



Innovation in Energy Research

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Oxford Energy Day 2023



Context

“This report is a clarion call to massively fast-track climate efforts by every country and every sector and on every timeframe. Our world needs climate action on all fronts: everything, everywhere, all at once.”

- Antonio Guterres



Innovation in Research





Context

National Grid ESO @NationalGridESO

New low carbon record 🏆🌱

On 18 September at 2pm, we achieved a new low carbon intensity record of 27g/kWh, beating the previous record set earlier this year on 10 April of 33g/kWh.

Download our carbon intensity app to see real time generation stats and our records bit.ly/44VKGck

Carbon Intensity

Average - GB electricity system

Map shows the daily average carbon intensity of electricity consumed in each region.

Carbon Intensity **66** gCO₂/kWh

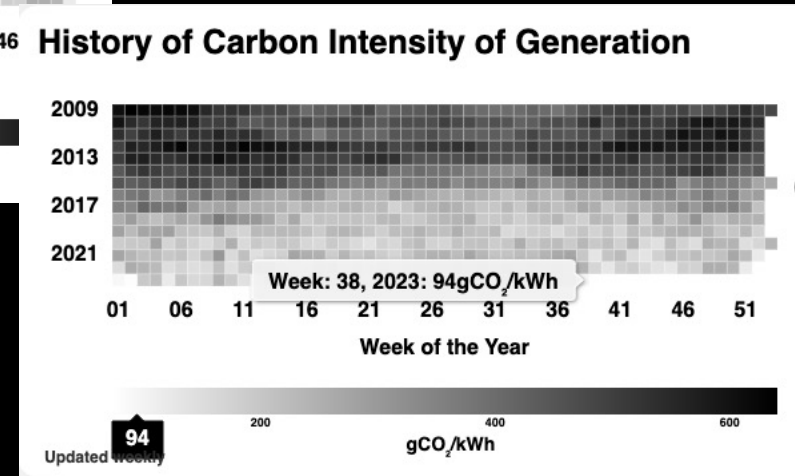
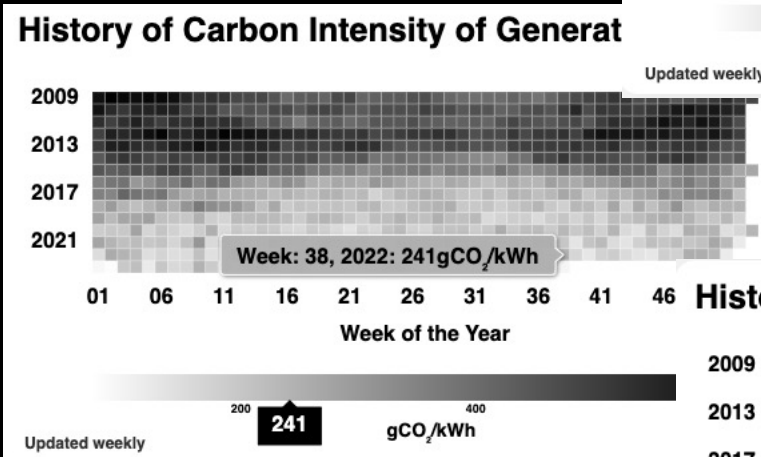
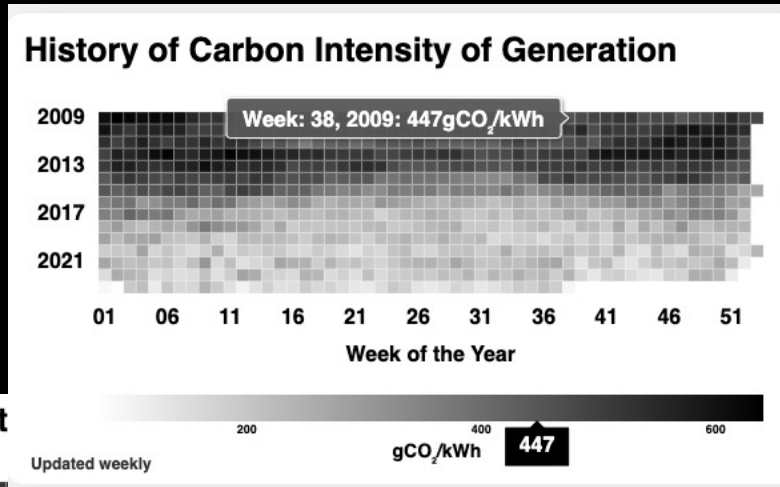
Low Carbon **76%**

Renewables **57%**

- Gas 14.5%
- Coal 0.1%
- Imports 9.0%
- Other 0.0%
- Wind 48.0%
- Solar 4.3%
- Hydro 0.9%
- Biomass 4.2%
- Nuclear 18.9%

Key: Very High, High, Moderate, Low, Very Low

carbonintensity.org.uk nationalgridESO



<https://www.nationalgrideso.com/future-energy/our-progress-towards-net-zero/carbon-intensity-dashboard>

