

The *World Energy Outlook (WEO)* is usually published in November. However, for the second year in a row, the International Energy Agency (IEA) is releasing our flagship report a month early, in October. We did this last year because it was an exceptional year defined by the Covid-19 crisis. This year is another exceptional year because of the COP26 Climate Change Conference meeting in Glasgow.

This COP – short for the Conference of the Parties, the main decision-making body of the United Nations Framework Convention on Climate Change – is particularly significant. It is the first test of the readiness of countries to submit new and more ambitious commitments under the 2015 Paris Agreement. It is also an opportunity – as the *WEO-2021* states – to provide an “unmistakeable signal” that accelerates the transition to clean energy worldwide.

This year’s edition of the *WEO* has been designed, exceptionally, as a guidebook to COP26. It spells out clearly what is at stake – what the pledges to reduce emissions made by governments so far mean for the energy sector and the climate. And it makes clear what more needs to be done to move beyond these announced pledges towards a pathway that would have a good chance of limiting global warming to 1.5 °C and avoiding the worst effects of climate change.

For this, the analysis in *WEO-2021* relies on our landmark report published earlier this year – *Net Zero by 2050: A Roadmap for the Global Energy Sector* – which is now an integral part of the pioneering energy modelling work that goes into producing the *WEO* each year.

The IEA’s work this year has demonstrated our commitment to leading clean energy transitions globally by enabling governments to understand what they need to do to put emissions into rapid and sustained decline. But we have also made very clear that countries’ transitions have to be secure, affordable and fair for all citizens. If governments do not ensure that these key elements are at the core of their policy making for the transformation of their energy sectors, then they risk failure.

At the time of publication of this year’s *WEO*, governments are getting an advanced warning of this risk, with the prices of natural gas, coal and electricity rising to all-time highs in many regions. The key reasons for these sharp increases in energy prices are not related to efforts to transition to clean energy. They include a rapid economic rebound from last year’s pandemic-induced recession, weather-related factors, and some planned and unplanned outages on the supply side.

However, that does not mean clean energy transitions in the years ahead will be free from volatility. The current context underscores the value of the special analysis that we carried out for *WEO-2021* on energy security risks in transitions. This analysis highlights the potential vulnerabilities that need to be on the radar screens of politicians and other decision makers as the world navigates this essential but deeply challenging era of change for our energy systems.

Successful transitions must be secure, or they will not happen fast enough to ward off catastrophic climate change. And they must have people at their centre, as the IEA has emphasised through the work of the Global Commission on People-Centred Clean Energy Transitions, which I convened in early 2021. Headed by Danish Prime Minister Mette Frederiksen, the Global Commission brings together national leaders, government ministers, civil society representatives and other prominent figures to identify how to ensure that the transition to clean energy is fair and inclusive for everyone. It will publish its recommendations ahead of the start of COP26 at the end of October 2021.

As always with the energy sector, investment is critical. The IEA has been warning for years that current investment levels in the global energy sector are inadequate – both to meet near-term energy needs and long-term transition goals. It is hard to understate the dangers inherent in today's shortfall in spending on clean energy transitions, compared with the levels required. If we do not correct it soon, the risks of destabilising volatility will only grow as we move forward.

Reaching the critical but formidable goal of net zero emissions by 2050 will require major efforts from across society – but it also offers major advantages in terms of human health and economic development. What comes through very clearly in this new *WEO* are the huge opportunities that come with clean energy transitions – for manufacturers of wind turbines, batteries, electrolysers and a host of other technologies. A new global energy economy is emerging, with the potential to create millions of decent jobs across a host of new supply chains. To make this a reality, government leaders in Glasgow must play their part by making the 2020s a decade of massive clean energy deployment.

Finally, I would like to thank the truly exceptional work – in extremely challenging times – by the team of IEA colleagues who worked so hard and so effectively on this *WEO* under the outstanding leadership of my colleagues Laura Cozzi and Tim Gould.

Dr Fatih Birol
Executive Director
International Energy Agency

This study was prepared by the World Energy Outlook (WEO) team in the Directorate of Sustainability, Technology and Outlooks (STO) in co-operation with other directorates and offices of the International Energy Agency. The study was designed and directed by **Laura Cozzi**, Chief Energy Modeller and Head of Division for Energy Demand Outlook, and **Tim Gould**, Chief Energy Economist and Head of Division for Energy Supply and Investment Outlooks.

