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GIANT FALL IN GENERATING COSTS FROM OFFSHORE WIND

Competitive bidding for projects has driven global levelised costs of electricity from offshore wind down 22% to a benchmark estimate of \$126 per megawatt-hour in H2 2016

London, New York and Shanghai, 1 November 2016 – Auction programmes in Netherlands and Denmark, in which developers bid for projects at the lowest electricity price they can offer, have added major impetus to the downward path of costs in offshore wind, according to Bloomberg New Energy Finance.

Its latest study of levelised cost of electricity, or LCOE, for all the renewable and fossil fuel generating technologies puts the benchmark (weighted average) estimate for offshore wind globally at \$126 per megawatt-hour in the second half of 2016. This is down 22% from H1 2016, and 28% from H2 2015.

BNEF's work on levelised costs draws on thousands of data points collected by the company's analysts and researchers, on capital costs, financing, operations and maintenance expenses and capacity factor – the amount of electricity generated per year from a given capacity in megawatts.

Seb Henbest, head of Europe, Middle East and Africa at BNEF and in charge of the levelised cost modelling work, said: "For years, offshore wind has been regarded as a high-cost option compared to onshore wind, solar PV, coal and gas. This study shows that the economics of offshore wind are now improving fast, with the best sites getting closer to striking distance of more mature technologies."

Tom Harries, offshore wind analyst at BNEF, added: "Behind this improvement are the use of much bigger turbines, enhanced knowhow on managing the construction of arrays in the North Sea, and the impact of auction programmes in Europe. The latter have simplified development by providing transmission and a permitted site, and have led to fierce competition between bidders."

In September, two offshore wind projects in Danish waters totalling 350 megawatts were awarded to Vattenfall, the utility, with a record-breaking bid of just 60 euros (\$67.33) per MWh. In July, another utility, Dong Energy, won a contract to develop a 700MW Dutch offshore array at 72.70 euros per MWh. Other projects, such as those in deep UK waters, are going ahead at higher cost, and this explains why the global benchmark, while falling rapidly, is well above these recent figures from Denmark and the Netherlands.

Offshore wind is not the only technology to have significantly improved its LCOE this year: onshore wind's global benchmark estimate is \$68 per MWh for the second half of 2016, some 16% below the first half of the year. Onshore wind is already cost-competitive with coal and gas-fired generation in many countries.

BNEF's latest benchmark estimate for the LCOE of crystalline-silicon solar photovoltaic projects reaching

financial close in H2 2016 is \$100 per MWh, with a wide range either side of this.

The range for each technology reflects the fact that generating costs can vary greatly between projects, based not just on technology type, but also the quality of the resource (for wind, solar, geothermal and hydro), the availability and price of feedstock (for coal, gas, nuclear and biomass), the cost of land, and local costs of manufacturing, importing and installing equipment. In offshore wind, the depth of the water and distance from shore are important factors. In all technologies in developing countries, the availability, or not, of concessional finance from international institutions has a big influence.

In solar, there have been some spectacularly low electricity prices agreed in recent auctions around the world – most recently, just \$29.10 per MWh for a project in Chile, breaking the records established earlier in the year first in Mexico, then in Dubai. However, these projects have advantageous – not average – conditions, and may also differ from the benchmark in date of construction start (this could be a year or more in the future, not H2 2016), the tariff duration and whether the tariffs are inflation-indexed. Taking this into account, most of the auction results in solar have been compatible with BNEF's LCOE range.

Luke Mills, senior analyst at BNEF and lead author of the report, commented: "We are continuing to see rapid reductions in costs per MWh for renewable energy around the world. Looking ahead to 2017, solar may be particularly interesting because excess capacity in global PV module making could lead to further rapid price deflation as manufacturers fight for customers."

BNEF's levelised cost estimates for fossil fuel generation differ greatly by region. In H2 2016, coal-fired power stations have LCOE benchmark estimates of \$51 in Asia-Pacific, \$55 in the Americas and \$88 in Europe, while gas-fired plants average \$53 in the Americas, \$78 in Europe and \$99 in Asia-Pacific.

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