A photograph of the IRENA building at sunset. The sun is low on the horizon, casting a warm glow over the scene. In the foreground, there are tall, dry grasses and a paved walkway. Several banners with the IRENA logo are visible on the left side of the image.

FIVE YEARS OF ADVANCING THE RENEWABLE ENERGY SOLUTION

The establishment phase of the International Renewable Energy Agency (IRENA) has coincided with a remarkable acceleration in the energy transition

Since 2011, the world has witnessed a dramatic energy shift. Capacity additions for renewable energy have skyrocketed as technology costs have plummeted. Leaders from the public and private sectors around the world have made commitments to renewables over other energy sources, and investment is growing year on year.

A rapid transition to renewables, combined with improving energy efficiency, offers the single most effective way to solve a host of social, economic and environmental concerns. Many countries are already pursuing this transition, using technologies available

today. The change can be cost-neutral and creates more new jobs than those displaced in the fossil fuel industries.



This year IRENA celebrates the rise of renewables, particularly in the past half-decade. On 4 April, the intergovernmental agency — founded to promote the widespread adoption and sustainable use of all forms of renewable energy — marked five years.

Enter the International Renewable Energy Photo Competition

IRENA invites you to help celebrate its fifth anniversary by participating in a photography competition, aimed at demonstrating the promise and power of renewable energy as the solution to a wide range of global, national and local challenges. These challenges include climate change, energy security, energy poverty, the health effects of air, water and soil pollution; and empowering communities. Winning photos will be thought-provoking, surprising, beautiful, dramatic or entertaining – and will focus on renewable energy in action.

The first place winner will receive an all-inclusive trip to Abu Dhabi during the seventh IRENA Assembly and the World Future Energy Summit (WFES) in January 2017. Top photos will be exhibited at the IRENA Assembly and WFES, where they will be seen by thousands of energy professionals from around the world. They will also be displayed at the IRENA Headquarters building in Abu Dhabi.

www.irena.org/photoCompetition/



Access to Infographics

www.flickr.com/photos/irenaimages/albums/72157654890726080

IRENA INNOVATION WEEK

The Age of Renewable Power

11-13 MAY 2016 • BONN, GERMANY

This first-of-its-kind event gathers the industrial and political frontrunners to present, discuss and explore innovative solutions to accelerate the transition to renewable energy.

This year's theme is "The Age of Renewable Power". Discussions will focus on how technological, operational and systemic innovations influence and reinforce each other in policy, regulation and business.

The global transition towards a renewable power sector is well underway. Technology costs are falling, investment is rising and renewable electricity capacity additions have outpaced those of nuclear and fossil-based generation for the past three years running. To foster this growth, electricity systems worldwide must embrace new business models and incorporate innovative technologies.

IRENA Innovation Week provides a global platform for thought leaders, technical experts and policy makers to share their vision and discuss the transformational role of renewable energy in a future power system (more information on page 8).

Renewable power generation capacity at the regional level 2015

North America

Capacity	330 GW
Global share	17%
Increase	+20 GW
2015 growth	+6.3%

Central America and the Caribbean

Capacity	12 GW
Global share	1%
Increase	+1.5 GW
2015 growth	+14.5%

South America

Capacity	180 GW
Global share	9%
Increase	+9.1 GW
2015 growth	+5.3%

Europe

Capacity	497 GW
Global share	25%
Increase	+24 GW
2015 growth	+5.2%

Middle East

Capacity	17 GW
Global share	1%
Increase	+1.3 GW
2015 growth	+7.8%

Africa

Capacity	37 GW
Global share	2%
Increase	+2.2 GW
2015 growth	+6.3%

Eurasia

Capacity	89 GW
Global share	4%
Increase	+4.0 GW
2015 growth	+4.7%

Asia

Capacity	797 GW
Global share	40%
Increase	+88 GW
2015 growth	+12.4%

Oceania

Capacity	26 GW
Global share	1%
Increase	+1.4 GW
2015 growth	+5.6%

RENEWABLE POWER UP A RECORD 8.3%

Global renewable power generation capacity last year increased by 152 gigawatts (GW) or 8.3%, making 2015 the sixth consecutive year it has shown growth of 8% or higher. This growth kept up even amid the fall in global oil prices. Generation capacity from renewables has increased by about a third over the last five years, with most of this growth coming from wind and solar installations.

