

26 February 2007

**EPS Company (Hong Kong) Limited Response:
Panel on Financial Affairs
Hong Kong SAR Legislative Council**

Extent and identified causes of problem

(A) The issue and background information

- There have been reported cases of customers failing to add value to their Octopus cards through EPS payment, and despite money being deducted from their bank accounts.
- A transaction whereby an Octopus card is added value through EPS (Octopus add-value through EPS payment) involves two separate steps [See Diagram 1]:
 - (1) EPS payment – debiting money from cardholder’s bank account; and
 - (2) Octopus add-value – adding monetary value to Octopus card.
- In a normal Octopus add-value transaction through EPS payment, the cardholder’s bank account will be debited once the relevant bank’s authorisation is obtained unless a reversal instruction initiated by the Electronic Fund Transfer (EFT) Module inside Octopus Add-Value Machine (AVM) is reached and recorded by EPS Host System in case where EFT Module does not receive payment response from EPS Host System within preset time interval.
- For the transactions in question, we understand from Octopus Cards Limited (OCL) that no reversal instructions for canceling the original EPS payment transactions have reached or have been recorded by EPS Host System.
- As no reversal transactions were made, the original EPS payment transactions were processed and settled as normal successful EPS transactions.
- Fund was therefore debited from the relevant cardholder’s bank accounts and transferred to OCL through EPS Company (EPSCO). EPSCO is merely an electronic fund transfer media and does not retain any funds.

(B) System design of EFT Module inside Octopus AVMs at MTR and KCR stations

- Octopus AVMs locating at MTRC and KCRC use Public Switch Data Network (PSDN) to connect to EPS Host System.
- Software on EFT Module inside Octopus AVM interacts with EPS Host System by means of a pre-defined communication protocol. By this protocol, EFT Module is the “payment commit-point”; meaning that payment status given out by the EFT Module is the “final status”.

- EFT Module always initiates communication with EPS Host System under the “Terminal Request – EPS Host Response” Mode. EPS Host System never initiates communication with, but responds to, EFT Module.
- In order to enhance customer protection, one of the security rules which have been established is that whenever EFT Module does not receive payment response from EPS Host System within preset time interval (currently for 30 seconds) after it has sent payment instructions to EPS Host System, EFT Module must treat that EPS payment unsuccessful. Right after, EFT Module must send payment reversal to EPS Host System to cancel the payment.
- EFT Module must repeatedly send payment reversal to EPS Host System until EPS Host System properly replies. No EPS payment can be made via such EFT Module until it receives proper reversal response from EPS Host System [See Diagram 3].
- During the processing of EPS payment, network instability is taken into consideration through reversal handling procedure mentioned above.

(C) General information about Octopus card add-value via EPS service

- OCL and EPSCO maintained commercial agreement since 1998 for the provision of electronic fund transfer (EFT) services in respect of Octopus card add value services.
- Under the agreement, MTRC and KCRC are the owners of AVMs, the relevant software and related communication equipment installed at their respective stations. The two transport operators also undertake the maintenance and any necessary repair or replacement of the equipment.
- Prior to deployment in market, for each model of EFT Module to be installed in AVMs, EPSCO would examine and certify it to ensure that it follows the specifications of the pre-defined communication protocol based on which interactions with EPS Host System are made. These specifications include reversal handling when no payment response is received by EFT Module inside AVM (as described in paragraph B above). The interface between EFT Module and the AVM (i.e. equipment and software for actual Octopus card add-value operations) is outside the scope of the certification test performed by EPSCO.
- Similar to other general EPS merchants, EPSCO provides OCL with a day-end reconciliation data file. Data file provided to OCL generally covers all transactions processed by EPSCO, including payment, reversal and other administrative messages. The data file is also a snapshot or summary of all transactional activities at EPS Host System relating to AVMs within an EPS fund settlement day. The data enables OCL to reconcile with their own transaction records. Discrepancies can be found and spotted by OCL during the reconciliation process. OCL is in a position to initiate any follow-up action or procedure, if required.

