



Technical Work Group

EUC Modelling 2015/16 – Single Year Modelling Results

19th May 2015

- Overview of Demand Estimation & Timetable
- Presentation of Current Completed Analysis
 - Modelling Basis
 - Small NDM – Modelling results for single year
 - Large NDM – Modelling results for single year
- Review and conclusions

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Demand Estimation changes for this year

- UNC Modification 432 will be implemented during Gas Year 2015/16, along with UK Link replacement – exact date to be determined following re-planning exercise
- The changes in this Modification include a revision of the NDM Nominations and Allocation formula – see new arrangements below:

$$\text{Supply Point Demand} = (\text{AQ}/365) * \text{ALP} * (1 + [\text{DAF} * \text{WCF}])$$

- The main points to note are:
 - WCF – The Weather Correction Factor will be based on the differences in weather variables (CWV and SNCWV)
 - DAF – The Daily Adjustment Factor will be calculated using only the EUC model weather sensitivities
 - SF – The Scaling Factor will be removed meaning NDM Allocation will no longer be the balancing figure
 - UG – Unidentified Gas will now become the balancing figure for the Total LDZ demand

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Purpose of NDM Modelling

- Provides a method to differentiate NDM loads and provide profiles of usage
i.e. End User Category (EUC) Definitions
- Provide a reasonable estimate of aggregate NDM demand (by EUC / shipper / LDZ) to allow the daily balancing regime to work
i.e. NDM profiles (ALPs & DAFs)
We will produce both “old” and “new” DAFs for the whole year to cover the transition between regimes
- Provide a means of determining NDM Supply Point capacity
i.e. NDM EUC Load Factors
- The underlying NDM EUC and aggregate NDM demand models derived each year are intended to deliver these obligations only
- NDM allocation is an initial estimate of demand which will be corrected by Reconciliation

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Role of DESC and TWG

- Responsibilities for Demand Estimation changed following implementation of UNC Modification 331 on 3rd January 2012
- DESC collectively required by UNC to:
 - Submit proposals to Transporters and Users for each Gas Year comprising:
 - EUC Definitions
 - NDM Profiling Parameters
 - Capacity Estimation Parameters
 - In addition:
 - Analysis of accuracy of the allocation process
 - Derivation of CWV and Seasonal Normal
 - Consultation with Industry
- Xoserve acts as the common NDM Demand Estimation service provider

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Agreed 2015 Modelling Work plan

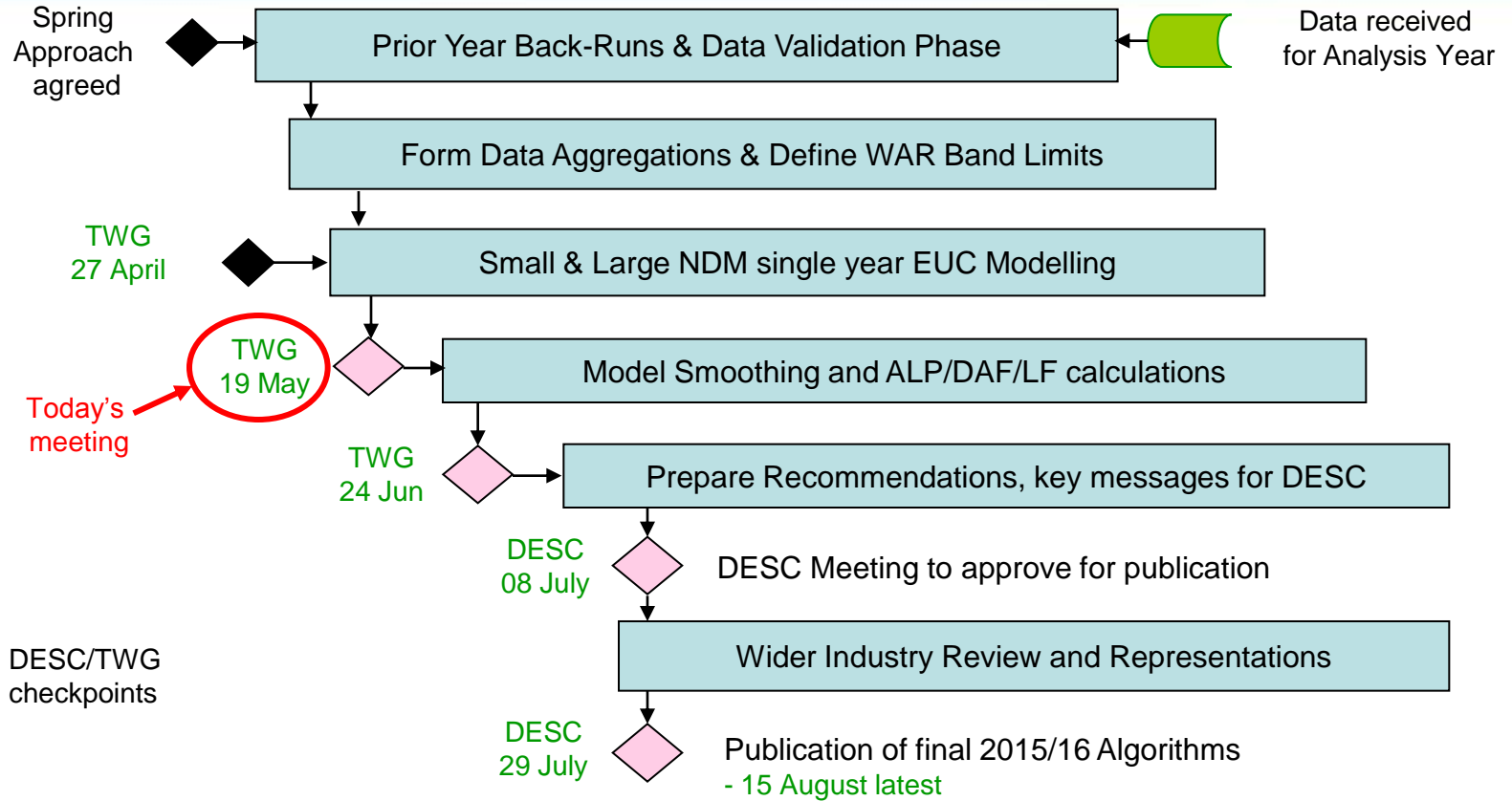
- Work plan for 2015 Modelling included as part of Spring Approach document which was confirmed and agreed at 11 February DESC meeting
- Work plan provides more transparency of process and includes checkpoints for DESC/TWG review

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Agreed 2015 Timetable



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Objectives of this Meeting

- 2nd checkpoint meeting of this year's modelling process
- Checkpoint required prior to commencing 3-year model smoothing
- Key objectives of May meeting
 - Review and confirm results of single year EUC Modelling
- Required Outcome – TWG agreement to single year models – needed prior to commencing next phase of modelling

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- Methodology described in “Spring Approach” document, approved at February 2015 meeting
- Key aspects of EUC demand modelling basis for Spring 2015 analysis:
 - 12 month analysis for AMR and datalogger data sets covering 1st April 2014 to 31st March 2015
 - Sample data collected, validated and options for aggregations agreed by TWG during April
 - Weather data used in the analysis is the set of Composite Weather Variable (CWV) values using the new definitions and the new Seasonal Normal basis both agreed by DESC at the end of 2014
 - All demand modelling is data driven – if the modelling results indicate then Holiday & Weekend Factors, Summer Reductions & Cut-Offs will be applied

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- Holiday codes and rules applicable to Christmas / New Year period are same as used in Spring 2014 (changes last made at the November 2011 DESC meeting)
- Warm-weather cut-offs:
 - Not applied to EUC models < 293 MWh pa to help mitigate the identified impact of summer Scaling Factor volatility
 - Therefore no cut-off is placed on warm weather demand reduction in EUC models representing nearly 80% of NDM load
 - Any cut-offs are based on modelling results from 3 years
- Summer Reductions:
 - Summer reductions can apply to EUC models over the period 24th May to 27th September 2014 (Sunday before Spring Bank Holiday Monday to last Sunday in September)
 - Applies along with the more general summer holiday period in July and August
 - Applied by modelling results over 3 years
- Modelling methodology described in NDM Report (Appendices 3 & 4)

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- Analysis carried out...
 - Aims to assist in the creation of profiles based on the relationship between demand to weather
 - Identify the best fit model based on available data samples
 - View of results so far and highlight any issues raised
- Tools used to identify best model :
 - R^2 Multiple Correlation Coefficient – statistical tool for identifying ‘goodness of fit’ (100% = perfect fit / direct relationship)
 - Variations in Indicative Load Factors
 - In some instances to support decision making T-Stats and Residuals also provided

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Indicative Load Factors (ILF) & Load Factors (LF)

- ILF used to compare variations in models
 - $LF = \text{average daily demand (i.e. AQ/365)} / 1 \text{ in } 20 \text{ peak demand}$
 - $ILF = (AQ/365) / \text{model demand corresponding to } 1 \text{ in } 20 \text{ CWV}$
- ILF based on available 1 in 20 CWV against demand to create replicated LF
- ILFs are only used to compare prospective demand models as an aid to making decisions on model choice
- ILFs are not the same as proper LFs and their values are not an indicator of the values of proper LFs (ILFs not used for determining NDM capacities)
- There should be distinguishable ILF values between consumption and WAR bandings

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Small NDM <2,196 MWh

Consumption Band Analysis

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- Current EUC Bands Small NDM :
 - 0 – 73.2 MWh pa
 - 73.2 – 293 MWh pa
 - 293 – 732 MWh pa
 - 732 – 2,196 MWh pa

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Total NDM Population Counts: Supply Point & AQ

Consumption Range	% of Total NDM	
	Total AQ	Total Count
0 – 73.2 MWh pa	71.6%	98.80%
0 – 293 MWh pa	77.7%	99.67%
0 – 2,196 MWh pa	88.3%	99.97%
>2,196 MWh pa	11.7%	0.03%

- On an AQ basis:

- Small NDM is by far the main component of the overall NDM sector
- The range 0-73.2 MWh pa constitutes nearly 3/4 of overall NDM
- The range 0-293 MWh pa constitutes nearly 4/5 of overall NDM
- The range 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 Supply Points (<2,196 MWh pa) Agreed Sample Data Aggregations

	Consumption Band Analysis – 2014/15 data
Band 01 0 to 73.2 MWh pa	Individual LDZ (NW/WN Combined)
Band 02 73.2 to 293 MWh pa	Individual LDZ (NW/WN Combined)
Band 03 293 to 732 MWh pa	Individual LDZ (NW/WN Combined and WS/SW Combined)
Band 04 732 to 2,196 MWh pa	Individual LDZ (NW/WN Combined)

- Aggregations as agreed at April TWG
- In the main sufficient data available to allow individual LDZ analysis
- Band 03 required WS and SW to also be combined

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Small NDM Modelling Results

EUC Band 1: 0 – 73.2 MWh pa Domestic Sites

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	34%	98%	224
NO	35%	98%	221
NW / WN	32%	98%	225
NE	35%	98%	254
EM	33%	99%	241
WM	32%	99%	244
WS	32%	98%	226
EA	32%	99%	261
NT	30%	99%	233
SE	29%	99%	227
SO	30%	99%	245
SW	30%	99%	234

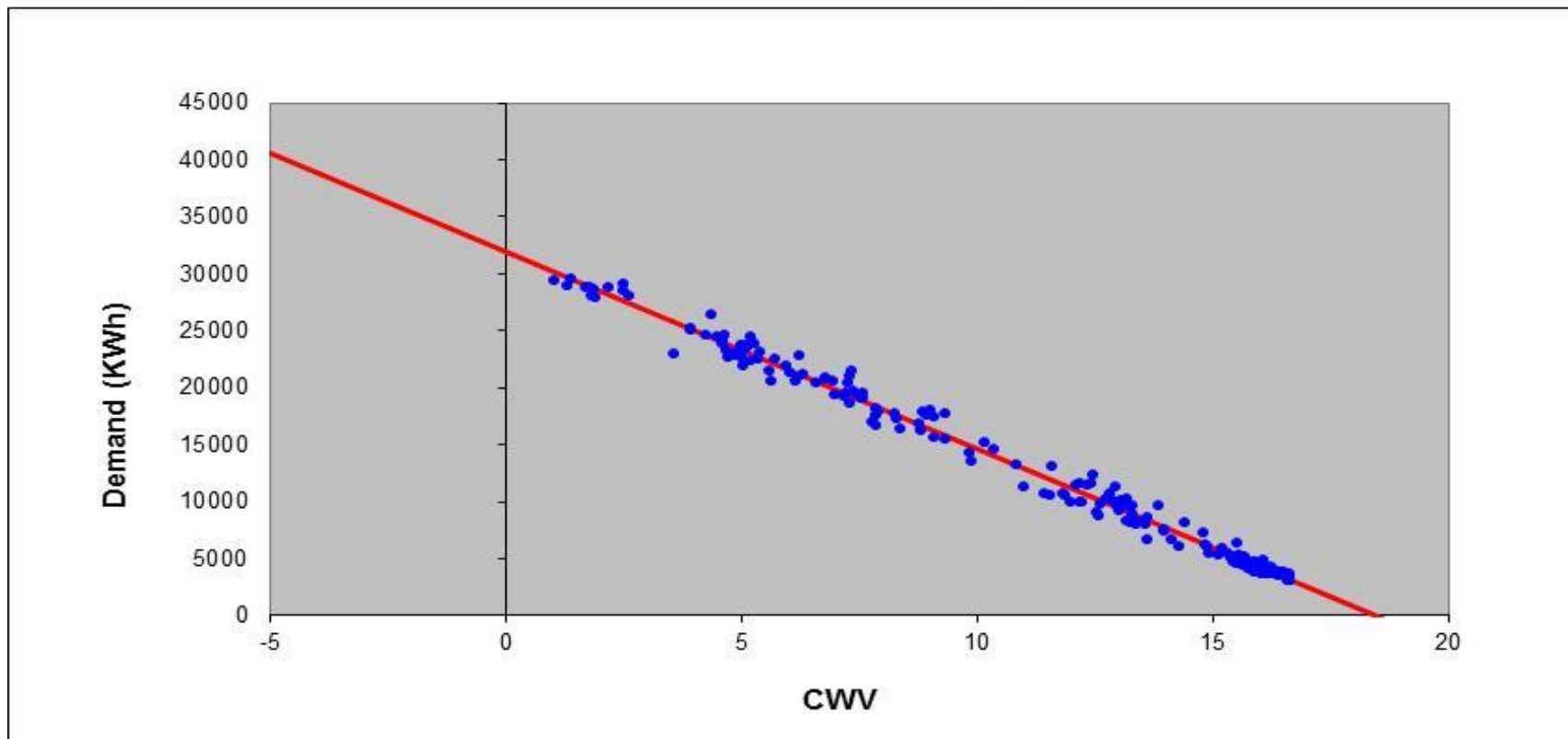
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Small NDM Modelling Results

EA LDZ, EUC Band 1: 0 - 73.2 MWh pa



Demand against EA CWV – Monday to Thursday - Holidays included

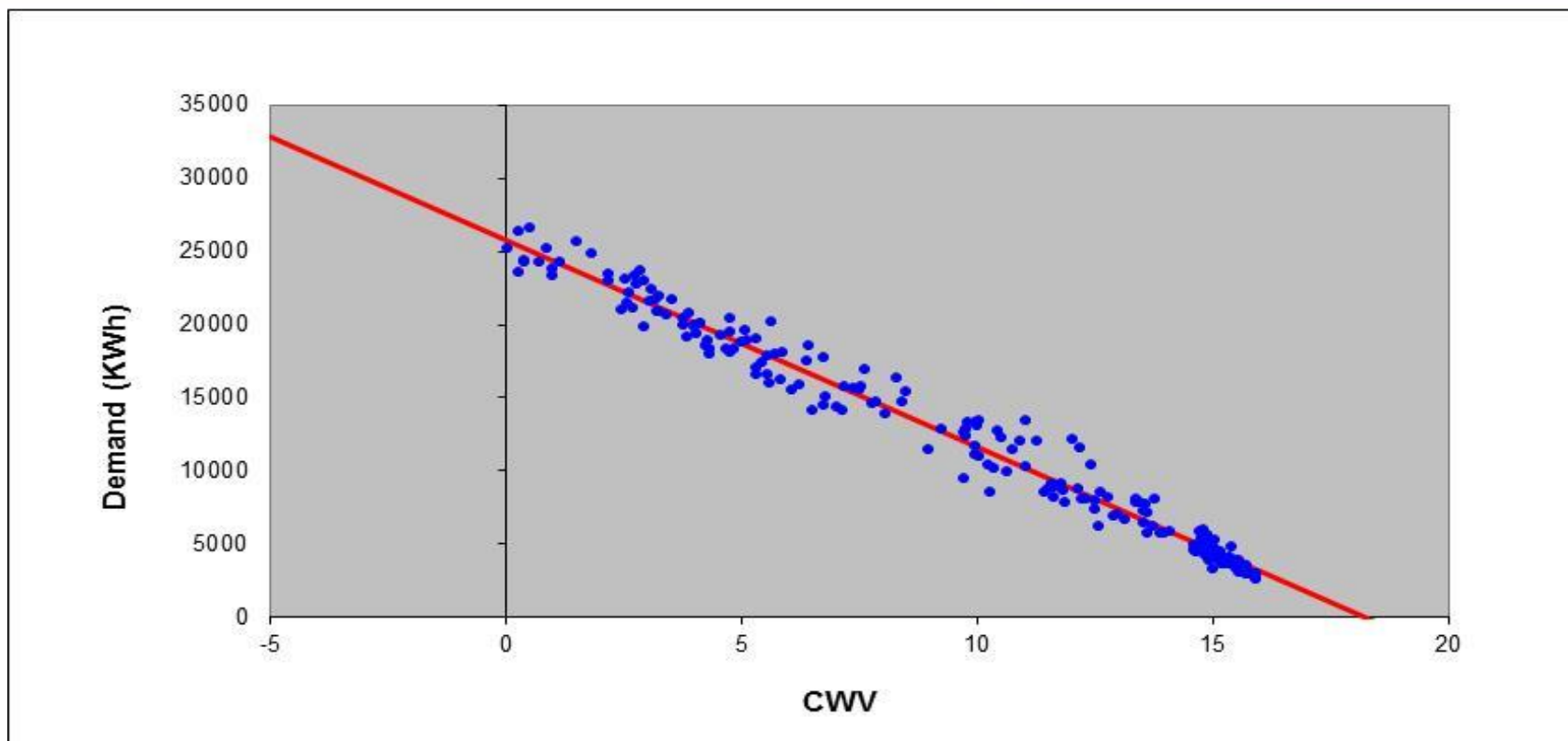
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Small NDM Modelling Results

