

## **Preliminary Report about Service Disruption on 9 April 2012**

### **1. Introduction**

On 9 April 2012, a power outage occurred in the Shatin Switching Centre, one of the three switching centres deployed by SmarTone Mobile Communications Limited (“SmarTone”), causing a service disruption in parts of the SmarTone cellular network. This preliminary report provides a detailed description of the events that led to the occurrence of the service disruption, the remedial actions taken and the improvement measures to be taken.

SmarTone regret the inconvenience caused to our customers and we are thoroughly investigating both the reasons for the building’s power outage and the failure of our power backup systems to ascertain the root causes. We are determined to learn from these findings and make improvements to prevent similar incidents in future.

### **2. Service Disruption on 9 April 2012**

#### **2.1 Events leading to the occurrence of the outage**

On 9 April 2012 at around 8:00 am, the building in Shatin in which one of our three switching centres is located, suffered a total power failure disrupting the power supply to the entire building. Our switching centre’s standby battery system immediately substituted the failed power source and there was no disruption to service. Our backup generator then commenced operation, successfully taking over from the standby battery system.

At approximately 10:35am a component in the starter circuit board of the backup generator broke down unexpectedly, causing the generator to stop operating. This also caused huge surges of electric current that triggered all the eleven groups of circuit breakers disconnecting the cellular switching system from the standby battery system. The resulting power outage disrupted cellular service in several areas in Hong Kong and selected MTR stations in Kowloon, affecting approximately 25% of SmarTone's total cell sites in the territory. SmarTone's other two switching centres remained in normal operation throughout the period, providing normal service to the other 75% of SmarTone cell sites.

Emergency restoration and recovery procedures started immediately and service was restored progressively from 12:15pm onwards. Voice and mobile internet services were largely back to normal at 1:00pm. From 2:30pm onwards, all SMS services had returned to normal. Some servers controlling certain services affecting a relatively small number of customers required further manual intervention to reset and restore in subsequent hours on the same day.

## 2.2 Incident History

Time	Event
Around 8:00am 9 Apr	<ul style="list-style-type: none"> <li>● A total power failure happened in the building which one of our three switching centres is located.</li> <li>● The standby battery immediately substituted for failed power.</li> <li>● 15 seconds later, the backup generator commenced operation and successfully took over from the standby battery system.</li> <li>● There was no disruption to service.</li> </ul>
9:40am 9 Apr	<ul style="list-style-type: none"> <li>● Confirmed by the Building Management Office, the power failure was caused by the short-circuit of a main AC bus bar to the earth.</li> <li>● Building Management Office expected that the building's power supply system would take many hours to restore.</li> </ul>
10:35am 9 Apr	<ul style="list-style-type: none"> <li>● The backup generator unexpectedly stopped and restarted 3 times within 1 minute causing the starter component to burn-out and a complete cessation of operation of the backup generator.</li> <li>● The three abnormal restarts also introduced 3 huge electric current surges within 1 minute which triggered all related main circuit breakers to disconnect the cellular switching system from the standby battery system.</li> <li>● This resulting power outage disrupted cellular service in 25% of SmarTone cell sites affecting several areas in Hong Kong and selected MTR stations in Kowloon. SmarTone's other two switching centres remained in normal operation throughout the period, providing normal service to the other 75% of SmarTone cell sites.</li> <li>● The emergency restoration and recovery procedures started immediately.</li> </ul>
10:35 – 11:30am 9 Apr	<ul style="list-style-type: none"> <li>● All tripped circuit breakers were inspected and manually reset in batches.</li> </ul>
11:30am 9 Apr	<ul style="list-style-type: none"> <li>● The standby battery system connections to the cellular switching system were restored.</li> <li>● Switching equipment and servers recovered in stages.</li> </ul>
12:15pm 9 Apr	<ul style="list-style-type: none"> <li>● Voice and mobile internet services were gradually restored.</li> </ul>
1:00pm 9 Apr	<ul style="list-style-type: none"> <li>● Voice and mobile internet services were largely back to normal.</li> <li>● After replacing the starter component, the backup generator was fully restored and successfully took over from the standby battery system.</li> </ul>
2:30pm 9 Apr	<ul style="list-style-type: none"> <li>● Short message service (SMS) resumed as normal. Some servers controlling certain services affecting a relatively small number of customers required further manual intervention to reset and restore in subsequent hours on the same day.</li> </ul>
4:30am 10 Apr	<ul style="list-style-type: none"> <li>● Building power supply was resumed.</li> </ul>

