RENEWABLES 2019
GLOBAL STATUS REPORT

ISES Webinar

Duncan Gibb
GSR Project Manager and Analyst

26 June 2019
REN21 Secretariat
gsr@ren21.net

2019

REN21 – A global policy network providing timely information to shape the energy debate.

Who we are…

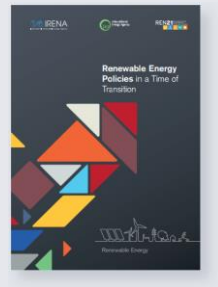
What we do…

Global Status Report: yearly publication since 2005

Renewables in Cities Global Status Report

Regional Reports

Global Futures Reports



Thematic Reports

REN21 ACADEMY

KIREC SEOUL 2019

23-25 October 2019

Renewables Global Status Report

Collaborative annual reporting since 2005 building on an **international expert community.**

The report features:

01. Global Overview
02. Policy Landscape
03. Market & Industry Trends
04. Distributed Renewables for Energy Access
05. Investment Flows
06. Energy Systems Integration and Enabling Technologies
07. Energy Efficiency
08. Feature: Renewable Energy in Cities

Over
1,500
experts have contributed to the GSR since its start in 2005.

70%
of these experts have participated in more than one GSR.

Over
350
experts contributed to GSR 2019, working alongside an international authoring team and the REN21 Secretariat.

45%
of these were new experts.

Another strong year for renewable energy

- Total global capacity rose **8%** in 2018
  - 2,378 GW capacity including hydropower
- **181 GW** of renewable power additions
- Non-hydropower capacity grew 15%
  - 1,246 GW by the end of 2018
- Global reach of renewable power
  - over 90 countries have more than 1 GW
  - over 30 countries have more than 10 GW

RENEWABLE ENERGY INDICATORS 2018

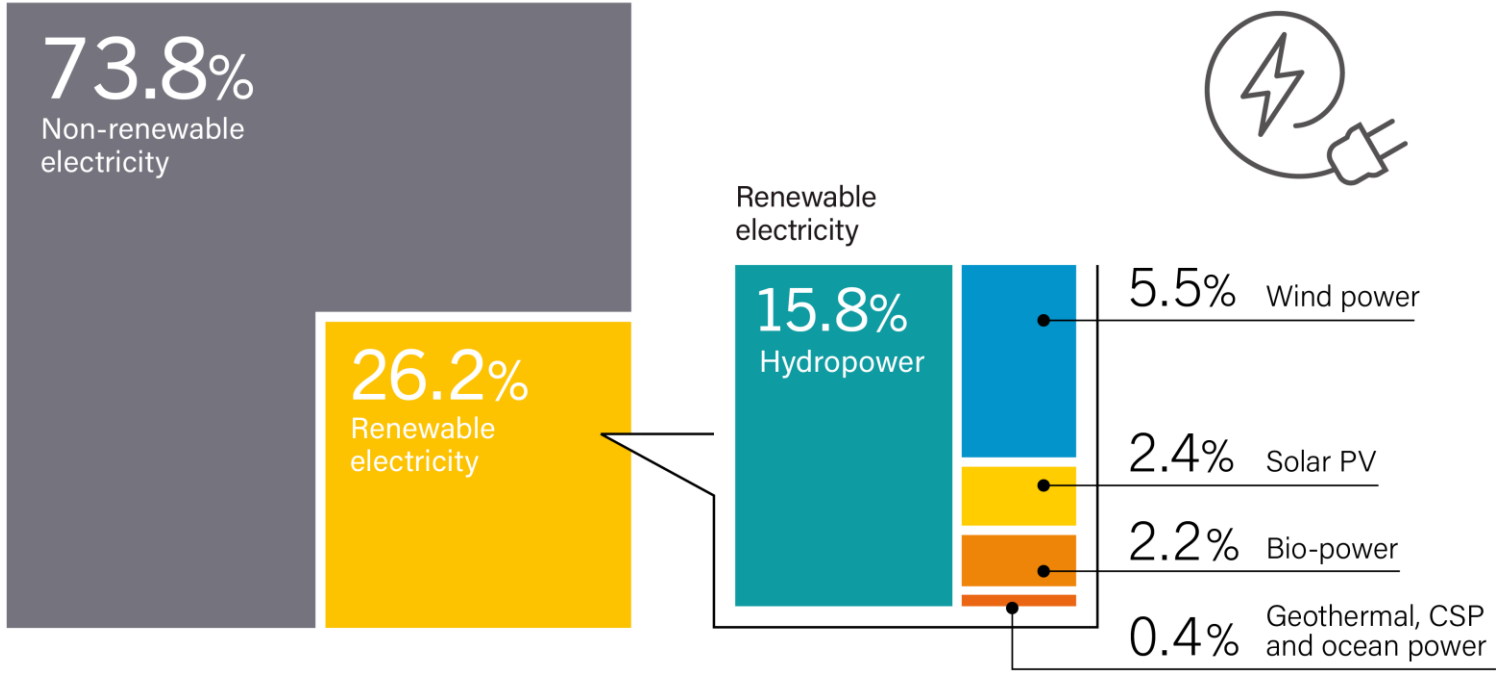
		2017	2018
INVESTMENT			
New investment (annual) in renewable power and fuels[1]	billion USD	326	**289**
POWER			
Renewable power capacity (including hydropower)	GW	2,197	**2,378**
Renewable power capacity (not including hydropower)	GW	1,081	**1,246**
Hydropower capacity[2]	GW	1,112	**1,132**
Wind power capacity	GW	540	**591**
Solar PV capacity[3]	GW	405	**505**
Bio-power capacity	GW	121	**130**
Geothermal power capacity	GW	12.8	**13.3**
Concentrating solar thermal power (CSP) capacity	GW	4.9	**5.5**
Ocean power capacity	GW	0.5	**0.5**
Bioelectricity generation (annual)	TWh	532	**581**
HEAT			
Solar hot water capacity[4]	GW_{th}	472	**480**
TRANSPORT			
Ethanol production (annual)	billion litres	104	**112**
FAME biodiesel production (annual)	billion litres	33	**34**
HVO biodiesel production (annual)	billion litres	6.2	**7.0**

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Power sector leading: Renewables supply more than 26% of global electricity

- Renewables supplied an estimated **26.2%** of global electricity at the end of 2018
- For the first year, more electricity suppled by solar PV than bio-power
- Strong growth in renewable generation, but rising electricity demand (**up 4% in 2018**) makes it challenging to achieve larger share

Estimated Renewable Energy Share of Global Electricity Production, End-2018

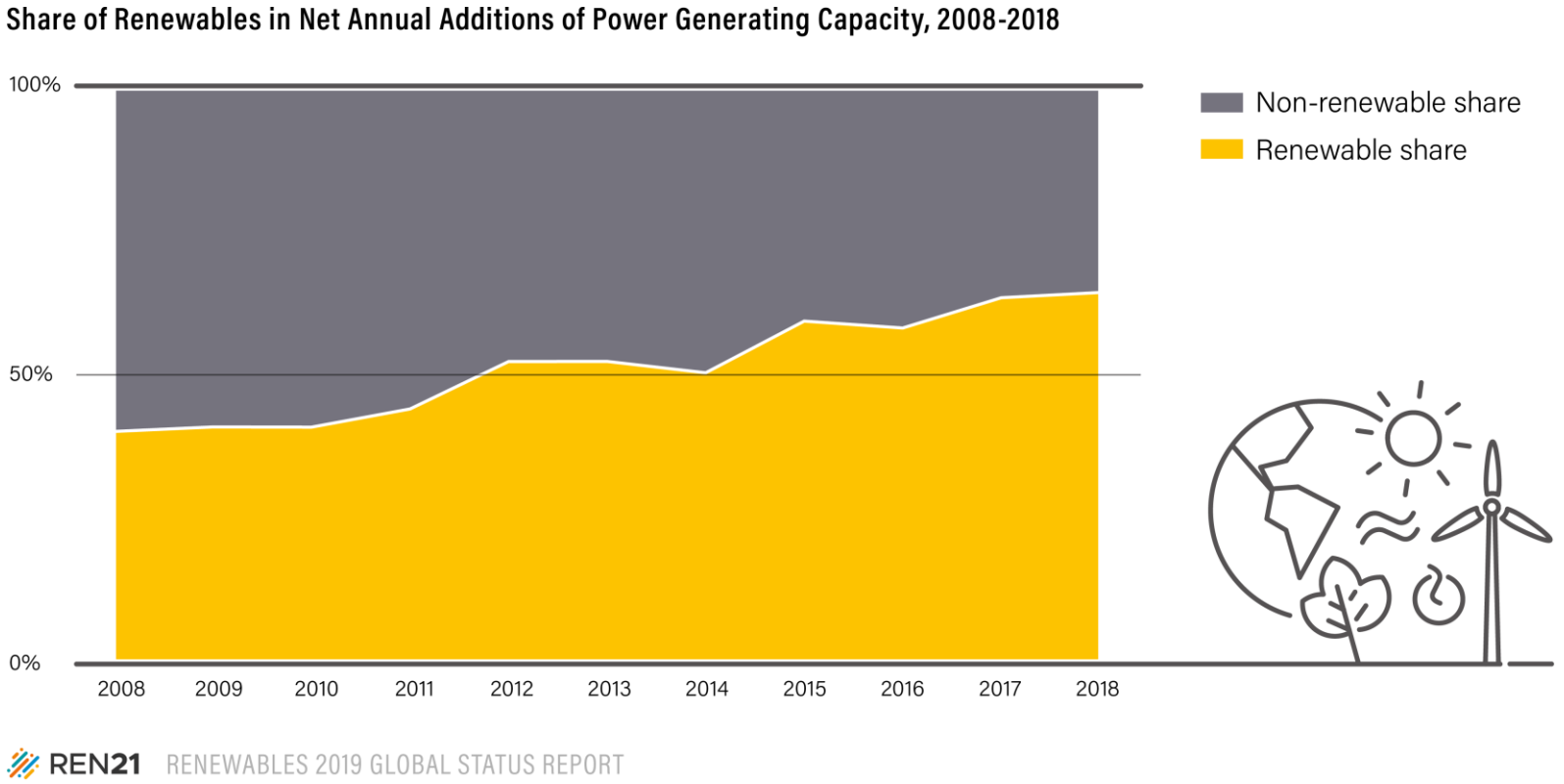


Note: Data should not be compared with previous version of this figure due to revisions in data and methodology.

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

More renewable power capacity added than fossil fuel and nuclear power

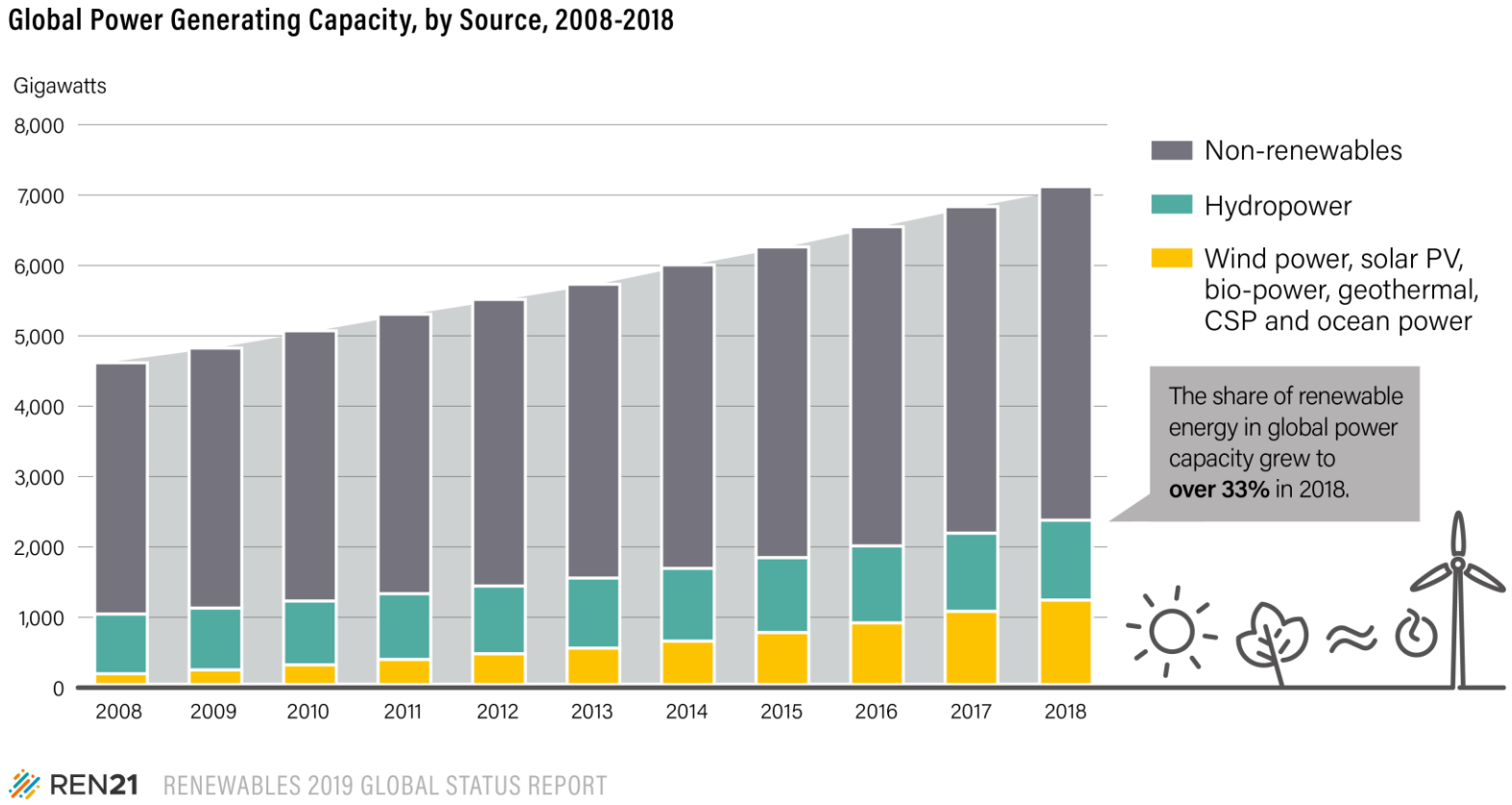
- In 2018, nearly twice as much renewable power capacity added as all other sources, **the highest share ever at 64%**
- Fourth consecutive year that net additions of renewable power were well above 50%
- 2011 was the last year that clearly more non-renewable capacity was added than renewable



REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Renewable power now makes up over one-third of global capacity

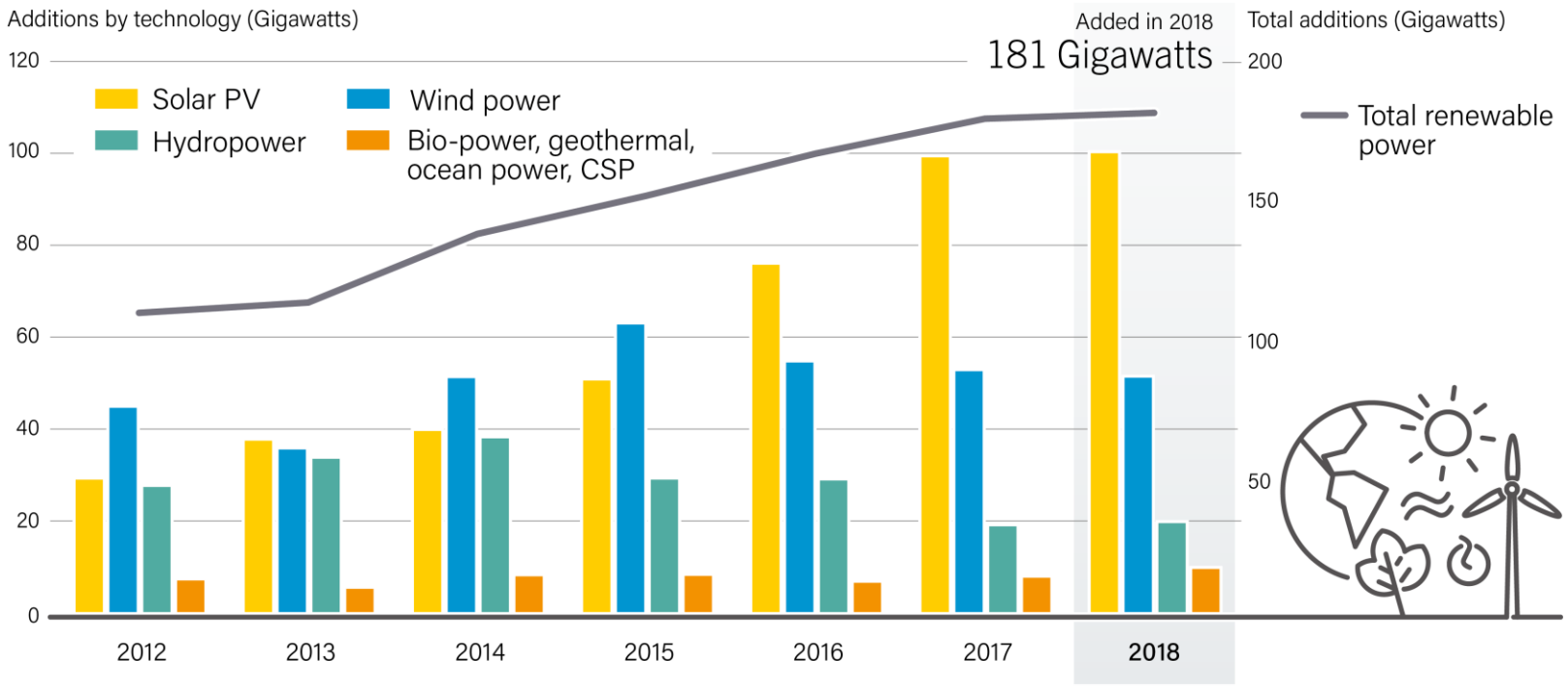
- Renewable energy is now more than 33% of global installed power generating capacity
- Within renewable capacity, hydropower (1,132 GW) no longer makes up half of installed capacity
- Wind power accounts for 25% and solar PV covers over 21%
- Remaining 6% of bio-power, geothermal power, CSP and ocean



181 gigawatts of renewable power added in 2018

- Added in 2018:
  - 100 GW of solar PV
  - 51 GW of wind power
  - 20 GW of hydropower
  - 10 GW of bio-power, CSP and geothermal power
- Around 55% of these new additions were solar PV
- Solar PV is clearly driving the growth in renewable power additions

Annual Additions of Renewable Power Capacity, by Technology and Total, 2012-2018



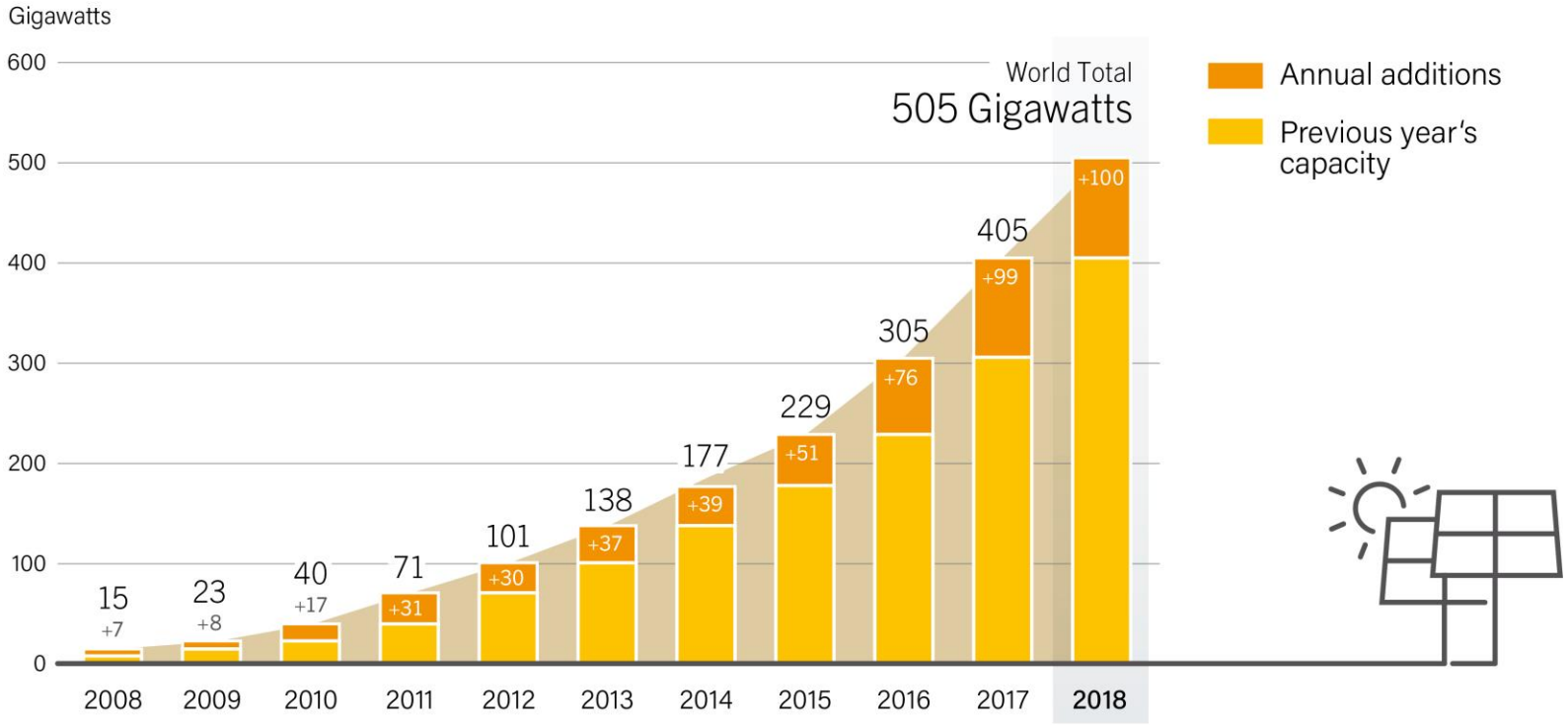
Note: Solar PV capacity data are provided in direct current (DC).

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Solar PV capacity additions reached 100 GW mark

- World first: solar PV capacity additions were more than 100 GW
- Cumulative capacity reached 505 GW, growing 25% on 2017
- Compared to 2014: Market increase of more than 150%

Solar PV Global Capacity and Annual Additions, 2008-2018



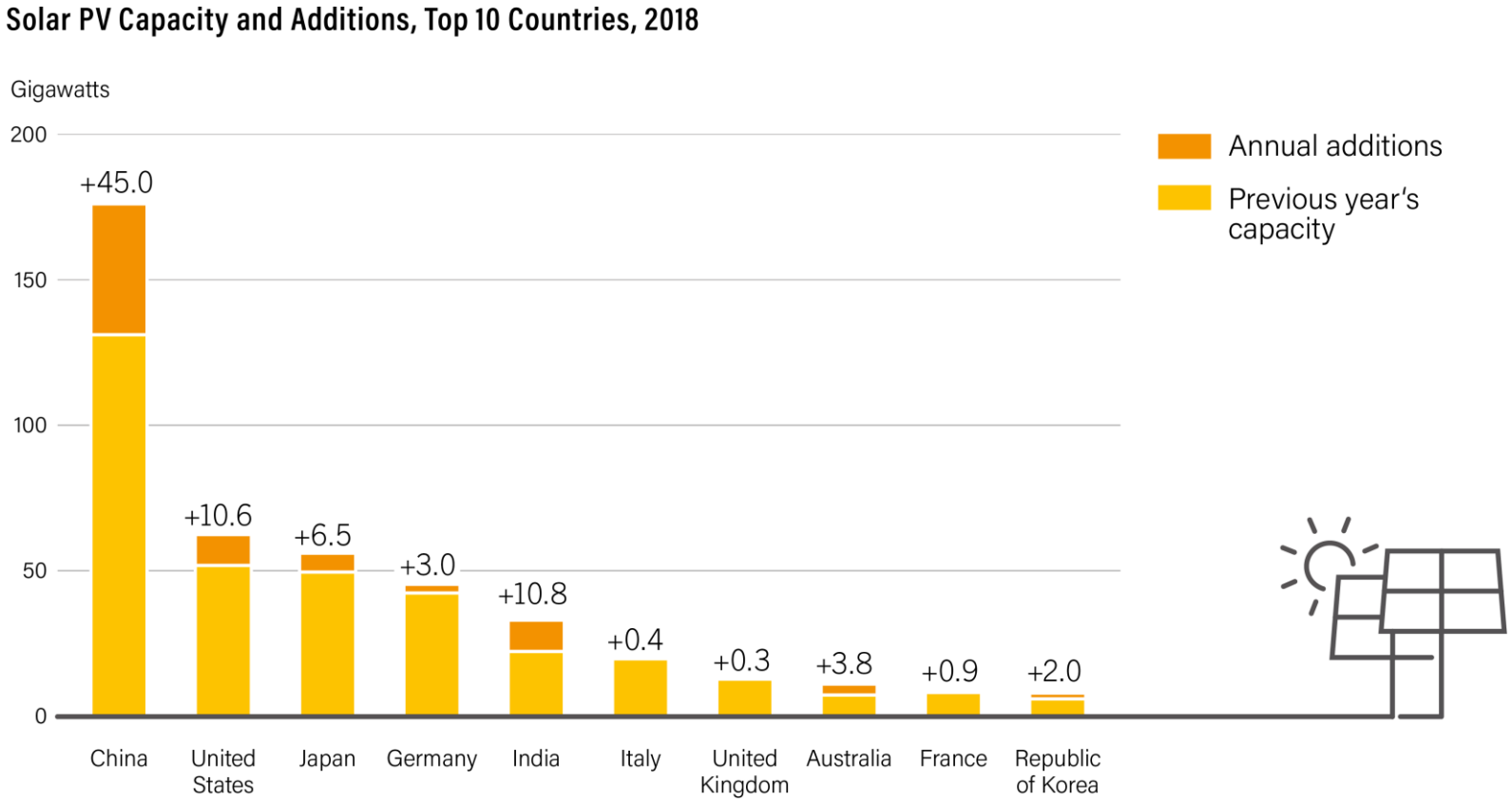
Note: Data are provided in direct current (DC).
Totals may not add up due to rounding.

Source: Becquerel Institute and IEA PVPS.