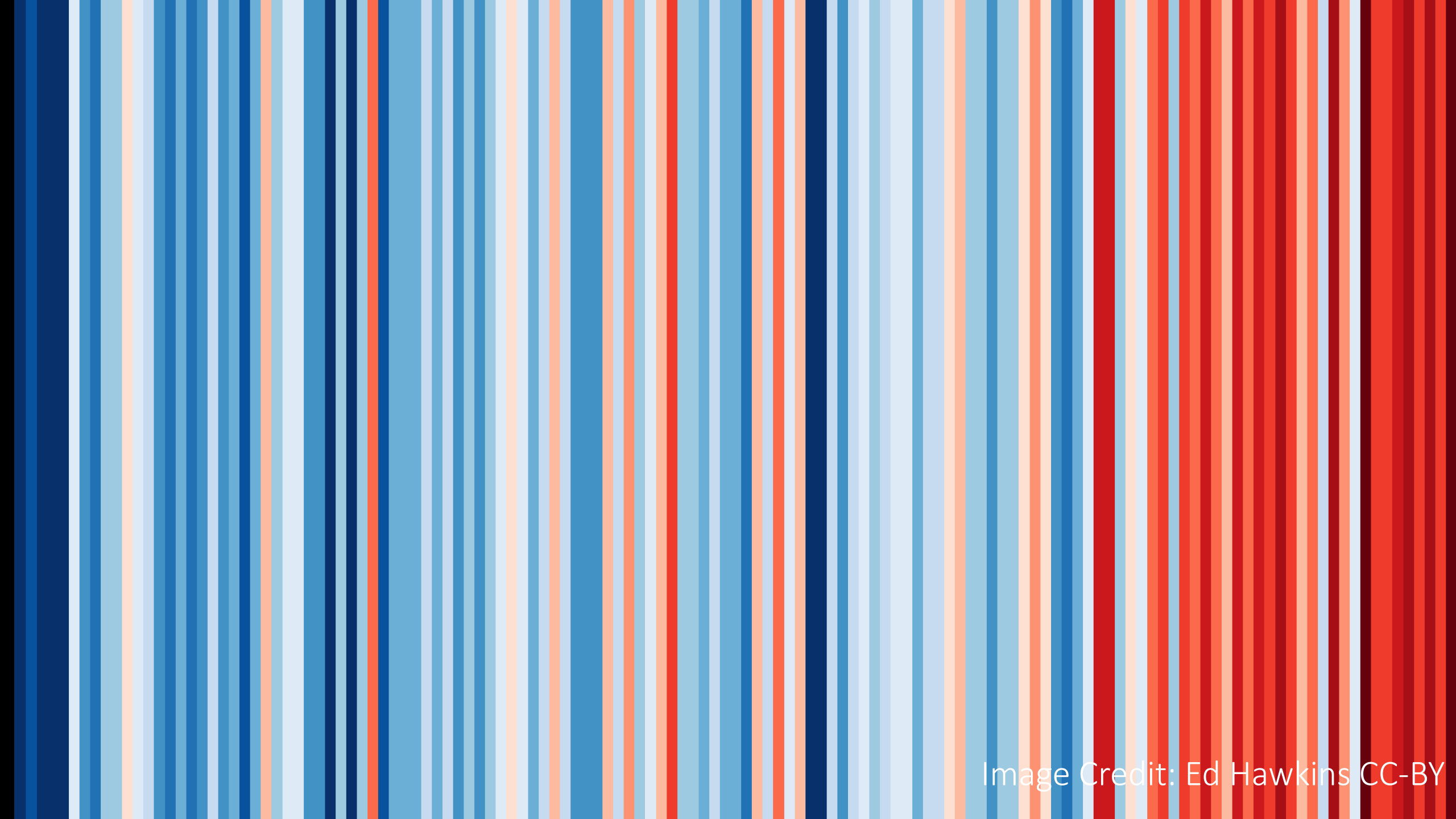


Image Credit: Ed Hawkins CC-BY

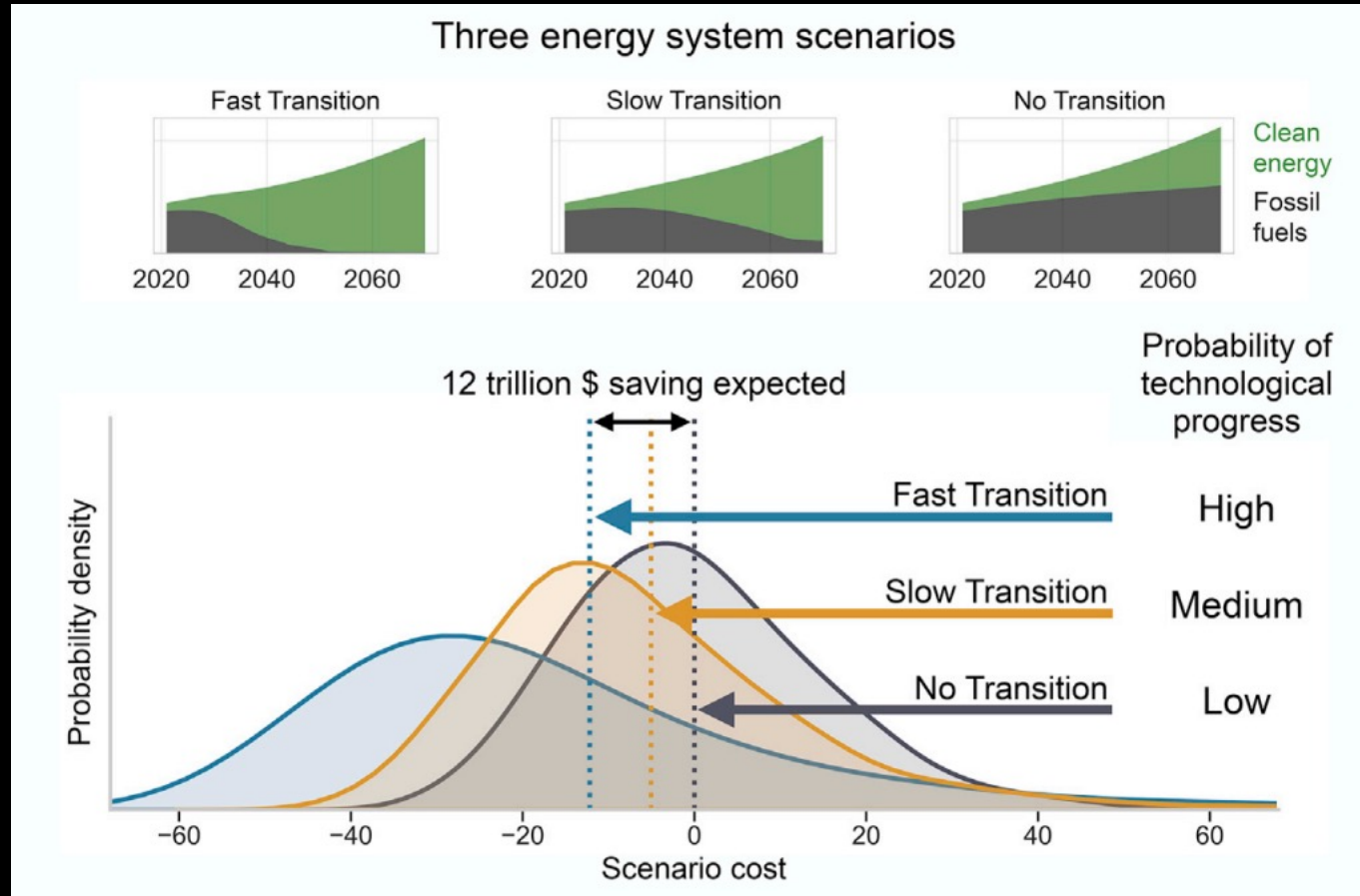


Context





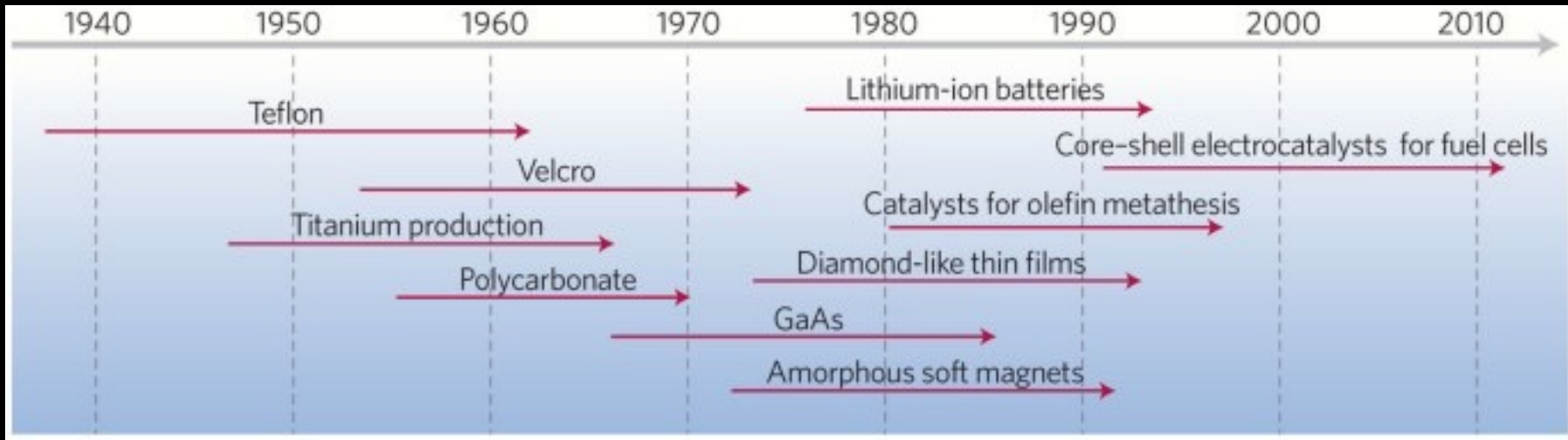
