SUZLON
POWERING A GREENER TOMORROW

FAQs

Ensuring a better tomorrow

Climate Change & Environment

Q1] What is Climate Change/Global Warming?

A] Global warming refers to the increase in the average temperature of the earth's near-surface air and oceans in recent decades and its projected continuation. Most of the observed increase in globally averaged temperatures since the mid-20 century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations which lead to warming of the surface and lower atmosphere by increasing the greenhouse effect.

Q2] What will be the impact of this phenomenon?

A] Effects of temperature increase have been documented in the following systems: a. Effects on agricultural and forestry management at Northern Hemisphere higher latitudes, such as earlier spring planting of crops and alterations in disturbance regimes of forests due to fires and pests. b. Some aspects of human health, such as heat-related mortality in Europe, infectious disease vectors in some areas and allergenic pollen in Northern Hemisphere high and mid-latitudes. c. Some human activities in the Arctic will not be possible (e.g. hunting and travel over snow and ice) and in lower elevation alpine areas (such as mountain sports). d. Settlements in mountain regions are at enhanced risk due to glacier lake outburst floods caused by melting glaciers. Governmental institutions in some places have begun to respond by building dams and drainage works. e. In the Saharan Africa, warmer and drier conditions have led to a reduced length of growing season with detrimental effects on crops. In southern Africa, longer dry seasons and more uncertain rainfall are prompting adaptation measures. f. Sea-level rise and human development are together contributing to losses of coastal wetlands and mangroves and increasing damage from coastal flooding in many areas.

Q3] Is Climate Change an established scientific fact?

A] The issue of global warming has garnered significant international attention through the Kyoto Protocol, a treaty which requires signatories to reduce their greenhouse gas emissions by considerable amounts below 1990 levels. The treaty explicitly acknowledges as true that manmade emissions, principally from the use of fossil fuels, are causing global temperatures to rise, eventually to catastrophic levels. Kyoto enthusiasts believe that if we dramatically cut back or even eliminate fossil fuels, the climate system will respond by sending global temperatures back to 'normal' levels.

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Q4] What is being done to stop/mitigate this phenomenon?

A] Mitigation is the first line of attack in the battle against global warming. Mitigation is the business of preventing excess carbon dioxide from being released. Some immediate strategies for mitigation for sustainability today are: a. Use Wind Energy and other such renewable sources to generate power. b. Using Ethanol as an alternative fuel. c. Walk, bike or ride in public transport. d. Eliminating your paper trail by banking and paying bills online. e. To cut back on carbon, environmentalists are using the force of the free market. f. Use solar energy, reducing emissions to zero. g. Installing compact fluorescent light bulbs (CFL). h. Use cloth bags instead of plastic bags.

Q5] Are there any international frameworks / treaties / organisations working to this end?

A] International Policy Framework for Climate Change and Business. b. Kyoto Protocol. c. IPCC (Intergovernmental Panel on Climate Change). D. National Round Table on the Environment and the Economy (NRTEE) on key international policy elements of a long-term energy and climate change strategy for Canada. e. CSIRO Atmospheric Research.

Q6] How does renewable energy/wind energy help avert this crisis?

A] With an established environmental consciousness and without such strong oil and coal lobbies, governments made a commitment to green power through systems of tax incentives and mandated green power purchases. Renewable energy is actually beginning to surface in the mainstream energy mire. 'Sustainability' has replaced 'national security' as the energy industry buzz phrase. Renewable Energy technology presents the best alternative and prospect for our global future. The potential to substitute atomic and fossil energy with Renewable Energy has already been practically proven. For instance: a. Germany has installed 16,000 MW of new renewable electric power capacities over the course of one decade. Reaching a capacity over and above the traditional large hydro power the German Renewable Energy Act gave most of the incentives to new development. b. Brazil provides a practical example of rapid substitution of bio-fuels for oil in cars. c. In Sweden entire public transport systems are run on bio-fuels. d. Some towns in China demonstrated how to mobilize solar thermal collectors on a large scale. e. Austria currently uses more pellets made from Biomass than oil and natural gas for the heating of buildings.

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Q7] What are the environmental benefits of wind power?

A] Reduced carbon dioxide (CO2) emissions. Wind energy does not deplete natural resources. The energy generated by wind turbines balances with the energy used to make them in a matter of months & about 5% of a wind farm sites contain turbines, equipment and access roads. Existing land uses, such as farming and grazing, can continue unaffected.

Q8] How does the greenhouse effect work?

A] The greenhouse effect is a natural process. Sunlight passes through the atmosphere, warming the earth's surface. In turn, the land and oceans release heat or infrared radiation into the atmosphere, balancing the incoming energy. Water vapour, carbon dioxide and some other naturally occurring gases can absorb part of this radiation, allowing it to warm the lower atmosphere. This absorption of heat which keeps the surface of our planet warm enough to sustain us is called the greenhouse effect. Without heat trapping greenhouse gases, average global surface temperature would be - 18°C rather than the current average of 15°C.

Q9] What is the enhanced greenhouse effect?

A] Since the industrial revolution and expansion of agriculture around 200 years ago, we have been raising the concentration of carbon dioxide gas in the global atmosphere. Levels of other greenhouse gases have also increased because of human activities. Higher concentrations of greenhouse gases in the earth's atmosphere will lead to increased trapping of infrared radiation. The lower atmosphere is likely to warm changing weather and climate. Thus, the enhanced greenhouse effect is additional to the natural greenhouse effect and is due to human activity changing the make-up of the atmosphere. (The enhanced greenhouse effect is often referred to as global warming.)

Q10] What's the difference between the enhanced greenhouse effect and ozone depletion?

A] Ozone depletion is a different environmental problem from the enhanced greenhouse effect. However, ozone depletion is also caused by changes to the atmosphere caused by humans. Ozone depletion has been happening since the late 1970s. It is caused by CFCs and Halons, industrially produced chemicals used in the past for refrigeration, plastic making and fire fighting. Once in the atmosphere, these chemicals destroy ozone in the stratosphere, 20 to 30 kilometers above the ground. This is the ozone layer, which stops much of the sun's

harmful ultraviolet radiation reaching us. Damage to the ozone layer means that over much of the planet, more ultraviolet radiation reaches the ground than in the past. Both the greenhouse effect and ozone depletion are due to chemicals released into the air by people's activities. Another similarity is that CFCs destroy ozone and greenhouse gases. In a curious turn of events, the warming effect of CFCs is offset by the fact that they destroy ozone, also a greenhouse gas, in the lower stratosphere.

Q11] Is greenhouse just a theory?

A] Yes and no! The way in which greenhouse gases affect climate is based on observations and scientific interpretations, as is the evidence that human activities have increased concentrations of greenhouse gases. The way in which these increases will affect our future climate is and can only be the result of theoretical calculations. However, there is unequivocal evidence that greenhouse gases are increasing in the atmosphere. Since the industrial revolution the level of carbon dioxide alone has risen from approximately 280 ppm (parts per million) to approximately 360 ppm. This will have an effect on the world's climate. What is not clear is the exact magnitude of that effect.

Q12] Isn't greenhouse just part of a natural cycle?

A] The greenhouse effect is a natural phenomenon, but the extra gases produced by human activity are making it stronger. We are now adding to these gases faster than oceans and plants can absorb them — the greenhouse effect is being 'enhanced' by humans. There is strong evidence that recent changes are unprecedented and not due to natural causes. When considering how climate will be affected, we need to be mindful that global warming due to the enhanced greenhouse effect will be in addition to the natural fluctuations of climate.

