Service Description for Profile Administration

Version 3.1

Date : [XXXXXXXXX]

SERVICE DESCRIPTION FOR PROFILE ADMINISTRATION

AMENDMENT RECORD

VERSION	DATE	DESCRIPTION OF CHANGES	Mods/CPs INCLUDED	MODS PANEL REF
1.0	26/01/04	Initial Version Approved by BSC Panel	n/a	71/017
2.0	BETTA Effective Date	SVA February 2005 Release and BETTA 6.3	CP1091 and BETTA 6.3	SVG/48/004
3.0	03/11/05	SVA November 2005 Release	CP1058	SVG/56/004
4.0	[ ]	Field Hardware Re-write	[CP[XXXX]]	XXXXXX

RELATED DOCUMENTS

Reference 1	SVA Data Catalogue Volume 1: Data Interfaces

CONTENTS TABLE

1 INTRODUCTION

1.1 Purpose

1.1.1 This is the Service Description for the Profile Administrator. The Profile Administrator is appointed by BSCCo for the purpose of providing a profile administration service in connection with the Balancing and Settlement Code ('the BSC').

1.1.2 The purpose of this Service Description is to describe the responsibilities and obligations of the Profile Administrator. The responsibilities and obligations of the Profile Administrator under this Service Description are collectively referred to as "the Profile Administrator Service".

1.1.3 This Service Description also describes the key interfaces between the Profile Administrator, BSCCo and other BSC Agents such as the Supplier Volume Allocation Agent (SVAA).

1.2 Structure of this Document

1.2.1 This document is structured as follows:

- Section 2 gives an overview of the Profile Administrator Service;
- Sections 3 and 4 describe the detailed requirements for the Data Collection and Data Analysis elements of the service respectively;
- Section 5 describes the deliverables;
- Section 6 specifies non-functional requirements;
- Appendix A contains the terms, acronyms and definitions used in this document;
- Appendix B specifies the profile transformation procedure used to convert 14-period switched load profiles into profiles of other durations;
- Appendix C provides background information on profiling under the BSC; and
- Appendix D describes Domestic Economy 7 Profile Classes.

1.3 The Balancing and Settlement Code Company

1.3.1 The BSC Panel is supported in the discharge of its duties and obligations under the BSC by the Balancing and Settlement Code Company (BSCCo). BSCCo is created by the BSC and procures, manages and operates services and systems that enable the Balancing Mechanism and Imbalance Settlement process to operate.

1.3.2 In accordance with Section E of the BSC, BSCCo shall enter into a contract with a person appointed as the Profile Administrator for the provision of the Profile Administrator Service as specified in this Service Description.

2 OVERVIEW

2.1 BSC Requirement for the Profile Administrator Service

2.1.1 Paragraphs 2.1.2 to 2.1.5 below summarise the requirements for the Profile Administrator Service. Note that these paragraphs 2.1.2 to 2.1.5 are a direct quote from Section S4.2 of the BSC (other than renumbering of paragraphs).

2.1.2 The principal functions of the Profile Administrator are, in accordance with the Supplier Volume Allocation Rules and relevant Code Subsidiary Documents:

(a) to create and maintain a load research sample using customer information provided to it by Suppliers and to carry out a programme of load research in order to collect half-hourly demand data from customers;

(b) to analyse data collected through the load research programme and from other sources approved from time to time by the Panel;

(c) to derive sets of Regression Coefficients for each Profile Class;

(d) to deliver the Regression Coefficients and related data to Parties, the SVAA, Supplier Agents or BSCCo;

(e) to analyse data and to monitor the accuracy of Profiles derived from Regression Coefficients; and

(f) to provide such consultancy services as the Panel may from time to time determine.

2.1.3 The Profile Administrator shall provide (unless and to the extent otherwise specified from time to time by BSCCo) to BSCCo or as otherwise directed by it a set of Regression Coefficients, Group Average Annual Consumption values and Profile Coefficients for each BSC Year on or before 30th November before the beginning of the relevant BSC Year, using data collected from the load research programme carried out by the Profile Administrator, augmented with data provided by Suppliers which is consistent with the overall sample design.

2.1.4 Unless and to the extent otherwise specified by BSCCo, the Profile Administrator shall deliver to BSCCo or as otherwise directed by it:

(a) on a quarterly basis, a breakdown by GSP Group of each Profile Class sample, together with a statement of the daily average number of Sample Participants for which monitoring equipment has been successfully installed and commissioned for each Profile Class in respect of the previous quarter (a quarter being a period of 3 months commencing on 1st January, 1st April, 1st July and 1st October in any year); and

(b) an annual report and data analysis plan (in such form as may be specified by the Panel) setting out what load research data the Profile Administrator proposes to use, together with a load research plan (in such form as the Panel shall specify) setting out the proposed sample design and sample sizes in respect of the following BSC Year.

2.1.5 Unless and to the extent otherwise specified by the Panel, the Profile Administrator shall:

(a) make one or more representatives available, subject to reasonable notice, to attend meetings of the Panel or its representatives in order to provide advice on profiling matters; and

(b) provide advice to the Panel as to the implications of introducing new or modified Profile Classes and GSP Groups and as to the implications of changing sample sizes and profiling methodology.

2.2 Timetable for Profile Administrator Service

2.2.1 Both the production and use of Profile data will take place on a BSC Year basis, where a BSC Year runs from 1 April to 31 March. The Technical Deliverables provided to BSCCo in a given BSC Year Y will be based on load research carried out in BSC Year (Y-1), and will be used to calculate Supplier energy volumes for Settlement Days in year (Y+1). A given set of Profile data therefore has a three-year life-cycle, as illustrated in Figure 2-1:

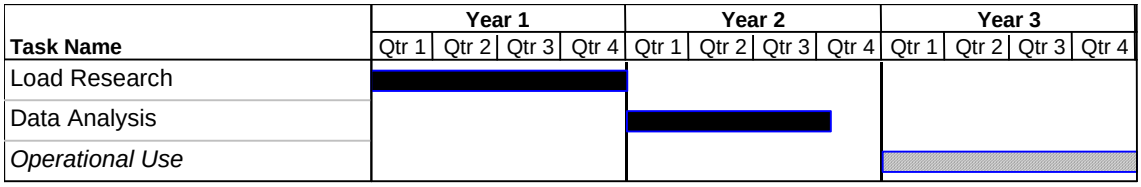

Figure 2-1: Overall Profile Cycle

2.2.2 In the first year of ~~the~~ this cycle - the Load Research Year and Data Collection stage - the Profile Administrator conducts a programme of Load Research to monitor the patterns of electricity demand among various samples of ~~customer~~Sample Participants. This is achieved through the installation of ~~data loggers~~meteringsuch electricity consumption measurement equipment as agreed between the Profile Administrator and BSCCo in the premises of domestic and non-domestic ~~customer~~Sample Participants. ~~with Non Half Hourly metering equipment. Loggers~~ Meters are installed by Fieldwork Agents on behalf of ~~the Profile Administrator and collect~~ Hdataalf hourly electricity consumption is then ~~is~~ collected~~.~~ for one year. The ~~loggers are then collected by Fieldwork Agents, or returned by customers directly to the Profile Administrator who then downloads the~~ data collected each half hour is for use in the Data Analysis stage of the programme.

2.2.3 In the second year of the cycle[1] - the Data Analysis stage - the Profile Administrator uses the results of that Load Research Year and Data Collection stage~~Load Research programme~~ to estimate the patterns of half-hourly average electricity demand for each Profile ~~c~~Class ~~of customer~~. Each pattern is a Profile, and is generated by the evaluation of regression equations to which temperatures and sunset data are applied for each type of ~~customer~~Sample Participant and GSP Group.

2.2.4 In the third year of the cycle - the Operational Use stage - these Profiles are used by the SVA Agent and others to estimate the half-hourly average demands of ~~customer~~Sample

[1] Note that the timetable described in thjs section 2.2 is somewhat simplified. In practice, depending upon the nature of the equipment installed, some or all of the data relating to the Load Research Year may not be retrieved until after the end of that

Participants based on meter readings taken over a longer period (such as a quarter). This stage is not the responsibility of the Profile Administrator and is included here only for completeness.

2.2.5 Figure 2-2 illustrates how the stages for successive Profile cycles run in parallel over a single Settlement Year:

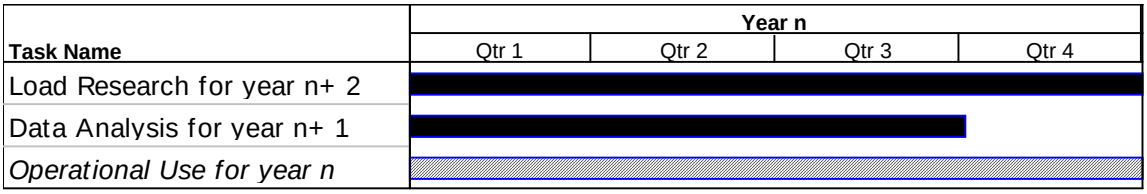

Figure 2-2: Profile activities in one Settlement Year

2.2.6 Within each BSC Year, the Regression Coefficients, GAAC values and Profile Coefficients shall be delivered on or before the last day of November.

3 DETAILED REQUIREMENTS FOR DATA COLLECTION

The Profile Administrator shall ensure that there exists a Load Research sample, shall ensure that this sample is of the requisite size, and shall ensure that data recorded at these ~~customer~~Sample Participant residences is collected not less than once each year. ~~and loggers reissued.~~ The Profile Administrator shall also be responsible for ensuring the development and planning of the sample.

3.1 Sampling Specification

3.1.1 The Profile Administrator shall design and operate the Load Research Programme so that ~~a~~ the sample of ~~customer~~Sample Participants is recruited and maintained which:

- includes ~~customer~~Sample Participants from each of the GSP Group Areas, subject to there being a sufficient population of ~~customer~~Sample Participants for sampling purposes;
- can be used, with regression analysis, to derive unbiased estimates of half-hourly average electricity demand per ~~customer~~Sample Participant (measured in kilowatts) for each Profile Class;
- ~~the customers shall be recruited to~~ forms part of a stratified random sample, with the ~~and the~~ sample design ~~will~~ specifying the required number of ~~customer~~Sample Participants for each stratum;
- includes sufficient ~~customer~~Sample Participants to allow the Profile Administrator to meet the ~~minimum~~ installed sample and ~~average~~data collection requirements for validated data ~~in Table 1 of~~described in section 3.7 of this Service Description. ~~(making appropriate allowance for the fact that a proportion of installed loggers will fail to collect validated data for the whole or part of the BSC Year).~~

3.1.2 The load research undertaken for the Domestic Unrestricted and Non-domestic Unrestricted Profile Classes shall include only ~~customer~~Sample Participants supplied on tariffs which incorporate no unit price differentiation at all, or in which the price differentials are not related to time-of-day, day-of-week, month or season. The samples for these Classes shall therefore be restricted to ~~customer~~Sample Participants supplied on tariffs with a single unit price or with prices which vary only according to the quantity of units used in a period.

3.1.3 The load research undertaken for the Domestic Economy 7 and Non-domestic Economy 7 Profile Classes shall be restricted to ~~customer~~Sample Participants supplied on Economy 7 tariffs characterised by a continuous 7-hour night regime occurring between the times of 00:30 and 07:30 Greenwich Mean Time (or within an hour thereof to allow for a degree of timeswitch variation) when load is recorded on a Low Register and a continuous 17-hour period when load is recorded on a Normal Register. It should be noted that on the whole ~~customer~~Sample Participants with clock-switched metering are favoured over tele-switched metering, and generally ~~customer~~Sample Participants recruited to the sample should have metering of this type.

3.2 Use of ~~Customer~~Sample Participant Information provided by Suppliers

3.2.1 The Profile Administrator shall obtain the information necessary to meet the sampling requirements in accordance with BSCP510 (Provision of Sampling Data to the Profile Administrator). The Profile Administrator shall use reports of all Metering Systems in each GSP group covered by each Supplier Meter Registration Agent provided by BSCCo and produce the required sample sizes for each Supplier, Profile Class and Standard Settlement Configuration (SSC) combination. The Profile Administrator shall then request the following ~~customer~~Sample Participant information for those selected Metering Systems from Suppliers:

- Profile Class Id;
- SSC Id;
- Metering/Timeswitch Class Id;
- MSID;
- Name of ~~customer~~Sample Participant and, if appropriate, contact name;
- Address of ~~customer~~Sample Participant, including billing address if different from site address;
- Total annual energy consumption;
- Where applicable, day/night split of annual energy consumption; and
- Where applicable, details of switching times for registers and/or load; and where applicable, Maximum Demand in kW.

3.2.2 The Profile Administrator shall carry out quality checks of the information which it receives to ensure that the ~~customer~~Sample Participants selected fit the requirements of the sample.

3.2.3 The ~~customer~~Sample Participant information obtained shall be used by the Profile Administrator to create a stratified random sample of ~~customer~~Sample Participants. The stratified random samples shall form the basis for recruiting ~~customer~~Sample Participants to the Load Research Programme.

