



# Clean Energy Transitions Programme

Annual Report 2023

International  
Energy Agency



# INTERNATIONAL ENERGY AGENCY

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The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 31 member countries, 13 association countries and beyond.

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# Abstract

The Clean Energy Transitions Programme (CETP) is the IEA's flagship initiative for accelerating progress toward a global net zero energy system. Launched at the 2017 IEA Ministerial to leverage the Agency's expertise, insights and influence, the programme has provided world-class analysis, technical assistance and capacity building to support the most ambitious reorientation of the world's energy systems this century. The CETP's work is structured across three pillars of activity, with a particular focus on emerging markets and developing economies. The first of these focuses on supporting emerging and developing countries to establish clean energy transition goals, in line with the objectives of the 2015 Paris Agreement and the Sustainable Development Goals established by the United Nations. The second pillar centres on facilitating coordination among multilateral organisations such as the Group of 20 (G20) and UN-affiliated collaborations. The final pillar showcases the IEA's work at a global level to enable and accelerate clean energy transitions.

The CETP Annual Report 2023 provides an overview of the programme's achievements over the past year. The remarkable impact of the CETP's work during this period was reflected in several notable achievements, including the announcement of a new set of fuel standards for trucks in Indonesia, the Energy Transition Plan in Uganda and the establishment of regulations for the spot electricity market in China. These and other policies announced in 2023 were all closely aligned with IEA recommendations and reinforced the Agency's status as a trusted advisor to emerging and developing countries. The programme's accomplishments also included the publication of the IEA's first *Latin America Energy Outlook* and a World Energy Outlook Special Report on universal access to clean cooking in Africa. Additional highlights included annual updates of our *World Energy Investment* and *World Energy Employment* reports along with many others.

The programme also provided support to the IEA's strategically important work on energy efficiency, critical minerals, energy employment, clean energy investment and people-centred energy transitions. The CETP supported the IEA's efforts to improve energy data collection and to develop capacity among policy makers in partner countries. It contributed to the Agency's role as a key coordinator of the global energy dialogue, as reflected in the many outcomes and mandates that emerged from G20, G7 and the Association of Southeast Asian Nations (ASEAN) Ministerial meetings throughout the year. The programme also helped facilitate the IEA's engagement with the Presidency of the 28<sup>th</sup> annual UN climate meeting (COP28) in Dubai and supported the Agency's ambitious action plan that informed the main outcome of that summit: the first ever global agreement to 1.5 °C-aligned energy transitions in the Global Stocktake outcome.

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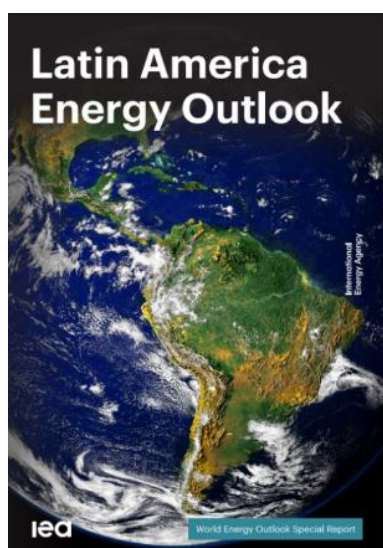
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# CETP in 2023: A year of impact

“Clean energy is moving fast – faster than many people realise” said Dr Fatih Birol, the IEA’s Executive Director. As the standard-bearer for this movement, the International Energy Agency launched the Clean Energy Transitions Programme (CETP) to accelerate the pace of transformation of the world’s energy system. In 2023, the programme proved once again to be a critical enabler of the Agency’s work, bringing cutting-edge expertise to emerging and developing economies and directly supporting their energy transitions.

In 2023, the CETP enabled more than 320 high-level meetings with policy makers as well as 725 dissemination events, workshops and technical exchanges. With support from the programme, the IEA also produced or enhanced more than 214 data products, models, tailored policy briefs and reports. It also delivered in-person capacity building to nearly 1 500 policy professionals in 2023.



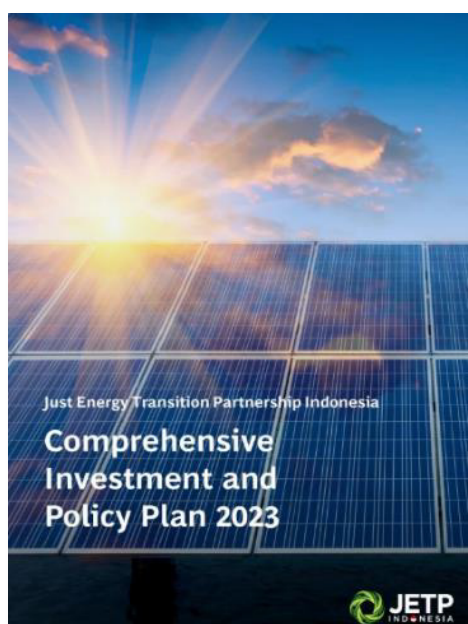
Last year was the first to follow the Joint Commitment by the programme’s funders at the IEA Ministerial in March 2022 – on the back of which the Agency established a new CETP Strategic Framework. Thanks to this reinforced focus and governance structure, the IEA was able to scale up the programme’s activities and achieve full buy-in from both CETP funders and the partner countries where the programme is implemented.

One of major achievements of 2023 was our debut [Latin America Energy Outlook](#) report, which was released in November. This first comprehensive assessment of energy and resources outlook – the result of extensive consultation, engagement and review with local stakeholders – helped strengthen the Agency’s relationships with Latin American partners. Our engagement included a High-Level Expert Workshop in Chile, a roundtable on energy efficiency held in France and bilateral consultations with Argentina, Brazil, Colombia, Chile and Costa Rica – all of which helped us to tailor our insights to address their specific energy transition needs. As a special World Energy Outlook, the report relies on the WEO modelling and provides the outlook of the energy sector in Latin America and the Caribbean but also for six major countries: Argentina, Brazil, Chile, Colombia, Costa Rica and Mexico.

Executive Director Fatih Birol led the online launch event, which was attended by more than 9 300 participants, while IEA Deputy Executive Director Mary Burce Warlick presented under-embargo the Outlook's findings at the OLADE Energy Week conference in Uruguay. The Executive Director also held a lunch with ambassadors from Latin American countries in Paris to discuss the main findings of the report.

A second report, [Boosting Efficiency in Latin America](#), was also published in 2023. In addition, we strengthened cooperation on regional energy efficiency standards for appliances with SICA – a body that promotes integration and cooperation in Central America.

The IEA's bilateral relationship with Brazil has thrived, consistently delivering successful outcomes. IEA experts actively provided input to the Ministry of Mines and Energy in revising the country's National Energy Efficiency Plan, with an emphasis on strengthening governance. We also collaborated with Empresa de Pesquisa Energética, an official government energy research office, to produce its Atlas of Energy Efficiency Brazil, with analysis of energy use in the residential sector, as well as the development of a roadmap to double the efficiency of electrical appliances in Brazil by 2030.



The IEA worked with Indonesia on their Just Energy Transition Partnership (JETP) as a strategic advisor. The JETP between Indonesia and the International Partners Group, led by the United States and Japan, is a key enabler for achieving Indonesia's energy transition targets, which were strongly influenced by the IEA's Energy Sector Roadmap to Net Zero Emissions in Indonesia published in 2022.

Currently, the Agency participates in the JETP's Policy Working Group and officially leads its Technical Working Group, whose purpose is to develop a credible and ambitious power sector transition pathway. Our particularly close collaboration with Indonesia and coordination of valuable inputs from partners in the JETP Technical Working Group allowed us to provide Indonesia with a techno-economic analysis of interconnected power systems and offer policy advice on the development of domestic solar PV manufacturing. These analyses were taken on board in the JETP Comprehensive Investment and Policy Plan, which was published in November 2023.

We also delivered a comprehensive policy review of energy efficiency to Indonesia's Ministry of Energy and Mineral Resources and provided policy guidance and analytical support on fuel standards for the transportation sector. The topic is especially relevant, since freight transport by road plays a central role in Indonesia's economy and is a major source of demand for energy, particularly oil. We were delighted when the ministry announced plans in March 2023 to introduce fuel economy standards for trucks.

In Southeast Asia, we engaged in regional exchanges on the regulation of power grids in 2023, providing analysis and organising technical events on the sidelines of other major regional policy forums. The IEA's efforts to advance cross-border trade in electric power were recognised in the official communiqué of the 41<sup>st</sup> ASEAN Ministers on Energy Meeting hosted by Indonesia in August.

In Viet Nam, we developed and carried out analyses of multiple pathways to achieving net zero emissions in the power sector, including a review of the country's 8<sup>th</sup> National Power Development Plan. We also provided recommendations to the Thai government for meeting its decarbonisation targets to support the revision of Thailand's Power Development Plan.

We deepened our engagement with Africa. In September, the IEA Executive Director attended the inaugural Africa Climate Summit in Nairobi to support discussion of the continent's growing role in global climate and energy issues and the opportunities presented by clean energy for its economic future. In anticipation of that regional summit and the COP28 gathering in December, our Executive Director and President William Ruto of Kenya called jointly for a New Energy Pact for Africa. Their call to action aims to foster deeper collaboration between African countries and international partners to accelerate progress toward universal energy access.



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*IEA Executive Director Fatih Birol and Kenyan President William Ruto at the Africa Climate Summit in Nairobi in September*

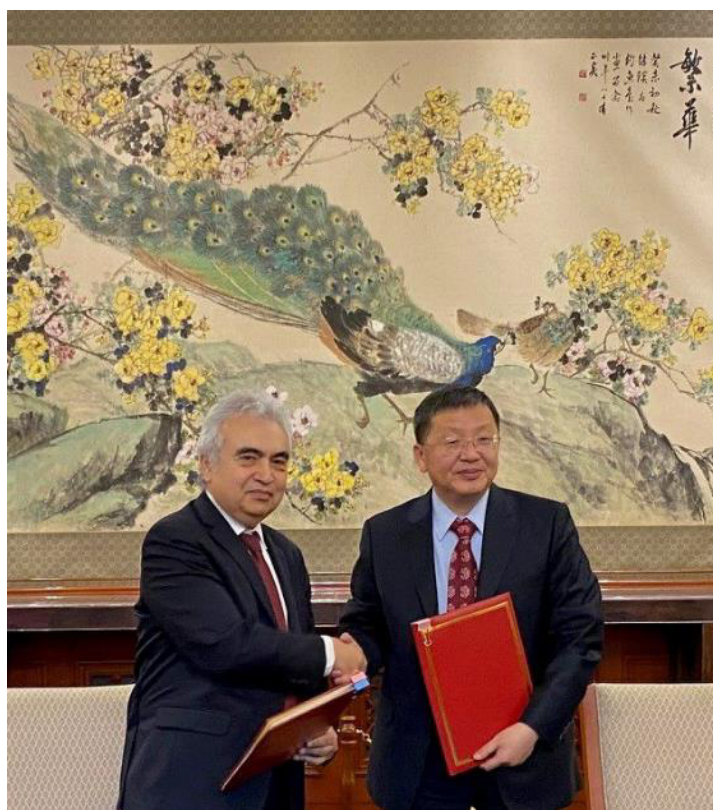
Our analytical work focused on areas most relevant to energy transitions in Africa. In July, we released the World Energy Outlook Special Report, [A Vision for Clean Cooking Access for All](#). A second report, [Financing Clean Energy in Africa](#), was prepared in collaboration with the African Development Bank Group and released in Nairobi in September. These publications document the critical need for financing in Africa to deliver on clean energy transitions in a just and equitable way.

We also worked directly with government stakeholders to support their policy processes. We supported the development of South Africa's National Energy Efficiency Strategy and delivered an analysis of renewable energy opportunities for Mauritania as well as a study of energy efficiency for improving affordability in Kenya. A close partnership with Uganda allowed us to deliver an in-depth review of the country's energy policies, which was released by our Deputy Executive Director Mary Burce Warlick in Kampala in November. This work directly contributed to the development of the country's Energy Transition Plan, announced in December 2023.

In June 2023, we were proud to welcome **Kenya** and **Senegal** into the IEA family as association countries.

In **China**, the IEA continued to work closely with the energy authorities to advocate for progress in energy efficiency, renewable energy integration and power market regulation. Our April report, [Building a Unified National Power Market System in China: Pathways for Spot Power Markets](#), was produced in close coordination with Chinese authorities involved in the project. Our collaboration took various forms, including closed-door workshops with the National Energy Authority of China, exchanges with experts during the peer-review phase and the first in-person visits by the IEA to China since the global Covid-19 pandemic. This joint effort had a tangible impact on policy reforms in China: The final version of the government's "Basic Rules for Electricity Spot Markets" – announced by the NEA and the National Development and Reform Commission in September – largely reflected the IEA's recommendations.





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*IEA Executive Director with China's Energy Minister Zhang Jianhua in Beijing, 6 July 2023*

In parallel, we continued exchanges with the New and Renewable Energy Department of the National Energy Administration to support the implementation of China's ambitious targets under the 14<sup>th</sup> Five Year Plan for Renewable Energy Development (2021-2025). We worked closely with China's National Development and Reform Commission Department of Resource Conservation and Environmental Protection on energy efficiency in public buildings and opportunities for the deployment of heat pumps. These exchanges were supported by efforts to reach out to Chinese policy makers and broader audiences – such as the translation into Mandarin of the key findings of IEA analyses, including our *Energy Efficiency* market reports. These initiatives were further reinforced by wide-ranging and detailed discussions in Paris between the IEA's Executive Director and China's Special Envoy on Climate Change, Xie Zhenhua and a visit by Deputy Executive Director Warlick to Beijing and Shenzhen.

We worked with producer economies in the **Middle East and North Africa** (MENA) to accelerate the development of clean energy and diversify their economies away from dependence on oil and gas revenues. In 2023, we worked with Morocco on renewable energy regulation, procurement and integration and with Algeria to strengthen the country's capacity to abate methane emissions. In close collaboration with Oman, we produced the reports [Renewable Hydrogen](#)

[from Oman: A Producer Economy in Transition](#) and [Leveraging Fossil Fuel Capabilities for Clean Energy Transitions: Assessment of Opportunities in Oman](#).

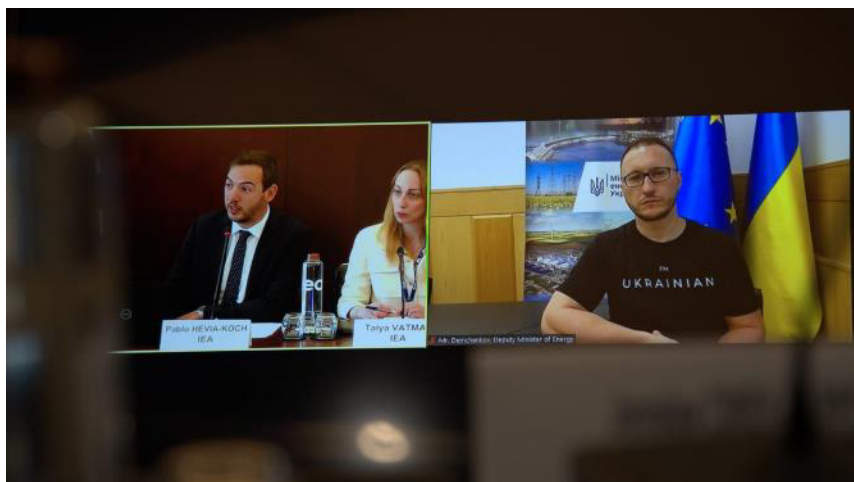


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*The IEA Executive Director and the Omani Minister of Energy and Minerals at the launch of the Renewable Hydrogen from Oman report, Paris, 12 June 2023*

The MENA, one of the regions most affected by climate change, is already seeing the impact of rising temperatures on energy systems that are straining to meet the demands of economic growth, energy security and social welfare. The IEA has been working closely with MENA countries to find ways to build energy systems that are more climate-resilient and secure. In 2023, the Agency delivered three reports on the climate resilience of the energy sectors in Morocco, Egypt and Oman – the first work of its kind in the region.

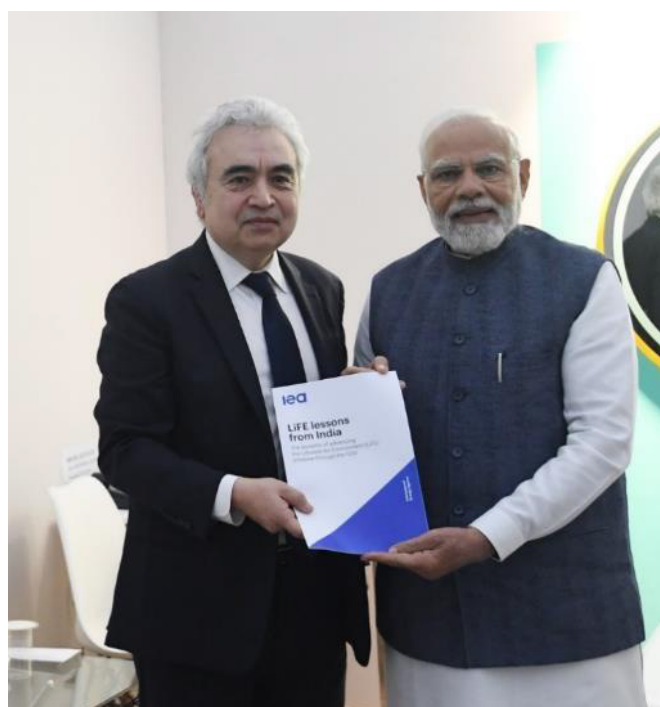
The issue of security and stability is particularly acute in **Ukraine**, whose energy system faces an existential crisis. While the country's power transmission system remains operational, more than 50% of Ukraine's power infrastructure has been damaged since the beginning of the full-scale war according to the Ukrainian Ministry of Energy. Thermal, nuclear, hydro and renewable energy generation as well as transmission systems have been heavily targeted by Russian attacks or are located in territory currently occupied by Russia. As a result, a new policy framework is needed to help the country rebuild its infrastructure with an emphasis on both security and sustainability. The IEA has been working closely with Ukraine on power system security, examining how to strengthen short-term resiliency and achieve a more decentralised and decarbonised power system in the medium-to-long-term. The Agency provided a strong support for the Ministry of Energy's effort to put together an Energy Strategy until 2050.



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*IEA experts speak with Ukraine's Deputy Minister of Energy, Yaroslav Demchenkov, August 2023, Paris*

Finally, the IEA reinforced its alliance with **India**, a country of critical importance to tackling global energy and climate challenges. Thanks to our strategic partnership with India's Ministry of New and Renewable Energy on solar PV deployment, the Ministry hosted the IEA's Renewable Energy Working Group and co-organised a workshop to address critical issues in the global solar PV supply chain with the IEA. We also further developed our extensive collaboration on energy and greenhouse gas emissions data with the Ministry of Statistics and Programme Implementation of India.



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*IEA Executive Director with India's Prime Minister, presenting the LiFE lessons from India report, Varanasi, June 2023*

In preparation for its 2023 **G20** Presidency, India requested IEA inputs to the energy, climate, development and finance working groups, illustrating its ever-closer engagement with the Agency. As a result, we had an opportunity to be at the heart of the G20's deliberations, helping to steer the dialogue about energy transitions. Our main achievements included producing new analysis for Prime Minister Narendra Modi's *Lifestyle for Environment* (LiFE) Initiative, the G20 voluntary action plan for doubling energy efficiency (which was elaborated with India's Bureau of Energy Efficiency) and a drafting a roadmap for the G20 on actions to triple installed renewable energy capacity by 2030 – a key outcome of the G20 New Delhi Communiqué. Overall, IEA analysis was critical in defining and shaping the G20's collective actions on energy efficiency, renewable energy, sustainable biofuels and lifestyle behaviour – all in support of the COP28 objectives.

Prime Minister Modi also invited the IEA to become one of the founding members of the Global Biofuels Alliance, which was announced at the New Delhi Summit.

Through the CETP, the IEA worked to build bridges between the **Group of Seven (G7)** and the broader community of G20 and emerging and developing economies. In 2023, the IEA advised the G7 energy and climate programme and created opportunities for selected non-G7 members – India, Indonesia, South Africa, ASEAN and the African Union – to take part in relevant meetings on the G7 agenda.

The growing and significant role of the IEA is reflected in many mandates that emerged from the [G7 Leaders' Summit in Hiroshima](#), Japan, in May 2023. Landmark outcomes such as the [G7 Five-Point Plan for Critical Minerals](#) and the [G7 Clean Energy Economy Action Plan](#) were based on IEA analysis.

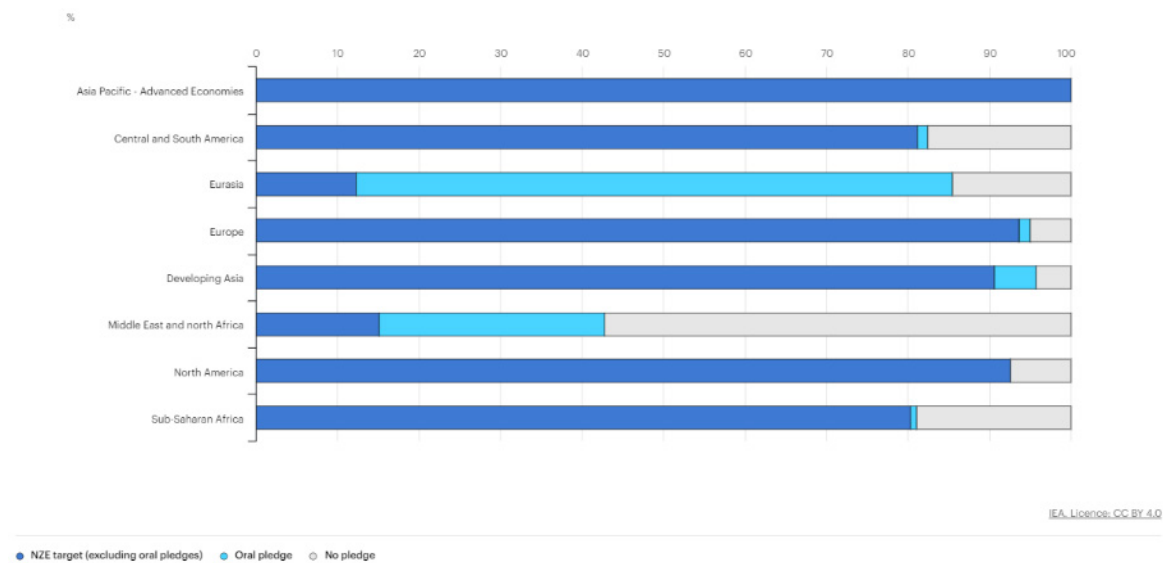
The IEA also played a key coordinating role in other **multilateral forums**, such as the Biofuture Platform and the Regulatory Energy Transition Accelerator (RETA). It also continued to act as a custodian agency for the UN's Sustainable Development Goals.

Over the course of 2023, the IEA used its analysis, strategic advice, convening power and consensus-building capacity to support the **COP28** Presidency and national governments as they worked to agree on important energy outcomes for the Dubai COP28 Summit. This support included the publication of the [Global Energy Transitions Stocktake](#) platform pulling together the latest essential data and analysis, including energy sector greenhouse gas emissions, technology developments, energy sector financing, energy access and energy employment, to track global progress of the energy transition and provide an accurate and objective picture of where we are now, and the trajectories we are on. The IEA also co-hosted the Climate and Energy Summit with Spain with the aim of building a "Grand Coalition" to keep 1.5 °C within reach. Informed by the IEA's recent



report, [Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach – 2023 Update](#), senior representatives from close to 40 countries around the world put forward 5 objectives for COP28 that were reflected in the COP's final decision document. We also secured a collective statement by 46 governments on doubling energy efficiency at the IEA's 8<sup>th</sup> Annual Global Energy Efficiency Conference in Versailles – and even tracked the impact of new pledges in real time during the meeting in Dubai.

### Regional coverage of long-term Net Zero Scenario pledges, 2030



Source: IEA (2023), [Tracking climate pledges: can the Global Stocktake be a landmark moment for energy sector ambition?](#)

In the lead-up to COP28, we co-hosted four **High-Level Dialogues with the COP28 Presidency**. The dialogues involved a series of strategic engagements with international energy decision makers on the COP28 Presidency's energy vision and energy package. They provided a forum to build consensus and momentum on the 1.5° C compatible energy transition pathways and the enabling conditions needed to achieve them.

We published an analysis highlighting the impact of the [Global Renewable and Energy Efficiency Pledge](#). We were pleased that our recommendations to keep the 1.5 °C goal alive received widespread support and were carried forward into both the final negotiated outcome of the First Global Stocktake of the Paris Agreement and the many other voluntary climate commitments made in Dubai. In a major achievement, the final text of the Global Renewables and Energy Efficiency Pledge – which explicitly quoted IEA analysis – was signed by 132 countries.



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*High-Level Dialogue during COP28 in Dubai*

As part of the Global Stocktake, we also released [an update of our landmark Net Zero Roadmap](#). The original report, published in 2021, shook the energy world. Our 2023 update sent a warning that the path to limiting global warming to 1.5 °C has narrowed, but that clean energy growth is keeping it open. And the case for transforming the global energy system in line with the 1.5 °C goal has never been stronger. One takeaway from the report is that increasing clean energy financing in developing countries is vital.

Consequently, we delivered advanced analysis of **clean energy investment** in our flagship report, [World Energy Investment](#), to provide a picture of global energy finance in 2022 and full-year estimates of the outlook for 2023. We focused on particular aspects of the CETP partner countries in a joint report, [Scaling Up Private Sector Financing for Clean Energy Transitions in Emerging Market and Developing Economies](#), which was produced jointly with the International Finance Corporation (IFC) and released during the Paris Summit on a New Global Financing Pact in June. We also established a high-level Finance Industry Advisory Board in March to enable a structured dialogue with the energy finance community and to accelerate the mobilisation of investment capital.

We continued to provide insights and data with the [Government Energy Spending Tracker](#), which we expanded to cover total government expenditures dedicated to energy, including short-term energy affordability measures, which are aimed to help shield consumers and industries facing soaring energy prices. The tracker, which now covers 68 countries and more than 1 600 spending policies, identifies major gaps in clean energy investment support across geographies, as well as an acceleration in efforts to establish domestic clean tech manufacturing capacities in all countries, notably EMDEs. We also further strengthened the Cost of Capital Observatory to improve transparency on capital costs for energy projects in emerging and developing economies.

Following its new mandate from IEA member countries, the IEA has also expanded its work on **critical minerals** to support policy makers in the implementation of measures to strengthen the resilience and reliability of critical mineral supplies. In July, we published the inaugural edition of the [Critical Minerals Market Review](#) to provide a concrete work programme on this crucial topic. To coordinate action and build consensus, the IEA hosted the first ever international summit on critical minerals and their role in clean energy transitions on 28 September. The event gathered ministers from roughly 50 mineral-producing and consuming nations around the world and around 40 business leaders, investors and heads of international organisations and civil society representatives.



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*Critical Minerals Summit, 28 September 2023, Paris, France*

Further, the IEA continued to expand its coverage of **employment trends and skills** necessary for clean energy transitions. The [World Energy Employment 2023](#) report, published in November, charted the uptick of clean energy jobs in every region of the globe, and highlighted critical skills gaps that could hinder the clean energy transition, including in many CETP priority regions. It also built on the momentum of initiatives such as the Global Commission on **People-centred Clean Energy Transitions** and the IEA Clean Energy Labour Council to consolidate relationships with stakeholders in CETP partner countries and to deepen analysis of how equality and inclusion can be built into clean energy policy design. The IEA also carried out the **Digital Demand-Driven Electricity Networks** (3DEN) initiative to provide policy advice and study solutions for smart power systems of strategic relevance for ensuring secure clean energy transitions.

In 2023, the CETP made it possible for the IEA to expand its **energy technology** policy analysis to include energy modelling, data analysis and research on the role

of innovation in meeting long-term climate goals. This helped support important outputs, such as the annual [Global EV Outlook](#), the [Global Hydrogen Review](#) and [Tracking Clean Energy Progress 2023](#).

The IEA strives to provide a complete picture of energy markets, working on all fuels and all technologies. This includes studying how traditional fossil fuel sources are being affected by the clean transitions and how we can ensure an orderly and just transition toward clean fuels. In 2023, we looked at the impact of methane emissions abatement and low-emission gases. We also explored the roles of oil and gas in energy transitions in [The Oil and Gas Industry in Net Zero Transitions](#), a much-discussed report that spelled out what these sectors would need to do to align their operations with the goals of the Paris Agreement.

Dialogue without fact-based, actionable analysis cannot achieve tangible results – and analysis requires **reliable, comprehensive and timely data**. Even though high-quality energy statistics are indispensable for planning, implementing and monitoring clean energy transitions, emerging economies often lack the capacity to effectively produce the data needed to support this process. In 2023, the IEA continued to work to address this issue. We strengthened our relationships with key data providers from non-member countries, consolidating and expanding data exchanges in several areas. We also continued to develop innovative indicators for tracking clean energy transitions.

**Building capacity** to implement policy recommendations is critical to the success of the CETP. In 2023, we directly supported capacity building and peer learning on energy data, modelling and energy efficiency tools. The in-person and online training sessions on energy statistics attracted a total of 163 participants from across India, Brazil and sub-Saharan Africa. A series of online training sessions and two Joint Summer Schools in Windhoek, Namibia, and Trieste, Italy, improved the skills of 150 participants from over 40 African countries in energy data statistics and modelling. These modelling bootcamps also supported the development of Uganda's Energy Transition Plan unveiled at COP and paved the way for the one to be developed with Mozambique in 2024. We also organised joint training sessions with the UN Economic and Social Commission for Western Asia and the Regional Centre for Renewable Energy and Energy Efficiency, as well as the energy data component of a climate statistics event for MENA countries organised by the International Monetary Fund and the Arab Monetary Fund.





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*Opening session of the 2023 Energy Efficiency in Emerging Economies Training Week in Paris. Speakers, from left to right: Ambassador Doreen Ruth Amule of Uganda; Ambassador Alexandre Guido Lopes Parola of Brazil; IEA Executive Director Fatih Birol; Ambassador Judi Wangalwa Wakhungu of Kenya; Ambassador Anna Bossman of Ghana*

We also held the Energy Efficiency in Emerging Economies Training Week, a flagship event that equips junior professionals from the developing world with the knowledge and skills necessary to deliver effective energy efficiency initiatives in their respective countries. The 2023 edition, held in Paris for the first time since 2019, was a huge success and brought together more than 120 policy makers and energy professionals from 41 partner countries.

The Energy Efficiency Training week held in Jakarta in October was a highlight of IEA’s work in the Southeast Asia. It brought together more than 200 energy efficiency professionals from government institutions and their supporting organisations from all ten ASEAN member states, as well as China, Sri Lanka and Pakistan. Additionally, in partnership with India’s Bureau of Energy Efficiency, we held a similar energy efficiency training event in New Delhi in December. That event gathered more than 150 policy makers and energy experts from across the country.



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*Participants of the IEA’s India Energy Efficiency Policy in Emerging Economies Training Week, New Delhi, December 2023*

Overall, the training events supported the capacity building in partner countries to provide their policy makers with essential tools to make informed decisions and create long-lasting, sustainable change for the energy transition. Importantly, each capacity building event facilitated peer exchanges and learning among professionals in a similar economic and political context of emerging and developing countries.

By working closely with partners in these countries, the CETP makes the IEA's state-of-the-art analysis and action-oriented guidance directly useful to them. It continues to demonstrate its proven model for implementing solutions for clean energy transitions on national level and raising the ambition for global action.

# Overview of the Programme

The CETP is the IEA's flagship initiative for accelerating progress toward a global net zero energy system. Launched at the 2017 IEA Ministerial to leverage the Agency's expertise, insights and influence, the programme has provided world-class analysis, technical assistance and capacity building to support the most ambitious reorientation of the world's energy systems this century. The CETP's work has enabled real and measurable change by providing technical, practical and political input to partner countries' clean energy transition policies. With its focus on emerging markets and developing economies (EMDEs), it has both transformed the IEA's bilateral relationship with EMDEs and strengthened multilateral cooperation on clean energy.

The CETP's activity is structured around three pillars. The first – and the largest – focuses on national transitions, with a focus on the emerging-market economies of Brazil, the People's Republic of China (hereafter "China"), India, Indonesia and South Africa. We also deliver considerable work on a regional basis in Latin America, the Middle East and North Africa, sub-Saharan Africa and Southeast Asia. National transitions form the core of the programme's work and as such, this pillar receives the largest budget allocation. Pillar I's priority is to support emerging and developing countries to develop clean energy transition targets, in line with the objectives of the Paris Agreement and the United Nations Sustainable Development Goals (SDGs).

The second pillar centres on strengthening multilateral coordination, through the IEA's participation in initiatives such as the Biofuture Platform, the Regulatory Energy Transition Accelerator (RETA) and the Group of 20 (G20), as well as several UN-related collaborations. The third pillar aims to inform the global dialogue on clean energy transitions and includes work on people-centred transitions; employment and skills analysis; critical mineral supply chains and policies; digitalisation of power systems; technology and innovation; private and public sector energy investment and many others. Although Pillar III activity is focused mostly on global energy transition trends, it produces direct input into policy discussions with partner countries – providing indispensable support to them on their paths towards clean transitions.

The CETP is funded by Australia, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, the United States and the European Commission. Building on the programme's highly successful first five years, the CETP's funders endorsed a CETP Joint Commitment at the IEA Ministerial Meeting in 2022, taking the CETP

to new levels of excellence. They reaffirmed their intention to use the CETP to further strengthen the capabilities and resources the IEA needs to accelerate the global energy transition by pledging an annual funding stream of around EUR 20 million through 2030. These financial contributions are critical for sustaining the IEA's support to partner governments around the world while ensuring a secure and sustainable energy future for all.

## CETP strategy and governance

The Strategic Framework of the CETP defines the direction of the programme and ensures that information about its impact and activities is transparent and universally accessible to IEA member countries and partners. The Strategic Framework serves as a comprehensive guide for current and potential funders, as it includes the essential information countries require when assessing donations to intergovernmental organisations – particularly in the case of development aid. The Strategic Framework is entirely aligned with the IEA's Programme of Work and Budget (PWB), ensuring that all CETP activities comply with the mandates given to the IEA by its member countries. The Strategic Framework, like the PWB, is therefore updated every two years to ensure CETP and IEA priorities remain aligned over time.

The Strategic Framework also sets out the governance structure of the programme. Similar to the board of directors of a private company, the CETP's main executive body is the Strategic Coordination Group (SCG), which brings together all the endorsees of the CETP Joint Commitment. The group provides oversight and enables funders to discuss CETP priorities and to advise on the development and implementation of the annual work plan.

As not all IEA member countries are CETP funders, the IEA Secretariat also reports to the wider IEA membership through its own standing groups and committees – including the Governing Board, the Standing Group on Global Dialogue and the Standing Group on Long-Term Cooperation – to showcase the programme's achievements and identify potential collaborations.

The intra-Agency CETP Steering Committee advises on the allocation of resources to the different workstreams of the programme. The Steering Committee, under the guidance of the IEA Executive Director, is chaired by the Head of the Strategic Initiatives Office (SIO) and includes senior managers and Division Heads from across the IEA. It meets regularly to exchange information on activities and coordinate programme priorities.

A central CETP Core Team, based in the SIO within the Executive Office, is responsible for strategic management, quality control, engagement with funders and dissemination of key messages, in collaboration with the IEA's



Communications and Digital Office. The CETP Core Team also coordinates work planning, monitoring and reporting.

## Delivery and coordination

CETP activities are anchored in an annual work plan, which is prepared the previous year under the guidance of the SCG and in close collaboration with colleagues across the IEA Secretariat. The CETP involves virtually all the Agency's departments, which means its activities are carried out by leading experts from all corners of the IEA.

Workplan development is managed by the CETP Core Team. This team solicits project proposals from Agency departments and allocates funding in compliance with the strategic guidance provided by the funders and the Executive Director. The detailed work plan is then reviewed and agreed by the SCG before implementation.

The Core Team is also responsible for tracking the delivery of programme outcomes and outputs against a comprehensive Results Framework. The Results Framework includes a set of indicators covering each of the CETP Pillars and Workstreams, providing a consistent approach to monitoring and the ability to assess the programme's wider impact.

Throughout the implementation of activities, the IEA ensures coordination with partner institutions, such as relevant national and regional actors and international organisations, including bilateral energy programmes in emerging and developing economies and IEA member countries.

## Dissemination of results

As the programme goes from strength to strength, its output continues to grow in both size and impact. In 2023, the CETP directly supported the publication of **214 reports, models, policy briefs and data products**. It has also allowed the IEA to enhance 11 flagship publications. As the Agency's expertise on clean transitions was increasingly sought after, the CETP also supported the delivery of **324 high-level bilateral exchanges, 120 dissemination events, 605 workshops** and technical exchanges and **37 capacity building events**.

## CETP communication strategy

In 2023, we strived to make the data, analysis and policy advice produced by the programme broadly accessible to all audiences in emerging and developing economies. Therefore, in the first quarter of 2023, the IEA's Communications and Digital Office together with the CETP Core Team designed a new

communications strategy to achieve even broader impact of the implementation work supported by the programme.

Those strategic communication efforts, delivered throughout the year both online and offline, have brought impressive impact and helped the programme successfully reach a wider audience to foster meaningful conversations, and support change, around clean energy transitions.

## CETP online presence

The online presence of the programme has been robust, with excellent year-on-year growth. [The CETP page on the IEA's website](#) has served as a central hub for information, providing access to analysis produced by the programme, recordings of events, training material, as well as interactive data tools to provide reliable and comprehensive information and evidence for policy making.

Between January and December 2023, the CETP website content produced in 2022 and 2023 received more than **2.7 million page views** from **1.2 million users**, indicating a high level of visitor engagement. We have seen outstanding results in terms of the number of users, with a **221% year-on-year increase between 2022 and 2023**. The share of users of CETP content in comparison to the overall number of IEA users also grew from 5% in 2022 to 12% in 2023. This demonstrates both the increased interest in CETP content from IEA audiences, and the growth of the programme itself.



The users of CETP content came from almost all countries across the world, with the highest number still originating from IEA member countries. Importantly, CETP priority countries – India, China, Indonesia and Brazil – were represented in the first 20 places of the ranking and the geographical coverage included all CETP focus regions.

In 2023, unique users of all IEA website content (including CETP) from India, China, Indonesia, Brazil and South Africa accounted for about 17% of total users (from 15% in 2022). As the overall number of visitors increased significantly, this

represents **remarkable increase in visitors from key partner countries**. In total, in 2023, IEA content attracted more than **1 600 000 unique users** in 2023, which is more than half a million more than in 2022.

## Social media and the CETP newsletter

Social media platforms have been instrumental in amplifying the programme's message and connecting with diverse audiences. As a result, **10,24%** of users of the CETP content came from social media posts.



One of the additional tools that contributed to the significant engagement from audiences was [the CETP newsletter](#). Launched as part of the new communications strategy, it aimed to provide the readers with regular updates on the IEA's work on clean energy transitions, as well as original content.

The first issue of the CETP newsletter was published in June. We originally planned to publish quarterly, but the feedback was so encouraging that we decided to increase the frequency of publication. In the second half of 2023, the newsletter was published once a month and this rhythm will continue in 2024.

The number of subscribers rose steadily with each edition to reach 216 000 in January 2024.

