HyLIGHT

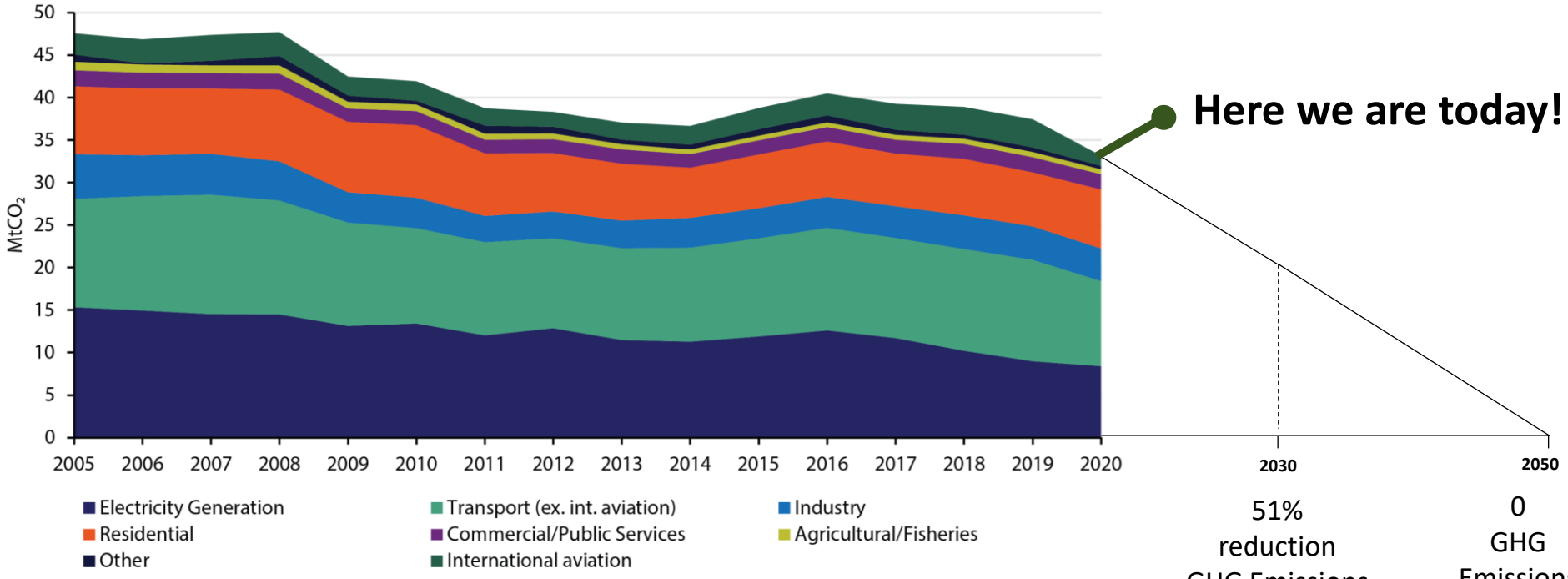
Leading Ireland's Green Hydrogen Transition

Roadmaps for Hydrogen to Support Decarbonisation of Ireland's Economy by 2050

https://www.marei.ie/project/hylight/

Ireland's Decarbonisation

Incremental vs **Transformational**



Here we are today!

