Legislative Council Panel on Transport

Supplementary Information on
Replacement of Tunnel Systems and Equipment

PURPOSE

At the Panel meeting held on 30 March 2001, Members noted from the paper on "Replacement of Tunnel Systems and Equipment" the Administration's four proposals to replace the tunnel systems and equipment for three Government tunnels. Except for the proposal to replace the traffic control and surveillance system of Lion Rock Tunnel, Members in general supported the other three proposals but requested for further details. This paper provides Members with supplementary information on the three proposals, namely the tunnel power supply system in Lion Rock Tunnel; the field equipment of toll collection system in Cross-Harbour Tunnel and the ventilation system in Aberdeen Tunnel. We shall separately provide Members with supplementary formation on the traffic control and surveillance system of Lion Rock Tunnel once we have completed local consultation as suggested by Members.

BACKGROUND

Replacement of high voltage switchboards, transformers and low voltage system of the tunnel power supply system in Lion Rock Tunnel

2. Installed for over 22 years, the high voltage switchboards, transformers and low voltage system are the core components of the tunnel power supply system. Power supply from the power company is transmitted through this equipment to all tunnel equipment such as tunnel luminaries, ventilation system, toll system and other equipment required for tunnel operation. The equipment performs the switching and stepping down of voltage of the electricity supply of the tunnel and protects

electrical and electronic equipment of the tunnel from faults of the power supply system. Electricity for the tunnel is supplied by the power company via the high voltage switchboards to the transformers and subsequently the low voltage switchboards, to which individual electrical and electronic equipment of the tunnel is finally connected.

Replacement of field equipment of toll collection system in Cross-Harbour Tunnel

3. Installed in 1987, the field equipment of the toll collection system includes traffic control equipment, vehicle detection equipment, vehicle classification equipment and toll registration equipment. All these equipment are under the control of the toll lane processors. The toll registration details are fed by the toll lane processors to the toll central computer system for real-time monitoring and generation of toll collection reports. The toll central computer system was replaced in 1999 for Y2K compliance.

Replacement of ventilation control panels, exhaust fans, motors and flexible connectors in Aberdeen Tunnel

4. Installed in 1982, the ventilation control panels, exhaust fans, motors and flexible connectors in Aberdeen Tunnel are for maintaining air freshness inside the tunnel tubes during normal operation of the tunnel. In case of fire, they are used for smoke extraction. Upon detecting a fire, the tunnel controller will turn on the fire mode of the ventilation system through the ventilation control panels. The exhaust fans will start to direct smoke away from the affected tunnel tube, thereby creating a smoke free zone for facilitating evacuation and rescue. The system should be able to operate under sustained high temperature.

5. The above systems and equipment have been in use for many years. While they are subject to regular maintenance or enhancement and are rendering smooth tunnel operations, many of them are reaching the end of their serviceable life and are beyond economical repair. Some spare parts have become obsolete due to technological advancement over the years. The current maintenance costs for each of the three existing systems as compared to the estimated maintenance

costs for the new systems are given at the Annex. On the basis of the current state of the three systems, the maintenance costs would be between 33% and 42% higher if the existing systems are to be kept in satisfactory conditions. The maintenance costs for the old systems will become substantially higher when more and more items to be replaced become obsolete and have to be specially ordered from the suppliers.

FINANCIAL IMPLICATIONS

Replacement of high voltage switchboards, transformers and low voltage system of the tunnel power supply system in Lion Rock Tunnel

6. We estimate the capital cost of the project to be $26.6 million, made up as follows –

			$ million
(a)	Replacement of high voltage switchboards, transformers and low voltage system		20.2
	(i) 4 high voltage switchboards	10.0	
	(ii) 4 transformers	3.0	
	(iii) 4 low voltage switchboards	2.8	
	(iv) high voltage cables	2.0	
	(v) low voltage cables	0.8	
	(vi) cable tray and other mounting accessories	0.2	
	(vii) distribution boards	1.3	
	(viii) protection analysis on protection relays	0.1	
(b)	Builder's work (for building of two new switch rooms)		2.2
(c)	Electrical and Mechanical Services Trading Fund (EMSTF) project management charges		2.0
(d)	Contingency (10% of (a) to (b))		2.2
	Total		**26.6**

7. As regards paragraph 6(a), the cost of $20.2 million is for the dismantling and removal of the existing high voltage switchboards, transformers and low voltage system, the supply, installation, testing and commissioning of a new replacement system comprising high and low voltage switchboards, transformers, distribution boards and the associated cabling works.

