

Status of Exploration offshore Ireland

New Data – New Knowledge

Clare Morgan
Head of Technical Section,
Petroleum Affairs Division

Department of Communications, Climate Action and Environment

Atlantic Ireland, 31st October, 2017



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

Petroleum Affairs Division (PAD) Technical

Presentation outline:

- **Licences**
- **Operations**
 - **Seismic**
 - **Well**
 - **Producing fields**
- **Interpretation**
- **Research**
- **Promotion**
- **Data**
- **New Data - New Knowledge**
- **Conclusions**

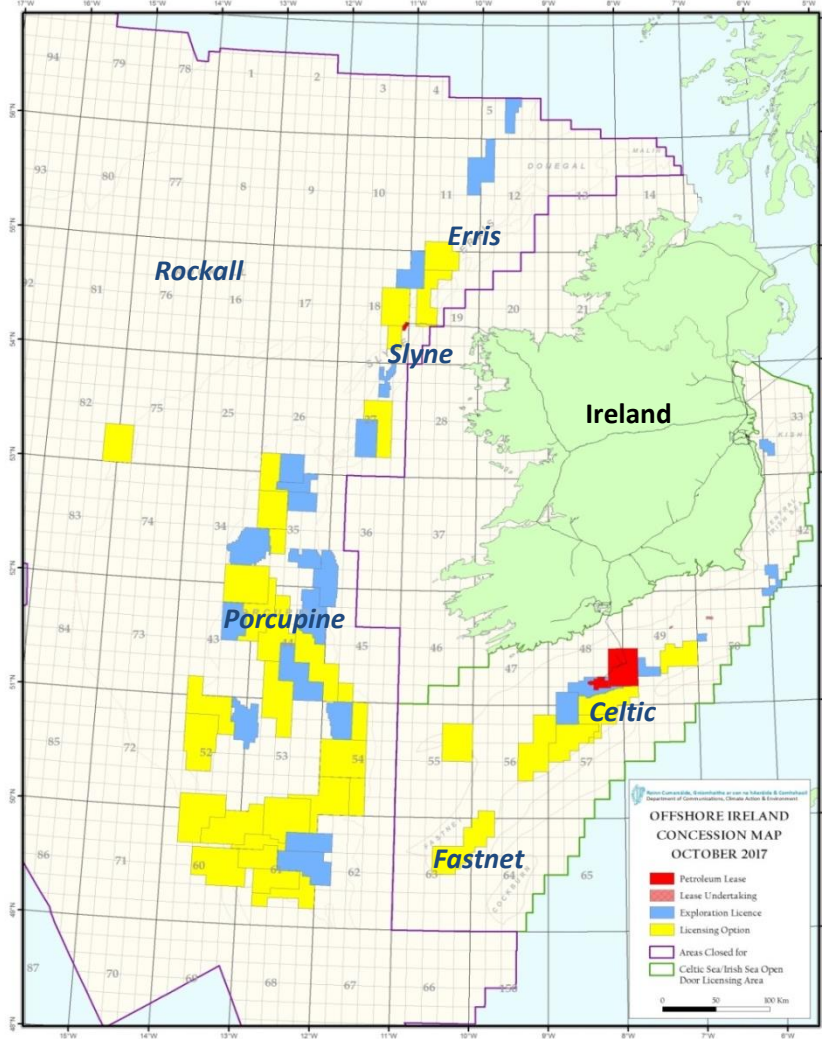




Licences

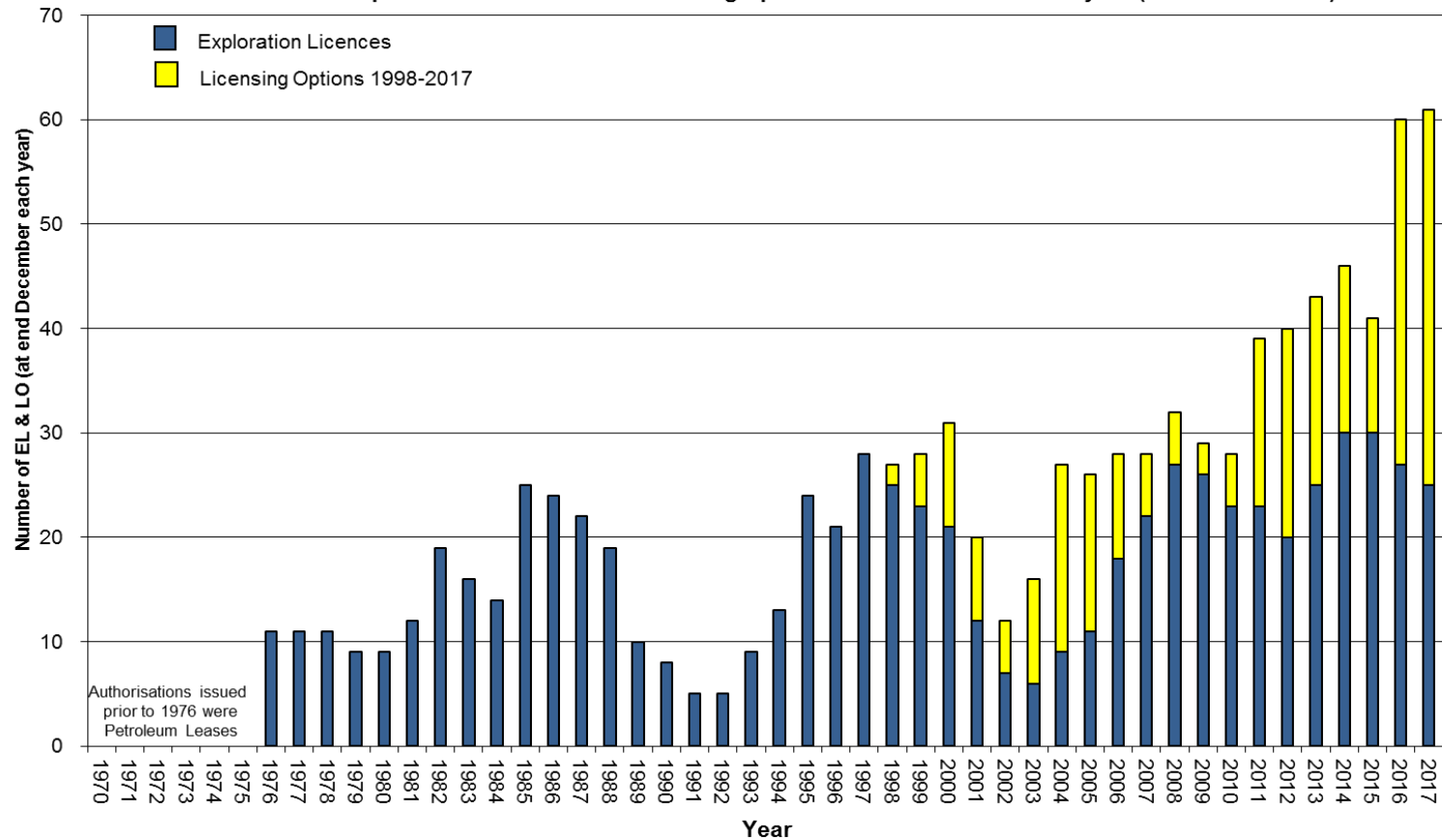
Concession Map

Exploration interest offshore Ireland is demonstrated by the current offshore Concession Map

