# Overview

In November 2021 the Irish Government launched Climate Action Plan 2021, which sets out ambitious targets for decarbonisation across the energy, transport, heating and agriculture sectors. The Climate Action Plan followed the Climate Act 2021, which committed Ireland to a legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030.

The Climate Action Plan sets out indicative ranges of emissions reductions for each sector of the economy.

* Electricity: 62-81%
* Transport: 42-50%
* Buildings: 44-56%
* Industry/Enterprise: 29-41%
* Agriculture: 22-30% reduction
* Land Use, Land Use Change and Forestry (LULUCF): 37-58%

Achieving these targets, cost effectively, safely and reliably, will be challenging and are likely to require changes in how society operates and the introduction of new technologies which today are considered uneconomic.

For example, in order to achieve a target of 80% renewable electricity will require at least a trebling in installed capacity of our wind fleet with offshore wind a key component of this expansion. Wind at this level will produce more than enough electrical energy to power the equivalent of every home in the country however utilising the energy that is produced at the correct time will be challenging. To achieve this, we will need to make the best use of all available resources connected to the energy system and it will be essential to be able to move in time or location, energy consumption or generation to balance supply and demand. Storing energy in the form of hydrogen produced by renewable electricity is seen by many as a key enabler of these targets. However, the use of hydrogen goes beyond its use as storage or a replacement for fossil fuel-based power plant. It also has been shown to have potential to decarbonise other difficult to decarbonise industries such as heat, transport (particularly heavy goods vehicles) and industrial processes.

The large-scale use of hydrogen in an energy system to enable the decarbonisation of a country’s energy system has not been attempted or achieved anywhere in the world. Challenges exist with respect to the cost effective and safe production, storage, transportation, and consumption of hydrogen but many of these are being currently addressed by the market and with innovative technology. Therefore, the state-of-the-art is in constant advancement from multiple areas of the hydrogen eco-system.

At the International Energy Research Centre (IERC) are seeking evidence and information on options for addressing these barriers and opportunities that hydrogen presents to enable Ireland’s decarbonisation targets and potentially establish Ireland as a world leader in this technology. This evidence will support the development of peer-reviewed paper that will be published to deliver empirical-evidence based suggestions for policy considerations in hydrogen to the Department of Environment, Climate and Communications.

Information that we receive through this call for evidence will help us to:

* Support the development of **hydrogen policy** in Ireland;
* Collect evidence on the challenges and opportunities associated with the **production** of low carbon hydrogen in Ireland;
* Collect evidence on the challenges and opportunities associated with the **distribution and delivery** of low carbon hydrogen in Ireland and;
* Collect evidence on the challenges and opportunities associated with the **consumption** of low carbon hydrogen in Ireland.

The call for evidence below is divided into 4 sections addressing the future policy and roles of hydrogen as per above. The responses to each of the questions below can be filled into this document and the completed document should be returned by e-mail to info@ierc.ie.

Responses need not cover all sections or even an entire section. This is a broad call for evidence, and we acknowledge that not all stakeholders will have time or expertise to complete all sections.

***About IERC***

The International Energy Research Centre at Tyndall National Institute is Ireland’s leading not-for-profit professional energy research centre, our work is independent and is free of any expressed technological bias, ideology or political position.

This study is funded by the Department of the Environment, Climate, and Communications (DECC) Research & Development (R&D) Programme and is prepared under International Energy Research Centre’s (IERC) Energy Policy Insights for Climate Action (EPICA) Project.

# Section 1: Hydrogen Policy

Q1P: What are the most promising applications of hydrogen in industry, road transport, domestic heating, aviation, maritime transport? Which application area(s) should a national policy on hydrogen cover?

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Q2P: Which types of hydrogen among blue, turquoise and green should be covered by the policy? Why?

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Q3P: What are the advantages of blue hydrogen with respect to green hydrogen you are aware of? Should the policy incentivise the production of blue hydrogen in the short term?

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Q4P: How can the policy contribute to lower the price of hydrogen used for public transportation?

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Q5P: How can policy incentivise the replacement of diesel buses with hydrogen-fuelled ones?

