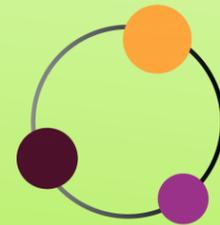




THE COMMUNITY HYDROGEN FORUM AND DECISION SUPPORT TOOL

- ▶ Dr Rory Monaghan, University of Galway
- ▶ 1 June 2023
- ▶ GenComm Conference, Belfast



Hydrogen Triple Alliance



OVERVIEW

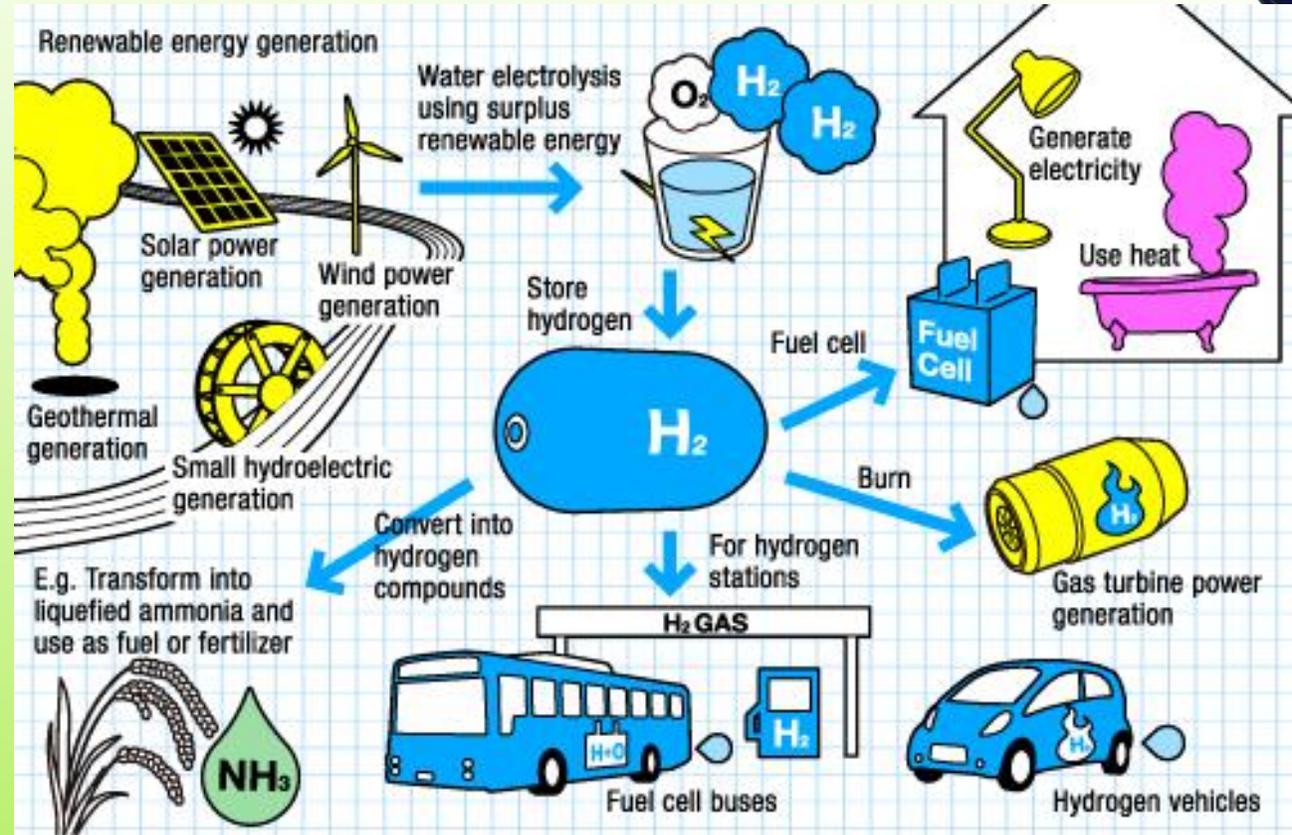


- ▶ The Renewable Hydrogen Opportunity for Communities
- ▶ The Community Hydrogen Forum
- ▶ The CH2F Decision Support Tool
- ▶ The Next Steps

THE RENEWABLE HYDROGEN OPPORTUNITY FOR COMMUNITIES



- ▶ Energy security
- ▶ Reliable emissions free transport, heat and power
- ▶ Long-term energy storage
- ▶ Reduced fossil fuel use
- ▶ Local investment
- ▶ New clean industries
- ▶ Hi-tech employment
- ▶ Community development



<http://www.thinktheearth.net/thinkdaily/report/2010/08/rpt-53.html#page-2>

How can communities recognise and take the H₂ opportunity?

THE COMMUNITY HYDROGEN FORUM

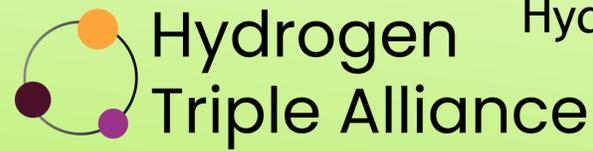


Hydrogen insights



Hydrogen links

Hydrogen case studies

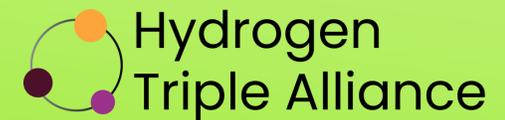


Hydrogen forum

Decision support tool



Hydrogen networking





THE COMMUNITY HYDROGEN FORUM OVERVIEW

- ▶ Platform designed to help everyone *understand the opportunities* renewable hydrogen technologies offer in Europe.
- ▶ Intended to be a forum for national, regional, and local governments, energy agencies, community development groups, energy cooperatives, educational institutions, renewable energy developers, transport sectors, and grid operators.
- ▶ Any stakeholder from Northwest Europe, the Atlantic Area or the Northern Peripheries and Arctic is *encouraged to participate* as a member.



