Spring 2006 NDM Analysis - Proposed Approach

Background :

Ahead of the spring 2005 NDM analysis, a note was prepared and circulated for comment to DESC members setting out the proposed approach to the analysis. In particular, it dealt with the overall approach to the analysis and the approach to model smoothing.

At the DESC meeting on 19th September 2006 it was agreed that model smoothing should continue to be applied in spring 2006.

At the DESC meeting on 12th December 2006 the revised definition of composite weather variable for WS LDZ is being presented for consideration and agreement in the light of the expected closure of the existing weather station used for this LDZ.

Taking into account these key changes, this note summarises the overall approach proposed for the spring 2006 NDM analysis.

Specific Points of Detail :

Model smoothing -

This section and the points below reflect the agreement reached at the aforementioned DESC meetings.

1. Year on year model smoothing will be used in the spring 2006 NDM analysis, in deriving the NDM proposals to be applied to gas year 2006/07.

2. In the absence of evidence of trends in the parameters of the year on year models, and taking into account the discussions at DESC in September, simple averaging will be applied to the NDM models feeding into model smoothing.

3. The NDM models for three years will be used for model smoothing. The three years will be 2003/04, 2004/05 and 2005/06. For both the first and second of these three analysis years, the data sets approximate to the twelve month period April to March, while for the most recent analysis year, 2004/05, the data sets cover the 13 month period March to March; the 13 months being necessary to ensure that there is at least one Easter holiday weekend in the data sets for that year.

4. In applying smoothing, models from equivalent WAR bands in the three separate years will be averaged although WAR band limits change from year to year. This was the approach adopted for each NDM analysis since spring 1999 (i.e. all previous NDM analyses in which model smoothing was applied), and there is no real alternative to this. As a subsidiary point there is also a strong stability incentive to retain the current period (December to March) in the definition of the WAR values and it is proposed that the existing definition is retained for the spring 2006 analysis.

5. The approach to model smoothing will be at the level of the underlying demand models, as was the case in the previous analyses. Further details are attached as an appendix to this note.

6. In line with previous commitments, it is proposed that the approach to model smoothing should be reviewed again by DESC in the summer/autumn next year following finalisation of the NDM algorithms for 2006/07.

Model Re-runs –

1. To assist in any investigation of trends in the autumn of next year (2006), all three years (i.e. 2002/03, 2003/04 and 2004/05) used in the spring 2005 implementation of model smoothing will be re-run using any revised definitions of composite weather variables (i.e. for WS LDZ), that may be agreed with DESC for use in the Spring 2006 NDM analysis and subsequent implementation from 1st October 2006.

2. In order to facilitate the possible introduction (should the analyses indicate merit in doing so) of a new consumption band breakpoint at 1465 MWh pa in terms of EUC definitions, appropriate back-runs of these consumption band aggregations will be undertaken.

3. Only the re-runs from the 2003/04 and 2004/05 data sets will be used (along with the new data set for 2005/06) in model smoothing, making up the three years of data applied in the spring 2006 analysis.

4. For EUCs in consumption ranges above 293 MWh pa, the data sets will cover the 12 month period April to March in 2003/04 and 2004/05. For these EUCs in 2005/06, the data sets will cover the 13 month period March to March (to ensure the presence of at least one Easter holiday weekend in that year's data sets).

5. For EUCs for the consumption ranges 0-73.2 MWh pa and 73.2-293 MWh pa, the analyses will in the case of all three years be done on data sets covering 12 months. These data sets run from mid-March to mid-March in each analysis year and therefore always contain at least one Easter holiday weekend.

6. The set of holiday days applied to the analyses will be the union of the holidays applying to England and Wales on the one hand and Scotland on the other. This approach has been used since the adoption of model smoothing in spring 1999 and continues to be appropriate. The actual holiday factor values (if any) that are applied will be derived from the modelling and will, of course, be as indicated by the various applicable data sets themselves.

