



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

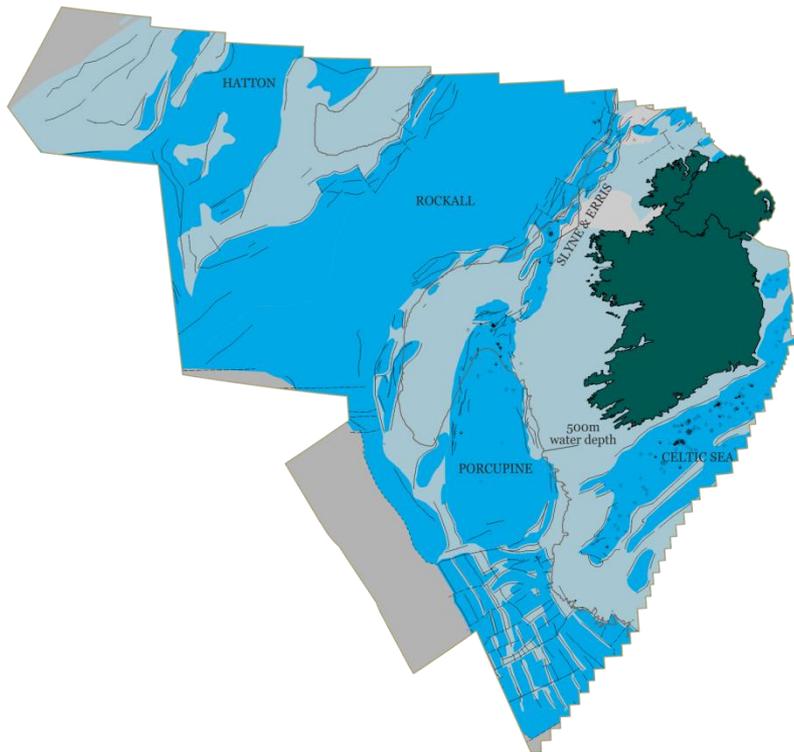
Presentation outline:

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



Licences

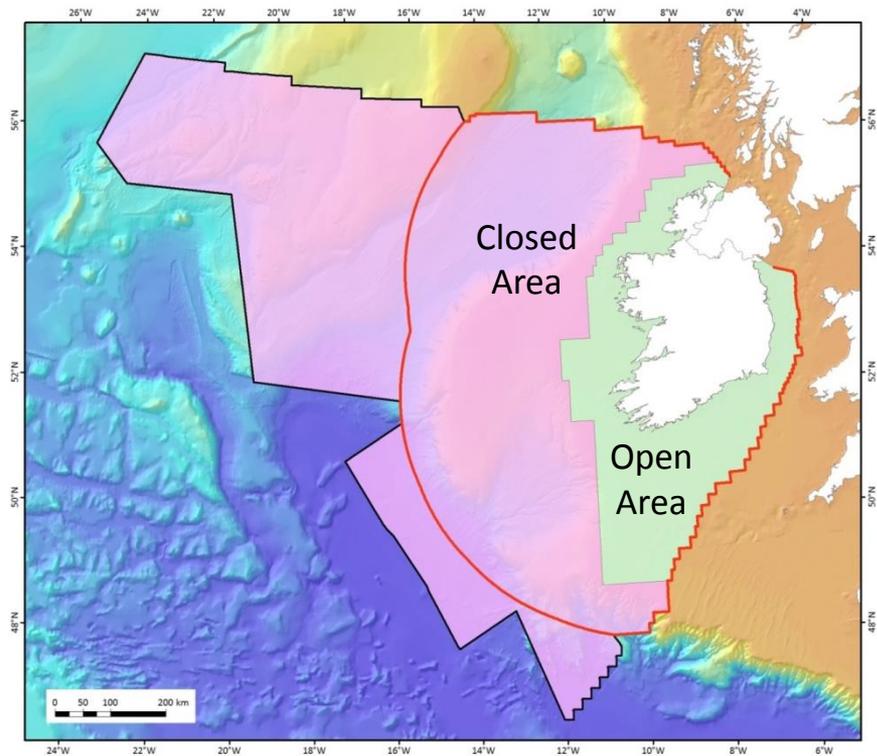
Offshore Ireland



Closed Area ~ 80%
Open Area ~ 20%

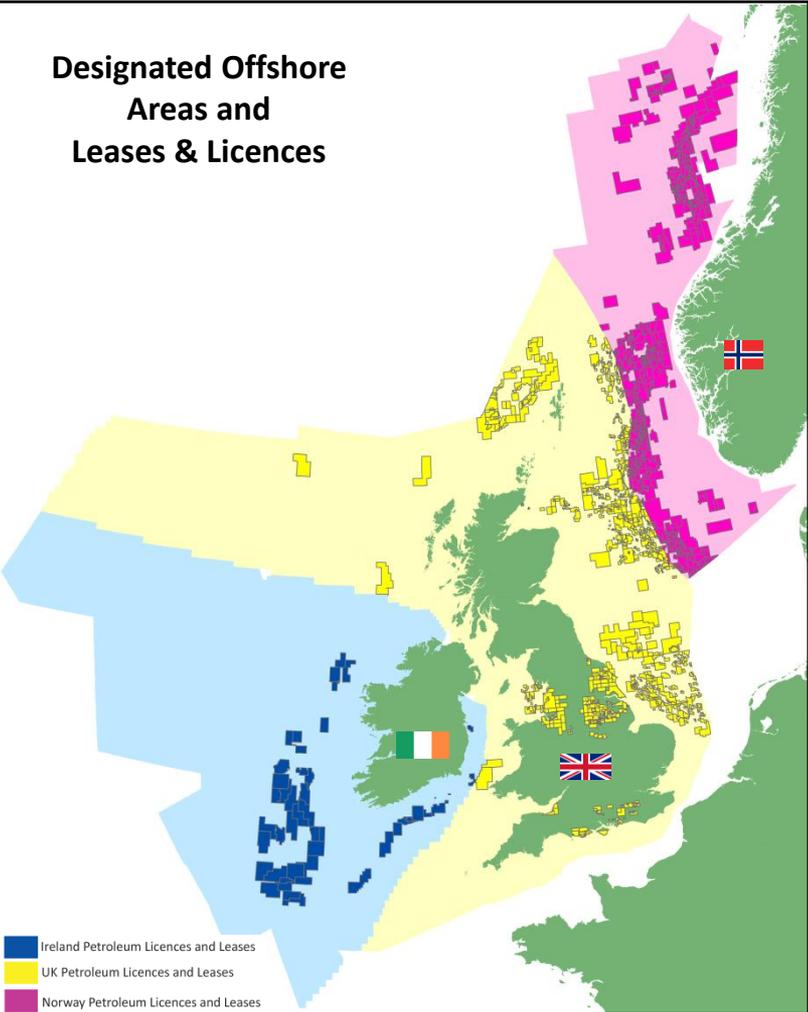
Designated Continental
Shelf limit —

Exclusive Economic Zone
EEZ 200M limit —



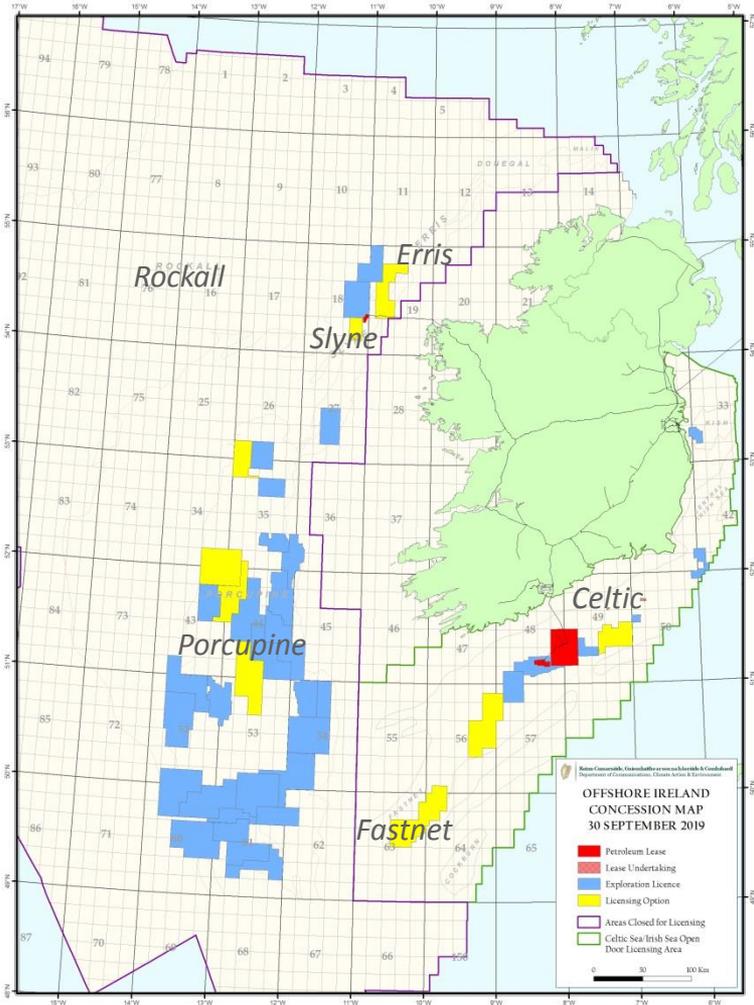


Designated Offshore Areas and Leases & Licences

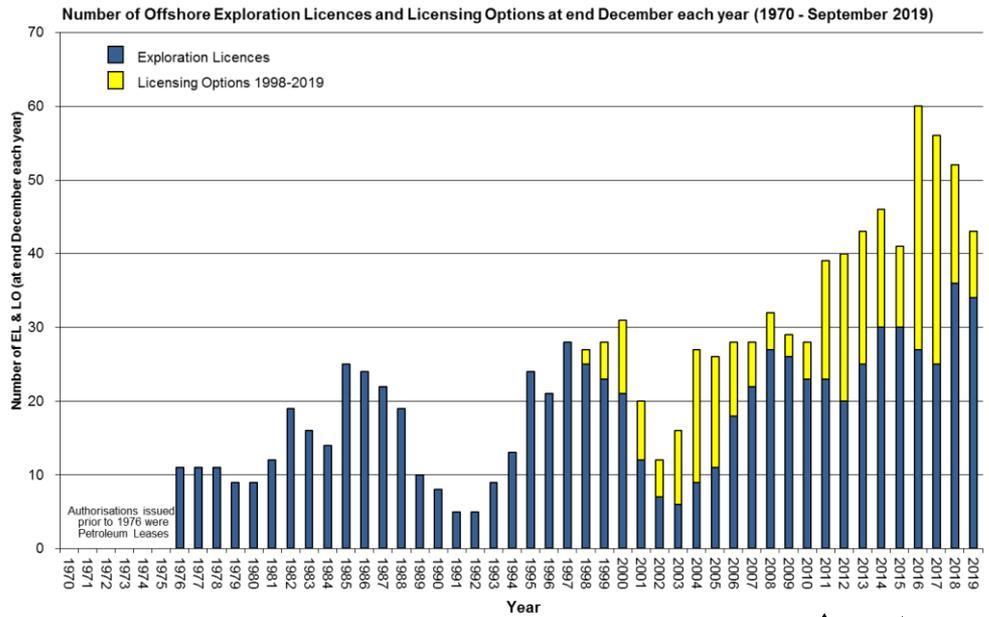




Ireland – Concession map



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

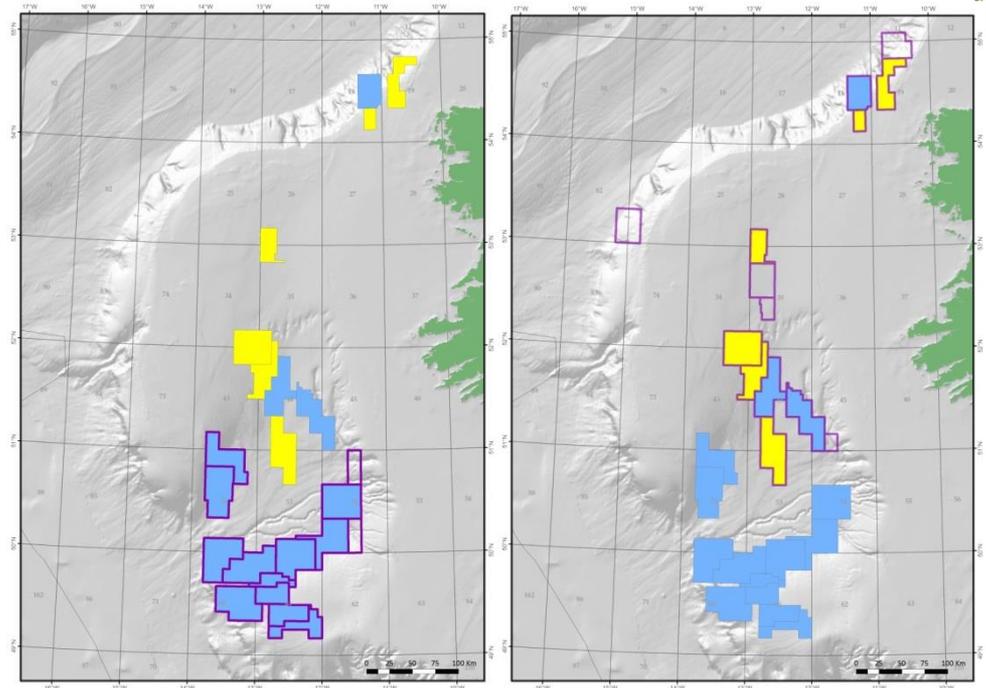
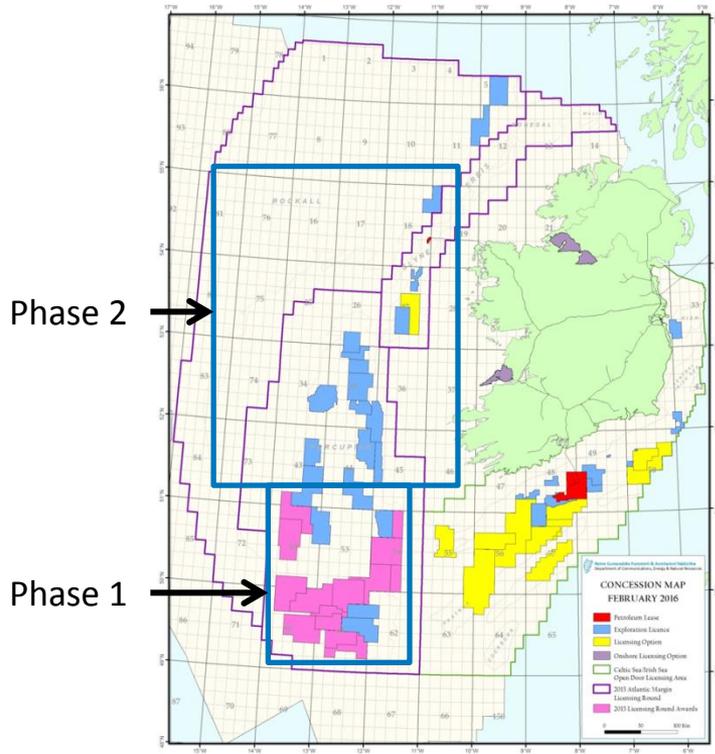


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Licensing Rounds

Ireland – Concession map



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

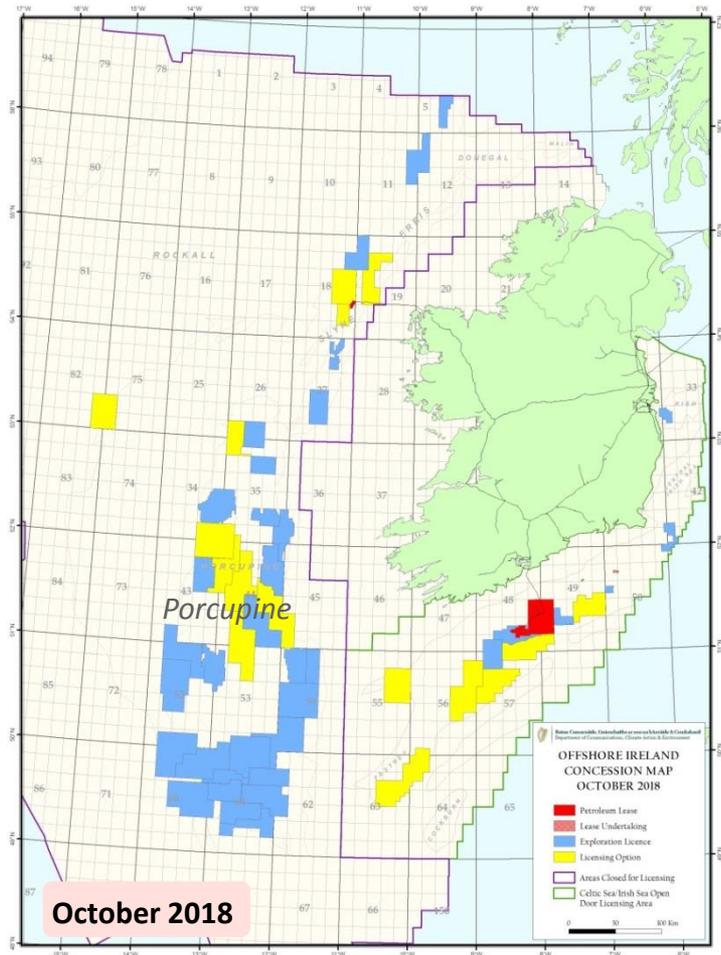


Phase 1

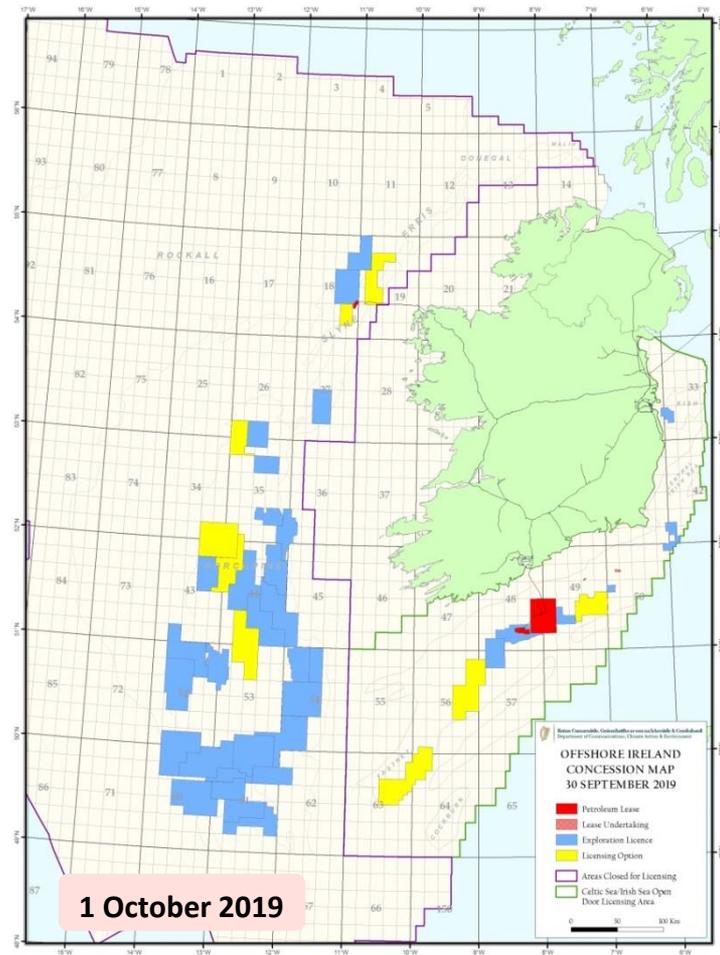
Phase 2

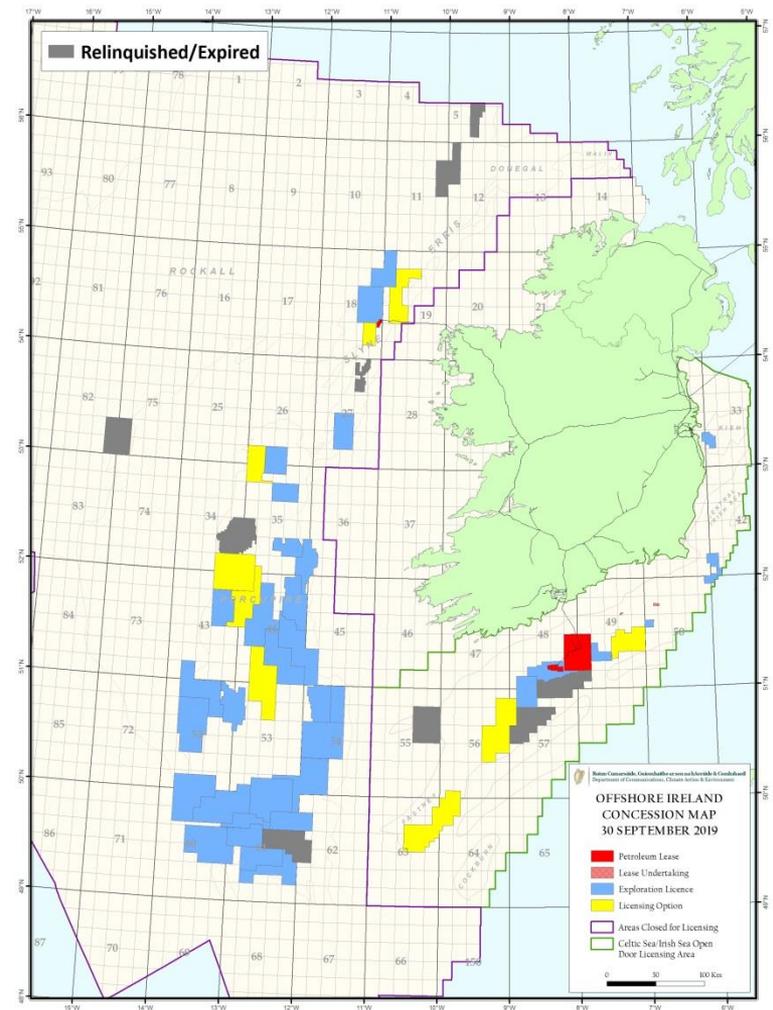
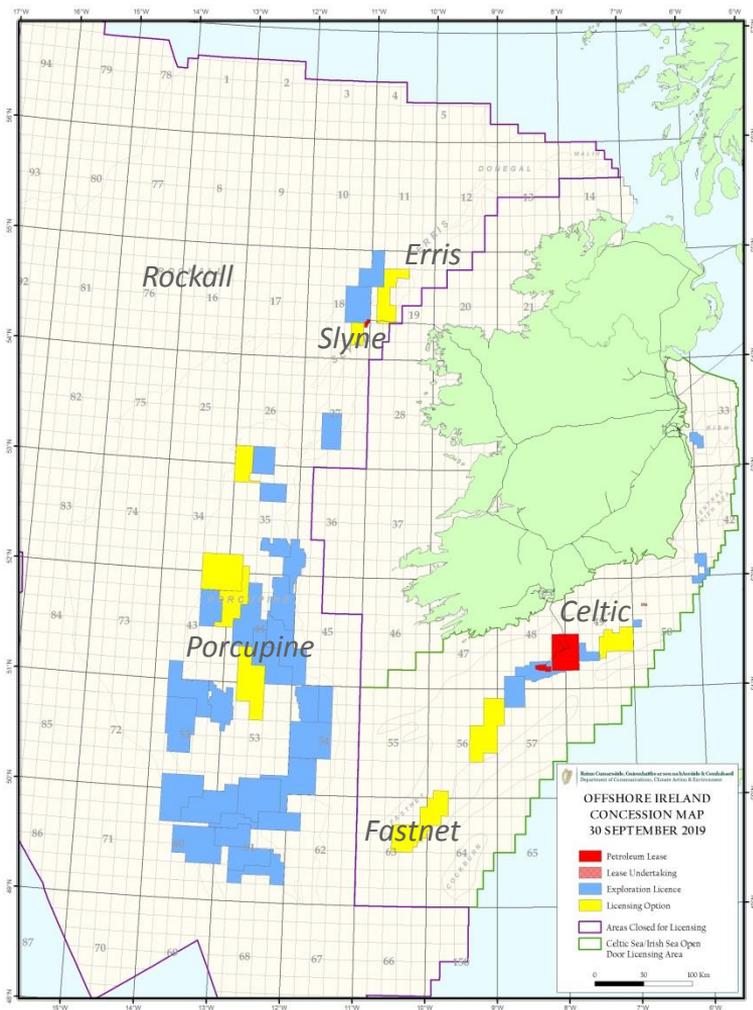
Licence conversions (from 2015 Licensing Round)

