

November 2018

Allianz Climate and Energy Monitor 2018

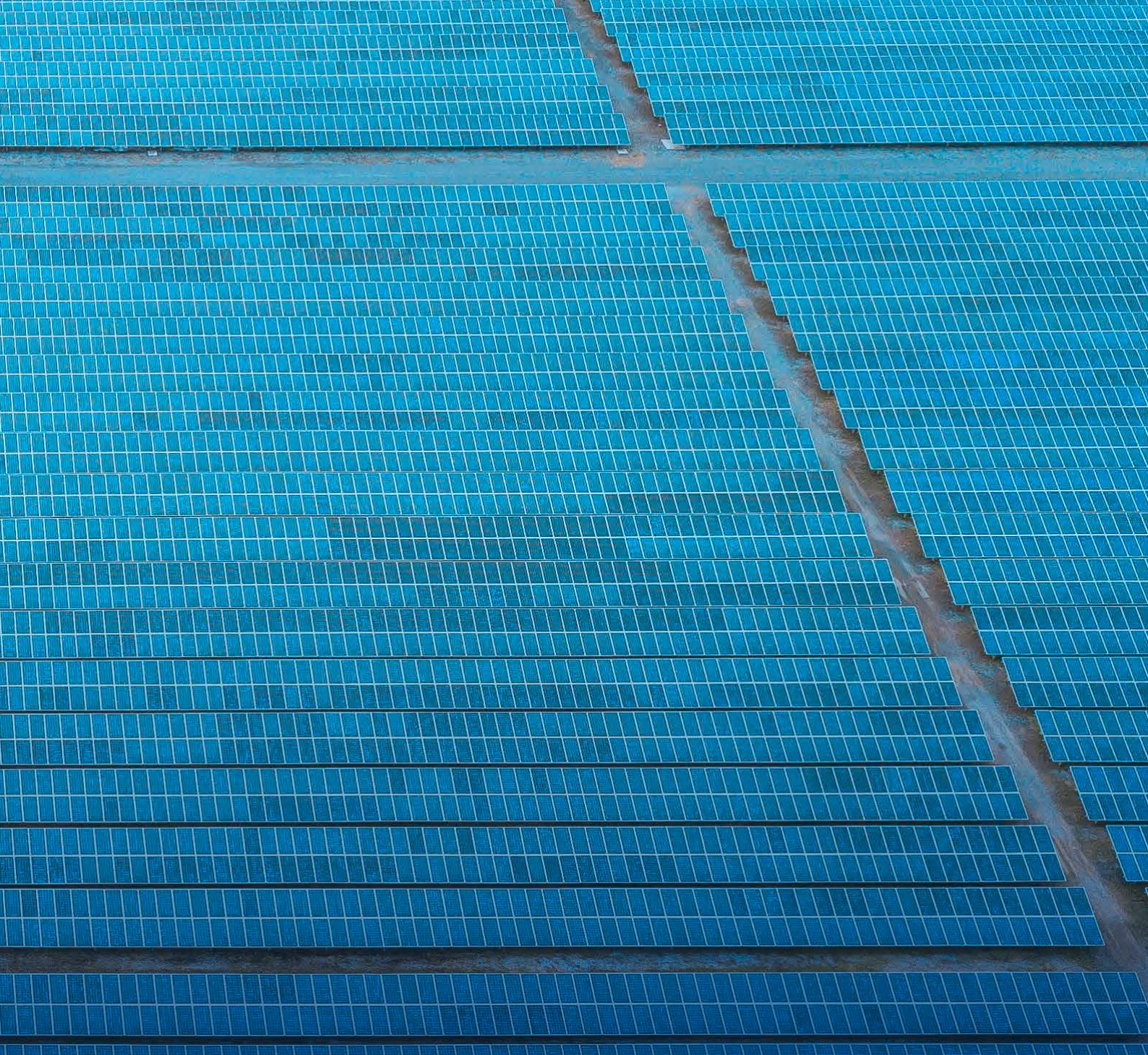
Assessing the needs and attractiveness of low-carbon investments in G20 countries



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The Allianz Climate and Energy Monitor is an annual publication, developed jointly by NewClimate Institute, Germanwatch and Allianz SE. The focus is on power production from renewables in G20 countries as core solutions for the decarbonization of the power infrastructure. The EU, as a supranational body, is excluded from the assessment.

The **NewClimate Institute** for Climate Policy and Global Sustainability is a German-based research institute generating ideas on climate change and driving their implementation. It undertakes research, designs policies and shares knowledge on ambition raising for preventative climate change action and sustainable development. The core expertise lies in the areas of climate policy analysis, climate action tracking, climate finance, carbon markets, and sustainable energy.

Germanwatch is an independent development and environmental organization that advocates for global equity and preservation of livelihood. They concentrate on politics and economies of the “global north” and its worldwide impacts. They work together with members, sponsors and other actors from the civil society to lobby for sustainable development. Drawing on scientific analysis they inform the public sector, undertake educational work, function as a lobbyist, and demonstrate consumers how to act according to their goals.

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1. The Allianz Climate and Energy Monitor

The Monitor assesses G20 countries across five categories which are crucial for renewable energy investments.

The Allianz Climate and Energy Monitor (hereinafter the 'Monitor') evaluates policy and market factors central for attracting renewable energy investments in G20 countries.

The IPCC special report on 1.5°C, released in October 2018, sends out a strong message: there is an urgent need to limit global warming to 1.5°C to avoid severe environmental and socio-economic impacts (IPCC, 2018). Politically, the Paris Agreement has set a clear goal for the direction of travel: Reducing net CO₂ emissions to zero, i.e. large-scale decarbonization by 2050. However, current mitigation efforts fall short of reaching anywhere near this target (Ibid). While all sectors must contribute to this goal, the energy sector can and has to move faster as low-carbon energy and power provision is a key enabler for the decarbonization of other sectors like transport, buildings, and industry (UNEP, 2017). The good news is that this low-carbon energy transformation can deliver other co-benefits like job creation, improved energy security, and almost universal deployment potential (UNDP, 2016).

