



ANNUAL REPORT 2018



THE OXFORD
INSTITUTE
FOR ENERGY
STUDIES

Oxford Institute for Energy Studies



Annual Report 2018

About the Oxford Institute for Energy Studies

The Oxford Institute for Energy Studies (OIES), a non-profit-making charity and Recognized Independent Centre (RIC) of the University of Oxford, 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 of primary and secondary energy sources, including petroleum, gas, coal, electricity, and renewable energy
- the economics of electricity market design and regulation of electricity networks
- the evolution of oil and gas price formation, market structures, and trading
- the politics and social aspects of energy
- the international relations of oil and gas producing and consuming nations;
- the economic development of oil-producing countries and the energy problems of other developing countries
- the economics and politics of the environment in its relationship with energy.

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



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A RECOGNIZED INDEPENDENT CENTRE OF THE UNIVERSITY OF OXFORD



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Message from the VICE Chairman

In 2018 the Brent price averaged \$71 per barrel, an increase of \$15/b from the 2017 average of \$56/b. This average price, however, hides wide variations over the year. After rising from \$65/b to \$74/b between December 2017 and June 2018, the second half of 2018 saw some heightened volatility and sharp price movements, reaching the high of \$86/b in October and the low of \$50/b in December. These sharp price movements reflected increased uncertainties and shifts in market fundamentals, expectations about these fundamentals, key players' behaviour and overall market sentiment. On the demand side, global oil demand growth registered another good performance, averaging 1.3 million barrels per day (mb/d) in 2018, albeit lower by 0.2 mb/d than 2017. But there have been growing concerns about the prospects of the global economy, with most of the risks tilted to the downside. Elevated trade tensions between the US and China, weaker-than-expected economic and trade indicators from China, higher US interest rates and increased borrowing costs for emerging economies have clouded the macro outlook.

On the supply side, US crude production exceeded all expectations, registering another strong year of growth of 1.6 mb/d to end at 11.6 mb/d. US shale production accounted for about 90 per cent of the total, having registered growth of 1.4 mb/d to surpass the 7.0 mb/d mark, the strongest growth on record. This is despite the infrastructure bottlenecks, which caused some US grades to trade at a large discount to the traditional benchmarks. While all the signals from the Organization of the Petroleum Exporting Countries (OPEC) at the start of 2018 were in favour of maintaining the OPEC+ cuts until November 2018, the US reimposition of sanctions on Iran and fears that high oil prices could derail the global economy altered the behaviour of key players, including Saudi Arabia, which in the second half of 2018 hiked output to record levels of above 11.0 mb/d. The sharp increase in US shale, core Gulf Cooperation Council (GCC) (i.e. Saudi Arabia, Kuwait and the UAE) and Russian output, alongside a slowdown in the global economy, contributed to the reversal of stock drawdowns in the final quarter of the year, with Organisation for Economic Cooperation and Development (OECD) stocks returning 9.0 mb above their five-year average in November. This development pushed OPEC+ in December 2018 to renegotiate and extend their agreement to cut output by 1.2 mb/d as of January 2019, in a renewed attempt to balance the market. In the background, the deterioration in the geopolitical scene continued to shape price outcomes. The US reimposition of sanctions on Iran caused much uncertainty about the potential Iranian output losses.

In the gas sector 2018 was marked by a contrasting start and end to the year. A cold winter in 2017/18 tested liquefied natural gas (LNG) and pipeline supplies to the limit, with prices rising sharply amid concerns over security of supply following the delay of a number of LNG projects. However, by the end of the year the position had been reversed, with a warm autumn and early winter combined with high stock levels and lower demand in Asia pushing prices down to levels not seen since early 2016 at around \$5 per million British thermal units (/mmbtu) in Europe. The expectation is that this trend will continue for most of 2019, but the major current concern, which was developing during 2018, is the question of Russian gas supplies to Europe. The future of gas transit through Ukraine remains a topic of commercial and political debate, with the EU taking steps to support Ukraine and limit the availability of alternative Russian export pipelines. Meanwhile, LNG developers in the US and Australia are now bringing their new projects up to peak production, which may alleviate supply concerns. Furthermore, the debate over the future of gas in the global energy economy continues, particularly in Europe where decarbonization is top of the agenda. This means that the prospects for gas look most promising in the developing world, where the switch from coal to gas to encourage better air quality continues to encourage new demand.

The rising share of renewables in electricity worldwide and continuing policy focus on the decarbonization of electricity has meant the continuation of disruptive change in the electricity sector during 2018. Unlike oil and gas markets, which are arguably 'global' in nature, the functioning of electricity markets is influenced by regional or national factors that determine their outcomes, including the availability of resources, the design of markets, and government policy targets on emissions reduction. In OECD countries, the focus has been

on redesigning electricity markets to deal with the integration of growing amounts of zero marginal cost renewables into markets that were originally designed for fossil fuels with positive marginal costs.

There has also been a move, particularly in OECD Europe, towards the electrification of heating and transport as the 'next steps' towards decarbonization of energy systems. This entails not just the redesign of electricity markets, but also a rethinking around wider issues such as network charging and regulatory frameworks, to make these fit for purpose. New entrants (e.g. aggregators, technology companies) have also begun to emerge in the electricity industry in response to expected decentralization and digitization of electricity production and consumption. Outside of the OECD, and particularly in developing Asian countries, the challenges continue to focus on issues around access to reliable and sustainable electricity, while avoiding the 'mistakes' made by OECD countries in the design of their electricity sector reforms (the so-called 'standard model' of electricity reform).

I am pleased to report that the OIES continues with its important research activities, contributing to the understanding of energy issues and events. It has a well-structured programme of research with synergy across all research programmes (oil, gas, and electricity) continuing to grow, making the work of the Institute ever more relevant to understanding the forces that underlie the international energy debate.

The Institute is also bringing together a growing research group formed of individuals with very diverse backgrounds, experience, time availability, and career paths. It is creatively integrating them into its research programmes, whilst encouraging flexibility to pursue personal research interests. The combination of experience and skill at the Institute creates a stimulating environment, allowing the Institute to expand effectively, inspiring new topics and ideas, and contributing to standards of excellence the Institute has maintained across all areas of research since it was founded nearly 40 years ago.

I wish to thank all the staff of the Institute for their continued hard work and dedication in 2018. I would like to thank staff members who have moved on from the Institute to other endeavours and I welcome those who have joined the Institute recently.

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: Barclays, Cyprus Energy Authority, ENN Trading, GECF, Hartree Partners, Mercuria, Open Grid Europe GmbH, Redburn, RS Energy Group, RWE, Saudi Aramco, Total, and UNITEN.

Finally, for the members, governors and staff of the Institute, the year 2019 started with a sad personal note. The untimely death of our Chairman, Prof. Roger Ainsworth, in Oxford on 23 February 2019, after a short illness, shocked us all.

Prof. Ainsworth served as a governor from 2002, representing St Catherine's College, Oxford, where he was Master, and as Chairman of the Board from 2014. He was a dedicated governor and a most able Chairman whose guidance, wisdom, wit, understanding, and aplomb will be sorely missed by all.

Dr Abdullah Al Kuwaiz

March 2019

Director's Note

The Institute's main objectives 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. 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. The Institute's work is detailed in this report.

Programmes

The Oil and the Middle East Programme and the Natural Gas Research Programme (Gas 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 Gas Programme has expanded its group of funders and its research agenda significantly in 2018. There are growing synergies between the work of the Electricity Programme, whose body of research and publications continues to expand, and that of the Gas Programme, with a number of collaborative research projects taking shape. Work continues to expand the research scope of the Africa Oil and Gas Programme.

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 2018 publications. In addition to research papers, the Institute now publishes *Oxford Energy Insights* and *Oxford Energy Comments* – shorter papers, often devoted to current policy issues – 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 29th year.

Staffing

In 2018 we were pleased to welcome Dr Jack Sharples as Research Fellow on the Gas Programme. Prior to joining the Institute, he spent four years as a lecturer in Energy Politics and International Relations at the European University at St Petersburg. His research focuses on the political economy of natural gas in Europe and Russia, energy security, and development of the EU gas market.

We also welcomed as Senior Research Fellows on the Gas Programme: Mr Martin Lambert, whose 34-year career with Shell included several senior leadership positions in the gas and LNG businesses; Mr Mike Fulwood, who before joining the Institute worked as a consultant with Energy Markets between 1997 and 2008 and then with Nexant as Director, Global Gas & LNG; and Dr Mostefa Ouki who has close to 30 years of experience in developing, executing, and managing gas- and energy-related techno-economic projects throughout the world.

Dr Andreas Economou also joined as Senior Research Fellow on the Oil and the Middle East Programme, having previously been a Research Associate. His research interests lie in natural resource and energy economics, with particular focus on the empirical analysis of crude oil markets, the dynamics of oil prices, and OPEC behaviour.

We bade farewell to our librarian, Scott McLachlan, who most ably managed the reorganization and maintenance of our live collection, identifying and introducing a suitable online library platform, leaving a much-improved resource for our Fellows as well as the wider audience, as he relocated to the US with his family. We were pleased to welcome Andrew Hudson as his successor. Andrew holds an MA in Library and Information Management from Northumbria University, and a degree in Philosophy from Oxford University. Prior to joining the OIES, he worked as a librarian at the Radcliffe Science Library, Regent's Park College, Oxford, and Canterbury Christ Church University. He is particularly interested in research support and dissemination.

Priorities for recruitment include further appointments relating to the economics and regulation of electricity, and China energy issues.

In 2018 the Institute attracted funding for two Supernumerary Fellowships. Dr Manal Shehabi was recruited for the KFAS Supernumerary Fellowship, which focuses on quantifying the impact of various fiscal, energy, and competition policies on the Kuwait economy. Dr Maggie Kumar was recruited for the UNITEN Supernumerary Fellowship, which focuses on gas and electricity issues in Malaysia. We welcome them both.

The OIES-Saudi Aramco Fellowship, made possible by the generosity of Saudi Aramco, attracted numerous applications in 2018. Four OIES-Saudi Aramco Fellows joined us:

Yanna Clara Prade is a researcher in the Energy Economics Group at the Federal University of Rio de Janeiro and a PhD candidate at the same university. She is also a consultant at Prysma E&T Consultores, a Brazilian consulting firm with expertise in local and regional markets in the oil and gas sectors. As a researcher she has participated in several projects on natural gas monetization and regulation issues in Brazil. Her thesis focuses on the structural changes in the Brazilian gas market and the international LNG market, particularly regarding asset structures and contract arrangements.

