RENEWABLES NOW

Renewables 2020 Global Status Report

Master slide deck



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THE ONLY GLOBAL RENEWABLE ENERGY MULTI-STAKEHOLDER COMMUNITY



AEE INTEC, Fundacion Bariloche, Higher School of Economics (Russia), IIASA, ISES, NREL, SANEDI, TERI

15/06/2020



MAKE THE SHIFT TO RENEWABLE ENERGY HAPPEN – NOW!



Our more than **2,000 community members** co-operate collecting information, changing norms and debating.



We build upon a decentralized intelligence, ensuring high responsiveness to an ever changing environment.

Our annual publications are probably the world's most comprehensive, crowdsourced reports on renewables.



RENEWABLES 2020 GLOBAL STATUS REPORT

COLLABORATIVE ANNUAL REPORTING ON RENEWABLES SINCE 2004

THE REPORT FEATURES:

- Global Overview
- Policy Landscape
- Market and Industry Trends
- Distributed Renewables for Energy Access
- Investment Flows
- Energy Systems Integration and Enabling Technologies
- Energy Efficiency
- Feature: Public Support for Renewables

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RENEWABLES 2020 GLOBAL STATUS REPORT





RENEWABLE ENERGY CONTINUED TO GROW IN 2019

Total power capacity rose 8.4%

- 2,588 GW including hydropower
- Non-hydropower: 14.7% increase
- **200** GW of renewable power additions
 - Solar PV: 115 GW; Wind: 60 GW; Hydro: 16 GW
- Renewable heat demand increased marginally
- **5% growth in biofuel production**

Table 1. Renewable Energy Indicators 2019

		2018	2019
INVESTMENT			
New investment (annual) in renewable power and fuels'	billion USD	296.0	301.7
POWER			
Renewable power capacity (including hydropower)	GW	2,387	2,588
Renewable power capacity (not including hydropower)	GW	1,252	1,437
O Hydropower capacity ²	GW	1,135	1,150
🐣 Wind power capacity	GW	591	651
😳 Solar PV capacity ³	GW	512	627
Bio-power capacity	GW	131	139
(i) Geothermal power capacity	GW	13.2	13.9
😳 Concentrating solar thermal power (CSP) capacity	GW	5.6	6.2
Ocean power capacity	GW	0.5	0.5
HEAT			
🚱 Modern bio-heat demand (estimated)4	EJ	13.9	14.1
Solar hot water demand (estimated) ⁵	EJ	1.4	1.4
Q Geothermal direct-use heat demand (estimated) ⁶	PJ	384	421
TRANSPORT			
📀 Ethanol production (annual)	billion litres	111	114
FAME biodiesel production (annual)	billion litres	41	47
HVO biodiesel production (annual)	billion litres	6.0	6.5



WHICH COUNTRIES LED THE WAY IN 2019?

Annual Investment / Net Capacity Additions / Production in 2019

Technologies ordered based on total capacity additions in 2019.

	1	2	3	4	5
Investment in renewable power and fuels capacity (not including hydropower over 50 MW)	China	United States	Japan	India	Chinese Taipei
🍪 Solar PV capacity	China	United States	India	Japan	Vietnam
👃 Wind power capacity	China	United States	United Kingdom	India	Spain
O Hydropower capacity	Brazil	China	Lao PDR	Bhutan	Tajikistan
0 Geothermal power capacity	Turkey	Indonesia	Kenya	Costa Rica	Japan
Concentrating solar thermal power (CSP) capacity	Israel	China	South Africa	Kuwait	France
🔅 Solar water heating capacity	China	Turkey	India	Brazil	United States
🚱 Ethanol production	United States	Brazil	China	India	Canada
🚱 Biodiesel production	Indonesia	United States	Brazil	Germany	France

As in past years, **China** led many key annual categories for renewable energy in 2019.



WHO WERE THE RENEWABLE ENERGY LEADERS AT THE END OF 2019?

Total Capacity or Generation as of End-2019

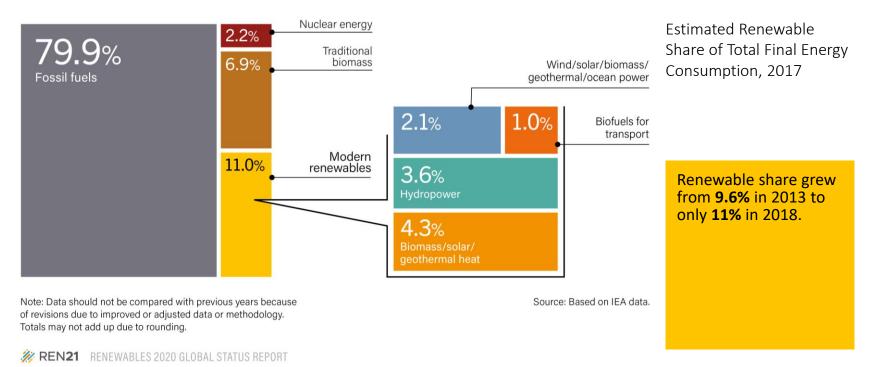
Countries in **bold** indicate change from 2018.

	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		
Renewable power capacity per capita (not including hydropower) ¹	Iceland	Denmark	Sweden	Germany	Australia		
🚱 Bio-power capacity	China	United States	Brazil	India	Germany		
🕖 Geothermal power capacity	United States	Indonesia	Philippines	Turkey	New Zealand		
O Hydropower capacity ²	China	Brazil	Canada	United States	Russian Federation		
O Hydropower generation ²	China	Brazil	Canada	United States	Russian Federation		
🛞 Solar PV capacity	China	United States	Japan	Germany	India		
Concentrating solar thermal power (CSP) capacity	Spain	United States	Morocco	South Africa	China		
S Wind power capacity	China	United States	Germany	India	Spain		
HEAT							
Solar water heating collector capacity ³	China	United States	Turkey	Germany	Brazil		
Solar water heating collector capacity per capita	Barbados	Cyprus	Israel	Austria	Greece		
🔃 Geothermal heat output ⁴	China	Turkey	Iceland	Japan	New Zealand		

Some countries changed places during the year, though in many cases the leaders for total capacity and generation are wellestablished.



ONLY MODERATE CHANGE IN RENEWABLE SHARE OF ENERGY DEMAND

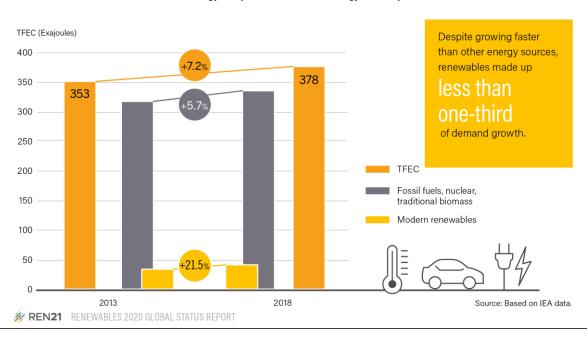


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RENEWABLES ARE GROWING FAST... BUT NOT FAST ENOUGH

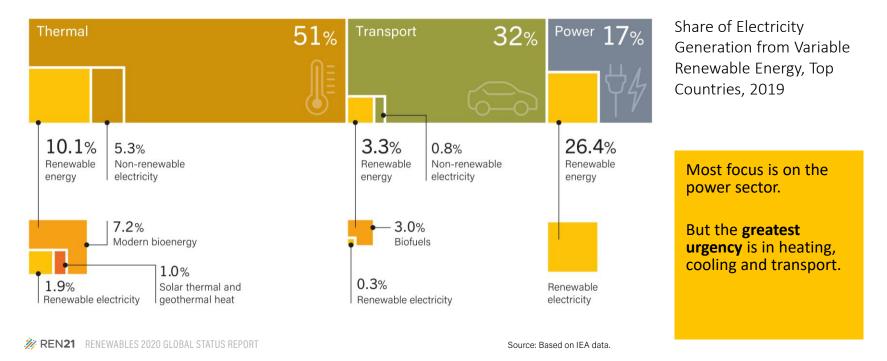
- Renewables grew three times faster than fossil fuels
- Renewable energy only accounted for 29% of demand growth
- Energy efficiency and renewables are complementary



Estimated Global Growth in Renewable Energy Compared to Total Final Energy Consumption, 2013-2018



MORE THAN 80% OF OUR ENERGY FOR HEATING, COOLING, TRANSPORT



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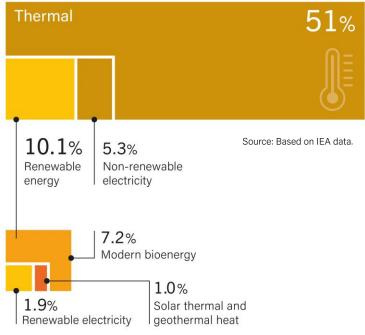


SLOW GROWTH IN RENEWABLE HEATING AND COOLING

KEY BARRIERS

- Sector heavily relying on fossil fuel
 - fossil fuel subsidies no level playing field
 - Upfront capital cost of RE
- Lack of supportive regulatory framework
 - No new H&C policies since 2017
 - for electrification
- Resource availability
- Investments in supporting infrastructure needed (e.g., district heating and cooling)
- Technological advances needed for high-temperature industrial processes

