Shaping the Debate

Summary of 2023 submissions and next steps

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Introduction

IOP works across skills, science and society to build the thriving physics landscape we need for a vibrant, sustainable future. As such, we are building our capacity to shape the debate on science matters that are important to our members and the wider physics community in academia and business across the UK and Ireland. This is enabling a more systematic way to create an ongoing programme of science and innovation projects that influence and drive impact for the health of physics and its application.

In 2023 we launched a submission call to gather ideas from members and the wider physics community to shape the future pipeline of science and innovation projects. This short report:

- Summarises the submissions that we received and how we have used insights to develop our projects and shape wider IOP strategy.
- Sets out our 2024 impact projects and the focus areas where members can input.
- Explains how members can input their ideas to help shape the future pipeline of projects.

IOP science and innovation impact projects

Our science and innovation impact projects convene community debates, gather evidence, set out recommendations and facilitate action to:

- influence national science and technology strategies and investment;
- create roadmaps that set out how physics can address sector challenges;
- address business innovation and growth issues;
- showcase important but less understood areas of physics and the difference it can make; and
- explore international best practice and collaboration opportunities.

We recognise that diversity of thought improves outcomes. We aim to gather diverse voices to shape discussions, thinking and innovation as part of our impact projects.

In 2022 and 2023, we engaged over 700 members of the physics community and stakeholders in impact projects to shape national strategies on semiconductors, quantum and the first phase of physics powering the green economy.

You can find out more information about our recent impact projects and the impact that they have achieved in Appendix A.

Call for submissions and panel review

In 2023, the IOP launched a call for submissions on matters of importance to the physics community in the UK and Ireland. This call was to inform future impact projects and shape the debate more widely. We received 26 submissions covering a wide range of physics topics and issues. The submissions, summarised later in the report, were reviewed by an IOP Advisory panel chaired by IOP's Vice-president for Science and Innovation. Details of the panel members are in Appendix B.

The panel evaluated the 26 submissions against impact criteria which included:

- fit with IOP strategy to unlock the full potential of physics;
- international competitive advantage with demonstrable record of physics excellence; and
- and an identified opportunity for influence and impact.

After thorough discussions, the panel prioritised the following submissions for the IOP to consider for future impact projects:

- Developing metamaterials – accelerating commercialisation
- Convergence of AI, large language models and physics
- Economic importance of space science and technology
- Bridging the gaps in medical physics
- Market demands for UK science and technology infrastructure
- Magnetics and magnetism
- Systems level thinking through physics
- Showcasing the strength and impact of physics of life research

2024 Impact projects

The IOP takes forward topics as impact projects when there is both a clear opportunity for impact and timeliness to mobilise the community to influence. Taking into consideration the panel's prioritisation alongside our discussions with government stakeholders, we will initiate three impact projects on green economy (phase two), space technologies, and venture capital investment. The following section provides more details on why these topics were selected for impact projects.

1. Green economy (phase 2)

In 2023, the IOP published the Physics Powering the Green Economy report that outlined fresh perspectives about the role of physics research and innovation in key technologies: Nuclear, Renewable energy, Energy storage, Hydrogen and alternative fuels and Carbon Capture, Usage and Storage (CCUS). The report was presented at an IOP COP28 meeting in Dubai and at a recent Government Chief Scientific Advisors [CSAs] network meeting. The findings have been well received, and specific opportunities for next steps are being explored with CSAs and senior representatives within Department for Energy Security and Net Zero [DESNZ], Department for Science, Innovation and Technology [DSIT] and across the Research Councils. The second phase of this impact project will go into more detail on specific areas to help inform national strategies and funding. Further details can be found in Appendix A.

2. Space technologies

Throughout 2023, the IOP has been in discussions with several government departments to understand their interests and priorities. We have identified an opportunity to investigate and evidence how the UK can gain greater economic value from investment in space technologies. The physics community in academia and business has an important role to play in identifying case studies and opportunities for the application of space technology into wider and more traditional sectors. As such, we are initiating an impact project that will unearth current and potential future use cases to demonstrate opportunities for economic impact that will inform the next government spending review.