Roxanne Rahnama was until June 2018 a graduate fellow at the MIT Tata Center for Technology and Design, where she collaborated with the MIT-Comillas Universal Access Lab on projects related to rural electrification in India and sub-Saharan Africa.

Lena Schreiner is an MSc candidate at the E.On Research Center of RWTH Aachen University, Germany. She has studied Engineering and Business Management at RWTH Aachen University, with academic exchanges at Nagoya Daigaku University, Japan, and Chulalongkorn University, Thailand.

Chung-Han Yang studied for his PhD at the University of Cambridge, his doctoral thesis investigating a range of innovative contractual mechanisms, such as environmental and human rights clauses in commercial contracts, NGO–business partnerships, and other multi-actor agreements for preventing and mitigating the environmental and social damage caused by international energy operations.

We were also pleased to welcome Farhad Billimoria, Marshall Hall, Stephen O’Sullivan and Claudio Steuer as Senior Visiting Research Fellows, and David Ramin Jalilvand, Loftur Thorarinsson and Rob West as Research Associates. In addition, we were pleased to host five visiting researchers during the year:

- **Mohammad AlShawaf**, Assistant Professor, Environmental Technology Management Dept., College of Life Sciences, Kuwait University.
- **Nickolai Drahos**, an economist at the Department of Industry, Innovation and Science, Australia.
- **Michael Schach**, a Master’s candidate at the E.On Research Center of RWTH Aachen University, Germany.
- **Alexander Scheibe**, a PhD candidate at the University of Luxembourg’s Institute of Political Science.
- **Zheng Xu**, a Master’s candidate at Sciences Po (Paris), PSIA.

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:

- **Stefano De Clara**, Director, International Policy, International Emissions Trading Association (IETA).
- **Spencer Dale**, Group Chief Economist, BP.
- **Emma Gordon**, East Africa risk analyst.
- **Adi Imsirovic**, Fellow at Surrey Energy Economics Centre (SEEC).
- **Michael Hochberg**, energy analyst with PA Consulting Group.
- **Kaisa Huhta**, Researcher, UEF Law School, University of Eastern Finland and Centre for Climate Change, Energy and Environmental Law.
- **Chikako Ishiguro**, Senior Analyst, Osaka Gas Co., Ltd.
- **Alexey Khokhlov**, Head of Power & Utilities Research, Energy Center, Moscow School of Management SKOLKOVO.

- **Kordula Mayr**, EU and International Policy Assistant, IETA.
- **Ahmed Mehdi**, Energy Strategist, Livingstone Partners.
- **Yury Melnikov**, Senior Analyst on Power Sector, Energy Center, Moscow School of Management SKOLKOVO.
- **Akira Miyamoto**, Executive Researcher, Osaka Gas Co., Ltd.
- **Ekaterina Orlova**, Energy Centre, Moscow School of Management SKOLKOVO.
- **Ben Pryor**, MA (Oxon).
- **Alexander Scheibe**, PhD candidate at the University of Luxembourg's Institute of Political Science.
- **Zlata Sergeeva**, Energy Centre, Moscow School of Management SKOLKOVO.
- **Monica Skaten**, Research Associate, Centre of African Area Studies, Kyoto University.
- **Evgenia Vanadzina**, Lappeenranta University of Technology, Finland.
- **Vitaliy Yermakov**, Head of Centre for Energy Policy Research, National Research University, Higher School of Economics, Moscow.

Activities and events in 2018

In April the annual 'Middle East Day' was held, entitled 'The Deployment of Renewables: Barriers, Options, and Lessons for the GCC' with support from KFAS. The annual 'Gas Day' was held in October and kindly supported by Snam. The 'Oil Day', kindly supported by Aramco and Argus Media, entitled 'Demand and Supply Factors Shaping the Oil Market', and the 'Electricity Day' were both held in November 2018. All our events were full to capacity 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 in Madrid, Spain, in May; we are very grateful to Repsol for their generous sponsorship and support of this event.

General

As a research institute, the OIES continues to depend on the dedication of all involved. As shown in this report, the research productivity of the OIES is extraordinary, and its reputation and influence continue to increase. The relaxed but productive research atmosphere, one of the main characteristics of the OIES, owes a huge amount to the administrative staff: Kate Teasdale, Susan Millar, Karen Clark, Jo Ilott, and Hannah Shipton. The interactive and networking aspects of the OIES continue to benefit greatly from the close historical and current relationships with its two sister institutions, the Oxford Energy Policy Club, which meets annually in St Antony's College, and the Oxford Energy Seminar, held annually at St Catherine's College.

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

Dr. Bassam Fattouh

March 2019

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 2018 and provides an overview of ongoing research. For a full list of published research in 2018, please see the end of this report or visit the OIES website, where a full list of published and planned research can also be accessed.

The **Oil and the Middle East 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 2018 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. We published several important papers in this regard. A paper published early in the year revisited the main factors that shaped oil market dynamics in 2017 and analysed how the oil price path could evolve in 2018 by evaluating the risks underlying the world oil market using a structural model of the oil market and considering various forecast scenarios. Another paper analysed the debate around 'peak oil demand', arguing that the focus on timeframes is misplaced and the significance of 'peak oil' is that it signals a shift in paradigm – from an age of (perceived) scarcity to an age of abundance. It is also likely to herald a shift to a more competitive market environment, posing material challenges for oil-producing economies that can no longer rely on oil revenues to provide their main source of revenue for the indefinite future.

The programme also published several *Comments* throughout the year looking at OPEC behaviour and its impact on oil markets. They included: an analysis of the US exiting the Joint Comprehensive Plan of Action (JCPOA) and the ensuing expectation of the loss of Iranian barrels; the role of OPEC's dominant player, Saudi Arabia, and its interests not just in the short-term rebalancing of the market, but also in stabilizing long-term expectations about long-run oil prices and producer behaviour; and unpicking the oil market's mixed signals – reflected in movements in oil prices, time spreads, and physical differentials – in relation to current and long-term market fundamentals.

The programme's second thematic area – *production* – covers the economic prospects for conventional and unconventional supply. Published research in 2018 focused on the Middle East. We had two papers on Iran, the first of these published before the US withdrawal from the JCPOA. The second paper was published following the US withdrawal, looking at the consequences for Iranian energy. We also published a paper assessing Iraq's short- to medium-term production outlook by looking at the interplay between upstream, midstream, and downstream trends. This is against the backdrop of Iraq's changing crude quality, delays to increasing onshore storage and pumping capacity, the growing need for water for oil injection needs, and the growing requirement for Iraq to upgrade existing refineries as production growth gets strengthens.

The programme's traditional strength lies in analysing *the policy and economics of resource-rich economies*, which is its third thematic area. In keeping with the continuing wave of energy pricing and other reforms in Middle Eastern and North African (MENA) countries, in 2018 we continued tracking and analysing developments in the region and the interplay between domestic reforms, dependence on oil revenues, and efforts at economic diversification. In 2018 we also began publishing on the issue of the ongoing 'energy transition' and its implications for both large oil companies and oil-exporting countries in the MENA region. The paper argued that for oil companies, moving beyond their core business is risky, but a 'wait-and-see' strategy could be costly, and therefore they need to gradually 'extend' their business model rather than make a complete shift from hydrocarbons to renewables. They should aim to build an integrated portfolio that includes both hydrocarbon and low-carbon assets. For oil-exporting countries, with subsidized domestic fuel prices and rising domestic energy consumption, there is no conflict between investing in renewables and in hydrocarbons as these countries can liberate oil and gas for export markets, improving the economics of renewables projects. In the long run, however, the main challenge for many oil-exporting countries is economic diversification, given that it is the ultimate safeguard against the energy transition.

The programme's fourth thematic area – *consumption and the development of emerging energy markets* – focuses largely on Asia. We published a paper looking at Japan's historically high oil import dependency (99.7% in 2016) and reliance on Middle Eastern suppliers (87.2% in 2016), which have resulted in a policy of actively seeking overseas equity oil, sometimes at a premium. The related oil development policy (resource diplomacy) has been a driving factor in Japan's relationship with the Middle East, but is also expected to change considering decreasing oil demand. The paper provided an up-to-date review of the major players in the Japanese oil industry, their strategies, involvement in the Middle East and a discussion of how oil producers are securing their market share in Japan. We also published a paper to follow up on our analysis of ongoing upstream oil industry reforms in India to boost domestic production, drawing lessons from previous (largely unsuccessful) attempts and putting forward some policy options for consideration.

The programme also published three issues of the *Oxford Energy Forum*: one on US energy policy, one on oil benchmarks, and one on disruptive change in the transport sector and its implications for oil demand.

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) and will cover new issues and geographical regions, in 2019 we also plan to expand our research on the energy transition. Our focus will be on its implications for the risk perceptions of investors and the impact on new investments in long-horizon oil projects, and on analysing the changes in the transport sector with regards to electrification, automation, and shared mobility and their implications for oil demand.

In late 2016 the OIES launched a dedicated *Africa Oil and Gas Programme*. Its research focus is on up-and-coming oil and gas producers in East Africa, the impact of lower global energy prices on large producers in West and Southern Africa, and the activities and strategies of Chinese, Indian, and other Asian investors on the continent.

Research in 2018 included two papers. One focused on Ghana's petroleum industry, its steady growth, and its initial challenges, such as the maritime border dispute and political interventions. The second paper focused on the politics of renewable energy in East Africa, comparing the two largest economies in the region – Ethiopia and Kenya – to show how government policy affects decisions on renewable energy investment. The programme also published an Africa-themed issue of the *Oxford Energy Forum*. Research in 2019 will include papers on Libya's oil industry and the opportunities for gas in sub-Saharan Africa.

The foundation of the research output of the **Gas Programme** in 2018 has continued to be the future of gas in a decarbonizing energy system. The primary analysis on this topic has been led by Jonathan Stern, who published two papers in 2017, one on the risks to the future of gas in Europe and the other on the potential for gas to have a positive outlook in the rest of the world if costs can be kept down. 2018 saw the further development of this work, focusing on the need for the industry to provide concrete proof that it is prepared to actively engage in the decarbonization debate and invest to achieve climate change goals.

Building on this overall theme, 2018 has seen the Gas Programme produce research across a number of new areas, including analysis of biogas and biomethane, and the potential for power-to-gas schemes to integrate electricity and gas markets via the production of hydrogen or synthetic methane. We have also considered how gas may find new markets as customers search for improved air quality, with the use of LNG in marine transport and potentially also in road and rail being a developing theme of research.