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

China remains dominant in solar PV despite market decline

- China's market declined for the first time since 2014 (15%)
  - Still, its additions were more than the rest of top-10 countries, combined
- Strong growth since 2016 in United States, India, Australia



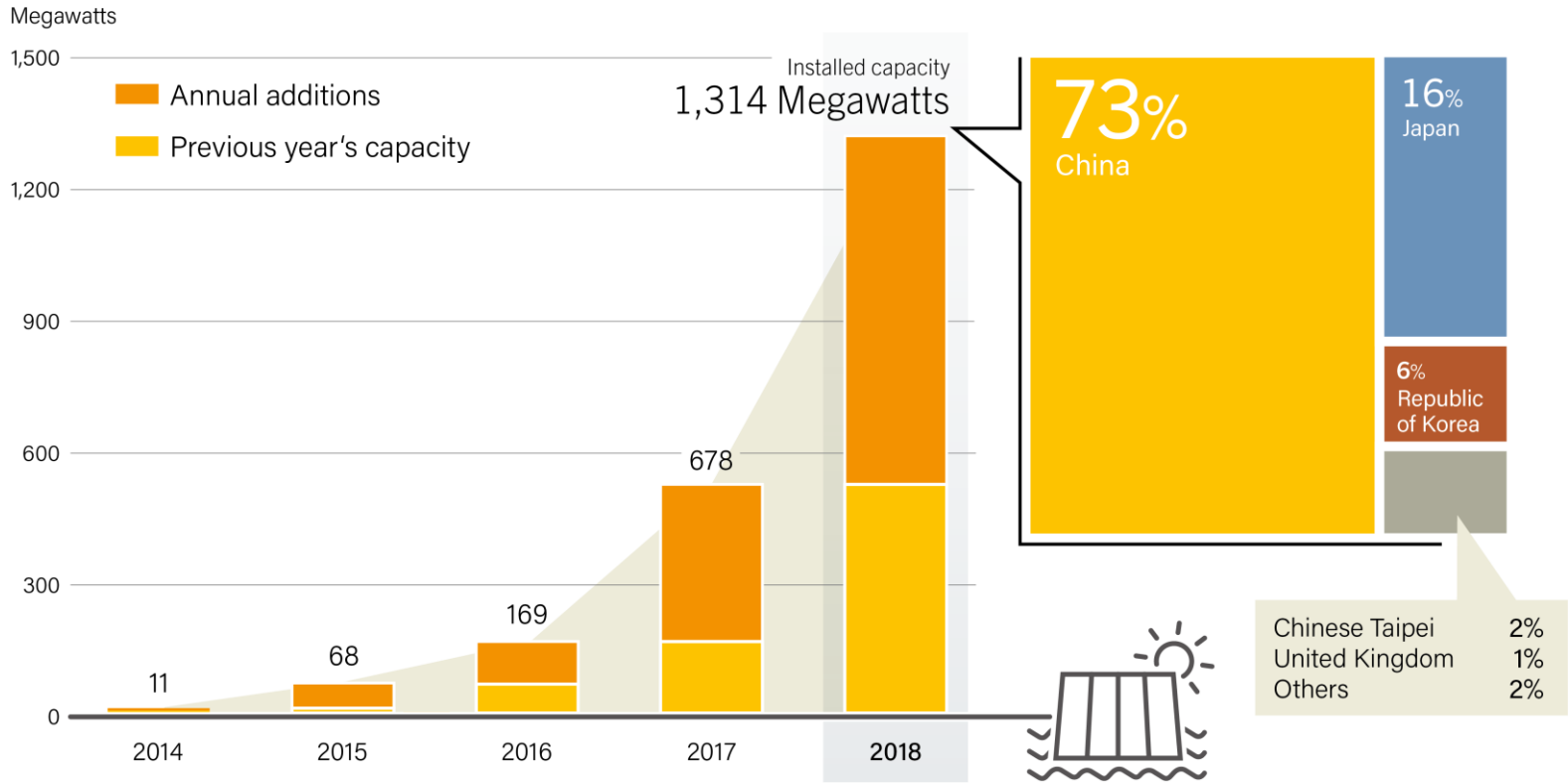
Note: Data are provided in direct current (DC).
Data for India are highly uncertain.

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Floating solar PV cumulative capacity passes 1 GW mark

- Floating PV systems exist in at least 29 countries in nearly every world region
- In 2018, installed capacity of Floating PV crossed the 1 GW mark
- Top markets include China, Japan, Republic of Korea, Chinese Taipei, and UK

Floating Solar PV Global Capacity and Annual Additions, 2008-2018, and Top Countries, End-2018

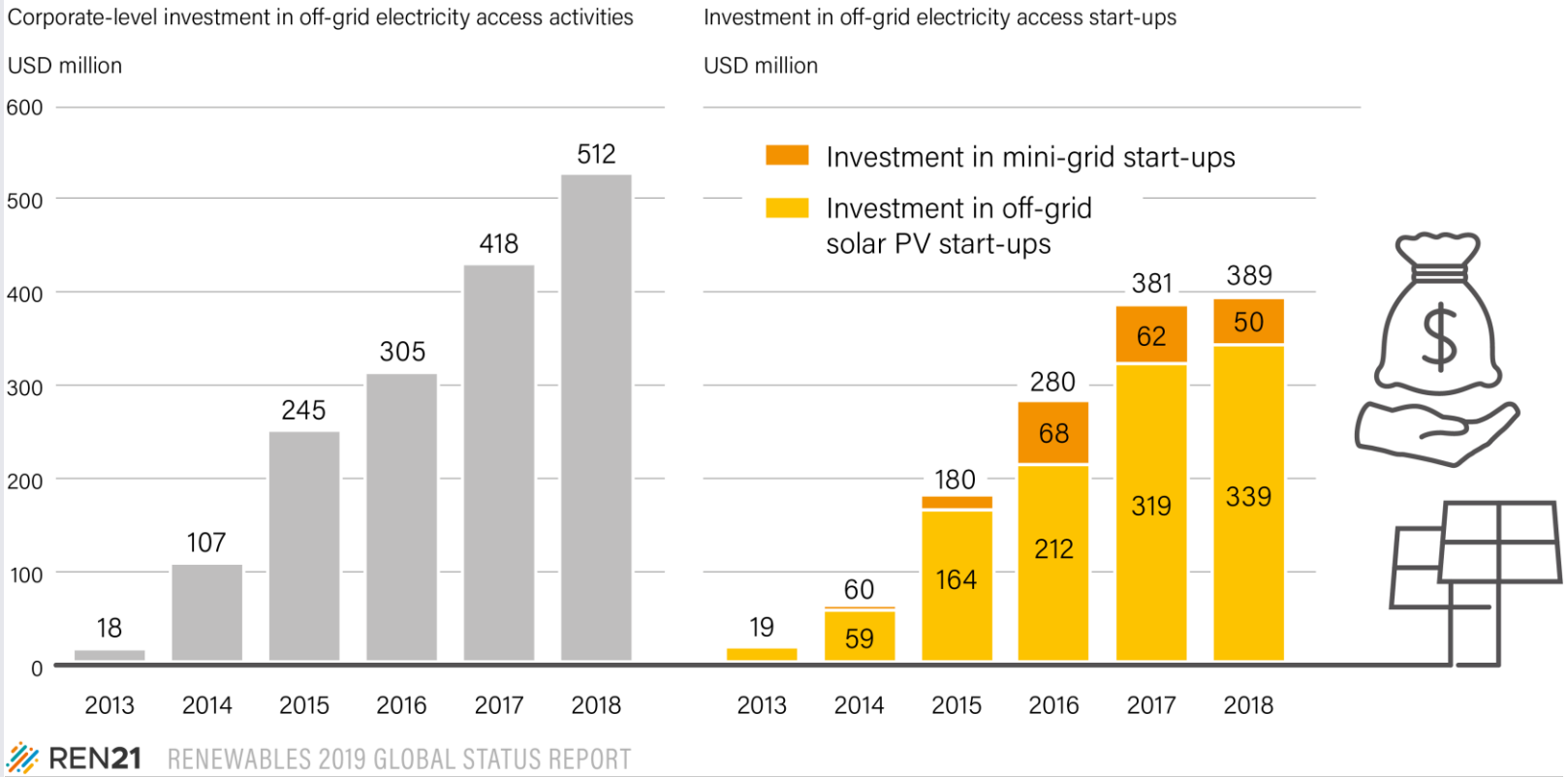


Source: World Bank Group, ESMAP and SERIS.

Off-grid solar providing access to energy

- 150 million people across Africa and Asia benefit from energy access through off-grid solar systems
- In 2018: USD 512m into off-grid electricity access companies
- Off-grid solar systems in 2018:
  - Pay-as-you-go solar home system companies: USD 339 million

Global Investment in Off-grid Electricity Access Activities, 2013-2018

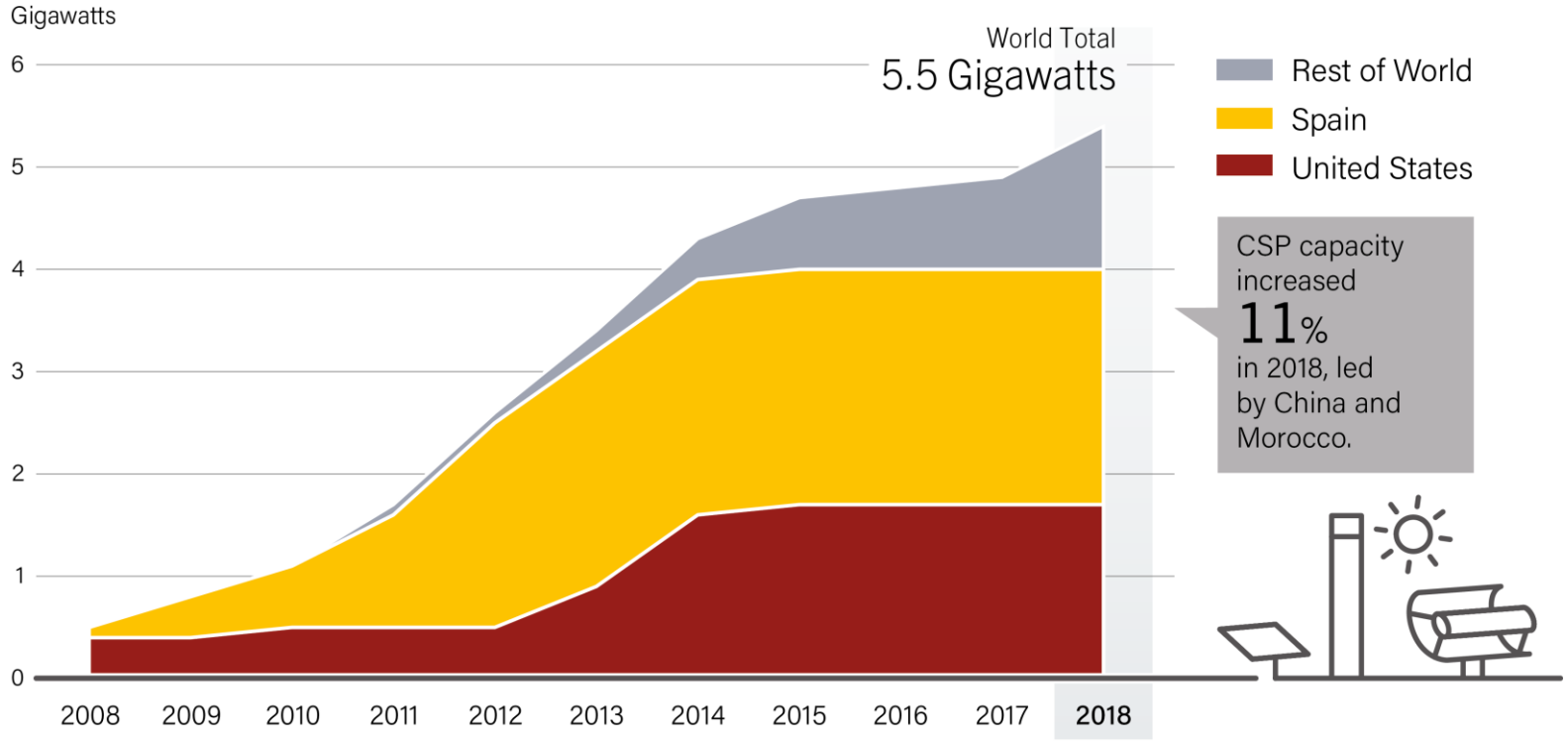


REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

New CSP additions installed exclusively in emerging markets

- An estimated 550 MW of CSP came online in 2018
  - 11% increase in global capacity
- 4 GW of total installed capacity is located in Spain and the United States
- For the third consecutive year, new capacity came online only in emerging markets

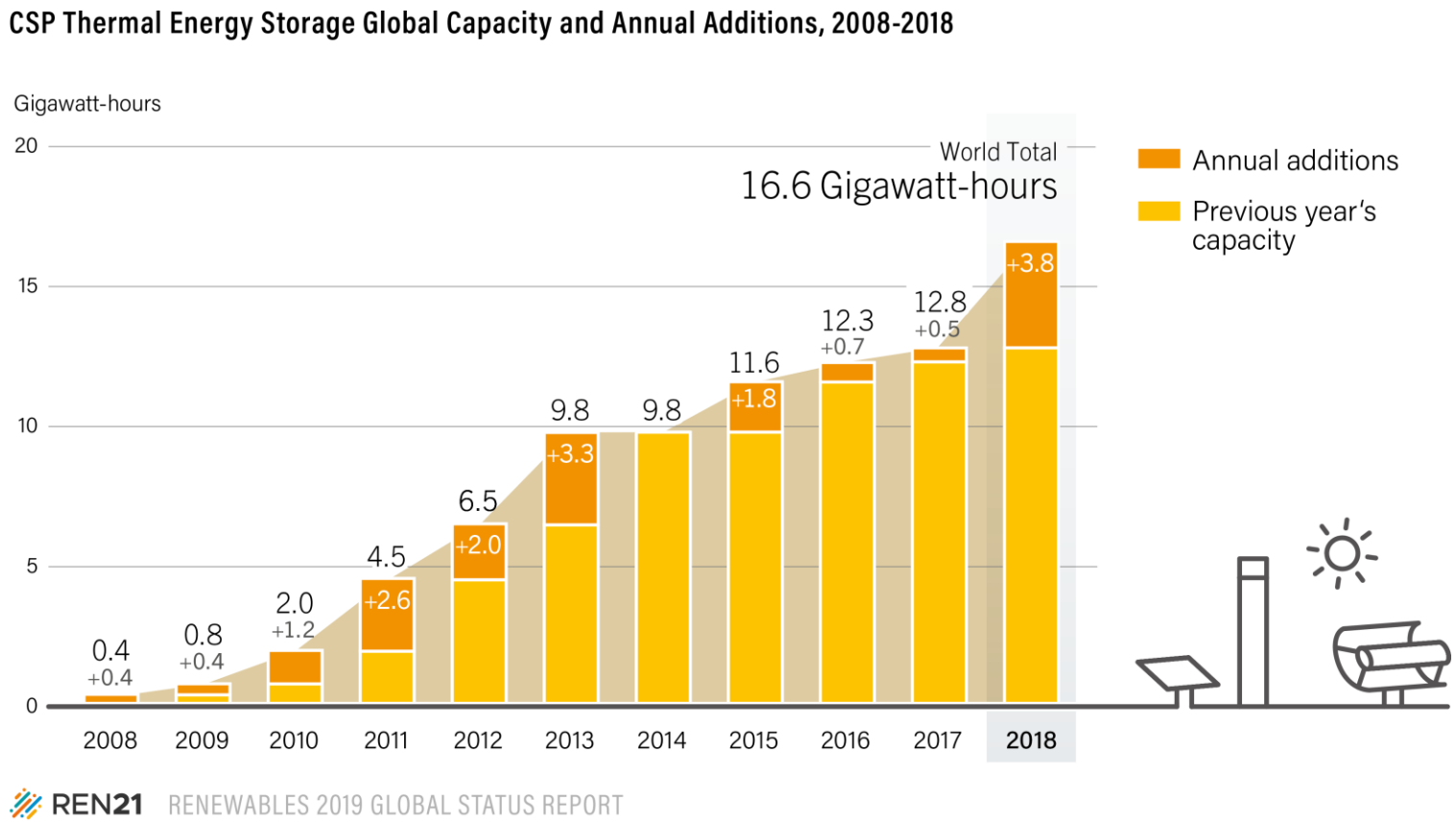
Concentrating Solar Thermal Power Global Capacity, by Country and Region, 2008-2018



REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Record year for thermal energy storage in CSP

- Almost 17 GWh of thermal energy storage was operational in conjunction with CSP plants by the end of 2018
  - Based almost entirely on molten salts
- 2018 was a record year with 3.8 GWh brought online



Solar power: Which countries led the way in 2018? Which were on top?

