Renewable energy capacity investment in developing economies out-weighed that in developed countries for the fourth year running in 2018, but the gap was much smaller than in 2017 due to a sharp drop in spending in China.

Capacity investment in “other developing countries” (outside China and India) reached $47.5 billion in 2018, some 22% up on the previous year and the highest figure on record. Developed economies enjoyed a 10% rise to $125.8 billion.

China saw capacity investment fall 38% to $88.5 billion, with solar down a massive 56% to $37.9 billion and wind just 3% lower at $50.5 billion. Part of the drop in solar was due to lower unit costs per MW, but the main cause was Beijing’s move in the middle of the year to restrict feed-in tariffs for new projects.

Capacity investment in India slipped 15% to $11 billion, with solar down 19% at $6.9 billion and wind 8% lower at $4.1 billion. Indian PV projects had among the lowest capital cost figures per MW worldwide, reflecting the cut-price competition in its auction program.

The Middle East and Africa region saw capacity allocations jump 61% to $16.1 billion in 2018, easily the highest ever. There was a rebound in financings of projects in South Africa, and Morocco and Kenya also easily exceeded the $1 billion barrier.

Vietnam was one of the most spectacular performers among developing countries in 2018, with a ninefold jump in capacity investment to $5.2 billion. In the Americas region, Mexico saw a 38% decline to $3.8 billion and Brazil a 44% fall to $3.4 billion.

Figure 12 in Chapter 1 showed that renewable energy capacity investment in developing economies as a whole fell 24% in 2018 to $147 billion. However, this was certainly not indicative of a generalized retreat. Figure 34 shows that, while investment fell by 36% to $99.6 billion combined in China and India, it actually increased by 22% in the rest of the developing countries, taken together.

The total for “other developing economies”, at $47.5 billion, was in fact the highest ever and almost

![Figure 34. Capacity Investment in Renewables: Developed Countries, China and India, Other Developing Economies, 2018, and Growth on 2017, $bn](chart.png)

Total values include estimates for undisclosed deals.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF
China has been by far the largest country for investment in renewable energy excluding large hydro in every year since 2012, and it maintained its lead last year, its financing of new capacity, at $88.5 billion, being more than twice the equivalent for the U.S., which deployed $42.8 billion.

However, the Chinese total in 2018 was 38% down on the 2017 record, and that country’s lowest since 2014. Figure 35 shows that most of this decline last year was due to the solar sector, which saw investment more than halve to $37.9 billion.

Two factors lay behind the $49 billion plunge in solar capacity commitments in China between 2017 and 2018—a change that was the largest single influence on the global comparison between those two years. One factor was that solar got cheaper, as it did everywhere else. BNEF data indicate that the capital cost in China per MW of a PV installation without tracking declined by 25% between the first half of 2017 and the first half of 2019.18

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The bigger effect, however, came from a sudden switch in the policy environment in China, from one in which developers felt confident that any new PV capacity they built would qualify for the country’s feed-in tariff, to one in which access to that tariff was much more tightly controlled by government. The reason for this policy shift was alarm in Beijing at the way the public sector’s liabilities were mounting as a result of the obligation to pay these guaranteed tariffs to project owners.

Solar investment, which had been running at a hectic average of more than $20 billion per quarter in 2017, slipped to an average of $11.2 billion per quarter in the first half of 2018, and then to $8.8 billion in the third quarter and just $6.6 billion in the fourth.

The amount of new PV capacity added in China fell less steeply, from the 53GW record in 2017 to an estimated 44.3GW in 2018. The fact that this was a smaller decrease than for investment was partly due to the lower average capital costs per MW and partly due to some developers rushing to build in the two months after the policy change. They were nursing a false hope that the government would allow for a grace period and allocate more subsidy.

Among the big Chinese solar plants reaching final investment decision in 2018 were a group of PV 500MW projects by Huanghe Hydropower Hainan Gonghe, at an estimated $465 million each; and the Zhangjiakou Zhangbei Poverty Alleviation plant, also at 500MW and an estimated $465 million. There was one significant deal in solar thermal, with the go-ahead of the 50MW Jiuquan Dunhuang project, at $246 million.

