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Technical Work Group

EUC Modelling 2012/13 – Single Year Modelling Results

23rd May 2012

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

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

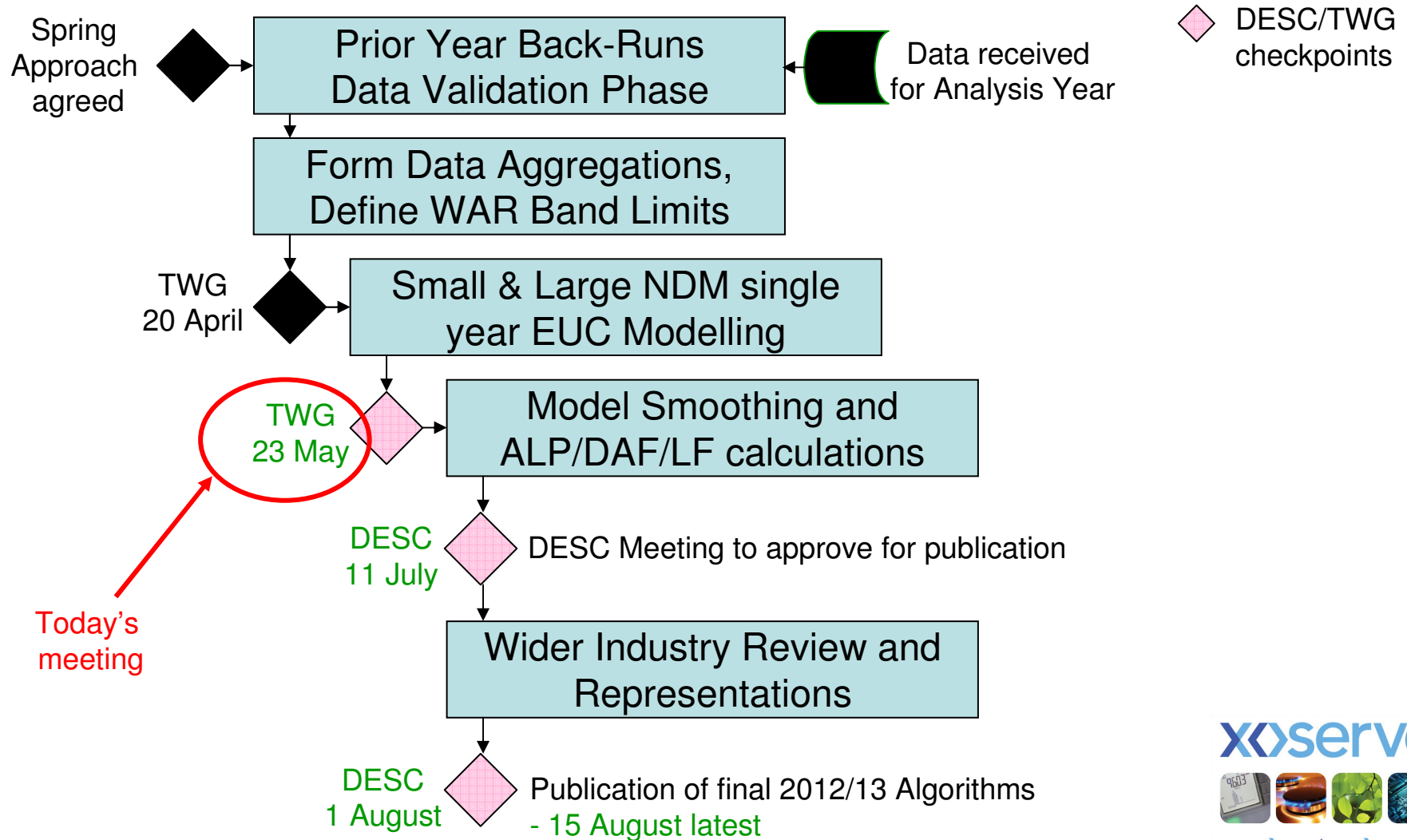
Changes to UNC Section H

- 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

Agreed 2012 Modelling Workplan

- Workplan for 2012 Modelling agreed at March DESC meeting
- Workplan aims to provide more transparency of process and introduce checkpoints for DESC/TWG review
- Limited scope for 2012 to change the process or structure of models

Agreed 2012 Timetable



Objectives of this Meeting

- Second meeting of Technical Workgroup (replaces old Technical Forum)
- 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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2012 Modelling Basis 1

- Methodology described in “Spring Approach” document, reviewed at February 2012 meeting
- Key aspects of EUC demand modelling basis for Spring 2012 analysis:
 - 12 month analysis for AMR and datalogger data sets covering 1st April to 31st March 2012
 - Sample data collected, validated and aggregations agreed by TWG during April
 - CWV definitions and SN basis same as Spring 2011
 - All demand modelling is data driven – if the modelling results indicate then Holiday & Weekend Factors, Summer Reductions & Cut-Offs will be applied

2012 Modelling Basis 2

- Holiday codes applicable to Christmas / New Year period revised again for Spring 2012 (changes agreed 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 3rd June to 30th September 2012 (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)

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.....

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

Feedback on Analysis Content / Format

- At 5th March DESC Xoserve invited feedback on format and content of technical material to be shared at the May meeting
- 1 shipper (E.On) responded with 3 suggestions, paraphrased below:
 - “Population counts in order to compare with collected sample numbers” **XO: Provided as part of TWG material in April**
 - “Provide some example regression models with warm weather cut-offs based on existing cut-off criteria (20% improvement) also re-run with different criteria (10% improvement)” **XO: Separate presentation published with examples for TWG to consider**
 - “Tricky to incorporate this time but ideas on how to review underlying data patterns/trends before proceeding through to final profiles” **XO: Currently being considered**

Small NDM Analysis

<2,196 MWh

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
- Appropriateness of Small NDM EUC bandings traditionally investigated each Spring
- TWG on 20 April agreed not to perform tactical analysis of Small NDM EUC bandings this year
 - Even if analysis supported a change, EUC bands could not be changed for 2012 Gas Year – thorough system testing would be required
 - Added review of all Bandings to list of possible Adhoc investigations for Autumn 2012

Total NDM Population Summary: Supply Point & AQ

Consumption Range	% of Total NDM	
	% of Total NDM AQ	% of Total NDM Count
0 – 73.2 MWh pa	71.7%	98.75%
0 – 293 MWh pa	77.4%	99.66%
0 – 2,196 MWh pa	87.4%	99.96%
>2,196 MWh pa	12.6%	0.04%

- 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

Small NDM Supply Points (<2,196 MWh pa) Agreed Sample Data Aggregations

	Consumption Band Analysis – 2011/12 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 WS/SW Combined
Band 04 732 to 2,196 MWh pa	Individual LDZ

