For discussion **PWSC(2010-11)31**
on 19 January 2011

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 705 – CIVIL ENGINEERING
Civil Engineering – Multi-purpose
45CG - District Cooling System at the Kai Tak Development

Members are invited to recommend to Finance Committee to increase the approved project estimate of **45CG** by $190.8 million from $1,671 million to $1,861.8 million in money-of-the-day prices for implementing Phases I and II of the District Cooling System at the Kai Tak Development.

PROBLEM

The approved project estimate (APE) of **45CG** is not sufficient to cover the cost of the works under the project.

PROPOSAL

2. The Director of Electrical and Mechanical Services, with the support of the Secretary for the Environment, proposes to increase the APE of **45CG** by $190.8 million from $1,671 million to $1,861.8 million in money-of-the-day (MOD) prices for implementing Phases I and II of the project.

/3. …..

3. Subject to the progress and development programme of KTD, we will invite tenders for Phase III works in due course. Based on the outcome of such tender exercise, we will seek approval from the Public Works Subcommittee (PWSC) and Finance Committee (FC) for further increasing the APE to cover Phase III works.

PROJECT SCOPE AND NATURE

4. The scope of works under **45CG** comprises –

(a) construction of a northern chiller plant;

(b) construction of a southern underground chiller plant cum underground seawater pumphouse and above-ground operational facilities;

(c) laying of seawater intake and discharge pipelines;

(d) laying of chilled water distribution pipe networks; and

(e) provision of connection facilities (including heat exchangers) at user buildings at KTD.

A conceptual layout plan of the proposed DCS at KTD is at Enclosure 1.

5. KTD has a planned total of about 1.7 million square metres (m^2) air-conditioned floor areas in public and private developments requiring about 284 megawatt (MW) cooling capacity. The project is to construct a large scale centralized air-conditioning system which produces chilled water at its central chiller plants and distributes the chilled water to user buildings in KTD through an underground water piping network. Subject to FC's funding approval, we will commence construction works for Phase I in February 2011 for completion in December 2012. The Phase II contract is a Design, Build and Operate (DBO) contract. Phase II construction works will commence in March 2011 for completion in September 2014. Operation of DCS under the Phase II contract will commence in September 2012 for completion in March 2019, with an option to extend the operation period for eight years up to March 2027. Subject to the progress and development programme of KTD, construction works for Phase III are expected to commence in 2013-14.

/**JUSTIFICATION** …..

JUSTIFICATION

6. In June 2009, FC gave approval for upgrading **45CG** to Category A at an estimated capital cost of $1,671 million in MOD prices. Upon funding approval by FC, we invited tenders for **45CG** in July 2009. The returned tender prices for both the capital and operating costs far exceeded the original estimates.

7. In view of the abovementioned tender outcome and having reviewed the latest development plan of KTD, we had refined the work requirements of **45CG** to provide more detailed site information, and adjusted the original procurement strategy by implementing the DCS in three phases, i.e. Phases I, II and III. An outline of the scope of works under various Phases is set out at Enclosure 2. We considered that the revised phasing approach would produce more reasonable cost estimates and would also better tie in with the development plan of KTD.

8. In June and July 2010, the Administration briefed the Legislative Council (LegCo) Panel on Environmental Affairs (EA Panel) on the details of the alternative procurement strategy. The EA Panel agreed that the Administration should retender the works under **45CG** under the alternative procurement strategy. The Administration had also provided the FC and PWSC Chairmen with an update on the revised approach.

Latest Returned Tenders for Phases I and II

9. In August 2010, the Administration invited tenders for works under the first two phases. The tenders for Phases I and II were returned on 24 September 2010 and 5 November 2010 respectively. Based on the returned tenders, we estimate the capital cost of Phases I and II to be $1,861.8 million in MOD prices.

10. Phase III will cover the works contracts for the installation of additional electrical and mechanical equipment and laying of chilled water distribution pipes to serve KTD Packages 2 and 3[1] users. In view of the

/returned …..

[1] The latest development programme of KTD is broadly grouped into three packages with reference to their scheduled completion dates, as follows –

(a) Package 1 – scheduled for completion in 2013, including mainly the Cruise Terminal and non-domestic areas of a public housing estate;

(b) Packages 2 and 3 – scheduled for completion in 2016 and thereafter, including Tourism Node, hotels, Kai Tak Government Offices, private commercial and residential developments etc.

returned tenders of Phases I and II, we estimate that Phase III would cost $1,784.5 million in MOD prices. However, given the scale of KTD, there may be adjustments to the design and implementation schedule of various projects, which may vary the cost of works under Phase III. The commencement of tender and works under this phase will match with the implementation timetables for projects under KTD Packages 2 and 3.

