Gas Demand EUC Model Supporting Files

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1 INTRODUCTION

This document provides an explanation of the electronic files of additional material published by Correla on behalf of Xoserve on a draft basis ahead of the Demand Estimation Sub Committee Technical Workgroup (TWG) and Demand Estimation Sub Committee (DESC) review. The data in these files may change prior to final publication once the formal consultation process has been followed.

The electronic files provide information to support the derived small and large NDM profiling and capacity estimation parameters from 1st October 2022 to 30th September 2023 for each End User Category (EUC).

Additionally, because of the demand model smoothing approach applied every year since 1999, information pertaining to all three years' gas demand EUC models used in the model smoothing process is provided.

This information supplements the information to be presented in the NDM Algorithms Booklet. This supplementary information consists of the indicative load factors, model parameters, standard errors and R² values for the gas demand EUC models over each of the three years.

 Also provided are the historical values of composite weather variables (CWVs) for the period 1st October 1960 to 31st March 2022 along with values of the seasonal normal effective temperature (SNET), the new solar radiance parameter (SNES) and the seasonal normal composite weather variable (SNCWV) for each LDZ for each day of a gas year based on the definitions that took effect from 1st October 2020.

Note; The underlying weather data used in the calculation of CWVs from 1st October 1960 up to 30th September 2012 is the output delivered by the Met Office as part of the Weather Station Substitution Methodology (WSSM). Thereafter it is observations received into UK Link / SAP-ISU from the Transporter and CDSP's Weather Service Provider. Note: The SNET, SNES and SNCWV parameters are those approved by the Demand Estimation Sub Committee in October and December 2019.

A set of files containing a comprehensive set of gas demand EUC modelling information for the final smoothed demand models along with the smoothed demand model parameters is provided. A file containing the domestic NDM sample and overall population distribution for the 0-73.2 MWh pa range is also provided.

Table 1 - LDZ abbreviations

LDZ Code	LDZ Name
SC	Scotland
NO	Northern
NW	North West
NE	North East
EM	East Midlands
WM	West Midlands
WN	Wales North
WS	Wales South
EA	Eastern
NT	North Thames
SE	South East
SO	Southern
SW	South West

Note: The EUCs and NDM parameters applicable to the Scottish Independent Networks (denoted by LC, LO, LS, LT and LW) are the same as those derived for SC LDZ. The term LDZ (codes and names) is used here in the context of the Uniform Network Code daily balancing regime.

2 DESCRIPTION OF FILES

All data files containing additional gas demand EUC modelling information are comma separated text files.

The supplementary information (i.e. Demand Model Parameters) for the three years' models had been previously provided in "pdf" format but is now provided as text file format.

The domestic NDM sample/population distribution information is provided as document files in "pdf" format.

2.1   Indicative Load Factors: ILF_3YEARS_22_v1.XLSX

The indicative load factor (ILF) published each year is in all cases an "indicative" value which is calculated by dividing the average daily demand derived from the aggregate annual quantity (on the latest seasonal normal weather basis), by an estimate of the peak demand (based on the value given by the model at the 1 in 20 value of the composite weather variable), for the particular subset of the data. The indicative load factors have been used as a summary statistic for each subset of the data in assessing where significant differences in load characteristics occur; they have not been used in the determination of the capacity parameters.

Within the Excel file there are two worksheets: "Consumption Bands" which contains all of the results for EUC Bands 1 to 9 and "WAR Bands" which contains the results for WAR Bands 3 through to 8.

This file contains the "indicative" load factors, R² multiple correlation coefficients from the "all days" model (this being the most appropriate available measure of the quality of fit of the overall model to the NDM sample data), and sample size for the NDM end user category (EUC) demand models.

These are provided for each of the EUCs based on the models selected and agreed by DESC for model smoothing. For EUC:

- 01BND -these were derived from the three years of 2019/20, 2020/21 and 2021/22
- 01BPD – these were derived from 2021/22 only
- All other EUCs were derived based on models from the three years of 2018/19, 2019/20 and 2021/22

The 1 in 20 values of the composite weather variables for each LDZ are listed in Section 11 of the NDM Algorithms Booklet for 2022/23' (due to be published in July 2022).

