

PIP

Petroleum
Infrastructure
Programme



Monday 12th November 2012

Atlantic Ireland 2012

Burlington Hotel
Upper Leeson Street, Dublin 4

A Petroleum Conference
Organised by PIP-ISPSPG

A one-day conference and exhibition on Ireland's offshore hydrocarbon potential

Abstracts Volume



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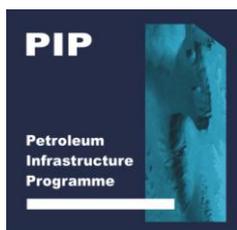
**A One Day Conference and Exhibition on
Ireland's Offshore Hydrocarbon Potential
Sponsored by PIP-ISPSG**

PROGRAMME & SHORT ABSTRACTS

Location: Burlington Hotel, Dublin, Ireland

Date: 12th November 2012 – 08.00 to 19.00hrs

Audience: Researchers, exploration companies, geophysical contractors, government departments & agencies, international guests.



Edited by:

Martin Davies & Laurena Leacy

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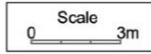
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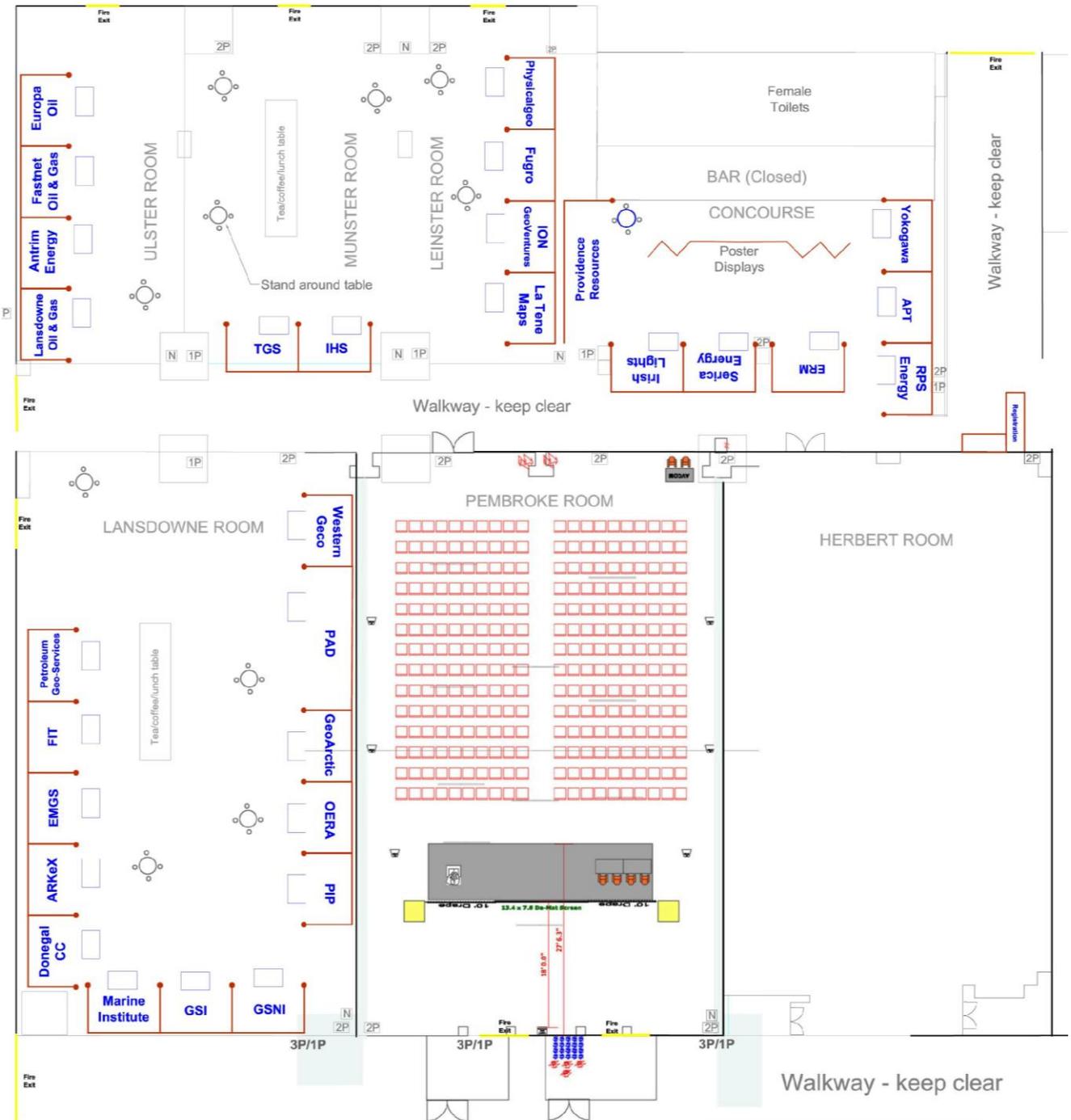
Exhibition Layout

Key:

- 1P|2P Electricity Sockets - single and double
- N Network Point
- 3P/1P 3 phase and 1 phase power panels



Note: Lansdowne, Ulster, Munster and Leinster rooms completely open across walkway. Pembroke room closed off with door.



Conjugate Margins 2014

St. John's, Newfoundland and Labrador, Canada

Go Deep: Back to the Source



Technical Programme



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Monday 12th November 2012
Atlantic Ireland 2012
Burlington Hotel
Upper Leeson Street, Dublin 4

Oral Programme

Monday 12th November 2012

08.00 - 08.55	Registration - Coffee / Tea available in Exhibition Room and Poster Room
08.55 - 09.00	Opening remarks - PAD-DCENR
09.00 - 09.15	Address by Minister of State (DCENR) - Fergus O'Dowd, TD
09.15 - 09.30	Exploration activity overview for Atlantic Ireland – finally turning the corner? – Noel Murphy (PAD-DCENR)
<p>Session 1 - Petroleum Systems Analysis Session Chair - David Mudge Introduction by Session Chair</p>	
09.30 - 10.00	A New Deformable Plate Kinematic Model for the North Atlantic Provides a New Perspective on the Petroleum Potential of the Hyperextended Basins of the Irish Margin - Richard Whittaker (GeoArctic)
10.00 - 10.20	New prospectivity through improved seismic data quality of the pre-Cretaceous section of the Porcupine basin - Andre Stout (PhysicalGeo)
10.20 - 10.45	North Atlantic margin petroleum systems: what does the Faeroe Shetland Basin tell us about prospectivity further south? - Patrick Barnard (APT)
10.45 - 10.55	Discussion
10.55 - 11.30	Coffee Break
<p>Session 2 - New Technologies and Data Session Chair - Rob Hardy Introduction by Session Chair</p>	
11.30 - 11.50	Designing comprehensive data acquisition programmes in the re-evaluation of dormant discoveries – a recent case study from the Barryroe oil field, offshore Ireland - John O'Sullivan (Providence Resources)
11.50 - 12.10	Improvements in seismic quality in the North Celtic Sea - Tim Wright (Lansdowne Oil & Gas)
12.10 - 12.25	Using EM methods for enhanced seismic imaging in complex salt and basalt provinces - Lorenz Nehring (EMGS)
12.25 - 12.40	Safety of Navigation and the CER Decision Paper - Nigel Teggin (CIL)

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**A Petroleum Conference
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12.40 - 12.55 The INFOMAR programme, the NAG-TEC Project and other Irish marine research - **Koen Verbruggen** (Geological Survey of Ireland)

12.55 - 13.00 Discussion

13.00 - 14.20 Lunch Break - Sandwiches Served In Exhibition Room

14.20 - 15.20 **Session 3 - Prospects 2 Go**

Session Chair - **John Craven**
Introduction by Session Chair

Prospects 2 Go - Licensing Options 12/2 ("Molly Malone") and 12/3 ("Mizzen") - **Paul Griffiths** (Fastnet Oil and Gas)

Prospects 2 Go - Licence Option 11/5, Porcupine Basin - **Kevin Morrison** (Antrim Energy)

Prospects 2 Go - Ventry and Valentia Prospects, LO 11/3 - **Donal O'Driscoll** (Bluestack Energy)

Prospects 2 Go - Muckish Prospect Drilling Opportunity, FEL 1/09 & LO 11/1, Rockall Basin, Atlantic Ireland - **Graham Pritchard** (Serica Energy)

15.20 - 16.00 Tea / Coffee Break

16.00 - 17.15 **Session 3 - continued**

Prospects 2 Go - Porcupine Basin Licence Options 11/4 & 11/6 - **Dave Naylor** (Petrel Resources)

Prospects 2 Go - Irish Licence Option 11/10 – Exploring Untested Passive Margin Plays in the Proven Porcupine Province - **Jerry Chessell** (Two Seas Oil & Gas)

Prospects 2 Go - Drombeg – An Apto-Albian prospect sourced from a seismically mapable hydrocarbon chimney - **Keith Byrne** (Providence Resources)

Prospects 2 Go - South Porcupine Basin, an Atlantic Margin Lower Cretaceous stratigraphic play -The Mullen prospect, LO 11/7 - **Hugh Mackay** (Europa Oil & Gas)

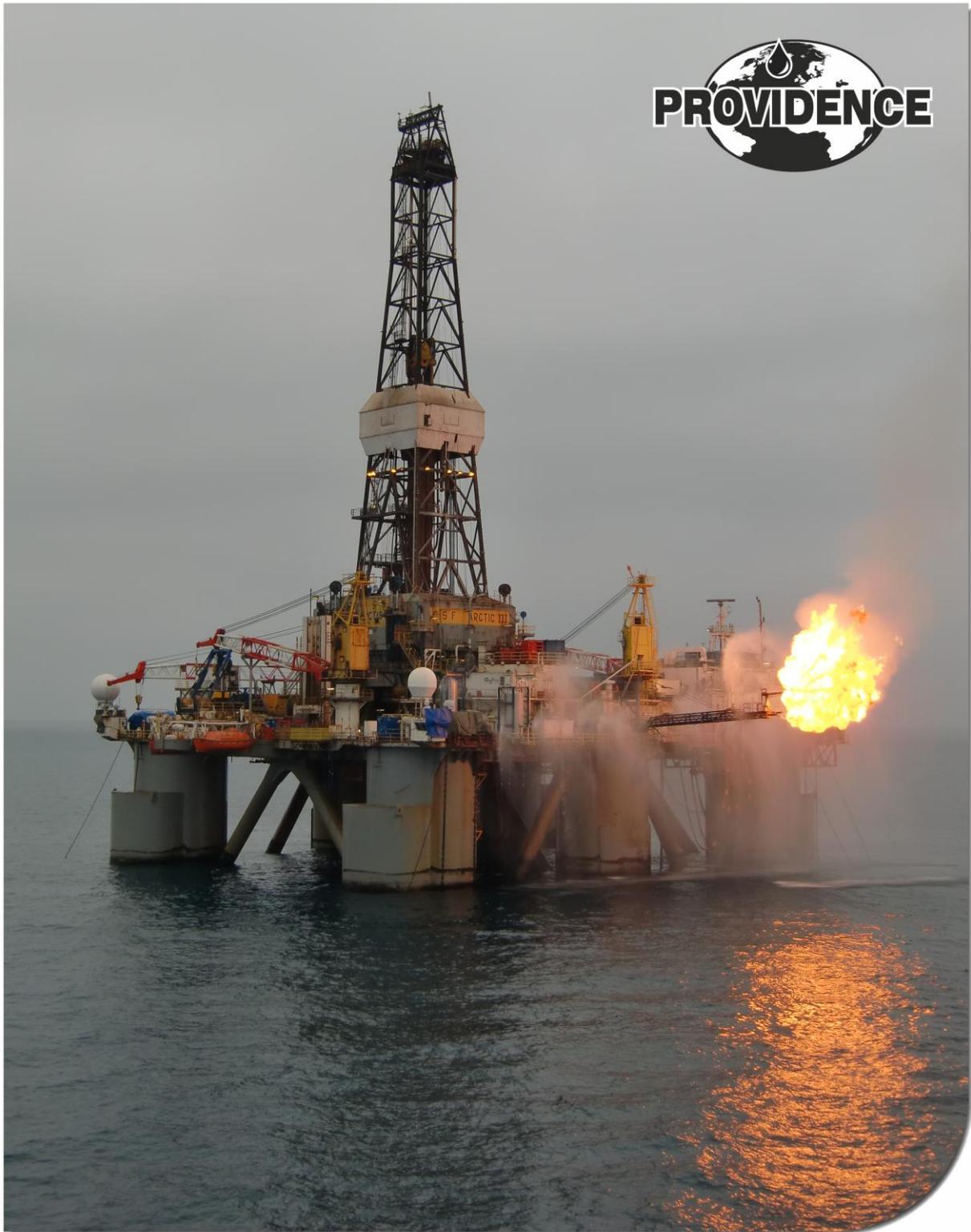
Prospects 2 Go - Prospectivity of SW Fastnet Basin - **Peter Mikkelsen** (Fastnet Petroleum)

17.15 - 19.00 Reception in Exhibition and Poster Area

This will be an ideal opportunity to visit exhibition booths and the poster display and to network with other delegates.

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Barryroe
A measure of our success



ORAL ABSTRACTS (in order of presentation)

Speaker is underlined

Exploration activity overview for Atlantic Ireland – finally turning the corner?

Murphy, N.¹

¹ *Petroleum Affairs Division, Dept. of Communications, Energy and Natural Resources, 29-31 Adelaide Road, Dublin 2*

Ireland is currently experiencing an increase in exploration interest and this is attributed to positive results from drilling, a growing recognition of Ireland's prospectivity and recent innovative licensing initiatives. While drilling levels have been disappointing, several significant discoveries have been made over the past four decades and encouraging results are currently being achieved from reassessing and appraising older discoveries.

Working petroleum systems are demonstrated in virtually all of the major Irish basins – North Celtic Sea, Porcupine, Slyne and Rockall – but many areas still suffer from sparse well control and seismic data gaps. These shortcomings, together with the severe water depths, remoteness from shore and lack of infrastructure in the case of frontier basins, have resulted in large areas of the Irish Shelf receiving little or no attention. In order to address some of these concerns, the Department is actively sponsoring regional petroleum research, new data acquisition and other data initiatives. This new work is designed principally to reduce exploration risk by providing the means to perform more precise hydrocarbon resource assessments.

While the level of exploration activity, drilling in particular, has been far from satisfactory, there have been a number of encouraging signs recently. These include record numbers of applications received for new authorisations, the rate at which companies are entering Ireland for the first time and the expected near term increase in drilling levels; wells planned for 2013 are set to focus on high profile targets of international interest.

Although substantial oil and gas resource potential has been indicated for Ireland's offshore basins, this potential can only be realised if the industry is prepared to commit the high level of investment required for exploration drilling. Significant exploration challenges lie ahead, but Ireland remains committed to maximising the exploitation of its natural resources. In so doing, it fully recognises the important role being played by the smaller exploration companies, some Irish, as well as the majors and larger independents.

This conference will demonstrate the valuable contribution that the Petroleum Infrastructure Programme is making to understanding hydrocarbon resource potential and you will be hearing about several drilling prospects currently on offer to the Industry. Ireland does seem to be finally making it onto the map as a serious candidate for international exploration investment.

A New Deformable Plate Kinematic Model for the North Atlantic Provides a New Perspective on the Petroleum Potential of the Hyperextended Basins of the Irish Margin

Whittaker, R.¹ (rwhittaker@geoarctic.com), Ady, B.E.¹, Štolfova, K.² and Shannon, P.M.²

¹ *GeoArctic Ltd, Calgary, AB, Canada*

² *UCD School of Geological Sciences, University College Dublin*

A two-year government sponsored research project to develop a deformable plate kinematic model for the North Atlantic between Ireland and Canada provides us with fresh insights into the evolution of the Ireland and Newfoundland margins. The new deformable plate model allows us to accurately restore the palaeo-geometry and palaeo-position of the offshore basins and predict the amount, direction and timing of extension. This has helped to identify potential source rock development at several intervals on the margins and also to predict the likelihood of source rock preservation and the location of likely reservoir fairways.

The major Late Jurassic to Early Cretaceous rift event was initiated in the Tithonian (~145 Ma) and active rifting continued to the end of the Valanginian (~136 Ma). This is associated with the progressive north-south breakup of Newfoundland and Iberia which ended in the Barremian (~127 Ma) with separation of the Flemish Cap from the Galicia Bank. Seismic data from the East Orphan Basin, the conjugate margin to the Porcupine Basin and sharing a similar structural evolution, show that major faulting with prominent detachment zones is related to the Tithonian to Valanginian rift event. In the central parts of the Porcupine, Rockall and Orphan basins highly rotated fault blocks, detachment faulting, mantle exhumation and high beta factors (>3) in the Late Jurassic and Early Cretaceous provide strong evidence for basin hyperextension. Hyper-extension must have resulted in removal and erosion of much of the potential pre-rift source rocks in these basins although preservation should still be possible locally and on the basin flanks.

Source rock potential also exists in the Early Cretaceous syn-rift sediments and this potential may even surpass that of the highly extended and fractured pre-rift source rocks. Lower Cretaceous sediments infill an irregular basin topography in a series of restricted basins which subsided rapidly following the Tithonian to Valanginian rift event. In the central and northern parts of the Porcupine Basin, Lower Cretaceous (Hauterivian – Barremian) strata were deposited in a series of restricted marine basins. The shapes of these basins were controlled by syn-sedimentary faults and pre-existing Jurassic palaeotopography.

Regional Lower Cretaceous stratal geometries are not consistent with a simple post-rift subsidence model and suggest instead a combination of fault-controlled and thermal subsidence during Early Cretaceous times. For example, the interpretation suggests that Aptian/Albian strata were deposited in fault-controlled depocentres along the margins of the Hatton Basin. The application of the deformable plates analysis, constrained by the kinematic model, reveals evidence of extensive Cretaceous extension in the Hatton Basin in two distinct sub-basins in the north and south. The presence of an extensive Mesozoic section within the Hatton Basin, with indications that clastics in the area were derived from Greenland, has implications for reservoir distribution along the western margin of Ireland.

The best examples of Early Cretaceous (Aptian/Albian) syn-sedimentary rifting are found in the southern part of the Porcupine Basin and the Goban Spur region. The Orphan Basin was also affected by a distinct later faulting event that is also interpreted to be of mid-Aptian to Late Albian age and related to the breakup of Ireland and Newfoundland. Tectonostratigraphic correlations along the axial 2D seismic lines in the Porcupine Basin illustrate several intra-Cretaceous unconformities including the Early Cretaceous (Aptian/Albian) unconformity. Hence, Early Cretaceous rifting was still active in the region and was coeval with the onset of sea floor spreading at Goban Spur margin.

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The Rockall and Porcupine basins show similar Upper Cretaceous stratal geometries. They overstep Lower Cretaceous depocentres, are largely unfaulted, and are interpreted to reflect a stage of thermal basin subsidence. However, new seismic data provide evidence of a latest Cretaceous inversion phase, well illustrated above a late Palaeozoic to Jurassic horst complex located in the south-western end of the Porcupine Basin. A similar timing of inversion is interpreted in the south-eastern Hatton Basin, where an inverted Cretaceous succession is overlapped by Paleocene basalt. A subsequent latest Eocene/Early Oligocene inversion episode occurred in the south-western Porcupine Basin and possibly in the central part of the Rockall Basin.

The new deformable plate model has provided fresh insights into the evolution of the Ireland and Newfoundland margins. The modelling has helped in the evaluation of source rock and reservoir potential at several stratigraphic levels in the Mesozoic. It has provided us with an enhanced understanding of the major controls and mechanisms for basin formation and evolution in offshore Atlantic Ireland and offshore Newfoundland. Potential reservoir development has also been correlated with the main tectonic events and their distribution can be mapped and predicted more accurately through application of the deformable plate model.

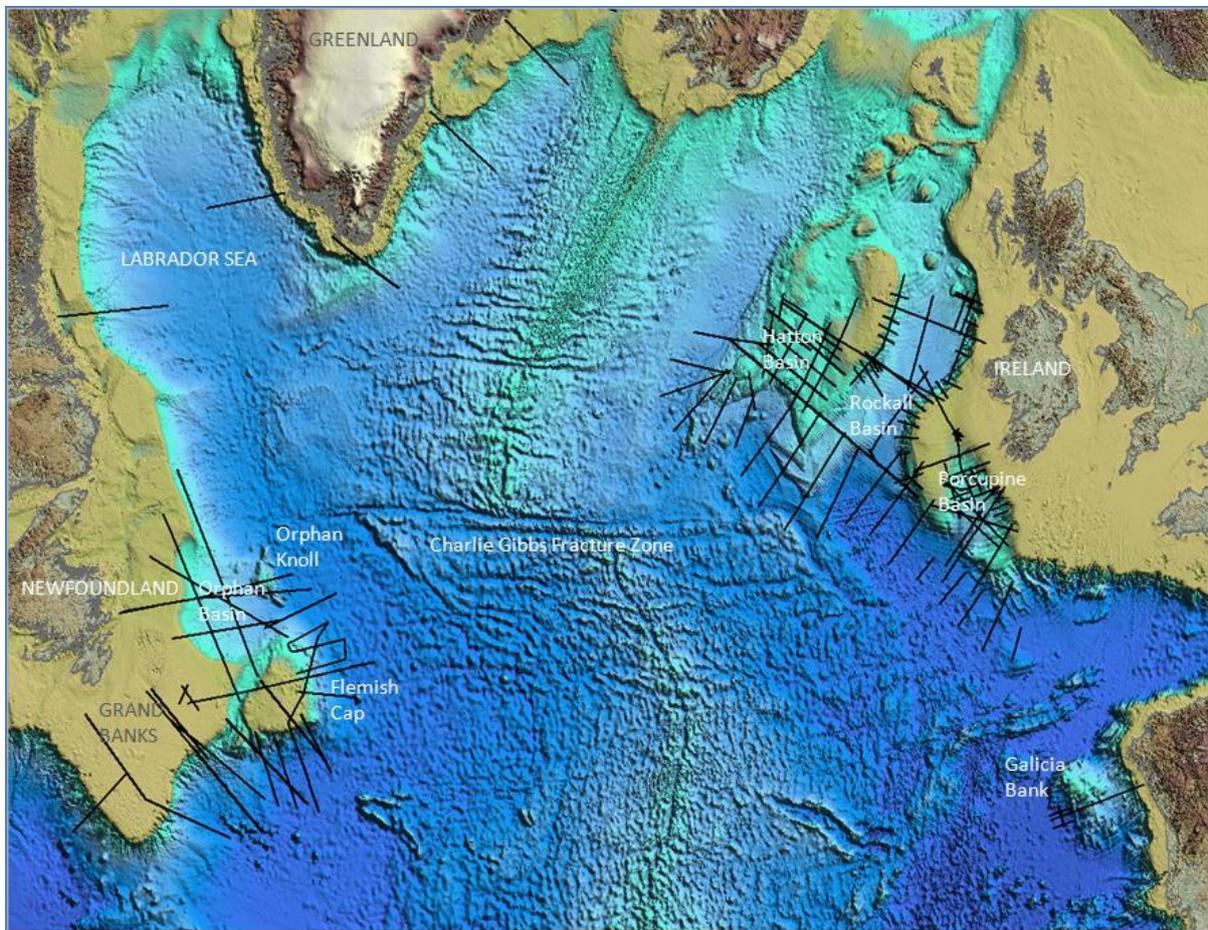


Figure 1. Bathymetry map showing the regional seismic database for the Irish and Newfoundland margins interpreted for the project.

This project is jointly funded by the Irish Shelf Petroleum Studies Group (ISPSG) of the Petroleum Infrastructure Programme and Nalcor Energy (on behalf of the Offshore Geoscience Data Program with the Government of Newfoundland and Labrador). The authors would also like to thank ION/GX Technology and TGS Nopec for the donation of seismic data for use on the project.

New Prospectivity through Improved Seismic Data Quality of the pre-Cretaceous section of the Porcupine Basin

Stout, A.¹ (andre@physicalgeo.com)

¹*Physicalgeo Ltd*

The Porcupine Basin of the Atlantic Margin off Ireland's western coast contains a number of Mesozoic discoveries, sourced from the Jurassic section. The seismic database of largely 1980's and 1990's vintage is of moderate quality in the Cretaceous and younger section, yet the key section below the Base Cretaceous Unconformity, the key part of the petroleum system, is poorly imaged.

Efforts have been made to re-process legacy 2D datasets. Also, new 3D data has been acquired. In both cases, the significant uplift in data quality has been below this key marker. Not only better defining observed features but also revealing hitherto unseen potential.

Examples will be shown from new 3D datasets where the sub-unconformity section can be more clearly understood in terms of structure and reservoir age. One 3D example will also show how a new 3D survey, acquired for one prospect actually revealed a new prospect in an adjacent area. Reprocessing of 2D data has been undertaken by two separate processing houses. Results from these efforts will be shown, with dramatic results that may impact prospectivity in existing and new petroleum fairways.

North Atlantic margin petroleum systems: what does the Faeroe Shetland Basin tell us about prospectivity further south?

Bernard, P.¹ (pcb@aptuk.co.uk), Cutler, I.¹, Thompson, S.¹ and Kerr, H.¹

¹*Applied Petroleum Technology (UK) Ltd*

A number of North Atlantic margin basins have proven to contain commercial quantities of hydrocarbons as evidenced by oil and gas production from the Jean d'Arc Basin on the west and the Faeroe-Shetland Basin and Mid Norway area on the east. All these basins produce fluids that have some affinities to, but also exhibit some distinct differences from, the hugely prolific North Sea basin.

Biomarker studies of the oils from the Jean d'Arc Basin suggest a source ranging from a restricted marine source to a significant lacustrine contribution. As a consequence dual Upper and Middle Jurassic source rocks have been proposed although earlier studies suggested derivation from a marine Upper Jurassic source rock, the Egret Member equivalent in age to the Kimmeridge Clay Formation.

It has similarly been reported that Porcupine Basin oils and shows have evidence for mixed source contributions and both Upper and Middle Jurassic contributions have been proposed.

Oils in the Mid Norway province are mostly attributed to a source within the Upper Jurassic Draupne Formation, a source rock equivalent in general age and type to the Upper Jurassic Kimmeridge Clay Formation which is generally considered to be the source of the bulk of the North Sea oil. The source of the gas in mid Norway and the neighbouring Møre Basin is less well characterised; in Mid Norway it has been assumed to be a combination of either primary generation from the coaly Are Formation or late stage maturation, or even cracking of, pre-existing oil from the Draupne Formation. Little appears to be known about the source of the gas in the very large Ormen Lange gas field which is notionally within the More Basin which has been reported to be formed over Cretaceous oceanic crust.

Recent studies of flowed oil and gas samples and / or proxy oils extracted from core and cuttings from most of the exploration wells drilled in the UK and Faeroes sectors in the Faeroe-Shetland Basin have shown that the principal source rock is again an equivalent of the same Kimmeridge Clay Formation that generates so much of the North Sea oil. Contrary to previous publications and opinions within the industry, there seems to be little to no evidence that older Middle Jurassic source rocks have contributed to hydrocarbon resources in the area. Rather, there is some evidence there are hydrocarbons sourced by different source rocks which might be of younger Early Cretaceous age. Apart from the source rock issues there are several other puzzling things about the petroleum system as a whole.

Firstly many of the oils including those from the major producing fields all contain biomarker compounds that imply an intense early stage bacterial degradation of generated hydrocarbons subsequently interrupted prior to mixing with a final phase of fresh non-degraded or only partially degraded oil. The mechanism that gave rise to these unusual compositions is not yet properly understood.

Secondly and perhaps more surprisingly, the biomarkers all suggest that most of the discoveries and shows are sourced by source rocks at an early to mid range of thermal maturity, quite at odds with the common assumption that any source rocks in the deep basin are now beyond the stage of generating any hydrocarbons, even gas. Indeed the liquids associated with some of the gas fields are clearly of relatively low thermal maturity while the gases themselves do not exhibit evidence of advanced maturity.

It is generally accepted that the fluids that are generated within deep kitchen areas carry with them vital information about the character of the sedimentary organic matter, depositional conditions and thermal history which can be used to reconstruct the petroleum system and therefore assess the remaining hydrocarbon potential. To date there is no consistently generated high quality and modern geochemical data set readily available for the North Atlantic area as a whole with which to evaluate the petroleum systems that give rise to the petroleum fluids.

Designing comprehensive data acquisition programmes in the re-evaluation of dormant discoveries – a recent case from the Barryroe oil field, offshore Ireland

O'Sullivan, J.M.¹ (josullivan@providenceresources.com)

¹ *Providence Resources*

The Barryroe oil field is located in the North Celtic Sea Basin, offshore southern Ireland. The field was discovered by Esso Exploration in 1974 and is situated in c. 100 metre water depth being c. 50 km off the south coast of Ireland. The main reservoir intervals are Lower Cretaceous sands in the basal part of the Wealden (c. 2,000 metres TVDSS) which are interpreted to have been deposited in Lower Delta Plain setting. The field is dip closed against a major inverted mid-basinal growth fault system which is areally extensive covering several hundred square kilometres. The oils are sourced from the Purbeckian shales which directly underlie the main reservoir interval and were deposited in a lacustrine environment giving rise to isotopically light low viscosity waxy crudes. A further four wells were drilled across the Barryroe structure up to 1990, all of which either logged or tested oil to surface, however the field was not progressed to development probably due to low oil prices at that time. In 2011, Providence Resources and Lansdowne Oil & Gas embarked on an appraisal programme to reevaluate the resource potential at Barryroe. The key elements of this programme included the acquisition of a 3D seismic survey together with the drilling of an appraisal well which

was designed to be a calibration point for the 3D seismic data. The appraisal well data acquisition programme included state of the art wire-line runs together with an extensive coring, fluid sampling and heat managed testing programme. The data from this well have provided important insights into many facets of the Barryroe Field and have allowed the partners to significantly increase the associated resource potential. The Barryroe success also demonstrates the value of comprehensive multi-domain subsurface data acquisition programmes in the re-evaluation of other dormant discoveries such as Spanish Point which is planned for drilling in 2013.

Improvements in seismic quality in the Celtic Sea

Wright, T.¹ (Tim.Wright@merlinenergy.co.uk) and Donato, J.²

¹ Lansdowne Oil and Gas / Merlin Energy Resources

² Merlin Energy Resources

Lansdowne Oil & Gas plc present the results of 2D and 3D reflection seismic data acquired in the North Celtic Sea Basin between 2008 and 2012. A total of three surveys show in great detail the existence of a number of large undrilled structures typified by the Amergin and Midleton Prospects. Acquired by the Polarcus Samur and processed by CGGVeritas, the surveys were carefully planned to optimise reflection characteristics in a basin where subsea chalk outcrops historically reduced the transmission of acoustic energy and decreased signal / noise ratios. The surveys have been reprocessed to investigate AVO characteristics and generate acoustic impedance volumes providing detailed information on rock properties and fluid phases within key reservoir units.

The Amergin 3D survey is perhaps the most striking example of the improvement in seismic imaging in the basin. The survey was focused on a poorly defined faulted dip closure mapped in a widely spaced 2D grid. Uncertainty regarding the orientation of faulting has been eliminated. The high resolution 3D surveying reveals a prominent 17km² faulted 3-way dip closure with crestal elevation relative to spill point of in excess of 200m at Base Wealden (the principal sand reservoir in nearby Barryroe accumulation). Unparalleled imaging at Base Chalk shows fine scale Alpine strike-slip lineaments cross-cutting deep-rooted Variscan and Caledonian fault trends. The Amergin and Rosscarbery surveys also reveal the presence and continuity of strong seismic markers in the Lower Jurassic and Triassic. Lansdowne sees large rotated fault blocks in the Middle and Lower Jurassic as being overlooked targets in spite of striking similarities with the Lower Jurassic succession of the Wessex Basin and flow rates of up to 6467bbls/d from the nearby 49/9-2 Helvick discovery (Basal Upper-Middle Jurassic reservoirs).

Lansdowne are able to show that the thoughtful application of geological and geophysical techniques can have a dramatic impact in terms of yielding new exploration targets whilst significantly reducing the risks attributed to existing drill ready prospects. Detailed subsurface evaluations undertaken in conjunction with on-going subsea and facilities engineering studies will determine commercial expectations and the final locations for the upcoming wells to be drilled 2013/14.

Using EM methods for enhanced seismic imaging in complex salt and basalt provinces

Nehring, L.¹ (lnehring@emgs.com)

¹ Electromagnetic Geoservices ASA

Electromagnetic methods have, over the last decade, gradually been making it into the mainstream workflow of an increasing number of exploration companies. The primary application of EM is and has been as a hydrocarbon indicator, used in drill-or-drop decisions or more recently in prospect ranking within a portfolio. A string of studies from around the world has testified to its value in this context. But the EM method, being a resistivity mapping technology, is not restricted to only identifying hydrocarbon accumulations, and several additional applications relevant for the exploration business are emerging. Among these is the enhancement of seismic imaging, particularly in complex geological settings such as salt and basalt provinces. We will present a collection of synthetic and real data examples to demonstrate the integration of EM data in salt and basalt exploration, followed by a brief discussion of where this development may be heading in the near future.