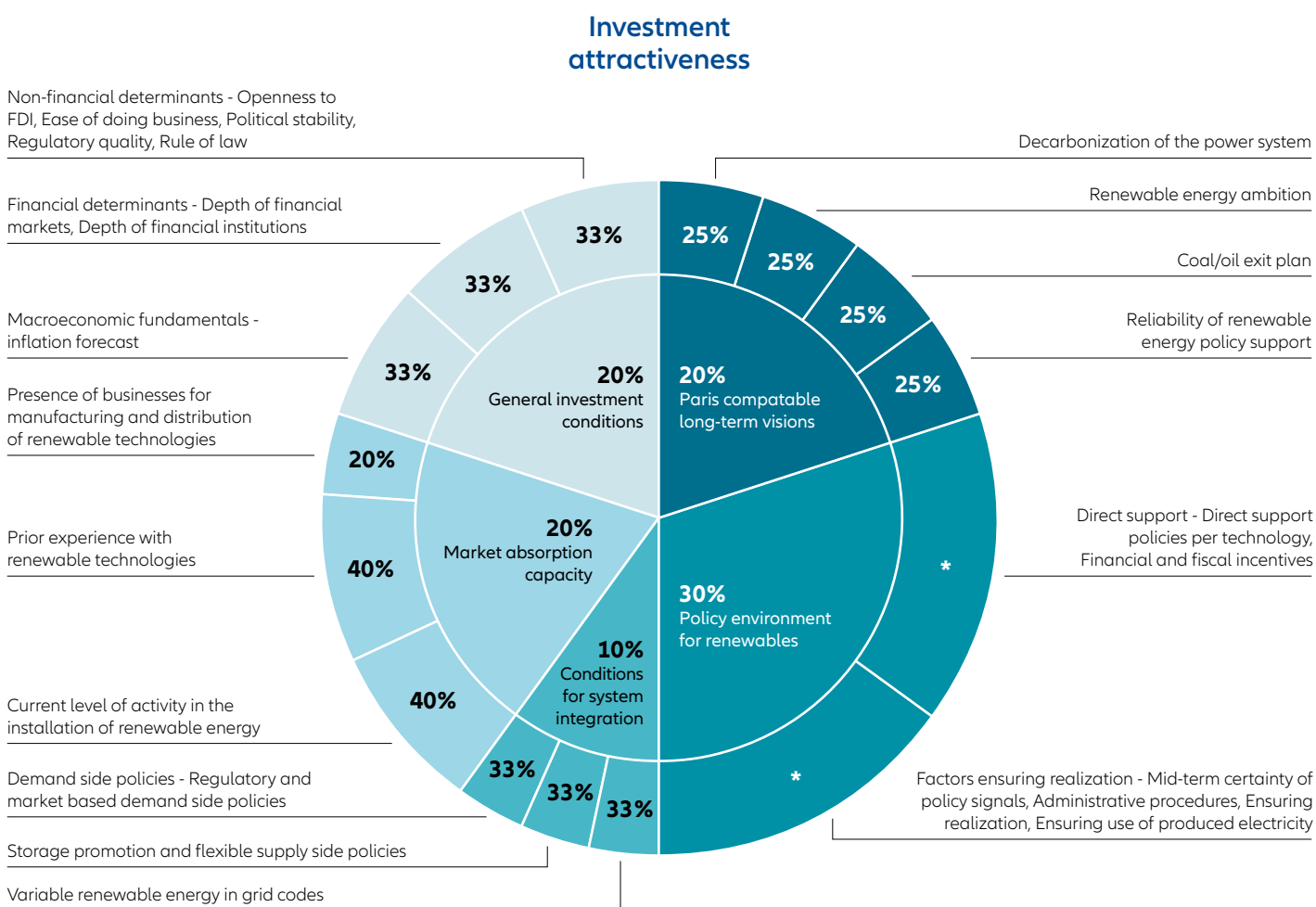
Continued strong policy signals and market certainty will be crucial for providing the private sector with the conducive environment it needs to ratchet up the deployment of renewables. The Monitor evaluates these policy and market factors and assesses the state-of-play for renewable energy attractiveness in the G20 countries, looking at five categories and benchmarks:

1. Long-term policy support for climate and renewable energy (*Paris-compatible long-term vision*). Given the urgency required for the world to not overshoot the temperature limits of the Paris Agreement, the Monitor includes a category which assesses each country's capacity to define a 'Paris-compatible long-term vision'. In an ideal world, countries would have binding, ambitious and concrete 2050-reaching strategies in place for decarbonizing the power sector and pursuing a renewable energy capacity increase at a rate that is compatible with that goal. This would be complemented by a coal or oil exit plan and high reliability of renewable energy support.
2. The adequacy of policy to create enabling conditions for private investors to operate in (*Policy Environment for Renewables*). To decide whether to engage in energy markets, investors need information on the quality of the policy framework supporting renewables in the country. This includes direct policy support for renewables through instruments such as feed in tariffs, auctions and renewable portfolio standards as well as the factors that ensure the investments are realized smoothly. A role model ideally has in place support policies for all major renewables, which are complemented by conducive financial instruments and measures to mitigate financial risks. In addition, certainty would be provided to investors on the medium-term prospects of investing in renewables. This would include, for example, streamlined procedures for permitting renewable energy projects accelerated uptake as well as priority dispatch and compensation in case of curtailment.
3. A country's preparedness for higher shares of variable renewable energy in its grid (*Conditions for system integration*). As a country's share of renewables in the grid increases, system integration becomes more important. Therefore, countries would ideally have in place policies that promote storage and flexible energy supply as well as demand-side energy management and complemented by grid codes that include measures or standards addressing variable renewable energy.

4. Renewable energy market status and dynamics (*Market Absorption Capacity*). The Monitor evaluates a country's prior experience with renewable technologies. A role model would show a continuous increase in pace of renewable energy capacity additions per capita, and a prevalence of businesses manufacturing and distributing renewables.
5. The overarching country-level factors that facilitate investments and business in a country (*General investment conditions*), which can be showstoppers even if the previous conditions are exist. These include, among others, local non-financial determinants such as the ease of doing business and rule of law, local financial determinants such as the depth of capital markets, and the inflation forecast.

Details of the method are provided in the technical note accompanying the Monitor.

FIGURE 1 Overview of the composition of the Monitor



* Indicators 'Direct policy support' and 'Factors ensuring realization' are multiplied.

2. Overall results and highlights for the G20

France now most attractive for renewable energy investments, Brazil climbs 5 ranks and Italy 4 ranks with much improved conditions

All countries need to improve their policy framework for required low-carbon investments

Germany loses first rank, South Korea and Indonesia fall by 8 and 4 ranks

France gains the 1st position due to an overall favorable environment for renewables, leading the G20 in investment attractiveness of renewables. Germany falls back one rank due to a drop in the quality of the overall policy environment for renewables and some deficiencies in policy design, as does the UK. Overall, with four European countries on top of the list, Europe still leads the way in providing attractive conditions for investing in renewables.

Despite high scores for several countries, no single country is yet close to becoming a role model. All countries still have considerable room for improving investment conditions to deploy renewables at the scale needed to reach Paris targets.

FIGURE 2 Overview of the results of the Allianz Climate and Energy Monitor 2018

Country	Score	2018	2017
France	69	1 ▲	3
Germany	67	2 ▼	1
United Kingdom	64	3 ▼	2
Italy	53	4 ▲	8
China	52	5 ▼	4
Japan	51	6	6
Canada	47	7 ▲	10
Brazil	46	8 ▲	13
United States	46	9 ▼	7
India	44	10 ▲	11
Australia	39	11 ▼	9
South Africa	38	12	12
South Korea	38	13 ▼	5
Mexico	34	14 ▲	15
Turkey	32	15 ▲	18
Saudi Arabia	23	16 ▲	19
Argentina	22	17 ▼	16
Indonesia	15	18 ▼	14
Russia	13	19 ▼	17

■ Paris compatible long-term vision
 ■ Policy environment for renewables
 ■ Conditions for system integration
 ■ Market absorption capacity
 ■ General investment conditions

