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Beijing, 7th June 2017
The report features:

- Global Overview
- Market & Industry Trends
- Distributed Renewable Energy for Energy Access
- Investment Flows
- Policy Landscape
- NEW: Enabling Technologies and Energy Systems Integration
- Energy Efficiency
- Feature: Deconstructing Baseload
REN21 Community

GSR Network:

- Over 800 active contributors and reviewers
- Tracking 155 countries
- Covering 96% of global GDP
- Representing 96% of global population
REN21 Renewables Interactive Map

→ Research tool for tracking the development of renewable energy worldwide

→ Complements perspectives and findings of REN21’s Global and Regional Status Reports with infographics and detailed, exportable data packs

www.ren21.net/map
In 2016 investors were able to acquire more renewable energy capacity for less money.

- 176 countries had **renewable energy targets**, renewable energy auctions were held in 34 countries in 2016 – more than double the year before.

- **Newly installed renewable power capacity set new records** in 2016, with 161 gigawatts (GW) added, increasing the global total by almost 9% relative to 2015.

- For the fifth consecutive year, **investment in new renewable power capacity** was roughly **double the investment in fossil fuel generating capacity**, reaching USD 249.8 billion.

- 2016 was the **third year in a row where global CO₂ emissions** from the energy sector remained stable despite a 3% growth in the global economy and an increased demand for energy.
Another extraordinary year for renewable energy

Total global capacity was up 9% compared to 2015, to more than 2,016 GW at year’s end (920 GW not including hydro)

- Solar PV - 47% of newly installed renewable power capacity in 2016
- Wind - 34%
- Hydropower - 15.5%

### Table summary

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INVESTMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New investment (annual)</td>
<td>312.2</td>
<td>241.6</td>
</tr>
<tr>
<td><strong>POWER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renewable power capacity (total, not including hydro)</td>
<td>GW</td>
<td>785</td>
</tr>
<tr>
<td>Renewable power capacity (total, including hydro)</td>
<td>GW</td>
<td>1,856</td>
</tr>
<tr>
<td>Hydropower capacity</td>
<td>GW</td>
<td>1,071</td>
</tr>
<tr>
<td>Bio-power capacity</td>
<td>GW</td>
<td>106</td>
</tr>
<tr>
<td>Bio-power generation (annual)</td>
<td>TWh</td>
<td>464</td>
</tr>
<tr>
<td>Geothermal power capacity</td>
<td>GW</td>
<td>13</td>
</tr>
<tr>
<td>Solar PV capacity</td>
<td>GW</td>
<td>228</td>
</tr>
<tr>
<td>Concentrating solar thermal power capacity</td>
<td>GW</td>
<td>4.7</td>
</tr>
<tr>
<td>Wind power capacity</td>
<td>GW</td>
<td>433</td>
</tr>
<tr>
<td><strong>HEAT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar hot water capacity</td>
<td>GWth</td>
<td>435</td>
</tr>
<tr>
<td><strong>TRANSPORT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethanol production (annual)</td>
<td>billion litres</td>
<td>98.3</td>
</tr>
<tr>
<td>Biodiesel production (annual)</td>
<td>billion litres</td>
<td>30.1</td>
</tr>
</tbody>
</table>
As of 2015, renewable energy provided an estimated **19.3%** of global final energy consumption.
Renewable Energy in the World

Growth in Global Renewable Energy Compared to Total Final Energy Consumption, 2004-2014

Chief among renewable sources is modern renewables, which were growing at an average annual rate of 2.8% from 2004 to 2014. Combined renewables grew faster at 4.7%, while traditional biomass grew at 1.8%. Fossil and nuclear energy remained relatively flat. Total final energy consumption also grew, with combined renewables growing at more than twice the rate of demand. Modern renewables were growing at only slightly more than half the rate of demand.