We have also continued our work on more traditional themes, with gas supply issues being particularly topical as the gas sector awaited the potential surge in LNG supply. Our research included work on traditional sources of supply, such as Norway, Russia, and Australia, as well as emerging players such as the US, Egypt, and Nigeria. Meanwhile, on the demand side of the equation China remained a topic of continuing interest due to its size and growth trajectory, and we produced research covering a range of topics from pricing to LNG imports. European demand, a core theme for the programme, saw research output on the heat sector in co-ordination with the Electricity Programme, in an attempt to analyse the interaction between the two sectors in key parts of the energy economy. Research on potential new markets in Africa, as well as a paper on the resurgence of Korea as an importer of LNG, were also completed. We also produced a detailed paper on demand in the Russian power sector.

On the topic of technology, we published detailed work on costs in the LNG sector, analysing the potential for the industry to optimize its performance to ensure the competitiveness of gas in global markets. We also wrote

a paper on LNG shipping costs, noting the impact that these can have on delivered prices and the importance of optimizing routes. However, a significant amount of our work focused on the increasingly geopolitical theme of security of gas supply, with a review of issues surrounding Ukraine transit, a paper on the real potential, or lack of it, for gas to arrive in Europe from the Caspian via the southern corridor, and the impact of EU regulation on new pipelines in and to Europe. We also considered the impact of the DG COMP ruling on Gazprom's activities in Central and Eastern Europe, and wrote in detail about concerns over the high capacity utilization of Russian gas export pipelines and the potentially limiting effect this could have on Europe's ability to access cheap gas in future.

In addition to our written output, the Gas Programme also initiated a series of podcasts in which research fellows were interviewed on their latest papers. Topics included the Indian gas market, the outlook for Russian exports, LNG supply chains in the Baltic region, gas in the energy transition, current trends in the US shale industry, and Australian LNG exports. 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. They can be found on the OIES website at www.oxfordenergy.org/publication-topic/multimedia/.

The *Electricity Research Programme* was established in 2015. The programme studies the role of public policy, regulation, and markets in supporting the transition to a decarbonized electricity system, along with the implications for end users, companies, and their business strategies. Research in 2018 examined these broad themes in depth, as well as their applicability to specific electricity issues in different regions, including Europe, Latin America, the US, Africa, non-OECD Asia and the MENA.

In relation to market design we published four papers focusing specifically on resource adequacy and operational security. One offered an alternative model to centralized capacity market mechanisms to respond to shortfalls in market provision under energy-only electricity markets. Existing capacity mechanisms require the central agency to infer consumer preferences for reliability, which is very challenging in practice, especially in markets where the value of lost load is increasingly differentiated among consumers. The paper proposed a new model for electricity market design – *the insurer-of-last-resort model* – which works as a risk overlay on an existing energy-only market, unbundling energy and reliability and incorporating insurance-based risk management concepts to guide new capacity deployment.

The second paper focused on Australia's National Electricity Market as an important global test case of the impacts of electricity sector transition in a large-scale liberalized energy-only market. The market's delayed and insufficient response to disorderly retirement and the need for certain system services have resulted in government and system operator intervention to bridge the gap. Furthermore, contributions to system services that were previously provided as a consequence of energy provision are not inherently provided by many new-generation technologies. The paper proposes the extension of energy-only design to an 'energy+services' model in which efficient price signals are provided for the 'missing products' necessary for operational security.

In 2018 we also expanded our geographical focus in relation to research on electricity market liberalization and decarbonization. The third paper that we published on market design focused on resource-rich MENA countries, proposing a transition model of electricity markets, the individual elements of which can eventually be adapted to suit either centralized or decentralized future electricity sector outcomes. The paper outlined key components of this model for the wholesale market, retail market, and network regulation, considering the objectives of governments and the specific contexts of the MENA region.

The fourth paper examined Brazilian and Mexican experiences in developing renewables and how their tendering programmes interact with the market and institutional frameworks in which they exist. The paper focused on two questions: what auction design issues may serve as barriers to renewable development, and how can auction design be improved further to meet the objectives of energy policy while keeping costs to consumers low.

In addition to the above papers, we also published an *Insight* and two *Comments* pertaining to electricity markets. The *Insight* reviewed the experience of liberalization and decarbonization of the Russian electricity sector, whereas both *Comments* dealt with issues related to the EU electricity system. The first *Comment* examined EU Member States' capacity mechanisms in the context of EU rules on free movement, which offer the

most powerful legal means to further internal market integration. The second reviewed the outlook on the EU's Emissions Trading System (EU-ETS) following the European Commission's adoption of its Phase IV package defining the EU-ETS rules for the next decade.

In addition to its focus on electricity sector decarbonization, in 2018 the Programme began expanding its research into the study of the decarbonization of heating and transport and its implications for electricity markets and networks. We published a paper looking at the possible role of 'green gas' in the decarbonization of heat in the UK as an alternative to the 'default' option of electrifying heat. Although green gas appears to be technically and economically feasible, the paper argued that there are major practical and policy obstacles which make it unlikely that the government will commit itself to developing green gas in the foreseeable future.

In relation to decarbonization of the transport sector, we published a paper that looked at the question of what determines the speed and nature of electric vehicle (EV) deployment and whether the electricity system and its regulatory regime are barriers to EV penetration, or are positioned to assist that penetration. The focus of paper was mainly on Europe and on passenger light-duty vehicles, including battery EVs (BEVs) and plug-in hybrid EVs (PHEVs) in cities. The paper argued that electricity is very unlikely to constitute a barrier to EV penetration, unless policy and regulation are badly designed or implemented.

The Programme also published two electricity-themed issues of the *Oxford Energy Forum* in 2018, one covering international perspectives on decarbonization and liberalization of the power sector, and another that focused on African electrification. The Programme also began *Oxford Energy Podcasts* in 2018 to disseminate its ideas, particularly on electricity market design, to a wider audience.

Research in 2019 will continue to develop the Programme's strengths on electricity market design, as well as expand its capabilities on related themes. Planned research for 2019 can be categorized into three main themes:

- market design, renewables integration, and electricity networks
- electricity pricing, electricity access, and energy sector fiscal policy
- decarbonization of heat and transport and implications for the electricity sector.

Planned research under the first theme will include papers looking at: the future of the retail electricity market and specifically how competition can be reconciled with consumer protection while allowing emerging and innovative retail models to grow; the evidence on whether consumers respond in expected ways to government policy incentives to encourage decarbonization; the future of auctions in electricity systems; and, reviewing the relevance of the OECD 'market model' of power sector reforms which have been applied in non-OECD countries. We will also be collaborating with the Gas Programme on research looking at the role of gas in the future electricity mix.

Planned research for 2019 under the second theme will include papers looking at issues such as the design of fiscal policy in the energy sector to promote efficient decarbonization, and the willingness to pay for electricity among energy-poor households.

Research under the third theme will include papers looking at: commercially viable options for EV integration based on vehicle grid integration (VGI) technologies; the question of how distribution network fixed costs can best be priced in the context of technological disruptions and the anticipated rise of distributed energy resources in the electricity sector; and the issues around meeting peak heat demand as one of the key challenges for energy decarbonization in the UK and the viability of a 'whole systems' approach.

Journal and Website

Oxford Energy Forum

The Institute's discussion journal, now in its 29th year, continues to tackle topical issues facing the energy world. Issues covered in 2018 included: electrifying Africa, decarbonization and liberalization in the power sector: international perspectives, oil benchmarks, disruptive change in the transport sector, and what next for US energy policy? Our thanks to the authors of all articles that appeared in OEF in 2018, 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 Programme, Oil and the Middle East Programme, Electricity Programme, and Africa Oil and Gas Programme. The site also has information on the research interests of our staff, many of whom provide assessments of important energy events for the website's Publications section.

The catalogue of papers and comment pieces on the OIES website continued to grow during 2018, with over 60 new publications and 14 podcasts added.

There are now over 5,500 subscribers to the Institute's publication notification email service, an increase of 10 per cent on the previous year. Visitor numbers to the website increased by 25 per cent in 2018. The Institute's Twitter following increased in 2018 to nearly 5,400 followers, and the Institute's LinkedIn page has over 4,400 followers.

In 2018 the Institute was mentioned in the press, on average twice per day, by, amongst others: *Arab News*, *Bloomberg*, the *Daily Telegraph*, *Die Welt*, the *Financial Times*, *The Guardian*, the *Gulf Times*, the *Irish Times*, *LNG World Shipping*, *Natural Gas World*, the *New York Times*, *Nikkei Asian Review*, *Oil & Gas Journal*, *Platts Gas Daily*, *The Standard*, the *Washington Post*, and *World Gas Intelligence*.

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 2018 the Institute's research fellows, Director, and programme directors gave numerous presentations and talks at many conferences, workshops, seminars, and meetings across the globe.

XXIX 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 29th such meeting was held on 31 May and 1 June in Madrid, Spain, with the kind support of Repsol. Participants engaged in lively discussions on a wide range of energy issues. These included: the global economy; the geopolitics of energy; the oil market; IMO2020; crude oil pricing systems; the dynamics of gas markets; and climate change, technology and the electricity sector.

2018 OIES Workshop – The Deployment of Renewables: Barriers, Options, and Lessons for the GCC

In April 2018 the Institute hosted a workshop on the deployment of renewables with a focus on the GCC. The event, which was held in Oxford, was kindly sponsored by the Kuwait Foundation for the Advancement of Sciences (KFAS). There were six sessions covering: global overview of the renewables market; power sector reforms and relevance of the market model; renewable deployment and electricity market design; the role of competitive auctions as a policy tool for renewable development; financing renewable energy projects; and the current status of renewables policy in the GCC. The workshop was attended by 35–40 academics, industry professionals, and policymakers.

2018 Oil Day – Demand and Supply Factors Shaping the Oil Market

In November 2018 the OIES successfully held its annual 'Oil Day'. This year's event, kindly supported by Aramco and Argus Media, focused on four main themes: the IMO 2020 marine fuel sulphur cap: impacts on shipping, refineries, and petroleum products demand; insights into the relationship between oil price shocks and demand: lessons from previous cycles; a deep dive into the Russian oil sector: economy, oil policy, companies' strategies, and supply prospects; a deep dive into the US shale rebound: production, productivity, infrastructure, and business models. The conference was attended by 35–40 key oil industry figures, representatives from national and international oil companies, financial institutions, price assessment agencies, the energy business community, and OIES Fellows.

