

April 2017 – Allianz Climate and Energy Monitor

Deep Dive

What do current policy developments in China, India and the US mean for investing in renewables?



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Key messages

- Investments in electricity supply in China and the US need to roughly double, in India even triple over the next decades to have a fair chance to remain within the ‘well below 2°C’ warming boundary set in the Paris Agreement.
- Adequacy and reliability of renewable energy policies are key for investors to realize the needed scale of investments. China and India outcompete the US in providing a strong, nation-wide green policy environment as per Allianz Climate and Energy Monitor’s 2016 findings. This trend is expected to remain unchanged in 2017.
- Currently, additions to renewable power capacity are going up in all three countries and have in total overtaken investments in fossil-fuel based capacity.
- China is swiftly decommissioning coal power plants to combat carbon emissions and environmental pollution, whereas India may not put a hold on building new capacities before 2022.
- Strong policies helped to set China and India on track for achieving its Paris climate targets, whereas the US might miss its targets if the new administration swiftly implements its recent announcements.
- A mature market, attractive state-level policies, and a very good general investment climate still attract high amounts of renewable energy investments in the US in progressive states.
- Without attractive and reliable nation-wide policies in the US, renewable energies face headwinds and will rely on their imminent cost competitiveness and state action.

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Renewable energy leadership of US, India and China is critical to meet the Paris Agreement goals

1 All details on the methodology of the Monitor as well as data and literature are available from the accompanying Technical Note, available on allianz.com/en/monitor.

The Paris Agreement sets an ambitious goal to limit global average temperature increase to well below 2°C and pursue efforts to limit it to 1.5°C. Bringing power sector emissions down to net zero by 2050 is critical to achieve the 1.5°C warming limit (Rogelj et al. 2015). Huge efforts are needed to reach this goal. Both, a complete phase-out of coal-based power and a massive scale-up of renewables by 2050 are required.

Power sector investments in China, India and the US are decisive for the development of renewable energies and the climate targets set in the Paris Agreement. Not only do these countries emit over 50% of global energy-related CO₂ emissions (IEA 2016d), they also play a key role in making renewables affordable globally. China has emerged as the global manufacturer for solar PV, while renewable corporations in the US are critical for technology innovation, holding most clean energy patents globally. India is attracting a lot of domestic investments due to the expansion needs in the electricity sector for meeting current shortages, increased electrification and rising demand.

Effectiveness and reliability of the policy environment is a key confidence-building measure for investors to achieve the scale of investment needed by these three critical players. **This analysis aims to inform investors and policy-makers on the scale of investments needed in China, India and the US to be in line with the Paris goals. Furthermore, it assesses what recent developments, especially regarding the leadership change in the US, mean for investing in renewable power in the future.** It is based on the **Allianz Climate and Energy Monitor** – a composite index for the G20 countries which measures year-on-year changes in the policy landscape (criteria on policy adequacy and reliability of sustained support) and specific market capacities (criteria on *market absorption capacity* and *national investing conditions*) determining the attractiveness of investing in renewable energies (see Annex for methodology¹).

Investments in China and the US need to roughly double, in India even triple, to stay below the Paris Agreement warming limit

In 2016, combined investments in renewable electricity in China, India and the US amounted to USD 134 billion – this accounts for over half of the global investments in electricity supply in 2016 (UNEP and BNEF 2017). The investment volumes fell in China and the US compared to previous years, while India maintained a stable growth. In China, they dropped by 32% (to ~USD 78 billion), as priority was given to integrating already-existing renewable capacity. US investments slowed down by 10% (to ~USD 46 billion) after aggressive installations in 2015 to avoid the potential federal tax credits' expiration in 2016. Yet, total global newly installed capacity still increased from 2015 to 2016, as the investment costs per unit decreased considerably.

Renewable power investments will need to significantly ratchet-up by 2035 to align with the Paris Agreement targets. Cumulatively, between 2014 and 2035, investments worth USD 2012 13,408 billion have to be made globally in electricity generation (IEA 2014). India, China and the US will have a major share in these future investments. USA and China need to roughly double investments in the electricity sector, and India triple them (IEA 2014). Almost all of these investments need to go into renewables or other zero-carbon options.

Absolute investment projections until 2035, however, are only one dimension of the investment needs assessment. In addition, current consumption patterns and the individual energy set-up of each country are important determinants of future needs. For instance, the US has much higher energy consumption than India and China today, while consumption is rising in the latter two to meet growing development demands (Table 1).

The investment needs pillar of the **Allianz Climate and Energy Monitor** provides such an assessment. Furthermore, **it assesses if investments are needed due to climate change impacts on power infrastructure** like physical damages or performance constraints and how vulnerable the power sector is to these risks.

Taken together, the investment needs pillar analyses market size, social parameters and climate vulnerability.

TABLE 1: Key socio-economic indicators for China, India and the US

	CHINA	INDIA	US
Share of global population (2015)	19%	18%	4.4%
Annual power consumption per person (2012)	3,800 kWh	770 kWh	13,000 kWh
Electrification rate (2012)	100%	79%	100%
Share of global energy related CO ₂ emissions (2014)	28%	6%	16%

Sources: IEA 2016a; World Bank 2016

In the 2016 assessment results, **India has the largest need for green investments** among the G20 members as a result of relatively low per-capita consumption, a fast-growing population and rising energy demands coming with economic development. Despite a mature market and high consumption, the **US is close to India and China in terms of investments needed**, reflecting a strong vulnerability of its power infrastructure to climate impacts.

The need for substantial scale-up of investments in all three countries is clear. To achieve the necessary growth of investments, a strong policy environment is a pre-requisite. How is the current policy environment for renewables in China, India and the US? What do recent developments, especially President Trump's election in the US mean for policy attractiveness in these countries? And, how does it impact the future of investments in renewables? The next section discusses these questions using the assessment framework of Allianz's Climate and Energy Monitor.

