

GLOBAL RENEWABLE ENERGY STATUS

LAUNCH OF RENEWABLES 2015 GLOBAL STATUS REPORT

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CESC webinar

Vienna, 18 June 2015

2015

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

Science & Academia:

IIASA, ISES, SANEDI, TERI, Fundacion Bariloche

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REN21 Renewables 2015 Global Status Report

REN21
Renewable Energy
Policy Network
for the 21st Century

RENEWABLES 2015 GLOBAL STATUS REPORT



www.ren21.net/gsr

Launched at Vienna Energy Forum on 18 June 2015

Network of over 500 contributors, researchers & reviewers worldwide

The report features:

- Global Overview
- Market & Industry Trends
- Investment Flows
- Policy Landscape
- Distributed Renewable Energy for Energy Access
- Feature: Using Renewables for Climate Change Adaptation

The report covers:

- All renewable energy technologies
- The power, heating & cooling, and transport sector
- Energy Efficiency

Country data available under new REN21 Renewables Interactive Map www.ren21.net/map

New REN21 Renewables Interactive Map

REN21 Interactive Map

Home > Status of Renewables > REN21 Interactive Map

Background | How to contribute | Contributors | Help | Glossary

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Topic (All) Technology (All)

This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Renewables Interactive Map
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The New REN21 Renewables Interactive Map has been sourced from over **7000** data lines, featuring information from REN21's latest reports, including **GSR2015**.

Data on the Map is **constantly being updated**, and represents up-to-date information on renewable energy.

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A Decade Of Renewable Energy Growth Surpassing Expectations

The evolution of renewable energy has surpassed all expectations.

Global installed capacity and production from all renewable technologies have increased substantially.

Significant cost reductions for most technologies.

Supporting policies spread throughout the world.

		START 2004	2013	2014
INVESTMENT				
New investment (annual) in renewable power and fuels	billion USD	45	232	270
POWER				
Renewable power capacity (total, not including hydro)	GW	85	560	657
Renewable power capacity (total, including hydro)	GW	800	1,578	1,712
 Hydropower capacity (total)	GW	715	1,018	1,055
 Bio-power capacity	GW	<36	88	93
 Bio-power generation	TWh	227	396	433
 Geothermal power capacity	GW	8.9	12.1	12.8
 Solar PV capacity (total)	GW	2.6	138	177
 Concentrating solar thermal power (total)	GW	0.4	3.4	4.4
 Wind power capacity (total)	GW	48	319	370
HEAT				
 Solar hot water capacity (total)	GW _m	86	373	406
TRANSPORT				
 Ethanol production (annual)	billion litres	28.5	87.8	94
 Biodiesel production (annual)	billion litres	2.4	26.3	29.7

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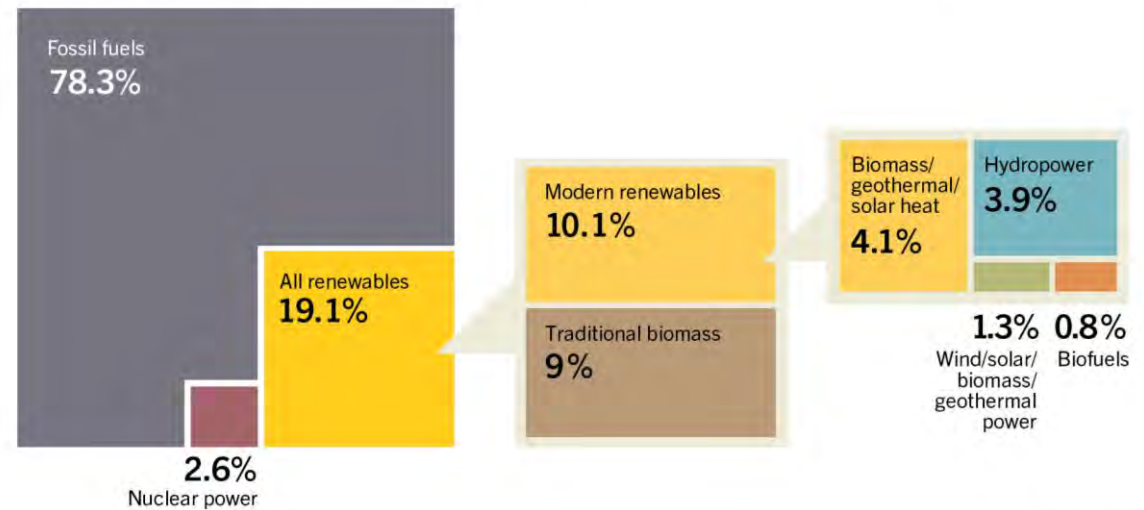
Renewable Energy in the World

Renewable energy provided an estimated **19.1%** of global final energy consumption in 2013.

The share of **modern renewable energy** increased to 10.1%.

The share of **traditional biomass** was of 9%, same as in 2012.

Estimated Renewable Energy Share of Global Final Energy Consumption, 2013



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Renewable Energy “Champions” - annual investment/capacity additions

ANNUAL INVESTMENT / NET CAPACITY ADDITIONS / PRODUCTION IN 2014

	1	2	3	4	5
Investment in renewable power and fuels (not including hydro > 50 MW)	China	United States	Japan	United Kingdom	Germany
Investment relative to annual GDP ¹	Burundi	Kenya	Honduras	Jordan	Uruguay
 Geothermal power capacity	Kenya	Turkey	Indonesia	Philippines	Italy
 Hydropower capacity	China	Brazil	Canada	Turkey	India
 Solar PV capacity	China	Japan	United States	United Kingdom	Germany
 CSP capacity	United States	India	—	—	—
 Wind power capacity	China	Germany	United States	Brazil	India
 Solar water heating capacity ²	China	Turkey	Brazil	India	Germany
 Biodiesel production	United States	Brazil	Germany	Indonesia	Argentina
 Fuel ethanol production	United States	Brazil	China	Canada	Thailand

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Renewable Energy “Champions” – total capacity

TOTAL CAPACITY OR GENERATION AS OF END-2014

	1	2	3	4	5
POWER					
Renewable power (incl. hydro)	China	United States	Brazil	Germany	Canada
Renewable power (not incl. hydro)	China	United States	Germany	Spain / Italy	Japan / India
Renewable power capacity per capita (not incl. hydro)	Denmark	Germany	Sweden	Spain	Portugal
Biopower generation	United States	Germany	China	Brazil	Japan
Geothermal power capacity	United States	Philippines	Indonesia	Mexico	New Zealand
Hydropower capacity ⁴	China	Brazil	United States	Canada	Russia
Hydropower generation ⁴	China	Brazil	Canada	United States	Russia
Concentrating solar thermal power (CSP)	Spain	United States	India	United Arab Emirates	Algeria
Solar PV capacity	Germany	China	Japan	Italy	United States
Solar PV capacity per capita	Germany	Italy	Belgium	Greece	Czech Republic
Wind power capacity	China	United States	Germany	Spain	India
Wind power capacity per capita	Denmark	Sweden	Germany	Spain	Ireland
HEAT					
Solar water collector capacity ²	China	United States	Germany	Turkey	Brazil
Solar water heating collector capacity per capita ²	Cyprus	Austria	Israel	Barbados	Greece
Geothermal heat capacity ³	China	Turkey	Japan	Iceland	India
Geothermal heat capacity per capita ³	Iceland	New Zealand	Hungary	Turkey	Japan

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Power Sector

Estimated Renewable Energy Share of Global Electricity Production, End-2014



Based on renewable generating capacity in operation at year-end 2014.

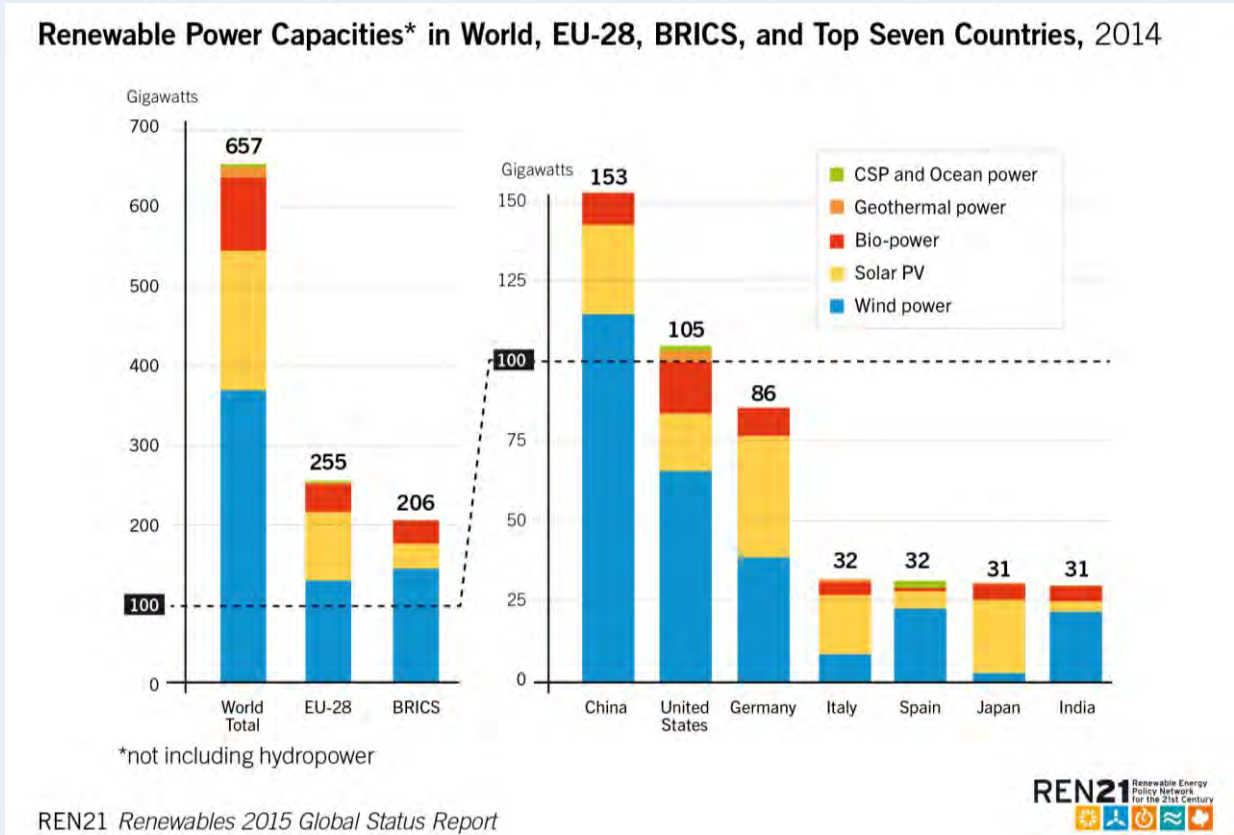
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- Renewables accounted **27.7%** of global power generation capacity and **22.8%** of global electricity demand.
- Renewables made up for **59%** of net additions to global power capacity.
- Total RE power capacity: **1712 GW**, an increase of more than 8.5% over 2013.



