Demand Estimation Sub Committee Technical Work Group

Data Validation and Aggregations - Spring 2020

27th April 2020

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Section 1:
Background, Timetable and Objectives of Meeting
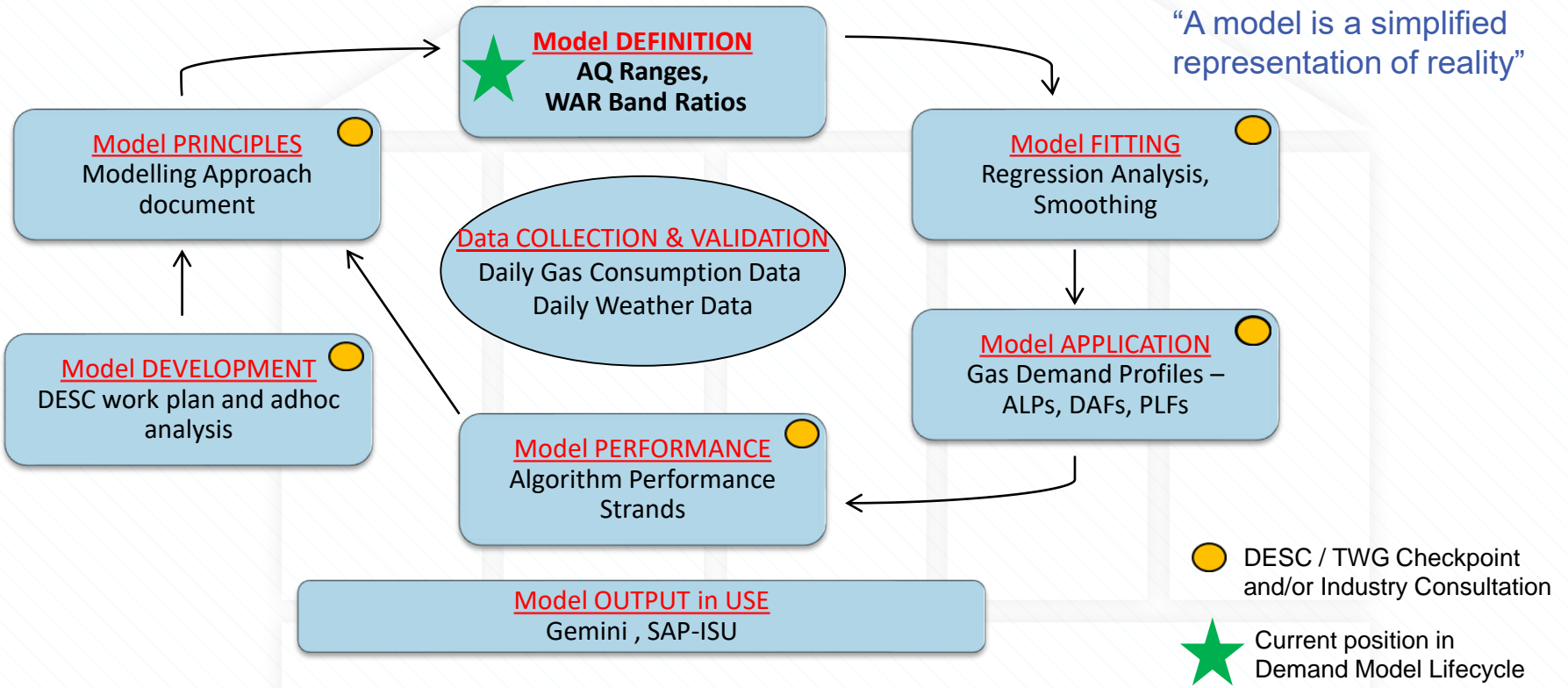
Background: Demand Estimation

- 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 "Modelling Approach"

- The Modelling 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 Modelling Approach after its meeting in February

