For discussion on
13 December 2023

Legislative Council
Panel on Development

Supply of Dongjiang Water

PURPOSE

The current three-year agreement with the Guangdong (GD) authorities adopting the "Package Deal Deductible Sum" approach[1] for the supply of Dongjiang (DJ) water is due to expire by the end of 2023 ("the Current Agreement"). A new agreement is needed to be signed before the end of 2023 for supply of DJ water in the next three years (i.e. 2024 to 2026). This paper briefs Members on the agreement for the supply of DJ water in the next three years ("the New Agreement").

THE NEW AGREEMENT

2. Under the nine-year framework[2] agreed in the Current Agreement, both sides will continue to apply the "Package Deal Deductible Sum" approach and the deduction mechanism for at least up to 2029. Therefore, the "Package Deal Deductible Sum" approach will continue to be adopted in the New Agreement. Notwithstanding this, the major features including water quantities, water quality and water prices are subject to review and adjustment as appropriate according to the circumstances during the renewal of each three-year agreement. After discussions with the GD side, the major salient features of the New Agreement are as follows –

[1] The previous "Package Deal Lump Sum" approach adopted in agreements before 2021 has been enhanced to be the "Package Deal Deductible Sum" approach in the Current Agreement in which the water prices are deducted according to the difference of the annual supply ceiling and quantity of DJ water actually supplied.

[2] A framework including the "Package Deal Deductible Sum" approach which is applicable for nine years (2021 to 2029) was agreed and mentioned in the Current Agreement signed in 2020.

Water Quantities

(a) annual supply ceiling of 820 million cubic metres (mcm) of DJ water in order to meet the actual needs[3] of Hong Kong for water supply with 99% reliability[4], will remain unchanged;

(b) minimum annual DJ water supply quantity of 615 mcm, as well as a long-term average annual DJ water supply quantity not less than 700 mcm over the nine-year period from 2021 to 2029, will remain unchanged;

(c) if it is necessary to exceed the pre-agreed ceiling of 820 mcm for any particular year within 2024 to 2026, the exceedance will be subject to the same arrangement in the Current Agreement. Both sides can discuss increasing the water supply quantity to 1 100 mcm;

Water Quality

(d) the standard of the quality of DJ water for supply to Hong Kong will remain unchanged. It will continue to be Type II water according to the Environmental Quality Standards for Surface Waters (GB3838-2002), which is the highest national standard for surface water applicable for human consumption;

Water Prices

(e) based on consumer price indices and rate of change in Renminbi (RMB) / Hong Kong Dollar (HKD) exchange rate, annual ceiling water prices for the annual supply ceiling of 820 mcm from 2024 to 2026 are adjusted

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[3] The actual need of Hong Kong for DJ water in a particular year is dependent on the amount of local yield collected. In the dry years of 2004 and 2011, during which our annual local yield was only 111 mcm and 103 mcm respectively, we imported 808 mcm and 818 mcm of DJ water respectively, which were very close to the annual supply ceiling of 820 mcm.

[4] "99%" reliability means that water supply is maintained round-the-clock even under an extreme drought in Hong Kong with a return period of one in 100 years. "Return period" is the average number of years during which an event will occur once statistically. A longer return period means a rarer chance of occurrence.

to HKD 5,136.24 million, HKD 5,259.00 million and HKD 5384.69 million respectively; and

(f) continuing with the formula allowing a deduction from the annual ceiling water price, based on the quantity of DJ water conserved (i.e. the difference between the annual supply ceiling and the actual quantity of DJ water imported) in a particular year, the updated unit rates for each m^3 DJ water conserved from 2024 to 2026 are adjusted to HKD 0.315, HKD 0.323 and HKD 0.331 respectively.

JUSTIFICATIONS

Provision of Reliable Water Supply to Hong Kong

3. The GD Provincial Government has been committed to protecting DJ and maintaining uninterrupted and stable supply of DJ water to Hong Kong for nearly 60 years. DJ water has been supporting Hong Kong's continuous social and economic development, contributing to Hong Kong's achievement as the international financial centre, which has solved Hong Kong's water shortage problem in the long run, making the city a better place for some 7 million Hong Kong people to live and work.

