



Overview of Exploration Status Offshore Ireland in 2019

Atlantic Ireland 2019, Dublin

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Petroleum Affairs Division

Department of Communications, Climate Action and Environment

Exploration Status

update since Atlantic Ireland conference 1 November 2018



Petroleum Affairs Division (PAD) Technical

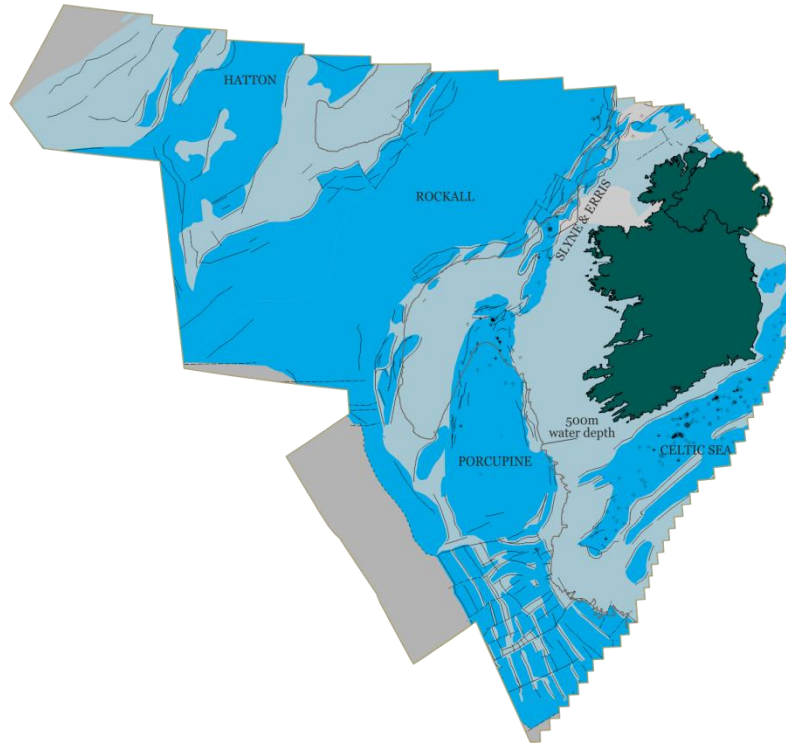
Presentation outline:

- **Licences**
- **Operations**
 - **Seismic**
 - **Wells**
 - **Producing fields**
- **Research**
- **Data**
- **Communications / Outreach / Interpretation**
- **Concluding Remarks**



Licences

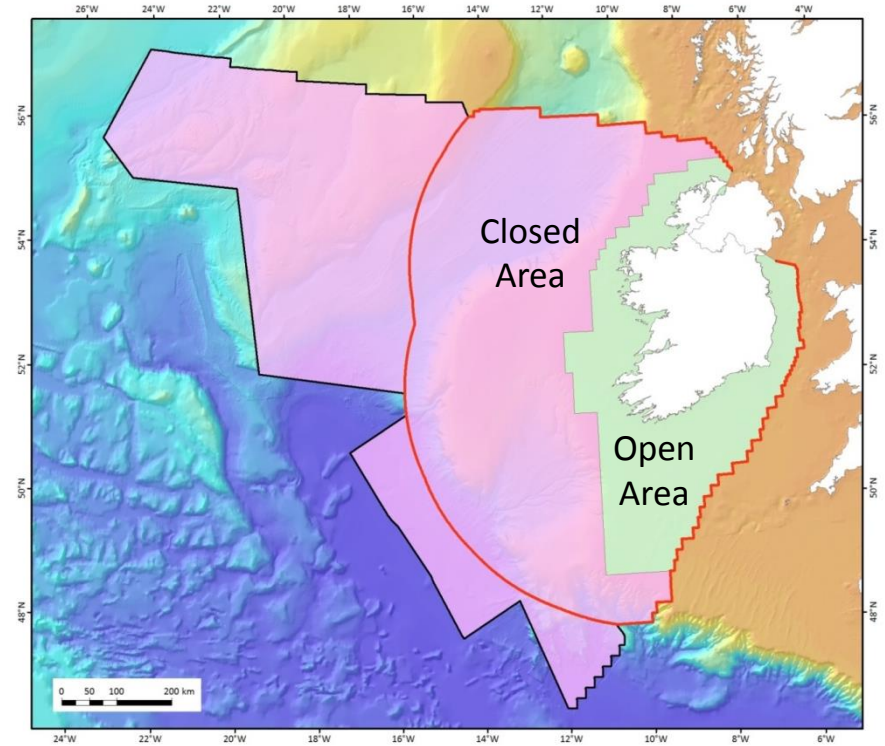
Offshore Ireland



Closed Area ~ 80%
Open Area ~ 20%

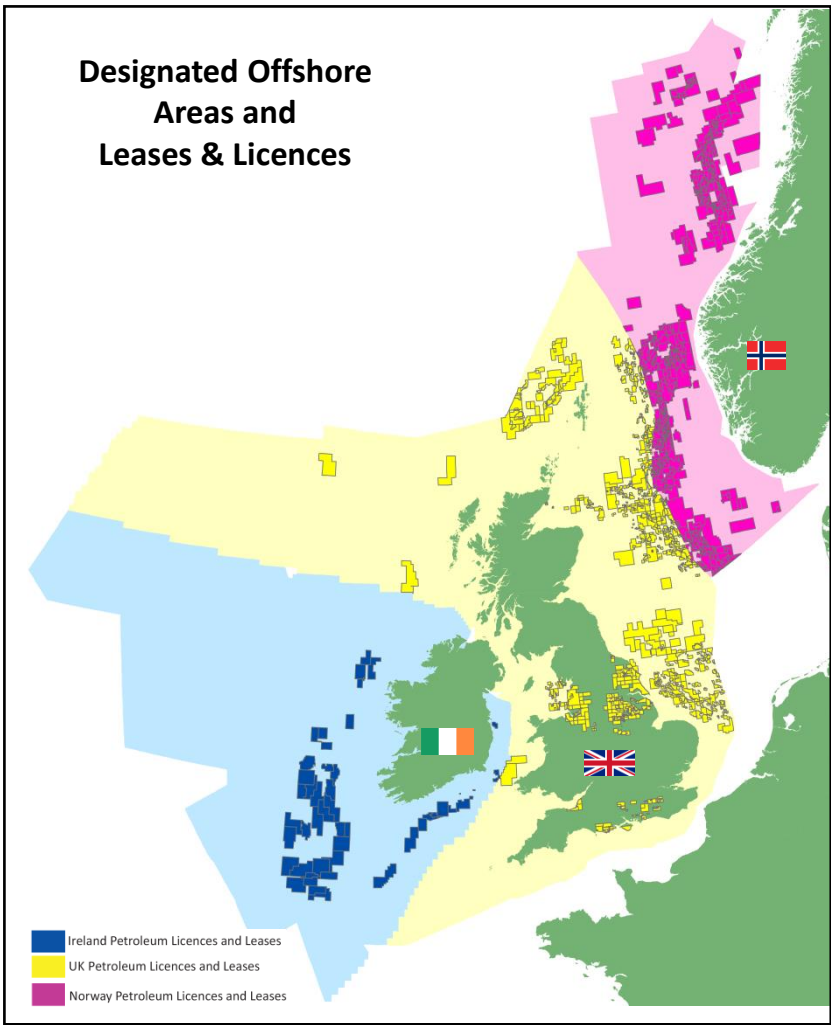
Designated Continental
Shelf limit —

Exclusive Economic Zone
EEZ 200M limit —





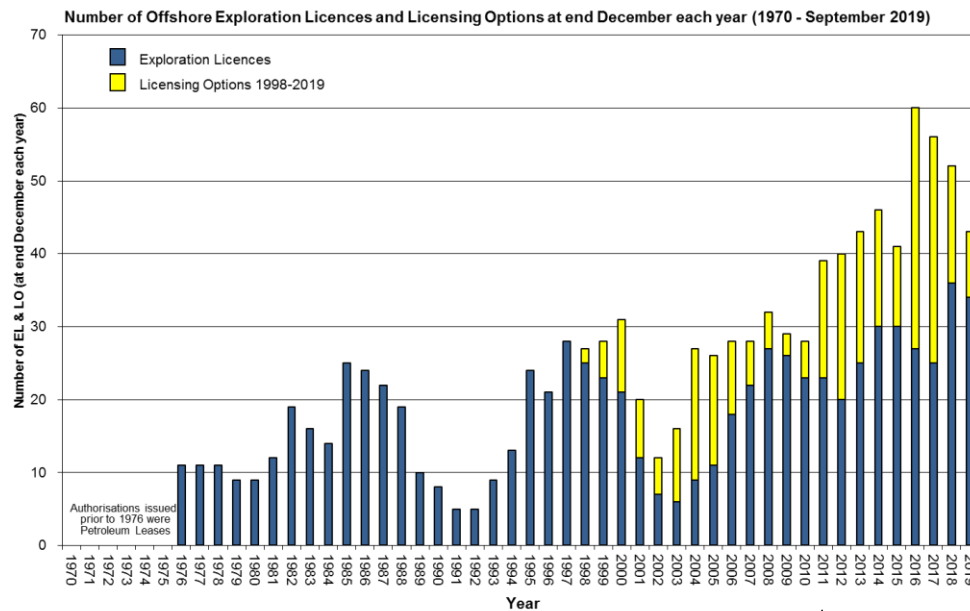
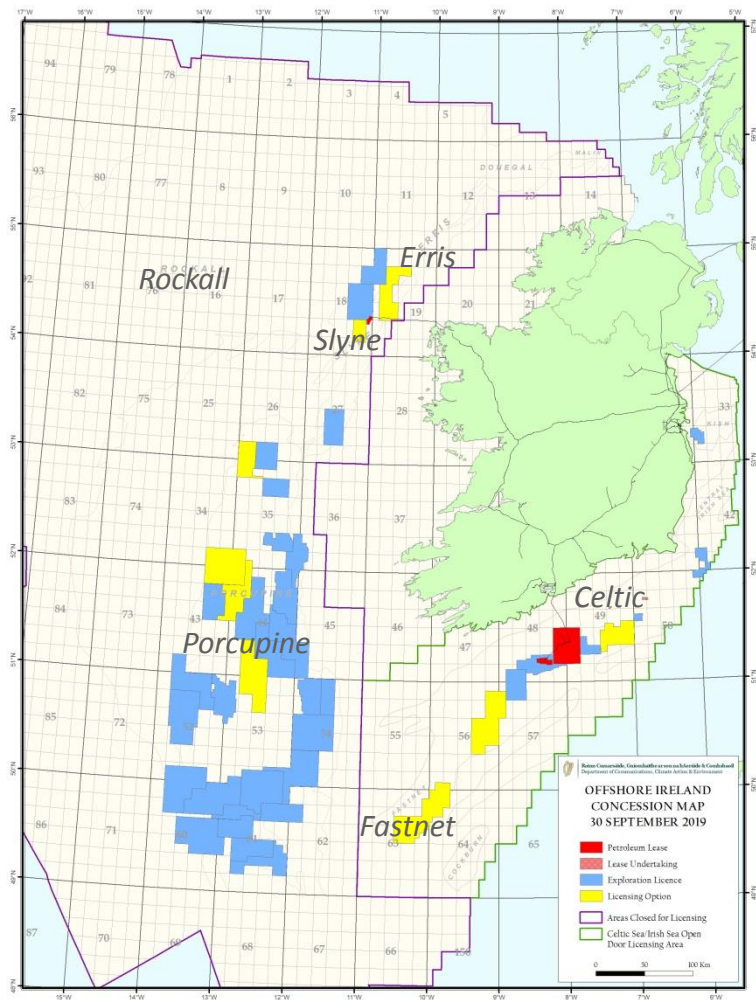
**Designated Offshore
Areas and
Leases & Licences**