Context



Way et al., Joule 6, 2057–2082 September 21, 2022



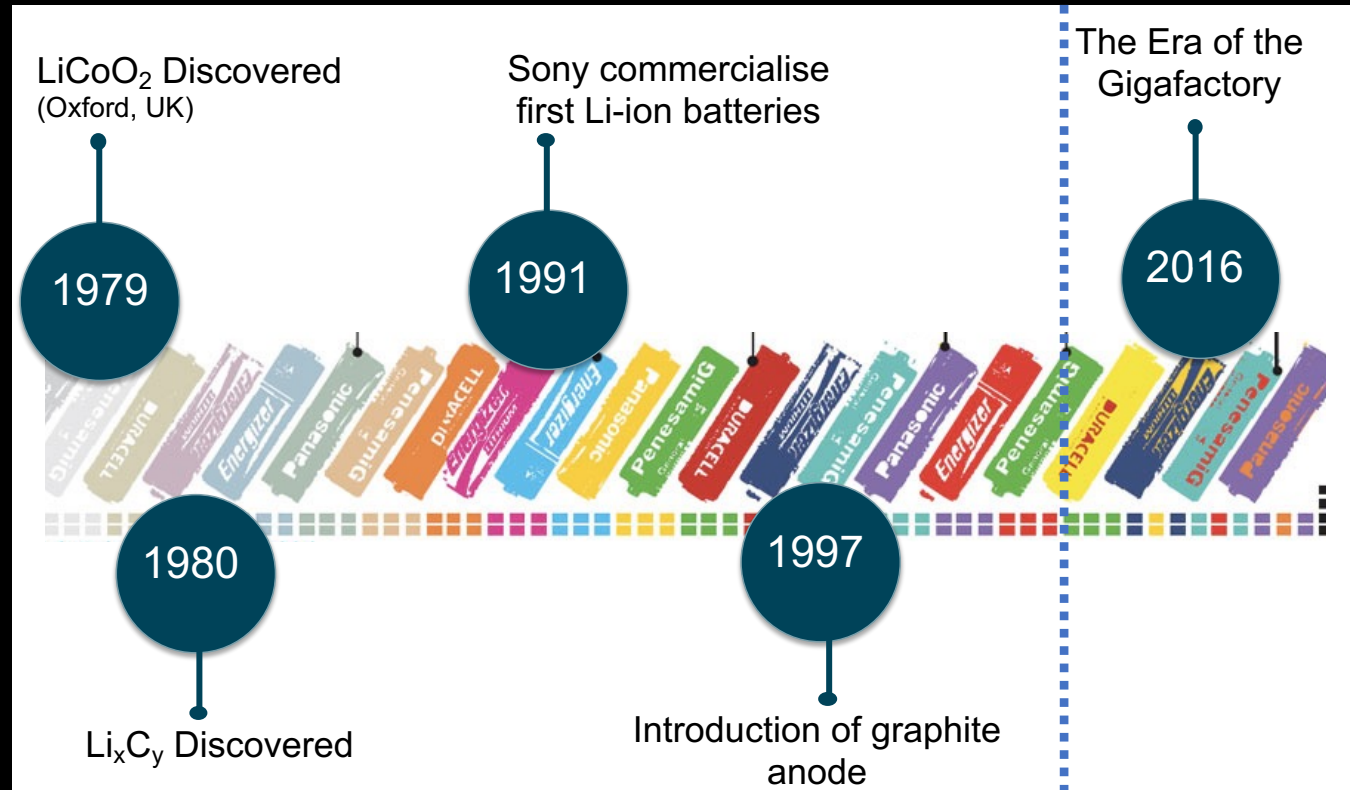
Innovation in Research at Speed



Courtesy of Gerd Ceder

