Annex B

EIA report on "Hong Kong Offshore LNG Terminal"

Relevant Extract of the draft minutes of the Environmental Impact Assessment Subcommittee meeting held on 23 July 2018

Present:

Professor TAM Fung-yee, Nora, B.B.S., J.P. (Chairperson)
Dr HUNG Wing-tat, M.H. (Deputy Chairman)
Ir Cary CHAN, J.P.
Dr Billy HAU
Ms Julia LAU
Dr Michael LAU
Mr Andrew LEE
Professor Albert LEE
Professor Kenneth LEUNG, J.P.
Ir MA Lee-tak, S.B.S.
Professor John NG
Ir Michelle TANG
Mr Luther WONG, J.P.
Mr Simon WONG, J.P.
Ms Becky LAM (Secretary)

Absent with Apologies:

Ir Professor Irene LO, J.P.
Dr Eric TSANG
Professor WONG Sze-chun, B.B.S., J.P.

In Attendance:

Mrs Alice CHEUNG, J.P.	Deputy Director of Environmental Protection (3)
Mr C F WONG	Assistant Director (Environmental Assessment), Environmental Protection Department (EPD)
Mr Patrick LAI	Assistant Director (Country and Marine Parks), Agriculture, Fisheries and Conservation Department (AFCD)
Mr Raymond WONG	Principal Environmental Protection Officer (Strategic Assessment), EPD
Mr Matthew CHAN	Senior Environmental Protection Officer (Strategic Assessment) 1, EPD
Miss Tiffany CHEUNG	Assistant Environmental Protection Officer (Strategic Assessment)11, EPD

Mr Dick CHOI	Senior Marine Conservation Officer, AFCD
Mr Thomas CHEUNG	Senior Engineer (Gas Standards B2), Electrical & Mechanical Services Department (EMSD)
Miss Dora CHU	Executive Officer (CBD) 1, EPD
Miss Apple LEUNG	Executive Officer (CBD) 2, EPD
Miss LEUNG Ka-man	Executive Officer (CBD) 2 Des., EPD

In Attendance for Item 2:

Project Proponent Team

CLP Power Hong Kong Limited	Mr Edward CHIU, Senior Director – Commercial Mr Graham HOLLAND, Director – Project Development Mr Jeff LEUNG, Deputy Director - Public Affairs Dr Helen CHIU, Senior Environmental Manager Ms Karen LUI, Environmental Regulatory Advisor
The Hongkong Electric Co. Ltd.	Mr Arthur WONG, General Manager (Group Commercial) Mr T C YEE, General Manager (Corporate Development) Mr Y L KWAN, Head of Mechanical Engineering Mr Norman CHAN, Senior Mechanical Engineer
Environmental Resources Management	Dr Jasmine NG, Project EIA Director Mr Mark EISENEGGER, Project EIA Manager Mr Kane CHOY, Principal Consultant

****

Action

Item 2: Discussion on EIA report on "Hong Kong Offshore LNG Terminal"
(ACE-EIA Paper 1/2018)

Question-and-Answer Session (Open Session)

Justifications for the Project

2. In comparison with pipeline gas supply, a Member sought information on the advantages of developing an offshore liquefied natural gas (LNG) terminal in Hong Kong in terms of the price and carbon footprint.

3. With reference to the incident of the West-East pipeline suspension in 2015, Mr Edward Chiu advised that the development of a LNG terminal could diversify supply sources and provide enhanced security and reliability of electricity supply in Hong Kong. The project could also provide Hong Kong with access to competitively priced gas from the global LNG market. As regards the carbon footprint, he explained that as LNG would be sourced from different parts of the

world, it would therefore be difficult to account for the carbon emission from the transportation of LNG. Similarly, it was also difficult to pinpoint the source of pipeline gas supply as the pipelines from different suppliers were connected.

4. Mr Arthur Wong followed that possible leakages from the pipelines would also contribute to global warming, and it would be relatively easier to contain LNG in vessels. Furthermore, as the Mainland's natural gas production was not sufficient to meet even its own demands, natural gas would have to be imported via pipelines covering extensive distances. As such, it was anticipated that energy efficiency of using LNG would be at least comparable, if not higher, than importing natural gas via pipelines. He supplemented that in order to achieve the 2020 fuel fix target of around 50% gas-fired power generation, it was necessary to identify additional gas supply options on top of pipeline gas supply from the Yacheng gas fields, Turkmenistan and the Guangdong Dapeng LNG which The Hongkong Electric Co. Ltd. (HKE) solely relied on. He also mentioned that sole reliance on pipeline gas supply would lower the bargaining power of Hong Kong.

5. Dr Jasmine Ng added that the Government had set stringent targets for reduction in carbon emissions by 2020 and 2030. In order to contribute to Hong Kong's commitment to reducing carbon emission and support the Government's objectives in improving air quality, both the CLP Power Hong Kong Limited (CLP) and HKE were committed to increase their gas-fired power generation capacity.

6. Given that it was difficult to account for the total carbon emissions from the entire production and supply chains, a Member suggested that the project proponent could make a local comparison of carbon emissions between developing an offshore LNG terminal and relying on pipeline gas supply.

Hazard to life

7. A Member remarked that contact with liquefied natural gas would lead to severe cold burns, and enquired if there was any contingency plan to handle incidents of accidental spillage or leakage of LNG under the proposed project.