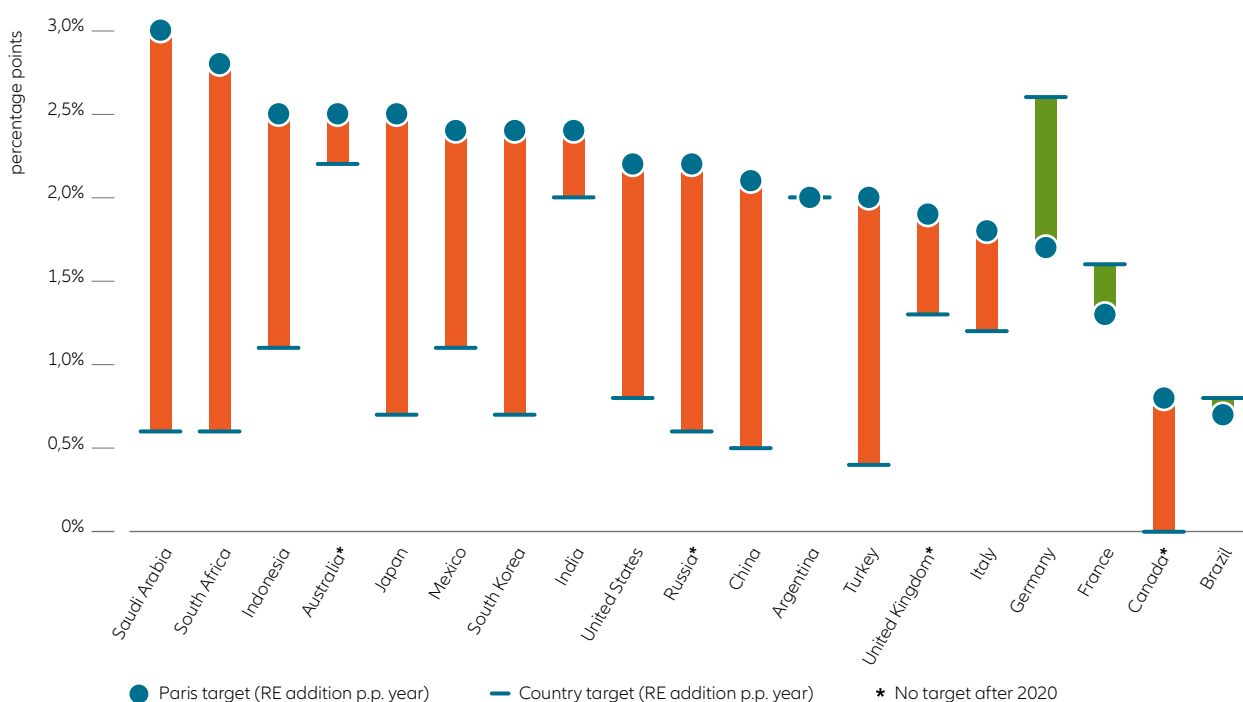
Brazil improved its ranking significantly (from rank 13 to 8). The US, unsurprisingly, has fallen two ranks to 9 as a result of recent policy decisions issued from the federal government, drastically cutting down its support for renewable energy policies. Russia occupies the last place amongst the G20, while formerly lagging countries such as Saudi Arabia and Turkey have made small improvements, gaining rank 16 and 15 respectively.

Very few countries, like UK, France and Mexico follow a concrete and binding long-term strategy

Governments are not following the ambition they set out in the Paris Agreement of 2015. Scientists now unequivocally agree that global CO₂ emissions have to be net-zero by 2050 to keep global warming below 1.5°C (IPCC, 2018). Yet among the G20, only Canada, France, Germany, Mexico, the UK and the US formally submitted a long-term decarbonization strategy that extends to 2050 to the United Nation’s body responsible for climate change issues (UNFCCC). Of these, only the UK’s strategy proposes a full decarbonization of the power sector. The current US government no longer supports its own strategy, after stating its clear intention to withdraw from the Paris Agreement in 2017.

Ambition of national targets for renewable energy fall short of decarbonization of the power sector needed to live up to the Paris Agreement in most countries (see Figure 3), with only Germany, France, Brazil and Argentina planning sufficient annual renewable installations. Additionally, most countries only have a medium-term vision with regards to renewables expansion, with targets rarely extending beyond 2025 or 2030. Consequently, these conditions may make a timely energy transition difficult for the majority of G20 countries.

FIGURE 3 Comparison of yearly renewable energy uptake in G20 countries according to country targets and needs for complete decarbonization



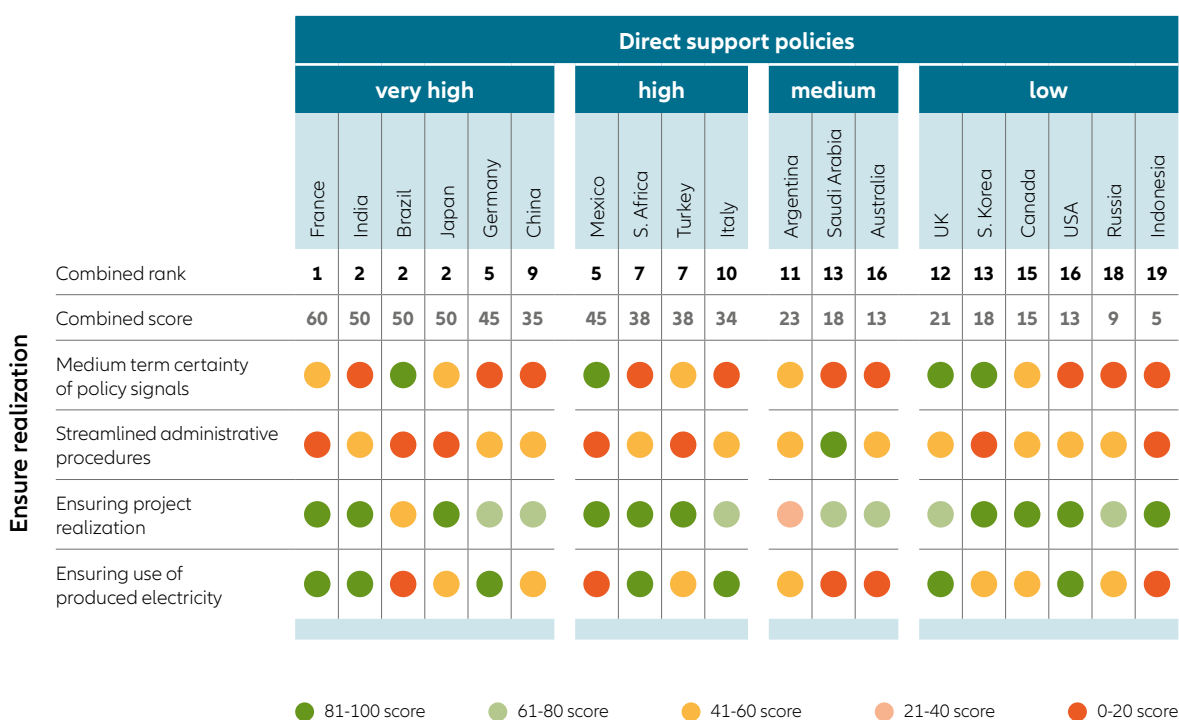
Previous stragglers like Saudi Arabia and Turkey are improving their policy environment, while some developed countries such as Australia and the US still have not taken charge

In 2017, many G20 countries continued to improve the design of their direct policies in support of renewables. Some countries that were seen as stragglers in previous years are now taking steps to improve their policy portfolios. Notable mentions include the Argentinian government’s push for renewables through its RenoVar auctioning scheme, the successful start of Saudi Arabian renewable auctions which obtained highly competitive bids, and the launch of the Turkish YEKA auctioning scheme that jumpstarted renewable deployment. On the other hand, the US and Australia continue to decrease federal support despite having more mature markets and experienced institutions in place.

Direct support policies for renewables are strong in many countries such as France, India, Brazil and Japan but all countries can improve certainty of policy signals and administrative procedures

Many G20 countries (e.g. China, Germany, India, Brazil, Japan and France) have a comprehensive framework of direct support policies, such as feed-in-tariffs (FiTs), auctions and renewable purchase obligations and financial support policies for all relevant renewable energy technologies. But all countries have room to improve the creation of effective policies and the provision of certainty to attract investments. This would include uninterrupted policy support, clear administrative procedures, ensuring realization of projects and use of the produced electricity (see Figure 4).

FIGURE 4 Policy environment for renewables



Major challenges in G20 countries

Widespread shift of policy schemes towards auctioning demands high transparency to avoid uncertainty for investors

Countries central to the global energy transition, such as China, Germany and Japan are currently in the middle of changing their long-standing policy support for renewables – a shift mostly away from subsidies (e.g. FiTs) to market-based instruments (e.g. competitive auctions, quotas with renewable energy certificate trading). However, this transition must be carried out in a very transparent way to limit policy risks for investors and avoid imperfect policies which impact energy deployment.

