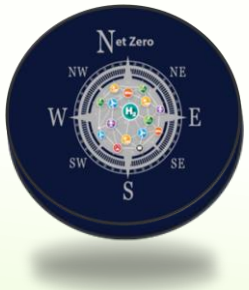


# DR JAMES CARTON

# DUBLIN CITY UNIVERSITY

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# 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/

Science Foundation Ireland For what's next

MaREI Centre for Marine and Renewable Energy

DCU

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

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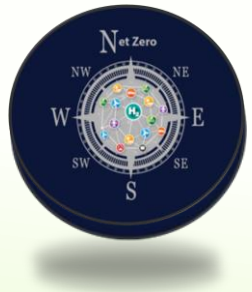
# WORK PACKAGES - FEEDBACK / DISCUSSION




- **WP1 - H2 Production**
  - Techno Economic Analysis
- **WP2 - Hydrogen Storage and Delivery**
  - TWh Storage
  - The evolution of the Gas Grid / Interconnection / tankers / on site storage
- **WP3 - Hydrogen Demand**
  - Large Industry Heat & Power Users
  - Hydrogen use in gas turbines
  - Outlook for E-fuels and H2-enriched Biofuels
  - Development of Hydrogen Markets in Ireland
- **WP4 - Hydrogen in the Energy System**
  - Energy System Modelling
- **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

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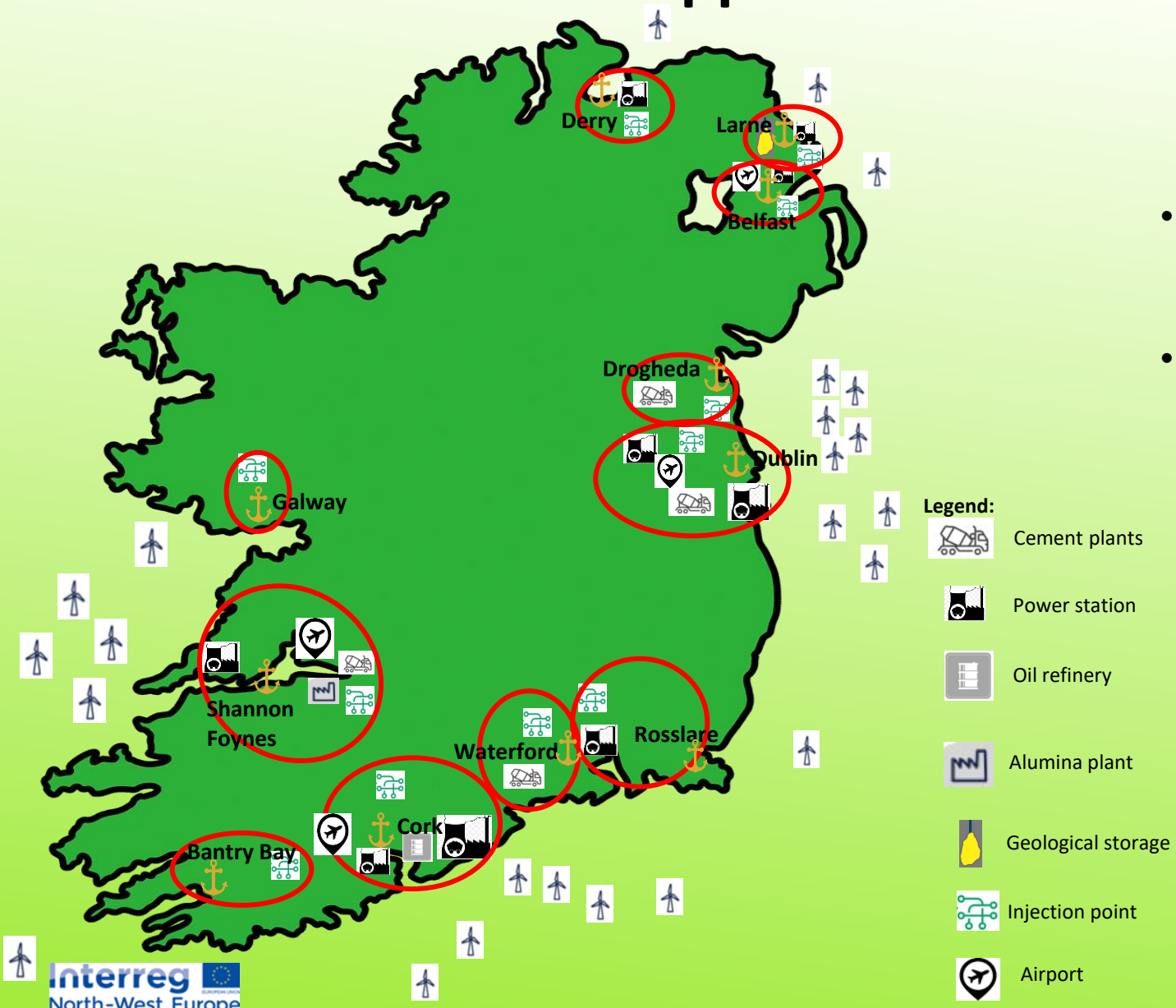
# New economic opportunities from Hydrogen production




