RENEWABLES 2017
GLOBAL STATUS REPORT

REN21 Renewable Energy Policy Network for the 21st Century

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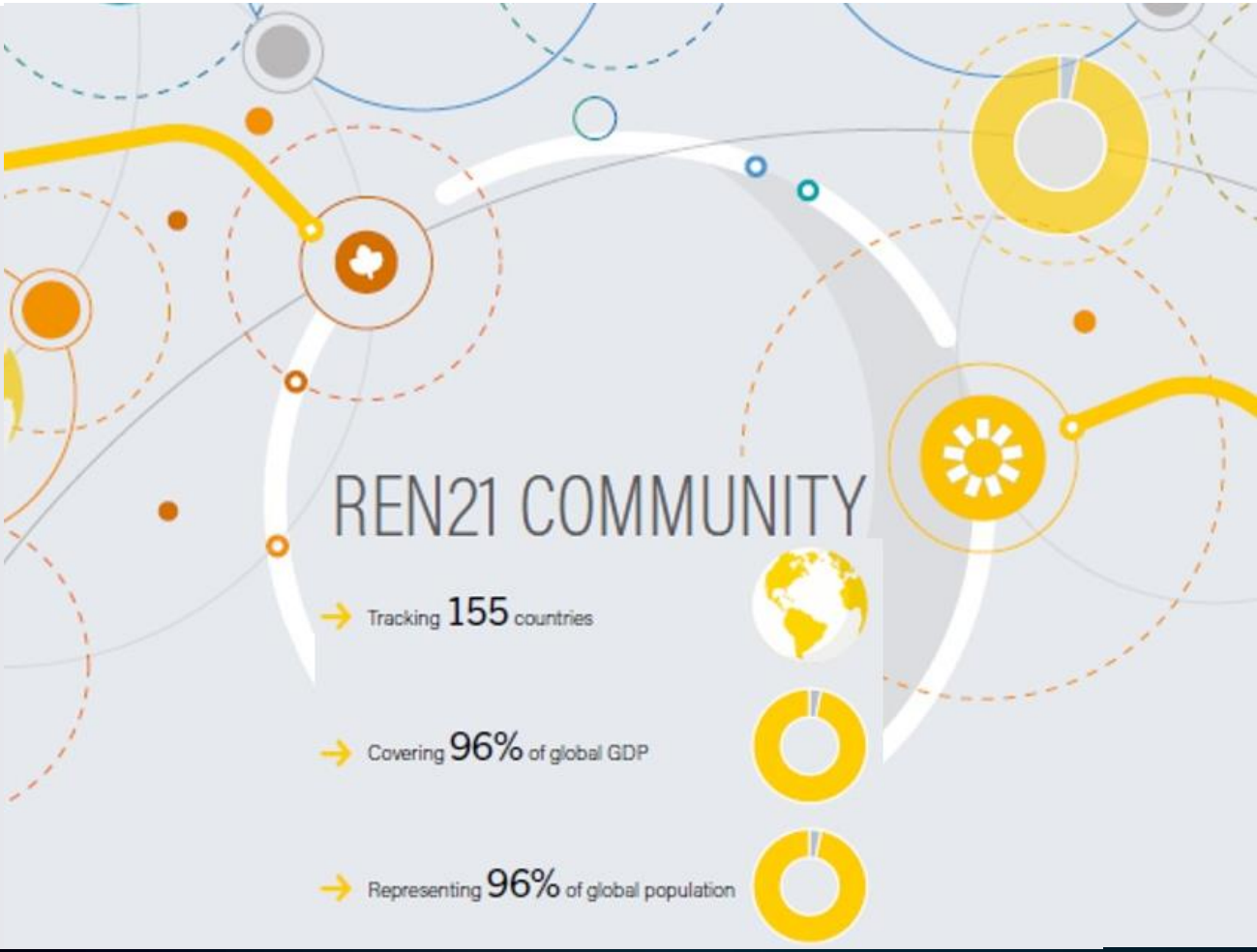
REN21 Renewables 2017 Global Status Report

- **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

REN21 Community

GSR Network:

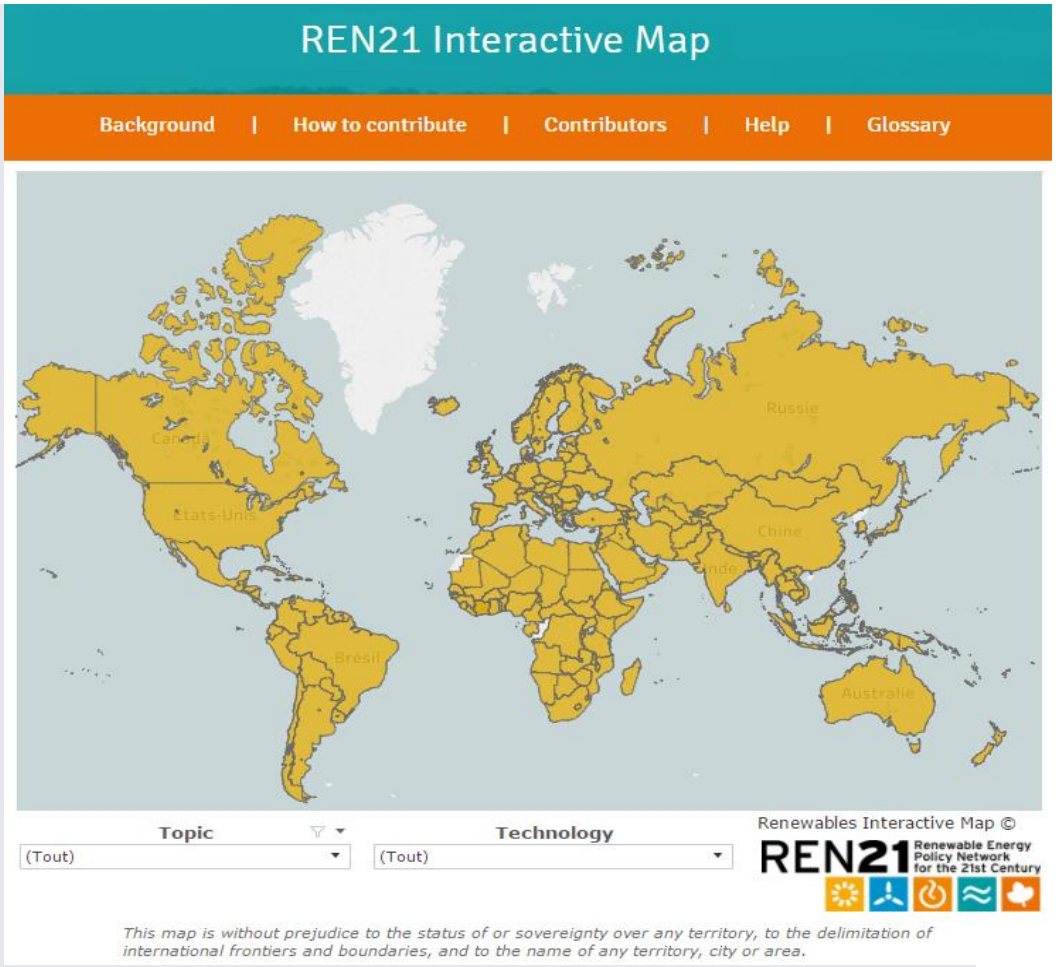
- Over **800** active contributors and reviewers
- Tracking **155** countries
- Covering **96%** of global GDP
- Representing **96%** of global population



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



Another extraordinary year for renewable energy

Total global capacity was **up 9%** compared to 2015, to **2,017 GW** at year's end (**921 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**

