Test Evidence Report for Philips CityTouch with the CityTouch Ready Luminaire

Date: 28/03/14

Version Number: 1.0

Contents

Introduction

In the spring of 2011, *Philips CityTouch* was approved for use in Great Britain as the Central Management System (CMS) component of an Equivalent Meter (EM) with the *Philips Starsense PLC* and *Philips Starsense Wireless* control systems.

Philips now has a new luminaire offering, called the *CityTouch Ready Luminaire*, which also works with *Philips CityTouch*. This luminaire contains an Outdoor Lighting Controller (OLC), known as the *CityTouch OLC*, which controls the lamp and communicates with *Philips CityTouch* via the General Packet Radio Service (GPRS). No segment controllers are used. The *CityTouch OLC* also has a Global Positioning System (GPS) chip, which enables it to compute its latitude, longitude, and switching point times very accurately. The latitude and longitude of each installed *CityTouch Ready Luminaire* is recorded automatically in the Detailed Inventory.

This document is a test evidence report for *Philips CityTouch* with the *CityTouch Ready Luminaire*. We are seeking approval to use this previously-approved CMS with the *CityTouch Ready Luminaire* as the CMS component of an Equivalent Meter (EM) in Great Britain.

Role of Philips CityTouch

Philips CityTouch is a sophisticated cloud-based CMS for remotely-managing street lights in cities. With *Philips CityTouch*, you can finesse the control of street lights, in groups or individually, and optimise their energy usage.

In terms of unmetered supplies data flows, *Philips CityTouch* fulfils the *Central Management System (CMS)* role, shown in Figure 1. It contains neither Meter Administrator functionality nor functionality for exporting a Control File.

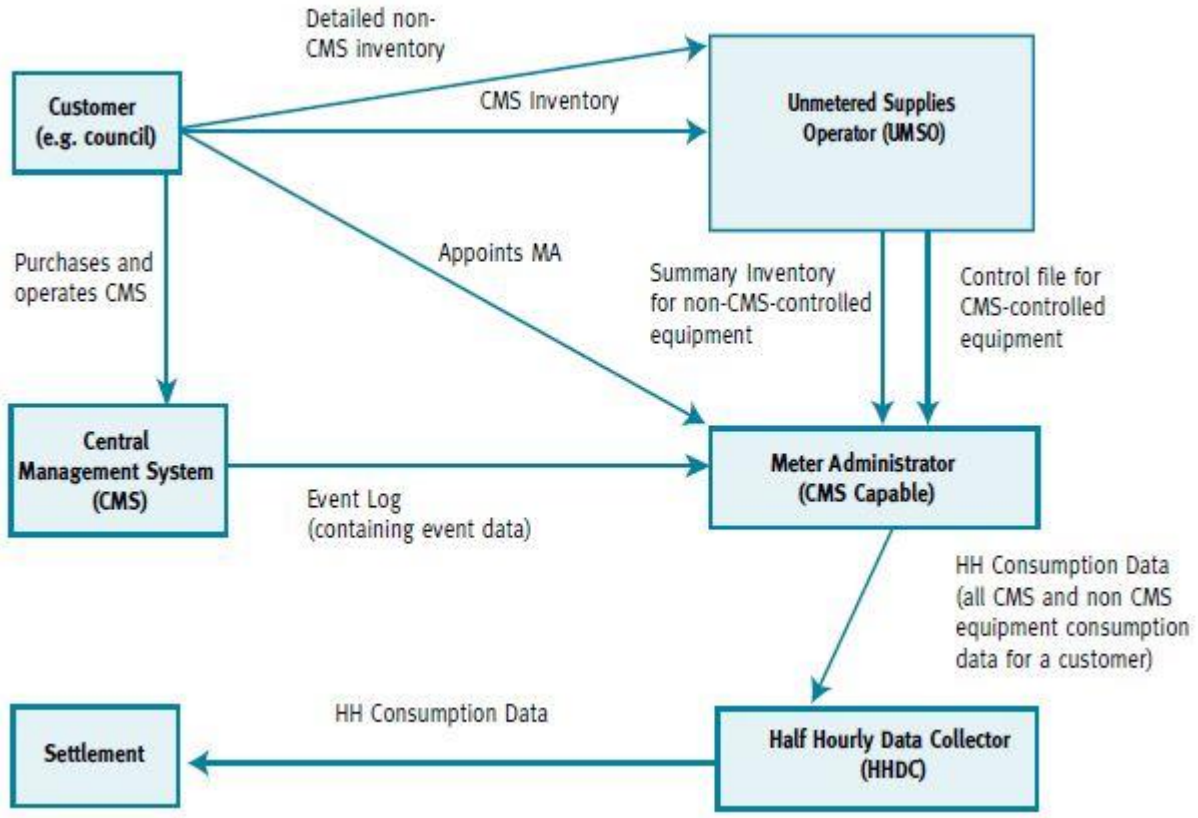


Figure 1: Data flows between unmetered supplies roles

Philips CityTouch Architecture

Figure 2 outlines the architecture of *Philips CityTouch*. As you can see, it has an independent core system with its own interface. The control systems call into this interface to communicate and interoperate with *Philips CityTouch*. The *CityTouch Ready Luminaire* uses a set of cloud-based services and a driver, known as the *CityTouch OLC Driver*, which also calls into this interface.

The *Philips CityTouch* architecture is pluggable – in the sense that the control systems and the *CityTouch OLC Driver* can be plugged into it, in order to interoperate with *Philips CityTouch*.

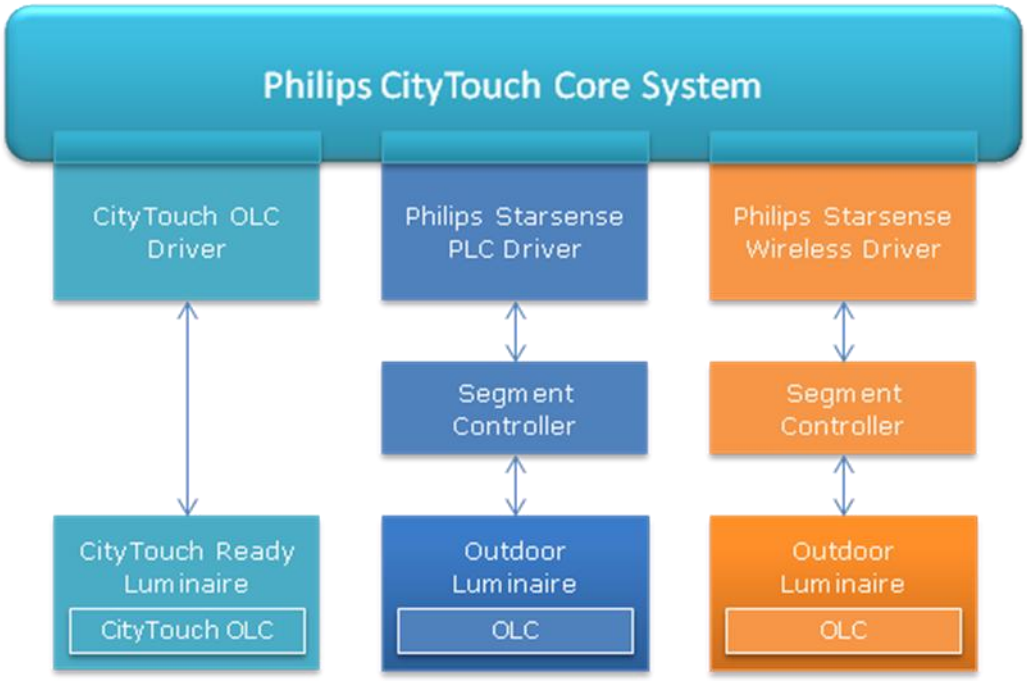


Figure 2: Architecture of Philips CityTouch

Code Modifications since the last Witness Tests

In the spring of 2011, ELEXON approved *Philips CityTouch* for use in Great Britain. The product has evolved since then. However, the software code for the following functionalities, which are central to the witness test, has not changed since the time of the previous tests:

- Logging switching points
- Generating and downloading event logs
- Uploading event logs to the Meter Administrator
- Generating and downloading event log audit trails
- Generating and downloading switching point audit trails
- Generating and downloading the Detailed Inventory
- Generating and downloading the Detailed Inventory audit trail

Since 2011, the existing role-based security has been augmented by optional two-factor authentication. This is described in *Appendix A – CityTouch Test Group 2*.

The User Interface (UI) for managing inventory and equipment control information (pertinent to *Test Groups 4 and 5*) has changed. However, the schema of the underlying database tables and associated

data access code remain essentially unchanged. This change warranted the increment of *CityTouch's* minor version number, described in *Appendix A – CityTouch Test Group 1,* to 1.5.

For the sake of brevity, the term *CityTouch* will be used from now on in this document to refer to the complete *Philips CityTouch* with *CityTouch Ready Luminaire* system.

Test Hardware

The tests were performed with two 29W *CityTouch Ready Luminaires* (*DALI version*). Each luminaire contains a *CityTouch OLC*. The charge code for the *CityTouch OLC* is currently pending.

More details are provided in *Appendix A - CityTouch Test Groups 6 and 7*, regarding the configuration of the luminaires with respect to dimming schedules, Switch Regime, CMS Unit Reference, and the other properties mentioned in Test Groups 4b and 5 of the Test Specification[2].

With regard to the luminaires, *CityTouch* uses a dimming curve provided by the manufacturer (Philips), to compute the percentage of base power for switching points (in the event logs) as a function of the recorded dimming value. Figure 3 shows the dimming curve for the 29W *CityTouch Ready Luminaire* (*DALI version*).

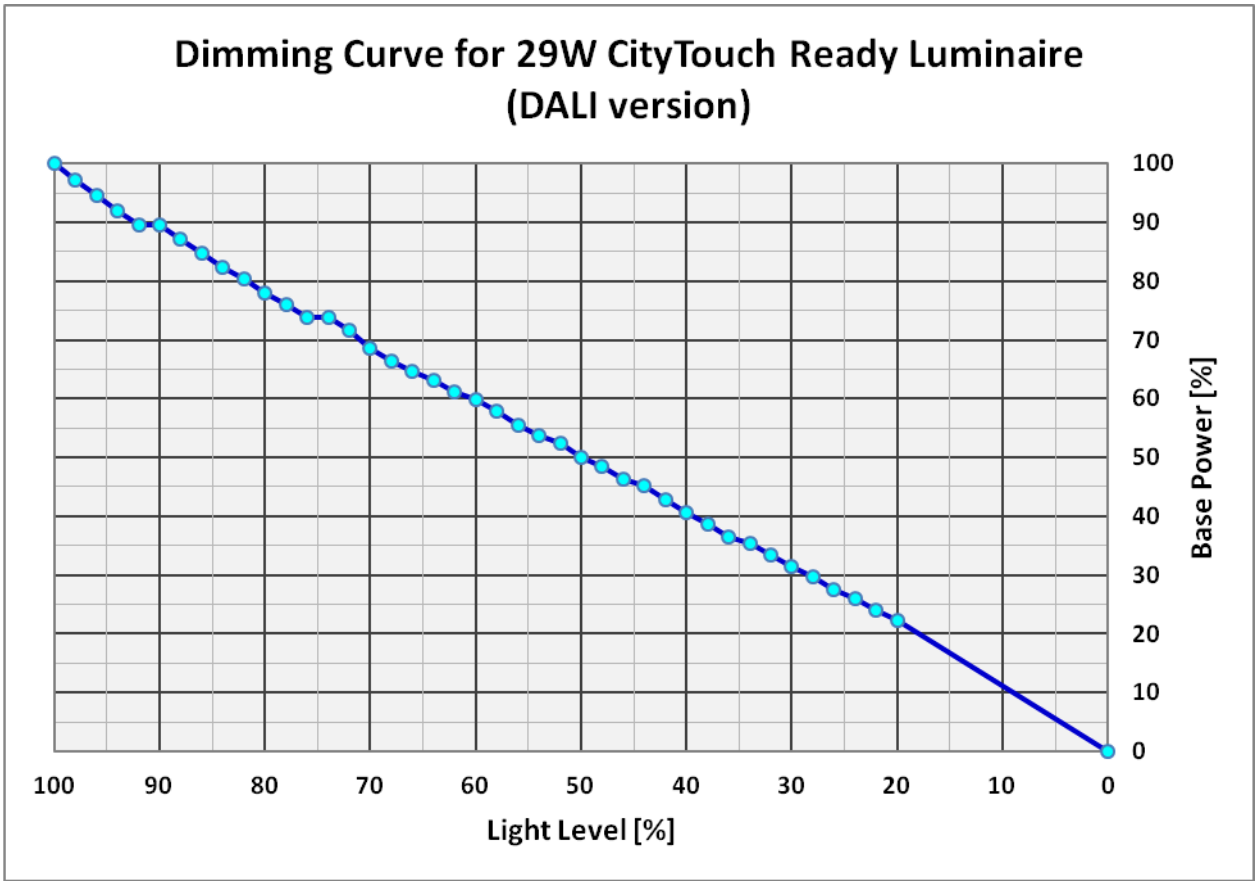


Figure 3: Dimming Curve for 29W CityTouch Ready Luminaire (DALI version)

Test Procedures

The tables below summarise all the test groups which are evidenced in this report. The test requirements are taken from the Test Specification[2].

Test Group	Test Requirements	Test Evidence
Test Group 1	**System Configuration** The operator of the CMS System should demonstrate the software versioning and operating platforms that will be subject to approval.	Please see *Appendix A – CityTouch Test Group 1*

Test Group	Test Requirements	Test Evidence
Test Group 2	**Security** The operator of the CMS System should demonstrate the procedures which provide secure access to data. Operators should only be able to access data which is relevant to them. Secure access procedures should be demonstrated for the following participants: • HHDC • Suppliers • Customers	Please see *Appendix A – CityTouch Test Group 2*

Test Group	Test Requirements	Test Evidence
Test Group 3	**Synchronisation to UTC** The operator of the CMS System should demonstrate that the CMS System is Synchronised to UTC, either by connection to internet time servers or a radio clock, and are accurate to within ± 20 seconds per month.	Please see *Appendix A – CityTouch Test Group 3*

Test Group	Test Requirements	Test Evidence
Test Group 4	**Inventory control information** The operator of the CMS System should demonstrate the addition, modification and deletion of Inventory Control information required for the key test scenarios, either manually or electronically. The Data subject to testing is: • Sub-Meter ID • Effective From Data • CMS Unit Reference • Number of Items • Switch Regime • Charge Code The operator of the CMS System should demonstrate the recording of the audit trail for the entries made above.	Please see *Appendix A – CityTouch Test Groups 4 and 5*

Test Group	Test Requirements	Test Evidence
Test Group 5	**Equipment control information** If applicable the operator of the CMS System should demonstrate the addition, modification and deletion of Equipment Control information, either manually or electronically. The Data subject to testing is: • CMS Unit Reference • Sum of CMS Controller devices • Switch Regime • Charge Code The operator of the CMS System should demonstrate the recording of the audit trail for the entries made above.	Please see *Appendix A – CityTouch Test Groups 4 and 5*

Test Group	Test Requirements	Test Evidence
Test Group 6	**CMS Issue Instructions** The operator of the CMS System should demonstrate the issuing of operational switching times and power level instructions for CMS Units in the CMS System for the following scenarios: • Scenario 1 – Switch Regime 999; • Scenario 2 – Switch Regime 998; • Scenario 3 – Control Failure (no data for a CMS Unit); • Scenario 4 – Revised Data after control failure (following day)	Please see *Appendix A – CityTouch Test Groups 6 and 7*

Test Group	Test Requirements	Test Evidence
Test Group 7	**Record operational switching times and power levels** The operator of the CMS System should demonstrate the recording of operational switching times and power levels for CMS Units in the CMS System for the following scenarios: • Scenario 1 – Switch Regime 999; • Scenario 2 – Switch Regime 998; • Scenario 3 – Control Failure (no data for a CMS Unit); • Scenario 4 – Revised Data after control failure (following day) The operator of the CMS System should demonstrate the audit trail for the above scenarios.	Please see *Appendix A – CityTouch Test Groups 6 and 7*

Test Group	Test Requirements	Test Evidence

Test Group 8	**Generate Operational Event Log – normal processing and control failure**
	
	The operator of the CMS System should demonstrate the sending of daily operational event logs of the operational switching times and power levels for specified CMS Units to the MA in the specified format for the following scenarios:
	
	• Scenario 1 – Switch Regime 999;
	• Scenario 2 – Switch Regime 998;
	• Scenario 3 – Control Failure (no data for a CMS Unit);
	• Scenario 4 – Revised Data after control failure (following day)
	
	The operator of the CMS system should demonstrate a control failure (no data for a CMS Unit) through use of the correct information flag as per Scenario 3.
	
	Operational Event Log – revision to previously reported data
	The operator of the CMS System should demonstrate that data can be revised by either issuing a refresh or an incremental operational event log (CMS and MA Separate Systems) to the MA in the specified format or if applicable the transferring of revised data (CMS and MA integrated System) from a previous control failure. (Scenario 3) The Refresh or Incremental Flow should cover:
	
	• *Refresh Flow*
	  ○ A complete refresh of the operational event logs which includes previously unknown data
	  ○ A complete refresh of the operational event logs which includes data which has been amended.
	
	• *Incremental Flow*
	  ○ An incremental update of the operational event log which includes previously unknown data
	  ○ An incremental update of the operational event log which includes data which has been amended.
	
	The operator should demonstrate that the operational event log has been retained for audit purposes and that the audit trail is correct.
		Please see *Appendix A – CityTouch Test Group 8*

Test Group	Test Requirements	Test Evidence
Test Group 9	**Volume and Performance** The operator of the CMS System should provide evidence of volume and performance tests completed by the applicant as part of their system testing, to the accredited test agent so that compliance with operational timescales can be assessed.	Please see *Appendix A – CityTouch Test Group 9*

Test Group	Test Requirements	Test Evidence
Test Group 10	**Operational Event Log – File format** The operator of the CMS System should demonstrate that the operational event logs are in the specified format, as per *BSCP520[1] Section 4.5.3.3 ©*.	Please see *Appendix A – CityTouch Test Group 10*

Appendix A

The sections below contain the detailed test evidence in this report.

CityTouch Test Group 1

CityTouch_TestGroup1_100314_1_Test1.2 (CMS Operating Platform and Version)

CityTouch is a sophisticated cloud-based software service, which has both client and server-side components.

On the server-side, *CityTouch* has a heterogeneous server farm, consisting of over 25 servers in the *Amazon Elastic Compute Cloud (EC2),* running either *Windows Server 2008 R2 SP1* or *Ubuntu Linux 12.04*. Two of the Windows machines are Domain Controllers (DCs). The other machines are:

- Database servers, running *PostgreSQL 9.2.7*
- Application servers, running *Internet Information Services* (*IIS) 8.5*, *Nhibernate 3.3.1.4000* and *Microsoft .NET Framework 4.5*
- Connectivity servers
- Map servers, running *PTV xMap Server 1.14.0.1*
- Revision control servers, running *Subversion 1.6.17* and *Git 1.9.0*. Please see the *Revision Control* section for more information about revision control in *CityTouch*.

The client-side component is a *Silverlight 5* application. The client machine must have the *Silverlight 5 Runtime* installed and meet the following minimum requirements:

Operating System	• *Windows 8,* • *Windows 7*, • *Windows Vista*, or • *Windows XP Service Pack 2*
CPU	• *Intel Core Duo 2.2 GHz* or faster
RAM	• For *Windows XP Service Pack 2*: 2GB • For *Windows 8*, *Windows 7* or *Windows Vista*: 4GB or more
Internet Connection	• 2Mbit/s or faster

Browser	• *Windows Internet Explorer 9 or higher* • *Chrome: latest stable version* • *Firefox: latest stable version* • *Firefox 10 ESR* • *Firefox 17 ESR*
Screen Resolution	• 1024 × 768

CityTouch_TestGroup1_140314_1_Test1.1 (CMS Software Version)

The *CityTouch* software version is displayed on the application's *About* page. You can access this page by clicking the **About** link in the *CityTouch* header bar. Figure 4 shows a detail from the About page.