Current Project Estimate

11. The estimated cost of Phases I and II is $1,861.8 million in MOD prices, which exceeds the APE for the whole DCS project by $190.8 million. Together with the estimated cost of $1,784.5 million in MOD prices for Phase III, the current estimated total project cost is about $3,646.3 million in MOD prices, which exceeds the APE by about $1,975.3 million. The significant increase in the estimated project cost is due to the following -

(a) the latest market price trend for major material, electrical and mechanical equipment and construction works which are specifically adopted for DCS, such as large diameter thermal insulated underground chilled water pipes and accessories, high voltage high capacity air-conditioning chillers and construction of deep underground building structures near the seafront;

(b) cost of additional works made necessary by project design development and changes in construction requirements such as additional structural reinforcement works for the underground plant rooms to allow for future ground developments which have not been allowed for in the original estimate;

(c) unexpected site constraints such as additional interfacing between the underground DCS pipes and other existing underground facilities at KTD requiring deeper excavation for DCS pipes laying and additional pipe jacking below utilities; and

(d) higher provision of price adjustment as a result of the increase in the overall project estimate and latest price adjustment factors.

/Reduction …..

Reduction in Costs Brought by the Alternative Procurement Strategy

12. Compared to the original procurement strategy, under which the project is covered under a single DBO contract spanning over 17 years, the alternative procurement strategy can better cater for changes in the development schedule of KTD such that greater flexibility and improved adjustments can be achieved. This strategy also minimizes unnecessary idling of early investment in pipe layings and electrical and mechanical equipment installations. Moreover, this strategy reduces the high risk premium over the extended project period and alleviates tenderers' concerns over the adequacy of provisions for price adjustments in the single contract arrangement under the original procurement strategy. In fact, comparing the results of the tenders for Phase I and Phase II against the result of the original tender exercise carried out in late 2009, we estimate that the alternative procurement strategy has rendered a reduction in capital cost by $164.7 million[2] and a significant reduction in the operating cost by $284 million for the operation period of the DCS from 2012-13 to 2026-27.

Need for DCS

13. Implementation of a DCS in the KTD will bring about significant environmental benefits. Given its high energy efficiency (35% more energy-efficient than traditional air-cooled air-conditioning system), the maximum annual saving in electricity consumption will be 85 million kilowatt-hour (kWh), with a corresponding reduction of 59 500 tonnes of carbon dioxide emission per annum for the planned total public and private non-domestic air-conditioned floor area of about 1.7 million m^2. As such, DCS can contribute to air quality improvement and the vision of achieving low carbon economy.

14. From the perspective of individual users, the DCS would bring about the following benefits -

/(a) …..

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[2] According to the results of the original tender, the estimated cost of the project (i.e. Phase I, II and III) was $3,420 million in MOD prices. By adding the costs of works due to project design development and changes in construction requirements (i.e. $115 million in MOD prices), and with reference to the about 7% increase in the Building Works Tender Price Index of Architectural Services Department between the 3rd quarter of 2009 and the 3rd quarter of 2010, the estimated project cost under the original procurement strategy would be $3,811 million in MOD prices. Under the alternative procurement strategy, the estimated project cost is $3,646.3 million in MOD prices, hence, there is a saving by $164.7 million in MOD prices.

(a) reduction in upfront capital cost for installing chiller plants at their buildings, the reduction is estimated to be about 5 – 10% of the total building cost;

(b) user buildings do not need to install their own chillers and the associated electrical equipment thus allowing more flexible building designs;

(c) the DCS is more adaptable than individual air-conditioning system to the varying demand for air-conditioning; and

(d) the service quality and reliability will be overseen by the Electrical and Mechanical Services Department (EMSD).

15. For the environment of the whole KTD, noise and vibration arising from the operation of heat rejection equipment and chillers of air-conditioning plants in buildings can be reduced as there will not be any need for such equipment for buildings subscribing to DCS.

