

# H<sub>2</sub> - Global Perspective

**Dr James Carton**

**Assistant Professor in Energy Sustainability & Hydrogen & Fuel  
Cell Technology Development**

**Dublin City University**

**&**

**World Energy Council FEL Member**

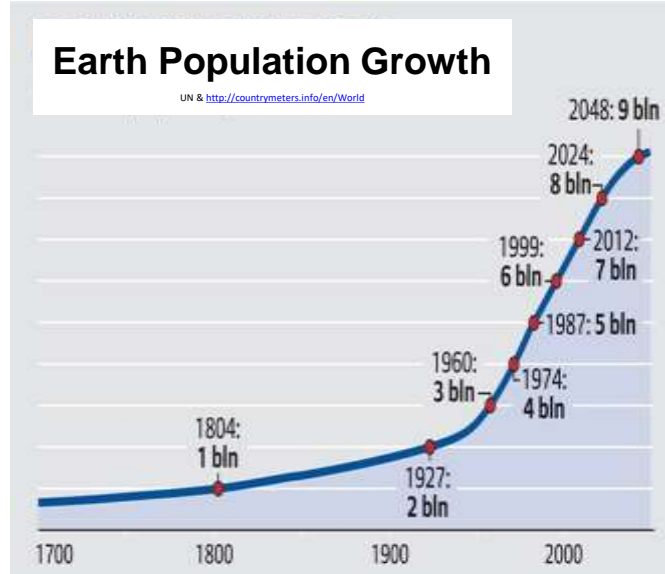
**&**

**Hydrogen Ireland Association**

[James.carton@dcu.ie](mailto:James.carton@dcu.ie)

**DCU**

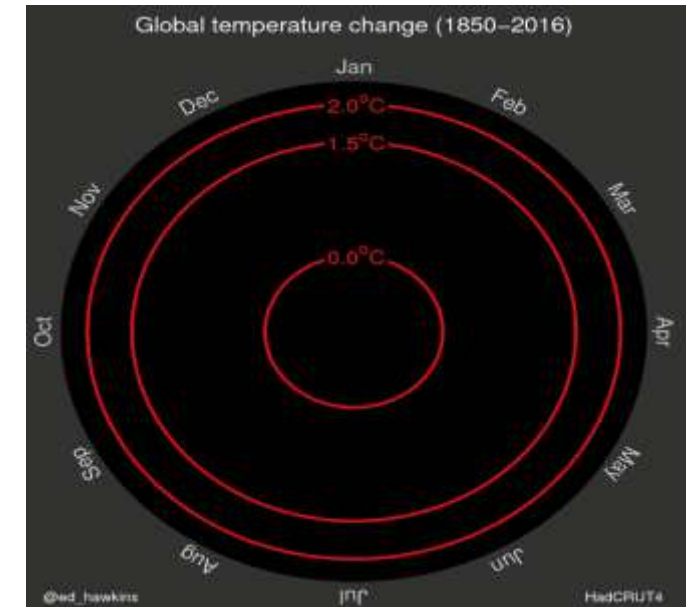
# A Changing World...



**Agriculture / Food**

What affect will these have on:

- Resources
- Energy Use
- Transport



# Grand Global Challenges

## HYDROGEN



<https://londonfuturists.com/previous-meetings/peace-grand-challenge/>



# Hydrogen Uses

Most hydrogen is used to refine crude and shale oil.



Hydrogen's extreme heat and cold help manufacture electronics, metal, and glass.



Hydrogen has been used for more than 90 years with an excellent safety record.

Hydrogen creates clean electricity and stores energy from renewables.



Hydrogen binds molecules together in chemicals and pharmaceuticals.



Hydrogen makes fertilizer, consumer products and food more shelf stable.



<https://cafcp.org/sites/default/files/hydrogenuse.jpeg>

# Hydrogen Market

## Global:

- The Global hydrogen generation market was valued at \$115.25 billion USD in 2017 and expected to grow to \$154.74 billion USD in 2022.
  - >90% Produced by SMR

## Ireland:

- The Irish hydrogen market is estimated at 1000tons/year. Mainly used for Desulphurisation, Semiconductor industry, Pharmaceutical & Food, & Energy Cooling.
- Produced as by product of Chemicals, Electrolysis & % is imported.
  - There is no SMR Plant on the island of Ireland.







