Spring 2015 NDM Analysis - Recommended Approach

Impacts of Industry change programme:

Ahead of each annual NDM analysis, it is customary to prepare a note for Demand Estimation Sub Committee (DESC) setting out the proposed approach to the next NDM analysis.

This year DESC will need to be mindful of the significant changes planned as a result of UK Link replacement and EU reform and their subsequent impacts to section H of UNC where the Demand Estimation rules and guidelines are maintained. Referenced in section H is the new concept of a Demand Estimation Methodology document where many of the more detailed formulae will reside.

In Spring 2015 the modelling performed will drive the new set of industry parameters required for 1st October 2015. This includes those parameters referenced in the NDM algorithm which supports key processes such as the NDM nominations and allocation processes. As a result of the implementation of UNC Modification 0432 the formula for the NDM algorithm is changing from 1st October 2015 to reflect the fact that NDM energy will no longer be the balancing figure in the LDZ instead being used to calculate a stand alone NDM demand figure, resulting in a new balancing figure of unidentified gas.

These changes include removal of the Scaling Factor (SF), an amendment to the Weather Correction Factor (WCF) to reflect 'real' variations in weather experience and a change to how the Daily Adjustment Factor (DAF) is calculated as a result of the change to WCF. The Daily Adjustment Factor (DAF) will no longer require the 'SND and weather sensitivity relationship' output from an aggregate NDM demand model to compare to. This will require changes to the EUC modelling system. For the avoidance of doubt the definition of the Annual Load Profile (ALP) remains unchanged.

The Spring 2015 approach document has been written reflecting the expected changes explained above, however we will also calculate DAFs under the current methodology to aid comparison to 2014/15, which would also provide a contingency in the event of any delays to UKLink implementation. Bearing this in mind there will be references in the approach document to both sets of DAFs.

Background :

The remainder of this document will now deal with the more traditional proposed overall approach to the analysis and to model smoothing.

The bi-annual assessment of model smoothing as applied to NDM demand estimation was presented to the DESC meeting on 13th November 2013. The results of the assessment supported the continued application of 3 year model smoothing. DESC agreed to this but asked their Technical Workgroup (TWG) to look into assessing whether alternative weightings given to the three years would be beneficial. Results presented at the TWG meeting on 15th January 2014 and subsequent discussions confirmed the approach to weighting should remain in the manner currently applied. The next review of the application of model smoothing is scheduled take place in autumn 2015.

During 2013 DESC asked TWG to investigate the boundaries of the current EUC definitions and assess whether any more appropriate NDM groupings exist. Results of this analysis were shared at the TWG meeting on 27th November 2013 and the TWG meeting on 15th January 2014. It was agreed that there did not appear to be any obvious 'new bandings' emerging, however TWG did make a recommendation to DESC to merge bands 07 (14650 – 29300 MWh pa) and 08 (29300 – 58600 MWh pa) for modelling purposes only, owing to the similarity in their profiles. In addition DESC had already previously agreed that should it become necessary due to limited sample strength, the data sets applicable to consumption bands 07 and 08 could be combined for both consumption band and WAR band EUC modelling in these consumption ranges.

Following the closure of Manchester Hulme Library weather station DESC's TWG agreed on 8th October 2013 that the temperature values (with bias adjustment) and wind speed as provided by Rostherne No 2 should be adopted. It was recommended that the NW / WN CWV parameters did not require any adjustment in the short term. This arrangement has been in place since 28th October 2013 and will continue upto 30th September 2015, however from 1st October 2015 Rostherne No 2 will become the formal gas industry weather station for NW and WN LDZs.

While there are no further weather station changes expected ahead of the start of gas year 2015/16, a comprehensive review of CWVs has been concluded. For each LDZ, revised definitions of CWVs and new seasonal normal weather bases (new SNCWV values) were presented to DESC on 3rd December 2014 and formally approved by DESC on 17th December 2014. EUC and aggregate NDM demand modelling in spring 2015 will use these new CWVs and SNCWVs.

A further consideration is the change in weather data used in the modelling process, as for the first time a weather data series derived from the Weather Station Substitution Methodology (WSSM) project will be used. This series starts from gas year 1960/61 which means there will be a reduction in the number of years available to simulate peak day demand.

