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Panel on Development

Meeting on 23 February 2016

**Updated background brief on the provision of a
District Cooling System at Kai Tak Development**

Purpose

This paper sets out the background to and progress of the provision of a District Cooling System ("DCS")¹ at Kai Tak Development ("KTD"), and gives a brief account of the views expressed by Members on the subject since the 2008-2009 legislative session.

Background

2. To promote energy efficiency and conservation, the Administration is constructing a first-of-its-kind DCS at KTD with a planned total of about 1.73 million square metres of non-domestic air-conditioned gross floor areas, requiring about 284 megawatt of refrigeration cooling capacity. According to the Administration², DCS is an energy-efficient air-conditioning system as it will consume 35% and 20% less electricity as compared with traditional air-cooled air-conditioning systems and individual water-cooled air-conditioning systems ("WACS") using cooling towers respectively. Implementation of a DCS at KTD will bring about

¹ District Cooling System is a very large-scale centralized air conditioning system. It consists of one or more chiller plants to produce chilled water, and a closed loop network of underground pipes for distributing the chilled water to buildings within its service area for air conditioning purpose. The chilled water is pumped to individual buildings for use in their air conditioning systems and is then returned to the central chiller plant for re-chilling.

² Source: LC Paper No. CB(1)759/14-15(05)
(<http://www.legco.gov.hk/yr14-15/english/panels/dev/papers/dev20150428cb1-759-5-e.pdf>)

significant environmental benefits. Due to better energy efficiency, the maximum annual saving in electricity consumption upon completion of the entire DCS project is estimated to be 85 million kilowatt-hour with a corresponding reduction of 59 500 tonnes of carbon dioxide emission per annum.

Implementation

Procurement of services for developing and operating the District Cooling System

3. On 5 June 2009, the Finance Committee ("FC") approved the DCS project at an estimated cost of \$1,671 million in money-of-the-day ("MOD") prices. The Administration originally intended to carry out the project under a single Design, Build and Operate ("DBO") contract spanning over 17 years. Tender procedures for the DCS project were initiated in July 2009. However, according to the Administration³, the returned tender prices of both project costs and operation costs far exceeded the original estimates.

4. In view of the tender outcome and having reviewed the latest development plan of KTD, the Administration briefed the Panel on Environmental Affairs ("EA Panel") on 28 June 2010 on the refined work requirements for the project and the adjustments to the original procurement strategy, i.e. offering a DBO contract. The Administration proposed to implement the project in three phases. An outline of the scope of works under the various phases is in **Appendix I**.

5. Under the alternative procurement strategy proposed by the Administration, the Administration would prepare the scheme design of DCS to ensure the integrity of the system, but would implement DCS with separate works contracts to better cater for the progress of major development and infrastructural projects at KTD. The contractors would mainly be responsible for the required detailed design, building and operation of DCS. EA Panel discussed the alternative procurement strategy on 28 June 2010, 12 and 21 July 2010. The Panel did not raise objection to the Administration's plan to conduct a re-tendering exercise under the alternative procurement strategy.

³ Source: LC Paper No. CB(1)2324/09-10(05)
(<http://www.legco.gov.hk/yr09-10/english/panels/ea/papers/ea0628cb1-2324-5-e.pdf>)

Phases I and II of the project

6. In August 2010, the Administration initiated the tendering procedures for works under Phases I and II. Based on the returned tenders, the Administration estimated that the capital cost of Phases I and II would exceed the approved project estimate ("APE") for the whole DCS project (\$1,671 million mentioned in paragraph 3) by about \$200 million. The revised estimate of the total project cost (for three phases) at that time was about \$3,650 million in MOD prices, which would exceed the APE by about \$1,980 million⁴.

7. The proposal to increase the APE for implementing Phases I and II of the DCS project was discussed at the meeting of EA Panel on 20 December 2010. The Administration advised that, to ensure the financial viability of DCS, it would require all private non-domestic projects at KTD to connect to DCS through inclusion of such a requirement in the land lease conditions.