NE LDZ, EUC Band 1: 0 - 73.2 MWh pa



Demand against NE CWV – Monday to Thursday - Holidays included

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Small NDM Modelling Results

EUC Band 2: 73.2 – 293 MWh pa

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	34%	98%	91
NO	35%	97%	78
NW / WN	31%	96%	115
NE	32%	96%	91
EM	30%	97%	104
WM	28%	96%	97
WS	31%	96%	77
EA	29%	96%	127
NT	30%	97%	138
SE	29%	97%	132
SO	30%	98%	108
SW	31%	97%	114

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Small NDM Modelling Results

EUC Band 3: 293 – 732 MWh pa

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	32%	98%	133
NO	34%	96%	71
NW / WN	30%	95%	115
NE	33%	97%	78
EM	29%	96%	116
WM	27%	96%	99
WS / SW	27%	96%	71
EA	29%	97%	121
NT	30%	97%	116
SE	30%	98%	146
SO	26%	96%	103

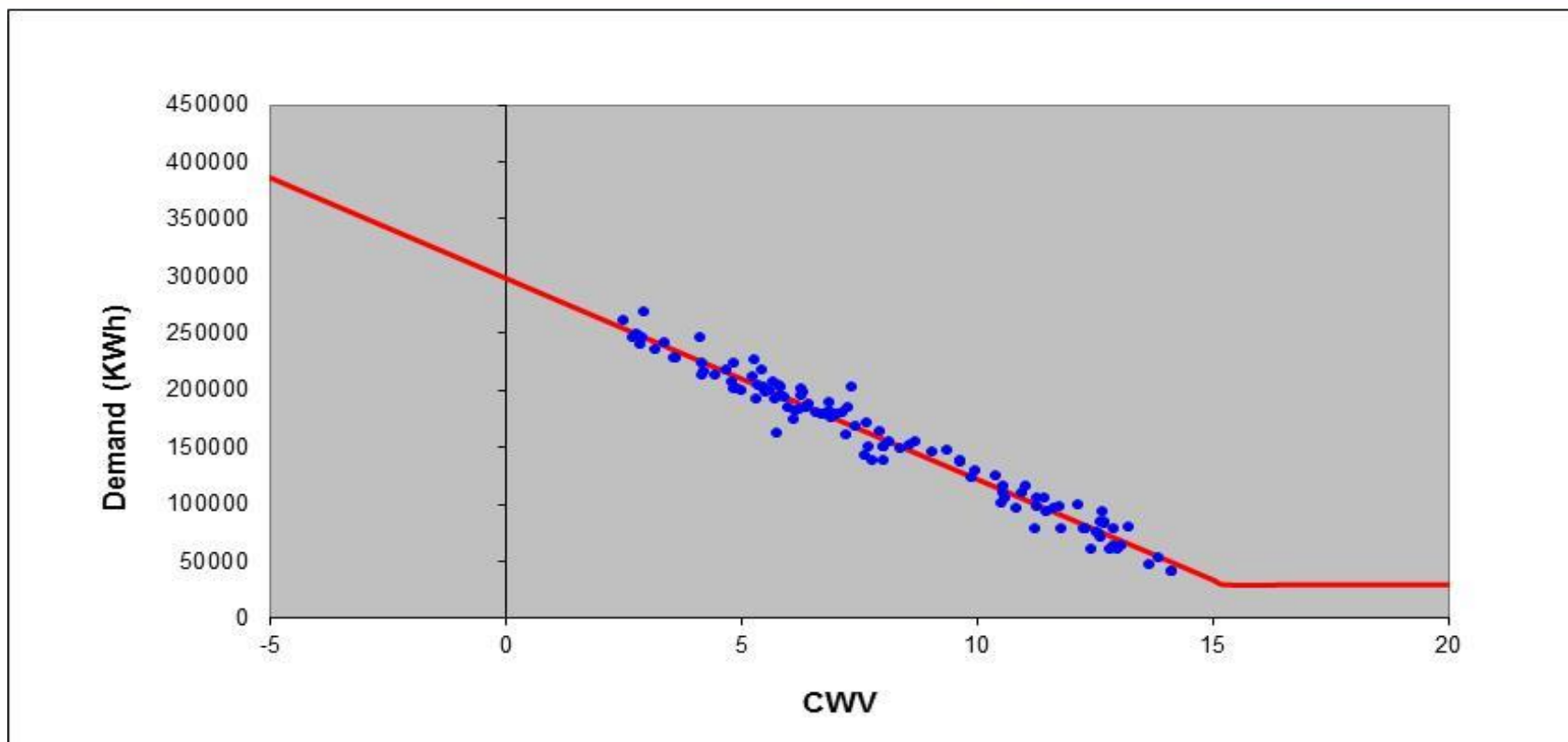
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Small NDM Modelling Results

WS LDZ, EUC Band 3: 293 - 732 MWh pa



- **Combined WS/SW Demand** against WS CWV – Non Holiday Monday to Thursday - Sample size: 71

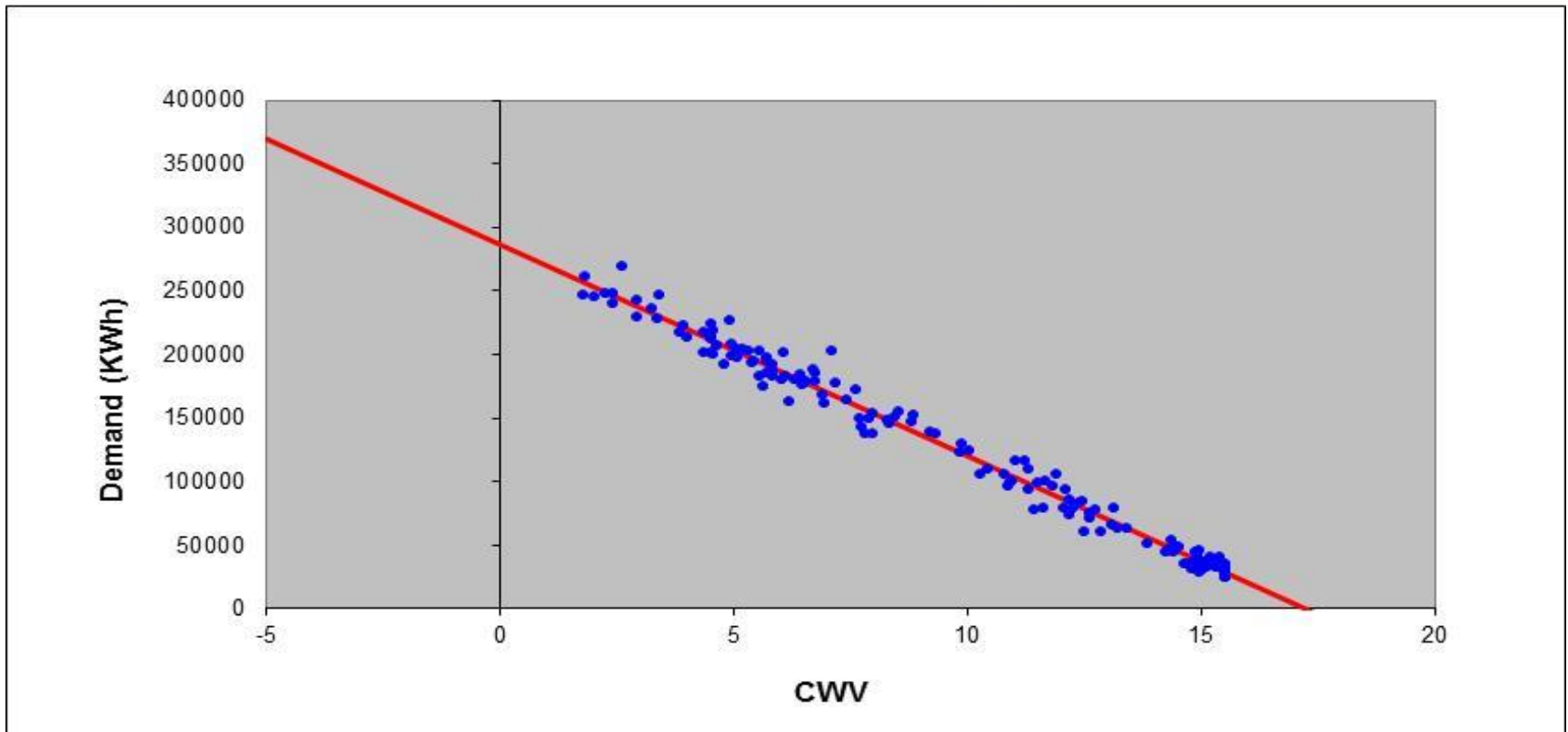
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Small NDM Modelling Results

SW LDZ, EUC Band 3: 293 - 732 MWh pa



- **Combined WS/SW Demand** against SW CWV – Non Holiday Monday to Thursday - Sample size: 71

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Small NDM Modelling Results

EUC Band 4: 732 – 2196 MWh pa

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	34%	98%	255
NO	34%	97%	104
NW / WN	32%	97%	257
NE	35%	97%	162
EM	33%	98%	195
WM	30%	96%	223
WS	32%	97%	49
EA	32%	98%	219
NT	34%	98%	270
SE	33%	99%	246
SO	30%	98%	181
SW	33%	97%	112

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Small NDM <2,196 MWh

WAR Band Analysis

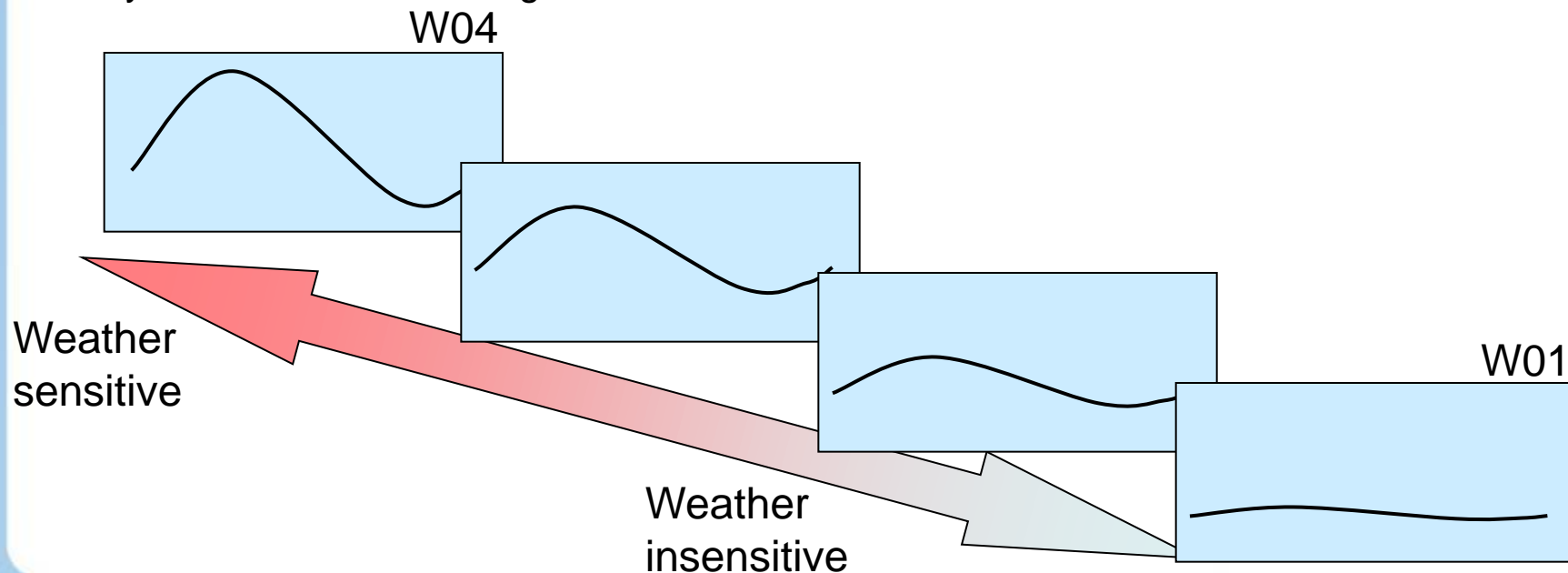
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Winter: Annual Ratio (WAR) Band EUCs

- 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



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Winter: Annual Ratio (WAR) Band EUC

- 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 an actual demand and the denominator is a weather corrected annual consumption, WAR values change from year to year as they are affected by December to March weather experience
- The limits defining WAR band EUCs are those applicable to the most recent winter (in this case winter 2014/15)
 - This is essential because supply points will be assigned to these newly defined WAR band EUCs (for 2014/15) based on their (Dec-Mar) consumption behaviour over winter 2014/15
 - 2014/15 was colder than 2013/14, so thresholds can expect to increase this year
- WAR Band limits for Spring 2015 Analysis were discussed and agreed at April TWG

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All Small NDM EUCs

Agreed WAR Band Analysis (April TWG)

Consumption Range	Comments on 2014/15 data
0 to 73.2 MWh pa (EUC Band 1)	Not generally Monthly read – no WAR Bands
73.2 to 293 MWh pa (EUC Band 2)	Not generally Monthly read – no WAR Bands
293 to 732 MWh pa (EUC Band 3)	Band 3 & 4 data merged for WAR Band Analysis: <u>Run 1:</u> Individual LDZ with NW/WN and WS/SW combined (Low number for LDZ 'NO' WB4) <u>Run 2:</u> Individual LDZ with NO/NW/WN, WS/SW, EA/NT and SE/SO combined
732 to 2,196 MWh pa (EUC Band 4)	

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Small NDM Modelling Results

DECISION: WAR Band Analysis: 293 to 2196 MWh pa

	WAR Banding											
	0.00 – 0.449			0.449 – 0.551			0.551 – 0.659			0.659 – 1.00		
SC	58%	96%	84	37%	97%	128	27%	96%	131	22%	96%	45
NO	60%	96%	38	39%	98%	62	28%	96%	57	20%	91%	18
NW / WN	55%	95%	81	40%	98%	105	27%	96%	95	21%	96%	91
NE	57%	96%	60	41%	97%	73	28%	95%	66	21%	93%	41
EM	63%	95%	61	40%	98%	88	27%	97%	98	20%	95%	64
WM	55%	96%	62	38%	97%	83	27%	96%	90	19%	94%	87
WS / SW	64%	83%	41	38%	97%	72	26%	97%	61	20%	95%	58
EA	57%	94%	45	40%	97%	100	28%	98%	128	21%	96%	67
NT	63%	89%	91	39%	98%	118	28%	97%	107	20%	96%	70
SE	57%	96%	70	42%	98%	119	28%	98%	123	20%	95%	80
SO	61%	92%	51	35%	97%	83	25%	97%	75	19%	96%	75

• **Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

- NO LDZ WAR Band 4 Model contains only 18 sample points

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Small NDM Modelling Results

DECISION: WAR Band Analysis: 293 to 2196 MWh pa

	WAR Banding											
	0.00 – 0.449			0.449 – 0.551			0.551 – 0.659			0.659 – 1.00		
SC	58%	96%	84	37%	97%	128	27%	96%	131	22%	96%	45
NO / NW / WN	56%	96%	119	40%	98%	167	28%	96%	152	21%	95%	109
NE	57%	96%	60	41%	97%	73	28%	95%	66	21%	93%	41
EM	63%	95%	61	40%	98%	88	27%	97%	98	20%	95%	64
WM	55%	96%	62	38%	97%	83	27%	96%	90	19%	94%	87
WS / SW	64%	83%	41	38%	97%	72	26%	97%	61	20%	95%	58
EA / NT	61%	92%	136	40%	98%	218	28%	98%	235	21%	96%	137
SE / SO	59%	96%	121	39%	98%	202	26%	98%	198	20%	96%	155

• **Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

- NO LDZ combined with NW / WN to boost the sample to 109 points

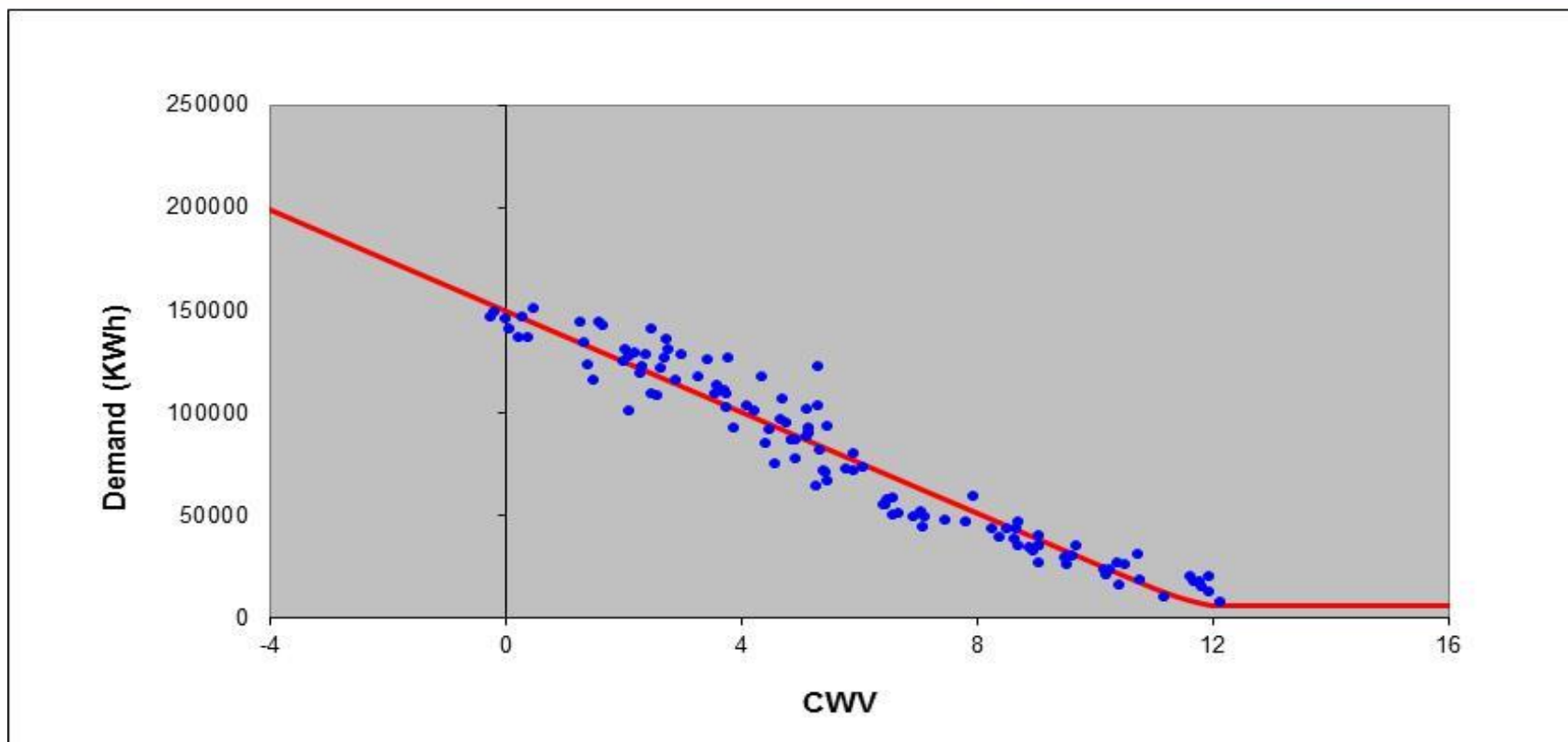
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Small NDM Modelling Results