China and India constantly improving their policy framework for long-term renewable investing, the outlook for the US is worsening on a federal level

Effective and reliable national policy environments are critical to support the scale of investments needed in the next decades for meeting the Paris goals. The current green policy environment in China and India is more effective and reliable than the one in the US. **China and India outcompeted the US in the adequacy and reliability of their climate and renewable energy policies in Allianz Climate and Energy Monitor's results last year** – a trend expected to remain unchanged in this year's assessment, which will be published end of June. Lower policy scores for the US were partially compensated by comparatively better market conditions like a mature market for renewables and generally safe investment climate. Despite ambitious climate as well as renewable energy targets and performance in progressive states like California and Texas, the attractiveness for renewable energy investments in the US is expected to remain scattered in the future without adequate and stable federal policies.

The next paragraphs discuss policy effectiveness and reliability in each of the three countries, followed by a commentary on most pressing developments that will impact long-term investing.

China reduces the use of coal steeply and creates a good policy environment for further investments in renewable energies

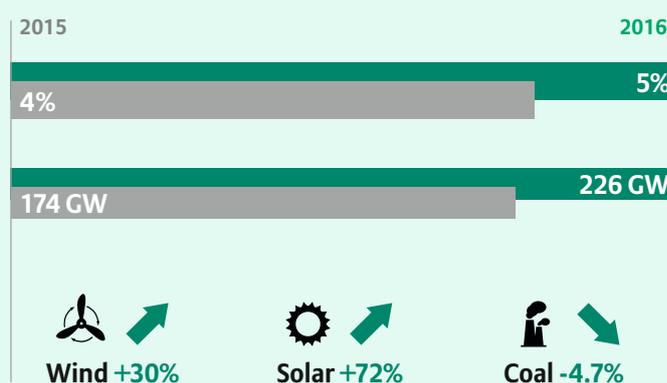
China has ambitious plans for renewables scale-up and has surpassed prior targets. Driven by wind and solar deployment (*Box 1*), ramping-up renewables is an important input for China to be on track for achieving its nationally determined contribution (NDC) towards the Paris Agreement, i.e. China's national climate plan.

Furthermore, **China is steeply reducing the use of coal, firstly, to combat environmental pollution and smog, and secondly due to the strong growth of renewables and a structural transition taking place in the Chinese economy** (Qi et al. 2016). Consumption of coal is expected to drop further, as China is swiftly decommissioning existing coal power plants and even cancelling plans for new fossil based power plants (Boren 2017).

BOX 1: KEY STATISTICS FOR CHINA

Key statistics

1. Share of renewables in the generation mix of the grid (without hydro): **4% (2015) → 5% (2016)**
2. Growth in capacities of wind and solar power (GW): **174 GW (2015) → 226 GW (2016)**
3. Power generated by wind energy grew **by 30%** and solar increased **by 72% in 2016 as compared to 2015**
4. Total coal consumption in China dropped for the third year in a row, **declining by 4.7% in 2016**



Targets relevant for renewable energy development

5. **NDC target:** Raise share of non-fossil fuels in primary energy mix to 20% by 2030; lower carbon intensity of GDP by 60%-65% below 2005 levels by 2030; Increase the share of natural gas in the total primary energy supply to around 10% by 2020; peak CO₂ emissions latest by 2030
6. **NDC implementation:** The 13th Renewable Energy Development Five Year Plan targets raising the installed renewable capacity (including hydro) in China to 680 GW by 2020, from 493 GW in 2015
7. **On track of meeting Paris commitments** – China is expected to achieve its targets with its current policies

Investment attractiveness

8. Allianz Climate and Energy Monitor (2016) **investment attractiveness rank** (among G20) = **4th**

Rank
4

9. Indicator results

(and trend expectation for 2017 Allianz Monitor):

Policy Adequacy:	(same)	high
Policy Reliability:	(same)	very high
Market Absorption Capacity:	(same)	medium
National investment conditions:	(same)	medium

Sources: 1,3 – (China Electricity Council 2017); 2 – (IRENA 2017); 4 – (National Bureau of Statistics of China 2017); 5, 7 (Climate Action Tracker 2015); 6 – (IEA 2017; China Electricity Council 2017); 8, 9 – (Höhne et al. 2016)



A strong federal policy push underlines these developments. Renewables have been part of a five-year planning cycle in China since 2001. In addition to the national five-year plans (FYPs), renewable energy targets are also set under an energy FYP and technology-specific plans for major renewables such as wind. The 13th Renewable Energy Development FYP aims to increase China's installed renewable capacity by 38% from 2015 levels (*Box 1*). To reach these targets, the Chinese government has declared to invest USD 361 billion in renewable energy between 2016-2020 (Reuters 2017b). 40% of the announced spending will be for solar technologies, followed by wind and hydro.

China is currently well on track for achieving its climate targets set for the Paris Agreement (Climate Action Tracker 2015, Wang et al. 2014). Furthermore, national experts believe the target on peaking emissions by 2030 may also be reached much earlier (Burck et al. 2016).

The Chinese climate targets have been supported by strong policies for renewables. China has subsidized renewable energy technologies through instruments such as tax reliefs, net metering and feed-in-tariffs (FiT). China's FiT was first put in place in 2009 to support deployment of onshore wind and was gradually expanded to cover most renewables. These instruments together have ensured the viability of renewables in China.

