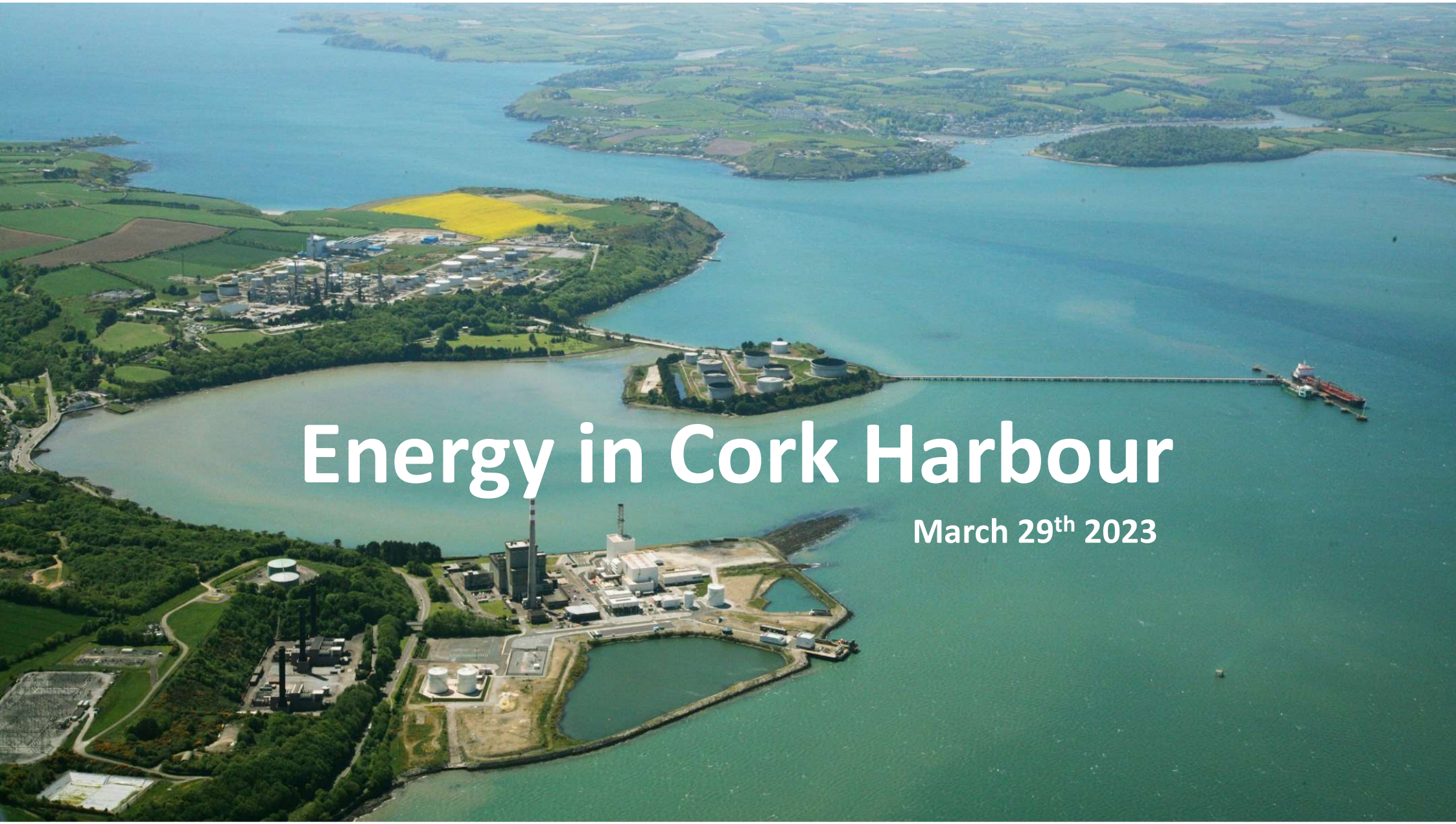
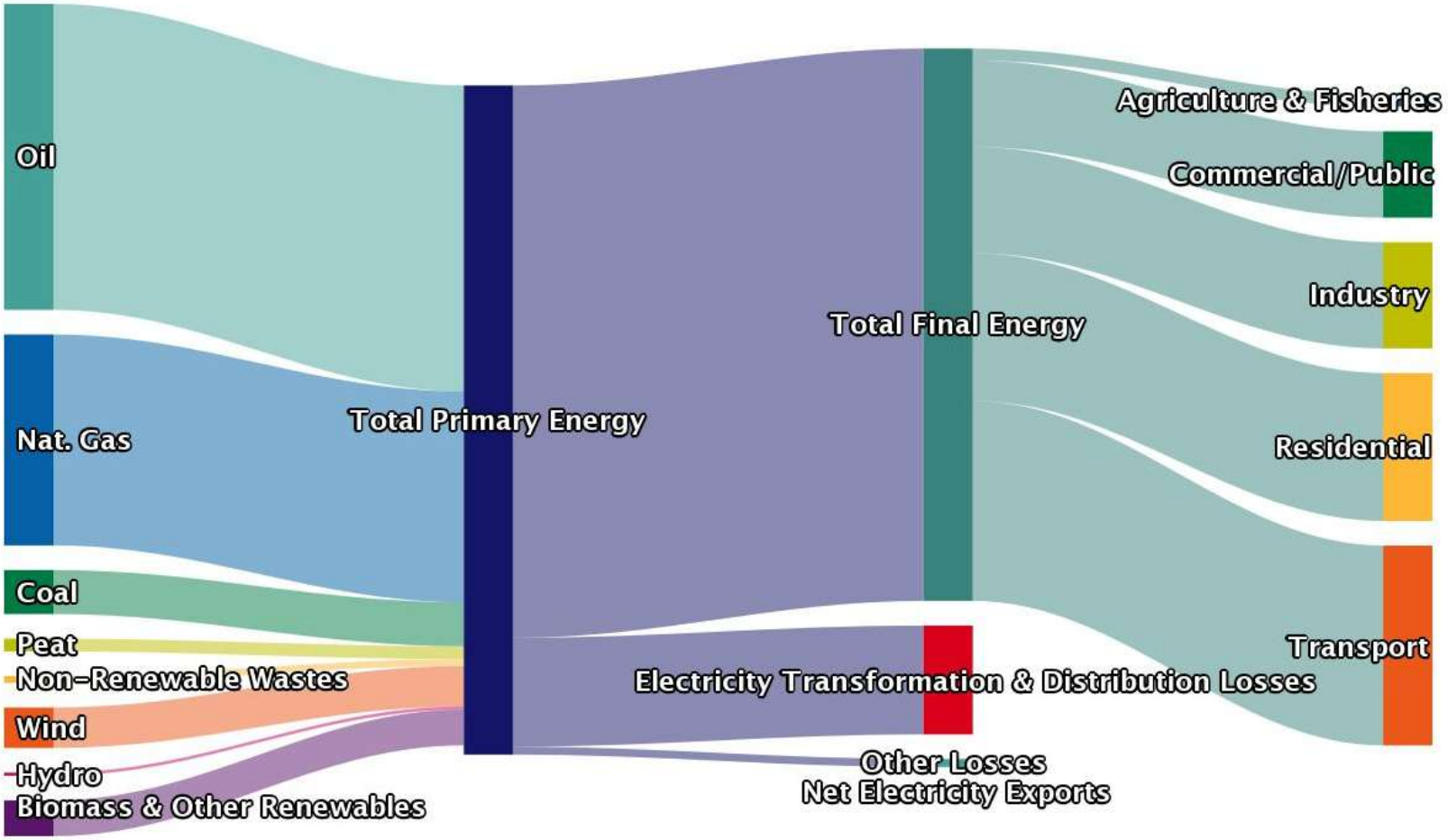


Energy in Cork Harbour

March 29th 2023

Cork Harbour

Total Primary Energy In Ireland 2021



RES Targets Ireland 2020

Overall: 16% Target
Achieved: 13.5%

RES(E): 39.3%
RES(T): 10.2%
RES(H): 6.3%

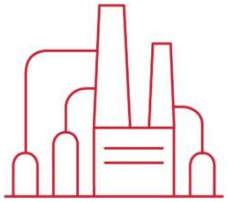
RES Target Ireland 2030: 34.1%

IRVING

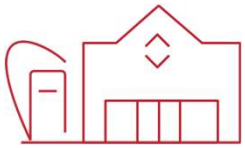
Welcome to the Irving Oil Whitegate Refinery

Who we are

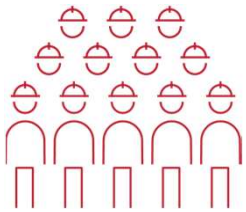
Founded by K.C. Irving in 1924 in his hometown of Bouctouche, New Brunswick, Canada.