3. Venture capital investment

Our Paradigm Shift report found that physics innovation is costly and risky, which gives rise to complex financing needs that must be sustained over time. These costs and pressures are most acute at the production and scaling up stage of the R&D/innovation journey. Further to our discussions with physics powered businesses, members in our Business Innovation and Growth Group and with stakeholders in government departments including the Department for Business and Trade [DBT], we will engage with venture capital investors to better understand their interests and the issues that they face in investing in physics growth markets. The purpose of this work is to strengthen equity investment in the sector.

Maximising the use of the submissions

Further to the three impact projects that we will deliver in 2024, we will use the insights that we gained from all 26 shaping the debate submissions to ensure the health of the discipline and its application.

1. **We will explore three impact project pathfinders [IPP].**

We will explore progressing three impact project pathfinders in additional topics that were prioritised by our science and innovation advisory panel. As such, we will start working with the community to develop insights and consider pathways to impact on:

- bridging the gaps in medical physics;
- convergence of AI, large language models and physics; and
- developing metamaterials and accelerating commercialisation.

The aim of this IPP work is to help shape the next wave of impact projects, with the expectation that they will develop into more intensive work programmes in 2025.

2. **We will use insights to shape IOP strategy and programmes.**

The shaping the debate submissions were also fed into the consultation around our new IOP strategy, Physics for our Future.

Submissions relating to energy and the environment were incorporated into our 2023 flagship impact project - Physics Powering the Green Economy.

We linked relevant submissions with our Learning and Skills and R&D blueprint work, and where relevant, we have linked similar topics to consider as part of broader themes.

3. **We will encourage community discussion and debate.**

Members are encouraged to use the submissions outlined in this report to stimulate wider discussion and debate. IOP member networks - Groups, Branches and Nations - are invited to consider how the submission topics might be incorporated into their plans around events and network collaborations.

4. **We will seek feedback and evaluate the shaping the debate submission process.**

The shaping the debate call for submissions is an important mechanism for members to input ides to shape the future pipeline of science and innovation impact projects. As part of the dissemination of this report, we will seek feedback to refine and develop the call for submissions as a mechanism to gather ideas on priority matters in the community for future years.

5. **Next call for submissions**

This was the first time that the IOP ran a call for submissions to identify issues where science and innovation projects could influence and deliver impact to benefit the health of the discipline and its application.

We envisage that this will be a biennial process, with a second call provisionally scheduled to take place in spring 2025.

However, please note, we will remain agile and responsive to matters that are important to the physics community by keeping the submissions portal open.

Submissions

This section summarises the 26 submissions (24 gave permission for publication).

1. Developing metamaterials – accelerating commercialisation

Submitted by: Metamaterials Network

Metamaterials have wide-ranging applications across various fields, including ICT, sustainability, health, defence, and security. Focusing on metamaterials within the IOP's work can lead to the development of innovative technologies, creating numerous high-tech jobs and maintaining the UK's strong position in the global market. These materials offer ground-breaking control of energy and information, with potential applications in sportswear, building materials, medical devices, and more. The IOP can bring together different research communities, influence policymakers, and attract investment by showcasing the potential impact of metamaterials. Although the UK has made progress in metamaterial research, commercial exploitation lags other countries like the US and China.

2. Bridging the gaps in medical physics – need to develop a national strategy.

Submitted by: Medical Physics Group

The UK has made significant advancements in medical physics, making it an ideal place for research in the field. However, there are some challenges that need to be addressed. The "valley of death" refers to the gap between invention and exploitation in clinical translation, which requires costly and time-consuming technical refinement. Regulatory issues, including those arising from Brexit, also affect medical physics research and development. Community building is necessary to bridge gaps between academia, industry, and the clinical environment. Recognition of medical physics as an interdisciplinary field is essential for its growth. Finally, securing the future of medical physics requires addressing the brain-drain issue and increasing the training of medical physicists to meet the rising demand.