4. Over the past three years, the annual fresh water consumption of Hong Kong has been increased to around 1 066 mcm in 2022. The local water resource, which mainly comes from rainfall, is inadequate. The amount of local yield is also unstable due to fluctuation in rainfall year by year[5]. DJ water, which now provides about 70% to 80% of our fresh water supply, is able to fill the gap arising from the inadequate local yield. Therefore, a reliable and stable DJ water supply arrangement is essential for Hong Kong.

[5] In the past 30 years (1993-2022), the annual rainfall recorded in Hong Kong varied from 1 487 millimetres (mm) to 3 343 mm and the annual yield collected from our local catchment fluctuated between 103 mcm and 385 mcm.

"Package Deal Deductible Sum" Approach

5. The "Package Deal Deductible Sum" approach was first adopted in the Current Agreement from 2021 to 2023. Under this approach, while an annual supply ceiling quantity is guaranteed, a mechanism allowing a deduction in water price according to the actual amount of DJ water supplied is also provided. This approach enables us to import DJ water as needed each year up to an annual supply ceiling specified in the water supply agreements. On the other hand, at years with more local yield collected from rain water and less DJ water is required, this approach can avoid unnecessary wastage of surplus DJ water resources and save pumping cost for water delivery.

6. We have specified in the Current Agreement with the GD side that the above mentioned approach should be maintained at least up to 2029 (i.e. three three-year water supply agreements, including the Current Agreement, the New Agreement and the next Agreement). In essence, the actual annual water price in the "Package Deal Deductible Sum" approach can be expressed by the following formula –

Actual water price for a particular year	=	Annual ceiling water price	–	Price deduction when actual DJ water supplied is less than the annual supply ceiling

The major salient features, details and underlying considerations of the New Agreement are provided below.

(a) Water Quantities

Annual supply ceiling

7. Following our promulgation of the Total Water Management (TWM) Strategy in 2008, we have made endeavour to contain the growth of fresh water demand through implementation of various water demand management initiatives, and from time to time review and make adjustments to the Strategy (details at

Annex). While we have been implementing measures to contain the growth of our fresh water demand in the past few years, due to the growing need for public hygiene and personal health during the COVID-19 pandemic, the fresh water consumption of Hong Kong has been increased from 996 mcm in 2019 to 1 066 mcm in 2022. As the city has resumed to normal after the pandemic, we have been enhancing the promotion of water conservation, with the launch of a new round of water conservation campaign in the end of 2023. We are also targeting to supply recycled water for non-potable uses in phases starting from early 2024 to reduce the fresh water demand.

8. The forecast demand of annual fresh water supply is at the level of 1 000 mcm in coming three years taking into account water consumption, new developments and combating anticipated climate change effects. The needs of Hong Kong for water supply with 99% reliability will be met by DJ water, annual local yield by rainfall and water from desalination plant to commission in end 2023. Among them, the guaranteed annual supply ceiling of DJ water is 820 mcm. A back up option for further increase of DJ water supply to meet the demand in case of worse-than-projected water actual demand is available as stipulated in the ensuing paragraph 10.

Minimum and average quantities of DJ water imported

9. Under the price deduction mechanism in the Current Agreement, to cope with the change in our fresh water demand and determine the supply quantity of DJ water for a stable operation by the GD, both sides agreed to set a minimum annual DJ water supply quantity of 615 mcm[6] as well as an average annual DJ water supply quantity which should not be less than 700 mcm during the nine-year period covering the Current Agreement and the next Agreement. Taking into account the latest demand forecast and supply data, we are of the view that the minimum and average annual supply quantities will still be valid and should be retained in the New Agreement[7].

[6] The actual annual DJ water supply quantities since 2005 were well above the minimum annual quantity of 615 mcm consistently, with the lowest consumption of about 615 mcm in year of 2006 and 2013 only. Thus, we believe it should not be a problem in meeting the minimum requirement.

[7] The average annual DJ water supply quantity from 2005 to 2022 was above 700 mcm. With the annual DJ water supply quantity showing a rather stable trend, it should not be difficult to meet the average annual DJ water supply of 700 mcm.