2030

51% reduction GHG Emissions

2050

0 GHG Emissions

HyLIGHT – 25 Industry Partners

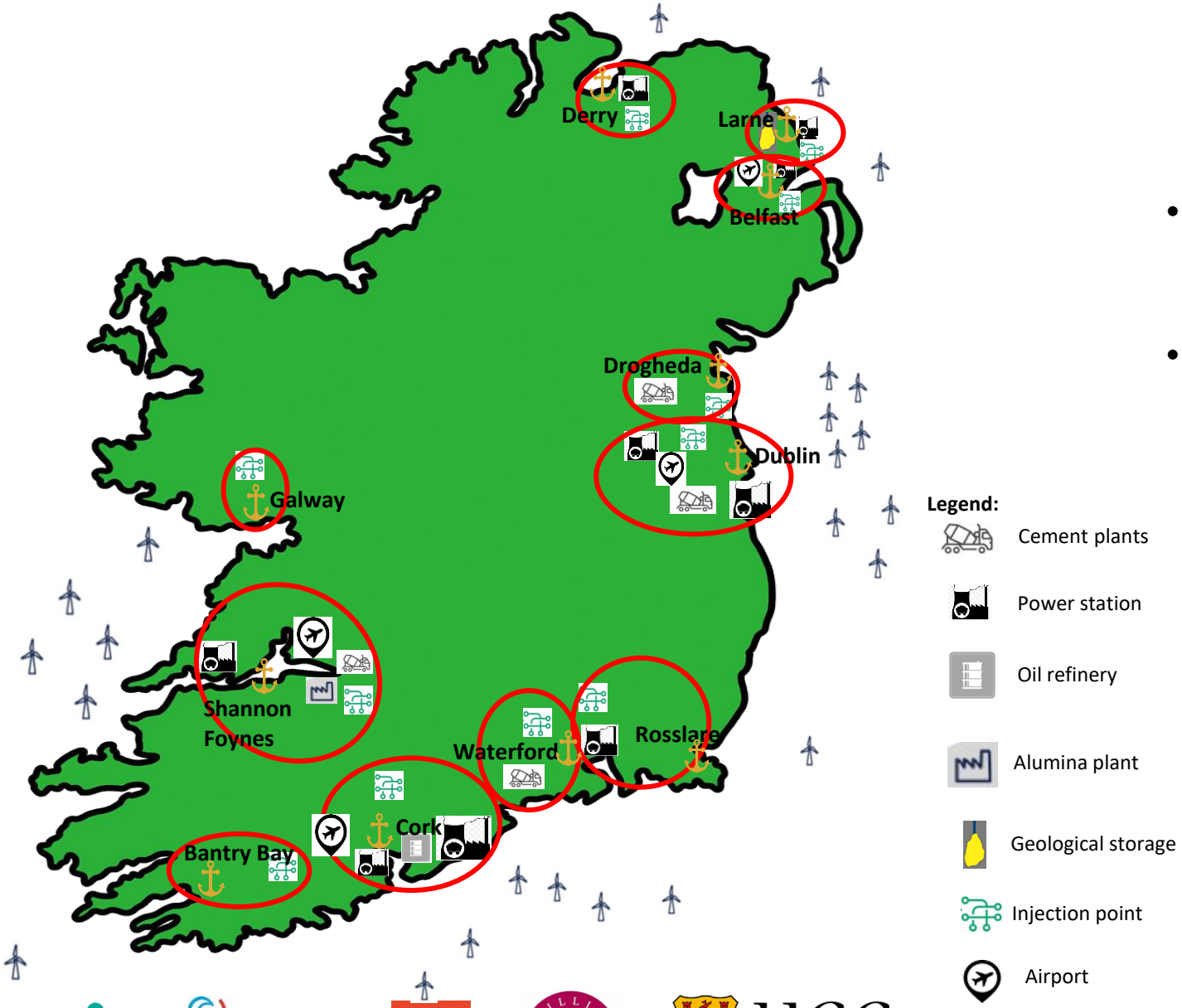
- Bord Gais Energy
- Bord na Móna
- Coillte
- Eirgrid
- Energia
- ESB
- Gas Networks Ireland / Ervia
- Aughinish Alumina
- Cement Manufacturers Ireland
- EI-H2
- SSE Thermal
- Sepam
- IslandMagee Energy
- Mannok Cement
- Vermilion
- Indaver
- GreenCoat Renewables
- Simply Blue Energy
- Micro-Bio
- Fingleton White
- Arup
- Echelon
- DCC Flogas
- Mutual Energy
- SSE Renewables


energia
EIH2
ESB
Energy for generations
Islandmagee Energy
MANNOK
mutualenergy
echelon
Simply Blue Energy
micro-bio
INDAVER
AUGHINISH ALUMINA
HyLIGHT
GREENCOAT CAPITAL
SSE Renewables
VERMILION ENERGY
ARUP
Gas Networks Ireland
Fingleton White
Bord na Móna
EIRGRID GROUP
FLO GAS
sse Thermal
CEMENT MANUFACTURERS IRELAND
Ireland FutureEnergy
Bord Gáis Energy
Science Foundation Ireland sfi For what's next
MaREI Centre for Marine and Renewable Energy
DCU
GAILLIMH GALWAY
ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Work Package 1

