

GLOBAL RENEWABLE ENERGY MARKET OUTLOOK

Executive summary

16 November 2011



EXECUTIVE SUMMARY

The *Global Renewable Energy Market Outlook* presents the latest forecasts from Bloomberg New Energy Finance on the future size of the world renewable energy markets. The projections extend to 2030 across all renewable energy technologies and regions. The analysis uses Bloomberg New Energy Finance's model of the global energy system and clean energy technologies – the Global Energy and Emissions Model – together with expert interpretation of current and proposed energy policies and targets. This document outlines the main findings of the *Global Renewable Energy Market Outlook*, which is available to download by Bloomberg New Energy Finance Insight clients.

Renewable energy sources will boost their share of total primary energy production to 15.7% in 2030 compared with 12.6% last year

The analysis has drawn on the contribution of over 65 technical experts within Bloomberg New Energy Finance across all the main renewable energy technologies and geographical regions. The short-term market projections are based on our detailed understanding of the construction pipeline in each sector, while longer-term forecasts use a combination of modelling energy policies in each region and the costs and resource availability of each technology in each major country. The analysis covers asset finance in all the main forms of renewable energy including small distributed capacity as well as those used for power generation, heat and biofuels.

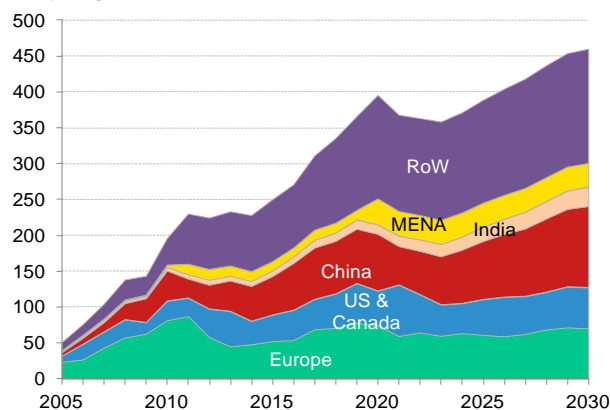
This will require nearly \$7 trillion of new capital over 2011-30

Renewable energy market projections

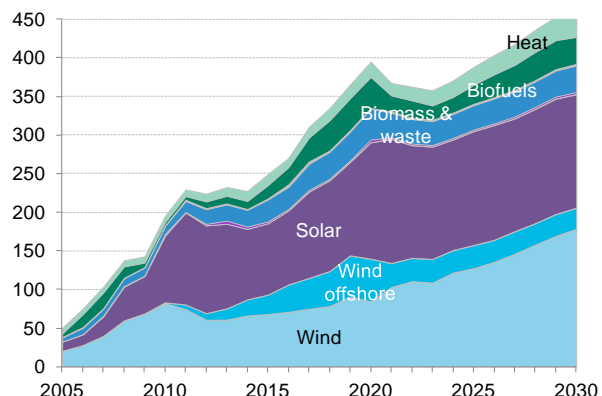
Global investment in renewable energy has grown rapidly in recent years, driven by concerns about climate change, the increasing cost of fossil fuels and national economic policies to create jobs. Looking forward, global investment in renewable energy projects will rise from \$195bn in 2010 to \$395bn in 2020 and to \$460bn by 2030, according to Bloomberg New Energy Finance analysis.¹ Over the next 20 years this growth will require nearly \$7 trillion of new capital.

Over this period renewable sources, including large hydro, will increase their share of total primary energy production from 12.6% in 2010 to 15.7% in 2030. The share of non-hydro renewable resources will increase from 10.3% to 13.2% over the same period.

Annual value of renewable energy capacity installed, 2005-30 by region (\$bn)



Annual value of renewable energy capacity installed, 2005-30 by technology sector (\$bn)



Source: Bloomberg New Energy Finance

¹ The figures presented herein differ somewhat from previous Bloomberg New Energy Finance annual investment figures. This is because those used for this report represent money spent on renewable energy assets – calculated as annual build (GW) multiplied by country-specific capital cost of technology – while previous investment figures refer to money raised for renewable energy projects. The difference arises because in most major renewable energy markets, there is a lag of some 2-3 years between when money is raised and when project begins operations.

The next 10 years will see a steep climb in investment as countries rush to meet their 2020 renewables targets. In addition, much of the spend in 2018-20 will be in the more costly offshore wind projects, in particular in Germany and the UK. Expenditure on renewable energy projects is likely to dip temporarily in the early 2020s as countries review their longer-term objectives, and digest the effects of the rapid expansion in renewables over the previous years.

Regional outlook

Geographically Europe will remain the largest regional market for renewables up to 2014, with 25% of world investment, but will experience a contraction over this period as governments review the value of clean energy support mechanisms in the face of severe sovereign debt problems. Growth in the European market will resume post 2015 at an annual growth rate of 8% as investment is scaled up to achieve the European renewable energy target by 2020.

