OIES

Annual Report 2021

About the Oxford Institute for Energy Studies

The Oxford Institute for Energy Studies (OIES) was founded in 1982 as an independent centre for advanced research into the social science aspects of international energy.

In addition to conducting leading-edge research on a wide range of current energy questions, the Institute is committed to exploring these through dialogue – between consumers and producers, government and industry, and academics and decision makers. This is reflected in the membership of the Institute and in the diversity of its research team, drawn from different national, academic, and professional backgrounds. Our aim is that co-operation between researchers and interaction with benefactors and external stakeholders will lead to a more informed and balanced understanding of the behaviour, motivations, and objectives of the various economic forces, agents, and policy makers that operate in or influence the performance of international energy markets.

Research carried out at the OIES is designed to encompass the following disciplines:

- The economics and geopolitics of the energy transition, decarbonization, and international energy across oil, gas and electricity markets with regional and national focus.
- The economics and politics of the environment in its relationship with energy.
- The regulation and business models for decarbonization and low carbon fuels.
- The economics of electricity market design and regulation of electricity networks
- The economics and forecasting of oil and gas price formation, market structures, and trading flows.
- The economics and politics of international relations of producing, consuming, and transit countries.

As a general policy, the Institute concentrates on research in energy issues of international significance.



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MESSAGE FROM THE CHAIRMAN

I am pleased to report that throughout all the turbulence of 2021 the Institute continued to provide commentary and analysis to help inform the public debate and to provide insights into the energy transition and energy issues covering production, consumption, markets, policy, regulation and across the entire global energy economy including oil, gas, and electricity markets.

The Institute has expanded its research and remains unique in conducting independent and evidence based research at the highest standard focused on contributing to a more coherent and balanced global understanding of the energy transition, decarbonization paths, and international energy markets and issues.

There were over 100 pieces of research published last year in the form of papers, insights, comments, podcasts, the Oil Monthly and the quarterly Oxford Energy Forum and Gas Review. Unique visits to the website reached 199,000 an increase of 7% on 2020. The Institute's social media following continues to grow rapidly, with follower numbers increasing by 40 per cent in 2021.

Of particular note in 2021 was the launch of the Energy Transition Research Initiative. The Institute is developing research modules on topics that are relevant to the energy transition, with particular focus on the process and implications of shifting from the existing hydrocarbon-dominated energy economy to a new system in which low-carbon energy sources and abated use of hydrocarbons will play a much greater role.

The Energy Transition Research Initiative is underpinned by the fact that renewable energy must play an integral and dominant role in global energy supply by 2050, in line with global climate change mitigation targets. However, the transition to that end goal will inevitably involve hydrocarbon consumption, and the analysis of the timing and extent of the decline in demand for the different fossil fuels and the resulting political and economic consequences will be as important as an understanding of the new energy sources that will replace them.

Launching in early 2022, the first research Module on 'creating a business case for a hydrogen economy' will build on existing work already completed by the Institute with the goal of understanding the key building blocks for a successful business model for investments in a hydrogen economy. The focus will be on the economic, commercial and regulatory aspects of the business case, while understanding the main technical issues, and will involve a broad evaluation of regional developments, corporate activity and specific project examples

The Institute continues to build its research capacity and expand its research team. The quality, breadth, depth, and number of publications it has produced this year, as well as its increasing presence online, is evidence of the hard work and dedication of the Institute team I wish to thank all the staff of the Institute for their continued hard work and dedication in 2021.

On behalf of the Board of Governors I want to convey our appreciation to Dr Masakazu Toyoda, Institute of Energy Economics, Japan, on his resignation from the Board, and to welcome, Mr Tatsuya Terazawa, Institute of Energy Economics, Japan, to the Board.

The Institute's capacity to continue with its research activities depends heavily on the continued generosity and support of its funders. We were therefore very pleased to welcome as sponsors of the Institute: ConocoPhillips, Osaka Gas, Macquarie Group and Sval Energi AS.

Mr Laurence Whitehead – March 2022

DIRECTOR'S NOTE

The main objectives of the Oxford Institute for Energy Studies (OIES) are to undertake advanced research on issues currently affecting the world's energy sector, and to help inform the public debate and improve understanding of the political economy of energy, energy policy and the energy transition. As an educational charity, the OIES is committed to the dissemination of the results of its research as widely as possible, both in academia and in the world at large, through its website, attendance at seminars and conferences around the world by its fellows, its own seminars and events, and its interaction with the media. OIES work is detailed in this report.

Programmes

The Oil and the Middle East Research Programme and the Gas Research Programme are well established and continue to produce high-quality research of international significance, as well as work with a more regional and national focus.

The Electricity Research Programme, whose body of research and publications continues to expand is involved with a number of collaborative research projects both with institute colleagues and external collaborators.

The China Energy Research Programme, is expanding its body of work and collaboration with the institute's more established research programmes.

In the last quarter of 2021 the institute launched its Energy Transition Research Initiative. The institute is developing research modules on topics that are relevant to the energy transition with particular focus on the process and implications of shifting from the existing hydrocarbon-dominated energy economy to a new system in which low-carbon energy sources and abated use of hydrocarbons will play a much greater role.

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The first module to launch will be the Hydrogen Module, the aim is to develop objective, realistic and unique insights into the challenges and opportunities of the evolving hydrogen economy. The Module has the overarching objective of "Developing business cases for a hydrogen economy". Research topics will include; Comparison of hydrogen with alternatives to deliver ET objectives, evaluation of range of low carbon hydrogen production methods - (a) SMR with CCS and (b) Electrolysis (cost, scale, efficiency, carbon intensity), tracking corporate activity and project development globally, understanding regional and country differences, alternative approaches to transport of hydrogen and evaluation of alternative business models for sustainable and scalable investments.

Research and dissemination

The Institute publishes a range of research publications and commentaries, all of which are made freely available on its website, with the exception of published books. This report highlights a selection of the Institute's 2021 publications. In addition to research papers, Insights and Comments the Institute now publishes the *Quarterly Gas Review* and *Oil Monthly* reports – as well as the now well established

Oxford Energy Podcast series, which covers a variety of topics and provides in-depth interviews with some of our authors. The Institute continues to publish its quarterly magazine, the *Oxford Energy Forum*, now in its 32nd year.

Staffing

Priorities for recruitment include further appointments relating to the economics and regulation of electricity, and decrbonisation and the energy transition and commercial hydrogen development.

We were also pleased to welcome Adnan Shihab-Eldin, Alexander Scheibe, Barbara Finamore and Gabriel Collins as Visiting Research Fellows, and Anders Hove, Chariton Christou, Wolf Heidug and Nnaziri Ihejirika, as Research Associates.

We have been fortunate to work with a number of contributing authors throughout the year, and we extend our thanks to the following for their contribution to the work of the OIES:

Eli Akinci, ELS Analysis Christine Brandstätt, research associate in energy economics at Jacobs University and Fraunhofer IFAM in Bremen Alex Booth, Head of Research, Kpler A. Bose, Xpansiv Luciano Caratori, Fundacion Torcuta Di Tella Hernan Carlino, Fundacion Torcuta Di Tella Roberto Carnicer is a senior international energy consultant Samuel Ciszuk, ELS Analysis J. Cohen, Xpansiv Fernanda Delgado, FGV Energia Liliana Diaz is an energy industry, economic, financial, policy, and regulatory expert consultant Ali Habib, energy consutant O. Johnson, CME Group Luca Meini, Enel Mohua Mukherjee, World Bank Carlo Napoli, Enel Laura Sousa, FGV Energia Kim Talus, James McCulloch Chair in Energy Law and Director of the Tulane Center for Energy Law (Tulane Law School, US); Professor of European Energy Law at UEF Law School (University of Eastern Finland); Professor of Energy Law at Helsinki University Laszlo Varro is Chief Economist of the International Energy Agency Floris Jacobus Adrianus de Klerk Wolters, Graduate Institute of International and Development **Studies** Anastasia Yermakova, RUDN University

Paul Zakkour is Founding Director, Carbon Counts GmbH,

Christian Zinglersen is Director of ACER, the EU's Agency for the Cooperation of Energy Regulators

Activities and events in 2021

With the exception of the 'Oil' day, on *What next for oil markets? – short-term prospects*, held in December 2021 all other institute events were held virtually throughout the year. There 'China' Day events were held in April over three days and covered topics including, *China's carbon neutrality: The political and economic framework, the geopolitics of China's energy transition, the outlook for China's gas demand* and *China's efforts to green its industrial structure and transport: implications for oil.* The annual 'Gas Day' was held in September, and Gas Sponsors' Meetings held in March and October. The 'Electricity' Day event in June on the topic of *The Role of Energy Storage in the Future Decarbonized Energy System: Policy, Regulation and Value Propositions.* All our events were well attended reflecting the quality, depth, and breadth of the programme for each event and the calibre of speaker that the Institute's events attract.

The Institute's annual 'Brainstorming Meeting' took place virtually in May.

General

I wish to extend special thanks to the entire OIES team for their hard work, adaptability and determination through yet another challenging year for the institute. I thank them all.

As shown in this report, the research productivity of the OIES is extraordinary, and its reputation and influence continue to increase.

Finally, we must acknowledge and thank our benefactors, sponsors, and friends for their kind support, without which the research conducted at the institute would not be possible.

Dr Bassam Fattouh

April 2022

RESEARCH

The Institute publishes a range of research publications and commentaries, all of which are made freely available on its website, with the exception of published books. This report highlights a selection of the papers published by the Institute in 2021 and provides an overview of ongoing research. For a list of published research in 2021, visit the OIES website, where all published research can be accessed.

In September 2021 the institute launched its **Energy Transition Research Initiative** with two primary goals in mind. The first was to recognise and coordinate the work already being done on transition and decarbonisation issues in the oil, gas, electricity and China programmes at the Institute. The second was to create an increased focus on new research and a greater public awareness of the Institute's research plans for the coming years on one of the key issues facing the global energy economy.

An initial white paper outlining the challenges facing incumbent and new players in the energy transition was published in September, underlining the Institute's core premise that the energy transition will involve both the rise of new technologies such as renewables and carbon capture and also the managed decline and decarbonisation of existing energy sources. The Institute aims to take a technology neutral and independent view of the different strategies for the energy transition and to avoid making premature judgements about the likely outcomes, focusing on developing broad understanding of the challenges, the range of potential solutions and the optimal policy and regulatory outcomes to catalyse and economically and environmentally efficient outcome.

The Energy Transition Research Initiative concept has also been based on the view that, while OIES will attempt to have a broad view of all the key issues in what is a vast topic, it will also focus on some key areas where it can hope to add real research value. These topics will form the basis of research modules, which will be supported by sponsors in their own right and which will have specific research goals. The foundations for the first of these, on developing a business case for hydrogen, were put in place in 2021, and by the end of Q1 2022 the module had been fully funded. It is being led by Martin Lambert with a team of dedicated research fellows and visiting fellows.

A number of other modules are under development. Two modules are being developed by the Electricity Programme under the Energy Transition Initiative umbrella. The topics are 1) the creation of efficient designs for the electricity market in order to deal with the impact of increased renewable power in the system and 2) the future of electricity (and gas) networks in the energy transition as new demands are made on the energy system and different energy networks need to be coordinated and developed.

The Institute is also considering other topics for development as research modules. These include GHG emissions measurement and accounting, the role of carbon capture, utilisation and storage (CCUS) as a key technology in the decarbonisation of hydrocarbons, the role of green finance and the prospects for carbon markets. The potential for any or all of these topics to become individually funded research modules will be explored during 2022. The Institute will also be exploring the potential to offer a broad "Energy Transition" programme to sponsors who would prefer to receive an overview of the key issues rather than a deep-dive into specific topics.

