Legislative Council Panel on Transport

Replacement of Tunnel Systems and Equipment

PURPOSE

This paper seeks Members' views on the Administration's proposal to replace the tunnel systems and equipment for three Government tunnels.

BACKGROUND

2. The following systems and equipment in various tunnels are reaching the end of their serviceable life –

(a) the traffic control and surveillance system in Lion Rock Tunnel;
(b) the tunnel power supply system in Lion Rock Tunnel;
(c) the field equipment of toll collection system in Cross-Harbour Tunnel; and
(d) the ventilation system in Aberdeen Tunnel.

We need to maintain the reliability of these systems and equipment to ensure safe and efficient tunnel operations and to avoid traffic congestion.

PROPOSAL

3. We propose to replace the traffic control and surveillance system in Lion Rock Tunnel; the high voltage switchboards, transformers and low voltage system of the tunnel power supply system in Lion Rock Tunnel; the field equipment of the toll collection system in Cross-Harbour Tunnel; and the ventilation control panels, exhaust fans, motors and flexible connectors in Aberdeen Tunnel at estimated costs of $119.4 million, $26.6 million, $19.8 million and $13.7 million respectively.

JUSTIFICATION

4. Most of the systems and equipment of the Government tunnels 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. Hence, apart from regular maintenance, the Government also conducts periodic reviews on the need for replacement of the systems. Given that the replacement works will take time, it is necessary to start such programmes in good time so as to maintain a reliable service.

(a) Replacement of traffic control and surveillance system in Lion Rock Tunnel

5. The existing traffic control and surveillance (TCS) system in the tunnel has been in service for over 22 years. The Director of Electrical and Mechanical Services (DEMS)'s assessment is that the core components of the system are reaching the end of their serviceable life. The system is also difficult to maintain as it has become obsolete due to technological advancement and the system manufacturer no longer produces spare parts of the system.

6. DEMS advises that delay in replacement could result in serious system failures when more and more components of the system become defective and irreplaceable. This will impair the efficiency of tunnel traffic control and jeopardise the normal operation and safety of the tunnel, thereby resulting in serious traffic congestion in the tunnel and adjacent areas. Due to the scale and complexity of this replacement project and the very limited working hours in an operating tunnel, the replacement works require a long lead time for tendering, delivery, installation and commissioning works. We therefore consider it necessary to embark on a replacement programme as soon as possible.

7. Under the proposed project, we will replace the computer hardware and software, data communication system, closed circuit television, signs, signals and other equipment of the existing surveillance system. We will also enhance the system with features such as automatic incident detection system, colour closed circuit television surveillance system and computerised traffic plan implementation, which are essential standard provisions nowadays.

8. The replacement project will enable the whole TCS system of the tunnel to be integrated with computer-assisted traffic control on change of traffic signs and signals, such as pre-programming of the sequence of change of traffic signs and signals and checking for any conflict of traffic signs and signals for each change requested by the traffic controller. The new system will reduce unnecessary traffic congestion and enhance road safety by providing additional signs, brighter lane-use signs and installation of automatic incident detectors.

9. We plan to start the project in April 2001 for completion in June 2005. We will phase the replacement works and implement temporary traffic management measures to avoid disrupting the flow of traffic through the tunnel during the replacement period.

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

10. The existing high voltage switchboards, transformers and low voltage system have been in service for over 22 years. DEMS advises that the equipment and system have reached the end of their serviceable life and are beyond economical repair. It is difficult to find the obsolete spare parts in the market and repairing the components piecemeal is very expensive. If these electrical components are not replaced, even with intensive maintenance, the performance of the whole electrical supply system will still be unstable. As the electrical supply system is the core component of all other electrical and electronic systems in the tunnel, early replacement is essential.

11. According to DEMS, delay in replacement could result in total failure of the electricity supply to the tunnel. This will paralyse the whole tunnel operation, resulting in closure of the tunnel with serious congestion in the adjacent areas, especially New Territories East. In view of the above problems and the long lead time required for tendering, delivery, installation and commissioning works, early replacement of the equipment is necessary. This will also enhance the overall security and stability of the power supply to the tunnel.