Ireland – Concession map

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

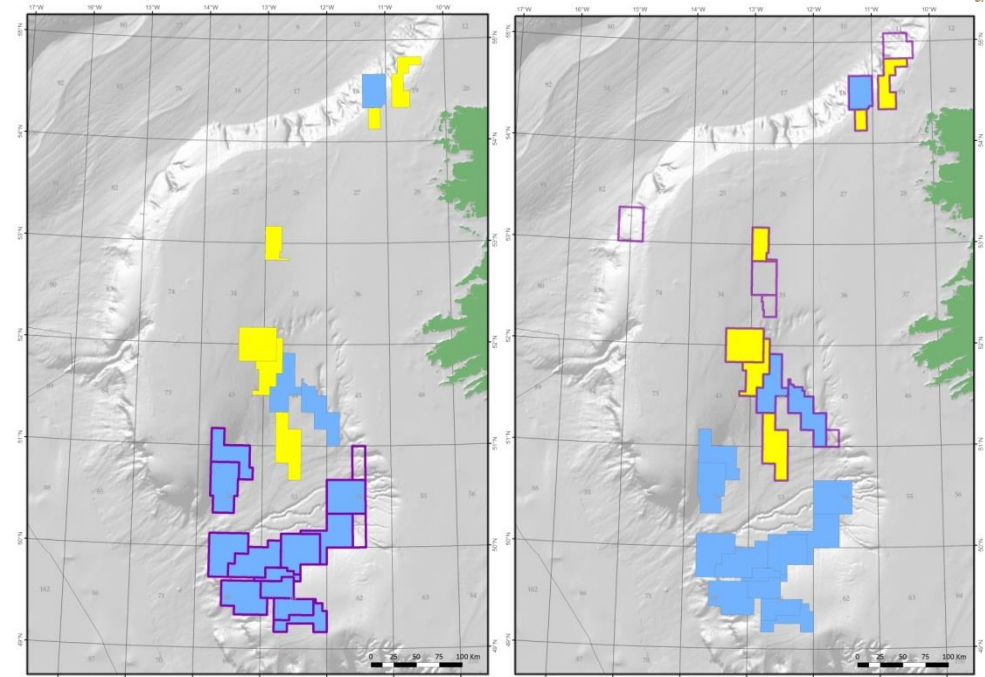
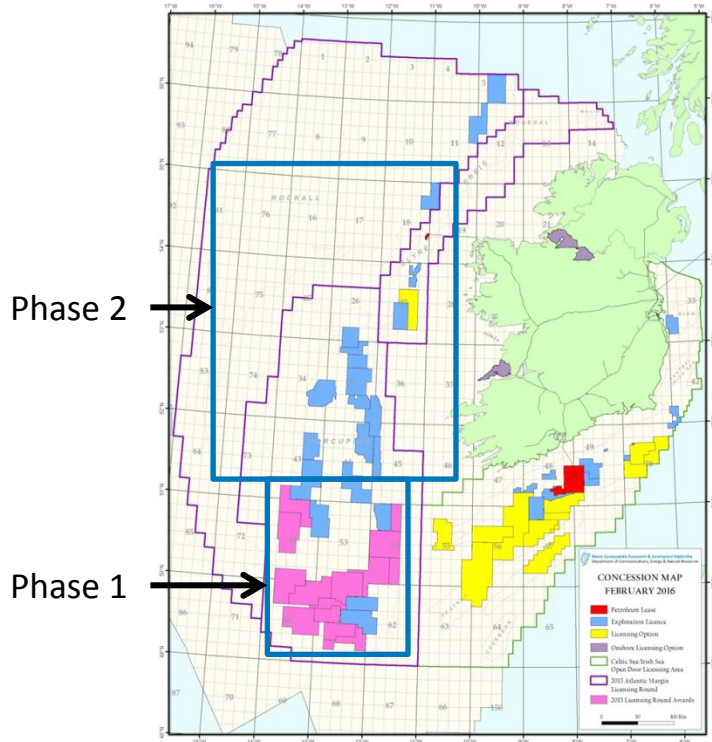


↑
Licensing Rounds

Ireland – Concession map

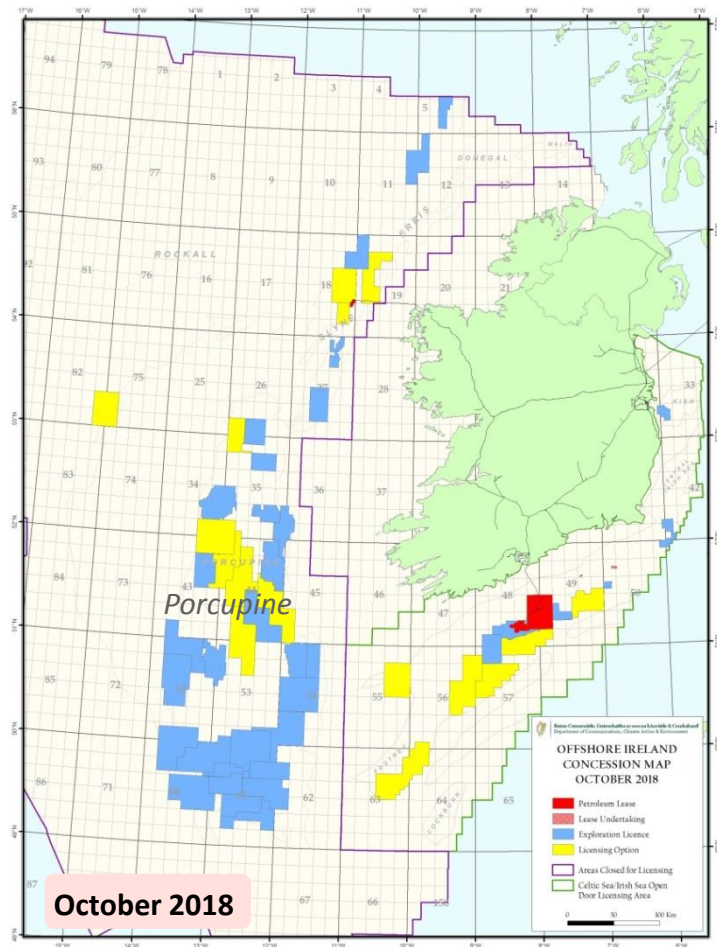


There were 2 stages of Licence Awards from the 2015 Atlantic Margin Licensing Round (Phase 1 and Phase 2)

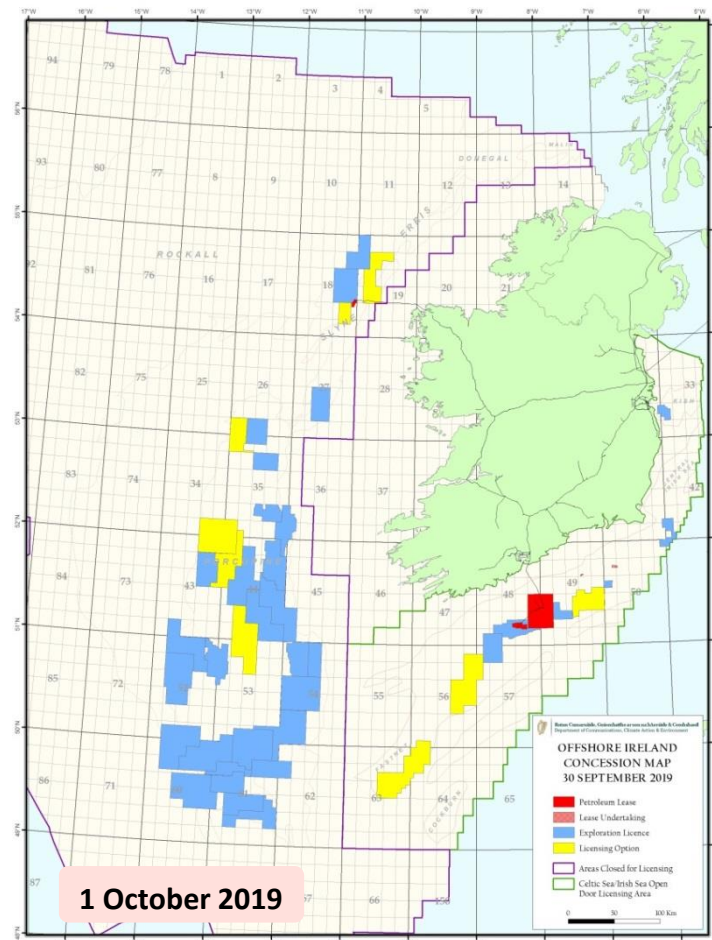


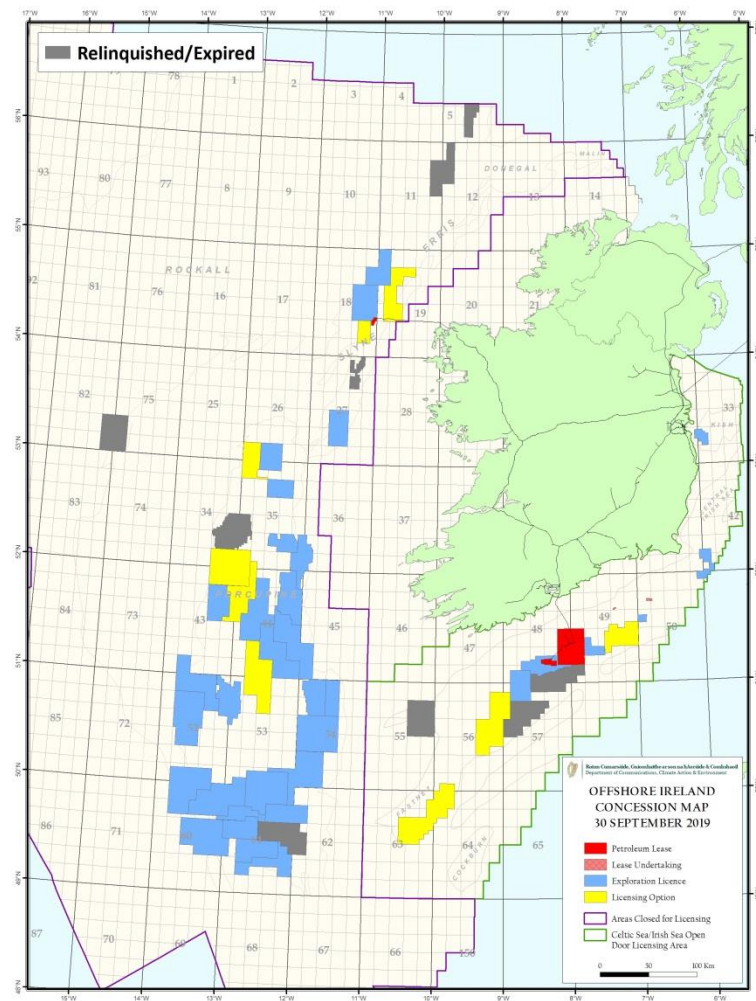
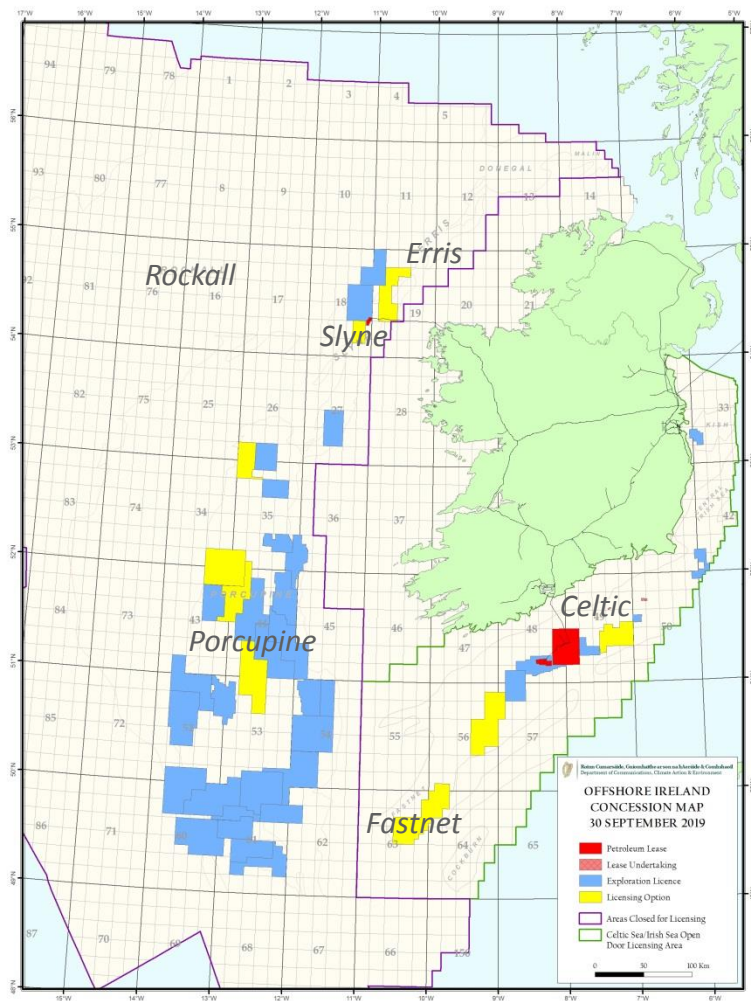
Licence conversions (from 2015 Licensing Round)

