Technical Work Group

Spring Approach to Modelling 2014

27th November 2013

Technical Work Group

Weather History

27th November 2013

Background

- Phase 1 of Mod 330 has delivered a revised Weather History for 10 Weather stations used by the gas industry (WSSM)
- Current modelling has been using the existing weather history
- Discussion required over the timing and transition between the existing to WSSM history and use in 2014 Spring Modelling approach

Transition Issues – Temperature variable

Temperature Variable	Existing Dataset	WSSM
Start of dataset	Oct 1928	Oct 1960 (to align with gas years)
End of dataset (gas day)	Current date	29th Sep 2012
CWV parameters	Optimised	Not optimised (if required would need to be completed by end Dec 2013 due to impact on AQ review)
1 in 20's	Based on 84 years	Based on 52 years (to 29th Sep 2012)
Missing Values	None	As per the methodology there are instances when "no reliable estimate" can be produced. (value -32768)

No reliable estimates Temperature - 1960s

LDZ	SC	NO	NW / WN	NW / WN	NE / EM	SO	SW	WM	WS
Weather Station	Glasgow, Bishopton	Albemarle	Manchester, Hulme Library	Rostherne No 2	Nottingham, Watnall	Southampton, Oceanography	Filton	Edgbaston	St Athan
Gas Year	03134	03238	99029	03351	03354	99079	03628	99028	03716
1960		31	7	7		1			9
1961		42	7	7	1			2	13
1962		26	11	11			4	3	22
1963		19	1	1		1		2	11
1964		29	5	5				1	7
1965	1		4	4					20
1966			15	15				1	3
1967			11	11	1	275		2	4
1968			1	1	1	365		1	
1969						365			

- Note. The counts represent the number of gas days impacted by at least 1 instance of “no reliable estimate”

No reliable estimates Temperature - 1970s

LDZ	SC	NO	NW / WN	NW / WN	NE / EM	SO	SW	WM	WS
Weather Station	Glasgow, Bishopton	Albemarle	Manchester, Hulme Library	Rosthern e No 2	Nottingham, Watnall	Southampton, Oceanography	Filton	Edgbaston	St Athan
Gas Year	03134	03238	99029	03351	03354	99079	03628	99028	03716
1970						92			
1972				2					
1973				1				1	3
1974	1			4					1
1975				4				1	3
1976	2			2					3
1977				34					
1978				15					
1979				17				3	

No reliable estimates Temperature - 1980s

LDZ	SC	NO	NW / WN	NW / WN	NE / EM	SO	SW	WM	WS
Weather Station	Glasgow, Bishopton	Albemarle	Manchester, Hulme Library	Rostherne No 2	Nottingham, Watnall	Southampton, Oceanography	Filton	Edgbaston	St Athan
Gas Year	03134	03238	99029	03351	03354	99079	03628	99028	03716
1980				18				1	2
1981				3					

- The data for the period after 1981 has a record for every hourly temperature observation (note this includes both actual and filled in values)

Transition Issues - Challenges

- Numerous challenges moving from existing to WSSM weather datasets:
  - "No reliable estimates" in the WSSM history at hourly level
    - these will need discussion on how to proceed with them and how we calculate a daily temperature
  - Complex - do we understand the underlying differences between the two weather histories.
  - CWV parameters should need to be re-optimised if using WSSM history – current parameters may not be best
  - Modelling:
    - Would CWV's calculated using the WSSM history (assuming re-optimising) produce models with material differences to those created using the existing weather history
  - 1 in 20 values could be impacted by a combination of:
    - change in history start point (1928 to 1960) and
    - Differences between the dataset 1960 onwards

Hulme Library change to Rostherne No2

- Hulme Library Manchester weather station closed on 31st October 2013
- Data streams providing weather for NW and WN LDZs switched to Rostherne No 2 (with bias corrections) from gas day 28th October 2013.
- These are currently using existing CWV parameters (previously optimised using Hulme data)
- Re-optimising Rostherne would need to be completed by end December to incorporate in spring 2014 modelling but also the AQ 2014 Review process

Recommendation for 2014 Spring Approach

- Recommendation for 2014 Spring Modelling Approach
  - Rostherne No 2 – carry on using the existing weather history without re-optimising CWV parameters
  - Modelling - continue with the existing history for one year
  - 1 in 20's to be based on existing history (80+ year) to ensure consistency of load factors and charging.

- Actions for 2014
  - Investigate and understand "No reliable estimates" and agree approach to filling in these gaps
  - Perform CWV optimisation on WSSM data
  - Look to incorporate WSSM history in modelling process

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Model Smoothing

27th November 2013

Model Smoothing - Background

- At DESC meeting 13th November results were presented on the evaluation of model smoothing
- In summary, model smoothing continues to provide less volatile models which DESC confirmed is still its priority
- DESC confirmed 3 years of models should continue to be used but were interested in testing the weightings used for each of the 3 years
- The current approach applies weightings of 34:33:33
- DESC asked if results could be produced using an approach of 50:30:20 where '50' is the most recent year and '20' the oldest
- DESC suggested results for Band 02b could be reviewed

Model Smoothing - Background

- Factors to consider….
- During the model smoothing stage an assessment is made on whether to apply summer reductions and/or CWV cut-off to the final smoothed model
- When the weightings are amended this can lead to a change the model characteristics, i.e. those with cut-offs and summer reductions

Model Smoothing – Volatility Analysis 1

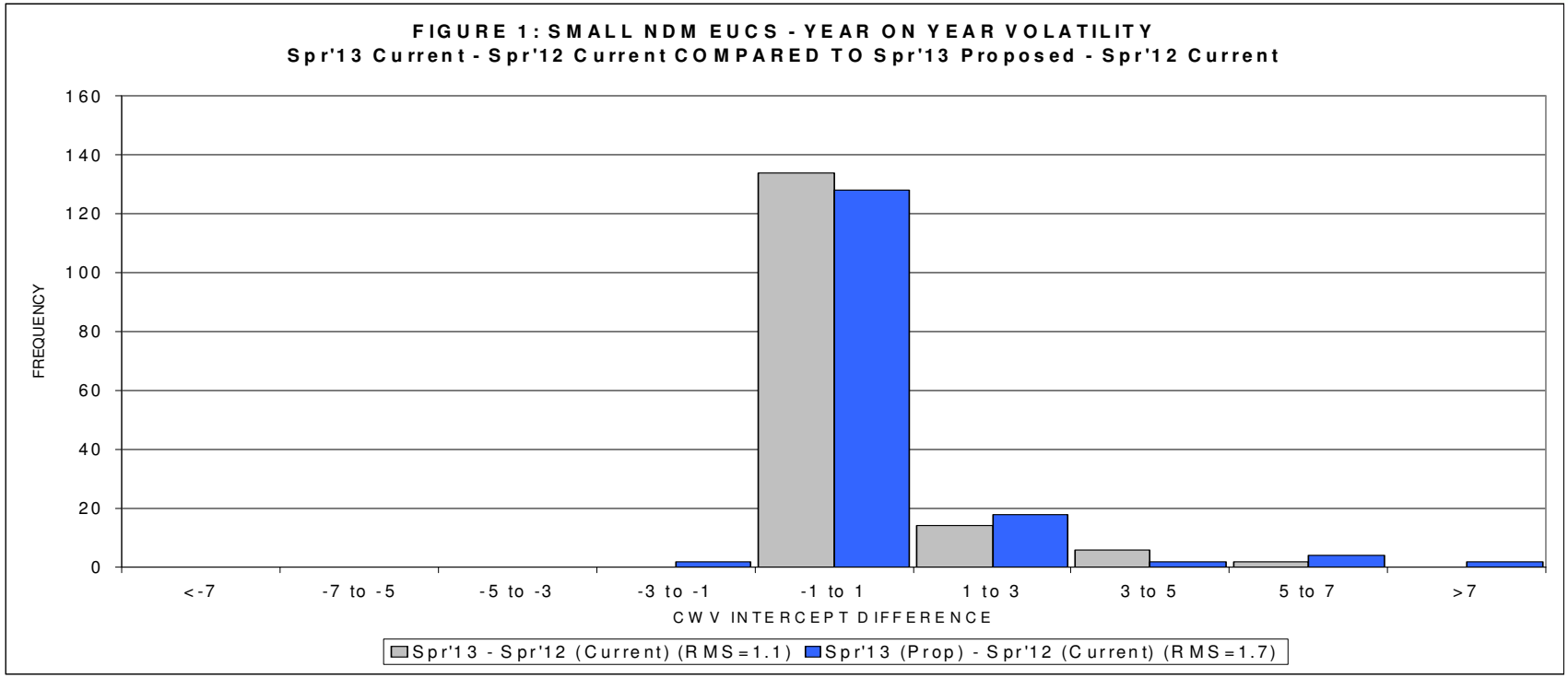
- Spring 2013

	Current Model Smoothing Approach		Proposed Model Smoothing Approach	
Analysis Period	**Spring 2012**	**Spring 2013**	**Spring 2012**	**Spring 2013**
09/10	33%		20%	
10/11	33%	**33%**	30%	**20%**
11/12	34%	**33%**	50%	**30%**
12/13		**34%**		**50%**

Model Smoothing – Volatility Analysis 1

- Compares year on year volatility reduction of each model type (smoothed with different weightings)
- AIM: To assess differences in between each year:
  - Compare **12/13** applied smoothed model (10/11, 11/12, 12/13) (34:33:33)
    To
  - Applied smoothed model for **11/12** (09/10, 10/11, 11/12) (34:33:33)
  - Compare **12/13** proposed model (10/11, 11/12, 12/13) with revised weightings (50:30:20)
    To
  - Applied smoothed model for **11/12** (09/10, 10/11, 11/12) with current weightings (34:33:33)
- The above gives an indication of the volatility if switching from one approach to another in first year of new approach
- Using variations in CWV intercepts and RMS values to identify level of volatility between model types and years for Small NDM EUCs.