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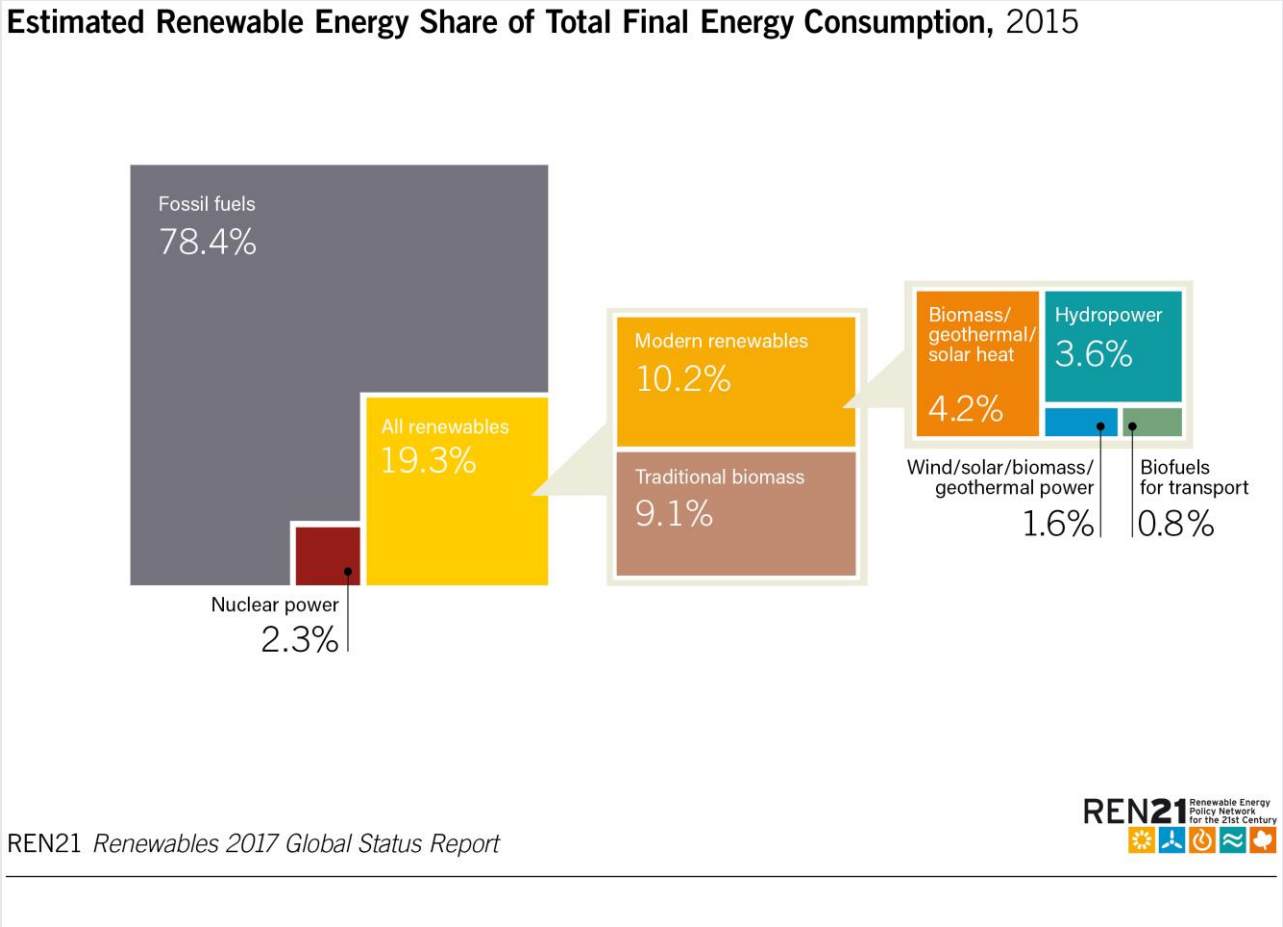
Renewable Energy in the World

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



Renewable Energy "Champions"

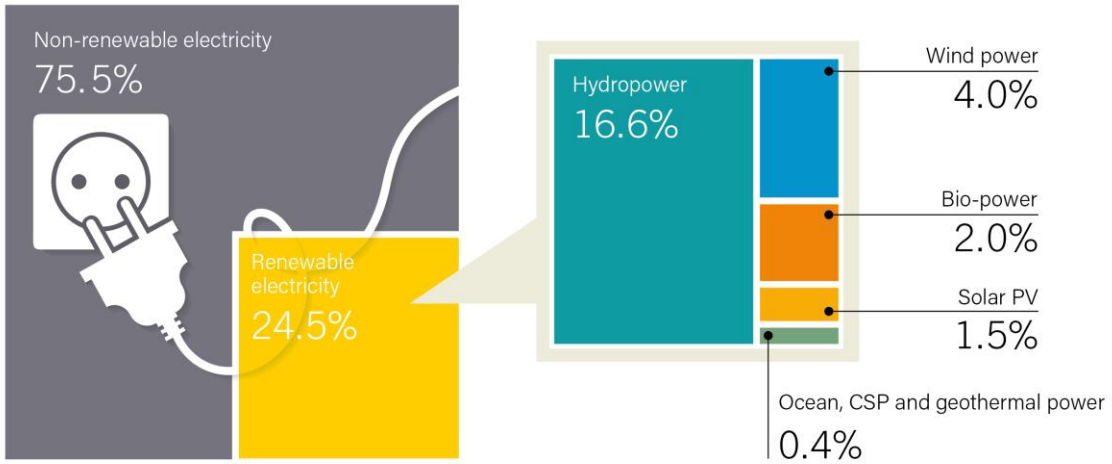
Annual Investment/Net Capacity Additions/Production in 2016

	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

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.

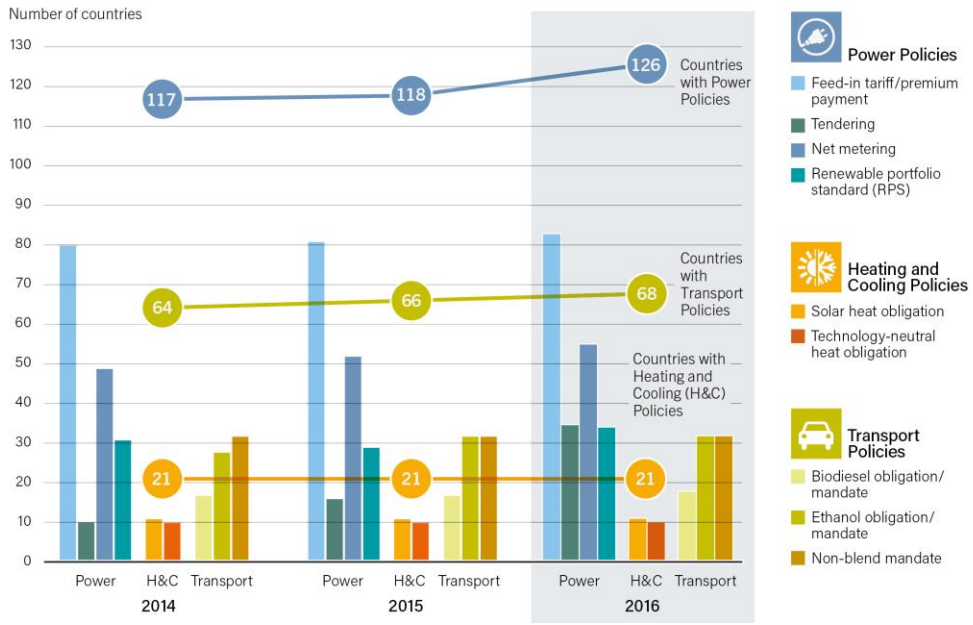
Biogas use in transport grew substantially in the **United States** and continued to gain shares of the transportfuel mix in Europe.

