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# Technical Work Group

## EUC Modelling 2014/15 – Single Year Modelling Results

**21<sup>st</sup> May 2014**

# Agenda

- 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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## 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 equitable means of apportioning aggregate NDM demand (by EUC / shipper / LDZ) to allow daily balancing regime to work  
i.e. NDM profiles (ALPs & DAFs)
- 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 EUC profiles are used to apportion aggregate NDM demand and do not independently forecast NDM EUC demand

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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 2014 Modelling Workplan

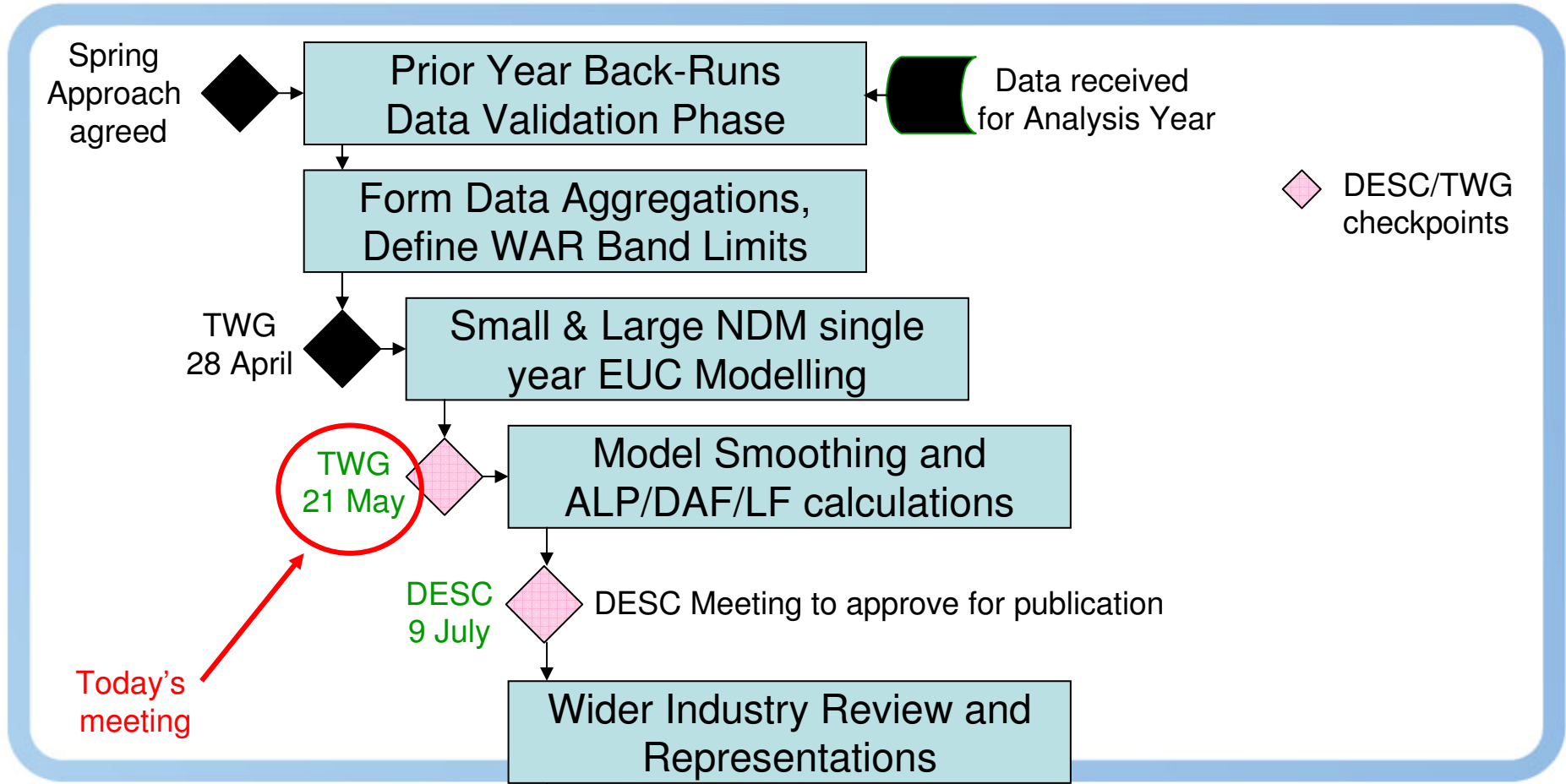
- Work plan for 2014 Modelling agreed at Feb DESC meeting
- Work plan provides more transparency of process and includes checkpoints for DESC/TWG review
- Timetable inserted as an Appendix to Spring Approach document

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# Agreed 2014 Timetable



## Objectives of this Meeting

- 2<sup>nd</sup> 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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# 2014 Modelling Basis 1

- Methodology described in “Spring Approach” document, approved at February 2014 meeting
- Key aspects of EUC demand modelling basis for Spring 2014 analysis:
  - 13 month analysis for AMR and datalogger data sets covering 1<sup>st</sup> March 2013 to 31<sup>st</sup> March 2014
  - Sample data collected, validated and options for aggregations agreed by TWG during April
  - CWV definitions and SN basis same as Spring 2013
  - 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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## 2014 Modelling Basis 2

- Holiday codes and rules applicable to Christmas / New Year period are same as used in Spring 2013 (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 26<sup>th</sup> May to 29<sup>th</sup> September 2013 (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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# Purpose of Analysis

- 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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## Small NDM Analysis

- 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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# NDM Population Counts: Supply Point & AQ

Consumption Range	% of Total NDM	
	Total AQ	Total Count
0 – 73.2 MWh pa	72.3%	98.81%
0 – 293 MWh pa	78.1%	99.67%
0 – 2,196 MWh pa	88.6%	99.97%
>2,196 MWh pa	11.4%	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 – 2013/14 data
Band 01 0 to 73.2 MWh pa	Individual LDZ
Band 02 73.2 to 293 MWh pa	Individual LDZ
Band 03 293 to 732 MWh pa	Individual LDZ or WS/SW Combined
Band 04 732 to 2,196 MWh pa	Individual LDZ

- Aggregations as agreed at April TWG
- In the main sufficient data available to allow individual LDZ analysis
- Decision to be made on model to be used for Band 03 – results to follow

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## Small NDM Modelling Results

### EUC Band 1: 0 – 73.2 MWh pa Domestic Sites

	Indicative Load Factor	R <sup>2</sup> Multiple Correlation Coefficient	Sample Size
SC	38%	98%	234
NO	32%	97%	237
NW / WN	35%	98%	232
NE	36%	98%	260
EM	34%	99%	256
WM	31%	98%	252
WS	32%	97%	239
EA	32%	98%	275
NT	32%	98%	241
SE	31%	98%	237
SO	29%	98%	267
SW	31%	97%	251

• **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

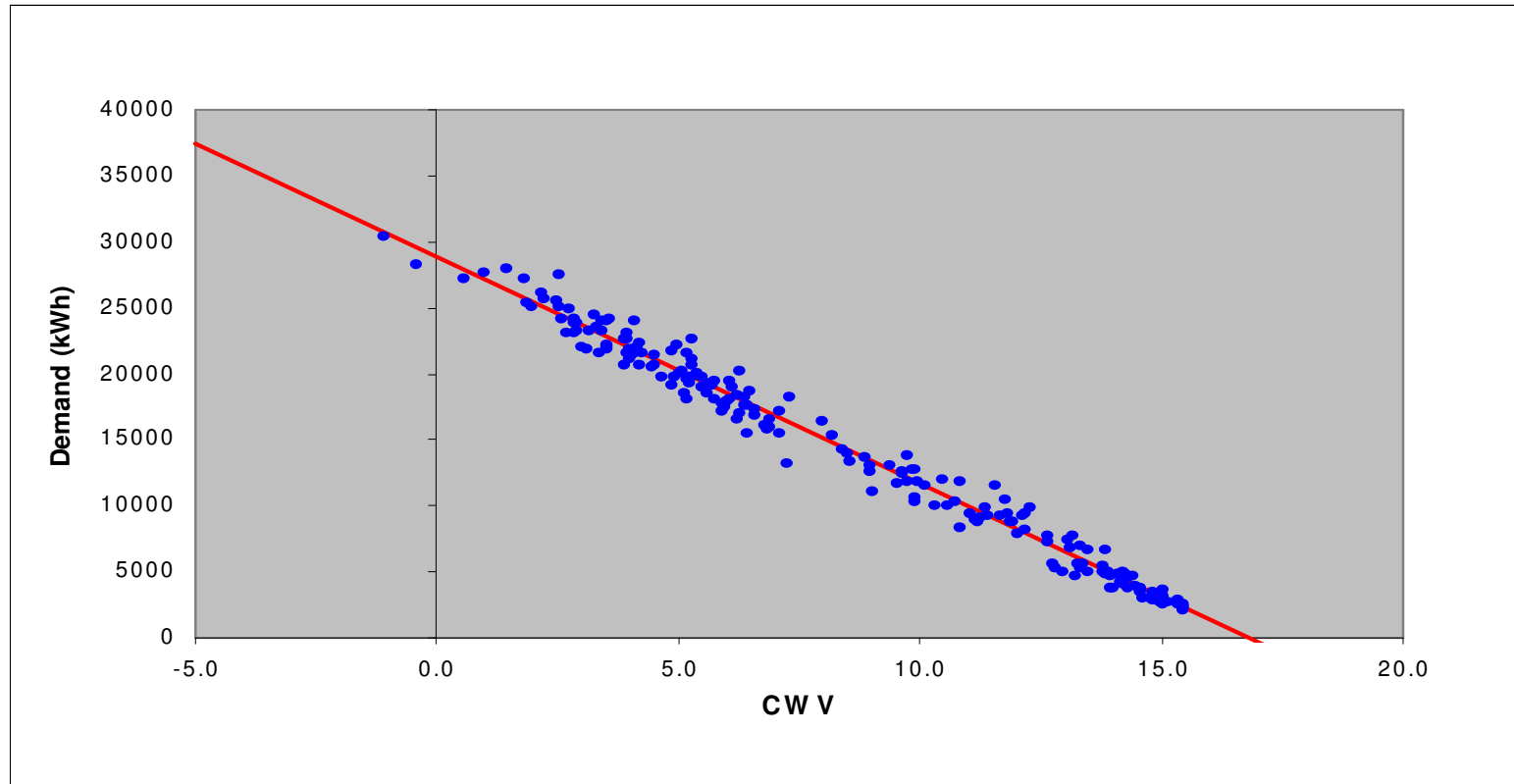
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## Small NDM Modelling Results EM LDZ, EUC Band 1: 0 - 73.2 MWh pa



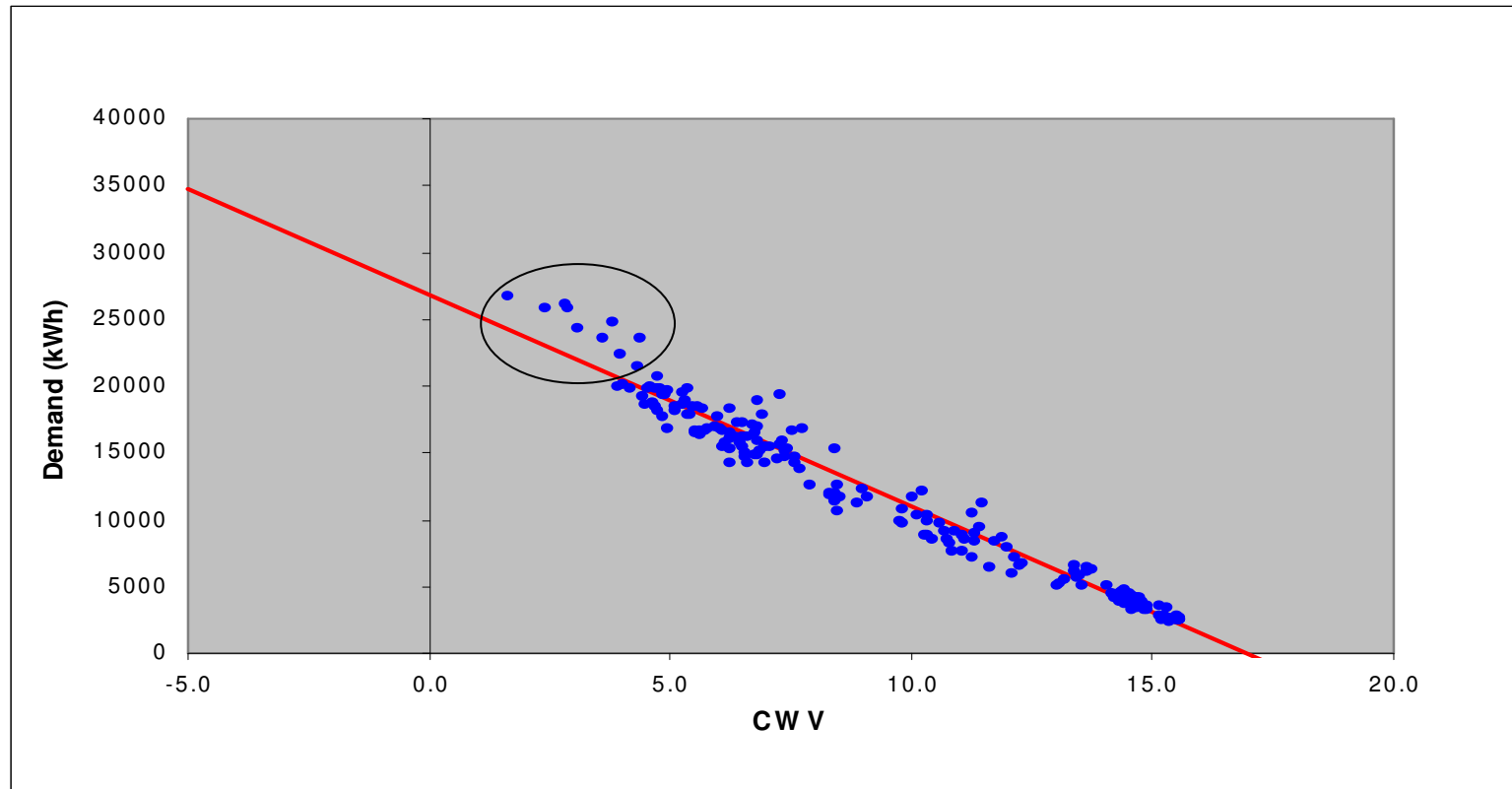
Demand against EM CWV – Monday to Thursday - Holidays included