- Aggregations agreed at April TWG
- In the main sufficient data available to allow individual LDZ analysis
- Feedback received during modelling phase accepted WS individual model for Band 03 – results to follow

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	37%	98%	225
NO	32%	97%	240
NW / WN	35%	98%	236
NE	35%	97%	266
EM	33%	99%	263
WM	30%	99%	237
WS	32%	97%	248
EA	31%	99%	273
NT	30%	99%	239
SE	31%	99%	251
SO	28%	98%	260
SW	30%	98%	258

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

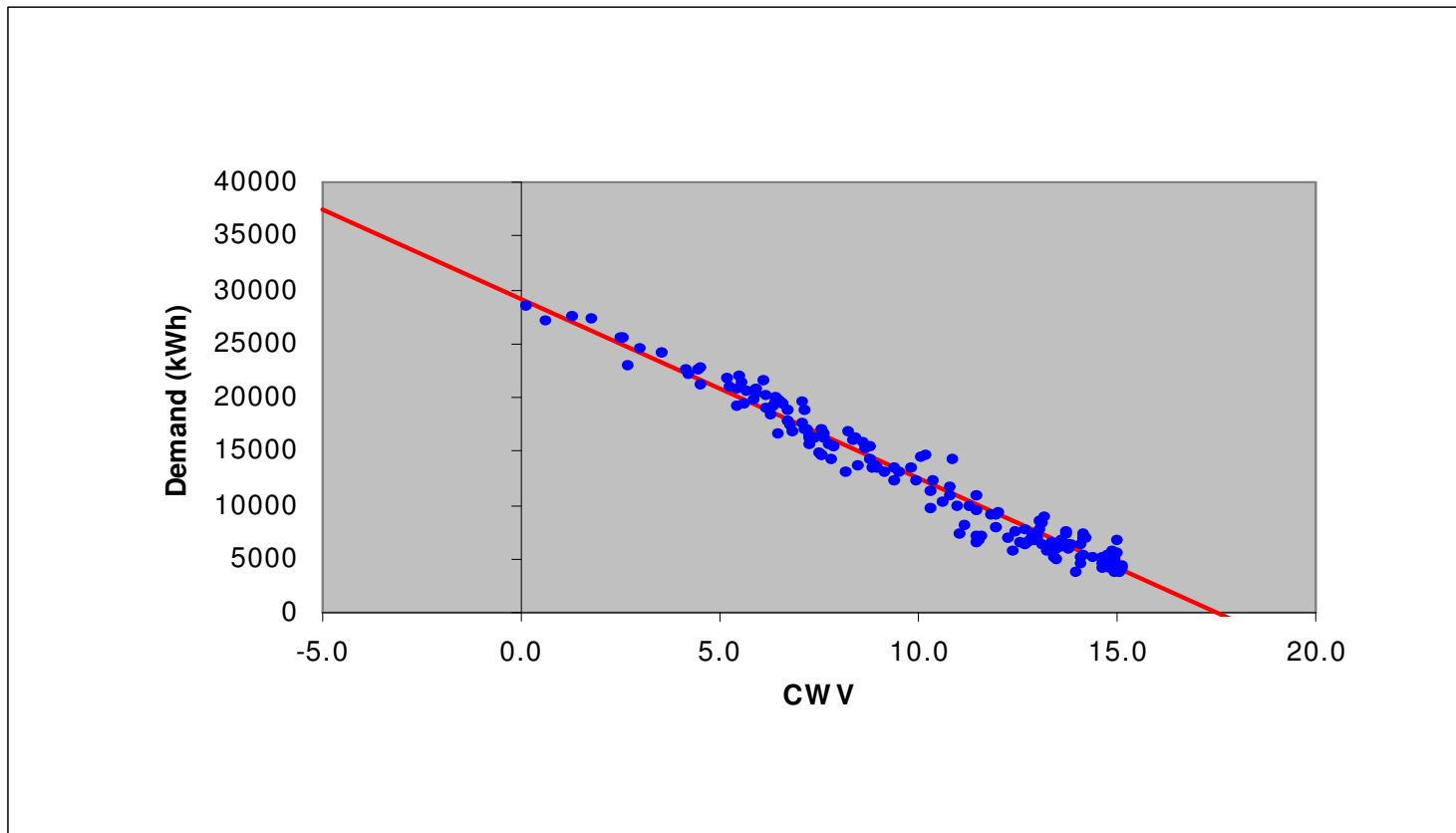
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Small NDM Modelling Results

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



Demand against WS CWV – Monday to Thursday - Holidays included

Small NDM Modelling Results

EUC Band 2: 73.2 – 293 MWh pa

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	37%	97%	98
NO	31%	96%	83
NW / WN	32%	95%	123
NE	31%	95%	101
EM	31%	97%	114
WM	29%	97%	88
WS	29%	95%	60
EA	30%	97%	124
NT	31%	97%	137
SE	31%	96%	124
SO	32%	98%	91
SW	32%	97%	95

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

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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	37%	97%	143
NO	32%	97%	73
NW / WN	30%	96%	139
NE	31%	96%	105
EM	30%	97%	146
WM	27%	96%	82
WS	28%	96%	29
EA	31%	97%	130
NT	32%	98%	141
SE	31%	98%	131
SO	26%	97%	99
SW	27%	97%	78