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**
- **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 (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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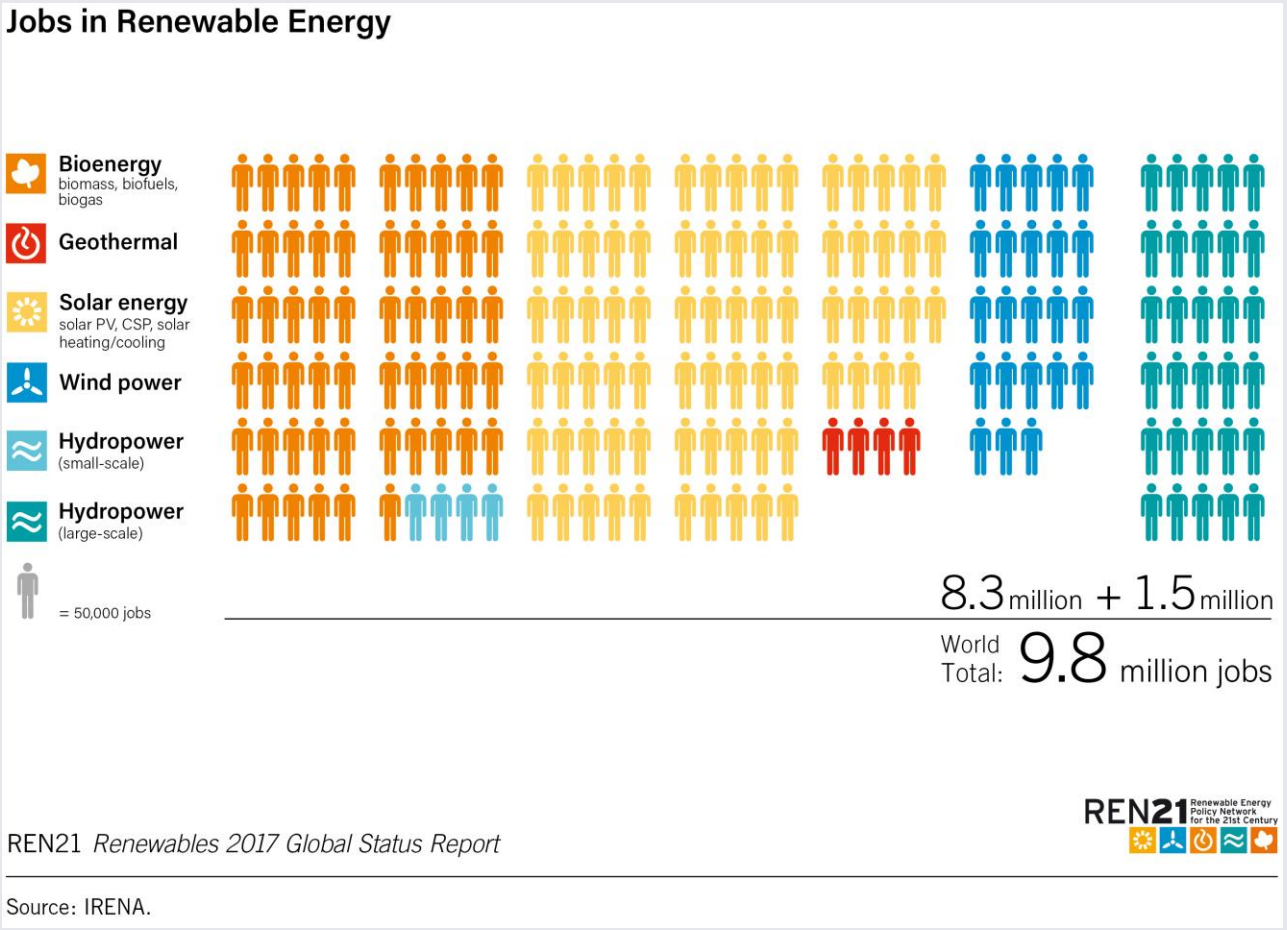
Source: REN21 Policy Database.

Jobs in Renewable Energy

The renewable energy sector employed

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

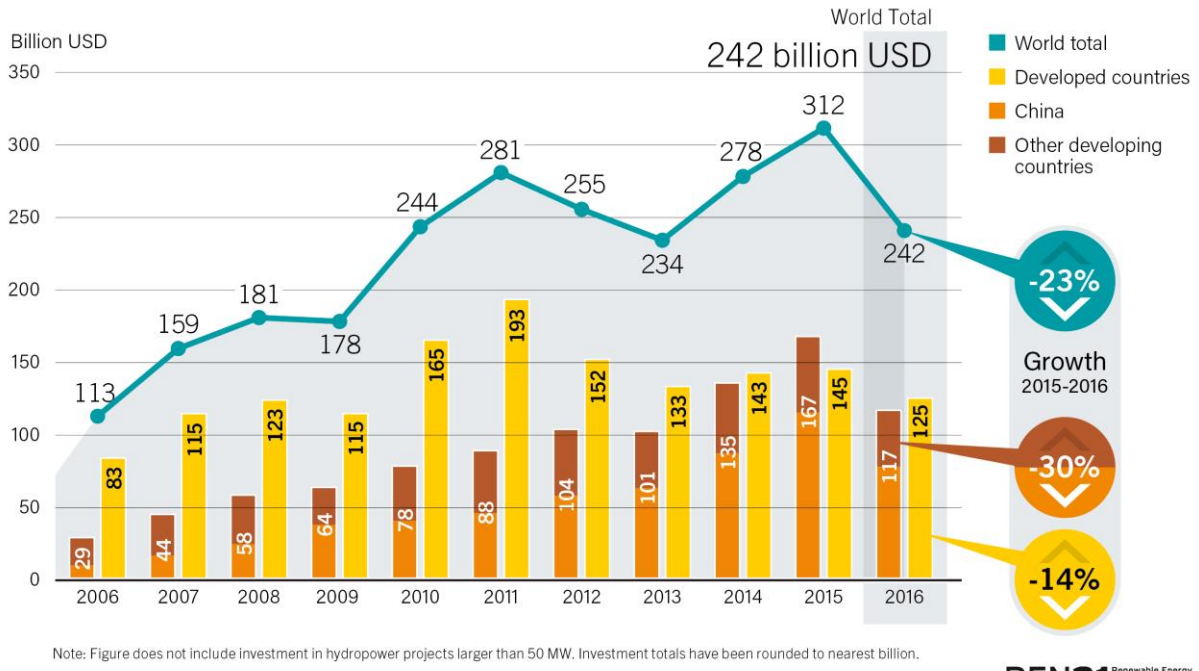


Global Investment in Renewable Energy

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.

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



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

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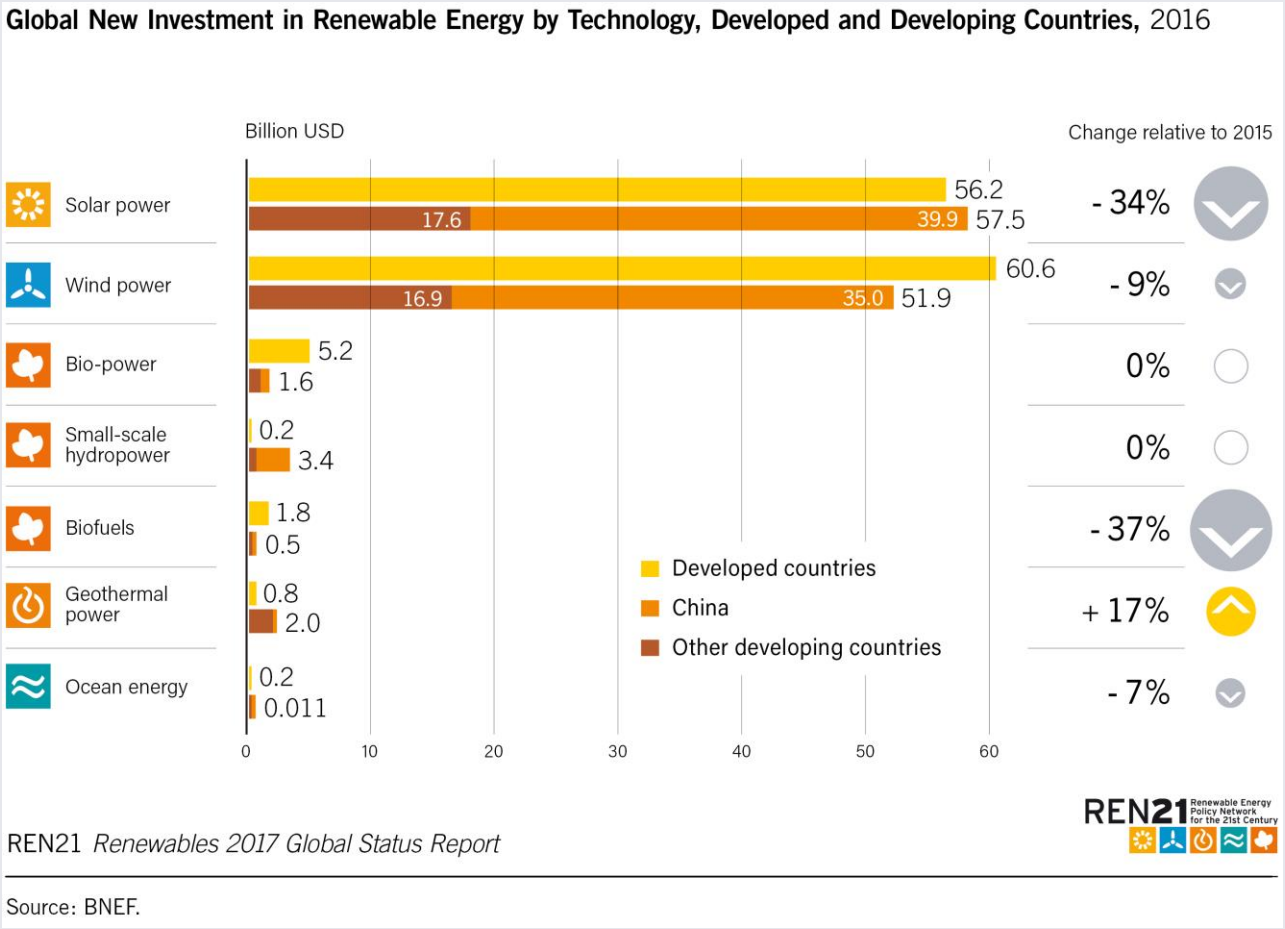
Source: BNEF.