3. Convergence of AI and physics – evolving DeepTech in the UK

Submitted by: Business Innovation and Growth (BIG) Group

Recent advancements in Artificial Intelligence (AI), particularly Large Language Models (LLMs), have brought AI into mainstream discussions. LLMs have the potential for emergence, surpassing designers' expectations, and achieving human-level performance on complex tasks. Physics has a history of utilizing computational tools, and LLM capabilities offer untapped opportunities for accelerating research in physics and fundamental science. LLMs can enable natural language queries over large datasets, driving research advancements in multiple fields and benefiting industries like pharmaceuticals and materials fabrication. However, there are risks and limitations associated with LLMs that need to be addressed. The Institute of Physics (IOP) is urged to explore cross-domain opportunities, support policymakers, educate the technical community, and leverage this technology for positive impact in the UK's physics economy.

4. Economic importance of space science and technology

The IOP Vice-presidents considered a potential impact project in space technology for 2023 but decided to roll it over to 2024 due to resource availability. The DSIT Space team is considering national strategy. Space technology is an example of physics powered solutions for societal challenges, including earth observation and climate change. IOP could play a role in advocating for physics in the space sector, working with its members to gather evidence of its importance for the economy as well as supporting business leaders in showcasing its applications. Establishing an IOP group for members in the space

sector would also help to connect physics working in the sector to share knowledge and explore collaborations.

5. Magnetics and magnetism

Submitted by: Magnetism Group

The UK and Ireland have expertise in magnetics and magnetism, but it is often seen in separate applications. The opportunity lies in raising awareness of the impact of magnetics on the green economy. Examples include the importance of hard disks in cloud services and the growth of the electric vehicle market. Companies like Seagate in Belfast are pushing the limits of storage density, while the UK has strong research in thin film magnetics. Magnetic design is crucial for efficiency in electric motors and generators, and businesses like Hirst Magnetic Instruments play a significant role in the global magnet market. Magnetics underpins many green technologies and deserves greater recognition.

6. Showcasing the strength and impact of physics of life research

Submitted by: Biological Physics (BPG)

The Physics of Life is a research area that has received significant funding and support in the UK. Close collaboration between the physical and life sciences has the potential for disruptive research outcomes and strong societal impact. The field encompasses diverse areas such as health, ageing, infectious diseases, biosensing, and personalized medicine. It also has implications for the green economy through initiatives like carbon dioxide fixation and the development of biomaterials. The interdisciplinary nature of the Physics of Life offers opportunities to increase diversity in STEM subjects and attract more physicists. Efforts are being made to engage the wider community, increase public awareness, and highlight the societal impacts of this research. The UK and Ireland have world-leading expertise in areas such as infection, the green economy, and bioimaging.

7. Tackling the decline in disruptive physics

A paper from Russel, Funk and Leahey at the University of Arizona this January highlights concerning implications for physics and science as a whole. The analysis of millions of papers and patents reveals a decline in fundamental breakthroughs and an increase in consolidating previous work. Researchers are relying on narrower slices of knowledge, particularly in the physical sciences. This trend raises alarm for global challenges like climate change and energy solutions. The academic culture of "publish or perish" and the preference for safe, incremental papers are identified as potential causes. Understanding the causes can lead to solutions, but convincing those with power to implement them is a crucial step.

8. Cross competence zero carbon reduction.

Most science is set up with people working in separate silos on detail, unlikely to have any wider relevance. Is this a good use of their capability, considering there are also important things to do, regarding carbon reduction? A public reworking of the IOP to have pillars of benefit, not specializations could address this challenge. The basics required for zero carbon are falling through the cracks, because there is nothing new in the basic physics, only in importance and application at scale. Typical example: insulation of a concrete floor with minimum height loss. There aren't any floor tiles with reflective foil I can see in the market, and a lot of people are laying foil in contact with another surface. Another example: government regulation in England doesn't enforce right to sunshine, which can drastically cut heating demand on sunny days in spring, especially.