Concession Map AI2018



Concession Map AI2019







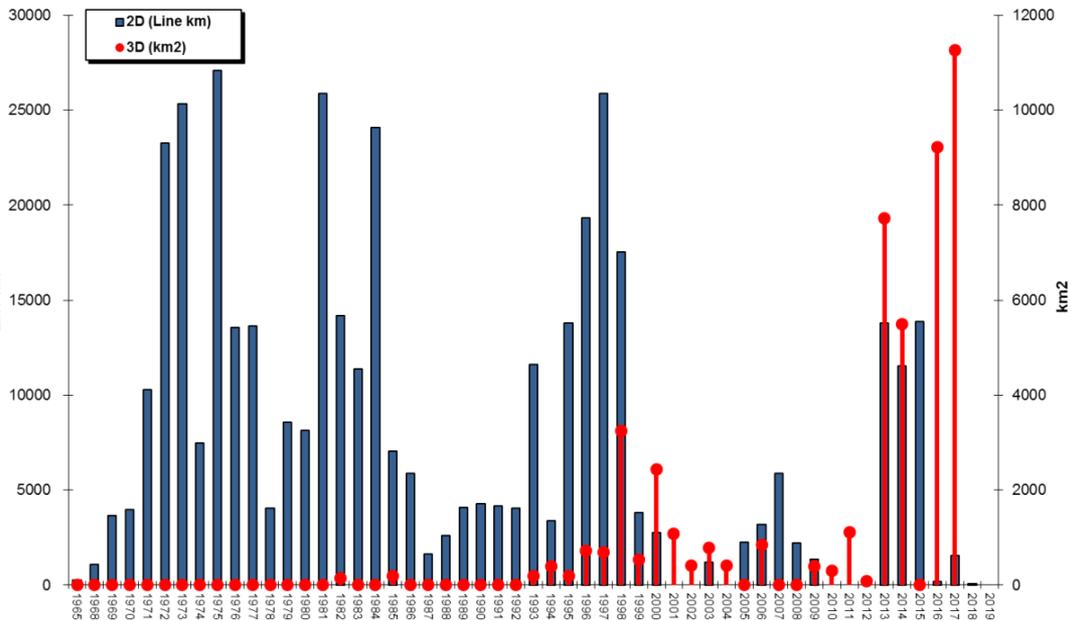
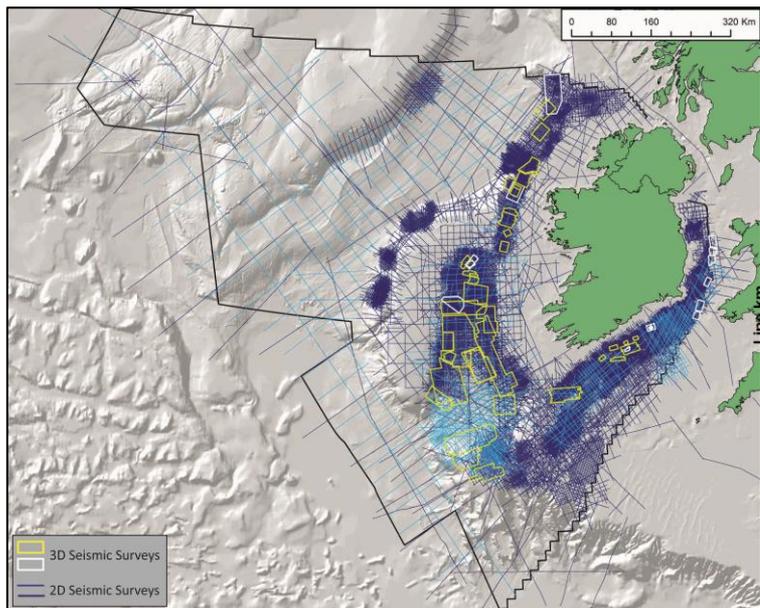
Operations

Seismic Data Acquired



2D: 415,000 km

3D: 48,000 sqkm

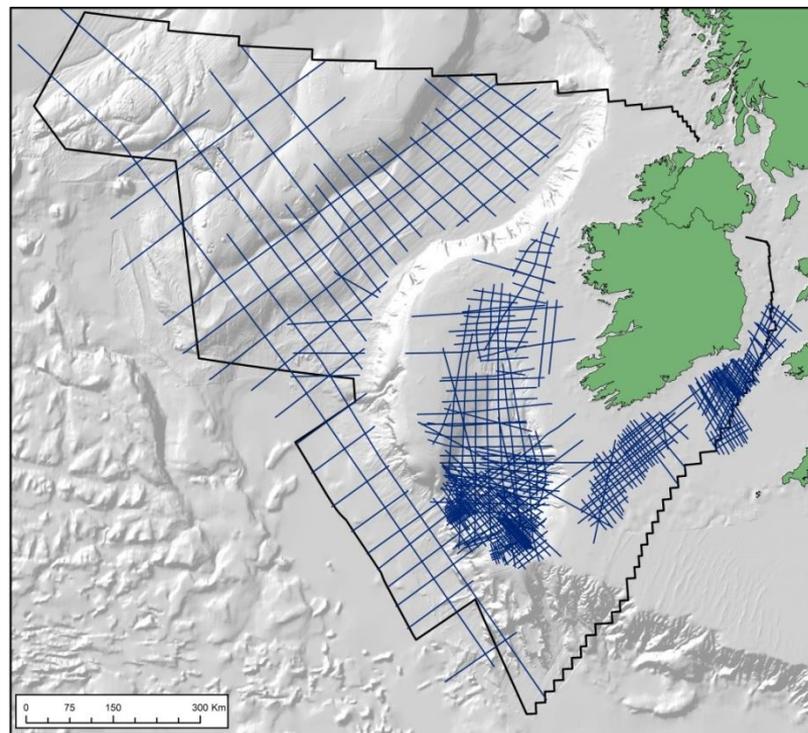
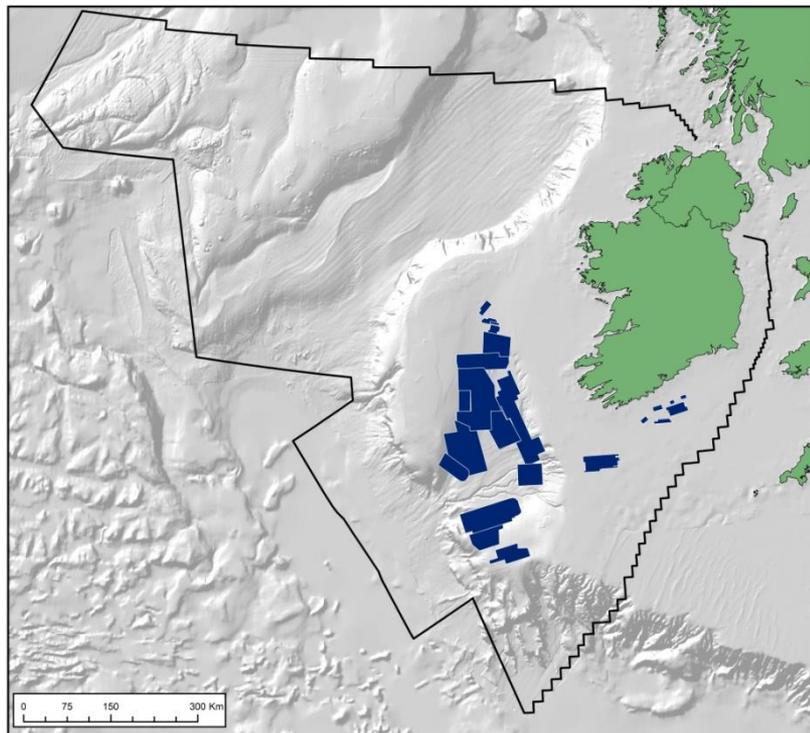


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Licensing Rounds

New Seismic Data Acquired

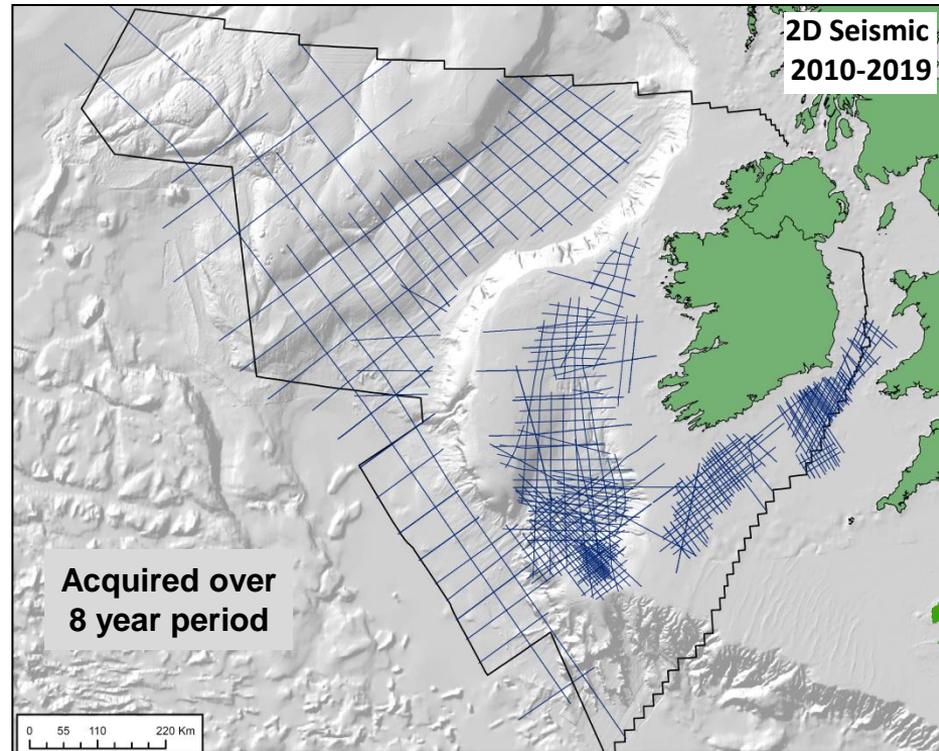
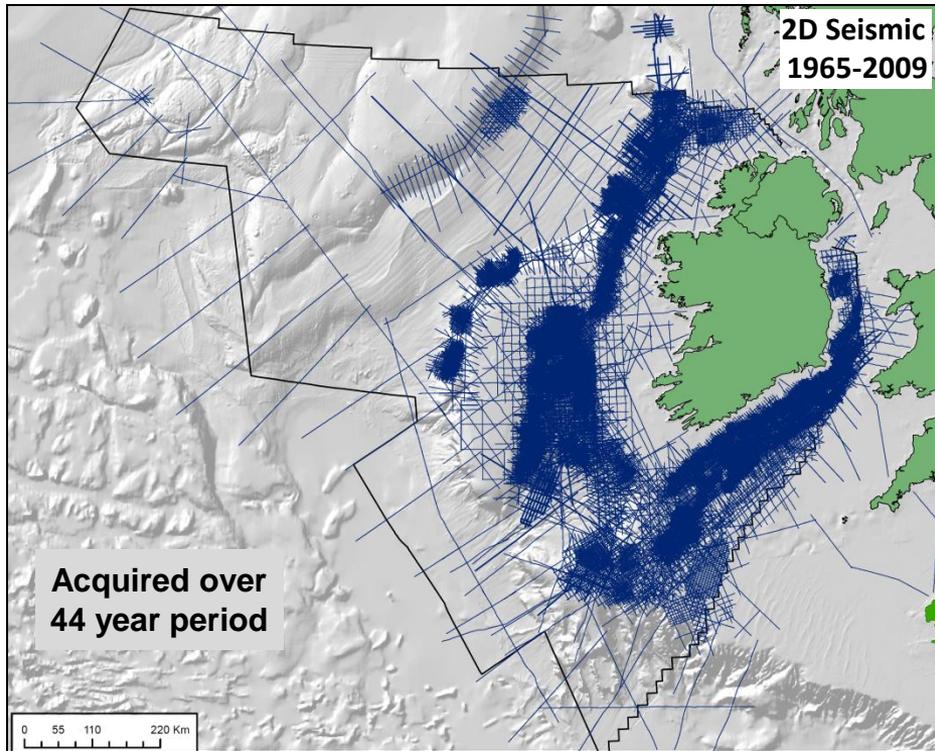