Global Investment in Renewable Energy

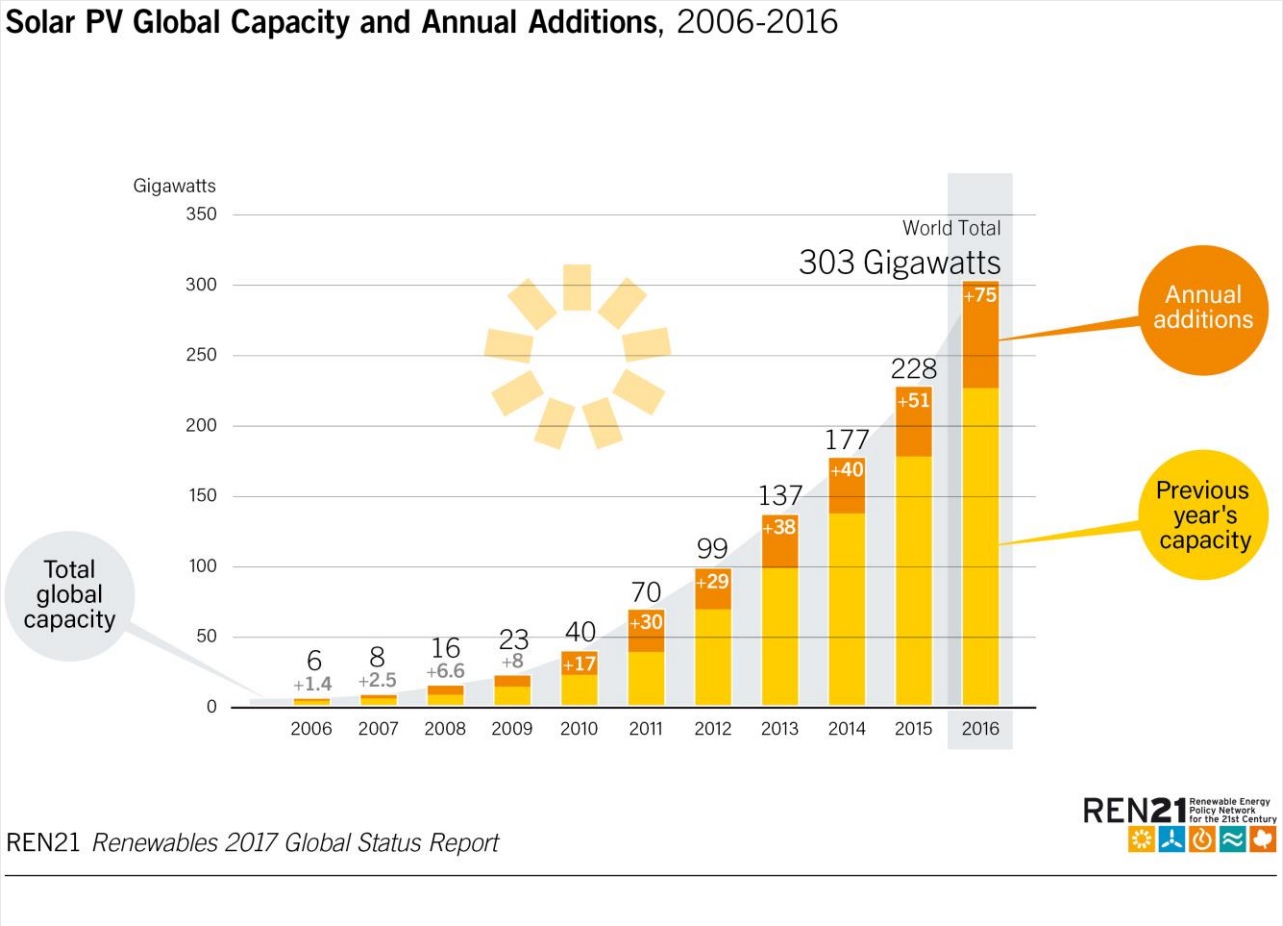
Solar and wind power continue to lead for money committed during 2016, each accounting for roughly **47%** of total investment



