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The Government of the Hong Kong Special Administrative Region
The People's Republic of China

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6 October 2014

Hon Tommy CHEUNG Yu-yan, SBS, JP
Room 818, Legislative Council Complex,
1 Legislative Council Road,
Central, Hong Kong

Dear

Tommy.

Organic Waste Treatment Facilities Phase 1

Thank you for your letter of 30 September 2014 setting out a number of questions regarding the project cost estimate for the proposed organic waste treatment facilities phase 1. Our replies to the questions are attached. If you have any further questions, we would be pleased to provide further information.

Yours sincerely,

A handwritten signature in black ink, appearing to read "KS Wong", with a large, stylized loop at the end.

(KS Wong)
Secretary for the Environment

ANNEX

Replies to Questions from HON Tommy Cheung

- Q1. Is this Organic Waste Treatment Facilities (OWTF) more elaborated than its functional necessities as the estimated cost of architectural, building and landscape works is stated at \$447.5 Mn? Given that OWTF is typically not a mission critical facility in its own right, will the Government consider simplifying the overall design requirements, particularly the non-core parts of the OWTF?

Reply to Question 1:

The proposed works to be carried out under the OWTF phase 1 project are all necessary and essential. Under the Design-Build-Operate (DBO) contract arrangement, we have specified the necessary and essential functional, operational, performance, quality, durability, sustainability, safety and environmental requirements for the OWTF phase 1 project. In meeting these requirements, the tenderers were required to propose their own design, choice of construction materials and method to maximize cost effectiveness and suit their operational needs. There are various mandatory environmental mitigation measures and fire services requirements that the tenderers must take into account in the tender design. For example, the whole plant should be covered and operated under a negative pressure such that all odourous gases could be collected for proper treatment to meet the stringent discharge limits to minimize the odour impact in accordance with the recommendations in the environmental impact assessment report.

On top of the basic treatment processes, the estimated construction and operation cost for the OWTF phase 1 also covers the essential provisions identified in the detailed feasibility design to provide sufficient and robust treatment capacity to meet the service level requirements for continuous 24 hour operation of the facility in normal and anticipated circumstances of scheduled maintenance, overhauls, variation in quality of incoming food waste, and inclement weather conditions. These requirements include the provision of robust pre-treatment facilities to render the food waste suitable for anaerobic digestion and the provision

of wastewater treatment requirements to comply with the standards for discharge to public sewer. The estimated cost also covers design, construction and maintenance of the natural terrain and slope protection cum mitigation works proposed as a result of a detailed site condition study.

As regards the item (b) architectural, building and landscape works in the OWTF phase 1 construction cost breakdown, the cost is estimated at \$473 million, comprising (i) architectural and interior fitting-out works (\$93.4 million); (ii) building and structural works (\$233.4 million); (iii) building services works (\$140.0 million); and (iv) landscaping and greening works (\$6.2 million). These architectural and building works shall be designed and constructed in accordance with various specifications and guidelines to meet relevant architectural standards required by the Architectural Services Department, fire services, electrical and mechanical installation requirements required by the Fire Services Department and Electrical and Mechanical Services Department, and building regulations required by the Buildings Department. In addition, most of the plant room area must be fully covered in order to comply with the stringent odour control requirement. The greening works and landscape design are required to fulfill the green coverage requirements in a sustainable manner as stipulated in the Development Bureau Technical Circular on site coverage of greenery for government building projects on greenery coverage requirements. We are also required to comply with the Government Technical Circular on adoption of energy efficient features and renewable energy technologies in Government projects and installation to incorporate green measures and energy efficient features in the design of the facility, such as natural ventilation, rainwater harvesting and energy efficiency, etc.

The total construction floor area of the proposed OWTF phase 1 is about 25,000 m². The average construction unit cost for the building works is about \$18,670 per m², which is commensurate with other recent government development projects. For example, the unit construction cost of the relocation project of the printing workshop of Government Logistics Department approved by the Finance Committee in June 2013 was \$19,002 per m². The average construction unit cost of OWTF

phase 1 is also on par with the local construction cost¹ in private sector for industrial factories at a unit rate of HK\$17,000 - \$21,000 per m² in Q3 2013.