Irving Oil Refinery in Saint John, New Brunswick, is the largest in Canada (320k bbls/d). Our Whitegate refinery in Ireland processes 75k bbls/d.



More than 1,100 fuelling locations serve customers throughout the Northeastern United States, Eastern Canada and Ireland.



More than 4,000 employees across all operations in Canada, the United States and Ireland.

Our climate commitments

Our climate goal is to reduce greenhouse gas emissions (Scope 1 and 2) across our business by 30% by the end of 2030 and to actively support the aspirations of all our markets to achieve net-zero emissions by 2050.

Energy efficiency/ process improvements

- Flaring reductions
- Electrification
- Cogeneration
- Increased reliability

Clean fuels

- Fuel switching to lower-carbon fuels (propane, hydrogen, natural gas)
- Biofuel blending, production/ co-processing
- Low-carbon intensity biofuels/ advanced biofuels

Renewable/ alternative energy

- Wind and solar power
- EV charging stations
- Hydrogen fuelling stations/ Hydrogen fuel cells

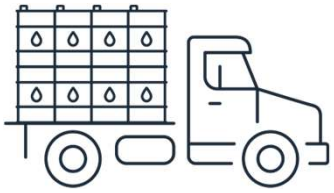
Technologies and partnerships

- Partnerships/ joint ventures
- Green hydrogen/ storage, battery storage
- Carbon capture, storage and use
- Carbon offsets

Taking action to reduce emissions

- At our Whitegate refinery, we blend more than 50% of Ireland's biofuels in diesel and petrol.
- Made with used cooking oil, the renewable diesel has a greenhouse gas emission reduction of over 90% when compared with fossil diesel.
- In 2021, through biofuel blending and renewable diesel production, we have reduced 100,000 tons of carbon emissions (50,000 cars).

Producing 400 barrels per day of renewable diesel



The supply of feedstock is locally sourced – largely from Ireland and others in the European Union

>90%

Renewable diesel production reduces GHG emissions by >90% vs. regular diesel

In 2021, our renewable diesel production equated to taking 50,000 cars off the road through emission reductions

Hydrogen: today and tomorrow 〉

- Hydrogen represents a compelling opportunity as we collectively look to decarbonize.

- Refineries are strategically positioned to accelerate the development of the hydrogen economy.

- Our Whitegate refinery is Ireland's largest producer and consumer of hydrogen – which is a key component of low-carbon liquid fuels.

- At our Saint John refinery, we have finalized an agreement to purchase a hydrogen electrolyzer, which will allow us to explore further hydrogen production to drive emission reductions at the refinery, as well as provide clean energy solutions for downstream customers.

- We have an immediate market for hydrogen within our refineries.

Gas Networks Ireland

Hydrogen & the Gas Network

Hydrogen and Ireland's Gas Network

Ireland’s gas network

Security of Supply

Providing 34% of Irelands primary energy needs. Proven ability in harshest weather conditions.

Flexible

A secure, instantly available energy source which has made renewable deployment possible

Future proofed

One of the safest and most modern gas networks in Europe

14,617km

of gas pipeline could wrap around Ireland’s coastline four times

Diversity

Supplying energy, for 710,000+ connections in power generation, heat and transport

Renewable readiness

€2.7bn network capable of transporting biomethane and hydrogen

Network Evolution

Preparing for Blends- 2023-2030

- Getting the existing gas network ready to accept blends of hydrogen/natural gas at the Moffat Interconnection Point in Scotland and accept green hydrogen injection at certain points on the gas network

Cluster Development- 2023-2030

- Support the development of hydrogen clusters, including the production, storage, transport and end-use of green hydrogen at key locations

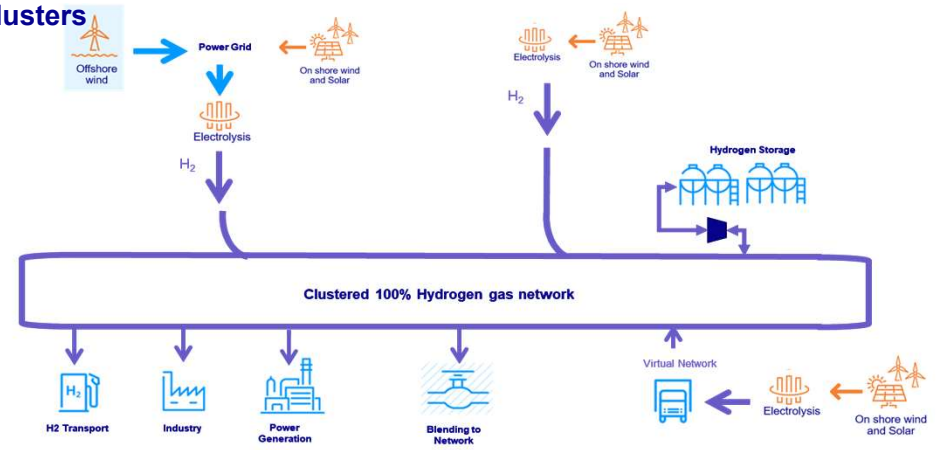
Network Conversion - 2030-2040

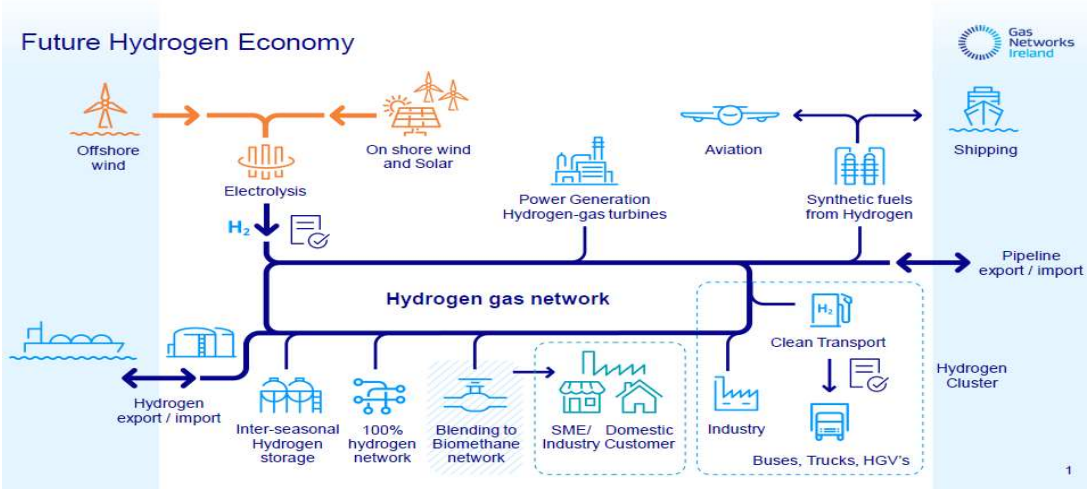
- Hydrogen networks are developed to link these clusters, providing resilience to the energy system and access to decarbonisation for gas dependant customers not in proximity to the clusters.

