# LOAD PROFILES AND THEIR USE IN ELECTRICITY SETTLEMENT

## Introduction

This document provides a broad overview of 'Load Profiling'. It explains what a Load Profile is, how Load Profiles are created by the Profile Administrator (PrA), and how they are applied to the Balancing and Settlement Code (BSC). The concept of 'Load Profiling' has been around for many years and data has been collected and analysed since the inception of the Electricity Council Load Research Programme in the 1950's. However, the use of 'Load Profiles' for electricity settlement is relatively new and was a product of the Electricity Pool '1998 Programme' put in place to open up the electricity supply market to competition. In order to avoid the huge and prohibitive costs of putting Half-Hourly metering into every supply market customer, it was decided that customers below 100 kW Maximum Demand would be settled using load profiles and readings from customers' existing electricity meters. In 1994 the 'Profiling Taskforce' set about a programme of analyses in order to define the number and type of profiles to be used in Settlement. It was decided that there would be eight basic types of profiles (Profile Classes), which would be manipulated in order to model the plethora of different metering configurations that exist in the electricity supply market.

## SECTION A        WHAT IS A LOAD PROFILE?

Load Profile is a broad term that can refer to a number of different forms of data. It can refer to demand and consumption data or it can be a reference to derived data types, such as Regression and Profile Coefficients. However, all these data types have one thing in common; that they represent the pattern of electricity usage of a segment of supply market customers. A load profile gives the Half-Hourly (Settlement Period) pattern or 'shape' of usage across a day (Settlement Day), and the pattern across the Settlement year, for the average customer of each of the eight profile classes. It is the proportion of demand in each settlement period that is of interest to the Settlement System. Figures 1 and 2 depict a typical daily and yearly pattern of demand for the average domestic unrestricted customer.



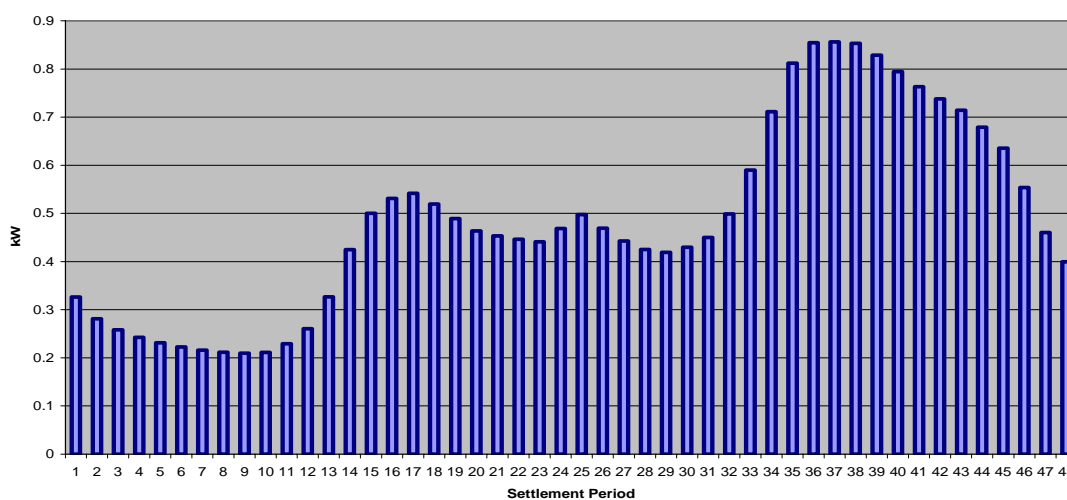Average Domestic, Unrestricted Customer - Daily Profile

Figure 1

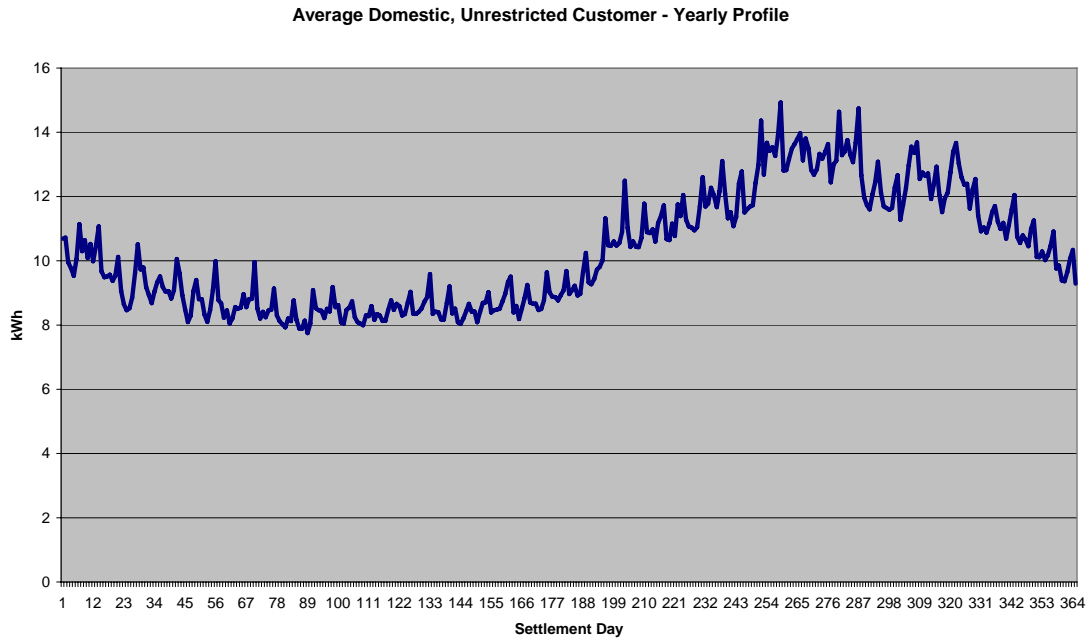**Average Domestic, Unrestricted Customer - Yearly Profile**



Figure 2

Figure 1 shows the daily pattern of demand in kW and Figure 2 shows the yearly pattern in kWh per Day.  The data provided to Settlement by the PrA is given in the form of Regression Coefficients and Profile Coefficients which can be manipulated to give the patterns of usage for each category.  The format and usage of the coefficients are discussed later in this document.

## The Profile Classes

The eight generic Profile Classes were chosen as they represented large populations of similar customers.  The eight profile classes are as follows:

- Profile Class 1        Domestic Unrestricted Customers

- Profile Class 2        Domestic Economy 7 Customers

- Profile Class 3        Non-Domestic Unrestricted Customers

- Profile Class 4        Non-Domestic Economy 7 Customers

- Profile Class 5        Non-Domestic Maximum Demand (MD) Customers with a Peak Load Factor (LF) of less than 20%

- Profile Class 6        Non-Domestic Maximum Demand Customers with a Peak Load Factor between 20% and 30%

- Profile Class 7        Non-Domestic Maximum Demand Customers with a Peak Load Factor between 30% and 40%

- Profile Class 8        Non-Domestic Maximum Demand Customers with a Peak Load Factor over 40%

## Maximum Demand and Peak Load Factors Explained

### Maximum Demand

Profile Classes 5 to 8 are described as Maximum Demand (MD) customers. This refers to customers whose Metering System has a register that gives the maximum demand for a given period.

### Peak Load Factor

A Peak Load Factor is defined as follows:

The ratio, expressed as a percentage, of the number of kWh supplied during a given period to the number of kWh that would have been supplied had the maximum demand been maintained throughout that period

So for an Annual Peak Load Factor:

$$LF = \frac{\text{Annual Consumption(kWh)} * 100}{\text{Maximum Demand (kW)} * \text{Number of Hours in the Year}^1}$$

[1] 8760 hours or 8784 hours in a leap year

Figures 3 to 5 give an example of each profile's typical shape for a winter weekday.
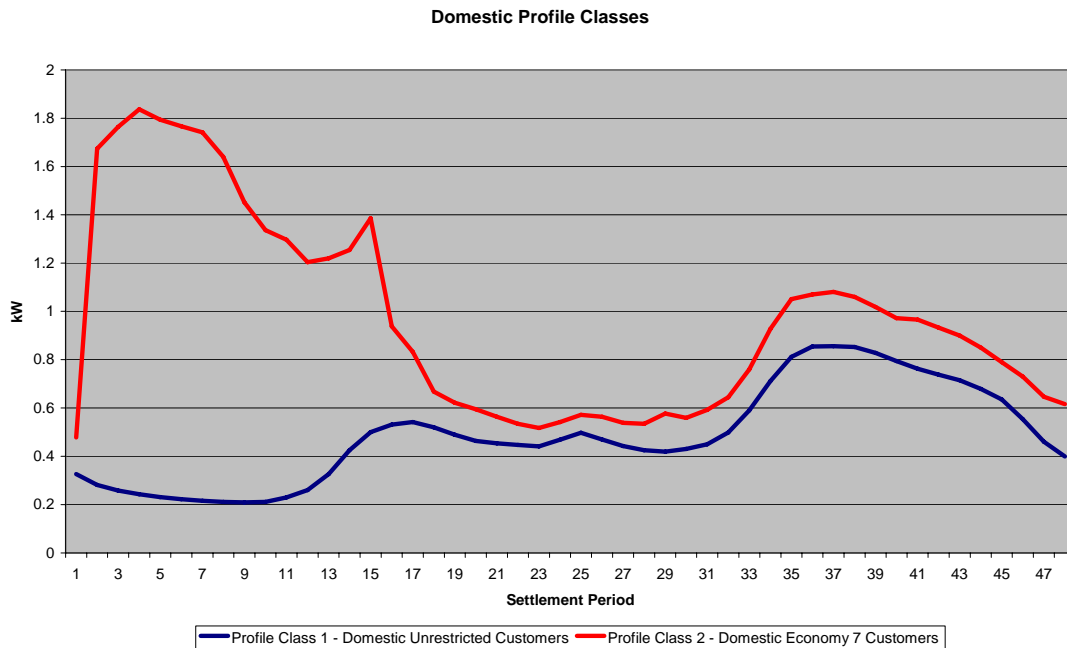


**Domestic Profile Classes**

Profile Class 1 - Domestic Unrestricted Customers
Profile Class 2 - Domestic Economy 7 Customers