Solar PV

75 GW of solar PV capacity was added worldwide

Global solar PV capacity totaled **303 GW**

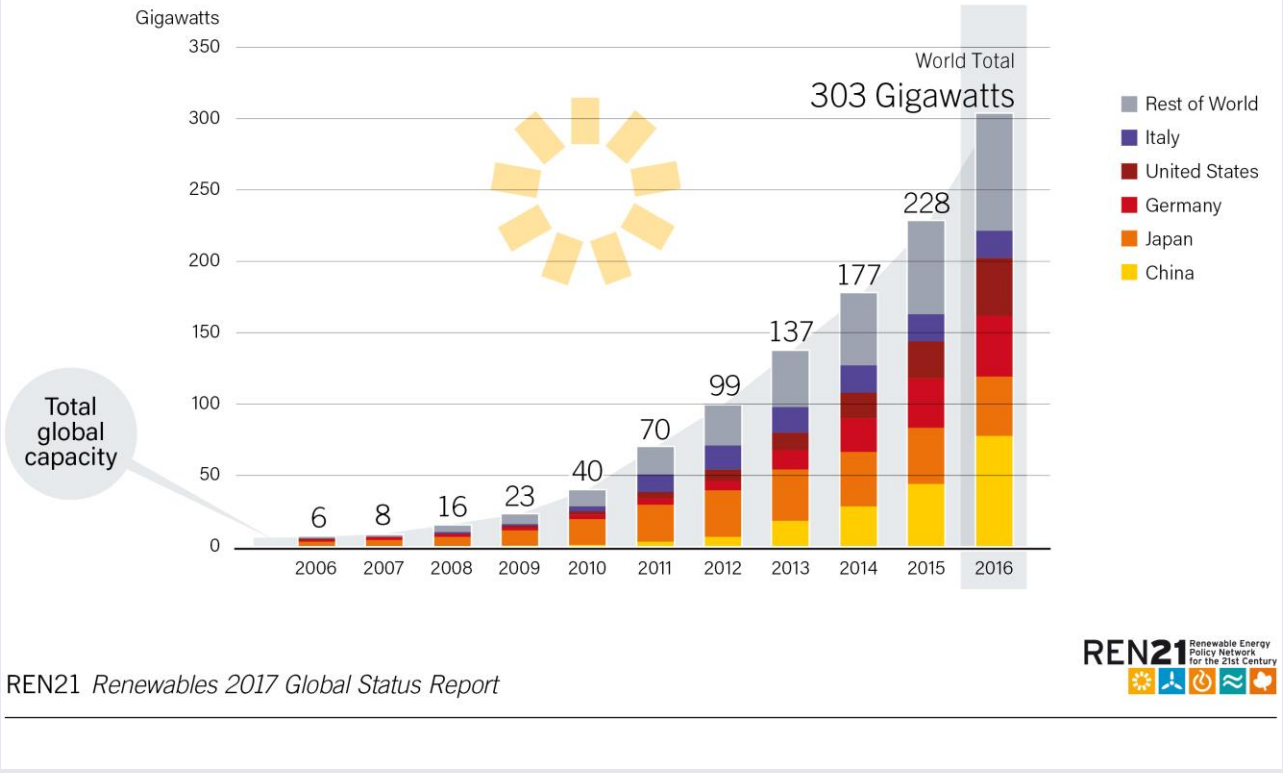


Solar PV

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**

Solar PV Global Capacity, by Country and Region, 2006-2016



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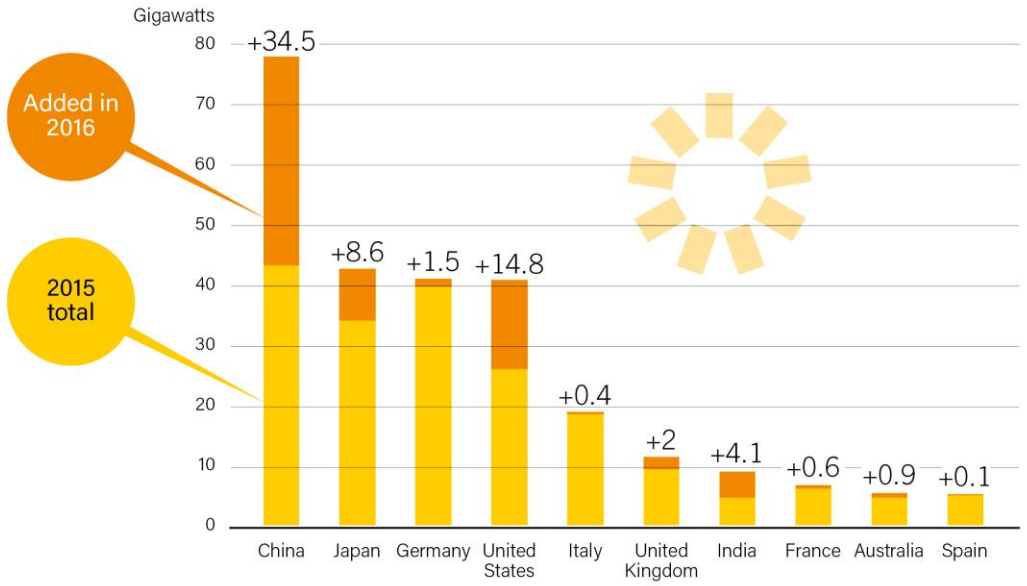
Solar PV

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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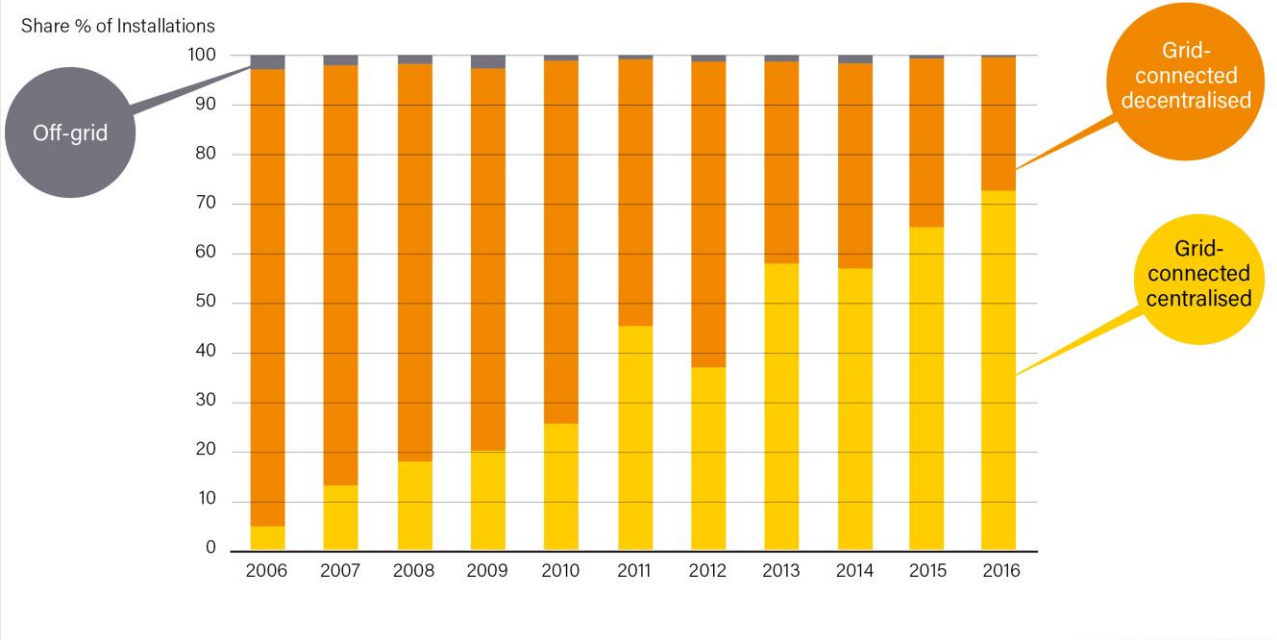
Solar PV

Demand is expanding rapidly for **off-grid solar PV**, but capacity of **grid-connected systems** is rising more quickly

Solar PV Global Additions, Shares of Grid-Connected and Off-Grid Installations, 2006-2016



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Source: IEA PVPS.

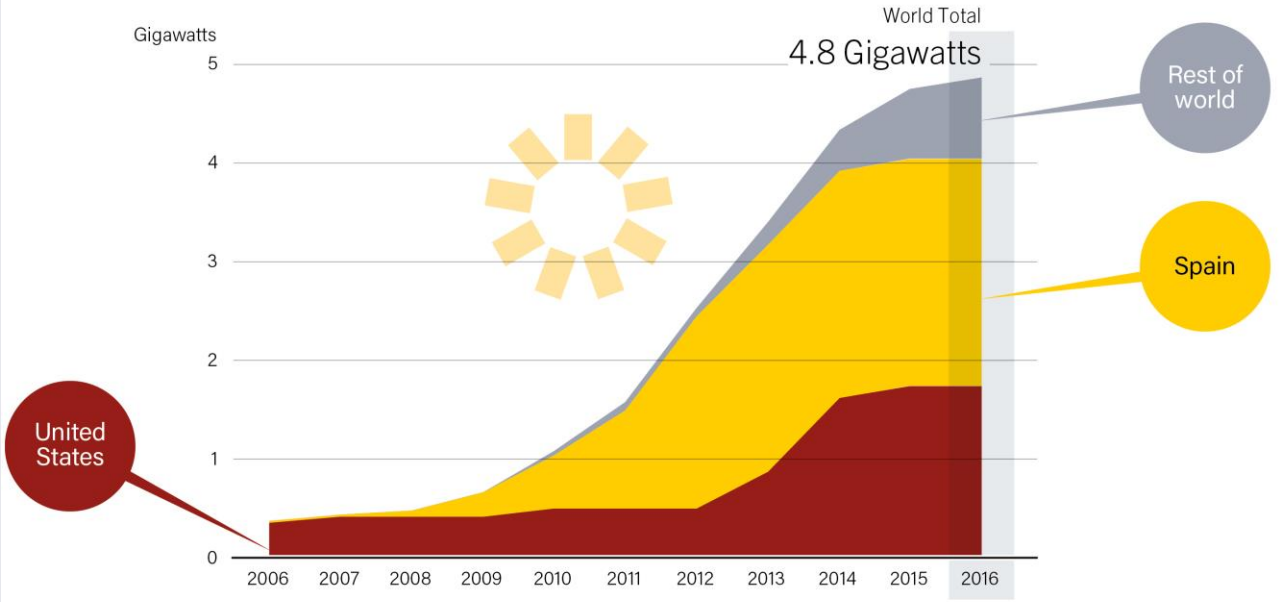
Concentrating Solar Thermal Power (CSP)

