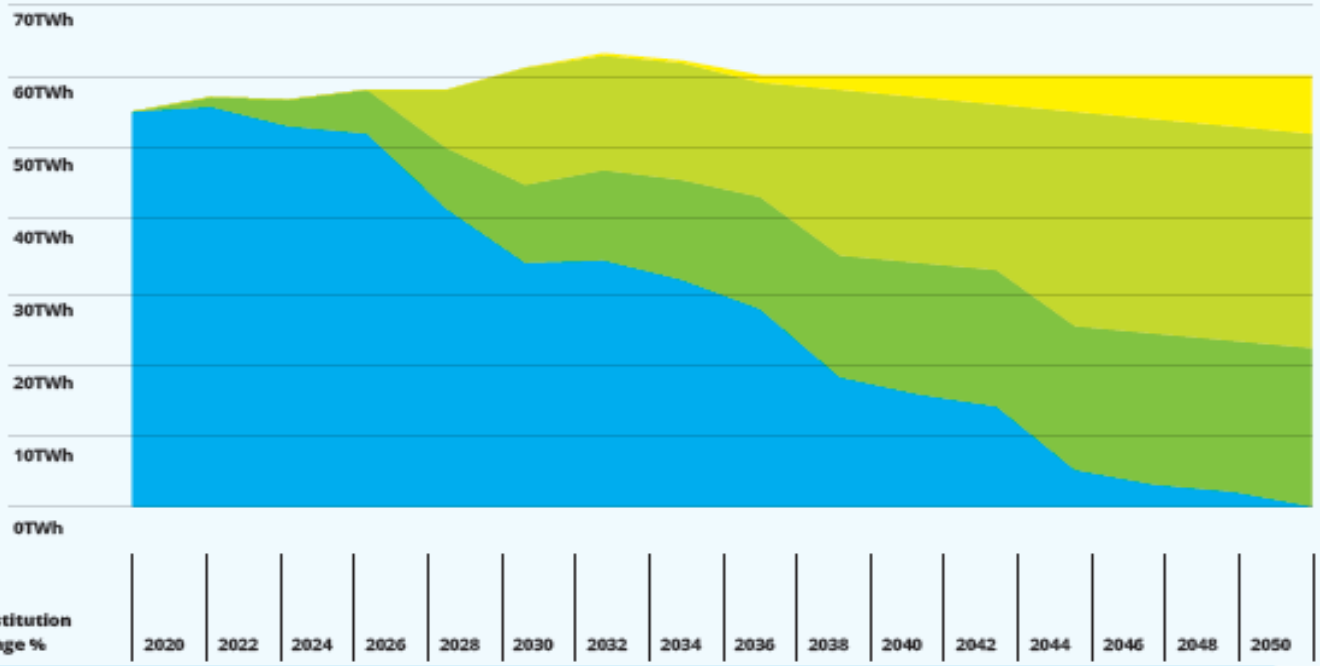
EU Innovation Workshop

10th December 2019

Vision 2050 - for Ireland's Gas to be net zero carbon – launched in September

ervia

Figure 6: Our vision for a net zero carbon gas network by 2050



Gas constitution percentage %	2020	2022	2024	2026	2028	2030	2032	2034	2036	2038	2040	2042	2044	2046	2048	2050
Abated Natural Gas (with CCS)	0	0	0	0	14	26	25	26	27	38	38	38	50	50	50	50
Hydrogen	0	0	0	0	0	0	0	1	2	3	5	7	8	10	12	13

Vision 2050 – Emission Savings from use of the gas network (total potential 18.7Mt per annum)

Electricity	Industry	Heat	Transport	Agriculture
8.2Mt	2.7Mt	2.6Mt	2.8Mt	2.4Mt

Natural gas currently contributes 1/6th of Irelands CO2 emissions. Implementation of Vision 2050 would reduce Irelands emissions by 1/3rd

