Demand Estimation Technical Work Group
Data Validation and Aggregations - Spring 2018

24th April 2018

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Section 1:

Background, Timetable and Objectives of Meeting

Background – Demand Estimation

- Key industry processes require various types of gas demand estimation at NDM Supply Points. These processes include:
  - Determining Supply Point Capacity
  - Daily Nominations and Allocations i.e. NDM Supply Meter Point Demand Formula
  - Determining Annual Quantities (AQs)

- To achieve this estimation, each NDM Supply Point belongs to an End User Category (EUC)

- EUCs are used to categorise NDM Supply Points in an LDZ and are defined by reference to variables which are maintained in the Supply Point Register

- Each EUC requires an associated Demand Model which represents its gas usage characteristics e.g. weather sensitivity, consumption profile etc

- Demand Models are mathematical models which provides an estimate of gas demand for each EUC by reference to variables determined by DESC

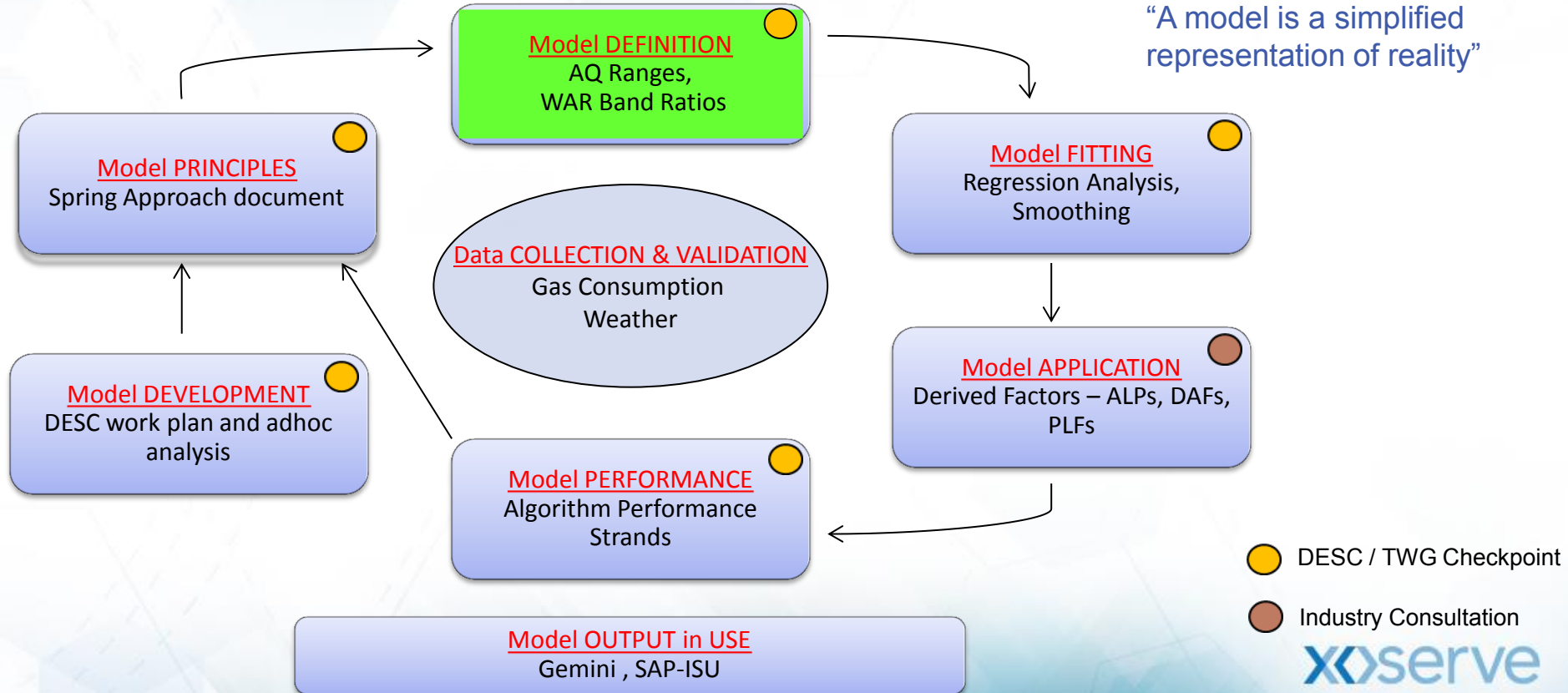xoserve

Background – Demand Estimation

- For each Gas Year, DESC will develop or revise the definitions of the EUCs for the LDZ and the Demand Models for each EUC. The CDSP will then implement these decisions