In terms of events, OIES ran its annual Transport Day in 2021 which gathered together key experts and industry players to discuss the future of the transport sector and the fuels that will be used to power it. There was a particular focus on the development of electric vehicles, batteries and charging infrastructure, as well as some discussion on the use of gas in the heavy transport and marine transport sectors. OIES also participated at COP26, and in particular ran its own workshop in partnership with

KAPSARC on the topic of the circular carbon economy and the role of decarbonised gases in the energy transition. The event was held as an in-person and live-streamed event and was well received by a large global audience.

Plans for 2022 include the development of a seminar at COP27 in partnership with the Egyptian organising committee, an Energy Transition event in Oxford over two days to highlight our research in a number of key areas, another edition of the Transport Day and the development of a Green Gas day in cooperation with the Gas Programme. This latter event highlights one of the key motivations for the Energy Transition Initiative, which is to ensure that energy transition themed research becomes a key focus across the Institute and that cooperation across research programmes is actively encouraged.

The **Oil Programme**, established in 2009, has cemented its reputation as a leading source of independent academic research on oil market issues. The programme is structured around four main themes: global oil market dynamics; production; the policy and the economics of resource-rich economies; and consumption and the development of emerging energy markets.

The programme's 2021 research on global oil market dynamics continued to build on our core understanding of oil price cycles, the behaviour of oil market participants, and the impact of new supply sources such as US shale. The programme also published several Comments throughout the year looking at oil markets, OPEC policy, the impact of the COVID-19 shock on oil markets, oil exporting countries and benchmarks. The programme's traditional strength also lies in analysing the policy and economics of resource-rich economies, which is its third thematic area.

While the programme will continue to expand upon its traditional strengths (in oil market dynamics, production, and the policy and economics of resource-rich economies), in 2021 we expanded our research on the energy transition and oil exporters' strategies in adapting to the energy transition. Also in 2021, we introduced a new OIES Oil Monthly publication which features our short-term oil market outlook updated on a monthly basis, looking at supply and demand dynamics, OPEC policy, non-OPEC production with special focus on US shale, trade flows and cracks, price risks and global balances. Analysis which builds on state-of-the-art econometric techniques employs a number of forecast scenarios each month covering geopolitics, global growth risks, oil output policy and speculative pressures based on which we derive our Reference oil price outlook and the balance of risks to the outlook, as well as our global balance. Overall, we project some 30+ data series covering global oil demand by region, sector and selected countries; global oil supply by selected countries and liquids (further disaggregated by conventional and unconventional production in the US); oil prices and price risks by driver; global balances and stock changes. Forecast data are published along with the report on a monthly basis via a dedicated excel spreadsheet.

It should also be mentioned that we significantly expanded our coverage of the Chinese oil market thanks to the formation of the China Energy Research Programme. There has been significant cooperation between the two programmes and a number of papers covering both demand and supply in China were published during the year.

In addition to our written output the Oil Programme also continued its podcast series in which research fellows were interviewed on their latest papers.

The research output of the **Gas Research Programme** in 2021 consistent of three main themes: first, the causes and consequences of high gas prices seen throughout the year (following a year of very low prices); second, the development of new supplies both in terms of producer countries as well as LNG business models and finally, underlying much of the above themes, research around the future of gas in

a de-carbonising energy system. Following from previous work on the regulatory issues surrounding the decarbonisation of the European energy system, our research has looked at developments outside of Europe as well as country- and region-specific examples of decarbonisation strategies and their implications for gas. We have developed additional research on carbon markets and methane emissions reporting and verification, with work by Jonathan Stern as well as other fellows.

The rise in prices in 2021, following low prices in 2020, was the topic of much research. Fellows including Jack Sharples and Mike Fulwood examined the supply dynamics into Europe while considerable analysis was devoted to Russian flows and the developments on Nordstream 2. We researched the demand-side elements leading to soaring prices but also the implications of rising costs both for gas use and its role in the energy transition. Finally, we published analysis on the trading dynamics associated with price volatility in 2020-2021 and the evolution of hub pricing. Some of this research was published in the Gas Quarterly which focuses on shorter-term issues and prices, as it remains a key resource for up to date, topical analysis that relates to the pricing environment that is so important to all our sponsors. In addition, we continue to use the Gas Quarterly to highlight Key Themes at the start of each year, which form the basis of future research as well as conversations with our sponsors.

Our research in 2021 focused on developments outside of Europe too, with research reports on gas market liberalisation in Brazil as well as the role of gas in Japan's energy transition as well as in the Southern Cone. In addition to the work on demand, we researched new potential supply sources: both country specific but also new LNG business models. Following the Russian invasion of Ukraine in early 2022, questions around producer countries, LNG supplies and business models will remain important in 2022.

The future of hydrogen continues to be a critical topic led by Martin Lambert has been leading our expanded efforts in this field. In 2021, we published reports on the potential for hydrogen in Egypt and Turkey, in addition to a special edition of the Oxford Energy Forum on hydrogen. While hydrogen is part of the Energy Transition Research Initiative offering, questions related to hydrogen and their impact on gas demand will remain part of the Gas Programme research agenda.

Related to this, our efforts to model the global gas market, led by Mike Fulwood using the Nexant Global Gas Model, now include various scenarios for the use of gas in the energy transition. These have provided the basis for sponsor presentations as well as research papers. We have used the global model to think through LNG, pipeline flows, and delve deeper into country-specific and regional dynamics. Based on the first model, we are now developing additional scenarios and sensitivity analyses to understand the implications of a potential mismatch between supply growth and future demand. This work will also continue to inform deeper cooperation with the other programmes as we discuss the role of gas in the electricity sector as well as China's future gas demand and impact on supplies.

In addition to our written output the Gas Programme also continued its podcast series in which research fellows were interviewed on their latest papers. Topics included the high prices in Europe, Russian flows, the future of Nordstream 2, methane emissions, decarbonisation strategies in different countries and regions as well as new supply and demand centres. The podcasts are intended to provide an accessible insight into the work produced by the Programme and last around 25-30 minutes each, taking the form of a conversation between the author of the work and one of the senior fellows at the institute, and they can be found at the OIES website at https://www.oxfordenergy.org/publication-topic/multimedia/.

The **Electricity Research Programme** seeks to inform public and private sector decision-making by improving understanding of the electricity supply chain. The Programme studies the role of public policy, regulation, and markets to support the energy transition, along with implications for end-users, companies and their business strategies. The Programme's research focus is structured into three themes to cover a spectrum of relevant issues. These themes are:

- Market design, renewable integration, and electricity networks;
- Electricity pricing, electricity access and energy sector fiscal policy; and,
- Decarbonization of heat and transport and implications for the electricity sector

In 2021, the Programme published several papers-some of which we highlight here - while continuing to expand its scope and depth. An important work was a paper on the Malaysian electricity supply industry reform and design of a competitive electricity market for this country. This paper which was the result of a collaboration with Tenaga Nasional Berhad (TNB), Malaysian electric utility company, and Universiti Tenaga Nasional (UNITEN), a private university in Malaysia, analyses issues and options in relation to electricity market design, integrating distributed resources and incentivising large scale renewable energy deployment in this country. Since the 1990s, Malaysia has been in the process of restructuring its electricity sector with the aim of improving the efficiency, governance, and administration of the sector, maintaining/enhancing the security of electricity supply, and encouraging the growth of low-carbon technologies. However, this process has not been straightforward. The paper discusses the specification of a suitable reform model for the Malaysian electricity sector which will promote competition, security of supply, and sustainability while at the same time is compatible with the country's own context and government objectives.

Another important paper published in 2021 analysed the learning curve- a concept that relates historically observed reductions in the cost of a technology to the number of units produced or the capacity cumulatively installed. The learning curve concept has been widely adopted to analyse the technological progress of renewable resources, such as solar PV and wind power, and to predict their future penetration. However, this paper argues that analysts often apply the concept, or make related assumptions, uncritically in their analysis of the technology. Cost reduction can be driven by factors not correlated with current output, implying other factors as drivers of long-term learning effects. Also, the concept relies on historical development of the technology, that is, the result will be accurate if the future holds a path-dependent trajectory, whereas in reality there is a possibility of future breakthroughs as well as technological stalemates.

Another key paper that was published in 2021 focused on circular economy concept. The authors try to understand what other solutions, apart from the reduction of emissions from energy production, can be used to enhance decarbonization and meet net zero carbon targets. They argue that the circular economy – a traditional concept in the economics of production and management of resources that has typically been adopted at the organizational level – can be a strong complement to existing policies in enhancing decarbonization through non-energy means. However, in practical terms, there are barriers to implementation, including: prevailing government regulation that is dominantly oriented towards the linear model of economic operation and hence decarbonization; the complexity of consumer behaviour; and, the absence of a dominant business model encapsulating the main components of the circular economy approach.

The programme also published a paper on electricity distribution networks. Traditionally, distribution networks were dimensioned to handle demand peaks which were driven by demand for heating in the winter and cooling in the summer. However, with the current decarbonisation strategy based on electrification, the distribution network infrastructure will have to evolve with increasing electricity

demand from other sectors and with stronger emphasis on volatility and flexibility in both generation and demand. The 'fit and forget approach' to network access is unlikely to be suitable during the energy transition era. In this regard, a key challenge facing electricity distribution grids is how to efficiently integrate new and flexible grid users. In this paper authors analyse the concepts of universal versus restricted network access as well as listed pricing versus market-based allocation of network access rights. Differentiating access can increase efficiency and under ideal circumstances, market-based allocations and listed prices can be equivalent. With restricted connection agreements on the rise and network operators buying back access as flexibility, the insights from this analysis accompany a current trend in electricity distribution grids and inform policy making and regulation.

The electricity programme also covered India which is currently the world's third-biggest emitter of greenhouse gases. India has pledged to achieve net-zero carbon emissions by 2070. The electricity sector is at the forefront of decarbonisation initiatives and distributed energy resources (DERs) are expected to play a key role in enabling the country to eventually transition away from fossil fuel power generation (especially coal). However, authors show that the Indian power sector requires a range of reforms to bring it into line with the rise of the decentralization paradigm. These include in the areas of market architecture, coordination between transmission and distribution network operators, reforming the distribution sector and rationalisation of retail tariffs.

Other publications in 2021 included a study of power purchase agreement in the context of Nordic power market. PPAs are not a new phenomenon but have come to take on a new shape in the Nordic markets, tied to new renewable power installations, as government support schemes have been phased out. The paper identifies a logic behind entering into long-term renewable PPAs for both buyers and sellers, as well as for investors.

The Programme also contributed several podcasts one of the most important of which was on why European electricity prices have risen so steeply in 2021. The podcast discusses the consequences of surging electricity prices for residential consumers, industry, and electricity suppliers, and the market and analyse some of policy responses in specific countries. The podcast concludes by highlighting some measures that could potentially help minimizing the negative impacts of similar events in the future.

Going forward, the Programme will continue to expand its research on energy networks and electricity markets, looking at issues such as emerging competition between energy networks, the contribution of Energy Communities to the energy transition, demand response flexibility and the role of CCUS in the energy system of the future. The programme also support energy transition initiative on the issues related to hydrogen.

The **China Energy Research Programme**, established in July 2019, continued to offer insight into the factors informing China's energy policies and choices and their pivotal role in global energy markets.

