40/F, Revenue Tower, 5 Gloucester Road, Wan Chai, Hong Kong
香港灣仔告士打道 5 號稅務大樓 40 樓

ACE-EIA Paper 1/2010
For advice

Environmental Impact Assessment Ordinance (Cap. 499)
Environmental Impact Assessment Report
Development of a 100MW Offshore Wind Farm in Hong Kong

PURPOSE

This paper presents the key findings and recommendations of the Environmental Impact Assessment (EIA) report for the Development of a 100MW Offshore Wind Farm in Hong Kong (hereafter known as the Project), submitted under section 6(2) of the Environmental Impact Assessment Ordinance (EIAO) (Application No. EIA-177/2009). The Hongkong Electric Company Limited (the applicant) and their consultants will present the report at the EIA Subcommittee if necessary.

ADVICE SOUGHT

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

NEED FOR THE PROJECT

3. The HKSAR Government has set a target of meeting 1% to 2% of Hong Kong's total electricity supply by renewable energy by 2012. This Project has an electricity generation capacity of about 100 mega-watt (MW), producing about 1.6% of the total electricity generated by the applicant in 2008.

4. The potential for large-scale land-based wind farm development in HKSAR is limited owing to lack of land availability. With the availability of offshore technology, offshore waters offer more useable space for large scale wind farm development.

DESCRIPTION OF THE PROJECT

5. The Project is located in the southern waters and at the southwest of Lamma Island. The Project location and cable alignment are shown in **Figure 1**. Key elements of the Project include –

(i) around 28 to 35 turbines each of 2.3 to 3.6 MW power generation capacity;

(ii) an offshore substation (it may be replaced by an onshore substation subject to detailed engineering design);

(iii) interconnecting submarine electricity cables;

(iv) an offshore wind monitoring mast; and

(v) an onshore lay down area and quayside for material storage and pre-assembly works at the Lamma Power Station.

6. The EIA has assessed the worst-case scenario in terms of deployment of number of turbines (i.e. 35 numbers), design of substation (using offshore development) and type of foundation (using monopole design with scour protection). The final design of the Project, including choice of turbine numbers, substation and their installations, turbines layout and cable routing, will be made at the later detailed design phase.

7. The Project constitutes a designated project under item D.1 Schedule 2 of the EIAO: *"Public utility electricity power plant"*.

CONSIDERATION OF ALTERNATIVE OPTIONS

8. The EIA has considered various options for project locations and construction methods. With the use of constraint mapping and comparative

assessment of the potential sites in the site selection, environmental sensitive areas, such as important coral sites, have been avoided. Among the potential sites considered, the site at southern waters having relatively short distance to the Lamma Power Station and hence shortened construction duration, cable length and travelling distance will reduce the associated environmental impacts during construction and operation of the Project.

9. Percussive piling for turbine foundations is recommended as it is the most common and proven construction method used internationally in the industry of offshore wind farm. Compared with bored piling, percussive piling will avoid dredging and have much shorter construction duration, and hence will have lesser water quality impact.

VIEWS OF THE DIRECTOR AND RELEVANT AUTHORITIES

10. The Director of Environmental Protection (DEP), in conjunction with the relevant authorities, considers that the EIA report meets the requirements of the EIA Study Brief and the Technical Memorandum on EIA Process (TM). Comments from the public and the Advisory Council on the Environment will be taken into account by the DEP in deciding on the approval of the EIA report under the EIAO.

SPECIFIC ENVIRONMENTAL ASPECTS TO HIGHLIGHT

Water quality

11. Major potential water quality impact arising from the Project will be from sediment dispersion owing to turbine foundations construction and submarine cables installation. Assessment results indicate that during percussive piling for turbine foundations, suspended solids and sediment deposition rate will meet the water quality objectives (WQO) at all nearby sensitive receivers.

12. Regarding the cable installation works, the EIA recommends grab dredging for the about 100 meters at the near shore section and jetting for the remaining offshore section as indicated in **Figure 2**. With the implementation of the recommended mitigation measures, including provision of silt curtains during dredging and restriction of dredging rate for the near shore section and

restriction of jetting speed for offshore section, the predicted suspended solids at nearby sensitive receivers will meet the WQO.

13. The results of the hydrodynamic modelling carried out in the EIA indicate that the Project during operation stage will have negligible impacts (both near-field and far-field) on current flow, current direction and key sea channels' flushing capacities.