Implementation shortfalls like in China, India and Germany reduce attractiveness

The presence of a policy framework does not necessarily translate into effective uptake of renewables. We found a range of implementation related challenges that impact the mid-term certainty of policy signals for an investor. These include: on-and off-policy support (e.g. in Australia, US, Germany); sub-optimal enforcement of a support policy (e.g. China, South Africa); regressive policy design (e.g. Indonesia) and non-policy related fluctuations influencing uptake (e.g. India).

Political push for renewables lacking especially in Australia and the US

Lack of policy support is not only due to limitations in policy design, in some countries it is the political will that is missing. The most prominent examples include the US, where the federal government is vocally opposing renewables and imposed an import tariff for solar cells and Australia which is heading towards a policy cliff-edge, meaning there will be no policy support for renewables after 2020.

Basic policies for integrating variable renewables into the power system exist in many G20 countries but strong headwinds await

Resounding evidence now exists on the need for, and ways and means by which the power system should adapt to an increasing share of variable renewables such as solar and wind (IEA, 2017; IRENA, 2018b). Three elements are important for integration of renewables in the power system: first, developing balanced grid codes for safe and reliable operation of power systems with increasing shares of variable renewables without limiting their deployment (IRENA, 2016) and avoid curtailment of power produced from renewables. Second, policies for managing power demand (demand-side management); and third, policies for building energy storage systems and/or flexible supply to balance the grid during times of high demand and flatten out spikes.

FiT: An incentive mechanism which includes a fixed price per kWh, a purchase agreement and a grid interconnection (Huenteler, 2014).

Auction: A competitive bidding process for procuring electricity (MWh) or capacity (MW) from renewable energy. The winning bidder will be realizing their project at the price of their bid (IRENA, 2015).

Curtailment: The involuntary reduction in output for electricity plants, due to the mismatch of generation and demand. Due to their variability, renewables are especially susceptible to curtailment. Hence, it is necessary to increase the grid's flexibility (NREL, 2015).

Verifying the presence of policies towards these three elements, we found that many G20 countries already have some form of policies supporting storage systems and demand-side management. Nevertheless, most countries have not yet explored all possible options to improve grid flexibility and some (5) are still lacking basic measures or standards addressing variable renewable energy in their grid codes.

Major show stoppers and makers for the attraction of renewable energy investments in the G20

Showstoppers	Country	Showmakers
<ul style="list-style-type: none"> – Re-negotiation of already awarded concessions – Underbidding of tenders – Local resistance to renewables 	France	<ul style="list-style-type: none"> + Working Feed-in-Premium scheme + Long-term vision that is largely Paris compatible
<ul style="list-style-type: none"> – Uncertainty about additional auctions – Unintended design feature of auction causes wind construction stop for two years 	Germany	<ul style="list-style-type: none"> + Auctions are well administered + High market absorption capacity
<ul style="list-style-type: none"> – Lack of policy support beyond 2020 – Solar PV market collapse due to policy change – Uncertainty of Brexit 	United Kingdom	<ul style="list-style-type: none"> + Well-functioning offshore wind policy + Mature private sector
<ul style="list-style-type: none"> – Uncertainty around the new wind-solar auctioning scheme 	Italy	<ul style="list-style-type: none"> + Support for onshore and offshore wind through FiT schemes
<ul style="list-style-type: none"> – Delay in subsidy disbursement – Subsidy (FiT) cut-back without full roll-out of the REC scheme 	China	<ul style="list-style-type: none"> + Strong interest in continued support for renewable deployment and grid integration
<ul style="list-style-type: none"> – Underbidding of auctions – Burdensome administrative process 	Japan	<ul style="list-style-type: none"> + The existing renewable purchase obligation covers all technologies
<ul style="list-style-type: none"> – No coherent policy framework on the national level 	Canada	<ul style="list-style-type: none"> + Some states show strong support for renewables
<ul style="list-style-type: none"> – Strenuous administrative procedures for project development 	Brazil	<ul style="list-style-type: none"> + Well-designed auctioning scheme
<ul style="list-style-type: none"> – Federal rollback of support policies – High political uncertainty 	United States	<ul style="list-style-type: none"> + Strong support in some states, decentralized grid structure, high presence of renewable energy companies
<ul style="list-style-type: none"> – Lack of clarity on import duties – Limited enforceability of RPOs 	India	<ul style="list-style-type: none"> + Continued policy reliability and support + Expected increase in RE target
<ul style="list-style-type: none"> – RE target cliff-edge in 2020 	Australia	<ul style="list-style-type: none"> + Ambitious regional targets and well-functioning auctions
<ul style="list-style-type: none"> – Political uncertainty 	South Africa	<ul style="list-style-type: none"> + Well-structured auctioning design
<ul style="list-style-type: none"> – Low ambition of renewable targets/policies – Rigid market structure 	South Korea	<ul style="list-style-type: none"> + Strong focus on smart grid systems
<ul style="list-style-type: none"> – Delay in renewable energy deployment – Lack in support to ensure grid integration 	Mexico	<ul style="list-style-type: none"> + Comprehensive policy scheme
<ul style="list-style-type: none"> – Hefty licensing fees strengthen unlicensed deployment – Strong local content requirements 	Turkey	<ul style="list-style-type: none"> + Recently started auctioning scheme
<ul style="list-style-type: none"> – Policy support only for small renewable power plants – High local content requirements, i.e. a high share of locally manufactured production goods is necessary before bidding 	Saudi Arabia	<ul style="list-style-type: none"> + Well-communicated auctioning process + Comprehensive fiscal incentives to ensure investment
<ul style="list-style-type: none"> – Auctioning specifications not ironed out 	Argentina	<ul style="list-style-type: none"> + Political commitment of the new government
<ul style="list-style-type: none"> – Newly lowered FiTs provides little to no incentive for renewables 	Indonesia	
<ul style="list-style-type: none"> – Lack of tax incentives – Incomplete implementation of the existing policy scheme 	Russia	

3. Detailed results - Investment attractiveness

3.1 Paris-compatible long-term vision

FIGURE 5 Composition of the category 'Paris-compatible long-term vision'

20% Paris-compatible long-term vision	Decarbonization of the power system	25%
	Renewable energy ambition	25%
	Coal/oil exit plan	25%
	Reliability of energy policy system	25%

The UK is the only country with a binding, ambitious and concrete long-term decarbonization plan for its power sector, but its formal renewable energy targets do not extend beyond 2020.