## Press mentions and media coverage

CETP publications and events were widely covered in both mainstream and more specialised publications, with **1 391 press mentions recorded in CETP priority countries and regions** during the reporting period, an increase of 52% on the previous year, and **5 050 press mentions across all countries**, an increase of 24% on the previous year (based on Dow Jones factiva). We saw a slight decrease (-7% year-on-year) in press coverage in Southeast Asia, as the work in the region in 2023 focused on direct policy advice and collaboration on the implementation of the Indonesian JETP, as opposed to the widely commented analytical reports of previous years, such as the [Energy Sector Roadmap to Net Zero Emissions in Indonesia](#) released in 2022. The overall excellent growth trend was driven by press coverage of the IEA's regional analysis in Latin America, as well as cooperation with MENA region and activities at COP28.

Joint press conferences and op-eds – such as the editorial on the importance of universal energy access, renewable energy deployment and investment in green industries in Africa co-authored by the IEA Executive Director and the President of Kenya – also amplified the voices of different stakeholders and helped shape public discourse on energy transition priorities in 2023.

Overall, through the strategic use of communication platforms and the fostering of meaningful partnerships, the programme has established itself as a key force in driving positive change in the clean energy sector. Going forward, continued efforts will be made to broaden outreach, deepen engagement and amplify the programme's impact in emerging and developing economies.

## Funding

The CETP is made possible by the financial contributions of the IEA members that endorsed the [2022 CETP Joint Commitment \(JC\)](#): Australia, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, the United States, and the European Commission. Recognising the CETP as an important vehicle for delivering the IEA's Ministerial mandates, the CETP JC endorsees announced their intention to work together to make available a collective annual fund of around EUR 20 million and, in response to the decade of action, also affirmed their intention to further strengthen financial support through to 2030.

In 2023, 19 Voluntary Contributions (VCs) were received by the IEA in support of activities coordinated under the CETP, with a cumulative value of approximately EUR 20.1 million. In particular, funding was received from the following IEA member countries: Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, Switzerland, and the United States, as well as the European Commission and the Energy Foundation, a non-governmental organisation. Given that many of the VCs received under the CETP are intended to support multi-year activities, the majority of the funding received in 2023 relates to activities to be implemented in 2024 and beyond.

CETP expenditure increased significantly in 2023, rising by 35% from around EUR 13 million in 2022 to around EUR 17.5 million – with a corresponding increase in impact. As requested by CETP funders, Pillar I projects received the largest share of the funding budget – 62% of the total – followed by Pillar III with 29% and Pillar II with 9%. Programme management and communication costs of around 9% were included in the Pillar expenditure as these costs supported the direct delivery and communication of project outputs, outcomes and impacts.

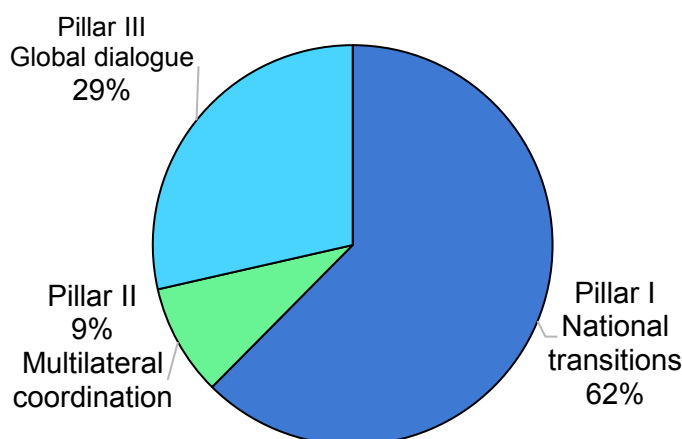
Note: These figures are provided for information purposes only. Formal financial reports will continue to be provided in established and agreed formats to IEA



member countries via the Committee on Budget and Expenditure and to individual donors via financial reports.

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#### Allocation of CETP expenses by pillar, 2023

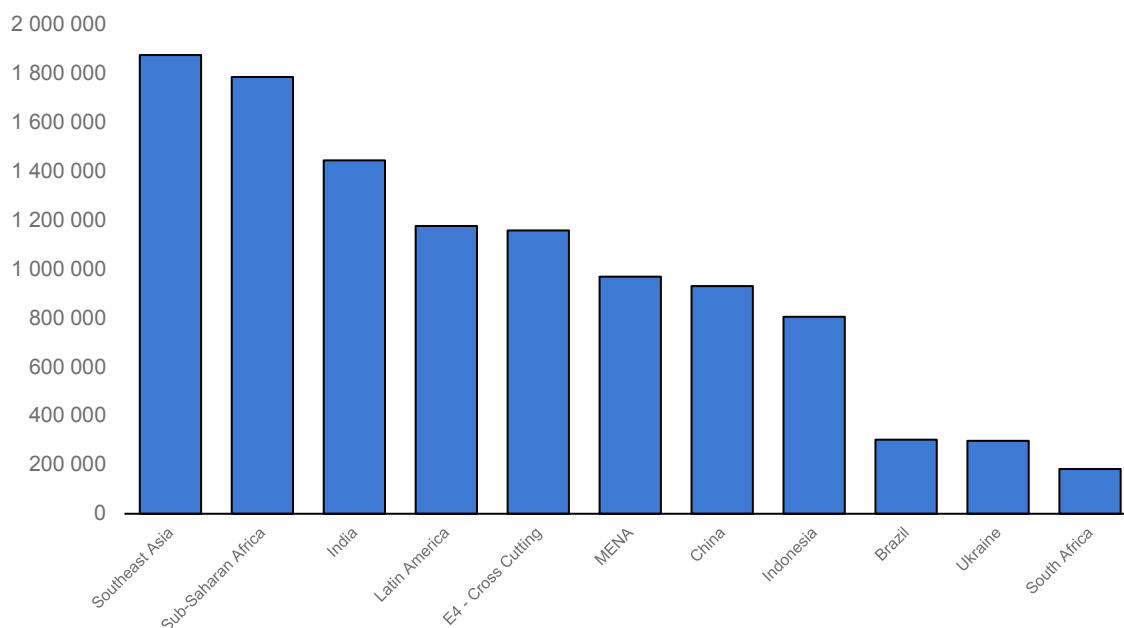


IEA. CC BY 4.0.

Looking at Pillar I in more detail, the largest regional programme in 2023 was with Southeast Asia, supporting a wide range of work in the region and ensuring representation of the work in key IEA outputs and fora, such as critical minerals, people-centred analysis, and improving data and statistics work across the region. The IEA also delivered key outputs with ASEAN on electricity markets, renewables and energy efficiency, as well as direct support for clean transitions through analysis, modelling and policy formulation in Thailand and Viet Nam. Another major push was made in sub-Saharan Africa – a critical region for energy transitions – where we engaged directly with Kenya, Mauritania, Senegal and Uganda, providing training to government staff on energy data and modelling. We also provided valuable regional analysis on clean cooking and approaches to financing clean energy transitions in Africa.

CETP’s close cooperation with India – the largest country programme in 2023 – helped support its national transition plan, which focuses on energy efficiency, deployment of renewable energy (including solar PV and biofuels) and critical minerals. The expenditure for Indonesia was lower in 2023 compared to 2022, when Indonesia held the G20 Presidency, and the IEA produced [An Energy Sector Roadmap to Net Zero Emission in Indonesia](#). However, this did not prevent us from strengthening our close and productive partnership with Indonesia to support the implementation of clean energy policies. Responding to CETP funders requests, this year was the first year of CETP activities in Ukraine and the IEA looks forward to continuing to grow this important country programme in 2024.

### Allocation of Pillar I expenses in EUR, 2023

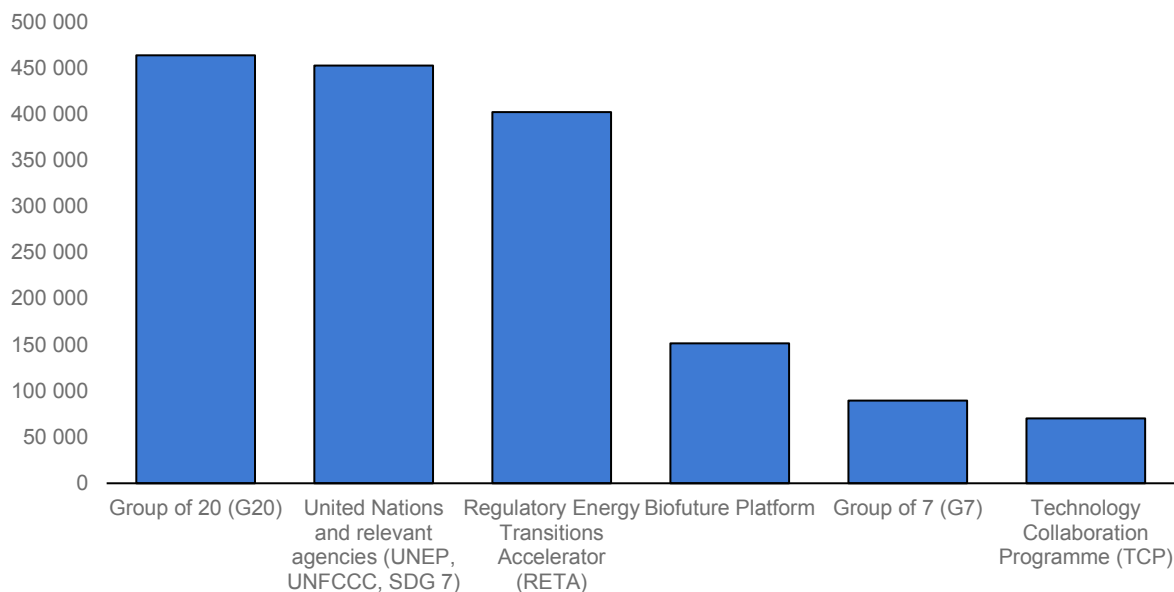


IEA. CC BY 4.0.

Note: MENA = Middle East and North Africa.

The IEA continued its long history of in-depth and strategic support to the Group of 20 (G20). With India holding the G20 Presidency in 2023, the close partnership between the country and the IEA was demonstrated by the very successful delivery of a large number of outputs produced in support of this work, which became the largest work stream under Pillar II – Multilateral Coordination. Important collaboration between the IEA and UN agencies followed closely and included working with the COP28 Presidency to raise ambition and advance the global climate agenda at the UNFCCC Conference of the Parties (COP) through a series of high-level dialogues, as well as strategic engagement and advice. In addition, under the CETP the IEA has also partnered with the UN Environment Programme (UNEP) to advance work on electric mobility, and carried out substantive activities on Sustainable Development Goal 7 (SDG7). The CETP component of the G7 was more modest in 2023, with the expectation that it would increase in 2024, with a focus on Africa and critical minerals.

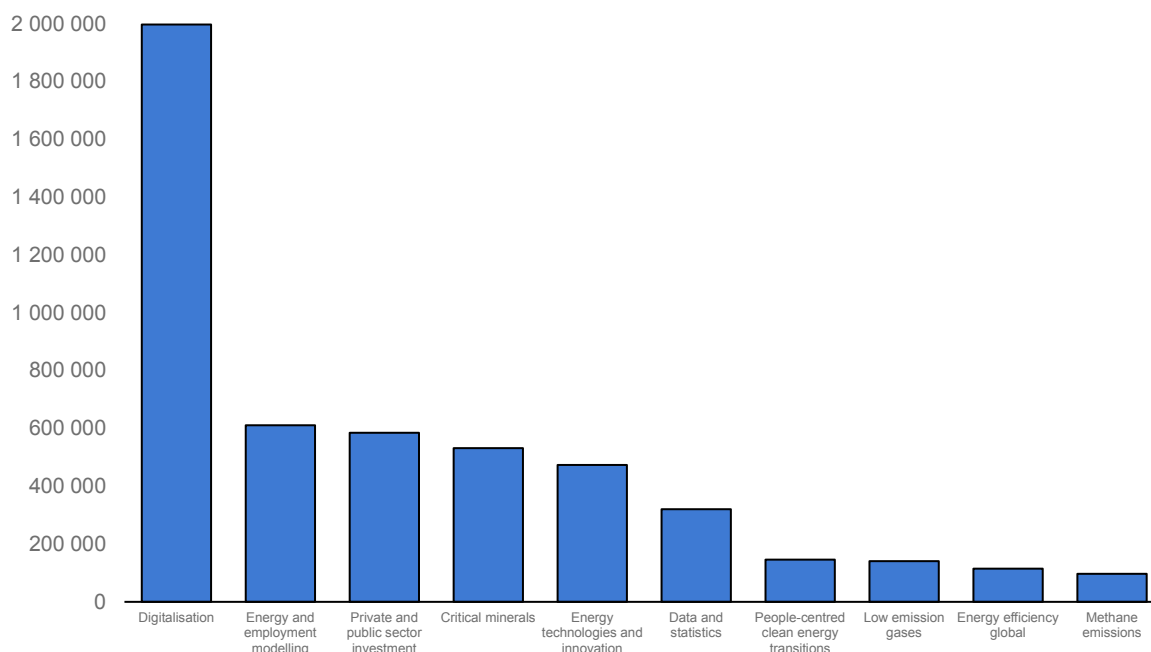
**Allocation of Pillar II expenses in EUR, 2023**



IEA. CC BY 4.0.

Under Pillar III – Enabling the Global Energy Dialogue, Digitalisation of energy systems was the largest workstream. It supported various analytical outputs and direct exchanges with Pillar I countries to help them drive improvements in energy efficiency and facilitate the improvements to clean electricity grids. One key 2023 milestone was the publication of the 3DEN guidance report [Unlocking Smart Grid Opportunities in Emerging Markets and Developing Economies](#), launched on 6 June 2023 at the special event “Powering the Future: Leveraging digitalisation for efficiency, resilience and decarbonisation”.

### Allocation of Pillar III expenses in EUR, 2023



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Beyond digitalisation, Pillar III provides broad support to several key workstreams. This included Energy and Employment Modelling – which delivered the [World Energy Employment Report 2023](#) – with CETP support enabling the improvement of analysis and data for emerging economies and developing countries, with recommendations to be integrated into relevant Pillar I work in the future. Private and public sector investment and critical minerals continue to be important workstreams. The [Cost of Capital Observatory](#) and [Critical Minerals Policy Tracker](#) are important examples of tools developed by the IEA that highlight policy successes and challenges in emerging and developing economies, which the Agency’s work under Pillar I will seek to address. Looking ahead to 2024, the CETP looks forward to building on these successes and linkages with Pillar I to further deliver impact at scale and accelerate the clean energy transition around the world.

# Pillar I – Accelerating national transitions

## India

### Highlights

- Significant contribution to India's Lifestyle for Environment (LiFE) agenda at the G20 with a report on the impact of policies on behaviour change and sustainable consumer choices, which was presented to Prime Minister Modi in February to inform G20 discussions. Key findings were included in the Varanasi G20 Development Ministerial Declaration.
- Strategic partnership with India's Ministry of New and Renewable Energy (MNRE) on solar PV deployment and a new collaboration on critical minerals with the Ministry of Mines in November, the MNRE hosted the IEA's Renewable Energy Working Group and both institutions co-organised a workshop to address critical issues in the global solar PV supply chain.
- The IEA held its India Energy Efficiency Policy in Emerging Economies Training Week in New Delhi in December, in partnership with the Bureau of Energy Efficiency. The training week brought together more than 150 policy makers and energy experts from across the country.
- The IEA's 2023 Renewable Energy Market Report included a dedicated section on biogas and biomethane for the first time, with a specific discussion of India's ambitious targets and regulations.
- In July, on the sidelines of the 14<sup>th</sup> Clean Energy Ministerial, the IEA presented [Transitioning India's Road Transport Sector](#), a report prepared at the request of Niti Aayog, the Indian government's top policy think tank.
- Extensive collaboration with the Ministry of Statistics and Programme Implementation of India (MOSPI) to harmonise energy balance data and emissions estimates.
- Worked closely with the Indian Self-Employed Women's Association to explore key issues related to the role of informal labour in energy transitions – a highly relevant issue for people-centred transitions in emerging economies around the world.



India is poised to have the largest energy demand growth in the world over the next two decades and has laid out its vision for the transformation of its energy system based on Prime Minister Narendra Modi's goal of net zero emissions by 2070. In 2023, as president of the Group of 20 (G20), India hosted its first summit meeting in New Delhi, where leaders of the world's 20 major economies agreed to pursue a tripling of their renewable energy capacity and made other important commitments to support a clean energy transition.

Our extensive support of India's G20 Presidency was instrumental in deepening direct engagement with the national stakeholders, paving the way for collaboration between the Agency and the Ministry of Power and the Bureau of Energy Efficiency, for example, as well as the Alliance for an Energy-Efficient Economy and other national institutions.

The IEA supported India's LiFE initiative with a report on the impacts of measures on behavioural change and sustainable consumer choices, presented to Prime Minister Modi in February to inform G20 discussions. The IEA Executive Director was invited to brief the G20 Development Ministers Meeting held in Varanasi in June about the IEA's analysis. As a result, key findings were incorporated into the Varanasi G20 Development Ministers' Declaration.



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*IEA Executive Director with India's Prime Minister, presenting the LiFE lessons from India report, Varanasi, June 2023*

In November, India's Ministry of New and Renewable Energy hosted the IEA's Renewable Energy Working Party and in December, the IEA also held an Energy Efficiency Policy Training Week in Delhi. Progress was made toward strengthening commitments on clean energy and decarbonisation with Indian ministries and institutions, including the National Skill Development Corporation (NSDC) and the Ministry of Steel. Important exchanges were established with the Ministry of Mines on critical minerals. Through its Petroleum Planning and Analysis Cell (PPCA), the Ministry of Petroleum and Natural Gas signed a commitment with the IEA to strengthen the exchange of data and research in the energy sector. Significantly, India also invited the IEA to become a founding member of the Global Biofuels Alliance – announced during the G20 Summit – alongside Brazil and the United States.

## Energy efficiency in India

As part of the IEA's [Energy Efficiency 2023](#) market report, the Agency published an India-focused commentary on efficient cooling. The commentary highlighted the role of energy efficiency policies and demand-side management in both sustainably meeting India's growing cooling needs and reducing peak demand to alleviate grid impacts while providing thermal comfort to all.

In July, on the sidelines of the 14<sup>th</sup> Clean Energy Ministerial, the IEA presented [Transitioning India's Road Transport Sector](#), a report prepared at the request of Niti Aayog, the Indian government's top policy think tank.

The IEA supported an energy efficiency agenda throughout India's G20 Presidency, providing data, analysis and insights to the Indian Bureau of Energy Efficiency. We contributed to a report detailing a strategic plan for advancing energy efficiency across demand sectors by 2030, which served as a critical input for the energy efficiency discussions of the Energy Transitions Working Group. In addition, the IEA also led the development of a Voluntary Action Plan on Doubling the Global Rate of Energy Efficiency Improvement by 2030, which was acknowledged in a joint declaration by the leaders at the G20 Summit.

## India Energy Efficiency Policy Training Week 2023

The IEA held its [India Energy Efficiency Policy in Emerging Economies Training Week](#) in New Delhi from 11-14 December, in partnership with the Bureau of Energy Efficiency. The training week brought together more than 150 policy makers and energy professionals from across the country to develop and share expertise and case studies on energy efficiency policy making and to underline the role that efficiency improvements can play in meeting energy and climate goals.



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*Panellists at the IEA’s “India Energy Efficiency Policy in Emerging Economies” training week, New Delhi, December 2023*

We delivered parallel courses covering energy efficiency in five areas – Appliances and Equipment, Transport, Buildings, Indicators and Evaluation and Industry – to help participants deepen their understanding of policy packages and to provide examples of best practice in regulation, information measures and incentives. The training offered opportunities for interactions with international trainers and local experts, as well as group activities to amplify cross-learning among participants and strengthen policy-making capacity locally and nationally.



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*Participants of the IEA’s “India Energy Efficiency Policy in Emerging Economies” training week, New Delhi, December 2023*

## People-centred clean energy transitions

The IEA Secretariat convened several events in 2023 and supported research in collaboration with Indian stakeholders in the field of people-centred clean energy transitions.

High-level representatives from the Self-Employed Women's Association (SEWA), India Smart Grid Forum (ISGF), IIT Delhi, World Resources Institute India, iForest and the OMI Foundation, for example, took part in our people-centred clean energy transitions webinar series to share best practice and intelligence on relevant topics in the Indian context.

The IEA Secretariat helped kickstart several important collaborations with Indian stakeholders as part of its analytical work on labour and skills. As a first step, the

IEA had several exchanges with the India Council for Green Skills and the India National Skill Development Corporation (NSDC) of the Ministry of Skill Development and Entrepreneurship. Following up on these exchanges, the IEA and NSDC established a two-year research initiative to identify the skills required for clean energy transitions. Its first planned output is a report on key labour trends and skills-related issues across various clean energy sectors in India, which will be published in March 2024.

Additionally, the IEA engaged extensively in 2023 with the Self-Employed Women's Association (SEWA) to explore key issues on the role of informal labour in energy transitions – a highly relevant topic for emerging economies across the world. Reema Nanavaty, General Secretary of SEWA, attended three meetings of the IEA's Clean Energy Labour Council (of which she is a member) to share India's perspective on this issue. Additionally, she gave a keynote speech on the subject during a webinar hosted by the IEA Secretariat in October. Other SEWA representatives shared their insights at an IEA event organised on the sidelines of the COP28 climate summit in Dubai that explored ways to integrate inclusion and fairness in clean energy policies.

## Renewable energy in India

The IEA's work on renewable energy policies in India continued to focus on solar PV supply chains and bioenergy. The Agency deepened its analysis and broadened dissemination activities in coordination with the Indian Ministry of New and Renewable Energy (MNRE), the Ministry of Petroleum and Natural Gas and the Ministry of Ports, Shipping and Waterways, as well as think tanks and industry.

### Accelerating deployment of solar PV in India

The collaboration between the IEA and the Ministry of New and Renewable Energy (MNRE) in India reflects a strategic partnership to advance renewable energy policies – particularly solar PV, a linchpin for clean energy transitions. The IEA actively engaged with the MNRE, the Ministry of Power and other key stakeholders throughout the year to help shape and implement solar PV and renewable energy policies in India. Our work provided support to the MNRE's objectives to expand local solar PV manufacturing and accelerate rooftop solar deployment, echoing the broader initiative of *Atmanirbhar Bharat* (“Self-reliant India”). The collaboration also builds upon previous joint efforts between the IEA and the MNRE, demonstrating their continued commitment to fostering sustainable energy solutions in India.

The IEA and the MNRE convened a workshop in November to address critical issues in the global solar PV supply chain. More than 100 participants – including national and state-level entities, NGOs and industry stakeholders – took part in



the closed-door discussions, which contributed to a deeper understanding of the effectiveness of Indian solar PV manufacturing policies and a better assessment of the contribution of these policies to global supply chain diversification. The workshop helped lay the foundation for a resilient, diversified and secure global solar PV landscape as the industry continues its unprecedented growth. The findings of the analytical work and the results of the workshop were shared through in-person and virtual presentations to key policy makers. These learnings also informed the dialogue at the multilateral level throughout India's G20 Presidency.



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*Workshop on global solar PV supply chain organised by the IEA and the India's Ministry of New and Renewable Energy, 7 November 2023, New Delhi*

The MNRE also sought the IEA's advice on the critical new energy technologies with the most potential for India and requested an update on how they are being deployed internationally. The IEA provided an internal briefing to the MNRE that included an overview of the Agency's analysis, data and policy work on new clean energy technologies. To inform the briefing, we also conducted a survey based on the [Clean Energy Technology Guide](#) (part of the IEA's [Energy Technology Perspectives 2023](#) report) and prepared an assessment of emerging new renewable technologies that India could develop by 2030. Additionally, the results of the survey were presented in a strategic session of the Renewable Energy Working Party, with the online participation of MNRE officials. At the MNRE's request, the IEA also mapped the reporting requirements of electricity capacity of different countries.

## Accelerating clean fuel deployment

As part of the support and guidance we provided during the design phase of the Global Biofuels Alliance (GBA), the IEA developed a report outlining the lessons learned from biofuels policy deployment in the United States, Brazil and India. The report found that these countries have turned to various measures to expand biofuel production and use, including designing long-term strategies, implementing appropriate investment signals, supporting innovation, ensuring that supplies are secure and affordable, addressing sustainability concerns early and collaborating with the international community. Further, the IEA identified three priority areas that would facilitate sustainable biofuel deployment in support of the global energy transition:

- identifying and helping develop markets with high potential for sustainable biofuels production,
- accelerating technology deployment,
- seeking consensus on performance-based sustainability assessments and frameworks.

The report was presented to Shri Hardeep Singh Puri, India's Minister of Petroleum and Natural Gas as well as other Indian government ministers and heads of international organisations during a special meeting at the G20 Energy Transitions Ministerial Meeting in Goa in July.

In October, the IEA supported the World Biogas Association India Congress in New Delhi. Paolo Frankl gave a keynote speech to the inaugural session, alongside Minister Puri and Tarun Kapoor, a former petroleum secretary and now advisor to Prime Minister Modi. In his keynote, Mr. Frankl shared the IEA's analysis of the role of biogas – and more broadly, sustainable bioenergy – in the energy transition and presented examples of positive spillovers into other sectors such as waste management, fertiliser production and rural employment.



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*Paolo Frankl, Head of the IEA Renewable Energy Division, speaks at the World Biogas Association India Congress in New Delhi, October 2023*

For the very first time, the IEA’s [Renewables 2023](#) market report included a dedicated section on biogas and biomethane with a specific discussion of India – whose government has set ambitious targets and developed specific regulations to develop those markets.

This new analysis covers the status of existing uses, policies in place, expected developments and market forecasts. It also includes suggestions for addressing a range of challenges such as the collection and use of waste and managing gas infrastructure growth. A draft of the report was shared with the Indian government, represented by the Ministry of New and Renewable Energy, before its official release.

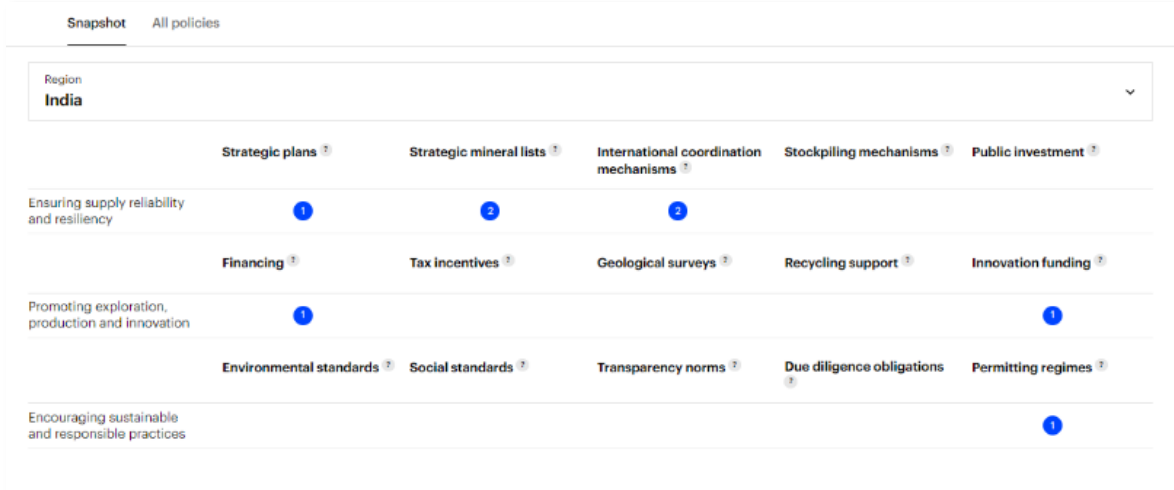
We also initiated analytical work on priority uses for hydrogen, its potential as a renewable energy source and related energy security aspects, in cooperation with the Ministry of Petroleum and Natural Gas and the Ministry of Ports, Shipping and Waters. The work aims to support India’s implementation of the National Green Hydrogen Mission and will feed into the IEA’s analysis in 2024.

## Critical minerals in India

Critical minerals such as copper, lithium, nickel, cobalt and rare earth elements are essential components in many of today’s rapidly growing clean energy technologies. As the IEA deepens its work on these minerals, it has also provided country insights for India, as the country develops a two-pronged strategy to increase domestic production and secure supply from overseas. In 2023, the IEA contributed to the first ever list of critical minerals released by India’s Ministry of

Mines. This collaboration was further strengthened by the ministry’s participation in the IEA’s Critical Minerals Summit.

### Snapshot of India policies



IEA. CC BY 4.0.

Sources: IEA (2023), [Critical Minerals Policy Tracker](#).

## Data and statistics in India

The IEA consolidated its coverage of India across energy statistics and balances, greenhouse gas emissions, energy prices, monthly electricity data and other output in 2023. The Agency and the Ministry of Statistics and Programme Implementation of India (MOSPI) also extensively collaborated to harmonise a set of calorific values used for various energy commodities, to enhance coherence within energy balances and estimation of emissions. We shared our sources and estimation methodologies to inform the development of MOSPI’s new surveys and data collection systems. This work is expected to lead to enhanced data quality for the energy balances of India. For the first time, the IEA also received a direct submission of monthly oil and gas data from India for the Joint Oil Data Initiative (known as JODI).

To complement the data collaboration work, the IEA and MOSPI jointly developed a National Energy Data Roadmap. The objective was to explore options for consolidating and further strengthening energy supply and demand data for focus sectors following priorities identified at country level. We aimed to facilitate and add value to the work of the Indian Energy Data Management project. The IEA held several meetings with MOSPI with participation from the Bureau of Energy Efficiency (BEE) on the topic.



The roadmap work with India would apply the conceptual framework developed by the IEA in 2023 through desk research and consultations with 11 countries (including Brazil, Morocco, Senegal, Kenya and Ethiopia). The framework identifies the key components of a national energy information system, such as planning and establishing a legal framework, creating institutional arrangements for implementation and the methodologies for data collection and dissemination.

Linked to our activities on tracking innovation progress, we also discussed with India's Department of Science and Technology (DST) the importance of collecting budget data on public energy research, development and demonstration. The DST gathered feedback from other ministries and as a result, India asked the IEA to co-organise a knowledge exchange webinar with participation from other countries that already provide RD&D data to the Agency.

## Indonesia

### Highlights

- In 2023, the IEA supported Indonesia's Just Energy Transition Partnership as a strategic advisor. The IEA was commended by the Indonesian government for its multiple and sustained efforts in leading the activities of the Technical Working Group and for its contribution to the work that allowed for the JETP process to advance towards funding and implementation in 2024.
- The IEA provided policy guidance and analytical support to the Ministry of Energy and Mineral Resources on fuel standards for the transportation sector with focus on freight transport by road. In March, the Ministry announced plans to [introduce fuel economy standards for trucks](#).
- IEA experts gave inputs on Indonesian power markets and on solar PV supply chain to the [JETP Comprehensive Investment and Policy Plan](#) (CIPP). The CIPP, including the IEA's recommendations, was published in November.
- IEA conducted a series of workshops on interconnected power systems to directly support the state utility PLN in planning the development of power system in Indonesia.

Over the past two years, Indonesia has assumed global leadership in multilateral energy forums – first during its G20 Presidency in 2022 and then as Chair of ASEAN in 2023. In parallel, the country has embarked on ambitious energy policy reforms to put it on track to meet its commitment to a net zero future. Still, significant challenges remain, including a continued reliance on coal, low levels of renewable energy and sub-optimal policy frameworks for many clean energy sectors. The IEA's efforts aim to help address these and to support Indonesia's ambitions. Our comprehensive work programme builds on the successes of the IEA-Indonesia G20 collaboration and the delivery of a 2022 net zero roadmap for the country, as well as a long history of intensive collaboration on energy efficiency, renewables, investment, carbon pricing, transport and other key issues.

The Just Energy Transition Partnership (JETP) between Indonesia and the International Partners Group (IPG), led by the United States and Japan, is a key enabler for achieving Indonesia's energy transition targets. Signed at the G20 Summit in Bali in November 2022, the JETP aims to set Indonesia on an ambitious pathway to peak power sector emissions at 290 Mt CO<sub>2</sub> eq by 2030 and to achieve net zero emissions by 2050 through improved energy efficiency, rapid expansion of renewables and phasing out coal power. The JETP targets were strongly influenced by the IEA's 2022 report, [Energy Sector Roadmap to Net Zero Emissions in Indonesia](#).

In 2023, the IEA supported Indonesia's JETP as a strategic advisor. The Agency officially chairs its Technical Working Group, whose purpose is to develop a credible and ambitious power sector transition pathway and participates in the JETP's Policy Working Group. The IEA also directed production of the technical chapter of the [JETP Comprehensive Investment and Policy Plan](#).

Our engagement in the JETP is set to continue in 2024, including through our participation in a new working group focused on Energy Efficiency and Electrification. The IEA will oversee the production of a roadmap focused on aligning Indonesia's off-grid industrial facilities with a low-carbon pathway and will help support its implementation.

## Sectoral policy packages for energy efficiency: Industry, transport and buildings

The IEA conducted a survey in 2023 of existing energy efficiency portfolios in the context of a net zero pathway that could guide the prioritisation of new and enhanced measures across all of Indonesia's industrial sectors. We delivered a comprehensive policy review of energy efficiency for Indonesia to the Ministry of Energy and Mineral Resources (MEMR). Throughout the year, we helped build capacity for meeting Indonesia's energy efficiency obligations and gave technical guidance on energy efficiency policies for buildings.

We also provided policy guidance and analytical support to the MEMR on fuel standards for the transportation sector. The topic is particularly relevant, since freight transport by road plays a central role in Indonesia's economy and is a major source of demand for energy, particularly oil. Heavy trucks account for almost 40% of total energy consumed by the country's road transport sector and trucks are currently responsible for emitting 50 million tonnes of CO<sub>2</sub> per year – around half of all Indonesian CO<sub>2</sub> emissions from transport. We were delighted when the ministry announced plans in March to [introduce fuel economy standards for trucks](#).

## Renewables and power markets in Indonesia

The overarching goals for the IEA's participation in the JETP working groups in 2023 were:

- to support the design of a power system development pathway towards 2030 and 2050, compliant with the JETP,
- offer guidance on coal flexibility and retirement,
- advise on the expansion of the country's grid and power fleet.

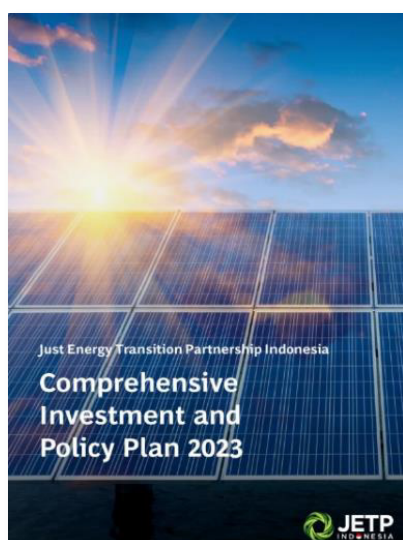
In March 2023, the Technical Working Group (TWG) was formally established in Jakarta. As an official chair, the IEA coordinated and led the group's efforts,

overseeing contributions from various institutions, including the World Bank, the US-based Rocky Mountain Institute, the Institute for Essential Services and Reforms – an Indonesian think tank – and the Indonesia-Denmark Energy Partnership Programme (INDODEPP).

The TWG's work also involved continued interaction with Indonesian institutions on all levels to guarantee buy-in to the project and to facilitate the exchange of information with, among others, the leadership in MEMR and the state electricity company PLN, the JETP Secretariat, Indonesia's Ministry for Maritime and Investment Affairs (MARVES) and members of other working groups.

The IEA organised a series of workshops to assist PLN on interconnected power systems:

- May in Paris: A workshop with a technical team from PLN to assess and assist their modelling efforts for planning different scenarios for the power system development. It allowed PLN to carry out more granular and detailed studies on the development plans than those done before.
- June and July in Jakarta: Assistance on the modelling efforts continued to support PLN in improving analysis of the projection plans and collaborate closely with PLN financial analysts.
- July in Jakarta: the JETP Secretariat organised a series of high-level meetings with MARVES, MEMR, PLN and members of the Technical Working Group to propose and agree on a strategy to unify visions for the power sector development in Indonesia. Guided by IEA experts, the two-week-long workshop ended with an agreement on an action plan and initial modelling results that combined the vision of all actors involved.



In addition to a techno-economic analysis of different possible power systems, IEA experts were responsible for inputs to the Comprehensive Investment and Policy Plan (CIPP) for solar PV supply chain development in Indonesia. This topic has been identified by the Indonesian government and other JETP stakeholders as a key focus area for investment and policy action and was therefore central to the energy transition process envisioned in JETP. The IEA provided insights on the global and regional solar PV supply chain – including present manufacturing capacity and development expected in the coming years, as well as estimates of investment costs and the potential for job creation.

We identified what had been the main challenges preventing development of large-scale PV manufacturing market in the past. We also highlighted the risks and possible benefits of supporting domestic manufacturing in Indonesia and provided recommendations for policy action.

The IEA's contributions to the CIPP were especially pertinent, since Indonesia is expected to significantly increase its installed solar PV capacity. Producing a large portion of PV equipment domestically should enable Indonesia to capture a larger share of the added value, create additional jobs and increase energy security – all of which will contribute to a successful energy transition.

The IEA's contributions to the Technical Working Group and the Policy Working Group reached fruition with the publication of the CIPP in November. The CIPP outlines a viable pathway that aligns with the specified targets and consolidates the vision of all relevant stakeholders. The document emphasises crucial enabling policies for accelerated decarbonisation and identifies priority projects in power transmission, coal phase-out, dispatchable and non-dispatchable renewable energy and renewable energy supply chains.

The CIPP also delineates the additional work required to fine-tune the plan and establish a common understanding on energy efficiency, off-grid coal development and further refinement of the overall decarbonisation pathway. The CIPP marks a significant step forward in the JETP negotiations between the government of Indonesia, the IPG and the Glasgow Financial Alliance for Net Zero (GFANZ), a coalition of global banks, toward financing and implementing the project.

The IEA was commended by MARVES, the MEMR, the JETP Secretariat and PLN for its multiple and sustained efforts in leading the activities of the Technical Working Group and for facilitating an open debate among their institutions. These efforts were also welcomed and praised by members of the IPG and GFANZ groups. The IEA was pleased to contribute to the work that allowed for the JETP process to advance towards funding and implementation and will continue to support these efforts in 2024.

## People-centred clean energy transitions

The IEA Secretariat worked closely with Indonesian stakeholders in 2023 to advance people-centred clean energy transitions. Participants from Indonesia joined virtual events organised as part of the IEA People-Centred Clean Energy Transitions webinar series on topics including citizen engagement, Just Energy Transition Partnerships and informal work. Perspectives from Indonesia on the role of labour in clean energy transitions were collected during the three meetings of the IEA Clean Energy Labour Council, of which Elly Rosita Silaban, President of the Confederation of All Indonesian Trade Unions, is an active member.