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

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

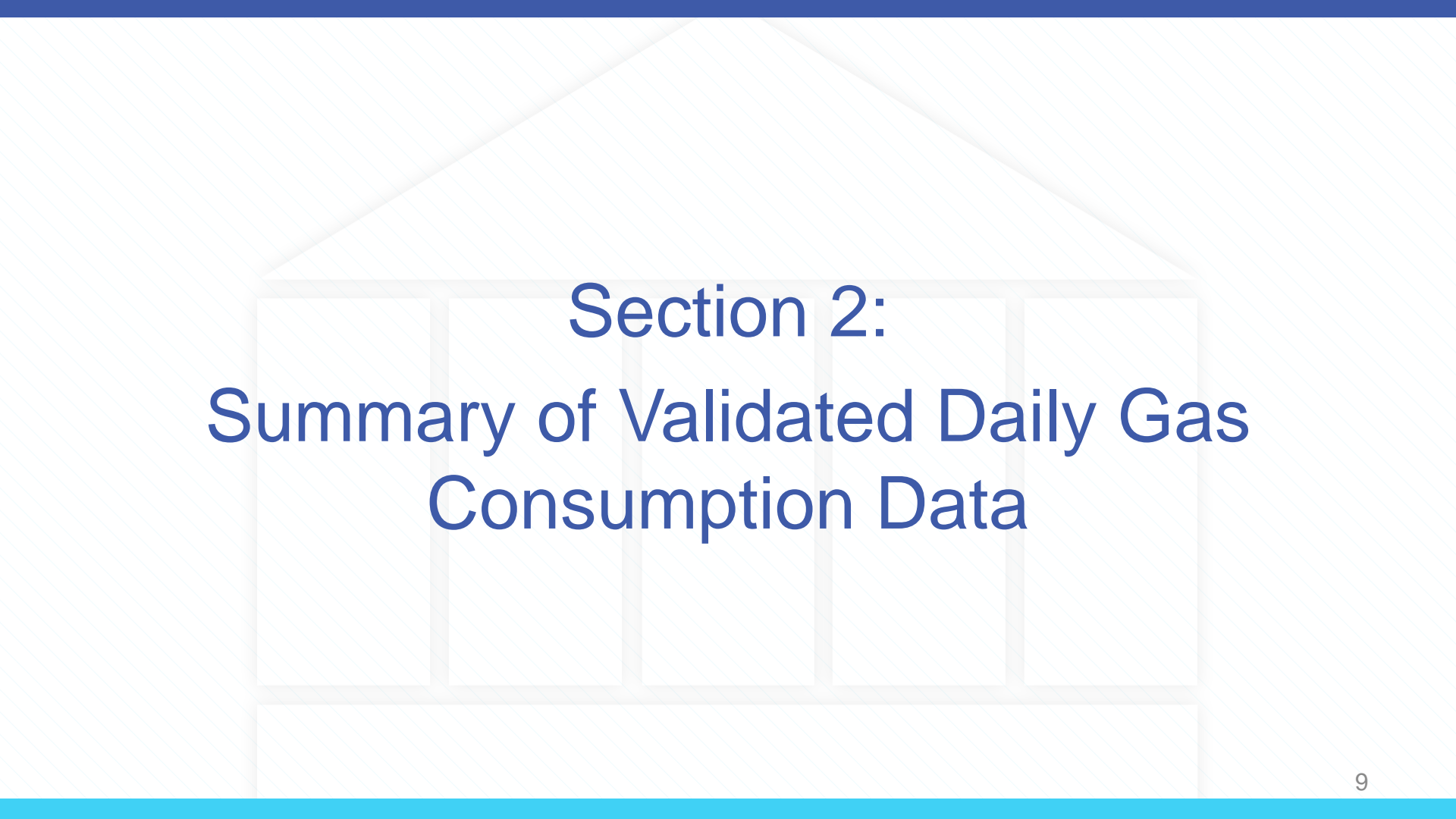The purpose of the Gas Demand EUC Model is to represent the behaviour and reactions of the EUC Population

"A model is a simplified representation of reality"