Since 2010 the Irish Offshore has seen extensive acquisition of long offset high quality seismic data both regional 2D and large 3D surveys

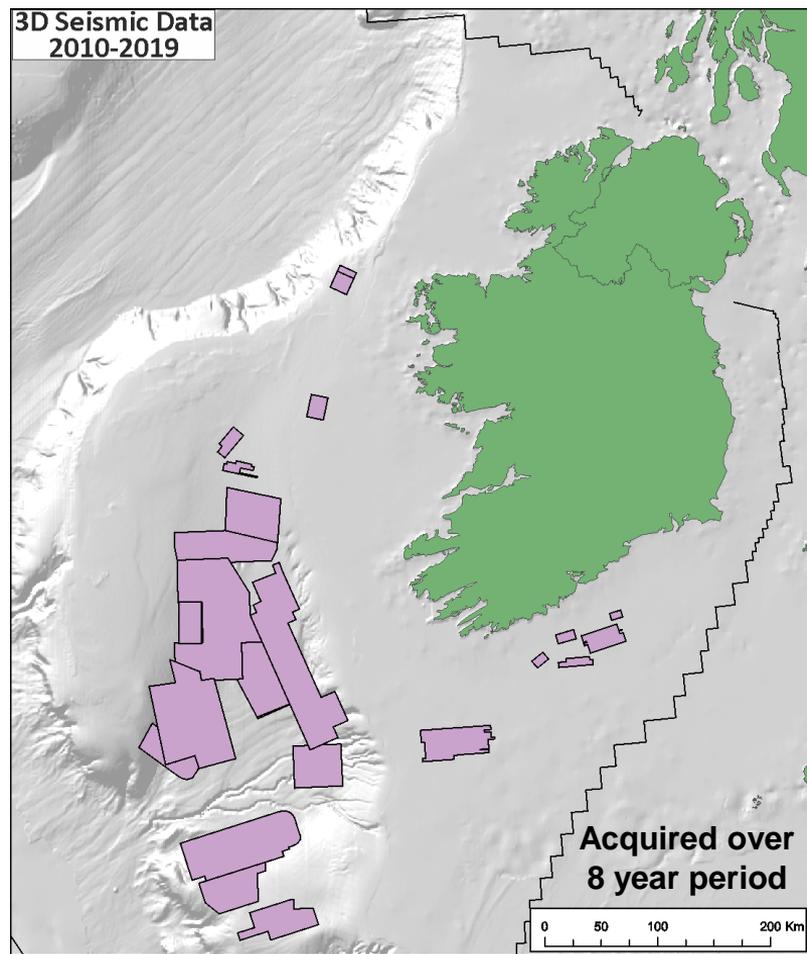
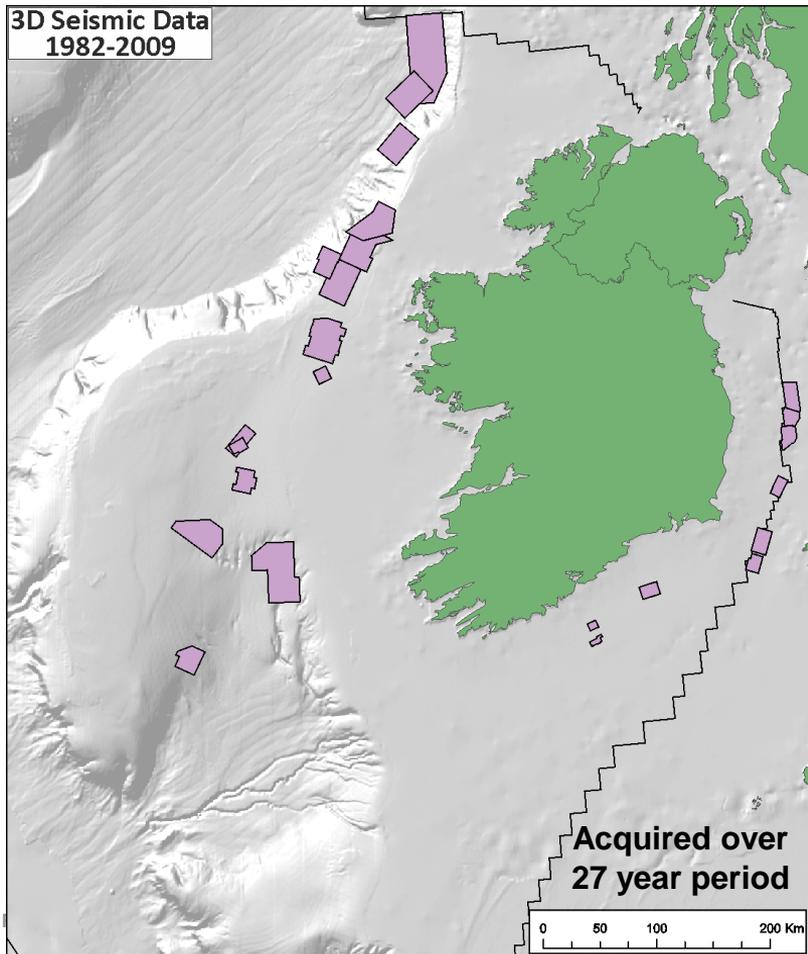


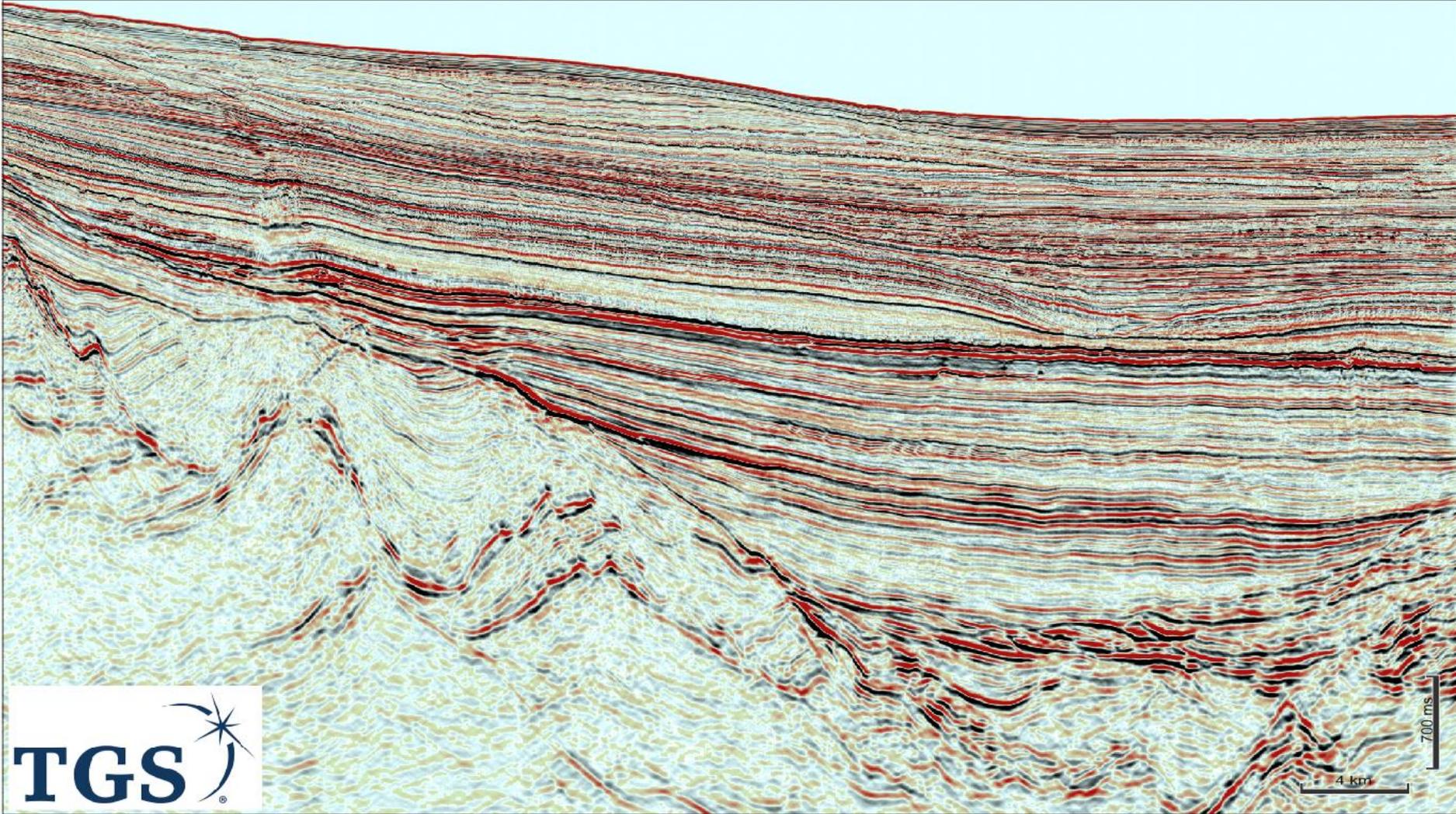
However no seismic acquisition in 2018 and 2019