2018 Gas Day

The OIES Natural Gas Research Programme held its eleventh annual 'Gas Day' in October 2018, with three sessions dedicated to discussing current issues in the gas sector. The first session focused on gas supply to Europe, reviewing short-term demand trends and questioning whether, in peak demand seasons, there would be adequate gas available at low prices. The continuing decline in indigenous supply, led by the enforced shutdown of the Groningen field over the next few years, was debated, with the main import alternatives being identified as Russian pipeline gas and LNG. The competition between the two was identified as a key feature of the next few years, and the impact on price volatility and hub prices was a key area of discussion.

The second session – entitled 'The Decarbonization of Gas: myth of reality' – discussed the prospects for gas in the global energy economy over the next two decades and highlighted the need for the gas industry to develop a decarbonization narrative. The potential for biogas and biomethane were key topics, and the potential for hydrogen was also debated, while the implications of any major shifts in gas supply for pipeline networks was also considered. The final session was called 'LNG Supply: feast or famine' and discussed the prospects for new LNG projects, the opportunities for cost reduction in the LNG value chain, the role of aggregators and portfolio players in the development of new business models, and the potential for China's LNG requirement to

create a supply crunch in the early 2020s. The event, held at St Anne's College, Oxford, was attended by over 90 invitees, including sponsors of the OIES and the Natural Gas Research Programme and invited guests from the academic, media, and corporate sectors.

2018 Gas Programme Sponsors' Meetings

The OIES Natural Gas Research Programme held its biannual sponsors' meetings on 24–25 April and 16–17 October 2018 at St Hugh's College, Oxford. The meetings, attended by Gas Programme sponsors and authors from a range of countries and backgrounds, including academia, industry, and energy journalism, discussed ongoing research projects and progress reports.

The April meeting started with a session on Russian gas issues, with the focus being on exports to Europe. Concerns over gas transit through Ukraine were discussed in the light of legal disputes in Stockholm, while the future of the Nord Stream pipeline was also debated. The DG COMP investigation into Gazprom's activities in Europe highlighted the regulatory push being made by the EU, while US and EU sanctions on Russia were also an important subject. Katja Yafimava discussed her new paper on the regulation of pipeline infrastructure in Europe. Session 2 covered European gas supply and demand issues, and included a review of 2017, the potential for future demand in the heat sector, the prospects for gas in marine transport, and the competition between gas and renewables in the German energy economy. Session 3 saw a presentation of the key findings from our imminent publication of *Gas in the Gulf*, with the authors presenting their thoughts on various Middle Eastern countries and their plans for gas consumption and supply. Session 4 then looked at a variety of LNG issues, including Chinese and wider Asian demand, US LNG exports, cost trends in the LNG industry, and projections of LNG supply and demand from our Global Gas Model. The meeting then concluded with a discussion group on natural gas emissions and decarbonization technologies, featuring Adam Hawkes from the Sustainable Gas Institute.

The October meeting began with a review of global LNG trends, before the presentation of a paper on LNG costs highlighted the need for the industry to focus on its ability to deliver gas at low cost. This theme then flowed into a discussion of US LNG, which in turn led to a debate on the new contract models and corporate strategies in the sector. Session 2 covered an update on key markets for gas, starting with a look at the growing Chinese market before addressing the potential for future growth in India. The session ended with an assessment of European demand, particularly in the industrial sector. Session 3 began with a presentation by Jonathan Stern on his new paper entitled "Narratives for natural gas in decarbonizing European energy markets", before two breakout groups looked in more detail at gas in transport and the pathways to renewable gas, led by OIES research fellows but involving guests from Equinor and the Natural Gas Vehicle Association. Session 4 then picked up the theme of Russian gas exports, addressing pipelines to Europe, Ukrainian transit, EU regulation, the emergence of Russian LNG, and the expansion of Russian gas sales to Asia.

2018 Electricity Programme Sponsors' Meeting and Electricity Day

The second annual Electricity Programme Sponsors' Meeting and 'Electricity Day' were held on 7 and 8 November 2018. The purpose of the Sponsors' Meeting was to discuss the research that had been completed during the year and to exchange views about the next year's research. Electricity Day focused on the overarching theme of 'Consumer-driven electricity markets', addressing key questions in light of the increasing focus placed on consumer-centric decarbonized electricity market design: Does the current electricity system architecture enable efficient consumer participation in the context of decarbonization and decentralized energy resources, and if not, can we build such an architecture? What are the key regulatory and behavioural barriers that could discourage consumers from participating? And are any new business models emerging that could encourage consumers to actively participate in electricity markets?

For Electricity Day, we invited a number of experts from academia, industry, and government, in addition to the usual Electricity Programme sponsors, to discuss these questions. The discussions from Electricity Day highlighted the unsuitability of current markets and regulations in clarifying, or in enabling, the role of consumer participation in markets, together with the importance of defining a workable new market design, and the challenges involved in doing so. Programme researchers produced a summary of proceedings based on the main insights from the day's discussions.

Library

In 2018 the Institute's library continued to support researchers and supply key publications. Requests for information by OIES researchers more than doubled from 2017 and loans of books to OIES researchers also increased.

DOIs (digital object identifiers) offer the opportunity to advertise research papers on multiple online platforms, including databases, repositories, search engines, and in the citation elements of major journal publishers. DOIs also provide permanent and stable links, which encourage their use in citations, online bibliographies, and other library systems.

In 2018 there were 3,741 clicks on DOI links bringing readers to papers on the OIES website.

The library is used not only by staff, but also by students from Oxford and other universities, and by researchers from abroad. It remains the Institute's policy to maintain the collection as a valuable research tool and to ensure it is as widely accessible as possible.

New visitors continued to discover the OIES and its library by way of OLIS (Oxford Libraries Information System), where it fills a hole in the academic library collections of other university libraries. Requests were made by other university libraries throughout the UK and abroad for material held by the OIES library and made discoverable through OLIS.

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 trade journals, statistical sources, and other materials vital to our research work, which could not have been afforded otherwise: Argus Media; Blackwell's; The Institute of Energy Economics, Japan; Live Media & Publishers, India; and MEES.

Research Team and Staff

Thierry Bros joined the Institute in 2016 as Senior Research Fellow for the Gas Programme. From 2010 to 2016, Thierry was Senior European Gas and LNG Analyst for Société Générale. He joined Société Générale in 2007 as a senior financial analyst to provide recommendations on listed pan-European gas stocks and in-depth research on gas issues. From 2002 to 2007, Thierry was a senior oil and gas expert at the French Ministry of Economy, Finance and Industry, where he represented France on oil markets and advised on emergency issues at the International Energy Agency (IEA), the European Commission and the Energy Charter. His responsibilities included providing global oil and gas industry reviews to senior French officials and negotiating European directives. As a gas specialist, he reviewed the regulations governing the liberalization of the French gas market and supervised the Contingency Gas Plan. Prior to that, Thierry worked, for eight years at IFPEN, an oil and gas research institute. Thierry Bros holds a Master's in Chemical Engineering from ESPCI ParisTech and a PhD from Ecole Centrale Paris. Thierry is the author of the book *After the US Shale Gas revolution* (2012) and a co-author of the books *The European Gas Markets: Challenges and Opportunities* (2017), *Géopolitique du gaz russe* (2017), and *The Oxford Handbook of International Security* (2018).

Thierry is also Vice President Research for Tellurian, a company building a global integrated low-cost LNG business from the US. He is also a Senior Expert at Energy Delta Institute, a visiting professor at SciencesPo Paris, a member of the EU-Russia Gas Advisory Council, and an advisory board member at Natural Gas World, an independent specialized website dedicated to global gas matters.

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 was appointed Director of the OIES in January 2014. He is also a professor at the School of Oriental and African Studies, University of London. He specializes in international oil pricing systems, OPEC pricing power, security of Middle Eastern oil supplies, and the dynamics of oil prices and oil price differentials. He has published a variety of articles on oil and gas topics and his publications have appeared in academic and professional journals. Dr Fattouh served as a member of an independent expert group established to provide recommendations to the 12th International Energy Forum (IEF) Ministerial Meeting for strengthening the architecture of producer–consumer dialogue through the IEF. He also acts as an adviser to governments and industry, and is a regular speaker at international conferences.

Mike Fulwood, Senior Research Fellow, joined the OIES in October 2017. Mike has 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 Nexant 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 as 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 a 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 Nexant's World Gas Model. Mike is a past chairman of the International Gas Union's Gas Pricing Group, which undertakes the 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.

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 entitled ‘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 has since brought the results of that research up to date in a co-authored *Insight* with Beatrice Petrovitch, ‘European traded gas hubs: an updated analysis on liquidity, maturity, and barriers to market integration’ (May 2017). His latest paper, ‘A hub for Europe: the Iberian promise?’, focuses on whether the Iberian peninsula could be a ‘gateway’ for more diverse supplies of gas to Europe.

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 APX and ICE futures exchanges, and various producer and end-user companies, financial institutions, regulators, and governments in Australia, Austria, Brazil, the UK, China, Estonia, France, Greece, the Netherlands, India, Italy, Japan, Malaysia, Norway, the Philippines, Poland, Russia, Sweden, and Turkey.

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. Patrick has nearly 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 of the Natural Gas Research Programme, succeeded Howard Rogers in October 2016. James joined the Institute in 2010 as Senior Research Fellow, contributing to the Gas and Oil Programmes by covering Russian and CIS issues as well as global energy matters that affect the region. He has been analysing the Russian oil and gas industry for the past 20 years. Having been Head of Energy for Wood Mackenzie Consultants in the mid-1990s, he moved to Moscow as Head of Oil and Gas Research for Renaissance Capital in 1997, and in 1999 became Head of Equity Research. Returning to the UK in 2002, he became Head of Russia at Lambert Energy Advisory, while also studying for his doctoral thesis on partnership in the Russian oil and gas industry at the University of London, which he completed in 2010. He is a Visiting Professor of Energy Economics at Masaryk University in the Czech Republic and lectures on energy issues at a number of universities in Europe. His publications include numerous titles on the Russian oil and gas sector, including *Non-Gazprom Gas Producers in Russia* (OIES/OUP, 2010), *The Russian Gas Matrix: How Markets are Driving Change* (co-editor) (OIES/OUP, 2014), and the recently published *International Partnership in Russia* (co-author) (Palgrave Macmillan, 2014).