Ultimate annual supply quantity (ceiling)

10. The Current Agreement stipulates an ultimate annual supply quantity (ceiling) of 1 100 mcm. According to the Review on the TWM Strategy completed in 2019, increase of DJ water supply is one of the backup options, which allow us to address the water demand if situation deviates from the present projections due to reasons such as faster-than-expected population growth, worse-than-projected impact of climate change on rainfall or less-than-anticipated effect of containing water demand growth. Taking into account our forecast demand and water supply from different sources, we consider that this ultimate annual supply quantity of 1 100 mcm is needed to retain in the New Agreement and it should be sufficient for protecting Hong Kong against unforeseen circumstances.

(b) Water Quality

11. The GD side has agreed to maintain in the New Agreement the quality of DJ water supplied to Hong Kong in compliance with Type II waters in the Environmental Quality Standards for Surface Water (GB3838-2002), which is the highest national standard for surface water applicable for the abstraction for human consumption. According to our water quality monitoring data, the quality of DJ water supplied to Hong Kong had been able to meet this standard.

(c) Water Prices

Annual ceiling water price

12. The annual ceiling water price is adjusted based on the established mechanism, where factors to be considered include changes in the exchange rate between RMB and HKD, changes in the relevant price indices of both sides, as well as increases in operation costs, etc.

13. The average annual rate of change in RMB/HKD exchange rate is about +0.83% in the past three years from 2020 to 2022, while the average annual rate of change of the relevant price indices of GD and Hong Kong is about +1.56%

over the same period and the actual combined rate of change in consumer price indices and RMB/HKD exchange rate is 2.40%. Also, there was some increase in the operation cost on the part of GD in arranging the supply of DJ water over the same period. After rounds of negotiations, we have secured and the GD side agreed an annual percentage increase in the proposed annual ceiling water price from 2024 to 2026 at 2.39%, not only excluding the increase in the operation cost, which is even lower than the 2.40% based on the two objective indices. The annual ceiling water prices from 2024 to 2026 in the New Agreement are HKD 5,136.24 million, HKD 5,259.00 million and HKD 5,384.69 million respectively. The increase in the annual ceiling water price is considered reasonable.

Unit rate for calculating the downward adjustment for amount of water supply less than the annual supply ceiling

14. According to the Current Agreement, the unit rate of deduction for DJ water conserved in 2021 is HKD 0.300/m^3 (or HKD 300,000 per mcm) which was derived based on the unit power cost, unit water cost, etc. of the GD side for delivery of DJ water to Hong Kong[8]. Making reference to the increase of annual ceiling water price of 1.33% in 2022 and 2023, the unit rate of deduction for DJ water conserved in 2023 is HKD 0.308/m^3. The unit rates for DJ water conserved for 2024 to 2026 in the New Agreement are HKD 0.315/m^3, HKD 0.323/m^3 and HKD 0.331/m^3 respectively (adjusted based on the increase in annual ceiling water price of 2.39% from 2024 to 2026).

[8] The unit rate of deduction for DJ water conserved is much lower than the unit rate for annual ceiling water price. This is because it only includes the unit power cost, unit water resources cost, etc. which account for only a small share of fixed costs of investment in the water supply infrastructures, protection of DJ, etc. which have to be incurred upfront and are not dependent on the quantity of DJ water eventually supplied.

WAY FORWARD

15. We plan to enter into the New Agreement with the GD side by the end of 2023 before the expiry of the Current Agreement. Also, to celebrate the 60th anniversary of Dongjiang water supply to Hong Kong in 2025, we will organise a series of publicity plans including exhibitions and seminars, focusing on the importance of DJ water to the development of Hong Kong, GD's investment on infrastructure as well as the support from policy and work to safeguard water supply for Hong Kong and water quality, for the public to appreciate the immense and continuous support and caring to Hong Kong from our motherland.

Development Bureau
December 2023

Annex

Total Water Management Strategy

At present, the treated water supply network covers about 99.9% of the population of Hong Kong. To better utilise water resources to support the sustainable development of Hong Kong, the Water Supplies Department (WSD) promulgated the Total Water Management (TWM) Strategy ("the Strategy") in 2008 which covers the long-term strategy for water demand management and water supply management.

2. WSD completed a review on the Strategy in 2019 and updated the Strategy to adopt a two-pronged approach with emphasis on containing fresh water demand growth[1] and building resilience in the fresh water supply with diversified water resources to cater for possible extreme effects of climate change. WSD is now striving to take forward the relevant measures for the Strategy.