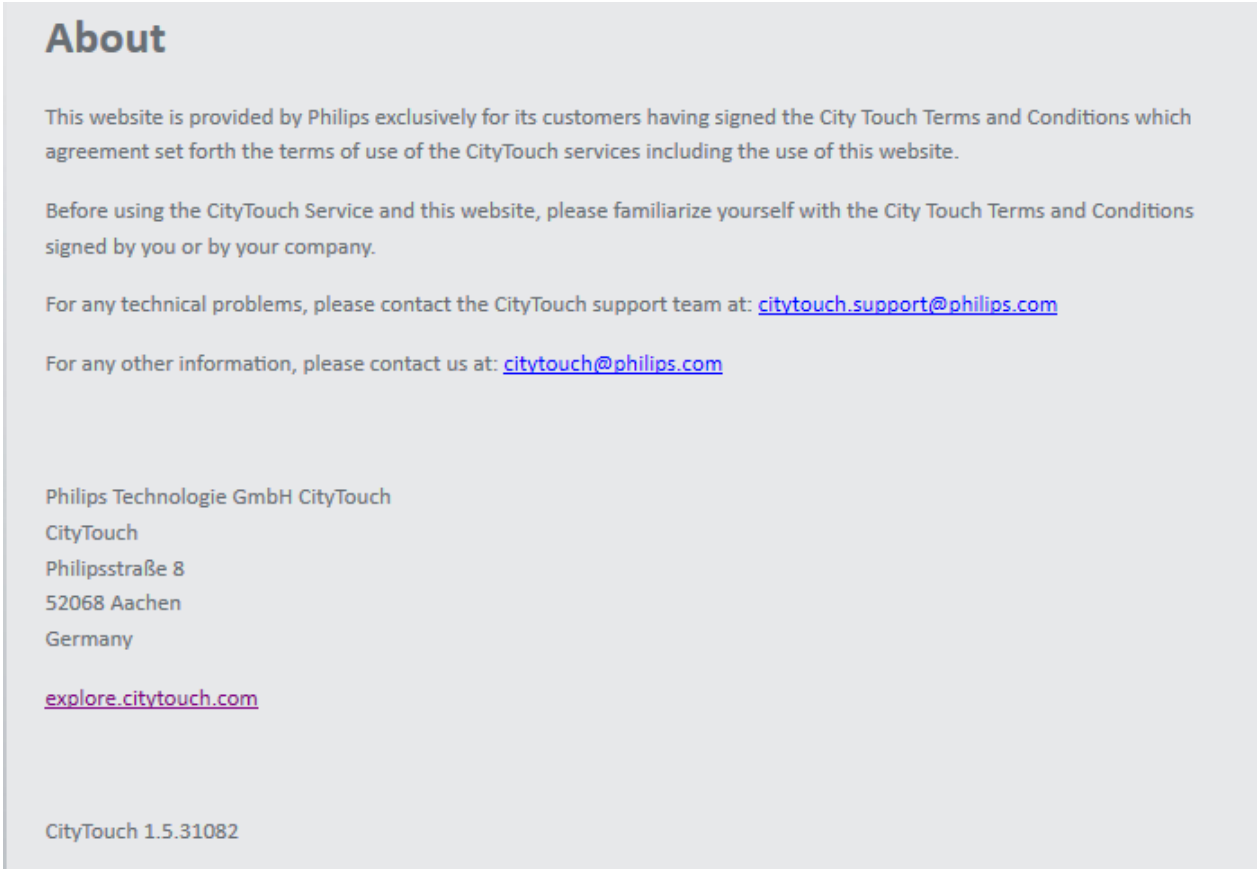


Figure 4: The About page

As you can see, the version number (*1.5.31082*) is represented by three numbers, separated by dots (.). The first is the major release number, the second is the minor release number, and the third is the latest revision number of the *Subversion* revision control system, which manages deployable files (primarily `.exe` and `.dll` files) on our production servers.

A new major release denotes a substantial overhaul of the software. When a new major release occurs, Philips will contact ELEXON to arrange for the re-certification of *CityTouch*. A minor release denotes the addition of a new feature. A new *Subversion* revision will appear in the version number every three weeks and denotes a small increment to the product (such as a set of bug-fixes).

Revision Control

Although we use *Subversion* to manage deployables on our production servers, we use *Git 1.9.0* (http://git-scm.com/) to manage our source code. Originally developed by the architect of the Linux kernel, Linus Torvald, *Git* is arguably the most highly-regarded revision control system of our time. It enables Developers to maintain a synchronized local repository. As a consequence, many operations, such as commit, merge, and branch, are blindingly-fast. In addition to local repositories, we have remote repositories on *Git* servers in both the Amazon cloud and in our local development environment. All these repositories are kept in-synch.

Figure 5 shows the *CityTouch* repository in *Git Extensions* (https://code.google.com/p/gitextensions/) - the Windows Explorer-based browser that we use to do *Git* operations.

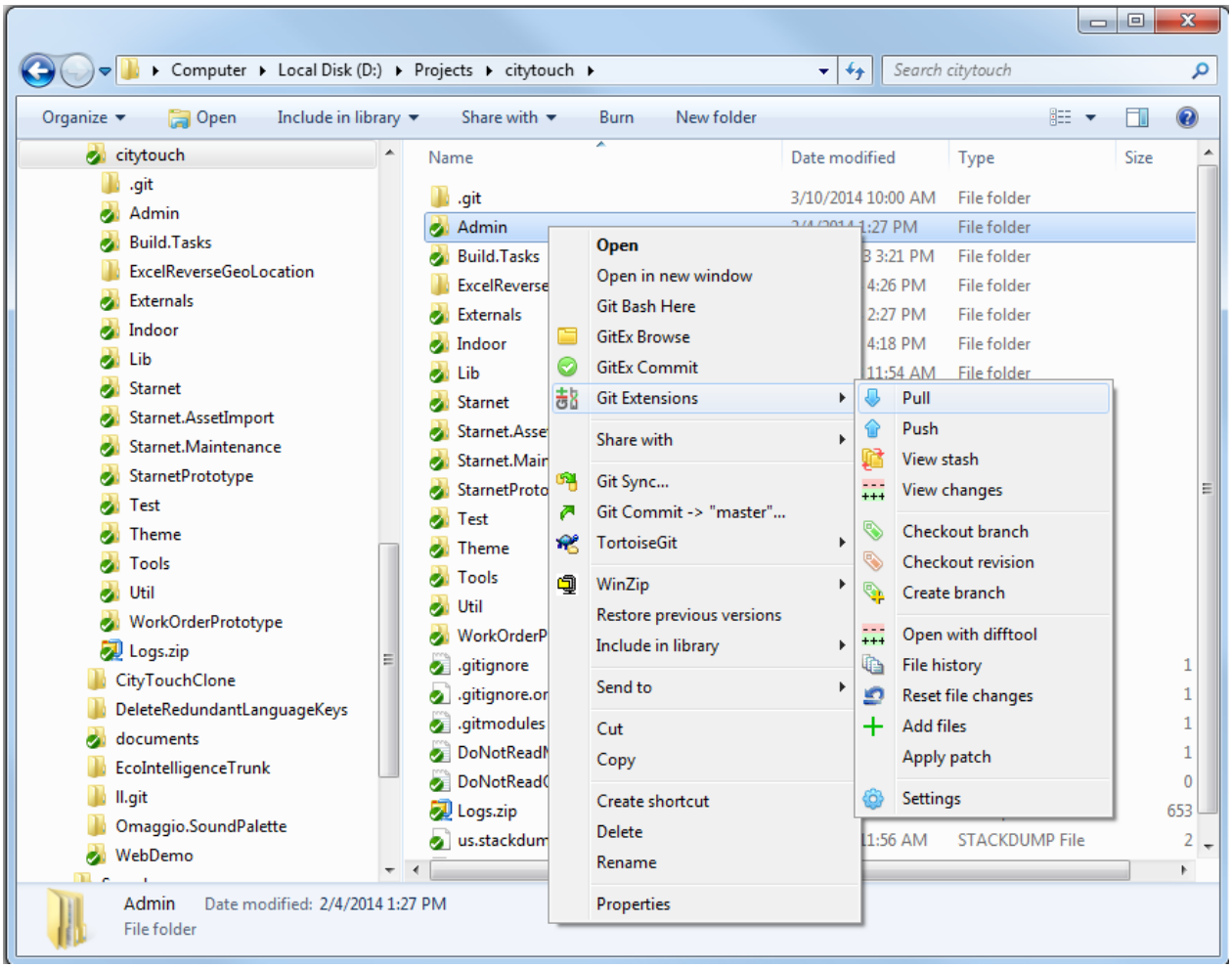


Figure 5: Browsing the CityTouch Git repository with Git Extensions

Our Developers also use the *Git Extensions Visual Studio* plug-in (http://visualstudiogallery.msdn.microsoft.com/8f594baa-e44e-4114-8381-e175ace0fe97) in their *Microsoft Visual Studio 2012* development environment.

In addition to simple revision control, we use *Git* to enact sophisticated branching and merging strategies. For example, we may develop a new feature or component on a branch, before merging it back into the trunk prior to release.

Development Methodology and Quality Control

The *CityTouch* development team uses a range of cutting-edge development methodologies and test strategies, to ensure that the quality of the released service remains high. The team uses the *Scrum* agile development methodology. All software is developed (test-first) using the *Test-Driven Development (TDD)* methodology, which ensures that resultant code is well-factored, of high-quality, and has good test coverage. TDD has also enabled us to create a very large suite of automated regression-tests, which can be run at any time. *CityTouch* currently has 1,244 test fixtures, comprising 10,360 unit tests and 518 integration tests, which test *all* aspects of *CityTouch*. Developers regularly run the fixtures relating to the areas they are working on. The tests act as a sort of safety net: when all tests are passing, we are confident that no bugs have crept into the code and that *CityTouch* - in its totality - is in a functional state.

The development team also uses the *Continuous Integration (CI)* methodology with *TeamCity* (http://www.jetbrains.com/teamcity/), to ensure that each branch, including the trunk, is built and has its entire suite of unit tests run as soon as a Developer synchronises his changes with the remote repository. This means in practice that the trunk is built and has its unit tests run many times each working day. CI enables us to identify bugs and regression issues soon after they occur, so they can be fixed immediately and don't become established in the code-base. Currently, we have 3 *TeamCity* build-agents running on 3 separate local servers, which are constantly building and testing code. One of the build agents is dedicated to the 518 long-running integration tests. *CityTouch* cannot be deployed on our test servers for manual testing if any unit tests have failed.

Figure 6 shows the test results for an automated build of our *Master* (trunk) branch in *TeamCity*. As you can see, there were 0 test failures: 10,359 tests passed and 1 test was temporarily set to be ignored by *TeamCity*.

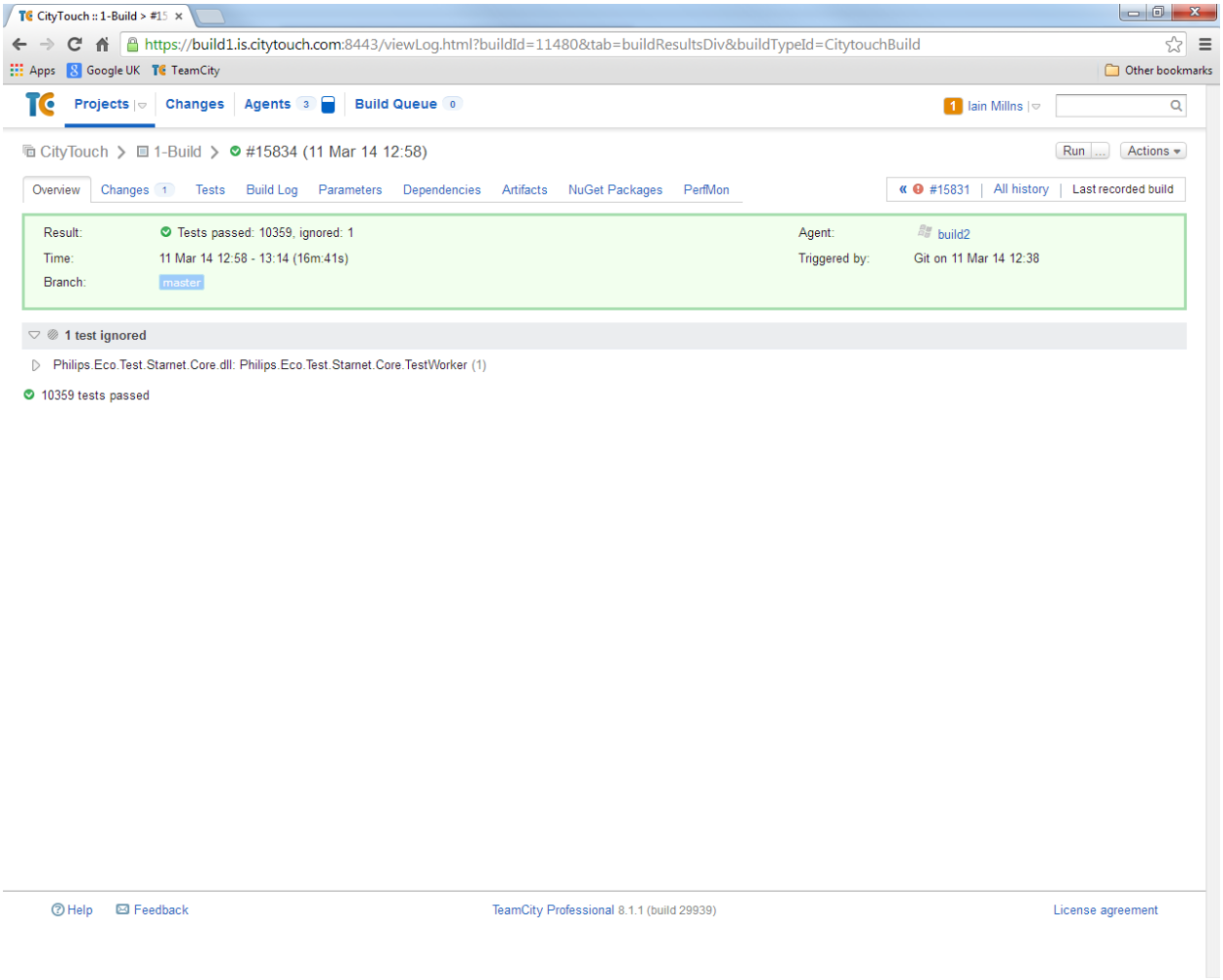


Figure 6: 10,359 passed unit tests after an automated build of the Master (trunk) branch in TeamCity

In addition to the automated tests, a battery of manual deployment tests and smoke tests are run (and must be passed) prior to any production release. These tests are defined in written test scripts.

CityTouch Test Group 2

CityTouch_TestGroup2_270214_1 (System Security)

Test References: 2.1, 2.2, 2.3, and 2.4

CityTouch has a comprehensive role-based security implementation, to enables users to authenticate themselves and authorise access to various parts of the application. In *CityTouch*, users with the role *Master* can access the *CityTouch* administration site. On the Users page, they can add other users to *CityTouch*. Figure 7 shows a detail from the Users page.

Figure 7: Detail from the Users page

When the **Create User** button is clicked, a Create User page appears. *Master* users can then add the details of the user and specify their role(s). The user name must be a valid Email address. Figure 8 shows a detail from the Create User page.

As you can see, there are many roles in *CityTouch*. Users can have several roles, and each role enables access to different parts of the application (with read or write access). For example, the *User* role has read-only access to the application, but the *Operator* role can create dimming calendars and apply them to street lights. New read-only users (with just the *User* role) can be created as required.

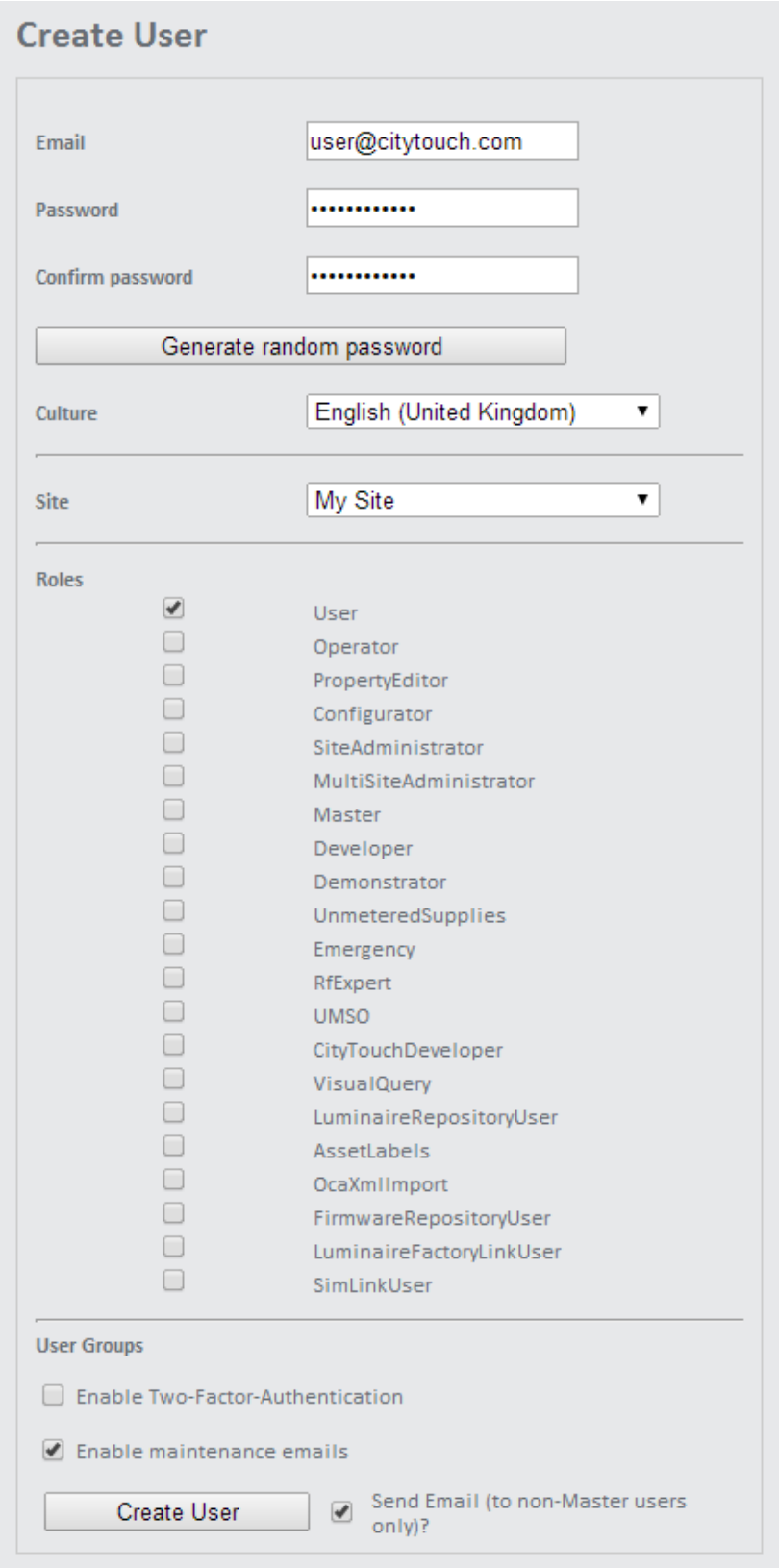


Figure 8: Detail from the Create User page

The read-only user indicated in Figure 8 was created and Figure 9 shows this user logging-in (using the *CityTouch* log-in page). Figure 10 shows the read-only user logged into *CityTouch*.

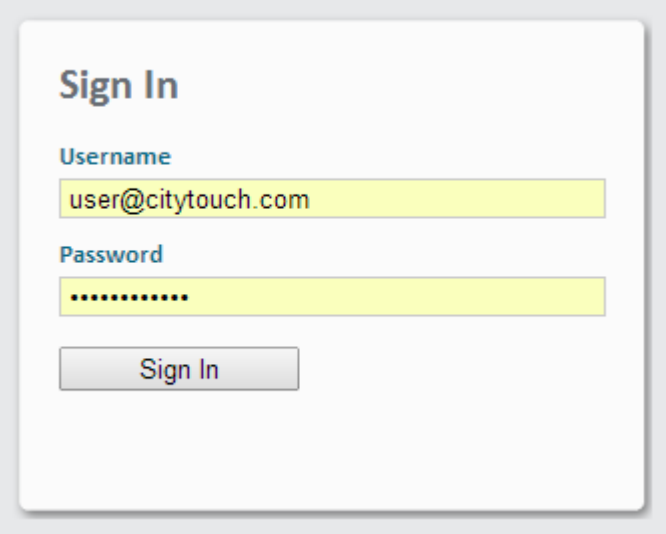


Figure 9: Read-only user logging-in

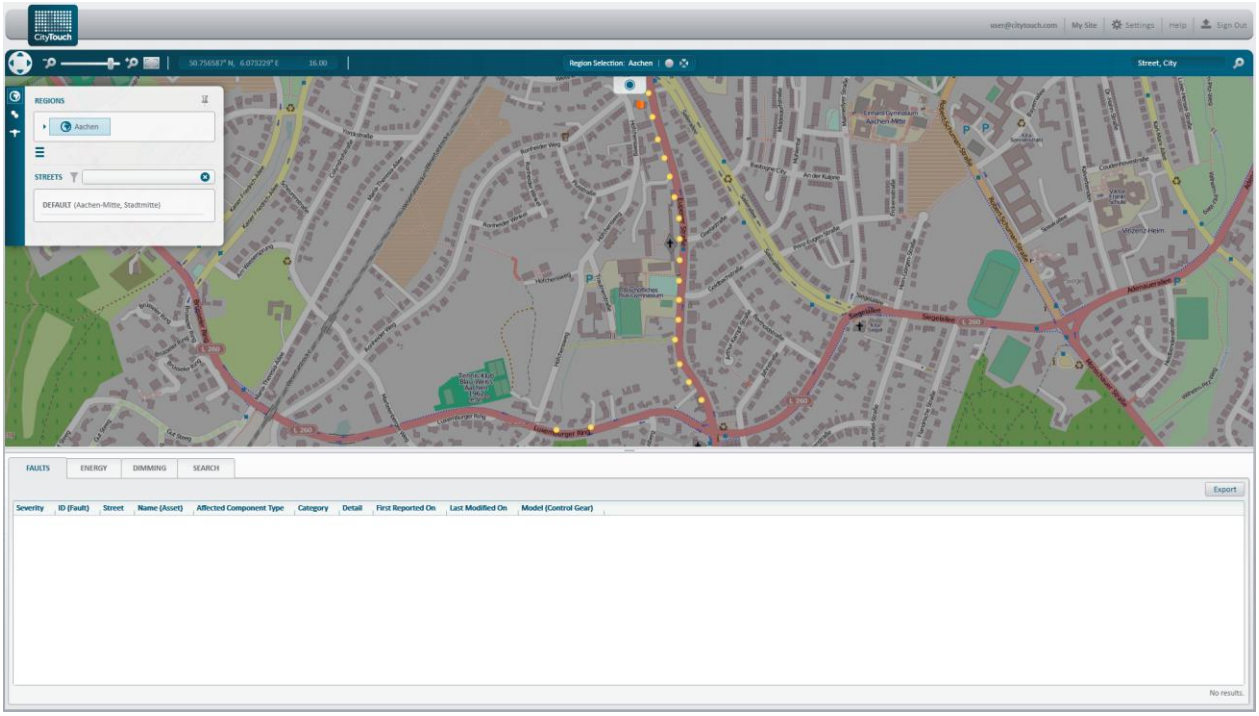


Figure 10: Read-only user logged-in to CityTouch

There is also an *Unmetered Supplies* role, which lets users view the Unmetered Supplies page on the *CityTouch* administration site. This page lets users generate and send event logs, and view the various types of audit trails. Figure 11 shows an *Unmetered Supplies* user logged into the Unmetered Supplies page.