- 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

# Comparison of Hydrogen Storage Technologies

~30 MWh

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

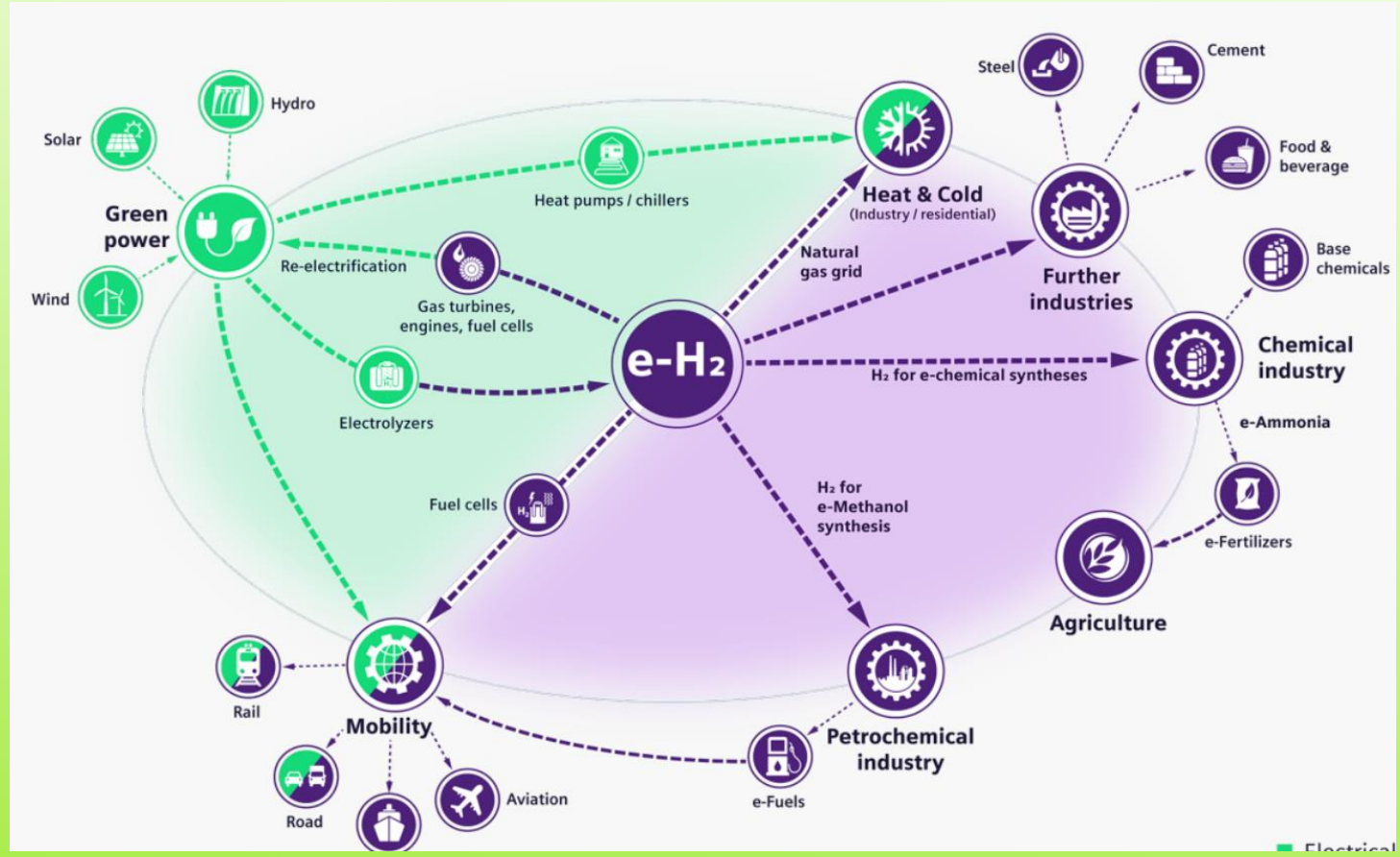
~10,000 MWh


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

# HYDROGEN DEMAND




**What is the policy implication for stakeholders in certain scenario?**

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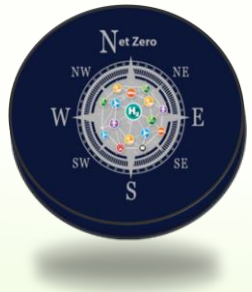
# HYDROGEN SECTOR-COUPLING:




Job Creation, local employment and opportunities

Social Impacts: positive and negative

Improvement of life standard

Regenerating rural communities / Community Development

