



International
Energy Agency
Secure
Sustainable
Together

Energy Access Outlook 2017

From Poverty to Prosperity

EXECUTIVE SUMMARY

World Energy Outlook Special Report



International
Energy Agency
Secure
Sustainable
Together

Energy Access Outlook 2017

EXECUTIVE SUMMARY

for more information, and the free download of
the report, please visit www.iea.org/energyaccess

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
 - Improve transparency of international markets through collection and analysis of energy data.
 - Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
 - Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

IEA member countries:

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Japan
Korea
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States



**International
Energy Agency**
Secure
Sustainable
Together

© OECD/IEA, 2017

International Energy Agency
Website: www.iea.org

Please note that this publication is subject to specific restrictions that limit its use and distribution.

The terms and conditions are available online at www.iea.org/t&c/

The European Commission also participates in the work of the IEA.

Energy access is the “golden thread” that weaves together economic growth, human development and environmental sustainability. Energy has long been recognised as essential for humanity to develop and thrive, but the adoption in 2015 by 193 countries of a goal to ensure access to affordable, reliable, sustainable and modern energy for all by 2030, as part of the new United Nations Sustainable Development Goals (SDGs), marked a new level of political recognition. Energy is also at the heart of many of the other SDGs, including those related to gender equality, poverty reduction, improvements in health and climate change.

This year the International Energy Agency has built on its work on energy access to produce a ground-breaking and in-depth examination of the prospects for, and pathway to, modern energy access for all by 2030. The IEA has tracked country-by-country data on access for over fifteen years, providing forward-looking analysis on access to electricity and clean cooking. This year it has combined its comprehensive energy balance data with its detailed analysis of recent progress to provide a first of its kind historical analysis that covers more than 140 countries and shows not only the number of people who gained access to electricity and clean cooking since 2000 but also how they gained it. This has been combined with an in-depth review of energy access policy ambitions, and with overall energy sector modelling and geospatial analysis, to provide the global energy community with its most detailed and robust examination yet of the pathways to universal energy access by 2030, including a full assessment of costs and benefits.

A wide range of technologies and new business models are contributing to significant progress on electricity access

The number of people without access to electricity fell to 1.1 billion in 2016 from 1.7 billion in 2000. It is on track to decline to 674 million by 2030, with India reaching universal access well before then. Since 2012, more than 100 million people per year have gained electricity access, an acceleration from the rate of 62 million people per year seen between 2000 and 2012. Developing countries in Asia, led by India, have made significant progress, and the electrification rate in the region reached 89% in 2016, up from 67% in 2000. China reached full electrification in 2015, while 100 million people in Indonesia and 90 million in Bangladesh gained access since 2000. Electrification efforts in sub-Saharan Africa outpaced population growth for the first time in 2014, leading to a decrease in the number of people without access in the region. Nonetheless, despite progress in the last few years the electrification rate in sub-Saharan Africa is currently just 43%. Many developing countries in Asia are well on track to reach universal access, including India and Indonesia, and this region reaches an electrification rate of 99% by 2030. Latin America and the Middle East reach 99% and 95% electrification respectively. While several countries in sub-Saharan Africa, including Ethiopia, Gabon, Ghana, and Kenya, reach or are on track to reach universal electricity access by 2030, progress across the region as a whole is uneven, and the number gaining access fails to keep pace with

population growth. By 2030, roughly 600 million of the 674 million people still without access are in sub-Saharan Africa, mostly in rural areas.

Analysis based on our unique database reveals that from 2000 to 2016 nearly all of those who gained access to electricity worldwide did so through new grid connections, mostly with power generation from fossil fuels. Over the last five years, however, renewables have started to gain ground, as have off-grid and mini-grid systems, and this shift is expected to accelerate. By 2030, renewable energy sources power over 60% of new access, and off-grid and mini-grid systems provide the means for almost half of new access, underpinned by new business models using digital and mobile technologies. Since 2000, most new access has come from fossil fuels (45% coal, 19% natural gas and 7% oil). The technologies used to provide access however have started to shift, with renewables providing 34% of new connections since 2012, and off-grid and mini-grid systems accounting for 6%. The declining costs of renewables and efficient end-user appliances and innovative business models for access are all having an impact. This combination of factors is set to transform the energy access landscape in the years to come, especially in rural areas. Over the period to 2030, new connections to the grid bring electricity to over half of those that gain access, and offer the most cost-effective means of access in urban areas, but decentralised systems are the most cost-effective solutions for over 70% of those who gain access in rural areas.