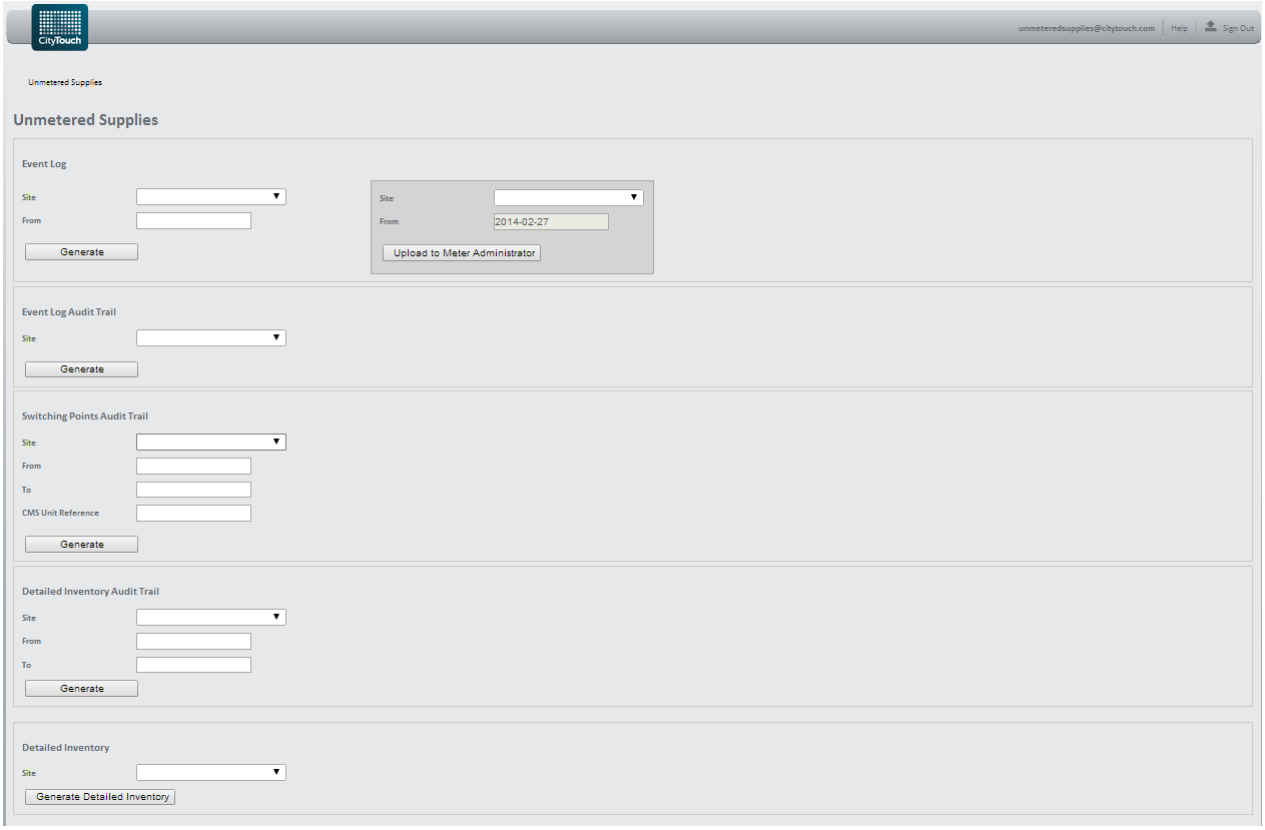


Figure 11: Unmetered Supplies user on the Unmetered Supplies page

Two-factor Authentication

In addition to role-based security, *CityTouch* now has optional two-factor authentication. When this is enabled, users are sent (by email) a verification code, which they must enter after their password in order to log-on. Users can specify that they wish to enter the code just once every 90 days. Figure 12 shows the dialog where you enter the code.

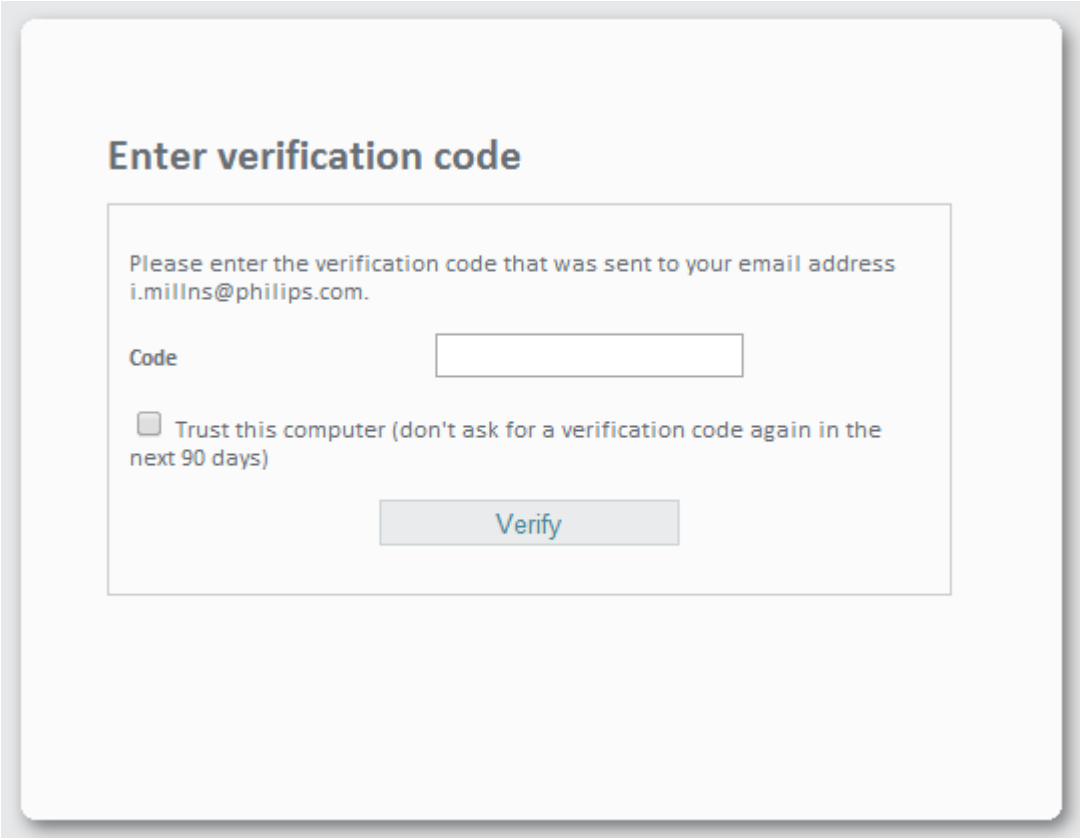


Figure 12: Enter verification code dialog

Users may request two-factor authentication themselves on the User Settings page, or *Master* users may set it up for them when they create the account (see Figure 8).

Penetration Testing (Pentesting)

In addition to the aforementioned security mechanisms, Philips pays for *CityTouch* to be regularly pentested by a certain German company, who are specialists in this field. During the tests, they endeavour to hack *CityTouch* using every known type of hacker-exploit. Through our close relationship with this company, we have taken many excellent precautions to ensure that *CityTouch* is as hacker-proof as possible.

CityTouch Test Group 3

CityTouch_TestGroup3_270214_1 (Synchronisation to UTC)

CityTouch servers are synchronised with NTP time servers, to ensure they always use UTC time accurate to within a few milliseconds. The Domain Controllers (DCs) are synchronised with an NTP time server, and the DCs then synchronise, in turn, the times of their associated database and application servers. Figure 13 is a Command Prompt, which shows that a DC is synchronised with `1.europe.pool.ntp.org`, and that its current time drift is only 9 milliseconds.

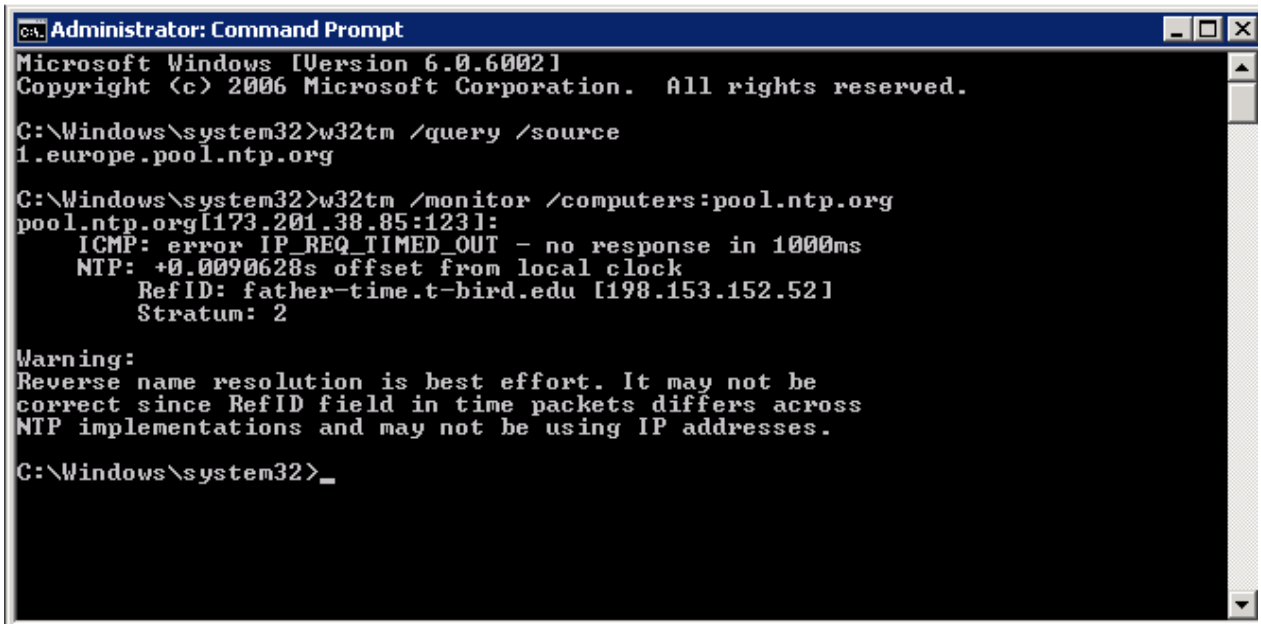


Figure 13: Time synchronization and drift of DC

CityTouch Linux servers are also synchronised with NTP time servers. Figure 14 shows the `ntp.conf` file of one of the Linux servers. As you can see, the file specifies four time servers. The Linux server will try to synchronise with `0.europe.pool.ntp.org` first, but if that's unavailable, it will endeavour to synchronise with the next server in the list (and so on).

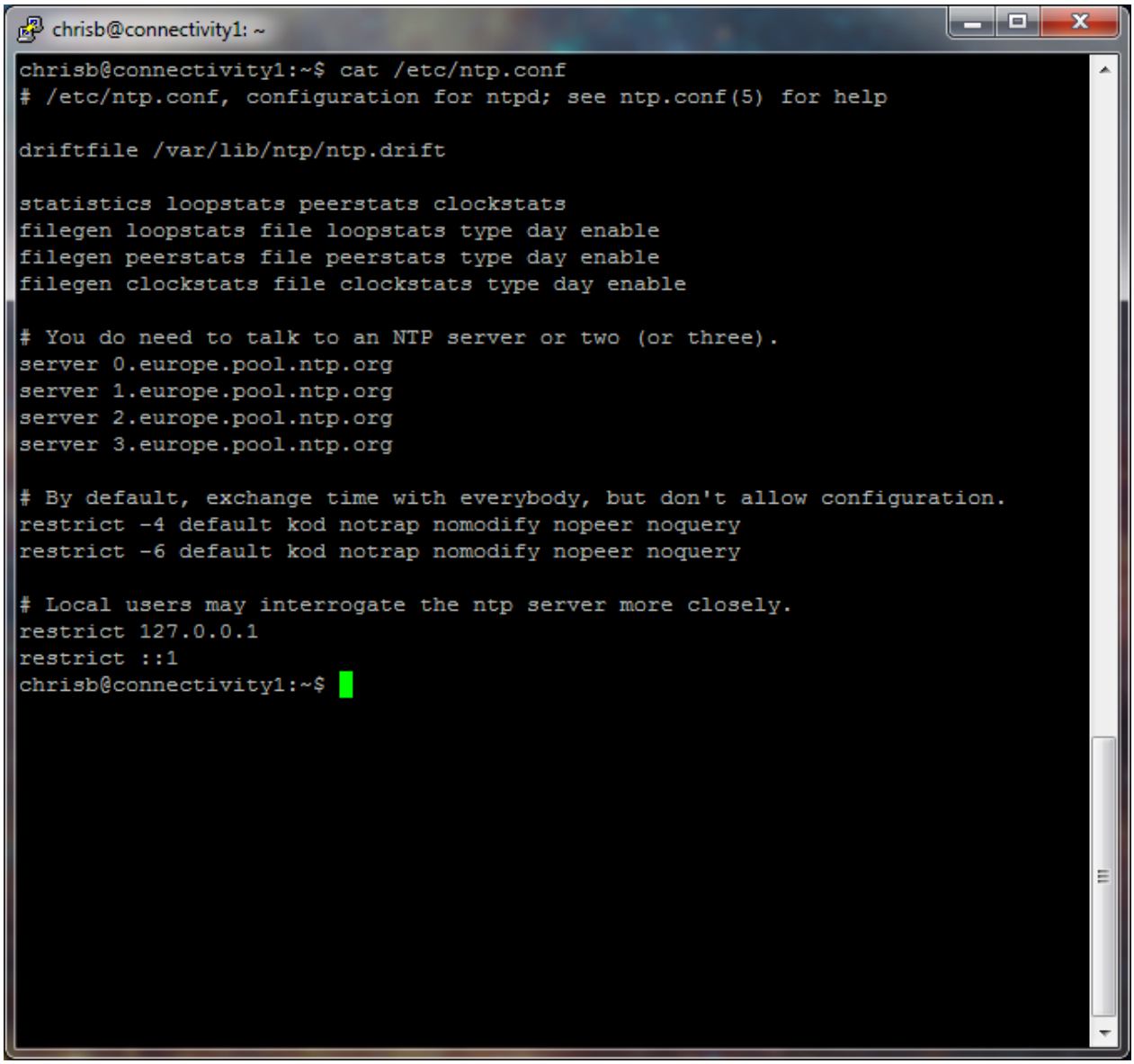


Figure 14: Linux server NTP configuration

As mentioned in the Introduction, the *CityTouch OLC* has an onboard GPS chip, which computes extremely accurate UTC times (to within one millisecond). Hence, we can be assured that our switching point times are extremely accurate.

CityTouch Test Group 4 and 5

CityTouch_TestGroup4b_190314_1 (Inventory Control Information)
Test References: 4.3, 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, and 4.3.6

CityTouch_TestGroup5_190314_1 (Equipment Control Information)
Test References: 5.1, 5.1.1, 5.1.2, 5.1.3, and 5.1.4

CityTouch manages all the properties in Test Groups 4b and 5 of the Test Specification[2]. It does not however manage all the properties in Test Group 4a; we therefore propose to omit these tests.

All the Test Groups 4b and 5 properties, apart from *Charge Code*, are given default values when street lights are created. All the properties, apart from *CMS Unit Reference* and *Unit Type*, may be subsequently edited. In conformance with the *Operational Information Document – A Guide to Unmetered Supplies under the BSC*[3], the *CMS Unit Reference* is the component's database ID formatted into a 12-character text field and *Unit Type* is '*M*' for control gear and '*L*' for luminaires.

In *CityTouch*, you set charge codes on a special Charge Codes page in the *CityTouch* administration site. You edit the other Test Groups 4b and 5 properties, using the *CityTouch* Asset Property Editor dialog. Both UIs are shown later in this section. All editable properties have validation, to ensure their values correspond to the formats specified in the *Operational Information Document – A Guide to Unmetered Supplies under the BSC*[3]. You delete property values by deleting the associated assets.

For assets to have corresponding entries in the event logs, they must have a valid *Sub-Meter ID* and *CMS Unit Reference*, and their *Effective From* date must be before or on the event log date.

Adding and Modifying Control Information

When a *CityTouch Ready Luminaire* is installed, it contacts *CityTouch* to register its location. A marker is created for the luminaire on the map and its Test Groups 4b and 5 properties are given default values. Figure 15 shows two markers (for two *CityTouch Ready Luminaires*) and a search result showing their default property values. The markers are considered as control gear, which is why they have the '*M*' Unit Type. The Sub-Meter ID is the default Sub-Meter ID for the site.

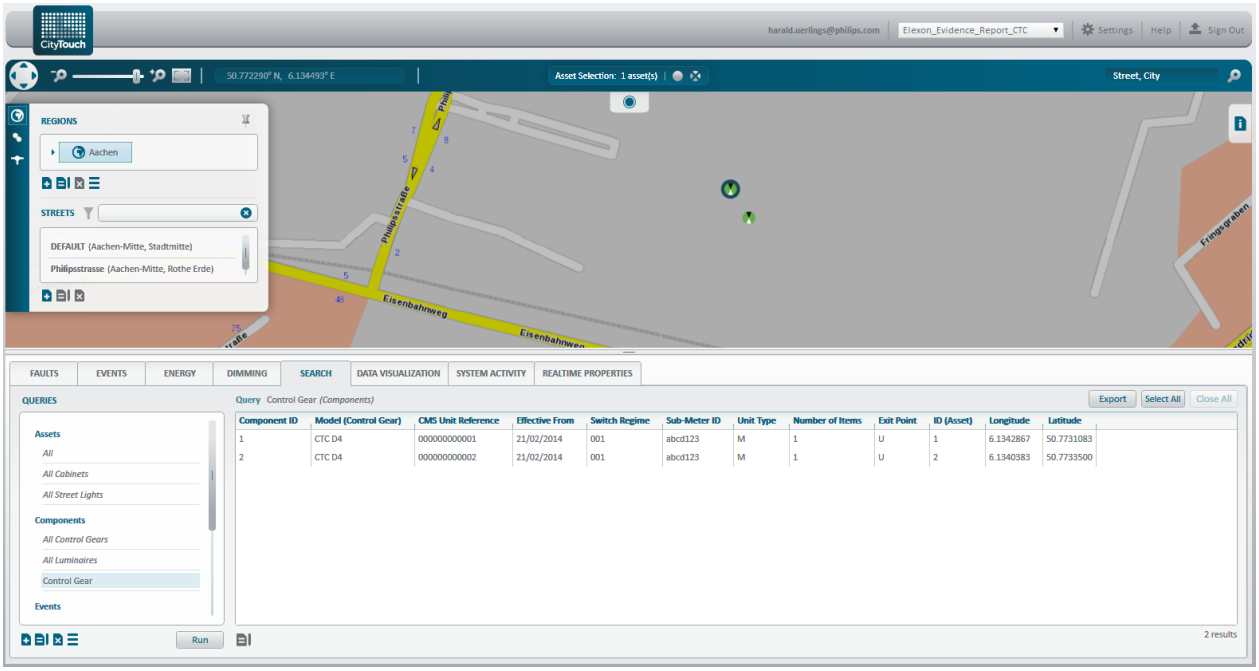


Figure 15: Two markers and their default property values

After the markers appear, you create street light assets for them using the **Create Street Light** map context menu item, shown in Figure 16.

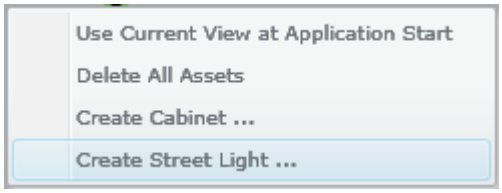


Figure 16: Create Street Light context menu item

These assets have default values for the Test Groups 4b and 5 properties. Figure 17 shows the values of these properties for the luminaire in a newly-created street light: unlike the markers, the Unit Type is '*L*' and the Switch Regime is *999*. This dialog is the Asset Property Editor.

