

RENEWABLES 2017

GLOBAL STATUS REPORT



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REN21 is a global multi stakeholder network dedicated to the rapid uptake of renewable energy worldwide.

NGOs:

CAN, CEEW, FER, GACC, GFSE, Greenpeace International, ICLEI, ISEP, MFC, SLoCaT, REI, WCRE, WFC, WRI, WWF

Industry Associations:

ACORE, ALER, APREN, ARE, CREIA, CEC, EREF, GOGLA, GSC, GWEC, IGA, IHA, IREF, RES4MED, WBA, WWEA

Science & Academia:

Fundacion Bariloche, IIASA, ISES, NREL, SANEDI, TERI,

International Organisations:

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

National Governments:

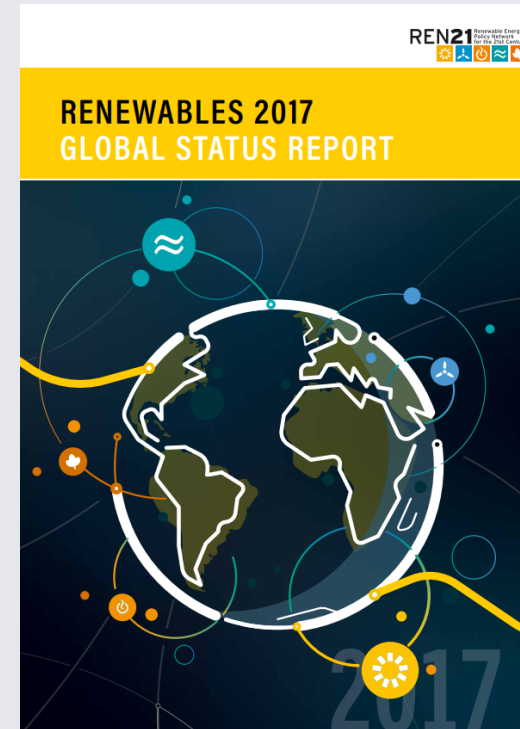
Afghanistan, Brazil, Denmark, Germany, India, Norway, South Africa, Spain, UAE, UK, USA



REN21 Renewables 2017 Global Status Report

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



RENEWABLES 2017 GLOBAL STATUS REPORT

Investors: Acquiring More Renewable Energy Capacity for Less Money in 2016

- 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. Solar PV was the star performer in 2016, accounting for around 47% of the total additions, followed by wind power at 34% and hydropower at 15.5%.
- 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 energy related 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%**

		2015	2016
INVESTMENT			
New investment (annual) in renewable power and fuels ¹	billion USD	312.2	241.6
POWER			
Renewable power capacity (total, not including hydro)	GW	785	921
Renewable power capacity (total, including hydro)	GW	1,856	2,017
 Hydropower capacity ²	GW	1,071	1,096
 Bio-power capacity	GW	106	112
 Bio-power generation (annual)	TWh	464	504
 Geothermal power capacity	GW	13	13.5
 Solar PV capacity	GW	228	303
 Concentrating solar thermal power capacity	GW	4.7	4.8
 Wind power capacity	GW	433	487
HEAT			
 Solar hot water capacity ³	GW _{th}	435	456
TRANSPORT			
 Ethanol production (annual)	billion litres	98.3	98.6
 Biodiesel production (annual)	billion litres	30.1	30.8



Renewable Energy “Champions”

Annual Investment/Net Capacity Additions/Production in 2016

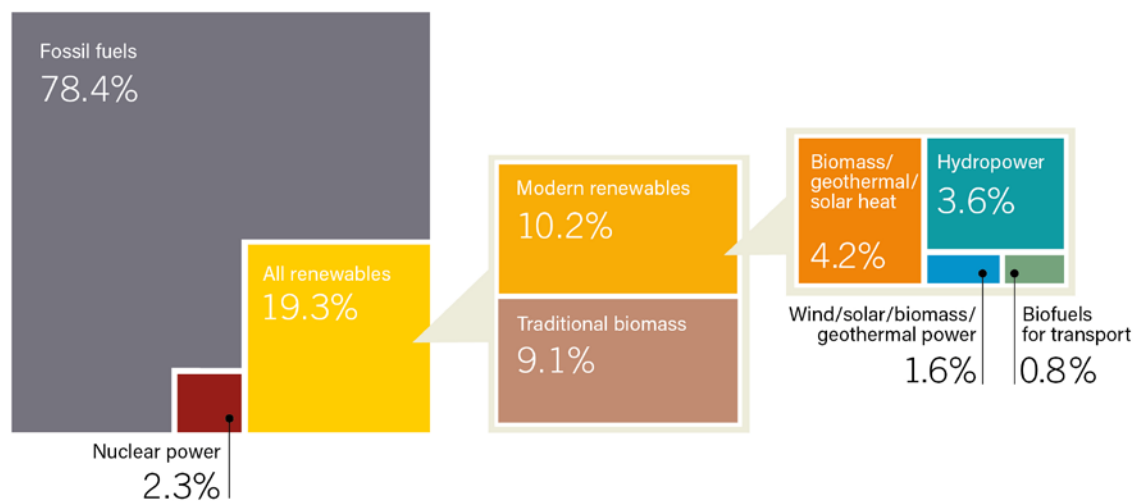
	1	2	3	4	5
Investment in renewable power and fuels (not including hydro > 50 MW)	China	United States	United Kingdom	Japan	Germany
Investment in renewable power and fuels per unit GDP ¹	Bolivia	Senegal	Jordan	Honduras	Iceland
 Geothermal power capacity	Indonesia	Turkey	Kenya	Mexiko	Japan
 Hydropower capacity	China	Brazil	Ecuador	Ethopia	Vietnam
 Solar PV capacity	China	United States	Japan	India	United Kingdom
 Concentrating solar thermal power (CSP) capacity ²	South Africa	China	-	-	-
 Wind power capacity	China	United States	Germany	India	Brazil
 Solar water heating capacity	China	Turkey	Brazil	India	United States
 Biodiesel production	United States	Brazil	Argentina/Germany/Indonesia		
 Fuel ethanol production	United States	Brazil	China	Canada	Thailand