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## Small NDM Modelling Results SW LDZ, EUC Band 1: 0 - 73.2 MWh pa



- Demand against SW CWV – Monday to Thursday - Holidays included
- Circled data points reflect a number of the coldest days in March 2013 (coldest March in last 50 years)

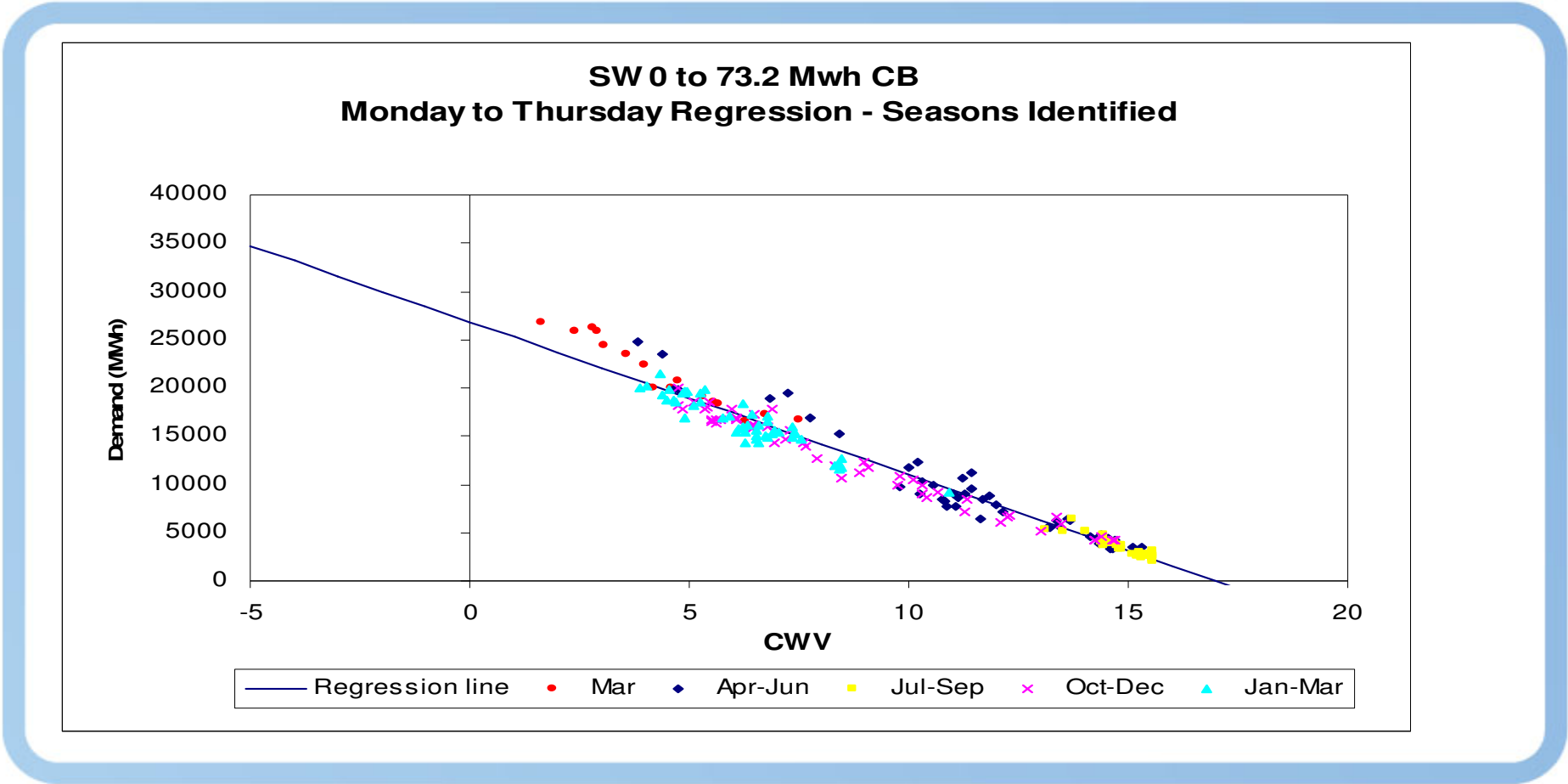
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# Small NDM Modelling Results

## SW LDZ, EUC Band 1: 0 - 73.2 MWh pa



- Demand against SW CWV – Monday to Thursday - Holidays included with seasons identified



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## Small NDM Modelling Results

### EUC Band 2: 73.2 – 293 MWh pa

	Indicative Load Factor	R <sup>2</sup> Multiple Correlation Coefficient	Sample Size
SC	36%	96%	106
NO	31%	97%	91
NW / WN	33%	96%	127
NE	32%	96%	101
EM	32%	97%	118
WM	29%	97%	103
WS	30%	97%	80
EA	30%	97%	119
NT	31%	95%	143
SE	32%	97%	127
SO	28%	97%	105
SW	30%	96%	118

- **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

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## Small NDM Modelling Results

### DECISION: EUC Band 3: 293 – 732 MWh pa

	Indicative Load Factor	R <sup>2</sup> Multiple Correlation Coefficient	Sample Size
SC	38%	97%	123
NO	37%	96%	59
NW / WN	32%	94%	117
NE	33%	95%	86
EM	31%	96%	130
WM	26%	94%	90
WS	26%	93%	27
EA	29%	96%	130
NT	32%	95%	122
SE	29%	97%	139
SO	26%	94%	90
SW	26%	93%	60
WS / SW	26%	96%	87

- **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

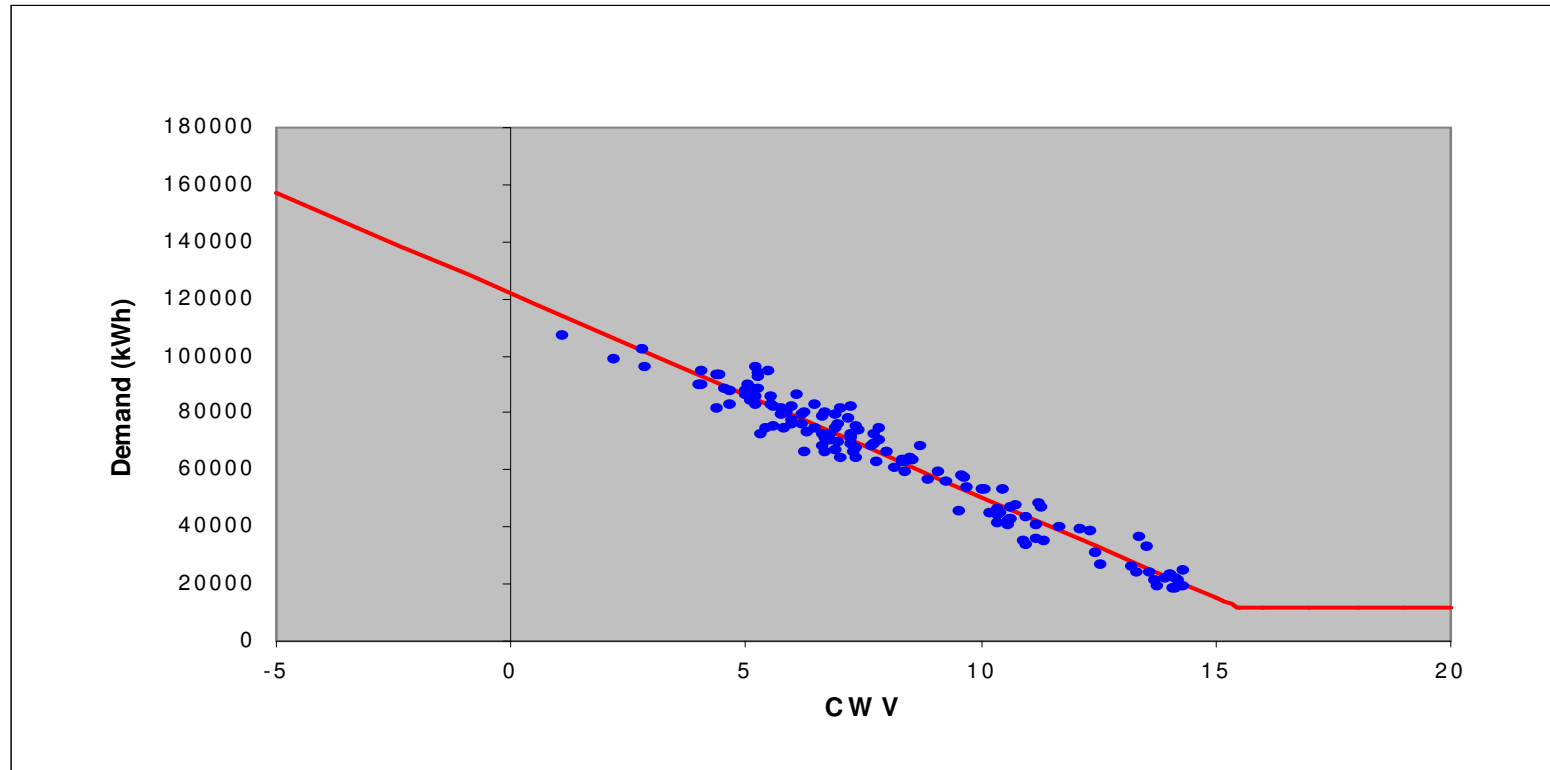
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## Small NDM Modelling Results

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



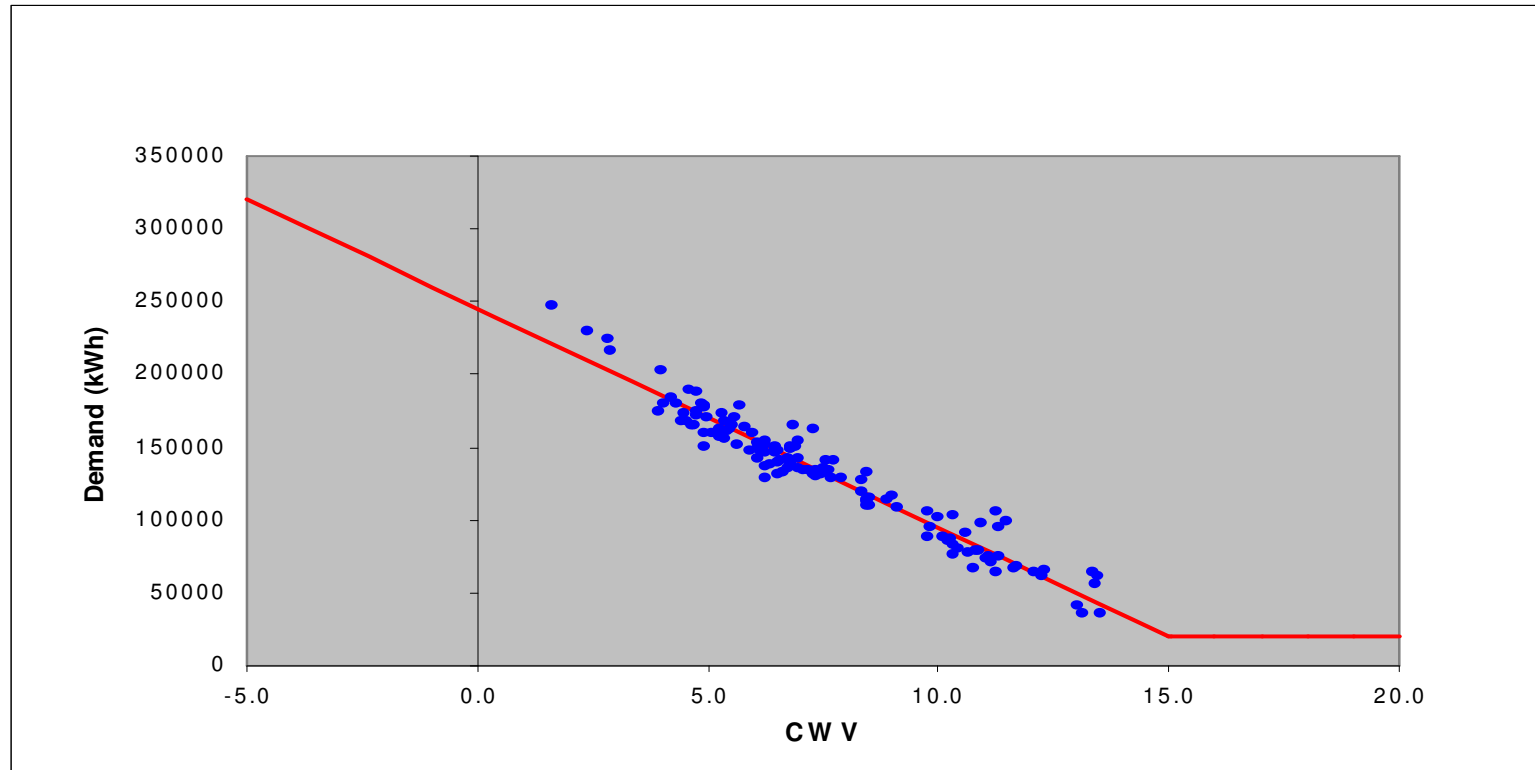
- **WS Demand** against WS CWV – Non Holiday Monday to Thursday  
Sample size: 27

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## Small NDM Modelling Results SW LDZ, EUC Band 3: 293 - 732 MWh pa



- **SW Demand** against SW CWV – Non Holiday Monday to Thursday  
Sample size: 60