8. Dr Jasmine Ng said that detailed assessments on the individual risk and societal risk were conducted and the results were in compliance with the criteria stipulated in the Technical Memorandum on Environmental Impact Assessment Process (TM). Safety systems would be provided on the jetty, the Floating Storage and Regasification Unit (FSRU) vessel and the LNG carrier (LNGC), and a safety zone was included as part of the project which restricted access by the off-site population to the project site. Furthermore, safety management measures would be put into place and site safety inspections and audits would be conducted regularly. She added that a project-specific contingency plan would be prepared and implemented to contain and clean up the spilled/leaked fuels or chemicals at the LNG terminal, surrounding waters and marine parks. The plan would include

protocols for reporting the accidental fuel spill event to the relevant authorities. The requirement for a contingency plan had been included in the Environmental Management & Audit (EM&A) implementation schedule.

Ecological impacts

Cooled water discharge and chlorination

9. Given that the system would be dosed with chlorine to inhibit the growth of biofouling organisms within the system, a Member opined that an assessment on the loss of phytoplankton and zooplankton as a result of chlorine exposure should be conducted. The combined effect of water temperature drop and chlorination should also be assessed. He also pointed out that as cooler water would sink, contour plots showing the total residual chlorine (TRC) levels at greater depths beyond that of the discharge outfall should be provided by the project proponent to assess the potential impact on marine benthos.

10. Dr Jasmine Ng said that the assessment criterion of 0.02 milligrams per litre (mg L^{-1}) for TRC was adopted by various approved EIA projects in Hong Kong and a study by the City University of Hong Kong showed that a TRC level below 0.02 mg L^{-1} would not lead to adverse impacts on marine organisms. While the use of alternative antifoulants, such as ozone and copper biocides, had been considered, the use of electrochlorination was considered more appropriate as it did not require the production or storage of hazardous chemicals on board. With reference to Annex 7F of the EIA report, she advised that the near field dispersion model provided predictions on the vertical profiles of cooled water plumes during wet and dry seasons. Results showed greater stratification in the wet season and stronger vertical mixing in the dry season. The predicted vertical profile was further incorporated in the far field modelling to simulate the representative conditions for wet and dry seasons. She clarified that the maximum TRC level of 0.5 mg L^{-1} and a drop of 9 degree Celsius (℃) in the water temperature at the discharge point was a prediction under the worst case scenario, in which both CLP and HKE would solely rely on the facility for natural gas supply and the cooled water discharge would be at the maximum design capacity of 20,000 cubic metres per hour (m^3 hr^{-1}). The project proponent had not conducted an assessment on the combined effect of water temperature drop and residual chlorine on phytoplankton and zooplankton as no adverse combined effect was anticipated. With regard to the potential impact on marine benthos, Dr Ng explained that no rare or uncommon species were recorded in the subtidal benthos survey conducted in both wet and dry seasons. The absence of hard bottom assemblages at the proposed location of the jetty indicated a low probability for the occurrence of coral communities. Given the low ecological value of the associated benthic assemblages, no unacceptable impacts on the ecological resources were expected. She assured Members that regular water quality monitoring would be conducted during the construction and operational phase under the EM&A programme to ensure compliance with the concerned standards/objectives.

11. A Member opined that a drop of 9℃ in the water temperature could cause adverse impacts on the ecology and asked the project proponent to adopt a conservative and prudent approach.

12. Given the plan of the Government to increase the percentage of natural gas used for power generation, a Member was concerned that the offshore LNG terminal would be required to operate at its maximum design capacity, and the worst case scenario which projected a TRC level of 0.5 mg L^{-1} and a drop of 9℃ in the water temperature would be realized.

13. Mr Edward Chiu replied that one of the objectives of the project was to diversify the supply sources of natural gas to ensure the security and reliability of electricity supply in Hong Kong. The worst case scenario for maximum discharge capacity would occur in emergency situations, for instance when all the pipelines failed, and Hong Kong had to rely solely on the facility for natural gas supply.

14. In reply to a Member's question regarding the habitat loss for finless porpoise resulting from the discharge of cooled seawater, Dr Jasmine Ng said that a 2℃ decrease in water temperature was not expected to deter the finless porpoises from using the concerned waters, and therefore the loss of habitat would only be limited to the footprint of the jetty, i.e. 2.5 hectares (ha).

Light pollution

15. Addressing a Member's concern on the potential impacts of lighting during night time, Dr Jasmine Ng said that assessment on the potential impacts to avifauna, turtles and whale sharks had been conducted and the results were included in the EIA report. While operational and navigational lighting would be required to meet operational needs and safety requirements, it was anticipated that most of the lighting would be kept minimal and would face downward to reduce the impact of light.

Underwater noise impacts

16. A Member was concerned that noise generated from underwater percussive piling could lead to permanent damage to hearing of finless porpoises given the high occurrence of finless porpoises at the proposed location of the LNG terminal. He considered that there was a need to conduct modelling on noise propagation to assess the impacts and propose mitigation measures as necessary.

17. Taking into account the presence of finless porpoise as well as other species of conservation importance, Dr Jasmine Ng advised that marine waters at the LNG terminal was conservatively assessed to be of moderate ecological importance. Considering that jetty construction involving percussive piling would result in moderate impacts to marine mammals, mitigation measures had been

proposed which included avoiding conducting underwater percussive piling works during night time and the peak season of finless porpoise from December to May. Ramp-up piling procedures would also be used so as to allow time for marine mammals to move away from the area. In order to ensure that the area was clear of marine mammals when underwater percussive piling works were taking place, a marine mammal exclusion zone of a radius of 500 metres (m) would be implemented in which qualified observers would scan the area prior to the commencement of and during the conducting of the works. She said that the assessment on noise impacts based on literature review and findings of field surveys, rather than noise propagation modelling, was appropriate.