Renewable Energy in the World

As of 2015, renewable energy provided an estimated **19.3%** of global final energy consumption

Estimated Renewable Energy Share of Total Final Energy Consumption, 2015



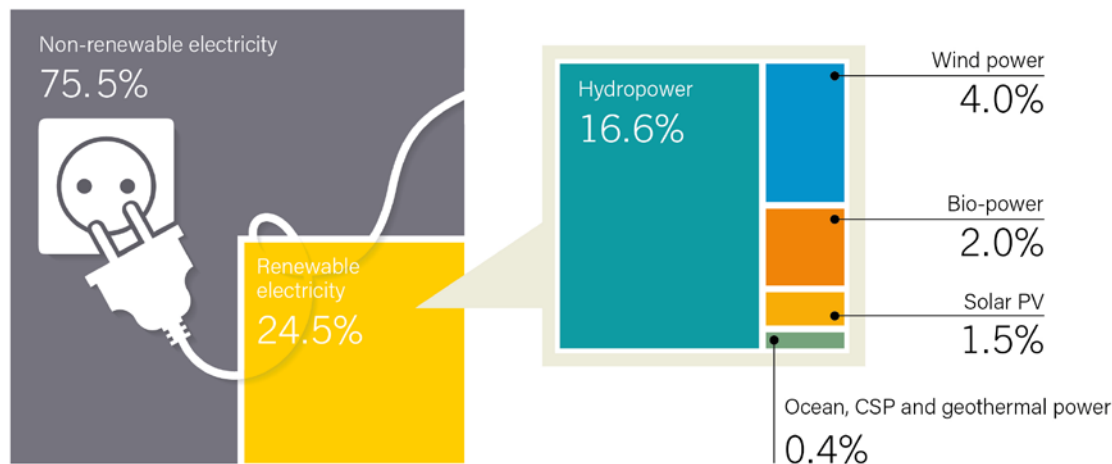
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Power Sector

By year's end, renewables comprised an estimated **30%** of the world's power generating capacity and **24.5%** of global electricity demand

Estimated Renewable Energy Share of Global Electricity Production, End-2016



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Heating and Cooling

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**.



Transport

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 transportfuel 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**.



Renewable Energy Policy Landscape

176 countries had renewable energy targets

Regulatory policies

→ **Power:**
126 countries

→ **Transport:**
68 countries

→ **Heating & cooling:**
21 countries

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 (i.e., 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.

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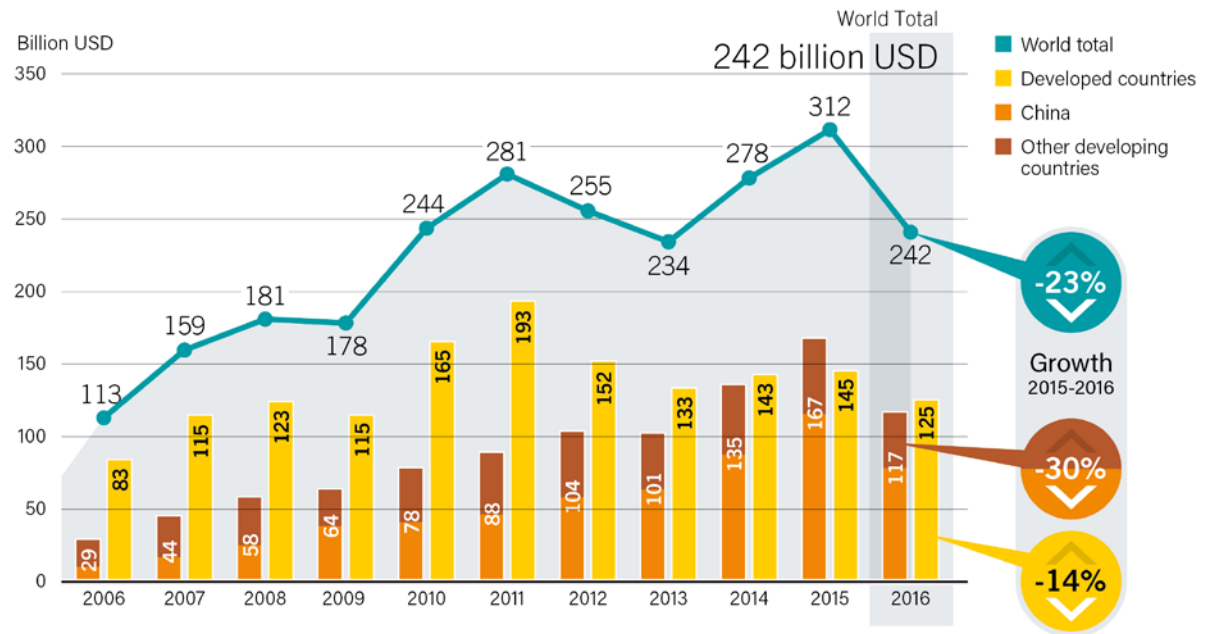
Source: REN21 Policy Database.