Wind energy capacity increased by 63 GW, or 17%, followed by solar, with an increase of 47 GW (26%). Hydropower capacity increased by 35 GW (3%), while bioenergy and geothermal energy both increased by 5% (5 GW and 1 GW, respectively).

By the end of 2015, all of the world's renewable generation capacity amounted to 1,985 GW. Hydro power accounted for the largest share of the global total, with 1,209 GW of installed capacity. Three quarters of this was in large-scale plants, each over 10 MW. Wind and solar energy accounted for most of the remainder, with installed capacities of 432 GW and 227 GW respectively. Other renewables included 104 GW of bioenergy, 13 GW of geothermal energy and about 500 MW of tidal, wave and ocean energy.

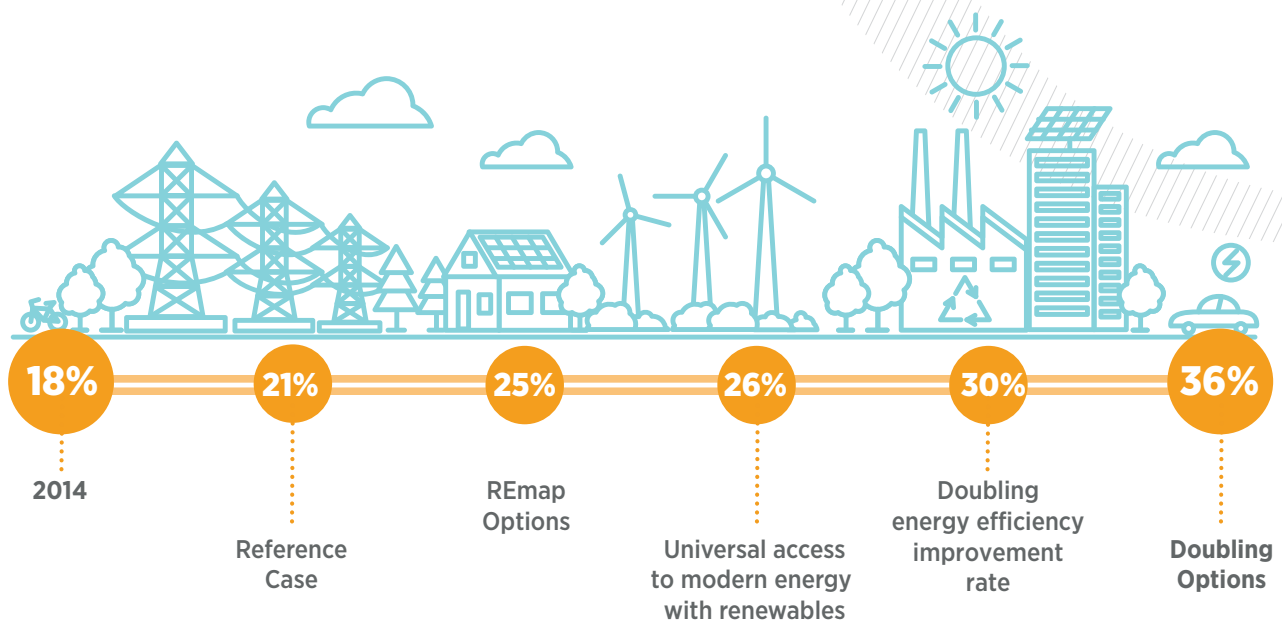
Asia, Europe and North America together account for over 80% of the world's renewable generation capacity. Asia accounted for 58% of new capacity additions last year, bringing its total to almost 800 GW or 40% of global capacity. Asia was also one of the year's fastest growing regions, with a 12.4% increase in renewable capacity, compared to 24 GW (5.2%) in Europe and 20 GW (6.3%) in North America.

While other regions account for smaller shares, renewable generation capacity increased by about 5% in all regions, with the exception of Central America, which increased by almost 15%, as major solar plants were commissioned in 2015.

Yet, the expansion of renewables remains focused on relatively few countries. Only 19 countries installed more than one gigawatt of renewables in 2015, and those account for over 90% of the new additions worldwide.

IRENA's latest [Renewable Capacity Statistics](#) show the installed capacity from renewables for all countries and areas, and all renewable energy technologies, throughout 2000-2015.

Roadmap to doubling the global share of renewable energy by 2030



DOUBLING RENEWABLES CAN SAVE TRILLIONS

Last year, global coal consumption fell by between 90 million tonnes and 180 million tonnes, whereas renewables continued to grow at an unprecedented pace, as they have for the past five years. Renewable energy drew a record USD 286 billion of investment in 2015. This follows the trend that more new renewable power capacity is installed each year than new fossil-based and nuclear power combined.