Anouk Honoré, Senior Research Fellow, joined the OIES Natural Gas Research Programme in 2004. Her research focuses on European natural gas issues, with particular emphasis on gas market fundamentals, energy policies, power generation, and the heat sector. Her main areas of expertise include building scenarios on natural gas demand and supply in 36 European countries (the 28 member countries in the European Union plus Albania, Bosnia and Herzegovina, Montenegro, Norway, Republic of North Macedonia, Serbia, Switzerland, and Turkey). She also works on the natural gas markets in South America (Argentina, Brazil, Bolivia, Chile, Colombia, Ecuador, Peru, Uruguay, and Venezuela). She is the author of various research papers and book chapters, and of the book *European Natural Gas Demand, Supply and Pricing: Cycles, Seasons and the Impacts of LNG Price Arbitrage* (OIES/OUP, 2010). Before joining the Institute, she worked at the IEA in Paris. Her work focused mainly on natural gas issues in the IEA’s 29 member countries, but also in China and in Latin America. Dr Honoré holds a PhD in Economics, an MA in Environmental and Natural Resources Economics, and an LLM in International Administration (Public Law) from universities in Paris.

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.

Maggie Kumar joined the Institute in September 2018 as OIES-UNITEN Supernumerary Research Fellow in Malaysian Energy Studies. Her research addresses the liberalization of gas and electricity markets in Malaysia, focusing on the evolution and design of competitive gas and electricity markets. Her previous research expertise includes working on energy system models for nuclear power planning in Malaysia. Her PhD work focused on optimal and near-optimal decarbonization strategies and technology transition pathways for energy and climate policy analysis.

Martin Lambert, Senior Research Fellow, works as an independent consultant specializing in the international gas and LNG business. His areas of expertise include commercial strategy, project development, economics, and gas and LNG marketing and trading. At the OIES he has been focusing on options for the decarbonization of gas, including publishing papers on biogas and power-to-gas.

Martin's 34-year career with Shell included several senior leadership positions in the gas, LNG, and biofuels 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 he was a key member of the team that closed a major LNG project in the Middle East. Martin holds an MA in Economics and Engineering from the University of Cambridge.

David Ledesma, Senior Research Fellow, 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 its books, namely: *Natural Gas in Asia* (2008), *Natural Gas in the Middle East and North Africa* (2011), and *The Pricing of Internationally Traded Gas* (2012), and he was co-editor of *LNG Markets in Transition, The Great Reconfiguration* (2016). David has also published a number of OIES papers, including: 'The changing relationship between NOCs and IOCs in the LNG chain' (July 2009); 'East Africa gas – potential for export' (March 2013); and 'The future of Australian LNG exports: Will domestic challenges limit the development of future LNG export capacity?' (September 2014). He also contributed the chapter 'Project Financing LNG Projects' to *The Principles of Project Finance* (Gower Publishing, 2012).

David gives numerous commercial training courses on gas and LNG in the UK and overseas, writes on gas and LNG, and presents regularly at conferences. During nearly 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 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 (formerly EconoMatters Ltd), David worked on and managed LNG and gas consulting assignments around the world. In May 2013 David was appointed as a non-executive director of Pavilion Energy, a subsidiary of the Singapore investment firm Temasek Holdings, and in August 2017 as a member of the Energy Advisory Committee of JERA. He has a degree in Economics and Geography from the University of Exeter.

Tatiana Mitrova, Senior Research Fellow, is 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, associate research fellow at Russia/NIS Center at Institut Français des Relations Internationales (IFRI), distinguished research fellow at the Institute of Energy Economics, Japan (IEEJ). She has more than 20 years of experience in the analysis 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, a board member of Schlumberger NV and a member of the Governmental Commission of the Russian Federation on fuel and energy complex. Dr Mitrova is a graduate of Moscow State University's Economics Department and visiting professor at the Institut d'Études Politiques de Paris (Sciences Po) Paris School of International Affairs. She has more than 120 publications in scientific and business journals and four books.

Mostefa Ouki, Senior Research Fellow and independent energy consultant, has 30 years of experience in developing, executing, and managing gas- and energy-related techno-economic projects throughout the world. He has led numerous consulting and advisory assignments commissioned by governments, national and international energy companies, and international financial institutions. He has also executed and led a number of 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 region. Dr Ouki has 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 has advised project lenders and financial advisors on the development of energy and infrastructure projects, including gas-to-power projects, gas-based petrochemical projects, and cross-border gas pipeline and LNG projects. He is also involved in work sponsored by international organizations on energy for sustainable development.

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, DC as a consultant on gas development projects for the World Bank. He was vice president of Nexant's Energy & Chemicals Advisory division based in London. Prior to Nexant, he was with Bechtel and Penspen. Dr Ouki holds a diplôme d'ingénieur d'état in Petroleum Engineering Economics from Algeria's Institut National des Hydrocarbures and an MSc in Energy Resources, and an MA and PhD in Economics from the University of Pittsburgh, Pennsylvania. He is a member of the American Economic Association, Association of International Petroleum Negotiators, the International Association of Energy Economics, and the Society of Petroleum Engineers.

Luke Patey, Lead Senior Research Fellow of the Africa Oil and Gas Programme, is also senior researcher at the Danish Institute for International Studies and fellow at the Rift Valley Institute. He is author of *The New Kings of Crude: China, India, and the Global Struggle for Oil in Sudan and South Sudan* (Hurst, 2014), which was shortlisted 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 *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 internationales (Paris), Peking University (Beijing), and the Social Science Research Council (New York). He holds a BSc (Hons.) in Commerce from Queen's University (Kingston, Ontario) and an MSc and PhD from the Copenhagen Business School.

Rahmatallah Poudineh, Lead Senior Research Fellow of the Electricity Programme, joined the Institute in November 2014 to lead the Electricity Research Programme. He has several years of industrial experience and is the author of numerous academic articles, book chapters, and reports with a focus on industrial organization, policy, and regulation of the electricity sector. He is also co-author of a recent book on the economics of offshore wind power. Rahmat holds a PhD in Energy Economics from Durham University, for which he received the best thesis prize. He also has an MSc in Energy Economics and Policy from the University of Surrey, a graduate diploma in Economics and Finance from Queen Mary University of London, and a BSc in Aerospace Engineering from Amirkabir University of Technology (Tehran Polytechnic).

David Robinson, Senior Research Fellow, joined the OIES in July 2007. He is a consulting economist who advises on public policy and corporate strategy, especially in relation to energy and climate change. His recent

research published by the Institute includes analysis of the following issues, among others: the role of central auctions to support investment in the power sector; the future design of decarbonized electricity markets; electricity and electric vehicles; experience of meeting the challenges of electricity sector decarbonization in the UK and Spain; phasing out coal in the Chinese power sector; a comparison of US and European electricity prices; the implications of the COP21 agreement for the natural gas industry; electricity demand response in Shanghai, China; the challenges of integrating renewable power in Europe; the prospects for coal and natural gas in the US electricity sector; and problems with regulation of wind power in Colombia. David runs his own consulting company (DR Associates), is an academic adviser to The Brattle Group of Economic and Financial Consultants, 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 IEA, and wrote his doctoral dissertation at the University of Oxford on the vertical disintegration of the international petroleum industry.

Howard Rogers, chairman of the Natural Gas Research Programme and Senior Research Fellow, joined the Institute in January 2009 and succeeded Jonathan Stern as Director of the Gas Programme in October 2011. He was appointed chairman and Senior Research Fellow of the Programme in October 2016 when James Henderson became Director. Prior to joining the Institute, Howard was with BP for 29 years, mostly in business development, strategy, planning, mergers and acquisitions, and negotiation roles in upstream oil and gas in European, North American, Middle Eastern, and FSU locations. In 1999 Howard joined BP's Gas and Power division and in 2003 he became head of Global Gas Fundamental Analysis. He has a degree in chemical engineering and is a Fellow of the Institution of Chemical Engineers. Howard has published research papers and authored book chapters on LNG price arbitrage between the regional markets of Asia, Europe, and North America, as well as on shale gas in the USA and UK. With Prof. Jonathan Stern he co-authored papers and book chapters on price formation and industry structure in European and Asian gas and LNG markets. He contributed to the joint 2016 OIES and KAPSARC LNG book, providing the assessment of demand outlook in Asian LNG Markets. His recent focus has been the evolving global LNG market balance and the implications for the European market and Russian pipeline gas imports.

Anupama Sen, Senior Research Fellow, joined the Institute in 2009. Her research interests lie in the applied economics of energy in developing countries, and her research has spanned the oil, gas, and electricity sectors, on which she has published extensively. In addition to OIES papers, her work has appeared in academic journals and professional publications such as the *Energy Journal* and *Gas Matters*, as well as in several books and op-eds. Anupama is a Fellow of the Cambridge Commonwealth Society and has been a Visiting Fellow at Wolfson College, Cambridge. She holds a BA (Hons) from the University of Mumbai, MSc from the London School of Economics, and PhD from Cambridge University where she was a Nehru Scholar.

Jack Sharples, Research Fellow of the Natural Gas Research Programme, 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 the OIES, he has been the author of the *Gazprom Monitor* monthly analytical reports for the European Geopolitical Forum (Brussels) since June 2012. In addition to his publications for the OIES, he is 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, OIES-KFAS Supernumerary Research Fellow, researches the economies of resource-rich countries, focusing on the Middle East and the Gulf states, economic and energy sustainability, applied macroeconomics, economy-wide modelling, the political economy of energy, and economic reform. She is also an SCR member of St Antony's College, University of Oxford. Dr Shehabi's current research projects include the construction of an economy-wide model for Kuwait and examining economic diversification and energy transitions in the Gulf. Using economy-wide modelling with oligopoly and political economic analyses, her research made important contributions to the analysis of economic adjustment, economic diversification, and

policy alternatives in the face of petroleum price volatility and recent economic reforms in the Middle East and the Gulf region. Her OIES publications quantified the impact of petroleum price volatility on the Kuwaiti economy, and examined economic and energy policies. Her other research covers the development and sustainability of energy from the ocean, and she was an invited contributing author to the Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC).

Prior to her current position at the OIES, she was a researcher at the University of Western Australia, where she also taught introductory and advanced undergraduate courses in economics, as well as being a Visiting Research Fellow at the OIES since 2016 and an economic consultant. In addition, Dr Shehabi has expertise in energy and mining multinationals' transfer pricing, gained while working as an economist consulting for a Big Four professional services firm in the USA and Australia and then as the in-house expert for a multinational oil and mining services company. Prior to that, she successfully launched and managed a business public policy project in Texas, and researched investments in the hydrocarbon industry in West Asia at UNCTAD. Dr Shehabi holds a PhD in Economics from the University of Western Australia; an MIA-Economics from Texas A&M University; a BA (Hons) *magna cum laude* from Ursinus College where she was Queen Noor-Ursinus College Scholar; and diplomas from Harvard Business School Publishing and France's Université Marc Bloch. A polyglot, her language capabilities include Arabic, English, French, Spanish, and Mandarin Chinese.