Wind investment in China was much more resilient, at $50.5 billion, down just 3%. Onshore
wind took $38.6 billion, down 1%, while offshore wind accounted for $11.9 billion, down 9% from 2017’s record. The main reason for the modest decline in dollars committed was simply the timing of deals – in fact there was more onshore wind commissioned in 2018 than in 2017, and 2019 is likely to be higher again. Predictably, the largest deals last year were in offshore, reflecting that technology’s higher cost per MW, with the largest of the year being the 500MW CGN & Guangdong Baolihua Shanwei Lufeng Houhu array, at about $1.5 billion.

Onshore, one of the top transactions was the Huaneng Puyang wind farm, at $636 million for 500MW. Beijing announced during 2018 a shift from feed-in tariffs to auctions, prompting some developers to accelerate construction to ensure their projects qualified for the former, and others to scale back the size of projects in order to make that task easier. Overall, BNEF estimates that China installed 19.3GW of onshore wind in 2018, up from 16.8GW in 2017. There is normally a lag of at least six months between the financing of an onshore wind project, and its commissioning.

Other sectors in China were subdued in 2018. Figure 35 shows small hydro capacity investment at zero last year, having averaged $2.2 billion a year in the rest of the decade. Activity in small hydro in China has been decreasing as the larger sub-50MW sites have become scarcer, but it is likely that the 2018 total will be revised up as more information on projects comes through. In biomass and waste-to-energy, Figure 35 shows capacity investment of just $224 million, also well down on recent years. This may also be revised up in due course, particularly due to the amount of activity going on in waste incineration. China has a problem with waste pollution and inadequate landfill capacity, and it has an official target to raise its cumulative installations of waste-to-energy plants from 4.7GW in 2015 to 7.5GW by 2020.19

INDIA

Figure 36 shows the breakdown of renewable energy investment in India in 2018. In total, the country committed $11 billion, down 15% on 2017, but slightly above its five-year average of $10.3 billion. Solar investment was $6.9 billion, some 19% lower, mainly due to falling capital costs, while wind investment was $4.1 billion, down 8%. Other renewable energy sectors recorded zero figures, as they did in 2017. However, some of these may be revised up if new information becomes available.

India remains committed to an ambitious target to reach 175GW of renewable energy capacity (excluding large hydro) by 2022, with solar making up some 100GW of that. The latter number compares to cumulative PV capacity installed in the country by the end of 2018, of 32GW.

Commissioning of new photovoltaic capacity in India was some 11GW last year, up from 10.3GW in 2017, but lower capital costs per MW helped to prevent the dollar value from increasing. There were also reasons for caution on the part of investors. The Indian government’s decision in July 2018 to impose a 25% safeguard duty on PV modules and cells imported from China and Malaysia created a period of uncertainty for developers constructing solar projects at tariffs

<table>
<thead>
<tr>
<th>FIGURE 36. RENEWABLE ENERGY CAPACITY INVESTMENT IN INDIA BY SECTOR AND SUB-SECTOR, 2018, AND CHANGE ON 2017, $BN</th>
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<tbody>
<tr>
<td><strong>Biofuels</strong></td>
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<td><strong>Biomass &amp; waste</strong></td>
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<td><strong>Total</strong></td>
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Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF

awarded prior to the announcement of the new duty. There was also a 16% depreciation of the rupee against the dollar in the first 10 months of 2018, putting up the costs of imported equipment.

Highlighting the ultra-competitive nature of the Indian solar market were some of the capital costs attributed to the largest projects financed in 2018. The NLC Tangedco PV plant, for instance, accounted for only $498 million for its 709MW, while the Adani Karnataka portfolio came in at an estimated $242 million for 350MW.

In onshore wind, a transition from feed-in tariffs to auctions as the main method for securing electricity prices caused the amount of new capacity added to slip 44% to 2.3GW. Auctions in 2017 and 2018 delivered highly competitive tariffs for wind projects in Gujarat and Tamil Nadu, and the commissioning of these from 2019 onward is expected to expand the market to 5-6GW annually.

India is starting to emerge as an offshore wind market, with the government eyeing up to 1GW of projects along the coast of Gujarat. The country has targets for offshore wind of 5GW by 2022 and 30GW by 2030, but investors are waiting for more clarity over the power offtake mechanism, the amount of subsidy, and what the conditions will be for site permissioning.