NO LDZ, EUC Band 3 to 4 – WAR Band 4



- **NO Demand** against NO CWV
Non Holiday Monday to Thursday – Sample size 18

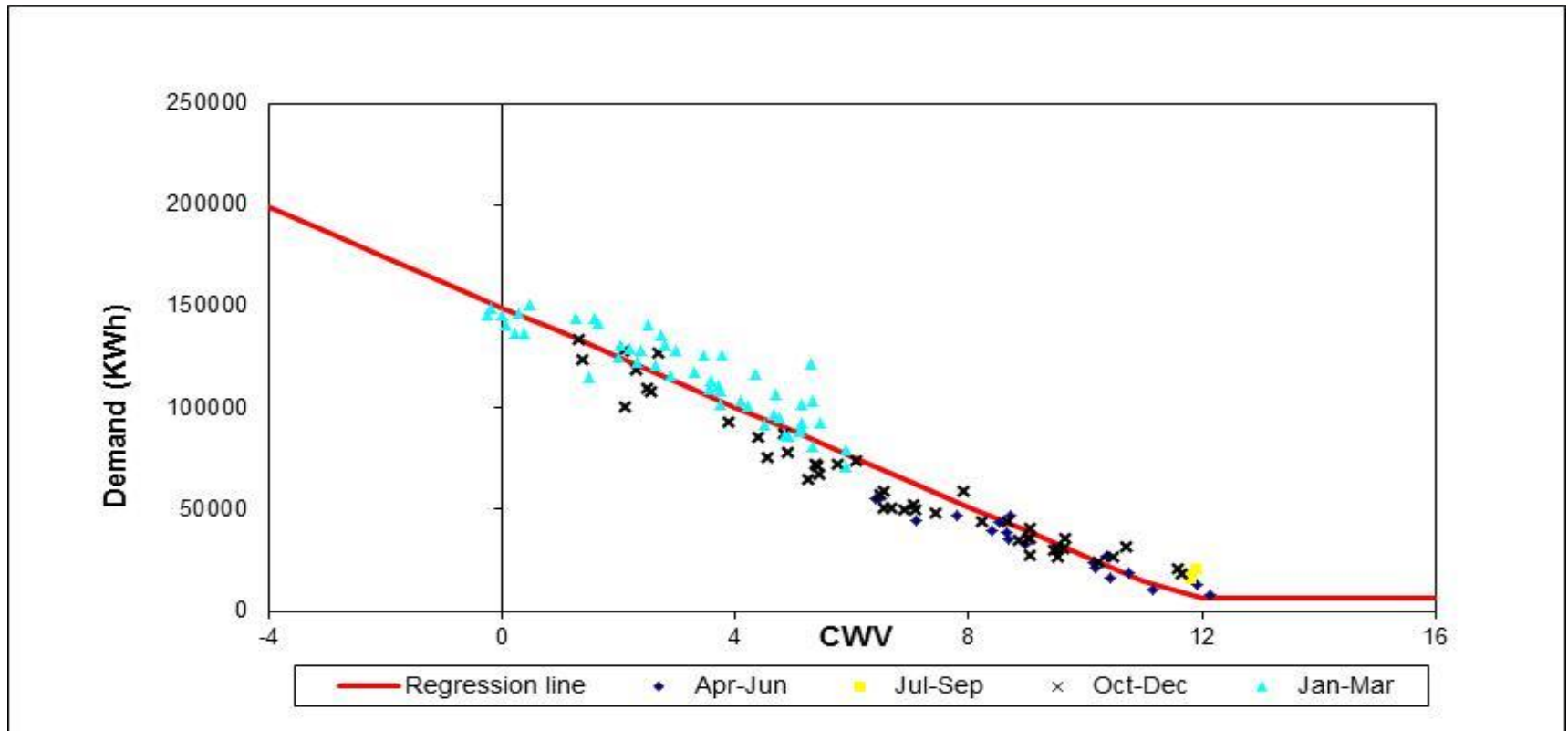
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Small NDM Modelling Results

NO LDZ, EUC Band 3 to 4 – WAR Band 4



- **NO Demand** against NO CWV with **Seasons** highlighted
Non Holiday Monday to Thursday – Sample size 18

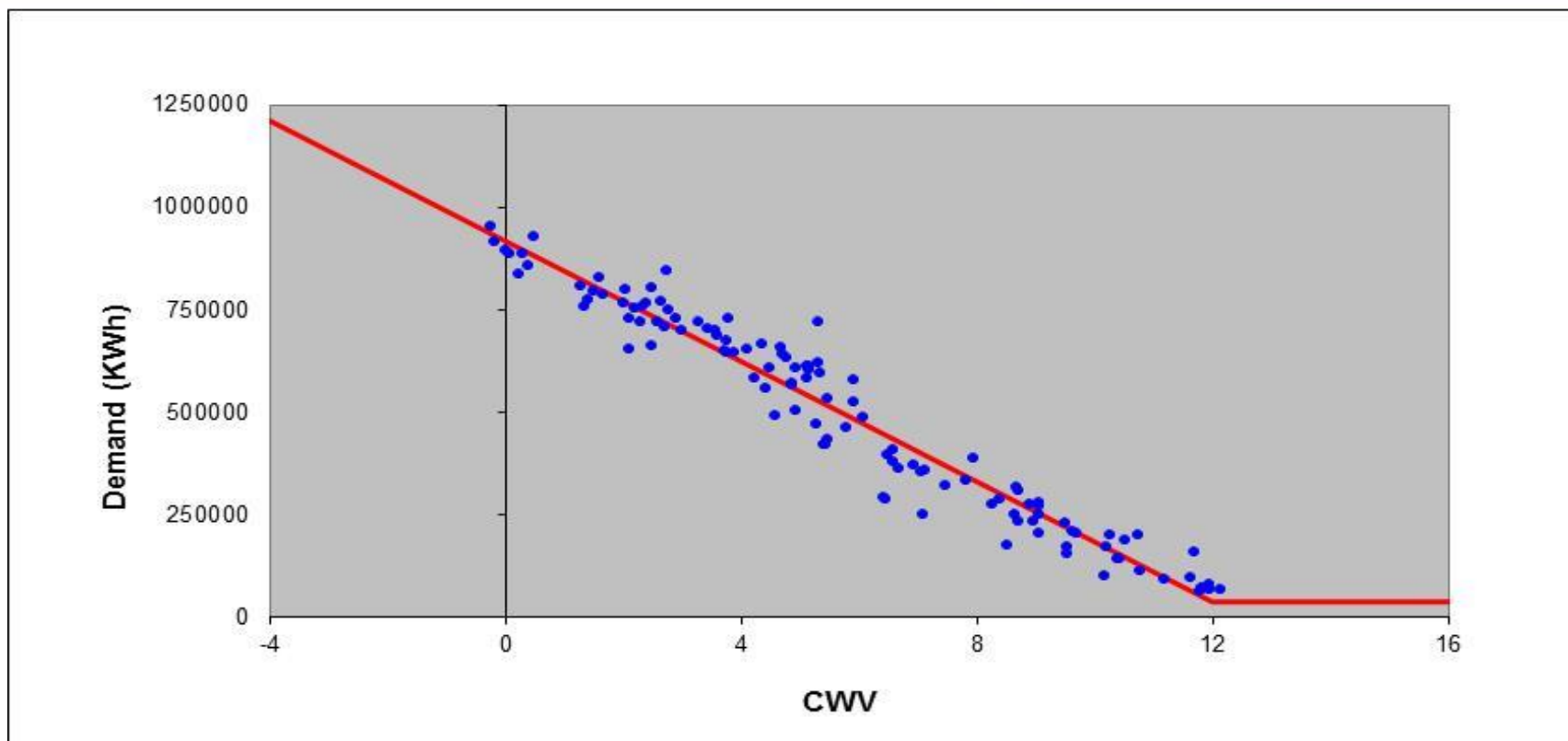
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Small NDM Modelling Results

NO LDZ, EUC Band 3 to 4 – WAR Band 4



- **Combined NO / NW/WN Demand** against NO CWV
Non Holiday Monday to Thursday – Sample size 109

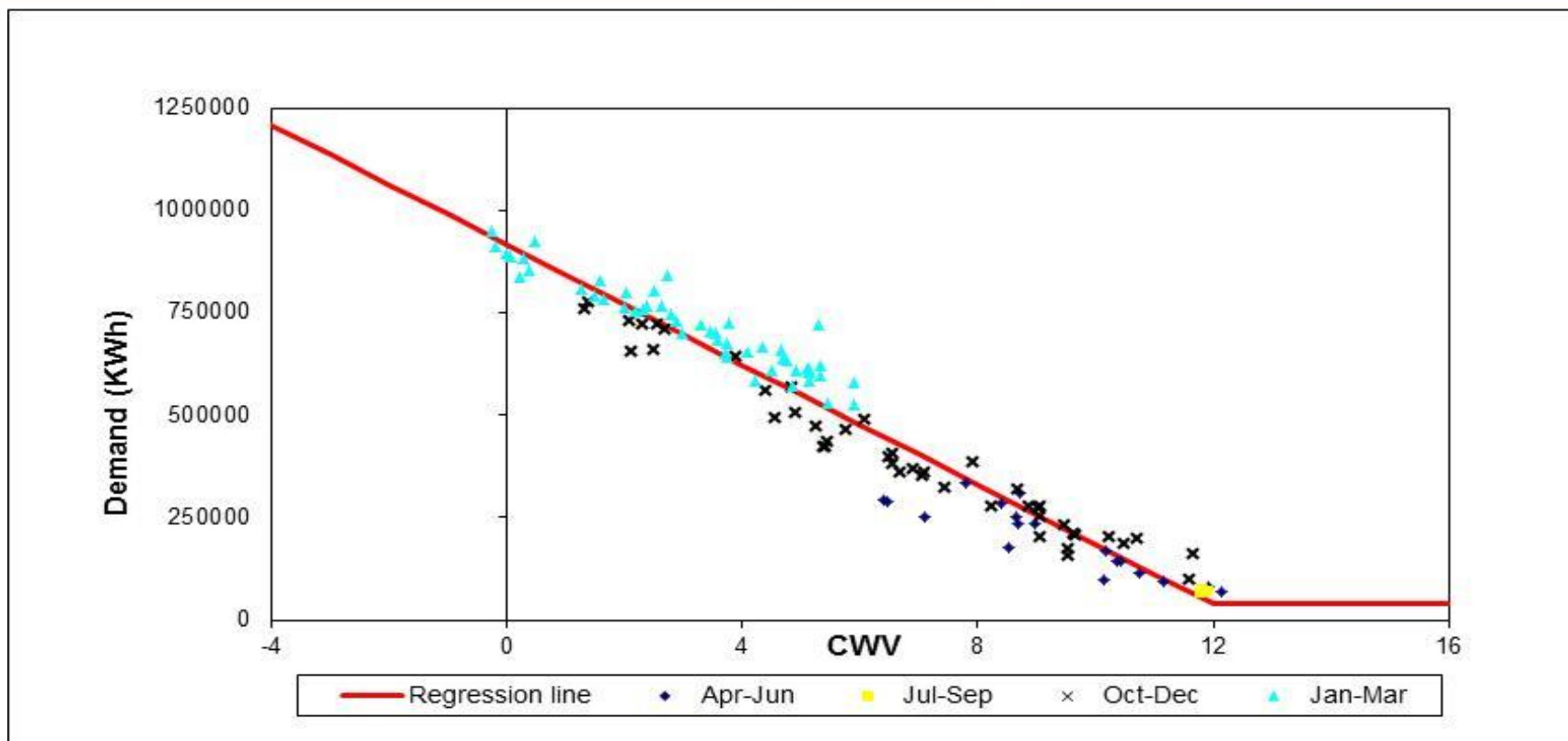
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Small NDM Modelling Results

NO LDZ, EUC Band 3 to 4 – WAR Band 4



- **Combined NO / NW/WN Demand** against NO CWV with **Seasons** highlighted

Non Holiday Monday to Thursday – Sample size 109

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T-Statistic:

- The use of the T-Statistic has been suggested for comparing models.
- The T-Statistic from least squares regression has been used:
 - Applied to Independent variable
 - It is the regression coefficient (of a given independent variable) divided by its standard error.
 - Tests if X is significantly related to Y
 - Significant if T-Statistic > 2
- Note: Where the T-Statistic is being used to compare models with different demands, i.e. the dependent variable Y, the T-Statistic requires normalization due to the different scales involved.

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Model Comparison: NO LDZ, EUC Band 3 to 4 – WAR Band 4

- Summary of Key Statistics:

	NO Individual		NO / NW / WN combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	149757	1993	917096	10479
C2 (Slope)	-12288	302	-73312	1588
R ²	91%		93%	
ILF	20%		21%	
Sample Size	18		109	
T stat C1 (Normalised)	75.14 (1)		87.52 (1)	
T stat C2 (Normalised)	-40.69 (-0.5415)		-46.17 (-0.5275)	

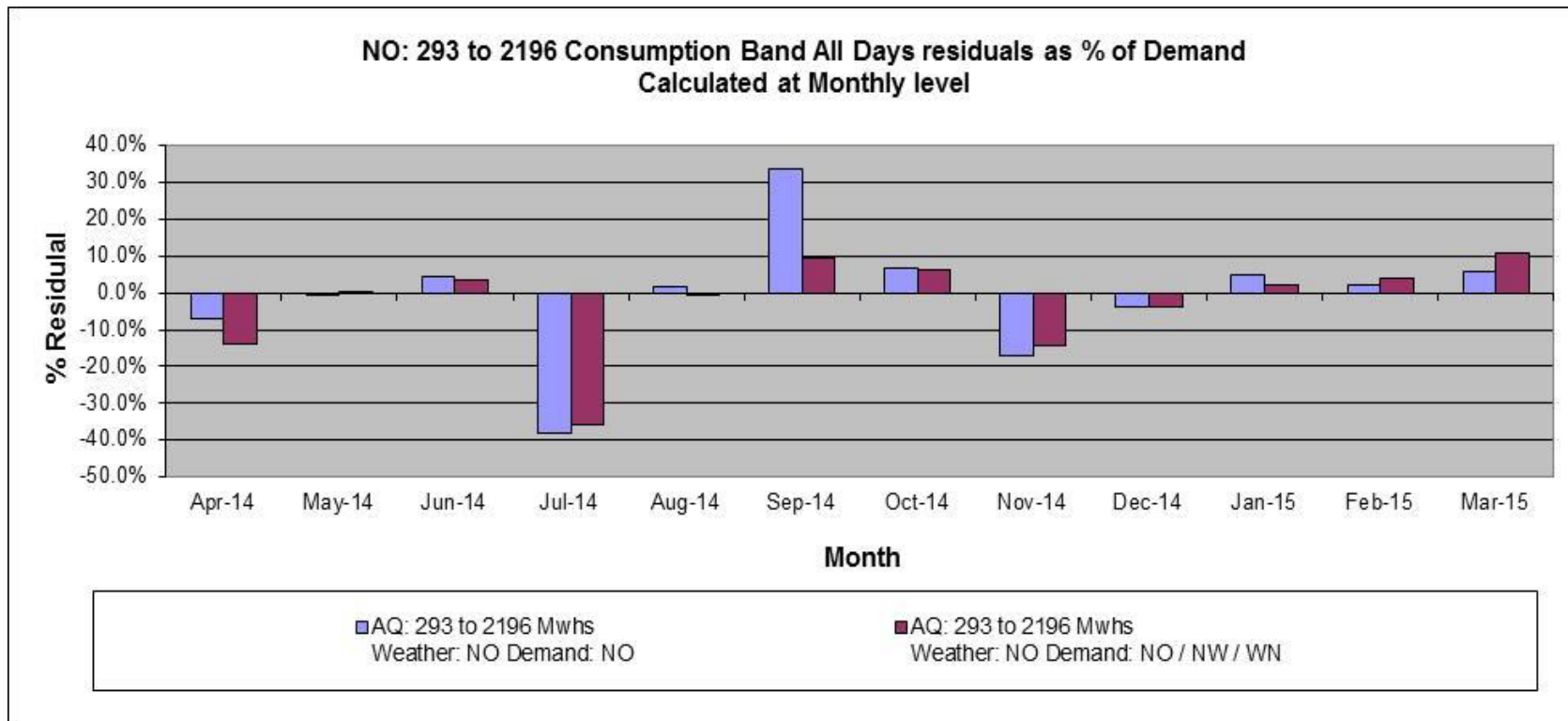



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Small NDM Modelling Results

Model Comparison: NO LDZ, EUC Band 3 to 4 – WAR Band 4

- Monthly Residuals:



TWG to decide on aggregation to use....