3.3 Recruitment of ~~Customer~~Sample Participants for Load Research

3.3.1 Where necessary to meet the requirements for validated data described in ~~Table 1 of~~ section 3.7 of this Service Description and in order to maintain a representative sample, the Profile Administrator shall recruit Sample Participants in such numbers as are required to ensure that the number of Sample Participants in each Profile Class is equal to the Installed Participant Requirement for that Profile Class~~customers to the sample~~.

3.3.2 When recruiting ~~customer~~Sample Participants, information pertaining to that ~~customer~~Sample Participant shall be collected by questionnaire. In particular, it should be established whether ~~customer~~Sample Participants in Profile Class 2 or 4 (the "switched load" Profile Classes) have storage heating, water heating or both installed.

3.3.3 Each ~~customer~~Sample Participant recruited to Load Research sample must be documented in the Profile Administrator's ~~own internal~~ systems, such that all relevant details pertaining to the ~~customer~~Sample Participant are held in accurate and secure forms, and in accordance with the Data Protection Act.

3.3.4 The Profile Administrator shall provide to each Supplier of the ~~customer~~Sample Participants included in the load research sample a list of the relevant sample MSIDs.

3.3.5 The Profile Administrator shall be notified of any MSIDs in the load research sample for which:

(a) there is a change to half-hourly metering; or

(b) there is a change in Profile Class or tariff; or

(c) there is a change to the time pattern regime for the metering system;

such notification to be provided as soon as possible after any intention to make such a change becomes known to the Supplier or in any event within one week of a change taking place.

3.3.6 The Profile Administrator shall carry out the following procedures to ensure that the load research sample remains statistically representative:

(a) a ~~Customer~~Sample Participant who leaves the Load Research Programme shall be replaced by a similar ~~Customer~~Sample Participant drawn from the relevant sample stratum;

(b) a ~~Customer~~Sample Participant in the sample who changes tariff or metering system and thereby no longer meets the sampling requirements, for example:

- Unrestricted ~~customer~~Sample Participants who change to a evening/weekend tariff;

- Economy 7 ~~customer~~Sample Participants who change from the standard 7-hour night regime;
- ~~Customer~~Sample Participants who change to half-hourly metering;
- Non Maximum Demand ~~customer~~Sample Participants whose Maximum Demand value exceeds 100kW;

shall be replaced by a consumer of electricity (who shall become a Sample Participant) who has the required consumption characteristics to replace the outgoing ~~Customer~~Sample Participant ~~drawn from~~in ~~the~~ relevant sample stratum;

(c) ~~each year, the~~from time to time, the Profile Administrator shall recalculate the stratum populations using data provided ~~by the Supplier Meter Registration Agents~~from Non-Half Hourly Data Aggregator (NHHDA) systems.

3.3.7 The Profile Administrator shall ensure that any disturbance and inconvenience experienced by the ~~customer~~Sample Participant taking part in the load research is reduced to a practical minimum.

3.4 Stratification of Samples

3.4.1 In order to ensure representative samples, the Profile Administrator shall classify the metering systems in the sample for each Profile Class into strata, according to the sample design, and assign an appropriate weight to each stratum, as follows. Note that this Service Description uses the subscript 'h' to refer to a particular stratum of a particular Profile Class, and the acronym W_h to refer to the weight assigned to a given stratum:

(a) each metering system shall be classified to one of a number of pre-defined ranges (at least 2 but no more than 10) for billed annual consumption; and

(b) where specified by the sample design each metering system shall be classified to its GSP Group Area.

3.4.2 The total number of metering systems in each stratum at the time that the samples were drawn shall be determined using frequency distribution information to be provided to the Profile Administrator. These populations shall be denoted by $N_h(PS_p)$, where p is the Profile Class represented by the relevant sample. The Profile Administrator shall calculate W_h the Stratum Weight of stratum h in Profile Class p as follows:

$$W_h = N_h(PS_p) / N_p$$

where:

Np = The total number of non half-hourly metering systems in Profile Class p.

3.5 Installation and Use of Equipment

3.5.1 The Profile Administrator shall install and maintain metering equipment at each ~~customer~~Sample Participants' premises for the purpose of recording half-hourly demand values and~~, where relevant,~~ automatically communicating these to the Profile Administrator's data centre for processing.

3.5.2 The Profile Administrator ~~shall~~ may procure Fieldwork Agents (as necessary) to install all necessary metering equipment in order to deliver the Profile Administrator Service.

3.5.3 The Profile Administrator shall ensure that:

(a) connection, disconnection and maintenance of the metering equipment at ~~customer~~Sample Participants' premises shall be carried out only by qualified staff employed by the Profile Administrator or its sub-contractors, and that those sub-contractors have been approved by BSCCo;

(b) all installation staff are familiar with the safety, installation, testing and maintenance procedures set out in the relevant installation notes to be provided by the Profile Administrator; and

(c) where necessary, training is given to staff of its sub-contractors (as approved by BSCCo) to explain the operation of any equipment used and the Profile Administrator's best practice installation guidelines.

~~3.5.4Upon initial installation of equipment in domestic customer premises the Profile Administrator shall demonstrate to the customer how data loggers are exchanged. The customer will be given the option of exchanging the data logger as an alternative to Profile Administrator visits. If the customer agrees, the Profile Administrator shall supply the customer with a replacement logger, and a self-addressed envelope for the return of the old logger, along with details of when the logger should be changed, and any further instructions as necessary.~~

~~3.5.5For non-domestic premises data loggers are mostly collected and exchanged by the Profile Administrator. The Profile Administrator shall supply new loggers to replace those in premises. The Profile Administrator shall then be responsible for agreeing a mutually acceptable appointment with the customer and the exchange and return of loggers to the Profile Administrator.~~

~~3.5.6The Profile Administrator shall ensure that each of its employees (or, where relevant, sub-contractors) involved in installing data loggers is informed of all relevant information relating to the installation of each logger. This includes, where available, the particular location of the data logger within the customer premises.~~

~~3.5.7The Profile Administrator shall collect half-hourly demand data from customers by the use of exchangeable cartridge type data loggers or local communications unit devices which remotely download data to the Profile Administrator's computer systems.~~

~~3.5.8The Profile Administrator shall maintain systems for tracking the location of each logger such that at any given time the Profile Administrator shall know the location of each logger, and where relevant, exactly how long the logger has been installed in a customer site.~~

~~3.5.9~~3.5.4 ~~The equipment used to measure customer demand shall be capable of recording values that are within the range of +/- 1.5% of the electricity used by the customer in each half hour.~~The ~~PrA~~Profile Administrator shall install ~~the appropriate~~such metering equipment~~,~~ as is required (given in the Sample Participant's circumstances) at the ~~provided by the BSCCo, in the customer~~Sample Participant's ~~p~~Premises in order that the data required to be

recorded and collected by this Service Description and BSC Agent Contract between BSCCo and the Profile Administrator can be recorded and collected. The metering equipment, unless otherwise agreed between BSCCo and the Profile Administrator shall be provided by the BSCCo.

3.5.5 The ~~PrA~~Profile Administrator shall ensure that the appropriate mobile telephony or other communication systems are installed and tested to ~~allow~~facilitate data collection from the ~~customer~~Sample Participant's premises.

3.5.6 The Profile Administrator shall ensure that all relevant information relating to the metering equipment installed and location of the metering equipment within the Sample Participants ~~p~~Premises is recorded by the person(s) performing the installation. ~~staff (or, where relevant sub-contractors).~~

3.5.7 The Profile Administrator shall maintain systems for tracking the location of each piece of metering equipment such that at any given time the Profile Administrator shall know the location of each piece of metering equipment.

3.5.8 The Profile Administrator shall maintain systems for communicating with the metering equipment installed such that at any given time the Profile Administrator can assess the operational status of the installed metering equipment.

3.5.9 The Profile Administrator shall maintain systems for communicating with the metering equipment installed such that ~~at~~ any third party contract data (e.g. Airtime Contracts and SIM Card Information) is accurately recorded.

3.5.10 The installation and communication data within the systems maintained by the current Profile Administrator shall be ~~both~~ auditable and, should an alternative Profile Administrator be appointed, transferable.

3.6 Collection and Validation of Data

3.6.1 The Profile Administrator shall collect (or procure the collection of) demand measurement data periodically (and at least annually) from each ~~customer~~Sample Participant included in the sample by way of a remote "dial up" link with the metering equipment.

~~3.6.2It is expected that new loggers will start to be issued to domestic customers and to Fieldwork Agents from buffer stocks prior to April in any given year, such that the logger exchange process can commence from the start of April onwards. For example, loggers will then be collected in the months April to July, such that by the end of July a suitable population of data has been recovered.~~

~~3.6.3~~3.6.2 ~~Once loggers are received by the Profile Administrator, data shall be extracted from the logger. This operation involves capture of the data collected by the various types of logger. It involves the use of one or more personal computers with suitable interfaces for the different types of logger (e.g. modem interface for modem loggers, interface and reader for exchangeable loggers). Immediately after unloading, the data is validated at a basic level,~~Following collection the data shall be converted to a standard format and uploaded to

project databases held on the Profile Administrator's central load research analysis computers.

3.6.43.6.3 The Profile Administrator shall carry out quality checks of the demand measurements recorded for each customerSample Participant. Examples of such checks include checking whether the data has any days of zeromissing– or uncharacteristic consumption, and whether the logger has more than twenty days of consumption data, whether the customer has any demand "spikes". and whether the data broadly matches the tariff meter advance for that customer. Any data failing these checks shall be rejected and not used for the purposes of data analysis.

3.6.53.6.4 The Profile Administrator shall have the ability to collect one year's worth of data from the sample within agreed timescales The Profile Administrator shall ensure that all loggers are exchanged in the sample, by issuing loggers to customers for installation and receiving used loggers in return. For clarification, it should be noted that this is envisaged to be a "rolling" process, with the Profile Administrator issuing and receiving loggers for a period of months. Loggers will be issued to customers as "used" loggers become available, so that not all customers in the sample will be required to be sent loggers at the commencement of the exchange period.

3.6.63.6.5 The Profile Administrator shall receive all returned loggers, noting the time and date received and the period of installation. Each logger shall be identified by a barcode, and this shall be checked upon receipt. The Profile Administrator shall then extract all data from the logger using the appropriate equipment and software.maintain a record of data collection activities relating to each installed metering systemall metering equipment in each Sample Participants Premises.

3.6.6 The Profile Administrator shall ensure that upon the receipt of each logger, a tariff meter advance is also collected from each customer. This is for validation purposes in ensuring that the half hourly measured values and the tariff meter advance are consistent.communication with the installed equipment an assessment of the operational capability of the installed equipment to provide valid data is undertaken and where necessary undertake additional actions to resolve any communications or metering issues.

3.6.7 If the Profile Administrator is unable to collect data from any metering equipment the Profile Administrator shall carry out all practicable "remote" diagnostics to determine the cause of the failure to collect data. Visits to Sample Participants Premises to diagnose the reason for the data failure shall be undertaken as a last resort. All cases of metering equipment failing to record and communicate data, along with the agreed rectification approach shall be reported promptly to BSCCo.

3.6.8The Profile Administrator will carry out data retrieval using the procedures set out in the Profile Administrator's Operating Procedures Manual. These procedures shall be designed to ensure that each set of data retrieved from the data logging devices is correctly matched to one of the customers included in the load research sample.

3.7 ~~Validated Data Requirements~~Installed Sample and Data Collection Requirements

3.7.1 The Profile Administrator will ensure that the number of Sample ~~p~~Participants for each Profile Class is at least equal to the Installed Participant Requirement for that Profile Class ~~maintain an installed customer sample~~ (for clarification a Sample Participant is eligible to be counted as part of the ~~n~~Installed Participant Requirement~~installed customer~~ where that ~~is a sample member~~Sample Participant ~~that~~ has been both recruited and had equipment successfully installed at their premises, as more fully detailed in the BSC Agent Contract between BSCCo and the Profile Administrator). The Installed Participant Requirement for ~~of the size for~~ each Profile Class shall be as determined ~~set~~ from time to time by ~~the~~ BSCCo.

3.7.2 The Profile Administrator will report the number of Sample Participants who are ~~i~~eligible to be included in the Installed Participant Requirement for each Profile Class~~nstalled sample size~~, at the first of April for the data collection year~~, for each Profile Class,~~ to the BSCC~~O~~o.

3.7.3 Upon receipt of the ~~installed sample sizes for each Profile Class~~figures referred to in 3.7.2 the BSCCo will set a validated data collection requirement for each Profile Class for the data collection year.

3.7.4 The Profile Administrator can recruit additional ~~sample customer~~Sample Participants, during the data collection year, up to the Installed Participant Requirement for each Profile Class~~defined installed customers sample requirement for the Profile Class~~ in order to achieve the data collection requirement set by ~~the~~ BSCCo. BSCCo shall not be obliged to provide metering equipment for Sample Participants recruited in excess of the Installed Participant Requirement for each Profile Class.