Model DEFINITION
AQ Ranges,
WAR Band Ratios

Model PRINCIPLES
Modelling Approach document

Data COLLECTION & VALIDATION
Daily Gas Consumption Data
Daily Weather Data

Model FITTING
Regression Analysis, Smoothing

Model DEVELOPMENT
DESC work plan and adhoc analysis

Model APPLICATION
Gas Demand Profiles – ALPs, DAFs, PLFs

Model PERFORMANCE
Algorithm Performance Strands

Model OUTPUT in USE
Gemini , SAP-ISU

DESC / TWG Checkpoint and/or Industry Consultation

Current position in Demand Model Lifecycle

Demand Estimation Timetable - 2020

High Level View of Demand Estimation Timetable 2020 - Key Checkpoints												

PHASE	JAN'20	FEB'20	MAR'20	APR'20	MAY'20	JUN'20	JUL'20	AUG'20	SEP'20	OCT'20	NOV'20	DEC'20
1. MODEL PRINCIPLES												
Modelling Approach 2020 Approved (DESC)		10th Feb										
2. Data COLLECTION & VALIDATION												
Daily Gas Consumption Data validated (CDSP)				15th Apr								
3. MODEL DEFINITION												
Agree Data Aggregations / WAR Band Limits (TWG)				27th Apr								
4. MODEL FITTING												
Gas Demand EUC Modelling review (TWG)					18th May							
5. MODEL APPLICATION												
Publication of Draft Gas Demand Profiles (CDSP)						5th Jun						
Gas Demand Profiles Approved for wider industry (TWG/DESC)							6th Jul					
Final Approval of Gas Demand Profiles (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			5th Oct		
8. MODEL PERFORMANCE												
Strands 1 to 3 reviewed (DESC)												7th Dec

Objective

- The 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 2019 to 31st March 2020

  - 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 Daily Gas Consumption Data

Demand Estimation: Daily Gas Consumption Data

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

- At this meeting the focus is on the daily gas consumption data which this year covers the period 1st April 2019 to 31st March 2020. This includes a full Easter holiday period (as defined by the modelling system)

- The daily gas consumption data has been provided from the following sources:
  - Xoserve-managed sample data sets
  - Transporter-managed sample data sets
  - Third party provided sample data sets

- Validation is applied to the daily gas consumption data in order to minimise data errors and therefore enhance the accuracy of the subsequent EUC gas demand models.
  The validation is set out in the Modelling Approach document here (Appendix 2)

Demand Estimation: Target Numbers and Stratification

- DESC agreed at its meeting on 10th December 2018 to apply a stratification method to Band 1 Domestic and Band 2 Non-Domestic sites. The following sub bands were agreed:
  - 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.

Demand Estimation: Validation Audit Trail

Analysis Period	**01/04/19 to 31/03/20**
START: MPRs with at least 300 'Daily Gas Consumption Data' records present within the analysis period	**39,593**
REMOVED: MPRs not on SAP-ISU	**138**
REMOVED: Exceeds Missing Read Tolerance	**8,565**
REMOVED: Exceeds Consecutive Zero Consumption Tolerance	**5,596**
REMOVED: Exceeds Maximum vs Average Consumption Tolerance (Spikes)	**927**
REMOVED: AQ Ratio Failures	**2,397**
REMOVED: Winter vs Summer Consumpiton Ratio Tolerance (Band 09B sites)	**31**
REMOVED: Winter Annual Ratio (WAR) less than 20%	**68**
REMOVED: Other (i.e. Scottish Independent LDZs; AQ Too Small; PrePayment above Band 02)	**246**
REMOVED: TOTAL	**17,968**
PASSED VALIDATION (Pre Stratification)	**21,625**
REMOVED: MPRs not required following Stratification	**3,791**
PASSED VALIDATION (Post Stratification)	**17,834**

Demand Estimation: Summary of Validated Data

- Validated sample counts – numbers provided are supply points

EUC Bands: Range *Source data*	2019/20 data	2018/19 data
Band 1: 0 to 73.2 MWh pa *Xoserve-managed, Third party provided*	4,052 Domestic 3,432 Non-Domestic 22 Pre-Payment	4,258 Domestic 2,510 Non-Domestic 1,120 Pre-Payment
Band 2: 73.2 to 293 MWh pa *Xoserve-managed, Transporter-managed and Third party provided*	109 Domestic 4,968 Non-Domestic 1 Pre-Payment	109 Domestic 5,274 Non-Domestic 2 Pre-Payment
Bands 3 to 4: 293 to 2,196 MWh pa *Transporter-managed and Third party provided*	6,265	6,908
Bands 5 to 9: > 2,196 MWh pa *Transporter-managed and Third party provided*	2,776	2,354

- Note: During the validation process it was apparent again that the Market Sector Code (MSC) held on UK Link is not always reliable. In the absence of any other information, accuracy of the EUC demand models and also now EUC assignment (since XRN4665 was implemented in GY 19/20) will continue to be impacted

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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