### Renewable Energy “Champions”

**Annual Investment/Net Capacity Additions/Production in 2016**

<table>
<thead>
<tr>
<th>Category</th>
<th>Top 5 Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment in renewable power and fuels (not including hydro &gt; 50 MW)</td>
<td>China, United States, United Kingdom, Japan, Germany</td>
</tr>
<tr>
<td>Investment in renewable power and fuels per unit GDP¹</td>
<td>Bolivia, Senegal, Jordan, Honduras, Iceland</td>
</tr>
<tr>
<td>Geothermal power capacity</td>
<td>Indonesia, Turkey, Kenya, Mexico, Japan</td>
</tr>
<tr>
<td>Hydropower capacity</td>
<td>China, Brazil, Ecuador, Ethiopia, Vietnam</td>
</tr>
<tr>
<td>Solar PV capacity</td>
<td>China, United States, Japan, India, United Kingdom</td>
</tr>
<tr>
<td>Concentrating solar thermal power (CSP) capacity²</td>
<td>South Africa, China, -</td>
</tr>
<tr>
<td>Wind power capacity</td>
<td>China, United States, Germany, India, Brazil</td>
</tr>
<tr>
<td>Solar water heating capacity</td>
<td>China, Turkey, Brazil, India, United States</td>
</tr>
<tr>
<td>Biodiesel production</td>
<td>United States, Brazil, Argentina/Germany/Indonesia</td>
</tr>
<tr>
<td>Fuel ethanol production</td>
<td>United States, Brazil, China, Canada, Thailand</td>
</tr>
</tbody>
</table>
Renewables comprised 30% of the world’s power generating capacity and 24.5% of global electricity demand. China is home to more than one-quarter of the world’s renewable power capacity.
Modern renewable energy supplies approx. 9% of total global heat demand.

In 2016, the vast majority of renewable heat continued to be supplied by biomass, with smaller contributions from solar thermal and geothermal energy.

Deployment of renewable technologies in this market continued to be constrained by factors such as comparatively low fossil fuel prices and a relative lack of policy support.
In 2016, **liquid biofuels** provided around 4% of world road transport fuels, which account for the majority of transport energy use.

**Biogas** use in transport grew substantially in the **United States** and continued to gain shares of the transport fuel mix in Europe.

Further **electrification** of the transport sector has the potential to create a **new market** for renewable energy and to facilitate the integration of **variable renewable energy**.
176 countries had renewable energy targets
126 countries had power policies
68 countries had transport policies
21 countries had heating and cooling policies

Number of Renewable Energy Regulatory Incentives and Mandates, by Type, 2014-2016

Note: Figure does not show all policy types in use. In many cases countries have enacted additional fiscal incentives or public finance mechanisms to support renewable energy. Heating and cooling policies do not include renewable heat FITs (e.g., in the United Kingdom). Countries are considered to have policies when at least one national or state/provincial-level policy is in place. A country is counted a single time if it has one or more national and/or state/provincial-level policies. Some transport policies include both biodiesel and ethanol; in this case, the policy is counted once in each category (biodiesel and ethanol). Tendering policies are presented in a given year if a jurisdiction has held at least one tender during that year.

Source: REN21 Policy Database.
Auctions are the most rapidly expanding form of renewable energy policy support. Renewables energy auctions held in 34 countries in 2016 – more than double the year before.
Carbon pricing policies were in place in 57 jurisdictions worldwide in 2016.

REN21 Renewables 2017 Global Status Report
The renewable energy sector employed 9.8 million people in 2016 - a 1.1% increase over 2015.
Global new investment in renewables was USD 241.6 billion in 2016.

For the fifth consecutive year, investment in new renewable power capacity was roughly double that in fossil fuel capacity.

Note: Figure does not include investment in hydropower projects larger than 50 MW. Investment totals have been rounded to nearest billion.

Source: BNEF.
Global Investment in Renewable Energy


Note: Data include government and corporate R&D.

REN21 Renewables 2017 Global Status Report

Source: BNEF.
Solar and wind power continue to lead for money committed during 2016, each accounting for roughly 47% of total investment.

Global New Investment in Renewable Energy by Technology, Developed and Developing Countries, 2016

- Solar power: 39.9 billion USD (+17%)
- Wind power: 51.9 billion USD (-37%)
- Bio-power: 5.2 billion USD
- Small-scale hydropower: 1.8 billion USD
- Biofuels: 0.8 billion USD
- Geothermal power: 2.0 billion USD
- Ocean energy: 0.011 billion USD

Change relative to 2015:
- Solar power: -34%
- Wind power: -9%
- Bio-power: 0%
- Small-scale hydropower: 0%
- Biofuels: -37%
- Geothermal power: +17%
- Ocean energy: -7%

Source: BNEF.
**Solar PV**

75 GW of solar PV capacity was added worldwide.

Global solar PV capacity totaled 303 GW.

