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Panel on Development

Meeting on 28 April 2015

**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"), as well as 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 Administration, 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 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

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.

corresponding reduction of 59 500 tonnes of carbon dioxide emission per annum².

Implementation

Procurement of services for developing and operating the District Cooling System

3. On 5 June 2009, the Finance Committee ("FC") approved the upgrading of the project to provide DCS at KTD to Category A at an estimated capital cost of \$1,671 million in money-of-the-day ("MOD") prices. The Administration then 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. According to the Administration, the returned tender prices of both project costs and operation costs far exceeded the original estimates³.

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 July 2010 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.

² Source: The 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)) for discussion at the meeting of the Panel on Environmental Affairs on 17 July 2014.

³ Source: The Administration's paper on "District Cooling System at the Kai Tak Development" (LC Paper No. CB(1)2324/09-10(05)) for discussion at the meeting of the Panel on Environmental Affairs on 28 June 2010.

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. It was estimated that DCS would break even within 25 years⁵ (instead of the original estimate of 30 years) if all private non-domestic projects at KTD were required to use the DCS service for their air-conditioned floor areas.

8. At the meeting on 18 February 2011, FC approved, on the recommendation of PWSC, a funding proposal to increase the APE of the DCS project (for implementing Phases I and II) to \$1,861 million.

Phase III (Package A) 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 KTD, 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, i.e. the Trade and Industry Tower and the Centre of Excellence in Paediatrics. 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

⁴ Source: The Administration's paper on "District Cooling System at the Kai Tak Development" (LC Paper No. CB(1)782/10-11(05)) for discussion at the meeting of the Panel on Environmental Affairs on 20 December 2010

⁵ Counting from 2010-2011 with a 100% subscription rate for connection to DCS at KTD.

APE of the DCS project was increased from \$1,861 million to \$3,146 million in MOD prices (covering Phases I, II and IIIA).

Progress of the project

10. At the meeting of EA Panel on 17 July 2014, the Administration advised that the works for Phase I had been completed in early 2013, while the works for Phases II and IIIA were expected to be fully completed by end of 2014 and end of 2017 respectively. 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 \$4,946 million in MOD prices. The Administration planned to seek FC's approval for the funding of the remaining works under Phase III, which was estimated to be \$1,800 million in MOD prices, by phases from 2015 to 2017 depending on the development schedule of KTD.

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

	<u>In MOD prices</u>	<u>Remarks</u>
Original APE for the whole project	HK\$1,671 million	Approved by FC in June 2009
First revision of APE	(Increased to) HK\$1,861 million	To cover the project costs of Phases I & II only Approved by FC in February 2011
Second revision of APE	(Increased to) HK\$3,146 million	To cover the project costs of Phases I, II and IIIA only Approved by FC in June 2013
Latest cost estimate (made in July 2014) for the whole project	HK\$4,946 million	

Major views and concerns expressed by Members

12. The major views and concerns expressed by Members in examining the proposals on Phases I, II and IIIA of the DCS project are summarized in the ensuing paragraphs.

Cost effectiveness and financial viability of DCS

13. In discussing the proposal to increase the APE for implementing Phases I and II of the DCS project in 2010, 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. Regarding the Administration's decision to require all private non-domestic projects at KTD to connect to DCS, some Members expressed concern about possible legal challenges by private developers who were unwilling to abide by the mandatory subscription to DCS under the land leases. As to the Administration's estimation that DCS would break even within 25 years, some Members questioned the basis upon which this projection was arrived at.

14. In examining the funding proposal for Phase IIIA of the DCS project, PWSC 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. At members' request, the Administration provided information on the financial viability of the DCS under different scenarios (e.g. depreciation set at 15 years, 20 years and 30 years respectively)⁶.

15. In response to PWSC 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.

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

Provision of district cooling services to other potential users

16. 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 DCS in the neighbouring areas of KTD like To Kwa Wan and Kowloon City.

17. 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 issue. 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.

Charging arrangements and tariff levels for district cooling services

18. Given that all public and private non-domestic developments using district cooling services in KTD would be required to pay DCS charges to the Government, Members stressed the importance for the Administration to enhance the transparency of the charging arrangements. Some Members suggested that the Administration should consider whether users of district cooling services should be given a choice to pay the capacity charge⁷ either in a lump sum or by installments.

19. Noting that two primary schools would be users of district cooling services, some Members expressed concern about the affordability of the tariffs to these schools. They urged the Administration to ensure that schools at KTD would not be required to pay the district cooling services tariffs at a level higher than the cost of using other air-conditioning systems. As a matter of fairness, similar considerations should apply in working out the level of tariff to be imposed on commercial users. Some Members requested the Administration to consider putting in place a subsidization policy for users of DCS to cover the difference in tariff between DCS and WACS should the tariff of the former exceed that of the latter.