In 2021, the programme published six research papers, spanning oil, gas and the governance of the energy transition as well as contributions to the Oxford Energy Forum on CCUS in China, hydrogen and the geopolitics of the energy transition. Some of the key themes and takeaways from these papers were also disseminated in podcasts, with contributing authors recording eight podcasts. The programme also launched and published five issues of the China Energy Brief, a periodic report highlighting some of the latest regulatory developments in China and their relevance to energy markets. This has provided ongoing research on the programmes key themes, namely macro, mix and markets.

In 2021, following China's net-zero pledge (issued in late 2020), research papers focused increasingly on the background for and implications of decarbonisation targets while continuing to monitor

developments in oil and gas markets. 2021 was a year of strong economic recovery in the wake of COVID-19 but also of considerable regulatory change. As such, issues around policymaking and implementation were an important focus of research and will remain key elements in 2022 as policy priorities change.

In addition to the policy and regulatory frameworks around China's energy transition, the power outages in late 2021 raised questions around power sector reform and the role of renewables in China's energy mix. These issues will remain important for the China programme in 2022 as will research into China's quest for technological innovation and for global leadership in the energy transition and the geopolitical implications of China's energy transition. The programme also drew on a wealth of external expertise as it welcomed new research fellow as well as an OIES-Saudi Aramco Fellow allowing it to widen and deepen the breadth of knowledge and analysis on China.

JOURNAL AND WEBSITE

Oxford Energy Forum

The Institute's discussion journal, now in its 32^{nd} year, continues to tackle topical issues facing the energy world. Issues covered in 2021 included: The Geopolitics of Energy, the Role of Hydrogen in the Energy Transition, Middle East Oil Pricing Systems in Flux and COP 26—Examining the balance between ambitious pledges and realistic expectations. Our thanks to the authors of all articles that appeared in *OEF* in 2021, to the editor, Bassam Fattouh, and to our guest editors.

Website: www.oxfordenergy.org

The website contains full information on OIES publications, research in progress, and dedicated sections for the OIES Gas Research Programme, Oil Research Programme, Electricity Research Programme, and China Energy Research Programme and the Energy Transition Research Initiative.

The catalogue of papers and comment pieces on the OIES website continued to grow during 2021, with 70 new publications and 50 podcasts added.

There are over 7,500 subscribers to the Institute's publication notification email service. Visitor numbers to the website increased by 7 per cent in 2021. The Institute's Twitter following increased in 2021 to nearly 9,500 followers, and the Institute's LinkedIn page has over 14,000 followers.

In 2021 the institute was regularly mentioned in the press by, amongst others: *ABC News* (Australia), *Arab News, Argus Media, BBC News, BBC World Service, Bloomberg, CNBC, CNN Business, the Economist, Euronews, ESJ,* the *Financial Times, Foreign Policy, Gas Strategies,* the *Guardian, IHS Markit,* the *Independent, Kommersant, Natural Gas World, New Europe,* the New Scientist, Oil Price, Reuters, S&P Global Platts, the Times, the Wall Street Journal, the Washington Post.

LECTURES AND SEMINARS

As part of its commitment to education and its mandate, the OIES strives to disseminate the results of its research as widely, and in as many ways, as possible. Lectures and seminars enable the Institute's researchers to present the findings of completed projects and to expose work in progress to the criticism of colleagues in industry, government, and academia. In 2021 the Institute's research fellows, Director, and programme directors gave numerous virtual presentations and talks at many conferences, workshops and seminars across the globe.

With the exception of the 'Oil' day event in 2021, on *What next for oil markets? – short-term prospects*, held in December, all other institute events were held virtually throughout the year. The 'China' Day events were held in April over three days and covered topics including, *China's carbon neutrality: The political and economic framework, the geopolitics of China's energy transition, the outlook for China's gas demand* and *China's efforts to green its industrial structure and transport: implications for oil.* The annual 'Gas Day' was held in September, and Gas Sponsors' Meetings held in March and October. The 'Electricity' Day event in June on the topic of *The Role of Energy Storage in the Future Decarbonized Energy System: Policy, Regulation and Value Propositions.* All our events were well attended reflecting the quality, depth, and breadth of the programme for each event and the calibre of speaker that the Institute's events attract.

2021 Annual Brainstorming Meeting

Since 1990 the Institute has held an annual 'Brainstorming Meeting', which draws together people from producing and consuming countries, national and private oil companies, governments, financial institutes, and other research organizations. The 2021 meeting was held virtually over three days in May and consisted of a series of four one-hour conversations with key industry leaders with free ranging discussions on their views on the current state, and future, of the energy industry. We were delighted to be joined by; HRH Prince Abdul Aziz bin Salman Al Saud, Minister of Energy, Saud Arabia, Mr Marco Alverà, CEO, Snam, Mr Patrick Pouyanné, CEO, TotalEnergies and Mr Francesco Starace, CEO, Enel.

2021 Oil Day event

This year's event took place in December, on *What next for oil markets? – short-term prospects, and* focused on three main themes: Global Oil Demand: Is the Recovery on Solid Ground?, How Constrained is non-OPEC Supply Growth? and OPEC+: A More Predictable Path Ahead? The event was well attended by key oil industry figures, representatives from national and international oil companies, financial institutions, price assessment agencies, the energy business community, and OIES Fellows.

2021 Gas Day

The OIES Natural Gas Research Programme organized its sixteenth annual 'Gas Day' in September 2021, although this year it was a virtual event again due to the pandemic with two sessions dedicated to discussing current issues in the gas sector. The first session focused on the medium- and long-term outlook for gas in light of the energy transition, with a discussion around the OIES energy transition scenarios and their regional implications. Mike Fulwood opened the first session with a brief overview of the OIES scenarios, followed by Fabian Kor, the Head of Strategy at Pavilion Energy, who focused on the outlook in Asia. Andrew Walker from Cheniere then presented his thoughts on the impact for gas flows from a US LNG perspective before Tatiana Mitrova from the OIES and the Moscow School of Management SKOLKOVO gave the Russian perspective. Anouk Honore and Jonathan Stern then contributed a European perspective to the discussion which highlighted the numerous uncertainties in

the energy transition and the regional differences in decarbonisation ambitions, views of the role of gas as well as constraints.

The second session then delved into the question of financing and investing in gases in the context of the Energy Transition. Ed Winter, Managing Director, BlackRock Global Energy & Power Infrastructure Fund opened the proceedings with his views on the role of natural gas in the energy transition, followed by comments by Eric Rasmussen, Director, Head of Natural Resources, EBRD on how the EBRD policies on financing gas projects are evolving. This was followed by remarks from Franco Magnani, Head of Equity Valorization, Global Gas & LNG, ENI and Glen Donovan, Vice President of Finance, Sempra LNG on their experience in project finance and investing in LNG projects.

2021 Gas Programme Sponsors' Meetings

Both the bi-annual sponsors' meetings in 2021 were held virtually and took the form of a week of webinars rather than a concentrated two days of activity. Although it was a shame not to be able to meet sponsors in Oxford as usual, the benefit of the virtual meetings was that they could be made available to many more company representatives than usual. Over both weeks we welcomed over 1000 sponsor representatives to the webinars that we held.

The April sessions started with a review the short -term gas market issues and the outlook for prices in 2021 amid tightening markets, with a focus on European demand and flows, the LNG market and changes in shipping following winter of 2020/2021. Webinar 2 focused on Europe to 2030, with an overview of sub-regional demand including Western Europe, followed by a discussion on the prospects for natural gas demand and decarbonization in Eastern Europe and finally an outlook for gas in South-East Europe. The panellists also touched on regulatory issues related to the role of gas in Europe's future energy system. Webinar 3 consisted of smaller breakout rooms that sponsors attended with the Fellows from the earlier webinars for continued discussions of the themes and research presented, allowing for more focused conversations. Webinar 4 focused on hydrogen with a comparison of hydrogen plans in 6 key European countries; a discussion around the potential for hydrogen in decarbonising the heat sector and an outlook for hydrogen trade, looking at hydrogen imports from Europe's near neighbours as well as Saudi Arabia as an exporter of hydrogen. Webinar 5 was an overview of the energy transition scenarios and their impact on gas markets. This webinar was led by Mike Fulwood presenting the scenarios for gas demand based on the global gas model, followed by breakout rooms to discuss regional supply and demand scenarios and to get feedback from sponsors on the parameters informing the different scenarios. As a result of this webinar, the energy transition scenarios were fine-tuned and adjusted. Webinar 6 concentrated on China with panellists discussing the implications of the country's 14th Five Year Plan for gas as well as the policy tensions facing China as it develops the Plan. Panellists further discussed market reforms in China and the outlook for gas use in the power sector. Webinar 7 then delved into Ukraine and Russia: Speakers discussed Ukraine and its increasing links to the European market; Russian exports flows and the gas export strategy to Europe alongside the outlook for Nord Stream 2. The final webinar then provided a round-up of the week in a discussion between the key OIES fellows who had taken part in the previous webinars.

The October sponsors' week again began with a review of short-term gas markets and pricing, the key drivers for the high gas prices seen in 2021, as well as the outlook for the winter. Speakers assessed whether the global market could cope with another cold winter and whether more supply is set to come in. The panellists asked if market tightness would persist into 2022 in light of the outlook for demand growth, for Gazprom's pipeline exports to Europe and for new LNG supplies.

Webinar 2 was a conversation between Jonathan Stern and Mark Brownstein (from the Environmental Defense Fund) on the role of gas in the energy transition and questions related to methane emissions. The third webinar focused on decarbonisation in Europe: regulatory changes, impacts on gaseous fuels and the evolution of networks. It looked at the impact of the decarbonization process on natural gas in Europe; on the development of alternative gaseous options, especially hydrogen; and on the evolution of networks around Europe with a special focus on the regulatory challenges associated with these changes. Webinar 4 then looked at the decarbonisation of imported gas and LNG, and questions of transparency and credibility. The panel examined the growing challenges sellers, buyers, aggregators, and trader face as pressure increases to decarbonise natural gas and LNG along the supply chain. The panel discussed both buyers' and sellers' steps towards reducing emissions from gas and LNG into European countries where governments have accepted net zero targets as well as the actions of North American LNG sellers and Asian LNG buyers. The panel then discussed progress towards transparent and credible methodologies for measuring, reporting, and verifying (MRV) emissions from imported gas and LNG and asked whether a single MRV system can be developed which will be globally acceptable. Webinar 5 analysed the outlook for Russian gas flows to Europe following the completion of Nord Stream 2 construction as well as the implications for suppliers, consumers, and transit countries, depending on its start up date. Panellists also assessed Russia's growing LNG ambitions and what they would mean for LNG and pipeline gas flowing to Europe. With Russia also looking to Asia as an increasingly important market, the session analysed the opportunities and challenges associated with exports to Asia via the Northern Sea Route. Webinar 6 turned to the challenges and opportunities in developing new LNG markets: The development of new gas demand and infrastructure is key to the economic development and achievement of emission reduction targets of many countries. New gas and LNG projects come with challenges across the whole supply chain. The challenges in both developing and a developed countries were discussed, setting out a technical solution and potential options. In Webinar 7, the conversation turned to the role of gas in India's energy transition with panellists looking at the underlying drivers of growth, regional issues, as well as climate (and other) constraints. As an increasing number of countries across the world commit to 'net zero' carbon targets by the middle of the century, pressure has been increasing on India to announce its own ambitions on 'net zero' and climate change mitigation. At the same time, while the country has an ambitious renewable capacity target of 450 GW by 2030, Indian policymakers face domestic pressures around the provision of reliable, affordable, and low or zero carbon energy to its population in support of its own economic development trajectory, notwithstanding the substantial existing share of hydrocarbons (mainly coal) in its current energy mix. The resolution of these two factors (international policy pressure and domestic economic pressure) is likely to determine the pathway for India's energy transition. Webinar 8 then provided a round-up of the week in a discussion between the key OIES fellows who had taken part in the previous seven webinars.

