Executive Summary

Direct Investigation
Water meter reading and billing system

Introduction

WSD bills consumers normally on the basis of the consumption figures recorded during meter readings. Where actual or accurate readings cannot be obtained due to reasons such as meters being defective or inaccessible, bills will be issued based on estimated consumption. In the case that a defective meter has to be replaced, WSD will examine the need to adjust the water bill(s) for the defective period.

2. WSD received 7,359 complaints about water bills and charges in 2010/11. One of the reasons for complaint was that the consumers felt aggrieved that WSD presented them with bills to account for adjustments made in respect of defective periods long ago, with little proof or information as to why and when the meters were found defective, and often with scant information as to how the adjustments were calculated.

3. Against this background, The Ombudsman initiated, on 10 November 2010, a direct investigation under section 7(1)(a)(ii) of The Ombudsman Ordinance, Cap. 397, to examine WSD's arrangements for reading meters, billing customers, replacing and testing defective meters, and adjusting bills, with a view to identifying areas for improvement.

WSD procedures and practices

4. The key activities in the process of meter reading, handling of defective meters and issue/adjustment of bills are given below.

(a) Meter reading

5. Routine meter readings are conducted by Meter Readers ("MR"), who read meters on site and input relevant data into their Personal Digital Assistants ("PDA"). A complete "Reading Data" comprises two elements:

- the reading as measured by the meter; and
- where irregularities are observed, a Meter Reader Remark Code ("MR code") and additional remarks (if any).

(b) Uploading of Reading Data onto Customer Care and Billing System ("CCBS")

6. At the end of each day, the Reading Data is uploaded from the PDAs onto WSD's computer system known as CCBS.

(c) Issue of bills and orders

7. On the basis of the reading and, where applicable, the MR code, CCBS will issue:

- a bill to the consumer; and
- where appropriate, a works order to WSD staff for rectification action, such as meter replacement.

8. There are a total of 61 MR codes to denote the various irregularities observed and trigger different follow-up actions on CCBS. These codes are given in **Annex 1**.

(d) Replacement and testing of meters

9. When a meter is observed or suspected to be defective, one of the defective-related MR codes will be recorded, triggering an order for replacement.

10. Not all replaced meters are tested before disposal. For the 42,553 meter replacements triggered by the MR codes in 2010/11, tests were only conducted on 37,130 meters (87%). WSD's general rule on meter testing is:

i. Testing will be carried out on the replaced meter if the MR finds its accuracy to be doubtful and enters an appropriate MR code.

ii. No test will be conducted on the replaced meter if the MR observes it to be defective and enters an appropriate MR code.

11. This rule is built into CCBS through the use of MR codes. However, it is not accurately reflected in WSD internal instructions. For example, a sample letter for notifying consumers of bill adjustments provided in Customer Accounts Section Instruction No. 1/2008 states that "the (replaced) meter was tested in (WSD's) laboratory and found defective" – this is not appropriate as a fair proportion of replaced meters are not tested.

(e) Adjustment of bills

12. After defective meters are replaced, WSD staff will observe the consumption pattern for a period of time and adjust the bills for the defective period where appropriate. WSD should notify the consumer of the adjustment within six weeks after meter testing or after routine meter reading is available. Where original bills have already been issued or where the adjustment period is three billing periods or more, WSD should issue an explanatory letter to the consumer. Otherwise, WSD will simply issue the adjusted bill with explanatory notes. The consumer is given an opportunity to respond if he finds the adjustment unwarranted.

Staff instructions

13. Details of the meter reading, billing and adjustment arrangements are set out in WSD Departmental Instruction 2004 (Revised in December 2010). The previous version of this instruction was issued in July 1998. The greater part of the instruction has become obsolete since the commissioning of CCBS in 2005. Although various manuals/handbooks were updated from time to time, the department took five years to revamp and update this obsolete instruction.

Training and monitoring of MRs

14. It can be noted from **paras. 5 to 10** above that the whole process of meter reading, billing and follow-up rectification is a highly automated one. Under this highly automated system, it is MRs' direct responsibility to input correct and accurate Reading Data into CCBS. In training MRs, WSD places much emphasis on verbal and onsite briefings, and less on written guidelines and instructions. For example, on the use of the 61 MR codes, MRs are only given a two-page Meter Reader Remark Code Inputting Instructions ("MRRC Instructions") (**Annex 1**) containing the description of the MR codes in Chinese and English. It is WSD policy that MRs are only required to use the MR codes to record their observations. They do not need to know the implications of the MR codes.

