IRENA QUARTERLY
Q4 2019

ELEVEN YEARS LEFT FOR ACTION

Photograph: Shutterstock

Leaders and decision makers meeting at 25th Conference of the Parties (COP25) have faced growing pressure to make a decisive breakthrough on the global climate agenda.

Despite growing urgency, current investment patterns show a stark mismatch with the path needed to ensure a climate-safe future. Annual renewable energy investments for the next decade need to double from around USD 330 billion to nearly USD 750 billion per year until 2030, analysis by the International Renewable Energy Agency (IRENA) shows. Renewable energy and energy efficiency, along with deeper electrification, can deliver 90% of the energy-related emission cuts needed under the Paris Agreement.

"It's possible to fulfill the Paris Agreement and meet the world's growing energy demand by rapidly accelerating the speed at which we deploy renewable energy," said IRENA's Director-General, Francesco La Camera. "Only an energy transformation driven by renewables will allow us to meet the goals of the UN 2030 Agenda and Paris Agreement. Renewables are the only ready and available instrument we have to hold the 1.5°C line over the next 11 years."

"It's possible to fulfill the Paris Agreement and meet the world's growing energy demand"

Countries around the world agreed in 2015 to cut carbon emissions with the aim to keep global warming "well below" 2°C and ideally within 1.5°C in the present century, compared to pre-industrial levels.

In response to the threat of climate change, countries have pledged to invest in low-carbon energy. Yet national plans and investment patterns are not on track with initial commitments. The USD 95 trillion worth of planned energy investments worldwide must rise to USD 110 trillion to climate-proof the energy mix, IRENA's roadmap to 2050 shows. At the same time, planned fossil-fuel investments must be substantially redirected, with annual investments in renewables more than doubled for the coming decade.

Transforming the energy system is not only about installing renewables. It is about investing in more flexible infrastructure, as well as rethinking current plans to avoid stranding assets in outdated systems. Aligning energy investments with broader socio-economic policies, meanwhile, can ensure just and timely changes that leave no one behind.

The renewables-based transformation can increase employment 14% and add 2.5% to global GDP compared to current plans. Every dollar spent would deliver returns between three and seven dollars in fuel savings, avoided investments and reduced health and environmental damage, the IRENA roadmap indicates.

The sooner coal- and oil-burning plants are excluded as new investment options, the earlier countries will be able to benefit from a modern, fit-for-purpose energy system. Dedicated policies are needed to accelerate climate-proof investments.

"We must create a low-carbon energy system to hold the line on rising global temperatures," says Mr La Camera.

For more, see IRENA's climate investment report **Transforming the energy system.**

Climate Investment Platform

A new investment platform aims to help developing countries pursue more ambitious energy decarbonisation. The Danish-backed, country-driven Climate Investment Platform will facilitate integrated, streamlined development assistance and private-sector engagement in the transition to sustainable, climate-safe, renewable energy systems.

IRENA joined Sustainable Energy for All (SEforAll), the United Nations Development Programme (UNDP) and the Green Climate Fund (GCF) in launching the platform during the Climate Action Summit in September. The inclusive partnership aims to promote accelerated, transformative investments to help developing countries pursue more ambitious climate commitments and fulfill Sustainable Development Goals (SDGs).

New generation embraces sustainable energy solutions

As delegates gathered for the UN Secretary General's Climate Action Summit in September, IRENA's Director-General Francesco La Camera met youth delegates to discuss renewable energy as a key climate solution.

IRENA hosted the young people, including representatives from YOUNGO, the official youth constituency at the UN's Climate Change Secretariat (UNFCCC), in New York on the margins on the UN Youth Climate Summit. As the voice of the world's new generation of decision makers, the young delegates shared their expectations and ideas on IRENA's work and initiatives to promote climate-safe energy.

IRENA's 10th Assembly, taking place in January 2020, includes a planned *IRENA Youth Forum* where more than 40 young people from around the world will share ideas and showcase successful initiatives.

Stronger climate pledges needed in 2020

Countries need to raise their renewable energy ambitions and adopt firm targets to transform the global energy system as climate pledges first made five years ago come up for revision in 2020. Delegates to the United Nations Climate Conference, COP-25, in December have recognised next year's round of new Nationally Determined Contributions (NDCs) as a decisive chance to turn the tide against global warming.

NDCs initiated in 2015 under the Paris Agreement remain too low, neither sufficing to curb climate change nor keeping pace with the actual growth of renewable power generation, analysis of current pledges indicates.