Q13] What are greenhouse gases?

A] Atmospheric trace gases that keep the earth's surface warm are known as greenhouse gases. About three-quarters of the natural greenhouse effect is due to water vapour. The next most significant greenhouse gas is carbon dioxide. Methane, nitrous oxide, ozone in the lower atmosphere and CFCs are also greenhouse gases.

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Q14] How do we know what is happening to concentrations of greenhouse gases in the air?

A] For many years, researchers have been measuring the make-up of air so they can monitor changes. CSIRO collects extensive data on atmospheric composition from the remote Cape Grim Baseline Air Pollution Station in Tasmania as well as from observatories around the world. The Station is the foremost facility of its type for monitoring pollutant levels in southern hemispheric air. It is operated jointly by the Australian Bureau of Meteorology and CSIRO. For a far longer record of atmospheric make-up, CSIRO researchers extract air from ice cores supplied by the Australian Antarctic Division. Analysis of the air reveals changes to the composition of the atmosphere dating back thousands of years. At CSIRO Atmospheric Research, air samples are analysed in the Global Atmospheric Sampling Laboratory (GASLAB). Results from GASLAB help us determine levels of greenhouse gases, where they are coming from and what happens to them once they are in the atmosphere.

Q15] How much have greenhouse gas concentrations increased?

A] The concentration of carbon dioxide is approximately 30 per cent greater than it was in the 18 century, before the industrial revolution. It has increased from around 280 ppm to approximately 360 ppm today. Although carbon dioxide comprises only 0.036 per cent of the air, its warming effect is significant. Methane levels have risen from a pre-industrial concentration of about 700 parts per billion (ppb) to 1700 ppb. However, the rapid growth of methane has slowed considerably since the 1980s. Nitrous oxide concentrations have increased from approximately 275 ppb to 315 ppb. There is strong evidence that ozone concentrations in the lower atmosphere are greater than in pre-industrial times, especially in the northern hemisphere. CFCs didn't exist 200 years ago. However, the concentrations of many of them are now starting to fall, thanks to international agreements to protect the ozone layer. Human activities do not directly change atmospheric water vapour concentrations. However, changes to water vapour concentrations may occur in response to increases in concentrations of carbon dioxide and other greenhouse gases. Carbon dioxide concentrations in the atmosphere has increased during the past thousand years, from measurements of air trapped in Antarctic ice (supplied by the Australian Antarctic Division) and since the late 1970s, from analysis by the Cape Grim Baseline Air Pollution Station.

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Q16] Where do greenhouse gases come from?

A] Most of the increase in carbon dioxide comes from burning of fossil fuels such as oil, coal and natural gas for energy and from deforestation. Cows, sheep and other ruminant animals 'burp' methane into the air. Rice paddies also generate methane. Other sources of methane are landfills, burning vegetation, coal mines and natural gas fields. Nitrous oxide concentrations are increasing because of changes to the way in which we use land, from fertilizer use, from some industrial processes and from burning vegetation. Ozone is a component of photochemical smog, which in turn is the result of emissions of hydrocarbons and nitrogen oxides from motor vehicles and industry. CFCs were made in the past for refrigerants, spray pack propellants, producing foam plastics and as solvents for electronic components. All developed countries, including Australia, have stopped producing CFCs.

Q17] How long do the greenhouse gases last in the atmosphere?

A] Carbon dioxide persists for more than a century in the air. Methane's average lifetime is about 11 years. Nitrous oxide and some of the CFCs stay in the air for more than a century.

Q18] Are all greenhouse gases equally as effective at trapping heat?

A] No. Greenhouse gases differ in their ability to trap heat. For example, a kilogram of methane released into the air today will lead to about 20 times more atmospheric warming over the next century than a kilogram of carbon dioxide. Molecule for molecule, methane, CFCs and nitrous oxide are more potent greenhouse gases than carbon dioxide. In order to compare the heating effect of different greenhouse gases, scientists have calculated a global warming potential for each one. The global warming potential takes into account: a. the amount of radiation that the gas absorbs and the wavelength at which it absorbs. b. the time that the gas stays in the atmosphere before reacting or being washed out by rainwater. c. the current concentration of the gas in the atmosphere. d. any indirect effects of the gas. For example, methane will produce ozone gas in the lower atmosphere and water vapour in the stratosphere.

Q19] Has the climate changed in the past 100 years?

A] The average surface temperature of the world is now 0.4 to 0.8°C higher than it was late in the 19 century. Most of the warming occurred over two periods in the 20 century: from 1910 to 1945 and from 1976 to 2002. Evidence for global warming is multi-faceted. In addition to the global average surface warming of about 0.6°C since 1900, there has been an increase in heat waves, fewer frosts,

warming of the lower atmosphere and deep oceans, retreat of glaciers and sea-ice, a rise in sea-level of 10-20 cm and increased heavy rainfall in many regions. Many species of plants and animals have changed their location or the timing of their seasonal responses in ways that provide indirect evidence of global warming. The latest research by Mann and Jones in 2003 confirms that the 20 century northern hemisphere warming is greater than any time in the past 1800 years, air over both, land and oceans has warmed. The most recent period of warming has been almost global, although the largest temperature increases have occurred over northern hemisphere continents in the mid - to high - latitudes. Parts of the north-western North Atlantic and the central North Pacific Oceans have cooled in recent decades.1998 was the warmest year and the 1990s the warmest decade globally since the record began in 1861. Nine out of the ten warmest years on record occurred in the 1990s and 2000s.

Q20] What information are satellites giving us about temperature changes?

A] Despite the wide range of indicators of global warming, critics often focus on a 23-year period from 1979-2001 when early studies with satellite data showed little or no warming in the lower atmosphere, whereas thermometer data showed that surface temperatures had increased. However, this disparity has declined in recent years. A recent study by Vinnikov and Grody found good agreement between the satellite and surface data from 1978-2002, with a satellite-based warming of 0.24°C per decade compared with 0.17°C per decade from surface data. Another study by Mears et al (2003) found a satellite-based warming of 0.10°C per decade. Santer and others have concluded that apparent inconsistencies between surface and satellite results may be an artefact of satellite data uncertainties. The satellite record is too short to be certain. The longer record of temperature measurements from weather balloons shows that the lower atmosphere has warmed by about 0.10°C per decade from 1958 to 2000, a similar rate to the surface warming. In addition, both weather balloons and satellites show that the stratosphere (the layer of the atmosphere from about 12 to 50 kilometers above the ground) is cooling. This is a change that scientists expect to happen as levels of greenhouse gases increase and the ozone layer thins.

Q21] Are humans responsible for changes to our climate?

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Q22] What about the 'heat island' effect?

A] Some people have claimed that measurements of global temperatures have been distorted because a number were made in cities where local temperature rises have been caused by urban development. Climatologists have long recognised the urban heat island effect and have allowed for it in their assessments. Sea-surface temperatures and small-island temperatures, which are not affected by the urbanisation, also show global warming, as do ocean temperatures to depths of 1000 meters. Other evidence of warming is available from tree rings, ice cores, boreholes and glacial retreat.

Q23] Has the sea level changed since 1900?

A] During the past 100 years, global average sea level has risen by between 10 and 20 cm. However, we have no evidence to associate this increase with global warming.