TOP FIVE COUNTRIES

Annual Investment / Net Capacity Additions / Production in 2018

	1	2	3	4	5
Investment in renewable power and fuels (not including hydropower over 50 MW)	**China**	United States	Japan	India	Australia
Investment in renewable power and fuels per unit GDP[1]	**Palau**	Djibouti	Morocco	Iceland/Serbia	
Solar PV capacity	**China**	India[2]/United States		Japan	Australia
Concentrating solar thermal power (CSP) capacity	**China/Morocco**		South Africa	Saudi Arabia	–

Total Capacity or Generation as of End-2018

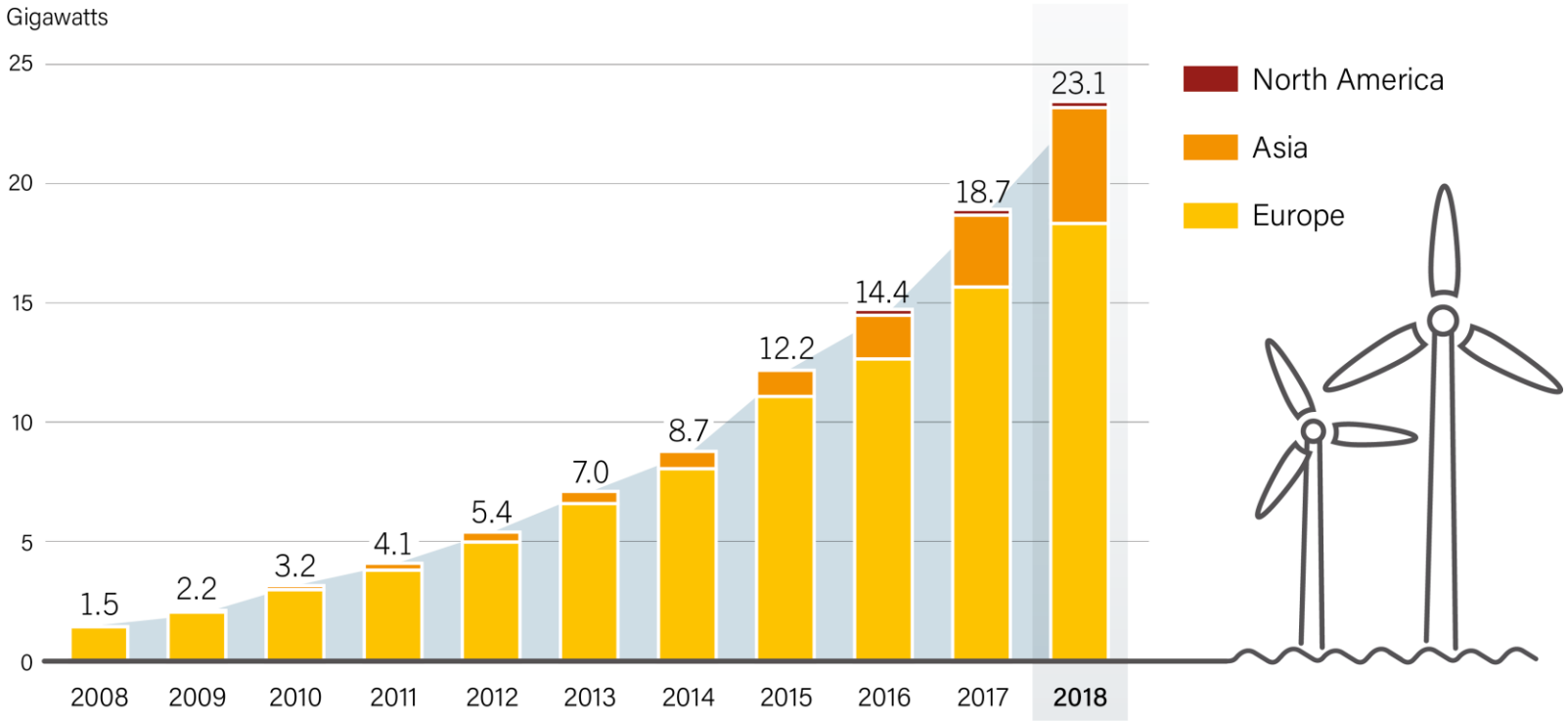
	1	2	3	4	5
POWER					
Renewable power capacity (including hydropower)	**China**	United States	Brazil	India	Germany
Renewable power capacity (not including hydropower)	**China**	United States	Germany	India	Japan
Solar PV capacity	**China**	United States	Japan	Germany	India
Solar PV capacity *per capita*	**Germany**	Australia	Japan	Belgium	Italy
Concentrating solar thermal power (CSP) capacity	**Spain**	United States	South Africa	Morocco	India

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Success of offshore wind in Europe continues spreading to Asia

- By the end of 2018, 17 countries had offshore wind capacity
  - Global capacity increased 24% and market doubled
- UK leads with 8 GW of total capacity
  - China installed 1.7 GW in 2018
- Europe accounts for about 79% of global capacity

Wind Power Offshore Global Capacity by Region, 2008-2018

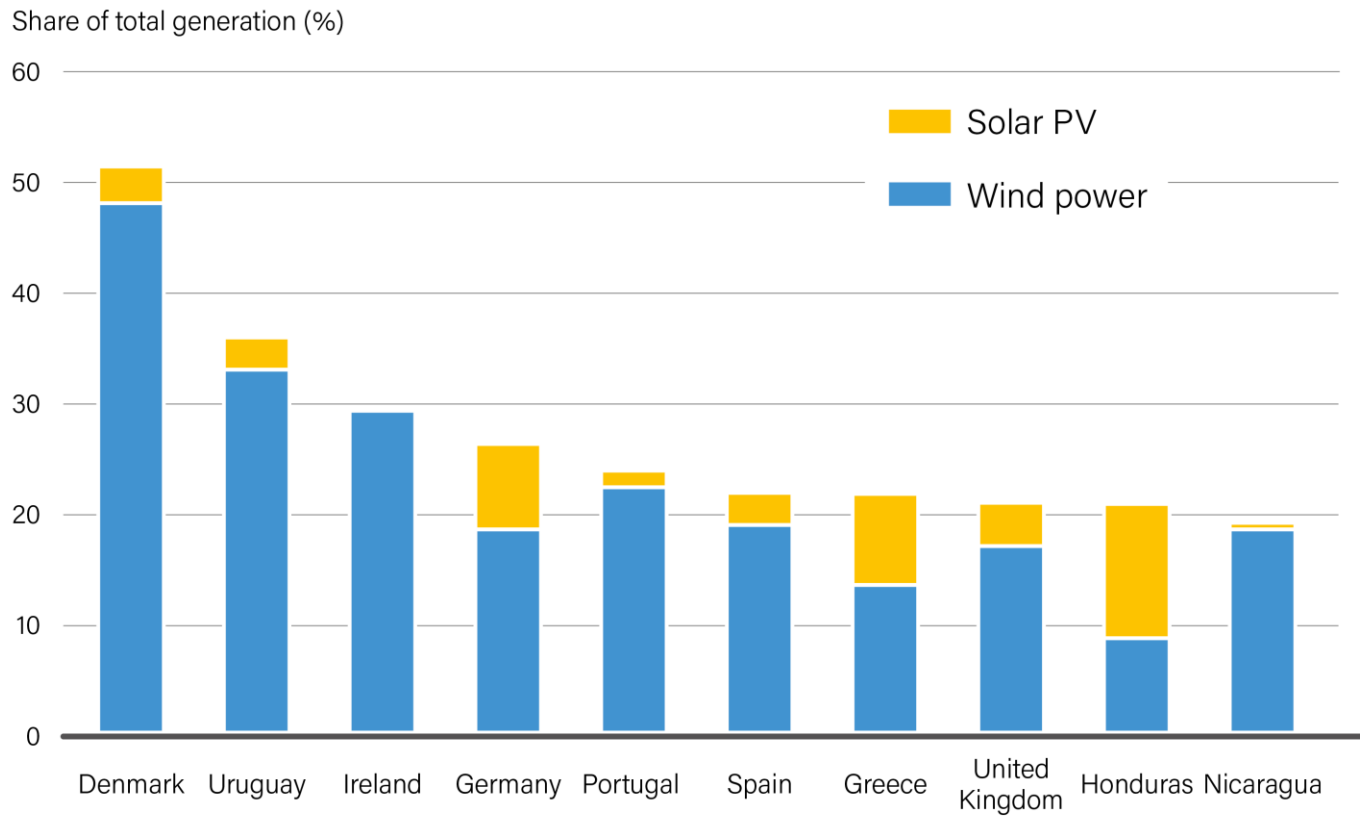


REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Variable renewable energy is reaching high shares in electricity grids

- Power systems around the world are adapting to higher shares of variable renewables (wind power and solar PV)
- At least 9 countries generated more than 20% of their electricity from variable wind power and solar PV

Share of Electricity Generation from Variable Renewable Energy, Top 10 Countries, 2018

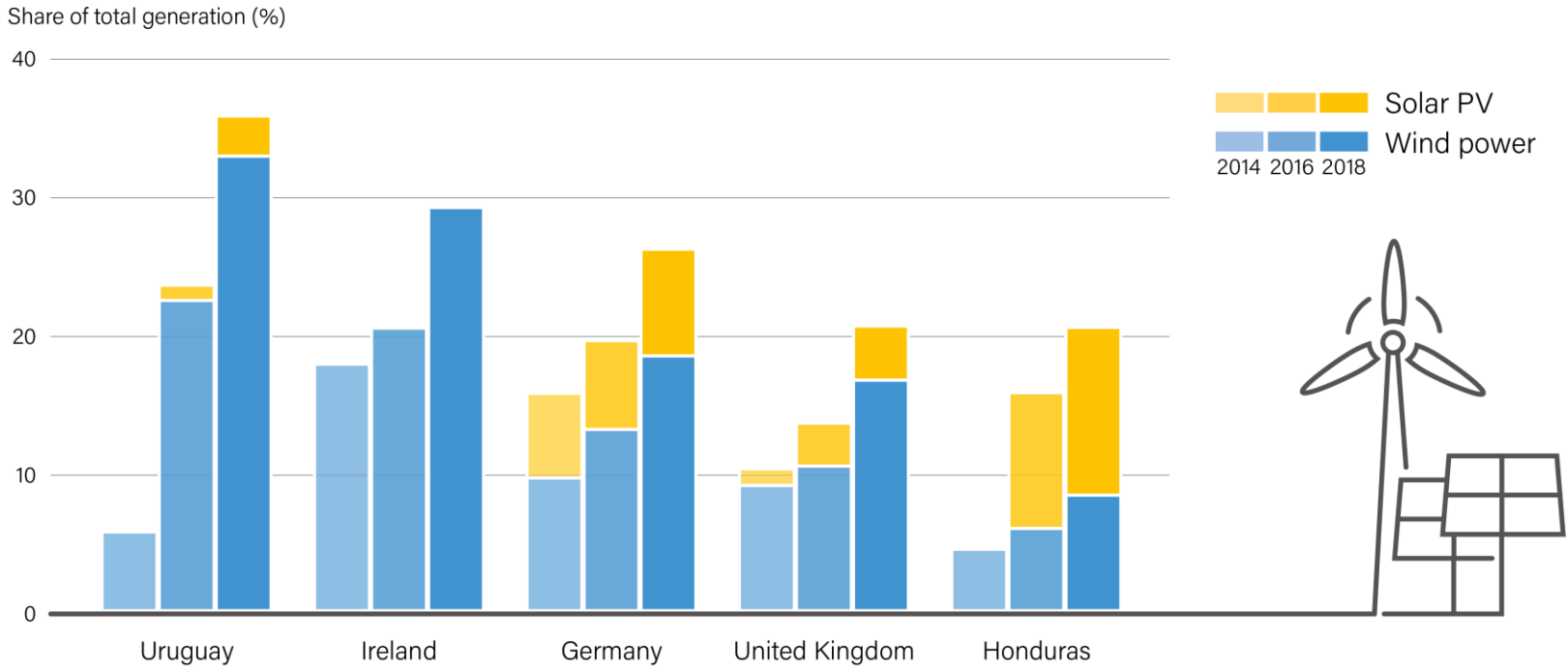


Note: This figure includes the top 10 countries according to the best available data known to REN21 at the time of publication.