16. DCS is one of KTD's major infrastructural facilities supporting the planning vision of a green web for sustainable development. There are strong public expectations that KTD is to become a green zone at the centre of Victoria Harbour. Various environmentally friendly initiatives will be introduced and adopted in the design of KTD thereby providing tangible benefits to the environment. The Cruise Terminal (CT) building, which is amongst the first batch and most prominent public projects being developed at KTD, has been designed on the basis that DCS will be available for air-conditioning services.

Urgency of Implementing Phases I and II

17. In order to meet the development schedules of the earliest projects in KTD, including the CT and shopping arcade of the public housing estate, which have been designed on the basis that DCS will be available to provide air-conditioning services, we need to urgently proceed with relevant works in order to meet with the development schedules of various projects in KTD.

18. The pipe laying works under Phase I will have to match the ongoing roadwork construction programme in North Apron to avoid delay in the roadwork construction programme or the need of re-opening the newly completed road.

/**FINANCIAL** …..

FINANCIAL IMPLICATIONS

19. We estimate the capital cost of the proposed works of Phases I and II to be $1,861.8 million in MOD prices (please see paragraph 20 below), broken down as follows –

		$ million	
(a)	DCS plants		
	(i) civil works	897.0	
	(ii) electrical and mechanical works	278.8	
(b)	Mains laying	410.4	
(c)	Connection facilities at user buildings	8.7	
(d)	Environmental mitigation measures	3.3	
(e)	Consultants' fee for contract administration	9.0	
(f)	Resident site staff costs	16.0	
(g)	Contingencies	71.4	
	Sub-total	1,694.6	(in September 2010 prices)
(h)	Provision for price adjustment	167.2	
	Total	1,861.8	(in MOD prices)

A detailed breakdown of the estimates for the consultant's fees and resident site staff costs by man-months is at Enclosure 3.

20. Subject to approval, we will phase the expenditure of Phase I and Phase II works as follows –

/**Year** …..

Year	$ million (Sept 2010)	Price adjustment factor	$ million (MOD)
2010-2011	14.0	1	14.0
2011-2012	404.6	1.04250	421.8
2012-2013	831.1	1.09463	909.7
2013-2014	359.4	1.14936	413.1
2014-2015	85.5	1.20682	103.2
	1,694.6		1,861.8

The cash flow and provision for price adjustments under all three phases of the project are set out in Enclosure 4. Comparison of the cost breakdown of the APE and the latest project estimate (PE) for Phases I and II is at Enclosure 5.

21. We have derived the MOD estimates on the basis of the Government's latest set of assumptions on the trend rate of change in the prices of public sector building and construction output for the period 2010 to 2015. The contracts will provide adjustments for price fluctuation.

22. We estimate that the annual recurrent cost arising from this project will increase from about $16.9 million in the initial operation year of 2012-13 to about $358.8 million by 2026-27 assuming a 100% subscription rate. The estimated annual recurrent costs based on the assumed subscription rate of 100% are at Enclosure 6. Subject to LegCo's approval of the relevant legislation, the recurrent costs arising from the proposal, including the service fee payment to the contractor and other operating costs, will be offset by the DCS tariff charges to users.

Subscription Rate

23. Our policy intention is to recover both the capital and operating costs from users over the project life which is estimated to be 30 years. The non-domestic areas of all public projects in KTD are mandated to subscribe to DCS service. These projects will account for up to 35% of the total air-conditioned floor area in KTD.

/24. …..

24. When we sought PWSC/FC's approval for upgrading **45CG** to Category A in June 2009 (PWSC(2009-10)24 refers), we proposed that the connection to the proposed DCS for private non-domestic developments would be on a voluntary basis. With a view to increasing the subscription rate and maximizing environmental benefit of the project, Members of the EA Panel suggested in July 2010 that all private non-domestic projects in the KTD should be obliged to subscribe to the DCS service.

25. The Government has actively explored the feasibility of the above suggestion and considered it a viable way of implementation to prescribe such a requirement to connect to the DCS in appropriate provisions in the land lease conditions. As a general practice for new developments on sale sites, Lands Department (LandsD) will check compliance with the land lease conditions before the issuance of Certificate of Compliance (CC)[3], which would only be issued to the developer by LandsD upon satisfactory compliance with the lease conditions. Insofar as the DCS is concerned, LandsD will invite EMSD's advice to ensure the compliance is to the satisfaction of EMSD. The proposal, as confirmed with the Department of Justice, is legally in order.

