# Demand Estimation Technical Work Group

## Data Validation and Aggregations - Spring 2019

24th April 2019

# Contents

# 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

# 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 include the 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

# Background: Demand Estimation

- DESC agreed that it would be good practice if the validated sample sites for Band 1 Domestic and Band 2 Non Domestic sites are sourced appropriately from the following sub bands:
  - Band 1: 0-10, 10-20, 20-30 and 30-73.2 MWh
  - Band 2: 73.2-140, 140-210 and 210-293 MWh

- Where the validated sample points for a particular EUC band are well in excess of the ideal target numbers, DESC agreed that a process should be created to select the required number of sample points needed to be representative of the population (which means in these cases not using all of the sample points available).

- Xoserve and Network managed samples will be prioritised ahead of third party data. Any additional sites obtained from third party provided data will be randomly selected to avoid any shipper bias in the demand profiles created.

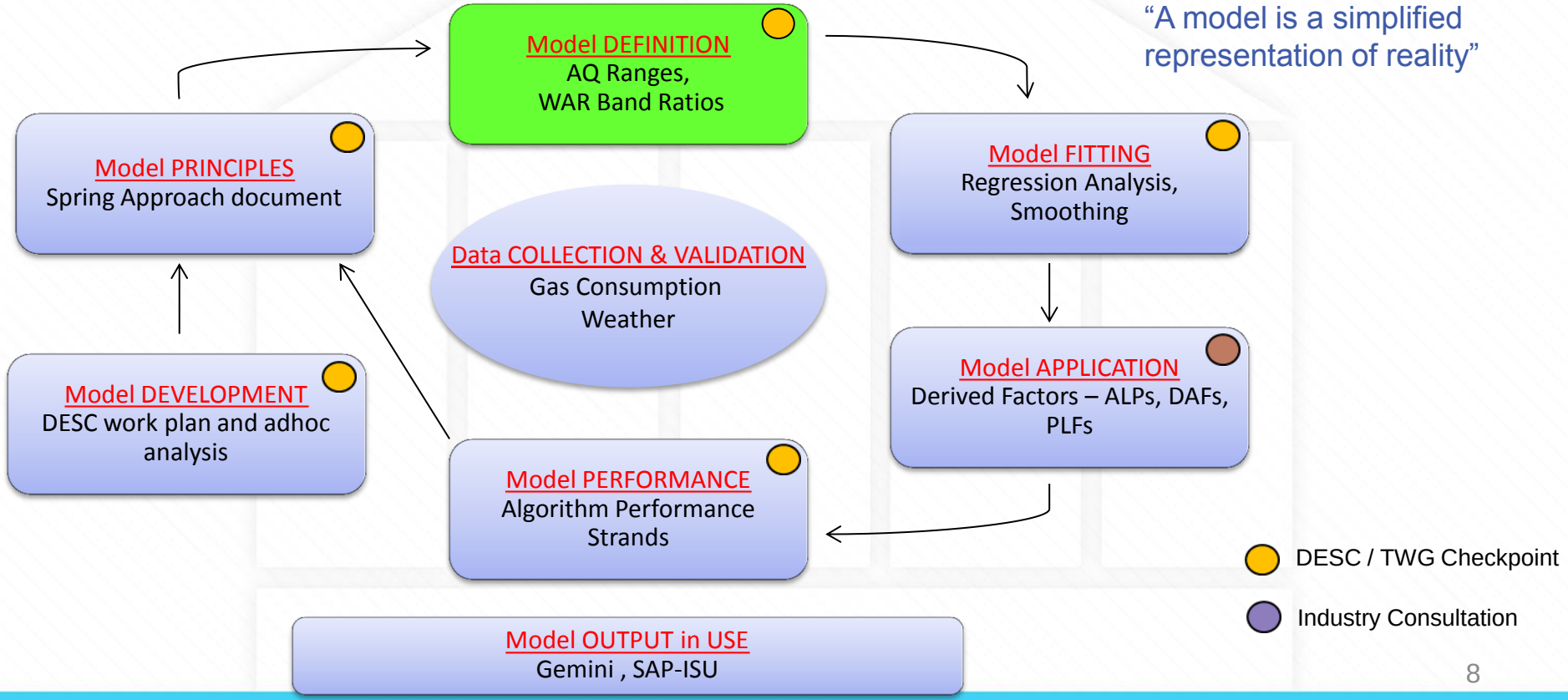
# Background: Demand Modelling Framework