2.2   Individual Gas Demand Model Parameter Files

These files contain the model parameters, standard errors and R² values for the NDM end user category (EUC) demand models fitted to the three most recent years' data sets, computed using the most up to date definitions of holiday periods, composite weather variables (CWVs) and seasonal normal composite weather variables (SNCWVs):

- Files 'MDLPAR19_22S.txt' and 'MDLPAR19_22L.txt' contain the parameters of small and large NDM demand models respectively, fitted afresh to the 2018/19 NDM sample data (excluding 01BND).
- Files 'MDLPAR20_22S.txt' and 'MDLPAR20_22L.txt' contain the parameters of small and large NDM demand models respectively, fitted afresh to the 2019/20 NDM sample data.
- File 'MDLPAR21_21S.txt' contains the parameters of Band 1 domestic non-prepayment (01BND) demand models only, fitted afresh to the 2020/21 NDM sample data.
- Files 'MDLPAR22_22S.txt' and 'MDLPAR22_22L.txt' contain the parameters of small and large NDM demand models respectively, fitted to the 2021/22 NDM sample data (i.e. the most recent data).

Each file or pair of files (small and large) constitute one set of the three years of EUC demand models from which the smoothed demand models are derived, which underpin the NDM profiles and EUC peak load factors proposed for adoption in gas year 2022/23.

The tables within each file show the regression coefficients, and the corresponding standard error. As described in Section 3 of the 'NDM Algorithms Booklet for 2022/23', the constant and slope terms are derived from the Monday to Thursday regression, and the Friday, Saturday and Sunday terms are derived from the "all days" regression. The R² multiple correlation coefficient for the "all days" fitted model is also shown. This value of the R² multiple correlation coefficient provides the most appropriate indicator of overall model fit.

NOTE:

- All values in fields 'AQ_Lower' and 'AQ_Upper' are expressed as MWh.
- All values in fields C1, C2, C3, C4, C5, C1_SE, C2_SE, C3_SE, C4_SE and C5_SE are expressed as kWh.
- Where LDZs have been grouped for analysis purposes, all LDZs in the group are listed.

Regression coefficients which are not significant at the 95% level are usually set to equal zero. Any exceptions to this are set out under paragraph '3.1 WEEKEND EFFECTS', in Section 4 of the 'NDM Algorithms Booklet for 2022/23'.

2.3 Composite Weather Variables Data File: CWV6022.TXT

The file 'CWV6022.txt' contains daily CWV values for each LDZ from 1st October 1960 to 31st March 2022. These CWVs are based on the definitions which took effect from 1st October 2020.

This data file is a fixed length, comma separated text file. Alphanumeric fields and date fields are double quote (") delimited.

Individual CWV values are expressed as real numbers with 2 decimal places and an overall field length of 6 characters (including the decimal place). The format of this data file is set out in Table 2.

2.4 Seasonal Normal Composite Weather Variables File: SNCWV22.TXT

Seasonal normal composite weather variable (SNCWV) data for each LDZ that will be applicable to each day of the forthcoming gas year from 1st October 2022 to 30th September 2023 is provided as file 'SNCWV22.txt'.

This data file is a fixed length, comma separated text file. Alphanumeric fields and date fields are double quote (") delimited. Individual SNCWV values are expressed as real numbers with up to 2 decimal places and an overall field length of 6 characters (including the decimal place). The format of this data file is set out in Table 2.

2.5 Seasonal Normal Effective Temperatures File: SNET22.TXT

Daily values of the demand based "pseudo" seasonal normal effective temperature (SNET) for each LDZ applicable to each day of the forthcoming gas year from 1st October 2022 to 30th September 2023 are provided as file 'SNET22.txt'. These SNET profiles are used in the calculation of CWV values.

This data file is a fixed length, comma separated text file. Alphanumeric fields and date fields are double quote (") delimited.

Individual SNET values are expressed as real numbers with up to 2 decimal places and an overall field length of 6 characters (including the decimal place). The format of this data file is set out in Table 2.