<http://communityh2.eu/>



THE COMMUNITY HYDROGEN FORUM OBJECTIVES



1. To raise *awareness* of the potential of hydrogen in sustainable community development, decarbonisation, and energy security.
2. To offer a forum to *share* information, experience and best practice of how communities and projects are deploying hydrogen across Europe.
3. To provide an *up-to-date*, informed resource for hydrogen information and case studies.
4. To provide access to a unique *Decision Support Tool* (DST) to assist in evaluating how hydrogen technologies can be deployed in individual scenarios.
5. To play a role in developing *long term* strategies for the advancement in adoption of hydrogen technologies.



<http://communityh2.eu/>



THE COMMUNITY HYDROGEN FORUM A TOUR OF THE WEBSITE



<http://communityh2.eu/>



DECISION SUPPORT TOOL



Where can I learn about hydrogen opportunities?





DECISION SUPPORT TOOL



Where can I learn about hydrogen opportunities?



Curtailed renewable energy sources



Wind Energy



Solar Energy



AD Plant

Decision Support Tool

Hydrogen could make sense for my community, organisation or company.

But how do I make it happen?

How do I find a hydrogen source or market?

Energy demands



Industry



Mobility



Stationary Energy

DECISION SUPPORT TOOL



Where can I learn about hydrogen opportunities?



Curtailed renewable energy sources



Wind Energy



Solar Energy



AD Plant

Decision Support Tool

Hydrogen could make sense for my community, organisation or company.

But how do I make it happen?

How do I find a hydrogen source or market?

Energy demands



Industry



Mobility



Stationary Energy



How do I take the next steps?
How do I connect with others across Europe?



THE DECISION SUPPORT TOOL

WHAT IS IT?

- ▶ Supports stakeholders to evaluate the potential of hydrogen in:
 - ▶ sustainable community development
 - ▶ Decarbonisation
 - ▶ energy security
- ▶ Achieves this by demonstrating the role of hydrogen produced at onshore wind farms with battery storage and PV arrays in decarbonising public bus fleets in large cities across the region
- ▶ Visualised in an online interactive map of Europe

THE DECISION SUPPORT TOOL

WHY CITY BUSES?



- ▶ Hydrogen fuel cell city buses are now on sale commercially
- ▶ They provide a large, predictable, centralised hydrogen demand
- ▶ Fuel cell buses or fleets operate in Aberdeen, Belfast, Dublin, London, Seoul, Tokyo, and many other cities
- ▶ CaetanoBus & WrightBus offer single-and double-decker FCEV buses



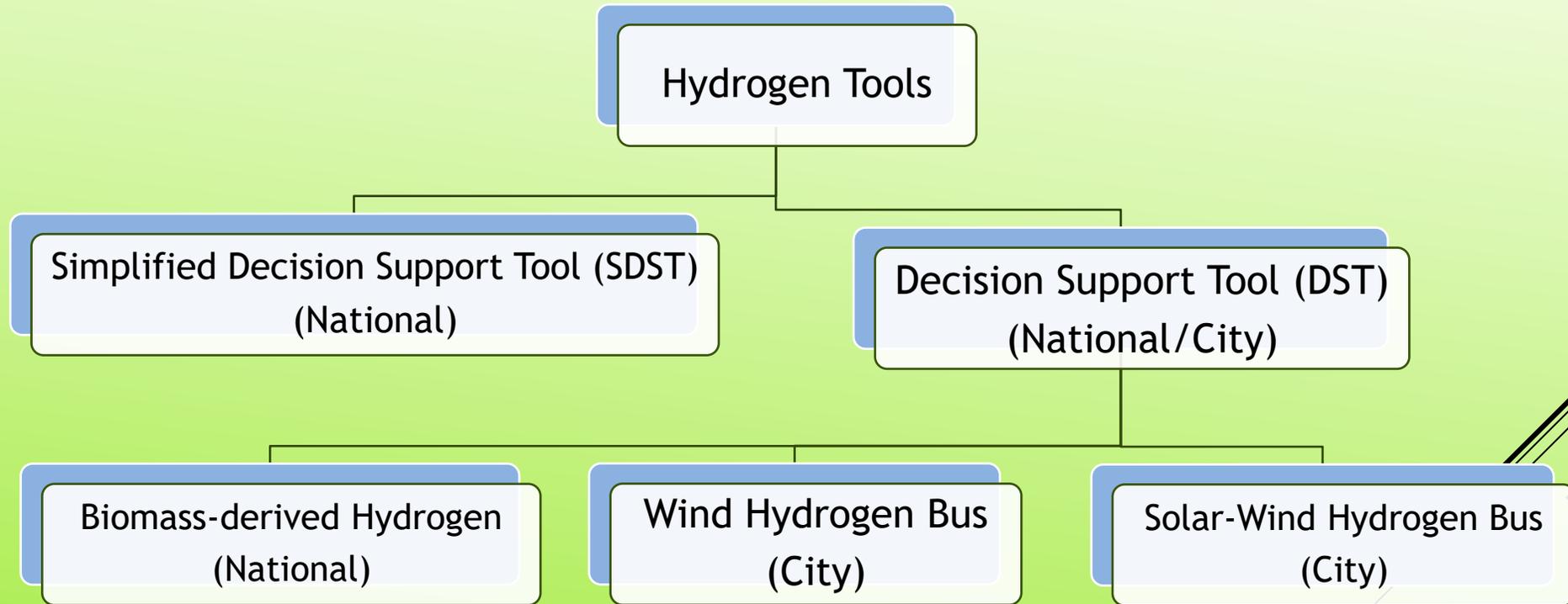
Dublin Caetano FCEV bus trial, Nov 2020
<https://www.rte.ie/news/business/2020/1111/1177483-cie-group-partners-in-hydrogen-fuel-cell-bus-trial/>