## Southeast Asia and ASEAN

### Highlights

- Energy Efficiency Policy in Energy Economies Training Week for Southeast Asia held in October in Jakarta gathered more than 200 energy efficiency professionals from government institutions and their supporting organisations from all ten ASEAN member states, as well as China, Sri Lanka and Pakistan.
- The IEA is providing recommendations to the Thai government for meeting its decarbonisation targets to support the revision of Thailand’s Power Development Plan.
- In 2023, the IEA developed and carried out analyses of multiple pathways to achieving net zero emissions in the power sector in Viet Nam, including a review of the country’s 8<sup>th</sup> National Power Development Plan.
- Presentation of the IEA work on critical minerals at the 9<sup>th</sup> Annual ASEAN Ministerial Meeting on Minerals in Phnom Penh, Cambodia and a high-level official side event at the 8<sup>th</sup> ASEAN Business Forum “Critical Minerals: Opportunities and Challenges for ASEAN” in Bali, Indonesia.
- The IEA’s contributions to regional collective action to advance cross-border trade of electric power in Southeast Asia were recognised in the official communiqué at the 41<sup>st</sup> ASEAN Ministers on Energy Meeting hosted by Indonesia in August.
- Support to regional exchanges on power grids regulation included a workshop with the Energy Market Authority of Singapore organised around ASEAN’s 22<sup>nd</sup> Annual Regional Energy Policy Planning meeting in May and the “Future of the Grid” event co-hosted by IEA and the Southeast Asia Energy Transition Partnership at the Singapore International Energy Week in October.
- A workshop with the ASEAN Centre for Energy and Indonesia’s Ministry of Energy and Mineral Resources to identify opportunities for greater regional collaboration on carbon capture, utilisation and storage.

Southeast Asia is one of the world’s fastest growing regions, both in terms of economies and energy, which means that the future of energy will be significantly influenced by developments that occur there. In addition to its excellent cooperation with Indonesia, the IEA works closely with Thailand and Singapore – valued members of the IEA family – and is working to strengthen cooperation with other members of the Association of Southeast Asian Nations (ASEAN) such as Viet Nam, the Philippines and Cambodia. We work with countries in the region to support their energy priorities and support their clean and secure energy transitions. We provide policy advice and capacity building and ensure that the

concerns of stakeholders across the region are addressed in our analysis and included in the discussions at relevant energy policy events. In light of the importance of the Southeast Asia region, in 2024 the IEA will establish its first ever overseas IEA Regional Engagement Centre in Singapore, as a technical hub to provide further support for the region's clean energy transitions.

Regional cooperation is critical to accelerating clean transitions and the IEA provides ongoing support to ASEAN and the ASEAN Energy Regulators Network (AERN), with particular focus on the integration of renewables. Following the G20 Presidency of Indonesia – a key IEA partner – in 2022, the Agency's engagement with Southeast Asia deepened still further in 2023 with Indonesia's assumption of the ASEAN Chairmanship.

## Energy efficiency: Capacity building and analysis

A major achievement in 2023 was the [Energy Efficiency Policy in Energy Economies Training Week for Southeast Asia](#). Held from 2 to 5 October in Jakarta, this event brought together more than 200 energy efficiency professionals from government institutions and their supporting organisations. Representatives from all ten ASEAN member states – as well as China, Sri Lanka and Pakistan – participated.



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*Participants and panellists at the Energy Efficiency Policy in Energy Economies Training Week for Southeast Asia, Jakarta, 5 October 2023*

The training consisted of five parallel courses that focused on energy efficiency in Buildings, Appliances and Equipment, Industry, Transport and Indicators and

Evaluation. Each course offered a mix of lectures, interactive discussions and practical exercises that allowed participants to learn from international best practices and from each other. An exit survey indicated an extremely high level of satisfaction with the event, with 97% of respondents rating their overall experience in as “good” or “excellent.”



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*Participants of the Energy Efficiency Policy in Emerging Economies Training Week for Southeast Asia with their certificates of completion. Jakarta, 5 October 2023*

During the opening morning of the training week, we also presented a new report, [Future of Buildings in the ASEAN](#), that analyses the opportunities and challenges for grid-interactive buildings in all ten ASEAN member states. Such buildings are becoming a crucial element for achieving net zero emissions globally, since they can combine enhanced energy efficiency with smart digital technologies and decarbonised electricity generation. The event provided opportunities for technical exchanges with government officials from across the region and from international organisations working on energy efficiency.

## Multilateral power trade and integration of renewables

When Indonesia assumed the ASEAN Chairmanship, its Ministry of Energy and Mineral Resources solicited support from the IEA, particularly in advancing a new pilot program to study cross-border trade in electric power: the Brunei Darussalam, Indonesia, Malaysia and Philippines (BIMP) Power Integration Project (PIP). Modelled on a previous multilateral PIP by Lao PDR, Thailand, Malaysia and Singapore, the objective of the BIMP-PIP is to facilitate the transmission of



electricity internationally as part of the broader ASEAN Power Grid (APG) initiative. Concretely, the objectives of Indonesia’s ASEAN Chairmanship were to produce a joint statement by the BIMP governments and to secure the signature of a Memorandum of Understanding by the utilities involved.

Greater regional cooperation and collective action is needed to advance on the BIMP-PIP – and on developing the APG vision in general – and this is what the IEA focused on in 2023. We helped to build capacity for governing institutions to develop a roadmap of actions needed to enable cross-border power trading. Specifically, two workshops were held in Singapore – one in May and one in October. The workshops were attended by government officials, energy regulators and utilities from ASEAN member states as well as private sector entities concerned with the interconnection of power systems.

The IEA co-hosted the first workshop with the Energy Market Authority (EMA) of Singapore, which was timed to follow ASEAN’s 22<sup>nd</sup> Annual Regional Energy Policy Planning-Sub Sector Network (REPP-SSN) meetings. The event, [Seizing Opportunities with Regional Power Grids](#) (30-31 May 2023), drew 160 participants from across the Asia-Pacific region for a day and a half. Based on a satisfaction survey, as well as verbal feedback, the interactive format was highly appreciated, as were the relevance of the topics discussed and the level of detail, which was found to be well-adapted to the cross-sectoral and multi-country setting.



Credits: Energy Market Authority of Singapore..

*Singapore Energy Market Authority (EMA) and IEA delegation with participants of the Singapore-IEA Regional Training Programme on Seizing Opportunities with Regional Power Grids, 31 May 2023.*

A second workshop was organised [on 26 October](#), during the Singapore International Energy Week, as part of the Future of the Grids programme. It was co-hosted by IEA and the Southeast Asia Energy Transition Partnership (ETP), a multi-donor initiative managed by the United Nations Office for Project Services (UNOPS). The event – which was attended by 60 participants from utilities, regulators, equipment manufacturers, financing institutions and think tanks – included a [panel](#), followed by roundtable discussions and an interactive session analysing the key focus areas for advancing the goals of the APG initiative.

In addition, the IEA produced a [commentary](#) on the importance of intergovernmental agreements for interconnecting powers systems, as well as an article about areas for short-term priority action for advancing regional interconnection. These contributions from the Agency were recognised in the official communication at the 41<sup>st</sup> ASEAN Ministers on Energy Meeting (AMEM) that was hosted by Indonesia in August.

The IEA also contributed to the [ASEAN Energy Business Forum](#), which took place alongside the AMEM. Other dissemination activities by the IEA included: a presentation in Cambodia in November on strengthening EU-ASEAN Cooperation on the Green and Digital Transition; a session on Power Trading and Interconnectivity in ASEAN, held in the Singapore Pavilion at COP28 in Dubai; a meeting of international partners for gathering inputs on regional power markets integration to the renewal of the ASEAN Power Grid Memorandum of Understanding; and a [video message to commemorate the 25<sup>th</sup> anniversary](#) of the founding of the ASEAN Centre of Energy.



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*Participants of the meeting of international partners involved in advancing regional integration with the ASEAN Power Grid meeting hosted by ASEAN Centre for Energy, November 2024*



## Climate resilience of electricity networks in Southeast Asia: Focus on interconnections

The IEA advanced its analysis of climate-resilient electricity networks in Southeast Asia in 2023. The Agency conducted modelling for climate risk and made impact assessments using the latest IPCC climate models and GIS analyses. Some of the preliminary findings were included in a Special Report, [Electricity Grids and Secure Energy Transitions](#), that the IEA published in October.

That analysis informed another IEA report, *Global Transboundary Climate Risk Report: Energy and Sustainable Energy Transformation* (to be released in 2024) that discusses the impact of climate change and extreme weather events on cross-border electricity networks and the cascading risks to people when power supplies are disrupted.

A comprehensive report with the results of the climate risk and impact assessments for Southeast Asian electricity networks is scheduled for publication in early 2024. It will include a list of tailored resilience measures for energy authorities, utilities and grid operators.

Reflecting the increasing interest in climate resilience and adaptation in the energy sector, the IEA was invited to present its important work at several key international conferences on climate change. The Agency organised two events on climate resilience during COP28 in Dubai and presented some of its findings at events hosted by others during the conference – as well as at other international meetings, including the International Conference Energy & Meteorology and the UNFCCC Regional Climate Week.

## Critical minerals in Southeast Asia

### 9<sup>th</sup> ASEAN Ministerial Meeting on Minerals

In November, the IEA's Director of Energy Markets and Security, Keisuke Sadamori, addressed mining ministers at the 9<sup>th</sup> Annual ASEAN Ministerial Meeting on Minerals in Phnom Penh, Cambodia. Mr. Sadamori underlined the need to secure supplies of the critical minerals that are integral to emerging energy technologies, as well as the important role that ASEAN can play in their diversification. The IEA also recommended that ASEAN countries address the environmental, social and governance issues surrounding critical minerals and strengthen their capacity building efforts to maximize regional potential in this area.

## ASEAN Ministers of Energy Meeting and ASEAN Energy Business Forum

A team from the IEA attended the 41<sup>st</sup> Annual ASEAN Ministers of Energy Meeting and the 8<sup>th</sup> ASEAN Energy Business Forum, both of which took place in Bali in August. At the request of Indonesia as this year’s ASEAN Chair, the IEA hosted a high-level official side event: “Critical Minerals: Opportunities and Challenges for ASEAN.” It was a great success and attracted significant interest from various stakeholders across the ASEAN region.

Following opening remarks by Dr. Tri Winarno, Director of Mineral and Coal Program Development at Indonesia’s Ministry of Energy and Mineral Resources and Hendi Prio Santoso, President Director of MIND ID (the largest nickel miner in the world), IEA experts presented the Critical Minerals Market Review 2023 and shared the implications of its findings for ASEAN. The presentation prompted many questions from the audience on the impacts of secondary supply, the importance of developing skilled talent, bottlenecks to investment and the IEA’s activities when it comes to environmental, social and governance (ESG) issues.



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*Tae-Yoon Kim, senior energy analyst, presents the IEA’s Critical Minerals Market Review 2023 at a high-level official side event at ASEAN Energy Business Forum, Bali, August 2023*

IEA experts also moderated a panel discussion about scaling up investment in the region. The panellists included: Hasudungan Eric Mamby, Head of Mineral Development at Indonesia’s Ministry of Energy and Mineral Resources (MEMR); Keiju Mitsuhashi, Energy Director for the Pacific and Southeast Asia at the Asian Development Bank; and Zulfikar Yurnaidi, Senior Officer with the ASEAN Centre

for Energy. They shared insights on the need for a roadmap for expanding the value chain in the region that builds on each country's competitive strengths. They also discussed major investment opportunities, key challenges and the importance of sharing technology, knowledge and capacities.

This panel was followed by a session on sustainable and responsible mineral development, moderated by Dr. Hariyanto, Head of Mineral, Coal and Geothermal Resources at MEMR. The panellists included Dewa Wirantaya, Director of Business Development at the Indonesian mining company, PT Aneka Tambang; Matthew Wittenstein, Chief of Section for Energy Connectivity at the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP); and Setiaji Hadiprayitno, Country Managing Partner at ERM Indonesia, a consulting firm. The discussion focused on areas where improvement in ESG performance is most needed, key regulatory and technological challenges and on ways to embed ESG considerations in ASEAN's policy decisions.

## CCUS in Indonesia and the ASEAN context

The IEA organised a workshop with the ASEAN Centre for Energy and Indonesia's MEMR to identify opportunities for greater regional collaboration on carbon capture, utilisation and storage (CCUS). Government representatives from Indonesia and Malaysia outlined their progress in developing regulatory frameworks, a crucial building block for CCUS projects in the region. International speakers gave their perspectives on the lessons learned from deploying CCUS projects abroad, particularly cross-border projects involving more than one country. As individual ASEAN member states look beyond their own borders for CCUS options, these learnings will provide important insights. The ASEAN Secretariat also outlined existing regional platforms for collaboration. The key findings of this workshop were presented on the sidelines of the ASEAN Energy Ministers Meeting in August.

Building on the success and knowledge of those two events, the IEA published a [policy brief on CCUS in Indonesia](#), identifying regulatory avenues to pursue in order for CCUS to play a role in the country's decarbonisation efforts.

## Engagement and collaborations with Thailand

In 2023, Thailand embarked on a revision of its most recent Power Development Plan (PDP). The IEA is providing recommendations to the Thai government for meeting its decarbonisation targets to support this process.

Building on recent work with Thailand on grid integration assessment and power system flexibility, we conducted an analysis of the Thai power system and provided policy guidance. The report found the current PDP to be insufficient for reaching Thailand's decarbonisation goals and proposed additional technologies and measures.

The IEA and the Electricity Generating Authority of Thailand (EGAT) co-hosted an event to launch the report in August, where officials from EGAT, the Thai government and UNESCAP discussed ways to advance the country's power system development. The event was well-timed, since it came as Thai stakeholders were reviewing and drafting their latest national energy plan – creating another opportunity to highlight the IEA's analysis and take its recommendations on board.

The IEA's contribution to the revision of Thailand's PDP was supported by direct exchanges with key stakeholders including the International Affairs Division of the Thai Ministry of Energy, the Energy Policy and Planning Office and EGAT. The IEA also coordinated projects to be delivered in Thailand with multilateral organisations based in Bangkok such as UNOPS, UNESCAP and the United States Agency for International Development (USAID), and with other international partners.

## Clean electricity roadmap in Viet Nam

In 2023, we developed and carried out analyses of multiple pathways to achieving net zero emissions in the power sector, including a review of the Viet Nam's 8<sup>th</sup> National Power Development Plan. The IEA also developed and modelled additional scenarios exclusively for the project, giving consideration to the country's JETP targets for 2030. Additionally, an in-house hourly electricity demand and supply model was developed to support in-depth analysis of electricity reliability and the integration of variable renewables.

IEA experts travelled to Viet Nam in May to meet in person with government officials and representatives of international entities operating in the country. Further activities in 2023 included several technical exchanges with JETP funders and other international groups, as well as participation in a meeting of an informal group organised by JETP funders from the United Kingdom and European Union to identify broad areas of agreement and to discuss differences in our respective analyses. These exchanges brought together several organisations with relevant analysis for Viet Nam, including World Bank, the Danish Energy Agency, Agora Energiewende and the IEA. An initial meeting was held on 31 January 2024, with each group giving presentations on their respective activities, including an IEA presentation showing preliminary results of our analysis on Viet Nam. These activities strengthened the project by ensuring that our analysis is well-coordinated and complementary to the work of others as well as relevant to advancing Viet Nam's clean energy transition.

The IEA plans to continue its engagement with Viet Nam in 2024 and will publish a report summarising the results of its analysis. The intent is to provide a set of comparable scenario pathways to highlight key topics for further consideration in

the planning to 2030 and beyond, including electricity demand pathways, the role of hydrogen and ammonia in the power sector, the role of coal and offshore wind and the integration of growing shares of wind and solar PV. There will be particular emphasis on the investment needs and costs associated with each pathway.

## **Expanding engagement with other Southeast Asian countries**

The IEA also initiated engagement with the Philippines and Cambodia in 2023. These exchanges included meetings with the Department of Energy of the Philippines, as well as meetings in Cambodia with Ministry of Energy officials, including the director general of the Ministry of Mines and Energy. We plan to continue these efforts in 2024 to support national policy processes and enhance multilateral dialogue on energy transitions in the ASEAN region.



# China

## Highlights

- IEA support for power market reforms had a tangible impact on policy reforms in China in 2023 – the Basic Rules for Electricity Spot Markets announced by the National Energy Administration (NEA) and the National Development and Reform Commission (NDRC) aligned closely with IEA recommendations from the report.
- The IEA report [Building a Unified National Power Market System in China: Pathways for Spot Power Markets](#), was released in April 2023.
- The IEA Executive Director made his first visits to China since Covid-19 restrictions were lifted. Meetings were held with the Minister of Energy, Ecology and Environment, Science and Technology, the Head of the NEA, China's Special Climate Envoy and other high-level government officials.
- IEA Deputy Executive Director and the IEA delegation participated in person in China's Energy Conservation Week in July, Asia-Pacific Regulatory Forum in Shenzhen in November and joined other events online, including the Suzhou International Forum on Energy Transition.
- A closed-door workshop with the New and Renewable Energy Department of NEA took place in January to discuss renewable energy policies to support the implementation of China's targets under the 14<sup>th</sup> Five Year Plan for Renewable Energy Development (2021-2025).
- The IEA collaborated closely with NDRC Department of Resource Conservation and Environmental Protection on energy efficiency in public buildings and opportunities for the deployment of heat pumps.
- A [full Chinese translation](#) of the Energy Efficiency 2022 report was published in cooperation with China Council for an Energy-Efficient Economy (CCEEE) and shared with experts from the NDRC and affiliated think tanks with the aim of informing negotiations at COP28.
- Cooperation on financing energy transitions included a webinar on sustainable finance, analysis of the role of sustainable debt in China's clean transition and the launch of the IEA's [World Energy Investment 2023](#), which attracted over 100 000 online participants in China and beyond.

China is the world's largest producer of renewable energy sources like solar and wind, but still faces significant challenges in decarbonising its energy sector, which accounts for almost 90% of domestic greenhouse gas (GHG) emissions. According to the IEA's [Renewables 2023](#) report, the country's renewable energy capacity has surged: China now has commissioned more solar PV than the rest

of the world combined, while new wind capacity grew by 66% year-on-year in 2022. In June 2023, China's government also announced that for the first time, power generated from non-fossil energy sources exceeded 50% of total installed capacity for the first time. Yet despite these achievements, China still faces significant challenges in decarbonising its energy sector, which accounts for almost 90% of its domestic greenhouse gas (GHG) emissions. While the government has underscored its commitment to increasing the share of renewables in the energy system, China still views coal as a crucial “backup” resource considering the current volatility in global energy markets as well as power outages related to extreme weather events. In the absence of adequate long-term energy storage options that would provide greater power system flexibility and given its copious domestic reserves, coal continues to supply more than half of China's total power generation. As a result, China risks not meeting its long-term energy and climate targets.

To help tackle these challenges, the IEA works with China to provide cutting-edge modelling and analytical expertise, policy advice and capacity building, with a focus on supporting the implementation of medium- and long-term energy targets, like the 14<sup>th</sup> Five Year Plan (2021-2025) and the “dual carbon” goals.

The IEA collaborated closely with China's National Energy Agency (NEA), the National Development and Reform Commission (NDRC), the Ministry of Science and Technology (MOST), the Ministry of Ecology and Environment (MEE), the National Bureau of Statistics (NBS) and other government departments in 2023 to support projects and promote discussions related to power market reform, energy efficiency, clean energy investment, climate targets, energy data and statistical methodologies. In addition to the increased recognition that the IEA received from Chinese policy makers and media for its international engagement and advice on energy issues, the Agency's impact on Chinese policy in 2023 was significant. For example, the recommendations of an IEA report on how spot markets for power can support a unified national power market system in China (April 2023) were ultimately reflected in national policy.

## Energy efficiency in China

### Close cooperation with the NDRC

The IEA continued to strengthen cooperation with China on energy efficiency and demand-side flexibility through a series of high-level and technical engagements in 2023. These included direct online exchanges at the Deputy Director Level with the NDRC's Department of Resource Conservation and Environmental Protection in January. The discussions focused on energy efficiency in public buildings and opportunities for the deployment of heat pumps. Further exchanges were held in person at the Division Director level in April 2023 at the IEA's headquarters in

Paris. This dialogue culminated in the signing of a new four-year MoU by Executive Director Birol and the NDRC Vice Chairman Zhao Chenxin during the IEA's 8<sup>th</sup> Annual Global Conference on Energy Efficiency.

The IEA also participated in China's Energy Conservation Week in July, at the invitation of the NDRC. The event is a key annual event promoting energy efficiency practices and behaviour change. Over the course of two technical workshops, IEA experts presented information on energy-efficient cooling and global energy efficiency trends and shared the [Chinese translation](#) of the Agency's *Energy Efficiency 2022* report. They also presented the IEA's latest analysis of efficiency trends in appliances, buildings and the digital demand-side response. Finally, the NDRC supported the online participation of the China National Institute of Standardisation (CNIS) and its affiliated think tank in the annual meeting of the IEA's Energy Efficiency Working Party in October. Chinese government experts shared national policy developments and perspectives on heat pumps and behaviour change with other working party members.



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*IEA Executive Director Fatih Birol and NDRC Vice Chairman Zhao Chenxin during the MoU signing at the IEA's 8<sup>th</sup> Annual Global Conference on Energy Efficiency*

## China's participation in the IEA's 8<sup>th</sup> Global Conference on Energy Efficiency

The 8<sup>th</sup> annual Global Conference on Energy Efficiency also saw strong participation from Chinese stakeholders. Vice Chairman Zhao Chenxin of the NDRC joined a high-level panel with Executive Director Birol and Ministers from Denmark, Kenya and the European Commission, where he shared an update on

China's national energy efficiency progress and emphasised the close relationship with the IEA. Policy makers and industry experts also participated in a range of events, including some organised by the State Grid Corporation of China (SGCC), the Chinese Academy of Sciences (CAS), Energy Foundation China and Wanbang Digital Energy Co., a maker of vehicle charging equipment. China's presence at the conference highlighted the strong relationship between the IEA and energy efficiency policy makers at all levels.

## Publication of Energy Efficiency 2022 and Energy Efficiency 2023 in Chinese

In the first half of 2023, the IEA worked closely with the China Council for an Energy-Efficient Economy (CCEEE) to produce [a full Chinese translation](#) of the *Energy Efficiency 2022* report. That translation was published in March and official launch events were organised both online and in person during the China National Energy Conservation Week. Following the release of the *Energy Efficiency 2023* report in November, the IEA also worked with CCEEE to produce a set of translated slides with the report's main highlights, which were shared with experts from the NDRC and affiliated think tanks in advance of COP28. The translated slides – which focused on the report's key message of the need to double the pace of energy efficiency improvement by 2030 – combined with a series of public WeChat articles helped to raise awareness among Chinese policy makers and practitioners and to raise support for more aggressive efficiency targets. While China did not ultimately sign on to the COP28 climate pledges (which included doubling energy efficiency targets), the IEA is continuing its efforts to engage with China on raising its energy efficiency ambitions.

## Energy efficiency opportunities for the building sector

The IEA also focused on developing closer engagement and exchanges in the building sector through a detailed analysis of China's building code, as well as exchanges on grid-interactive efficient buildings and on ways to accelerate the deployment of heat pumps.

The IEA engaged closely with the Chinese Academy of Sciences (CAS) through a series of high-level digital forums in Shenzhen that included a presentation from IEA experts on grid-interactive buildings at the International Digital Energy Expo 2023 and at the Suzhou Energy Transition Forum. IEA experts also gave presentations at two online workshops organised by Energy Foundation China and the European Chamber of Commerce in China, sharing our latest analysis and findings on grid-interactive buildings and behind-the-meter demand-side response. The IEA also worked with CAS to develop a detailed breakdown of China's latest National Building Code, which was used to inform a developing global database for tracking and comparing national building codes. That work

also provided direction for analysis under an ongoing project on heat pumps. Information from this analysis informed the [Energy Efficiency 2023](#) report as well.

The IEA also worked to develop its relationship with China's Ministry of Housing and Urban-Rural Development (MOHURD). In December, a delegation from MOHURD visited the IEA headquarters, where experts from both sides exchanged on best practices for promoting energy efficiency in the building sector, with a particular focus on energy efficiency certificates and lessons learned in Europe. The session also included a dialogue on heat pumps, focusing on opportunities for promoting adoption in public, commercial and residential buildings as well as the related challenges. Policy makers from both the national and provincial level – including from Shanghai and Anhui provinces – were present for these exchanges.

Cooperation on heat pumps was strengthened via a series of activities throughout 2023. In July, IEA analysts presented the IEA's [Energy Efficiency 2022](#) and [Future of Heat Pumps](#) reports during a workshop organised by Tsinghua University Buildings Energy Research Centre (BERC) and engaged in detailed discussions on international policy developments. Together with Tsinghua BERC, the IEA also organised exchanges with Energy Foundation China, the China Heat Pump Association (CHPA), the CNIS and others about the future of heat pumps in China.

## Participation in IEA Energy Efficiency in Emerging Economies Training Week

Key Chinese policy makers participated in energy efficiency capacity building and training activities organised by the IEA. In April, 6 representatives from the NDRC and its Energy Research Institute (ERI), Tsinghua University, the China Quality Certification Centre (CQC), the National Energy Conservation Centre (NECC) and the CNIS took part in the Energy Efficiency Policy in Emerging Economies Training Week held in Paris. Five courses were offered – Buildings, Appliances and Equipment, Industry, Smart Cities, and Indicators and Evaluation – which promoted cross-country learning between practitioners from more than 40 countries. During the week, a representative from CNIS gave a presentation on China's use of QR codes to label the energy efficiency of appliances – highlighting for other countries the success of this policy measure. Representatives also attended a closed-door meeting with IEA experts to share latest policy updates in industry, transport and buildings sectors.



## Renewable energy

### Policies for implementing China's Five Year Plan for Renewable Energy

In January, the IEA held a closed-door workshop with the New and Renewable Energy Department of the National Energy Administration (NEA) to discuss renewable energy policies to support the implementation of China's ambitious targets under the 14<sup>th</sup> Five Year Plan for Renewable Energy Development (2021-2025). The IEA highlighted the potential for bioenergy and renewable heat applications, while the NEA indicated its plans for a green certificate policy and suggested closer collaboration in this area.

Those exchanges continued in January 2024, when the IEA and NEA held another closed-door workshop focusing on international policy best practices on green certificates, as well as the IEA's latest findings on China's renewable energy development and avenues for continued cooperation and policy input in 2024. The NEA provided a comprehensive overview of China's renewable energy market developments, policy targets and the challenges linked to building out the sector.

## Support for power market reforms in China

### Building a unified national power market system in China

The IEA report, [Building a Unified National Power Market System in China: Pathways for Spot Power Markets](#), was released in April 2023. It examines the role of power markets in China and the pathways to developing a national market. The analysis focuses on short-term markets, which have the potential to unlock the flexibility needed by the system, considering renewable energy growth and changing weather patterns. The report provided recommendations to improve the coordination of markets across the country and within provinces. The full text of the report was [translated into Chinese](#) to ensure broader dissemination of the results in China.

The report was launched at an event co-organised by Energy Foundation China in Beijing on 25 April. Keisuke Sadamori, the IEA's Director of Energy Markets and Security and Zou Ji, the chief executive of Energy Foundation China, gave opening remarks. The report's presentation was followed by a panel discussion between four eminent Chinese power sector experts, including the former Vice President of State Grid Energy Research Institute. Sixty participants joined the event in person in Beijing and another 6 600 followed it online through a livestreaming platform. The launch event and the report received extensive media coverage in Chinese media, including both print and digital editions of China Daily, the state-owned English-language newspaper.



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*Presentation of the report Building a Unified National Power Market System in China  
Beijing, 25 April 2023*

Thanks to the quality of the analysis delivered and the involvement of Chinese authorities in the project (notably through a closed-door workshop with the NEA and their selected experts during the peer-review phase) the report had a tangible impact on policy reforms in China. Some of the recommendations from the report were reflected in a policy (Basic Rules for Electricity Spot Markets) that the NEA and the NDRC announced in September 2024. In November, a representative from the NEA confirmed that the IEA's report was very well received and directly informed national policy recommendations.

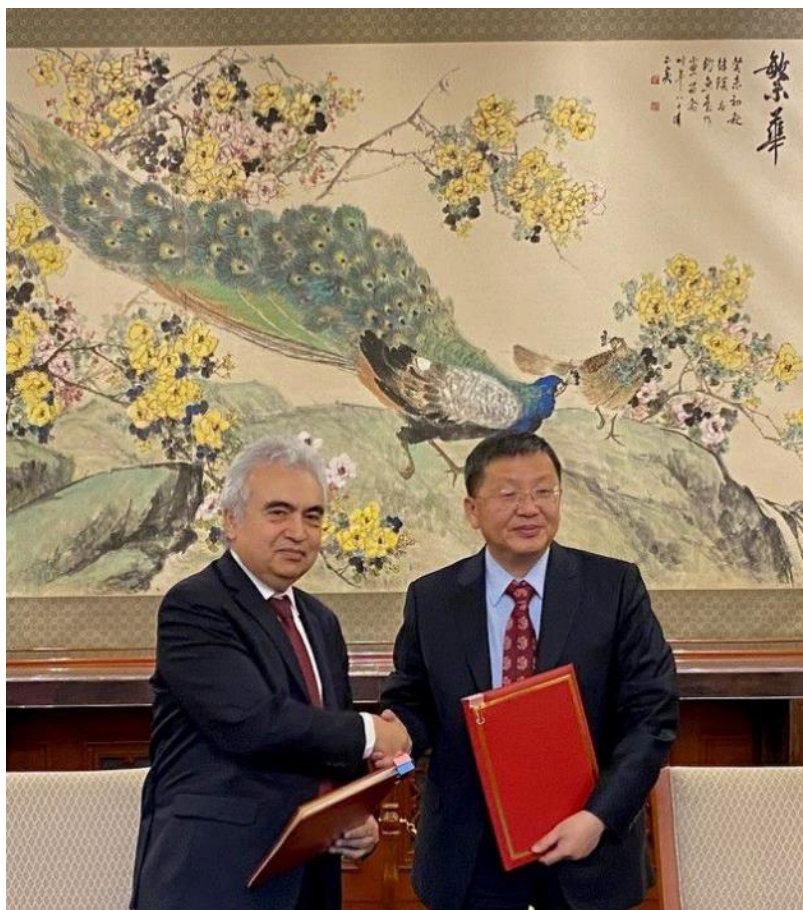
## Webinar on reforming power markets to accelerate China's energy transition

On 13 September, the IEA co-organised a [webinar on power market reform](#) with China's Electric Power Planning and Engineering Institute and the Rocky Mountain Institute. This dialogue expanded upon the analysis presented in the IEA report on unified power markets. More than 200 participants joined via Zoom, while approximately 5 000 others followed the discussion on Chinese livestream platforms, underscoring the significant interest and engagement these topics evoke among Chinese and international power sector experts.

## High-level exchanges with China

Close exchanges with the Chinese government were supported by high-level engagements. In July, IEA Executive Director Dr Fatih Birol travelled to Beijing, where he signed the third Three-Year Work Programme (2023-2025) with China's Energy Minister and Administrator of the National Energy Administration, Zhang Jianhua, to further strengthen cooperation and support China's clean energy

transition, with a particular focus on renewable energy, hydrogen, CCUS and energy efficiency. The Executive Director discussed a range of energy security and climate issues with China’s Special Climate Envoy Xie Zhenhua, Minister of Ecology and Environment Huang Runqiu and the Minister of Science and Technology Wang Zhigang. At COP28 in Dubai he again met outgoing Special Climate Envoy Xie Zhenhua and his successor Liu Zhenmin. Denmark’s Ambassador to China hosted a reception in honour of the Executive Director with representatives from IEA member and association countries.



*IEA Executive Director with China’s Energy Minister Zhang Jianhua in Beijing, 6 July 2023* IEA. All rights reserved.

In November, the IEA Deputy Executive Director Mary Warlick visited Beijing and held a series of bilateral meetings with representatives from China’s NEA and the National Bureau of Statistics to deepen technical exchanges, capacity building and align statistical methodologies. She also met the Asian Infrastructure and Investment Bank to discuss investment needs and mechanisms to accelerate clean energy deployment. She participated in an event hosted by the German Embassy with IEA member and association countries to discuss challenges in China’s energy transition, supply chain issues and investments in clean energy technologies. She also gave a keynote speech during the opening ceremony of the 6<sup>th</sup> Asia-Pacific Energy Regulatory Forum in Shenzhen to present the IEA’s



[Electricity Grids and Secure Energy Transitions](#) report, released in October 2023. The Deputy Executive Director was accompanied by IEA analysts who provided a more detailed presentation of the *Electricity Grids* report during the forum on Digital Technology for Green Energy Transition which was attended by around 80 participants.



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*IEA Deputy Executive Director Mary Burce Warlick at the 6<sup>th</sup> Asia-Pacific Energy Regulatory Forum in Shenzhen, 16 November 2023*

## Accelerating sustainable energy investment in China

### Publication of *World Energy Investment 2023* in China

In May, the IEA published [World Energy Investment 2023](#), a report that provides a full update on global energy investments in 2022 and an initial reading of the emerging picture for 2023. The report provided a global benchmark for tracking capital flows in the energy sector and examined how investors are assessing risks and opportunities across all areas of fuel and electricity supply, critical minerals, efficiency, research and development, and energy finance. It focuses on some key features of the new investment landscape that are already visible, including the policies now in place that reinforce incentives for clean energy spending; the energy security lens through which many investments are now viewed; widespread cost and inflationary pressures; the major boost in revenues that high fuel prices are bringing to traditional suppliers; and growing expectations in many countries that investments should be aligned with solutions to the climate crisis.

Following the report's international release, the IEA, together with Energy Foundation China and Peking University, organised a [launch event in China](#) on 20 September to present the key findings to local audiences and discuss the common challenges and opportunities facing China and international stakeholders when it comes to leveraging investment for a cleaner energy future.

## Webinar on sustainable finance for clean energy in ASEAN

On 17 October, the IEA together with the Energy Foundation China and the ASEAN Centre for Energy held a [webinar on sustainable finance](#) for clean energy in Southeast Asia. This virtual workshop brought together policy makers and experts from China and ASEAN to share experiences and strategies for using sustainable debt instruments to fund clean energy projects. It provided an important platform for countries to share experiences and lessons learned in developing markets for so-called green, social and sustainability (GSS) bonds and raise awareness about sustainable debt instruments among potential issuers. This webinar also supported the implementation of Phase II (2021-2025) of ASEAN's 10-year Plan of Action for Energy Cooperation (APAEC) – especially its Regional Energy Policy and Planning programme, designed to enhance regulators' capabilities in attracting investments in energy infrastructure and technologies.

The introductory session provided an overview of sustainable finance trends in the region and included the IEA's latest analysis of China's sustainable debt market (outlined below). It also presented the future priorities for ASEAN regulators. The second session focused on lessons learned from practitioners in China and other ASEAN countries, highlighting both regulatory elements and concessional tools (financial instruments and mechanisms) that have proved most helpful for kickstarting sustainable debt markets elsewhere in the region. It also identified areas where further work is necessary. The sessions triggered interest and discussion among participants and will also help strengthen future IEA analysis and recommendations.

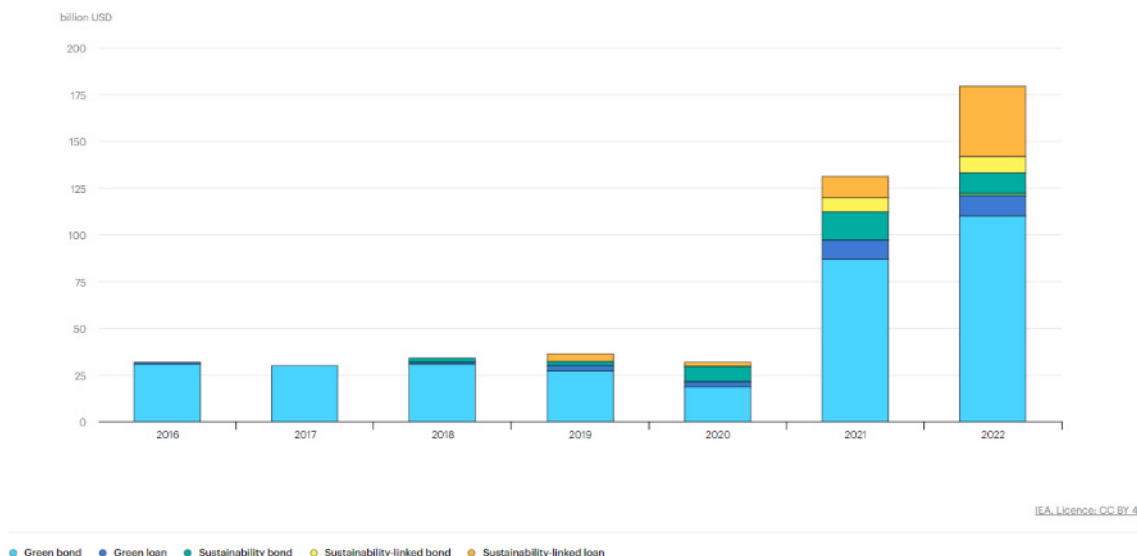
## Analysis of sustainable debt

In addition to the events mentioned above, on 30 October, the IEA published an analytical article focusing on [how sustainable debt can help support China's energy transition](#).

The paper discusses the rapid growth and evolution of the market for sustainable debt instruments, which allocate funds to predefined activities or projects with strict reporting and verification requirements. It highlighted the different types of sustainable debt – including green, social, sustainability and transition bonds – and showed how they are quickly becoming a key tool for financing environmentally friendly and sustainability-focused initiatives.



## Sustainable debt issuance by type in China, 2016-2022



Source: IEA (2023), [How can sustainable debt support China’s energy transition?](#)

The report also showed how China has emerged as a significant player in sustainable debt – particularly in green bonds, where it is already the world's second-largest market. Notably, China’s state-owned banks have played a pivotal role in driving the market’s expansion, in contrast to OECD economies, where it is the private sector that tends to take the lead in sustainable finance efforts. The Chinese experience offers valuable lessons for emerging sustainable debt markets, emphasising the importance of government policy support and the need for harmonising and enforcing regulations to ensure the credibility of these instruments.

The article marks the first time the IEA has been able to carry out a deep dive on the Chinese sustainable finance market. Its analysis is expected to feed into 2024’s *World Energy Investment* report. While sustainable finance can support energy transitions globally, the trend is currently heavily weighted to advanced economies. Having a greater understanding of how other prominent markets operate will strengthen the availability of broader analysis on this important topic.

## Brazil

### Highlights

- IEA experts worked with the Ministry of Mines and Energy to revise its National Energy Efficiency Plan, with an emphasis on strengthening governance.
- The IEA collaborated with Empresa de Pesquisa Energética (EPE), an official government energy research office on its Atlas of Energy Efficiency Brazil 2023, which included a special chapter on energy use in the residential sector.
- The IEA supported the development of a roadmap to double the efficiency of electrical appliances in Brazil by 2030.
- The IEA and Brazil reinforced their close cooperation on energy statistics and data, with the IEA delivering an in-person training session in Brasilia in November, for officials at the Ministry of Mines and Energy and the EPE.

Beginning with their first joint work programme signed in 2011, the IEA and Brazil have established an excellent bilateral relationship – one that has only deepened since Brazil became an association country of the IEA in 2017. In 2023, Brazil's high level of engagement in preparing the [Latin America Energy Outlook](#) brought the two sides still closer. Brazil was an active participant in the technical and high-level meetings where the report was drafted and throughout the peer-review process. Brazil provided multiple opportunities for high-level engagement with the Ministry of Foreign Affairs, the Ministry of Mines and Energy and with the Brazilian embassy in Paris. Those efforts have laid the foundation for further bilateral cooperation as Brazil assumes the G20 Presidency in 2024.