The economic challenges in Europe will be felt less in the rest of the world. In China investment in renewable energy is expected to continue to increase in all years, and by 2014 China will become the largest single market for renewable energy with an annual spend of just under \$50bn, accounting for 21% of the world market. The US and Canada are also expected to see no lasting slowdown in project build, together hitting \$50bn of investment by 2020.

By far the most rapid growth will be seen in the rapidly developing economies of India, the Middle East and North Africa, Africa and Latin America, which are projected to experience growth rates of 10-18% per year between 2010 and 2020. By 2020 the markets outside of the EU, US, Canada and China will account for 50% of world demand.

Technology sector

After 2020 more ambitious energy policies coupled with much lower unit costs of renewable technologies will drive further deployment of renewable energy technologies. Although in the 10 years to 2030, world investment in renewables will rise by a more modest 2.5% per year, this masks a very significant increase in development as the cost of technologies declines.

The benefits of cost reductions over time will mostly affect the solar sector, where unit costs are expected to fall by 60% over the next 20 years. This will spur deployment of solar technologies around the world, but it will also mean less capital is required to produce the same output. Annual investment in solar power assets will go from \$86bn in 2010 to \$150bn in 2020 and then remain constant at \$150bn a year between 2020 and 2030.

The wind sector will broadly match solar and grow from \$71bn in 2010 to \$140bn in 2020 and \$82bn in 2030. The bioenergy sector will see renewed activity with the commercialisation of second-generation technologies and global supply chains developing in the movement of biomass fuels. Investment in biofuels, biomass and waste-to-energy is projected to increase from \$14bn in 2010 to \$80bn in 2020 and then remain level in the following decade.

Power generation

Our base case forecasts that net power production will increase by nearly 90% over the next 20 years, to 34,000TWh worldwide. Although electricity intensity has declined over the last 20 years and will continue to come down, there is a clear correlation between economic growth and electricity demand. The share of clean electricity (renewables, including large hydro, and fossil-fuel plants with carbon capture and storage) is projected to rise from 23% in 2010 to 29% in 2020, reaching 34% in 2030.

Within the renewable sector, the share of hydro power is expected to decline from some 19% in 2010 to 15% by 2020. Because of the overall increase in renewable energy production, hydro output will still increase in absolute terms by 2% a year. The aggregate share of other renewable

China will become top spot for renewable energy investment in 2014, while India, MENA, Africa and Latin America will see the fastest growth

Some 34% of power production will come from renewables and CCS by 2030 from 23% in 2010

Offshore wind will see the fastest growth in capacity, increasing by 39% up to 2020

Europe will be the biggest market for renewable power over the next five years but China will then take top spot until at least 2030

To meet rising transport fuel demand, total production of biofuels, diesel and gasoline substitutes will nearly double this decade

technologies, such as wind, solar and geothermal, and CCS, will grow from 5% in 2010 to 19% in 2030, corresponding to a 10% compound annual growth rate.

Reflecting the rising production and investment levels, installed capacity of renewable power sources is also projected to climb, reaching 2.5TW by 2030 – growth of over 800%. We therefore expect around 1.1TW of new build this decade, with 36% from solar and 46% onshore wind, followed by 1.4TW between 2021 and 2030, of which half will be new solar installations and 37% onshore wind.

Total clean energy investment in the power sector, including the cost of replacing and/or refurbishing aging installations, is expected to exceed \$5.4 trillion over the next 20 years. Up to 2020, an average \$229bn will be invested each year, increasing to \$314bn from 2021. Solar will attract around half of the spend, at \$1.1 trillion between 2011 and 2030 and \$1.5 trillion in the next decade. Wind (onshore and offshore) will follow, absorbing a little over one-third of total investment this decade and 41% over the next. The relatively high levels of investment in wind are due to the large number of new offshore installations expected in Europe, mainly UK and Germany, before 2020 as well as the refurbishment of old wind farms in the EU, US and China over 2026-30.

The focus of the renewable power market is rapidly moving away from the traditional mature markets of Europe and the US. Smaller markets are expanding far more aggressively as their power demand ramps up more quickly and – more importantly – there remains considerable unexploited potential for renewable power in these regions. This paints a stark contrast to Europe for example where suitable sites for onshore wind are getting harder to find. In absolute terms Europe will be the biggest market for renewable power over the next five years, attracting 26% of the finance, but for the rest of the period, China will take pole position, with some 20% of new investment. The MENA market will also grow very quickly – over 400% over the next 20 years – with most of the investment from solar technologies replacing oil-fired power plants.

Biofuels

Fuel demand from the transport sector will climb 20% by 2020 and 46% by 2030 on 2010 levels, according to Bloomberg New Energy Finance projections. This implies a slightly lower annual growth rate compared with the historical average of 2% per year in the last decade. The slight slowdown is caused by the rapid penetration of electric vehicles and continuously higher efficiencies, all driven by high fuel prices and environmental regulations.

