(ACE-EIA Paper 8/2004)
For advice

Renewable Energy by a Wind Turbine System on Lamma Island

Purpose

This paper presents the key findings and recommendations of the Environmental Impact Assessment (EIA) report for the Proposal: "Renewable Energy by a Wind Turbine System on Lamma Island" submitted under Section 6(2) of the Environmental Impact Assessment Ordinance (EIAO). Representative(s) of the Project Proponent, Hongkong Electric Co. Ltd (HEC), and their consultants will make a presentation. The Director of Environmental Protection will take comments from the public and the ACE when he makes the decision on the approval of the EIA report under the EIAO.

Advice Sought

2. Members' views are sought on the findings and recommendations of the EIA report.

Need for the Project

3. The HEC is proposing to install the first utility scale and grid-connected wind turbine as a demonstration project to utilize wind as a renewable energy for power generation in Hong Kong. Visitors' facilities will be provided and the project will serve as educational use for promoting green awareness among the public, particularly students. The project will also provide local experience on wind turbines facilitating exploration of future utilization of wind energy in Hong Kong.

4. Subject to review of the data to be gathered from this demonstration project in respect of technical, environmental and commercial aspects, HEC intends to evaluate the potential for its wider application in Hong Kong. Any further plan to install additional wind turbine(s) will be subject to approval by the Government. The design life of the proposed demonstration wind turbine is 20 years; the proposed project site would be granted to HEC under a short-term tenancy (STT) for an initial term of 5 years, subject to negotiation upon renewal.

5. The demonstration wind turbine will have a planned capacity of 600 to 850 kW. Based on the available wind potential information, the wind turbine is estimated to harvest about 700 MWh of electricity per annum, which would reduce the use of up to 240 tonnes of coal and the associated gaseous emissions per year (i.e. about 2 tonnes of SO_2, 1 tonne of NO_X, 100 kg of particulates and 600 tonnes of CO_2 per year).

Description of the Project

6. The demonstration project is proposed to be erected at Tai Ling, Lamma Island (***Figure 1***) and comprises the following key elements:

- Site formation and foundation works affecting about 0.3 ha of shrubby grassland;
- Erecting a 600 to 850 kW wind turbine: with hub height and rotor blade diameter of about 45m and 52m respectively, resulting in an overall height of about 71m for the entire structure (***Figure 2***). The blade rotating speed is planned for 14 to 31 rpm and will operate between wind speed of 2.5 m/s to 25 m/s;
- Constructing a 12 m^2, 2.8 m high stainless steel hut for housing switchgear and other devices;
- Laying about 50m of underground cables connecting to the nearby existing power grid; and
- Operating and maintaining the wind turbine system.

7. The project is classified as a designated project (DP) under item D1, Schedule 2 of the EIAO: “public utility electricity power plant”.

Consideration of Alternative Sites

8. HEC identified a wind power density of over 150 W/m^2 at the proposed site, which would meet the suitability criteria for wind energy utilization. Compared to other potential sites, such as Po Toi Island and elsewhere on Lamma Island, the selected site is preferred having regard to the following considerations; it being:

i. away from densely populated areas;

ii. not on any migratory bird flight path;

iii. close to existing access road and power grid;

iv. relatively flat requiring less earthwork; and

v. has avoided ecologically sensitive areas such as the existing and potential country parks and Site of Special Scientific Interest in south Lamma.

9. Through the above site selection considerations, impacts on both developed areas and ecologically sensitive areas are avoided, the chance of bird strike is reduced, and disturbances due to works such as major site formation, access road construction and cable laying are minimized. On the other hand, Po Toi Island as an alternative site would need to provide suitable access and build power grid connection, which may inevitably require earthworks that disturb the natural environment there. HEC considers that a utility scale wind turbine demonstration project on Po Toi Island would unlikely be technically feasible, environmental friendly or economically attractive.

Specific Environmental Aspects to Highlight

Ecological Impacts

10. Bird strike is a common environmental concern during the operational stage of most wind farm developments around the world. The construction of the proposed wind turbine system would also result in permanent and temporary losses of shrubby grassland of 0.17 ha and 0.14 ha respectively.