8. At the meeting on 18 February 2011, FC approved, on the recommendation of the Public Works Subcommittee ("PWSC"), a funding proposal to increase the APE of the DCS project (for implementing Phases I and II) to \$1,861.8 million.

Phase III (Package A & Package B) of the project

9. The Administration sought the support of the Panel on Development ("DEV Panel") at its meeting on 22 January 2013 for a funding proposal to carry out Phase III (Package A) ("Phase IIIA") of the DCS project at an estimated cost of about \$1,300 million in MOD prices. Phase IIIA of the project aimed to provide chilled water supply from DCS to the public developments at KTD (e.g. the Trade and Industry Tower). The pipe laying works under Phase IIIA would also facilitate the connection of DCS to future developments located close to the area. The funding proposal was supported by DEV Panel. It was approved by FC, on the recommendation of PWSC, on 21 June 2013. The APE of the DCS project was increased from \$1,861.8 million to \$3,145.9 million in MOD prices (covering Phases I, II and IIIA).

10. On 28 April 2015, the Administration sought DEV Panel's support for an increase in the APE of the DCS project by \$606.1 million (from \$3,145.9 million to \$3,752 million in MOD prices) to implement Phase III

⁴ Source: LC Paper No. CB(1)782/10-11(05)
<http://www.legco.gov.hk/yr10-11/english/panels/ea/papers/ea1220cb1-782-5-e.pdf>

(Package B) ("Phase IIIB") of the DCS project. Phase IIIB of the project was to provide chilled water supply from DCS to a number of public developments at KTD, including the Electrical and Mechanical Services Department Headquarters, the To Kwa Wan Station and the Kai Tak Station of the Shatin to Central Link. The pipe laying works under Phase IIIB would facilitate the connection of DCS to future developments located close to the area. The funding proposal, supported by DEV Panel and endorsed by PWSC, was approved by FC on 14 July 2015.

Progress of the project

11. According to the Administration⁵, the construction works for Phases I and II of the DCS project were completed in the first quarter of 2013 and the third quarter of 2014 respectively. The Phase IIIA works were expected to be completed by end-2017 while the target completion date of the Phase IIIB works was end-2018. The project cost for all three phases (including the remaining works under Phase III of which the relevant funding approval from FC has not yet been sought) was estimated to be \$4,945.5 million in MOD prices. The Administration would seek FC's approval for the funding of the remaining works under Phase III at an estimated cost of \$1,193.5 million in MOD prices in due course, depending on the development schedule of KTD.

12. A summary of the changes to the cost estimate for the DCS project is given in the table below:

	In money-of-the-day prices	Remarks
Original APE for the whole project	HK\$1,671 million	Approved by FC in June 2009
First revision of the APE	(Increased to) HK\$1,861.8 million	To cover the project costs of Phases I and II only Approved by FC in February 2011

⁵ Sources: LC Papers Nos. CB(1)759/14-15(05) (<http://www.legco.gov.hk/yr14-15/english/panels/dev/papers/dev20150428cb1-759-5-e.pdf>) and CB(1)932/14-15(01) (<http://www.legco.gov.hk/yr14-15/english/panels/dev/papers/dev20150428cb1-932-1-e.pdf>)

	In money-of-the-day prices	Remarks
Second revision of the APE	(Increased to) HK\$3,145.9 million	To cover the project costs of Phases I, II and IIIA only Approved by FC in June 2013
Third revision of the APE	(Increased to) HK\$3,752 million	To cover the project costs of Phases I, II, IIIA and IIIB only Approved by FC in July 2015
Latest cost estimate (made in April 2015) for the whole project	HK\$4,945.5 million	

The District Cooling Services Ordinance

13. The Administration introduced the District Cooling Services Bill into the Legislative Council ("LegCo") for first reading on 15 October 2014. The Bill provides for matters relating to district cooling services provided by the Administration, including the imposition of charges for the services and other related matters. The key provisions of the Bill are set out in **Appendix II**. A Bills Committee was formed on 17 October 2014 to scrutinize the Bill. The Bill was passed at the LegCo meeting of 25 March 2015 and the District Cooling Services Ordinance (Cap. 624) was gazetted on 27 March 2015.