Potential Carbon Capture & Storage (CCS) models for Ireland

ervia

CAPTURE

- Pre Combustion
- Oxyfuel
- Post Combustion

TRANSPORT

- Pipeline

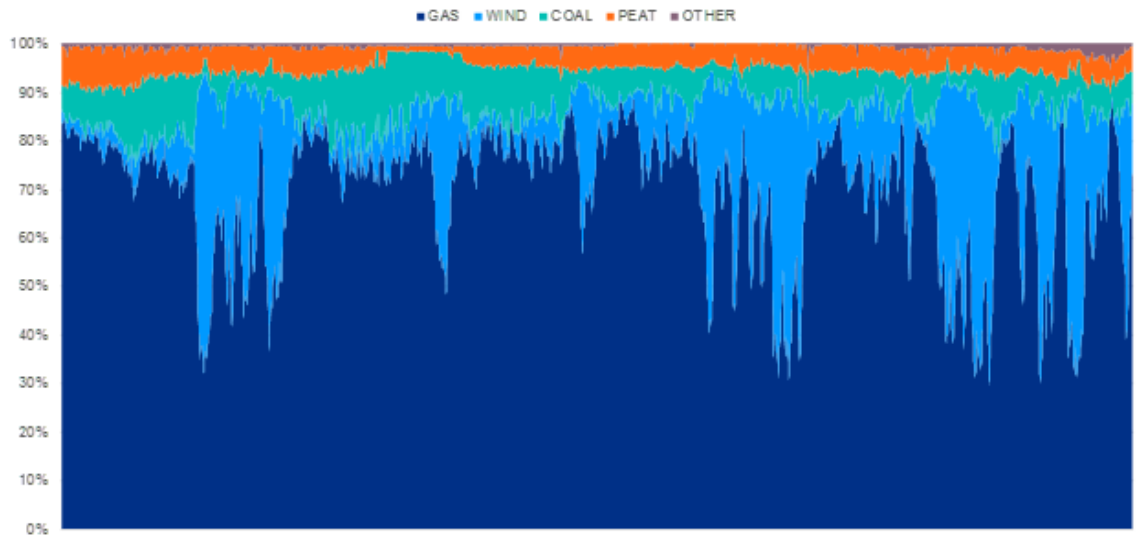
- Ship

STORAGE

- UK 70,000Mt
- Cork 300Mt
- Norway 70,000Mt

- POWER
- INDUSTRY
- HOMES

Why CCS will be needed in Ireland



To support variable electricity renewables

Security of Supply

Longer term, zero emission, electricity Security of Supply

- ✗ Nuclear
- ✗ Hydro
- ✗ Biomass
- ✗ Electrical I/C

- ✓ *CCGT with post combustion CCS*
- ✓ *CCGT or OCGT with pre-combustion hydrogen*

Energy Storage

To provide longer term, zero emissions, energy storage for electricity, heat and transport.