- Q2. This OWTF is largely self-contained in terms of having its own composting system (estimated cost \$23 Mn), wastewater treatment system (estimated cost \$48 Mn), and heat recovery, power generation and surplus electricity export systems (estimated cost \$99.6 Mn). Will the Government also consider a design concept which could leverage on other facilities, such as landfill site to handle the final solid residues, nearby wastewater treatment works to take up the wastewater, and off-site biogas utilization solution to avoid on-site power generation?

Reply to Question 2:

(a) Landfill site to handle the final solid residues

The key purpose of the OWTF Phase 1 is to divert food waste from landfills to the maximum extent possible so as to reduce the burden on landfills, to minimize nuisance arising from food waste disposal at landfills and to reduce greenhouse gas emission. In line with the Government's Blueprint on Sustainable Use of Resources, the OWTF Phase 1 aims to maximize the use of resources to the maximum extent possible. As such, the final solid residue after the anaerobic digestion is regarded as a useful resource that can be converted to compost for beneficial use, rather than disposing of it at the landfills which would add to the burden on landfills and might also create odour nuisance.

The OWTF phase 1 is a designated project under the Environmental Impact Assessment (EIA) Ordinance and an environmental permit (EP) is required for its construction and operation. The EIA report was approved under the EIA Ordinance on 24 February 2010. The EIA Authority issued the EP for the project on 21 June 2010. The project would comply with the established standards stipulated under the EIA

¹ Source: Quarterly Construction Cost Review Hong Kong Third Quarter 2013, Langdon Seah Hong Kong Limited; <http://www.langdonseah.com/en/cn-hk/files/download/2544>

Ordinance. The EIA study covered various aspects such as air quality, hazard to life, wastewater quality, noise, waste management, landscape and visual impacts. On waste management, the EP stipulates that the anaerobic digestion residues shall be properly treated and recycled to become compost product, and the compost produced shall be used beneficially such that no compost product shall end up in the landfills.

Compost is an organic fertilizer and could be used in planting, landscaping and agriculture activities. Compost can also be used for improving soil structure, enhancing water retention ability and reducing soil erosion rate. According to the experience learned from the pilot food waste composting plant at Kowloon Bay, the food waste-turned-compost is good in quality and there is a market demand on compost products in Hong Kong. Users of the pilot plant compost include local organic farms, schools, Leisure and Cultural Services Department, Housing Department, and Agriculture, Fisheries and Conservation Department. Feedback from the users has been very positive.

The compost products from OWTF shall meet the Compost and Soil Conditioner Quality Standards formulated by Hong Kong Organic Resource Centre. This is the most widely adopted local standard for organic farming, general agricultural and non-agricultural uses. From the operation experience of Kowloon Bay Pilot Food Waste Composting Plant since 2008, it has been proved that composting technology is capable of converting food waste into high quality compost products.

The OWTF phase 1 will produce about 7,000 tonnes of compost per year. We estimate that the demand of compost / fertilizer in Hong Kong of around 20,000 tonnes per annum should be able to fully absorb the compost produced from the OWTF. The contractor of the OWTF will also open up the mainland and overseas market for the compost products. And we would also promote the greater use of compost from OWTF in government contracts, schools, housing estates landscaping etc.

(b) Nearby wastewater treatment works to take up the wastewater

In accordance with the Water Pollution Control Ordinance, wastewater from the trade shall meet the standards for discharge to public sewer in

accordance with the Technical Memorandum on Effluent Standards in order to protect the downstream wastewater treatment works and the ultimate receiving water bodies. The wastewater treatment facility proposed at OWTF phase 1 is required for recycling part of the wastewater for reuse onsite and for pre-treating the remaining surplus part to meet the Technical Memorandum standards for discharge to public sewer and subsequent final treatment at the Siu Ho Wan Sewage Treatment Works (SHWSTW). The opportunity available at the nearby SHWSTW has been taken for final treatment of wastewater and has helped to significantly reduce the extent and scale of wastewater treatment plant required for the OWTF phase 1 project.

(c) Off-site biogas utilization

Different biogas utilization options have been explored in the feasibility study, such as direct injection to the gas network, biogas derived vehicle fuel, heating fuel and industrial use.