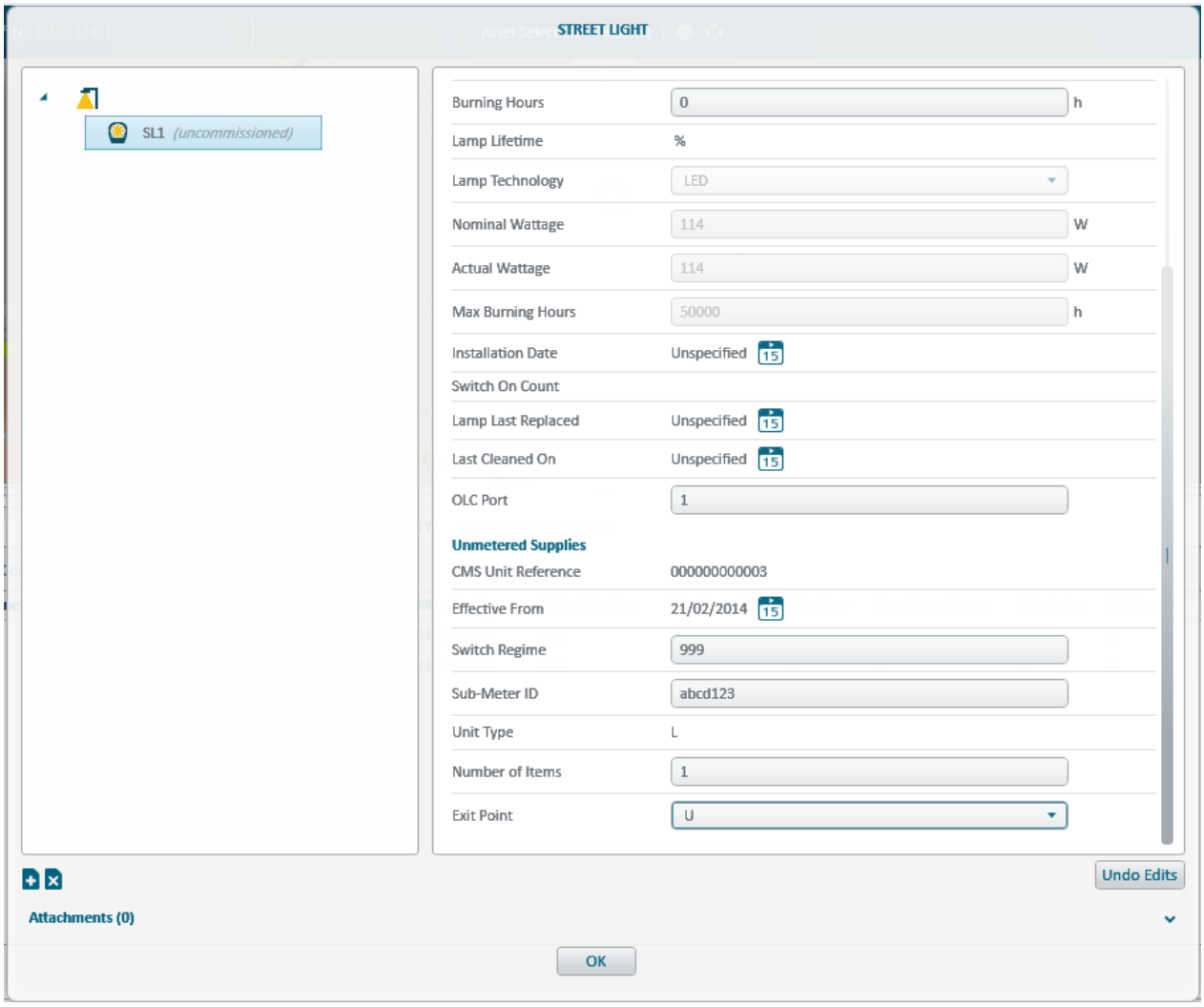


Figure 17: Default values for the Test Groups 4b and 5 luminaire properties of a newly-created street light

We created two street lights and edited the properties of the second street light, shown in Figure 18, changing its Sub-Meter Id to *abcd456* and its Switch Regime to *998*.

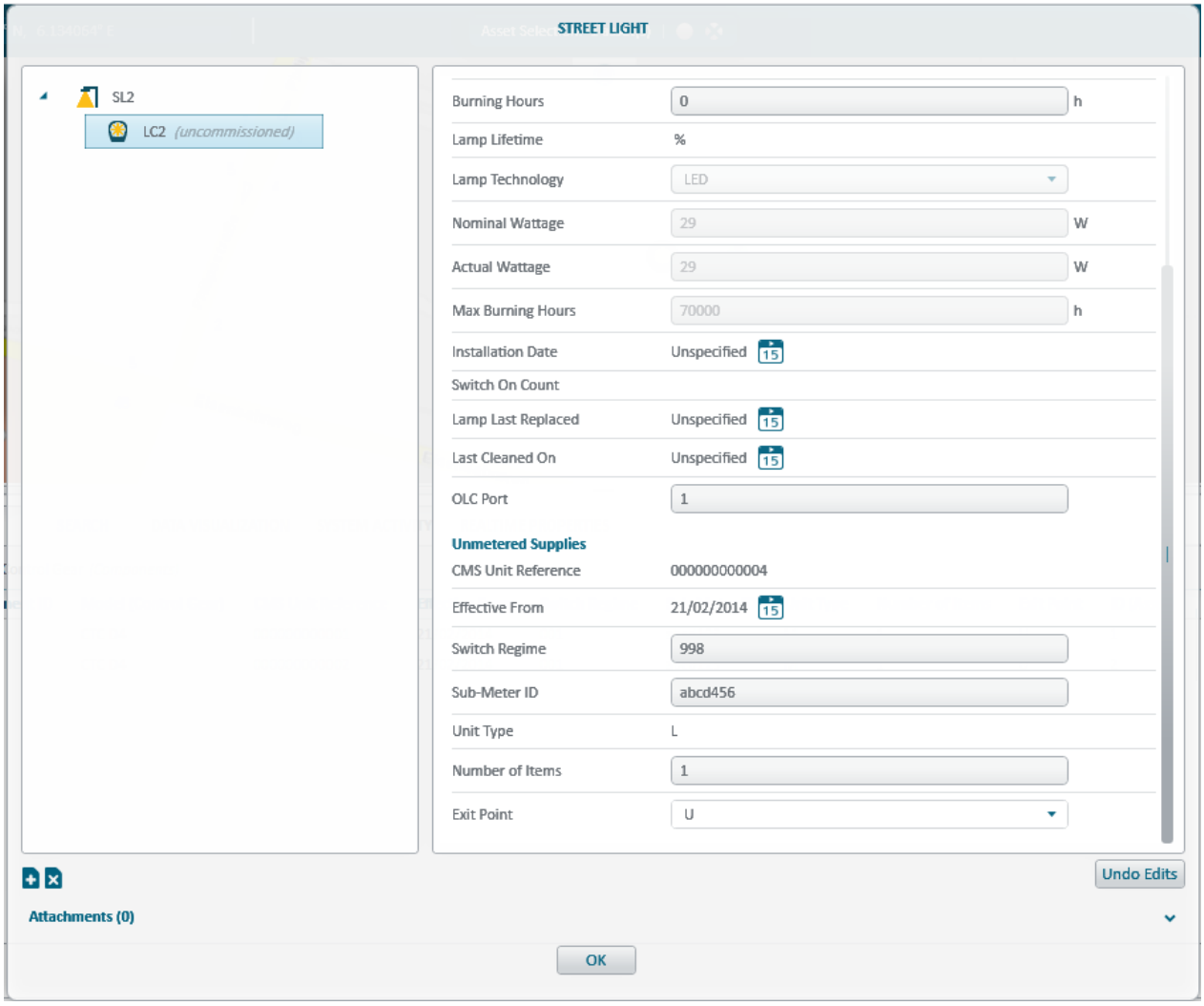


Figure 18: Edited luminaire property values

You use the **Link to Street Light** marker context menu to associate markers with street lights. We created the two linked pairs shown in Figure 19.

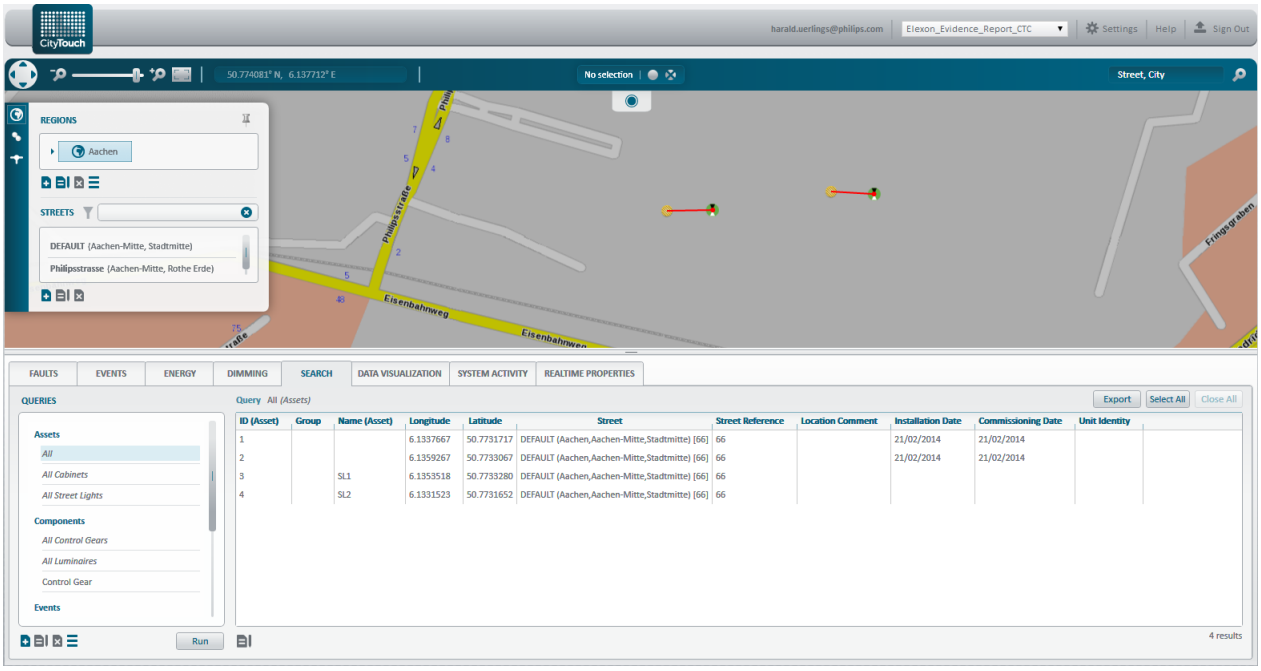


Figure 19: Paired markers and street lights

For each pair, you then use the **Assign to Street Light** marker context menu, shown in Figure 20, to merge the marker into the street light. During the merge, the marker's properties become the street light's OLC properties and the street light is commissioned.

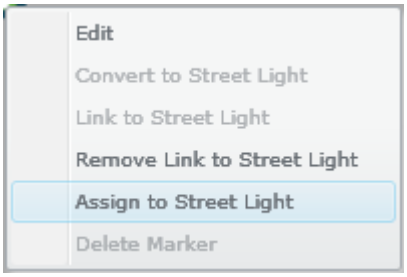


Figure 20: Assign to Street Light context menu item

We merged both markers into their associated street lights. Figures 21 and 22 show the OLC and luminaire properties of the street light, whose luminaire has a *999* Switch Regime. Although the *CityTouch Ready Luminaire* physically contains the *CityTouch OLC*, the luminaire and OLC are shown as separate components (with separate properties) in the Asset Property Editor.

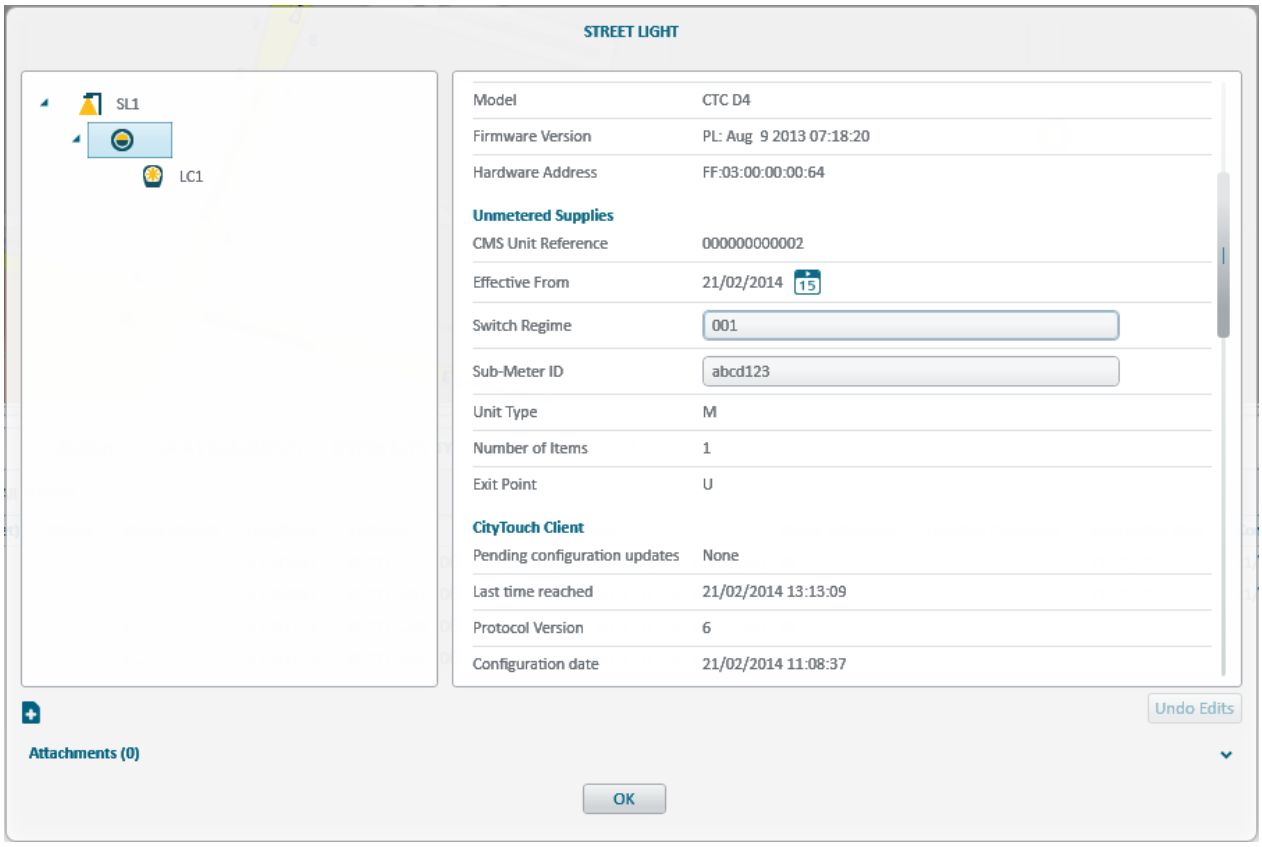


Figure 21: OLC property values

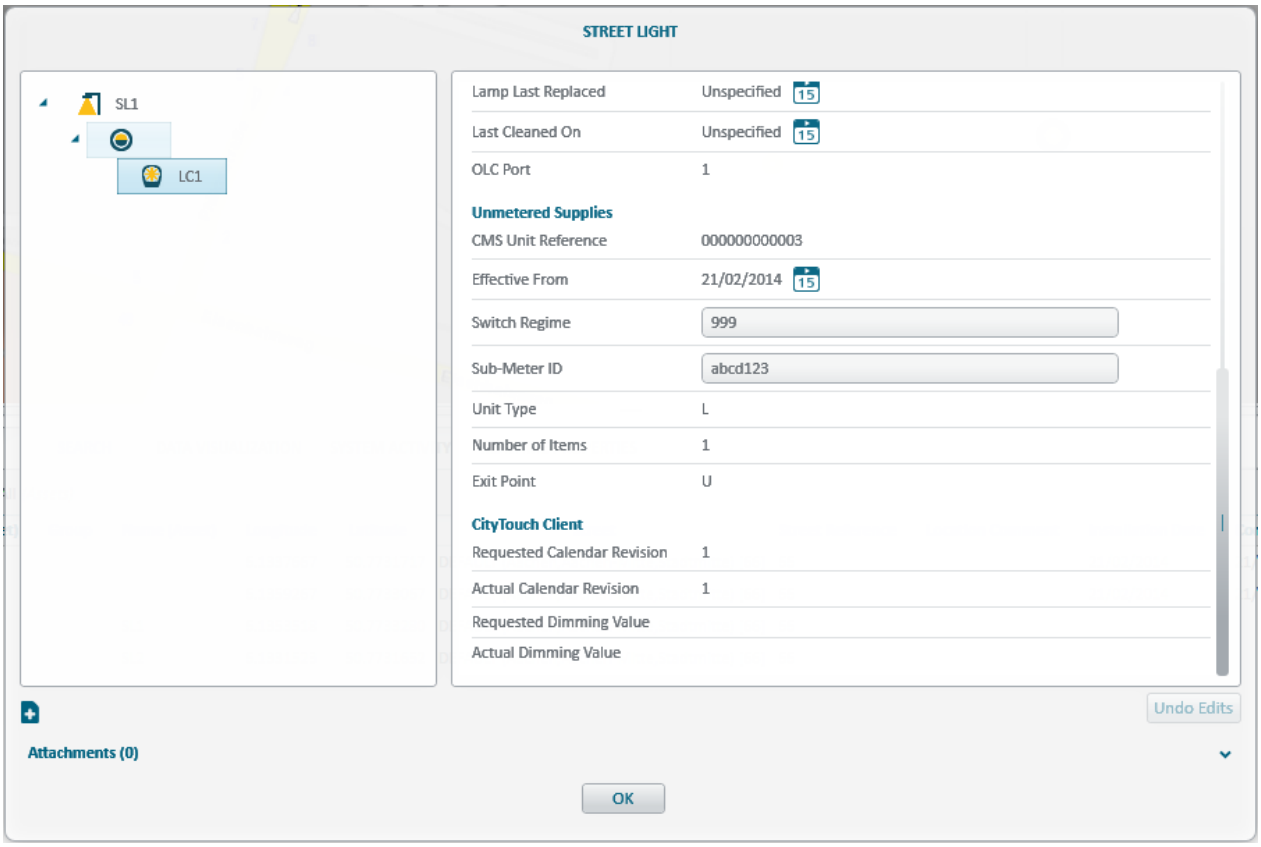


Figure 22: Luminaire property values

After street lights are commissioned, you may use the Asset Property Editor to change their editable properties at any time. Figure 23 shows the street light whose luminaire has a *998* Switch Regime in the Asset Property Editor.

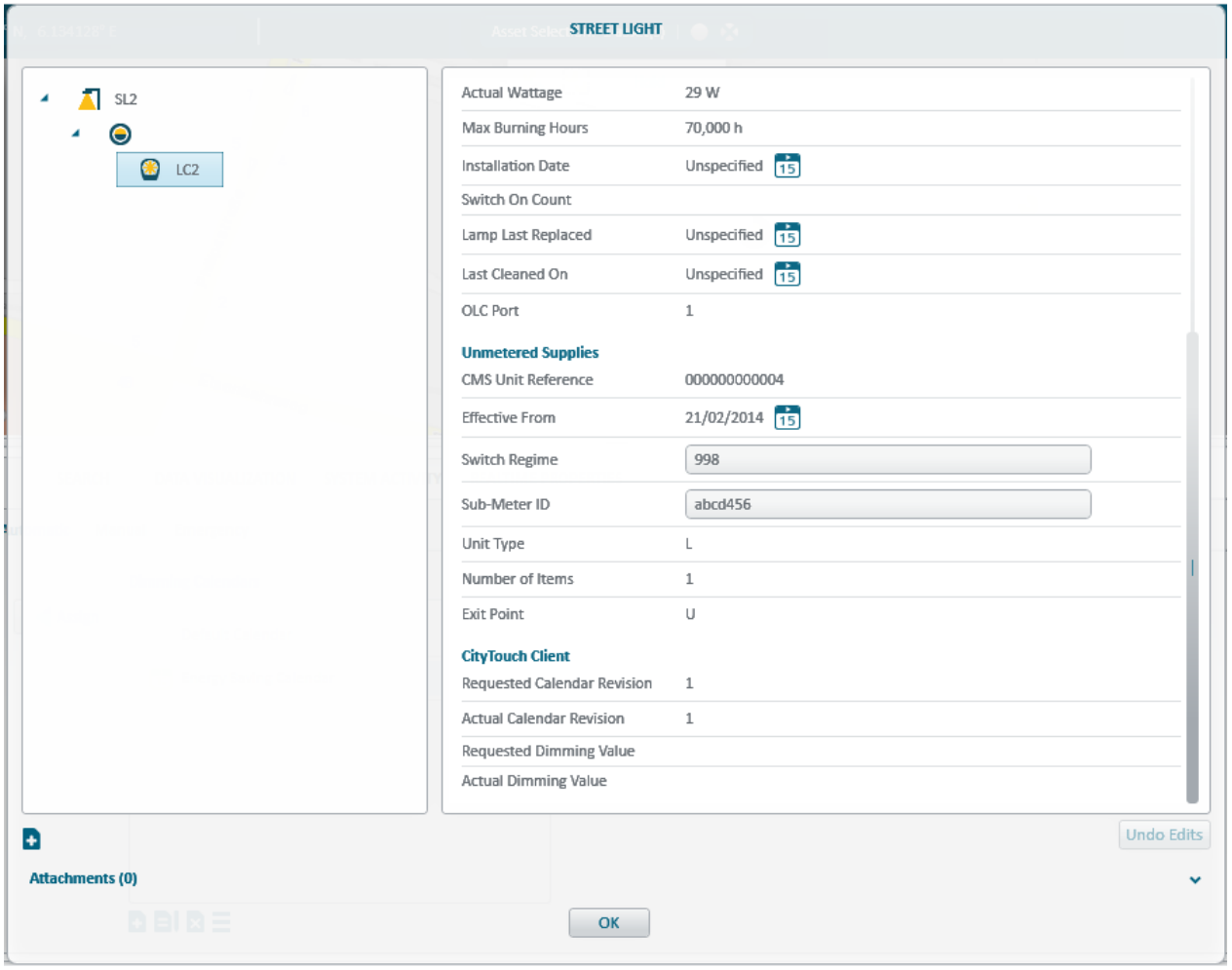


Figure 23: Asset Property Editor

Charge Codes

Charge codes are set differently to other Test Groups 4b and 5 properties. Rather than being set in the Asset Property Editor, they are set on a Charge Codes page in the *CityTouch* administration site. Figure 24 shows this page before any charge codes were set. Figure 25 shows this page after we set the charge codes.