15. The performance of MRs is monitored by Senior MRs. Their monitoring tools include spot checks (rate of spot check in 2010/11 was 0.77%) and performance reports. From our interviews with MRs, we note that accuracy in inputting readings is monitored closely – any inaccuracy of readings will be reflected in appraisal reports; in contrast, accuracy of MR code input is not given the same degree of attention.

System checks

16. To ensure appropriate bills and actions are triggered on CCBS, there are a number of system checks, including:

a. **PDA Warnings**: The PDA gives Negative, Zero and High/Low Warnings to alert the MR to carefully check his input again. In the case of Zero Warning, the MR is required to observe whether the zero consumption is genuine or the meter is defective, and to input an appropriate MR code to trigger a corresponding follow-up action.

b. **CCBS High/Low Check**: After the Reading Data is uploaded onto CCBS, the system will perform a High/Low Check before adopting the readings for billing purposes.

- If the reading fails the pre-set low rules, CCBS will still issue a bill, and, depending on other predefined factors, may issue an order for meter replacement.

- If the reading fails the pre-set high rules and depending on other predefined factors, CCBS may hold up the bill and issue an order for special reading or bring the case to the attention of WSD staff for a review.

17. It can be noted that under the rules of the CCBS High/low Check, most low consumption cases are handled automatically by CCBS. They are brought to the attention of WSD staff at a late stage - only where meters are replaced and tested and after the test results are available.

Making changes to CCBS

18. Since the commissioning of CCBS in 2005, WSD has been making changes to CCBS from time to time to enhance its performance and to rectify system inadequacies.

19. As at end June 2011, 108 changes to CCBS had been completed and 29 were outstanding. On average it took 11 months to implement a change to CCBS. The quickest change took less than one month and the longest took 54 months.

20. Much of the work on CCBS changes was held up during mid 2010 to mid 2011 due to a major upgrading exercise of CCBS. During that period only urgent and high priority changes were made. As at end of June 2011, all enhancements and rectifications requested after February 2009 (28 months ago) were still outstanding.

Case studies

21. We have studied over 30 cases and summarised six cases in our report to illustrate (as being illustrative of) the problems in WSD's meter reading and billing arrangements. Details of these cases are given in **Chapter 3** of the full report.

Case No.	Problems revealed
Case 1	Failure of MRs to identify a defective meter for over one year, insufficient monitoring of case progress, lack of consideration for the consumer, and site observations on defective meter not recorded.

Case No.	Problems revealed
Case 2	Failure of MRs to identify a defective meter for over two years, insufficient monitoring of case progress, and lack of consideration for the consumer.
Case 3	Inadequate system checks for defective meters, insufficient monitoring of case progress, lack of consideration for the consumer, problems in communicating with consumers, and site observations on defective meter not recorded.
Case 4	Inadequate system design for using consecutive input of the same code, long time to rectify system design inadequacy to trigger action, and insufficient monitoring of works orders.
Case 5	Inadequate system design for using consecutive input of the same code to trigger action, unsatisfactory interface between CCBS and users, insufficient monitoring of case progress, lack of consideration for the consumer, and problems in communicating with consumers.
Case 6	Inadequacy in estimation logic for new accounts, and long time to rectify system inadequacy.

Observations and opinions

22. WSD's regular monitoring programme shows that in 2010/11, 5% of the in-service meters selected for testing failed its accuracy rule. By projection 138,000 of the 2.8 million in-service meters in the territory may be inaccurate or defective. This is a cause for concern. Any deficiency in dealing with defective meters and related bill adjustments warrants serious attention.

23. In the cases studied, WSD had reasons to initiate bill adjustment. WSD is authorised under regulation 31 of the Waterworks Regulations, Cap. 102A to issue or adjust water bills on the basis of estimates when "the consumption for any period during which a meter is known **or suspected** to be out of order". In practice, WSD will observe the consumption pattern after meter replacement and establish the need for adjustment before initiating action, and the consumer will be given an opportunity to explain the consumption pattern if he considers the adjustment not warranted.