18. Considering that the use of vibratory / hydraulic 'pushing' piling would generate noise ranging from 160 to 200 decibels (dB), a Member pointed out that sound levels of 150 dB and 179 dB could lead to respectively temporary and permanent reductions in the hearing sensitivity of small dolphins. Dr Jasmine Ng responded that mitigation measures for percussive piling would be considered for the use of vibratory / hydraulic 'pushing' piling to mitigate the noise impacts generated.

19. Given that the sounds generated by the FSRU vessel could range from 155 dB to 185 dB, a Member pointed out that the noise impacts would not be limited to the area of the jetty and requested that a modelling on noise propagation should be conducted.

20. In response to a Member's suggestion regarding the adoption of quieter piling techniques to reduce the impacts on marine ecology, Dr Jasmine Ng advised that bored piling or suction piling as an alternative to friction piling had been considered for the construction of the jetty substructure. With detailed assessments in Chapter 2 of the EIA report, both were considered unsuitable for the project.

21. A Member further suggested the use of smaller piles to reduce the noise generated. Dr Jasmine Ng said that the proposed diameter of each pile was approximately 1.5 m. With the use of a steel jacket substructure design, in which each structural jacket was installed by driving steel piles through each of its four corner legs to secure it to the seabed, the number of steel piles used was fewer than that in the traditional piled substructure design. She explained that more piles would have to be used if the diameter of the piles was reduced. Notwithstanding the foregoing, she responded that the piled substructure design would be further reviewed.

22. A Member suggested the project proponent review the use of percussive and vibratory piling methods during the detailed design stage with a view to minimizing the ecological impacts as far as possible.

Impingement and entrainment resulting from seawater intake

23. In reply to a Member's question regarding the velocity and pressure of the water intake and outfall system, Mr Y L Kwan advised that the intake and outfall pumping pressures would typically not exceed 1 and 3 bars respectively.

24. Regarding a Member's question on whether the intake of seawater would be conducted intermittently to allow time for trapped marine organisms to escape, Dr Jasmine Ng replied in the negative and advised that adult fish were less susceptible to risks of impingement and entrainment as they could swim at higher velocities to counteract the intake velocity. As regards juveniles, larvae and eggs, the use of screening systems with suitable mesh size and adjustment of the intake velocity would be considered to reduce the impingement and entrainment risks to fisheries resources.

25. A Member suggested the project proponent make reference to the experience of California in which a series of intake screens with different mesh sizes were utilized to prevent debris accumulation, reduce impingement and entrainment of marine organisms, and decrease the dosage of chlorination to inhibit the growth of organisms within the system. While this would require the installation of a better pump, such an environmentally-friendly design would set an example for other projects involving seawater intake. A cross flow design could also be considered, which according to some studies, could effectively reduce the entrainment of marine organisms by 30%.

26. A Member followed that the use of a closed-loop system could also be considered to avoid the need of seawater intake and discharge of cooled water. Dr Jasmine Ng replied that the use of a closed-loop system had been explored and it was considered that such a system would require a large amount of energy for heating, i.e. approximately four times the energy required for an open-loop system, and would lead to the increased emissions of air pollutants such as nitrogen oxides and carbon dioxides. She added that the market currently did not offer FSRU vessels of a suitable size using a closed-loop system for this project.

Methodology of ecological impact assessment

27. In reply to a Member's question regarding the validity of the assumption that marine mammals would avoid the vicinity of the work areas and return upon cessation of the disturbance, Dr Jasmine Ng advised that the same assumption had been adopted by other marine works in Hong Kong, and there were data to support the assumption.

28. A Member further asked the project proponent to review the peak season of finless porpoise, given that the underwater passive acoustic monitoring (PAM) survey results indicated finless porpoise occurrence was still high in June and July and no data was available for the following few months. Dr Jasmine Ng advised that PAM survey data of 12 months was available for the Shek Kwu Chau site, which was used mainly to evaluate finless porpoise occurrence pattern within and

outside daylight hours. The peak season of finless porpoise from December to May was determined based on the data of the long-term marine mammal monitoring programme conducted by AFCD and 12-month field surveys conducted under this project, and she responded that the peak season of occurrence could be re-affirmed if deemed necessary.

29. A Member sought for justification for basing the assessment of marine mammals on solar seasons, i.e. spring, summer, autumn and winter. He opined that the 10 years data should be presented by month instead so as to provide concrete evidence to support the conclusion that the peak season of finless porpoises was from December to May. With reference to Figures 9D.9 of the EIA report which showed the number of sightings of finless porpoises in the southern waters of Hong Kong from 2007 to 2017, he pointed out that the number of sightings of finless porpoises near/at the LNG terminal was still high during summer and autumn. Expressing disappointment that the assessment was based mainly on qualitative interpretation, the Member considered that quantitative analysis should be conducted instead given that there were more than 10 years of data collected by AFCD. He further enquired on the area of permanent habitat loss for finless porpoise due to noise and cooling water impacts.