To keep the rise in global temperatures within specified limits, the renewable energy ambitions expressed in NDCs would have to more than double for the coming decade, analysis of pledges shows. This would put the world on course to deploy more than 7.7 terawatts (TW) of renewables by 2030. Today's undertakings, by contrast, would achieve only 3.2 TW.

In fact, almost half of the renewable energy deployment foreseen by current NDCs has already been achieved. Based solely on existing climate pledges, renewables would be growing by about 4% each year. Yet the actual installed capacity for renewable power generation has grown by 8.6% yearly since 2015.

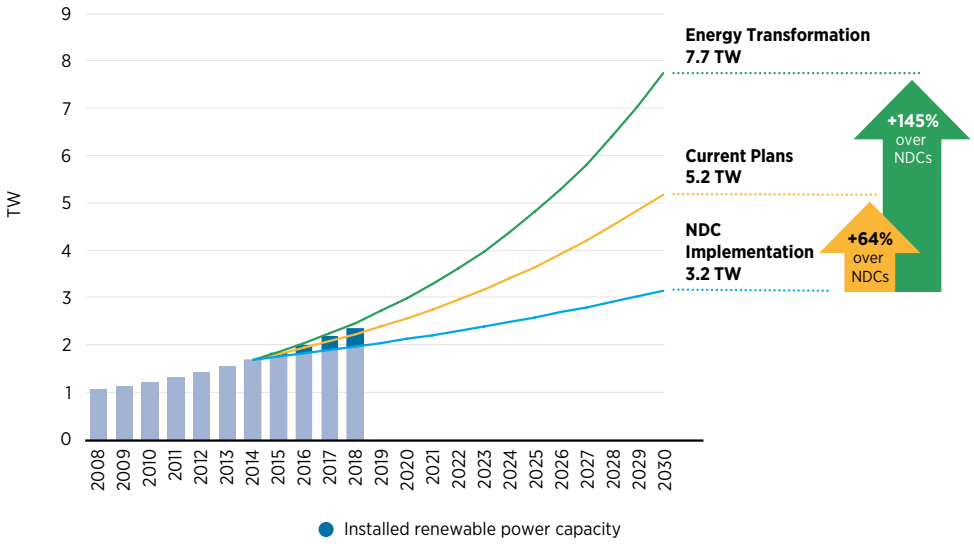
Renewables, in combination with steadily improving energy efficiency, offer the only immediate way to meet rising energy demand, while also reducing carbon dioxide (CO_2) emissions and building climate-resilience.

For a full briefing, see **NDCs in 2020: Advancing Renewables in the Power Sector and Beyond.**

Deployment disparities

- The first round of NDCs (2015-2020) would, if fulfilled, achieve far less growth in renewable power by 2030 than existing national energy plans.
- Climate-vulnerable countries have set more ambitious targets in NDCs. The Sub-Saharan African region would more than triple its renewable power capacity by 2030, followed by Asia, the Middle East and North Africa doubling their capacity.
- G20 countries leave 60% of their renewable power potential untapped in current NDC targets.
- For a climate-safe future, renewables must grow from 25% of power generation today to 57% in 2030.

Current plans outpace NDC implementation, while both fall short of potential



Green hydrogen helps tackle tough sectors

As countries strive to decarbonise their economies, they need renewable energy in multiple forms. Hydrogen offers many of the advantages of conventional fuels as a versatile energy carrier. But whether hydrogen is green, blue or grey depends on the sources used to create it. While most hydrogen today is still produced using natural gas or coal, cleaner options are on the horizon.