Coal-phase out has been announced by France, Italy and the UK

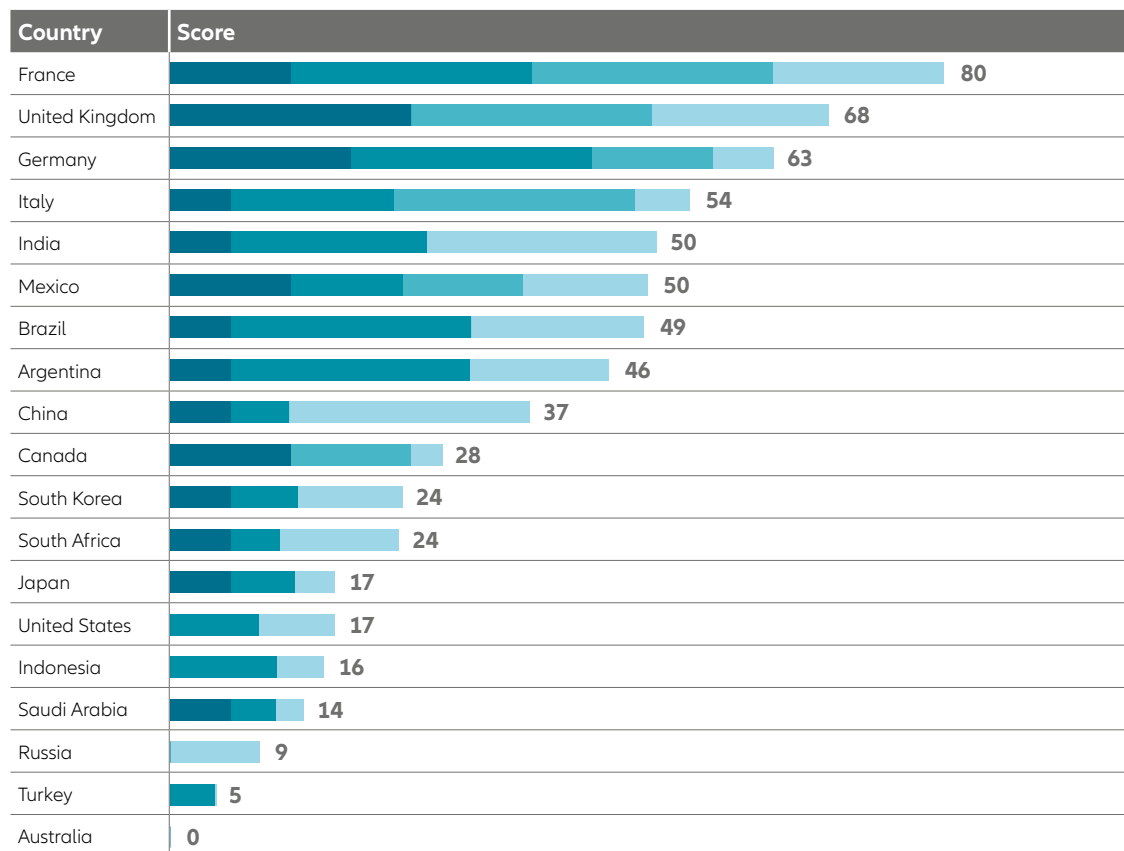
This category looks at the ambition of national climate and renewable strategies in the long-term, taking as reference an energy transition aligned to the goals of the Paris Agreement. A long-term vision ensures investors of the long-term direction of government policies and helps them to define investment strategies and understand associated investment risks.

We consider four criteria for assessing the Paris-compatible long-term vision: 1) presence of a binding, ambitious and concrete decarbonization strategy for the power system, 2) renewable energy ambition or a country's renewable energy generation targets against a path towards full decarbonization by 2050; 3) coal and oil exit plans; 4) reliability of renewable energy policy support.

Most countries are yet to chart a decarbonization vision for their power sectors (Figure 7) and set course on a trajectory towards this vision (Figure 3).

Very few countries (France, Italy and the UK) have already announced a coal phase-out, and only some countries (Canada, Germany and Mexico) are currently considering it. Germany has the highest share of coal out of the three (World Bank, 2018), thus the decision to phase-out coal would have the highest emission reduction impact on the domestic energy system. The political sentiment in the countries regarding renewables show that the highest political consensus, according to country experts, can be found in India, China, Mexico and South Korea. The lowest consensus, unsurprisingly, is in the US, Australia and Turkey.

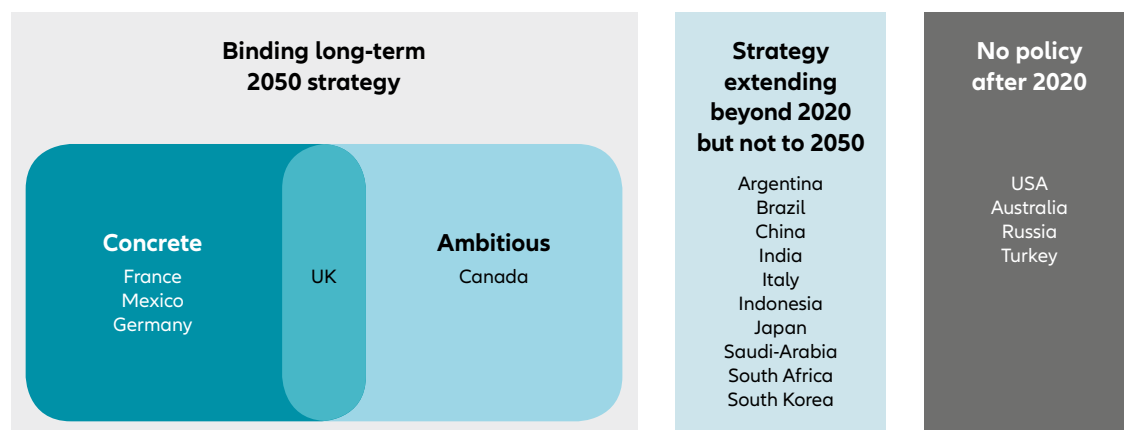
FIGURE 6 Results for 'Paris-compatible long-term vision'



■ Decarbonization plan for the power system ■ Coal and oil exit
■ Renewable energy ambition ■ Reliability of renewables policies

1 Binding because a long-term low-emission strategy is submitted to UNFCCC, concrete because intermediate targets and sector roll-outs are defined, ambitious because a full decarbonization by 2050 is planned

FIGURE 7 Long-term low-emission development strategies in G20 countries¹



3.2 Policy environment for renewables

FIGURE 8 Composition of the category 'Policy environment for renewables'

30% Policy environment for renewables	Direct support - Direct support policies per technology, Financial and fiscal incentives	multiplied with below
	Factors ensuring realization - Mid-term certainty of policy signals, Administrative procedures, Ensuring realization, Ensuring use of produced electricity	multiplied with above

No country gets a high overall score for its policy environment for renewables because investment realization is constrained by policy signals and administrative procedures

Positive developments in lower-ranking countries such as Saudi Arabia and Argentina

A favorable policy environment for renewables sets the groundwork for any investment in renewables, since it defines the conditions for successful project execution. Our assessment considers two indicators. First, the presence of a comprehensive package of direct support policies and financial incentives to promote deployment of renewables (*direct support*). Second, policy specific factors ensuring realization of projects (*ensuring realization*) – these include: mid-term certainty of policy signals, presence of streamlined administrative procedures for permitting, factors ensuring the renewable energy plants are set up on time (e.g. pre-defined realization period, pre-qualification requirements and effective penalties if timelines are not met) and factors that ensure the generated power is used (e.g. presence of priority dispatch for renewables and compensation in case of curtailment).²

No country scored highly in this category, partly because of lower scores on factors that ensure investments are realized smoothly. First of these factors is the regularity and predictability of policy support in a country or what we call mid-term certainty of policy signals. According to our assessment, a range of factors lowered the certainty of policy signals in countries. These were:

- on and off-policy support, e.g. federal level ambition in Australia and the US and delay of onshore and offshore wind auctions, no new tenders in the pipeline for offshore wind until 2021 in Germany;
- sub-optimal enforcement of a support policy, e.g. non-payment of FIT subsidies in China and lack of follow-through on awarded contracts in South Africa;
- regressive policy design, e.g. effective lowering of FIT support under Indonesia's new regulation on tariff setting for renewables
- non-policy related fluctuations affecting uptake, e.g. confusion persisted throughout 2017 on import duties on solar panel components in India or delays in approval of Italy's new support scheme within the country and at the EU level.

² Please note that the scores in this category cannot be directly compared to last year's edition due to improvements made to the method. Please refer to the accompanying technical note for details.

FIGURE 9 Results for ‘Policy environment for renewables’



The second aspect that may impact investor interest is ease of processes in a country. Administrative procedures may severely restrict participation in an auction (AURES Consortium, 2017; del Río, 2017). Moreover, we found evidence of strenuous administrative procedures for renewable energy permitting in Brazil, France, Japan, Mexico, South Korea and Turkey.

Of the 16 G20 countries that conduct some form of competitive auctioning for renewables, a majority have some form of pre-qualification requirements (14), pre-define the timeframe in which projects must be completed (15) and set in place penalties in case of non-compliance (10) in place in place. Predefined realization periods, prequalification requirements and penalties are considered good practice to reduce the risk that awarded bidders do not realize their projects (AURES Consortium, 2017; del Río, 2017; Kreiss, Ehrhart and Haufe, 2017). The ‘right’ level of these safeguards depends on the context, however we found that in Brazil and Argentina, project delays have occurred despite these requirements, highlighting the importance of setting adequate requirements in place.