Over the course of 2023, the IEA and Brazil broadened their collaboration on energy efficiency through training events, publications and participation in global events, such as the annual Energy Efficiency Conference. Furthermore, the IEA and Brazil maintained a close cooperation on energy statistics and data, with the IEA delivering an in-person training session in Brasilia for officials at the Ministry of Mines and Energy (MME) and Empresa de Pesquisa Energética (EPE), a government energy research office. The main purpose of the training was to support Brazil in its transition to reporting annual energy statistics as if the country were an OECD member, by increasing the quality and coverage of its data.

## Energy efficiency in Brazil

### Benchmarking analysis and policy recommendations for key industries

The IEA has established a robust relationship with the MME in Brazil. In 2023, IEA experts actively assisted the ministry in revising its National Energy Efficiency Plan, with an emphasis on strengthening governance.

The IEA also worked with EPE to produce both the 2022 and 2023 editions of its Atlas of Energy Efficiency Brazil. The primary goal of this document is to track the advancement of energy efficiency in Brazil through comprehensive indicator analysis. The [Atlas of Energy Efficiency 2022](#) included a special chapter on the Brazilian iron and steel sector. The 2023 [edition](#) featured a chapter dedicated to the residential sector, which offered an in-depth analysis of the national and international aspects of energy use in the residential sector, breaking down consumption by end-use and income class. Both publications were developed as a collaborative effort between EPE and the IEA.



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Cooperation with Brazilian institutions also contributed significantly to the policy analysis on energy efficiency included in the IEA's comprehensive Special Report, [Latin America Energy Outlook 2023](#) and the [Energy Efficiency 2023](#) market report, enriching the content with a multitude of case studies and in-depth analyses.

### Advancing key indicators to reflect the impact of efficiency programmes

Working together with two Brazilian initiatives, the Esplanada Eficiente (Programme for Energy Efficiency, or PEE) and PotencializEE (Promoting Investments Energy Efficiency in Industry Programme), the IEA collected and documented evidence in 2023 that highlighted the benefits of energy efficiency efforts in Brazil. As part of this collaboration, IEA developed a practical tool for

registering data quantifying these benefits in municipal buildings. The aim of the tool is to support well-informed decisions and encourage the widespread adoption of energy-efficient practices throughout the country. The IEA's Office of Energy Efficiency and Inclusive Transitions (EEIT) also translated a paper [promoting the multiple benefits of efficiency into Portuguese](#).

### Supporting the doubling of appliance efficiency

The IEA supported the development of a roadmap to double the efficiency of electrical appliances in Brazil by 2030, to be published in 2024. The IEA's online course on energy-efficient appliances is being translated into Portuguese and will serve as a resource to support implementation of the roadmap.

## Training on the reporting of annual energy data

In 2023, the IEA consolidated its longstanding data collaboration with the MME, which is fundamental to the dissemination of high-quality energy statistics for Brazil. The IEA also proposed improvements, including ways to increase disaggregation in the energy balance. It also suggested that Brazil provide more information on its trading partners for oil, coal or natural gas, which would allow for a more granular picture of the country's energy systems.

In November, the IEA's Energy Data Centre organised a five-day in-person training for MME staff in Brasilia. The goal was to support the transition to a new way of reporting Brazil's annual fuel data using the IEA's Annual Questionnaires. Using this methodology – the same one used by OECD and Eurostat countries – increases data quality and coverage and is fully compliant with the International Recommendations for Energy Statistics (IRES). Around 50 people attended the training. Participating institutions included: the MME, the National Agency for Petroleum, Natural Gas and Biofuels (ANP), the Energy Research Company (EPE), the Electricity Trading Chamber (CCEE) and Petrobras, the state-owned oil company. Various divisions of the MME participated, including the Department of Information, Studies and Energy Efficiency (DIEE) and the Department of Petroleum, Natural Gas and Biofuels, as well as the Department of Electric Energy.



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*Participants of the training for MME staff in Brasília, November 2023*



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*Training on the IEA data reporting for MME staff in Brasília, November 2023*

The event led to better collaboration, improvements in the quality and coverage of the IEA’s annual energy data for Brazil and to a commitment by Brazil to submit its Annual Questionnaires for the 2023 reference year to the IEA by the end of 2024. In their final remarks, Gustavo Santos Masili, Director of the DIEE and Esdras Godinho Ramos, the DIEE’s General Coordinator of Information, expressed their satisfaction with the training, which was the first such event to take place in Brazil since it became an IEA association country in 2017: “The MME is making efforts to send energy data in accordance with the reference methodology, in the format that OECD countries do. In this way, Brazil’s energy data is better represented internationally”, Mr. Ramos said.



The IEA also consolidated its broader collaboration with Brazil in areas beyond the fuel questionnaires. End-use data and efficiency indicators were also discussed during the training event, for example. Brazil shared its data on research, development and demonstration budgets with improved timeliness and provided extended time series. End-use energy prices of fuels and monthly electricity supply data were also collected – the latter retrieved through desk research by the IEA. All such activities make it possible to broadly disseminate energy data for Brazil in comparable formats.

## Latin America

### Highlights

- The [Latin America Energy Outlook 2023](#), released in November, provided the IEA's first comprehensive overview of energy and resource trends and reinforced the IEA's ties with countries in the region.
- On 8 November, the IEA Executive Director, participated in the online launch of the report, an event that attracted more than 9 300 viewers from around the world.
- On 7 November, the IEA's Deputy Executive Director and the report's authors presented the findings at the OLADE Energy Week conference in Montevideo, Uruguay.
- The IEA's High-Level Expert Workshop hosted by the UN's Economic Commission for Latin America and the Caribbean took place in March in Santiago, Chile and brought together 160 senior government officials, energy experts, industry leaders and civil society representatives from 16 countries.
- The Energy Efficiency Roundtable took place on the sidelines of the IEA's 8<sup>th</sup> Annual Global Conference on Energy Efficiency Conference in Versailles in June, with participation of high-level officials from Argentina, Brazil, Costa Rica and Uruguay.
- The IEA held several bilateral consultations on the preliminary findings of the Latin America Energy Outlook 2023 and how national policies and targets would shape the energy transitions of Argentina, Brazil, Colombia, Chile and Costa Rica – countries highlighted in the report.
- The IEA also released the report [Boosting Efficiency in Latin America](#) and its translations in [Spanish](#) and [Portuguese](#).
- The IEA strengthened its cooperation on regional standards for appliances with SICA – a body that promotes integration and cooperation in Central America. This included a presentation to SICA's Technical Working Group on Energy Efficiency on standards for energy-efficient lighting systems and a training session on the outlook for and trends in energy efficiency.

The year 2023 was a milestone for cooperation between the IEA and countries in Latin America and the Caribbean, exemplified by the publication of the [Latin America Energy Outlook](#) – the IEA's first comprehensive outlook of energy and resources in the region. The report explores the opportunities and challenges that lie ahead and provides insights on the ways in which the outlook for the region and the biggest global energy trends are deeply intertwined. The report not only succeeded in mapping out Latin America's potential for impact on global

energy transitions, but it also opened the door for further bilateral engagement with countries across the region.

Throughout the year, the IEA provided analysis on the topics most relevant to the challenges Latin American countries face on their paths to energy transition. The IEA produced commentaries and delivered policy recommendations on subjects ranging from power markets and access to electricity, to energy efficiency regulation and initiatives and the participation of local communities in establishing regulatory frameworks, as well as critical minerals and the potential to produce low-cost, low-emission hydrogen – all of which helped to support the dialogue on clean energy transitions in the region.

The IEA also welcomed the participation of several Latin Americans in its training sessions, seminars and at the annual Global Energy Efficiency Conference.

## Latin America Energy Outlook

Work on the [Latin America Energy Outlook 2023](#) was initiated in January 2023, with an official letter from the IEA's Executive Director to energy ministers across Latin America. The letter announced the Agency's plans for the forthcoming report and asked each country to nominate a point person for all exchanges and collaboration regarding the study.

On 14 February, the IEA held its first ever meeting with Latin American diplomats in Paris to discuss its preparatory work on the report and gave an overview to the 17 country representatives present of the cooperation that would be needed. On 28 February, we held a meeting with the nominated points of contact from 14 countries to provide a more precise outline of the report and its scope, explain the main milestones of the project and detail their roles in the preparation of the report. Attendees also initiated preparations for a High-Level Expert Workshop that took place in March.

### High-Level Expert Workshop

Those in-person meetings took place from 16-17 March in Santiago, Chile. Hosted by the UN's Economic Commission for Latin America and the Caribbean (ECLAC), the workshop focused on the challenges and opportunities for the region as countries implement their energy and climate strategies. The proceedings helped to frame the key areas of analysis for the Energy Outlook report. The event brought together 160 senior government officials, energy experts, industry leaders and civil society representatives from 16 countries.

The workshop was formally opened by ECLAC Executive Secretary José Manuel Salazar-Xirinachs and IEA's Deputy Executive Director, Mary Warlick, followed by introductory remarks by Andrés Rebolledo, Executive Secretary of the Latin

American Energy Organisation (OLADE) and a keynote address by US Deputy Energy Secretary David Turk. Secretary Turk encouraged policy makers to set more ambitious climate targets and take advantage of the opportunities provided by clean energy transitions.

In subsequent sessions, Chile's Energy Minister Diego Pardow focused on people-centred transitions, while Costa Rica's Vice Minister of Energy Ronny Rodríguez Chaves and Walter Verri, Deputy Minister of Industry, Energy and Mining for Uruguay, shared some of their countries' energy transition experiences. Argentina's Deputy Secretary of Energy Planning, Cecilia Garibotti, discussed the role of renewables in the region. High-profile moderators included Agnes da Costa, Director of the Brazilian power regulator ANEEL; Luiz Barroso, a former President of EPE, the Brazilian Energy Planning Agency; and Luisa Palacios, a senior research scholar at Columbia University's Center on Global Energy Policy.

The workshop focused on five themes: 1) the state of the regional energy transition and how to turn national pledges into action; 2) hydropower, bioenergy and variable renewables; 3) people-centred clean energy transition pathways; 4) clean transport, sustainable cities and energy efficiency and 5) opportunities within clean energy to attract investment and optimise resources.

## Regional consultations and bilateral discussions

Building on the already existing network of energy experts in the region, as well as on the recommendations provided by the government focal points, the IEA organised a series of technical meetings to discuss in detail the challenges, resources, approaches and priorities around key topics covered in the report.

From March to July, we held a series of bilateral sessions to confirm the IEA's assumptions and input data, to refine the analysis and to test the usefulness of the recommendations. It was important to discuss the initial findings with the countries of particular focus in the Latin America Energy Outlook, such as Argentina, Brazil, Colombia, Chile and Costa Rica. Government representatives, including energy modellers and officers in charge of long-term planning, joined to provide valuable input. We also held technical meetings bringing experts on specific topics relevant for Latin America such as just energy transition, critical minerals, the future role of hydrogen, and transition of producer economies.

We also held an Energy Efficiency Roundtable at the margins of the annual Energy Efficiency Global Conference in Versailles in June, with participation of high-level officials from Argentina, Brazil, Costa Rica and Uruguay. Finally, a hybrid meeting to update the designated national points of contact as well as embassy representatives and to announce the schedule for peer-review took place on 11 July.

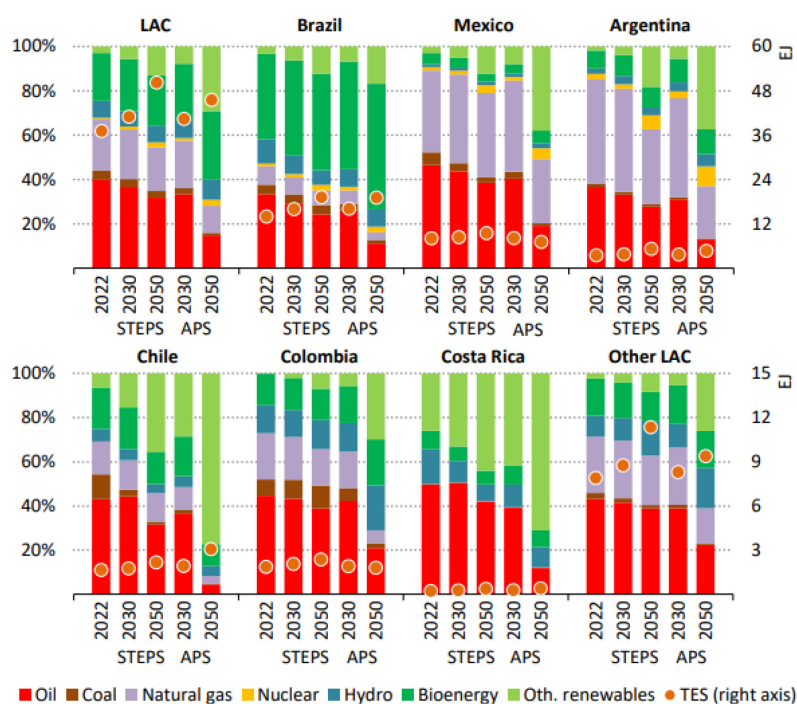
In parallel, we carried out a policy mapping exercise for Latin America, collected relevant data and developed new sections of the IEA's Global Energy and Climate Model to include energy systems from the region that informed the analysis. This work included the development of special country models for Argentina, Chile, Colombia, Costa Rica and the update of the country models for Brazil and Mexico.

## Dissemination and impact of the *Energy Outlook*

The [Latin America Energy Outlook 2023](#) was formally released in November. As the IEA's first in-depth and comprehensive assessment of Latin America and the Caribbean, the report built on decades of collaboration with partners and on a comprehensive and inclusive consultation process with relevant stakeholders in the region. In support of the region's energy goals, the outlook explores the opportunities and challenges that lie ahead. It provides the regional outlook and some country specific outlooks, building on national resources and national policies and targets. It also delves into nine areas for policy action such as the potential of energy efficiency, the role that the region could play in global hydrogen and biofuel production, the transition of producer economies, and the required investment and finance to meet net zero goals. It provides insights on the ways in which the outlook for the region and the biggest global energy trends are deeply intertwined – and makes policy recommendations to help Latin America and the Caribbean countries take full advantage of their great potential.



### Total energy supply by fuel and scenario in Latin America and selected countries, 2022-2050



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*Renewables displace fossil fuels in all countries, especially after 2030;  
natural gas sees particularly divergent trends depending on national policies*

Note: TES = total energy supply. Oth. Renewables = other renewables.

Source: IEA (2023), [Latin America Energy Outlook 2023](#).

On 7 November, during the OLADE Energy Week conference in Montevideo, Uruguay, the IEA’s Deputy Executive Director Mary Burce Warlick and the report’s authors presented the report main findings to a high-level audience. The key messages were extremely well received, with compliments given to the IEA team not only for its impressive analysis, but also for the process of close consultation, engagement and review with partners in the region. Thiago Barral, Brazil’s Secretary for Energy Transition and Planning, praised the “amazing work from the IEA that will be an inspiration to the region.” Maria Cecilia Garibotti, Undersecretary of Energy Planning for Argentina expressed “many thanks to the IEA for including all the perspectives of countries.” Other members of the high-level panel that met after the report’s presentation included the Honduran Deputy Energy Minister, Tomás Rodríguez; Fitzgerald Cantero, National Energy Director at Uruguay’s Ministry of Industry, Energy and Mining; and Maria Victoria Ramírez Martínez, the Director of Electric Energy at the Colombian Ministry of Mines and Energy. The panel underscored the importance of people-centred transitions and thinking and planning strategically as a region and it emphasised the opportunities offered by the region’s vast resources.



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*Mary Burce Warlick, the IEA Deputy Executive Director and Brent Wanner, head of the IEA's Power Sector Unit present the Latin America Energy Outlook 2023 at OLADE's VII Energy Week*

On 8 November, the IEA Executive Director Fatih Birol participated in the online launch of the Latin America Energy Outlook – an event that attracted 1 200 viewers from around the world. The Executive Director also met separately with ambassadors and senior diplomats from Latin America – including Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela – whose economies account for 95% of the region's energy demand. Representatives from the French energy companies Total and EDF, as well as L'Institut d'études politiques de Paris, a leading French research university, also attended.



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*Diplomatic representatives of Latin American countries in France with the IEA Executive Director, November 2023*

Further high-profile dissemination events included an in-person presentation by Executive Director Birol at the Inter-American Development Bank (IDB) Pavilion at COP28 that focused on the role of Latin America and the Caribbean in the new world energy economy. IEA experts also participated virtually in the 58<sup>th</sup> High Executives

Meeting of the Commission for Regional Electricity Integration (CIER) to present the outlook report's key findings. Both events reached a total of 200 participants.

The outlook report drew on substantial input from government officials, experts and stakeholders across Latin America and the Caribbean, building on decades of IEA work on energy and climate issues in the region. Since its publication in November 2023, the Latin America Energy Outlook has become a go-to reference for important sectors like energy, critical minerals and producer economies, to name a few. The Executive Summary was translated into [Portuguese](#) and [Spanish](#) and its key findings were cited by multiple local and international news outlets.

## Advancing regional energy efficiency policy

Close and productive consultations around the Latin America Outlook 2023 allowed the IEA to strengthen cooperation on various topics, including energy efficiency. Priority areas of focus included: advancing analysis and dialogue to improve appliance efficiency in the region; bolstering cooperation on net zero buildings; engaging with countries on the social and systems benefits of energy efficiency; and continuing the dialogue on the importance of digitalisation and demand-side management. The IEA's main partners included stakeholders in Argentina, Chile, Colombia, Mexico, Panama, Uruguay as well as SICA (the Central American Integration System).

The IEA also partnered with the Swiss Agency for Development and Cooperation (SDC) to organise a two-day in-person regional training, "[International Seminar on Sustainable and Net Zero Buildings: How to Move Forward Effectively in Latin America](#)", which took place 5-7 June in Bogota, Colombia. The workshop was organised together with the SDC, the Colombia Green Building Council (CCCS), the University of the Andes and the Latin American Development Bank (CAF). The event gathered more than 150 policy makers and key stakeholders from ten countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Peru, Panama and Uruguay) to stress the importance of energy-efficient buildings and identify key policy actions to support their large-scale implementation in the region.

Activities in Latin America in 2023 also included the publication of [Boosting Efficiency in Latin America](#). This report explored the social and systems benefits of energy efficiency policies and programmes and provided evidence and recommendations to build on experiences in the region to drive greater energy efficiency. The publication was followed by a webinar, attended by 300 people from 32 countries. It featured a panel discussion of experts from ANEEL, the Brazilian power regulator, Uruguay's Ministry of Industry, Energy and Mining and the Inter-American Development Bank (IDB). Translations of the report, in [Spanish](#) and [Portuguese](#), were released at the end of the year.

In cooperation with the Super-Efficient Equipment and Appliance Deployment (SEAD) initiative, the IEA held a series of discussions with the Chilean Ministry of Energy and with the International Copper Association (ICA), a trade group, to support discussions of policies promoting efficient motors in industry.

The IEA continued its work with SICA – a body that promotes integration and cooperation in Central America – in its efforts to develop regional standards for appliances. This included a presentation to SICA’s Technical Working Group on Energy Efficiency on standards for energy-efficient lighting systems and a training session on the outlook for and trends in energy efficiency. In addition, we published a [commentary](#) on harmonising energy efficiency standards and labels for appliances and how IEA supports this process in Central America.



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*Participants in the training session for SICA’s Technical Working Group on Energy Efficiency, November 2023*

The support for policy making in Latin America continued, both on a regional level and within key countries. The IEA supported Argentina in 2023 with a technical review of its National Efficiency Plan. It also helped Brazil’s Ministry of Mines and Energy update its National Energy Efficiency Plan.

The IEA participated in the third regional workshop of the Programme for the Rational and Efficient Use of Energy (PMUREE), held in Panama and organised by the IDB. We contributed to the technical discussions to update the Energy Efficiency 2024 Plan and presented the IEA report, [Boosting Efficiency in Latin America](#) (March 2023).

## Boosting Efficiency in Latin America

Delivering affordability, security and jobs to advance people-centred energy transitions





Throughout the year, the IEA’s energy efficiency team maintained high-level contacts in Mexico, with the Ministry of Energy (SENER) and engaged at the operational level with the National Commission of Energy-Efficient Use (CONUEE). We held working meetings with Mexican officials – including Heberto Barrios, the Deputy Minister for Energy Transition, as well as Odon de Buen, the former Director General of CONUEE and his successor, Israel Jauregui and other technical experts in energy and energy efficiency data – to advance a national roadmap for developing energy efficiency data. Terms of Reference were defined and the project is expected to begin in the second quarter of 2024.

## Supporting regional cooperation in low-emissions hydrogen

Hydrogen continues to be an increasingly relevant topic for Latin America and a key area of collaboration with the IEA, thanks to the region’s potential to produce low-cost, low-emissions hydrogen from its vast natural resources. To encourage Latin American governments to develop coordinated strategies for the production, use and export of low-emissions hydrogen, the IEA partnered with the Green Hydrogen Development Platform for Latin America and the Caribbean (H2LAC) to share the key messages from the IEA’s Global Hydrogen Review and the Latin America Energy Outlook 2023 on their respective digital platforms. Specific engagements in 2023 included participation in a number of H2LAC working sessions, a meeting of the Association of Oil, Gas and Renewable Energy Companies of Latin America and the Caribbean (ARPEL) and an event organised by the Clean Hydrogen Mission and the OLADE.

## People-centred clean energy transitions

In April, the IEA organised a webinar alongside the release of its report, [Boosting efficiency in Latin America: Delivering affordability, security and jobs to advance people-centred energy transitions](#) to further develop awareness of people-centred solutions. Stakeholders from Brazil and Panama also took part in IEA events on the sidelines of COP28 as well as virtual events organised as part of a series of presentations on this topic. Analysis of people-centred approaches was included in a dedicated chapter in the Latin America Energy Outlook 2023. A commentary, “Unleashing the potential of energy communities in Latin America’s Clean Energy Transitions”, has also been drafted and will be published in the first quarter of 2024. The IEA also plans to work closely with Brazil during its 2024 G20 Presidency and provide support on the topic of social equity and inclusion.



## Sub-Saharan Africa

### Highlights

- Kenya and Senegal joined the IEA family as Association countries in June 2023.
- The IEA Executive Director and the Kenyan President co-authored an editorial on the importance of committing to universal energy access, accelerating the deployment of renewables and boosting investment in green industries on the continent.
- In September, the IEA Executive Director attended the inaugural Africa Climate Summit in Nairobi to support discussion on Africa's growing role in global climate and energy issues.
- Exceptionally close partnership between IEA and Uganda's government stakeholders led to the development of [the country's Energy Transition Plan](#), launched in December.
- The IEA Deputy Executive Director released an [in-depth review](#) of Uganda's energy policies in Kampala in November.
- The IEA supported the development of South Africa's National Energy Efficiency Strategy.
- The World Energy Outlook Special Report, [A Vision for Clean Cooking Access for All](#), was released in July, with a special focus on sub-Saharan Africa
- [Financing Clean Energy in Africa](#), a World Energy Outlook Special Report, was launched in September at the Africa Climate Summit in Nairobi, at an event led by Executive Director Birol and Dr. Akinwumi Adesina, President of the African Development Bank. The report included a Foreword from President Ruto of Kenya.
- [Energy Efficiency for Affordability: Improving People's Lives Through Delivery of a Modern, Sustainable Energy System in Kenya](#) was released in December at COP28.
- [Renewable Energy Opportunities for Mauritania](#) was released in Nouakchott in November.
- A webinar on raising public awareness of energy efficiency in Africa with participation of speakers from Côte d'Ivoire, Burkina Faso, Senegal and Togo took place in July.
- A series of extensive online training sessions and an in-person Joint Summer School on Modelling Tools for Sustainable Development for junior staff of governments of 15 African countries took place in July.

Sub-Saharan Africa faces a wide and diverse range of energy challenges, including access deficits, security of electricity supply, infrastructure reliability and low efficiency standards. In 2023, the IEA provided recommendations on clean energy transitions at the regional level, with analysis and calls to action on access to clean cooking solutions, energy transition financing, energy efficiency and support for renewable energy deployment. We worked closely with selected countries to address these issues based on their specific needs and potential. For example, we supported Uganda in developing its energy transition plan. In Kenya, we provided analysis of energy efficiency opportunities and in South Africa, we advised on energy efficiency policy. In Mauritania, we identified potential in renewable energy and hydrogen. We also helped governments and their staff build expertise in energy efficiency policy and energy system modelling. Finally, we were delighted to welcome Kenya and Senegal to the IEA family as new association countries.

## Kenya and Senegal join the IEA family

In June 2023, the IEA Governing Board voted unanimously to grant “association” status to the Republic of Kenya and the Republic of Senegal, which allows them to participate in meetings of the Agency’s standing groups, committees and working parties alongside full members. This is a significant step toward deepening our engagement across Africa on energy and climate issues.

“Kenya lauds joining the IEA family and its admission as an association country,” said Davis Chirchir, Kenya’s Minister of Energy and Petroleum. “We will seek to enhance our collaboration and experience, especially in geothermal development, off-grid electrification, and access to clean cooking solutions. We have to collectively make the world a better place by focusing on clean energy transition in the near future.”

“I am delighted with IEA’s decision to welcome Senegal into the IEA family as an association country,” said Senegal’s Oil and Energy Minister, Sophie Aïssatou Gladima. “This demonstrates, if proof were needed, the relevance of the choices made by our country, which is aiming to achieve energy security, universal access and industrialisation while endeavouring to limit its environmental footprint. Together with the other countries, we will work to strengthen these areas for our country and the sub-region.”

Senegal has worked closely with the IEA since signing a Memorandum of Understanding in 2019 (which was renewed in October 2022). In 2023, the IEA advised on the design of market reforms to enhance governance in the country’s energy sector and an IEA peer-review team visited Dakar in May to prepare an in-depth review of its energy policy that will be published in 2024.

Kenya is currently working with the IEA on a wide range of topics, including data and statistics capacity building, clean energy transition policies, energy efficiency policy implementation and energy access. Those technical exchanges are supported by frequent high-level exchanges. In June, Executive Director Birol met with Kenyan President William Ruto in Paris to welcome the country into the IEA family and discuss further collaboration across several key areas. President Ruto and the Executive Director covered several important energy and climate topics, including the need to expand access to clean cooking solutions in developing economies and to develop more electric mobility options. They also discussed the IEA Global Conference on Energy Efficiency which will be co-hosted by Kenya in 2024.



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*IEA Executive Director Fatih Birol and Kenyan President William Ruto at the Africa Climate Summit in Nairobi in September*

In September, the IEA Executive Director attended the inaugural Africa Climate Summit in Nairobi to support discussion on Africa's growing role in global climate and energy issues and the opportunities presented by clean energy for the continent's economic future. The Executive Director met once again with President Ruto along with other leaders from government, industry and civil society.

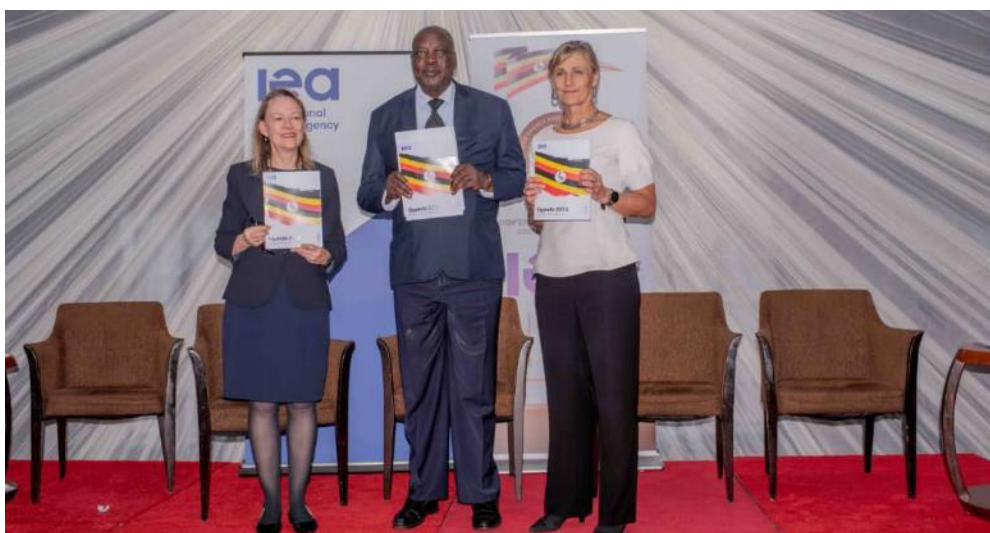
In preparation for the African Climate Action Summit, Executive Director Birol and President Ruto also published a commentary, [A New Energy Pact for Africa](#), to raise awareness on the importance of committing to universal energy access, accelerating the deployment of renewables and boosting investment in green industries on the continent.

## Uganda's In-Depth Review and Energy Transition Plan

The IEA provided [an in-depth review \(IDR\) of Uganda's energy policies in 2023](#) to support the government in energy policy development and encourage the exchange of international best practices and experiences. The analysis was the first of its kind developed for a sub-Saharan African country. The IDR was the first step in a broader partnership between the IEA and the Ministry of Energy and Mineral Development (MEMD) in developing their Integrated Energy Resource Master Plan (IERMP). The IDR and its recommendations prepared the groundwork for the Energy Transition Plan (ETP) and included a review week where an IEA team and experts from IEA member countries travelled to Kampala to interview more than 200 energy stakeholders from public and private sectors, civil society, NGOs and IOs, development partners and more.

Preparations for the report also included close collaboration with MEMD officials, including meetings with the Minister of Energy and Mineral Development, Hon. Ruth Nankabirwa, the Ministers of State for Energy and Mineral Development, Hon. Okaasai and Hon. Lokeris, the Permanent Secretary Irene Bateebe and many technical experts from MEMD. The report was launched by IEA Deputy Executive Director Mary Burce Warlick in November in Kampala. The event drew more than 80 stakeholders from both the public and private sectors, as well as development partners and included a panel discussion focused on energy access and how the IEA, development partners and private companies can help develop the energy sector in Uganda.

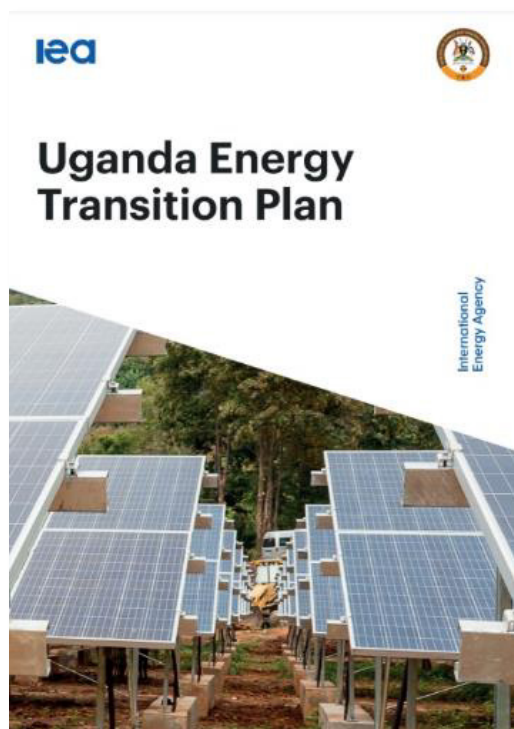
While in Kampala, the Deputy Executive Director also signed a Memorandum of Understanding between Uganda and the IEA to strengthen future cooperation.



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*From left to right: IEA Deputy Executive Director Mary Burce Warlick, Ugandan Minister of State Peter Lokeris and Norwegian Ambassador Anne Kristin Hermansen at the launch of the Uganda 2023 Energy Policy Review*





In 2023, the IEA worked in remarkably close partnership with Uganda's stakeholders throughout the development of the country's Energy Transition Plan (ETP). This included building complex models of the country energy systems, reviewing model outputs and analysis, participation in internal steering committee meetings with representatives from Uganda's Ministry of Energy and Mineral Development, collecting reviews of the preliminary results from external experts and helping the Ugandans finalise their documentation. This involved multiple exchanges with Uganda's government, as well as a

visit by the IEA to Kampala in June to share the preliminary results of model calibrations with more than 50 ministry officials.

The [Uganda Energy Transition Plan](#) is a long-term scenario-based analysis that explores the different pathways for Uganda's energy system development – including different energy supply and investment options – to reach the country's access and climate goals. It also highlights opportunities for accelerating climate action that could benefit from the help of Just Energy Transition Partnerships. These pathways will feed into Uganda's Integrated Energy Resource Master Plan (IERMP) and will form a solid basis for Uganda to attract international financing for its energy transition.

Uganda's ETP was officially launched on 5 December at COP28 at an event attended by Uganda's Minister of Energy and Mineral Development, Ruth Nankabirwa, Executive Director Birol, Nicolas Guichard, Head of the Energy Unit of the Agence Française de Développement (AFD) and Daniel Schroth, Director of Renewable Energy and Energy Efficiency at the African Development Bank (AfDB). The event, together with the announcement of Uganda's ambitious ETP also attracted coverage from a number of African and Middle Eastern newspapers including [The National](#) and [Al Arabiya](#) in the United Arab Emirates, as well as the Ugandan daily [Monitor](#). The IEA's support to Uganda received a very positive recognition from the Minister Nankabirwa, as well as from other stakeholders.





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*IEA Executive Director with Uganda's Minister of Energy and Mineral Development Ruth Nankabirwa at COP28*

## Universal access to clean cooking

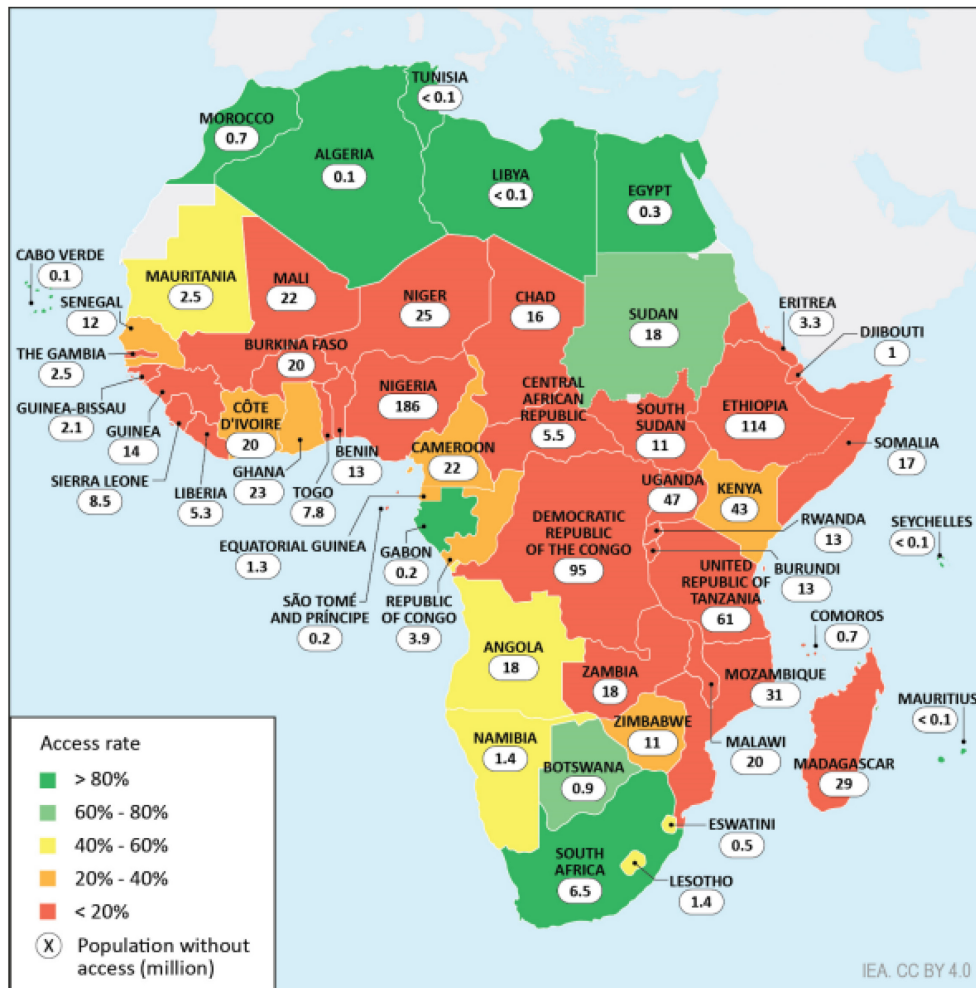
The IEA worked to increase policy momentum on access to clean cooking. In July 2023, we released the World Energy Outlook Special Report [A Vision for Clean Cooking Access for All](#).

The report noted that nearly one-third of the human population – 2.3 billion people – still prepares meals over open fires or rudimentary stoves, a practice that exposes them to hazardous smoke, be it from burning coal, charcoal, firewood, agricultural residue or animal waste. Women and children bear the brunt of this harm, for which low-cost solutions are readily available. Investment in this area could deliver major benefits to human health, economic development and gender equality and would help to mitigate climate change.

In Africa alone, limited access to clean cooking affects close to 1 billion people – approximately 70% of the continent. A full transition to clean cooking in Africa could reduce emissions by the equivalent of 900 million tons of CO<sub>2</sub> annually, which is why universal access to clean cooking is an essential component of Africa's net zero agenda. Most African countries already include clean cooking solutions among their Nationally Determined Contributions (NDCs) under the Paris Agreement, but climate finance is critical for realising these plans.

At COP28, Executive Director Birol met with President Samia Suluhu Hassan of Tanzania to discuss potential cooperation, with a focus on clean cooking. They agreed that Tanzania would co-chair the [IEA Summit on Clean Cooking in Africa](#) in May 2024, together with Prime Minister Jonas Gahr Støre of Norway.

### Population without access to clean cooking in Africa, 2022



**Almost a billion people are without access to clean cooking in Africa, half of those are concentrated in 5 countries (Nigeria, Ethiopia, DRC, Tanzania, Uganda).**

Note: 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.

Sources: IEA analysis based on the World Health Organisation (WHO) [household energy database](#) and other national sources.

Source: IEA (2023), [A Vision for Clean Cooking Access for All](#).

## Financing clean energy transitions

Although Africa accounts for one-fifth of the global population, the region currently attracts only 3% of global energy investment. If the region is to achieve its goal of

universal access to modern energy sources – while meeting its Nationally Determined Contributions in full and on time – energy investment in Africa needs to double, to more than USD 200 billion per year, by 2030.

[Financing Clean Energy in Africa](#), a World Energy Outlook Special Report published in September 2023, builds on the key findings from the [Africa Energy Outlook 2022](#) – which introduced the Sustainable Africa Scenario – and charts innovative investment solutions that are critical to scale up energy investment across the continent. The analysis was produced jointly by the IEA and the African Development Bank and benefitted from the review of more than 85 case studies and 40 interviews with stakeholders. The report was launched at the Africa Climate Summit in Nairobi, at an event led by Executive Director Birol and Dr. Akinwumi Adesina, President of the African Development Bank.