Power Sector – total renewable energy power capacity installed



BRICS lead for total RE power capacity (incl. hydro): **38%** of global capacity.

EU leads for non-hydro RE power capacity: **42%** of global capacity

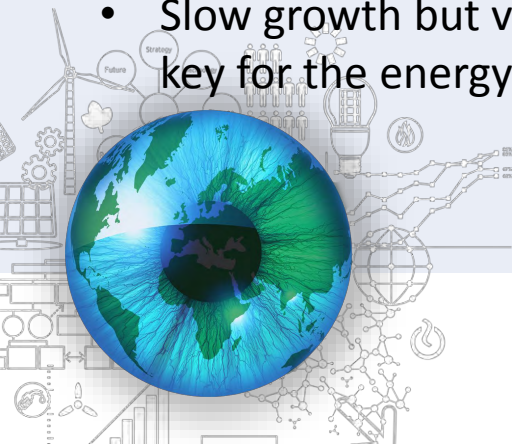
Heating & Cooling

Energy use for heat accounted for about half of total world final energy consumption in 2014.

Small but growing modern renewable energy share of final global heat demand: **approx. 8%.**

Trends:

- Growing interest, although advanced systems represent a small fraction of the global market
- Slow growth but vast potential—key for the energy transition



Transport

Renewable energy accounted for an estimated **3.5%** of global energy demand for road transport in 2013, up from **2%** in 2007.

Trends in the development of **gaseous fuels** and electricity continued to create pathways for the integration of renewables into transportation.

Growing interest in new applications and markets for biofuels.



Hydropower - global capacity

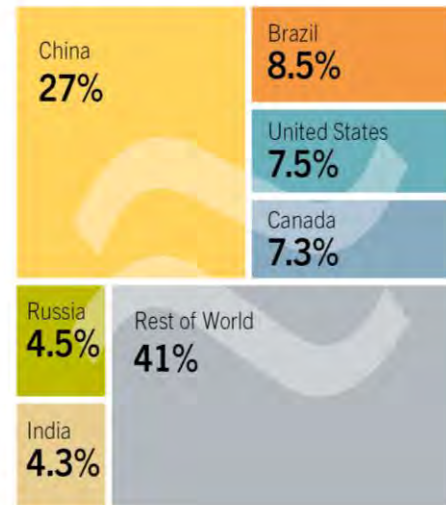
Total global hydropower capacity:
1,055 GW

37GW of new capacity were commissioned in 2014, presenting a **3.6%** increase

Steady industry growth, driven by:

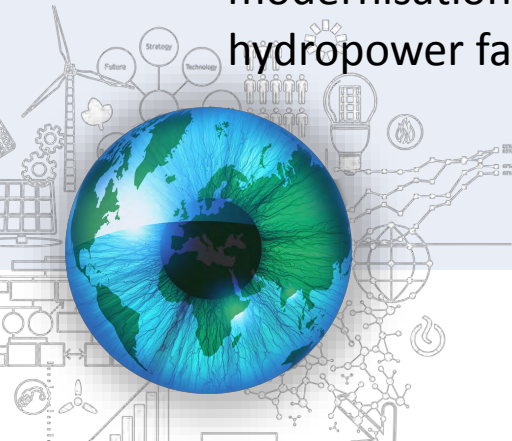
- China's expansion
- modernisation of ageing hydropower facilities.

Hydropower Global Capacity, Shares of Top Six Countries and Rest of World, 2014



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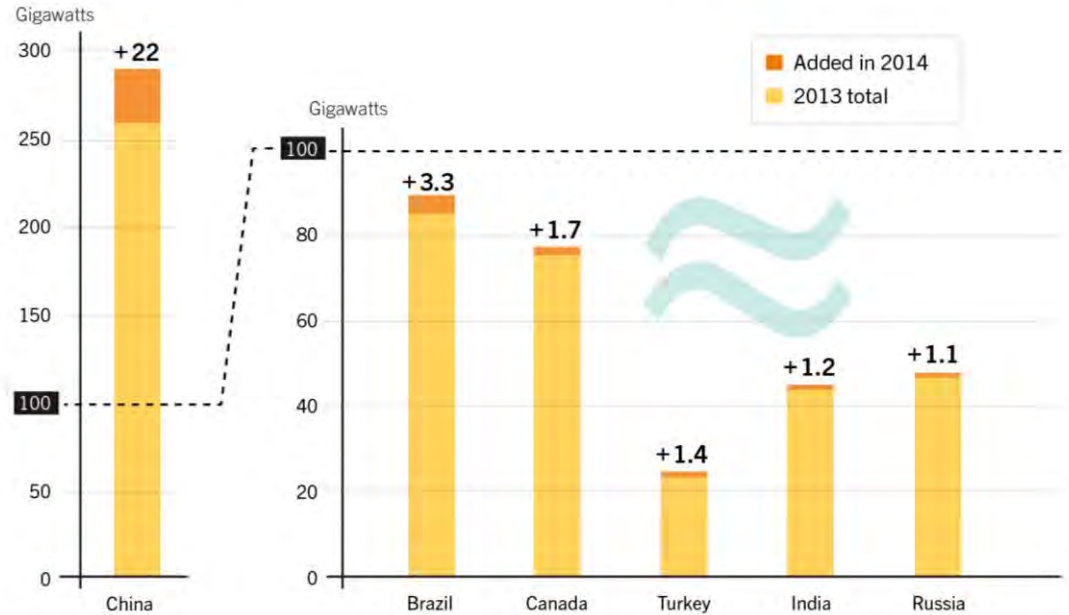


Hydropower – top countries (capacity & additions)

China added the most capacity: **+22 GW**.

Significant capacity was also added in **Turkey, Brazil, Vietnam, India, and Russia**.

Hydropower Capacity and Additions, Top Six Countries for Capacity Added, 2014



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Solar Photovoltaics (PV) – total global capacity

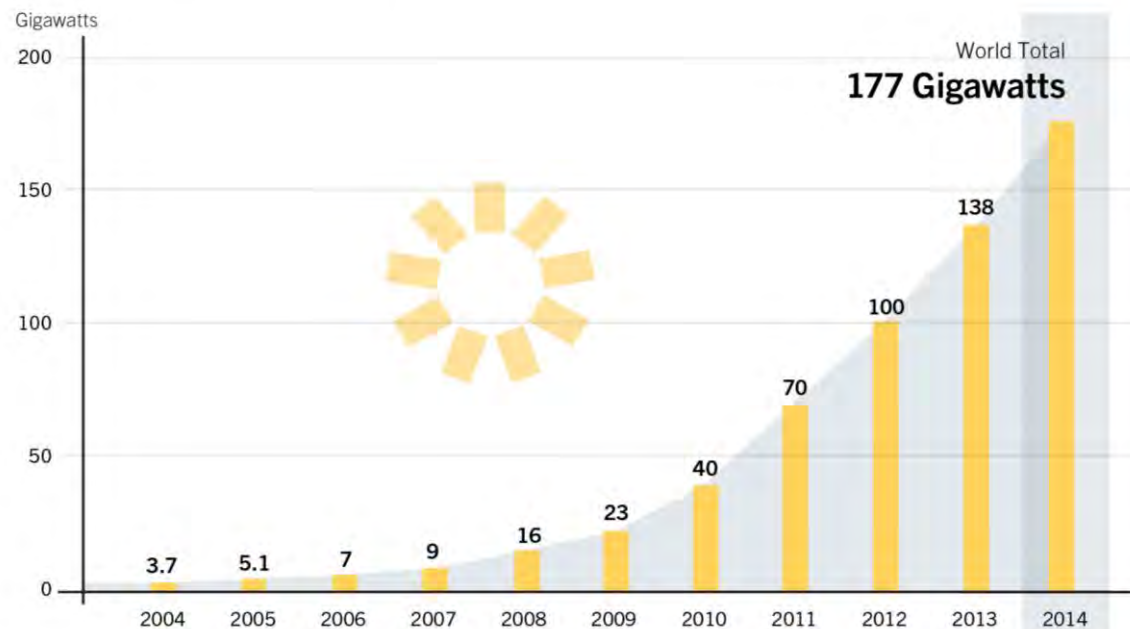
Solar PV:

- **+40 GW** added
- Total capacity: **177 GW**

More than 60% of all PV capacity in operation worldwide at the end of 2014 was **added over the past three years**.

Asia eclipsed all other markets, accounting for almost **60% of global additions**.