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Small NDM Analysis Summary

- Good R^2 Coefficients for majority of Consumption Band and WAR Band models
- Decrease in sample numbers available for modelling, however still sufficient this year for individual LDZ analysis for majority of Consumption Band models
- The decrease has seen an impact to the WAR Band models with individual LDZ analysis becoming more difficult e.g. NO WAR Band 4
- *Recap on decisions made*
- Are TWG happy to move to model smoothing with the results previously presented?

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Large NDM Analysis

>2196 MWh p.a.

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Large NDM Analysis (>2,196 MWh pa)

- Current EUC Bands Large NDM:
 - 2,196 to 5,860 MWh
 - 5,860 to 14,650 MWh
 - 14,650 to 29,300 MWh
 - 29,300 to 58,600 MWh

} 1 Consumption Band
x4 Winter Annual Ratio (WAR) Bands

 - >58,600 MWh 1 Contingency Band for sites which should be DM
- Large NDM represents approx. 11.7% of total NDM load and 0.03% of supply points.
- Subsequently, lower sample numbers available in Large NDM sector so underlying demand modelling can be done on basis of more broadly aggregated bands
 - As from Spring Approach 2014 DESC agreed to combine the models for the ranges 14,650 to 29,300 and 29,300 to 58,600 MWh (for modelling purposes only)

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Total NDM Population Counts: Supply Point & AQ

Consumption Range	% of Total NDM	
	Total AQ	Total Count
0 – 73.2 MWh pa	71.6%	98.80%
0 – 293 MWh pa	77.7%	99.67%
0 – 2,196 MWh pa	88.3%	99.97%
>2,196 MWh pa	11.7%	0.03%

- On an AQ basis:

- Small NDM is by far the main component of the overall NDM sector
- The range 0-73.2 MWh pa constitutes nearly 3/4 of overall NDM
- The range 0-293 MWh pa constitutes nearly 4/5 of overall NDM
- The range 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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Large NDM >2,196 MWh

Consumption Band Analysis

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Large NDM Supply Points (>2,196 MWh pa) Agreed Sample Data Aggregations

Consumption Band Analysis – 2014/15 data	
Band 05 2,196 to 5,860 MWh pa	Individual LDZ (NW/WN Combined)
Band 06 5,860 to 14,650 MWh pa	<u>Run1</u> : Individual LDZ (NW/WN Combined) <u>Run 2</u> : Individual LDZ (NW/WN and WS/SW Combined)
Band 07 and Band 08 14,650 to 58,600 MWh pa	Individual LDZ (NW/WN, WS/SW and SE/SO Combined)
Band 09 >58,600 MWh pa	National

- Aggregation of sample data to allow sufficient sample analysis
- Options for aggregations as agreed at April TWG
- Decision to be made on model to be used for Band 06 – results to follow

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Large NDM Modelling Results

Band 5: 2,196 – 5,860 MWh pa

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	40%	98%	200
NO	39%	97%	87
NW / WN	* 40% 38%	* 98% 92%	161
NE	38%	98%	78
EM	39%	98%	155
WM	38%	98%	169
WS	38%	98%	33
EA	39%	98%	95
NT	38%	99%	179
SE	39%	99%	139
SO	35%	98%	118
SW	39%	98%	82

- * NW / WN results updated following further investigation

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DECISION: Band 6: 5,860 – 14,650 MWh pa

	Run1: Individual LDZ (NW/WN Combined)			Run 2: Individual LDZ (NW/WN and WS/SW Combined)		
SC	45%	97%	85	45%	97%	85
NO	46%	96%	38	46%	96%	38
NW / WN	* 48% 43%	* 97% 85%	84	* 48% 43%	* 97% 85%	84
NE	52%	96%	58	52%	96%	58
EM	45%	97%	71	45%	97%	71
WM	40%	98%	86	40%	98%	86
EA	49%	97%	53	49%	97%	53
NT	44%	98%	65	44%	98%	65
SE	40%	99%	46	40%	99%	46
SO	36%	98%	37	36%	98%	37
WS	45%	93%	27	44%	97%	83
SW	43%	97%	56			

• **Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

- * NW / WN results updated following further investigation

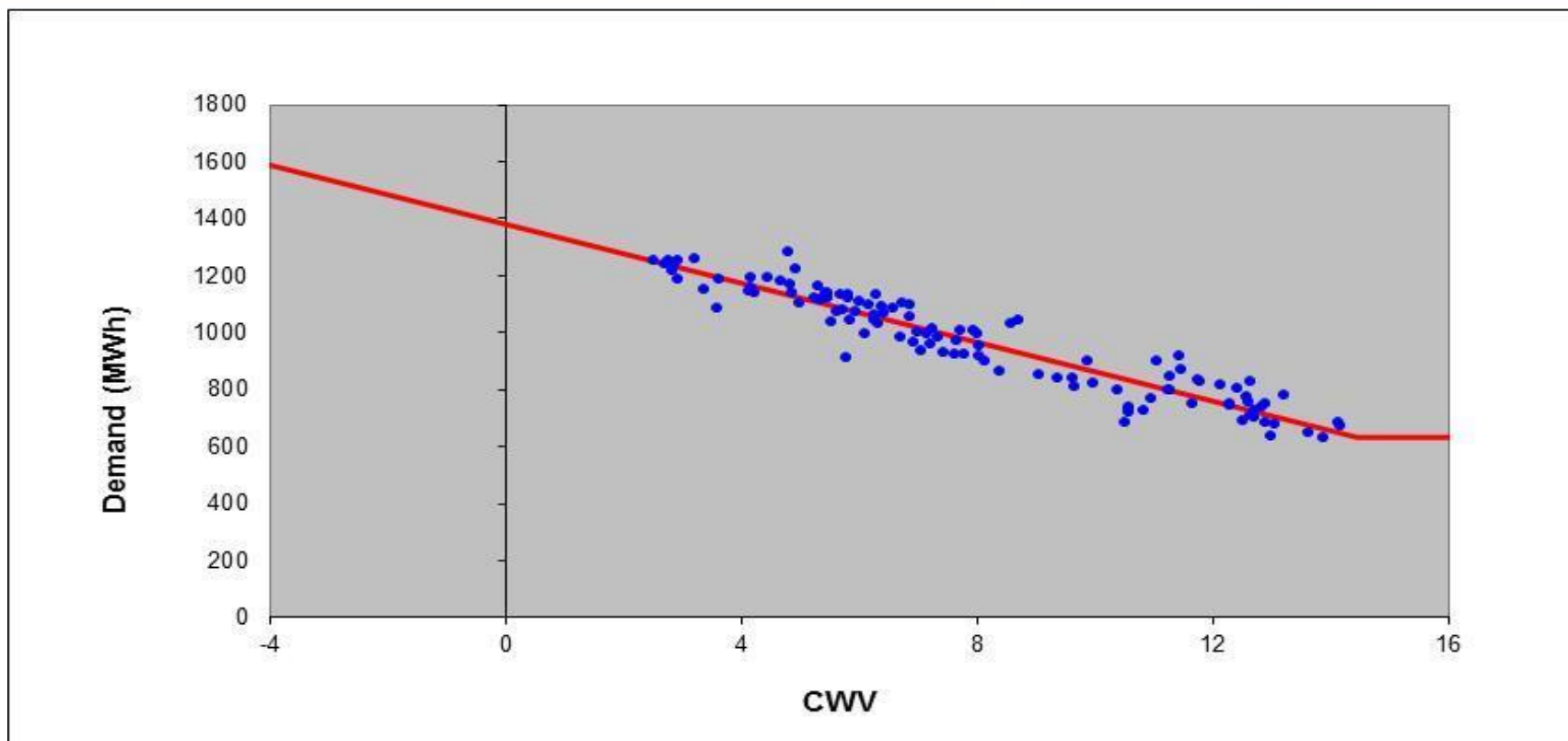
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Large NDM Modelling Results

WS LDZ, EUC Band 6 – Consumption Band



- **WS Demand** against WS CWV
Non Holiday Monday to Thursday – Sample size 27

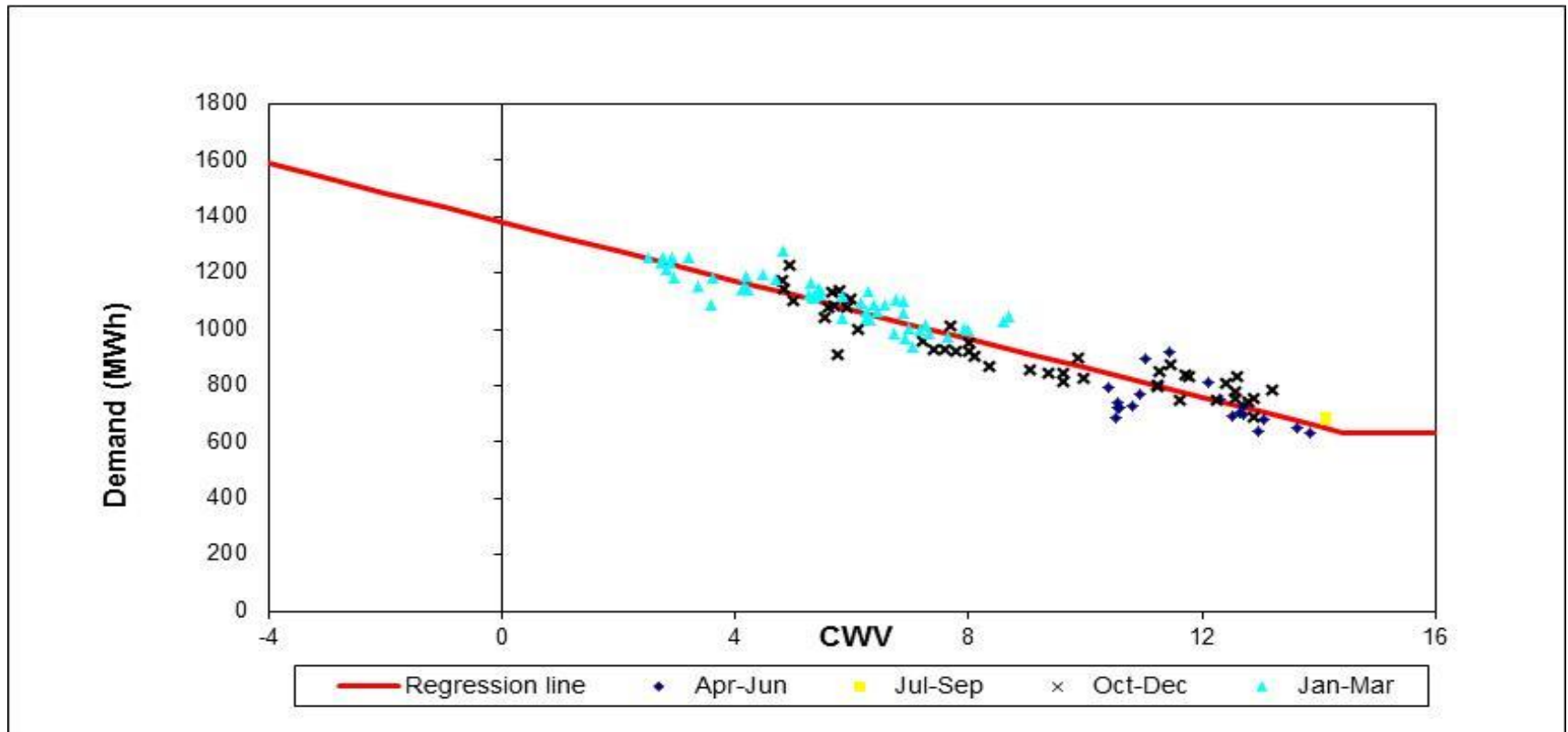
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Large NDM Modelling Results

WS LDZ, EUC Band 6 – Consumption Band



- WS Demand against WS CWV with Seasons highlighted
Non Holiday Monday to Thursday – Sample size 27

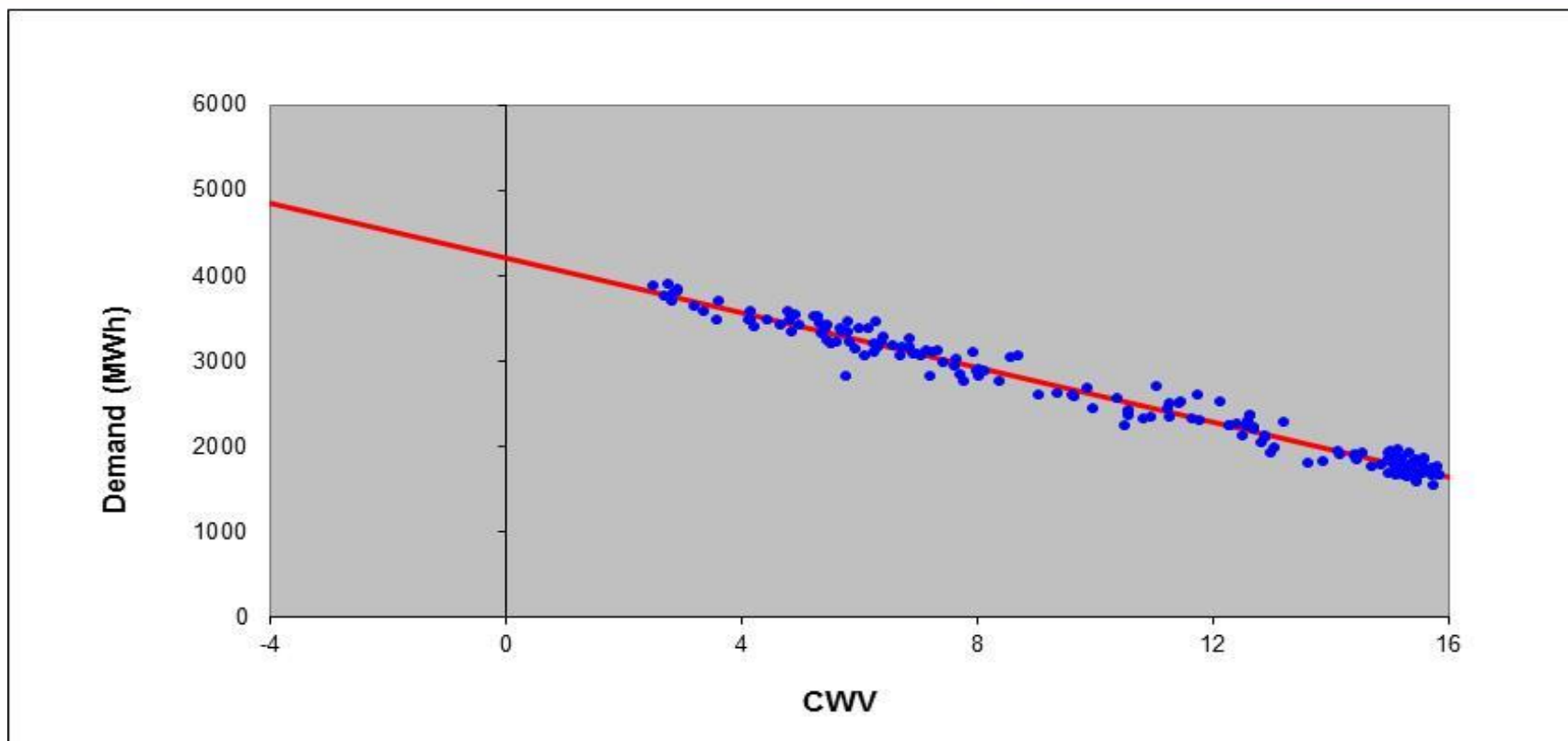
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Large NDM Modelling Results

WS LDZ, EUC Band 6 – Consumption Band



- **Combined WS/SW Demand** against WS CWV
Non Holiday Monday to Thursday – Sample size 83

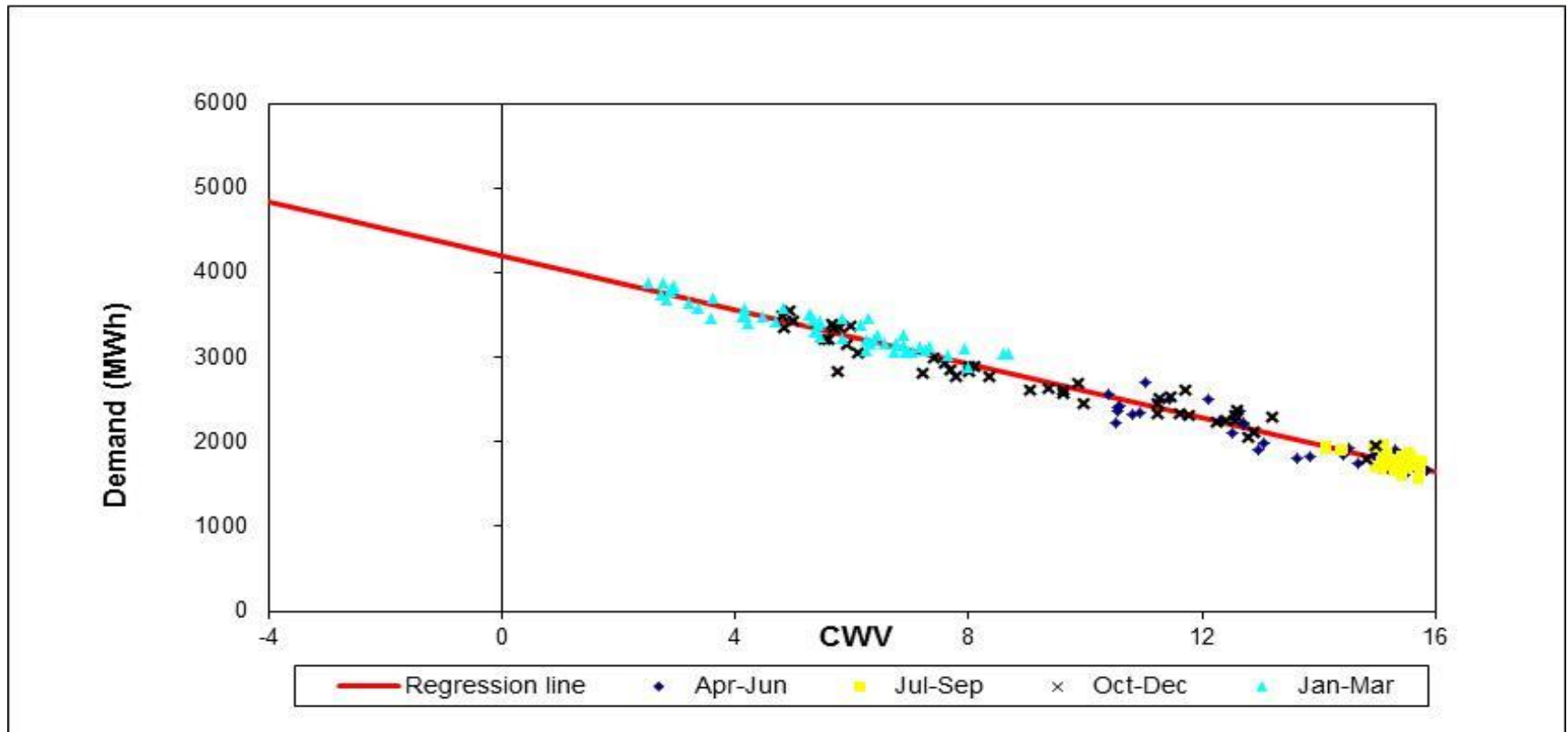
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Large NDM Modelling Results