Concession Map AI2018



Concession Map AI2019







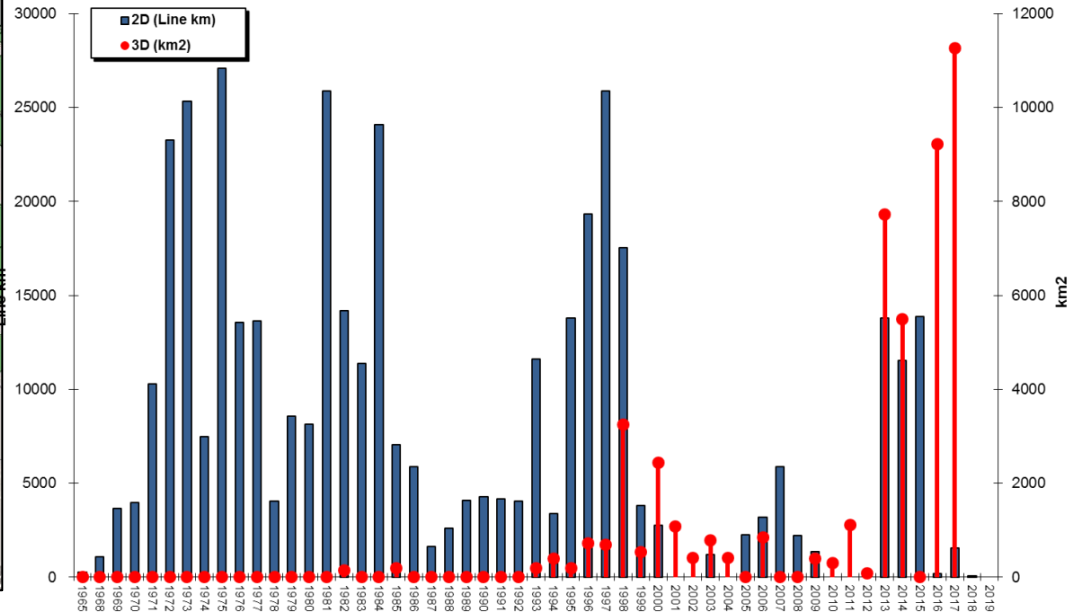
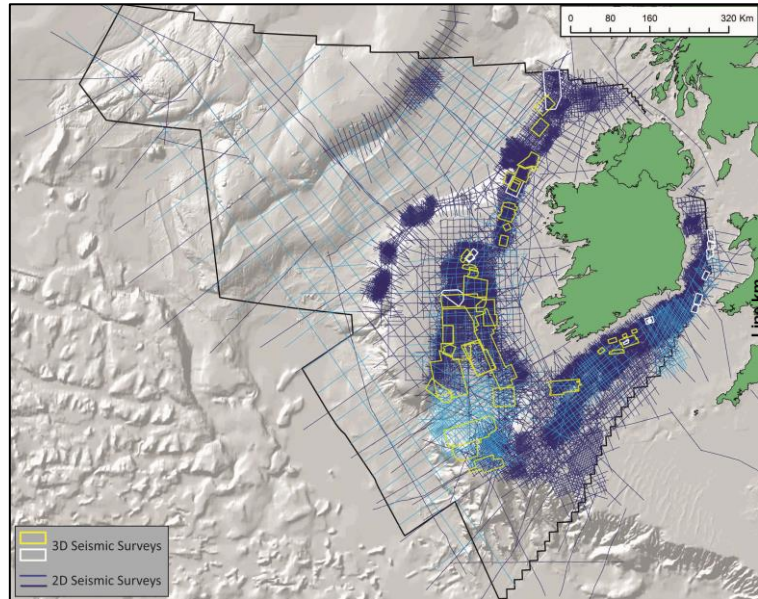
Operations

Seismic Data Acquired



2D: 415,000 km

3D: 48,000 sqkm

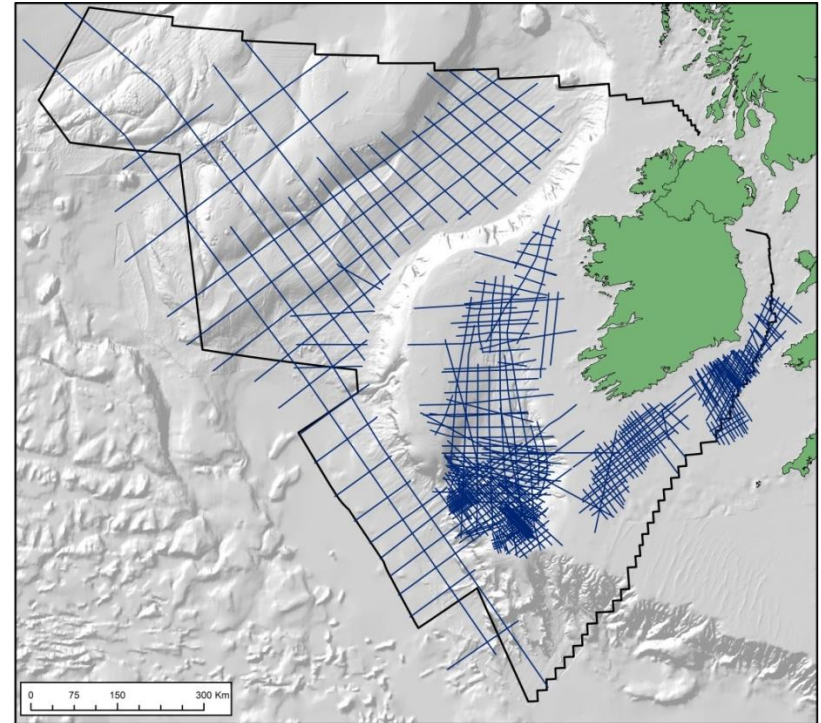
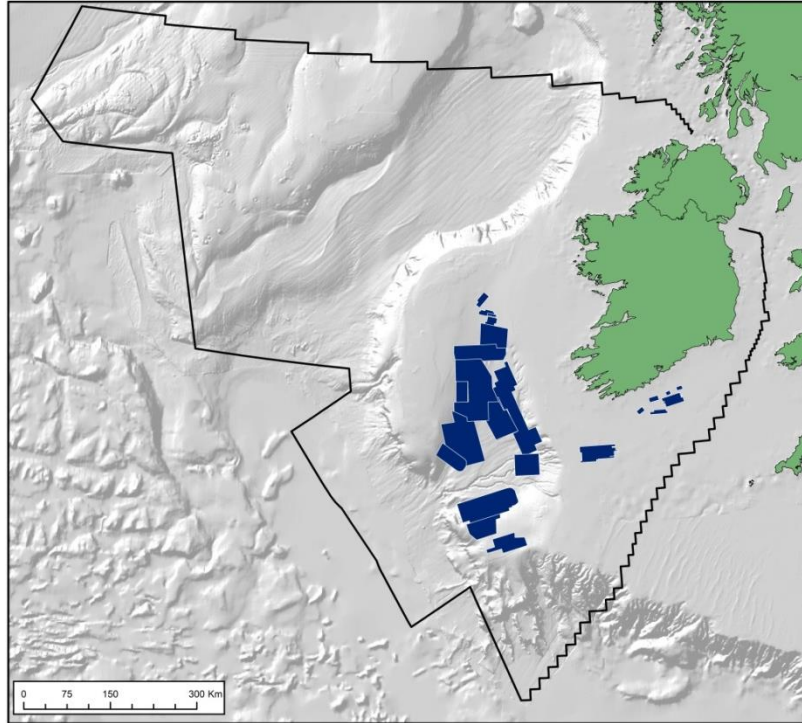


↑ ↑
Licensing Rounds

New Seismic Data Acquired

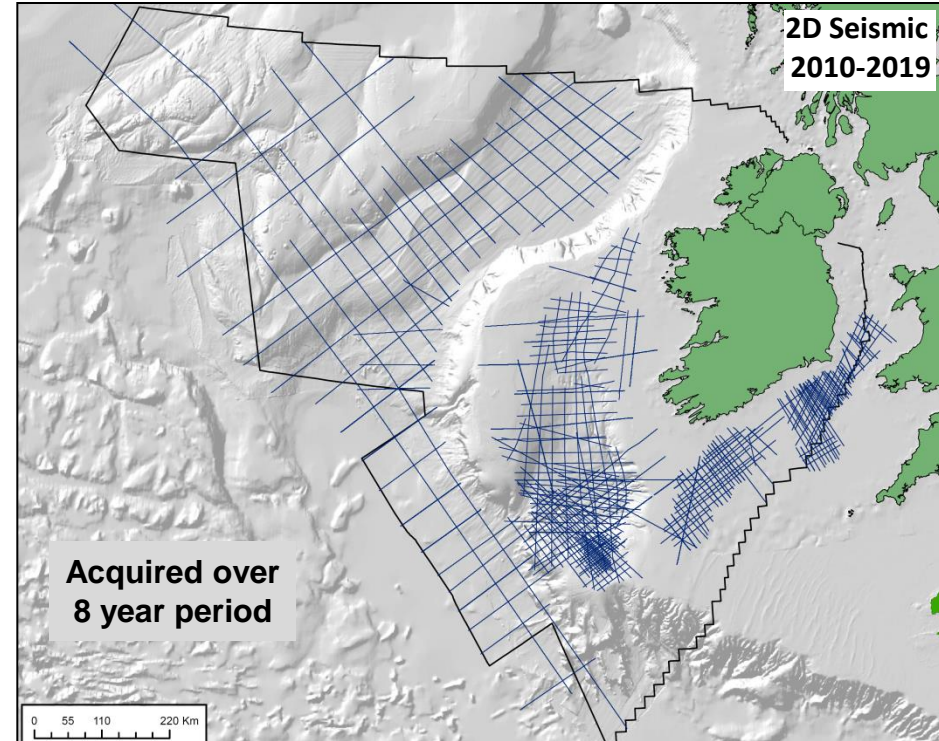
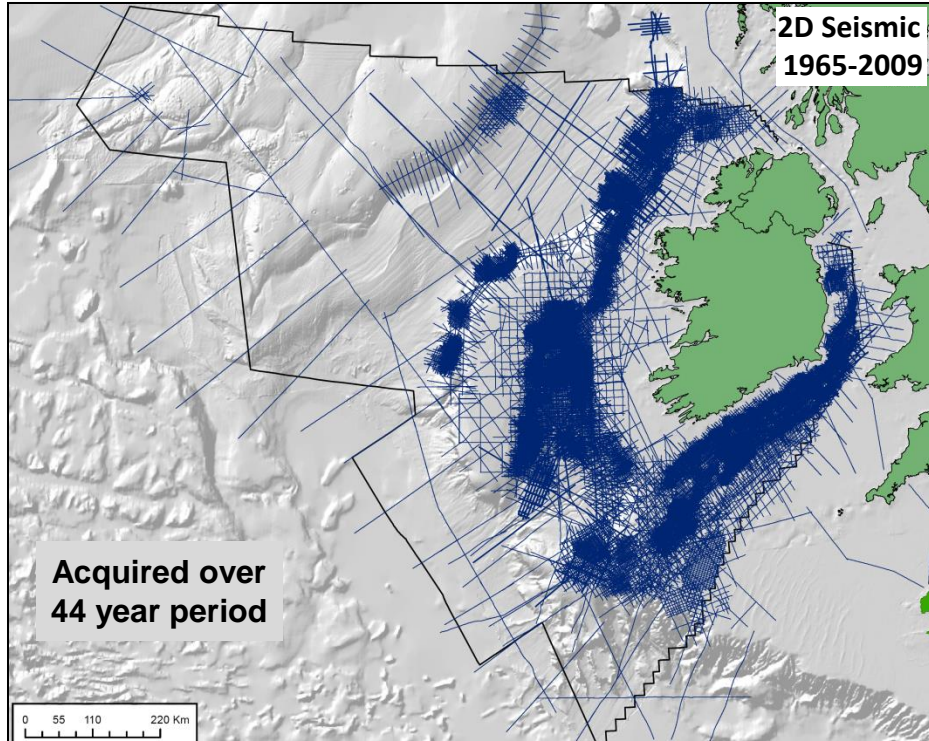


Since 2010 the Irish Offshore has seen extensive acquisition of long offset high quality seismic data both regional 2D and large 3D surveys