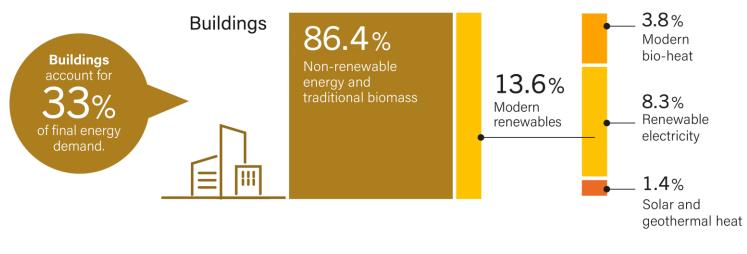
Renewable Share of Total Final Energy Consumption, by Final Energy Use, 2017





RENEWABLES WERE FASTEST GROWING ENERGY SOURCE IN BUILDINGS

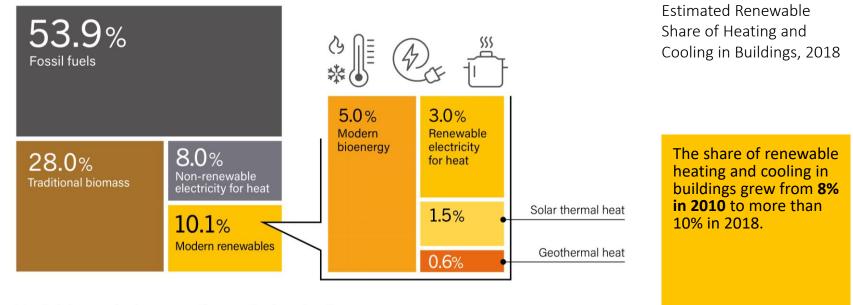
Renewable Share of Total Final Energy Consumption in Buildings, 2017



Note: Modern bio-heat includes heat supplied by district energy networks. Totals may not add up due to rounding. Source: Based on IEA data.



RENEWABLE HEAT IS GRADUALLY GROWING IN BUILDINGS



Note: Includes space heating, space cooling, water heating and cooking. Modern bioenergy includes heat supplied by district energy networks.

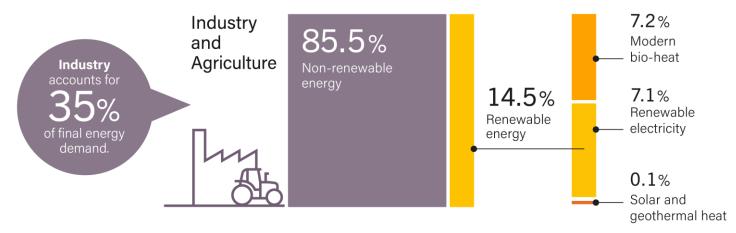
Source: Based on IEA data.

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RENEWABLES IN INDUSTRIAL ENERGY USE REMAINS SMALL

Renewable Share of Total Final Energy Consumption in Industry and Agriculture, 2017



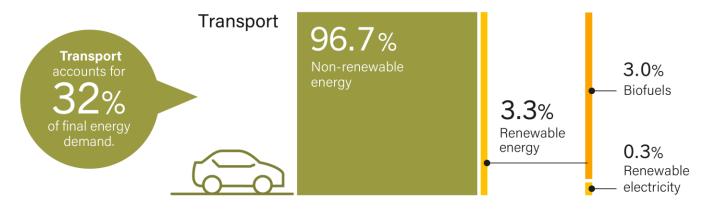
Note: Modern bio-heat includes heat supplied by district energy networks. Totals may not add up due to rounding. Source: Based on IEA data.

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THE SHARE OF RENEWABLES IN TRANSPORT HAS NOT CHANGED

Renewable Share of Total Final Energy Consumption in Transport, 2017



Source: Based on IEA data.

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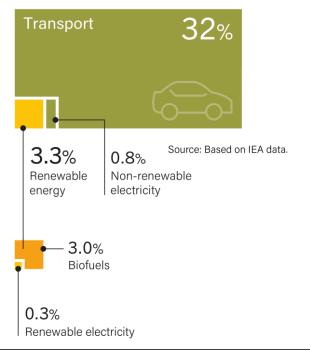


THE SHARE OF RENEWABLES IN TRANSPORT HAS NOT CHANGED

KEY BARRIERS

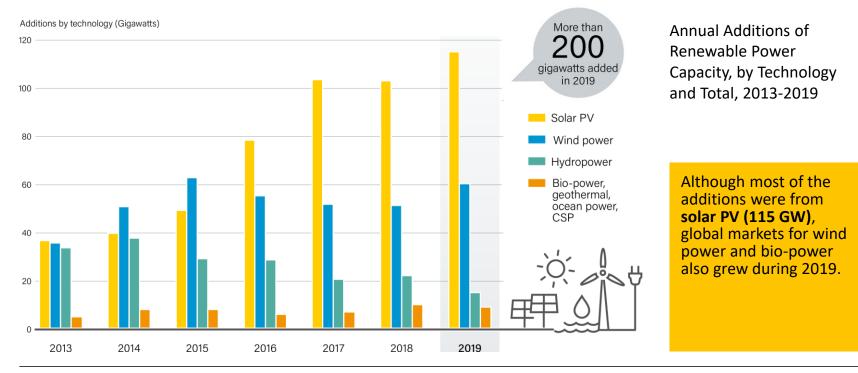
- Sector heavily relying on fossil fuel
 - Fossil fuel "centered" market structures
 - Fossil fuel subsidies no level playing field
- Lack of strong policy support → no new countries with biofuel blend mandates since 2017
- Exploding demand growth
- Only nine countries with advanced mandates
- Limited options in aviation and shipping

Renewable Share of Total Final Energy Consumption, by Final Energy Use, 2017



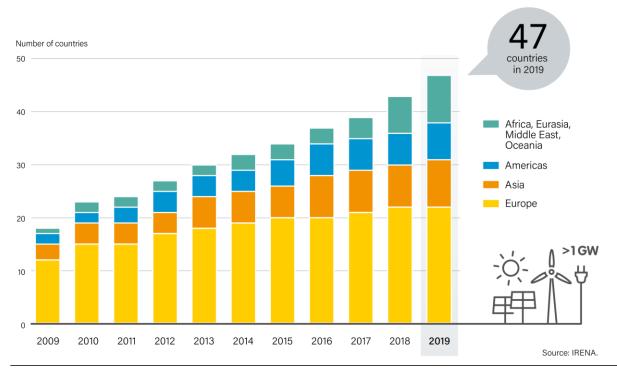


MORE THAN 200 GIGAWATTS OF RENEWABLE POWER ADDED IN 2019





SOLAR PV AND WIND POWER ARE SPREADING AROUND THE WORLD



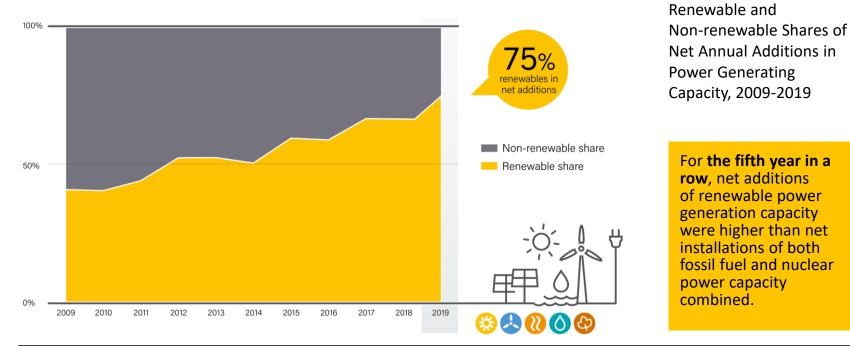
Number of Countries with More Than 1 GW of Solar PV and Wind Power, by Region, 2009-2019

47 countries had installed at least 1 GW of solar PV and wind power. compared to **18 countries** in 2009.