FUTURE CHANGES TO CLIMATE AND SEA LEVEL:

Q24] What impact will rising greenhouse gases have on climate?

A] Increasing levels of greenhouse gases are likely to produce a warming at the earth's surface. This warming is likely to lead to world-wide changes in weather and climate. Some places may get more rain and storms while others may get less. Not all changes will be bad for everybody. However, almost everywhere the weather and climate will be different from what it used to be. By the end of the 21 century, according to the Intergovernmental Panel on Climate Change, average world temperatures are likely to be between 1.4°C and 5.8°C higher than they were in the year 1990. This is much larger than the changes observed over the 20

century and the rate of warming is unprecedented in at least the last 10,000 years. Average rainfall across the globe is likely to increase, particularly during winter in northern mid - to high latitudes. Precipitation events are very likely to be more intense over most areas of the globe as well as a likely increase in summer risk of drought.

Q25] Will global warming increase the variability of climate?

A] Most climate models indicate that in many places global warming is likely to increase the frequency and duration of extreme events such as heavy rains, droughts and floods.

Q26] What will happen to the sea level?

A] By the year 2030, the global average sea level is likely to be between 3 and 17 cm higher than the 1990 level. By 2100, sea level is projected to rise by approximately 9 to 88 cm, compared to 1990. The rate and magnitude of sea level change will vary from place to place in response to coastline features, changes in ocean currents, differences in tidal patterns and sea-water density and vertical movements of the land itself. In some areas, sea level may actually fall. For much of the planet though, sea levels are expected to continue rising for hundreds of years even if atmospheric temperatures stabilise.

Q27] Why will the sea level rise?

A] If the earth's atmosphere warms, the upper layers of the oceans will also warm. Like most substances, water expands when heated. Expansion will raise sea level. Land-based ice in temperate regions such as South America and North America will melt more rapidly. Glaciers may retreat. Melting also contributes to increased sea level. The net effect on sea level rise from ice changes in Greenland and Antarctica is likely to be small.

Q28] What's happening to Antarctica?

A] Overall, Antarctica is not warming significantly. Only the Antarctic Peninsula is warming throughout the year at a rate that statisticians call 'significant'. Ice shelves, such as those in the Antarctic Peninsula float and will not change the sea level if they disintegrate or melt. (You can check this by adding an ice block to water in a glass. Mark the height of the water on the glass and then see what happens to the height after the ice melts.) Global warming may even lead to increased precipitation over Antarctica, which would lock water away in the ice caps. This may offset some of the sea-level rise caused by thermal expansion of water.

Wind Energy

Q1] What is a wind turbine and how does it work?

A] Wind energy system transforms the kinetic energy of the wind into mechanical or electrical energy that can be harnessed for practical use. Mechanical energy is most commonly used for pumping water in rural or remote locations. Wind electric turbines generate electricity for homes and businesses and for sale to utilities.

Q2] How much electricity can one wind turbine generate?

A] The output of a wind turbine depends on the turbine's size and the wind's speed through the rotor. Wind turbines being manufactured now have power ratings ranging from 250 watts to 5 MW.

Q3] How many turbines does it take to make one megawatt (MW)?

A] Most manufacturers of utility-scale turbines offer machines in the 700-kW to 2-MW range. Ten 1 MW units would make a 10MW wind plant, while 10 5- MW offshore machines would make a 50-MW facility. Machines of even larger size are in development and will be available over the coming years.

Q4] How many homes can one MW of wind turbine capacity supply?

A] An average U.S. household uses about 10,000 kilowatt-hours (kWh) of electricity each year. One MW of wind turbine capacity can generate between 2.4 million and 3 million kWh annually. Therefore, a MW of wind generates enough electricity to power 240 to 300 homes.

Q5] What is a wind power plant?

A] The most economical application of wind electric turbines is in groups of large machines (660 kW and up), called 'wind power plants' or 'wind farms.' For example, the 1,000-MW Suzlon wind farm under development in Maharashtra, India. Wind plants can range in size from a few MW to over 1,000 MW in capacity. Wind power plants are 'modular,' which means they consist of small individual modules (the turbines) and can easily be made larger or smaller as needed. Turbines can be added as electricity demand grows.

Q6] What is 'capacity factor' or PLF?

A] Capacity factor is a way of measuring the productivity of a wind turbine or any other power production facility. It compares the plant's actual production over a given period of time with the amount of power the plant would have produced if it had run at full capacity for the same amount of time. A wind plant is 'fueled' by the

wind, which blows steadily at times and not at all at other times. Most modern utility-scale wind turbines operate with a capacity factor of 25% to 40%, although they may achieve higher capacity factors during windy weeks or months. It is possible to achieve much higher capacity factors by combining wind with a storage technology such as pumped hydro or compressed-air energy storage (CAES).

Q7] If a wind turbine's capacity factor or PLF is 33%, doesn't that mean it is only running one third of the time?

A] No. A wind turbine typically runs about 65-80% of the time. However, much of the time it will be generating at less than full capacity depending on wind speed making its capacity factor lower.

Q8] What is "availability factor"?

A] Availability factor (or just 'availability') is a measurement of the reliability of a wind turbine or other power plants. It refers to the percentage of time that a plant is ready to generate (that is, not out of service for maintenance or repairs). Modern wind turbines have an availability of more than 98% - higher than most other types of power plant. After two decades of constant engineering refinement, today's wind machines are highly reliable.

Q9] How much does wind energy cost?

A] Over the last 20 years, the cost of electricity from utility-scale wind systems has dropped by more than 80%. In the early 1980s, when the first utility-scale turbines were installed, wind-generated electricity cost as much as 30 cents per kilowatt-hour. Now, state-of-the-art wind power plants can generate electricity for less than 5 cents/kWh in many parts of US, a price that is in many cases more competitive than conventional energy technologies with the soaring prices of fossil fuels.

Q10] How do utility-scale wind power plants compare in cost to other renewable energy sources?

A] Wind power has developed exponentially in sophistication and reliability putting it at par with conventional energy sources. Wind is today the second largest RE resource and expanding rapidly, making it the most viable and least expensive RE resource by far.

Wind Energy

Q11] What is the 'production tax credit' for wind energy?

A] Generally, the credit is a business credit that applies to electricity generated from wind plants for sale at wholesale (i.e. to a utility or other electricity supplier). It applies to electricity produced during the first 10 years of a wind plant's operation.

Q12] What is Renewables Portfolio Standard (RPS) and how does it work?

A] RPS is a policy instrument employed to ensure investment in RE, by specifying a minimum percentage of power that must be procured from RE sources of the total procurement/production of power.

Q13] If wind energy is competitive, why does it need subsidies?

A] The energy market has never been free-large energy producers such as coal and oil have always been able to win government subsidies of various kinds. Generally, coal and other sources receive a huge hidden subsidy resulting from the fact that its full environmental and health costs are not accounted for.

Q14] What is the 'energy payback time' for a wind turbine?

A] The 'energy payback time' is a term used to measure the net energy value of a wind turbine or other power plant-i.e., how long does the plant have to operate to generate the amount of electricity that was required for its manufacture and construction? Several studies have looked at this question over the years and have concluded that wind energy has one of the shortest energy payback times of any energy technology. A wind turbine typically takes only a few months (3-8, depending on the average wind speed at its site) to 'pay back' the energy needed for its fabrication, installation, operation and retirement.