Figure 3

**Non-Domestic Customers**



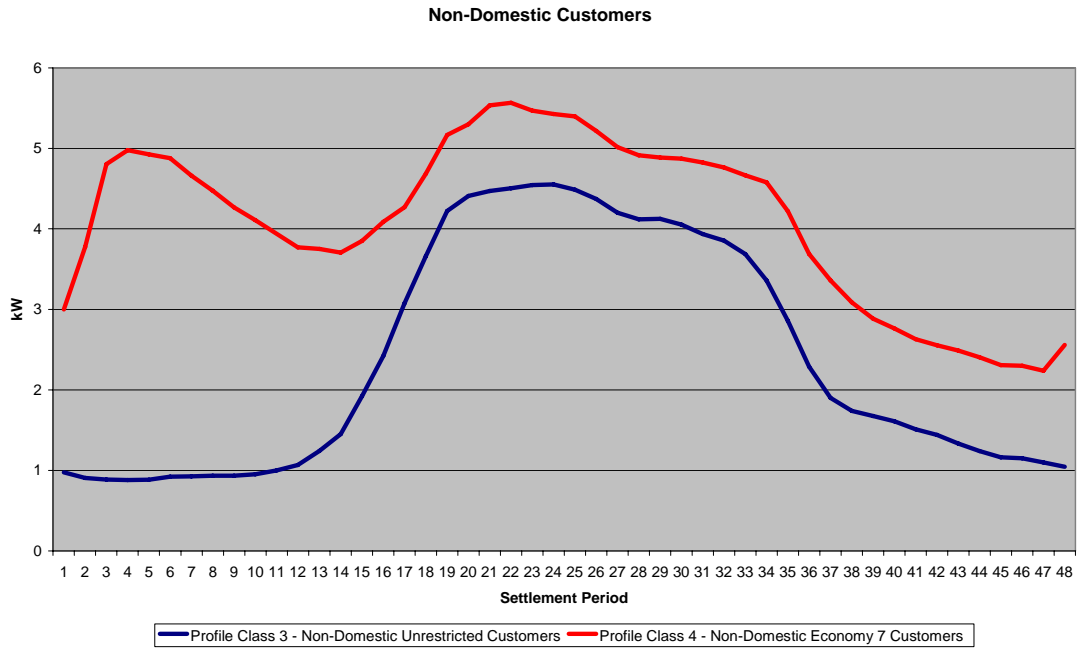Figure 4

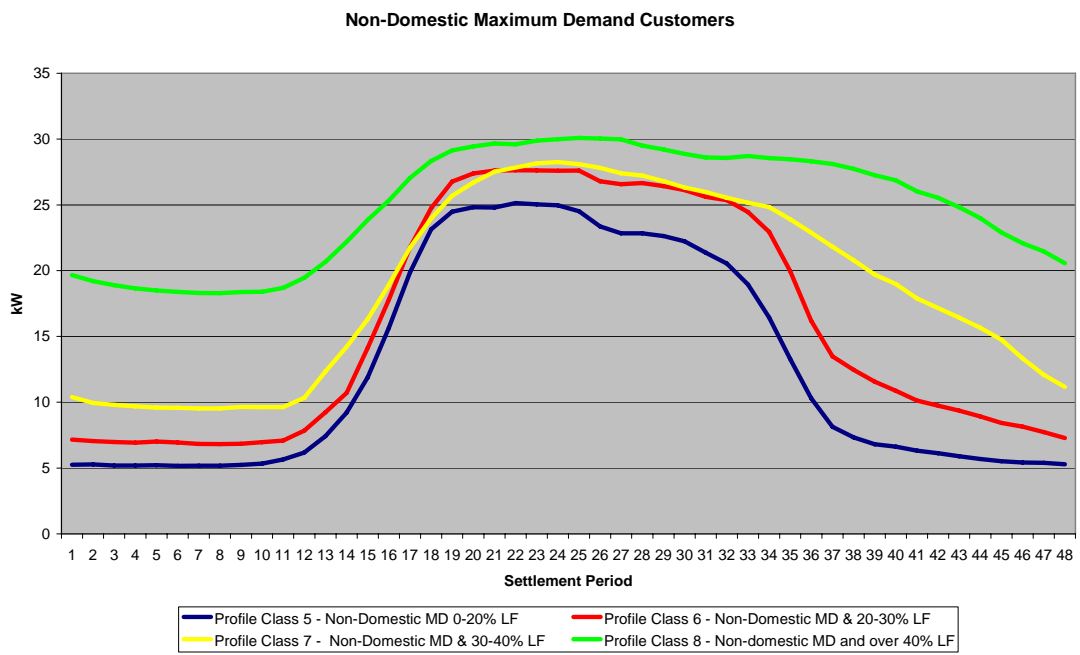**Non-Domestic Maximum Demand Customers**



Figure 5

## SECTION B          CREATING LOAD PROFILE DATA

Load Profile data is created by recording and analysing Half-Hourly demand data from a representative sample of customers from each of the eight Profile Classes. This section discusses the sample selection and data collection processes involved in creating a load profile. A simplified model of the basic processes involved is given in Figure 6.
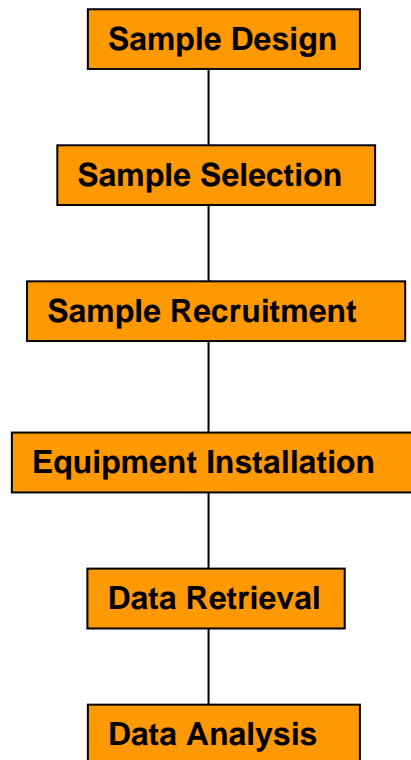
```
           Sample Design

           Sample Selection

           Sample Recruitment

         Equipment Installation

           Data Retrieval

           Data Analysis
```

Figure 6

A brief description of each of the stages referred to in Figure 6 is given below.

## Sample Design

In order to design a sample first you must decide on the required sample size. There are two main drivers of this decision:

### Cost

The larger the sample size decided upon the greater the expense at each of the stages shown in Figure 6.

### Accuracy

The larger the sample size the greater the accuracy (precision) of the Load Profile

There is clearly a trade off between cost and accuracy when deciding the required sample size. In order to assess this you must define a **sampling variable.** Since we are attempting model the average load shape of sample members, the sampling variable for Load Profiling is

annual consumption (kWh). Historically this information was readily available from Supplier billing systems. Using a **sampling fraction** of 1 in n (e.g. 1 in 2000 for domestic customers) it was possible to draw a random **primary sample** from Supplier billing systems for each of the Profile Classes. Using the primary sample information it is possible to design a **stratified sample.** The strata referred to in the stratified sample are consumption bands. By setting the strata so that customers within each band are more homogenous(less variance) greater accuracy can be achieved with a smaller sample size thus reducing costs. A typical stratification for domestic unrestricted customers is as follows:

Stratum 1       Customers who consume less than 3,000 kWh per year
Stratum 2       Customers who consume between 3,000 kWh and 7,500 kWh per year
Stratum 3       Customers who consume over 7,500 kWh per year

## Sample Selection

It is desirable to have a sample that accurately represents the distribution of the national population for each of the Profile Classes. Therefore, customers are randomly selected within each stratum and each **Grid Supply Point (GSP) Group** (a collection of GSPs for a region) using the primary sample data. There are currently 12 GSP Groups in England and Wales and another 2 in Scotland. The population within each of the strata within each region obtained from Suppliers billing systems will later be used to weight the strata together in the correct proportions. Figure 7 shows a typical distribution of customers within 500 kWh consumption bands for a GSP Group.



**Profile Class 1 Customers in GSP_Group X**

Figure 7

## Sample Recruitment

Since you cannot compel customers to take part in the Load Research sample, a small incentive payment is offered to domestic customers who are selected for the sample. Unsuccessful recruitment attempts can be replaced by a new selection from the same stratum and region from the primary sample data. Similarly, sample customers who retire or move

off-profile (e.g. a customer who has Half-Hourly metering installed) are replaced by a new selection from the primary sample data.

## Equipment Installation and Data Retrieval

Licensed Meter Operator Administrators (MOAs) are used to install half-hourly demand data logging equipment in successfully recruited customer premises. Modern 'solid state' data loggers can collect a year of data before they need replacement and retrieval. Historically data logging equipment has had a number of formats from primitive ticker tape readouts to magnetic 'cassette' tape. Today small solid state logging equipment is easily fitted into customer premises. This has in recent years been supplemented by remote reading equipment. This equipment can simply be dialled up and data retrieved down existing phone lines. In practice loggers are exchanged after the first month in order to check that the installation of the equipment was successful. Loggers are then changed throughout the year as necessary with the final logger for the analysis year being retrieved after the 1st of March. Some examples of logging equipment are pictured below:



**Current Transformer**         **Logger**         **Housing Unit**

## Data Analysis

After retrieval, the Half-Hourly demand data is downloaded and validated. Validation consists largely of comparison of aggregated recorded demand data to Meter advances, calculated using readings taken at the time of installation and retrieval of the loggers. Data which does not pass the validation tests are excluded from further analyses. A simplified model of the basic data analysis processes are given in Figure 8 and a brief description of each stage is given below.
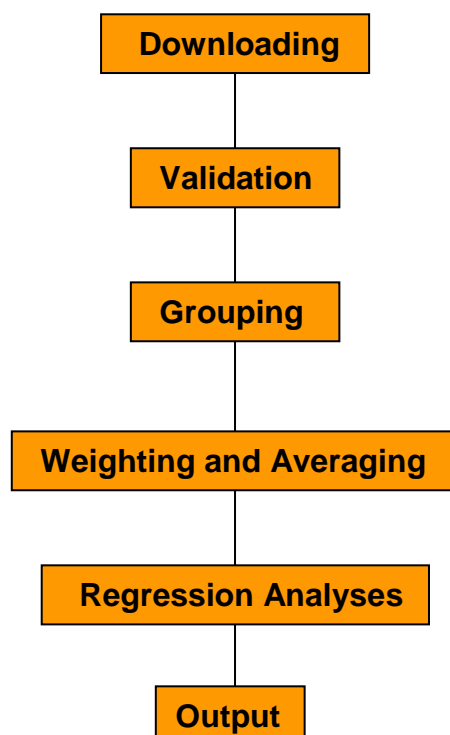
**Downloading**

**Validation**

**Grouping**

**Weighting and Averaging**

**Regression Analyses**

Figure 8

**Output**

## Grouping

After validation demand data is grouped by Profile Class using the sample customer's **Metering Point Administration Number (MPAN)**. The first two digits of the full MPAN indicates the Profile Class. Customers in the sample whose MPAN does not tally with the Profile Class sample, to which they were recruited, are omitted from further analyses.