The modelling and analytical teams for the *WEO-2021* were led by **Stéphanie Bouckaert** (demand), **Christophe McGlade** (supply analysis), **Paweł Olejarnik** (supply modelling), **Thomas Spencer** (climate and environment), **Michael Waldron** (investment and finance) and **Brent Wanner** (power).

Key contributions from across the WEO team were from: **Lucila Arboleya Sarazola** (investment and finance), **Yasmine Arsalane** (lead economic outlook, power), **Blandine Barreau** (recovery plan analysis), **Simon Bennett** (lead hydrogen, energy technologies), **Daniel Crow** (lead behaviour analysis, air pollution), **Davide D'Ambrosio** (lead on data science, power), **Amrita Dasgupta** (hydrogen, critical minerals), **Tanguy de Bienassis** (investment and finance), **Tomás de Oliveira Bredariol** (methane), **Musa Erdogan** (fossil fuel subsidies, data management), **Eric Fabozzi** (power and electricity networks), **Víctor García Tapia** (data science, buildings), **Victor Gautier** (industry), **Pablo Gonzalez** (investment and finance), **Timothy Goodson** (co-lead on end-use demand analysis), **Shai Hassid** (power), **Paul Hugues** (lead on industry), **Inchan Hwang** (investment and finance), **Bruno Idini** (transport), **George Kamiya** (energy technologies, digitalisation), **Tae-Yoon Kim** (co-lead on fuel supply analysis and energy security), **Vanessa Koh** (power and electricity networks), **Martin Kueppers** (industry, Africa), **Lilly Yejin Lee** (transport), **Laura Maiolo** (oil and gas supply), **Ariane Millot** (buildings, climate and environment), **Toru Muta** (fuel supply), **Lucas Pereira** (demand-side response), **Apostolos Petropoulos** (lead on transport), **Mariachiara Polisena** (power), **Ryszard Pospiech** (supply modelling and data management), **Arnaud Rouget** (energy access and Africa), **Jasmine Samantar** (energy access and Africa), **Rebecca Schulz** (oil and gas supply), **Leonie Staas** (industry, behaviour), **Gianluca Tonolo** (lead on energy access), **Daniel Wetzel** (lead on employment), **Peter Zeniewski** (lead on gas, co-lead on energy security). Other contributions were from **Olivia Chen**, **Chloé Delpierre**, **Michael Drtil**, **Frank Gentile**, **Jérôme Hilaire**, **Hyeji Kim**, **Katharina Lobo**, **Lia Newman** and **Sebastian Papapanagiotou**. **Teresa Coon**, **Marina Dos Santos** and **Eleni Tsoukala** provided essential support.

Edmund Hosker carried editorial responsibility.

Debra Justus was the copy-editor.

Colleagues from the Energy Technology Policy (ETP) Division led by Timur Gül provided valuable help on demand modelling and analysis, with overall guidance from Araceli Fernandez Pales and Uwe Remme. Alexandre Gouy, Peter Levi, Hana Mandova and Tiffany Vass contributed to the analysis on industry; Leonardo Paoli, Jacopo Tattini and Jacob Teter

contributed to the analysis on transport; Thibaut Abergel and Chiara Delmastro contributed to the analysis on buildings; José Bermúdez Menéndez and Francesco Pavan contributed to the analysis on hydrogen. Other key contributors from across the IEA were: Carlos Fernández Alvarez, Heymi Bahar, Zakia Adam, Adam Baylin-Stern, Jean-Baptiste Dubreuil and Craig Hart.

Valuable comments and feedback were provided by other senior management and numerous other colleagues within the IEA. In particular, Mary Warlick, Keisuke Sadamori, Mechthild Wörsdörfer, Amos Bromhead, Alessandro Blasi, Toril Bosoni, Joel Couse, Peter Fraser, Paolo Frankl, Tom Howes, Brian Motherway, Aad Van Bohemen, Rebecca Gaghen, Masatoshi Sugiura, An Fengquan and Kristine Petrosyan.

Thanks go to the IEA's Communications and Digital Office for their help in producing the report and website materials, particularly to Jad Mouawad, Fabien Barau, Claire Dehouck, Mariam Aliabadi, Jon Custer, Astrid Dumond, Tanya Dyhin, Merve Erdem, Grace Gordon, Barbara Moure, Jethro Mullen, Isabelle Nonain-Semelin, Julie Puech, Robert Stone, Clara Vallois, Gregory Viscusi, Therese Walsh, and Wonjik Yang. Ivo Letra and Ben McCulloch provided essential support to the production process. IEA's Office of the Legal Counsel, Office of Management and Administration and Energy Data Centre provided assistance throughout the preparation of the report.