110 MW of capacity came online in 2016

Total global capacity: **4.8 GW**

900 MW expected to enter operation during the course of 2017

Concentrating Solar Thermal Power Global Capacity, by Country and Region, 2006-2016



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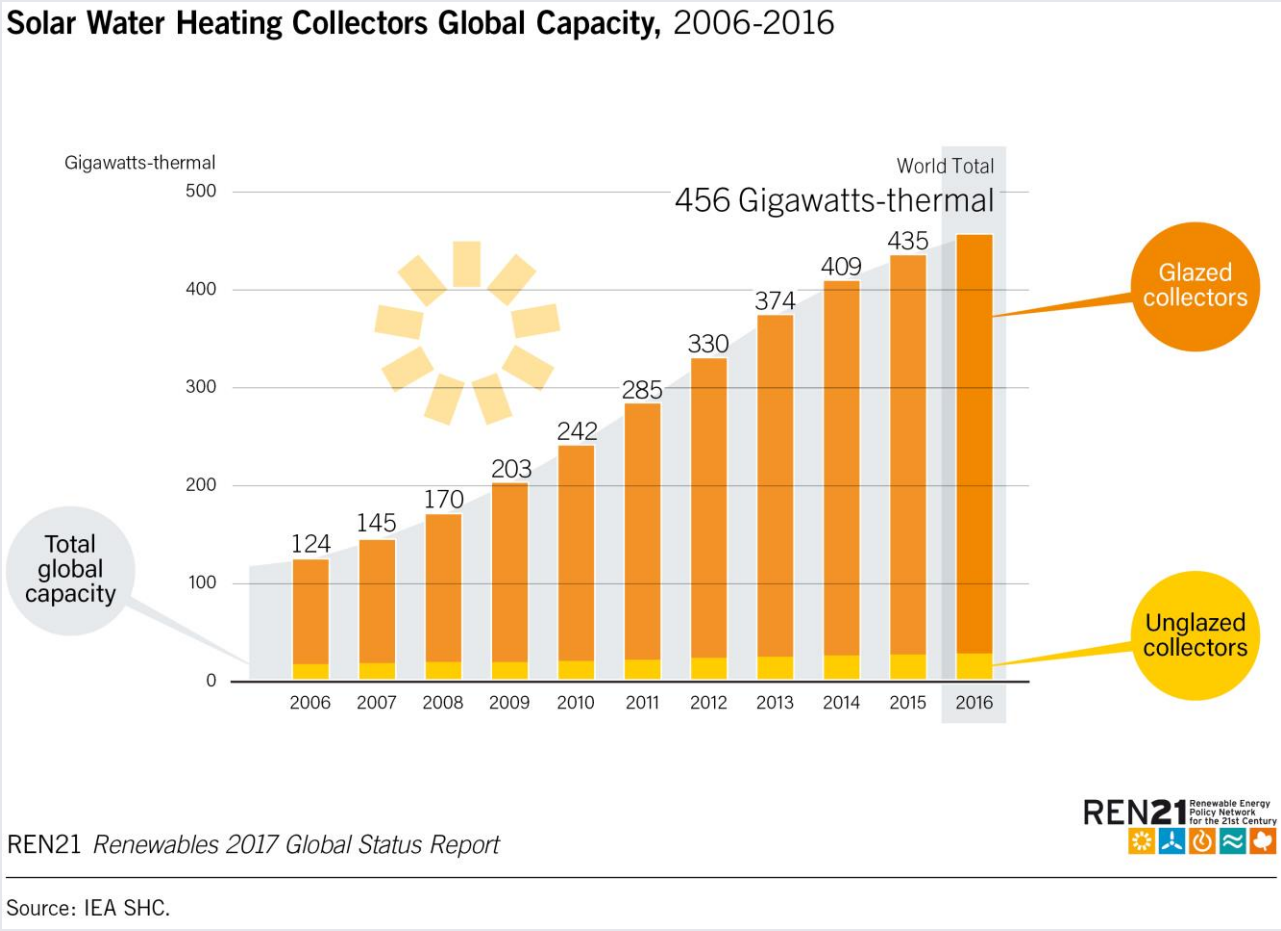
Solar Thermal Heating and Cooling

Total capacity of water collectors increased by **5%** to **456 GWth**

Solar heating and cooling technologies have been sold in at least **127 countries**



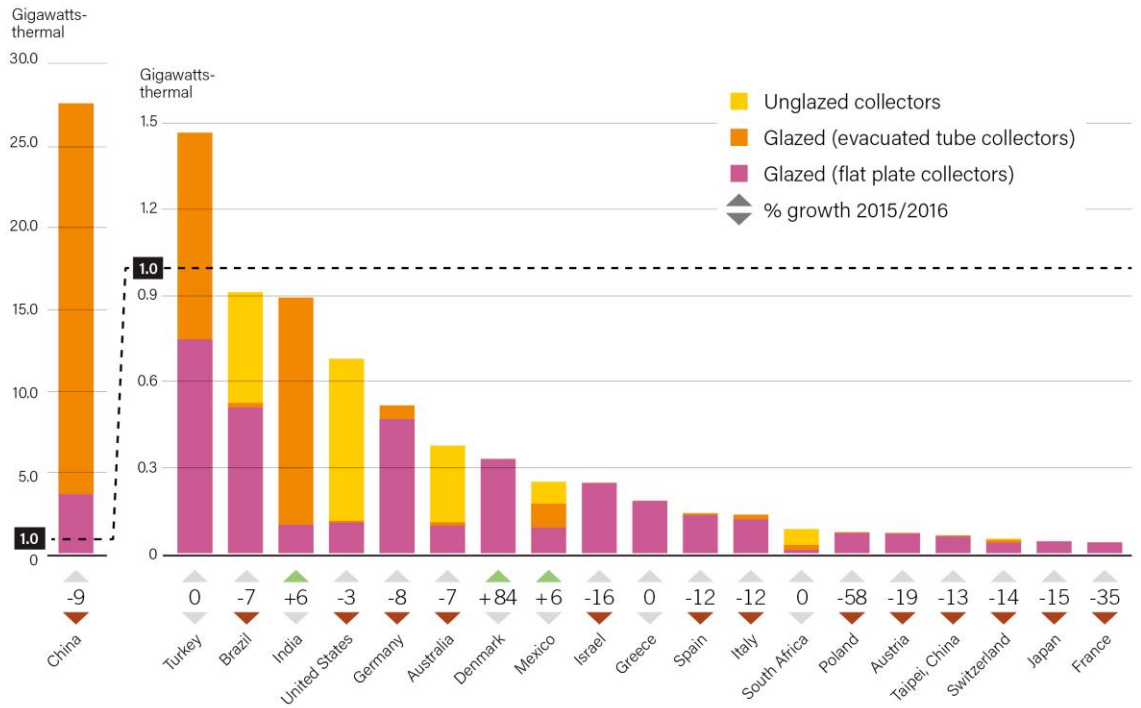
Solar Thermal Heating and Cooling

Gross additions:
36.7 GWth

Significant market growth in:

- → Denmark: 84%
- → Mexico: 6%
- → India: 6%

Solar Water Heating Collector Additions, Top 20 Countries for Capacity Added, 2016