But despite this recent sprint towards renewable energy, there is still a marathon left to run to meet the international development and climate targets. To reach the goals set in the Paris Agreement, signed on 22 April, the world needs to double the share of renewables in the total energy mix by 2030, IRENA's REmap analysis shows. In terms of total final energy consumption, renewables are only growing at a rate of 0.17% per year. If they are to double by 2030, this rate of growth must increase six-fold, to 1% per year.

How can this be done? A new report from IRENA provides an in-depth perspective on the energy transition in 40 economies, representing 80% of global energy use. This latest global REmap study offers concrete technology options and outlines solutions and action areas to accelerate renewable energy growth.

Doubling renewables in the global energy mix by 2030 is feasible and actually less expensive than

not doing so. It would save up to USD 4.2 trillion annually by 2030 – 15 times more than the costs – while bringing numerous economic, social and environmental benefits.

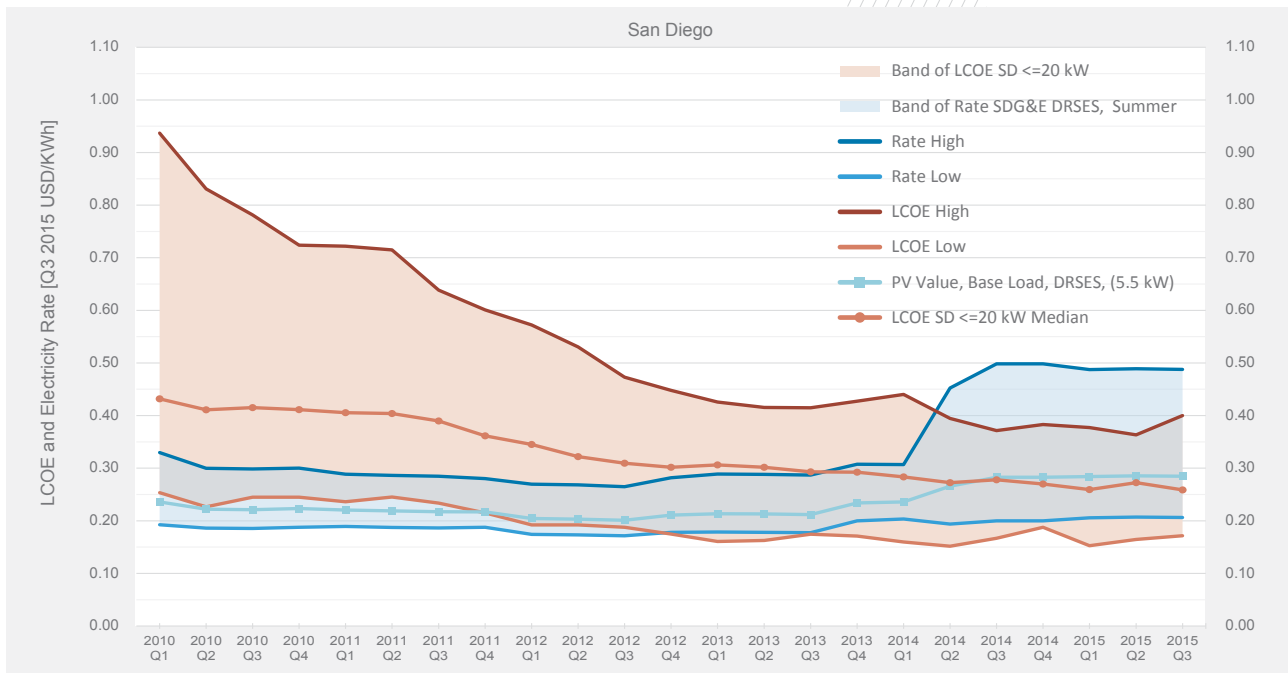
Great strides have been made to increase renewable power generation, where they are on track to produce roughly 30% of the world's electricity by 2030 (up from 23% today). More action is needed to increase renewables in transport (via electric cars) and in buildings and industry (via heating and cooling), which today lag in transition.

The REmap report helps map the course the global community must run to scale up renewables in the next 14 years. Policy makers and governments must take action to make such aspirations a reality.

