Decarbonisation: How to do everything everywhere all at once

Presented by Lorraine Ferris
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to
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UN Secretary General Antonio Guterres in response to IPCC report March 23

“In short, our world needs climate action on all fronts -- everything, everywhere, all at once.......... We have never been better equipped to solve the climate challenge – but we must move into warp speed climate action now.”
An alternative explanation for the title?

- A 2022 American independent film which incorporates elements from a number of genres and film mediums, including absurdist fiction, comedy-drama, surreal comedy, science fiction, fantasy, martial arts films, immigrant narrative, and animation.

- Michelle Yeoh stars as Evelyn Quan Wang, a Chinese-American immigrant who, while audited by the IRS, discovers that she must connect with parallel universe versions of herself to prevent a powerful being from destroying the multiverse.
Contents

• Introduction to Economiser
• Industry needs – potential solutions
• Industry needs – the complexity of delivery
• Warp speed climate action?
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  • What could we do as Network+?
The EconoMISER project

Economic Material Innovation for Sustainable and Efficient use of Resources

AIM: To address Foundation Industry innovation challenges to achieve sustainability and net zero objectives.

The first project of the Foundation Industry Sustainability Consortium (FISC).

The FISC partners collaborate on several cross sector research themes, with the aim of accelerating industry led innovation.
Who are the Foundation Industry Sustainability Consortium?

FISC is a partnership between five research and technology centres who have agreed to collaborate. The aim being to solve industry innovation challenges to achieve sustainability and net zero objectives by working together and cross-sectorally.

- Centre for Process Innovation
- Glass Futures
- Henry Royce Institute
- Lucideon
- Materials Processing Institute
Henry Royce Institute

A national research institute, hosted at the University of Manchester established to

- develop and capitalise on the UK’s world-leading excellence in advanced materials research.
- support and grow world-recognised excellence in UK materials research, accelerating commercial exploitation, and delivering positive economic and societal impact for the UK.
The EconoMISER project is structured to drive the delivery of these **themes that are critical to** the creation of a **zero carbon** resource efficient sustainable foundation industry in the UK.

- **Alternative fuels**
- **Circular economy, feedstock, recycling and reuse**
- **Digital control and sensors**
- **Process optimisation**
- **Sustainable materials development**
EconoMISER Project Lifecycle

**Connect**

TFI Fellows will engage with companies and RTOs to landscape the national research & innovation challenges faced by the foundation industries and identify project partnerships for EconoMISER.

This connection will establish cross sector links throughout technology and manufacturing readiness levels to initiate projects that will extend beyond the lifecycle of EconoMISER.

**Collaborate**

EconoMISER Application Scientists will work alongside two or more members of FISC and external project partners to deliver R&D solutions for the Foundation Industries.

FISC is comprised of five research facilities who can offer a wide range of test facilities and expertise to help identify solutions to research and innovation challenges faced by the foundation industries.

**Innovate**

The EconoMISER team and project partners will develop identified solutions through the network of scale-up centres established by FISC and roll out technology and manufacturing solutions into the Foundation Industries.

EconoMISER is organised around five research themes and will use FISC facilities to scale-up research through technology and manufacturing readiness levels.

**Impact**

EconoMISER projects will support the decarbonisation and sustainability needs of the Foundation Industries through improved resource efficiency, sustainable products and Industry 4.0 solutions.

Outcomes will add security to raw materials supply chains, improve cost competitiveness, accelerate digitisation, and advance skills & diversity within the workforce.

**Stakeholder(s):**

- UK Foundation Industries Community
- Foundation Industries Sustainability Consortium
- FISC Partners
- Foundation Industries Partners
- FISC Partners
- Foundation Industries Partners
- UK Foundation Industries Community

**Supported by:**

- TFI Fellows
- Application Scientists
- EconoMISER Scale-Up Centres
- FISC Partnership
Industrial decarbonisation: Public R&D funding landscape

**Transfire**
How the foundations industries can develop innovative solutions to reduce energy and resource use. Part of TFI challenge

**TFI Network+**
Co-create with the Foundation Industries new science and technology that can transform their sustainability. Part of TFI challenge

**Economiser**
Address Foundation Industry innovation challenges to achieve sustainability / NZ. Part of TFI challenge

**IDRIC**
Co-creating whole-system, multidisciplinary solutions that are accelerating the green futures of our industries. Part of Industrial Decarbonisation Challenge

FISC
Foundation Industries Sustainability Consortium

UKRI
Engineering and Physical Sciences Research Council

UK Research and Innovation

Innovate UK

funding
Industry needs – Potential solutions
Multiple sites, multiple industries, multiple challenges
Multiple sites, multiple industries, multiple challenges

Simplify: Consider one site
Foundation Industry GHG emissions sources

Feed-stocks

Energy

Process

Scope 1&2

Scope 1,2&3

Products
Is hydrogen or electrification the answer?