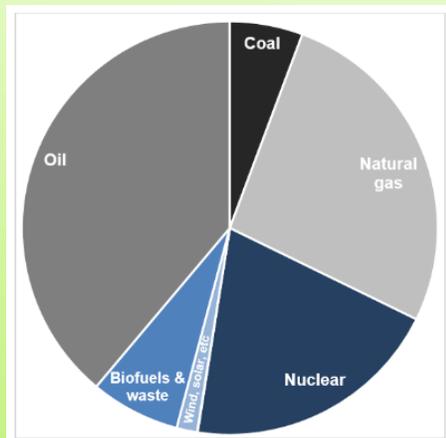
Belfast WrightBus FCEV bus deployment, Dec 2020
<https://www.belfasttelegraph.co.uk/news/northern-ireland/translinks-hydrogen-powered-buses-enter-service-in-northern-ireland-39872290.html>



THE HYDROGEN TOOLS OF THE COMMUNITY HYDROGEN FORUM

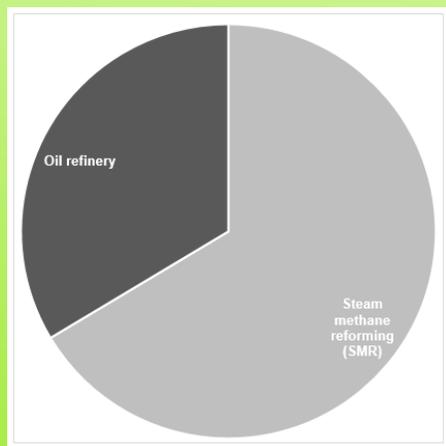


THE SIMPLIFIED DECISION SUPPORT TOOL (SDST) ENERGY & HYDROGEN OUTLOOK FOR BELGIUM



What Are the Primary Energy Sources in My Country?

This figure shows the percentage share of total primary energy supply (TPES) by energy source. It can be seen that 71% of the Belgian energy demand are supplied by fossil fuels (coal, natural gas and oil). Renewable energy contributes to nearly 9% of the total energy supply. Renewable includes wind, solar, hydro, biofuels & waste.



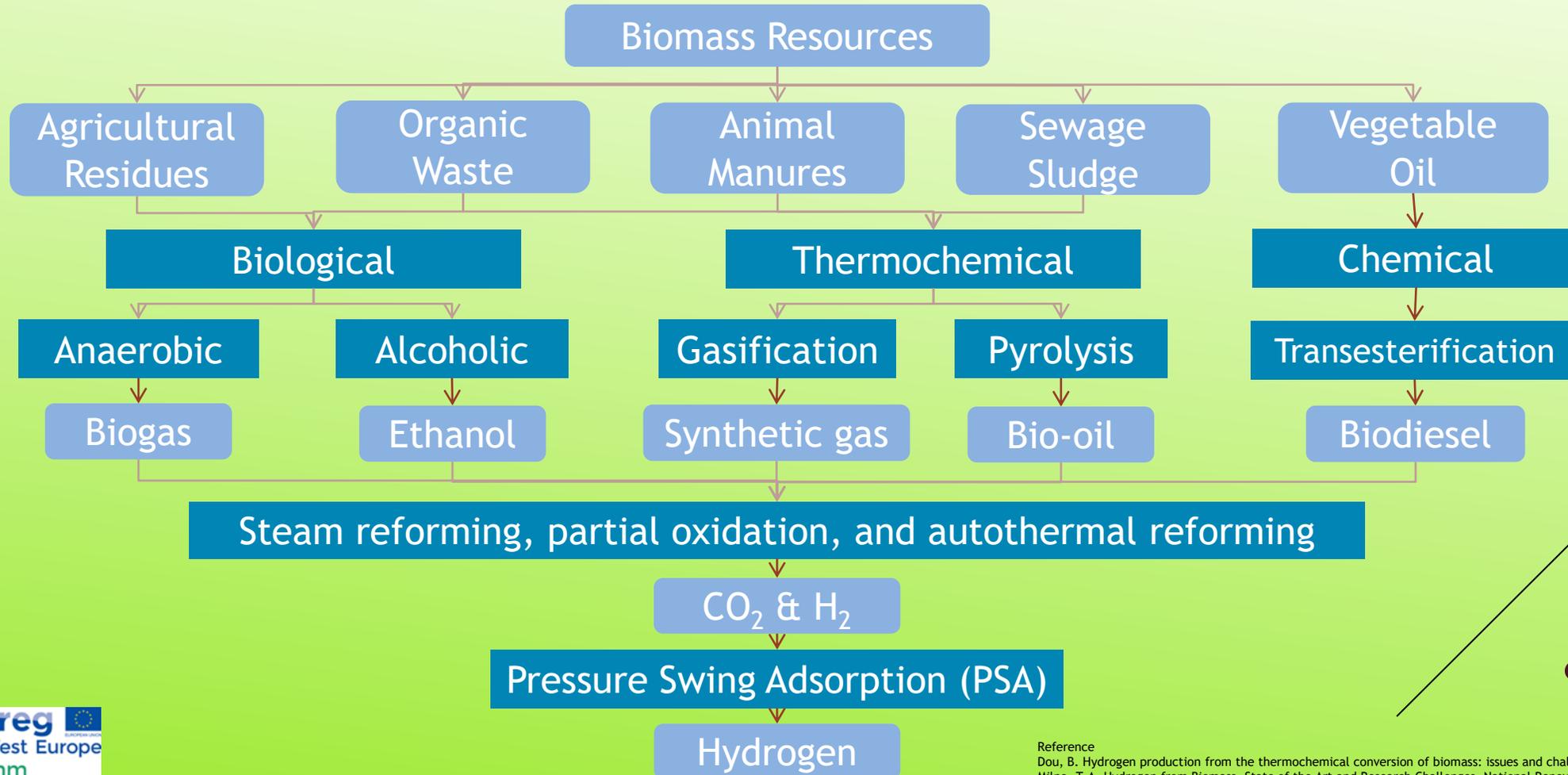
How Is Hydrogen Produced in My Country?