## Weighting and Averaging

After grouping it is possible to create a simple average demand for each half-hour of the year for each stratum for each GSP Group. These simple averages can be weighted together using the fractions of the population that are in each GSP Group. Figure 9 show the weighting and averaging procedure for 1 Profile Class GSP for 1 half-hour on 1 settlement day. Summating across each GSP Group gives a **Group Average Demand (GAD)** for that settlement period for that Settlement Day. Repeating the procedure for each Half-Hour of the year gives a 365 * 48 matrix of GADs, which are used in the regression analyses.
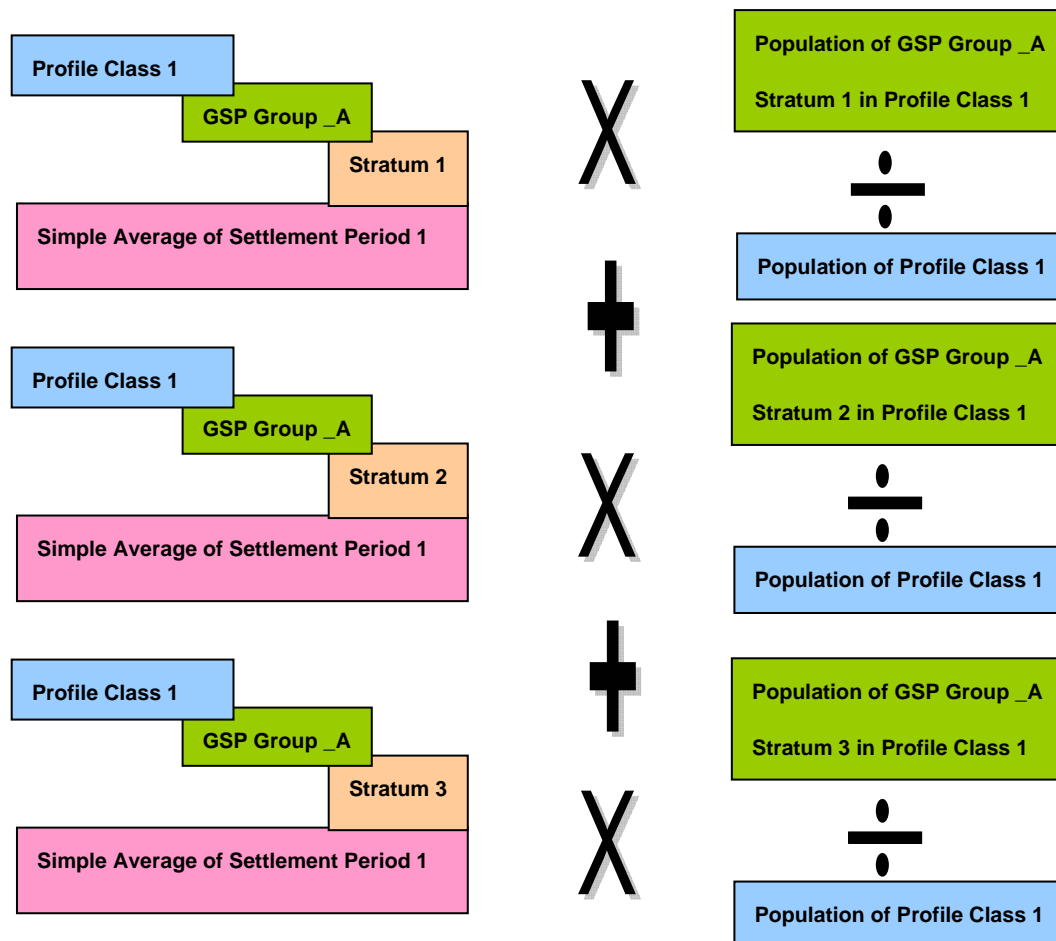


Figure 9

**Switched and Base Load for Economy 7 Customers**

The two Economy 7 profile's GADs are split into switched load and base load, using sample customer information on storage and immersion heater ownership and information on customer switching regimes (the times that the customer's low Meter register is active). Figure 10 depicts a typical switched load/ base load split.
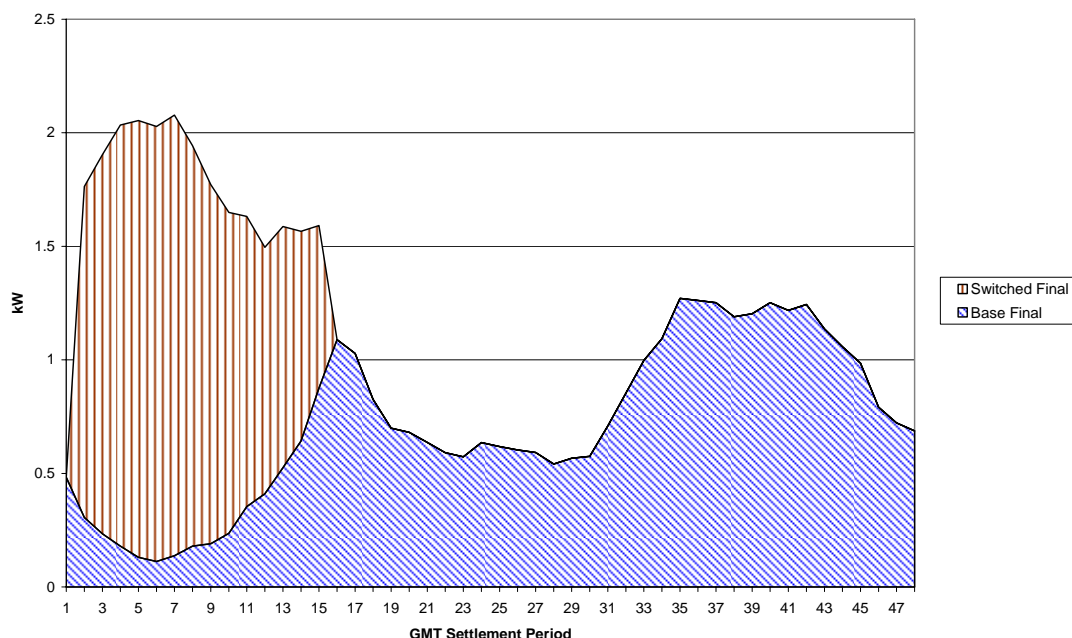


Figure 10

## Regression Analyses

A brief explanation of what regression analysis is and how Regression Coefficients are created and evaluated is given below.

**What is linear regression?**

The Regression Coefficients that are used in the Settlement System are multi-linear. This means that the regressions use more than one **variable**. In fact, they use up to seven variables including temperature, sunset and day of week variables. More detail on the variables is given later in this section. For simplicity, regression analysis is easiest explained using only 1 variable. This is called **simple linear regression.** The variable used in this simplistic explanation is noon temperature in °F. Figure 11 shows a plot of GADs against noon temperature with a linear trend line (the line of best fit).

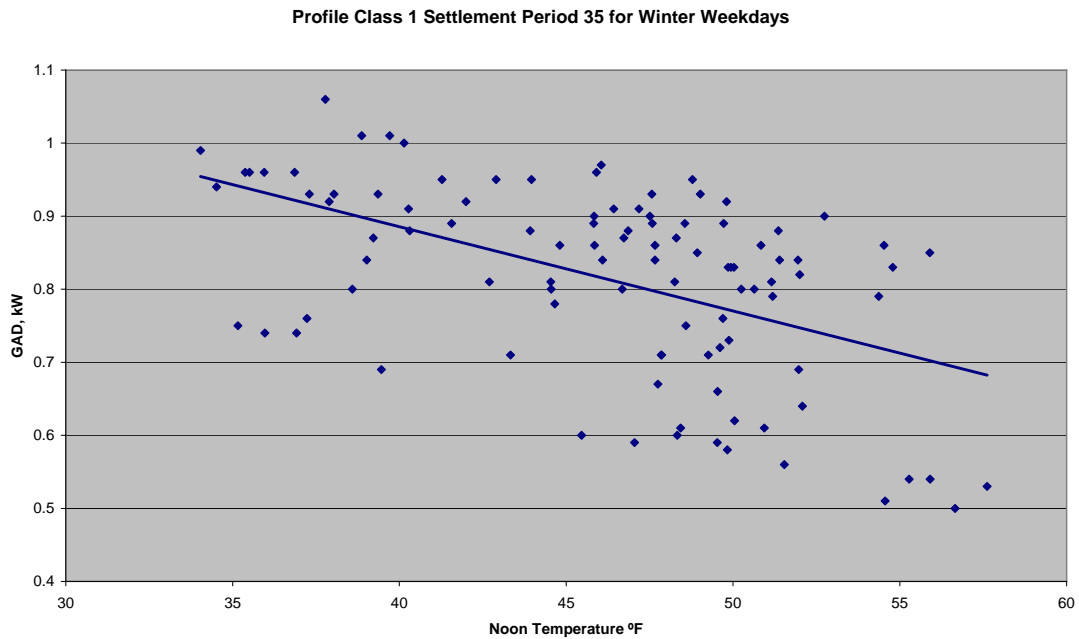**Profile Class 1 Settlement Period 35 for Winter Weekdays**



Figure 11

It can be seen from Figure 11 that for every 1°F increase in temperature the trend line falls by a fixed amount. It is this fixed amount is regarded as a coefficient.

The equation of a straight line can be expressed as:

$$Y = BX + C$$

Where Y is the estimate of demand (kW), B is the coefficient, X is the noon temperature and C is a constant that gives the point at which the line will intersect with the Y axis when X = 0 (The above example has the Y axis where X = 30. If one plotted the axis where X = 0 and extended the trend line it would intercept at 1.346).