Improved access to clean cooking remains elusive

About 2.8 billion people still lack access to clean cooking, the same number today as it was in 2000. Yet, there are some notable success stories, especially in China and Indonesia as urbanisation and increased policy efforts are prompting a switch to liquefied petroleum gas (LPG), natural gas and electricity. China has seen a reduction in the share of people relying on solid fuels for cooking to 33% in 2015, from 52% in 2000. However, despite increasing awareness of the health and environmental risks, and decades of programmes targeting access to modern cooking, one-third of the world's population – 2.5 billion people – still rely on the traditional use of solid biomass while another 120 million people cook with kerosene and 170 million with coal. Most of those without clean cooking are living in developing Asia (1.9 billion), followed by sub-Saharan Africa (850 million).

In our projections, 2.3 billion people remain without access to clean cooking in 2030. Most progress comes from a switch to LPG in urban areas, especially in developing Asia. In rural areas, 370 million people gain access to clean cooking by 2030, but biomass remains a primary cooking fuel. Improved and advanced biomass cookstoves, which can be considerably more efficient and less polluting than traditional stoves, are the most common stepping stone towards clean cooking in rural areas, but are only used by one-in-ten households reliant on biomass as a cooking fuel in 2030. In developing Asia, 1.2 billion people are set to rely primarily on the traditional use of biomass for cooking in 2030. In

sub-Saharan Africa, clean cooking efforts fail to keep pace with population growth: as a result, the number of people without access grows to 910 million in 2030.

India has led recent global progress in electricity access

Half a billion people have gained access to electricity in India since 2000, almost doubling the country's electrification rate. This remarkable growth puts India on course to achieving access to electricity for all in the early 2020s – a colossal achievement. The pace has accelerated in recent years, with an additional 40 million people gaining access each year since 2011. Nearly all those who gained access since 2000 have done so as a result of new connections to the grid, which has been the main focus of government measures. Coal has fuelled about 75% of the new electricity access since 2000, with renewable sources accounting for around 20%. Still, 239 million people remain without electricity access in 2016, about a quarter of the worldwide total. But India's continued emphasis on electrifying households means it is expected to reach universal electricity access in the early-2020s, with renewables accounting for about 60% of those who gain access. Progress has also been made on clean cooking, although 830 million people in India still lack access. There are clear indications however that government policy efforts targeting LPG have begun to take hold. The share of the population relying primarily on biomass for cooking fell to 59% in 2015 from 66% in 2011. By 2030, the promotion of LPG and improved biomass cookstoves by the government means that more than 300 million people gain access to clean cooking facilities, but still more than one-in-three people remain without.

Energy for all by 2030 is achievable and Africa must be at the heart of the process

Providing electricity for all by 2030 would require annual investment of \$52 billion per year, more than twice the level mobilised under current and planned policies. Of the additional investment, 95% needs to be directed to sub-Saharan Africa. In our Energy for All Case, most of the additional investment in power plants goes to renewables. Detailed geospatial modelling suggests that decentralised systems, led by solar photovoltaic in off-grid systems and mini-grids, are the least-cost solution for three-quarters of the additional connections needed in sub-Saharan Africa. Scaling up investment in electricity access will require that the right policies and investment frameworks are in place. Similarly, reaping broader social and economic benefits will require a perspective on access that extends beyond household connections to include electricity for productive uses, such as businesses, agriculture and industry. This can create anchor loads to attract investment, lowering the average cost of household connections, improving food security and creating job opportunities, notably for women.

Achieving clean cooking for all relies on the deployment of LPG, natural gas and electricity in urban areas, and a range of technologies in rural areas and the involvement of local communities, especially women, when designing solutions. To achieve clean

cooking for all, an additional 2.3 billion people need to gain access to cleaner fuels and technologies by 2030. The investment required for clean cooking facilities is modest, amounting to less than one-tenth of what is needed for universal electricity access. In the Energy for All Case, 800 million people gain access in urban areas. The mix of fuels and technologies for clean cooking in rural areas varies, depending on locally available resources and infrastructure, but in total around 1 billion people in rural areas gain access via improved biomass cookstoves, while LPG and biogas provide for the remaining 1 billion people. Providing funds is not enough on its own. Experience shows that past programmes can fall short if they don't take account of social and cultural factors and do not involve women from the outset.

Achieving “Energy for All” would provide significant benefits, especially for women, without having any impact on climate change

Providing energy for all would significantly improve the lives of those without access and boost their economic prospects. Women in particular stand to gain by cutting the time spent on gathering fuel and cooking and avoiding household air pollution. At present, an estimated 2.8 million people die prematurely each year because of the smoky environments caused by burning solid biomass in inefficient stoves or from combustion of kerosene or coal for cooking. Women and children suffer most of the worst effects. In addition, households relying on biomass for cooking dedicate around 1.4 hours each day collecting firewood, and several hours cooking with inefficient stoves, a burden largely borne by women. Providing access to clean cooking for all lowers the premature death toll by 1.8 million people per year in 2030. It also reduces the amount of time spent gathering fuelwood and cooking - time which can be redirected to more productive activities or to acquire new knowledge and skills.