30. Dr Jasmine Ng advised that the peak season was determined by dolphin experts based on data obtained from AFCD's long-term marine mammal monitoring programme, studies of other EIA projects and 12-month transect surveys conducted under this project. The 10 years data from AFCD was presented based on the solar seasons adopted in AFCD reports and other EIA reports and she responded that the data could be presented in various ways. As adopted in AFCD's marine mammal monitoring, winter would be from December to February, and spring from March to May. Referring to Figure 9D.9, she drew Members' attention to the significantly lower number of sightings of finless porpoises in the summer and autumn. Given that the Figure showed data of 10 years from 2007 to 2017, the number of sightings near/at the LNG terminal could not be considered as high. She advised that the LNG Terminal site was located at the southern periphery of areas used by finless porpoises and Chinese White Dolphins (CWDs) with major habitats in West Lantau did not use the marine waters at the site. Having assessed that the underwater sound generated from FSRU vessel and LNGC operation and transits would not have a significant impact on the finless porpoises, the EIA study concluded that the permanent loss of habitat would only be limited to 2.5 ha due to the presence of the jetty.

31. Regarding the underwater PAM survey, a Member opined that the project proponent should provide a map to indicate the locations of the C-POD units deployed to monitor the activity of marine mammals. He also requested for justification for not replacing the C-POD units at Locations 3 and 4 which were lost just two months after initial deployment.

32. Dr Jasmine Ng advised that the locations of the deploying of C-POD units

were shown in Annex 9B of the EIA report (Figure 2.11). With the knowledge from the other EIA studies that CWDs were more active during the night time, a PAM survey was conducted to collect supplementary data on the activity pattern of finless porpoises and assess the importance of the LNG terminal to the finless porpoises.

33. As regards a Member's question on the effectiveness of implementing the marine mammal exclusion zone, Dr Jasmine Ng said that qualified observers independent of the works contractor would be engaged. Minimal time lapse was expected between the reporting of sighting of marine mammal by the observers and the cessation of piling works as the observers would be on the same vessel as the works contractor. The marine mammal exclusion zone would also be implemented for the pipeline construction works which had been proposed to be carried out 24 hours a day to minimize the total works duration, with the exception of the pipeline section from South of Soko Islands to the LNG Terminal. Night vision devices would be deployed during night time monitoring. With reference to the other projects, including "Expansion of Hong Kong International Airport into a Three-Runway System" (3RS) and "Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities" (HZMB), this mitigation measure was considered to be effective in protecting marine mammals. Given that finless porpoises were harder to be detected visually, exclusion zone monitoring by underwater acoustic means would be explored to supplement the monitoring by qualified observers.

Environmental monitoring and audit

34. Given that the West Lantau waters was a major CWD habitat, a Member requested that monitoring must be performed to ensure that the contractor comply with the speed limit of 10 knots.

35. Dr Jasmine Ng said that given the relatively smaller scale of the project compared with the 3RS project, small working vessels might not be equipped with the Automatic Identification System for tracking. Having said that, she advised that vessel operators would be required to use predefined and regular routes to avoid traversing into marine parks and sensitive habitats. The contractor would be required to submit information on the vessel routes and speed which would be reviewed by the environmental team leader and the independent environmental checker and reported to EPD and AFCD as necessary. She advised that the pipeline construction works duration at the Southwest Lantau waters was targeted to last for about three months and would involve only a small number of work vessels. Furthermore, the pipeline construction works would be conducted in phases, hence the disturbance to dolphins could be minimized through the management and sequencing of the work fronts.

36. Considering the ecological sensitivity of the West Lantau waters, a Member strongly recommended the project proponent to make use of the tracking

technology to monitor the contractors so as to ensure strict compliance with the speed limit and predefined routes.

37. As regards a Member's enquiry on the monitoring of marine mammals, Dr Jasmine Ng advised that a baseline survey would be conducted before the construction of the project, and monitoring would be conducted during the construction phase to keep track of the usage of the waters by marine mammals in the vicinity of the works area. Post-construction monitoring would also be conducted to find out whether the marine mammals would return to the area upon cessation of the disturbance. As described in the EM&A manual, the baseline monitoring to be conducted would provide data for the determination of the appropriate action and limit levels in the event and action plan to be devised.

Impacts of gas venting

38. Addressing a Member's enquiry regarding the potential impacts of emergency gas flares, Dr Jasmine Ng said that based on the current design, gas venting would be adopted instead which would involve discharging natural gas into the atmosphere through a vent stack without going through the combustion process. This was commonly used in large LNGCs for depressurization. She assured Members that there were other mechanisms to conduct depressurization during normal operations and gas venting would occur only during emergency conditions as part of safety measures to maintain the integrity of the facility. Although gas flaring / venting might result in the mortality of birds passing by the vent stack at the time of such activity, no unacceptable impact was expected given that gas flaring /venting would not occur during normal operations.

39. With reference to the incident of birds killed in gas flare at a LNG facility in Canada, a Member considered that there was a need to propose mitigation measures, such as deploying alarm systems to scare off birds before gas venting. Dr Jasmine Ng clarified that the LNG facility in Canada used a permanent flare system and thus the risk of bird mortality was much higher. Nevertheless, she responded that measures to minimize the potential risks to birds would be considered.

Impacts on marine parks

40. Considering the large sizes of the FSRU vessel and LNGCs, a Member was concerned that the encroachment of these vessels into the proposed South Lantau Marine Park (SLMP) would lead to significant impacts to the ecology, and asked the project proponent to review the site location / orientation or transit routes of the vessels such that encroachment into SLMP could be completely avoided.