Jonathan Stern, Distinguished Research Fellow of the Natural Gas Research Programme, founded the Gas 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 and Mineral Law and 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 to 2016 he was the EU Speaker 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 OIES/OUP in 2008; co-editor with Bassam Fattouh of *Natural Gas Markets in the Middle East and North Africa* (OIES/OUP, 2011); and editor of *The Pricing of Internationally Traded Gas* (OIES/OUP, 2012). In 2014 his publications included papers (co-authored with other members of the Gas Programme) entitled 'Reducing European dependence on Russian gas: distinguishing natural gas security from geopolitics' and 'The dynamics of a liberalized European gas market: determinants of hub prices and roles and risks of major players'. He is author of two chapters in: eds. Anne-Sophie Corbeau and David Ledesma, *LNG Markets in Transition: the Great Reconfiguration*, published by the OIES and KAPSARC in 2016. In 2017 he published two papers on: 'The future of gas in decarbonizing European energy markets: the need for a new approach' and 'Challenges to the future of gas: unburnable or unaffordable?'. His most recent paper, 'Narratives for natural gas in decarbonizing European energy markets', was published in early 2019. All these papers are available on the OIES website. He is the editor of a new book entitled *The Future of Gas in the Gulf: Continuity and Change*, which will be published by the Institute in the summer of 2019.

Claudio Steuer, Senior Research Fellow of the Natural Gas Research Programme, focuses his research on African and South American countries' natural gas, LNG, floating LNG (FLNG) and power generation activities. He is a faculty member of the International Human Resources Development Corporation (IHRDC) from Boston, USA, and a leader in energy training and competence development, and compliance and assurance systems. Mr Steuer is the founder and Director of SyEnergy, an energy consultancy focused on strategy, gas master/supply planning, project development, commercial negotiations, economic evaluation, dispute resolution, senior management advice involving natural gas, LNG, FLNG, regasification terminals (onshore and offshore), and power generation projects.

Mr Steuer has over 30 years of international energy experience with Shell, ENI, Nigeria LNG, New African Global Energy, Saipem, Centrica, Gas Strategies and consulting clients, having worked and advised on energy projects in North America, South America, Africa, Europe, Central Asia, and Australia. Mr Steuer presents at energy conferences focused on upstream gas, LNG and FLNG, and has lectured on energy courses at ENI Corporate University, Alphatania, CWC School for Energy, and IHRDC. Claudio has provided analysis and commentary featured in articles by *ICIS Global LNG*, *Interfax Gas Daily*, *Bloomberg*, *Gas Matters*, *LNG Business Review*, and *Maritime Executive*. Mr Steuer has a BSc in Computer Science and Marketing from Boston College,

an MBA in International Business from Babson College, and completed courses from Harvard Law School and Lax Sebenius/Harvard Business School, IHRDC, and the Institute of Directors (London).

Keun-Wook Paik, Senior Research Fellow, joined the OIES in January 2007. He is an acknowledged authority on Eurasian energy, in particular on Sino-Russian oil and gas cooperation, China's natural gas industry, and North Korea's offshore oil exploration. His recent research interest extends to Russia's Arctic onshore gas development and LNG exports, gas development in Iraq and Nigeria, LNG exports and related infrastructure development, and East Africa's offshore gas development and related domestic infrastructure development. He is also currently an associate fellow of the Chatham House Energy, Environment and Development Programme. He is the author of *Gas and Oil in North-East Asia: Policies, Projects and Prospects* (Royal Institute of International Affairs, 1995), and co-author/supervisor of *China Natural Gas Report* (China OGP, Xinhua News Agency, and RIIA, 1998).

Dr Paik has contributed over 50 papers to a myriad of publications including: *Energy Policy*, *Journal of Energy and Development*, *Geopolitics of Energy*, the *Pacific Review*, *Oil & Gas Journal*, *Petroleum Economist*, *FT Asia Gas Report*, *China Daily Business Weekly*, *China Brief*, and *Asia-Pacific Review*. His book *Sino-Russian Oil and Gas Cooperation: The Reality and Implications* (OIES/OUP, 2012) has also been published in Chinese (in January 2013), Korean (in March 2014), and Japanese (in January 2016). In 2018 his new book entitled *Handbook of Energy Politics* (Edward Elgar) was published. In 2013 he was invited to become an adjunct professor by both Yonsei University (South Korea) and China Petroleum University (Beijing). In 2015 he was also invited to become a guest professor by Jilin University.

Katja Yafimava, Senior Research Fellow, joined the OIES Natural Gas Research Programme in November 2006. She holds a DPhil in Geography and an MPhil in Russian and East European Studies from Oxford University. She was an expert at the EU–Russia Gas Advisory Council during 2012–16. Prior to joining the Institute in 2006, she was an intern at Shell and at the Energy Charter Secretariat. She is the author of *The Transit Dimension of EU Energy Security: Russian Gas Transit Across Ukraine, Belarus, and Moldova* (OIES/OUP, 2011). She is also the author and co-author of chapters in other books, including *The Russian Gas Matrix: How Markets Are Driving Change* (OIES/OUP, 2014), *Research Handbook on International Energy Law* (Edward Elgar, 2014), *The Pricing of Internationally Traded Gas* (OIES/OUP, 2012), and *Russian and CIS Gas Markets and their Impact on Europe* (OIES/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 'Russian gas transit across Ukraine post-2019: pipeline scenarios, gas flow consequences, and regulatory constraints' (2016).

She has published several OIES papers on EU and Russian gas regulation including: 'The evolution of gas pipeline regulation in Russia: third party access, capacity allocation and transportation tariffs' (2015), 'The EU Third Package for Gas and the Gas Target Model: major contentious issues inside and outside the EU' (2013), 'The OPAL exemption decision: past, present, and future' (2017), '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), 'The Council Legal Service's assessment of the European Commission's negotiating mandate and what it means for Nord Stream 2' (2017), 'Building new gas transportation infrastructure in the EU – what are the rules of the game?' and, most recently, 'Gas Directive Amendment: implications for Nord Stream 2'. She is currently working on a new paper exploring regulatory aspects of LNG.

The following staff contributed to the work of the OIES in 2018. Their dedication and professionalism are essential to its continued smooth running.

- **Karen Clark** is responsible for the Institute's accounts.
- **Jo Ilott** provides administrative support for the OIES Natural Gas Research Programme.
- **Susan Millar** manages the Oxford Energy Policy Club and Oxford Energy Seminar.
- **Andrew Hudson** is responsible for the Institute's library.
- **Hannah Shipton** provides administrative support.
- **Kate Teasdale** is administrator and Company Secretary.

Visiting Research Fellows, Research Associates

Ali Aissaoui, Visiting Research Fellow, returned to the OIES, while also acting as an independent consultant, having retired from a long and fulfilling career in the energy and banking sectors. After serving at energy policy level in Algeria, including representing the country on the OPEC board of governors, he seized on the opportunity offered to him by the late Robert Mabro in the mid-1990s to move to Oxford and conceptualize his experience. The books, book chapters, and research papers he has since authored provide key insights on how history, economic policy, and international relations combine to shape the political economy of oil and gas in developing countries. During his last full-time position, working for an energy investment-oriented regional multilateral bank as its head of research, he developed original approaches to policy and decision-making, including a systematic mapping of the investment climates as well as the risks and financeability of large-scale energy projects across the MENA region. In addition to sharing his research findings through regular publications, he has sought to put his ideas to the test whenever involved as a speaker, discussant or peer reviewer. Ali has also been involved in relevant professional societies, including the Oxford Energy Policy Club, the Paris Energy Club, and the Arab Energy Club. Regular attendance at their reunions has allowed him to interact with international fellows and debate emerging trends and their likely impact.

Robert Arnott, Research Associate, is currently Executive Chairman of Norway-based Petrolia NOCO plc and IOT AS. He has previously held board-level positions at various exploration and production companies, most recently with Hurricane Energy plc, Rocksource ASA, Core Energy AS, and Spring Energy AS. He worked as a Senior Fellow at the OIES from 2001 to 2005, focusing on all aspects of mature oil and gas provinces, as well as the corporate strategies of the major upstream energy companies. He has a strong background in all aspects of exploration and production and is recognized for his research into the oil and gas industry. After working as a geologist and economist with Royal Dutch Shell, he began working in the City of London in 1991, holding senior positions as an oil and gas equity analyst at Goldman Sachs and Morgan Stanley for ten years.

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.

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 post-socialist 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-in-chief 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.

David Buchan, Research Associate, joined the OIES in January 2007 as Senior Research Fellow, became Senior Visiting Research Fellow in August 2017 and Research Associate in 2018. Educated in Oxford and Geneva, he began his writing career in 1970 with *The Economist*. In 1975 he joined the *Financial Times*, where he remained until 2006, rising to energy editor (2000–02). He was a foreign correspondent posted in Brussels, Washington, DC, and Paris, and when based in London he covered energy, defence, the Soviet bloc, and diplomacy. At the OIES, he specializes in the energy and climate policies of the European Union. Aside from writing *The Rough Guide to the Energy Crisis* (Penguin, 2010), he has written two books for the Institute, namely: *Energy and Climate Change: Europe at the Crossroads* (OIES/OUP, 2009) and, with OIES colleague Malcolm Keay, *Europe's Long Energy Journey – Towards an Energy Union?* (OIES/OUP, 2015).

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.

Trisha Curtis, Research Associate, is the president and co-founder of PetroNerds, LLC. She co-founded the company in 2015 and began working full time at PetroNerds in January 2016. She was formerly the Director of Research, Upstream and Midstream at the Energy Policy Research Foundation, Inc. (EPRINC) in Washington, DC. Since 2010, she has led extensive research efforts and major consulting projects, and has authored several reports on the North American upstream and midstream markets.

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).

John Elkins, Research Associate, joined the OIES in January 2008 and has edited many of the Gas Programme working papers since then. He wrote the paper 'Natural gas in the UK: an industry in search of a policy?', published in 2010. Elkins was formerly managing editor of the Gas Strategies publications department, responsible for *Gas Matters*, *Gas Matters Today*, and other publications. He was for a number of years a regular presenter at the Gas Strategies 'Gas Chain' training course. He joined Gas Strategies as a consultant in 1995 after leaving British Gas HQ, where he held various posts involving liaison with regions on annual and peak forecasting methodology, and preparation of amalgamated national, annual, and peak supply and demand forecasts. He was secretary of the matching panel, which advised the British Gas board on supply/demand issues for company plans and negotiations with Ofgas, the Office of Fair Trading, and the Monopolies Commission.