Safety of Navigation and the CER Decision Paper

Teggin, N.¹ (nigel.teggin@cil.ie) and McClenahan, H.¹

¹Commissioners for Irish Lights

The waters around Ireland have up to now not experienced the proliferation of manmade offshore structures we see in the North Sea or Liverpool Bay. However technological developments in petroleum exploration and extraction mean it is now feasible to operate in our sometimes harsh and challenging environment.

One of the features of the Irish Coast is a relatively high level of marine traffic in the Eastern Sector and a relatively low level of traffic on the west coast. So the risks of navigational incidents on the west coast may be small however severe weather conditions and a false sense of security for mariners who would not expect to see structures in open ocean areas is one of the many factors to be taken into account.

Navigational incidents such as passing ship collisions are rare but due to the dynamic forces involved the consequences can be catastrophic in terms of human casualties and damage to the environment and economy.



There are many ways of avoiding collisions with passing ships but the basic principle is that all navigators who pose a risk should be made aware of the hazard. This can be done through electronic systems transmitting information to the ships bridge and also through more traditional methods of marine publications such as paper charts and pilot books. But we must also take into account the poorly managed, poorly equipped and perhaps poorly manned ship. These vessels pose the highest risk and therefore every method possible must be used to ensure all navigators are aware of the hazards. Basic visual aids to navigation such as lights and identification boards may seem old fashioned but they remain the most reliable back up to the sophisticated warning systems available today.

We must also be concerned for small vessels such as leisure and fishing vessels that may not damage a structure but could suffer significantly themselves. These vessels may not have the sophisticated navigational aids commercial ship are equipped with so they may rely on physical and visible aids to navigation alone.

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Offshore platforms are required to be conspicuous during the hours of daylight and darkness and target conspicuous in restricted visibility (fog and mist) through radar and Automatic Identification System display. For more than thirty years the two Kinsale gas platforms have operated successfully off the port of Cork without any major navigational incidents. This is testament to the operator's high standards in collision avoidance management and we are committed to ensure that future developments continue in this vein.

The Decision Paper on the High Level Design of the Petroleum Safety Framework produced by the Commission for Energy Regulation gives the CER responsibility for the safety regulation of petroleum exploration and extraction activities in Ireland.

The Framework is a collection of regulations, written regulatory documents and procedures which, taken together, describe the system the CER will use to regulate safety for petroleum activities and infrastructure in Ireland.

The CER recognises the requirement to interface and co-operate with other statutory authorities in Ireland.

In terms of Aids to Navigation the Commissioners of Irish Lights are the statutory authority for Irish waters. CIL is the General Lighthouse Authority for all of Ireland, its adjacent seas and islands. CIL carry out the obligations of the British & Irish Governments in relation to the provision of Aids to Navigation (AtoN) around the coast of Ireland commensurate with the amount of traffic and degree of risk under the Safety of Life at Sea Convention (SOLAS). CIL is concerned with safe and expedient navigation for all vessels around our coast line. Apart from the safety and environmental aspects CIL are also concerned that and that the efficient routing of vessels is as far as possible not adversely affected by new man made offshore structures.



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The INFOMAR programme, the NAG-TEC Project and other Irish marine research

Verbruggen, K.¹ (koen.verbruggen@gsi.ie), Monteys, X.¹, Guinan J.¹ and Judge, M.¹

¹ *Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4*

INFOMAR, (Integrated Mapping for the Sustainable Management of Ireland's Marine Resource), is Ireland's national marine mapping programme, funded by Government and implemented as a joint venture between the Geological Survey of Ireland (GSI) and the Marine Institute (MI) and is the successor to the Irish National Seabed Survey (INSS). The programme covers the remaining Irish waters to be mapped, <200m deep, c.125,000 square kilometres, and is producing integrated mapping products including updated charting (with UKHO) as well as seabed substrate maps and digital DTMs. The surveys are carried using a range of platforms, including the MI's RV Celtic Explorer and RV Celtic Voyager, GSI's inshore launches RV Keary and Geo, and from 2012 a new converted patrol vessel Cosantoir Bradan. The programme uses ship-mounted acoustic multibeam sonar and geophysical technology to provide vital information on water depth for safe shipping, as well as analyse the properties of the seabed for information that can guide fishing, ocean renewable development, environmental protection, marine archaeology and all offshore development. The data is made available free of charge via the web. Highlights in 2012 also included the first use of multi-spectral satellite for bathymetric mapping in Irish waters and collaboration with the Irish Seafood Agency BIM to map the Inisboffin and Inishturk Islands. INFOMAR is currently sponsoring 23 research projects, half of which involve or are led by Industry partners, covering a range of topics from geology, to renewable energy, software development and oceanography.

The European Commission's Green Paper Marine Knowledge 2020 'from seabed mapping to ocean forecasting', highlights the opportunities for the blue economy and the potential for job creation. The challenges include improving marine data infrastructure by collating fragmented data to facilitate coherent, interoperable data sets which will inform ocean management, monitoring and conservation. Central to the strategy is the concept of linking marine data centres across Europe to provide improved access to harmonised, interoperable, multidisciplinary datasets through common access points. This paper describes how mapping, such as that being carried out in Ireland under INFOMAR, is making an important contribution to Marine Knowledge 2020 through its involvement in EU projects EMODnet (European Marine Observation and Data Network) Geo-Seas (a pan-European marine geological and geophysical data infrastructure) along with a more recent initiative NAG-TEC which is developing a Northeast Atlantic Tectonostratigraphic Atlas.

The recently completed preparatory phase of **EMODnet** (2009-2012) involved the collation of data for maritime basins across 14 member states for hydrographic, geological, biological and chemical data as well as functional habitat maps. EMODnet-Geology involved the collation and harmonisation of INFOMAR data across several themes e.g. sea floor geology, seabed sediment, aggregates and hydrocarbon resources, geological events and probabilities for delivery to the OneGeologyEurope data portal. EMODnet-Hydrography has developed an online portal providing access to hydrographic data for a number of European maritime regions. Data users have the opportunity to discover, download and analyse datasets e.g. water depth in gridded or vector formats, depth profiles along tracklines, coastlines and underwater features. The INFOMAR programme is currently a partner in a consortium bid for new calls in geology and hydrography modules for the next phase of EMODnet, to include an extended area of European maritime regions and higher resolution datasets. The results of this new call are due to be released by December 2012.

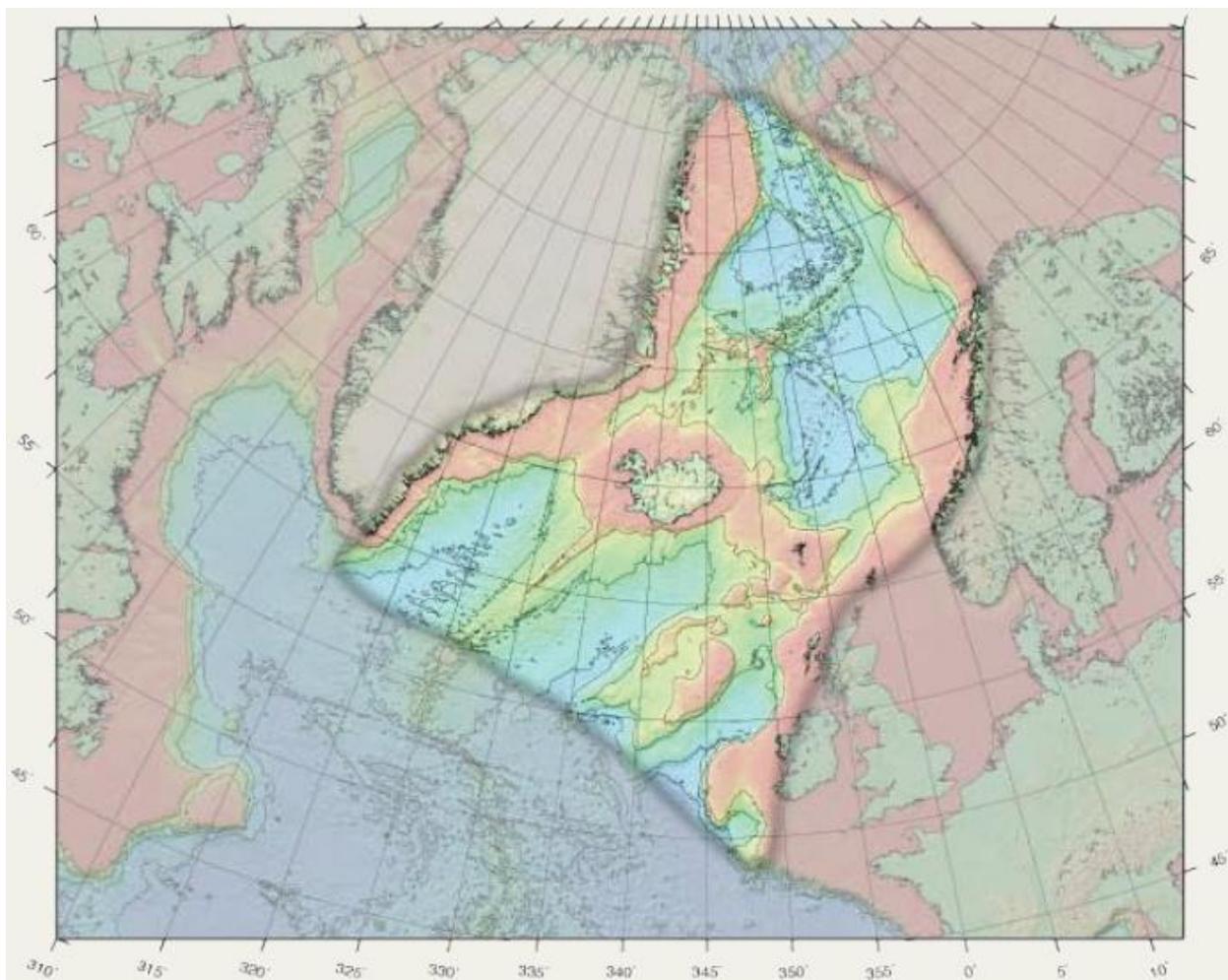
Similarly the **Geo-Seas** project (2009-2013) links 26 marine geological surveys and data centres, where datasets and derived products are accessed through a single common data portal. INFOMAR data developed through Geo-Seas data products and services is currently available for: government agencies, industry, engineering (pipelines, platforms), environmental research and monitoring,

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academic researchers, offshore sustainable energy, dredging, conservation management. INFOMAR datasets are now available to access across Europe via online portals and web map services developed as part of the EMODnet and Geo-Seas projects.

GSI are part of the Northeast Atlantic Geoscience (NAG) group, a cooperative framework agreement between the National Geological Surveys of the Northeast Atlantic comprising; Ireland, Great Britain (including Northern Ireland), the Netherlands, Norway, Germany, Iceland, and Denmark and Greenland (including the Faroe Islands).

The first large scale project undertaken by the NAG consortium, **NAG-TEC**, is co-sponsored by Surveys and Oil Industry companies in order to tackle the common theme of interest: Tectonic development of the North Atlantic. NAG-TEC will result in the production of an Atlas and accompanying GIS database for the region (Fig 1.) by July 2014. The Atlas aims to provide: quantitative analysis of key basin parameters, regional correlations of key stratigraphic units, unconformities, and geologic formations, an understanding of the connectivity and similarities between known prospective regions and unexplored areas, as well as comprehensive analysis of conjugate margin pairs by the systematic compilation of all tectonostratigraphic information over the



region.

Figure 1. Highlights the regional extent of the NAG-TEC project.

Prospects 2 Go (Fastnet Oil and Gas)

Licensing Options 12/2 (“Molly Malone”) and 12/3 (“Mizzen”)

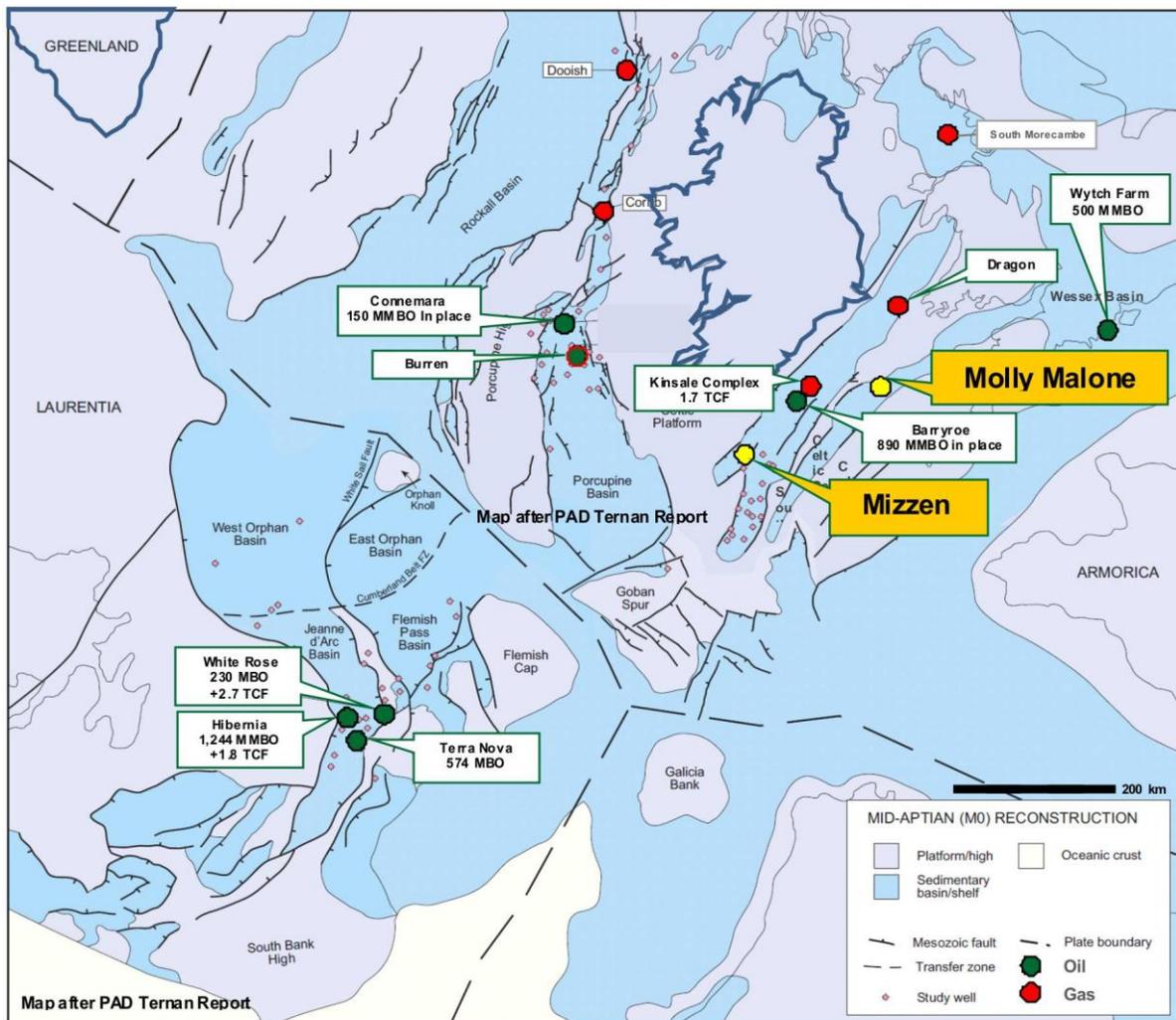
Griffiths, P.¹ (paul.griffiths@fastnetoilandgas.com)

¹Fastnet Oil and Gas Plc

Introduction

Fastnet Oil and Gas (Ireland) Limited (“Fastnet”), a wholly owned subsidiary of Fastnet Oil and Gas Plc, owns a 100% interest in Licensing Options 12/2 (Molly Malone) and 12/3 (Mizzen) off the south coast of Ireland in an under-explored “Frontier Area”. Tendering for the largest 3D seismic survey ever acquired off the south coast of Ireland has begun in order to de-risk and mature “World Class”, drill-ready, prospects that were first identified by Paul Griffiths and John Craven during the period 1984 to 1994. Fastnet is seeking an experienced industry partner to participate in the 2013 3D seismic programme as a prelude to an anticipated multi-well drilling programme in 2014 to unlock the potential of substantive and material exploration targets.

Location Map



Key Opportunity Highlights

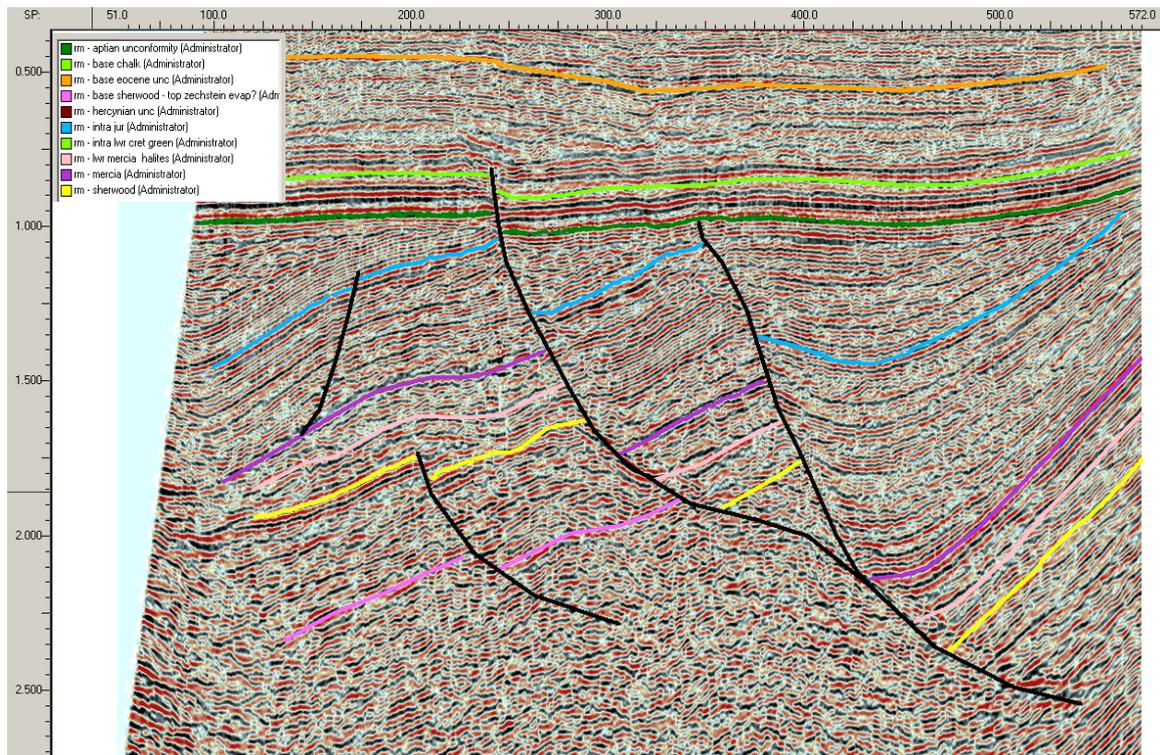
Strategic Opportunity

- Under-explored conjugate margin relative to other Atlantic Margin basins
- due to low oil price economics and a lack of 3D seismic imaging technology at the time of historical exploration activities
- Out of 100 of the largest conventional discoveries in each of the past 3 years 50% of the discovered resources have come from frontier basins
- Frontier exploration provides some of the most attractive upside potential of any activity in the oil and gas space – exemplified by the East African Cove Energy story (generated by elements of Fastnet's management and advisory team) and the Ghana "Jubilee" story (created by Fastnet's partner Kosmos Energy in Morocco where new 3D seismic acquisition is generating a portfolio of over 50 prospects and leads)
- Conjugate margin palaeo-reconstructions have emphasised the stratigraphic similarities between sand packages and reservoirs in the Jeanne D'Arc Basin (Eastern Canada) and the Mizzen Basin (Ireland) thereby illustrating the potential for analogous giant oil finds offshore Ireland (the 1.3 BBOE Hibernia Field offshore Eastern Canada discovered by Exxon in 1979 was followed up by Esso drilling two exploration wells to the west and east of the Mizzen Basin in the early 1980's)
- Regional presence of a "World Class" Triassic Sherwood Sandstone reservoir that is the principle reservoir in proven material oil and gas fields (Corrib, Morecambe Bay and Wytch Farm)
- Irish fiscal terms and acreage acquisition costs reward those companies prepared to "get in early" in the cycle of maturing and drilling material prospects

Geology and Resource Potential

- Molly Malone shares the same geology and structural setting as the Wytch Farm oil field in Southern England (up to 5 billion BO in place)
- Mizzen shares the same geology as Barryroe (multi-billion BO in place estimates) and Hibernia (1.3 BBO recoverable)
- Independent CPR resource estimates for Molly Malone and Mizzen gives combined Best Estimate STOIP of 14.31 BBO or 24.76 TCF of GIIP

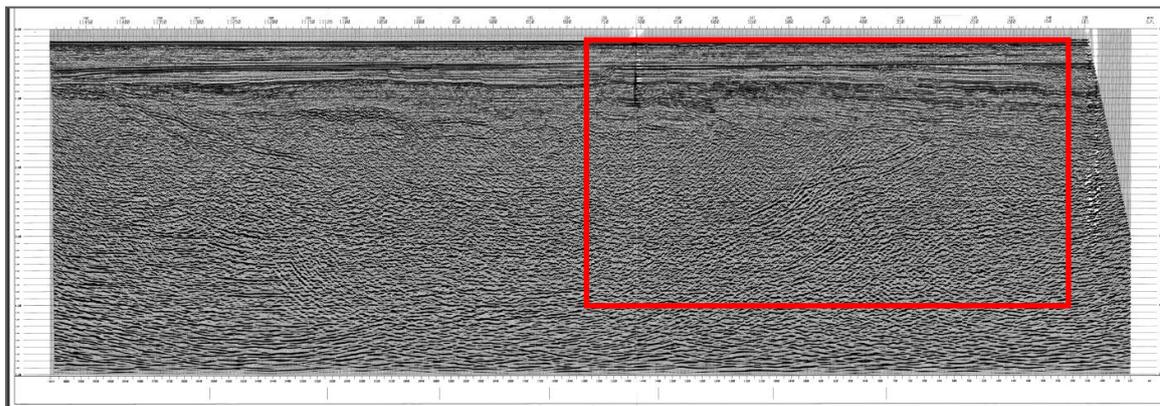
The Molly Malone “North” and “South” Prospects



Triassic Sherwood Sandstone Petroleum System

- Two tilted fault block prospects analogous to the trap hosting the Wytch Farm Oil Field
- Over 1,000 feet of good quality Triassic Sherwood Sandstone reservoir encountered in offset well 93/2-2 in the UK Sector
- Salt is present and forms robust caprock
- Hettangian (“Blue Lias”) oil prone source rock well developed in offset wells (live oil shows in well 49/29-1 in Irish Sector and proven source rock for Wytch Farm)
- Area of source kitchen equivalent to the source kitchen for Wytch Farm (300 sq. km.) demonstrating potential to generate material volumes of oil

The Mizzen “Intra-Basin” Prospect



Lower Cretaceous “Barryroe Equivalent” Basal Wealden Petroleum System

- Structural nose at Late Aptian Unconformity developed along transfer fault zone (trap comparison with the Hibernia Field)
- Basal Wealden reservoir sands (equivalent to but thicker than the Barryroe sands tested by) penetrated downdip in Esso well 56/12-1. Esso drilled on an invalid structural closure prior to seismic being acquired in the Mizzen Basin. 56/12-1 encountered oil shows in the “Barryroe Equivalent” reservoirs
- Onlap and stratigraphic pinch out updip over structural nose enhances trap integrity and size
- Lower Cretaceous marine shales related to maximum flooding surfaces form topseal
- Upper Jurassic (Lower Purbeck) oil prone source rocks (the source for the Barryroe oil) present at depth based on thermal extraction chromatogram for the live oil in 56/12-1 comparison with that for the Lower Purbeck source rocks
- Potential seismic DHI’s and gas chimneys being investigated by WesternGeco reprocessing

Triassic Sherwood Sandstone Petroleum System

- Large intra-basinal tilted fault block developed along early Upper Jurassic transfer fault
- Triassic Sherwood Sandstone reservoir highly prospective based on offset wells – good seismic character comparison with regional wells that have penetrated the interval
- Topauseal formed by Mercia Mudstone which may include salt
- Lower Jurassic (Hettangian “Blue Lias”) source rocks generated the light API oil tested in wells in the Fastnet Basin to the south
- Potential to fault-juxtapose mature Lower Jurassic source rocks and Triassic reservoir rocks – Chevron’s 56/15-1 well is the only valid test of the play concept in the North Celtic Sea. The well encountered residual oil shows proving the play concept but failed due to later (Tertiary) reactivation of the trap

Contact:

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Fastnet Oil and Gas Plc

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Website: www.fastnetoilandgas.com

Prospects 2 Go (Antrim Energy)

Licence Option 11/5, Porcupine Basin

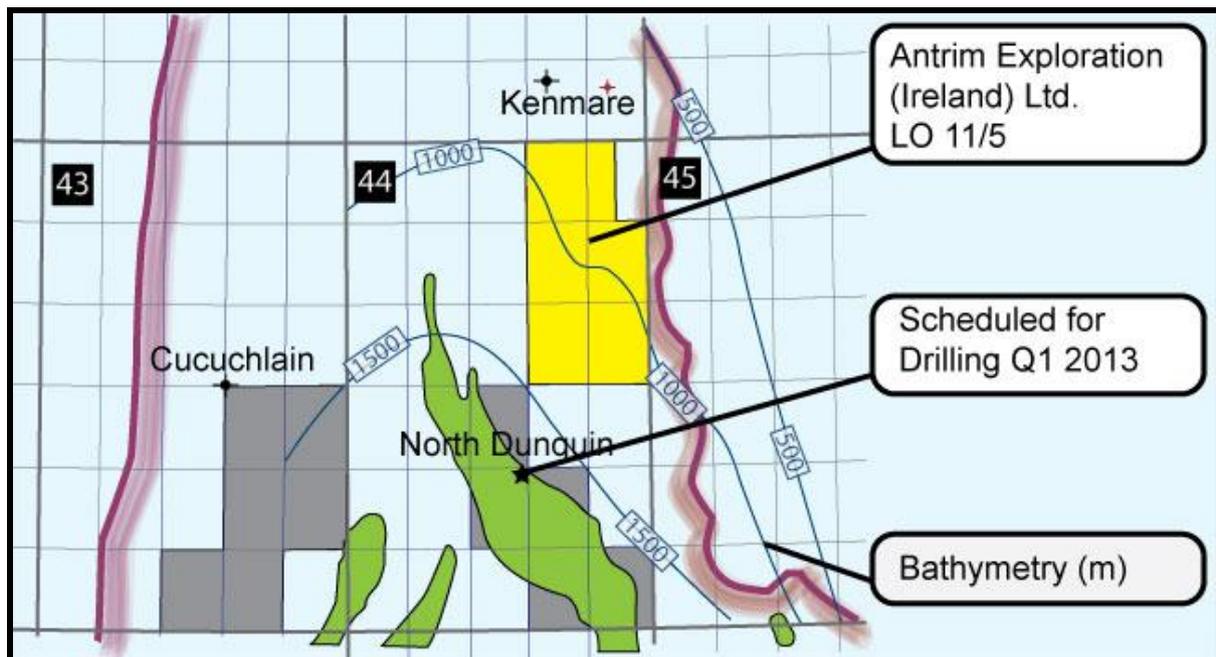
Morrison, K.¹ (morrison@antrimenergy.com)

¹Antrim Energy

Antrim Energy Inc. believes that the undrilled Lower Cretaceous fairway along the eastern Porcupine Basin margin could contain extensive oil-mature source rock horizons and the potential for multi-horizon stratigraphic traps. Antrim's License Option 11/5 (see map) is very well positioned in the Porcupine Basin to pursue both Cretaceous plays and established Jurassic targets.

A Frontier License application must be submitted in October 2013. Only limited 3D seismic exists in the fairway of interest. Antrim engaged TGS to reprocess the regional 1997 PSB 2D survey (~4500 line km) to recover amplitudes not preserved in the original processing. Subsequently selective pre-stack AVO inversion, post stack inversion, and forward seismic modelling will be performed to calibrate and characterize realistic reservoir/fluid response in the fairway of interest as a precursor to designing a comprehensive work program bid.

ExxonMobil et al is scheduled to drill the basin central North Dunquin high adjacent to and southwest of Antrim's LO 11/5 in early 2013. North Dunquin and LO 11/5 likely share a common Jurassic and Lower Cretaceous petroleum system but traps are independent. Water depths over Antrim's block range from 700 to 1500 meters.



For further information please contact Antrim Energy Inc.

1-403-264-5111

or

Please visit our website: www.antrimenergy.com

Prospects 2 Go (Bluestack Energy)

Ventry and Valentia Prospects, LICENCE OPTION 11/3

O'Driscoll, D.¹ (donal@bluestackenergy.ie), Robbins, J.¹ and Rawlinson, A.¹

¹Bluestack Energy

Summary

- Bluestack is a private company registered in Ireland, 100% holder of Licensing Option 11/3 in the Porcupine Basin. Equity is available in exchange for investment to take 11/3 into a Frontier Exploration Licence, and to progress to drilling an exploration well.
- Full coverage of good quality 3D seismic (1999-2000).
- Proven working petroleum system: well 35/30-1 encountered a 2,000ft gas column.
- Multi-TCF Middle and Upper Jurassic prospects which could be drilled on existing data.
- No well commitment required for 1st 3-year phase of a Frontier Licence.
- Water depth is 500 to 900m. The LO is located approximately 150km from land zoned for industrial development in the Shannon Estuary.

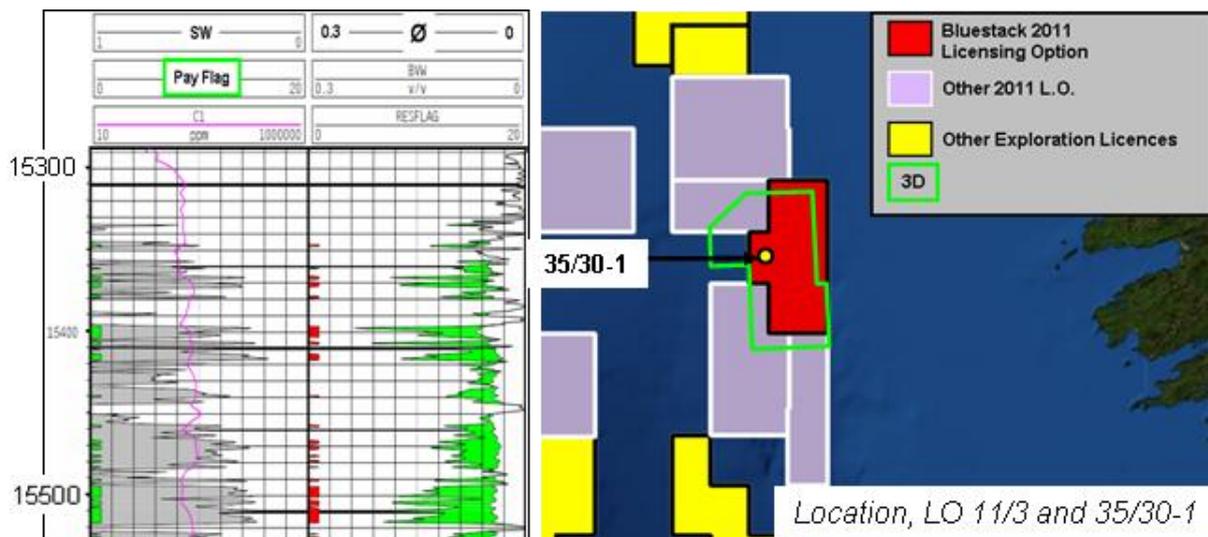


Figure 1. Location map and section of CPI log from Middle Jurassic of well 35/30-1.

Well 35/30-1 was drilled by Marathon in 1997 on a large structural high, defined on 2D seismic. The well found a gross gas column of 2,000ft in Middle Jurassic deepwater sandstones with 163 ft of logged net gas pay. The well was not tested. Bluestack names the discovery “Valentia”, a combined structural / stratigraphic trap with an estimated 1.5 TCF of gas in-place. Middle Jurassic reservoirs are also the main target in a terrace play, located up to 5,000 ft shallower than the reservoirs in well 35/30-1.