2D Seismic Data acquired Offshore Ireland

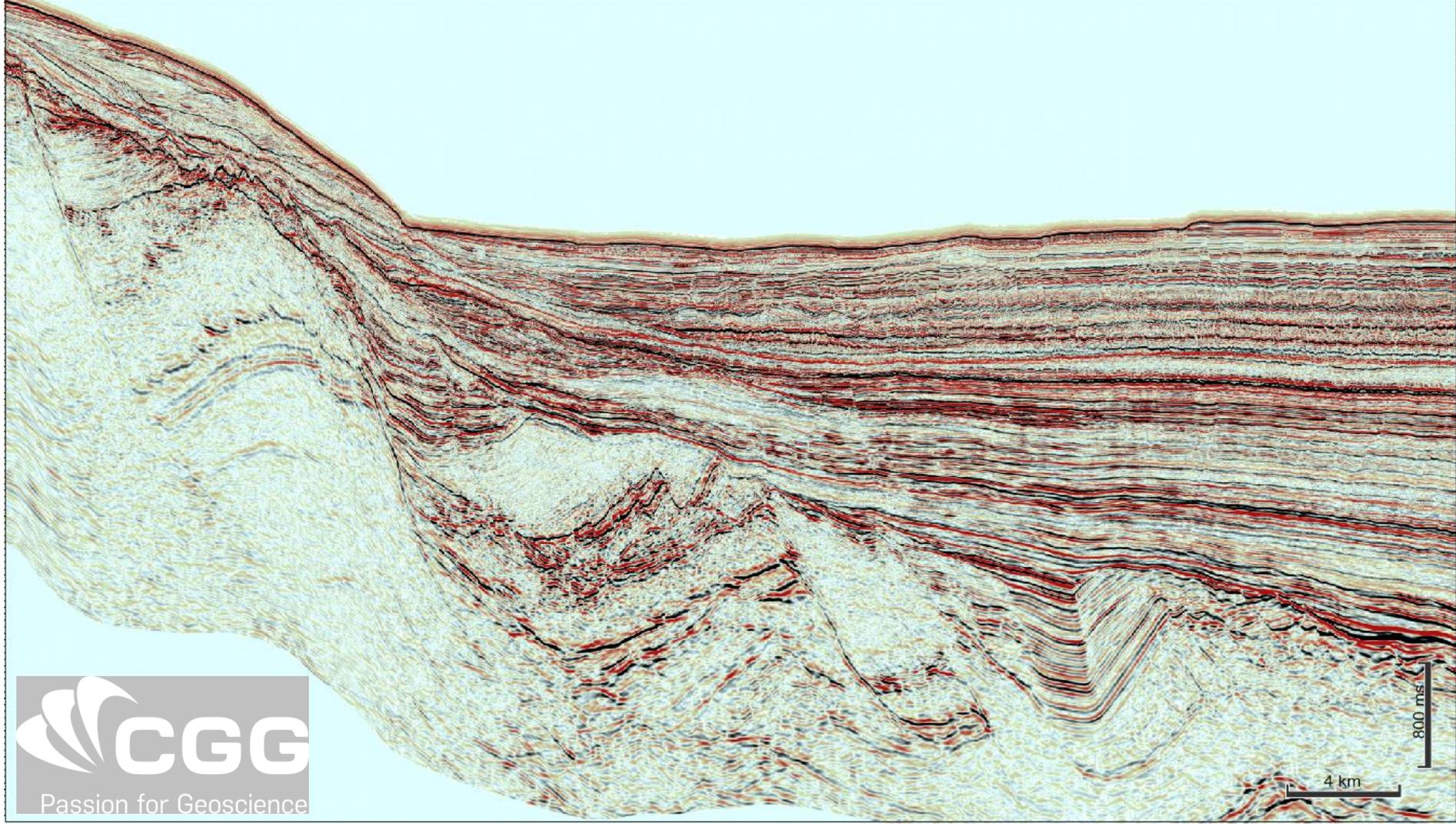


3D Seismic Data acquired Offshore Ireland





700 ms
4 km



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

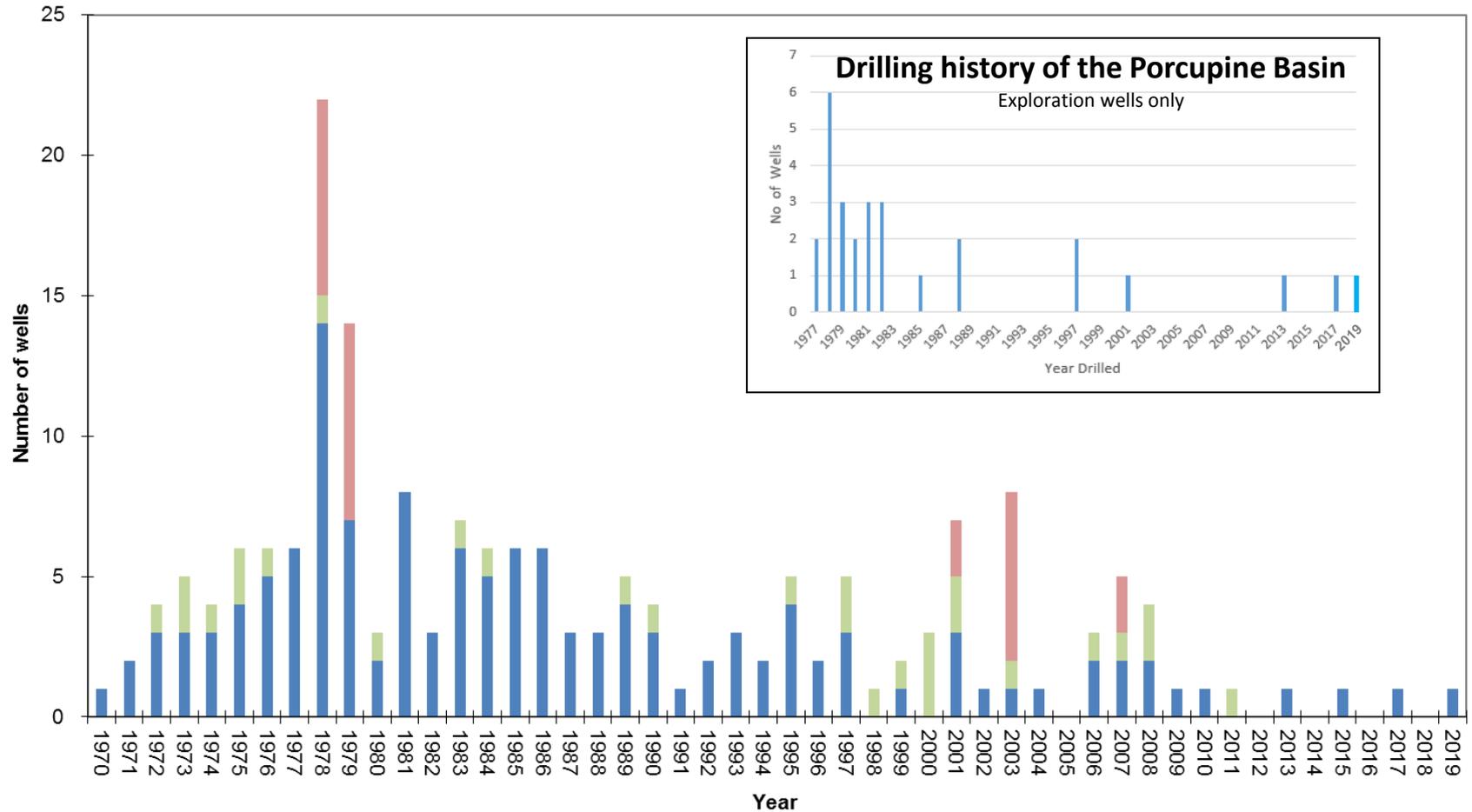


SURVEY AIMS

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

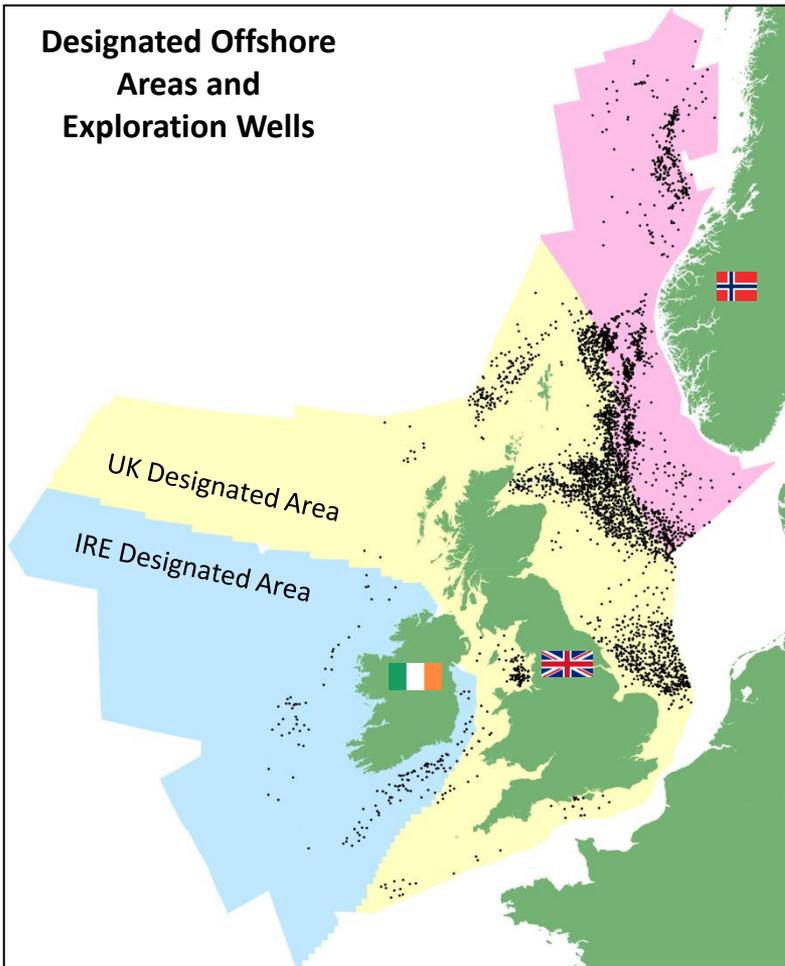
- Accurately determine water depths;
- Provide information on depth of sediments overlying chalk bedrock and to identify and map any chalk exposures;
- Provide information to inform archaeological assessments of the sites;
- Assess the area for the presence of any Annex 1 habitats (as defined in the 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