24. However, the manner in which such actions were carried out, particularly the long time taken over the cases and the lack of consideration for the consumer, was a source of much aggravation and frustration among the complainants, and there is much room for improvement.

25. WSD makes use of a highly automated system to support its meter reading and billing process. We do not question that a highly automated system is necessary for handling the huge number of accounts WSD has to serve. However, the proper functioning of such a system relies heavily on the proper operation of all the inter-dependent links in the chain of activities, including correct and timely input, sufficient system checks, faultless system design, seamless interface between CCBS and WSD staff, and efficiency in rectifying system inadequacies once revealed. Weakness or deficiency in any one link can trigger, through the system, outcomes that could lead to highly undesirable and, at times, absurd consequences.

26. We have identified the following deficiencies in the way WSD handles meter reading, defective meters and issue/adjustment of bills.

(a) Insufficient staff training and monitoring in meter reading

27. The long time taken in identifying defective meters is a major source of problems in adjusting bills. Under the WSD system, there are two main ways of identifying defective meters: observations made by MRs during meter reading and system checks such as the PDA Warnings and the CCBS High/Low Check.

28. **Cases no. 1** and **2** illustrate MRs' failure in identifying defective meters as such. Our analysis has shown that the training/guidance given to MRs in this aspect is limited (**para. 14**) and monitoring by supervisors insufficient (**para. 15**). We doubt the WSD policy of not requiring MRs to know the implications of the MR codes which are used by the system to automatically trigger follow-up actions (**para. 14**). In a system where an MR code will trigger a whole chain of outcomes, such compartmentalised mentality in training and guiding MRs can only lead to trouble.

29. WSD introduced some improvements in June 2010 to assist MRs by adding new MR codes to record observations about vacant premises, which indirectly help to distinguish cases of defective meters. However, the improvements are not thorough, and, as revealed in our interviews with MRs, their implementation inconsistent among different staff. Further enhancement in staff training and monitoring is needed.

(b) Insufficient system checks for identifying defective meters

30. Apart from observations made by MRs, another way of identifying defective meters is the built-in checks in the system. These built-in system checks include the PDA Warnings and the CCBS High/Low Check..

31. **Case no. 3** is an example of how low consumption can be recorded six times without triggering any PDA Warning or action under the CCBS High/Low Check. Since then WSD has tightened the rules of the latter check. We consider that the rules of the system checks should be kept under review and tightened where appropriate.

32. Furthermore, as long periods of zero and/or low consumption are a useful warning sign for identifying defective meters, we consider that WSD should consider enhancing its checks in this respect. Possible measures to be considered include arranging special reading for repeat zero consumption readings and mounting special programmes to check all accounts with long period, say, 12 months, of zero consumption.

(c) System design inadequacies

33. The efficient running of WSD's highly automated system is heavily dependent on the proper operation of each link in the chain of activities.

34. However, as shown in **Cases no. 4, 5** and **6**, the system still contains inadequacies after years of operation, rectification is slow, and staff/computer interface unsatisfactory. **Cases 4 and 5** reveal problems in the use of consecutive inputs of the same code to trigger action, a feature which is widely used in the WSD system.

35. Furthermore, WSD statistics show the time taken to make changes to CCBS (including rectification of system inadequacies) is unacceptably long (average time taken 11 months and all rectifications requested after February 2009 have yet to be implemented (**paras. 19 and 20**). WSD should speed up the process in rectifying system inadequacies.

(d) Insufficient monitoring of works orders

36. The long time taken to implement works orders in **Cases no. 2, 4** and **5** suggests that there is inadequate progress monitoring in this regard.

37. Since 2009 WSD has introduced regular progress monitoring reports. However, **Case no. 4** (which took place after 2009) shows that there were still delays in implementing works orders. A close examination of WSD monitoring reports shows that they only set out the creation dates of the works orders but not the target completion dates. This shows that WSD further improvement is needed.

