



Demand Estimation Technical Forum

2nd June 2008

Agenda

- Overview of Demand Estimation & Timetable
- Presentation of Current Completed Analysis
 - Modelling Basis
 - Small NDM – sample details, aggregations, initial models
 - Large NDM – sample details, aggregations, initial models
- Recommendations

Demand Estimation

- Provides a method to differentiate NDM loads and provide profiles of usage
 - Sample Demand : Weather – EUC Definitions
- Provide a reasonable equitable means of apportioning aggregate NDM demand (EUC / Shipper / LDZ) to allow daily balancing regime to work
 - NDM profiles (ALPs & DAFs)
- To provide a means of determining NDM Supply Point capacity
 - NDM EUC Load Factors
- Profiles do not independently forecast NDM EUC demand
- LDZ demand forecasts derived from separate short term demand forecasting processes
- Demand models derived for Demand Estimation:
 - Not suitable for short term demand forecasting – this is not their intended purpose
 - Purpose - deriving profiles and Load Factors

Consultation Process: NDM Demand Models & EUCs (UNC)

- 2 June Technical Forum / DESC meeting (To guide analysis) (H 1.8.1)
- 30 June NDM draft proposals published by now (H 1.8.1)
- 15 July Users make representation by now (H 1.8.3)
Consultation (DESC Meeting 25th July) (H 1.8.4 / 5 / 6)
- 15 Aug Final proposals published by now (H 1.9.1)

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- Transporters' Final proposals published (*date X*)
 - No later than 15 August
 - Transporter or User application for disapproval to Ofgem (*date Y*)
 - by 5 business days of date x
 - Ofgem determination (if required)
 - by 5 business days of *date Y*

Spring 2008 – Ongoing Analysis

- UNC obligation to consult and seek agreement with DESC in June on the current state of analysis
 - Data collected, consider most appropriate data sets via validation and appropriate aggregations to apply to the most recently available sample data - 2007/08
 - Small NDM (up to 2,196 MWh pa)
 - Large NDM (> 2,196 MWh pa)
- } Validation & Analysis
} Considered Separately

Modelling Basis 1

(Previously agreed in consultation with DESC)

- Modelling basis broadly unchanged from spring 2007
 - Model smoothing (over 3 years) retained
 - Standardise models – take average of slopes
 - More robust: minimises year on year volatility (Load Factors, profiles shapes)
 - Variable weekend weather sensitivity model
 - Warm-weather cut-offs not applied to EUC models < 293 MWh pa
 - To help mitigate the identified impact of summer Scaling Factor volatility
 - 12 month analysis for most recent data sets (2007/08)
 - Data sets cover mid-march to mid march or April – March (depending on data set)
- No new CWV definitions since the Spring 2007 analysis

Modelling Basis 2

Principles of Holiday Factors, Summer Reductions, CWV Cut-Offs

- All demand modelling is data driven – intention to model based on the sampled data
- If the modelling results indicate then:
 - Holiday & Weekend Factors, Summer Reductions & CWV Cut-Offs will be applied
 - As defined in the methodology agreed with DESC
- 3 year Model smoothing removes the impact of any extreme instances during a single year
- Assessment of Model smoothing undertaken in Autumn 07
 - DESC confirmed in Nov 07 to continue to apply model smoothing

Modelling Basis 3

Principles of Holiday Factors, Summer Reductions, CWV Cut-Offs

- Summer reductions can apply to EUC models over the period 24th May to 27th September (top 2° of warm weather)
 - Applied by modelling results over 3 years
- Applies along with the more general summer holiday period in July and August
- Warm Weather Cut-offs are not applied to EUCs <293 MWh pa.
 - Cut-offs increase 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
- Modelling methodology described in NDM Report (Appendices 3 & 4)

Comparing Data and Model Accuracy / Appropriateness

- The Technical Forum offers a comparison of data and profiles for analysis
- Analysis:
 - Create profiles of the relationship of demand to weather
 - Identify the best fit profile based on available data samples
 - Identifies and addresses any significant instances of change year-on-year
- Tools used to identify best model ('goodness of fit' of profile):
 - Root Mean Squared Error and R^2 – 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
 - $LF = \text{average daily demand (i.e. } AQ/365) / 1 \text{ in } 20 \text{ peak demand}$
 - $ILF = (AQ/365) / \text{model demand corresponding to } 1 \text{ in } 20 \text{ CWV}$
- 1 in 20 peak Demand is derived from the completed models
 - 1 in 20 not available at this stage
- ILF based on available 1 in 20 CWV against demand to create replicated LF
- ILFs 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 (LF) values between consumption and WAR bandings

