THE ONLY GLOBAL RENEWABLE ENERGY MULTI-STAKEHOLDER COMMUNITY

GOVERNMENTS
Afghanistan, Austria, Brazil, Denmark, Dominican Republic, Germany, India, Mexico, Norway, Republic of Korea, South Africa, Spain, UAE, USA

INTERGOVERNMENTAL ORGANISATIONS
ADB, APERC, ECREEE, EC, GEF, IEA, IRENA, IsDB, RCREEE, UNDP, UNEP, UNIDO, World Bank

NGOs
CAN-I, CLASP, CCA, Club-ER, CC35, Energy Cities, EHP, FER, Global 100%RE, GFSE, Greenpeace Intl, GWNET, ICLI, IEC, ISEP, JVE, MFC, Power for All, REEEP, REI, RGI, SCI, SLOCAT, SEforAll, WCRE, WFC, WRI, WWF

SCIENCE & ACADEMIA
AEE INTEC, CEEW, Fundacion Bariloche, Higher School of Economics (Russia), IIASA, ISES, NREL, SANEDI, TERI

INDUSTRY ASSOCIATIONS
ACORE, AMDA, ALER, ARE, APREN, CREIA, CEC, EREF, GOGLA, GSC, GWEC, IREF, IGA, IHA, RES4Africa, Solar Power Europe, WBA, WWEA
MAKE THE SHIFT TO RENEWABLE ENERGY HAPPEN – NOW!

The only **global community** of renewable energy actors from science, academia, NGOs, governments, and industry.

Our more than **2,000 community members** co-operate collecting information, changing norms and debating.

We build upon a **decentralized intelligence**, ensuring high responsiveness to an ever changing environment.

Our **annual publications** are probably the world’s most comprehensive, crowdsourced reports on renewables.
RENEWABLES 2021 GLOBAL STATUS REPORT
COLLABORATIVE ANNUAL REPORTING ON RENEWABLES SINCE 2005

THE REPORT FEATURES:
- Global Overview
- Policy Landscape
- Market and Industry Trends
- Distributed Renewables for Energy Access
- Investment Flows
- Energy Systems Integration and Enabling Technologies
- Energy Efficiency, Renewables and Decarbonisation
- Feature: Business Demand for Renewables

www.ren21.net/gsr
Ambition lacking on key performance indicator of renewable energy share.
RENEWABLE ENERGY CONTINUED TO GROW IN 2020

- Total power capacity rose almost 10%
  - 2,839 GW including hydropower
  - Non-hydropower: 16.6% increase

- 256 GW of renewable power additions
  - Solar PV: 139 GW; Wind: 93 GW; Hydro: 20 GW

- Renewable heat demand increased marginally

- Biofuel production fell 5% in 2020
As in past years, **China** led many key annual categories for renewable energy in 2020.

### WHICH COUNTRIES LED THE WAY IN 2020?

**Top Five Countries 2020**

Annual Investment / Net Capacity Additions / Production in 2020
Technologies ordered based on total capacity additions in 2020.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solar PV capacity</strong></td>
<td>China</td>
<td>United States</td>
<td>Vietnam</td>
<td>Japan</td>
</tr>
<tr>
<td><strong>Wind power capacity</strong></td>
<td>China</td>
<td>United States</td>
<td>Brazil</td>
<td>Netherlands</td>
</tr>
<tr>
<td><strong>Hydropower capacity</strong></td>
<td>China</td>
<td>Turkey</td>
<td>Mexico</td>
<td>India</td>
</tr>
<tr>
<td><strong>Geothermal power capacity</strong></td>
<td>Turkey</td>
<td>United States</td>
<td>Japan</td>
<td>–</td>
</tr>
<tr>
<td><strong>Concentrating solar thermal power (CSP) capacity</strong></td>
<td>China</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Solar water heating capacity</strong></td>
<td>China</td>
<td>Turkey</td>
<td>India</td>
<td>Brazil</td>
</tr>
<tr>
<td><strong>Ethanol production</strong></td>
<td>United States</td>
<td>Brazil</td>
<td>China</td>
<td>Canada</td>
</tr>
<tr>
<td><strong>Biodiesel production</strong></td>
<td>Indonesia</td>
<td>Brazil</td>
<td>United States</td>
<td>Germany</td>
</tr>
</tbody>
</table>
RENEWABLE ENERGY LEADERS AT THE END OF 2020