MIDDLE EAST AND AFRICA

Some of the most promising markets for renewables, and solar in particular, are in the Middle East and Africa, given plentiful insolation and fast growth in electricity demand in most countries. Sure enough, that region produced a 61% rise in green energy capacity investment in 2018, to a record $16.1 billion. Solar took the lion’s share of the total, at $10.1 billion, up 19%, but there was also a fivefold jump in wind investment.

Most of the investment in new capacity ($12.6 billion) came in the form of utility-scale projects, but there was also an estimated $3.4 billion of financing of small-scale solar systems, the highest in any year to date.

Figure 37 shows the detail by country. The biggest contributor to the surge in investment in region was, ironically, an established market that suffered a slump in investment in 2016-2017: South Africa. The country attracted $4.1 billion of capacity investment in 2018, up 35-fold, and back roughly to its average in the 2012-2015 period. Wind took $2.7 billion of last year’s total, and solar $1.3 billion.

Behind the rebound was the belated signing of power purchase agreements, or PPAs, by the electricity utility, Eskom. These had been held up during the latter stages of the Zuma presidency in South Africa, even though the projects concerned had won capacity in renewable energy auctions, but there was a change of mind under the new political leadership. The biggest wind financing in the country in 2018 was the Enel Green Power wind portfolio, at $1.3 billion for 704MW, and in solar, $396 million for the 258MW Scatec PV portfolio.

Morocco has been a strong feature in renewables in Middle East and Africa for several years, with the size of the investment total in each year depending on the timing of particular deals. In 2018, it secured $2.6 billion of solar financings, more than double the previous year, a tally dominated by the 800MW NOORm Midelt PV
portfolio at $2.4 billion. Wind investment was $439 million, up from zero the previous year.

Kenya saw investment of $1.4 billion in 2018, the highest on record, and split almost equally between geothermal at $486 million, wind at $476 million and solar at $467 million. The largest deals were $366 million for the 83MW Kengen Olkaria 1 geothermal plant, unit 6, and $333 million for the 100MW Actis Kipeto wind farm.

One market that has come from nowhere in recent years is Egypt. Its total of $967 million marked a big decline from $3.4 billion in 2017, but this reflected the timing of financings that come out of auction rounds, rather than any underlying problem. The country has a target to reach 20% of electricity production from renewables by 2022, and 41% by 2035.

The two largest asset financings in Egypt last year were the third phase of the NREA Gabal El Zayt wind farm, at an estimated $202 million for 120MW, and the Acciona and Swicorp Benban PV portfolio, at $180 million for 186MW.

Among the countries not breaking the $1 billion investment barrier in 2018, Saudi Arabia was the most spectacular riser, achieving its highest total to date, at $651 million, thanks entirely to solar projects. United Arab Emirates, which saw $1.9 billion of solar financings in 2017 and then hosted in early 2019 the largest solar deal ever worldwide (at $4.2 billion), had an investment lull in the year in between.

LATIN AMERICA

This region had a quieter 2018, with three of the major four markets seeing investment slide. New investment in renewable energy capacity in Latin America was $12.1 billion, down by more than 30% in 2018 compared to the previous year, a decline primarily driven by Brazil and Mexico. In a historic first, solar led the way with $7.3 billion of investment, up 12%, mostly directed to Mexico and Chile. Wind, which had been the biggest sector for financings since taking over from biofuels in 2011, came second last year with $4.3 billion of investment, down 57%. The only other sectors to see financings in 2018 were biomass and waste, and small hydro, both at around $200 million.

Looking at individual countries, Figure 38 shows that Mexico was once again the leader in the region, although its total was down 38% at $3.8 billion. The jump in the value of investment in 2017 reflected projects that had won capacity in earlier auctions reaching financial close, and this influence was less powerful in 2018. Nevertheless, there were several big deals, including the 493MW Acciona and Tuto Puerto Libertad PV plant, at an estimated $404 million, and the 306MW EnerAB Mesa La Paz wind farm, at $405 million.

Brazil suffered a 44% drop in capacity investment to $3.4 billion, the lowest for that country since way back in 2005. Solar attracted $1.8 billion, down 24%, while wind slipped 61% to $1.3 billion. The Enel Sao Goncalo PV portfolio was the largest financing in that country in 2018, at $390 million for 388MW.