26. According to our latest review, if all air-conditioned floor area of private non-domestic projects in the KTD uses the DCS service, the DCS is expected to break even within 25[4] years.

27. If the private non-domestic projects in the KTD might opt for subscription to the DCS service, taking into account the estimated capital and operating cost and assuming that the tariff could be adjusted annually in the same pace with the price level changes of recurrent expenditure, DCS is expected to break even within its service life (30 years) with an overall subscription rate of about 73%. Apart from the public projects which are mandated to subscribe to DCS service, it means that subscription from about 58% of the air-conditioned floor area of private non-domestic developments in KTD would be required.

/28. …..

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[3] A CC is issued to the grantee/buyer after all the positive obligations imposed under the General and Special Conditions of the land grant documents have been complied with to the satisfaction of the Director of Lands or other authorities as prescribed.

[4] Our sensitivity analysis indicates that if the total project cost increases by 10%, 20% and 25%, the project will break even within 26, 29 and 30 years respectively. On the other hand, if the revenue reduces by 5%, 10% and 14%, the project will break even within 26, 28 and 30 years respectively. All calculations are counted from 2010-11, based on a 100% subscription rate for connection to DCS at KTD.

28. Despite the competitiveness of DCS over other forms of air-conditioning systems, whether the project would be financially viable is still subject to a number of uncertain factors. These factors include the actual capital and recurrent costs, the evolving development schedule of KTD, the changes in tariff levels of DCS and cost of cooling using other forms of air-conditioning system, in particular the water-cooled air-conditioning system.

Tariff Rate

29. The tariff for the use of district cooling services would be set at a competitive level comparable to the cost of individual water-cooled air-conditioning systems using cooling towers, which is one of the most cost-effective air-conditioning systems available in the market. We will introduce legislation for the Government to charge tariff for the DCS services.

PUBLIC CONSULTATION

30. We consulted the EA Panel on the proposed increase of APE for implementing Phases I and II on 20 December 2010. Members had no objection to the submission of the proposal to PWSC/FC for consideration.

31. Regarding the proposal in paragraph 25 to require private non-domestic projects in KTD to connect to the DCS by way of appropriate provisions in the land lease conditions, the Government has started to gauge views from relevant stakeholders. We consulted the Lands Sub-Committee of the Land and Development Advisory Committee on 14 December 2010. Members of the Sub-Committee, including representatives from the Real Estate Developers Association of Hong Kong and professional bodies (e.g. the Hong Kong Institution of Engineers, the Hong Kong Institute of Surveyors, the Hong Kong Institute of Planners, the Hong Kong Institute of Architects, the Hong Kong Institute of Landscape Architects etc.), did not object to the proposed requirement in land lease. They provided valuable views on the detailed arrangements, for example, the service and stability of DCS and the tariff issues. In implementing the relevant arrangements, we will seek to incorporate their views as far as possible.

/ENVIRONMENTAL …..

ENVIRONMENTAL IMPLICATIONS

32. The environmental implications of **45CG** have been set out in the submission for upgrading **45CG** to Category A in June 2009 (PWSC(2009-10)24 refers). The proposed increase in APE for implementing Phases I and II does not have any additional environmental impact.

ENERGY CONSERVATION MEASURES

33. The energy conservation measures of **45CG** have been set out in the submission for upgrading **45CG** to Category A in June 2009 (PWSC(2009-10)24 refers).

HERITAGE IMPLICATIONS

34. The heritage implications of **45CG** have been set out in the submission for upgrading **45CG** to Category A in June 2009 (PWSC(2009-10)24 refers). The proposed increase in APE for implementing Phases I and II will not have any heritage impact.

LAND ACQUISITION

35. The proposed works do not require any land acquisition.

BACKGROUND INFORMATION

36. In June 2009, FC approved the upgrading of **45CG** to Category A at an estimated cost of $1,671 million in MOD prices.

37. A DCS is a large scale centralized air-conditioning system. It produces chilled water at the central chiller plants and distributes the chilled water to user buildings for air-conditioning purpose. It 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 using cooling towers respectively. The DCS technology has been widely adopted around the world. Examples of DCSes in overseas countries are at Enclosure 7.

/38. …..

38. The impact of the project on trees in the project boundary has been set out in the submission for upgrading **45CG** to Category A in June 2009 (PWSC(2009-10)24 refers).