- The annual process for determining the EUCs and Demand Models for the following gas year begins with the production of a document called the "Spring Approach"

- The Spring Approach provides an overview of the proposed EUC definitions and how the modelling shall be performed, including a reference to the sample data required in order to produce the relevant demand models

- DESC approved the latest version of the Spring Approach after its meeting in February, which included the possibility of deriving additional EUCs in Bands 1 and 2

- Section H of UNC and the NDM Demand Estimation Methodology document provides more detail of the Demand Estimation process

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Background – Demand Modelling Framework

- DESC's obligation of producing a set of End User Categories and Demand Models for the next gas year has to be delivered within certain timescales:

  - The sample data collected for analysis must include the most recent Winter period (December to March), meaning the sample data collation and validation cannot start until early April

  - The Final EUCs and Demand Models must be approved and submitted to the Authority and loaded to CDSP's systems by 15th August

  - In between April and August is when the sample data validation results are reviewed, WAR Band ratios are set, single year models are developed and reviewed, model smoothing is applied, draft Derived Factors are produced and reviewed, followed by an industry consultation commencing early June

- The above explains why it is necessary to agree modelling principles and methodologies in February each year, as there is not time in the Spring/Summer to make fundamental modelling decisions and gain agreement from all DESC members

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Background - EUCs and Demand Model Lifecycle

The purpose of the EUC Demand Model is to represent the behaviour and reactions of the EUC Population

"A model is a simplified representation of reality"

Model DEFINITION
AQ Ranges, WAR Band Ratios

Model PRINCIPLES
Spring Approach document

Model FITTING
Regression Analysis, Smoothing

Data COLLECTION & VALIDATION
Gas Consumption
Weather

Model DEVELOPMENT
DESC work plan and adhoc analysis

Model APPLICATION
Derived Factors – ALPs, DAFs, PLFs

Model PERFORMANCE
Algorithm Performance Strands

Model OUTPUT in USE
Gemini , SAP-ISU

- DESC / TWG Checkpoint
- Industry Consultation

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Spring Approach 2018 - Timetable

High Level View of Demand Estimation Timetable 2018 - Key Checkpoints												

PHASE	JAN'18	FEB'18	MAR'18	APR'18	MAY'18	JUN'18	JUL'18	AUG'18	SEP'18	OCT'18	NOV'18	DEC'18
1. MODEL PRINCIPLES	▒	▒										
Spring Approach 2018 Approved (DESC)		13th Feb										
2. Data COLLECTION & VALIDATION		▒	▒	▒								
Sample data validated (CDSP)				13th Apr								
3. MODEL DEFINITION				▒								
Agree Data Aggregations / WAR Band Limits (TWG)				24th Apr								
4. MODEL FITTING				▒	▒							
Small & Large NDM Single Year modelling review (TWG)					15th May							
5. MODEL APPLICATION					▒	▒	▒					
Publication of Draft Derived Factors (CDSP)						1st June						
Derived Factors Approved for wider industry (TWG/DESC)							9th July					
Final Approval of Derived Factors (DESC)							24th July					
6. MODEL OUTPUT IN USE							▒	▒				
SAP-ISU and Gemini updated (CDSP)								15th Aug				
7. MODEL DEVELOPMENT							▒	▒	▒	▒	▒	▒
Adhoc Work-plan approved (DESC)							24th July					
8. MODEL PERFORMANCE										▒	▒	▒
Strands 1 to 4 reviewed (DESC)												TBC