A regression tells us that in this case B = -0.0115 and C = 1.346. This means that for every 1°F increase in temperature demand falls by around 11.5 W.

Using this information we can predict (evaluate) the likely demand at any temperature by using the equation. So at 50°F the estimate of demand will be:

$$Y = -0.0115 * 50 + 1.346 = approx.\ 0.77\ kW$$

The **evaluation** is demonstrated in Figure 12. The dashed yellow line at 50°F extends upwards until it hits the regression line. Reading this point off on the Y axis gives an estimate of 0.77 kW.
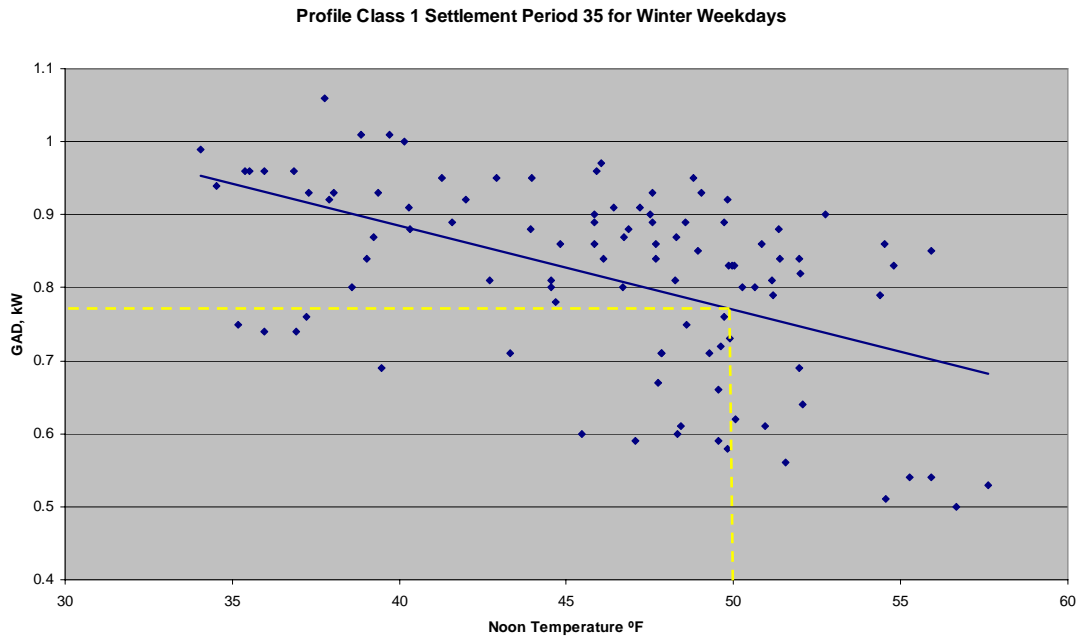
**Profile Class 1 Settlement Period 35 for Winter Weekdays**



Figure 12

In reality, there are a number of variables, and the calculations are somewhat more complicated, but the theory is exactly the same.

**The Variables**

This section defines the variables that are actually used the regression analysis and give a brief explanation of the reasoning behind their usage. There are up to 7 variables in each regression depending on the day type of the regression. The variables are as follows:

*Noon Effective Temperature (NET)*

The above example of simple linear regression uses noon temperature in °F. However, in reality the temperature variable used is Noon Effective Temperature (NET). A NET is designed to take account of the residual heat left behind in building fabric over a number of days.  It is a weighted °F value of the noon temperature on the day, the noon temperatures on the previous day and the day before that. The weights are as follows:

NET =    0.57 * Actual Temp. in °F on Day + 0.28 * Actual Temp. in °F on Day before
         + 0.15 * Actual Temp. in °F on Day before that.

Figure 13 show the England and Wales NET values for a typical year (April to March).
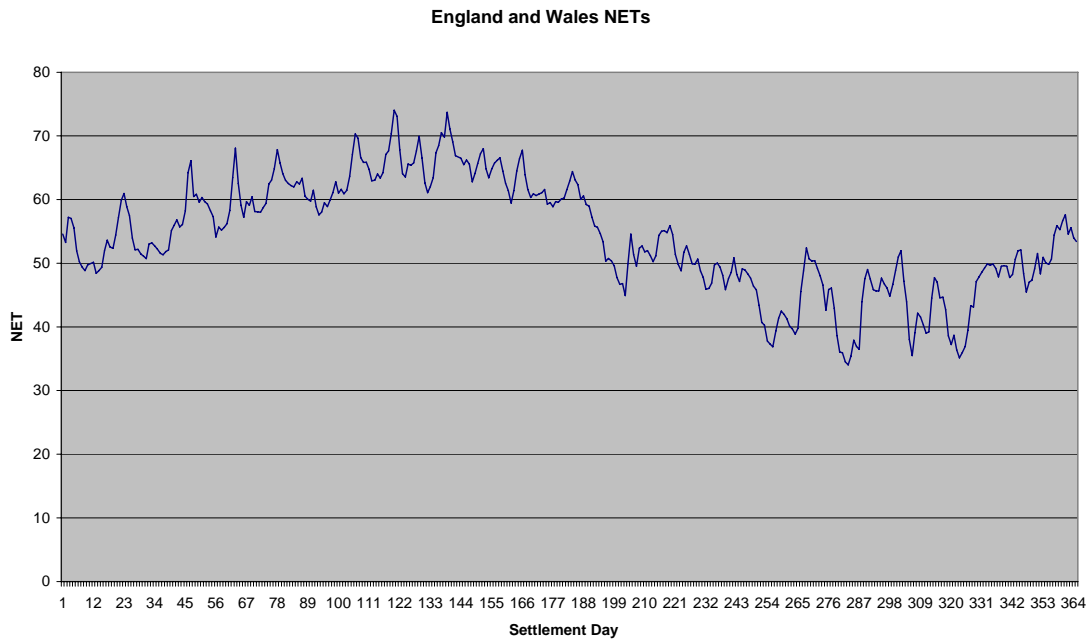
**England and Wales NETs**



Figure 13

The reason for having a temperature variable is perhaps the most obvious. The relationship between temperature and demand is fairly straightforward: when temperatures fall, heating load increases, when temperatures rise, load decreases until any cooling load (air conditioning perhaps) is applied.

### The Sunset Variables

There are two sunset variables used in all the regressions. The sunset variable, which is expressed as minutes before or after 18:00 hours, is included because the time of sunset affects illumination, e.g. when the sun sets lights are switched on.

The other sunset variable is sunset squared. This may seem like a bizarre concept but squaring the sunset variable gives values that are positive across the year. This variable is used in order to predict seasonal effects. Figure 14 depict sunset variables for a year (April to March).
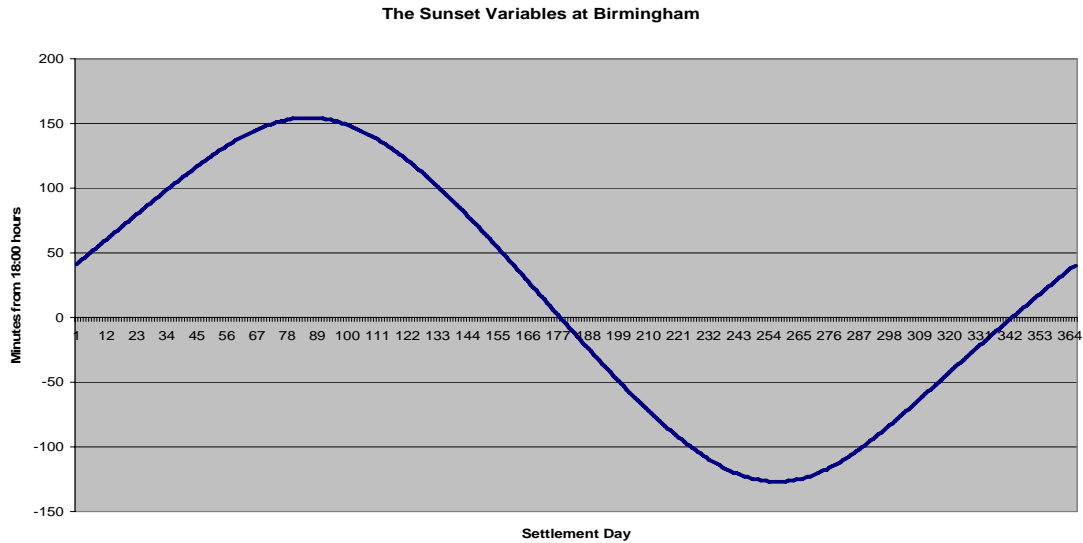
The Sunset Variables at Birmingham

Figure 14

## Day of Week Variables

The weekday regressions also include sets of **dummy variables.** These variables are expressed as 1s and 0s. Four sets of dummy variables are included in the weekday regressions as follows:

Set 1  1 if the day is a Monday else 0
Set 2  1 if the day is a Wednesday else 0
Set 3  1 if the day is a Thursday else 0
Set 4  1 if the day is a Friday else 0

Tuesday is taken to be the standard day and does not get a dummy variable. This means that when evaluating regressions for a Tuesday the weekday coefficients are ignored.

# Regression Equations and Evaluating Regression Coefficients

Using these variables creates a more complex equation than in the simple linear regression example. The equation for a weekday would be:

Y = Temperature Coefficient x Temperature Variable + Sunset Coefficient x Sunset Variable + Sunset Squared Coefficient x Sunset Squared Variable + Monday Coefficient x Monday Variable + Wednesday Coefficient x Wednesday Variable + Thursday Coefficient x Thursday Variable + Friday Coefficient x Friday Variable + Constant

When evaluating the regression coefficients the relevant variables are inserted into the equation above to get an estimate of Y for any half-hour.

## The Regression Types

There are fifteen basic regression types representing five season and three day types. The GAD Matrices are divided in to five season and three day-types. The definitions of the seasons are 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.