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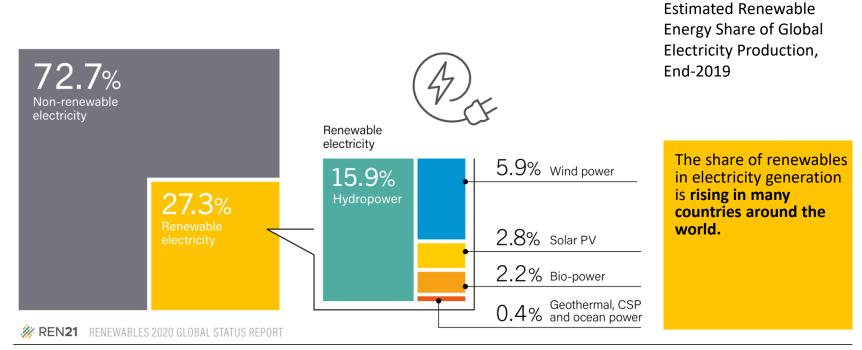


MORE RENEWABLE POWER ADDED THAN FOSSIL FUEL AND NUCLEAR



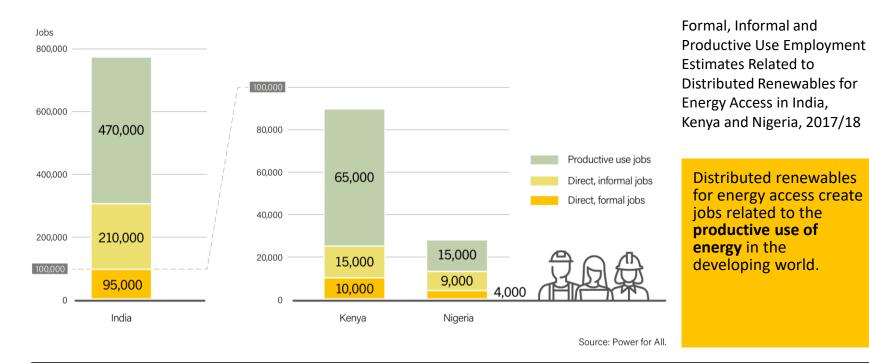


MORE THAN 27% OF GLOBAL ELECTRICITY IS NOW RENEWABLE



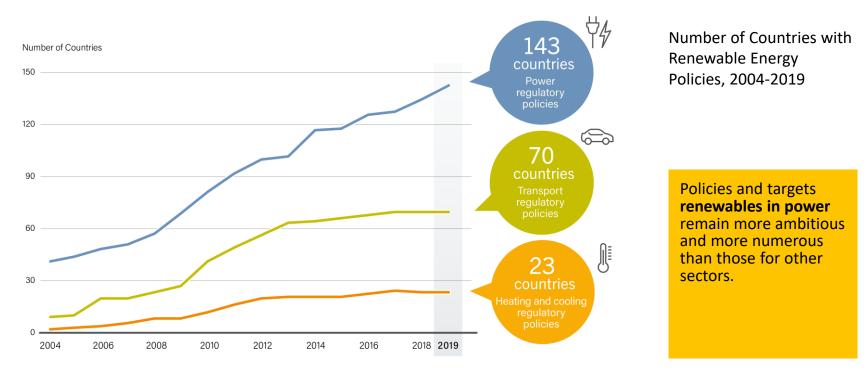


RENEWABLES PROVIDE DIRECT AND INDIRECT EMPLOYMENT





POWER SECTOR CONTINUES TO RECEIVE MOST POLICY ATTENTION

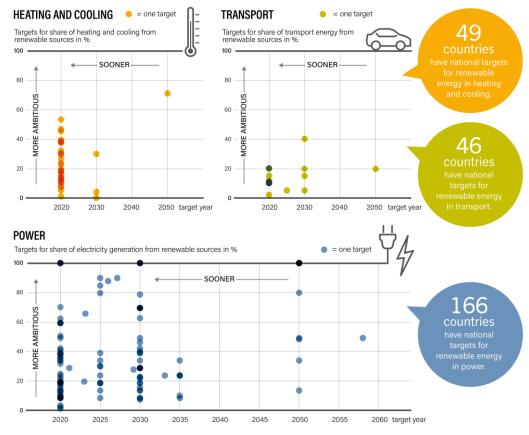


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TARGET IMBALANCE

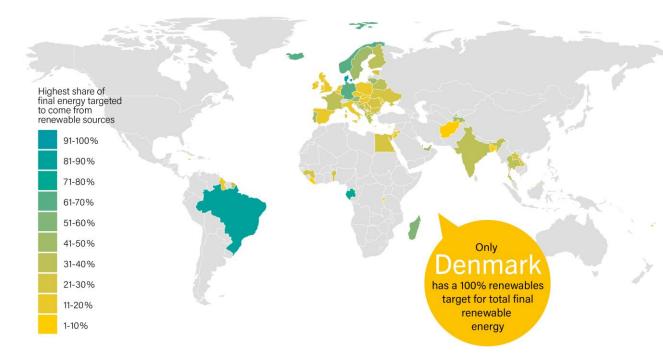
National Sector-Specific Targets for Share of Renewable Energy by a Specific Year, in Place at End-2019

Globally, most renewable energy targets are aimed exclusively at the **power** sector.





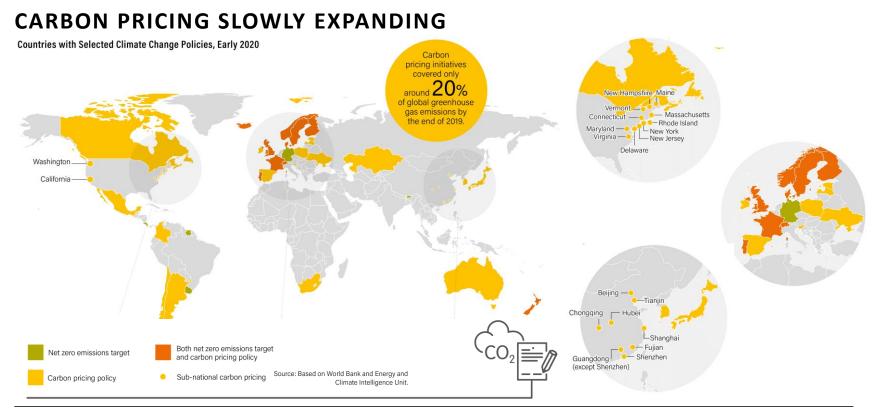
RENEWABLE ENERGY TARGETS AROUND THE WORLD



National Targets for Share of Renewable Energy in Final Energy, by a Specific Year, in Place at End-2019

Only one new country (Spain) adopted an economy-wide renewable energy target during 2019.

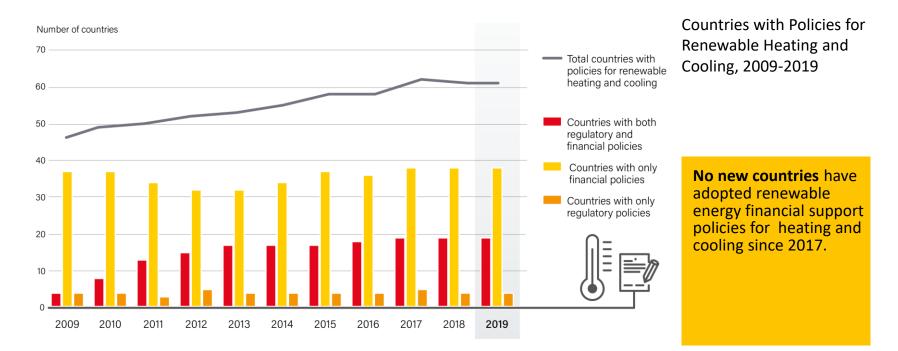




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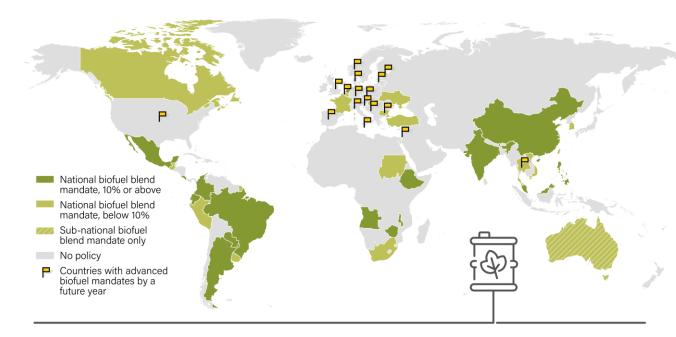


POLICY SUPPORT STAGNATING IN HEATING AND COOLING SECTOR





POLICY SUPPORT REMAINS STATIC FOR TRANSPORT



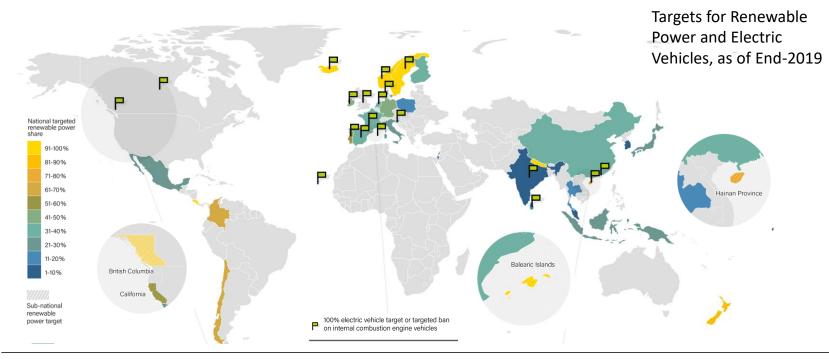
National and Sub-National Renewable Transport Mandates, as of End-2019

Biofuel blending mandates remain the most widely adopted renewable energy support policy in the transport sector.