9. To re-examine critically the "problem" of climate change

The specific claims for limiting carbon dioxide (CO_2) emission from burning fossil fuels are based on two main issues, that CO_2 is a pollutant, i.e., harmful to humans, and that global temperatures will rise

beyond an acceptable to a dangerous level. CO_2 is not a pollutant and global temperature rises have been minimal, contradicting climate models. There is no scientific evidence to support carbon emission limitations or the goal of achieving "net zero carbon." A re-evaluation of climate change will lead to economic benefits by returning to fossil fuels for electricity generation. The Institute of Physics (IOP) should challenge the climate consensus and align its statements and publications accordingly.

10. Climate change resilience

The recent publication of the IPCC's final report on climate change risks being overlooked in the media. There is a need for an organization to facilitate discussions on how to translate the report into actionable steps for policymakers, the public, and private sectors. The Institute of Physics (IOP) can play a valuable role in this by showcasing the importance of physics in addressing climate change and promoting evidence-based decision-making. The IOP can bring together diverse stakeholders to foster collaboration and engage in ground-up debates involving scientists from various regions and sectors. This could be targeted at specific areas, sectors, or cross-border issues, offering an opportunity to commemorate the Belfast/Good Friday Agreement's 25th anniversary.

11. The increase in electricity use for modern 'green' living - what we all need to know

What does going 'green' mean for the everyday person? How can we, as individuals, afford to go green? If I stop using fossil fuels for my house heating and car then how can I afford the increase in my electricity bill from the alternatives? I have heard that an air source heat pump does not heat the water as hot as fossil fuels so will an air source heat pump be warm enough with my existing radiators or will I need to replace them all? Will the water be hot enough for my bath with an air source heat pump? The IOP is uniquely placed to offer respected impartial advice for the common person to help them make sense of this huge change and supercharge the switch for every population including our own in the UK and throughout the world.

12. Study of the process of the collapse of a neutron star to form a stellar mass black hole.

Scientists have been overlooking the gravitational potential energy released during the collapse of a black hole, which could lead to the formation of new universes. Ian Kimber has conducted a preliminary analysis using classical gravity and standard quantum mechanics, finding compatibility with current cosmology models and string theory. This concept suggests a cyclic cosmology where universes are created through black holes, explaining phenomena like inflation, antimatter formation, and quantum entanglement. These ideas should be shared to contribute to the understanding of the origin of the universe.

13. Partial differential equations solved by finite difference on £8k 250GB RAM 16-Core laptops

The template will be in an Application Programming Interface (API); an example is included in the API doc which implements the routines. MS Windows should be able to support this as well as a R&D Linux Red Hat distro. The user solves any partial differential equation (PDE) on a laptop. PDE's occur in many places, the software & memory is cumbersome or canned & expensive. Super computers solve PDE's of the earth for weather forecasts. PDE's are found in heat flow, fluid flow, quantum mechanics, electromagnetism, stress/strain, general relativity, etc. A one page API example should show how to set boundaries, set up the call back function, communicate data between the cells. So about any physicist who can program can get started. Getting the template to function correctly is programming "grunt work". Once done, getting the finite difference models to agree with experiment is the physics. A one-time purchase cheap supercomputer laptop is available for the price of a car. After that is incorporation of Finite Element Model (FEM) with its matrices. But a 1st step finite difference is great.

14. Review of cosmic origins from Webb results and other anomalies

The recent discovery by the JWST of early galaxies challenges current cosmology and necessitates a re-evaluation of our understanding. Additionally, the origin of the Earth-Moon system lacks conclusive evidence, offering room for debate. The upcoming Artemis program and the exploration of the Moon present an ideal opportunity to raise the profile of physics and leverage the Moon's potential for discovery and resource exploitation. However, the Moon's future may also bring power struggles, calling for new ideas to ensure peaceful development. Understanding the Moon better could even influence cosmological theories. These developments provide exciting prospects for industries, governments, and inspiring the next generation, emphasizing the importance of global collaboration in physics.