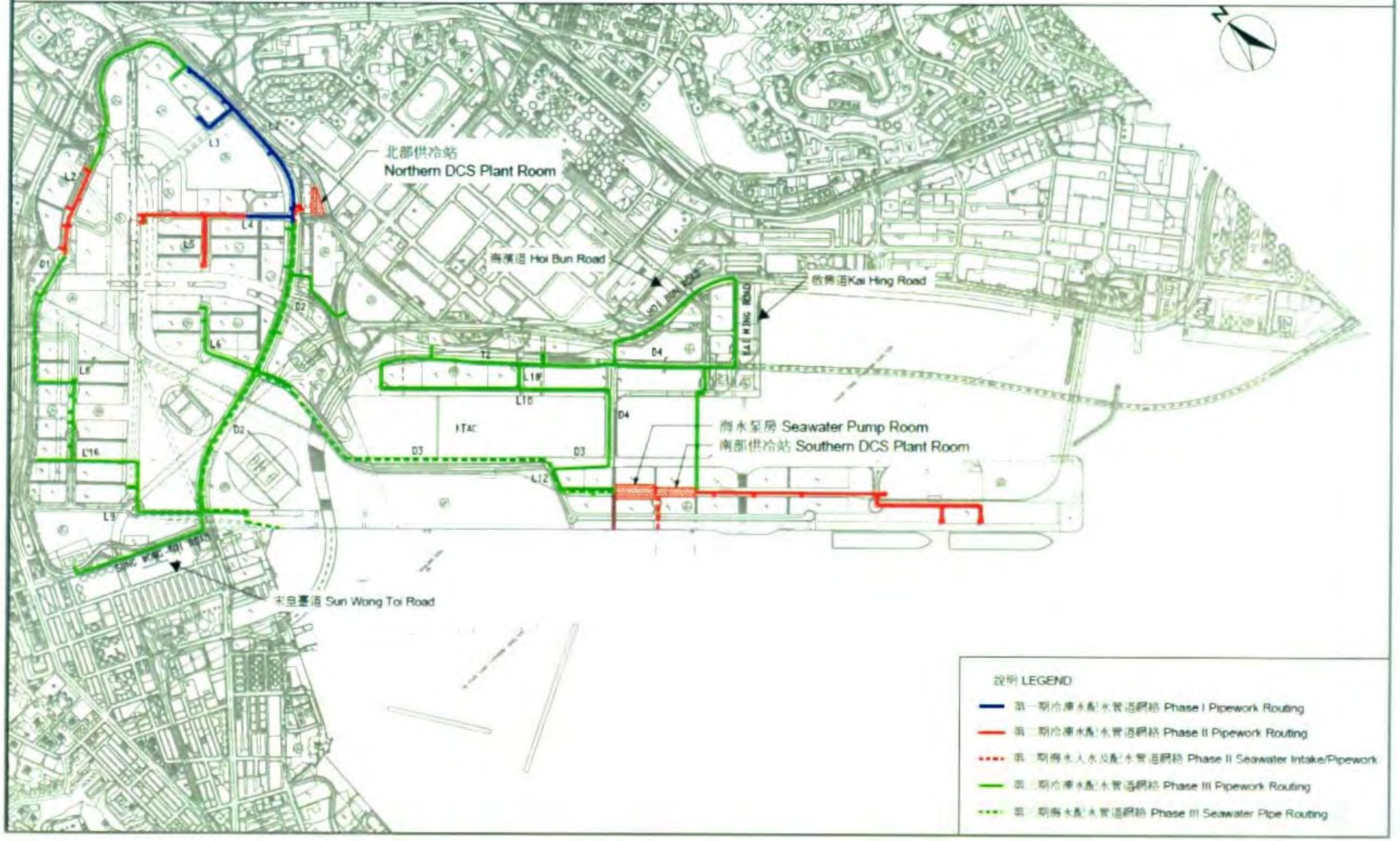
39. We estimate that the proposed works for Phases I and II will create about 1 035 jobs (835 labourers and another 200 professional/technical staff) providing a total employment of 30 600 man-months.