~~3.7.1~~3.7.5 The Profile Administrator shall carry out data validation following the procedures set out in the Profile Administrator's Operating Procedures Manual. These procedures shall include tests and checks to be applied to the retrieved half-hourly data values and shall be designed to ensure that invalid or erroneous data are not included in the datasets used for regression analysis.

~~3.7.2~~3.7.6 Data accepted as valid for data analysis shall be retained in the Profile Administrator's computerised database systems for later processing and extract purposes for at least one year. After this period the data shall be archived and retained in accordance with the data retention requirements in section 6.3 of this Service Description.

~~3.7.3The Profile Administrator shall ensure that the number of customers for whom complete validated, half-hourly demand measurements have been collected meets the requirements detailed in Table 1 overleaf:~~

Table 1 – Validated Data Requirements for each Load Research Year		
Profile Class	Number of customers for whom complete, validated, half-hourly demand measurements have been collected	
	Minimum on each day of the year	Average per day over the year
Domestic Unrestricted	450	500
Domestic Economy 7	400	450
Non-domestic non-Maximum Demand (MD) Unrestricted	240	300
Non-domestic non-MD Economy 7	220	250
Non-domestic MD with Load Factor in range:		
≤ 20%	160	180
>20% and ≤ 30%	80	100
>30% and ≤ 40%	80	100
>40%	160	180

3.7.43.7.7 In meeting the validated data requirements set out in Table 1 above, the Profile Administrator may use validated data from appropriate sources external to the Load Research Programme in addition to or instead of the validated data collected from the load research samples.

3.8 Load Research Planning

3.8.1 Each year, prior to the commencement of the Load Research Year, the Profile Administrator shall develop a Load Research Plan setting out the recommended minimum sample recruitment requirements for the next full Load Research Year based on the defined installed sample customerSample Participant requirements . The plan shall be derived from a review of Profile accuracy requirements with BSC Parties. The Profile Administrator shall calculate accuracy values and distributions and usewhich will be used by the BSCCo these for the purpose of estimating minimum installed sample size requirements.

3.8.2 In planning the Load Research sample recruitment requirement the Profile Administrator shall account for sample attrition. CustomerSample Participants may either leave the sample or become invalid for inclusion in the sample for a number of reasons including mid-year change of Profile Class, not informing the Profile Administrator if they move house or if data becomes lost from a particular premises.

4 DETAILED REQUIREMENTS FOR DATA ANALYSIS

This section describes the requirements for the Data Analysis stage of the Load Research Cycle. This Data Analysis takes as its input the validated half hourly demand values from the Data Collection stage of the load research cycle (see section 3).

4.1 Outputs from Data Analysis

4.1.1 The purpose of the data analysis programme is to derive sets of Regression Coefficients that can be used to estimate half hourly demands for Non Half Hourly ~~customer~~Sample Participants during the following Settlement Year. The Regression Coefficients will also be used to calculate GSP Group Average Annual Consumption (GAAC) values for each Profile Class and GSP Group and to calculate a set of 'nationally-representative' Profile Coefficients for each Profile Class. These deliverables are then used for purposes of volume allocation under the BSC, as follows:

(a) The Regression Coefficients and GAAC values are to be used by the Supplier Volume Allocation Agent (SVAA) for the purpose of Daily Profile Production and estimation of Suppliers' half-hourly energy purchases (the outputs of the daily profile production process are sets of half-hourly profile coefficients for each Standard Settlement Configuration within a GSP Group).

(b) The Profile Coefficients are to be used by Half-Hourly Data Collectors for the purpose of estimating half-hourly demands for half-hourly metered ~~customer~~Sample Participants when actual metered consumption data is not available.

(c) The half-hourly profile coefficients for each Standard Settlement Configuration (produced in Daily Profile Production) are summed by SVAA to derive sets of daily profile coefficients and these are provided to Non Half-Hourly Data Collectors for the purpose of calculating Annualised Advances from meter readings.

4.2 Overview of Data Analysis Process

4.2.1 Figure 3-3 overleaf provides a high-level overview of the calculations required to produce these deliverables. Note that the number in the top right corner of each box is a cross-reference to the sub-section of this document which describes the process in more detail:

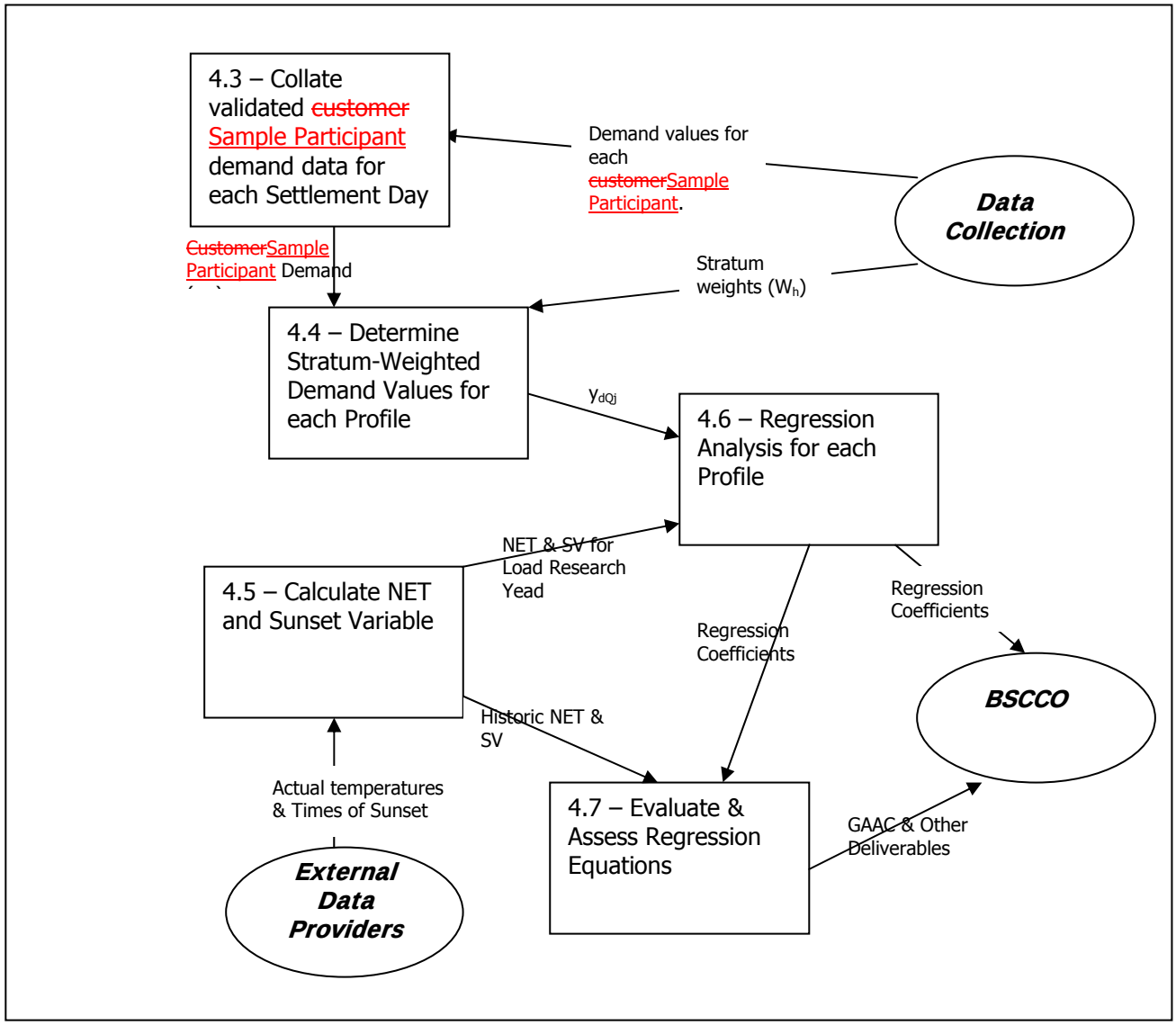

Figure 3-3: Diagrammatic Representation of Data Analysis Requirements

4.2.2 It can be seen from the above diagram that the inputs to the Data Analysis stage are as follows:

- Validated half hourly demand data from the Data Collection program. For each ~~customer~~Sample Participant i in the load research sample, this data will take the form of demand values for some or all of the Settlement Periods in the Load Research Year.
- Details of the Profile Class P and Stratum h to which each ~~customer~~Sample Participant belongs.
- For Domestic E7 ~~customer~~Sample Participants (i.e. those in the sample for Profile Class 2), details of whether they have storage heating and/or immersion heating installed.
- Details of the Stratum Weight W_h for each Profile Class p and Stratum h.
- Actual Noon Temperature data.

- Time of Sunset.

4.3 Collate Validated ~~Customer~~Sample Participant Demand Data for each Settlement Day

4.3.1 In order to allow Regression Coefficients to be calculated, the demand values for each ~~customer~~Sample Participant must first be divided up into individual Settlement Days. For each ~~customer~~Sample Participant i in the load research sample, and each Settlement Day T in the Load Research Year, the process is as follows:

- Check that the ~~customer~~Sample Participant has validated demand data for each Settlement Period j in the day. Note that a Settlement Day runs from 00:00 to 00:00 clock time (i.e. not GMT), and has 48 periods, labelled 1 to 48 (except for the clock change days, which have 46 or 50 periods, as explained in Appendix C).
- If any data is missing for that ~~customer~~Sample Participant and Settlement Day, the whole day's data will be excluded from the calculation. However, that ~~customer~~Sample Participant's data can still be used for other Settlement Days.
- If the data is complete for that ~~customer~~Sample Participant and Settlement Day, it can then be used in the remainder of the calculation. This Service Description uses the term y_{Tij} to refer to the validated demand data for ~~customer~~Sample Participant i in period j of Settlement Day T.

4.3.2 The output of this process is therefore validated ~~customer~~Sample Participant demand data y_{Tij} for each Settlement Day of the year. However, the set of ~~customer~~Sample Participants for whom such data has been successfully calculated will potentially vary from one Settlement Day to the next (depending on which ~~customer~~Sample Participants had complete data for a given day).

4.4 Determine Stratum-Weighted Demand Values for each Profile

4.4.1 Having derived demand values y_{Tij} (as described in section 4.3), the individual ~~customer~~Sample Participants' demand values are used to calculate a weighted average y_{TQj} of demand for a given Settlement Day T, Profile Q and Settlement Period j. The details of this process differ depending on the Profile Class:

- For the non-Economy 7 Profile Classes, demand data y_{TQj} is required only for the single 48-period Profile.
- For the Economy 7 Profile Classes, demand data y_{TQj} is required for both the 48-period baseload Profile, and the 14-period switched load Profile. A process is therefore required to split the demand data between base and switched load, as described below. Note that demand data is not required for switched load Profiles with durations other than 14 periods, because these are derived through manipulation of the Regression Coefficients, as described in section 4.6.10.

Non-Economy 7 Profile Classes

4.4.2 For Non-Economy 7 Profile Classes, the stratum-weighted demand value for each Profile is calculated as:

$$y_{TQj} = \Sigma_h (W_h \, y_{Thj})$$

where:

- W_h is the fraction of the total Profile Class population belonging to stratum h; and
- y_{Thj} is the average demand for Settlement Day T, stratum h and Settlement Period j (i.e. the simple arithmetic mean of the y_{Tij} values for all ~~customer~~Sample Participants i in stratum h).

Domestic Economy 7 Profile Class

4.4.3 See Appendix D for a full description of Domestic Economy 7 Profile Classes.

4.5 Calculation of Noon Effective Temperature and Sunset Variable

4.5.1 As explained in Appendix C, two of the key variables used in the regression equations are the Sunset Variable (SV), and the Noon Effective Temperature (NET). The Sunset Variable is defined as the number of minutes after 18:00 GMT at which sunset occurs. The Noon Effective Temperature on a day T is defined as a weighted average of the Actual Temperatures (in degrees Fahrenheit) at noon on days T, T-1 and T-2:

$$NET_T = 0.57\ AT_T + 0.28\ AT_{T-1} + 0.15\ AT_{T-2}$$

4.5.2 The Profile Administrator shall obtain the required temperature and sunset time measurements from the Authorised Temperature Provider and Sunset Time Provider for the 1998 Market. The means by which the data are obtained and the payments made for such data shall be subject to the contract's audit requirements.

4.5.3 In the case of the Sunset variables, these are the same for each GSP Group and the values at Birmingham are used. The weather stations to be used for recording temperature, shall be specified by BSCCo, and will be different for each GSP Group. Note however that the use made of this GSP Group-specific temperature data varies depending on the usage to which the data is being put:

- When evaluating regression coefficients to derive GSP Group Average Annual Consumption (GAAC) values, as described in section 4.7, the relevant temperature for each GSP Group is used, resulting in different GAAC values for each GSP Group.
- When constructing regression coefficients (as described in section 4.6), and evaluating regression coefficients to derive Profile Coefficients (as described in section 4.7), national rather than GSP-Group specific temperature values are required and an arithmetic average of the value for each GSP Group is used.