The pie diagram illustrates the percentage share of total hydrogen capacity by process production. The figure shows the hydrogen has been produced and consumed in Belgium. In fact, most of hydrogen is generated from fossil fuels via steam methane reforming (SMR). The rest of hydrogen is extracted in oil refinery. In the near future, renewables can also be potential energy sources for hydrogen production.



THE DECISION SUPPORT TOOL - BIOMASS-DERIVED H₂

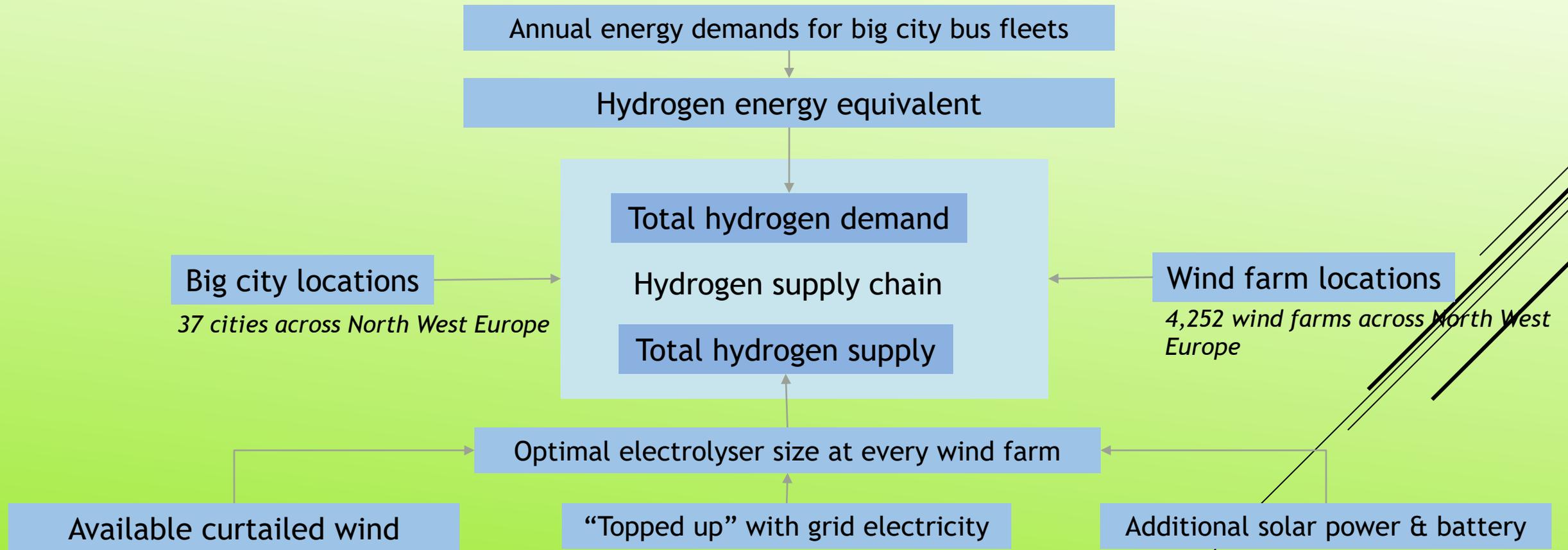
HOW TO PRODUCE HYDROGEN FROM BIOMASS?



Reference
Dou, B. Hydrogen production from the thermochemical conversion of biomass: issues and challenges. Sustainable Energy & Fuels. Issue 2, 2019.
Milne, T.A. Hydrogen from Biomass. State of the Art and Research Challenges. National Renewable Energy Laboratory. Golden, USA. 2010.
IEA. The Future of Hydrogen. Seizing today's opportunities. International Energy Agency (IEA). Paris, France. 2019.