Q15] Since wind is a variable energy source, doesn't its growing use present problems for reliable supply?

A] The 'value' of any supply resource is in the energy the resource produces, not the capacity it adds to a utility system. Having said that, utilities use sophisticated computer models to determine the value in added capacity that each new generating plant adds to the system. According to those models, the capacity value of a new wind plant is approximately equal to its capacity factor. Thus, adding 100-MW wind plant with an average capacity factor of 35% to the system is approximately the same as adding 35 MW of conventional fueled generating capacity.

Wind Energy

Q16] How much wind generating capacity currently exists worldwide? How fast is it growing and where?

A] As of today, there is over 94 GW of wind power capacity installed worldwide and is expected to reach over 289 GW by 2012. In 2007, the wind industry achieved 32% YoY growth.

Q17] What exactly is 'Green Power'? Can you tell me more about it? How can I buy it?

A] Green Power is electricity generated from renewables. Most power providers/utilities have RE sources as part of their generation mix and will be able to provide you with Green Power to fulfill you needs at a nominally higher cost, on request.

Q18] What is the global potential of wind energy?

A] It is estimated that wind energy could have an installed base of 455 GW by 2016.

Q19] What is the global level of adoption of wind energy?

A] Over 70 countries around the world have adopted wind energy and the number and level is set to grow rapidly with increasing global cooperation and frameworks on climate change and global warming.

Q20] Which are the major manufacturers of wind energy systems and their respective market-share?

A] 1. Vestas supplied 4,503 MW in 2007 with a market share of 28.2%. 2. GE Wind supplied 3,283 MW in 2007 with a market share of 16.6%.3. Gamesa supplied 3,047 MWs in 2007 with a market share of 15.4%. 4. Enercon supplied 2,769 MW in 2007 with a market share of 14.0%. 5. Suzlon supplied 2,082 MW in 2007 with a market share of 10.5%.

Q21] Which are the key markets worldwide for wind energy?

A] U.S.A, Germany, India, China and Spain are among the leading markets for wind energy worldwide.

Q22] What are the key components of a modern wind turbine?

A] External - Rotor Blades, Nacelle, Tower; Internal - Generator, Gearbox, Control Systems et al.

Wind Energy

Q23] What are the different categories and sizes of wind turbines?

A] Wind turbines are typically divided in sub-MW, MW-class and Multi-MW according to capacity. A further distinction exists between Offshore wind turbines and Onshore wind turbines.

Q24] What is offshore wind turbine technology?

A] The offshore installations will see very different environments and energy density. These turbines also need to be designed with confidence in the nature of the offshore winds (higher energy, lower turbulence) in combination with wave and current loadings at the base. Both these environments need to be specified sufficiently to allow designers to optimise the system for the conditions at the site. Current approaches to design specification are not capable of providing such a complete designation of site design conditions.

Q25] Does wind power have other negative environmental impacts?

A] Wind energy system operations do not generate air or water emissions and do not produce hazardous waste. Nor do they deplete natural resources such as coal, oil, or gas or cause environmental damage through resource extraction and transportation. Wind's pollution free electricity can help reduce the environmental damage caused by power generation worldwide.

Q26] How much land is needed for a utility-scale wind plant?

A] In open, flat terrain, a utility-scale wind plant will require about 50 acres per MW of installed capacity. However, only 5% (2.5 acres) or less of this area is actually occupied by turbines, access roads and other equipment-95% remains free for other compatible uses such as farming.

Q27] How much water do wind turbines use compared with conventional power plants?

A] Water use can be a significant issue in energy production, particularly in areas where water is scarce, as conventional power plants use large amounts of water for the condensing portion of the thermodynamic cycle. For coal plants, water is also used to clean and process fuel. Small amounts of water are used to clean wind turbine rotor blades in arid climates (where rainfall does not keep the blades clean). The purpose of blade cleaning is to eliminate dust and insect buildup, which otherwise deforms the shape of the airfoil and degrades performance.

Wind Energy

Q28] Do fossil fired generating units have to be kept running on a stand by basis in case the wind dies down?

A] No. It is true that other generating plants have to be available to the power system's operator to supply electricity when the wind is not blowing. However, the wind does not just start and stop. Typically, wind speeds increase gradually and taper off gradually, and the system operator has time to move other plants on and off line (start and stop them from generating) as needed—the fluctuations in wind plant output change more slowly than do the changes in customer demand that a utility must adjust to throughout the day. Studies indicate that for a 100 MW wind plant, only about 2 MW of conventional capacity is needed to compensate for changes in wind plant output.

Q29] What about turbines throwing blades, or ice? Is wind energy dangerous to the public?

A] Blade throws were common in the industry's early years, but are unheard of today because of better turbine design and engineering. Ice throw, while it can occur, is of little danger because of setbacks typically required from populated spaces.

Markets

MARKET – GLOBAL

Q1] What does the wind industry contribute to the economy?

A] Wind power supplies affordable, inexhaustible energy to the economy. It also provides jobs and other sources of income. Best of all, wind powers the economy without causing pollution, generating hazardous wastes or depleting natural resources-it has no 'hidden costs.' Finally, wind energy depends on a free fuel source-the wind-and so it is relatively immune to inflation.

Q2] What are our current sources of electricity?

A] Coal, the most polluting fuel and the largest source of the leading greenhouse gas, carbon dioxide (Co2) is currently used to generate more than half of all of the electricity (52%) used. Other sources of electricity are: natural gas (16%), oil (3%), nuclear (20%) and hydropower (7%).

Q3] How many people work in the wind industry?

A] Now grown into a respectable industry with a considerable business volume, the sector has also become an important area for employment. About 150,000 people are employed in the wind power industry worldwide, with 64,000 in Germany alone, according to estimates by the European Wind Energy Association (EWEA).

Q4] What is the value of export markets for wind?

A] Export markets are growing rapidly. The potential economic benefits from wind are enormous. AWEA estimates that wind installations worldwide will total more than 100,000 MW over the next decade, or more than $100 billion worth of business.

Q5] In what other ways does wind energy benefit the economy?

A] Wind farms can revitalize the economy of rural communities, providing steady income through lease or royalty payments to farmers and other landowners. Although leasing arrangements vary widely, a reasonable estimate for income to a landowner from a single utility-scale turbine is about $3,000 a year. For a 250-acre farm, with income from wind at about $55 an acre, the annual income from a wind lease could be $14,000, with no more than 2-3 acres removed from production. Such a sum can significantly increase the net income from farming.

Farmers can grow crops or raise cattle next to the towers. Wind farms may extend over a large geographical area, but their actual 'footprint' covers only a very small portion of the land, making wind development an ideal way for farmers to earn additional income.

Q6] How much wind generating capacity currently exists?

A] Worldwide installations of end energy generating capacity have now reached a total of 94,005 MW. On an average this capacity will generate an annual output of almost 194 billion kWh (194 TWh).

Q7] How much will be added over the next several years?

A] This year, 2007, a growth of 25% is expected. The upgrade of the forecast, compared to last years five year forecast, is justified by strong global drivers. The most uncertain prediction from the period front 2012 to 2016 indicates an average growth close to 14% also justified by political decisions taken on an international level now. Other key figures from the forecast and predictions are: a. Europe will maintain its leading role until 2010 and account for cumulative demand over the forecast period of time. b. The Americas, particularly US and Canada, will increase their contribution by the end of the forecast period. c. South and East Asia will see rapid increase in India and China particularly. d. By 2012 end cumulative installations will reach 289,940 MW.