Model Smoothing - Volatility Analysis 1



- 156 Small NDM EUCs assessed
- Current Model has smaller CWV Intercept differences and lower RMS values and so overall less volatility

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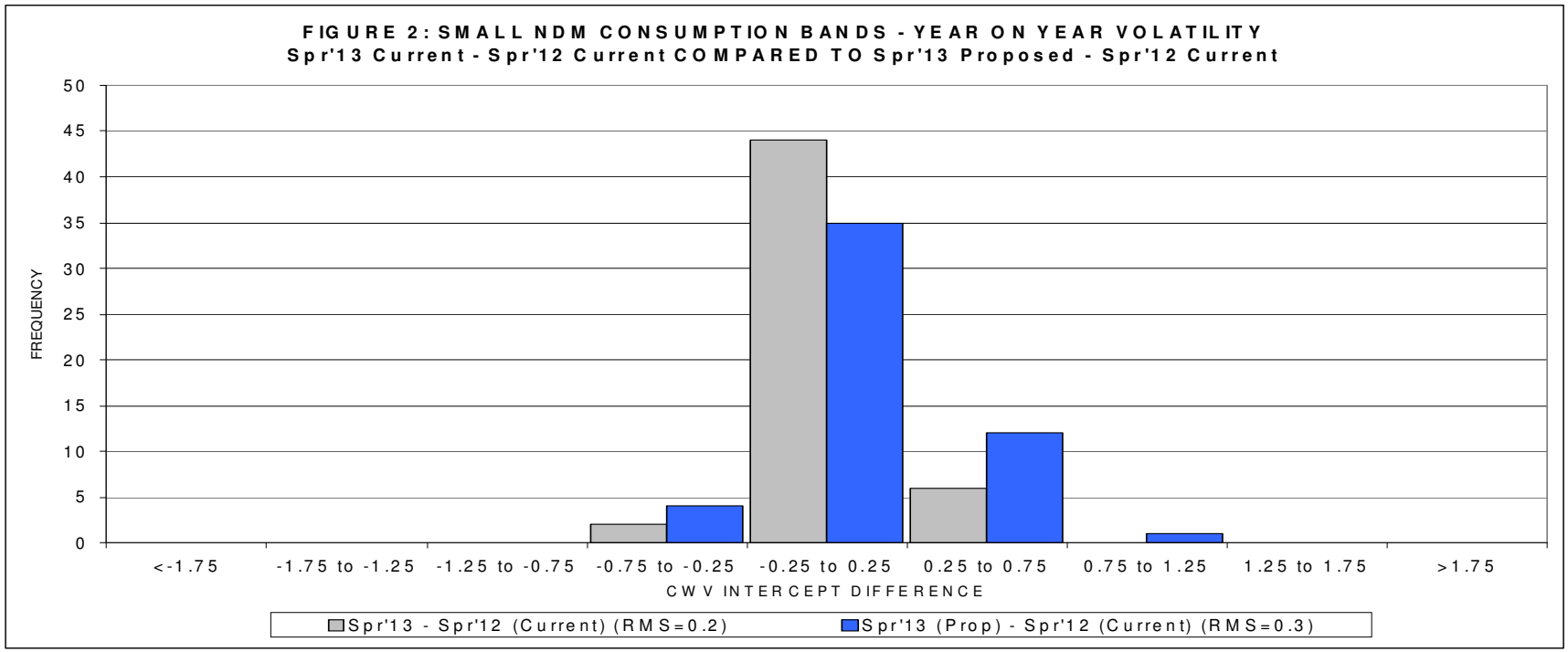
Model Smoothing - Volatility Analysis 1



- 52 Small NDM EUCs assessed
- Current Model has smaller CWV Intercept differences and lower RMS values and so overall less volatility

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Model Smoothing – Volatility Analysis 2

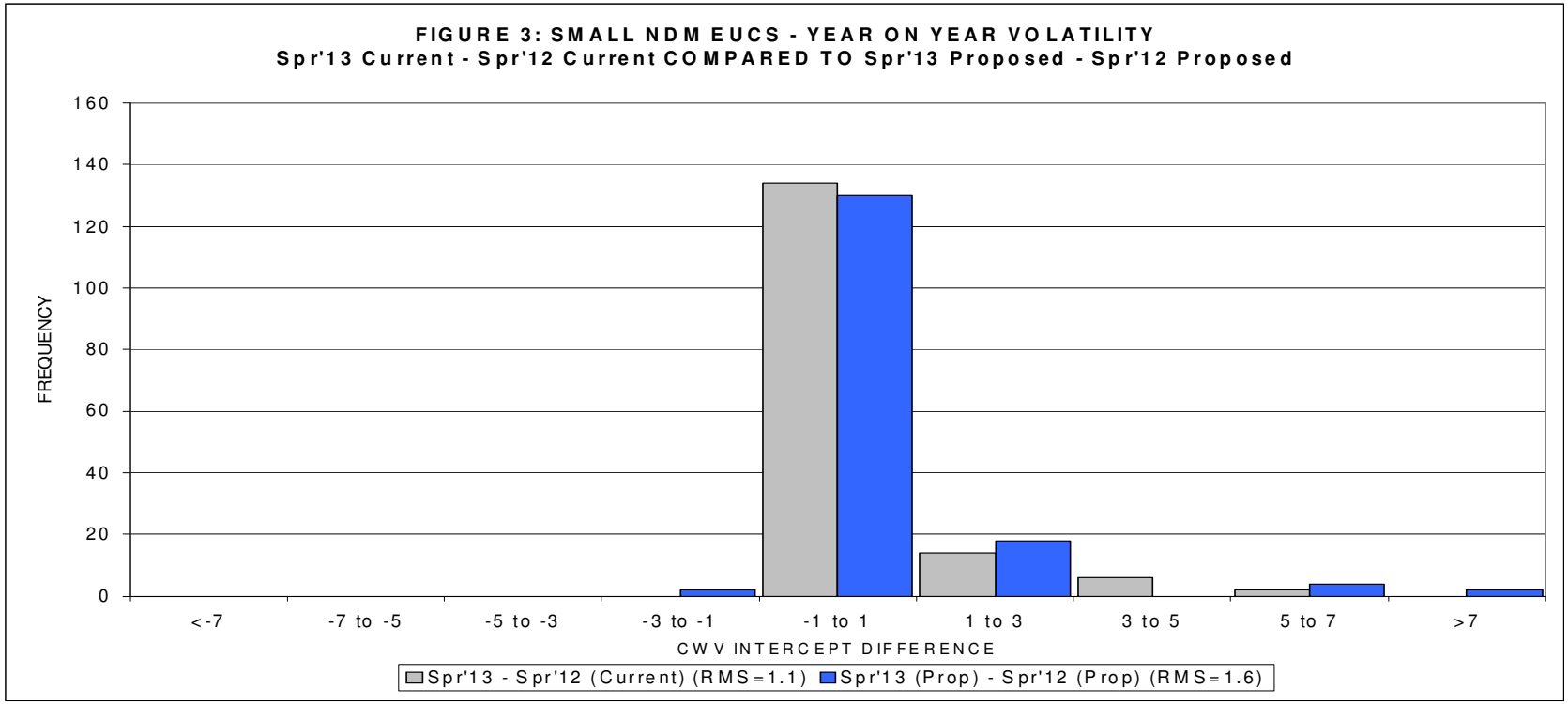
- Spring 2012

	Current Model Smoothing Approach		Tested Model Smoothing Approach	
Analysis Period	**Spring 2012**	**Spring 2013**	**Spring 2012**	**Spring 2013**
09/10	**33%**		**20%**	
10/11	**33%**	33%	**30%**	20%
11/12	**34%**	33%	**50%**	30%
12/13		34%		50%

Model Smoothing – Volatility Analysis 2

- Compares year on year volatility reduction of each model type (smoothed with different weightings)
- AIM: To assess differences in between each year:
  - Compare **12/13** applied smoothed model (10/11, 11/12, 12/13) (34:33:33)
    To
  - Applied smoothed model for **11/12** (09/10, 10/11, 11/12) (34:33:33)
  - Compare **12/13** proposed model (10/11, 11/12, 12/13) with revised weightings (50:30:20)
    To
  - Proposed smoothed model for **11/12** (09/10, 10/11, 11/12) with revised weightings (50:30:20)
- The above gives an indication of the volatility where both are on the same basis
- Using variations in CWV intercepts and RMS values to identify level of volatility between model types and years.