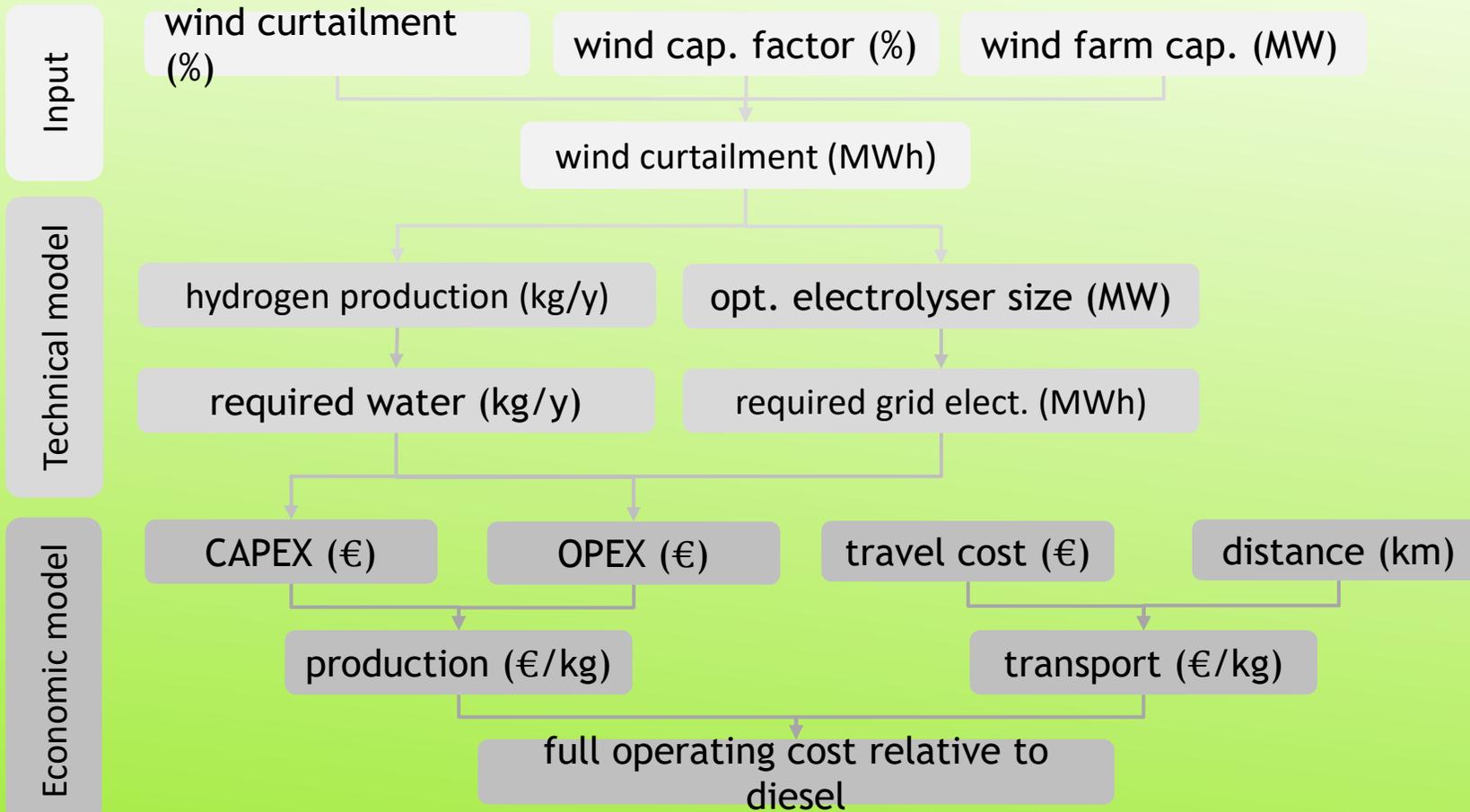
THE DECISION SUPPORT TOOL - WIND/SOLAR-BASED H₂

HOW IT WORKS



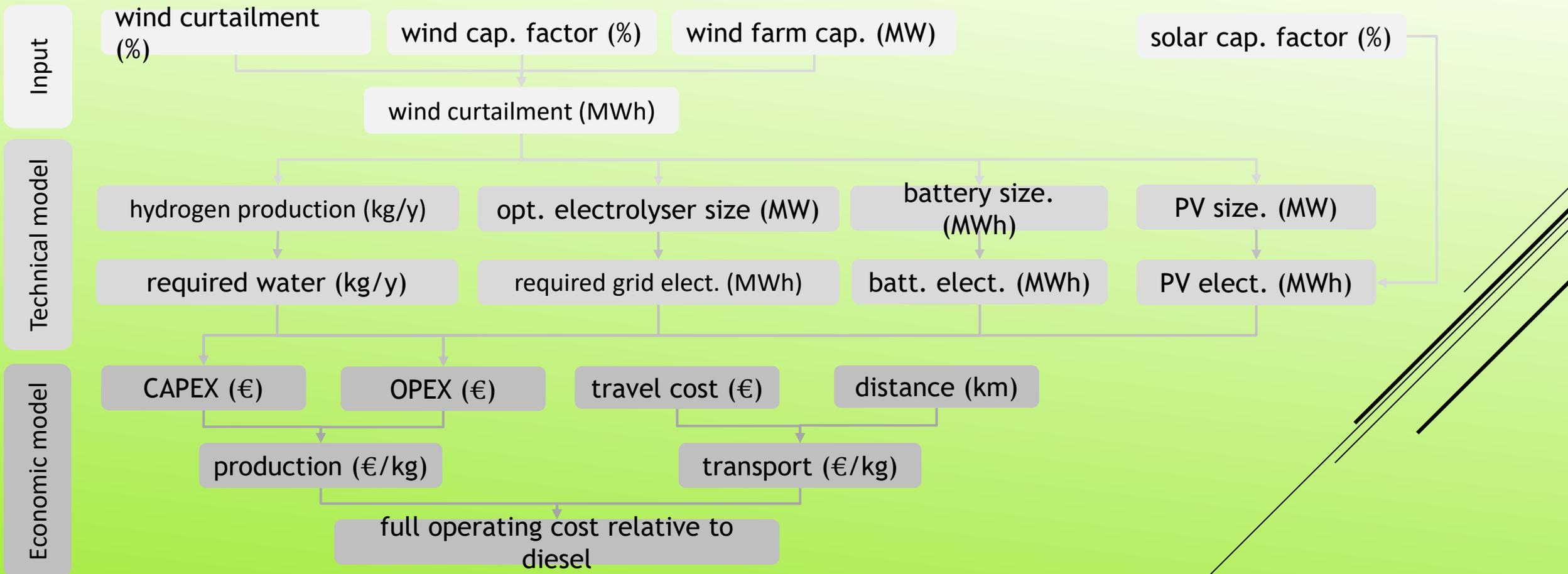
THE DECISION SUPPORT TOOL - WIND-BASED H₂

HOW IT WORKS



THE DECISION SUPPORT TOOL - SOLAR-WIND-BASED H₂

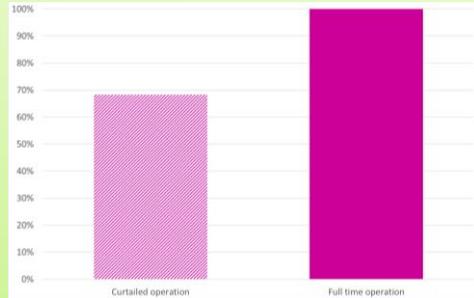
HOW IT WORKS



THE DECISION SUPPORT TOOL RESULTS FOR DUBLIN

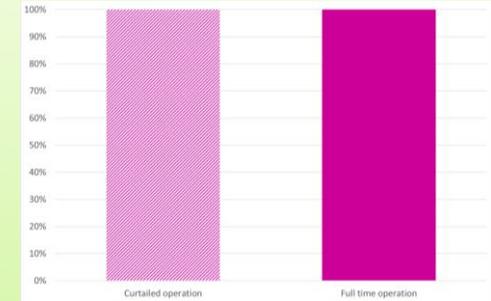


Wind-only results

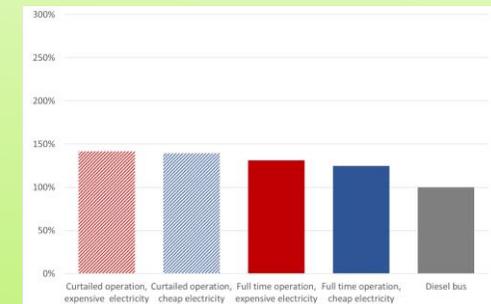
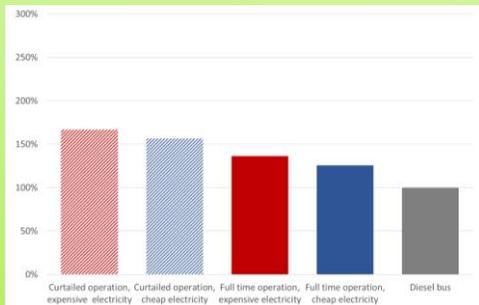


The percentage of city bus fuel displaceable by renewable H2 for different electrolyser operation modes