Global Investment in Renewable Energy

Global new investment in renewables was **USD 241.6 billion** in 2016 (-23% compared to 2015)

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

Global New Investment in Renewable Power and Fuels, Developed, Emerging and Developing Countries, 2006-2016



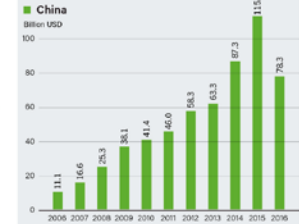
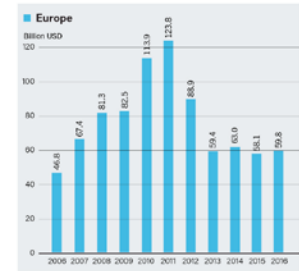
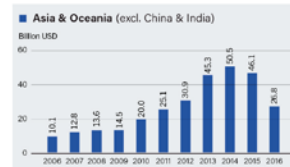
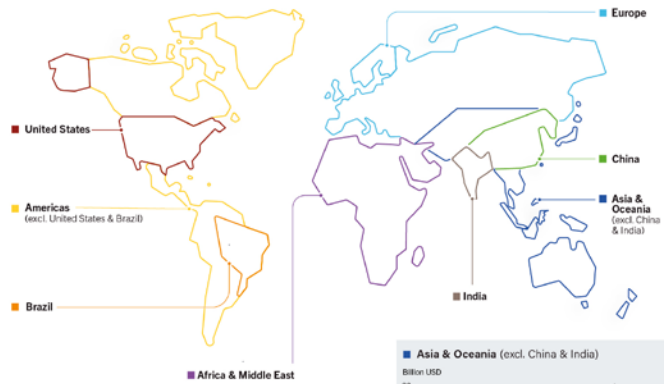
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Source: BNEF.



Global Investment in Renewable Energy

Global New Investment in Renewable Power and Fuels, by Country and Region, 2006-2016



Note: Data include government and corporate R&D.

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Source: BNEF.



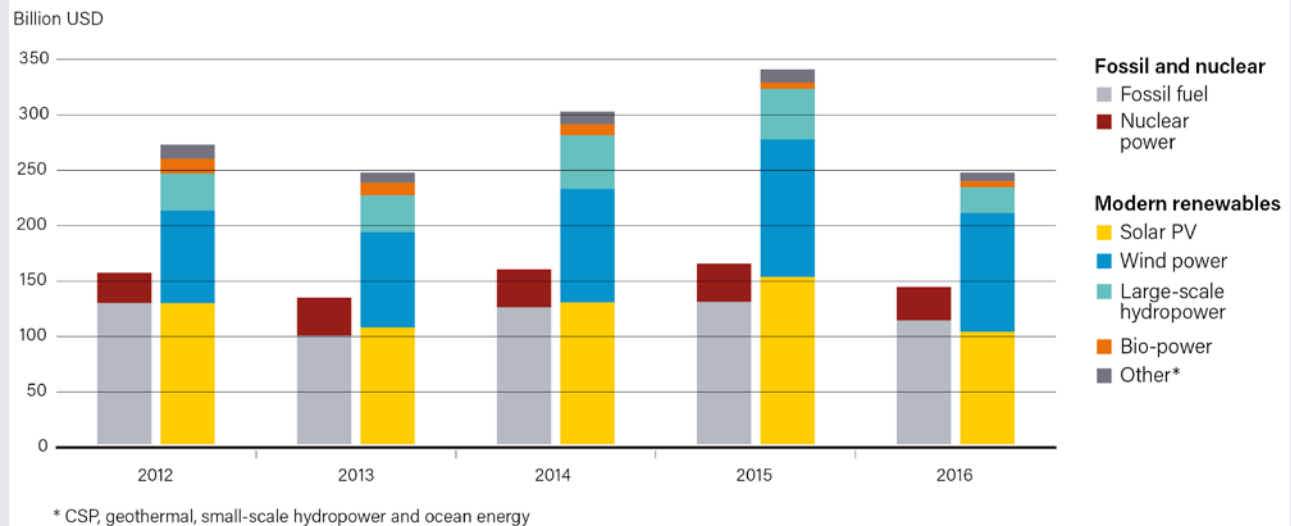
Global Investment in Renewable Energy

An estimated **USD 249.8 billion** (63.5%) was committed to constructing new renewable power plants, compared to:

→ Fossil fuel capacity: USD 113.8 billion

→ Nuclear capacity: USD 30 billion

Global Investment in Power Capacity, by Type (Renewable, Fossil Fuel and Nuclear Power), 2012-2016



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Source: BNEF.