Environment Bureau
January 2011

附件 1 **Enclosure 1 to PWSC(2010-11)31**

5045 CG 啟德發展計劃區域供冷系統
5045 CG DISTRICT COOLING SYSTEM AT KAI TAK DEVELOPMENT

啟德發展計劃區域供冷系統概念設計圖
District Cooling System at the Kai Tak Development Conceptual Layout Plan



Enclosure 2 to PWSC(2010-11)31

Alternative Procurement Strategy
Scope of Works under Various Phases

Phases	Construction Period	Scope of Works	Operation Service
Phase I – Works contract for the pipe laying works for part of KTD Package 1	2010-11 to 2012-13	• Pipe laying from northern chiller plant room for provision of chilled water to public housing estate project etc. to meet the roadwork programme in the North Apron	
Phase II – DCS core services under DBO arrangement	2011-12 to 2014-15	• Design for the whole DCS • Building and engineering works, the northern chiller plant room , southern underground chiller plant room and the seawater pumphouse • Laying of chilled water distribution pipes not covered in Phase I for Package 1 users • E&M equipment for KTD Package 1 users	• Operation of DCS from 2012-13 up to 2018-19, and possibly up to 2026-27 (for users of all packages) assuming extension of operation contract
Phase III – E&M installation and pipe	2013-14 to 2020-21	• Laying works of chilled water distribution pipes for KTD Packages 2 and 3 users	

Phases	Construction Period	Scope of Works	Operation Service
laying for KTD Packages 2 and 3 users	(Note)	• Provision of E&M equipment for KTD Packages 2 and 3 users	

Note – Commencement date of the works under Phase III will match with the implementation timetables for projects under KTD Packages 2 and 3.

45CG - District Cooling System at the Kai Tak Development

Breakdown of the estimates for consultants' fees and resident site staff costs for Phases I and II (in September 2010 prices)

			Estimated man-months	Average MPS* salary point	Multiplier (Note 1)	Estimated fee ($million)
(i)	Consultants' fees for					
	(a) Construction supervision and contract administration	Professional	57	38	2.0	6.6
		Technical	55	14	2.0	2.2
	(b) EM&A programme	Professional	1	38	2.0	0.1
		Technical	3	14	2.0	0.1
(ii)	Resident site staff costs (Note 2)	Professional	79	38	1.6	7.4
		Technical	269	14	1.6	8.6
				Total		25.0

*** MPS = Master Pay Scale**

Notes

1. A multiplier of 2.0 is applied to the average MPS point to estimate the cost of staff to be employed in the consultants' offices. A multiplier of 1.6 is applied to the average MPS point to estimate the cost of resident site staff supplied by the consultants. (As at now, MPS pt.38 = $58,195 per month, and MPS pt.14 = $19,945 per month.)

2. The actual man-months and actual costs will only be known after the completion of the construction works.

Enclosure 4 to PWSC(2010-11)31

45CG – District Cooling System at Kai Tak Development

Table 1 – Cash flow and provision for price adjustment for the project in PWSC(2009-10)24

Year	Original project estimate (PE) ($ million in September 2008 prices) X	Original price adjustment Factors Y	Approved PE ($ million, in MOD prices) Z	Provision for price adjustment ($ million) A = Z – X
2010 - 2011	75.0	1.05570	79.2	4.2
2011 - 2012	119.0	1.07681	128.1	9.1
2012 - 2013	194.0	1.09835	213.1	19.1
2013 - 2014	234.0	1.12032	262.2	28.2
2014 - 2015	168.0	1.15113	193.4	25.4
2015 - 2016	113.0	1.18566	134.0	21.0
2016 - 2017	99.0	1.22123	120.9	21.9
2017 - 2018	83.0	1.25787	104.4	21.4
2018 - 2019	76.0	1.29560	98.5	22.5
2019 - 2020	75.0	1.33447	100.1	25.1
2020 - 2021	65.0	1.37450	89.3	24.3
2021 - 2022	47.0	1.41574	66.5	19.5
2022 - 2023	27.0	1.45821	39.4	12.4
2023 - 2024	12.0	1.50196	18.0	6.0
2024 - 2025	6.0	1.54702	9.3	3.3
2025 - 2026	5.0	1.59343	8.0	3.0
2026 - 2027	4.0	1.64123	6.6	2.6
Total	**1,402.0**		**1,671.0**	**269.0**

Note: Price adjustment factors adopted in May 2009 were based on the then Government's latest assumptions on the trend rate of change in the prices of public sector building and construction output for the period 2010 to 2027.