4.6 Regression Analysis for each Profile

4.6.1 Having derived stratum-weighted average demand values (y_{TQj}) for each Profile Q, Settlement Day T and Settlement Period j, a regression analysis is then performed to derive the Matrix of Regression Coefficients $MRC_{Q(aa)(nn)j}$.

4.6.2 The Profile Administrator shall first partition the data into different Analysis Classes, depending upon the Day Types and Season to which each Settlement Day belongs. See Appendix C for a more detailed description of Analysis Classes.

4.6.3 The regression variables Mon_T, Wed_T, Thu_T, Fri_T, NET, SV and SV must then be determined for each Settlement Day:

- The day of the week variables (Mon_T, Wed_T, Thu_T, Fri_T) depend solely on the day of the week.
- The Noon Effective Temperature (NET) is derived from the actual noon temperatures at weather stations in each of the GSP Groups, as described in section 4.5 above.
- The Sunset Variable (SV) and the square of the Sunset Variable (SV^2) are derived from the calculated sunset times at Birmingham, as described in section 4.5 above.

4.6.4 Having calculated the seven regression variables for each Settlement Day, the Profile Administrator shall then perform a regression analysis for each separate combination of Profile, Analysis Class and Settlement Period. The result is the Matrix of Regression Coefficients $MRC_{Q(aa)(nn)j}$ for the 48-period and 14-period profiles. (Regression Coefficients for other durations of switched load profile are then derived algorithmically as described in section 4.6.10 below.)

4.6.5 Note that for all Day Types other than Weekday ('WE'), the day of the week variables are all zero, and the corresponding Regression Coefficients are set to zero.

4.6.6 Note also that in some cases, it may be necessary to augment the load research data (y_{TQj}) collected in respect of each Load Research Year with data collected during prior years in order to ensure that:

- the validated data requirements set out in Table 1 of section 3.7 of this Service Description are achieved in respect of each Profile Class; and
- the data in respect of each Analysis Class have been collected for a set of days that provides a reasonable range of temperature variation.

Special Processing for Temperature Coefficient in Winter

4.6.7 For the Winter season only, any positive values of the Regression Coefficient for Noon Effective Temperature should be removed as follows:

- Set the temperature coefficient (i.e. coefficient five) to zero; and
- Adjust the regression constant (i.e. coefficient zero) by adding 42 times the original temperature coefficient.

The effect of this adjustment is to make the evaluated demand the same for all temperatures i.e. equal to the original evaluated demand at 42 degrees Fahrenheit.

Special Processing for Bank Holidays and Shoulder Days

4.6.8 For all the 'special' Day Types i.e. those that are not Weekday ('WE'), Saturday ('SA') or Sunday ('SU'), there is insufficient data to perform a regression analysis. The following method is therefore used instead.

4.6.9 All the Regression Coefficients except the regression constant (i.e. the coefficients for NET, SV and SV^2) are set to equal to those for Sundays (Day Type 'SU') in the same Season. The regression constant (i.e. Regression Coefficient zero) is then set as follows:

- Average the demand values y_{TQj} for all Settlement Days in the Analysis Class to obtain a single demand shape y_{Qj}. Note that some Analysis Classes will have only a single Settlement Day anyway (e.g. Christmas Day), but others will have several (e.g. Winter Shoulder Days).
- Subtract from this the non-constant part of the Sunday Regression Equation for that Season, using the national average temperature and Birmingham sunset time for the particular day in question:

$$RC_{Q0j} = y_{Qj} - RC_{Q5j} * NET - RC_{Q6j} * SV - RC_{Q7j} * SV^2$$

where $RC_{Q(nn)j}$ is the Regression Coefficient for Profile Q, Settlement Period j and Regression Coefficient Type (nn).

In the case of an Analysis Class containing more than one day (e.g. Shoulder Days), the average sunset time and temperature for those days is used.

The effect of this is that:

- For a sunset time and temperature matching that on the day in question, the regression equations will evaluate to a demand equal to the measured demand for the day.
- For other temperatures and times of sunset, the evaluated demand will vary as it would do for a Sunday in the same Season.

Algorithmic Stretching and Contracting of Switched Load Profiles

4.6.10 The Profile Administrator will derive the algorithmic procedure described in Appendix B to transform each set of 14 Regression Coefficient values derived for the Switched-load Profiles of the two Economy 7 Profile Classes such that the normal duration of the Economy 7 switching period (seven hours) is made shorter or longer. The Regression Coefficients derived from the load research data will thereby be transformed into separate sets of Regression Coefficients, each representing a different daily duration of switching regime. The Profile Administrator shall apply the procedure to create a set of Regression Coefficients representing all possible duration of regime from two to forty-seven half hour periods: that is 46 regime durations beginning with the shortest duration (two half-hours) and increasing in half-hourly increments up to and including the longest duration (47 half-hours).

4.7 Evaluation and Assessment of Regression Equations

4.7.1 Having produced the Regression Coefficients (as described in section 4.6 above), additional analysis is required to produce the Technical Product Deliverables, as described in this section 4.7.

Regression Coefficients

4.7.2 The Matrix of Regression Coefficients $MRC_{Q(aa)(nn)j}$ will be formatted as described in section 5 (Deliverables) for delivery to BSCCo.

Profile Coefficients

4.7.3 The Profile Administrator shall calculate a set of 'nationally-representative' Profile Coefficients for each of the non Economy 7 Profile Classes for the Settlement Year in which the Regression Coefficients are to be used for settlement purposes. The calculations shall be carried out for each non Economy 7 Profile Class as follows:

a) A set of half-hourly average electricity demand estimates for the Settlement Year are calculated by evaluating the relevant Regression Coefficients using historic, 10-year national-average daily temperatures, and times of sunset recorded at Birmingham for the Load Research Year, ensuring by calendar matching that the Regression Coefficients used for each date correspond to the correct Season and Day-Type for the Settlement Year concerned.

b) Calculate the sum of the evaluated demand estimates calculated at step a);

c) Each of the demand values calculated at step a) is divided by the sum calculated at step b).

4.7.4 The Profile Administrator shall then format the profile coefficients as described in section 5 (Deliverables) for delivery to BSCCo.

GSP Group Average Annual Consumptions

4.7.5 The Profile Administrator shall calculate GAAC values for each Profile Class and GSP Group. In the case of the Economy 7 Profile Classes, separate GAAC values shall be calculated for the Baseload Profile and for the Switched-load Profile. The values shall be calculated by forming the sum of a complete year's half-hourly average electricity demands (measured in kW), derived by evaluating the Regression Coefficients for the relevant Profile Class, and dividing this number by 2000 (a factor to convert the half-hourly kW values to MWh). The half-hourly average demands shall be calculated for each GSP Group Area by evaluating the relevant Regression Coefficients using historic 10-year averages of daily temperatures (recorded at the relevant weather station for the GSP Group) and sunset times (relating to the relevant location for the GSP Group) for the most recent Load Research Year.

4.7.6 The Profile Administrator shall then format GAAC values as described in section 5 (Deliverables) for delivery to BSCCo.

Analysis of Profile Accuracy

4.7.7 The Profile Administrator shall analyse the statistical precision of the half-hourly demand estimates for each Profile Class, as follows:

- Estimate the precision (i.e. the precision ±x% at one or more confidence levels P% agreed with BSCCo) for each of the 17,520 (or 17,568) half-hourly demand estimates for each Profile Class; and
- For each Profile Class, determine the demand-weighted average across all Settlement Periods of the precision level x% (giving a single measure of profile accuracy for each Profile Class).

4.7.8 The Profile Administrator shall provide summary details of these analyses in the Annual Report.

Clock Change Days

4.7.9 Whenever Regression Coefficients (other than those for switched load) are evaluated for an entire year (as for example in paragraphs 4.7.3 and 4.7.5 above), special rules are required for clock change days. In each case, the 48 half hourly values obtained by evaluating the regression equations are manipulated to obtain 46 or 50 values as required, in accordance with the following rules:

- In the case of the short day (when the clocks go forward from 1:00 to 2:00 at 1:00 GMT), the values for the third and fourth periods are discarded (and subsequent periods renumbered as 3 to 46);
- In the case of a long day (when the clocks go back from 2:00 to 1:00 at 1:00 GMT), the values of the third and fourth periods are repeated as periods five and six respectively (and subsequent periods renumbered as 7 to 50).

5 DELIVERABLES

For each Settlement Year subsequent to that ending on 31 March 2004, the Profile Administrator shall deliver the following Technical Product Deliverables on or before the last day of November (the Delivery Date):

a) a set of Regression Coefficients, GAAC values and Profile Coefficients;

b) a set of "friendly format" Technical Product Deliverables, in which the Regression Coefficients are provided in comma separated ASCII text for each Settlement Day; and

c) a report presenting comparative results of the Profile Administrator's sample data demonstrating that the Technical Product Deliverables will provide reliable profile estimates for use in energy settlement. The comparisons should include a comparison of average weekday group demands recorded in the Load Research Year with the calculated Regression Coefficients and a comparison of calculated weekday Regression Coefficients with weekday regression coefficients for the previous year evaluated at noon effective temperatures and Birmingham sunset times.

In addition, the Profile Administrator shall deliver the following Documentation Deliverables:

Documentation Deliverables			
Deliverable	**Description**	**Delivery Date**	**Acceptance Period**
Data Analysis Plan	A plan proposing the quantity, source and period of collection of the ~~customer~~Sample Participant demand data to be used in regression analysis for each Profile Class. The report will discuss and justify any decisions made by the Profile Administrator to use data collected from sources outside the load research sample and to use data from prior years.	15 June each year	10 Days
Load Research Plan	A plan for the next full year of load research proposing the sample design and sample ~~sizes~~ recruitment needed to meet the Installed Participant R~~r~~equirement ~~s~~ for each Profile Class, drawing on the estimated relationship between sample sizes and accuracy and other suitable measures.	15 November each year	10 Days

Documentation Deliverables			
Deliverable	**Description**	**Delivery Date**	**Acceptance Period**
Annual Report	A report comparing the results achieved during the last twelve months against the objectives and targets set out in the previous plan, summarising the key objectives for the next twelve months, and discussing any outstanding issues, constraints and risks.	15 November each year	10 Days

This remainder of this section 5 describes in detail the derivation and format of the Technical Product Deliverables.

5.1 Regression Coefficients

Purpose

To be used to calculate Profile Coefficients for each Profile Class and each Settlement Period.

Derivation

By application of the procedures set out in Section 4 (Data Analysis Programme) and applied to load research data collected in the Load Research Year.

Quality Criteria

The Regression Coefficients shall satisfy the quality criteria detailed below:

Format and Completeness:

The electronic version of the data is in the required format and the expected number of data values is present.

Acceptance Tests:

Evidence is provided to BSCCo that the acceptance tests set out in the Acceptance Procedures Documentation Deliverable have been successfully carried out.

Format and Presentation

The Profile Administrator shall provide copies of the Regression Coefficients in electronic form. The Regression Coefficients shall be provided in a single physical file (together with the GAAC values referred to in 5.3). The physical file format shall be specified by BSCCo, and the data delivered annually on CD-ROM. The logical format should be as defined in the SVA Data Catalogue Volume 1: Data Interfaces flow P0014: Regression Data File, as detailed in the SVA Data Catalogue Volume 1: Data Interfaces (Reference 1).

The data shall be grouped by Profile Class and the following logical data items shall be provided in order to identify each set of Regression Coefficients within a Profile Class:

a) the date of the first day of the Settlement Year for which the data are to be used;

b) a code to be specified by BSCCo identifying the Profile Class;

c) a code to be specified by BSCCo identifying the type of Profile (i.e. Baseload Profile or Switched-load Profile) and the Profile daily duration in half-hours.

For each Profile within each Profile Class, the following logical data items shall be provided in order to identify each Regression Coefficient:

a) a code to be specified by BSCCo identifying the Season;

b) a code to be specified by BSCCo identifying the Day-Type;

c) a number identifying the Settlement Period to which the Regression Coefficient relates;

d) a code to be specified by BSCCo identifying the Regression Coefficient (eight Regression Coefficients are required for each Settlement Period: zero values must be provided in the case of Day-Types for which values are not calculated for all eight such Regression Coefficients);

e) the numeric value of the Regression Coefficient itself.

The physical file format may specify additional data items (e.g. checksums, control totals) for audit and security purposes.

5.2 Profile Coefficients

Purpose

To be used to estimate demand values for half-hourly metering systems for which actual metered values are not available.

Derivation

From the Regression Coefficients, in accordance with the procedures specified in Section 4 (Data Analysis Programme).