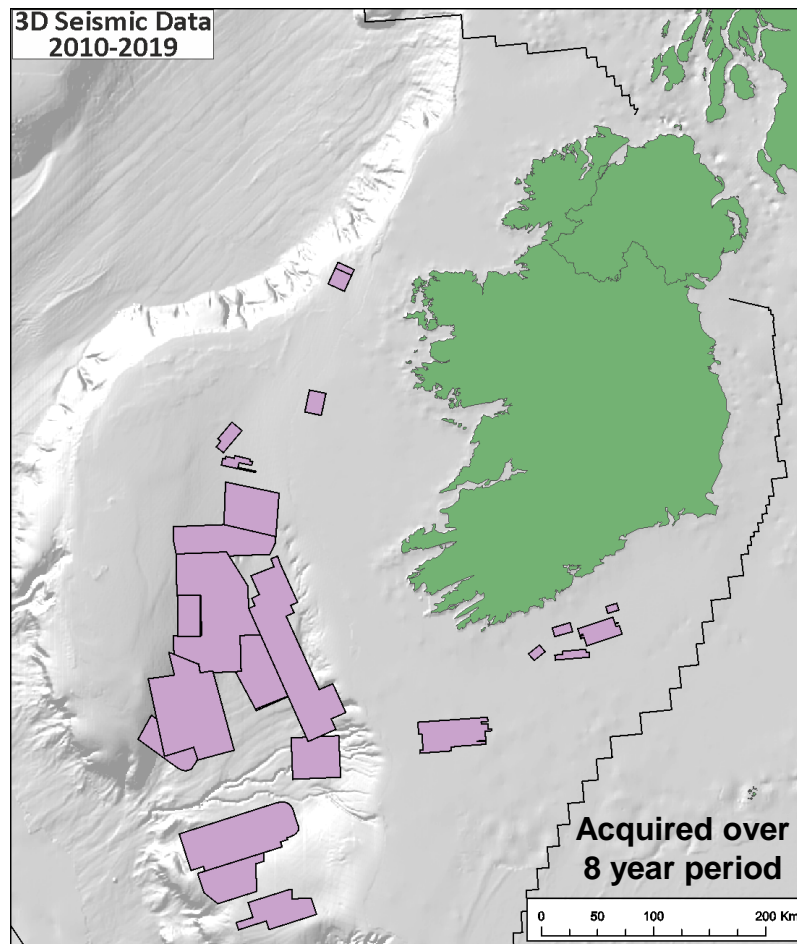
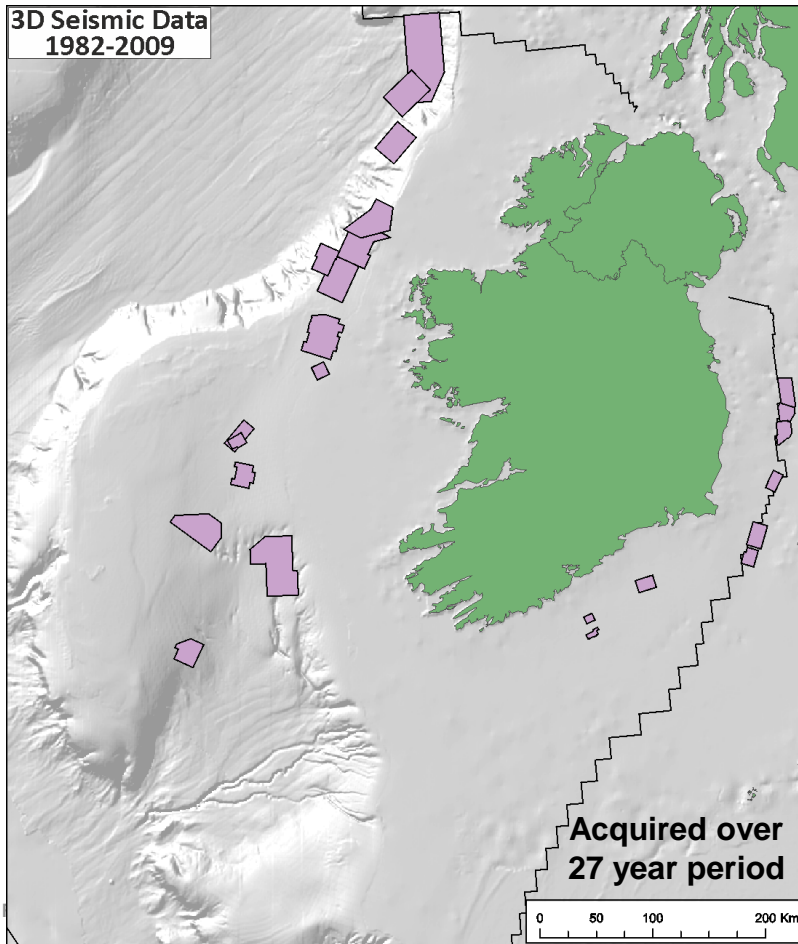


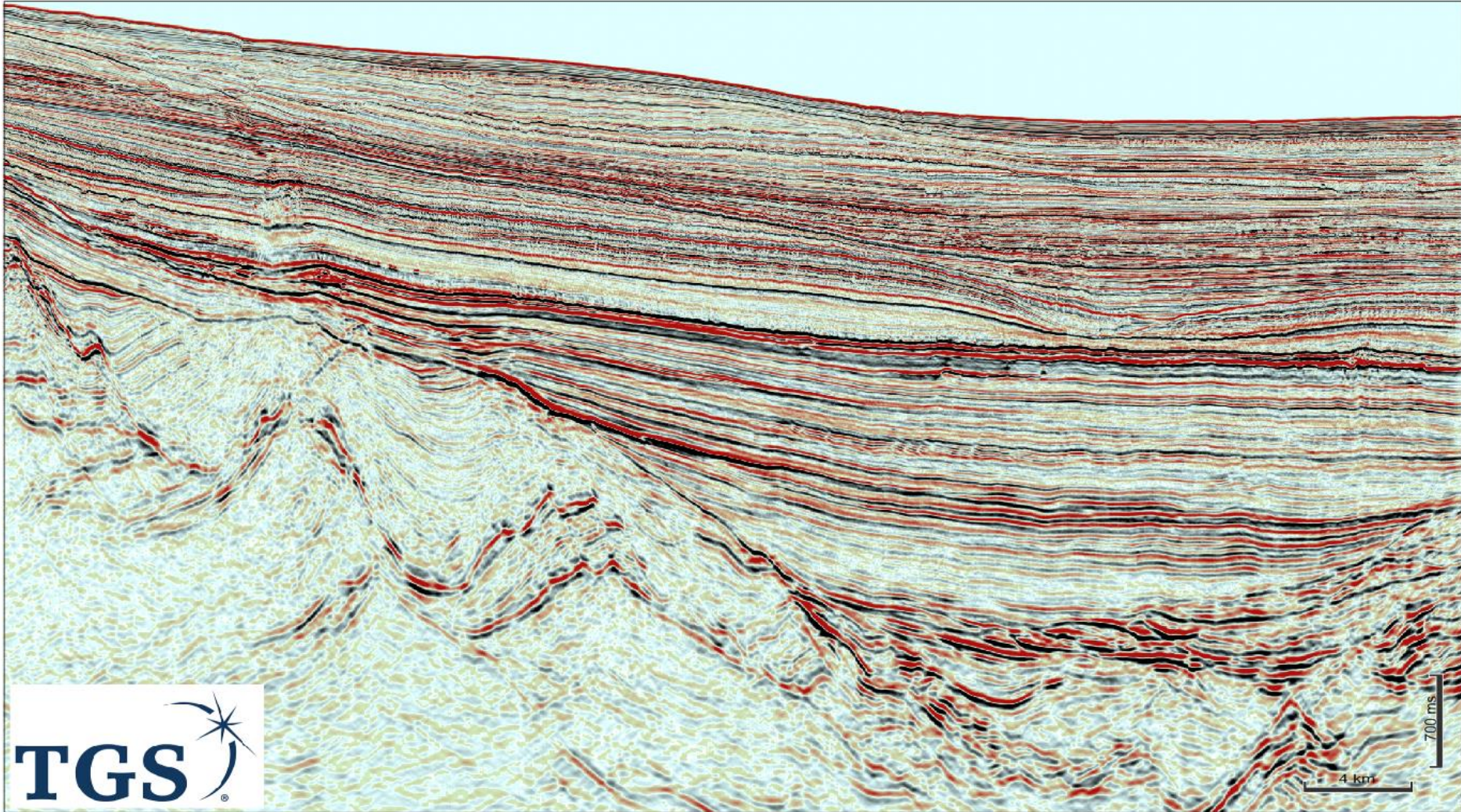
However no seismic acquisition in 2018 and 2019

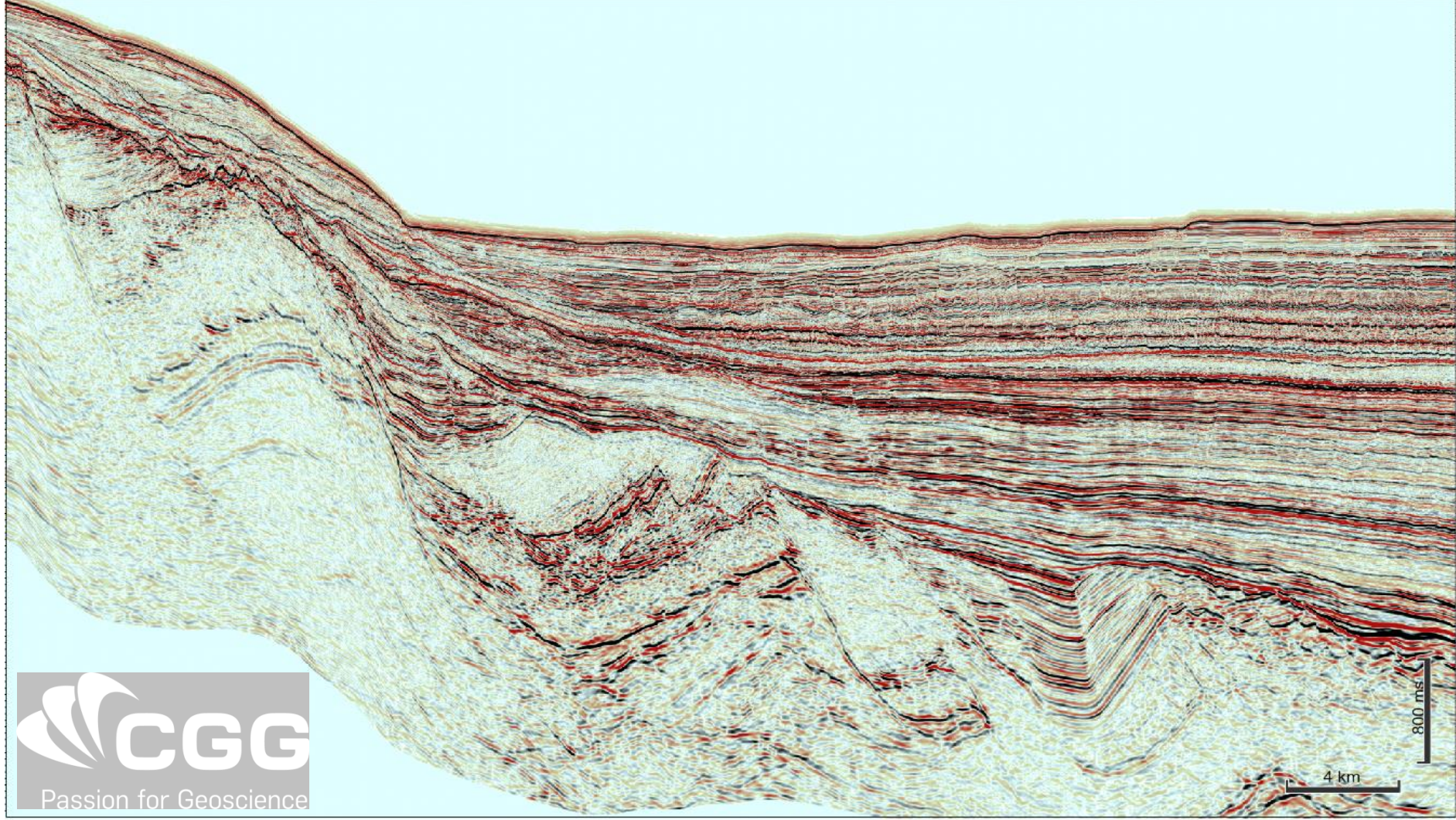
2D Seismic Data acquired Offshore Ireland



3D Seismic Data acquired Offshore Ireland







Site Survey Data acquired Offshore Ireland 2019



Barryroe Site Survey acquired in early September 2019 for Providence Resources

Gardline acquired the data using the vessel M/V Kommandor

- 2 shallow survey locations with a total of 228km of analogue data and some
- 20 environmental grabs and 21 environmental camera stations