Once a project is up and running, another uncertainty for investors can arise if the power generated from the plant is not used. To check countries' performance on this, we checked for presence of priority dispatch for renewables and compensation in case the generated power is curtailed. 14 of the 19 G20 countries give renewables a priority over conventional power for dispatch, but only 8 have some provision to compensate project developers in case the produced power is curtailed.

There has been some favorable development in the G20 as well, namely in the low-ranking Saudi Arabia, Argentina and Turkey, all of which conducted successful auctions in 2017. Others however, and especially the US, Australia and Indonesia, have drastically reduced their national efforts: The Australian government has announced to discontinue its national support policy along with its renewable energy target after 2020 (Murphy, 2018), showing a lack of political will. The US federal government displayed considerable opposition to the renewable energy industry, imposing import tariffs of 30% on solar cells in 2018 and with the national Environmental Protection Agency (EPA) announcing in 2017 that it would appeal the former administration's Clean Power Plan (EPA, 2017; USTR, 2018). However, in both the US and Australia, some states maintain comprehensive renewable energy support schemes, most notably California and South Australia. In Indonesia, the FIT scheme has been reformed in January 2017, reducing the effective tariff for renewables, especially for solar PV (CEEW, 2018).

3.3 Conditions for system integration

FIGURE 10 Composition of the category 'Conditions for system integration'

10% Conditions for system integration	Variable renewable energy in grid codes	33%
	Storage promotion and flexible supply side policies	33%
	Demand side policies - Regulatory and market based demand side policies	33%

| About 90% of G20 countries have some form of demand-side management policies in place

| More than half of G20 countries have some form of policy support for storage systems

The assessment on conditions for system integration is new this year to reflect a growing requirement for governments to plan for power systems with higher shares of renewables. The category assesses whether policies that support electricity storage and demand-side management³ exist and if the codes of the grid operators in a country consider variable renewables⁴. It does not, however, evaluate the quality or implementation of those policies.

More than 50% of G20 countries already have some policies for storage promotion in place. This can be supplemented by other actors' active support and development for storage capacity. For example, Hyundai, a major South Korean corporation, announced in 2017 that it would install the world's largest storage grid battery in the country.

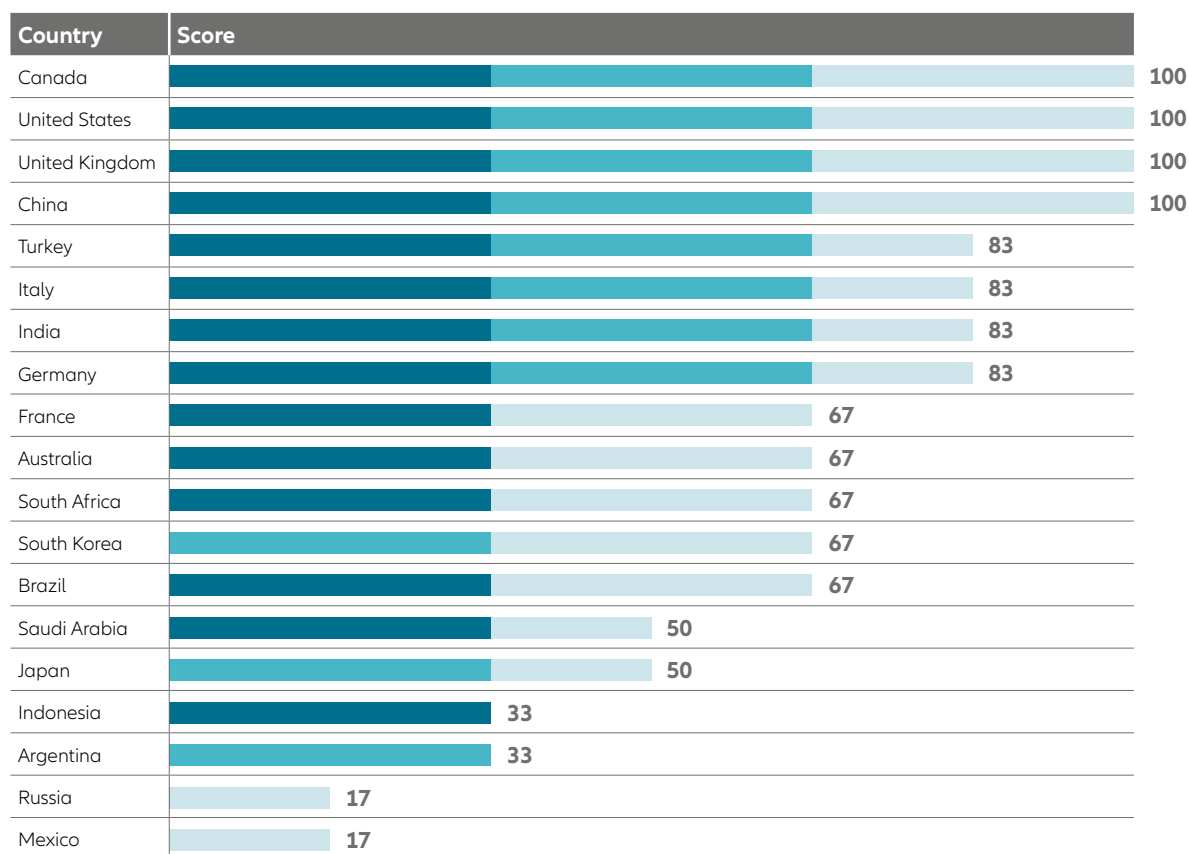
About 90% of countries have at least some form of demand-side management policies in place – 12 G20 countries have rolled out programs for smart meter installation, 10 have energy efficiency obligations and 9 have some policies on dynamic power pricing in place.

3 We checked the presence of both regulatory demand-side management (DSM) policies (e.g. energy efficiency obligations and smart meter roll-outs) and market-based DSM policies on dynamic power pricing (e.g. time-of-use pricing)

4 Based on World Bank's RISE index

Demand-Side Management refers to technologies, actions and programs on the demand-side of energy meters that seek to manage or decrease energy consumption, in order to reduce total energy system expenditures or contribute to the achievement of policy objectives such as emissions reduction or balancing supply and demand. (Warren, 2015).

FIGURE 11 Results for 'Conditions for system integration'



■ System integration - grid codes
 ■ System integration - storage promotion
 ■ Demand side management policies

3.4 Market absorption capacity

FIGURE 12 Composition of the category 'Market absorption capacity'

20% Market absorption capacity	Current level of activity in the installation of renewable energy	40%
	Prior experience with renewable technologies	40%
	Presence of businesses for manufacturing and distribution of renewable technologies	20%

India, Brazil, Turkey and China are continuously increasing the pace of solar PV capacity additions

Onshore and offshore wind capacity additions are lagging

The category 'market absorption capacity' assesses the current role of renewables in electricity production as well as new renewable capacity additions. Additionally, we assess the presence of large renewable energy companies⁵.

Some countries are continuously increasing the pace of new renewable energy capacity additions. For solar PV, the highest absolute capacity increase can be seen in emerging economies like India, Brazil, Turkey and China. Total new solar PV capacity additions in the G20 amounted to over 85 GW in 2017. In the UK, solar PV capacity additions have slowed down significantly, while still being higher than in many other developed G20 countries.

New capacity additions of wind power (both off shore and onshore) are lacking behind those of solar PV, with little more than 40 GW installed in G20 countries in 2017. Few countries go against this trend, with the UK, India and France adding most capacity. The highest capacity additions per capita can be found in Germany. However, this trend is likely to reverse as new wind installations significantly declined in 2018, with a further decline projected for 2019 and 2020 (BMW, 2018).