Water conservation

3. School education is crucial to developing the awareness of water conservation. Thus, WSD has launched the "Cherish Water Campus" Integrated Education Programme (IEP) in primary schools since 2015/16 school year. Also, to extend water conservation education to kindergarten level, WSD has comprehensively implemented education programme in all kindergartens in Hong Kong in the 2018/19 school year to facilitate a smooth transition to IEP for primary schools. WSD has also launched the Cherish Water Ambassador Scheme for secondary and tertiary students to deepen their understanding on the importance of cherishing water resources, and to fulfil and publicise the habits of cherishing water through an array of events.

4. To enhance public understanding about water resources and water conservation, a water resources education centre named "H_2OPE Centre" was set up in Tin Shui Wai which covers more new elements and extensive information about water resources for people from various sectors to visit.

5. WSD has been working closely with stakeholders to support or co-organise events with non-government organisations and green groups, with aims to strengthening their continuous cooperation and promoting water conservation

[1] The Government pledged in the Policy Agenda 2017 and 2018 to reduce the average fresh water per capita consumption by 10% by 2030 at the earliest, using 2016 as the base year.

through environmental activities. For example, WSD and Green Council organise Enterprises Cherish Water Campaign which creates a collaboration platform for commercial and industrial sectors to promote water conservation through initiatives including signing of charter, appointment of cherishing water manager, recognition programme, etc.

6. WSD has distributed flow controllers for water taps to about 300 000 households joining the "Let's Save 10L Water" Campaign and using e-Bill service. It has also completed the installation of flow controllers on water taps and showers at about 205 000 public housing households to enhance water efficiency.

7. WSD has launched the Water Efficiency Labelling Scheme (WELS) to facilitate consumers to select water efficient fixtures and appliances. It is implementing the Mandatory WELS in stages. The first stage has launched in February 2018 to mandate the use of water efficient products (showers for bathing, water taps, urinal flushing valves and water closets) registered under WELS with prescribed water efficiency grading in new buildings. For the next stage, we are now working on legislative amendments requiring the designated types of products supplied in Hong Kong to be registered under the WELS and affixed with an effective water efficiency label for consumers' reference.

8. WSD has developed best water using practices for selected government facilities (such as public swimming pools, parks and markets), and compiled Best Practice Guidelines for Water Usage for high water consumption industries (including catering and hotel sectors).

9. WSD also required new public and private developments to implement Automatic Meter Reading (AMR) system. AMR system can provide customers with timely water consumption data and related information. The use of AMR system can raise customers' awareness about water conservation and alert them of abnormal water consumption which may be caused by leakage in water mains inside their premises. Customers could then take early rectification action accordingly. We hope the information would encourage customers to develop water saving habits.

Water loss reduction

10. WSD has been striving to reduce leakage of water mains. The "Replacement and Rehabilitation of Water Mains" programme has been launched in 2000 to replace and rehabilitate about 3 000 kilometres of aged water mains in phases, with a view to arresting the rapidly rising trend of main bursting and leakage. Following the substantial completion of the programme in 2015, the annual number of bursts in government water mains has decreased from about 2 500 cases in 2000 to about 40 in 2022. The leakage rate has also dropped from the peak of over 25% to about 14% in 2022.

11. At present, the condition of the water supply networks has improved significantly. WSD is currently implementing a risk-based water main asset management strategy to maintain the healthiness of the water supply networks and reduce the risk of water main bursts or leaks. Taking into account various factors including the consequences of bursts or leaks, ages and materials of the water mains, past records of bursts or leaks, surrounding environment, etc., WSD accords priorities for improvement works including replacement or rehabilitation to those water mains assessed with high risk to reduce the risk of main bursts or leaks. In addition, WSD will carry out improvement works with priorities given to water mains at "main burst hot spots" (i.e. locations with repeated water main bursts).

12. WSD is also establishing a "Water Intelligent Network" (WIN). Under the WIN, WSD collects data from the water supply networks by setting up District Metering Areas and analyse water loss therein, with a view to implementing appropriate measures, including active leakage detection, pressure management, speedy repair of water main leaks, and replacement or rehabilitation of water mains, etc. WSD will also continue to adopt advanced technologies for leakage detection.