(e) Insufficient progress monitoring in adjusting bills

38. One of the frequent complaints related to bill adjustments is the long time taken by WSD to observe the consumption pattern after meter replacement before they notify consumers about the bill adjustments. This problem is illustrated in **Cases no. 1, 2** and **3**.

39. In response to our suggestion, WSD introduced a time limit on the observation time after meter replacement in mid 2010. WSD should be given credit for taking steps to improve in this area. We urge WSD to further reduce the time limit as far as practicable.

(f) Confusion and other problems about meter testing

40. WSD's general rule on testing of meters is set out in **para.10** above. However, there is considerable evidence that much confusion and even ignorance exist among WSD staff about this rule, as reflected in the inappropriate advice provided in its staff instructions (**para. 11**) and the incorrect information supplied to consumers (**Case no. 3**).

41. Apart from the issue of confusion/ignorance among WSD staff, a closer look at the WSD meter testing rule raises the question of whether it is adequate to support the subsequent bill adjustment, especially when MR code NR (Zero warning but there should be water consumption) is used. Under the WSD rule, meters replaced in connection with MR code NR are not tested. Also, when inputting this code, MRs are not required to record the reasons for judging that there is water consumption. As a result, WSD is unable to adduce concrete evidence to prove that the meter was

indeed defective when taking action to adjust bills in such cases. This is inadequate in answering consumers' queries (**Cases no. 1** and **3**) and would give consumers the impression that WSD is arbitrary and high-handed.

42. We consider that WSD should review its meter testing rule, particularly for MR code NR (Zero warning but there should be water consumption). WSD should also enhance staff training to clarify its meter testing rule.

(g) Inadequate staff instructions

43. Our analysis of WSD procedures and practice and complaint cases shows that the administration within the Department is rather loose. This is related to the inadequacy of its staff instructions and training. For example:

- Taking five years to revamp and update its Departmental Instruction No. 2004 (**para. 13**) is one example of WSD not providing its staff with adequate guidelines.

- Some of WSD's staff instructions contain inaccurate information and inappropriate advice, such as that on meter testing contained in Customer Accounts Section Instruction No. 1/2008 (**para. 11**).

- Different MRs have different interpretations and understanding of MR codes, as revealed in our interview with them.

44. With such inadequate instructions, it is difficult for WSD frontline staff to provide complete and accurate responses to customer enquiries, and in some cases, not even a reasonable service to customers. We consider that WSD should review its staff instructions with a view to providing a set of clear and comprehensive guidelines, and align the understanding of its staff with their correct interpretation through training.

(h) Lack of consideration for consumers

45. One of the stated missions of WSD is "To adopt a customer-oriented approach in services". WSD has not lived up to this mission in the way it handles bill

adjustments. Examples of lack of consideration for consumers abound in the cases studied:

- WSD took an unduly long time before notifying the consumer of the bill adjustment (in **Cases no. 1, 2, 3,** and **5**).

- WSD omitted important information from its letters (**Cases no. 1** and **3**).

- WSD supplied incorrect information in its letters (**Cases no. 3**).

- In case after case (such as **Cases no. 3** and **5**) WSD relied on inconspicuous messages in its bills to communicate important information to consumers.

46. We consider that WSD should adopt a more customer-oriented approach, especially in adjusting bills, bearing in mind that consumers are invariably upset in such situations. Specifically, we suggest that WSD should consider issuing explanatory letters for all bill adjustments and presenting more clearly important messages such as those relating to meter replacement and bill adjustments.

Recommendations

47. The Ombudsman has made 12 recommendations to WSD, as set out below:

Meter reading

(1) To review the policy of not requiring MRs to know the implications of the MR codes (**para. 28**);
(2) To review the 61 MR codes with a view to simplifying them;

System checks

(3) To keep under review the rules of the system checks for identifying defective meters, and to tighten them where appropriate (**para. 31**);

(4) To consider additional measures for identifying defective meters at an early stage (**para. 32**);

(5) To review the rules and assumptions for using consecutive inputs of the same code to trigger follow-up action (**para. 34**);

Use of computer system

(6) To speed up the process in rectifying system inadequacies (**para. 35**);

Monitoring of works orders

(7) To improve in the area of progress monitoring of works orders, such as setting out the target completion dates of individual works orders in monitoring reports (**para. 37**);