Production of gasoline substitutes, mainly ethanol, is projected to increase from 100bn litres in 2010 to 190bn and 300bn litres in 2020 and 2030 respectively. Production of diesel substitutes will double by 2020, reaching 100bn litres from roughly 50bn today, and will double again by 2030 reaching 200bn litres. These forecasts are relatively conservative: high fuel prices may force countries to remove the free trade constraints and relax their current sustainability criteria.

Total production of biofuels, diesel and gasoline substitutes will nearly double this decade and rise a further 72% over the next, according to our analysis. The historically big biofuel markets and producers – the US and Brazil – will boost their domestic production by some 60% up to 2020 and then an extra 35% by 2030. While small at present, other markets like China, India and Africa will increase their production at significantly higher rates. As a result, the aggregate share of Brazil and the US will shrink to 45% by 2030 from 67% today. In absolute terms, however, Brazil will still add 26bn and 23bn litres of capacity over the next two decades, and the US and Canada will together increase capacity by some 35bn in each decade. This corresponds to 35% of the total cumulative growth of the sector.

Food scarcity has already forced international bodies to put in place tough sustainability criteria for biofuels production. As countries continue to impose tough sustainability standards, production will likely shift towards next-generation biofuels (from wood, straw, waste etc). These technologies

Some \$510bn will be invested in biorefineries over the next 20 years, with 22% in the EU and 21% in North America

are relatively immature and expensive but we expect higher adoption levels to accelerate learning and bring down costs quickly. Hence, we expect first-generation biofuels production to grow slowly until 2020 and remain steady thereafter. In contrast, next-generation biofuels production is forecast to climb more than 10% on average every year between 2010 and 2030.

With regard to investment, small and immature markets such as Africa and Latin America are expected to attract the most asset finance due to abundant resources and strong domestic demand. Over the next 20 years, only 30% of investment on biofuels will be spent in Brazil, the US and Canada. Europe will see significant investment between 2015 and 2020 mainly driven by its Renewable Energy and Waste Directives. However, financing levels will then decline due to falling demand for transport fuels. Emerging sustainability standards and the need to address food scarcity will mean that some 95% of the total investment (\$510bn) on biofuels infrastructure will target next-generation facilities over 2011-30.

Heat generation

The heat generation sector includes large-scale heat generation plants (ie, those used exclusively for heat production²) and commercial and residential water heating systems. With regard to water heating, solar systems are already cost-competitive with fossil fuels or electric boilers in sunny countries. Hence their penetration is much higher in regions with high solar irradiation like the Middle East and North Africa and southern Europe (on a MW/capita basis).

China will retain the top spot for solar water heating capacity, holding a 50% share of the global total in 2030

China has by far the most solar water heating capacity, due to low costs and government support. The EU-27 is the second largest market, with the majority of installations located in the south. Falling technology capital costs and increasing efficiencies will soon make solar water heating systems economically attractive for a broader range of climates. As a result, global capacity is forecast to double to 975GWth by 2030, with China still holding 50%, followed by India with 10%.

Our forecasts show that some \$120bn will be spent on solar water heating technologies between 2011 and 2020, rising to \$221bn over the next decade. China will see about 50% of the investment in commercial-scale solar heating schemes, gradually extending its lead over other markets. India will be second, attracting some \$30bn until 2030. Other smaller markets, such as Australia, Brazil and Japan, and upcoming markets in Asia and Africa will see over \$80bn of investment by 2030.

With great potential to replace fossil fuels with biomass and waste, the commercial heating sector will attract \$36bn over 2010-30

The commercial heating sector – essentially large plants producing heat and distributing it through district heating schemes to industrial facilities and/or residential areas – is the smallest segment of the global renewables market. Less than 5% of energy in the sector comes from renewables but there is considerable potential to replace coal and natural gas by biomass and waste.³ However, for this potential to be realised, governments need to implement appropriate incentives.

The market for renewable commercial heating systems will grow albeit more slowly than other sectors. As implementing building district heating schemes is capital-intensive, developed countries without a history of investing in such mechanisms are likely to proceed slowly. The bulk of demand growth is expected to come from developing countries, primarily China, with relatively high urbanisation rates. Developing countries could also increase their heat production but we expect this growth to be limited to existing district heating schemes.

The US and Canada, China, and northern and eastern European countries had over 70% of the installed biomass and waste-fired heat generators in 2010. We expect investment to climb 11% (to \$17bn) by 2020 and an additional 13% (to \$20bn) by 2030.⁴

- 2 In other words, facilities used exclusively for heat production – combined heat and power (CHP) plants are covered under the power generation sector.
- 3 Solar thermal plants could also be deployed for heat generation but they would fall under the CHP classification.
- 4 The cost of creating district heating schemes has not been taken into account

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