Winter to Annual Ratio (WAR)

- The WAR value of a supply point is defined as the actual consumption in the months December to March divided by the supply point AQ.
- Since the numerator is an actual and the denominator a weather corrected annual consumption, WAR values change from year to year.
- For consumption ranges over which meter points are monthly read, EUCs may be defined on the basis of WAR values as well as consumption band and LDZ.
- In a warmer winter WAR values tend to take on lower values than in a colder winter (2006/07 was the warmest winter in gas industry weather records; 2007/08 was warmer than average but not as warm as 2006/07).
- This year the limits defining WAR band EUCs are therefore a little higher than those of last year.
- This is essential because supply points will be assigned these newly defined WAR band EUCs (for 2008/09) based on their (Dec-Mar) consumption behaviour over winter 2007/08.

Small NDM Analysis <2,196,000 kWh

Small NDM Analysis (<2,196 MWh pa)

- Defined Demand Estimation purposes <2,196,000 kWh
- Represents nearly 90% of total NDM load (73% <73,200) and 99.9% of all Supply Points
- EUC consumption ranges not prescribed in Uniform Network Code
 - Process to analyse most appropriate small NDM EUC bands
 - Split consumption range – test profiles (regression analysis, ‘goodness of fit’)
- Purpose:
 - Sample data available / Proposed data sets
 - Results so far / Proposed EUCs / Proposed aggregations
 - Issues raised

Available Sample Data: Small NDM DATA RECORDERS

Active Data Recorders at 17/03/07	4,304
Previous 12 Months:	
<ul style="list-style-type: none"> ▪ Sample Site Terminations 	358
<ul style="list-style-type: none"> ▪ Sample Site Replacements 	358
<ul style="list-style-type: none"> ▪ New Installations 	67
Active Data Recorders at 16/03/08	4,371
Data Recorders Active At 17/03/07 and with data	4,013
Total No. of Validated Data Recorders	<u>3,633</u>
Total No. of Validated Supply Points (3,371 Spring 2007)	<u>3,633</u>
<i>(2,877 classified Domestic & in 0-73.2 MWh pa range. 613 in the 73.2-293 MWh pa range)</i>	

Sample Data Available: Small NDM DATALOGGERS

- Data Recorders & Dataloggers used in Small NDM Analysis (<2,196 MWh pa)
- Small NDM Datalogger Counts:

Active Dataloggers at Start of Analysis Period (at 01/04/07)	10,675
Total Number of Small NDM Validated Dataloggers	8,465
Total Number of Validated Supply Points:	5,120 (5,708)
73.2 to 293 MWh pa Range (Combined with Datarecorders: 1,219)	542 (550)
293 to 2,196 MWh pa Range	4,578 (5,158)

- *2007 highlighted in (x)*

Small NDM: Proposed Data Sets For Analysis

Consumption Range	Sample Data Used	Supply Point Count
0 to 73.2 MWh pa (EUC Band 1)	12 Months Data Recorder Data	2,877 Supply Points <i>(Domestic sub-set)</i> OR 2,925 Supply Points <i>(Incl. Some non-domestic)</i>
73.2 to 293 MWh pa (EUC Band 2)	12 Months Combined Data Recorder & Datalogger Data	1,155 Supply Points
293 to 2,196 MWh pa (EUC Band 3 & 4)	12 Months Datalogger Data	4,578 Supply Points

- Small NDM Analysis undertaken at individual LDZ level
- Band 1 increased (356) Bands 2 to 4 decreased (644)
- Sufficient sample data to allow analysis – has not impacted modelling

Small NDM EUC Bands: Investigation of Appropriateness

- Current EUC Bands Small NDM (not defined in UNC):
 - 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 investigated
 - Analysis in 2007 - no significant reason for changing the EUC bandings from 'current'
 - 2008 Investigates:
 - Configuration of 0 to 73.2 MWh pa (single band – inclusion of non domestics)
 - Split Band 2 at 145 MWh pa
 - Split Band 4 at 1,465 MWh pa