Model Smoothing – Volatility Analysis 2



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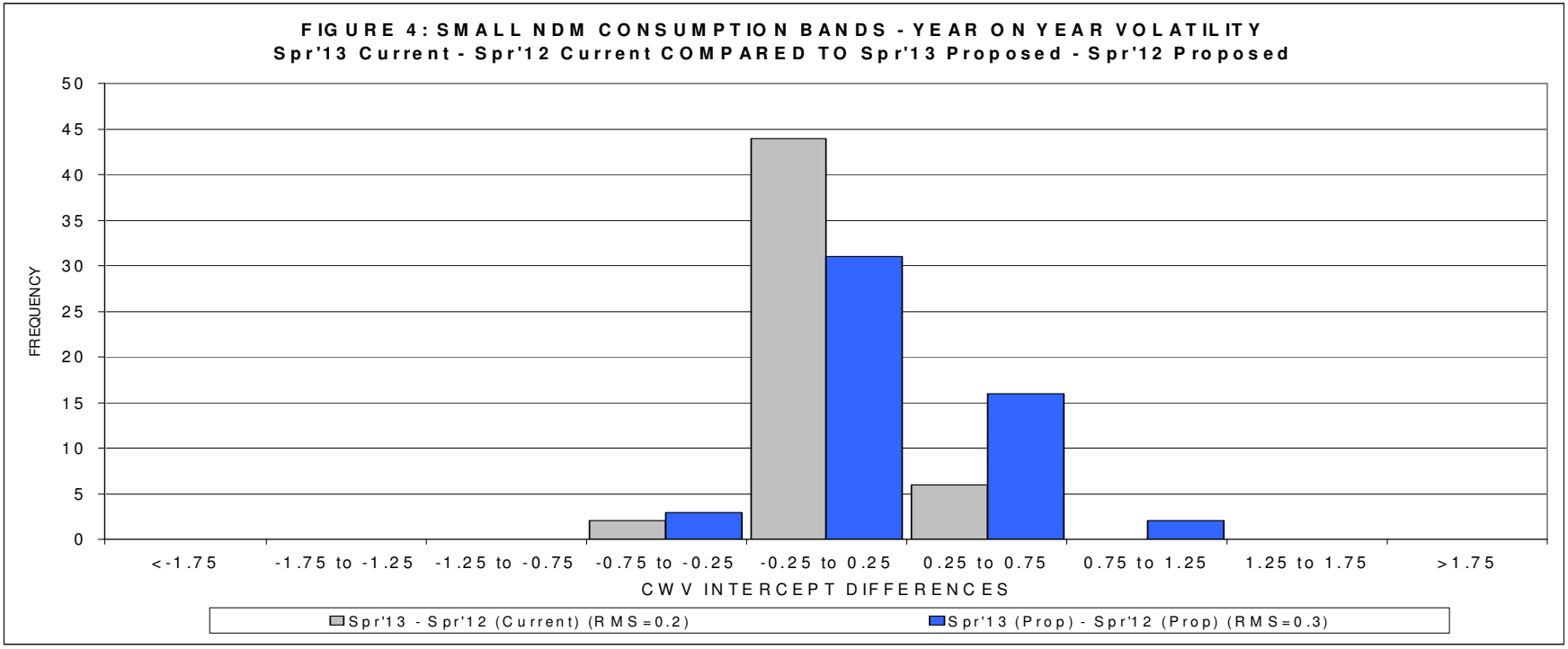
Model Smoothing - Volatility Analysis 2



- 52 Small NDM EUCs assessed
- Current Model has smaller CWV Intercept differences and lower RMS values and so overall less volatility

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Model Smoothing – Predictability Analysis

- Compares variance of actual CWV intercept from most recent data set (i.e. 2012/13) to the different smoothed models
- AIM: To assess differences in CWV intercepts between each year:
  - Compare 12/13 smoothed model (with current weightings 34:33:33)
    To
  - Most recent data set for 12/13
  - Compare 12/13 smoothed model (with revised weightings 50:30:20)
    To
  - Most recent data set for 12/13
- Using variations in CWV intercepts and RMS values to identify level of predictability

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Model Smoothing – Predictability Analysis

- Predictability Update:
- Predictability tables and figures to follow when complete, initial results indicate little difference between 2 approaches

Model Smoothing – Conclusions

- DESC approved continued use of 3 years in model smoothing
- Results suggest that current approach of an ‘even’ weighting for the 3 years provides less volatility than the tested approach of 50:30:20
- As reducing volatility is main driver for smoothing then recommendation is to continue with current approach
- TWG thoughts ?

Technical Work Group

LDZ Aggregations

27th November 2013

LDZ Aggregations Background

- April 2013 TWG highlighted the group wished to investigate alternative LDZ combinations
  - Specifically an additional combination was requested as part of the Spring 2013 analysis for EUC band 5
- DESC asked TWG to look at LDZ aggregations as part of the Adhoc work plan as TWG Priority (2)
- The modelling system has been investigated and additional combinations can be incorporated

TWG requested Aggregation

- April 2013 TWG requested the following grouping be tested for EUC band 5
- The grouping was:
  - SC
  - NE
  - EM
  - WM
  - WS and SW (pre-existing)
  - EA and NT (new combination)
  - SE and SO (new combination)
  - NO and NW / WN (new combination)

- 3 additional combinations are required in the modelling system.
- Addition of this grouping can be included for 2014 Spring Analysis

LDZ Aggregations Combinations

- Are there other combinations that be desirable?
- Current available / advised combinations :

Individual LDZ	NW / WN	SC / NO / NE	WS / SW
SC / NO / NW / WN	NE / EM / WM	EA / NT / SE	WS / SO / SW
NO / NW / WN	NW / EM / WM / WN	SC / NO / NW / WN / NE / EM / WM	
EA / NT / SE / WS / SO / SW		National (all 13 LDZs)	**EA / NT**
NE / SO	**NO / NW / WN**		

- There is limited space for some other combinations (empty boxes).
- We don't want to fill them all up but can add some.
- They should be geographically sensible groups and work with other groupings so that all have a rule to apply to all 13 LDZs for an EUC
- These can be included but require programming before the start of the Spring Analysis cycle

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Holiday code rules for Spring 2014 modelling

27th November 2013

Holiday Code Rules: Background

- November 2011 DESC agreed a new set of holiday code rules for Christmas and the New Year.
- These holiday codes were used in the Spring 2012 & Spring 2013 modelling and are due to be used for Spring 2014.
- The derived Annual Load Profiles for gas year 2014/15 using these rules are due for approval by end of July 2014.
- Following slides summarise the existing rules and provide a view of how they interact with the Christmas and New Year period for the modelling target year of 2014/15.

Holiday Code Rules: Existing rules as agreed by DESC

- Start of period: Monday before 25th December (but if 25th December falls on a Monday, Tuesday or Wednesday, it starts on the Friday before 25th December).
- End of period: First Friday on or after second Scotland New Year bank holiday.
- Holiday code 1: 25th December
- Holiday code 2: 26th December, January 1st and any remaining bank holidays (except second Scotland New Year bank holiday) and any other Saturdays and Sundays in the period.
- Holiday code 3: Any remaining Mondays to Fridays between 24th December and day before second Scotland New Year bank holiday inclusive
- Holiday code 4: Remaining days before 24th December
- Holiday code 5: Remaining days (will always include second Scotland New Year bank holiday)

Holiday Code Rules: Application to Christmas and New Year 2014/15

Demonstration - Christmas and New Year 2014/15

						BH	BH						BH	SBH				
19-Dec	20-Dec	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-Dec	27-Dec	28-Dec	29-Dec	30-Dec	31-Dec	01-Jan	02-Jan	03-Jan	04-Jan	05-Jan	06-Jan
Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue
			4	4	3	1	2	2	2	3	3	3	2	5				

Start of Period:		Monday before 25th December (but if 25th December falls on a Monday, Tuesday or Wednesday, it starts on the Friday before 25th December).
End of Period:		First Friday on or after second Scotland New Year bank holiday.
Holiday Code	1	25th December
	2	26th December, January 1st and any remaining bank holidays (except second Scotland New Year bank holiday) and any other Saturday and Sundays in the period.
	3	Any remaining Mondays to Fridays between 24th December and day before second Scotland New Year bank holiday inclusive.
	4	Remaining days before 24th December
	5	Remaining days (will always include second Scotland New Year bank holiday).

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Review of EUC Definitions

27th November 2013

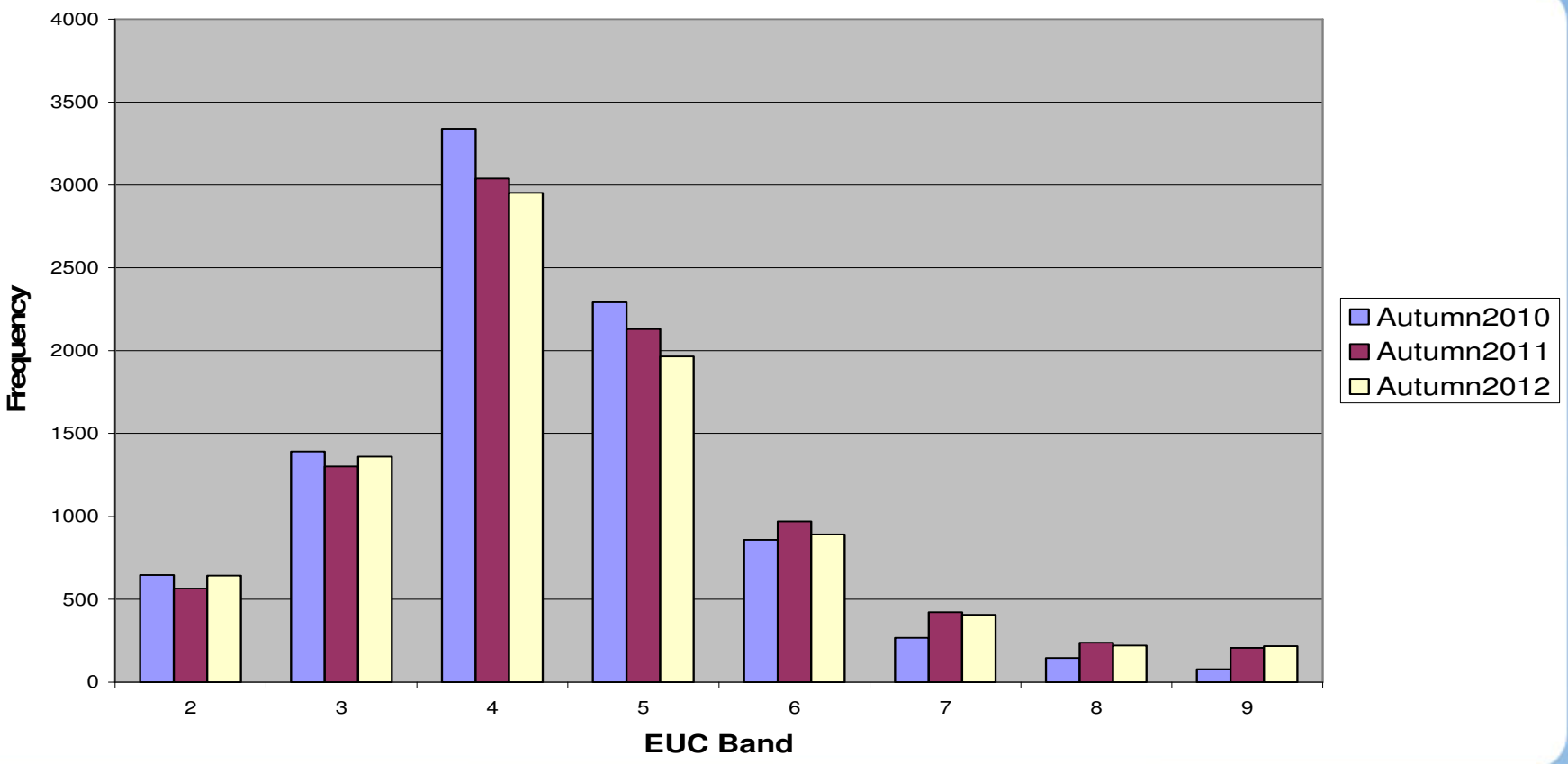
Background

- The purpose of this analysis is to review the appropriateness of current EUC definitions for small and large NDMs.
- Band 1 has been excluded from the analysis due to RbD requirements.
- Band 9 should be dismissed when considering 'bands to be merged' as a band that has daily metered sites will always need to exist and the current boundary can not be changed.
- The data used in this analysis was taken from the Autumn collection (which is used primarily for the performance evaluation).