European Backbone – 2040-2045

- Repurposing one of the existing gas interconnectors to enable green hydrogen export/import, providing energy system resilience and access to the UK and European hydrogen networks

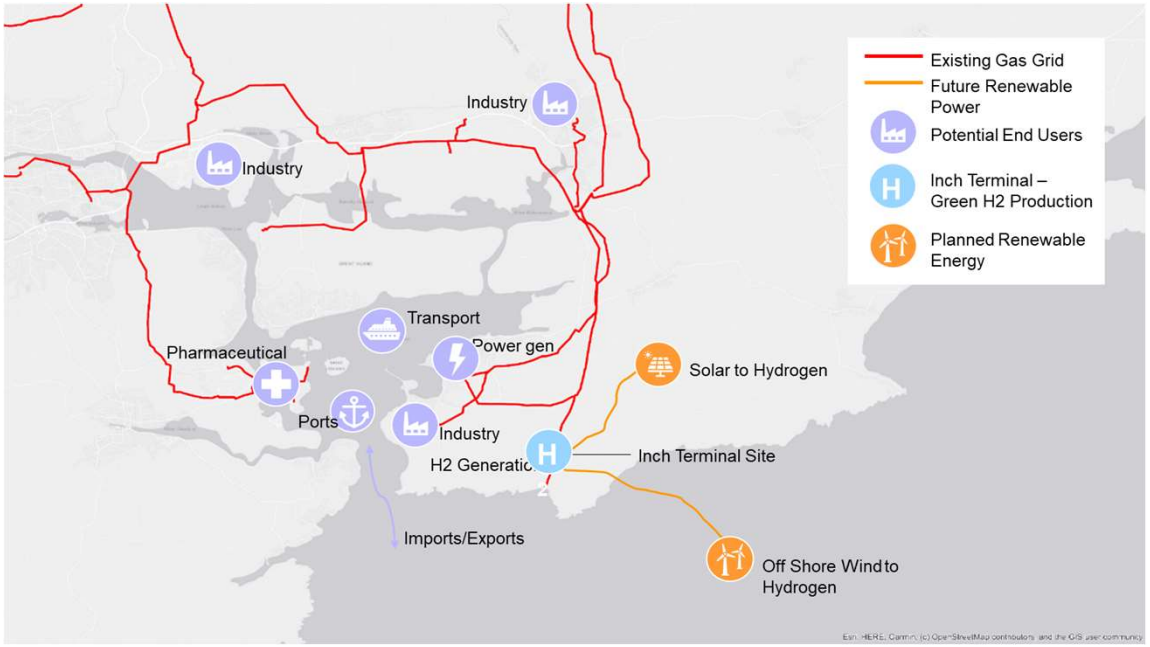
Hydrogen Clusters





Cork Hydrogen Opportunity

- Gas Networks Ireland has significant infrastructure & customers in the area
- Projects progressing on renewable gases in the greater Cork area
  - Graze & Central Grid Injection in Mitchelstown
- Existing pipelines and installations could be repurposed to transport & store hydrogen
  - Linking multiple production & supply sites
  - Managing third party access to H2 infrastructure
  - Storage for network operation
  - Storage for production optimisation
- An initial production of hydrogen in Cork could provide a larger decarbonisation potential through existing networks
  - Can provide initial routes to market through blending
  - Repurposing/new pipeline can provide routes to larger national & internal markets



Gas Networks Ireland

Ireland's Potential Journey

1.3GW
Dedicated Offshore Wind
= 20% H_2 blend ROI

56TWh/yr
Total ROI Gas Demand 2021

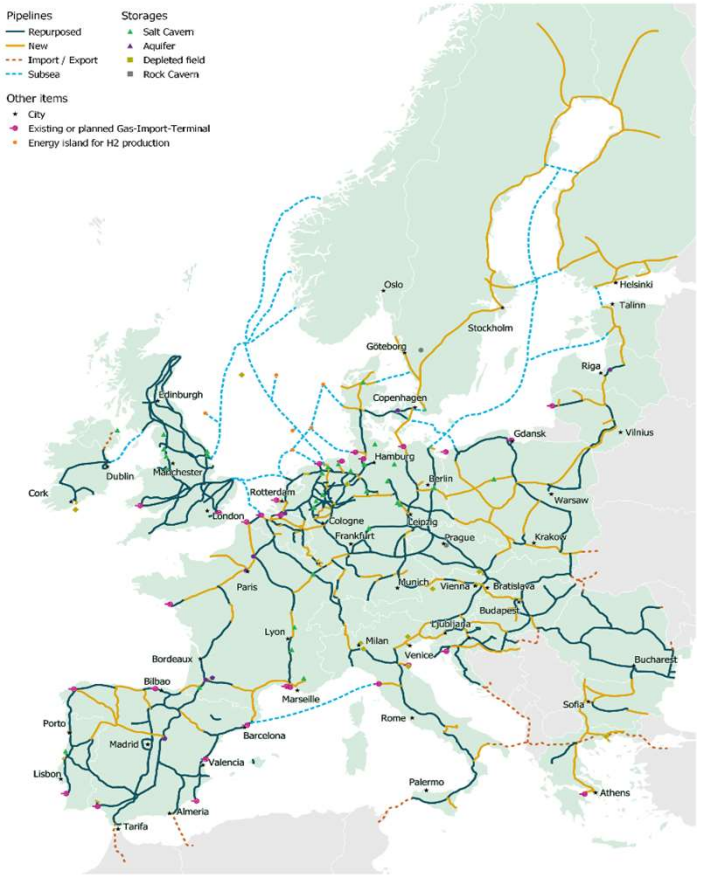
90TWh/yr
Potential for Hydrogen Production (SEAI)

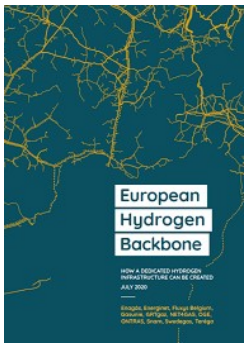
2024: Pilot blending projects commence

2030: Hydrogen infrastructure development as part of clusters

2040: Extensive 100% hydrogen network linking clusters and large users

2050: National 100% hydrogen network. Reversal of interconnector(s) for hydrogen export with potential capacity of circa 18GW





https://ehb.eu/

Simply Blue Group

Who we are

A leading early-stage project developer in the following areas:

- Floating Wind
- E-Fuels
- Sustainable Aquaculture
- Deeper Blue Economy

Headquartered in Cork **Nine offices worldwide**

Cork, Dublin, Edinburgh, Hamburg, Spain, Newquay, Portland, Pembroke, Halifax

SimplyBlueGroup.com

Simply Blue Group

Our Projects & Partners – Ireland & British Isles

In Partnership with:

TotalEnergies subsea 7 Ørsted

Offshore Wind Energy Pipeline 2023

Projects Competing for 2030 Delivery

Over 6,000 MW in development off the West Coast across 7 projects

Over 15,000 MW in development off the East Coast across 18 projects

Over 10,000 MW in development off the South Coast across 11 projects

Key Takeaways:

- Over **31GW** in development competing for 2030 delivery*
- Additional **20GW** in development for post-2030
- Over 15 floating offshore wind projects in development

WIND ENERGY IRELAND

** Indicative figures – full survey will be complete by end February 2023*

Simply Blue Group

We need to look at offshore wind as being part of an energy system, it's about more than the grid.

From Grid…

To Renewable Energy Park Solutions and Synthetic Fuels

Simply Blue Group

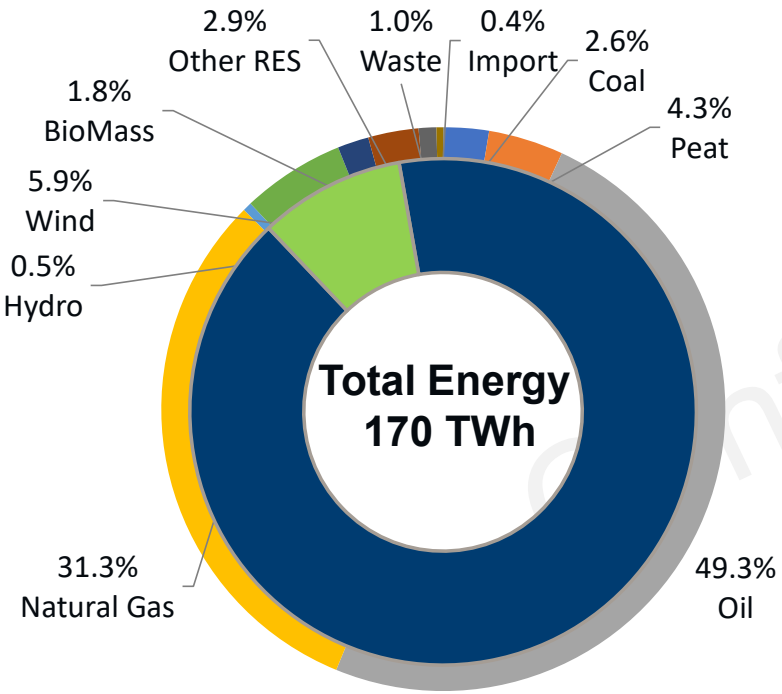
A Renewable Energy Park

- SBG – Irving Oil investigating feasibility to co-develop renewable energy park in Cork
- Creates carbon neutral e-fuels (synthetic fuels) for domestic market (post 2030)
- Creates an export and enterprise opportunity – supply deficit markets
- Can help stabilises the electricity grid (flexible electrolysis)
- Meets EU regulations (e.g. sustainable aviation fuel) and national targets (e.g. Climate Action Plan)
- Provides Route to market for Giga-Watts of FLOW
- Utilises existing oil & gas infrastructure