Representing 0 - 73.2 MWh pa

- Spring 2007 NDM analysis, 0-73.2 MWh pa consumption range:
 - Load factor differentiation greater if sample is sub-divided by LDZ rather than by consumption sub-band (4 bands: 0-10,10-20,20-30,30-73.2 MWh pa)
- Following adoption of NDM proposals for 2007/08 two options were further investigated and reported to DESC in Nov. 2007
 - Split at 20 MWh pa and 30 MWh pa
 - Clear degradation in fit across sub bands
 - No compelling statistical grounds to represent 0-73.2 by two sub bands
 - Evidence of analysis was clear – no repeat as part of Spring 2008 analysis
- Further analysis agreed with DESC to be done in Autumn 2008 – investigating splits of the 0-293 MWh pa range

0-73.2 MWh pa: Data Set Identification & Impacts Domestic & Non-Domestic Inclusion

- Band contains 'Domestic' and 'I&C'
- Market Sector Flag (MSF) instituted some years ago
 - No MSF information available for ~8.1 million Meter Points (04/08)
 - ~12.8 million Meter Points classified to date: ~1.8% are non-domestic
 - Separate treatment of domestic/non-domestic is not currently feasible due to accuracy and verification issues persisting with MSF
- Analysis - Inclusion of a proportion of non-domestic sample points: ILF and R^2 values are not significantly different. Leads to lower positive or negative weekend factors in the 01B model
 - Weekend (Fri/Sat/Sun) Scaling Factor (SF) patterns continue to indicate under estimations of demand (as with previous years) with inclusion of non-domestics
- From a modelling perspective this leads to lower accuracy

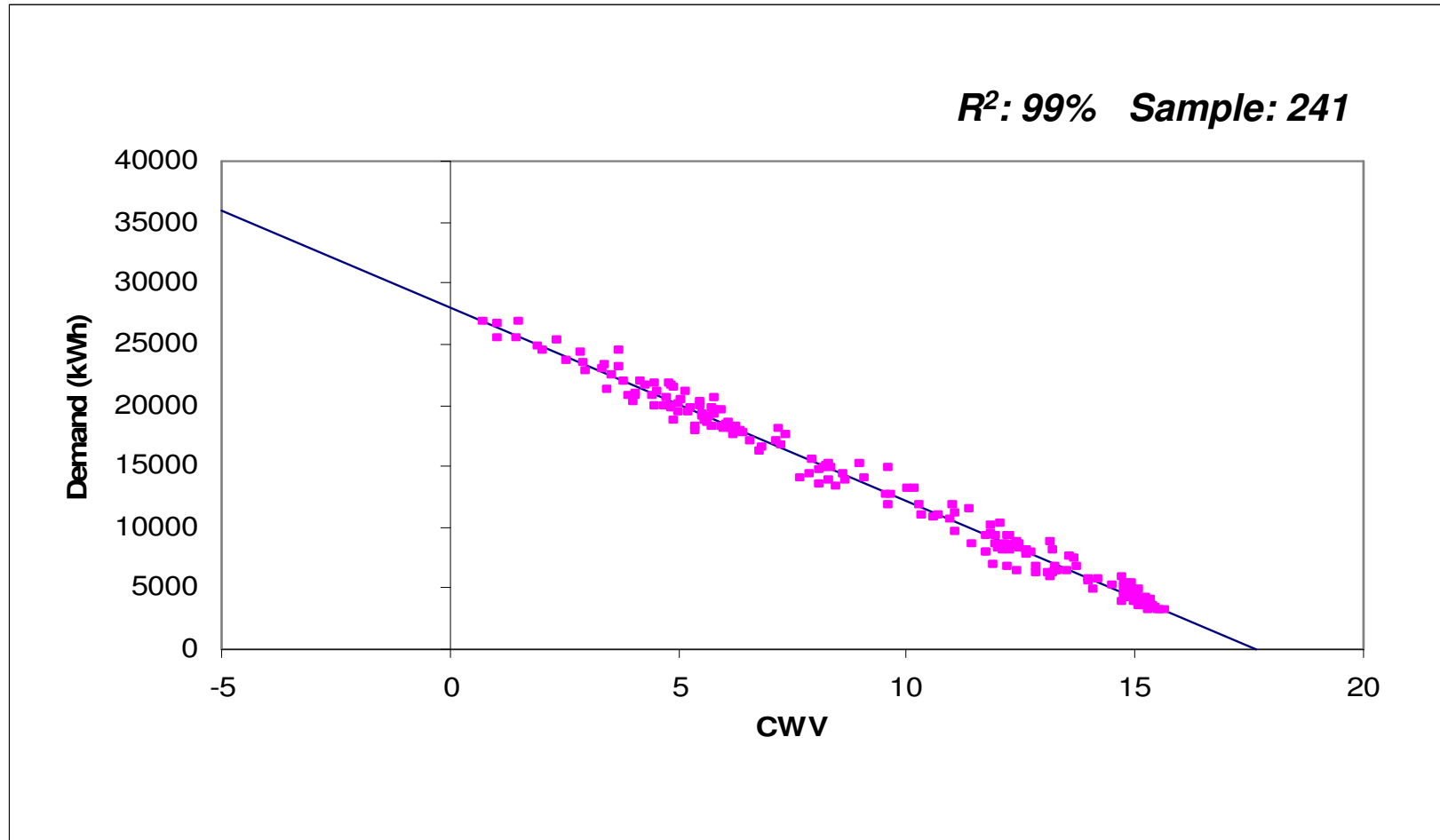
0-73.2 MWh pa: Data Set Identification & Impacts

