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IMPACTS OF WIND ENERGY EXPLOITATION

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Abstract—The environmental impact of wind power when compared to the environmental impacts of fossil fuels is relatively minor. Man has harnessed the energy in wind for thousands of years, both for sailing boats and powering wind mills at land. Of all renewable energy sources, wind power is the most mature in terms of commercial development. This energy source is interesting because of its renewability and its availability. Potential for development is huge, and the world's capacity is far larger than the world's total energy consumption. Since the beginning of industrialization, energy consumption has increased far more rapidly than the number of people on the planet. It is known that the consumption of energy is amazingly high and the fossil based resources may not be able to provide energy for the whole world as these resources will be used up in the near future. Hence, renewable energy expected to play an important role in handling the demand of the energy required along with environmental pollution prevention. The impacts of the wind energy on the environment are important to be studied before any wind firm construction or a decision is made. Although many countries showing great interest towards renewable or green energy generation, negative perception of wind energy is increasingly evident that may prevent the installation of the wind energy in some countries.

Keywords— consumption, installation, Metrics

I. INTRODUCTION

Due to the economical and technological developments around the world, demand for energy is increasing significantly .The global economy grew 3.3% per year over the past 30 years and energy demand increased 3.6% .World energy production was 17,450TWh in 2004 and it is estimated that the world will consume about 31,657TWh in 2030. According to international energy outlook 2009, world energy consumption will increase from472 quadrillion Btu in 2006 to 552 quadrillion Btu in 2015 and 678 quadrillion Btu in 2030 – a total increase of 44% over the projected period 2006–2030 .Various industries and machineries/appliances used in different energy consuming sectors are releasing contaminated gases to pollute the environment. Global warming and the associated changes in the world climate pattern have been accepted world wide as the gravest threat to humanity in the 21st century [1].

It becomes increasingly important to develop realistic environmental evaluation techniques that are practically useful for electric power energy sector that are expected to include a rapidly growing proportion of wind generation in the coming years. The benefits from wind sources are largely dictated by the wind regime at the wind farm site. It is, therefore, very important to obtain suitable wind speed simulation models and appropriate techniques to develop power generation model for WFs to get their environmental impact. The main objective of this paper is to develop a robust programming model to evaluate the environmental impact of wind generation penetration into electrical power system by incorporating uncertainty wind power generation from Wind Farms (WF). This analysis requires the formulation of a Unit Commitment UC-type model. Conventional generation constraints and wind generation effects are included. Studies are carried out to examine the impact of wind farms, on the total environmental emissions and operation system cost [2].

II. WIND POWER PLANT LAND-USE METRICS

Development of a wind power plant results in a variety of temporary and permanent (lasting the life of the project) disturbances. These disturbances include land occupied by wind turbine pads, access roads, substations, service buildings, and other infrastructure which physically occupy land area, or create impermeable surfaces. Additional direct impacts are associated with development in forested areas, where additional land must be cleared around each turbine. While land cleared around a turbine pad does not result in impervious surfaces, this modification represents a potentially significant degradation in ecosystem quality [3].

III. THE POTENTIAL HEALTH IMPACT OF WIND TURBINES

A) Sound and Noise

Sound is characterized by its sound pressure level (loudness) and frequency (pitch), which are measured in standard units known as decibel (dB) and Hertz (Hz), respectively. The normal human ear perceives sounds at frequencies ranging from 20Hz to 20,000 Hz. Frequencies below 200 Hz are commonly referred to as "low frequency sound" and those below 20Hz as "infrasound," but the boundary between them is not rigid. There is variation between people in their ability to perceive sound. Although generally considered inaudible, infrasound at high-enough sound pressure levels can be audible to some people. Noise is defined as an unwanted sound. Wind turbines generate sound through mechanical and aerodynamic routes. The sound level depends on various factors including design and wind speed. Current generation upwind model turbines are quieter than older downwind models. The dominant sound source from modern wind turbines is aerodynamic, produced by the rotation of the turbine blades through air. The aerodynamic noise is present at all frequencies, from infrasound to low frequency to the normal audible range, producing the characteristic "swishing" sound. Environmental sound pressure levels are most commonly measured using an A-weighted scale. This scale gives less weight to very low and very high frequency components that is similar to the way the human ear perceives sound. Sound levels around wind turbines are usually predicted by modeling, rather than assessed by actual measurements. The impact of sound on health is directly related to its pressure level. High sound pressure levels (>75dB) could result in hearing impairment depending on the duration of exposure and sensitivity of the individual. Current requirements for wind turbine setbacks in Ontario are intended to limit noise at the nearest residence to 40 dB. This is a sound level comparable to indoor background sound. This noise limit is consistent with the night-time noise guideline of 40 dB that the World Health Organization (WHO) Europe recommends for the protection of public health from community noise. According to the WHO, this guideline is below the level at which effects on sleep and health occurs [4].