To the south of the well, Upper Jurassic sandy section is interpreted from seismic character, showing downlapping reflectors in a fan-shaped amplitude anomaly. The section is interpreted to be analogous to the youngest reservoir section at Spanish Point (35/8-2) and also to the Magnus, Miller and Burns Sandstones of the North Sea. All of these reservoirs are acoustically hard and often have a high-frequency banded appearance reflecting extensive lateral continuity of bedding. Bluestack informally names this fan complex the “Ventry Sandstone”. The Ventry prospect is a stratigraphic pinch-out trap, well imaged on 3D seismic. The trap is encased within the source rock Kimmeridge

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Clay Formation, located within or above the gas column encountered in well 35/30-1. The Ventry Sandstone section is absent in the well. Gas in-place estimate is 0.5 – 3.3 – 15.7 TCF (P90 -50-10). Gas is the expected phase but oil is also possible, having been found at 11,500ft in Upper Jurassic sands in well 43/13-1.

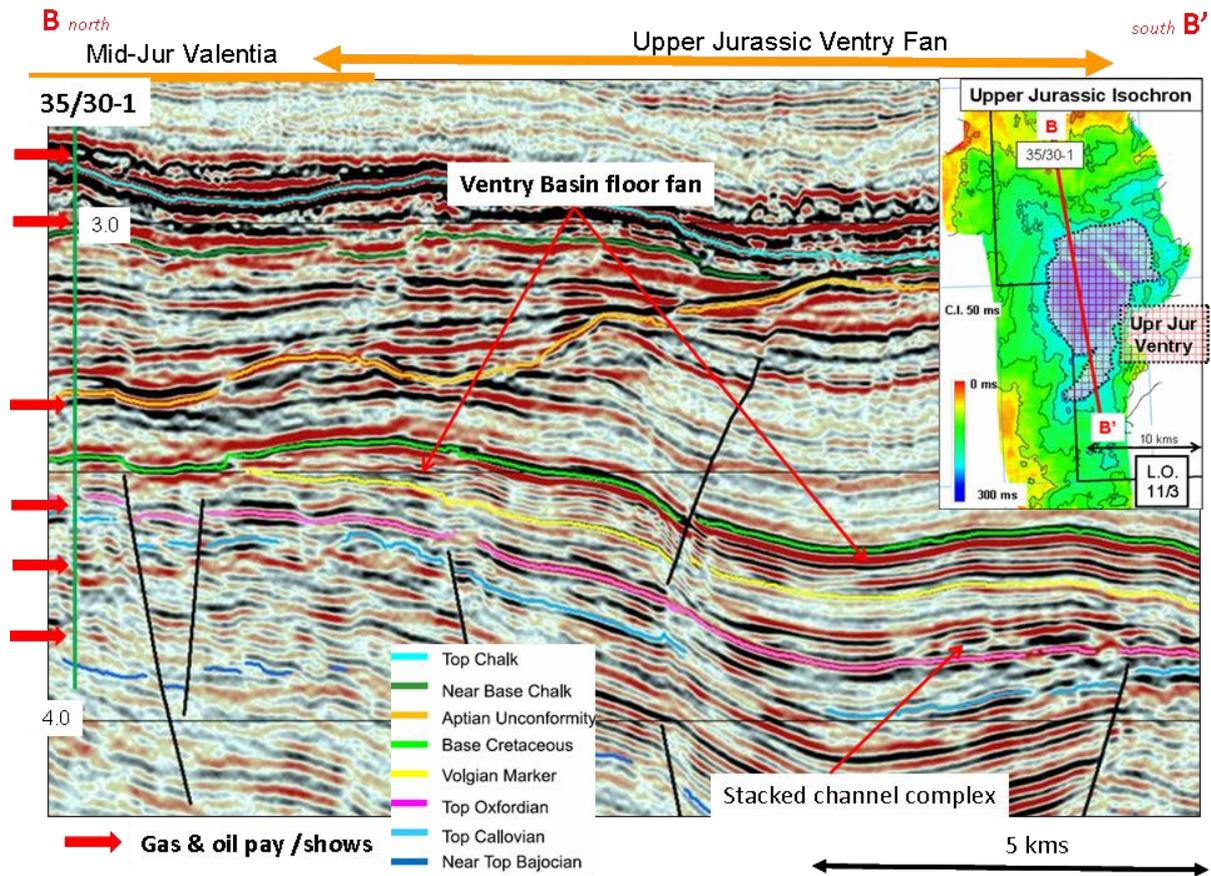


Figure 2. Well tie from 35/30-1 to Ventry prospect. The well was drilled on a structural high, finding a tight and condensed Upper Jurassic section which expands greatly off structure, to > 300ms TWT. The Ventry basin floor fan lies between the green Base Cretaceous pick and the yellow Volgian Marker. The deeper channelised fan complex forms a secondary target within Ventry.

Further prospectivity is being evaluated in the Lower Cretaceous. A significant show of wet gas was encountered within the Lower Cretaceous in well 35/30-1, in a thin-bedded, tight limestone and sandstone section (22% total gas, C1 – C4) below the Aptian Unconformity.

Parties interested in acquiring equity in this exciting opportunity should contact Donal O'Driscoll (donal@bluestackenergy.ie) or John Robbins (john@bluestackenergy.ie)

Prospects 2 Go (Serica Energy)

Muckish Prospect Drilling Opportunity

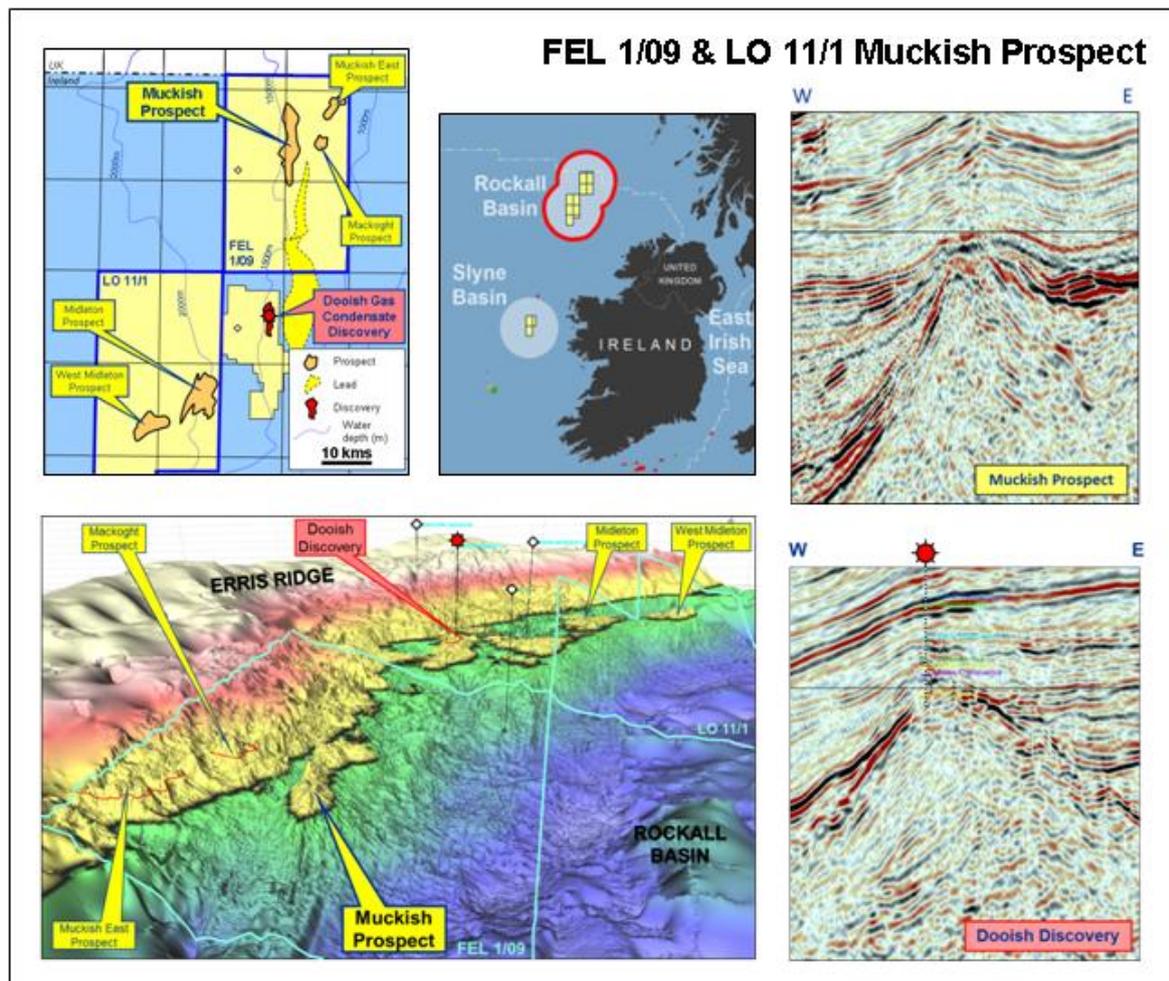
FEL 1/09 & LO 11/1, Rockall Basin, Atlantic Ireland

Pritchard, G.¹

¹Serica Energy (clara.altobell@serica-energy.com)

Serica Energy (UK) Limited is seeking a partner to drill an exploration well on the Muckish Prospect, Rockall Basin, Atlantic Ireland. The Muckish Prospect is a significant tilted fault block that is structurally analogous to the nearby Dooish Discovery. Mapped on excellent-quality 3D seismic data, it has up to 31 km² areal closure and over 600m of vertical closure. By analogy with Dooish, wet gas-condensate charged sandstone reservoirs of Permian to Middle Jurassic age are anticipated, although reservoirs of other ages are also possible.

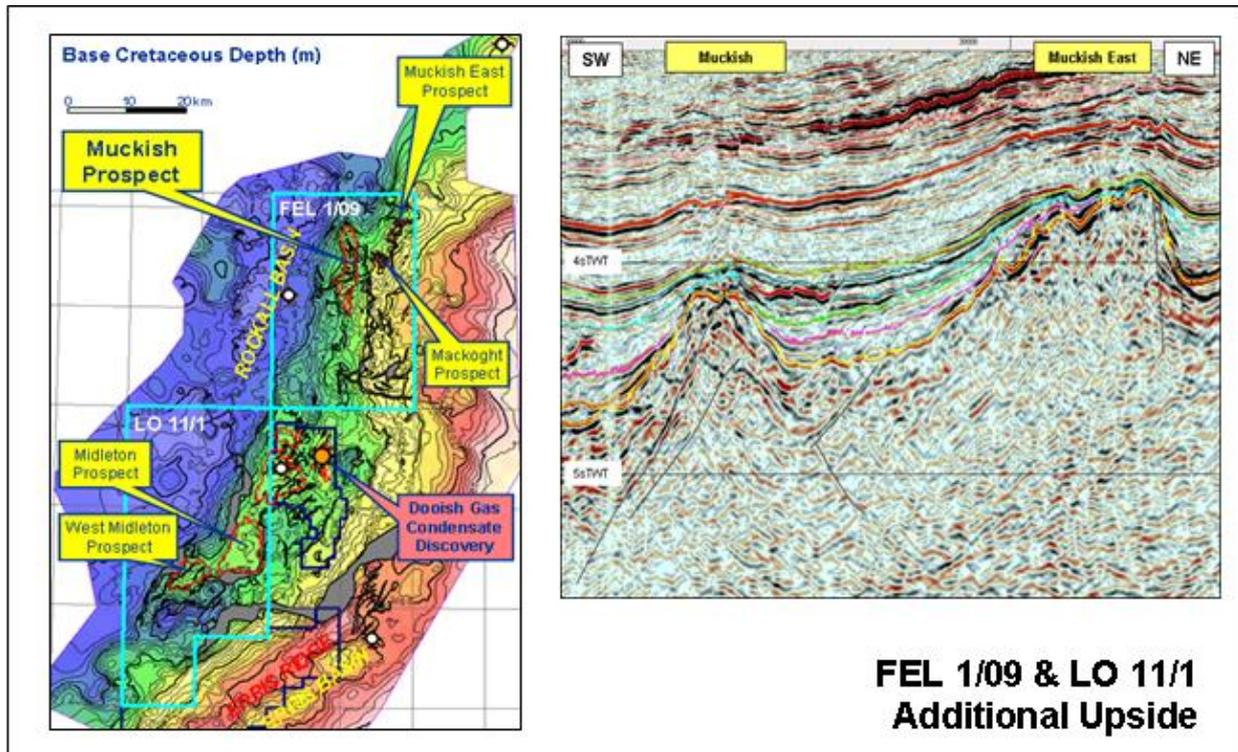
Serica has 100% in licences FEL 1/09 and LO 11/1 and is offering significant equity in return for partial funding of an exploration well on the Muckish Prospect. Muckish is located 30 km north of the Dooish Discovery well 12/2-1,1z, which has confirmed the significant hydrocarbon potential of this under-explored basin. An exploration well on Muckish is expected to cost \$52million (dry hole cost) and water depth is 1500m.



A number of follow-on prospects have been identified that provide substantial upside in the event of success at Muckish. These comprise the Muckish East, Mackoght, Middleton and West Middleton

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prospects, which are all conventional tilted fault block structures analogous to the Dooish Discovery. All prospects are clearly imaged on 3D seismic data.



Companies interested in pursuing this opportunity should contact:

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Tel: +44 (0) 207 487 7300,

Email: clara.altobell@serica-energy.com

Serica Energy, 52 George Street, London, W1U 7EA

Prospects 2 Go (Petrel Resources PLC)

Naylor, D.¹

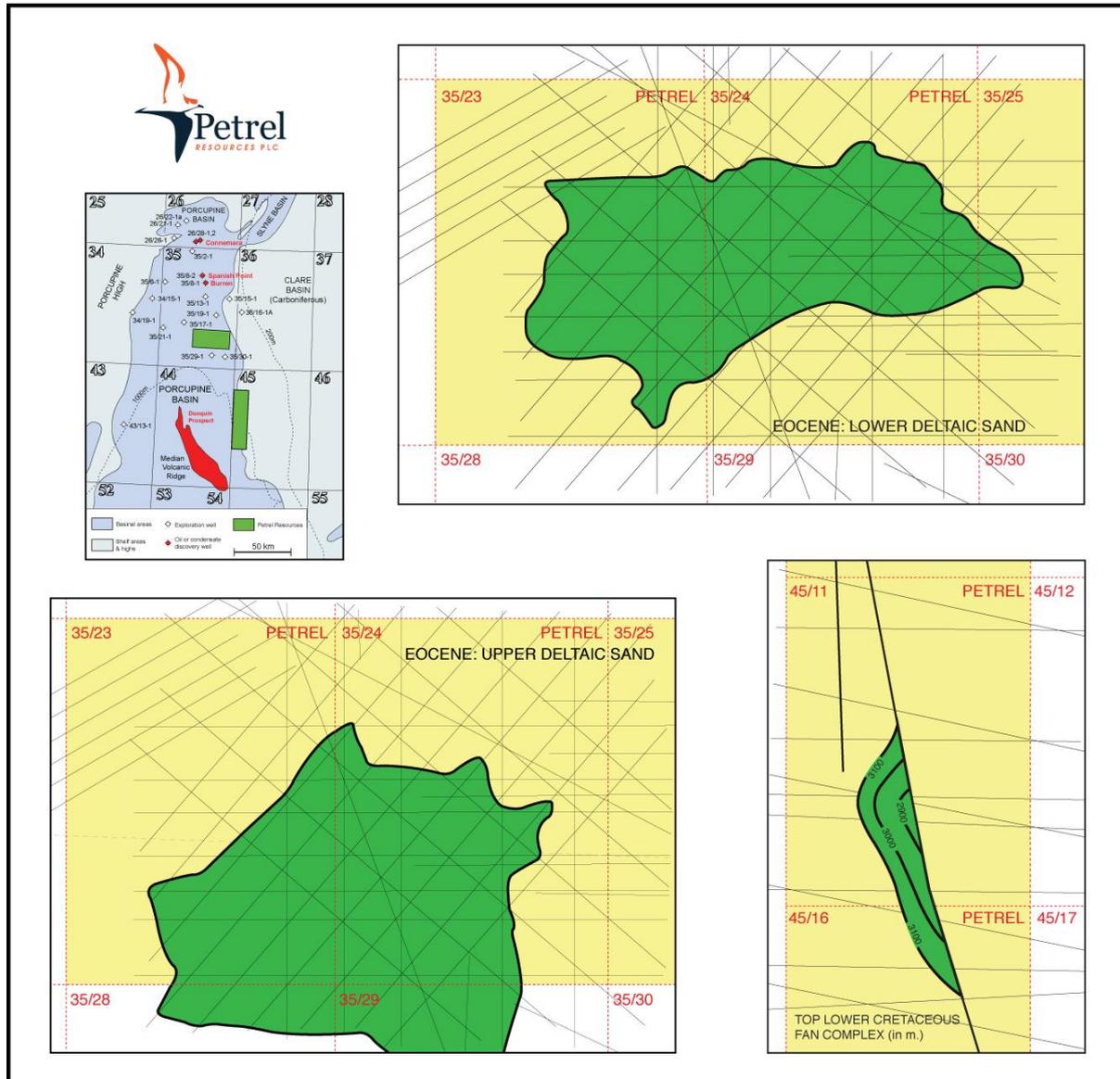
¹ Petrel Resources Plc (dhorgan@petrelresources.com)

THE COMPANY

Petrel Resources Plc is an AIM-listed independent oil and gas explorer focused on exploration and production projects in Ireland, Iraq and Ghana. The company was formed in 1982 to explore offshore Ireland and has a substantial database in the Irish offshore. Its operating headquarters are in Dublin.

PORCUPINE BASIN

Working petroleum systems have been demonstrated in the Porcupine Basin, with shows or flows of oil, gas and condensate recorded in many instances. Regional migration of hydrocarbons is likely to have been northwards and towards the basin margins. In the 2011 Atlantic Margin Licencing Round Petrel Resources was granted licencing options over the majority of its first two preference areas. The options (1,400km²) cover Blocks 35/23, 35/24 and the western half of 35/25, and also Blocks 45/6, 45/11 and 45/16.



Since the licencing options were granted the work programme has comprised:

- Petrophysical appraisal of 17 wells.
- Purchase of additional 2D seismic lines and re-interpretation of the integrated data set across both option areas.
- Purchase of 3D seismic data (eastern portion, Quad 35 blocks) and this is being interpreted.
- Inversion of selected 2D seismic lines to assess targeted reservoir sections.

- Petrel Resources is funding two MSc research students at the UCD School of Geological Sciences at University College Dublin.
 - A seismic project to detail the depositional facies and character of the identified sand bodies and potential reservoirs.
 - A study of the provenance of the reservoir successions using petrographic analysis, followed by the application of the Pb-in-feldspar technique.

PROSPECTS

QUAD 35

Petrel has mapped two Eocene sand units in the Quad 35 blocks at the front of the deltaic complex (see figure), with clear up-dip seal by facies change. There are areas of 4-way closure on the surface of the sand bodies. Seismic inversion of selected 2D lines will establish the reservoir quality. Wells further north in the basin have drilled reservoir sections in Eocene deltaic and associated environments, with deltaic units in excess of 200 m of net sandstones and porosities up to 39%. The mapped Eocene sand complex lies above a mounded Lower Cretaceous feature with 4-way closure, and this in turn is underlain by a Jurassic high – additional Upper Jurassic section on the flanks of this feature is clearly seen.

Quad 35 highlights:

- The closed Eocene deltaic sand bodies lie in an ideal position for the entrapment of northward migrating hydrocarbons
- Reservoir quality is likely to be good
- Stacked targets at Eocene, Lower Cretaceous and possibly Jurassic levels
- Drill depths to the top of the Eocene sand sequence are about 2.500m

QUAD 45

An elongate area of closure against the basin boundary fault has been mapped at 'Top Lower Cretaceous Fan' level in blocks 45/11 and 45/16 (see figure). The Lower Cretaceous fan complex is seen to abut directly against the boundary fault in these blocks. Inversion of the data is underway, although there is a lack of well control in this part of the basin. The sediments forming the fan were probably derived from the Celtic Platform immediately to the east, which may in part comprise sandy and siliceous basement rocks.

Quad 45 highlights:

- Substantial area of structural closure
- Drill depths of about <3000m to the Lower Cretaceous marker
- Thick untested reservoirs derived from an easterly source

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Prospects 2 Go (Two Seas Oil and Gas)

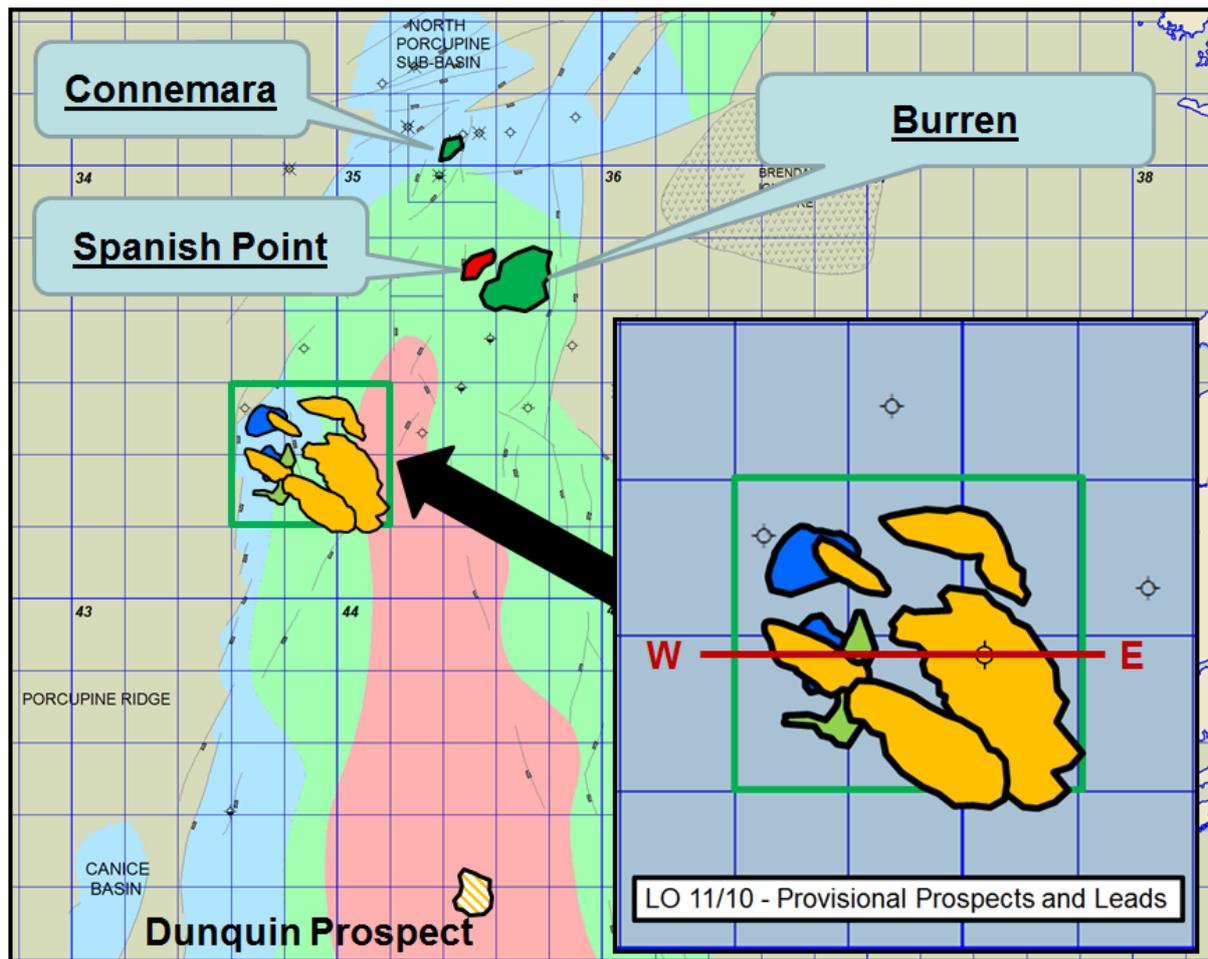
Irish Licence Option 11/10 – Exploring Untested Passive Margin Plays in the Proven Porcupine Province

Chessell, J.¹ (jerry@twoseasoil.com) and Charlampowicz, H.¹

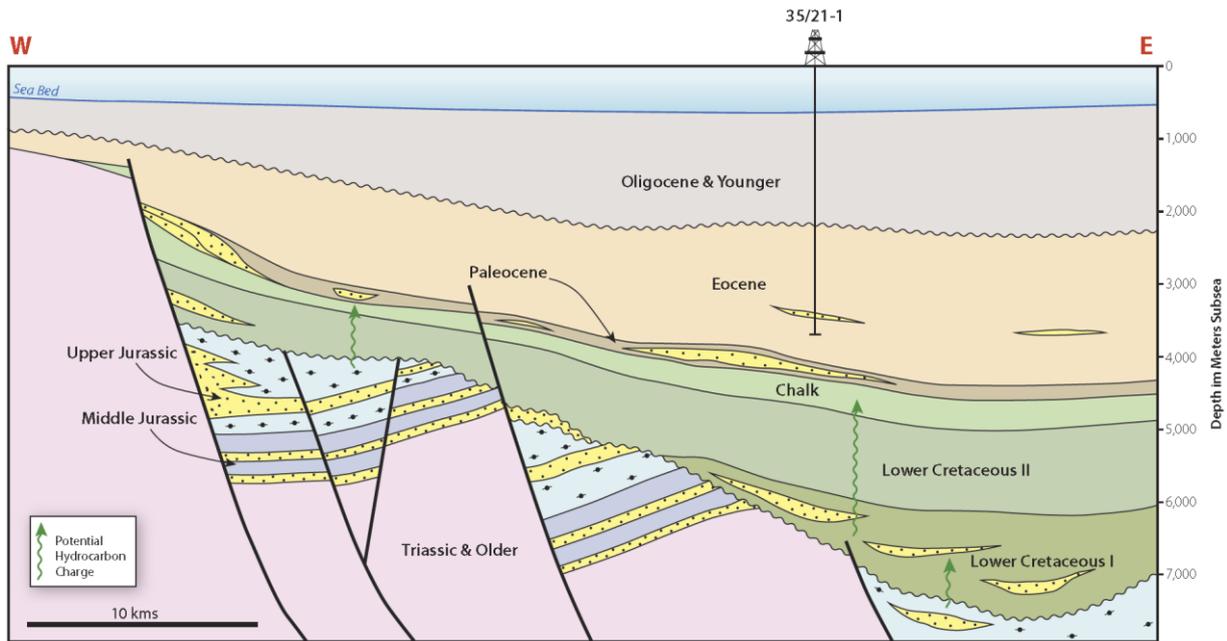
¹Two Seas Oil & Gas Ltd

Licence Option 11/10 was granted to Two Seas Oil & Gas in the 2011 Atlantic Margin awards. The acreage comprises 6 blocks: 34/19, 34/20, 34/24, 34/25, 35/16 & 35/21 on the western side of the main Porcupine Basin covering an area of 1519 sq. km.

Two Seas operate with a 60% interest on behalf of themselves and Strike Oil (40%).



The Licence area lies just 30 km SW of the large hydrocarbon accumulations in block 35/8 (Spanish Point and Burren) and 76% of all wells previously drilled in the basin have tested hydrocarbons to the surface or have demonstrated good hydrocarbon shows. A working petroleum system is thus empirically proven and geochemical studies have documented that both Middle and Upper Jurassic source rocks, whilst not ubiquitous, have expelled significant volumes of hydrocarbons which have subsequently migrated into potential reservoirs at Jurassic, Lower Cretaceous and Tertiary levels.



Mapping of a regional grid of 2D seismic lines (various vintages) and an on block 1000 sq. km 3D survey (acquired by Statoil in 1998) has identified a series of Late Paleocene sub-marine fan prospects for which the Foinaven/Schiehallion fields, West of Shetland may be a close analogy and this “fairway” is uniquely focussed on the held blocks. Our conservative potential in place volume for just one of the fans identified is in the order of 400mmb.

Detailed mapping has also identified large tilted fault block closures (Brent type) and syn-rift (Brae type) packages incorporating seismic facies indicative of potential sands at Middle and Upper Jurassic levels as well as wedges of late syn-rift/early post-rift sediments representing a previously undrilled early Cretaceous sequence.

Once the current work programme (block specific hydrocarbon charge modelling and seismic reprocessing) is complete and the acreage remapped, a comprehensive prospect inventory will be compiled with candidate well locations firmed-up.

Based on the work so far the Group are confident that conversion of the Option into a full Exploration Licence at the end of 2013 will be fully justified.

3rd Party participation in this opportunity is invited and discussions with potential joint venture partners are on-going.

Prospects 2 Go (Providence Resources)

Drombeg – An Apto-Albian prospect sourced from a seismically mapable hydrocarbon chimney

Byrne, K.¹ (kbyrne@providenceresources.com)

¹ Providence Resources

The Drombeg prospect lies in c. 2,500 metre water depth (c. 3,000 metres below the seabed) and is located in the southern Porcupine Basin, c. 220 km off West Cork, being c. 60 km from the ExxonMobil-operated Dunquin exploration prospect which is due to be drilled Q2 2013. The prospect is within License Option 11/9 which was awarded to Providence Resources Plc (80%, Operator) and Sosina Exploration (20%) as part of the 2011 Atlantic Margin Licensing Round.

The prospect is primarily defined by a 2008 long offset 2D survey and reprocessed 1998 2D survey with a line spacing of c. 3 km. Providence have mapped a significant seismic amplitude anomaly which is interpreted to be the deepwater equivalent of Lower Cretaceous Apto-Albian aged shallow water marine sandstones encountered in the BP-operated 43/13-1 well. That well, which was situated c. 80 km from Drombeg, encountered c. 70 ft of net Apto-Albian sandstone (average porosity of c. 19%).

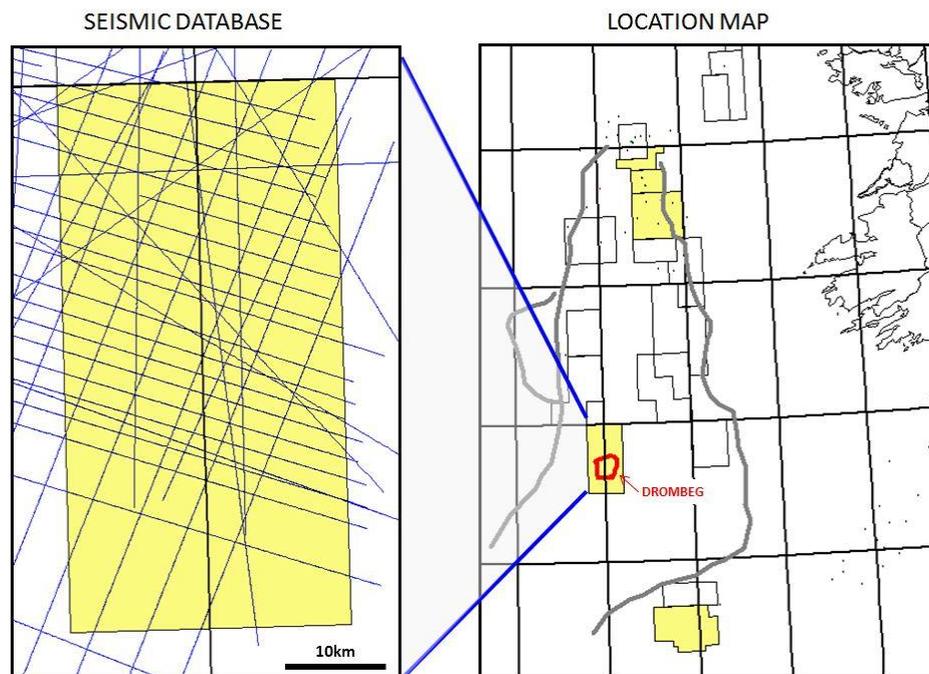


Figure 1. Licence location map and 2D seismic database.

The Drombeg prospect demonstrates a marked AVO response and Providence recently engaged Ikon Science to carry out a rock physics modelling and 2D seismic inversion study of the Drombeg prospect using a number of key 2D seismic lines together with regional well data. This study has concluded that the mapped seismic anomaly is consistent with a modelled hydrocarbon bearing sandstone interval which has a seismically derived thickness of c. 200-300 ft. Providence's mapping shows that the anomaly is aurally extensive covering c. 240 sq. km.

An underlying second seismic anomaly has also been identified and modelled to be consistent with hydrocarbon bearing sandstone with a seismically derived thickness of c. 140-200 ft and both anomalies appear to have a potential common down-dip depth termination.

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Further analysis of the PreSTM Gathers has been conducted which shows a clear AVO on the gathers over the prospect, and no AVO effect down-dip from the prospect.

