

**For discussion on
17 July 2014**

**Legislative Council
Panel on Environmental Affairs**

**Collection of Charges for
District Cooling System at the Kai Tak Development**

INTRODUCTION

This paper briefs Members on the Administration's legislative proposals to provide the necessary legal backing for the collection of charges for the use of the services provided by the District Cooling System (DCS) at the Kai Tak Development (KTD) and other related matters.

BACKGROUND

2. The DCS is one of the major infrastructure facilities in support of the sustainable and environmentally-friendly development at Kai Tak. To promote energy efficiency and conservation, and with the support of the Legislative Council (LegCo), the Government 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.

3. The DCS is an energy-efficient air-conditioning system as it consumes 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. The technology has been widely adopted in other parts of the world, such as Singapore, Europe and the United States. Implementation of a DCS in the KTD will bring about significant environmental benefits. Due to better energy efficiency, the maximum annual saving in electricity consumption upon completion of the entire project is estimated to be 85 million kilowatt-hour, with a corresponding reduction of 59 500 tonnes of carbon dioxide emission per annum.

4. Apart from energy saving, the DCS would bring about the following benefits for individual users –

- (a) reduction in upfront capital cost for installing chiller plants at their buildings; the reduction is about 5-10% of the total building cost;
- (b) more flexible building designs for user buildings as they do not need to install their own chillers and the associated electrical equipment;
- (c) reduced heat island effects in KTD and no noise and vibration arising from the operation of heat rejection equipment and chillers of air-conditioning plants in buildings as such equipment will no longer be necessary for buildings subscribing to district cooling services. Also, DCS can contribute to air quality improvement and the vision of achieving low carbon economy; and
- (d) a more adaptable air-conditioning system to the varying demand as compared to individual air-conditioning systems. For each individual building, cooling capacity can be increased by requesting additional cooling capacity from the DCS without carrying out extensive modification works for the building in question.

5. As reported to the Finance Committee in June 2013, on the basis of the latest development schedule of KTD, the project cost for all phases (including the remaining works under Phase III ^[1]) is estimated to be \$4,945.5 million in money-of-the-day (MOD) prices. Funding approval from LegCo has been secured for Phases I, II and IIIA of the project at an Approved Project Estimate of \$3,145.9 million in MOD prices. We plan to seek funding approval from LegCo for the remaining works under Phase III, which are estimated to be \$1,799.6 million in MOD prices, by phases in 2015 to 2017 depending on the development schedule of KTD.

¹ The scope of the remaining works under Phase III includes the installation of electrical and mechanical equipment and pipe laying for remaining KTD Packages II and III.

6. The DCS at KTD will provide services to public and private non-domestic developments in the district. All public developments in the region, which account for around 35% of the total air-conditioned floor area in KTD will subscribe to the services. To follow up on the advice of Members of the LegCo Panel on Environmental Affairs (the Panel) to require all private non-domestic projects in the KTD to subscribe to the DCS with a view to maximizing the environmental benefits of the project, we will impose a requirement for all private non-domestic projects to construct and maintain DCS substation to connect to the DCS. This requirement will be prescribed in appropriate provisions in the conditions of land sale. As a general practice for new developments on sale sites, Lands Department (LandsD) will check compliance with the positive obligations under the conditions of sale before the issuance of Certificate of Compliance, which would only be issued to the developer by LandsD upon satisfactory compliance with such positive obligations. Insofar as the DCS is concerned, LandsD will consult the Electrical and Mechanical Services Department (EMSD) to ensure that the compliance is to the satisfaction of EMSD.

7. As at end of May 2014, the cumulative expenditure of the project stood at \$1.928 billion (in MOD prices), representing 61.3% of the Approved Project Estimate. Works for Phase I were completed in early 2013, while works for Phase II were 97.9% complete and are expected to be fully completed by end of 2014. Works for Phase III (Package A) were 25.5% complete and are expected to be fully completed by end of 2017.

8. Following the completion of Phase I, district cooling services to the Kai Tak Cruise Terminal building and Ching Long Shopping Centre under the Hong Kong Housing Authority commenced in February 2013 and May 2013 respectively. District cooling services to two primary schools are expected to commence in July 2015.

CHARGING PRINCIPLES

9. All public and private non-domestic developments that use district cooling services will be required to pay DCS charges to the Government. As DCS is to provide chilled water for central air-conditioning system on a building basis, the DCS tariff will be collected from building owners of the central air-conditioning systems or their authorized agents such as building

management offices. The tariff will be collected on a monthly basis.