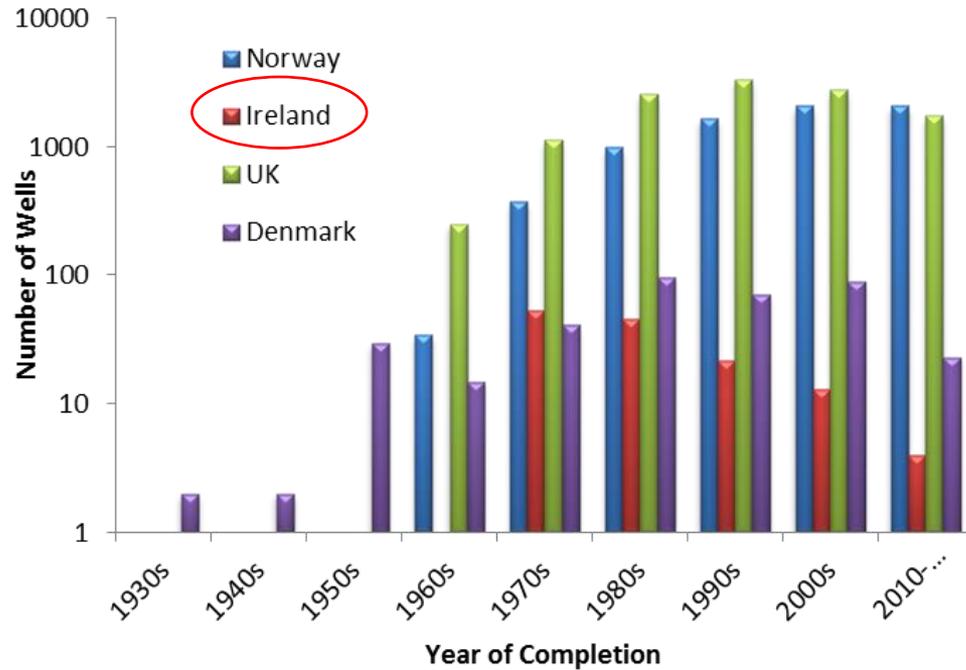




Designated Offshore Areas and Exploration Wells

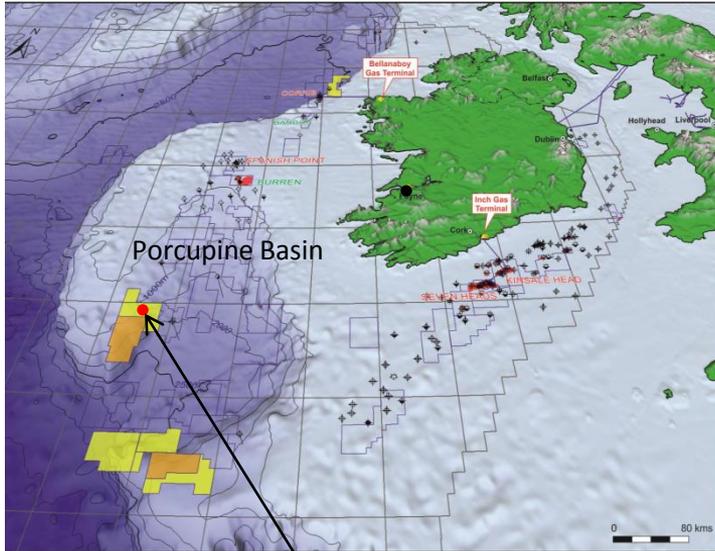


Wells



logarithmic scale

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%

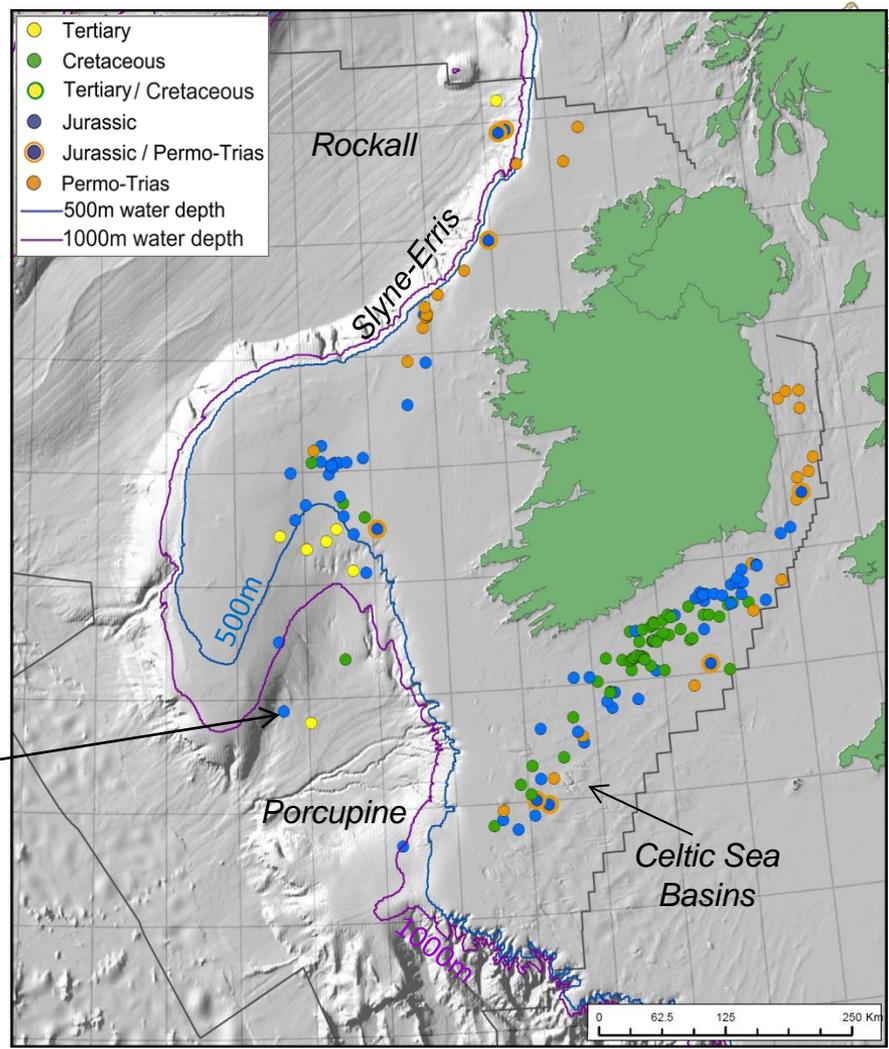
Wells offshore Ireland

Exploration wells:	133
Appraisal wells:	28
Total:	161

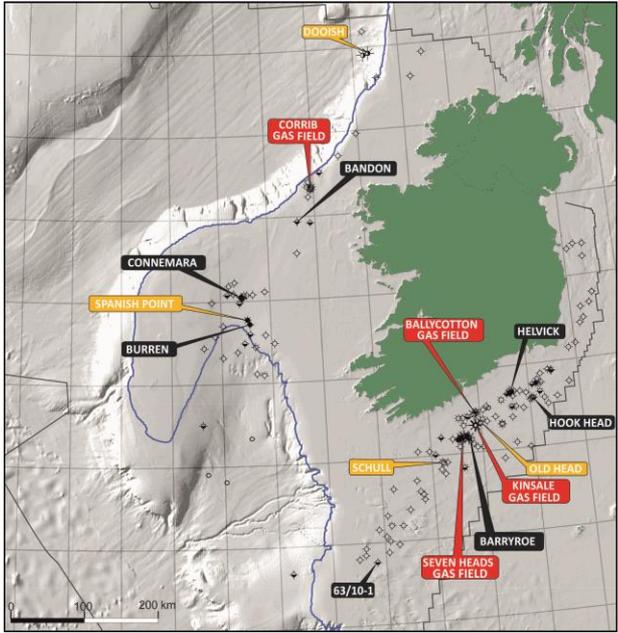
- Only 6 wells >1 km water depths
- Only 12 wells drilled on 3D seismic
(3 wells in Porcupine)
- 2 wells drilled on post-2000 2D seismic

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

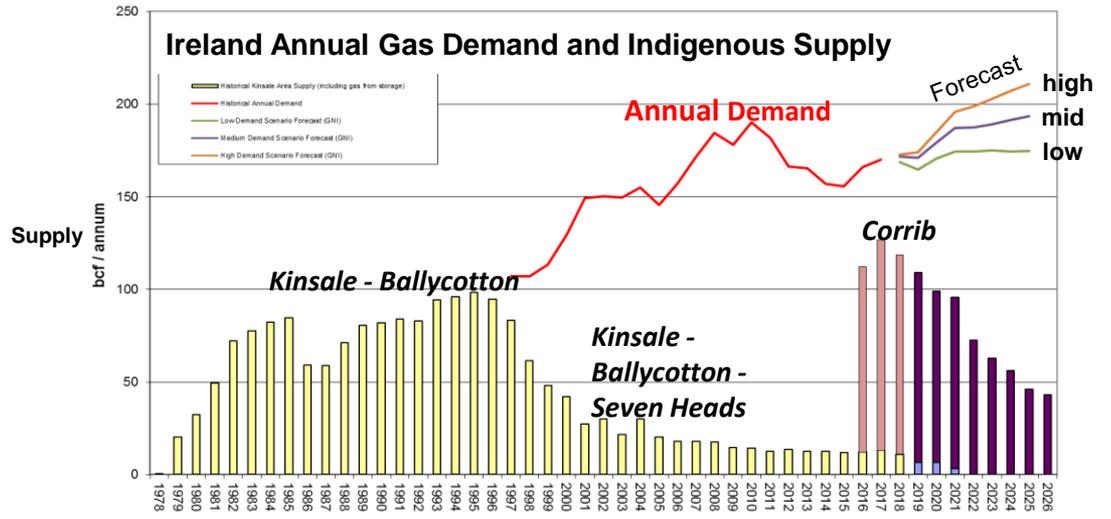
IOLAR 52/04-1



Production



Fields and discoveries offshore Ireland



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

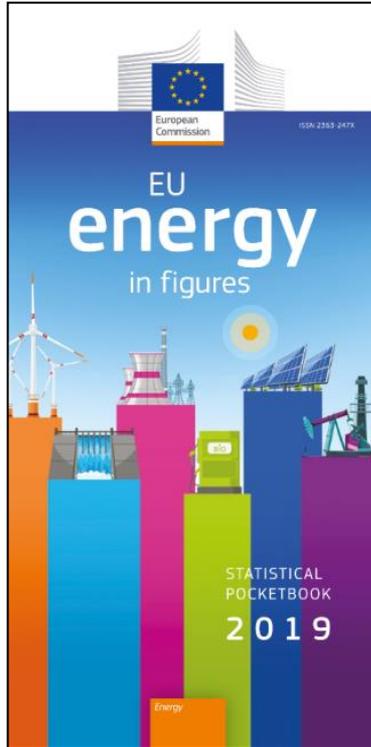
Production – Corrib gas Field



- 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 Ireland's gas demand *

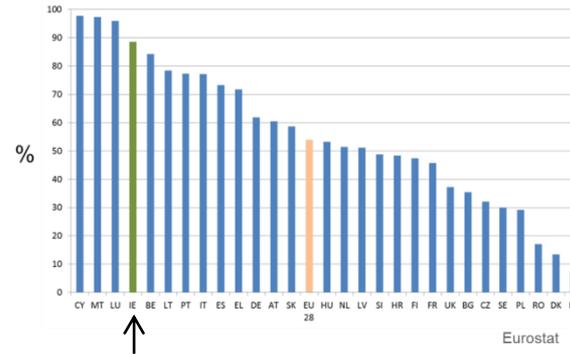
* projections based on Gas Network Ireland's Network Development Plan (May 2018).

Production from Corrib Gas Field

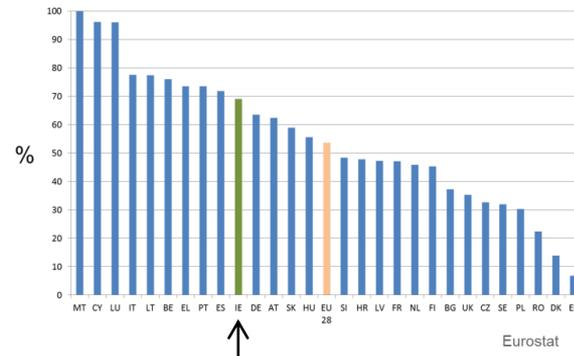


The latest version of the Commissions Energy Statistics handbook (September 2019)

EU 28 Energy Import Dependency 2015



EU 28 Energy Import Dependency 2016

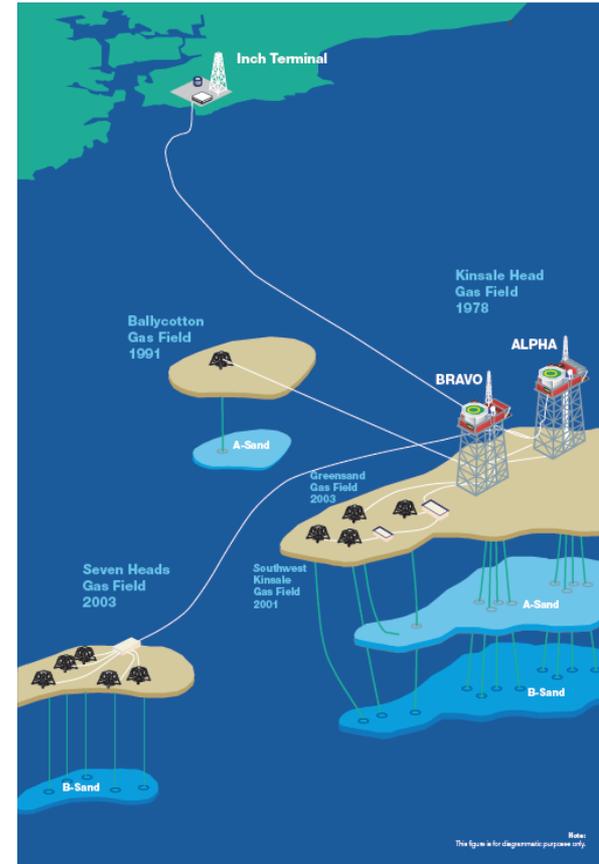


**Reduction due to Corrib impact.
Ireland remains above EU average**

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.napsa.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 overall aim of **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

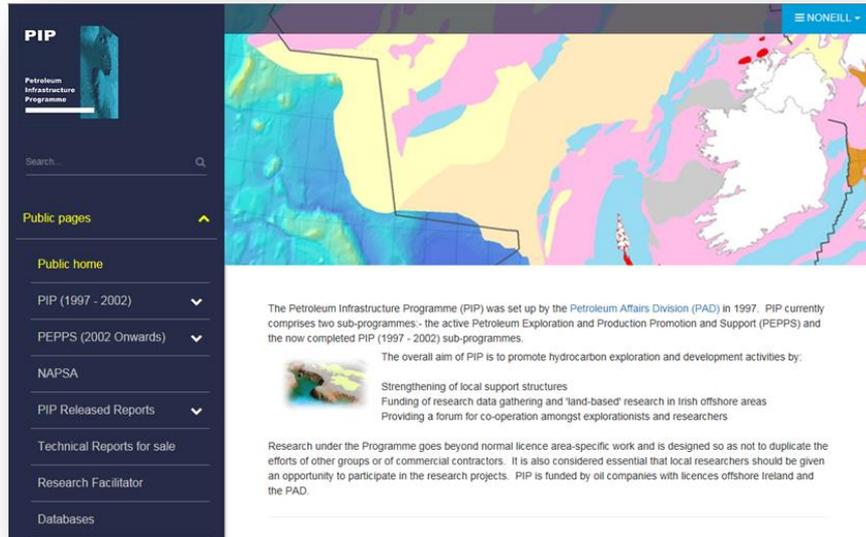
Irish Centre for Research in Applied Geosciences (iCRAG)