WS LDZ, EUC Band 6 – Consumption Band



- Combined WS/SW Demand against WS CWV with Seasons highlighted
Non Holiday Monday to Thursday – Sample size 83

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Model Comparison: WS LDZ, EUC Band 6 – Consumption Band

- Summary of Key Statistics:

	WS		WS/SW combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	1380.7	14.2	4207.8	22
C2 (Slope)	-51.8	1.6	-160.1	1.9
R ²	93%		97%	
ILF	45%		44%	
Sample Size	27		83	
T stat C1 (Normalised)	97.23 (1)		191.26 (1)	
T stat C2 (Normalised)	-32.38 (-0.3330)		-84.26 (-0.4406)	

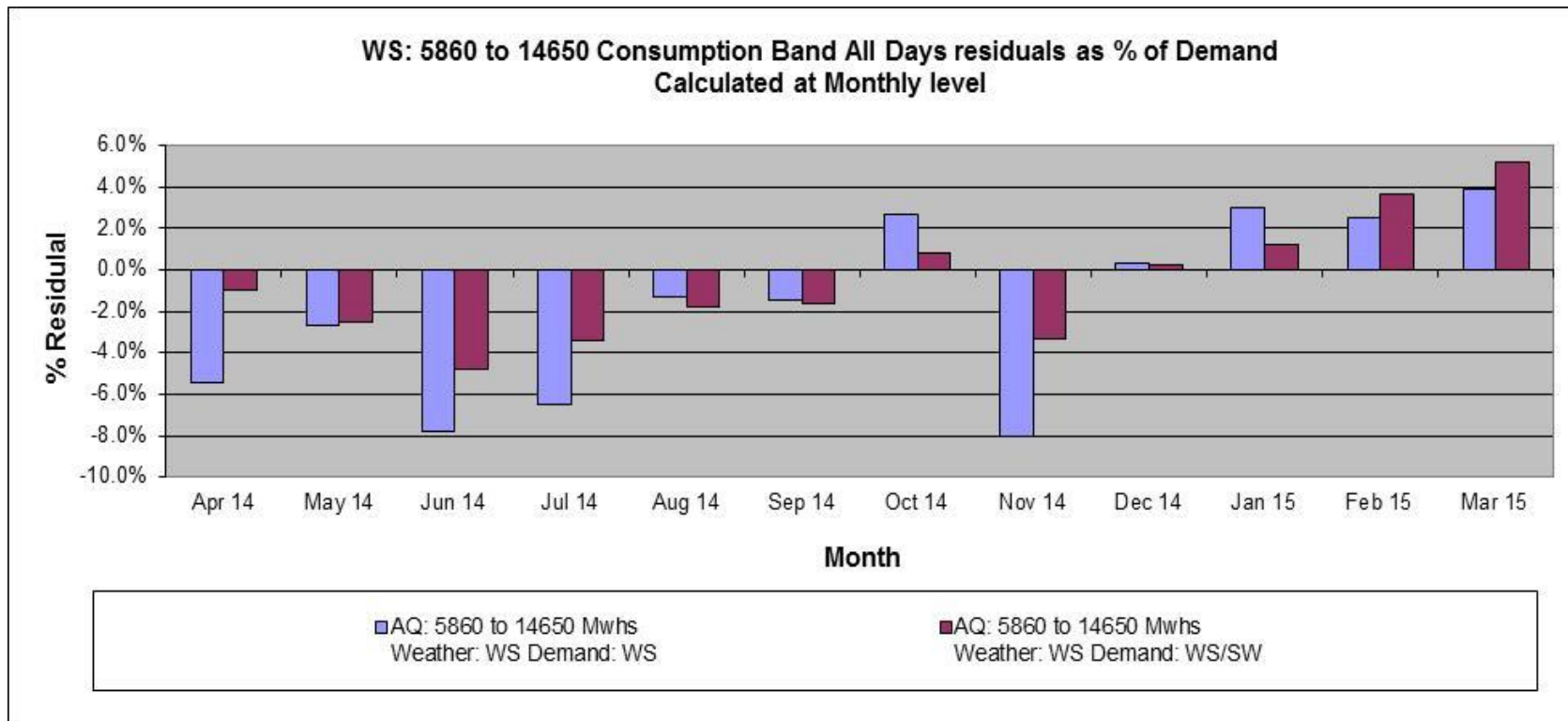



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Large NDM Modelling Results

Model Comparison: WS LDZ, EUC Band 6 – Consumption Band

- Monthly Residuals:



- TWG to decide on aggregation to use....

Xserve



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Large NDM Modelling Results

Band 7 and 8: 14,650 – 58,600 MWh pa

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	56%	92%	37
NO	64%	87%	31
NW / WN	* 57% 51%	* 96% 92%	84
NE	66%	94%	54
EM	60%	97%	91
WM	58%	96%	67
WS / SW	54%	96%	58
EA	61%	88%	35
NT	53%	90%	32
SE / SO	40%	97%	49

- * NW / WN results updated following further investigation
- SE / SO ILF appears low compared to other LDZs, but result is similar to last years ILF (43%)

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Large NDM Modelling Results

Band 9: above 58,600 MWh pa

	NATIONAL GROUPINGS		
SC			
NO			
NW / WN			
NE			
EM			
WM	74%	* 90% 91%	134
WS			
EA			
NT			
SE			
SO			
SW			

• **Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

- * National results updated following further investigation

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Large NDM >2,196 MWh

WAR Band Analysis

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55 Large NDM Bands: 2,196 to 58,600 MWh pa - WAR Band Analysis Agreed Sample Data Aggregations

Consumption Range	2014/15 Analysis
Band 05 2,196 to 5,860 MWh pa	<p><u>Run 1:</u> 7 LDZ Group – SC, NO/NE, NW/WN, EM/WM, WS/SW, EA/NT, SE/SO</p> <p><u>Run 2:</u> 4 LDZ Group – SC/NO/NW/WN, NE/EM/WM, EA/NT/SE, WS/SO/SW</p>
Band 06 5,860 to 14,650 MWh pa	<p><u>Run 1:</u> 4 LDZ Group - SC/NO/NW/WN, NE/EM/WM, EA/NT/SE, WS/SO/SW</p> <p><u>Run 2:</u> 3 LDZ Group – SC/NO/NW/WN, NE/EM/WM, WS/EA/NT/SE/SO/SW</p>
Band 07 and Band 08 14,650 to 58,600 MWh pa	<p><u>Run 1:</u> 3 LDZ Group - SC/NO/NW/WN, NE/EM/WM, WS/EA/NT/SE/SO/SW</p> <p><u>Run 2:</u> 2 LDZ Group – SC/NO/NW/WN/NE/WM/EM, WS/EA/NT/SE/SO/SW</p>

- Options for aggregations as agreed at April TWG
- In each case, as requested by TWG, there are 2 modelling runs in case the results are poor where there are instances of low sample numbers

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Large NDM Modelling Results

DECISION: WAR Band Analysis: 2,196 – 5,860 MWh pa

- Consumption Band 5: 2,196 to 5,860 MWh pa : 7 LDZ Aggregations applied**

	WAR Banding											
	0.00 – 0.398			0.398 – 0.481			0.481 – 0.584			0.584 – 1.00		
SC	74%	95%	27	48%	98%	71	36%	98%	78	26%	96%	24
NO / NE	66%	95%	34	48%	98%	49	37%	98%	50	22%	94%	32
NW / WN	68%	94%	42	47%	97%	44	36%	97%	43	23%	96%	32
EM / WM	63%	97%	83	46%	98%	89	34%	97%	83	24%	97%	69
WS / SW	63%	94%	34	47%	94%	28	36%	98%	25	24%	97%	28
EA / NT	78%	84%	35	51%	98%	88	36%	98%	94	24%	97%	57
SE / SO	72%	96%	43	49%	97%	79	35%	98%	77	23%	95%	58

- Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

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Large NDM Modelling Results

DECISION: WAR Band Analysis: 2,196 – 5,860 MWh pa

- Consumption Band 5: 2,196 to 5,860 MWh pa : 4 LDZ Aggregations applied**

	WAR Banding											
	0.00 – 0.398			0.398 – 0.481			0.481 – 0.584			0.584 – 1.00		
SC / NO / NW / WN	68%	97%	90	49%	97%	142	36%	97%	143	24%	95%	73
NE / EM / WM	63%	97%	96	47%	98%	111	35%	98%	111	24%	97%	84
EA / NT / SE	75%	91%	60	51%	98%	130	36%	98%	137	24%	96%	86
WS / SO / SW	65%	95%	52	47%	96%	65	35%	98%	59	23%	97%	57

- Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

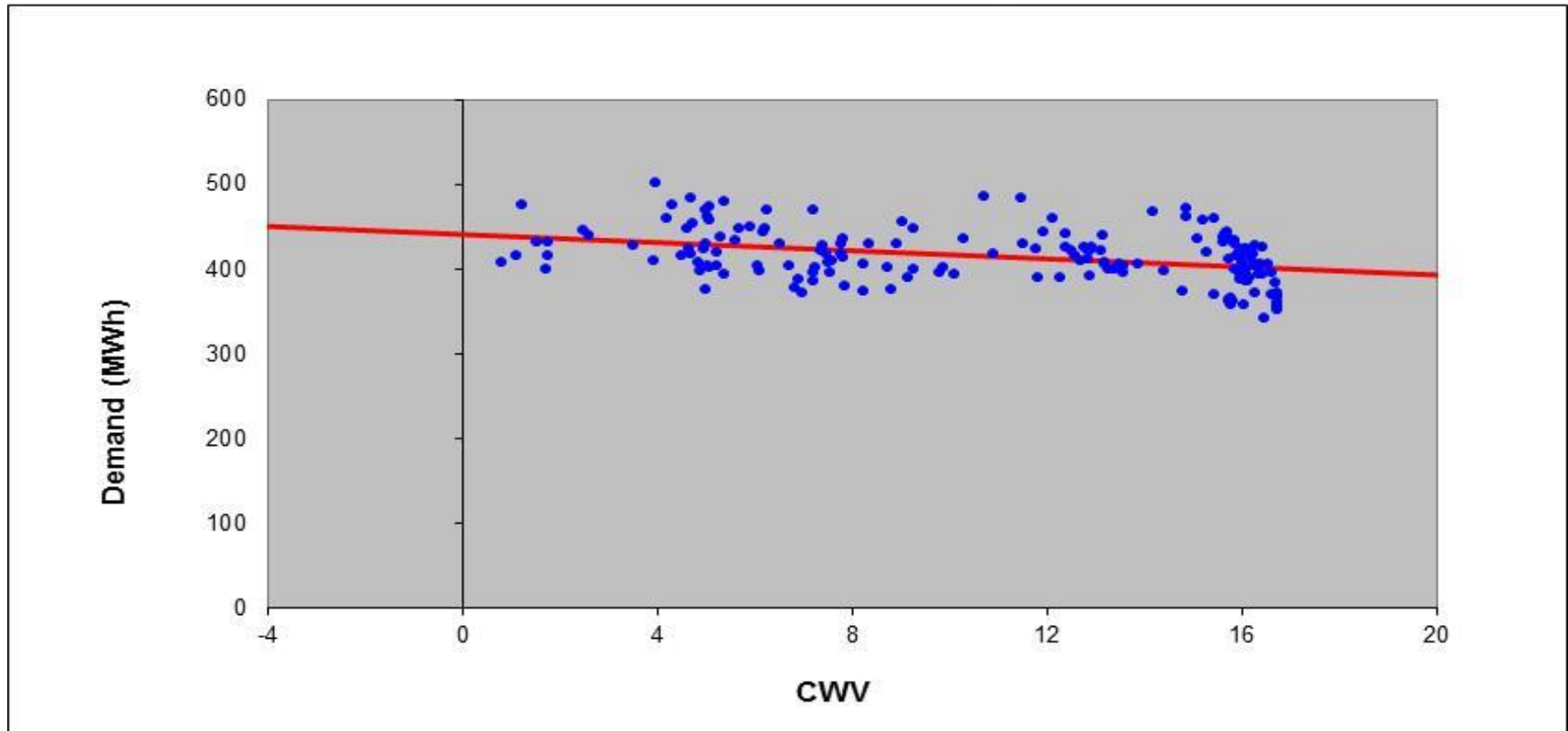
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Large NDM Modelling Results

NT LDZ, EUC Band 5 – WAR Band 1



- **Combined EA / NT Demand** against NT CWV
Non Holiday Monday to Thursday – Sample size 35

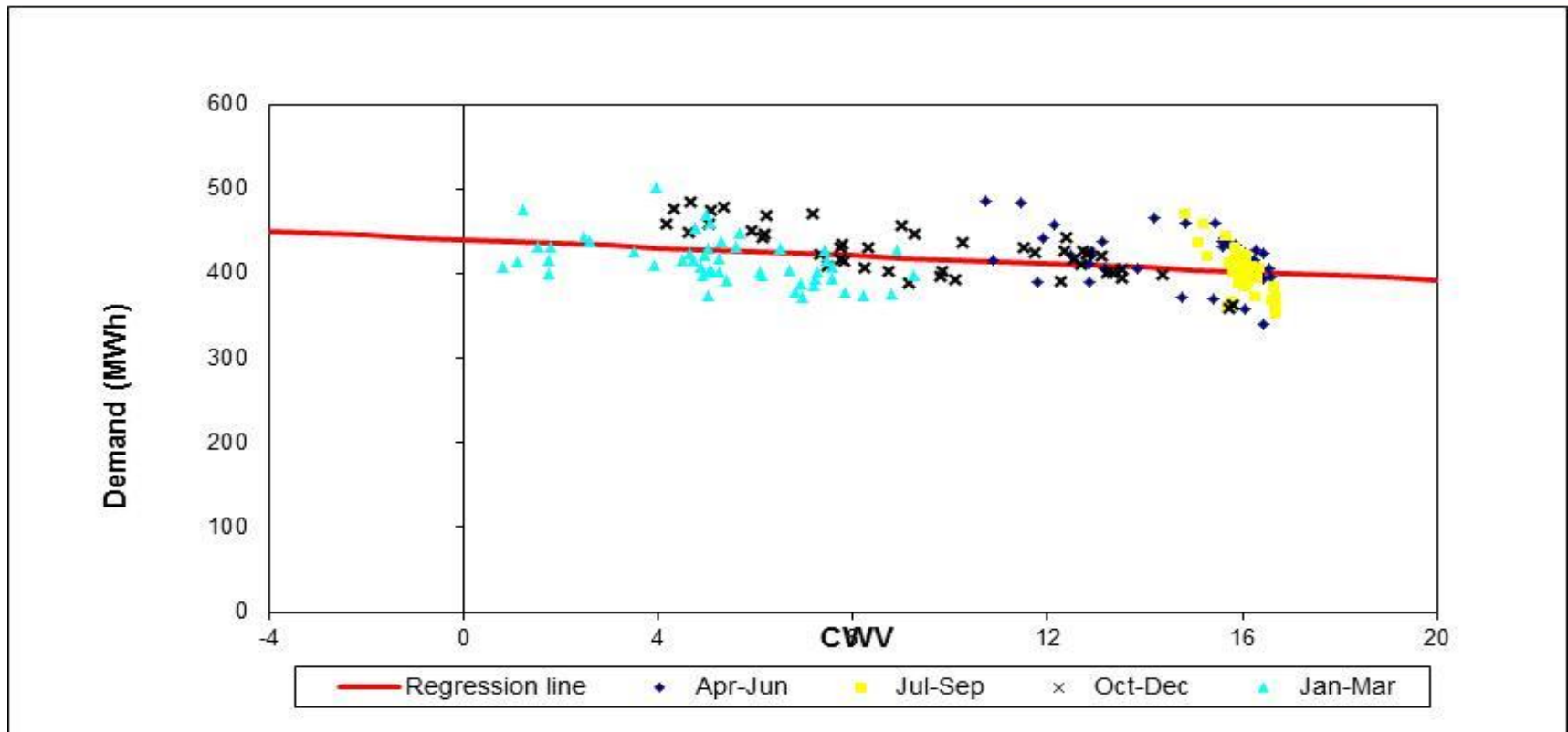
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Large NDM Modelling Results