⁷ The key components of the DCS charges include the capacity charge, the consumption charge, the capacity overrun charge and the surcharges for unpaid charges.

20. The Administration advised that while there would be no Government subsidy for the use of district cooling services, the tariff of DCS would be 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. Based on the Administration's estimation of 2011-2012, the estimated tariff of DCS remained lower than that of WACS⁸. All private non-domestic developments using central air-conditioning installation at KTD would be obliged to subscribe to DCS services by way of appropriate provisions in the land leases. To ascertain if the schools at KTD could benefit from district cooling services, the Administration would liaise closely with relevant school sponsoring bodies and Government departments.

System reliability

21. Some Members expressed concern about the reliability of DCS and enquired if any back-up facilities would be provided for DCS in case of system failure. 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.

The District Cooling Services Ordinance

22. The Administration introduced the District Cooling Services Bill into 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. A Bills Committee was formed on 17 October 2014 to scrutinize the Bill. The work of the Bills Committee has been completed⁹. The Bill was passed at the LegCo meeting of 25 March 2015. The District Cooling Services Ordinance was gazetted on 27 March 2015¹⁰.

⁸ The Administration subsequently provided information on the estimated tariff of the proposed DCS at KTD based on the then estimated construction cost. The paper was circulated to FC and PWSC members vide LC Paper No. PWSC70/12-13 on 18 June 2013.

⁹ The report of the Bills Committee to LegCo is available at the hyperlink below:
<http://www.legco.gov.hk/yr14-15/english/bc/bc02/reports/bc0220150325cb1-649-e.pdf>

¹⁰ The contents of the Ordinance are available at the hyperlink below:
<http://www.legco.gov.hk/yr14-15/english/ord/ord007-2015-e.pdf>

Latest development

23. The Administration has proposed to brief DEV Panel, at its meeting on 28 April 2015, on a funding proposal to implement Phase III (Package B) of DCS at KTD. Members of EA Panel have been invited to join the discussion.

Relevant papers

24. A list of relevant papers is in **Appendix II**.

Council Business Division 1
Legislative Council Secretariat
21 April 2015

Appendix I

Scope of Works under Various Phases of the Project of Provision of a District Cooling System at Kai Tak Development (as at May 2013)

Phases	Construction 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 Design, Build and Operate ("DBO") arrangement</p>	<p>2010/11 – 2019/20 (include 6.5 years operation)</p> <p>(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, 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 ("KTCT") 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

Phases	Construction Period	Scope of Works
Phase IIIA – E&M installation and pipe laying for part of KTD Packages II & III ¹	2013/14 – 2017/18	<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 Centre of Excellence in Paediatrics ● Provision of E&M equipment for the above building developments
Remaining works under Phase III – E&M installation and pipe laying for remaining KTD Packages II & III	2014/15 – 2021/22	<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(2013-14)12

¹ The cost of the connection facilities for the two primary schools in the North Apron was included in Phase IIIA works when the Administration consulted the LegCo Panel on Development in January 2013. As the cost of pipe laying works for the schools has already been included in Phase I works, and having reviewed the overall financial position of 45CG, the Administration consider it appropriate to absorb the cost of the connection facilities for the schools within the APE for Phases I and II, instead of including it under Phase IIIA.

District Cooling System at Kai Tak Development

List of relevant papers

Council/ Committee	Date of meeting	Paper
Panel on Environmental Affairs	10 February 2000	<p data-bbox="735 573 1433 741">Information paper on "Energy Efficiency and Conservation Initiatives for 2000/01" provided by the Administration (LC Paper No. CB(2)1020/99-00(03))</p> <p data-bbox="735 786 1433 864">Minutes of meeting (LC Paper No. CB(2)1604/99-00)</p>
Panel on Environmental Affairs	2 March 2000	<p data-bbox="735 920 1433 1088">Information paper on "Water-cooled Air Conditioning Systems" provided by the Administration (LC Paper No. CB(2)1232/99-00(06))</p> <p data-bbox="735 1133 1433 1211">Minutes of meeting (LC Paper No. CB(2)1605/99-00)</p>
Panel on Environmental Affairs	20 December 2002	<p data-bbox="735 1261 1433 1473">Information paper on "Implementation of District Cooling System at South East Kowloon Development" provided by the Administration (LC Paper No. CB(1)548/02-03(03))</p> <p data-bbox="735 1518 1433 1597">Response to members' questions from the consultant (LC Paper No. CB(1)930/02-03)</p> <p data-bbox="735 1641 1433 1720">Minutes of meeting (LC Paper No. CB(1)826/02-03)</p>
Panel on Environmental Affairs	15 December 2008	<p data-bbox="735 1776 1433 1944">Information paper on "District Cooling System at the Kai Tak Development" provided by the Administration (LC Paper No. CB(1)363/08-09(03))</p> <p data-bbox="735 1989 1433 2067">Minutes of meeting (LC Paper No. CB(1)604/08-09)</p>