Solar PV Global Capacity, 2004–2014



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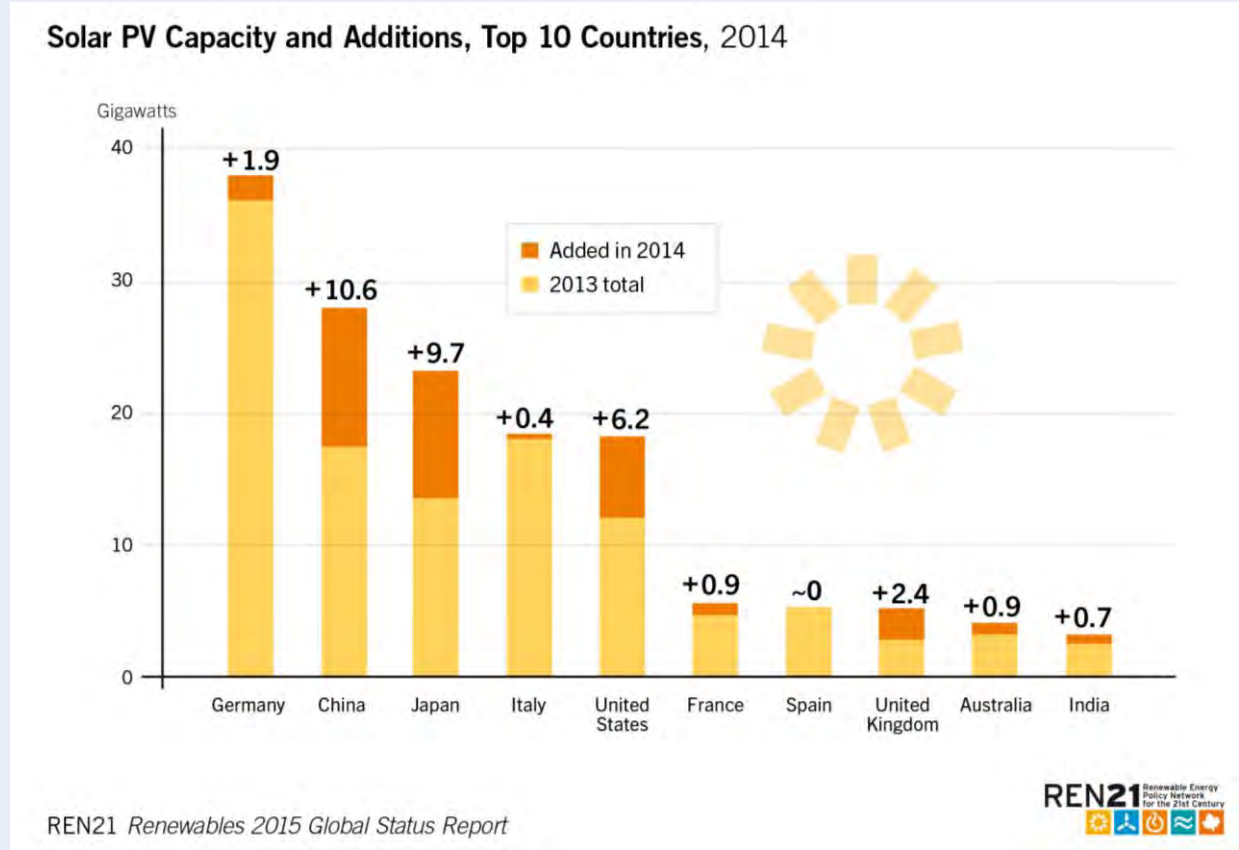
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Solar Photovoltaics (PV) – top countries

China accounted for a **third** of global capacity additions, followed by Japan & the U.S

Annual investment/net capacity additions in 2014:

- China
- Japan
- United States
- Germany
- United Kingdom



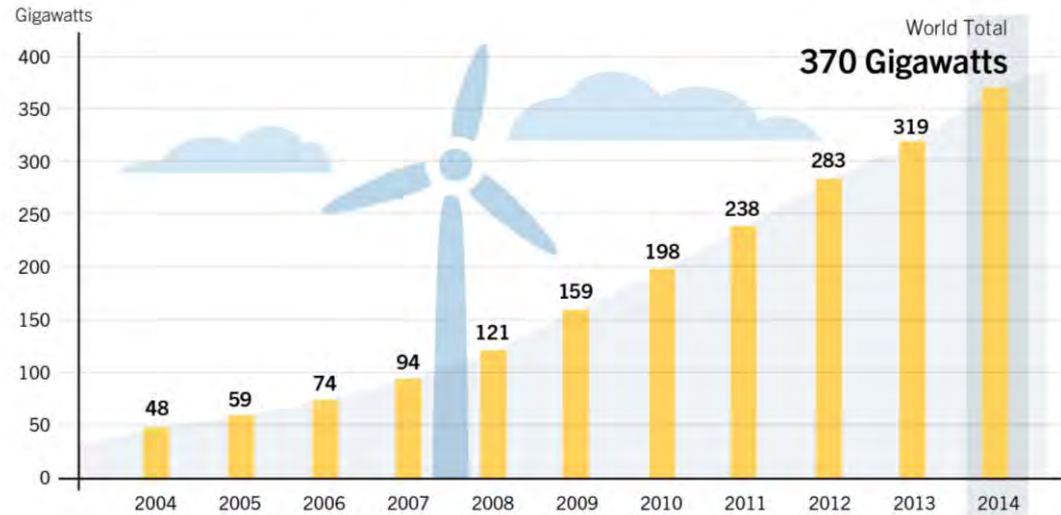
Wind Power – total world capacity

51 GW of capacity were added

Total capacity: **370 GW**

Offshore, an estimated **1.7 GW** of grid-connected capacity was added in 2014, for a world total exceeding **8.5 GW**

Wind Power Global Capacity, 2004–2014



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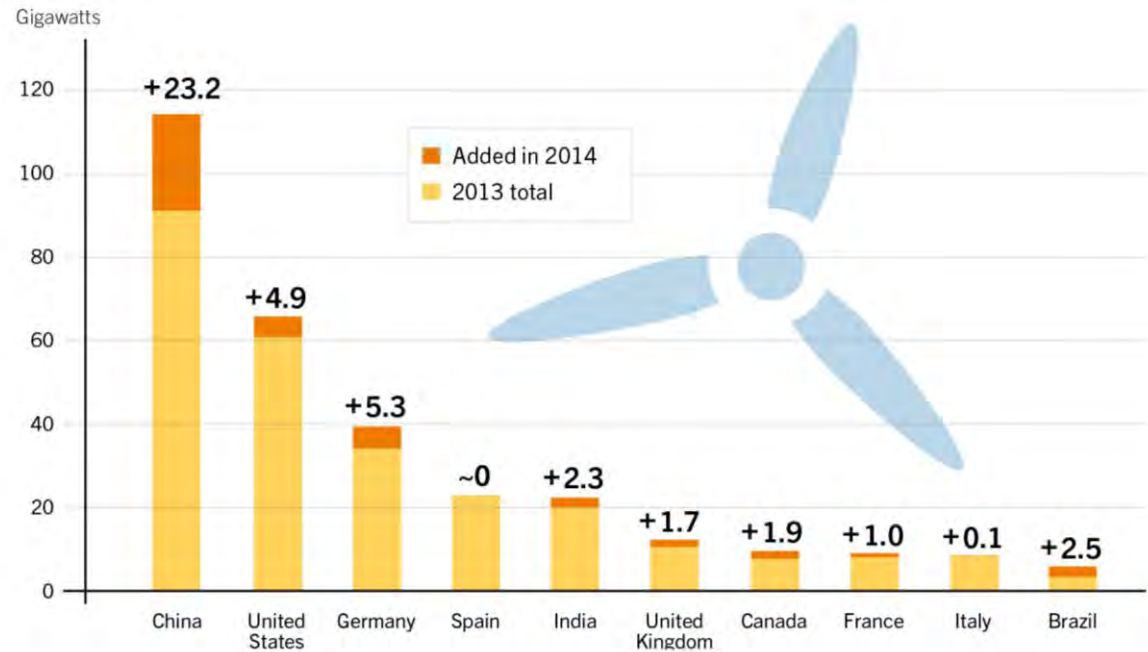


Wind Power Capacity & Additions

Europe remained top region, closely followed by Asia – China adding 23.2 GW in 2014

Wind became **cost competitive** in many markets (falling capital costs, technology advances)

Wind Power Capacity and Additions, Top 10 Countries, 2014



Additions are net of repowering.

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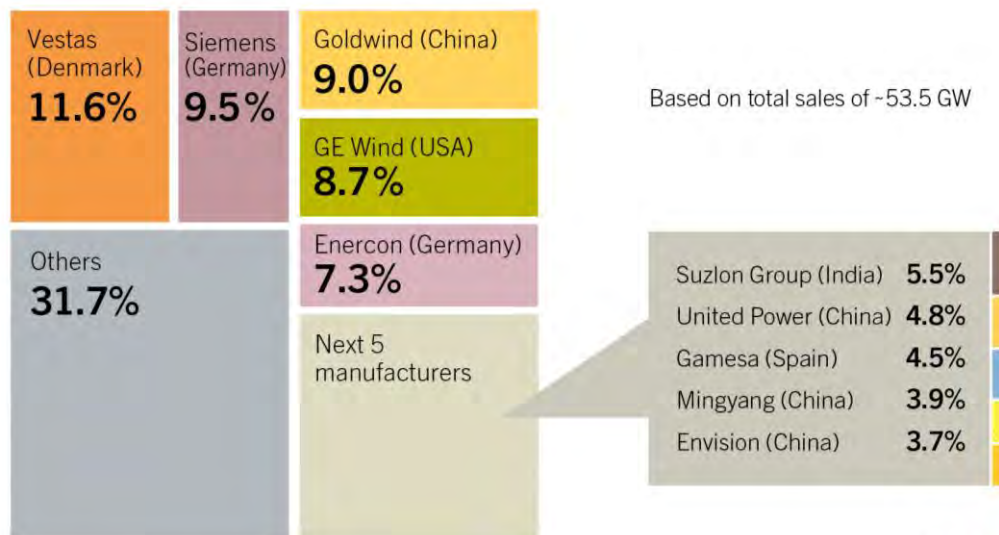


Wind Power – market shares of Top 10 wind turbine manufacturers

Wind generated **156.3 TWh** in 2014, accounting for **2.8%** of China's total electricity generation (up from 2.6% in 2013)

Globally, wind power capacity by the end of 2014 was enough to meet at **least 3.1%** of total electricity consumption.