41. Dr Jasmine Ng clarified that the LNGCs would not pass through the SLMP during manoeuvring to the jetty. As regards the FSRU vessel, it would be permanently moored at the jetty and would only transit through the SLMP when

returning to the jetty after typhoon evacuations. Mr Edward Chiu supplemented that the FSRU vessel must berth at the jetty facing south so as to enable immediate evacuation during emergency situations. Given that backward berthing was not a common practice in the industry and it was not possible to propel the vessel into berthing position from the east due to insufficient water depth, it was recommended for the FSRU vessel to berth at the jetty from the southern approach, which would unavoidably cross into the SLMP. He however assured Members that the FSRU vessel would be required to operate at a speed lower than 10 knots within the SLMP with a view to reducing the risks of physical injuries to marine mammals. As regards the orientation of the jetty, he explained that the current proposal was based on an assessment on a number of factors, including met-ocean conditions, bathymetry, winds, waves and currents.

42. In reply to the Chairman's enquiry regarding the extent of encroachment of the FSRU vessel into the SLMP, Dr Jasmine Ng said that the FSRU vessel would only pass through the periphery of the SLMP and the duration within the SLMP would be around five to ten minutes. She assured Members that manoeuvring of the FSRU vessel would be assisted by tug boats at slow speed, i.e. at around two to three knots, to the berthing position.

43. As the Chairman of the Marine Parks Committee, a Member clarified that vessels were allowed to travel into marine parks with a speed of 10 knots or below regardless of their sizes. He informed that this project had been discussed at the Marine Parks Committee and members had no objection given that the law had been complied with.

44. A Member enquired and Dr Jasmine Ng confirmed that any anchoring / anchor spread requirements would avoid encroachment into the existing and proposed marine parks unless under emergency situations.

Consideration of alternatives

45. Considering the potential ecological impacts of the dredging works associated with the installation of pipelines, a Member opined that dredging works should be reduced as far as possible and non-dredged options for constructing the pipelines should be considered.

46. Dr Jasmine Ng advised that, in order to protect the pipelines from anchor drop and drag from large marine vessels passing the Black Point Power Station (BPPS) pipeline route, dredging would be required to place the pipelines in greater depths under the seabed at the major shipping channels, including the Urmston Road, next to the Tonggu Waterway at the west of Lung Kwu Chau and Southwest Lantau BPPS Pipeline sections. The extent of dredging had been kept to a minimum with only around 9 kilometres (km) of pipeline construction involving dredging, and the majority of the pipeline sections would be constructed by jetting. Mr Edward Chiu supplemented that apart from the depth, wider trenches were

proposed for better pipeline protection at the major shipping channels.

47. In reply to a Member's remark that it was against the law for any vessels to anchor within any principal fairway, Dr Jasmine Ng said that it was necessary to protect the pipelines from any emergency anchoring needs of vessels.

48. Addressing a Member's concern that high pressure jetting would also lead to adverse impacts on the environment, Dr Jasmine Ng advised that alternative subsea pipeline construction methods had been considered but were considered to be non-viable. For instance, as the horizontal directional drilling method could only construct pipelines of short distances, the need of many intermediate work stations would create an even greater impact on the environment. There were also technical challenges associated with this construction method.

49. A Member sought information on the frequency of maintenance dredging operations at the LNG terminal and the need for conducting a separate EIA prior to each operation. Dr Jasmine Ng advised that the water depth of proposed site of the LNG terminal exceeded 15 m which was suitable for safe vessel transits. The frequency of maintenance dredging would be subject to the condition of the site. Given that the EIA study of this project had assessed the impacts of maintenance dredging, no separate EIA was required prior to each dredging operation. As the draft of the FSRU vessel was about 12 m and that of LNGCs were less than 11 m, Mr Arthur Wong supplemented that the under keel clearance was more than adequate. Furthermore, with a low natural siltation rate at an offshore site, the frequency of maintenance dredging was anticipated to be very low.

50. A Member suggested the project proponent specify clearly the requirements in the tender documents so as to ensure that contractors for the project could provide the necessary professional services and equipment, especially for the dredging and jetting works for laying the gas pipelines. He considered that there was a need to conduct a trial before commencing the relevant works so as to ensure there was no unacceptable impact on the environment.

Visual impacts

51. A Member opined that the project proponent should provide clearer visual illustrations to show the proposed design of the structures from both aerial and lateral viewpoints. He also sought for details regarding the sensitive architectural design for enhancing the visual elements of the project.

52. Dr Jasmine Ng advised that a visual envelope model had been adopted to assess the visual impacts of the jetty, FSRU vessel and LNGC. While standardized colour schemes might have to be adopted for some structures due to safety reasons, sensible designs with regard to the texture and colour would be adopted such that the facilities would harmonize with the surrounding environment as far as possible. Given the jetty was proposed at an offshore position in the southern periphery of

Hong Kong, the visual impacts of the jetty and the FSRU vessel would be minimal with reference to the photomontages showing the views from country parks and scenic lookouts. She further advised that sensible architectural designs such as greening would be deployed to enhance the aesthetics and blend in the gas receiving stations (GRSs) at the BPPS and LPS where practicable with the power stations.

Environmental benefits

53. A Member suggested the project proponent give consideration to utilizing the cooled seawater discharge or the cold energy generated during the regasification process, such as by using closed-loop systems, heat pump systems and/or phase change materials. This could help avoid temperature changes and chlorination associated with the discharge of cooled seawater which could lead to negative ecological impacts. The Chairperson and another Member supported the suggestion considering that it could improve the energy efficiency and environmental benefits of the project.

