

政府總部
發展局
工務科
香港添馬添美道 2 號
政府總部西翼



Works Branch
Development Bureau
Government Secretariat

West Wing, Central Government Offices,
2 Tim Mei Avenue, Tamar, Hong Kong

本局網址 Our Website: <http://www.devb.gov.hk>

電話 Tel No.: 3509 8277

本局檔號 Our Ref.: ()in DEVB(CR)(W)1-55/149/1 Pt.2

傳真 Fax No.: 2801 5034

來函檔號 Your Ref.:

電郵 E-mail: wp1s@devb.gov.hk

19 February 2019

Ms Doris LO
Clerk to Panel on Development
Legislative Council Secretariat
Legislative Council Complex,
1 Legislative Council Road,
Central, Hong Kong

Dear Ms Lo,

**Hon Andrew WAN's Request for Information about
Installation of On-site Chlorine Generation Facilities
by the Water Supplies Department**

Attached (see annex) please find our response to the letter from Hon Andrew WAN to the Chairman of the Panel on Development of the Legislative Council on 28 January 2019 for your consideration.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'Vitus NG'.

(Vitus NG)
for Secretary for Development

Encl.

Hon Andrew WAN's Request for Information about Installation of On-site Chlorine Generation Facilities by Water Supplies Department

In response to the letter from Hon Andrew WAN to the Chairman of the Panel on Development of the Legislative Council (LegCo) on 28 January 2019, Development Bureau provides the following information regarding the installation of on-site chlorine generation (OSCG) facilities at water treatment works (WTW) of the Water Supplies Department (WSD).

OSCG Facilities Installation Plan by WSD

2. Hong Kong has all along imported chlorine in liquid form from the Mainland and transported to different WTWs for storage and use for disinfection of drinking water. WSD adopts stringent safety measures to manage the potential risk of chlorine gas leakage during the transportation and use of liquid chlorine. Given that liquid chlorine is categorized as dangerous goods, and its supply susceptible to various factors, the treatment and supply of drinking water in Hong Kong can be unduly affected by the importation of liquid chlorine. In view of the above, in order to eliminate the risk of chlorine gas leakage associated with transportation and storage of liquid chlorine entirely, and to ensure a stable supply of chlorine gas for the treatment of drinking water, WSD has been closely monitoring the latest development of OSCG facilities and exploring feasible alternatives to liquid chlorine.

3. After an internal study conducted in early 2016, WSD concluded that the technology of OSCG facilities was ready for adoption in the WTWs in Hong Kong. Given that OSCG facilities can generate chlorine gas to suit the actual demand, the potential risk associated with the transportation and storage of liquid chlorine can be entirely eliminated, and a stable supply of chlorine gas can be secured. WSD therefore decided to follow the international practice in minimizing use of liquid chlorine by installing OSCG facilities in all of its WTWs.

Pilot Scheme for OSCG Plant

4. WSD there launched a pilot scheme for OSCG plant in April 2016 to determine the compatibility of OSCG plant with the existing water treatment environment and facilities, as well as to acquire the know-how of installation, testing and operation of OSCG plant. There were three completely separate liquid chlorine store rooms in

Ngau Tam Mei WTW equipped with a chlorine absorption system capable of dealing with the emergency situation of chlorine gas leakage. WSD could therefore install one set of OSCG plant in one of the chlorine store rooms for conducting the pilot project without major alteration works and impact on the operations of the WTW. WSD conducts an open tendering exercise every three years for a mechanical and electrical (M&E) engineering term contract to provide maintenance and repair services for M&E equipment of various waterworks facilities, as well as to carry out new small-scale M&E works. Under the term contract, WSD issues works orders to the term contractor for providing the relevant services and carrying out the related works. Under the authority delegated by the Secretary for Financial Services and the Treasury, the heads of works departments may issue works orders with a maximum financial limit of \$30 million each under a term contract for carrying out new works without the need for open tendering. In 2016, ATAL Engineering Ltd. (ATAL) was the contractor of M&E Term Contract No. 4/WSD/14 for the contract period from 2015 to 2018. In May 2016, in order to carry out the pilot scheme in the soonest possible time, WSD issued a works order under the said delegated authority to the contractor of the M&E term contract for the supply and installation of one set of OSCG plant at Ngau Tam Mei WTW at a value of about \$20 million.

5. Testing of the OSCG plant at Ngau Tam Mei WTW under the pilot scheme began in early 2017 after the completion of its installation in December 2016. According to the test report, the daily production rate of chlorine gas by the OSCG plant met the requirements prescribed in the contract. Since then, the OSCG plant has produced chlorine gas for disinfection of drinking water at Ngau Tam Mei WTW. In addition to the production of chlorine gas, the OSCG plant can convert the chlorine gas generated through a chemical process to sodium hypochlorite solution, which will then be supplied to other WTWs for drinking water disinfection.