Modelling Details -

1. With the adoption of revised weather variables and their corresponding new-basis seasonal normal values, the general modelling approach to be adopted for the spring 2006 analysis will be the same as that applied in spring 2005. This approach is detailed in the flowcharts on pages 30 and 31 of the spring 2005 NDM Report. A broad outline of the approach is reproduced below :

   a. Exclude warm weather data and summer data (ie. June to September) and fit a line to the remaining data. Any flat models are detected and re-run with all the data.

   b. Warm weather data (for exclusion) is defined in this context as the warmest 2º of data (ie. that for which the CWV is greater than Max. CWV - 2º).

   c. Assess the excluded summer data against the line fitted in step a to establish whether a summer reduction is required. It is proposed that the current condition of a 5% bar before any summer reduction is considered to apply is retained.

   d. Reintroduce the summer data into the data set (after inflating by any summer reduction identified in step c; if no summer reduction is identified then there would be no inflation). Fit a line to the augmented data set, excluding the warmest 2º, to establish whether a cut-off is appropriate, considering potential cut-offs in the range 0.5 to 4 degrees below the maximum value of the composite weather variable. It is proposed that the criterion applied from spring 2001 onwards, of a 20% improvement in the mean square residual over that obtained by using the straight line alone, is retained in assessing whether or not there should be a cut-off.

   e. If a cut-off is not required, then reintroduce the warmest 2º of data and fit a line to the entire data set.

   f. Model smoothing considers three years' models and the application of summer reductions or not to the smoothed model is dependent on all of the years contributing to the smoothed model. Thus it is possible that the smoothed model will not incorporate a summer reduction, in spite of a summer reduction being identified for one (or more) of the individual years. To cover this eventuality it is necessary in each year's modelling to produce models with and without summer reductions. The model without summer reductions will be produced by including summer data (except for the warmest 2º) in the regression in step a above, and fitting a cut-off if necessary, as in steps d and e above.

2. As previously agreed and implemented from the spring 2002 NDM analysis onwards, weekend effects for the "01B" EUCs will be modelled using the same "variable weather sensitivity" form of model used for other EUCs. (This form of the model is set out in Appendix 3, on page 22 of the spring 2005 NDM Report.) As in previous years, holidays will not be excluded from the regression models for "01B" EUCs.

3. The data applicable to the year 2005/06 (March 2005 to March 2006) will not have been analysed previously, and so, investigation of the most appropriate data aggregations, determination of WAR band limits, etc., will be undertaken with respect to this data set.

4. The models for all EUCs will allow the possibility of summer cut-offs and summer reductions being applied. Note however that cut-offs will not be applied to the models derived for consumption bands up to 293 MWh pa (i.e. the "01B" and "02B" EUCs), for the spring 2006 analysis. This amended approach was agreed by DESC in December 2003, with a view to mitigating summer scaling factor instability and was also applied to the spring 2004 and spring 2005 NDM analyses.

5. In any single LDZ, the same definition of CWV will be used for all runs (i.e. for all EUCs in that LDZ and for all years of data).

6. Weekend, holiday and summer reductions will be calculated (where appropriate) as the average of the percentage reductions estimated for the three individual years' models; where applicable the CWV cut-off (at which models cease to be weather sensitive) will be the simple average of the three separate estimates. (If for one or two of the three years there is no CWV cut-off, the maximum value of the CWV will be substituted as the cut-off for those years.) Further details are provided in the Appendix attached hereto.

7. As set out in the Appendix, the key aspect of averaging the models will be to average the ratio of the slope to the constant term, from each year's model. These ratios are equivalent to the reciprocals of the CWV intercepts.
8. Prior to the averaging, any models giving non-negative slopes on initial analysis (excluding the warmest weather from the regression), will be re-fitted to the entire data set. Any positive slopes remaining will be set to zero. This has become established practice.