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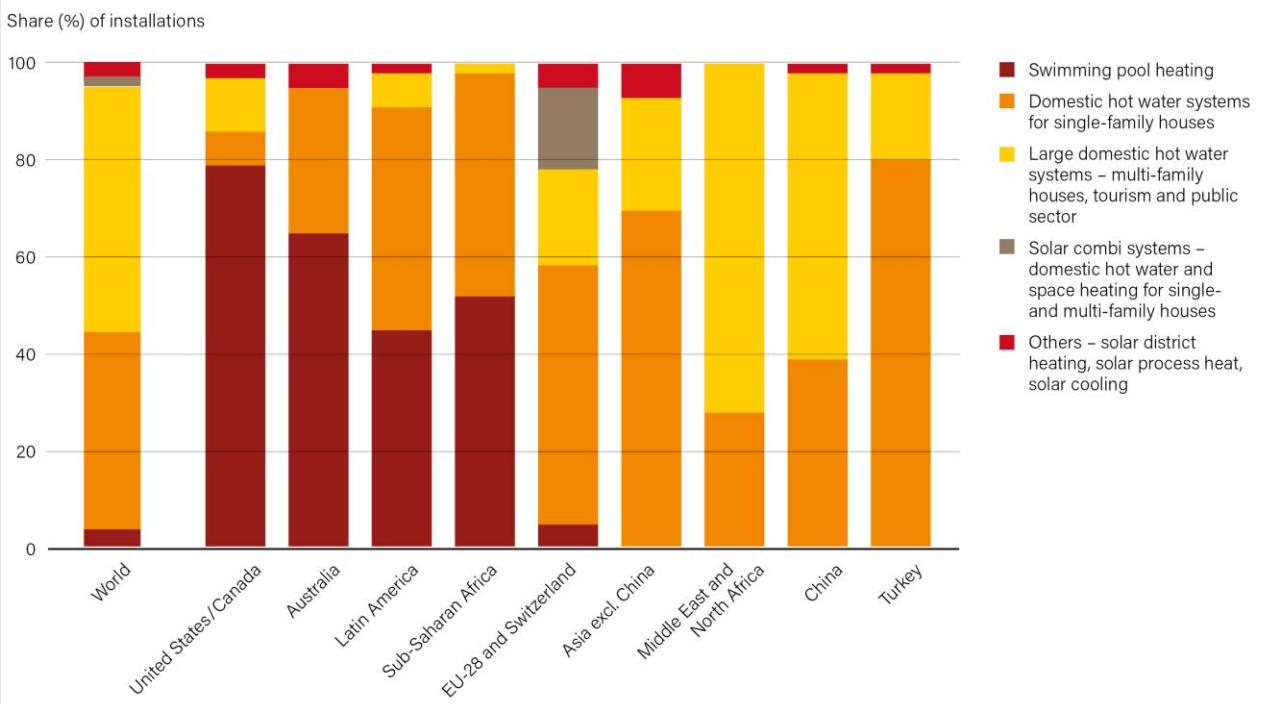
Solar Thermal Heating and Cooling

Residential sector accounted for **63%** of total installed collector capacity at the end of 2015

Markets transitioning to large-scale systems

Solar Water Heater Applications for Newly Installed Capacity, by Economic Region, 2015



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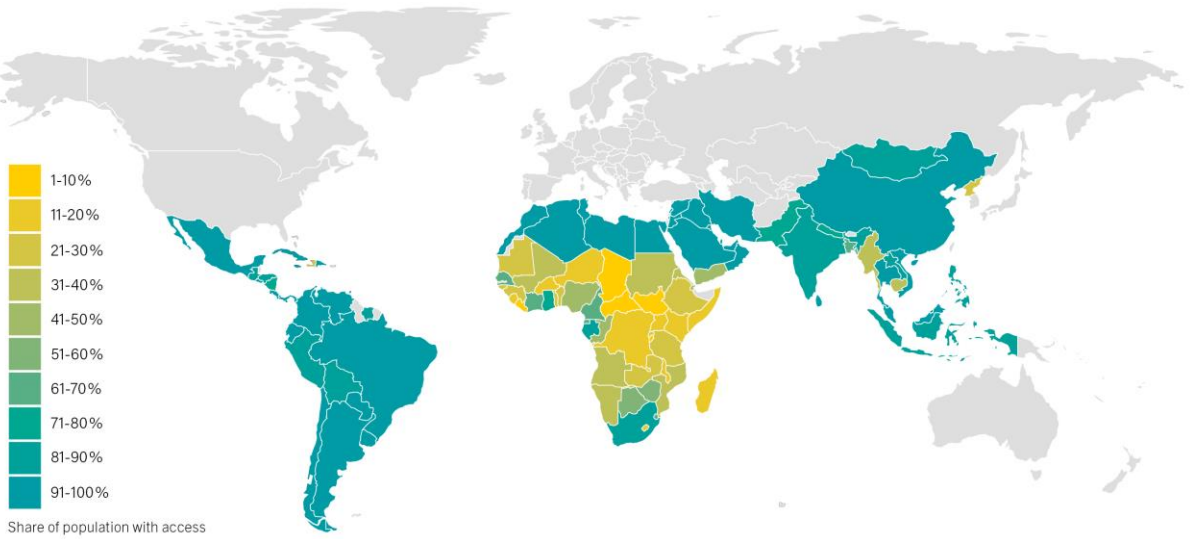
Source: IEA SHC.

Distributed Renewable Energy for Energy Access

16% of the global population lived **without electricity** - approx. 1.19 billion people

Electricity Access in Developing Countries, 2014



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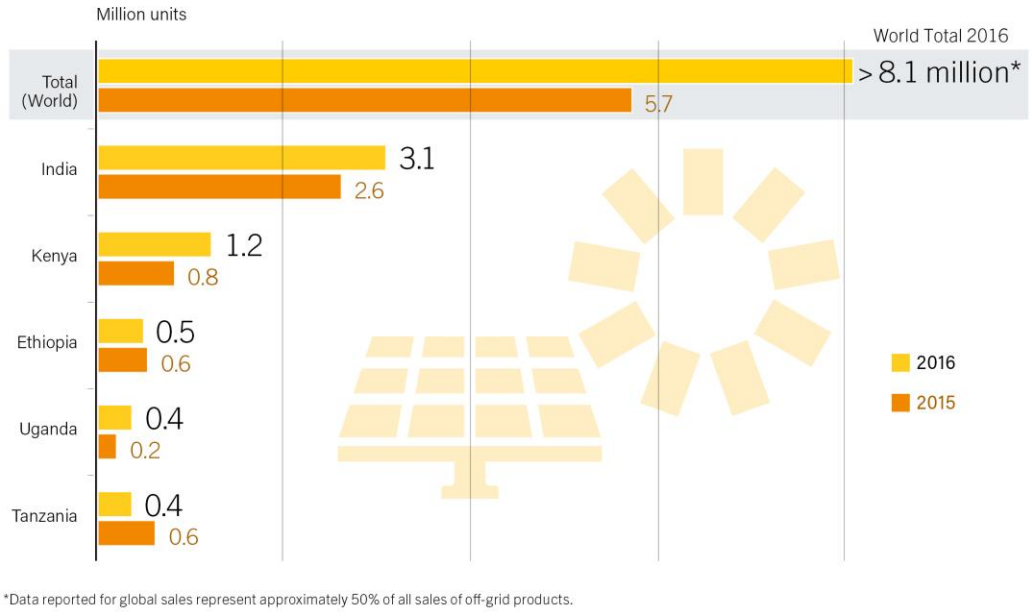
Distributed Renewable Energy for Energy Access

Sales of off-grid solar systems reach **8.1 million** units worldwide

Sales were highest in sub-Saharan Afria, in particular in East Africa

Sales of Off-Grid Solar Systems in Top 5 Countries, 2015-2016



*Data reported for global sales represent approximately 50% of all sales of off-grid products.