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

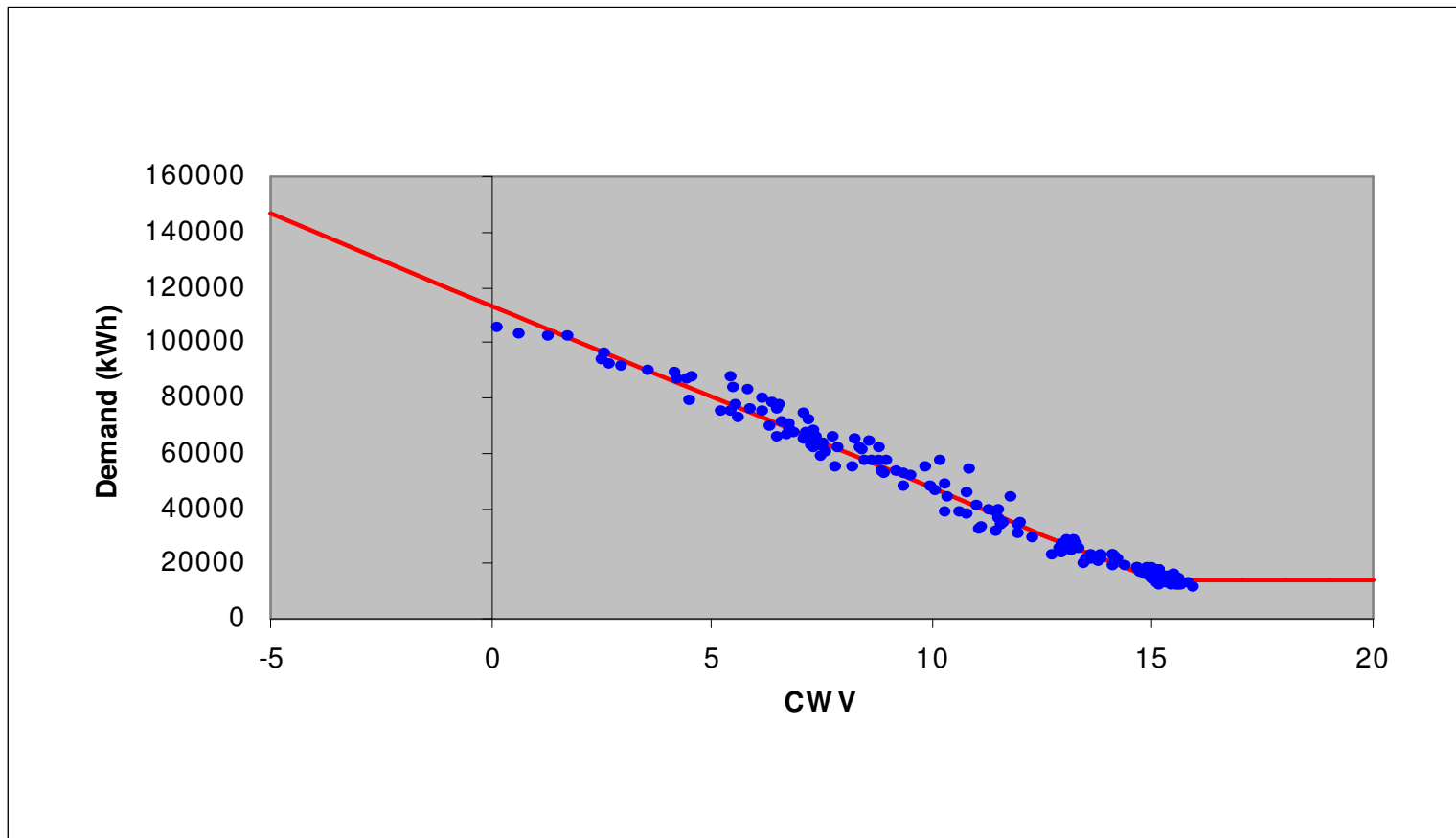
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Small NDM Modelling Results

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



- Demand against WS CWV – Non Holiday Monday to Thursday
- Please note TWG decided to accept this model over combined WS/SW model

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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	37%	98%	328
NO	30%	97%	136
NW / WN	36%	97%	337
NE	36%	98%	221
EM	33%	98%	264
WM	31%	97%	262
WS	29%	97%	70
EA	33%	98%	292
NT	35%	99%	350
SE	35%	98%	287
SO	29%	98%	231
SW	32%	98%	157

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

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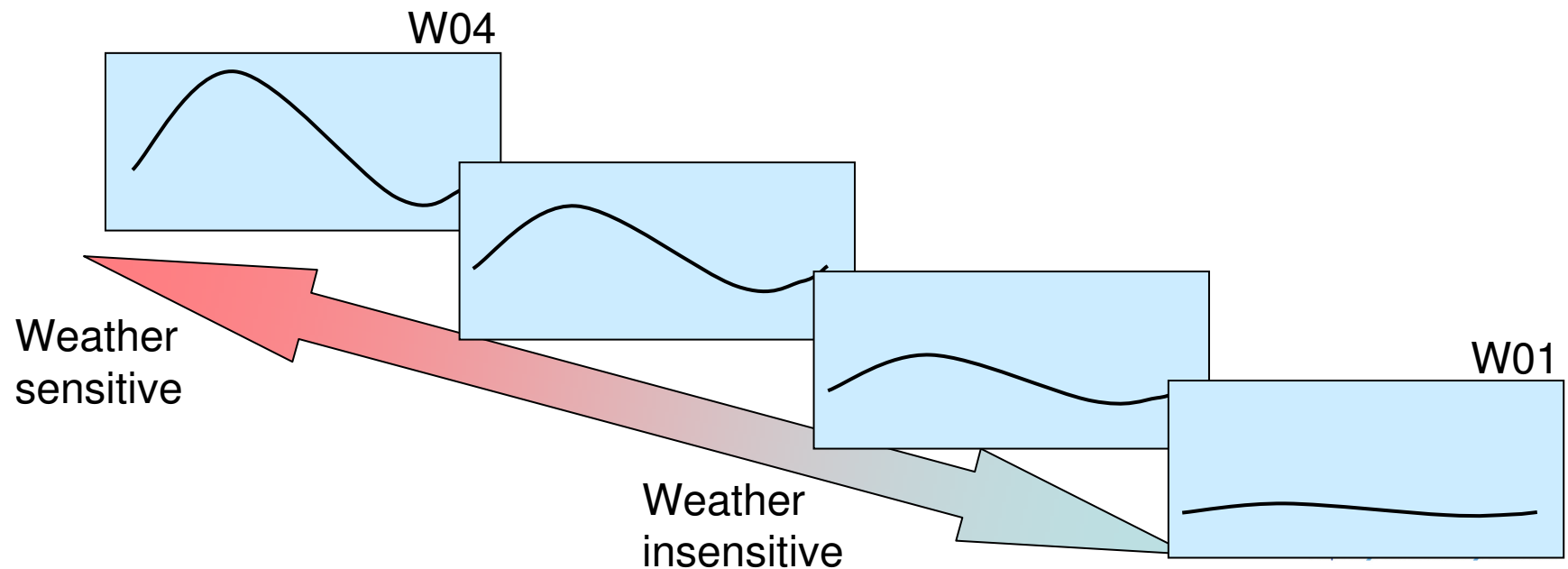


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Small NDM <2,196 MWh WAR Band Analysis

Winter:Annual Ratio (WAR) Band EUC

- Higher AQ Bands where meter points are monthly read have a standard EUC plus 4 differential EUCs based on ratio of winter consumption to total annual consumption
- Sites with adequate read history allocated automatically to a WAR Band based on system calculation during AQ review



Winter: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 2011/12)
 - This is essential because supply points will be assigned to these newly defined WAR band EUCs (for 2012/13) based on their (Dec-Mar) consumption behaviour over winter 2011/12
 - 2010/11 was colder than 2011/12, so thresholds can be expected to drop this year
- WAR Band Limits for Spring 2012 Analysis were discussed and agreed at April TWG