  Analysis has been carried out at national level.

  The years that have been analysed are as follows:
  - 2009/10 (Gas year)
  - 2010/11 (Gas year)
  - 2011/12 (Gas year)
- The following slides present the analysis for 2011/12 as the results for all years are fairly consistent.

Summary of Sample Size



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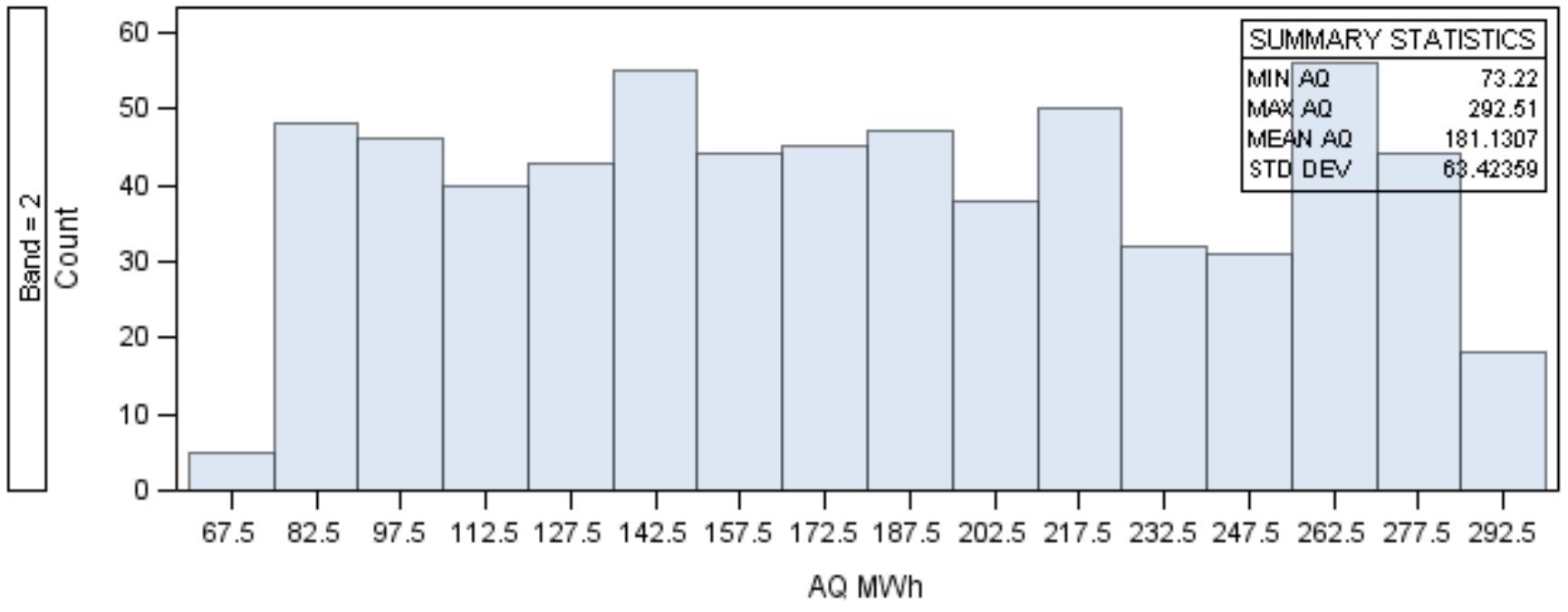
Distribution of Sample within EUC Bands 2011/2012



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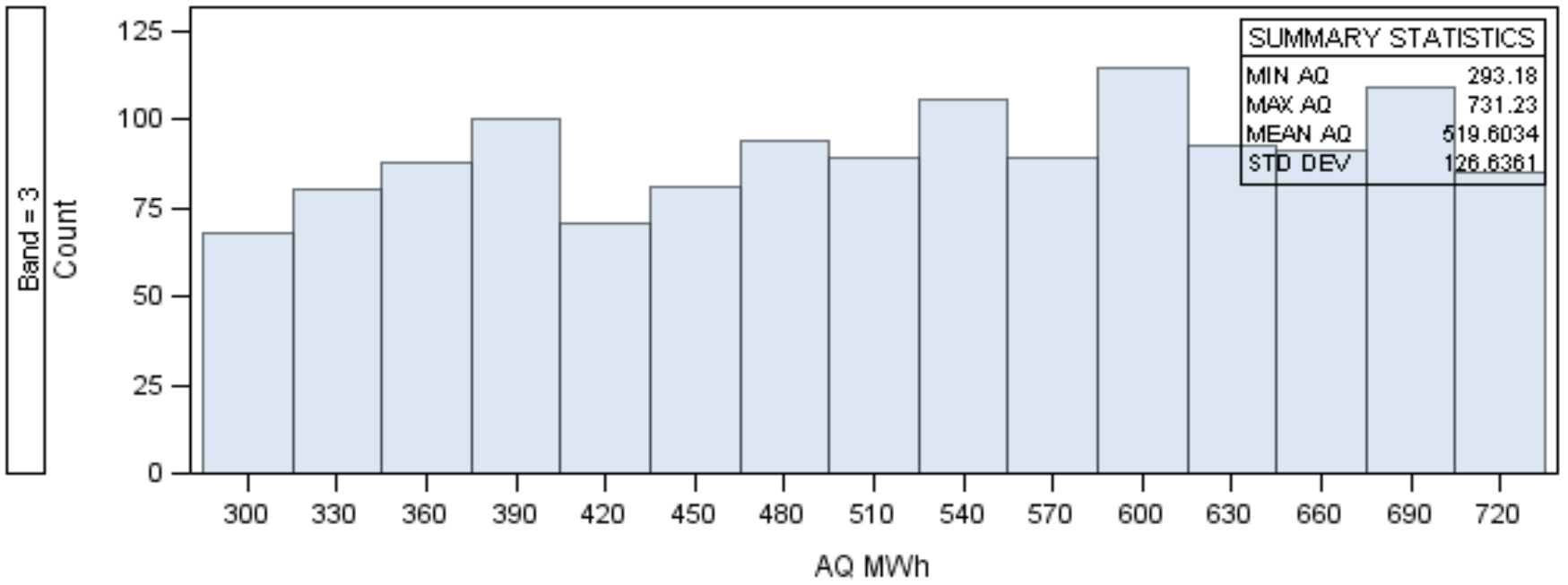
Distribution of Sample within EUC Bands 2011/2012



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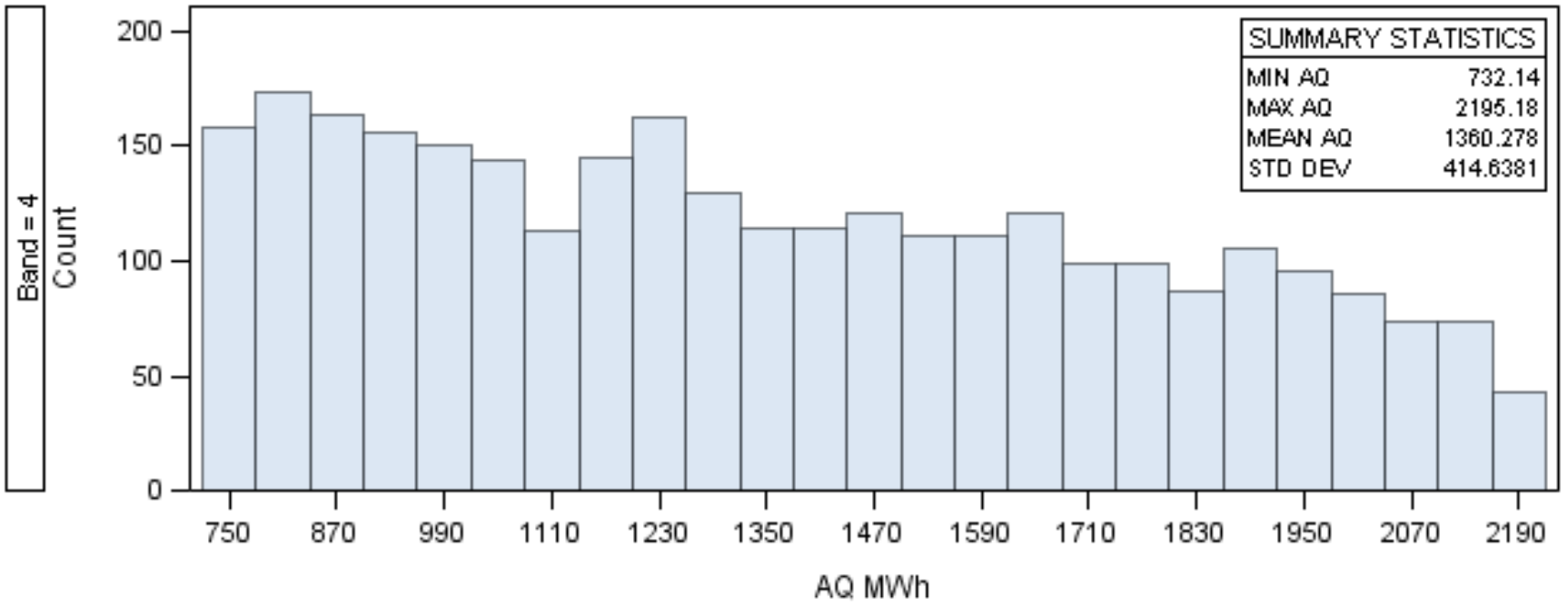