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Objective – Today's Meeting

- The final objective of the "Model Definition" phase is to agree how the sample points available for modelling (post validation) should be deployed in the next phase "Model Fitting"

- Objective of today's meeting is for TWG to:

    - Review the no. of sample points available for period 1st April 2017 to 31st March 2018

    - Based on data available confirm the EUC definitions which require demand models

    - Agree the most appropriate data sets / aggregations to be used to represent the demand models

    - Agree the Winter Annual Ratio (WAR) Band Thresholds for Bands 3 and above

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Section 2:

Summary of Validated Sample Data

Demand Estimation: Daily Demand Data

- The requirement to develop Demand Models and End User Categories relies upon certain key inputs, these are daily demand data and weather data

- At this meeting the focus is on the daily demand data which this year covers the dates 1st April 2017 to 31st March 2018. This includes a full Easter holiday period (as defined by the modelling system)

- The demand data has been provided from the following sources:

  - Xoserve-managed sample data sets (Bands 1 and 2)
  - Transporter-managed sample data sets (Bands 1 and above)
  - Third party provided sample data sets (Bands 1 and above)

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Demand Estimation: Third Party Data

- Over recent years the numbers of sample points available for modelling from the Transporter managed and Xoserve managed samples have been decreasing

- Following analysis presented at Nov '15 meeting, DESC approved the use of third party supplied data (as allowed in UNC). This was used for the first time in the 2016 modelling and provided a substantial boost to Bands 2 and above

- This year, in addition to the usual plea for more sample data to boost numbers for existing EUCs, there is the added dimension of trying to create new EUCs for Bands 1 and 2 as per the Spring Approach

- This objective meant it was imperative that third party data was provided for different consumer categories than used before e.g. non-domestic and pre-payment

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Demand Estimation: Pre-Payment Data

- Xoserve has not received any daily consumption data for pre-payment meters, however one Third party has provided periodic reads, which if TWG agree, could be considered for modelling

- The EUC modelling system requires daily data to build an EUC demand model, Xoserve's approach to using the periodic data has been as follows:

  - (1) Apply usual cleansing criteria i.e. remove records for obvious errors such as duplicate reads, negative consumptions, infrequent read data etc

  - (2) To create daily demand the principles used from MOD451 were applied i.e. use the appropriate EUC01B WAALPs to apportion the consumption between reads.
  This does mean that a model from a different category of consumers is informing the profile, however there is no other obvious approach ?

  - (3) Apply the same formal validation criteria as used for the Domestic 01B AMR sample

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Demand Estimation: Use of New EUC Models

- Important:
  The use in industry systems of any new EUC demand models developed by DESC, in time for the beginning of Gas Year 2018/19 remains in doubt due to system impacts and potentially industry readiness ?

- As confirmed recently at MOD0644 discussions, changes to 'EUC assignment rules' will require system changes in SAP-ISU. Further updates on the level of change required due to be discussed at the next MOD0644 meeting on 1st May

- Any work developing EUC models this year, even if not used by industry systems, is still valuable e.g.

  - Data collected and analysed would start to build up a history which could contribute to future modelling years i.e. smoothed models for existing EUCs use the 'average effect' from 3 historic years
  - New EUC profiles could also be used 'off-line' to simulate NDM allocation and explore whether they have improved accuracy and subsequent UiG levels

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Demand Estimation: Summary of Validated Data

- Validated sample counts – numbers provided are supply points

EUC Bands: Range *Source data*	2017/18 data	2016/17 data
Band 1: 0 to 73.2 MWh pa *Xoserve-managed, Third party provided*	2,068 Domestic (-309) 2,783 Non-Domestic 1,962 Pre-Payment	2,377 Domestic N/A N/A
Bands 2 to 4: 73.2 to 2,196 MWh pa *Xoserve-managed, Transporter-managed and Third party provided*	12,787 (+6,556)	6,231
Bands 5 to 9: > 2,196 MWh pa *Transporter-managed and Third party provided*	2,832 (-115)	2,947