All Small NDM EUCs

Agreed WAR Band Analysis (April TWG)

Consumption Range	Comments on 2011/12 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 – 0.42			0.42 – 0.51			0.51 – 0.63			0.63 – 1.00		
SC	61%	95%	111	43%	98%	163	29%	97%	155	22%	96%	42
NO	60%	87%	42	39%	97%	68	26%	97%	64	18%	96%	35
NW / WN	62%	95%	101	43%	98%	149	28%	96%	149	20%	95%	77
NE	57%	97%	66	43%	98%	97	30%	97%	106	22%	96%	57
EM	62%	98%	75	45%	98%	108	29%	98%	126	21%	97%	101
WM	54%	98%	77	37%	98%	101	25%	97%	102	19%	96%	64
WS / SW	61%	95%	54	40%	98%	97	26%	97%	98	19%	96%	85
EA	60%	95%	72	43%	98%	113	29%	98%	148	20%	96%	89
NT	66%	91%	91	43%	99%	164	29%	98%	148	21%	97%	88
SE	62%	92%	74	43%	98%	141	29%	98%	129	21%	96%	74
SO	56%	93%	56	38%	99%	93	25%	98%	97	18%	97%	84

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

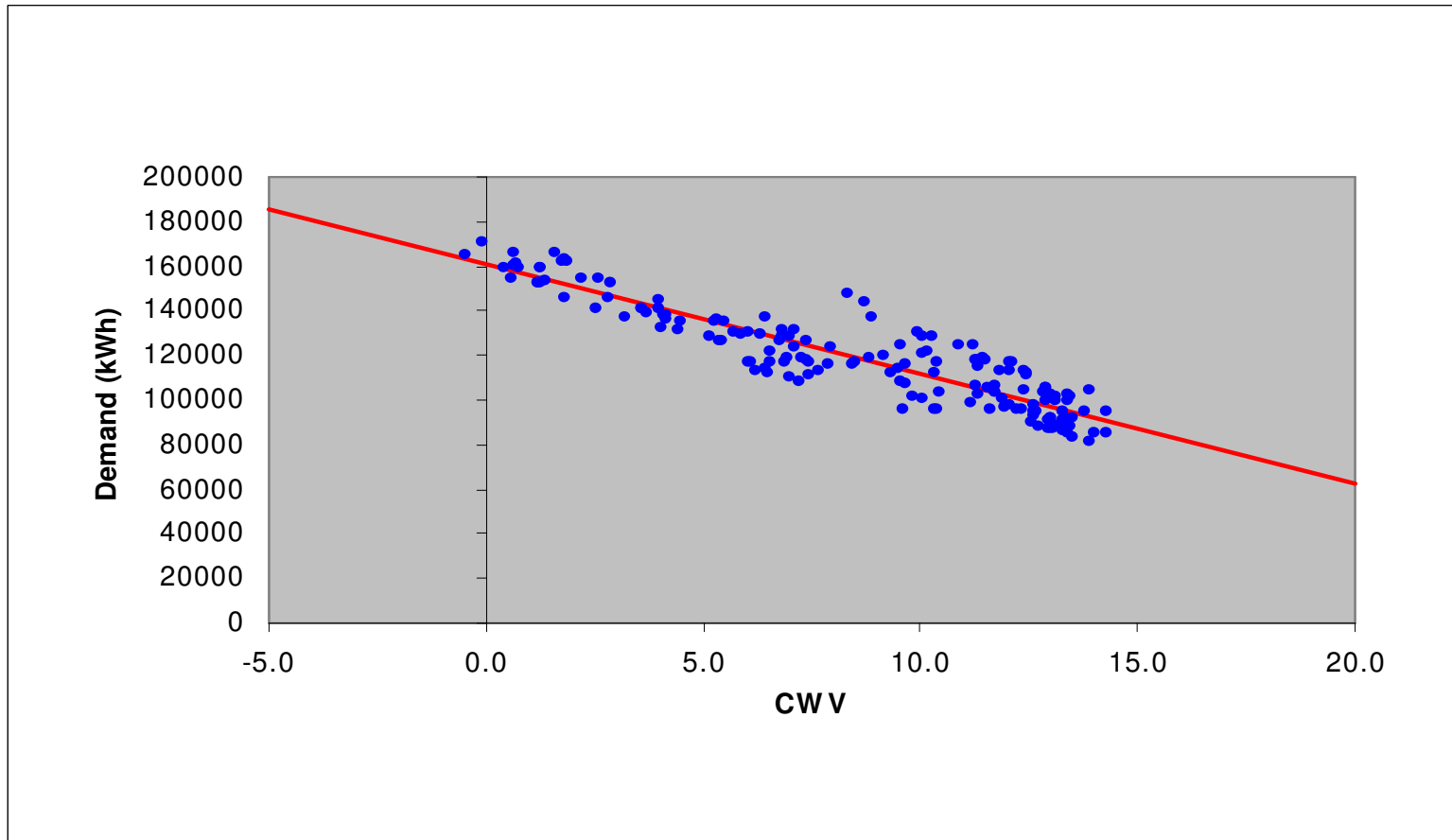
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Small NDM Modelling Results

NO LDZ, EUC Band 293 - 2196 MWh pa WAR Band 1



- Demand against NO CWV – Non Holiday Monday to Thursday
- Please note TWG decided to accept this model despite lower R Squared value due to expected scatter which can be more prevalent in WAR Band 1

Small NDM Analysis Summary

- Good R^2 Coefficients for all models, including WAR Bands
- Sample sizes generally good
- Are TWG happy to move to model smoothing with the results previously presented?

Large NDM Analysis >2196 MWh p.a.