Last year, however, **Chinese regulators have indicated an intention to re-design the renewable energy market.** Solar and wind FiTs were reduced in 2016. In February 2017, China's National Development and Reform Commission (NDRC) announced its plan to roll out a pilot renewable energy certificates scheme in the third quarter of 2017 and potentially mandating it from 2018. The scheme would replace existing subsidies, resulting in lower tariffs for renewable generators in China (Reuters 2017a). While limited details on the scheme's design have been made available until now, renewable energy certification schemes are often accompanied by setting purchase obligations on the demand sectors. That means that power procurers and industries would need to buy renewable power. If this happens, the **renewable credit scheme may be beneficial in the long run in terms of institutionalizing the use of renewables.** China has struggled in the past to convince its grid companies and provinces to increase electricity purchases from renewables (Dupuy & Xuan 2016). In the short term, one may also expect Chinese renewables giants to accelerate their investments in attractive foreign markets.

China is also set to launch a national emission trading scheme (ETS) later this year, building on the experience of seven sub-national pilots since 2013. The Chinese ETS will cover power generation, co-generation and grid operators. Thus, in principle, the Chinese ETS can further disincentive thermal power generation. Further, the **interaction between renewables certificates (if implemented) and the ETS is also a development to watch-out for** as these two policies can have a mutually reinforcing or hindering effect.

Going forward, **China now needs to strengthen domestic regulation for adapting its power systems to cope with increasing shares of volatile renewable power.** In China, the issue of curtailment of renewables due to a lack of market integration first surfaced in 2015. 33.9 billion kWh capacity was curtailed in 2015, mostly in the North-Western region (Bloomberg 2016). This has been one of the reasons for lower RE targets in the 13th FYP. China's state grid expected a 240 GW target for grid-connected wind and 150 GW for solar in the 13th plan period. However, the 13th FYP declared 30 GW less for wind and 40 GW less for solar (Slater 2017). The issue of wind curtailment is also recognized in the 13th energy development FYP and attempts are underway to minimize its impact on project developers by ensuring compensation (Dupuy & Xuan 2016).

India has strong renewable energy targets and the implementation of renewable energy support schemes is improving. The growth of coal use is slowing down

India is also developing its renewable energy capacity at a rapid pace, aimed at achieving the low-carbon growth targets set in its first NDC (Box 2). Solar and wind installations in 2016 exceeded the yearly goal set out by the government towards its 2022 renewable energy targets by 116% and 43% respectively (Government of India 2017).

Further, **there are clear signals of slowing coal power growth, with the potential to stop building new capacity after 2022**. The National Electricity Plan draft (2016) indicates that the 50 GW of coal power capacity currently being built in the country will surpass the needs until 2022 and after 2022 will easily cover the expected additional demand between 2022-2027 (Central Electricity Authority 2016). This means that no new thermal power plants may be needed to be deployed in India after 2022, a claim supported by another independent scenario based assessment (TERI 2017).

India is trying out different auctioning models to increase solar cost competitiveness and piloted auctions for wind power in the beginning of 2017. Traditionally, solar has been supported by auctioning in the country. For the National Solar Mission's Batch II and III solar auctions, the government introduced a fixed tariff, but in turn provided a "viability gap funding" (VGF) to reduce upfront equity investment by power developers (Thapar et al. 2016). Amendment of this model and improvement of tender designs to further reduce power procurement costs is already under discussion after record-low bids equaling EUR 0.05 per KWh were submitted in a recent tender (Business Standard 2017). The current trend of policy adjustments for market development is expected to continue as the government has a clear intent to accelerate cost-competitiveness. Lower solar module prices will further support aggressive bids by developers. Success achieved in solar development is also showing signs of policy change in the wind sector.

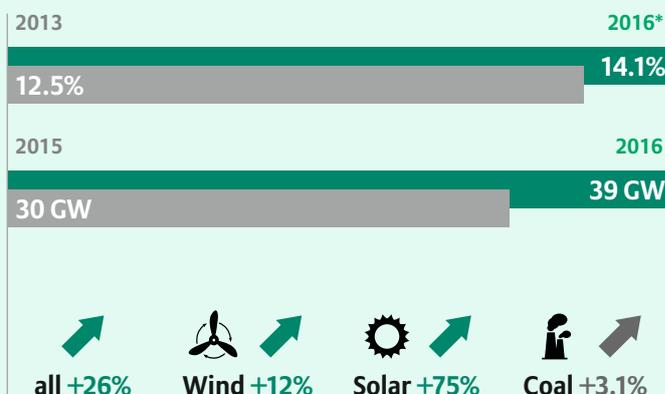
Wind power has been traditionally supported by a wide range of financial support schemes in India. These include accelerated depreciation benefits (i.e. waiving of 80% income tax for a period of time); feed-in-tariffs with fixed long-term power purchase agreements; and generation-based incentives (i.e. a premium on top of the tariff for 4 to 10 years) (Shrimali et al. 2017, p.547). However, India is now switching from FiT to auctioning for wind power, and had record-low tariffs at the first auction round held in the beginning of 2017.



BOX 2: KEY STATISTICS FOR INDIA

Key statistics

1. Share of renewables in the grid's capacity mix (excluding large hydro): **12.5% (2013)[#] → 14.1% (2016)^{*}**
2. Wind and solar capacity: **30 GW (2015) → 39 GW (2016)**
3. Growth in power generated by renewables: **26% growth is expected for all renewables in the financial year ending March 2016. In 2015, wind power generation grew by 12% and solar by 75% (compared to 2014).**
4. Total coal consumption in India increased by 3.1% (2015). However, coal based power generation grew slower than renewables in 2016.



