

The role of academia in achieving net-zero emissions

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The Royal Society

The Royal Society



- The national science academy of the UK, representing the British scientific community.
- A fellowship of some of the most outstanding scientists, in the UK and abroad.
- Strategic priorities:
 - Promoting excellence in science
 - Supporting international collaboration
 - Demonstrating the importance of science to everyone.
- Plays an important role in providing science advice to policy-makers, at home and internationally.

Introductory text on why

The threat and the challenge

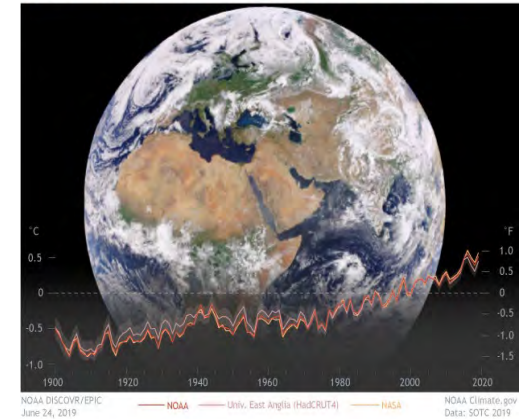
Climate change - greatest threat to humanity

Mitigation and adaptation – a global challenge

Net zero 2050 (UK target) , Net zero 2050 (Japan target)

Science and technology has a vital role in both presenting the evidence but also in bringing nations together through a common goal (science diplomacy).

2019 AMONG TOP THREE WARMEST YEARS ON RECORD



Recommendations from the S7 on Net zero to G7 in May of this year

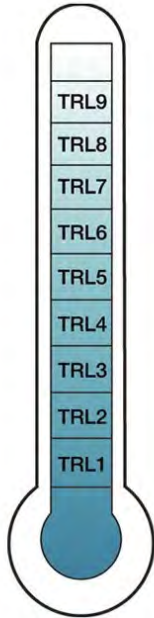


Key objectives

- To press for a **higher level of climate ambition** at national and international levels;
- All countries to create an **evidence-based technology roadmap** to net zero;
- For the world's wealthiest nations to work together to **fund breakthrough science** needed to reach net zero emissions and improve climate resilience;
- For all nations to work together to **research, develop and deploy** the science and innovation to reduce climate change and improve climate resilience;
- To ensure **policy levers** are put in place to allow the road map to net zero be followed.

This work is led by Professor Peter Bruce, Vice President and Physical Secretary

Technology focused solutions



- First, there are solutions available now but need incentives to **accelerate deployment**;
- Second are technologies that need to be **developed and demonstrated at scale**: e.g. biofuels and carbon capture and storage;
- Third **need advances in science and engineering** to deliver solutions where none exist or, where good solutions are available in the near term, need to be replaced by excellent solutions in the longer term: e.g. electrolyses of H_2O to form H_2 rather than steam methane reforming.

**Royal Society
established, with
international input,
12 areas of solutions
through science**

- Aimed at policy makers around the world
- Format: what could technology X do to reduce green house gas emissions?
What are the barriers and how can they be overcome?
- 120 scientists from over 20 countries including Japan provided input into these.
 - Climate models
 - Climate resilience
 - Digital technology
 - Heating and cooling
 - H₂ and NH₃
 - Carbon capture and storage
 - Batteries
 - Carbon cycle
 - Land
 - Food
 - Health
 - Economics



How can we work with Science Council of Japan to ensure the science promised in the solutions from science can be delivered?

And with thanks to our Japanese colleagues

- Professor Masahide Kimoto, National Institute for Environmental Studies, Japan
- Professor Hide Tokuda, National Institution of Information and Communications Technology, Japan
- Dr Toru Okazaka, Institute of Applied Energy of Japan, Japan
- Professor Katsuhiko Hirose, HyWealth, Japan

Royal Society Net Zero actions



The Royal Society additionally provides science advice on specific topic where we view science based evidence is essential for good policy making. Recent work includes:

Workshops on:

Net zero aviation, sustainable synthetic fuels, ammonia, **nuclear cogeneration**, **greenhouse gas removal** and energy storage.

Produced briefings on:

- Low carbon hydrogen production.
- Carbon dioxide use.
- Nuclear cogeneration.
- Green ammonia as a fuel.
- Sustainable synthetic fuels.
- Greenhouse gas removal.