Using new CWVs (based on a new historical weather data series) and SNCWVs in spring 2015 is a major change which will fundamentally alter the results of the modelling process and so it is not advisable to make further changes to the underlying basis of the EUC and aggregate NDM demand modelling. Considering the additional changes also necessary due to the previously referenced industry change programme it is suggested that no further changes are planned for the spring 2015 analysis.

This document now summarises the proposed overall approach to be applied for the spring 2015 NDM analysis.

Specific Points of Detail :

Model smoothing -

1.   Year on year model smoothing will be used in the spring 2015 NDM analysis, in deriving the NDM proposals to be applied to gas year 2015/16.

2.   In the absence of evidence of trends in the parameters of the year on year models, 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 2012/13, 2013/14 and 2014/15. For both the first and third of these three analysis years, the data sets cover a twelve month period (April to March) while for the second analysis year, 2013/14, the data sets cover a thirteen month period (March to March); this is necessary to ensure that there is at least one complete 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 is 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 therefore the existing definition will be retained for the spring 2015 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 in Appendix 1 to this note.

6.   Following the Autumn 2013 review the assessment of the approach to model smoothing is scheduled to be reviewed in full again by DESC during the autumn of 2015 following finalisation of the NDM algorithms for 2015/16.

Model Re-runs :

1.   To assist in any investigation of trends, all three years (i.e. 2011/12, 2012/13 and 2013/14) used in the spring 2014 implementation of model smoothing will be re-run to correctly take into account changes in weather variable definitions (CWVs and SNCWVs) and any changes in holiday periods applicable to the spring 2015 NDM analysis.

2.   Only the re-runs from the 2012/13 and 2013/14 data sets will be used (along with the new data sets for 2014/15) in model smoothing, making up the three years of data applied in the spring 2015 analysis.

3.   For all EUCs the data sets will cover the 12 month period April to March in 2011/12 and 2012/13 and cover the 13 month period March to March in 2013/14. .All these contain at least one Easter holiday weekend.

4.   The holiday codes that apply to the Christmas/New Year period are the latest that were agreed following discussion at DESC on 8th November 2011. There are no planned special bank holidays at present for the 2015/16 period. Therefore the holiday code rules that apply (including treatment of recent special bank holidays) will be unchanged from the spring 2014 analysis. As in the spring 2014 analysis, the holiday codes that apply to the Diamond Jubilee holiday week in June 2012 will be those that normally apply to the second bank holiday week in May, with the days from Sunday 3rd June 2012 to the Diamond Jubilee holiday on Tuesday 5th June 2012 inclusive and Saturday 9th June 2012 assigned the holiday code that normally applies to the second bank holiday in May and the preceding Sunday and following Saturday.

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 because EUC sample data from geographically adjacent LDZs are usually aggregated to allow some EUCs to be modelled. Both population and sample disposition are such that this aggregation of data is essential to enable modelling of all EUCs in all LDZs. No judgemental alterations will be made to the disposition or derived values of the ensuing holiday codes when they are applied to deriving EUC profiles for the target gas year (2015/16). Following evidence presented at the 10th November 2010 DESC meeting about the inconsistent holiday factors that would arise if holidays were to be excluded from the regression models, and there being no widespread support among DESC members for a change to this practice, holidays will not be excluded from the regression models for "01B" EUCs.

Modelling Details

1.   The general modelling approach to be adopted for the spring 2015 analysis will be the same as that applied in spring 2014. This approach is detailed in the flowcharts on pages 30 and 31 of the July 2014 NDM Report. A broad outline of the approach is reproduced below:

   a.   Exclude warm weather data and summer data (i.e. 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 2° of data (i.e. that for which the CWV is greater than Max. CWV - 2°).

c. Assess the excluded summer data against the line fitted in step (a) to establish whether a summer reduction is required. The current condition of a 5% bar before any summer reduction is considered to apply to each individual year model will be 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 2°, 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. 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, will be retained in assessing whether or not there should be a cut-off applied to each individual year model.

e. If a cut-off is not required, then reintroduce the warmest 2° 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 2°) 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 all other EUCs. (This form of the model is set out in Appendix 3, on page 22 of the spring 2014 NDM Report.)

3. The data applicable to the analysis year 2014/15 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. This will be done in conjunction with the Technical Work Group (a decision point described in Appendix 2 below).

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 2015 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 all previous NDM analyses from spring 2004 onwards.

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 attached Appendix 1.