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*Panellists at the launch of the Financing Clean Energy in Africa report on 6 September 2023. From left to right: Rebekah Shirley, Deputy Director Africa at World Resources Institute; IEA Executive Director Fatih Birol; China Azubike, CEO of InfraCredit; Akinwumi Adesina, President of the African Development Bank; Michael Franz, Team Leader at GET.invest; and Kome Ajegbo, Vice President at Africa Finance Corporation*

The report focuses on a range of energy sectors and technologies as well as financing providers – including local institutions – and considers which types of capital are best suited to a specific sector or technology. The analysis also explores ways to scale up private investment and looks at the role of de-risking support from development finance institutions (DFIs) and donors. It notes that Africa will require USD 90 billion in private investment in clean energy by 2030, including roughly USD 28 billion in “concessional capital” – financing provided under preferential terms and conditions. Increasing the role of the private sector in clean energy investment would allow DFIs and donors to scale up their financing and direct it to areas with less commercial potential, such as creating enabling

environments for fostering innovation, funding research and development of unproven technologies or helping to stabilise fragile and conflict-afflicted states.

## Energy efficiency

### African participation in the 8<sup>th</sup> Annual Global Conference on Energy Efficiency

In June, six ministers and 30 delegates from Angola, Ethiopia, Ghana, Kenya, Mauritania, Senegal, Togo, Uganda, as well as the African Union (AU) took part in the IEA's 8<sup>th</sup> Annual Global Conference on Energy Efficiency, which was held in Versailles, near Paris. Their representatives also signed a joint statement as a key outcome of the conference, alongside 37 other international governments. Speeches were made by several high-level African participants. Davis Chirchir, Cabinet Secretary for Energy and Petroleum in Kenya, spoke on 7 June, announcing that Kenya would co-host the 9<sup>th</sup> Annual Global Conference in Nairobi in 2024. Other speakers included Okaasai Opolot, Uganda's Minister of State for Energy; William Owuraku Aidoo, Deputy Minister of Energy in Ghana; and Amani Abou-Zeid, Commissioner for Infrastructure and Energy of the African Union. The IEA also held a closed-door roundtable with policy makers that included representatives from the Kenyan Ministry of Energy and Petroleum, the Ghana Energy Commission, the South African National Energy Development Institute (SANEDI) and the Zambia Bureau of Standards (ZABS).

### Energy efficiency at Africa Climate Summit

A successful high-level IEA event on energy efficiency was held in September during the Africa Climate Summit in Nairobi. IEA experts moderated a panel that included Executive Director Birol, Cabinet Secretary Chirchir of Kenya and Commissioner Abou-Zeid of the African Union, as well as Dr. Matthew Opoku Prempeh, Ghana's Minister of Energy and Dr. Ana Fontoura Gouveia, Secretary of State for Energy and Climate of Portugal. The session highlighted the important role that energy efficiency can play in driving sustainable energy transitions to an audience of international policy makers, companies and organisations.

### Energy efficiency at COP28

Stakeholders from sub-Saharan Africa were involved in events and activities organised by the IEA during the COP28 summit in Dubai. Representatives from the Kenyan Ministry of Energy and Petroleum and the Ghana Energy Commission joined panel discussions for a side event, "Large-Scale Deployment of Super-



Efficient Appliances for Cooling and Doubling of Efficiency Progress”. The officials shared their experiences developing energy efficiency standards for appliances.



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Group photo taken following the COP28 side event, including Hubert Zan of the Ghana Energy Commission (centre) and David Mutisya of the Kenyan Ministry of Energy and Petroleum (third from right)

## Energy efficiency analysis at the country level

In December – just in time for COP28 – the IEA published an analysis of energy efficiency in Kenya – its first ever report at the country level for sub-Saharan Africa. The report [Energy Efficiency for Affordability: Improving People's Lives Through Delivery of a Modern, Sustainable Energy System in Kenya](#) assessed the country's progress and provided policy recommendations on four key areas: Appliances, buildings, clean cooking and power system losses. The project helped strengthen the important partnership between the IEA and the Republic of Kenya and support the country in their promotion of the energy efficiency agenda both at a national level and more broadly across the continent. Kenya further demonstrated its commitment to cooperation by agreeing to host key events in Nairobi, including the [IEA's 9<sup>th</sup> Annual Global Energy Efficiency Conference](#) in May 2024 as well as an in-person Energy Efficiency Training Week for Africa in March 2024 – a gathering it has hosted annually since 2019.

## Renewable energy in Mauritania

The highlight of our work on renewable energy in Africa was [Renewable Energy Opportunities for Mauritania](#), our first report focusing on the country. It identified critical pathways that could accelerate the country's sustainable development.



Mauritania has high-quality wind and solar resources which, if developed at scale, could have catalytic effects in supporting the country’s goal of delivering universal electricity access to its citizens – and advance its vision for economic growth and industrialisation generally.

In particular, expanding renewable energy in Mauritania could enhance the sustainability of its mining sector, which contributes significantly to the economy. Mauritania also has a substantial pipeline of renewable hydrogen projects and developing this sector could drive sustainable development and economic growth through strategic foreign investments in infrastructure and skills transfer.

At an event launching the report in Nouakchott in November, Lehib Khroumbaly an advisor to the country’s Ministry of Petroleum, Energy and Mines thanked the IEA for “this valuable piece of analysis, which explores Mauritania’s major renewable energy potential and helps put the country on the map for clean hydrogen production.” He added that the ministry was “delighted to see that national policy is aligned with the insights of the report and looks forward to further collaboration with the IEA”.

## Supporting clean energy transitions in producer economies

The World Energy Outlook Special Report on [Oil and Gas Industry in Net Zero Transitions](#) includes a chapter that examines the strategies of net exporters and importers of energy for achieving their net zero goals. This chapter – which highlights the critical choices facing producer economies in energy transitions – is of particular relevance to sub-Saharan Africa, where the export of natural resources represents a significant share of the economy. It examines current conditions in oil- and gas-rich economies, including established and emerging producers like Nigeria and Angola, as well as countries seeking to accelerate their development such as Mozambique, Senegal and Tanzania. It discusses the impact of net zero transitions on production prospects, revenues and options for energy diversification and assesses how international partners can support diversification by promoting cooperation among oil and gas exporters and importers.

The report garnered global attention on its release (see section on Oil and Gas in Clean Energy Transitions below) including from several producer economies. It will continue to inform CETP work in this area throughout 2024 and beyond.

## People-centred clean energy transitions

The IEA Secretariat worked closely with stakeholders in sub-Saharan Africa in 2023 to advance people-centred clean energy transitions. Representatives from

South Africa, Kenya and Nigeria took part in IEA side events at COP28 as well as virtual events organised as part of the IEA People-centred Clean Energy Transitions webinar series. Most specifically, the IEA Secretariat organised a webinar about raising public awareness of energy efficiency in July. Conducted in French, the session brought together stakeholders from Côte d'Ivoire, Burkina Faso, Senegal and Togo to explore the role that educational and public awareness policies can play in improving energy efficiency and empowering Africans to adopt beneficial energy consumption practices and behaviours. The webinar was attended by more than 300 people and its online recording has been viewed more than 400 times. Finally, perspectives from sub-Saharan Africa on the voice of labour in clean energy transitions were collected over the course of the three meetings of the IEA Clean Energy Labour Council, co-chaired by Zingiswa Losi, President of the Congress of South African Trade Unions (COSATU).

## Capacity building in energy efficiency and modelling tools

The main highlight of the IEA's energy efficiency work in 2023 was the Energy Efficiency in Emerging Economies Training Week, held in Paris in April. Attended by 20 policy makers from eight sub-Saharan African countries, participants engaged across five simultaneous course topics: Appliances, Buildings, Industry, Smart Cities, and Indicators and Evaluation. The week kicked off with a high-level panel on the first day, led by Executive Director Birol and included panellists from Ghana, Kenya and Uganda. Ivory Coast, Mauritania, Sudan and Zambia who were also represented by their ambassadors.



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*Opening session of the 2023 Energy Efficiency in Emerging Economies Training Week in Paris. Speakers, from left to right: Ambassador Doreen Ruth Amule of Uganda; Ambassador Alexandre Guido Lopes Parola of Brazil; IEA Executive Director Fatih Birol; Ambassador Judi Wangalwa Wakhungu of Kenya; Ambassador Anna Bossman of Ghana*

The IEA's general approach to engaging with Africa is to support governments in developing domestically driven roadmaps for their energy transitions that are models-based. To that end, we work with countries on enhancing their data foundations as well as domestic modelling capabilities. In 2023, in partnership with Climate Compatible Growth (CCG), a UK government funded research programme, we organised a series of online training sessions as well as a Joint Summer School on Modelling Tools for Sustainable Development that took place in Windhoek, Namibia and Trieste, Italy in July. We worked closely with 15 different African ministries to ensure relevant participants could attend. The goal was to improve the understanding and use of energy data statistics and modelling, which are essential tools for making informed decisions and creating sustainable energy projects. In at least one country, Uganda, this training directly supported the modelling of energy systems underpinning its energy transition plan.

Participants in these sessions consistently provided positive feedback, emphasizing the valuable insights gained. They also benefitted from networking opportunities with like-minded professionals as well as discussions about other aspects of sustainable development and clean energy. Appreciation was also expressed for the emphasis on women and youth in the 2023 edition of the training.

## South Africa

South Africa faces major challenges in decarbonising its economy, particularly due to its high dependence on coal for power generation. Its heavy industries and transport sectors also remain heavily reliant on fossil fuels. The IEA aims to support the country on its long-term decarbonisation path and has been engaging with its leaders for decades, establishing cooperative relations with ministries, state-owned enterprises, universities and energy research institutes.

### Energy efficiency in South Africa

The Energy Efficiency in Emerging Economies (E4) programme, delivered under the CETP, continued its long-term support for South Africa's Department of Mineral Resources and Energy (DMRE) on energy efficiency. In 2023, this included further development of indicators and benchmarks for the pulp and paper sector as part of our ongoing exchanges since 2021. Regular meetings were also held to discuss IEA support for developing South Africa's National Energy Efficiency Strategy (NEES). In November, the E4 team organised an online webinar on motor efficiency in mining, where Maphuti Legodi of the Department of Mineral Resources and Energy (DMRE) presented some of the key opportunities and challenges in South Africa and engaged in an online discussion with experts from Canada and Australia.

South Africa was represented at the IEA's 8<sup>th</sup> Annual Global Conference on Energy Efficiency in Versailles by Ashanti Mbanga, Programme Manager at the South African National Energy Development Institute (SANEDI). Ms. Mbanga joined a [special event](#) on promoting the harmonisation of appliance energy efficiency standards, where she shared best practices from South Africa's Standards and Labelling (S&L) programme with other international experts.

The country was also well-represented during the IEA's 51<sup>st</sup> Energy Efficiency Working Party, held in October in Paris, where experts from SANEDI shared lessons learned from the development of both the S&L programme and the National Energy Efficiency Strategy.

The IEA also expanded its engagement with other government partners in South Africa. In November, our experts presented opportunities and mechanisms to stimulate demand for electric vehicles (EVs) through public procurement at a webinar organised with the South African Ministry of Transport. During that session, they shared recent analysis and case studies on global EV development, including a deep dive on public procurement strategies in China.

## Middle East and North Africa

### Highlights

- As part of its groundbreaking work on climate resilience – the first of its kind in the region – the IEA delivered three reports on energy sectors of [Morocco](#), [Egypt](#) and [Oman](#).
- The IEA provided support for clean energy transitions in producer economies through [Leveraging Fossil Fuel Capabilities for Clean Energy Transitions: Assessment of Opportunities in Oman](#), a report published in November.
- The report [Renewable Hydrogen from Oman](#) was launched in June by the IEA Executive Director and the Omani Minister of Energy and Minerals.
- A two-day in-person workshop on Morocco's Clean Electricity Transition was held in Rabat with focus on renewable energy regulation, procurement and integration.
- The IEA worked with Algeria to strengthen the country's capacity to abate methane emissions.
- The IEA's Energy Data Centre delivered a specialised training session on energy and emissions data to representatives of governments of MENA countries.
- A virtual workshop Skills Development for the Clean Energy Transition in the MENA Region took place in March.

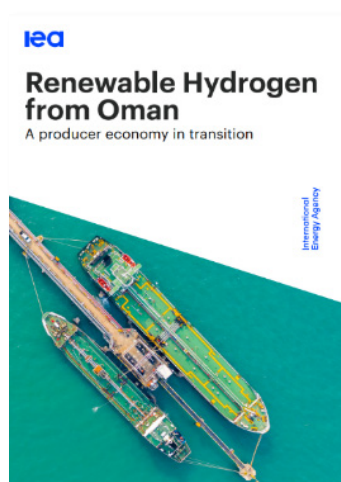
Countries in the Middle East and North Africa (MENA) are particularly vulnerable to climate change, while at the same time economically dependent on oil and gas exports, which could come under increasing pressure from global efforts to decarbonise the energy sector. MENA countries must therefore find ways to accelerate the development of clean energy while diversifying their economies away from dependence on oil and gas revenues.

The IEA is working with countries across the region to leverage their existing capacities and competitive advantages in traditional energy forms towards clean and low-emissions technologies. Our activities in 2023 increasingly focused on climate adaptation and our analysis looked more closely at the climate resilience of national energy systems. Overall, our aim is to help countries chart a low-emissions pathway for their own growing energy demand, while also exploring export opportunities for emerging low-emissions energy sectors.



## Supporting clean energy transitions in producer economies

The World Energy Outlook Special Report on [Oil and Gas Industry in Net Zero Transitions](#) (November 2023) incorporates a chapter examining the strategic responses of producer economies to net zero transitions. This chapter notes that producer economies, including those in MENA, face some stark choices in energy transitions. While the benefits of a shift towards a more diversified economic structure and sustainable energy mix have long been recognised – not least by the producer economies themselves – net zero transitions introduce an additional element of urgency, as they set both a timeline and a deadline. The chapter considers the implications of net zero transitions for production prospects and revenues, as well as different energy-related diversification options and strategies in different economies with large oil and gas resources, including established producers in the MENA region such as Algeria, Iraq and Saudi Arabia. It also assesses the ways that international partners can support the diversification process and the collaborative ways in which today's oil and gas exporters and importers can work together to facilitate net zero transitions globally.



To complement this work, the IEA developed a model to support Oman in assessing the impact that specific clean energy policies could have on key macroeconomic indicators. These two reports were preceded by the publication in June of [Renewable Hydrogen from Oman](#), which was launched in Paris in the presence of the IEA Executive Director and the Omani Minister of Energy and Minerals. That study provides an overview of Oman's potential in developing a domestic renewable hydrogen industry while scaling up its renewable energy capacity.

The IEA's analysis dedicated to Oman provides a compelling example of producer economies' potential to accelerate their domestic energy transitions while diversifying their economies and moving away from dependence on natural resource exports. The report also provided a key framework linking the development of a domestic renewable hydrogen industry and the scaling of clean energy capacity with a wide range of applications, notably in the power sector, where lowering electricity prices would improve long-term economic competitiveness.



As a follow-up to this study, the IEA published a report in November 2023 entitled [Leveraging Fossil Fuel Capabilities for Clean Energy Transitions: Assessment of Opportunities in Oman](#). The report builds on an extensive cooperation between the IEA and key institutions in Oman, including the Ministry of Energy and Minerals and Petroleum Development Oman, as well as other institutions. The objective of this study – which is based on a survey of energy sector stakeholders (ministries as well as domestic and international companies, contractors and suppliers) – is to assess

opportunities for repurposing oil and gas infrastructure, assets and skills for the production and distribution of clean energy. A high degree of repurposing would enable Oman to diversify its economy and create new economic growth engines.



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*The IEA Executive Director and the Omani Minister of Energy and Minerals at the launch of the report Renewable Hydrogen from Oman, Paris, 12 June 2023*

## Accelerating renewable energy integration

In July, we organised a two-day in-person workshop on Morocco's Clean Electricity Transition in Rabat. The event discussed regulation, renewables procurement and integration, tariffs and regional interconnection. A side event on energy sector climate resilience also took place. More than 30 participants joined from the private sector as well as various Moroccan power sector stakeholders, including the Ministry of Energy Transition and Sustainable Development, the Moroccan Agency for Sustainable Energy (MASEN) and the Moroccan Electricity Regulatory Authority (ANRE).

## Climate resilience

We worked with countries in the region to improve the climate resilience of the energy sector. In close cooperation with national institutions and stakeholders, we produced reports on [Morocco](#), [Egypt](#) and [Oman](#) in 2023 that assessed climate hazards and their impact on energy supply and demand in each of these countries. We also synthesised the findings of these three reports in an [analytical paper](#) released in Rabat in July.

The IEA's work on climate resilience was the first of its kind in the region. The key findings, which received extensive coverage by national media, were greatly appreciated by the focus countries. Stakeholders from Morocco, Egypt and Oman said the results were valuable to their policy decision making and asked the IEA to provide a more detailed analysis of selected elements of the reports in 2024. Other countries in the region also showed interest in the IEA climate resilience policy advice. As a result, the IEA plans to replicate the study in Algeria, Jordan, Iraq and selected African countries.

The analytical work fed into high-level bilateral exchanges with the countries. It also led to the signature of the first ever joint work programme between Egypt and the IEA. Egyptian government and the Agency committed to cooperate closely across key strategic issues including tackling methane emissions from fossil fuel use, renewable energy deployment and hydrogen production.



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*IEA Executive Director and Egypt's Minister for Petroleum and Mineral Resources Tarek El-Molla signing the joint work programme on 31 October 2023 in Paris*

## Reducing methane emissions in Algeria

The IEA worked with Algeria in 2023 to strengthen the country's capacity in terms of methane emissions abatement by addressing leaks and gas flaring. The IEA

held a series of workshops, including methodological training around emissions data collection and analysis and provided support on reporting and the use of monitoring tools.

The first workshop, on the methane emissions accounting methodology, took place in June and was attended by representatives from the Ministry of Energy and Mines, Sonatrach (the state-owned oil company) and the Algerian Space Agency. The event prompted a discussion of the potential to reduce emissions from the oil and gas sector and participants showed particular interest in possible approaches to setting an emissions baseline for Algeria. Algerian officials plan to conduct a more thorough internal assessment in early 2024, after which they intend to seek further IEA support.

## Data collection and capacity building

In December, the IEA's Energy Data Centre delivered an energy and emissions related training as part of an advanced course, "Compilation of Macro-Relevant Environment and Climate Change Statistics", organised by the Arab Monetary Fund (AMF) and the International Monetary Fund (IMF). The three-day event drew 30 participants from 17 of the 22 AMF member countries. Our interventions were well received and prompted many questions from attendees and both the AMF and IMF showed great interest in future collaboration. The workshop also allowed us to establish new contacts with national statistical institutions to further improve the energy balances for MENA countries.

As a result of this workshop, various countries in the region requested IEA's support in making improvements to their energy statistics collection. We worked with Lebanon on detailed recommendations for such improvements, for example, and we established contact with relevant officials in Jordan, Mauritania, Oman and Somalia.

## People-centred transitions

In March 2023, the IEA organised a virtual workshop, [Skills Development for the Clean Energy Transition in the MENA Region](#), which gathered representatives from across civil society to discuss key issues related to just transitions in the region. Findings from this discussion were shared with the IEA's People-Centred Clean Energy Transitions team to support their global efforts.

## Ukraine

### Highlights

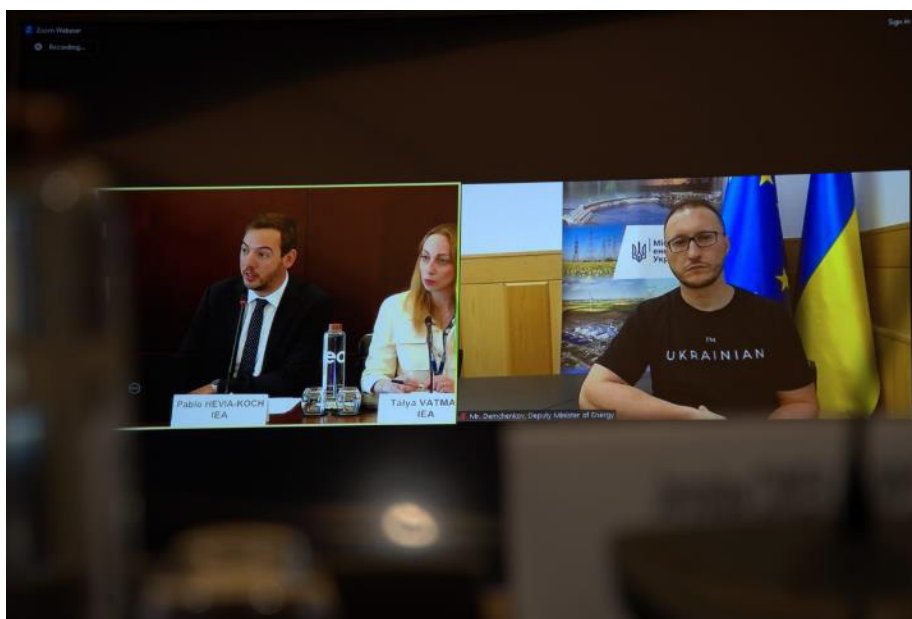
- The IEA supported the Ministry of Energy of Ukraine in the preparation of its 2050 Energy Strategy to help develop plans for recovery and reconstruction, with a strong focus on energy security, while also laying the foundation for its transition to a secure and sustainable energy future.
- An IEA delegation visited Kyiv in mid-October and met with the Ukrainian Minister of Energy, representatives of utilities and other publicly owned energy companies as well as IEA member country embassies.
- A series of workshops was held on power grid security to build capacity among Ukraine's government staff and Ukrainian energy stakeholders.
- Data exchanges were maintained under very difficult conditions.

Ukraine, which joined the IEA as an association member in 2022, is a key country for European and global energy security. Russia's invasion of Ukraine has pushed it to fundamentally reshape its past dependence on energy imports from Russia. As the full-scale war continues, the IEA has ramped up its support for Ukraine's to develop its strategy for recovery and reconstruction, with a strong focus on energy security – while also laying the foundation for its transition to a secure and sustainable energy future.

Following the signing of a two-year Joint Work Programme with Ukraine in December 2022, the IEA's focus for the first half of 2023 was supporting the Ministry of Energy in the development of its 2050 Energy Strategy. This work provided a basis for better understanding Ukraine's longer-term ambitions, particularly in the context of both European integration and decarbonisation.

We worked to enable capacity building, analysis and engagement in order to best help Ukraine and we coordinated these efforts to make sure that support was also adapted to the country's short-term needs (including tracking energy supply disruptions and restoring power and heating for civilians) as well as its long-term energy security and decarbonisation goals. In parallel, we worked on innovative communication strategies to highlight the significant challenges Ukraine faced during the winter heating season and to share energy security and resiliency lessons from Ukraine with the rest of the world.





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*IEA experts speak with Ukraine's Deputy Minister of Energy, Yaroslav Demchenkov, August 2023, Paris*

This holistic approach, with a strong level of donor coordination, served to significantly strengthen our institutional ties with Ukraine. It has also required the IEA to be flexible in the support it provides to various Ukrainian government institutions, given the shifting context on the ground.

## Electricity system resilience

The first half of the year was an inception period for the power system security workstream. We followed a two-pronged approach that focused on strengthening short-term resiliency of Ukraine's power system while also looking ahead toward the medium-term goals of reconstruction, with a focus on European integration and decarbonisation.

Capacity building activities began in August, with a series of three in-person workshops:

- **August in Paris:** The first workshop focused on flexibility and security, with seven attendees from Ukrenergo (operator of Ukraine's electricity transmission system), the Ministry of Energy, JSC Distribution Grids (the state enterprise charged with power distribution), individual distribution system operators (DSOs), the Guaranteed Buyer (a state enterprise charged with buying electricity from renewable sources), as well as 13 external speakers.



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*Family photo after the workshop on electricity systems resilience in Paris, August 2023*

- October in Kyiv:** In mid-October, an [IEA delegation travelled for 30 hours to reach Kyiv](#) to engage with Ukrainian stakeholders across the energy sector and host a Smart Grids workshop. The event responded to specific Ukrainian needs and was aimed at capturing as wide of an audience as possible, with regional DSOs from across Ukraine attending, in addition to Ukrenergo, the Ministry of Energy, the National Energy Regulator and many others.



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*Minister Yaroslav Demchenkov with the representatives of the Ministry of Energy and the IEA delegation in Kiev, October 2023*

- November in Tbilisi:** In the end of November, the third workshop in the power system security workstream took place in Tbilisi, Georgia. This time, its focus was on distributed resources as well as policies and frameworks for a modern and

resilient power system. The event was attended by eight representatives from Ukrenergo, the Ministry of Energy, DSOs, the National Energy and Utilities Regulatory Commission (NEURC), JSC Distribution Grids and 18 external speakers.



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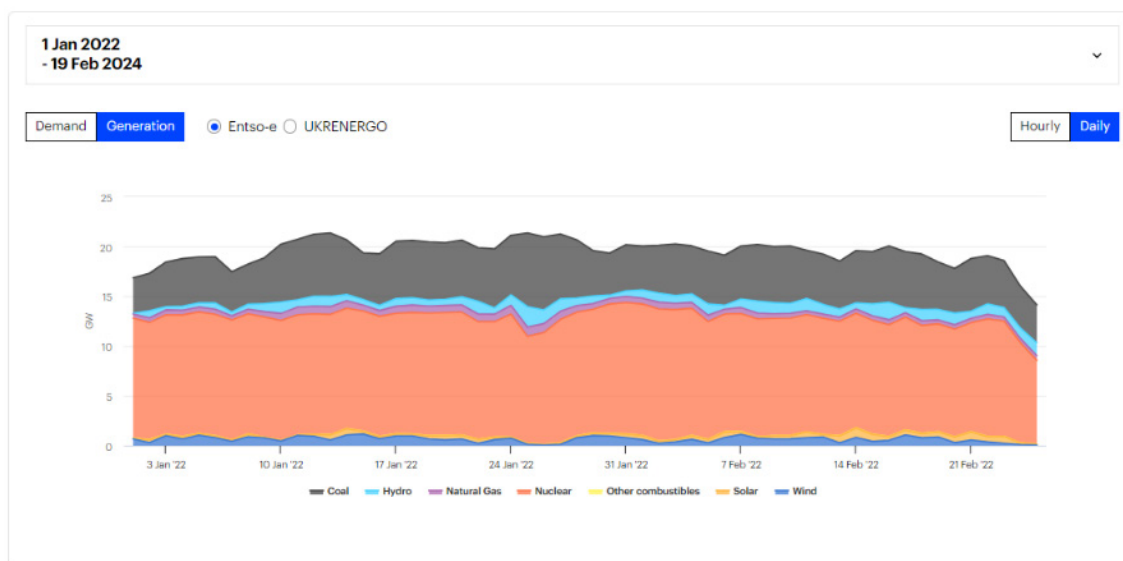
*Participants of the workshop in Tbilisi, November 2023*

This workstream focused on strengthening the capacity of Ukrainian power system stakeholders to allow for a more resilient future grid with a higher amount of distributed resources. Workshops were designed to consider Ukraine’s specific challenges, priorities and current barriers to investment and regulatory evolution, while looking ahead to eventual implementation of a secure and modern power system in the country. Above all, they were a chance to understand the concrete needs and challenges faced by the population of the war-torn country. “The energy sector, without doubt, is another frontline in this war”, said Ukraine’s Deputy Minister of Energy Yaroslav Demchenkov at the meeting with the IEA delegation in October.

## **Annual energy data and energy security indicators**

In 2023, the IEA and Ukraine were able to sustain their collaboration under difficult circumstances. Despite the martial law and ongoing security concerns, the State Statistical Service of Ukraine submitted responses to the Agency’s energy end-uses and efficiency indicators questionnaires – providing significant data and remaining available to answer queries. Ukraine’s data could therefore be included in IEA analyses and statistical outputs. The IEA also disseminated data on energy prices in Ukraine based on information from the Ministry of Energy and the State Statistical Service.

## Real-time data on electricity demand and generation in Ukraine



Notes  
UKRENERGO, the Ukrainian national power company, continues to provide electricity data. Entso-e, the European Network of Transmission System Operators for Electricity, provided a more detailed breakdown of Ukrainian electricity generation by source but was disconnected shortly after the invasion.

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Source: IEA (2022), [Ukraine Real-Time Electricity Data Explorer](#).

In July, we signed an agreement with Ukraine’s Ministry of Energy to receive sensitive power system data. The first batch of that data was shared with the Agency in August.

The IEA has also worked with the Ministry of Energy to receive data that will help us model Ukraine’s power system with the aim of strengthening its resilience and helping the country move towards decentralisation. The modelling is being done using PLEXOS, a powerful simulation tool that Ukrenergo also uses, to ensure that the results of the IEA’s analysis are in a format that can be used directly by Ukrainian stakeholders.



## Pillar II – Multilateral coordination

### Highlights

- The IEA's recommendations, based on the main insights from the updated Net Zero Energy Roadmap released in September 2023, informed both the final negotiated outcome of the First Global Stocktake and many other voluntary climate commitments made at COP28.
- The IEA provided support to countries as they worked to shape and agree important energy outcomes from the UNFCCC COP28 summit. In the lead-up to COP28, the IEA co-hosted three in-person and one virtual High-Level Dialogue with the COP28 Presidency and with the support of the UNFCCC and the IRENA.
- During COP28, the IEA released an analysis on the impact of the doubling of energy efficiency improvement and tripling of renewable capacity on fossil fuel demand reduction (based on the number of countries having committed to those targets).
- The IEA worked at the heart of G20 deliberations to deliver a new analysis for the Indian G20 Presidency's Lifestyle for Environment (LiFE) Initiative and a roadmap for the Group on actions to triple installed renewable energy capacity by 2030 – a key outcome of the G20 New Delhi Communiqué. The IEA also worked with India's Bureau of Energy Efficiency on a G20 voluntary action plan for doubling energy efficiency.
- India's Prime Minister invited the IEA to become a founding member of the Global Biofuels Alliance announced at the G20 New Delhi Summit, alongside Brazil and the United States.
- The G20 India Sherpa also invited input from the IEA Executive Director and the IEA Secretariat to the G20 Development Ministerial (May 2023), the G20 Energy Transitions Ministerial (July 2023) and the G20 Leaders' Summit-level meetings (September and November 2023).
- IEA analysis was critical in defining and shaping G20 collective action on doubling energy efficiency and tripling renewable energy, sustainable biofuels and lifestyle behaviour, in support of the COP28 objectives.
- The IEA has advised the G7 energy and climate programme and helped build bridges between industrialised countries and emerging and developing economies. In 2023, the IEA created opportunities for selected non-G7 members – India, Indonesia, South Africa, ASEAN and the African Union – to take part in relevant meetings on the G7 agenda.



- IEA recommendations were reflected in many outcomes and mandates that emerged from the G7 Leaders' Summit in Hiroshima in May 2023. Landmark outcomes such as the G7 Five-Point Action Plan on critical minerals and the G7 Clean Energy Economy Action Plan were based on IEA analysis.
- The IEA continued its crucial role as the custodian for the UN's Sustainable Development Goals data. It also advanced joint efforts on data collection and harmonisation with the UN Statistics Division and with the UN Industrial Development Organization, expanding coverage and improving data quality.

## Collaboration with the United Nations

The IEA works closely with the United Nations and its agencies in several areas. With the support of the CETP under the second pillar of the programme, our focus in 2023 included close collaboration with the COP28 Presidency to raise ambitions and support negotiations on energy and climate, as well as delivery of the Global Stocktake of the Paris Agreement. It incorporated the [updated Net Zero Roadmap](#) and a package of recommendations on ambitious, but achievable actions to inform COP28 discussions. This analytical work underpinned the IEA's direct exchanges with the COP28 Presidency and other high-level events to arrive at constructive outcomes from the climate summit.

We also continued our role as the official custodian of the UN Sustainable Development Goals data and worked to improve the technical capacity of selected countries on energy statistics to reinforcing transparency in reporting national greenhouse gas inventories and mitigation actions.

## COP28-IEA High-Level Energy Transition Dialogues

Over the course of 2023, the IEA sought to use its analysis, strategic advice, convening power and consensus building expertise to support the COP28 Presidency and countries as they worked to shape and agree on key energy outcomes leading up to and during COP28.

This support ranged from the publication of the IEA's [updated Net Zero Roadmap](#), the [Oil and Gas Industry in Net Zero Transitions](#) report and the *Energy Transitions Stocktake* series, to co-hosting the COP28-IEA High-Level Energy Transition Dialogues.



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*The first COP28 High-Level Dialogue, Goa, India, 22 July 2023*

In the lead-up to COP28, the IEA co-hosted three in-person and one virtual High-Level Dialogue with the COP28 Presidency and with the support of the UNFCCC and IRENA. The dialogues involved a series of strategic engagements with international energy decision makers on the COP28 Presidency's energy vision and energy package. They provided a forum to build consensus and momentum on the 1.5° C compatible energy transition pathways and the enabling conditions needed to achieve them, such as the need for a just transition, concrete commitments and actions by countries, businesses and other actors that raise overall ambition and actions consistent with a 1.5° C compatible energy transition.

The first High-Level Dialogue was held alongside the Clean Energy Ministerial (Goa, 21 July) and initiated the process with ministers and high-level private sector representatives. The second High-Level Dialogue was held on the sidelines of the first Africa Climate Summit (Nairobi, 5 September) and focused on accelerating renewable energy growth and access to clean energy by addressing key enablers. The third High-Level Dialogue was held on the sidelines of the UN General Assembly (New York 21 September) and focused on the principles of a just and orderly energy transition. The fourth High-Level Dialogue was held virtually (15 November) and focused on accelerating the inclusive scaling up of clean energy to enable rapid emissions reductions.

A final dialogue was held during the World Climate Summit at COP28 on 2 December. More than 40 high-level leaders, including four heads of state, concluded the negotiations with clear convergence on the building blocks of a 1.5° C energy transition and strong support for an ambitious decision on the Global Stocktake at COP28.

The IEA set out an ambitious and integrated package across five pillars for COP28:

- Tripling global renewable power generation capacity by 2030
- Doubling annual energy efficiency improvements by 2030
- An orderly decline of fossil fuel use by 2030, starting with no new coal plants
- Commitment from the oil and gas industry to align their strategies and investment portfolios with the 1.5 °C objective, with a focus on a 75% reduction in methane emissions by 2030
- Financing mechanisms for a major scaling up of clean energy investment in emerging and developing economies.

Attendees highlighted the strong support for the COP28 Presidency's Global Renewables and Energy Efficiency Pledge, which to date has been signed by 132 countries. There was broad agreement on the need for urgent action on coal, not only on no new unabated coal plants, but also on accelerating the retirement of existing plants.

There was also acknowledgement that countries must seize the opportunity to develop and accelerate their own energy transition plans, while supporting developing countries with finance and technology transfer. Initiatives such as the Just Energy Transition Partnerships (JETPs) were highlighted as an effective mechanism for enabling a just and orderly energy transition that supports developing countries.

## UN Climate Ambition summit

Our work to raise ambitions at COP28 was not limited to exchanges with the COP28 Presidency. On 20 September, the Executive Director brought IEA insights to the world leaders attending the UN Climate Ambition Summit in New York to show that both the energy and industry sectors remain off track to meet Paris Agreement targets to limit rising global temperatures. Despite the lowering of the cost of renewables, heavy industries such as cement, steel and transportation continue to lag behind. The pathways to meeting the 1.5°C limit for these sectors require rapid, deep and sustained emissions cuts in the very near term. That is why the IEA Executive Director provided updated, science-based guidance for governments and industry actors to follow. Participants agreed on the need for enhanced policies and regulations, including global standard setting for zero emission commodities and more cooperation on technology transfers and intellectual property issues. The official [Chair's Summary](#) of the summit referenced the IEA's updated Net Zero Roadmap.

## International Climate and Energy Summit co-hosted by the IEA and Spain

On 2 October 2023 in Madrid, the IEA co-hosted with Government of Spain an **International Climate and Energy Summit**. Ministers and senior officials from close to 40 countries, as well as heads of international organisations and representatives from industry, civil society and youth organisations, convened to discuss how to facilitate a just energy transition and strengthen ambition and implementation ahead of COP28 in Dubai, aiming to keep the 1.5 °C goal within reach. Informed by the IEA's recent report, [Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach – 2023 Update](#), senior representatives from close to 40 countries around the world put forward 5 objectives for COP28 that were reflected in the COP's final decision document.



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*Ministers and senior officials from close to 40 countries took part in a high-level event co-hosted by Spain and IEA with aim of strengthening ambition and implementation ahead of COP28 in Dubai.*

## IEA-UNFCCC collaboration on the Global Stocktake of the Paris Agreement

The first five year Global Stocktake of the Paris Agreement, which assesses the world's collective progress against its climate goals, concluded at COP28. Building on the synthesis report by the co-facilitators of the related technical dialogue, Parties participated in several high-level events at COP28 and ultimately adopted a decision on the outcome of the first Global Stocktake. The text commits to an acceleration of efforts and delineates a way forward, including by mentioning for the first time the necessity for a just, orderly and equitable transition away from fossil fuels.

In support of this unprecedented global effort, which is at the heart of the Paris Agreement [ambition mechanism](#), the CETP made it possible for the IEA to develop a dedicated [Global Energy Transitions Stocktake platform](#).



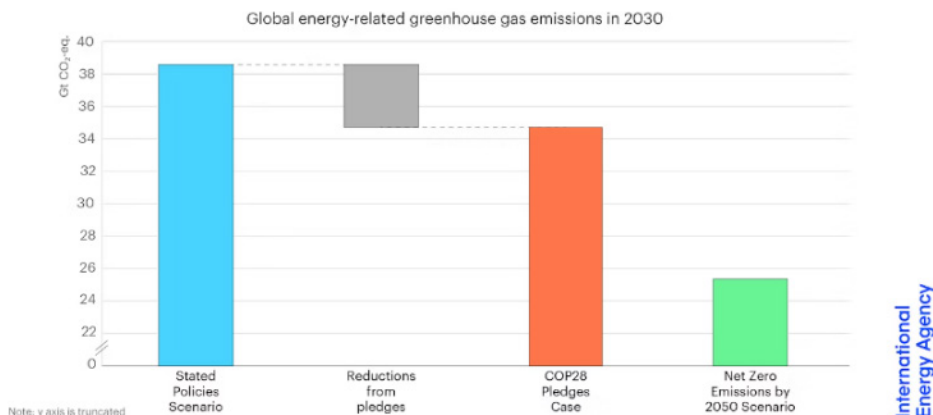
**The latest IEA analysis tracking the global energy transition, covering technology, investment and people-centred progress toward the Paris Agreement**

This year marks the finalisation of the first global stocktake of the Paris Agreement, which assesses the world's collective progress against its climate goals. In support of that important effort, the IEA is bringing together all of its latest data and analysis on clean energy transitions in one place, making it freely accessible to citizens, governments, and industry.

Reaching net zero emissions requires a complete transformation of how we power our daily lives and the global economy. The IEA's *Net Zero by 2050 Scenario* lays out a narrow but achievable pathway to net zero emissions in the energy sector by mid-century – a trajectory consistent with limiting global temperature rise to 1.5°C. Following this pathway represents the world's best chance of avoiding the worst effects of climate change, and requires accelerating the shift to non-emitting sources of energy, such as wind and solar; increasing energy efficiency; electrifying transport, industry and buildings; expanding the use of clean hydrogen and other low-emission fuels; and investing in emissions abating technologies, including negative emission technologies.

Launched in March 2023 as an informal input to the Global Stocktake, this new portal supported the harnessing of the IEA latest data and analysis on clean energy transitions and made it freely accessible to citizens, governments and industry. The IEA's Global Energy Transition Stocktake was consistently updated in the lead-up to COP28. It featured all major IEA releases throughout the year and provided a comprehensive picture of how the world is tracking against its net zero ambitions, Nationally Determined Contributions (NDCs) and other climate objectives. This new dataset for all NDCs and Net Zero pledges can be seen in our new [Climate Pledges Explorer](#).