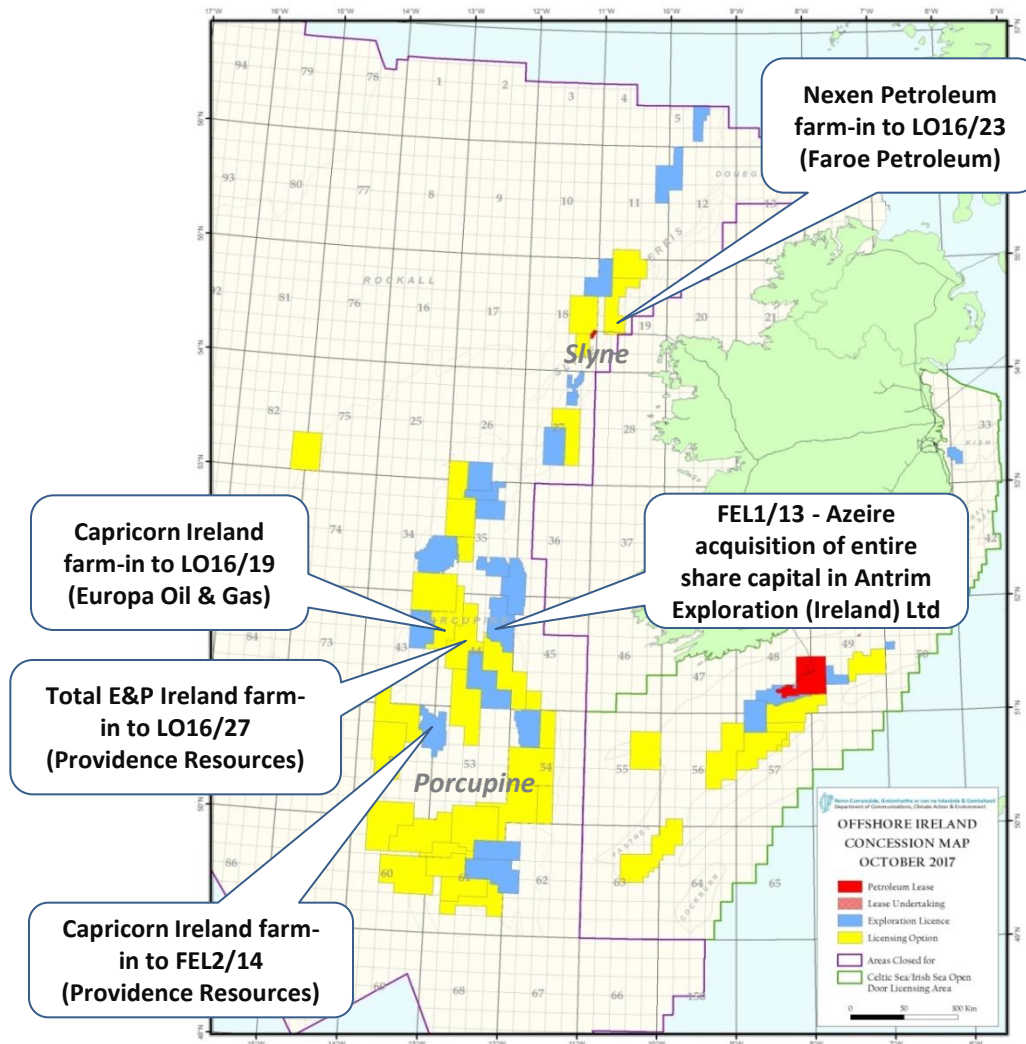


Licences

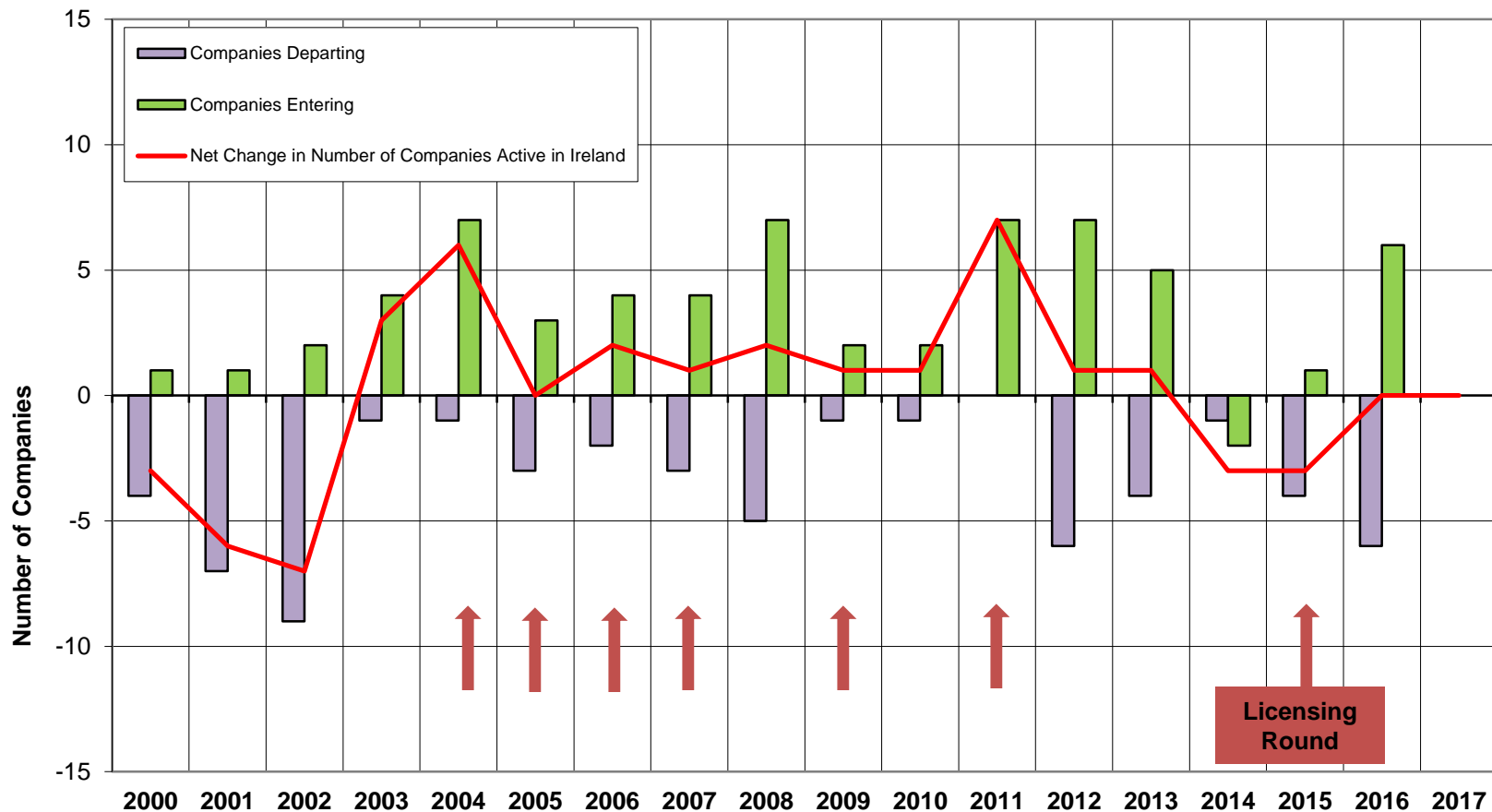
Number of Offshore Exploration Licences and Licensing Options at end December each year (1970 - June 2017)



Licences



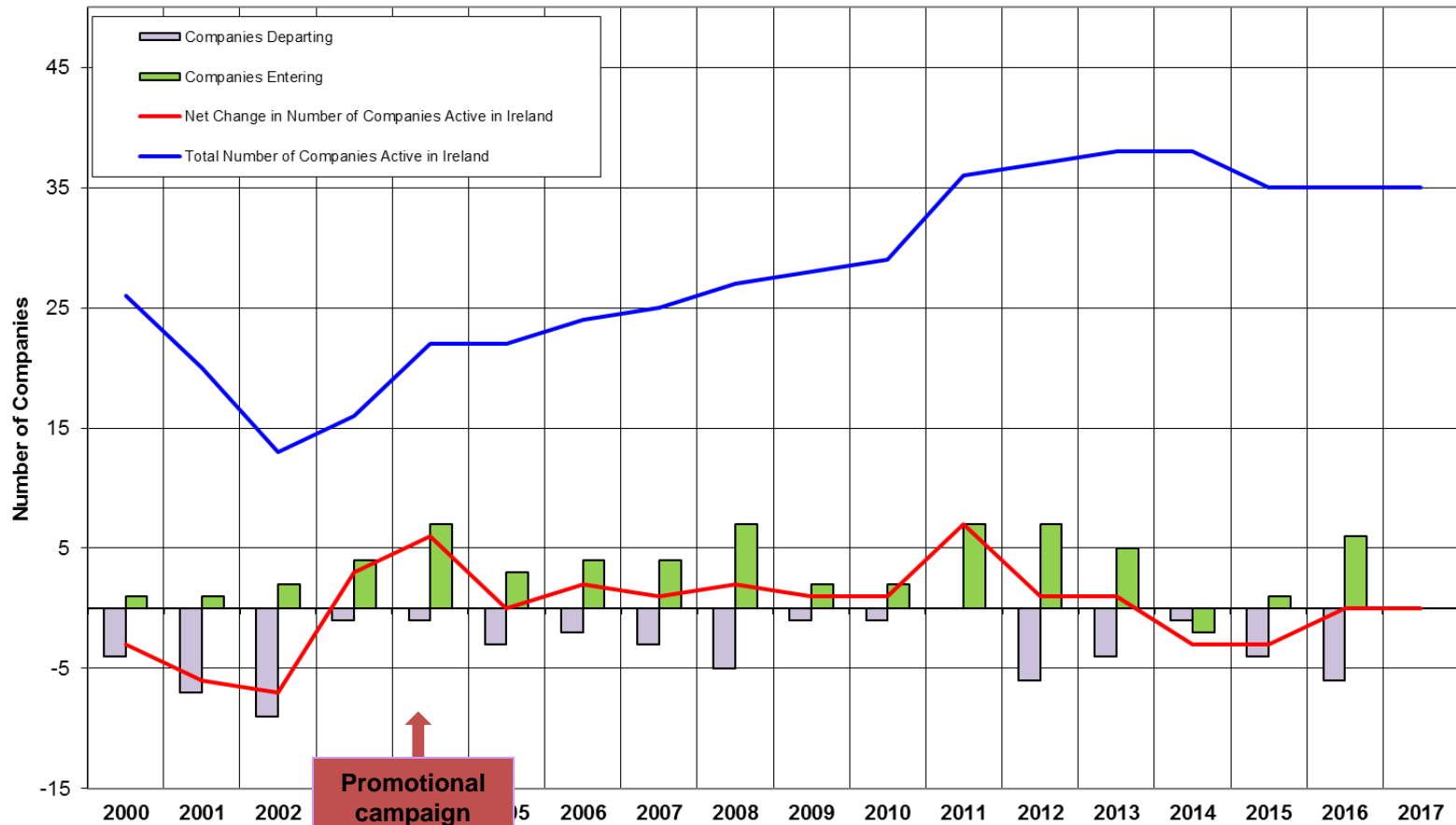
Exploration company numbers (2000-2017)



Reversal of company departure trend and increase in companies entering from 2003 (dip in 2015)



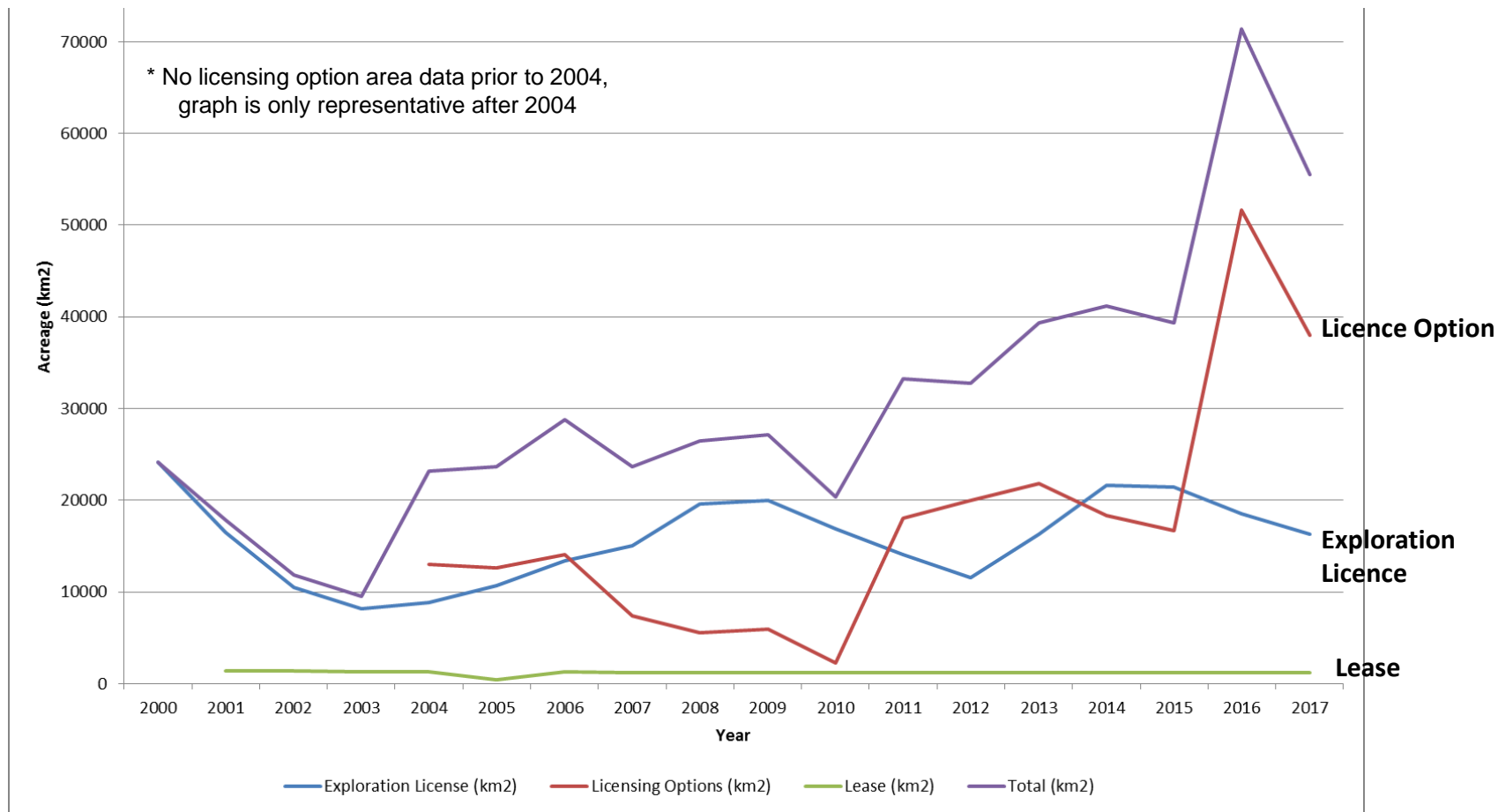
Exploration company numbers (2000-2017)