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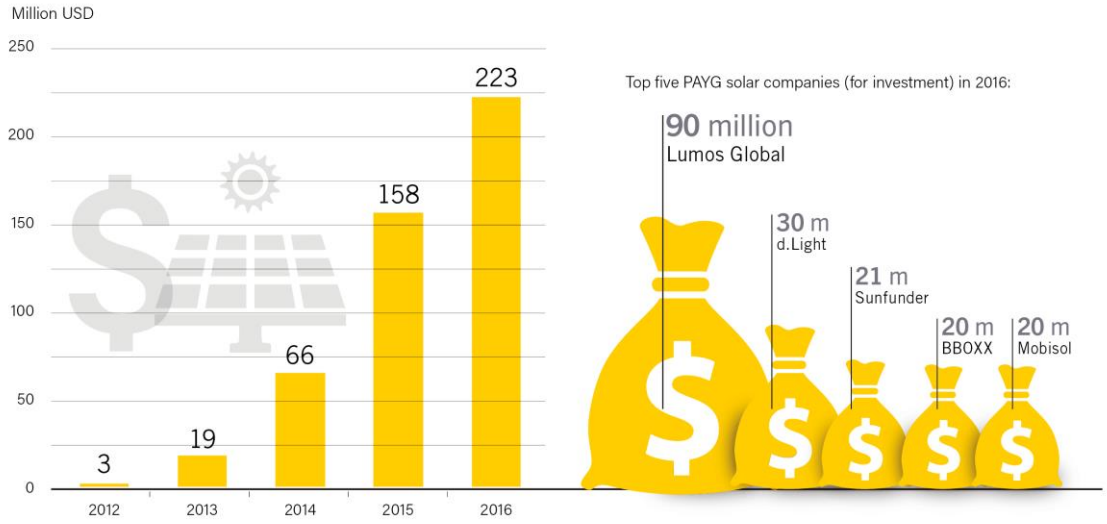
Source: GOGLA/IFC.

Distributed Renewable Energy for Energy Access

USD 223 million raised by PAYG solar PV companies, an increase of about **40%** from 2015

Investment in Pay-As-You-Go Solar Companies, 2012-2016



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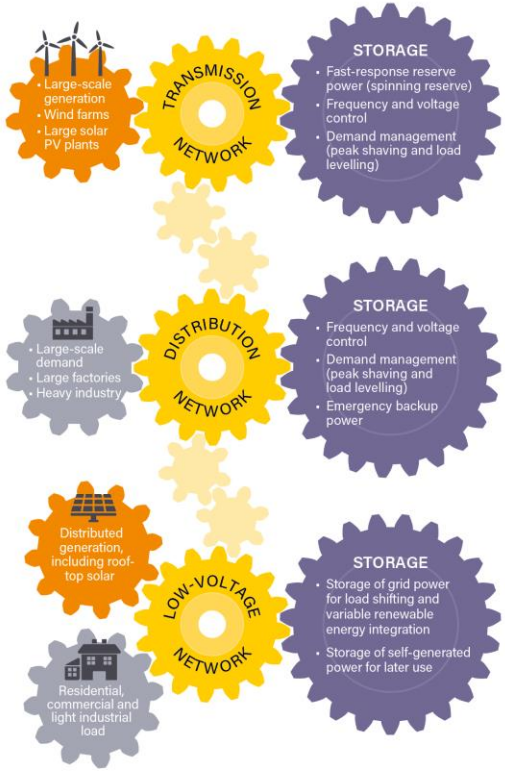
Enabling Technologies and Energy Systems Integration

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



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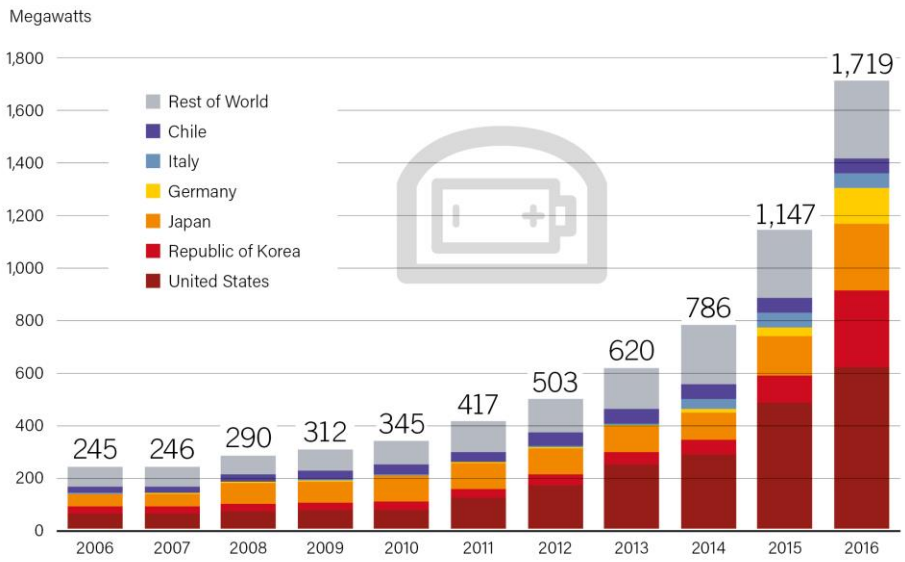
Enabling Technologies and Energy Systems Integration

Grid-connected battery storage grew by **50%** in 2016

Global Grid-Connected Stationary Battery Storage Capacity, by Country, 2006-2016



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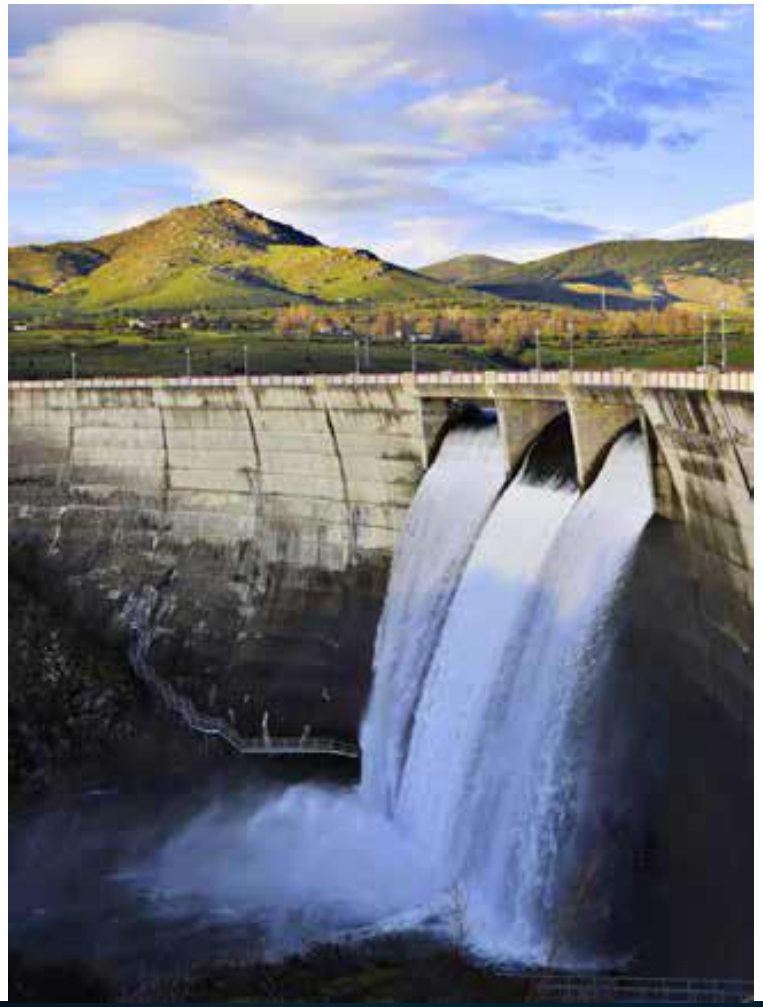
Feature: Deconstructing Baseload

- 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.



Conclusions

- Global renewable energy transition advancing with record capacity additions and rapidly falling costs – more capacity installed for less money
- 2016 was the third year in a row where decoupling of economic growth and energy-related CO_2 emissions occurred
- **However, progress not fast enough to reach Paris Agreement goals**
- Better-integrated sectoral planning
- Smarter, more flexible systems integrating variable renewables
- More use of enabling technologies

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