- ✗ Batteries

- ✓ *Blue Hydrogen (with CCS) as pathway to Green Hydrogen*

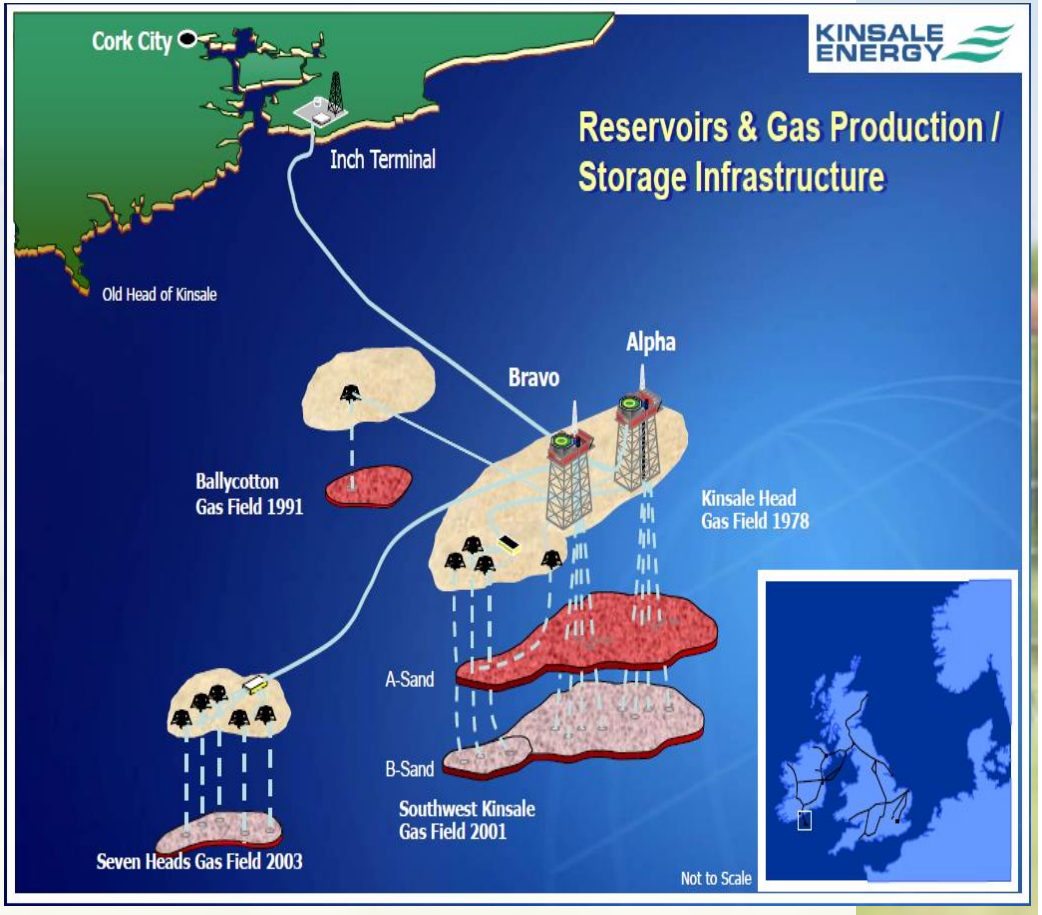
Negative Emissions

To provide a net zero GHG economy

- ✓ *Biomethane with CCGT and CCS*
- ✓ *Negative emission Hydrogen (with biomethane and CCS)*

Cork CCS Feasibility Study

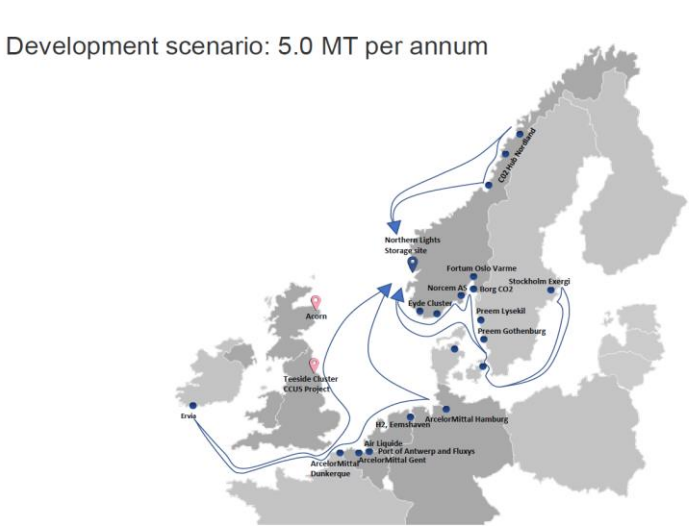
ervia



MoU signed with Equinor to explore export of CO2 to Northern Lights project in Norway