15. Development of REBCO coated conductor tapes specifically for use in tokamak

The applied superconductivity community has been studying the effects of irradiation on REBCO tapes for two decades, aiming to use them as magnet materials in fusion reactors. However, further development and appropriate testing methods have not been proposed, hindering progress. This is problematic because REBCO tapes face challenges under high fields, currents, and radiation, and current qualification methods are insufficient. Without suitable materials and testing, viable tokamak power plants cannot be realized. To address this, focus should shift to developing REBCO tapes with improved performance under irradiation and field conditions. Additionally, better characterization methods and collaboration are needed. This aligns with the IOP's goals for green energy and innovation, offering opportunities for skill development and advancing fusion as a clean energy source.

16. Scientific facilities and their neighbours

This impact project focuses on understanding and improving the social and political dynamics between large scientific facilities and their surrounding communities. It recognizes that these facilities are crucial for national scientific, technological, medical, and educational goals, but their relations with community stakeholders can be complex. The project aims to study and analyse these dynamics to identify ways to mitigate potential disruptions and conflicts. As large scientific facilities continue to expand, it becomes increasingly important to address the concerns and fears that may arise among the public. By managing these dynamics effectively, the project seeks to have a positive impact on national needs, health, and welfare.

17. Systems level thinking through physics

System level thinking within engineering is a crucial part of both concept design and performance evaluation. This is ideally suited to physicist, trained across multi-disciplinary domains, with clear focus on problem solving. To maintain UK engineering capabilities in systems design and engineering, this form of the application of physics knowledge needs to be highlighted and strengthened in university courses, supported by the IOP. Developing system design topics or courses, perhaps linked to industrial partners, would be an ideal way to raise awareness of this key skillset for the future.

18. Epistemology and the philosophy of Physics

Modern society heavily relies on socio-economic interactions driven by information and data. Fake news poses a significant challenge in the political sphere, highlighting the difficulty in distinguishing truth from falsity. Physics, as a field perceived with authority, carries a responsibility to handle knowledge appropriately by explaining what is known, how it is known, and acknowledging areas of ignorance. However, the current approach to teaching physics often emphasizes equations and mathematics over observation and experimentation, leading some students to place excessive trust in AI models like ChatGPT. The IOP accreditation schemes in UK universities provide an opportunity to reconnect physics with its philosophical foundations, fostering students' understanding of their chosen field and

empowering them to be global citizens. By integrating a broader understanding of knowledge and the scientific method, graduates can apply physics to address societal challenges and prepare for careers in sectors like finance, IT, and AI development.

19. Market demand for UK science and technology infrastructure

Building on IOP's recent major science & technology facilities review, there is the opportunity to explore market demand and requirements for future facilities to benefit physics research, development and innovation.

20. Post 16 routes in physics careers

There are many keen and enthusiastic students in Y 7 that love science. Many gifted scientists are often channelled by society into thinking that medicine is the only way to 'do science and help people'. With the new government requirement for schools to promote alternative vocational pathways post 18 rather than just University courses, this seems like an excellent opportunity to promote physics. I would love to have Physics careers mapped onto the school curriculum. Maybe republish the 'once a physicists' articles from Physics World as a standalone resource. Possibly create a database of Physics based careers and link these to work experience and apprenticeship opportunities. Maybe they could supply Physics based careers information to careers advisors across the country. Possibly a standalone career in Physics CPD session for Physics teachers. Maybe online presentations from current Physicists available to book so that students can listen to and ask questions to Physicists.

21. Eliciting creative ideas from young physicists.

Good managers should be able to efficiently elicit creative ideas from highly intelligent but inexperienced members of their team. This would lead to better solutions and a sense of involvement within their team. Put simply, business managers should be trained to get the best out of the knowledge and experience of their team members, especially if they come from diverse backgrounds. The benefits can be immense ranging from team satisfaction, career development and optimal business solutions.