NT LDZ, EUC Band 5 – WAR Band 1



- **Combined EA / NT Demand** against NT CWV with **Seasons** highlighted

Non Holiday Monday to Thursday – Sample size 35

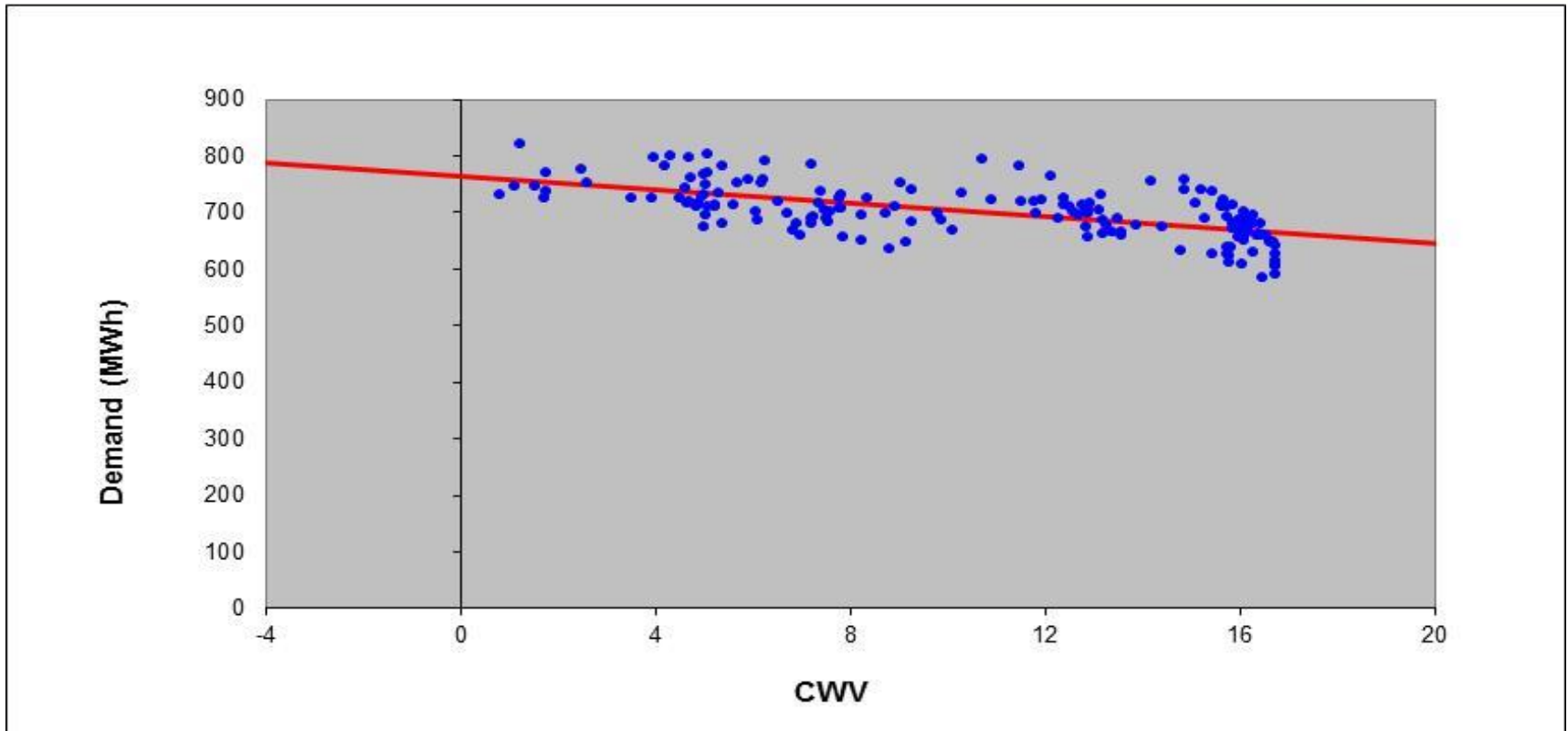
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Large NDM Modelling Results

NT LDZ, EUC Band 5 – WAR Band 1



- **Combined EA / NT / SE Demand** against NT CWV
Non Holiday Monday to Thursday – Sample size 60

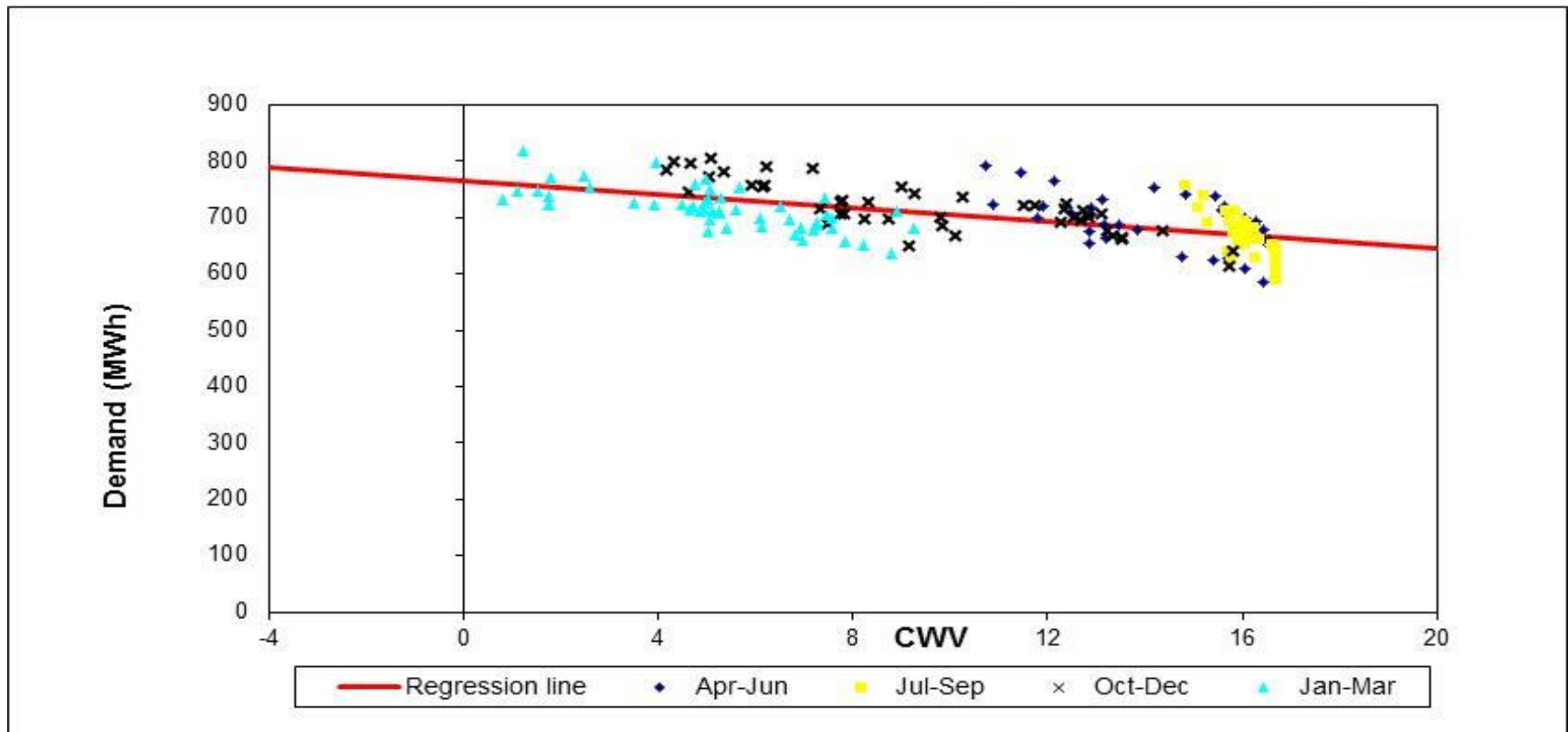
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Large NDM Modelling Results

NT LDZ, EUC Band 5 – WAR Band 1



- Combined EA / NT / SE Demand against NT CWV with Seasons highlighted

Non Holiday Monday to Thursday – Sample size 60

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Model Comparison: NT LDZ, EUC Band 5 – WAR Band 1

- Summary of Key Statistics:

	EA / NT combined		EA / NT / SE combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	440.9	5.4	764.2	6.7
C2 (Slope)	-2.4	0.5	-5.9	0.6
R ²	84%		91%	
ILF	78%		75%	
Sample Size	35		60	
T stat C1 (Normalised)	81.65 (1)		114.06 (1)	
T stat C2 (Normalised)	-4.8 (-0.0588)		-9.83 (-0.0862)	

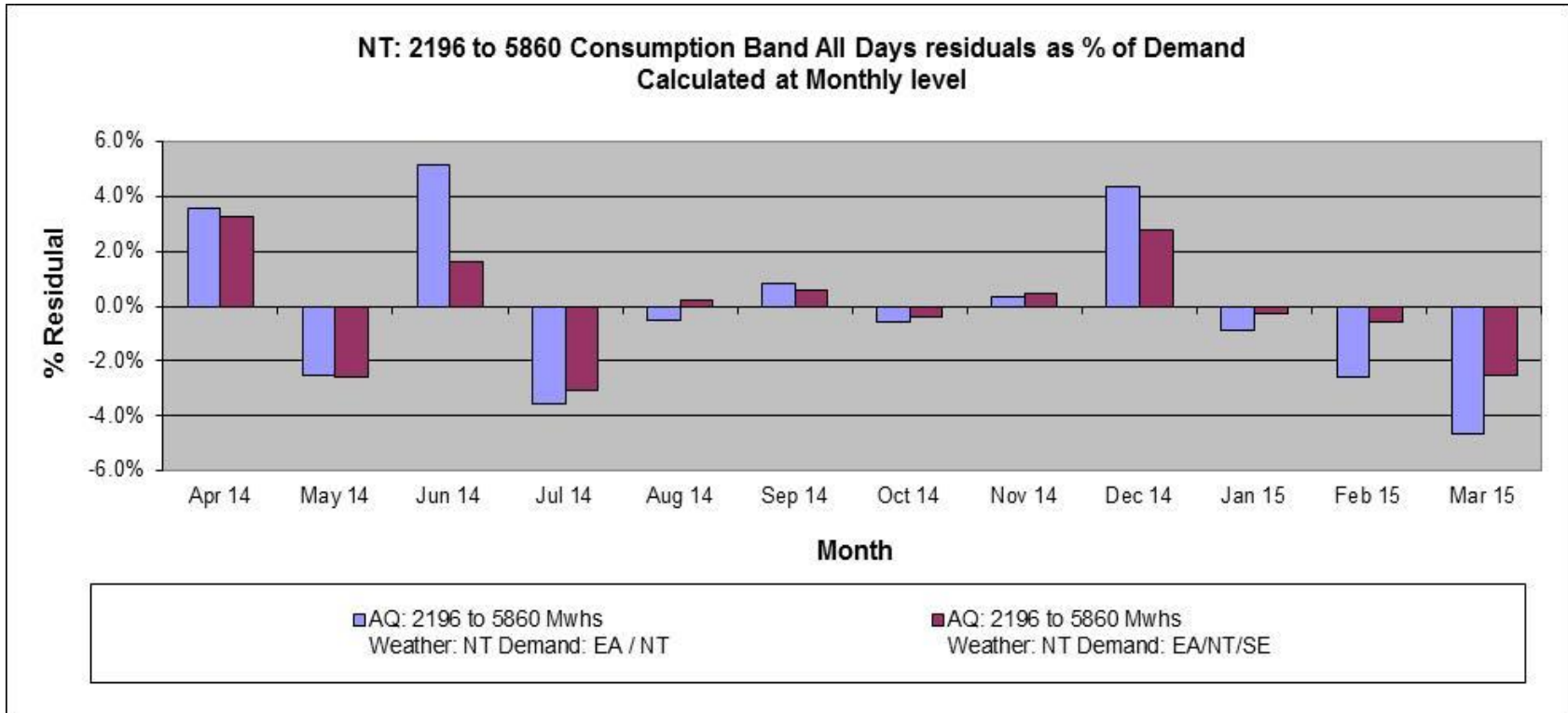



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Large NDM Modelling Results

Model Comparison: NT LDZ, EUC Band 5 – WAR Band 1

- Monthly Residuals:



- TWG to decide on aggregation to use....

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Large NDM Modelling Results

DECISION: WAR Band Analysis: 5,860 - 14,650 MWh pa

- Consumption Band 6:** 5,860 to 14,650 MWh pa : 4 LDZ Aggregations Applied

	WAR Banding											
	0.00 – 0.347			0.347 – 0.432			0.432 – 0.543			0.543 – 1.00		
SC/NO/NW/WN	76%	91%	33	57%	96%	79	43%	98%	61	27%	96%	34
NE/EM/WM	76%	98%	61	53%	97%	63	40%	97%	52	25%	97%	39
EA/NT/SE	85%	83%	22	59%	94%	37	42%	99%	71	27%	96%	34
WS/SO/SW	73%	94%	25	56%	95%	33	40%	98%	28	26%	96%	34

- Consumption Band 6:** 5,860 to 14,650 MWh pa : 3 LDZ Aggregations Applied

	WAR Banding											
	0.00 – 0.347			0.347 – 0.432			0.432 – 0.543			0.543 – 1.00		
SC/NO/NW/WN/	76%	91%	33	57%	96%	79	43%	98%	61	27%	96%	34
NE/EM/WM	76%	98%	61	53%	97%	63	40%	97%	52	25%	97%	39
WS/EA/NT/SE/SO/SW	78%	94%	47	58%	97%	70	41%	98%	99	27%	97%	68

- Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

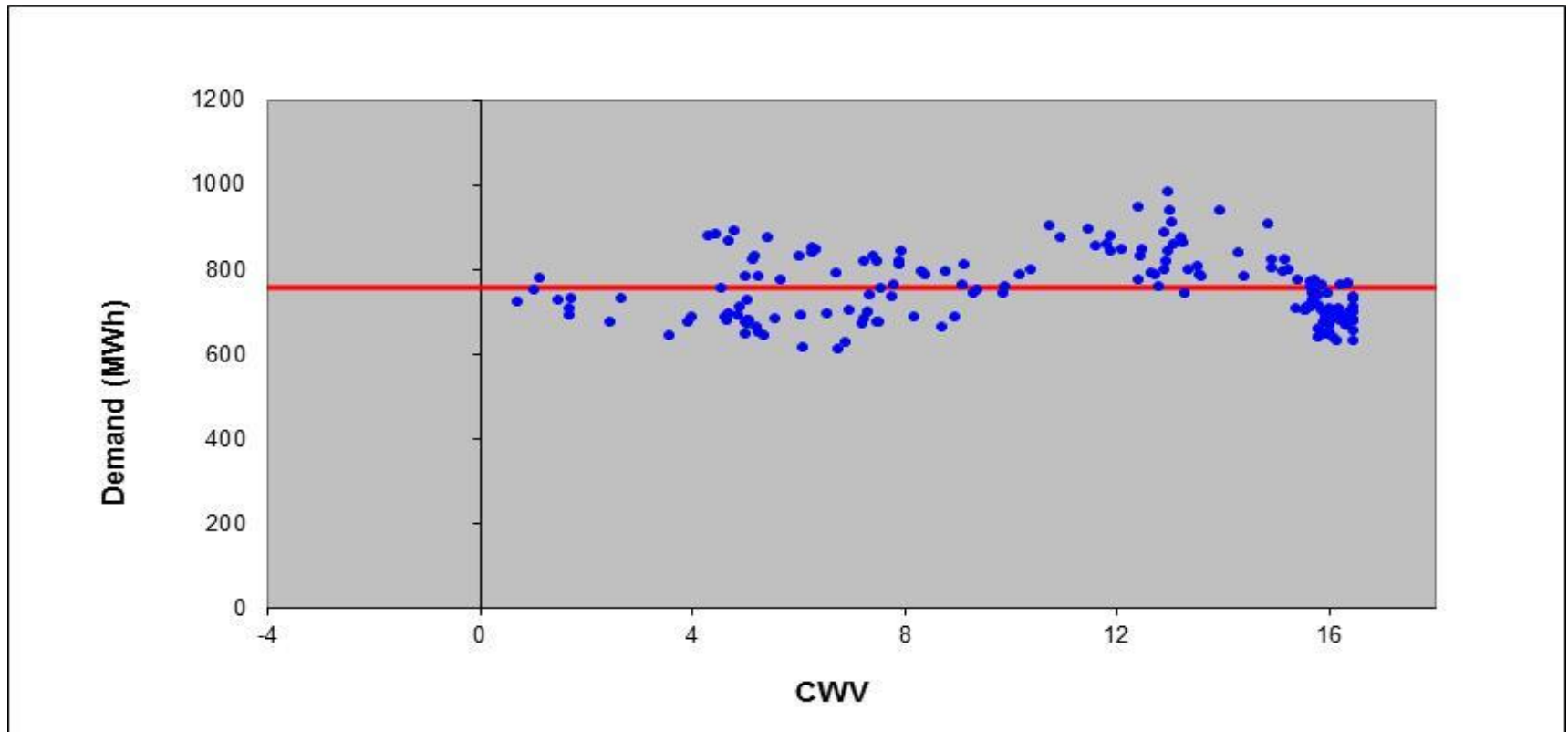
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Large NDM Modelling Results

SE LDZ, EUC Band 6 – WAR Band 1



- **Combined EA/NT/SE Demand** against SE CWV
Non Holiday Monday to Thursday – Sample size 22