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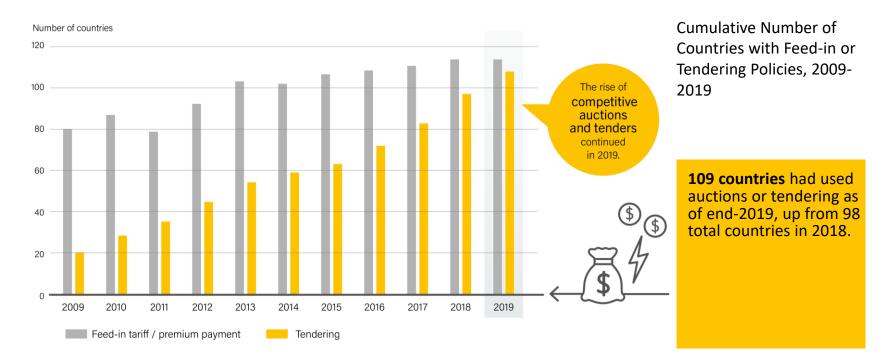


ONLY SEVERAL COUNTRIES HAVE TARGETS FOR EVS AND RENEWABLES





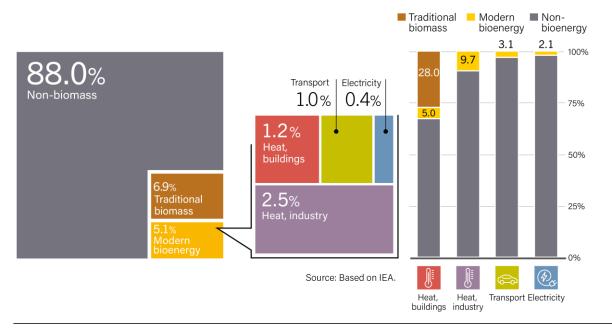
THE RISE OF RENEWABLE POWER AUCTIONS CONTINUED





BIOENERGY MAKES LARGEST CONTRIBUTION TO RENEWABLE SUPPLY

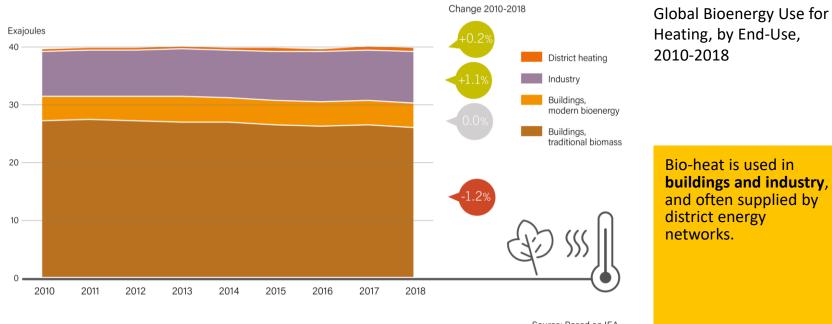
Estimated Shares of Bioenergy in Total Final Energy Consumption, Overall and by End-Use Sector, 2018



Modern bioenergy supplies energy for heating, transport and electricity end-uses.



USE OF MODERN BIOENERGY IS INCREASING SLOWLY



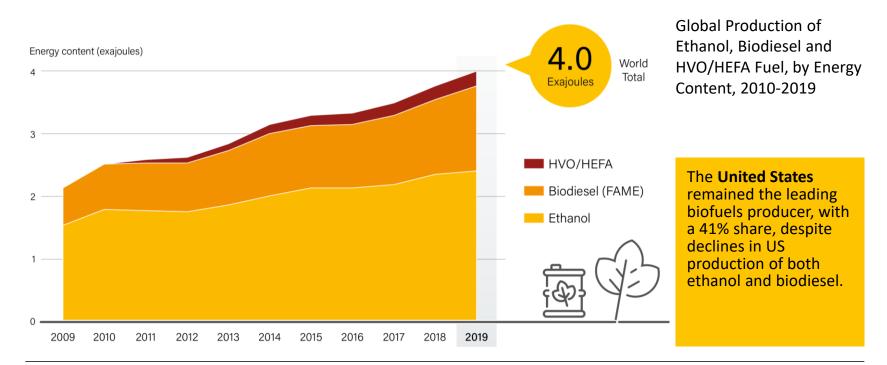
Source: Based on IEA.

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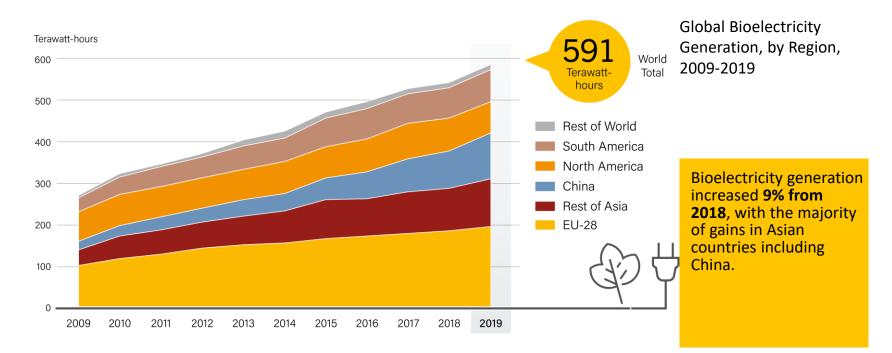


BIOFUELS PRODUCTION INCREASED, DOMINATED BY US AND BRAZIL



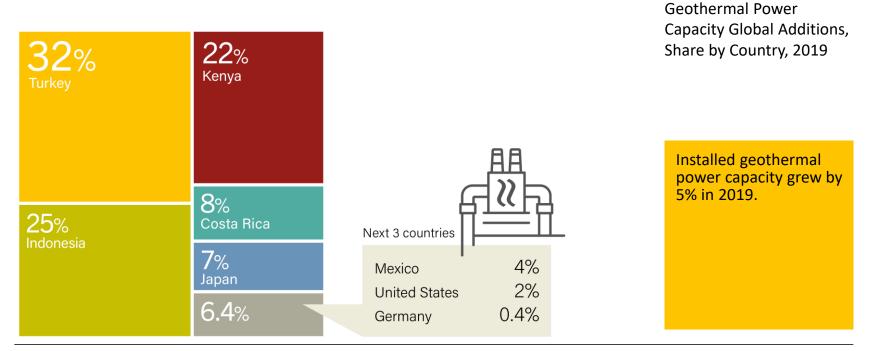


BIOELECTRICITY PRODUCTION HAS GROWN RAPIDLY



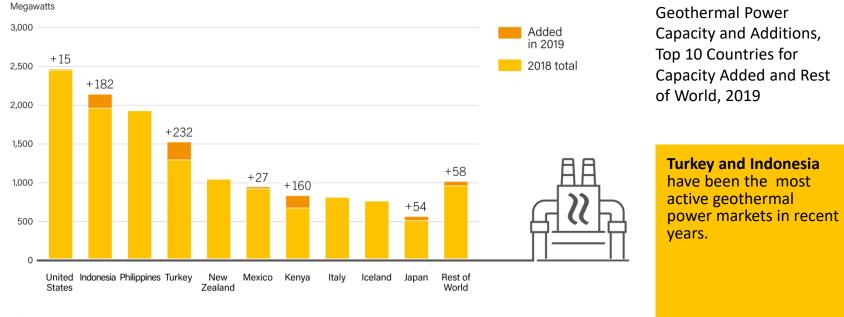


GEOTHERMAL POWER CAPACITY ADDITIONS MAINLY IN THREE COUNTRIES





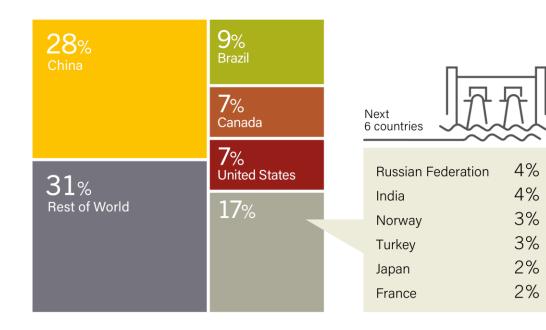
TURKEY AND INDONESIA LED NEW GEOTHERMAL POWER INSTALLATIONS



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HYDROPOWER CHARACTERISED BY MARKET STABILITY



Hydropower Global Capacity, Shares of Top 10 Countries and Rest of World, 2019

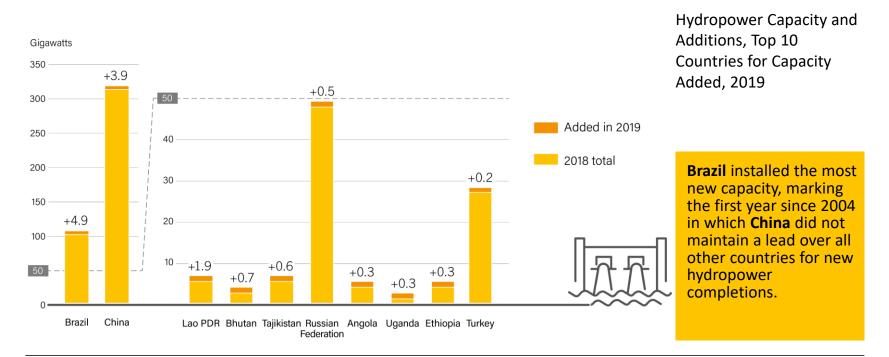
Only 15.6 GW added in 2019, continuing a multi-year trend of market deceleration.

Note: Totals may not add up due to rounding.

Source: Global total from IHA.