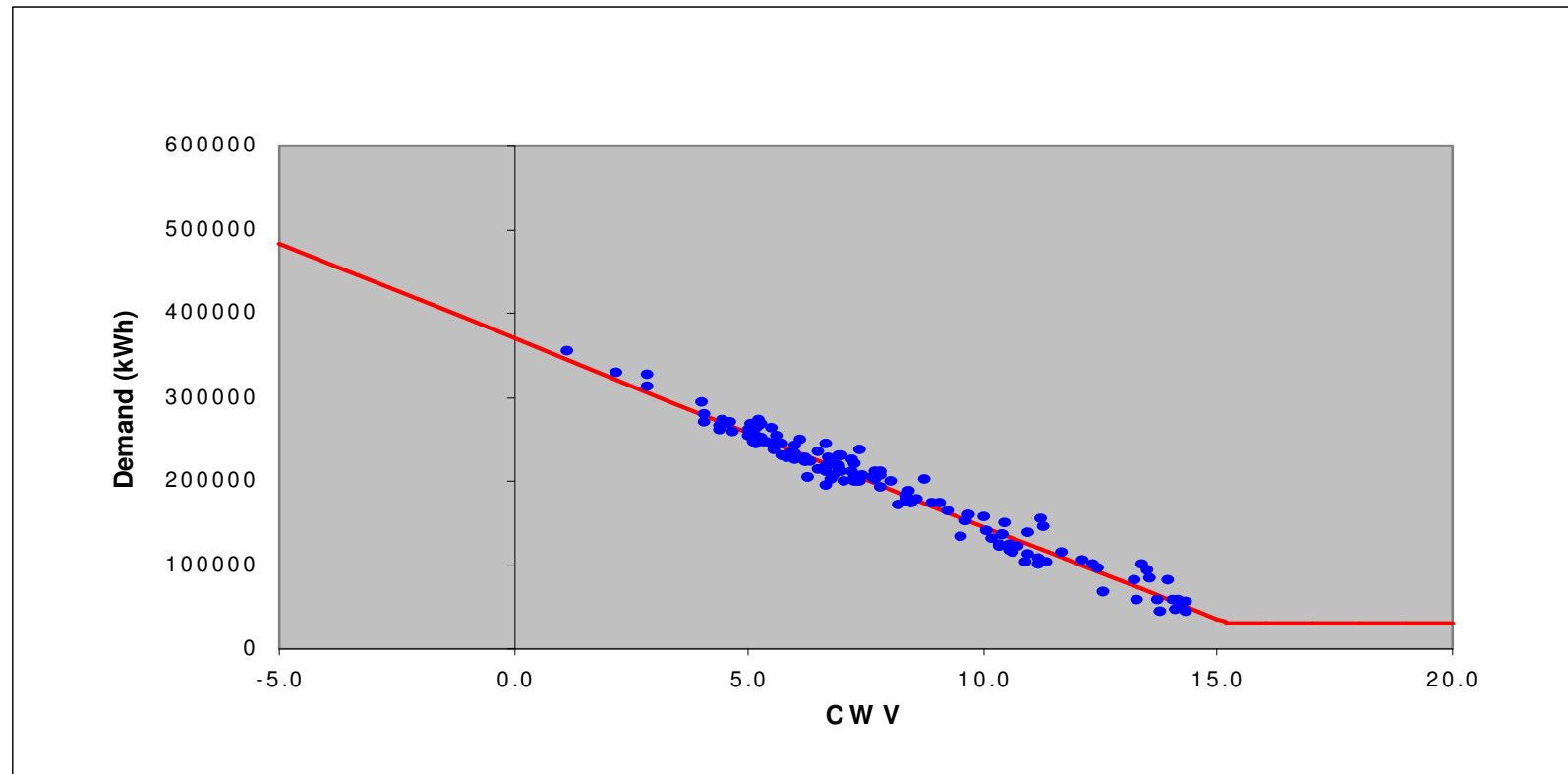
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## Small NDM Modelling Results

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



- **Combined WS/SW Demand** against WS CWV – Non Holiday Monday to Thursday - Sample size: 87
- **DECISION** required by TWG on which model to choose, further statistical information to follow

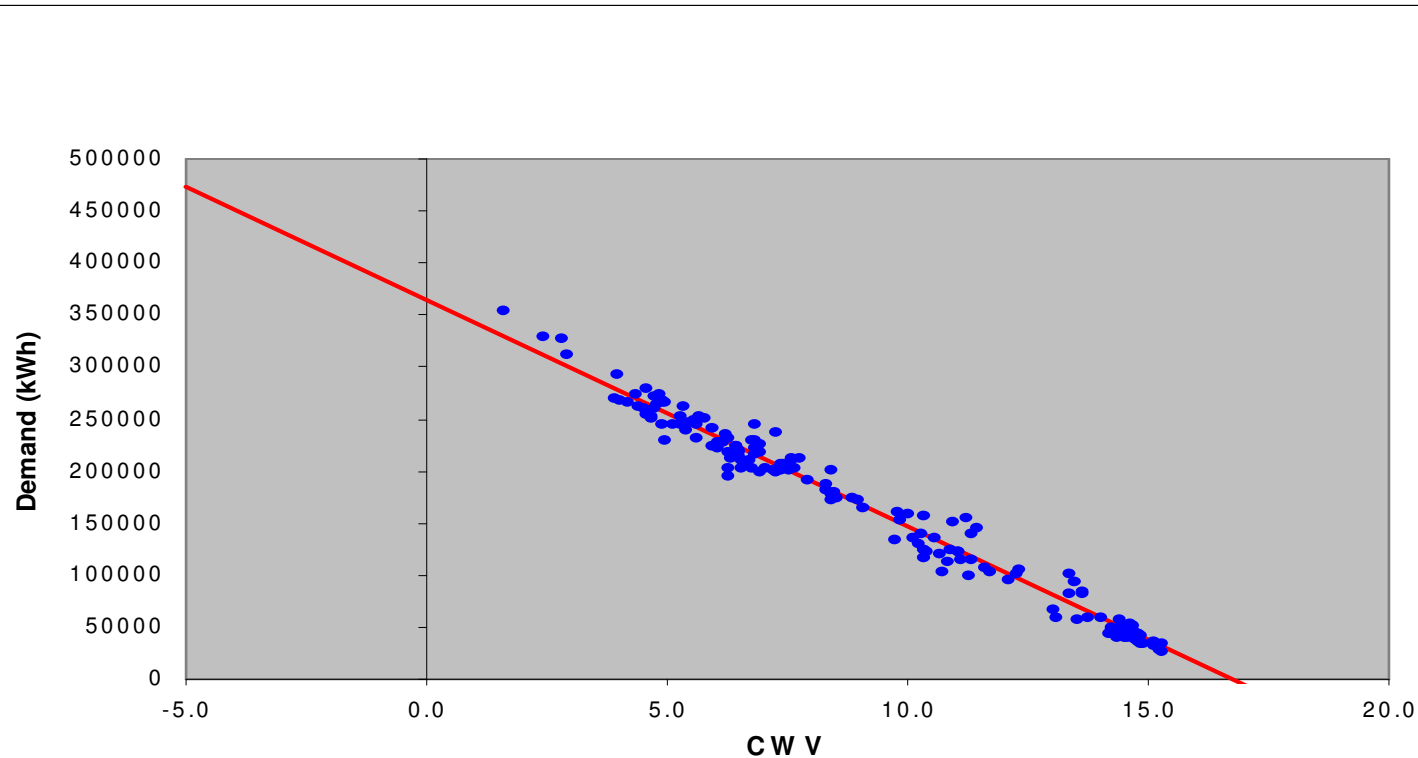
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## Small NDM Modelling Results SW LDZ, EUC Band 3: 293 - 732 MWh pa



- **Combined WS/SW Demand** against SW CWV – Non Holiday Monday to Thursday - Sample size: 87
- **DECISION** required by TWG on which model to choose, further statistical information to follow

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## Small NDM Modelling Results

### Model Comparison - EUC Band 3: 293 - 732 MWh pa

#### 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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## Small NDM Modelling Results

### Model Comparison – WS EUC Band 3: 293 - 732 MWh pa

- Summary of Key Statistics:

	WS Individual		WS / SW combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	121801	1201	371023	2988
C2 (Slope)	-7106	139	-22424	346
R <sup>2</sup>	93%		96%	
ILF	26%		26%	
Sample Size	27		87	
T stat C1 (Normalised)	101.42 ( 1 )		124.17 ( 1 )	
T stat C2 (Normalised)	-51.12 ( -0.5041 )		-64.81 ( -0.5219 )	

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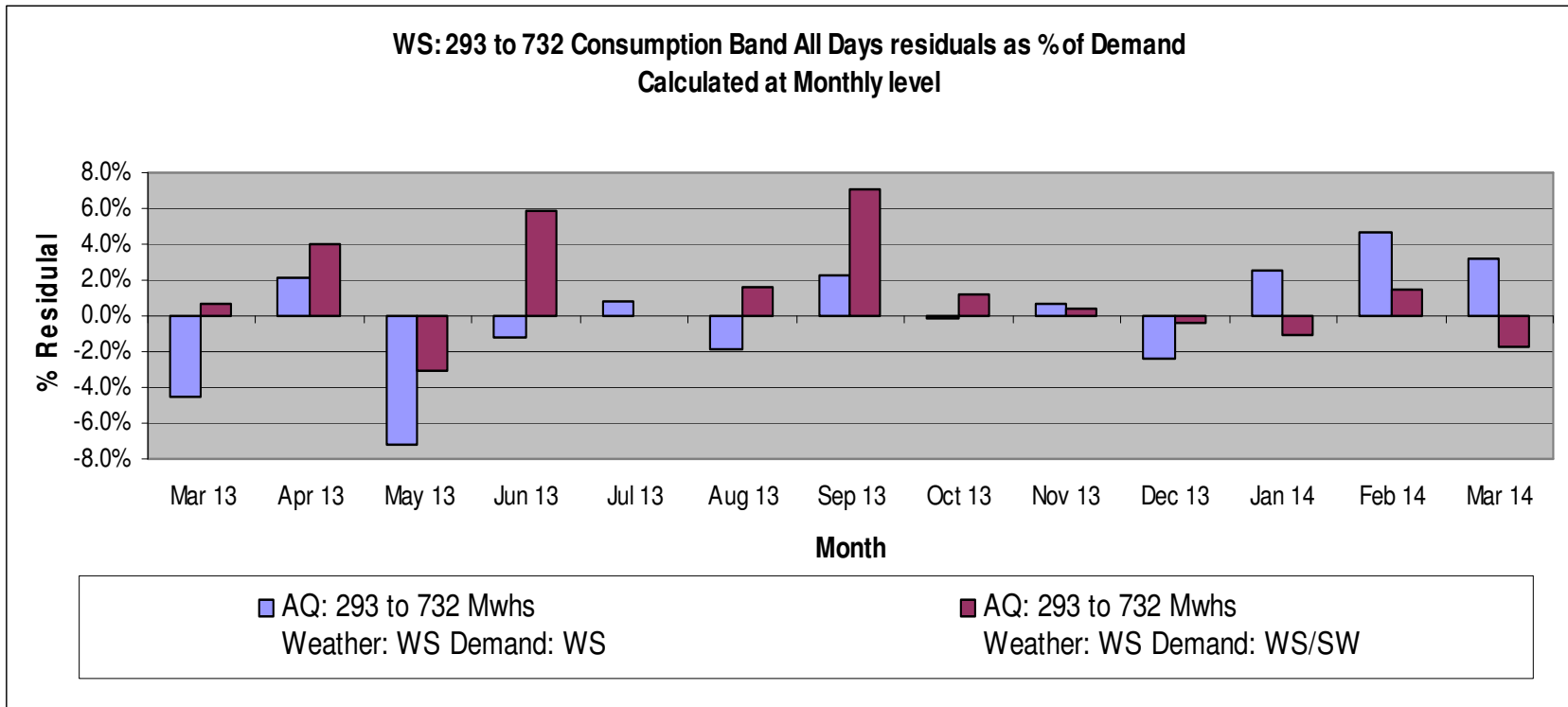


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# Small NDM Modelling Results

## Model Comparison – WS EUC Band 3: 293 - 732 MWh pa

- Monthly Residuals:**



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## Small NDM Modelling Results

### Model Comparison – SW EUC Band 3: 293 - 732 MWh pa

- Summary of Key Statistics:

	SW Individual		WS / SW combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	245849	2719	363725	2138
C2 (Slope)	-15017	338	-21622	200
R <sup>2</sup>	93%		96%	
ILF	26%		27%	
Sample Size	60		87	
T stat C1 (Normalised)	90.42 ( 1 )		170.12 ( 1 )	
T stat C2 (Normalised)	-44.43 ( -0.4914 )		-108.11 ( -0.6355 )	

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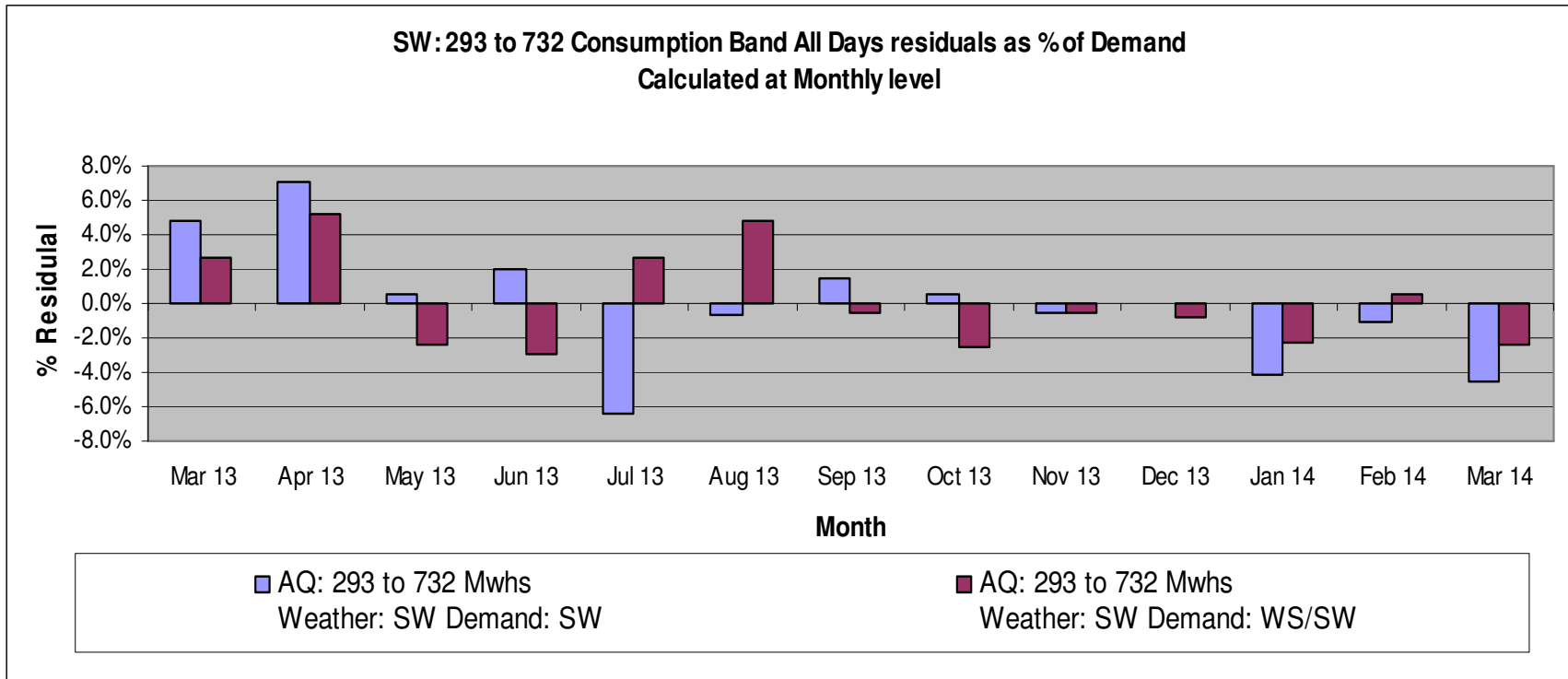