“The age of renewable energy is here, but without concerted efforts, its potential will not be reached fast enough to meet international climate and development targets,” says IRENA Director-General Adnan Z. Amin. “For decision makers in the public and private sectors alike, this roadmap sends an alert – both on the opportunities at hand and on the costs of not taking them.”

For more about the world's energy options, see REmap Series REmap: Roadmap for A Renewable Energy Future: 2016 Edition.

Solar PV residential system prices in California, 2010-2015



MEASURING SOLAR PV SUCCESS

Solar panels are found on rooftops, in gardens and in fields from China to South America. While solar photovoltaic (PV) technology and power costs continue to fall, the question remains: how much cheaper is it compared to other energy sources, and how can that be quantified amid rapid technological advances?

New indicators, reflecting the evolution of PV system costs compared to the solar power generated, highlight the affordability of residential PV. These competitiveness indicators allow timely analysis of fast-moving renewable energy markets. This can aid decision makers in the design, adoption or strengthening of solar support policies.

In 2014, California was the leading state in the U.S. for new capacity of solar PV (57% of the U.S. total) and cumulative installed capacity (48% of the U.S. total). California installed about 615 megawatts (MW) of residential solar PV in 2014, bringing total residential solar PV capacity in California to 1,698 MW. Solar PV installed system costs for the state, collected from the California Public Utilities Commission (CPUC), support levelised cost of electricity (LCOE) calculations. Based on preliminary results, the median cost of residential PV systems dropped about 40% over the last five years.

Translating data on system costs and the performance of solar PV systems into an LCOE, results in a curve, like the one shown for San Diego. The city's LCOE cost reductions are following a similar pattern to California installed cost levels, with the median LCOE similarly dropping by 40% in five years.

The cost of electricity generated by solar PV has fallen steadily and relentlessly. By early 2012, the lowest power rates (brown line in figure) started falling below the estimated value of PV generation (blue line with squares). This value reflects the difference in costs between buying electricity from the grid and from owning and using installed solar PV.

The median LCOE also fell for the first time below the estimated PV value late 2014, and continues to stay below this value. During the second quarter of 2014, the high LCOE boundary (dark red line) fell for the first time below the high electricity rate boundary (dark blue line) and continues to stay lower through late 2015. This makes solar PV generation cheaper than buying electricity from the grid.

IRENA's Solar PV Parity Indicators (PVPIs), compare solar PV costs to electricity rates, with the aim of informing governments, policy makers, regulators and other stakeholders about recent trends in the competitiveness of solar PV.



Children in traditional Mongolian dress in front of 200 kW solar PV system

Photo: B. Sarvagambaaatar

MONGOLIA: VAST RESOURCES FOR SUSTAINABLE DEVELOPMENT

For the world's 19th largest country in terms of geographic area, Mongolia's electricity market is still tiny. But the expansive desert across this country of 3 million people holds enormous untapped renewable energy potential.

Today, only 7% of the country's installed power-generation capacity comes from renewables, mostly hydropower. Coal-fired power plants and industries, meanwhile, add to a rising pollution problem in urban centres.

Domestic wind and solar resource potential could match neighbouring China's huge power demand.

But new policies could boost the share of renewables in the energy mix to 20% by 2023 and 30% by 2030. Parliament recently adopted broad measures aimed at green development, energy efficiency and future sustainability.

"This new legislation enables Mongolia to provide energy security and reliability, improve energy efficiency, pursue public-private partnerships and create a market-oriented framework for the sector," says the Minister of Energy, Zorigt Dashzevag.

Mongolia can boost its energy security, reduce chronic pollution, meet global climate commitments and spur future economic growth, especially through eventual exports of renewable power around the region, he says.

Mongolia's National Renewable Energy Center (NREC)* sees a huge possible resource base, with total renewable energy potential estimated at 2.6 terawatts. Resource assessment indicate that electricity output from solar and wind resources alone could reach 15,000 terawatt-hours per year, enough

to supply neighbouring China's total electricity demand in 2030.

This vast solar and wind potential of Mongolia's Gobi Desert could drive power production and exports. Key goals for the energy ministry include:

- » Building a large-capacity renewable energy complex to export to north-eastern Asian countries;
- » Pursuing long-term agreements with neighbours for power imports and exports;
- » Strengthening cooperation with international organisations and donor countries;
- » Attracting investors.

Mongolia's president, Tsakhia Elbegdorj, set up the Gobitec initiative to examine ways to exploit the desert's potential. The president envisages his country as a renewable energy exporter, mainly to the north and east by way of developing the Asian Super Grid (ASG).