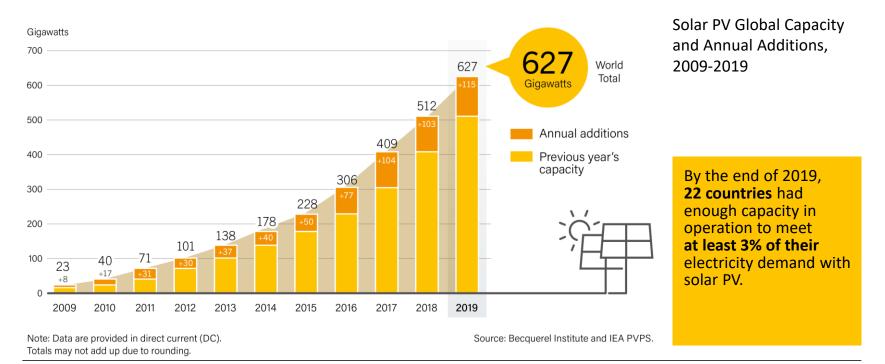


HYDROPOWER CAPACITY ADDED IN NEARLY EVERY REGION



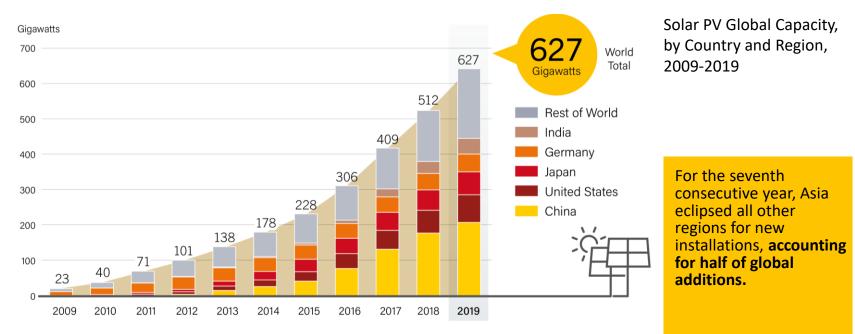


SOLAR PV CAPACITY ADDITIONS PASSED 115 GW MARK IN 2019





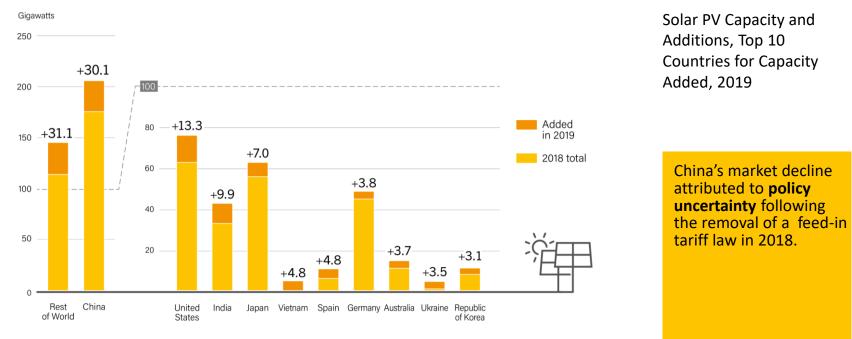
SOLAR PV SPREADING TO NEW PARTS OF THE WORLD



Note: Data are provided in direct current (DC).



CHINA REMAINS LEADER IN SOLAR PV DESPITE DECLINE IN MARKET



Note: Data are provided in direct current (DC).



ASIA: MAIN REGIONAL SOLAR PV MARKET FOR 7TH CONSECUTIVE YEAR

6%

4%

4%

3%

3%

3% 3%

26% _{China}	12% United States	
	9% India	Next 7 countries
27% Rest of World	27%	Japan Vietnam Spain Germany Australia Ukraine Republic of Korea

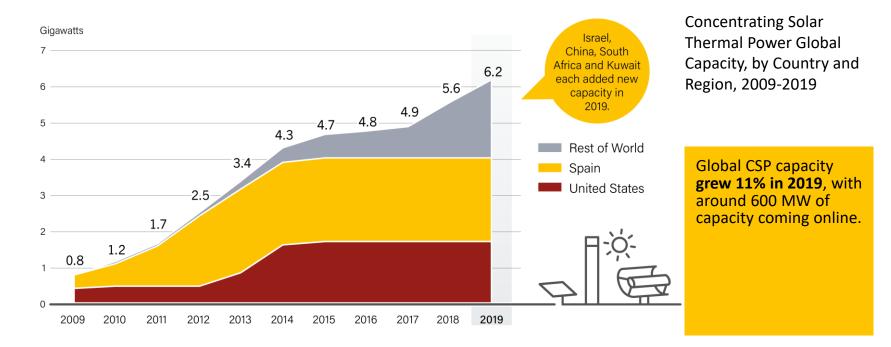
Solar PV Global Capacity Additions, Shares of Top 10 Countries and Rest of World, 2019

Asia accounted for half of global additions, despite declines in the region's top three markets (China, India and Japan).

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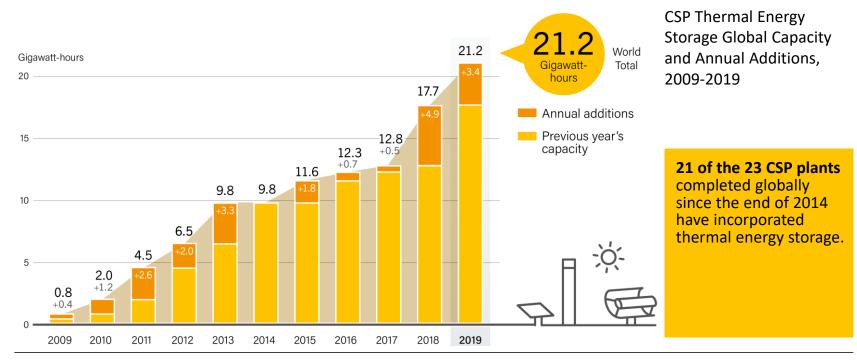


NEW CSP ADDITIONS EXCLUSIVELY IN EMERGING MARKETS



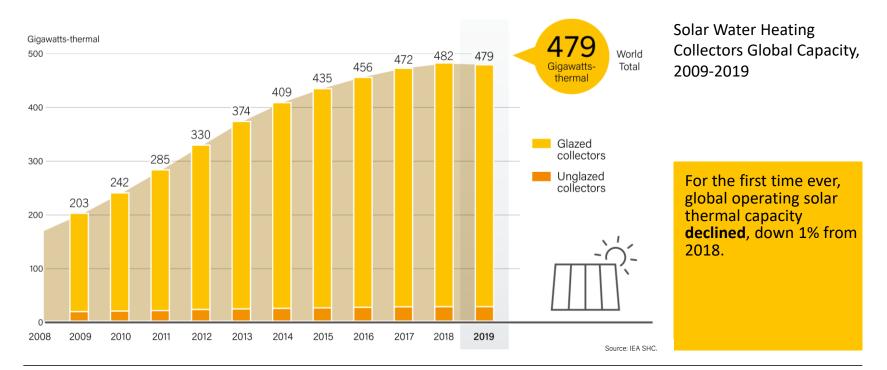


NEARLY ALL CSP PLANTS USE THERMAL ENERGY STORAGE





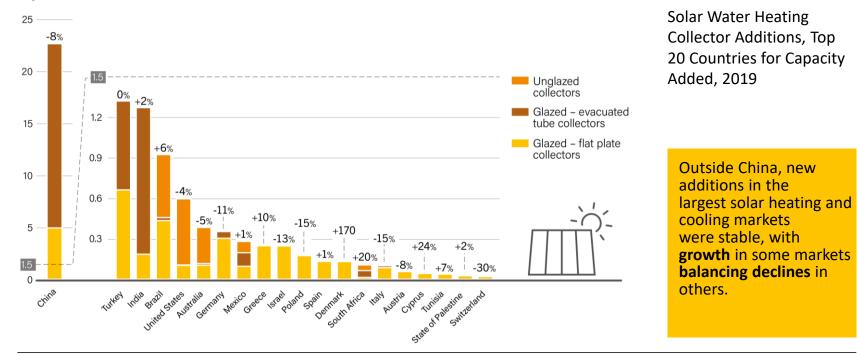
INSTALLED SOLAR WATER HEATING CAPACITY DECLINED





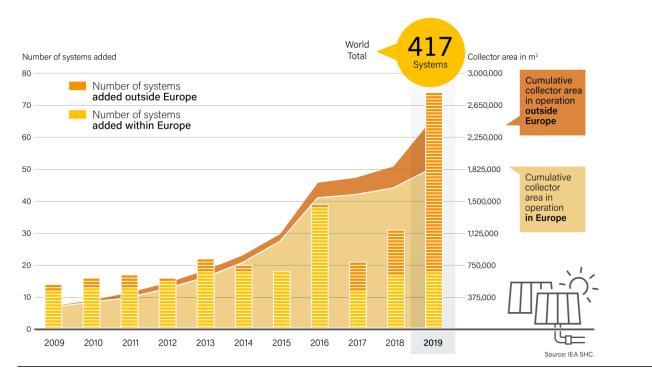
CONTRACTION IN SOME MARKETS, GROWTH IN OTHERS

Gigawatts-thermal





LARGE INCREASE IN SOLAR DISTRICT HEATING SYSTEMS

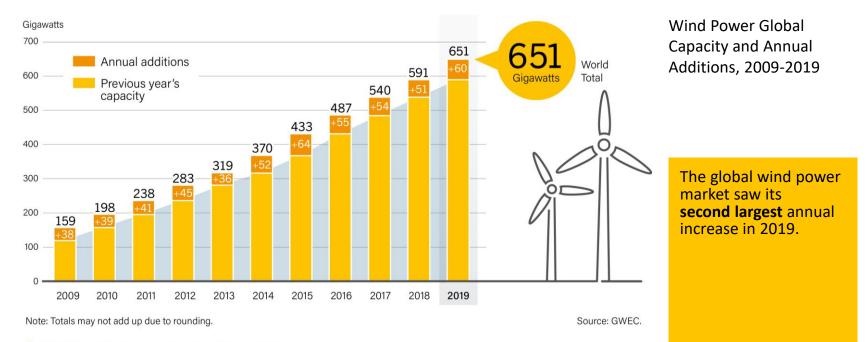


Solar District Heating Systems, Global Annual Additions and Total Area in Operation, 2009-2019

Leading markets for solar district heating were **Denmark, China** and Germany.