- WP1 - H2 Production - Techno Economic Analysis
  - Arjun Bopaiah

New economic opportunities from Hydrogen production



- Ports focal point for assembly, storage and O&M of offshore wind farm (OWF) assets.
- Ports can also be used as energy hubs for H2 production:
  - By 2030, not all OWF can be connected to the Irish electricity grid.
  - OWF not connected to electricity grid, H2 production as a route to market
  - Port storage space and nearby geological storage
  - Proximity to demand centres: nearby industries, heavy duty transport activities and gas grid.

Note: Analysis for ports as domestic H2 hubs

Work Package 2

- WP2 - Hydrogen Storage and Delivery
  - TWh Storage
  - The evolution of the Gas Grid (H2 pipes) / Interconnection / tankers / on site storage

- Dr Ali Saberi Mehr

Comparison of Hydrogen Storage Technologies

HyLIGHT

~30 MWh

Composite storage vessels with pressure of 700 bar capacities of (**560–900 kg)** of hydrogen per trailer

~10,000 MWh

Largest LH2 Tank, NASA Florida
Usable capacity = 4,732 m3 **(282,000 kg)**
Max. boiloff 0.048% (2,271 L/day)
Temp= 4k
Pressure= 6 bar

~200,000 MWh

1 Single Cavern
Diameter of 50m, height=200m
Stored H2= 78M Sm3
(6,500,000 kg)
Temp= 290k
Pressure= 260 bar

Science Foundation Ireland sfi For what's next
MaREI Centre for Marine and Renewable Energy
DCU
GAILLIMH 1845 GALWAY
ucc Coláiste na hOllscoile Corcaigh, Éire University College Cork, Ireland

Work Package 3

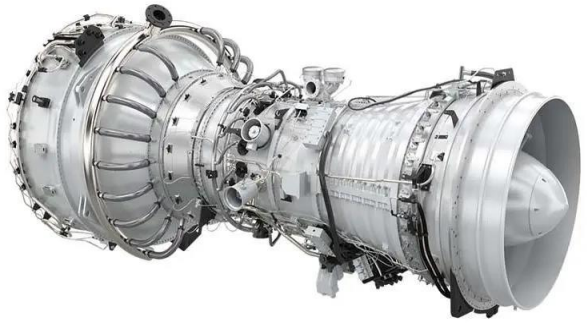
- WP3 - Hydrogen Demand
  - Large Industry Heat & Power Users
  - Hydrogen use in gas turbines
  - Outlook for E-fuels and H2-enriched Biofuels

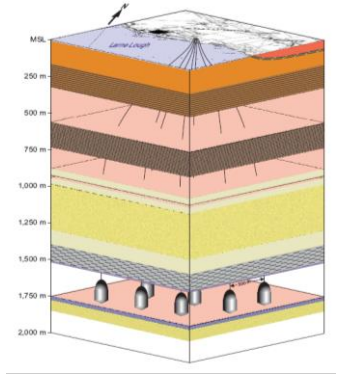
- Dr Ahmad Rafiee
- Thuso Booth Mogorosi
- Fatemeh Dadashidooki

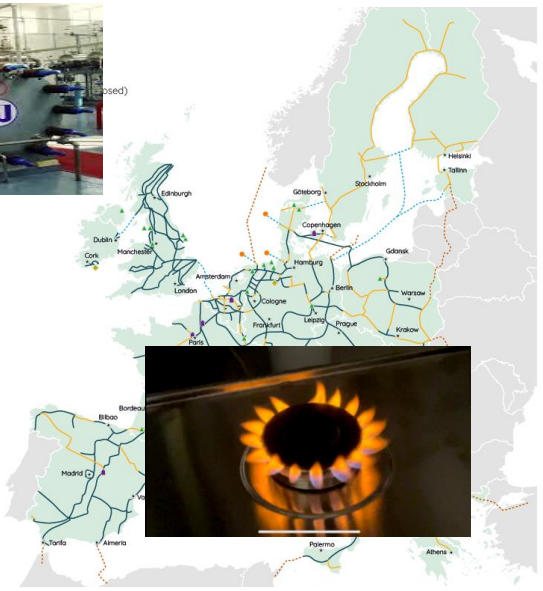
Innovations & Trends - Hydrogen

HyLIGHT

Large Scale Hydrogen Production & Large Scale transport and use of Hydrogen







Solar, Offshore Wind, large scale production, Gas grid infrastructure, Seasonal Energy Storage, Hydrogen to electricity