54. Mr Edward Chiu responded that the feasibility to make use of the cold energy would be explored. With reference to the pilot programme launched in Japan, the needs of nearby industrial facilities were to be identified.

55. Given the proximity of the jetty site to the proposed SLMP, a Member requested the project proponent to consider providing AFCD with a berthing area for patrol boats as well as adequate space for the installation of a surveillance system to facilitate monitoring against non-compliance activities within the proposed SLMP. Mr Edward Chiu agreed to liaise with AFCD on their needs but remarked that there could be safety concerns associated with boats travelling within the project site.

56. A Member suggested the project proponent make reference to overseas experience and identify technologies and good practices applicable to this project.

57. Mr Edward Chiu said that while an extensive study on existing LNG terminals had been conducted, the construction and operation of an offshore LNG terminal would have different considerations from an onshore terminal. In respect of the suggested consideration of reuse of the cooling capacity from regasification, Mr Arthur Wong pointed out that it was uneconomical and even not adopted by onshore facilities.

Marine enhancement measures

58. With a view to enhancing the ecological value, a Member suggested deploying artificial reefs on the steel jacket substructure which supported the jetty platform. The design of the jetty platform should account for the need to allow light penetration for providing favourable conditions for the growth of organisms

at the artificial reefs. Dr Jasmine Ng said that subject to operational and safety considerations, consideration could be given to incorporating elements in the jetty design to enhance the ecological value.

59. In reply to a Member's enquiry regarding the independent funding committed by CLP to support initiatives for the enhancement of South Lantau marine environment, Dr Helen Chiu said that reference would be made to the funding arrangement and management of similar funds. The proposed fund was preliminarily planned to be at around HK$100 million which should be able to support meaningful and constructive projects for five to ten years.

60. A Member enquired whether the proposed funding would be sourced from the profits of CLP or from electricity users by increasing the price of electricity. Mr Edward Chiu said that the arrangement of the proposed funding would be subject to further liaison with the relevant Government departments.

61. As regards a Member's enquiry regarding the allocation of the funding, Dr Helen Chiu advised that approximately half of the funding would support initiatives related to marine ecology and conservation, and the remaining half for conserving fisheries resources and supporting sustainable development of the fishing industry. The latter would involve liaising and collaborating with fishery organizations and other relevant stakeholders.

Risk management and control

62. In reply to a Member's enquiry regarding the risk assessment and control of the BPPS and LPS pipelines, Mr Edward Chiu said that the running of cleaning and inspection robots in the pipelines would be carried out to monitor the condition of the pipelines. There would also be continuous monitoring of various parameters, such as the pressure built up in the pipelines, to detect any irregularities.

Conclusion

63. There being no further questions from Members, the Chairperson thanked the project proponent team for their presentation and detailed clarification on the project.

[The project proponent team left the meeting at this juncture.]

Internal Discussion Session (Closed-door session)

64. The Chairperson advised that the EIA Subcommittee could make recommendations to ACE on the EIA report with the following consideration:

(i) endorse the EIA report without condition; or

(ii) endorse the EIA report with conditions and / or recommendations; or
(iii) defer the decision to the full Council for further consideration, where issues or reasons for not reaching a consensus or issues to be further considered by the full Council would need to be highlighted; or
(iv) reject the EIA report and inform the project proponent of the right to go to the full Council.

65. The Chairperson proposed and Members agreed to endorse the EIA report with conditions and recommendations which were detailed below.

Ecological impacts

Impacts on the marine parks

66. A Member reiterated his concerns on large vessels passing through the SLMP and opined that the project proponent should consider alternative berthing methods.

67. The Chairperson reminded that the boundary of the proposed SLMP had yet to be defined and invited AFCD to provide advice on the matter.

68. Mr Patrick Lai pointed out that regular work vessels adopted predefined routes which avoided traversing into the existing and proposed marine parks, and the FSRU vessel would only pass through the SLMP at a slow speed when returning to the jetty after typhoon evacuations. Such an arrangement had been discussed in the Marine Parks Committee and was considered acceptable.

69. A Member agreed and said that there was no legal basis to ban vessels from entering marine parks at a speed of 10 knots or below, regardless of the size of the vessels.

70. A Member pointed out that the purpose of conducting an EIA was not only to meet the lowest standards required by law but to deploy the best practicable means to minimize the environmental impacts and maximize the environmental benefits as far as practicable.

71. Mr C F Wong advised Members that EPD had discussed with the project proponent thoroughly on alternative ways of berthing. It was agreed that the LNGC should avoid passing through the SLMP given its much higher frequency of berthing than the FSRU. As regards the FSRU vessel, the water was too shallow for the FSRU vessel to approach its berthing position from the east side, and having

consulted the Marine Department (MD), backward berthing with the assistance of tug boats was also considered infeasible. Given the site constraints, the EIA concluded that there were no better alternatives that could completely obviate the need of the FSRU vessel from transit through the SLMP when returning to the jetty after typhoon evacuations.

72. A Member pointed out that the large size of the FSRU vessels had imposed technical difficulties on manoeuvring and berthing and she trusted that EPD and MD had already explored all other possible alternatives.

73. Given that the current proposal was the best practicable method and there was no detrimental effect on the environment, the Chairperson opined with the agreement of a Member that there was no strong justification to support the imposition of conditions on the project proponent for alternative berthing methods.