Q8] How much is currently invested in the wind industry?

A] The value of cumulative sales of wind power and its installations till the end of 2007 amounts to nearly USD 420 bn. Wind turbine equipment represents about 70-75% of the total value for on shore installations; the proportions is only 40-50% for an offshore project. The remaining costs are related to construction, including foundations, grid connection, sea cables, land lease etc.

Q9] How much electricity does wind generate here today?

A] In certain areas of the world, electricity production from wind energy has grown to a significant level. In Denmark for example, wind energy now meets around 20% of the country's electricity consumption. In several German states, the penetration of wind electricity already exceeds 25%. For Germany as a whole the level of

penetration reached more than 7.6 in 2007. In Spain some provinces have achieved penetration rates close to 100%; for the entire country the contribution of wind energy is now around 9%. For Europe, as a whole, the penetration of wind has reached around 3.7%.

MARKET – INDIA

Q10] What does the wind industry contribute to the economy?

A] Supplies affordable, inexhaustible energy to the economy. It also provides jobs and other sources of income. Best of all, wind powers the economy without causing pollution, generating hazardous wastes or depleting natural resources-it has no 'hidden costs'.

Q11] What are our current sources of electricity?

A] A mix of many different energy sources, from coal, oil and gas to renewables such as wind and solar power are sources of electricity in India.

Q12] How many people work in the wind industry?

A] While there are no national estimates available; nearly 14,000 people work in wind industry directly with Suzlon alone and many times that number through allied industries, vendors and suppliers.

Q13] What is the value of export markets for wind?

A] According to the BTM WMU 2007 the number of WTGs installed worldwide at the end of 2007 is 14,595.

Q14] In what other ways does wind energy benefit the economy?

A] Job generation, rural development, improving access to infrastructure, access to markets, contribution to exports, added power generation capacity critical to the growth of the economy.

Q15] How much wind generating capacity currently exists?

A] The cumulative installed capacity (MW) by the end of 2007 was 19,791 MW.

Markets

Q16] How much will be added over the next several years?

A] The forecast for India from 2007 to 2012 is 22,845 MW of installed capacity.

Q17] How much electricity does wind generate here today?

A] The estimated electricity production from wind in India in 2007 was 1,800 MW of estimated average full load hours.

Q18]What are the policy frameworks in place to support the growth of wind energy?

A] In February 2005, the Government of India released National Electricity Policy. The policy was categorical in stating that feasible potential of non conventional energy resources mainly small hydro, wind and bio-mass would also need to be exploited fully to create additional power generating capacity. With the view to increase the overall share of non-conventional energy resources in the electricity mix, the policy states that efforts will be made to encourage private sector participation through suitable promotional measures.. In addition several state level initiatives are also in place to ensure the uptake of renewable energy, such as renewable portfolio standards that mandate a minimum percentage of renewable sources in the portfolio of any utility company.

Q19] Is accelerated depreciation being withdrawn? What effect will it have on demand?

A] The Tax Reform Act of 1986, which established the modified accelerated cost recovery system (MACRS), set the current rules for federal tax depreciation. Under MACRS, wind property is currently provided a depreciation life of 5 years, substantially shorter than the 15 to 20 year depreciation lives of non-renewable power supply investments. Faster depreciation results in tax benefits early in a project's life and is preferred by investors because an after-tax dollar is worth more today than in later years. Accelerated depreciation is not being withdrawn from India any time in the immediate future but if it is withdrawn that will not make a considerable difference to the wind industry as the returns will remain the same but will be recovered over a longer period than it is now.

Markets

Q20] Is a re-powering market coming into being?

A] India's installed capacity is over 8,000 MW currently and the potential capacity is much more. In this case there is a lot of wind power potential to tap into and therefore most of the regions in India are not ready for re-powering except for a few regions like Tamil Nadu where there are areas with a concentrated number of older small-capacity turbines, which can be replaced with more efficient higher-capacity turbines.

Q21] Market share - current projections?

A] India's global market share at the end of 2007 is 8.2%.

Q22] What is the planned investment by GoI in 11 plan for RE / Wind energy?

A] India's Energy Outlook 2007 says that augmenting the country's power generation capacity by an additional 1,00,000 MW by the end of 11th Five Year Plan will need an investment of US$150 billion. It underlines the recent efforts made by the Government of India in recognizing the need for private participation and ensuring that policies to promote investments are being implemented.

MARKET – USA

Q23] What does the wind industry contribute to the economy?

A] The wind industry contributes directly to the economies of 46 states, with power plants and manufacturing facilities that produce wind turbines, blades, electronic components, gearboxes, generators and a wide range of other equipment.

Q24] What are our current sources of electricity?

A] Other sources of electricity are: natural gas, oil, nuclear and hydropower.

Q25] How many people work in the wind industry?

A] The U.S. wind industry currently directly employs more than 2,000 people.

Q26] What is the value of export markets for wind?

A] According to the BtM Report 2007 the number of WTGs installed worldwide at the end of 2007 was 22,460.

Markets

Q27] In what other ways does wind energy benefit the economy?

A] Additional income is generated from one-time payments to construction contractors and suppliers during installation and from payments to turbine maintenance personnel on a long-term basis. Wind farms also expand the local tax base and keep energy dollars in the local community instead of spending them to pay for coal or gas produced elsewhere.

Q28] How much wind generating capacity currently exists?

A] The installed capacity in the US at the end of 2007 was 19,391 MW.

Q29] How much will be added over the next several years?

A] The forecast from 2008- 2012 projects total new installations of 56,500 MW.

MARKET – CHINA

Q30] What does the wind industry contribute to the economy?

A] Wind energy supplies affordable, inexhaustible energy to the economy. It also provides jobs and other sources of income. Best of all, wind powers the economy without causing pollution, generating hazardous wastes or depleting natural resources-it has no 'hidden costs'.

Q31] What are our current sources of electricity?

A] Coal, oil, gas, nuclear and other renewables are sources of energy in China.

Q32] What is the value of export markets for wind?

A] China supplied 3,287 MW of wind turbine capacity in 2007.

Q33] How much wind generating capacity currently exists?

A] The installed capacity in the China at the end of 2007 was 5,875 MW.

Q34] How much will be added over the next several years?

A] The forecast from 2008- 2012 predicts an added cumulative installation of 42,375 MW.

Markets

MARKET – EUROPE

Q35] What does the wind industry contribute to the economy?

A] Wind energy supplies affordable, inexhaustible energy to the economy. It also provides jobs and other sources of income. Best of all, wind powers the economy without causing pollution, generating hazardous wastes or depleting natural resources-it has no 'hidden costs'.

Q36] What are our current sources of electricity?

A] Coal, oil, gas, nuclear and other renewables are sources of energy.

Q37] What is the value of export markets for wind?

A] Europe supplied 8,285 MW of wind turbine capacity in 2007.

Q38] How much wind generating capacity currently exists?

A] The installed capacity in Europe at the end of 2007 was 56,824 MW.

Q39] How much will be added over the next several years?

A] The forecast from 2008- 2012 predicts an added cumulative installation of 129,489 MW.

MARKET: RotW

Q40] Key markets?

A] Indonesia, South Korea, Malaysia, Philippines, Thailand, Vietnam etc.

Q41] What does the wind industry contribute to the economy?