Valuable input to the analysis was provided by: David Wilkinson (independent consultant); Peter Rafaj, Gregor Kiesewetter, Wolfgang Schöpp, Chris Heyes, Pallav Purohit, Laura Warnecke, Adriana Gomez-Sanabria and Zbigniew Klimont (International Institute for Applied Systems Analysis).

The work could not have been achieved without the support and co-operation provided by many government bodies, organisations and companies worldwide, notably: Enel; Enel Foundation; Eni; European Union (Global Public Goods and Challenges Programme); Hitachi ABB Power Grids; Iberdrola; Ministry of Economic Development, Italy; Ministry of Economy, Trade and Industry, Japan; The Research Institute of Innovative Technology for the Earth, Japan; Ministry of Economic Affairs and Climate Policy, the Netherlands; Shell; Energy Market Authority, Singapore; Toshiba; and USAID Power Africa, the United States.

The IEA Clean Energy Transitions Programme (CETP), particularly through the contributions of the Agence Française de Développement, Italy, Japan, the Netherlands, Sweden and the United Kingdom supported this analysis. Thanks also go to the IEA Energy Business Council, IEA Coal Industry Advisory Board, IEA Energy Efficiency Industry Advisory Board and the IEA Renewable Industry Advisory Board.

Peer reviewers

Many senior government officials and international experts provided input and reviewed preliminary drafts of the report. Their comments and suggestions were of great value. They include:

Saleh Abdurrahman	Ministry of Energy and Mineral Resources, Indonesia
Emmanuel Ackom	UN Environment Programme (UNEP), Technical University of Denmark Partnership (DTU)
Keigo Akimoto	Research Institute of Innovative Technology for the Earth, Japan
Venkatachalam Anbumozhi	Economic Research Institute for ASEAN and East Asia (ERIA)
Doug Arent	National Renewable Energy Laboratory (NREL), United States
Peter Bach	Danish Energy Agency
Manuel Baritaud	European Investment Bank
Marco Baroni	Enel Foundation
Paul Baruya	Clean Coal Centre
Harmeet Bawa	Hitachi ABB Power Grids
Christian Besson	Independent consultant
Pete Betts	Grantham Research Institute on Climate Change and the Environment, United Kingdom
Sama Bilbao y Leon	World Nuclear Association
Rina Bohle Zeller	Vestas, Denmark
Jason Bordoff	Columbia University, United States
Mick Buffier	Glencore
Nick Butler	King's College London
Diane Cameron	Nuclear Energy Agency
Kimball Chen	Global LPG Partnership
Drew Clarke	Australian Energy Market Operator
Rebecca Collyer	European Climate Foundation
Russell Conklin	US Department of Energy
Deirdre Cooper	Ninety One
Jon Lezamiz Cortazar	Siemens Gamesa
Ian Cronshaw	Independent consultant
Ewelina Daniel	DG Energy, European Commission
François Dassa	EDF
Ralf Dickel	Oxford Institute for Energy Studies, United Kingdom
Zuzana Dobrotkova	World Bank
Haldane Dodd	Air Transport Action Group
Dan Dorner	Clean Energy Ministerial
David Elzinga	Asian Development Bank
Francesco Ferioli	DG Energy, European Commission
Fridtjof Fossum Unander	Research Council of Norway