"Mongolia has huge potential for renewable energy and is a strategically located country," he says. "Mongolia can become a global hub for renewables. We will make our best effort to implement this initiative."

For more on the country's energy challenges and opportunities, see [Renewables Readiness Assessment: Mongolia](#), prepared by IRENA in co-operation with the Ministry of Energy of Mongolia.

* Mongolia's NREC bases its calculations on data from the US National Renewable Energy Laboratory (NREL).

Recent publications



REmap: Roadmap for A Renewable Energy Future, 2016 Edition

Doubling renewables in the global energy mix by 2030 is not only feasible, but cheaper than not doing so. Economic savings would far exceed the costs. This second edition of IRENA's global roadmap provides an in-depth perspective on the energy transition in 40 economies.



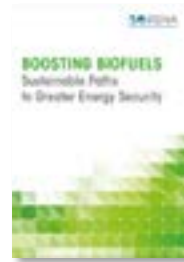
Wind Power

This technology brief from IRENA and IEA-ETSAP notes the increased power generation from this key renewable energy source. It includes onshore and offshore wind power generation and turbines, and provides information for policy makers and wind developers alike.



Renewable Energy Market Analysis: The GCC Region

The countries of the Gulf Cooperation Council (GCC) could reap multiple benefits from scaling up renewable energy use. This report looks at the opportunities and barriers for renewable energy deployment in the GCC economies and offers recommendations for greater integration of renewables into the regional energy mix.



Boosting Biofuels: Sustainable Paths to Greater Energy Security

Substantial potential exists to expand both food and fuel supply in a sustainable fashion. This report examines sustainable paths for biofuel development. Part of this potential can be harnessed through "first-generation", "second-generation" and "third-generation" technologies to produce biofuel from different sources.

www.irena.org/publications

About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.

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IRENA INNOVATION WEEK

The Age of Renewable Power

11-13 May, 2016, Beethovenhalle, Bonn, Germany

WEDNESDAY 11 MAY 2016

OPENING SESSION		
Welcome Speech: Adnan Z. Amin, Director-General, IRENA		09:00-10:00
Opening by Host Country: Rainer Baake, State Secretary, Federal Ministry of Economic Affairs & Energy		
Plenary I: The Age of Renewable Power	• High-level panel	10.00 – 11.30
Plenary II: Systemic Innovation	<ul style="list-style-type: none"> • Renewable energy policy • Market design • Emerging markets • Business models • Financing 	12.00 – 13.30
Group Discussions I:	<ul style="list-style-type: none"> • Decentralised electricity systems for islands and rural electrification • Emerging electricity systems for high demand growth • Mature electricity systems for low demand growth 	14.30 – 16.30
Plenary III: Findings from Group Discussions		17.00 – 18.00
Evening Reception: Kunstmuseum Bonn		19.00 – 21.00

THURSDAY 12 MAY 2016

Plenary IV: Technological Innovation	<ul style="list-style-type: none"> • Renewable energy grid services • Smart grids • 21st Century grid • Energy storage • Remote systems 	09.00 – 10.30
Deepdive sessions:	<ul style="list-style-type: none"> • The future grid: Smart, mini and microgrids • Energy systems modelling and planning • From science to innovation 	11.00– 13.00
Deepdive sessions:	<ul style="list-style-type: none"> • The future grid: Electric highways • New market designs • Frontiers in technology development 	14.00 – 16.00
Deepdive sessions:	<ul style="list-style-type: none"> • Energy systems modelling and planning • Advancing frontiers of reliability and quality 	16.30 – 18.30
Evening reception		19.00 – 21.00

FRIDAY 13 MAY 2016

Plenary V: Operational Innovation	<ul style="list-style-type: none"> • Control options • 'Big Data' • Consumer engagement • Demand response • Virtual Power Plants 	09.00 – 10.30
Group Discussions II:	<ul style="list-style-type: none"> • Decentralised electricity systems for islands and remote areas • Emerging electricity systems with high demand growth • Mature electricity systems with low demand growth 	11.00 – 13.00
Plenary VI: Creating a Global Innovation Agenda	<ul style="list-style-type: none"> • Findings from deepdive sessions • Mission innovation • Breakthrough Coalition • Climate Technology Centre and Network (CTCN) 	14.00 – 15.30
CLOSING SESSION		
Findings from Group Discussions		16.00 – 17.30
Closing Speech: Adnan Z. Amin, Director-General, IRENA		