



G20 TURNS TO RENEWABLE ENERGY FUTURE

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Energy demand growth is a worldwide phenomenon.

The Group of Twenty (G20), representing the world's 20 largest economies, provides a forum for governments and multilateral financial institutions to discuss world economic and security issues.

The world's largest economies are the ones that must tip the balance of investment to ensure a sustainable future.

Turkey held the annually rotating G20 presidency last year, hosting a high-profile summit in Antalya. G20 leaders, gathered in the Turkish seaside resort in November, recognised the importance, as well as the long-term

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potential, of renewables by endorsing a toolkit of voluntary deployment options proposed by the International Renewable Energy Agency (IRENA).

The toolkit — included in a communiqué by G20 energy ministers — paves the way for the group to advance the global renewable energy agenda.

G20 countries hold 75% of total deployment potential for all renewables in the energy sector and around 70% of total investment potential for renewable power between now and 2030. Group members play a key role in technology development and innovation and can do much to accelerate renewable energy deployment. Institutions within the G20 represent the bulk of the global financial system.

Building on the group's principles on energy collaboration, adopted in 2014 in Brisbane, Australia, the toolkit outlines ways for G20 countries to take an integrated and sustainable approach to enhanced renewable energy deployment. A background report, prepared by IRENA in cooperation with other international

organisations triggered discussions in the working group on G20 renewable energy deployment and helped to identify areas of focus for the toolkit.

The *G20 Toolkit of Voluntary Options on Renewable Energy Deployment* highlights innovation, risk mitigation and conducive policy and regulatory frameworks as crucial instruments to ensure environmentally, socially and economically sustainable investment and development in the sector. G20 members also

stressed the key importance of exchanging good practices on policy design, technology costs and power system integration. Roadmaps for how to fully utilise renewable energy potential, including modern bioenergy options, are of particular interest to some G20 countries. Implementation is foreseen to start under the Chinese G20 Presidency in 2016.

The **Ministerial Communiqué** is available on the IRENA website.



Wind trees Photo: IRENA

IRENA Assembly Builds on Paris Climate Agreement

On 16-17 January, government leaders from over 150 countries and representatives from more than 140 international organisations gathered in Abu Dhabi for the sixth annual IRENA Assembly. The first international meeting held after COP21, the meeting aimed to help move the Paris Agreement to the next phase: action and implementation.

The assembly focused on key elements to accelerate the renewable energy transition, including finance and investment, innovation and power sector transformation. Building on the COP21 “solutions” theme, IRENA highlighted tools and resources to support countries, businesses and investors in scaling up renewable energy worldwide.

For the fourth consecutive year, the intergovernmental agency hosted the *IRENA — Financial Times Debate*, with a special address this year by UN Secretary-General Ban Ki-moon.

Speakers at the debate included IRENA Director-General Adnan Z. Amin, Executive Secretary of the UN Framework Convention on Climate Change (UNFCCC) Christiana Figueres, Cook Islands Prime Minister Henry Puna, European Commissioner Miguel Arias Cañete, and Kyung-Ah Park of Goldman Sachs.

The *FT*'s Pilita Clark hosted a lively discussion of ways to step up climate change mitigation through renewable energy.

For more information: www.irena.org

Flags of the World
Photo: IRENA

Focus on Renewable Energy at COP21

On 12 December, delegations at the 2015 Paris Climate Conference, also known as COP21, adopted a commitment to decisive, inclusive and co-ordinated action on climate change.

The Paris Agreement provides a framework for international co-operation and sends a clear signal to governments, businesses, international organisations and civil society to raise their ambition. It also provides a long-term vision for the sizeable reduction of global emissions. Decarbonising energy is imperative.

For the first time at any United Nations climate conference, the centrality of renewable energy in any viable climate solution was clear. The commitments submitted by countries reflected this. Bold announcements from the private sector and others on renewable energy and energy efficiency also bolstered the conference's focus on finding solutions.

The energy sector, accounting for some two-thirds of all global emissions, must be a top priority to keep the average global surface temperature from rising more than 2°C above pre-industrial levels.

IRENA's Director-General, Adnan Z. Amin, welcomed the agreement as "a watershed for global energy transition."

"The commitments submitted by countries in their Intended Nationally Determined Contributions demonstrate the centrality of renewable energy in national strategies. And the bold announcements made by private sector and other actors strengthened the meeting's solution-focused theme," he said.

"But to meet the ambition set forth in the agreement, accelerating the deployment of renewable energy across all sectors must start now."