Large NDM Analysis (>2,196 MWh pa)

- Defined for Demand Estimation purposes > 2,196,000 kWh
 - UNC previously prescribed EUCs for Large NDM (in respect of consumption range) to remain unchanged:
 - 2,196 to 5,860 MWh
 - 5,860 to 14,650 MWh
 - 14,650 to 29,300 MWh
 - 29,300 to 58,600 MWh
 - >58,600 MWh
- } 1 Consumption Band
x4 Winter Annual Ratio
(WAR) Bands
- } 1 Contingency Band for sites which should be DM
- Large NDM represents approx 12.4% of total NDM load and 0.4% 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
 - For example - DESC already agreed 14,650 to 29,300 and 29,300 to 58,600 could be done as a combined range, if necessary

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

Consumption Band Analysis – 2011/12 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 14,650 to 29,300 MWh pa	By 5 or 4 LDZ Groups
Band 08 29,300 to 58,600 MWh pa	By 4 or 3 LDZ Groups
Band 09 >58,600 MWh pa	National

- Aggregation of sample data to allow sufficient sample analysis
- Aggregations agreed at April TWG

Large NDM Modelling Results

Band 5: 2,196 – 5,860 MWh pa

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	43%	98%	248
NO	37%	98%	91
NW / WN	39%	97%	255
NE	38%	97%	121
EM	42%	98%	187
WM	35%	98%	231
WS	39%	98%	39
EA	37%	98%	138
NT	39%	99%	263
SE	38%	99%	161
SO	33%	98%	123
SW	37%	98%	103

- **Indicative Load Factor** : **R² 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 ² Multiple Correlation Coefficient	Sample Size
SC	48%	97%	68
NO	47%	96%	50
NW / WN	52%	98%	103
NE	51%	98%	77
EM	48%	99%	104
WM	45%	98%	108
WS	51%	97%	34
EA	46%	98%	70
NT	46%	98%	78
SE	44%	99%	57
SO	37%	97%	52
SW	48%	97%	75



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

Large NDM Modelling Results

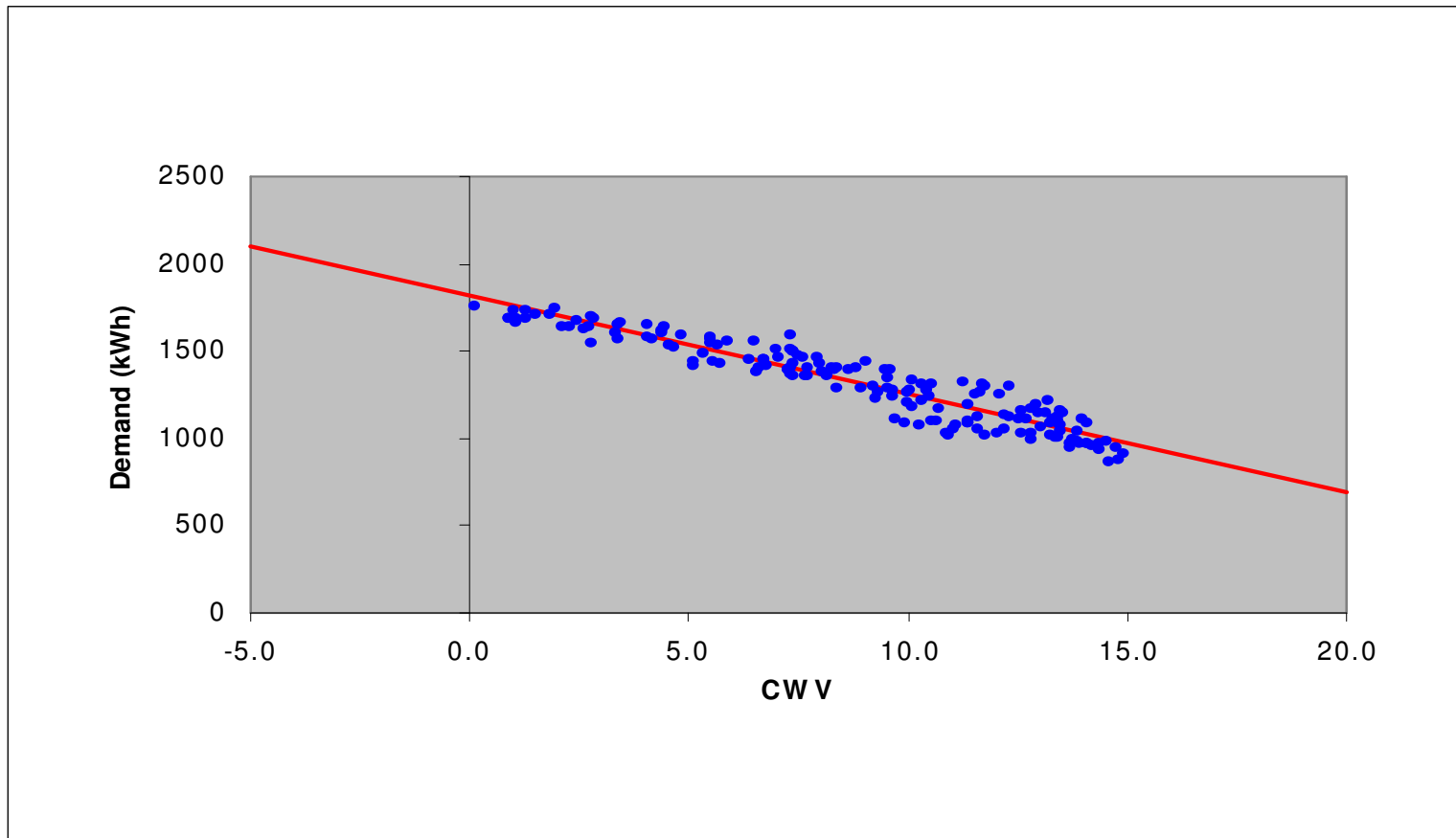
Band 7: 14,650 – 29,300 MWh pa

	5 LDZ GROUPING			4 LDZ GROUPING		
SC	54%	95%	20	57%	97%	107
NO	58%	97%	87			
NW / WN						
NE				58%	98%	168
EM	58%	98%	168			
WM						
EA				52%	96%	70
NT	52%	96%	70			
SE						
WS				47%	97%	58
SO	47%	97%	58			
SW						

- **Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**
- Xoserve recommends cautious approach of 4 LDZ Grouping because :
 - ILF for SC differs by 3% compared with neighbouring LDZs which possibly due to small sample size of 20
 - Consistent with last years aggregation