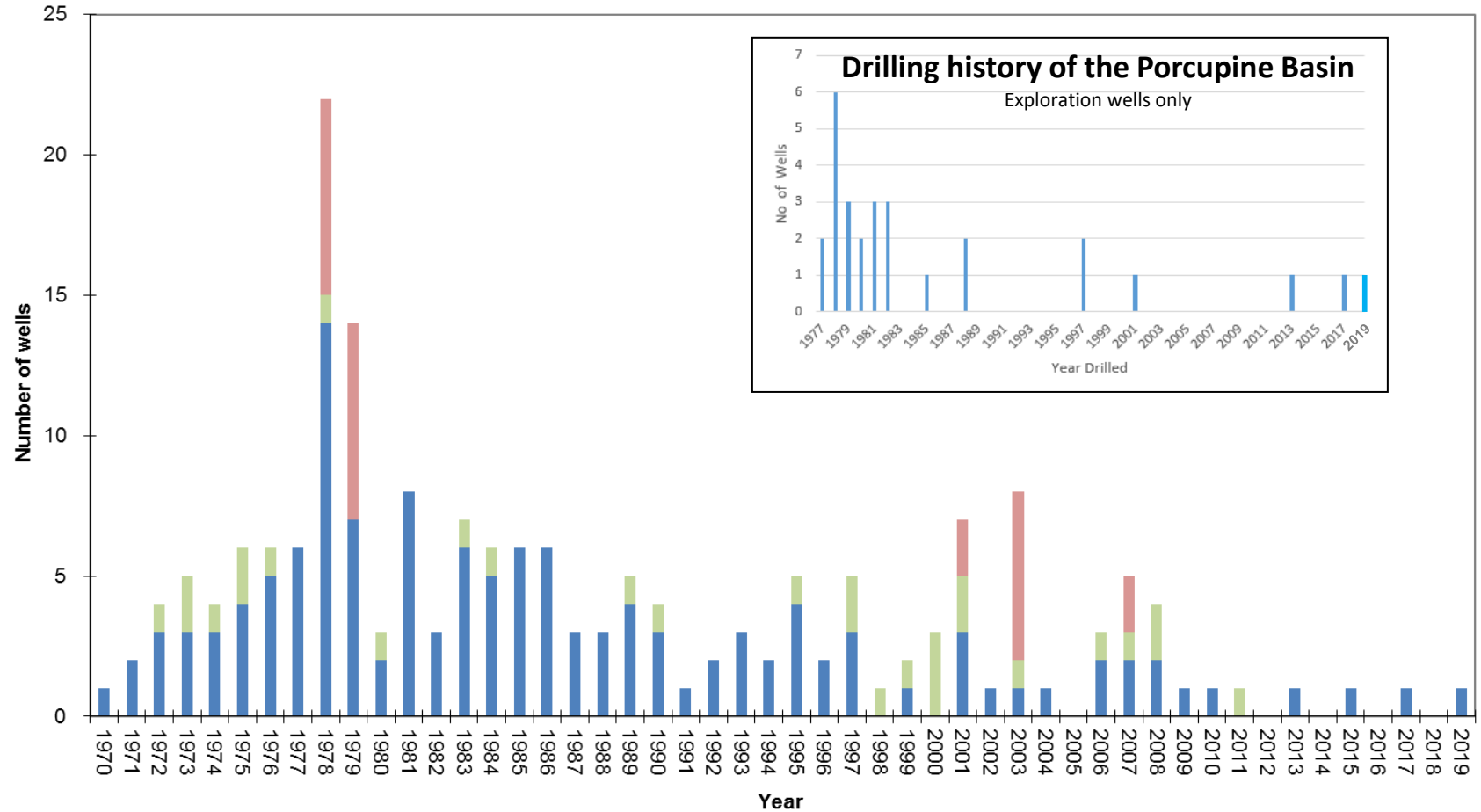


SURVEY AIMS

A seabed and shallow soils geophysical survey will be conducted to:

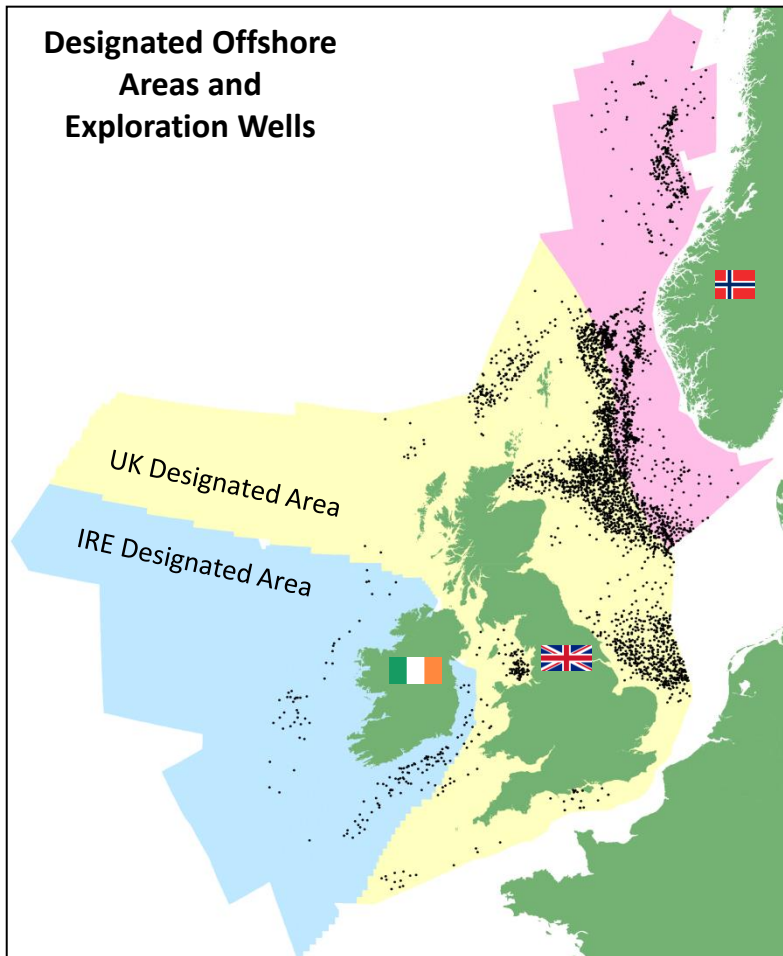
- Accurately determine water depths;
- Provide information on depth of sediments overlying chalk bedrock and to identify and map any chalk exposures;
- Provide information to inform archaeological assessments of the sites;
- Assess the area for the presence of any Annex 1 habitats (as defined in the EC Habitats Directive 97/62/EC);
- Investigate the 'baseline' or background condition of the seabed sediments and associated benthic faunal communities at the Barryroe location to enable accurate measurement of any future impacts from the proposed drilling operations.
- Provide information on seabed and sub seabed conditions to ensure the safe emplacement and operation of a drilling rig within the survey area.

Wells drilled offshore Ireland

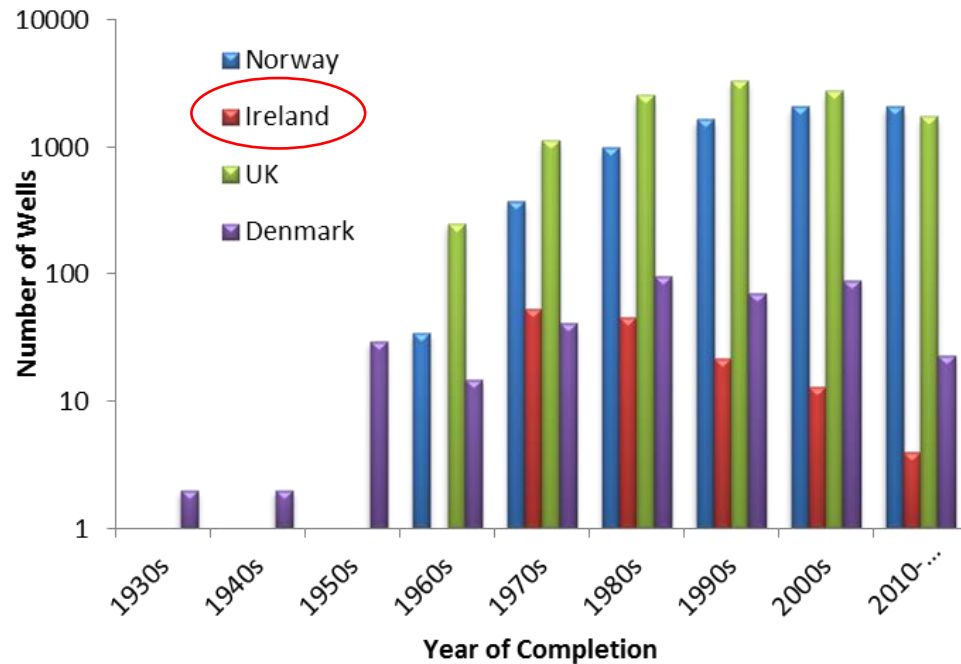




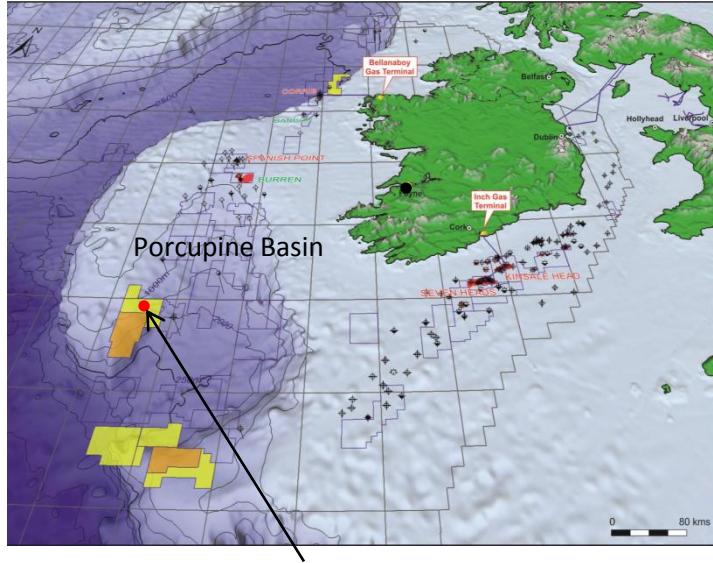
Designated Offshore Areas and Exploration Wells



Wells



Wells drilled Offshore Ireland in 2019



IOLAR 52/04-1



Porcupine Basin

‘Iolar’ exploration well 52/4-1 in Frontier Exploration Licence 3/18
Located ~ 230km off the southwest coast of Ireland
Water depth ~ 2160m
Drilling unit – Stena ICEMax
Foynes shore base was the primary shore base

FEL3/18 comprises:

CNOOC Petroleum Europe Limited (Operator) – 50%
ExxonMobil Exploration & Production Ireland (Offshore South) Limited – 50%

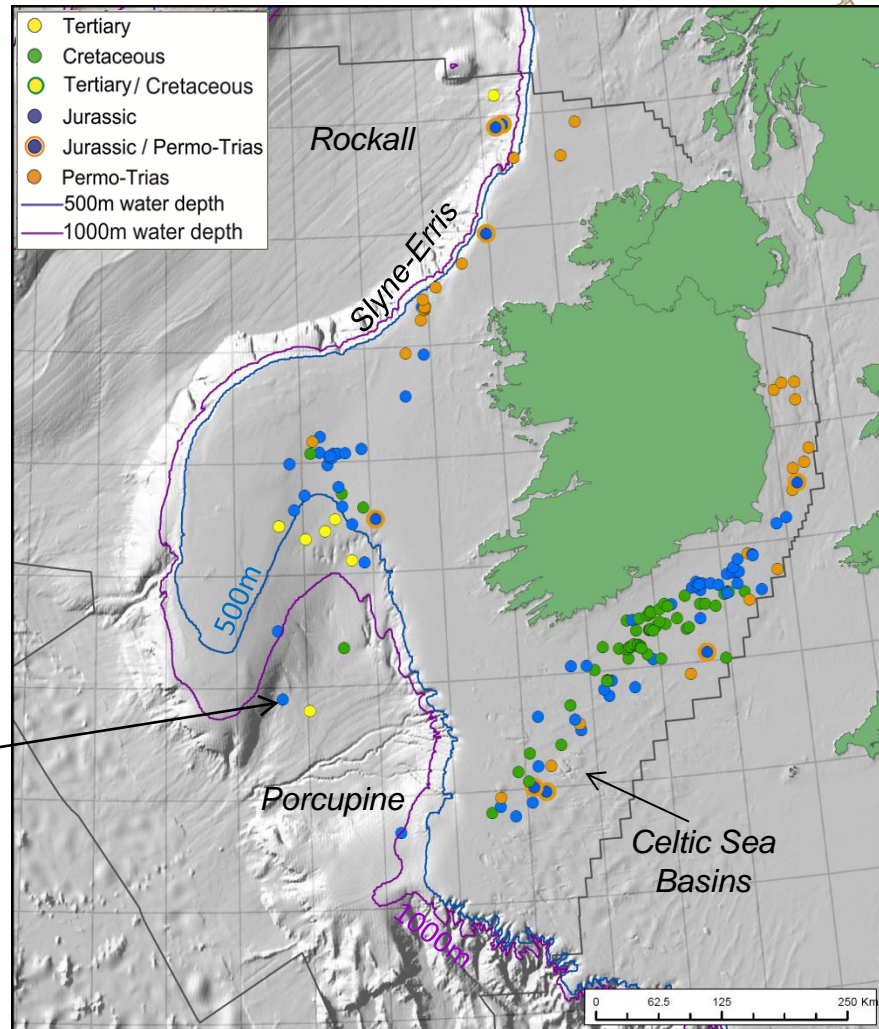
Wells offshore Ireland

Exploration wells:	133
Appraisal wells:	28
Total:	161

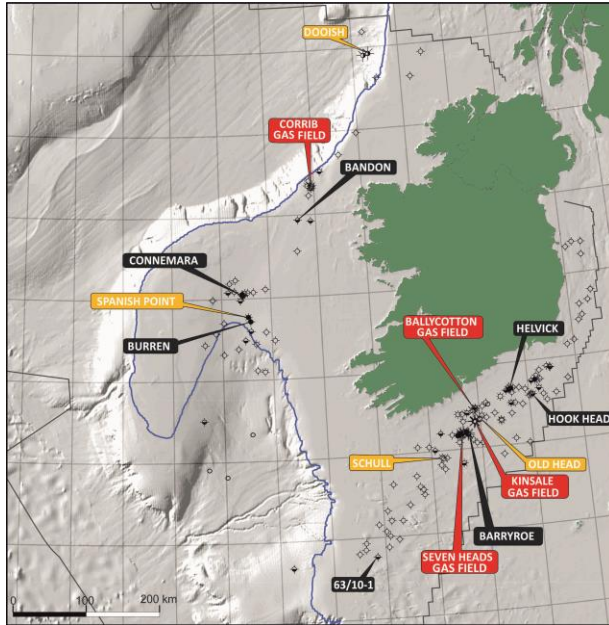
- Only 6 wells >1 km water depths
- Only 12 wells drilled on 3D seismic
(3 wells in Porcupine)
- 2 wells drilled on post-2000 2D seismic