Domestic & Non-Domestic Inclusion

	PROPOSED - Dataset: Domestic Sites Only			Dataset: Including Some Non-Domestic Sites		
SC	41%	98%	243	40%	98%	247
NO	34%	98%	242	34%	98%	246
NW / WN	37%	98%	219	37%	98%	223
NE	37%	97%	256	36%	97%	260
EM	37%	98%	220	37%	98%	224
WM	34%	99%	241	33%	99%	245
WS	35%	97%	265	35%	97%	269
EA	34%	98%	257	34%	98%	261
NT	34%	99%	219	33%	99%	223
SE	32%	99%	231	33%	99%	235
SO	30%	99%	244	30%	98%	248
SW	32%	98%	240	32%	98%	244

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

Demand against CWV, Monday to Thursday, holidays included, WM LDZ, 0 - 73.2 MWh pa



- Example of 'well behaved' data and excellent fit for Band 1

Representing 0 - 73.2 MWh pa (Band 1): Proposed Approach

- Non-domestic data will have adverse effects on Weekend SF values and therefore reduced model accuracy in allocating demand
- Scaling Factors are multipliers used to correct forecast weather and demand to actual
- Estimated effect:
 - Fri: small effect up to 0.3% pts.
 - Sat. up to 1.2% pts.
 - Sun. up to 1.6%pts.

7 / 13 / 12 LDZs worse in respect of Fri / Sat / Sun
- Therefore proposed approach is: *(same as spring 2007 & previous years)*
 - Domestic Supply Point only smoothed model for 0 – 73.2 MWh band
 - Consistently positive Fri/Sat/Sun weekend factors in smoothed model but have a statistically insignificant impact (would be more apparent with inclusion of non-domestic)
 - Consistent with previous years analysis and approach

Small NDM 73.2 to 293 MWh pa (Band 2) Split At 145 MWh pa Consumption Band Analysis: ILF Comparison

- Analysis undertaken on Band 2 split at 145 MWh pa
- Impact - Aggregated LDZs required to allow sufficient sample analysis

		Consumption Band								
		73.2 TO 293 MWh pa (NO SPLIT)			73.2 TO 145 MWh pa (SPLIT at 145)			145 TO 293 MWh pa (SPLIT at 145)		
Data Aggregation	SC	41%	97%	73	41%	96%	38	41%	95%	35
	NO / NW / WN	32%	95%	220	33%	95%	94	32%	95%	126
	NE / EM/ WM	30%	97%	279	30%	97%	145	30%	96%	134
	EA / NT / SE	32%	97%	315	32%	97%	131	32%	97%	184
	WS / SO / SW	31%	97%	268	31%	97%	137	31%	96%	131

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

Small NDM 73.2 to 293 MWh pa (Band 2) Split At 145 MWh pa Consumption Band Analysis: Historical ILF Comparison

	2007/08		2006/07		2005/06	
	73.2 to 145 MWh pa	145 to 293 MWh pa	73.2 to 145 MWh pa	145 to 293 MWh pa	73.2 to 145 MWh pa	145 to 293 MWh pa
SC	41%	41%	40%	38%	38%	37%
NO / NW / WN	33%	32%	34%	30%	33%	31%
NE / EM / WM	30%	30%	28%	29%	31%	31%
EA / NT / SE	32%	32%	32%	29%	34%	33%
WS / SO / SW	31%	31%	31%	30%	31%	29%

- Differences in ILF values across the sub-bands are generally small and are inconsistent across LDZ groups both within and between years
- Therefore: EUC Split at 145 MWh pa (Band 2) is not proposed, further supported by ...