Table 2a – Latest cash flow and provision for price adjustment for Phases I and II

Year	Latest PE ($ million in Sept 2008 prices) (a)	Latest PE ($ million in Sept 2010 prices) (b)	Latest price adjustment factors (Sept 2010)* (c)	Latest PE ($ million in MOD prices) (d)	Latest provision for price adjustment ($ million) (e)	Net change in provision for price adjustment (f)
2010 - 2011	13.1	14.0	1	14.0		
2011 - 2012	378.6	404.6	1.04250	421.8		
2012 - 2013	777.6	831.1	1.09463	909.7	**(e)=(d)-(a)**	**(f)=(e)-A [in Table 1]**
2013 - 2014	336.3	359.4	1.14936	413.1		
2014 - 2015	80.0	85.5	1.20682	103.2		
Total	**1,585.6**	**1,694.6**		**1,861.8**	**276.2**	**7.2**

Table 2b – Latest cash flow and provision for price adjustment for all Phases

Year	Latest PE ($ million in Sept 2008 prices) (a)	Latest PE ($ million in Sept 2010 prices) (b)	Latest price adjustment factors (Sept 2010)* (c)	Latest PE ($ million in MOD prices) (d)	Latest provision for price adjustment ($ million) (e)	Net change in provision for price adjustment (f)
2010 – 2011	13.1	14.0	1	14.0		
2011 – 2012	378.6	404.6	1.04250	421.8		
2012 – 2013	777.6	831.1	1.09463	909.7		
2013 – 2014	724.2	774.0	1.14936	889.6		
2014 – 2015	394.4	421.5	1.20682	508.7		
2015 – 2016	83.8	89.6	1.27169	113.9		
2016 – 2017	94.1	100.6	1.34163	135.0	**(e)=(d)-(a)**	**(f)=(e)-A [in Table 1]**
2017 – 2018	101.6	108.6	1.41542	153.7		
2018 – 2019	103.9[#]	111.1[#]	1.49327	165.9[#]		
2019 – 2020	68.7	73.4	1.57540	115.6		
2020 – 2021	64.1	68.5	1.66205	113.9		
2021 – 2022	55.8	59.6	1.75346	104.5		
Total	**2,859.9**	**3,056.6**		**3,646.3**	**786.4**	**517.4**

Note: The latest PE in September 2008 prices is multiplied by 1.06877 for conversion to September 2010 prices. The figure of 1.06877 represents the changes in price movement for public sector building and construction output between September 2008 and September 2010.

* Price adjustment factors adopted in October 2010 are based on the latest movement of prices for public sector building and construction output, which are assumed to increase by 2% per annum in 2010, by 5% per annum from 2011 to 2014, and by 5.5% per annum from 2015 to 2027.

For 2018-19, the latest PE in September 2008, September 2010 and MOD prices are about $103.94 million, $111.09 million, and $165.89 million before rounding up respectively.

Enclosure 5 to PWSC(2010-11)31

45CG – District Cooling System at Kai Tak Development

Comparison between existing APE and the latest project estimate for Phases I & II

A comparison of the existing APE and the latest project estimate for Phases I and II is as follows –

		(A) Existing APE for whole project ($ million)	(B) Latest Project Estimate for Phases I & II ($ million)	(B) – (A) Difference ($ million)
(a)	DCS plants			
	(i) civil works	422.0	897.0	475.0
	(ii) electrical and mechanical (E&M) works	464.0	278.8	(185.2)
(b)	Mains laying	279.0	410.4	131.4
(c)	Connection facilities at user buildings	54.0	8.7	(45.3)
(d)	Environmental mitigation measures	10.0	3.3	(6.7)
(e)	Consultants' fee for contract administration	9.0	9.0	0
(f)	Resident site staff costs	41.0	16.0	(25.0)
(g)	Contingencies	123.0	71.4	(51.6)
(h)	Provision for price adjustment	269.0	167.2	(101.8)
	Total	1,671.0	1,861.8	190.8

2. **As regards item (a)(i) (DCS plants – civil works)**, the increase of $475 million takes into account the latest market price trend for construction works which are specifically required for the project such as construction of deep underground building structures near the seafront, as reflected in the tender return for Phase II works. Also, the increase has taken into account additional works that are necessary to suit the latest project design development and changes in construction requirements such as additional structural reinforcement works for the underground plant rooms to allow for future ground developments which have not been allowed for in the original estimate.