Installation of OSCG Plant in Major WTWs over the Territory

6. WSD also commissioned a consultant in mid 2016 to conduct a study which ascertained that OSCG plant would be suitable for installation in major WTWs over the territory. Subsequently, WSD consulted the Panel on Development and Public Works Subcommittee of the LegCo about the proposal in March 2017 and July 2017 respectively, and obtained the relevant funding approval of the Finance Committee of the LegCo in October 2017 for Project 9363WF - "Upgrading of Disinfection Facilities in Water Treatment Works" for installation of OSCG plant in major WTWs (excluding Tai Po WTW, in which expansion works were already underway) in Hong Kong. The scope of works included the installation of two sets of OSCG plant, with one as a

standby unit, in each of the major WTWs. As Ngau Tam Mei WTW had already installed one OSCG plant under the pilot scheme, only one more plant as standby unit was required to be installed.

Tai Po WTW Expansion Project

7. Tai Po WTW commenced operation since 2003. The expansion of Stream II of the water treatment facilities commenced construction in 2013 (see Figure (i)). The works contract for the expansion project was awarded to China State – ATAL Joint Venture (CSAJV) through an open tendering exercise. Black & Veatch Hong Kong Limited (B&V), a WSD engineering consultant, was responsible for the supervision of the expansion works. As the expansion works of the WTW had already commenced when WSD decided to install OSCG plant to substitute imported liquid chlorine, WSD had to request the contractor to purchase and install OSCG plant instead, before the contractor placed order for the supply and installation of the disinfection equipment using liquid chlorine as required under the contract. In February 2017, in accordance with the power vested under item 520 and Annex V (B) of the Stores and Procurement Regulations of the Government, WSD approved B&V to issue a variation order to the contractor responsible for the expansion of Tai Po WTW to purchase and install four sets of OSCG plant including a standby unit. As the expansion works of Tai Po WTW was underway, it was considered not feasible to commission the installation of these four sets of OSCG plant by another contractor by means of open tendering. There may be difficulty in aligning the works programmes of the two contractors that might result in possible delay and contractual claims.



Figure (i)–Tai Po WTW Overview

8. According to the internal study conducted by WSD in early 2016, two manufacturers in the United States and Uruguay, which were already supplying OSCG plant for local use, would be capable of manufacturing OSCG plant suitable for use in our WTWs. WSD decided to allow its staff, the contractor and engineering consultant (i.e. CSAJV and B&V) to visit the United States and Uruguay in May 2016 to see the OSCG plant in operation and meet the OSCG plant manufacturers. The visit was to enable them to acquire the know-how of the actual operation of OSCG plant in a WTW and the design, installation, operation and maintenance of OSCG plant such that the pilot scheme at Ngau Tam Mei WTW as well as the substitution of the liquid chlorine disinfection facilities at Tai Po WTW by OSCG plant could be carried out more effectively. This would also enable the staff of the Environmental Protection Department (EPD) responsible for approving the risk assessment of OSCG plant to obtain risk management information of the OSCG plant. According to the terms of the works contract for the expansion of Tai Po WTW, the contractor, CSAJV, shall be required to carry out visits for testing and verification of plant facilities manufactured overseas for the project, including all related liaison work. The contractor shall also be required to provide for each visit air travel and accommodation arrangement for not more than two staff from WSD and two from the engineering consultant. Therefore, WSD requested the contractor to modify one of these overseas visits to visit some OSCG plant in operation and their manufacturers in the United States and Uruguay. The delegation included representatives from WSD, EPD, CSAJV and B&V. Since there were more than two staff from WSD and the destinations of the visit had been changed, WSD approved B&V to issue a variation order to the contractor of the expansion of Tai Po WTW in accordance with the power vested under item 520 and Annex V (B) of the Stores and Procurement Regulations of the Government to cover the additional costs of \$270,000. The contractor and EPD paid for all the expenses of their delegates.

9. Due to the limited floor spaces inside Tai Po WTW, the four sets of OSCG plant needed to be installed at the lower level of the liquid chlorine disinfection building in the Stream I of the water treatment facilities. Under this arrangement, for safety reasons, liquid chlorine cannot be stored or used at the upper level of the liquid chlorine disinfection building during the testing and operation of OSCG plant (see Figure (ii)). Therefore, during the testing of the OSCG plant at Tai Po WTW, there will be no liquid chlorine for drinking water disinfection in the Stream I of the water treatment facilities. Also, there will be no chlorine gas for use in the Stream II of the water treatment facilities for drinking water disinfection before the four sets of OSCG plant are put into operation. In order to maintain the normal operation of Tai Po WTW, WSD had to

identify another location to install facilities to produce sufficient sodium hypochlorite solution for use in Tai Po WTW for the disinfection operation during the testing and commissioning of OSCG plant. In accordance with the power vested under item 520 and Annex V (B) of the Stores and Procurement Regulations of the Government, WSD approved B&V to issue a variation order to the contractor for the expansion of the Tai Po WTW to install one set of OSCG plant at Ngau Tam Mei WTW to operate in conjunction with the OSCG plant installed under the pilot scheme to provide sodium hypochlorite solution sufficient for Tai Po WTW for disinfection of drinking water until the four sets of OSCG plant at Tai Po WTW are put into operation. The cost incurred would be paid under Project 9334WF – “Expansion of the Tai Po Water Treatment Works”.