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# Small NDM Modelling Results

## Model Comparison – SW EUC Band 3: 293 - 732 MWh pa

- Monthly Residuals:**



**Xoserve Suggestion:**

To proceed with single year models for SW and WS for Band 3  
Last year TWG selected single model per LDZ



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## Small NDM Modelling Results

### EUC Band 4: 732 – 2196 MWh pa

	Indicative Load Factor	R <sup>2</sup> Multiple Correlation Coefficient	Sample Size
SC	37%	97%	250
NO	31%	97%	120
NW / WN	34%	96%	275
NE	35%	96%	162
EM	33%	98%	216
WM	31%	96%	223
WS	30%	94%	54
EA	33%	97%	233
NT	36%	97%	269
SE	34%	98%	251
SO	29%	97%	200
SW	32%	96%	136

• Indicative Load Factor : R<sup>2</sup> Multiple Correlation Coefficient : Sample Size

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Small NDM <2,196 MWh

WAR Band Analysis

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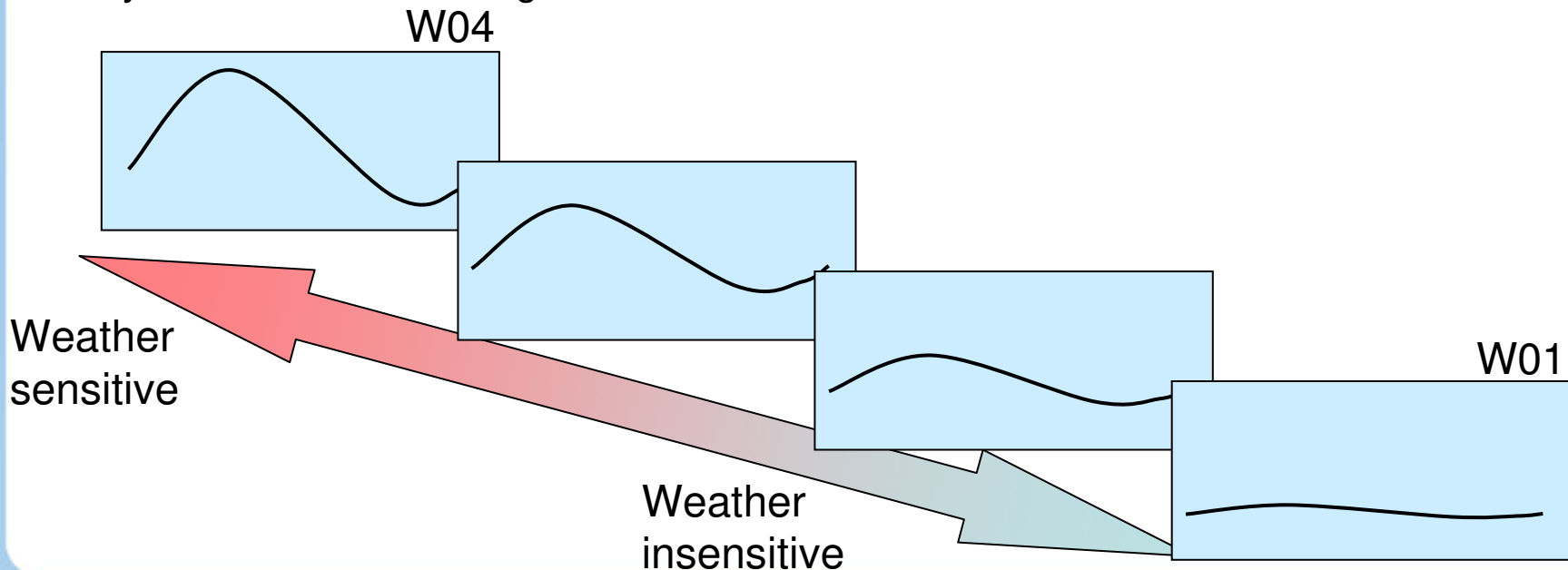


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## Winter:Annual Ratio (WAR) Band EUCs

- 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 2013/14)
  - 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 2013/14
  - 2013/14 was warmer than 2012/13, so thresholds can expect to decrease this year
- WAR Band limits for Spring 2014 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 2013/14 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)	Agreed to merge Band 3 & 4 data for WAR Band Analysis – Model all LDZs separately except: NW/WN combined WS/SW combined
732 to 2,196 MWh pa (EUC Band 4)	

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## Small NDM Modelling Results

### WAR Band Analysis: 293 to 2196 MWh pa

	WAR Banding											
	0.00 – 0.43			0.43 – 0.49			0.49 – 0.56			0.56 – 1.00		
SC	50%	84%	75	42%	96%	122	33%	97%	131	29%	91%	45
NO	49%	85%	43	38%	95%	63	26%	95%	43	22%	93%	30
NW / WN	52%	88%	85	40%	95%	93	29%	95%	110	25%	94%	104
NE	50%	82%	49	42%	97%	81	30%	95%	68	23%	93%	50
EM	54%	96%	60	39%	97%	75	31%	97%	99	25%	89%	112
WM	47%	90%	63	37%	96%	67	29%	96%	83	21%	92%	100
WS / SW	53%	77%	47	36%	94%	66	28%	96%	80	22%	95%	84
EA	49%	80%	59	38%	96%	95	29%	97%	118	23%	92%	91
NT	50%	73%	102	38%	95%	126	30%	97%	96	25%	91%	67
SE	54%	76%	65	41%	97%	128	28%	97%	116	23%	94%	81
SO	49%	74%	50	33%	95%	75	27%	97%	91	19%	94%	74

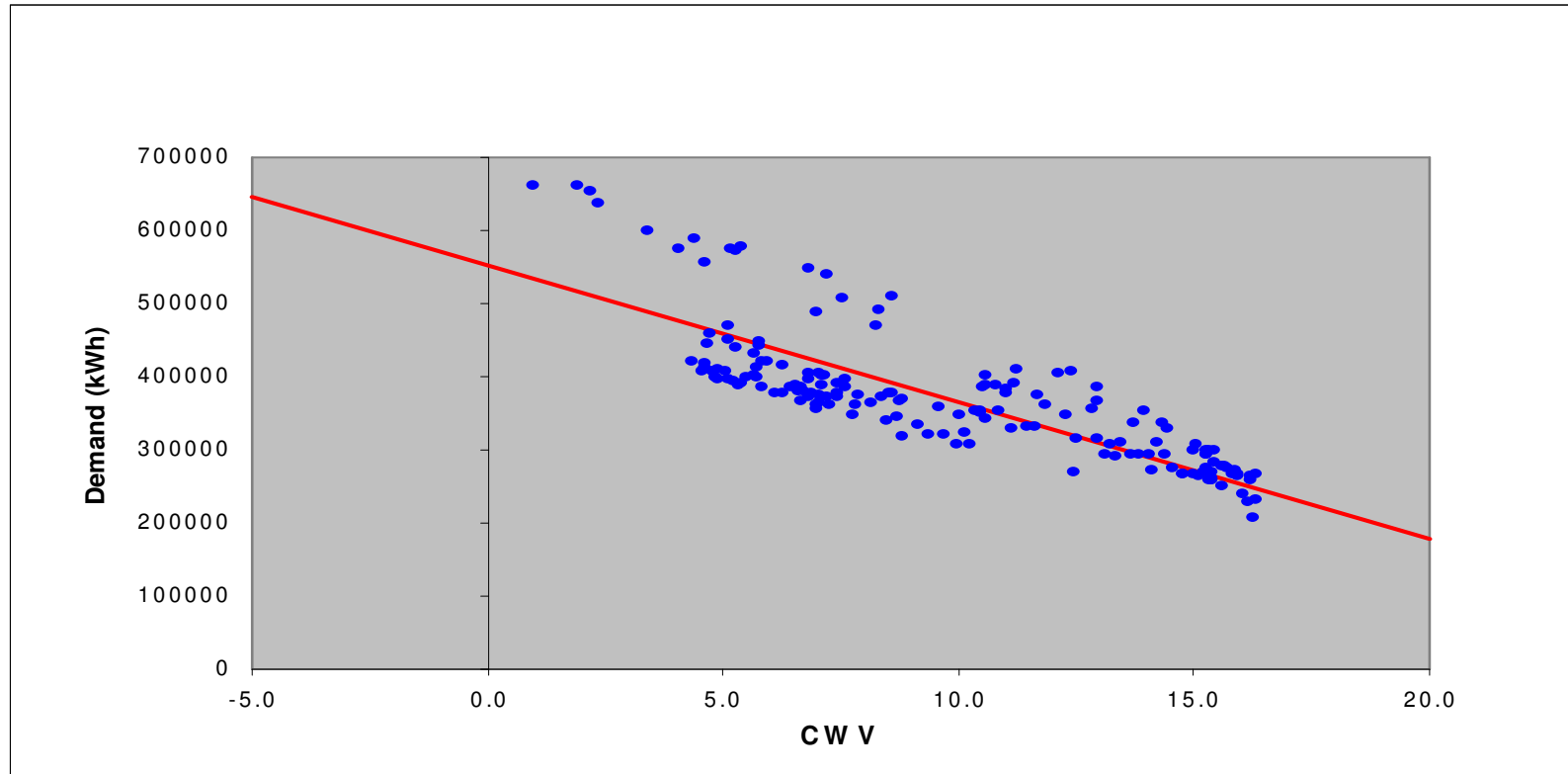
- Indicative Load Factor :  $R^2$  Multiple Correlation Coefficient : Sample Size

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## Small NDM Modelling Results NT LDZ, EUC Band 3 to 4 – WAR Band 1



- Demand against NT CWV – Non Holiday Monday to Thursday
- Lower R Squared value due to scatter which can be more prevalent in WAR Band 1

## Small NDM Analysis Summary

- Good  $R^2$  Coefficients for majority of Consumption Band and WAR Band models
- Lower  $R^2$  Coefficients within WAR Band 1 models where less weather sensitive sites are prevalent
- Significant decrease in sample numbers available for modelling, however still sufficient this year for individual LDZ analysis with results overall good
- *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 11.4% 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
  - Earlier this year 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	72.3%	98.81%
0 – 293 MWh pa	78.1%	99.67%
0 – 2,196 MWh pa	88.6%	99.97%
>2,196 MWh pa	11.4%	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 Supply Points (>2,196 MWh pa) Agreed Sample Data Aggregations

	Consumption Band Analysis – 2013/14 data
Band 05 2,196 to 5,860 MWh pa	Individual LDZ
Band 06 5,860 to 14,650 MWh pa	Individual LDZ
Band 07 and Band 08 14,650 to 58,600 MWh pa	By 10 or 8 LDZ Groups
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 07 / 08 – results to follow

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## Large NDM Modelling Results

### Band 5: 2,196 – 5,860 MWh pa

	Indicative Load Factor	R <sup>2</sup> Multiple Correlation Coefficient	Sample Size
SC	<b>43%</b>	<b>97%</b>	<b>206</b>
NO	<b>35%</b>	<b>96%</b>	<b>73</b>
NW / WN	<b>41%</b>	<b>98%</b>	<b>177</b>
NE	<b>40%</b>	<b>97%</b>	<b>86</b>
EM	<b>40%</b>	<b>98%</b>	<b>155</b>
WM	<b>36%</b>	<b>98%</b>	<b>190</b>
WS	<b>35%</b>	<b>96%</b>	<b>39</b>
EA	<b>36%</b>	<b>98%</b>	<b>108</b>
NT	<b>39%</b>	<b>98%</b>	<b>195</b>
SE	<b>41%</b>	<b>98%</b>	<b>122</b>
SO	<b>34%</b>	<b>98%</b>	<b>100</b>
SW	<b>38%</b>	<b>97%</b>	<b>86</b>

• **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

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# Large NDM Modelling Results

## Band 6: 5,860 – 14,650 MWh pa

	Indicative Load Factor	R <sup>2</sup> Multiple Correlation Coefficient	Sample Size
SC	<b>53%</b>	<b>97%</b>	<b>81</b>
NO	<b>44%</b>	<b>97%</b>	<b>49</b>
NW / WN	<b>46%</b>	<b>98%</b>	<b>95</b>
NE	<b>51%</b>	<b>96%</b>	<b>79</b>
EM	<b>47%</b>	<b>98%</b>	<b>87</b>
WM	<b>42%</b>	<b>97%</b>	<b>81</b>
WS	<b>47%</b>	<b>94%</b>	<b>32</b>
EA	<b>46%</b>	<b>97%</b>	<b>65</b>
NT	<b>44%</b>	<b>94%</b>	<b>69</b>
SE	<b>42%</b>	<b>96%</b>	<b>44</b>
SO	<b>35%</b>	<b>97%</b>	<b>44</b>
SW	<b>46%</b>	<b>96%</b>	<b>55</b>