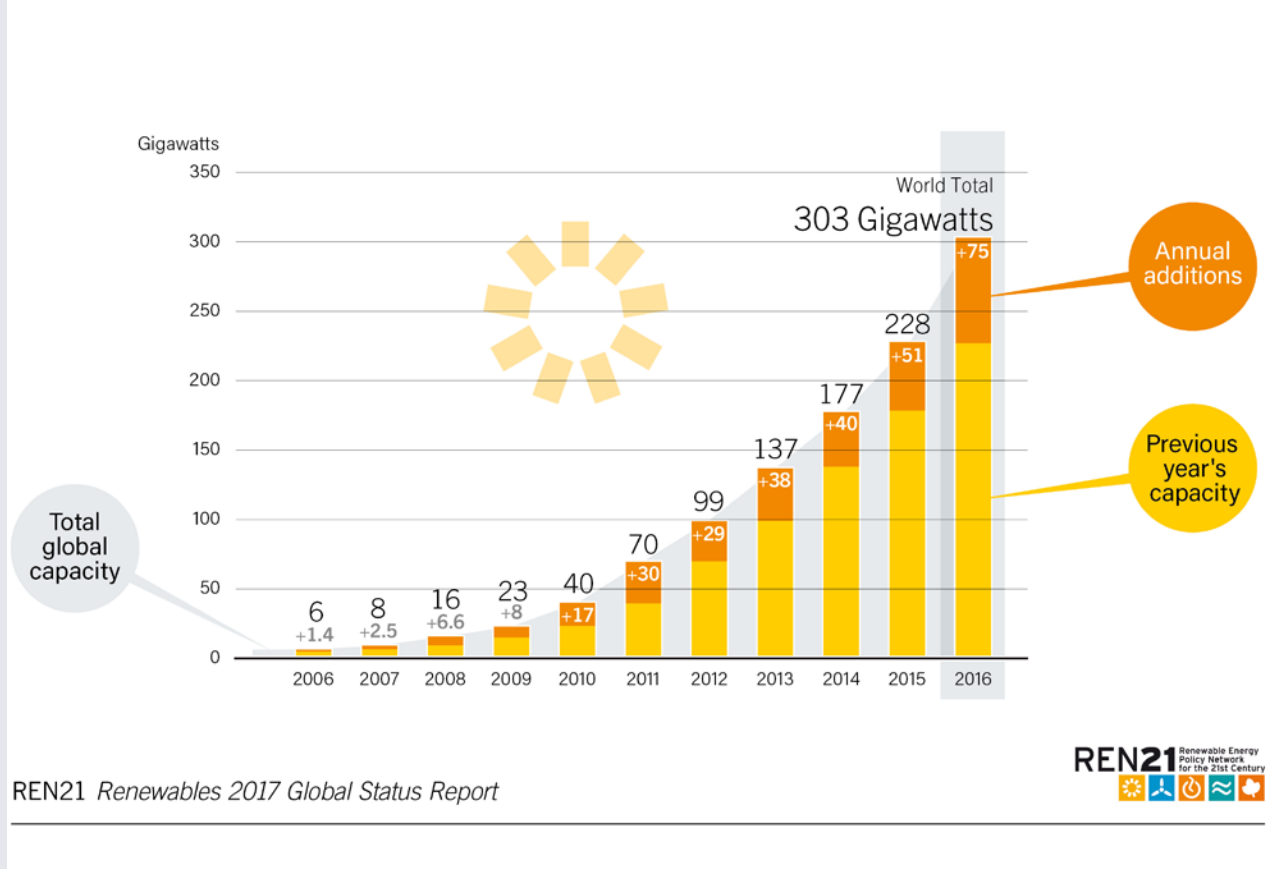
Solar PV

Global solar PV capacity totaled **303 GW**
(31,000 PV panels every hour)

By end-2016:

- Every continent had installed > **1 GW**
- At least 24 countries had **1 GW** or more of capacity
- At least 114 countries had more than **10 MW**

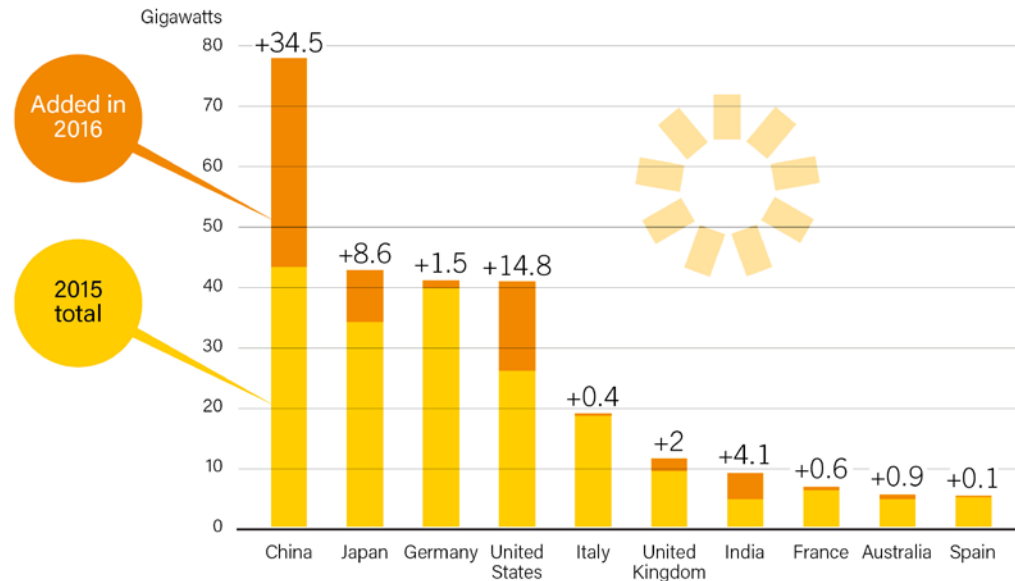
Solar PV Global Capacity and Annual Additions, 2006-2016