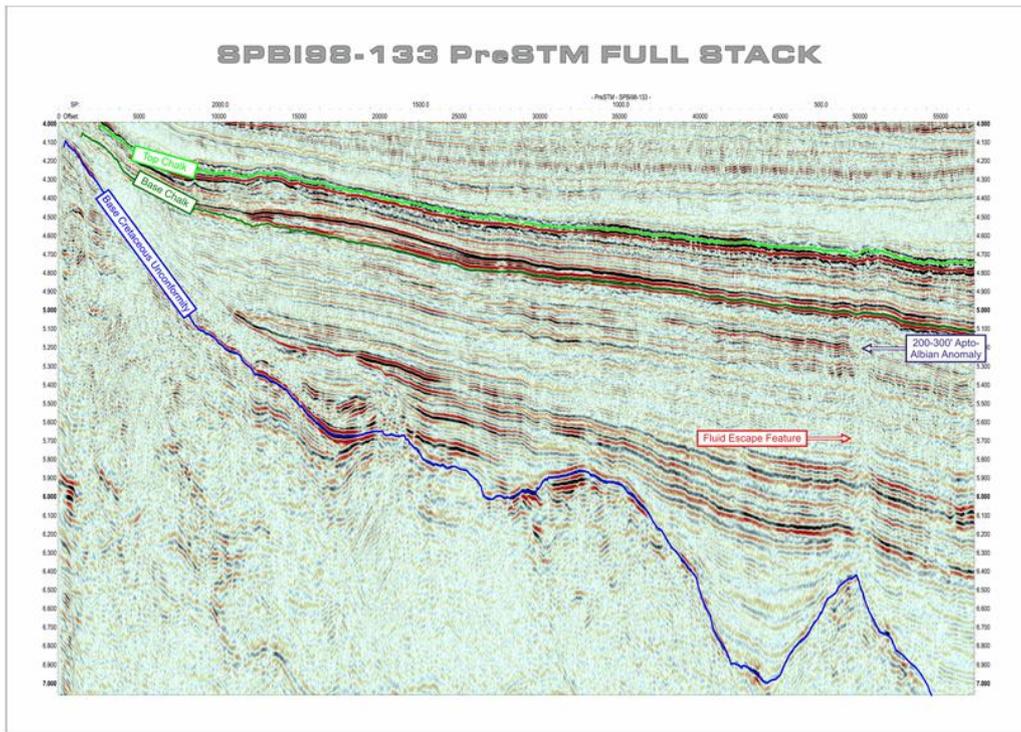


Figure 2. Seismic line SPBI98-133 through Drombeg Lower Cretaceous Prospect showing fluid escape feature from Jurassic/Triassic tilted fault block extending up to the downdip extent of the mapped anomaly.

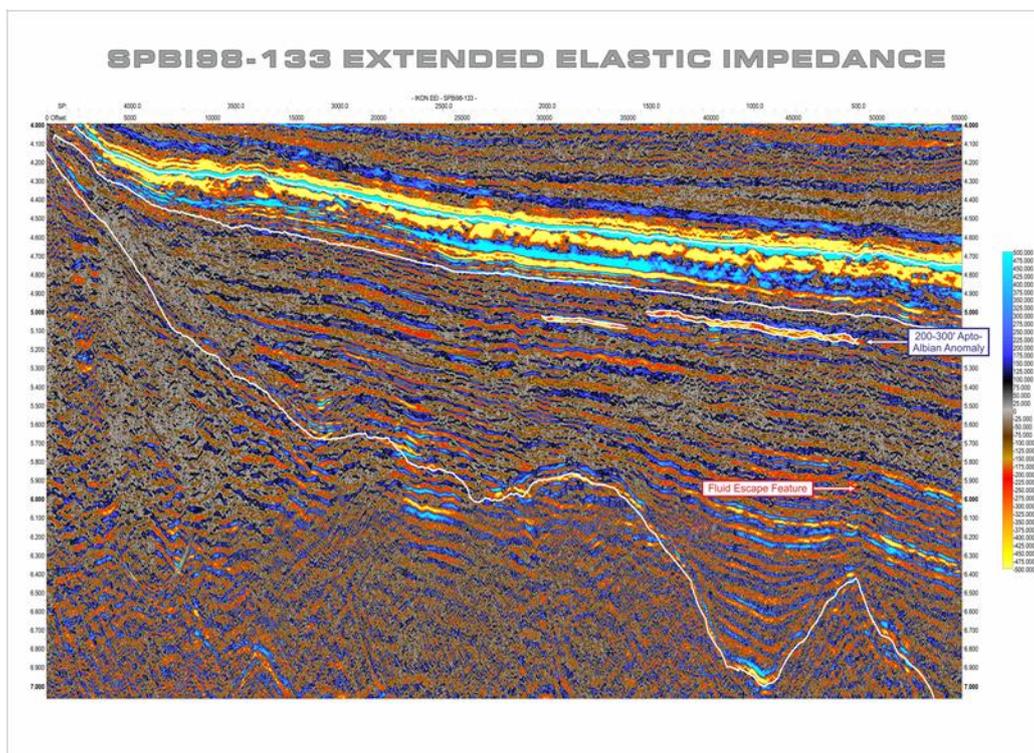


Figure 3. Extended Elastic Impedance of SPBI98-133 showing a clear anomaly at the Apto-Albian Drombeg prospect

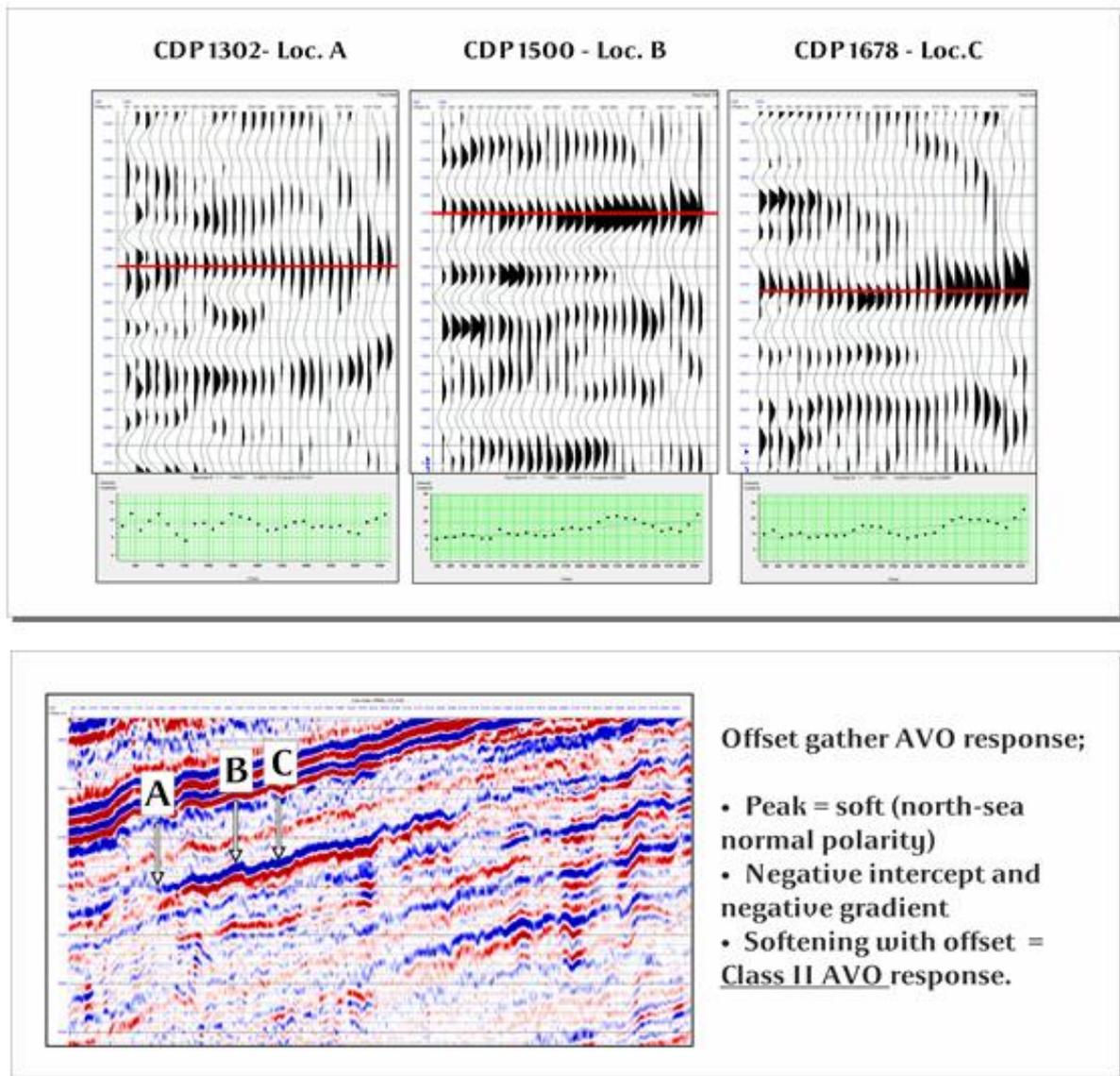


Figure 4. PreSTM Gathers along SPBi98-133 showing AVO

A major Jurassic tilted fault block closure covering c. 150 sq. km. has been mapped beneath the prospect and a marked fluid escape feature has been identified at its crest. This 'chimney' appears to terminate at the down-dip edge of the Drombeg seismic anomaly and provides potential evidence of hydrocarbon sourcing and migration into the prospect.

Prospects 2 Go (Europa Oil and Gas)

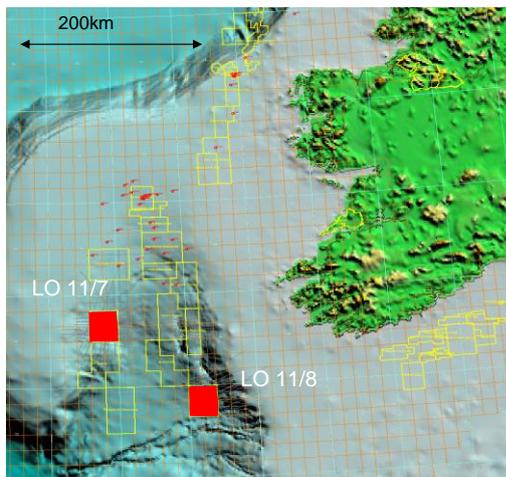
South Porcupine Basin, an Atlantic Margin Lower Cretaceous stratigraphic play

The Mullen prospect, Licence Option 11/7

Mackay, H.¹ (hugh.mackay@europaoil.com)

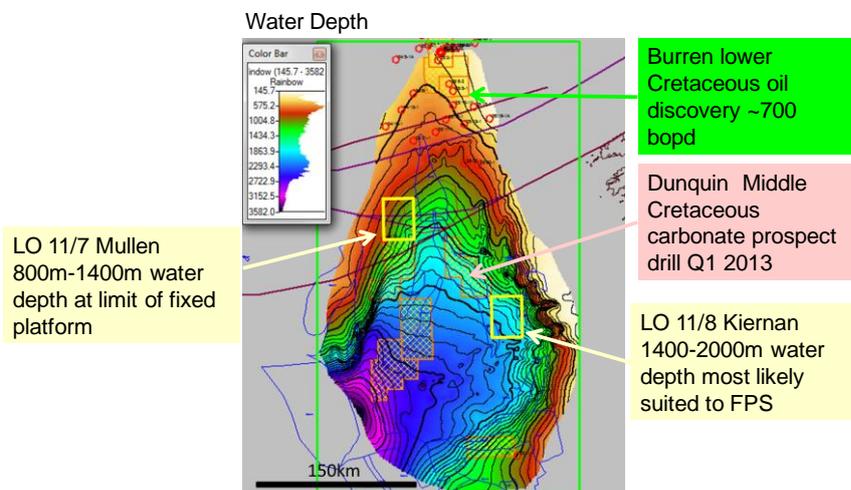
¹ Europa Oil and Gas

Europa Oil and Gas (Holdings) plc is an independent exploration and production company listed on the AIM market of the London Stock Exchange (symbol: EOG) and has a portfolio of exploration, appraisal and production assets in UK, France and Ireland.



Europa has a 100% equity in two licensing options in the South Porcupine Basin in the Irish Atlantic Margin. LO 11/7 is over blocks 43/9, 43/10, 43/14 and 43/15. LO 11/8 is over blocks 54/1, 54/2, 54/6 and 54/7. Each licence is approximately 1000km² in size. The option period is from 1 November 2011 to 30 October 2013. Europa Oil and Gas has implemented the technical work programme for this initial period, which involves the integration and interpretation of existing 2D seismic and well data sets, and reprocessing of selected 2D seismic data. Subject to the fulfilment of this work programme, government approval and a minimum 25% relinquishment, a 15 year Frontier Exploration licence may be obtained.

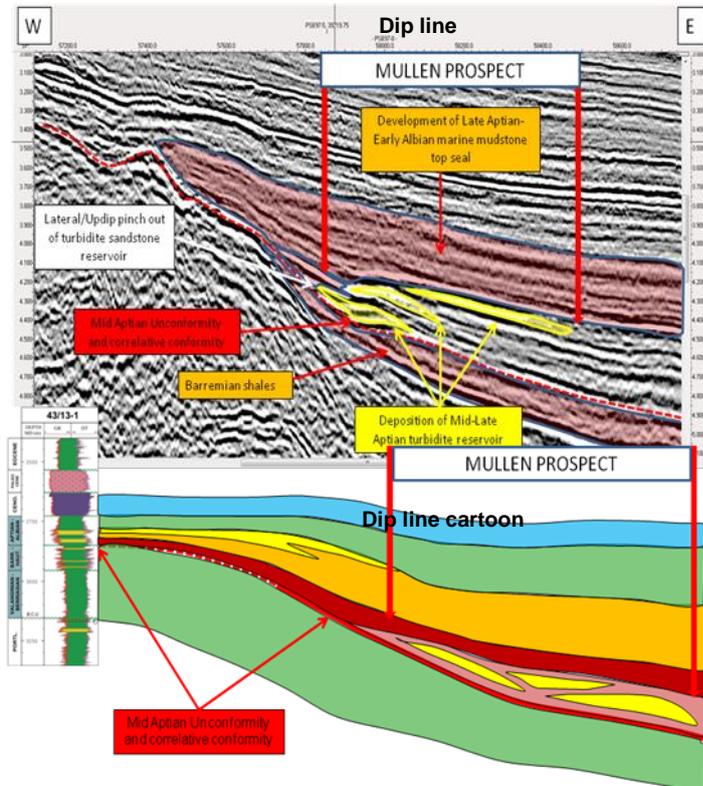
Europa has identified two prospects: Mullen within 11/7 and Kiernan within 11/8. The play configuration in both blocks involve the presence of Early Cretaceous turbidite reservoirs derived from hinterland areas characterised by the development of Devonian Old Red Sandstone. These reservoirs are charged by mature Late Jurassic and Early Cretaceous organic-rich marine shales. Both of these prospects are stratigraphic traps, reliant upon updip pinch-out of the turbidite reservoir on to a mud-dominated slope succession. The trapping configurations are analogous to the Jubilee and Mahogany fields in the equatorial Atlantic Margin province.



This Early Cretaceous play is proven in the North Porcupine Basin by the Burren oil discovery made by Phillips in 1978 and which flowed circa 700 bopd of 34° API oil. The South Porcupine Basin is essentially undrilled. Technical success at the upcoming Dunquin well may help de-risk some source rock elements of the Lower Cretaceous clastic play.

ATLANTIC IRELAND 2012

First pass seismic reprocessing over the Mullen prospect has been completed making this the most technically advanced and suitable for presentation at this conference. Reprocessing over Kiernan is ongoing and this prospect will be presented at a later date.

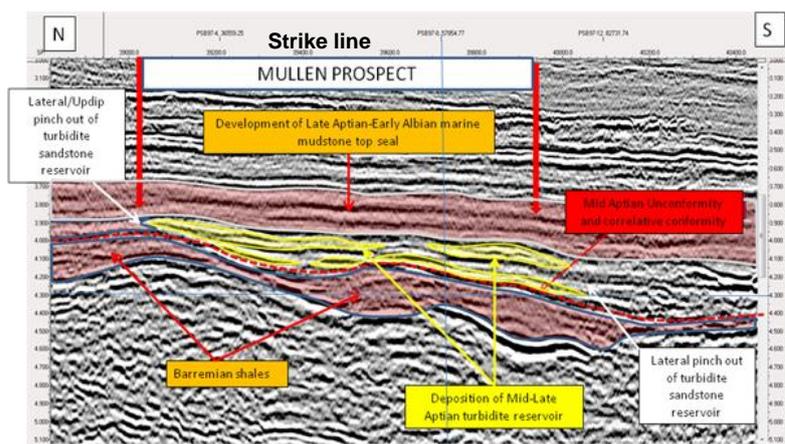


Base seal at Mullen is considered to be Barremian shales. Top seal is provided by Late Aptian-Early Albian marine mudstones. The Mid-Late Aptian turbidite reservoir was derived from the Porcupine High and both lateral and updip stratigraphic pinchout of the reservoir package can be observed on dip and strike seismic lines.

Upper Jurassic source rocks are proven in the North Porcupine basin, both by drilling and analysis of produced hydrocarbons. There is only one well, 43/13-1, in the South Porcupine Basin. The well is located on the flanks of the Basin and contained thermally immature Upper Jurassic source rocks. It is also possible that Lower Cretaceous oil prone source rocks might be present in the South Porcupine Basin. Lack of drilling means these are not proven although the presence of parallel

continuous seismic facies characteristics observed on seismic may provide some support to the development of potentially organic-rich mudstone dominated successions within this stratigraphic interval.

The water depth at the Mullen prospect location is approximately 1000m, and is therefore feasible for a fixed platform development. Depth to top reservoir is approximately 3840m below the mudline. Indicative reserves at Mullen are estimated to be between 66 and 1092 MMBO. P50 reserves are 318 MMBO and are supported by an amplitude shut-off at a constant depth. Europa's commercial modelling suggests an NPV10 of \$18/barrel is appropriate for valuation purposes.



Europa believes the South Porcupine Basin has the potential to host a new hydrocarbon province and is very encouraged by the results of the initial prospect evaluation. Europa is seeking a joint venture partner with which to undertake further technical work and mature its prospects in LO 11/7 and LO 11/8 to drillable status.

For further information contact Hugh Mackay: hugh.mackay@europaoil.com tel +44 20 7224 3770. www.europaoil.com

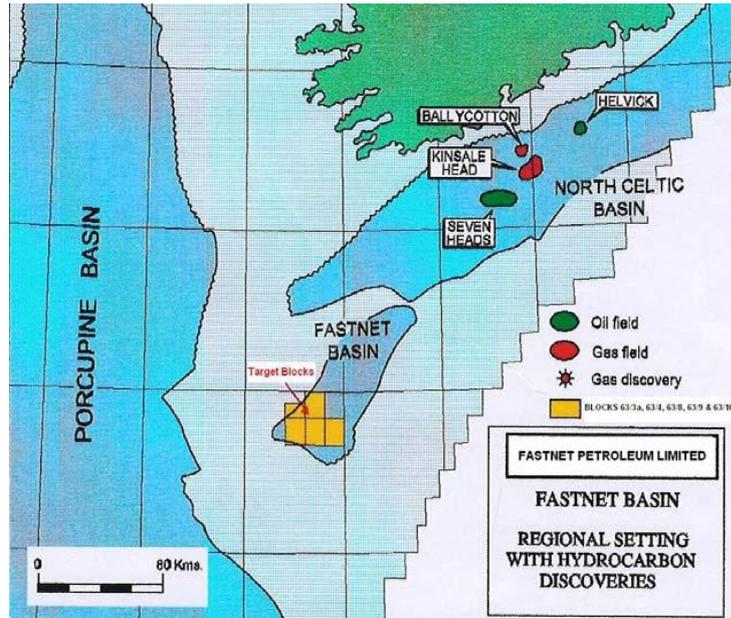
Prospects 2 Go (Fastnet Petroleum Ltd.)

Prospectivity of SW Fastnet Basin

Mikkelsen, P.¹ (PeterMikkelsen@simco-pet.com)

¹Fastnet Petroleum Ltd

Overview: Blocks 63/3a, 63/4, 63/8, 63/9 & 63/10 lie in the SW part of the Fastnet Basin, about 200 km SW of Cork. They cover an area of 1,200 km² and lie in water depths of approximately 430 feet (130m).



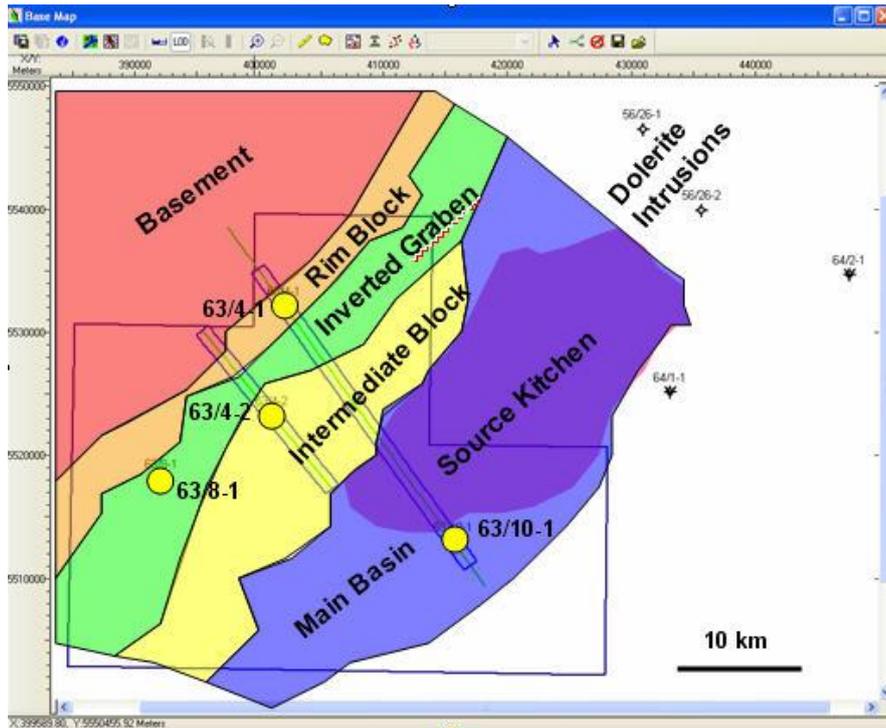
They were awarded to a group consisting of:

Fastnet Petroleum Ltd (operator): 50%

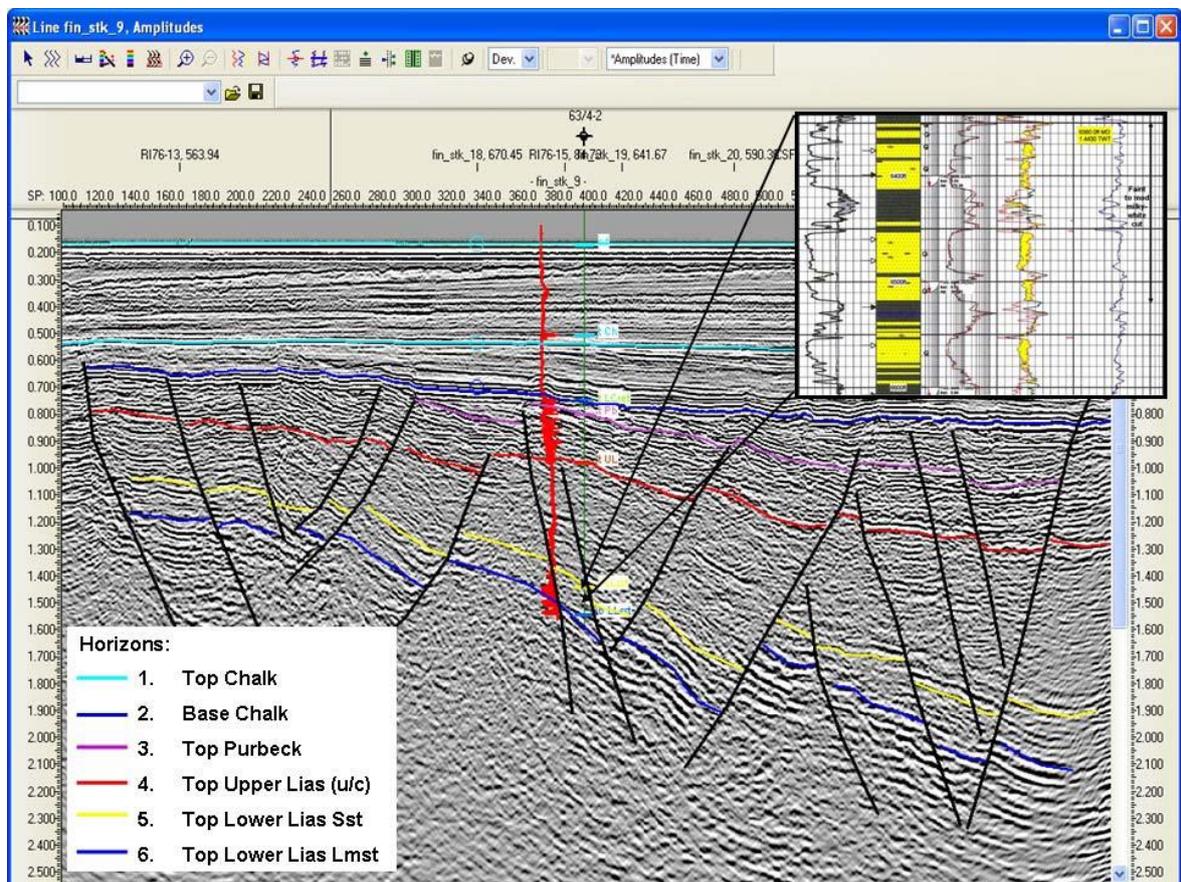
Excalibur Exploration Ltd: 50%
as Licence Option 12/1 by the Irish Energy Ministry on 2nd May 2012 for a three year period. The initial work programme involves the reprocessing of vintage 2D seismic, structural remapping, a basin modelling study and petrophysical analysis of existing wells. The seismic reprocessing was completed by GeoKinetics in Sept-12 and the remaining projects are in hand for completion by the end of 2012.

The next step is to acquire approximately 600 km² of 3D seismic to delineate the prospects and leads identified to a point where a commitment to drill can be made and the Licence Option be converted into a full Exploration Licence. Because of the acceleration of the initial work, it is now planned to acquire the new 3D survey in the summer of 2013. The current equity partners would welcome the entry of one or more farminees to help carry out this programme.

Background: The Fastnet Basin is a Triassic to Early Jurassic rift, covered by Upper Jurassic, Cretaceous and Tertiary post-rift sediments, with a maximum estimated thickness of >5 km and an extent of 40 x 80 km (about 3,000 km²). 11 wells were drilled here during the late 70s to early 80s, based on a relatively widely spaced grid (2x2 km or worse) of variable quality 2D seismic. The 3 wells in the NE found no Jurassic reservoir, while the 5 in the central area found thin, mostly tight reservoir affected by dolerite intrusions of Bajocian age, but which nevertheless had oil shows. By contrast, the 3 wells in the SW part of the basin encountered mostly good quality, thick Lower Lias sands, with one (63/10-1) testing an oil/acid emulsion of 67 bpd from an estimated oil column of ~15m.



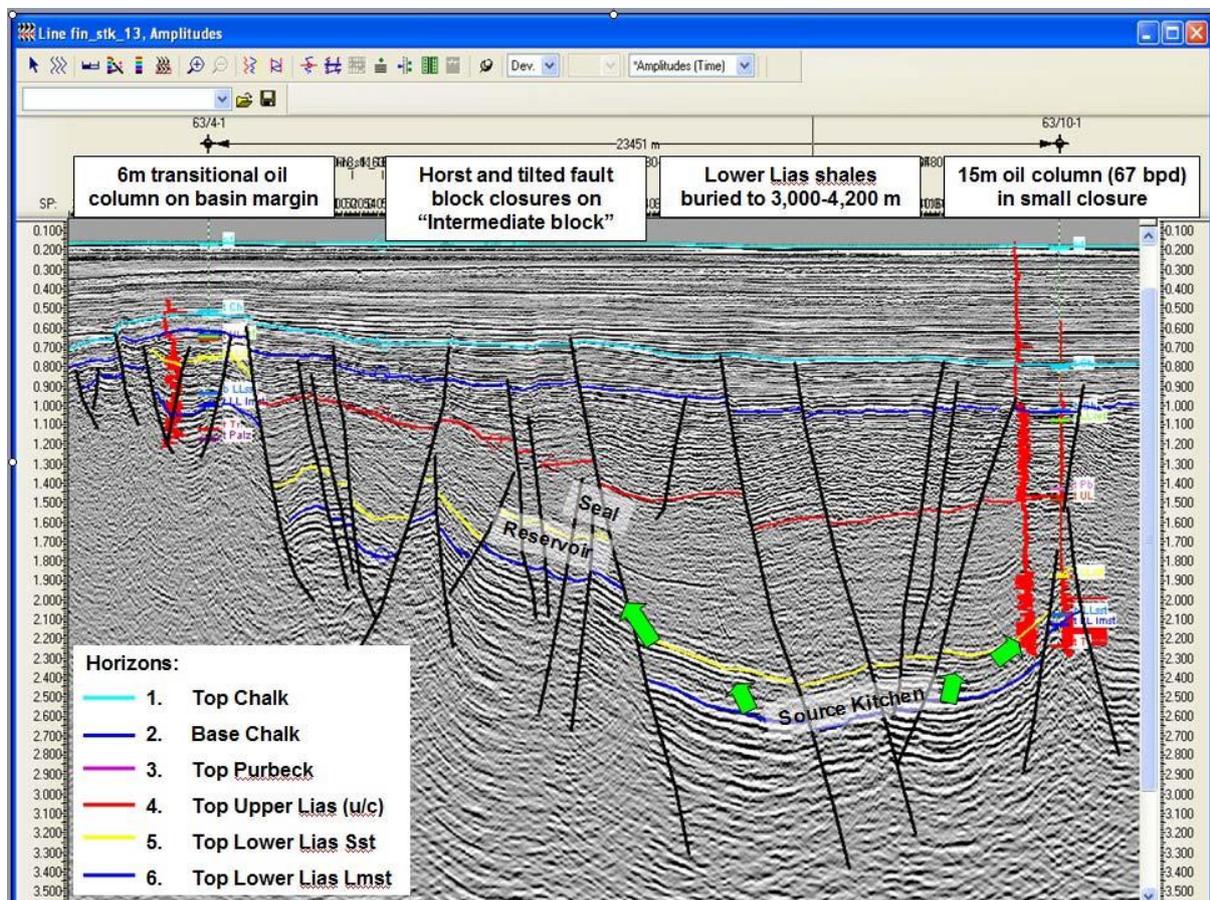
The final well in the basin (63/4-2) was drilled by EDC in 2001, still on a 2D seismic grid. It encountered some of the best reservoir rock seen to date (>80m net sand with average porosity of ~20%), but came in 300m low to prognosis, testifying to an incorrect structural model.



ATLANTIC IRELAND 2012

Petroleum System: The principals of the present licence group have all had some past association with exploration in the basin and strongly believe that all the key elements of a petroleum system have been proven:

- good quality Lower Lias reservoir sands are present in the southern half of the basin;
- an oil prone source rock (100-200m thick with TOC up to 2.7%) in the Sinemurian has been encountered in most wells. It is buried into the oil window (3,000-4,200m) over the central 300 km² of the basin. This is the time equivalent of the Black Ven Marls which have generated and trapped >1 billion bo at Wytch Farm.
- Numerous tilted fault blocks and horsts of Jurassic to Early Cretaceous age provide structural traps;
- Thick (>600m) seal of Upper Lias clays (proven from wells) should retain most generated hydrocarbons in the sand immediately beneath. The general lack of shows in the Wealden sands compared to the numerous shows in the Lias sands support this view.



Current programme: The reprocessing of 400 km of 1996 seismic has achieved a significant improvement in quality, removing multiples, better and sharper imaging of faults and enhancing horizon character in the target Liassic horizons. The key 63/4-2 well can clearly be seen to be ~150 msec (>200 metres) downdip on a rotated fault block. A full reinterpretation has just commenced and will be completed by end November. It is anticipated that this will indicate several attractive prospects and leads which will be detailed by 3D seismic in 2013. Petrophysical and Basin Modelling studies have also been initiated with TGS in London, which will be completed by December 2012.

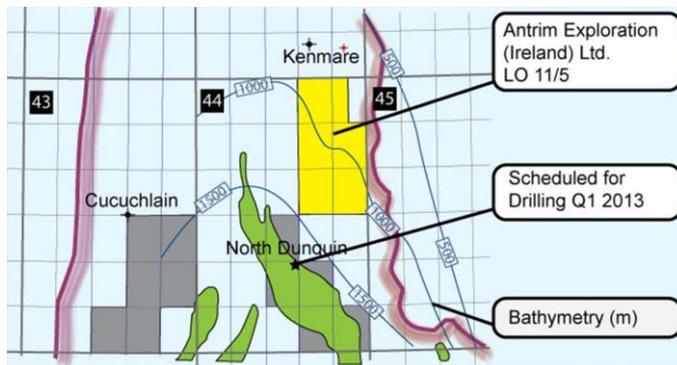
STANDS (in alphabetical order)

Antrim Energy Stand

Licence Option 11/5 – Porcupine Basin

The undrilled Lower Cretaceous fairway along the eastern Porcupine Basin margin could contain extensive oil-mature source rock horizons and the potential for multi-horizon stratigraphic traps. Antrim's Licence Option 11/5 (see Map 1) is well positioned in the Porcupine Basin to pursue both new Cretaceous play types and the established Jurassic targets.