2021 Electricity Day

The 'Electricity' Day event was held in June with the overarching theme of *,The Role of Energy Storage in the Future Decarbonized Energy System: Policy, Regulation and Value Propositions.* There were two sessions which looked critically at the role of storage in decarbonized electricity systems; at the value it offers throughout the electricity value chain; and, at how markets, regulation and policy can best be designed to realize this value – in different countries and contexts.

2021 China Day

The 2021 'China' Day on the topic of *China's long-term ambitions and short-term realities*, consisted of a series of five webinars between 13-15 April. Themes covered during the event included: China's carbon neutrality: The political and economic framework, the geopolitics of China's energy transition, the outlook for China's gas demand, China's efforts to green its industrial structure and transport: implications for oil and China's power sector: can reliability and decarbonisation go hand in hand?

LIBRARY

In 2021, due to COVID-19, the institute's library has not been open to visitors and the difficult decision to no longer have a librarian was made.

The OIES would like to offer thanks to the following organizations and publications for supplying – either free of charge or at substantially discounted prices – important journals, statistical sources, and other materials vital to our research work, which could not have been afforded otherwise: Argus Media, IEA, Kpler, MEES and S&P Global Platts.

RESEARCH TEAM AND STAFF

Philip Andrews-Speed is a Senior Research Fellow with OIES' China Energy Research Programme. He is also Senior Principal Fellow at the Energy Studies Institute, National University of Singapore. He started his career as a mineral and oil exploration geologist before moving into the field of energy and resource governance. His main research interest has been the political economy of the low-carbon energy transition. China has been a particular focus for his research, but in recent years he has been more deeply engaged with energy challenges in Southeast Asia. Philip has published extensively on China's energy governance in academic and policy fora. His latest book, with Sufang Zhang, is *China as a Global Clean Energy Champion: Lifting the Veil* (Palgrave, 2019).

Andreas Economou, Senior Research Fellow, joined the Institute in July 2015. His research interests lie in natural resource and energy economics with a particular focus on the empirical analysis of crude oil markets, the dynamics of oil prices and OPEC behaviour. The central topic of his research is largely the causes and consequences of oil price shocks, using advanced econometric techniques to model the world oil market. Other aspects of his research focus on OPEC's behaviour and pricing power in the oil market, the relationship between oil prices and the global economy, and the real-time analysis of oil price risks using forecast scenarios. Previously he was an OIES-Saudi Aramco Fellow. Andreas is currently completing his PhD in Energy Economics at UCL Energy Institute. He holds an MSc (Hons) in Oil and Gas Enterprise Management from the University of Aberdeen with specialization in petroleum economics and international fiscal systems analysis, and a BSc in Business Administration from the University of Macedonia, Greece.

Bassam Fattouh is the Director of the Oxford Institute for Energy Studies (OIES) and Professor at the School of Oriental and African Studies (SOAS). He has published a variety of articles on energy policy, the international oil pricing system, OPEC behavior, the energy transition, and the economies of oil producing countries. Dr Fattouh served as a member of an independent expert group established to provide recommendations to the 12th International Energy Forum (IEF) Ministerial Meeting in Cancun (29-31 March 2010) for strengthening the architecture of the producer-consumer dialogue through the IEF and reducing energy market volatility. He is the recipient of the 2018 OPEC Award for Research. He acts as an advisor to a number of governments and companies. He is a regular speaker at international conferences.

Mike Fulwood, Senior Research Fellow. Mike Fulwood joined the OIES in October 2017. Mike has over 40 years of experience in the gas industry. Before joining the OIES, Mike worked as a consultant, with Energy Markets between 1997 and 2008 and then with NexantECA as Director, Global Gas & LNG. Before working as consultant, Mike worked for British Gas from 1979, latterly as a Director at British Gas Transco, in charge of the price control review, and prior to that President of British Gas Americas during which time he oversaw many successful acquisitions and projects including the acquisitions of Metrogas (Argentina), NGC (now Dynegy), the Bolivia – Brazil pipeline and Trinidad LNG project.

While working as a consultant Mike undertook a wide range of projects in all areas of the gas chain, covering regulatory matters, gas pricing and tariffs, gas sales and transportation contracts, market studies and price forecasting, as well as helping develop NexantECA's *World Gas Model*. Between 2009 and 2018, Mike was Chairman of the International Gas Union's Gas Pricing Group, and still undertakes the IGU's Wholesale Gas Price Survey. He also speaks widely at gas conferences all over the world, particularly on gas markets, gas trading matters and gas pricing.

Marshall Hall, Senior Research Fellow, spent 35 years working in and around the European oil and gas industry between 1981 and 2016. He began his career in oil trading and refining at BP and worked

as an oil analyst at the IEA, an equity and commodity analyst at SG Warburg/UBS in the financial sector, and in gas and LNG markets analysis at BG Group until 2013. He then moved to Oil & Gas UK as Energy Policy Manager, dealing principally with EU energy and climate policy and gas market regulation until late 2016. He joined the Natural Gas Research Programme of the OIES in 2017 as a Visiting Research Fellow and published a paper on the prospects for Norwegian gas production and export in March 2018. He is currently preparing a second paper on the outlook for gas production from the UK continental shelf and the potential impact on future gas output of the regulatory and fiscal reforms introduced in 2015–16.

Since joining the OIES Gas Research Programme, he has contributed to research papers on the UKCS, Norwegian gas, emission reduction in the upstream industry and energy -related methane emissions.

Patrick Heather, Senior Research Fellow, joined the institute in June 2006. His works include: 'The Evolution and Functioning of the Traded Gas Market in Britain' (August 2010); a co-authored comment with Jim Henderson, 'Lessons from the February 2012 European gas crisis' (April 2012); and the paper 'Continental European Gas Hubs: are they fit for purpose?' (June 2012). His paper, 'The evolution of European traded gas hubs' (December 2015) focused on the evolution of the gas markets across the continent in the context of the European Commission's vision of a Single Energy Market (in gas); the paper described the 'path to maturity' of traded gas hubs and analysed their stages of development using both objective and subjective measures; he brought the results of that research up to date in a coauthored Insight with Beatrice Petrovitch, 'European traded gas hubs: an updated analysis on liquidity, maturity and barriers to market integration' (May 2017); 'The SPIMEX Gas Exchange: Russian Gas Trading Possibilities' a paper co-authored with James Henderson and Tatiana Mitrova (Jan 2018) exposed the path that Russia is taking in developing a traded gas market; the comment co-authored with Thierry Bros 'French gas customers face a real risk from a No Deal Brexit' examined the risk that a No Deal Brexit could have very serious and immediate consequences for the French economy (February 2019); his paper 'A Hub for Europe: the Iberian Promise?' (March 2019) focused on whether the Iberian Peninsula could be a 'gateway' for more diverse supplies of gas to Europe; the Insight 'European Gas Hubs: a decade of change' (July 2019) reviewed the progress of European hubs' development over the whole decade, including the smaller and emerging hubs; there followed a Comment 'European Traded Gas Hubs: the supremacy of TTF' (May 2020), which detailed how the Dutch TTF has become the European hub as well as a global price marker; and another comment 'European Traded Gas Hubs: German hubs about to merge' (July 2021), not only gave an update on the status of all the European gas hubs but focused on the imminent merger of the two German hubs as well as analysing the relative liquidity of the three main global gas price benchmarks; the initial performance of the new German hub was reviewed in the comment 'European Traded Gas Hubs: German THE fails to impress' (December 2021); his latest Insight is part of a trilogy of papers published by the Institute, 'A series of unfortunate events: the role of the traded gas hubs' (March 2022) reviews the possible trading reasons behind the unprecedented gas prices and market volatility during 2021.

Since 2004, Patrick has been an independent consultant focusing on the gas market evolution in Europe, supply and demand dynamics, the impact of regulation on market outcomes, contracting strategy, and marketing strategies to take advantage of new market opportunities. Patrick has advised and given presentations to many different organizations, including the European Commission, the EBRD, the IEF, the IOGP, the APX, CQPGX, GME, ICE, Henex, SHPGX and Spimex exchanges, and various producer and end user companies, financial institutions, regulators, and governments in Australia, Austria, Belgium, Brazil, Britain, China, Estonia, France, Greece, Holland, India, Italy, Japan, Malaysia, Norway, the Philippines, Poland, Romania, Russia, Sweden, Switzerland, Turkey and Ukraine. In 2006, he was appointed commercial adviser to South Hook Gas to assist them through the long commissioning phase of their world-leading LNG import facility in South Wales, which was successfully achieved in 2009. Prior to 2004, Patrick established PowerGen's (now E.on UK) gas trading capabilities and later

set-up their electricity trading desk; he later joined BG Group as Trading Manager to set-up their trading capability from scratch. Patrick has 40 years' experience of broking, trading, and risk management in the natural gas, power, oil, and oil products markets, and working as a gas market expert for European utilities and gas suppliers, British investment banks, and international oil majors.

James Henderson, Director, Gas Research Programme, has been writing for and working with the Institute since 2010. He produces research for both the Gas and Oil Programmes covering Russia and CIS issues as well as global energy matters that affect the region. He is a Visiting Professor at Masaryk University in the Czech Republic and has lectured on energy economics and security of supply at a number of universities in Europe and the US. He has worked in the oil sector for US company Amerada Hess, as well as spending time as a consultant and investment banker. He obtained a PhD in Social Sciences from London University in 2010. With OIES he initially published a monograph on "Non-Gazprom Gas Producers in Russia" before contributing numerous working papers on the Russia oil and gas sectors and their connection with the global energy economy. In particular he co-edited the 2014 book entitled "The Russian Gas Matrix: How Markets are Driving Change" and has more recently published papers on the future of Russian oil production, tight oil in Russia, Arctic oil, East Siberia's hydrocarbon export potential, Russia's gas export strategy and Russia's energy relations with China. He has also published a book on "International Partnership in Russia" (Palgrave Macmillan) and is currently writing a book on the history of Rosneft for Columbia University Press.

Anouk Honoré, Senior Research Fellow, is a Senior Research Fellow in the Gas Research Programme. Her research at the OIES focuses on gas issues in the EU and in individual countries in Europe and South America, with particular emphasis on energy policies, decarbonisation of the heating sector, market fundamentals decarbonisation of road transport, gas and power generation. Before joining the Institute, she worked at the International Energy Agency in Paris. Her work focused mainly on natural gas issues in the member countries but also in China and in Latin America. Dr Honoré holds a PhD in Economics, a MA in Environmental and Natural Resources Economics and a LLM in International Administration (public law). Dr Honoré is author of European Natural Gas Demand, Supply & Pricing, cycles, seasons and the impact of LNG price arbitrage (Oxford University Press 2011), and the author and co-author of chapters in other books, including OIES books such as Pricing of Pipeline Gas and LNG in Latin America and the Caribbean, with D. Ledesma in J. Stern (ed.) The Pricing of Internationally Traded Gas (Oxford University Press 2012), The Gas Exporting Countries' Forum: Global or Regional Cartelization?, with L. El-Katiri in J. Stern (ed.) The Pricing of Internationally Traded Gas (Oxford University Press 2012), LNG Demand Potential, with H. Rogers, S. D'Apote and A-S Corbeau in A-S. Corbeau and D. Ledesma (eds.) LNG Markets in Transition, The Great Reconfiguration. She is also the author of several working papers on natural gas demand in Europe and in South America, decarbonization of heat and implications for natural gas demand, decarbonization of the industrial sector, and some country-specific analysis of their gas market. A selection of the latest publications in this series includes Natural gas demand in Europe: The impacts of COVID-19 and other influences in 2020 (2020), Decarbonization and industrial demand for gas in Europe (2019), Decarbonisation of heat in Europe: implications for natural gas demand (2018). At present, Dr Honoré's main area of research is on decarbonization policies in the EU and individual European countries; interaction between gas and renewables in electricity generation, decarbonization of heat and road transport, all with a focus on potential impact on future gas demand (both natural gas and decarbonized gases).