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	71.98%	98.83%
Bands 1 to 2: 0 to 293 MWh pa	78.34%	99.70%
Bands 1 to 4: 0 to 2,196 MWh pa	88.17%	99.97%
Bands 5 to 9: >2,196 MWh pa	11.83%	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 Band 1

EUC Bands: Range	Comments on 2019/20 data Proposed Aggregations	Final Aggregations for 2018/19
Band 1 PPM Domestic: 0 to 73.2 MWh pa	Sample size issues - No model viable	Individual LDZ analysis (including WN on its own)
Band 1 Non PPM Domestic: 0 to 73.2 MWh pa	Individual LDZ analysis for all LDZs	Individual LDZ analysis (including WN on its own)
Band 1 PPM I&C: 0 to 73.2 MWh pa	Sample size issues - No model viable	Sample size issues - No model viable
Band 1 Non PPM I&C: 0 to 73.2 MWh pa	Individual LDZ analysis for all LDZs	Individual LDZ analysis (including WN on its own)

- Spreadsheet TW_B_SAMPLE_POP_SMALL_270420.xlsx provides sample numbers per LDZ for Bands 1 to 4 and any recommendations for additional runs

Pre-Payment EUC Demand Models

- As expected and trailed on an email to TWG on 3rd April we have not been able to source enough sample points to derive an EUC demand model

- Last year, following some 'unconvincing' modelling results provided by 3rd party data, TWG agreed to use the demand model developed for UNC Modification 0451AV

- In the absence of any other sources of daily gas consumption data for Pre-payment supply points, there appears to be 2 options:

    - Use the equivalent 'Non PPM' demand model (so profiles will be the same as credit)
    - Roll forward the current PPM demand model (based on data that is 8 years old and yet to be proven (algorithm performance not done – also needs data !)

- TWG thoughts welcome ?

Small NDM Consumption Bands: Review of Bands 2-4

EUC Bands: Range	Comments on 2019/20 data Proposed Aggregations	Final Aggregations for 2018/19
Band 2 PPM Domestic: 73.2 to 293 MWh pa	Sample size issues - No model viable	Sample size issues - No model viable
Band 2 Non PPM Domestic: 73.2 to 293 MWh pa	1) 2 LDZ Group (SC/NO/NW/WN/NE/EM/WM & EA/NT/SE/WS/SO/SW) 2) National	2 LDZ Group (SC/NO/NW/WN/NE/EM/WM & EA/NT/SE/WS/SO/SW)
Band 2 PPM I&C: 73.2 to 293 MWh pa	Sample size issues - No model viable	Sample size issues - No model viable
Band 2 Non PPM I&C: 73.2 to 293 MWh pa	1) Individual LDZ analysis for all LDZs 2) Individual LDZ for most LDZs except WN being combined with NW	Individual LDZ analysis (including WN on its own)
Band 3 : 293 to 732 MWh pa	Individual LDZ analysis for all LDZs	Individual LDZ analysis (including WN on its own)
Band 4 : 732 to 2,196 MWh pa	Individual LDZ analysis for all LDZs	Individual LDZ analysis (including WN on its own)