Arunabha Ghosh	Council on Energy, Environment and Water (CEEW)
Dolf Gielen	International Renewable Energy Agency (IRENA)
Craig Glazer	PJM Interconnection
Andrii Gritsevskiy	International Atomic Energy Agency (IAEA)
Michael Hackethal	Ministry for Economic Affairs and Industry, Germany
Selwin Hart	United Nations
James Henderson	Oxford Institute for Energy Studies, United Kingdom
Masazumi Hirono	Tokyo Gas
Andreas Hoffmann	Ministry of Climate, Energy and Utilities, Denmark
Takashi Hongo	Mitsui Global Strategic Studies Institute, Japan
Jan-Hein Jesse	JOSCO Energy Finance and Strategy Consultancy
Rafael Kawecki	Siemens Energy
Michael Kelly	World LPG Association
Nobu Kikuchi	Ministry of Foreign Affairs, Japan
Agnes Koh	Energy Market Authority, Singapore
Hidechika Koizumi	Ministry of Economy, Trade and Industry, Japan
Ken Koyama	Institute of Energy Economics, Japan
Atsuhito Kurozumi	Kyoto University of Foreign Studies
Richard Lavergne	Ministry for Economy and Finance and the Recovery, France
Joyce Lee	Global Wind Energy Council (GWEC)
Lee Levkowitz	BHP
Li Jiangtao	State Grid Energy Research Institute, China
Carol Lloyd	ExxonMobil
Pierre-Laurent Lucille	Engie
Felix Chr. Matthes	Öko-Institut – Institute for Applied Ecology, Germany
Antonio Merino Garcia	Repsol
Cristobal Miller	Department of Natural Resources, Canada
Josh Miller	The International Council on Clean Transportation
Vincent Minier	Schneider Electric
Simone Mori	ENEL
Isabel Murray	Department of Natural Resources, Canada
Steve Nadel	American Council for an Energy-Efficient Economy, United States
Andi Novianto	Coordinating Ministry for Economic Affairs, Indonesia
Stefan Nowak	Technology Collaboration Programme on Photovoltaic Power
Natascha Nunes da Cunha	Inter-American Development Bank
Pak Yongduk	Korea Energy Economics Institute (KEEI)
Ignacio Perez Arriaga	Comillas Pontifical University's Institute for Research in Technology, Spain
Stephanie Pfeifer	Institutional Investors Group on Climate Change (IIGCC)
Cédric Philibert	French Institute of International Relations, Centre for Energy & Climate

Dmitry Popov	CRU
Andrew Purvis	World Steel
Seth Roberts	Saudi Aramco
Yamina Saheb	OpenEXP
Hans-Wilhelm Schiffer	World Energy Council
Robert Schwiers	Chevron
Adnan Shihab Eldin	Independent expert
Maria Sicilia	Enagás
Paul Simons	Yale University
Gurdeep Singh	National Thermal Power Corporation Limited (NTPC)
Jim Skea	Imperial College London
Maria Antonietta Solinas	Eni
John Staub	US Energy Information Administration
Jonathan Stein	Hess Corporation
Jonathan Stern	Oxford Institute for Energy Studies, United Kingdom
Tim Stern	UK Department for Business, Energy and Industrial Strategy (BEIS)
Wim Thomas	Independent consultant
Nikos Tsafos	Center for Strategic and International Studies (CSIS), United States
Noé Van Hulst	International Partnership for Hydrogen and Fuel Cells in the Economy
Tom Van Ierland	DG for Climate Action, European Commission
David Victor	University of California, San Diego
Andrew Walker	Cheniere Energy
Peter Wood	Royal Dutch Shell
Markus Wråke	Swedish Energy Research Centre
Akira Yabumoto	J-Power
William Zimmern	BP
Christian Zinglarsen	European Union Agency for the Co-operation of Energy Regulators (ACER)

The work reflects the views of the International Energy Agency (IEA) Secretariat but does not necessarily reflect those of individual IEA member countries or of any particular funder, supporter or collaborator. None of the IEA or any funder, supporter or collaborator that contributed to this work makes any representation or warranty, express or implied, in respect of the work's contents (including its completeness or accuracy) and shall not be responsible for any use of, or reliance on, the work.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Comments and questions are welcome and should be addressed to:

Laura Cozzi and Tim Gould

Directorate of Sustainability, Technology and Outlooks

International Energy Agency

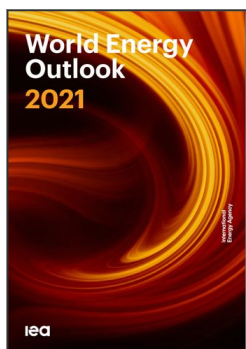
9, rue de la Fédération

75739 Paris Cedex 15

France

E-mail: weo@iea.org

More information about the *World Energy Outlook* is available at www.iea.org/weo.



From:
World Energy Outlook 2021

Access the complete publication at:

<https://doi.org/10.1787/14fcb638-en>

Please cite this chapter as:

International Energy Agency (2021), "Foreword", in *World Energy Outlook 2021*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9827b1c1-en>

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area. Extracts from publications may be subject to additional disclaimers, which are set out in the complete version of the publication, available at the link provided.

The use of this work, whether digital or print, is governed by the Terms and Conditions to be found at <http://www.oecd.org/termsandconditions>.