New for 2022:

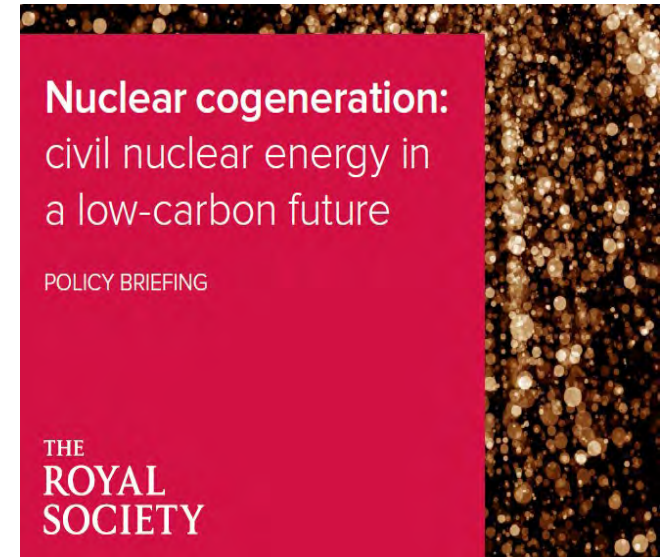
- Net zero aviation fuels,
- Geological carbon storage,
- Large scale energy storage.

Nuclear cogeneration: civil nuclear energy in a low-carbon future

Nuclear as part of the systems
approach to Net Zero

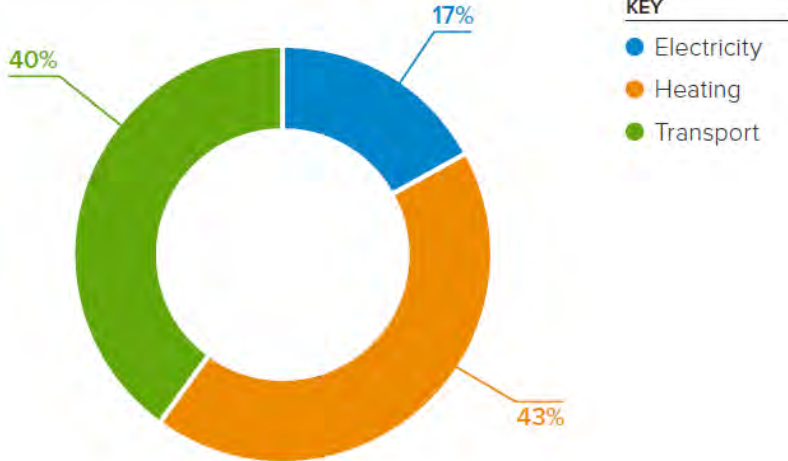
<https://royalsociety.org/topics-policy/projects/low-carbon-energy-programme/nuclear-cogeneration/>

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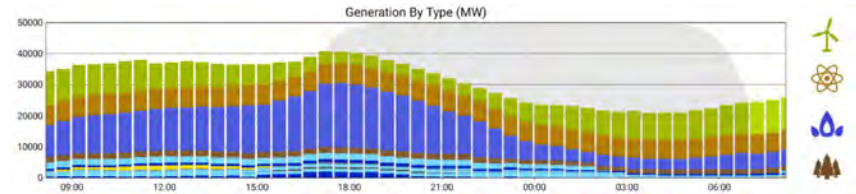


We need to double electricity generation to meet Net Zero. It needs to be decarbonized, and able to turn on and off quickly.

Current UK energy consumption:

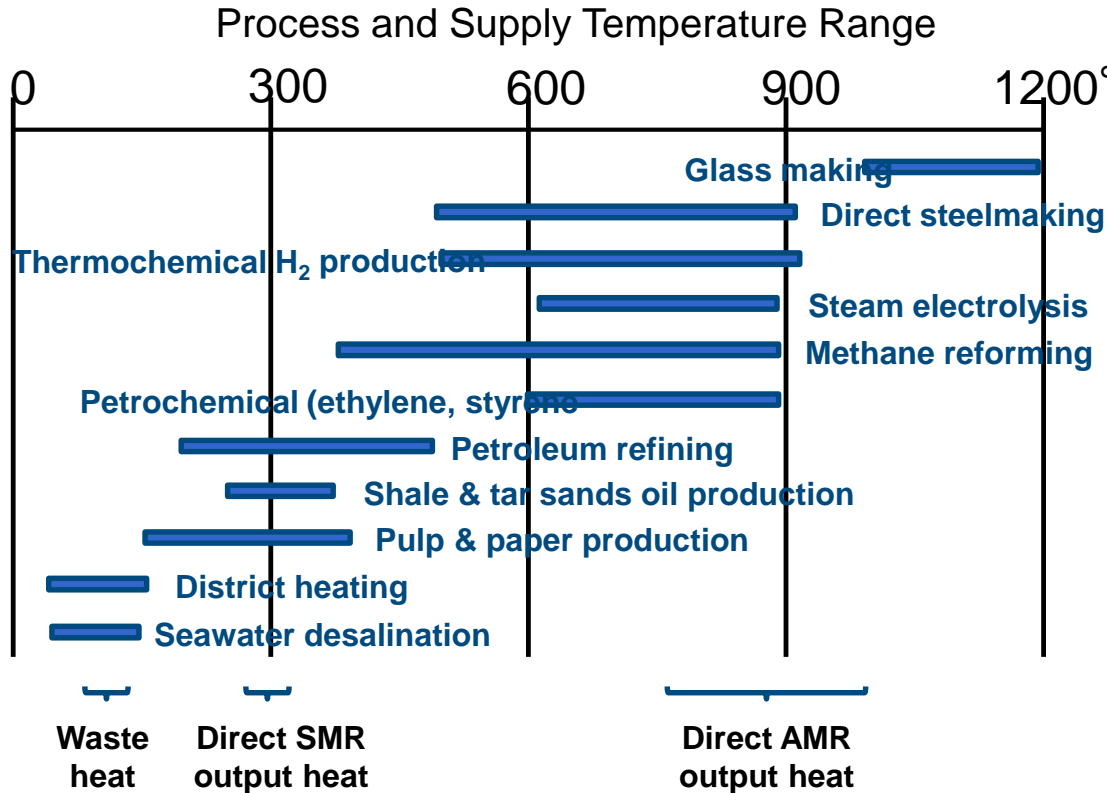


Renewables are intermittent. Today, we manage these fluctuations with gas:



- Nuclear has provided reliable low carbon power for over 60 years.
- “Gigawatt build” nuclear plants provide baseload contribution (brown above), but have not managed fluctuations well, and will not be the solution to manage intermittency.
- Gas (blue above) currently manages intermittent fluctuations in electricity demand.

The potential for co-generation to contribute to Net Zero



- Electricity when electricity is needed – eg when renewables generate less.
- Other ‘products’ when electricity needs are met by renewable
- But products that contribute to those ‘hard to reach’ areas of decarbonisation
- H₂, NH₄, direct air capture, synthetic fuels.

Climate change and biodiversity



Biodiversity and climate change: interlinkages and policy options.

Actions with great benefits for the climate **and** biodiversity include:

- Building a sustainable food system with climate and biodiversity friendly agricultural practices, responsible food trade, and equitable food distribution;
- Reducing rates of natural ecosystem loss and degradation;
- Protecting, restoring and expanding natural ecosystems;
- Increasing landscape connectivity;
- Ensuring that expansion of renewable energy systems has positive biodiversity benefits built into its design;
- Discouraging ecosystem-based approaches to climate mitigation that have negative outcomes for biodiversity, such as tree planting in inappropriate ecosystems, monocultures, and unsustainable energy crops.

Inter Academy Partnership statement highlighting how policymakers globally can address biodiversity decline and climate change.

Science diplomacy:

Why Academia is important in achieving net- zero emissions



Science in diplomacy

Science informs policy objectives by providing robust evidence or access to people & networks – *science supports diplomatic competencies*

Science for diplomacy

Science as a beach-head, leading to improved political, social and economic links, builds confidence – *science builds diplomatic relations*

Diplomacy for science

We need diplomats to help us achieve our goals – *diplomacy supports science*

Based on: Royal Society Report January 2010 “New frontiers in science diplomacy” RS Policy document 01/10.

Any questions?