Antrim has engaged TGS to reprocess the regional 1997 PSB 2D survey (Antrim's share is 2484 line km) to recover amplitudes not preserved in the original processing. Selective pre-stack AVO inversion, post stack inversion and forward seismic modelling are being performed to calibrate and characterize realistic reservoir/fluid response in the fairway of interest. Once completed Antrim will submit a comprehensive work program bid.



Map 1: An integrated assessment of the petroleum resource potential of the area must be submitted and a detailed future work program must be proposed for a maximum of 75% of the Licence Option area (1409 sq.km) no later than July 31, 2013. Final authorization for the grant of a Frontier Exploration Licence is at the Minister's discretion.

The basin central North Dunquin high located adjacent to and southwest of Antrim's LO 11/5 is scheduled to be drilled in early 2013. North Dunquin and LO 11/5 likely share a common Jurassic and Lower Cretaceous petroleum system but traps are independent. Water depths over Antrim's lock range from 700-1500m.

Building on Exploration Success

Antrim Energy Inc. is a Canadian based oil and gas exploration & production company active in the UK North Sea, Ireland and Tanzania.

- Antrim's operated wells in the UKNS Causeway Field have established > 30 million barrels of oil (2P gross).
- Antrim's non-operated production from the UKNS Causeway Field is expected to commence in October 2012 at an initial annual rate of 3000 bopd (net).
- Antrim has built a large and focussed licence position in the Central North Sea adjacent to the 100% Antrim-owned Fyne Field and has mapped several prospects and leads with a similar play concept to the recent Catcher discovery, 35km to the south.

- Antrim's current Q4 2012 exploration drilling programme includes a well ("Contender") to be drilled offsetting the North Cormorant Field in the Northern North Sea and a well to be drilled for an Eocene target in the Central North Sea.

In addition to the UKNS, Antrim has been making significant investments in frontier areas such as Ireland and East Africa (Tanzania), now one of the most promising new hydrocarbon provinces on the globe.

APT Stand

APT is a commercial company offering high quality analyses and consultancy services to the oil industry within the fields of petroleum geochemistry, biostratigraphy, production monitoring, sedimentology, structural geology and basin modelling.

APT was established in March 2000 and is owned by the Institute for Energy Technology, one of Norway's largest and leading research centres and a group of ex-Saga Petroleum employees. APT purchased the Saga Petroleum geochemistry and biostratigraphy laboratory facilities following the take-over of Saga Petroleum by Norsk Hydro. APT is closely integrated with the "Reservoir and Exploration Technology" and "Environmental Technology" departments at IFE. APT acts as the commercial arm of petroleum geological services for IFE and as an indicator for research directions, through close contact with oil companies.

During its short existence APT has provided services to 21 oil companies and 13 consultancy/research organisations within the various disciplines and embracing exploration and production problems, concession rounds, well studies, surface geochemistry and none – exclusive regional studies.

ARKeX Stand

ARKeX is a leading supplier of gravity and magnetic services to the exploration industry. As well as being a release agent for offshore PAD and DECC gravity and magnetic data, ARKeX can also supply non-exclusive data on behalf of the BGS and most of the major seismic companies. ARKeX offers processing and re-processing of gravity and magnetic data, and are able to merge overlapping data of different vintages into one contiguous data set. Drawing on nearly 25 years industry experience of international projects, ARKeX can interpret integrated potential fields and seismic data to produce geological models in areas where seismic alone is insufficient. In areas of inadequate data coverage, ARKeX is able to acquire both airborne and marine magnetic and gravity gradiometry data.

Donegal County Council Stand

The Donegal County Council stand promotes the facilities in the County available for the offshore oil industry. This includes the deep water port of Killybegs and the airport at Carrickfinn.

Killybegs is a modern, vibrant and forward looking harbour operation. Located in County Donegal in the North West of Ireland it is well placed for servicing offshore energy exploration along Ireland's West Coast and indeed Europe's Western approaches.

Killybegs has deep water all-weather harbour infrastructure along with hydraulic and mechanical services to play a pivotal role in the development of offshore energy. The town of Killybegs has a proud maritime heritage. Developed initially as a fishing port, it has since 1999, played an important role in facilitating offshore exploration and in particular the development of the Corrib Field. It has also been the harbour of choice for wind farm developers, with turbines being delivered for wind farms throughout the north and west of Ireland. In a further development, Killybegs has become the port of call of many cruise ships that benefit from modern berthing and quayside facilities along with direct access to the Highlands of Donegal. Killybegs in essence has evolved into a multifunctional port serving the fishing, energy and cruise sectors. Therefore the presence of this expertise, adaptability and flexibility ensures that Killybegs can meet any challenge. A “can do” attitude pervades.

All the companies listed below have selected Killybegs as their port of choice in support of their offshore activities.

Exploration & Production Companies

Shell
Statoil
Lundin
Serica / AGR
Eni

Subsea / Offshore Construction Companies

Allseas
Technip
Van Oord
Tideway
CTC Marine

Seismic Companies

PGS – Fugro Survey
CGG Veritas – Bergen Oilfield Mgt.
TSS Nopec – Seabird Exploration

Renewable Energy Companies

Enercon
Gamesa
GE Wind Energy
Ocean Energy
Siemens
Vestas
Wavebob
West

In recent years Donegal Airport at Carrickfinn has also provided a hub for the offshore oil and gas industry for many of the major oil Companies. It is strategically located for the support of air services to offshore operations in the West and North West. Helicopters are based at the Airport and fixed wing charters operate to/from Scotland and Norway for the duration of the contracts. Other airport operations include air corps, search and rescue services, private charters and general aviation.

EMGS Stand

EMGS, the marine EM market leader, uses its proprietary electromagnetic (EM) technology to support oil and gas companies in their search for offshore hydrocarbons. EMGS supports each stage in the workflow, from survey design and data acquisition to processing and interpretation. The company's services enable integration of EM data with seismic and other geophysical and geological information to give explorationists a clearer and more complete understanding of the subsurface. This improves exploration efficiency, and reduces risks and the finding costs per barrel.

EMGS has conducted more than 650 surveys to improve drilling success rates across the world's mature and frontier offshore basins. The company operates on a worldwide basis with main offices in Trondheim, Stavanger and Oslo, Norway; Houston, USA; and Kuala Lumpur, Malaysia. Please visit www.emgs.com for more information.

ERM Stand

An engaging challenge in the Atlantic Margin

An Irish economy that has been struggling gainfully to lift itself out of the economic doldrums can sound a more optimistic note when it casts an eye out towards the Atlantic Margin. According to the Irish Government's Petroleum Affairs Division, last year's offshore licensing round, covering a quarter of a million square kilometres of often hostile ocean, was the largest ever. PAD believes there are potential resources of 10 billion barrels of oil while total gas reserves may well run into multiple trillions of cubic feet.

It's no surprise then that a growing number of exploration companies, from small and medium-sized firms to some of the world's largest operators, are now investigating opportunities in the region. Here is an oil and gas play that could make a serious contribution to global energy needs – not to mention the Irish economy – and companies are positioning themselves to develop what they believe will be highly profitable operations.

Non-technical risks

A big challenge for junior explorers and indeed some of the larger companies moving into the region is managing what can best be described as the non-technical risks associated with their plans. While new technologies and higher energy prices have helped to extend the boundaries of exploration, companies still need to demonstrate that they are responsible citizens to a range of stakeholder groups, including regulators, well organized NGOs and local communities.

ERM has extensive experience working with clients to manage the gamut of risks associated with oil and gas exploration in frontier areas. These can range from managing the community consultation which is considered a crucial element of the licensing regime (for the Atlantic Margin and elsewhere), to providing core services in such fields as oil spill contingency planning, contractor and management system auditing, preparation of safety cases and social impact assessment. In addition to our direct experience supporting the planning and permitting of Irish energy projects, we bring a 40 year track record supporting E&P projects around the world.

We believe that our experience as both an international risk management advisor and local partner can deliver tangible benefits to companies seeking to harness the potential of the Atlantic Margin. Faced not only with challenging operating conditions but also local sensitivities in relation to proposed

drilling activities, explorers must demonstrate that they are well prepared with actions and forward planning to manage any adverse risks and impacts.

Effective engagement

As has been shown recently in relation to drilling applications for the region, the flip side of this coin can be strong opposition and even stronger criticisms when a license is granted with what is seen to be an inadequate assessment of potential impacts. This can be the case, for example, if a drilling operation is proposed close to the shore or a clean-up strategy is considered inadequate. Only through effective engagement with stakeholders and transparency (flexibility) in relation to plans can this type of opposition be overcome. Being seen to be responsible and alert to local sensitivities is a key requirement in relation to any application.

In fact, demonstrating that you can operate in fragile environments without adversely impacting on local communities is now seen as an essential element of a company's license to operate. This can apply at all stages of the permitting process and as part of an increasingly tough and testing oil and gas operating environment.

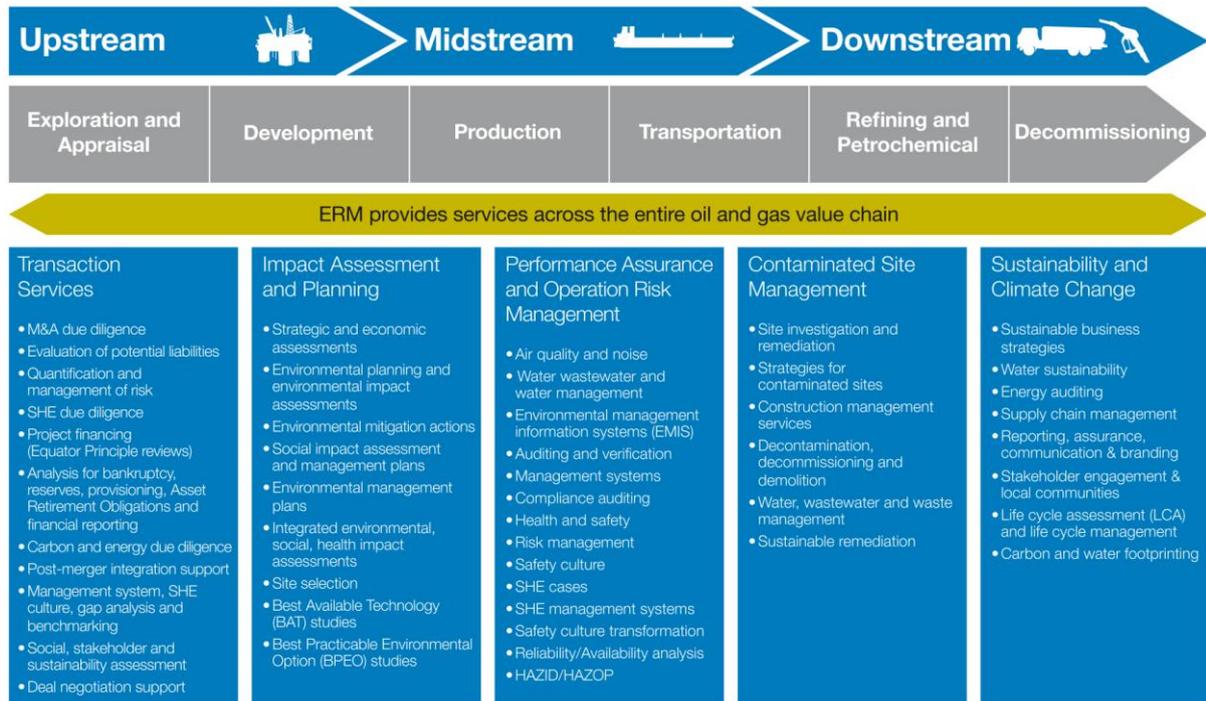
As operations in the Atlantic Margin expand, a key challenge will be for explorers to demonstrate that they are giving sufficient priority to social and environmental considerations, including the management of risks throughout the project cycle. What communications strategy should be adopted? What will be the impact of seismic acquisition and drilling on biodiversity and ecosystems? How will the operator mitigate the risk of an oil spill? How will waste be managed? What impact will there be on the local population and what are the broader climate change implications? Operators must be prepared well in advance for these and many other challenges when applying for a new drilling permit.

The New Operating Environment

As a leading sustainability consultancy, ERM offers a unique combination of disciplines to help meet the needs of oil and gas clients. These include the safety and risk services which are part of what has become known as the "New Operating Environment" following in the wake of the Deepwater Horizon disaster. Operators, their partners and contractors must have robust systems in which management can have confidence and upon which external stakeholders, including regulators, pressure groups and shareholders can also rely.

Working with clients in the Atlantic Margin, ERM is able to combine local knowledge with a proven international capability in stakeholder engagement, acquired through our experience on some of the most controversial projects in the world, to produce solutions which satisfy all stakeholders. This means working with clients to identify both risks and opportunities relating to a project, ensuring that proposals are supported by sound technical knowledge and helping to convey what are frequently complex sustainability messages.

In short, companies operating in the region need to ensure that they engage early having developed robust (and sustainable) plans and permit applications. As noted in this article, ERM is well placed to help them.



Europa Oil and Gas Stand

Europa Oil & Gas (Holdings) plc is an AIM listed oil and gas company with a diverse portfolio of both conventional and unconventional hydrocarbon assets at various stages of the development cycle including exploration and production. Europa has several highly prospective exploration projects in the UK, France, Ireland and Romania, with the most significant being a 100% interest in the Berenx gas appraisal project in onshore France, a potential company maker in its own right. At the same time, approximately 200 barrels of oil per day are currently produced from three onshore UK oilfields, generating a profit for the Company at the operating level, a key differentiator from other similar sized oil and gas companies. Europa is run by a highly experienced management team with a proven track record in generating substantial shareholder value.

Fastnet Oil and Gas Stand

Fastnet Oil & Gas plc is incorporated in England & Wales and is an independent oil and gas exploration company listed on the AIM market of the London Stock Exchange and the Enterprise Securities Market (ESM) of the Irish Stock Exchange.

Fastnet was established following the reverse takeover by Terra Energy of AIM shell Sterling Green Group plc in June 2012. Sterling Green Group plc was subsequently renamed Fastnet Oil & Gas plc.

Terra Energy was incorporated in February 2008 and was established to explore and develop unconventional oil and gas resources in Europe and Africa. The company has since focused on conventional oil & gas resources in Offshore Ireland and Africa. Its immediate focus is on implementing its Offshore Ireland and Africa strategies where it has been awarded two offshore licensing options in the Celtic Sea (Molly Malone Basin and Mizzen Basin) and acquired a material interest in the highly prospective Fom Assaka licence area, offshore Morocco. In addition, Fastnet

will pursue new conventional oil and gas opportunities in Africa where the Directors and Advisory Board have significant knowledge, contacts and experience of creating value. The company successfully raised £10m in June 2012 to fund these activities.

Fastnet's current assets include:

- A 25% Gross (18.75% net) carried interest in the highly prospective Fom Assaka licence area, offshore Morocco. The licence operator is Kosmos Energy who holds a 75% Gross (56.25% net) working interest.
- Two offshore licensing options in the Celtic Sea (Molly Malone Basin and Mizzen Basin)
- An interest in a net profit bonus arrangement relating to the Connemara prospects offshore Ireland.

Fluid Inclusion Technologies (FIT) Stand

Fluid Inclusion Technologies (FIT), Inc., is a laboratory-based petroleum service organization offering a variety of analytical services including some previously proprietary technologies. The most widely applicable of these new technologies is Fluid Inclusion Stratigraphy (FIS) - a rapid analytical technique that involves the automated analysis of volatile compounds trapped within micron-sized cavities in rock material taken from well cuttings, core or outcrop samples. These "fluid inclusions" are representative samples of subsurface fluids, and are not subject to fractionation during sampling or evaporative loss during sample storage for any length of time. The new procedure yields valuable information on Pay/Bypassed-Pay, Product Type, Migration, and Seal Integrity, unattainable via more traditional methods and, over the past ten years, has been instrumental in the discovery of significant petroleum reserves, influenced exploration and acreage acquisition decisions and provided innovative options for resource estimation, petroleum production and enhanced oil recovery operations.

An equally impressive aspect of FIS technology is the rapid turnaround time: large sample sets (i.e., 100's to 1000's of samples) from single or multiple wells can be analyzed, the results interpreted, and the findings delivered virtually anywhere in the world in a matter of days. Thus, the results can play a crucial role in decision making regarding current plays as well as provide valuable new insights through the analysis of archived cuttings.

The geochemical services offered by Fluid Inclusion Technologies (FIT), Inc., including FIS Analysis are variable and problem specific. By combining patented techniques, emerging geochemical methodology and standard microscopic methods, all of which complement each other, we provide a unique and unequalled industry product. A partial listing of proven applications of our analytical services includes:

- petroleum migration pathway mapping
- characterization of seals to oil and gas
- identification of dry holes proximal to undiscovered hydrocarbons
- delineation of pay or bypassed pay within penetrated sections
- identification of fluid pressure compartments
- characterization of petroleum-water transition zones
- delineation of reservoir compartmentalization

For further information including applications and more technical aspects of the geochemical and petrological services we provide, please browse through our Slideshow Overview of Fluid Inclusion Technologies. This presentation is available on CD and in some cases as a command performance.

Fugro Gravity & Magnetic Services Stand

Fugro Gravity & Magnetic Services is backed by more than 600 professionals at Fugro Airborne Surveys, Fugro Ground Geophysics, and Fugro Gravity and Magnetic Services (formerly Fugro Robertson Inc).

- **Land Services**

Fugro Gravity & Magnetic Services offers its clients a complete suite of Land Services including gravity and electromagnetic techniques.

- **Airborne Services**

Fugro Gravity & Magnetic Services offers high-resolution aeromagnetic surveys, airborne gravity and Falcon™; gravity gradiometry using state-of-the-art equipment.

- **Marine Services**

Fugro Gravity & Magnetic Services offers marine magnetic gravity and bathymetry services.

- **Interpretation Services**

Fugro Gravity and Magnetic Services provide leading edge interpretation of potential field geophysical data.

- **Software**

Fugro Gravity & Magnetic Services provides a complete suite of 2D and 3D modelling and interpretation software for potential field geophysical data.

Non-Exclusive Database

Fugro Gravity and Magnetic Services houses the most comprehensive, privately owned non-exclusive airborne, land and marine potential fields geophysical database in the world. The database incorporates approximately 14,000,000 line kilometres of AeroMagnetic data, 1,200,000 line kilometres of Marine Gravity & Magnetic data, and 2,000,000 stations of land gravity data worldwide. Data may be licensed for entire surveys or for specific areas of interest.

GeoArctic Stand

GeoArctic has provided geoscience consulting and services since 1996. Our consultants specialise in structural geological modelling, palaeogeographic and palaeoenvironmental mapping, and geoscience software development.

Plate models developed by GeoArctic more accurately reconstruct the palaeogeography of the plate margins over geological time. Our specialized plate reconstruction methods have been successfully used for regional studies in oil and gas exploration.

Regional plate reconstructions projects have been completed for the North Atlantic, Norway-East Greenland, Labrador Sea-West Greenland, Eastern Canada-Central Atlantic, Northern Canada and the Arctic and Southeast Asia.

PIP-ISPSG signed a contract in mid 2010 to carry out a new Plate Reconstruction of the North Atlantic between Ireland and Canada. GeoArctic are the lead contractor, assisted by Badley Geoscience Ltd in the UK, GSC Atlantic in Nova Scotia and a team of academic experts in Canada, the UK and Ireland. The project involved research collaboration between Ireland, Canada and several other countries. The work is funded equally by the government of Newfoundland Labrador through Nalcor Energy and the Irish joint government-industry Petroleum Infrastructure Programme (PIP). The project's objective is to use newly developed software and innovative analytical techniques to define the original architecture and geological history of the North Atlantic prior to the opening of the Atlantic Ocean in much greater detail than has been hitherto possible. The project should provide a powerful new tool to support exploration and help answer questions like "Can the giant discoveries off eastern Canada be replicated on the Irish side?" It is hoped that new insights will emerge that will provide a major stimulus to exploration.

GSI Stand

The GEOLOGICAL SURVEY OF IRELAND (GSI), founded in 1845, is the National Earth Science Agency. It is responsible for providing geological advice and information, and for the acquisition of data for this purpose. GSI produces a range of products including maps, reports and databases and acts as a knowledge centre and project partner in all aspects of Irish geology. It is a division of the Department of Communications, Energy & Natural Resources (DCENR) and has about 50 multi-disciplinary staff.

Operational Programmes

GSI serves its customer needs through a range of operational programmes and support services:

- The Information Management Programme underpins all of our activities in the delivery of geological information to our customers, and is recognised as the most important corporate priority.
- The Surveying Programmes (Bedrock Geology, Quaternary Geology, Marine Geology and Geophysics) are long-term, and feed information to the Applied Programmes, as well as producing maps and reports used directly by a wide range of external customers.
- The Applied Programmes (Groundwater, Minerals, Geotechnical, Geological Heritage) are largely project-oriented, and provide solutions to specific customer needs, their various activities helping to build their respective databases.

The Geological Survey of Ireland is responsible for gathering, storing and disseminating geological information. It carries out its duties of gathering information by:

- field mapping and recording of data (which does not involve topographic surveying - that function is carried out by the Ordnance Survey). This may be part of a long-term systematic survey, or may take place as part of a specific project, for example a Groundwater Protection Scheme for a particular County;
- the compilation and interpretation of geological data gathered by others. The data may have been collected by university staff or students as part of academic research, it may be open-filed information from Mineral Exploration companies, or it might be reports of geotechnical investigations;
- the drilling of boreholes for stratigraphic data, quaternary sediments or aquifer characteristics, using its own drilling rig.

The GSI maintains an ever-growing store of earth-science information:

- paper maps and reports, ranging from the original sets of six-inch hand-coloured manuscript maps of the 19th Century, through reports submitted to GSI by outside bodies, to published reports and maps;
- physical materials, such rock samples, thin sections, an extensive fossil collection, and an enormous store of drill core;
- a library of earth sciences journals and books;
- digital information, which at present consists principally of metadatabases, but will be complemented over the next few years by digital versions of most current paper reports and maps, together with a country-wide Geographic Information System.

The geological information held by the GSI is used by staff to answer queries, produce reports, and compile special or series maps. The Public may also access these data, either via our free Document Management System or for a nominal handling charge.

Tellus Border is a €5 million mapping project that will collect scientific data on soils, water and rocks across the six border counties - Donegal, Sligo, Leitrim, Cavan, Monaghan and Louth. Information from the project will help manage the environment and support sustainable development of our natural resources. The project is a follow-on from the Tellus project successfully completed in Northern Ireland recently.

GSNI Stand

The GSNI is part of the Department of Enterprise, Trade and Investment (DETI). It is staffed by scientists of the British Geological Survey (BGS) under contract to DETI, which allows GSNI to call upon expertise from within other parts of the BGS. GSNI also advises other Northern Ireland government departments and liaises closely with the Geological Survey of Ireland (GSI).

What we do

The Geological Survey of Northern Ireland (GSNI) provides geoscience information and services to inform decision making.

Services

GSNI holds an extensive archive of maps, boreholes and site investigation reports; detailed urban and regional geochemical and geophysical data, and publishes books, memoirs and reports.

Science

GSNI maps, models and monitors the ground we live on. Our geological research underpins decision making, promotes economic development and generates baseline data for environmental management.

IHS Stand

For over 50 years IHS has been providing our customers the largest portfolio of critical international energy information and insight in the industry. For Ireland we provide:

- Well Data & Seismic - Ireland
- Ireland Well Listing
- Ireland Digital Seismic Data
- Ireland Paper Copy Seismic Data
- Ireland Digital Wireline Data, Well Attributes and Pressure Data

Following a recent agreement with the Irish government, IHS, as official agent to the Irish government, now delivers released digital SEG-Y seismic as well as hardcopy data for the Irish offshore sector. SEG-Y data is deliverable on DVD, multiple CD, 8mm Exabyte or 4mm DAT. Hardcopy data is available on paper or film sepia. Both SEG-Y and hardcopy seismic data is offered on a per line and per survey basis.

SEG-Y data will enable easier and less expensive data transfer, greater integration into technical documentation, and will reduce storage costs in comparison to hardcopy data.

For more information or to place an order, please contact releaseddata@ihs.com

For SubSurface Sales enquiries for Ireland please contact ssg_enquiries@ihs.com

ION Stand

Corporate Overview

ION Geophysical Corporation (NYSE: IO) is a leading provider of geophysical technology, services, and solutions for the global oil & gas industry. ION's offerings are designed to allow E&P operators to obtain higher resolution images of the subsurface to reduce the risk of exploration and reservoir development and to enable seismic contractors to acquire geophysical data safely and efficiently.

Problem-solving Toolkit

Our family of wholly-owned business units delivers integrated technologies and services throughout the seismic workflow. Our structure allows our team of expert problem solvers to draw from our business units' and our partners' portfolio of technologies and services to develop and deliver unique solutions for our clients.

GeoVentures

Design and management of proprietary and multi-client 2D and 3D seismic data programs known as BasinSPANS and ResSCANS, and Reservoir Services.

GX Technology

Advanced seismic data processing and imaging services, and GMG software.

Marine Imaging Systems

Seismic acquisition systems, positioning equipment, energy sources, Concept Systems command and control software, and survey design planning and acquisition services.

Sensor

Precision geophones, cases, and testers.

Global Footprint

Headquartered in Houston, ION has almost 1,000 employees who operate from 23 offices in key petroleum centres throughout the United States, Canada, Latin America, Europe, Africa, Russia, China, and the Middle East.

Additional information is available at www.iongeo.com

For more information on BasinSPANS visit www.iongeo.com/SPANS

Or email us at BasinSPAN@iongeo.com

Irish Lights Stand

The Commissioners of Irish Lights is the General Lighthouse Authority for all of Ireland, its adjacent seas and islands. CIL carry out the obligations of the British & Irish Governments in relation to the provision of Aids to Navigation (AtoN) around the coast of Ireland commensurate with the amount of traffic and degree of risk under the Safety of Life at Sea Convention (SOLAS).

CIL's Vision Statement is to deliver a reliable, efficient and cost effective Aids to Navigation Service for the benefit and safety of all Mariners.

In addition, there is an obligation on CIL to inspect and approve the AtoN systems and to audit the subsequent management of AtoNs provided by Ports and Local Lighthouse Authorities. CIL also has obligations regarding the marking or removal of wrecks in areas of general navigation.

The legal basis for the operations of the Commissioners of Irish Lights dates back to an Act passed by the Irish Parliament sitting in Dublin in 1786 which set up a body called "The Corporation for Preserving and Improving the Port of Dublin". Various Acts were passed over the years and in 1867 a new Act separated the Port of Dublin Corporation from the Corporation for the Preserving and Improving the Port of Dublin. It was not until 1935, following Irish independence, that the functions of Irish Lights were finally regularised when adaptations were made by an Order of the Executive Council, entitled: Irish Lights Commissioners Adaptation Order, 1935.

The cost of the Service to mariners is met from the General Lighthouse Fund which derives its income mainly from light dues that are charged on commercial shipping calling at UK and Irish ports. The Irish Government contributes to the Fund under the terms of an agreed formula. The Irish Lights service is part of an integrated system of Aids to navigation around the coasts of Britain and Ireland. Trinity House and Northern Lighthouse Board are our sister providers.

Irish Lights affairs are run by a Board of 12 Commissioners, 4 Officials from Dublin Corporation, the Chief Executive and 4 Heads of Department.

Irish Lights is now based at Dun Laoghaire on Dublin Bay where the workshops, buoy yard and administration are all located on the same site. From here Irish Lights oversee the provision and maintenance of lighthouses, buoys, beacons and radio aids to marine navigation. There is a 24 monitoring service of the major AtoNs from this site. A contracted helicopter is used to transfer maintenance teams to and from offshore lighthouses. The dedicated vessel *Granuaile* is deployed to maintain and service the AtoNs provided, mainly buoyage, but is also engaged in project support, lighthouse replenishment, surveying and wreck marking or removal. *Granuaile* is also a strategic asset of the Irish State and is available for appropriate commercial contracts.

Contact:

Commissioners of Irish Lights,
Harbour Road,

Dun Laoghaire,
Ireland
Tel: 01 271 5400
Email: info@cil.ie

La Tene Maps Stand

La Tene Maps is a knowledge based company based in Dublin, Ireland specialising in the research and production of maps, educational posters and associated data products. The company works mainly in areas which are constantly changing and particularly in the fields of Aquaculture, Fisheries, Oil and Gas Exploration, Renewable Energy, Energy/Power Generation, Marine Environment and Leisure Subjects. We produce and publish a range of maps and posters for clients and ourselves. The company has a whole series of maps covering many parts of the world.

The company is also involved in production of confidential maps and graphics for clients and also sells a small range of maps and posters produced by itself and other companies through its secure online store.

The company's research arm is active in its own right and participates in EU research projects as well as research projects for Government departments, state bodies and private companies.

La Tene Maps has produced every full colour map on the Irish Oil and Gas exploration sector since the Mid 1980's. Today the company specialises in the offshore areas west of Greenwich (UK). The sectors we cover are the UK Irish Sea and South West Approaches; West of Scotland and West of Shetland, the Faeroe Islands and of course the Irish Sector. The company also offers a concession map service to those companies requiring regular updated concession maps.

Printed Oil & Gas exploration maps published by La Tene Maps are available free to bone-fide team members with operators or consortia members working in areas covered by the map. The maps are also distributed free at various conferences and exhibitions. Printed, Digital Print and pdf files are available for purchase by all interested persons.

Projects in Planning Printed Renewable Energy maps published by La Tene Maps are available free to operators of power generating companies in the areas covered by the map. The maps are also distributed free at various conferences and exhibitions. Printed, Digital Print and pdf files are available for purchase by all interested persons.

Lansdowne Oil and Gas Stand

Lansdowne Oil & Gas plc is an independent oil and gas exploration company listed on the AIM market of the London Stock Exchange since April 21st, 2006. Lansdowne has its operating headquarters based in Dublin, Ireland with its registered office in London, England.

Lansdowne is focused on oil and gas exploration and appraisal opportunities in the North Celtic Sea Basin offshore southern Ireland. Lansdowne holds rights, through its wholly owned subsidiaries, to five Standard Exploration Licences and one Licensing Option in the proven oil and gas prone shallow waters of the North Celtic Sea Basin (NCSB).

In 2011, Lansdowne embarked on the most extensive 3D seismic acquisition programme to date in the North Celtic Sea Basin utilising the Polarcus Samur vessel. In total four surveys were shot over c. 514 sq kms. Lansdowne also acquired the Ballycotton 3D seismic from Kinsale Energy making Lansdowne the holder of the largest 3D seismic database in the NCSB. Processing of Lansdowne's surveys by CGGVeritas has revealed enhanced imaging of its prospects adding confidence to previous interpretations. Amplitude anomalies are present over Cretaceous gas targets and existing gasfields and are an invaluable aid in de-risking the prospects ahead of drilling.

Marine Institute Stand

The Marine Institute is Ireland's national agency responsible for Marine Research, Technology Development and Innovation (RTDI). They seek to assess and realise the economic potential of Ireland's 220 million acre marine resource; promote the sustainable development of marine industry through strategic funding programmes and essential scientific services; and safeguard our marine environment through research and environmental monitoring.

The Marine Institute worked in partnership with the Geological Survey of Ireland (GSI) on the Irish National Seabed Survey (INSS), a multimillion European initiative supported by the Irish government. The survey aimed to map Ireland's 220 million acres of territorial seafloor, a natural resource that is approximately ten times the size of Ireland's land area.

Phase 1 of the Irish National Seabed Survey (INSS) is now complete, and they are currently in Phase 2: Integrated Mapping for the Sustainable Development of Ireland's Marine Resources (INFOMAR). While Phase 1 concentrated on outer deep-sea territorial waters, Phase 2 has moved inshore to coastal waters. INFOMAR aims to map the remaining 13% of the Irish territorial seafloor, concentrating on specific areas of interest such as priority bays and areas of biological interest.

OERA Stand

The Background

The Offshore Energy Research Association of Nova Scotia (OERA) was established in March, 2006, as the OEER (Offshore Energy Environmental Research Association) and OETR (Offshore Energy Technical Research Association) as not-for-profit associations dedicated to respond to the lack of exploration activity in Nova Scotia's offshore and pre-prepare for movement toward Nova Scotia's ambitious renewable energy targets. The OEER and OETR Associations amalgamated in April, 2012, and adopted the name of Offshore Energy Research Association of Nova Scotia with a mandate to foster research and development related to offshore petroleum, renewable energy resources and their interaction with the marine environment, and the diffusion of that knowledge. The OERA membership includes the Nova Scotia Department of Energy, Acadia University, Cape Breton University, St. Francis Xavier University, Dalhousie University and Saint Mary's University.