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

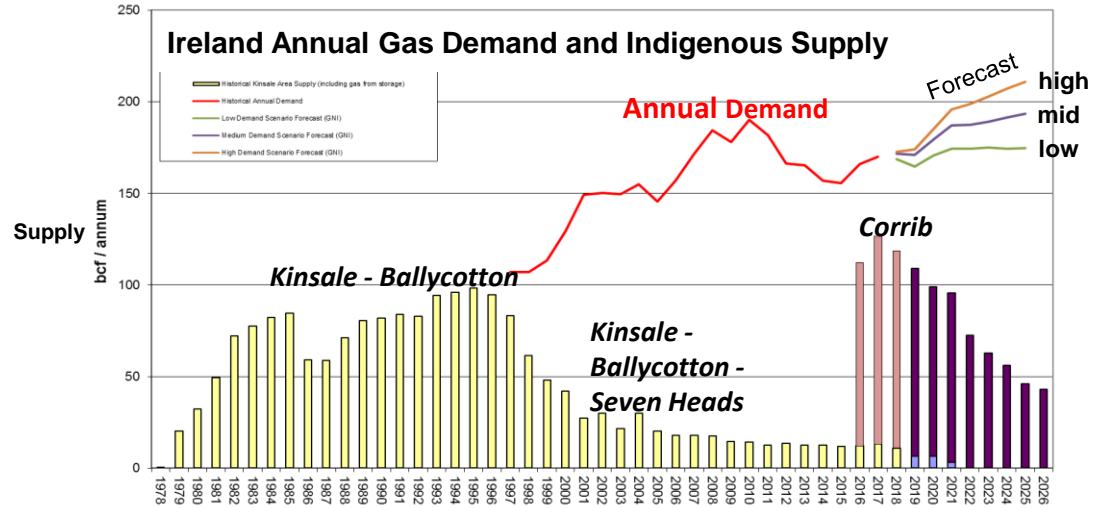
IOLAR 52/04-1



Production



Fields and discoveries offshore
Ireland



Even in low case gas demand scenario, demand significantly exceeds supply

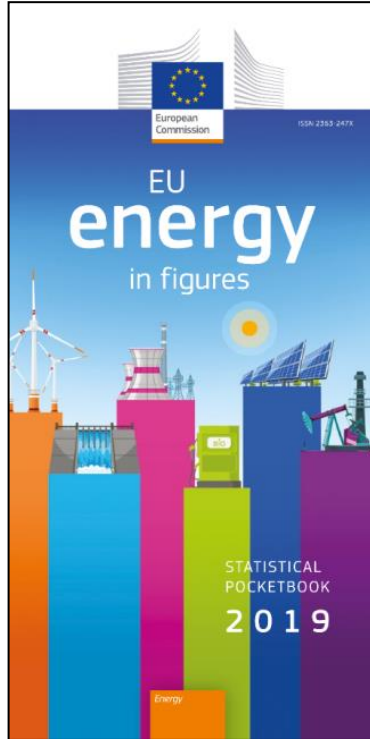
Production – Corrib gas Field



- Minister approves sale of the Corrib gasfield
On 30 November 2018, the Minister approved the sale of Shell's stake (45%) in the Corrib field to Nephin Energy. Nephin is a wholly owned indirect subsidiary of the Canada Pension Plan Investment Board (CPPIB). Vermilion and CPPIB formed a strategic partnership whereby
- Vermilion assume operatorship of the Corrib natural gas project
- Production continued offshore during 2019 from the Corrib gas field in the Slyne Basin (supplying about 60% of Ireland's gas demand)
- In 5 years Corrib will meet approximately a quarter of Irelands gas demand *

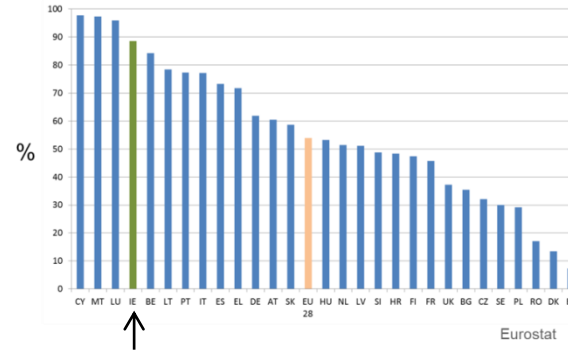
* projections based on Gas Network Irelands Network Development Plan (May 2018).

Production from Corrib Gas Field

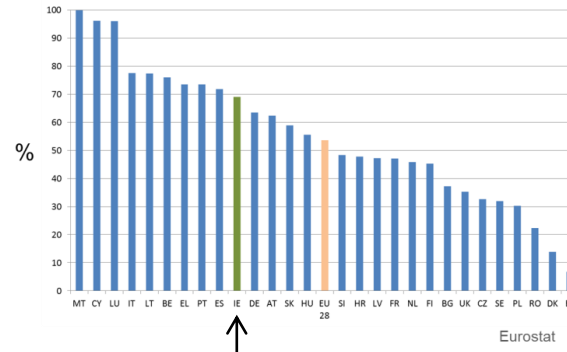


The latest version of the Commissions Energy Statistics handbook (September 2019)

EU 28 Energy Import Dependency 2015



EU 28 Energy Import Dependency 2016

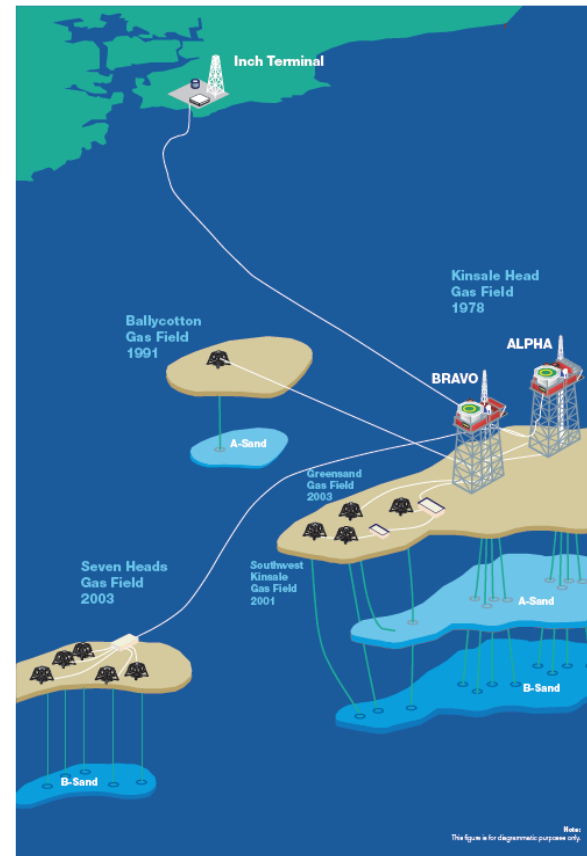


**Reduction due to Corrib impact.
Ireland remains above EU average**

Kinsale Decommissioning



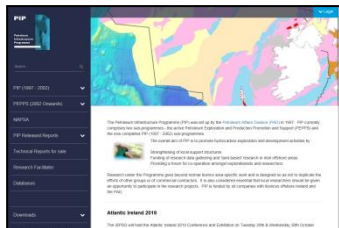
During 2019, consent was granted for the first phase of the decommissioning of the Kinsale gas fields. The Department is in receipt of an application for the second phase of decommissioning.





Research

Research Entities



www.pip.ie



www.napso.org



www.icrag-centre.org

Petroleum Infrastructure Programme (PIP)

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 research in Irish offshore areas
- Providing a forum for collaboration amongst explorationists & researchers

North Atlantic Petroleum Systems Assessment (NAPSA)

The **NAPSA** is to foster research collaboration between Irish and Atlantic Canadian researchers that will lead to the establishment of funded scientific projects to enhance our understanding of the petroleum geology of the North Atlantic basins

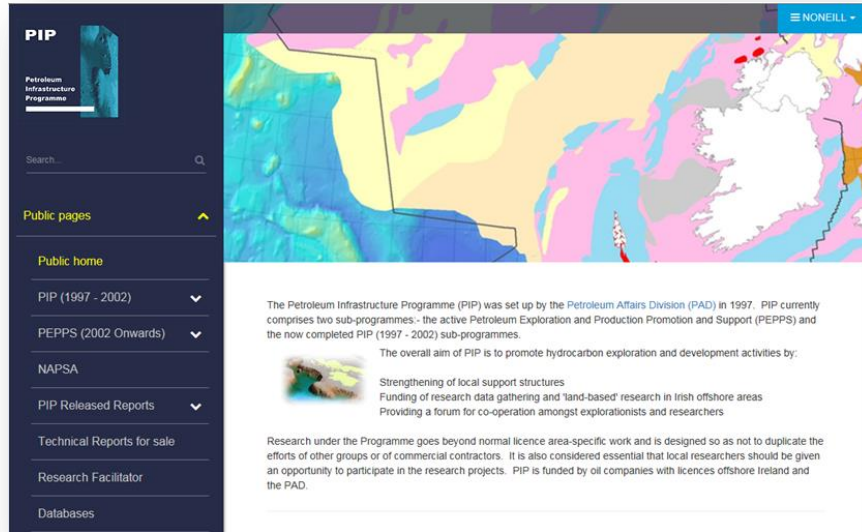
Irish Centre for Research in Applied Geosciences (iCRAG)

Our mission is to transform Irish geoscience by driving research and discovery, delivering economic and societal benefit, and advancing public understanding

PAD plays an important role in hydrocarbon research

Technical Committees

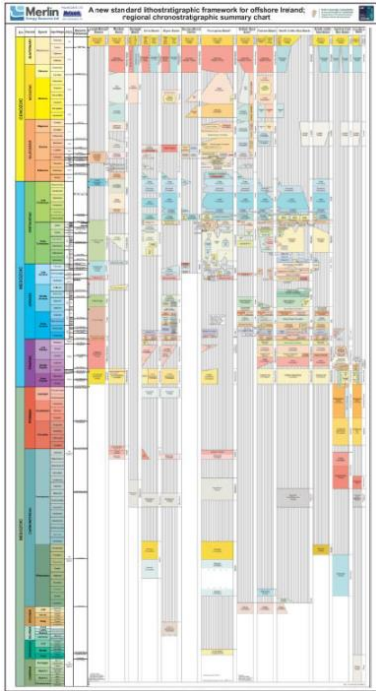
Proposals for research focussed on common industry issues



- Geology & Geophysics
- Environment
- Engineering
- Data Management & Support Services

- *Multiphysics integration into seismic depth models for long offset regional seismic data set*
- *Deep Structure of Porcupine Ridge and Rockall Plateau Margins*
- *Full Waveform Inversion of long offset regional seismic data set*

New Stratigraphic Framework for Offshore Ireland



- Updated stratigraphic framework for all basins offshore Ireland
- Integrated analysis of lithology, biostratigraphy and seismic data using national archive of released datasets, published research, and new samples.
- **Results of the study will advance our understanding of the offshore basins, and assist in future exploration and research initiatives.**