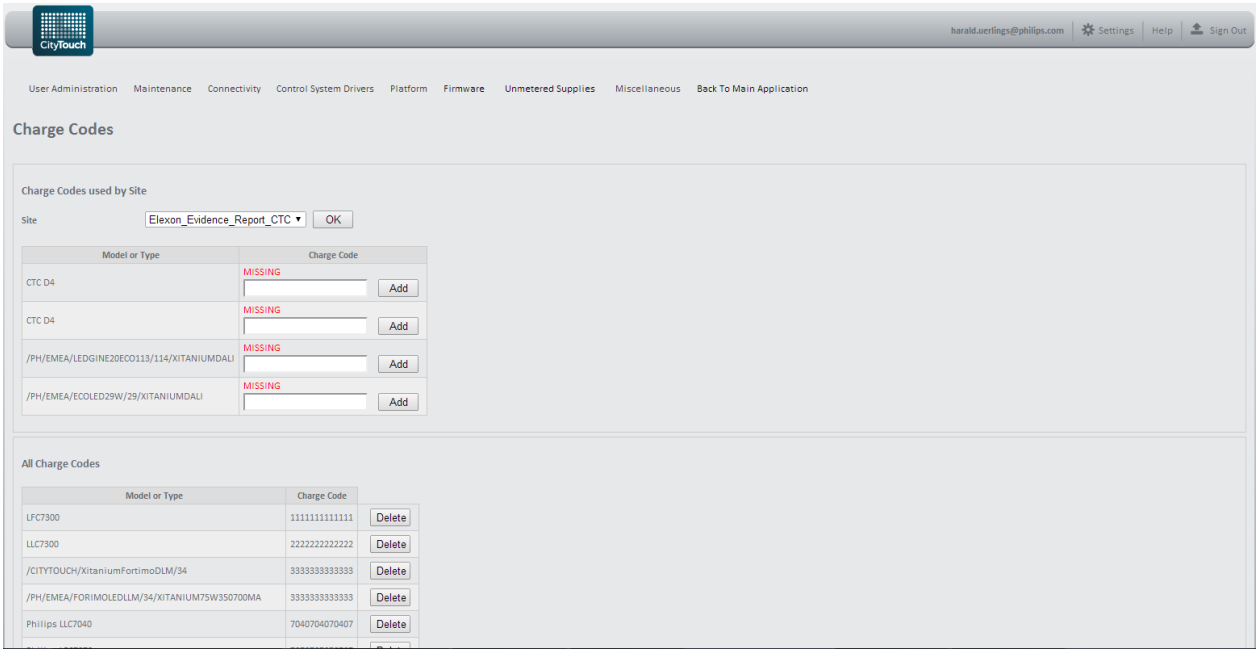


Figure 24: Charge Codes page with missing charge codes

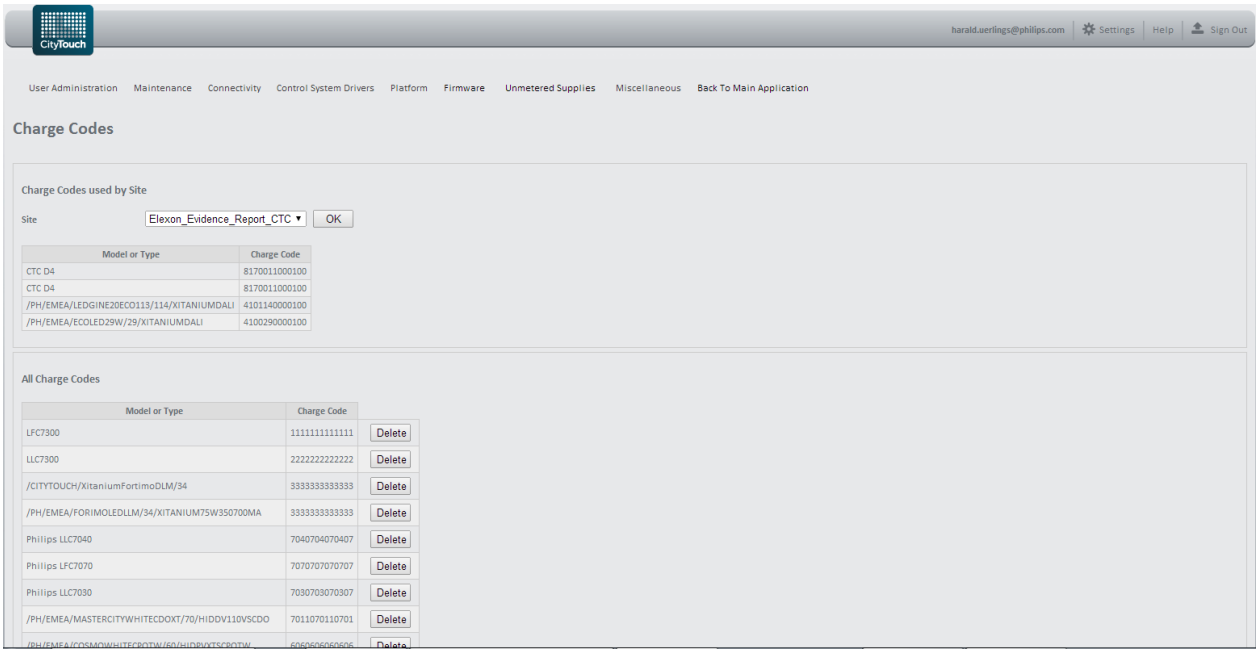


Figure 25: Charge Codes page with set charge codes

Deleting Control Information

To complete the life-cycle of the street lights, we decommissioned and deleted them using the **Decommission …** and **Delete Asset** menu items on the Asset Context Menu. The street lights then disappeared from the map. Figure 26 shows a detail from the Asset Context Menu.

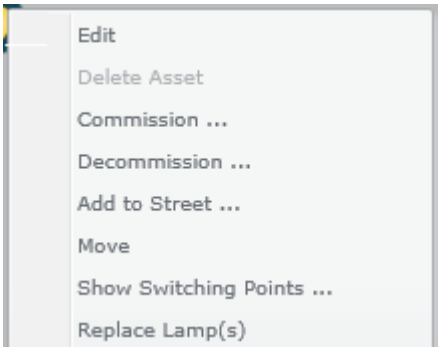


Figure 26: Detail from the Asset Context Menu

Inventory Audit Trail

CityTouch_TestGroup4b_190314_1_Test4.4 (Audit Trail)
CityTouch_TestGroup5_190314_1_Test5.2 (Audit Trail)

The actions described above, to add, update, and delete data about lights and control devices, generate audit trail items which can be viewed in *CityTouch*. To view this audit trail, go to the Unmetered Supplies page on the *CityTouch* administration site, where you will see the Detailed Inventory Audit Trail UI shown in Figure 27.

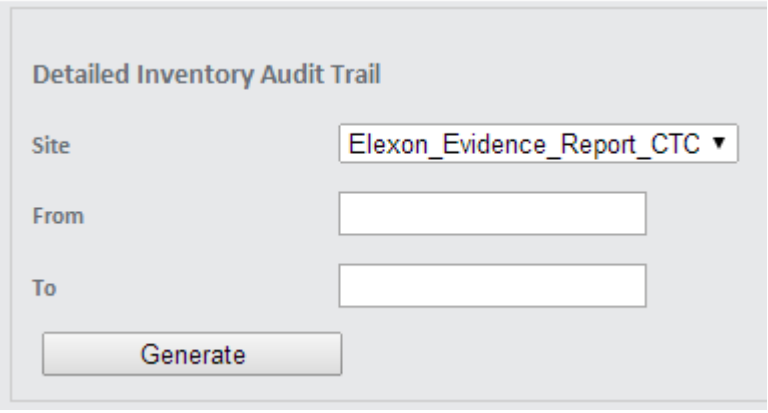
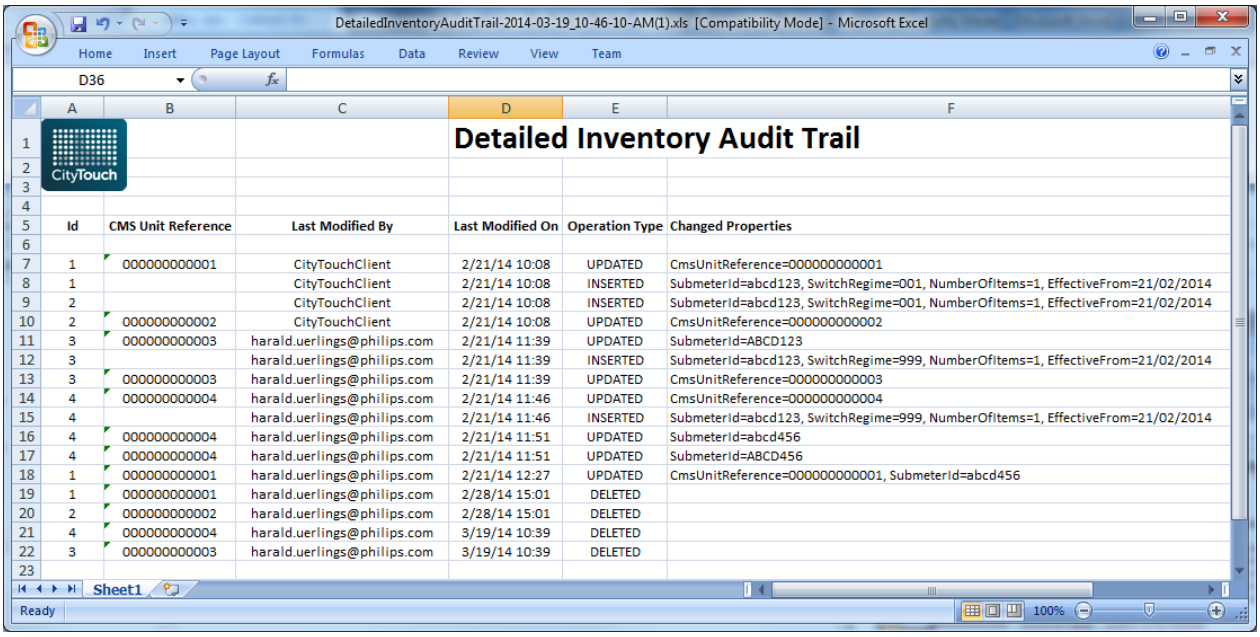


Figure 27: Detailed Inventory Audit trail UI

You can the select the **Site** the inventory is associated with, as well as **From** and **To** dates (either or both of these fields can be empty, to make the date range unbounded on one or both sides). When you click the **Generate** button, *CityTouch* will generate and download a spreadsheet of all audit trail items in the

specified date range. Figure 28 shows the audit trail for the adding, editing, and deleting of inventory properties performed in this section.



DetailedInventoryAuditTrail-2014-03-19_10-46-10-AM(1).xls [Compatibility Mode] - Microsoft Excel

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Detailed Inventory Audit Trail

Id	CMS Unit Reference	Last Modified By	Last Modified On	Operation Type	Changed Properties
1	000000000001	CityTouchClient	2/21/14 10:08	UPDATED	CmsUnitReference=000000000001
1		CityTouchClient	2/21/14 10:08	INSERTED	SubmeterId=abcd123, SwitchRegime=001, NumberOfItems=1, EffectiveFrom=21/02/2014
2		CityTouchClient	2/21/14 10:08	INSERTED	SubmeterId=abcd123, SwitchRegime=001, NumberOfItems=1, EffectiveFrom=21/02/2014
2	000000000002	CityTouchClient	2/21/14 10:08	UPDATED	CmsUnitReference=000000000002
3	000000000003	harald.uerlings@philips.com	2/21/14 11:39	UPDATED	SubmeterId=ABCD123
3		harald.uerlings@philips.com	2/21/14 11:39	INSERTED	SubmeterId=abcd123, SwitchRegime=999, NumberOfItems=1, EffectiveFrom=21/02/2014
3	000000000003	harald.uerlings@philips.com	2/21/14 11:39	UPDATED	CmsUnitReference=000000000003
4	000000000004	harald.uerlings@philips.com	2/21/14 11:46	UPDATED	CmsUnitReference=000000000004
4		harald.uerlings@philips.com	2/21/14 11:46	INSERTED	SubmeterId=abcd123, SwitchRegime=999, NumberOfItems=1, EffectiveFrom=21/02/2014
4	000000000004	harald.uerlings@philips.com	2/21/14 11:51	UPDATED	SubmeterId=abcd456
4	000000000004	harald.uerlings@philips.com	2/21/14 11:51	UPDATED	SubmeterId=ABCD456
1	000000000001	harald.uerlings@philips.com	2/21/14 12:27	UPDATED	CmsUnitReference=000000000001, SubmeterId=abcd456
1	000000000001	harald.uerlings@philips.com	2/28/14 15:01	DELETED	
2	000000000002	harald.uerlings@philips.com	2/28/14 15:01	DELETED	
4	000000000004	harald.uerlings@philips.com	3/19/14 10:39	DELETED	
3	000000000003	harald.uerlings@philips.com	3/19/14 10:39	DELETED	

Sheet1

Ready 100%

Figure 28: Detailed inventory audit trail after adding, editing, and deleting

As you can see, the audit trail shows the:

- CMS Unit Reference
- The user name of the person who made the change
- The date of the modification
- The type of modification: *INSERTED*, *UPDATED* or *DELETED*
- The property that changed (if any) and the value it changed to

Separate items were generated for markers and street lights. We demonstrated *UPDATEs* by changing the case of the Sub-Meter IDs.

CityTouch Test Groups 6 and 7

CityTouch_TestGroup6_120314_1 (CMS Issue Instructions)
Test References: 6.1, 6.2, 6.3, and 6.4

CityTouch_TestGroup7_120314_1 (Record operational switching times and power levels)
Test References: 7.1, 7.2, 7.3, and 7.4

Dimming Shapes

In *CityTouch*, you can define dimming shapes and apply them, using rules and calendars, to luminaires. For Test Groups 6 and 7, we defined two dimming shapes, corresponding to the shapes prescribed in *Scenario 1 – Switch Regime 999* and *Scenario 2 – Switch Regime 998*, in sections 4.1 and 4.2 respectively in the Test Specification[2]. Figure 29 shows the dimming shape for *Scenario 1 – Switch Regime 999* and Figure 30 shows the dimming shape for *Scenario 2 – Switch Regime 998*.

These shapes were also used in the tests for *Scenario 3 – Control Failure for Multiple CMS Unit References* and *Scenario 4 – Revised Data after Control Failure (Following Day)*, defined respectively in sections 4.3 and 4.4 of the Test Specification[2].

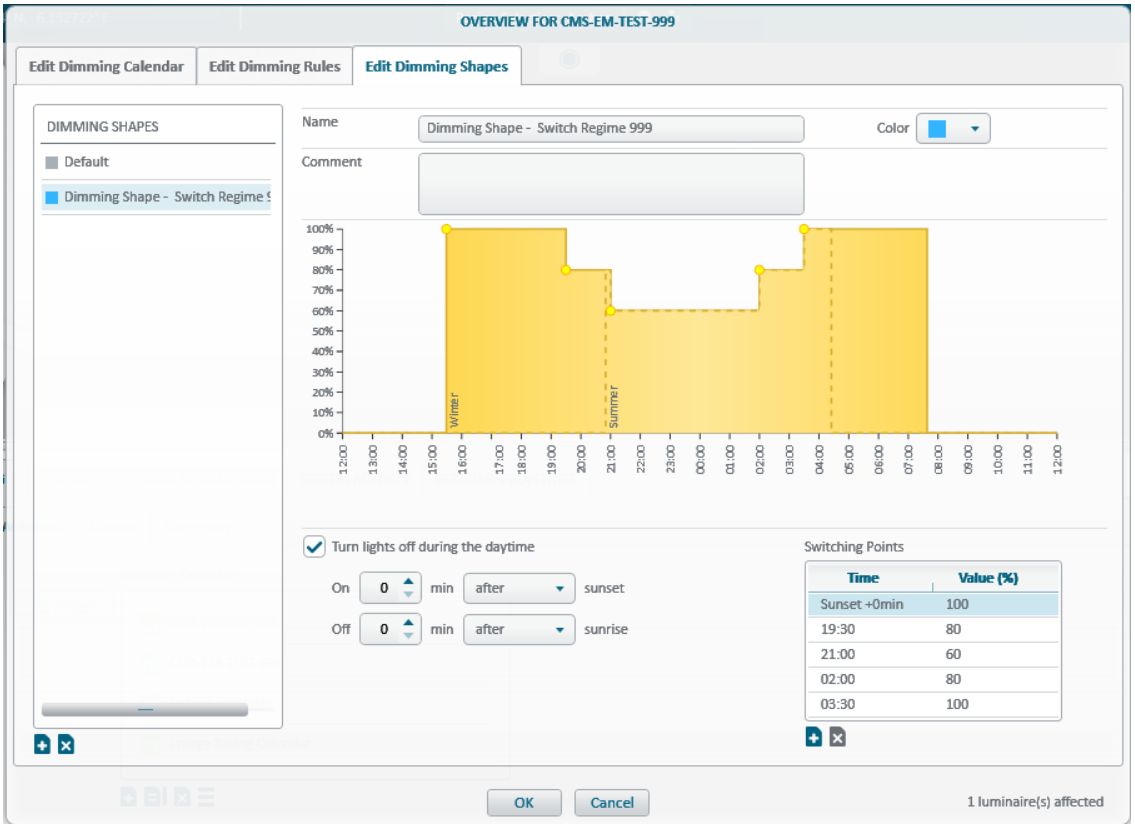


Figure 29: Dimming shape defined for Scenario 1 – Switch Regime 999

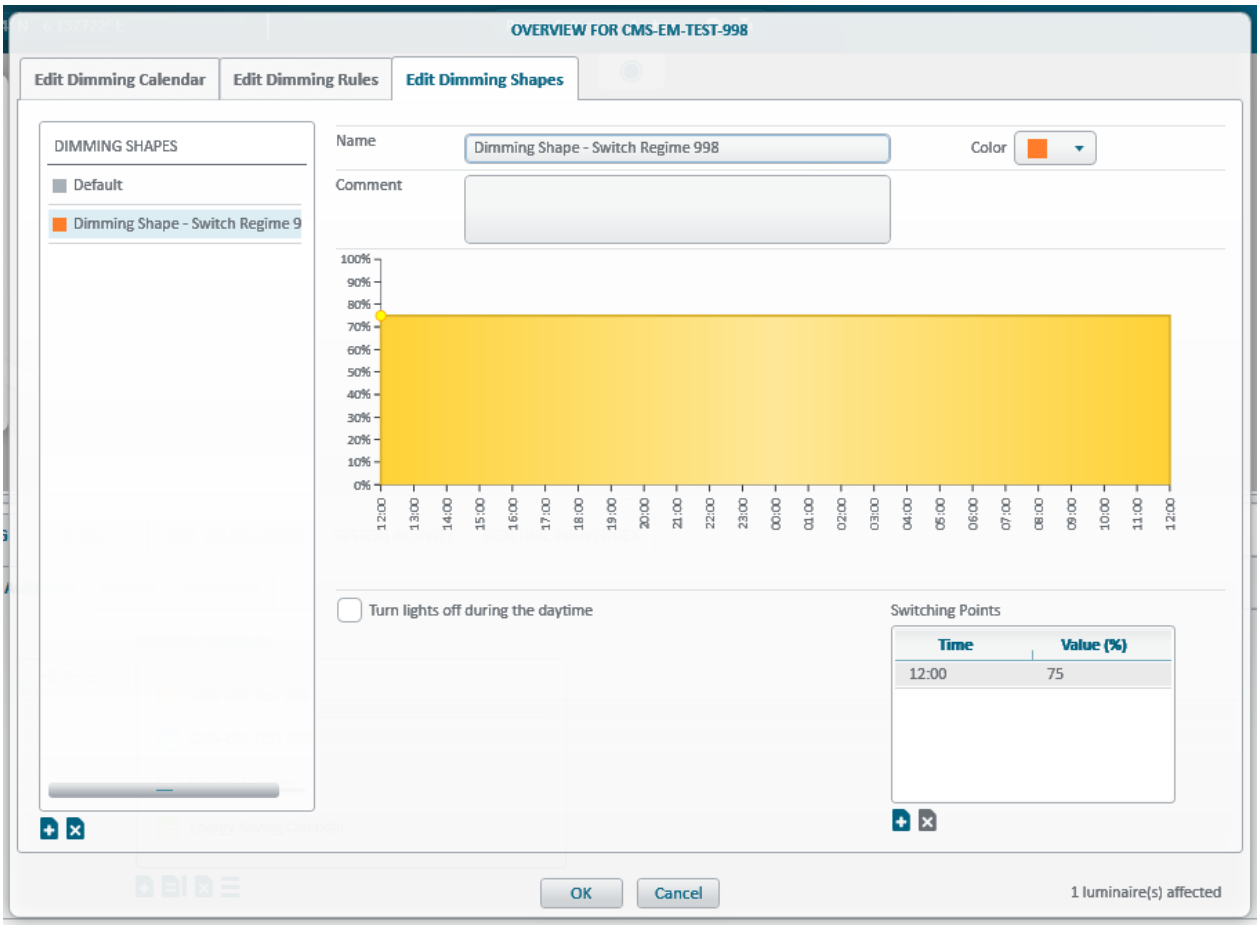


Figure 30: Dimming shape defined for Scenario 2 – Switch Regime 998

Figure 31 shows the Switching Points grid for the *999* dimming shape. The switching points match the ones specified in section 4.1 of the Test Specification[2].