Infrastructure? Timescales? Capacity of supply? Grid upgrades as late as 2037? Awareness of options?

Feedstocks

Electrify heat  Hydrogen fuel

Energy  Process

Products

Scope 1&2

Scope 1,2&3
Is Carbon Capture the answer?

- Infrastructure needed & timescale of it?
- Business models? Investment?
- Hydrogen?
- How to select BAT?
- Technology readiness?

CCU  CCS

Energy  Process

Feedstocks

Scope 1&2

Scope 1,2&3

Products

CCU: Carbon Capture Utilization
CCS: Carbon Capture and Storage
Is Recycling the answer?

- Scope 1&2
  - Energy
  - Process
  - Recycle

- Scope 1,2&3
  - Feedstocks
  - Products

EOL capture? Societal IS & change. Suitable recycling process? Investment?
Is Resource efficiency the answer?

Reduce: Energy use; Costs; C footprint. Timescale

Can’t totally decarbonise Scope 1&2 - still need alternative fuel or CCUS

Note: In report to Climate Change Committee, Resource Efficiencies were assumed to contribute c.33% reduction to C emissions by 2050
DEEP DECARBONISATION PATHWAYS FOR UK INDUSTRY (thecc.org.uk)
UK government assume resource efficiency will bring about 15% of energy demand reduction from buildings & industry by 2030
Powering up Britain - GOV.UK (www.gov.uk)
Overall, the answer is?

Everything, everywhere all at once but phased 😞

Sites must create a plan, starting with Resource Efficiencies

Many technologies are available but most need development or improvement

Figure courtesy of Energy Systems Catapult © 2023 Energy Systems Catapult
How is Economiser helping address the challenges?

• Studies of alternative fuels use
• Development of new materials for furnace environments
• Modelling of plasma for next-generation furnaces
• Bringing together academia, suppliers and FI industry to explore feasibility on electrical heating / heat batteries
• Analysis of life-cycle assessments to substantiate sustainability claims
• Pilot processes for glass and carbon fibre composites recycling
• Exploration of chemical recycling processes for polymers
• Application of digital technologies to process improvement / energy reduction in boilers & driers
• & others
Industry Needs: Complexity of Delivery
Infrastructure, integration and shared services are critical
Critical Infrastructure: Electrical
Critical Infrastructure: Waste heat?
Critical Infrastructure: CCS and / or hydrogen
Add shared services for a circular economy:
Warp speed climate action?

Some suggestions.............
Industry needs action on:

- Infrastructure delivery
- Developing resource efficiencies through process improvement / digitisation
- Developing systems for recovery and use of waste heat (& how to share heat)
- Developing awareness of heat options; electrify or alternative fuels?
- Developing novel heat batteries & thermochemical batteries
- Understanding how to use alternative fuel in specific process
- Materials for alt fuel uses e.g. in next gen furnaces, hydrogen combustion
- Less energy intensive CCUS & hydrogen source for CCU
- Better recycling; technical, sorting, systems & policy
- Policy – influence policies to incentivise not penalise (would result in off-shoring)
- And many, many more........................
Rapid development routes needed

- Commercialise
- Scale up
- R&D
- Needs
- New business models
how to deliver innovation within complexity?
One possible solution?

Connect with parallel universe versions of ourselves.

*Probably not.....*
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UKRI funding
Accelerated utilisation of research outputs is needed to make impact
Accelerated transfer, scale up & commercialisation

TFI Network+
IDRIC
Transfire
Economiser

UK start ups or licences
UK business growth
UK business retention

UK & Global Decarbonisation

Policy recommendations

funding
Contact Us

If you would like to discuss a decarbonisation or sustainability issue faced in your industry, please get in touch with me:

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