Adi Imsirovic, Senior Research Fellow. Adi Imsirovic has over 30 years of experience in oil trading. He held a number of senior positions, including Global Head of Oil at Gazprom Marketing & Trading, Director of Petraco and the Head of their Singapore office and The Regional Manager of Texaco Oil Trading for Asia.

Adi also taught economics at Surrey University for several years: Energy Economics as well as Resource and Environmental Economics. He has written a number of papers and articles on the topic of oil and gas prices, benchmarks and energy security. He is the author of the book: 'Trading and Price Discovery for Crude Oils: Growth and Development of International Oil Markets', published by Palgrave in August 2021.

He has an honours degree (B.Sc.) in Economics and a Master of Science (M.Sc.) degree in Energy Economics from Surrey University. He is also a Fulbright Scholar and he studied at the Graduate School of Arts and Sciences, Harvard University.

Malcolm Keay, Senior Research Fellow, joined the OIES in January 2005. His career has ranged widely across the energy scene, including roles in: the public sector, as director of energy policy at the UK Department of Trade and Industry (1996–9) and division head at the IEA; the private sector, as senior managing consultant at Oxera; and the non-profit sector, working at Chatham House and the World Coal Institute. He has acted as an adviser for many energy studies, including as special adviser to a House of Lords committee inquiry into energy security in Europe, and director of the energy and climate change study for the World Energy Council.

His research focuses on the implications of electricity market liberalization for the achievement of key energy policy objectives, particularly in relation to the environment. He contributed the chapter entitled 'Can the market deliver security and environmental protection in electricity generation?' to *UK Energy Policy and the End of Market Fundamentalism*, edited by Ian Rutledge and Philip Wright (OIES/OUP, 2011). This updated the analysis and conclusions of his 2006 monograph for the OIES, *The Dynamics of Power*, to argue that governments have failed to develop policies which will enable them to meet their environmental targets in the context of liberalized markets, and that more interventionist approaches would be needed. His research interests also include EU energy policy; with David Buchan, he co-authored a book published by OUP in 2016 entitled *Europe's Long Energy Journey: Towards an Energy Union?* Recently his research has focused on electricity market design and the decarbonization of heat, with an emphasis on a whole system approach.

Recently, he has published a number of papers on electricity market reform for a decarbonised system, and on the decarbonisation of heat in the UK.

Martin Lambert, Senior Research Fellow. Martin Lambert joined OIES in 2017 and now specialises in renewable gas and hydrogen, while also writing occasionally on global LNG. He also works as an independent consultant. His areas of expertise include commercial strategy, project development and structuring, economics, gas and LNG marketing and trading. Martin's 34 year career with Shell included several senior leadership positions in the gas and LNG businesses. His overseas assignments included Japan, where he was responsible for marketing Shell's LNG to gas and power companies, the Philippines where he was commercial manager during the development of the Malampaya gas field, and Australia where he was seconded to North West Shelf Australia LNG as Senior Vice President Marketing. From his UK base, his career also included frequent international travel, and was a key member of the team which closed a major LNG project in the Middle East. Martin's career also included several years in related areas outside the core gas business: managing research teams developing products from Gas to Liquids and leadership roles in Shell's biofuels business. Martin holds an MA in economics and engineering from the University of Cambridge

David Ledesma, Chairman, Gas Research Programme & Senior Research Fellow. David Ledesma is an independent gas and LNG consultant focusing on gas and LNG strategy along the value chain, including the structuring of commercial arrangements, financing, and markets for pipeline gas and LNG

projects. Since joining the institute in November 2007, he has contributed chapters to several of the institute's books, namely: Natural Gas in Asia (2008), Natural Gas in the Middle East and North Africa (2011), The Pricing of Internationally Traded Gas (2012) and was Co-Editor of the institute's book LNG Markets in Transition, The Great Reconfiguration (2016). He has also published a number of papers, including: 'The Changing Relationship between NOCs and IOCs in the LNG Chain' (July 2009); 'East Africa Gas – Potential for Export' (March 2013); 'The Future of Australian LNG Exports: Will Domestic Challenges Limit the Development of Future LNG Export Capacity?' (September 2014) and New Players New, Models a research think piece (March 2019). David also manages the OIES Podcast series and is a regular presenter. David also contributed the book chapter 'Project Financing LNG Projects' to The Principles of Project Finance (Gower Publishing, 2012). David also writes on gas and LNG, and presents regularly at conferences. During over 40 years in the energy and utilities sector, David has worked on the development of complex integrated energy projects, negotiations at government level, and in the management of joint ventures. With Shell, he worked in Malaysia and the Netherlands, travelled extensively to Oman and Asia, and was a key member of the team that closed a major LNG project in the Middle East. He is an experienced commercial manager with hands-on experience of developing and closing commercial gas transactions as well as developing business strategy. From 2000 to 2005, as director of consulting then managing director of the Gas Strategies Group (formally EconoMatters Ltd), David worked on and managed LNG and gas consulting assignments around the world. In May 2013 David was appointed a non-executive Director of Pavilion Energy, a subsidiary of the Singapore investment firm Temasek Holdings in 2013. He has a degree in economics and geography from the University of Exeter.

Michal Median, Director of the Gas Research Programme and China Energy Programme at the Oxford Institute for Energy Studies. Before joining OIES in July 2019, she headed cross-commodity China research at Energy Aspects. Prior to that, she headed China Matters, an independent research consultancy providing analysis on the politics of energy in China. Michal also held senior analytical roles at Eurasia Group in New York and London, and at Asia Centre-Sciences Po, Paris. She taught undergraduate courses on China's political economy at the Hebrew University in Jerusalem and has authored numerous academic articles. Michal also regularly provides comments for a wide variety of media outlets and is featured as a speaker at industry conferences. Michal holds a PhD in Political Science and East Asian studies from Sciences Po, Paris. She is fluent in Mandarin and French.

Tatiana Mitrova, Senior Research Fellow, is Professor and Research Director at the Energy Centre, Moscow School of Management, SKOLKOVO, Scientific advisor at the Energy Research Institute of the Russian Academy of Sciences (ERI RAS), Research Scholar at the Center on Global Energy Policy at Columbia University, Distinguished Research Fellow at Institute of Energy Economics, Japan (IEEJ). She has more than twenty years of experience in the analyses of the Russian and global energy markets, including production, transportation, demand, energy policy, pricing and market restructuring. She is Head of the annual "Global and Russian Energy Outlook up to 2040" project and a Board Member of Schlumberger and NOVATEK. Tatiana is a Visiting Professor at the Institut d'Etudes Politiques de Paris (Sciences Po) Paris School of International Affairs. She has more than 200 publications in scientific and business journals and eight books.

Mostefa Ouki, Senior Research Fellow, Dr Mostefa Ouki is an independent energy consultant and has over thirty years of experience in developing, executing, and managing gas and energy-related technoeconomic projects throughout the world. He led numerous consulting and advisory assignments commissioned by governments; national and international energy companies; and, international financial institutions. He also executed and led a number of consulting assignments on the planning and implementation of oil, gas and petrochemical infrastructure projects in key hydrocarbon producing countries in the Middle East and North Africa (MENA) region. Dr Ouki worked closely with government and private sector policy decision makers in a number of countries on the formulation, funding and implementation of energy and infrastructure projects and policies. He advised project lenders and financial advisors on the development of energy and infrastructure projects.

Dr Ouki is presently involved in research work on plans and developments in the MENA region to reduce greenhouse gas emissions and achieve carbon neutrality targets. He is also undertaking work on the preparedness of MENA hydrocarbon producing countries to address potential international decarbonisation measures.

Dr Ouki started his career with the gas exports division of Algeria's national oil and gas company, Sonatrach, in Algiers, and worked in Washington, D.C. as a consultant on gas development projects for the World Bank. He was Vice President in Nexant's Energy & Chemicals Advisory division based in London. Prior to Nexant, he was with the US engineering, procurement, construction and project management company Bechtel and worked for the international pipeline engineering and project management company Penspen.

Dr Ouki holds a diplôme d'ingénieur d'état in petroleum engineering economics from Algeria's Institut National des Hydrocarbures and MSc in Energy Resources, MA and PhD in Economics from the University of Pittsburgh, Pennsylvania, USA. He is a member of the American Economic Association; Association of International Petroleum Negotiators; and the International Association of Energy Economics.

Luke Patey, Lead Senior Research Fellow, is Lead Senior Research Fellow of the Africa oil and gas programme at OIES. He is also senior researcher at the Danish Institute for International Studies and fellow at the Rift Valley Institute. Patey is author of *How China Loses: The Pushback abasing Chinese Global Ambitions* (OUP, 2021), *The New Kings of Crude: China, India, and the Global Struggle for Oil in Sudan and South Sudan* (Hurst, 2014), which was short-listed for the Africa-Asia Book Prize, and co-editor of *Sudan Looks East: China, India, and the Politics of Asian Alternatives* (James Currey, 2014) with Daniel Large.

Patey has written for *the* New York Times, the *Financial Times*, *Foreign Policy*, *Foreign Affairs*, *The Guardian*, *The Hindu*, and *VICE News*. His commentary has appeared in *Bloomberg*, *The Wall Street Journal*, *The New York Times*, the *Financial Times*, *Reuters*, *Al Jazeera*, *China Central Television* (*CCTV*), the *BBC World Service*, and *Radio France*. He has also published scholarly articles in *African Affairs*, *the Journal of Modern African Studies*, *Journal of Contemporary China*, *Middle East Policy*, *and Third World Quarterly*. He has been a visiting scholar at the Centre d'études et de recherches internationals (Paris), Peking University (Beijing), the Social Science Research Council (New York), and the United Nations University (Tokyo). He holds a BSc (Hons.) in commerce from Queen's University (Kingston) and a MSc and PhD from the Copenhagen Business School.

Rahmatallah Poudineh, Senior Research Fellow & Director of Research, Electricity Programme. Rahmat joined the institute in November 2014 to design and setup the electricity research programme. He is Senior Research Fellow and, since 2019, Director of Research. Rahmat is an economist and engineer by training, with several years of experience in the economics and regulation of the electricity sector. He has published numerous peer-reviewed academic articles on a number of key issues relating to the energy sector, including: network regulation, electricity market design, power system flexibility, renewable support schemes, gas and power interdependence, power sector reform in developing countries, and the implications of the energy transition for oil companies. He has also co-authored a book on 'The Economics of Offshore Wind Power: Challenges and Policy Considerations'. Rahmat's main research interest lies in the design of markets and regulation for future decarbonised energy systems.

Rahmat has been involved in a number of policy oriented projects, including a European Commission funded project on developing a regulatory framework to ensure the security of the European power grid against natural, accidental and malicious damage. He also led a project on sustainable electricity pricing for Tanzania funded by International Growth Centre (IGC).