- **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

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## Large NDM Modelling Results

**DECISION: Band 7 and 8: 14,650 – 58,600 MWh pa**

	10 LDZ GROUPINGS			8 LDZ GROUPINGS		
SC	57%	92%	36	57%	92%	36
NO	61%	90%	29	59%	97%	117
NW/WN	58%	97%	88			
NE	63%	92%	49	63%	92%	49
EM	61%	95%	89	61%	95%	89
WM	54%	94%	78	54%	94%	78
WS/SW	54%	94%	57	54%	94%	57
EA	53%	90%	42	53%	95%	78
NT	52%	92%	36			
SE/SO	43%	96%	48	43%	96%	48

- **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

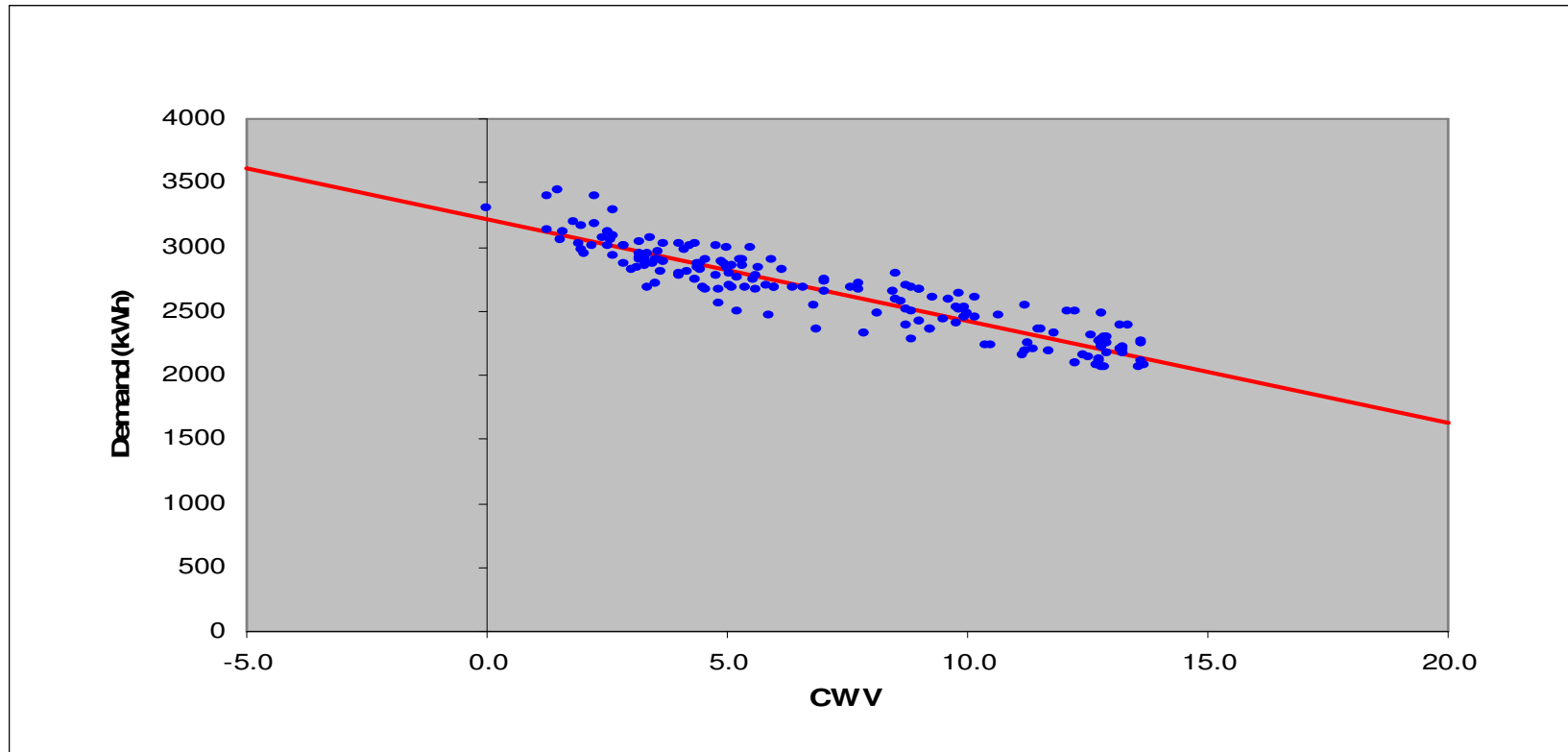
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## Large NDM Modelling Results

### NO LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **NO Demand** against NO CWV – Non Holiday Monday to Thursday  
Sample size: 29

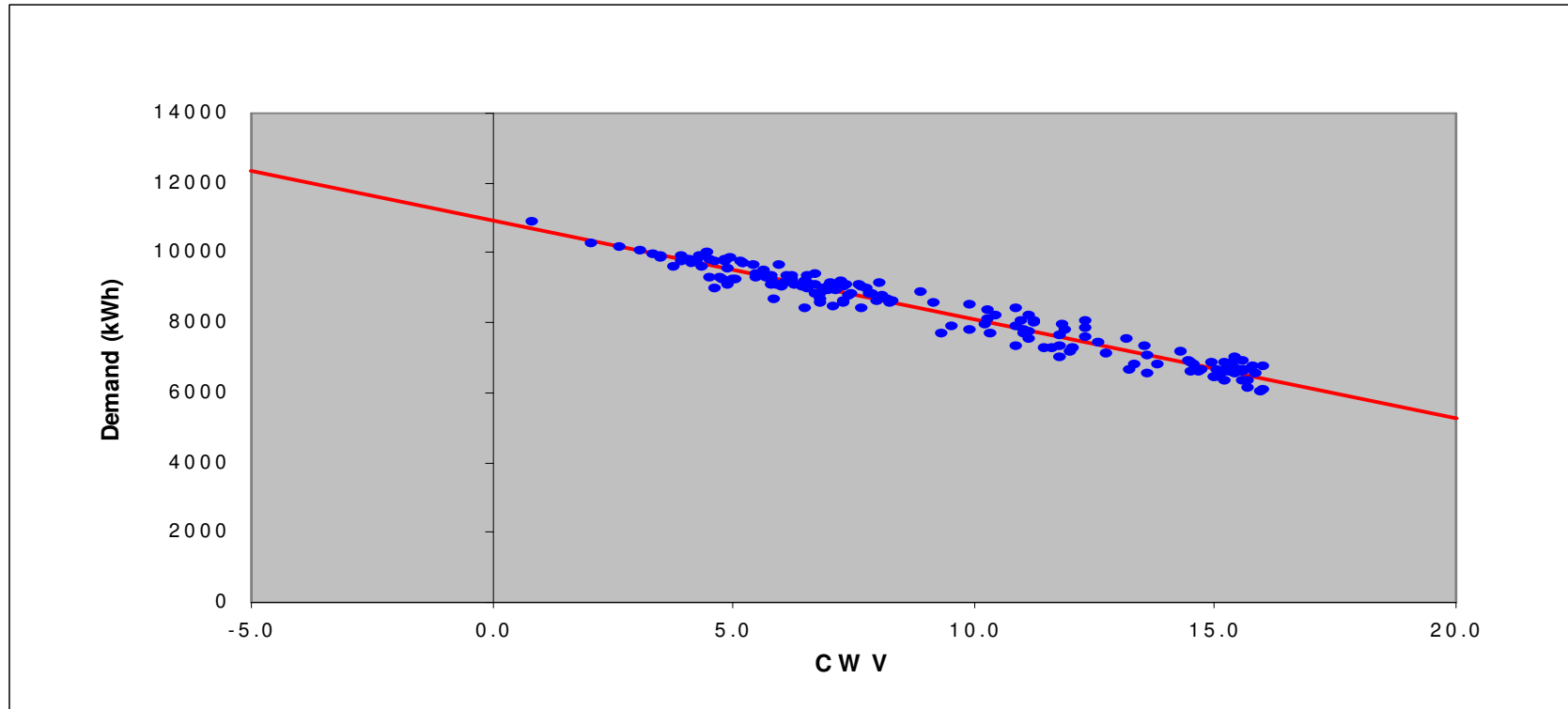
Xserve



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## Large NDM Modelling Results

### NW/WN LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **NW/WN Demand** against NW CWV – Non Holiday Monday to Thursday  
Sample size: 88

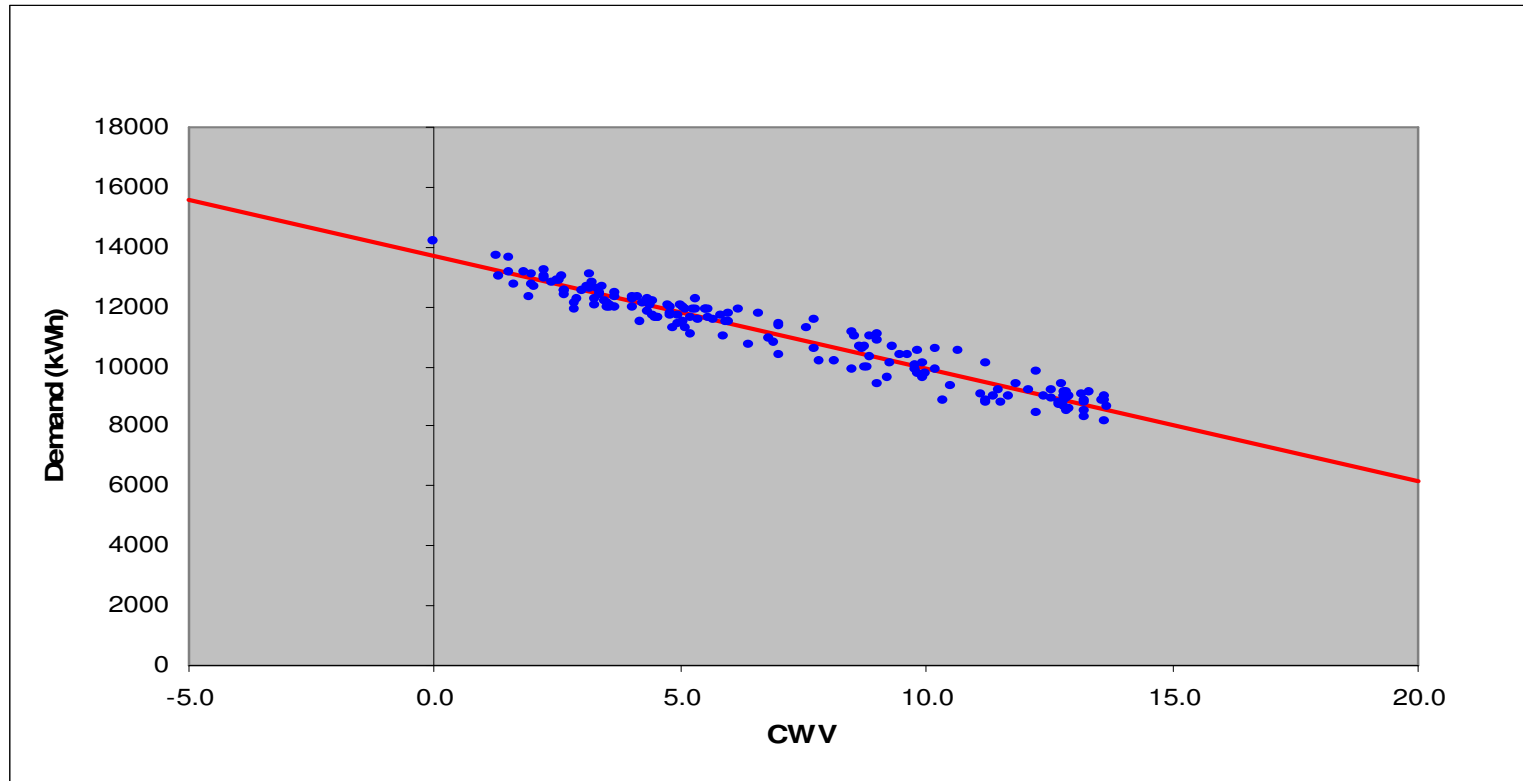
Xserve



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## Large NDM Modelling Results

### NO LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **Combined NO / NW/WN Demand** against NO CWV – Non Holiday Monday to Thursday - Sample size: 117
- **DECISION** required by TWG on which model to choose, further statistical information to follow