(D) Network upgrade on 4 December 2006

- Network upgrade to the system serving the machines in the MTRC and KCRC stations was conducted during the period from 2:00a.m. to 5:00a.m. on 4 December 2006.
- This network upgrade merely changed the network equipment used by EPSCO to connect the EPS Host System to the PSDN. The change involved a replacement of Front End Processor with EFT Network Access Controller. Physical locations of the network equipment also changed from the Central to Quarry Bay and Sheung Wan.
- The implementation approach was agreed on 28 June 2006 amongst EPSCO, OCL, KCRC and MTRC. Acceptance test and live tests prior to cutover were performed with joint involvement of MTRC and KCRC. All parties had been satisfied with the test results before the network upgrade was implemented. Under this exercise, there was no software or hardware upgrade on AVMs at MTRC and KCRC stations.
- At this stage of the investigation, there is no evidence suggesting that the network upgrade causes the problems.

(E) Possible causes of problem and current extent

- Failure for reversal instructions to reach EPS Host System could be due to a number of technical issues which may include, but not limited to, problems in relation to the following [See Diagram 2]:-
 - (i) The ability of AVM, especially the EFT Module inside responsible for the communication with EPS Host System, in sending out reversal message according to the pre-defined communication protocol between EFT Module and EPS Host System;
 - (ii) Software interface between EFT Module and Octopus card processing module inside AVM;
 - (iii) The Public Switch Data Network connecting AVMs at MTRC and KCRC to EPS Host System;
 - (iv) The operating and troubleshooting procedure relating to AVMs at MTRC and KCRC; and
 - (v) The EFT Network Access Controller connecting PSDN and EPS Host System.
- Reported cases indicate that some of the Octopus add-value transactions through EPS payments performed at AVMs at MTRC and KCRC stations have been affected by certain technical problems. There are 268 AVMs at MTRC/KCRC stations having EPS payment function. These AVMs are connecting through the same PSDN to EPS Host System. EPS Host System does not connect to any other party with the same connection mode.
- In view of the technical nature of and the multiple parties involved in the data communication process, EPSCO agreed that engaging an independent consultant to conduct a thorough investigation is an appropriate step to identify root cause(s) of the problem and the suitable measures to rectify the situation.