Major views and concerns expressed by Members

14. The major views and concerns expressed by Members in examining the funding proposals on Phases I, II, IIIA and IIIB of the DCS project and the District Cooling Services Bill are summarized in the ensuing paragraphs.

Cost effectiveness and financial viability of the District Cooling System

15. When discussing the proposal to increase the APE for implementing Phases I and II of the DCS project in 2010, some Members expressed grave concern about the significant increase in the estimated total project cost, let alone the operating cost which was unknown at that stage. Some Members questioned the cost-effectiveness of DCS and considered that efforts should be made to identify other equally environmentally-friendly options.

16. In examining the funding proposal for Phase IIIA of the DCS project in 2013, Members noted that the Administration intended to recover both the capital and operating costs from DCS users over the project life, which was estimated to be 30 years. Some Members considered that, with the full cost of depreciation taken into account, it might be too optimistic for the Administration to set the payback period of DCS at 30 years. The Administration advised that with proper maintenance, the life span of large scale electrical and mechanical facilities that would be used in DCS could be up to 30 years. The 30-year cost-recovery basis had been adopted to fully reflect the expected service life of DCS.

17. In response to Members' enquiry about the actual savings in construction cost for public works projects at KTD with the adoption of DCS, the Administration advised that DCS could reduce the upfront capital cost for installing chiller plants at buildings, which was estimated to be about 5% to 10% of the total building cost. Afterwards, the Administration provided supplementary information on the estimated savings in construction cost of the Government's public works projects at KTD with the adoption of DCS⁶.

18. In considering the funding proposal for Phase IIIB of the DCS project in 2015, some Members expressed concerns about the cost overrun of the DCS project from the original \$1,671 million in 2009 to the latest estimate at \$4,945.5 million. They also asked about the impact of the delay in the completion of the KTD developments on the cost recovery period of DCS, as well as the operation and maintenance ("O&M") cost of the system.

19. The Administration advised that as the period of full cost recovery was 30 years, minor delay on the progress of KTD would unlikely affect

⁶ The Administration's supplementary information was circulated to PWSC and FC members vide PWSC70/12-13 on 18 June 2013.

the break-even period. According to the Administration's estimation⁷, when the DCS project operated in full capacity upon completion of the remaining works under Phase III, the annual O&M cost until the end of its project life would be equivalent to about 1.6% of the total capital cost of the project (i.e. \$4,945.5 million in MOD prices).

20. During the deliberation on the District Cooling Services Bill, some members of the Bills Committee opined that in view of the rapid technology advancement, DCS might no longer be an energy-efficient system in future, and user buildings might choose not to subscribe to district cooling services. Under these circumstances, the DCS project might turn into a "white elephant project" and the costs of running DCS might eventually be shouldered by a few DCS users.

Provision of district cooling services to other potential users

21. Some Members enquired whether the Administration would allow private residential developments to connect to DCS voluntarily in future so as to fully utilize the capacity of DCS and hence achieving cost-effectiveness. They also enquired whether DCS at KTD could accommodate the demand for district cooling services in the neighbouring areas of KTD like To Kwa Wan and Kowloon City.

22. The Administration advised that while it might not be cost-effective for residential users to connect their buildings to DCS, given that their demand for cooling services would unlikely be sustained throughout the year, the Administration would take an open attitude towards the suggestion. Regarding the use of DCS in the neighbouring areas of KTD, the Administration said that while the capacity of DCS at KTD had been designed to cater for additional cooling plant capacity of about 10% in future, additional installations such as underground chilled water distribution pipes would be required to allow users in the neighbouring areas of KTD to connect to DCS. That said, the technical issues of expanding the area coverage of DCS, if needed in future, were not expected to be insurmountable.