- Spreadsheet TW_B_SAMPLE_POP_SMALL_270420.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
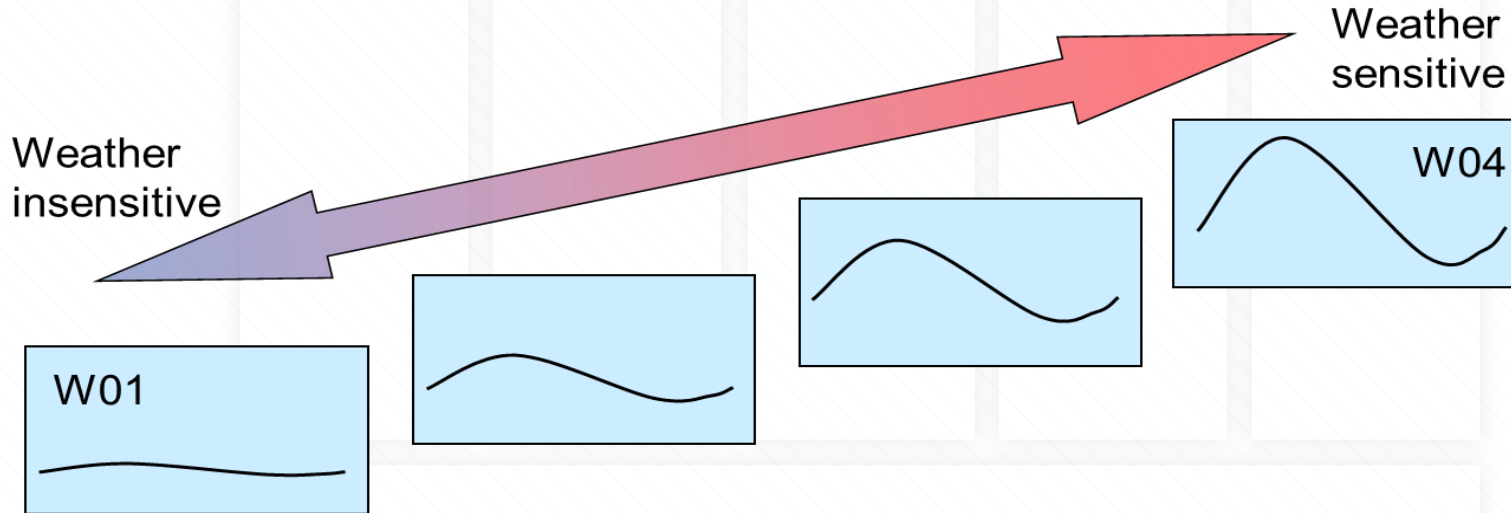
Winter to Annual Ratio (WAR) Band EUCs

- 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 2019/20)

- This is essential because supply points will be assigned to these newly defined WAR band EUCs (for 2020/21) based on their (Dec-Mar) consumption behaviour over winter 2019/20

WAR Band basics

- WAR values are affected by December to March weather experience:
    - 2019/20 was generally colder than 2018/19, so thresholds can be expected to increase 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 Bands 3-4

EUC Bands: Range	Comments on 2019/20 data Proposed Aggregations	Final Aggregations for 2018/19
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 for most LDZs except WN being combined with NW (Table B.9)	INDIVIDUAL LDZ Analysis with NW/WN combined

- Spreadsheet TW_B_SAMPLE_POP_SMALL_270420.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   Each with:
  - Band 7: 14,650 to 29,300 MWh   1 Consumption Band
  - Band 8: 29,300 to 58,600 MWh   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 2020/21
- 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	71.98%	98.83%
Bands 1 to 2: 0 to 293 MWh pa	78.34%	99.70%
Bands 1 to 4: 0 to 2,196 MWh pa	88.17%	99.97%
Bands 5 to 9: >2,196 MWh pa	11.83%	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 Bands 5-9

EUC Bands: Range	Comments on 2019/20 data Proposed Aggregations	Final Aggregations for 2018/19
Band 5: 2,196 to 5,860 MWh pa	1) Individual LDZ analysis for all LDZs 2) Individual LDZ for most LDZs except WN being combined with NW	Individual LDZ analysis (NW/WN combined)
Band 6: 5,860 to 14,650 MWh pa	1) Individual LDZ analysis for all LDZs 2) Individual LDZ for most LDZs except WN combined with NW and WS being combined with SW	Individual LDZ with NW/WN combined
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	Individual LDZs with the following WS/SW, EA/NT, SE/SO and /NW/WN combined	Individual LDZs with the following WS/SW, EA/NT, SE/SO and NO/NW/WN combined
Band 9: >58,600 MWh pa	National	National

- Spreadsheet TW_C_SAMPLE_POP_LARGE_270420.xlsx provides sample numbers per LDZ for Bands 5 to 9 and any recommendations for additional runs