22. Physics education (school level) regarding gravity, kinetic energy and momentum.

Teach acceleration due to gravity from measuring freefall objects at various heights. Seems obvious to reproduce the famous experiment by Galileo, now you can have such easy timings from a phone app. Then see which formula fit the data best, increase in speed in m/s^2, or m/s per meter of descent. Also need to have a convincing demonstration of the difference between kinetic energy and momentum on an airtrack, which should be within the budget of a secondary school in any country, and if not, there are NGOs who can supply this. Need to make sure there are no rotating wheels with angular momentum to confuse the picture.

23. Use of physics teachers for purposes other than teaching physics.

Teachers generally are being increasingly imposed upon to do the job of parents, such as sex education and gender issues and filling in forms to apply for driving licence etc and many moral issues and this should not be so as it just increases the workload in what is already a very demanding job. The object is to make the teaching of Physics an attractive profession which is highly desirable in a modern society. Without good teaching by enthusiastic teachers, pupils will opt out of doing physics. Seriously decreasing the extraneous workload of teachers is desired. It aligns with the IOP's work which is already funding students to encourage them into teaching. Good schools/colleges teach separate sciences by specialists to create excellence.

24. Pipeline of physics Training

Submitted by: SEPnet

There is a shortage of people trained with the skills needed to power the UK's growing knowledge-based economy and further investigation of the full training pipeline should be a big priority for the country's future success. The South East Physics Network (SEPnet) is a collaborative consortium of nine physics departments in the South East of England, focusing on delivering excellence in physics graduate training, employability, outreach, and accessibility. They highlight the need to address declining physics student numbers and higher rates of progression and withdrawals compared to related subjects like engineering. They suggest investigating the impact of student clustering in a few institutions due to the lifting of student number caps, and the importance of training students with the right skills to meet industry needs. A comprehensive study of the training pipeline, engagement, and provision in the sector is proposed to improve these aspects and benefit university physics departments, the physics-related economy, and the overall health of the field.

Note

If you would like to connect with any of the submitters, please email us.

Appendix A: Impact projects 2022-23

Semiconductor technology

The IOP, in partnership with the Royal Academy of Engineering, engaged experts in the semiconductor sector around issues to do with access to skills and electronic design tools.

The resulting report summarised their views to inform government strategy development, suggesting solutions including: addressing visa issues; funding for equitable internship schemes; funding for an awareness campaign; a coordinated approach to skills challenges across technology areas with common needs; taking decisive action to break down stereotypes about physics, science and apprenticeships; and a new 'semiconductor institute' to provide a range of essential functions to support the sector.

Key points, including the need for a 'semiconductor institute' were directly reflected in the £1bn Semiconductor Strategy launched in 2023.

Quantum Technology

Our 'Vision for Quantum Technologies in the UK' report engaged with 6 groups and 150 members to call for a long-term strategy with innovation roadmaps. Recommendations from the report included scaling up the UK quantum research and innovation community; investment at every level of skills; and support for international partnerships. The impact of IOP's work can be seen in the National Quantum Strategy, which sets out a ten-year ambition for the UK to lead the world in quantum technologies. The strategy is supported by a commitment to invest £2.5 billion in the sector, with the aim of attracting significant additional private investment on top of that.

To celebrate the landmark launch of the National Quantum Strategy, we held a celebratory round table and networking dinner for key stakeholders in universities, business, finance and government. A summary report was created to capture some of the achievements and hopes for the future that the sector feels is key. Following on, IOP gave evidence to the government's Commercialising Quantum Technologies inquiry on the need for training across a range of quantum skills, became active in the Quantum Skills Taskforce, and worked with HM Treasury to embed quantum within government department's priority plans.

An exciting legacy of this work is the new IOP quantum Business Innovation and Growth Group (qBIG) for IOP members involved in quantum commercial applications, along with a business innovation prize sponsored by Quantum Exponential. A representative from qBIG joined the panel alongside those from DSIT and InnovateUK at the Digital Regulation Cooperation Forum (DRCF) Quantum Symposium in 2023, to discuss how regulatory bodies could help the growth of the sector.