Charging arrangements and tariff levels for district cooling services

23. Under the District Cooling Services Ordinance, the district cooling services charges comprised: (a) the capacity charge (to cover the capital cost and the O&M cost of DCS); (b) the consumption charge (to cover the

⁷ Source: LC Paper No. CB(1)932/14-15(01)

costs that vary with the actual consumption of district cooling services by the occupiers/tenants); (c) the capacity overrun charge⁸; and (d) the surcharges for unpaid charges⁹. The capacity charge rate effective from 27 March 2015 is \$112.11 per kilowatt refrigeration and the consumption charge rate is \$0.19 per kilowatt-hour refrigeration¹⁰. According to the Administration, the tariff of district cooling services had been set at a competitive level comparable to the cost of WACS, which was one of the most cost-effective air-conditioning systems available in the market. For all types of buildings at KTD, the unit costs of DCS were lower than those of WACS¹¹.

24. While the Administration advised that it would conduct a comprehensive review of the level of district cooling services charges once every five years, some Members held the view that more frequent reviews of the tariff were necessary to ensure the competitiveness of the district cooling services charges.

25. Noting that two primary schools at KTD would be users of district cooling services, some Members expressed concern about the affordability of the tariffs to these schools and enquired if the Administration would offer district cooling services tariff concessions to these schools. The Administration advised that the Education Bureau was discussing the detailed tariff concessionary arrangements with these schools.

System reliability

26. Some Members expressed concern about the reliability of DCS and the possibility of the breakdown of some major DCS components before they reached the end of their service lives. They also enquired whether any back-up facilities would be provided for DCS in case of system failure and whether the Administration would review the replacement schedule for the equipment on a regular basis.

⁸ The capacity overrun charge will be levied if the highest actual cooling capacity demand exceeds the contract cooling capacity to discourage consumers of buildings from deliberately under-estimating their contract cooling capacity for the purpose of driving down the capacity charge. Consumers will have to pay an extra 10% for the capacity charges for the overrun part.

⁹ A surcharge equal to 5% of the unpaid amount will be charged after the payment due date. If the amount remains unpaid for six months after the payment due date, a further surcharge that equals 10% of the total unpaid amount will be imposed.

¹⁰ Source: Schedule 2 to the District Cooling Services Ordinance (Cap. 624)

¹¹ Source: Annex 2 to LC Paper No. CB(1)759/14-15(05)

27. The Administration advised that DCS was a highly reliable air-conditioning system widely used in other countries. While sufficient back-up facilities would be provided for DCS, users might install their own back-up air-conditioning systems. As regards the replacement schedule, as the DCS project would be implemented in phases, different pieces of equipment would be procured in phases as necessary and they would not reach the end of service lives at the same time.

Latest development

28. At the meeting of DEV Panel to be held on 23 February 2016, the Administration will seek the Panel's support for a proposed increase in the APE of the DCS project to implement Phase III (Package C) of the project.

Relevant papers

29. A list of relevant papers with their hyperlinks is in **Appendix III**.

Council Business Division 1
Legislative Council Secretariat
16 February 2016

**Scope of Works under Various Phases of the Project of
Provision of a District Cooling System at Kai Tak Development
(as at June 2015)**

Phase	Period	Scope of Works
<p>Phase I – Works contract for the pipe laying work for part of the Kai Tak Development ("KTD") Package I</p>	<p>2010/11 – 2012/13</p>	<ul style="list-style-type: none"> ● Pipe laying from northern chiller plant room for provision of chilled water to public rental housing site project to meet the roadwork programme in the North Apron
<p>Phase II – District Cooling System ("DCS") core services under the Design, Build and Operate arrangement</p>	<p>2010/11 – 2019/20 (with an option for extending the operation period for eight years)</p>	<ul style="list-style-type: none"> ● Design for the whole DCS ● Building and engineering works, the northern chiller plant room, the southern underground chiller plant room and the seawater pumphouse to support the operation of the entire DCS ● Laying of chilled water distribution pipes not covered in Phase I for Package I users (Kai Tak Cruise Terminal building) ● Electrical and Mechanical ("E&M") equipment for KTD Package I users ● Operation of DCS up to 2019/20, and possibly for eight more years (for users of all packages) assuming extension of operation contract
<p>Phase III (Package A) – E&M installations and pipe laying for part of KTD Packages II and III</p>	<p>2013/14 – 2017/18</p>	<ul style="list-style-type: none"> ● Pipe laying works to match with the programme of road construction and upcoming building developments including the Trade and Industry Tower and the Hong Kong Children's Hospital ● Provision of E&M equipment for the above building developments and two schools