![FIGURE 38. RENEWABLE ENERGY CAPACITY INVESTMENT IN LATIN AMERICA BY COUNTRY, 2018, AND CHANGE ON 2017, $BN](image_url)

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF
The fall in Brazilian investment was mostly a reflection of the fact that no auctions for new capacity were held between November 2015 and December 2017. Investment levels may pick up in the near term as a result of four auctions held over 2017 and 2018 that contracted 2.8GW of wind and 1.8GW of solar, to be commissioned between 2021 and 2024.

Argentina registered an increase in capacity investment of 15% in 2018 to a record $1.9 billion, thanks largely to the financing of projects awarded in the RenovAr auction held in 2016-2017, as well as the launch of a renewable energy corporate PPA market. The vast majority of money ($1.3 billion) went into wind projects, with solar accounting for $518 million. One of the largest deals of the year was an estimated $180 million for the 122MW Petroquimica Comodoro Rivadavia del Bicentenario wind portfolio.

Chile saw a decrease of 38% in new investments to $1.3 billion, below the country’s five-year average of $1.9 billion. However, within this, solar attracted $1.2 billion, up 106%, while wind slumped 96% to less than $100 million. Both technologies were affected by worries about curtailment and delays to transmission expansion projects, but the solar number was bolstered greatly by the estimated $1 billion financing of the 110MW EIG Atacama 1 parabolic trough thermal plant.
EMERGING ASIA EXCLUDING CHINA AND INDIA

Figure 39 shows the leading eight developing countries in Asia in 2018 in terms of investment in renewables excluding large hydro (apart from the two giants of China and India discussed above). Vietnam soared to lead the list by a long distance, its record annual tally of $5.2 billion being nine times that of the previous year.

Most of the activity ($4.6 billion), up 25-fold, came in solar, with wind contributing a more modest $599 million, up 63%. There were some 10 PV projects of 100MW or more financed in 2018, led by the first phase of the 420MW Tieng Reservoir Tay Ninh plant, for an estimated $402 million, and the 351MW Hong Phong Binh Thuan Bac Binh undertaking, for about $326 million.

The rush of investment in solar reflected pressure on developers to get their projects commissioned and connected to the grid by June 30, 2019 to be eligible for the feed-in tariff rate of 9.35 U.S. cents per kWh for 20 years.

Vietnam also had a 142MW offshore wind farm financed in 2018, for some $392 million. The third phase of the Cong Ly Bac Lieu project will, like earlier phases, be built in shallow waters just off the coast and accessible by bridge from shore.

Taiwan enjoyed a 163% leap in renewable energy investment last year, to $1.8 billion, thanks in greatest part to small-scale solar funding, which came to some $900 million in 2018, the highest to date. The year also saw the island’s first big offshore wind financing, of an estimated $627 million for the 120MW Formosa 1 Miaoli array. The latter project was interesting in an Asian context, in that it involved Danish developer Orsted, Australian investor Macquarie and a club of European, Australian, Japanese and Taiwanese banks.

Indonesian investment slipped 23% to $771 million in 2018, close to that country’s five-year average. As in many other years, the main activity was in geothermal, with the estimated $701 million financing of the 91MW Supreme Rantau Dedap by Engie, Marubeni and a consortium of banks.

The country’s state-owned utility, PLN, issued a new procurement plan in 2018, shaving the overall additions to reflect weaker-than-expected electricity demand growth, but sticking with coal-fired generation as the main technology choice.

Pakistan was the other Asian developing economy to see renewables capacity investment of more than half a billion dollars in 2018, although in its case the total was only a little above this level, at $563 million, down 56% and the lowest since 2012. Small-scale solar systems made up the majority of Pakistan’s investment last year.

The decline in the country’s overall total should be treated with caution, since previous years’ figures for Pakistan have often been revised up as information has emerged with a delay. In addition, there has been a stream of projects in both solar and wind seeking tariff approval from the regulator, and these are likely to reach financing in 2019-2020. Tariffs have mostly been set on a cost-plus basis by the regulator, but the authorities have been working on a possible competitive bidding system to encourage investment.

Source: UN Environment, Frankfurt School-UNEP Centre, BloombergNEF