### Impact of COP28 pledges as of 8 December on global emissions trajectory



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Source: IEA (2023), [IEA assessment of the impact of evolving COP28 pledges](#).



This effort culminated with the update of the 2021 IEA [Net Zero Roadmap, A Global Pathway to Keep the 1.5 °C Goal in Reach](#) (September 2023) exploring the most recent trends, constraints and sensitivities in the pathway for the world to limit the rise in global temperature to below 1.5°C. The Roadmap provided an update on the landmark report released in May 2021 to survey the complex and dynamic energy markets landscape and sets out an updated pathway to net zero by 2050, taking account of the key developments that have occurred since 2021. It noted that greater ambition and implementation, supported by stronger international cooperation, will be critical to reach climate goals.

The analysis directly informed all exchanges in preparation of the COP28 in Dubai and inspired participating countries to converge around actions necessary to accelerate clean energy transitions.

## IEA pillars for action reflected in COP28 results

The main conclusions of IEA analysis and the key pillars for action that we proposed – notably the call to triple renewable energy capacity, double the rate of energy efficiency improvements and reduce methane emissions by 2030 – were directly reflected in the decision taken by governments on the first Global Stocktake at COP28.



UNFCCC CC BY-NC-SA 2.0

*High-Level Dialogue during COP28 in Dubai*

A major achievement for the world's climate action – the final text of the [Global Renewables and Energy Efficiency Pledge](#), which explicitly quoted IEA analysis – was signed by 132 countries.

## GEF funded Global E-Mobility Programme

IEA provided for the GEF funded Global E-Mobility Programme special analysis in the IEA [Global EV Outlook 2023](#) report. The analysis covered updates on EV policy and market updates from a range of countries that are involved in the implementation of the Programme. In 2023, the IEA also released an online interactive tool to support policy makers to better understand the impact of EV charging infrastructure on national and regional grid capacity needs. Furthermore, the IEA prioritised dissemination of previously released knowledge products, such as the Total Cost of Ownership tool through webinars organised in close collaboration with other executive agencies such as the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the UN Environment Programme (UNEP) and the Centro Mario Molina in Chile. In sum, the activities related to the Global E-Mobility Programme have contributed to better policy making for the deployment and scaling up of EVs in low- and middle-income countries.

## Custodian for the Sustainable Development Goals

The COP28's pledges to triple the world's installed renewable energy generation capacity and double the average annual rate of energy efficiency improvements underline the importance of progress on Goal 7 of the UN's Sustainable Development Goals (SDGs), which calls for “affordable, reliable, sustainable and modern energy for all” by 2030. The COP28 targets closely align with SDG 7.2 (to increase substantially the share of renewable energy in the global energy mix by 2030) and SDG 7.3 (to double the global rate of improvement in energy efficiency by 2030) – underscoring the critical importance of a globally harmonised dataset, for which IEA is the designated custodian.

In terms of cross-Agency collaboration, joint efforts on data collection and harmonisation with the United Nations Statistics Division (UNSD) on SDG 7.2 and 7.3 and with the United Nations Industrial Development Organization (UNIDO) on SDG 9.4 (upgrading infrastructure and retrofitting industries) were once again fruitful and contributed to a high quality of data and an expanded coverage of the database.

The development of SDG 7.2, 7.3 and 9.4 indicators for the 2023 reporting cycle included the dissemination of multiple outputs to the key global databases and publications on SDG progress of the UNSD:

- Official data submission to the SDG Global Database<sup>1</sup>
- Submissions to the UN Regional Commissions

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<sup>1</sup> UNSD SDG Global Database: <https://unstats.un.org/sdgs/dataportal/database>

- Submission of the corresponding storylines, which also contributed to the UN Secretary General's *Report on Progress towards the SDGs: Towards a Rescue Plan for People and Planet*<sup>2</sup> and to the *UN Sustainable Development Goals Report 2023*<sup>3</sup>

These reports and the UNSD SDG database are widely publicised and have had a strong global impact. According to UNSD figures, the SDG Report 2023 has been downloaded 1.6 million times. Pages related to the SDG Report garnered more than 640 000 total views in the third and fourth quarters and more than 1.6 million total pageviews for the full year. In addition, the *SDG Progress Report 2023* was covered in some 3 600 news articles around the world. Social media saw close to 1800 mentions, with 9100 engagements, potentially reaching 64.8 million users.

The IEA worked to improve its data management infrastructure, making progress on a new, flexible and futureproof system that takes advantage of the IEA's internal data warehouse. This allows for integrated use of the data across publications and opens new opportunities for timely projections. The migration work will continue in 2024. To optimise coherence across historical data and IEA projections, a more comprehensive database was introduced as the GDP data source<sup>4</sup> for SDG indicators 7.3.1 and 9.4.1. In addition to expanded coverage, the new dataset provides GDP projections up to five years in the future, allowing both nowcasting (prediction of the present and the very recent past) and forecasting of timely indicators. In combination with the new data processing architecture, this allows for integration of these timely data in various reports across the Agency.

The IEA SDG 7 web platform was updated to include the latest published data corresponding to SDG 7.2.1 and 7.3.1 indicators. The web platform was also upgraded to include downloadable data files. This strengthens the role of IEA as an important source for publicly available SDG progress tracking data, guiding the global discourse and research on goals 7.2 and 7.3.

This workstream also helped optimise delivery of the tailored output required for the cross-Agency Goal 7 progress report<sup>5</sup> and the corresponding digital platforms.

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<sup>2</sup>UN Secretary-General's Report on Progress towards the Sustainable Development Goals (Special Edition): <https://hlpf.un.org/sites/default/files/2023-04/SDG%20Progress%20Report%20Special%20Edition.pdf>

<sup>3</sup> The Sustainable Development Goals Report 2023 (Special edition): <https://unstats.un.org/sdgs/report/2023/The-Sustainable-Development-Goals-Report-2023.pdf>

<sup>4</sup> The new dataset uses the International Monetary Fund (IMF) World Economic Outlook database as a primary source and fills gaps from the World Bank (WB) World Development Indicators and the *Centre d'Études Prospectives et d'Informations Internationales (CEPII) - Comptes Harmonisés sur les Échanges et L'Économie Mondiale (CHELEM)* datasets.

<sup>5</sup> Tracking SDG7: The Energy Progress Report, 2023: <https://www.iea.org/reports/tracking-sdg7-the-energy-progress-report-2023>

## Strengthening national data capacities within the UNFCCC enhanced transparency framework

In 2023, the IEA collaborated with the UNFCCC on an initiative to improve the technical capacity of selected countries on energy statistics to reinforcing transparency in reporting national greenhouse gas (GHG) inventories and mitigation actions, in accordance with the requirements under the Enhanced Transparency Framework of the Paris Agreement.

This activity contributed to strengthening the IEA's collaboration with the UNFCCC, already consolidated around analytical support in such activities as the regular provision of targeted data from the IEA to the UNFCCC throughout their process of review of official national GHG Inventories from Annex I countries.

The IEA assisted 11 countries (Azerbaijan, Benin, Burkina Faso, Colombia, Namibia, Niger, Panama, Sudan, Togo, Zimbabwe, Trinidad and Tobago) by co-organising online training workshops with UNFCCC and by designing material on energy data for climate reporting with a focus on sectoral demand that was targeted to each country.

In Colombia, for example, IEA experts actively contributed to an in-person workshop on Quality Assurance of the National Energy Information Management System and Energy Statistics (April 2023). The workshop produced a set of informal recommendations for the government to advance data improvement projects. They also enabled the IEA to strengthen relationships with governments and to develop new data collaborations. Following these workshops, the IEA received official data for Niger and Sudan for the first time and the Ministry of Energy of Namibia requested further assistance.

More broadly, the workshops gave the IEA the opportunity to raise key data validation questions on energy balances. They also allowed countries to exchange with the IEA on their national energy information system and share the challenges they are facing. The IEA's contributions were well appreciated by all the participants and by the UNFCCC, as noted in the excellent feedback received.

## G20

Since 2015, the IEA has been supporting the G20 Presidencies across the Sherpa and Finance tracks on accelerating clean energy transitions, a leader-level priority. In preparation for its 2023 G20 Presidency, India requested IEA inputs to the energy, climate, development and finance working groups, illustrating an ever-closer engagement with the IEA.

As a result, we had an opportunity to work at the heart of G20 deliberations and deliver major impact. Main achievements included producing new analysis for

Prime Minister Narendra Modi's Lifestyle for Environment (LiFE) Initiative and a roadmap for the G20 on actions to triple installed renewable energy capacity by 2030, a key outcome of the G20 New Delhi Communiqué. The IEA also worked with India's Bureau of Energy Efficiency on a G20 voluntary action plan for doubling energy efficiency. Also, the Global Biofuels Alliance was launched at the G20 New Delhi Summit by Prime Minister Modi, with the IEA as one of the founding member organisations.

The work engaged a range of cross-Agency contributions including reports, workshops and ministerial meetings on India's key focus areas: renewables and fuels for the future (biofuels, hydrogen); energy efficiency; critical minerals and diversified supply chains; low-cost finance and investment; and technology gaps, climate resilience and energy security. The IEA's contribution was delivered in close cooperation with the Indian Ministry of External Affairs, as well as the Ministry of Environment and Climate Change, the Ministry of Finance, the Ministry of Petroleum and Natural Gas, the Ministry of Coal, the Ministry of Mines and the Ministry of Power, together with the Bureau of Energy Efficiency.



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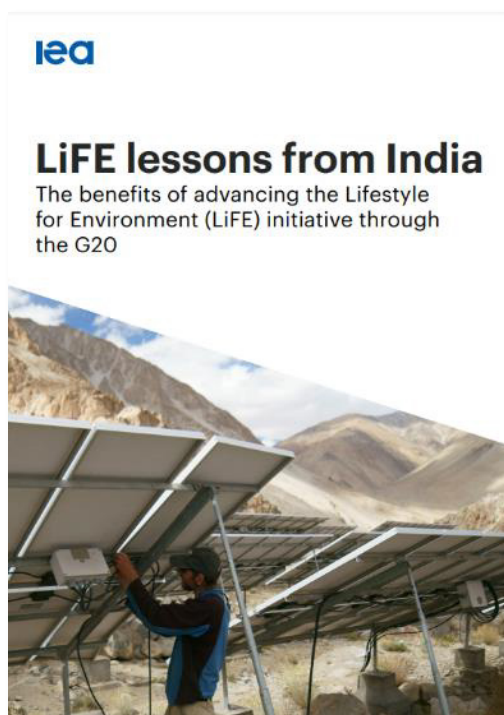
*IEA Executive Director discussing the IEA's LiFE analysis with Mr. Bhupender Yadav, the Minister of Environment, Forest and Climate Change of India*

The G20 India Sherpa also invited input from the IEA Executive Director and the IEA Secretariat to the G20 Development Ministerial (May 2023), the G20 Energy Transitions Ministerial (July 2023) and the G20 Leaders' Summit-level meetings (September and November 2023). IEA analysis was critical in defining and shaping G20 collective action on doubling energy efficiency and tripling renewable energy, sustainable biofuels and lifestyle behaviour, in support of the COP28 objectives.



India's leadership in its energy transition and the importance of its G20 Presidency at a time of shifting energy and geopolitical landscapes was the key focus of an event co-hosted by the IEA with India's G20 Secretariat in New Delhi in June. The IEA Executive Director met with Hardeep Singh Puri, India's Minister for Petroleum and Natural Gas and Amitabh Kant, India's G20 Sherpa, as well as the CEOs of Tata Power and Standard Chartered Bank India.

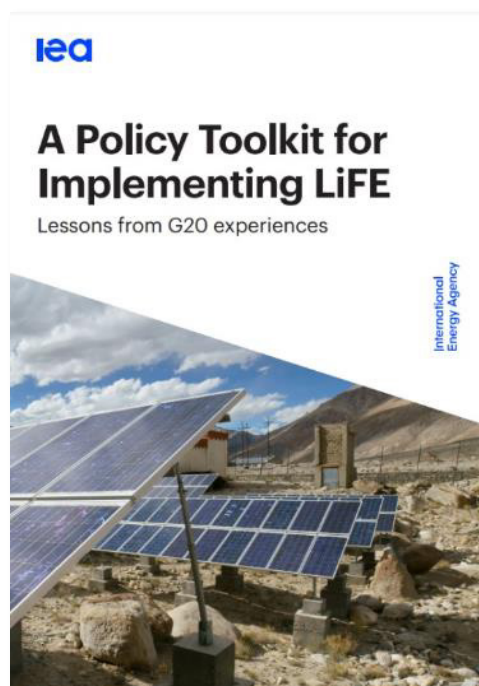
## LiFE lessons from India



The IEA made a significant contribution to India's *Lifestyle for Environment* (LiFE) initiative under the G20, which encourages the adoption of sustainable behaviours and consumption choices in India and worldwide, with an [assessment](#) of the impact on energy consumption, costs and emissions. The report was presented to Prime Minister Modi in February and fed into the G20 deliberations under the Development Working Group. In June, the IEA Executive Director was invited to brief ministers on the central role of energy in sustainable development at the G20 Development Ministerial in Varanasi. At the same meeting, India's External

Affairs Minister, S. Jaishankar, welcomed the IEA's LiFE report and its key findings featured in the Varanasi G20 Development Ministers' Declaration.

At the September New Delhi G20 Summit, the LiFE initiative was formally adopted in the G20 Leaders' Communiqué, which urged international organisations to mainstream and take LiFE's priorities into account in their work programmes, notably behavioural energy efficiency changes. IEA analysis on the emissions savings impact of LiFE was referred to in the G20 Leaders' Communiqué. As input to the COP28, the IEA produced a second [report](#) on LiFE, providing a concrete policy toolkit for advancing LiFE implementation at the level of countries, subnational jurisdictions and individuals, and through international fora such as the G20. It was presented at the India pavilion in the presence of IEA Deputy Executive Director, Mary Burce Warlick and Bhupender Yadav, India's Minister of Environment, Climate Change and Forests.



The messages of the LiFE analysis were also disseminated at a special event at India pavilion at COP28, co-organised with the Ministry of Environment, Forest and Climate Change and UNICEF India.

## Raising the energy transitions agenda

Building on the G20 Bali Roadmap on Accelerating Clean Energy Transitions – a multi-annual work programme for the G20 energy track up to 2030 – the IEA provided significant support to reaching strong outcomes for the G20 Energy Transitions Ministerial (Goa, July 2023). As a knowledge partner under the G20 Energy Transitions Working Group, the IEA supported several G20 analytical reports and outcome documents by preparing significant inputs to:

- Developing Resilient Renewable Energy Supply Chains for Global Clean Energy Transition, a [report](#) presented by the Council on Energy, Environment and Water that highlights the structure of global supply chains for solar photovoltaic, onshore and offshore wind, lithium-ion batteries and hydrogen
- G20 Voluntary High-Level Principles for Collaboration on Critical Minerals and Critical Minerals for India a [report](#) from the Committee on Identification of Critical Minerals, developed by the Ministry of Mines, India
- G20 Voluntary Action Plan on Doubling the Rate of Energy Efficiency Improvements by 2030 and the [Strategic Plan for Advancing Energy Efficiency Across Sectors](#), produced jointly with the Alliance for an Energy-Efficient Economy and Sustainable Energy for All

- G20 High-Level Principles on Hydrogen
- G20 Voluntary Action Plan for Promoting Renewable Energy to Accelerate Universal Energy Access
- G20 Voluntary Action Plan for Lowering the Cost of Finance for Energy Transitions

## New mandates for disaster risk reduction and climate tracks

The IEA worked to facilitate multilateral coordination under the new G20 Working Group on Disaster Risk Reduction (DRR), initiated by India in 2023. We also supported India's National Disaster Management Authority (NDMA), headed by Prime Minister Modi and its main partner, the Coalition for Disaster Resilient Infrastructure (CDRI). We attended the first meeting of the DRR (Gandhinagar, March 2023) to present a case study on hydropower for the G20 and at a second meeting (Mumbai, May 2023), contributed to a panel discussion on infrastructure risk assessment tools and data platforms.

## Expanded role in the finance tracks

In 2023, the IEA's expertise was sought after by partners and informed deliberations in the G20 finance tracks:

- We delivered an analysis of the global energy crisis and its macroeconomic impacts to the G20 Framework Working Group (FWG) at the request of HM Treasury (the United Kingdom economic and finance ministry) and India's Ministry of Finance
- We presented a short-term and medium-term outlook for global energy markets, including critical minerals supply chains as input to meetings of the G20 Finance Ministers and Central Bank Governors
- We were mandated to work on updated analysis of energy and food security with the United Nations Food and Agriculture Organization and the International Monetary Fund
- We delivered analysis on macroeconomic risks from climate change and benefits stemming from transition pathways to the FWG
- We were invited to cooperate with the Network for Greening the Financial System on the macroeconomic implications of bottlenecks to climate transition and how macro-policy cooperation can help resolve them
- In support of the Sustainable Finance Roadmap, we continued our participation in the G20 Sustainable Finance Working Group on aspects of clean energy technology investment and finance, notably for policies and instruments to support innovation, early-stage and demonstration technologies.

## G7

For more than two decades, the IEA has advised the Group of Seven (G7) energy and climate programme, helping the world’s largest industrial economies to raise their ambitions and build synergies across policy priorities and collective actions. The growing and significant role the IEA plays is reflected in many outcomes and mandates that emerged from [G7 Leaders’ Summit in Hiroshima](#) in May 2023. The IEA was a strategic advisor to Japan’s G7 Presidency, providing support for the Hiroshima summit as well as the G7 Energy/Climate Ministerial in Sapporo (April 2023).

Landmark outcomes such as the [G7 five-point action plan on critical minerals](#) and the [G7 Clean Energy Economy Action Plan](#) were based on IEA analysis. The Japan G7 Presidency also invited the IEA to deliver technical analysis on hydrogen, steel, clean technology manufacturing, renewables integration and natural gas, as well as energy efficiency and reducing emissions from road transport. These contributions included more than ten reports and related workshops in 2023.



Mandated by the G7 Leaders’ Hiroshima Summit, the IEA advised the group on [overcoming the energy trilemma](#): the climate crisis, the global energy crisis and new geopolitical risks. Our recommendations stressed the critical importance of strengthening energy security and national energy transitions in both G7 as well as EMDEs. Moreover, we highlighted the need for transitions to be inclusive and for closing the gap on clean energy investment and finance flows.

Through the CETP, the IEA supports building bridges between the G7 and the broader community of G20 and EMDE nations. In 2023, we created opportunities for selected non-G7 members – notably India, Indonesia, South Africa, ASEAN and the African Union – to take part in relevant meetings on the G7 agenda. The

IEA also supported G7 engagement with partners in the “G7+” – countries affected by active or recent conflict – by working with Brazil (G20 Presidency in 2024), the African Union (Comoros in 2023), India (G20 Presidency), Indonesia (ASEAN Chair) and Ukraine to better understand the needs of countries in fragile situations.

## Broadening multilateral coordination

The IEA worked to ensure the consistency and coherence of the energy and climate agendas of the G7, G20 and UNFCCC. Our focus in 2023 was on helping these organisations scale up their efforts on renewable energy, energy efficiency and clean energy investment and finance, as well as energy security, low-carbon fuels and collaboration on hydrogen and industrial decarbonisation. In this context, the IEA is working with the incoming Italian G7 Presidency (which has made net zero by 2050 a key priority) to design an ambitious climate and energy programme in 2024.

## Supporting clean manufacturing and innovation

One area where we see potential for better coordination among the G7, G20 and UNFCCC is addressing the persistent gaps in access to promising clean energy technologies – including hydrogen, low-carbon fuels and CCUS. It is a subject where the IEA has already demonstrated leadership through its role in developing the G7 Industrial Decarbonisation Agenda.

The [G7 Energy/Climate Ministerial in Sapporo](#), Japan mandated the IEA to advance the G7 agendas on technology innovation, supply chains and clean manufacturing. As requested in the G7 Hiroshima Communiqué and the G7 Clean Energy Economy Action Plan, in November 2023, the IEA’s Energy Technology Policy division organised a [high-level dialogue](#) on the topic of Diversifying Clean Technology Manufacturing. The insights gathered in the workshop fed into the clean energy manufacturing roadmap and supply chain [update report](#) for COP28 (November 2023) and the forthcoming (May 2024) *Energy Technology Perspectives* Special Report on *Advancing Clean Technology Manufacturing*. We were also asked to arrange an [innovation forum](#) with low- and middle-income countries and start-ups that took place during the most recent IEA Ministerial (February 2024). The IEA’s work on critical minerals also fed into the discussions of G7 and directly supported the implementation of the G7 Five-Point Critical Minerals Action Plan.

The IEA Energy Technology Policy Division supported Japan’s G7 Presidency and discussions among G7 members on industrial decarbonisation and hydrogen. Our report, [Emissions Measurement and Data Collection for a Net Zero Steel Industry](#) (April 2023), complemented an earlier analysis conducted for the German G7 Presidency in 2022 by providing a direction for the G7 Industrial Decarbonisation



Agenda with regard to tackling industrial emissions. The IEA report, [Towards hydrogen definitions based on their emissions intensity](#) (April 2023), assessed the greenhouse gas emissions intensity of different hydrogen production routes and reviewed ways that emissions intensity measurements could be used in the development of regulation and certification schemes for hydrogen production. This analysis has also informed G20 discussions and helped build consensus on hydrogen collaboration.

## Biofuture Platform

Bioenergy has a key role to play in the clean energy transition and is an area with huge potential for innovation. In the IEA Net Zero Roadmap, sustainable bioenergy is to reach more than 100 Exajoules (EJ) by 2050, almost one-fifth of total world energy supply. However, investment in innovative technologies and sustainable bioenergy supply chains are currently hampered by uncertainty and concerns about sustainability and availability of biomass feedstocks, social acceptance issues and policy uncertainty. The IEA works to address these issues, serving as the coordinator and facilitator of the OECD's Clean Energy Ministerial (CEM) [Biofuture Platform](#) Initiative and the co-manager of the Biofuture Campaign, established at the 11<sup>th</sup> and 12<sup>th</sup> CEM meetings in 2020 and 2021.

The Biofuture Platform is a country-led, multi-stakeholder initiative which aims to enhance sustainability, availability, best practices, financing mechanisms and cooperation on biomass. It is led by five core countries – the United States (Chair), Brazil, Canada, India, Netherlands – and includes 23 members, of which 12 are drawn from CETP priority countries and regions. To seek recommendations and share results across these workstreams, the Biofuture Platform has established three distinct groups: the Biofuture Platform Member Group, comprised of 23 member governments; the Technical Advisory Group, made up of more than 40 experts and the Biofuture Campaign, made up of 41 companies. Additionally, Australia became a new member of the Biofuture Platform in September 2023.

As part of its G20 Presidency in 2023, India proposed a Global Biofuel Alliance (GBA) to bring countries together to expand and create new markets for sustainable biofuels. The GBA's objectives of sharing of best practices, providing technical support and building capacity are welcome additions to international efforts to expand sustainable biofuel production and use – a key step to decarbonising transportation and heat services with secure and affordable energy supplies. The Biofuture Platform has been designated as one of the GBA's privileged partners and the IEA plays an integral part in informing the work of this new structure.



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*Launch of the Global Biofuels Alliance at the G20 Summit in New Delhi, India, 18 September 2023*

The GBA was formally launched on 9 September in Goa, India. In preparation, our Indian partners asked the IEA to deliver two reports. The internal policy briefing *Mapping of Bioenergy Organisations and Initiatives* (May 2023) was drafted to avoid overlap of initiatives and promote collaboration. The second report, [Biofuel Policy in Brazil, India and the United States](#) (July 2023), served to inform and focus the GBA's work by sharing biofuel policy insights from the founding countries.



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*Paolo Frankl, head of the IEA Renewable Energy Division discussing the Biofuel Policy report with Shri Hardeep Singh Puri, India's Minister of Petroleum and Natural Gas, during a G20 event in July*

Other activities of the Biofuture Platform in 2023 included:

- 7 March: A workshop, “Avoiding a Supply Chain Crunch for Liquid Biofuels”, was attended by more than 90 industry members. The event explored the feedstock challenges facing the biofuels industry and the potential to overcome them. It included a preparatory brief and summary report.
- 20-22 March: Clean Energy Ministerial Senior Officials’ Meeting and Mission Innovation Annual Gathering in Rio de Janeiro. Among its key sessions were:
  - Future Fuels workshop: This event focused on how to enable cross-cutting work on Future Fuels across multiple CEM initiatives including the CCUS Initiative, Industrial Deep Decarbonisation Initiative, Clean Energy Marine Hubs Initiative, Mission Innovation Zero Emission Shipping Initiative, MI Biorefineries Mission and Innovation for Sustainable Aviation Fuels.
  - Biofuture Initiative working session: This session gathered the Initiative’s member countries to consider priorities and prepare for meetings in Mumbai and Goa.
- 15 May: G20 Energy Transition Working Group Mumbai side event. The Biofuture Platform organised a session on the future of fuels and chemicals, including speakers from the engineering group Praj Industries, India’s Ministry of Petroleum and Natural Gas and Bharat Petroleum Company. In addition, the Biofuture Platform presented a gap analysis on international organisation activities in bioenergy and a draft outline of a planned policy insights paper to support India’s Global Biofuel Alliance.
- 12 and 24 May: Biomass Energy Security Workshops. Two workshops considering the steps the EU and its member states can take to increase the use of sustainable bio-based products to help European and global economies replace fossil fuels with alternative energy sources.
- 19-22 July: 14<sup>th</sup> Clean Energy Ministerial (CEM14) held in Goa, India. Highlights included:
  - A CEO-Minister Roundtable, where 18 representatives of the governments of Brazil, India, Italy, Korea and the Netherlands, as well as chief executives from the renewable and sustainable fuels industry – including Gevo, Futuria and Praj Industries – had the opportunity to showcase their projects, discuss barriers to using biogenic carbon in transportation and heavy industry and recommend performance-based ways to accelerate sustainable production and use of bioproducts.
  - Side events on “New technologies and policies for a net zero biofuture”, which covered liquid biofuels and bio-based chemicals, “Mobilising sustainable feedstocks”, which included two sessions on feedstock availability and sustainability.
- 19 September: New York Energy Climate Week. A reception was organised by the Biofuture Campaign, with keynote speeches from Brazil’s Secretary for Climate, Energy and Environment as well as leaders from Topsoe, a Danish

supplier of emissions-reduction technologies, and the Clean Cooking Alliance. These remarks were followed by a roundtable with other industry CEOs.

- 6 December: The [Biofuture Campaign co-hosted a side event](#) during COP28 on cutting-edge fuels, together with the Methanol Institute and the Renewable Natural Gas Coalition at the Denmark State of Green Pavilion.

Also in 2023, the Biofuture Platform prepared its first [update report](#) published during the CEM14 Goa conference, covering the work carried out by the different workstreams in the past year. To frame those discussions, this report included good practices for sustainable biomass, tools to manage biomass investment risk and a summary of the feedstock availability analysis performed during the first half of 2023, as well as Biofuture Campaign input and key industry recommendations.

Additionally, [the Initiative's webpage](#) has been redesigned to provide more content and material to members and the general public. to reinforce dissemination efforts.

## Regulatory Energy Transition Accelerator

Launched at COP26 in 2021, the Regulatory Energy Transition Accelerator (RETA) is the first global regulatory network focused on decarbonisation through flexible, renewables-based power systems and inclusive energy transitions. RETA has established a unique model to create strategic partnerships with other organisations – the “delivery partners” who produce policy advice, bespoke technical assistance, capacity building events and facilitate peer-to-peer learning between regulators. The IEA is one of the founding members of RETA, along with the UK Office of Gas and Electricity Markets (Ofgem), the World Bank and the International Renewable Energy Agency (IRENA). Since its launch, RETA has expanded its membership from 20 to more than 50 regulators from across the world, with more joining each month, including six CETP Joint Commitment signatories (Australia, Canada, the United Kingdom, Italy, France and the United States). RETA also includes regulators from key CETP implementation countries and regions such as Indonesia, as well as others from Southeast Asia, Latin America and Africa – including in Egypt, Kenya, Morocco, Malaysia, Peru, Singapore and Uganda. The IEA is the administrator for RETA and a key delivery partner.

In 2023, RETA delivered four major projects on

- Digitalisation for Flexibility,
- Small Developing Island States,
- Decarbonisation in Regulatory Decision Making and
- Principles for Interconnectors.

Following the launch of the [Interconnectors project first report](#) in November, RETA was invited to deliver presentations for regional associations such as the Energy

Regulators Regional Association (ERRA), the Canadian Association of Members of Public Utility Tribunals (CAMPUT) and the ASEAN Energy Regulators Network ([AERN](#)) to organise capacity building events. RETA collaborated in the development of training materials for two regulatory trainings, namely those developed by ERRA and Singapore's Energy Markets Authority

The Project on Decarbonisation in Regulatory Decision Making was based on interviews with regulators from 25 countries. It found that while most regulators are finding creative ways to accommodate decarbonisation criteria in their decision making, only one of the surveyed regulators has an explicit mandate on the topic. As a follow-up in 2024, RETA aims to work with energy ministries to secure more effective decarbonisation mandates.

The results of the IEA's activities were presented at nine different dissemination events, including high-level meetings at the [World Forum for Energy Regulation in Peru in August](#) and a dedicated event at COP28. The importance of the work on regulation was recognised at other events such as a special event on grids organised by the COP28 Presidency. In addition to broader dissemination events, RETA held two high-level bilateral meetings with India's Central Energy Regulatory Commission and Indonesia's Ministry of Energy and Mineral Resources.

## Enhancing multilateral innovation partnerships

The IEA's [Technology Collaboration Programme](#) (TCP) represents 39 international technology partnerships – cooperative projects established by at least two IEA member countries to carry out a broad range of activities such as energy technology RD&D and analysis, capacity building, dissemination and scientific exchanges. Through the TCP, the IEA plays an important role in accelerating innovation and driving deployment of new technologies critical to clean energy transitions. TCP partnerships act as a key platform for international collaboration for strengthening markets for early-stage technologies and bolstering public support for RD&D. Emerging and developing countries (EMDCs) already take part in many TCP projects. In 2023, we continued to broaden EMDC participation with the view of expanding the diversity of members to include CETP focus countries and regions, extend the reach of the TCP and enhance the IEA's ability to drive critical innovation for clean energy transition.

In 2023, we organised bilateral meetings with CETP countries introducing them to the TCP programme through for instance support with the organisation of their National TCP Days. In parallel, we assisted the TCPs in their outreach and communication with individual focus countries. In November, for example, upon request from India's Ministry of New Renewable Energy the IEA organised a special TCP workshop in New Delhi. After the meeting, the IEA continued to



facilitate contacts between individual TCP partners and Indian stakeholders with the aim of increasing India's engagement in the TCP program. This engagement and further outreach to other focus countries and regions will continue in 2024. Additionally, in October, we held the fifth edition of the biannual [Universal Meeting](#) of the TCP (attended by representatives from 31 different collaborations as well as country delegates to the Committee on Energy Research and Technology) to discuss new forms of cooperation that can bring further support to energy RD&D.

# Pillar III – Enabling global energy dialogue

## Highlights

- In June, the IEA hosted the 8<sup>th</sup> Global Conference on Energy Efficiency in Versailles, France. In a statement released at the conference, 46 governments from across Africa, the Americas, Asia and Europe highlighted the critical role that energy efficiency can play – not only in improving living standards and energy security, but in accelerating the clean energy transition.
- The IEA significantly advanced progress on financing clean energy transitions with the provision of extended, reliable and timely data on levels of government spending with the [Government Energy Spending Tracker](#), an update to the [Cost of Capital Observatory](#) and analysis that included the [World Energy Investment 2023](#) and other reports.
- A high-level Finance Industry Advisory Board was established in March, which brought together 40 representatives from leading players in energy finance to provide guidance and feedback developing the report recommendations.
- Following its new mandate from IEA member countries, the IEA has expanded its work on critical minerals to support policy makers in the implementation of measures to strengthen the resilience and reliability of critical mineral supplies. In July, we published the inaugural edition of the [Critical Minerals Market Review](#) to provide a concrete work programme on this crucial topic.
- The [World Energy Employment 2023](#) report, published in November, traced the transformation of the energy workforce in the context of the global clean energy transition.
- A series of eight webinars on various aspects of people-centred energy transitions were attended by more than 1 300 people. Online recordings of these sessions were viewed more than 2 500 times.
- Policy advice, analysis and dissemination activities were delivered by 3DEN – a major initiative that sheds light on how digital technologies can contribute to the decarbonisation of power systems.
- The IEA addressed the role of abating methane emissions and low-energy gases – as well as traditional fossil fuels – in energy transitions with the publication of [The Oil and Gas Industry in Net Zero Transitions](#). The report spelled out what the global oil and gas sectors would need to do to align their operations with the goals of the Paris Agreement.

- The 2023 edition of our flagship Energy Efficiency Policy in Emerging Economies Training Week – held in Paris for the first time since 2019 – brought together more than 120 policy makers and energy professionals from 41 countries. Notably, more than half of the participants were women.
- The IEA offered a highly successful in-person and online training session on energy statistics. Roughly half of the attendees came from sub-Saharan Africa, while other participants were from India, Brazil and other key CETP regions.
- The IEA strengthened its relationship with key data providers from non-member countries, consolidating and expanding data exchanges in several areas. It also advanced development of its clean energy transitions indicators.
- The IEA also created a roadmap for designing a national system for demand-side data and energy efficiency indicators – a practical tool to help develop national capacity in data collection.

## Private and public sector investment

This workstream covers three focus areas. The first is expanding the scope of the [Government Energy Spending Tracker](#) beyond clean energy technology to encompass total government expenditures dedicated to energy, with a focus on emerging market and developing economies. The second is expanding analysis of financing for clean energy transitions in emerging and developing economies. The third is further strengthening the [Cost of Capital Observatory](#) to improve transparency on capital costs for energy projects in emerging and developing economies and understand how they differ by project type and explore ways to reduce project risk.

## Tracking government energy spending

In 2023, the Agency significantly scaled up its efforts to track clean energy transitions through the provision of extended, reliable and timely data on levels of government spending.

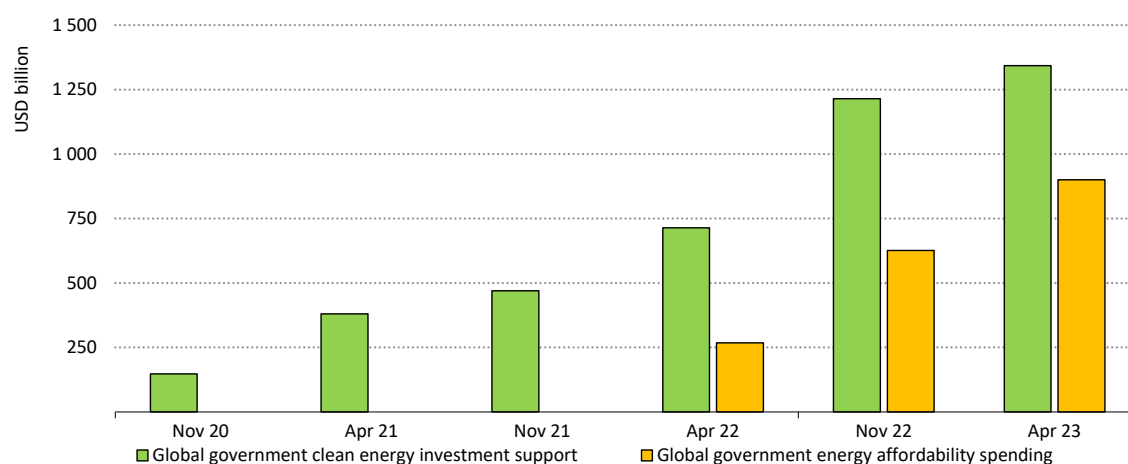
The [Government Energy Spending Tracker](#), which succeeded the clean-energy-technology focused Sustainable Recovery Tracker, received a major update in June 2023 to cover almost 1 600 government financial measures from 68 countries, all of which are extensively checked and fully detailed in a [dedicated database](#). The Tracker – which now encompasses short-term energy affordability measures aimed to help consumers facing soaring energy prices alongside clean energy investment support officially enacted by governments – offers a unique view of trends in public spending over the last three years.

The analysis was launched in parallel with a [commentary on how energy affordability has changed amidst the energy crisis](#) (June 2023) and directly contributed to the [World Energy Outlook 2023 report](#) modelling, as well as to the [World Energy Investment 2023](#) deep dive into global financial evolutions shaping the energy sector.

The June 2023 update identifies USD 1.34 trillion allocated by policy makers for clean energy investment support since 2020, confirming that public spending has played a central role in the rapid growth of clean energy investment since the Covid-19 crisis. The Tracker also estimates that USD 900 billion have been earmarked by governments for short-term consumer affordability measures since the start of the global energy crisis. Around 30% of this amount – which is additional to pre-existing subsidy schemes – was earmarked over a six-month timeframe and despite calls to better target households and industries most in need, only 25% of these new affordability measures are aimed at low-income households and industries most impacted by the energy crisis.

The new areas explored by the Tracker also confirmed that the spending mobilised in advanced economies still outstrips that put forth in emerging market and developing economies. Advanced economies account for 93% of total government clean energy investment support and 85% of consumer affordability support.

### Government spending for clean energy investment support and crisis-related short-term consumer energy affordability measures, Q2 2023



IEA CC BY 4.0

Source: IEA (2023), [Government Energy Spending Tracker](#).

Governments, private sector stakeholders and experts are using the Tracker to assess how national policy up against net zero emissions goals. The Tracker enables cross-country and cross-sectoral comparison over a wide range of industries and technologies. It notably includes for the first time an initial estimate

of clean energy manufacturing incentives, many of which are designed as direct responses to the US Inflation Reduction Act (IRA), which still represents almost one-quarter of all clean energy support globally since 2020. Support programs are multiplying not only among advanced economies, but also in emerging and developing economies, a clear sign that the global race for clean energy competitiveness is picking up.

The IEA will closely monitor these incentives in the 2024 updates of the Tracker. Preparatory work is ongoing to update and deepen the analysis on this aspect, exploring the implications for government incentives for clean energy technology trade and industrial domestic capacities, as well as prospects for a net zero emission trajectory by mid-century.

## Financing clean energy transitions in emerging and developing economies

Building a clean energy system is crucial to meeting rising demand for energy services in the developing world in a sustainable way. The economics behind these investments have been enhanced by the energy crisis and the high and volatile prices seen for fossil fuels. But the crisis has also complicated the investment environment, with higher indebtedness in many EMDEs, increasing energy poverty, rising inflation driving up borrowing costs and increasing risks to the financial sustainability of utilities that typically have a crucial role in the development of grid infrastructure and as electricity purchasers.