Total Power Capacity or Demand/Output as of End-2020

<table>
<thead>
<tr>
<th>POWER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable power capacity (including hydropower)</td>
<td>China</td>
<td>United States</td>
<td>Brazil</td>
<td>India</td>
<td>Germany</td>
</tr>
<tr>
<td>Renewable power capacity (not including hydropower)</td>
<td>China</td>
<td>United States</td>
<td>Germany</td>
<td>India</td>
<td>Japan</td>
</tr>
<tr>
<td>Renewable power capacity per capita (not including hydropower)</td>
<td>Iceland</td>
<td>Denmark</td>
<td>Sweden</td>
<td>Germany</td>
<td>Australia</td>
</tr>
<tr>
<td>Bio-power capacity</td>
<td>China</td>
<td>Brazil</td>
<td>United States</td>
<td>Germany</td>
<td>India</td>
</tr>
<tr>
<td>Geothermal power capacity</td>
<td>United States</td>
<td>Indonesia</td>
<td>Philippines</td>
<td>Turkey</td>
<td>New Zealand</td>
</tr>
<tr>
<td>Hydropower capacity</td>
<td>China</td>
<td>Brazil</td>
<td>Canada</td>
<td>United States</td>
<td>Russian Federation</td>
</tr>
<tr>
<td>Solar PV capacity</td>
<td>China</td>
<td>United States</td>
<td>Japan</td>
<td>Germany</td>
<td>India</td>
</tr>
<tr>
<td>Concentrating solar thermal power (CSP) capacity</td>
<td>Spain</td>
<td>United States</td>
<td>China</td>
<td>Morocco</td>
<td>South Africa</td>
</tr>
<tr>
<td>Wind power capacity</td>
<td>China</td>
<td>United States</td>
<td>Germany</td>
<td>India</td>
<td>Spain</td>
</tr>
</tbody>
</table>

HEAT

| Modern bio-heat demand in buildings | United States | Germany | France | Italy | Sweden |
| Modern bio-heat demand in industry | Brazil | India | United States | Finland | Sweden |
| Solar water heating collector capacity | China | Turkey | India | Brazil | United States |
| Geothermal heat output | China | Turkey | Iceland | Japan | New Zealand |

Some countries changed places during the year, though in many cases the leaders for total capacity and generation are well-established.
INCREASING ENERGY DEMAND AND FOSSIL FUEL USE

The world is **burning more fossil fuels** than ever.
RENEWABLES ARE GROWING FAST... BUT NOT FAST ENOUGH

- Renewables grew two times faster than fossil fuels
- Renewable energy only accounted for 25% of demand growth
- Energy efficiency and renewables are complementary

Source: Based on IEA data.
MORE THAN 80% OF ENERGY FOR HEATING & TRANSPORT

Most focus is on the power sector, but the greatest urgency is in heating and transport.

Note: Data should not be compared with previous years because of revisions due to improved or adjusted methodology.
Source: Based on IEA data.
SLOW GROWTH IN RENEWABLE HEATING AND COOLING

KEY BARRIERS

- Sector heavily relying on fossil fuel
  - fossil fuel subsidies – no level playing field
  - Upfront capital cost of RE
- Lack of supportive regulatory framework
  - No new H&C policies since 2017 for electrification
- Resource availability
- Investments in supporting infrastructure needed (e.g., district heating and cooling)
- Technological advances needed for high-temperature industrial processes
SLOW GROWTH IN RENEWABLE TRANSPORT

KEY BARRIERS

- Sector heavily relying on fossil fuel
  - Fossil fuel subsidies – no level playing field
- Demand increasing faster than other sectors
- Lack of policy support frameworks
  - Holistic strategies missing
  - Direct linking between EVs and renewables is limited
  - Avoid-Shift-Improve often missing renewable energy
- Investment in supporting infrastructure needed (e.g., EV charging)
- Technological advances needed for renewables in advanced biofuels, maritime and aviation sectors
OIL AND GAS SPENDING ON RENEWABLES REMAINS LOW

Oil and gas companies do not explicitly report on renewable energy spending in their financial statements.

Spending on Renewable Energy versus Total Capital Expenditure
Selected Oil and Gas Companies, 2020

<table>
<thead>
<tr>
<th>Company</th>
<th>Total Capital Expenditure</th>
<th>Capital Expenditure on Renewable Energy</th>
<th>Capital Expenditure on Low-Carbon Solutions</th>
<th>Capital Expenditure on Renewable Energy and Power (including fossil-based generation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eni</td>
<td>5.7</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equinor</td>
<td>9.8</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chevron</td>
<td>8.9</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BP</td>
<td>14.1</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell</td>
<td>17.8</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>21.4</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15.5</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Eni was the only oil and gas company that reported renewable energy spending data for 2020.
RENEWABLE HEAT IS GRADUALLY GROWING IN BUILDINGS

The share of renewable heating and cooling in buildings grew from 7.8% in 2009 to more than 10% in 2019.