A] Wind energy supplies affordable, inexhaustible energy to the economy. It also provides jobs and other sources of income. Best of all, wind powers the economy without causing pollution, generating hazardous wastes, or depleting natural resources-it has no 'hidden costs'.

Markets

Q42] What are our current sources of electricity?

A] Coal, oil, gas, nuclear and other renewables are sources of energy.

Q43] How much wind generating capacity currently exists?

A] The installed capacity in the 'rest of the world' outside the top ten markets at the end 2007 was 127.4 MW.

Q44] How much will be added over the next several years?

A] The forecast from 2008- 2012 predicts an added cumulative installation of 5,352 MW.

Suzlon

GLOBAL BUSINESS

Q1] What is the share of global business in the total revenue? Is this expected to change? If so, by how much?

A] Overseas business currently forms about 40% of Suzlon's revenues. However this is expected to rise to over 60% by 2008; and subsequently to nearly 80% of total revenues.

Q2] What was Suzlon's first entry into foreign markets?

A] Suzlon's first international foray came in 2002 with an export order for the US wind market.

Q3] How does Suzlon integrate in overseas markets?

A] Suzlon provides customized solution for the customer's needs.

Q4] What is the level of staffing overseas? What is the ratio between Indian and Non-Indian staff?

A] Overseas staffing took an upturn in the last FY with the opening of manufacturing facilities in China and USA and with the addition of international subsidiaries. At current staffing levels, Suzlon has over 10,000 employees in India and nearly 4,000 employees of other nationalities in global operations.

Q5] Does Suzlon Energy Limited run its back office operations from India?

A] Suzlon runs all its critical functions from India including group corporate management, with the exception of marketing in international geographies which is headed directly from local markets.

Q6] Does Suzlon source products from low-cost countries in South East Asia, China or elsewhere outside India?

A] Yes, Suzlon imports several sub-components from manufacturers in China and other countries depending on need.

Suzlon

Q7] How does Suzlon compete in the European markets that have more experience in wind energy?

A] Suzlon has over 12 years of rich operational experience in various global markets and has acquired the maturity in product, processes, practice and people to take rank among the leaders in wind energy worldwide. This is witnessed in our increasing global market share and our increasing footprint in Europe.

Q8] What is Suzlon's strategy to match global giants like GE?

A] Suzlon has developed over time an integrated solutions model, combined with end-to-end solutions for the customer, providing differentiated and customized solutions to customers - allowing us to leverage our product and business model to the maximum benefit of all stakeholders.

Q9] Which countries have the friendliest policies to wind energy? How would you rate the Indian policy in comparison?

A] Many countries have now adopted wind-friendly policies, allowing for rapid growth of wind energy. India too offers some of the best policies for renewable energy, but much remains to be done such as the extension of RPS to more Indian states, PTC linked tariff frameworks, etc.

Q10] How does Suzlon protect its technology copyrights in countries like China?

A] Suzlon has taken a 'go-it-alone' approach to manufacturing in China and combines it with the best people practices and leading edge information security practices. These measures, combined with a rapid technology development program, allows Suzlon to retain its edge even in adverse environments.

SEZ & FFM

Q11] What is the progress of SEZ projects and units in the SEZs?

A] All SEZs developed by Suzlon associates are currently in different stages of approval and notification with the approving authority.

Q12] Locations for FFM?

A] Coimbatore and Vadodara.

CAPACITY / MANUFACTURING / PRODUCTS

Q13] Current production capacity?

A] 4,200 MW of total capacity (including US and China, excluding Hansen and REpower).

Q14] What will be the level of utilization over time?

A] Over 95%.

Q15] China and US - what is the scope of operations?

A] China - Fully integrated manufacturing facility to meet local demand; US Rotor Blade Manufacturing unit to support local order. Wind turbines to US market are shipped from India.

Q16] Plans for set up in China?

A] Already complete - 600 MW integrated manufacturing unit in Tianjin came online in FY07.

Q17] Plans for US?

A] Already complete-600 MW Rotor Blade manufacturing unit in Pipestone, Minnesota, came online in FY07.

Q18] Are we developing bigger WTGs? When will we launch them?

A] Yes, larger models are under development, and will be launched depending on market needs.

Q19] What is the largest turbine size commercially available today?

A] The REpower 5 MW offshore turbine.

Q20] What is the market for the Suzlon 600kW turbine ?

A] Smaller customers with lower investment capacity and in many cases for captive consumption, however with relatively low power needs.

Q21] Do competitors have 2.1 MW or larger turbine?

A] Yes, competitors have turbines ranging from 2 MW to 5 MW in capacity.

CAPEX

Q22] What is the Capex budget for current and next FY?

A] Suzlon's capex plans are complete with capacity increase from 2,700 MW to 4,200 MW in FY2009. There are no immediate plans for further capex, however the company can move to add additional capacity rapidly in response to market demand.

COMPETITION

Q23] Competition internationally for higher capacity WTG?

A] Vestas, Gamesa and GE Wind.

Q24] Essar - REpower JV for 5 MW - what is our reaction to this type of competition?

A] We welcome such ventures in interest of encouraging investment in and expansion in wind energy worldwide.

MARKETS – GENERAL

For the following Refer to MARKETS section
The outlook for key markets
USA
Latin America
Europe
India
China
Australia
RotW

ORDER BOOK

Q25] What is the current order book?
A] 1,916 MW; USD 2,302 mn. (including a component orderbook value of 175 mn)

Q26] Distribution over markets?
A] India 98; China 471.5 MW; USA 1013.5 MW; Ukraine 105 MW; ANZ 128 MW; Brazil 90 MW; Sri Lanka 10 MW

Q27] What is the delivery cycle from order to delivery?
A] 3 to 6 months.

Q28] What is the delivery timeline for current domestic orders? Next quarter or two?
A] Next quarter.

Q29] Overseas booking timeline and pricing trend?
A] Up to two years in advances, and prices in line with global trend.

Q30] Overseas order scope and realizations?
A] Supply, EPC and in limited number of orders also O&M.

Q31] Domestic and international pricing trends - is the increase uniform overseas or is it for some countries only?
A] Fairly uniform globally.

Q32] What are the models being offered for international business?
A] 1.5 MW and 2.1 MW.

Suzlon

SALES

Q33] What are the Realizations for domestic and international markets and their trends?

A] Improved realizations will result with the drive to move up value chain with integrated solutions package.

Q34] What is the difference in scope for exports?

A] Domestic - end-to-end solutions, Overseas - varies based on customer and market, see above.

Q35] What was the volume of sales in the last quarter?

A] 679 MW consolidated in Q3FY09

SUBSIDIARIES AND ASSOCIATES

Q36] What other components are planned for backward integration?

A] As of today, Suzlon is fully vertically integrated with access to all key components (manufacturing capacity and development). The latest additions are forging and foundry components, which are manufactured out of Sulon-subsidiary SE Forge facilities in Vadodara and Coimbatore, India.

Hansen

FAQs – HANSEN TRANSMISSION

Q1] How independent is the management of Hansen?

A] Completely independent. Suzlon on overall provides guidance in strategy. However Suzlon's management is entirely at arms-length from that of Hansen.

Q2] Suzlon is a non-European, family owned company. What is Suzlon's understanding of Corporate Governance compared to the European understanding of Corporate Governance?

A] Suzlon is listed in Indian stock exchanges and today operates in 21 countries. The Company has a good understanding global Corporate Governance practices and operates in full conformity with global best practices.