Peter Findlay, Research Associate, based in Calgary, Canada, is vice-president of the energy group EY Parthenon, EY's global corporate finance strategy practice. He has supported and analysed major acquisition and divestiture decisions, as well as developed strategic initiatives across the global energy value chain. At OIEA he has been charged with analysing Canada's oil sands since 2015 and, more recently, Canadian natural gas. Mr Findlay has extensive experience in energy strategy consulting, numerical modelling, mechanical engineering and technology, and mergers and acquisitions (M&A). While working as strategy and management consultant with AT Kearney from 2008 to 2014, he managed and led large-scale strategy, investment, analytic,

and operations engagements for supermajors, national oil companies, and private equity firms, including making M&A recommendations on midstream, upstream, petrochemical, and LNG assets. He has also worked in non-oil and gas sectors such as utilities and renewable power generation, including disruptive technology. He started his career designing aircraft engines as an aerodynamics engineer for Pratt & Whitney and is today registered as a professional engineer. Mr. Findlay earned a BSc degree in Mechanical Engineering from University of Alberta, an MSc degree in Fluid Dynamics and Numerical Methods from McGill University, and an MBA degree from the ESSEC, Warwick and Mannheim business schools. In addition to his OIES contributions, Mr Findlay has contributed energy insights to the *Financial Post*, the *Daily Oil Bulletin*, *Alberta Oil Magazine*, the *Wall Street Journal*, and *Petroleum Economist*.

Andy Flower, Research Associate, has been working as an independent consultant since 2001. He specializes in the LNG business, where his areas of expertise include: strategy marketing, project structures, shipping, pricing, supply and demand, and project economics. He retired from BP in 2001 after 32 years, including 22 years working in the company's LNG and natural gas businesses.

Sylvie Cornot-Gandolphe, Research Associate, is an independent consultant on energy and raw materials, focusing on international issues. Since 2014 she has collaborated with the OIES as a Research Associate. She also works with the Energy Centre of the Institut français des relations internationales (IFRI) as a Research Associate, with *CyclOpe*, the reference publication on commodities, and with CEDIGAZ, the international centre of information on natural gas of the Institut Français du Pétrole (IFPEN). Sylvie has a long and proven experience in global gas and energy markets, gained during her past positions at IFPEN/CEDIGAZ, the UN/ECE, the IEA, and ATIC Services. She is the author of several reference publications on energy markets.

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.

Marshall Hall, Senior Visiting 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.

Marianne Haug, Research Associate, teaches energy policy and sustainable development at the University of Hohenheim in Stuttgart, Germany, and serves as a member of the HORIZON 2020 Advisory Group on Energy at the European Commission. Following a career at the World Bank in Washington, DC (inter alia as director and senior adviser to the president), she served as a director at the IEA in Paris (2001–05), and as chairman of the board at the Forum für Zukunftsenergien in Berlin (2006–09). Her present research and advisory interests focus on the innovation dynamics and growth of clean energy within a rapidly changing global economy.

Charles Henderson CB, Distinguished Fellow, retired from the Department of Trade and Industry in 1996, where he was head of the energy directorate. He is a former chairman of TOTAL's oil business in the UK (1998–2005) and a former member of the Monopolies and Mergers Commission.

Paul Horsnell, Research Associate, is head of commodities research at Standard Chartered plc. He was previously managing director and head of commodities research at Barclays Capital, joining in 2003 from his role as JP Morgan's head of energy research. Prior to that, he was Assistant Director for Research at the OIES and a research fellow in economics at Lincoln College, Oxford University. He is the author of *Oil in Asia: Markets, Trading, Refining and Deregulation* (OIES/OUP, 1997), and (with Robert Mabro) *Oil Markets and Prices: The Brent Market and the Formation of World Oil Prices* (OIES/OUP, 1993). He holds a degree in Philosophy, Politics, and Economics, and a doctorate in Economics, both from Keble College, Oxford.

David Ramin Jalilvand, Research Associate, is a Berlin-based analyst and consultant. His work focuses on the interplay of energy and international politics in Iran and the Middle East. Between 2015 and 2018 he led the Iran programme of the Friedrich-Ebert-Stiftung in Berlin. He earned a PhD in Political Science from the Free University of Berlin in 2016 with a thesis on the energy sector, politics, and the economy in Iran. Previously he studied at the London School of Economics, the Moscow State Institute for International Relations, and Erfurt University. Most recently he co-edited *The Political and Economic Challenges of Energy in the Middle East and North Africa* (with Kirsten Westphal, Routledge, 2018).

Chris Le Fevre, Senior Visiting Research Fellow, joined the OIES in September 2012. He has published working papers on gas storage in Great Britain (January 2013), the potential for natural gas as a transport fuel in Europe (March 2014), the impact of UK energy policy on the gas sector (September 2015), methane emissions in the gas industry (July 2017), a review of demand prospects for LNG as a marine fuel (July 2018), and a review of prospects for natural gas as a fuel for road transport (April 2019). Chris has worked in the oil and gas industry for over 35 years, having held a variety of positions up to executive director level at Transco plc (now National Grid Gas plc) and British Gas. At Transco, he was the director responsible for implementing the 'Network Code' and for the introduction of domestic competition. His roles at British Gas included establishing operations in a number of European countries, including Spain, the former German Democratic Republic (East Germany), Hungary, and the Czech Republic. Before British Gas, he worked for Shell in exploration and production companies in the Netherlands and Malaysia. He has worked as an independent energy consultant since 2002 and, until 2011, sat on the boards of the Northern Ireland Utility Regulator and the South Central Strategic Health Authority.

Mari Luomi, Research Associate, is a Senior Research Fellow at the Emirates Diplomatic Academy (EDA), Abu Dhabi, where she leads a research programme on energy, climate change, and sustainable development and teaches on climate change negotiations. Specializing in the politics and political economy of natural resources and the environment, Dr Luomi is an expert on international climate politics and climate and sustainable energy policy in the GCC nations. She holds a PhD in Middle Eastern Studies and has worked for research institutes in the fields of international affairs, regional studies, and energy studies in Finland, Qatar, and the UK. Dr Luomi was formerly the vice-president of the Finnish International Studies Association, researcher at the Finnish Institute for International Affairs, and post-doctoral fellow at Georgetown University in Qatar, to name just a few. Over several years, as part of a team of thematic experts, she has provided independent on-site reporting from intergovernmental negotiations on climate change; she has also written hundreds of news stories on multilateral developments in the fields of climate change and sustainable energy policy globally. Her research publications include a broad range of working and briefing papers, academic journal articles, essays, books, and book chapters. She is also the co-editor of the recently-published volume *From Bali to Marrakech: A Decade of International Climate Negotiations* (IISD, 2017).

Richard Mallinson, Research Associate, leads analysis of geopolitics and global energy policy at Energy Aspects, where he is also a founding partner. He is a specialist on the MENA region, and follows developments in Libya, Iran, and Iraq particularly closely. Richard focuses on how geopolitical events and trends impact on energy market fundamentals, particularly global oil markets. Prior to joining Energy Aspects, Richard spent more than six years working in central government functions in both the UK and Australasia. He has a deep understanding and track record of impact in all aspects of policy-making and analysis. He regularly provides media comment on geopolitical events and energy markets in publications such as the *Financial Times* and *Wall*

Street Journal, as well as appearing on CNBC, Bloomberg, the BBC, Sky News, and others. Richard holds a BA in Politics and International Studies from the University of Warwick and is a member of the Royal Institute of International Affairs (Chatham House).

Michal Meidan, Research Associate, leads analysis of Asian energy policies and geopolitics at Energy Aspects, with a particular focus on China. Before joining Energy Aspects in January 2016, she headed China Matters, an independent research consultancy providing analysis on the politics of energy in China. Prior to that, Michal held senior analytical roles at Eurasia Group in New York and London, and at Asia Centre-Sciences Po, Paris. She has authored numerous academic articles and edited the book *Shaping China's Energy Security: The Inside Perspective* (Asia Centre, 2007). 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, Hebrew, and French.

Robin Mills, Research Associate, is CEO of Qamar Energy (Dubai). He is an expert on Middle East energy strategy and economics. He is the author of two books: *The Myth of the Oil Crisis* (Praeger, 2008) and *Capturing Carbon* (Hurst, 2011), columnist on energy and environmental issues at *The National*, and comments widely on energy issues in the media, including the *Financial Times*, *Foreign Policy*, *Atlantic*, CNN, BBC, Bloomberg, and others. He worked for a decade for Shell, concentrating on new business development in the Middle East, followed by six years with Dubai Holding and the Emirates National Oil Company. He is a Fellow of the SIPA Center on Global Energy Policy at Columbia University, Senior Fellow of the Iraq Energy Institute, and was non-Resident Fellow for Energy at the Brookings Institution. He holds a first-class degree in Geology from the University of Cambridge and speaks five languages, including Arabic and Farsi.

John Mitchell, Distinguished Fellow, is also an associate research fellow at Chatham House. In November 2007 he received a lifetime achievement award for research from Saudi Arabia's King Abdullah at the opening of the Third OPEC Summit in Riyadh. He retired in 1993 from BP, where he held roles including: special adviser to the managing directors, co-ordinator for BP's subsidiaries in the western hemisphere, and head of BP's Policy Review Unit. In 1976–77 he was an academic visitor in the Department of Economics at the University of Cambridge. Mitchell is the author of numerous reports and briefing papers.

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.

Donna Peng, Research Associate, is an associate at Aurora Energy Research where she provides customised power market forecast, asset valuation, and transaction support for clients in Ireland, Great Britain, and Australia. Before joining Aurora, she worked with the OIES as a Research Fellow, specializing in the analysis of extended gas-to-power value chains under different institutional and political contexts. Donna holds degrees in Engineering, Policy Analysis, and Economics from Delft University of Technology, Comillas Pontifical University, University of Waterloo, and McGill University.

Simon Pirani, Senior Visiting Research Fellow on the OIES Natural Gas Research Programme, joined the Institute in September 2007. His research focuses on natural gas markets and changing consumption patterns in the former Soviet Union. Recent publications include *Russian Gas Transit through Ukraine after 2019: The Options* (Energy Insight, 2018) and *Let's Not Exaggerate: Southern Gas Corridor Prospects to 2030* (2018). He was editor of, and contributor to, *The Russian Gas Matrix: How Markets are Driving Change* (OIES/OUP, 2014) and *Russian and CIS Gas Markets and their Impact on Europe* (OIES/OUP, 2009), and has authored many OIES publications on the Ukrainian gas sector and the Russo-Ukrainian gas trade. His book *Burning Up: A Global History of Fossil Fuel Consumption* (Pluto Press) was published in August 2018; his prior publications as a historian include *The Russian Revolution in Retreat* (Routledge, 2008) and *Change in Putin's Russia: Power, Money and People* (Pluto, 2009). Prior to joining the Institute, he worked as a journalist covering the Russian and Ukrainian economies.

