

# NEW ENERGY OUTLOOK 2015

Long-term projections of  
the global energy sector

EXECUTIVE  
SUMMARY  
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## SECTION 1. PREAMBLE

The New Energy Outlook (NEO) is Bloomberg New Energy Finance's annual long-term global forecast for the future of energy. Focussed on the electricity system, NEO combines the expertise of over 65 in-house country and technology-level specialists in 11 countries to provide a unique assessment of how the market will evolve.

What sets NEO apart is that our assessment is focussed on the parts of the system that are driving rapid change in markets, grid systems and business models. This includes the cost of wind and solar technology, battery storage, electricity demand and consumer dynamics among others.

In the near term, our market projections are based on policy targets and Bloomberg New Energy Finance's proprietary project database that provides a detailed understanding of planned new build, retrofits and retirements, by country and sector. In the medium to long term, the forecast is driven by the cost of building different power generation technologies to meet projected peak and average demand. Demand varies dramatically between developing and developed countries, which have different economic growth and energy efficiency profiles. The modelling then preferentially deploys least-cost technology options that change over time in line with shifting capital, operating and financing costs. The latter, in turn, are influenced by manufacturing and deployment experience, fuel and carbon prices and changing risk profiles.

The analysis assumes that renewables globally will see no further policy support – be that feed-in tariffs or net energy metering – from 2018 onwards, except for offshore wind, which will see subsidies end from 2030. It assumes carbon prices continue to exist where they are already in place or where we have some confidence in their emergence. In particular, the forecast does not explicitly take into account the long-term impacts of the US Clean Power Plan as it has not yet been finalised by the Environmental Protection Agency.

Critically, the analysis looks in detail at consumer adoption and investment in distributed small-scale solar PV, coupled with consumer-scale battery storage. Uptake for these technologies is governed by both payback periods and market penetration, creating dynamics that are very different from those driving traditional large-scale investments within a centralised power system.

In countries where the penetration of variable renewables is high, we allow for additional system services to emerge that absorb variations in power generation, ensure system stability and help meet demand peaks. This *flexible capacity* consists of a range of technology options including demand response, grid-scale, consumer and electric vehicle battery storage, greater cross-border interconnection, renewable control systems, virtual power plants and flexible distributed capacity.

## SECTION 2. EXECUTIVE SUMMARY

By 2040, the world's power-generating capacity mix will have transformed: from today's system composed of two-thirds fossil fuels to one with 56% from zero-emission energy sources. Renewables will command just under 60% of the 9,786GW of new generating capacity installed over the next 25 years, and two-thirds of the \$12.2 trillion of investment.