Quality Criteria

The Profile Coefficients shall satisfy the quality criteria detailed below:

Format and Completeness

The electronic version of the data is in the required format and the expected number of data values is present.

Accuracy

Evidence is provided to BSCCo that the Profile Coefficient values have been derived from the Regression Coefficients and GAAC values.

Format and Presentation

The Profile Administrator shall provide copies of the Profile Coefficients in electronic form and they shall be provided in a single physical file. The physical file format shall be specified by BSCCo. The logical format shall be as follows.

The data shall be grouped by Profile Class and the following logical data items shall be provided in order to identify the set of Profile Coefficients for each Profile Class:

a) the date of the first day of the Settlement Year for which the data are to be used;

b) a code to be specified by BSCCo identifying the Profile Class.

For each day of the Settlement Year in which the Profile Coefficients are to be used, the following logical data items shall be provided in order to identify each Profile Coefficient:

a) the date of the day to which the data refers;

b) the number of Settlement Periods within that day;

c) a number identifying the Settlement Period to which the Profile Coefficient relates;

d) the numeric value of the Profile Coefficient itself.

The physical file format may specify additional data items (e.g. checksums, control totals) for audit and security purposes.

5.3 GAAC Values

Purpose

To be used to convert half-hourly demand estimates, derived from evaluating the Regression Coefficients, into Profile Coefficients.

Derivation

From the Regression Coefficients, in accordance with the procedures specified in Section 4 (Data Analysis Programme).

Quality Criteria

The GAAC Values shall satisfy the quality criteria detailed below:

Format and Completeness

The electronic version of the data is in the required format and the expected number of data values is present.

Accuracy

Evidence is provided to BSCCo that the GAAC values have been derived from the Regression Coefficients.

Format and Presentation

The Profile Administrator shall provide copies of the GAAC values in electronic form.

Electronic Form

The GAAC values shall be provided in a single physical file (together with the Regression Coefficients referred to in 5.1). The physical file format shall be specified by BSCCo. The logical format shall be as follows.

The data shall be grouped by GSP Group and Profile Class and the following logical data items shall be provided in order to identify each GAAC Value:

a) the date of the first day of the Settlement Year for which the data are to be used;

b) a code to be specified by BSCCo identifying the GSP Group;

c) a code to be specified by BSCCo identifying the Profile Class;

d) a code to be specified by BSCCo identifying the type of Profile (i.e. Baseload Profile or Switched-load Profile) and the Profile daily duration in half-hours;

e) the numeric value of the GAAC in MWh.

The physical file format may specify additional data items (e.g. checksums, control totals) for audit and security purposes.

5.4 Friendly Format Technical Product Deliverables

Purpose

To be used to calculate Profile Coefficients for each Profile Class and each Settlement Period. The friendly format TPDs document the same information as the Regression Coefficients and GAAC values, but are produced in a comma separated text format from which it is simple to obtain the Regression Coefficients for a particular day. They are generally used in the acceptance process.

Derivation

By application of the procedures set out in Section 4 (Data Analysis Programme) and applied to load research data collected in the Load Research Year.

Quality Criteria

The Regression Coefficients shall satisfy the quality criteria detailed below:

Format and Completeness:

The electronic version of the data is in the required format and the expected number of data values is present.

Format and Presentation

The Profile Administrator shall provide copies of the friendly format Technical Product Deliverables in electronic form. Each Profile Class shall be delivered in its own individual text file, as shall Profile Class 2 and 4 Switched Load Regression Coefficients, with data in comma separated format and shall contain the following information:

1. Profile Class,
2. (Total, base or switched load),
3. Season, Day Type,
4. Half-Hour,

5. Temperature Coefficient,
6. Sunset Coefficient,
7. Sunset Square Coefficient,
8. Monday Coefficient,
9. Wednesday Coefficient,
10. Thursday Coefficient,
11. Friday Coefficient,
12. Constant.

Each file should contain 1152 lines of data (48 Settlement Periods x 24 day types (see below)), and the seasons and day type should be in the following order:

1. Autumn Saturdays
2. Autumn Sundays
3. Autumn Weekdays
4. High Summer Saturdays
5. High Summer Sundays
6. High Summer Weekdays
7. Summer Saturdays
8. Summer Sundays
9. Summer Weekdays
10. Spring Saturdays
11. Spring Sundays
12. Spring Weekdays
13. Winter Saturdays
14. Winter Sundays
15. Winter Weekdays
16. Good Friday (GFBH)
17. Easter Monday (EMBH)
18. May Bank Holiday (MAYBH)
19. Spring Bank Holiday (SPRBH)
20. Summer Bank Holiday (SMRBH)
21. Christmas Day (CD)
22. Boxing Day (BD)
23. New Year Bank Holiday (NYBH)
24. Christmas Shoulder Days (SD)

Note that:

- The Summer Bank Holiday (SMRBH) data is used for both the early August Bank Holiday (in Scottish GSP Groups) and the late August Bank Holiday (in E&W GSP Groups); and
- The Boxing Day (BD) data is also used for the 2nd January Bank Holiday (in Scottish GSP Groups only).

The information below is an example of this file:

```
Profile_1_Final_Yr6,Total,AUT,SAT,0.30,0.0012182341,-0.0001160324,0.000003669, 0,0,0,0,0.211244698
Profile_1_Final_Yr6,Total,AUT,SAT,1.00,0.0003049405,-0.0000052294,0.0000041406, 0,0,0,0,0.2345546052
Profile_1_Final_Yr6,Total,AUT,SAT,1.30,-0.0018490848,-0.0000142034,0.0000010316, 0,0,0,0,0.3418389599
Profile_1_Final_Yr6,Total,AUT,SAT,2.00,-0.0003801295,-0.0001261095,0.0000003721, 0,0,0,0,0.243004026
Profile_1_Final_Yr6,Total,AUT,SAT,2.30,-0.0001321875,-0.0000318315,0.0000007931, 0,0,0,0,0.2211213139
```

A separate file should also be produced for GAAC values, documenting the GAAC values for each GSP Group and Profile class. The file should include the following information:

1. GSP Group
2. Profile Class
3. Type
4. GAAC

The information below is an example of this file:

"GSP"	"Profile_Class"	"Type"	"GAAC"
"C"	1	"TOTAL"	3943
"J"	1	"TOTAL"	3971
"H"	1	"TOTAL"	3933
"L"	1	"TOTAL"	3922
"A"	1	"TOTAL"	4012
"B"	1	"TOTAL"	4010
"E"	1	"TOTAL"	3990
"K"	1	"TOTAL"	3926
"D"	1	"TOTAL"	3976
"M"	1	"TOTAL"	3980
"F"	1	"TOTAL"	3997
"G"	1	"TOTAL"	3984
"N"	1	"TOTAL"	3962
"P"	1	"TOTAL"	3977
"C"	2	"SWITCHED"	2143
"J"	2	"SWITCHED"	2207
"H"	2	"SWITCHED"	2124

5.5 Comparison Report

Purpose

The Comparison Report shall present the comparative results of the Profile Administrator's sample data for the Load Research Year. Comparisons shall be drawn with data from the previous Load Research Year and with the current Load Research Year. The object of the report is to give some confidence that sample data for the Load Research Year will provide reliable profile estimates for use in energy settlement in the Settlement Year.

The comparisons should be given in two sections:

1. a comparison of average weekday group demands in the Load Research Year with the evaluated Regression Coefficients for the same Load Research Year;

2. a comparison of the current Load Research Year weekday Regression Coefficients with the previous Load Research Years' weekday Regression Coefficients evaluated at noon effective temperatures and Birmingham sunset times.

Tabulations of annual consumptions should also be given along with sample sizes used in the Load Research Year.

Format and Presentation

The Profile Administrator shall provide copies of the friendly format Comparison Report in electronic form. The comparisons should be made for all Profile Classes, as well as the Switched Load components of Profile Classes 2 and 4. The report should compare for both 1 and 2 above, the average working day demand estimates for every season as well as monthly consumption estimates. Any anomalies in the comparisons should be highlighted by the Profile Administrator and explanations provided.

6 NON-FUNCTIONAL REQUIREMENTS

6.1 Audit Requirements

6.1.1 The determinations and calculations made by the Profile Administrator in connection with the Profile Administrator Service, and the extent to which such determinations and calculation comply with the BSC and Code Subsidiary Documents, shall be subject to regular audit by the BSC Auditor, in accordance with the BSC Audit.

6.1.2 The Profile Administrator shall, as a condition precedent to its appointment, execute a confidentiality undertaking with the BSC Auditor.

6.1.3 The Profile Administrator shall be able to re-perform calculations in accordance with the data retention requirements in 6.3.1, producing the same results from the same input data.

6.1.4 All processes operated by the Profile Administrator in respect of the Profile Administrator Service must be verifiable. This means that:

(a) processes must be documented such that they can be verified by the BSC Auditor;

(b) all processing must be recorded and these records must contain such cross-references as are necessary to allow verification by tracing data through processing, both forwards and backwards.

6.1.5 The Profile Administrator must make available at all reasonable times input data and other related documentation (including procedures and evidence of operation of controls) used in the provision of the Profile Administrator Service for inspection and copying (including electronically) by the BSC Auditor, in accordance with the data retention requirements in 6.3.1.

6.1.6 The Profile Administrator must also make its staff available at all reasonable times to provide explanations and answer any questions arising from the audit that the BSC Auditor may require.

6.1.7 BSCCo shall instruct the Profile Administrator to carry out such corrective action at its own cost as may be required by BSCCo consequent on receipt of the BSC Auditor's Report. The Profile Administrator shall take such corrective action as may be necessary.

6.2 Helpdesk Service

6.2.1 The Profile Administrator is required to appoint a single point of contact as a helpdesk service, which shall be available between the hours of 9h00 to 17h00 on Business Days only.

6.2.2 The single point of contact shall receive incoming calls from BSCCo on matters that affect the service described in this service requirement.

6.2.3 The single point of contact shall include:

(a) logging of all incidents notified including;

(i) allocation of a unique call reference number;

(ii) a description of the problem;

(ii) details of the source of the problem, how widespread the problem is; and

(iv) the likely duration of the problem.

(b) a call back and progress reporting mechanism.

6.2.4 The Profile Administrator shall respond to all incoming calls as detailed below:

Type of Incident	Severity Level	1st Call Back to caller	Follow-up Calls to caller
Any operational incident that will prevent timely delivery of the Technical Product Deliverables in accordance with the time-scales set out in 2.2	1	Within 15 minutes	Within time-scale agreed with caller
All Other Enquiries	All	Within 4 Business Hours	Within time-scale agreed with caller

6.2.5 The Profile Administrator shall contact BSCCo via their single point of contact for the purposes of the services set out in this Service Description and the table above. The Profile Administrator shall tell BSCCo immediately of any issue impacting the delivery of the Profile Administrator Service.

6.3 Data Retention and Transfer

6.3.1 In respect of Audit requirements and disputes, the Profile Administrator is required to retain data for at least 40 months from the last Settlement Day the data was used in the Settlement calculations. The data shall be kept for 28 months in a format that may be rapidly retrieved; thereafter it shall be kept in a format from which the data can be retrieved if requested within 10 Business Days.

6.3.2 The Profile Administrator is required to retain all the following datasets:

(i) all data inputs used in the production of the Technical Product Deliverables; and

(ii) Technical Product Deliverables sent to BSCCo.

6.3.3 The Profile Administrator shall be required to transfer the datasets in section 6.3.2 on the appointment of a new Profile Administrator, and this obligation endures the termination of the Profile Administrator BSC Contract.

6.4 Change Management

6.4.1 The Profile Administrator Service Description is a Code Subsidiary Documents and therefore BSC Parties (and other industry participants e.g. energywatch) can raise Change Proposals (BSCP40) and Modification Proposals (BSC Section F, BSCP76) that may have an impact on this document.

6.4.2 The Profile Administrator shall provide a Change Management service in accordance with BSC Procedure BSCP40 "Change Management" as amended from time to time. The latest version of BSCP40 will be made available to the Profile Administrator by BSCCo.

6.4.3 The Profile Administrator shall conduct impact assessments of the costs, timescales and other relevant considerations on any proposed changes to the service as notified by BSCCo. The Profile Administrator shall respond with their impact assessment within 5 Business Days of receiving the request from BSCCo or a longer period by prior agreement with BSCCo.

6.5 Consultancy Service

6.5.1 The Profile Administrator shall make available a consultancy service providing business and technical consultancy relating to the provision of profiles or other subject matter as may be directed by BSCCo.

6.5.2 The consultancy service shall have the capability to analyse existing business needs and business processes relating to the provision of profiles, or other subject matter as directed by BSCCo. The consultancy service shall produce proposals, specify requirements, produce business case justifications and deliver additional, new or changed business processes as may be required.

6.6 Security and Controls

6.6.1 The Profile Administrator shall use reasonable endeavours to maintain the physical and logical security of all hardware and software used by it, and all data and other information acquired or held by it as the Profile Administrator in order to prevent data loss or corruption.