Meter testing

(8) To review the meter testing rule, particularly for MR code NR (Zero warning but there should be water consumption), in order to collect sufficient evidence of defective meters to support bill adjustment (**para. 42**);

Communicating with consumers

(9) To consider issuing explanatory letters to consumers for all bill adjustments (**para. 46**);

(10) To review the design and layout of the water bill, paying special attention to the presentation of important messages to consumers (**para. 46**);

Staff instructions

(11) To review staff instructions with a view to providing a set of clear and comprehensive guidelines (**para.44**); and

Staff training and monitoring

(12) To enhance staff training and monitoring in a number of areas, including meter reading, interfacing with CCBS and communications with consumers.

Office of The Ombudsman
September 2011

輸入抄錶員備註代碼須知
（例行抄錶適用）
Meter Reader Remark Code Inputting Instructions
(for routine meter reading)

1. 如 PDA 出現 0 讀數警號（Zero Warning），必須再三清楚核實。如讀數正確，應觀察周圍環境、搜集資料以輸入適當的代碼（如 NR, ZX 等）。若現場環境資料不足，必須輸入 ZX。所有 0 讀數必須配合輸入適當的代碼方爲完成記錄。
2. 輸入代碼應力求精準、齊全，絕不可省去不入。尤其 0 讀數的成因可有多種，必須按現場情況輸入代碼。如前所述，若無其他更適合的代碼，0 讀數的代碼應爲 ZX。
3. 如 PDA 出現過高或過低讀數警號（High-Low Warning），必須再三清楚核實。
4. 如 PDA 出現負讀數警號（Negative Warning），必須再三清楚核實。如讀數無誤及水錶安裝正確，應輸入代碼 XX。
5. 輸入由他人提供資料的代碼（如 ZW, ZT 等）時，如情況許可應同時簡單記錄資料來源，如管理員姓氏，鄰居所住單位等。
6. 如未能成功抄錶，必須輸入代碼說明原因，並盡可能向客戶發出 WWO 167B/C/D 表格。

代碼 MR Code	說明 Description		現場處理 Action on Site
ZP	危險/困難錶位	Meter in dangerous/ difficult position.	在記事紙報告情況，拍盡兩圖。
L	通道上鎖	Access locked.	嘗試要求客戶、管理員或在場適合人士協助抄錶，或在可行情況下安排於同日另約時間再行抄錶。用備註欄 / 記事紙報告情況，及記錄有助日後抄錶的資料，如客戶聯絡電話、最適合抄錶的時間等。有需要時聯絡高級抄錶員尋求指示。 在可行情況下，即時派發 "無法抄錶通知書" (WWO167 表格)，並使用標準格式，記錄有關事項。 示例：L – 123456(123456 爲 WWO167 編號，參閱《抄錶組外勤操作備忘》)
ZL	門鎖損壞	Access blocked by defective lock. (can be repaired in a few days)	
O	錶位受阻	Access obstructed.	
OP	喉管阻讀	Meter obstructed by pipe.	
LS	山泥阻路	Landslide near the meter position.	
MC	錶被泥掩	Meter covered by earth.	
F	錶位水浸	Meter location flooded.	
ZF	路面水浸	Road / path to meter flooded.	
PF	錶井水浸	Pit containing meter flooded.	
PJ	錶井蓋難開	Pit cover cannot be opened.	
ZE	升降機壞	Elevators out of order.	
ZD	無人鄉狗	Meter guarded by dogs.	
VA	空置待租賣	Vacant with sale advertisement	需要時在備註欄 / 記事紙報告情況。
VN	空置新樓	Unoccupied new building	
VR	空置待重建	Vacant pending for redevelopment	
VT	住客稱空置	Tenant said vacant	
VV	空置村屋	Vacant village house	
VX	空置 (其他原因)	Vacant (other reasons)	
DH	屋已拆毀	Premises demolished.	嘗試抄錶，需要時在備註欄 / 記事紙報告情況。
ZB	屋已燒毀	Premises burnt.	
SD	屋待清拆	Premises to be demolished and meter cannot be reached.	在 PDA 的 eForm 記錄有關資料，例如清拆通告上負責機構的聯絡電話等。
ZT	住客稱不用	Tenant said no consumption.	在備註欄 / 記事紙記錄有關資料來源及其他事項。
ZW	看更稱公共地方不用水	Watchman said no consumption for maintenance of public/ common area	
ZG	貨倉不用	Godown of no consumption.	