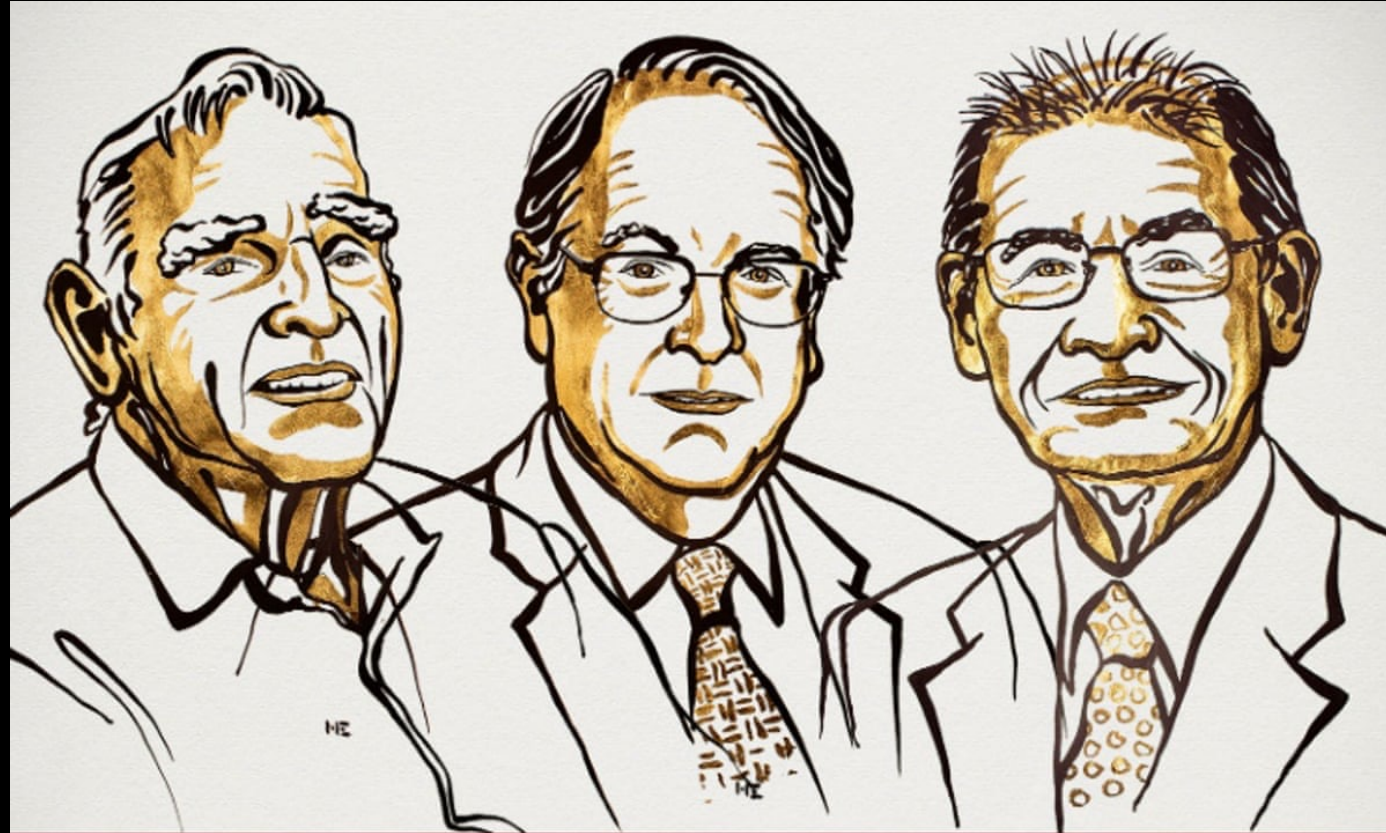


Innovation in Research at Speed





Innovation in Research Across Disciplines





Innovation in Research at Scale

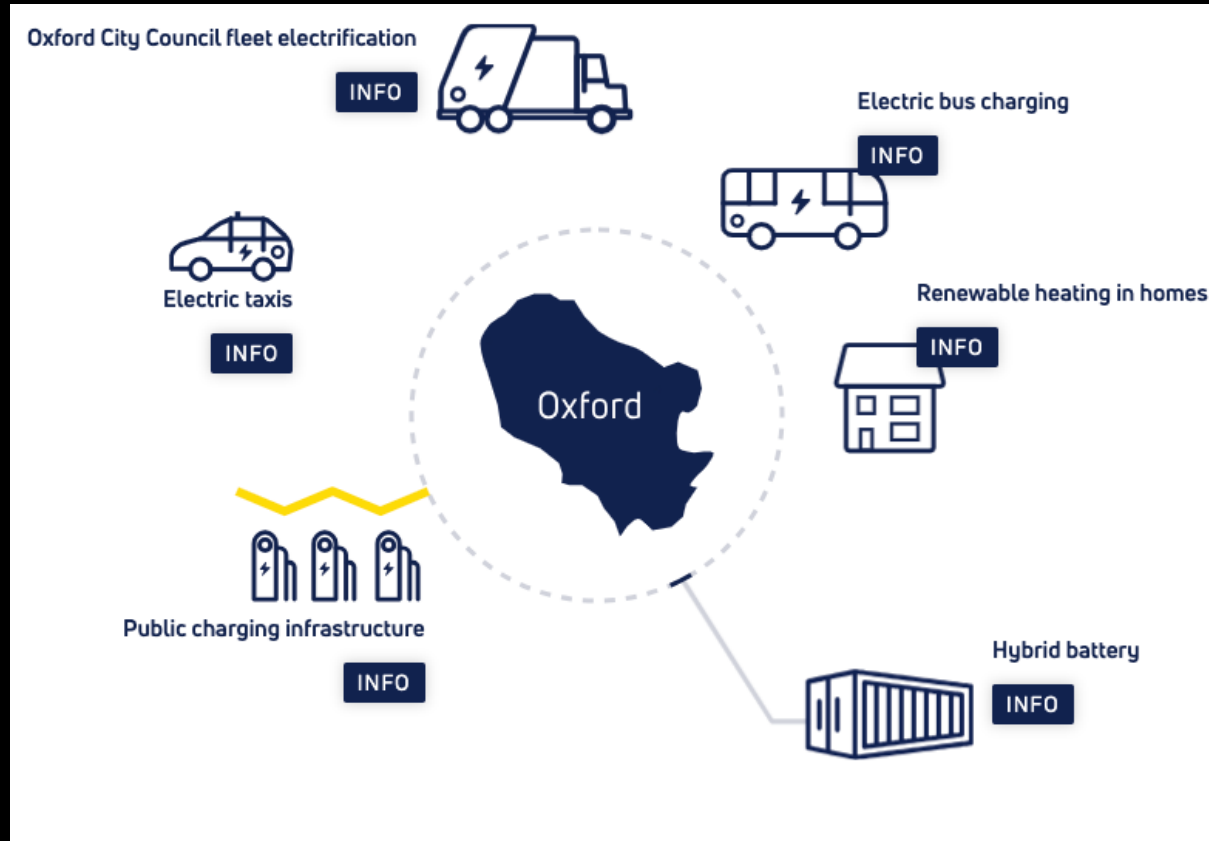


