Annex B

EIA report on
"Development of a 100MW Offshore Wind Farm in Hong Kong"
A summary of issues discussed by the EIA Subcommittee
at the meeting on 22 March 2010

The Environmental Impact Assessment (EIA) Subcommittee discussed the EIA report on "Development of a 100MW Offshore Wind Farm in Hong Kong" at its meeting on 22 March 2010. The issues discussed are summarized below.

Environmental benefits of the project

2. On the estimated proportion of renewable energy for power generation by the Hongkong Electric Company Limited (HEC) upon completion of the wind farm project in 2015, the project proponent explained that it would depend very much on the growth in power demand. Based on the relatively low rate of growth in recent years, the estimated proportion of renewable energy would be in the region of 1.6% of the total electricity generated by HEC.

Site selection

3. Some Members noted that the site near Lamma Island was not considered as a preferred site for offshore wind farm construction as shown in the EIA report conducted by the Hong Kong Offshore Wind Limited for another power company. The concerns included proximity to marine fairways and helicopter routes, presence of seabed utilities and density of marine mammals. The project proponent explained that southwest Lamma was selected as the preferred site in view of the environmental and physical benefits. In respect of marine traffic, the proposed layout plan of a relatively compact wind farm had taken into account comments of the Marine Department. A marine navigation risk assessment was conducted and the Marine Department was satisfied with the findings that no adverse impact on the marine traffic was expected. Regarding the proximity to helicopter routes, discussions were held with the Civil Aviation Department and helicopter operators to work out mitigation measures such as alternative flight procedures. The Civil Aviation Department had no objection in principle to the selection of the project site. Regarding seabed utilities, there was only one submarine telecommunication cable passing through the project site. The construction works would be able to avoid physical disturbance to the cable.

Regarding impacts on marine mammals, the project site had avoided key areas of sightings of marine mammals. Findings of the EIA and data available from the Agriculture, Fisheries and Conservation Department (AFCD) indicated that the main habitats of Finless Porpoises were close to the coastline rather than open waters of southwest Lamma Island.

4. Regarding the rationale for selecting the site in view of its potential impacts on marine ecology, the project proponent explained that marine ecology was only one of the many factors being considered in the site selection process. A total of eight alternative sites were reviewed through a comparative assessment of wide-ranging environmental concerns under the Technical Memorandum on Environmental Impact Assessment Process, including impacts on water quality, marine ecology, fisheries, avifauna, landscape and visual impacts. Planning and physical aspects were also examined. For example, the distance of wind farm to the HEC Grid was important as a longer distance would require a longer submarine cable and thus greater environmental impacts. In the first round of site selection, constraint mapping was used to exclude sites which were subject to insurmountable constraints, such as sites associated with major environmental features and sites near major vessel fairways. The southwest Lamma site and the eastern offshore site were the two options left behind after the screening. Comparative assessment was conducted according to the Study Brief as summarized in Table 3.18 of the EIA report. The southwest Lamma site was selected as it had more environmental and physical benefits.

Construction method

5. Some Members noted that percussive piling was proposed for turbine foundation installation while suction caisson was proposed for the other offshore wind farm project by the other power company. The project proponent explained that while suction caisson was considered a viable option for turbine foundation installation, the technology was still in the developing stage which had not been employed in other offshore wind farm projects in overseas countries. At this stage, percussive piling was relatively a more developed and proven technology for wind farm projects. Nonetheless, they were open-minded and would not rule out the option of employing suction caisson. They were carrying out studies on overseas experience on the most suitable technology, not only from the technical perspective but also from the safety point of view. In the EIA study, the worst-case scenario was adopted and thus percussive piling was assumed. For the wind monitoring mast which was a static structure, they were seriously considering the option of using suction caisson. For the turbine foundations, a more prudent approach would be

adopted given the design life span of 20 to 25 years.

6. Some Members were concerned about the underwater noise impacts of percussive piling on marine mammals and suggested the project proponent to make reference to the studies conducted by the Hong Kong Offshore Wind Limited, especially on the use of suction caisson to minimize potential impacts on marine mammals. The project proponent explained that they noted the concern of Members on the use of percussive piling on marine mammals. They had been actively liaising with the other power company for sharing information and experience, in particular on technical aspects and project programme, on the two offshore wind farm projects with a view to achieving synergy benefits.