**Xserve**

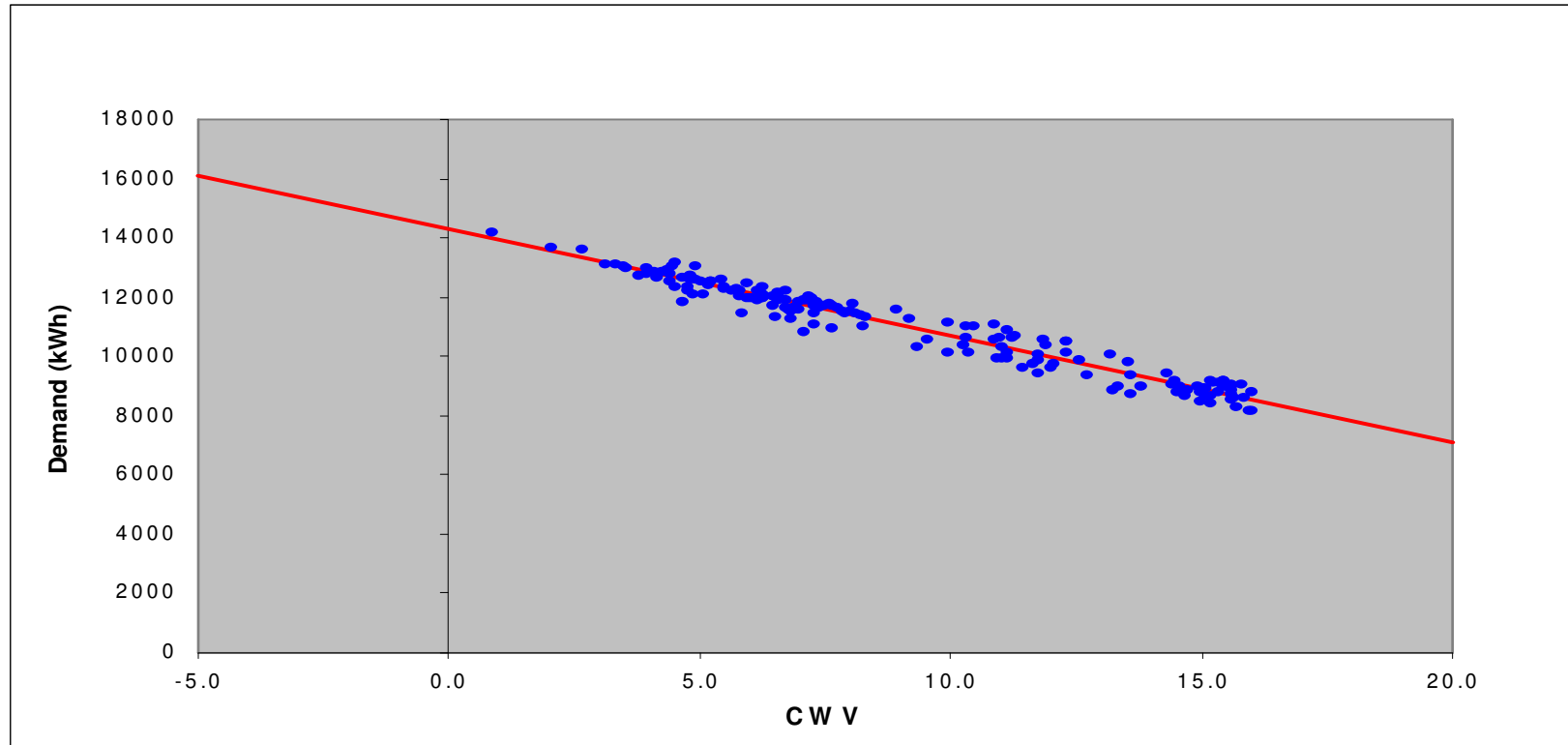


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## Large NDM Modelling Results

### NW/WN LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **Combined NO / NW/WN Demand** against NW CWV – Non Holiday Monday to Thursday - Sample size: 117
- **DECISION** required by TWG on which model to choose, further statistical information to follow

Xserve



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## Large NDM Modelling Results

### Model Comparison – NO EUC Band 7 & 8: 14,650 – 58,600 MWh pa

- Summary of Key Statistics:

	NO Individual		NO / NW/WN combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	3219.3	19.5	13672.5	56.3
C2 (Slope)	-79.6	2.2	-376.5	6.3
R <sup>2</sup>	90%		96%	
ILF	61%		57%	
Sample Size	29		117	
T stat C1 (Normalised)	165.09 ( 1 )		242.85 ( 1 )	
T stat C2 (Normalised)	-36.18 ( -0.2192 )		-59.76 ( -0.2461 )	

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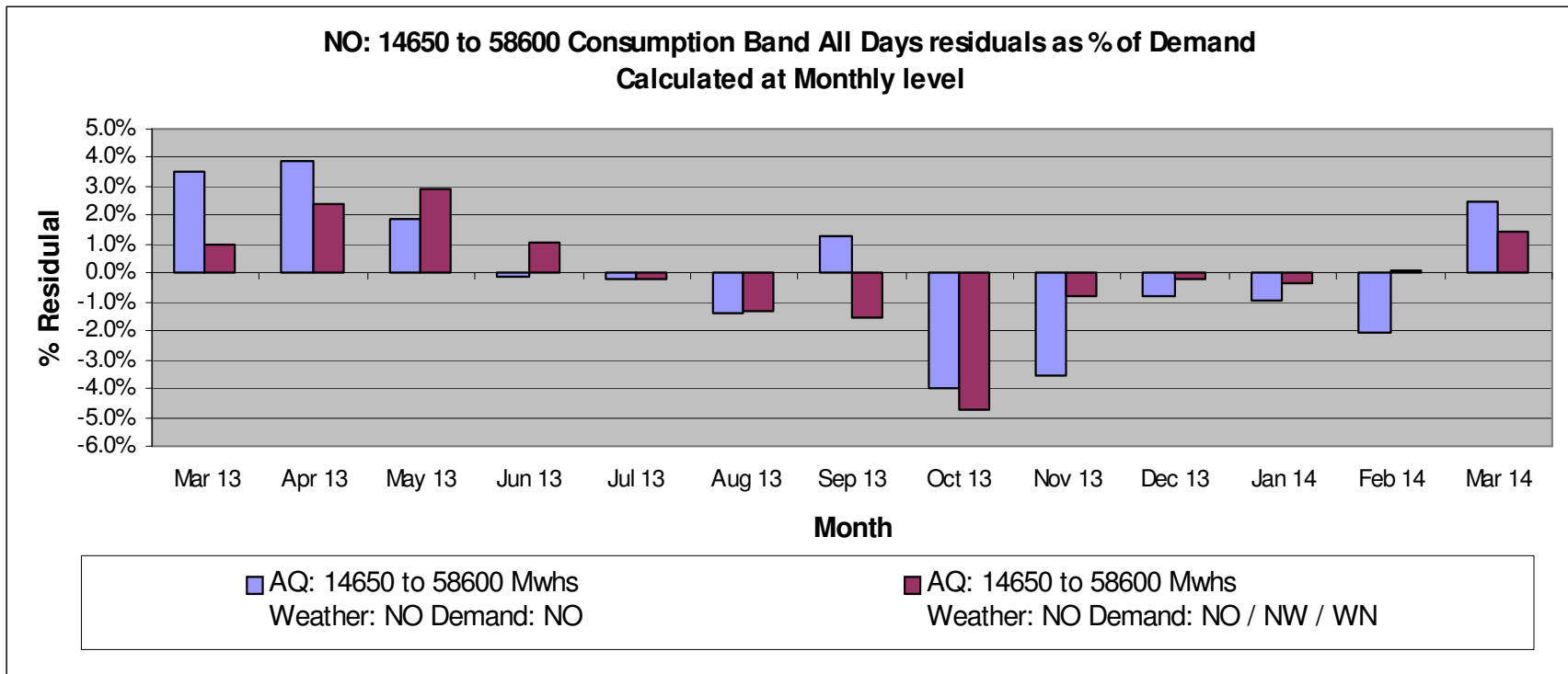


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# Large NDM Modelling Results

## Model Comparison – NO EUC Band 7 & 8: 14,650 – 58,600 MWh pa

- Monthly Residuals:**



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## Large NDM Modelling Results

### Model Comparison – NW/WN EUC Band 7 & 8: 14,650 – 58,600 MWh

- Summary of Key Statistics:

	NW/WN Individual		NO / NW/WN combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	10942	46.9	14286.9	57
C2 (Slope)	-284.3	4.3	-359.9	5.3
R <sup>2</sup>	97%		97%	
ILF	58%		60%	
Sample Size	88		117	
T stat C1 (Normalised)	233.3 ( 1 )		250.65 ( 1 )	
T stat C2 (Normalised)	-66.12 ( -0.2834 )		-67.91 ( -0.2709 )	

**Xserve**

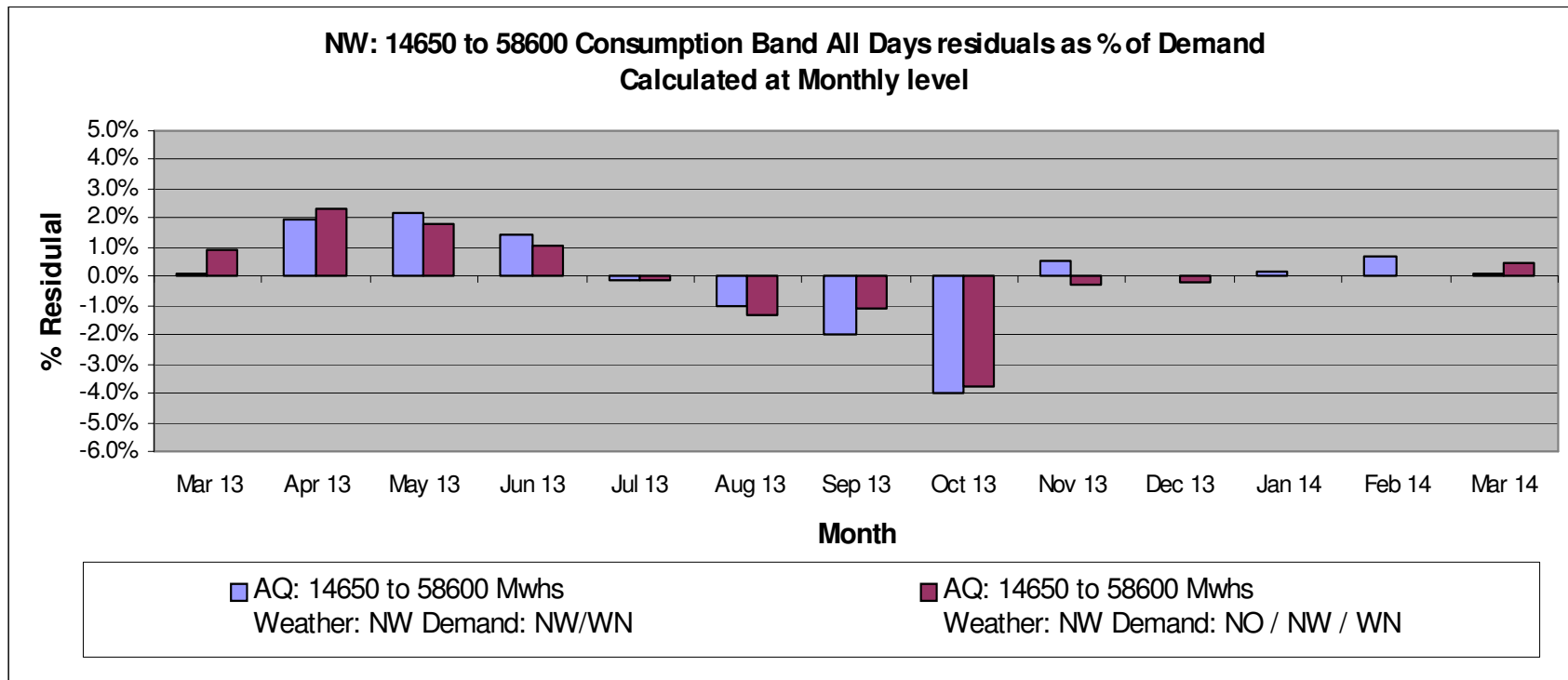


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# Large NDM Modelling Results

## Model Comparison – NW/WN EUC Band 7 & 8: 14,650 – 58,600 MWh

- Monthly Residuals:**



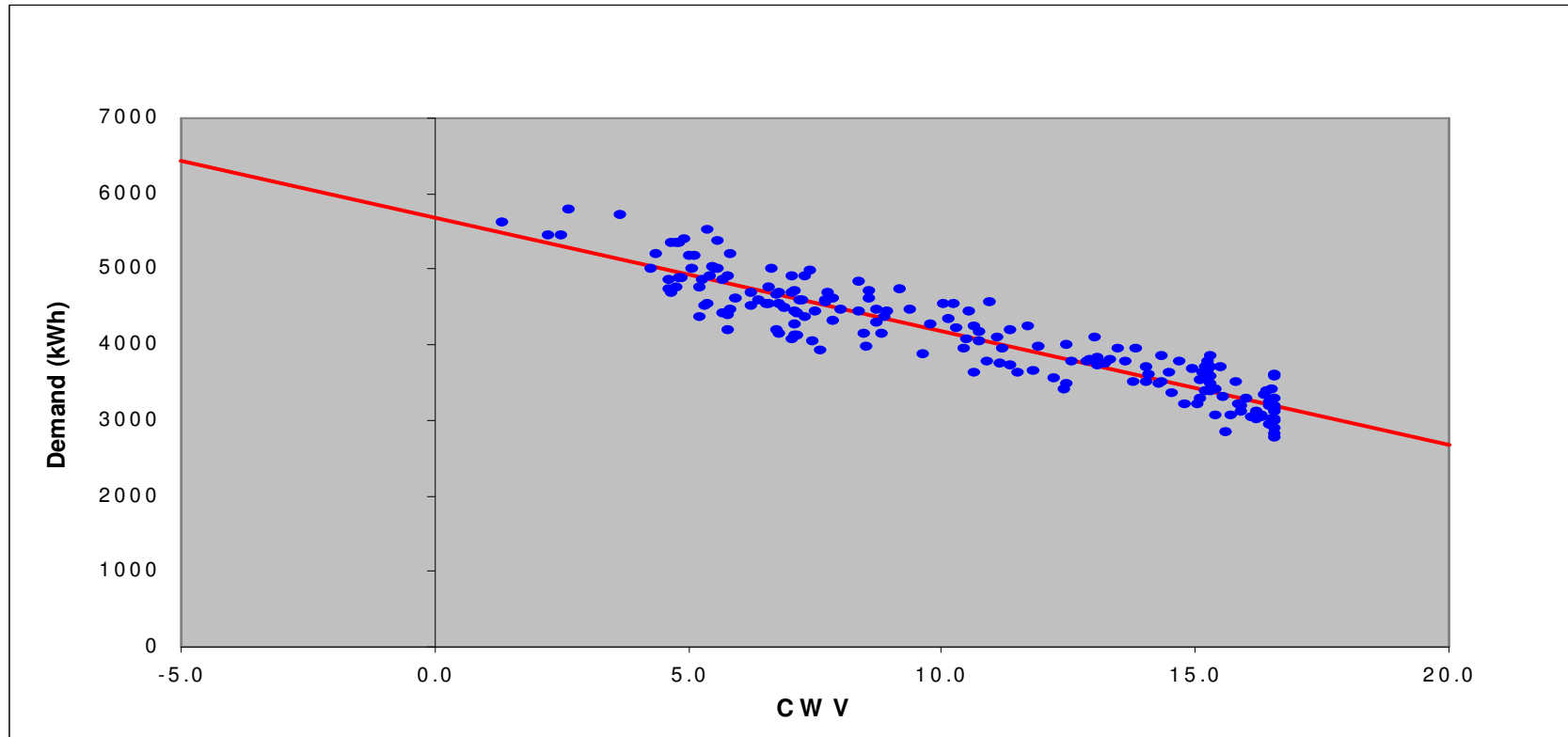
Xserve



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## Large NDM Modelling Results