11. While the proposal involves only a single turbine with less concern on potential bird strike when compared with an array of turbines forming a wind farm, the site has been selected to avoid migratory birds flight path. Apart from avoiding a site on major flying route of migratory birds, the literature review supported by site surveys has established that the project area and its surroundings are not important bird habitats. Due to the relatively low ecological value of the area, impacts due to wind turbine bird collision are considered to be minor and of low magnitude and significance.

12. With respect to disturbance due to construction activities, site surveys identified three Romer's Tree Frogs in an abandoned container and a discarded PVC water pipe within the project site. As such, the EIA recommended that Romer's Tree Frog surveys and translocation be conducted before commencement of the works. Good construction practices to control surface run-off, fire, and surplus material disposal are also recommended. The 0.14 ha of temporary disturbed areas will also be

reinstated immediately after completion of the construction works.

13. Given the small scale of the project, the site has been selected to avoid migratory bird flight path, and the affected shrubby grassland are of low ecological value, the residual ecological impacts are not considered to be significant.

Landscape and Visual Impacts

14. The proposed 71m tall wind turbine with 52m diameter rotating blades will stand on a spot at about 92mPD with two knolls to the immediate west and southeast, at about 127mPD and 136mPD respectively. The turbine would be visible from Ap Lei Chau, south-east and south Hong Kong Island, parts of Lamma Island including some popular walking trails, and ferries en-route to Lamma. Given that the turbine will be of low rotating speed type and will adopt a non-reflective light grey colour scheme, the assessment concluded that there would be slight to moderate adverse residual impact when taking into account the distance of the site from various sensitive viewers. The visual impact is considered to be acceptable with mitigation measures.

15. In relation to the landscape impacts, no tree felling is required for the project. Extra trees and shrubs will be planted as part of the reinstatement work for the 0.14 ha of shrubby grassland temporarily disturbed by the project. The residual landscape impact is considered to be acceptable with mitigation measures.

Noise Impacts

16. Noise will be generated during the operation of the wind turbine. The nearest noise sensitive receivers are three village houses at some 260 to 360 meters away from the proposed turbine. The most critical noise impact scenario would happen during nighttime when the EIAO noise criteria is 45dB(A) $L_{Aeq,\ 30\ min}$.

17. Making reference to noise performance information provided by wind turbine suppliers and the industry, the EIA predicted that the noise due to the operation of the wind turbine as affecting the nearest village house would be 45dB(A), thereby meeting the EIAO night-time operational noise criteria. The predicted noise has taken into consideration noise generated from both the mechanical/electrical parts and the aerodynamic noise at the highest operation wind speed.

18. Only a small amount of construction plant is required for the project, and none of the noise sensitive receivers would have direct line of sight to the construction

site. Construction noise impact is therefore not a critical issue. The EIA predicted that the maximum construction noise level would be 61 dB(A) at the nearest sensitive receiver.

Other Impacts

19. The EIA has also considered the dust and water quality impacts and waste management issues at the site during construction. Given the local nature of the project, with no sensitive receivers identified within 200m of the site, and that it just requires about 1,300m^3 of earthwork with nearly 95% to be reused on-site, the construction stage impacts could be controlled through implementation of various standard mitigation measures.

Environmental Monitoring & Audit (EM&A)

20. An EM&A programme covering both the construction and operation stages are recommended in the EIA. Implementation of the EM&A programme will be included as an Environmental Permit condition.

Public Consultation

21. HEC consulted the Lamma Rural Committee and the local green group "A Better Living Environment (ABLE)" in June 2004 and the responses to the project were positive. In the recent processing of the STT, the Southern District Council has confirmed that it is not necessary for HEC to present the proposal to them. Regarding the Islands District Council, HEC is still checking on their consultation requirement.

22. HEC has also made the EIA report, EM&A manual and Executive Summary available for public comment under the EIAO on 10 September 2004. Members will be briefed about any comments received from the public at the meeting.

Environmental Protection Department
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