6.6.2 The Profile Admininstrator shall provide evidence of adequate controls processes to include such areas as:

(i) access to operations area:

(ii) access to application (e.g. passwords, audit log, spot checks);

(iii) prevention of unauthorised changes to the software;

(iv) authorisation process for software changes; and

(v) defect correction process, which shall include processes to ensure that the Profile Administrator shall not deploy changes without notifying BSCCo of the defect and its severity level so that the Profile Administrator can agree the timing of the resolution with BSCCo.

6.7 Service Levels

6.7.1 The minimum levels of performance required of the Profile Administrator shall be specified in the Profile Administrator BSC Contract, and shall as a minimum relate to the following:

1. Timely delivery of Technical Product Deliverables; and
2. The use of sufficient validated ~~customer~~Sample Participant data in the creation of the Technical Product Deliverables ~~(as measured against the Validated Data Requirements in section 3.7 of this Service Description).~~

APPENDIX A – TERMS, ACRONYMS AND DEFINITIONS

Appendix A describes Terms, Acronyms and Definitions used in this document. The following table defines terms used in this document:

Term	Definition
BSC	Balancing and Settlement Code.
BSC Year	each successive period of 12 months beginning on 1st April in each year.
Business Hours	the hours from 9h00 to 17h00 on any Business Day.
Business Day	means a day (other than a Saturday or a Sunday) on which banks are open in London for general interbank business in Sterling and, in relation to payment in Euro, any such day when in addition the Trans European Automated Real-time Gross Settlement Express Transfer System is operated.
Code	The Balancing and Settlement Code.
Code Subsidiary Documents	means any document referred to in Section H1.2.4 of the Code as modified from time to time in accordance with Section F of the Code.
Documentation Deliverables	Deliverables of the Profile Administrator Service, other than Technical Product Deliverables.
Fieldwork Agent	An agent appointed by the Profile Administrator to install and maintain equipment at ~~customer~~Sample Participants' premises. A Fieldwork Agent must be appropriately qualified to perform such work (which may in some cases require the breaking of meter seals) i.e. must be a Meter Operator approved by OFGEM or have Approved Contractor status with the National Inspection Council for Electrical Installation Contracting.
Installed Participant Requirement	Shall mean the Installed Participant Requirement by Profile Class as set out in the Profile Administrator BSC Contract.
metering equipment	Shall means the meter, communications and ancillary equipment installed at the Sample Participant's Premises for the purpose of collecting (and communicating to the Profile Administrator) such ~~of~~ data as is required to be collected by virtue of this Service description and the BSC Agent Contract between the Profile Administrator and BSCCo.
Profile Class	A classification of profiles which represents an exclusive category of ~~customer~~Sample Participants whose Consumption can be reasonably approximated to a common profile for Settlement purposes.

Profile Coefficients	The Profile Coefficients delivered to BSCCo by the Profile Administrator (in the format described in section 5.2 of this Service Description). *For the avoidance of doubt, these Profile Coefficients are calculated in advance using historical temperature and sunset data, and are intended for use in estimation of missing data by Half Hourly Data Collectors in accordance with BSCP 502. They correspond to the Default Period Profile Class Coefficients (DPPCC) referred to in BSCP502. They are not the same as the Profile Coefficients calculated by the SVAA (using actual temperature data) in accordance with Section 6 of Annex S-2 of the BSC.*
Regression Coefficients	The Regression Coefficients delivered to BSSCo by the Profile Administrator (in the format described in section 5.1 of this Service Description). *For the avoidance of doubt, these Regression Coefficients correspond to the Matrix of Regression Coefficients $MRC_{Q(aa)(nn)j}$ as defined in the BSC.*
Sample Participant(s)	Shall mean a consumer of electricity (referred to as "customer(s)" in section 2.1 of this Service Description) whose consumption of electricity is being measured by the Profile Administrator.
Standard Settlement Configuration	A standard Non Half Hourly Metering System configuration recognised for settlement purposes under the BSC.
Supplier Volume Allocation Agent (SVAA)	The BSC Agent responsible for Supplier Volume Allocation.
Supplier Volume Allocation Rules	The rules contained in Annex S-2 of the BSC (including any BSC Procedures and Party Service Lines referred to in that Annex).
Technical Product Deliverables	Those deliverables of the Profile Administrator Service that are defined as Technical Product Deliverables in section 5 of this Service Description (i.e. the Regression Coefficients, Profile Coefficients, GAAC Values, Friendly Format Technical Product Deliverables and Comparison Report).

The following table lists acronyms used in section 4 of this document ('Detailed Requirements for Data Analysis'):

Acronym	**Data Item**
$MRC_{Q(aa)(nn)j}$	Matrix of Regression Coefficients for Profile Q, Analysis Class (aa), Regression Coefficient Type (nn) and Settlement Period j.
$RC_{Q(nn)j}$	Regression Coefficient for Profile Q, Regression Coefficient Type (nn) and Settlement Period j.
W_h	The stratum weight assigned to a given stratum of the sample for a Profile Class. These weights are used to calculate the stratum-weighted demand values, as described in section 4.4.
y_{TQj}	Stratum-weighted demand data (in kW) for Profile Q in Settlement Period j of Settlement Day T.
y_{Thj}	Stratum-weighted demand data (in kW) for stratum h in Settlement Period j of Settlement Day T.
y^{A}_{Tj}	Stratum-weighted demand data (in kW) for Domestic E7 consumers

	who are ~~customer~~Sample Participants in 'Group A' (i.e. both Storage and Immersion Heating) in Settlement Period j of Settlement Day T.
Y^{B}_{Tj}	Stratum-weighted demand data (in kW) for Domestic E7 consumers who are ~~customer~~Sample Participants in 'Group B' (i.e. Immersion Heating without Storage Heating) in Settlement Period j of Settlement Day T.
Y^{C}_{Tj}	Stratum-weighted demand data (in kW) for Domestic E7 consumers who are ~~customer~~Sample Participants in 'Group C' (i.e. no Storage or Immersion Heating) in Settlement Period j of Settlement Day T.
y_{Tij}	Validated half-hourly demand data (in kW) for ~~consumers who are~~a consumer who is ~~customer~~Sample Participant i in Settlement Period j of Settlement Day T. These values are derived in accordance with section 4.3, and then used to calculate the stratum-weighted demand values in accordance with section 4.4.

APPENDIX B – PROFILE TRANSFORMATION PROCEDURE

The purpose of the procedure is to 'stretch' or 'contract' the standard 7-hour Switched-load Profile, derived from load research, so as to represent switching regimes of different duration. The algorithm is designed to preserve the daily shape of the demand profile and so the total daily demand estimated by the Switched-load Profiles will be the same for each duration.

Background

The algorithm must be applied separately to the set of 14 values for each Switched-load Profile Regression Coefficient derived for each Day-Type (i.e. combination of Season and Day-Type or a specific Bank Holiday). For example, if the regression model used derives three Regression Coefficients for a given Day-Type (such as Winter Sundays), there will be 3x14 coefficient values for each of the Economy 7 Switched-load Profiles for this Day-Type:

Half hour of switch regime	Regression Coefficient values		
	β_1	β_2	β_3
1	$b_{1,1}$	$b_{1,2}$	$b_{1,3}$
2	$b_{2,1}$	$b_{2,2}$	$b_{2,3}$
.....	.....	.....	.....
14	$b_{14,1}$	$b_{14,2}$	$b_{14,3}$

Procedure

The procedure consists of four steps as follows:

Step 1: Form the cumulative version of the daily coefficient values.

Index	Regression Coefficient values (cumulated)		
	β_1	β_2	β_3
0	$C_{0,1}= 0$	$C_{0,2}= 0$	$C_{0,3}= 0$
1	$C_{1,1}=b_{1,1}$	$C_{1,2}=b_{1,2}$	$C_{1,3} =b_{1,3}$
2	$C_{2,1}=b_{1,1}+b_{2,1}$	$C_{2,2}=b_{1,2} + b_{2,2}$	$C_{2,3}=b_{1,3} + b_{2,3}$
.....	.....	.....	.....
14	$C_{14,1}= \sum_{i=1}^{14} b_{i,1}$	$C_{14,2}= \sum_{i=1}^{14} b_{i,2}$	$C_{14,3}= \sum_{i=1}^{14} b_{i,3}$

Step 2: Calculate the ratio R= old_length/new_length

where: old_length = duration of standard regime in half hours (14)
new_length = duration of transformed regime in half hours

For example, if the transformed regime is to be 12 half hours long, then R would be calculated as 14/12.

Step 3: Calculate a new set of cumulative values for each Regression Coefficient using the following procedure:

Calculate new cumulative values for each index value of h = 1.....new_length, as follows:

$$D_{h,i} = C_{k,i} + f \times (C_{k+1,i} - C_{k,i})$$

where: k = Min (47, Int[hxR]), the *integer* part of the product of h and R
and f = hxR - Int[hxR], the *fractional* part of the product of h and R.

In the example, the cumulated values for the i^{th} Regression Coefficient of the 12-hour switch regime Profile would be calculated as follows:

h	k	f	new values $D_{h,i}$
0	0	0	$D_{0,i}=C_{0,i} + 0 \times (C_{1,i} - C_{0,i}) = 0$
1	1	2/12	$D_{1,i}=C_{1,i} + 1/6 \times (C_{2,i} - C_{1,i})$
2	2	4/12	$D_{2,i}=C_{2,i} + 1/3 \times (C_{3,i} - C_{2,i})$
3	3	6/12	$D_{3,i}=C_{3,i} + 1/2 \times (C_{4,i} - C_{3,i})$
....	.....	.....	.....
11	12	10/12	$D_{11,i}=C_{12,i} + 5/6 \times (C_{13,i} - C_{12,i})$
12	14	0	$D_{12,i}=C_{14,i} + 0 \times (C_{15,i} - C_{14,i}) = C_{14,i}$

Step 4: Calculate the Regression Coefficients for the transformed switch regime from the new cumulative values as follows:

	Regression Coefficients values for transformed Profile		
Index	β_1	β_2	β_3
1	$b_{1,1} = D_{1,1} - D_{0,1}$	$b_{1,2} = D_{1,2} - D_{0,2}$	$b_{1,3} = D_{1,3} - D_{0,3}$
2	$b_{2,1} = D_{2,1} - D_{1,1}$	$b_{2,2} = D_{2,2} - D_{1,2}$	$b_{2,3} = D_{2,3} - D_{1,3}$
.....	.....	.....	.....
n=new_length	$b_{n,1} = D_{n,1} - D_{n-1,1}$	$b_{n,2} = D_{n,2} - D_{n-1,2}$	$b_{n,3} = D_{n,3} - D_{n-1,3}$

APPENDIX C – PROFILING UNDER THE BSC

Appendix C is provided for information only, and provides background information on certain concepts relevant to profiling under the BSC e.g. Profile Classes, Analysis Classes, GSP Groups and Settlement Periods.

Profile Class and Profiles

For purposes of profiling, all Non Half Hourly metering systems are allocated to one of eight Profile Classes:

Profile Class	Description
1	Domestic Unrestricted
2	Domestic Economy 7
3	Non-domestic Unrestricted
4	Non-domestic Economy 7
5	Non-domestic, MD, load factor 0-20%
6	Non-domestic, MD, load factor 20-30%
7	Non-domestic, MD, load factor 30-40%
8	Non-domestic, MD, load factor 40%+

Within each Profile Class, the Profile Administrator is required to produce Regression Coefficients for one or more Profiles:

- The six non-Economy 7 Profile Classes (i.e. Profile Classes 1, 3, 5, 6, 7 and 8) have a single Profile associated with them (used for estimating the total demand on a metering system).
- The two Economy 7 Profile Classes (i.e. Profile Classes 2 and 4) each have a number of different Profiles:
    1. A baseload Profile, used for estimating demand that is not associated with switched load; and
    2. A number of switched load Profiles, used for estimating demand from switched load. 46 different switched load Profiles are required for each E7 Profile Class, corresponding to different durations of switched load from 2 to 47 Settlement Periods.

Although each Economy 7 Profile Class has 46 different switched load Profiles, only one of these (i.e. the one with a duration of 7 hours or 14 Settlement Periods) is derived directly from load research. All the others are derived from the seven-hour Profile using a simple algorithmic transformation, as described in section 4.6 of this Service Description.

Settlement Days and Settlement Periods

The term 'Settlement Day' refers to a day on which electricity is traded. It should be noted that these days are defined in clock time rather than GMT, so during British Summer Time a Settlement Day runs from 23:00 GMT to 23:00 GMT.

It follows from this that each year contains two 'clock change' days that are not twenty-four hours long: a 'short day' in March, and a 'long day' in October. These should be treated as follows:

- When constructing the Regression Coefficients, the short and long days are entirely excluded from the regression analysis.
- When evaluating the Regression Coefficients, simple rules are used to convert 48 values into 46 (for the short day) or 50 (for the long day), as described in paragraph 4.7.9 of this Service Description.