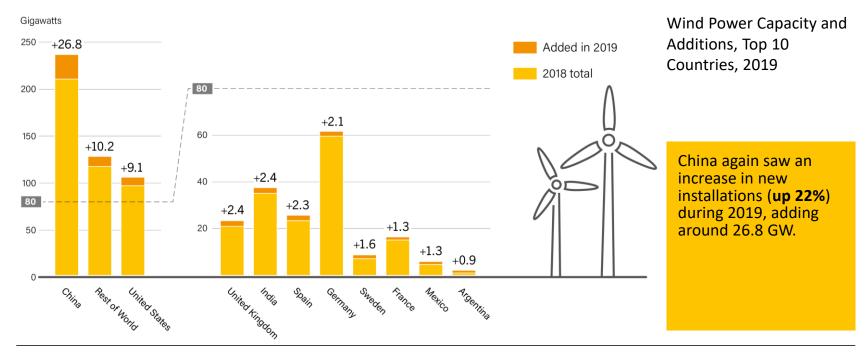


WIND POWER CAPACITY CONTINUES INCREASE STEADILY YEAR-ON-YEAR



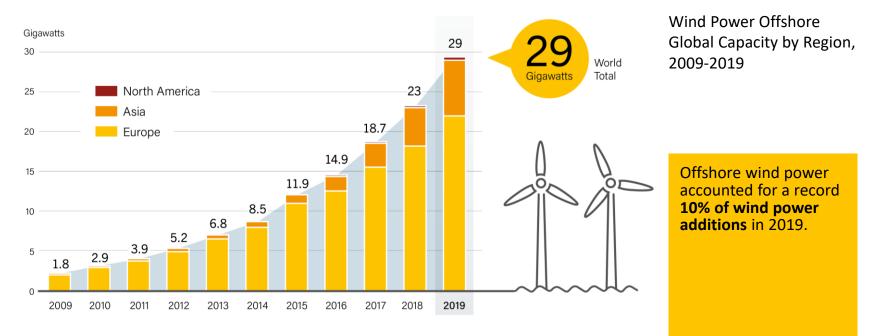


MORE THAN HALF OF NEW WIND POWER CAPACITY IN ASIA



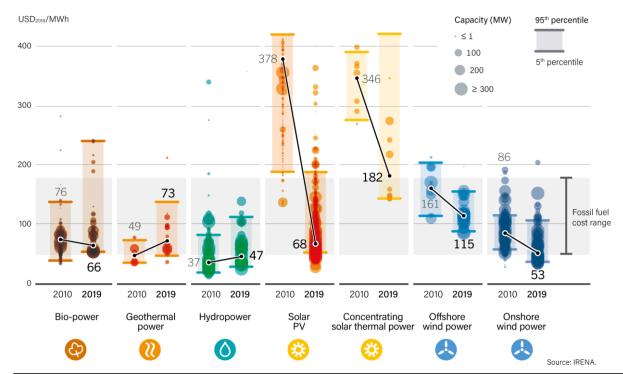


SUCCESS OF OFFSHORE WIND IN EUROPE SPARKED INTEREST ELSEWHERE



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RENEWABLE POWER COSTS KEEP FALLING

Global Levelised Cost of Electricity from Newly Commissioned, Utilityscale Renewable Power Generation Technologies, 2010-2019

Costs for solar PV and CSP as well as onshore and offshore wind have fallen sharply over the past decade.



All Developing and Emerging Countries All Developing and Emerging Asian Countries 04 86% 799 R 43% 57% 6 74% India Ĩ 56% 45% 34% 49% Access to Electricity Access to Clean Cooking All Africa 0 2010 2018 2010 2018 Ā 26% 29% 54% Sub-Saharan Africa 13% 17% 45% **Central and South America** 97% 94%

Source: IEA.

ACCESS TO ENERGY EXPANDS, ALBEIT UNEVENLY

Access to Electricity and Clean Cooking by Region, 2010 and 2018

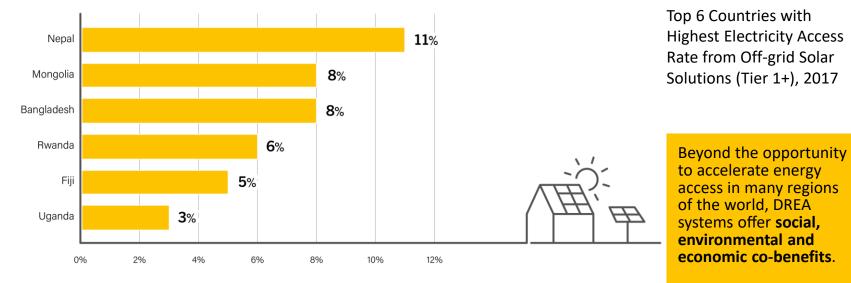
By the end of 2018, the global population without access to electricity fell to **860 million**, while **2.65 billion** people lived without access to clean cooking facilities

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DISTRIBUTED RENEWABLES: KEY SOLUTIONS TO PROVIDE ENERGY ACCESS

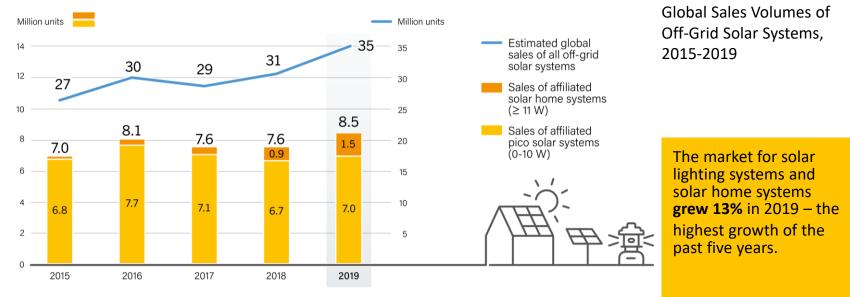


Note: Data in figure include solar home systems and mini-grids but exclude solar lights. Data are rounded to the nearest ones. Tier 1+ access technologies include small solar home systems (11-50 W), large solar home systems (>50 W) and mini-grids.

Source: World Bank.



GLOBAL SALES OF OFF-GRID SOLAR SYSTEMS SEES STRONG GROWTH

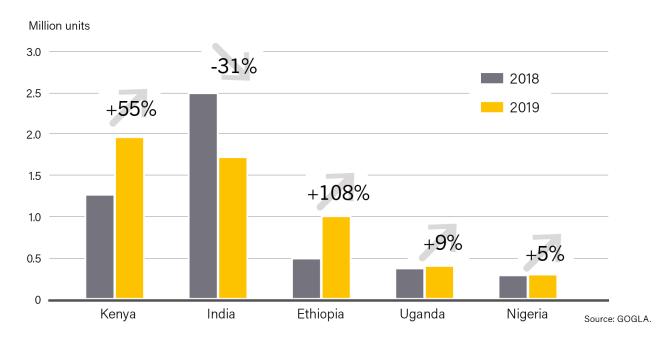


Note: Affiliated products are those sold by companies that are connected to any of the partner organisations involved in the semi-annual GOGLA sales data reporting process, including GOGLA members and companies selling products that meet Lighting Global Quality Standards.

Source: IFC and GOGLA.



MARKETS FOR OFF-GRID SOLAR SYSTEMS EVOLVING

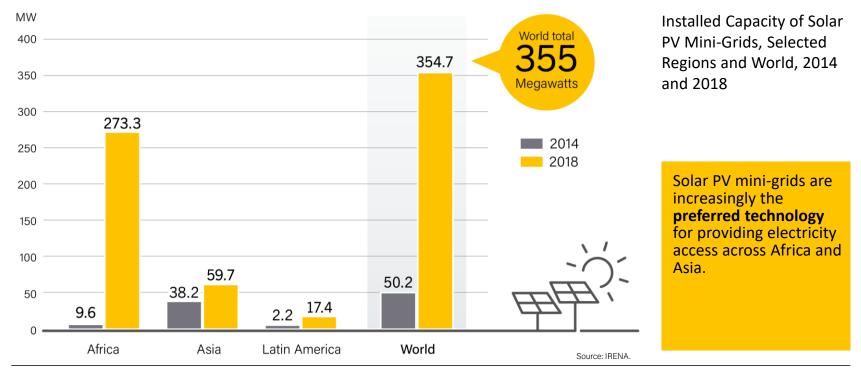


Sales Volumes of Affiliated Off-Grid Solar Systems in Top 5 Countries, 2018 and 2019

Sales of affiliated offgrid solar systems expanded the most in Ethiopia and Kenya, contrasting with a drop in India.