OERA works very closely with volunteers on our Board, Research Advisory Committees, Seismic Invertebrate Area Sub-committee, Tidal Area Sub-committee, and a Program Management Committee. In addition, we nurture research collaboration through vital networks and relationships. Our excellent history of collaboration has fostered partner-ships with over 200 researchers worldwide (companies, institutes, universities), local academia, students, and stake-holders in government, industry and the research community – locally, federally, and internationally, helping us to bring together other disciplines (engineering, mathematics, and earth sciences) within our stakeholder groups.

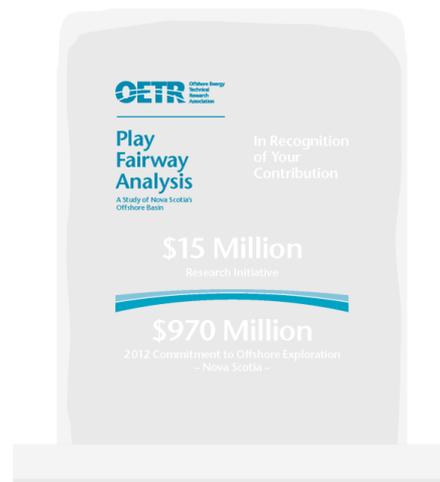
Our Record

We have a proven process model and strong track record as evidenced in the success of the Play Fairway Analysis (PFA) completed in 2011 and our current research including a Strategic Environmental Assessment of the Bay of Fundy and over 30 projects involving impact assessments of energy extraction in the Bay of Fundy. Our proposal reviews are carried out by experts in the field and continued exchanges and oversight with researchers, as well as detailed program management, resulting in project completion on time, on scope, and on budget.

OEER	# of Projects	Project Values
Total	46	\$5,147,796
OETR		
Total	43	<u>18,528,330</u>
OERA combined total	89 Projects	\$23,676,126

Play Fairway Analysis and Geoscience Data Package (OETR)

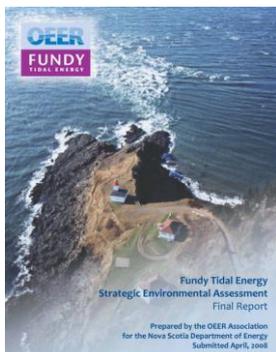
- Provides a clear picture of offshore Nova Scotia
 - 121 trillion cubic feet of natural gas
 - 8.15 billion barrels of oil
- Reduces technical and engineering barriers to the development of discovered re-serves of offshore NS by reigniting interest in exploring offshore NS and benefits all Nova Scotian's through industry spin-offs
- Led to two Call for Bids for exploration rights for 8



deep-water parcels of land by the Canada-Nova Scotia Offshore Petroleum Board

- Shell Canada committed ~ \$970 billion dollars to explore our offshore
- OERA is in a position to bring its Play Fairway Analysis approach to research projects globally through our future plans to evergreen the PFA.

Tidal Energy Potential in Nova Scotia (OEER)



Research indicates that the Bay of Fundy has 60,000 MW total potential with the potential of 2,500 MW which can be safely extracted. Nova Scotia's provincial renewable energy targets are that by 2015, 25% of the renewable electricity supply will use only environmentally-friendly sources such as hydro, wind, solar, biomass, and tidal and by 2020, 40% renewable electricity.

The OERA tidal research program focuses on advancing the science and understanding of the impacts and benefits of marine renewable energy on the ocean ecosystems, i.e., the IF, WHEN, WHERE and under what conditions to proceed with tidal energy, and with the knowledge that it must be done properly and responsibly. We currently have over 15 tidal energy research projects underway in the areas of tidal energy resource assessment, sediment dynamics, animal behaviour, near- and far-field effects, potential effects of ice and debris; and potential effects of tidal lagoons. In the fall of 2012, we will be releasing a Request for Proposals (RFP) for a Strategic Environmental Assessment and in a lead up to the RFP are completing a gap analysis, a resource assessment of South West Nova Scotia Tidal and a Mi'kmaq Ecological Knowledge Study.

Strategic Planning

OERA is currently carrying out a strategic planning exercise to identify new research and funding partners, to create a Renewable Energy Research Investment Fund, and to partner with international and local stakeholders in research, industry and government.

PAD / DCENR Stand

The role of the Petroleum Affairs Division (PAD) is to maximise the benefits to the State from exploration for and production of indigenous oil and gas resources, while ensuring that activities are conducted safely and with due regard to their impact on the environment and other land/sea users.

The functions of the Division are carried out through a number of strategies with the following objectives:

To maximise the area of Continental Shelf jurisdiction:

- establish and delineate an undisputed outer limit of the continental shelf

To license private enterprise to conduct exploration and production (E&P) under terms which balance the interests of the State and of private enterprise while ensuring that:

- there is effective and efficient E&P
- operations are carried out in accordance with best practices
- there is effective liaison with the E&P industry

To have the opportunities maximised for Irish business/institutions to service the needs of E&P in Ireland by:

- facilitating the establishment of a mechanism whereby Irish goods and services get full opportunities to participate in exploration activities offshore of Ireland

To provide stimuli for medium and long-term exploration efforts in Ireland by:

- securing Irish E&P industry assistance towards building up the local E&P-related infrastructure, and working with the Irish E&P industry to have research and joint industry research and data-gathering carried out.

The Division is responsible for the promotion, regulation and monitoring of the exploration and development of oil and gas in onshore and offshore Ireland. This involves the allocation of acreage to exploration companies under various types of licences agreeing appropriate work programmes and the promotion of acreage, either through open access or by a Round system.

Promotion

- identification of areas with potential
- preparation of interpretative reports [over such areas]
- encouraging companies to acquire new data in such areas
- release of basic geological, geophysical and well data to the industry

Regulating

- agreeing with operators work programmes which are appropriate for the type of authorisation and the area to be licensed while taking account of both the operator's and the State's interests

Monitoring

- ensuring that agreed work programmes are carried out in accordance with good oilfield practice, having particular regard to safety, the environment and other land sea users.

The PAD Stand will display a series of posters covering promotion of exploration in Ireland's waters and PIP-related project posters.

The [Integrated Petroleum Affairs System \(IPAS\)](http://gjs.dcenr.gov.ie/internetIPAS/servlet/internet/IPAS2IHome) (<http://gjs.dcenr.gov.ie/internetIPAS/servlet/internet/IPAS2IHome>) provides access to information

relating to authorisations, wells, potential field and seismic surveys using search screens or through map interface. Access to PAD's geospatial data (licences, wells, seismic, offshore geology etc.) is through an online GIS viewer (<http://www.dcenr.gov.ie/Spatial+Data/Petroleum+Affairs/>). Spatial datasets may also be downloaded.

Petroleum Geo-Services Stand

Petroleum Geo-Services (PGS) offers a broad range of products including; seismic and electromagnetic services, data acquisition, processing, reservoir analysis/interpretation and multi-client library data. We help oil companies to find oil and gas reserves offshore worldwide.

Overview

PGS was founded in Norway in 1991, with 2 seismic ships and some highly innovative ideas on how to reshape the industry. Today we share the same drive to innovate as inspired our founders, though the team is bigger:

- 14 offshore seismic vessels
- 21 data processing centres
- 35 offices worldwide, employing over 70 nationalities

PGS has a presence in over 25 countries with regional centres in London, Houston and Singapore. Our headquarters is in Oslo, Norway and the PGS share is listed on the Oslo stock exchange (OSE:PGS).

Petroleum Geo-Services possesses the world's most extensive 3D MultiClient data library comprising over 400,000 km² worldwide. Additionally the developing MultiClient 2D portfolio (200,000 km²) is available in frontier and developing hydrocarbon areas and includes a growing proportion of GeoStreamer® data that demonstrates excellent imaging qualities.

PGS flagship MultiClient products include the MegaSurvey, MegaSurveyPlus and MegaProject data packages which provide contiguous 2D and 3D coverage across vast areas.

Recent work by PGS in Ireland has focused on the Atlantic Margin MegaProject. A large database of 2D and 3D seismic data has been assembled from released datasets and PGS MultiClient surveys. All the data has been matched, merged and balanced to provide a regionally consistent, coherent seismic dataset.

The Atlantic Margin MegaProject is being offered for licensing and includes 4,700 km² of high end 3D MultiClient data, a comprehensive 2D data package and four regional gridded horizons.

PGS Reservoir has provided a regional interpretation and high level prospectivity review of this dataset and will be presenting this as a poster summary at the Atlantic Ireland 2012 Conference.

Physicalgeo Stand

We are a small yet dynamic and driven oil and gas consultancy based in Berkshire. Our focus is on quality geoscientific commercial consulting, non-exclusive reports and software provision.

ATLANTIC IRELAND 2012

The principal consultant, Andre Stout, has been serving the community for over 14 years, for majors, minnows and all in between. He has a track record as an oil finder and is in high demand for his services.

Andre has worked on the Atlantic Margin from the Barents Sea to West Africa for companies such as Shell, BP, Chevron, Total, Maersk, Tullow and Nexen. He is familiar with the elements required for successful evaluation of potential; from field development and appraisal through to new basin entry.

Andre is a member of the SEG, EAGE and PESGB.

Contact Andre directly on andre@physicalgeo.com

Further business support is provided by Alison Egan, a marketing specialist with a history of excellent client management. She initially trained in Retail Management and followed this with a Diploma from the Chartered Institute of Marketing.

Contact Alison directly on alison@physicalgeo.com

Other specialists in the oil and gas industry are brought in as required, from data analysts to commercial engineers, using a network of trustworthy contacts.

South Porcupine Basin: Seismic interpretation and evaluation of prospectivity

In order to support the industry in the 2011 license round (closed May 31st 2011) and two high profile farm-in opportunities, Physicalgeo have prepared a comprehensive evaluation of this untested Mesozoic rift basin. We have accessed ALL available seismic data (100,000km+) over this huge area and are in a unique position to support you in your evaluation of this exciting province.

The South Porcupine Basin, sometimes known as the Porcupine Seabight Basin, is a deepwater basin, 150km to the southwest of the Irish coast. Similar petroleum systems are present to those found in the shallower water North Porcupine Basin, where oil and gas fields have been discovered. Crucially, there is potential for better reservoir quality and more numerous source rocks than found in the North Porcupine Basin. Although oil, gas and seismic amplitude anomalies do exist in this basin, proving a working petroleum system at many levels.

Also, the Porcupine Basin is NOT affected by the level of igneous intrusives as seen in other Atlantic Margin basins. The 'igneous' provinces recognised by previous authors are potentially structural features, salt intrusions and mud volcanoes!

PIP Stand

The Petroleum Infrastructure Programme (PIP) was set up by the Petroleum Affairs Division (PAD) in 1997. PIP presently comprises two sub-programmes:- the active Petroleum Exploration and Production Promotion and Support (PEPPS) and the now completed PIP (1997 - 2002) sub-programmes.

The overall aim of PIP is to promote hydrocarbon exploration and development activities by:

- Strengthening of local support structures
- Funding of research data gathering and 'land-based' research in Irish offshore areas
- Providing a forum for co-operation amongst explorationists and researchers

Research under the Programme goes beyond normal licence area-specific work and is designed so as not to duplicate the efforts of other groups or of commercial contractors. It is also considered

ATLANTIC IRELAND 2012

essential that local researchers should be given an opportunity to participate in the research projects. PIP is funded by oil companies with licences offshore Ireland and the PAD.

Providence Resources Stand

Providence's strategy has been to assemble a portfolio of producing assets in geo-politically safe areas, with a portfolio of offshore and onshore prospects, combining existing discoveries with large new prospects to improve overall economics and reduce risk profile.

The Company also continues to evaluate acquisition of international prospects and niche business ventures in countries where Providence has strong links. Providence's objective is to acquire strategic prospects and realise value to generate sustainable incremental wealth for the company and its shareholders.

A key strand in Providence's strategy revolves around the exploration and exploitation of the hydrocarbon potential around the island of Ireland. Ireland is an area that has limited hydrocarbon commercial developments, (relative to other north west European countries, such as the United Kingdom and Norway) despite a number of exploration successes over the past 40 years, certain macro elements have changed the operating environment and there is now increased international interest in Ireland. These macro elements include attractive fiscal terms, new technology, the installation of infrastructure (and connectivity to the UK and onwards to mainland Europe) and higher commodity pricing.

As a result of these elements, where "the market has moved to us", Providence is currently embarking on the most ambitious multi-basin, multi-year drilling programme to test the true hydrocarbon potential. This programme, expected to last over two years, will be the largest concerted drilling programme ever carried offshore the island of Ireland and will comprise a mixture of appraisal/development drilling on proven discoveries as well as exploration drilling.

Barryroe Appraisal

- PROVIDENCE HOLDS 80% (Operator)
- Partners is LANSDOWNNE (20%)
- Successful Well Test - March 2012
- Post Well Analysis – March through September 2012
- Oil in Place Estimates – as of September 2012

<u>Reservoir Interval</u>	P50 <u>MMBO</u>	P10 <u>MMBO</u>
MIDDLE WEALDEN	287	706
LOWER WEALDEN	416	663
BASAL WEALDEN	756	906
PURBECKIAN	<u>362</u>	<u>502</u>
TOTAL	1,821	2,777

- Further upside potential identified in deeper upper Jurassic exploration objective
- Ongoing Post Well Analysis – October through December 2012

Attractive Future E&P Portfolio:

Dunquin Prospect (16%)

- ExxonMobil Operated
- Partners – ENI, Repsol, Sosina
- 1.7 BNBOE REC
- Well planned for 2013

Dalkey Island Prospect (50%)

- Providence Operated
- Partner - PETRONAS
- 250 MMBO REC
- Well planned for 2013

Spanish Point Gas Condensate Field (32%)

- Chrysaor Operated
- Partner - Sosina
- 100 MMBOE REC
- Well planned for 2013

Newgrange Prospect (40%)

- Repsol Operated
- Partner - Sosina
- 1.6 BNBOE REC

Drombeg Prospect (80%)

- Providence Operated
- Partner – Sosina
- TBC REC

Dragon Gas Field (100%)

- Providence Operated
- 300 BSCF REC

Rathlin Basin (100%)

- Providence Operated
- TBC MMBO

RPS Energy Stand

RPS is an international consultancy providing advice upon the exploration and production of energy and other natural resources and the development and management of the built and natural environment. We employ 5,000 people in the UK, Ireland, the Netherlands, the United States, Canada, Brazil, Africa, the Middle East, Australia and Asia. Our international presence allows us to undertake co-ordinated and integrated projects throughout the world. Since the beginning of 2010 we have undertaken projects in 123 countries across six continents. RPS Energy provides integrated technical, commercial and project management support services in the fields of geoscience, engineering and HS&E helping clients develop natural energy resources across the complete asset life cycle, combining technical and commercial skills with a wide knowledge of environmental issues. We have an annual portfolio of over 500 projects, a client-focussed organisation, adapting to clients' needs and provide a world-class flexible service to deliver projects on time and within budget.

Operations Support

For almost thirty years, RPS Energy (www.rpsgroup.com/energy) and its predecessors have provided a full range of operations support for international oil & gas projects. Latterly this has also embraced projects in renewables and nuclear energy.

ATLANTIC IRELAND 2012

Our Operations Support business has over 250 staff and 800 associates. The wide ranging expertise and experience of this group is a world-class resource that allows us to support the operations behind the exploration for, and development of, energy assets around the world.

- Environmental Support
- Cetacean studies & MMO support
- Geohazards
- Geotechnics
- Metocean studies
- Renewable Energy
- Safety & Health
- Seismic Acquisition, Data
- Navigation Processing
- Site Investigation
- Survey & GIS
- Unexploded Ordnance
- Wellsite & Operations Geology
- Tidal Power

Technical Studies

RPS Energy has worked in almost every petroleum basin in the world. Every year we undertake hundreds of projects ranging from niche specialist work to large multi-disciplinary exploration and development studies.

- Basin Studies & Regional Reports
- Biostratigraphy
- EOR Screening & Optimisation
- Geology & Geophysics
- Geomodelling
- Integrated Field Studies
- Petrophysics
- Production & Well Engineering
- Prospect Generation
- Reservoir Engineering
- Sedimentology
- Sequence Stratigraphy

Advisory

RPS Energy provides independent, technically-informed advice and management support, using experienced consultants to work individually or with our clients' teams. Whether working on business process or specific assets and portfolios, we can provide support across the complete Oil & Gas value chain, from E&P through to Downstream Strategy Development projects.

- Asset Evaluation & Due Diligence
- Downstream Consulting
- E&P Strategy
- Equity Redetermination
- Expert Witness
- Gas Consultancy
- IT & Data Strategies
- Petroleum Economics
- Portfolio Optimisation
- Competent Person & Reserves Reporting
- Unconventional Oil & Gas
- Carbon Capture & Storage
- Coalbed Methane

Integrated Risk Management Solutions

RPS Integrated Risk Management Solutions provides specialist HSE & Risk Management consultancy services to the energy industry and other major hazard industries. We specialise in the management of health, safety, environmental, social, security and other related business risks in the oil and gas, nuclear and renewable sectors.

- Strategy, Policy & Management Plans
- Management Systems
- Audit & Verification
- Regulations Analysis & Permitting
- Competence & Training
- Risk Assessment & Management
- Environmental Assessment & Management
- Emergency Planning & Business Continuity
- Project & Operations Management

Marine and Coastal Services

RPS is a leading provider of marine and coastal consultancy services to both public and private sectors. Our team of experts have extensive experience of holistic assessments in seas, coasts and estuaries, assisting developers with advice on all phases of a project lifecycle. We undertake management of large-scale multi-disciplinary projects and we provide survey and consultancy support for planning applications, consents issues under the environmental permitting regulation (EPR) and marine construction consents through environmental impact assessments where required. We have a team of over 50 marine and coastal experts based in 10 offices across the UK and Ireland (www.rpsgroup.com/ireland), as well as marine teams based in Australia, the US and Canada making RPS well placed to take on any project.

Policy development and appraisal

- Development of legislative guidance and advisory services, regulatory impact analysis and regulatory and policy implementation
- Policy strategy studies, design and option appraisal
- Strategic Environmental Assessment
- Sustainability Appraisal
- Impact Assessment / Regulatory IA

Planning and development control

- Marine, coastal and terrestrial planning
- Master planning and urban design
- Marine and coastal consents
- Public inquiry and expert witness

Conservation and biodiversity protection

- Marine protected area design
- Habitat / species action plans
- Environmental / socio-economic monitoring
- Habitat Regulations Assessment
- Marine protected species licenses

Risk, impact and liability assessment

- Environmental Impact Assessment
- Habitat Regulations Assessment / Appropriate Assessment
- Environmental risk, damage and liability
- Safety and risk
- Due diligence
- Explosive ordnance detection
- Environmental management systems

Environmental survey and monitoring

- Hydrography and hydrology
- Water and sediment quality
- Intertidal and subtidal benthic ecology
- Seabirds

- Marine mammal observation
- Fisheries and plankton
- Eco-toxicology
- Marine archaeology / heritage

Physical processes and modelling

- Hydrodynamics, hydrology and water quality
- Contaminant fate modelling
- Sediment dynamics and coastal geomorphology
- Marine noise and vibration

Coastal and marine engineering

- Port / harbour design, project management and supervision
- Offshore exploration
- Seismic survey
- Marine renewables (wave, tidal, CCT)
- Pipeline / outfall engineering
- Coastal / shoreline management

Economic, socio-economic and financial analysis

- Valuation of natural resources, impacts and risks
- Damage assessment and compensation
- Cost benefit analysis
- Business cases and plans

Stakeholder engagement

- Stakeholder consultation and engagement
- Guidance manuals, training and educational materials
- Corporate Social Responsibility reporting

Spatial analysis and data support

- Geographic Information Systems, mapping and visualisation
- Habitat mapping and remote sensing
- Environmental resource

Training Programmes

RPS Energy has historically delivered training courses in our core discipline areas and as part of our knowledge transfer commitments, usually associated with the technical studies we undertake. In 2011 Nautilus joined the RPS group adding industry leading training capabilities across the E&P value chain. Training Services can be accessed through scheduled programmes or alternatively bespoke programmes, including competency assessment and capability development consultancy, can be built to meet specific client requirements

W: www.rpsgroup.com

Serica Energy Stand

Serica Energy plc is an oil and gas exploration, development and production company with activities in Europe, Africa and Indonesia. The Company is development operator for the Columbus gas-condensate field in the UK North Sea and produces light oil and gas in Indonesia. Serica is exploring for oil and gas in the UK North Sea and East Irish Sea, as well as in the Atlantic margin offshore Ireland, Morocco and Namibia, which it sees as emerging new play areas.

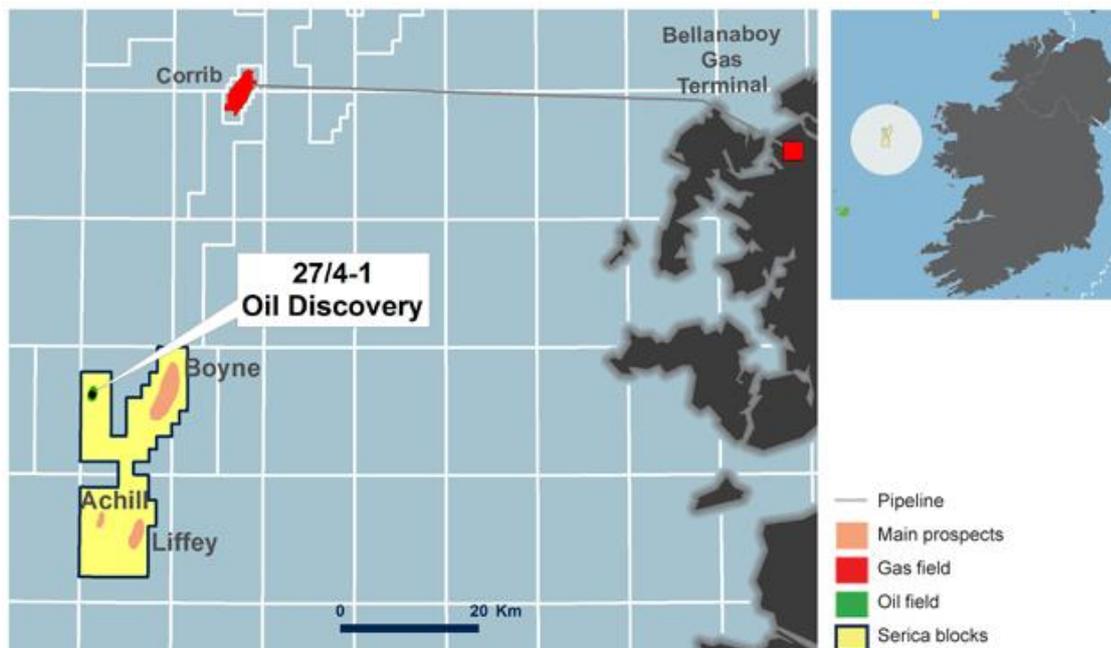
Serica is listed on the London Stock Exchange and on the Toronto Stock Exchange in Canada, with the share symbol "SQZ" on both markets.

Serica Energy in Ireland

Serica Energy (UK) Ltd holds three licences in offshore Ireland; FEL 1/06, FEL 1/09 and LO 11/1.

FEL 1/06

Bandon Oil Discovery; Boyne, Achill and Liffey Prospects



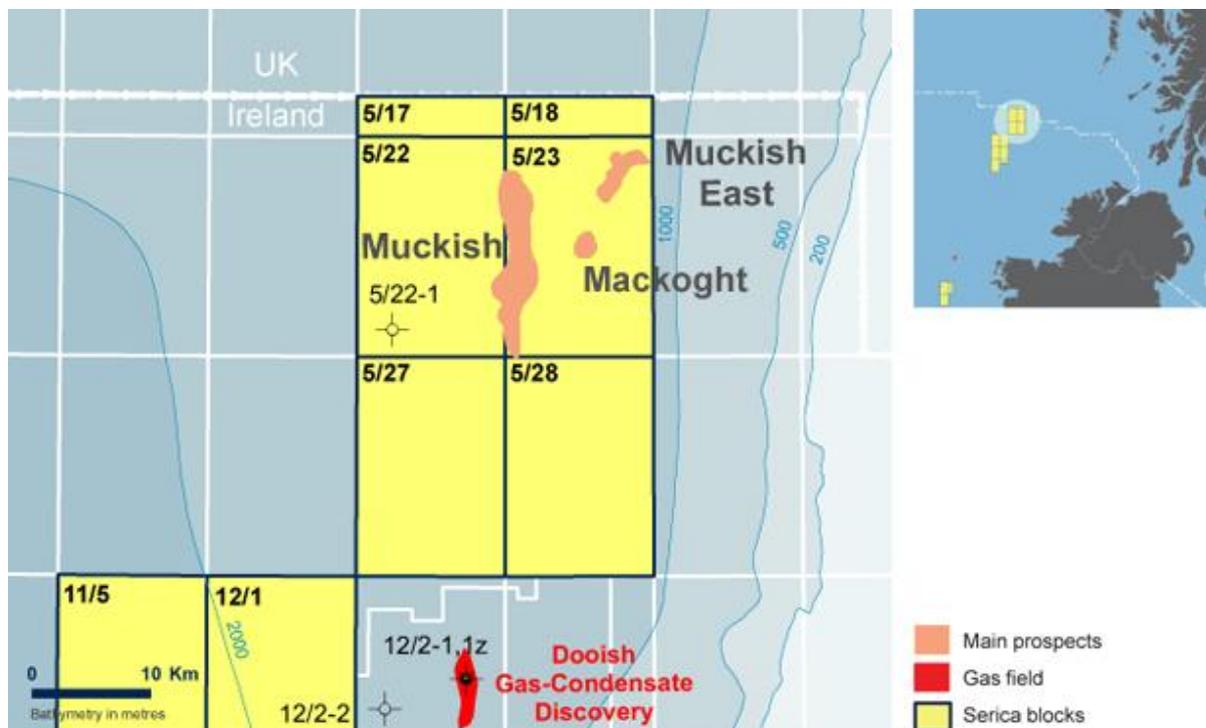
Serica was awarded Licence FEL 1/06 in December 2006, comprising blocks 27/4, 27/9 and part block 27/5, in the Slyne Basin off the west coast of Ireland. Following a mandatory 50% relinquishment (confirmed in September 2012), Licence FEL 1/06 now covers an area of approximately 305 square kilometres. The blocks lie some 40 kilometres south of the Corrib discovery, which reportedly has reserves of approximately 800 billion cubic feet of gas.

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As the result of reprocessing approximately 500 square kilometres of 3D seismic, four large Sherwood sandstone gas prospects were originally mapped, Bandon, Boyne, Achill and Liffey. In December 2008, Serica completed a farm-in agreement with RWE, under which RWE acquired a 50% interest in FEL 1/06 in return for drilling the first exploration well. Well 27/4-1 was spudded on 11th May 2009 to test the Bandon prospect and reached a total depth of 1900 metres in the Sherwood sands. No gas was found but an oil accumulation in shallower high-quality Jurassic sands was encountered and a sidetrack well 27/4-1z was drilled to confirm the discovery. Oil samples were taken in both wells for analysis. The discovery of oil has opened a new oil play in the Slyne Basin and enhanced the prospectivity of the blocks. Two deeper Jurassic oil prospects have now been identified at Boyne and Liffey, each with an underlying gas prospect in the Sherwood as proven by the Corrib field.

FEL 1/09

Muckish Prospect



These six blocks (collectively licence FEL 1/09) were awarded to Serica in July 2009. The licence covers a total area of 993 square kilometres and lies in the north-eastern part of the offshore Rockall Basin. The Rockall Basin has an areal extent of over 100,000 square kilometres in which only three exploration wells in the Irish sector have been drilled to date; the basin is therefore highly underexplored.

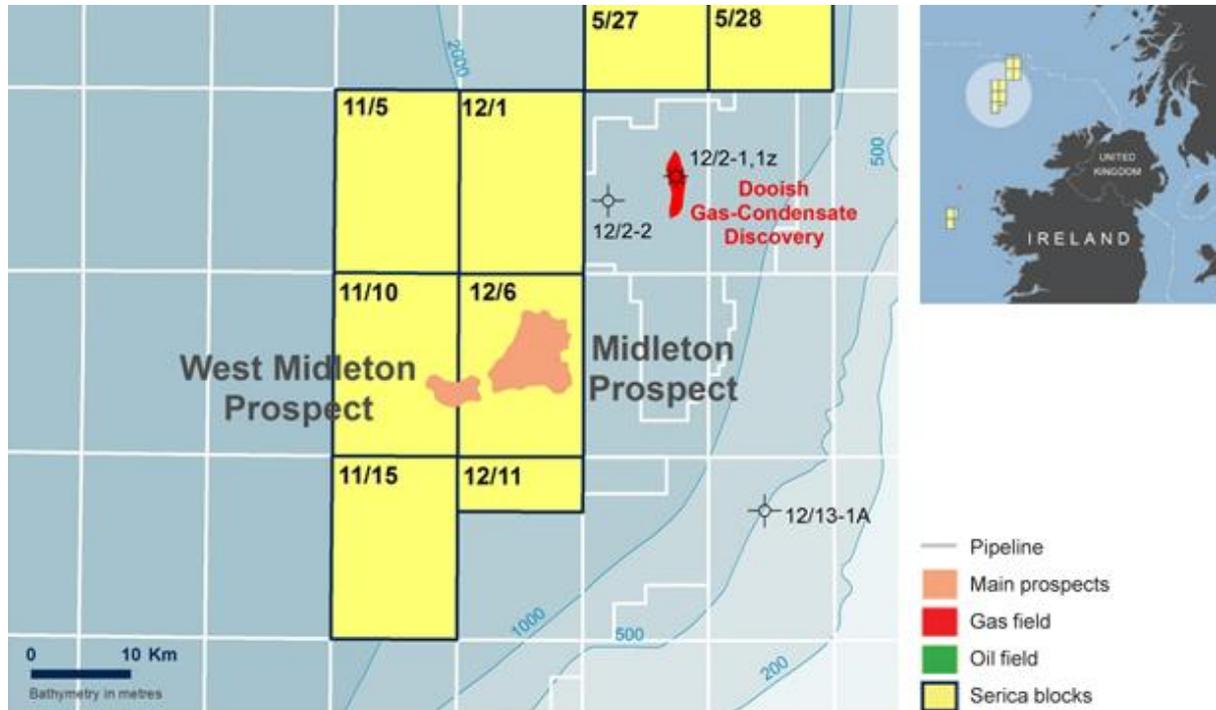
FEL 1/09 contains a very large pre-Cretaceous fault block prospect (Muckish) covering an area of 31 square kilometres in a water depth of 1,450 metres. Although wet gas or gas-condensate is considered to be the most likely hydrocarbon phase that could be found, oil is also possible. Muckish is analogous to the nearby gas-condensate bearing Dooish structure drilled by Enterprise in 2002, which encountered a 214 metre hydrocarbon column. Two further prospects, Muckish East and Mackoght have also been identified in the licence area and are obvious follow-up prospects in the event of success at Muckish. Serica has acquired 2D long-offset seismic lines and reprocessed the existing 3D seismic volume, which has helped de-risk the Muckish prospect as it demonstrates that it

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has distinct similarities to the nearby Dooish discovery. Serica is commencing plans to drill the Muckish prospect and is actively seeking partners to share the drilling cost.

LO 11/1

Midleton Prospect



Licence LO 11/1 covers Blocks 11/5, 11/10, 11/15, 12/1, 12/6 and 12/11 (part), an area of approximately 1,230 square kilometres in the Rockall Basin, south-west of the Dooish Discovery. The blocks contain two large pre-Cretaceous fault block prospects mapped on 3D seismic data, Midleton and West Midleton. These prospects complement the Muckish prospect lying in Serica's acreage just to the north-east in FEL 1/09.

TGS Stand

TGS provides multi-client geoscience data and services to oil and gas Exploration and Production companies around the globe. TGS' geophysical and geological data products include multi-client seismic libraries, extensive magnetic and gravity data, the industry's largest global database of digital well logs and regional interpretive products. TGS also provides high-end depth imaging services to help resolve complex seismic imaging problems.

Geophysical	Geological	Imaging
<ul style="list-style-type: none"> • 2D & 3D Seismic • Depth imaging products • Wide Azimuth Seismic • Aeromagnetics • Gravity • Electromag (CSEM) • Multi-beam 	<ul style="list-style-type: none"> • Digital well data • Directional surveys • Production data • Core data • Regional geologic • Interpretations • Facies Map Browser • Interpretive Services 	<ul style="list-style-type: none"> • Seismic processing • High end depth imaging • Proprietary technology • Ongoing R&D investment • Contract business model

TGS specializes in planning, acquiring and processing multi-client geophysical data in major and emerging offshore exploration plays worldwide. Resources are centred on a core collection of multi-client exploration data products. These data sets are diverse in location, acquisition technique and specifications and are united by a common approach to quality assurance, advanced processing and expertise. TGS' 2D and 3D seismic library is among the strongest, most diverse and highest quality in the marketplace. The company also offers value-added gravity and magnetic data products to complement regional interpretations and seismic data packages.