### EA LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **EA Demand** against EA CWV – Non Holiday Monday to Thursday  
Sample size: 42

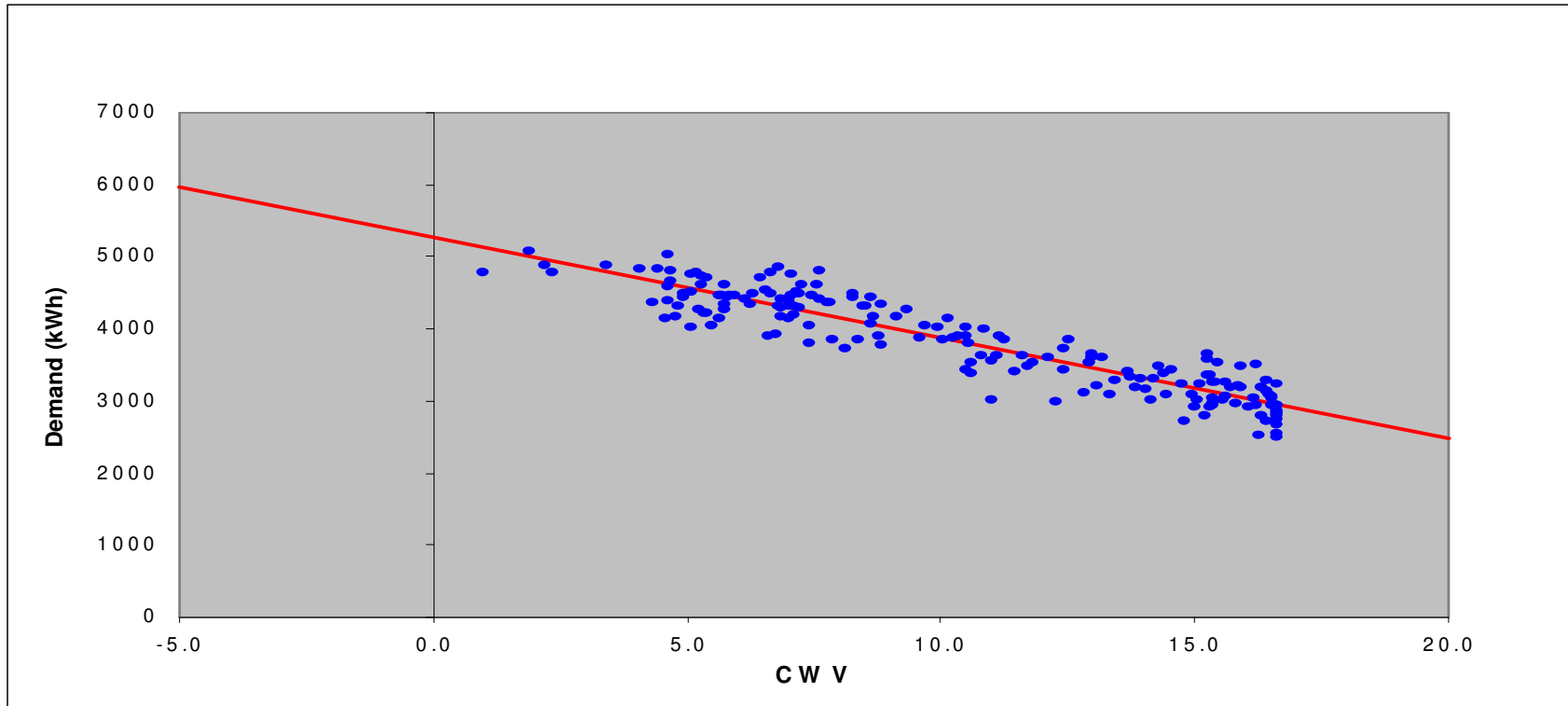
**Xserve**



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## Large NDM Modelling Results

### NT LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **NT Demand** against NT CWV – Non Holiday Monday to Thursday  
Sample size: 36

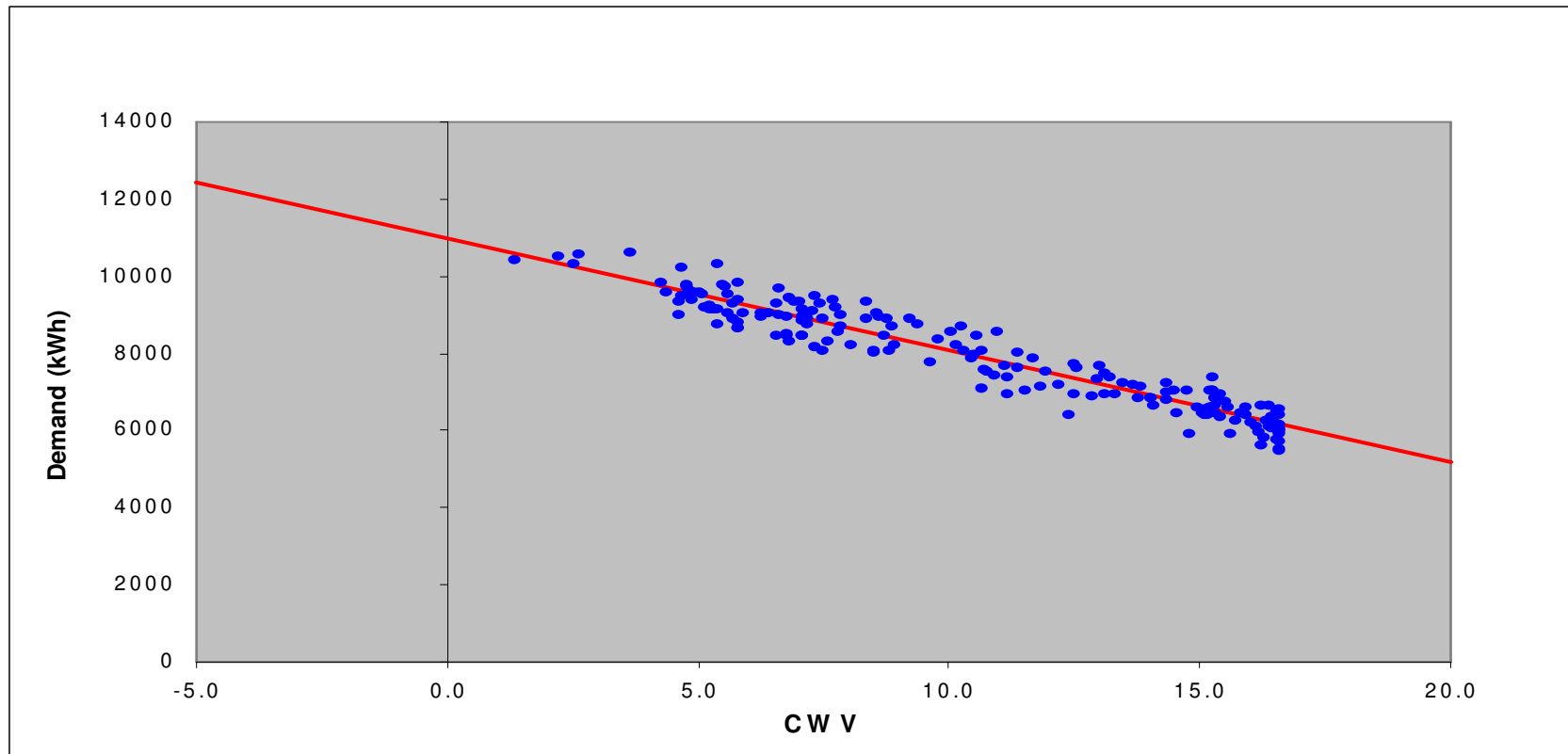
Xserve



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## Large NDM Modelling Results

### EA LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **Combined EA / NT Demand** against EA CWV – Non Holiday Monday to Thursday - Sample size: 78
- **DECISION** required by TWG on which model to choose, further statistical information to follow

Xserve

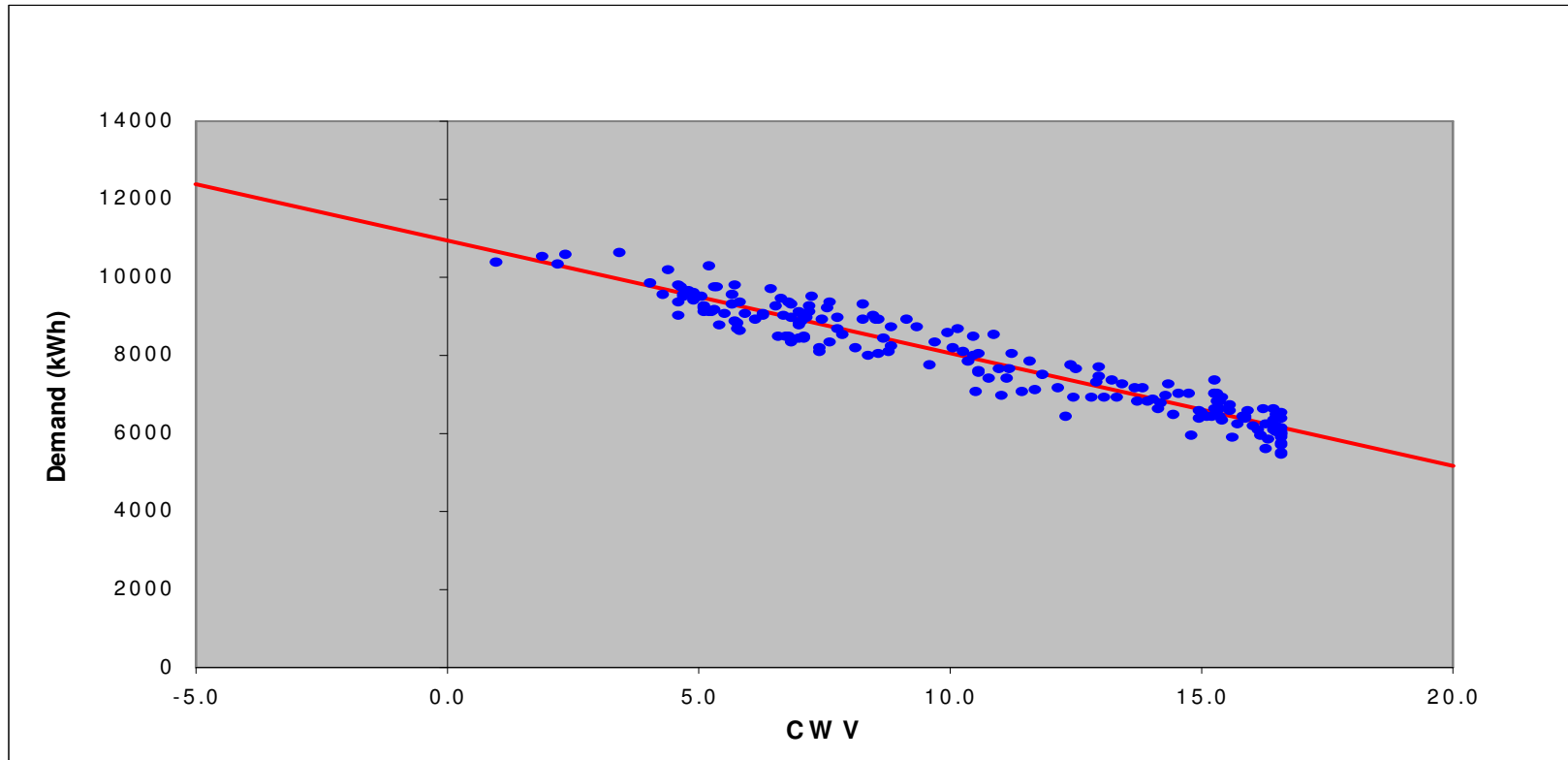


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## Large NDM Modelling Results

### NT LDZ, EUC Band 7 & 8: 14,650 – 58,600 MWh pa



- **Combined EA / NT Demand** against NT CWV – Non Holiday Monday to Thursday - Sample size: 78
- **DECISION** required by TWG on which model to choose, further statistical information to follow

Xserve



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## Large NDM Modelling Results

### Model Comparison – EA EUC Band 7 & 8: 14,650 – 58,600 MWh pa

- Summary of Key Statistics:

	EA Individual		EA / NT combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	5683.9	50.8	10966.2	72.5
C2 (Slope)	-150	4.5	-289.7	6.4
R <sup>2</sup>	90%		95%	
ILF	53%		53%	
Sample Size	42		78	
T stat C1 (Normalised)	111.89 ( 1 )		151.26 ( 1 )	
T stat C2 (Normalised)	-33.33 ( -0.2979 )		-45.27 ( -0.2993 )	