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



PIP
Petroleum
Infrastructure
Programme

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Public pages

Public home

PIP (1997 - 2002)

PEPPS (2002 Onwards)

NAPSA

PIP Released Reports

Technical Reports for sale

Research Facilitator

Databases

NONOELL

The Petroleum Infrastructure Programme (PIP) was set up by the Petroleum Affairs Division (PAD) in 1997. PIP currently 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:

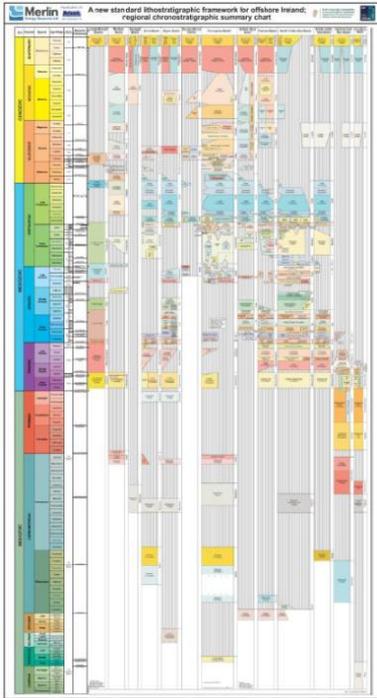
- Strengthening of local support structures
- Funding of research data gathering and "land-based" research in Irish offshore areas
- Providing a forum for co-operation amongst explorationists and researchers

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 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.

- 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.**

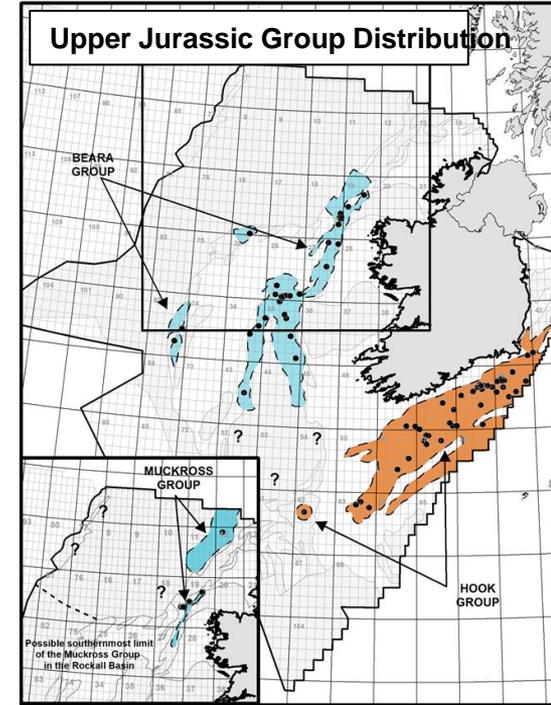
New Stratigraphic Chart & Nomenclature

Regional & Basin Specific Interpreted Horizons

Updated Well Tops, Summary Logs & Type Wells

New Biozonation Scheme

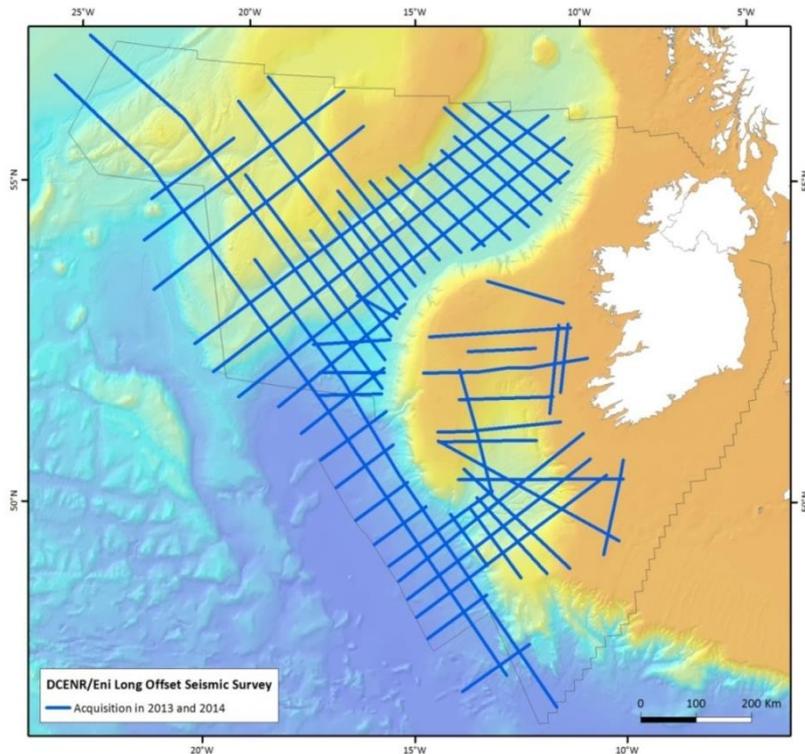
Rock Unit Distribution & Paleofacies Maps



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

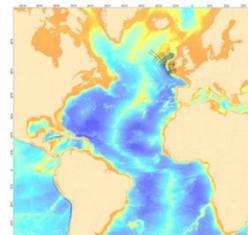
Visit PAD booth

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



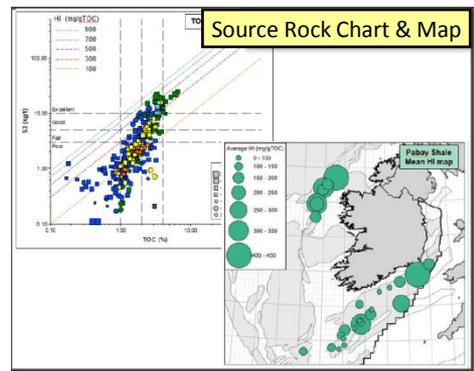
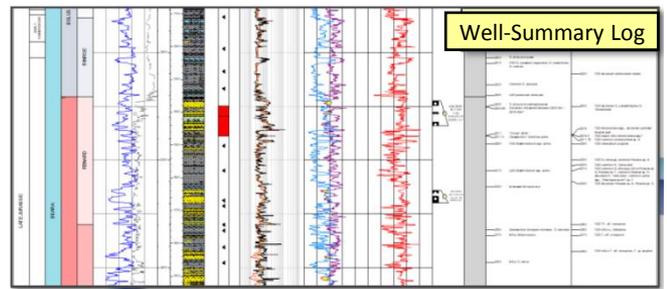
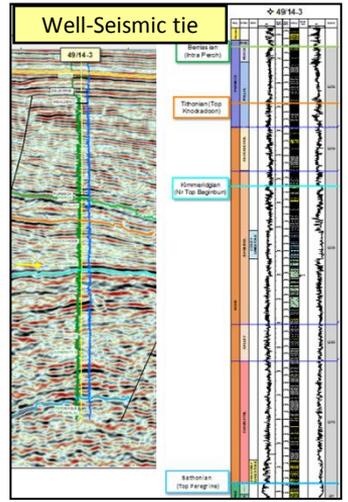
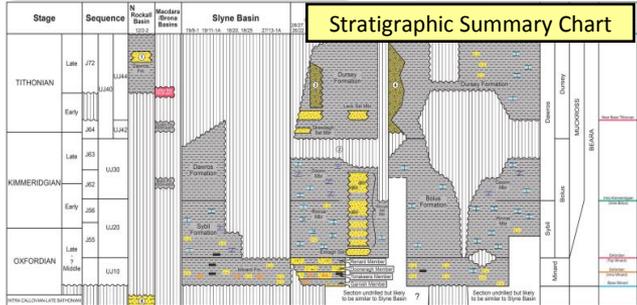
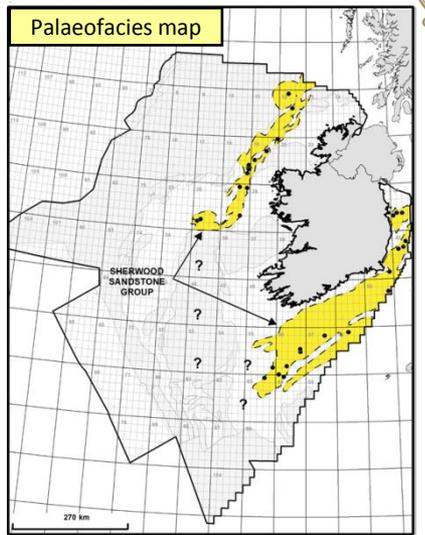
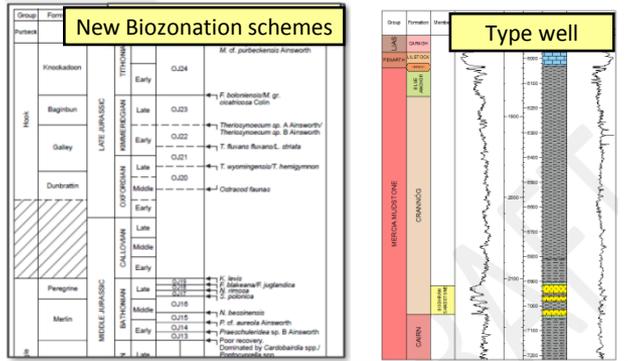
Data

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
- 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

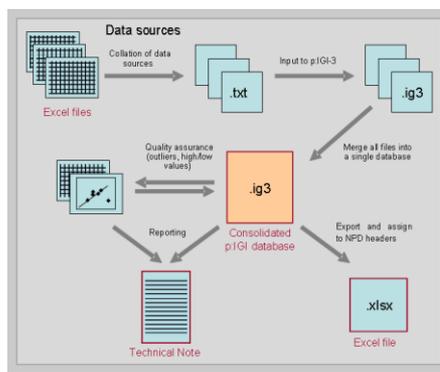
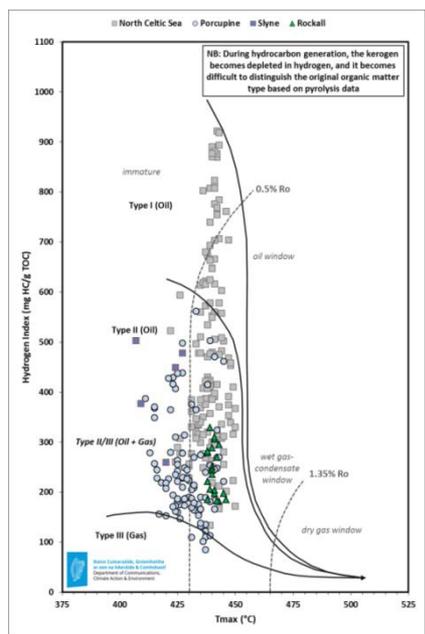
Trans- Atlantic Source Rock Study - New Geochemistry Database



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_v)	3,179
Gas chromatography (GC)	1,182
GC-MS (biomarkers)	389
Gasoline composition	470
Bulk fraction carbon isotopes	252
Gas fraction carbon isotopes	2,118
Gas carbon isotopes	206