Solar PV Global Capacity and Annual Additions, 2006-2016

REN21 Renewables 2017 Global Status Report
Solar PV

By end-2016:

→ Every continent had installed at least 1 GW

→ At least 24 countries had 1 GW or more of capacity

→ At least 114 countries had more than 10 MW
China added **34.5 GW** (up 126% over 2015), increasing its total solar PV capacity 45% to **77.4 GW**, far more than that of any other country.

**Solar PV Capacity and Additions, Top 10 Countries, 2016**

China added **34.5 GW** in 2016, increasing its total solar PV capacity to **77.4 GW**. This is far more than that of any other country.

China, Japan, Germany, United States, Italy, United Kingdom, India, France, Australia, Spain.

**Source:** Renewables 2017 Global Status Report
Wind Power

55 GW of wind power capacity added

Global total increased 12% to 487 GW

Wind Power Global Capacity and Annual Additions, 2006-2016

REN21 Renewables 2017 Global Status Report
The global wind power market contracted in 2016.

China added most new installations: 23.4 GW.
At least 24 countries met 5% or more of their annual electricity demand with wind power.

Enough global capacity to meet 4% of total electricity consumption.
16% of the global population lived without electricity - approx. 1.19 billion people.
USD 223 million raised by PAYG solar PV companies, an increase of about 40% from 2015.
Enabling Technologies and Energy Systems Integration

Storage can provide **system benefits** and **flexibility** to customers, system managers and utilities.

Can be applied from the **household level** to **utility-scale**

**Storage Applications in Electric Power Systems**

- **TRANSMISSION NETWORK**
  - Fast-response reserve power (spinning reserve)
  - Frequency and voltage control
  - Demand management (peak shaving and load levelling)

- **DISTRIBUTION NETWORK**
  - Frequency and voltage control
  - Demand management (peak shaving and load levelling)
  - Emergency backup power

- **LOW-VOLTAGE NETWORK**
  - Storage of grid power for load shaving and variable renewable energy integration
  - Storage of self-generated power for later use

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REN21 Renewables 2017 Global Status Report
Global grid-connected and stationary energy storage capacity in 2016 totalled an estimated **156 GW**

**Enabling Technologies and Energy Systems Integration**


- **Pumped storage**: 150 GW
- **Thermal storage**: 3.1 GW
- **Electro-chemical**: 1.7 GW
- **Electro-mechanical**: 6.4 GW

*Source: REN21 Renewables 2017 Global Status Report*
Grid-connected battery storage grew by 50% in 2016.
Global sales of EVs reached **775,000 units**

More than **2 million passenger EVs** were on the world's roads by year's end (1% of the light vehicle market)

So far, little linking of renewable energy and electric mobility

REN21 Renewables 2017 Global Status Report
By end-2016, at least 149 countries had enacted one or more energy efficiency targets.

Of these countries, 56 adopted a new target in 2015 or 2016.

Countries with Energy Efficiency Targets, 2016

Source: REN21 Policy Database.

REN21. Renewables 2017 Global Status Report
Traditional baseload generators such as coal and nuclear are beginning to lose their economic advantage and may no longer be the first to dispatch energy.

A number of countries and regions – including Denmark, Germany, Uruguay and Cabo Verde – have integrated high shares (from 20-40%) of variable renewable energy.
Conclusions

- Record installed capacity, however progress not fast enough to reach Paris Agreement goals
- Fossil fuels must be left in the ground
- Focus on dispatchable renewable energy & flexibility options to integrate high-shares of renewables – shift away from baseload
- Increased effort to speed up sustainable energy access
- Policy matters: system approach needed for linking power, heating and cooling as well as transport sector
- More use of enabling technologies such as storage, EVs, etc.
Renewable Energy Policy Network for the 21st Century

Global Status Report: yearly publication since 2005

Regional Reports

www.ren21.net/map

Global Futures Reports

REN21 Renewables Academy

Mexico International Renewable Energy Conference (MEXIREC)
11-13 September 2017

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