7. On the acceptability of employing percussive piling as the technology for turbine foundation installation, EPD advised that the use of percussive piling was stated in the EIA report submitted by the project proponent. The major consideration was on the environmental acceptability of this kind of technology for the project.

Marine ecology and noise impacts on marine mammals

8. Members were concerned about the underwater noise impacts of percussive piling on marine mammals. The project proponent explained that the EIA study adopted the worst-case scenario and principle of avoidance for mitigation. No percussive piling activities would be conducted during the peak season of Finless Porpoises from December to May. Based on the data collected, Finless Porpoises were rarely sighted in summer and autumn. Moreover, an exclusion zone would be set up to ensure that the area of works would be clear of marine mammals before piling works. Together with other mitigation measures, such as adoption of ramp-up piling procedures and carrying out piling only during daytime, adverse impacts on Finless Porpoises were not anticipated.

9. Regarding assessment of potential noise impacts arising from percussive piling, the project proponent explained that there was no requirement in the Study Brief for conducting noise impact assessment. Nonetheless, they had conducted some additional assessments. During the operational phase, the sound power level of each wind turbine was about 109.4 dB(A) at wind speed of 9 m/s at 10 m above the ground level which was the industry standard. Based on a total of 35 wind turbines to be installed for the project, the nearest Noise Sensitive Receiver (NSR) at Lo So Shing on Lamma Island would likely experience a predicted noise level of 35 dB(A) against the background noise level of about 43 to 49 dB(A) at

night time. No significant noise impact on NSRs was anticipated.

10. On noise impact assessment during the construction phase, some Members noted in the EIA report that the UK experience showed that the measured sound pressure level of percussive piling could be as high as 250 dB re 1 Pa at 1 m distance. The project proponent explained that the experience of piling works for the Permanent Aviation Fuel Facility (PAFF) project in Hong Kong waters where percussive piling operations had been undertaken in marine mammal sensitive habitats and through the employment of exclusion zones, it was proven that there were no adverse impacts on marine mammals. The setting up of a similar exclusion zone for the project would make reference to this information.

11. Some Members noted that the data on noise assessment in the EIA report were based on maximum pile diameter of 4.7 m. As larger piles of 5 to 7 m in diameter might be used, the noise impacts arising from the percussive piling would have even greater impacts on marine mammals. The behavioural changes of marine mammals caused by noise impacts should be closely monitored. The project proponent explained that the design of the project acknowledged the presence of marine mammals near the project site and through a commitment of no piling works for the turbine foundations during the peak season of Finless Porpoise (December through May), the principle of avoidance as a mitigation had been adopted for percussive piling works. Reference was also made to the PAFF project which had adopted a series of additional mitigation measures for noise impacts, such as exclusion zone and soft-start procedures. The PAFF project found that through these measures, there was no change in the abundance of marine mammals before, during and after the piling works. They had been liaising with AFCD and marine mammal experts and it was agreed that with the implementation of mitigation measures, no significant behavioural disturbance on marine mammals was anticipated.

12. On the operation of exclusion zone, the project proponent explained that the practice of exclusion zone had been adopted in many offshore projects. Mammal observers would start the observing works on the piling barge at least 30 minutes before the piling works to ensure that the zone would be cleared of marine mammals before piling works could start. Monitoring would continue throughout the piling works. In case a marine mammal was spotted within the exclusion zone, the piling works would stop. If piling works had to re-start, the 30-minute observation period would have to start again before piling works could start. A qualified mammal observer should have a degree in biological science and relevant experience. Mammal observers would work independently from the contractor and

would be approved by the independent environmental checker prior to monitoring.

13. On the yardsticks in assessing noise impacts of underwater noise on marine mammals, AFCD advised that the principles of avoidance, minimization and compensation would be adopted. It was considered that the project proponent had adopted the principle of avoidance by avoiding key habitats of marine mammals and adoption of closed period for piling works from December to May. On minimization of impacts, mitigation measures such as exclusion zone and soft-starts were recommended. Moreover, the use of percussive piling would also minimize the time required for foundation installation. According to the data collected by AFCD over the past ten years and field surveys conducted by the project proponent, Finless Porpoises usually appeared in the southern and eastern waters of Hong Kong from December to May. In the rest of the year, they would usually move to the eastern waters or outer sea and rarely appear near Lamma Island. Data in the recent five years recorded 60 sightings of Finless Porpoises around Lamma Island. Among them, 59 sightings were recorded from December to May and only one was recorded from November to June. Thus, the avoidance of percussive piling from December to May was considered an acceptable measure to avoid impacts on Finless Porpoises.