ESB
Energy for generations
DRIVEN TO MAKE A DIFFERENCE
NET ZERO
BY 2040

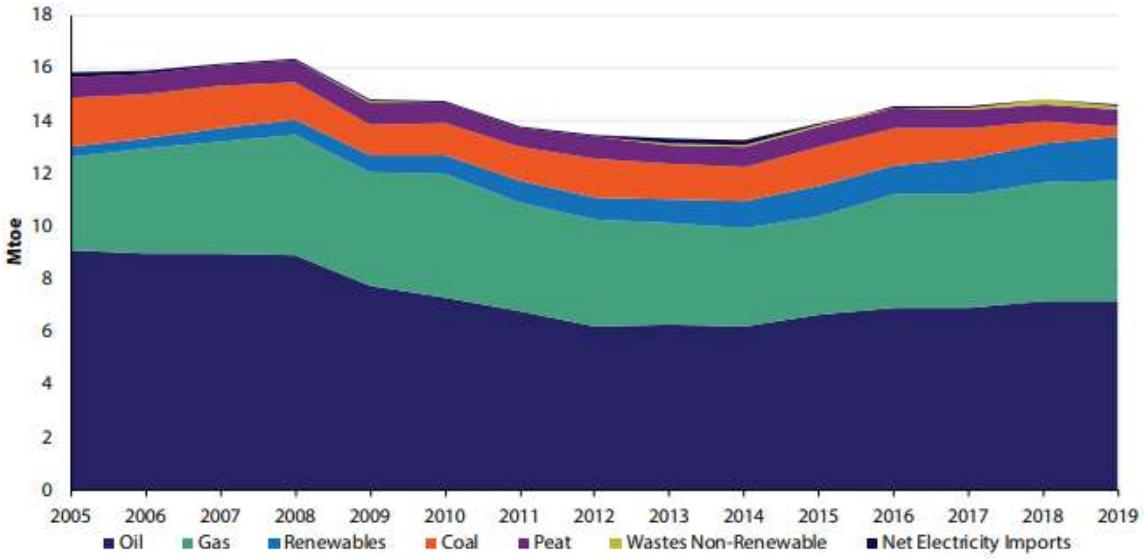
Ireland's 2019 Primary Energy Source

- 170 TWH primary energy – electricity is c. 31%
- Renewables still only account for 9% of primary energy
- Ireland must eliminate the remaining 91% by 2050



Renewables

Fossil Fuel



Source SEAI

Delivering Net-Zero, a Secure Integrated **Energy** System

Renewables

Storage

Backup Zero-Carbon Power Generation

Renewable Enablers Technology

Hydrogen

Ireland has the potential to attain very high levels of energy security
ESB is actively investing in all elements of the Energy Transition

Offshore Wind Programme – Ireland and UK

Onshore Wind:

- c. 600MW in operation today;
- Pipeline ~500MW

Onshore Solar:
1000MW Pipeline

Offshore Wind:

- C. 5,000MW of offshore wind under development;
- Further multi GW pipeline being assessed

Reference	Project
1	Oriel
2	Clogherhead
3	Seastacks
4	Hibernia
5	Loch Garman
6	Helvik Head
7	Celtic One
8	Celtic Two
9	Moneypoint One
10	Moneypoint Two
11	Sealtainn
12	Mhairi
13	Sheena
14	Inch Cape
15	NNG
16	Galloper
17	Five Estuaries
	Total

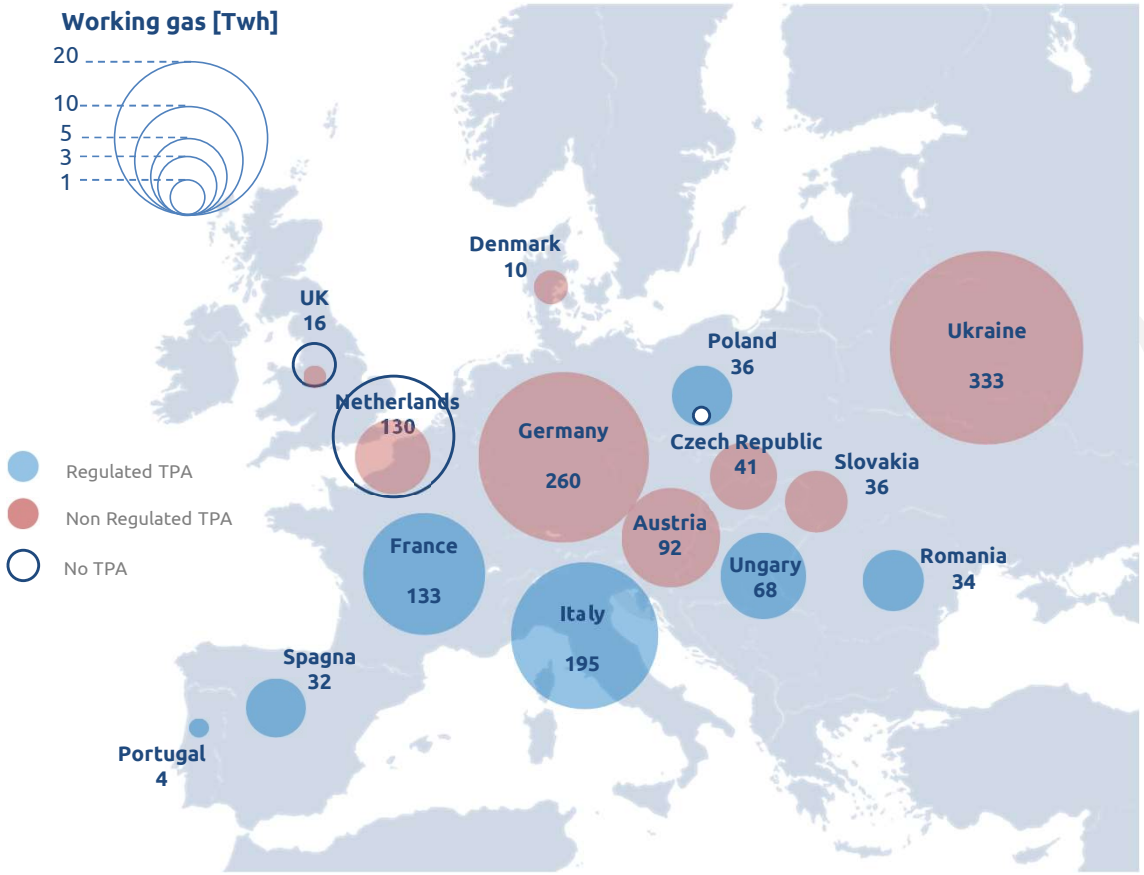
Offshore Wind:

- 2,000MW under dev/const;
- Assessing Scotwind Opportunities

Onshore Wind:

- C. 120MW in operation today;
- C. 1,500MW pipeline with c. 200MW consented

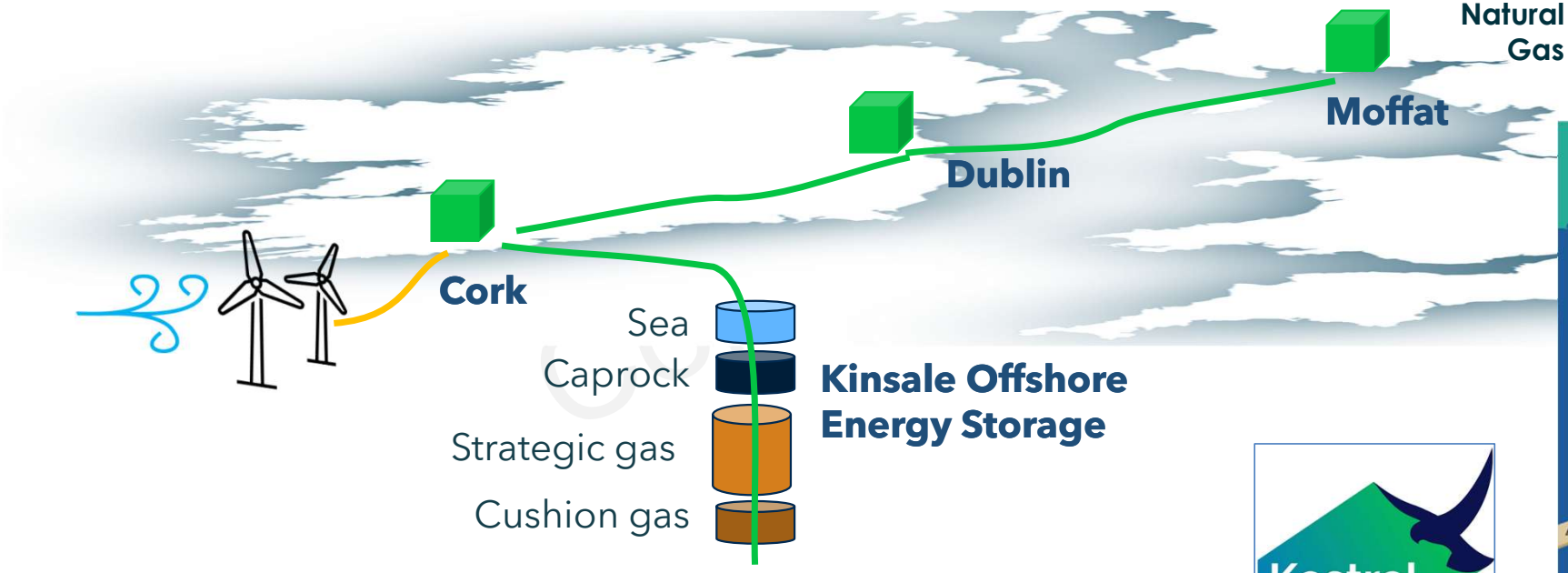
Ireland - No large scale energy storage



- Ireland does not comply with EU Security of Supply directives requiring two EU gas interconnections
  - One non-EU interconnection – Moffat, Scotland
- Whilst Ireland adheres to IEA & EU directives on 90-day oil storage (NORA), it has no in-country natural gas storage capacity
  - SW Kinsale 0.23 BCM offshore storage facility closed 2017
  - 60% of electrical power generation in Ireland is gas-fired
  - 2GW of new gas fired CCGT planned
  - Irish Government CAP committed to increase electrification
- Reliance on UK gas storage capacity means Ireland's energy security is open to overseas system outages
- ESRI study showed Ireland's financial exposure to 90-day natural gas outage would be c. €80B
- Lack of large-scale energy storage will inhibit significant offshore wind/hydrogen projects & Net Zero

KESTREL – Utilising Ireland's proven storage facility

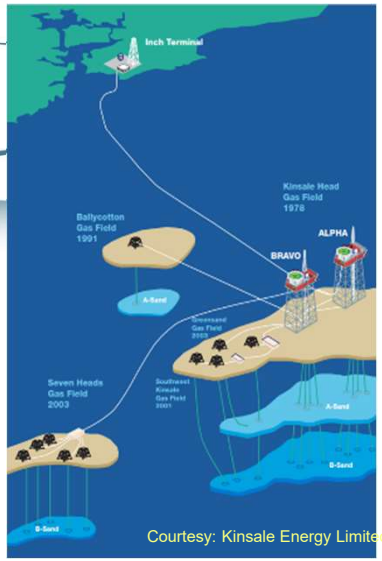
KESTREL provides strategic gas storage today & green hydrogen storage tomorrow



Decarbonisation Blend

Natural Gas → Green H2

Present → Future



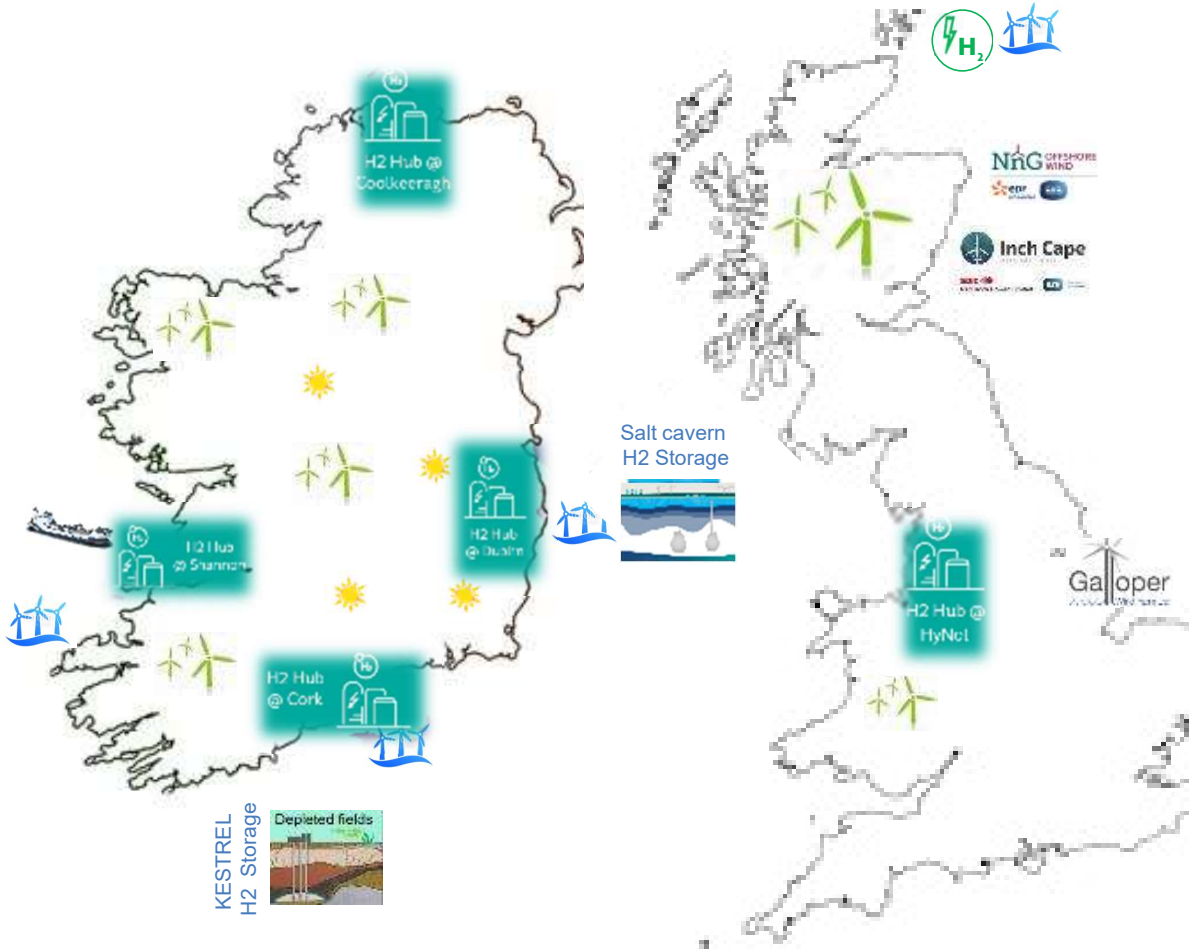
Courtesy: Kinsale Energy Limited

Delivering a Resilient, Reliable Net-Zero Integrated Energy System

1. ESB's vision for a secure net zero energy system is firmly based on **offshore wind, green hydrogen, storage** and **backup power** fuelled by green hydrogen.

2. ESB , with **partners**, will develop **energy clusters** of **H2 production** and use. To achieve required scale, co-location with offshore wind is vital.

3. ESB's early hydrogen **partnerships** will focus on **lighthouse projects** decarbonising transport, aviation and replacing fossil fuel use in industry.