Gulmira Rzayeva, Research Associate, 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.

Ivan Sandrea, Research Associate, is founder and former CEO of Sierra Oil and Gas, the leading upstream player in Mexico post energy reform that participated in the world class Zama discovery. Prior to this, Ivan held a number of entrepreneurial, leadership, and corporate roles such as: Co-head of global oil and gas emerging markets at EY, President of Energy Intelligence, Vice President of Upstream Strategy at Statoil (Equinor), Head of oil supply at OPEC, investment banker at Merrill Lynch, and exploration/operations geologist at BP. He is an active member of the Oxford Energy Policy Club, trustee of the Energy Policy Research Foundation (EPRINC), and has been a regular guest at the Global Business Policy Council of AT Kearney. Ivan's academic activities include being co-founder and guest lecturer at the Executive Energy MBA programme at Wirtschaftsuniversität (WU) in Vienna, the Executive Energy Program at Mexico's ITAM University, authorship of over 20 research papers, and co-authorship of the recent book entitled "Mexico: History of Oil Exploration, its Amazing Carbonates and Untapped Oil Potential". Ivan holds a BSc in Geology from Baylor University, an MSc and MBA from Edinburgh University, and attended the Berkeley Executive Leadership Program in Stanford.

Amrita Sen, Research Associate, is the founding Partner and Chief Oil Analyst at Energy Aspects. Amrita leads Energy Aspects' analysis and forecasting of crude and products markets. Her specialism is in energy commodities, particularly oil and oil products. Amrita's deep understanding of the complex relationships within the global energy sector and her wealth of industry contacts, together with 10 years of experience, allow for a unique perspective on market outlook. She holds an MPhil in Economics from Cambridge University, a BSc in Economics from the University of Warwick, and is pursuing a PhD in Economics at the School of Oriental and African Studies, University of London. She is a non-resident Senior Fellow at the Atlantic Council and was formerly Chief Oil Analyst for Barclays Capital. She is frequently featured in leading media outlets, including the *Financial Times*, BBC News, *Reuters*, *Bloomberg*, CNBC, *The Wall Street Journal*, and Sky News, and at leading industry events as a speaker, and is regarded as a leading authority on oil markets.

Adnan Shihab-Eldin, Research Associate, is Director General of the Kuwait Foundation for the Advancement of Sciences and former Acting Secretary General and Director of Research at OPEC. He held earlier senior management posts at national and international institutions including UNESCO, the International Atomic Energy Agency (IAEA), the Kuwait Institute for Scientific Research (KISR), and Kuwait University. He has taught and directed research in the physical and engineering sciences, as well as energy technology and economics, at a number of universities and research centres in Kuwait, the United States, and Europe. He is a member of many international boards and advisory committees, including recently: A. T. Kearney Energy Transition Institute, Singapore's International Advisory Panel on Energy (IAP), the King Abdullah Petroleum Studies and Research Center (KASPARC) International Advisory Council, and the Standing Advisory Group on Technical Assistance and Cooperation (SAGTAC/IAEA). He has published extensively in various fields, including nuclear science and engineering, energy economics, markets and technology, and science policy. He is a recipient of many awards and honours.

Ian Skeet, Distinguished Fellow, is a consultant to the OIES and former editor of *Oxford Energy Forum*. Between 1953 and 1985 he worked for Shell, where he was in charge of government and international relations from 1975 to 1985. Widely travelled in the Middle East, his publications include *Oman and Muscat: End of an Era* (Faber, 1974) and *OPEC: Twenty-Five Years of Prices and Politics* (CUP, 1988).

Robert Skinner, Distinguished Fellow, is a former Director of the OIES and has previously held roles as vice president of oil sands TOTAL E&P Canada Ltd, director of the IEA policy office, assistant deputy minister for energy commodities (Canadian government), and senior vice president at Equinor (formerly Statoil) Canada. He is an executive fellow at the School of Public Policy, and energy research adviser, at the University of Calgary, Alberta. He consults for industry, governments, and academic institutions in Canada and abroad through Kimacal Energy Strategies, his private advisory service based in Calgary. He was recently named as Envoy for the Premier of Alberta to advise on actions to reduce the damaging price differential for Alberta's crude oil.

Brian Songhurst, Research Associate, has an honours degree in Chemical Engineering from Imperial College London and is a fellow of the Institution of Chemical Engineers. He has 50 years of experience in the oil and gas industry, working for engineering contractors, operators, and specialist consultants. He is a past chairman of the Institution of Chemical Engineers Special Interest Group for Oil and Natural Gas (SONG), which provides technical networking among its members to deliver best practices within the chemical engineering community. He has held senior positions in engineering, projects, and sales, and has led engineering and process design teams for gas processing, offshore oil and gas, refinery, and petrochemical facilities around the world. He recently retired and his last position was director of LNG for London-based consultancy ThyssenKrupp Uhde Energy and Power, for whom he managed a variety of LNG projects for both onshore and offshore (FLNG) applications. He was previously engineering manager with MW Kellogg, one of the world's leading LNG contractors, and facilities engineering manager with J Ray McDermott, one of the world's leading offshore contractors.

Loftur Thorarinsson, Research Associate, is a doctoral researcher at the National Graduate Institute for Policy Studies in Japan and conducts research on the evolution of national and international oil company strategies, East Asian oil and gas markets, and energy markets in Japan. He was an OIES-Saudi Aramco Fellow and holds an MSc in International Management from SOAS, University of London, an MA in Public Policy from the National Graduate Institute for Policy Studies, and a BSc from Copenhagen Business School. Loftur has worked as a business developer and a project manager for over nine years with leading solar energy companies in Japan and served as director of the Icelandic Chamber of Commerce in Japan, where he was responsible for energy affairs, member outreach, and industry events.

Robert West, Research Associate, is the founder of Thunder Said Energy, a new research consultancy into disruptive energy technologies. His main interests are the ascent of shale, renewables, smaller-scale gas, and digital oilfield technologies, to attract capital into the energy industry. Previously, Rob was the Head of Global Energy Research at Redburn, where he advised institutional investors on the 'supermajors' and broader energy sector; and part of Sanford Bernstein's European Oil & Gas team. He has completed 75 modules for the IPIMS Petroleum Geology & Engineering Programme, which is used by 40 upstream oil and gas companies to train internal technical staff. Rob holds a first class degree in Experimental Psychology from University College, Oxford. He is a CFA Charterholder.

Accounts

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

For the Year Ended 31 December 2018

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

| | Unrestricted funds £ | Endowment funds £ | Total 2018 £ | Total 2017 £ |
|---|----------------------------|-------------------------|--------------------|--------------------|
| Income from: | | | | |
| Voluntary income | 763,661 | - | 763,661 | 678,931 |
| Incoming resources from charitable activities | 1,140,775 | - | 1,140,775 | 670,346 |
| Incoming resources from investments | 220,828 | - | 220,828 | 229,825 |
| Total income | 2,125,264 | - | 2,125,264 | 1,579,102 |
| Expenditure on: | | | | |
| Raising funds | 44,125 | - | 44,125 | 41,567 |
| Charitable activities | | | | |
| Projects and publications | 1,073,394 | - | 1,073,394 | 831,611 |
| Support costs | 327,825 | - | 327,825 | 396,339 |
| Total charitable expenditure | 1,401,219 | - | 1,401,219 | 1,227,950 |
| Other expenditure | 27,811 | - | 27,811 | 31,791 |
| Total resources expended | 1,473,155 | - | 1,473,155 | 1,301,308 |
| Net gains/(losses) on investments | (267,741) | (329,759) | (597,500) | 739,887 |
| Net movement in funds | 384,368 | (329,759) | 54,609 | 1,017,681 |
| Fund balances at 1 January 2018 | 4,168,252 | 4,240,533 | 8,408,785 | 7,391,104 |
| Fund balances at 31 December 2018 | 4,552,620 | 3,910,774 | 8,463,394 | 8,408,785 |

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)**

Statement of Financial Position

At 31 December 2018

| | 2018 | | 2017 | |
|---|----------------|------------------|----------------|------------------|
| | £ | £ | £ | £ |
| Fixed assets | | | | |
| Tangible assets | | 17,190 | | 29,142 |
| Investments | | 7,838,316 | | 7,760,584 |
| | | <u>7,855,506</u> | | <u>7,789,726</u> |
| Current assets | | | | |
| Debtors | 220,211 | | 28,437 | |
| Cash at bank and in hand | 484,862 | | 781,561 | |
| | <u>705,073</u> | | <u>809,998</u> | |
| Creditors: amounts falling due within one year | | | | |
| Taxation and social security | 21,906 | | 18,653 | |
| Other creditors | 75,279 | | 94,036 | |
| Deferred income | - | | 78,250 | |
| | <u>97,185</u> | | <u>190,939</u> | |
| Net current assets | | <u>607,888</u> | | <u>619,059</u> |
| Total assets less current liabilities | | <u>8,463,394</u> | | <u>8,408,785</u> |
| Capital funds | | | | |
| Endowment funds - general | | 3,910,774 | | 4,240,533 |
| Income funds | | | | |
| Unrestricted funds | | <u>4,552,620</u> | | <u>4,168,252</u> |
| | | <u>8,463,394</u> | | <u>8,408,785</u> |

**OXFORD INSTITUTE FOR ENERGY STUDIES
(REGISTERED NUMBER: 01676971)**

Statement of Cash Flows

At 31 December 2018

| | 2018 | | 2017 | |
|---|-----------|----------------|-----------|----------------|
| | £ | £ | £ | £ |
| Cash flows from operating activities | | | | |
| Cash generated from operations | | 161,647 | | 140,282 |
| Investing activities | | | | |
| Purchase of tangible fixed assets | (3,942) | | (29,665) | |
| Purchase of investments | (990,309) | | (635,449) | |
| Proceeds on disposal of investments | 315,077 | | 447,301 | |
| Interest received | 220,828 | | 229,825 | |
| Net cash (used in)/generated from investing activities | | (458,346) | | 12,012 |
| Net cash used in financing activities | | - | | - |
| Net (decrease)/increase in cash and cash equivalents | | (296,699) | | 152,294 |
| Cash and cash equivalents at beginning of year | | 781,561 | | 629,267 |
| Cash and cash equivalents at end of year | | <u>484,862</u> | | <u>781,561</u> |

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Affiliations as at the time of joining:

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