3. **As regards item (a)(ii) (DCS plants – E&M equipment)**, the $185.2 million originally included in the existing APE will form part of the cost estimate for DCS Phase III works. The latest market price trend for E&M equipment which is specifically adopted for DCS, such as high voltage high capacity chillers, as reflected in the tender return for Phase II works has been taken into account.

4. **As regards item (b) (mains laying)**, the increase of $131.4 million takes into account the latest market price trend for major materials which are specifically adopted for DCS (such as large diameter thermal insulated underground chilled water pipes and accessories) and unexpected site constraints (such as additional interfacing issues between the underground DCS pipes and other underground facilities at KTD requiring deeper excavation for DCS pipes laying and additional pipe jacking below utilities) as reflected in the tender return for Phase I and II works.

5. **As regards item (c) (connection facilities at user buildings)**, the $45.3 million originally included in the existing APE will form part of the cost estimate for DCS Phase III works. The latest market price trend for E&M equipment which is specifically adopted for DCS , such as heat exchangers, as reflected in the tender return of Phase II works has been taken into account.

6. **As regards item (d) (environmental mitigation measures)**, the $6.7 million originally included in the existing APE will form part of the cost estimate for environmental mitigation measures for DCS Phase III works. The latest market price trend for environmental mitigation measures which are specifically adopted for DCS, such as water, noise and air pollution controls as reflected in the tender return of Phase I and II works has been taken into account.

7. **As regards item (f) (resident site staff costs)**, the $25 million originally included in the existing APE will form part of the cost estimate for resident site staff for DCS Phase III works. The latest market price trend for resident site staff as reflected in the tender return of Phase I and II works has been taken into account.

8. **As regards item (g) (contingencies)**, the $51.6 million originally included in the existing APE will form part of the cost estimate for contingency for DCS Phase III works.

9. **As regards item (h) (provision for price adjustment)**, the $101.8 million originally included in the existing APE will form part of the provision for price adjustment for DCS Phase III works.

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45CG - District Cooling System at the Kai Tak Development

Estimated recurrent costs on the assumed subscription rate of 100% (in MOD prices)

Year	Estimated recurrent costs* $ million (in MOD prices)
2012-2013	16.9
2013-2014	46.8
2014-2015	53.0
2015-2016	64.0
2016-2017	103.1
2017-2018	129.3
2018-2019	136.6
2019-2020	144.9
2020-2021	152.9
2021-2022	179.0
2022-2023	287.2
2023-2024	305.6
2024-2025	322.4
2025-2026	340.1
2026-2027	358.8

* The estimated recurrent costs cover the service fee for the repairs, maintenance and management of the DCS plants operated by the DCS operator, and the operating costs for the electricity and other utility charges such as water for the operation of the DCS plants. Price adjustment factors adopted for converting recurrent costs in September 2010 prices to MOD prices are based on the latest movement of prices for public sector building and construction output, which are assumed to increase by 2% per annum in 2010, by 5% per annum from 2011 to 2014, and by 5.5% per annum from 2015 to 2027.

45CG – District Cooling System at Kai Tak Development

District cooling systems in overseas countries

DCS is a popular air-conditioning system which has been widely adopted in overseas countries. Some prominent examples are set out below for reference (figures in brackets refer to their cooling capacities) -

(a) United States of America
- Boston (366MW);
- Chicago Downtown (349MW);
- New York International Business Centre (172MW);
- the Pentagon (132 MW);
- Denver Airport (42MW);
- Cleveland, Ohio (35 MW); and
- New York Kennedy Airport (35MW)

(b) Canada
- City of Toronto Downtown (263 MW); and
- City of Windsor (18 MW);

(c) Japan
- Yokohama MM21 (301 MW);
- Tokyo Marounouchi (232 MW);
- Tokyo Shinjuku Kabukicho Area (207 MW);
- Osaka Airport (90 MW);
- Tokyo Arfino (89 MW);
- Tokyo Nishi-Shinjuku 1-chome Area (44 MW); and
- Osaka Senri New Town (69.6 MW);

(d) United Kingdom
- Heathrow Airport (28 MW);
- Channel Tunnel of Shakespeare Cliff Lower (28 MW); and
- City of London (12 MW);

(e) France
- La Defense Business District (243 MW);
- City Centre of Paris (92 MW);
- Monaco (36 MW); and
- Bordeaux Airport (24 MW).