- 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

# Background: EUC & 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"



# Demand Estimation Timetable - 2019

**High Level View of Demand Estimation Timetable 2019 - Key Checkpoints**

| PHASE | JAN'19 | FEB'19 | MAR'19 | APR'19 | MAY'19 | JUN'19 | JUL'19 | AUG'19 | SEP'19 | OCT'19 | NOV'19 | DEC'19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. MODEL PRINCIPLES | | | | | | | | | | | | |
| Spring Approach 2019 Approved (DESC) | | 11th Feb | | | | | | | | | | |
| 2. Data COLLECTION & VALIDATION | | | | | | | | | | | | |
| Sample data validated (CDSP) | | | | 15th Apr | | | | | | | | |
| 3. MODEL DEFINITION | | | | | | | | | | | | |
| Agree Data Aggregations / WAR Band Limits (TWG) | | | | 24th Apr | | | | | | | | |
| 4. MODEL FITTING | | | | | | | | | | | | |
| Small & Large NDM Single Year modelling review (TWG) | | | | | 13th May | | | | | | | |
| 5. MODEL APPLICATION | | | | | | | | | | | | |
| Publication of Draft Derived Factors (CDSP) | | | | | | 3rd Jun | | | | | | |
| Derived Factors Approved for wider industry (TWG/DESC) | | | | | | | 8th Jul | | | | | |
| Final Approval of Derived Factors (DESC) | | | | | | | 22nd Jul | | | | | |
| 6. MODEL OUTPUT IN USE | | | | | | | | | | | | |
| SAP-ISU and Gemini updated (CDSP) | | | | | | | | 15th Aug | | | | |
| 7. MODEL DEVELOPMENT | | | | | | | | | | | | |
| Adhoc Work-plan approved (DESC) | | | | | | | 22nd Jul | | | 7th Oct | | |
| 8. MODEL PERFORMANCE | | | | | | | | | | | | |
| Strands 1 to 4 reviewed (DESC) | | | | | | | | | | | | 9th Dec |

# Objective

- 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 March 2018 to 31st March 2019

  - 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

# 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 March 2018 to 31st March 2019. 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)

# Demand Estimation: New EUC Models

- For Gas Year 2019/20 DESC have proposed additional EUCs for Bands 1 and 2
- Each new EUC will require an underlying demand model and in some cases it is anticipated that EUCs will not have its own unique demand model (see Spring Approach), last year we were able to create additional models for the following:
  - – i) meter points in Band 1 (0-73.2 MWh pa) which are categorised as non-domestic
  - – ii) meter points in Band 1 (0-73.2 MWh pa) which use pre-payment meters
  - – iii) meter points in Band 2 (73.2-293 MWh pa) which are categorised as domestic
- To produce demand models for the above again this year will be reliant upon receiving the appropriate sample data

# 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.
- MOD654s (which mandates shippers to provide NDM sample data) became effective on 1st March 2019. Whilst it is expected that this MOD will result in an increase in data going forward, affected Shippers were again contacted to request voluntary sample data covering the modelling period 1st March‘18 to 31st March‘19.
- With the expected increase in sample data numbers, there is also a new requirement to stratify the sample data in Bands 01 and 02 to ensure that it is representative of the population (as detailed in the Spring Approach).

# Demand Estimation: Summary of Validated Data

- Validated sample counts – numbers provided are supply points

| **EUC Bands: Range**<br>*Source data* | 2018/19 data | 2017/18 data |
|---|---|---|
| **Band 1: 0 to 73.2 MWh pa**<br>*Xoserve-managed, Third party provided* | 4,258 Domestic<br>2,510 Non-Domestic<br>1,120 Pre-Payment | 2,068 Domestic<br>2,783 Non-Domestic<br>1,962 Pre-Payment |
| **Bands 2 to 4: 73.2 to 2,196 MWh pa**<br>*Xoserve-managed, Transporter-managed and Third party provided* | 9,308 | 12,787 |
| **Bands 5 to 9: > 2,196 MWh pa**<br>*Transporter-managed and Third party provided* | 2,354 | 2,832 |

- Band 1: Large increase in Domestic sample population
- Bands 2 to 4: Additional third party provided data allowed us to stratify the data in Band 2.
- Bands 5 to 9 have seen a slight decrease.

- Spreadsheet TW_A_SAMPLE_VAL_SUMM_240419.xlsx provides details of validation outcomes, including reasons for validation failures.

