The Evolution and Economics of Wind Power

Description: The Evolution and Economics of Wind Power report contains four chapters:-

Chapter 1 The wind resource and global wind generating capacity
Wind is the movement of air generated by the earth's rotation and by the heating of the atmosphere by the sun. The wind resulting is both intermittent and unpredictable. The amount of wind energy available varies with position on the globe and some regions have much better resources than others. Wind atlases can help reveal the best resource regions but site measurements are usually necessary to evaluate a particular wind project. Global wind capacity has been growing steadily since the beginning of the century. Early growth was driven by expansion in Europe but towards the end of the first decade of the century the centre of gravity moved away from Europe with growth in both the USA and China growing rapidly. Europe still has the largest wind capacity but this will soon be overtaken by Asia. Offshore wind, however, remains a European phenomenon with virtually all the global capacity still located in European waters.

Chapter 2 Wind technology and market trends
Modern large wind turbines follow a standard design with a horizontal axis carrying a rotor fixed to the top of a tall tower. This standardization has allowed manufacturers to concentrate on development of key turbine components. A major trend has been a continued increase in turbine size with larger turbines generally more economical than smaller units. This has been accompanied by developments to allow manufacture of longer and lighter blades. Blades and towers are being designed in segments so that they can be more easily transported to difficult sites. There have also been developments in the drive train, particularly the introduction of direct drive and permanent magnet generators that offer greater efficiency of operation. Other important developments have focused on measures to improve the integration of large volumes of wind power into grid systems. All these developments are making higher and higher penetration levels possible. The market, meanwhile, remains largely regional so that locally-based manufacturers often take the major share of each market.

Chapter 3 The economics of wind power
Wind power is capital intensive with most of the investment required upfront. The largest capital cost component is the turbine itself which can account for between 40% and 80% of the total capital cost of an onshore wind installation. Costs offshore are higher because of the more expensive operating environment and the greater difficulty establishing a foundation so the proportion of capital cost taken by the turbine is generally lower than onshore. Turbine cost fell from 1980 until 2002 when prices started to rise again, peaking in 2009 before falling further. Technological advances and greater overall efficiency are continuing to bring costs down. This is feeding into capital cost trends which are following turbine prices by falling. There are regional variations in capital costs, with costs lower in India and China than in Europe or the USA but regional differences are narrowing as the market becomes more global. With capital cost the dominant component of the cost of energy, the levelized cost of electricity from wind plants is falling too and onshore wind is beginning to compete with other technologies, particularly new coal. There is a growing consensus that onshore wind will reach parity in many parts of the world by the end of the decade, if not before. Offshore wind will take longer but could be competing with the main conventional sources of power by the middle or end of the third decade of the century.

Chapter 4 Wind prospects
The cost of wind power has continued to fall compared to many other technologies over the past five years and is now approaching the level at which it can compete with conventional technologies. Power from natural gas and coal remains cheaper (without carbon capture and storage) but the steady growth in renewable penetration from both wind and wind power is leading to coal and gas-fired plants operating for less of the time, a factor which adversely affects their economics. On the other hand the low cost of wind power is leading governments to reduce subsidies to wind. By the end of the decade wind power could be the second cheapest source of electricity after natural gas in many markets. Growth of wind power is expected to continue strongly in the major markets of Europe, Asia and North America. Markets in Latin America are advancing more slowly and wind power in Africa remains a rarity.

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