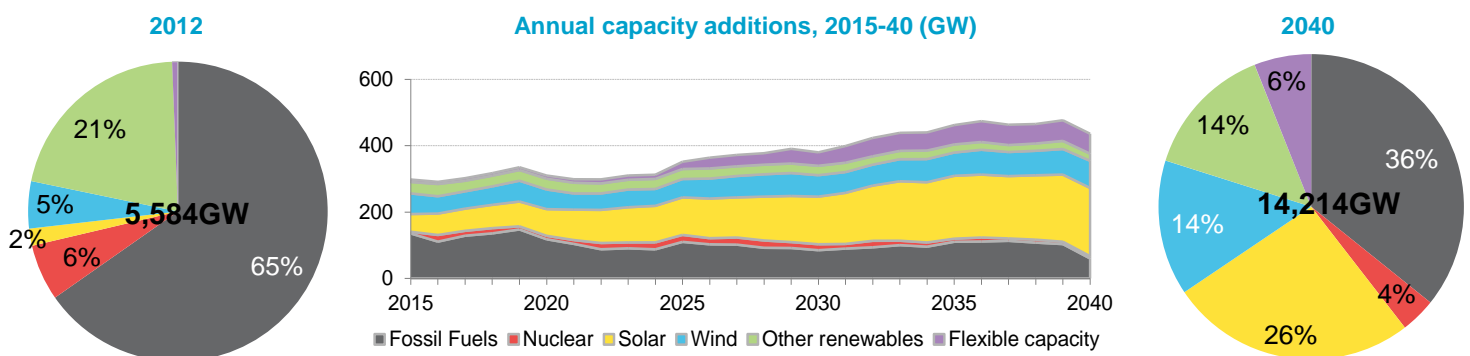
- **Economics – rather than policy – will increasingly drive the uptake of renewable technologies.** All-in project costs for wind will come down by an average of 32% and solar 48% by 2040 due to steep experience curves and improved financing. Wind is already the cheapest form of new power generation capacity in Europe, Australia and Brazil and by 2026 it will be the least-cost option almost universally, with utility-scale PV likely to take that mantle by 2030.
- **Over 54% of power capacity in OECD countries will be renewable energy capacity in 2040 – from a third in 2014.** Developed countries are rapidly shifting from traditional centralised systems to more flexible and decentralised ones that are significantly less carbon-intensive. With about 882GW added over the next 25 years, small-scale PV will dominate both additions and installed capacity in the OECD, shifting the focus of the value chain to consumers and offering new opportunities for market share.
- **In contrast, developing non-OECD countries will build 287GW a year to satisfy demand spurred by economic growth and rising electrification.** This will require around \$370bn of investment a year, or 80% of investment in power capacity worldwide. In total, developing countries will build nearly three times as much new capacity as developed nations, at 7,460GW – of which around half will be renewables. Coal and utility-scale PV will be neck and neck for additions as power-hungry countries use their low-cost domestic fossil-fuel reserves in the absence of strict pollution regulations.
- **Solar will boom worldwide, accounting for 35% (3,429GW) of capacity additions and nearly a third (\$3.7 trillion) of global investment, split evenly between small- and utility-scale installations:** large-scale plants will increasingly out-compete wind, gas and coal in sunny locations, with a sustained boom post 2020 in developing countries, making it the number one sector in terms of capacity additions over the next 25 years.
- **The real solar revolution will be on rooftops, driven by high residential and commercial power prices, and the availability of residential storage in some countries.** Small-scale rooftop installations will reach socket parity in all major economies and provide a cheap substitute for diesel generation for those living outside the existing grid network in developing countries. By 2040, just under 13% of global generating capacity will be small-scale PV, though in some countries this share will be significantly higher.
- **In industrialised economies, the link between economic growth and electricity consumption appears to be weakening.** Power use fell with the financial crisis but has not bounced back strongly in the OECD as a whole, even as economic growth returned. This trend reflects an ongoing shift to services, consumers responding to high energy prices and improvements in energy efficiency. In OECD countries, power demand will be lower in 2040 than in 2014.
- **The penetration of renewables will double to 46% of world electricity output by 2040 with variable renewable technologies such as wind and solar accounting for 30% of generation – up from 5% in 2014.** As this penetration rises, countries will need to add flexible capacity that can help meet peak demand, as well as ramp up when solar comes off-line in the evening.
- **Daily load profiles are also getting 'peakier', reflecting more household and commercial consumption and less steady industrial baseload.** As this trend increases over time, power



systems will need to increasingly reward system services such as demand response, battery storage, interconnectors and control systems that work along with traditional firm capacity to help match supply with demand.

- **Despite significant growth in renewables, fossil fuels will maintain a 44% share of generation in 2040 – albeit down from two-thirds in 2014.** Some 1,291GW of new coal-fired capacity will be added to 2040, and 99% of this will be in developing countries where supply is relatively cheap and climate change policies weak or yet to be implemented. Only 1,359GW of gas will be added globally – 86% in developing countries – as its role as a 'transitional fuel' looks more and more doubtful outside the US where the shale gas revolution and environmental regulations seem set to push coal out of the market.
- **CO2 emissions from the power sector will rise by 13% over 2014-40.** The utilisation of low-cost domestic fossil-fuel reserves from developing countries, the long life of coal plants and the absence of a strict regulatory framework will mean power sector carbon emissions are likely to peak around 2029 at 15.3Gt, then ease only slowly to reach 14.8Gt in 2040.
- **More than half of the new generating capacity to 2040 will be built in Asia Pacific so that for every 1GW of new build in the Americas, 3.4GW will be installed in APAC.** China alone will attract \$3.3 trillion of new investment – nearly double the total for the Americas – and build 2,601GW more capacity by 2040.
- **In Europe, small-scale solar will increase its share of the capacity mix to 22% from 6% in 2014 as households and businesses try to offset high retail power tariffs.** Meanwhile environmental legislation, the age of the coal fleet, the EU carbon price and the technology's relative inflexibility will nearly halve coal capacity. By 2040, just under 50% of generation will come from variable sources like wind and solar.
- **In the Americas, the US story to 2020 will be all about gas, which will see 90% of new build, thanks to low wholesale prices and coal retirements.** From 2020 however it is small-scale solar that dominates, with 21GW added per year. At the same time, Latin America will invest just under \$500bn in wind and solar as it tries to diversify away from an over-reliance on drought-prone hydro over the next 25 years.
- **In the Middle East & Africa, some 38% of new capacity will be fossil-fuelled as countries seek to exploit their substantial reserves.** But we also expect 160GW of solar PV as many of these nations exploit their world-class solar potential. Despite the prevalence of subsidised retail power tariffs, as much as 40% of the new solar could be small-scale systems, used for example to build mini-grids to electrify communities sited away from the main grid.

**Figure 1: Global installed capacity in 2014 and 2040 and projected capacity additions, by technology (GW)**



Source: Bloomberg New Energy Finance

## ABOUT US

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