# Analysis of more than 200 Power-to-X (Hydrogen Production) projects shows:



**“if” POWER-TO-X?**

*Is P2X a solution for only developed countries with an over-generation concern or is P2X one of the solutions for decarbonizing all sectors of the global economy?*

This Forum brings to public discussion the findings of the recently published *“International Aspects of a Power-To-X Roadmap”*. The study explores the potential of the power-to-x market and identifies a roadmap for sector development.

Energy leaders from around the globe will gather to discuss the viability and cost-effectiveness of power-to-x solutions and the pace of electrification and decarbonisation trends.

The forum will focus on three key themes: (1) scaling up technology, (2) creating markets and (3) facilitating investment. Interactive sessions will address the following questions:

1. **What role can power-to-x play in decarbonising the energy system?**
  - a. Where we get the “Power” in power-to-x?
  - b. What is “X” in power-to-x?
  - c. Policy and industry perspectives on power-to-x as a decarbonisation pathway
2. **Is power-to-x a solution with global appeal?**
  - a. Producers, exporters and importers: sizing the power-to-x global market
  - b. Economic viability of power-to-x fuels and supports
  - c. Industry applications: transport, heating and manufacturing

**WORLD ENERGY COUNCIL**

Date TBC  
**2019**

**9:00am – 5pm**

---

**A platform to exchange ideas and challenge assumptions.**

---

**“if” power-to-x, then what?**

---

**Invitation Only Event**

**LOCATION**  
 London, U.K.  
 (venue tbc)

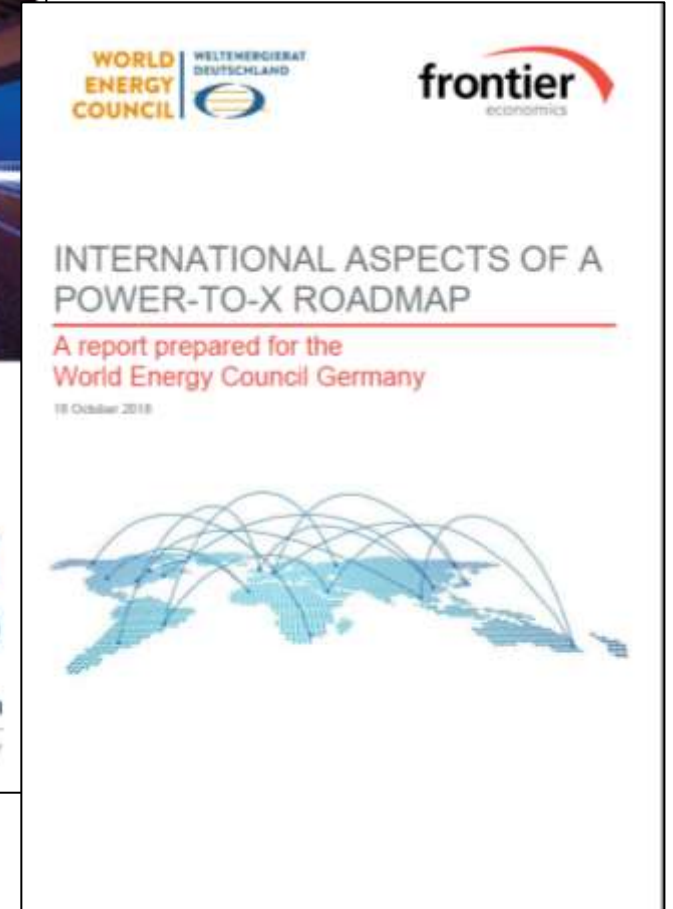
- OECD countries with national and industrial funds available, and with developed gas grid and transport infrastructure, **lead the deployment** of Power-to-X technology.
- Power-to-X technology is technologically mature.
- Hydrogen has an added value to renewables: it can store renewable energy and convert this clean energy into **fuel for cars; chemicals for industry, and gas for the grid.**