Rahmat holds a BSc in aerospace engineering from Amirkabir University of Technology (Tehran Polytechnic), a graduate diploma in economics from Queen Mary University of London, MSc in energy economics and policy from University of Surrey, and PhD in energy economics from Durham University, where he received the best thesis prize for his doctoral dissertation on economic regulation of electricity distribution networks.

David Robinson, Independent consultant and a Senior Research Fellow at the Oxford Institute for Energy Studies. He is an economist who advises on public policy and corporate strategy, especially in relation to energy and climate change. His recent research includes analysis of the following issues, among others: policies to replace coal with decarbonized energy resources in China; the impact of Covid-19 on the global energy transition; the integration of intermittent renewable electricity; the lessons of the Texas and California electricity blackouts for reform of the energy sector; and future energy market design for a decarbonised energy sector. David runs his own consulting company, is an academic adviser to The Brattle Group, and was previously a director of NERA, where he was the co-chair of European Operations and of the Global Energy and Telecom Practices. He also worked at the International Energy Agency (IEA), and wrote his doctoral dissertation at the University of Oxford on the vertical disintegration of the international petroleum industry.

Anupama Sen, Executive Director, Electricity Programme. Anupama Sen joined the Institute in November 2009. She is Executive Director of the Electricity Programme and Senior Research Fellow. Her research interests lie in the applied economics of energy in developing countries and her research has spanned the oil, gas and electricity sectors. In addition to publishing at OIES, her work has appeared in top peer-reviewed academic journals, professional publications, as well as in several books and Op-Eds. Anupama is a Fellow of the Cambridge Commonwealth Society and has been a Junior Research Fellow and a Visiting Fellow at Wolfson College, Cambridge. She also teaches on the MSc Energy Systems at Oxford University. Anupama holds a B.A. (Hons) from the University of Mumbai, M.Sc. from the London School of Economics and Ph.D. from the University of Cambridge.

Jack Sharples, Research Fellow. Dr Jack Sharples is a Research Fellow on the Gas Research Programme at the Oxford Institute for Energy Studies (OIES), having joined the Institute in January 2018. He holds a PhD and MSc in Russian and East European Studies from the University of Glasgow, and a BA in Politics from the University of York. Prior to joining the Institute, he spent four years as a Lecturer in Energy Politics and International Relations at the European University in St Petersburg. Outside OIES, he has been the author of the 'Gazprom Monitor' monthly analytical reports for the European Geopolitical Forum (Brussels) since June 2012.

Beyond his OIES publications, he is also the author of several academic journal articles and book chapters, including: 'The international political economy of Eastern European energy security: Russia, Ukraine, and the European Union' (2018); 'Europe's largest natural gas producer in an era of climate change: Gazprom' (2017) 'Energy transitions in carbon-producing countries: Russia' (2016); 'Building the Energy Union: the problem of cross-border gas pipeline interconnections in Baltic, Central, and

South-Eastern Europe' (2016); 'The importance of gas storage facilities in the European gas and power markets' (2016); 'The shifting geopolitics of Russia's gas exports and the impact on EU Russia gas relations' (2016); and 'Russian gas supplies to Europe: the likelihood, and potential impact, of an interruption in gas transit via Ukraine' (2016).

Manal Shehabi, Senior Research Fellow, is also SCR Member of St. Antony's College, University of Oxford, and Research Associate of the Economic Research Forum (ERF). She is an applied economist with expertise in economic modeling and economic, energy, and resource sustainability in resource economies, especially in the Middle East and Gulf region with a focus on Kuwait.

Using economy-wide modeling with oligopoly and political economic analyses, her research made important contributions to the analysis of economic adjustment and policy alternatives in the face of the recent declines in oil prices and demand, offering a unique and powerful mathematical model of the Kuwaiti economy, which is translated to other economies. Her published papers on the model and its applications offered new perspectives on economic diversification, expatriate labor, and oligopolistic behavior in resource exporters and the management of both resource and non-resource oligopoly rents. She published papers, journal articles and chapters on energy subsidies reform, private sector and oligopoly regulations, impacts of COVID-19 on oil economies, Kuwaitization, energy transition, economic and energy sustainability in Kuwait and resource economies. Her current projects include: modeling energy outlook in Kuwait; the hydrogen economy in Gulf states and Kuwait; decarbonization in Saudi Arabia; and modeling effects of climate change response measures on developing countries. She presented at various international conferences and seminars.

Manal's research has impacted policymaking. Her research was featured in key policy debates and capacity building (such as at the WTO, IEA, UNFCCC). Her modeling research will be used in Kuwait in policy making and she provided capacity building to policy makers. With a team, she completed a pilot project under the UNFCCC's mandate to develop an economic toolkit to analyse impacts of response measures to climate change, the results of which are scheduled to be delivered at COP26 in Glasgow. She (co)authored numerous policy reports, including the Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate (2019); ocean sustainability policy brief by the International Hydrographic Organization (2019); and Kuwait Energy Outlook 2020.

Prior to joining the OIES, Manal was a researcher at the University of Western Australia, where she also taught courses in economics, and a Visiting Research Fellow at the OIES 2016-2018. Beyond academia, she was the in-house expert for a multinational mining and oil services company in Western Australia; as well as economist/consultant in the US and Australia advising multinationals, including Fortune 500 companies, primarily in petrochemical, energy, and mining industries on transfer pricing and relevant modeling. Prior to that, she successfully launched and managed a business public policy project in Texas and examined investments in the oil industry in West Asia at the UNCTAD.

Manal holds a PhD in economics (The University of Western Australia); an MIA-Economics (Texas A&M University); a BA (Honors) magna cum laude (Ursinus College, where she was Queen Noor-Ursinus College Scholar); and diplomas (Harvard Business School Publishing; and Université Marc Bloch). She is recipient of various grants, honors, and awards. A polyglot, her language capabilities include Arabic, English, French, Spanish, and Mandarin Chinese.

Jonathan Stern, Distinguished Research Fellow, founded the OIES Gas Research Programme in 2003 and was its Director until October 2011 when he became its Chairman and a Senior Research Fellow, he became a Distinguished Fellow in October 2016. He is honorary professor at the Centre for Energy,

Petroleum & Mineral Law & Policy, University of Dundee; visiting professor at the Centre for Environmental Policy, Imperial College London; fellow of the Energy Delta Institute and a Distinguished Research Fellow of the Institute of Energy Economics, Japan (in Tokyo). From 2011-16 he was the EU Speaker, and remains a member of the EU–Russia Gas Advisory Council. He is the author and editor of several books, including: *Natural Gas in Asia: The Challenges of Growth in China, India, Japan and Korea*, the second edition of which was published by OUP in 2008; co-editor with Bassam Fattouh of *Natural Gas Markets in the Middle East and North Africa* (OUP, 2011); and editor of, *The Pricing of Internationally Traded Gas* (OUP, 2012), editor of *The Future of Gas in the Gulf: continuity and change* (OIES, 2019). He is author of two chapters in: eds. Anne-Sophie Corbeau and David Ledesma, *LNG Markets in Transition: the Great Reconfiguration*, published by OIES and KAPSARC in 2016. His most recent papers published by the Institute in 2019 and 2020 are: Narratives for Gas in Decarbonising European Energy Markets, Challenges to the Future of LNG: decarbonisation, affordability and profitability, and Methane Emissions from Natural Gas and LNG Imports: an increasingly urgent issue for the future of gas in Europe.

Katja Yafimava,NSenior Research Fellow, on the Oxford Institute for Energy Studies Gas Research Programme, holds a D.Phil. in Geography and an M.Phil. in Russian and East European Studies from Oxford University. She has been an expert at the UNECE Group of Experts on Gas since January 2015 and was an expert at the EU-Russia Gas Advisory Council during 2012-16. Her main research areas include EU pipeline gas and LNG regulation, regulation of decarbonisation, transit security of Russian gas exports to Europe.

Dr Yafimava is the author of The Transit Dimension of EU Energy Security: Russian Gas Transit Across Ukraine, Belarus, and Moldova (OUP 2011) and the author and co-author of chapters in other books, including The Russian Gas Matrix: how markets are driving change (OUP 2014), Research Handbook on International Energy Law (Edward Elgar 2014), The Pricing of Internationally Traded Gas (OUP 2012), Russian and CIS Gas Markets and their Impact on Europe (OUP 2009). She is also the author and co-author of several working papers on Russia-Ukraine, Russia-Belarus, and Russia-Moldova gas transit disputes, the latest in this series is a co-authored OIES paper 'Implications of the Russia-Ukraine gas transit deal for alternative pipeline routes and the Ukrainian and European markets' (2020). At present, Dr Yafimava's main area of research is EU regulation, including regulation of pipeline gas and LNG as well as regulation of decarbonisation, reflected in many OIES publications, including 'Nord Stream 2: on the verge of sending gas to Europe' (2021), 'The OPAL Exemption Decision: a comment on the Advocate General's Opinion on its annulment and its implications for the Court of Justice judgement and OPAL regulatory treatment' (2021), 'Finding a home' for global LNG in Europe: understanding the complexity of access rules for EU import terminals' (2020), 'EU hydrogen strategy: regulatory opportunities and challenges' (2020), 'Gas Directive Amendment: implications for Nord Stream 2' (2019), 'Building New Gas Transportation Infrastructure in the EU – what are the rules of the game?' (2018), 'The EU Competition Investigation into Gazprom's sales to central and eastern Europe: a detailed analysis of the commitments and the way forward' (co-authored) (2017). Her most recent paper is 'German regulator's decision to suspend certification of Nord Stream 2 AG: F.A.Q.' (co-authored) (2021).

Vitaly Yermakov, Senior Research Fellow, Vitaly's research focus is on oil and gas in Russia and CIS. Before joining OIES in 2019 he worked for over 20 years in the industry holding positions of Commodity Strategist for Sberbank CIB, Visiting Researcher at KAPSARC, Saudi Arabia, Director of Research at Cambridge Energy Research Associates (CERA) and IHS CERA and a manager at TNK-BP, an oil company.

Vitaly's recent publications include papers for Oxford Institute of Energy Studies on the issues of Russia-OPEC cooperation, Russian refining, Russia's LNG and pipeline strategy, Russian gas spare productive capacity, gas demand flexibility, and gas taxation. He also published a paper for KAPSARC, Saudi Arabia on price competitiveness of US LNG and Russian pipeline gas in Europe. Mr. Yermakov is also the author of over 50 CERA and IHS CERA analytical private reports, including analysis of gas demand issues and gas price regulation in Russia and Ukraine, analysis of tax changes for Russian oil and gas industries, regulatory reform in the Russian energy sector and comparative analysis of oil and gas transportation tariffs in Russia and North America. He also led numerous consulting projects for the CERA and IHS CERA clients, including Russian tax reform for the oil sector, developing gas strategy and developing strategy of marketing LPG for major Russian companies, analysing gas transportation in Russia for a major Western company.

Vitaly has been lecturing for Energy Delta Institute's executive MBA program on a wide range of topics, including natural gas and LNG developments and pricing, China's gas demand, and Russian gas developments. He also works with Higher School of Economics in Russia and is a frequent speaker at major industry conferences in Russia and abroad. Mr. Yermakov holds a master's degree from Duke University and a PhD from Samara State University.

The following staff contributed to the work of the OIES in 2021. Their dedication and professionalism are essential to its continued smooth running.

- Karen Clark is responsible for the Institute's accounts.
- Jo llott provides administrative support for the Gas Research Programme.
- Hannah Shipton provides administrative support.
- Kate Teasdale is administrator and Company Secretary.