Targets relevant for renewable energy development

5. **NDC target:** Increase the share of non-fossil based energy resources to 40% of installed power capacity by 2030; Reduce emissions intensity of GDP by 33% – 35% by 2030 below 2005 levels
6. **NDC implementation:** The National Action Plan on Climate Change (NAPCC) recommends renewables to have a share of 15% of the total power generated in 2020. To achieve targets set out in NAPCC, the National Solar Mission has a target to install 175 GW renewables by 2022. Taking account of recent renewable uptake, the Draft National Electricity Plan (2016) predicts the share of non-fossil fuel installed capacity (renewables, nuclear and hydro) to already reach 56.5% by 2026-2027. This translates to a 20.3% share of renewables in power generation in 2021-22 and 24.2% in 2026-27
7. **On track of meeting Paris commitments** – Yes, India is expected to achieve its NDC target under current policies

Investment attractiveness

8. Allianz Climate and Energy Monitor (2016) **investment attractiveness rank** (among G20) = **11th**

Rank
11

9. Indicator results

(and trend expectation for 2017 Allianz Monitor):

Policy Adequacy:	(same)	high
Policy Reliability:	(same)	high
Market Absorption Capacity:	(same)	very low
National investment conditions:	(same)	very low

Sources: 1 – (BNEF 2016); 2 – (IRENA 2017); 3 – (IEA 2016b; The Economic Times 2017); 4 – (IEA 2016c; BNEF 2016); 5 – (Government of India 2015); 6 – (LSE 2016; Central Electricity Authority 2016); 7 – (Climate Action Tracker 2016a); 8, 9 – (Höhne et al. 2016) | * financial year (ending in March)

With market forces set into action by a clear policy intent, **India is expected to comfortably achieve its NDC target.** Independent estimates have suggested current policies to lead to a 39% share of non-fossil fuel power in generation capacity by 2030, almost reaching its target (Climate Action Tracker 2016a). However, the recently published draft National Electricity Plan from December 2016 forecasts **overachievement of the NDC target, with the share of non-fossil-fuel capacity expected to reach 56.5% by 2026-2027** (Central Electricity Authority 2016).

In the future, **chalking out an enabling policy framework to support long distance transmission and grid integration of renewables will be a challenge for India**, where both large utility scale and medium-to-small distributed renewables are being planned.

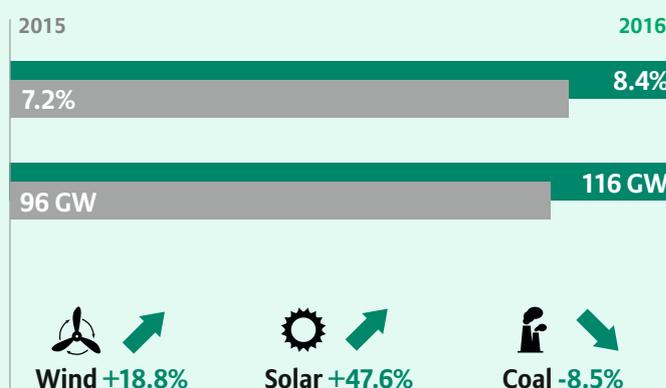
Proactive support for renewables in individual US states stands against a worsening trend for federal policy ambition

Renewables are booming in the US, comprising 60% of new capacities – but the new administration may constrain the nation-wide transition. Wind and solar alone contributed to 60% of the 27 GW new power installations in 2016, natural gas adding another third (US EIA 2017c). Much of this development has been driven by the ambitious Renewable Portfolio Standards (RPS) set by various US states, the decline in capital costs and rise in cost-competitiveness of renewables. Further, existing coal power infrastructure in the US is nearing the end of its operational life span and facing competition from natural gas and renewables throughout the country. The US has retired an average of 3.78 GW coal capacity annually since 2002 (US EIA 2017c). However, the new White House administration has plans for reviving the domestic coal power sector and scrapping existing low-carbon policy support.

BOX 3: KEY STATISTICS FOR THE US

Key statistics

1. Share of renewables in the grid's generation mix (without hydro): **7.2% (2015) → 8.4% (2016)**
2. Wind and solar capacity: **96 GW (2015) → 116 GW (2016)**
3. Growth in power generated by renewables: **wind increased by 18.8% in 2016 and solar by 47.6% in 2016 as compared to previous year**
4. Coal consumption in US also dropped for the third year in a row in 2016, with an 8.5% drop in 2016



Targets relevant for renewable energy development

5. **NDC target:** A 26-28% emission reduction below 2005 levels by 2025 (incl. LULUCF) and 83% emission reduction below 2005 levels by 2050 (excl. LULUCF)
6. **NDC implementation:** Clean Power Plan (CPP) outlines how the individual states decrease power-sector related emissions cumulatively to 32% below 2005 levels by 2030
7. **On track of meeting Paris commitments** – A closed-down CPP could hinder the US progress for achieving its Paris Agreement targets. The new administration signed an executive order to halt the CPP in March 2017

Investment attractiveness

8. Allianz Climate and Energy Monitor (2016) **investment attractiveness rank** (among G20) = **9th**

Rank **9**

9. Indicator results

(and trend expectation for 2017 Allianz Monitor):

Policy Adequacy:	(same)	low
Policy Reliability:	(same)	low
Market Absorption Capacity:	(same)	medium
National investment conditions:	(same)	high

Sources: 1,3,4 – (US EIA 2017b), 2 – (IRENA 2017); 5,6,7 – (Climate Action Tracker 2016c); 8,9 – (Höhne et al. 2016)



2 PTC was first introduced under the Energy Policy Act of 1992 and ITC was introduced in the Energy Policy Act of 2005.

The federal climate policy environment in the US has been volatile, with political support for low-carbon energy going back and forth. The last federal administration drove climate action via executive orders and tightening of existing legislations to circumvent a congress averse to climate policy. Key instruments have been the Climate Action Plan (CAP) and the Clean Power Plan (CPP), introduced in 2013. The CAP laid the foundation for increased uptake of renewables in lands owned by the federal government and committed federal agencies to several actions. Additionally, instruments like the Clean Power Plan were embedded in the mandate of the existing Clean Air Act. The CPP set a national target of reducing emissions from the power sector to 32% below 2005 levels in the year 2030. Implementation of the targets was left to each state, which were to outline their approach to meet these standards.