 Each season is divided into weekdays, Saturdays and Sundays.  Figure 15 shows the relationship between the GADs and the Regression Coefficients.
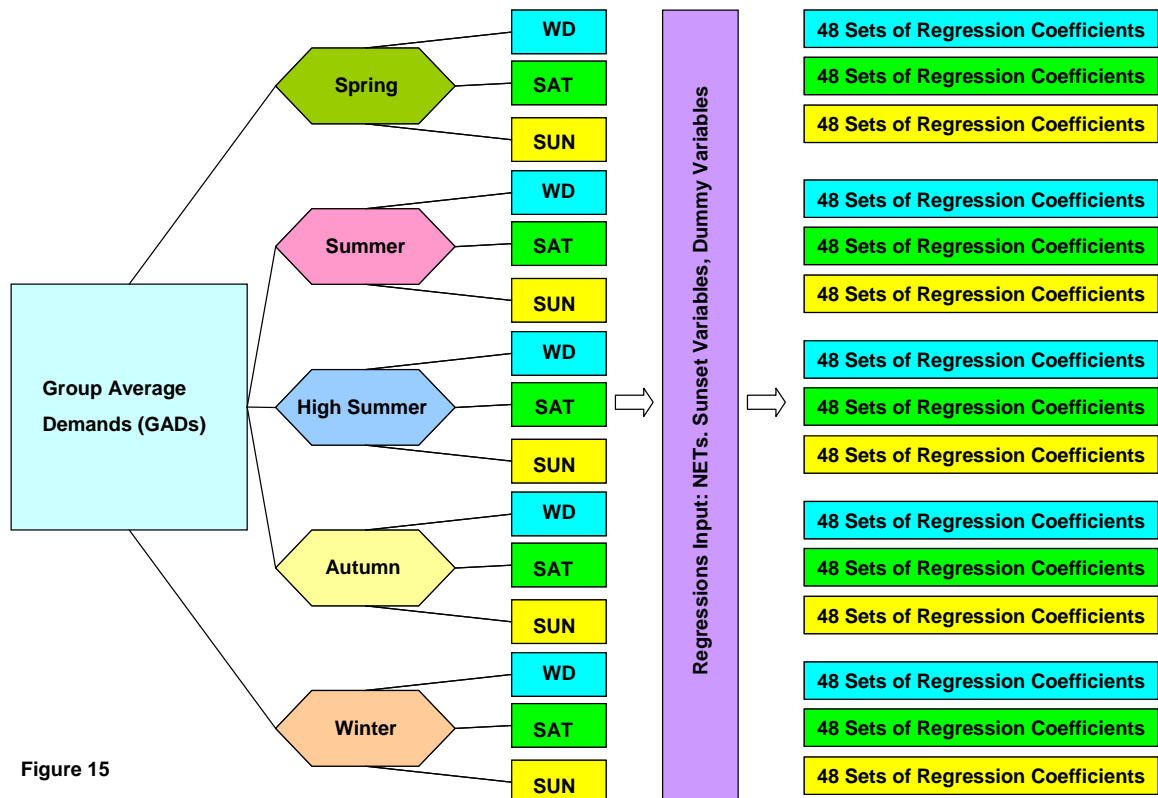


**Figure 15**

### The Regressions and Special Days

The regressions are performed on a Half-Hourly basis within each of the fifteen basic day-types using the relevant GADs and variables. However, there are some days of the year such as Bank Holidays that are unlike other days. In order to create Regression Coefficients for these days, the Sunday Coefficients for the relevant season are copied and an adjustment is made to the constant term using information from the GADs for the relevant day. Diagram A shows the relationship between the GADs and the regression coefficients. The regression output is Regression Coefficients for each Profile Class, Season, Daytype, Half-Hour, Coefficients and the Constant. An example is given in Table 1 below:

Table 1

| | | | | Temp. | Sunset | Sunset Sq. | Mon | Wed | Thu | Fri | Const. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile_1 | AUT | WD | 1 | -1.33E-03 | -3.11E-05 | 4.66E-06 | 7.49E-03 | -3.99E-05 | -1.60E-03 | 1.04E-02 | 0.322 |

### Evaluating the Coefficients

Evaluation of the coefficients will usually occur at out-turn NETs and Sunset Variables for the day that is being estimated. Figure 16 shows how the coefficients evaluate to form a profile.
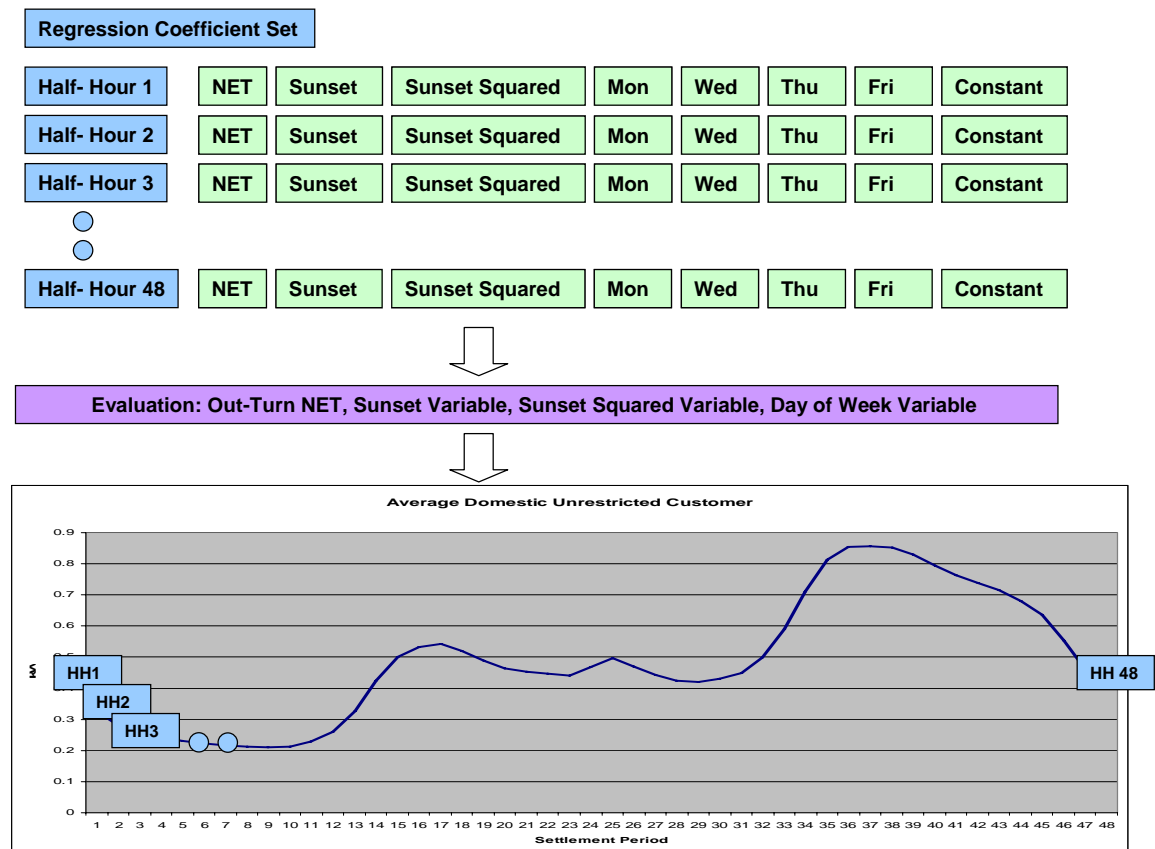


Figure 16

An example evaluation, using the above coefficients, for a Wednesday, with a NET of 52°F and a Sunset Variable of -13 is given in Table 2 below:

Table 2

| | | | | Temp. | Sunset | Sunset Sq. | Mon | Wed | Thu | Fri | Const. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Prof_1 | AUT | WD | 1 | -1.33E-03 | -3.11E-05 | 4.66E-06 | 7.49E-03 | -3.99E-05 | -1.60E-03 | 1.04E-02 | 0.322 |
| Multiply | | | | X | X | X | X | X | X | X | X |
| Evaluation Variables | | | | 52 | -13 | 169 | 0 | 1 | 0 | 0 | 1 |
| TOTAL | | | | -6.90E-02 | 4.04E-04 | 7.87E-04 | 0 | -3.99E-05 | 0 | 0 | 0.322 |
| GRAND TOTAL | | | | 0.254 kW | | | | | | | |

Diagram B show the relationship between the Regression Coefficients and the evaluation.

### Algorithmic Profiling

The Regression Coefficients for the Economy 7 switched load profiles undergo another procedure called algorithmic profiling. This process allows the coefficients to model switching regimes that are less than or greater than seven hours or even regimes that are split. Figure 15 shows evaluated Regression Coefficients for regimes of various lengths. The thicker brown line is the evaluation for the standard seven hour regime. The procedure ensures that the area under each curve remain the same.
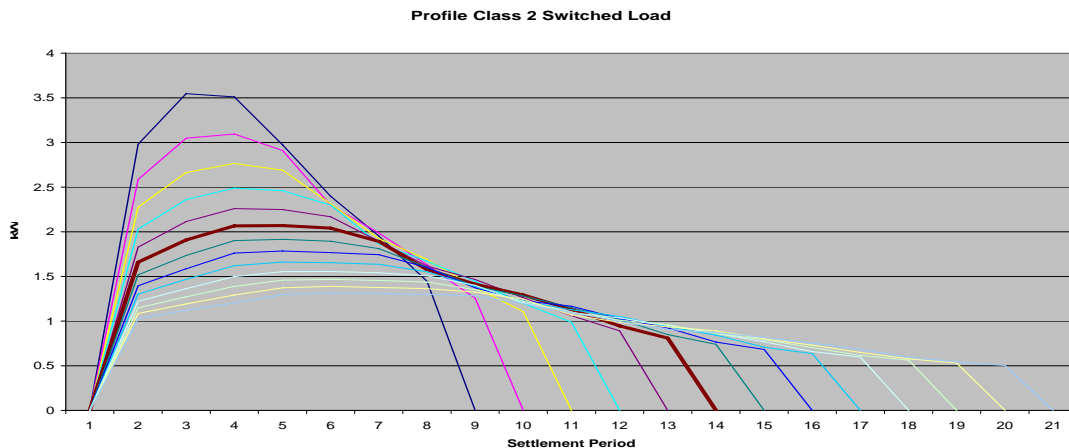


Profile Class 2 Switched Load

Figure 17

# Additional data provided by the PrA

### Group Average Annual Consumption (GAAC)

Using ten-year average NETs and sunset variables for each GSP Group, the relevant Regression Coefficients are evaluated for every day in the Settlement year to which they are to be applied for each Profile Class and each GSP Group. Summing the evaluations (within each Profile Class and region) and dividing by 2 creates a Group Average Annual Consumption (GAAC) in kWh. The GAACs are used for calculation of Profile Coefficients in the Settlement System and are provided in MWh. An example of a GAAC is given below:

| "GSP" | "Profile_Class" | "Type" | "GAAC" |
|-------|-----------------|----------|------------|
| "C"   | 1               | "TOTAL"  | 3.740 MWh  |

## Profile Coefficients

A Profile Coefficient is an estimate of the fraction of yearly consumption within each Settlement period. It can refer to a fraction of the whole year or the fraction of consumption in a Settlement period relating to a single Meter register to the yearly consumption for that register. Profile Coefficients are calculated as follows:

Evaluated Regression Equation / (GAAC * 2000)

The GAAC is multiplied by 2000 to convert it from MWh to kW. So the fraction is:

kW per Half Hour/ kW per year

This section has described how Load Profile data is created. The use of Regression and Profile Coefficients are discussed in the next section which describes how load profiles are used to estimate Half-Hourly consumption from a Meter advance.