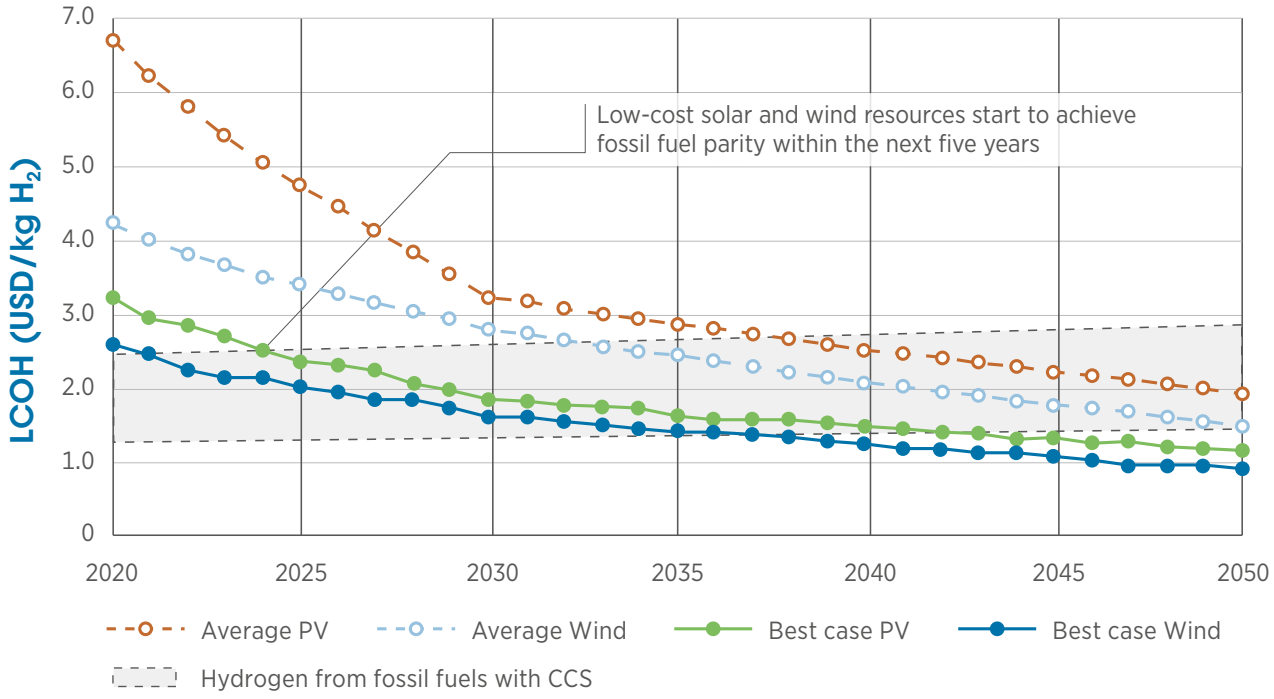
Green hydrogen – produced using electricity from renewable sources to split water into hydrogen and oxygen – offers a way to tackle various critical energy challenges simultaneously. It can improve air quality, strengthen energy security, and can also help to decarbonise sectors where direct electrification is not practical. It also increases power system flexibility and can effectively store vast amounts of renewable-based energy. Helpfully, it can often work with existing gas infrastructure.

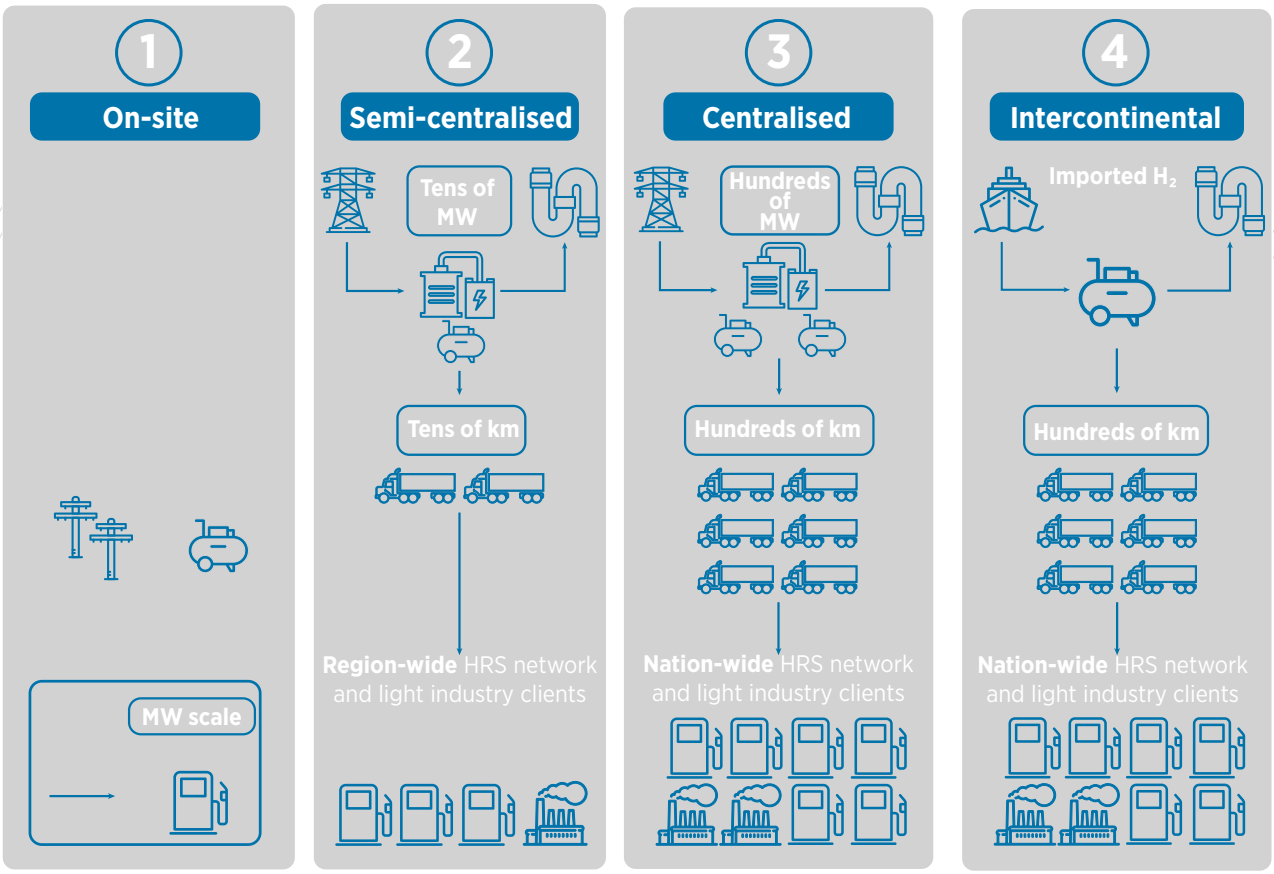
The hydrogen debate has rapidly evolved in recent years, with a shift in attention from fuels for cars to sectors that are harder to decarbonise. These include energy-intensive industries, trucks, aviation, shipping and heating applications. Hydrogen could also be used in buildings and to convert its energy back also to electric power.