VISITING RESEARCH FELLOWS

Agnieszka Ason, Visiting Research Fellow. Agnieszka specialises in energy law and international dispute resolution. She has particular expertise in gas price reviews. Having started her career at the Berlin Institute for Energy law and worked on major energy deals and disputes in European and Asian markets for a decade, Agnieszka currently lectures in international commercial and investment arbitration and energy law and trading at the London School of Economics, Technische Universität Berlin, Freie Universität Berlin and Queen Mary University of London. Agnieszka has published high-impact research quoted by judges and arbitrators (including on challenges to arbitral awards in national courts) and regularly offers guest lectures and presents at conferences. She holds law degrees from Freie Universität Berlin and the University of Warsaw. Agnieszka is fluent in Polish (native), English, Russian and German.

Robin Baker, Visiting Research Fellow, has over 35 years' experience in energy finance; with the Chase Manhattan Bank where he headed the Oil & Gas Group's Asia Pacific region and subsequently with Société Générale, heading their Global Energy Finance Group. He is currently a Managing Consultant with Gas Strategies. He has been particularly active in advising and lending project finance to the energy sector and has provided financial advice to many projects throughout the energy chain; from upstream oil and gas to power generation. He has been actively involved in LNG since leading the first international LNG project finance (for Woodside's share of the first Northwest Shelf LNG project) in 1987 and has advised LNG projects in Qatar, Egypt, Indonesia, Russia, Australia, PNG, the USA and Mozambique. Prior to energy finance he worked in various refining and supply planning positions in the UK and Asia with the Royal Dutch/Shell Group. He has a B.Sc. in Chemical Engineering from Imperial College and an MBA from Cranfield School of Management, and is a Fellow of the Energy Institute.

Alex Barnes, Visiting Research Fellow, is an independent consultant specialising in energy market design and regulation. He has nearly thirty years' experience in the oil and gas sector, most of it spent in the liberalisation of gas and electricity markets. He has worked for a range of companies including Total, BG Group and Gazprom, helping them manage the impacts of energy liberalisation, both exploiting new opportunities and defending existing positions. At BG Group he led the team which secured an exemption from third part access regulation for the Dragon LNG terminal, enabling investment to go proceed. He established the Regulatory Affairs function for Gazprom Marketing & Trading in 2009, supporting its rapid expansion in gas and power trading in Europe, and also advised Gazprom on gas market liberalisation related issues. He has helped draft gas market rules as an industry representative on expert panels for the European Network of Transmission Operators for gas (ENTSOG) and the European energy market regulator ACER. He has also represented the European Federation of Energy Traders at the Madrid Forum organised by the EU Commission. He is a regular speaker at conferences and seminars, and on the advisory board for the European Annual Gas Conference and the European Gas Conference. He has a degree in Politics, Philosophy and Economics from Oxford University, and an MBA from Henley Management College.

Farhad Billimoria, Visiting Research Fellow, is an energy professional with over 14 years of global energy experience. He has covered electricity (renewable and conventional) and gas markets across Australia, New York, and California. He is currently with the Australian Energy Market Operator (AEMO) responsible for the design and analysis of electricity and gas markets in Australia, focusing on decarbonized market design for reliability and security. Prior to AEMO, Farhad was an active energy investor in US and international markets, as an energy and infrastructure specialist at the State of California (CalPERS) managing a \$5 billion portfolio of energy and infrastructure assets, and as Vice

President at AMP Capital in New York. Farhad has Bachelor's degrees in Electrical Engineering and Laws (both with Honours), and holds a Masters in Energy Systems from the University of Melbourne with a focus on energy market modelling, forecasting, and system design.

Klaus-Dieter Borchardt, Senior Visiting Research Fellow, is since October 2020 a Senior Energy Advisor at the European Competition Law Practice in the Baker McKenzie Brussels office.Before this, Klaus-Dieter worked for 33 years at the European Commission, including four years at the European Court of Justice. He spent 12 years in the Commissions' Legal Service where he was responsible for state aid, internal market and agriculture, worked as a Head of the private office for the Danish Commissioner for Agriculture and Rural Development and spent the last 8 years in DG Energy, first as a Director for the internal Energy Market and the last 2 years as a Deputy Director General for Energy.Klaus-Dieter is also a Professor at the Julius-Maximilians-University, author of a standard textbook on EU Law and co-editor of a commentary of the EU Treaties.

Julian Bowden, Senior Visiting Research Fellow, worked for BP for four decades in a variety of mainly planning, strategy and business development roles in downstream oil and international gas. His international roles included postings to BP's offices in Moscow and Brussels. He was involved in the planning for Caspian crude oil exports (culminating in the BTC pipeline) and latterly in the development of the southern gas corridor. Publications include chapters on Azerbaijan and Georgia in an OIES book on CIS gas, a chapter on SE Europe's gas markets in an European Commission sponsored book on gas in the EU's energy union and research papers on gas pricing for the IGU. He has also published an academic journal article on Soviet oil marketing in the UK in the 1930s. Principle interests remain in gas and broader energy issues in Eurasia.

Michael Bradshaw, Senior Visiting Research Fellow, joined the OIES in August 2008 and is also a professor at Warwick Business School, teaching in the Global Energy MBA Programme. Before taking up this post in January 2014, he was professor of Human Geography at the University of Leicester. His PhD is from the University of British Columbia, Canada. His research is at the interface of economic and political geography, business and management, and international relations. In 2007, he was awarded the Royal Geographical Society's Back Award for his applied research on economic change in postsocialist economies. From 2008 to 2011 he was engaged in a programme of research funded by a Leverhulme Trust Major Research Fellowship that examined the relationship between energy security, globalization, and climate change. This led to the publication of his book, entitled *Global Energy* Dilemmas (Polity Press, 2013). He has also completed projects on the UK's Global Gas Challenge (2014) and The Future Role of Gas in the UK (2016), funded by the UK Energy Research Centre. He is co-editor of Global Energy: Issues, Potentials, and Policy Implications, published by OUP in 2015. He is currently writing a book on the geopolitical economy of natural gas for Polity Press. He is editor-inchief of Wiley-Blackwell's Geography Compass and contributing editor of Eurasian Geography and Economics. In addition to his involvement with the OIES, he is an honorary senior research fellow at the Centre for Russian, European and Eurasian Studies at the University of Birmingham.

Toby Chancellor-Weale, Senior Visiting Research Fellow, is an independent consultant specialising in Natural Gas Processing and Liquified Natural Gas (LNG) facilities. He has 30 years' experience working for a range of oil & gas contractors and consultants including Bechtel, Granherne, KBR and Wood. He has worked with client teams including ADNOC, BP, Chevron, Eni, Equinor, NCOC, NLNG and Shell on the design and operation of both on and offshore hydrocarbon processing facilities in Africa, Australia, the Caspian region, the Middle East, Norway and Russia.

Toby is currently Chair of the Institution of Chemical Engineers (IChemE) Oil and Natural Gas Special Interest Group (SONG). Toby is a Fellow of the IChemE, he holds an MBA from Imperial College and a BEng in Chemical Engineering from Bradford University.

Michael Xiaobao Chen, Senior Visiting Research Fellow, is a leader at Equinor's marketing and trading division, after having previously worked with Equinor's global upstream strategy and business development. Before joining Equinor, Michael worked as a senior energy economist in the Chief Economist's Office of the IEA, leading on the Asian/China energy outlook, G20 global fossil fuel subsidy initiatives, global oilfield decline rate analysis, and energy poverty. Michael is an editorial board member of the prestigious journal *International Petroleum Economics* of the China Petroleum Society and a senior advisor of the China Energy Research Society. Michael is also an advisor to Enrupt Energy Startup Accelerator in Singapore. His areas of expertise include: the Chinese gas markets and origination; energy reforms and economic transition; national oil company strategy; ASEAN energy markets; offshore wind partnerships; and oil industry upstream trends. Since joining the Institute in 2011, he has contributed a chapter to *The Pricing of Internationally Traded Gas* (OIES/OUP, 2012) and published a paper entitled 'The development of Chinese gas pricing: drivers, challenges and implications for demand' (July 2014). Michael holds an MSc in Economics from University College London and an MSc in Development from the London School of Economics.

Gabriel Collins, Senior Visiting Research Fellow, is the Baker Botts Fellow in Energy & Environmental Regulatory Affairs at Rice University's Baker Institute. He was previously an associate attorney at Baker Hostetler, LLP, and is the co-founder of the China SignPostTM (洞察中国) analysis portal. Collins has worked in the Department of Defense as a China analyst and as a private sector global commodity researcher, authoring more than 100 commodity analysis reports, both for private clients and for publication. Collins' research portfolio is global. His work currently focuses on legal, environmental and economic issues relating to water — including the food-water-energy nexus — as well as unconventional oil and gas development, and the intersection between global commodity markets and a range of environmental, legal and national security issues. His analysis draws from a broad swath of geospatial and other data streams, and often incorporates insights from sources in Chinese, Russian and Spanish. Collins received his B.A. from Princeton University and a J.D. from the University of Michigan Law School. He is licensed to practice law in Texas.

Ralf Dickel, Senior Visiting Research Fellow, has worked as an independent expert on international energy trade since leaving the Energy Charter Secretariat in October 2010. In October 2004 he joined the Energy Charter Secretariat as Director for Transit and Trade, after heading the Energy Diversification Division at the IEA from 2001, being responsible for policy analysis of energy markets and energy market reform. Before joining the IEA, he worked as Senior Specialist for Oil and Gas Policy at the World Bank, after a long career with Ruhrgas from 1980 to 1998, where he held various management positions both in the gas purchase and the gas sales departments. He managed and co-authored several publications at the IEA and the Energy Charter, amongst them: *Security of Gas Supply in Open Markets* (IEA, 2004) and *Putting a Price on Energy* (Energy Charter, 2007).

Nikolai Drahos, Visiting Research Fellow, is a senior economist at the Office of the Chief Economist in the Australian Department of Industry, Innovation and Science. His work focuses on Australia's domestic gas market, global LNG markets and resources and energy forecasting. Nikolai holds a Bachelor of Arts (Honours) and a Graduate Diploma in Economics from the Australian National University, where he is currently undertaking a Master of Environmental and Resource Economics. He is a co-author of the OIES paper *Prices and crisis – LNG and Australia's East Coast gas market* and the Department of Industry, Innovation and Science's *Resources and Energy Quarterly*. **Barbara Finamore**, Senior Visiting Research Fellow, is a senior leader and environmental advocate with over 40 years of experience in environmental law and China climate and clean energy policy. In 1996, she founded the Natural Resources Defense Council (NRDC) China Program in Beijing, the first clean energy program to be launched by an international NGO. She helped to develop China's first energy codes for residential and commercial buildings, first research and development program for fuel cell vehicles, first utility-based initiative for energy conservation, and first nationwide emission control regulations for the shipping industry. She served as the Senior Strategic Director for Asia at NRDC, the President and Chair of the Professional Association for China's Environment (PACE), and the co-founder and President of the China-U.S. Energy Innovation Alliance. Ms. Finamore also worked for the U.S. Departments of Justice and Interior, the United Nations Development Programme, and the Center for International Environmental Law. In 2017, she was named a member of Foreign Policy's "The U.S.-China 50", a group of 50 individuals who are powering the world's most complex and consequential relationship. She holds a J.D. degree with honors from Harvard Law School, and is the author of "*Will China Save the Planet*?" (Polity Press).