Council/ Committee	Date of meeting	Paper
Public Works Subcommittee	7 May 2009	<p>Discussion paper on "HEAD 705 -- CIVIL ENGINEERING -- 45CG -- District Cooling System at the Kai Tak Development" provided by the Administration (LC Paper No. PWSC(2009-10)24)</p> <p>Minutes of meeting (LC Paper No. PWSC112/08-09)</p>
Finance Committee	5 June 2009	<p>Minutes of meeting (LC Paper No. FC7/09-10)</p>
Panel on Environmental Affairs	28 June 2010	<p>Information paper on "District Cooling System at the Kai Tak Development" provided by the Administration (LC Paper No. CB(1)2324/09-10(05))</p> <p>Minutes of meeting (LC Paper No. CB(1)2956/09-10)</p>
Panel on Environmental Affairs	21 July 2010	<p>Information paper on "District Cooling System at the Kai Tak Development" provided by the Administration (LC Paper No. CB(1)2564/09-10(03))</p> <p>Minutes of meeting (LC Paper No. CB(1)31/10-11)</p>
Panel on Environmental Affairs	20 December 2010	<p>Information paper on "District Cooling System at the Kai Tak Development" provided by the Administration (LC Paper No. CB(1)782/10-11(05))</p> <p>Paper on the provision of a District Cooling System at the Kai Tak Development prepared by the Legislative Council Secretariat (Updated background brief) (LC Paper No. CB(1)782/10-11(06))</p> <p>Minutes of meeting (LC Paper No. CB(1)1229/10-11)</p>

Council/ Committee	Date of meeting	Paper
Public Works Subcommittee	19 January 2011	<p><u>Discussion paper on "HEAD 705 -- CIVIL ENGINEERING -- 45CG -- District Cooling System at the Kai Tak Development" provided by the Administration</u> (LC Paper No. PWSC(2010-11)31)</p> <p><u>Minutes of meeting</u> (LC Paper No. PWSC39/10-11)</p>
Finance Committee	18 February 2011	<p><u>Minutes of meeting</u> (LC Paper No. FC21/11-12)</p>
Panel on Environmental Affairs	4 July 2012	<p><u>Information paper on "Legislative framework of the proposed charging arrangements for the District Cooling System at the Kai Tak Development" provided by the Administration</u> (LC Paper No. CB(1)2256/11-12(03))</p> <p><u>Paper on the provision of a District Cooling System at the Kai Tak Development prepared by the Legislative Council Secretariat (Updated background brief)</u> (LC Paper No. CB(1)2256/11-12(04))</p> <p><u>Minutes of meeting</u> (LC Paper No. CB(1)2560/11-12)</p>
Panel on Development	22 January 2013	<p><u>Information paper on "PWP Item No. 45CG -- District Cooling System at the Kai Tak Development" provided by the Administration</u> (LC Paper No. CB(1)428/12-13(06))</p> <p><u>Paper on the provision of a District Cooling System at Kai Tak Development prepared by the Legislative Council Secretariat (Updated background brief)</u> (LC Paper No. CB(1)428/12-13(07))</p> <p><u>Minutes of meeting</u> (LC Paper No. CB(1)735/12-13)</p>

Council/ Committee	Date of meeting	Paper
Public Works Subcommittee	28 May 2013	<p>Discussion paper on "HEAD 705 -- CIVIL ENGINEERING -- 45CG -- District Cooling System at the Kai Tak Development" provided by the Administration (LC Paper No. PWSC(2013-14)12)</p> <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	<p>Minutes of meeting (LC Paper No. FC23/13-14)</p>
Panel on Environmental Affairs	17 July 2014	<p>Information paper on "Collection of charges for District Cooling System at the Kai Tak Development" provided by the Administration (LC Paper No. CB(1)1785/13-14(01))</p> <p>Updated background brief on "Provision of a District Cooling System at the Kai Tak Development" prepared by the Legislative Council Secretariat (LC Paper No. CB(1)1785/13-14(02))</p> <p>Minutes of meeting (LC Paper No. CB(1)179/14-15)</p>
Bills Committee on District Cooling Services Bill	25 November 2014 to 26 February 2015	<p>Report of the Bills Committee (LC Paper No. CB(1)649/14-15)</p>
Legislative Council	25 March 2015	<p>District Cooling Services Bill -- resumption of second reading debate and third reading Hansard (p. 132 - 149, Floor version)</p>