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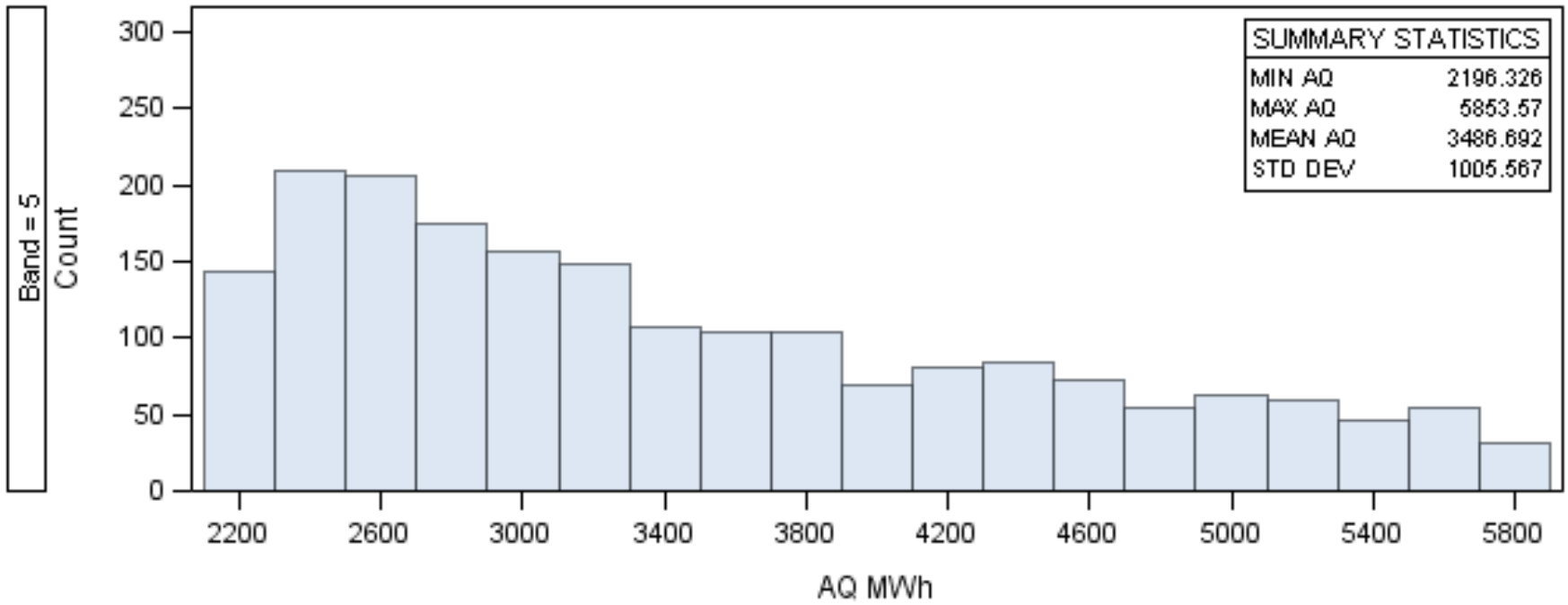

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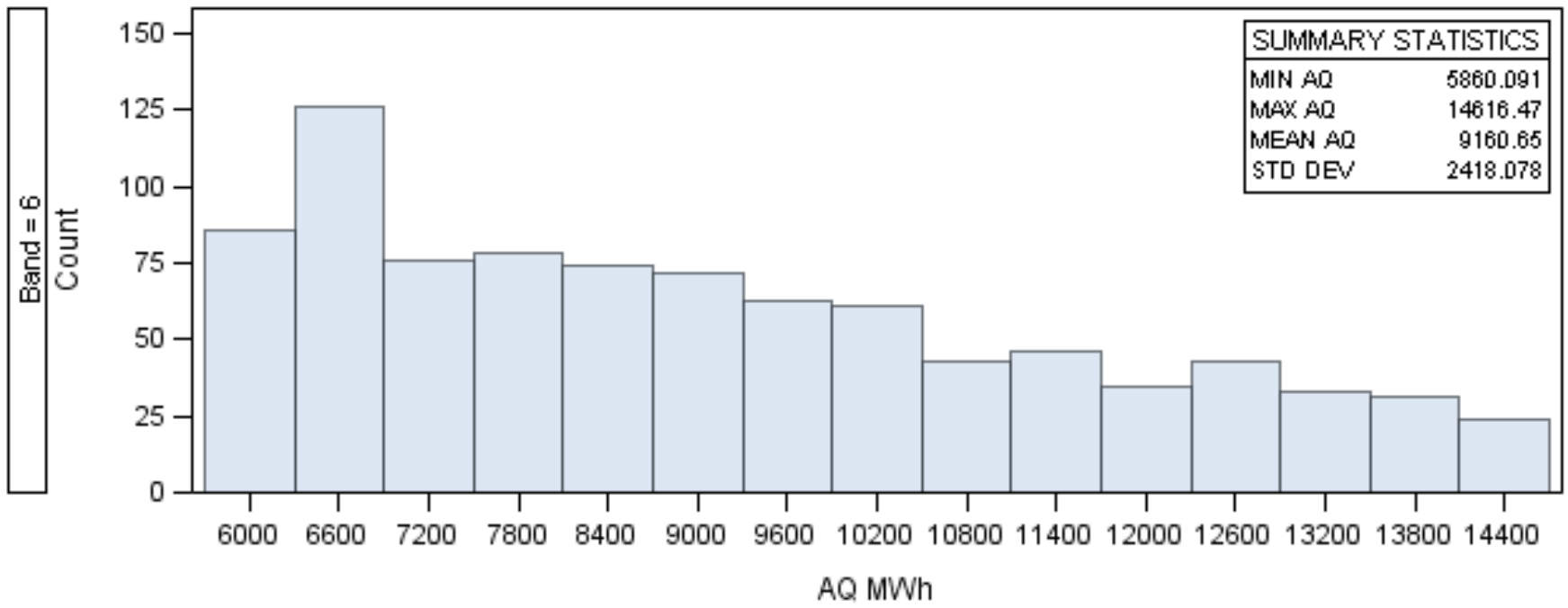

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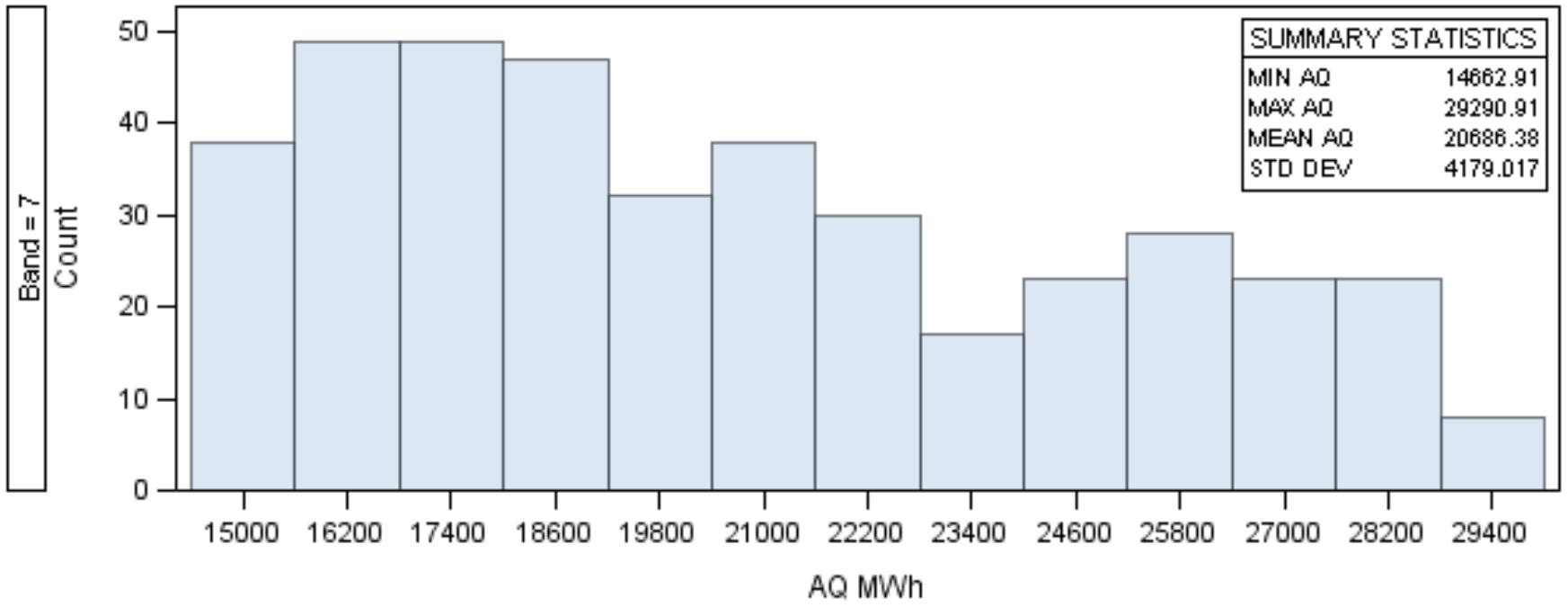
Distribution of Sample within EUC Bands 2011/2012