More detail on IOP actions can be found at on our website.

Green Economy

The IOP's flagship impact project in 2023 sets out the role of physics in the green economy. The project benefited from knowledge provided by an expert advisors group of IOP Members and Fellows in academia and business, 10 of our special interest groups and over 500 members.

Community insights supplemented by IOP data analysis, fed into our Physics Powering the Green Economy report that highlights the role that physics and physicists play, enabling the development of nuclear, renewable, hydrogen and clean fuels and CCUS technologies, and driving business innovation across energy production, transport, building and industry decarbonisation applications. Interactive dashboards allow further deep dives into the rich evidence base we've gathered as part of the report. The history of physics is replete with examples of where fundamental discovery and theoretical

underpinning has led to technologies that are currently exploited. Three accounts are detailed in the IOP Physics and the making of the Green Economy report.

The report sets out future focus for R&D investment to accelerate the energy transition, and shares leadership views on key enablers to sector growth, including taking a systems approach; addressing skills shortage; infrastructure; financial strategies; and the need for a fair and just transition. Some key facts in the report:

- 83% of member survey respondents don't think that the UK will reach 2050 net zero targets – this is alarming.
- 74%, 66% and 58% of respondents think barriers are due to government policies, lack of investment, and skills shortages respectively.
- 72% of UKRI research council £2.24bn funding in green economy technologies targets physics research with around 155 physics topic dependencies – highlighting that a healthy physics discipline is essential to realising a thriving green economy.
- 1772 companies in the UK and Ireland are taking green economy technologies to market representing a combined turnover of nearly £750bn – showing just how large the potential economic upside of green economy leadership is.

The report notes that progress towards net zero is not proceeding quickly enough. We need to think beyond electricity with greater urgency around decarbonisation of heating and transportation. There is a need to accelerate required components of the energy system, such as energy storage, and provide the right incentives for businesses to deliver tech to market. All this needs to be coordinated as a systems solution – with a coordinated strategy across government.

The report, with forward by Sir Alok Sharma KCMG MP, former Secretary of State for Business, Energy and Industrial Strategy, and President of COP 26, encourages government and policy makers to draw the physics community into focussed programmes aimed at fast tracking national, systems level, net zero solutions to address the challenge and seize the economic opportunity.

The IOP Physics Powering the Green Economy report was presented at an IOP event at COP28. It is supporting discussions on science, innovation and skills strategy with policy makers across the UK and Ireland and was well received when presented at the December Chief Scientific Advisors network meeting.

At our prestigious reception in February this year, we were honoured to welcome HRH Duke of Edinburgh KG GCVO along with 150 members of the physics community to celebrate the role of physics in the Green Economy, where we also announced the second phase of this work.

Appendix B: Science & Innovation Advisory Panel

Member	Organisation	Title
Prof Martin Freer FInstP	University of Birmingham	Panel chair, IOP Vice-president, Science and Innovation
Dr John Bagshaw FInstP	Independent	IOP Vice-president, Business
Dr Dimitra Darambara CPhys MInstP	Institute of Cancer Research, Royal Marsden NHS Foundation Trust	Head, Multimodality Molecular Imaging - Instrumentation
Dr Peter Thompson FREng FRSC FInstP	National Physical Laboratory	CEO, IOP Trustee
Dr Shakardokht Jafari	TrueInvivo	CEO & Founder
Dr Norman Apsley OBE CPhys FInstP	LEDCom	Chairman
Henry White CPhys MInstP	BAE Systems	Executive Scientist, Air Sector Research & Technology team
Dr Yolanda Ohene	University of Manchester	Research Associate, biophysicist; IOP medallist
Oriel Petry	Airbus	Head of Public Affairs, Airbus
Dr Jo Slota-Newson	IQ Capital	Principal, Investor
Prof Sir Richard Friend, FRS, FREng	University of Cambridge	Director of Research
Prof Robert Lamb FInstP	Leonardo UK	Chief Research and Technology Officer, Electronics Division