10. As reported to the Panel in December 2008, July 2010 and July 2012, the DCS tariff will be set at a competitive level comparable to the cost of individual WACS using cooling towers, which is one of the most cost-effective air-conditioning systems available in the international market. We also intend to recover both the capital and operating costs of the DCS from building owners or their authorized agents over the project life, which is estimated to be 30 years, as taxpayers should not subsidize such air-conditioning charges.

11. EMSD has commissioned a consultancy study to develop the charging mechanism having regard to international practices and features of the DCS at the KTD. Apart from the above principles, the proposed charging mechanism is designed towards achieving the objectives of providing price stability and a simple charging regime with common charge rates for all consumers regardless of their load profiles.

12. Non-Government Buildings using district cooling services at KTD will be charged on the basis of the charging arrangements stipulated in the District Cooling Services Bill (the “Bill”). As Government buildings using district cooling services will not be subject to the charging regime provided in the Bill, EMSD will work out with the user departments the administrative arrangements for recovering the utility costs arising from the provision of district cooling services in the form of allocation warrants. Notwithstanding this, the notional “revenue” from Government departments (which could have been received by EMSD if Government departments are to be charged for district cooling services in the same way as non-Government buildings using district cooling services at KTD) will be incorporated into the financial model for assessing the DCS’s financial performance and for calculating the appropriate tariff that can achieve full cost recovery.

LEGISLATIVE PROPOSALS

13. Since we reported to the Panel in July 2012 on the legislative framework of the proposed charging arrangements for the DCS, the Administration proceeded with the drafting of detailed provisions of the

legislation in the light of the comments and policy issues raised by Members. Our legislative proposals are set out below.

(a) Application of the Ordinance

Apart from the DCS at the KTD currently specified in the Bill, the Bill may also be amended to apply to other DCSes that may be constructed by the Government in the future as necessary.

(b) Consumers of DCS

The Bill will specify the conditions under which the Director of Electrical and Mechanical Services (DEMS) may approve a consumer. Conditions for granting approval include the giving of an undertaking by the applicant to pay all charges, fees and deposits for the services. The Bill will also specify the circumstances under which district cooling services to a building may be provided, refused, suspended or terminated. It will also provide for the mechanism for setting and revising the contract cooling capacity, based on which the capacity charge to be paid will be determined.

(c) Charges of DCS

The Bill will set out the components of DCS charges which have been drawn up with reference to international practices and were reported to the Panel in July 2012. They are –

(i) Capacity Charge

to cover the capital cost of the DCS (including the plants, pipes and heat exchangers for individual consumers of buildings) and operation and maintenance cost to be paid to contractor. It will be levied according to the contract cooling capacity (i.e. an estimation of the maximum designed cooling capacity for the building) as agreed between consumers and DEMS before provision of district cooling services;

(ii) Consumption Charge

to cover costs that vary with the actual consumption of DCS by occupiers/tenants. The major part of the charge is the cost of electricity used to provide district cooling services;

(iii) Capacity Overrun Charge

this 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; and

(iv) Surcharges for Unpaid Charges

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, the further surcharge will be 10% of the total billed and unpaid amount.

Each consumer will be required to pay deposits to cover any charge or fee that is or may be payable. In line with practices applicable to other utilities such as water supply, the amount will be twice the estimated monthly tariff which will be based on the contract cooling capacity demand as agreed between consumers and the DEMS before provision of district cooling services.

(d) Tariff adjustment

As reported to the Panel in July 2012, the capacity charge rate will be adjusted annually based on the Composite Consumer Price Index while the consumption charge rate is proposed to be adjusted annually to take into account the change in electricity tariff rate.

As the actual cost and revenue may deviate from the forecast, apart from the annual tariff adjustments to be provided in the

Bill, we will conduct tariff review at least once every five years. If the review outcome indicates that the discrepancy between the actual cost and revenue and the forecast is significant and will have a permanent impact on the cost and the revenue, the capacity charge rate stipulated in the Bill will be adjusted in the light of the review outcome by notice published in the Gazette. The Gazette notice is a piece of subsidiary legislation.

(e) Offsetting Arrangement

The Bill will provide for the offsetting arrangement for EMSD's expenses^[2]. 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 settling payment to the DCS operator or covering other expenses arising from the provision of district cooling services such as electricity costs will not form part of the general revenue and may be used for those purposes.

(f) Improvement Notice

The Bill will stipulate that DEMS may issue an improvement notice to a consumer, if the consumer's behaviour or installation is jeopardizing or will jeopardize the satisfactory operation of the DCS. It will also provide that DEMS may suspend or terminate the provision of district cooling services in case of non-payment of charges or failure to comply with the improvement notices issued by DEMS.