The steady increase in E&P companies interest



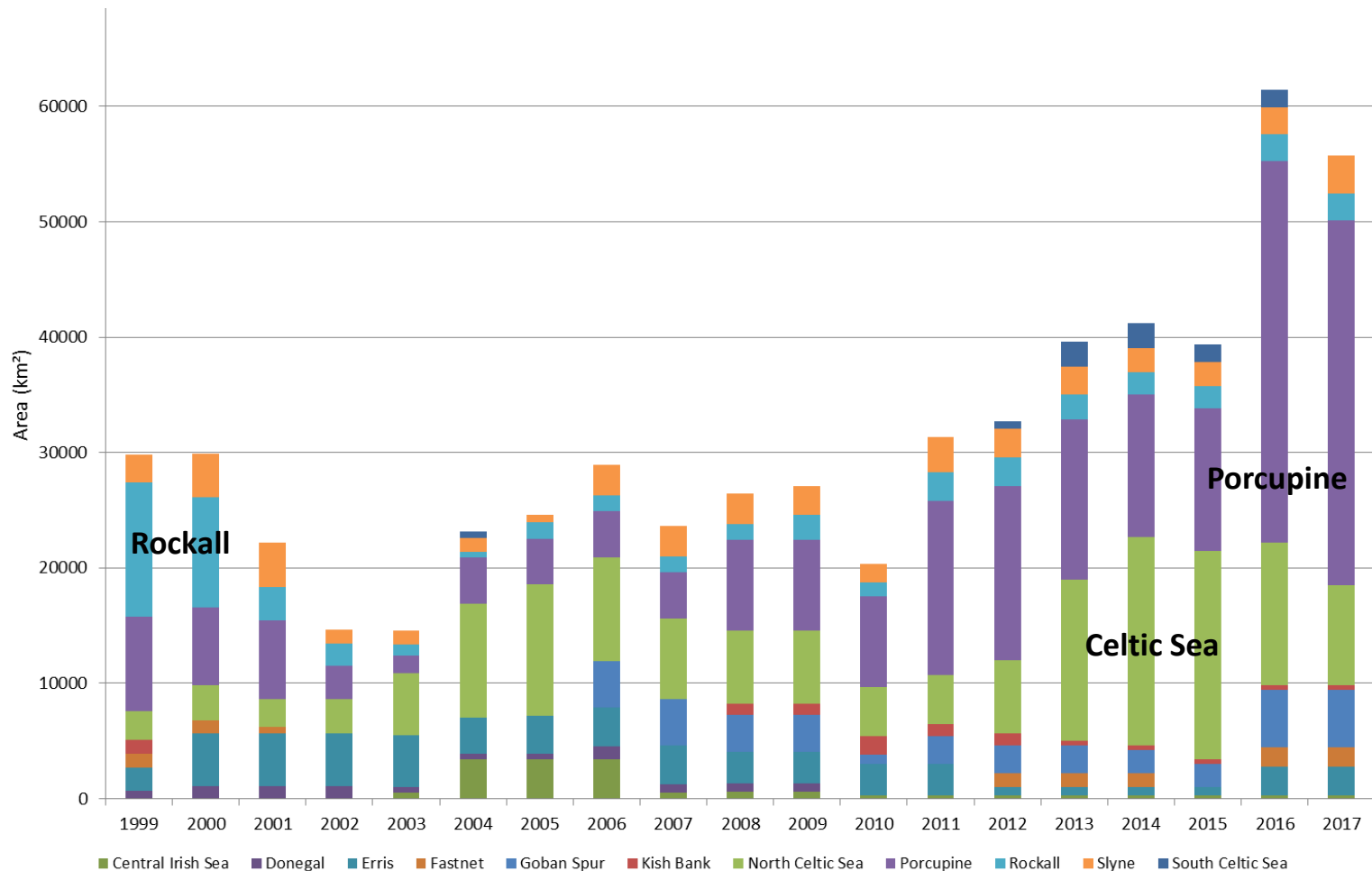
Licensed Acreage offshore Ireland (2000-2017)



The steady increase in acreage awarded



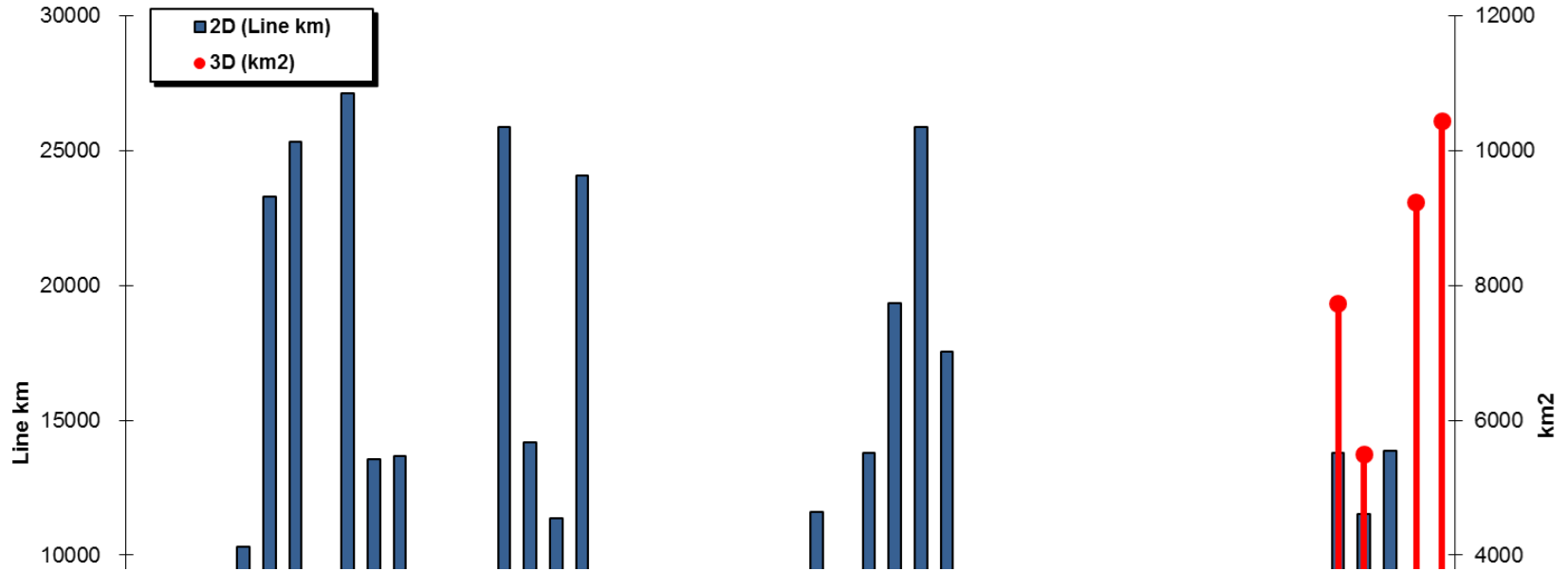
Licensed Acreage offshore Ireland by Basin (1999-2017)



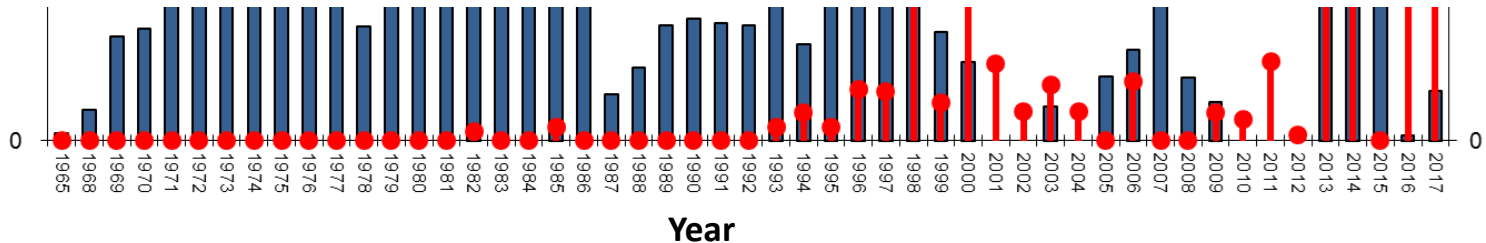


Seismic

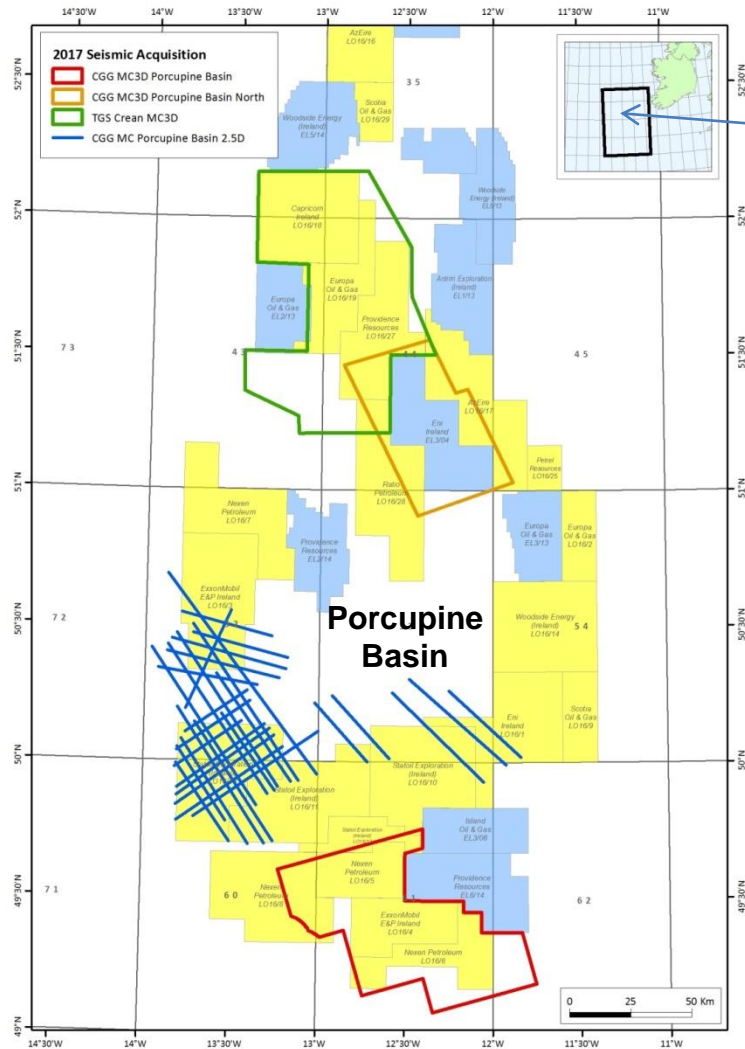
SEISMIC



Over 455 individual surveys have been carried out between 1965 to 2017, providing over 415,000 km of 2D seismic data and 50,000 sq km of 3D seismic data