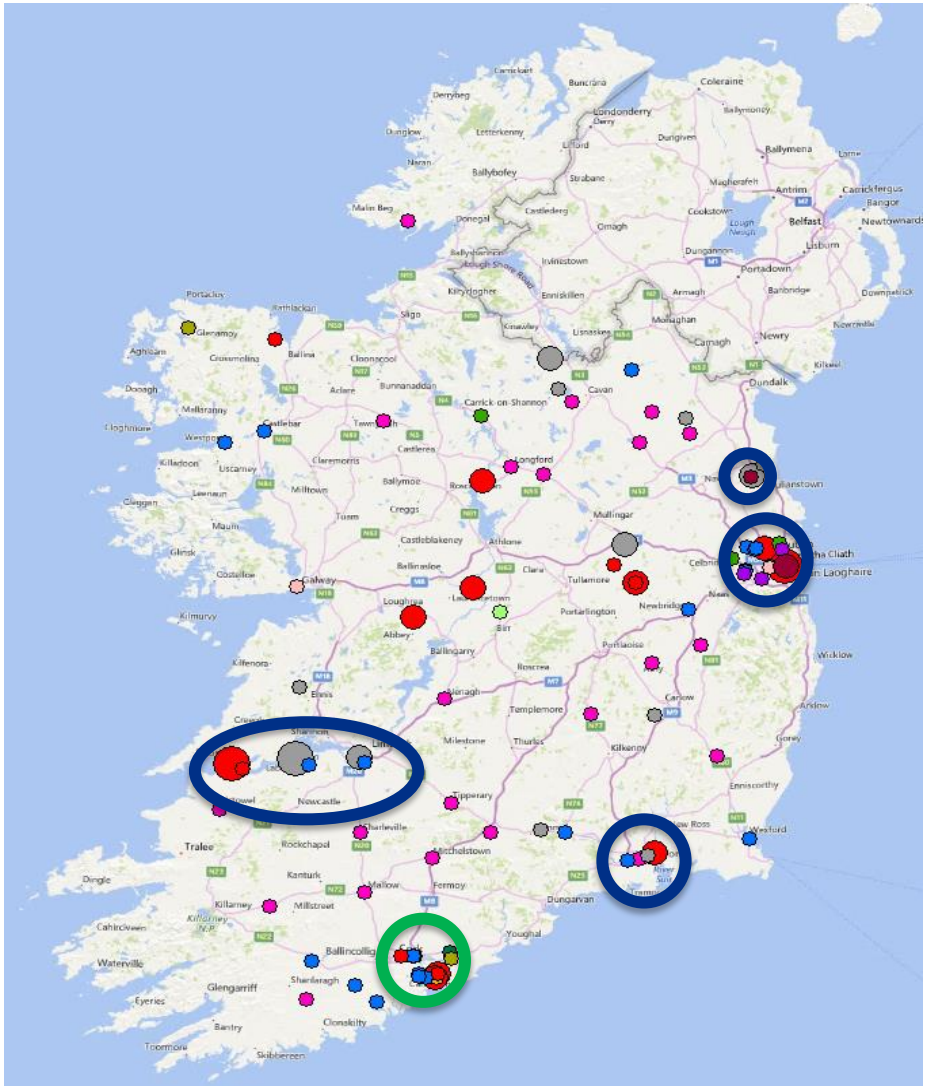
ervia

- Seven MoUs signed by Equinor at CCS Conference 5.9.19
- MOU with Ervia
  - Roadmap towards potential start of operations
  - Logistics studies – storage, shipping etc.
  - CO_2 specifications
  - Joint advocacy



CO_2 Emitters in Ireland with potential electricity and industry Clusters for CCS

ervia



- Potential for five CCS clusters.
- Existing emitters within potential clusters:
  - Gas fired power stations
  - Cement plants
  - Alumina production plant
  - Waste to energy facility
  - Oil refinery
  - Lime production
- Potential to produce emissions free hydrogen with CCS within clusters.

Successful Applications:
Project of Common Interest & Horizon2020

ervia

Project of Common Interest (PCIs)

• Cork CCUS PCI for CO_2 conditioning and transport for storage/export to Norway, Netherlands and Scotland.

• Two application partners - Gasunie & Equinor. Several letters of support.

• **Application approved**

Horizon2020: Carbon capture at oil refinery

• "Realise" application - 10 members led by SINTEF

• Funding of ~€6m.

• Includes UCC, TNO, Equinor, Irving Oil, ESB & BGE.

• Ervia to facilitate pilot plant at Irving Oil refinery & undertake study on the Cork CCUS Cluster.