Image Credit: Energy Superhub Oxford



Innovation in Research With Impact

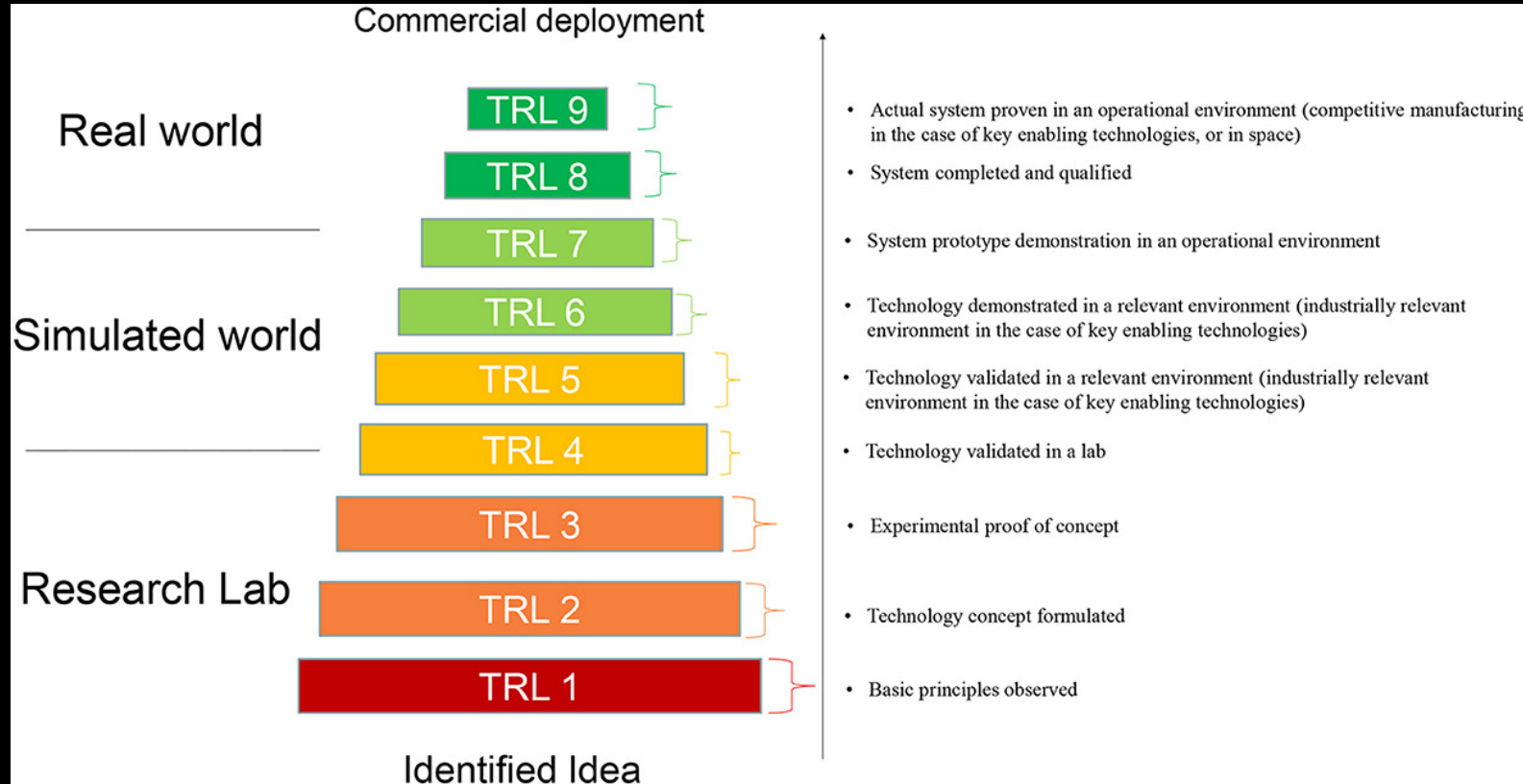
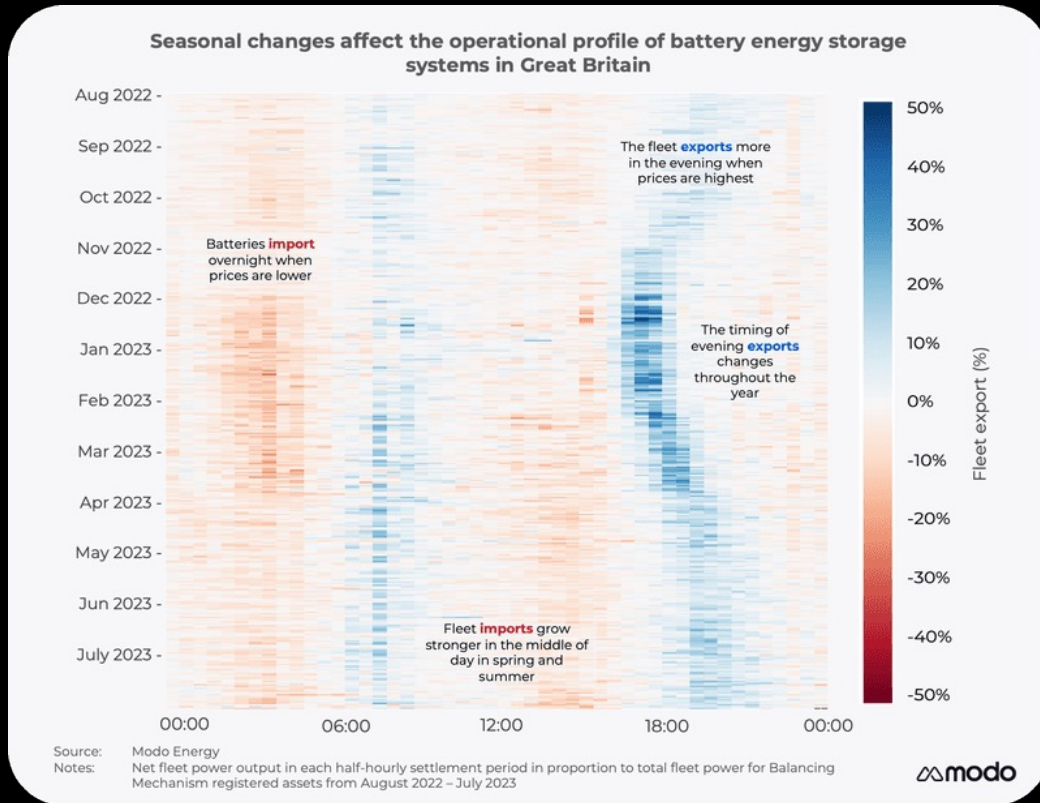