Seismic acquired in 2017



3D:
CGG South Porcupine 2,650 sqkm
CGG North Porcupine 2,550 sqkm

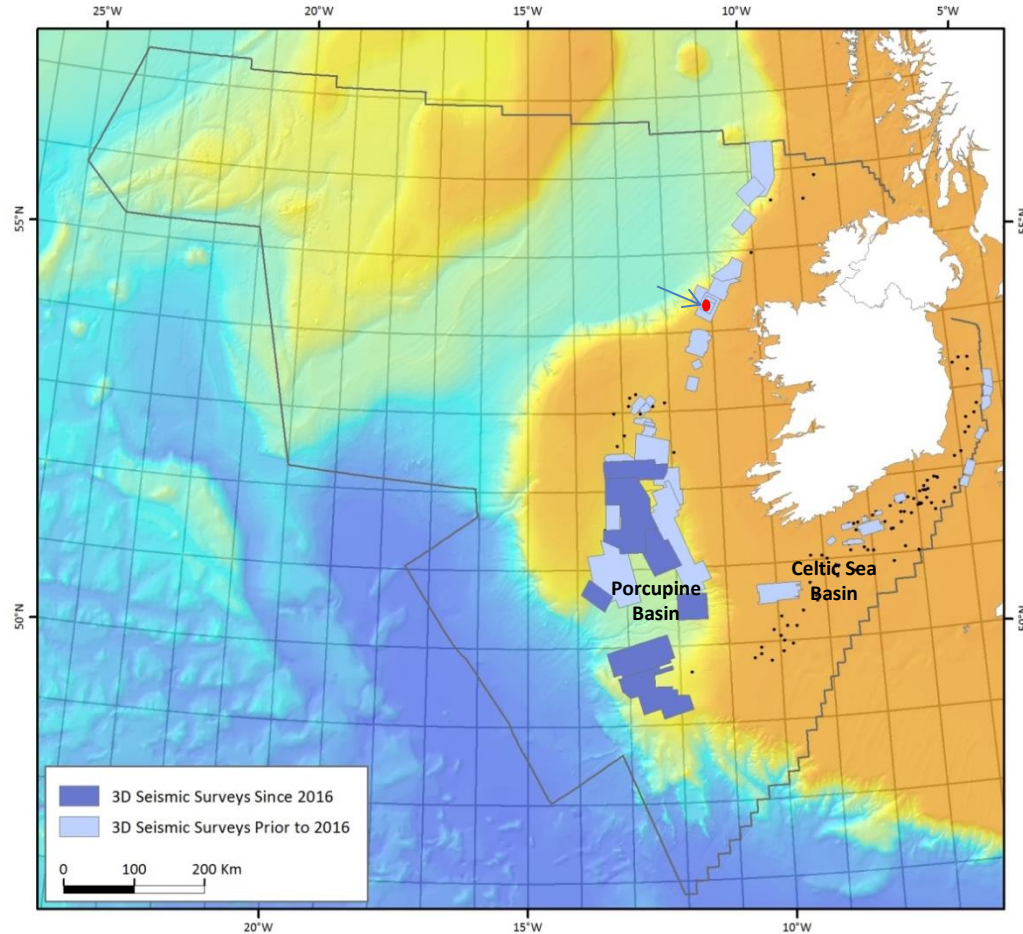
TGS North Porcupine 5,300 sqkm

2D (2.5D):
CGG South Porcupine 1,500 km

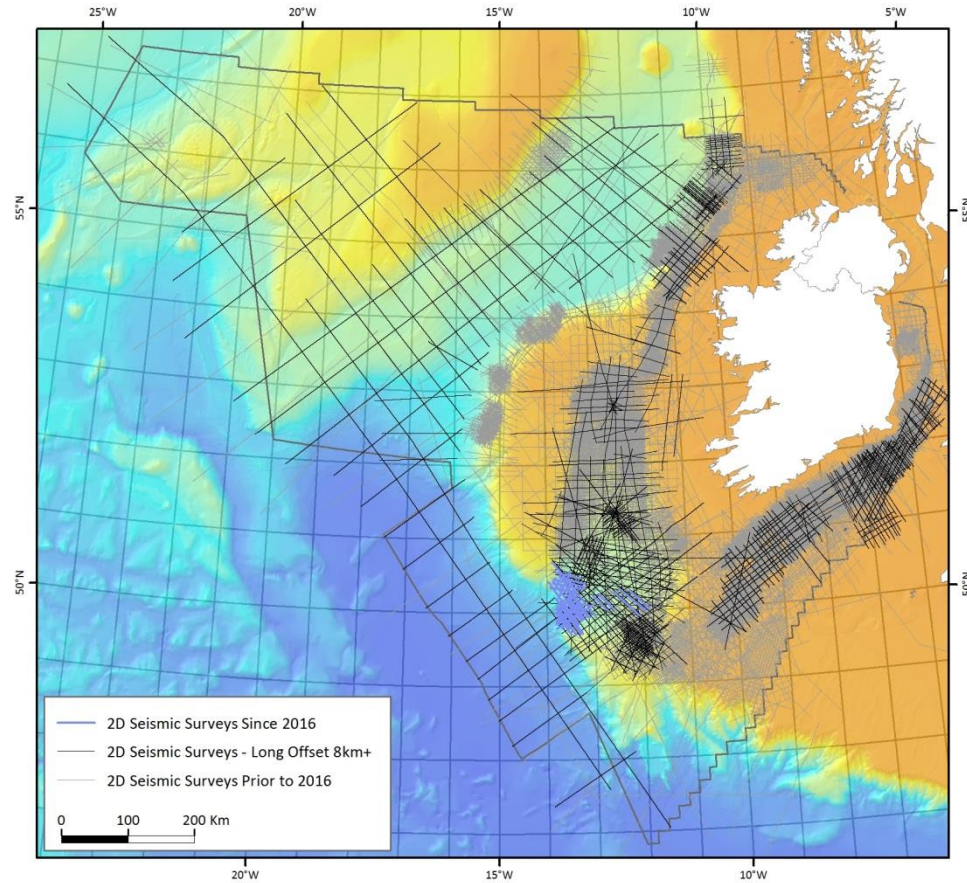
Total 3D acquired in 2017 (prime): c. 10,500 sqkm
Total 2D acquired in 2017 : c. 1,500 km



3D Seismic Surveys Offshore Ireland



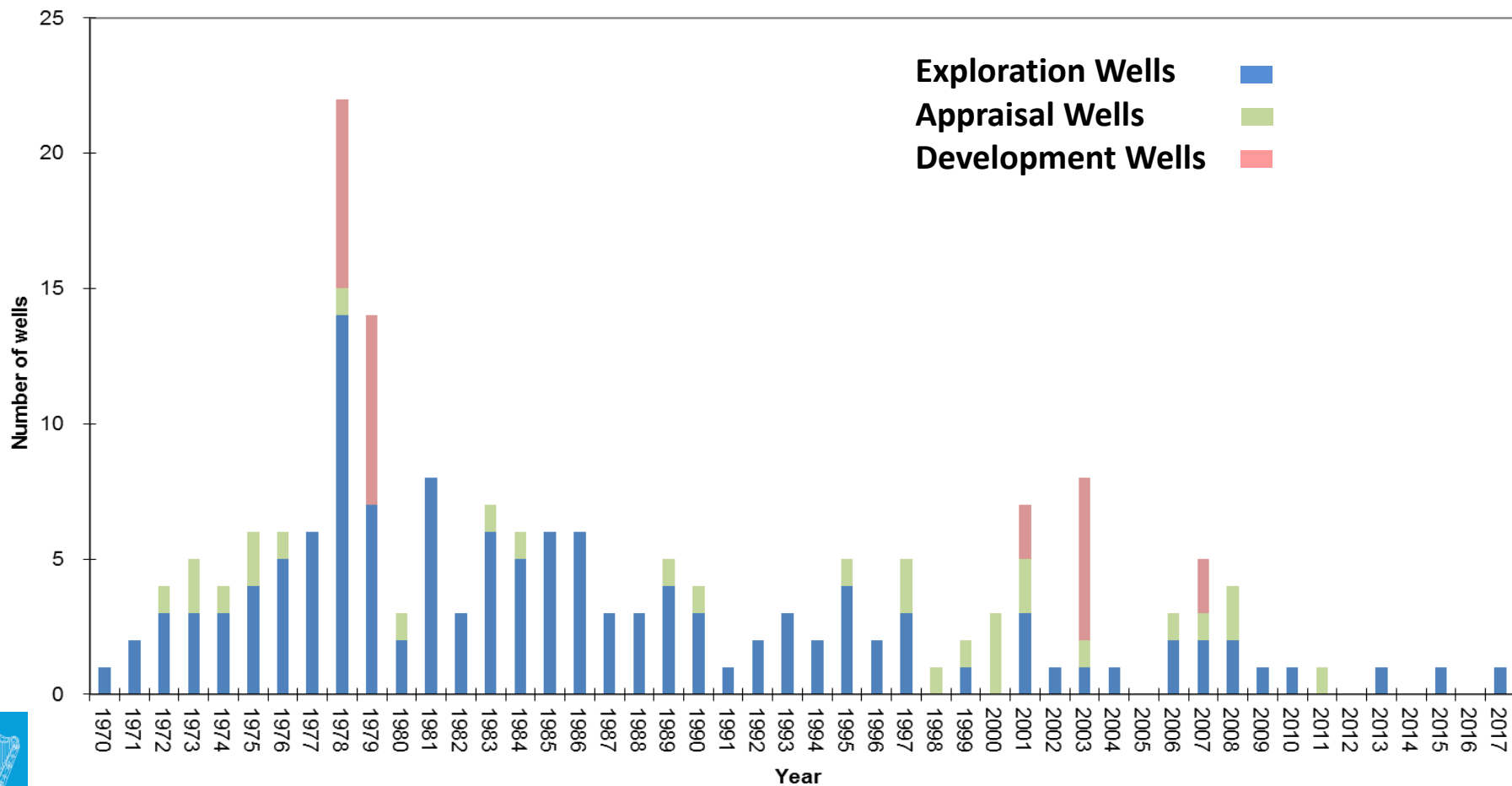
2D Seismic Surveys Offshore Ireland





Wells

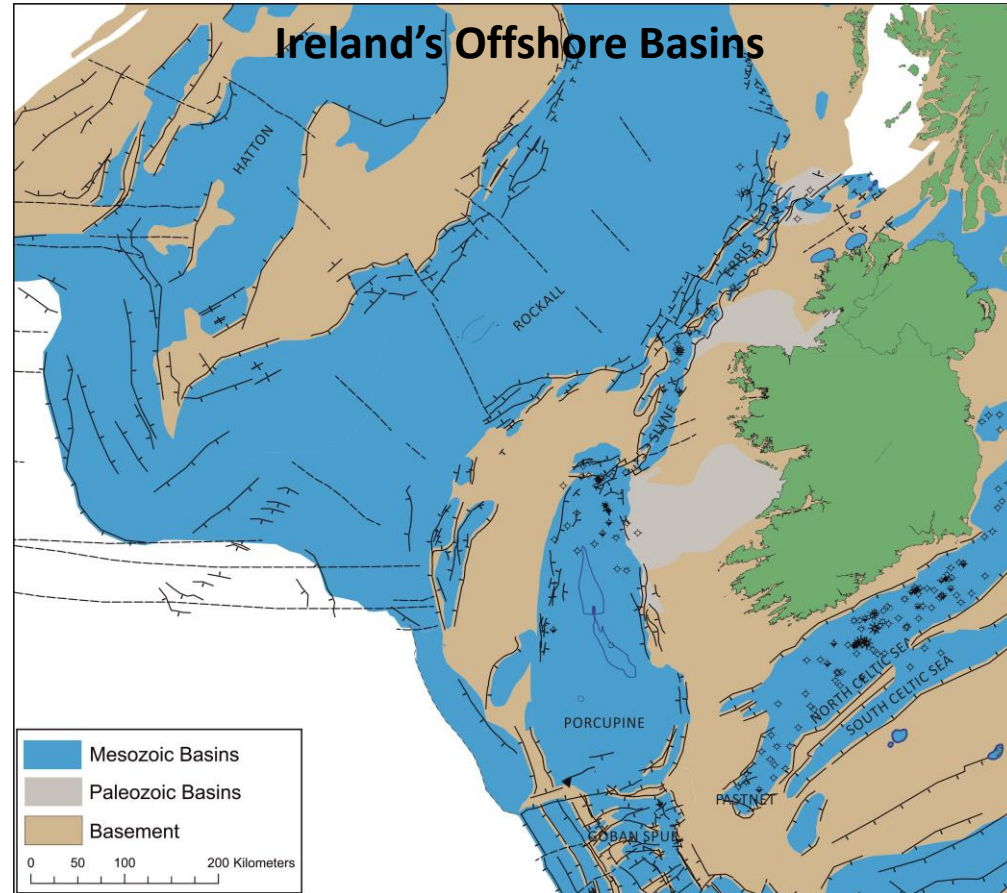
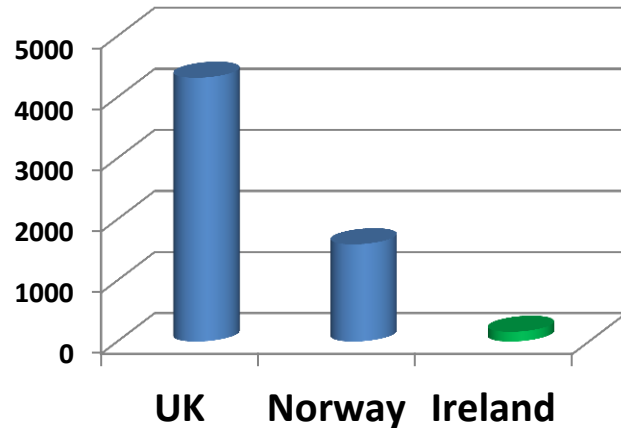
Wells



Exploration offshore Ireland - Wells

- Under explored Atlantic Margin
- Lower historical drilling compared to neighbours