Marine Ecology

14. Major marine ecological issues arising from the Project will be the potential impacts on Finless Porpoises, sea turtles and corals. Finless Porpoises are abundant in the waters of the Project during winter and spring (from December to May) but are rarely present in these waters during summer and autumn. To avoid potential adverse impacts on Finless Porpoises during the peak season, the EIA recommends no percussive piling works be conducted from December to May. Together with other recommended mitigation measures, such as adoption of ramp-up and daytime piling procedures, setting up of an exclusion zone, engagement of qualified observers to scan for absence of marine mammals in the exclusion zone and monitoring of abundance of Finless Porpoises, adverse impacts on Finless Porpoises are not anticipated.

15. Sham Wan at Lamma Island, which is known as a nesting site of green turtle, is about 5 kilometers away from the Project site. The nesting site is topographically concealed from the Project site and hence will not be directly affected by the Project. Based on the satellite tracking studies, sea turtles stay relatively close to inshore coastal areas during migration and thus the offshore wind farm site is not a preferred habitat for sea turtles during migration. Therefore, the Project is not expected to cause adverse impact on nesting green turtle or migratory sea turtles. However, as a precautionary measure for sea turtles, mitigation measures for marine mammals outlined in the latter part of paragraph 14 are also recommended for sea turtles.

16. The EIA has assessed the seabed conditions within the wind farm site and along the cable route. The survey findings confirm that the seabed at all survey locations consists of silty mud with no hard substrate recorded. Few corals of low ecological importance and low coverage have been recorded at the artificial seawall of the Lamma Power Station and near the proposed

cable route. Pre-construction survey will be conducted to re-confirm their existence and if affirmative, mitigation such as relocation of corals will be implemented.

Fisheries

17. All fish culture zones are distant away (more than 10 kilometers) from the Project site and, with the implementation of recommended mitigation measures, culture fisheries will not be affected by the Project. Major fisheries issue arising from the Project will be the potential impact on capture fisheries. The waters of the Project are of medium to high importance in terms of fisheries production and operation.

18. With the implementation of mitigation measures recommended during construction stage, relevant WQO will be met. Significant impact on fisheries outside the construction area is not anticipated. During operation stage, apart from the permanent loss of fishing ground of about 0.16 hectare which will be occupied by the wind turbines, potential loss of fishing ground of about 700 hectares will be resulted if fishing activities are entirely prohibited within and close to (buffer of about 50 meters) the wind farm area in accordance with typical international safety practices. The maximum loss of fishing ground represents 0.42% of 165,000 hectares of HKSAR territorial waters. It will unlikely cause significant impact on the overall fisheries production of Hong Kong, but will affect fishermen who habitually fish in that area. On the other hand, due to the artificial reef effect created by the hard substratum at the turbine foundations and control of activities within the wind farm area, overseas experience shows that the overall abundance and diversity of fisheries resources in the area may be increased in the long term.

19. To address the identified issues, the applicant proposes to implement a Fisheries Review and Consultation Programme (FRCP) to outline the scope of fishing operation that may be permitted within the wind farm site and to explore any additional measures for enhancing fisheries resources around the wind farm area. Fishery sector will be consulted in the FRCP and a Fisheries Enhancement Plan will be developed consequentially.

Avifauna

20. Literature review complemented with vessel-based surveys between July 2008 and June 2009 are used to establish the baseline avifauna information for the study area of the Project. While some birds of conservation interest are recorded, most of the recorded birds are common and widespread in Hong Kong. The EIA reveals that the Project site is neither an important foraging ground for birds nor an important flight path of migratory birds.

21. The EIA has assessed the barrier effect on and collision risk of birds and concluded that adverse impact is not anticipated. Most of the birds are flying below or outside the rotor area and low number of bird collision is predicted even using the worst-case scenario. To check the predicted effect on birds, a bird collision monitoring programme will be carried out during construction and operation stages of the Project.

Landscape and Visual Impacts

22. The Project will cause relatively lesser change in Offshore Water Landscape Character owing to the presence of other nearby artificial elements such as the Lamma Power Station. Mitigation measures, such as re-arraying of the layout of and use of non-reflective and pale colour for wind turbines, are recommended to reduce visual impact of the Project. The EIA concludes that the predicted landscape and visual impacts are acceptable with mitigation measures.

Other Environmental Impacts

23. The EIA has also addressed other environmental issues, including waste management and cultural heritage, and concluded that, with the implementation of recommended mitigation measures, the Project will comply with relevant requirements under the Technical Memorandum on EIA Process.