Small NDM 73.2 to 293 MWh pa (Band 2) Split At 145 MWh pa Consumption Band Analysis: Statistical RMSE Comparison

	Population AQ Weighted "Root Mean Squared Error" Values Models Based on 2007/08 Data Set			
	NO SPLIT 73.2 to 293	SPLIT 73.2 to 145 145 to 293	Improvement (+) or Degradation (-) Using Two Bands	
			CURRENT: 2007/08	2006/07
SC	549056.5	637356.7	-16.1%	-12.7%
NO / NW / WN	1190340.9	1288921.8	-8.3%	5.0%
NE / EM / WM	1784248.0	1888925.0	-5.9%	-3.6%
EA / NT / SE	1894986.5	1965570.8	-3.7%	2.6%
WS / SO / SW	1048320.7	1132449.6	-8.0%	-3.8%
OVERALL	573269.3	613095.8	-6.9%	-3.0%

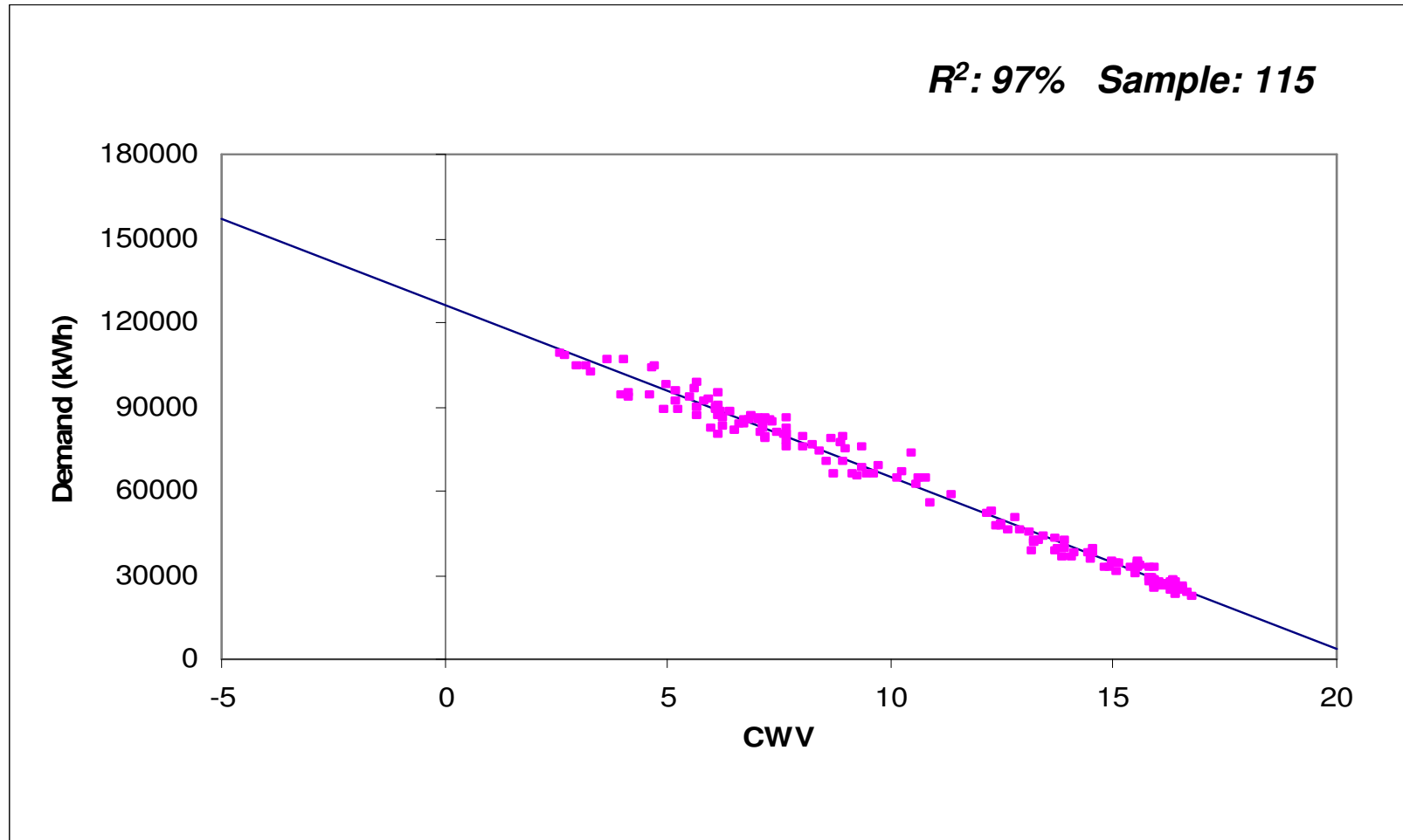
- No split further supported by no overall improvement in RMSE analysis of model accuracy ('goodness of fit')
- RMSE analysis shows a degradation in model/profile accuracy when splitting EUC Band 2

