



SPEAKER

Dr Sheila Samsatli

Lecturer (Assistant Professor)
and Prize Fellow, University
of Bath

Whole-system optimisation for planning, design and operation of hydrogen value chains for Net Zero

Dr Sheila Samsatli, University of Bath

Wednesday 14 July 2021



My research in a nutshell

I am developing large, high fidelity optimisation models for whole-system value chains to achieve net zero, while protecting the environment, ecosystem services and biodiversity.



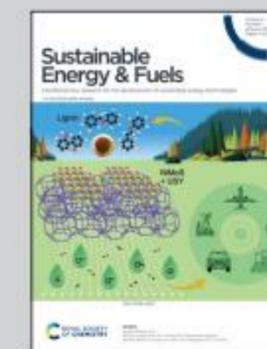
Showcasing research from the group of Dr Sheila Samsatli at University of Bath, UK.

The curious case of the conflicting roles of hydrogen in global energy scenarios

A collaboration between the IEA Hydrogen Implementing Agreement Task 38 and the group of Dr Samsatli, developing large, high-fidelity optimisation models, such as the Value Web Model, for integrated energy value chains that preserve the environment, biodiversity and ecosystems services.

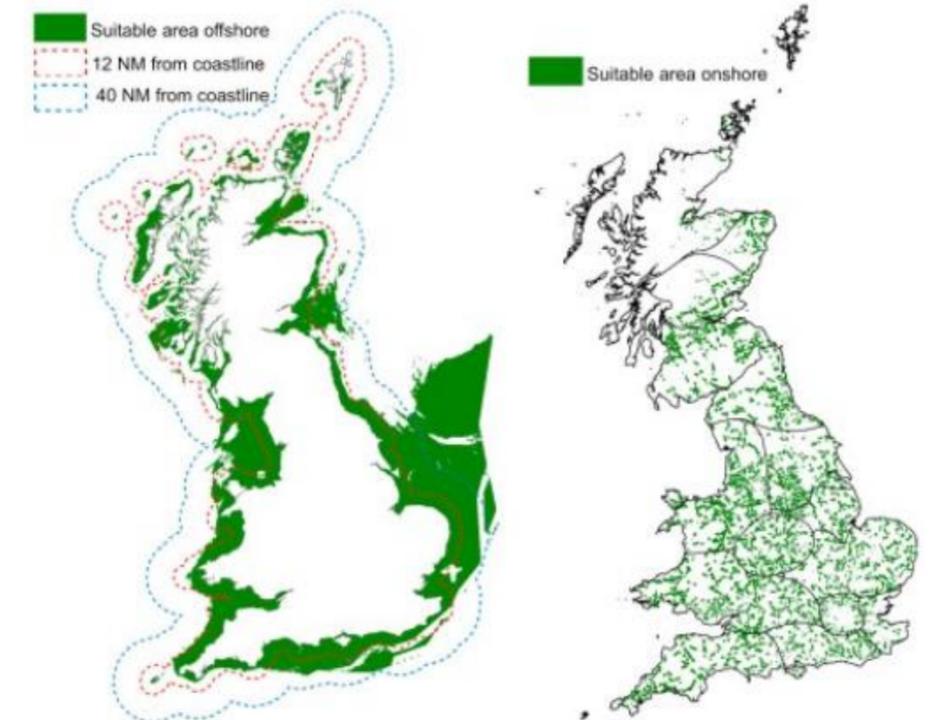
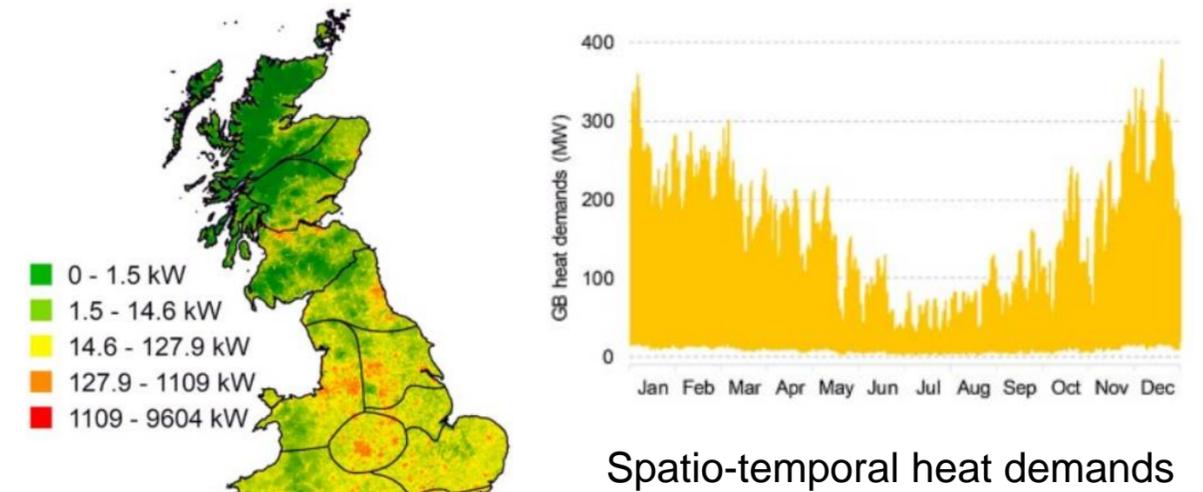
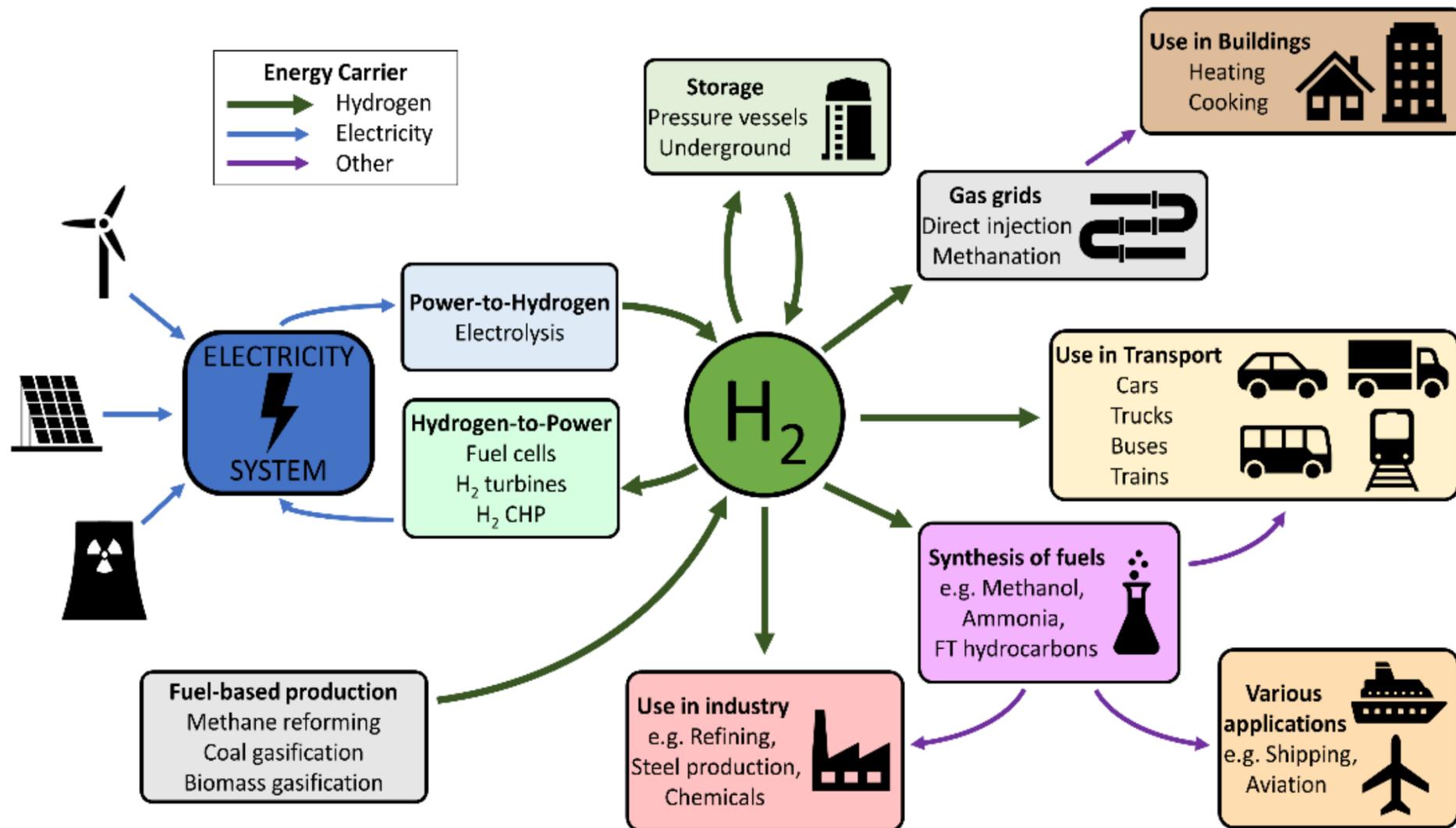
Hydrogen is a crucial element in future low-carbon energy systems, where higher penetrations of renewables will require more responsive networks including load balancing, energy storage and sector coupling. However, it is puzzling that hydrogen does not play a more prominent role in global energy scenarios. This paper discusses the reasons for this and provides recommendations for energy scenario development so that hydrogen will be represented more consistently and to its full potential.