IRENA led two major discussions at COP21 on the ongoing energy transition. About 1,000 participants joined live and via webcast for "RE-Energising the Future", a discussion on solutions, innovations and actions. A similar number joined COP21's *Energy Day*, which featured announcements on new initiatives, targets and alliances to further the renewable energy transition.

Global energy leaders, who gathered a month later at the 6th IRENA Assembly, have moved the Paris Agreement to the next phase: establishing a blueprint for action to meet climate goals and thus set the world on a path to a sustainable energy future.

For full coverage of IRENA's activities in and around COP21 visit: www.irena.org/newsroom

Power Grid Transformation Unlocks Long-term, Sustainable Growth

In 1936, when President Franklin D. Roosevelt decided the entire United States should be electrified, his administration had to mobilise massive system-level investments. Like in other countries, power for all citizens brought long-term payoff, transforming previously isolated communities and spurring ground-up economic growth.

Policy makers increasingly see the transformation to renewable-based power systems as a comparable challenge. More than 164 countries have set renewable energy targets in the power sector, and such ambitions keep rising. In 2015, China, India, and the United States all increased their renewable electricity targets. Globally, more than 100 gigawatts (GW) of solar photovoltaic (PV) and wind power were actually installed.

Yet the rapid growth of decentralised, variable renewables raises questions about the established, 20th-century paradigm for power system management. For a century, utilities have sought to match demand with electricity conveyed from centralised plants. In contrast solar and wind energy — ebbing and flowing with weather conditions — require new protocols to maintain adequate supply at all times.

Commercially available solutions, including smart grids, weather forecasting and demand-side management, all help to maintain grid stability. But research and development must continue as the energy mix evolves.

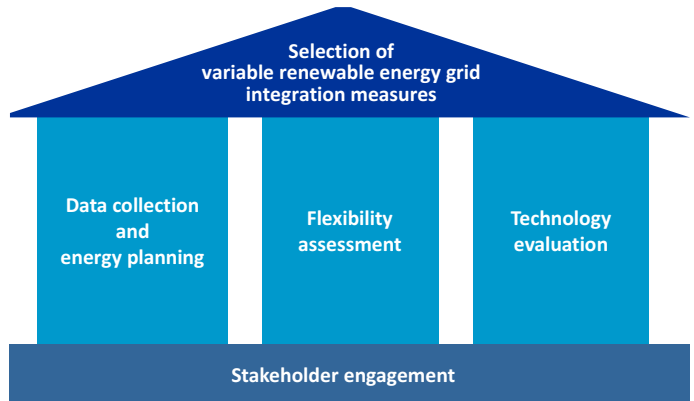
Only a few countries have reached the levels variable renewable energy (VRE) use that rule out traditional grid management, and none has completed the transition to a fully renewable power sector. Even so, enough examples now exist to demonstrate what is possible.

Ample experience in resource assessment, power system modelling and other crucial processes can lay the groundwork for successful renewable energy development. Pilot and demonstration projects can bolster any national strategy.

Governments in the Clean Energy Ministerial, the G20 and the G7 have called for dialogue and exchanges of best practices on renewable power

globally. IRENA — with the mandate to promote renewables worldwide — can assist with national road-mapping for the energy transition.

Framework for developing national roadmaps to guide the power sector transformation



For any country or jurisdiction, road-mapping starts with stakeholder engagement to identify specific needs and aspirations. This is followed by assessing options for flexible power dispatch and reserves; gathering data and planning for the development of renewable energy resources; and evaluating different technology options for integrating variable renewables.

All these considerations will influence the measures chosen to create the 21st-century power grid.

Today, investments to integrate high shares of renewable power promise to unlock long-term, truly sustainable growth for countries around the world. Setting ambitious targets is often the crucial first step. The next step is to turn those targets into reality.

*A key report in IRENA's Power Sector Transformation package, **The Age of Renewable Power**, outlines the steps in road-mapping for the transition to renewable power in any country or jurisdiction.*



Small hydropower facility, Brazil
 Photo: Shutterstock

New Technologies Boost Hydropower Potential

Hydropower has been used to generate electricity since the late 19th century. At least 135 countries now use this mature, relatively simple technology, for which cumulative installed capacity amounts to nearly 1,200 gigawatts (GW). Simultaneously, hydropower installations provide flood control, irrigation and potable water reservoirs.

As a power source, hydro dams offer valuable flexibility. Their reservoirs provide built-in energy storage, allowing a quick response to demand fluctuations across the grid. This helps to optimise power generation and can compensate for fluctuations or outages from other sources.

