



THE PETROLEUM INFRASTRUCTURE PROGRAMME

De-Risking Hydrocarbon Exploration Offshore Ireland

Atlantic Ireland
31st October 2017
DUBLIN



Irish Shelf Petroleum Studies Group



De-Risking Hydrocarbon Exploration Offshore Ireland

1997 - 2017



The First Petroleum Infrastructure Programme Management Committee Meeting at the Petroleum Affairs Division, Beggars Bush on 1st December 1997

Government Industry Research Collaboration



Members Workshop 27th March 2017



Objectives of the Workshop



- To investigate the impact and relevance of ISPSG research to date
- To identify the research priorities for ISPSG for the next 3 years to 2020

The Workshop was facilitated by Jonathan Craig, Senior Vice President Exploration & Global Exploration Advisor, Eni Milan.

Atlantic Ireland 2017 Conference

Clayton Hotel, Upper Leeson St, Dublin

October 31st – November 1st, 2017

A New Biostratigraphic, Lithostratigraphic & Sequence Stratigraphic Framework of Offshore Ireland

Copestake, P.¹, Ainsworth, N. R.², Bailey, H. W.³, Dominey, S. J.¹, Donato, J. A.¹, Farrimond, P. R.⁴, Gallagher, L. T.³, Gehlen, M.⁴, Gueinn, K.⁵, Hampton, M.³, Lavis, O. M.¹, Loy, T.¹, Riley, L. A.⁵, Wright, T. D.¹ & Stevenson, C.⁶

¹Merlin Energy Resources Ltd, ²Palaeodate Ltd, ³Network Stratigraphic Consulting Ltd, ⁴IGI Ltd,

⁵Riley Geoscience Ltd, ⁶University of Birmingham



Oils of the North Atlantic: Long lost families or just a similitude of strangers?

James Armstrong¹, Jean-Marie Laigle², Samuel Piriou², Alain-Yves Huc², Ian Atkinson³, Michael Hanrahan⁴

Kara English⁴

(1). Petroleum Systems Limited, Prestatyn, Wales, UK., (2). Beicip-Franlab, Rueil-Malmaison, France., (3). Nalcor Energy - Oil and Gas, St. John's, Newfoundland-Labrador , Canada.,
(4). Petroleum Affairs Division, Department of Communications, Climate Action and Environment, Dublin, Ireland.

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Petroleum exploration in Ireland's offshore basins

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Introduction

Since the Industrial Revolution the burning of fossil fuels has raised the concentration of atmospheric carbon dioxide (CO₂) from 280 ppm to over 400 ppm. This increase is the major cause of the enhanced greenhouse effect causing global warming. It is almost universally agreed that we must reduce CO₂ emissions and develop alternative energy sources.

During the transition to a low-carbon future we will continue to require fuel for transport, heat and electricity generation. With limited fossil fuel resources, Ireland relies heavily on foreign imports. Currently all of Ireland's oil demand is met through imports. Oil and wind gas yields provide Ireland with a portion of its energy needs but these yields are not in a position to meet all of the country's annual gas demand and so we will continue to rely on gas via the United Kingdom for the foreseeable future.

Tectonic plates

Plate tectonics is the study of the lithosphere, the outer portion of the earth consisting of the crust and part of the upper mantle. The lithosphere is divided into some very large and several smaller plates. The plates slowly move through time, changing size and shape. When the plates interact with each other, they create geologic events such as sea level changes, volcanoes, mountains, mid-oceanic ridges and the formation of sedimentary basins. The type of event depends on the composition of the plates and how they move relative to each other.

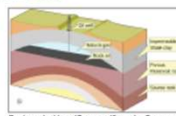
Approximately 300 mya (million years ago) the plates were assembled into a supercontinent called Pangea. Pangea began to break up during the early Jurassic (approximately 200 mya) eventually forming the modern continents and the Atlantic and Indian Oceans.

Many of the Earth's natural resources (energy, minerals, and soil) are concentrated near past or present plate boundaries. Understanding the movement of the Earth's surface and the relative position of the plates is key to petroleum geoscientists in locating oil and natural gas deposits. This is particularly the case for Ireland where understanding the reconstruction of the plates in the North Atlantic is an essential tool for the exploration of oil and gas offshore Ireland.

The formation of fossil fuels

Most oil and gas is formed from the remains of plankton (both zooplankton and phytoplankton) that sink to the ocean floor. Fossil fuels can also form from land plants. In order for fossil fuels to form, the plankton and land plants must be buried in anoxic (without oxygen) conditions. Over long periods of time (millions of years) these organic layers are covered with sediment and, with heat and pressure, eventually form coal, oil and natural gas.

Oil and gas trapped in the pore spaces of the sedimentary rock moves through the subsurface and escapes unless it is trapped by an impermeable layer of rock (e.g. shale, salt, carbonates).



Methods of finding oil/gas reserves

Drilling wells offshore using oil rigs and drill ships is not cheap; for example, a well drilled offshore Ireland in 2014 cost in the order of 200 million euro. The actual cost of drilling a well depends on a number of factors, including water depth, rig type and rig availability. So, before attempting to drill for oil it is essential to survey the area in order to identify the most likely locations of trapped oil or gas. The main types of survey used for this purpose are seismic, gravity and magnetic.

Typically, in a marine seismic survey, sound pulses are produced by a mooring ship and the resulting echoes from the subsurface layers are detected by a long line of hydrophones towed behind the ship. As the ship moves, the accumulated data are recorded and later processed and uploaded to high specification computers for interpretation by geoscientists.