TABLE 2 - Record Format for Files CWV6022.TXT, SNCWV22.TXT AND SNET22.TXT

FIELD	FORMAT	LENGTH	START POSITION	END POSITION
Quote delimiter	Character	1	1	1
Date	dd/mm/yyyy	10	2	11
Quote delimiter	Character	1	12	12
Comma separator	Character	1	13	13
Value for SC LDZ	real (F6.2)	6	14	19
Comma separator	Character	1	20	20
Value for NO LDZ	real (F6.2)	6	21	26
Comma separator	Character	1	27	27
Value for NW LDZ	real (F6.2)	6	28	33
Comma separator	Character	1	34	34
Value for NE LDZ	real (F6.2)	6	35	40
Comma separator	Character	1	41	41
Value for EM LDZ	real (F6.2)	6	42	47
Comma separator	Character	1	48	48
Value for WM LDZ	real (F6.2)	6	49	54
Comma separator	Character	1	55	55
Value for WN LDZ	real (F6.2)	6	56	61
Comma separator	Character	1	62	62
Value for WS LDZ	real (F6.2)	6	63	68
Comma separator	Character	1	69	69
Value for EA LDZ	real (F6.2)	6	70	75
Comma separator	Character	1	76	76
Value for NT LDZ	real (F6.2)	6	77	82
Comma separator	Character	1	83	83
Value for SE LDZ	real (F6.2)	6	84	89
Comma separator	Character	1	90	90
Value for SO LDZ	real (F6.2)	6	91	96
Comma separator	Character	1	97	97
Value for SW LDZ	real (F6.2)	6	98	103

2.6   Seasonal Normal Effective Solar File: SNES22.TXT

Daily values of the demand based "pseudo" Seasonal Normal Effective Solar (SNES) for each LDZ applicable to each day of the forthcoming gas year from 1st October 2022 to 30th September 2023 are provided as file 'SNES22.txt'. These SNES profiles are used in the calculation of the Solar radiation term which forms part of the daily CWV calculation.

This data file is a fixed length, comma separated text file. Alphanumeric fields and date fields are double quote (") delimited. Individual SNES values are expressed as real numbers with 0 decimal places and an overall field length of 5 characters.

The format of the SNES data file is set out in Table 3.

TABLE 3 - Record Format for File SNES22.TXT

FIELD	FORMAT	LENGTH	START POSITION	END POSITION
Quote delimiter	Character	1	1	1
Date	dd/mm/yyyy	10	2	11
Quote delimiter	Character	1	12	12
Comma separator	Character	1	13	13
SNES for SC LDZ	real (F5.0)	5	14	18
Comma separator	Character	1	19	19
SNES for NO LDZ	real (F5.0)	5	20	24
Comma separator	Character	1	25	25
SNES for NW LDZ	real (F5.0)	5	26	30
Comma separator	Character	1	31	31
SNES for NE LDZ	real (F5.0)	5	32	36
Comma separator	Character	1	37	37
SNES for EM LDZ	real (F5.0)	5	38	42
Comma separator	Character	1	43	43
SNES for WM LDZ	real (F5.0)	5	44	48
Comma separator	Character	1	49	49
SNES for WN LDZ	real (F5.0)	5	50	54
Comma separator	Character	1	55	55
SNES for WS LDZ	real (F5.0)	5	56	60
Comma separator	Character	1	61	61
SNES for EA LDZ	real (F5.0)	5	62	66
Comma separator	Character	1	67	67
SNES for NT LDZ	real (F5.0)	5	68	72
Comma separator	Character	1	73	73
SNES for SE LDZ	real (F5.0)	5	74	78
Comma separator	Character	1	79	79
SNES for SO LDZ	real (F5.0)	5	80	84
Comma separator	Character	1	85	85
SNES for SW LDZ	real (F5.0)	5	86	90

2.7   Domestic Supply Point Distribution File:DOMSMP_22.PDF

This file contains the distribution of Domestic supply points below 73.2 MWh pa by LDZ and consumption range at overall population level and Gas Demand EUC Modelling level (i.e. to derive the Band 01 Domestic model). This file is in "pdf" format and is accessible using Acrobat Reader.

2.8   Comprehensive set of smoothed demand model parameters and modelling information

These demand model parameters are provided as a set of 7 distinct comma separated text files (for ease of importation into other applications and systems).

The parameters refer to the "multiplicative form" of the smoothed demand models for all EUCs proposed for gas year 2022/23. In this context, please note that the forthcoming report "NDM Algorithms Booklet for 2022/23" contains Section 7 which provides smoothed demand model parameters for the "additive form" of the gas demand EUC models, which, in general, may be different to the "multiplicative form" of the demand models presented in these supplementary files. Sections 3 and 4 of the forthcoming booklet explain the demand modelling structure and the demand model smoothing process.