In the US, renewable energy policy support at the federal level is limited and is due to phase out, when compared to India and China. Production tax credits (PTC) for wind developers and solar investment tax credits (ITC) have been the main federal financial incentives for renewables in the US. However, both schemes have expired and were extended and revised numerous times since their inception (Mai et al. 2016)². Due for expiration in 2016, both schemes were extended again by the Congress in December 2015. The wind PTC will now phase down by 20% every year between 2017-2019, ending in 2020 (Mai et al. 2016). The solar ITC will continue to be 30% until 2019 and will by 2022 gradually phase-down to 10% for business developers and expire for residential host-owned installers (Mai et al. 2016). The recent extension and the planned phase-out of these schemes has brought some clarity for renewable producers in the US.

The staunch support for renewables in individual US states partly offsets the declining federal policy ambition. Many US states have set targets for renewable energies. Renewable portfolio standards (RPS) are the most favored policy instrument and are currently implemented in 29 states in the US (N.C. University 2016). While policy design differs across states, an RPS generally mandates utilities/retail electricity providers to include renewable electricity in their purchased or sold electricity. Besides RPS, net metering and FiT policies have also gained popularity in states over the years (N.C. University 2016). In parallel, state power producers are predominantly planning to retire coal power plants and replace them with wind, solar (e.g. in Texas), or natural gas. For instance, in 2017, Massachusetts, Connecticut and New Hampshire are expected to retire their last coal plants (EnerNOC 2017). At the same time, demand for renewables is also rising in the private sector, with Fortune 500 companies setting renewable targets for consumption and own generation.

Future climate policy support under the new government is unclear. The current administration has made its intentions clear on repealing most climate actions started by President Obama, even an exit of the Paris Agreement is being discussed. The new 'America-first energy plan' sets priority towards '...eliminating harmful and unnecessary policies such as the Climate Action Plan' (The White House 2017). The CPP is also under scrutiny with the president signing an executive order which mandates the Environmental Protection Agency (EPA) to overhaul the rule. This is expected to be a long process as the agency will be required to follow elaborate procedures for developing a new rule. The original plan took more than two years between conception and final release in August 2015. This **regulatory snooze on fossil fuels extends an already delayed opportunity to scale up renewables in the US by disincentivizing fossil-based power.**

A closed-down CPP could hinder the US to achieve its Paris Agreement targets (Climate Action Tracker 2016c). Estimates suggest national emissions will decrease 6.4% below 2005 levels in the NDC target year (2025) if the CPP is scrapped – 2.6% less from what could be achieved if the original plan were to be fully implemented (Climate Action Tracker 2016b).

If the tax credit schemes remain in place, the short-term renewable support outlook for the US appears stable. However, policy retrenchment currently taking shape in the US under the 'America first' agenda is also expected to reduce the federal support for renewables. However, a recent modelling study conducted by the US Energy Information Administration projects a slight decline in renewable capacity additions post-2020 in a 'no CPP scenario' (US EIA 2017a). While renewable technology costs continue to fall, the cost competitiveness also depends on regulation for the power production based on coal and natural gas. The absence of a strict regulatory framework for coal based power and favorable policies towards natural gas may further limit a country-wide scale-up of renewables needed for complete decarbonization. In case fossil fuels are favored by federal policies and tax credits are canceled, renewable energies will have a harder time.

Going forward, if the US falls behind, the EU must step up and join forces with China and India to lead the renewable energy transition

China, India and the US appear to be pacing towards three very different policy futures for renewables. On one hand, the Asian economies are quickly ramping up their renewable portfolio – China is eyeing a global investment opportunity and solution for domestic air pollution concerns; and India is inching closer to the long-kept ambition of energy access to its people through renewables. The US, on the other hand, is expected to heavily support fossil fuels under the new administration. Four years of unhindered coal and natural gas support could constrain climate action and limit the pace of renewable growth in the US. But **the cost competitiveness of renewables and strong climate action in progressive states gives hope.**

With the need for nearly-doubling of investments in the next decades to avoid dangerous heights of global warming, adequacy and reliability of renewable energy policies will be key. While China and India give hope that their policies will further support the global low-carbon transition, a third stable economy, with the experience and culture for policy innovation, is needed to complete the renewable triad. **The EU can step up to take this role** – in particular, for developing and implementing policy designs to enable cost-competitiveness and grid integration of renewables – and sharing experience with other countries. The proposal by the German G20 presidency for establishing a climate and energy action plan should be implemented in all G20 countries, ideally with a clear roadmap and dates for a renewable energy roll-out as part of 2050 national climate strategies.

NOTE:

The upcoming 2017 update of the Allianz Climate and Energy Monitor will provide updated analysis of renewable energy investment attractiveness in G20 member states for 2016 and the widening investment gap for greening the power supply in line with the Paris accord of keeping global warming well below 2°C. The release is due ahead of the G20 summit in July 2017.

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About Allianz Climate and Energy Monitor

The Monitor assesses the G20 countries' renewable electricity production, excluding fossil fuels, large hydro and nuclear as well as transportation and storage infrastructure.

Monitor's analysis bases on two pillars: Investment needs and Investment attractiveness

Investment needs: General investment needs in the energy sector through to 2035, including absolute and relative investment requirements for the electricity infrastructure, and the vulnerability of the existing electricity infrastructure to the effects of climate change.

Investment attractiveness: The attractiveness of various circumstances to potential investors for renewable energy, including policy adequacy and reliability, market absorption capacity and general national investment conditions.