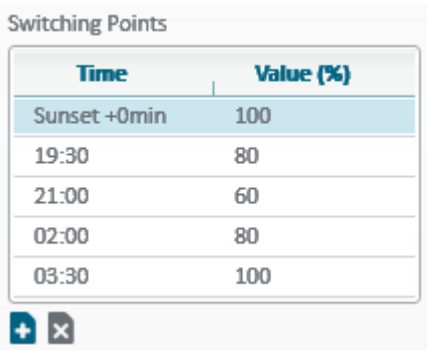


Figure 31: Switching points for the 999 Dimming Shape

Figure 32 shows the Switching Points grid for the *998* dimming shape. The shape is a flat line, as specified in section 4.2 of the Test Specification[2], and consists of just one switching point. When applied to a luminaire, this switching point is added to the daily event log (in the non-failure scenario): it records that

the lamp was on, even though the initial instruction to turn on may have been issued sometime in the past.

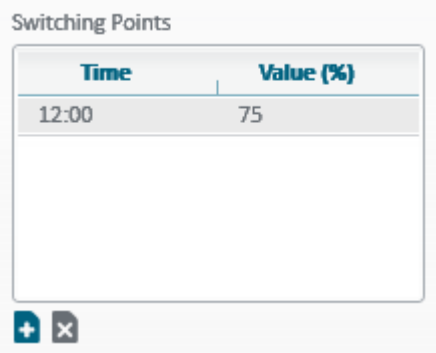


Figure 32: Switching point for the 998 Dimming Shape

Luminaire Configuration and Dimming Shape Assignment

The OLC and luminaire property values for the two *CityTouch Ready Luminaires* are shown in the search results in Figure 33. All the properties mentioned in Test Group 4b of the Test Specification[2] have values. As these search results are difficult to read from the screen shots, we clicked the **Export** button to export them into Excel spreadsheets. Figure 34 shows the exported spreadsheets.

As you can see, one luminaire has a *999* Switch Regime and the other has a *998* Switch Regime. Both luminaires have separate Sub-Meter IDs, to fulfil the criterion mentioned in Section 4.3 of the Test Specification[2], that we can reproduce failures across multiple unmetered supplies. It also ensures that separate event logs are generated for each luminaire (to clarify comprehension of the test results).

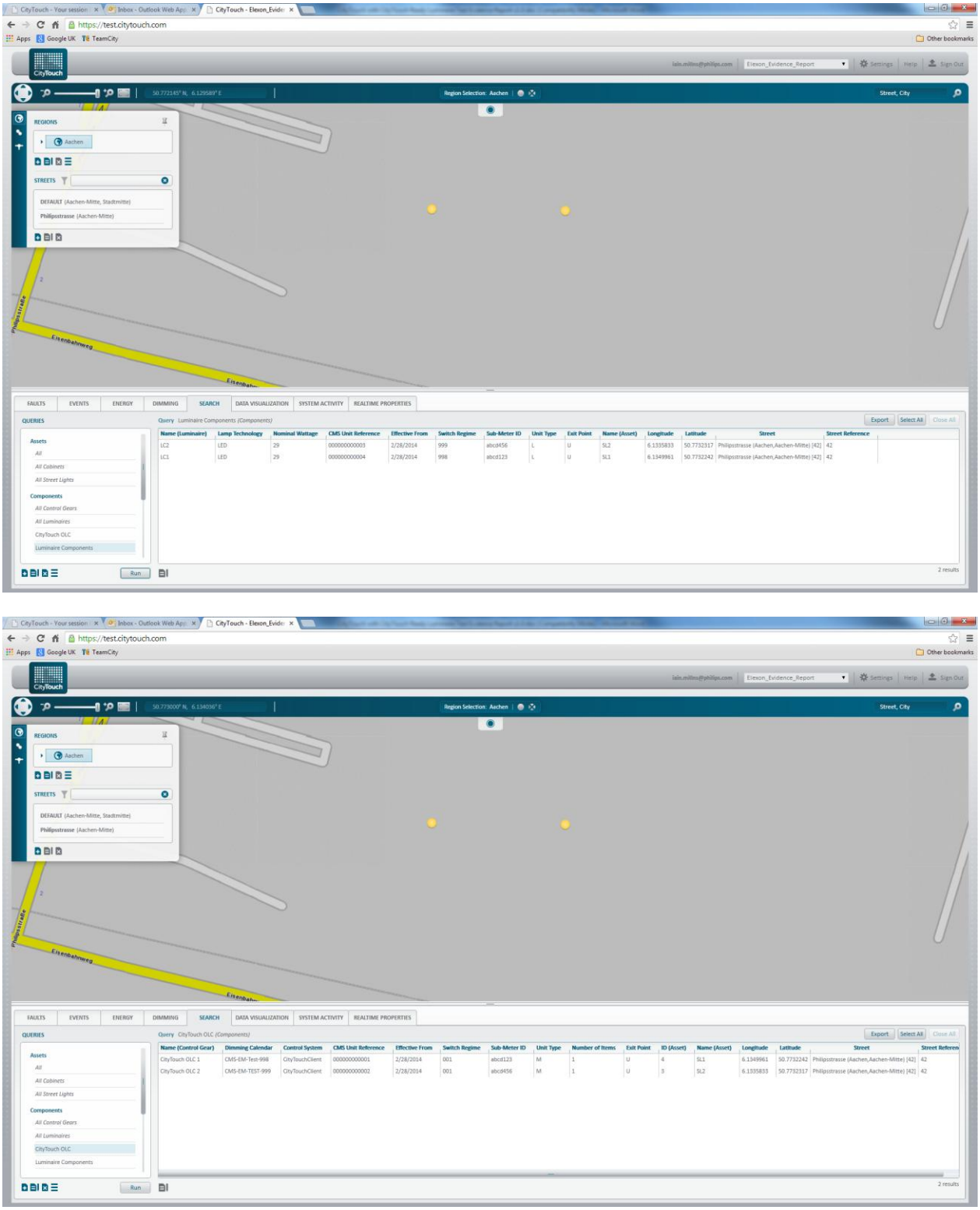
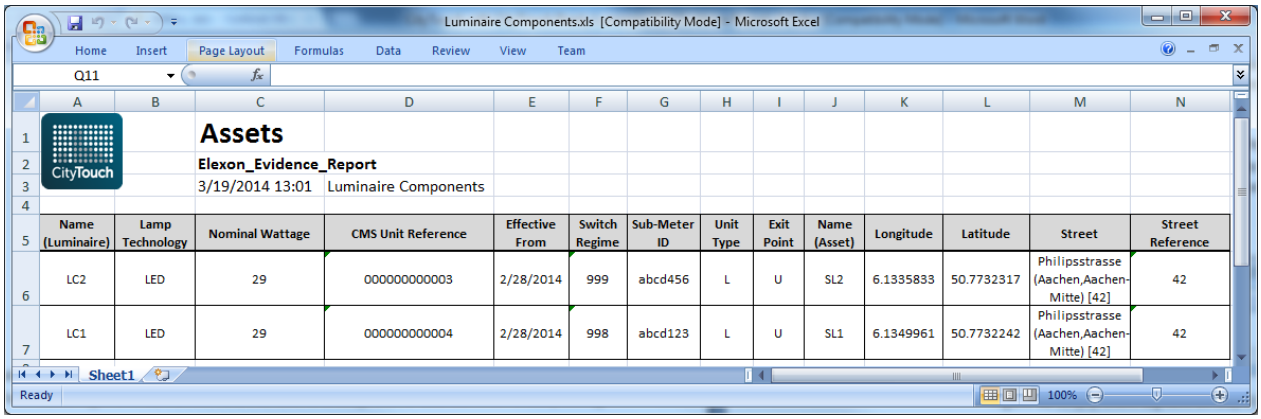


Figure 33: Search results showing luminaire and OLC property values



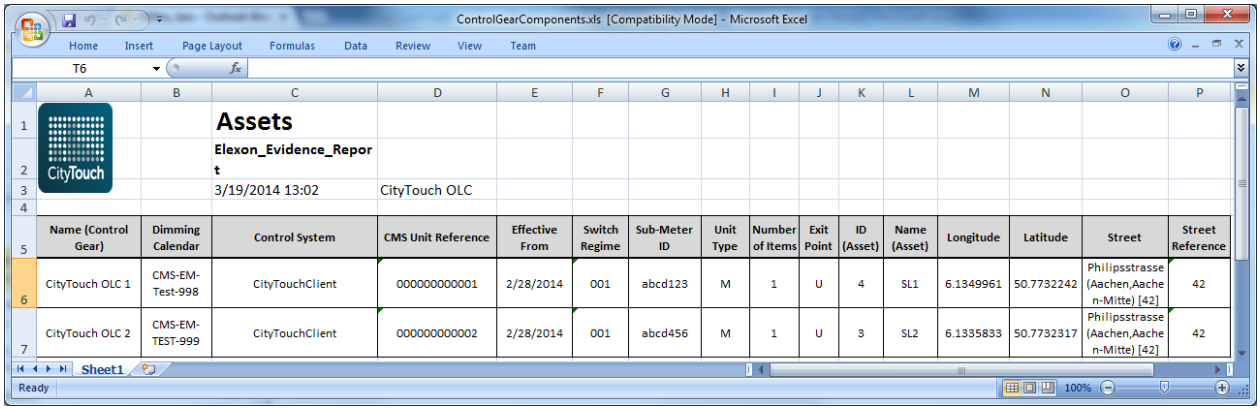
Luminaire Components.xls [Compatibility Mode] - Microsoft Excel

Assets

Elexon_Evidence_Report

3/19/2014 13:01 Luminaire Components

Name (Luminaire)	Lamp Technology	Nominal Wattage	CMS Unit Reference	Effective From	Switch Regime	Sub-Meter ID	Unit Type	Exit Point	Name (Asset)	Longitude	Latitude	Street	Street Reference
LC2	LED	29	000000000003	2/28/2014	999	abcd456	L	U	SL2	6.1335833	50.7732317	Philipsstrasse (Aachen,Aachen-Mitte) [42]	42
LC1	LED	29	000000000004	2/28/2014	998	abcd123	L	U	SL1	6.1349961	50.7732242	Philipsstrasse (Aachen,Aachen-Mitte) [42]	42



ControlGearComponents.xls [Compatibility Mode] - Microsoft Excel

Assets

Elexon_Evidence_Report

3/19/2014 13:02 CityTouch OLC

Name (Control Gear)	Dimming Calendar	Control System	CMS Unit Reference	Effective From	Switch Regime	Sub-Meter ID	Unit Type	Number of Items	Exit Point	ID (Asset)	Name (Asset)	Longitude	Latitude	Street	Street Reference
CityTouch OLC 1	CMS-EM-Test-998	CityTouchClient	000000000001	2/28/2014	001	abcd123	M	1	U	4	SL1	6.1349961	50.7732242	Philipsstrasse (Aachen,Aachen-Mitte) [42]	42
CityTouch OLC 2	CMS-EM-TEST-999	CityTouchClient	000000000002	2/28/2014	001	abcd456	M	1	U	3	SL2	6.1335833	50.7732317	Philipsstrasse (Aachen,Aachen-Mitte) [42]	42

Figure 34: Exported search results showing luminaire and OLC property values

Figure 35 shows which dimming shapes are applied to which luminaires (via the associated colours):

- The *998* dimming shape is applied to the luminaire with Name *LC1*, Sub-Meter ID *abcd123*, and CMS Unit Reference *000000000004*.
- The *999* dimming shape is applied to the luminaire with Name *LC2*, Sub-Meter ID *abcd456*, and CMS Unit Reference *000000000003*.

Each day, the *CityTouch OLC* sends back its switching points for the preceding day. Sometimes, *CityTouch* may generate event logs for the preceding day, before the switching points have arrived. In this case, the switching points will appear in a refresh log on the following day. For example, switching points for Day 1 may be sent on Day 2, after the event log for Day 1 was generated. The switching points will then appear in a refresh event log for Day 1 generated on Day 3.

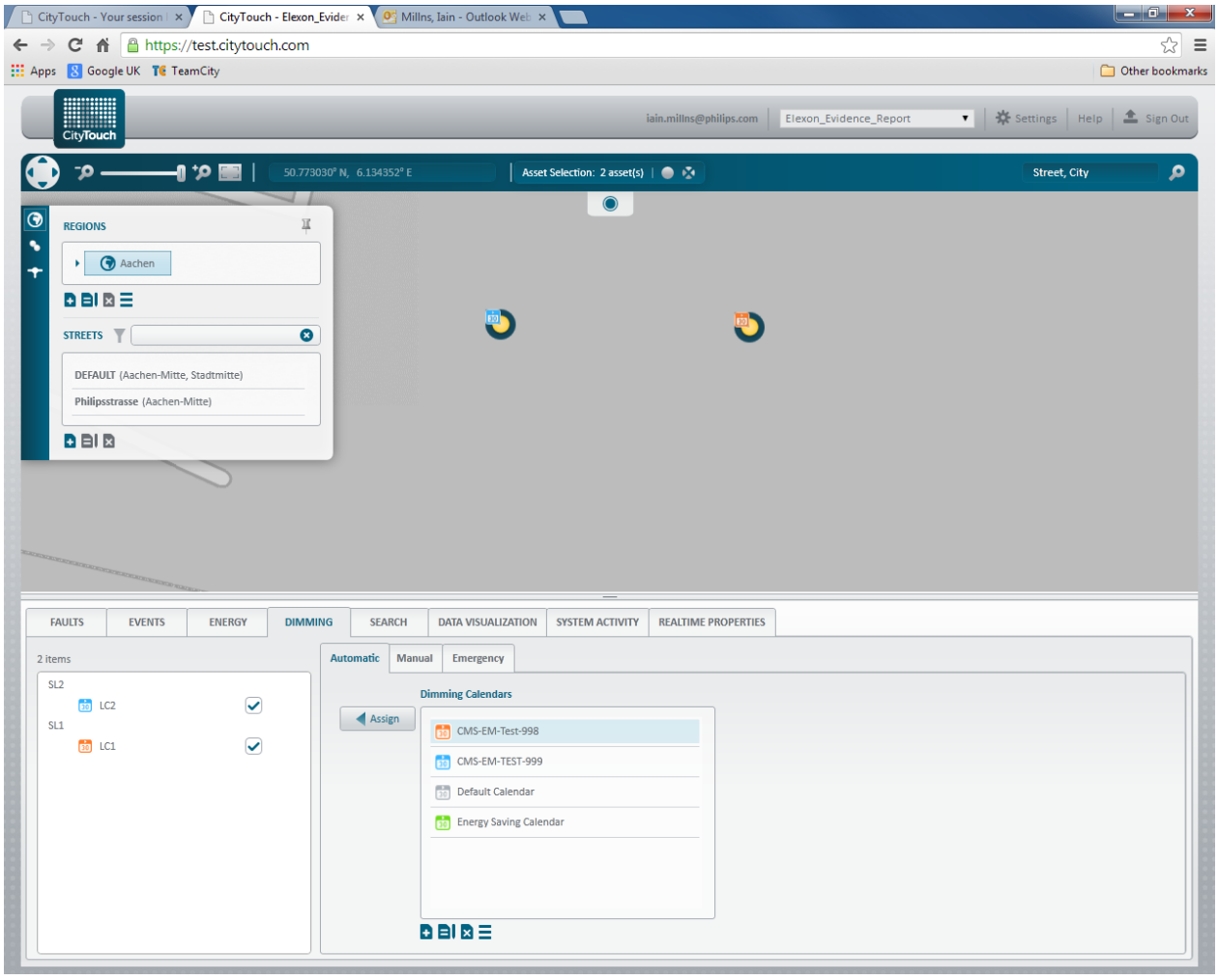


Figure 35: Luminaire configuration for the tests

Scenarios 3 and 4

This section documents the test evidence for *Scenario 3 – Control Failure for Multiple CMS Unit References* and *Scenario 4 – Revised Data after Control Failure (Following Day)* [2]. The tests were performed with the two luminaires, described in the previous section *Luminaire Configuration and Dimming Shape Assignment,* which have *998* and *999* switch regimes respectively. Their lamps had been burning (with their assigned dimming shapes) for several days prior to the tests.

If a connectivity failure occurs in *CityTouch*, no switching points for the affected luminaires will be added to the event logs until the correct switching points appear. If the correct switching points appear a day or more late, they will be added to refresh event logs. *CityTouch* does not amend switching points which were added to previous event logs. New versions of event logs always show the latest record of what happened to the luminaires associated with those Sub-Meters on those days.

The first test shows the generation and sending of refresh event logs after a control failure extending over a "range of settlement days". It was performed with the luminaire that has CMS Unit Reference *000000000003*, Sub-Meter ID *abcd456*, and Switch Regime *999*.

On Day 1 of the test (5th March 2014), we created a connectivity failure between the luminaire and the *CityTouch OLC Driver*. The lamp of course, controlled by its OLC, continued to dim according to its assigned shape. The connectivity was restored on Day 4.

In terms of event logs, *CityTouch* generated and sent empty event logs (apart from the file header and trailer) on Day 2 and Day 3, for Day 1 and Day 2 respectively. On Day 4, after reconnection, it sent refresh event logs for Day 1 and Day 2 and a new event log for Day 3. The switching points in these event logs are correct and complete. Figures 36-40 shows all the event logs.

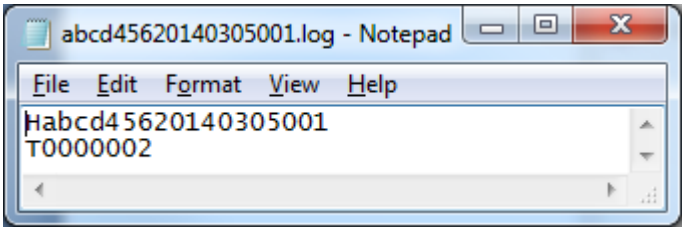


Figure 36: Empty event log sent on Day 2 (for Day1)

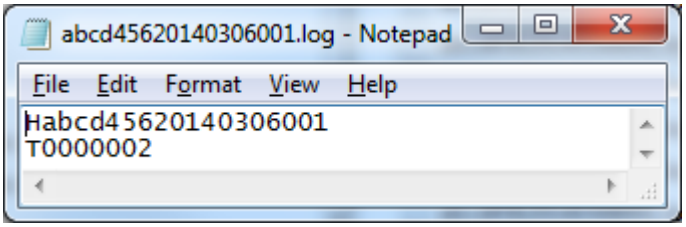


Figure 37: Empty event log sent on Day 3 (for Day 2)

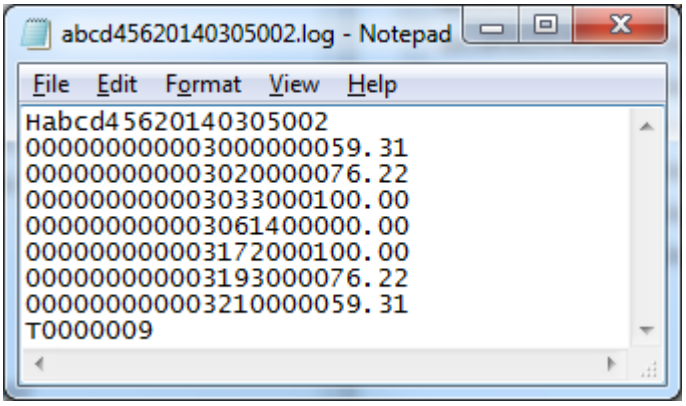


Figure 38: Refresh event log sent on Day 4 (for Day 1)

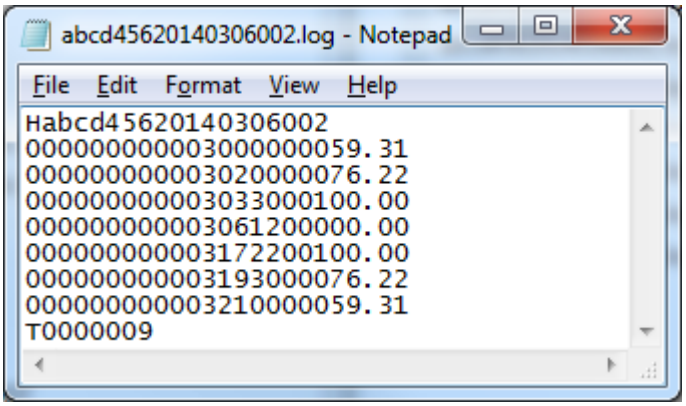


Figure 39: Refresh event log sent on Day 4 (for Day 2)

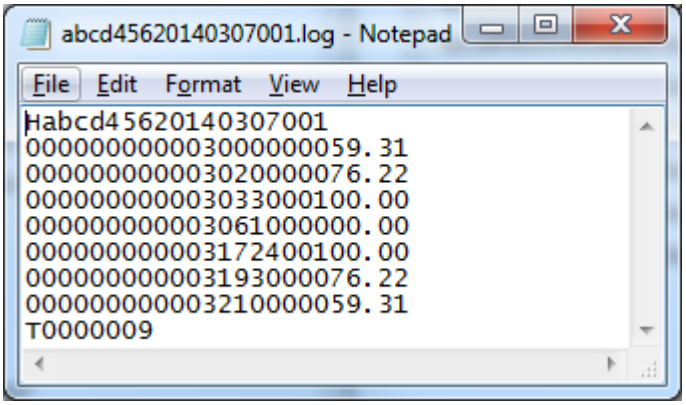


Figure 40: Event log sent on Day 4 (for Day 3)

The second test shows the generation and sending of refresh event logs after a control failure on a "single settlement day". It was performed with both luminaires.