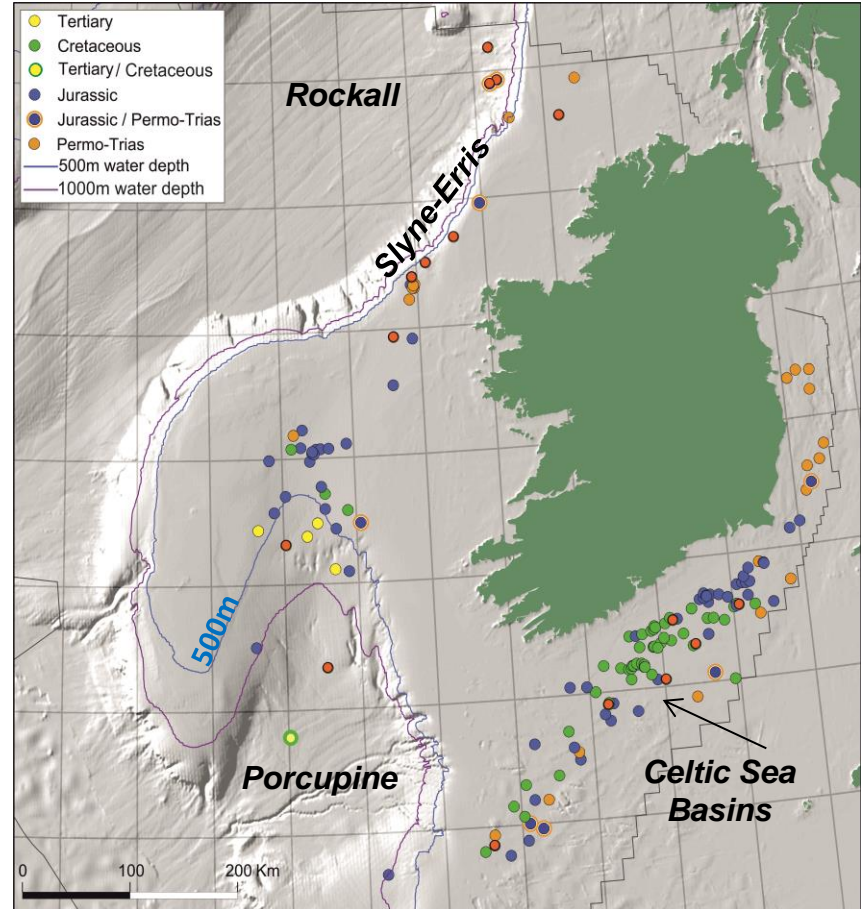
Exploration & Appraisal Wells (Total)



Wells

Exploration wells:	132
Appraisal wells:	28
Total:	160

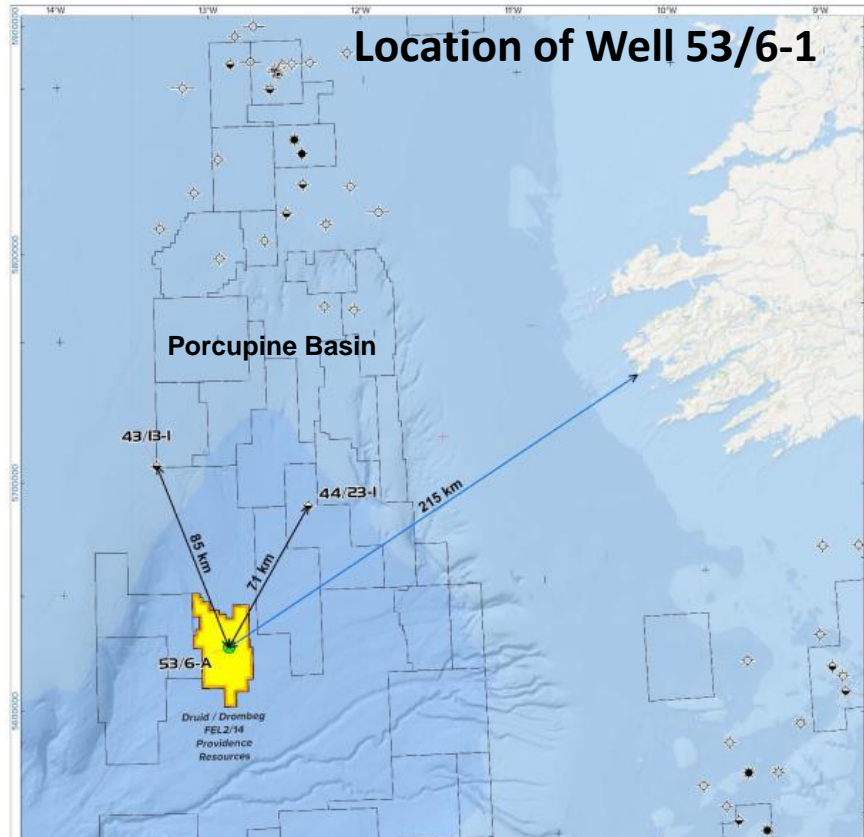
- Only 5 wells >1 km water depths
= *1 discovery*
- Only 11 wells drilled on 3D seismic
= *2 discoveries*
= *2 well in Porcupine*
- 2 wells drilled on post-2000 2D seismic



Majority of Wells drilled in shallow water on poor quality 2D seismic



Drilling in 2017



- Well drilled in FEL2/14 in the Porcupine Basin
- Well location approximately 215km southwest of Kerry coast
- Water depth at location = 2233m (deepest water well drilled offshore Ireland)
- Nearest well 44/23-1 ('Dunquin'), 71km to the northeast

FEL2/14 comprises:

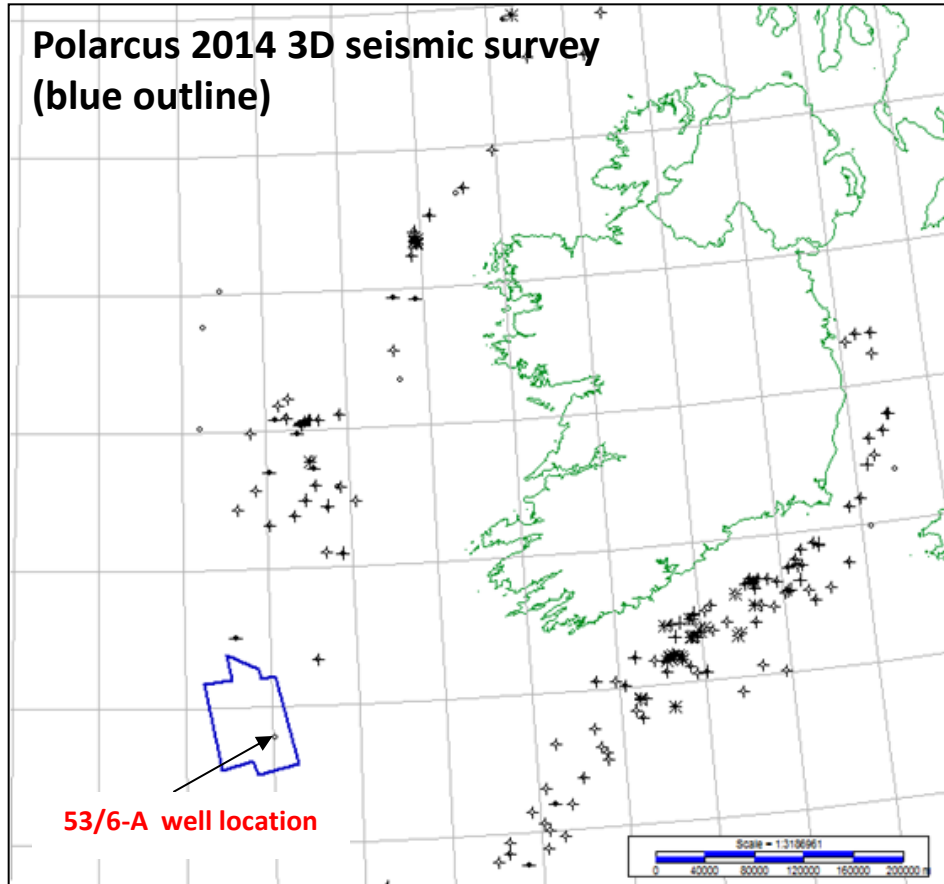
Providence Resources plc (Operator)

Capricorn Ireland Ltd

Sosina Exploration Ltd



Drilling in 2017 – 53/6-1



Offshore Drilling Unit Stena ICEMax
(image source: Marine Traffic)



53/6-A



Note the more distal part of the Drombeg fan to be intercepted by well



Press Releases 53/6-1

THIS ANNOUNCEMENT CONTAINS INSIDE INFORMATION

OPERATIONAL UPDATE

DRUID PROSPECT

53/6-1 EXPLORATION WELL
FRONTIER EXPLORATION LICENCE 2/14
SOUTHERN PORCUPINE BASIN

04 August 2017



- PALEOCENE DRUID RESERVOIR INTERVAL ENCOUNTERED WITHIN THE PRE-DRILL DEPTH PROGNOSIS
- PRELIMINARY INTERPRETATION INDICATES DRUID TO COMPRISE A POROUS WATER BEARING RESERVOIR INTERVAL
- THE WELL WILL BE DEEPEINED TO EVALUATE THE LOWER CRETACEOUS DROMBEG PROSPECT

THIS ANNOUNCEMENT CONTAINS INSIDE INFORMATION

OPERATIONAL UPDATE

DROMBEG PROSPECT

53/6-1 EXPLORATION WELL
FRONTIER EXPLORATION LICENCE 2/14
SOUTHERN PORCUPINE BASIN

11 September 2017



- LOWER CRETACEOUS DROMBEG RESERVOIR INTERVAL ENCOUNTERED WITHIN THE PRE-DRILL DEPTH PROGNOSIS
- PRELIMINARY LOG INTERPRETATION INDICATES THE PRESENCE OF A POROUS WATER BEARING RESERVOIR INTERVAL
- FOLLOWING A COMPREHENSIVE DATA ACQUISITION PROGRAMME THE WELL IS BEING PLUGGED AND ABANDONED AS PER PROGRAMME