### 2.3 Remedial actions taken

- At 10:35am on 9 Apr, after observing the tripping of the eleven main circuit breakers that caused the disconnection of the cellular switching system from the standby battery system, our duty engineers immediately started to carefully inspect all affected circuit breakers. Each of these main circuit breakers was in turn connected to a group of sub-circuit breakers connecting to individual switching equipment and servers.
- After confirming all the tripped main circuit breakers were in good condition, our duty engineers manually switched off all sub-circuit breakers to prepare for power restoration. Afterwards, all main circuit breakers, followed by all sub-circuit breakers were reset in batches to restore standby battery connections to the cellular switching system. Starting from 11:30am, switching equipment and servers recovered in phases.
- During the restoration, some servers controlling certain services could not be returned to normal operation automatically. These required manual intervention to reset and restore them in subsequent hours on the same day.
- At 1:00pm on 9 Apr, the faulty generator starter component was successfully replaced and the generator was put back to operation.
- At 2:21pm on 9 Apr, the building's faulty main AC bus bar was isolated from the AC main switch for repair. Mains electricity was temporarily resumed and the backup generator was switched off.
- At 4:30am on 10 Apr, the building's faulty main AC bus bar was repaired and mains electricity was completely resumed.

## 2.4 Root cause analysis

- One of the main AC bus bar of the building short circuited to the earth and caused an electrical supply failure to the whole building.
- The backup generator unexpectedly stopped and restarted 3 times within 1 minute, causing the starter component to break down, preventing it from starting again.
- The abnormal voltage fluctuations caused by the restarting backup generator introduced 3 huge electric current surges within 1 minute, which triggered all related circuit breakers to disconnect the cellular switching system from the standby battery system.

## 2.5 Number of affected customers

The outage affected approximately 25% of SmarTone's cell sites in the territory. However, it is difficult to estimate the number of affected customers due to the mobility of users and the lack of reference to a non-working day within a long holiday.

## **3. Communication with OFCA on the outage**

Having reviewed conversations between our staff and OFCA, we agree that we were not adequately proactive in notifying OFCA about the network outage according to the guidelines, which requires us to inform OFCA within an hour of such an event. In mitigation, our staff were focusing on restarting the system and restoring service as soon as possible. We also agree that we should have kept OFCA better updated both in terms of frequency and details of the incident.

SmarTone first noticed that a service disruption had occurred due to a power outage at around 10:35am on 9 April. We took all possible measures to speedily restore services and minimize the service interruption to our

customers. During the incident, SmarTone communicated with OFCA on 6 occasions between 12:30pm and 5:14pm.

The following is the log of dialogue between our NOC and OFCA on the day of the incident:

<b>Time</b>	<b>Event</b>	<b>Summary of dialogue</b>
~12:30pm	Call received from OFCA informing our NOC that there were complaints of a service outage in Central and Western Districts.	NOC confirmed with OFCA that there was an outage involving hundreds of cell sites and we were attempting to restore our services as soon as possible. OFCA requested a preliminary report.
~1:36 pm	Call received from OFCA requesting an incident update.	NOC confirmed that the service was largely restored and only a very small number of cell sites requiring manual recovery remained out of service.
~2:15pm	NOC called OFCA	NOC informed OFCA that our cell sites and services were back to normal, with only around 10 cell sites yet to be restored.
~3:36pm	NOC sent a preliminary report to OFCA with a follow up call	NOC's preliminary report to OFCA stated the time and event causing the outage. OFCA also requested the number of customers affected. NOC advised that the number of affected customers was not available at that moment.
~4:27pm	OFCA called SmarTone	SmarTone advised OFCA that all cell sites and services had been resumed.
~5:14pm	SmarTone called OFCA	SmarTone advised that it would be difficult to provide the number of affected customers. OFCA advised SmarTone that they had communicated with media at around 16:00 about the outage incident.

#### **4. Communication with our customers and the public on the outage**

SmarTone has communicated with customers and the public about the service disruption through the following channels on the day of incident:

- Retail and Hotline staff
- Facebook
- Customers
- The media

##### 4.1 Communication through our Retail and Hotline staff

At 11:01am and 12:26pm on 9 Apr, two notifications were issued through internal email to inform our retail and hotline staff about the power outage at one of our switching centres causing service disruption, and that investigation and restoration was in progress.

At 2:56 pm, an updated notification was issued to inform retail and hotline staff that service has been restored after the power outage.

At 5:56 pm, a further notification was issued to inform retail and hotline staff of further details of the incident.