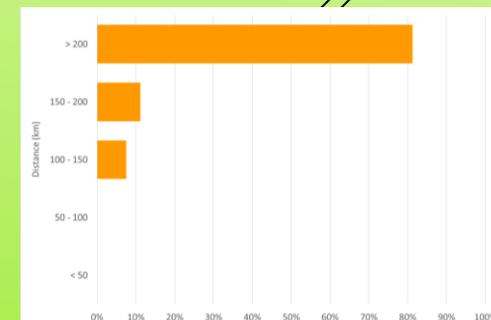
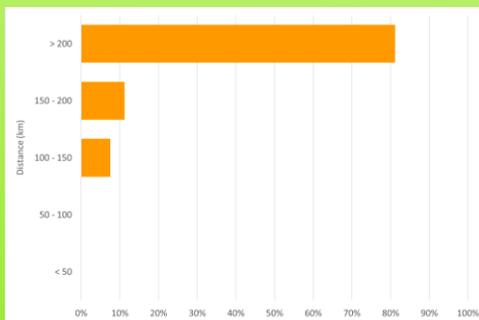
Wind+PV+battery results



The percentage of operational costs for hydrogen buses for different electricity prices and electrolyser operation modes, relative to diesel



Distances from hydrogen sources to city bus fleet

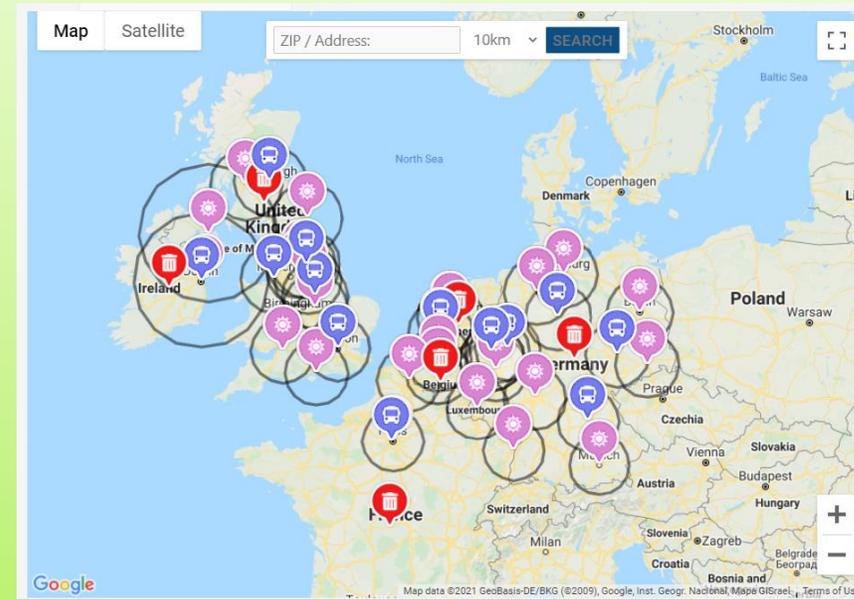
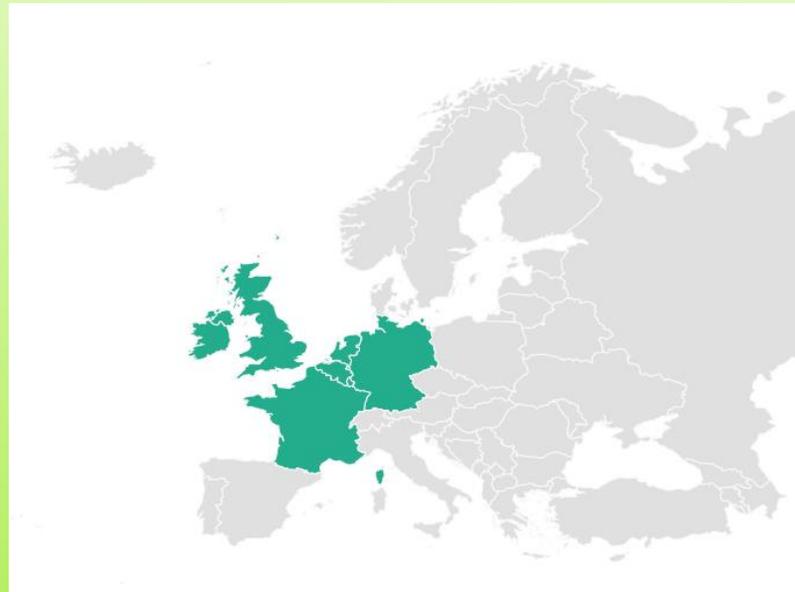


THE HYDROGEN TOOLS OF THE COMMUNITY

HYDROGEN FORUM



The hydrogen opportunity is here.
Will your community explore it?