Q3] Are you planning to merge the companies? If yes, how?

A] No, Hansen will continue as an independent entity under the Suzlon umbrella.

Q4] Where do you see the combination in 5 years?

A] Ranking amongst the top 3 wind turbine makers worldwide.

Q5] When will technology integration happen and turbines suitably modified?

A] Suzlon has commenced sourcing gearboxes for turbines from Hansen transmissions in FY09 from the expanded capacity.

Q6] Is the expansion only for third parties?

A] No, some part of the expansion will also cater to Suzlon and needs to be taken forward.

Q7] When will supplies to Suzlon start?

A] Already commenced.

Q8] Will you continue to source 50% from Winergy despite your relationship with Hansen?

A] For the foreseeable future.

Hansen

Q9] Any plans to shift some manufacturing to India or China?

A] Additional capacity is under development in India and China may be considered based on need. However, there are no plans to shift manufacturing.

Q10] Capacity expansion will come in phases - timeline?

A] A large part of the capacity expansion is already completed, and the remainder will be phased in over time in response to changing market needs.

Q11] What is the capacity distribution geographically as of today?

A] All manufacturing assets in Belgium and new facilities under development in India.

Q12] What is the location of the India unit?

A] Near Chennai, Tamil Nadu.

Q13] India unit - will 3,500 MW be its capacity or initial sales?

A] 3,500 MW will be its capacity.

Q14] Does Suzlon plan to conclude a domination and/or profit and loss pooling agreement with Hansen?

A] No decision to that effect.

Q15] How did you finance the acquisition costs?

A] Long term loan and and internal accruals.

Q16] What are the estimated integration costs and what timing is anticipated?

A] No significant integration cost anticipated; integration will happen from FY09.

Q17] How did Suzlon finance the offer? To what extent has this impacted Suzlon's credit quality?

A] Long term loan and and internal accruals. No significant impact on Suzlon's credit rating.

Repower

BACKGROUND

Q1] Are different corporate cultures to be taken into account?

A] Yes, Suzlon has a mature global management team with considerable many years of top management experience. Suzlon has worked in Germany for many years and will be able to work confidently with REpower to deliver maximum value to all stakeholders.

Q2] Suzlon is a non-European, family owned company. What is Suzlon's understanding of corporate governance compared to the German understanding of corporate governance?

A] Suzlon is listed in Indian stock exchanges, and today operates in 21 countries, the company has a good understanding global Corporate Governance practices and operates in full conformity with global best practices.

Q3] Are you planning to merge Suzlon and REpower? If yes, how?

A] It is not possible and premature to speculate on these descisions. They will be considered at an appropriate time.

Q4] Where do you see a combination of Suzlon and REpower in 5 years?

A] Ranking in the Top 3 wind turbine makers worldwide.

SYNERGIES

Q5] Is Suzlon capable of realizing the necessary synergies with the amount of shares it has received so far?

A] Suzlon has over 91% of voting rights through pooling arrangements with Areva and Martifer ensuring full synergies will be achieved.

Q6] What level of synergies do you anticipate and what kind of synergies are these?

A] Market access, leveraging Suzlon's fully integrated supply chain and economies of scale, integrated development approach et al.

Q7] How long will it take to realise these synergies?

A] Work has commenced in FY08 and continue to increase over the coming years.

Repower

Q8] Suzlon expressed its intention to develop R&D capacities in Hamburg regardless of the outcome of the takeover attempt. Is this still valid?

A] Yes. The Company entered into a Joint Venture with REpower for establishment of a Renewable Energy Technology Centre or RETC in Hamburg, Germany. The RETC aims to combine forces and co-operate strategically in the fields of research, innovation, training, validation and technical processes in the wind industry. The intention of the RETC is to implement innovative projects and solutions leading to the development of next generation wind energy technologies.

MANAGEMENT

Q9] How independent will the management of REpower be? Will the company be managed from Hamburg?

A] Completely independent, Suzlon on provides overall guidance in strategy. Management is entirely arms-length.

FINANCIALS

Q10] Does Suzlon plan to conclude a domination and/or profit and loss pooling agreement with REpower?

A] No decision to that effect.

Q11] Does Suzlon plan a squeeze out?

A] No decision to that effect.

Q12] How do you finance the acquisition costs?

A] Long term loan, FCCB USD 500 mn, Internal Accruals.

Q13] What are the estimated integration costs and what timing is anticipated?

A] We have commenced working to leverage synergies and will progress over the coming years.

Repower

Q14] How did Suzlon finance the offer? To what extent has this impacted Suzlon's credit quality?

A] Long term loan, FCCB USD 500 mn, Internal Accruals; excellent credit rating based on company performance - no significant impact on credit quality.

Q15] REpower's operating margin is significantly lower than Suzlon's. Can you explain the difference and what the margin development will be post integration?

A] Operating synergies will allow REpower to start improving margins.

Wind Energy Myths

Q1] Wind Turbines Are a Nuisance

A] Wind turbines do not cause any kind of inconvenience or nuisance to people as wind power offsets other, more polluting sources of energy. That is important because electricity generation is the largest industrial source of air pollution. When wind power projects generate electricity, fuel at other power plants is not consumed. Wind energy requires no mining, drilling, or transportation of fuel, and does not generate radioactive or other hazardous or polluting waste.

Q2] Turbines Are Noisy

A] Wind turbines are quiet. An operating modern wind farm at a distance of 750 to 1000 feet is not noisier than a kitchen refrigerator or a moderately quiet room. The sound turbines produce is similar to a light whooshing or swishing sound, and much more quiet than other types of modern-day equipment. Even in rural or low-density areas, where there is little additional sound to mask that of the wind turbines, the sound of the blowing wind is often louder.

Q3] Turbine Lighting Is Excessive

A] Lights at wind farms are non-intrusive, and improvements in design will make them even less so as the technology expands. As per global standards lighting for most structures more than 200 feet in height is installed to ensure aviation safety.

Q4] Nearby Residences Will Be Affected by Shadow Flicker

A] Shadow flicker is the term used to describe what happens when rotating turbine blades come between the viewer and the sun, causing a moving shadow. Shadow flicker is almost never a problem for residences near new wind farms, and in the few cases where it could be, it is easily avoided. For some who have homes close to wind turbines, shadow flicker can occur under certain circumstances and can be annoying when trying to read or watch television. However, the effect can be precisely calculated to determine whether a flickering shadow will fall on a given location near a wind farm, and how many hours in a year it will do so. Potential problems can be easily identified using these methods, and solutions range from providing an appropriate setback from the turbines to planting trees to disrupt the effect.

Wind Energy Myths

Q5] Turbines Interfere with Television and Other Communications Signals

A] Interference is rare and easily avoided. Large wind turbines installed at wind farms can interfere with radio or television signals if a turbine is in the "line of sight." Improving a receiver's antenna or installing relays to transmit the signal around the wind farm solves this problem; both solutions are common practice in modern wind energy development.

Q6] Turbines Are Ugly

A] Many people feel wind turbines are majestic. Wind farm developers have computer modeling tools that accurately depict virtual views from given spots in the surrounding area. Careful design of a wind project can alleviate many visual concerns.

Q7] Wind Turbines Do Not Benefit Local Communities

A] The construction and operation of wind farms have a positive effect on the economy with use of local services during the construction phase and in the longer term they create positive benefits through landowner rentals, farm diversification and employment of maintenance staff. A Wind farm is a positive feature in a local environment, and at each site further initiatives could provide direct benefits to local people throughout the wind farm's life.