Solar PV

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

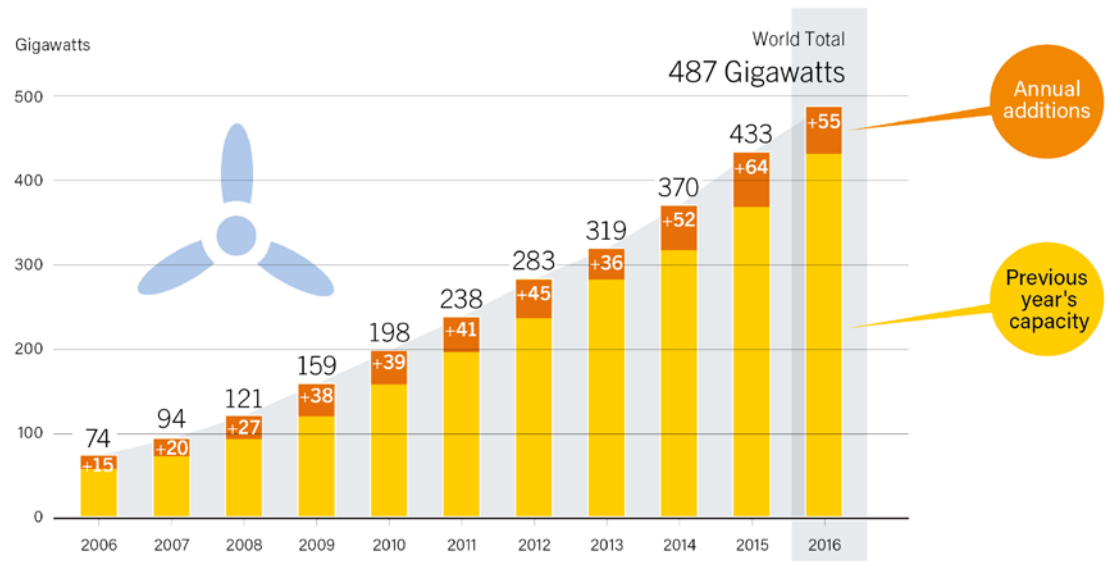


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Wind Power

Wind Power Global Capacity and Annual Additions, 2006-2016



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55 GW of wind power capacity added

Global total increased 12% to **487 GW**

Over 90 countries with commercial wind power activity; 29 countries > 1GW

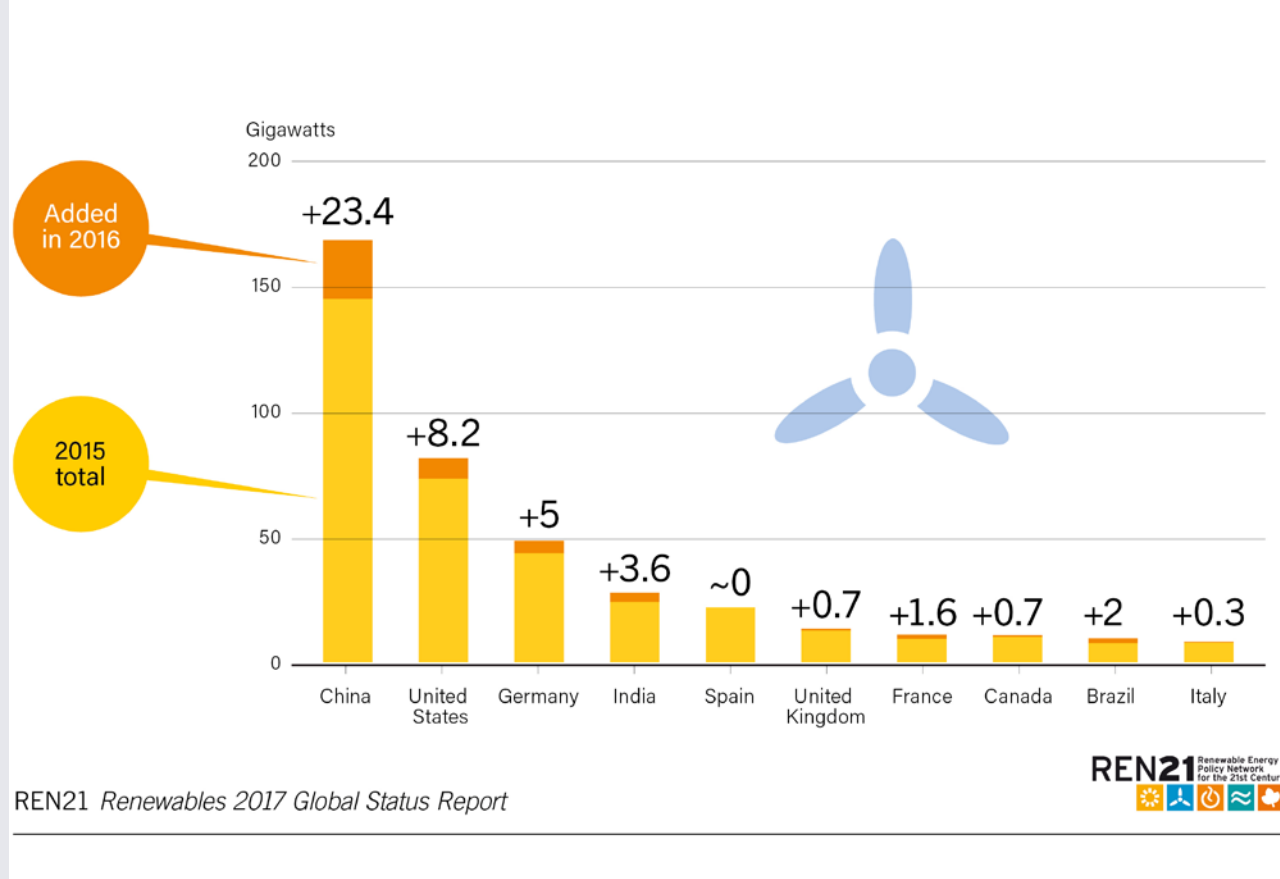


Wind Power

The global wind power market contracted in 2016

China added most new installations: **23.4 GW** (significant decline compared to 2015)