Hydrogen and hydrogen-based fuels offer a way to transport energy from renewable sources over long distances. Moreover, hydrogen and electricity could be complementary in a renewable energy-dominated world. Still, the shift to hydrogen-based energy use will not happen overnight. The need for dedicated supply infrastructure could limit hydrogen use to countries that make this a strategic priority.

Costs are expected to come down for both electrolysers and hydrogen

Hydrogen production costs from solar and wind vs. fossil fuels





Governments and industry must work together to foster green hydrogen production

Today's, fossil-based grey *hydrogen* is responsible for significant CO_2 emissions – close to the annual emissions of Indonesia and the UK combined. However, low-carbon green hydrogen costs too much to displace grey hydrogen for now. Fortunately, amid falling costs for renewable-powered electrolysers, it promises to become more competitive in the coming decade.

***For more see:* Hydrogen: A renewable energy perspective.**

Increasingly competitive

Hydrogen from renewable power is technically viable today and is quickly approaching economic competitiveness. Electrolysers – the key devices used to produce hydrogen from water using electricity – are experiencing a rapid scale up. Electrolysis projects are also becoming larger as the technology continues to evolve.

Costs for green hydrogen are projected to fall 50% by 2040-2050, as renewable electricity costs also continue to fall. Applying a price for CO_2 emissions from fossil fuels would further boost the competitiveness of green hydrogen. If coupled with the best renewable resources, renewable-based hydrogen should become competitive with hydrogen from fossil fuels that use CCS (the so-called *blue hydrogen*) within five years, IRENA analysis shows.

Smart charging needed to manage EV impact

Electric vehicles (EVs) have much to offer future energy systems. However, their uptake brings technical challenges. To reduce carbon emissions, future power systems must make maximum use of renewables at the same time as expanding to support increasingly electrified transport. But solar and wind power, are subject to seasonal, daily, and hourly fluctuations.

With EV numbers rising quickly, existing grids could soon come under pressure. Fortunately, the resulting load impact can be managed through energy storage and controlled timing for EV charging.

"EVs at scale can create vast electricity storage capacity, but if everyone simultaneously charges their cars in the morning or evening, electricity networks can become stressed," says Dolf Gielen, Director of Innovation and Technology at the International Renewable Energy Agency. "The timing of charging is therefore critical. 'Smart charging', which both charges vehicles and supports the grid, unlocks a virtuous circle in which renewable energy makes transport cleaner while enabling EVs to support larger shares of renewables."

EV batteries themselves add crucial storage capacity, helping to integrate high shares of solar and wind. Globally, EVs could grow from about 6 million today to over 1 billion by 2050. They would thereby provide 14 terawatt-hours (TWh) of storage, dwarfing the 9 TWh expected from stationary batteries.

Smart charging could save billions of dollars in grid investments, while harnessing the EV charging cycle to serve both the power system and vehicle users.