14. On the potential impacts of the project on sea turtles, in particular on their habitats and migratory pathways, the project proponent explained that available data showed that relatively few numbers of sea turtles could be found in Hong Kong waters and they were not found every year. Sham Wan at Lamma Island was a known nesting site of green turtles and it was about 5 km away and topographically concealed from the project site. The last recorded nesting at Sham Wan was in 2008. Though the inter-nesting period of green turtles was mainly summer and autumn during which piling works would take place, the satellite tracking studies conducted by AFCD showed that green turtles stayed relatively close to inshore coastal areas rather than open waters during the inter-nesting period. Given that the proposed wind farm was located away from the coastline and Sham Wan, green turtles would unlikely be affected. Research revealed that the hearing capability of sea turtles was not as well developed as that of porpoises and their hearing range was at the low frequency. It was noted that the exclusion zone would also be applied for sea turtles, with the observer monitoring the exclusion zone to verify that it was clear of any sea turtle prior to piling works as well as stopping works should a sea turtle move into the zone during piling. Soft starts would also be used to alert any sea turtles of piling works commencing. With the implementation of mitigation measures, no significant impact was anticipated arising from the use of percussive piling for turbine foundation installation.

15. Regarding the migratory pathways of sea turtles, AFCD advised that two green turtles which nested on Sham Wan in 2002 (HK1) and in 2003 and 2008 (HK2) were tracked by satellite telemetry. The study showed that the post-nesting migratory pathways taken by the turtles to their respective feeding grounds in Vietnam or Hainan Island did not penetrate the project site. The project site was also not a preferred foraging ground to the green turtles. The observation was in line with finding of overseas studies which showed that sea turtles tended to use inshore coastal areas during inter-nesting period and coastal areas during migration. As illustrated by HK2 and other studies, sea turtles showed plasticity in the post-nesting migratory routes. They managed to maintain proper courses even if they travelled along different migratory routes. Based on the available information, the project was not expected to cause significant impacts on nesting or migratory green turtles from Sham Wan.

16. Regarding the need to provide compensation for the loss of marine habitats under the EIA framework, AFCD advised that in principle, compensation would be considered as one of the mitigation measures if EIA findings concluded that the residual ecological impacts were significant. For the project under consideration, the proponent had proposed mitigation measures in the EIA report, through avoidance and minimization, to reduce the impacts on marine ecology, and the anticipated residual ecological impact was regarded as insignificant. The need of ecological compensation was therefore considered not necessary.

Water quality

17. On siting of the offshore substation, the project proponent explained that an offshore substation was assumed in the EIA study based on the worst-case scenario. While an onshore substation would have comparatively less environmental impacts, electricity loss from the wind farm would be more in view of the lower transmission voltage of typically 33 kV. Overseas experience showed that onshore substation was a preferable option only if the wind farm was located very close to shore. The feasibility of building an onshore substation would be evaluated in the detailed design stage. The final siting would aim at optimizing the voltage level of output and minimizing the footprint of the substation and impacts on marine ecology.

18. On the possibility of shortening the submarine cable connecting the wind farm and the substation by straightening the cable routing, the project proponent explained that the curved routing of the cable was to avoid intersecting

with the existing submarine pipeline for natural gas supply to the Lamma Power Plant and maximizing the crossing angle with the navigation channel of vessels supplying coal to the plant.

19. On the need of dredging for submarine cable installation and maintenance, the project proponent explained that dredging was limited to near shore area of the Lamma Power Station Extension site for cable landing preparation works. It was estimated that only about 3,000 m^3 of marine sediment would be dredged. Sampling showed that the dredged marine sediment would be uncontaminated. The rest of the cable alignment would be laid by jetting method. Dredging would not be required for cable maintenance works.

Fisheries

20. On the suggestion of deploying artificial reefs to compensate the potential loss of fishing ground of about 700 hectare and enhance fishery resources, the project proponent explained that deploying artificial reefs was one of the measures they were considering under the proposed Fisheries Review and Consultation Programme. They would maintain a close dialogue with the fishery sector to collect their views for enhancing fishery resources around the wind farm area.