Wind Power Capacity and Additions, Top 10 Countries, 2016



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Wind Power

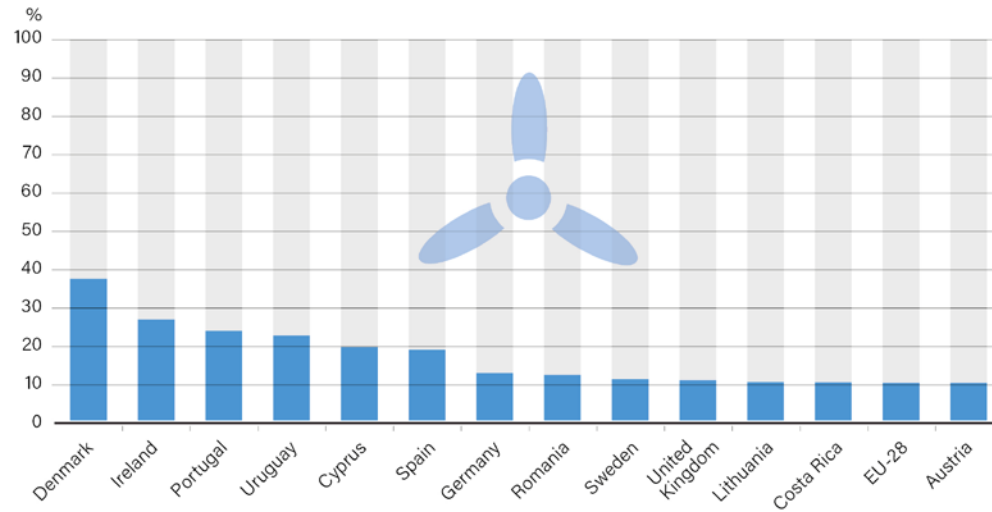
At least **24** countries met **5%** or more of their annual electricity demand with wind power.

EU: 10.4%

Two States in Germany: 86% and 60%

US: 5.5%, Iowa: 36.5%

Share of Electricity Demand Met by Wind Power, Selected Countries with over 10% and EU-28, 2016



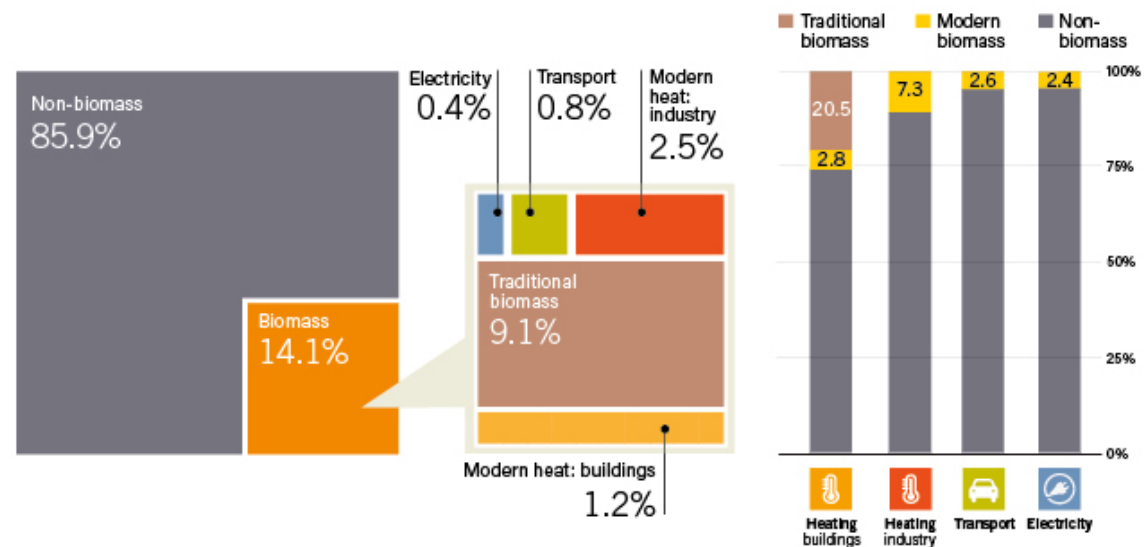
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Biomass Energy

Biomass accounted for **14.1%** of total final energy consumption

Shares of Biomass in Total Final Energy Consumption and in Final Energy Consumption, by End-use Sector, 2015



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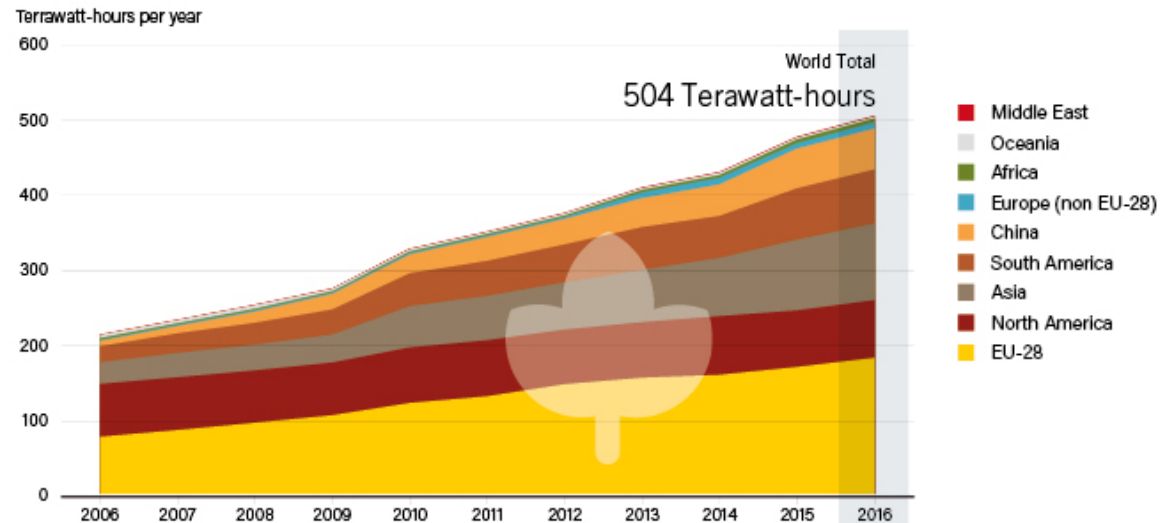