Please note also that each gas demand model presented here is derived from and based on NDM sample data and is not a model of the entire population of the EUC.

2.8.1 File: WKHOLDEF22.txt – CHANGED

This file contains the definitions of the applicable modelling cases and the weekend, holiday and summer reduction (if applicable) codes that pertain to each modelling case for the forthcoming gas year.

There are 4 sets of holiday codes

- EWDOM2022: England and Wales LDZs, Domestic EUCs
- SCDOM2022: Scotland LDZs, Domestic EUCs
- EWIandC2022: England and Wales LDZs, Non-Domestic EUCs
- SCDOM2022: Scotland LDZs, Non-Domestic EUCs

There are four possible modelling cases:

- HINR: holidays included, no summer reductions
- HIWR: holidays included, with summer reductions
- HXNR: holidays excluded, no summer reductions
- HXWR: holidays excluded, with summer reductions

The file contains a header row which describes each of the comma separated data fields. These fields are (header names shown in brackets):

- Holiday Code Set (HOLSET)
- Modelling case code (CASECODE)
- Date (DATE)

- Weekday/weekend code (WKCODE)
- Holiday (and/or summer reduction) code (HOLCODE)

The header record also gives the number of days in the applicable period (this would be 365 or 366 depending on whether the target gas year is a normal or leap year).

The comma separated data records follow this header record. Since there are 4 sets of holiday codes and 4 possible modelling cases, the number of data records in the file is 4 x 4 x no of days in period (365 or 366). In addition there is a single header record.

The file specifies for each day of the forthcoming gas year, and for each possible modelling case, the codes that apply in respect of weekdays/weekends, holidays and/or summer reduction days.

This file combined with the files described immediately below enable identification of the weekend, holiday and/or summer reduction factor values that apply to each EUC on each day of the target gas year.

2.8.2 File: EUCHOLSET22.txt – NEW

This is an additional file provided this year to enable the linking of EUCs to the different sets of holiday codes. The file contains all the EUCs, the holiday code set that applies, and the 4 modelling cases.
The file contains a header row which describes each of the comma separated data fields.
These fields are (header names are shown in brackets):

- EUC name e.g. EM:E2201BND (FULL_EUC)
- Holiday Code Set (HOLSET)
- Modelling case code (CASECODE)

The comma separated data records follow this header record. Since there are 507 full EUCs (excluding Scottish independents) each with a single set of holiday codes and 4 possible modelling cases, the number of data records in the file is 2028. In addition there is a single header record.

2.8.3 File: EUCPAR22S.txt

This file contains the smoothed demand model parameters for the multiplicative form of model for all small NDM EUCs (i.e. those applicable to the consumption range up to 2196 MWh pa).

The file contains a header row which describes each of the comma separated data fields.
These data fields are (header names are shown in brackets):

- EUC name e.g. EM:E2201BND (EUC)
- Constant term of the model (CONST)
- Weather sensitivity term of the model (WSENS)
- CWV cut-off value or 99.00 if there is no CWV cut-off applicable (CUTOFF)
- Residual error (RESERR)
- Autocorrelation coefficient (AUTO)

All parameters refer to the smoothed demand models based on NDM sample data. The units of NDM sample demand are kWh for small NDM EUCs. Note also that residual error and autocorrelation coefficient are not used in the computation of the ALP and DAF profiling parameters.

The header record also states the number of small NDM EUCs (this year 234 for small NDM). There is one data record for each EUC. Thus, the number of data records in the file is equal to the number of small NDM EUCs. In addition there is a single header record.

2.8.4 File EUCWK22S.txt

This file contains the applicable modelling case and weekday/weekend factor values for each EUC, for the multiplicative form of model for all small NDM EUCs (i.e. those applicable to the consumption range up to 2196 MWh pa).