Figure (ii) – Tai Po WTW Expansion Project – OSCG Facilities

10. The second set of OSCG plant installed at Ngau Tam Mei WTW can be used as a standby unit for Ngau Tam Mei WTW after the four sets of OSCG plant of Tai Po WTW is put into operation. However, since Tai Po WTW will become one of the most important WTWs in Hong Kong when its treatment capacity is increased to 800 000 cubic metres per day after expansion, it is necessary to ensure that Tai Po WTW will have a sustainable and reliable supply of chlorine gas (or sodium hypochlorite solution) for disinfection of drinking water. After its OSCG plant has been put into operation, WSD has planned to use the second set of OSCG plant installed at Ngau Tam Mei WTW as the second standby unit of Tai Po WTW to supply sodium hypochlorite solution for use at Tai Po WTW for disinfection of drinking water when necessary. WSD will also use the funding under Project 9363WF to install an additional set of OSCG plant at Ngau Tam Mei WTW as the standby unit of the WTW.

Arrangement of OSCG plant at Ngau Tam Mei WTW

11. Ngau Tam Mei WTW has three liquid chlorine store rooms adjacent to each other. Based on safety considerations and no impact on the operation of liquid chlorine disinfection facilities, the storage room in the middle is now designated as the buffer zone between the other two store rooms at either side. One of the rooms is used for the storage of liquid chlorine for drinking water disinfection at Ngau Tam Mei WTW, while the other is equipped with two sets of OSCG plant (one under the pilot scheme and the other to support Tai Po WTW) (see Figure (iii)). As mentioned earlier, the two sets of OSCG plant are used for the production of sodium hypochlorite solution for Tai Po WTW for drinking water disinfection until the OSCG plant of Tai Po WTW is put into operation. By then, the OSCG plant under the pilot scheme will produce chlorine gas for Ngau Tam Mei WTW for drinking water disinfection, and the liquid chlorine disinfection facilities of Ngau Tam Mei WTW can be removed. The store room currently serving as the buffer zone can then be used for the installation of a set of OSCG plant to serve as standby unit for Ngau Tam Mei WTW. Under Project 9363WF - "Upgrading of Disinfection Facilities in Water Treatment Works", WSD awarded three works contracts in March 2018 through open tendering for the supply and installation of OSCG plant at major WTWs in Hong Kong. When WSD prepared the tender invitation for the above three works contracts, the timing on when the OSCG plant at Tai Po WTW could be put into operation was uncertain. In order to avoid contractual disputes and claims, WSD did not include the standby unit of OSCG plant at the Ngau Tam Mei WTW in the relevant contract.