- <u>Band 1:</u> Large reduction again in Domestic sample population (see next slide)
  Third party data is source of Non-Domestic and Pre-Payment sample data

- <u>Bands 2 and above:</u> There has been a significant increase in the sample numbers for Bands 2 to 4 as a result of Third party data provision. Bands 5 to 9 has seen a slight decrease

- Spreadsheet **TW_A_SAMPLE_VAL_SUMM_240418.xlsx** provides details of validation outcomes, including reasons for validation failures

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Xoserve Managed Sample (Band 1 Domestics)

Xoserve Managed Sample - Count of Daily Reads
(last 5 Spring Analysis)
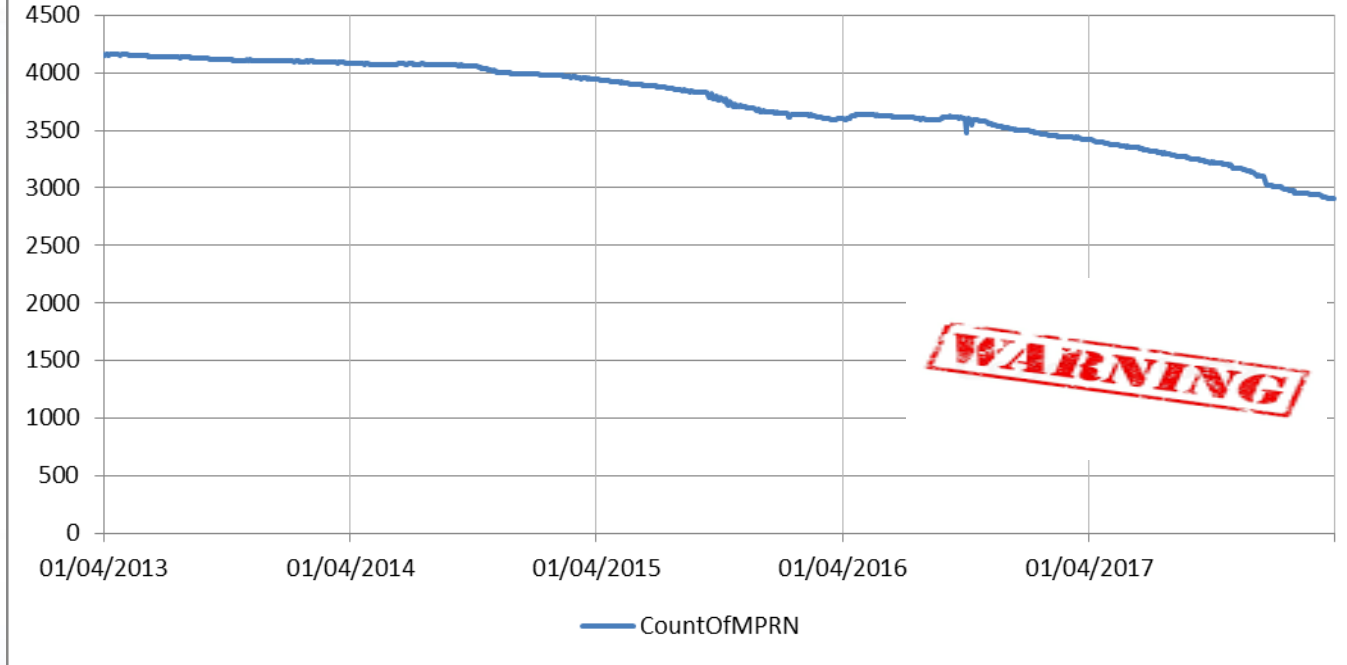
- Spring 2014: ⬇1.38%

- Spring 2015: ⬇3.43%

- Spring 2016: ⬇8.60%

- Spring 2017: ⬇5.05%

- Spring 2018: ⬇**14.93%**

- Band 1 'Domestic' Model urgently requires support from industry for future modelling years

Sample losses due to SMART metering programme not sustainable

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Small NDM (<2,196 MWh pa)