Q8] Wind Projects Harm Property Values

A] There is no evidence that the presence of a commercial windfarm within sight of a property systematically decreases that property's value. In fact, a nationwide study conducted in 2003 surveyed property near multiple wind farms and found that not only do wind farms not harm property values, but that in some cases the values increased.

Q9] Wind Projects Depress Tourism

A] There is no evidence to indicate that wind turbines drive tourists away. In some areas, wind turbines even draw tourists. Local governments frequently work with developers to install information stands and signs near wind farms, as well as pull-off areas, similar to "scenic overlooks", from nearby roads. Surveys of tourists have found that the presence of wind turbines would not affect the decision of most visitors to return. The thousands of turbines in Palm Springs, California, have had no negative impact on the tourism business; on the contrary, the local tourism center organizes bus tours to the wind farms.

Wind Energy Myths

Q10] Wind Projects Don't Contribute to the Local Community Development

A] Installing millions of dollars of equipment in most areas greatly increases the local taxes assessed, and wind farms are no exception. Wind farms support the local tax base, helping to pay for schools and roads far more than their impact to local facilities.

Q11] Wind Turbines Aren't Safe

A] Wind energy is one of the safest energy technologies. It is a matter of record that no member of the public has ever been injured during the normal operation of a wind turbine, with over 25 years operating experience and with more than 70,000 machines installed around the world.

Q12] Turbines May Throw Blades or Collapse

A] Ice throw, while it can occur under certain conditions, is of little danger. Setbacks typically used to minimize noise are sufficient to protect against danger to the public. In addition, ice buildup slows a turbine's rotation and will be sensed by a turbine's control system, causing the turbine to shut down. Modern wind turbines are so safe they successfully operate near schools, in urban settings and densely populated areas, and in rural communities. Blade throws were common in the industry's early years, but are unheard-of today because of better turbine design and engineering. Utility-scale wind turbines are certified to international engineering standards, such as those developed by Germanischer Lloyd or Det Norske Veritas, and these include ratings for withstanding different levels of hurricane-strength winds and for other criteria.

Q13] Wind Turbines Harm Wildlife

A] Raptor kills (of eagles, hawks, and owls) are a problem at one large older wind farm in California, in Altamont Pass, built in the 1980s. Wind farm operators there have worked with wildlife officials and experts to reduce the impacts on raptors, and those efforts continue today. Despite the minimal impact wind development has on bird and bat populations in most areas, the industry takes potential impacts seriously. In addition, avian studies are routinely conducted at wind sites before projects are proposed. Pre-construction wildlife surveys are now common practice throughout the industry.

Wind Energy Myths

Q14] Turbines Kill Many Birds and Bats

A] Wind energy development's overall impact on birds is extremely low compared with other human-related activities. No matter how extensively wind is developed in the future, bird deaths from wind energy are unlikely to be ever more than a small fraction of bird deaths caused by other human-related sources, such as cats and buildings.

Q15] Wind Projects Fragment Wildlife Habitat

A] Wind farms are most often built in areas close to transmission lines where habitat has already been modified and fragmented, typically by farming and ranching. And, wind energy has a light footprint, with only the turbine itself, along with some roads and power lines, impacting the land, while pre-existing land use continues around the turbines as before. Windy land can also often be found in undeveloped areas, however, so habitat fragmentation can be a concern, especially in unbroken stretches of prairie grasslands or forests. The industry supports more research to better understand the extent of possible habitat or wildlife impacts in these areas, but those impacts must be balanced against the effects of not developing renewable energy sources and thereby aggravating global warming and pollution pressures on wildlife and their habitats-- not just in prairie or forest areas, but around the world.

Q16] Wind Turbines are Expensive and Unreliable

A] The most expensive element of installing a wind turbine is in the initial capital cost which is between 75% and 90% of the total cost. the total amount to be invested to install a turbine is 4 - 5 Cr. INR. Ongoing running costs are cheap because wind as a source of fuel is free and turbines have extremely low maintenance costs. They only need servicing once or twice a year and this will usually be to top them up with oil. Consideration does need to be given to the cost of rent for the land and insurance premiums. The cost for wind energy is coming down and is expected to continue to do so. As the technology for turbines has improved, energy is being produced more efficiently. The increase in the number of wind turbines being manufactured has brought the cost of production down and the trend towards building larger machines reduces the infrastructure costs because fewer turbines are needed for the same output. The cost of financing is also declining as investors gain more confidence in the technology. In comparison, the cost of conventional and nuclear power production is set to increase, meaning wind power will become an even more competitive source of energy supply.

Wind Energy Myths

Q17] Back-up Generation Is Needed for All Wind Turbines

A] Because of the grid's inherent design, there is no need to back up every megawatt of wind energy with a megawatt of fossil fuel or dispatchable power. The electric grid is designed to have more generation sources than are needed at any one time because no power plant is 100% reliable. It is a complicated system designed to absorb many impacts, from electric generation sources going out of service unexpectedly to industrial customers starting up energy intensive equipment. The grid operator matches electricity generation to electricity use, and wind energy's variability is just one more variable in the mix

Q18] Wind Turbines Operate Only for a Small Fraction of the Time

A] Wind turbines generate electricity most (65-80%) of the time, although the output amount is variable. No power plant generates at 100% "nameplate capacity" 100% of the time. Nameplate capacity refers to the maximum generation potential of a power plant. A conventional power plant is occasionally closed for maintenance or repairs, or runs below full capacity to best match demand. Wind farms are built in areas where the wind blows most of the time, but because of variations in speed, a wind farm will generate power at full rated capacity about 10% of the time, and on average throughout the year the plant will generate 30% to 35% of its rated capacity.

Q19] Wind Energy Will Never Provide More Than a Fraction of the World's Electricity Needs

A] A typical one-megawatt turbine generates enough electricity for 300 homes. The Potential for Wind Energy in India is around 45,000 MW. It is expected that 10 per cent of the proposed capacity addition in India of 100,000 MW in the next 10 years i.e. 10,000 MW would come from the Wind Energy Sector.

Q20] Wind Turbines Are Inefficient

A] Wind turbines are efficient, and that is part of their beauty. One of the simplest ways to measure overall efficiency is to look at the "energy payback" of an energy technology, i.e., the amount of energy it takes to produce a given amount of energy. The energy payback time for wind is in fact similar to or better than that of conventional power plants.

Wind Energy Myths

Q21] Wind Energy Is Expensive

A] Wind energy is now in a range that is competitive with power from new conventional power plants. The up-front, capital cost of wind energy is more expensive than that of some traditional power technologies such as natural gas. However, there are no fuel costs, and in good locations the "levelized" cost (which includes the cost of capital, the cost of fuel, and the cost of operations and maintenance over the lifetime of the plant) of wind energy can now be very competitive with that of other energy sources.

Q22] Wind Energy Is Heavily Subsidized

A] Wind energy is now in a range that is competitive with power from new conventional power plants. The up front, capital cost of wind energy is more expensive than that of some traditional power technologies such as natural gas. However, there are no fuel costs, and in good locations the "levelized" cost (which includes the cost of capital, the cost of fuel, and the cost of operations and maintenance over the lifetime of the plant) of wind energy can now be very competitive with that of other energy sources.