Market Shares of Top 10 Wind Turbine Manufacturers, 2014



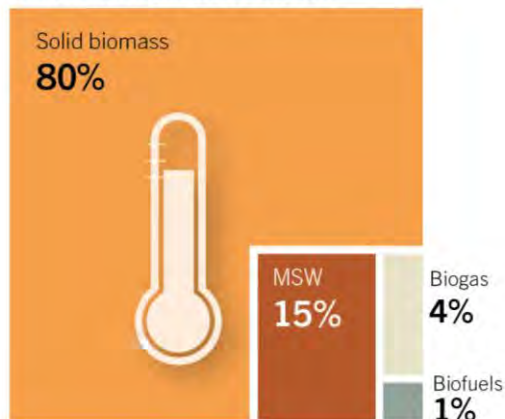
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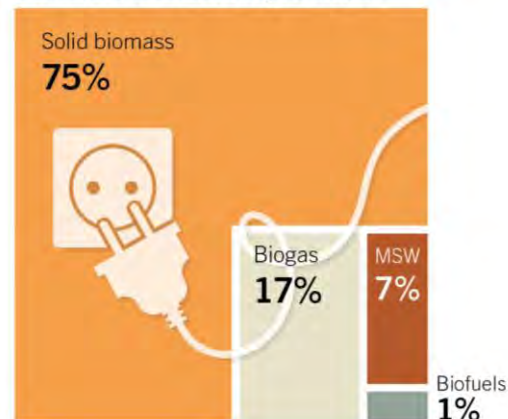
Bioenergy

Shares of Biomass Sources in Global Heat and Electricity Generation, 2014

Biomass Sources in **Heat Generation**



Biomass Sources in **Electricity Generation**



Solid biomass shares include both traditional and modern bioenergy from fuelwood, bagasse, black liquor, animal waste, and others.

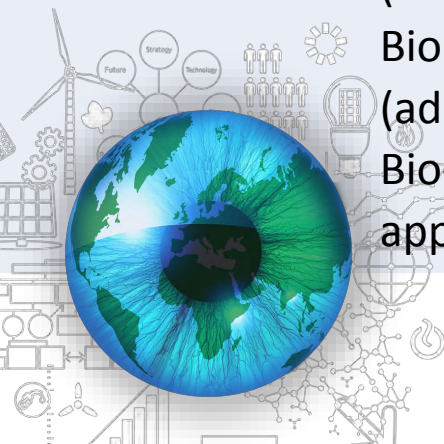
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Total primary energy demand from biomass was approximately **16,250 TWh** (58.5 EJ).

Biomass was used to produce an estimated **12,500 TWh** (45 EJ) of heat (addition of 9GWth).

Bio-power capacity increased by an estimated **5 GW** in 2014 to a total of approx. 93 GW.



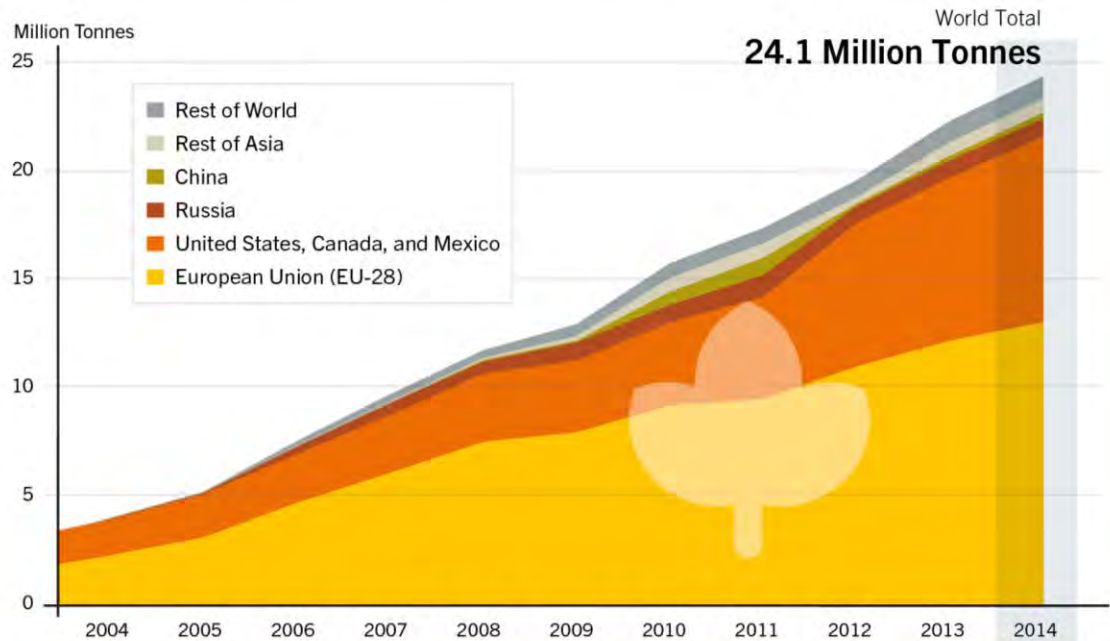
Bioenergy

Demand from modern biomass, such as wood pellets increased international trade

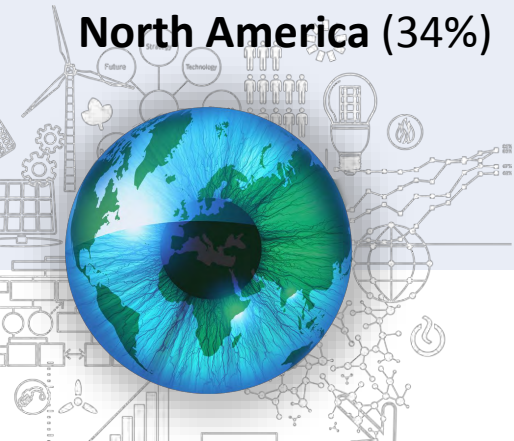
Global production of wood pellets rose by 9% to just over 24 million tonnes

Main wood pellet producing regions continue to be **Europe (62%)** and **North America (34%)**

Wood Pellet Global Production, by Country or Region, 2004–2014



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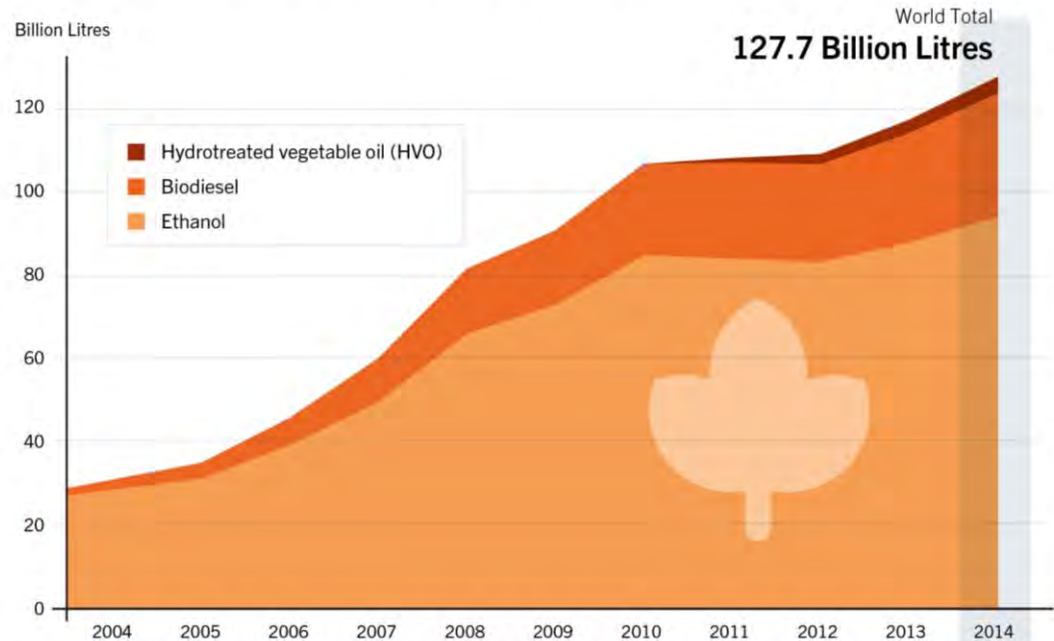
Bioenergy – liquid biofuels

The top countries for total production of biofuels were the **United States, Brazil, Germany, China, and Argentina.**

Global biofuel production increased **8%** in 2014, to a total of **127.7 billion litres**

Global investment in biofuels production capacity continued **to fall in 2014, down 8%** from 2013 and reaching a near 10-year low of **USD 5.1 billion.**