• **Application approved**

Horizon2020: Geological Storage Pilot

• Geological characterisation of possible storage sites

• €30m funding available for 3 projects

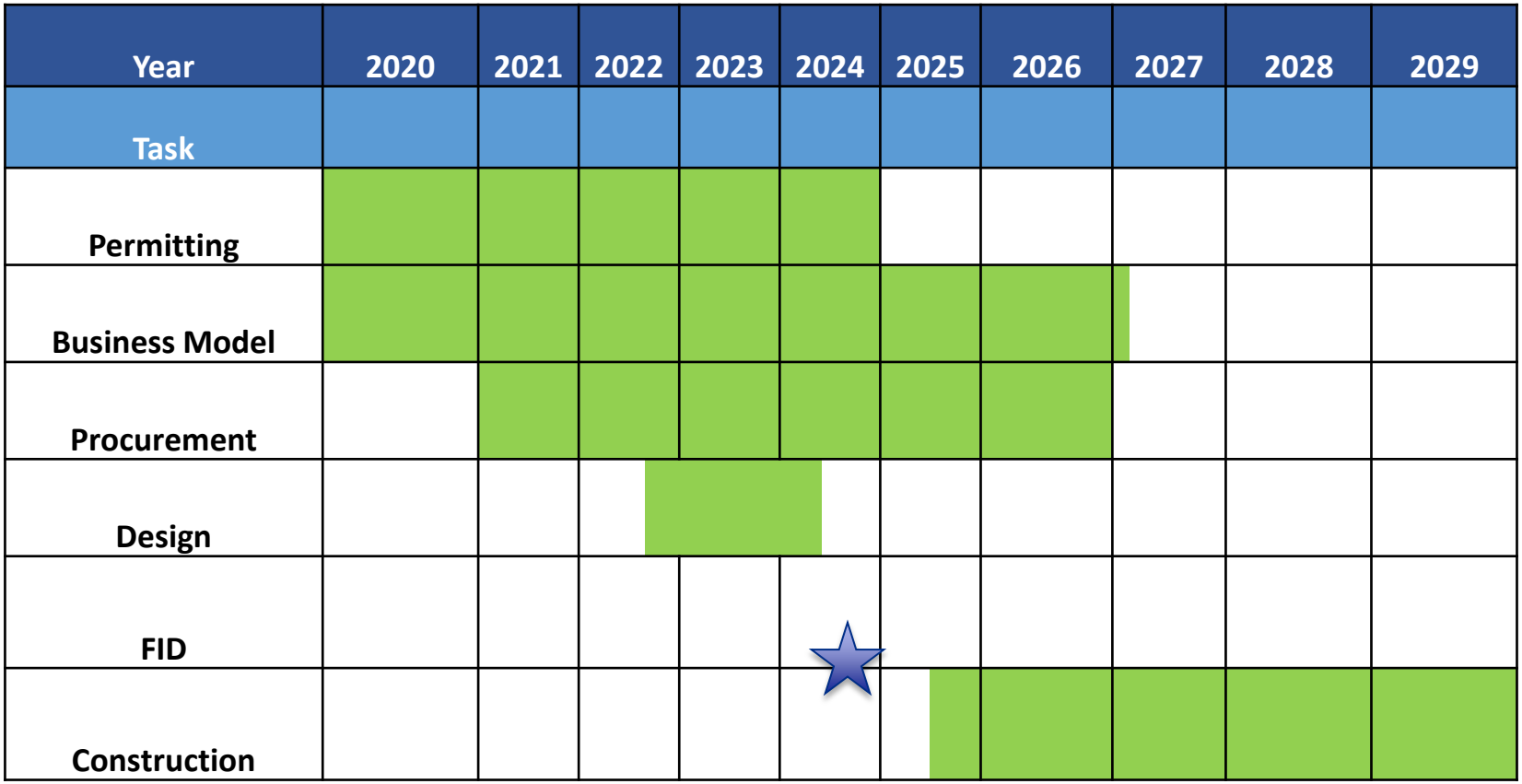
• Assessing potential partners to create consortium

• Characterisation of Kinsale Head gas field for subsequent application for a storage permit.

• Lead partner in the application

Estimated timeline for CCGT power station with CCS

ervia



Estimated timelines could be shortened depending on business models developed, procurement options selected, commercial arrangements etc.

Timelines for Industrial CCS or Blue Hydrogen projects could be shorter.

What Ervia will potentially seek funds for

- Detailed development studies on:
  - Compression, conditioning, transport and storage (interim and permanent) of CO_2 i.e. development of CO_2 networks for power/industry clusters at strategic locations.
  - Capture (for industry and electricity).
  - Hydrogen production (Blue, Negative Emissions and roadmap to Green).
  - Hydrogen transport and storage.
- Development studies of full chain business models on:
  - Electricity market.
  - Industry.
  - Hydrogen (Blue, Negative Emissions and Green).
- Demonstration infrastructure
  - Larger scale CCS for refinery.
  - Slip stream CCS for a CCGT.
  - CCS with Hydrogen (natural gas and/or biomethane).