In summary

1. *Hydrogen will be required to reach net zero*
2. *Energy Clusters fed by Renewable Power producing Green H2 and Ammonia provide an opportunity to decarbonize local industry.*
3. *Opportunities exist in Ireland for Green H2 Clusters*

GenComm Meeting

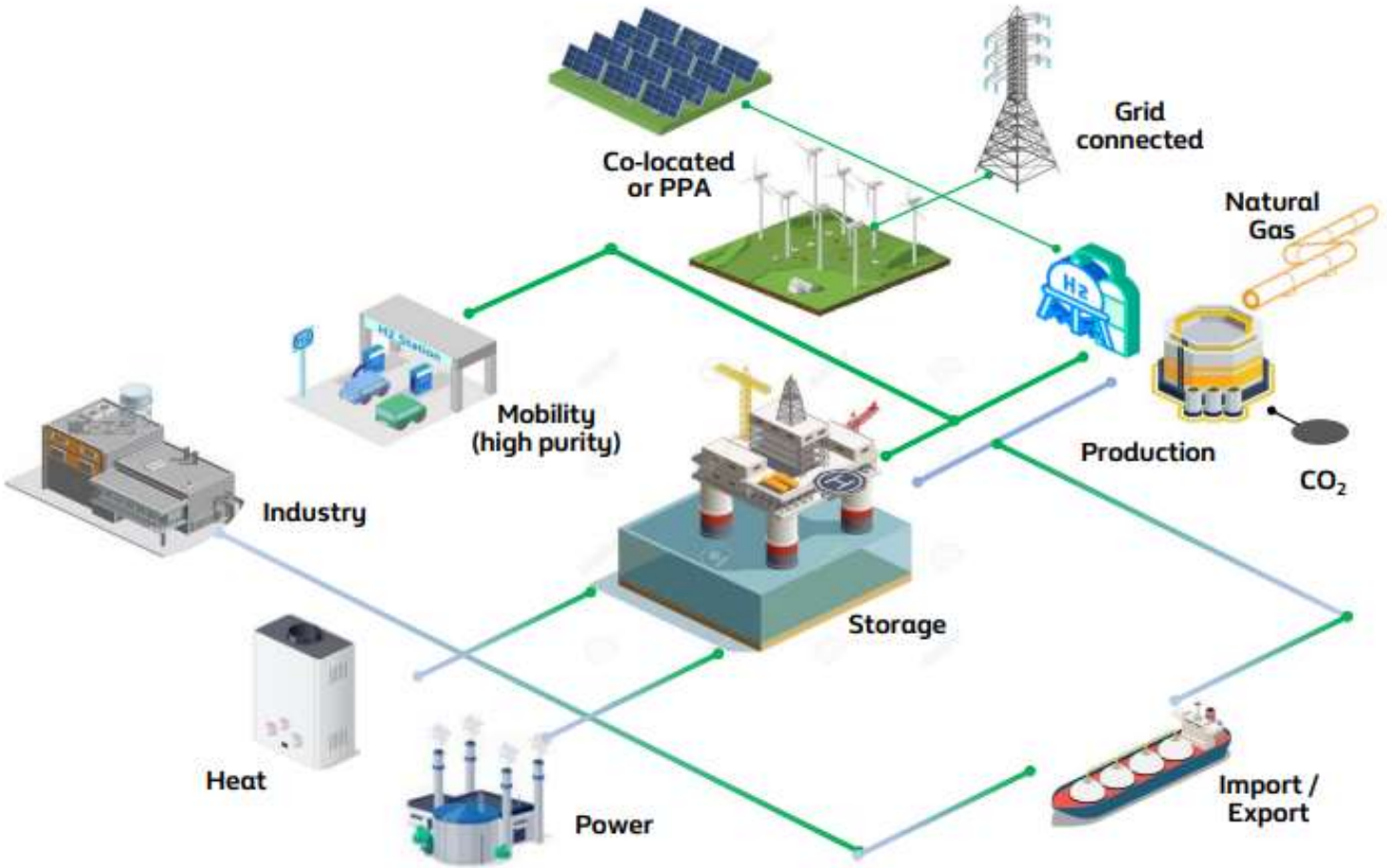
Wednesday 29th March 2023

Bord Gáis Energy

Imagine a better way

centrica

Centrica are taking a whole system approach to hydrogen



UK energy supply & services

Over **10 million** I&C and residential customers in UK

Largest UK heating installer

8,000 heating engineers and world-class training academies

European asset management

16GW renewables across Europe with in-house optimisation platform

Long duration energy storage

Rough gas field potential to provide long term strategic **UK energy storage**

Global energy trading

300 physical LNG cargoes traded globally per year

Today, we are one of Ireland's largest energy and services companies, with a purpose to help customers live sustainably, simply and affordably.

Bord Gáis Energy

Imagine a better way

Irish Offshore Wind Overview

Ireland's Offshore Wind Potential

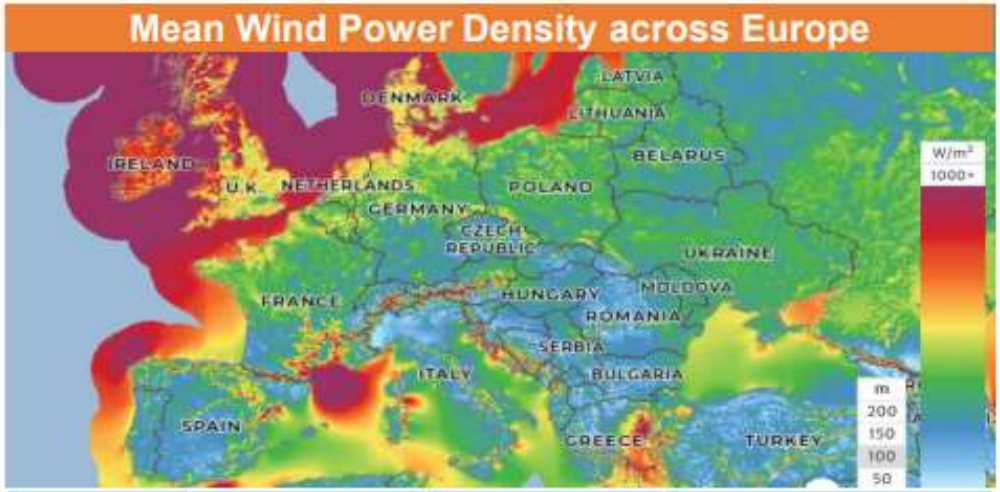
- Ireland's sea area (at circa 880,000km^2) is around ten times the size of its landmass, and the country has one of the best offshore renewable energy resources in the world.
- 641GW offshore wind generation potential has been identified in the Government's Offshore Renewable Energy Development Plan II (OREDP II).

Offshore Wind Targets

- 5GW installed capacity by 2030
- 20GW installed capacity by 2040
- 37GW installed capacity by 2050

Development Pipeline Overview

- **Phase 1:** Special designation given to 6 projects (c.5GW) to advance ahead of other projects – expected to form the basis for the Government's 2030 targets. Seabed exclusivity to be awarded by DECC Minister.
- **Phase 2:** c.56 projects have applied for Foreshore Investigation Licenses (60GW of generation potential). Details for ORESS-2 expected mid 2022.



Offshore Wind Phase	Target	Route to Market	Technology
Phase 1	< 5GW Installed pre-2030	• ORESS 1 Auction • 2022	Fixed bottom
Phase 2	Balance of 5GW Installed pre-2030	• ORESS 2 Auction • Expected 2023	Fixed bottom
Phase 3	2GW In development 2030	• Hydrogen	Floating
Enduring Regime	~30GW deployed post 2030	• TBC	Mix

Cork is an ideal location for the development of a Green Energy Valley

- **Offshore Wind:** Fixed bottom projects developed first, with Floating to follow
- **Electrolysis:** H2 production on land (or possibly offshore)
- **H2 Storage:** Kinsale has potential to cater for heavy H2 demand users
- **H2 Demand:** 2 x Power Stations, Oil Refinery, Pharma Industry, Distillery, Transportation, Export, etc

Corks Hydrogen Opportunity

Green Hydrogen
An Opportunity for Cork!