Variable renewable shares have grown dramatically in some countries

- Average annual growth rates of more than 10% in at least five countries
- Growth due in part to quickly declining costs for solar PV and wind power
- Advances in storage, grids (interconnection, extensions) demand-side management grids also key

Share of Electricity Generation from Variable Renewable Energy, Selected Countries, 2014, 2016, 2018



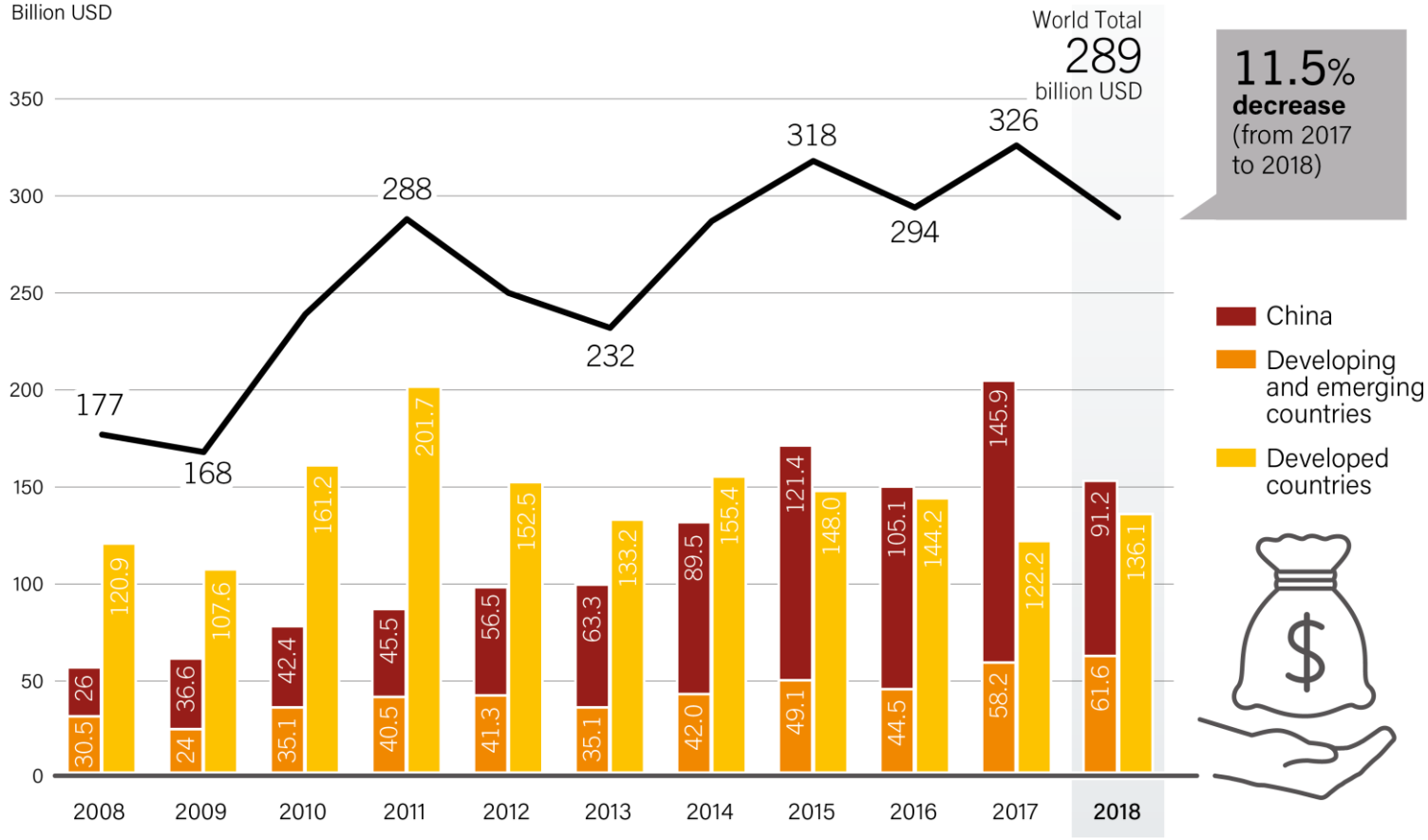
Note: This figure includes selected countries with high shares of variable renewable energy according to the best available data at the time of publication. Factors including annual weather variations may significantly impact generation from VRE in a particular year. Trends shown are not meant to imply assumed future growth of generation shares.

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Investment in renewable energy fell in China, rose elsewhere

- Global investment in renewable power and fuels decreased 11.5%
  - Fall driven mainly by China
- Fifth consecutive year in which investment topped USD 280 billion
- Investment in developing and emerging countries exceeded that in developed countries for the fourth consecutive year

Global New Investment in Renewable Power and Fuels in Developed, Emerging and Developing Countries, 2008-2018



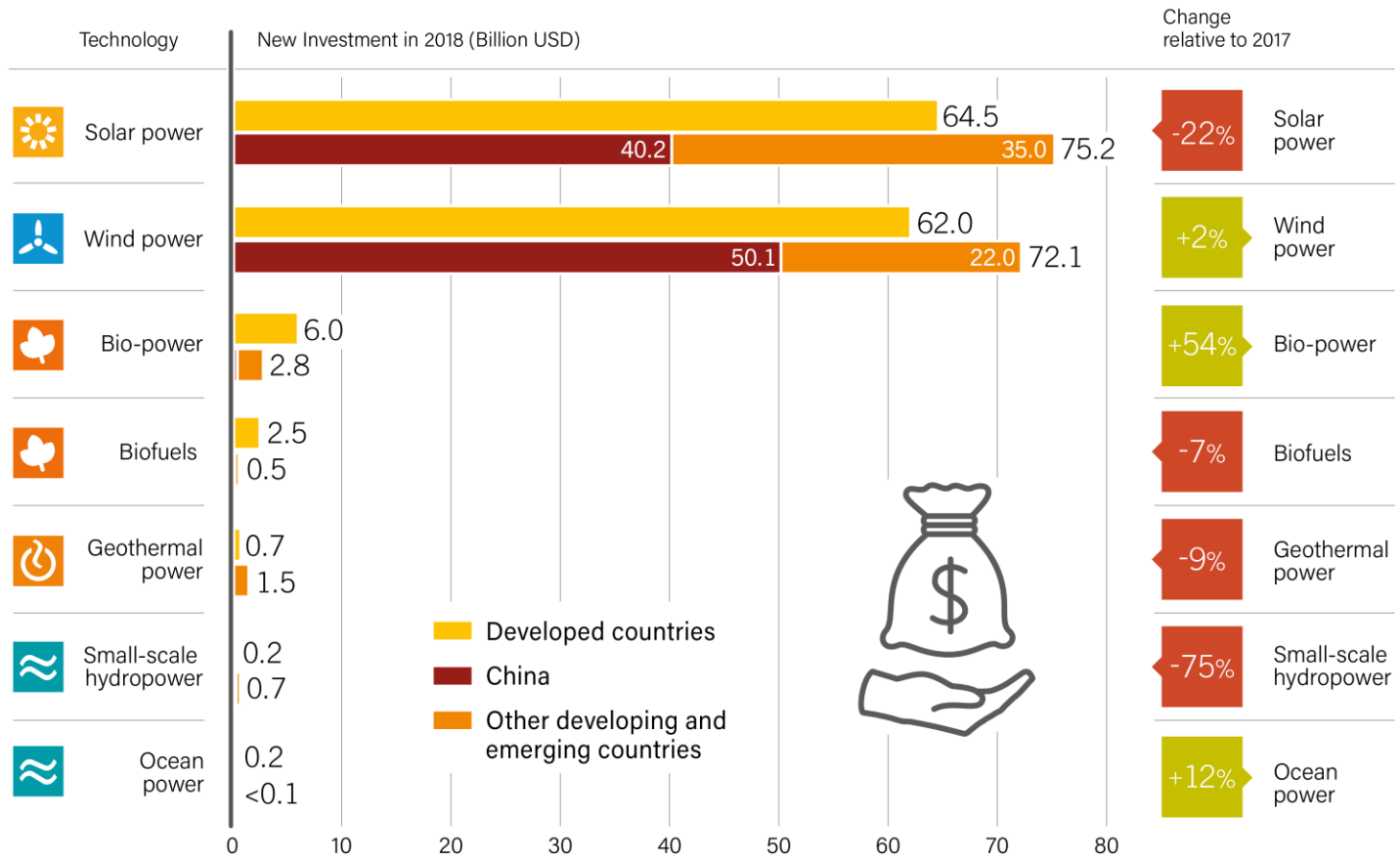
REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Source: BNEF.

Investment in solar PV and wind power continue to lead

- Investment in renewable power accounted for 65% of all new generating capacity
- Solar PV and wind power continued to dominate new investment in renewable energy in 2018
- The gap narrowed between the two
  - Solar accounted for 48%
  - Wind power for 46%

Global New Investment in Renewable Energy by Technology in Developed, Emerging and Developing Countries, 2018



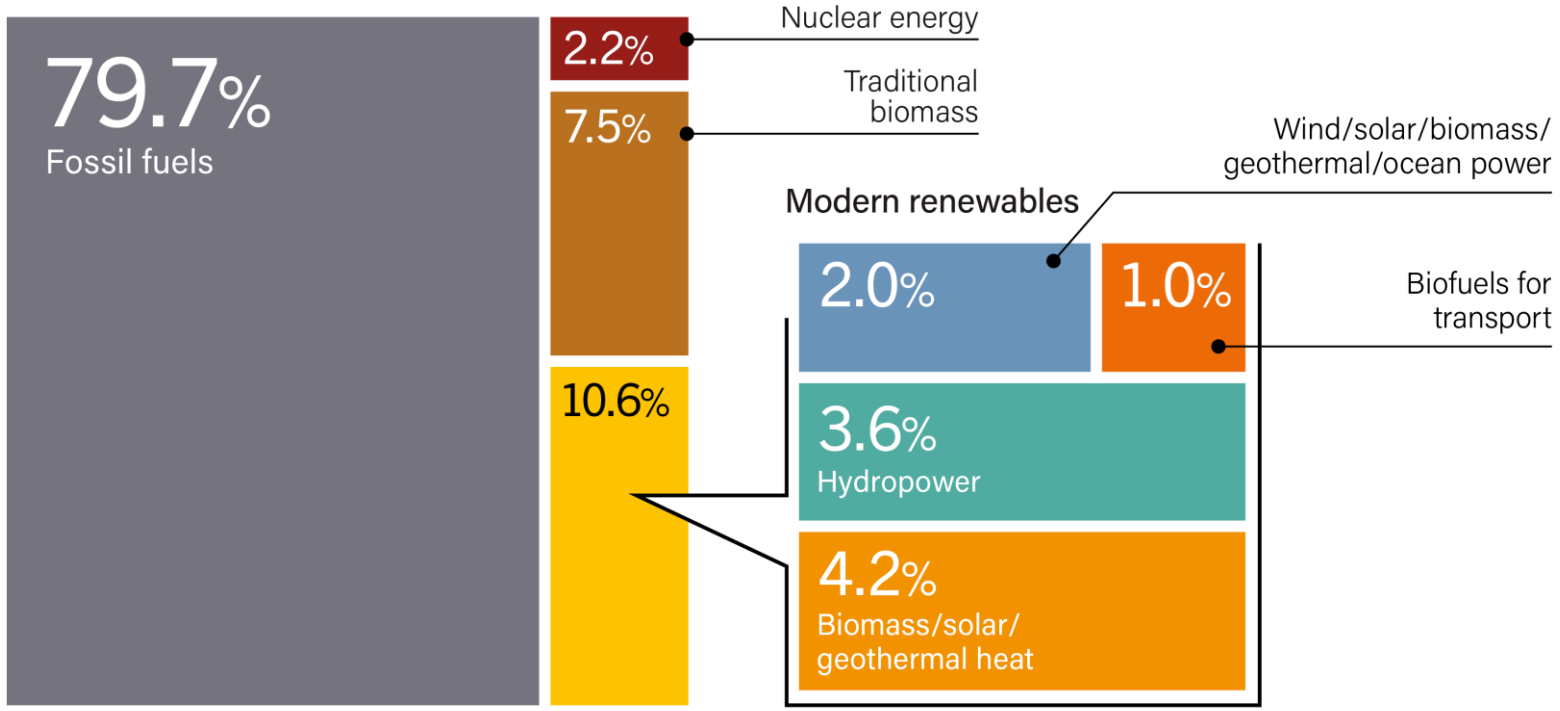
Note: Total values include estimates for undisclosed deals as well as estimates for small distributed capacity and corporate and government R&D.

Source: BNEF.

Modern renewables slowly gaining ground in final energy demand

- Modern renewable energy accounted for 10.6% of final energy demand in 2017.
  - Increase from 10.4% in 2016
- Renewable power accounts for only half of this total
- What about the rest?