Science Foundation Ireland sfi For what's next

MaREI Centre for Marine and Renewable Energy

DCU

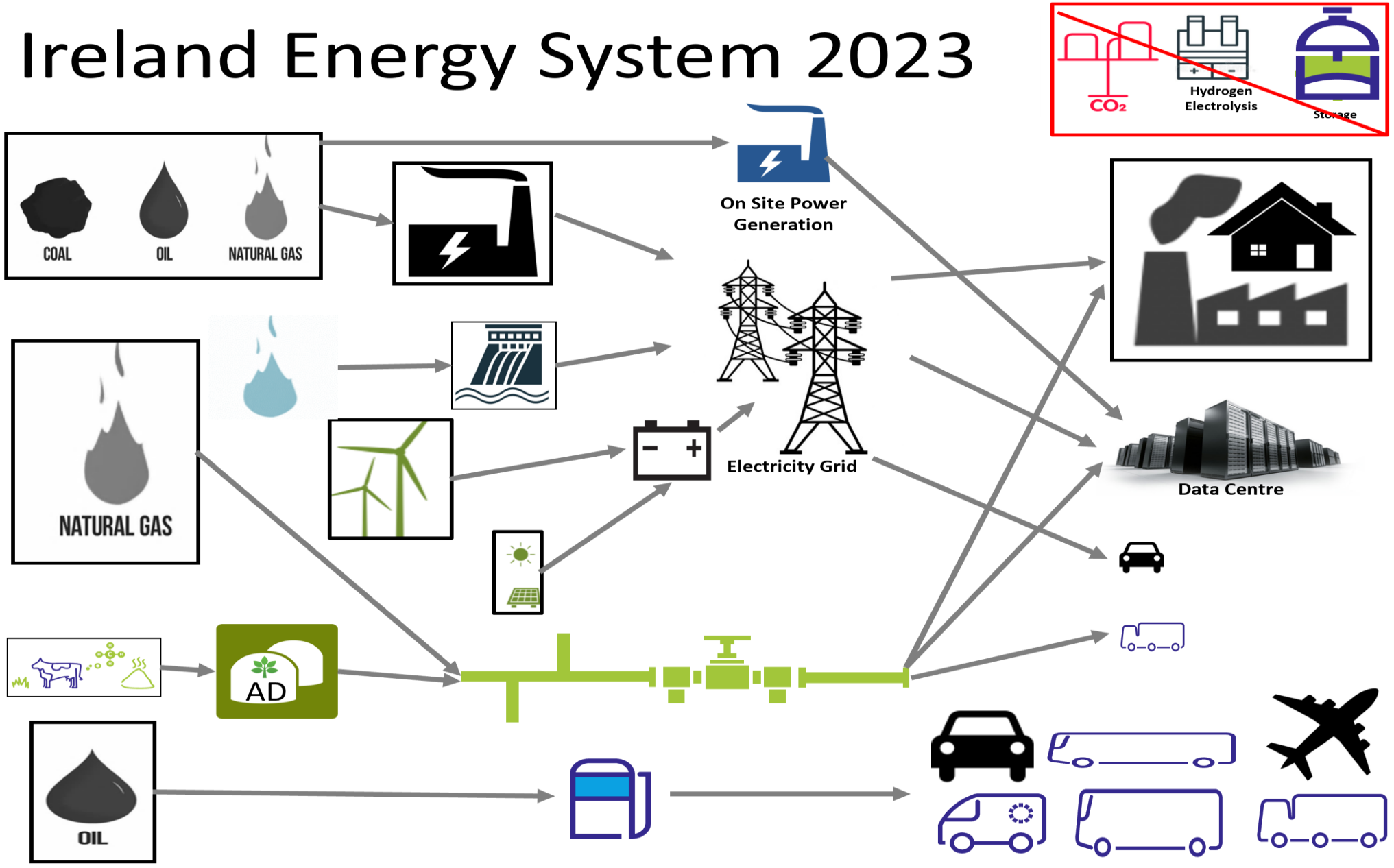
Gaillimh 1845 Galway

ucc Coláiste na hOllscoile Corcaigh, Éire University College Cork, Ireland

Work Package 4

- WP4 – Hydrogen in the Energy System
    - Energy System Modelling
    - Dr Habour Mohammed Riadh

Ireland Energy System 2023



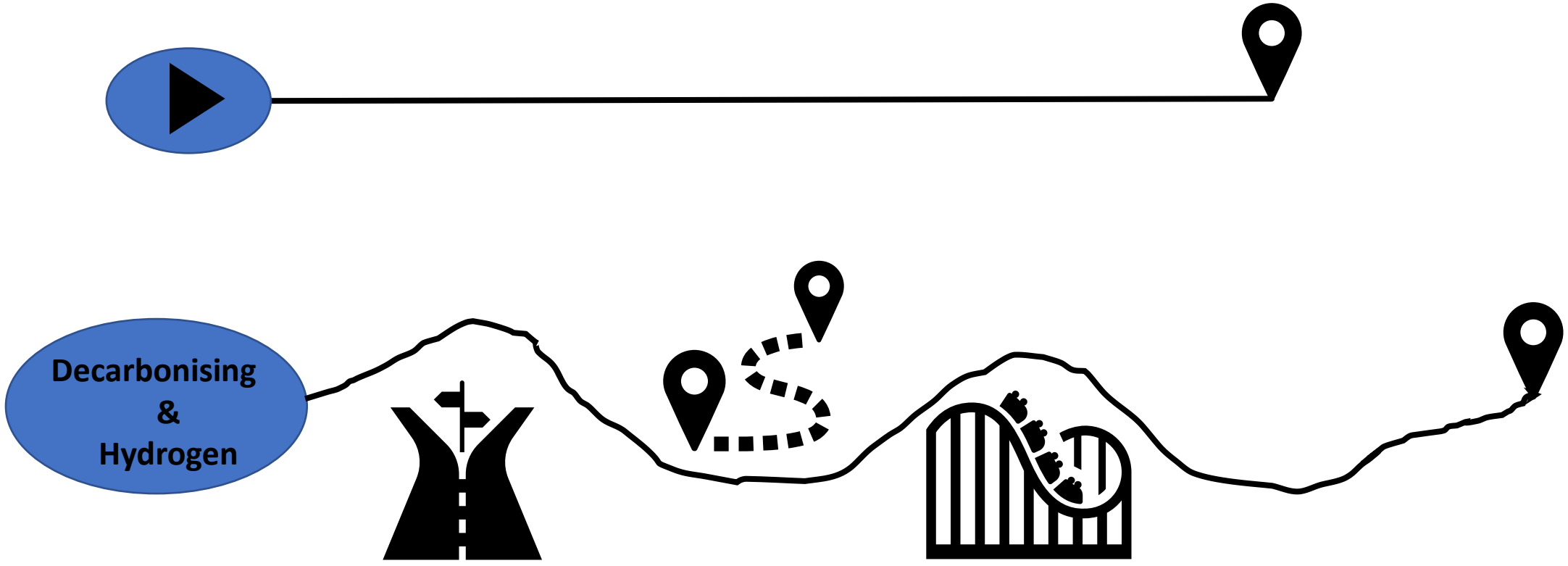
HyLIGHT

Work Package 5

- WP5 - Hydrogen Policies, Social and Economic Aspects
  - EU & Ireland & UK hydrogen policy & GHG emission reduction
  - Determine the policy environment necessary to enable decarbonisation of the Irish energy system
  - Public perception of hydrogen
  - Assess socio & economic costs and benefits of large-scale hydrogen roll out
  - Development of Hydrogen Markets in Ireland / Hydrogen Strategy / Suppports