代碼 MR Code	說明 Description		現場處理 Action on Site
ZN	不用水 (現場有明確原因)	No consumption (with definite reasons)	在備註欄記錄有關情況。(e.g. stop cock before meter closed / 錶前掣已關)
NR	錶不轉動 (估計有用水)	The reading triggers 0 warning in PDA but there should be water consumption.	如經現場測試，確認水錶不轉動，用備註欄記錄有關事項 (e.g. test NR)
NT	住客稱錶不動	Tenant said meter not moving	嘗試進行簡單的水錶測試
ZX	錶不轉動 (沒有資料估計有否用水)	The reading triggers 0 warning in PDA. Insufficient information to judge no consumption or not.	
RB	讀數倒行	Reading running backwards.	使用本代碼前，先表面觀察水錶是否安裝正確。
XX	負讀數	Negative Reading.	
SE	客戶報錶	Self-read.	如讀數是抄錶時現場獲得，在備註欄 / 記事紙記錄資料來源。
YY	錶號不符	Meter number different from record.	在備註欄 / 記事紙記錄有關資料。
ZU	找不著錶	Meter cannot be located.	
ZO	超出範圍	Meter location out of the assigned route.	
FW	錶面向牆	Meter facing wall.	嘗試用鏡輔助抄錶。
JL	接口漏水	Leakage found at meter joints.	在備註欄記錄漏水位置 (在水錶前還是在水錶後，或用記事紙繪畫簡圖記錄漏水位置。如水管爆裂或嚴重漏水，嘗試通知客戶。必要時聯絡高級抄錶員。
ML	錶身漏水	Water leaks from the meter.	
SL	喉管漏水	Water leaks from piping near meter.	
CL	錶前掣漏水	Water leaking from stop-cock.	
SB	封條破損	Seal broken.	
GB	玻璃破損	Meter glass broken / blocking the dials or pointers.	
GO	玻璃模糊	Water vapour masked the meter glass or lens defaced.	嘗試令水氣消散，但小心勿弄破玻璃。
MI	錶號模糊	Unclear meter number.	使用標準格式，記錄有關事項。 示例：MI – 456789aaaaa0 (參閱《抄錶組外勤操作備忘》) 或用記事紙繪畫簡圖記錄有問題部份
HI	指針不正	Dials / pointers not in correct positions.	
HM	指針缺失	Dials / pointers missing.	
ID	錶盤航髒	Dirt covering the dials / pointers.	
LM	錶蓋遺失	Meter lid missing.	只適用於有錶蓋及錶蓋上有水錶號碼的水錶型號，其他水錶型號不必輸入此代碼。
MD	水錶損毀	Meter damaged.	如損壞情況可用其他代碼更清楚記錄，不應使用此代碼。
MR	錶被拆走	Meter removed from the pipe.	在備註欄 / 記事紙報告情況。
MP	資料不確	Wrong meter particulars including meter type and size.	用 PDA 的 eForm 記錄有關資料。
MQ	數位錯誤	Wrong meter dials.	
WA	水錶錯置	Wrong meter arrangement.	使用本代碼前，嘗試測試用水，並在備註欄 / 記事紙報告情況。
WF	水錶倒裝	Meter fixed in the reverse direction.	
SP	內喉已封	Water supply plugged but meter still remains.	
WM	無錶用水	Supplies given without meter.	用記事紙報告情況，並繪畫簡圖。
ZC	不用水相連單位	No consumption record in common flats.	在備註欄 / 記事紙記錄有關資料。
NS	用水用途改變	Change in nature of water use.	
ZS	無來水	Meter installed with no water supplies.	在備註欄 / 記事紙記錄有關資料。
ZI	錶位受阻 (其他原因)	Meter inaccessible due to special reasons.	使用本代碼時須向高級抄錶員徵詢意見。在備註欄 / 記事紙記錄報告情況。
SR	特別原因 (內部用途)	Special reasons – internal official use.	