Each Settlement Day is then subdivided into 48 half-hour Settlement Periods (except for the short and long day, which contain 46 and 50 Settlement Periods respectively as noted above). These are labelled from 1 to 48:

- Period 1 – 00:00 to 00:30
- Period 2 – 00:30 to 01:00

  … … …
- Period 48 – 23:30 to 00:00

Seasons, Day Types and Analysis Classes

For the purpose of modelling ~~customer~~Sample Participant demand, the year is divided into five Seasons, defined as follows:

- Winter (Season Id 1): defined as the period from the day of clock change from British Summer Time (BST) to Greenwich Mean Time (GMT) in October, up to and including the day preceding the clock change from GMT to BST in March;
- Spring (Season Id 2): defined as the period from the day of clock change from GMT to BST in March, up to and including the Friday preceding the start of the Summer period;
- Summer (Season Id 3): defined as the ten-week period, preceding High Summer, starting on the sixteenth Saturday before the August Bank Holiday;
- High Summer (Season Id 4): defined as the period of six weeks and two days from the sixth Saturday before August Bank Holiday up to and including the Sunday following the August Bank Holiday; and
- Autumn (Season Id 5): defined as the period from the Monday following the August Bank Holiday, up to and including the day preceding the clock change from BST to GMT in October.

In addition, each Settlement Day is assigned a 'Day Type' i.e. a 2-character alphanumeric code that identifies what sort of day it is. The details of these Day Types will potentially vary from year to year, as required by BSCCO and the BSC Panel, but for purposes of guidance it's expected that they will be allocated as follows:

- Normal weekdays (i.e. excluding Bank Holidays, Shoulder Days and other special cases) will be assigned the Day Type 'WE' (for Weekday).
- Saturdays will be assigned the Day Type 'SA'.
- Sundays will be assigned the Day Type 'SU'.

- Bank Holidays (and any other day that needs to be treated as a special case for profiling purposes) will be assigned a specific code. This may be specific to a single day (e.g. 'CD' for Christmas Day); or it may cover more than one day. An example of the latter is the code 'SD' used for so-called 'Shoulder Days' i.e. days like Christmas Eve that are not public holidays, but on which electricity demand is significantly affected by proximity to the holiday period.

The significance of these Seasons and Day Types is that separate sets of Regression Coefficients are calculated for each combination of Profile, Season and Day Type. Each combination of Season and Day Type is referred to as an 'Analysis Class'.

The number of Analysis Classes may vary slightly from year to year, as new Day Types are agreed. However, the set of Analysis Classes for BSC Year 2003/04 (i.e. the profile deliverables based on Load Research Year 2001/02) was as follows:

Analysis Classes for the Current BSC Year (2003/04)		
Day Type	**Season**	**No. of Days**
Weekday (WE)	Winter (1)	100
	Spring (2)	29
	Summer (3)	49
	High Summer (4)	29
	Autumn (5)	40
Saturday (SA)	Winter (1)	22
	Spring (2)	5
	Summer (3)	10
	High Summer (4)	7
	Autumn (5)	8
Sunday (SU)	Winter (1)	22
	Spring (2)	6
	Summer (3)	10
	High Summer (4)	7
	Autumn (5)	7
Shoulder Day (SD)	Winter (1)	7
Late August Bank Holiday (A2)	High Summer (4)	1
Boxing Day (BD)	Winter (1)	1
Christmas Day (CD)	Winter (1)	1
Easter Monday (EM)	Spring (2)	1
Good Friday (GF)	Spring (2)	1
New Years Day (J1)	Winter (1)	1
1st May Bank Holiday (M1)	Spring (2)	1
2nd May Bank Holiday (M2)	Summer (3)	1

Form of Regression Equations

The form of the regression equations that the Profile Administrator is required to calculate is specified in Section 6.5.3(e) of Annex S-2 of the BSC:

$$\bar{y}_{HQj} = RC_{HQ0j} + (RC_{HQ1j} * Mon_T) + (RC_{HQ2j} * Wed_T) + (RC_{HQ3j} * Thu_T) +$$

$$(RC_{HQ4j} * Fri_T) + (RC_{HQ5j} * NET_H) + (RC_{HQ6j} * S) + (RC_{HQ7j} * (S)^2);$$

where $RC_{HQ(nn)j}$ is the Regression Coefficient for Profile Q, Settlement Period j and Regression Coefficient Type (nn). There are eight Regression Coefficient types, as follows:

- Regression Coefficient 0 is the constant term.
- Regression Coefficients 1 to 4 are applied to the Day of the Week variables Mon_T, Wed_T, Thu_T and Fri_T. Mon_T is defined as being one (1) on Mondays and zero (0) on other days; Wed_T is one (1) on Wednesdays and zero (0) on other days; and so on. The inclusion of these variables in the regression equation therefore allows different days of the week to have different profile shapes, even though they are all assigned to the 'WE' Day Type.
- Regression Coefficient 5 is applied to the Noon Effective Temperature. The inclusion of this variable in the regression equation allows the demand estimates to take into account the effect of temperature on demand.
- Regression Coefficients 6 and 7 are applied to the Sunset Variable, and the square of the Sunset Variable. (See paragraph 4.5.1 of this Service Description for the definition of the Sunset Variable). The inclusion of these variables in the regression equation allows the demand estimates to take into account the effects of changing demand within a Season (including but not limited to the effect of sunset and sunrise times on lighting demand).

The Profile Administrator provides a different set of Regression Coefficients for each Analysis Class. The BSC refers to the complete set as a Matrix of Regression Coefficients $MRC_{Q(aa)(nn)j}$. So, for a given Profile and Analysis Class, the number of Regression Coefficients required is equal to eight times the number of Settlement Periods in the Profile (eight being the number of Regression Coefficient types).[2]

GSP Groups

The BSC divides the country into a number of 'GSP Groups', where each GSP Group represents one or more Distribution Systems. Currently there are fourteen GSP Groups under the BSC, although this can potentially change as required by the BSC Panel.

The Regression Coefficients required from the Profile Administrator are national i.e. they do not vary by GSP Group. The concept of GSP Group is therefore not central to the data analysis performed by the Profile Administrator. However, GSP Groups are relevant to the analysis for the following reasons:

- The stratum weights used to calculate average demand values are different for ~~customer~~Sample Participants in different GSP Groups.
- GSP Group Average Annual Consumption (GAAC) data is required for each GSP Group.

[2] Note however that Regression Coefficient Types 1 to 4 will have zero Regression Coefficients for all Analysis Classes other than Weekday ('WE').

APPENDIX D – DOMESTIC ECONOMY 7 PROFILE CLASSES

Appendix D describes the procedures for splitting and aligning the Economy 7 demand profiles into switched and base load for use in the regression analyses. For Profile Class 2 (Domestic Economy 7), this process has three main steps:

1. Compare the demand profile for ~~customer~~Sample Participants with storage heating and/or immersion heating to that for ~~customer~~Sample Participants without either, and hence estimate the fraction of total demand (for each Settlement Period within the standard E7 window of 00:30 to 07:30 GMT) that represents switched load.

2. Use the fractions from step (1) to split the demand profile for each switching regime into base and switched load.

3. Calculate a weighted average of the demand profiles for each switching regime to construct base and switched load demand profiles for the Domestic Economy 7 Profile Class as a whole.

The switched load fractions from step (1) are also used to split the Non-Domestic Economy 7 demand profile into base and switched load. Note that the Non-Domestic sample does not include ~~customer~~Sample Participants on regimes other than the standard 00:30-07:30, so there is no need to combine data for different switching regimes.

The remainder of this Appendix describes each of these steps in detail.

For the purposes of this Appendix, the year is divided into GMT days (running from 00:00 GMT to 00:00 GMT), each of which contains 48 Settlement Periods. Note that this is different to the approach taken in the regression analysis, where the year is divided into Settlement Days (running from 00:00 clock time to 00:00 clock time). This Appendix therefore uses a different notation to the remainder of the Service Description:

- For the purposes of this Appendix only, subscript 'T' denotes a GMT day (running from 00:00 GMT to 00:00 GMT); and Settlement Period 1 in a given day always starts at 00:00 GMT;

- In the remainder of the Service Description, subscript 'T' denotes a Settlement Day (running from 00:00 local time to 00:00 local time); and Settlement Period 1 in a given day starts at 23:00 GMT during British Summer Time.

Domestic E7 (Step 1) – Estimation of Switched Load Fraction

For the Domestic Economy 7 Profile Class (i.e. Profile Class 2), the equation for the stratum-weighted demand value (see paragraph 4.4.2 of this Service Description) is applied to give a stratum-weighted average demand for the Profile Class as a whole (referred to in this Appendix by the acronym yPC2Tj):

$$yPC2Tj = \Sigma h\ (Wh\ yThj)$$

where:

T	=	GMT Day
j	=	Settlement Period (labelled from 00:00 GMT as explained above)
h	=	Stratum
i	=	All ~~customer~~Sample Participants i in stratum h
Wh	=	Stratum weight for stratum h
yThj	=	the average demand for GMT Day T, stratum h and Settlement Period j (i.e. the simple arithmetic mean of the yTij values for all ~~customer~~Sample Participants i in stratum h)

The equation is also applied separately to three sub-groups of ~~customer~~Sample Participants within Profile Class 2, deriving a separate stratum-weighted average demand for each:

- Group A – ~~Customer~~Sample Participants with Storage and Immersion Heating. This section uses the acronym y^{A}_{Tj} for the stratum-weighted average demand of this group of ~~customer~~Sample Participants in Settlement Period j of GMT Day T.
- Group B – ~~Customer~~Sample Participants with Immersion Heating but no Storage Heating. This section uses the acronym y^{B}_{Tj} for the stratum-weighted average demand of this group of ~~customer~~Sample Participants in Settlement Period j of GMT Day T.
- Group C – ~~Customer~~Sample Participants without Storage or Immersion Heating. This section uses the acronym y^{C}_{Tj} for the stratum-weighted average demand of this group of ~~customer~~Sample Participants in Settlement Period j of GMT Day T.

Note that ~~customer~~Sample Participants with Storage Heating but no Immersion Heating are not included in any of the groups (A, B or C). However, their data is still used in the calculation of the overall Profile Class demand yPC2Tj. There are very few such ~~customer~~Sample Participants, typically less than 5 in the sample.

For the avoidance of doubt, it should be noted that the three ~~customer~~Sample Participant groups (A, B or C) include E7 ~~customer~~Sample Participants from all switching regimes, not just the standard 00:30 – 07:30 regime.

For each of the fourteen Settlement Periods in the standard 00:30 – 07:30 GMT regime period, the average demand shapes (yATj, yBTj and yCTj) are used to calculate average demand values for Storage Heating and Immersion Heating:

$$y^{Immersion}_{Tj} = \max(0, y^{B}_{Tj} - y^{C}_{Tj})$$

$$y^{Storage}_{Tj} = \max(0, y^{A}_{Tj} - y^{B}_{Tj})$$

which are then combined to create a composite switched load profile:

$$y^{PC2\_Switched}_{Tj} = y^{Immersion}_{Tj} * F_{Immersion} + Y^{Storage}_{Tj} * F_{Storage}$$

where $F_{Immersion}$ and $F_{Storage}$ are the fractions of the total Domestic E7 sample that have storage heating and immersion heating respectively.

Note: in each case demand values outside the standard 00:30-07:30 regime period should be set to 0.

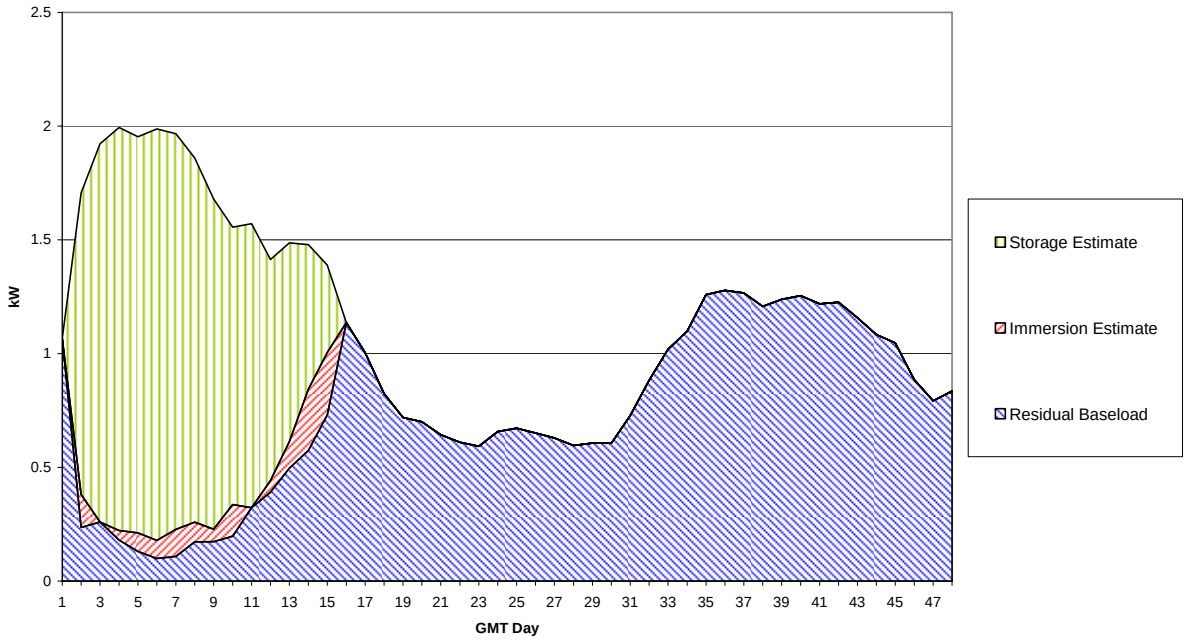

Figure 1 Storage and Immersion Heater ~~Customer~~Sample Participant Demand Estimates

The switched fractions for each half-hour of the standard 00:30–7:30 regime period (i.e. each value of j from 2 to 15) are then calculated as follows:

$$Y^{FRACTION}_{Tj} = \max(1, Y^{PC2\_Switched}_{Tj} / Y^{PC2}_{Tj})$$

Domestic E7 (Step 2) – Split Demand into Base and Switched for Each Regime

The next step of the process is to split the demand values for each separate switching regime in the sample into base and switched load, using the fraction determined in step 1.