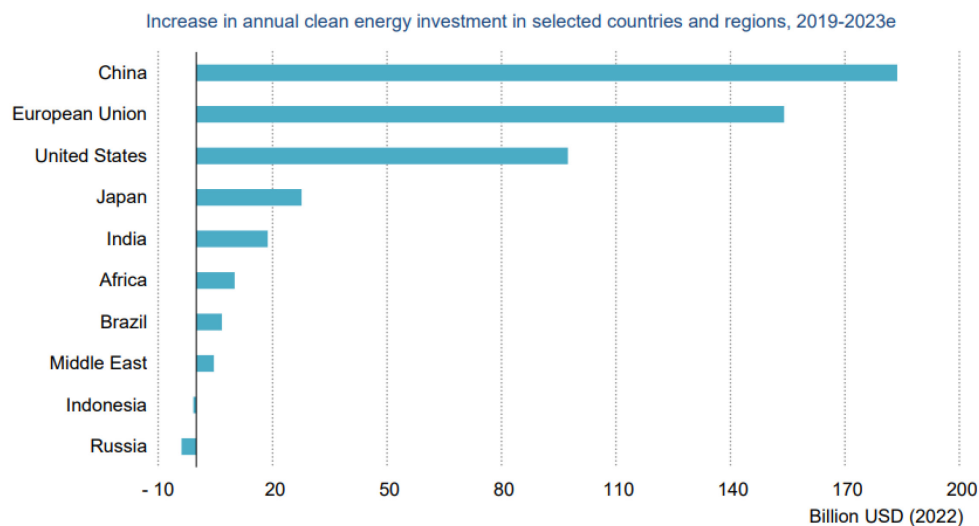
Against this background, the objective of the investment workstream has been to raise awareness of the risk of shortfalls in clean energy investment in EMDEs and to offer solutions that unlock private capital by strengthening policy frameworks and improving the effectiveness of limited public funds to mobilise financing for clean energy transitions. Our activities in 2023 have focused on countries in Africa and developing Asia. We produced several reports that advanced understanding and expertise on these topics.

The IEA [World Energy Investment 2023](#) report, published in May, provided a picture of global energy investment in 2022 and full-year estimates of the outlook for 2023. The report detailed the amount of investment needed in clean energy by sector, energy source and provider. It also highlighted that despite some bright spots like solar in India, clean energy spending in emerging and developing economies (excluding China) remains stuck at 2015 levels – with no increase since the Paris Agreement. Much more needs to be done, including by international development institutions, to boost these investment levels and bridge widening regional divergences in the pace of energy transition investment.



## Increase in annual clean energy investment in selected countries and regions, 2019-2023e

The increase in clean energy spending in recent years is impressive but heavily concentrated in a handful of countries



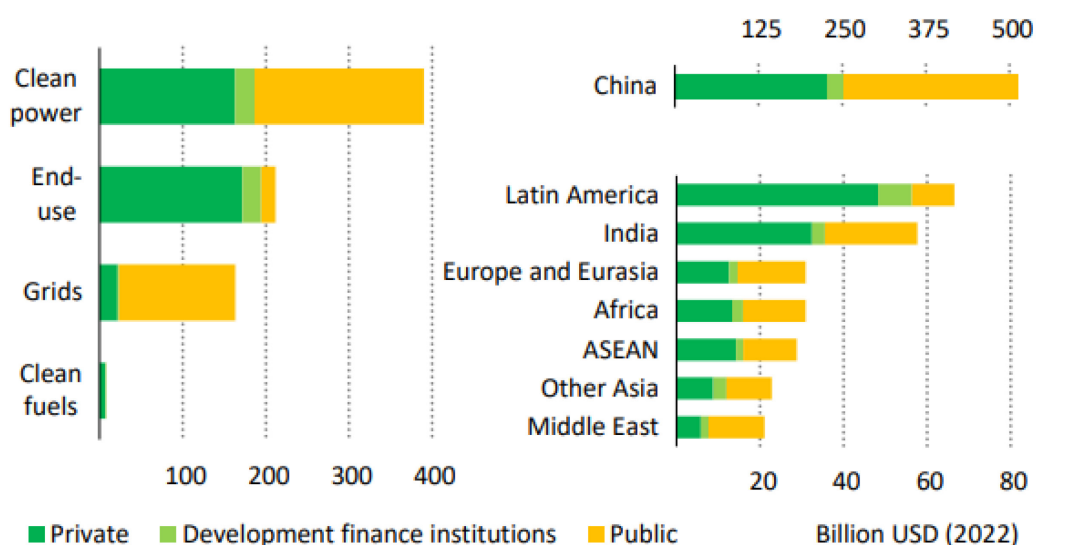
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Note: 2023e = estimated values for 2023.

Source: IEA (2023), [World Energy Investment 2023](#).

[Scaling up private sector financing for clean energy transitions in emerging market and developing economies](#), a joint report by the IEA and the International Finance Corporation (IFC), was released in June with a special launch event during the [Paris Summit on a New Global Financing Pact](#). The report shows that public investments alone would be insufficient to deliver universal access to clean energy and tackle climate change. Increased public funding can be used most effectively in partnership with private sector capital to reduce project risks and two-thirds of the finance for clean energy projects in emerging and developing economies (outside China) will need to come from the private sector. It emphasised the need for greater international technical, regulatory and financial support to unlock the potential for clean energy investments. As an output of the summit, the IEA was tasked with developing recommendations to lower the cost of capital in emerging and developing economies for delivery during the IEA's Ministerial Meeting in February 2024.

### Clean energy finance in EMDEs by public and private sources in 2022



IEA. CC BY 4.0.

*Around half of clean energy investment in EMDEs is financed by public entities, but a scale-up will require a much greater role for the private sector*

Source: IEA (2023), [Scaling Up Private Finance for Clean Energy in Emerging and Developing Economies](#).

Moreover, a high-level [Finance Industry Advisory Board](#) was established in March that brought together 40 representatives from leading players in the world of energy finance, including banks, asset managers and international financial institutions to provide guidance and feedback developing the report recommendations.

## Cost of Capital Observatory

The Cost of Capital Observatory tracks financing costs for clean energy projects in emerging market and developing economies. It provides a [dashboard](#) with free data on the cost of capital and covers clean energy projects that have taken final investment decisions in 2019, 2021 and 2022 with the aim of identifying and addressing risks that have impeded vital investment flows to these regions and improving transparency around higher borrowing costs for energy projects in the developing world.

It provides tools and [analysis](#) to help governments understand and quantify the main underlying risks perceived by investors and financiers in each country. It also includes [case studies](#) with lessons learned about how policy makers – together with the private sector, development finance institutions and other entities – successfully managed to mitigate risks and mobilise capital for clean energy initiatives across the emerging and developing world. In November, a [commentary](#) was released together with the second year of data.

## Critical minerals

Critical minerals, essential for a range of clean energy technologies, have gained increased attention on both policy and business agendas in recent years. Rapid growth in demand is providing new opportunities for the industry, but a combination of volatile price movements, supply chain bottlenecks and geopolitical concerns has created a potent mix of risks to secure and rapid energy transitions. Engagement with emerging and developing economies is crucial, given their central role in improving the reliability and diversity of global supplies of these minerals, which include copper, lithium, nickel, cobalt and rare earth elements.

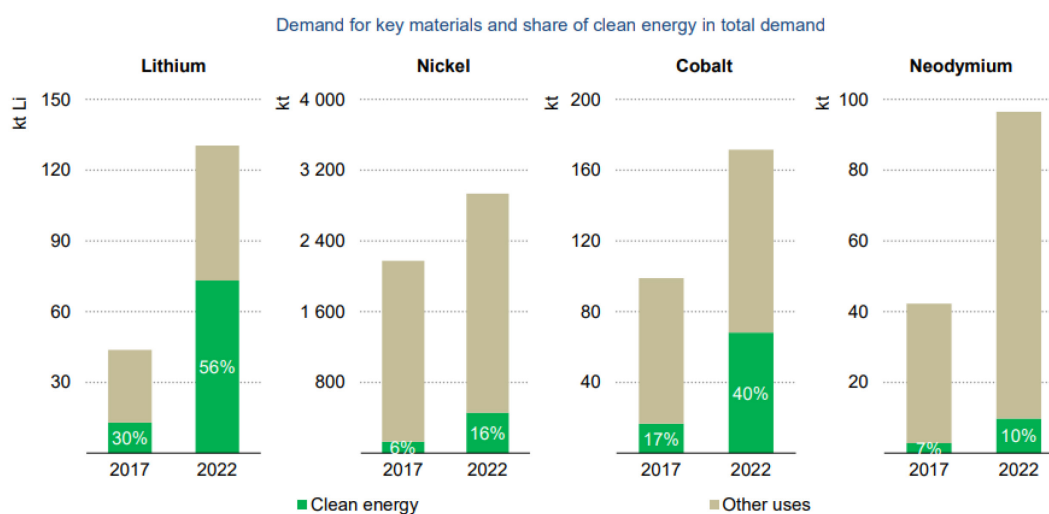
### In-depth analysis

Following its [new mandate](#) from IEA member governments, the Agency has been expanding its work on critical minerals to support policy makers in the implementation of measures to strengthen the resilience and reliability of critical mineral supplies.

In July, we published the first edition of the [Critical Minerals Market Review](#) to provide a concrete work programme, encompassing various aspects such as market monitoring, technology innovation, supply chain resilience, recycling, environmental and social standards and international collaboration. In this inaugural piece of analysis, we reviewed the latest price, investment and production trends in the critical minerals sector. We provided a snapshot of industry developments in 2022 and early 2023 and reviewed key trends in the battery sector given its importance in driving demand growth for critical minerals. We also presented a review of key trends for each individual commodity, as well as implications for policy and industry stakeholders.

## Demand for key materials and share of clean energy in total demand

The rapid rise of clean energy has underpinned significant growth in mineral demand



Source: IEA (2023), [Critical Minerals Market Review 2023](#).

The IEA’s work on critical minerals responds directly to a request in the [G7 Five-Point Plan](#) for analysis on critical minerals security. The Group’s climate, energy and environment ministers asked the IEA to produce medium- and long-term outlooks for critical minerals demand and supply to help inform decision making.

## Data tools

Critical minerals have been fully integrated into the IEA’s [Global Energy and Climate Model](#), which means that the projections for critical minerals demand and supply are regularly updated in line with latest policy and technology trends in the IEA energy scenarios, notably in the [World Energy Outlook](#) and the [Global EV Outlook](#). The projections are available through the [IEA Critical Minerals Data Explorer](#), an online tool that allows users to easily access and navigate the latest data. We released the updated version of the Data Explorer in July 2023.

As part of efforts to enhance market transparency by making more data publicly available, we also provide regular updates on policies in the critical minerals area through the [Critical Minerals Policy Tracker](#). Since its launch in November 2022, the Tracker has expanded to include more than 35 countries and 450 polices, with an additional focus on reducing environmental, social and governance impacts. Though not exhaustive, this tool gives a valuable overview of evolving mineral supply chain governance. It is updated yearly, with the most recent update in December 2023.

## Building momentum for action

To help coordinate action and build consensus, the IEA hosted the first ever international [summit on critical minerals and their role in clean energy transitions](#) on 28 September. This high-level event focused on measures to promote the secure, sustainable and responsible supply of raw materials that have a central role in the global clean energy transitions. Ministers from almost 50 key producing and consuming nations around the world – including both large mineral producers and consumers – met with around 40 business leaders, investors and heads of international organisations and civil society representatives to discuss effective courses of action to diversify mineral supply chains, enhance market transparency, accelerate technological innovation and recycling and promote sustainable and responsible development practices.



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*IEA Critical Minerals and Clean Energy Summit, Paris, 28 September 2023*

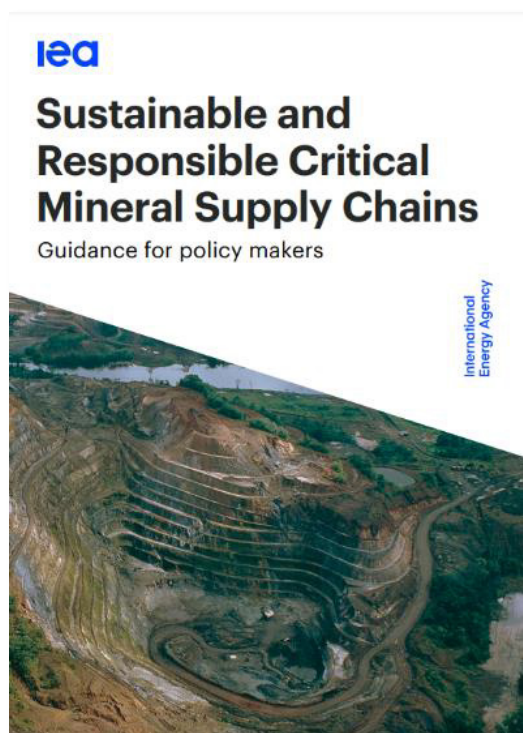
In addition to this major event, we held an important number of technical exchanges and workshops, including two webinars: “Navigating Geopolitical Uncertainties and Scaling Up Investment for Diversified Supplies” (9 November) and “The Nexus of Environmental, Social and Governance Performance and Mineral Security” (21 November). We also detailed the recommendations at presentations for various institutions including Eurometaux, International Card Manufacturers Association, Mining 2030 and the Korean Ministry of Foreign Affairs.

## Environmental, Social and Governance (ESG) considerations

Critical mineral supply chains cannot be truly secure, reliable and resilient unless they are also sustainable and responsible. The demand surge will require new facilities, such as mines, processing facilities and refineries, which pose risks to the environment and communities. Addressing these risks is crucial to prevent disruptions in supply and facilitate clean energy technology expansion, which enhances supply chain security. However, the primary motivation for addressing environmental, social and governance risks is to protect people and the



environment. Developing responsible supply chains allows communities to benefit from mineral development and ensures a people-centred clean energy transition that fosters investment and bolsters both tax revenue and job growth.



In December 2023, we released [Sustainable and Responsible Critical Mineral Supply Chains](#), a report with recommendations for policy makers to ensure that critical minerals value chains are sustainable and responsible. In addition to recommendations, the report included a deep dive on six key areas of focus: water, greenhouse gas emissions, communities, human rights, biodiversity and corruption.

We also held four environmental, social and governance (ESG) task force meetings in 2023 and a series of consultations with relevant international organisations, companies, industry associations and civil society organisations. These consultations helped collect valuable input for the ESG report and to identify potential impact areas for future work.

## Critical minerals security of supply and emergency preparedness considerations

In 2023, the CETP support also allowed us to advance the project of establishing the Voluntary Critical Minerals Security Programme with the IEA member countries. It includes the development of a framework to enhance security of supply and emergency preparedness at national, regional and global levels. One of the objectives of the year's critical minerals activity was to build a platform for IEA member countries to work with non-member countries, particularly in Asia and Africa, to structure the critical minerals market in a way that would both provide a secure foundation for clean energy transitions but also help the economic development of critical minerals-producing countries, enabling them access to clean technologies and supporting their clean transitions. To this end, the IEA worked with a range of non-member countries, including Brazil, Chile, Cook Islands, DRC Congo, India, Indonesia, Israel, Kazakhstan, Kenya, Madagascar, Mongolia, Mozambique, Tanzania and Ukraine (all countries participated in the 28 September Summit at the IEA).

We established a Task Force on Security of Critical Minerals in 2023, comprised of nominated experts from IEA member countries. The first meeting took place on

7 March and was followed by as many as seven sessions throughout the year. The Task Force initiated an online survey to collect detailed information on member states' needs and policies regarding critical minerals. Three additional Task Force meetings aimed to present an interim progress report on potential security mechanisms in June. The group also prepared a security component for a High-level IEA Summit on Critical Minerals and Clean Energy, focusing on developing a new security mechanism for the supply of critical minerals, to bring solutions for an orderly global critical minerals market, especially in the context of producing countries and people-centred transitions.

The main objective of the Task Force was to create conditions for secure supplies of critical minerals for global clean energy transitions, with a focus on providing solutions that ensure access to clean technologies to the developing world. The growth needed to support clean energy transitions holds great promise for supporting economic development and lifting some of the world's poorest nations out of poverty. The Task Force also considers that, alongside supply concerns, there are also significant risks associated with the environmental, social and governance (ESG) impacts of mining projects. Mineral wealth can, if properly managed, contribute to public revenue and provide decent living standards – particularly if paired with strong ESG guidelines that ensure that workers and communities are protected from environmental and social harms.

## Energy efficiency: Global activities and training

The rate of improvement in energy efficiency must double from current levels under the IEA's Net Zero Emissions by 2050 Scenario. This imperative provides the framework for the CETP's Energy Efficiency in Emerging Economies (E4) programme, which facilitates the exchange of experience and learning between its partner countries and regions and IEA member countries to provide better evidence and deeper knowledge on effective energy efficiency policies.

Accelerating efficiency progress is a challenge that requires a global step change in ambition. In 2023, the Agency worked to keep energy efficiency high on the agenda and build consensus for stronger global commitments and action. In June, we hosted the 8<sup>th</sup> Global Conference on Energy Efficiency in Versailles, where governments from around the world endorsed the goal of doubling the average global rate of energy efficiency improvement by the end of the decade to drive sustainable economic growth and put the world on a safe and affordable path to net zero emissions.

We also provided energy efficiency training to build the capacity of policy makers and energy professionals in emerging economies and developing countries, without whom energy efficiency policies cannot be developed or implemented.

The 2023 edition of the Energy Efficiency Policy in Emerging Economies Training Week, held in Paris for the first time since 2019, was a huge success.

## The 8<sup>th</sup> Global Conference on Energy Efficiency

The 8<sup>th</sup> Annual Global Conference on Energy Efficiency, co-hosted by Executive Director Birol and France's Minister for Energy Transition, Agnès Pannier-Runacher, was the IEA's largest energy efficiency conference. The June event attracted 650 participants from more than 80 countries, including 30 ministers and 50 industry CEOs.

In a [ministerial statement](#) released at the conference, 46 governments from across Africa, the Americas, Asia and Europe highlighted the critical role that energy efficiency can play – not only in improving living standards and energy security, but in accelerating the clean energy transition. This means ramping up annual energy efficiency progress from 2.2% today to at least 4% by 2030 – a move that would create jobs, expand energy access, reduce energy bills, decrease air pollution and diminish reliance on imported fossil fuels, as well as other social and economic benefits.

In support of the meeting, the IEA produced [Energy Efficiency – The Decade for Action](#), a report that underscores the importance of energy efficiency actions in the coming years. We also developed a policy toolkit for governments: [The Energy Efficiency Policy Toolkit 2023: From Sønderborg to Versailles](#) includes a set of strategic principles as well as new and updated policy packages that can help governments seeking to implement efficiency policies rapidly and effectively.

CETP support allowed government representatives from IEA partner countries to attend the conference as well.

Promoting energy efficiency progress in emerging and developing economies will be at the heart of the next IEA Global Conference, which will be held in Nairobi, Kenya, in 2024.

## Energy efficiency capacity building

Design and implementation of effective energy efficiency policy requires appropriate capacity within the public service – yet in most emerging economies, only a small group of people are involved in energy efficiency day-to-day. These people are in high demand and succession strategies are uncommon. This phenomenon led to the IEA's decision in 2016 to launch the Energy Efficiency in Emerging Economies (E4) training week, which has become a flagship event that provides face-to-face training for as many as 2 000 people from 130 countries, equipping them with the knowledge and skills necessary to deliver effective energy efficiency initiatives in their respective countries.

The training targets younger officials and women wherever possible. When the Covid-19 pandemic prevented the IEA from organising face-to-face training, the E4 Programme shifted its capacity-building work online. While that made the sessions accessible to more people around the world, it was difficult to replicate the depth of training provided through the week-long course, or the peer-to-peer learning model, in a purely virtual setting. A decision was made to hold the 2023 training week in Paris to enable in-person exchanges among junior professionals from various CETP countries. The April event was a great opportunity to bring Paris-based ambassadors together to demonstrate how CETP activities work in practice. Members involved in relevant bilateral programmes were also encouraged to join the proceedings, either by filling guest speaker slots or by nominating participants.



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*Participants of the Energy Efficiency in Emerging Economies Training Week, Paris, April 2023*

The E4 Training Week consists of five parallel courses: Energy Efficiency in Buildings; Appliances and Equipment; Industry; Cities, and Indicators and Evaluation. Each course offers a mix of lectures, interactive discussions and practical exercises that allow participants to learn from international best practice and each other. The programme also includes joint sessions on assessing the potential for energy efficiency, tracking progress and communication campaigns as well as a special focus on measuring the social and economic benefits of energy efficiency measures.

The 2023 training week brought together more than 120 policy makers and energy professionals from 41 countries – of which more than half were women. Nearly all participants – 96% of those surveyed – expressed a high level of satisfaction with the event, while 64% rated the overall experience as “excellent.”

## Digitalisation

Global electricity demand growth to 2050 is driven by emerging market and developing economies, which together account for about [three-quarters](#) of the global total in IEA scenarios. While renewables are the first choice for new generation capacity, climate change is already putting strain on power systems and driving sharp increases in peak demand and causing outages and negatively impacting growth. Digital technologies can play a positive role to transform the power system. They create a more interconnected and responsive electricity system, help to minimise system costs and the need for new investment, improve stability, resilience and security and enhance the quality of the power supply. Yet despite these crucial functions, digital technologies and smarter grids are still not receiving the necessary policy support they deserve.

The [Digital Demand-Driven Electricity Networks](#) (3DEN) initiative is a cross-IEA project delivered under the CETP. It fills a knowledge gap by providing first-of-its kind policy advice and analysis of solutions for smart power systems of strategic relevance for ensuring secure clean energy transitions.

## Analysis and policy advice

One key 2023 milestone was the publication of the 3DEN guidance report [Unlocking Smart Grid Opportunities in Emerging Markets and Developing Economies](#), launched on 6 June 2023 at the special event “[Powering the Future: Leveraging digitalisation for efficiency, resilience and decarbonisation.](#)” This event was attended by more than 200 participants and viewed online more than 9 000 times. It was part of the IEA’s 8<sup>th</sup> Global Conference on Energy Efficiency, where 46 governments recognised the importance of digitalisation in creating opportunities to drive energy efficiency and enable the transition to clean electricity grids. The conference concluded with a [joint statement](#) endorsing the goal of doubling global energy efficiency progress by 2030.





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*A panel discussion at the “Powering the Future: Leveraging Digitalisation for Efficiency, Resilience and Decarbonisation” event, 6 June 2023*

3DEN also supported ministerial discussions on the topic and a dedicated high-level panel [“Modernising efficiency: Smart systems and consumers”](#) (7 June) that included private and public sector speakers from China, Costa Rica and Ghana.

In 2023, 3DEN enabled effective peer-to-peer learning opportunities bringing together public and private sector stakeholders from Italy, Brazil, Australia and India on the topic [of digital tools for the management of distributed photovoltaics \(PV\)](#). The well-attended [roundtable](#) at the India Smart Grid Utility Week in March sparked interest from multiple ministries and organisations and resulted in a request for a [follow-up roundtable](#) which took place on 26 July, to discuss outcomes and policy actions that could be taken at the Indian national and state level. The Brazilian electricity regulator highlighted the value of international peer-to-peer exchange and appreciation for the 3DEN project. One indication of the high level of interest – particularly in developing registries for distributed energy resources – was the decision by India Smart Grid Forum to establish a consultation process for designing a national registry. The first multi-stakeholder meeting on the proposed registry was held in January 2024.



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*“Digital Tools for Grid Integration and Management of Distributed Solar PV” roundtable, 3 March 2023*

## Capacity building and peer-to-peer exchanges

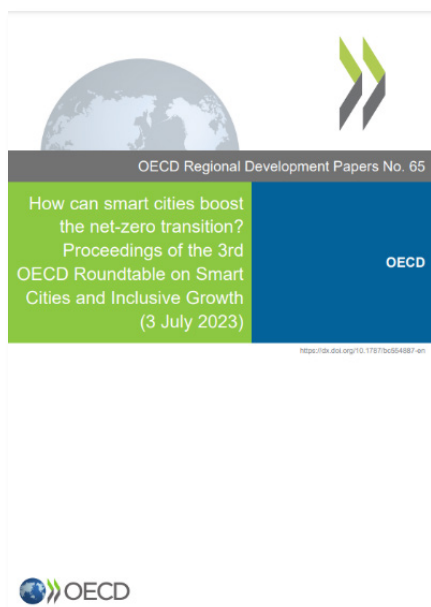
Further peer-to-peer exchanges included representatives from Brazil, Colombia, Indonesia and South Africa, who shared practical insights regarding the use of digital technologies to improve energy efficiency of urban systems.

As part of the [IEA Energy Efficiency Policy in Emerging Economies Training Week in April](#), 3DEN designed and delivered a first of its kind training on Energy-Efficient Cities Through Digital Tools. The session, which drew 40 participants from subnational and national governments, focused on how cities can use digital tools to make smarter, better-informed decisions and improve quality-of-life for all.

## Collaboration with international organisations

Collaboration with international initiatives continued in 2023. 3DEN actively engaged with the Regulatory Energy Transition Accelerator and supported knowledge exchange on power system digitalisation and data by participating in three workshops. 3DEN continues to engage closely with the International Smart Grid Action Network, Green Powered Future Mission, the IEA User-Centred Energy Systems Technology Collaboration Programme and the Cities Technology Collaboration Programme.

The IEA continues to elevate the topic of digitalisation globally through analysis and policy guidance for a wide range of audiences and across a diverse series of dissemination events, as well as online activity and discussions. The continued productive relationship with United Nations Environment Programme (UNEP) on the 3DEN implementation phase is enabling effective use and dissemination of lessons learned and policy insights when they emerge from the pilots, supported by Italy and administered by UNEP.



On 6 December, 3DEN together with the Italian Ministry of Environment and Energy Security and the UNEP organised the side event, “[Implementing tomorrow’s smart power systems](#)”, at COP28 that featured high level experts, including Francesco Corvaro, Italy’s Special Envoy for Climate Change.

3DEN expertise on smart cities, building on the 3DEN G20 report [Empowering Cities for a Net Zero Future](#) (2021), directly informed the [OECD report on smart cities](#). The OECD also invited the IEA to join its [Roundtable on Smart Cities and Inclusive Growth](#) in July to

present how smart cities can boost the net zero transition.

In the last months of 2023, 3DEN supported preparations for the Italian G7 Presidency in 2024 on the topic of smart cities and grids. This work, which draws upon IEA analysis, initial insights from 3DEN implementation phase and broad stakeholder consultations, identifies opportunities to better align city and power system planning for efficiency and flexibility, leveraging data and analytics and supporting people and community centric implementation.

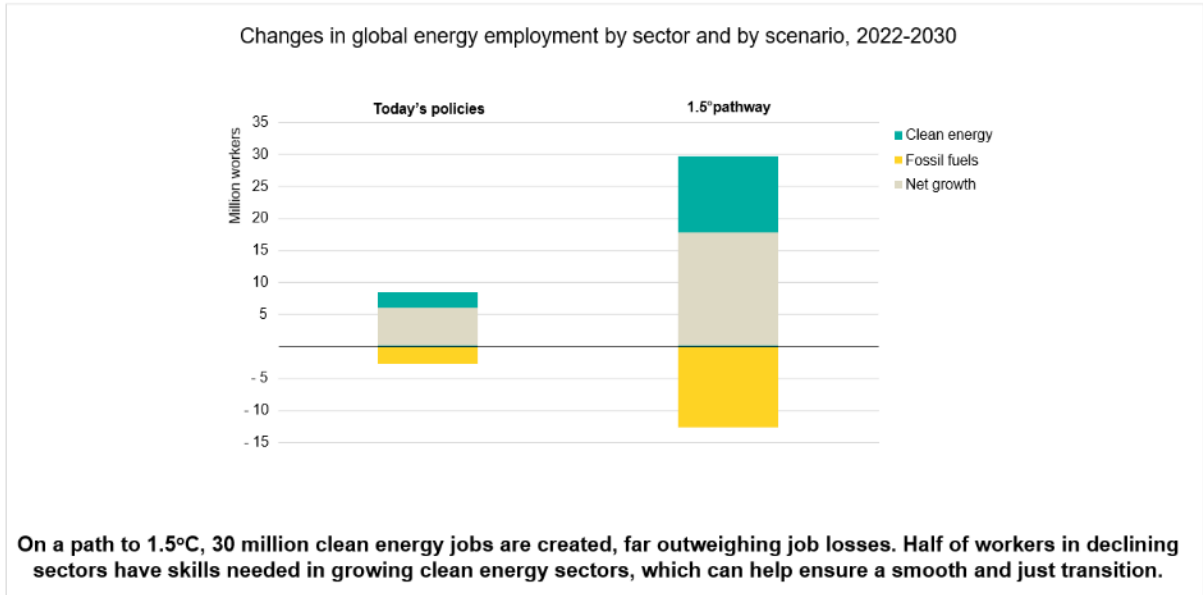
## Digitalisation in IEA publications

The 3DEN process of mainstreaming the importance of digitalisation across the IEA's broader analysis work has continued throughout the year, with targeted contributions to relevant IEA outputs on topics such as distributed solar PV, electric vehicles, energy communities, modernised power system planning and other relevant themes. The 3DEN team has ensured content on digitalisation and power system modernisation across more than 55 IEA publications since its inception.

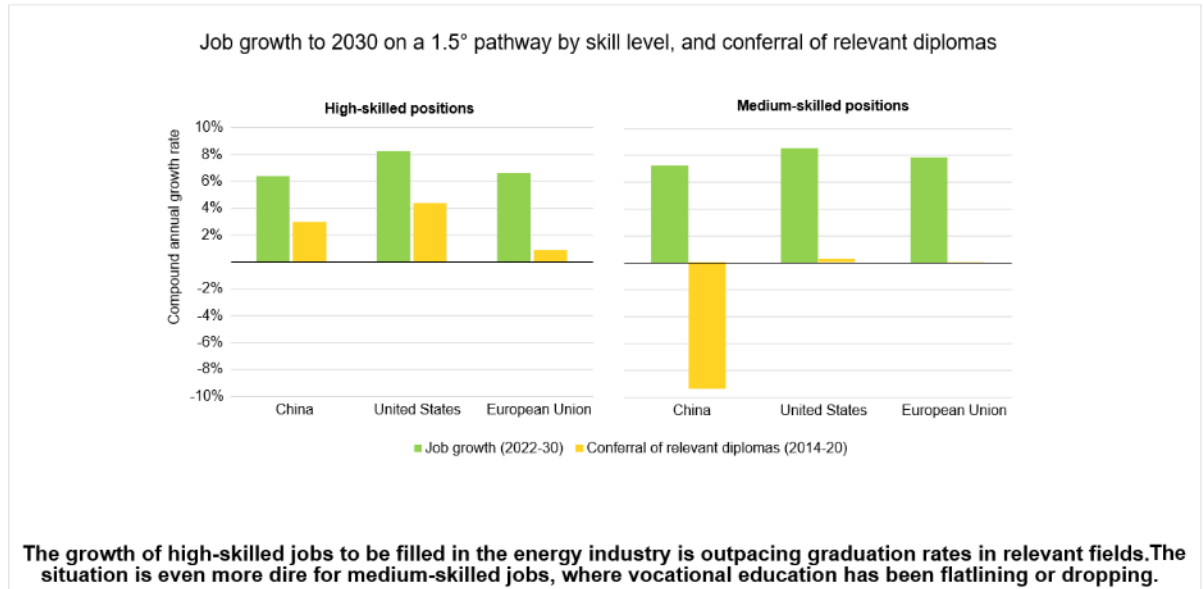
## Energy and employment modelling

The global clean energy transition is set to radically transform the energy workforce, demanding many more skilled workers in the energy sector than today. The IEA estimates that an additional 30 million people will be needed in clean energy sectors by 2030, the majority of which will require upskilling and (re)training. Many countries are trying to develop the energy industries of tomorrow, but without the necessary skilled workforce they will neither be able to capture these emerging opportunities nor deploy clean energy technologies rapidly at scale. The challenge of shifting energy sector employment and skill needs is particularly relevant to emerging market and developing economies such as China – home to 30% of the global energy sector workforce – as well as Indonesia, South Africa and Colombia, some of the world's most coal-dependent economies.

The [World Energy Employment 2023](#) report, published in November, charted the uptick of clean energy jobs in every region of the world, with China accounting for the largest number of jobs added globally. The report noted that the expansion of clean energy industries is also generating upstream employment in critical mineral mining, 180 000 jobs added in the last three years – highlighting the growing importance of these essential elements in the new energy economy. However, a growing number of energy industries view skilled labour shortages as a key barrier to ramping up activity. The report found that the number of workers pursuing degrees or certifications relevant to energy sector jobs is not keeping pace with growing demand. This is particularly the case for vocational workers like electricians specialised in energy-sector work, as well as professionals in science, technology and engineering.



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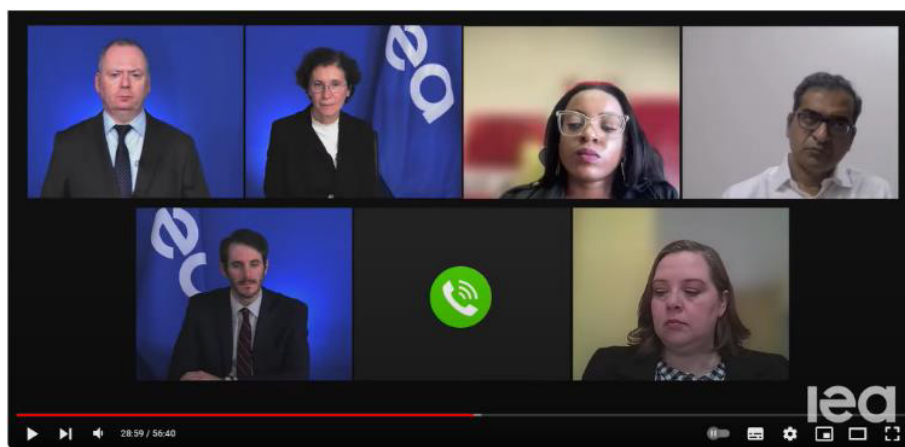
Source: IEA (2023), [World Energy Employment 2023](#).

Support from the CETP in 2023 allowed the IEA’s Energy Modelling Office to expand employment modelling, gather more granular data and deepen its analysis. In addition to detailed data collection from national sources, the authors also developed a proprietary survey of energy companies to gather perspectives from leaders in industry and government working at the intersection of employment and energy policy to understand the most urgent needs and concerns. Responses from 160 energy firms globally – who shared their insights into the composition of their workforce, their hiring and dismissal plans and the challenges of finding the needed skilled labour – underpinned the research.

Analysis resulting from this project contributed to several reports, including the [Latin America Energy Outlook 2023](#), [Oil and Gas in Net Zero Transitions](#) (May 2023), [A Vision for Clean Cooking Access for All](#) (July 2023), the IEA Special Report [Electricity Grids and Secure Energy Transitions](#) (October 2023) and the [World Energy Outlook 2023](#) (October 2023).



On 15 November, the [World Energy Employment](#) report was launched by Laura Cozzi, Director of Sustainability, Technology and Outlooks; Daniel Wetzel, Head of Tracking Sustainable Transitions; and Brian Motherway, Head of Office, Energy Efficiency and Inclusive Transitions Office. Presentations of insights and national case studies were made by: Betony Jones Director of the Office of Energy Jobs in the US Department of Energy; Dr. Maneesh Mishra, Executive Vice President, Strategy, National Skill Development Corporation, India; Cori Anderson, Director of Sustainable Jobs in Energy Systems Sector, Natural Resources Canada; and Boitumelo Molete, Social Development Policy Coordinator, Congress of South African Trade Unions.



World Energy Employment 2023

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*Launch of the World Energy Employment 2023 report, 15 November 2023*

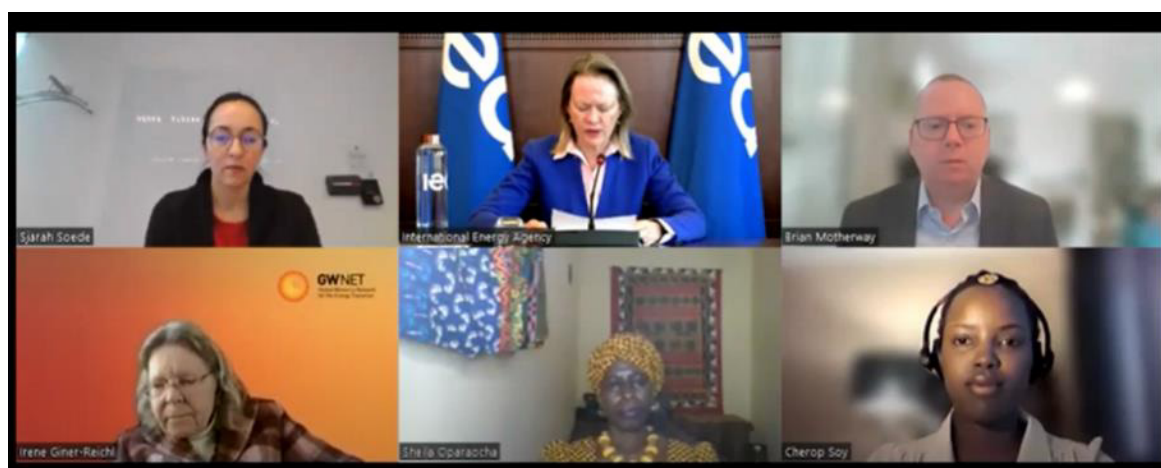


The results of the research were also presented at numerous events and provided input to the deliberations of the G20 Energy Transition Working Group. As a result of the initial dissemination activities, the G7 asked the IEA to deepen its work on Just Transitions in the Coal industry in cooperation with the International Labour Organisation.

## People-centred clean energy transitions

Over the last year, the IEA has built on the momentum of initiatives established in 2021 and 2022, such as the [Global Commission on People-centred Clean Energy Transitions](#) and the [IEA Clean Energy Labour Council](#). We translated these early successes into clear relationship roles and positioning, and we enhanced knowledge and best practice exchanges to help governments and international stakeholders steer their clean energy transitions, so that both processes and outcomes are people-centred and inclusive.

As part of the IEA People-Centred Clean Energy Transitions Programme, the IEA organised a series of eight webinars attended by more than 1 300 people and with online recordings viewed more than 2 500 times. Topics included: “Engaging citizens as decision makers in clean energy transitions” (January 2023); “Addressing the gender dimensions of clean energy transitions” (April 2023); “The role of local energy communities in clean energy transitions” (May 2023); “Supporting informal workers and economies for an inclusive transition” (October 2023) and “Exploring the social impacts of clean transport policies” (November 2023).



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*Discussion at the webinar “Addressing the gender dimensions of clean energy transitions”, April 2023*

The IEA also organised two side events at COP28 in December, bringing together key stakeholders on the topics of “Ensuring equity, inclusion and fairness in energy transitions” and “A just transition through inclusive energy infrastructure.” These webinars and side events have helped gather intelligence on key socio-economic

factors that have yet to be fully explored analytically by the IEA Secretariat while fostering a network of stakeholders from across the world, especially emerging economies, with the IEA at its core. Some of the insights gathered during these webinars have helped feed into several IEA publications, including the [Latin America Energy Outlook 2023](#) and upcoming IEA reports on inclusive energy infrastructure and affordability planned for publication in the first two-quarters of 2024. Insights gathered have also been used to develop individual analytical pieces such as the commentary on [Empowering people: The role of local energy communities in clean energy transitions](#) (August 2023) or an upcoming commentary on “Unleashing the potential of energy communities in Latin America’s Clean Energy Transitions”.