On Day 1 of the test (10th March 2014), we created a connectivity failure between the luminaires and the *CityTouch OLC Driver*. The lamps of course, controlled by their OLCs, continued to dim according to their assigned shapes. The connectivity was restored late in the afternoon on Day 2. In terms of event logs, *CityTouch* sent event logs for the two luminaires (for Day 1) on Day 3. The switching points in these event logs are correct and complete. Figure 41 shows these event logs.

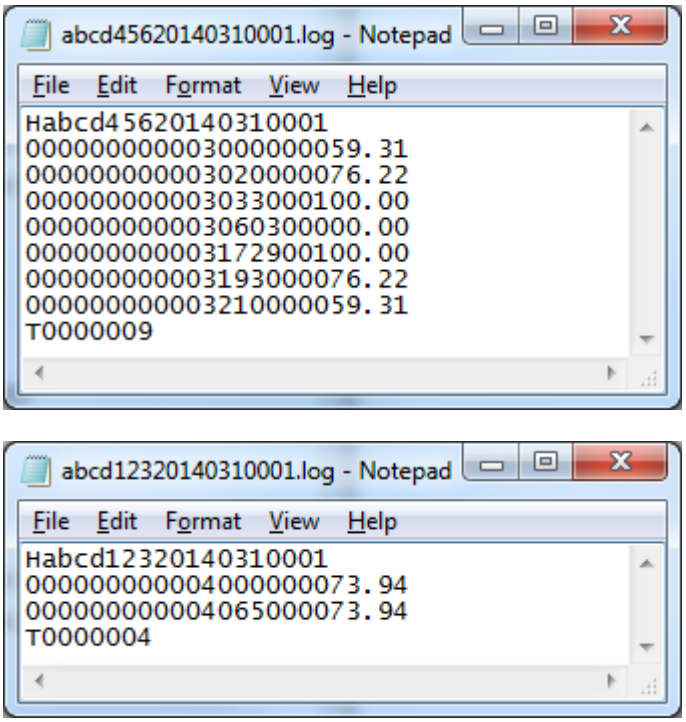


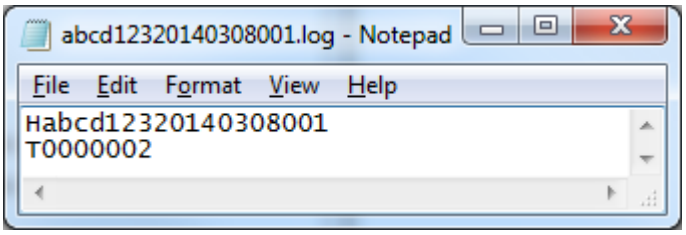
Figure 41: Refresh event log sent on Day 3 (for Day 1)

The second switching point in the log for the luminaire with the *998* Switch Regime was generated as a result of a UTC time synchronisation on the CityTouch OLC. It has of course the same percentage of base power as the first switching point.

Scenarios 1 and 2

This section documents the test evidence for *Scenario 1 –Switch Regime 999* and *Scenario 2 – Switch Regime 998*[2]. The tests were performed with the two luminaires, described in the section *Luminaire Configuration and Dimming Shape Assignment,* which have *998* and *999* switch regimes respectively.

On Day 1 of the test (8th March 2014), both lamps burnt as normal according to their assigned shapes. On Day 2, *CityTouch* sent empty event logs for Day 1, because it generated the logs before the switching points were received. On Day 3, *CityTouch* generated and sent event logs for Day 1. The switching points in these event logs are correct and complete. Figures 42 and 43 show these event logs.



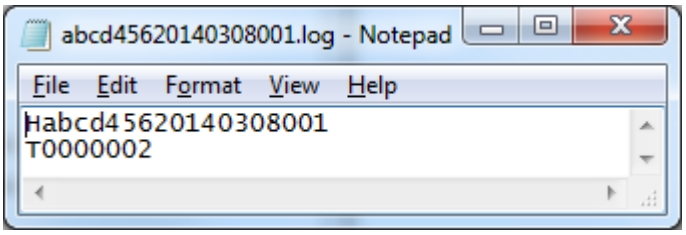


Figure 42: Empty event logs sent on Day 2 (for Day 1)

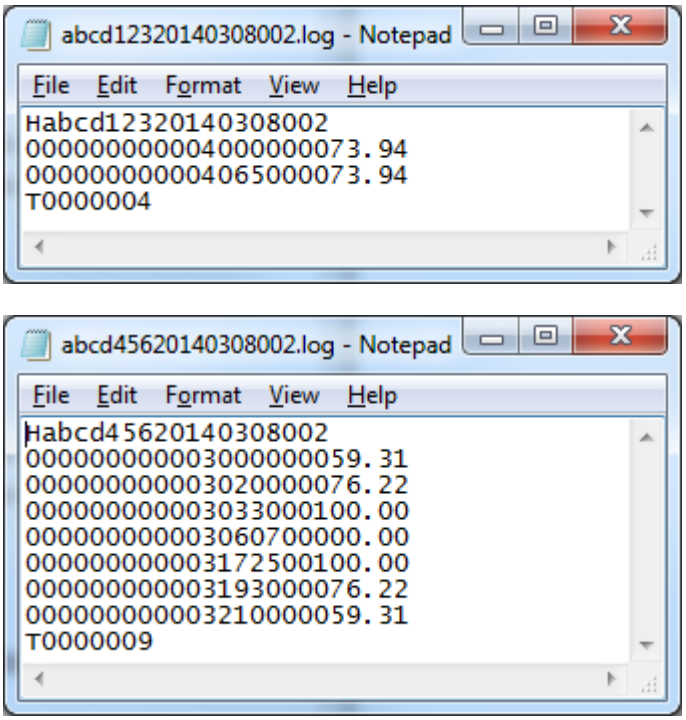


Figure 43: Refresh event logs sent on Day 3 (for Day 1)

Switching Point Audit Trail

CityTouch_TestGroup7_120314_1 (Record operational switching times and power levels)

Test References: 7.5

An audit trail item is generated in *CityTouch*, whenever a switching point is recorded. To view this audit trail, go to the Unmetered Supplies page on the *CityTouch* administration site, where you will see the Switching Points Audit Trail UI shown in Figure 44.

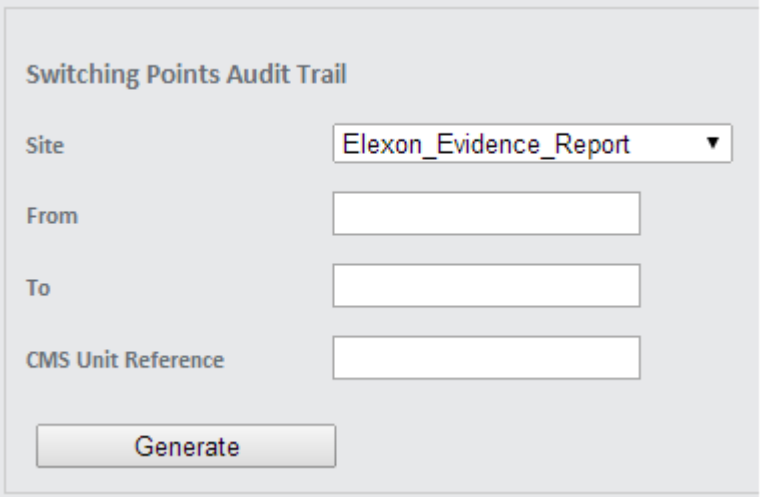
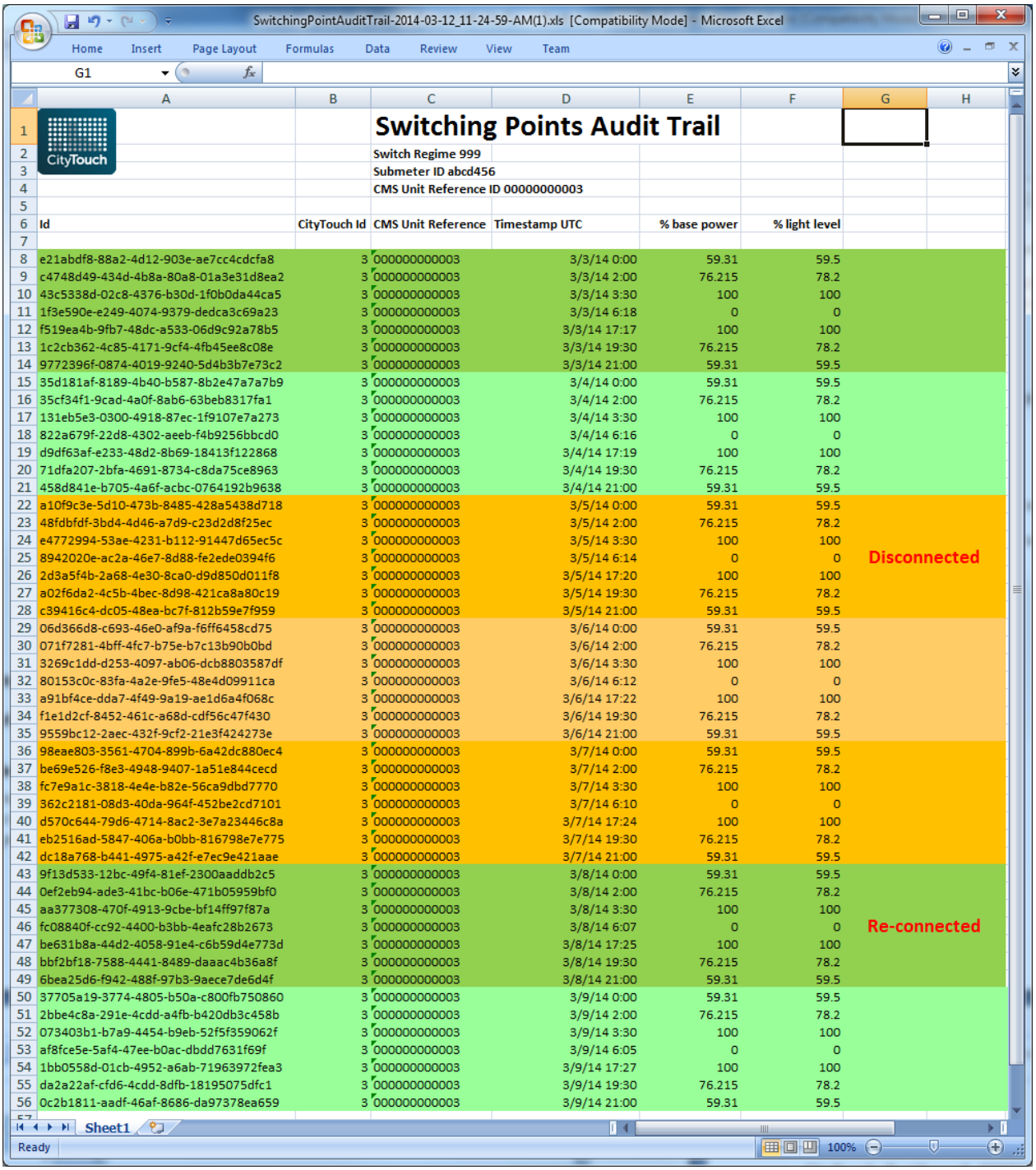


Figure 44: Switching Points Audit Trail UI

To generate an audit trail, select the **From** and **To** dates, enter an **Asset ID**, and click the **Generate** button. *CityTouch* will download an Excel spreadsheet, containing all the associated audit trail items. The spreadsheet shows the:

- Asset ID
- Timestamp of the switching point (in UTC)
- Percentage of base power
- Percentage dimming

Figure 45 shows the switching points audit trail for the luminaire with the *999* Switch Regime. It shows the switching points for this luminaire for scenarios 1 and 2 and for the first test in scenarios 3 and 4.



SwitchingPointAuditTrail-2014-03-12_11-24-59-AM(1).xls [Compatibility Mode] - Microsoft Excel

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G1

Switching Points Audit Trail

Switch Regime 999
Submeter ID abcd456
CMS Unit Reference ID 00000000003

Id	CityTouch Id	CMS Unit Reference	Timestamp UTC	% base power	% light level	
e21abdf8-88a2-4d12-903e-ae7cc4cdcfa8	3	000000000003	3/3/14 0:00	59.31	59.5	
c4748d49-434d-4b8a-80a8-01a3e31d8ea2	3	000000000003	3/3/14 2:00	76.215	78.2	
43c5338d-02c8-4376-b30d-1f0b0da44ca5	3	000000000003	3/3/14 3:30	100	100	
1f3e590e-e249-4074-9379-dedca3c69a23	3	000000000003	3/3/14 6:18	0	0	
f519ea4b-9fb7-48dc-a533-06d9c92a78b5	3	000000000003	3/3/14 17:17	100	100	
1c2cb362-4c85-4171-9cf4-4fb45ee8c08e	3	000000000003	3/3/14 19:30	76.215	78.2	
9772396f-0874-4019-9240-5d4b3b7e73c2	3	000000000003	3/3/14 21:00	59.31	59.5	
35d181af-8189-4b40-b587-8b2e47a7a7b9	3	000000000003	3/4/14 0:00	59.31	59.5	
35cf34f1-9cad-4a0f-8ab6-63beb8317fa1	3	000000000003	3/4/14 2:00	76.215	78.2	
131eb5e3-0300-4918-87ec-1f9107e7a273	3	000000000003	3/4/14 3:30	100	100	
822a679f-22d8-4302-aeeb-f4b9256bbcd0	3	000000000003	3/4/14 6:16	0	0	
d9df63af-e233-48d2-8b69-18413f122868	3	000000000003	3/4/14 17:19	100	100	
71dfa207-2bfa-4691-8734-c8da75ce8963	3	000000000003	3/4/14 19:30	76.215	78.2	
458d841e-b705-4a6f-acbc-0764192b9638	3	000000000003	3/4/14 21:00	59.31	59.5	
a10f9c3e-5d10-473b-8485-428a5438d718	3	000000000003	3/5/14 0:00	59.31	59.5	
48fdbfdf-3bd4-4d46-a7d9-c23d2d8f25ec	3	000000000003	3/5/14 2:00	76.215	78.2	
e4772994-53ae-4231-b112-91447d65ec5c	3	000000000003	3/5/14 3:30	100	100	
8942020e-ac2a-46e7-8d88-fe2ede0394f6	3	000000000003	3/5/14 6:14	0	0	Disconnected
2d3a5f4b-2a68-4e30-8ca0-d9d850d011f8	3	000000000003	3/5/14 17:20	100	100	
a02f6da2-4c5b-4bec-8d98-421ca8a80c19	3	000000000003	3/5/14 19:30	76.215	78.2	
c39416c4-dc05-48ea-bc7f-812b59e7f959	3	000000000003	3/5/14 21:00	59.31	59.5	
06d366d8-c693-46e0-af9a-f6ff6458cd75	3	000000000003	3/6/14 0:00	59.31	59.5	
071f7281-4bff-4fc7-b75e-b7c13b90b0bd	3	000000000003	3/6/14 2:00	76.215	78.2	
3269c1dd-d253-4097-ab06-dcb8803587df	3	000000000003	3/6/14 3:30	100	100	
80153c0c-83fa-4a2e-9fe5-48e4d09911ca	3	000000000003	3/6/14 6:12	0	0	
a91bf4ce-dda7-4f49-9a19-ae1d6a4f068c	3	000000000003	3/6/14 17:22	100	100	
f1e1d2cf-8452-461c-a68d-cdf56c47f430	3	000000000003	3/6/14 19:30	76.215	78.2	
9559bc12-2aec-432f-9cf2-21e3f424273e	3	000000000003	3/6/14 21:00	59.31	59.5	
98eae803-3561-4704-899b-6a42dc880ec4	3	000000000003	3/7/14 0:00	59.31	59.5	
be69e526-f8e3-4948-9407-1a51e844cecd	3	000000000003	3/7/14 2:00	76.215	78.2	
fc7e9a1c-3818-4e4e-b82e-56ca9dbd7770	3	000000000003	3/7/14 3:30	100	100	
362c2181-08d3-40da-964f-452be2cd7101	3	000000000003	3/7/14 6:10	0	0	
d570c644-79d6-4714-8ac2-3e7a23446c8a	3	000000000003	3/7/14 17:24	100	100	
eb2516ad-5847-406a-b0bb-816798e7e775	3	000000000003	3/7/14 19:30	76.215	78.2	
dc18a768-b441-4975-a42f-e7ec9e421aae	3	000000000003	3/7/14 21:00	59.31	59.5	
9f13d533-12bc-49f4-81ef-2300aaddb2c5	3	000000000003	3/8/14 0:00	59.31	59.5	
0ef2eb94-ade3-41bc-b06e-471b05959bf0	3	000000000003	3/8/14 2:00	76.215	78.2	
aa377308-470f-4913-9cbe-bf14ff97f87a	3	000000000003	3/8/14 3:30	100	100	
fc08840f-cc92-4400-b3bb-4eafc28b2673	3	000000000003	3/8/14 6:07	0	0	Re-connected
be631b8a-44d2-4058-91e4-c6b59d4e773d	3	000000000003	3/8/14 17:25	100	100	
bbf2bf18-7588-4441-8489-daaac4b36a8f	3	000000000003	3/8/14 19:30	76.215	78.2	
6bea25d6-f942-488f-97b3-9aece7de6d4f	3	000000000003	3/8/14 21:00	59.31	59.5	
37705a19-3774-4805-b50a-c800fb750860	3	000000000003	3/9/14 0:00	59.31	59.5	
2bbe4c8a-291e-4cdd-a4fb-b420db3c458b	3	000000000003	3/9/14 2:00	76.215	78.2	
073403b1-b7a9-4454-b9eb-52f5f359062f	3	000000000003	3/9/14 3:30	100	100	
af8fce5e-5af4-47ee-b0ac-dbdd7631f69f	3	000000000003	3/9/14 6:05	0	0	
1bb0558d-01cb-4952-a6ab-71963972fea3	3	000000000003	3/9/14 17:27	100	100	
da2a22af-cfd6-4cdd-8dfb-18195075dfc1	3	000000000003	3/9/14 19:30	76.215	78.2	
0c2b1811-aadf-46af-8686-da97378ea659	3	000000000003	3/9/14 21:00	59.31	59.5	

Sheet1

Ready 100%

Figure 45: Switching points audit trail for the luminaire with the 999 Switch Regime

CityTouch Test Group 8

CityTouch_TestGroup8_200314_1 (Generate Operational Event Log)

Test References: 8.1, 8.2, 8.3, 8.4, 8.5

We no longer schedule the generation of event logs for 07:00am GMT [UTC] each day, because we now have many UK sites, and the mass generation of event logs at 07:00am caused CPU spikes which affected the performance of other server processes. Instead, we schedule the generation of event logs to occur at different times throughout the day, so that CPU spikes don't occur. As mentioned in *CityTouch Test Groups 6 and 7*, this means that sometimes an event log may be generated before all switching points for its sub-meter for the previous day are in. These switching points will then appear in a refresh log on the following day.

CityTouch generates a separate event log per sub-meter per day, and sends these files immediately to folders on our FTP server (where they can then be picked up by the Meter Administrator's daily "dial" process). The folder names are Sub-Meter IDs. Figures 46 and 47 show the event logs generated in *CityTouch Test Groups 6 and 7,* in their respective sub-meter folders on our test FTP server.