TGS has a large geophysical database in Ireland including:

- Over 20,000 km of multi-client seismic data
- Facies Map Browser
- Seep data

These data provide the exploration tools for evaluating open acreage. Examples from the TGS' long offset database are on display in the booth.

WesternGeco Stand

With more than 40 years of experience in seismic data acquisition, processing, and imaging, WesternGeco offers the industry's most comprehensive 2D and 3D multiclient seismic data library of the world's major hydrocarbon basins.

Our library addresses all geophysical and geological challenges from basin-scale 2D surveys to full-azimuth broadband 3D prospecting and appraisal surveys.

WesternGeco offers an integrated approach to multiclient surveys. Our services range from survey design and modelling to incorporation of multiple measurements and geological knowledge into a shared earth model, and they often employ the most advanced imaging techniques on the market today.

WesternGeco experts work in industry-standard Petrel and Omega integrated software platforms, enabling clients to interact with the data and collaborate with our geologists and geophysicists during the imaging stages of projects.

Yokogawa Stand

Yokogawa's global network of 90 companies spans 55 countries. Founded in 1915, the US\$4 billion company conducts cutting-edge research and innovation. Yokogawa is engaged in the industrial automation and control (IA), test and measurement, and other businesses segments. The Industrial Automation segment plays a vital role in a wide range of industries including oil, chemicals, natural gas, power, iron and steel, pulp and paper, pharmaceuticals, and food.

Yokogawa's commitment to innovation is reflected in its extraordinary investments in R&D, which ensure development of the most advanced products and services. Yokogawa has consistently made above-average investments in research and development. Over the past decade Yokogawa has set an industry standard by committing a full 9 percent of sales revenue on average for R&D. As a result, Yokogawa has secured more than 4,500 patents and registrations, representing a number of important

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innovations, including the World's first distributed control system and the first digital sensors for flow and pressure measurement.

The global Yokogawa operation is a preferred supplier to major offshore oil and gas companies, including Shell, BP, Chevron and Total. In Europe Yokogawa established a dedicated North Sea team which, in addition to promoting the latest control and safety systems, offers the ability to handle brownfield and Greenfield projects with support for oil and gas clients throughout the life cycle of their assets from centres in Aberdeen, Scotland, Stavanger, Norway and Amersfoort, Netherlands.

Yokogawa addresses the need to comply with evolving regulations and the desire to improve safety and control through modern systems that provide for asset intelligence and production management. Advanced diagnostics, communications and instrumentation configurations help to lower personnel on board, or allow unmanned operation while ensuring full support from shore.

Unique instrumentation and intelligent tools including subsea flow simulation provide a sophisticated platform for enhanced oil recovery strategies. Online documented operational philosophies, best operational practice guidance, latest display techniques, and alarm management tools combine to empower the operator for continuous safe operation.

Yokogawa's reliable systems, plus a host of advanced tools including alarm management, fault tolerance and remote diagnostics, predictive simulation, operator simulator training are applied to optimise a platform's productive uptime.

Yokogawa complements its automation products with a rich array of operational support - VigilantPlant Services - that extend from simple maintenance and repair all the way to performance optimisation. With the active support of Yokogawa's experts, automation investments reduce business risk and deliver tangible return on investment.

Yokogawa in Ireland provides control and instrumentation solutions for the oil and gas, power generation, pharmaceutical and Food & Beverage industries. With operations in Rathcoole, Dublin the company specialises in the provision of Advanced Process Measurement Products, Systems & Software Engineering, Training & Maintenance Support, as well as consultation for Advanced Control Studies, Management Information Systems and Safety Management Systems. Our advanced capabilities provide sophisticated automation platforms to underpin sustained profitable operations, and help drive evolving production strategies. We uniquely incorporate knowledge and expertise with renowned technologies to achieve best-in-class outcomes from design, implementation, test and through a flawless changeover to excellent operation.

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POSTER ABSTRACTS (in alphabetical order)

A New Kinematic Plate Reconstruction of the North Atlantic between Ireland and Canada

Ady, B.¹ (bady@geoarctic.com) and Whittaker, R.¹

¹ GeoArctic Ltd., Calgary, Canada

A two-year government sponsored research project to develop *A New Kinematic Plate Reconstruction of the North Atlantic between Ireland and Canada* has now been completed. The new kinematic model project takes into account the wide range of geological processes responsible for basin development by incorporating interpretations of recently acquired industry seismic data and older seismic data (Whittaker et al, this conference; Štolfová et al, this conference) with analytical techniques that include 2D and 3D gravity inversion, flexural backstripping, fault restoration and forward modelling (Kusznir et al, this conference), detailed local studies around the margin and deformable plate reconstruction analyses.

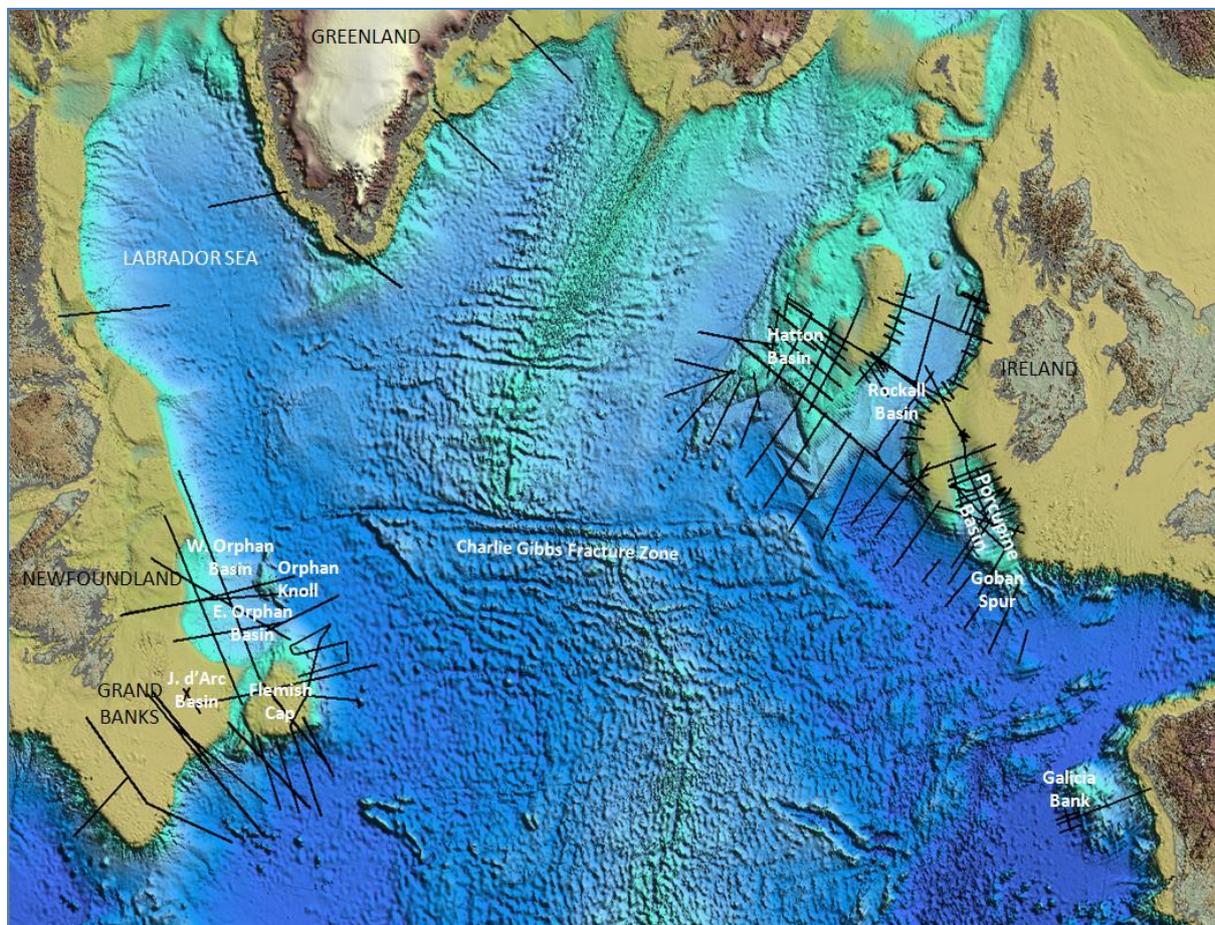


Figure 1. Bathymetry map showing the regional seismic database for the Irish and Newfoundland margins interpreted for the project.

The new kinematic model has provided fresh insights into the evolution of the Ireland and Newfoundland margins. It has helped to identify potential source rock development at several intervals on the margins and predict the likelihood of source rock preservation. The integration of a deformable plate model with a plate kinematic model allows basins to be restored to their pre-breakup

geometry prior to breakup and represents a major advance over the rigid plate models. Restored structure maps, palaeogeography maps, reconstructed pre-rift subcrop maps showing Carboniferous and structural trends, sediment source area maps, source rock and reservoir facies maps have been reconstructed to their palaeo-position. These have been used to evaluate source rock and reservoir potential and provide us with an enhanced understanding of the major controls and mechanisms for basin formation and evolution in offshore Atlantic Ireland and offshore Newfoundland. Potential reservoir development has also been correlated with the main tectonic events and their distribution can be mapped and predicted more accurately using basins restored to their palaeo-geometry.

The deformable plate analysis provides techniques to back-strip Beta stretching factors (β) from total β derived from gravity inversion and other methods for time intervals associated with tectonic events. Major tectonostratigraphic sequences and tectonic events have been defined for the project and the amount of crustal extension is sub-divided into individual tectonic events or time intervals and converted to a stack of β grids (β -Stack). These β grids are constrained both by the plate kinematic model and by all available onshore and offshore geological data. The β -Stack forms the key component of the deformable plate model and can be fully integrated with the plate kinematic model.

The β -Stack and new kinematic model enable us to produce a set of derived maps showing the distribution of source rock preservation. High extension factors result in highly rotated fault blocks, detachment faulting and even exhumation which result in removal and erosion of potential source rocks. This source rock preservation index can be quantified using deformable plates analytical techniques. The β -Stack and new kinematic model also enable us to calculate detailed maps of strain rate for each major tectonic event. These maps show variations in strain rate across the basin. These strain rate maps can be used to determine heat flow which is used in basin modelling of source rock maturity.

Kusznir, N., Roberts, A, Alvey, A., Whittaker, R.C. & Štolfová, K, 2012. Crustal Structure, Subsidence History and Stretching within the Ocean-Continent-Transition of the Conjugate Ireland and Newfoundland North Atlantic Margins. *Abstract, Central Atlantic Conjugate Margins Conference, Dublin, 2012.*

Štolfová, K. & Whittaker, R.C. and Shannon, P. M. 2012. New insights into regional Mesozoic and Cenozoic evolution of the Irish offshore continental margin. *Abstract, Central Atlantic Conjugate Margins Conference Dublin, 2012.*

Whittaker, R.C. 2012. Geological Constraints for a New Plate Reconstruction of the Newfoundland Continental Margin. *Abstract, Central Atlantic Conjugate Margins Conference Dublin, 2012.*

This project is jointly funded by the Irish Shelf Petroleum Studies Group (ISPSG) of the Petroleum Infrastructure Programme and Nalcor Energy (on behalf of the Offshore Geoscience Data Program with the Government of Newfoundland and Labrador).

Modelling the thermal structure of onshore Ireland and its offshore basins

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The Cenozoic exhumation history of Ireland and Britain has major implications for understanding the development of the onshore geology of Ireland and Britain, intra-plate exhumation studies and the distribution of hydrocarbon resources. This project is characterizing the timing and causes of

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exhumation of onshore Ireland and Britain and their offshore basins to address the Cenozoic exhumation history. This includes modelling the thermal evolution, evaluating regions of high heat flow (onshore) as targets for geothermal purposes and the timing of basin inversion (offshore) for the hydrocarbon industry.

For this project we are collecting samples from mainland Ireland and Britain and also boreholes from the offshore basins where accessible (Figure 1). Sampling is being undertaken on both a regional scale (to detect regional exhumation trends) and local scale (employing vertical sampling). The vertical sampling will utilize steep escarpments combined with onshore boreholes, including an approx. 500 m deep borehole within the Mourne Mountains Granite. Offshore sampling will utilize existing petroleum exploration boreholes where material is accessible.

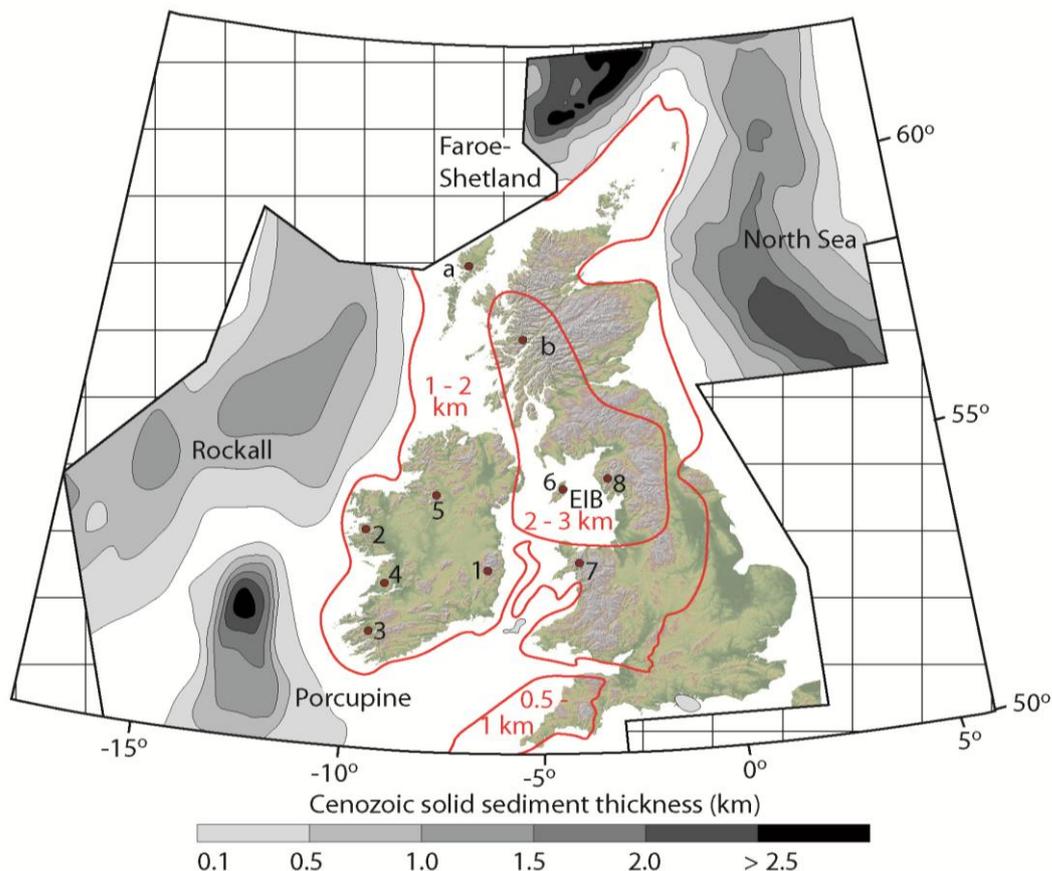


Figure 1: NW European shelf with isopachs of Cenozoic solid sediments (Jones et al., 2002) and estimates of onshore denudation (Allen et al., 2002).

The analysis of these samples will be made by low temperature radiometric chronometers such as apatite fission track (AFT) and (U-Th-Sm)/He on apatite (AHe). The AFT research is taking place in the fission track lab at Trinity College Dublin (TCD) and the AHe studies in East Kilbride are being undertaken in conjunction with Dr. Finlay Stuart (Scottish Universities Environmental Research Centre). Vitrinite reflectance studies will be undertaken in cooperation with Prof. Geoffrey Clayton (TCD).

The AFT and AHe provide thermal history information on rock samples between 120°C to 40°C. Employing typical upper crustal geothermal gradients, it is therefore possible to investigate the exhumation history of the uppermost crust (1 to 4 km). These methods are ideal for determining the small amounts of exhumation that took place in Ireland and Britain during Cenozoic times. The

results from the AFT and AHe analysis will then be modelled to yield 2D and 3D thermal models of Ireland and Britain. The 3D model will also be integrated into a GIS visualization suite.

This combination of AFT and AHe studies is ideally suited to investigate the thermal history of sedimentary basins (including detection of inversion episodes). It is thus of interest to hydrocarbon exploration, particularly as the oil maturation window is within the temperature range of AFT and AHe (between 120°C and 40°C). Therefore, the causes and timing of the exhumation in Ireland and Britain is of significant economic interest for the hydrocarbon industry, including yielding information on:

- The distribution of reservoir sands
- Trap breaching and probability of encountering effective top-seals
- The timing of source maturation
- The quality of reservoir rocks due to higher levels of reservoir diagenesis

References

Allen, P.A., Bennet, S.D. Cunningham, M.J.M., Carter, A., Gallagher, K., Lazzaretti, E., Galewesky, J., Densmore, A.L., Phillips, W.E.A., Naylor, D., Solla Hach, C., 2002. The post-Variscan thermal denudational history of Ireland. In: Doré, A.G., Cartwright, J.A., Stoker, M.S., Turner, J.P., White, N. (Eds.), *Exhumation of the North Atlantic Margin: Timing, Mechanisms and Implications for Petroleum Exploration*. Geological Society, London, Special Publications, 196, 371 – 399.

Jones, S.M., White, N.J., Clarke, B.J., Rowley, E., Gallagher, K., 2002. Present and past influence of the Iceland plume on sedimentation. In: Doré, A.G., Cartwright, J.A., Stoker, M.S., Turner, J.P., White, N. (Eds.), *Exhumation of the North Atlantic Margin: Timing, Mechanisms and Implications for Petroleum Exploration*. Geological Society, London, Special Publications, 196, 13 – 25.

Improving Seismic Reflection Data from Goban Spur Rifted Margin and Assessing the Impact on Models of Crustal Structure.

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The hydrocarbons industry routinely uses seismic reflection data as an initial tool to probe continental margins beneath deep waters. Excellent images are produced from modern 2D data with 8km streamers, 10s record lengths and greater than 150 fold of coverage. In this paper we investigate the improvement that modern processing techniques can bring to older data and we additionally demonstrate the utilisation of information from coincident seismic refraction, gravity, magnetics and swath bathymetry. Such an integrated approach is not normally utilised in hydrocarbon industry studies. We concentrate on the BIRPS (British Institutions reflection Profiling Syndicate) WAM (Western Approaches Margin) profile which was shot from oceanic to continental crust across the Goban Spur rifted margin by BIRPS in 1985.

Signal to noise ratio is moderate and the low 30 fold and short 3km offset limited the efficacy of multiple suppression which could be applied during the original processing of WAM. Multiples hamper the interpretation of deep crustal reflectors in the critical zone between continental and oceanic crust. We utilise modern interpolation, surface related multiple elimination (SRME), diffracted multiple attenuation and high resolution residual moveout based methods to remove multiples. Most

recently Bullock and Minshull (2005) interpreted a 70km wide zone of exhumed mantle between thinned continental and oceanic crust. The velocity depth model was constructed using an integrated wide angle seismic refraction experiment with coincident gravity, magnetics and swath bathymetry. We use the Bullock and Minshull (2005) velocity-depth model to prestack depth migrate the data following the new multiple suppression. Improved multiple suppression results in a more confident interpretation of the deep seismic reflections in this continental margin setting.

Reference:

Bullock, A.D., and Minshull, T.A., 2005, From continental extension to seafloor spreading: crustal structure of the Goban Spur rifted margin, southwest of the UK. *Geophys. J. Int.*, **163**, 527–546, doi: 10.1111/j.1365-246X.2005.02726.x

Processing and Acquisition Design through Elastic Simulation: A North Sea Case Study

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It is quite common for mature North Sea fields to be producing significant volumes but infill drilling may be using maps made on survey data which is over a decade old. New acquisition has been common where the reservoirs are acoustically favourable to time-lapse (4D) studies but in many fields new acquisition is often thought to be unjustifiable based on cost and a perceived stagnation in the continued improvement in acquisition quality. New understanding of the value of azimuthally diverse information has undoubtedly brought a step change in image quality to sub-salt reservoir delineation. In this paper we use 3D elastic modelling to try and decide whether different acquisition geometries may bring similar benefits to North Sea imaging and multiple suppression.

New methods of improving seismic data to aid understanding of passive margin evolution: A series of case histories from offshore West of Ireland.

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Deep-water sedimentary basins are attracting increased attention from the hydrocarbon industry and academia as they remain one of the last geological frontiers still to be fully explored and understood. As part of a regional project to understand basin development offshore Ireland, we have developed and tested new ways of improving seismic images, and of incorporating these improvements into geological interpretations. Here we illustrate this methodology using three case histories from the Porcupine, Slyne and Erris Basins. In each case, the first stage of the workflow consists of re-processing a selection of key seismic data. Processing includes relative amplitude preservation, advanced demultiple and interpretation driven prestack depth imaging. Interpretation of the data is assisted by incorporating products such as multiple models, prestack gathers, velocity models and

attributes. Finally, we show how a velocity model can be inverted to exhumation estimates. The results and approach developed here can be applied to other deep-water exploration areas.

Analysis of preserved ocean floor cores for hydrocarbons from the east coast of Newfoundland and Labrador

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An extensive library of ocean seabed core samples collected over a period from 1965 to present exists for the east coast of Canada. These cores are stored at the Geological Survey of Canada, Bedford Institute of Oceanography in Dartmouth, Nova Scotia.

Nalcor Energy Oil and Gas selected 170 cores from 2001 to 2011 as a pilot program to perform geochemical sampling from certain areas off the coast of Newfoundland and Labrador. Objective was to determine if there are indications of petroleum hydrocarbons on any of the cores.

Amplified Geochemical ImagingSM technology was utilized to geochemically sample the cores for the presence of hydrocarbons at nanogram (10⁻⁹) levels. Sampling was performed by experienced technician in a similar way to fresh offshore cores. Approximately 60cc of core sediment was exposed to a Gore® module. The Gore® module was analyzed using thermal desorption/gas chromatography/mass spectrometry. Detection of hydrocarbons in nanograms for both microseepage and macroseepage signals in the C2 to C20 range was recorded. Statistical data processing identified gas phase or liquid phase from background.

The conclusions of the pilot program were that ocean seabed cores collected and stored properly could have valuable geochemical signal even after years in storage. Well preserved cores are usually:

- Sealed and encased in plastic or some other material to retain core integrity and moisture
- Refrigerated or Frozen Cores are desirable
- Cores should be stored in a clean environment away from volatile organics.

Hydrocarbon signal was detected on well preserved cores as old as 10 years, in this case back to 2001. The results can provide information on hydrocarbon potential and phase in underexplored areas.

Irish and Newfoundland Rifted Margins: Crustal Cross-sections from Gravity Inversion

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We have determined Moho depth, crustal thickness and continental lithosphere thinning factors for the conjugate margins of Ireland and Newfoundland using a new gravity inversion method which incorporates a lithosphere thermal gravity anomaly correction. We use these to map the ocean-continent transition structure, the distribution of oceanic crust, thinned continental crust and microcontinents. This work forms part of the North Atlantic plate reconstruction project (*Whittaker et al this conference*).

3D gravity inversion, using public-domain gravity and sediment-thickness information, has been used to produce regional maps of (i) Moho depth, (ii) crustal thickness and (iii) continental lithosphere thinning for the North Atlantic. In addition gravity inversion using the interpreted sediment thickness from seabed to top-basement produced during the seismic-interpretation phase of the North Atlantic project (*Whittaker et al this conference*) has been used to produce a new set of 17 2D depth-transects across both margins (10 for Ireland, 1 for Galicia and 6 for Newfoundland).

Moho depth, crustal thickness and continental lithosphere thinning ($1 - 1/\beta$) have been determined using gravity inversion incorporating a lithosphere thermal gravity anomaly correction (Greenhalgh & Kusznir, 2007; Chappell & Kusznir, 2008). The gravity anomaly inversion is carried out in the 3D spectral domain (using Parker 1972) to determine 3D Moho geometry. The gravity anomaly contribution from sediments assumes a compaction controlled sediment density increase with depth. Lithosphere thermal model re-equilibration (cooling) times, used to calculate the lithosphere thermal gravity anomaly correction, are conditioned by ocean isochron information (Mueller et al. 2008), and continental rifting and breakup ages. The gravity inversion method provides a prediction of ocean-continent transition location which is independent of ocean isochron information. The gravity inversion includes a parameterization of the decompression melting model of White & McKenzie (1999) to predict volcanic addition generated during continental breakup lithosphere thinning and seafloor spreading.

Our analysis of the 2D and 3D gravity inversion results, together with subsidence analysis, suggests that the conjugate, paired, deep-water basins of Rockall – West Orphan and Porcupine – East Orphan each represent a failed attempt at breakup prior to the eventual Ireland/Newfoundland separation which cut across these previously-formed failed-breakup basins.

This project is jointly funded by the Irish Shelf Petroleum Studies Group (ISPSG) of the Petroleum Infrastructure Programme and Nalcor Energy (on behalf of the Offshore Geoscience Data Program with the Government of Newfoundland and Labrador).

Irish and Newfoundland Rifted Margins: Crustal Cross-sections from Gravity Inversion

Nick Kusznir^{1&2}, Andy Aivey², Alan Roberts², Richard Whittaker³ & Katerina Stofova⁴

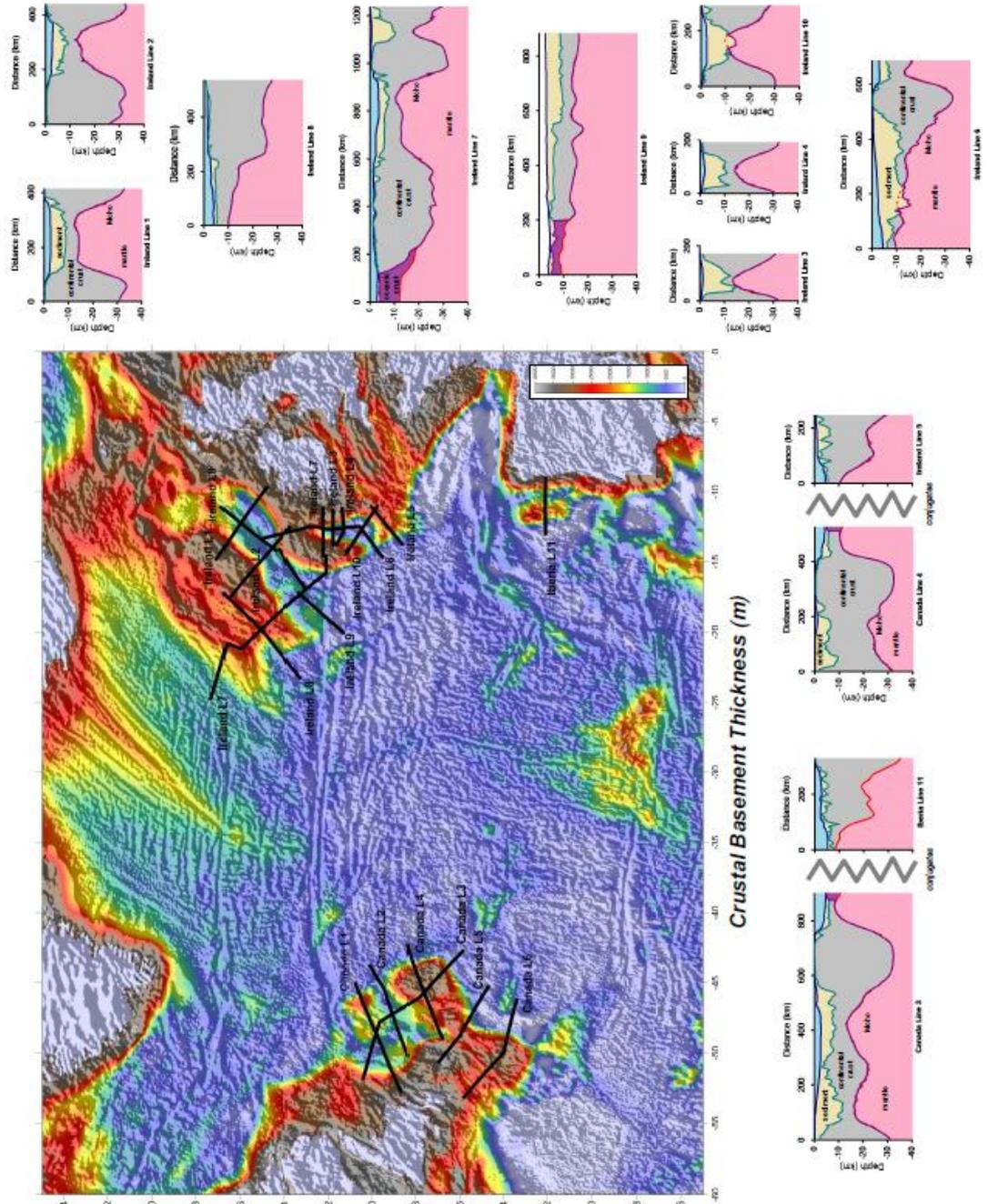
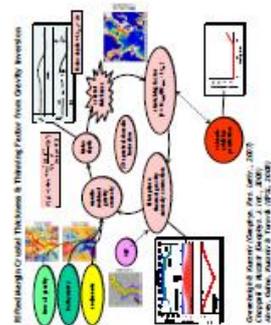
¹University of Liverpool, ²GeoArctic, ³Badley Geoscience, ⁴University College Dublin

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- Moho depth, crustal thickness and continental lithosphere thinning (1-10%) have been determined using 3D spectral domain gravity inversion incorporating a lithosphere thermal gravity anomaly correction.
- Sediment thickness data used in the gravity inversion to produce the crustal cross-sections are from new regional seismic interpretations by GeoArctic and University College Dublin.

• This work forms part of **The North Atlantic Plate Reconstruction Project** led by GeoArctic (Canada) and Irish-Canadian government-industry consortium funded.



The Seismic Signature of “Hidden” Faults at Magma-Poor Rifted Margins

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Magma-Poor Rifted Margins (MPRMs), such as the W. Iberian Margin, or Goban Spur Margin, commonly exhibit an extension discrepancy (Davis & Kusznir, 2004; Reston, 2007), whereby the amount of stretching accommodated in the upper crust – as calculated from the summation of heaves on seismically observable faults - is far less than is required to thin the entire crust to the extent that is observed on wide-angle seismic and gravity models. Possible solutions to this “extension discrepancy” include depth-dependent stretching/thinning, or multiple phases of unrecognised faulting.

While depth-dependent stretching may provide an attractive solution to the problem, it requires that the lower crust be thinned to a far greater extent than the upper crust. A depth-dependent stretching mechanism requires either the lower crust to be displaced oceanward - producing large expanses of continental lower crust exhumed in the oceanic domain (Reston, 2009) -, or landward – producing rifted margin mountains (Reston, 2009) - of the rift zone. However, evidence for these scenarios is not been observed at MPRMs. Furthermore, analysis of crustal scale refraction seismic models suggests that the upper crust and the whole crust actually thin oceanward to roughly the same degree, suggesting that there is no extension discrepancy (Reston, 2009).

If upper crustal stretching is accommodated through brittle faulting mechanisms, the suggestion is that there must be unrecognised fault generations present at MPRMs and other regions of hyper-extension (Reston, 2007; Reston, 2009). In order to facilitate high degrees of stretching ($\beta \geq 1.7 - 2.0$) multiple fault generations are required (Jackson & White, 1989). The complexity of both the structural geometries and the associated seismic velocity gradients, produced by the progressive polyphase faulting (PPF) mechanism serve to render the earliest fault generations effectively invisible, or where they are imaged, to not be interpreted correctly.

We present a velocity cross-section through a simulated rifted margin that has been attenuated by the PPF mechanism. The velocity model is extended by three individual, cross-cutting fault generations and both the velocity gradient and structural geometries are seen to significantly increase oceanward. Image-ray tracing was performed on the velocity model to produce simulated (perfectly) migrated seismic data in two way time. A very wide migration aperture was used in order to maximise the imaging potential of steeply dipping structures, and low-velocity zones were introduced to ensure that intra-basement faults had sufficient acoustic impedance to generate a reflection. The resulting synthetic seismic data represent the absolute best case imaging scenario for the PPF mechanism.

From the synthetic data the characteristic PPF identifiers - crestal Wedges, fault bifurcations (up-dip, and down-dip), and oversteepened stratigraphy – are described. Both correct and incorrect interpretations of the synthetic data are presented to demonstrate how PPF structures can easily be misinterpreted on seismic data. Intra-basement faults are not likely to be perfectly reflective on industry seismic data, but as basement lithologies are not perfectly isotropic it is possible that they may produce discontinuous reflections.

The results of the synthetic modelling suggest that many PPF structures may have gone unrecognised on industry seismic data. We present an example from the hyper-extended Porcupine Basin, where an interpreted listric fault system from the western margin of the basin (Naylor et al., 1992), may in fact be two cross-cutting fault generations based on down-dip fault bifurcations and oversteepened stratigraphy, as described from the synthetic modelling.