<https://www.worldenergy.org/wp-content/uploads/2019/02/WEC-Netherlands-Hydrogen-Industry-as-Catalyst.pdf>



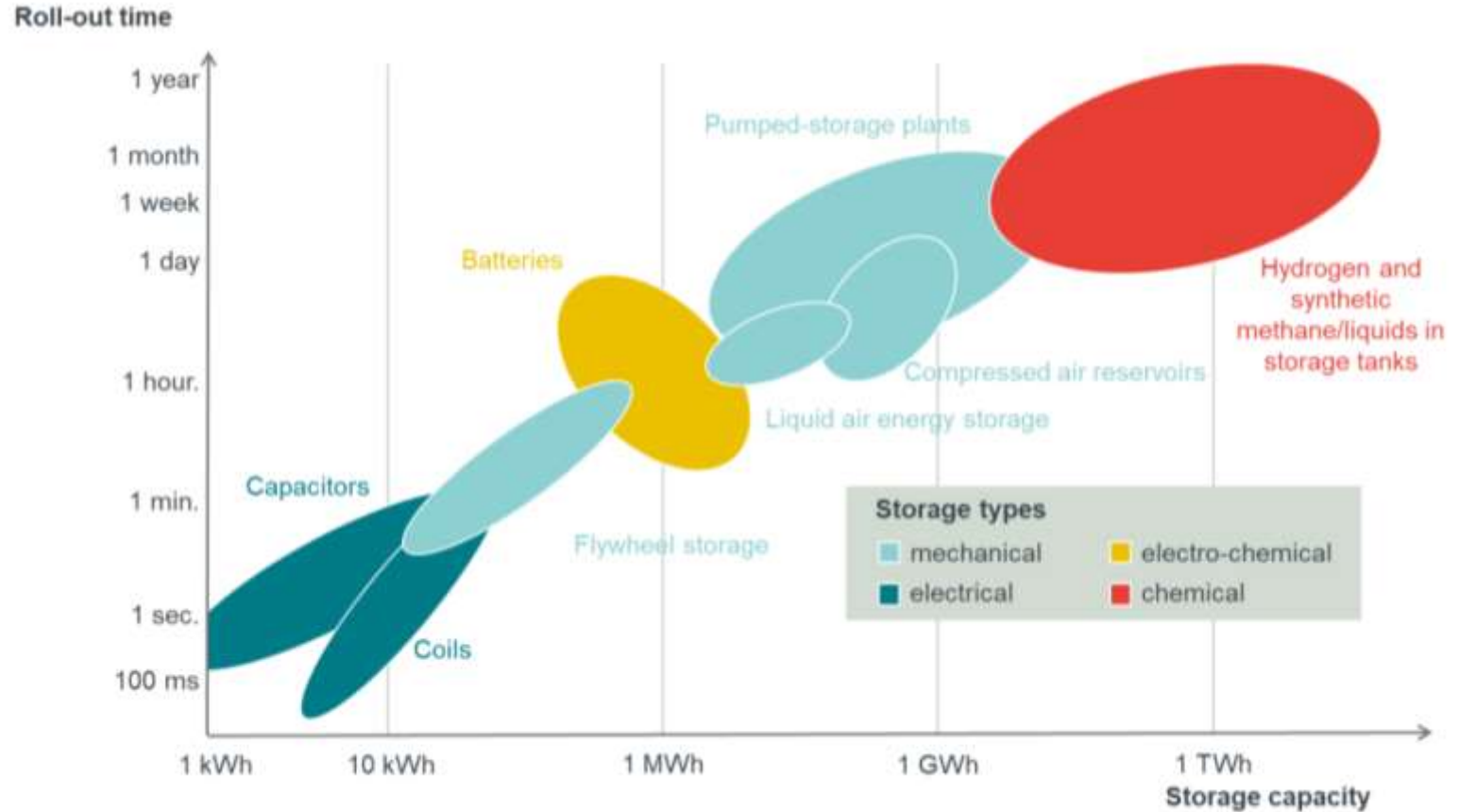
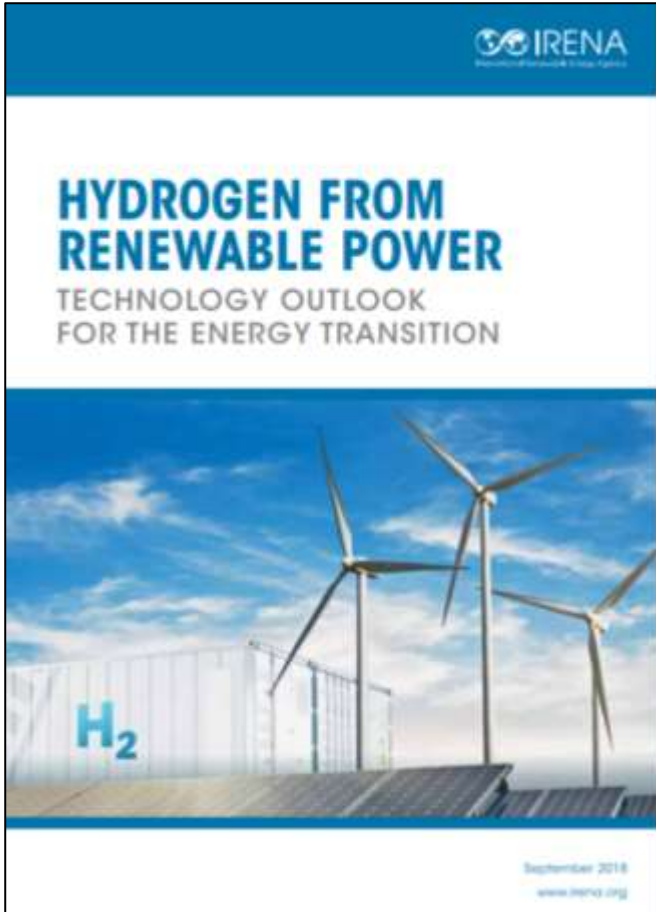
McKinsey - Hydrogen Scaling Up -  
HydrogenCouncil - 2017