Estimated Renewable Share of Total Final Energy Consumption, 2017

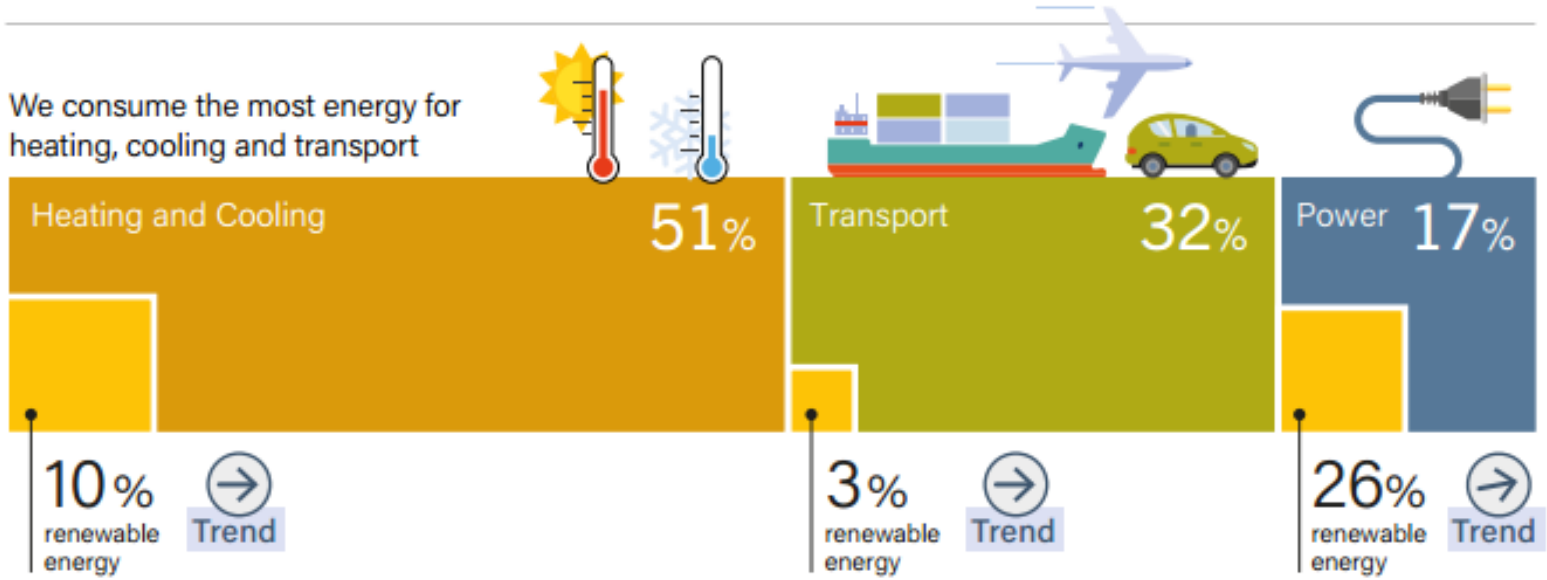


Note: Data should not be compared with previous years because of revisions due to improved or adjusted data or methodology. Totals may not add up due to rounding.

Source: Based on OECD/IEA and IEA SHC.

Over 80% of energy demand for heating, cooling, and transport

- Over half of final energy demand is from the heating and cooling sector
  - Around 10% demand is supplied by renewable energy
- 32% of final energy demand for transport end-uses
  - Just over 3% is renewable and primarily met by biofuels
  - Renewable electricity still plays small role
- Around 26% of electricity was renewable in 2016

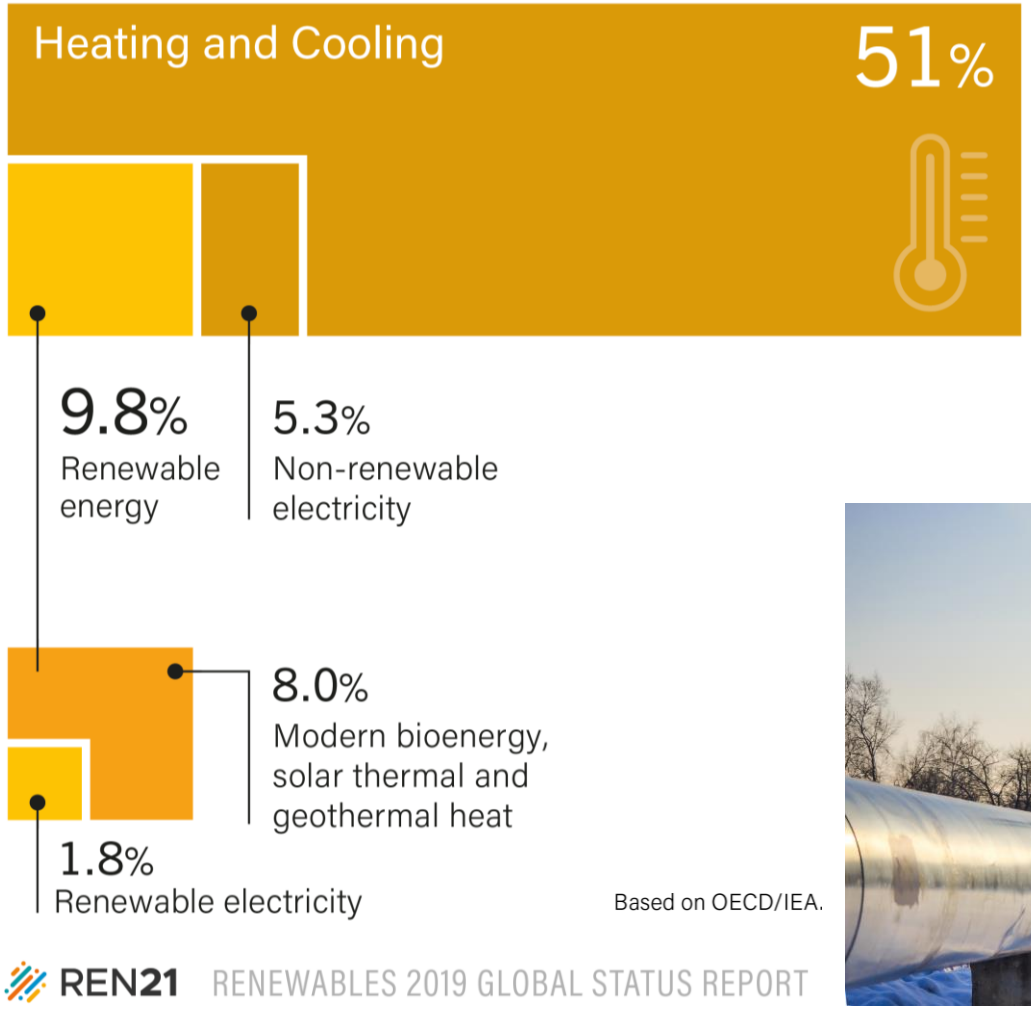


REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Based on OECD/IEA.

Renewables in heating and cooling increasing very slowly

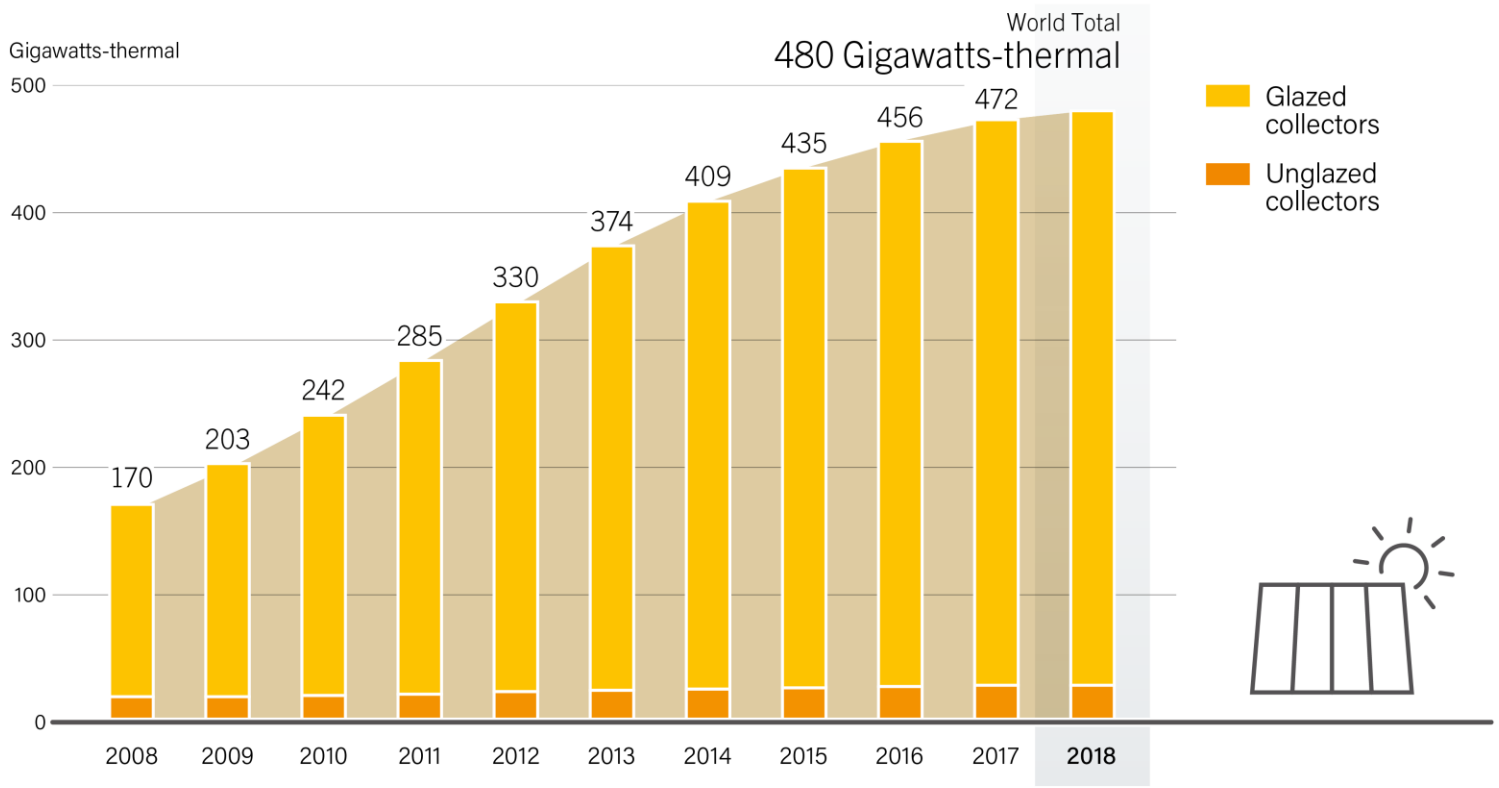
- Modern renewables account for just 10% of heating and cooling demand
  - Demand growth is minimal (1.8%/year)
- Lack of policy support in the sector
  - Number of countries with regulatory policies fell from 21 to 20
  - Only 47 countries had targets for RHC
- Bioenergy provides majority, but integration with power sector is key



Growth rate slows for solar water heating capacity additions

- Cumulative global operating capacity for solar water heating collectors increased 2% to reach 480 GW_{th}
- Globally, 33.3 GW_{th} (gross) of solar thermal was added in 2018
  - Down 4% from the 34.6 GW_{th} newly installed in 2017
- Annual installations rose in 10 of the world's 20 largest markets

Solar Water Heating Collectors Global Capacity, 2008-2018



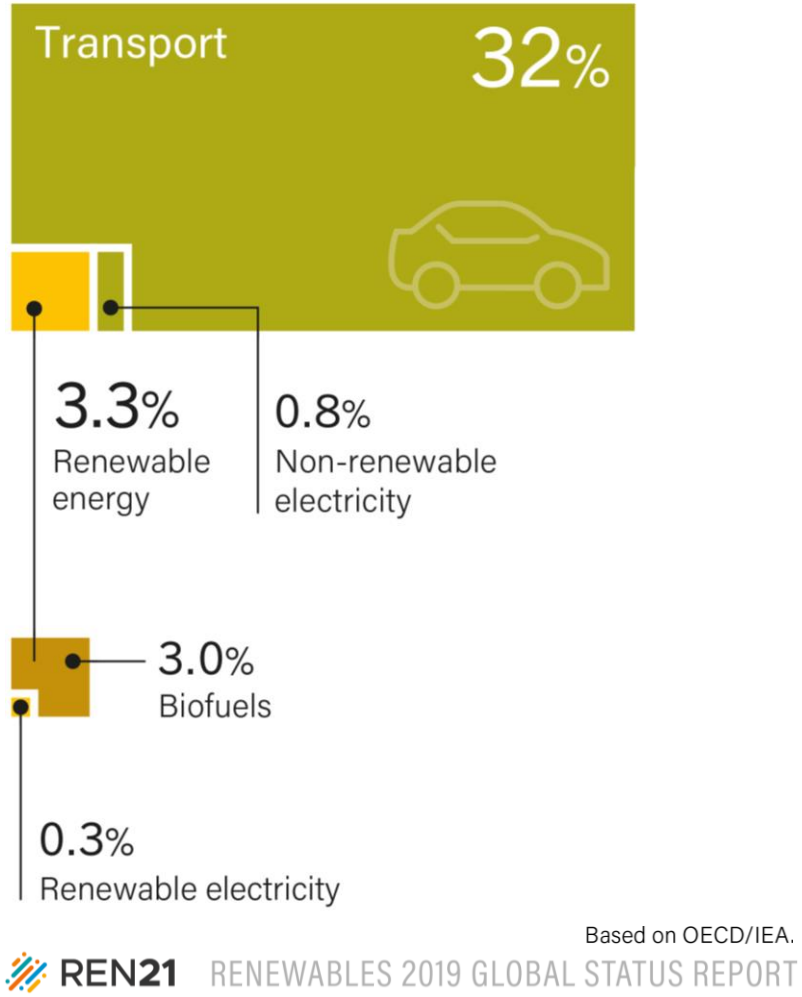
Note: Data are for glazed and unglazed solar water collectors and do not include concentrating and air collectors.

Source: IEA SHC.

REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Biofuels and EVs growing but renewable share in transport remains low

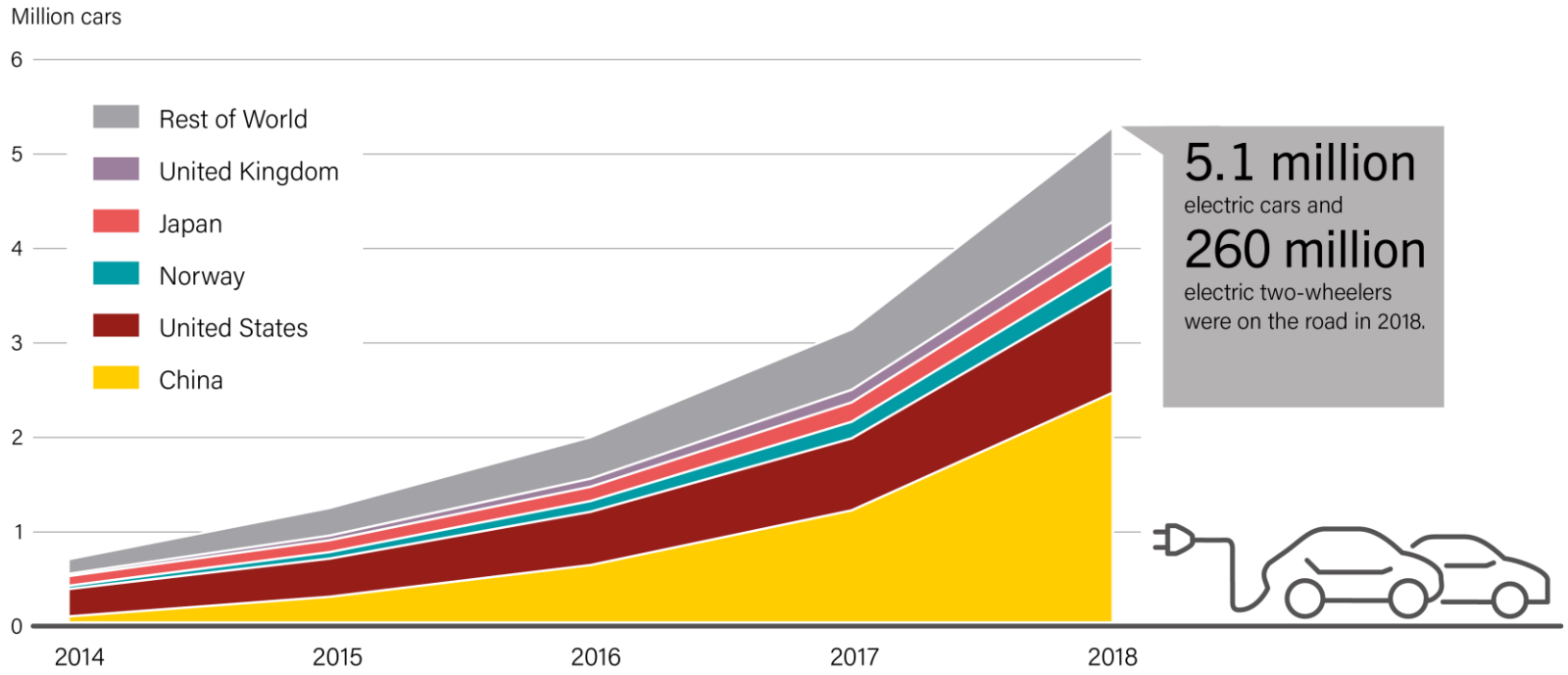
- Global energy demand in transport increased 45% since 2000
- Transport accounts for 23% of global CO_2 emissions
- The renewable share of transport grew slightly to 3.3%
- Biofuels make up majority of renewable contribution, but sector increasingly open to electrification



Electric passenger vehicle stock grew over 60%

- 260 million electric two-wheelers and 40 million electric three-wheelers
- More than 2 million electric cars were sold in 2018 (+68%)
- EV markets highly concentrated: 40% of all EVs were in just 20 cities
- Share of RE power: around 26%

Electric Car Global Stock, Top 5 Countries and Rest of World, 2014-2018

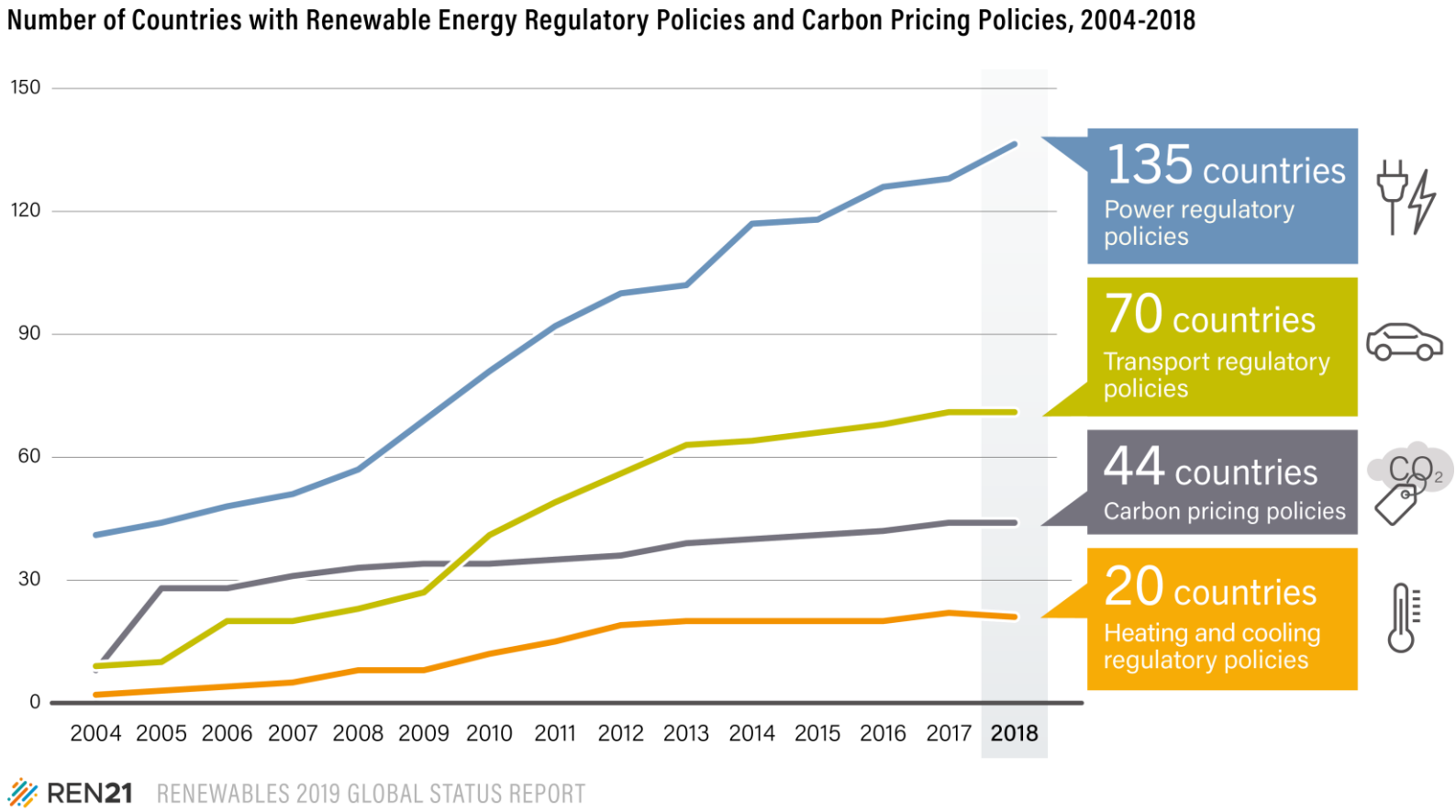


REN21 RENEWABLES 2019 GLOBAL STATUS REPORT

Source: OECD/IEA.

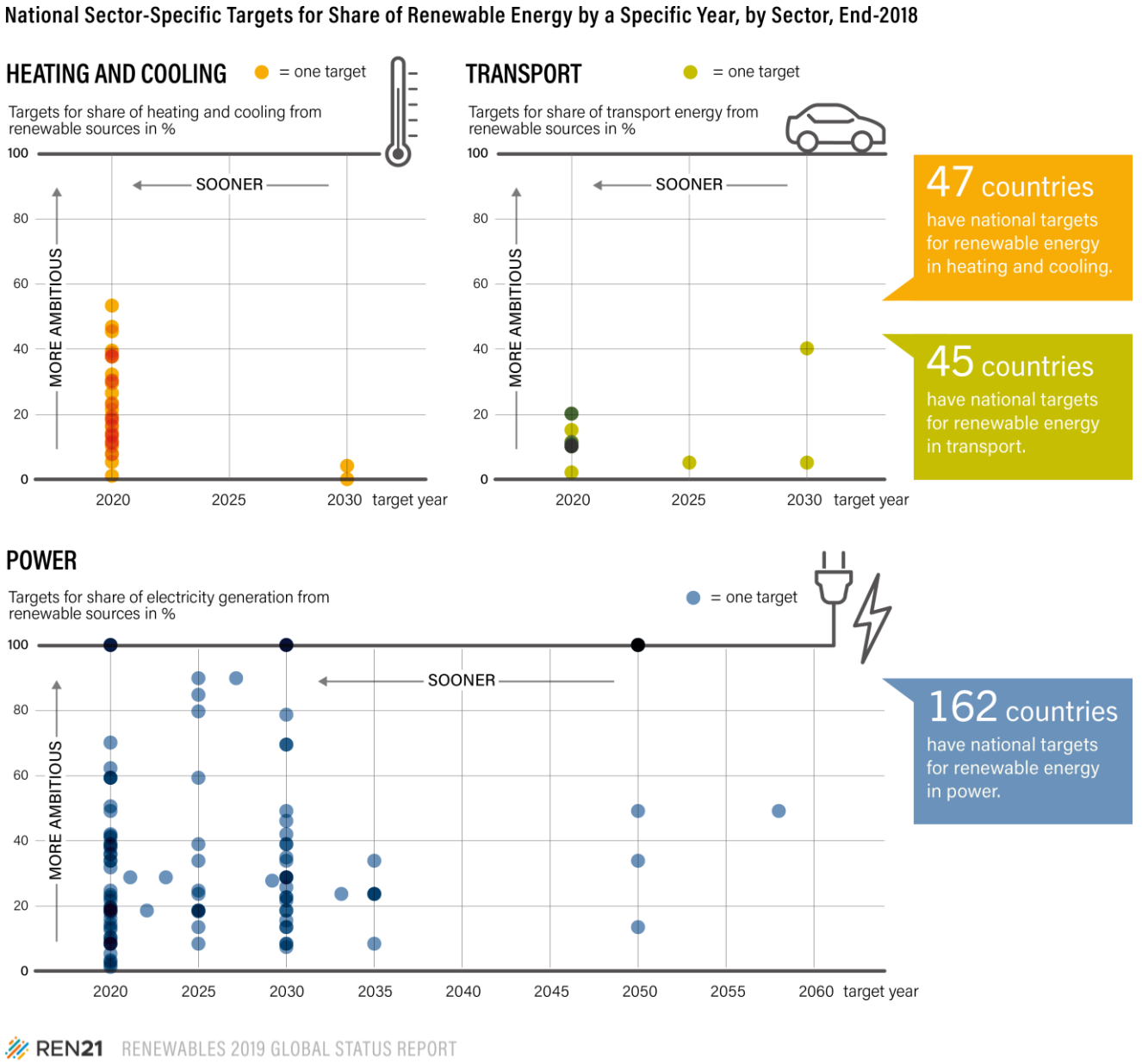
Advances in power made possible by policy support, other sectors lacking

- Renewable power auctions were held in at least 48 countries
- FITs in place in 111 countries
- No new countries adopted biofuels mandates
- The number of countries with H&C regulatory policies fell by 1



Targets uneven across sectors

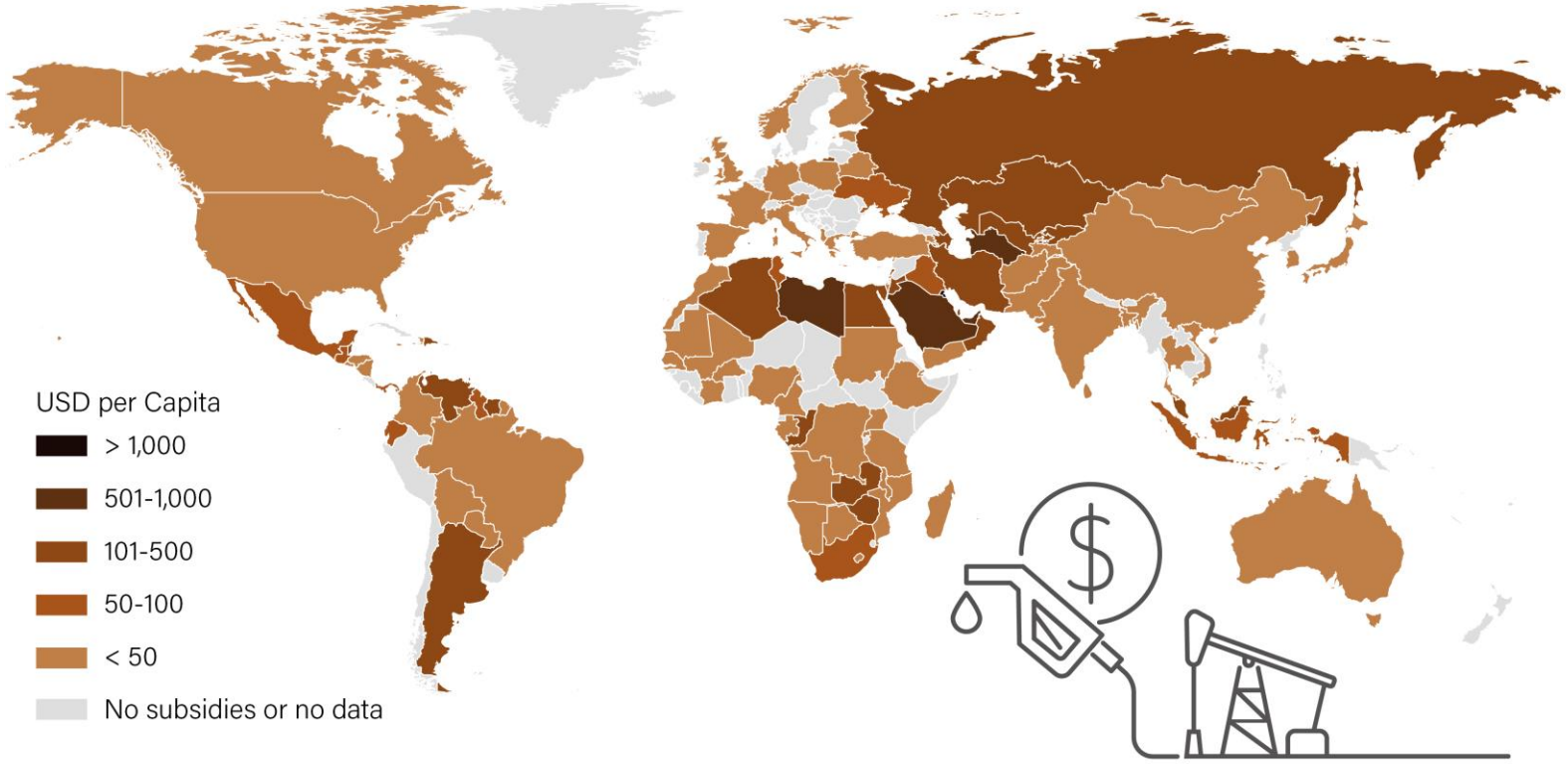
- Targets in the power sector remain more ambitious, more numerous than in heating and cooling and transport
- Fewer than 10 countries and states/provinces had economy-wide targets for at least 50% renewable energy
- Still only 1 country with a target for 100% renewables in total final energy