##### 4.2 Communication through Facebook

A holding statement on the service disruption should have been posted as soon as the disruption occurred. However the personnel responsible for communicating with customers decided to gather more detailed information on the cause of the incident and the progress of recovery to provide a more complete explanation to the public.

At 2:13 pm on 9 Apr, SmarTone posted the first message on Facebook in response to customer enquiries about our service disruption. The message informed our customers of the power outage at one of our switching centres causing a service disruption, and that most services, except SMS, were largely back to normal after our emergency recovery process.

At 7:46 pm and 7:51 pm, full Chinese and English statements were posted on Facebook to explain the details of the incident to the public.

#### 4.3 Communication to customers

An email was sent on the evening of 10 Apr to all customers with whom we have their email address, informing them the details of the incident.

#### 4.4 Communication to the media

Between 12:30 - 5:00 pm on 9 Apr, SmarTone received media calls. SmarTone acknowledged to media that there was a network outage and responded that the service interruption was due to a power failure at one of our switching centres.

At 5:36 pm on 9 Apr, SmarTone issued a press statement to media to explain the incident and apologize to affected customers.

At 5:00 pm on 10 Apr, SmarTone issued another press release with further information including our preliminary investigation results and evaluation.

Despite our official press statement issued on 9 Apr and the subsequent press release on 10 Apr, there were unsubstantiated media reports regarding the incident. We would like to make the following clarifications.

<b>Media reports</b>	<b>SmarTone's clarifications</b>
1. The service disruption was caused by a power or technical failure at a switching board or centre in Central and Western District, according to OFCA.	- The service interruption was caused by a power failure at a building in which one of our three switching centres is located.
2. The entire network broke down.	- The outage affected approximately 25% of

	<p>SmarTone's cell sites in the territory, rather than the entire network.</p> <ul style="list-style-type: none"> <li>- SmarTone's other two switching centres remained in normal operation throughout the period, providing normal service to the other 75% of SmarTone cell sites.</li> </ul>
<p>3. The service disruption lasted six to eight hours.</p>	<ul style="list-style-type: none"> <li>- The service disruption lasted for 2.5 hours from 10:35am to 1:00pm.</li> <li>- Voice and mobile internet services were largely back to normal at 1:00pm. From 2:30pm onwards, all SMS services had returned to normal. Some servers controlling certain services affecting a relatively small number of customers required further manual intervention to reset and restore in subsequent hours on the same day.</li> </ul>
<p>4. The service interruption might have been caused by testing of the 4G network.</p>	<ul style="list-style-type: none"> <li>- The service disruption was definitely not related to any testing of the 4G network, but a power failure at the building in which one of our three switching centres is located.</li> </ul>

## 5. Going Forward

### 5.1 Current design of our backup power supply system

- Each of our switching centres is equipped with two levels of backup power protection. The first level is the standby battery system which activates immediately upon any power disruption. The second level is the backup generator which takes over from the standby battery after 15 seconds.

- The standby battery system can run continuously for four hours. To ensure proper functionality and designed capacity, the battery system is inspected and tested every two months.
- As for the backup generator, it is designed for continuous operation as long as it receives adequate fuel. Like the standby battery system, it is thoroughly inspected and drill tested every two months.
- The concerned backup generator successfully passed recent full inspections and drill tests on 22 Feb 2012 and the standby battery passed tests on 5 Apr 2012.

## 5.2 Improvement plans for the technical issues

- Perform checks on all switching centres' common power supply systems with Building Management Offices within April 2012
- Employ an E&M consultant to review the overall design of the backup power system in all our switching centres (including the standby battery system, backup generator, circuit breakers etc) by May 2012.
- Investigate the root cause of the 3 abnormal restarts of the backup generator and develop a solution accordingly. If the reason for the abnormal restarts cannot be ascertained, we will consider replacing the current backup generator system.
- Re-design and implement the auto-restart mechanism of the backup generator to prevent unexpected electric current surges within May 2012

## 5.3 Review of procedures for communication with OFCA, our customers, the media and the public

For communication with OFCA, our customers, the media and the public, we agree that there is room for improvement in terms of timeliness and frequency.

SmarTone will thoroughly review the procedures for communication with OFCA in order to strictly adhere to OFCA's Guidelines for Fixed and Mobile Operators for Reporting Network Outage. We will also review procedures for informing our customers, the media and the public in the event of major service disruption through various channels including the corporate website. The result of the comprehensive review will be provided in the full report to be submitted to OFCA by 27 Apr 2012.

SmarTone Mobile Communications Limited

Date: 12 April 2012