8. As regards paragraph 6(b), the cost of $2.2 million is for the civil works on building of two new switch rooms for the high voltage switchboards of the power supply company. At present, the incomer switchboards of the power supply company (for supplying incoming electrical power to the Lion Rock Tunnel) and the high voltage switchboards of the tunnel are housed inside the same compartment in the switch room at each end of the tunnel. For safety reason, this arrangement is undesirable and we take the opportunity to build two new switch rooms, one at each end of the tunnel, to separately house the high voltage switchboards of the power supply company.

9. As regards paragraph 6(c), the cost of $2.0 million is for paying the EMSTF engineering consultancy services.

Replacement of field equipment of toll collection system in Cross-Harbour Tunnel

10. We estimate the capital cost of the project to be $19.8 million, made up as follows –

		$ million
(a)	Replacement of the toll booth equipment for 14 toll lanes	5.4
(b)	Replacement of the toll lane equipment for 14 toll lanes	7.5
(c)	Replacement of other ancillary toll collection field equipment	2.8
(d)	EMSTF project management charges	2.5

(e)	Contingency (10% of (a) to (c))	1.6
	Total	19.8

11. As regards paragraph 10(a), the cost of $5.4 million is for replacing the toll booth equipment for 14 toll lanes, including the toll lane processors for control and monitoring of all field equipment, the toll collector consoles, the card readers for access control, the intercoms and the interfacing devices with Autotoll System at the autotoll lanes.

12. As regards paragraph 10(b), the cost of $7.5 million is for replacing the toll lane equipment for 14 toll lanes, including the toll lane status signals, the manual barriers, the classification signs, the vehicle detectors and axle counters, the toll paid signs, traffic lights as well as the security switches and beacons.

13. As regards paragraph 10(c), the cost of $2.8 million is for replacing other ancillary field equipment of the toll collection system. This includes the toll supervisor console, the communication network between the toll lane processors and the toll central computer, and the uninterruptible power supply for the toll collection system.

14. Paragraphs 10(a) to (c) cover the supply, installation, testing and commissioning of the above new replacement systems and equipment.

15. As regards paragraph 10(d), the cost of $2.5 million is for paying the engineering consultancy services provided by EMSTF.

Replacement of ventilation control panels, exhaust fans, motors and flexible connectors in Aberdeen Tunnel

16. We estimate the capital cost of the project to be $13.7 million, made up as follows -

		$ million
(a)	Replacement of four ventilation fans (including motors)	6.5
(b)	Replacement of flexible connectors for the ventilation fans	0.9
(c)	Replacement of four control panels for the ventilation system and the associated work	2.4
(d)	Builders' works and associated civil works	1.5
(e)	EMSTF project management charges	1.3
(f)	Contingency (10% of (a) to (d))	1.1
	Total	**13.7**

17. As regards paragraph 16(a) to (c), the cost of $9.8 million is for the supply, installation, testing and commissioning of four new ventilation fans (including motors and flexible connectors) and four new control panels for the ventilation system as well as the associated electrical works such as wiring.

18. As regards paragraph 16(d), the cost of $1.5 million covers the builders' works and the associated civil works required for this replacement project, which include the demolition and rebuilding of the concrete fence for the fan room outlets, and the modification of the structural base for accommodating the equipment.

19. As regards paragraph 16(e), the cost of $1.3 million is for paying the EMSTF engineering consultancy services.

20. EMSTF will oversee the above three projects which includes feasibility study, definition of requirements, preparation of project programme and estimates, design, tendering, site inspection, supervision of installation and testing, as well as monitoring defect rectification during the defect liability period. We consider the fees charged by EMSTF to be reasonable when compared to fees charged by consultancy firms in the private sector for projects of a similar nature.

21. There will be no additional recurrent expenditure for the above three systems and equipment in Lion Rock, Cross-Harbour and Aberdeen Tunnels as the operation and maintenance costs of the replaced systems and equipment will be met by the contractors managing the tunnels.

THE WAY FORWARD

22. We will seek the approval of the Finance Committee on 27 April 2001 on funding for implementation of three projects.

Transport Bureau
April 2001

Annex

Maintenance cost of tunnel systems and equipment

	Annual Maintenance Cost	
	New System	Old System**
LRT project	$0.78M	$1.09M
CHT project	$0.30M	$0.40M
ABT project	$0.43M	$0.61M

Remark:

** The maintenance cost for the old systems will vary with the parts to be replaced. Where the items to be replaced have become obsolete, the maintenance cost will be substantially higher.

LRT Project - tunnel power supply system in Lion Rock Tunnel

CHT Project - field equipment of toll collection system in Cross-Harbour Tunnel

ABT Project - ventilation system in Aberdeen Tunnel