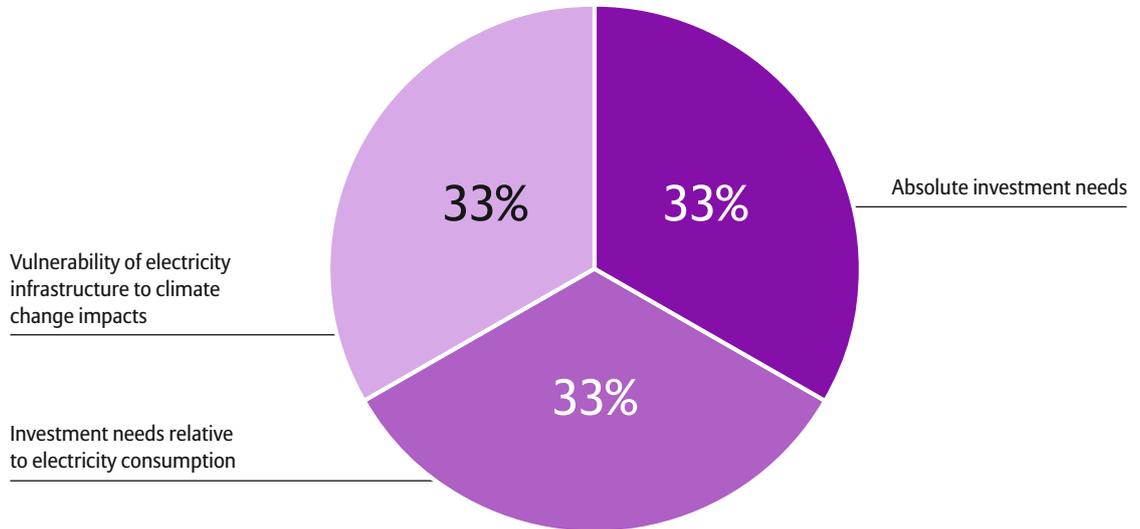
Once calculated, the absolute scores were normalized for each indicator in a manner that such ratings lie between the best (100) and the worst (0) possible scores in the sample. Therefore, any given country is scored in relation to the performance of its fellow G20 countries.

Details of the methodology and year on year changes are provided in a technical note which accompanies each year's monitor.

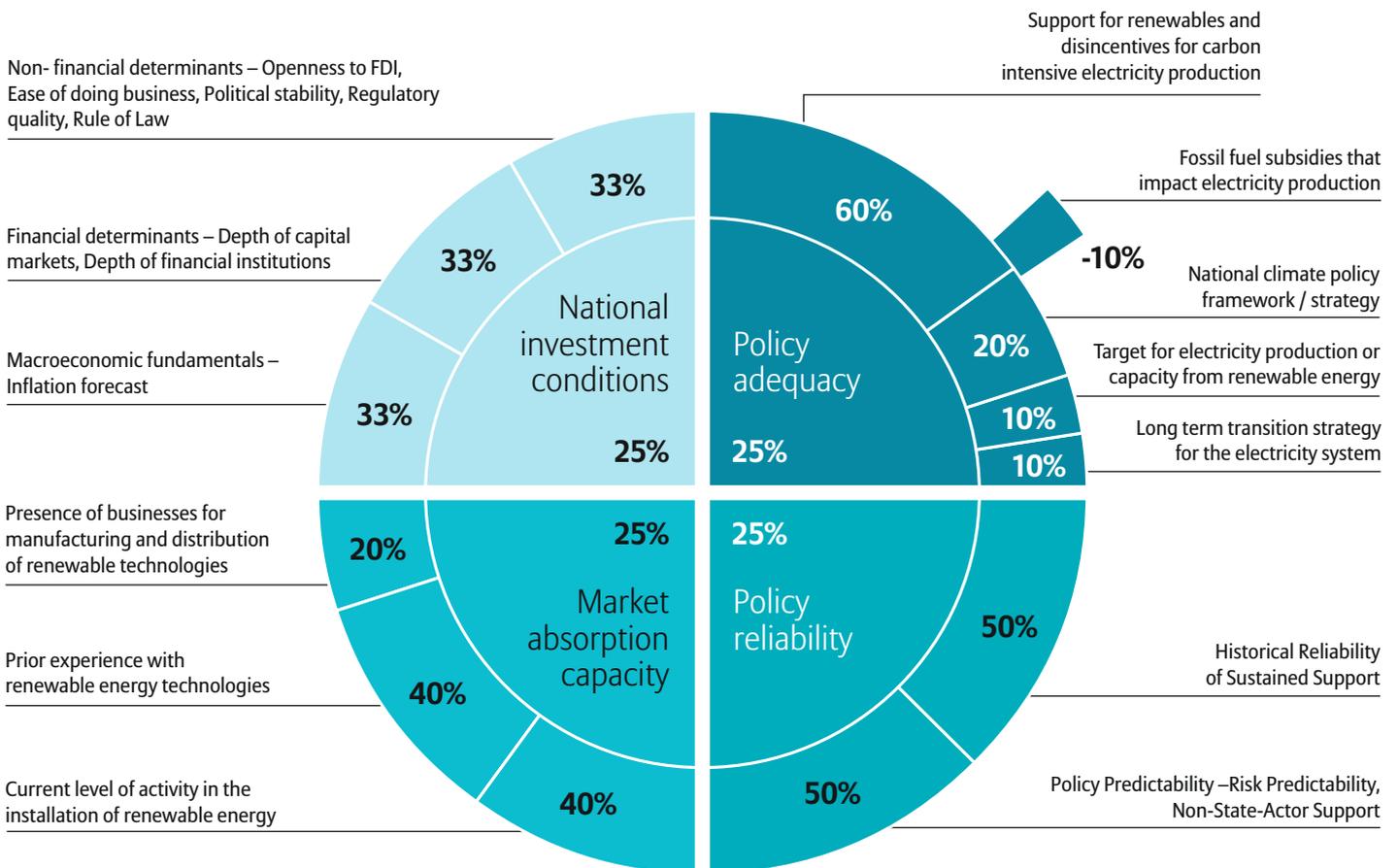
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INVESTMENT NEEDS