(g) Appeal Mechanism

Any person aggrieved by certain decisions or direction made under the Bill may lodge an appeal to an appeal board, which will be empowered to confirm, vary or revoke the decision or direction appealed against, as well as to substitute its own

² According to section 3(1) of the Public Finance Ordinance (Cap. 2), any charges received for the purposes of the Government will form part of the general revenue unless there are express statutory provisions to provide for alternative arrangements. We therefore propose to provide the off-setting arrangement in the Bill to enable EMSD to make use of the DCS charges and fees received to settle the operation and maintenance fees for the DCS operator as well as utility costs for operating the DCS plants.

decision or direction for the decision or direction appealed against. Appealable decisions and direction are: refusal to approve a person as a consumer, refusal to provide district cooling services to a building, suspension or termination of the district cooling services to a building under certain circumstances, the issue of an improvement notice and the directions contained in an improvement notice.

14. The charging formulae and the adjustment mechanisms to be stipulated in the Bill are at **Annex**.

CHARGING LEVEL

15. EMSD has commissioned a consultancy study to advise on the initial tariff and future review mechanism having regard to international practices and features of the DCS at the KTD. The opening tariff at 2012/13 ^[3] as recommended by the consultant and the charging level for 2014/15 deduced from the opening tariff are as follows –

Type of charge	Charging level ^[4]		
	Opening at 2012/13	2013/14	2014/15
Capacity Charge (\$/kilowatt per month)	102.96	107.80	112.11
Consumption Charge (\$/kilowatt-hour)	0.17	0.18	0.19

16. The proposed tariff seeks to achieve full cost (including capital and operating costs to ensure that taxpayers' money will not be used to subsidise any air-conditioning changes incurred by consumers) recovery of DCS over

³ 2012/13 is chosen as the base year as it marks the commencement of operation of the DCS.

⁴ The tariff levels for 2013/14 and 2014/15 are estimated by applying the auto-adjustment formulae set out in the Annex to this paper to the opening tariff at 2012/13. The tariff in 2014/15 is the latest available figure and will be adopted in the Bill when it is introduced to the LegCo. Should adjustment to the proposed tariff be necessary to reflect movements in Composite Consumer Price Index and electricity charges when the Bill is being scrutinized by the Bills Committee, we will propose the relevant committee stage amendments to adjust the tariff provided in the Schedule to the Bill accordingly.

its project life in 30 years at an appropriate target rate of return (i.e. the discount rate to be applied to the cash flows of the DCS project such that the present value of the DCS revenue is equal to the present value of the total costs of the DCS project over its project life of 30 years). The target rate of return has been worked out taking into account the nature of the industry; the specific project related risk; the market interest rate as well as the expected rate of return for similar investment. Having reviewed the rate of return used by the Government in financial assessment of the infrastructure projects in Hong Kong, and the allowed rate of returns in regulated infrastructure sectors in other countries, the consultant has recommended a pre-tax target rate of return of 4.94% in real terms for setting the recommended tariff.

17. In recommending the adoption of the target rate of return at 4.94% in real terms, we have also made a comparison between the costs (including capital and recurrent costs) of DCS and the costs under WACS per unit of cooling energy in order to confirm that the principle of setting the DCS tariff at a competitive level comparable to the cost of individual WACS using cooling towers is met. When drawing this comparison, it should be noted that while the Government has undertaken to apply common charging rates for all buildings regardless of their load profiles, there is no single or uniform unit cost for both the DCS and the WACS. Reasons are set out below –

- (a) different types of buildings require different designs of WACS, and hence there will be variations in the unit costs of WACS across different types of buildings; and
- (b) there are also variations in the DCS unit costs among different types of buildings. The differences are largely the result of differences in the capacity charges for different types of building as well as the hours of operation. The capacity charge varies with the maximum cooling capacity of the building and tends to be higher for buildings which require higher cooling load, and the unit cost of DCS tends to be higher if the hours of operation of the cooling service are short.

18. A comparison of the unit costs of DCS and those of WACS for public facilities, Government premises and commercial developments in KTD at the price level of 2012/13 is summarized below.

Types of Buildings (weighted average)	% of air-conditioned floor area in KTD	Unit Cost of DCS ^[5]	Unit Cost of WACS ^[6]
All Building Types	100	0.635	0.791
Government premises	24	0.714	1.053
Facilities of public bodies	12	0.489	0.621
Commercial developments (e.g. private retail and offices and hotels)	64	0.632	0.722

19. With the target rate of return of 4.94%, overall and on average, the unit cost of DCS is lower than the unit cost of an individual WACS, which is in line with the expectation that long-term energy savings would translate into a reduction in cooling costs.