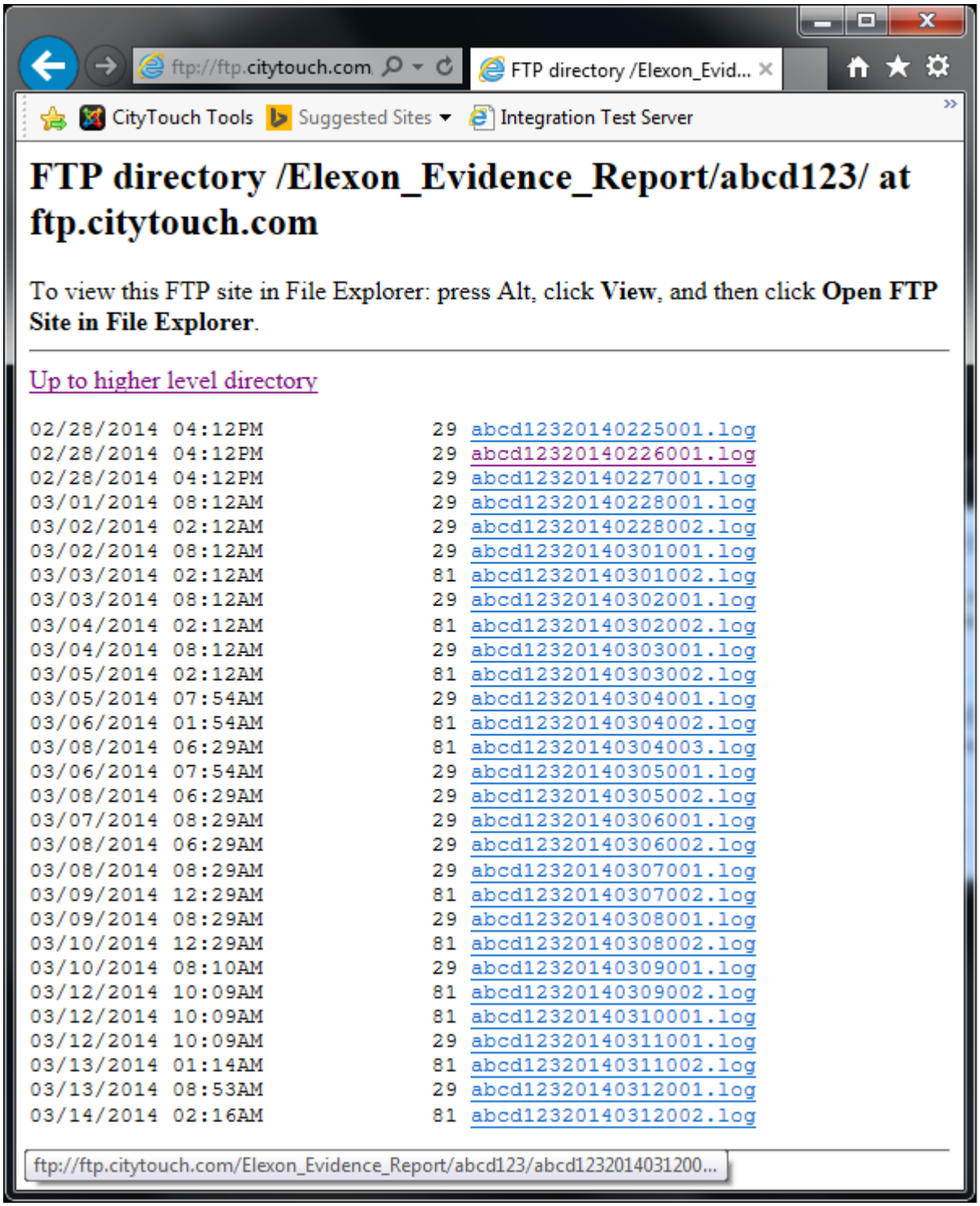


Figure 46: Folder for sub-meter abcd123

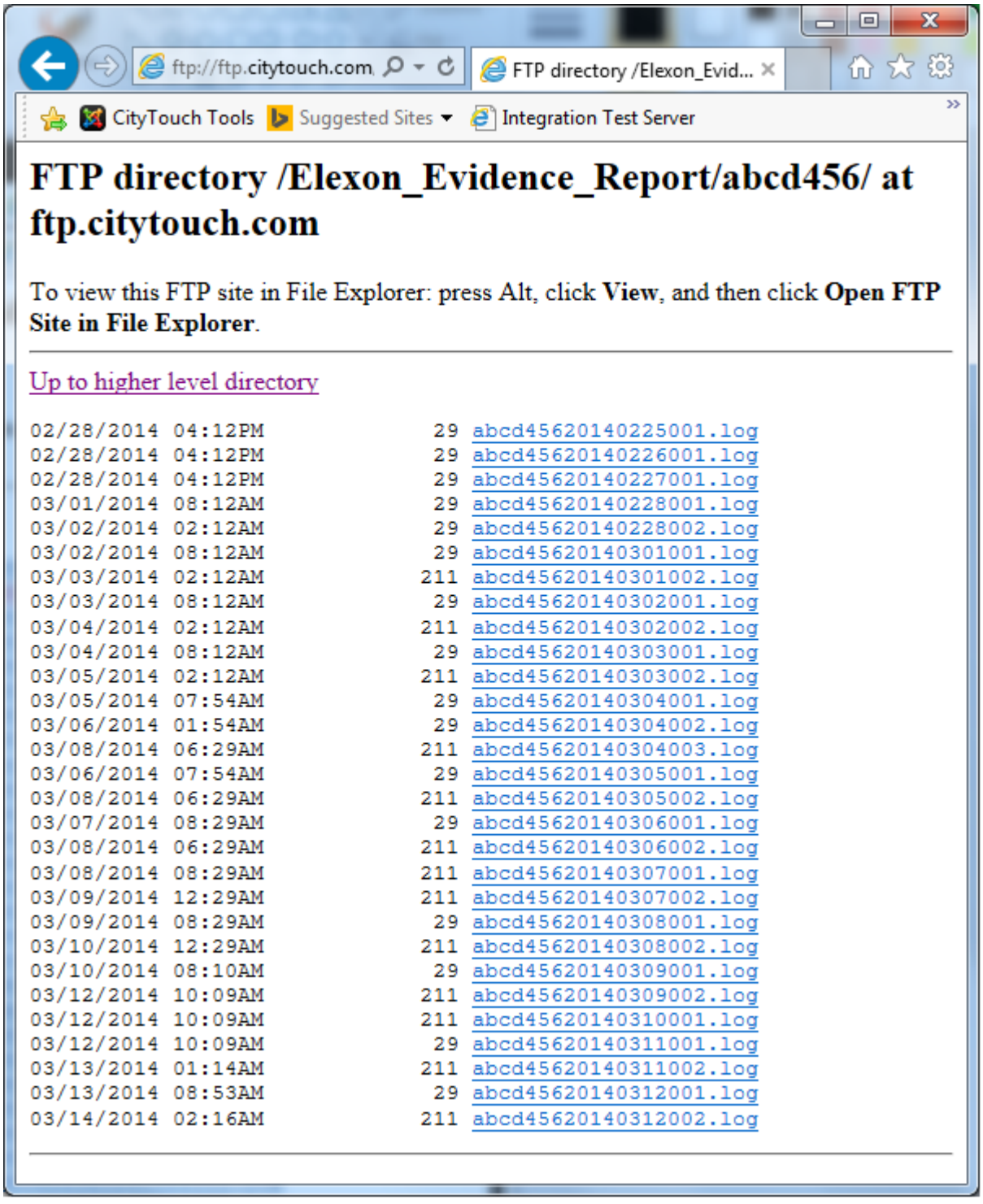


Figure 47: Folder for sub-meter abcd456

The British Meter Administrator (MA) *Power Data Associates* have verified in writing that they were able to successfully "dial", retrieve, parse, and process the event logs generated in *CityTouch Test Groups 6 and 7*.

Generating and Sending Ad-hoc Event Logs

In addition to the scheduled event log generation, *Unmetered Supplies* users can generate and send ad-hoc event logs, using the Event Log UI on the Unmetered Supplies administration page (shown in Figure 48).

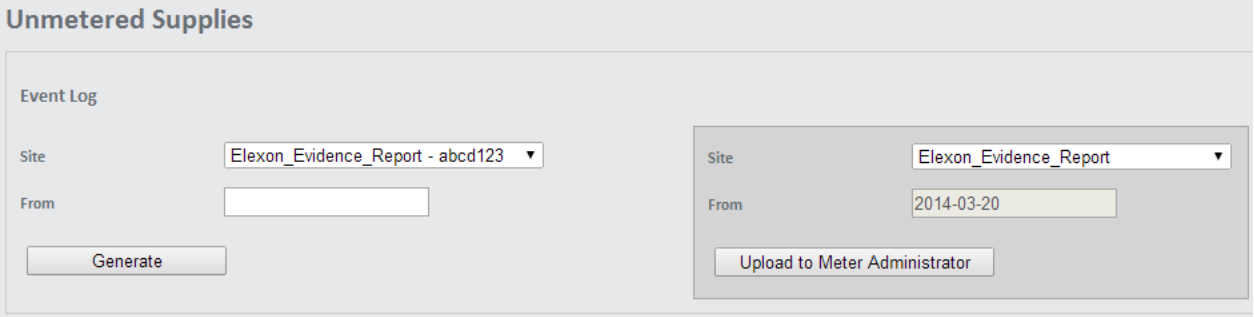


Figure 48: Event Log UI on the Unmetered Supplies administration page

When the **Upload to Meter Administrator** button is clicked, *CityTouch* will generate and send new event logs for today to our FTP server (assuming new switching points have been received for the site since the last event log generation). It increments the version numbers correctly. The button click does nothing if no new switching points were received.

In the left-hand part of the UI, if you select a **Site** / **Sub-Meter ID** combination and **From** date, and click the **Generate** button, *CityTouch* will generate and download an un-versioned event log for that day and sub-meter. The event log will show the latest and best understanding of what happened to the luminaires associated with that sub-meter on that day. Clicking **Generate** does not send the event log to the FTP server.

Event Log Audit Trail

CityTouch_TestGroup8_140314_1 (Generate Operational Event Log)
Test References: 8.7

An audit trail item is added to *CityTouch*, whenever an event log is generated and sent. To view this audit trail, go to the Unmetered Supplies page on the *CityTouch* administration site, where you will see the Event Log Audit Trail UI shown in Figure 49.

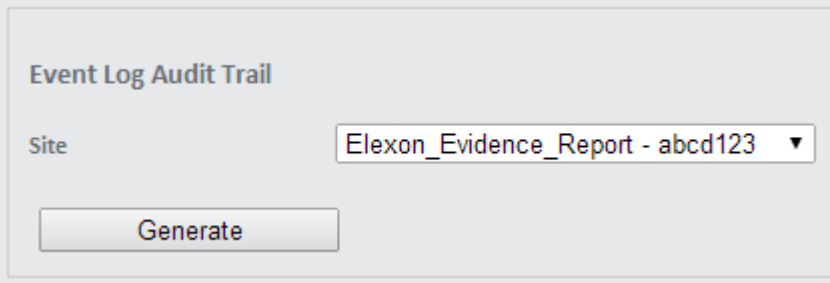
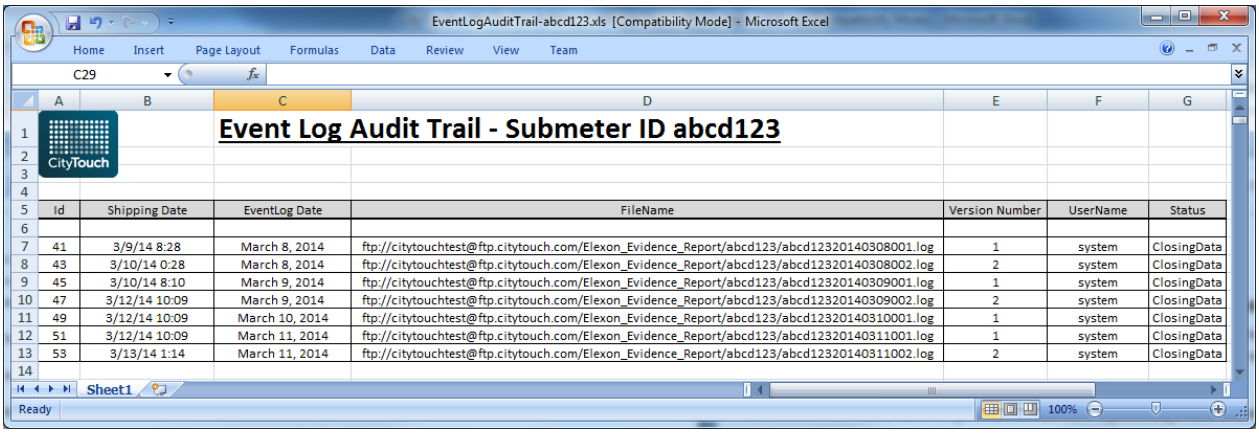


Figure 49: Event Log Audit Trail UI

To view an event log audit trail, select a **Site** / **Sub-Meter ID** combination and click the **Generate** button. *CityTouch* will download an Excel spreadsheet, containing all the associated audit trail items. The spreadsheet shows the:

- Shipping date
- Event log date
- Filename
- Version number
- User who generated and sent the event logs
- FTP status code - *ClosingData* indicates that the file was sent successfully

Figure 50 shows the event log audit trail for sub-meter *abcd123* during the tests in *CityTouch Test Groups 6 and 7*.



EventLogAuditTrail-abcd123.xls [Compatibility Mode] - Microsoft Excel

Event Log Audit Trail - Submeter ID abcd123

Id	Shipping Date	EventLog Date	FileName	Version Number	UserName	Status
41	3/9/14 8:28	March 8, 2014	ftp://citytouchtest@ftp.citytouch.com/Elexon_Evidence_Report/abcd123/abcd12320140308001.log	1	system	ClosingData
43	3/10/14 0:28	March 8, 2014	ftp://citytouchtest@ftp.citytouch.com/Elexon_Evidence_Report/abcd123/abcd12320140308002.log	2	system	ClosingData
45	3/10/14 8:10	March 9, 2014	ftp://citytouchtest@ftp.citytouch.com/Elexon_Evidence_Report/abcd123/abcd12320140309001.log	1	system	ClosingData
47	3/12/14 10:09	March 9, 2014	ftp://citytouchtest@ftp.citytouch.com/Elexon_Evidence_Report/abcd123/abcd12320140309002.log	2	system	ClosingData
49	3/12/14 10:09	March 10, 2014	ftp://citytouchtest@ftp.citytouch.com/Elexon_Evidence_Report/abcd123/abcd12320140310001.log	1	system	ClosingData
51	3/12/14 10:09	March 11, 2014	ftp://citytouchtest@ftp.citytouch.com/Elexon_Evidence_Report/abcd123/abcd12320140311001.log	1	system	ClosingData
53	3/13/14 1:14	March 11, 2014	ftp://citytouchtest@ftp.citytouch.com/Elexon_Evidence_Report/abcd123/abcd12320140311002.log	2	system	ClosingData

Figure 50: Event log audit trail for sub-meter abcd123

CityTouch Test Group 9

As mentioned in the Introduction, we have not modified the code for logging switching points, generating and downloading event logs, and generating and downloading switching point audit trails since the last witness tests. Hence, we think that the results of test group *CityTouch_TestGroup9_180211_1_Test9.1 (Compliance with operational timescales)* from the last witness tests are still valid and still stand. These results are described below.

CityTouch_TestGroup9_180211_1_Test9.1 (Compliance with operational timescales)

CityTouch has received extensive volume and performance testing. The following metrics were devised to gauge the performance of *CityTouch* with large volumes of data in relation to event log generation, switching point audit data retrieval, and switching point insertion:

- Time taken to generate a daily event log for a large data set (64,845 luminaires × 7 switching points per day)
- Time taken to retrieve 10 months worth of switching point data for a luminaire (which has 7 switching points per day)
- Time taken to add 3000 switching points
- Time taken to add 648,450 switching points

Test machines

The tests were performed on two test machines:

Machine A: 2.4GHz Intel Core 2 quad-core CPU, 4GB RAM, 200GB HDD, 64-bit Windows 7 Enterprise

Machine B: Intel Xeon E5405 CPU, 8GB RAM, 200GB HDD, 64-bit Windows Vista

Time taken to generate a daily event log for a large data set

This test was performed on a large data set, consisting of 64,845 luminaires (the number of luminaires in Washington DC). Each luminaire had 7 switching points per day and the test was performed on Machine A. It took **25 seconds** to generate and download a daily event log.

Time taken to retrieve 10 months worth of switching point data for a luminaire

This test was also performed on the Washington DC data set (64,845 luminaires). Each luminaire had 7 switching points per day and the test was performed on Machine A. It took **3 seconds** to retrieve 10 months worth of switching point data for a given luminaire and to download the data in an Excel spreadsheet.

Time taken to add 3000 switching points

This test was performed on Machine B. It took **20 seconds** to insert 3000 switching points, using the *CityTouch* core system Application Programmers Interface (API).

Time taken to add 648,450 switching points

This test was performed on Machine B and entailed storing all the switching points for Washington in a single batch. In addition to storing 8 switching points for 64,845 luminaires it also stored 2 switching points for 64,845 associated OLCs, making 648,450 switching points in all. It took **70 minutes** to store these switching points as a single batch.

With regard to this test it should be noted that:

- *CityTouch* normally adds switching points in small chunks throughout the day, rather than as a single huge batch.
- *CityTouch* creates new PostgreSQL partial tables for switching points in new months automatically, to ensure database performance is not compromised by switching point tables becoming too big.
- The algorithm for adding switching points is necessarily complex, as de-duping must be done (to ensure duplicate points are not persisted) and error switching points must be updated if revised switching points are received. This requires additional table lookups per insertion.

CityTouch Test Group 10

CityTouch_TestGroup10_080314_1 (Operational Event Log)

Test References: 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9. 10.10, and 10.11

This section demonstrates that *CityTouch* generates event logs which meet exactly the criteria specified in *BSCP520*[1] *Section 4.5.2.3 (c)*. For the purposes of this test, we opened one of the event logs (*abcd45620140308002.log*) generated in *CityTouch Test Group 7*. Figure 51 shows this event log.

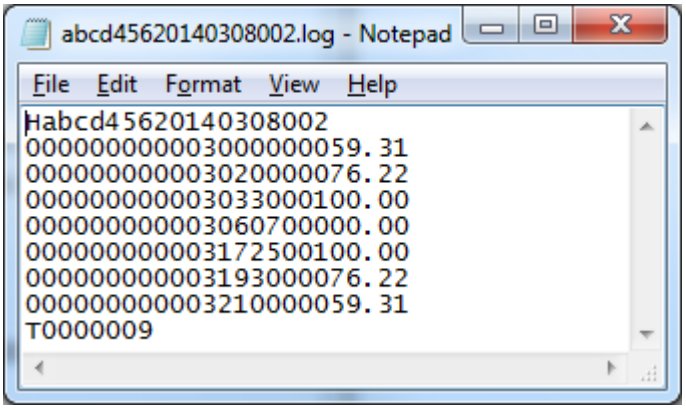


Figure 51: abcd45620140308002.log

As you can see, the first 7 characters in the filename are the *Sub-Meter ID* (*abcd456*), followed by the date in *YYYYMMDD* format (*20140308*), the 3-digit version number (*002*), and the *.log* filename extension.

The file header starts with the *H* identifier, followed by the 7-character *Sub-Meter ID* (*abcd456*), the date in *YYYYMMDD* format (*20140308*), and the 3-digit version number (*002*).

In the file body, each row starts with a 12-character *CMS Unit Reference* (*000000000003*), followed by the UTC time in *HHMMSS* format (e.g. *193000*), and the percentage of base power in *PPP.PP* format (e.g. *076.22*).

The file trailer starts with the *T* identifier, followed by the total number of lines in the file (9 in this case) padded with leading-zeros in a 7-digit field (*T0000009*).

Independent event log file validation with Power Data Associates

A *CityTouch* team member sent some control files, corresponding to the event logs generated in *CityTouch Test Groups 6 and 7*, to the British MA *Power Data Associates*. *Power Data Associates* were then able to configure their MA system to successfully "dial", retrieve, parse, and process the event logs generated in *CityTouch Test Groups 6 and 7*. *Power Data Associates* have confirmed this in writing, and their letter will be submitted to ELEXON as a separate item of evidence.

References

This document (including Appendix A) references the following documents:

[1]ELEXON Ltd (2014, February). *BSCP520 - Balancing and Settlement Code Procedure - Unmetered Supplies Registered in SMRS, Version 22.0*. Retrieved from: http://www.elexon.co.uk/wp-content/uploads/2014/02/BSCP520_v22.0.pdf

[2]ELEXON Ltd (2013, November). *Central Management System Equivalent Meter Test Specification, Version 5.0*. Retrieved from: http://www.elexon.co.uk/wp-content/uploads/2013/11/cms_equivalent_meter_test_specification_v5.0_cgi.pdf

[3]ELEXON Ltd (2013, November). *Operational Information Document – A Guide to Unmetered Supplies under the BSC, Version 13.0*. Retrieved from: http://www.elexon.co.uk/wp-content/uploads/2013/11/operational_information_document_v13.0_cgi.pdf