INVESTMENT ATTRACTIVENESS



Note: The weights are rounded to one decimal digit

About the contributors

Allianz Climate Solutions is the competence center of Allianz Group for climate change and renewable energy. We offer insurance and advisory services on financing issues for renewable energy projects to both external clients and Allianz entities. Furthermore, we are responsible for climate-related advisory and strategy development of Allianz and are an incubator for climate-related product development.

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The NewClimate Institute for Climate Policy and Global Sustainability is a Germany-based research institute generating ideas on climate change and driving their implementation. They do research, policy design and knowledge sharing on raising ambition for action against climate change and supporting sustainable development. Their core expertise lies in the areas of climate policy analysis, climate action tracking, climate finance, carbon markets, and sustainable energy

→ [NewClimate Institute](#)

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. Starting point of the work are disadvantaged people from the “global south” and together with their members, sponsors and other actors from the civil society to lobby for sustainable development. Based on scientific analyses they inform the public sector, make educational as well as lobby work and demonstrate consumers how to act according their goals.

→ [Germanwatch](#)

References

- Bloomberg, 2016. China Scales Back Solar, Wind Ambitions as Renewables Cool – Bloomberg. *Bloomberg News*. Available at: <https://www.bloomberg.com/news/articles/2016-11-08/china-scales-back-solar-wind-ambitions-as-renewables-boom-cools> [Accessed March 13, 2017].
- BNEF, 2016. *Financing India's Clean Energy Transition*, Available at: <https://www.bbhub.io/bnef/sites/4/2016/10/BNEF-Financing-Indias-clean-energy-transition.pdf> [Accessed April 4, 2017].
- Boren, Z.D., 2017. China suspends 104 planned coal power plants. *Energy Desk, Greenpeace*. Available at: <http://energydesk.greenpeace.org/2017/01/16/china-coal-power-overcapacity-crackdown/>.
- Burck, J. et al., 2016. *Climate Change Performance Index CCPI – 2017*, Bonn. Available at: www.germanwatch.org/en/ccpi [Accessed March 13, 2017].
- Business Standard, 2017. Solar park tenders, power purchase on hold as Rewa bids disrupt market. Available at: http://www.business-standard.com/article/economy-policy/solar-park-tenders-power-purchase-on-hold-as-rewa-bids-disrupt-market-117031600049_1.html.
- Central Electricity Authority, 2016. *Draft National Electricity Plan*, Available at: http://www.cea.nic.in/reports/committee/nep/nep_dec.pdf.
- China Electricity Council, 2017. 2016 National power industry statistics data list. Available at: <http://www.cec.org.cn/guihuayutongji/tongjinxin/niandushuju/2017-01-20/164007.html> [Accessed March 30, 2017].
- Climate Action Tracker, 2015. China country page – Climate Action Tracker. Available at: <http://climateactiontracker.org/countries/china.html> [Accessed March 13, 2017].
- Climate Action Tracker, 2016a. India country page – Climate Action Tracker. Available at: <http://climateactiontracker.org/countries/india.html>.
- Climate Action Tracker, 2016b. *The ten most important short term steps to limit warming to 1.5°C*, Available at: http://climateactiontracker.org/assets/publications/publications/CAT_10_Steps_for_1o5.pdf.
- Climate Action Tracker, 2016c. USA country page- Climate Action Tracker. *Climate Action Tracker (CAT)*. Available at: <http://climateactiontracker.org/countries/usa.html> [Accessed March 13, 2017].
- Dupuy, M. & Xuan, W., 2016. China's String of New Policies Addressing Renewable Energy Curtailment An Update. Available at: <http://www.renewableenergyworld.com/articles/2016/04/china-s-string-of-new-policies-addressing-renewable-energy-curtailment-an-update.html>.
- EnerNOC, 2017. *What to Expect from Energy Markets in 2017*, Available at: https://www.enernoc.com/sites/default/files/P17003_2017-Energy-Markets-Outlook.pdf [Accessed March 31, 2017].
- Government of India, 2015. *India's Intended Nationally Determined Contribution*, Available at: <http://www4.unfccc.int/submissions/INDC/Published Documents/India/1/INDIA INDC TO UNFCCC.pdf>.
- Government of India, 2017. *Ministry of New and Renewable Energy, India: Annual Report 2016-17*, New Delhi. Available at: <http://mnre.gov.in/file-manager/annual-report/2016-2017/EN/content.html> [Accessed March 13, 2017].
- Höhne, N. et al., 2016. *Allianz Climate and Energy Monitor Assessing the needs and attractiveness of low-carbon investments in G20 countries*, Allianz Climate Solutions. Available at: <https://newclimateinstitute.files.wordpress.com/2016/06/allianz-climate-energy-monitor-report-0306.pdf> [Accessed August 27, 2016].
- IEA, 2017. China 13th Renewable Energy Development Five Year Plan (2016-2020). *IEA/IRENA Joint Policies and Measures Database*. Available at: <https://www.iea.org/policiesandmeasures/> [Accessed March 31, 2017].