Source: Based on IEA data.
MORE THAN 250 GW OF RENEWABLE POWER ADDED

Note: Solar PV capacity data are provided in direct current (DC). Data are not comparable against technology contributions to electricity generation.
Renewable power generation capacity additions remain ahead for the sixth year in a row.
The share of renewables in electricity generation is rising in many countries around the world.
Policies and targets for renewables in power remain more ambitious and more numerous than those for other sectors.
The number of countries with targets fell across all sectors.
Carbon pricing initiatives covered only around 22% of global greenhouse gas emissions by early 2021.
Only 10 countries had renewable heat support policies covering all sectors as of end-2020.
POLICY SUPPORT REMAINS STATIC FOR TRANSPORT

Biofuel blending mandates remain the most widely adopted renewable energy support policy in the transport sector.
Only several countries have targets for EVs and renewables.
116 countries had used auctions or tendering as of end-2020, up from 111 total countries in 2019.
Modern bioenergy contributes most to renewable supply.

Modern bioenergy supplies energy for heating, transport and electricity end-uses.

Estimated Shares of Bioenergy in Total Final Energy Consumption
Overall and by End-Use Sector, 2019

- 88.4% Non-biomass
- 6.5% Traditional biomass
- 5.1% Modern bioenergy
- 1.2% Heat, buildings
- 1.0% Transport
- 2.5% Heat, industry

Source: Based on IEA.
Bio-heat is used in buildings and industry, and often supplied by district energy networks.

Source: Based on IEA.
The United States remained the leading biofuels producer, with a 51% share, despite declines in US production of both ethanol and biodiesel.
Bioelectricity generation increased 6.4% from 2019, with the majority of gains in China.
NEW GEOTHERMAL POWER INSTALLATIONS IN 2020

USA and Indonesia have been the most active geothermal power markets in recent years.
China, Turkey, Iceland, and Japan together represented roughly 75% of the global total geothermal direct use in 2020.
An estimated 19.4 GW was added in 2020, representing a 24% increase in capacity additions from 2019.
China installed the most new capacity in 2020, followed by Turkey, India, Angola and the Russian Federation.
By the end of 2020, at least 15 countries had enough capacity in operation to meet at least 5% of their electricity demand with solar PV.
For the eighth consecutive year, Asia eclipsed all other regions for new installations, accounting for almost 60% of global additions.
Following two years of decline, China’s market increased 60% – driven largely by pending changes to the country’s FIT structure.
Asia accounted for almost 60% of global additions, despite declines in the region’s top three markets (China, India and Japan).
Global CSP capacity grew 1.6% in 2020, with a single 100 MW project coming online in China.

NEW CSP ADDITIONS EXCLUSIVELY IN CHINA

Concentrating Solar Thermal Power Global Capacity by Country and Region, 2010-2020

China was the only country to add new CSP capacity in 2020.
22 of the 24 CSP plants completed globally since the end of 2014 have incorporated thermal energy storage.
Global operating solar thermal capacity increased 5% from 2019.
China accounted for 71% of new global sales in solar water heating collectors, followed by Turkey and India.
LARGE INCREASE IN SOLAR DISTRICT HEATING SYSTEMS

Leading markets for solar district heating were Brazil, China and Turkey.
At 93 GW added, the global wind power market was 45% higher than its previous high in 2015.
China had its biggest year yet for new installations at 52 GW, doubling its capacity added in 2019.

MORE THAN HALF OF NEW WIND POWER CAPACITY IN ASIA
Offshore wind power accounted for a record 6.5% of wind power additions in 2020, down from 10% in 2019.
RENEWABLE POWER COSTS KEEP FALLING

Costs for solar PV and CSP as well as onshore and offshore wind have fallen sharply over the past decade.

Source: IRENA.
Distributed renewables for energy access provide electricity to between 5% and 10% of the population in several developing countries.
Despite recent progress, China and India still account for nearly half of the global population without access.
The bulk of the biogas production per capita (99.7%) occurs in Asia.
Sales of off-grid solar systems fell 22% compared to 2019, largely due to lockdown-related disruptions.
Solar PV has been the fastest growing mini-grid technology, incorporated into 55% of mini-grids in 2019 compared to only 10% in 2009.
Corporations more than tripled their investment during this period, from USD 22 million in 2018 to USD 68 million in 2019.
Equity funding fell 46%, but this was compensated by an increase in both debt and grant funding.
By 2019, policies to promote mini-grids and stand-alone renewables had been implemented in many countries.
To reach global climate and sustainable development goals, annual investment in renewables must at least triple by 2030.
DEVELOPING COUNTRIES INVESTED MORE THAN DEVELOPED ONES

Investments for the year rose 13% in developed countries and fell 7% in developing and emerging countries.