Large NDM Modelling Results

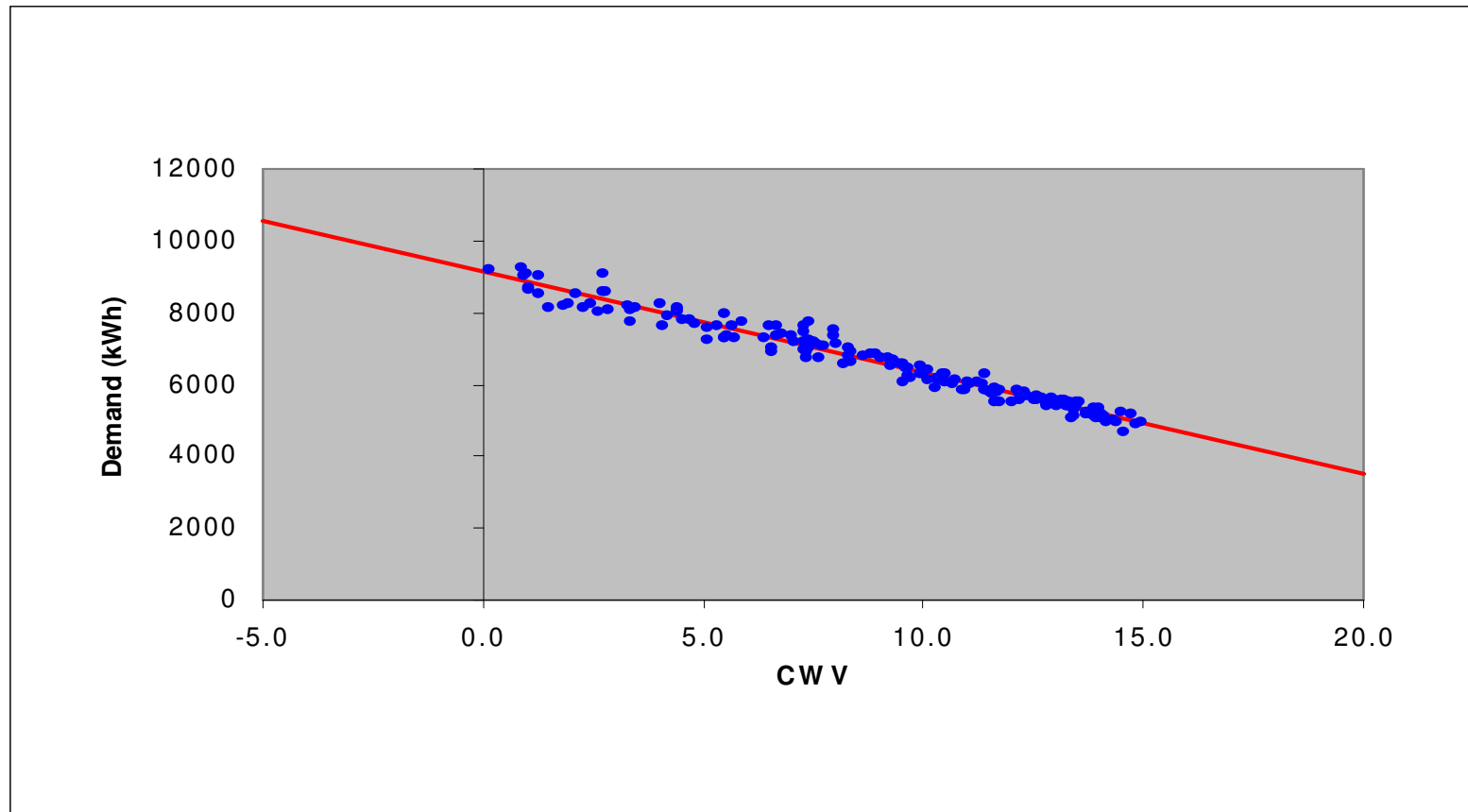
SC LDZ, EUC Band 14,650 – 29,300 MWh pa (5 LDZ Grouping)



- Demand against SC CWV – Non Holiday Monday to Thursday
- Based on 5 LDZ grouping i.e. SC demand only

Large NDM Modelling Results

SC LDZ, EUC Band 14,650 – 29,300 MWh pa (4 LDZ Grouping)



- Demand against SC CWV – Non Holiday Monday to Thursday
- Based on 4 LDZ grouping i.e. SC/NO/NW/WN demand aggregated
- TWG to decide on which is their preferred aggregation