- IEA, 2016a. *CO₂ emissions from fuel combustion 2016 Highlights*, Available at: https://www.iea.org/publications/freepublications/publication/CO2EmissionsfromFuelCombustion_Highlights_2016.pdf [Accessed April 11, 2017].
- IEA, 2016b. *Energy Balances. 2016 edition.*, Paris, France: International Energy Agency.
- IEA, 2016c. *Key Coal Trends*, Available at: <https://www.iea.org/publications/freepublications/publication/KeyCoalTrends.pdf>.
- IEA, 2016d. *Key world energy statistics 2016*. Available at: <https://www.iea.org/publications/freepublications/publication/KeyWorld2016.pdf> [Accessed March 31, 2017].
- IEA, 2014. *World Energy Investment Outlook 2014*, Available at: <https://www.iea.org/publications/freepublications/publication/WEIO2014.pdf> [Accessed April 7, 2016].
- IRENA, 2017. *Renewable Energy Capacity Statistics 2017*, Available at: http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Capacity_Statistics_2017.pdf [Accessed April 4, 2017].
- LSE, 2016. National Action Plan on Climate Change. *The Global Climate Legislation Study*. Available at: <http://www.lse.ac.uk/GranthamInstitute/law/national-action-plan-on-climate-change/> [Accessed April 4, 2017].
- Mai, T. et al., 2016. *Impacts of Federal Tax Credit Extensions on Renewable Deployment and Power Sector Emissions*, Available at: <http://www.nrel.gov/docs/fy16osti/65571.pdf>.
- N.C. University, 2016. *Database of State Incentives for Renewables & Efficiency*, Available at: <http://www.dsireusa.org/about-us/> [Accessed April 8, 2016].
- National Bureau of Statistics of China, 2017. Statistical Communiqué of the People's Republic of China on the 2016 National Economic and Social Development. Available at: http://www.stats.gov.cn/english/PressRelease/201702/t20170228_1467503.html [Accessed March 31, 2017].
- Qi, Y. et al., 2016. China's post-coal growth. *Nature Geoscience*. Available at: <http://www.nature.com/ngeo/journal/v9/n8/full/ngeo2777.html>.
- Reuters, 2017a. China to launch green certificates for renewable power in July. Available at: <http://af.reuters.com/article/energyOilNews/idAFL4N1FO0KP>.
- Reuters, 2017b. China to plow \$361 billion into renewable fuel by 2020. Available at: <http://uk.reuters.com/article/us-china-energy-renewables-idUKKBN14P06P>.
- Rogelj, J. et al., 2015. Energy system transformations for limiting end-of-century warming to below 1.5 °C. *Nature Climate Change*, 5(6), pp.519–527. Available at: <http://www.nature.com/doi/10.1038/nclimate2572> [Accessed October 19, 2016].
- Shrimali, G. et al., 2017. The effectiveness of federal renewable policies in India. *Renewable and Sustainable Energy Reviews*, 70(August 2015), pp.538–550.
- Slater, H., 2017. China's new lacklustre renewable energy targets. Available at: <http://www.eastasiaforum.org/2017/03/01/chinas-new-lacklustre-renewable-energy-targets/>.
- TERI, 2017. *Transitions in Indian Electricity Sector 2017-2030*, New Delhi. Available at: <http://www.teriin.org/files/transition-report/index.html#p=18> [Accessed March 13, 2017].
- Thapar, S., Sharma, S. & Verma, A., 2016. Economic and environmental effectiveness of renewable energy policy instruments: Best practices from India. *Renewable and Sustainable Energy Reviews*, 66, pp.487–498. Available at: <http://dx.doi.org/10.1016/j.rser.2016.08.025>.

The Economic Times, 2017. Big boost for India's power generation: Solar power capacity crosses 10,000 Megawatt. *ET Energy World*. Available at: <http://energy.economictimes.indiatimes.com/news/renewable/big-boost-for-indias-power-generation-solar-power-capacity-crosses-10000-megawatt/57506743>.

The White House, 2017. An America First Energy Plan. Available at: <https://www.whitehouse.gov/america-first-energy> [Accessed January 25, 2017].

UNEP and BNEF, 2017. *Global trends in renewable energy investments 2017*, Available at: <http://fs-unep-centre.org/publications>.

US EIA, 2017a. *Annual Energy Outlook 2017 with projections to 2050*, Available at: [https://www.eia.gov/outlooks/aeo/pdf/0383\(2017\).pdf](https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf) [Accessed March 31, 2017].

US EIA, 2017b. Electricity data browser. Available at: <https://www.eia.gov> [Accessed March 31, 2017].

US EIA, 2017c. U.S. electric generating capacity increase in 2016 was largest net change since 2011. Available at: <https://www.eia.gov/todayinenergy/detail.php?id=30112> [Accessed March 31, 2017].

Wang, Z.-X. et al., 2014. Estimate of China's energy carbon emissions peak and analysis on electric power carbon emissions. *Advances in Climate Change Research*, 5(4), pp.181–188. Available at: <http://www.sciencedirect.com/science/article/pii/S1674927815000234> [Accessed March 28, 2017].

World Bank, 2016. World Bank open data. Available at: <http://data.worldbank.org/>.

Acronyms

Carbon dioxide	CO₂	Investment tax credits	IT
Clean Power Plan	CPP	National Development and Reform Commission, China	NDRC
Climate Action Plan	CAP	Nationally Determined Contribution	NDC
Emission Trading Scheme	ETS	Production tax credits	PTC
Environmental Protection Agency	EPA	United National Environment Program	UNEP
Feed-in-tariffs	FiT	Viability gap funding	VGf
Five-year plans	FYPs		
Giga Watts	GW		
Gross Domestic Product	GDP		

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Allianz Climate Solutions is the competence center of Allianz Group for climate change and renewable energy. We offer insurance and advisory services on financing issues for renewable energy projects to both external clients and Allianz entities. Furthermore, we are responsible for climate-related advisory, business and strategy development for Allianz.

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