# 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

# 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 | 72.40% | 98.86% |
| Bands 1 to 2: 0 to 293 MWh pa | 78.65% | 99.70% |
| Bands 1 to 4: 0 to 2,196 MWh pa | 88.40% | 99.97% |
| Bands 5 to 9: >2,196 MWh pa | 11.60% | 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

# Small NDM (<2,196 MWh pa)

- EUC consumption ranges not prescribed in Uniform Network Code
- Proposed EUC Bands / Consumption Ranges for Small NDM (<2,196 MWh pa):
  - Band 1: 0 – 73.2 MWh pa
    - Prepayment Domestic
    - Non Prepayment Domestic
    - Prepayment I&C
    - Non Prepayment I&C
  - Band 2: 73.2 – 293 MWh pa
    - Prepayment Domestic
    - Non Prepayment Domestic
    - Prepayment I&C
    - Non Prepayment I&C
  - Band 3: 293 – 732 MWh pa
  - Band 4: 732 – 2,196 MWh pa

# Small NDM Consumption Bands: Review of data

| EUC Bands: Range | Comments on 2018/19 data<br>Proposed Aggregations | Final Aggregations<br>for 2017/18 |
|---|---|---|
| **Band 1 PPM Domestic:**<br>**0 to 73.2 MWh pa** | Individual LDZ analysis<br>(**including WN on its own**) | Individual LDZ analysis (NW/WN combined) |
| **Band 1 Non PPM Domestic:**<br>**0 to 73.2 MWh pa** | Individual LDZ analysis<br>(**including WN on its own**) | Individual LDZ analysis (NW/WN combined) |
| **Band 1 PPM I&C:**<br>**0 to 73.2 MWh pa** | Sample size issues - No model viable | N/A |
| **Band 1 Non PPM I&C:**<br>**0 to 73.2 MWh pa** | Individual LDZ analysis<br>(including WN on its own) | Individual LDZ analysis (NW/WN combined) |

- Spreadsheet TW_B_SAMPLE_POP_SMALL_240419.xlsx provides sample numbers per LDZ for Bands 1 to 4 and any recommendations for additional runs

# Small NDM Consumption Bands: Review of data

| EUC Bands: Range | Comments on 2018/19 data<br>Proposed Aggregations | Final Aggregations<br>for 2017/18 |
|---|---|---|
| **Band 2 PPM Domestic:**<br>**73.2 to 293 MWh pa** | Sample size issues - No model viable | N/A |
| **Band 2 Non PPM Domestic:**<br>**73.2 to 293 MWh pa** | Sample size issues - National model possible | Sample size issues - National model possible |
| **Band 2 PPM I&C:**<br>**73.2 to 293 MWh pa** | Sample size issues - No model viable | N/A |
| **Band 2 Non PPM I&C:**<br>**73.2 to 293 MWh pa** | Individual LDZ analysis<br>(including WN on its own) | Individual LDZ analysis<br>(NW/WN combined) |
| **Band 3 :**<br>**293 to 732 MWh pa** | Individual LDZ analysis<br>(including WN on its own) | Individual LDZ analysis<br>(NW/WN combined) |
| **Band 4 :**<br>**732 to 2,196 MWh pa** | Individual LDZ analysis<br>(including WN on its own) | Individual LDZ analysis<br>(NW/WN combined) |

- Spreadsheet TW_B_SAMPLE_POP_SMALL_240419.xlsx provides sample numbers per LDZ for Bands 1 to 4 and any recommendations for additional runs

# Section 3 continued:
# Review of Sample Data for Small NDM

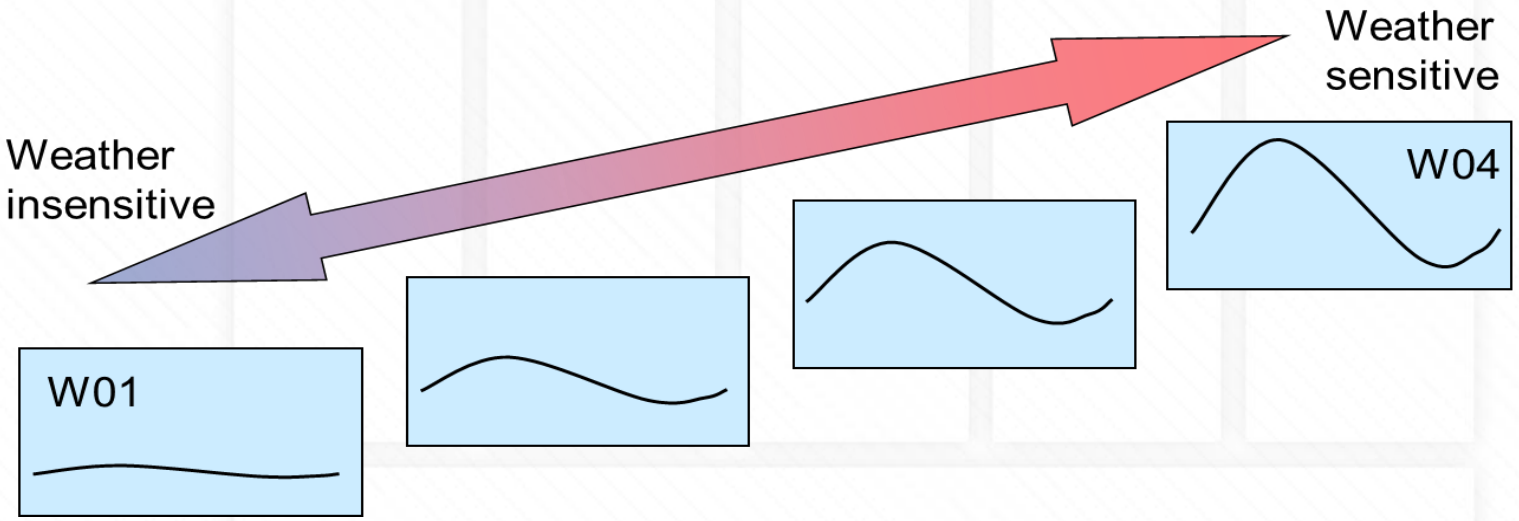
Sample numbers, proposed aggregations and WAR band thresholds for EUC WAR Bands: 3 to 4