## Social

Hydrogen Storage and Delivery (WP2)

Hydrogen Production (WP1)

Hydrogen Demand (WP3)

Support Infrastructure Development

Support renewable energy development

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

Macroeconomic impact

Linked to job creation, community development

Export opportunities

Reduced Fossil Fuel Imports

## Policy

Provide certainty in the investment market

## Economic

Hydrogen in the Irish Energy System (WP4)

Hydrogen Policies, Social and Economic Aspects (WP5)

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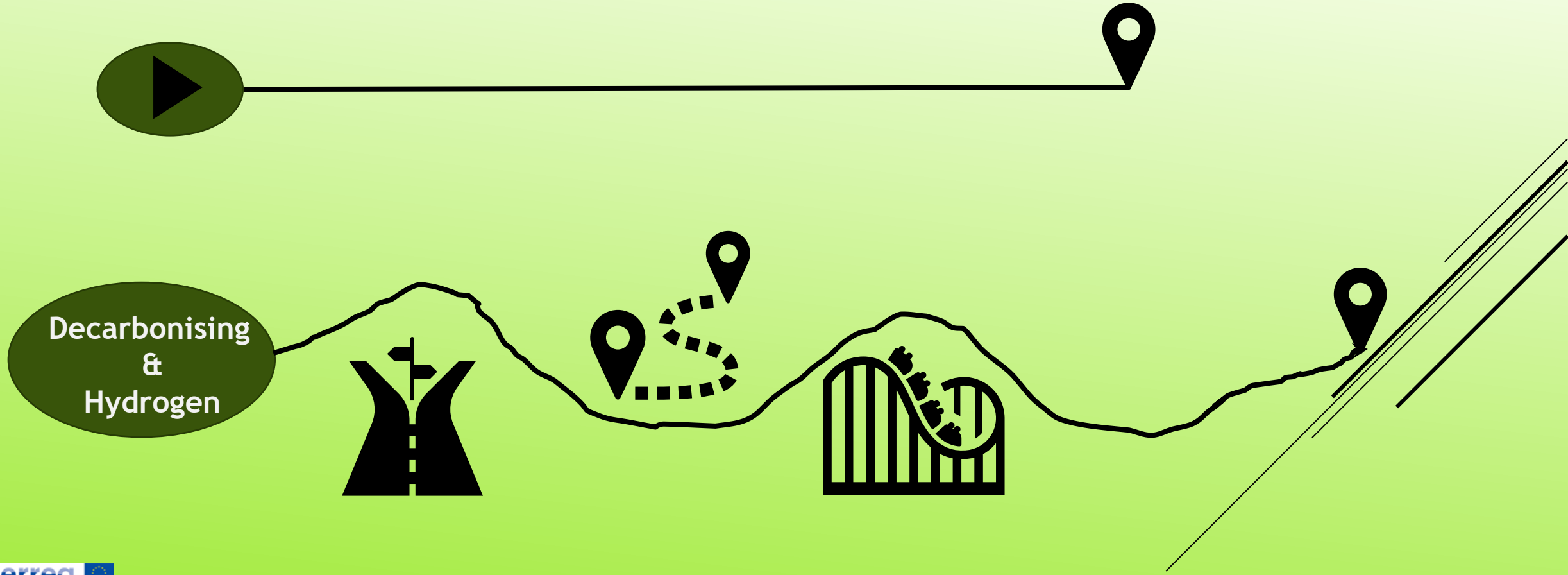
# HYLIGHT ROAD-MAPPING