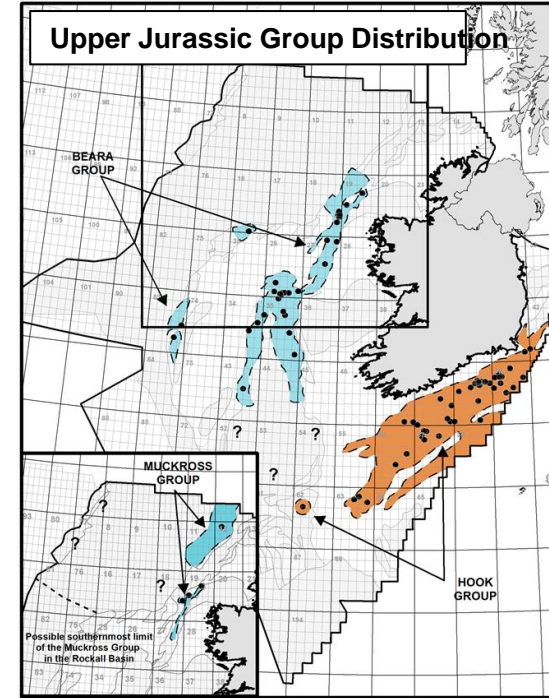
New Stratigraphic
Chart &
Nomenclature

Regional & Basin
Specific Interpreted
Horizons

Updated
Well Tops,
Summary Logs
& Type Wells

New Biozonation
Scheme

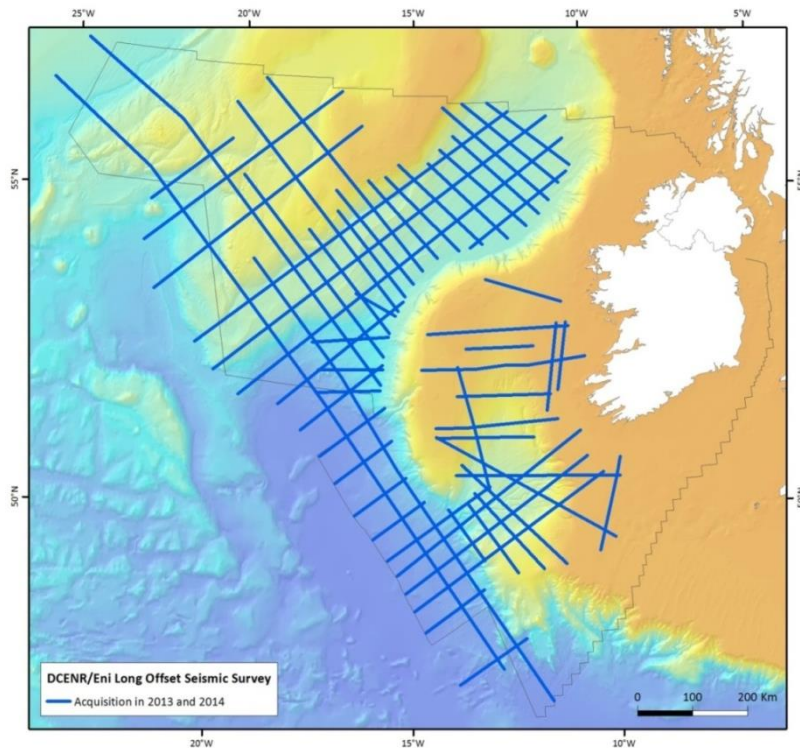
Rock Unit
Distribution &
Paleofacies
Maps



Example : Distribution of **Upper Jurassic Groups** (Beara, Muckross and Hook Groups)

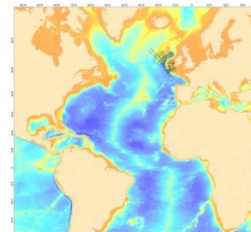
Visit PAD booth

DCENR/Eni regional seismic survey 2013/2014



- Acquired programme**
16,800km of new:
- **2D PreStack Time Migrated seismic data**
 - **velocity**
 - **gravity**
 - **magnetic and**
 - **field data**
 - **Acquisition report**
 - **Processing Report**

All data released for copying charge



Reprocessing of this 2D survey on-going as a PIP project



Data

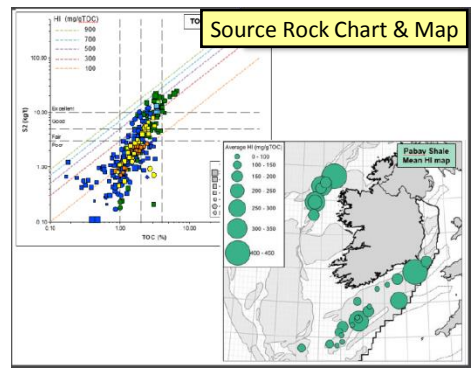
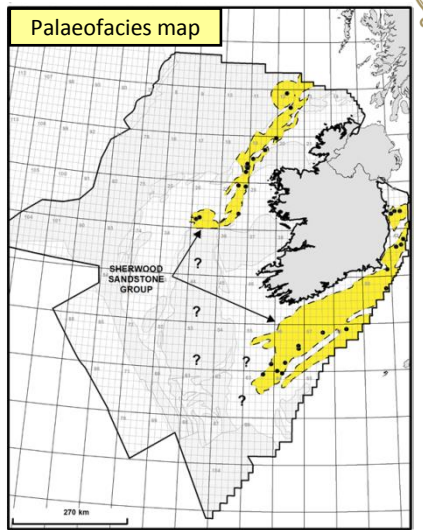
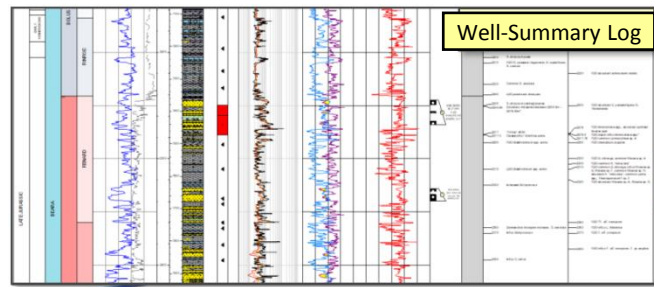
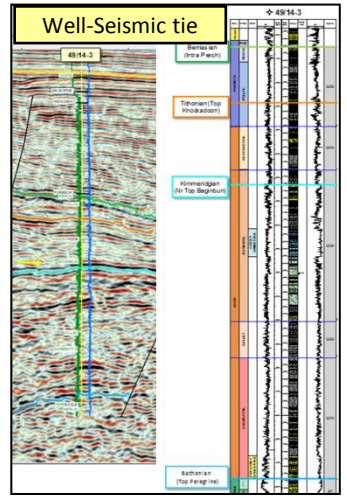
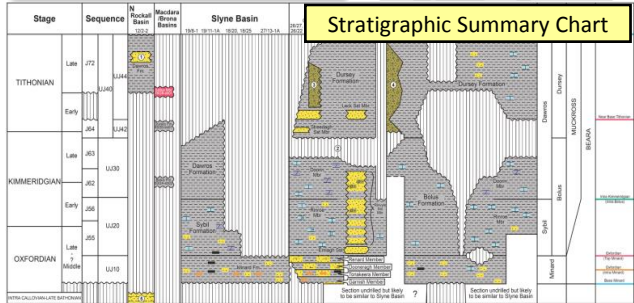
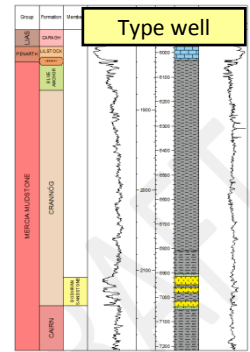
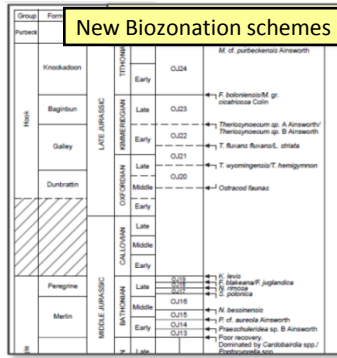
Ireland's Stratigraphic Nomenclature - Data



Final Atlas will contain:

- Descriptions of all the lithostratigraphic units offshore Ireland illustrated with type and reference wells, distribution maps & palaeofacies maps
- Stratigraphic summary charts
- Regional seismic lines
- Well-seismic ties
- Sequence stratigraphy schemes
- Well summary logs with new stratigraphy
- New biozonation schemes
- Source rock intervals and maps (tied to new stratigraphy)

Atlas is to be released as a Special PAD Publication



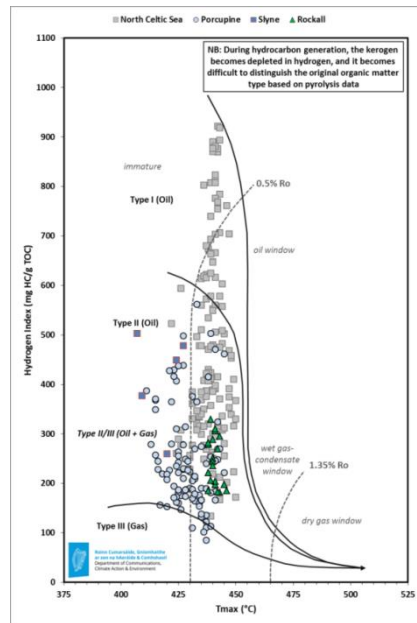
Trans- Atlantic Source Rock Study - New Geochemistry Database



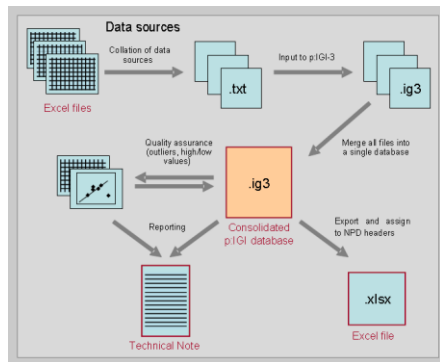
All available geochemical data for each well offshore Ireland have been digitised and compiled into a single geochemical analytical database, allowing data to be interrogated and trends to be observed



Data type	Samples
Total Organic Carbon (TOC)	12,725
Rock Eval pyrolysis	6,472
Pyrolysis gas chromatography	177
Maceral analysis	613
Vitrinite Reflectance (R_o)	3,179
Gas chromatography (GC)	1,182
GC-MS (biomarkers)	389
Gasoline composition	470
Bulk fraction carbon isotopes	252
Gas composition	2,118
Gas carbon isotopes	206



Upper Jurassic - by Basin



Stratigraphy	ID	Sample type	Depth m	TOC %	S1 ppg	S2 ppg	S3 ppg	H	CR	Tmax	Comments	Comments	Lab
UCAM-PANIAN	C191		3650	0.75				632	231	399	1000-1		Robertson-Pac
UCAM-PANIAN	C191		3650	0.75				430	295	384	1000-1	After extraction	Robertson-Pac
UCAM-PANIAN	C191		3716	0.76				489	237	382	1000-1		Robertson-Pac
UCAM-PANIAN	C191		3716	0.75				489	237	384	1000-1		Robertson-Pac
UCAM-PANIAN	C191		3722	0.82				600	194	381	1000-1		Robertson-Pac
UCAM-PANIAN	C191		3722	0.79				371	222	368	1000-1	After extraction	Robertson-Pac
CONACIAN	C191		3683	0.52				482	187	372	1000-1		Robertson-Pac
CONACIAN	C191		3683	0.54				331	200	375	1000-1	After extraction	Robertson-Pac
CONACIAN	C191		3676	0.57							1000-1		Robertson-Pac
CONACIAN	C191		3689	0.77				508	204	382	1000-1		Robertson-Pac
CONACIAN	C191		3691	0.68				284	165	387	1000-1	After extraction	Robertson-Pac
TUFONIAN	C191		3883	0.3				260	123	370	1000-1	After extraction	Robertson-Pac
TUFONIAN	C191		3885	0.66							1000-1	After extraction	Robertson-Pac
L-TUFONIAN	C191		3947	0.98				368	93	372	1000-1	After extraction	Robertson-Pac
L-TUFONIAN	C191		3950	0.94							1000-1	After extraction	Robertson-Pac
TUFONIAN	C191	Picked	3930	0.93				328	170	376	1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191		3944	0.89				239	163	372	1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4001	0.59				275	121	368	1000-1		Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4001	0.69				270	124	370	1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4001	0.94				271	74	385	1000-1		Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4019	0.82				249	19	386	1000-1		Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4020	0.71				46	16	377	1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4027	0.87				261	99	385	1000-1		Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4027	0.76				201	147	386	1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191		4066	0.47							1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4080	1.08				262	56	380	1000-1		Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4081	0.95				248	101	383	1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4073	0.52							1000-1	After extraction	Robertson-Pac
L-ORE TACEOUS-4	C191	Picked	4076	0.3				376	83	385	1000-1		Robertson-Pac

BeicipFranlab

Roinn Cumarsáilte, Gníomhaíocht ar son na hAeráide & Comhshaoil
Department of Communications, Climate Action & Environment



The database has allowed further analysis by members using the extensive Geochem database

ObSERVE Data



The baseline aerial and acoustic data acquisition (2015 - 2017) of the ObSERVE programme is completed and results and impact have been analysed.

Data was made publically available before year end 2018 by DCCAIE.