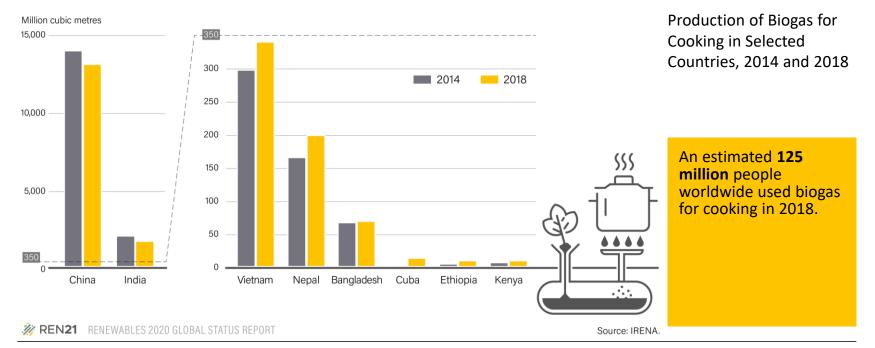


RENEWABLE ENERGY-BASED MINI-GRIDS GAIN MOMENTUM



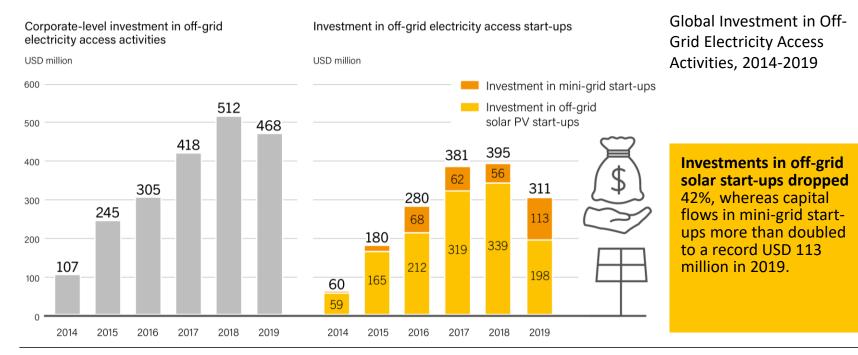


PRODUCTION OF BIOGAS FOR COOKING EXPANDS IN NEW MARKETS



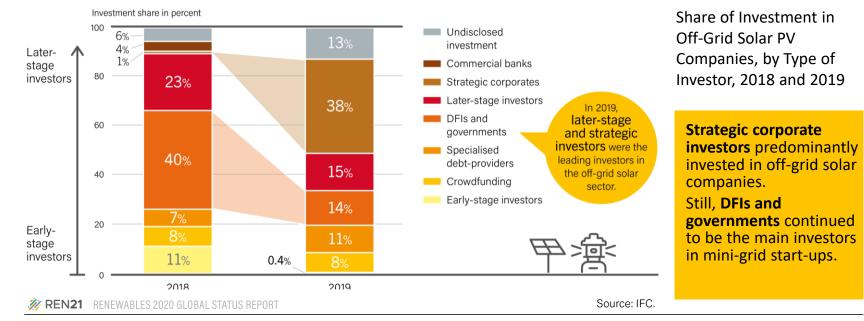


INVESTMENT IN OFF-GRID ELECTRICITY ACCESS FACED A DECREASE



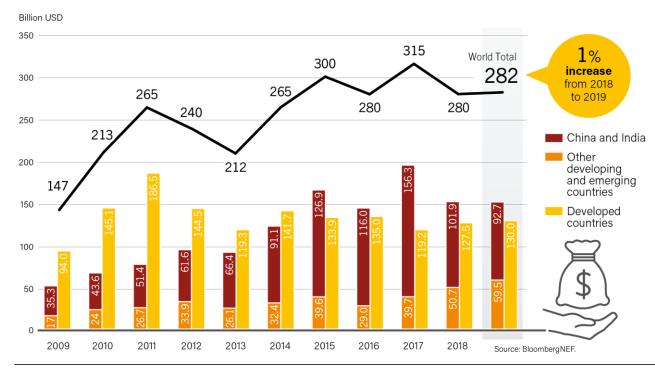


THE TYPE OF INVESTORS IN DREA MARKETS SHIFTED NOTABLY IN 2019





INVESTMENT IN RENEWABLES HAS BARELY GROWN

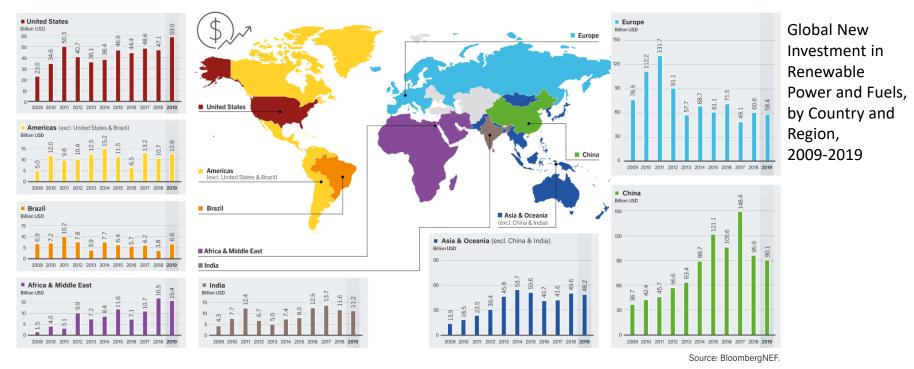


Global New Investment in Renewable Power and Fuel Capacity in Developed, Emerging and Developing Countries, 2009-2019

Developing and emerging economies surpassed developed countries in renewable energy capacity investment for the fifth year running, reaching USD 152 billion.



INVESTMENT GREW IN THE AMERICAS, BUT DECREASED ELSEWHERE





Global New Investment in

Renewable Energy by

Technology, 2019

Wind power and

dominate new

investment in

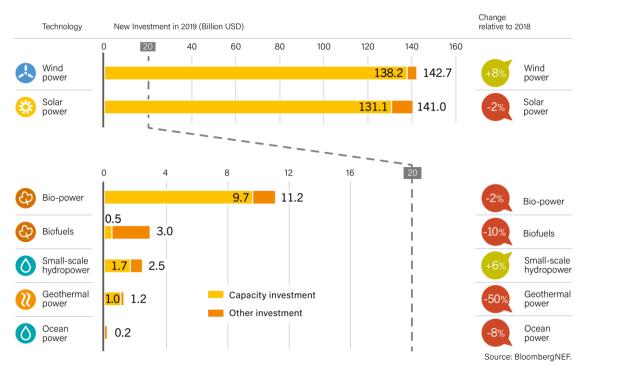
total.

solar PV continued to

renewable energy in

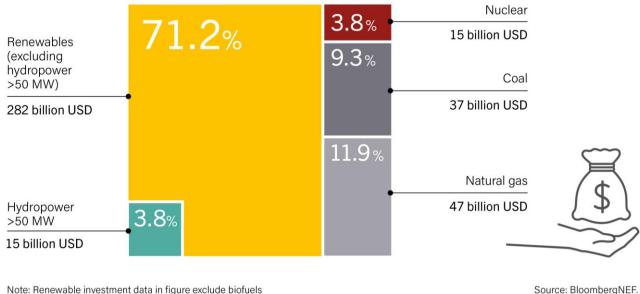
2019, each accounting for roughly 47% of the

INVESTMENT IN SOLAR PV AND WIND POWER CONTINUE TO LEAD





3X MORE INVESTMENT IN RENEWABLES THAN IN COAL, GAS AND NUCLEAR



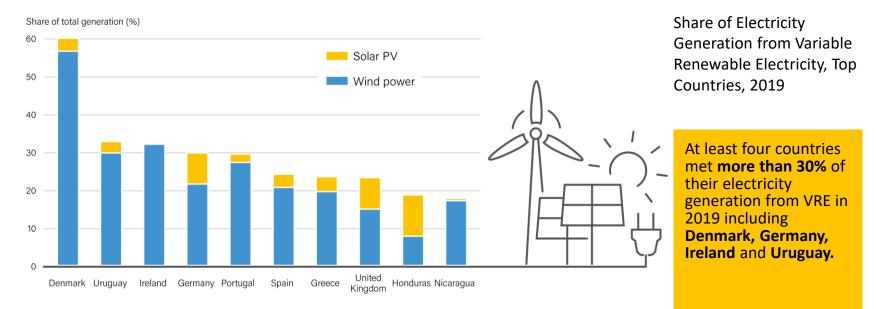
Global Investment in New Power Capacity by Type (Renewables, Coal, Gas and Nuclear Power), 2019

In 2019, renewable power technologies continued to attract far more investment dollars than did coal, natural gas or nuclear power generating plants.

Note: Renewable investment data in figure exclude biofuels and some types of non-capacity investment.