12. Under the project, we will provide a new replacement system comprising high and low voltage switchboards, transformers and distribution boards. Maintenance free vacuum circuit breakers for high voltage switchboard will be used to replace the existing oil circuit breakers, hence reducing the manpower required in maintaining the high voltage switchboard.

13. We plan to start the replacement works in April 2001 for completion in March 2005. To minimise impact to traffic during the works period, we will carry out works at night time when the tunnel is implementing one-tube-two-way operation for maintenance.

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

14. The existing field equipment of the toll collection system in Cross-Harbour Tunnel has been operating for nearly 13 years. DEMS' assessment is that most components of the equipment are reaching the end of their serviceable life and are beyond economical repair. It has also become increasingly difficult to maintain the aged equipment and to secure spare parts from the market.

15. DEMS advises that delay in replacement could result in system failure. This will seriously affect the efficiency of toll collection and also traffic throughput of the tunnel, leading to congestion in the tunnel and adjacent areas. In view of the long lead time for tendering, delivery, installation and commissioning works, we need to start the replacement works early.

16. Under the project, we will replace the toll booth and lane equipment for 14 toll lanes and other ancillary toll collection field equipment. The new field equipment will adopt the most advanced technologies to minimise equipment downtime and hence unexpected toll lane closures. Detailed real-time equipment status and toll registration information will be indicated at the toll supervisor control console in the tunnel control room. The storage period of toll data in toll lane processors

will also be extended in case the central toll computer system breaks down. Shift roster table and card reader will be implemented to enhance access control. The overall design will emphasise on high data security, high availability, high operation efficiency and low maintenance.

17. We plan to start the replacement project in April 2001 for completion in March 2004. To avoid disrupting the traffic flow through the tunnel during the replacement period, we will replace the equipment lane by lane and divert the traffic to other lanes if closure of one lane is required.

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

18. The ventilation system in Aberdeen Tunnel has been in service for about 19 years. DEMS is of the view that the ventilation control panels have reached the end of their serviceable life and are beyond economical repair. With aging of the control panels which are the core component of the tunnel ventilation system, even with intensive maintenance, the ventilation system will still be unreliable. There is no further supply of spare parts from the existing manufacturer as the panel components have become obsolete. In the event of occurrence of major breakdowns in the future, there would be great difficulties in reinstating the system. The safety of tunnel operation will be compromised if the obsolescent ventilation control panels are not replaced.

19. The ventilation system is a critical system of a tunnel, without which a tunnel could not be open to traffic. If the service of the tunnel has to be suspended due to the ventilation system failure, there will be serious traffic congestion on the external links of the Southern District as they do not have sufficient capacity to take up the displaced traffic from the tunnel. DEMS recommends early replacement of the ventilation equipment.

20. The new control panels will be installed with programmable logic controller and control devices, which can provide more efficient and reliable control. The new ventilation fans, motors and flexible connectors can sustain the high temperature of smoke for a period of time to ensure that the system will be operational under fire condition in accordance with the

requirements imposed by the Fire Services Department and the Transport Department.

21. We plan to start the replacement works in April 2001 for completion in March 2004. To minimise impact to traffic during the works period, we will carry out works at night time when the tunnel is implementing one-tube-two-way operation for maintenance.

FINANCIAL IMPLICATIONS

22. We estimate that the capital cost of the four projects to be as follows :

		$ million
(a)	replacement of traffic control and surveillance system in Lion Rock Tunnel	119.4
(b)	Replacement of high voltage switchboards, transformers and low voltage system in Lion Rock Tunnel	26.6
(c)	Replacement of field equipment of toll collection system in Cross-Harbour Tunnel	19.8
(d)	Replacement of ventilation control panels, exhaust fans, motors and flexible connectors in Aberdeen Tunnel	13.7

THE WAY FORWARD

23. We will seek the approval of the Finance Committee on 27 April on funding for replacement of the above tunnel systems and equipment.

ADVICE SOUGHT

24. Members are invited to provide comments on the replacement projects.

Transport Bureau
16 March 2001