21. On the availability of fisheries enhancement plan, the project proponent explained that a fisheries enhancement plan might be drawn up with reference to the views gathered through the Fisheries Review and Consultation Programme. Regarding the possibility of opening the wind farm area for fishing, it would depend on further study and consultation with the fishery sector and relevant authorities. The major consideration would be on safety concerns. The worst-case scenario of closing the area was assumed in the EIA study.

Construction programme

22. Some Members noted that the construction programme of turbine foundation installation (i.e. 3rd quarter in Year 3 to 1st quarter in Year 4) shown in Figure 5.14 of the EIA report did not match with the commitment of no percussive piling from December to May. The project proponent explained that the construction programme was only a preliminary schedule for indicative purpose and a more detailed programme would be drawn up after gathering more information. Moreover, turbine foundation installation works would consist of two parts. The first part involved percussive piling and thus would avoid winter (December

through February) and spring (March through May) seasons. The second part on the construction of platform for supporting turbine towers would be carried out above water and thus would not have impacts on marine mammals. Overseas experience showed that it took about a few hours to install one monopile. It was expected that piling works would take only about two to three months for the project and thus it would be feasible to avoid the winter and spring seasons.

23. On the lead time for preparatory works of percussive piling, the project proponent explained that most of the preparatory works would be conducted on land and thus would not affect the marine mammals. The monopiles would be prepared and transported on land. The major piling equipment was a piling vessel and arrangements could be made to ensure that the piling works would be on schedule.

Avifauna

24. Regarding the potential impacts on White-bellied Sea Eagles (WBSE), the project proponent explained that according to historical sighting records of WBSE, the nearest sighting (but not nesting location) to the project site was near Sham Wan which was about 5 km away. WBSE appeared mainly around coastal areas. According to the 9-month avifauna vessel surveys conducted from July to October 2008 and from February to June 2009, only one sighting of WBSE was recorded around the project site. Although there were some sightings of WBSE at the height of the rotor area of the wind turbines, the majority of these sightings were found in inshore coastal areas and not within the project site. Collision risk of WBSE was, therefore, estimated to be low. HEC had been operating a wind turbine on Lamma Island for about 4 years and no bird strike was recorded. Moreover, the project site was neither an important foraging ground for birds nor an important flight path of migratory birds.

Landscape and visual impacts

25. Regarding studies on the perception and acceptability of wind farm, the project proponent explained that there were some overseas studies and the perceptions were generally positive. No local study was available. At the meetings with Lamma residents and local communities, visual impact was not raised as an area of concern. For the EIA study, the worst-case scenario of regarding the wind farm structures as industrial infrastructures was assumed for assessment as required by the Planning Department.

26. Regarding assessment of visual impacts on sensitive receivers in Cheung Chau, the project proponent explained that the photomontage taken from the eastern side of Cheung Chau was presented in Figure 11.27 of the EIA report. The proposed wind farm would be visible from the southeast of Cheung Chau but the visual impact was considered acceptable with mitigation measures. The layout of wind turbines would be organized to minimize the number of turbines being visible from most sensitive receivers, including those from Cheung Chau and Lamma Power Station beach with direct line of sight from the wind farm.

Other issues

27. Regarding plans on promoting environmental education and tourism, the project proponent explained that no concrete plan was formulated at this stage. Suggestions had been received from Lamma residents for building viewing structures along the trail between Yung Shu Wan and Sok Kwu Wan. The onshore wind turbine on Lamma was welcomed and became a landmark for attracting tourists and residents would expect tourist enhancement facilities.

28. On the possibility of setting up stakeholder liaison groups, the project proponent explained that there were on-going consultation and engagement with relevant stakeholders and they would continue to liaise closely with them to gather their views on the project, in particular the fishery sector.

29. On the existence of geological features near the project site, the project proponent explained that conservation of geological features was one of the criteria in the site selection process. No geological feature was identified in proximity to the project site.

Conclusion

30. The meeting agreed that the project proponent be requested to provide the following supplementary information for Members' further consideration –

(a) assessment on predicted noise level and noise impacts, both airborne and underwater, on NSRs arising from the use of percussive piling for the construction of wind farm structures with piles of 5 to 7 m in diameter; and

(b) a more detailed construction programme for the detailed design and construction phases.