Very few countries (Japan, Mexico and the US) decreased the pace of capacity additions for both solar PV and wind.

⁵ As listed in the global stock index RENIXX. RENIXX index lists the 30 largest listed companies of the renewable energy industry worldwide by market capitalization

Among the countries which attract most large listed renewable energy companies, we find again the US, Germany and the UK. China's increasingly favorable policy conditions for renewables also manifest in an increased presence of large renewable energy companies in the country.

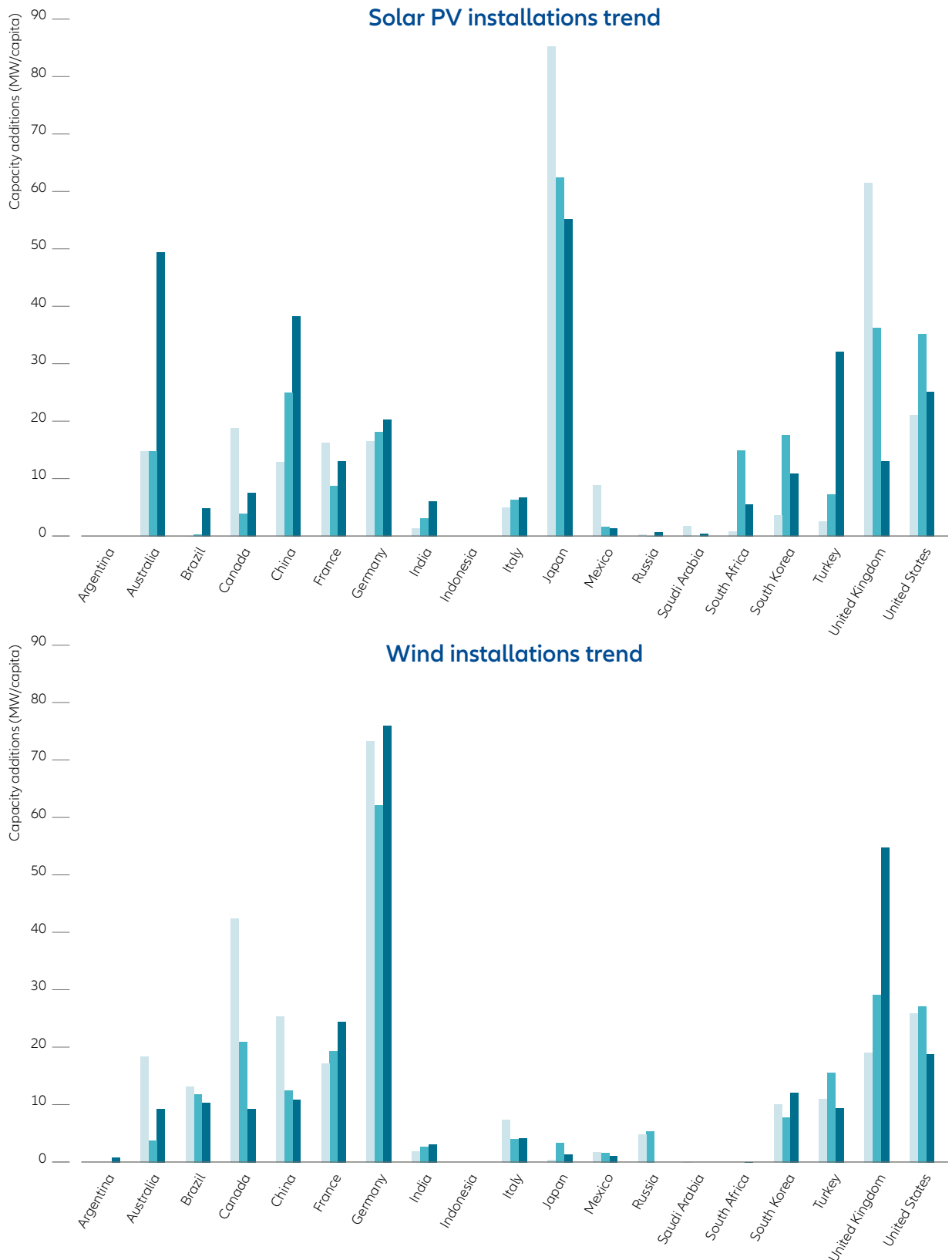
FIGURE 13 Results for 'Market absorption capacity'

Country	Score	2018	2017
Germany	89	1	1
United Kingdom	80	2	2
United States	64	3	3
China	57	4	▲ 8
Australia	56	5	▼ 4
Italy	53	6	▲ 7
France	53	7	▲ 9
Japan	51	8	▼ 6
Turkey	45	9	▲ 11
Canada	40	10	▼ 5
Brazil	36	11	▼ 10
India	27	12	▲ 14
South Korea	24	13	▼ 12
South Africa	19	14	▼ 13
Mexico	15	15	15
Indonesia	4	16	16
Argentina	3	17	▲ 18
Russia	0	18	▼ 17
Saudi Arabia	0	19	19

■ Prior experience with renewable technologies
 ■ Current activity with renewable installations

■ Presence of major renewable energy companies

FIGURE 14 Trends in renewable energy capacity installations



3.5 General investment conditions

FIGURE 15 Composition of the category 'General investment conditions'

20% General investment conditions	Macroeconomic fundamentals - inflation forecast	33%
	Financial determinants - Depth of financial markets, Depth of financial institutions	33%
	Non-financial determinants - Openness to FDI, Ease of doing business, Political stability, Regulatory quality, Rule of law	33%

| Non-OECD countries are catching up

This indicator looks at a country's general macroeconomic investment conditions, combining institutional qualities like rule of law or openness to foreign direct investments, financial market depth and the inflation forecast to give a picture of variables which can hinder renewable investments despite a suitable set of renewable energy policies. Here, OECD countries continue to lead, although Non-OECD countries are slowly improving.

Canada is leading the ranking this year, as its institutional settings and financial market capabilities both support investment security. Argentina still scores last among the G20 countries, mainly as a result of a high inflation rate and no depth of the financial sector. Nevertheless, its openness to FDI stays on a very high level, and political stability and rule of law improved significantly.

FIGURE 16 Results for 'General investment conditions'

Country	Score	2018	2017
Canada	92	1 ▲ 5	
United Kingdom	91	2 ▼ 1	
Australia	89	3 ▲ 4	
France	86	4 ▼ 2	
Japan	86	5 ▼ 3	
South Korea	80	6	6
United States	80	7	7
Germany	75	8	8
Italy	64	9	9
China	63	10 ▲ 11	
South Africa	56	11 ▼ 10	
Saudi Arabia	49	12	12
Brazil	37	13 ▲ 14	
Russia	35	14 ▲ 15	
Indonesia	31	15 ▲ 16	
Mexico	31	16 ▼ 13	
India	26	17	17
Turkey	14	18	18
Argentina	13	19	19