THE NEXT STEPS FOR POTENTIAL HYDROGEN STAKEHOLDERS

- ▶ Go to <http://communityh2.eu/> and register to join the Community Hydrogen Forum
- ▶ Learn about the exciting community hydrogen projects underway across Europe
- ▶ Explore your region's renewable hydrogen potential using the DST
- ▶ Contact the Community Hydrogen Forum at info@communityh2.eu to start taking the next steps to realise your community's renewable hydrogen opportunity



BACKUP SLIDES



TOUR BACKUP SLIDES ABOUT US



Home About Us H2 Discussion H2 Insights Decision Support Tool Links Contacts Register Login



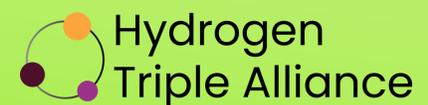
ABOUT US

About CH2F

The Community Hydrogen Forum (CH2F) is a platform designed to help everyone understand the opportunities hydrogen technologies offer, especially in Northwest Europe. The platform is intended to be a forum for national, regional, and local governments, energy agencies, community development groups, energy cooperatives, educational institutions, renewable energy developers, transport sectors, and grid operators. In fact, any stakeholder from Ireland, UK, France, Belgium, Netherlands, Luxembourg, and Germany is encouraged to participate as a member of CH2F. The main objectives of CH2F can be summarised as;



<http://communityh2.eu/about-us/>



TOUR BACKUP SLIDES HYDROGEN INSIGHTS



Home About Us H2 Discussion H2 Insights Decision Support Tool Links Contacts Register Login



HYDROGEN INSIGHTS

KEY

- Why Hydrogen?
- What is Smart Hydrogen?
- Hydrogen's Role in Energy Transition
- Europe's Decarbonisation Challenge
- Hydrogen Safety
- Hydrogen Roadmap Europe
- Community Energy



<http://communityh2.eu/h2-insights/>



TOUR BACKUP SLIDES LINKS



The screenshot shows the website for the Community Hydrogen Forum. At the top left is the logo, which consists of a stylized 'H₂' inside a blue circle with the text "Community Hydrogen Forum" to its right. A navigation menu at the top right includes links for Home, About Us, H2 Discussion, H2 Insights, Decision Support Tool, Links, Contacts, Register, and Login. Below the navigation is a large photograph of four men in business suits standing behind a white hydrogen fuel cell vehicle. The car has "ONE" and "Hydrogen" branding. Below the photo, the text "COMPANY LINKS" is displayed in blue. Underneath, there is a section titled "Hydrogen associations in Europe" with a horizontal line below it. At the bottom of the screenshot, three logos are displayed: UK HFCA (with a stylized 'H₂' logo), VÄTGAS SVERIGE (in purple text), and DWV (Deutscher Wasserstoff- und Brennstoffzellen-Verband, with a stylized 'H₂' logo).



<http://communityh2.eu/>



TOUR BACKUP SLIDES

LINKS - NATIONAL HYDROGEN ASSOCIATIONS



Hydrogen associations in Europe

The image displays a collection of logos for national hydrogen associations across Europe. The logos are arranged in a grid-like fashion. From top-left to bottom-right, they include: UK HFCA (UK Hydrogen Fuel Cell Association), VÄTGAS SVERIGE (Swedish Hydrogen Association), DWV (Deutscher Wasserstoff- und Brennstoffzellen-Verband), Hydrogen Ireland, SCOTTISH Hydrogen & Fuel Cell ASSOCIATION, NWBA (Nederlandse Waterstof & Brandstofcel Associatie), Brintbranchen (Dutch Hydrogen Industry), AẽH₂ (Asociación Española del Hidrógeno), hydrogen.no (Norwegian Hydrogen Forum), and AFHYPAC (Association Française de l'Hydrogène).



<http://communityh2.eu/links/>



TOUR BACKUP SLIDES

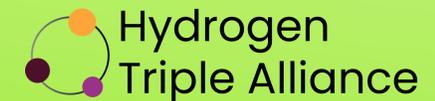
LINKS - SOME KEY EU PROJECTS



Some examples of key hydrogen projects in Europe



<http://communityh2.eu/links/>



TOUR BACKUP SLIDES HYDROGEN DISCUSSION FORUM



Recent Presentations and Background Materials		Topics	Posts
Hydrogen: Getting the Green Light, Driving Europe's Green Recovery Here you can find all of the materials used by speakers from Gencomm's 'Hydrogen: Getting the Green Light, Driving Europe's Green Recovery' Recent Topics	3	9	
Full Q&A Document	6 months ago	By Admin	
Video Recordings	7 months ago	By Admin	
Slides from Hydrogen: Getting the Green Light...	8 months ago	By Admin	



<http://communityh2.eu/community/>



TOUR BACKUP SLIDES

DECISION SUPPORT TOOL



[Home](#) [About Us](#) [H2 Discussion](#) [H2 Insights](#) [Decision Support Tool](#) [Links](#) [Contacts](#) [Register](#) [Login](#)



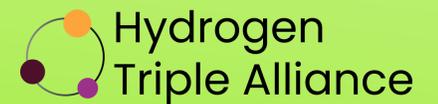
DECISION SUPPORT TOOL

What Is The Decision Support Tool?