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*From left to right: Brian Motherway, Head of Energy Efficiency and Inclusive Transitions, IEA; Winifred Awinpoya Atanga, Founder, Conservation Leaders Network & CoFounder, EcoHomes project; Boitumelo Molete, Social Development Policy Coordinator, Congress of South African Trade Unions; Anita Otubu, Senior Director, SE4All; Samantha Stratton-Short, Head of Strategic Initiatives, UNOPS. Dubai, December 2023, Credit: UNOPS*

The year 2023 was also important for developing our relationship with the [IEA Clean Energy Labour Council](#) – which groups 19 members, including nine from emerging economies – and collecting their insights on key labour issues at the heart of clean energy transitions to help inform IEA analysis. Activities included the organisation of three virtual meetings of the Labour Council to gather intelligence ahead of COP28 on the labour dimensions of the Just Energy Transition Partnerships, workers’ engagement in response to the global energy crisis and other key labour issues. Fostering these connections has been particularly valuable as we prepare for the upcoming in-person [Global Summit on](#)

[People-centred Clean Energy Transitions](#) on 26 April 2024, which will bring members of the Labour Council together with energy and climate ministers.

In addition to convening activities, 2023 was also a key year for expanding knowledge and evidence in the field of people-centred transitions, most specifically on the topics of skills development, social impacts of clean energy policies and inclusive energy infrastructure. The IEA kickstarted several important collaborations with Indian stakeholders as part of its analytical work on labour and skills. First, the IEA held several exchanges with the India Council for Green Skills and the India National Skill Development Corporation (NSDC), which is co-owned by the Ministry of Skill Development and Entrepreneurship. Following up on these, the IEA and NSDC issued a statement of intent that officialised a two-year collaborative research initiative aimed at identifying the skills required for clean energy transitions. Its first planned output is a report on key labour trends and skills-related issues across various clean energy sectors in India, to be launched in March 2024.

In order to understand how equality and inclusion can be built into clean energy policy design to avoid disproportionate or unintended consequences for certain segments of society, the IEA started a programme of research on the social impacts of clean energy policies. A workshop with key experts, “Social Impacts of Clean Energy Policies”, was organised in May to gather initial insights and intelligence, with the results of the translated into a [commentary](#) published in July. Additional analysis on this topic – specifically on the distributional effects of clean energy policies in the Global North and Global South – has been developed and will be integrated into a new major report on affordability to be published in May 2024.

Understanding approaches to developing inclusive and climate-resilient energy infrastructure in the Global South to achieve the Sustainable Development Goals has also been a key topic of analysis, on which the IEA hosted a side event at COP28 to gather insights. The IEA Secretariat has also collaborated with the UN Office for Project Services (UNOPS) to produce a Guidebook for Infrastructure Practitioners on Inclusive Energy, which will be published in March 2024. This publication takes an integrated approach by providing recommendations that consider solutions across the entire life cycle (planning, delivery and management phases) of infrastructure development. These recommendations can be broadly categorised as: strengthening the enabling environment; prioritising inclusive solutions; delivering inclusive solutions well; and maximizing the system performance of existing infrastructure without any harm to the local community or natural environment.

To consolidate the IEA’s database of best practice case studies on people-centred transitions and make them available to policy makers, we developed in 2023 an

online Global Observatory on People-centred Clean Energy Transitions, which includes cases from around the world on people-centred and inclusive clean energy programmes and policies. The Global Observatory's case studies are divided into four themes and 12 topics, reflecting the [Recommendations of the Global Commission on People-centred Clean Energy Transitions](#). The Global Observatory will be launched in the first quarter of 2024 and will be updated on a regular basis with new case studies and information collected as part of the IEA's ongoing programme of research and analysis.

Finally, the IEA Secretariat continued to formally engage with youth from around the world in 2023. This engagement has included regular meetings organised virtually and at COP28 with representatives from major youth organisations, including the SDG7 Youth Constituency and YOUNGO, the UNFCCC's children and youth constituency. Youth representatives were also invited to participate in IEA events and webinars – through an international application process similar to the IEA's 8<sup>th</sup> Annual Global Conference on Energy Efficiency, where five young representatives were selected from more than 400 applicants. Youth were also included as peer reviewers of flagship IEA reports such as the *Energy Efficiency Market Report*.

## Understanding energy inequality

The IEA expanded its analysis on energy affordability topics in a range of outputs. In June, the IEA released a [commentary](#) and a [press release](#) on the effectiveness of government affordability measures in taming energy price spikes for consumers. According to our analysis of data from 12 countries – which combined represent nearly 60% of the global population – the average household spent a greater share of its income on energy in 2022 as energy prices outpaced nominal wage growth, despite government mitigation efforts. Our findings were also shared at various forums such as the IEA Clean Energy Labour Council and were included in IEA flagship reports.

The [2023 update of the IEA Net Zero Roadmap](#) discussed disparities regarding the adoption of clean energy technologies worldwide, including upfront cost challenges for low-income households. It also analysed energy bill trajectories in the IEA's Net Zero Emissions by 2050 Scenario and stressed that energy subsidy phase-outs and carbon pricing policies would need to be carefully designed to sustain support for the clean energy transition. The [World Energy Outlook 2023](#) examined these challenges in more detail, including assessments of cost competitiveness of clean technologies over their lifetime and rising upfront cost burdens in emerging market and developing economies. Our new analysis has been picked up by several international news outlets, including [Business Day South Africa](#). The [Latin America Energy Outlook 2023](#) discussed energy affordability challenges in that region.

Our recent analysis was enabled by new data compiled on clean energy technology costs. CETP support allowed the IEA to compile a first-of-its-kind dataset on costs and efficiency levels of key appliances such as air conditioners and refrigerators across major markets in Asia, Latin America and Africa. Thanks to the funding, we were also able to build a new dataset on household incomes by income level, building on World Bank data.

In addition, we set up detailed analytical frameworks within the [Global Energy and Climate Model](#) to analyse energy consumption levels per household by fuel, end use and region and to look into energy consumption inequalities by income level based on a range of new datapoints spanning all of our modelling regions. We extended our analysis of household energy spending in combination with up-to-date energy price data collected by the team. We further examined impacts of carbon pricing policies and fossil fuel subsidy phase-outs with new levels of granularity, building on existing frameworks.

## Enhancing data to advance equality in energy transitions

Collecting data on gender and energy is crucial for developing informed policies and strategies that address the unique needs and challenges faced by woman in the energy sector. The IEA has initiated data collection to better track the contributions of women to the energy transition in areas such as innovation, entrepreneurship, employment and senior management. This effort allows us to generate key indicators that will help measure the progress made towards gender equality in the energy sector.

## Data and statistics

Reliable energy data and statistics are indispensable for planning, developing, implementing and monitoring clean energy transitions. Emerging economies often lack the capacity to effectively produce high-quality data to support this process. In 2023, the IEA continued to work to address this issue. We consolidated and strengthened our ability to collect and provide global data across our various focus areas. The IEA's data and statistics webpage was the second-most visited page on our website after the homepage, while our Energy Statistics Data Browser – which offers a large free sample of global energy statistics – received more than 800 000 pageviews from 75 000 unique users (20% of whom came from China, Brazil and India) in 2023. The IEA also strengthened its activities to develop national data capacities, through training and bilateral work with priority countries and regions, leveraging partnerships with other institutions and in parallel with its in-depth programme targeting countries in sub-Saharan Africa.



## Non-member country data

In 2023, our Energy Data Centre strengthened its relationship with key data providers from non-member countries of the IEA, consolidating and expanding data exchange in several areas. Selected examples include:

- collaboration with Indonesia on the dissemination of coal statistics, including analysis of the correlation between coal's physical units, heat conversion values and emissions, with an aim to enhance data clarity and reliability
- establishment of a point of contact in Niger to enable direct access to official statistics and foster improved dialogue on data and methodologies
- submission of data on sectoral energy prices and end-use energy data from Argentina
- submission of energy prices data from Colombia.

Progress on data for key countries, such as Brazil and India, is discussed in more detail in the relevant country and regional sections in Pillar I (Accelerating National Transitions) of this report.

## Power and natural gas data

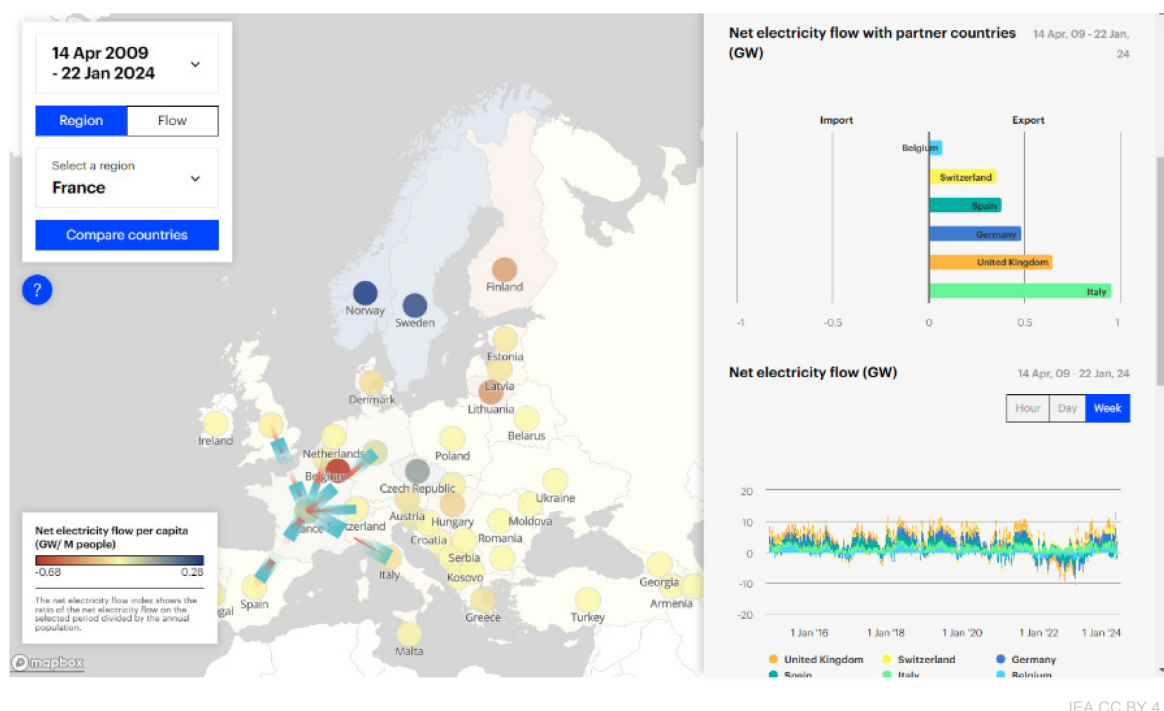
To adapt to the evolving energy landscape, we revised our annual Electricity and Renewables Questionnaires in 2023 to include data on batteries, expand the coverage and disaggregation of electrical capacity data and improve the disaggregation of data on electricity transmission and distribution losses. In addition, we developed a new Annual Hydrogen Questionnaire in collaboration with Eurostat to collect data on hydrogen, ammonia and e-fuels.

Over the course of the year, we substantially strengthened our collaborations with Argentina and Colombia. Direct exchanges with both countries, in their native language, have proven essential in improving the quality of monthly natural gas and electricity data. Both countries now regularly and consistently report their data on gas and electricity as well as coal – which in the past was not always the case. This more effective collaboration has significantly contributed to the improvements of the data collection according to international standards and has facilitated the centralization of information within the country.

Meanwhile, IEA analysis of gas storage information from various sources around the world has been significant in improving the quality of this data. Moreover, it has served to highlight to countries the importance of coherence in the information provided or published by different national institutions. The IEA also worked on compiling information from various sources to produce gas storage security indicators, including the storage filled (%) and has started incorporating monthly gas statistics for non-OECD European countries from Eurostat into the IEA data warehouse.

## Clean energy transition indicators

In 2023, the IEA added more sources to its **real-time electricity database** and enhanced the existing data collection tools to make them more robust and broaden their coverage. The IEA also extended its real-time electricity work to include trade data, which is now available to the public, at the hourly level, for more than 40 countries. The IEA has also initiated methodological work on real-time power-based CO<sub>2</sub> emissions, allowing us to better analyse smart interactions with the grid (e.g. smart EV charging, load shifting, demand-side management). We have also started to work on collecting real-time data related to aviation.



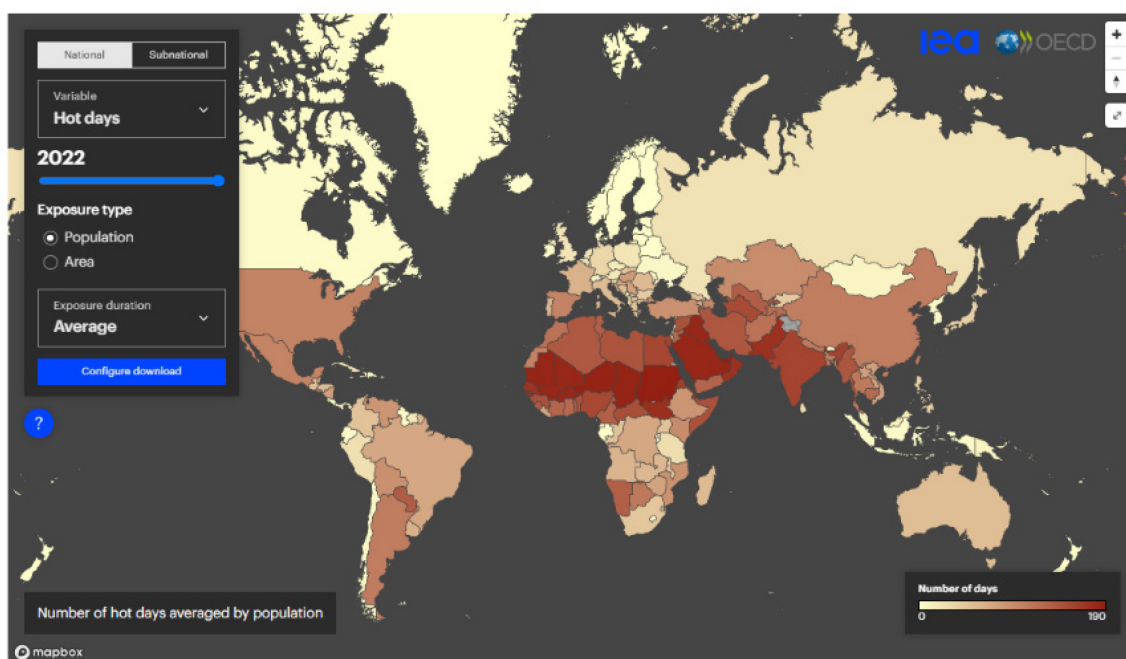
Source: IEA (2023), [Real-Time Electricity Tracker](#).

Considering the importance of assessing the **jobs and skills** needed to ensure the energy transition, the IEA initiated work on a very large database of open job postings. This work already allows us to track job profiles related to the energy transition and consolidation of the database will continue.

As a complement to its flagship database on emission factors, the IEA started research work on **life cycle emissions for electricity generation**. Considering the climate impacts over the generation life cycle provides a better understanding of the emissions-reduction benefits that can be achieved through electrification. It also helps us capture how the penetration of low-carbon generation sources contributes to decarbonisation goals. Life Cycle Assessments (LCAs) of electricity systems are critical for identifying potential environmental burden-shifting along supply chains and technology life cycles. The IEA has worked on assessing and compiling reliable data to provide a harmonised global database that includes the

life cycle emission factors corresponding to national electricity grids. The work is based on a comprehensive assessment and merging of datasets from multiple sources, including IEA statistics, IEA modelling work and IEA-performed life cycle harmonisation. A [pilot version of the database](#) was released in September and the IEA has solicited feedback from experts in order to develop the full version of the database in 2024.

In collaboration with the OECD environment directorate, the IEA also developed statistical outputs and analysis on **climate-related natural hazards**, with a special focus on their impact in energy systems. The [Climate Hazard Exposure Tracker](#) is a user-friendly tool for visualising extensive time-series national climate hazard indicators on a global scale. It follows the methodologies described in a [working paper](#) published under the framework of the OECD International Programme for Action on Climate (IPAC). An [associated commentary](#) (November 2023) described some of the threats these hazards pose to the energy sector and beyond. Detailed data are available at the country level and at subnational level for selected countries, including China, India and Brazil.



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Source: IEA (2023), [Weather, Climate and Energy Tracker](#).

Linked to its broader work on people-centred energy transitions, the IEA also produced a [commentary](#) (June 2023) on energy affordability for G20 countries based on data from the IEA Energy Prices publication and desk research. The article highlighted wide disparities across countries, as well as a decoupling of wholesale and retail energy prices due to government interventions.

## Statistics workshops and capacity building

Throughout 2023, the IEA offered in-person and online training on energy statistics to participants from many countries and regions. As every year, two main online training events were offered by the IEA, drawing a total of 163 participants from across India, Brazil and the key CETP regions. Roughly half of the attendees came from sub-Saharan Africa. Translations into Arabic, French and Russian supported delivery and helped engage the participants.

In addition to the regular training events, the IEA strengthened its training capability in key thematic areas and priority geographies. Climate was a key area of attention, with dedicated material on energy data for climate reporting designed for a series of training events in collaboration with the UNFCCC Secretariat. Priority countries included Brazil, with a five-day training session in November devoted to annual fuel questionnaires.

The Middle East and North Africa (MENA) was also a focus area: In October, we organised a joint training session for the UN Economic and Social Commission for Western Asia (UNESCWA) and the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE), while in December the IEA delivered the energy data component of a climate statistics event organised by the International Monetary Fund (IMF) and the Arab Monetary Fund (AMF).

The October online workshop was attended by 33 participants from 15 countries, covering 65% of the MENA region. The training was well-rated and participants benefitted from the interaction with their international counterparts. The December in-person course on Compilation of Macro-relevant Environment and Climate Change Statistics-Advanced was attended by 30 participants from 17 out of the 22 AMF countries. The IEA interventions were very well received with both AMF and IMF expressing interest in future collaborations. The workshop also allowed the IEA to make new data contacts – including a follow-up with Lebanon that identified several areas of improvement in their energy balance.



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*Joint training session for the UN Economic and Social Commission for Western Asia and the Regional Centre for Renewable Energy and Energy Efficiency, October 2023*

To advance capabilities of global energy information systems, the IEA, together with the UN Economic Commission for Europe (UNECE) and Eurostat, organised a [global workshop on the use of administrative micro-data](#) for climate change, energy and environment statistics (March 2023). More than 200 participants from multiple regions joined the discussions, exchanging best practices for leveraging emerging technologies as well as use cases for newly available data, such as utility meter data, building energy performance certificates and vehicle test data. This promising discussion will be followed by an international consultation through the Conference of European Statisticians.

To complement its training events, the IEA has also been working on practical tools to support national capacity development: A demand-side data collection roadmap and an energy statistics roadmap. The IEA's [roadmap to designing a national system](#) for demand-side data and energy efficiency indicators was released in 2023. Different countries contributed to the associated consultation, including Brazil, Chile, Costa Rica, Indonesia, Mexico and Thailand. A more general guide to support countries in tracking energy transitions is under development for release in 2024. The guide will allow users to assess and improve their national energy statistics framework to support development and implementation of more evidence-based energy and climate policies. It is expected to be applied in our bilateral work with India and Costa Rica.

At the end of 2023, the IEA also received a request from World Energy Council India to train a group of young professionals within their Future Energy Leaders Programme. The session, which will focus on statistics and analytics, will be delivered in 2024.



## Energy technology and innovation

Funding to the CETP in 2023 also helped the IEA strengthen the fundamentals of energy technology policy making. CETP resources have enabled efforts by the Energy Technology Policy division to expand energy modelling, data collection and analysis related to the role that innovation – including development of carbon management technologies like CCUS – plays in achieving long-term climate goals. Reports such as the annual [Global EV Outlook](#) and [Global Hydrogen Review](#), as well as the technology and innovation elements of [Tracking Clean Energy Progress 2023](#) (TCEP), are examples of outputs that have benefits from additional CETP resources. The TCEP report launched in July included a new “country and regional highlights” section on most pages, with examples from some EMDEs such as China and India.

The IEA also launched the second phase of the Clean Energy Transitions in Emerging Economies (CETEE-2) programme, which contains several innovation-related elements. These include continued work to enhance and expand the IEA’s world-leading data collection on public energy R&D spending, in particular through engagement with large non-member governments such as India and an update of the associated technology classification framework to align it with net zero emission transition needs. Other elements include the further refinement of two unique IEA databases, the [Global Clean Demonstration Projects database](#) and [ETP Clean Energy Technology Guide](#), which rank among the most popular on the IEA website. Work under the CETEE programme will help tailor these to the needs of policy makers, for example by improving the online interface, and include more information from EMDE projects. Other innovation tracking work within the CETEE includes the revamping of the [analysis of clean energy venture capital \(VC\) investment](#) to enable more analysis of digital start-ups and EMDEs. Each of these CETEE elements was launched in 2023 and will continue in 2024.

### Clean Energy Demonstration Projects Database

The most comprehensive database of clean energy technology demonstrators

A final element of the CETEE project is the coordination of several new case studies of policies in EMDEs and their success in fostering energy technology innovation. The first phase of this work involved five virtual meetings with experts from eleven countries who have each agreed to contribute case studies to a compendium to be published in 2024. The aim is to increase global understanding of the common challenges these countries face when designing policies to support clean energy innovation ecosystems, and to identify opportunities for action by governments and the international community. The countries to be covered

include Argentina, Brazil, China, Colombia, India, Kazakhstan, Kenya, Mexico, Morocco, Nigeria and South Africa. One important source of insights and engagement for this work will be the IEA Energy Innovation Forum, which will be held alongside the IEA Ministerial Meeting in early 2024, for which special attention has been paid to the representation of start-ups, industrial firms, venture investors and governments from EMDEs.

## Implementing policies for clean energy transitions

### Cross-country policy dialogues on carbon pricing for clean energy transitions

The IEA has a longstanding history of collaborating with CETP countries on emissions-trading solutions for clean energy transitions. In recent years, it has worked closely with India, Indonesia, South Africa and China on carbon pricing and its role in supporting industry's energy transition efforts. IEA scenarios identify decarbonisation challenges and sector-specific milestones and complement them with focused cross-country dialogues. In 2023, these dialogues continued to address concrete questions related to carbon pricing and its role in the decarbonisation of key sectors. Activities also included geospatial analysis to examine the relationship between the competing land use needs of energy transition technologies and biodiversity, providing policy makers with tools for better decision making.

On 8-10 November, we organised the [23<sup>rd</sup> Annual IEA-IETA-EPRI GHG Emissions Trading Workshop](#) in Paris. It gathered around 150 in-person participants and another 100 virtual attendees – including senior government officials, corporate executives and researchers from non-governmental organisations and academia – to discuss the latest updates and prospects for emissions trading around the world. The CETP contribution helped secure the participation of representatives from Ghana, the Gambia and Indonesia. These stakeholders actively participated in the dialogues by presenting in different sessions and interacting with other workshop participants – creating networking links that otherwise would not have been possible – and facilitating knowledge sharing across jurisdictions in CETP target countries.

### Geospatial analysis of the increased competition for land use linked to clean energy transitions

We also initiated a geospatial analysis for clean energy transitions in 2023, focusing on land use competition. This scoping exercise involved reviewing existing approaches, consulting experts and designing an initial methodology with

identified limitations and potential future enhancements. Initial analyses were conducted for onshore wind and utility-scale solar PV – the primary technologies for clean energy transitions. A literature review assessed project designs and estimated land use, supplemented by primary research on more than 100 operational projects using satellite images. This research informed key assumptions, ensuring the analysis reflected observed variations. Land use data was collected and processed to identify suitable available land. Findings of the analysis were published in the 2023 IEA Net Zero Roadmap, with a key figure summarising the total land requirements for solar PV and wind today and in the future, which range from 1% to 2.5% of available land globally.

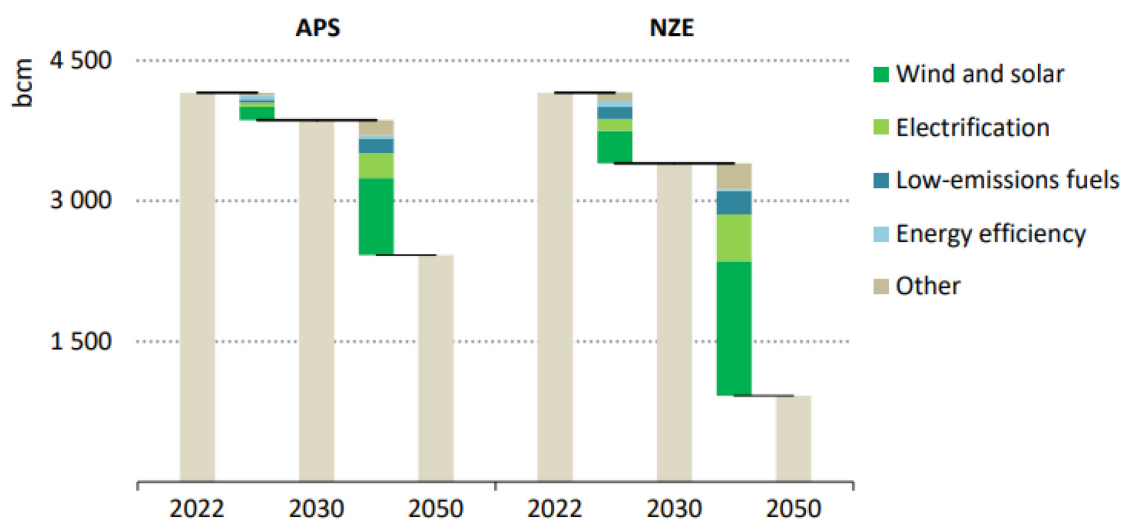
## Oil and gas in clean energy transitions

In November, ahead of the crucial COP28 meeting in Dubai, the IEA released the World Energy Outlook Special Report [The Oil and Gas Industry in Net Zero Transitions](#). The report analysed the implications and opportunities for the industry that would arise from more aggressive international efforts to reach energy and climate targets and set out what the global oil and gas sector would need to do to align their operations with the goals of the Paris Agreement. The report stated that producers must choose between contributing to a deepening climate crisis or becoming part of the solution by embracing the shift to clean energy.

To align with a 1.5 °C scenario, the report explained that industry's own emissions need to decline by 60% by 2030. The emissions intensity of oil and gas producers with the highest emissions is currently five-to-ten times greater than the lowest emitters, revealing the vast potential for improvements. Strategies to reduce emissions from methane – which accounts for half of the total emissions from oil and gas operations – are well-known and can typically be pursued at low cost.

While the level of oil and gas production is vastly lower in transitions to net zero emissions, it will not disappear entirely – even in a 1.5 °C scenario. Some investment in oil and gas supply is needed to ensure the security of energy supply and provide fuel for sectors where emissions are harder to abate. Yet the USD 800 billion currently being invested in the oil and gas sector each year is still double what is required in 2030 on a pathway that limits warming to 1.5 °C.

## Reductions in natural gas demand in the Announced Pledges Scenario and the Net Zero Scenario



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*Wind and solar play essential roles in reducing natural gas demand in the power sector. A wide range of other fuels and technologies are needed to reduce gas use in other sectors.*

Note: Other = nuclear and other renewables.

Source: IEA (2023), [The Oil and Gas Industry in Net Zero Transitions](#).

In transitions to net zero, oil and gas activity is set to become less profitable and riskier over time. The report's analysis finds that the current USD 6 trillion valuation of private oil and gas companies could fall by 25% if all national energy and climate goals are reached – and by as much as 60% if the world gets on track to limit global warming to 1.5 °C.

Opportunities lie ahead despite these challenges. The report finds that the oil and gas sector is well placed to scale up some crucial technologies for clean energy transitions. In fact, some 30% of the energy consumed in 2050 in a decarbonised energy system comes from technologies that could benefit from the industry's skills and resources – including hydrogen, carbon capture, offshore wind and liquid biofuels.

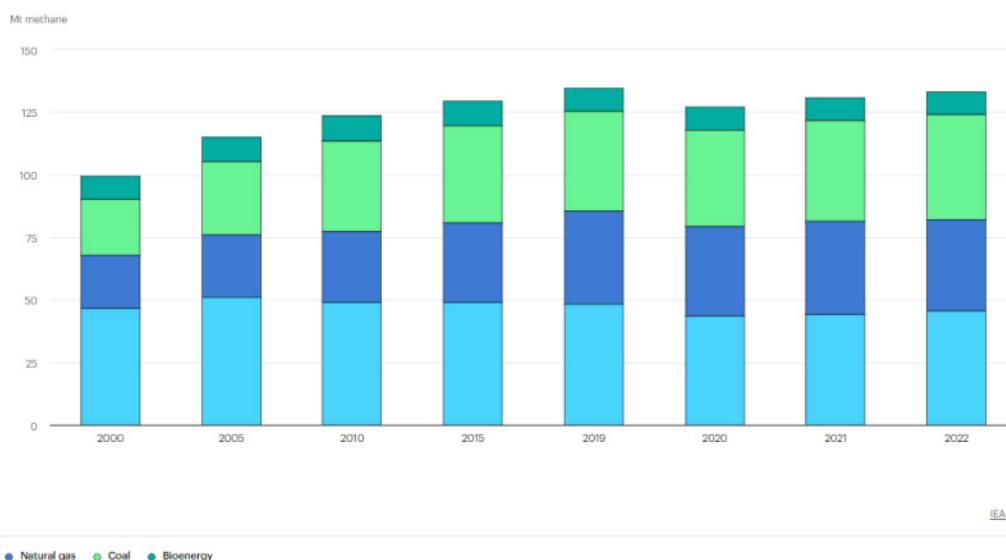
The report received widespread media attention from around the world on its release, including from the [Financial Times](#), [BBC](#), [The National](#), [Le Monde](#), [AP](#), [Reuters](#) and [Tagesspiegel](#). It also fed into the discussions at COP28 by emphasising what the industry needs to do – both in terms of reducing its own emissions and scaling up clean energy – to align with climate goals.

## Reducing methane emissions

Reducing methane emissions is an issue of major importance to energy transitions. Despite widespread recognition of the issue, progress has been stubbornly slow – particularly in emerging markets and developing economies. In these countries, there is often a lack of reliable measurements, data and reporting. Capacity and knowledge about regulatory and policy options to reduce methane is also often limited. This workstream addresses both issues – the IEA’s Global Methane Tracker targets the first problem, while the policy and regulatory work aims at the second.

In 2023, we published the [Global Methane Tracker 2023](#) with updated oil and gas figures, expanded analysis on coalmine methane and potential abatement options and updated material on new policy and regulatory developments. The Methane Tracker currently covers 60 countries and regions.

### Global methane emissions from the energy sector, 2000-2022



Source: IEA (2023), [Global Methane Tracker 2023](#).

We continued the rollout of the Regulatory Roadmap [Driving Down Coal Mine Methane Emissions](#), with a [Chinese translation](#) and regionally focused events introducing the topic, as well as in-depth training exercises for interested countries to reach audiences with the highest potential for methane emissions reduction.

We provided policy advice and analytical material to governments and other partners in implementation of the [Global Methane Pledge](#), including support to the International Methane Emissions Observatory (IMEO), the Climate and Clean Air Coalition as well as the leading governments behind the initiative, the United States and the European Union.



We also developed a project plan for a joint technical assistance programme for Iraq, in collaboration with the Clean Air Task Force, United Nations Environment Programme and Carbon Limits.

## Low-emissions gases

The decarbonisation of the energy system will require the scale-up and deployment of low-emissions gases, including biomethane, pure low-emissions hydrogen, hydrogen blends, synthetic methane (or e-methane), as well as natural gas subject to CCUS, from both producers and end-users. The production of low-emissions gases remains expensive and their deployment will take time. However, industry, infrastructure and regulation should begin adapting now to enable their cost-efficient integration into the gas and broader energy system in the future.

In recognition of the growing interest of its member countries, association countries and non-member countries, the IEA set up a Low-Emissions Gases Work Programme for an initial period of two years. The programme aims to address the current knowledge gaps and build awareness of the potential role of low-emissions gases by providing high-quality information through a series of analytical pieces and as part of the IEA's series of Quarterly Gas Reports. This approach leverages existing networks and audiences, since the publications are widely read and already reach relevant stakeholders. The programme will also enable the exchange of best practices and will build political support for change among key stakeholders through a series of expert events.

## Market and policy monitoring

As part of its Low-Emissions Gases Work Programme, the IEA closely tracks market and policy developments in this sphere. This includes a regular section in the Quarterly Gas Reports dedicated to this topic.

- [Gas Report Q1 2023](#) provided an in-depth review of the policies enacted on low-emissions gases in 2022 in selected countries; a review of biomethane market developments in 2022, including preliminary numbers on production and demand growth; and a review of corporate strategies related to low-emissions gases (including the acquisition of biomethane producers; e-methane value chains).
- [Gas Report Q2 2023](#) provided the IEA's first in-depth analysis on e-methane (synthetic methane). The report included an overview on possible technology production routes, costs assessments and an update on the project initiatives.
- [Gas Report Q3 2023: Global Gas Security Review](#) focused on the system for integrating low-emissions gases within the gas system. The report provided a review of the options and challenges related to the underground storage of low-emissions gases (both biomethane and low-emissions hydrogen). It also included

a special section on the potential role of liquefied low-emissions gases in maritime transport, which is considered to be a hard-to-abate sector.

- [Gas Report Q4 2023: Medium-Term Gas Report](#) included a medium-term outlook for biomethane, low-emissions hydrogen and e-methane. The forecast shows that the supply of low-emissions gases is expected to more than double over the medium term, resulting in an increase of more than 8 billion cubic meters in absolute terms. The analysis included biomethane developments in Brazil and India, as well as low-emissions developments in Namibia and Oman.

The IEA presented the results of the analysis to high-level conferences, workshops and webinars. This included, among others: a workshop organised by Gas Infrastructure Europe (January 2023); the Europe CCUS & Hydrogen Decarbonisation Summit (February 2023); a presentation on hydrogen infrastructure developments in Northwest Europe; as well as around ten gas webinars in association with the release of the Quarterly Gas Report, which included a special section with findings on low-emission gases.

## Data on low-carbon gases

In 2023, a new joint Annual Hydrogen Questionnaire along with associated reporting instructions, were co-developed by the IEA and Eurostat. In October, an introduction to the new questionnaire was presented during the IEA Energy Training Week. In November, the questionnaire and reporting instructions were finalised and circulated to IEA reporting countries (including Morocco) for voluntary data collection. The questionnaire was also shared with Brazil, which is transitioning to submitting annual questionnaires to the IEA and with the Asia-Pacific Energy Research Centre (APEREC). The files were also made available for download on the IEA website.

In 2023 and early 2024, the IEA and Eurostat continued working together on developing a common methodology that will accommodate the reporting of hydrogen in the other five joint Annual Questionnaires (Coal, Oil, Natural Gas, Electricity and Heat, and Renewables and Waste) and incorporate hydrogen into the Energy Balance.

In December, the IEA drafted a proposal describing how hydrogen-derived fuels (e.g. e-Fuels) could be incorporated into the Standard International Energy Product Classification (SIEC) system. This document was presented to the UN-led Task Team overseeing the forthcoming revision of the SIEC.

# Acknowledgements

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The CETP Core Team would like to thank Dr Fatih Birol (IEA Executive Director), Mary Burce Warlick (Deputy Executive Director) and Dan Dorner (Head of Strategic Initiatives Office) for their strategic overview and guidance in the implementation of the programme over the past year. Our sincere thanks also go to the other members of the IEA leadership and to all the members of their teams for the excellent guidance and management of various aspects of the programme: Laura Cozzi (Director, Sustainability, Technology and Outlooks) and Keisuke Sadamori (Director, Energy Markets and Security), as well as Claire Bouteille (Chief Management Officer), Jason Elliott (Head of Energy Security and Critical Minerals Division), Paolo Frankl (Head of the Renewable Energy Division), Tim Gould (Chief Economist), Timur Gül (Chief Technology Officer), Rebecca Gaghen (Head of Division, Global Energy Relations), Dennis Hesseling (Head of Gas, Coal and Power Markets Division), Pablo Hevia-Koch (Acting Head of Renewable Integration and Secure Electricity Unit), Nick Johnstone (Chief Statistician), Toru Kajiwara (Head of Division, Global Energy Relations), Pascal Laffont (Chief Legal Counsel), Brian Motherway (Head of Office, Energy Efficiency and Inclusive Transitions), and Jethro Mullen (Acting Head of the Communications and Digital Office).

The CETP Annual Report 2023 was led by Magdalena Sanocka (CETP Programme Officer) with oversight from Adam Ward (CETP Programme Manager). It has been made possible by the contributions of colleagues across the IEA – we would like to thank all of them for their outstanding implementation of the programme activities and for their contribution to this report. We are grateful to our colleagues in IEA Corporate Services, and particularly those who form part of the CETP Core Team for their invaluable support throughout the year.

Special thanks also go to the IEA Communications and Digital Office for their help in producing this report.

# Abbreviations

ACE	ASEAN Centre for Energy
AERN	ASEAN Energy Regulatory Network
AfDB	African Development Bank
AFD	Agence Française de Développement
ANEEL	Brazilian Electricity Regulator
APEC	Asia-Pacific Economic Cooperation
BEE	Bureau of Energy Efficiency
CCUS	carbon capture, utilisation and storage
CEEW	Council on Energy, Environment and Water
CEIIC	Clean Energy International Incubation Centre
CEM	Clean Energy Ministerial
CERT	Committee on Energy Research and Technology
CETP	Clean Energy Transitions Programme
COP	Conference of the Parties
CONUEE	National Commission for the Efficient Use of Energy
CORFO	Chilean Economic Development Agency
DRC	Democratic Republic of the Congo
ECECP	European Union-China Energy Cooperation Platform
EGAT	Electricity Generating Authority of Thailand
EMDE	emerging market and developing economies
ENS	Eco-Niwas Samhita
EPE	Energy Research Office
ERI	Energy Research Institute
ESCO	energy service company
ESG	environmental, social and governance
ETS	emissions trading system
EV	electric vehicle
GEF	Global Environment Facility
GER	Office of Global Energy Relations
GHG	greenhouse gas
GoI	Government of India
GPFM	Green Powered Future Mission
G7	Group of Seven
G20	Group of 20
IFC	International Finance Corporation
IIT Delhi	Indian Institute for Technology
IMF	International Monetary Fund

IPG	International Partners Group
ISGAN	International Smart Grid Action Network
JETP	Just Energy Transition Partnership
MEE	Ministry of Ecology and Environment
MEFED	MENA Europe Future Energy Dialogue
MEMR	Ministry of Mineral Resources and Energy
MENA	Middle East and North Africa
MEPS	minimum energy performance standards
MI	Mission Innovation
NEA	National Energy Administration
NDC	nationally determined contribution
NDRC	National Development and Reform Commission
OECD	Organisation for Economic Co-operation and Development
OLADE	Latin American Energy Organization
OVP	Nigeria's Office of the Vice President
PAT	Perform, Achieve and Trade
R&D	research and development
RD&D	research, development and demonstration
RETA	Regulatory Energy Transition Accelerator
SDC	Swiss Agency for Development and Cooperation
SDG	Sustainable Development Goal
SEAD	Super-efficient Equipment Appliance Deployment
SENER	Secretary of Energy of Mexico
TCP	Technology Collaboration Programme
TERI	The Energy Resources Institute
TGO	Thailand Greenhouse Gas Management Organization
UN	United Nations
UNEP	UN Environment Programme
UNFCCC	UN Framework Convention on Climate Change
UNIDO	UN Industrial Development Organization
UNSD	UN Statistics Division
VC	voluntary contribution
WRI	World Resources Institute
3DEN	IEA Digital Demand-Driven Electricity Networks Initiative



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