Gravity surveys measure variations in the Earth's gravitational field. Local gravity variations are generally less than 0.1%. The actual value varies with latitude and the relative positions of the Earth, the Moon and the Sun. The difference between the expected gravity and the measured value is called an anomaly. It can be positive or negative. Negative anomalies indicate lower than average local densities.

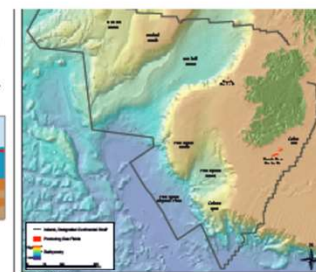
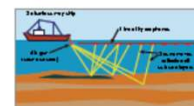
Similarly, magnetic surveys measure variations in the Earth's magnetic field. Although shipborne magnetic and gravity measurements can be taken simultaneously, although gravity and magnetic surveys have less resolution than seismic surveys they help in the identification of sedimentary basin geometry, oceanic continental crust, and igneous bodies, the estimation of depth to basement and geological faults. Even when the survey data and interpretation indicate the likely presence of commercial quantities of oil or gas, success is not guaranteed.

What is the Irish Shelf

The designated Irish Continental Shelf is the area mostly to the west of Ireland which is designated as an area for the exploration of the seabed and is subject to rights to natural resources, including oil and gas resources. This area, which is almost 10 times the size of the island of Ireland, ranges in water depth from less than 200 m in the shallower parts to more than 4500 m in the deeper parts.

Oil and gas exploration in Ireland

Following the drilling of some uncommercial onshore (i.e. land-based) wells in Ireland in 1962 and 1963, exploration moved offshore in 1970. The first two wells drilled were unsuccessful but the third well, off the Inish Meen, produced commercial quantities of natural gas and came on stream in 1973. Neighboring fields came on stream in 1991, 1999 and 2003. Exploration continued in all offshore basins including Celtic Sea, Porcupine, Bore, Finn and Rockall basins. In 1996 the Corrib Gas Field was discovered and came into production at the end of 2015. Oil has been discovered in a number of basins offshore Ireland, but no commercial quantities and as such there is no oil production to date.



Uses for oil and gas

- energy for transport, heating and electricity
- fertiliser
- pharmaceuticals, detergents, pesticides
- inks, dyes, paints, nail polish
- synthetic fibres and fabrics, foam, 'fire-glass' bonding, adhesives, lubricants, candles
- synthetic rubber, tyres, plastic containers, pipes etc.

Energy is indispensable to our society and economy and, in common with all developed economies, Ireland's energy policy seeks to balance the competing aspects of sustainability, competitiveness and supply.

The discovery of natural gas fields offshore Ireland has enabled the transition from fuel sources such as peat, coal and wood to natural gas. Natural gas is now used for domestic heating in many cities and towns in Ireland. Continued offshore exploration for natural gas can help secure Ireland's energy supply and help meet our current and future energy needs.

Petroleum products are a part of everyday life for Irish citizens. In order to move to a low carbon economy we must reassess our use of fossil fuels, make conscious decisions on the products we buy and seek alternatives where possible.



DOCAE (the Department of Communications, Climate Action and Environment) is responsible for communications, climate action, environment, broadcasting, energy, natural resources and postal services.

Petroleum Affairs Division

The role of DOCAE's Petroleum Affairs Division (PAD) is to maximise the benefits to the State from exploration for and production of Ireland's oil and gas resources. It ensures that activities are conducted with due regard to their impact on the environment and other stakeholders.

PAD is responsible for licensing and regulating activities relating to exploration and production of oil and gas, both offshore and onshore Ireland. It promotes investment in exploration in the Irish waters and supports research directed at deepening knowledge of the oil and gas potential of the Irish offshore. (Link)

For more details visit: www.dca.ie

The Petroleum Infrastructure Programme (PIP)

The Petroleum Infrastructure Programme was set up by the Petroleum Affairs Division (PAD) in 1997. Research under the programme goes beyond normal licence area-specific work and avoids duplicating the efforts of other groups or of commercial contractors. PIP is funded by oil companies with tender licences offshore Ireland and the PAD.

For more details visit: www.pip.ie

Irish Offshore Petroleum Study Group (IOPSG)

The IOPSG was set up by the Petroleum Affairs Division (PAD) in 2002 to address common industry problems anywhere in the Irish Offshore. It supports relevant geoscientific surveys, studies to improve cost-effectiveness and environmental monitoring and other agreed projects.

For more details visit: www.iopsg.ie

To view the brochure from the DOCAE on Climate Change from edition 12 please click the link below.
<http://sta.ie> can obtain a brochure as a service.

Find bills and other elections on www.sta.ie

Strong Drilling Performance in a Remote, Harsh Operating Environment Offshore Ireland



Presented by Stephen Jewell

2017 Update to the ISPSG 'Engineering Downtime Analysis and Cost Effective Drilling' Study

Prepared by George Ross, Kinetic Engineering Ltd



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





*During this week
the NAPSA
agreement will be
formally renewed
for another five
years at a
ceremony to be
held at the
Canadian Embassy*



To **REMAIN** a **world leader in applied geosciences research**, securing maximum benefit from our natural resources while protecting the environment.

To **transform geoscience research and education in Ireland**, by driving discovery, delivering economic and societal benefit and advancing public understanding of our science.

De-Risking Hydrocarbon Exploration Offshore Ireland



Ideas, concepts and new methodologies



“Ní neart go cur le chéile”
President Michael D. Higgins