Pumped-storage hydropower is currently the most cost-competitive option for large-scale energy storage. Such plants can fill the natural gaps in power from variable renewables like solar and wind.

Installed hydropower generation costs are generally very low, between USD 450 per kilowatt (/kW) and USD 3,500/kW. The levelised cost of electricity (LCOE), which indicates the viability of any given power source, ranges from USD 0.02 per kilowatt-hour (/kWh) to USD 0.15/kWh for hydropower. Although varying from country to country and site to site, this is cheaper than coal or natural gas, both of which range upwards from USD 0.04/kWh.

The world's technical hydropower potential amounts to around 15,000 terawatt-hours (TWh) per year. Half of this is in Asia and about 20% in Latin America. However, many sites remain

untapped. Even in the most hydropower-developed region, Europe, about half the technical potential is unexploited.

Small hydropower, usually referring to installations from 1 megawatt (MW) to 20 MW, could provide as much as 150-200 GW globally. Only about 20% of this potential has been exploited to date.

However, hydropower projects — especially large ones — often raise environmental or social concerns. Dams can heavily reduce water availability over large areas, destroying valuable ecosystems and forcing the relocation of populations. Reservoirs, meanwhile, can produce greenhouse gas (GHG) emissions due to the decomposition of organic material, both from the initial inundation and subsequent deposits. Water quality needs to be properly monitored.

Stringent environmental standards for water management help to ensure the sustainability of hydropower development. At the same time, high capital costs and a long payback period can be a constraint for developers. Policy makers and developers need to address all such concerns.

Although familiar, hydropower technology offers room for improvement. New, low-head turbines could make future dams less ecologically intrusive. Small hydro needs intensified research and development to improve equipment design, materials and control systems. Lower technology costs would allow wider resource exploitation.

For more information, see the [IRENA/IEA-ETSAP technology brief on hydropower](#)



Wind turbine in Nicaragua
 Photo: Shutterstock

Central America Prepares for Solar and Wind-powered Future

Central American countries recognise renewable energy as a way to address their fast-growing power demand and support their socio-economic development. Yet the prospect of higher shares of solar and wind in the region’s power systems calls for a new paradigm to maintain grid stability.

The recently completed Central American Electrical Interconnection System (SIEPAC), a transmission line interconnecting Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama, presents a clear opportunity for renewable energy deployment to bolster regional energy security and sustainability.

To promote renewables in these increasingly interconnected markets, IRENA is working with the Central American Integration System (SICA) and other stakeholders to promote renewable power generation across the region.

The resulting Clean Energy Corridor Central America (CECCA) initiative calls for accelerated development and cross-border trade of renewable power. After an extensive consultation process with SICA member states, the CECCA strategy document was finalised in September and officially endorsed in December at the fourth council of SICA energy ministers, which took place in El Salvador. With Mexico, Colombia and Belize expected to join the regional electricity market, the CECCA strategy could further expand.

CECCA activities should support a systemic transition, enhance energy security, contribute to local economic development and also help to address climate change.

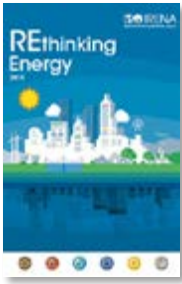
For more information visit: [IRENA-Latin America High-Level Consultation](#)



SICA Energy Ministers meet in El Salvador

Photo: IRENA

Recent publications



Rethinking Energy: Renewable Energy and Climate Change

The second edition of IRENA's flagship report looks at how the transition to renewables could help limit global warming. Renewable energy is at the core of any strategy for countries to meet climate goals while supporting economic growth, employment and domestic value creation.



Quality Infrastructure for Small-scale Renewable Energy Technologies

A series on quality infrastructure (QI) begins with *Guidelines for Policy Makers*, *Small Wind Turbines* and *Solar Water Heaters*. The guides explain essential concepts, highlight the benefits of QI, and offer guidance on how to incrementally introduce it in national markets.



Renewable Desalination: Technology Options for Islands

Desalination using renewable energy can meet island water needs at reduced costs. Methods including reverse osmosis (RO) or multi-effect distillation (MED) can be combined with solar photovoltaic or concentrating solar power technologies. IRENA produced the report using the expertise of Germany's Fraunhofer Institute for Solar Energy ISE.



Renewables Readiness Assessment: Ghana

Ghana has one of Africa's highest rates of access to electricity. In 2014 this was estimated at 72%, with over 87% in urban areas and nearly 50% in rural areas. However, annual demand growth of 10% calls for increased generation capacity. The report identifies the domestic resources that can best address energy insecurity and help to expand energy access.

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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