74. A Member suggested with the support of Members that the project proponent should be recommended to review the transit route of the FSRU vessel under adverse weather conditions and emergency situations, with a view to reducing the extent of encroachment, in terms of frequency, duration and distance, onto the proposed SLMP.

Cooled seawater discharge and chlorination

75. A Member proposed and Members agreed to require the project proponent to conduct a baseline study on phytoplankton, zooplankton and benthic organisms at both the seawater intake and discharge points of the FSRU. The findings of the baseline study should be submitted to the EPD for approval before commencement of construction of the project.

76. A Member also considered that there was a need to estimate the combined effects of cooled seawater discharge and chlorination on marine ecology and water quality.

77. Mr Dick Choi advised that given that there were not many previous studies on the phytoplankton and zooplankton communities in Hong Kong and they had not been covered in previous EIA studies, relevant information based on literature review was likely limited.

78. The Chairperson suggested and Members agreed that in addition to the baseline study to be conducted, the project proponent would be recommended to

monitor the conditions of phytoplankton, zooplankton and benthic organisms at both the seawater intake and discharge points of the FSRU during the operational phase of the project and study any synergistic effect of cooled seawater discharge and chlorination on marine ecology.

Impingement and entrainment resulting from seawater intake

79. With reference to the earlier suggestion of a Member, the Chairperson proposed and Members agreed to recommend the project proponent to explore alternative seawater intake arrangements, for instance multiple screens with different mesh sizes, backwashing and cross flow intake design, with a view to preventing and reducing impingement and entrainment of marine organisms, and the need and dosage of chlorination to inhibit the growth of organisms within the heat exchange system for the regasification process.

Underwater noise impacts

80. A Member suggested that the project proponent should be required to review the number and diameter of the piles to be installed as well as the piling method during the detailed design stage, with a view to minimizing potential ecological impacts. The Chairperson agreed and proposed with the support of Members that a detailed pile installation plan of the jetty should be submitted to EPD for approval before commencement of construction of the jetty.

81. In reply to another Member's suggestion to ban the use of percussive piling method completely, a Member advised that the presence of scattered boulders might render it unsuitable for vibratory / hydraulic pushing piling method. Mr C F Wong said that the project proponent intended to use vibratory / hydraulic pushing piling whenever technically feasible to minimise the underwater piling noise impact.

82. A Member opined with the support of another Member that there was a need to conduct a noise propagation modelling to assess the noise impacts on the marine mammals during both construction and operation phases. He suggested making reference to overseas guidelines to determine whether the noise impacts arising from the project were acceptable. With only the monitoring data obtained under the EM&A programme, he pointed out that it would be difficult to attribute any decrease in dolphin populations to the noise impacts generated by this project.

83. Mr C F Wong suggested and Mr Patrick Lai concurred that it would be more effective and practical to monitor the noise impacts under the EM&A

programme. Mr Wong considered that mitigation measures including the implementation of the marine mammal exclusion zone and the adoption of the ramp-up piling procedures could effectively mitigate the noise impacts during the construction phase. It was expected that the operation noise would largely be air-borne apart from the noise generated from the propellers of the LNGC and FSRU vessel during transits. Acoustic decoupling was proposed by the project proponent to mitigate the potential underwater sound impacts. Mr Lai added that there was yet to be strong scientific evidence to ascertain the actual effects of different levels of noise on dolphins.

84. A Member remarked that without conducting noise propagation modelling, there was no scientific evidence supporting the effectiveness of implementing a marine mammal exclusion zone with a radius of 500 m.

85. Mr C F Wong said that the project proponent had made reference to other projects in determining the radius of the marine mammal exclusion zone. For instance, the radius of the marine mammal exclusion zone in the 3RS project was 250 m.

86. Mr Dick Choi supplemented that despite noise propagation modelling had not been employed as an assessment methodology, the project proponent had adopted a cautious approach in evaluating the ecological impact of the project to finless porpoises, and had proposed a range of mitigation measures to mitigate any potential noise impacts identified. Underwater percussive piling was not new to Hong Kong and had been studied in previous EIAs, for instance, the Proposed Aviation Fuel Receiving Facility (AFRF) at Sha Chau, Permanent Aviation Fuel Facility for Hong Kong International Airport, and the Development of a 100MW Offshore Wind Farm in Hong Kong. The effectiveness of the bubble curtain as a mitigation measure had been validated through actual field measurements and published as a scientific paper. The dolphin monitoring conducted under the AFRF project also showed that dolphins had avoided the waters during percussive piling works, and subsequently returned to the concerned area about six months after the cessation of the piling activities.

87. Having regard to EPD and AFCD's advice, the Chairperson and Members agreed that it would not be necessary for the project proponent to conduct noise propagation modelling.

88. With reference to the comments raised by Members, the Chairperson suggested that the project proponent should be required to conduct a review to

ascertain the peak occurrence season of the finless porpoise based on the long term data from the marine mammal monitoring programme of the AFCD, with a view to avoiding underwater piling works for jetty construction during the peak season of occurrence of the finless porpoise.

Impacts of dredging and jetting works

89. With regard to another Member's concern on the impacts of the dredging works at the West Lantau which would be conducted for 24 hours a day, a Member pointed out that banning the dredging works to be conducted during the night time would lengthen the total works duration and might lead to prolonged impacts on the environment.