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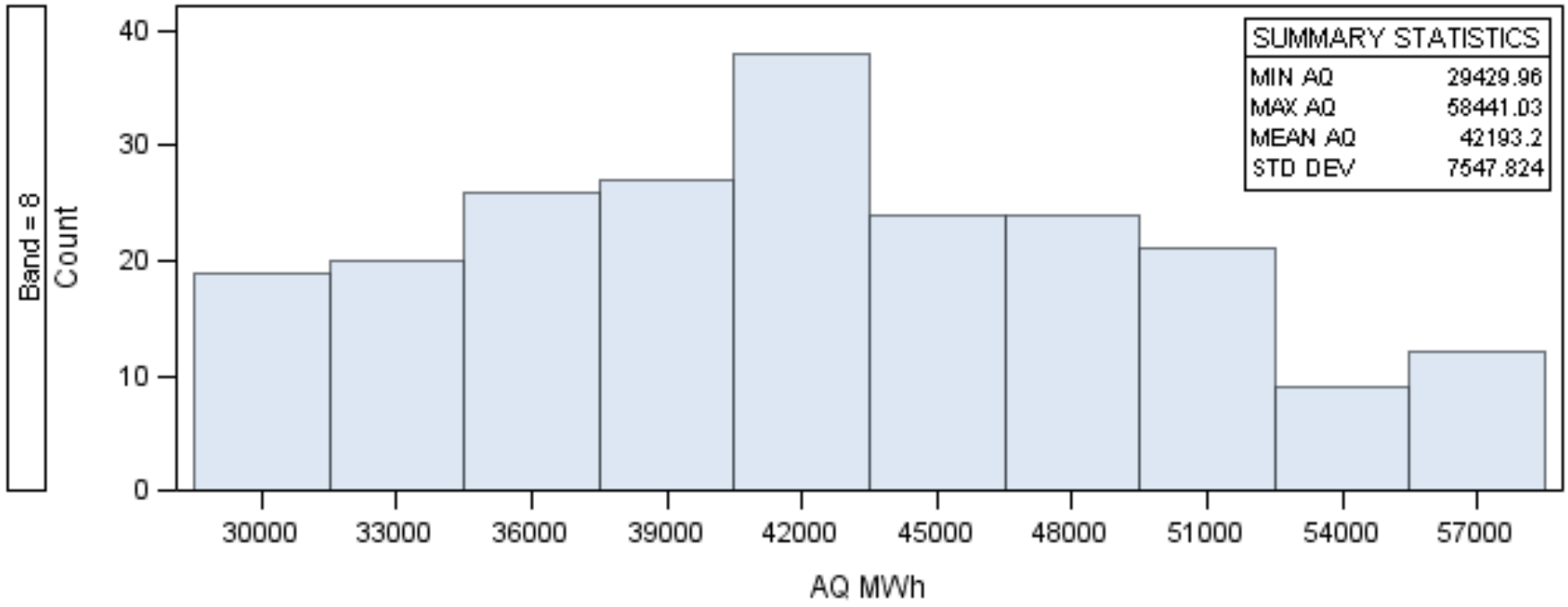
Distribution of Sample within EUC Bands 2011/2012



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Current EUC Boundaries and considerations

EUC	MWh	
	Lower	Upper
01	-	73.20
02	73.20	293.00
03	293.00	732.00
04	732.00	2,196.00
05	2,196.00	5,860.00
06	5,860.00	14,650.00
07	14,650.00	29,300.00
08	29,300.00	58,600.00
09	58,600.00	

Some considerations need to be made when deciding which bands could possibly be merged:

- Cut offs are tested for only bands 3 and above (as agreed by DESC in Dec '03, with a view to mitigating summer scaling factor instability

- Upper limit of band 3 cannot be changed due to the pricing structure (a separate pricing structure which incorporates bands 2 and 3)

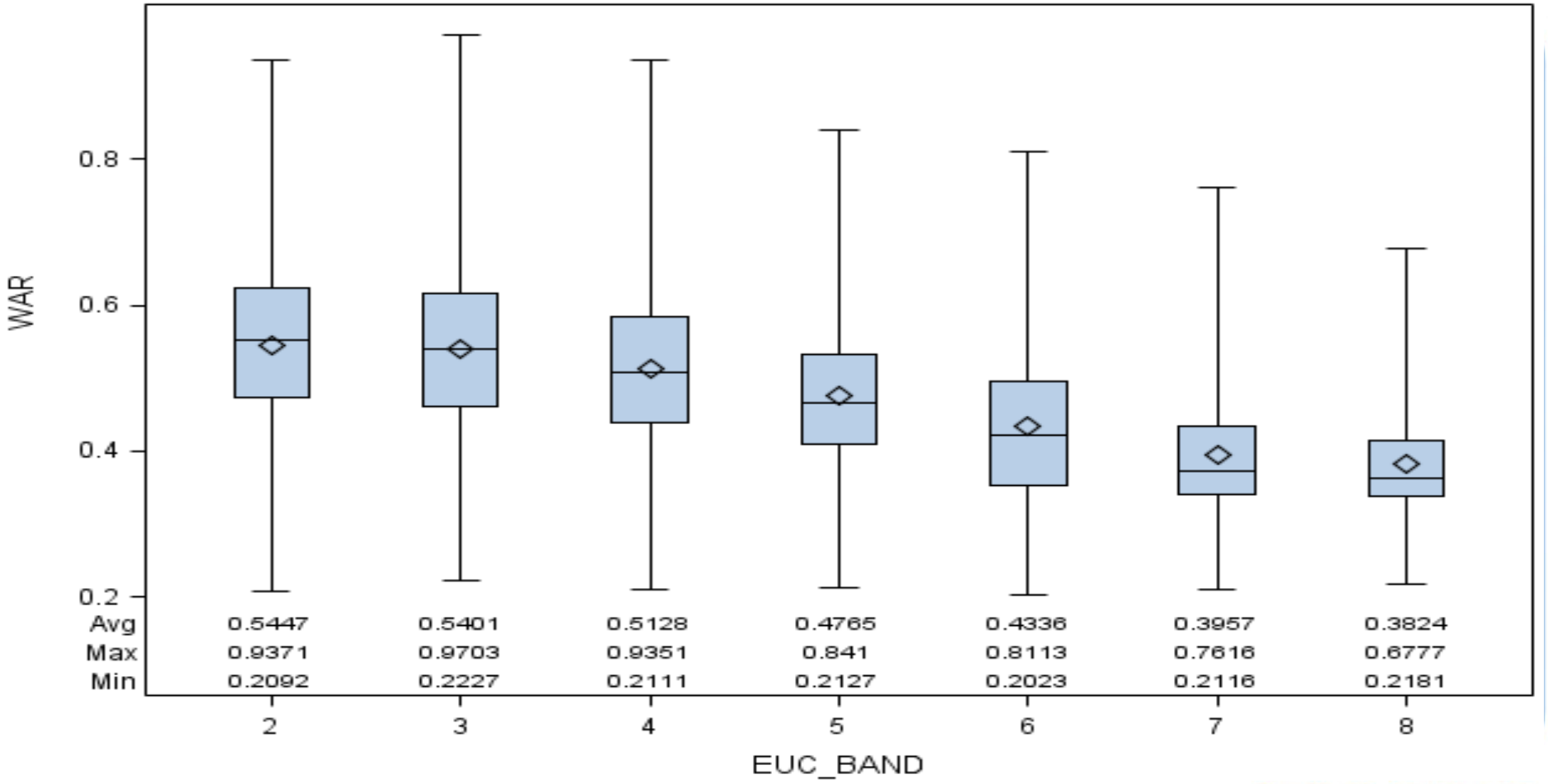
- Bands 4 and above have the same pricing structure so merges could be possible within these bands.

Data used in analysis

- The data available that is not dependent on current EUCs:
  - Daily Consumption
  - LDZ
  - LDZ CWV

- The first piece of analysis that was carried out was the assessment of the Winter Annual Ratio (WAR). WAR provides a quick indicator of differences within the sample. The WAR for each site has been calculated to assess how much of the annual consumption is used in the winter months (1st Dec – 31st Mar) and how this varies within the current bands (See Box Plot).
- WAR has also been plotted on scatter plots by combining EUCs to see if there was a “step change” which indicated a different break point.

Box Plot of WAR across the EUC Bands (2011/12)