- EUC consumption ranges not prescribed in Uniform Network Code

- Current EUC Bands / Consumption Ranges for Small NDM (<2,196 MWh pa):
  - Band 1: 0 – 73.2 MWh pa
  - Band 2: 73.2 – 293 MWh pa
  - Band 3: 293 – 732 MWh pa
  - Band 4: 732 – 2,196 MWh pa

- There are no proposed changes to the AQ ranges used in EUC definitions for Gas Year 2018/19, however, if sufficient data available to support demand model production, then three EUCs are proposed to represent each of Band 1 and 2

- These three EUCs would represent Domestic, Non-Domestic and Pre-payment consumers

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Section 3:

Review of Sample Data for Small NDM

Sample numbers & proposed aggregations for
EUC Consumptions Bands: 1 to 4

AQ Range: <2,196 MWh pa

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Total NDM Population Counts: AQ & Supply Point

EUC Bands: Range	% of Total NDM	
	Total AQ	Total SP Count
Band 1: 0 to 73.2 MWh pa	72.66%	98.87%
Bands 1 to 2: 0 to 293 MWh pa	78.88%	99.71%
Bands 1 to 4: 0 to 2,196 MWh pa	88.65%	99.97%
Bands 5 to 9: >2,196 MWh pa	11.35%	0.03%

- Small NDM is the main component of the overall NDM

  - Band 1 (0-73.2 MWh pa) constitutes nearly 3/4 of overall NDM (on an AQ basis)
  - Bands 1 to 2 (0-293 MWh pa) constitutes nearly 4/5 of overall NDM
  - Bands 1 to 4 (0-2196 MWh pa) constitutes nearly 9/10 of overall NDM

- Large NDM is very much a minority component of overall NDM

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Small NDM Consumption Bands: Review of data

EUC Bands: Range	Comments on 2017/18 data Proposed Aggregations	Final Aggregations for 2016/17
Band 1 PPM: 0 to 73.2 MWh pa	Individual LDZ analysis (NW/WN combined)	N/A
Band 1 Domestic: 0 to 73.2 MWh pa	Individual LDZ analysis (NW/WN combined)	Individual LDZ analysis (NW/WN combined)
Band 1 Non-Domestic: 0 to 73.2 MWh pa	Individual LDZ analysis (NW/WN combined)	N/A
Band 2 PPM: 73.2 to 293 MWh pa	Sample size issues - No model viable	N/A
Band 2 Domestic: 73.2 to 293 MWh pa	Sample size issues - National model possible	N/A
Band 2 Non-Domestic: 73.2 to 293 MWh pa	Individual LDZ analysis (NW/WN combined)	Individual LDZ analysis (NW/WN combined)
Band 3 : 293 to 732 MWh pa	Individual LDZ analysis (NW/WN combined)	Individual LDZ analysis(NW/WN combined)
Band 4 : 732 to 2,196 MWh pa	Individual LDZ analysis (NW/WN combined)	Individual LDZ analysis (NW/WN combined)

- Spreadsheet **TW_B_SAMPLE_POP_SMALL_240418.xlsx** provides sample numbers per LDZ for Bands 1 to 4 and any recommendations for additional runs

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Section 3 continued:

Review of Sample Data for Small NDM

Sample numbers, proposed aggregations and WAR band thresholds for EUC WAR Bands: 3 to 4

AQ Range: 293 to 2,196 MWh pa

Winter: Annual Ratio (WAR) Band EUCs

- Higher AQ Bands where meter points are monthly read have a standard EUC plus 4 differential EUCs based on ratio of winter consumption to total annual consumption