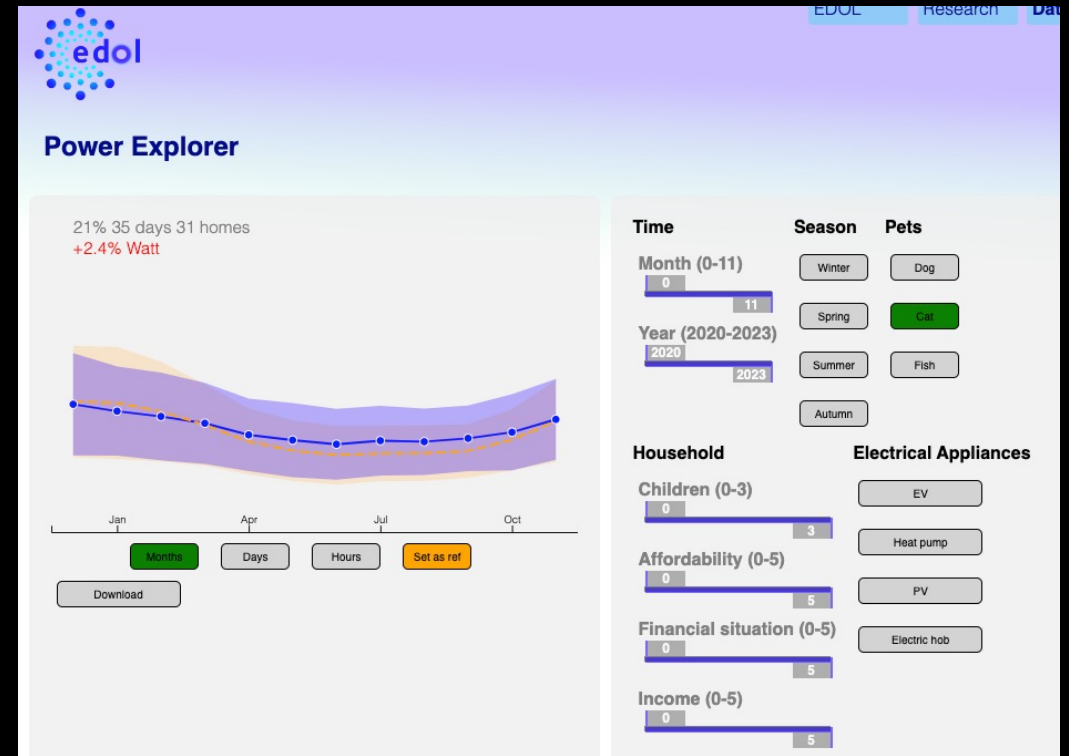
Image Credit: Frontiers in Neuroscience CCBY



Innovation in Research Data



Source: Modo Energy



Source: EDOL



Innovation in Research: Communicated Effectively

energy saving trust

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Blog Post · 28 May 2021 · Updated 20 December 2022

The future of heating in the UK: heat pumps or hydrogen?

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BBC Paul Shearing Home News Sport Weather iPlayer Sounds

NEWS

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Science & Environment

The truth about heat pumps and the power needed to run them

1 August

Climate change

Joule Commentary CellPress

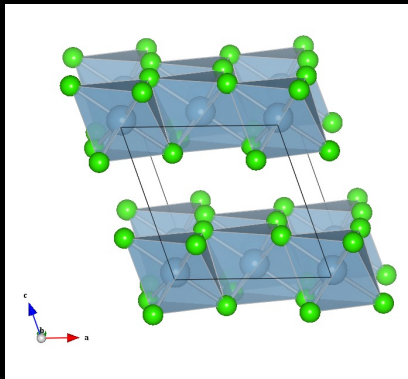
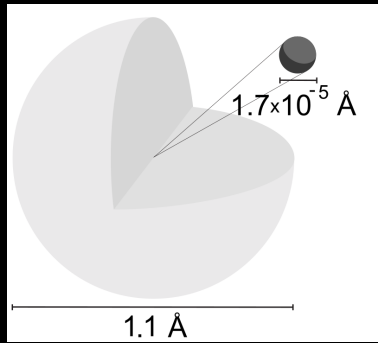
Is heating homes with hydrogen all but a pipe dream? An evidence review

Jan Rosenow^{1,2,*}

An important question is whether the available evidence supports a case for heating homes with hydrogen. This paper reviews independent analyses on the use of hydrogen for space and hot water heating. "Independent" in this context is defined as "not carried out by or on behalf of a specific industry (e.g. gas, oil, electricity, heat pumps,



Innovation in Research Across Length Scales





The ZERO Institute

www.zero.ox.ac.uk

Founded in 2022 with a £3.2M investment from the university's strategic research fund, our goals are to:

- Establish Oxford as a centre for **thought leadership on the zero carbon energy transition** and accelerate our research to real world impact.
- Provide leadership in **stakeholder engagement, networking and development** for the community of energy researchers in Oxford.
- Build on existing research based in departments, to address interactions and systems issues **across disciplines**.
- Provide a single point of contact for energy research at Oxford, in partnership with the Oxford Energy Network.



The ZERO Institute

Research

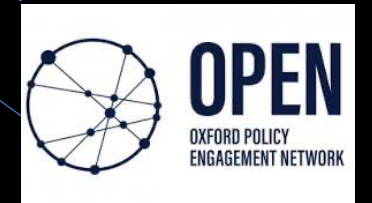
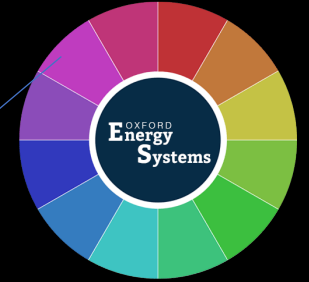
Demonstration