## SECTION C    USING LOAD PROFILE DATA TO ESTIMATE HALF-HOURLY CONSUMPTION FROM A METER ADVANCE

The Settlement System uses load profiles to estimate half-hourly consumption for all supply market customers with numerous metering configurations on a daily basis for each supplier. Operation of the NHH Settlement system is undertaken by BSC and Party Agents. The role of these Agents is discussed later in this section. The theory of Load Profile application is described below.

To understand the theory it is easiest to consider how the load profiles can be used to estimate the half-hourly take for a single supply market customer with a single meter register.

**Example 1**:    A domestic unrestricted customer in London with a quarterly meter advance (1 April 2004– 30 June 2004) of 1000 kWh

**Step 1**:    Using the methodology described in Section B evaluate the Regression Coefficients using the NETs for the relevant period and London Sunset Variables and other variables as appropriate to give **Estimated Regional Average Demands per Customer (ERADPCs)**. Figure 16 shows the evaluated Regression Coefficients for Profile Class 1 for the 1 April 2004.
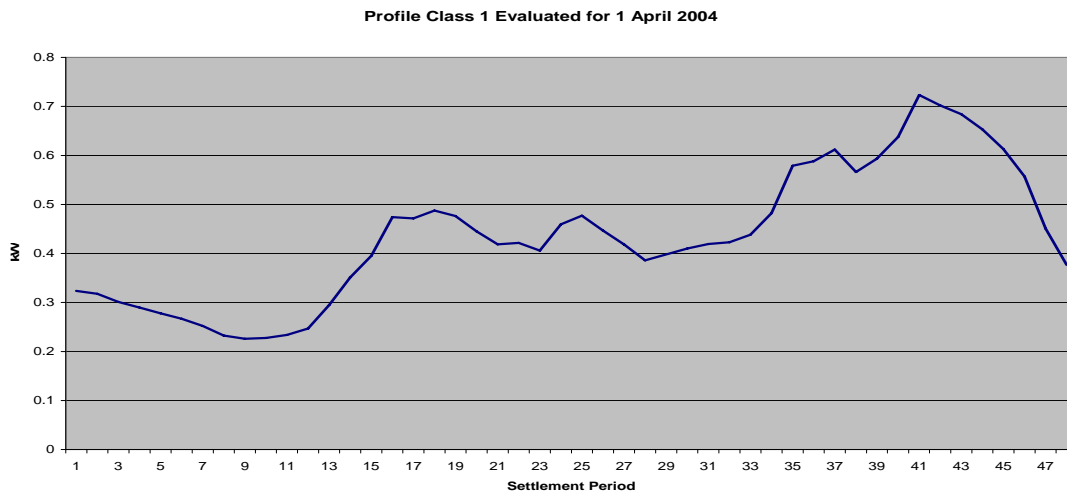


Profile Class 1 Evaluated for 1 April 2004

Figure 18

**Step 2**:     Calculate Profile Coefficients for the Meter advance period using the GAAC as described in Section B. Figure 17 shows the Profile Coefficients for the 1 April 2004.
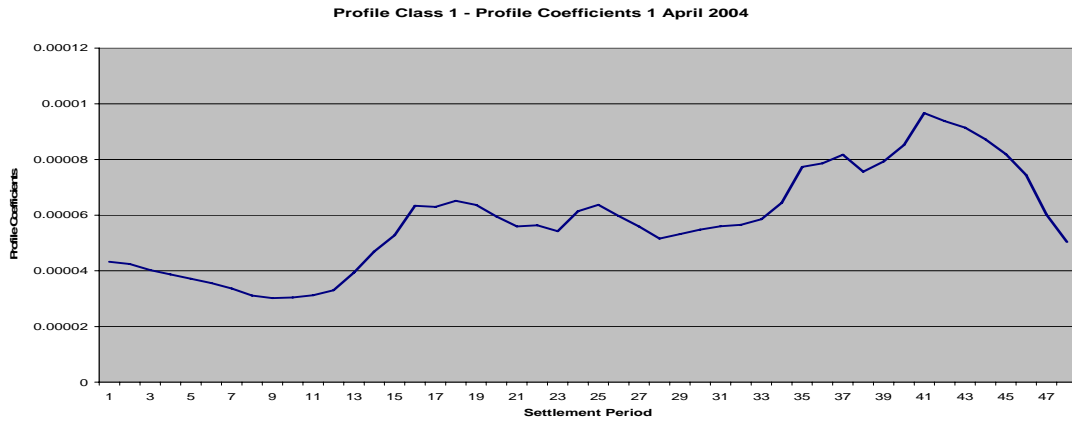
**Profile Class 1 - Profile Coefficients 1 April 2004**



Figure 19

**Step 3**: Calculate an **Annualised Advance (AA)**

To calculate an Annualised Advance you simply divide the Meter advance by the sum of the Profile Coefficients over the period of the advance (1 April 2004-30 June 2004) in this case:

Annualised Advance = 1000 (Meter Advance)/0.221136 (Sum of Profile Coefficients)

= 4522 kWh

This is an estimate of the customer's annual consumption for the year

**Step 4**: Allocate the calculated volume to each day by multiplying the Profile Coefficients by the AA.   Figure 18 show the allocation of the AA to the Profile Coefficients for the 1st April.

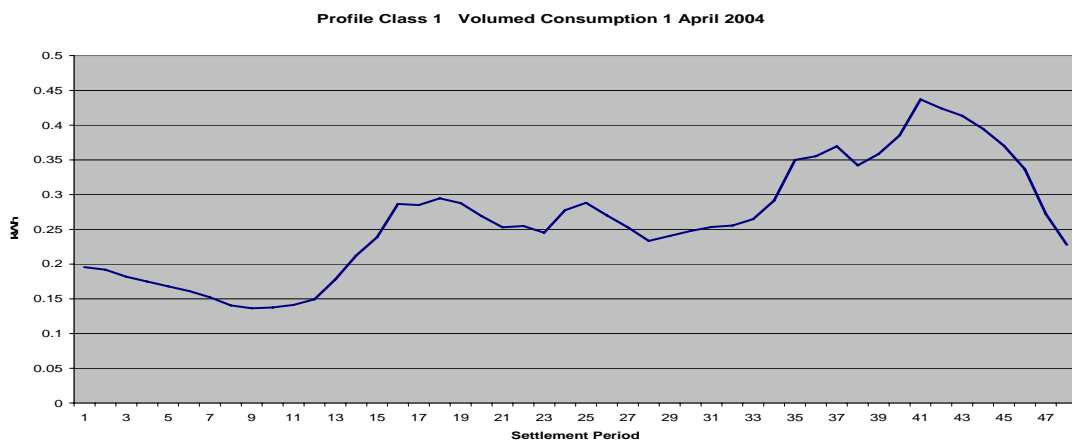**Profile Class 1   Volumed Consumption 1 April 2004**



Figure 20

The customers Meter advance has now been split into Half-Hourly consumption without the need of Half-Hourly metering. The daily consumption estimate over the Meter reading period can be seen in Figure 19.



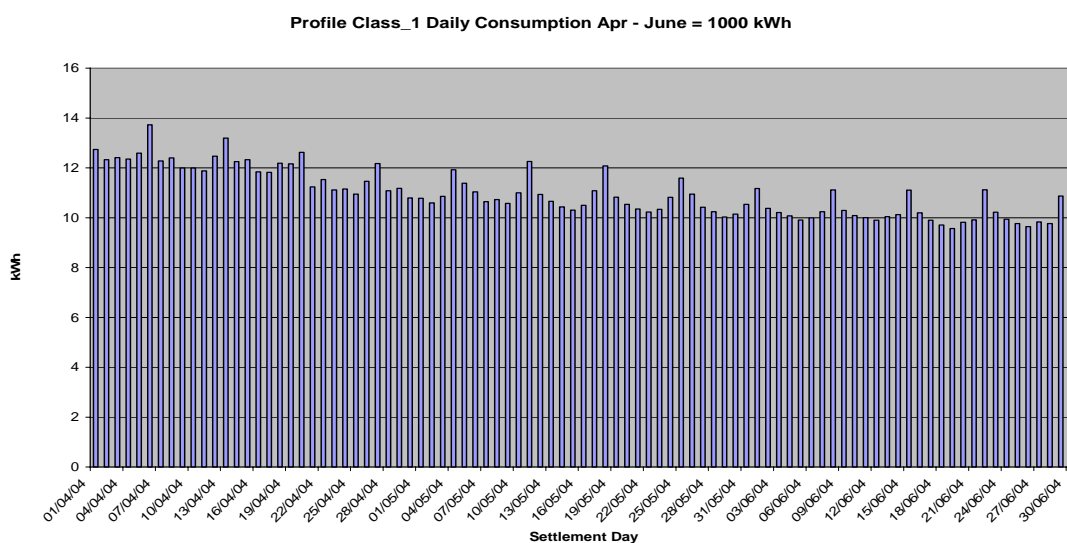Profile Class_1 Daily Consumption Apr - June = 1000 kWh

Figure 21

In practice, the true profile for an individual customer would look nothing like the profile shape as the profile is an average customer shape. In application all of a Supplier's domestic unrestricted customers in the GSP region have AAs calculated and aggregated before the volume is allocated. If there is no Meter advance for a customer an **Estimated Annual Consumption (EAC)** (using historical Meter reading information) is used in Settlements until the customers meter has been read. At this level, the profile should give a reasonable estimate of a Supplier's take for each Half-Hour.