Jack Reardon

Jack.Reardon@eih2.ie

29th Mar 23

EIH2

- Founded in 2021 by Pearse Flynn
- Green Hydrogen Project Developer
- Green Hydrogen Solutions Company – Enterprise Ireland Green Services Provider
- Sister Company to Green Rebel (Marine, Aerial & Met Ocean)

EIH2's mission

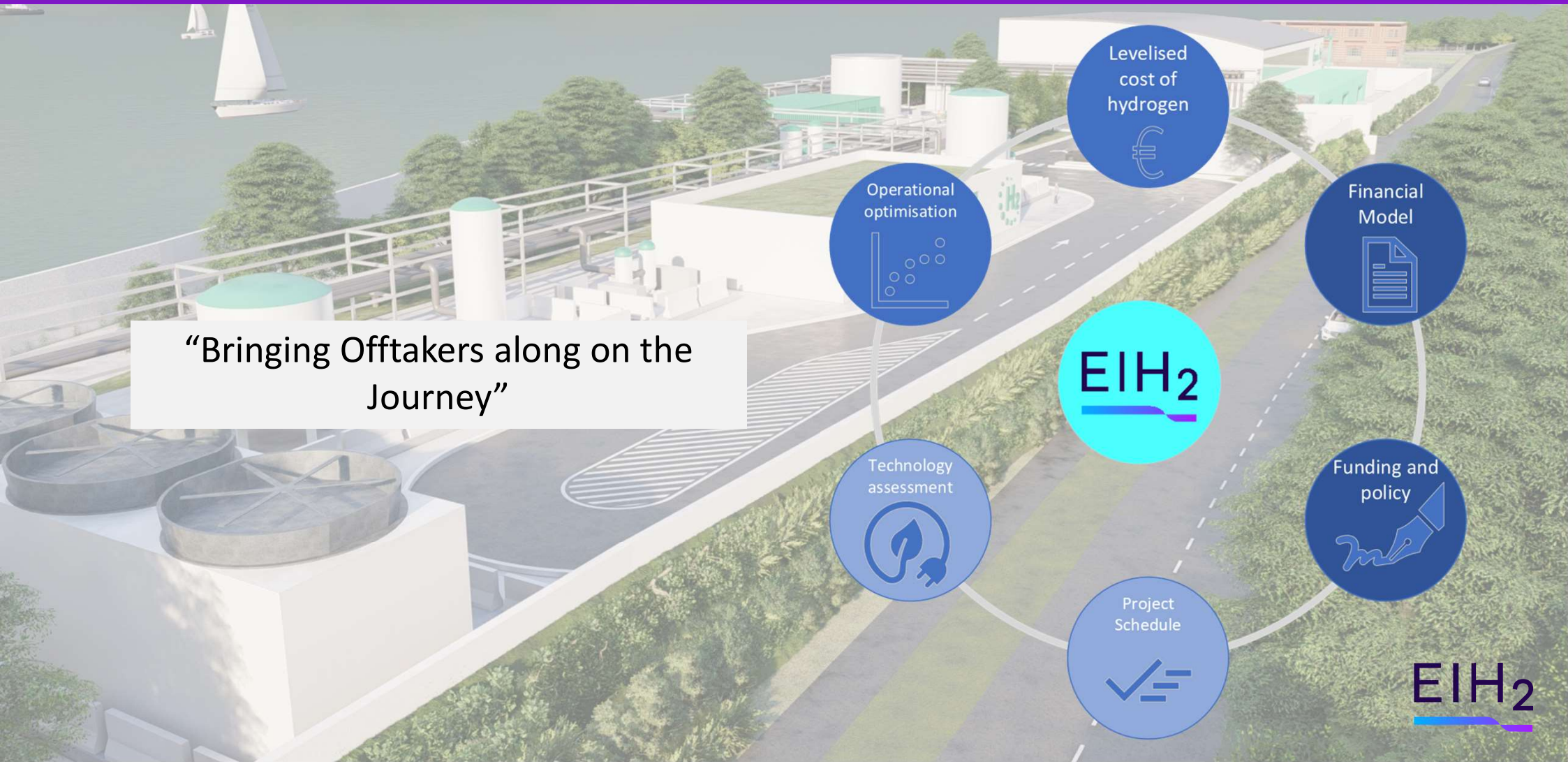
#1 Act as a pivotal leader accelerating Irelands **renewable deployment**

#2 Increase Ireland's **security of energy supply**

#3 Play an instrumental role in **decarbonising electricity, transport, industry and heat**

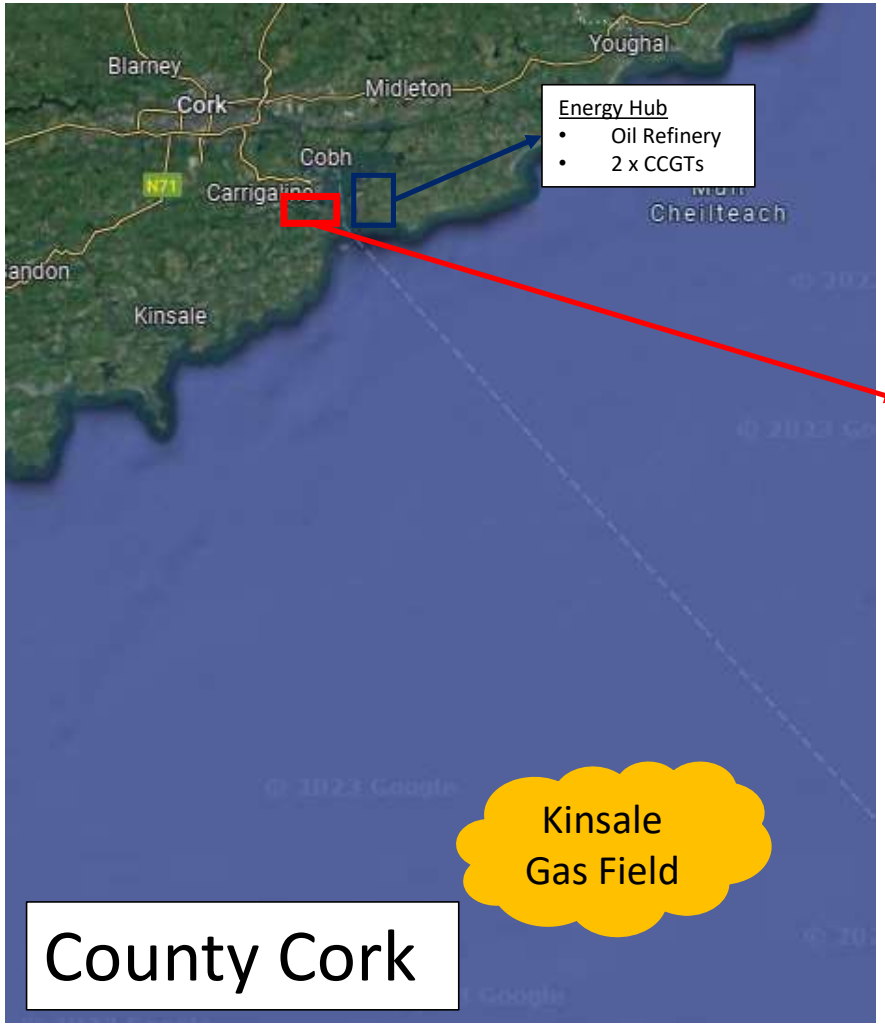
EIH2

Consulting Services



"Bringing Offtakers along on the Journey"