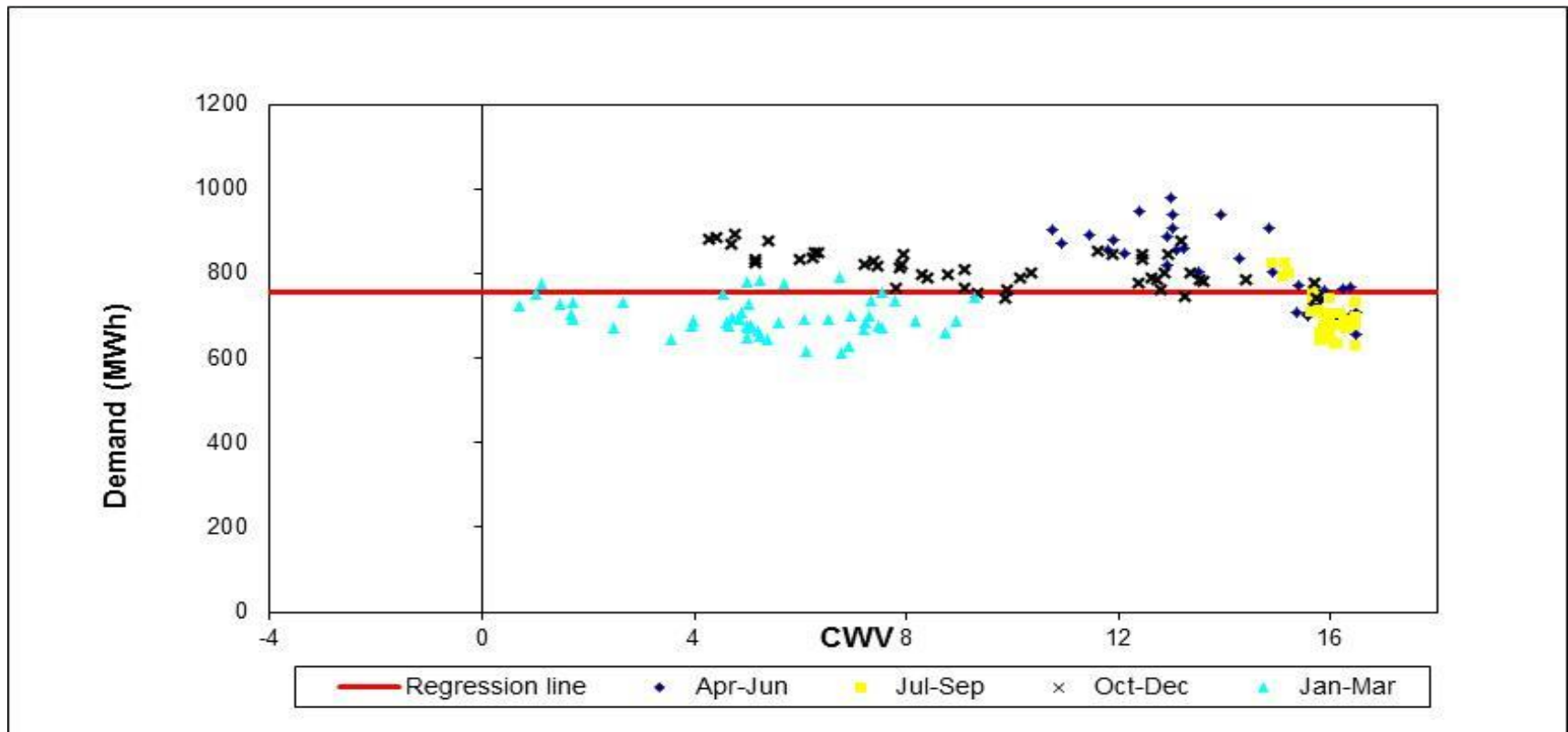
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Large NDM Modelling Results

SE LDZ, EUC Band 6 – WAR Band 1



- **Combined EA/NT/SE Demand** against SE CWV with **Seasons** highlighted

Non Holiday Monday to Thursday – Sample size 22

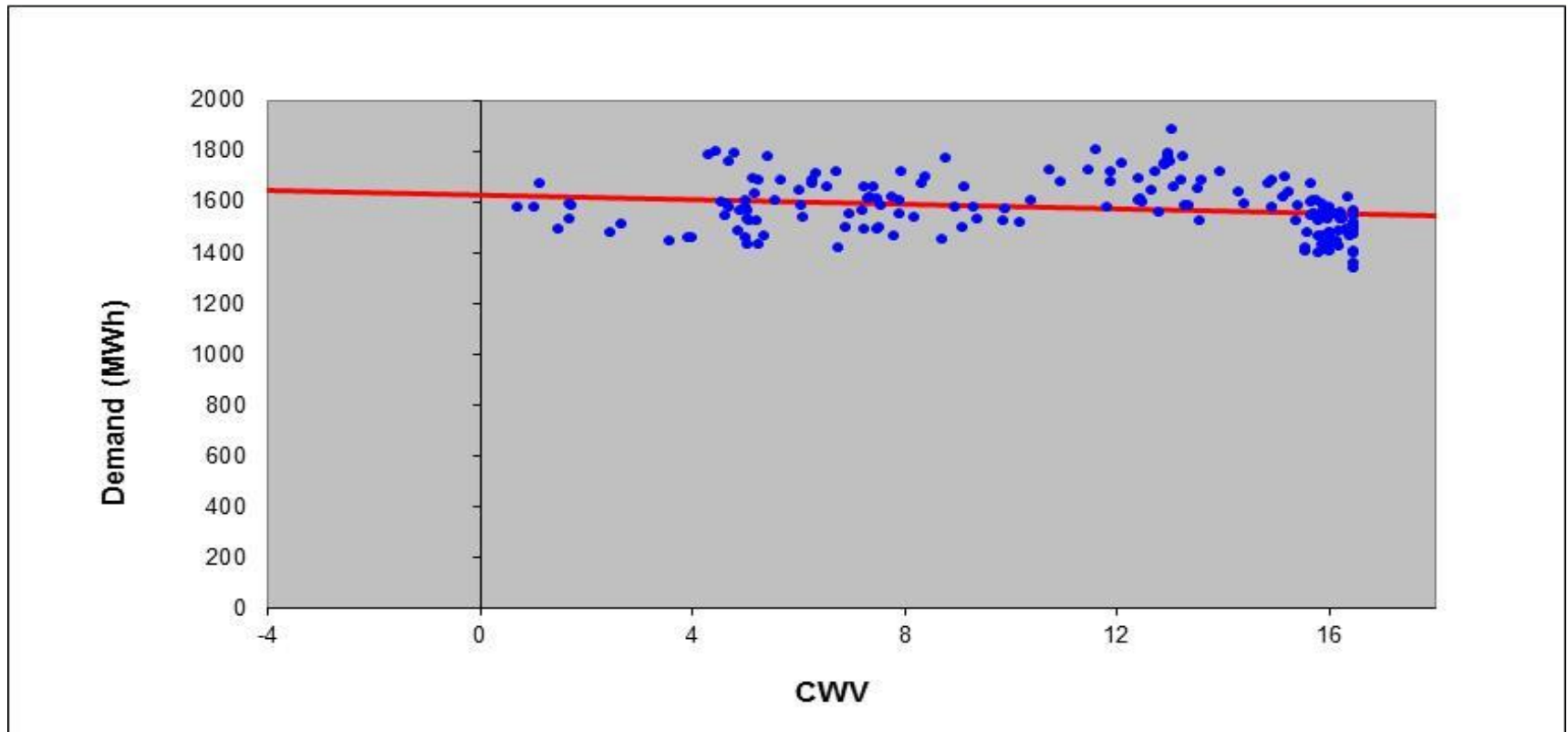
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Large NDM Modelling Results

SE LDZ, EUC Band 6 – WAR Band 1



- **Combined WS/EA/NT/SE/SO/SW Demand** against SE CWV
Non Holiday Monday to Thursday – Sample size 47

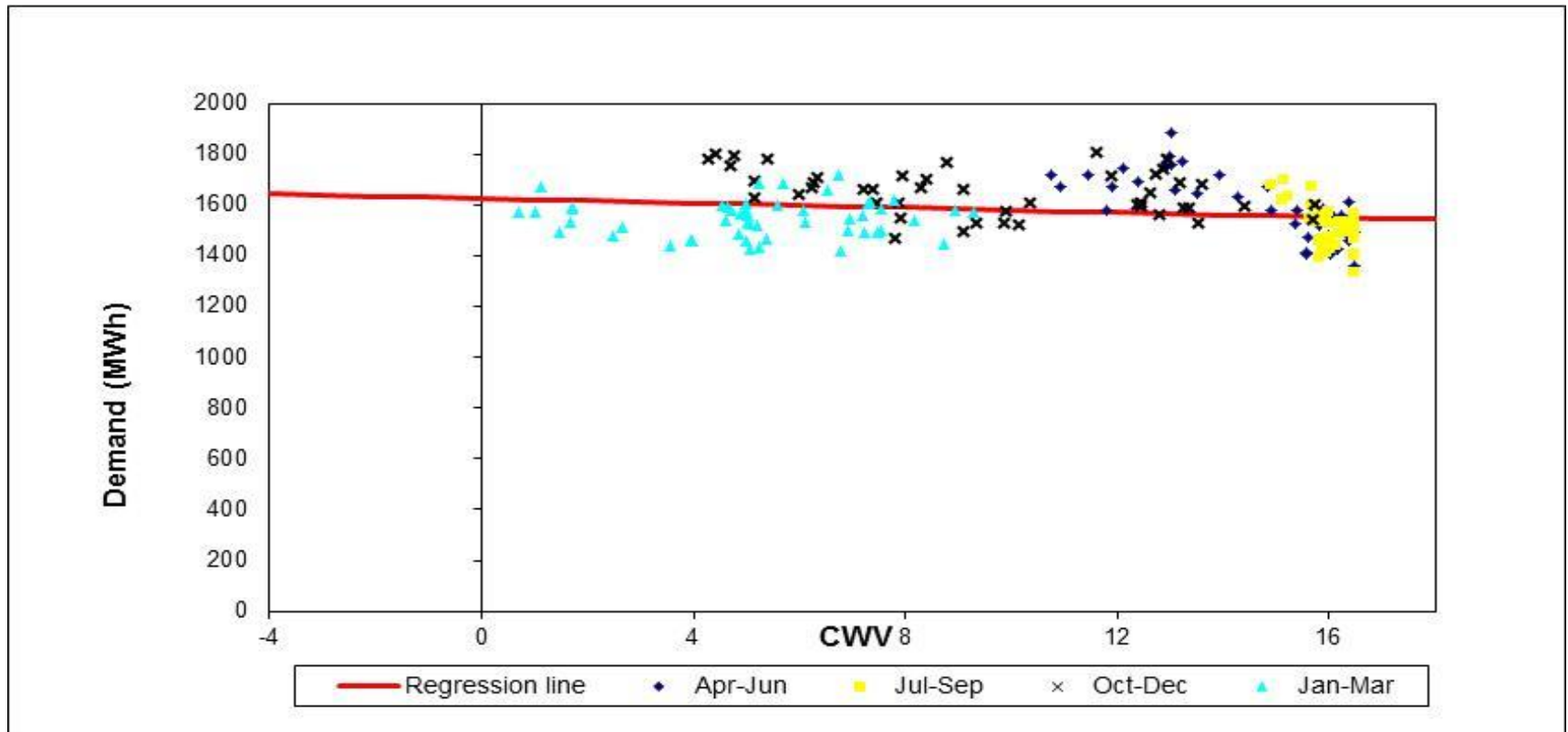
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Large NDM Modelling Results

SE LDZ, EUC Band 6 – WAR Band 1



- **Combined WS/EA/NT/SE/SO/SW Demand** against SE CWV with **Seasons** highlighted

Non Holiday Monday to Thursday – Sample size 47

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Large NDM Modelling Results

Model Comparison: SE LDZ, EUC Band 6 – WAR Band 1

- Summary of Key Statistics:

	EA/NT/SE		WS/EA/NT/SE/SO/SW combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	757.6	14.9	1627.3	19.8
C2 (Slope)	0	1.3	-4.5	1.7
R ²	83%		94%	
ILF	85%		78%	
Sample Size	22		47	
T stat C1 (Normalised)	50.85 (1)		82.19 (1)	
T stat C2 (Normalised)	0 (0.0000)		-2.65 (-0.0322)	

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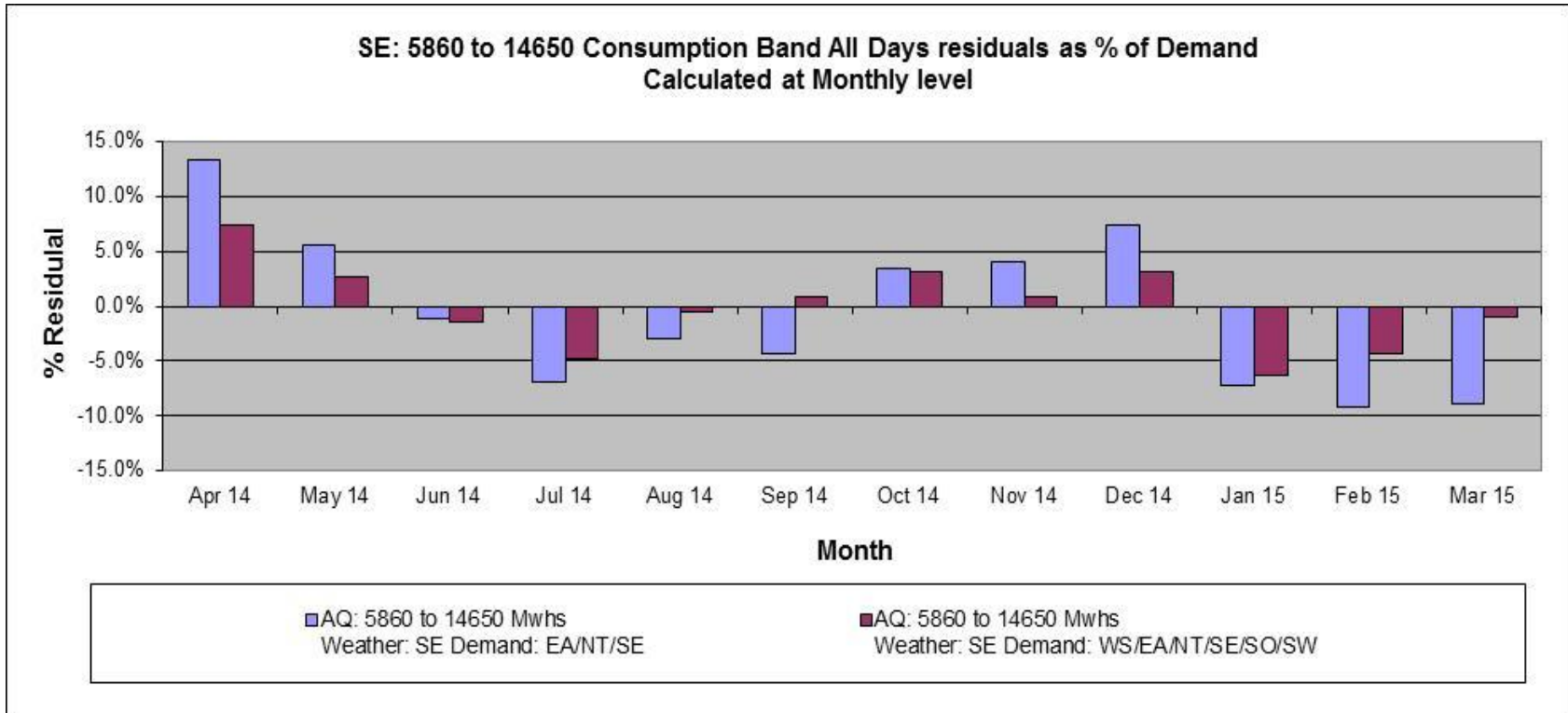


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Large NDM Modelling Results

Model Comparison: SE LDZ, EUC Band 6 – WAR Band 1

- Monthly Residuals:



- TWG to decide on aggregation to use....

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Large NDM Modelling Results

DECISION: WAR Band Analysis: 14,650 - 58,600 MWh pa

- Consumption Band 7 & 8:** 14,650 to 58,600 MWh pa : 3 LDZ Aggregations Applied

	WAR Banding											
	0.00 – 0.331			0.331 – 0.364			0.364 – 0.461			0.461 – 1.00		
SC/NO/NW/WN	90%	67%	25	74%	86%	48	57%	94%	47	36%	95%	32
NE/EM/WM	86%	92%	47	71%	97%	72	56%	96%	65	34%	98%	28
WS/EA/NT/SE/SO/SW	90%	90%	33	78%	89%	41	55%	94%	48	31%	97%	52

- Consumption Band 7 & 8:** 14,650 to 58,600 MWh pa : 2 LDZ Aggregations Applied

	WAR Banding											
	0.00 – 0.331			0.331 – 0.364			0.364 – 0.461			0.461 – 1.00		
SC/NO/NW/WN/NE/WM/EM	87%	91%	72	72%	96%	120	56%	97%	112	35%	97%	60
WS/EA/NT/SE/SO/SW	90%	90%	33	78%	89%	41	55%	94%	48	31%	97%	52

- Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**

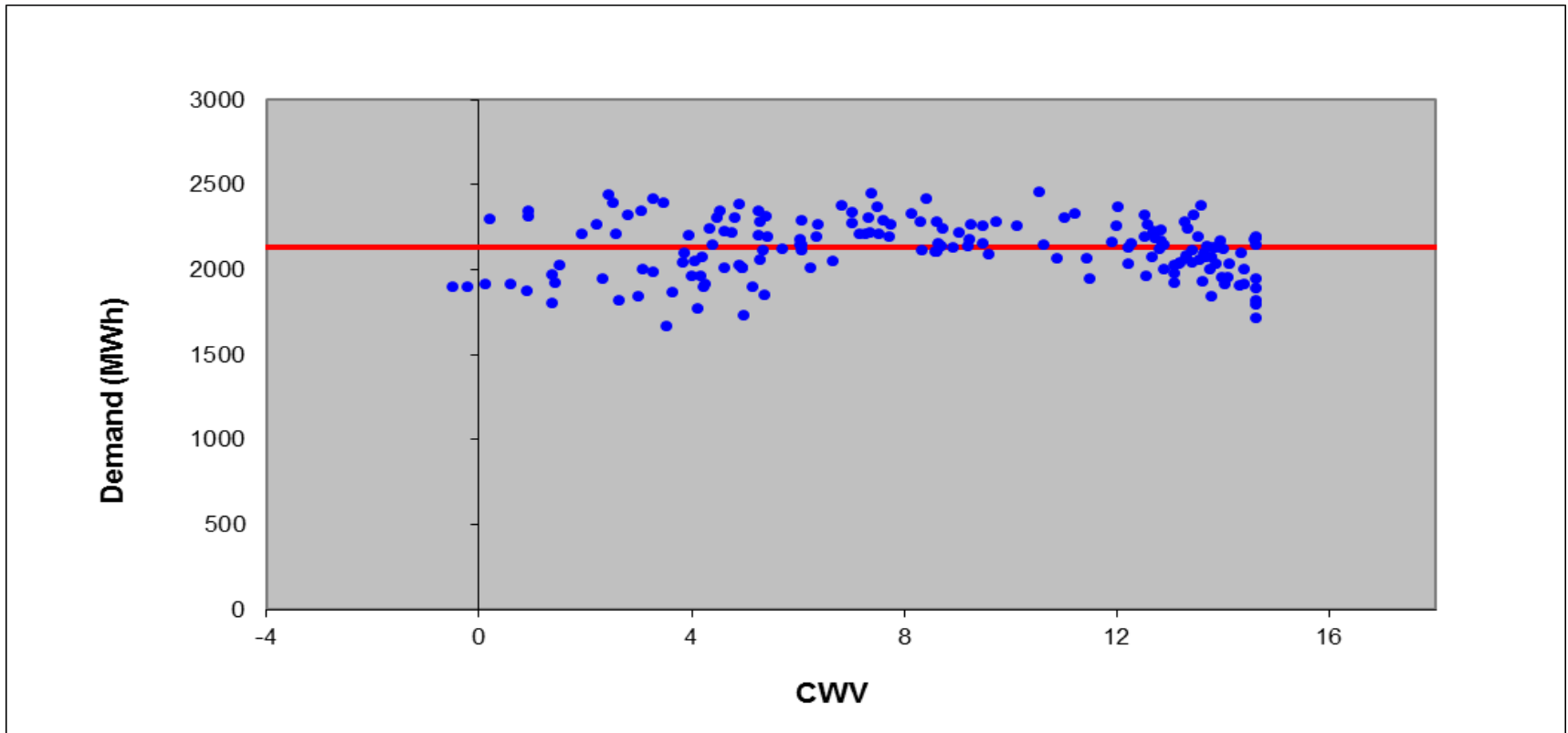
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Large NDM Modelling Results