Not a level playing field: Fossil fuel subsidies are still widespread

- Global subsidies for fossil fuel consumption reached an estimated **USD 300 billion** in 2017
  - an **11% increase** from the year before
- Fossil fuel subsidies remained in place in at least 115 countries in 2017
- Subsidies around the same level of total investment in renewable power and fuels in 2018

Fossil Fuel Subsidies, per Person, by Country, 2017



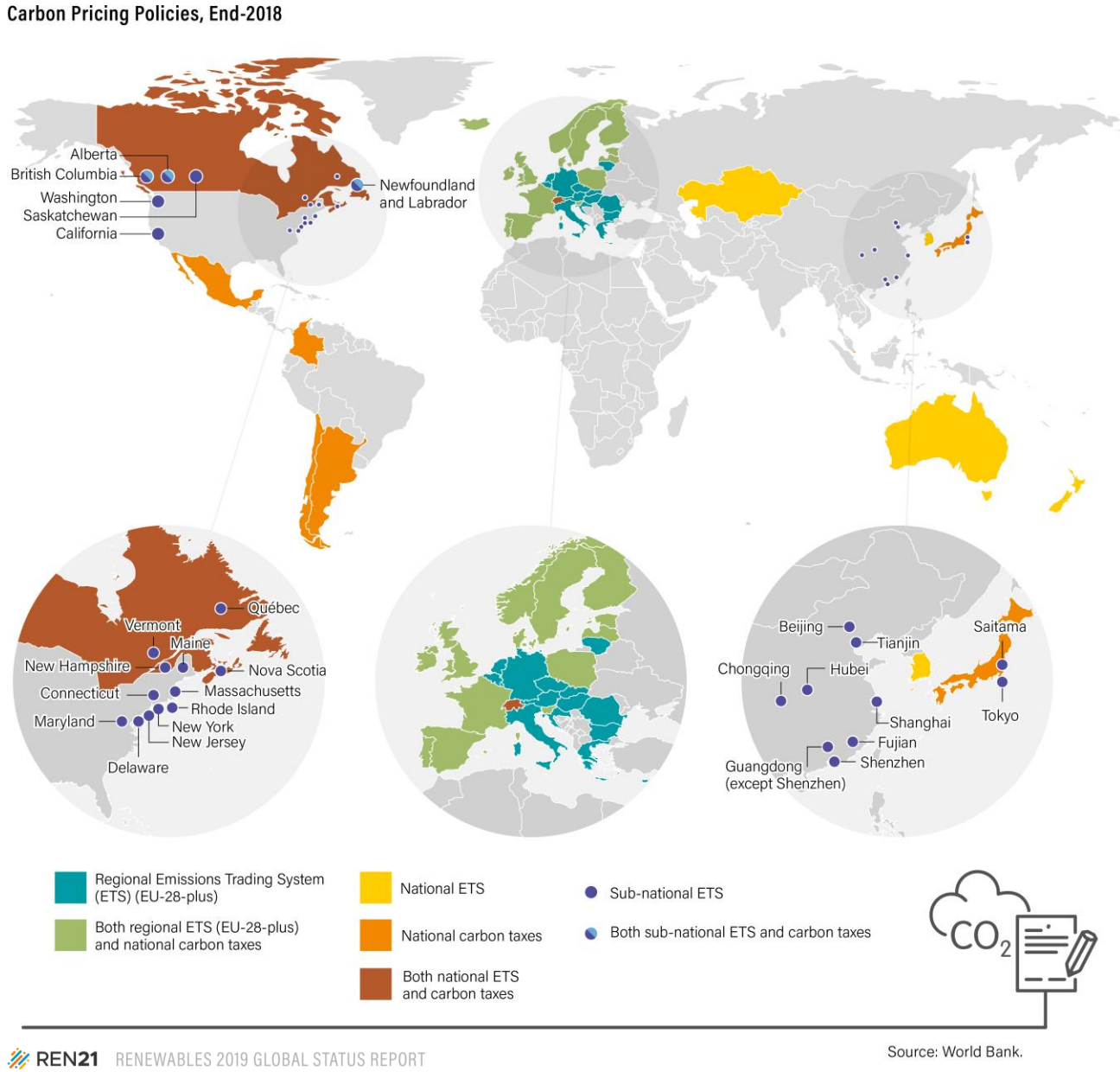
Note: Shading depicts pre-tax consumption subsidies only.

Source: Based on IMF.

Carbon pricing slowly expanding

- At least **54 carbon pricing initiatives** implemented by end-2018
  - 27 emission trading systems
  - 27 carbon taxes
  - Covering 44 countries

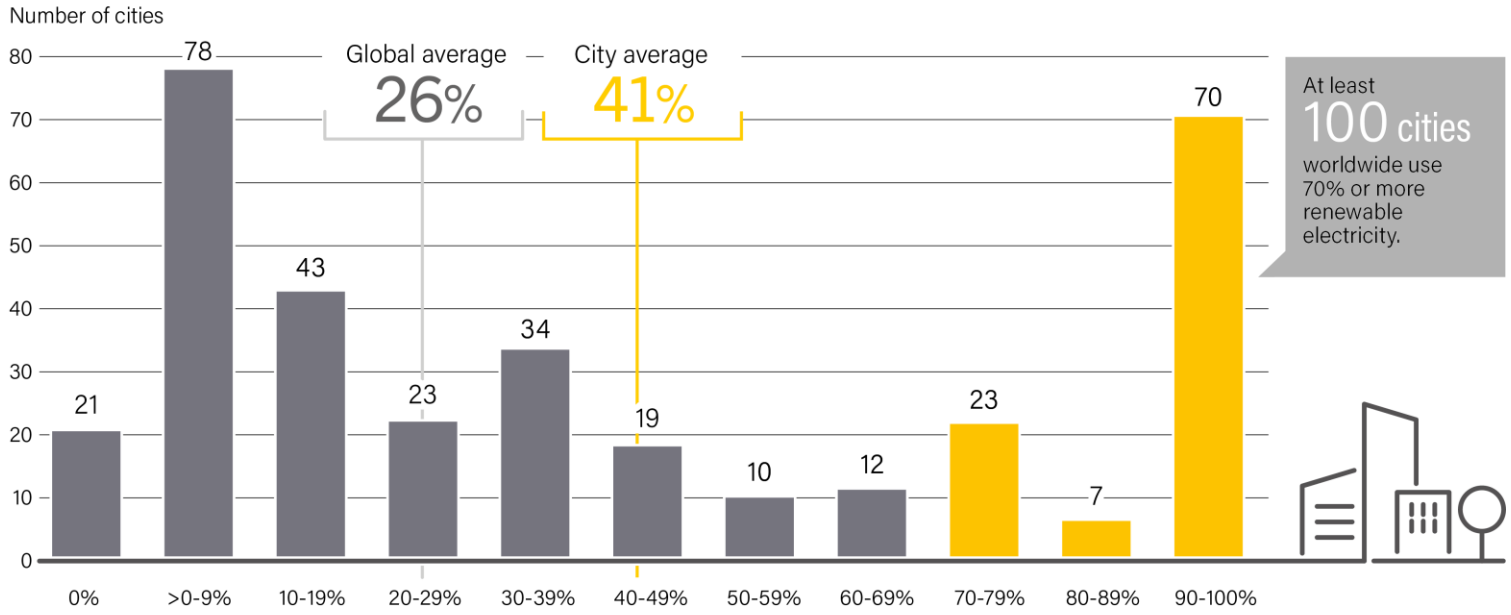
- Covering only **13% of global greenhouse gas emissions**
  - Including policies scheduled for implementation, coverage rises to 20%



Cities have higher levels of ambition, action on renewable energy & climate

- Cities account for **65% of global energy demand**
- Some cities able to accomplish more ambitious renewables goals than national and state/provincial bodies
- Cities have more ambitious targets than national counterparts

Renewable Power in Cities*, by Number of Cities and Renewable Share, 2017



* The figure shows shares of renewables in the electricity consumption of 340 cities that self-reported to CDP.

Source: CDP.

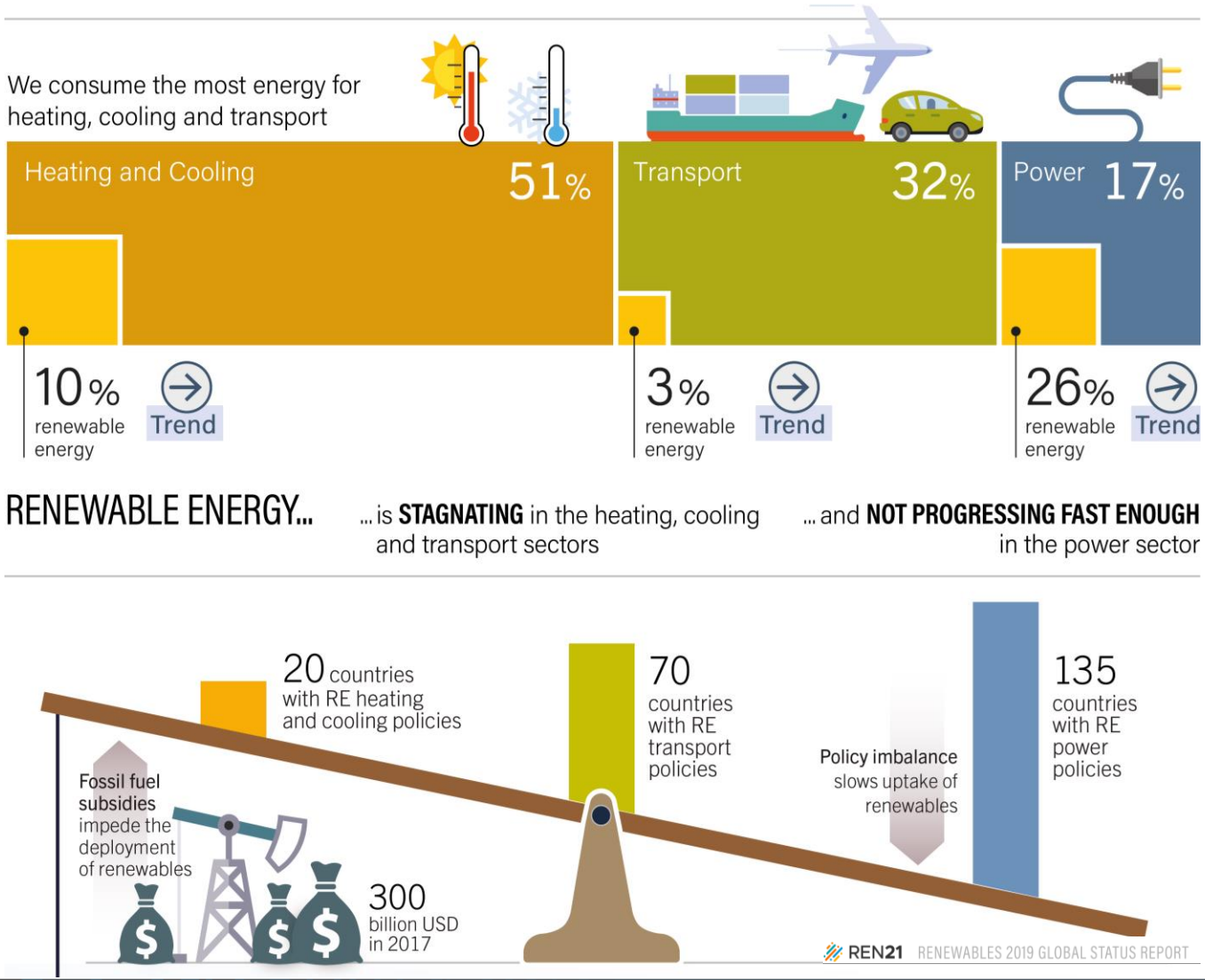
Note: City average is calculated based on the 340 cities shown.
Categories include all values below the lower limit of adjacent category.

The transition is possible – positive examples are showing the way!

- **Leadership from national governments** is paving the way towards 100% renewables in countries.
- **Cities and sub-national governments** are setting more ambitious policies than their national governments.
- **1000+ organisations**, totaling USD 8 trillion, have committed to divesting from fossil fuels.
- The **private sector** has doubled its investment in sourcing renewable power.

From an electricity transition to an energy system transformation

- **Create a level playing field** by removing fossil fuel subsidies and adopting carbon pricing
- **Encourage sector integration** among power, heating and cooling, and transport
- **Align policies** across the national, sub-national and local levels
- **Link to energy efficiency** in renewable energy policy initiatives



www.ren21.net/gsr

gsr@ren21.net