Source: BloombergNEF.
Solar power represented nearly half of global renewable energy capacity investment in 2020 - up 12% from 2019.
As of early 2021, only 7% of COVID recovery spending was allocated to renewables.

Source: EnergyPolicyTracker.org.
Multilateral development bank investments in renewable energy projects increased 89% between 2015 and 2019.
Almost 70% of the global investment in new renewable power and fuel capacity went to renewable power plants, while only 31% went to coal, gas and nuclear plants.
At least nine countries produced more than 20% of their electricity generation from VRE in 2020.
Digital technologies are increasing the usable capacity of existing transmission infrastructure, often a barrier to wider VRE deployment.
End-use technologies supporting the integration of renewables in power systems experienced increased sales in 2020 despite the onset of the COVID-19 pandemic.
Share of electric cars in new car sales reached 4.6%, a record high.
Norway remained the leader in the share of electric cars in overall car sales, at 75%, followed by Iceland (52%), and Sweden (32%).
The global operational energy storage capacity reached 191.1 GW in 2020, reflecting 3.4% growth year-on-year.
Despite a decline in energy efficiency improvements, there was an overall decoupling of global economic growth and CO2 emissions between 2013 and 2018.
Between 2008 and 2018, the global carbon intensity of final energy decreased 2%.
Uptake of monitoring, reporting and verification has nearly doubled over the decade, from 27 countries in 2010 to 60 countries in 2020.

In a selection of OECD countries, carbon intensity in industry improved 25% between 2008 and 2018, as the share of electrification increased to 13%.
TRANSPORT CARBON INTENSITY IMPROVING SLOWLY

In OECD countries, the carbon intensity of transport improved at an annual rate of 0.64% between 2008 and 2017.
CORPORATE RENEWABLE PPAS INCREASED

New renewable corporate power purchasing agreements increased 18% in 2020.

Source: BloombergNEF
MANY NET ZERO TARGETS ANNOUNCED IN 2020

Only about one-fifth of all announced national net zero targets are actually in law or have been achieved.
Renewables represented the largest share of energy demand growth in the power sector.

Source: Based on IEA data.
RENEWABLES IN TRANSPORT GREW SLOWLY

The share of renewable energy in transport grew slowly from 2.1% in 2008 to 3.4% in 2018.

Note: Fossil fuels includes non-renewable electricity, which accounted for 0.82% in 2008 and 0.85% in 2018.

Source: Based on IEA data.
TRANSPORT RELATED EMISSIONS ON THE RISE

Global CO₂ emissions rose over the decade in all transport sectors except rail, where it dropped by 2%.

Note: Other pipeline and non-specified transport increased 28% during this period.
Source: SLOCAT and IEA.
MARKET SHARE OF ELECTRIC CARS INCREASED

Norway remains the largest market for electric cars in the world.
THE AVOID-SHIFT-IMPROVE FRAMEWORK

Avoid-Shift-Improve Framework in the Transport Sector

<table>
<thead>
<tr>
<th>AVOID</th>
<th>SHIFT</th>
<th>IMPROVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid or reduce the need for motorised travel</td>
<td>Shift to more efficient, less carbon-intensive modes</td>
<td>Improve efficiency, vehicle technology and fuels</td>
</tr>
<tr>
<td>Transport demand management</td>
<td>Public transport, intercity and high-speed rail, and new mobility services (powered by renewable energy)</td>
<td>Fuel economy</td>
</tr>
<tr>
<td>Mixed-use, transit-oriented development</td>
<td>Zero emission logistics and last-mile delivery</td>
<td>Renewable fuels (e.g., sustainable biofuels, renewable electro-fuels)</td>
</tr>
<tr>
<td>Active transport (e.g., walking, cycling)</td>
<td></td>
<td>Renewable-based electric vehicles</td>
</tr>
<tr>
<td>Telecommuting</td>
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</tr>
</tbody>
</table>

Such a framework can greatly decrease energy demand and associated greenhouse gas emissions in the transport sector.
When the energy used to drive a heat pump is renewable, so is 100% of its output.