28 TB of data

Acoustic and aerial environmental baseline
programme of marine wildlife



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



An Roinn Cultúir,
Oidhreacht agus Gaeltachta
Department of Culture,
Heritage and the Gaeltacht



Visit ObSERVE booth

Digital Capture of Technical Data



Digital capture hard-copy seismic:

- 337 surveys from 1968 to 2000, onshore & offshore
 - 26,000 film profiles; 3,500 paper profiles
 - Approx. 300,000 line km
- + Digital capture 2,500 technical reports

Objectives:

- To protect the archive of the records
- To allow ease of retrieval of the records
- To facilitate reconstruction to digital seismic format
- To aid in the transcription of additional information held on the records to other more accessible formats.



Objective of ease of data access to progress work programme timelines and to aid in disaster recovery

Technical Data – Future Plans



Detailed digital capture of well attributes – core, SWC, DST, water chemistry etc.

Completion of digital capture of hard copy data – paper seismic sections, reports, maps, montages, historical well files

Complete re-read of all well log tapes

Continue to support cuttings, Photostrat, XRF QEMSCAN, Core and slide scanning multi-client project

New build of iPAS (PAD's integrated data and licensing system).

Build national archive of seismic field data

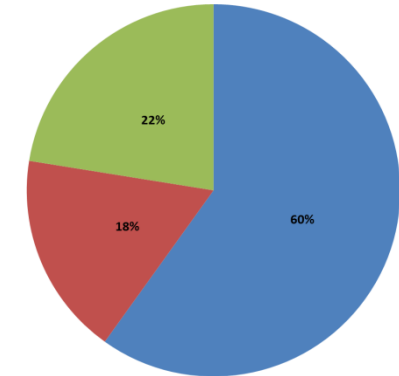
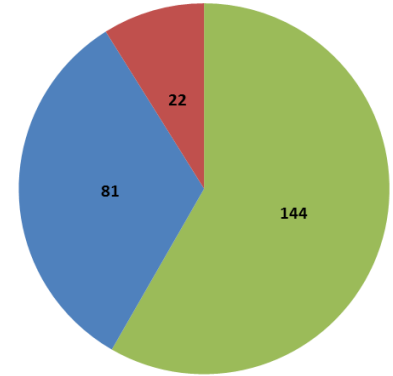
There has been a significant increase in volumes of data acquired in recent years.

Technical Data Archive – Corestore, Dataroom

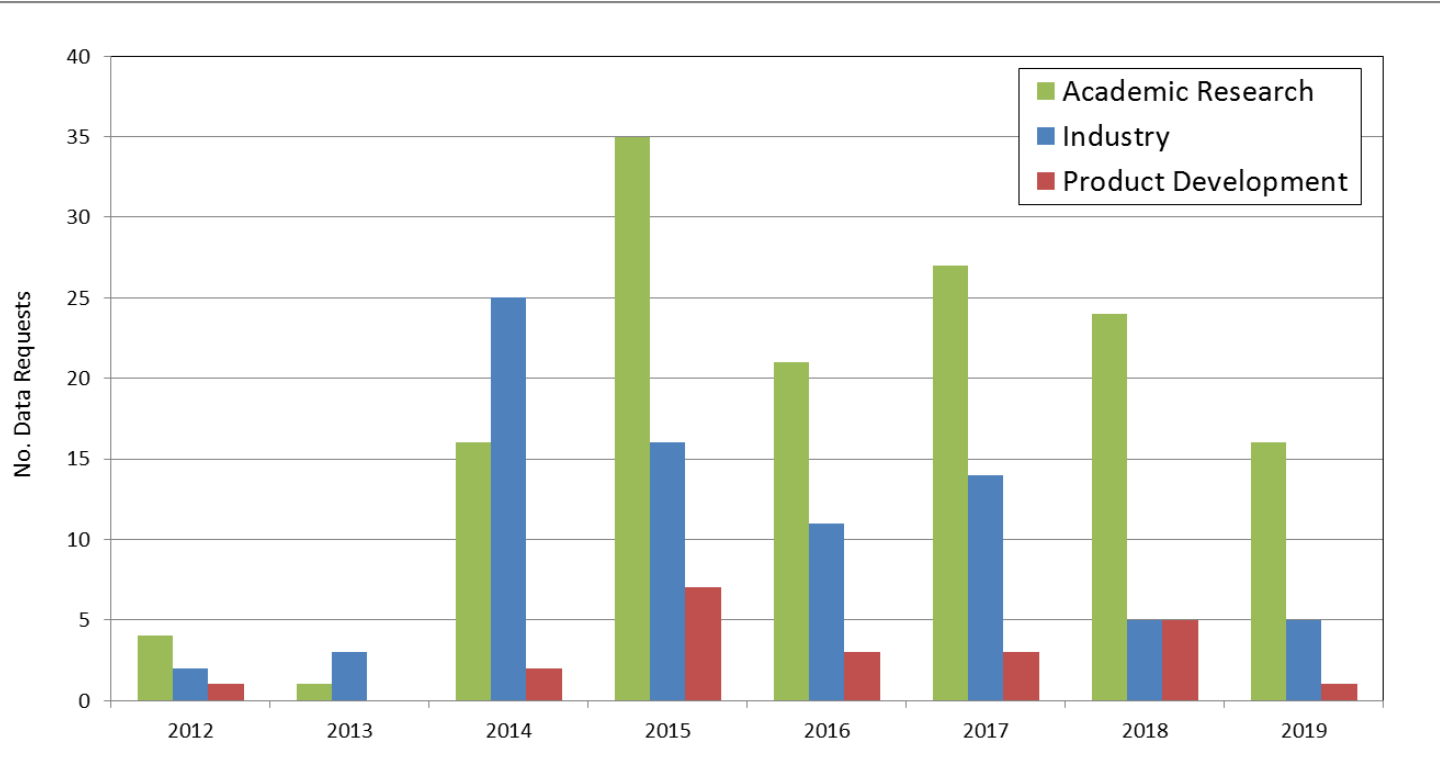
Technical Data



Data Requests



Dataroom Visits





Communication/Outreach

Communication/Outreach



PAD/DCCAE Booth 2019

Communication/Outreach - National



BT Young Scientists,
Dublin, January 2019



Irish Geological Research Meeting
(IGRM), UCD, March 2019


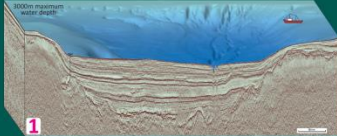
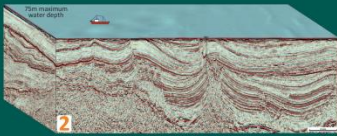
PAD at Our Ocean Wealth/Seafest
June 2019, Cork




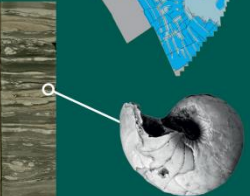
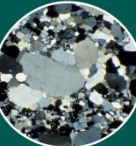
Outreach




WHAT LIES BENEATH OUR OCEAN FLOOR






WHAT LIES BENEATH OUR OCEAN FLOOR

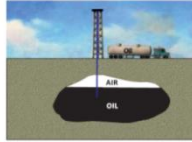






Rialtas na hÉireann
Government of Ireland



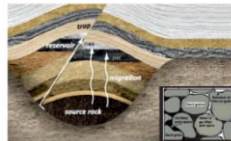
Rialtas na hÉireann
Government of Ireland




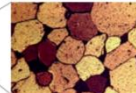
Oil and Gas form in large empty spaces underground?

X


Oil and Gas come from remains of buried plants and animals, due to increased heat and pressure. Oil migrates from the source rock and can be trapped in small voids (pores) within a reservoir.



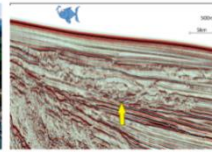
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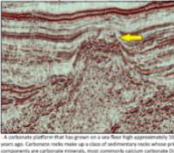
Seismic Data and Modern Examples




River consisting of a number of channels (Brazos/Arroyos, New Zealand)



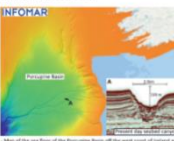
Cross section of ancient sub-sea river systems with numerous channels eroding into older channel deposits over millions of years giving it a physical shape expressed on seismic data



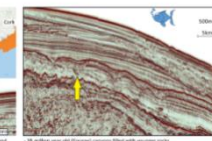
A sedimentary channel that had a great flow rate for millions of years ago. Carbonate rocks make up a lot of sedimentary rocks where primary components are carbonate ions (e.g. shells, commonly calcium carbonate (limestone) and other important carbonate minerals)



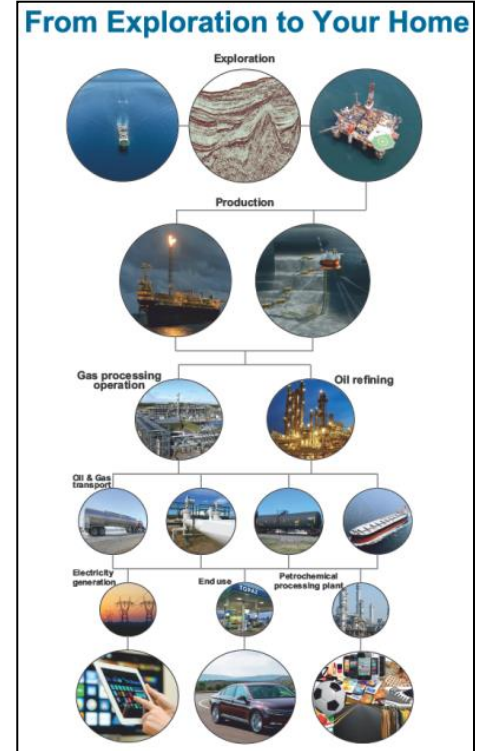
Seismic data showing a river system (Permian, Niger Delta)



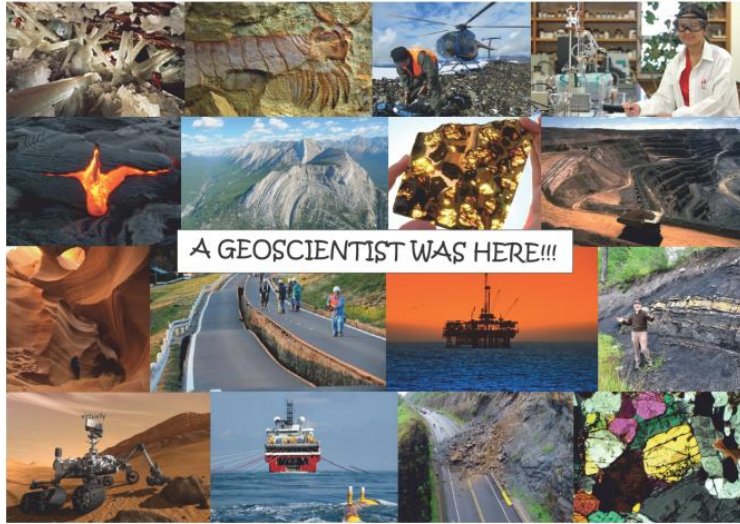
Map of the sea floor of the Porcupine Basin off the west coast of Ireland and a cross-section through a greater distance than the seismic data



15 million year old (Eocene) compares that with younger rocks



Geoscience Graduate Placement Programme



Congratulations to the 4 New Additions to the PAD Tech Team



Pictured above: Laura Berdi , Callum Gilchrist, Pablo Rodriguez Salgado and Kishan Soni who are successful candidates from the Geoscience Graduate Placement Programme 2019.

Proposed in Mar 2019 to ISPSG members

Objective – to enable geoscience career progression, for knowledge exchange, to capacity build in the sector

Implemented – October 2019 with 3 PIP members

Oil and Gas Politics 2019



Richard Bruton  @RichardbrutonTD · 18m

We will accept the advice of the Climate Advisory Council and end the exploration of oil in Irish Waters [#ClimateActionSummit](#) [@LeoVaradkar](#)



Taoiseach Leo Varadkar announced the plan at the United Nations Climate Action Summit in New York

23 September 2019

Concluding Remarks



- ❖ Licences: While 80% of the offshore area is currently closed for licensing, exploration interest in Ireland's offshore basins remains strong.
- ❖ Operations: Ireland offshore is under-explored in terms of drilling. The quality, coverage and quantity of seismic data has improved significantly in recent years, highlighting the oil and gas prospectivity of the basins.
- ❖ Data and petroleum research are vital to support E&P Ireland.
- ❖ Our Communications and Outreach programme is now designed for a variety of stakeholders.
- ❖ Government is committed to support the future exploration for gas in Ireland's offshore.

PAD Technical as geoscientists will continue to support industry and academia in the challenge of understanding the geology of our offshore basins

IRELAND

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THE ABUNDANT ONE



Rialtas na hÉireann
Government of Ireland

Go raibh maith agat

Thank you