Partnerships and Networks

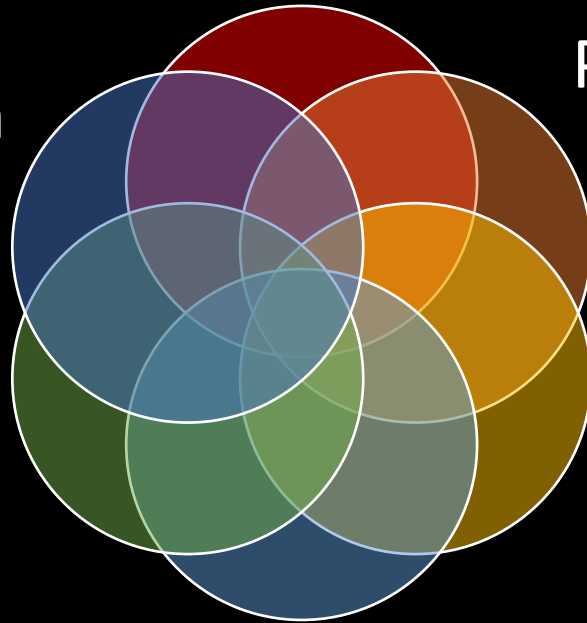
Researcher Development

Policy and Energy Justice

Enterprise



OSE



Infrastructure

People

Communications



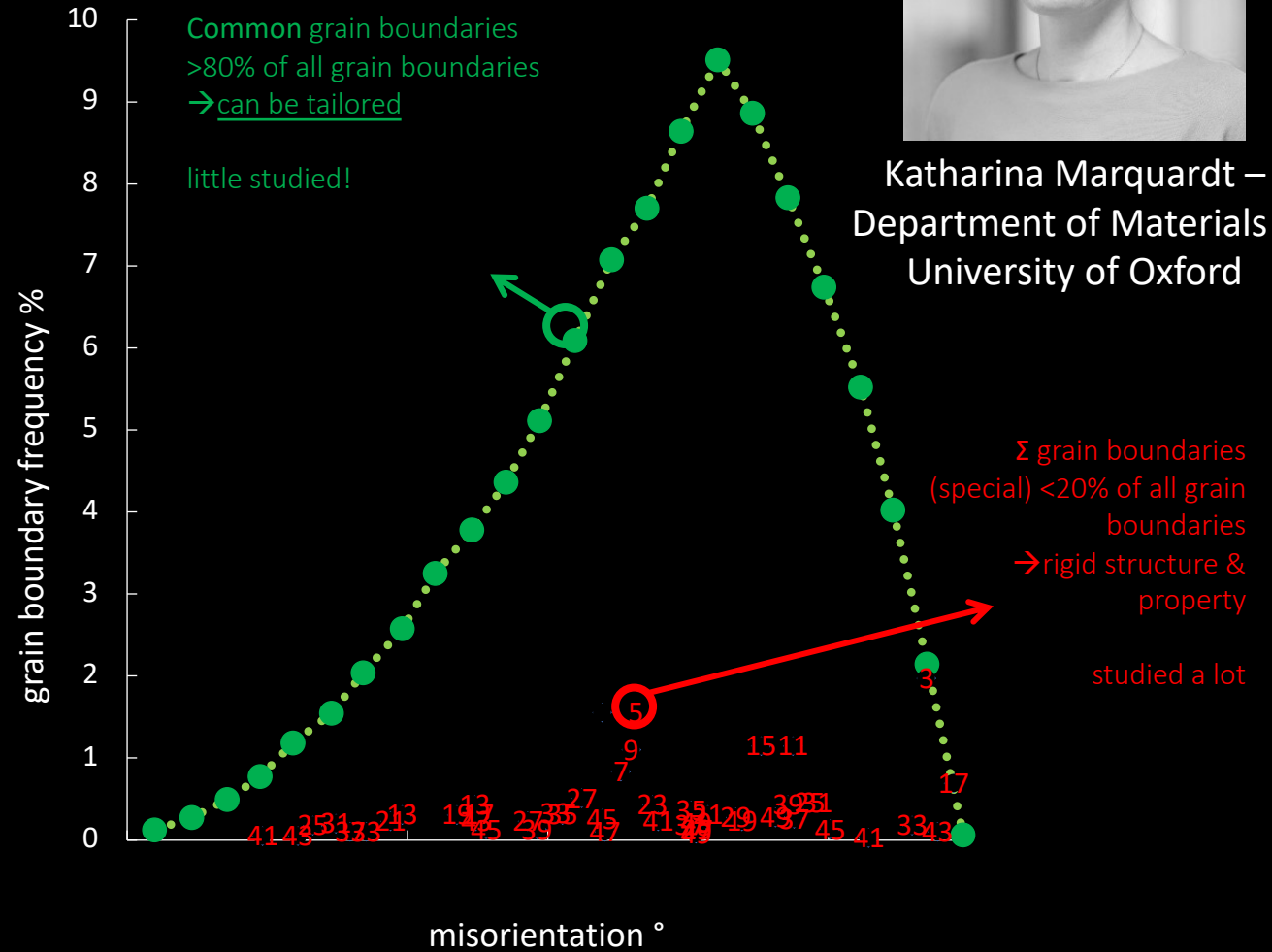
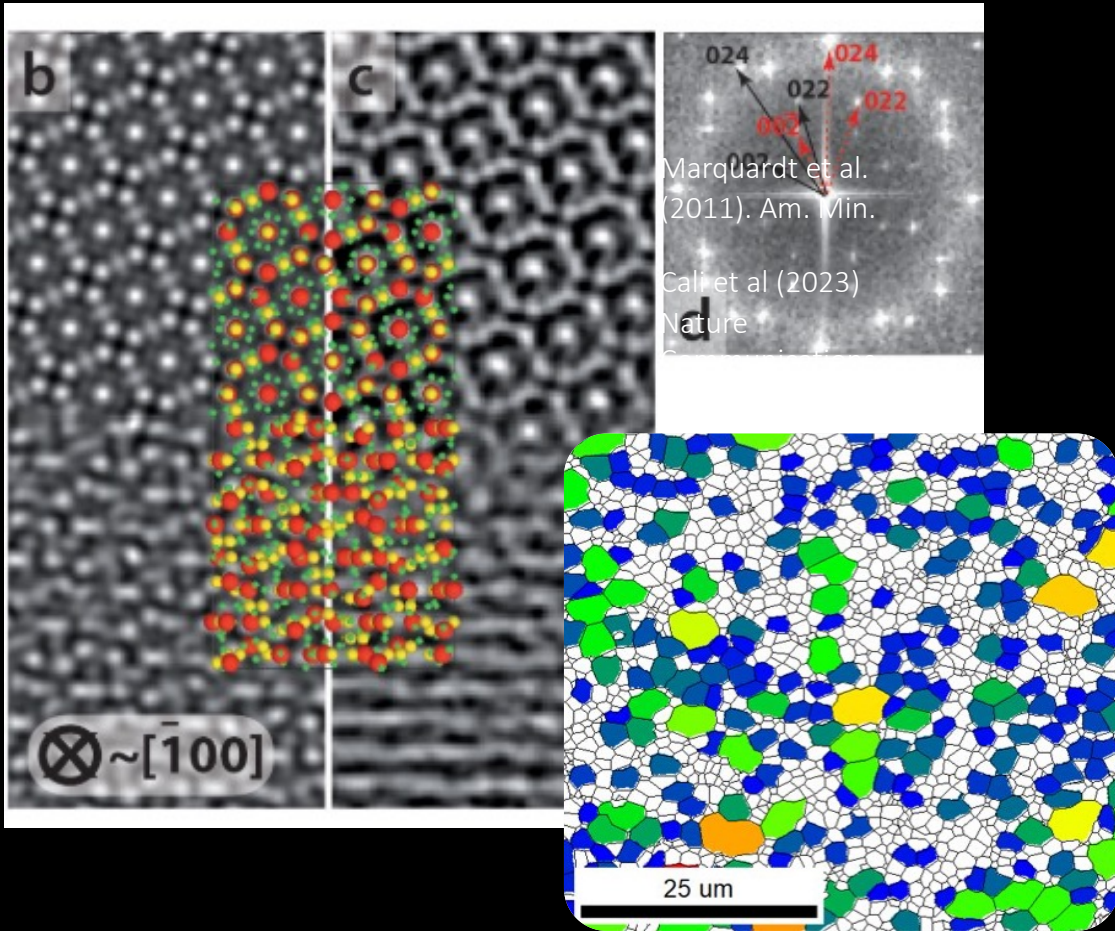
The ZERO Institute