Large NDM Modelling Results

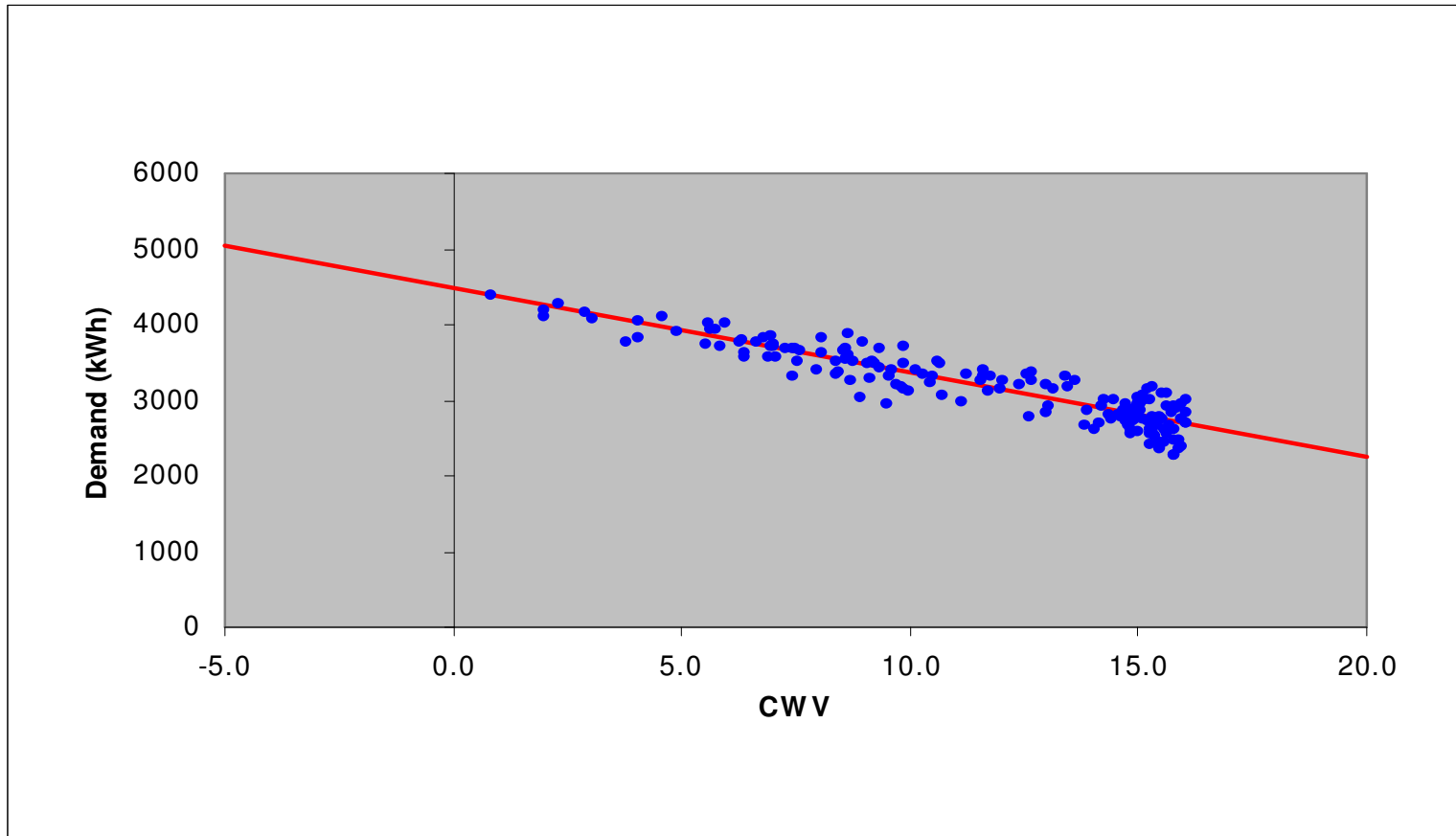
Band 8: 29,300 – 58,600 MWh pa

	4 LDZ GROUPING			3 LDZ GROUPING		
SC						
NO	68%	92%	54	68%	92%	54
NW / WN						
NE						
EM	67%	96%	98	67%	96%	98
WM						
WS						
EA	54%	93%	51			
NT						
SE				56%	94%	79
SO	63%	88%	28			
SW						

- **Indicative Load Factor** : **R² Multiple Correlation Coefficient** : **Sample Size**
- Xoserve recommends cautious approach of 3 LDZ Grouping because :
 - ILF for SE/SO/SW differs by >3% compared with neighbouring LDZs which possibly due to small sample size of 28
 - Consistent with last years aggregation

Large NDM Modelling Results

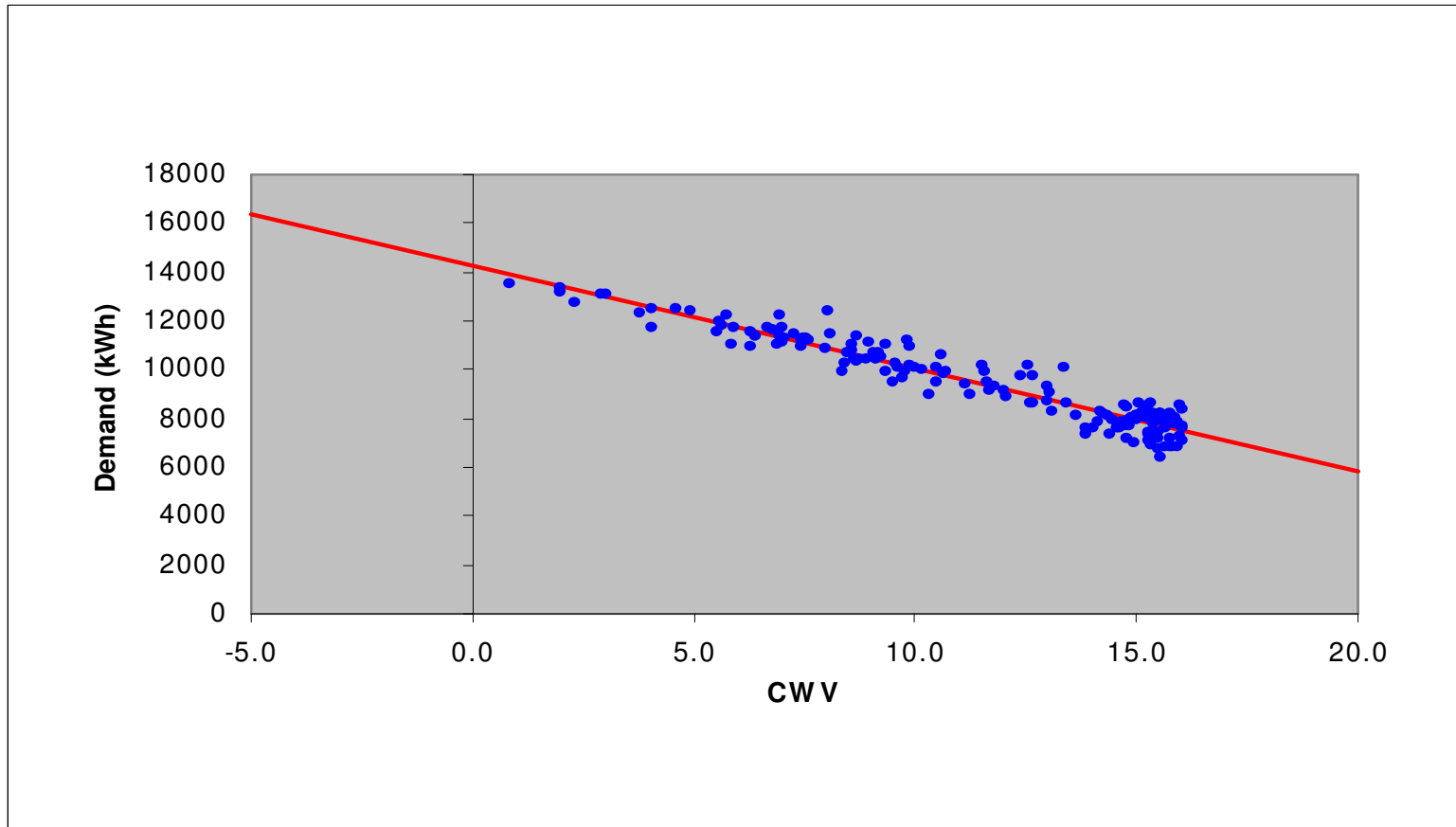
SO LDZ, EUC Band 29,300 – 58,600 MWh pa (4 LDZ Grouping)



- Demand against SO CWV – Non Holiday Monday to Thursday
- Based on 4 LDZ grouping i.e. WS/SO/SW

Large NDM Modelling Results

SO LDZ, EUC Band 29,300 – 58,600 MWh pa (3 LDZ Grouping)



- Demand against SO CWV – Non Holiday Monday to Thursday
- Based on 3 LDZ grouping i.e. WS/EA/NT/SE/SO/SW
- TWG to decide on which is their preferred aggregation

Large NDM Modelling Results

Band 9: above 58,600 MWh pa

	NATIONAL GROUPING		
SC	75%	93%	162
NO			
NW / WN			
NE			
EM			
WM			
WS			
EA			
NT			
SE			
SO			
SW			

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

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Large NDM >2,196 MWh WAR Band Analysis

Large NDM Bands 5 to 8: >2,196 MWh pa Agreed WAR Band Analysis

Consumption Range	2011/12 Analysis
Band 05 2,196 to 5,860 MWh pa	By 5 LDZ Groups
Band 06 5,860 to 14,650 MWh pa	By 3 LDZ Groups
Band 07 14,650 to 29,300 MWh pa	National
Band 08 29,300 to 58,600 MWh pa	National
Band 09 >58,600 MWh pa	N/A - No WAR Bands