Phase	Period	Scope of Works
<p>Phase III (Package B) – E&M installations and pipe laying for part of KTD Packages II and III</p>	<p>2015/16 – 2018/19</p>	<ul style="list-style-type: none"> ● Pipe laying works to match with the programme of road construction and upcoming building developments including the Electrical and Mechanical Services Department Headquarters, To Kwa Wan Station and Kai Tak Station of the Shatin to Central Link, and the proposed Kowloon East Regional Headquarters and Operational Base cum Ngau Tau Kok Divisional Police Station ● Provision of E&M equipment for the above building developments ● Consultancy services for pre-construction stage (design) of the remaining Phase III works to tie in with the ongoing and upcoming programmes on the developments and infrastructure works carried out by the Civil Engineering and Development Department
<p>Other works under Phase III – E&M installations and pipe laying for the remaining KTD Packages II and III</p>	<p>2016/17 – 2021/22</p>	<ul style="list-style-type: none"> ● Pipe laying works for remaining works in KTD to match with the overall development programme ● Provision of E&M equipment for the above developments

Source: PWSC(2015-16)29 (<http://www.legco.gov.hk/yr14-15/english/fc/pwsc/papers/p15-29e.pdf>)

Appendix II

Key provisions of the District Cooling Services Bill

The District Cooling Services Bill contains the following provisions --

- (a) Part 1 (Clauses 1 to 3) contains preliminary provisions. In particular, it provides for the application of the Bill in relation to the district cooling system(s) ("DCS(s)") specified in Schedule 1.
- (b) Part 2 (Clauses 4 to 9) deals with matters relating to the provision of district cooling services. It specifies the conditions under which the Director of Electrical and Mechanical Services Department ("DEMS") may approve a consumer, as well as the circumstances under which district cooling services to a building may be provided, refused, suspended or terminated. It also provides for the contract cooling capacity.
- (c) Part 3 (Clauses 10 to 17) contains provisions relating to charges for district cooling services. It stipulates that an approved consumer is liable for any charge, fee or deposit payable under the proposed charging arrangement. DEMS may reduce, waive or refund a charge, fee or deposit as provided under clause 15. Clause 17 provides for the offsetting arrangement for the expenses of the Electrical and Mechanical Services Department. Subject to the approval of the Financial Secretary, those parts of the charges and fees received by the Government under the Bill that are required for the purposes of settling payment to the DCS operator or other expenses arising from the provision of district cooling services do not form part of the general revenue and may be applied for those purposes.
- (d) Part 4 (Clauses 18 to 21) contains provisions relating to the administration of district cooling services. Clauses 18 and 19 empower DEMS to issue improvement notices and appoint authorized officers. Clause 20 stipulates the powers of an authorized officer. Clause 21 provides for offences.
- (e) Part 5 (Clauses 22 to 30) contains provisions relating to appeals against certain decisions or direction. It provides for the composition of the appeal board panel and the proceedings of an appeal board. It empowers an appeal board to confirm, vary or revoke the decision or direction appealed against. The appeal board is also empowered to substitute its own decision or direction for the decision or direction appealed against.

- (f) Part 6 (Clauses 31 to 34) contains miscellaneous provisions. It empowers the Secretary for the Environment to amend the Schedules by notice published in the Gazette. It also empowers DEMS to specify forms and delegate functions.
- (g) Schedule 1 specifies the DCS(s) in relation to which the Bill applies.
- (h) Schedule 2 provides for details of charges.