13. All in all, through the implementation of the WIN and the risk-based improvement of water mains, WSD successfully identified the leakage areas and conducted speedy repair of water main leaks, thereby reducing leakages in water mains. Moreover, we are further improving our data analytics capability to more effectively identify the leakage areas and conduct speedy repair of water main leaks with a view to enhancing the overall effectiveness of the WIN. With the continuous development of the WIN and the risk-based improvement of water

mains, we strive to achieve the target of reducing leakage rate of water mains to below 10% by 2030.

14. As for leakages in private water mains, WSD will continue with enforcement action against such cases to minimise water loss caused by the lack of proper maintenance or prolonged repairs of inside service in private housing estates. Meanwhile, WSD will continue to promote and assist the leakage detection and maintenance of private water mains. Moreover, WSD will expedite the installation of master meters for buildings to continuously monitor the water loss of inside service, mandate the responsible party to carry out investigation and rectification works regarding the water loss in communal service, and will consider to restrict, suspend and disconnect the water supply to prevent waste of water, if necessary. At the same time, WSD will continue to explore the feasibility of other methods to reduce water loss.

Expansion of use of lower grade water

15. Lower grade water refers to seawater and recycled water. Recycled water comprising reclaimed water, treated grey water and harvested rainwater is suitable for non-potable purposes. We have been using seawater for toilet flushing in the urban areas and most of the new towns, covering a population of about 85%. WSD's target is to expand the network coverage of using lower grade water for flushing from 85% of the total population to 90% in the long run in order to further reduce the fresh water demand for flushing.

16. Tung Chung New Town is currently supplied with fresh water for flushing. WSD is extending the seawater supply network to Tung Chung New Town and its extension in phases. The related seawater flushing system is expected to be commissioned in mid-2024.

17. WSD has been actively promoting the use of recycled water (viz. reclaimed water, treated grey water and harvested rainwater) for toilet flushing and other non-potable purposes. We are continuing to take forward our work on the supply of reclaimed water in the north-eastern part of the New Territories (including Sheung Shui and Fanling) for non-potable uses. It is anticipated to supply reclaimed water to the residents in Sheung Shui and Fanling in phases starting from 2024 onwards, and further extend the supply to Kwu Tung North and Fanling North New Development Areas in accordance with their development

programmes. The centralised grey water recycling system in the Anderson Road Quarry Development, which will supply treated grey water for flushing and other non-potable uses within the development area, is now under construction. The system is anticipated for commissioning in phases starting from 2024 to tie in with the progress of the development of Anderson Road Quarry Development and its population intake.

Desalination

18. WSD strives to develop diversified water resources in order to build resilience in our fresh water supply. We are constructing the first stage of Tseung Kwan O (TKO) Desalination Plant to cater for the impacts of climate change. The desalination plant will have a water production capacity of up to 50 million cubic metres (mcm) per annum, which meets about 5% of the fresh water consumption in Hong Kong. The project will tentatively commission for trial operation in end 2023 to produce drinking water. Besides, WSD is reviewing the programme for implementing the second stage of TKO desalination plant. With the extension works, the ultimate water production capacity is expected to increase to 100 mcm per annum.

Water supply facilities of remote villages

19. In addition, regarding the supply of water to Tung Ping Chau, Shenzhen and Hong Kong have set up a task force to explore the feasibility of supplying water from Shenzhen side. At the same time, the Government and the Environmental Association are studying the installation of "domestic seawater filter device" at remoted areas including Tung Ping Chau to supplement the water supply there by means of desalination. Currently, the Environmental Association has obtained consent from the villagers in Tung Ping Chau to install the first "domestic seawater filter device" in one of the village houses. The device is expected to be available for villagers' use in the near future after obtaining a satisfactory result in the fresh water test. As the plan is generally welcomed by the villagers, the Environmental Association plans to implement it to other village houses in 2024. The Government and the Environmental Association will collect and monitor the data on the water quality, operation, maintenance and cost in relation to the device. If the result is desirable, we would consider extending the application of such technology to other remote villages such as Po Toi Island.

Mid-term review of the Strategy

20. To cope with future challenges including the sustainable social development, population growth and exacerbated climate change, WSD has commenced a mid-term review on the TWM Strategy in July 2023. The preliminary findings of the review are targeted to be available by mid-2024.