Direct Injection to the Gas Network

Although energy efficiency would be high under this option as there is no conversion between gas and electricity and distribution losses would also be minor, further treatment and upgrading of the biogas would be needed in order to meet gas company's gas quality requirements, including stringent limits on hydrogen sulfide and moisture content and upgrading of biogas to increase the methane content from about 60% to a minimum of 80%. However, there is no gas pipeline available at Siu Ho Wan and is not economically viable to lay a long dedicated pipeline for transportation of gas to the existing gas network.

Vehicle Fuel

Compressed biogas from the OWTF could potentially be used as an alternative transport fuel, for example as a replacement fuel in the public transport sector or for the waste collection fleet. A number of potential environmental benefits of this strategy are possible in terms of reducing carbon emissions and improving air quality. To be used as a transport fuel, biogas has to be upgraded (to at least 95% methane by volume), it can then be used in vehicles originally modified to operate on Compressed Natural Gas (CNG). As the biogas produced at the OWTF is assumed to have methane content of around 60%, it would be

necessary to implement a highly efficient system of biogas purification at the facility. Following upgrading, the biogas would then require storage at around 200 to 250 bar in steel or aluminium pressure vessels. The necessary biogas upgrading, compression and storage systems would require significant additional capital and operational costs, and the associated additional energy requirements for the operation would also reduce the energy efficiency of the OWTF. Storage of compressed gas at the project site would also elevate safety risks and mitigation requirements. However, given the above considerations, the site constraints and the lack of biogas modified vehicles at present, developing commercial biogas fuelling facilities at the site would not be viable at this stage. For other OWTFs we would keep in view this future development possibility and monitor closely the experience elsewhere.

Production of Heat

Biogas from the OWTF could be used as a fuel for boilers, burners and furnaces to provide heat for domestic (i.e. water heating), or commercial or industrial applications. However, the scope for providing heat to off-site facilities (i.e. through heated water/ steam pipelines) is low as no viable heat applications have been identified within close proximity of the project site.

Biogas Supply to Industrial Facilities

Biogas could be directly supplied to industrial customers. However, there is no nearby industrial customer in the vicinity of project site. Thus, biogas would need to be transported by road using tube trailers. While supplying these facilities represents a technically feasible option, there are potential issues associated with supplying to small-scale commercial or industrial facilities. The demand from small-scale commercial or industrial facilities is likely to vary. Variability in demand and shortfalls are likely to result in storage requirements for compressed gas, potentially with additional treatment to facilitate longer term gas storage. Industrial customers would require additional on-site storage, for which they would require a Dangerous Goods license and other relevant permits. Due to these transport, storage, permitting and economic constraints, supply of biogas to industrial customers is not considered to be a viable option for OWTF phase 1.

- Q3. Will the Government consider involving private sectors in forms other than DBO for possible time and cost benefits in future OWTF?

Reply to Question 3:

Under the detailed feasibility study, we have studied different private sector participation options including Design-Build-Operate (DBO), Build-Operation-Transfer (BOT), and Build-Own-Operate (BOO). As one form of PPP, the DBO approach was recommended to be adopted for the OWTF phase 1 in view of the merits of the DBO approach such as less complexity, shorter time and less costly and also the urgency of the projects. As stipulated in the Food Waste and Yard Waste Plan for Hong Kong announced by the Environment Bureau in February this year, Hong Kong needs to build a network of OWTFs in order to meet our disposal at landfill reduction target of 40% by 2022. The Government plans to develop OWTFs in different districts for collecting and recycling source separated food waste. OWTF phase 1 is expected to be commissioned in 2017. We need to take forward this project expeditiously using the established DBO arrangement in order to provide Hong Kong with the basic food waste treatment capability as soon as possible.

It is envisaged that Hong Kong needs to build a network of around five to six OWTFs with a total treatment capacity of 1,300 to 1,500 tonnes per day. We are open to adopting different types of private sector participation mode for future OWTFs either on sites identified by the Government or on sites proposed by the private sector, with a view to building them as soon as practicable while maintaining high technological and operational standards.

We welcome the private sector to participate in the development of further organic waste recycling. We are prepared to communicate with private companies on the details of their idea and willing to consider appropriate follow-up action in an open and proactive manner.

Environmental Protection Department
October 2014