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Q6P: Should policy introduce incentives for the retrofit of gas-fired boilers, such that blended hydrogen can be reliably used in the domestic heating system? If so, how should this be done?

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Q7P: Should policy incentivise the adoption of technologies for hydrogen capture and storage from industrial processes? If so, how should this be done?

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Q8P: Should policy incentivise the production of hydrogen from biomass? If so, how should this be done?

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Q9P: How can political decisions support the strategy and policy development that will determine the success of hydrogen’s economy in Ireland by 2050? How to reduce uncertainties related to such political decisions?

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Q10P: What experiments, demonstrations, pilot projects and partnerships will contribute to mature technologies related to production, storage, and transmission of hydrogen in Ireland?

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Q11P: How is Ireland progressing with the development of a hydrogen economy when compared to other EU countries? What are the main barriers in Ireland with respect to other EU countries?

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Q12P: How can the banks in Ireland facilitate the financing of hydrogen projects? What are the barriers related to project financing? How can a well-designed national policy lower such barriers?

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# Section 2: Hydrogen Production

Q1HP: Is blue hydrogen produced in Ireland? Should blue hydrogen be made competitive with that of green hydrogen in the short term?

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Q2HP: Are there any industrial processes in Ireland producing hydrogen as a by-product in useful quantities? If the answer is yes, are you aware of available technologies for hydrogen capture, utilisation and storage which could be used to recover the produced hydrogen? Are those technologies reliable and cost-effective?

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Q3HP: What are the opportunities of using biomass in Ireland to produce hydrogen?

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Q4HP: What are the available technologies for carbon capture, utilisation and storage which could be used to support the production of blue hydrogen in Ireland? Do you consider those technologies reliable and cost-effective?

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Q5HP: What are the most effective ways to achieve a price reduction of hydrogen without increasing carbon emissions associated to its production?

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Q6HP: What are the main technological barriers to widespread deployment of wind-hydrogen systems in Ireland? Are there any cost-related barriers?

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Q7HP: How can PV panels and batteries be used to improve the production process of green hydrogen in wind-hydrogen systems installed in Ireland?

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# Section 3: Hydrogen Distribution and Delivery

Q1TD: What are the factors determining the effective development of a hydrogen transmission and distribution network in Ireland?

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Q2TD: What are the main barriers to the development of a hydrogen refuelling infrastructure for road vehicles in Ireland?

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Q3TD: What are the main barriers to hydrogen’s blending in the gas distribution network in Ireland?

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Q4TD: Which percentage of hydrogen is the most appropriate when blending it with natural gas in the existing gas distribution network? What are the advantages of blending hydrogen in low concentrations?

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Q5TD: Could hydrogen import from neighbour countries (UK and France) be made a viable and a cost-effective solution to increase hydrogen utilisation by 2050?

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# Section 4: Hydrogen Consumption

## 4.1 Hydrogen consumption in transportation

Q1CT: How should hydrogen contribute to the decarbonisation of the public transport sector in Ireland?

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Q2CT: What are the main outcomes of pilot projects demonstrating hydrogen fuelled bus transportation in Ireland?

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Q3CT: What is the current cost of green hydrogen used for transportation per kilogram? How does it compare with diesel fuel? How do you see this cost evolving in the future, specifically by 2030?

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Q4CT: Where do you see hydrogen being used in the transportation sector in Ireland in a 2050 scenario?

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## 4.2 Hydrogen consumption in heating

Q1CH: What are the implications of replacing natural gas with a mixture of natural gas and hydrogen in domestic heating systems to reduce carbon emissions?

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Q2CH: What is the acceptable price range per kWh to make a mixture of hydrogen and natural gas competitive with pure natural gas when used in domestic heating systems?

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Q3CH: What are the advantages/disadvantages of replacing a natural gas fired boiler of the current technology with a new hydrogen boiler?

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**4.3 Hydrogen consumption in industry**

Q1CI: Which industries should be incentivised to use hydrogen in Ireland?

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Q2CI: What is the current annual demand of hydrogen for industrial applications in Ireland?

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Q2CI: What is the current buying price per ton of hydrogen used in industrial processes in Ireland?

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Q3CI: What do you believe is the acceptable price range for green or blue hydrogen per ton to make it competitive with other alternatives?

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