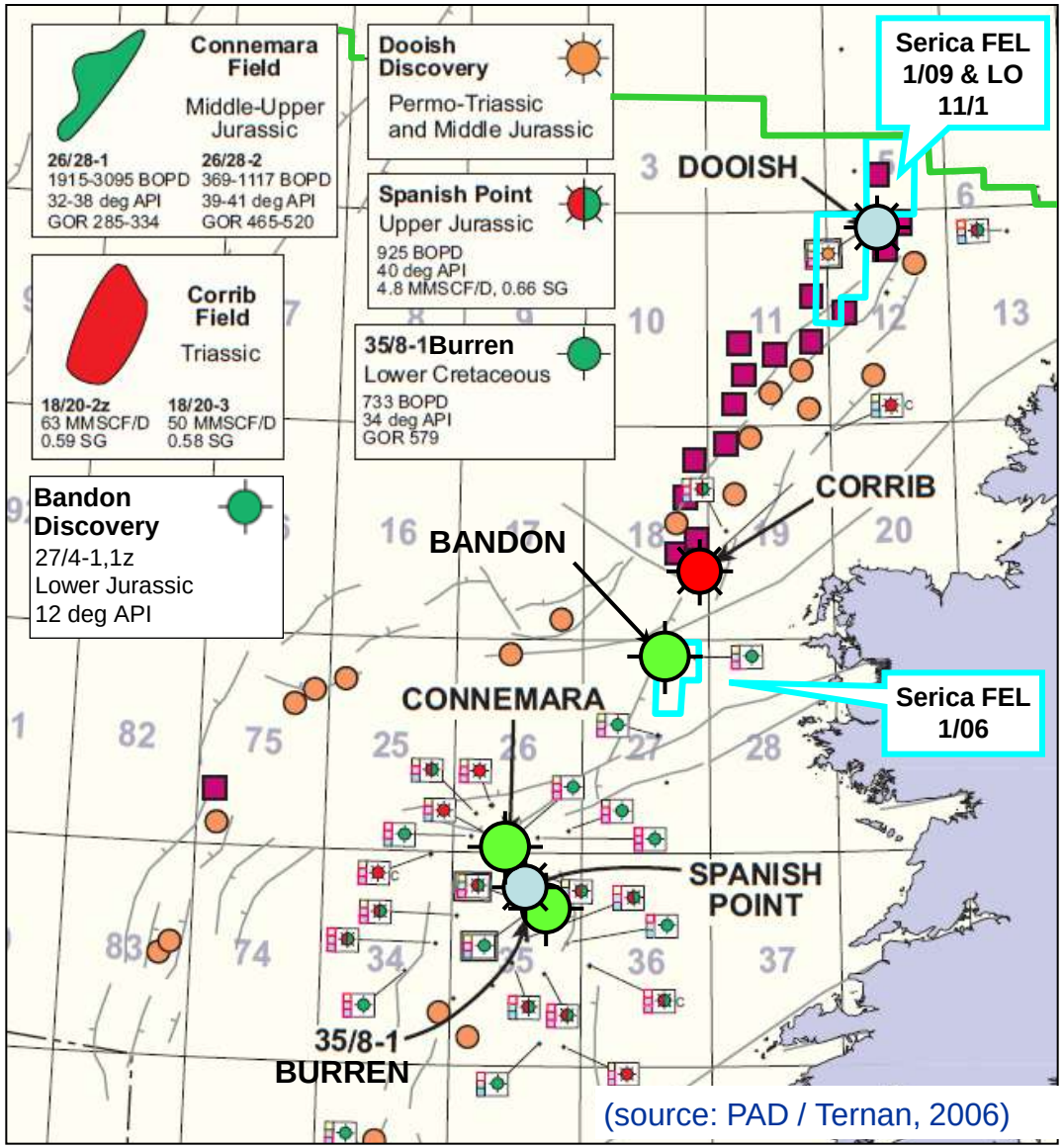
IRELAND ATLANTIC MARGIN

Hydrocarbons, Shows & Seeps

SERICA ENERGY

- Three gas / condensate fields / discoveries
- Three oil fields/ discoveries
- Numerous oil shows encountered in wells
- Gas chimneys on seismic data
- Thermogenic hydrocarbon shows from seabed cores





(source: PAD / Ternan, 2006)