In order to do this, stratum weighted average demands must be calculated for all allowable regime sub-groups. Regimes must be seven hour continuous and not more than 1 hour outside the standard 00:30-07:30 regime. There are therefore five regimes potentially eligible for inclusion: 00:30-07:30, 00:00-07:00, 01:00-08:00, 01:30-08:30 and 23:30-06:30. However, a given regime will only be included in the calculation where the sample size is sufficient to create a viable grouping.

This Appendix uses the subscript 'C' to denote a regime included in the calculation, and the acronym y_{TCj} for the stratum-weighted average demand of regime 'C' in Settlement Period j of GMT Day T. The switched load fractions calculated in step 1 are then applied to the y_{TCj} values for each regime to calculate the switched load $y^{PC2\_Switched}_{TCj}$ for each regime as follows:

$$Y^{PC2\_Switched}_{TCj} = Y^{FRACTION}_{T(j-n)} * Y_{TCj}$$

where:

- For a given regime 'C', the calculation is performed for those Settlement Periods which fall within the switched load period for that regime. In the case of the 01:30 – 08:30 regime, for example, the calculation would be performed for Settlement Periods 4 to 17. For all other Settlement Periods, the value of $y^{PC2\_Switched}_{TCj}$ is zero.

- For a given regime 'C', the offset 'n' in the term $y^{FRACTION}_{T(j-n)}$ is the number of Settlement Periods time difference between regime 'C' and the standard 00:30-07:30 regime. In the case of the 01:30 – 08:30 regime, for example, n would take the value +2. The function of this offset value n is to ensure that the $y^{FRACTION}_{Tj}$ values used are always those for periods 2 to 15, not those for the periods relevant to regime 'C'.

- In the case of the 23:30-06:30 regime (for which n takes the value -2), applying the above equation to period 48 will produce a value of j larger than 48 i.e. $y^{FRACTION}_{T(50)}$. In this context, period 50 of day T has to be interpreted as period 2 of day (T+1). To put this more formally:

$$y^{PC2\_Switched}_{TCj} = y^{FRACTION}_{(T+1)(j-n-48)} * y_{TCj} \quad (\text{if } j-n>48)$$

The base load demand y^{BASE}_{TCj} is then calculated for each GMT Day D, Settlement Period j and regime C by subtracting the switched load from the total:

$$y^{BASE}_{TCj} = y_{TCj} - y^{PC2\_Switched}_{TCj}$$

Domestic E7 (Step 3) – Calculate Weighted Average of Demand for Each Regime

Calculation of the final switched load demand profile is made by offsetting the load for each individual regime into Settlement Periods 1-14 (as required for the regression analysis), and weighting by sample population estimates.

The following diagram illustrates this process of aligning different regimes on the standard Settlement Periods 1-14:

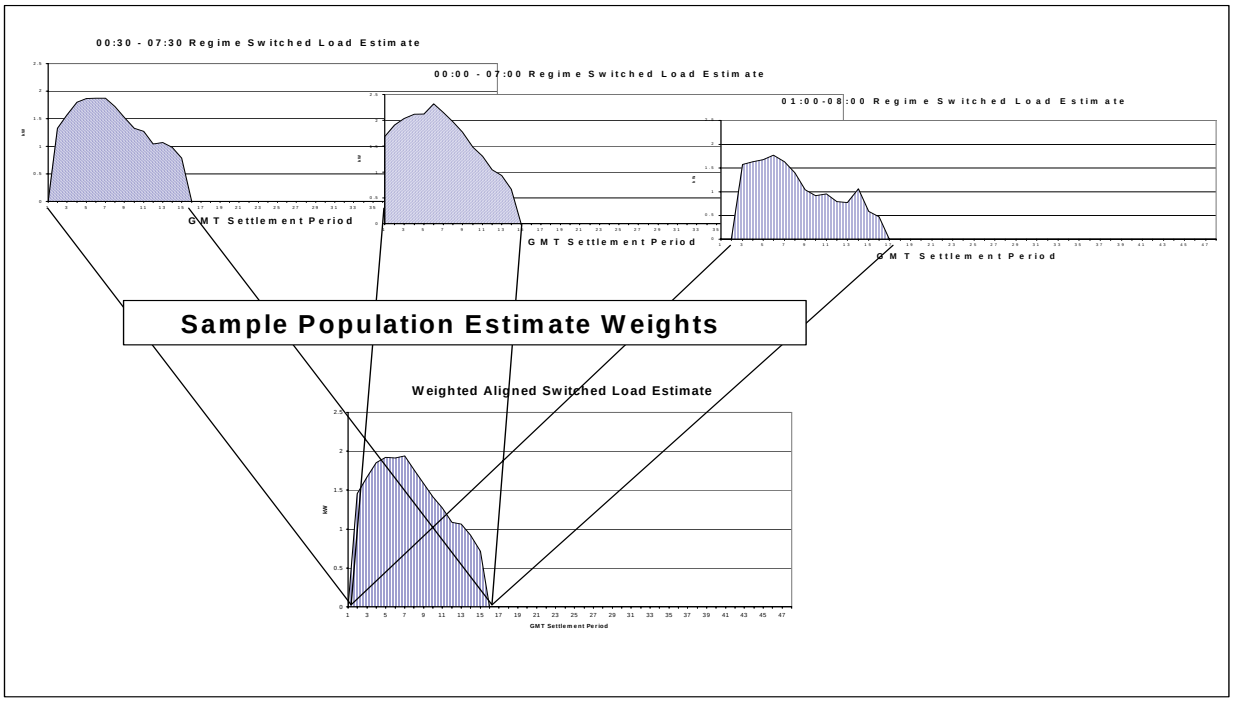

Figure 2 Switched Load Alignment Procedure

Mathematically, this process of alignment and weighting is achieved by calculating the final switched load demand values y_{TQj} for the 14-period switched load profile (for each GMT Day T and each Settlement Period j in the range 1 to 14) in accordance with the following formula:

$$y_{TQj} = \Sigma_C \left(y^{PC2\_Switched}_{TC(j+n+1)} * PE_C\right) / \Sigma_C \left(PE_C\right)$$

where:

- PE_C is the sample population estimate for regime 'C'
- Σ_C denotes summation over all regimes
- For a given regime 'C', the offset 'n' is the number of Settlement Periods time difference between regime 'C' and the standard 00:30-07:30 regime (as defined in step 2 above). In this case the (j+n+1) subscript in the equation is being used to 'move' the switched load periods from the Settlement Periods relating to that particular regime into periods 1-14.

- In the case of the 23:30-06:30 regime (for which n takes the value -2), applying the above equation to period 1 will produce a value of j less than 1 i.e. $y^{PC2\_Switched}_{T(0)}$. In this context, period 0 of day T has to be interpreted as equivalent to period 48 of day (T-1).

The final base load demand estimate is calculated by a similar process of weighting together the regime base loads using sample population estimates, but without the issue of aligning the different regimes. For each Settlement Period j of each GMT Day d, the y_{TQj} values for the base load profile are calculated as follows:

$$y_{TQj} = \Sigma_C (y^{BASE}_{TCj} * PE_C) / \Sigma_C (PE_C)$$

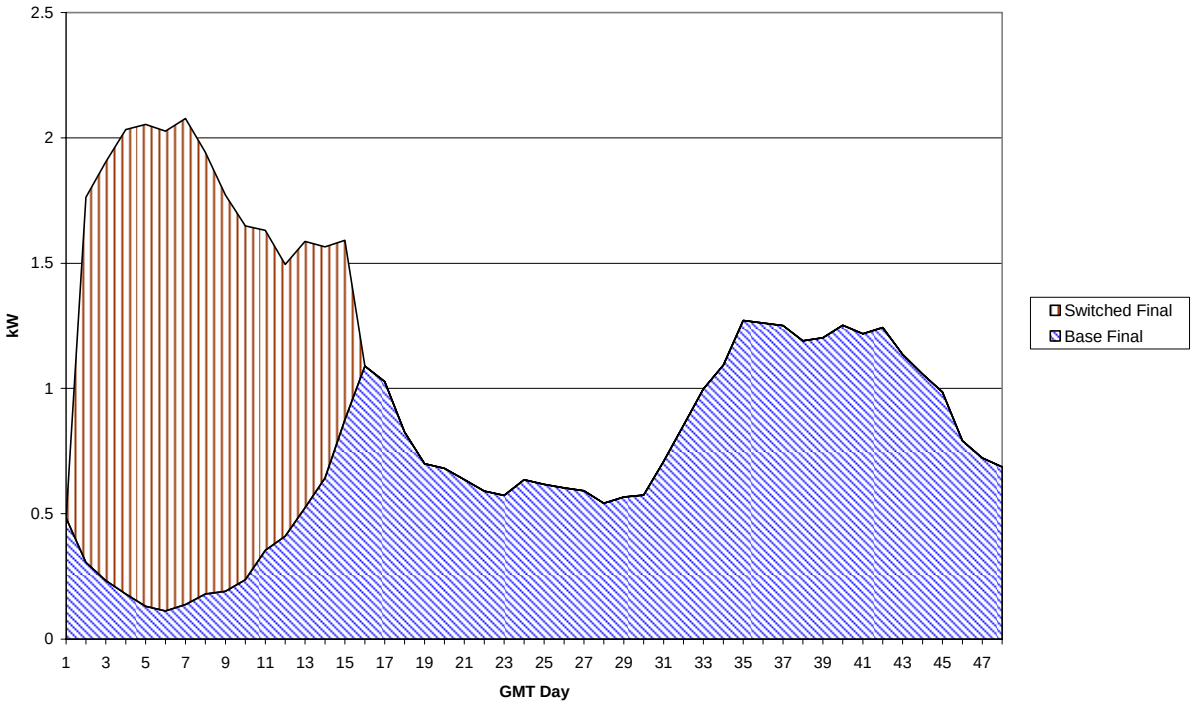

Figure 3 Final Switched and Base Load Estimates

Non-Domestic E7

The base load and switched load demand values for the Non-Domestic Economy 7 Profile Class are constructed by splitting the overall demand in the same ratio as the base and switched load for Profile Class 2:

Create stratum-weighted average demand values for the Profile Class as a whole (referred to in this section by the acronym y^{PC4}_{Tj}):

$$y^{PC4}_{Tj} = \Sigma_h (W_h \, y_{Thj})$$

These total values are then split into base and switched load by applying the fraction calculated previously for Profile Class 2:

$$Y^{FRACTION}_{Tj} = \max(1, Y^{PC2\_Switched}_{Tj} / Y^{PC2}_{Tj})$$

to the overall demand for Profile Class 4. For the switched load profile, values of yPC4_Switched_FinalTj are calculated (for each GMT Day T and each Settlement Period j in the range 2 to 15) as follows:

$$Y^{PC4\_Switched\_Final}{}_{Tj} = Y^{FRACTION}{}_{Tj} * y^{PC4}{}_{Tj}$$

However, because the regression analysis requires switched load demand values y_{TQj} for periods 1-14 rather than periods 2-15, these values are 'shifted' by one period as follows:

$$Y_{TQj} = Y^{PC4\_Switched\_Final}{}_{T(j-1)}$$

Finally, the base load demand values are calculated (for each GMT Day T and Settlement Period j) by deducting the switched load profile from the total load:

$$Y_{TQj} = y^{PC4}{}_{Tj} - Y^{PC4\_SWITCHED\_FINAL}{}_{Tj}$$

The switched and base load estimates can now be entered into the regression process.