Diagram 1: Normal EPS payment flow of add-value transaction at AVM

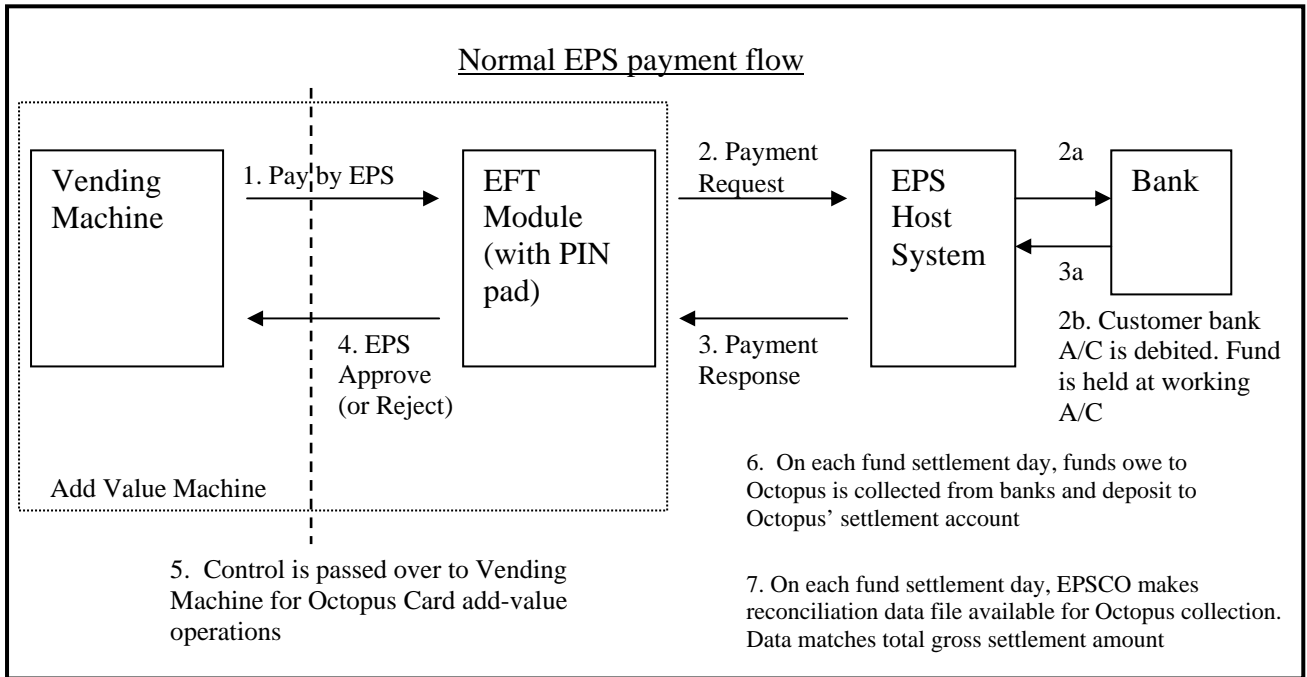


Diagram 2: Five possible points of failure for EPS payment reversal instructions to reach EPS Host System

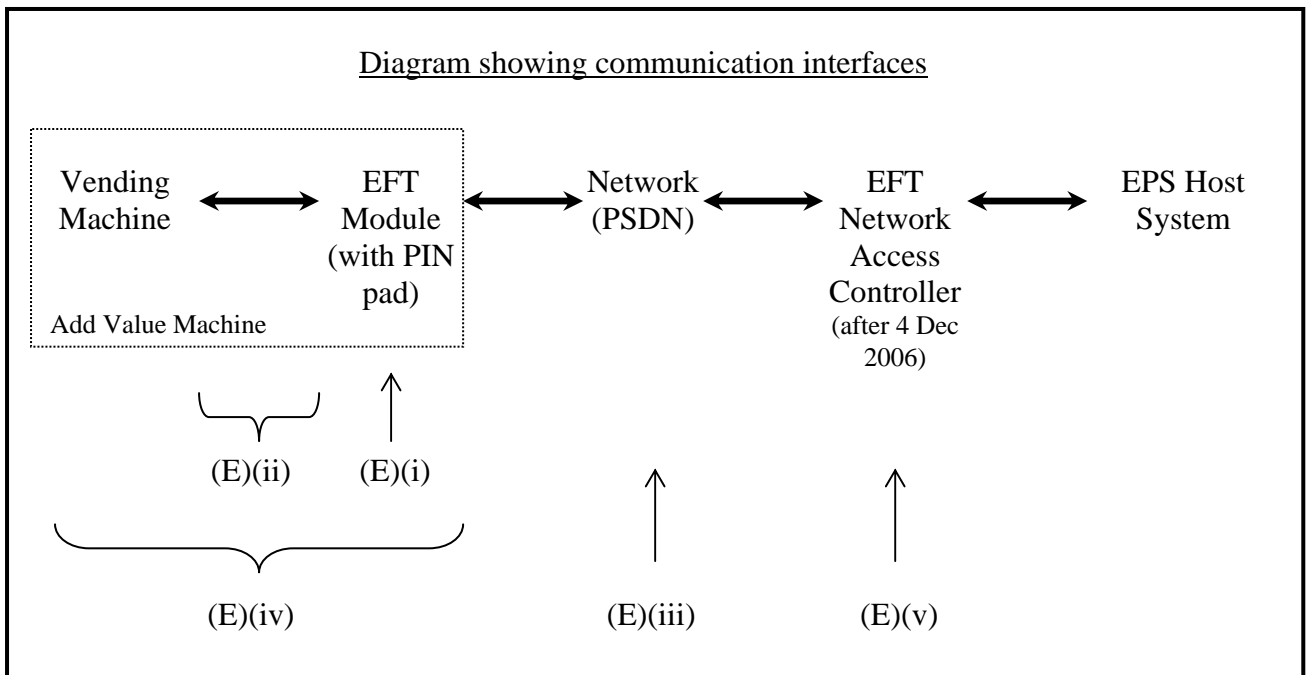


Diagram 3: Illustration of the reversal handling procedure

