NDM DEMAND ESTIMATION METHODOLOGY

Document Control

Version	Date	Reason for Change
Draft version 1	19 April 2013	Initial draft to support UNC Modification discussion
Draft version 2	14 May 2013	Further draft to support initial Legal Text discussions
Draft version 3	31 July 2013	Updated draft to align with draft Legal Text for Modification 0453.
Draft version 4	25 September	Updated draft to align with revised Legal Text for Modification 0453, following Workgroup walkthrough on 16 September 2013

CONTENTS

1. Document Purpose

1.1. This document describes the methodology which supports the estimation of NDM Daily Demand for use in the following UNC processes:

- NDM Output Nominations - before the gas day
- NDM Daily Quantities - after the gas day
- Determination of NDM Meter Point Peak Load (SOQ)

1.2. The Methodology reproduces and explains certain terms used in the Uniform Network Code (UNC). For the avoidance of doubt, in the event of any conflict between this Methodology and the UNC, for example as a result of modification of the UNC, the UNC takes precedence over this Methodology.

1.3. This methodology is intended to take effect in conjunction with the implementation of the UNC Modifications which support the Replacement of the UKLink Suite of systems, specifically UNC Modification 0453 – "Project Nexus Demand Estimation".

2. Supply Meter Point Demand Formula

2.1. The formula for determining NDM Supply Meter Point Demand ('SPD') for a Day (Day 't') is set out in UNC [H2.2.1] and is reproduced here for ease of reference only:

$$SPD_t = ((AQ/365) \times ALP_t \times (1 + (DAF_t \times WCF_t)))$$

2.2. Weather Correction factor formula:

$$WCF_t = CWV_t - SNCWV_t$$

where

CWV_t is Composite Weather Variable for the LDZ for the day (as described in 3.3 below); and

$SNCWV_t$ is the Seasonal Normal value of the Composite Weather Variable the LDZ for the day

3. Determination of Demand Estimation Parameters

3.1. Development of a Demand Model

3.1.1. A Demand Model will be developed for each End User Category (EUC) based on a statistical relationship between:

a) aggregate Demand for a sample of NDM Meter points for one or more years; and

b) actual weather data for the LDZ, as expressed in the form of the Composite Weather Variable for the period to which the demand relates; and

c) other relevant factors, including day of the week

3.1.2. DESC will determine (and from time to time may review) the key elements of the business rules around the development of the Demand Model, including:

a) The number of years of data to be used in developing the Demand Model

b) The target size of the NDM Sample, by LDZ and End User Category

3.2. Relevant Weather Data

3.2.1. The weather data items which are currently used in the development of the Demand Models are:

a) Temperature, at two-hourly intervals throughout the day and night

b) Wind speed, at four-hourly intervals throughout the day and night

3.2.2. DESC will determine (and from time to time may review) the list of weather data items used in the development of the Demand Model and the frequency at which they are required.

3.3. Definition of the Composite Weather Variable

3.3.1. The Composite Weather Variable is a single measure of weather in and LDZ for a day, which uses the weather data items defined in 3.2 above.

3.3.2. The objective of the CWV definition is to describe a straight line (linear) relationship between daily NDM Demand in the LDZ and the CWV.

3.3.3. This is achieved by the application of a number of constants and of variable parameters, such as summer cut-offs and cold weather up-turns.

3.3.4. DESC will determine (and from time to time may review) the process for developing the definitions of the parameter values of the Composite Weather Variable.

3.4. Annual Load Profile

3.4.1. The Annual Load Profile (“ALP”) for an End User Category for a Day is a factor representing the Seasonal Normal Demand of the End User Category for that Day as a proportion of the

average Seasonal Normal Demand (for all Days of the Gas Year) of the End User Category.

3.4.2. The Annual Load Profile ('ALPt') for an End User Category for Day t shall be determined as:

$$ALPt = \frac{SNDE_t}{\left(\frac{\sum_{t=1}^{N} SNDE_t}{N}\right)}$$

where:

$SNDE_t$ is seasonal normal demand for the End User Category for Day t

N is the number of Days in the Gas Year.

3.4.3. Seasonal Normal demand for a day will be determined by applying the averaged results of the regression analysis (constant and slope) from the Demand Model for the EUC to the seasonal normal values of the Composite Weather Variable applicable to the day of the Gas Year and LDZ in question, combined with any other relevant adjustments (e.g. day of week, holiday factors, summer reductions).

3.5. Daily Adjustment Factor

3.5.1. The "Daily Adjustment Factor" for an End User Category for a Day is a factor representing the weather sensitivity of demand in that End User Category on that Day..

3.5.2. The Daily Adjustment Factor ('DAFt') for an End User Category for a Day shall be determined as:

$DAF = WVCE_t/SNDE_t$

where for Day t:

$WVCE_t$ is the value of the Weather Variable Coefficient in the Demand Model for the End User Category (i.e. the sensitivity to weather);

$SNDE_t$ is the value of seasonal normal demand for the End User Category.

3.6. EUC Peak Load Factor

3.6.1. The Peak Load Factor (PLF) for an EUC is used to determine the Peak Load (i.e. the SOQ) of a Supply Point, using the formula

Peak Load = AQ/(PLF * 365)

3.6.2. The Peak Load Factor is calculated as:

PLF = average demand/1-in-20 peak day demand

3.6.3. Peak Day Demand is an estimate of the 95% confidence level of highest demand that might be expected to be experienced for an End User category.

3.6.4. Peak Day Demand will be determined by simulation using a long period of actual historic CWV data for the relevant LDZ.

3.6.5. DESC will determine (and from time to time may review) the number of years of historic data used in the simulation of Peak Day Demand and the method of simulation.

3.7. Weather Correction Constraint

3.7.1. Without the application of a "constraint" i.e. a minimum value for the outcome of the clause $(1 + (DAF_t \times WCF_t))$ it would be possible for the overall formula for Supply Point Demand to return a negative value, where weather is significantly warmer than seasonal normal.

3.7.2. DESC will agree (and may from time to time review) a minimum value for the weather correction clause, to prevent the calculation of negative demand estimates.

4. Overview of the Annual Process for Determining the NDM Algorithms

4.1. Each gas year the approach to the development of the following year's NDM Algorithms (ALPs, DAFs, Load Factors) is agreed with DESC and documented in the **Spring Approach** document. This agreement normally takes place in around February each year for the following Gas Year. The Spring Approach is usually presented at the February meeting of DESC and will typically cover matters such as:

a) Which years and months of sample data will be used in the regression analysis

b) Detailed rules to be applied to the regression analysis and the treatment of exceptions

c) Agreed days to which holiday codes will apply (i.e. which days in the sample datasets will be treated as holidays for the purposes

of determining typical holiday effects and to which days in the coming year will those holiday effects be applied)

d) How smoothing will be applied to the models for the coming gas year

e) Key checkpoints in the process and how and when DESC and/or any sub-group of DESC members will be involved in the decision-making process

4.2. The outcomes of the annual process are summarised each year in the **NDM Algorithms booklet**, which is usually published at the same time as the proposed algorithm values. The booklet includes a number of appendices and typically summarises key decisions and outcomes, such as:

a) Numbers of validated data points used in the demand modelling

b) EUC definitions

c) Data aggregations used in the modelling (e.g. where data has been aggregated across multiple LDZs and/or consumption bands

d) WAR Band boundaries to be applied for the coming year

e) Outcomes of the modelling, including regressions parameters and load factors

f) A review of the performance of the NDM algorithm during the previous full gas year.