<https://www.frontier-economics.com/media/2642/frontier-int-ptx-roadmap-stc-12-10-18-final-report.pdf>

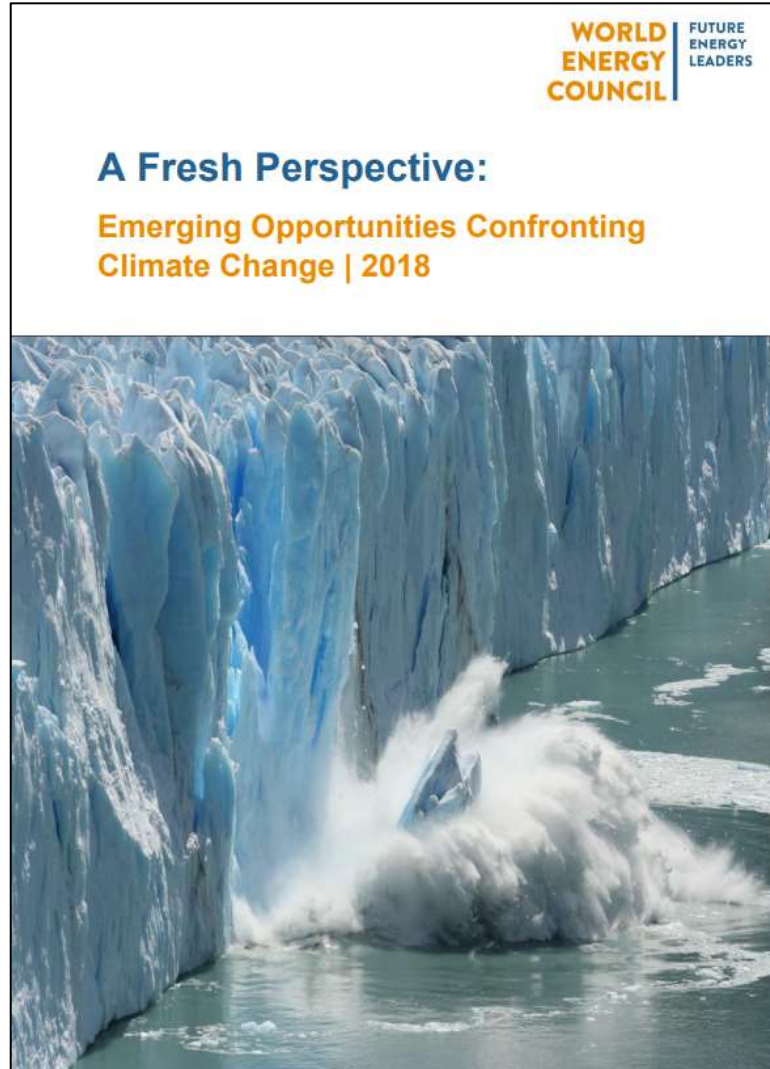


# Our Energy Transition Needs Hydrogen!



Source: Frontier Economics based on Sterner et al. (2014), and own analyses. Also see WEC (2016).

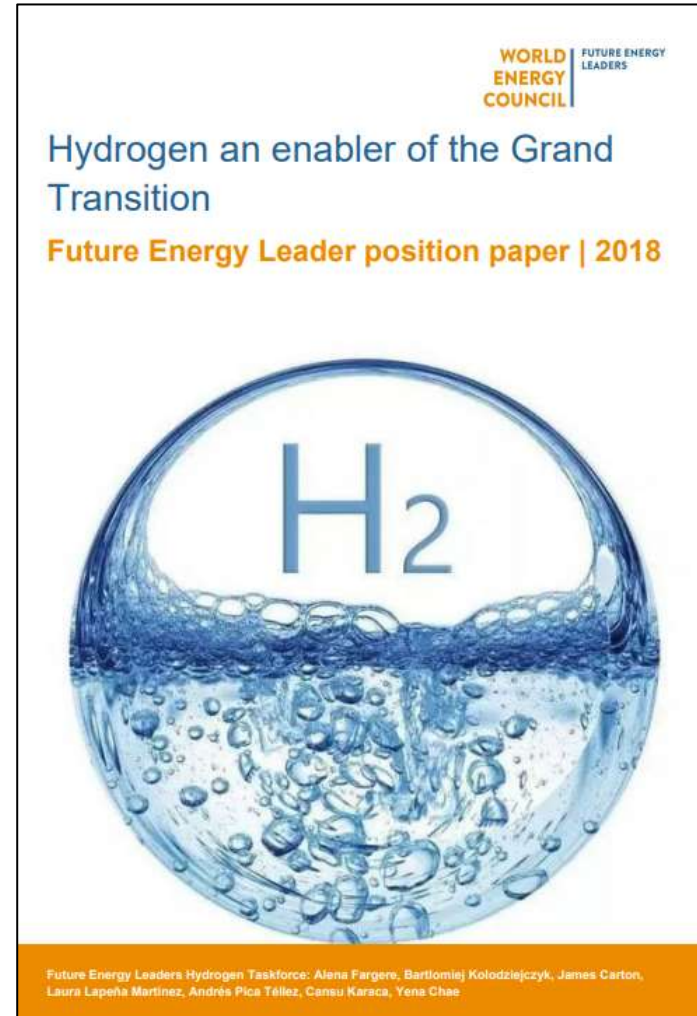
<https://irena.org/publications/2018/Sep/Hydrogen-from-renewable-power>



<https://www.worldenergy.org/wp-content/uploads/2018/05/A-Fresh-Perspective-Emerging-Opportunities-Confronting-Climate-Change-2018-Final.pdf>

# Key Messages:

- Hydrogen can enable the a transition to low carbon economy through systemic impact to the whole energy system
- Hydrogen technology is mature and is starting to be deployed to decarbonize different sectors across the globe
- Industry leads early market deployment to anticipate future regulation [e.g. Hydrogen Council counts 42 multinational companies]



<https://www.worldenergy.org/wp-content/uploads/2019/02/Hydrogen-an-enabler-of-the-Grand-Transition-FEL-WEC-2018-2.pdf>

# Key Messages:

- **Need for** coherent low carbon regulation to ensure short term profitability of hydrogen solutions
- **Need for** extensive communication, education and future workforce training to enhance social acceptance of hydrogen technologies



Thank You.