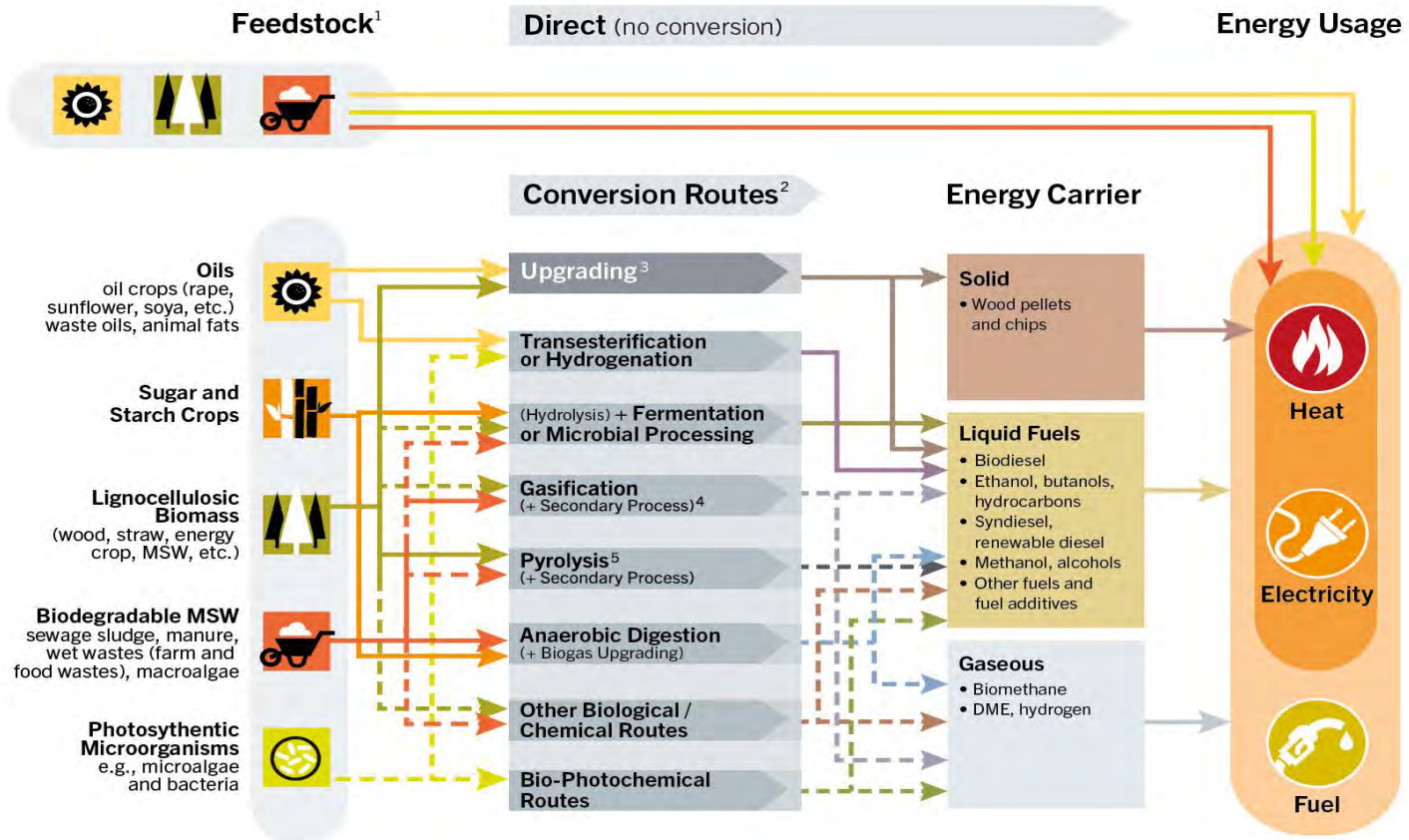
Ethanol, Biodiesel, and HVO Global Production, 2004–2014



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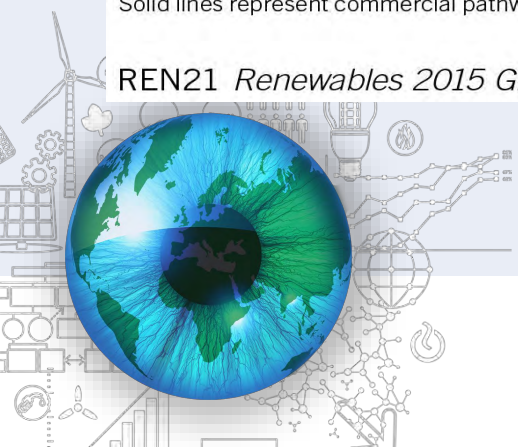


Bioenergy Conversion Pathways



Solid lines represent commercial pathways, and dotted lines represent developing bioenergy routes.

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Concentrating Solar Power (CSP) – global capacity

Total CSP capacity: **4.4 GW**

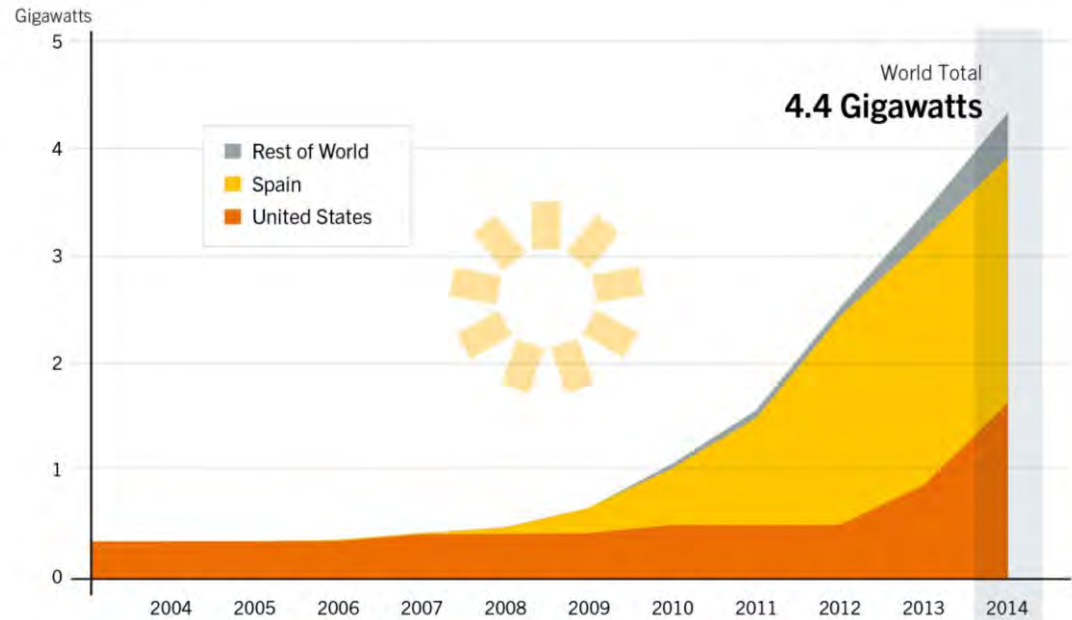
With **+0.9 GW** added, this represents an increase of **27%**.

Trends:

Markets continue to shift to **developing countries**.

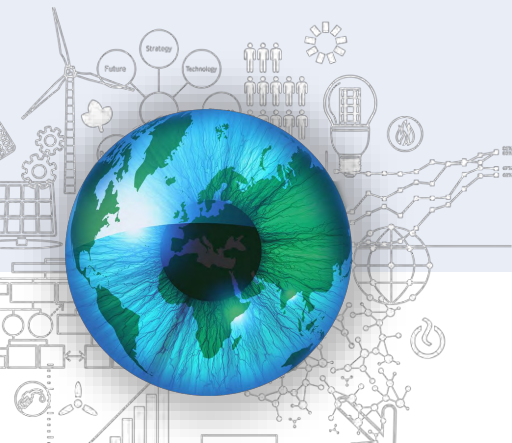
Diversification of the CSP technology landscape

Concentrating Solar Thermal Power Global Capacity, by Country or Region, 2004–2014



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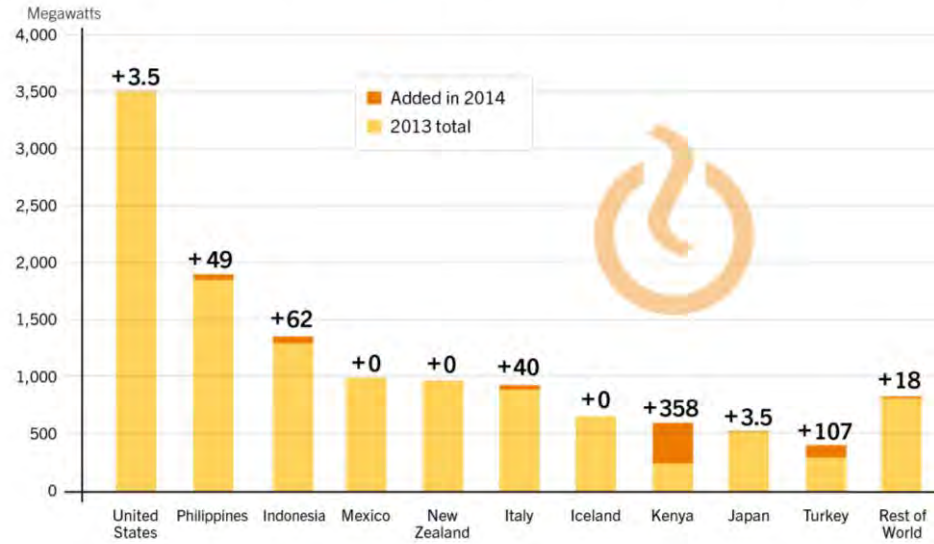
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Geothermal Energy

About **650 MW** net additions came on line, bringing total global geothermal capacity to **12.8 GW**

Geothermal electricity generation is estimated to be half of the total final geothermal output (**74 TWh**)

Geothermal Power Capacity and Additions, Top 10 Countries and Rest of World, 2014



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Geothermal Energy

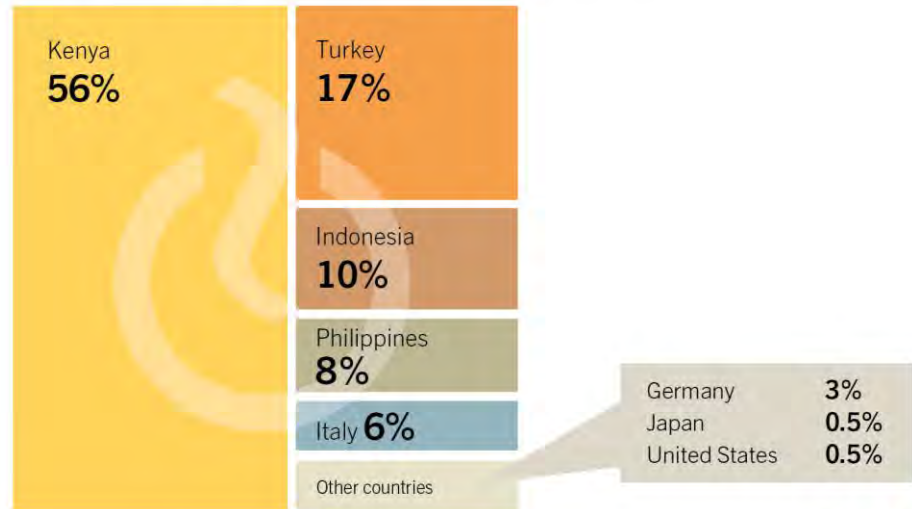
Countries that added capacity in 2014 were:

Kenya, Turkey, Indonesia, the Philippines, Italy, Germany, the United States, and Japan

Lead countries for geothermal electric generating capacity:

- United States (3.5 GW)
- Philippines (1.9 GW)
- Indonesia (1.4 GW)
- Mexico (1.0 GW)
- New Zealand (1.0 GW)
- Italy (0.9 GW)

Geothermal Power Global Capacity Additions, Share by Country, 2014



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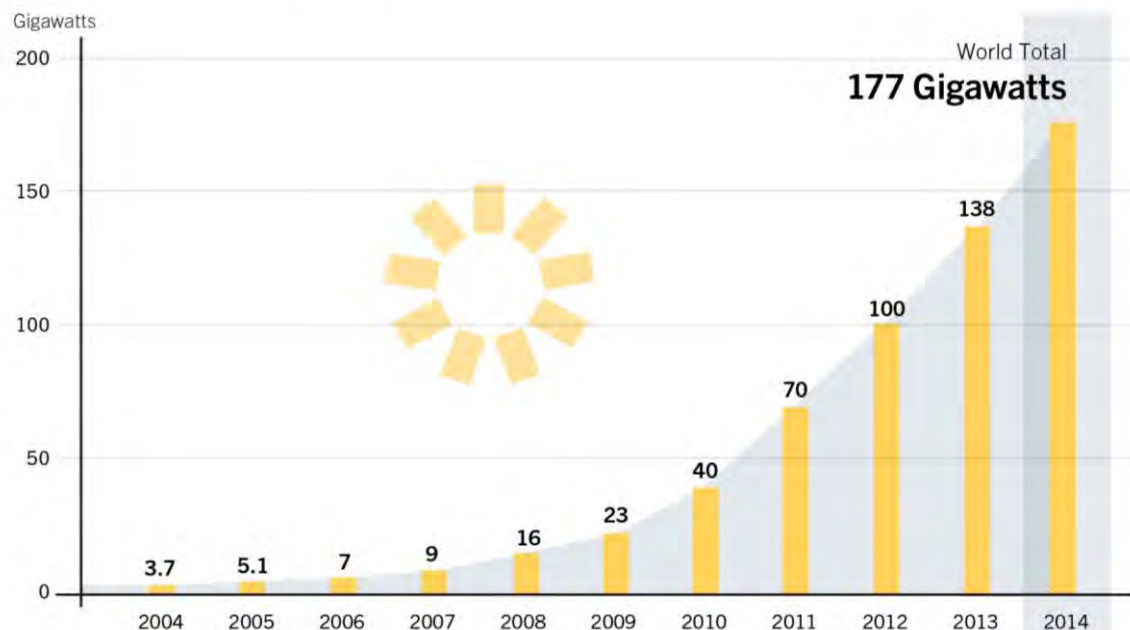
Solar Thermal Heating & Cooling

Cumulative capacity of all collector types in operation rose by a net **44 GWth** for a year-end total of **374.7 GWth**

2014 Trends:

- focus on glazed water collectors
- slowdown in market growth continued in 2014
- China seeing a trend away from market to commercial

Solar PV Global Capacity, 2004–2014



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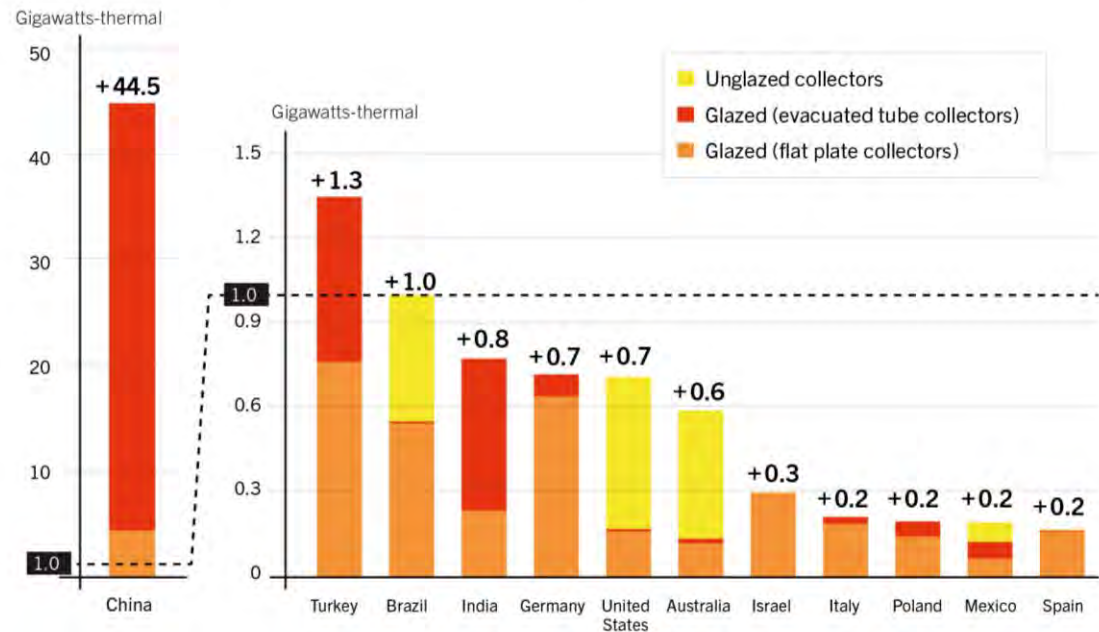


Solar Thermal Heating & Cooling – additions

China maintained multi-year lead in the global solar heating industry

China added a capacity of **36.7 GW_{th}** of collectors

Solar Water Heating Collectors Additions, Top 12 Countries for Capacity Added, 2013



Additions represent gross capacity added.

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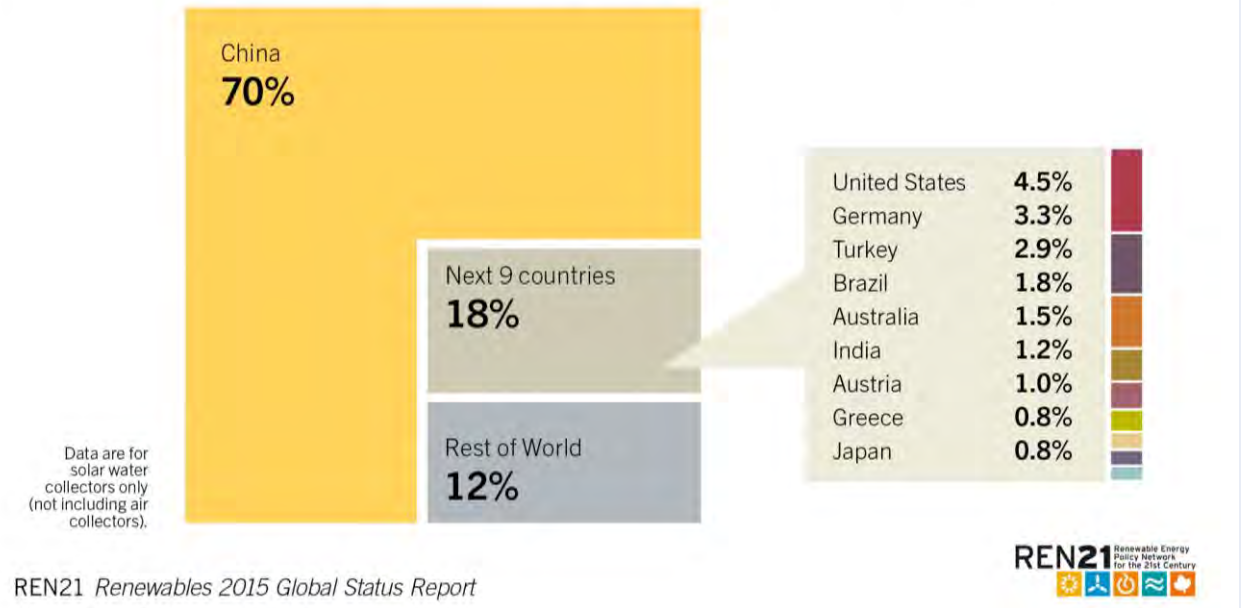
Solar Thermal Heating & Cooling – global capacity

China accounts for nearly **81%** of the global market.

Total solar water heating capacity per capita:

1. Cyprus
2. Austria
3. Israel
4. Barbados
5. Greece

Solar Water Heating Collectors Global Capacity, Shares of Top 10 Countries and Rest of World, 2013



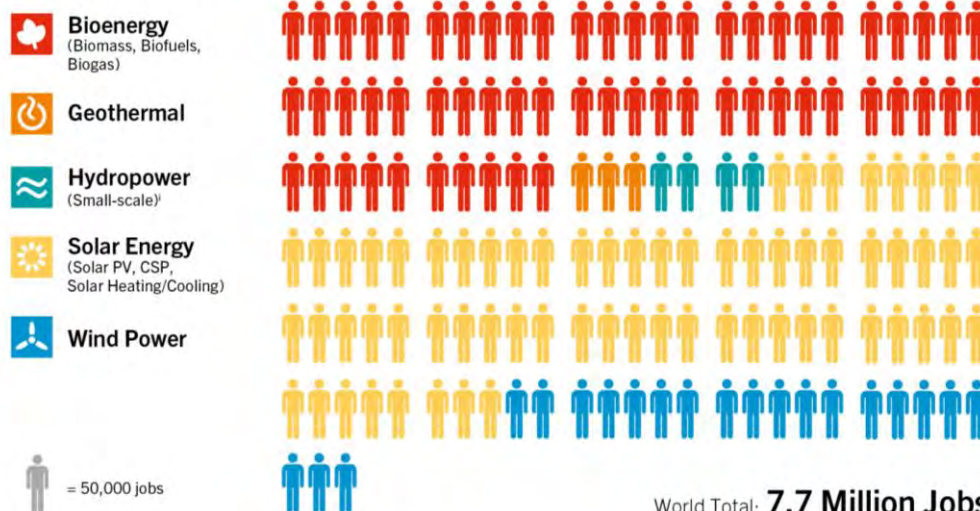
Jobs in Renewable Energy

Global employment continued to increase

An estimated **7.7 million** direct or indirect jobs in the renewable energy industry

Global wind power employment crossed the 1 million jobs threshold in 2014

Jobs in Renewable Energy, 2014



i - Employment information for large-scale hydropower not included.