Source: Legislative Council Brief: District Cooling Services Bill (File Ref: ENB CR 4/2061/08)
(http://www.legco.gov.hk/yr14-15/english/bills/brief/b201409261_brf.pdf)

Appendix III

Provision of a District Cooling System at Kai Tak Development

List of relevant papers

Council/ Committee	Date of meeting	Paper
Panel on Environmental Affairs	15 December 2008	Administration's paper on "District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)363/08-09(03)] Minutes of meeting [LC Paper No. CB(1)604/08-09]
Public Works Subcommittee	7 May 2009	Administration's paper on "Head 705 -- Civil Engineering 45CG -- District Cooling System at the Kai Tak Development" [LC Paper No. PWSC(2009-10)24] Minutes of meeting [LC Paper No. PWSC112/08-09]
Finance Committee	5 June 2009	Minutes of meeting [LC Paper No. FC7/09-10]
Panel on Environmental Affairs	28 June 2010	Administration's paper on "District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)2324/09-10(05)] Minutes of meeting [LC Paper No. CB(1)2956/09-10]
Panel on Environmental Affairs	21 July 2010	Administration's paper on "District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)2564/09-10(03)] Minutes of meeting [LC Paper No. CB(1)31/10-11]

Council/ Committee	Date of meeting	Paper
Panel on Environmental Affairs	20 December 2010	Administration's paper on "District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)782/10-11(05)] Minutes of meeting [LC Paper No. CB(1)1229/10-11]
Public Works Subcommittee	19 January 2011	Administration's paper on "Head 705 -- Civil Engineering 45CG -- District Cooling System at the Kai Tak Development" [LC Paper No. PWSC(2010-11)31] Minutes of meeting [LC Paper No. PWSC39/10-11]
Finance Committee	18 February 2011	Minutes of meeting (at 3:00 pm) [LC Paper No. FC21/11-12]
Panel on Environmental Affairs	4 July 2012	Administration's paper on "Legislative framework of the proposed charging arrangements for the District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)2256/11-12(03)] Minutes of meeting [LC Paper No. CB(1)2560/11-12]
Panel on Development	22 January 2013	Administration's paper on "PWP Item No. 45CG -- District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)428/12-13(06)] Minutes of meeting [LC Paper No. CB(1)735/12-13]
Public Works Subcommittee	28 May 2013	Discussion paper on "Head 705 -- Civil Engineering 45CG -- District Cooling System at the Kai Tak Development" [LC Paper No. PWSC(2013-14)12]

Council/ Committee	Date of meeting	Paper
		<p>Supplementary paper provided by the Administration [LC Paper No. PWSC70/12-13(01)]</p> <p>Minutes of meeting [LC Paper No. PWSC73/12-13]</p>
Finance Committee	21 June 2013	Minutes of meeting (at 3:30 pm) [LC Paper No. FC23/13-14]
Panel on Environmental Affairs	17 July 2014	<p>Administration's paper on "Collection of charges for District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)1785/13-14(01)]</p> <p>Supplementary paper provided by the Administration [LC Paper No. CB(1)1903/13-14(01)]</p> <p>Minutes of special meeting [LC Paper No. CB(1)179/14-15]</p>
Bills Committee on District Cooling Services Bill	25 November 2014 to 26 February 2015	Report of the Bills Committee [LC Paper No. CB(1)649/14-15]
Council meeting	25 March 2015	District Cooling Services Bill -- Resumption of Second Reading Debate and Third Reading Hansard (p. 8038 - 8060)
Panel on Development	28 April 2015	<p>Administration's paper on "45CG -- District Cooling System at the Kai Tak Development" [LC Paper No. CB(1)759/14-15(05)]</p> <p>Supplementary paper provided by the Administration [LC Paper No. CB(1)932/14-15(01)]</p> <p>Minutes of meeting [LC Paper No. CB(1)1107/14-15]</p>

Council/ Committee	Date of meeting	Paper
Public Works Subcommittee	16 June 2015	Administration's paper on "Head 705 -- Civil Engineering 45CG -- District Cooling System at the Kai Tak Development" [LC Paper No. PWSC(2015-16)29] Minutes of meeting [LC Paper No. PWSC240/14-15]
Finance Committee	14 July 2015	Minutes of meeting (at 9:00 am) [LC Paper No. FC50/15-16] Minutes of meeting (at 11:10 am) [LC Paper No. FC51/15-16]