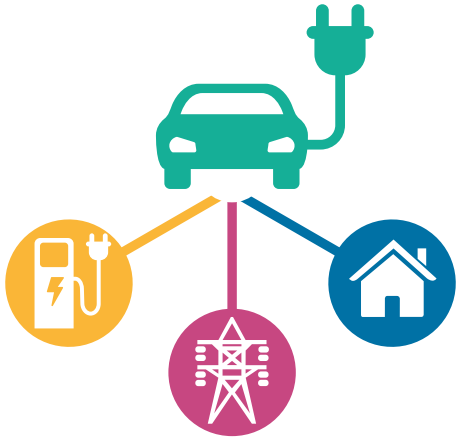
German distribution system operator Stromnetz, for example, is testing digital technologies to control EV charging in Hamburg based on grid and customer requirements. This approach costs 90% less than reinforcing the grid, according to the company.

Vehicle-to-Grid (V2G) charging allows EVs not only to withdraw electricity from the grid, but also to inject electricity back in. V2G technology creates a business case for car owners to provide ancillary services to the grid. To be attractive, however, it must also satisfy people's mobility needs. Charging must be available when needed, at the lowest possible cost, while also serving to compensate car owners for providing services. Installation rebates, electricity price signals and aggregator business models could help to spur widespread adoption of smart charging.

Among several initiatives worldwide, Nissan has been working since 2016 with the utility Enel and EV charging company Nuuve on a solution that lets vehicle owners operate as individual energy hubs. Pilot projects in Denmark and the UK let Nissan EV owners to earn money for sending power to the grid through Enel's bidirectional chargers.

To learn more, see IRENA's **Innovation Outlook: Smart charging for electric vehicles.**

Advanced forms of smart charging



V1G = Unidirectional controlled charging
Vehicles or charging infrastructure adjust their rate of charging

V2H/B = Vehicle-to-home/-building
Vehicles will act as supplement power suppliers to the home

V2G = Vehicle-to-grid
Smart grid controls vehicle charging and returns electricity to the grid

MEMBER BULLETIN

Mali builds climate resilience with solar PV

Mali contributed just 0.06% of the world's greenhouse gas (GHG) emissions in 2015. However, the West African Sahel is strongly affected by climate change and must adapt itself, notably the power sector, which will be hard hit by reduced rainfall. Indeed, Mali's National Adaptation Programme of Action identified electricity as the third most vulnerable sector to climate change, after agriculture and health.

An IRENA member since 2010, Mali depends on large hydropower, much of this from the Niger River. The hydrological regime, which until recently amounted to nearly 1000 millimetres per annum, could fall below 850 millimetres by the end of the present century.

Africa's eighth largest country (more than 1.2 million square kilometres in area), Mali has considerable potential to develop renewables, including solar and wind. Southwestern Mali alone has 53 gigawatts (GW) of solar potential, enough to satisfy expected power demand for the whole country. Yet today, more than half of Mali's 19 million people still lack modern energy access.

Large hydropower accounts for half of installed power generation capacity. The other half is from fossil fuels, making electricity the country's highest GHG-contributing sector.

Carbon dioxide or equivalent (CO_2eq) emissions reached 5.26 million tonnes by 2015, growing 6.4% annually. For a landlocked and import-dependent country, fossil fuels are an expensive and unreliable power generation source.

Indigenous energy resources, such as solar energy, would help to boost climate resilience. In this respect, Mali could learn from other hydropower-reliant countries like Brazil and Colombia, where solar and wind power offset dry-season shortfalls. The resulting power system flexibility effectively lowers dependence on fossil-fuel imports and reduces GHG emissions. Decentralised renewable energy solutions also help to expand energy access to previously isolated communities.

In September 2019, Mali concluded a Renewables Readiness Assessment with IRENA's support. The country-led consultative process underlined the need to encourage private investment in renewables, both on and off the national grid.

Along with building climate resilience, diversifying the power generation mix would create considerable socio-economic value for the country.

For more, see: **Renewable Readiness Assessment: Mali.**

Recent publications

Navigating the way to a renewable future: Solutions to decarbonise shipping

The shipping sector is responsible for about 3% of annual global green-house gas emissions on a CO_2-equivalent basis. This report explores impacts of maritime shipping that need to be addressed to reduce the sector's carbon footprint.

Zhangjiakou Energy Transformation Strategy 2050

A host city for China's Winter Olympic Games in 2022 has turned to renewables to reduce future emissions and address growing energy demand. By 2050, Zhangjiakou could increase renewables from less than half to nearly three quarters of its electricity mix.

Advanced biofuels: What holds them back?

Advanced liquid biofuels are important for low-carbon transport development to meet emission-reduction targets. A survey of industry executives identifies barriers to investment in the sector.

Future of solar photovoltaic

Solar PV power will form a major part of the future, climate-safe energy mix. This report presents options to speed up deployment and fully unlock the world's vast solar PV potential over the period until 2050.

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 co-operation, 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.

Subscribe to the IRENA Quarterly ***www.irena.org***