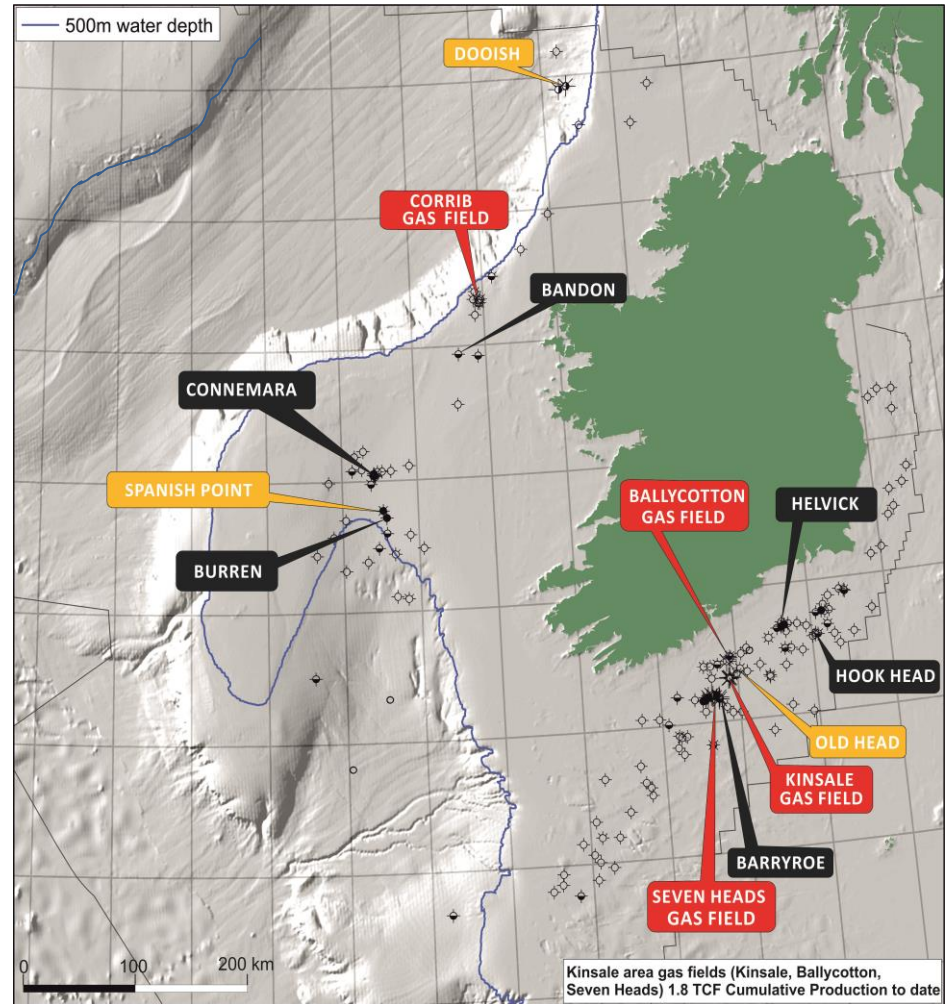
Producing fields

Discoveries

- Gas /Condensate
- Oil

Commercial Fields

- Gas Field

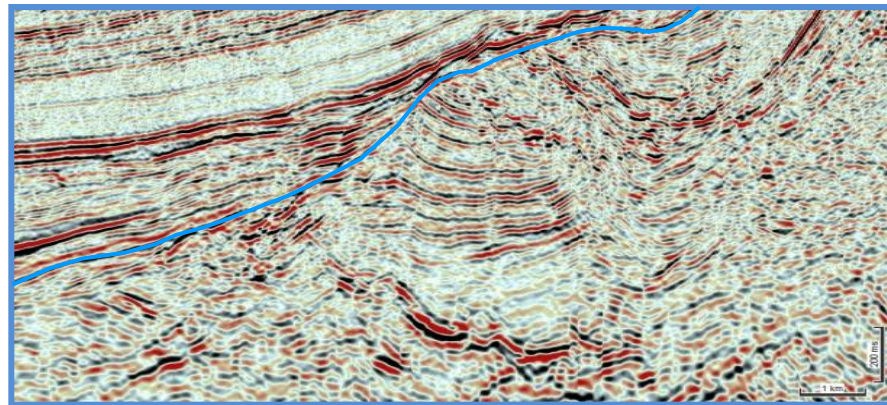
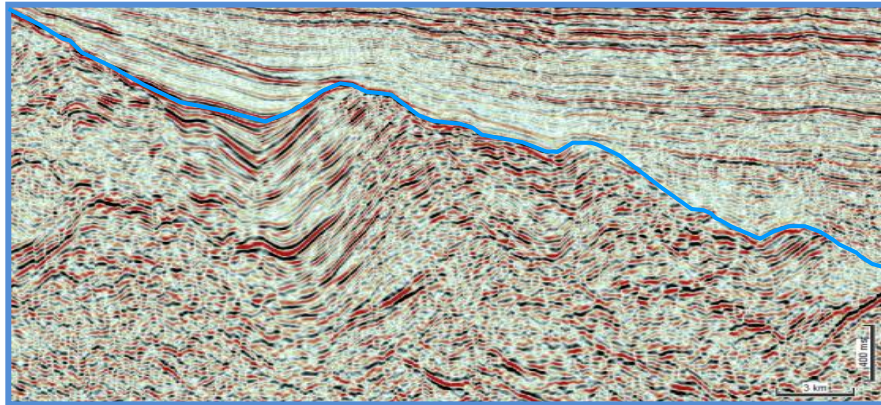
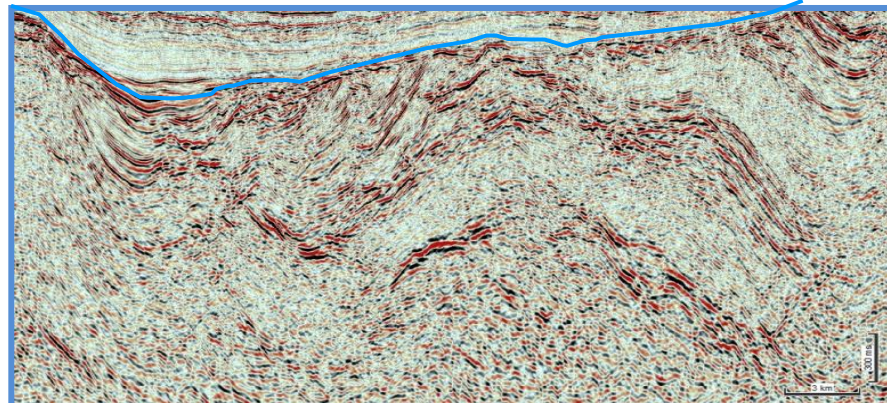
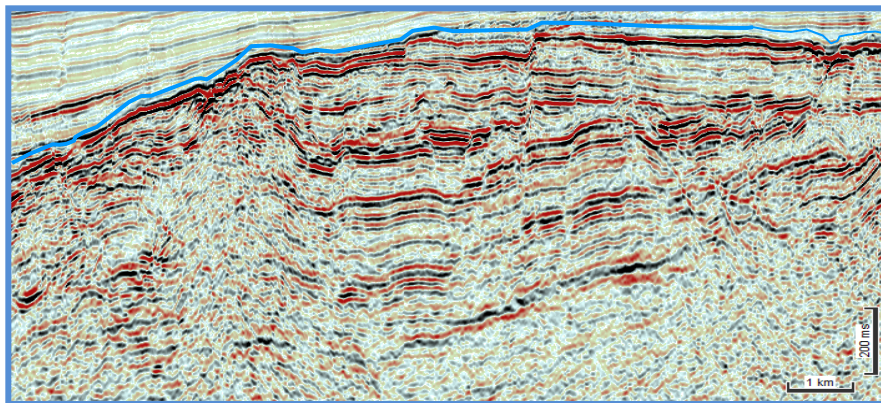




Interpretation

Example - Jurassic Rift and Syn-Rift Plays

on Regional Seismic Survey acquired by the Department/Eni in 2013 and 2014



— Base Cretaceous Unconformity





Research

Research Entities

The Petroleum Infrastructure Programme (PIP)
was initiated by the PAD 1997 www.pip.ie

iCRAG - Irish Centre for Research in Applied Geosciences
established in 2015. Based in UCD Dublin www.icrag-centre.org

North Atlantic Petroleum Systems Assessment (NAPSA)
was formalised in 2007 www.napsaresearch.org

Key objective is to de-risk Ireland's hydrocarbon potential



Research – PAD Role

- **PAD Technical representatives on Committees and liaison with academic institutions**
- **Initiate research, including joint research initiatives with Canada**
- **Steer research direction**
- **Interrogate research**
- **Provide data for research**

Complement increased industry investment in exploration activity



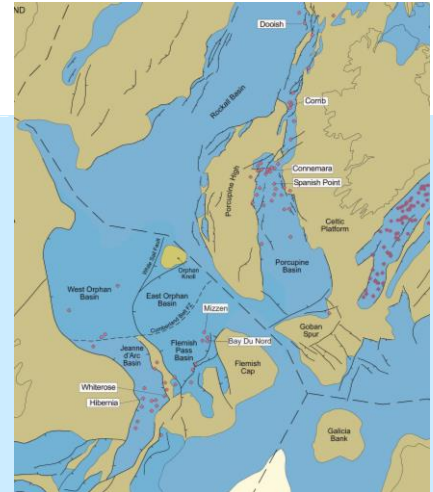
TransAtlantic Source Rock Study (Ireland-Canada)

IS16/01 - Atlas of source rocks, oil characteristics and oil-source correlation in Mesozoic basins offshore Newfoundland-Labrador and offshore Ireland

Objectives of the study

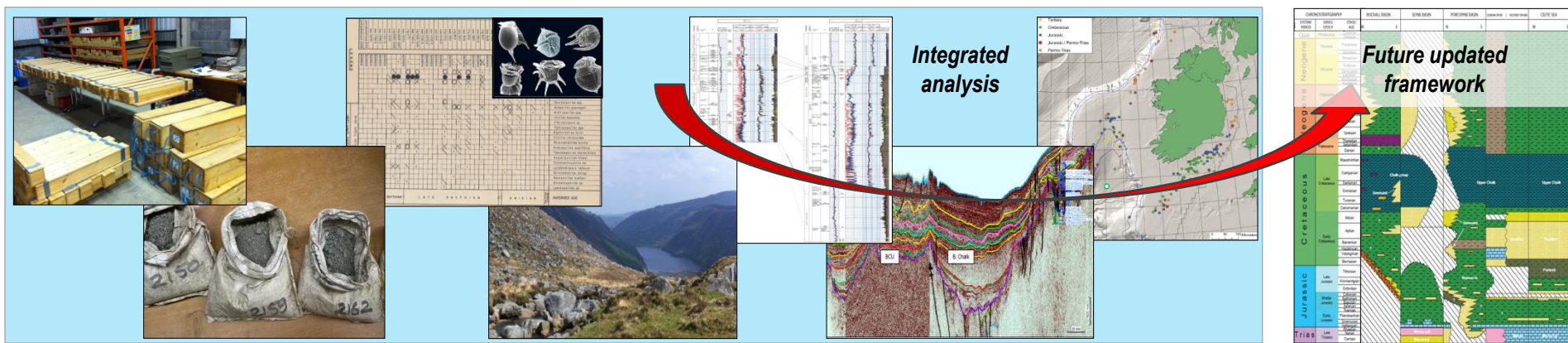
- Compare oil and source rocks from offshore Ireland and Newfoundland-Labrador
- Summarize all geochemistry data into a single database
- Infill data gaps with extensive new analysis
- Summarise the source rock potential of each of the basins offshore Ireland and Newfoundland-Labrador
- Integrate the data and compare results within basins, between basins and across the conjugate margin

Final results of this landmark study will be presented at this Conference



Updating Ireland's Stratigraphic Framework

- Ongoing initiative to construct an updated stratigraphic framework for all basins offshore Ireland.
- Integrated analysis of lithology, biostratigraphy and seismic data currently underway by **Merlin Energy Resources Consortium**, and is funded, supported and steered by members of PIP, PAD and academia.
- Long-awaited project to improve our understanding of the offshore basins, and aid in future exploration and research initiatives.



Drilling Downtime Study



Irish Shelf Petroleum Studies Group

Engineering Downtime Analysis & Cost Effective Drilling

2017 Revision

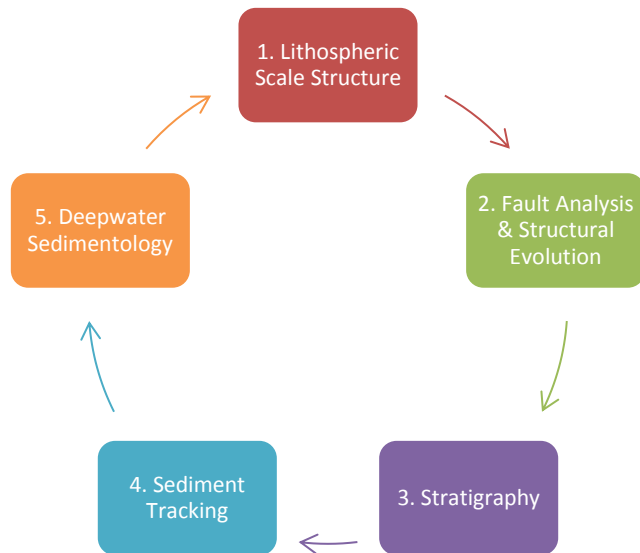
by Kinetic Engineering



PIP (Irish Shelf Petroleum Studies Group)

Porcupine Basin Prospectivity workshop

Held at UCD on 30 August 2017



This workshop was structured as an informal information sharing session based around five 'clinic' type themed sessions dealing with different aspects of the Porcupine Basin that iCrag is actively researching.

The clinics (workstation or laboratory) facilitated by the group of researchers who are working on that theme.

The researchers themselves interested in hearing directly from company representatives what the main issues and challenges they face are. Awareness of (and possibly share) data available.

Industry meet the Researchers face to face and witness PIP/iCrag project progress.

The clinic sessions were book-ended by introductory and wrap sessions involving all participants.

**Representatives from 12 separate companies, IOOA Chair,
more than 25 Researchers, PAD Technical**



Testimonials

“Atlantic Ireland is a very large area, comprising many different basins and hydrocarbon plays. Individual oil companies are working comparatively small parts of Atlantic Ireland. PIP provides a means for independent research at the basin level; it can facilitate spread of ideas; Creates a lasting legacy of practice and sharing of insights, and create a lasting legacy for present and future explorers in offshore Ireland.”

EUROPA

“The PIP infrastructure makes an important contribution to the oil and gas exploration of Ireland. It brings together industry and academia to address critical risks and challenges. The forum enables large scale projects (BIECEP and Merlin), that are of a scale that no one company could do on its own. PIP brings together industry and academia to address critical risks and challenges; Enables and facilitates funding of students through ICIRAG who make a valuable contribution to the ongoing understanding of the subsurface challenges offshore Ireland. The forum allows companies operating in Ireland to come together and share ideas.”