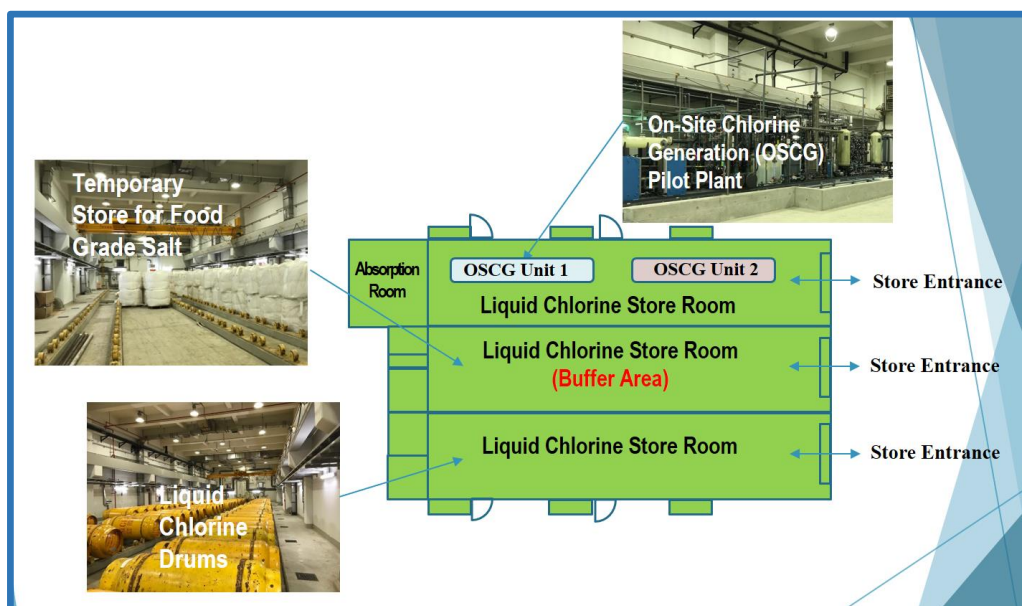


Figure (iii) – Ngau Tam Mei WTW Chlorine Building Floor Plan

12. The Stream II of the water treatment facilities under the expansion of Tai Po WTW has now been completed and put into operation. As mentioned above, supply of chlorine gas for disinfection of drinking water by the four sets of OSCG plant at the WTW can only commence after the completion of testing and commissioning. The OSCG plant under the pilot scheme has been tuned in and is able to maintain stable supply of sodium hypochlorite solution to the Stream II of the water treatment facilities at Tai Po WTW for drinking water disinfection. When the four sets of OSCG plant at Tai Po WTW are put into operation, WSD will monitor the actual operation of the WTW to see whether there is adequate backup facilities to maintain stable and reliable supply of chlorine gas to the WTW for drinking water disinfection at all times under all circumstances. If the four sets of OSCG plant are found to be able to provide sufficient backup, for prudent use of public funds, the WSD will use the second set of OSCG plant at Ngau Tam Mei WTW as its standby unit, obviating the need to install another standby unit of OSCG plant. If there is a need to install a third set of OSCG plant at Ngau Tam Mei WTW as its standby unit, WSD will conduct an open tendering exercise for the works and the cost incurred will be paid under Project 9363WF.

Update on the Scheme of WSD's OSCG Plant Installation

13. At present, the second set of OSCG plant at Ngau Tam Mei WTW has been installed. Fire Services Department (FSD) will carry out site inspection after the completion of all fire safety recommendations by the WSD contractor. After confirmation of compliance of the required fire safety recommendations, FSD will issue relevant storage and manufacture licences of dangerous goods. The four sets of OSCG plant at Tai Po WTW have also been installed, and the WSD contractor has been submitting the required documents to FSD for review. FSD will grant the approval of the storage and manufacture licences of dangerous goods pending the compliance of all fire safety recommendations by the contractor. Upon FSD's approval and issue of the storage and manufacture licences of dangerous goods, the second set of OSCG plant at Ngau Tam Mei WTW and the four sets of OSCG plant at Tai Po WTW will be tested and put into operation. WSD will take over these five sets of OSCG plant after completing all testing procedures. With regard to Project 9363WF - "Upgrading of Disinfection Facilities in Water Treatment Works", three works contracts were awarded in March 2018 through an open tendering exercise for installation of OSCG plant in major WTWs. It is anticipated that the OSCG plant will be delivered to Hong Kong in the middle of this year, and installed and tested by the end of this year.

Response to the Enquiries from Hon Andrew WAN

14. There were some teething problems at the early stage of the pilot scheme at Ngau Tam Mei WTW, which is not uncommon when a new system is brought in, and the problems have been essentially resolved after tuning and adjustment. WSD will closely monitor the operation of the OSCG plant. WSD has briefed the relevant staff in 2018 on the details of operation and maintenance arrangement for the OSCG plant. The contractors of the OSCG plant are required to provide 24-hour technical support to WSD staff during the first two months of operation of the OSCG plant. WSD will also employ specialist contractor to take up the repair and maintenance of OSCG plant and to provide support to WSD staff to operate the OSCG plant. In the long run, WSD will explore setting up a dedicated teams, and provide adequate training (including overseas training) to ensure that they all possess the expertise and experience to operate, repair and maintain OSCG plant.

15. As mentioned above, as the Stream II of Tai Po WTW is currently using sodium hypochlorite solution produced by the OSCG plant under the pilot scheme at Ngau Tam Mei WTW for drinking water disinfection, the operation and maintenance of the OSCG plant is now being undertaken by the contractor for the expansion of Tai Po WTW until the OSCG plant at Tai Po WTW is put into operation. The operation and M&E maintenance staff of WSD are currently not required to operate and maintain that OSCG plant. That OSCG plant will produce chlorine gas for Ngau Tam Mei WTW for drinking water disinfection after the OSCG plant at Tai Po WTW is put into operation. As mentioned above, WSD will then engage specialist contractors to undertake the repair and maintenance of OSCG plant and to provide support to WSD staff to operate the OSCG plant.

16. As mentioned above, in the entire course of procurement of OSCG plant, WSD has been acting in accordance with the established procedures and relevant requirements based on actual needs and circumstances.

**Development Bureau
Water Supplies Department
19 February 2019**