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Source: IRENA



Global Investment in Renewable Energy

Global new investment estimated **USD 270.2 billion in 2014**

(including hydropower USD 301 billion)

Reasons for the increase:

- Increase in solar power installations in China and Japan
- Investment in solar power up **25%**
- Record investment in offshore wind projects in Europe

Global New Investment in Renewable Power and Fuels, Developed and Developing Countries, 2004–2014

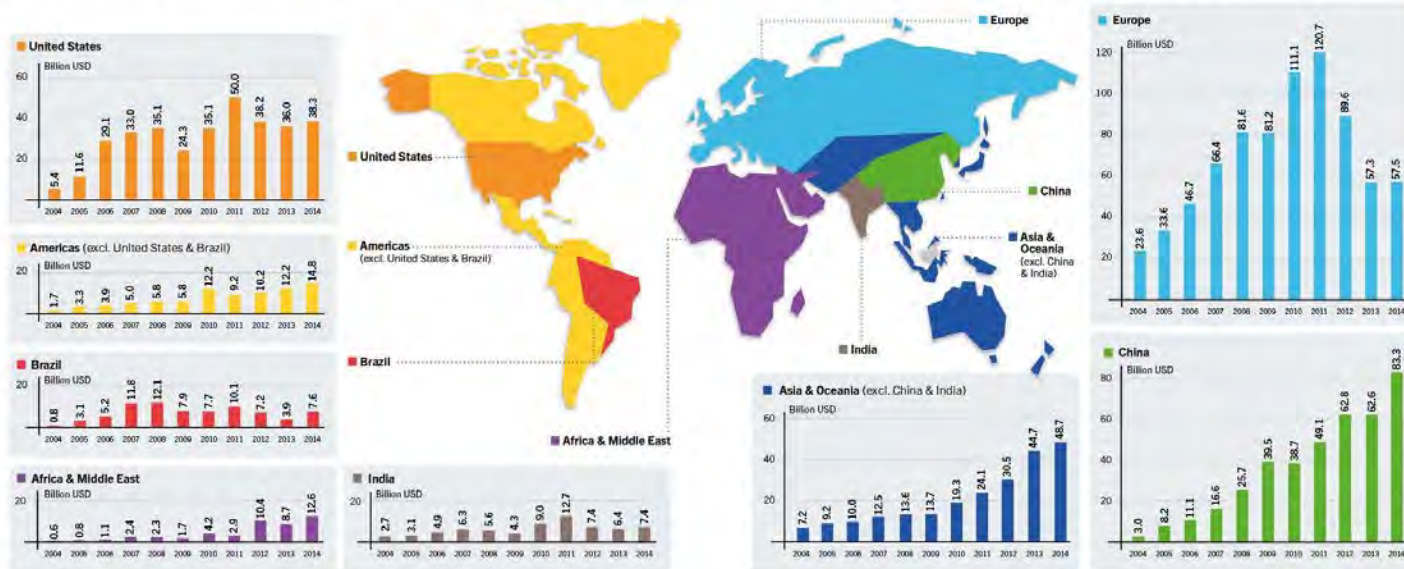


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Source: Frankfurt School–UNEP and BNEF



Global New Investment in Renewable Power and Fuels, by Region, 2004–2014



Data include government and corporate R&D.

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Source: Frankfurt School–UNEP and BNEF



Developed Countries: Annual investment in 2014: **USD 138.9 billion**
(increase of 3 % compared to 2013)

Developing Countries: annual investment in 2014: **USD 131.3 billion**
(increase of 36% compared to 2013)

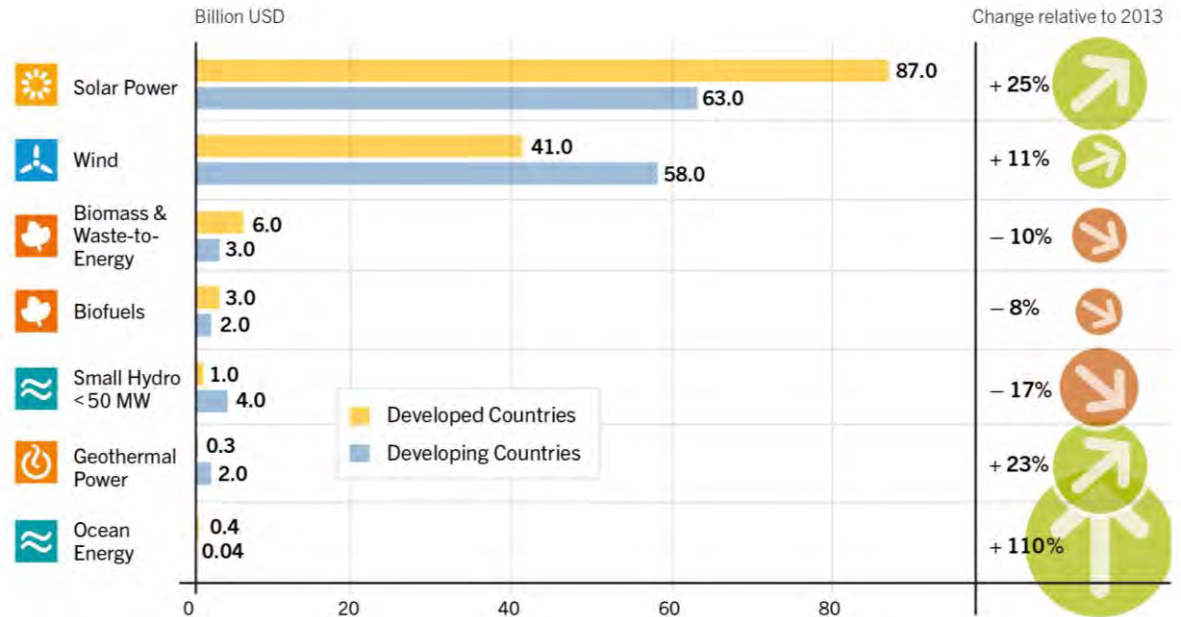


Global Investment in Renewable Energy by Technology

Solar power - leading sector for money committed during 2014, receiving more than **55%** (USD 149.6 billion) of total new investment in renewable power and fuels

Wind power followed with **USD 99.5 billion**

Global New Investment in Renewable Energy by Technology, Developed and Developing Countries, 2014



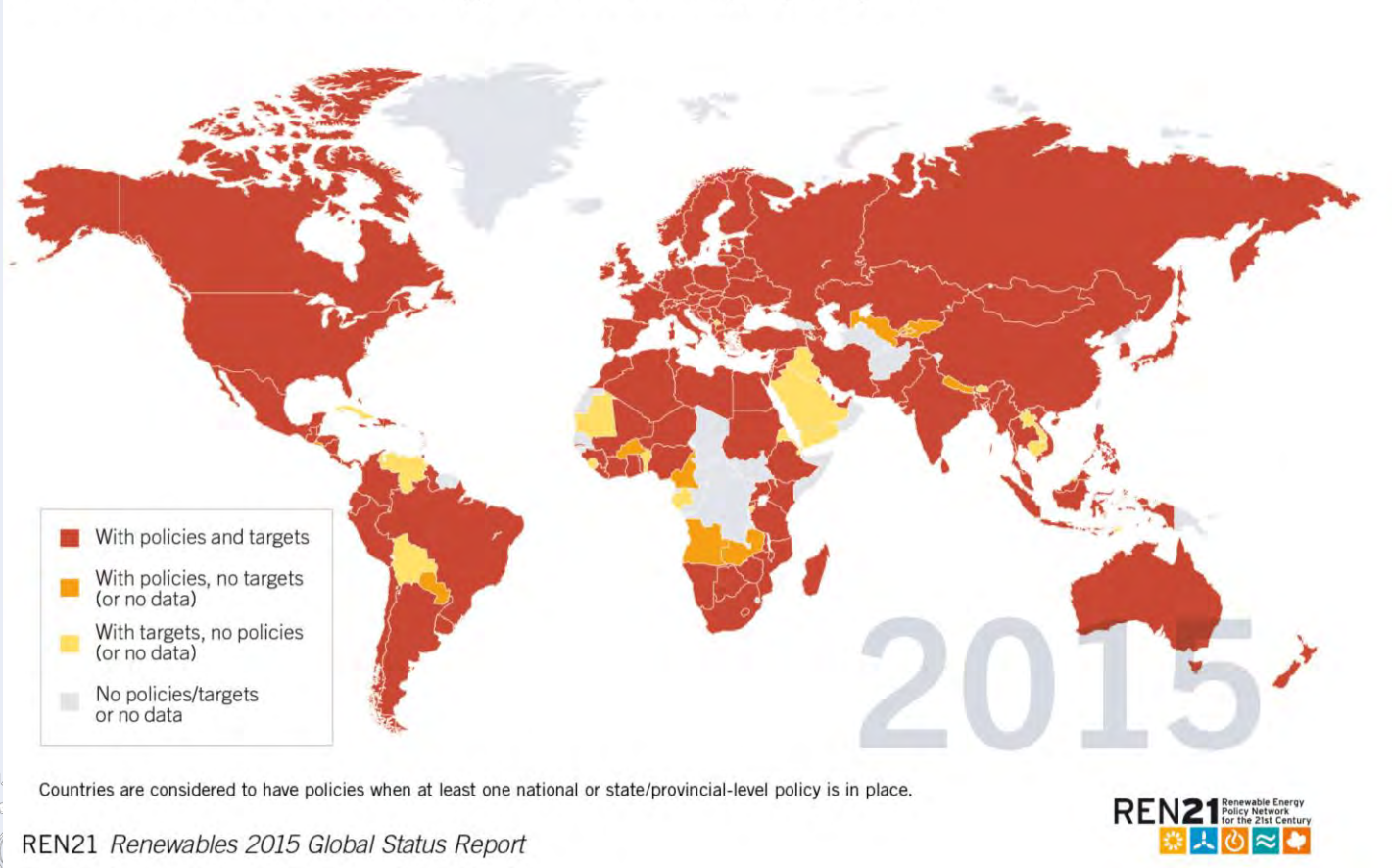
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Source: Frankfurt School-UNEP and BNEF