Ieda Gomes, Senior Visiting Research Fellow, is a researcher and consultant specializing in energy strategy, natural gas and LNG supply, pricing, contracts, and market fundamentals. In a career spanning 30 years in the gas and energy industry, Ieda spent more than 13 years with BP, where she held senior positions such as: vice president of new ventures for South Asia and the Middle East, president of BP Brasil, and vice president of regulatory affairs for BP Gas and Power. Prior to BP, Ieda was the CEO of the S. Paulo Gas Company (Comgas), the largest gas distribution company in Brazil. Ieda is currently a councillor at the Brazilian Chamber of Commerce in Great Britain, a director at the Department of Infrastructure of the S. Paulo Federation of Industries, a member of the advisory board of Comgas, and sits on the boards of directors of Bureau Veritas, Saint Gobain, Exterran Corporation, Odebrecht SA, and InterEnergy Holdings. Ieda is a senior adviser of the Brazilian think tank FGV Energia and is an active member of International Gas Union (IGU), having served on the executive committee and currently being vice-chair of the Task Force, Strategic Communication and Outreach. She has presented at several energy conferences and training courses and she is a member of the programme committee of LNG 19. She is a regular columnist for the specialist magazine Brasil Energia. Ieda has a degree in Chemical Engineering from Universidade Federal da Bahia, an MSc in Energy from Universidade de S. Paulo, and a troisième cycle diploma from École Polytechnique Fédérale de Lausanne.

Michael Hochberg, Visiting Research Fellow, is an energy industry professional with expertise in power project development, electricity markets, and regulation. Michael began collaborating with the Institute as the OIES-Saudi Aramco fellow in 2017, when he led a study evaluating auctions as policy tool for renewable energy procurement. His experience includes renewable project origination & development at Hecate Energy, management consulting in the Global Energy & Utilities practice of PA Consulting Group, and research related to the economics and regulation of the power sector. He holds a master's degree focused on energy economics from Universidad Pontificia Comillas, and graduated summa cum laude with a BA in Political Science from Tulane University.

Ahmed Mehdi, Senior Visiting Research Fellow, is an energy consultant who advises oil companies and trading houses on oil and gas pricing, country strategy and energy economics. He previously acted as an advisor to BHP Petroleum's strategy division and spent several years working with PricewaterhouseCoopers (PwC) in London. Ahmed comments widely on energy issues in the media, including the New York Times, Bloomberg, Foreign Affairs, Middle East Economic Survey (MEES), Petroleum Economist and S&P Global Platts. He is the founder of the London-based Commodities Intelligence Network. Ahmed was educated at the University of Oxford and University College London. Adnan Shihab-Eldin, Senior Visiting Research Fellow, is a member of the Board of Directors of Kearney Energy Transition Institute (Nederland) and Gulf Bank. Dr. Adnan Shihab-Eldin is former Director General of the Kuwait Foundation for the Advancement of Sciences (2011-2021) and former Acting Secretary General and Director of Research at OPEC. He held earlier senior Director positions at both UNESCO and the International Atomic Energy Agency (IAEA). In Kuwait, he served as Director General of the Kuwait Institute for Scientific Research (KISR) and Vice President, academic Affairs, and faculty member at Kuwait University. He continues to teach, and publish research papers and articles in the physical and engineering sciences, as well as energy policy, technology and economics. He is a member of many International Boards of Directors and intern Advisory Councils (IAC), including, recently, the IAC of the King Abdullah Petroleum Studies and Research Center (KASPARC), the American University of Beirut (AUB) and Georgetown University, Qatar (GU-Q) as well as a member of the Standing Advisory Group on Nuclear Applications (SAGNA), IAEA. He is a recipient of many prestigious international awards and honors.

Stephen O'Sullivan, Senior Visiting Research Fellow, began his oil and gas career with several years' experience as an oil trader, economist and corporate planner in the downstream and trading divisions of BP, as well as the North Sea upstream and gas divisions of Total. In 1989 he joined Coopers & Lybrand as a strategy consultant in the oil and gas consulting business, working on the privatization and restructuring of the energy sectors across emerging markets, as well as in the nuclear power and transport sectors. He lived and worked in China, Russia, Central Asia, Eastern Europe, Southern Africa and the Middle East. In 1995 he was appointed Head of Research and Oil & Gas Analyst at MC Securities in London, where the team was ranked number one in EMEA oil and gas. Following the sale of that business to JP Morgan in 1998, he moved to Moscow as a Partner and Head of Research at United Financial Group, where he and his team were ranked the number one oil and gas research team and the number one Russia country team for seven years in a row. After the sale of UFG to Deutsche Bank in 2005, Stephen became Head of EMEA and Latin American Research where his research team was ranked number one across all sectors, in Russia and South Africa and across the broader EMEA region in 2006 and 2007. In 2007 he moved to Hong Kong as Head of Asian Research for the Australian bank Macquarie. In 2009 he joined Barclays to lead the build-out of its Asia ex-Japan equity research business. In 2013 he joined Trusted Sources, focusing on China energy based in Hong Kong. His major research themes include China's gas sector reform and nuclear renaissance. In 2016, following the merger between Trusted Sources and Lombard Street Research to form TS Lombard, he took on an additional role as CEO of TS Lombard Research Partners, TS Lombard's market-facing independent analyst platform.

Aliaksei Patonia, Visiting Research Fellow, is currently reading for a Master's in Public Policy at the University of Oxford specializing in sustainable energy policy. Prior to that, Aliaksei was a fellow at the Open Development Cambodia, an NGO focusing on promoting sustainability in the Greater Mekong Sub-region, where he participated in drafting the Environment and Natural Resources Code of Cambodia while being a policy advisor to the local authorities on achieving SDG 7. Alex holds an MSc in International Management (Oil and Gas) from the University of Liverpool and an MSc in Sustainable Development from the University of St Andrews (both with distinction).

Gulmira Rzayeva, Visiting Research Fellow, is an advisor to the World Energy Council's Global Gas Center based in Geneva and visiting research fellow at the Center on Global Energy Policy of Columbia University. She is also on the board of directors of the Institute for Effective Governance and Stabilization based in Stockholm, Sweden, and the Trade Forest trading company based in London. She is a founder and managing director of the London-based Eurasia Analytics Ltd consulting company. She was a senior research fellow at the Center for Strategic Studies (SAM) under the President of the Republic of Azerbaijan for ten years until January 2019. Her area of expertise includes energy security, covering issues such as the energy policy of Azerbaijan and the East Europe/Caspian region, the Turkish domestic natural gas market, SEE gas market.

Simon Schulte, Senior Visiting Research Fellow, analyses the economics and regulation of hydrogen and natural gas. He is Manager and Head of Gas Markets at the Institute of Energy Economics (EWI) at the University of Cologne. His responsibilities include the acquisition, operation and execution of projects for industrial clients and the public sector. In applied research and consulting projects, he has examined the European and global perspectives of hydrogen and natural gas markets. He has advised, e.g. the German Federal Foreign Office, the German Ministry for Economic Affairs and Energy (BMWi) and the European Commission. Furthermore, he worked as a consultant in the Energy Market and Security Directorate at the International Energy Agency (IEA) in Paris. His research focus lies in the economic modelling and analysis of energy markets. Simon Schulte holds a PhD in economics from the University of Cologne. Before, he studied industrial engineering with a major in chemical and energy engineering at the Münster University of Applied Sciences, the University of California in Los Angeles, the Norwegian School of Economics and the Dresden University of Technology.

ACCOUNTS

STATEMENT OF FINANCIAL ACTIVITIES (INCORPORATING AN INCOME AND EXPENDITURE ACCOUNT)

Independent Auditors' Statement to the Members of the Oxford Institute for Energy Studies

For the Year Ended 31 December 2021

	Unrestricted funds		Inrestricted Endowment funds funds		Total Unrestricted funds		Total
		2021	2021	2021	2020	2020	2020
Να	otes	£	£	£	£	£	£
Income from:							
Voluntary income Incoming resources from charitable	3	701,230	-	701,230	730,023	-	730,023
activities	4	1,453,507	-	1,453,507	948,677	-	948,677
Incoming resources from investments	5	243,299	_	243,299	256,608	-	256,608
		·					
Total income		2,398,036	-	2,398,036	1,935,308	-	1,935,308
Expenditure on:							
Raising funds	6	48,851	-	48,851	43,503	-	43,503
Charitable activities							
publications	7	1.226.692	-	1.226.692	1.240.362	-	1.240.362
Support costs	7	279,809	-	279,809	397,399	-	397,399
Total charitable expendit	ure	1,506,501	-	1,506,501	1,637,761	-	1,637,761
Other expenditure	12	59,399	-	59,399	60,998	-	60,998
Total resources expende	d	1,614,751	-	1,614,751	1,742,262	-	1,742,262
Net gains/(losses) on investments	11	1,257,383	(58,097)	1,199,286	121,970	11,147	133,117
Net movement in funds		2,040,668	(58,097)	1,982,571	315,016	11,147	326,163
Fund balances at 1 Januar 2021	у	6,242,092	4,421,450	10,663,542	5,927,076	4,410,303	10,337,379
Fund balances at 31 December 2021		8,282,760	4,363,353	12,646,113	6,242,092	4,421,450	10,663,542

The statement of financial activities includes all gains and losses recognised in the year.

All income and expenditure derive from continuing activities.

OXFORD INSTITUTE FOR ENERGY STUDIES (REGISTERED NUMBER: 01676971)

Summary Income and Expenditure Account

At 31 December 2021

	All income funds		
	2021	2020	
	£	£	
Gross income	2,398,036	1,935,308	
Gains on investments	1,257,383	121,970	
Total income in the reporting period	3,655,419	2,057,278	
Total expenditure from income funds	1,614,751	1,742,262	
Net income for the year	2,040,668	315,016	

OXFORD INSTITUTE FOR ENERGY STUDIES (REGISTERED NUMBER: 01676971)

Statement of Financial Position

At 31 December 2021

	2		021	2020	
	Notes	£	£	£	£
Fixed assets					
Tangible assets	13		2,925		7,828
Investments	14		11,208,514		9,434,911
			11,211,439		9,442,739
Current assets					
Debtors	16	514,118		169,177	
Cash at bank and in hand		1,059,122		1,148,484	
		1,573,240		1,317,661	
Creditors: amounts falling due within one year					
Taxation and social security		32,952		34,693	
Other creditors		105,614		62,165	
		138,566		96,858	
Net current assets			1,434,674		1,220,803
Total assets less current liabilities			12,646,113		10,663,542
Capital funds					
Endowment funds - general			4,363,353		4,421,450
Unrestricted funds			8,282,760		6,242,092
			12,646,113		10,663,542

OXFORD INSTITUTE FOR ENERGY STUDIES (REGISTERED NUMBER: 01676971)

Statement of Cash Flows

At 31 December 2021

		20	21	2020	
	Notes	£	£	£	£
Cash flows from operating activities					
Cash generated from/(absorbed by) operations	22		241,657		(46,251)
Investing activities					
Purchase of tangible fixed assets		-		(1,548)	
Decrease/(Increase) in cash within investme	ent				
portfolio		(570,762)		53,048	
Purchase of other investments		(2,674,897)		(947,998)	
Proceeds on disposal of other investments		2,671,341		1,093,155	
Investment income received		243,299		256,608	
Net cash (used in)/generated from			(331.010)		153 265
investing activities			(331,019)		455,205
Net cash used in financing activities			-		-
Net (decrease)/increase in cash and cash equivalents			(89,362)		407,014
Cash and cash equivalents at beginning of y	/ear		1,148,484		741,470
Cash and cash equivalents at end of year	r		1,059,122		1,148,484

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