In reality, many Supply market customers have metering configurations with more than one register. The configurations are referred to as **Standard Settlement Configurations (SSC's)** and the registers as **Time Period Registers (TPRs).** For each SSC, the approximate fraction of consumption on each register is calculated. This is called an **Annual Fraction of Yearly Consumption (AFYC)**.

**Example 2**: A domestic Economy 7 customer in London on an 00:30–07:30 GMT switching regime (01:30-08:30 BST) who has a low register advance of 500 units and a normal register advance of 1000 units for the period 1 April 2004–30 June 2004. This example will also demonstrate how the switched and base load coefficients are used.

**Step 1**: Evaluate the Regression Coefficients for switched and base load using the NETs for the relevant period and London Sunset Variables. Figure 20 shows using a stacked bar chart of the evaluated Regression Coefficients for Profile Class 2 for the 1 April 2004.
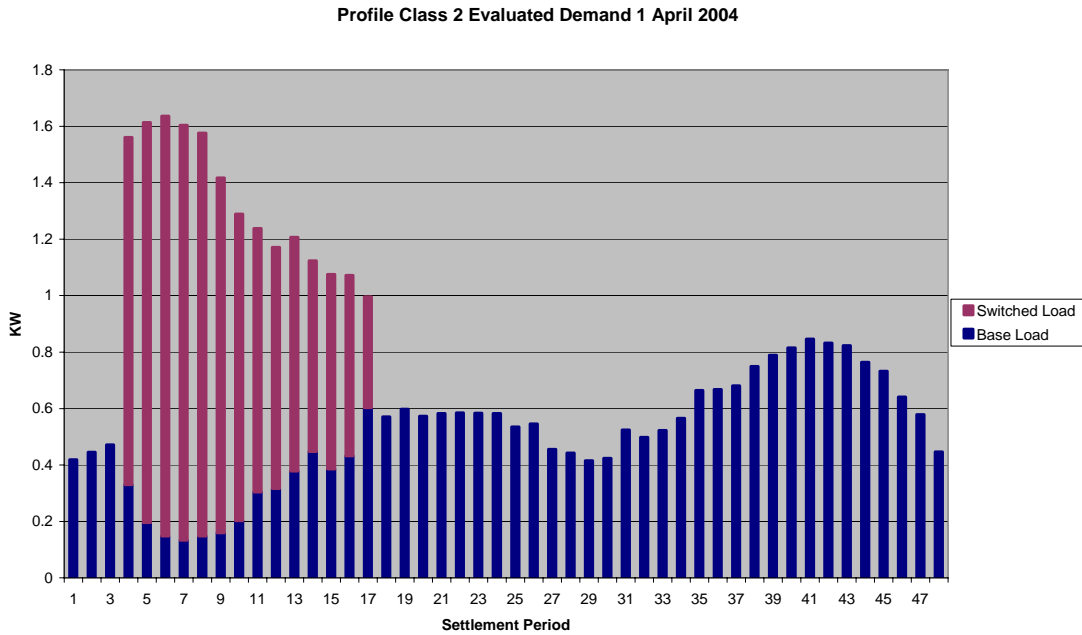
**Profile Class 2 Evaluated Demand 1 April 2004**



Figure 22


**Step 2**: **The Basic Period Profile Coefficients (BPPC)** for switched and base load are calculated in the usual way using the GAAC. There is, however, a procedure which combines the two sets of Profile Coefficients in the correct proportions. Figure 21 shows **Combined Period Profile Coefficients (CPPCs)** for the 1 April 2004.
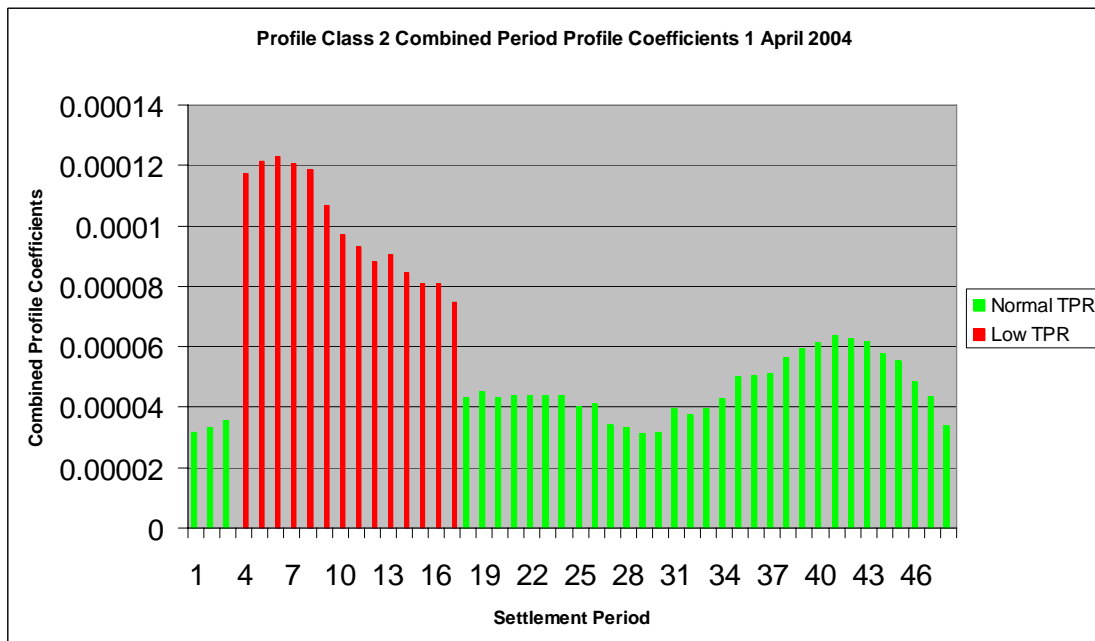


Figure 23


**Step 3**: Divide the coefficients on the low register by the low register AFYC and the coefficients on the normal register by the normal AFYC (0.4 low and 0.6 normal are used for this example). This is sometimes referred to as **'chunking'** and creates **Period Profile Class Coefficients (PPCCs)**. This step is also carried out in the first example but as there

is only one register the AFYC is 1 and therefore makes no difference. Figure 22 shows the 'chunked' coefficients for 1 April 2004.
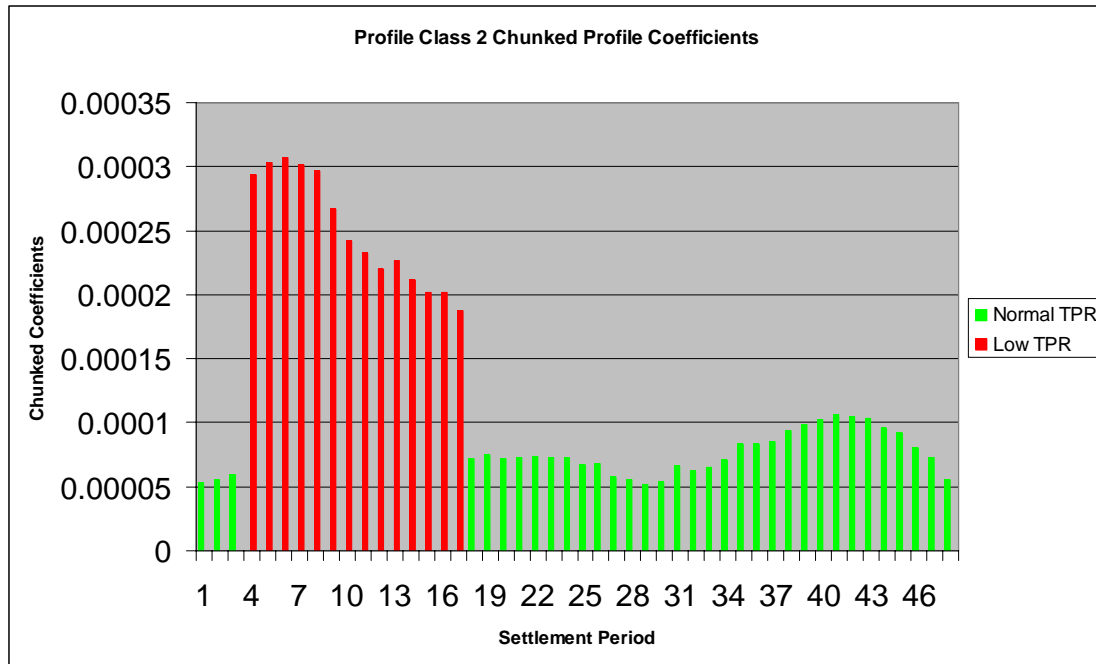


Figure 24

**Step 4**: Calculate AA for each register by dividing the annual advances by the sum of the 'chunked' coefficients for the register over the reading period.

In this case: Low AA = 500/0.174 = 2869 Normal AA = 1000/0.232 = 4304

**Step 5**: Multiply the 'chunked' coefficients (PPCC's) by the relevant AA to give Half-Hourly consumption estimates for each register. Figure 23 shows the volumes allocated to each TPR for the 1 April.
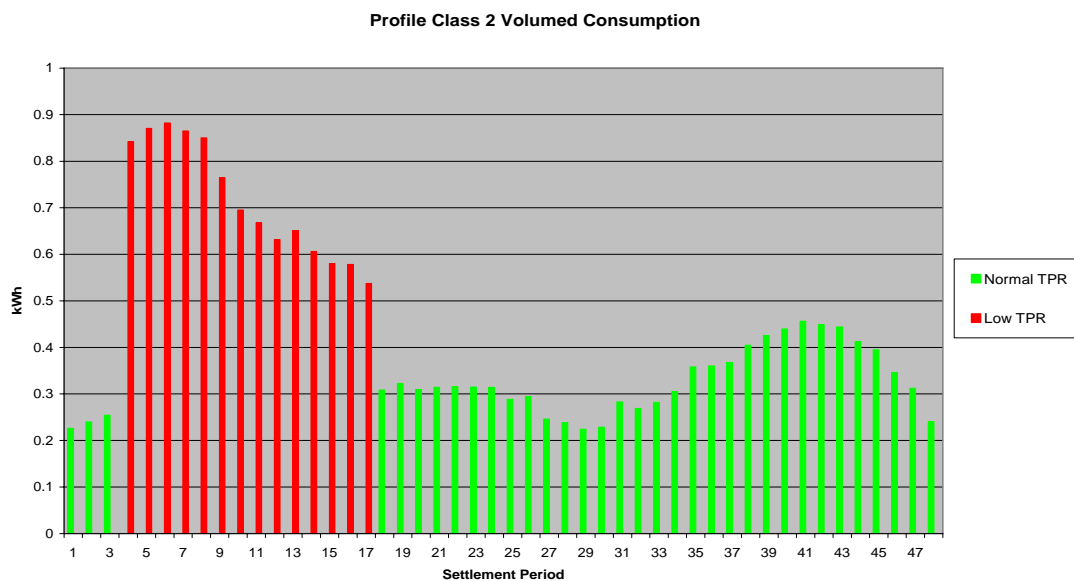