7. As set out in Appendix 1, 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. A single EUC will be applied in each LDZ for the consumption range 0 - 73.2 MWh pa. Domestic only data sets will be applied to modelling this consumption range. This is in line with the approach taken in spring 2014. There has been various analysis investigating the appropriateness of this approach which is described in the paragraph below:

Following a detailed investigation (reported to DESC on 8th November 2007) of the modelling of this consumption range as two sub bands split at 20 MWh pa and at 30 MWh pa, with and without non-domestic supply points included in the upper sub-band, it was clearly shown that given the available sample strength no statistical improvement in the representation of the consumption range was obtained by either sub-bands or the inclusion of non-domestic supply points. Furthermore, a follow-up investigation (reported to DESC on 11th November 2008) of assessing potential breakpoints other than 73.2 MWh pa for dividing the range 0-293 MWh pa, showed clearly that breakpoints lower than 73.2 MWh pa at 30 MWh pa and 60 MWh pa gave no statistical improvement over the currently applied 73.2 MWh pa. The results of a further analysis of three sub-bands of the consumption range 0 to 73.2 MWh pa (split at 10 MWh pa and 20 MWh pa) was presented to DESC on February 1st 2012 which concluded that there was no compelling evidence for dividing the 0-73.2 MWh pa consumption band into three sub bands.

10. The following approach will be taken in spring 2015 with respect to non-statistically significant (at the 95% confidence level) weekend effects:

    For 01B EUCs, a purely domestic sample will be used and all positive non-significant weekend effects will be retained at their original values.

    For all of the remaining EUCs, all negative non-significant weekend effects will be retained at their original values.

11. For large NDM (i.e. above 2196 MWh pa), the consumption band break points by which large NDM EUCs are defined will remain in line with current practice. However, it is intended following the DESC decision on 12th February 2014 that the samples applicable to the models for consumption ranges 14650 - 29300 MWh pa and 29300 - 58600 MWh pa (EUC bands 07 and 08, respectively) will be combined.
    This will provide better sample numbers for more robust demand modelling and merge two bands which analysis has shown to display similar consumption behaviour.

    It is recommended that the data will be combined in this way for the consumption band EUCs and the WAR band EUCs. Even when data is combined in this way, separate EUCs will be defined for consumption band and WAR band EUCs in the consumption ranges 14650 - 29300 MWh pa and 29300 - 58600 MWh pa.

    However, the underlying demand models applicable to the most recent year of data will be the same for some of these EUCs. For the avoidance of doubt, previous years' data sets for these EUCs, included in deriving the final smoothed model, will be at the level of aggregation that applied at the time (i.e. bands 07 and 08 are separately modelled). Thus, despite any aggregation of data in the most recent year's data sets, the derived factors (i.e. ALPs, DAFs and load factors) will in general be different for each of these EUCs.

Exploratory Analyses -

In line with spring 2014, the exploratory NDM analyses will focus on confirming the most appropriate levels of aggregation to apply to the data sets for the various EUC analyses within the existing EUC boundaries. 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.

Derived Factors -

1. The DAFs for gas year 2015/16 will be based on the formula in the Demand Estimation Methodology document. It will no longer be required to be computed using output from an aggregate NDM demand model following the decision to change the NDM algorithm formula. As mentioned above in the final paragraph of the first section we propose to prepare a set of DAFs for gas year 2015/16 reflecting current rules, which would mean a continued reliance on the output computed from aggregate NDM demand. The following 3 paragraphs, therefore, relate only to this requirement.

    For the NDM proposals for 2015/16, the historical aggregate NDM demand modelling approach will be retained (in line with recent practice since spring 2009). From spring 2009 to spring 2011 (inclusive) the aggregate NDM demand model was created for three separate sub-aggregations within the NDM sector. This introduced an inaccuracy whereby weekend and holiday effects within the aggregate model did not correctly cancel out, and therefore such effects were also present in the DAF shape.

    From spring 2012 onwards the aggregate NDM demand model has been re-built to work with aggregate NDM LDZ demand in total. This ensures that weekends and holidays are more accurately represented. This approach was approved by TWG on 23rd May 2012 and will be retained for spring 2015.

    The aggregate NDM models used will be models obtained from the average of three previous gas years aggregate NDM data modelled against weather (in this instance gas years: 2011/12, 2012/13 and 2013/14). The ensuing averaged historical model would be applied to the day of the week and holiday pattern of the target gas year but no forecast element would pertain to the model.