From the synthetic data it can be seen that due to velocity distortions, even when all PPF structures generate reflections, they are highly unlikely to be interpreted correctly. Failure to recognise the PPF mechanism would cause any estimation of stretching accommodated by upper crustal faulting to be grossly underestimated and so result in an apparent “extension discrepancy”.

References

- Davis, M. and Kusznir, N.J., 2004. Depth-dependent lithospheric stretching at rifted continental margins. *In* Karner, G.D., ed., *Proceedings of NSF Rifted Margins Theoretical Institute: New York*, Columbia University Press, 92–136.
- Jackson, J. and White, N., 1989. Normal Faulting in the Upper Continental-Crust - Observations from Regions of Active Extension. *Journal of Structural Geology*, **11**(1-2), 15-36.
- Naylor, D., Shannon, P.M. & Murphy, N. 2002. Porcupine–Goban region—a standard structural nomenclature system. Petroleum Affairs Division, Special Publication, 1/02
- Reston, T., 2007. Extension discrepancy at North Atlantic non-volcanic rifted margins: Depth-dependent stretching or unrecognized faulting? *Geology*, **35**(4), 367-370.
- Reston, T.J., 2009. The extension discrepancy and syn-rift subsidence deficit at rifted margins. *Petroleum Geoscience*, **15**(3), 217-237.

Carbon Sequestration in Carboniferous Black Shales in Ireland

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There is a proven link between climate change and increase of carbon dioxide (CO₂) in the atmosphere from anthropogenic sources. Carbon Capture and Storage (CCS) is one of the best solutions to store CO₂ in deep geological formation for a long period of time (Bachu, 2003).

Black shales are now being studied for their gas generating potential and CO₂ adsorption properties. CO₂ injection can provide a way to enhance methane production and, at the same time, store CO₂. In coals, there is evidence that adsorption capacity decreases with increasing coal rank (Eble et al, 2010) but less is known about organic rich shales. In this investigation, three maturity maps (Base Carboniferous [Figure 1a], Base Viséan [Figure 1b] and Base Westphalian [Figure 1c] have been created for onshore Ireland using published vitrinite reflectance data, palaeogeography and vitrinite reflectance gradient [Figure 1d].

Maturity trends for the Base Carboniferous do not seem to follow any clear structural trend and the lowest values recorded are in the South East of Ireland (Co. Wexford). The Base Chadian shows a progressive increase in vitrinite reflectance from NE to S in Ireland. The Base Westphalian map shows the same trend as the Base Chadian, but with lower values especially in parts of Co. Wexford.

References

- Bachu, S., 2003. Screening and ranking of sedimentary basins for sequestration of CO₂ in geological media in response to climate change. *Environmental Geology*, **44**, 277–289.
- Eble, C., Greb, S., Nuttall, B., McClure, M., Conrad, M., Grimm, R., 2010. Factors Affecting the Gas Content of Pochaontas Basin Coal Beds, SW Virginia: Implication for Coal-Based Carbon Capture/Storage and Enhanced Coal Bed Methane Production. Unpublished presentation, Geological Society of America Meeting, Denver 2010.

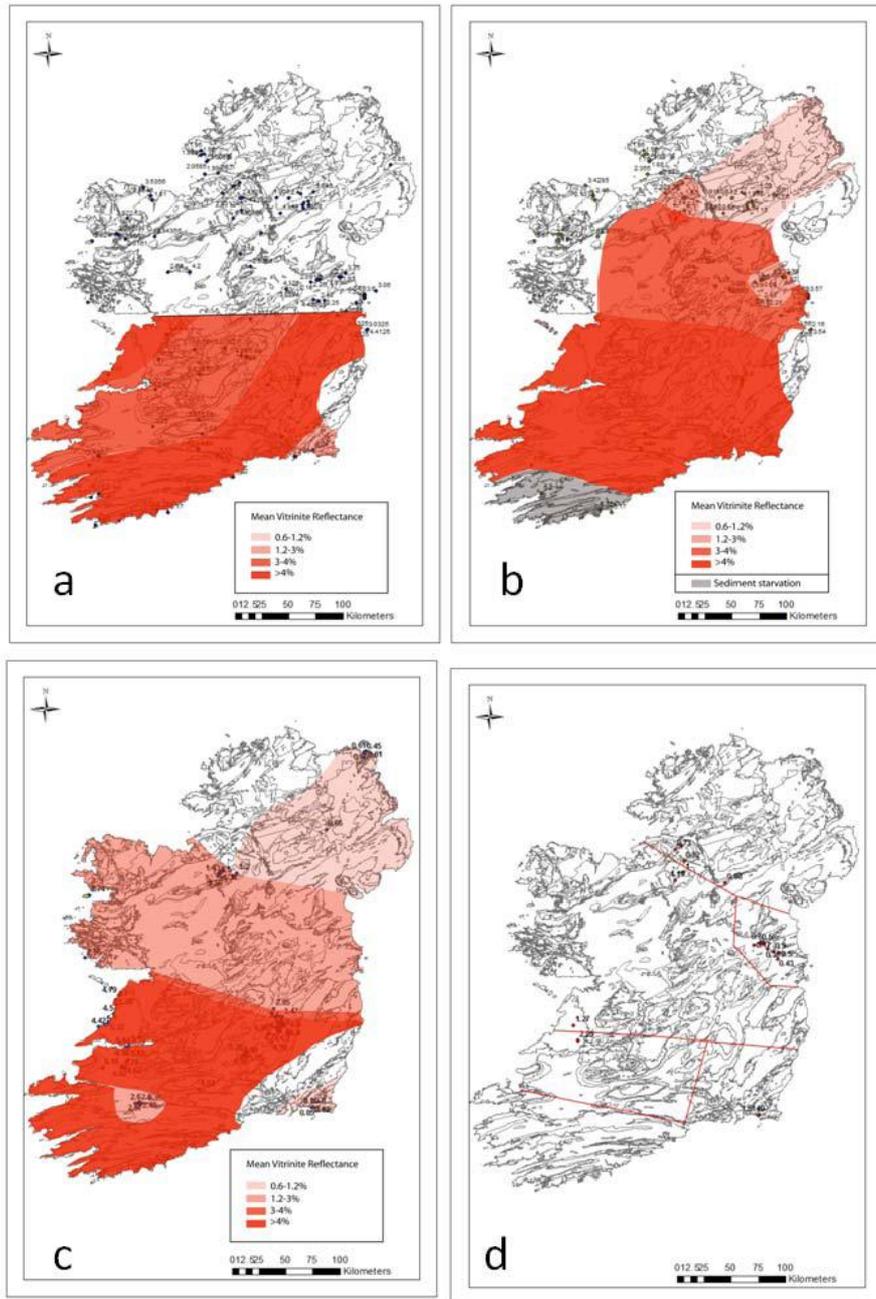


Figure 1. Mean Vitrinite Reflectance data distribution in Ireland for a) the Base Carboniferous, b) the Base Viséan and c) the Base Westphalian. In the figure d is displayed the gradient map that was used to extrapolate vitrinite reflectance data that were not available

'Palynomorph Darkness Index' – a new method for determining thermal maturity

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Palynomorph Darkness Index (PDI) is a new thermal maturity indicator. It is calculated from measurement of the red, green and blue (RGB) intensities of light transmitted through palynomorphs, using standard palynological microscopes and digital cameras. Laboratory heated, Early Permian *Tasmanites* show a progressive increase in PDI with increasing temperature and suggest that the technique is applicable through a broad temperature range, encompassing the whole of the oil window and at least part of the zone of dry gas generation (Figure 1).

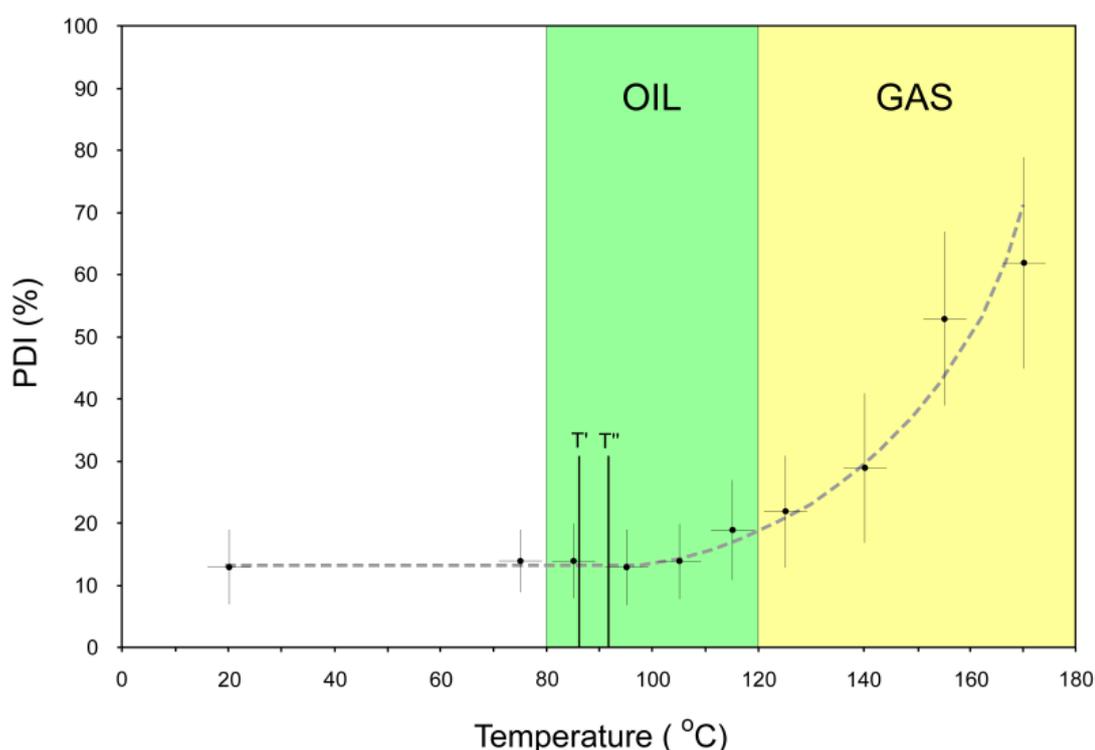


Figure 1: Correlation of furnace temperatures used to heat Early Permian *Tasmanites* with PDI values from RGB measurements on 50 specimens per sample (after Goodhue & Clayton 2010). Lines T' and T'' indicate the peak palaeotemperature attained naturally by the unheated samples using calculations of Barker (1991) and Barker and Goldstein (1990) respectively.

Potential applications of this inexpensive method include the estimation of thermal maturity of sections deficient in vitrinite, such as including pre-Devonian strata and many marine black shales. Standard mounts of organic residues on glass slides are used, so PDI can be determined readily during routine palynological investigations. PDIs determined by different microscope and camera combinations show excellent correlation, suggesting that the method is largely platform-independent (Figure 2). Calibration is achieved using photographic filters as standards.

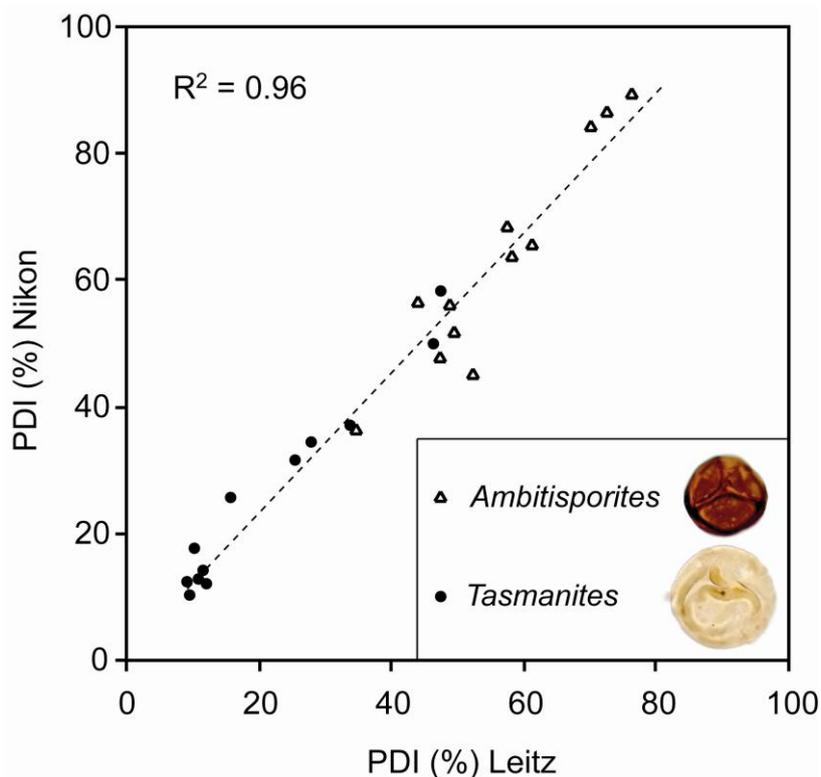


Figure 2: Correlation of calculated PDI values from RGB measurements of unoxidised Palaeozoic *Tasmanites* (prasinophytes) and *Ambitisporites* (plant spores), using two different microscope/camera combinations (after Goodhue & Clayton 2010).

References:

- Barker C.E. 1991. Implications to organic maturation studies of evidence for a geologically rapid increase and stabilization of vitrinite reflectance at peak temperature: Cerro Prieto Geothermal System, Mexico. *American Association of Petroleum Geologists Bulletin*, **75**, 1852-1873.
- Barker C.E. & Goldstein R.H. 1990. Fluid-inclusion technique for determining maximum temperature in calcite and its comparison to vitrinite reflectance geothermometers. *Geology*, **18**, 1003-1006.
- Goodhue, R. & Clayton, G. 2010. Palynomorph Darkness Index (PDI) - a new technique for assessing thermal maturity. *Palynology*, **34**, 147-156.

A regional stratigraphic and structural synthesis of Mesozoic/Cenozoic basins, offshore Ireland

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Extensive occurrences of Mesozoic and Cenozoic strata are preserved in the Porcupine, Rockall and Hatton basins and in the Goban Spur region, offshore Ireland. Successions were studied using recent 2D high-resolution seismic data integrated with older seismic data (Figure 1) and available well

information. The new seismic data provide improved imaging below Early Cenozoic lavas, show good seismic resolution beneath the Cretaceous and image Jurassic and older fault blocks. The new study has identified new structural and stratigraphic elements including (i) small tilted half-grabens filled with Early Cretaceous strata along the western margin of the Hatton Basin, (ii) large half-grabens filled predominantly with Early Cretaceous sediments in the Goban Spur region and (iii) inversion structures in the southern parts of the Hatton and the Porcupine basins. The seismic study has provided an improved constraint on the detailed structure and the timing of structuring, especially for Jurassic and Cretaceous periods.

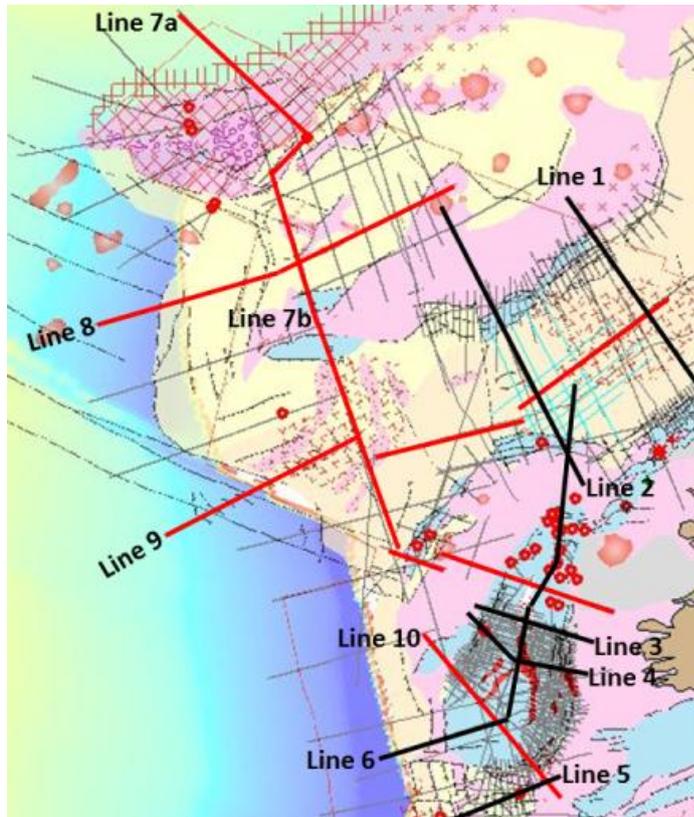


Figure 1. The map shows the seismic grid used in the project. The studied region includes the Hatton, the Rockall, the Porcupine basins and the Goban Spur region, offshore Ireland. The map shows the location of 10 regional geoseismic profiles constructed through key areas of the margin.

Ten regional profiles, each consisting of several seismic lines across key areas, illustrate the regional and detailed structure of the Irish Atlantic continental margin (Figure 1). The Jurassic pre-rift and syn-rift successions are preserved in tilted fault blocks and indicate a major basin reorganisation and structuring during Middle and Upper Jurassic times. The Jurassic strata were interpreted in the deepest part of the Porcupine Basin whereas they are imaged predominantly along the margins of the Rockall Basin. Overlying Cretaceous strata exhibit both syn-rift and post-rift successions, which are variably distributed across the region. The best example of Early Cretaceous (Aptian/Albian) syn-sedimentary rifting is found in the southern part of the Porcupine Basin and the Goban Spur region. The Albian successions are also preserved in small, partly preserved half-grabens situated along the western margin of the Hatton Basin. Based on seismic character and correlation with neighbouring areas, Cretaceous strata are also interpreted in larger basins perched along the south-eastern margin of the Hatton Basin. The Cretaceous succession was inverted during latest Cretaceous times. Similar timing of inversion is interpreted in the south-western part of the Porcupine Basin. The southern part of the studied Irish continental margin was therefore affected by an inversion episode which predates the more well constrained Oligocene and Miocene inversion structures found in basins offshore Ireland.

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Wheeler diagrams were constructed along the axial 2D seismic lines in the Porcupine Basin to illustrate spatial variations of sedimentary facies and depositional environments (Figure 2). In addition, the diagrams illustrate several intra-Cretaceous unconformities including the Early Cretaceous (Aptian/Albian) unconformity that is interpreted to be related to a final continental breakup at the Goban Spur margin.

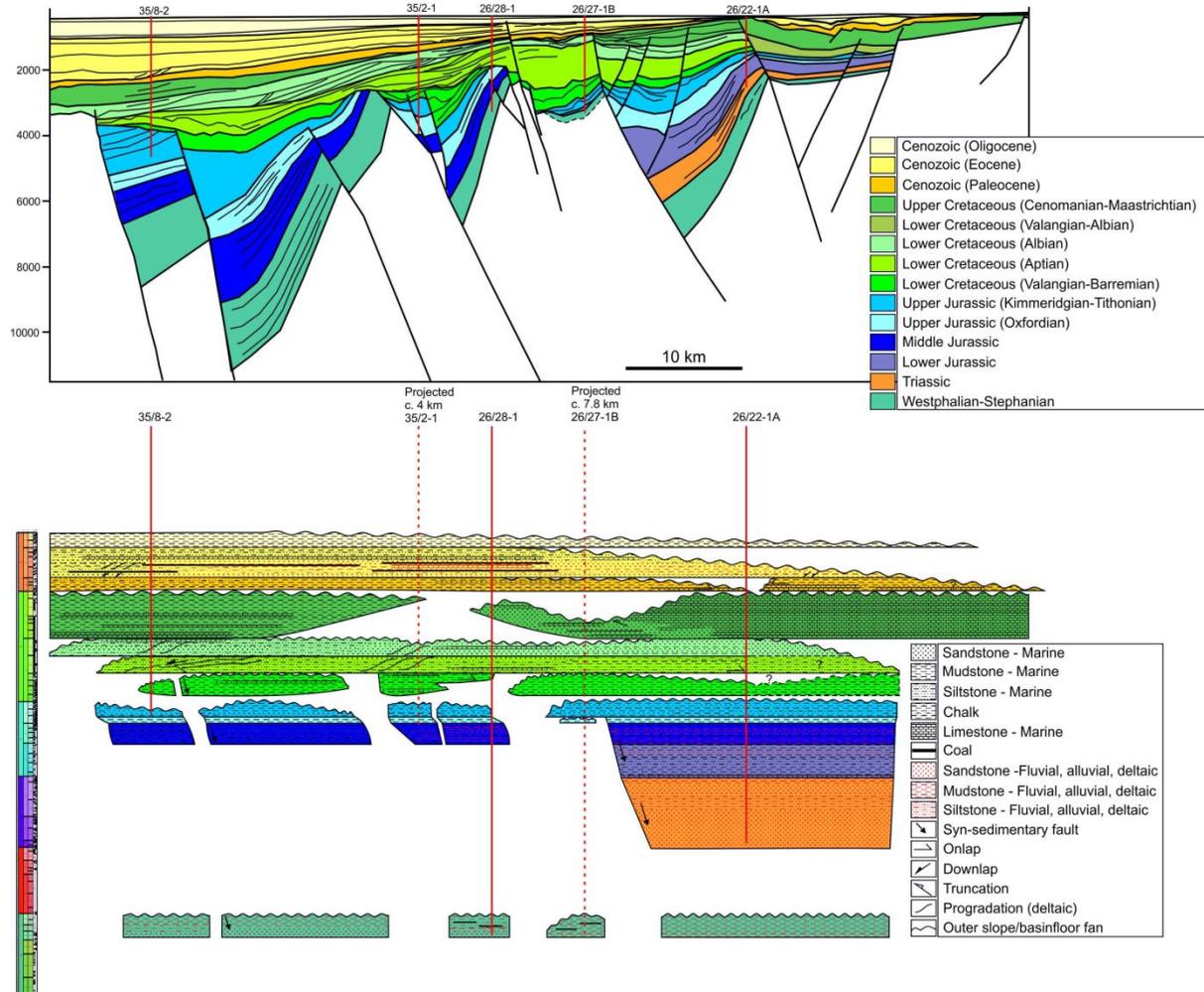


Figure 2. Wheeler diagram constructed for the North Porcupine Basin and the northern part of the Main Porcupine Basin.

This project is jointly funded by the Irish Shelf Petroleum Studies Group (ISPSG) of the Petroleum Infrastructure Programme and Nalcor Energy (on behalf of the Offshore Geoscience Data Program with the Government of Newfoundland and Labrador).

Acoustic imaging of variable water layer structure in Rockall Trough, NE Atlantic

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The new adaptation of seismic reflection profiling, to image study the oceans interior, can create detailed pictures of eddies, internal waves, and other oceanic features. Reprocessed seismic profiles in Rockall Trough show a bright reflective channel at a sea depth of 800 – 1300 m. Structures are observed within these layers including dipping reflectors close to the slope, eddy like features and undulations within reflectors that represent internal waves. Seismic reflection sections provide very high resolution images of the oceans structure and complement conventional physical oceanography data. Horizontal and vertical resolution is approximately 150 – 250 m and 3 – 6 m respectively.

Seismic oceanography has been successfully applied to image water mass fronts, boundaries, Meddies and internal waves. Pre-stack shot gathers, from multi-channel seismic reflection data, are used to measure internal wave displacement, phase speed, wavelength and frequency. The individual internal wave oscillations are non sinusoidal and are observed both in the open ocean and close to the continental slope. One advantage of using this method is that internal wave propagation direction can be determined by comparing consecutive shot gathers. In the Rockall Trough, the majority of the internal waves propagate towards the Irish continental slope. Phase speeds decrease with depth in the water column, but increase as the waves approach the Irish Continental Slope. The largest wavelengths and displacements are found at a depth of 1000 – 1200 m, where there the Mediterranean Outflow Water and Labrador Sea Water interact and mix together.

Echo-sounding is also used to image variable oceanic structure at depth in the Rockall Trough. Stratification on echogram correlate with coincident CTD casts at depths of 500 – 1500 m in Rockall Trough. Internal wave measurements are made on the echograms. These measurements are similar in range to the measurements made on multi-channel seismic reflection data. Internal waves, picked on echograms, closely relate to the theoretical dispersion relationship whereby larger wavelengths show faster internal wave speeds ($R^2 = 0.92$).

Multi-channel seismic data is proficient in imaging Mediterranean Eddies (Meddies), while also giving information on their dimensions, as well as detailed vertical and lateral distribution and characteristics of fine-structure. Most seismic sections from Rockall Trough contain sub-circular lens shaped features consisting of a seismically transparent core surrounded by highly reflective edges. Such oceanic features have previously been documented further south in the Gulf of Cadiz, but this is the first discovery of these lenticular bodies on seismic profiles in Rockall Trough. Salinity and temperature anomalies are found inside the structural core of these Meddies. The Meddies, in Rockall Trough, are of the order of 15 km in lateral diameter by 300 m vertically thick. Intrusive mixing from the colder Atlantic waters is causes heat and salt loss within the Meddy. Therefore these Meddies become smaller and weaker, and seismically less reflective as they migrate northwards.

A Regional Stratigraphic and Structural Interpretation of the Newfoundland and Ireland Conjugate Margins

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A regional seismic grid has been interpreted on the Newfoundland margin using a combination of modern industry data, and seismic data from government and academia (Figure 1). On the Newfoundland margin, seismic data made available to the project included modern (2002), high-resolution seismic data in the Orphan Basin (courtesy of TGS-Nopec). The interpreted results provided input to A New Kinematic Plate Reconstruction of the North Atlantic between Ireland and Canada (Whittaker et al, this conference).

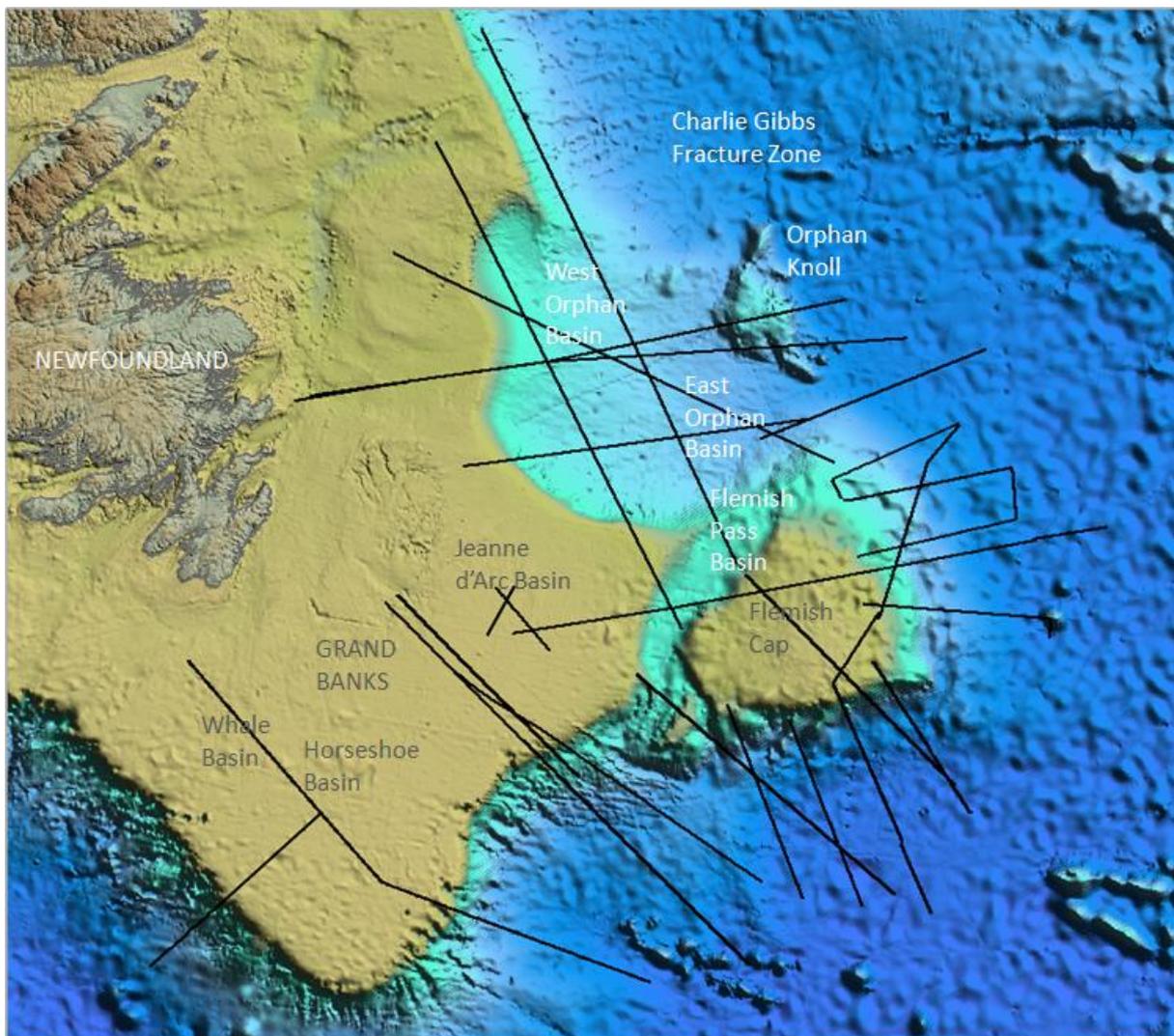


Figure 1. Bathymetry map showing the regional seismic database for the Newfoundland margin used in the project.

Major tectonostratigraphic sequences defined from seismic interpretation around the margin were mapped and seismic stratigraphic correlations (Wheeler Diagrams) were constructed along selected 2D seismic lines in the East Orphan and West Orphan basins. These correlations image spatial variations of sedimentary facies and depositional environments. Fault restoration software has also

been used to model the structural development of the conjugate margins. Fault restoration has enabled us to evaluate the structural history of the margin and both differentiate and measure the relative magnitude of the various tectonic events that have affected the area.

The most prominent regional unconformity is the Base Cretaceous which in the east Orphan and Flemish Pass basins is overlain by Lower Cretaceous sediments deposited in restricted basins. In addition, the Wheeler Diagrams show several intra-Cretaceous unconformities, notably an Albian unconformity that is interpreted to be related to a continental breakup at the Flemish Cap - Goban Spur margin. Complementary regional seismic stratigraphic sections were interpreted on the conjugate margin of Ireland (Štolfova et al., this conference) and it is possible to correlate the Albian unconformity between the East Orphan and the Porcupine basins which were juxtaposed prior to breakup.

In the East Orphan Basin a Late Cretaceous unconformity is also interpreted. The exact age of this unconformity is unclear but it is possibly related to tectonic events associated with the progressive breakup of the Irish-Newfoundland margin northwards from the Flemish Cap between Albian and Santonian times. In the central part of the East Orphan Basin the unconformity is overlain by a high amplitude sheet-like deposit, interpreted as a turbidite. The base of the Cenozoic is marked by the regionally extensive unconformity which occurred post-breakup in this area. Late Cretaceous volcanics are interpreted to be present along the outer Newfoundland margin at the outer edge of the Orphan Knoll and West Orphan Basin, to the south of the Charlie Gibbs Fracture Zone. An Early Eocene unconformity has also been recorded in the western Jeanne d'Arc Basin related to basin margin uplift.

The structural and stratigraphic development of the Newfoundland and Irish margins is linked due to the relative movements of the N. American, Eurasian, Greenland and Iberian plates. Fully understanding the kinematic plate model is vital for the analysis of basin development in this area. The interpretation of regional seismic data from the margins of Newfoundland and Ireland has enabled a comparison of both margins and has also resulted in an improved understanding of the evolution of the conjugate passive margins of Canada and NW Europe in general. The stratigraphic study has led to a more thorough evaluation of potential Cretaceous and younger source and reservoir intervals along the margin.

Ady, B.E. & Whittaker, R.C. 2012. A New Kinematic Plate Reconstruction of the North Atlantic between Ireland and Canada. Abstract, *Central Atlantic Conjugate Margins Conference, Dublin, 2012*.

Štolfova, K., Whittaker, R.C. & Shannon, P. M. 2012. New insights into the regional Mesozoic and Cenozoic evolution of the Irish offshore continental margin. Abstract, *Central Atlantic Conjugate Margins Conference Dublin, 2012*.

This project is jointly funded by the Irish Shelf Petroleum Studies Group (ISPSG) of the Petroleum Infrastructure Programme and Nalcor Energy (on behalf of the Offshore Geoscience Data Program with the Government of Newfoundland and Labrador).

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Olan Howell	ERM
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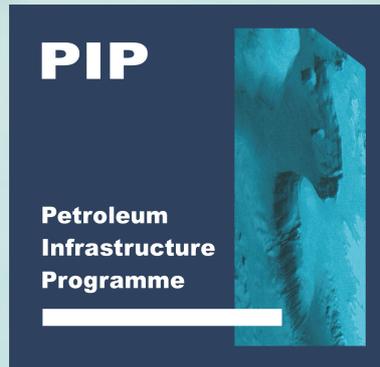
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