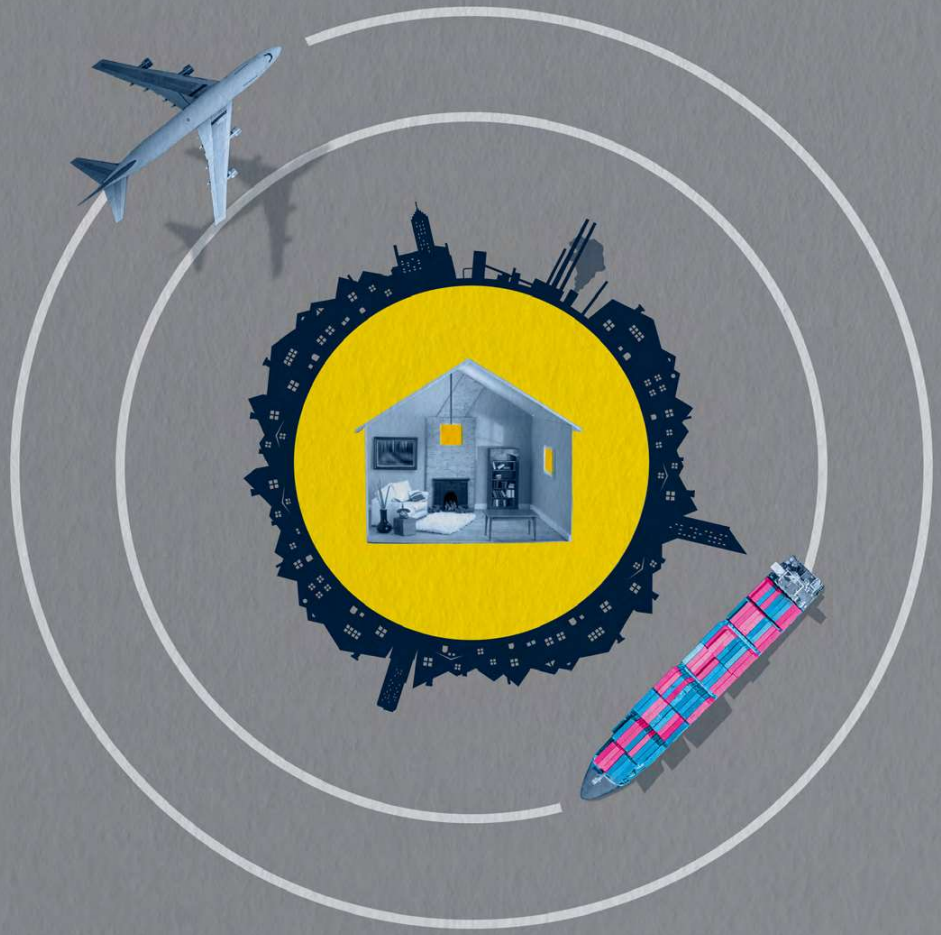
# 04 | Strategic Research

Building on our **global partnerships** to accelerate the future integrated energy system.





In January 2022, as a legacy for the UK's presidency of COP26, NNL convened the first ever global summit for national laboratories working on energy research.

**This summit was driven by NNL's commitment to advancing an Integrated Energy Systems approach – one which encompasses all low-carbon technologies – to accelerate the worldwide transition to net zero.**

The virtual summit was a starting point for long-term international collaboration, with each delegate organisation committing to ways they would play a part. The premise was simple: by working together, we can optimise resources and investment and support global decarbonisation efforts more effectively than if we were to act alone.

Since then, the Global National Laboratories Integrated Energy Systems (GNL-IES) collaboration has begun to deliver on its ambitions. From launching an impact paper setting key recommendations on Integrated Energy Systems at the 27th United Nations Climate Change Conference (COP27), to convening a second annual summit in the UK, the forum has established strong foundations from which to deliver future impact.

GLOBAL NATIONAL LABORATORIES ENERGY SUMMIT 23

## Impact

### Setting the parameters for collaboration

Given the scale of the decarbonisation challenge, the forum was set up in the knowledge that greater shared working across low-carbon technologies was required to deliver a successful, holistic, integrated energy approach. With eight national laboratories across five countries represented, the first stage of the forum's work was to set the direction of travel for their collaboration, identifying what would most deliver impact in the short and longer term.

This culminated in the launch of the forum's impact paper in November 2022. Drawing together each laboratory's relevant research, this paper not only highlighted the work already being undertaken but also set out key recommendations for advancing further Integrated Energy Systems research, development and demonstration (RD&D).