2. Load factor computations for each EUC will be based on the relevant smoothed model. This is the same approach as adopted for all NDM analyses since spring 1999. Note: the Load Factor computations will be impacted by a number of changes in the underlying data used in the peak day demand simulations, most notably the change to a new weather data series, the revision to the CWV parameters and the reduced number of historic years available in the series.

3. 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 68 of the spring 2014 NDM Report. This approach has been in place since its introduction at the time of the spring 1997 NDM analysis.

4. 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 profiles computed for all gas years since 2004/05 it has never been necessary to invoke this constraint).

Fallback Position –

Section H of UNC states that, in the event DESC does not wish to approve the proposed NDM factors (ALPs, DAFs and Load Factors) derived from the Spring analysis, then DESC has the option of rejecting them and using the 'fallback' position. The fallback position for the coming year would normally be the use of EUC definitions and derived factors based on the underlying EUC demand models from the previous year's Spring NDM analysis.

The analysis performed in Spring 2015 and subsequent models will reflect new industry arrangements due to take effect on 1st October 2015 whereas the Spring 2014 analysis was based on the rules applicable at that time.

Due to the significant changes planned for the coming gas year and the inappropriateness of reverting to models based on now out of date industry rules, TWG has recommended that, for this year only, the fallback position is not an option open to DESC. Therefore, for 2015 only, there would be no requirement to produce a set of "fallback models" for use in the unlikely event of DESC rejecting the proposed 2015 NDM Algorithms and Parameters.

Reporting -

The parameters for the smoothed models will be published, in an Appendix to the spring 2015 NDM Report.

As usual, all model parameters (for each of the three years feeding into model smoothing) will be provided in electronic form.

For all final smoothed EUC models, information (i.e. values of factors and flags where these apply to each model) pertaining to: summer cut-off, summer reduction, non-holiday weekend effects, and holiday effects will be provided in electronic form.

As in the spring 2014 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 2015 NDM Report will continue to have the now customary three strands of information (WCFs & SFs, RVs and NDM sample analysis) and as agreed by DESC at the 7th November 2012 meeting this will be a repeat of the gas year analysis published in the autumn / winter period. The analysis will not be updated prior to inclusion in the NDM report.

Appendix 11 of the NDM Report customarily contains a comparison of the proposed EUC load factors with the corresponding EUC load factors that applied in the previous gas year (in this instance 2014/15). However, due to the seasonal normal basis change, daily average demands would be different on the old and new seasonal normal bases. Therefore, a direct comparison of load factors (2015/16 -v- 2014/15) will be inappropriate. At the last seasonal normal basis change in 2010/11, the comparison that was made was the proposed EUC load factors against corresponding EUC load factors for the previous year, that would have applied if the revised CWV definitions and new seasonal normal basis had been in effect in that previous year. The same approach will be adopted in the spring 2015 NDM Report.

Appendix 2: Interaction and / or Decision Points			
Phase	**Approx Dates**	**Interaction / Decisions**	**Made by**
Approach to modelling	Winter 14/15	Agree the approach to be taken to modelling for the 2015/16 NDM profiles allowing back runs to be completed and new year modelling. - 7 -	Technical Workgroup and DESC
Sample data validation	23/04/15 to 27/04/15	Agree modelling runs based on collected data aggregations and WAR band definitions	Technical Workgroup
Single year modelling	27/04/15 to 15/05/15	Possible that any issues with the regression analysis need to be reviewed promptly with consensus decisions made quickly	Technical Workgroup
Single year modelling	18/05/15 to 22/05/15	Review of all single year modelling results. Decisions likely to be required on which models are best for certain EUC/LDZ combinations. Choice of models will be offered that the group shall be required to select	Technical Workgroup
Draft NDM profiles	08/06/15 to 26/06/15	Review will be required of draft NDM proposals for all EUCs such as Annual Load Profiles and Daily Adjustment Factors. Consensus will be required on any comments raised and agreement of key messages to be taken forward to DESC	Technical Workgroup
Draft NDM profiles	06/07/15 to 10/07/15	Recommendations from TWG for draft NDM proposals to be reviewed seeking approval for informing wider industry	DESC
Final NDM profiles	27/07/15 to 31/07/15	Industry representations to be reviewed along with an agreed response before finalising the NDM proposals	DESC