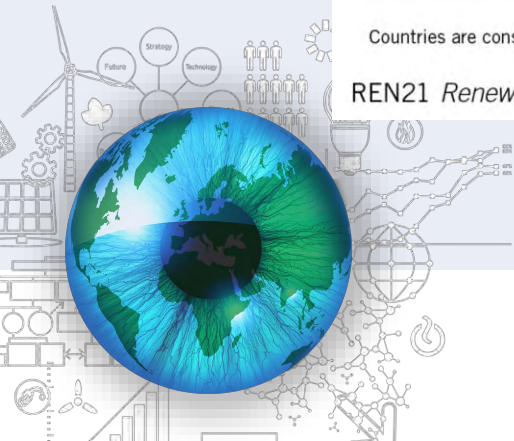


Renewable Energy Policy Landscape

Countries with Renewable Energy Policies and Targets, Early 2015



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Renewable Energy Policy Landscape

		START 2004 ¹	2013	2014
POLICIES				
Countries with policy targets	#	48	144	164
States/provinces/countries with feed-in policies	#	34	106	108
States/provinces/countries with RPS/quota policies	#	11	99	99
Countries with tendering/ public competitive bidding ⁵	#	n/a	55	60
Countries with heat obligation/mandate	#	n/a	19	21
States/provinces/countries with biofuels mandates ⁶	#	10	63	64

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At least **164 countries** had **renewable energy targets**.

At least **145 countries** had **renewable energy policies** in place.

Most policies focus on power: mainly feed-in-tariffs and renewable portfolio standards.

Recent trends: Merging of components from different policy mechanisms.



Renewable Energy Policy Landscape

Number of Countries with Renewable Energy Policies, by Type, 2011–Early 2015

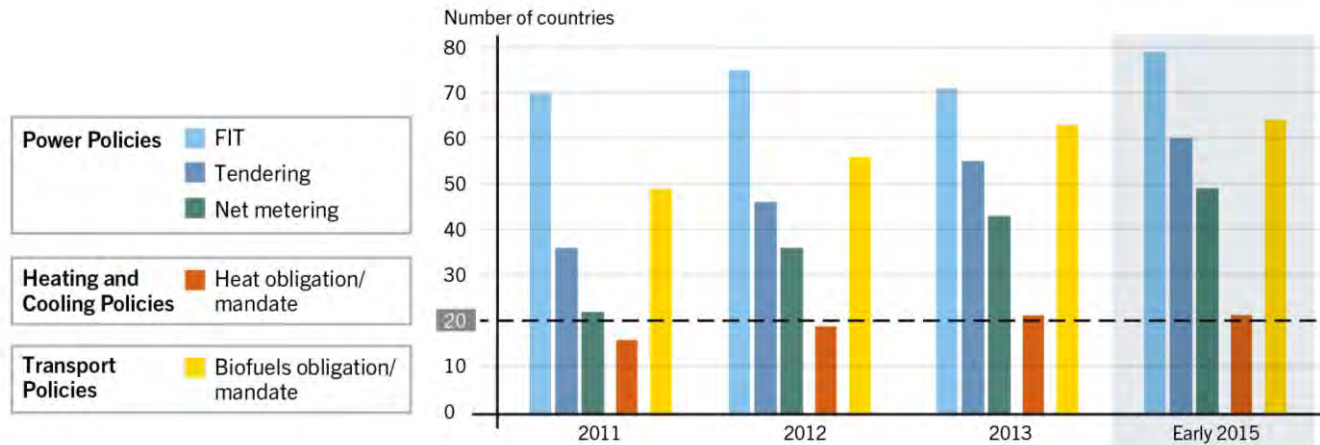


Figure does not show all policy types in use.
Countries are considered to have policies when at least one national or state/provincial-level policy is in place.

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Power sector: the main focus of policies over the last years

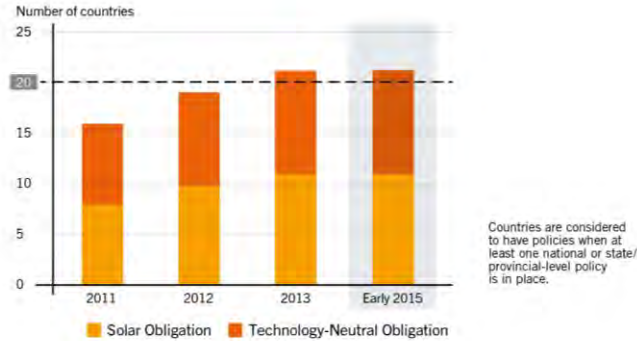
FITs were the most popular type of policy

Net metering or net billing policies were in force in 48 countries as of early 2015, increase of approx. 220% . (2010: 15 countries, 2015: 48 countries)



Renewable Energy Policy Landscape

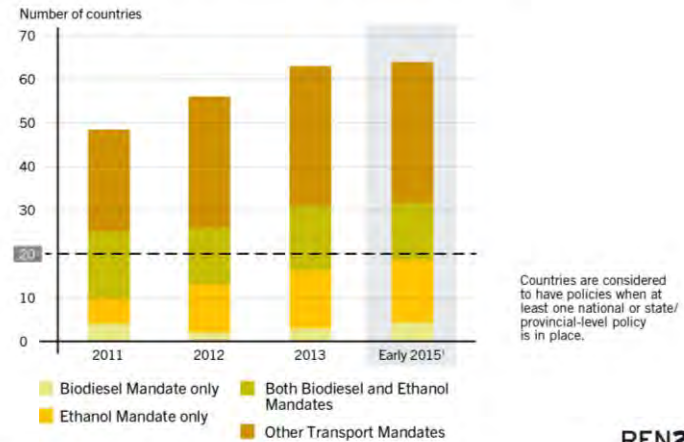
Number of Countries with Renewable Energy Heating and Cooling Obligations, by Type, 2011–Early 2015



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Number of Countries with Renewable Energy Transport Obligations, by Type, 2011–Early 2015



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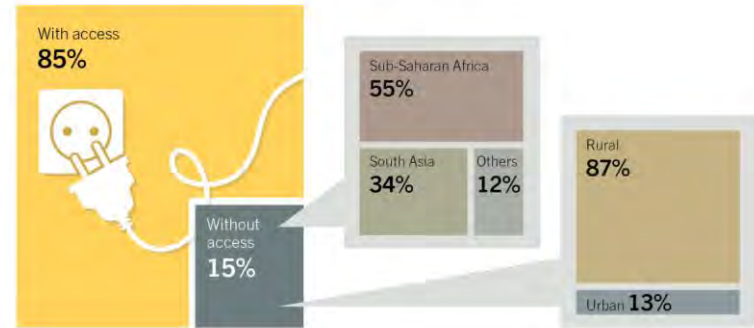
Distributed Renewable Energy in Developing Countries

15% of the global population still lack electricity access

Distributed renewable energy systems offer unprecedented opportunity to accelerate the transition to modern energy services in remote areas and new markets, as they are **more cost-competitive**.

Little quantitative information on DRE markets, but information available indicates that **markets are significant**, e.g. **off-grid solar PV** attracted approx. **USD 64 billion of investment in 2014**.

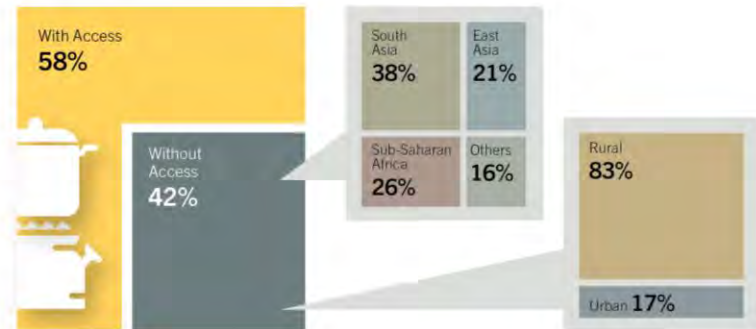
World Electricity Access and Lack of Access by Region, 2012



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World Clean Cooking Access and Lack of Access by Region, 2012



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Conclusions

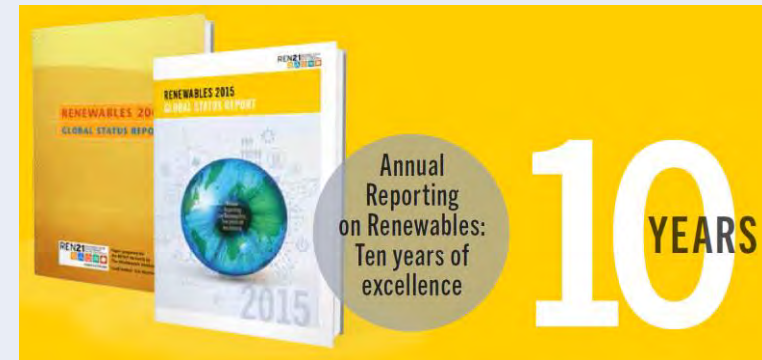
Renewable energy continued to grow in 2014 against the backdrop of increasing global energy consumption, and a dramatic decline in oil prices during the second half of the year.

For the first time in 40 years, economic and CO₂ growth has “decoupled” – marking a record year for renewables.

The past decade has set the wheels in motion for a global transition to renewables, but a concerted and sustained effort is needed to achieve it:

- Long-term and stable policy frameworks, which can adapt to changing environment, to sustain and increase investment levels
- Greater attention to the heating and cooling and the transport sector and “energy system thinking”
- Improve information on distributed renewable energy markets in developing countries and improve access to up-front finance

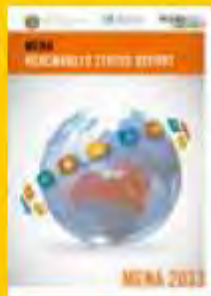
See you at SAIREC 2015
Cape Town, 4-7 October 2015



RENEWABLE ENERGY POLICY NETWORK FOR THE 21st CENTURY



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