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 2018/19)
- This is essential because supply points will be assigned to these newly defined WAR band EUCs (for 2019/20) based on their (Dec-Mar) consumption behaviour over winter 2018/19

# WAR Band basics

- WAR values are affected by December to March weather experience:
  - 2018/19 was considerably milder than 2017/18, so thresholds can be expected to decrease 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

# Small NDM WAR Bands: Review of data

| EUC Bands: Range | Comments on 2018/19 data Proposed Aggregations | Final Aggregations for 2017/18 |
|---|---|---|
| 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 | 1) INDIVIDUAL LDZ Analysis with NW/WN combined<br>2) INDIVIDUAL LDZ with NW/WN and WS/SW combined<br>(Table B.9) | Individual LDZ analysis (NW/WN combined) |

- Spreadsheet TW_B_SAMPLE_POP_SMALL_240419.xlsx (Table B.9) for recommendation on aggregations and WAR Band thresholds

# 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
  - Band 7: 14,650 to 29,300 MWh
  - Band 8: 29,300 to 58,600 MWh

  1 Consumption Band
  x4 Winter Annual Ratio (WAR) Bands

  - 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 2019/20
- 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

# 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 | 72.40% | 98.86% |
| Bands 1 to 2: 0 to 293 MWh pa | 78.65% | 99.70% |
| Bands 1 to 4: 0 to 2,196 MWh pa | 88.40% | 99.97% |
| Bands 5 to 9: >2,196 MWh pa | 11.60% | 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

# Large NDM Consumption Bands: Review of data

| EUC Bands: Range | Comments on 2018/19 data<br>Proposed Aggregations | Final Aggregations<br>for 2017/18 |
|---|---|---|
| **Band 5: 2,196 to 5,860 MWh pa** | Individual LDZ analysis<br>(NW/WN combined) | Individual LDZ analysis<br>(NW/WN combined) |
| **Band 6: 5,860 to 14,650 MWh pa** | Low sample size in WN, WS & EA<br>See s/sheet for recommendation<br>(Table C.2) | Individual LDZ analysis<br>(NW/WN combined) |
| **Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa** | Low sample sizes in NO, WN, WS, EA, NT, SE, SO, SW<br>See s/sheet for recommendation<br>(Table C.3) | Individual LDZ analysis<br>(NW/WN, WS/SW and SE/SO combined) |
| **Band 9: >58,600 MWh pa** | National | National |

- Spreadsheet TW_C_SAMPLE_POP_LARGE_240419.xlsx provides sample numbers per LDZ for Bands 5 to 9 and any recommendations for additional runs

# 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 2018/19 data Proposed Aggregations | Final Aggregations for 2017/18 |
|---|---|---|
| Band 5: 2,196 to 5,860 MWh pa | 5 LDZ GROUP with SC as an INDIVIDUAL LDZ | 5 LDZ Groups |
| Band 6: 5,860 to 14,650 MWh pa | 3 or 2 LDZ Groups (Table C.6) | 3 LDZ Groups |
| Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa | National or 2 LDZ Groups (Table C.7) | 3 LDZ Groups |
| Band 9: >58,600 MWh pa | N/A - No WAR Bands | |

- Spreadsheet TW_C_SAMPLE_POP_LARGE_240419.xlsx provides sample numbers per LDZ for Bands 5 to 8 and any recommendations for additional runs

# 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 Monday13th May