

ENVIRONMENTAL IMPACT ASSESSMENT AND WIND ENERGY USE

D. BOJOVIĆ

Center for Multidisciplinary Studies, Belgrade, Serbia, draganab@cms.bg.ac.yu

ABSTRACT

Environmental Impact Assessment (EIA) is a preventive tool for environmental management. All environmental impacts of a venture must be predicted, identified and analysed, prior to the permission of the project. By introducing the Regulation on EIA of Objects and Activities, the assessment of the investment projects was launched in Serbia. The Environmental Impact Assessment Law, from 2004, regulates the procedure of EIA for projects that could have adverse environmental impacts. The assessment is required for projects in the energy field. In the Council Directive 97/11/EC Annex II we find, among the projects that need EIA, installations for the harnessing of wind power for energy production. EIA is necessary in the case that the planned wind farm has more than 5 turbines, total capacity is over 5 MW or the rotor height is over 15 m. The most significant negative aspects of wind energy, which must be taken into account, are: bird strikes, acoustics, land use and visual impact.

Keywords: EIA, Wind turbines

Introduction

Environmental assessment is a procedure that ensures that the environmental implications of decisions are taken into account before the decisions are made [1]. Environmental Impact Assessment (EIA) is originated in the National Environmental Policy Act (NEPA), enacted in the United States in 1969, as the result of the growing awareness of the negative environmental effects of the big industrial, infrastructural and other objects. Showing good results in US, during eighties, EIA was later adopted by many countries and international organizations. On the UN Conference on Environment and Development, Rio de Janeiro, 1992, EIA was officially accepted as one of the most important facilities for achieving sustainable development concept. EIA was introduced in EU legislation by passing Council Directive 85/337/EEC of 27 June 1985 on the Assessment of the Effects of Certain Public and Private Projects on the Environment. Council Directive 97/11/EC of 3 March 1997 amended Directive 85/337/EEC.

In this paper we analyze environmental impact assessment of wind farms and the way that environmental assessment should develop together with the expansion of wind energy use in Serbia.

EIA in Serbia

Environmental assessment of investment projects was introduced in Serbia with Regulation on Environmental Assessment of Objects and Activities in 1992 [2].

The Environmental Impact Assessment Law regulates the procedure of EIA for projects that could have adverse environmental impacts [3]. The assessment is, among the others, required for the projects in the energy field and for all the project planned in the protected areas.

The EIA survey is an integral part of the necessary documentation for the development proposal's license. Legal entity can form for this task a multidisciplinary team, composed of persons qualified for analyzing all the environmental aspects [3].

Council Directive 97/11/EC

Council Directive 97/11/EC of 3 March 1997 amended Directive 85/337/EEC on The Assessment of the Effects of Certain Public and Private Projects on the Environment.

Annex I contains a list of projects, which shall be made subject to an EIA. Installations for the harnessing of wind power for energy production (wind farms) are contained in this list.

Characteristics of the project, location and potential environmental aspects are relevant selection criteria, set out in Annex III of the Directive, that shall be taken into account when EIA is made [4]. The most important attributes, considering characteristics of the project are: dimensions of the project, cumulative effects with other projects, natural resources exploitation, waste generation, pollution and risk of accidents. Considering location, vulnerability of the environment is the most important aspect. Environmental attributes that could be under the risk by the project development must be described in the environmental impact assessment.

Wind farm development and nature conservation

In the study Wind Farm Development and Nature Conservation [5] it is suggested that EIA is required if there are potential significant environmental impacts from the installation of more than two turbines, or if the hub height of any turbine or height of any other structure exceeds 15 meters. DETR Circular 02/99 *Environmental Assessment* suggests that a formal EIA is more likely to be required

if a wind farm has more than five turbines or if its generating capacity is exceeding 5 MW [5]. There are additional obligations for assessment under Article 6 of the Habitats Directive (and the UK Habitats Regulations), where a proposal may affect the integrity of a Natura 2000 site. If wind farm receives consent in potentially sensitive locations, it may be necessary to monitor possible impacts on features of nature conservation importance.

Annex 1 of the study Wind Farm Development and Nature Conservation is guidance on possible impacts of relevance to nature conservation. There is the list of nature conservation impacts that should be considered in an environmental assessment:

- Temporal parameters: pre-installation, construction, operation, decommissioning
- Spatial parameters: on site/off site buffer area/area of influence, cable route...
- Cumulative influence: over time, in combination with other wind farms, in combination with other projects/activities

Environmental impact assessment and windturbins

According to the study done by Totontohydro company [6], environmental components that should be considered in the assessment include:

- **Biophysical Environment:** aquatic environment and water quality, noise, soils, terrestrial vegetation, terrestrial wildlife (including birds)
- **Socio-Economic Environment:** cultural resources, planned land use, recreation, safety (including ice shedding), social environment, visual landscape.

Wind is environmentally friendly energy source but wind energy use includes towering mechanical structures that can't be completely fit in environment. The most commonly identified issues relating to social effects of sitting wind turbines are noise and aesthetics - "horizon pollution". But these concerns, while apparent in advance of the actual installation of the turbines, are significantly reduced once the turbines are installed and in operation [6]. The most significant negative environmental aspects of wind energy use are: noise, land area and use, visual impact and bird strike.