Microstructure evolution studies for enhanced energy conversion



Katharina Marquardt –
Department of Materials –
University of Oxford

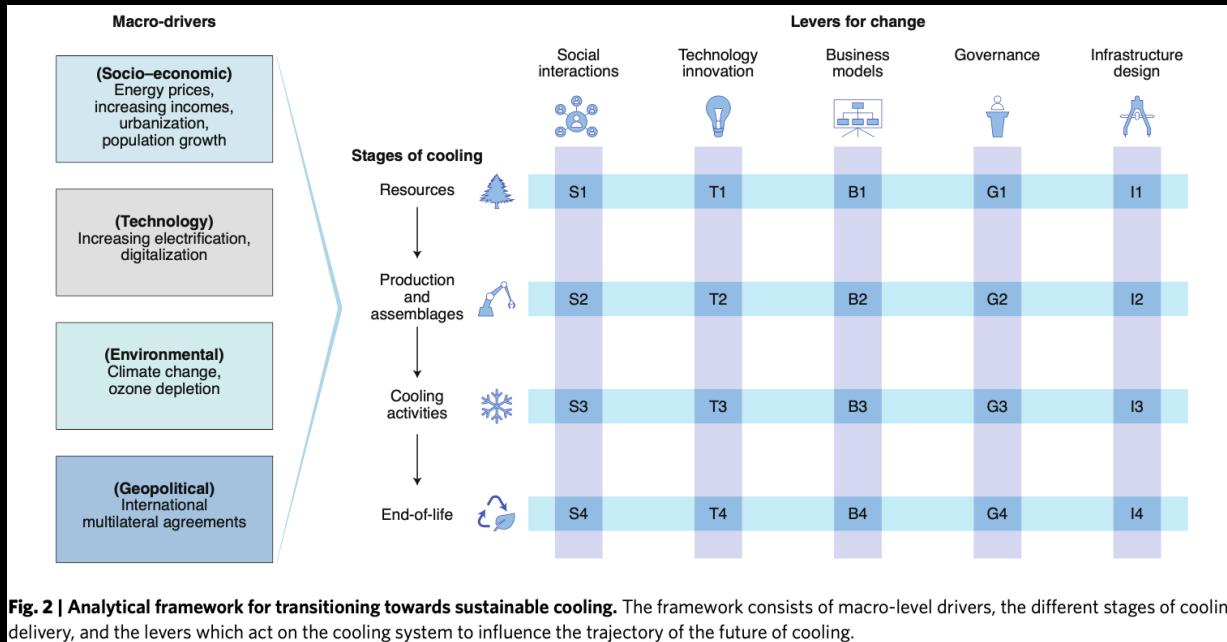




How do societies understand, govern, and shape their energy needs, while simultaneously protecting the local and global environment?



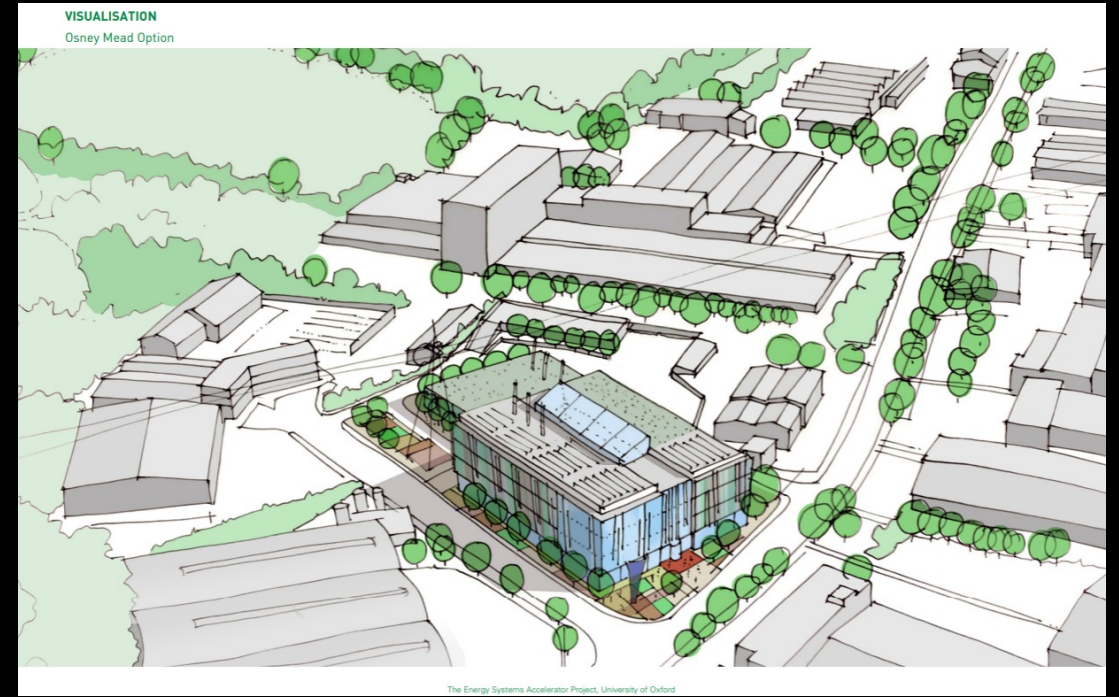
Radhika Khosla—
University of Oxford



- Focus on examining transitioning energy services in the context of development.
- Socio-technical systems approach across multiple levels of governance
- Particular focus on how can we understand and shape the future of global cooling demand?
- Working across nodes of cooling system framework in different geographical regions



The ZERO Institute





The ZERO Institute

www.zero.ox.ac.uk

ZERO ECR Enrichment
Programme & Forum

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ZERO Policy Engagement
Network

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Thank You

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