- Sites with adequate read history allocated automatically to a WAR Band based on system calculation during AQ review
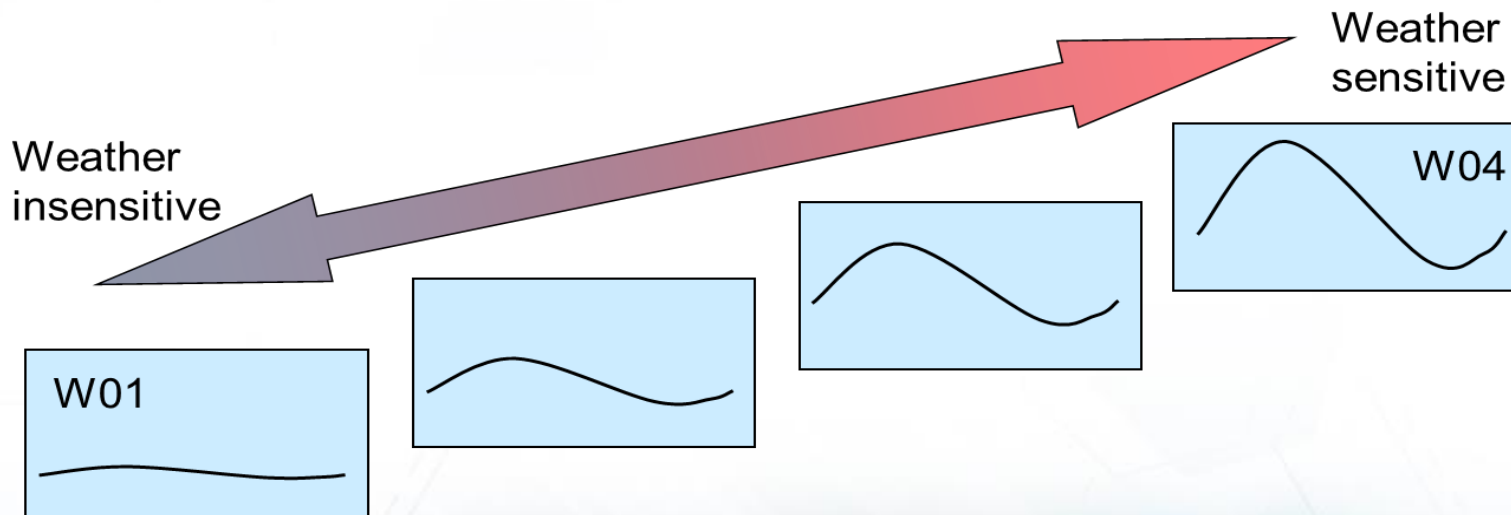
Winter to Annual Ratio (WAR) Band EUCs

- The WAR value of a supply point is defined as the actual consumption in the months December to March divided by the new supply point AQ

- Since the numerator is actual demand and the denominator is weather corrected annual consumption, WAR values change from year to year

- The limits defining WAR band EUCs are those applicable to the most recent winter (in this case winter 2017/18)

- This is essential because supply points will be assigned to these newly defined WAR band EUCs (for 2018/19) based on their (Dec-Mar) consumption behaviour over winter 2017/18

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WAR Band basics

- WAR values are affected by December to March weather experience:
  - 2017/18 was considerably colder than 2016/17, so thresholds can be expected to rise this year

- When setting WAR band limits, the approach previously adopted is to aim for a 20%:30%:30%:20% split of sample numbers on a national basis

- There are practical limitations due to the actual distribution of WAR values of individual sample supply points in the consumption band

  - WAR band ratio boundaries will again be defined at 3 decimal points to make it easier to get closer to the target % splits

- For practical reasons we can only proceed to the modelling stage with one WAR band definition per band

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Small NDM WAR Bands: Review of data

EUC Bands: Range	Comments on 2017/18 data Proposed Aggregations	Final Aggregations for 2016/17
Band 1: 0 to 73.2 MWh pa	Not generally Monthly read – no WAR Bands	
Band 2: 73.2 to 293 MWh pa	Not generally Monthly read – no WAR Bands	
Band 3 and Band 4 (combined): 293 to 2196 MWh pa	Individual LDZ analysis (NW/WN combined)	Individual LDZ analysis (NW/WN, WS/SW combined)

- Spreadsheet **TW_B_SAMPLE_POP_SMALL_240418.xlsx** (Table B.9) for recommendation on aggregations and WAR Band thresholds

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Section 4:

Review of Sample Data for Large NDM

Sample numbers & proposed aggregations for
EUC Consumptions Bands: 5 to 9

AQ Range: <2,196 MWh pa

Large NDM (>2,196 MWh pa)

- Current EUC Bands / Consumption Ranges for Large NDM:

  - Band 5: 2,196 to 5,860 MWh
  - Band 6: 5,860 to 14,650 MWh   } 1 Consumption Band
  - Band 7: 14,650 to 29,300 MWh   x4 Winter Annual Ratio (WAR) Bands
  - Band 8: 29,300 to 58,600 MWh
  - Band 9: >58,600 MWh   1 Contingency Band for sites which should be DM

- There are no proposed changes to EUC definitions for Gas Year 2018/19

- However, underlying demand modelling can be done on basis of more broadly aggregated bands

  - DESC agreed in Spring 2014, as part of the adhoc analysis of EUC Definitions, that the bands 14,650 to 29,300 (Band 7) and 29,300 to 58,600 (Band 8) could be merged for modelling purposes if necessary

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Total NDM Population Counts: AQ & Supply Point

EUC Bands: Range	% of Total NDM	
	Total AQ	Total SP Count
Band 1: 0 to 73.2 MWh pa	72.66%	98.87%
Bands 1 to 2: 0 to 293 MWh pa	78.88%	99.71%
Bands 1 to 4: 0 to 2,196 MWh pa	88.65%	99.97%
Bands 5 to 9: >2,196 MWh pa	11.35%	0.03%

- Large NDM remains very much a minority component of overall NDM

  - Bands 5 to 9 (>2,196 MWh pa) constitutes approx. 1/10 of overall NDM (on an AQ basis)

- Small NDM is the main component of the overall NDM

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Large NDM Consumption Bands: Review of data

EUC Bands: Range	Comments on 2017/18 data Proposed Aggregations	Final Aggregations for 2016/17
Band 5: 2,196 to 5,860 MWh pa	Individual LDZ analysis (NW/WN combined)	Individual LDZ analysis (NW/WN combined)
Band 6: 5,860 to 14,650 MWh pa	Low sample size in WS See s/sheet for recommendation (Table C.2)	Individual LDZ analysis (NW/WN combined)
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	Low sample sizes in WS, NT, SE & SO See s/sheet for recommendation (Table C.3)	Individual LDZ analysis (NW/WN, WS/SW, SE/SO combined)
Band 9: >58,600 MWh pa	National	National

- Spreadsheet **TW_C_SAMPLE_POP_LARGE_240418.xlsx** provides sample numbers per LDZ for Bands 5 to 9 and any recommendations for additional runs

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Section 4 continued:

Review of Sample Data for Large NDM

Sample numbers, Proposed aggregations and WAR band thresholds for EUC WAR Bands: 5 to 8

AQ Range: 2,196 to 58,600 MWh

Large NDM WAR Bands: Review of data

EUC Bands: Range	Comments on 2017/18 data Proposed Aggregations	Final Aggregations for 2016/17
Band 5: 2,196 to 5,860 MWh pa	5 LDZ Groups See s/sheet for recommendation (Table C.5)	By 5 LDZ Groups
Band 6: 5,860 to 14,650 MWh pa	3 LDZ Groups (Table C.6)	By 3 LDZ Groups
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	3 or 2 LDZ Groups (Table C.7)	By 3 LDZ Groups
Band 9: >58,600 MWh pa	N/A - No WAR Bands	

- Spreadsheet **TW_C_SAMPLE_POP_LARGE_240418.xlsx** provides sample numbers per LDZ for Bands 5 to 8 and any recommendations for additional runs

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Section 5:

Meeting Summary –
Review, Conclusions and Next Steps

Meeting Summary

- Summary of decisions reached

- Recap on agreed actions, owners and timescales

- Any further questions about this stage ?

- Next steps towards TWG check point in May:

  - Xoserve to commence single year modelling once all the definitions of this years EUC models have been agreed
  - Xoserve may contact TWG for prompt decisions on modelling analysis (probably by email)
  - TWG meeting booked for Tuesday 15th May

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