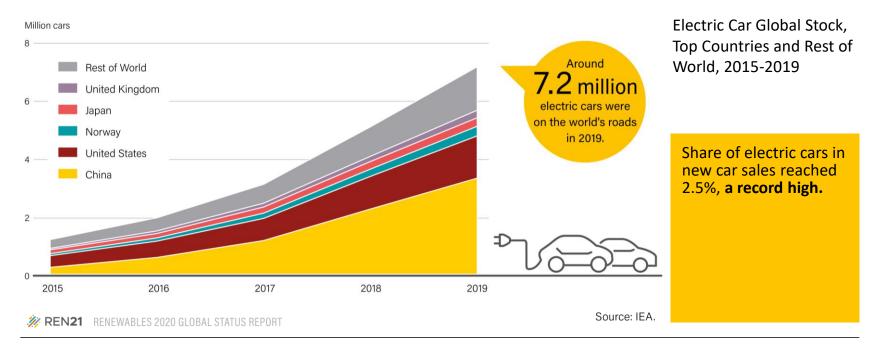


VARIABLE RENEWABLES REACHING HIGH SHARES IN MANY COUNTRIES



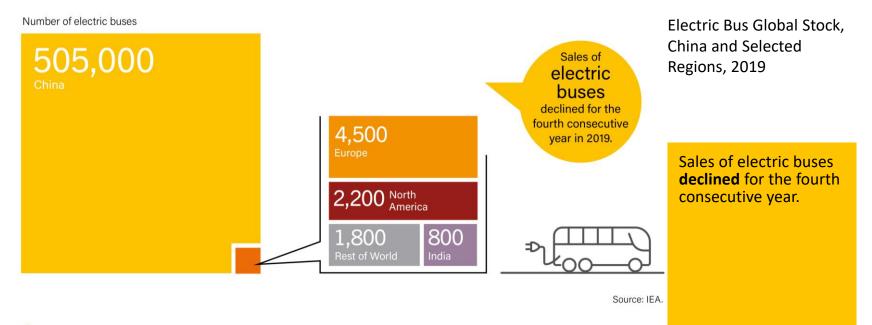


ELECTRIC CAR STOCK INCREASED 40% IN 2019





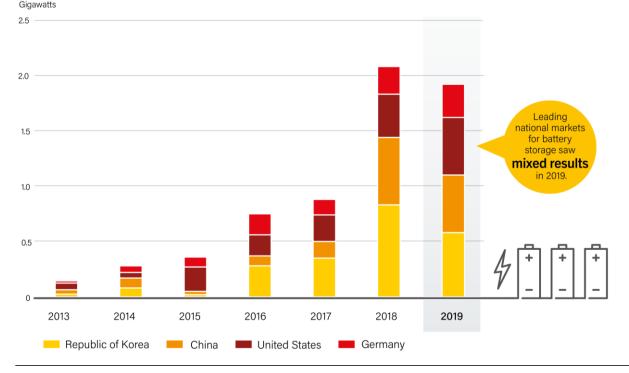
VIRTUALLY ALL ELECTRIC BUSES ARE IN CHINA



🎉 REN21 🛛 RENEWABLES 2020 GLOBAL STATUS REPORT



THE LEADING MARKETS FOR BATTERY STORAGE SAW MIXED RESULTS

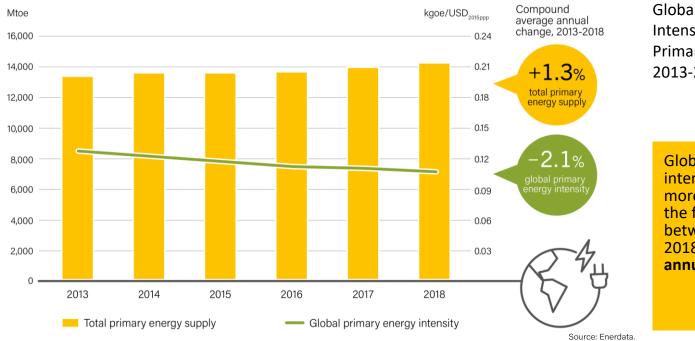


Battery Storage Annual Additions, Selected Countries, 2013-2019

Battery storage markets grew in the United States and Germany, but declined in Republic of Korea, China and Europe as a whole.



GLOBAL PRIMARY ENERGY INTENSITY CONTINUES TO FALL

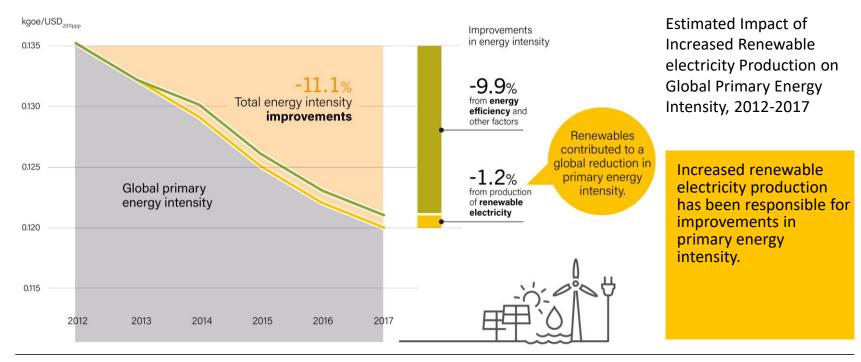


Global Primary Energy Intensity and Total Primary Energy Supply, 2013-2018

Global primary energy intensity decreased more than 10% during the five-year period between 2013 and 2018, at an average annual rate of 2.1%.

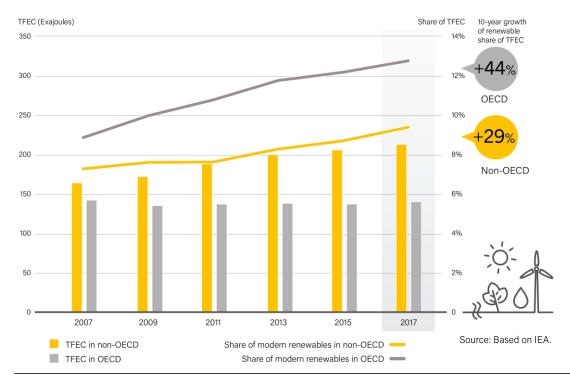


RENEWABLES CONTRIBUTE TO HIGHER ENERGY EFFICIENCY





ENERGY DEMAND TRENDS VARY BASED ON COUNTRY



Total Final energy Consumption and Share of Modern Renewables in OECD and non-OECD countries, 2007-2017

Increases in final energy demand have been driven by economic growth and improved energy access in developing and emerging economies.

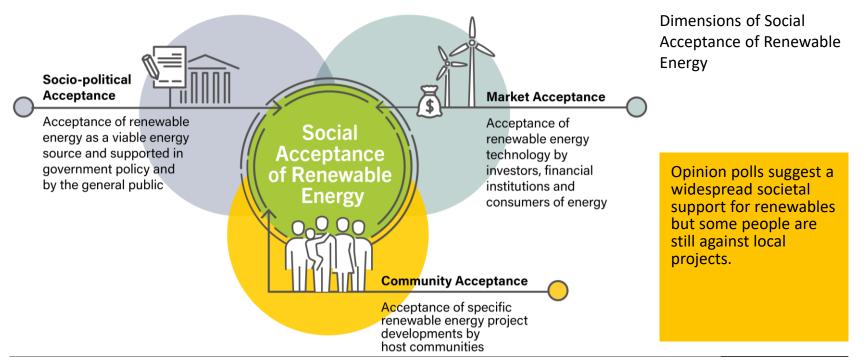


AVOID-SHIFT-IMPROVE TO REDUCE ENERGY DEMAND IN TRANSPORT

AVOID	SHIFT	IMPROVE	Avoid-Shift-Improve Framework in the
Avoid or reduce the need for motorised travel	Shift to more efficient, less carbon-intensive modes	Improve efficiency, vehicle technology and fuels	Transport Sector
 Transport demand management Mixed-use, transit-oriented development Active transport (e.g., walking, cycling) Telecommuting 	 Public transport, intercity and high-speed rail, and new mobility services (powered by renewable energy) Zero emission logistics and last-mile delivery 	 Fuel economy Renewable fuels (e.g., sustainable biofuels, renewable electro-fuels) Renewable-based electric vehicles 	Renewable energy can benefit from wider initiatives to decrease energy demand in the sector, as this could help boost the renewable share.

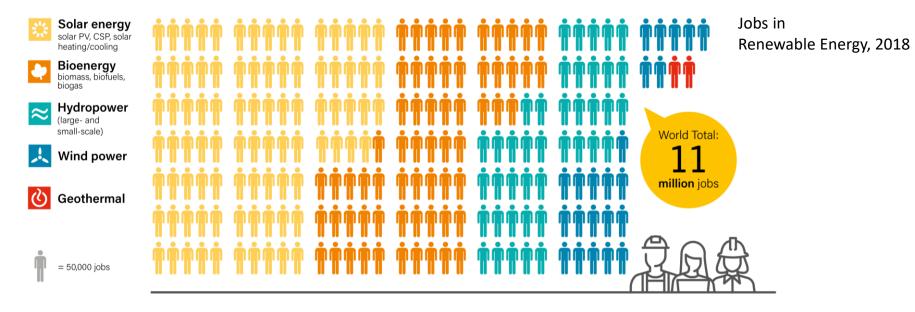


PUBLIC SUPPORT FOR RENEWABLES





JOBS IN RENEWABLE ENERGY KEEP GROWING



Source: IRENA.



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