B) ADVERSE HEALTH EFFECTS OF INDUSTRIAL WIND TURBINES

Guidelines and regulations for the siting of industrial wind turbines (IWT) close to human habitation are generally predicated on the need to protect the sleep of the residents.

The recommended setback distances and "safe" external noise levels make the assumptions that IWT noise can be regarded as similar to other forms of environmental noise (traffic, rail and aircraft) and is masked by ambient noise. There has been no independent verification that these assumptions are justified and that the safeguards are sufficient to protect sleep.

Anecdotal complaints of annoyance and health effects from IWT noise have grown in number in recent years, not least because turbine size has increased and they have been placed closer to population centers. The predominant symptom of health complaints is sleep disturbance. The consequences of sleep disturbance and the contribution of environmental noise are well documented (WHO 2009). Complaints of adverse health effects were made shortly after IWT installations at Mars Hill and Vinalhaven, Maine, USA, began operating. A preliminary survey at Mars Hill,comparing those living within 1,400 m with a control group living 3,000-6,000 m away showed that sleep disturbance was the main health effect. A further study was therefore carried out at both Mars Hill and Vinalhaven using validated questionnaires and comparing those living within 1.5 km

of the turbines with a control group living 3,500-6,000 m away and found that some people had health effects [5].

C) WIND TURBINE SYNDROME: A REPORT ON A NATURAL EXPERIMENT

The Symptoms of the Wind Turbine Syndrome (WTS) is the clinical name Dr. Nina Pierpont has given to the constellation of symptoms experienced by many (not all) people who find themselves living near industrial wind turbines. Some of the symptoms are as follows.

a. Sleep disturbance
b. Headache
c. Tinnitus (ringing or buzzing in the ears)
d. Ear pressure
e. Dizziness
f. Vertigo
g. Nausea
h. Irritability
i. Visual blurring [6].

D) COMMUNITY NOISE

Community noise is recognized as an environmental stressor, causing nuisance, decreased wellbeing, and possibly non-auditory adverse effects on health. The main sources of community noise are transportation and industry.

Wind turbines are a new source of community noise to which relatively few people have yet been exposed. The number of exposed people is growing, as in many countries the number of wind turbines is rapidly increasing. The need for guidelines for maximum exposure to wind turbine noise is urgent: While not unnecessarily curbing the development of new wind farms, it is also important to avoid possible adverse health effects. No generalized dose-response curves have yet been modeled for wind turbines, primarily due to the lack of results of published field studies [7].

IV. WIND TURBINE INTERACTIONS WITH WILD LIFE

Adverse impacts of wind energy on wildlife in the following categories:

i. Direct Mortality
ii. Cumulative Impacts of Mortality
iii. Avoidance and Minimization of Collision Fatalities
iv. Direct and Indirect Habitat-Based Impacts

Collisions of small songbirds (<31 cm in length) account for approximately 60% of fatalities at U.S. wind facilities, small songbirds comprise more than 90% of all land birds. Most song bird species are migratory resulting in spring and fall peaks of bird casualty rates at most wind facilities [8].

V. RESULTS AND CONCLUSION

From the studies it can be made sure that even though the wind energy is clean and free but it cause lots of damage to the environment both to human and wild life.

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