SC LDZ, EUC Band 7 and 8 – WAR Band 1



- **Combined SC/NO/NW/WN Demand** against SC CWV
Non Holiday Monday to Thursday – Sample size 25

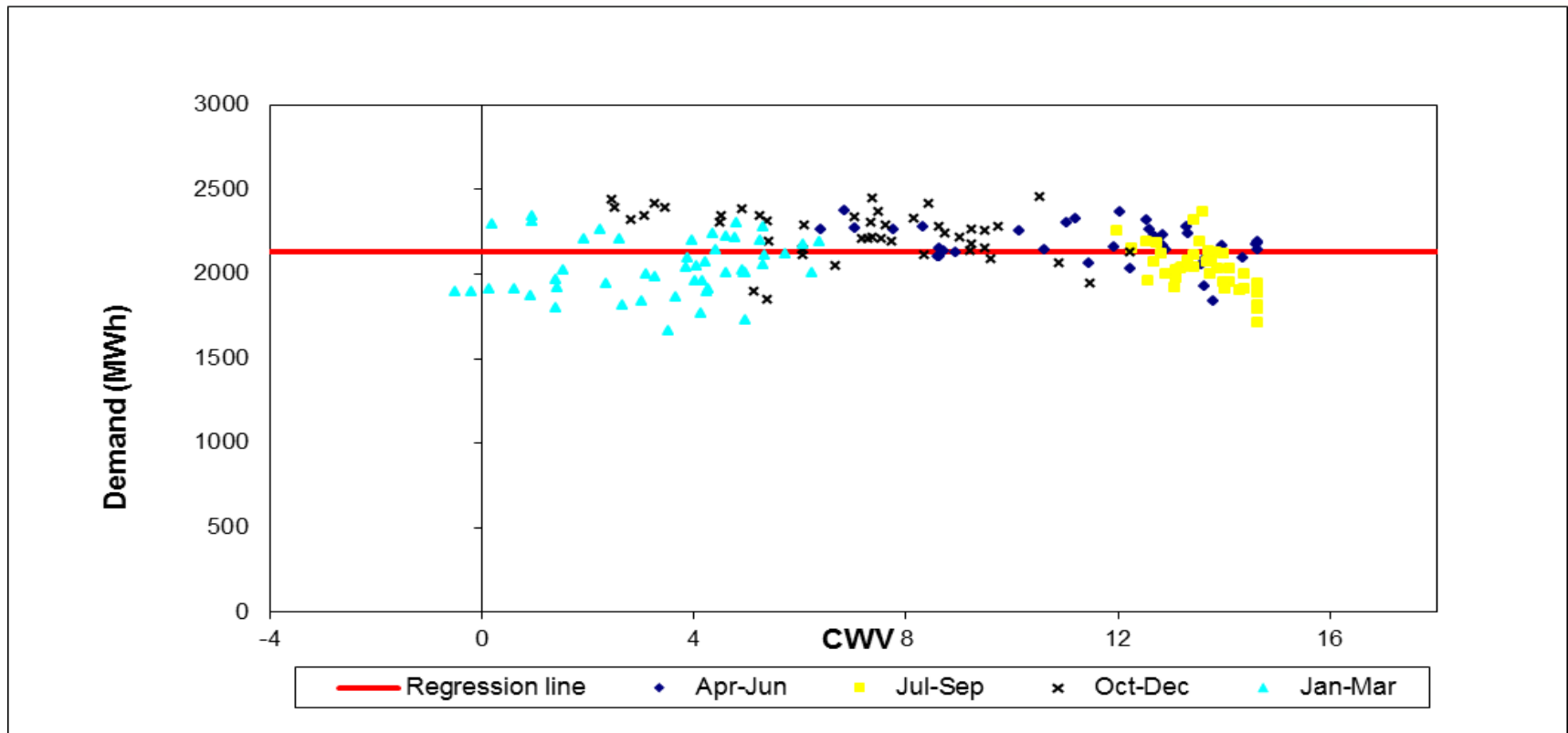
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Large NDM Modelling Results

SC LDZ, EUC Band 7 and 8 – WAR Band 1



- **Combined SC/NO/NW/WN Demand** against SC CWV with **Seasons** highlighted

Non Holiday Monday to Thursday – Sample size 25

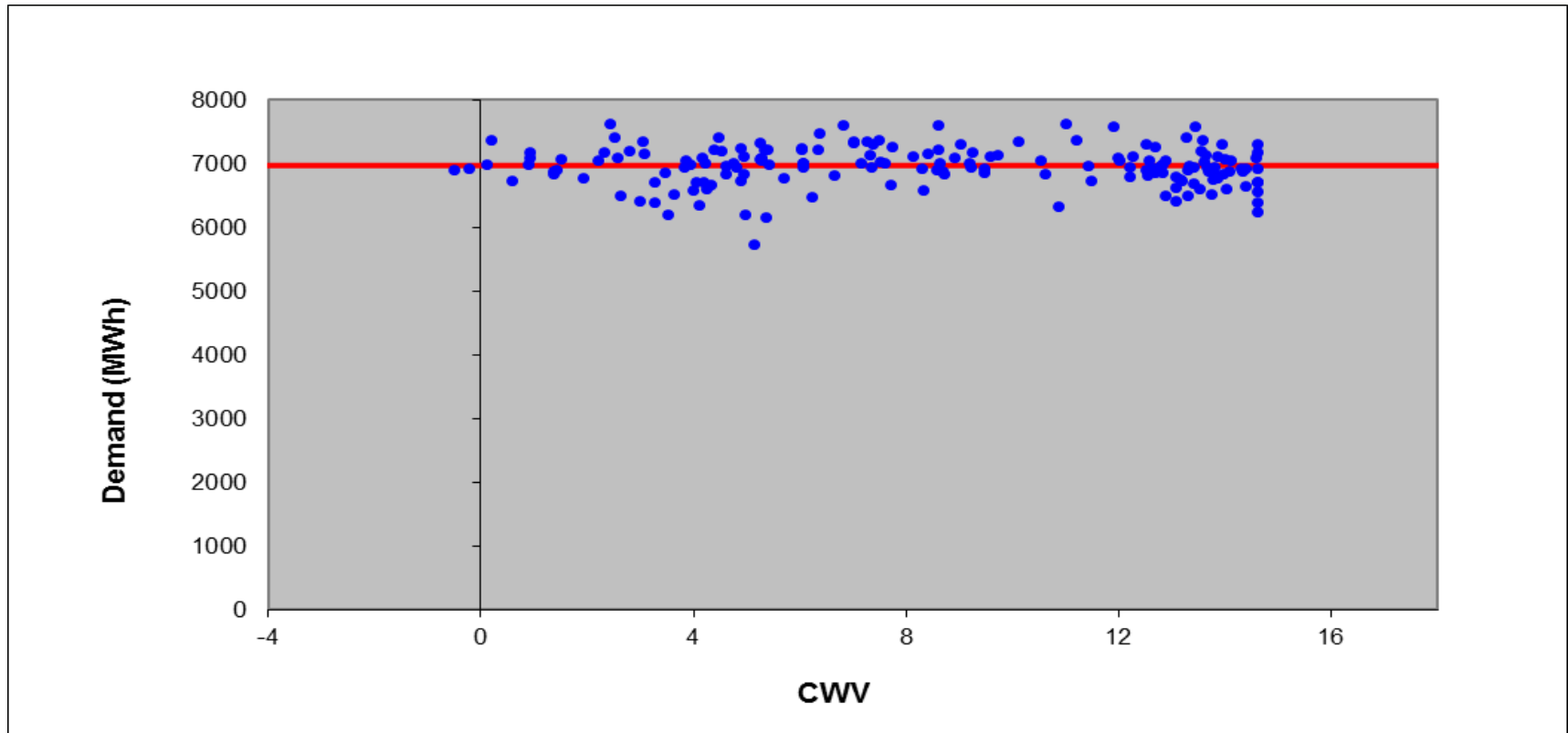
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Large NDM Modelling Results

SC LDZ, EUC Band 7 and 8 – WAR Band 1



- Combined SC/NO/NW/WN/NE/EM/WM Demand against SC CWV
Non Holiday Monday to Thursday – Sample size 72

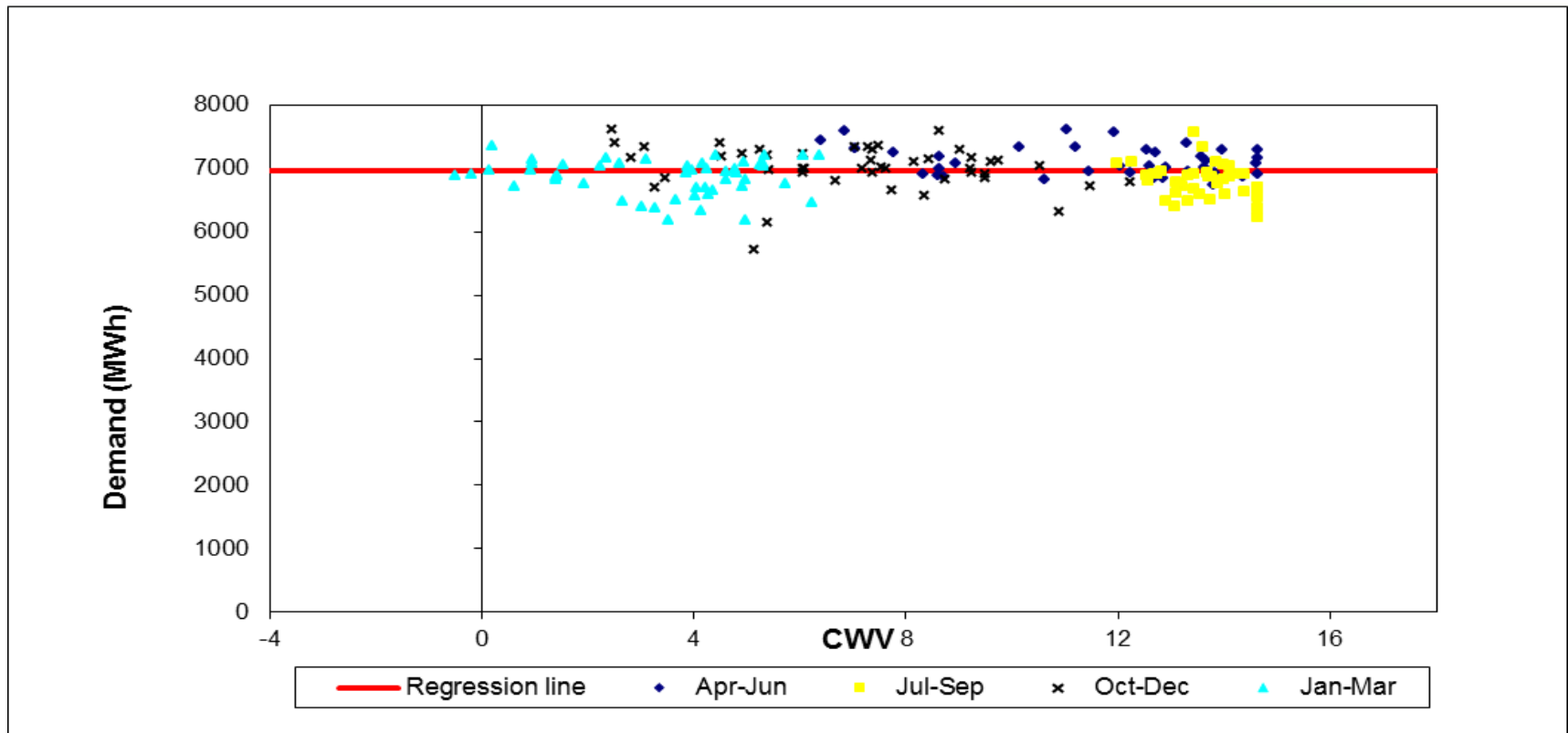
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Large NDM Modelling Results

SC LDZ, EUC Band 7 and 8 – WAR Band 1



- **Combined SC/NO/NW/WN/NE/EM/WM Demand** against SC CWV with **Seasons** highlighted

Non Holiday Monday to Thursday – Sample size 72

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Model Comparison: SC LDZ, EUC Band 7 and 8 – WAR Band 1

- Summary of Key Statistics:

	SC/NO/NW/WN		SC/NO/NW/WN/NE/EM/WM combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	2133	27.3	6966.6	50.8
C2 (Slope)	0	2.8	0	5.3
R ²	67%		91%	
ILF	90%		87%	
Sample Size	25		72	
T stat C1 (Normalised)	78.13 (1)		137.14 (1)	
T stat C2 (Normalised)	0 (0.0000)		0 (0.0000)	

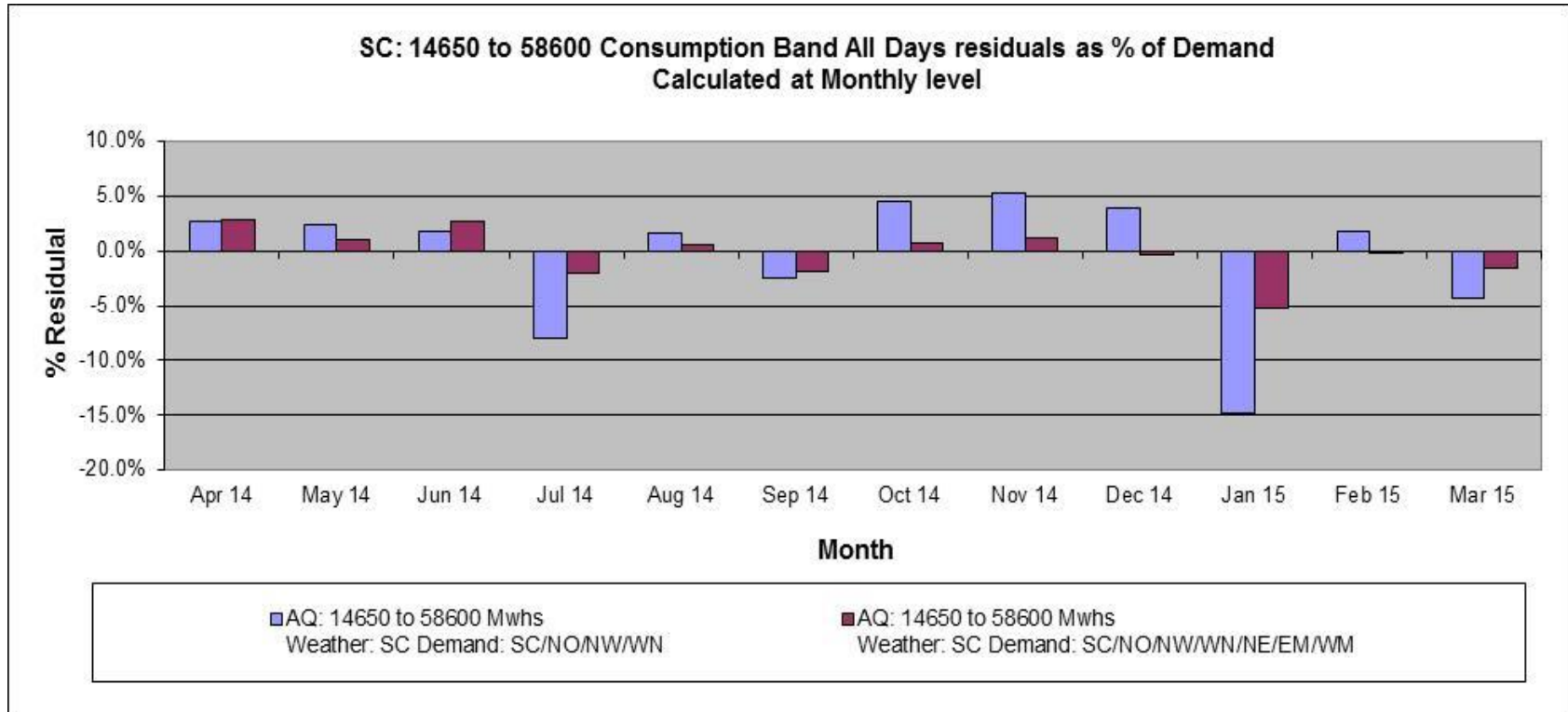



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Large NDM Modelling Results

Model Comparison: SC LDZ, EUC Band 7 and 8 – WAR Band 1

- Monthly Residuals:



- TWG to decide on aggregation to use....

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Large NDM Analysis Summary

- Good R^2 Coefficients for majority of models, including WAR Bands, some lower values in WAR Band 1
- Further fall in sample numbers available, however merging Bands 7 and 8 for modelling purposes has helped results remain acceptable
- *Recap on decisions made*
- Are TWG happy to move to model smoothing with the results previously presented?

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- Xoserve to commence model smoothing once all single year models have been agreed
- Xoserve may contact TWG for further prompt decisions on modelling analysis (probably by email)
- w/c 8th June Xoserve to publish draft parameter values i.e. ALPs, DAFs, LFs for DESC and TWG to review and provide feedback
- TWG meeting planned for 24th June to review feedback received
- DESC meeting 8th July to finalise proposals in order to publish to wider industry participants

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