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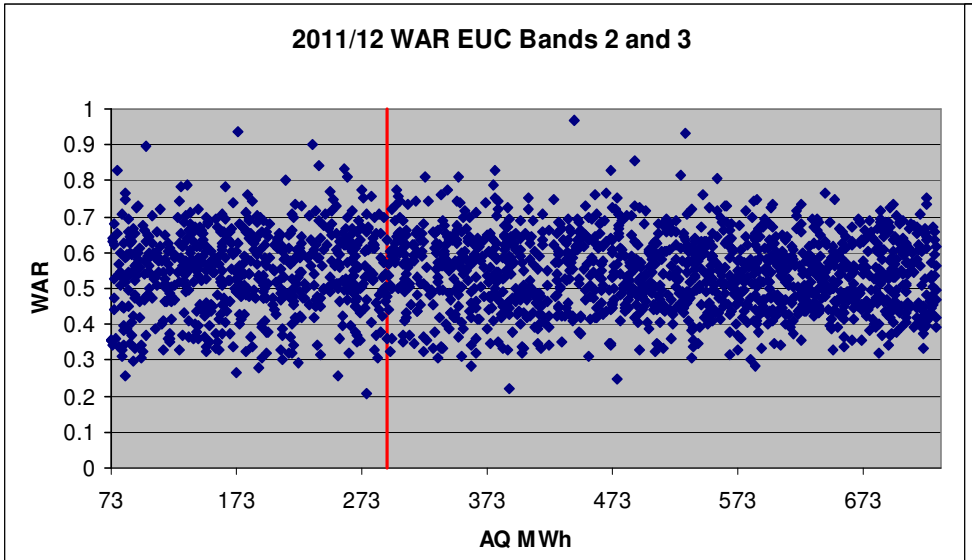
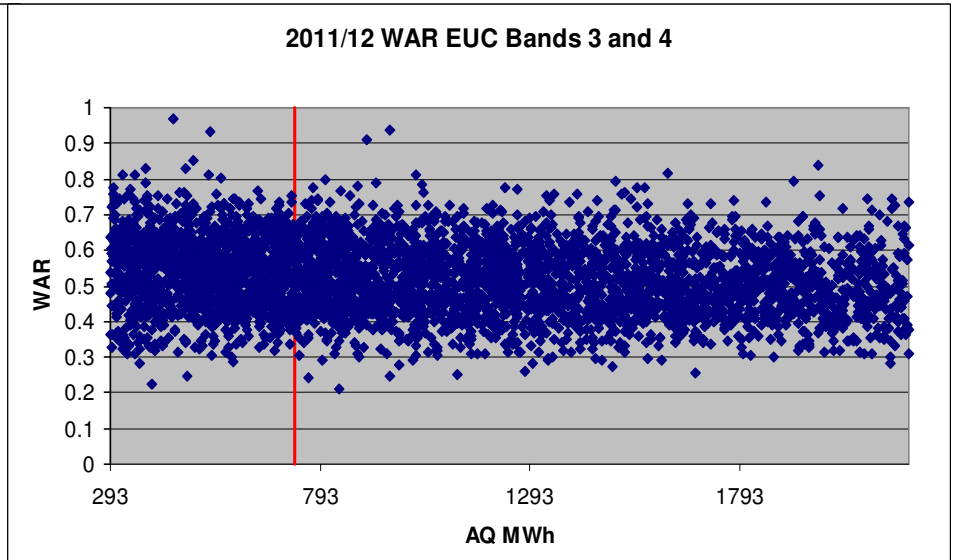
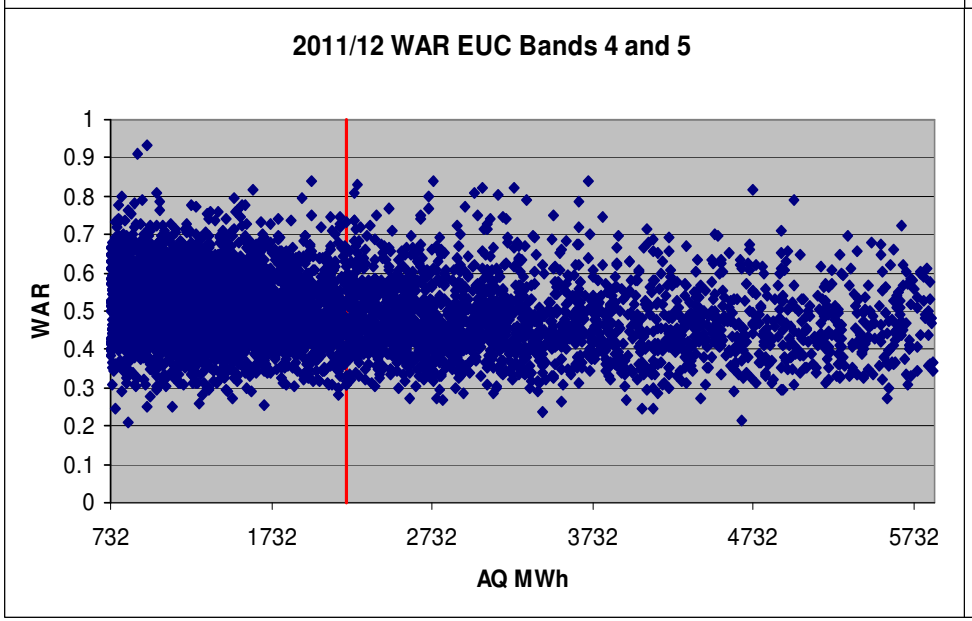
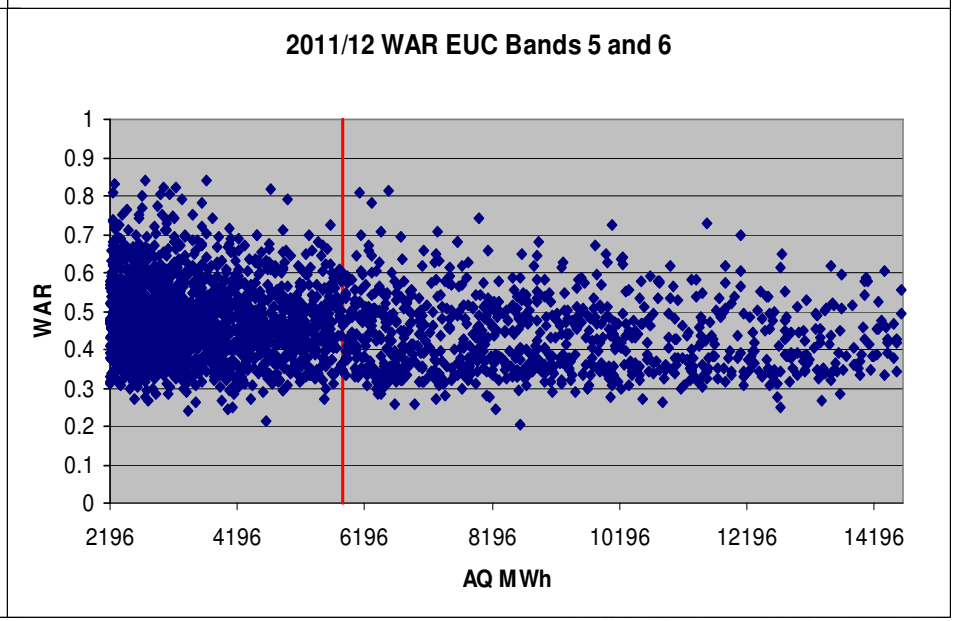
Scatter Plots of WAR by Band 2011/12