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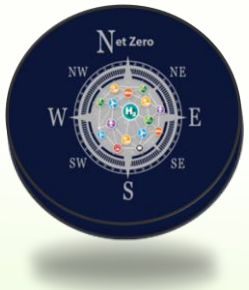



# PYTHON FOR POWER SYSTEM ANALYSIS CONCEIVE, SIMULATE & OPTIMIZE: MODERN ENERGY SYSTEMS AND POWER MODALS

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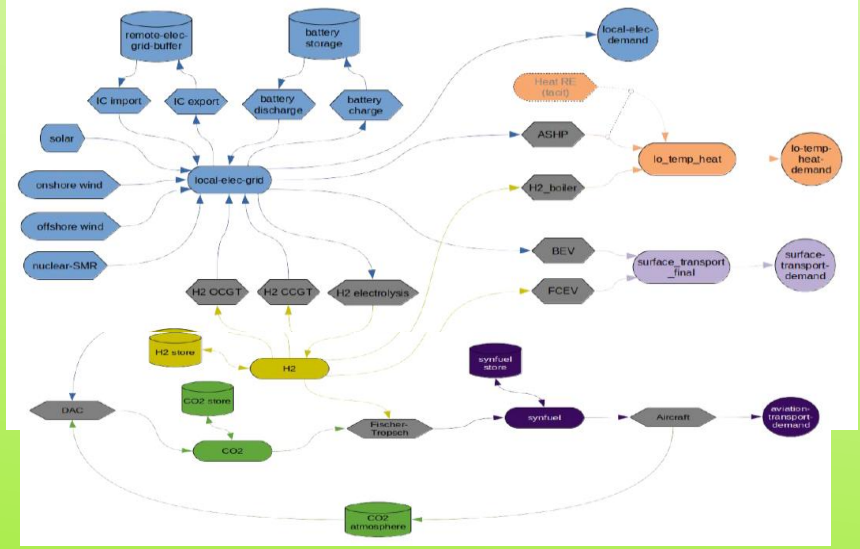
# IRISH ENERGY SYSTEM MODELLING

- Conventional and renewable generators.
- Distribution and transmission lines.
- All type of electrical converters.
- Unit commitment and storage units (Battery, Salt caverns, hydro storage…)
- Sector of heating and cooling (Electrical pumps, Boilers…)
- Sector of transport (Electrical vehicle, Hydrogen vehicle…)
- All types of energies and fuels (Coal, Peat, Diesel, Oil… )



Co-funded by the Erasmus+ Programme of the European Union

# HySKILLS

DCU Ollscoil Chathair Bhaile Átha Cliath Dublin City University

HySkills is an Erasmus+ project providing the future hydrogen workforce with key **technical and safety skills**

**A comparative needs analysis** was performed across 5 EU countries to map the necessary skills

**A modular training course** will ensure future workers become fully competent for the green hydrogen sector

8 Learning Units currently being developed and piloted by DCU and other partners

- Hydrogen Basics
- Hydrogen Safety Risk Standards Regulation
- Hydrogen High-Pressure Fittings and Connections
- Hydrogen Storage
- Op & Maintenance of Electrolysers and Fuel Cells
- Hydrogen Transportation and Delivery
- Hydrogen Combustion
- Hydrogen Sensors, Detectors and Monitoring

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HyLIGHT

Net Zero

# THANK YOU.

Science Foundation Ireland sfi For what's next

MaREI Centre for Marine and Renewable Energy

DCU Ollscoil Chathair Bhaile Átha Cliath Dublin City University

Gaillimh 1845 Galway

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

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