ENVIRONMENTAL MONITORING AND AUDIT

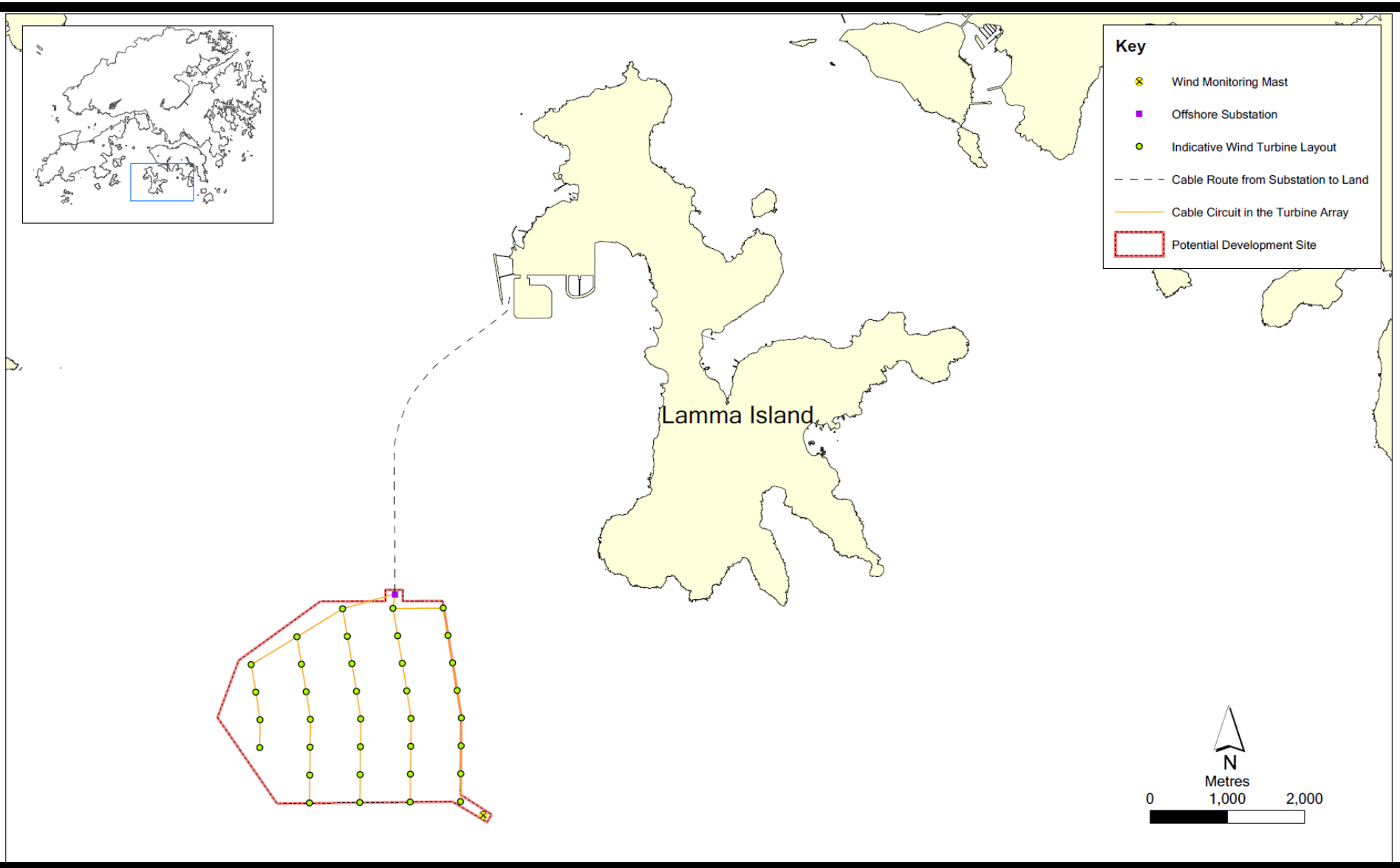
24. The EIA report includes an Environmental Monitoring and Audit (EM&A) Manual which recommends an EM&A programme during the construction and operation stages of the Project. Key recommended EM&A

requirements include monitoring of water quality, Finless Porpoise abundance and bird collision.

PUBLIC CONSULTATION

25. The applicant has made the EIA report, EM&A Manual and Executive Summary available for the public to comment under the EIAO from 8 February to 9 March 2010. Members will be informed of any public comment received by the Environmental Protection Department.

March 2010
Environmental Assessment Division
Environmental Protection Department



Project Title: Development of a 100MW Offshore Wind Farm in Hong Kong

Figure 1: Location of the Project **(Reproduced from Figure 5.1 of the EIA Report)**

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Figure 2: Zones of Dredging and Jetting (Reproduced from Figure 5.9 of the EIA Report)