Figure 25

As before, these calculations would in reality use aggregated AAs and EACs for all customers on the same SSC in each GSP Group for each Supplier. Figure 26 summarises the calculations. The SSCs, TPRs , switching times, AFYCs, and other information are contained in the **Market Domain Data (MDD).** Diagram C summarises the calculations.
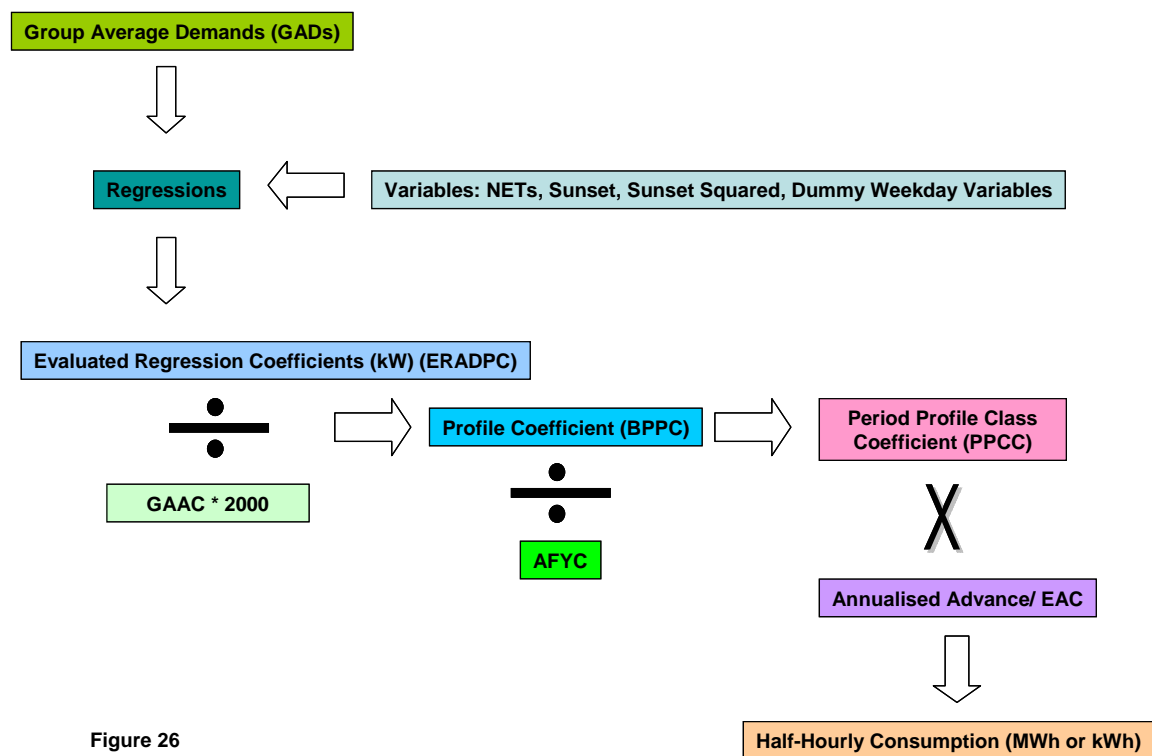


**Figure 26**

## The BSC Agents

All the calculations referred to above are carried out by BSC Agents and BSC Party Agents. The following is a brief overview of the agents and their roles in NHH settlement as they relate to load profiles.

### The Profile Administrator (PrA)

The PrA calculates the Regression Coefficients, GAACs and 'default' Profile Coefficients (coefficients to be used when a true coefficient cannot be calculated).

### Non Half-Hourly Data Collectors (NHHDCs)

The NHHDCs read the NHH Meters and calculate AAs using the **Daily Profile Coefficients (DPCs)** (sum of PPCCs for the settlement day for the settlement period) produced by the Supplier Volume Allocation Agent (SVAA). They provide the AAs together EACs to the Non Half-Hourly Data Aggregators (NHHDAs).

### Non Half-Hourly Data Aggregators (NHHDAs)

The NHHDAs aggregate the AAs and EACs by SSC, TPR, Supplier to create a **Supplier Purchase Matrix (SPM),** which will be used by the SVAA.

### The Supplier Volume Allocation Agent (SVAA)

The SVAA uses the Regression Coefficients to calculate DPCs for each SSC and TPR combination in the MDD.  The SVAA allocates the aggregated volumes given in the SPM to the applicable settlement period using the Period Profile Class Coefficients (PPCC). The SVAA also calculates the AFYCs and provides the MDD.

### Supplier Metering Registration Agents (SMRAs)

The SMRA provides information to the other agents on Metering Systems and their Suppliers within each GSP group.

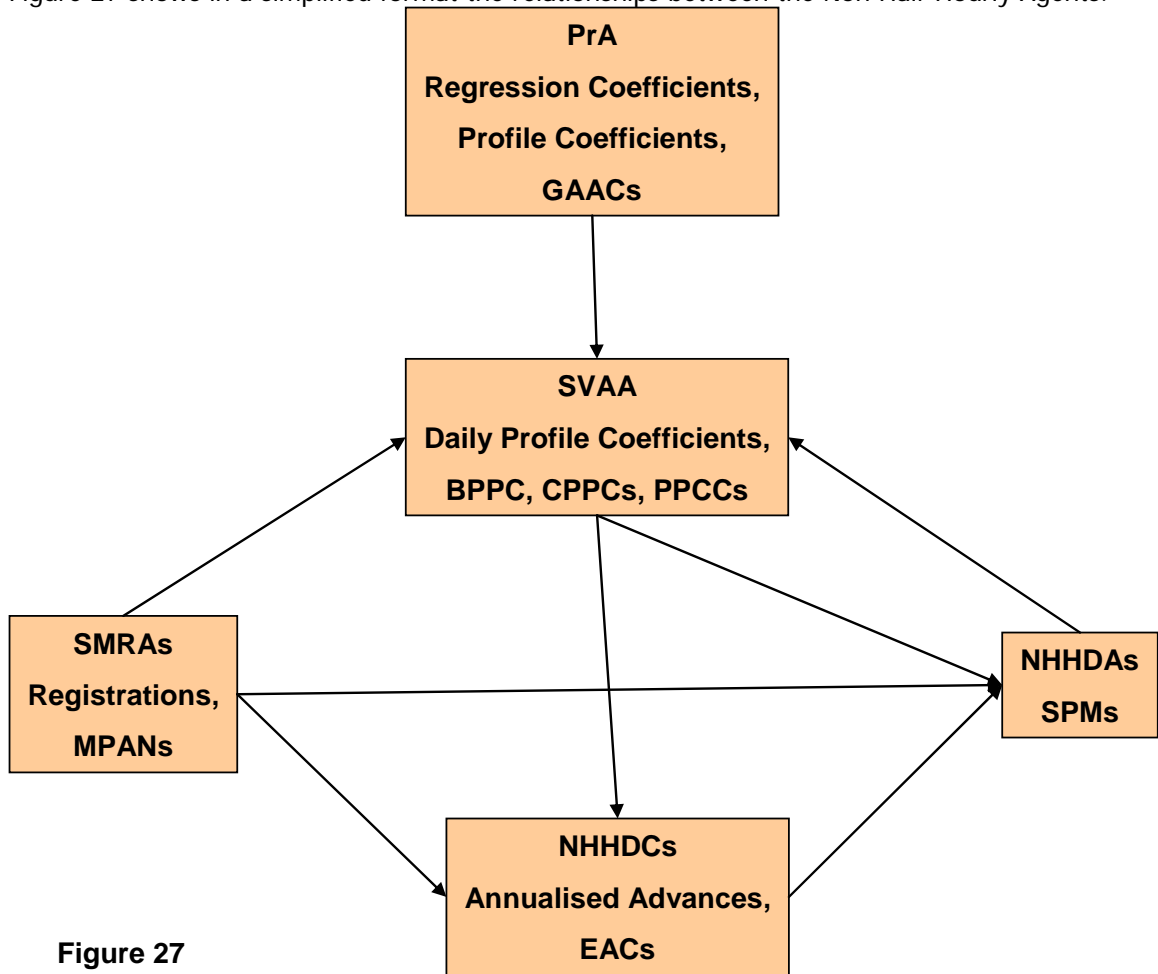Figure 27 shows in a simplified format the relationships between the Non Half-Hourly Agents.



**Figure 27**

## Settlement Runs

The daily settlement runs calculate the Profile Coefficients for the day. The Profile Coefficients for previous days are updated with AAs calculated using the latest Meter reading information. After a 14 month period final reconciliation (RF) for the day occurs when hopefully most, if not all, supply customers' Meters have been read at least once.

# Profiling Error

Sources of load profiling error occur at every stage described above. However, these errors fall into two main categories:

- Profile Estimation Errors
- Profiling Process Errors

### Profile Estimation Errors

The two main sources of Profile Estimation Error are:

Sampling Error:      Sampling Errors are inherent in the all samples but tend reduce as sample sizes increase.

Regression Error:      This is also unavoidable as can be seen in Figures 11 and 12 above. The vertical distance between the trend line and the data points can be described as the regression error. These are also sometimes referred to as residual demands.

### Profiling Process Errors

The following are a few of the Profiling Process Errors:

- Application of national profiles to GSP Groups
- Incorrect assignment of customers to profile
- Incorrect AAs and EACs

# GSP Group Correction Factors

When all Suppliers' profiled Half-Hourly consumptions are summated across a GSP Group, the total can be compared to the actual metered take for the Group (after taking account of Half-Hourly metered data).  Dividing the profiled take into the actual take creates a **GSP Group Correction Factor (GSPGCF)**. This factor is applied to each Supplier's individual profiled take in order to correct the profiled error.