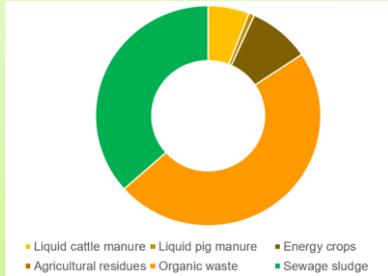
Welcome to the CH2F's Decision Support Tool (DST). The DST is designed to support stakeholders to evaluate the potential of hydrogen in sustainable community



<http://communityh2.eu/dst/>

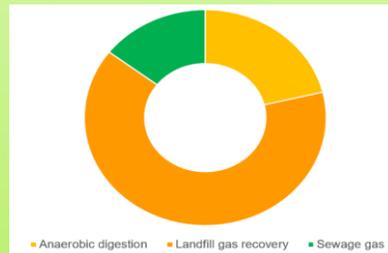


THE DECISION SUPPORT TOOL - BIOMASS-DERIVED H₂ RESULTS FOR THE UNITED KINGDOM (UK)



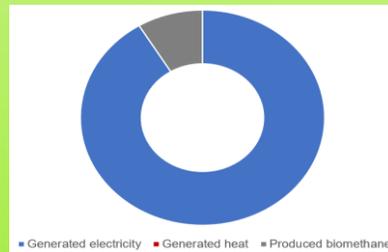
The percentage share of feedstock to produce biogas

This graph illustrates the portion of feedstocks to produce the entire biogas in the UK. As can be seen in the figure, nearly half of the entire biogas in the UK is produced from organic waste. Followed by sewage sludge and energy crops. Manures from pig and cattle have a small portion.



The percentage share of processes to produce biogas

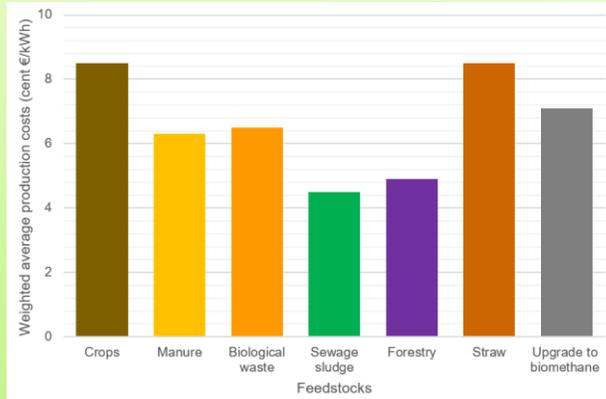
The figure shows three anaerobic processes to produce biogas in the UK. It can be seen that more than 50% of the entire biogas in the UK is produced by land fill recovery. Anaerobic digestion and sewage gas are the second and third large contributors, respectively.



The percentage share of generated energy from biogas

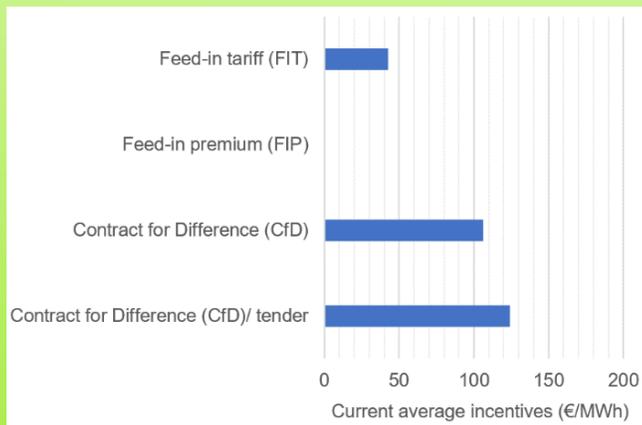
This figure indicates how biogas is utilised in the UK. Most of biogas is used to generate power. A little portion of biogas is upgraded to biomethane.

THE DECISION SUPPORT TOOL - BIOMASS-DERIVED H₂ RESULTS FOR THE UNITED KINGDOM (UK)



The weighted average production costs of biogas from various type of feedstock

The bar graph shows the average production cost of biogas from various type of feedstocks. Biogas produced from sewage sludge (coloured in green) has the lowest production cost compared to other feedstocks. The upgrading cost to biomethane is indicated at the last bar (coloured in grey).



The percentage share of processes to produce biogas

This figure informs the energy communities with regard to the available support scheme. In the UK, biogas production is supported by various schemes such as feed-in tariff, contract for difference and tender. The incentives vary from 40 to 120 €/MWh.

TOUR BACKUP SLIDES

DST SIMPLE



The screenshot shows the top navigation bar of the CH2F Community Hydrogen Forum website. The logo is in the top left, and the navigation menu includes: Home, About Us, H2 Information, Hydrogen Tools, News, and Login. Below the navigation is a large photograph of a solar farm with rows of solar panels in a field with trees and hills in the background. The main heading of the page is "SIMPLIFIED DST".

What Is The Decision Support Tool?

Welcome to the CH2F's Decision Support Tool (DST). The DST is designed to support stakeholders to evaluate the potential of hydrogen in sustainable community development, decarbonisation, and energy security throughout the North West Europe (NWE) region. The DST achieves this by demonstrating the role of hydrogen produced at onshore wind farms throughout NWE in decarbonising public bus fleets in large cities across the region. It is visualised in an online interactive map of NWE and explained in more below.

What is the Simplified DST?

The simplified DST (SDST) follows a similar principle to the full version, however there are a few distinct differences. The SDST examines the renewable energy landscapes of a number of select countries based in NWE, as opposed to specific European cities. The resource shows data detailing the primary energy sources of the countries examined as well as their current hydrogen production methods.