Achieving energy for all by 2030 will not cause a net increase in global greenhouse-gas emissions. Achieving energy for all would have a minimal impact on global energy demand, with an increase of 0.2% (37 million tonnes of oil equivalent) relative to our base case. However, the corresponding rise in carbon-dioxide (CO₂) emissions of around 0.2% (70 million tonnes [Mt] of CO₂) in 2030, is more than offset as reducing the biomass used for cooking provides a net reduction in greenhouse-gas emissions, which would save the equivalent of around 165 Mt of carbon-dioxide equivalent from methane and nitrous oxide.

While each country will take a different route to achieving energy for all, there are some general lessons from what has already been done that will help along the way. Our analysis highlights that the following actions can help ensure “no one is left behind” – the imperative of the Sustainable Development Goals.

- *Implement policies that encourage a wide range of solutions and business models, avoiding barriers to new entrants.* Where progress has occurred, it is because policies have been clear and consistent, encouraged cost-effective investment from a wide range of financial streams and engaged a wide range of stakeholders, including the local community.

- *Facilitate rural electricity access by creating suitable conditions for off-grid investment, and by making provision for subsequent connection of decentralised solutions to the grid.* On-grid and decentralised solutions are complementary, and their relative share depends on a country's circumstances. Co-ordinated, flexible planning that encourages investment in both and makes provision to integrate them is the quickest and most resilient way to achieve access for all.
- *Make energy efficiency an integral part of energy access policies.* Efficient appliances and lighting, such as light-emitting diodes (LEDs), enable consumers to access more energy services for lower overall investment. It also facilitates the uptake of new business models and improves the affordability of off-grid solutions.
- *Take a holistic approach and include productive uses in energy access policies and targets.* Electrification strategies should take into account other development goals and opportunities to use energy access to stimulate economic activity and create jobs in addition to household electrification. Actions taken to achieve energy for all can complement those taken to address climate change.
- *Women need to be at the centre of the shift to clean cooking.* Despite the scope of the challenge, access to clean cooking receives less attention than access to electricity. For people, mostly women, to move away from solid biomass, policies and programmes need to reflect local needs and expectations, account for social and cultural factors, clearly explain the health risks, and empower women, as they are central decision-makers in household cooking matters.

This publication reflects the views of the IEA Secretariat but does not necessarily reflect those of individual IEA member countries. The IEA makes no representation or warranty, express or implied, in respect of the publication's contents (including its completeness or accuracy) and shall not be responsible for any use of, or reliance on, the publication. Unless otherwise indicated, all material presented in figures and tables is derived from IEA data and analysis.

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

IEA Publications,
International Energy Agency

Website: www.iea.org

Contact information: www.iea.org/aboutus/contactus

IEA/OECD possible corrigenda on: www.oecd.org/about/publishing/corrigenda.htm

Layout in France by IEA - Printed in France by IEA October 2017

Cover design: IEA, photo credits: Shutterstock

Explore the data behind the Energy Access Outlook 2017



www.iea.org/energyaccess

The IEA's *World Energy Outlook* has tracked country-by-country data on access to electricity and clean cooking for over fifteen years. Its unique database provides a historical time series from 2000 to present for over 100 countries on access to electricity and clean cooking. Please visit the free database from the *Energy Access Outlook 2017* report at www.iea.org/energyaccess/database. There you will find data on the electricity and clean cooking access rates for more than 100 countries, including the urban and rural divide, along with much more material.

Energy Access Outlook 2017

Energy is essential for humanity to develop and thrive. In 2015, the new Sustainable Development Goals, adopted by 193 countries, included for the first time a target to ensure affordable, reliable, sustainable and modern energy for all, underscoring a new level of political agreement on the importance of access to modern energy services. At the same time, the declining cost of decentralised renewables, increased access to affordable energy-efficient appliances and the use of mobile platforms are changing the way we think about providing energy access. It is against this backdrop that the IEA produced this Special Report, part of its flagship *World Energy Outlook (WEO)* series.

This report:

- Expands and updates the *WEO's* country-by-country electricity and clean cooking access database, and assesses the status for all developing countries, reviewing recent trends and policy efforts up to 2016.
- Presents a global and regional electricity and clean cooking access outlook to 2030, with a dedicated chapter on sub-Saharan Africa.
- Provides a pathway for achieving access to modern energy for all by 2030, identifying policy priorities, detailing investment needs, and the role that decentralised and on-grid solutions may play.
- Analyses how energy development can unleash economic growth in sectors such as agriculture, and explores how energy access intersects with other issues such as gender, health and climate change.

40 years of World Energy Outlook

For more information, and the free download of the report, please visit www.iea.org/energyaccess