Noise

The noise impact is the most significant during the construction period. During the operation of the turbine there are two possible noise sources: mechanical from the gearbox and aerodynamic noise from blades. Thanks to modern constructions and decrease of vibrations there is no mechanical noise generated from new turbines. The aerodynamic noise is generated from blades passing towers and the higher the speed the louder the sound. Thanks to better

blade design this noise is decreased as well. The most important thing is for blades to be as smooth as possible and blades mustn't be scratched during the construction. At the present, the average noise from turbine is 45 dBA and 35 dBA at distances of about 250 m or less, which is acceptable for the calm inhabited quarters.

In the building, public and other objects, with closed windows, statutory noise level, from the outdoor source, is 40 dBA during the day and 35 dBA in the nighttime [7].

Impact of wind turbines on nature

Existing vegetation is removed from a small area at the construction site, and at the access to the site. Disturbance may also occur during temporary placement of fencing. Such removal is not considered to be significant since the species involved are common invasive plants, and disturbance is temporary. The disturbed sites can be revitalized quickly. Where wind farms are proposed, their development should not adversely affect the conservation objectives or reasons for identification and notification of sites of national natural importance [5]. Under the Wildlife and Countryside Act it is an offence to intentionally disturb any bird listed in Schedule 1 while it is nest building or is at (or near) a nest with eggs or young, or to disturb the dependent young of such a bird. It is also an offence to compromise the conservation of animals listed in Schedule 5 and plants listed in Schedule 8 of the same Act (Wildlife and Countryside Act 1981 and Countryside and Rights of Way Act 2000 -CROW Act). Consideration must be given to the potential impacts of wind farm development on rare and nationally scarce plant and invertebrate species, as identified by the relevant Red Data Book Lists.

Impact on Birds

EIA of a wind farm must include assessment of the possible impacts of the project on birds - ornithological impact assessment (OIA).

There are three main ways in which a wind farm development could affect bird populations:

- Direct habitat loss - through displacement from an area around the wind turbines that can be bird's typical feeding or nesting area.
- Collision – the magnitude of the predicted collision rate should be determined in the context of the background mortality rate for that species. A 'negligible' magnitude impact would be predicted if the collision mortality was to represent an increase of less than 1% on the background mortality rate [8]. The birds most likely to suffer mortality are small nocturnal migrants, flying in large numbers, especially when poor flying conditions of fog and rain are they more susceptible to strikes at tall structures.

- Disturbance – mostly because of extensive disturbance to the surroundings, or the continued presence of people and vehicles than the turbines themselves. Disturbance would have a real ecological impact if it resulted in reduced resource use by the birds and hence a reduction in carrying capacity.

Land use

Turbines should be separated by at least five to ten tower heights, this allows the wind strength to reform and the air turbulence created by one rotor not to harm another turbine downwind [8]. Consequently, only about 1 % of land area is taken out of use by the towers, and rest of the land area on which a wind farm is situated is physically available for use as before. The problem is that there are usually other planned uses of that same location.

Conclusion

Although insignificant comparing to the destructive effects caused by fossil fuel use, there are also environmental effects of wind energy use. EIA gives us information on all possible consequences of a technology utilization. Prerequisite for EIA study with comprehensive analyzes and reliable results, comparing to earlier inexact estimations, provides better environmental protection and makes the concept of sustainable development possible. The most harmful environmental effect of wind farm is impact on birds. Bird species populations on one location are observed through environmental assessment, together with biology and ecology of all present species, including examination of life strategies. The evaluation of flight and migratory lines must be proceeded. All above mentioned can provide complete picture of the potential negative effects of a wind farm and possibility for the correct decision when the location for the farm is to be approved. EIA of a wind farm can provide biodiversity protection and clean energy production from the renewal source, at the same time.

References

- [1] <http://ec.europa.eu/environment/eia/home.htm>
- [2] Regulation on Environmental Assessment of Objects and Activities, "Official Gazette of the RS", No. 61/92
- [3] Law on Environmental Impact Assessment, "Official Gazette of the RS", No.135/2004
- [4] Council Directive 97/11/EC of 3 March 1997 Amending Directive 85/337/EEC on the Assessment of the Effects of Certain Public and Private Projects on the Environment

- [5] Harley, M., Drewitt, A., Gilliland, P., Cleary, B., Langston, R., Southgate, M., Marsh, R et al. (2001). Wind farm development and nature conservation. WWF-UK, RSPB, English Nature and British Wind Energy Association.
- [6] http://www.torontohydro.com/energyservices/green_power/ea_approval/pdf_files/appendixC.pdf, Prepared by Dillon Consulting Limited for TREC and Toronto Hydro (2000). Wind Turbine Environmental Assessment – Draft Screening Document.
- [7] Regulation on Noise Level in the Environment, “Official Gazette of the RS”, No. 99/92.
- [8] Percival, S. (2003). Birds and Wind Farms in Ireland: A Review of Potential Issues and Impact Assessment. Ecology Consulting, UK.
- [9] Bedi, E., Myles, R. and Olesen, G. (2005). Distant internet Education on Renewable energy Technologies. International Network for Sustainable Energy – Europe.