- Aggregation of sample data to allow sufficient sample analysis
- Aggregations agreed at April TWG

Large NDM Supply Points (>2196 MWh pa) WAR Band Analysis – Indicative Load Factors

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

	WAR Banding											
	0.00 – 0.38			0.38 – 0.46			0.46 – 0.56			0.56 – 1.00		
SC	70%	94%	41	53%	98%	92	37%	98%	86	25%	96%	29
NO / NW / WN	66%	98%	90	49%	97%	103	35%	97%	77	21%	95%	76
NE / EM / WM	66%	99%	127	48%	98%	159	34%	98%	134	23%	97%	119
EA / NT / SE	72%	93%	80	50%	99%	166	37%	99%	200	24%	98%	116
WS / SO / SW	68%	93%	63	47%	97%	55	34%	98%	77	22%	97%	70

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

Large NDM Supply Points (>2196 MWh pa) WAR Band Analysis – Indicative Load Factors

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

	WAR Banding											
	0.00 – 0.33			0.33 – 0.41			0.41 – 0.51			0.51 – 1.00		
SC/NO/NW/WN	86%	91%	43	60%	97%	80	43%	98%	63	29%	96%	35
NE/EM/WM	83%	97%	89	58%	97%	79	41%	98%	62	27%	97%	59
EA/NT/SE/WS/SO/SW	89%	95%	56	60%	97%	105	43%	98%	121	27%	97%	84

- Consumption Band 7:** 14,650 to 29,300 MWh pa : National Aggregations Applied

	0.00 – 0.32			0.32 – 0.36			0.36 – 0.45			0.45 – 1.00		
	ALL LDZs	92%	94%	85	70%	98%	121	51%	97%	113	34%	97%

- Consumption Band 8:** 29,300 to 58,600 MWh pa : National Aggregations Applied

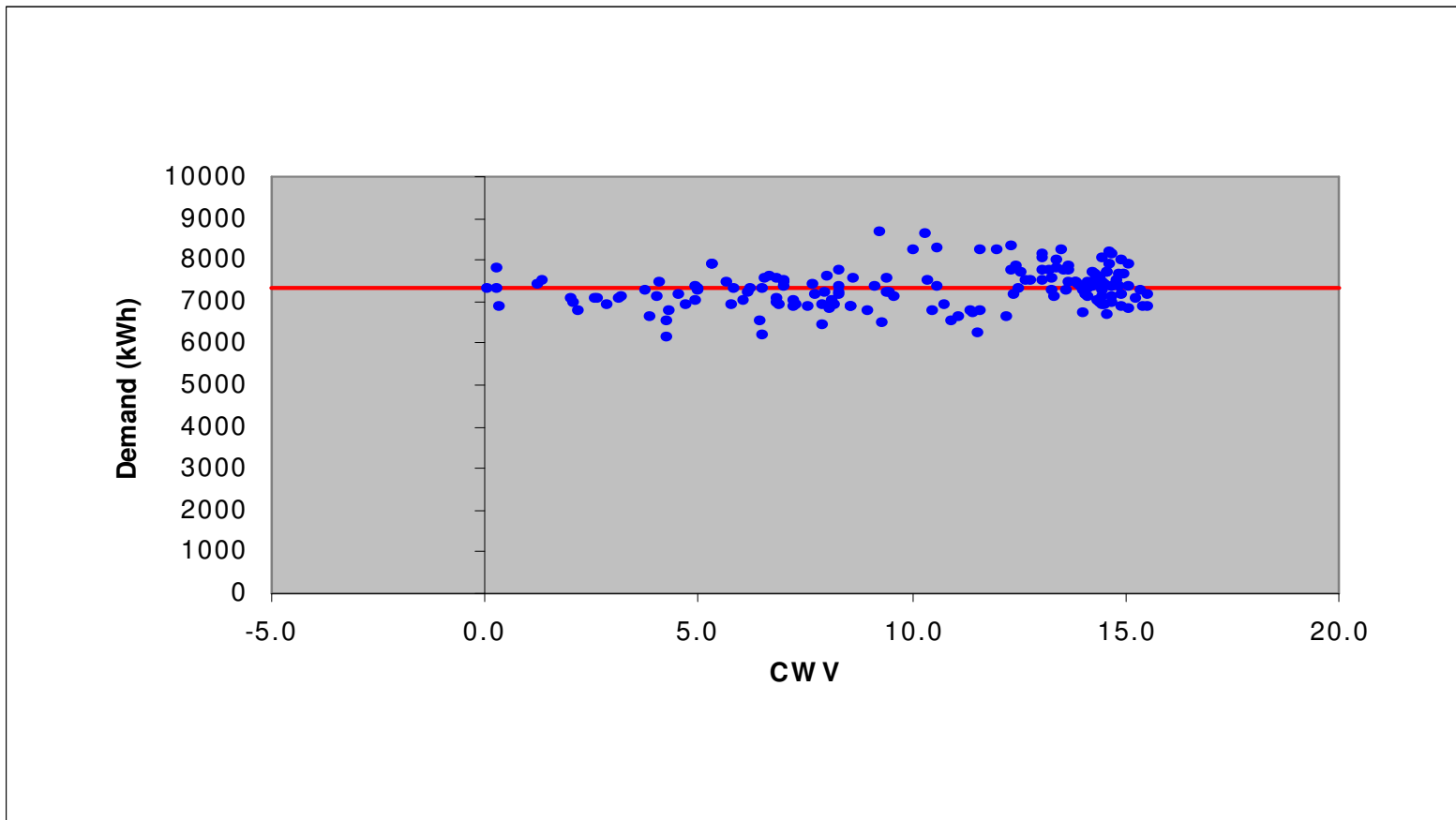
	0.00 – 0.32			0.32 – 0.35			0.35 – 0.44			0.44 – 1.00		
	ALL LDZs	97%	84%	59	78%	93%	66	60%	95%	65	35%	96%

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



Large NDM Modelling Results

WM LDZ, EUC Band 29,300 – 58,600 MWh pa WAR Band 1



- Demand against WM CWV – Non Holiday Monday to Thursday
- Based on National Aggregation

Large NDM Analysis Summary

- Good R^2 Coefficients for all models, including WAR Bands
- Sample sizes generally good
- *Recap on decisions made*
- Are TWG happy to move to model smoothing with the results previously presented?

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 11th June Xoserve to publish draft parameter values i.e. ALPs, DAFs, LFs for DESC and TWG to review and provide feedback
- DESC meeting 11th July to finalise proposals in order to publish to wider industry participants