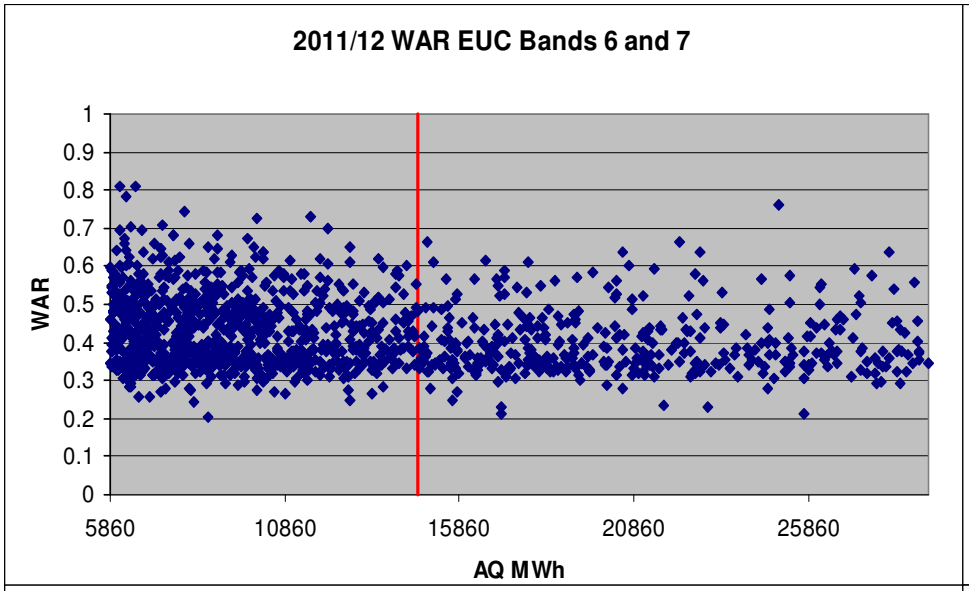


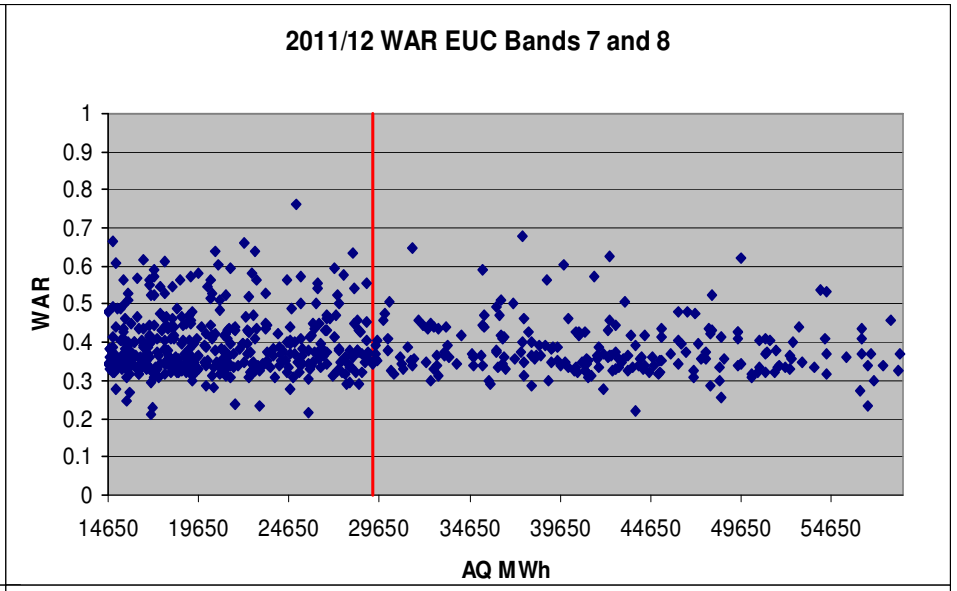


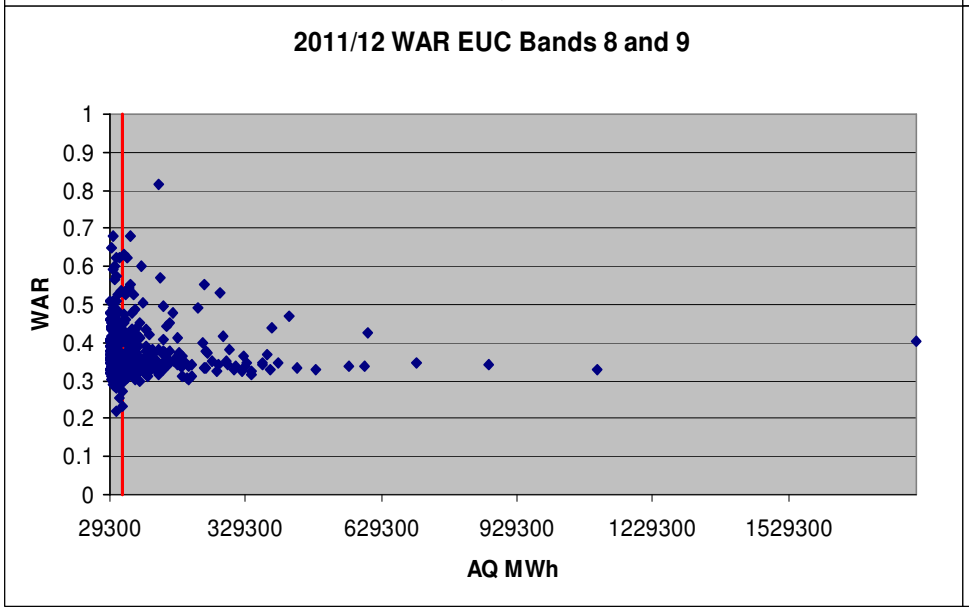


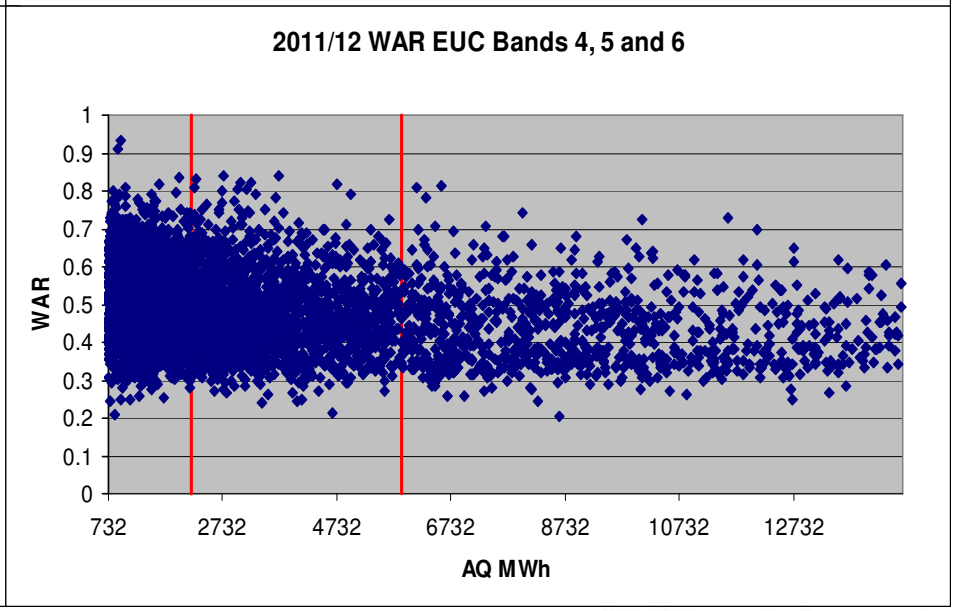


Scatter Plots of WAR by Band 2011/12

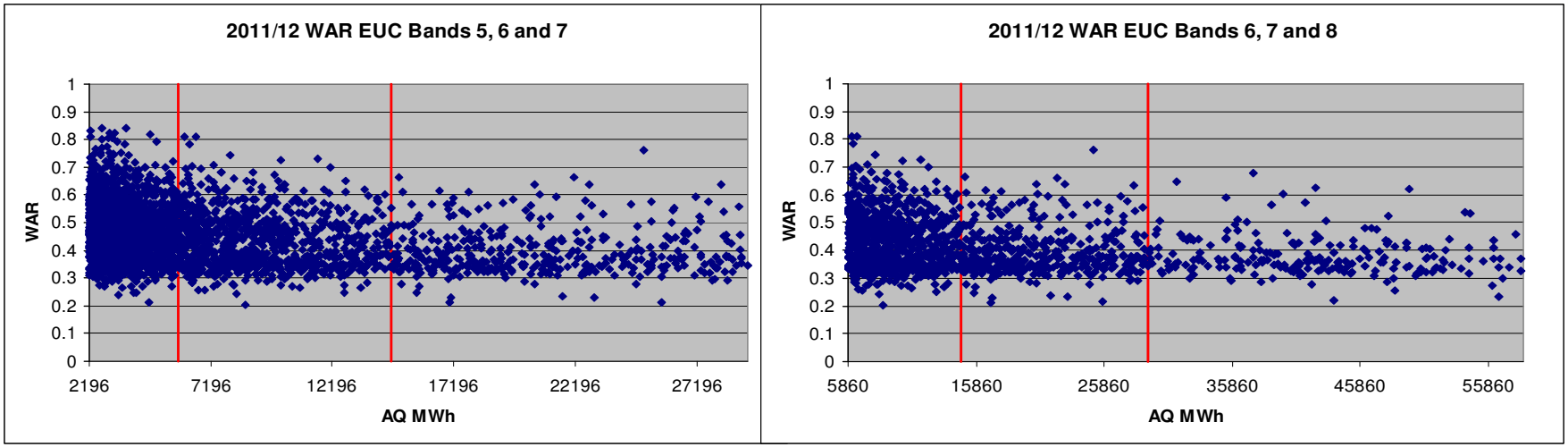








Scatter Plots of WAR by Band 2011/12



From observing the WAR across the current bands, it appears that there are clear similarities between Band 2 & 3 and Band 3 & 4.

There are also possible similarities between Band 4 & 5 and Band 7 & 8.

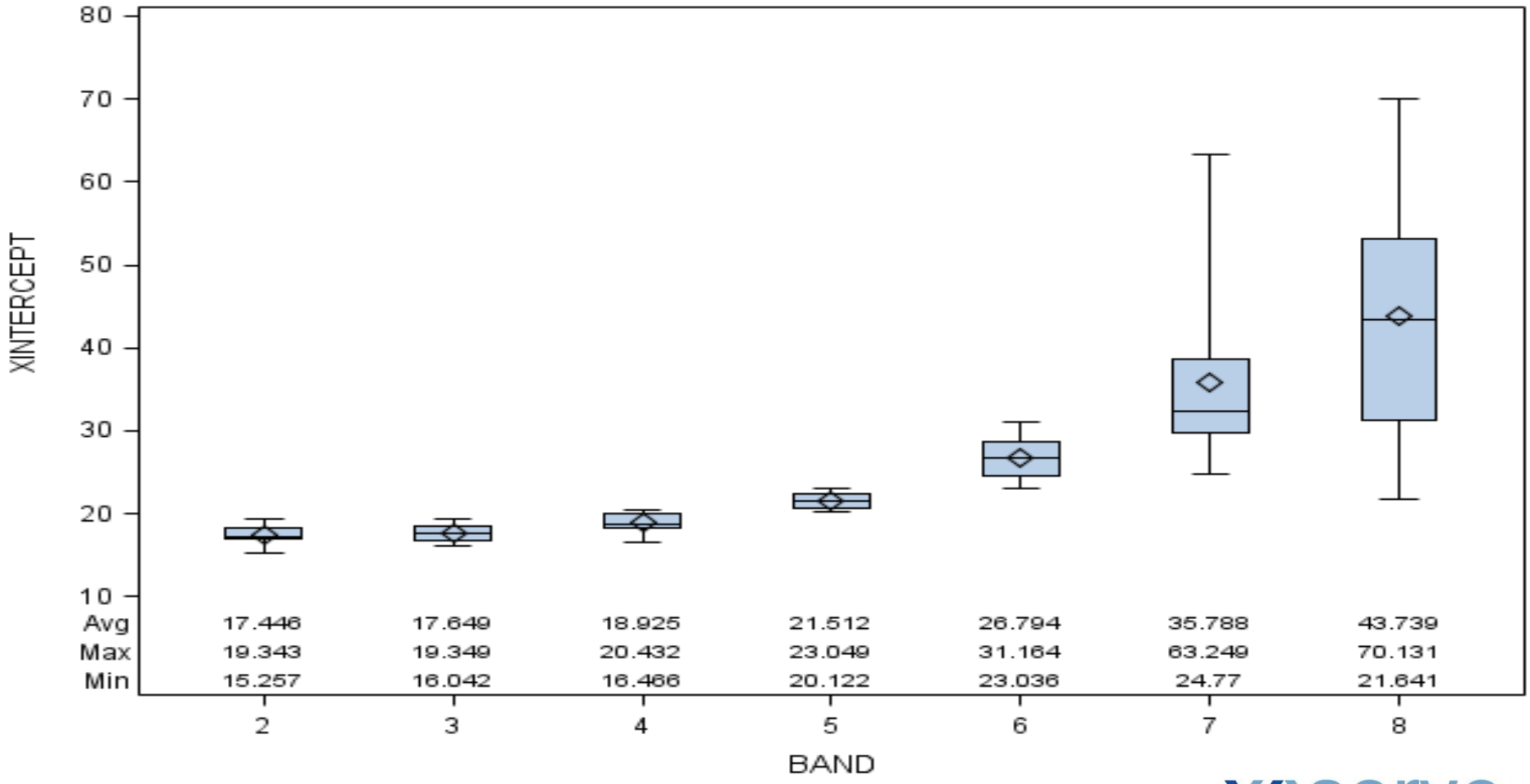
Intercept Analysis

The next piece of analysis carried out was based on the cwv (x) intercept across the current EUC bands i.e. what the cwv is when demand (y) is zero – and how this varies across the bands.

To do this, regressions were calculated by:

- aggregating demand at LDZ level
- using the LDZ cwv
- Mon – Thu (excluding holidays)

Box plot of cwv (x) intercept 2011/12



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Intercept Analysis

From observing the cwv intercept across the current bands, it appears that there are similarities in the relationship between energy consumption and cwv for Bands 2, 3 and 4 - and possibly Band 5.

Recommendations / Conclusions

- No strong evidence of better break points from the data
- Possible scope to rationalise Bands 5 to 8
- Simpler solution is use of more aggregation in modelling
- More complex change is to alter EUC Bands and/or reduce number of bands

TWG views now invited