**These recommendations were as follows:**

**A focus on nuclear-renewable hybrid systems, with storage and flexibility, supports the decarbonisation of an increasingly electrified energy system;**

**Beyond electricity, broaden the consideration of energy vectors to include heat, hydrogen and synthetic fuel;**

**Deepen engagement with end users to optimise the outputs from integrated energy solutions;**

**Take an integrated approach at multiple spatial scales and ensure consistency between national strategies and local energy planning;**

**Take an integrated approach at each stage of system deployment, from long term planning to operational control;**

**Ensure the integration readiness of physical system components through development and demonstration;**

**Facilitate the economic assessment of Integrated Energy Systems to inform business planning by future owner/operators.**

These recommendations have now set the parameters within which the forum and, through it, the partner organisations will look to work collaboratively over the coming years, identifying the greatest potential areas of impact.

## Quality

**Raising our work on the global stage**

The launch of the impact report was timed to coincide with COP27, which was hosted in Sharm el-Sheikh, Egypt. For NNL, we recognised this as a key opportunity not only to bring the role of nuclear to the fore within global climate discussions, but to emphasise its place as part of an Integrated Energy System. And, at a time of global energy market pressures and concerns around security of supply, this was of particular resonance.

As part of NNL's engagement in COP27, we therefore hosted a dedicated event on our international Integrated Energy Systems collaboration at the International Atomic Energy Agency (IAEA)'s Atoms4Climate Pavilion. Marking nearly a year since the initial summit, this event brought together several forum representatives – comprising both nuclear and non-nuclear national laboratories – to reflect on what the group had achieved since COP26. With the impact report providing a grounding to discussions, the panel highlighted the actions identified and once again emphasised the value of an integrated approach to the energy transition.


NNL's Chief Strategy Officer, James Murphy, leads a panel discussion at the Atoms4Climate panel session in the IAEA pavilion at COP27

On panel: Jonathan Cobb, World Nuclear Association; Martin Keller, National Renewable Energy Lab (US); Paul Nevitt, NNL; Paul Kearns, Argonne National Laboratory; Chair: James Murphy, NNL.

One of the key points of panel discussion – reflecting the impact paper – was the need to look beyond electricity if we are to achieve global decarbonisation. The event made clear the importance of broader energy vectors such as heat, hydrogen and synthetic fuel as we seek to address hard-to-decarbonise sectors, and the role of RD&D in accelerating technologies for this.

This intervention at COP27 was an important moment for raising the profile of an Integrated Energy System approach, emphasising the work of the forum and continuing the dialogue on the world stage.


NNL at COP27 Conference (Egypt) - YouTube link

> "Collaboration across laboratories and different countries is extremely important. We have historically not done too much work on the full systems integration because we had these pillars of energy use and now this is changing. Globally we are moving towards electrification but then we also have a lot of other areas of industry – like cement, steel and heavy-duty transportation – where we need to look at the whole systems approach. That's why I think this deep collaboration across borders, countries and the different laboratories is so critical."

Speaking at the COP27 panel, **Dr Martin Keller** Director, National Renewable Energy Laboratory (NREL)

## Partnerships

**Progressing key areas of collaboration**

Following COP27, NNL was pleased to host the second annual summit in January 2023 – this time in person. National laboratories from the UK, US, Canada and France were all in attendance, with representatives from Japan joining for some virtual activities. With an additional exploratory visit to Tyseley Energy Park, meeting with the University of Birmingham and the Manufacturing Technology Centre, the second summit was an opportunity to agree an action plan for the year ahead.

In progressing the impact report's recommendations, actions agreed included the commitment to data and model sharing across countries and to engage further with end users of energy, particularly in hard-to-decarbonise sectors such as aviation and shipping. For the latter, the forum will be mapping out energy customers and identifying the laboratories interested in working with them, to allow a heat map of common interests to emerge. Another priority area of focus is around access to facilities, to ensure we make the most efficient use of specialist capabilities at our national laboratories around the world.

With a clear set of aims and tangible actions agreed for the coming year, we are now establishing working groups for delivering on the key areas of collaboration. The forum will continue to meet regularly to review progress of each working group and to maintain overall momentum.

NNL's Chief Science and Technology Officer, Dr Fiona Rayment at the Integrated Energy Systems Summit

## Talent

**Developing ongoing UK expertise and understanding**

As we continue to develop the UK skills, research-base and relationships required for the future energy landscape, NNL announced our intention to create a UK Collaborating Centre on Integrated Energy Systems. This will act as a hub for partnership working and help to solidify links between academia, industry and other research partners to progress the RD&D the UK will need in the decades to come.

We have now set plans in place for the opening of this Collaborating Centre – which will be delivered in partnership with Energy Systems Catapult – later in 2023. Central to its mission will be developing talent, bringing in early careers researchers and modelers as well as partnering with universities for sponsored PhDs.


Summit attendees visiting Tyseley Energy Park