STATOIL

“The Petroleum Infrastructure Programme provides a fantastic baseline for new companies arriving in Ireland. Championing 20 years’ worth of studies, it has delivered a robust baseline for new companies arriving in Ireland; Supports environmental impact assessments for offshore operations”

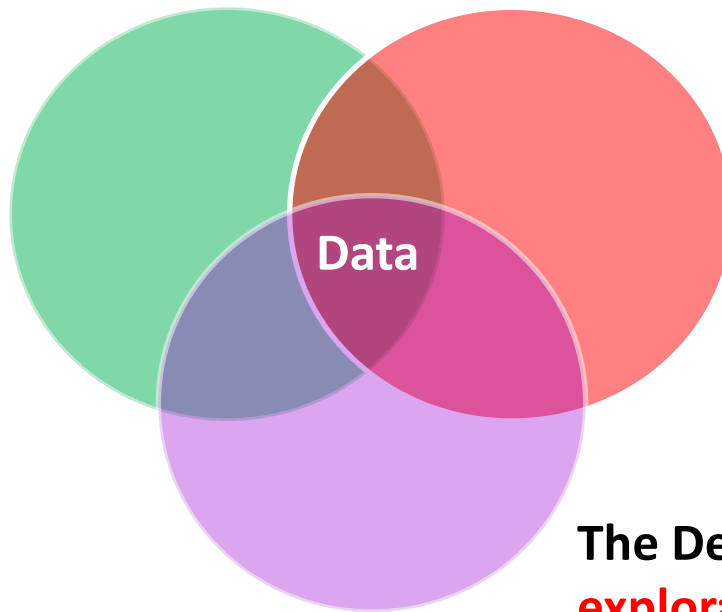
WOODSIDE



Data

Government, Industry, Academia

Industry's objective
is to **discover and
develop**
hydrocarbons



Researchers aim to
derisk exploration

The Department wants **effective
exploration** in our offshore
basins, with safe and
environmental best practices

Joined-up thinking by Government, Research Community and Industry



Data

- 1) **National archive:**
Receipt of all petroleum data onshore and offshore,
including core store
- 2) **Access:**
Website IPAS
Sales (agents), dataroom , core store
Petroleum Atlases in 2005 and 2006, Regional studies
- 3) **Acquire:**
To address recognised data gaps
- 4) **Future:**
Plans regarding data

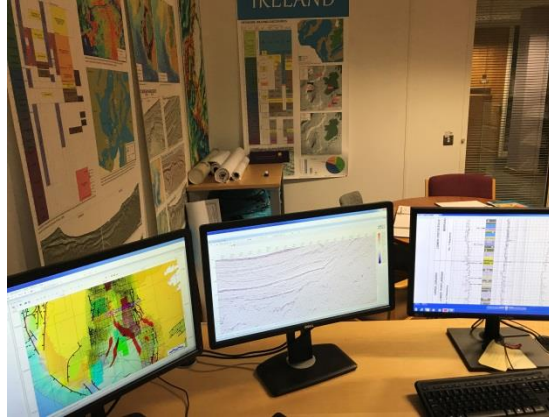
The Department is kept fully informed on petroleum industry activities



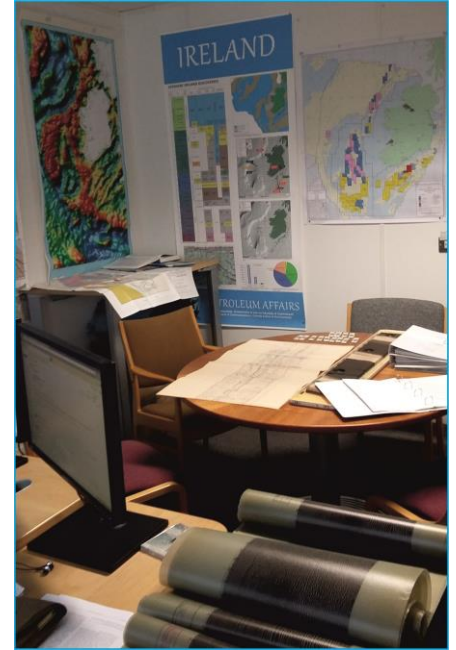
Data Archive



**PAD Corestore,
Sandyford, Dublin**



**PAD Dataroom,
Adelaide Road, Dublin**



PAD is responsible for the National Archive of all Petroleum Data



Data Access

Well and Seismic Data – Data agent

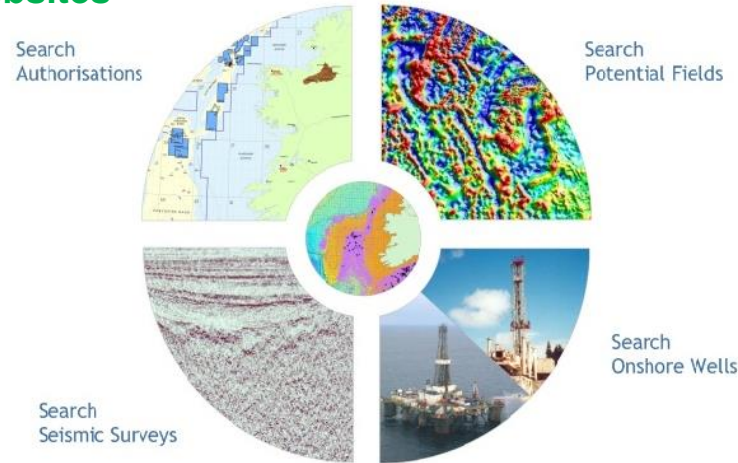
Gravity and Magnetic Data –Data agent

Technical Studies & Regional Reports – PAD/DCCAE **Data Rooms**

Rock & Fluid Samples – PAD/DCCAE **Core Store**

Data Access for Applied Research Related to Petroleum E&P – PIP Secretariat and PAD/DCCAE

Websites



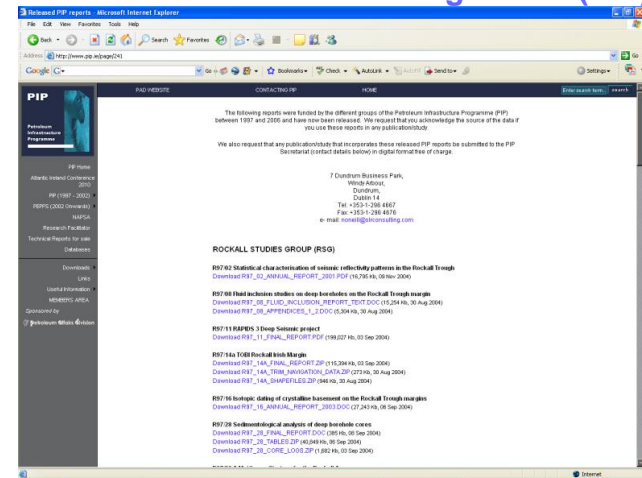
INDUSTRY DATA

Search
Offshore Wells

www.pad.ie

**Website IPAS (Integrated
Petroleum Affairs System)**

Petroleum Infrastructure Programme (PIP)



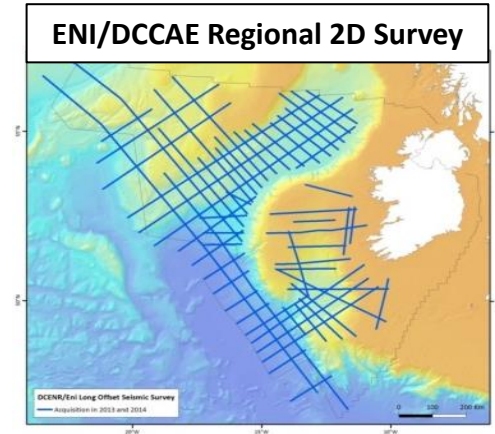
RESEARCH DATA

www.pip.ie

Data Acquisition

Seismic data

Regional Seismic Survey 2013 and 2014
16,800 km of 2D seismic in frontier basins



Well data

Shallow boreholes in 2006 and 2008

Environmental data

ObSERVE data gathering in 2016 and 2017
Acoustic and aerial environmental baseline programme of marine wildlife



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Climate Action & Environment



An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

Data - Future plans

Full digital capture of hard copy data – seismic sections, reports, maps, montages etc.

Re-tender for Data Agent services

Core Store upgrade



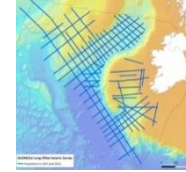


New Data - New Knowledge

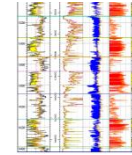
New data (since last Atlantic Ireland - Nov 2016 to Nov 2017)



Seismic data



Well data



Research/ Special Studies



iCRAG




Environmental data



Government collaboration with Industry and Researchers



New Research




From Rifting to hyperextension: Upper Jurassic – Lower Cretaceous tectonostratigraphy of the Porcupine Basin
Liam Whiting, Peter Houghton & Patrick Shannon
Irish Centre for Research in Applied Geosciences, University College Dublin
UCD School of Earth Sciences, University College Dublin





Controls of pre-existing structures on the post-Jurassic deformation of the Porcupine Basin, offshore west Ireland
Muhammad Mubeen Saqab^{1*}, Elfratios Delogios², Conrad Chiles³, John Walsh¹
¹ICRAG (Irish Centre for Research in Applied Geosciences), School of Earth Sciences, University College Dublin, Belfield, Ireland
²Geological Survey of Ireland, School of Earth Sciences, University College Dublin, Belfield, Ireland






High-resolution imaging of seismic properties in the Porcupine Basin by full waveform inversion of long-streamer data
F. Lavoué^{1,2*}, M. Prada^{1,2}, M. M. Saqab^{1,3}, S. Lebedev^{1,2}, B. M. O'Reilly^{1,2}
¹Irish Centre for Research in Applied Geosciences (ICRAG), ²Dublin Institute for Advanced Studies (DIAS), Geophysics Section, 8 Merrion square, Dublin 2, Ireland, ³School of Earth Sciences, University College Dublin (UCD), Belfield, Ireland, ⁴francois.lavoue@icrag-centre.org