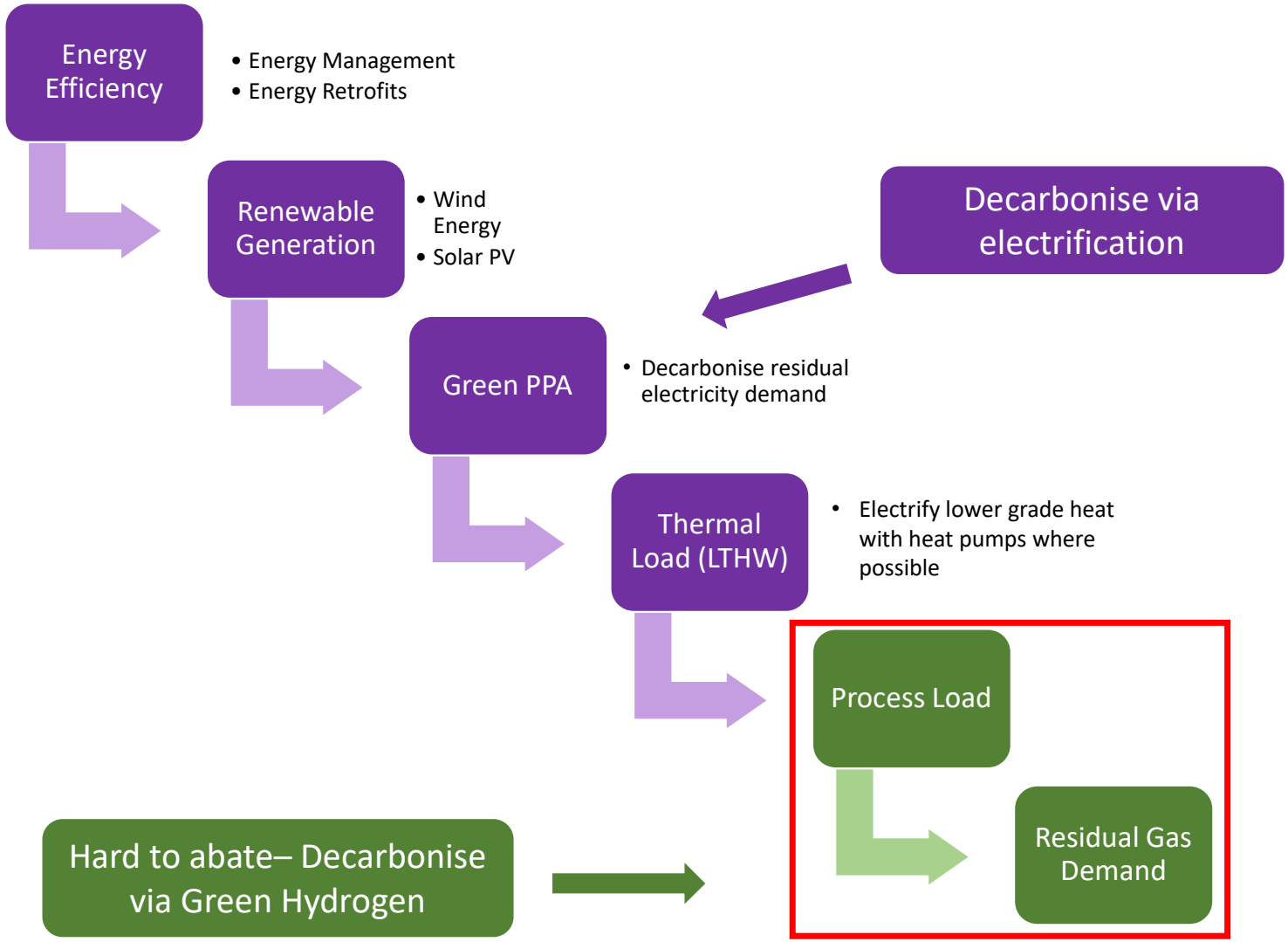
Hydrogen For Cork



- Pharmaceutical Cluster
- Port of Cork
- MaREI

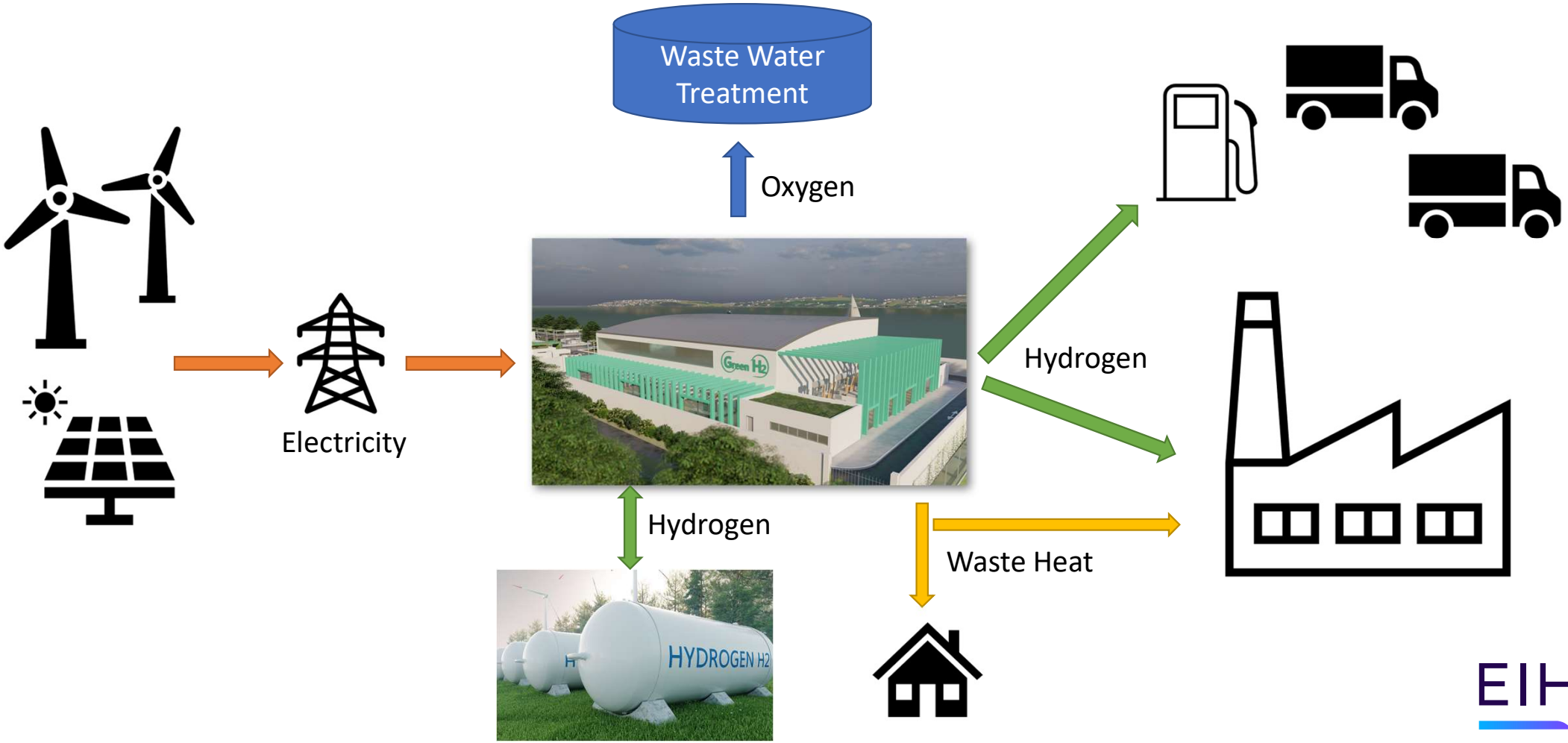
EIH2

Path to Carbon Neutrality - Challenges for Large Energy Users

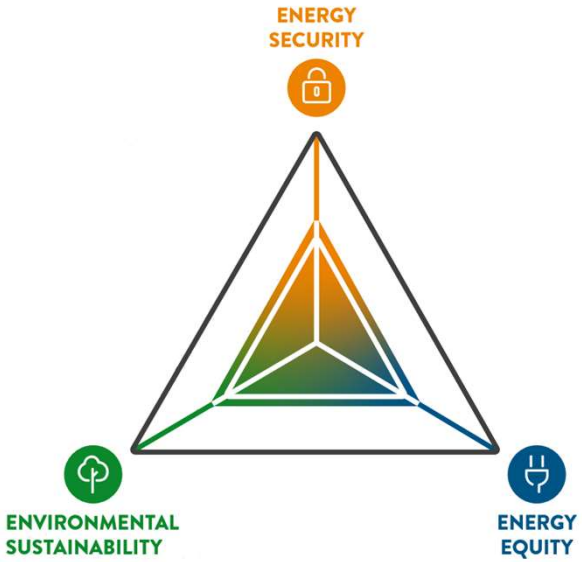


EIH2

Hydrogen Valley - Ringaskiddy



Benefits


ENERGY SECURITY
ENVIRONMENTAL SUSTAINABILITY
ENERGY EQUITY


CARBON NEUTRAL
CO2
NEUTRAL


Foreign Direct Investment

Cork is an ideal location for the development of a Green Energy Valley

- **Offshore Wind:** Fixed bottom projects developed first, with Floating to follow
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Corks Hydrogen Opportunity