- Yunfei Li
- Jochelle Ma Lois Laguipo
- Abhijeet Rajendra Gaikwadi

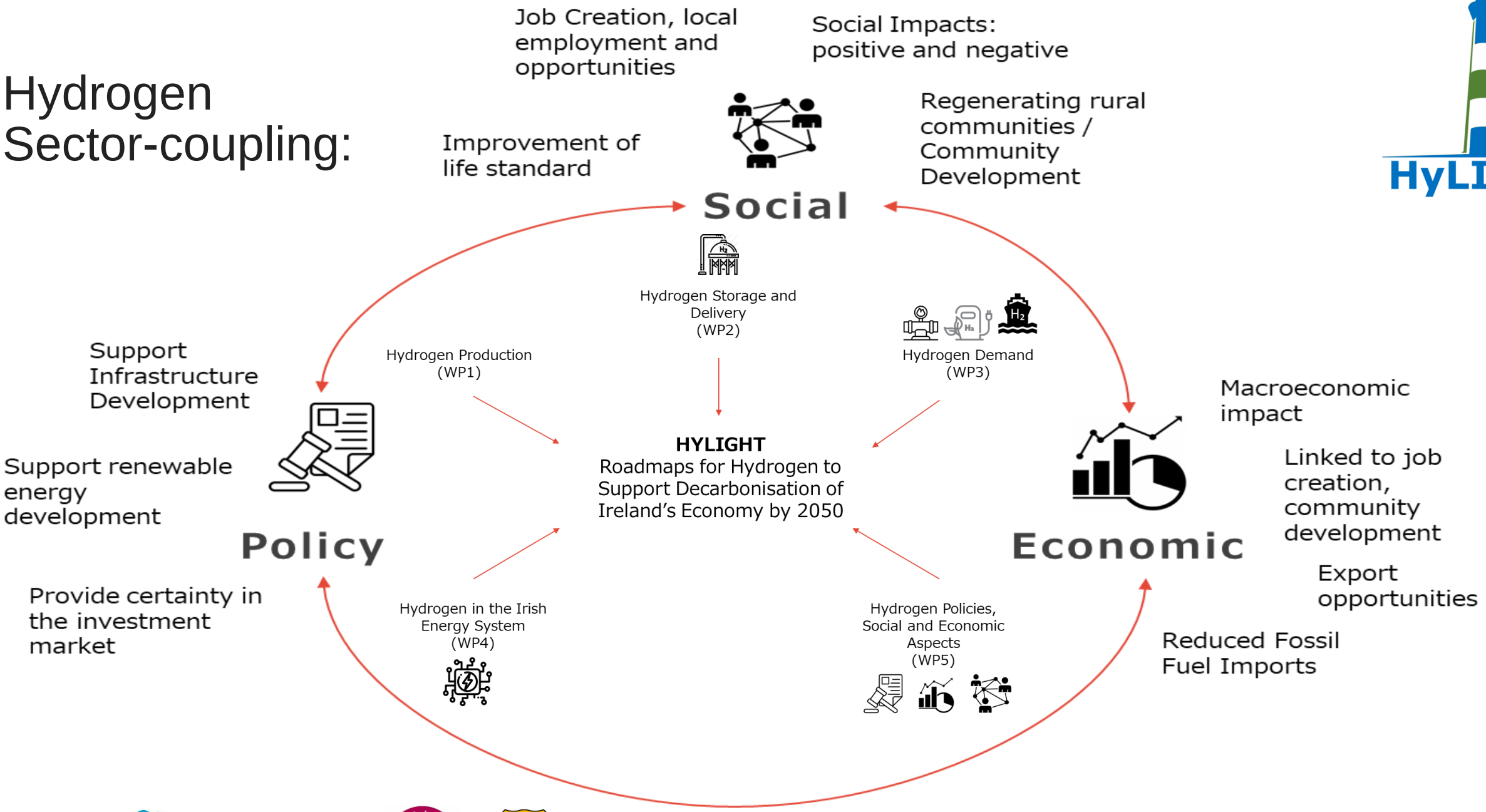
Road-Mapping



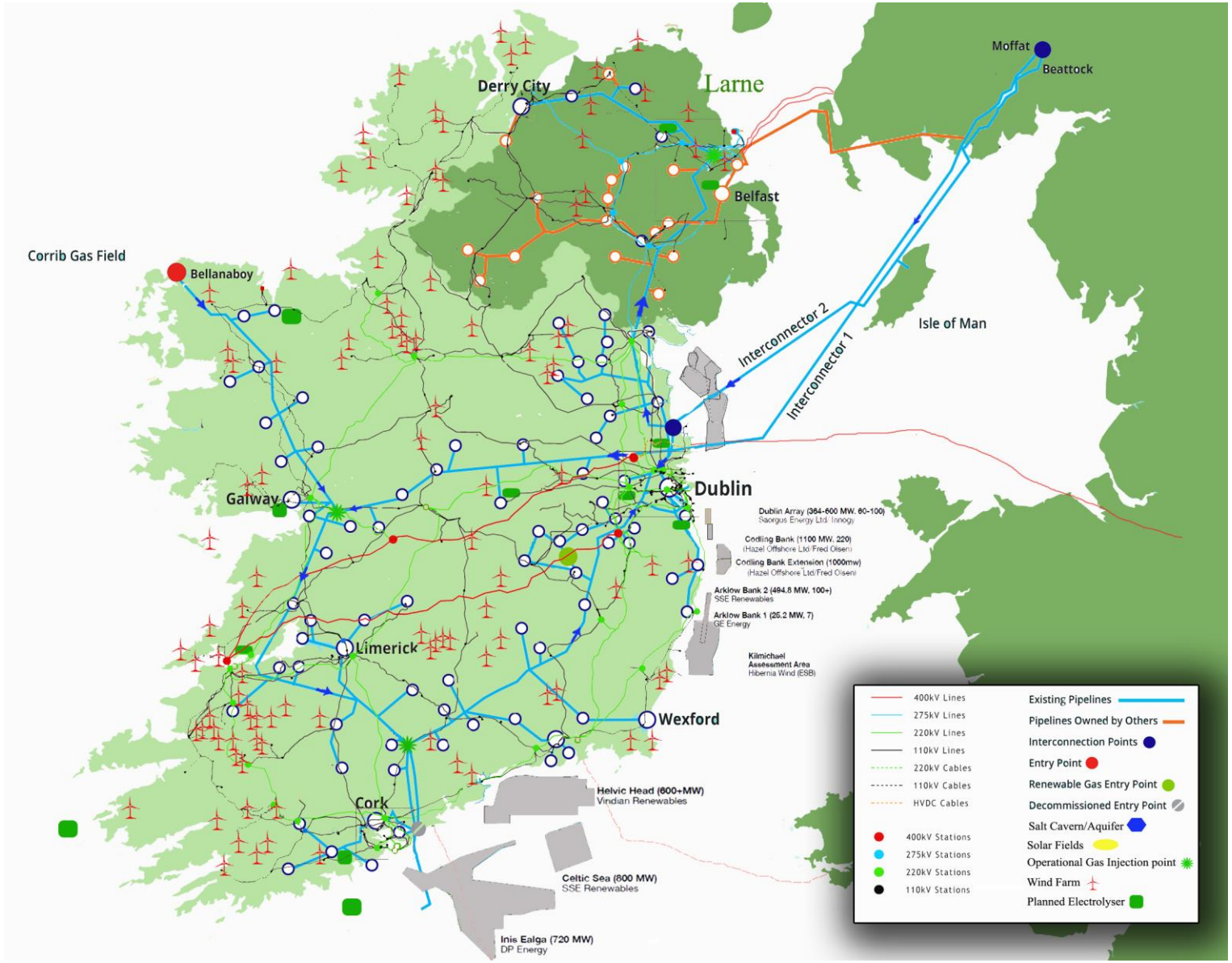
Road Mapping – 2023 to 2030 to 2050

- Energy System Modelling
- Road Mapping…. What is this…
- Scenarios… which ones…
- Sector coupling: involves identifying the co-benefits of direct electricity, existing electrical & gas infrastructure, energy storage and a dispatchable low carbon energy carrier (green Hydrogen)

Hydrogen Sector-coupling:



Overlay of Electricity, Gas Pipe, Storage & Wind Infrastructure



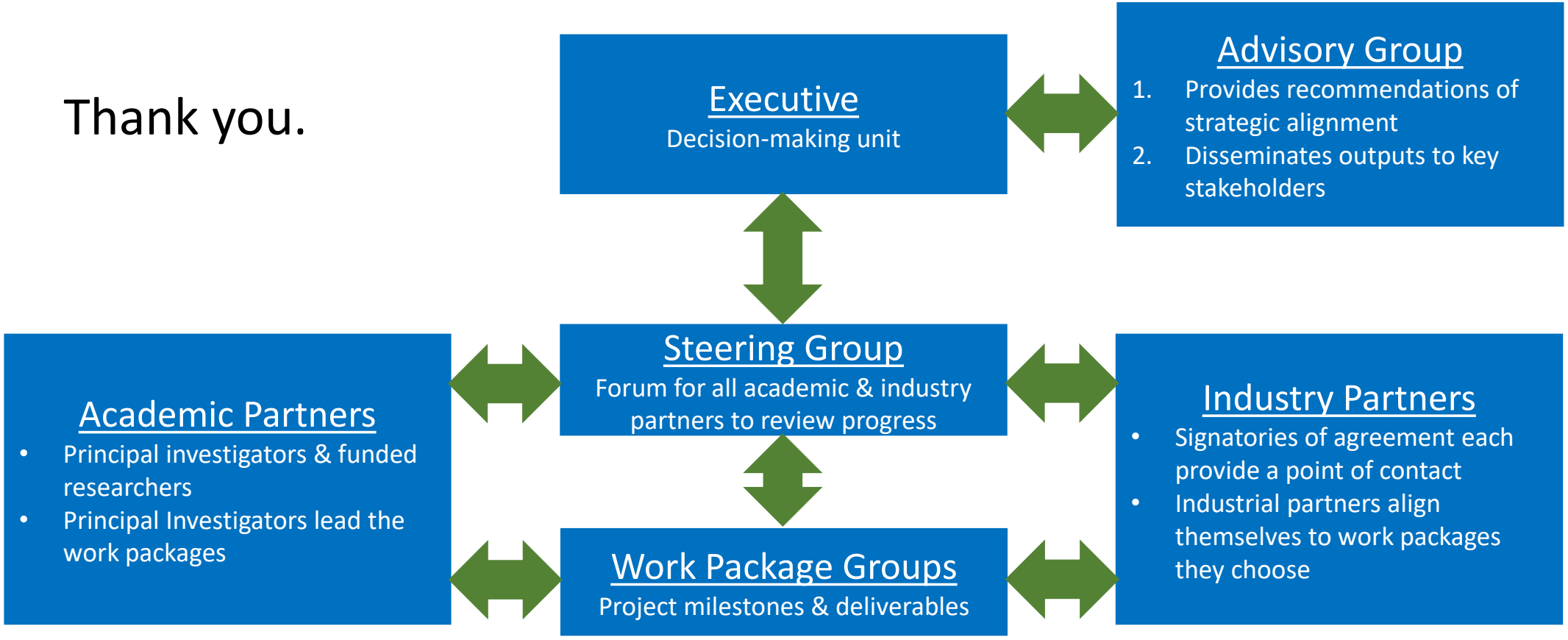
https://www.4coffshore.com/windfarms/ireland/arklow-bank---phase-1-ireland-ie01.html

HyLIGHT Road-Mapping

- Strategic Methodology Applied
- All Island
- Date: 2025, 2030, 2040, 2050
- Targets: Paris Agreement, EU, CAP2022 & Sectoral Emissions Ceilings
- Energy System: Electricity, Industry, Heat, Transport
- Separate Analysis:
  - Regional/Local Mini Analysis – individual sites/transport hubs/industry
  - National Macro Analysis – Energy security / export
- Output Policy & Regulatory Recommendations

HyLIGHT Organisational Structure

Thank you.



HyLIGHT

Thank You.

James.carton@dcu.ie

Science Foundation Ireland sfi For what's next

MaREI Centre for Marine and Renewable Energy

DCU

GAILLIMH 1845 GALWAY

ucc Coláiste na hOllscoile Corcaigh, Éire University College Cork, Ireland