Stratigraphy	ID	Sample type	Depth (m)	TOC (%)	S1 (wt %)	S2 (wt %)	S3 (wt %)	H	IR	ER	Tmax	Comments	Comments	Lab
U-CAMPANIAN	C191	Core	3630	0.78	0.19	0.19	0.02	231	199			SH11		Robertson.Pac
U-CAMPANIAN	C192	Core	3630	0.75	0.25	0.25	0.02	430	295	304		SH11	After extraction	Robertson.Pac
L-CAMPANIAN	C193	Core	3796	0.76	0.26	0.26	0.02	199	217	262		SH11		Robertson.Pac
L-CAMPANIAN	C194	Core	3796	0.75	0.26	0.26	0.02	460	217	304		SH11		Robertson.Pac
L-CAMPANIAN	C195	Core	3722	0.82	0.20	0.20	0.02	600	94	301		SH11		Robertson.Pac
L-CAMPANIAN	C196	Core	3722	0.79	0.20	0.20	0.02	171	222	308		SH11	After extraction	Robertson.Pac
CONACIAN	C197	Core	2683	0.82	0.20	0.20	0.02	482	197	272		SH11		Robertson.Pac
CONACIAN	C198	Core	2683	0.84	0.20	0.20	0.02	331	200	271		SH11	After extraction	Robertson.Pac
CONACIAN	C199	Core	2676	0.87	0.20	0.20	0.02					SH11		Robertson.Pac
CONACIAN	C200	Core	2681	0.77	0.20	0.20	0.02	106	204	262		SH11		Robertson.Pac
CONACIAN	C201	Core	2681	0.85	0.20	0.20	0.02	294	195	267		SH11	After extraction	Robertson.Pac
TURFONIAN	C202	Core	2683	0.83	0.24	0.24	0.02	260	120	170		SH11	After extraction	Robertson.Pac
TURFONIAN	C203	Core	2685	0.86	0.20	0.20	0.02					SH11	After extraction	Robertson.Pac
L-TURFONIAN	C204	Core	2687	0.88	0.21	0.21	0.02	368	93	272		SH11	After extraction	Robertson.Pac
L-TURFONIAN	C205	Core	2620	0.84	0.20	0.20	0.02					SH11	After extraction	Robertson.Pac
L-TURFONIAN	C206	Core	2630	0.83	0.25	0.25	0.02	328	170	176		SH11	After extraction	Robertson.Pac
TURFONIAN	C207	Core	2644	0.89	0.20	0.20	0.02	289	163	172		SH11	After extraction	Robertson.Pac
L-ORE TACEOUS-4	C208	Core	4001	0.28	0.01	0.01	0.01	175	151	268		SH11		Robertson.Pac
L-ORE TACEOUS-4	C209	Core	4001	0.28	0.01	0.01	0.01	170	123	170		SH11	After extraction	Robertson.Pac
L-ORE TACEOUS-4	C210	Core	4002	0.84	0.25	0.25	0.02	271	74	251		SH11		Robertson.Pac
L-ORE TACEOUS-4	C211	Core	4019	0.82	0.24	0.24	0.02	249	19	266		SH11		Robertson.Pac
L-ORE TACEOUS-4	C212	Core	4020	0.75	0.27	0.27	0.02	16	96	177		SH11	After extraction	Robertson.Pac
L-ORE TACEOUS-4	C213	Core	4027	0.87	0.27	0.27	0.02	201	93	245		SH11		Robertson.Pac
L-ORE TACEOUS-4	C214	Core	4027	0.87	0.27	0.27	0.02	201	147	266		SH11	After extraction	Robertson.Pac
L-ORE TACEOUS-4	C215	Core	4046	0.47	0.02	0.02	0.02	262	56	260		SH11	After extraction	Robertson.Pac
L-ORE TACEOUS-4	C216	Core	4051	0.18	0.01	0.01	0.01	202	56	260		SH11		Robertson.Pac
L-ORE TACEOUS-4	C217	Core	4051	0.28	0.01	0.01	0.01	248	101	263		SH11	After extraction	Robertson.Pac
L-ORE TACEOUS-4	C218	Core	4073	0.32	0.02	0.02	0.02	176	121	265		SH11	After extraction	Robertson.Pac
L-ORE TACEOUS-4	C219	Core	4076	0.3	0.01	0.01	0.01	176	121	265		SH11		Robertson.Pac

Upper Jurassic - by Basin

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

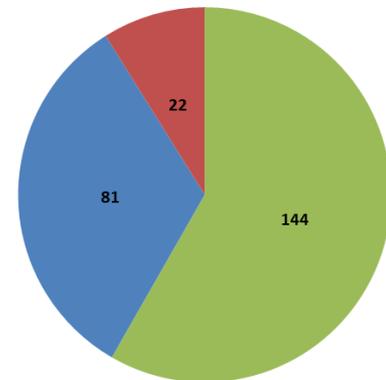
There has been a significant increase in volumes of data acquired in recent years.

Technical Data Archive – Corestore, Dataroom

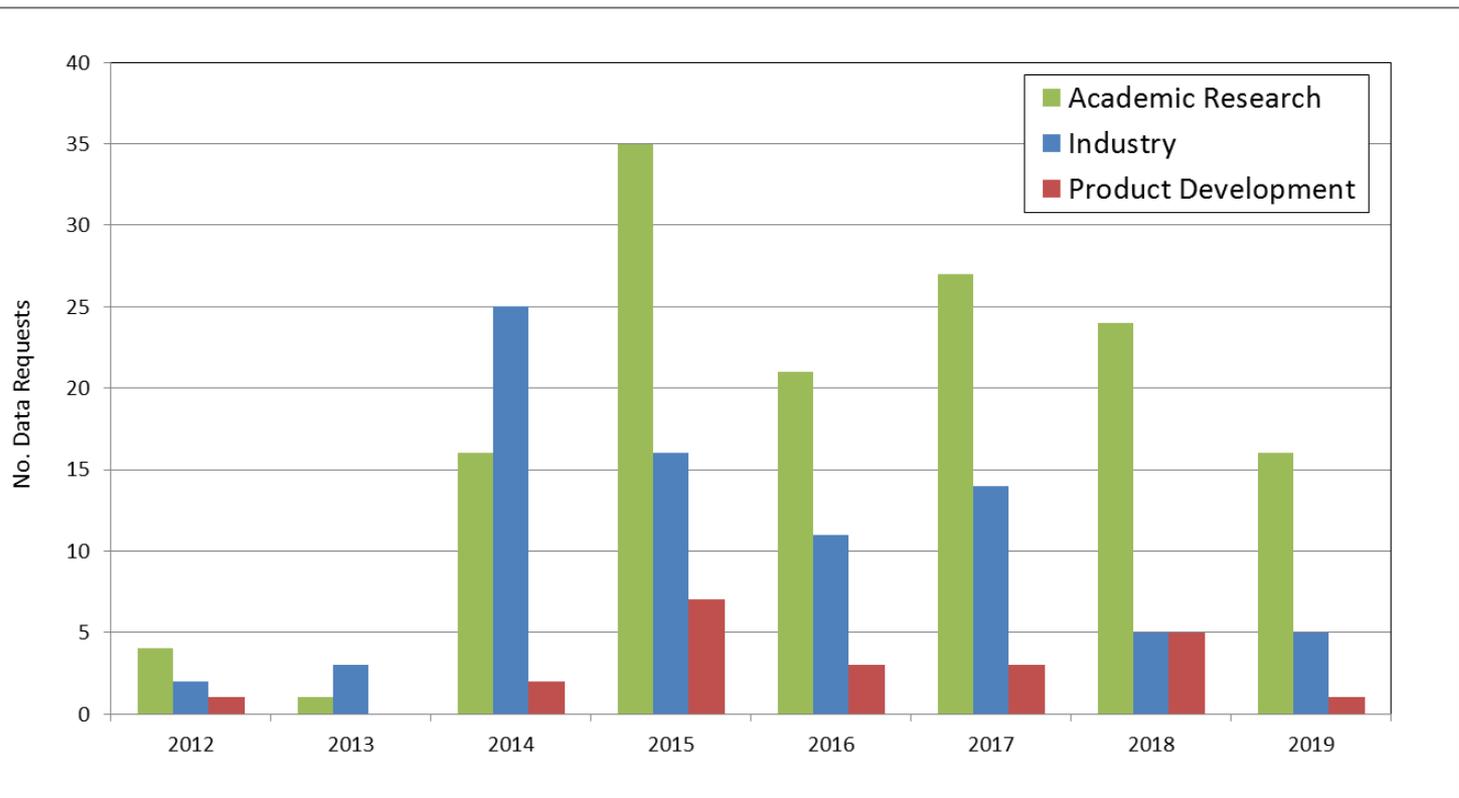
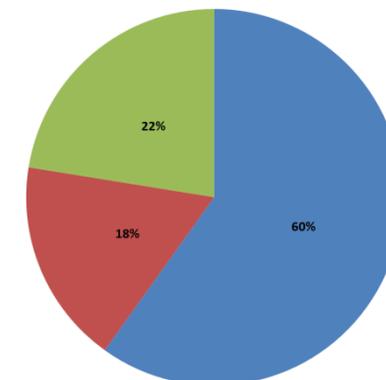
Technical Data



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

1000m maximum water depth

200m maximum water depth

Rialtas na hÉireann
Government of Ireland

Oil and Gas form in large empty spaces underground?

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.

Seismic Data and Modern Examples

Plan view of a number of channels (Barrabojon) flow, New Zealand

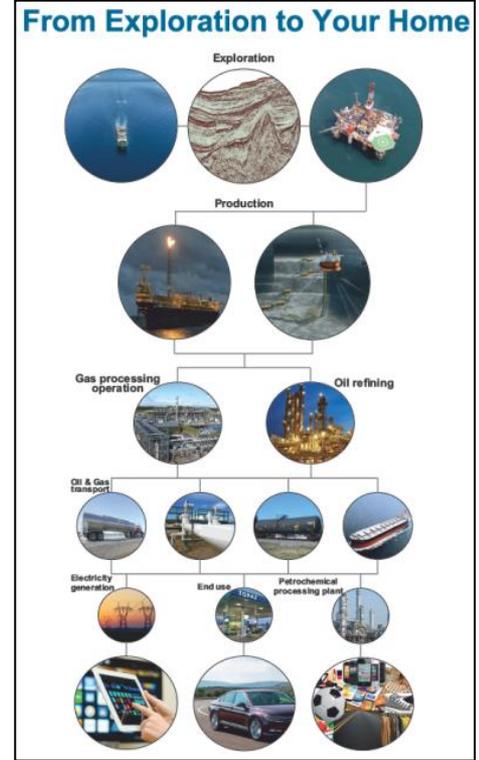
Cross section of ancient subs sea system with numerous channels eroding into older channel deposits and ridges of sand giving it an optical depth expression on seismic data.

A 200m thick sandstone reservoir that has been drilled and is now producing oil and gas. Carbonate rocks make up a lot of sedimentary rocks when primary components are carbonate in origin, which commonly contain calcification (limestone) and magnesium (dolomite) (carbonates).

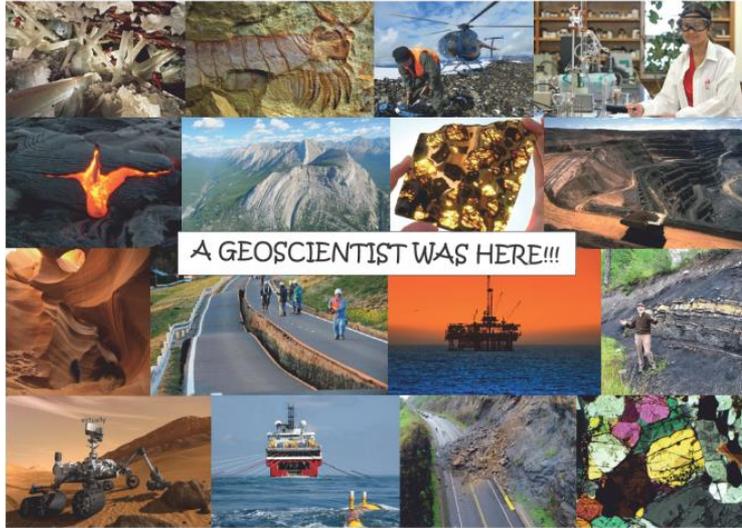
15 million year old (Eocene) carbonate flow with younger rocks

Map of the sea floor of the Porcupine basin off the west coast of Ireland and shows another through a greater size and their shape seen on seismic data.

INFOBAR



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

I R E L A N D

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T H E A B U N D A N T O N E



Rialtas na hÉireann
Government of Ireland

Go raibh maith agat

Thank you