DIAS
Dublin Institute for Advanced Studies



Examples in poster area of the exhibition hall



European Union
European Research Council
SFI



European Union
European Research Council
SFI

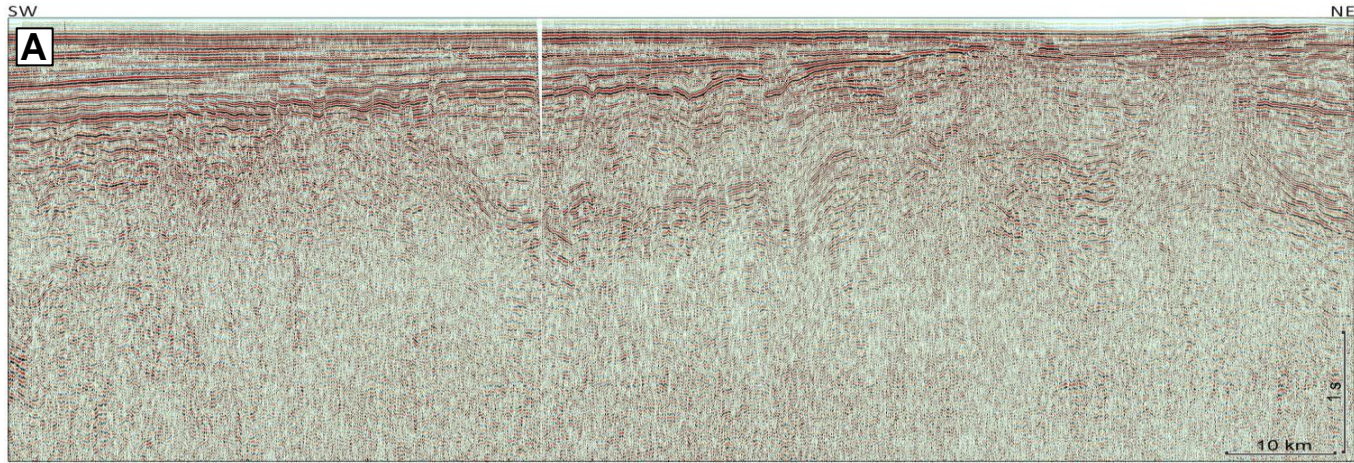


European Union
European Research Council
SFI

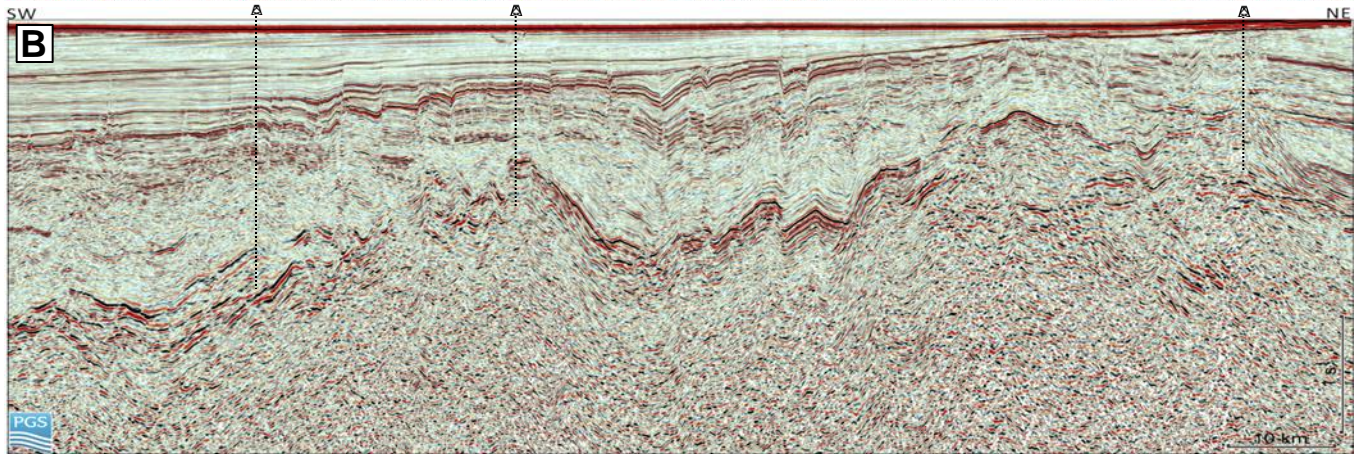


European Union
European Research Council
SFI

New Seismic – Celtic Sea



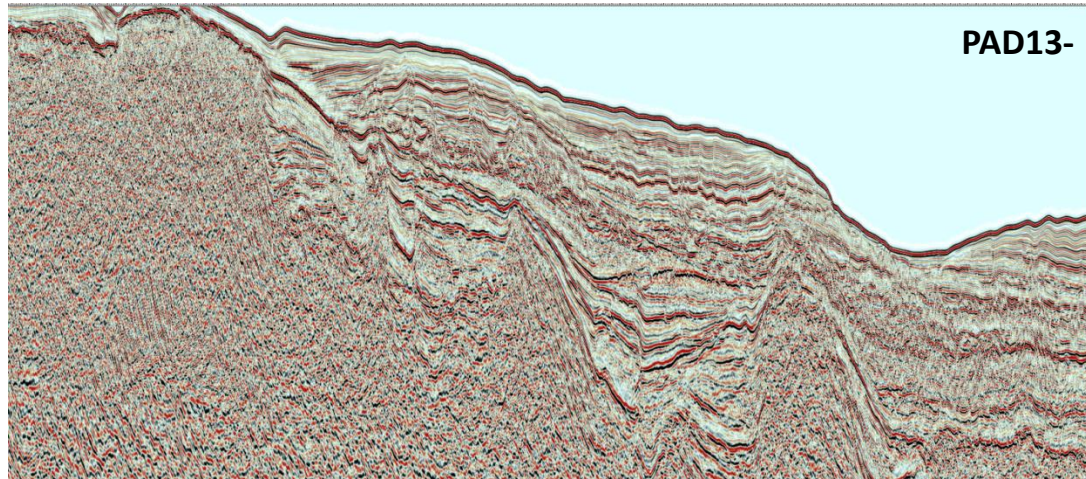
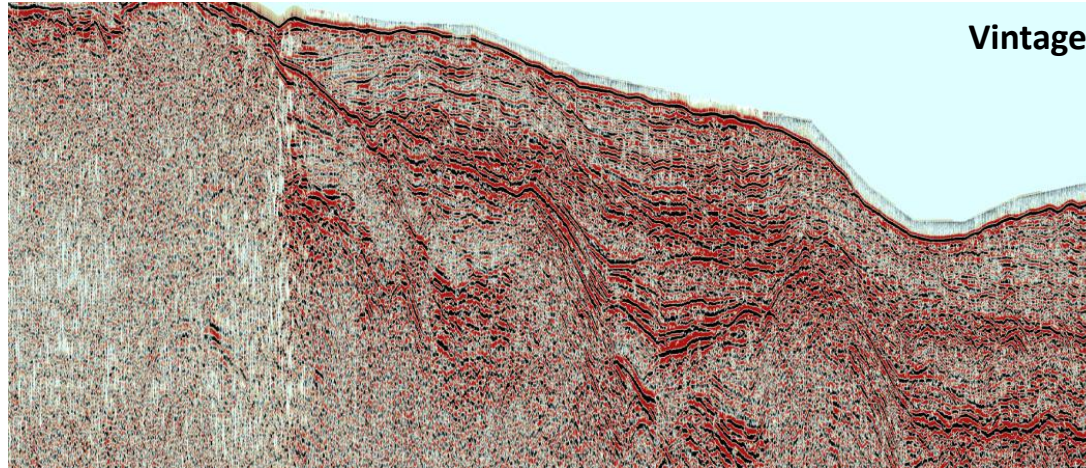
EE 1972



There has been a vast improvement in seismic data quality in the last decade



New Seismic – Rockall Basin



Comparison of
seismic data quality





Promotion

Promotion




Promotion - Graduates



MSc Scholarship in Petroleum related discipline -
geoscience, petroleum engineering or environmental science
topics of direct relevance to the development of Ireland's
petroleum resources.

MSc Bursary placements in PAD



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Department of Communications,
Climate Action & Environment

**MSc Scholarship Opportunities
Petroleum Related Courses**

The Department of Communications, Climate Action and Environment is currently offering scholarships under the Petroleum Scholarship Scheme for students undertaking one year taught MSc degree courses commencing in the academic year 2017/2018 on topics of direct relevance to the development of Ireland's petroleum resources.

Eligibility

Applications under the Petroleum Scholarship Scheme are invited from persons who have been accepted on a one year taught MSc degree course, commencing in the academic year 2017/2018, in geoscience, petroleum engineering or environmental science topics of direct relevance to the development of Ireland's petroleum resources. Applicants must have either successfully completed a relevant honours primary degree course or will complete a relevant honours primary degree course in the academic year 2016/2017.

Scholarships under the Petroleum Scholarship Scheme are open to both EU and non-EU citizens and studies may be undertaken in universities outside of Ireland. However, applicants must clearly demonstrate in their application the direct relevance of their chosen taught MSc degree course to the development of Ireland's petroleum resources.

Funding for the Petroleum Scholarship Scheme is being made available from the Petroleum Infrastructure Programme - Expanded Offshore Support Group Fund which is managed by the Department.





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Department of Communications,
Climate Action & Environment



Petroleum exploration in
Ireland's offshore basins

science &
technology
in action
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13th
edition

Outreach Programme

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Ireland's offshore basins

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The 13th Edition will
be launched before
December 2017

Science & Technology
in Action





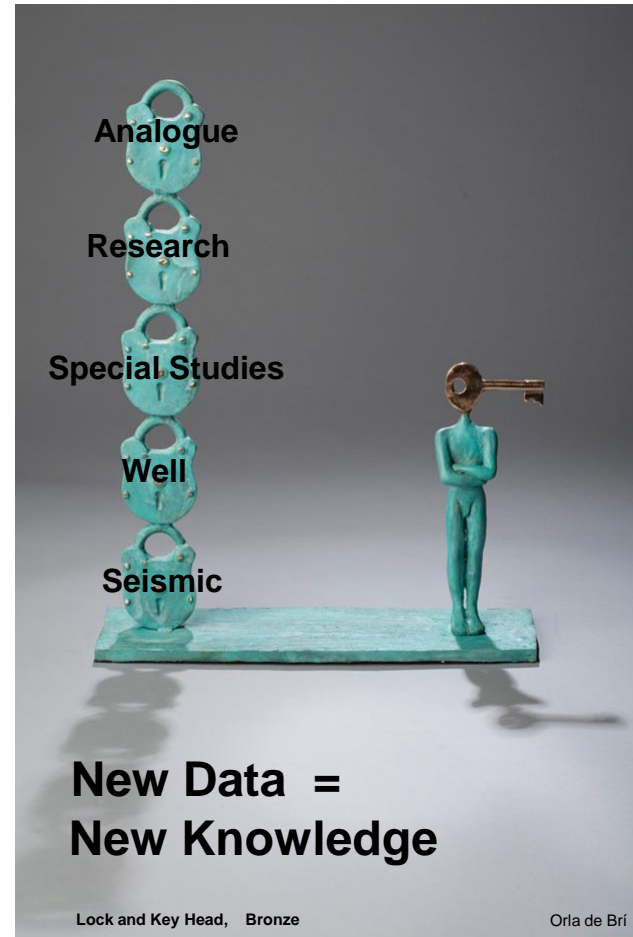
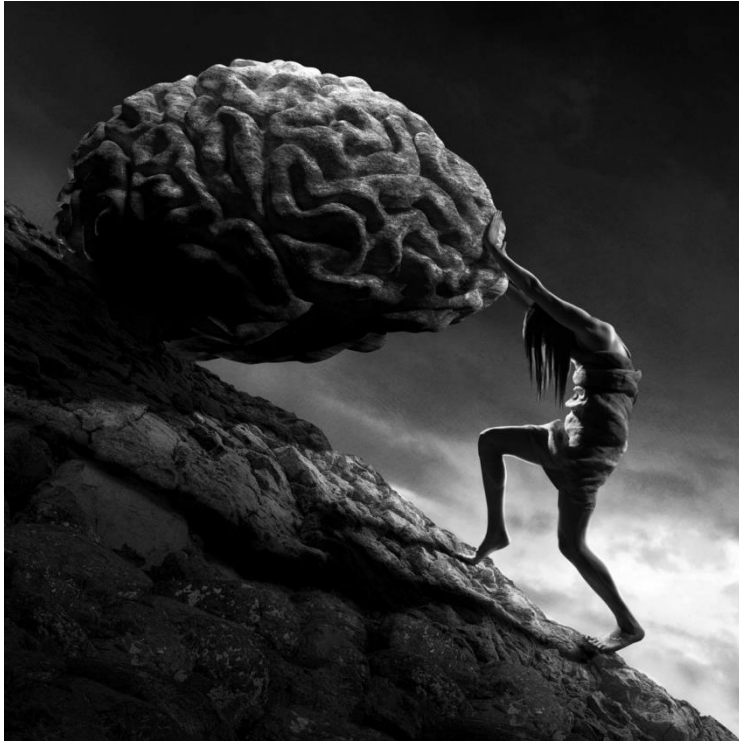
Conclusions

Conclusions

- **The current status of exploration offshore Ireland is robust, despite the continued low oil price.**
- **Key performance indicators such as the number of active petroleum licences, the quantity of licence applications, the quality of associated work programmes, the number and calibre of companies as operators or joint venture partners, the amount of new seismic surveys acquired, forecasted drilling operations, the level of visits to the PAD dataroom & corestore are all positive.**
- **New data and petroleum research provides significant insight and valuable new knowledge on the prospectivity in our offshore basins.**

Next 5 to 10 years important for Exploration





Thank You



**Roinn Cumarsáide, Gníomhaithe
ar son na hAeráide & Comhshaoil**

Department of Communications,
Climate Action & Environment