As featured in:



See Sheila Samsatli *et al.*, *Sustainable Energy Fuels*, 2020, 4, 80.

Hydrogen value chains



Suitable areas for offshore and onshore wind turbines

Selected publications on the roles of H₂ for net zero

- Inter-seasonal hydrogen storage (salt caverns, depleted oil and gas fields, etc.)
 - Samsatli, S., & Samsatli, N. J. (2019). *Applied Energy*, 233-234, 854-893.
- Hydrogen alongside other energy carriers
 - Samsatli, S., & Samsatli, N.J. (2018). *Applied Energy*, 220, 893-920.
- Power-to-gas
 - Quarton, C., & Samsatli, S. (2018). *Renewable & Sustainable Energy Reviews*, 98, 302-316.
- Hydrogen injection into gas grids and linepack
 - Quarton, C., & Samsatli, S. (2020). *Applied Energy*, 275, [115172].
- Hydrogen and carbon capture, storage and utilisation
 - Jarvis, S. M., & Samsatli, S. (2018). *Renewable & Sustainable Energy Reviews*, 85, 46-68.
 - Quarton, C., & Samsatli, S. (2020). *Applied Energy*, 257, [113936].
- Optimisation of hydrogen policy scenarios for net zero
 - Quarton, C., & Samsatli, S. (2021). *Sustainable Production and Consumption*, 27, 1215-1238.

More publications on hydrogen for heat, power-to-hydrogen-to-X etc.
<https://researchportal.bath.ac.uk/en/persons/sheila-samsatli/publications/>

Membership of the BEIS Science Expert Group

- Whole-systems approach to determine pathways to net zero
 - Sustainable, resilient and measurable
 - All sectors of the economy
 - Equitable transition
 - Identify UK's economic advantage

Leading IEA Hydrogen TCP Task 42

- Hydrogen value chains for decarbonising hard-to-abate sectors
 - E.g. steel, cement, petrochemicals (e.g. plastics), fertilisers such as ammonia, aluminium
 - Largest CO₂ abatement per unit cost
 - Challenging to electrify completely some industries
 - Large and reliable demands for green hydrogen from industry
- Challenges
 - Time. Long investment cycles in energy intensive industries
 - Carbon leakage
 - Capacity for renewable energy and green hydrogen