■ Non financial determinants
■ Depth of financial sector
■ Inflation forecast

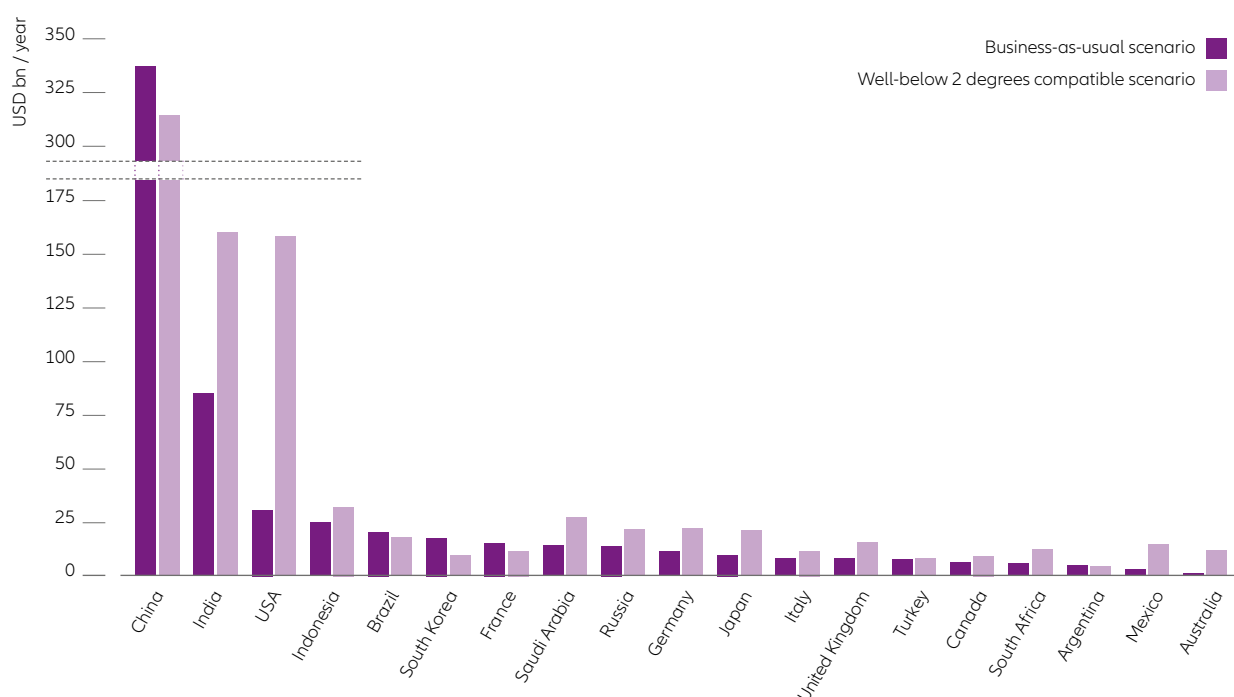
4. Investment needs

The global energy system needs to undergo substantial structural transformations to be compatible with the Paris agreement goals. This entails an increasing share of renewable energy in national energy provision as well as accelerated progress on energy efficiency and a higher flexibility of power grids (IRENA, 2018a). These transformations require a wide set of private and public investments. Investments as such are no net expenses as they generate future income and add value to the economy.

⁶ Includes transmission and distribution grid expansion, electricity storage and increased generation flexibility needs.

The need for investments for creating a Paris-compatible and climate-resilient power infrastructure continues to be high, especially in developing countries. Future investments in power grids and energy flexibility⁶ are of special importance.

FIGURE 17 Yearly investment needs of G20 countries in the power sector (incl. power grids and energy flexibility) between 2016 and 2050

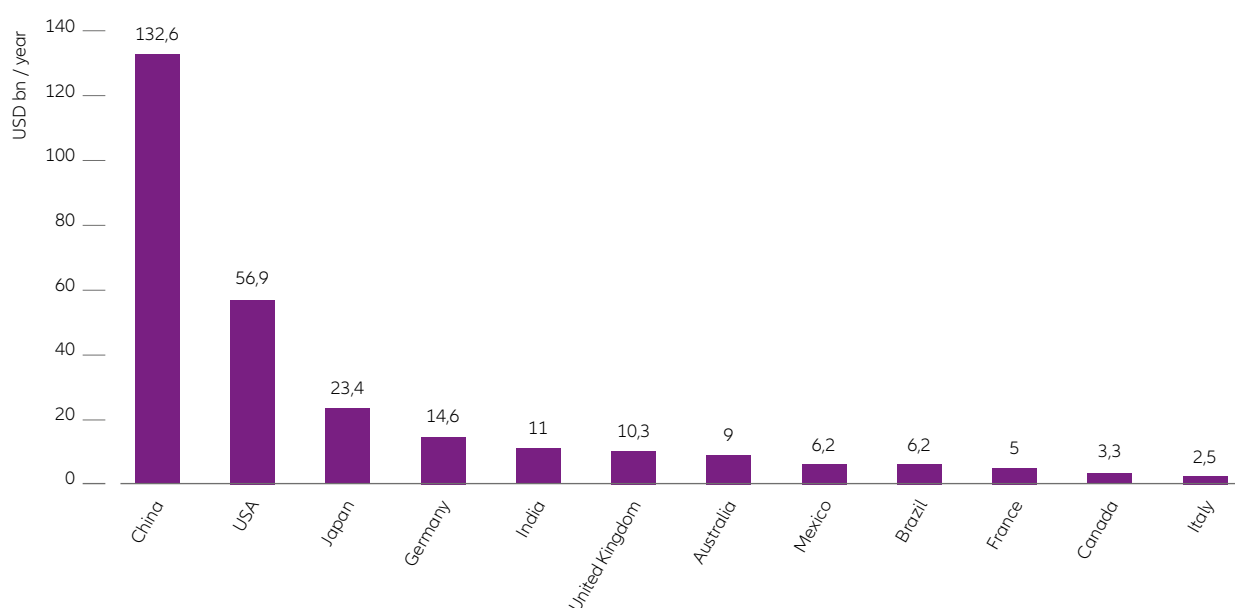


The International Renewable Energy Agency's (IRENA) data sees higher investment needs for a Paris-compatible pathway for the energy sector ('REmap case') in the majority of G20 countries compared to a business-as-usual scenario ('reference case'). This is due to the fact that the deployment of renewable technologies has higher capital costs than non-renewable technologies and the need for additional investments for power sector infrastructure. Exceptions are France, Korea and Brazil (see Figure 17). Key take-aways for the G20 are as follows:

- **Highest absolute annual investment needs can be found in China, India and in the US:** Due to their size and the need for a massive decarbonization of the energy systems, investments are high under a reference case and for a Paris-compatible pathway. For China, the *additional* investment for a Paris-compatible pathway compared to the reference case is lower due to higher renewables deployments already considered in national plans and targets. However, for India and the US it is significantly higher because their reference case is less ambitious.

- **Annual investment needs for a Paris-compatible pathway will be lower for some G20 countries than the current fossil / nuclear intensive path:** This is the case for South Korea (USD -8.0 billion), France (USD -3.8 billion), Brazil (USD -2.7 billion) and Argentina (USD -0.3 billion). This difference relates to the existing capacity in the country, how much new capacity is installed, the electrification rate, and the amount of energy efficiency. The latter is the largest driver of lower investment needs with a Paris-compatible scenario.
- **Largest absolute investment shifts from conventional generation (i.e. fossil fuels and nuclear) are required in South Korea, France, Turkey, Argentina, Brazil, Canada and Russia.**

FIGURE 18 Current investments in renewable energy in 12 G20 countries (2017)⁷



When looking at recent investment volumes of twelve G20 members where data is coherently available, China (USD 132.6 bn), the US (USD 56.9 bn) and Japan (USD 23.4 bn) had the largest new investments in clean energy⁷ in 2017 (Bloomberg New Energy Finance, 2017). Mexico increased its investments in clean energy to the highest in history. New investments in clean energy in the UK nearly halved compared to 2016 (from USD 23.4 bn in 2016 to USD 10.3 bn in 2017). In Germany, new investments are constantly declining since the renewable boom in 2010/2011; yet they are still on a considerably high level (USD 14.6 bn)⁸.

Strong policy signals and market certainty will be crucial for giving the private sector a conducive environment to ratchet-up deployment to meet these needs.

⁷ Including wind, solar, biofuels, biomass & waste, energy smart technologies & other renewables.

⁸ Note that due to different methodologies, this data is not comparable with the previously displayed data on investment needs.

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Imprint

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