Biomass Energy

Global bio-power capacity increased 6% in 2016 to **112 GW**

Generation increased 6% to **504 TWh**

Global Bio-Power Generation, by Region, 2006-2016



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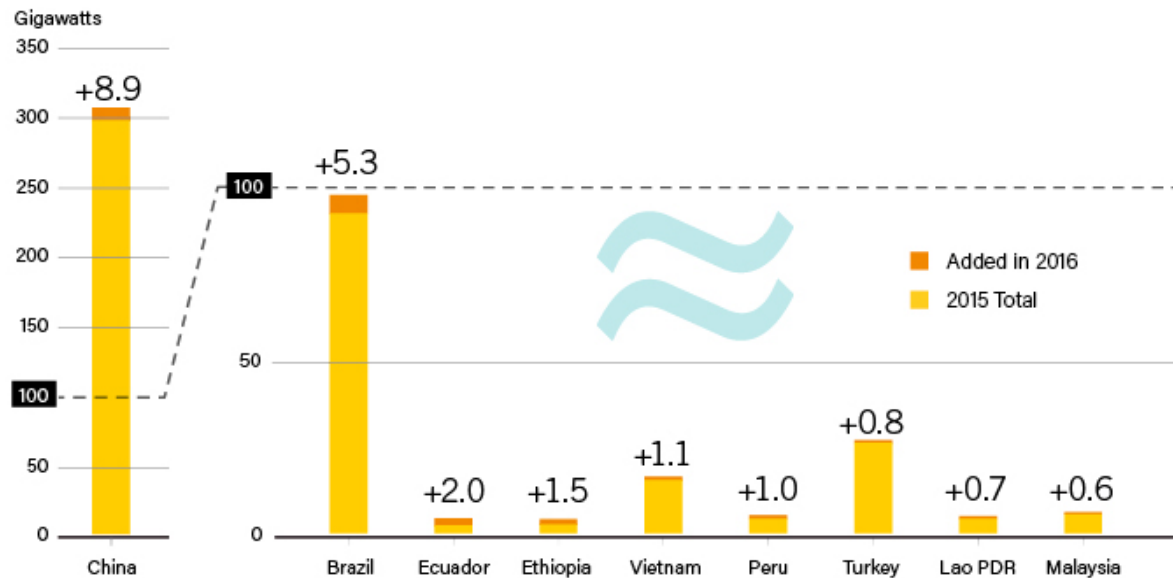
Hydropower

Total global hydropower capacity increased to **1,096 GW** (+25 GW in 2016)

More than **one-third** of new capacity in **China**

Global hydropower generation reached **4,102 TWh** – up by 3.2% over 2015

Hydropower Capacity and Additions, Top 9 Countries for Capacity Added, 2016



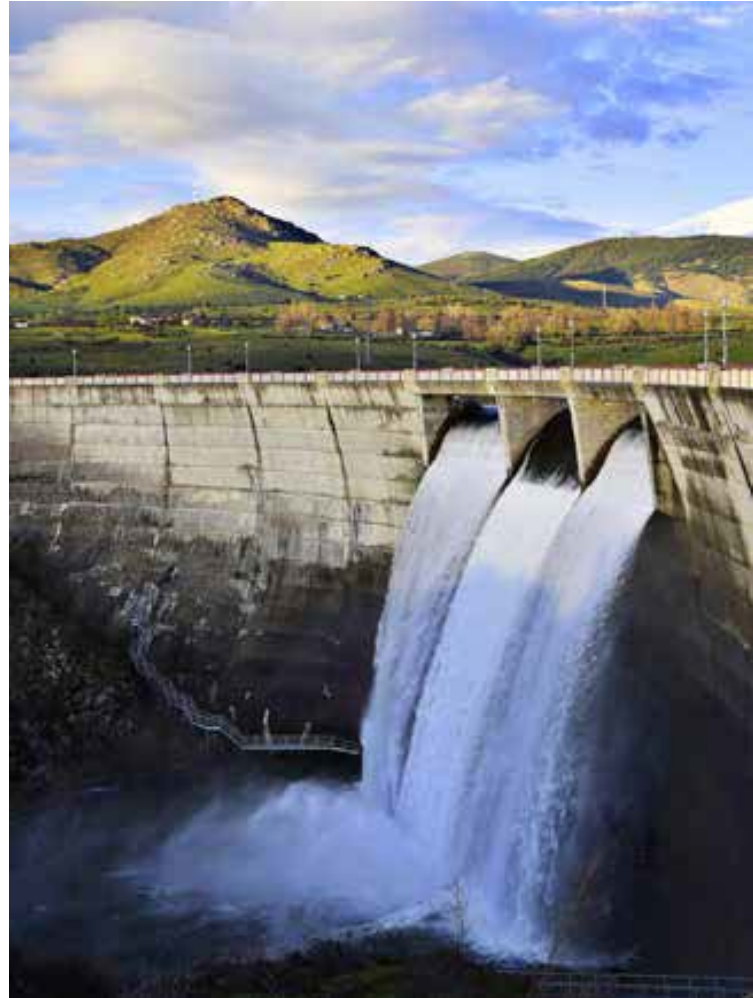
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Source: IEA PVPS.