**Xserve**

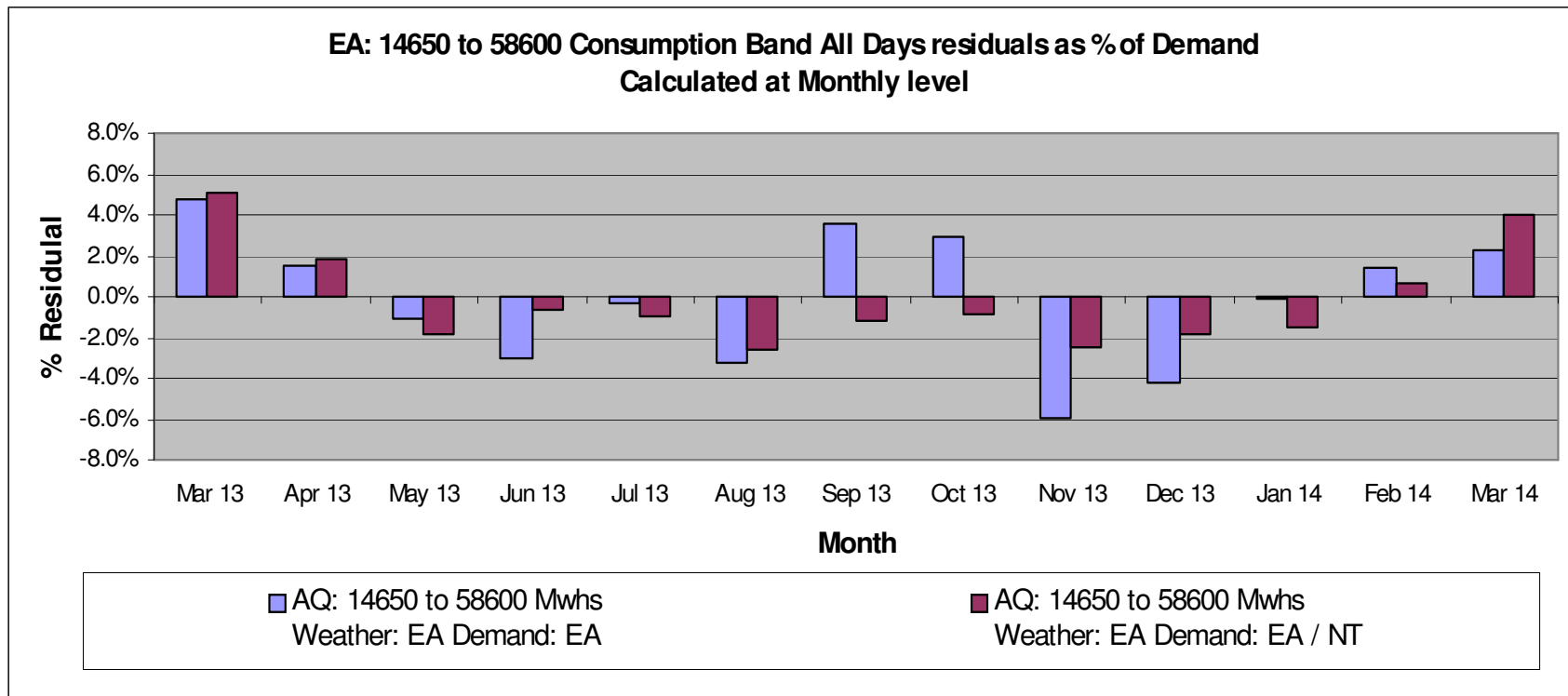


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# Large NDM Modelling Results

## Model Comparison – EA EUC Band 7 & 8: 14,650 – 58,600 MWh pa

- Monthly Residuals:**



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## Large NDM Modelling Results

### Model Comparison – NT EUC Band 7 & 8: 14,650 – 58,600 MWh pa

- Summary of Key Statistics:

	NT Individual		EA / NT combined	
	Coefficient	Standard Error	Coefficient	Standard Error
C1 (Intercept)	5267.7	46.5	10934.9	70.6
C2 (Slope)	-139.2	4.1	-288.6	6.2
R <sup>2</sup>	92%		95%	
ILF	52%		53%	
Sample Size	36		78	
T stat C1 (Normalised)	113.28 ( 1 )		154.89 ( 1 )	
T stat C2 (Normalised)	-33.95 ( -0.2997 )		-46.55 ( -0.3005 )	

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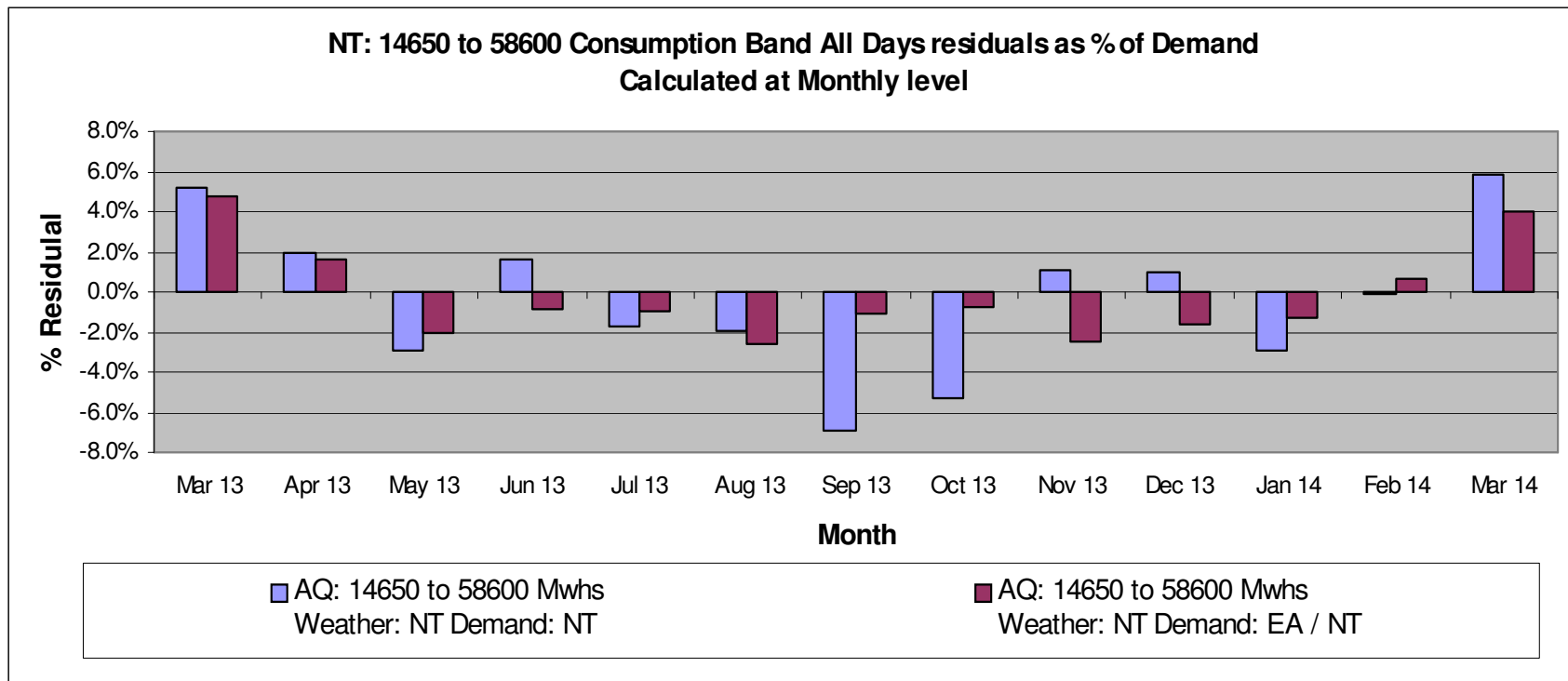


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# Large NDM Modelling Results

## Model Comparison – NT EUC Band 7 & 8: 14,650 – 58,600 MWh pa

- Monthly Residuals:**



### Xoserve Suggestion:

To proceed with 8 LDZ groupings for Bands 7 and 8

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## Large NDM Modelling Results

**DECISION: Band 7 and 8: 14,650 – 58,600 MWh pa**

	10 LDZ GROUPINGS			8 LDZ GROUPINGS		
SC	57%	92%	36	57%	92%	36
NO	61%	90%	29	59%	97%	117
NW/WN	58%	97%	88			
NE	63%	92%	49	63%	92%	49
EM	61%	95%	89	61%	95%	89
WM	54%	94%	78	54%	94%	78
WS/SW	54%	94%	57	54%	94%	57
EA	53%	90%	42	53%	95%	78
NT	52%	92%	36			
SE/SO	43%	96%	48	43%	96%	48

- **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

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## Large NDM Modelling Results Band 9: above 58,600 MWh pa

	NATIONAL GROUPINGS		
SC	62%	37%	102
NO			
NW / WN			
NE			
EM			
WM			
WS			
EA			
NT			
SE			
SO			
SW			

- **Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

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## Large NDM Bands 5 to 8: 2,196 MWh – 58,600 MWh pa Proposed WAR Band Analysis

Consumption Range	2013/14 Analysis
Band 05 2,196 to 5,860 MWh pa	By 4 LDZ Groups
Band 06 5,860 to 14,650 MWh pa	By 3 LDZ Groups
Band 07 and Band 08 14,650 to 58,600 MWh pa	By 2 LDZ Groups
Band 09 >58,600 MWh pa	N/A - No WAR Bands

- Aggregation of sample data to allow sufficient sample analysis
- Options for aggregations as agreed at April TWG

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Large NDM >2,196 MWh

WAR Band Analysis

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## Large NDM Modelling Results

### 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 – 0.40			0.40 – 0.46			0.46 – 0.53			0.53 – 1.00		
SC / NO / NW / WN	58%	93%	103	47%	96%	146	36%	96%	146	27%	91%	61
NE / EM / WM	58%	96%	102	44%	97%	126	35%	98%	105	26%	95%	98
EA / NT / SE	59%	80%	63	46%	95%	149	36%	97%	129	26%	88%	84
WS / SO / SW	55%	88%	56	45%	96%	53	33%	97%	53	25%	93%	63

- Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

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## Large NDM Modelling Results

### WAR Band Analysis: 5,860 - 58,600 MWh pa

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

	WAR Banding											
	0.00 – 0.36			0.36 – 0.42			0.42 – 0.50			0.50 – 1.00		
SC/NO/NW/WN	69%	92%	46	54%	97%	82	42%	97%	68	31%	87%	29
NE/EM/WM	71%	94%	65	55%	98%	75	41%	97%	58	28%	94%	49
EA/NT/SE/WS/SO/SW	68%	70%	50	55%	97%	90	40%	97%	100	30%	96%	69

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

	WAR Banding											
	0.00 – 0.35			0.35 – 0.38			0.38 – 0.45			0.45 – 1.00		
SC/NO/NW/WN/NE/WM/EM	76%	87%	76	68%	94%	110	56%	96%	123	37%	97%	60
EA/NT/SE/WS/SO/SW	79%	78%	38	69%	86%	37	51%	94%	48	36%	94%	60

- Indicative Load Factor** : **R<sup>2</sup> Multiple Correlation Coefficient** : **Sample Size**

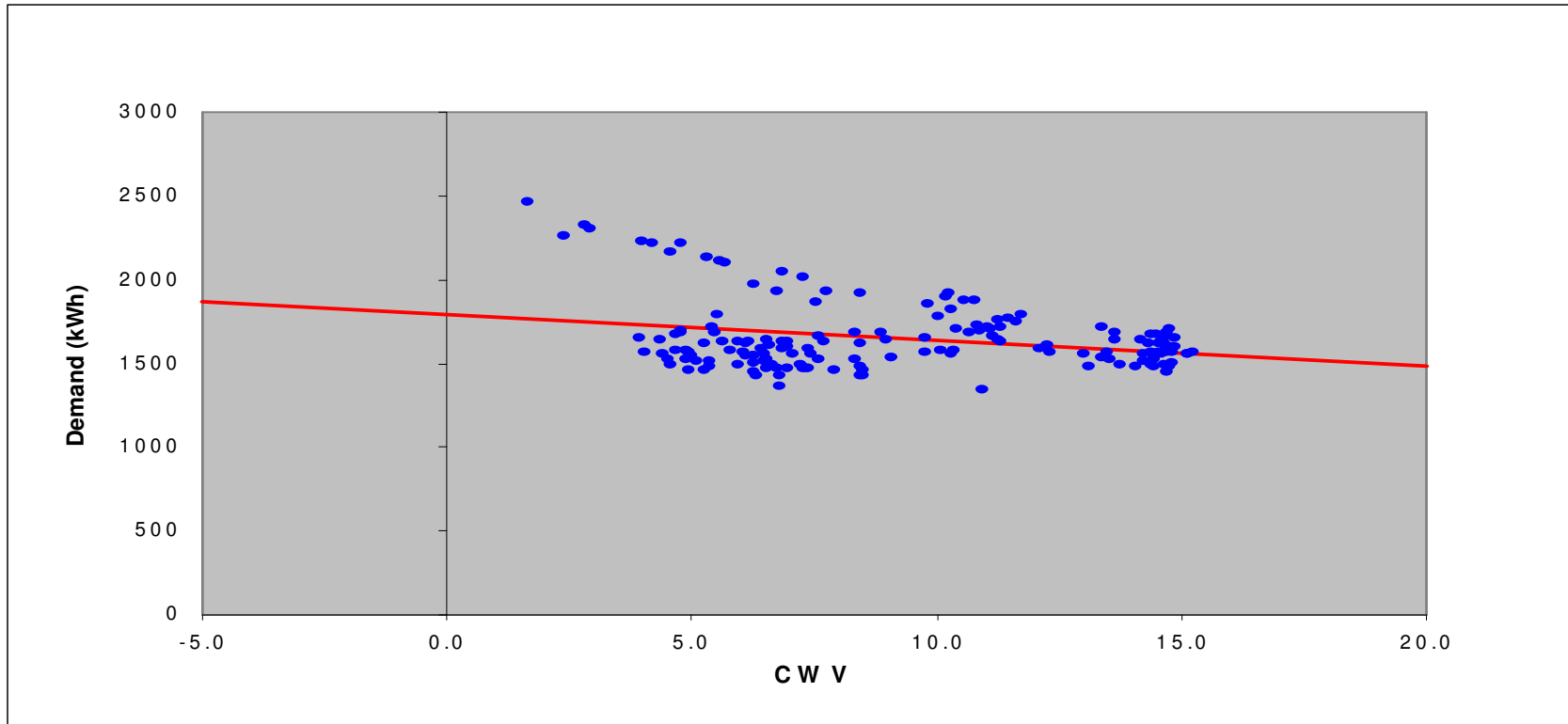
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# Large NDM Modelling Results

## SW LDZ, EUC Band 6 – WAR Band 1



- **Combined WS/EA/NT/SE/SO/SW Demand** against SW CWV  
Non Holiday Monday to Thursday - Sample size: 50

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# Large NDM Analysis Summary

- Good R<sup>2</sup> Coefficients for majority of models, including WAR Bands, some lower values in WAR Band 1
- Significant fall in sample numbers available, however with merger of Bands 7 and 8 for modelling purposes this 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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## Next Steps

- 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 9<sup>th</sup> 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 25<sup>th</sup> June to review feedback received
- DESC meeting 9<sup>th</sup> July to finalise proposals in order to publish to wider industry participants

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