90. A Member remarked that there were urgent needs to advance efforts to convert to clean energies with a view to combating climate change. As such, it would not be desirable to delay the commissioning date of the project. She also considered that the best possible solution to protect the marine ecology was to complete the project as quickly as possible so as to allow the early restoration of habitats.

91. The Chairperson echoed the views of a Member that the project proponent could be recommended to specify clearly in tender documents the environmental requirements so as to ensure that contractors for the project would be able to provide the required professional services and equipment, and implement the measures for meeting the environmental performance as required in the EIA, especially for the dredging and jetting works for laying the gas pipelines.

92. Addressing another Member's opinion that jetting would lead to greater impacts than grab dredging, a Member said that jetting being a non-dredged option would not generate dredged sediments. While sediment dispersion would likely be greater for jetting, the use of silt curtain had been proposed to minimize the impacts.

93. Mr C F Wong said that the jetting method could greatly reduce the quantity of dredged sediments while meeting the water quality objectives. The use of grab dredging solely for pipeline trench formation would generate much larger quantity of dredged sediments as compared with the current proposal, which used three different trenching methods including grab dredging, suction dredging and jetting. With regard to the sensitive habitats in the West Lantau, the project proponent had proposed to avoid works during the peak calving season of CWDs

(May and June) and to use suction dredging for pipeline trench formation to minimize the impact on marine mammals. Grab dredging would be used at the major shipping channels for building deeper and wider trenches for better pipeline protection. Apart from the aforementioned, the rest of the pipeline routes would be constructed by jetting.

94. Given the importance of the West Lantau waters to CWDs, a Member suggested enhancing the monitoring of CWDs and enlarging the marine mammal exclusion zone at the West Lantau, which was currently proposed to be of a radius of 250 m, as far as possible.

95. A Member followed that the project proponent should ensure proper management and sequencing of the work fronts so as to minimize the impacts of the construction works on marine mammals. The Chairperson agreed and proposed with the support of Members that the project proponent should be required to submit to EPD a pipeline construction plan with information on the sequence and schedule of different work fronts for conducting dredging and jetting works associated with laying of gas pipelines under the project.

Impact of gas venting

96. With regard to the concerns raised by a Member on the impacts of gas venting, the Chairperson suggested requiring the project proponent to propose measures to reduce the potential impacts on avifauna associated with gas discharge via the vent stack for natural gas during emergency.

Data sharing

97. A Member suggested recommending the project proponent to provide AFCD with relevant ecological data from this project to enrich its ecological database in geographic information system. He opined that all project proponents should be recommended to do the same hereafter.

Enhancement measures

98. A Member suggested recommending the project proponent to explore the possibility of reusing the cooled seawater from regasification process with reference to overseas studies and experience.

99. The Chairperson proposed and Members supported to require the project proponent to submit a detailed enhancement plan for the proposed funding to

support environmental enhancement initiatives to be established for the enhancement of South Lantau marine environment, including marine ecology and conservation, as well as fisheries resources and sustainable development of the fishing industry.

100. A Member opined that the plan should provide information on the setting up of an independent management committee consisting of experts, representatives of the fishing industry and other stakeholders to oversee the operation of the fund.

101. Some Members enquired whether it would be possible to impose requirement on the project proponent to set up the funding proposed in the EIA from its own profits outside the Scheme of Control Agreements.

102. Mr C F Wong pointed out that the idea might fall outside the ambit of the Environmental Impact Assessment Ordinance (Cap. 499) (EIAO), and he agreed to consult the Environment Bureau (ENB) and relevant departments accordingly.

[Post meeting note: After the EIA Subcommittee meeting on 23 July 2018, EPD and ENB carefully considered Members' suggestion of including a condition on the setting up of a fund to implement the environmental enhancement initiatives with a specific amount and restricting the source of the funding to the effect that it should not contribute or recover from electricity tariff. As EPD had reservations on whether the DEP had the power to impose such a condition when approving the EIA report or granting the environmental permit (EP), it consulted the Department of Justice on whether it was possible to impose such a condition, having regard to the provisions in the EIAO (Cap. 499). EPD had considered the legal advice obtained, and it appeared that such requirements might arguably fall outside DEP's power to impose conditions in relation to ecological assessment and fisheries impact assessment when approving the EIA report and granting the EP under the EIAO. In the circumstances, any follow up action on the establishment of the fund should be left to discussion between the project proponent and ENB which would take place outside the framework of the EIAO. ENB would follow this up with the project proponent.]

103. A Member suggested recommending the project proponent to consider the creation of "artificial reefs" effect at the proposed jetty and to provide AFCD with necessary space and equipment within the project site for setting up a monitoring system against activities suspected to be non-compliant with the Marine Parks Ordinance within the proposed SLMP.

Carbon footprint and energy efficiency

104. On behalf of a Member who had left the meeting, a Member suggested recommending the project proponent to compare the carbon footprint and energy efficiency of the use of LNG supply among LNGCs and piped gas supply.

Action

Visual impacts

105. A Member suggested recommending the project proponent to enhance the visual elements associated with the project with a view to reducing the visual impacts generated by the project.

106. A Member remarked that the project faced strong objections from the public. While only 51 sets of public comments had been received, he pointed out that one of the sets contained more than 300 online petition signings.

107. The Chairperson said that given that the project proponent could address most of the concerns raised in the public concerns, the meeting would recommend the full Council to endorse the EIA report with the conditions and recommendations as discussed in the meeting.

108. The meeting also agreed that the project proponent team would not be required to attend the full Council meeting scheduled on 10 September 2018 for the report.

****