9. In line with previous practice, a single EUC will be proposed in each LDZ for the consumption range 0-73.2 MWh pa.

10. For the "01B" EUCs, a pragmatic approach will be taken with respect to weekend effects taking into consideration both observed weekend scaling factor patterns and the prevalence or otherwise of non-positive and/or non-statistically significant (at the 95% level) weekend effects arising from the individual years' models over the weekend days (Friday, Saturday, Sunday). This is consistent with the approach taken during spring 2005 and previous years' NDM analyses.

Exploratory Analyses -

As with previous years including spring 2005, it is proposed that the exploratory NDM analyses will focus on confirming EUC definitions (small NDM only) and establishing the most appropriate levels of aggregation to apply to the data sets for the various EUC analyses.

Additionally, as in all previous years, it is proposed that exploratory analyses will be undertaken to establish whether to analyse the consumption range 293-2196 MWh pa as a single data set or to undertake the analysis over this consumption range in more than one set. The alternatives to be explored are: 293-732 MWh pa and 732-2196 MWh pa, which was the approach adopted, for these consumption band EUCs only, from the spring 2002 analysis onwards, or including a further consumption band breakpoint at 1465 MWh pa to give three consumption band ranges: 293-732 MWh pa, 732-1465 MWh pa and 1465-2196 MWh pa.

Similarly, as in all previous years, it is proposed that exploratory analyses will be undertaken to establish whether to continue to analyse the consumption range 73.2-293 MWh pa as a single data set.

In line with previous practice, WAR band EUCs over the consumption range 293-2196 MWh pa will be based on the overall range, which should then enable analysis by individual LDZ instead of LDZ groupings.

Note that, apart from the requirements of a potential new EUC definition break-point at 1465 MWh pa, whatever the outcome of the analysis of the 2005/06 NDM sample data, the models from the previous two years, used for smoothing purposes, will be based on the aggregations applied in those years' analyses.

Derived Factors -

1. As was the case from the spring 2002 NDM analysis onwards, the DAFs for gas year 2006/07 will be computed based on aggregate NDM demand rather than total demand in each LDZ.

2. The load factor computation for each EUC will be based on the smoothed model. This is the same approach as adopted for all NDM analyses since spring 1999.

4. In calculating DAF values in the case where the smoothed model has a cut-off, the reduction in the magnitude of weather sensitivity will be phased in as described on page 70 of the spring 2005 NDM Report. This approach has been in place since its introduction at the time of the spring 1997 NDM analysis.

5. In the context of the non-application of cut-offs to EUC models in consumption range 0-293 MWh pa, and as agreed by DESC in December 2003, the values of ALPs for EUCs in this consumption range will be constrained to be never less that 1% of their maximum values. Note that this is a safeguard against a theoretical possibility of negative ALPs arising (in the proposed profiles for both 2004/05 and 2005/06 this constraint did not need to be applied).

Reporting -

The parameters for the smoothed models will be published, in an Appendix to the spring 2006 NDM Report. Additionally, all model parameters (for each of the three years feeding into model smoothing) will be provided in electronic form.

As in the spring 2005 NDM Report, all CWV intercepts (for each year's models and for the smoothed model) will be included in the report.

The performance evaluation appendix of the spring 2006 NDM Report will continue to have the now customary three strands of information (WCFs & SFs, RVs and NDM sample analysis).

Key Dates -

05 June 2006	- Technical Forum (AM) & DESC Meeting (PM)
30 June 2006	- Initial proposals published
15 July 2006	- Shippers make representations by this date
24 July 2006	- DESC Meeting to consider representations
15 August 2006	- Final proposals published by this date

Appendix - EUC Model Smoothing

The key stages of the end user category (EUC) model smoothing process are explained below. This is unchanged from previous practice.

Produce models for the EUC based on the data for each of the last three years. In the case that summer reductions have been applied in an individual year, two versions of the EUC model for that year exist, one with summer reductions and one without summer reductions. Where summer reductions are applied, the magnitude of these reductions is expressed in terms of a summer multiplier applied to the fitted daily demands over the non holiday days from the spring bank holiday period to the last weekend in September. For example, a summer multiplier of 0.850 means that fitted demands are reduced by 15% over this period. If no summer reductions are applied, the summer multiplier takes a value of 1.