The file contains a header row which describes each of the comma separated data fields. These data fields are (header names are shown in brackets):
- EUC name e.g. EM:E2201BND (EUC)
- Modelling case code (CASECODE)
- Weekday/weekend code (WKCODE)
- Applicable weekday/weekend factor value (WKFACTOR)

The header record also states the number of small NDM EUCs (this year 234 for small NDM). There is one data record for each combination of weekday/weekend code and EUC. Thus, the number of data records in the file is equal to the number of small NDM EUCs (this year 234) x the number of applicable distinct weekday/weekend codes (usually 4). Therefore, the number of data records in this file is 936. In addition there is a single header record.

2.8.5 File EUCHOL22S.txt

This file contains the applicable modelling case and holiday (and/or summer reduction) factor values for each EUC, for the multiplicative form of model for all small NDM EUCs (i.e. those applicable to the consumption range up to 2196 MWh pa).

The file contains a header row which describes each of the comma separated data fields. These data fields are (header names are shown in brackets):
- EUC name e.g. EM:E2201BND (EUC)
- Modelling case code (CASECODE)
- Holiday and/or summer reduction code (HOLCODE)
- Applicable holiday and/or summer reduction factor value (HOLFACTOR)

The header record also states the number of small NDM EUCs (this year 234 for small NDM). There is one data record for each combination of holiday (and/or summer reduction) code and EUC. Thus, the number of data records in the file is equal to the number of small NDM EUCs

(this year 234) x the number of applicable distinct holiday (and/or summer reduction) codes (usually 21). Therefore, the number of data records in this file is 4914. In addition there is a single header record.

2.8.6 File: EUCPAR22L.txt

This file contains the smoothed demand model parameters for the multiplicative form of model for all large NDM EUCs (i.e. those applicable to the consumption range greater than 2196 MWh pa).

The file contains a header row which describes each of the comma separated data fields. These data fields are (header names are shown in brackets):

- EUC name e.g. SE:E2206B (EUC)
- Constant term of the model (CONST)
- Weather sensitivity term of the model (WSENS)
- CWV cut-off value or 99.00 if there is no CWV cut-off applicable (CUTOFF)
- Residual error (RESERR)
- Autocorrelation coefficient (AUTO)

All parameters refer to the smoothed demand models based on NDM sample data. The units of NDM sample demand are kWh for large NDM EUCs. Note also that residual error and autocorrelation coefficient are not used in the computation of the ALP and DAF profiling parameters.

The header record also states the number of large NDM EUCs (usually 273 for large NDM). There is one data record for each EUC. Thus, the number of data records in the file is equal to the number of large NDM EUCs. In addition there is a single header record.

2.8.7 File EUCWK22L.txt

This file contains the applicable modelling case and weekday/weekend factor values for each EUC, for the multiplicative form of model for all large NDM EUCs (i.e. those applicable to the consumption range greater than 2196 MWh pa).

The file contains a header row which describes each of the comma separated data fields. These data fields are (header names are shown in brackets):

- EUC name e.g. SE:E2206B (EUC)
- Modelling case code (CASECODE)
- Weekday/weekend code (WKCODE)
- Applicable weekday/weekend factor value (WKFACTOR)

The header record also states the number of large NDM EUCs (usually 273 for large NDM). There is one data record for each combination of weekday/weekend code and EUC. Thus, the number of data records in the file is equal to the number of large NDM EUCs (usually 273) x the number of applicable distinct weekday/weekend codes (usually 4). Therefore, the number of data records in this file is 1092. In addition there is a single header record.

2.8.8 File EUCHOL22L.txt

This file contains the applicable modelling case and holiday (and/or summer reduction) factor values for each EUC, for the multiplicative form of model for all large NDM EUCs (i.e. those applicable to the consumption range greater than 2196 MWh pa).

The file contains a header row which describes each of the comma separated data fields. These data fields are (header names are shown in brackets):

- EUC name e.g. SE:E2206B (EUC)
- Modelling case code (CASECODE)
- Holiday and/or summer reduction code (HOLCODE)
- Applicable holiday and/or summer reduction factor value (HOLFACTOR)

The header record also states the number of large NDM EUCs (usually 273 for large NDM). There will be one data record for each combination of holiday (and/or summer reduction) code and EUC. Thus, the number of data records in the file is equal to the number of large NDM EUCs (this year 273) x the number of applicable distinct holiday (and/or summer reduction) codes (usually 21). Therefore, the number of data records in this file is 5733. In addition there is a single header record.