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Feature: Deconstructing Baseload

- 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.



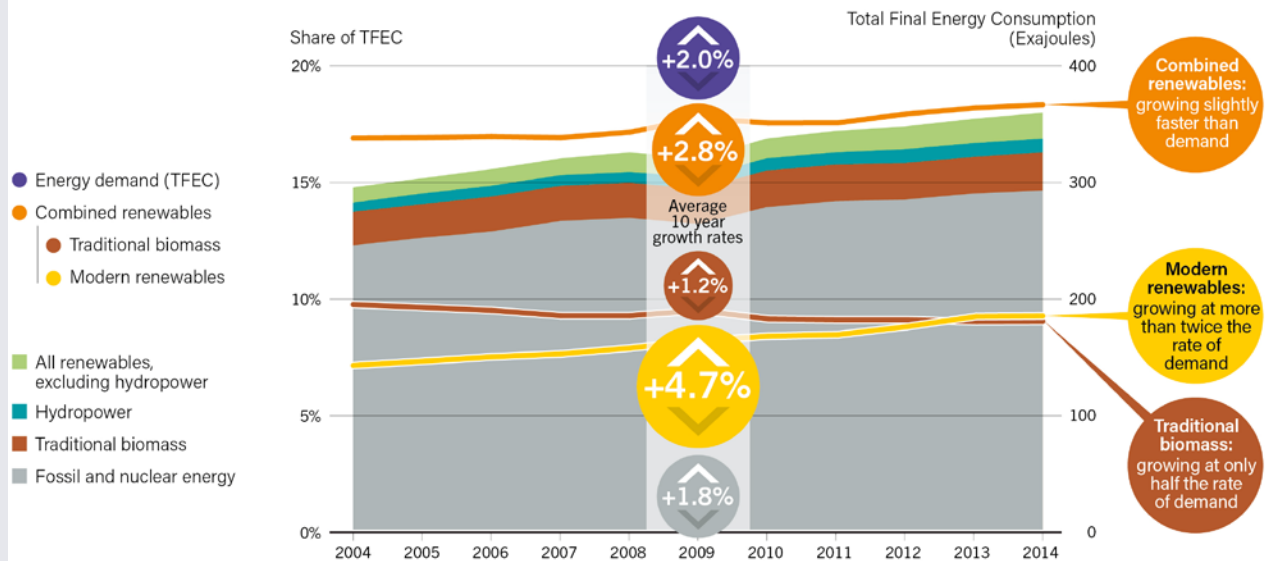
Renewable Energy in the World

Overall share of renewable energy has increased only modestly.

Reasons:

- growth of energy demand
- Decrease of traditional biomass at a slower pace
- Increase in fossil fuel & nuclear

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



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Source: based on IEA World Energy Balances, 2016.

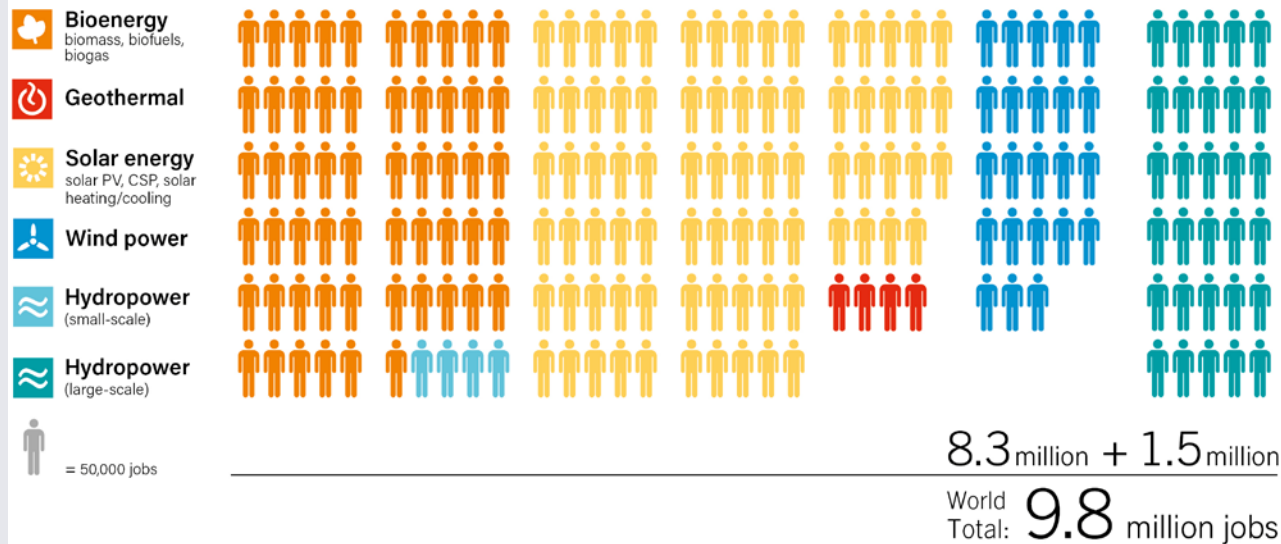


Jobs in Renewable Energy

The renewable energy sector employed

9.8 million people in 2016 - a **1.1% increase** over 2015

Jobs in Renewable Energy



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Source: IRENA.



Conclusions

- Global renewable energy transition advancing with record capacity additions and rapidly falling costs – more capacity for less money
- 2016 was the third year in a row where decoupling of economic growth and energy-related CO₂ emissions occurred
- **However, progress not fast enough to reach Paris Agreement goals**
- Better-integrated sectoral planning
- Smarter, more flexible systems integrating variable renewables
- Systems approach: energy efficiency, more use of enabling technologies

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