Section 4 continued:
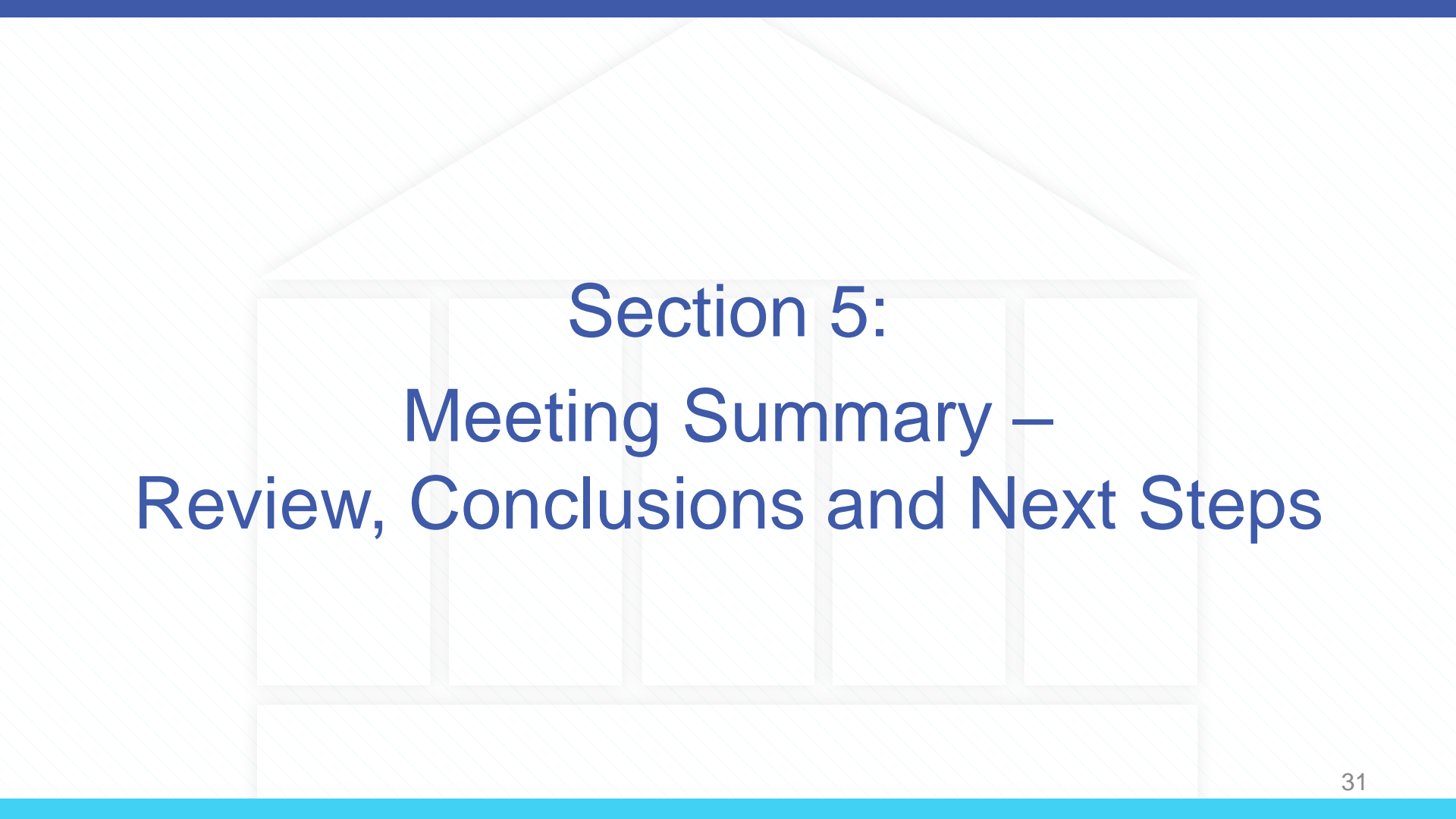# Review of Sample Data for Large NDM

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 Bands 5-8

EUC Bands: Range	Comments on 2019/20 data Proposed Aggregations	Final Aggregations for 2018/19
Band 5: 2,196 to 5,860 MWh pa	1) 7 LDZ group with SC as an individual LDZ 2) 5 LDZ group	5 LDZ GROUP with SC as an INDIVIDUAL LDZ
Band 6: 5,860 to 14,650 MWh pa	3 LDZ group SC/NO/NW/WN, NE/EM/WM & EA/NT/SE/WS/SO/SW)	2 LDZ Group (SC/NO/NW/WN/NE/EM/WM & EA/NT/SE/WS/SO/SW)
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	2 LDZ group (SC/NO/NW/WN/NE/EM/WM & EA/NT/SE/WS/SO/SW)	National
Band 9: >58,600 MWh pa	N/A - No WAR Bands	

- Spreadsheet TW_C_SAMPLE_POP_LARGE_270420.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 EUC demand modelling
  - Xoserve may contact TWG for prompt decisions on modelling analysis (probably by email)
  - TWG meeting booked for Monday 18th May where EUC demand modelling results will be presented for review