Decide whether to apply summer reductions to the final smoothed model. The criterion applied in making this decision is as follows. The summer multipliers for the three individual year models for the EUC are averaged. If this average summer multiplier is less than the critical value of 0.9 (a 10% reduction), summer reductions are applied in the smoothed model; the summer multiplier for the smoothed model is this average value. If the average summer multiplier is greater than or equal to the critical value, summer reductions are not applied to the smoothed model.

For example, for an EUC with summer multipliers of 1.000 (i.e. no summer reductions), 0.800, and 0.850 in the individual years, the average summer multiplier is 0.883. This is less than the critical value of 0.9, so a summer reduction is applied to the smoothed model.

This decision process allows a unique EUC model to be selected for each individual year. If summer reductions are to be applied in the smoothed model, the version of each individual year's model with summer reductions (if such a version exists) is selected. Otherwise, the version without summer reductions is selected for each individual year.

At this stage, the decision as to whether to set weekend effects to zero is taken.

The selected individual year models for the EUC are standardised, by dividing through by the constant for that individual year. This gives a model for each year (yr) of the form:

$$D_t(yr) = 1 + C_2(yr)*CWVt + C_3(yr)*Fri + C_4(yr)*Sat + C_5(yr)*Sun$$

This standardisation ensures that all three individual year models give the same normalised daily demand value (i.e. 1.0) for a non-holiday Monday to Thursday at 0° CWV. This ensures that equal weight is given to each individual year in the smoothing process.

Each individual parameter of the initial smoothed model for the EUC is calculated by averaging the values of the parameter over the three individual years.

For example, C2(smoothed) = {C2(yr. 1) + C2(yr. 2) + C2(yr. 3)}/3

The constant (which is 1 in the standardised model) and the slope of the smoothed model are then multiplied by the constant term of the original (unstandardised) model for the most recent year. Note that this step has no effect on the NDM profiling or capacity estimation parameters, but it gives model parameters of the same scale as that of the model for the most recent individual year.

The multiplicative day of week/holiday factors (P_t as described in Appendix 3 of the spring 2005 NDM Report) are calculated for the smoothed model for the EUC. These are calculated for each day as averages of the corresponding values in the three individual years' models.

A decision is made as to whether to apply a composite weather variable cut-off to the smoothed model for the EUC. Application of a CWV cut-off has the effect of causing the fitted demand to level off for values of CWV above the cut-off. The criterion used in making the decision is as follows. The value of the CWV cut-off is estimated for each year's model. If no cut-off is required, the cut-off value for that year is set to the maximum CWV for the LDZ. The three individual years' CWV cut-offs are then averaged. If this average value is less than the maximum CWV for that LDZ, a CWV cut-off is set at this value in the smoothed model. Otherwise no CWV cut-off is applied to the smoothed model. Note however that cut-offs will not be applied to the models derived for consumption bands up to 293 MWh pa (i.e. the “01B” and “02B” EUCs), for the spring 2006 analysis. This amended approach was agreed by DESC in December 2003, with a view to mitigating summer scaling factor instability and was also previously applied to the spring 2004 and spring 2005 NDM analyses.

The ensuing form of model is used in the calculation of NDM profiling parameters and capacity estimation parameters.

A form of the smoothed model is also produced with additive weekend effects. The averaged standardised parameters for each day from Friday to Sunday are multiplied by the constant term of the original unstandardised model for the most recent year, to give additive weekend effects for the smoothed model. This gives a smoothed model of the form:

$$D_t = C_1 + C_2*CWVt + C_3*Fri + C_4*Sat + C_5*Sun$$

C_1 has the same value as the constant term of the EUC model for the most recent year. This is a simple form of the smoothed model because it does not embody such features as holiday effects, summer cut-offs and summer reductions. The parameter values for this form of model will be shown in the spring 2006 NDM Report, for consistency with previous years' reports.