PUBLIC CONSULTATION

20. We consulted various stakeholders including professional bodies, developer associations, business chambers and advisory committee from April to July 2012 on the DCS tariff charging mechanism and relevant arrangements.

⁵ The cost of DCS is equivalent to the capacity charge and consumption charge to be paid by a consumer for the use of the district cooling services. The unit cost of DCS is worked out by dividing the total annual charges paid by the consumer for a building (i.e. the capacity charge and the consumption charge) by the building's annual consumption of the cooling energy (i.e. the cooling energy, in the unit of kWh, actually used for generating chilled water to be supplied to the building) over a year.

⁶ The cost of WACS is the life-cycle cost, which is the present value of the current and future expenditures for the procurement, replacement, operation and maintenance of building materials and building services installation throughout the life span of the self-generated WACS for a particular building type in the KTD. The cost items include construction cost of plant rooms and equipment (i.e. chillers, pumps, cooling towers, transformers and low voltage switchboards) and pipework, operation cost (i.e. electricity cost, water cost and sewage cost) and maintenance cost (i.e. annual maintenance cost and maintenance staff cost). The WACS is assumed to have a project life of 20 years.

The unit cost of WACS is worked out by dividing the total discounted cash flow of the costs by the required cooling energy (i.e. the quantity of heat removed per second in the unit of kWh, actually demanded for generating chilled water to be supplied to the building).

21. The parties consulted welcomed the implementation of the DCS at KTD and did not raise any objection to the proposed charging mechanism.

LEGISLATIVE TIMETABLE

22. To prepare for the collection of charges from non-Government users which are expected to subscribe to district cooling services in July 2015, the legislation will need to be in place before the end of the 2014-15 legislative session.

ADVICE SOUGHT

23. Members are invited to comment on the above legislative proposals, and to support our plan to introduce the Bill into LegCo in the beginning of the 2014-15 legislative session.

Environment Bureau
July 2014

**District Cooling System
Charging Formulae and Rate Adjustment Formulae**

Charging Formulae

The charging formulae of capacity charge and consumption charge to be stipulated in the District Cooling Services Bill (the “Bill”) are as follows –

(a) Capacity Charge

monthly capacity charge = contract cooling capacity (kilowatt refrigeration (kW_r)) ^[1] x capacity charge rate (\$/kW_r)

(b) Consumption Charge

monthly consumption charge = measured cooling energy consumption (kilowatt-hour refrigeration (kW_rh)) x consumption charge rate (\$/kW_rh)

2. The charging formulae for capacity overrun charge, as well as surcharge and further surcharge, which will also be specified in the Bill, are set out below –

(a) Capacity Overrun Charge

monthly capacity overrun charge = (highest actual cooling capacity (kW_r) - contract cooling capacity (kW_r)) x capacity charge rate (\$/kW_r) x 1.1

¹ Contract cooling capacity is to be confirmed by the applicant prior to the approval of the applicant as a consumer of the district cooling services.

(b) Surcharge

surcharge in respect of a primary charge or fee = (the charge or fee payable as at the due date – the part of the charge or fee that has been paid, if any, as at the end of the due date) x 0.05

(c) Further Surcharge

further surcharge in respect of a primary charge, fee or surcharge = (total amount of the charge, fee or surcharge payable as at the due date – part of the charge, fee or surcharge that has been paid, if any, as at the expiry of the period of six months after the due date) x 0.1

Rate Adjustment Formulae

3. The capacity charge rate and consumption charge rate are proposed to be adjusted annually with the following formulae –

(a) Capacity Charge Rate Adjustment

$$C_{n+1} = C_n (1 + CPI_n)$$

where

C_{n+1} = Capacity Charge Rate (\$/kWr) at $(n+1)^{th}$ period

C_n = Capacity Charge Rate (\$/kWr) at n^{th} period

CPI_n = Rate of change in Composite Consumer Price Index for n^{th} period

(b) Consumption Charge Rate Adjustment

$$EC_{n+1} = EC_n (1 + ET_{n+1})$$

where

EC_{n+1} = Consumption Charge Rate (\$/kWrh) at $(n+1)^{th}$ period

EC_n = Consumption Charge Rate (\$/kWrh) at n^{th} period

ET_{n+1} = Rate of change in electricity tariff for $(n+1)^{th}$ period