PROPOSED APPROACH: Small NDM Indicative Load Factors

EUC Band 2: 73.2 to 293 MWh pa (No Split)

	Indicative Load Factor	R ² Multiple Correlation Coefficient	Sample Size
SC	41%	97%	73
NO	29%	95%	96
NW / WN	33%	96%	124
NE	28%	93%	84
EM	32%	97%	101
WM	30%	97%	94
WS	29%	96%	69
EA	30%	96%	98
NT	34%	97%	115
SE	32%	96%	102
SO	31%	98%	95
SW	32%	96%	104

Demand against CWV, Monday to Thursday, holidays excluded, NT LDZ, 73.2 – 293 MWh pa



- Band 2 example – good sample size and R-squared value

Small NDM 293 to 2,196 MWh pa (Band 3&4) Split At 1465 MWh pa Consumption Band Analysis: ILF Comparison

- No Split Band 3 (293 to 732 MWh pa) – Band 4 analysis undertaken split at 1465 MWh pa

	293 TO 732MWh pa			732 TO 1,465 MWh pa			1,465 TO 2,196 MWh pa			732 TO 2,196 MWh pa		
SC	38%	97%	85	40%	98%	158	40%	98%	129	40%	98%	287
NO	32%	96%	85	31%	96%	130	31%	96%	120	31%	96%	250
NW / WN	32%	96%	131	33%	97%	201	37%	97%	174	35%	97%	375
NE	30%	94%	87	34%	96%	156	34%	95%	106	34%	95%	262
EM	31%	96%	121	31%	96%	191	37%	97%	122	34%	97%	313
WM	27%	95%	80	29%	96%	130	33%	97%	147	31%	97%	277
EA	33%	96%	116	33%	97%	183	34%	98%	113	33%	98%	296
NT	32%	96%	126	36%	97%	204	37%	98%	163	36%	98%	367
SE	32%	97%	128	32%	98%	219	35%	98%	139	33%	98%	358
WS	29%	95%	65	28%	95%	88	33%	95%	64	31%	95%	152
SO	30%	98%	72	30%	98%	144	33%	98%	97	31%	98%	241
SW	30%	97%	84	33%	97%	138	36%	97%	82	34%	97%	220

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

Small NDM 732 to 2,196 MWh pa (Band 4) Split At 1465 MWh pa Consumption Band Analysis: Historical ILF Comparison

	2007/08		2006/07		2005/06	
	732-1465 MWh pa	1465-2196 MWh pa	732-1465 MWh pa	1465-2196 MWh pa	732-1465 MWh pa	1465-2196 MWh pa
SC	40%	40%	40%	38%	41%	40%
NO	31%	31%	31%	29%	31%	33%
NW / WN	33%	37%	33%	36%	35%	37%
NE	34%	34%	32%	37%	35%	35%
EM	31%	37%	31%	33%	34%	37%
WM	29%	33%	26%	30%	31%	32%
EA	33%	34%	30%	32%	34%	35%
NT	36%	37%	33%	35%	34%	36%
SE	32%	35%	32%	33%	34%	35%
WS	28%	33%	26%	31%	30%	33%
SO	30%	33%	28%	32%	31%	34%
SW	33%	36%	32%	34%	33%	34%

- ILF sub-band differences: small & inconsistent across LDZs within & between years
- Only 4 LDZs indicate a minor (2% points) ILF difference across all 3 years

Small NDM 732 to 2,196 MWh pa (Band 4) Split At 1,465 MWh pa Consumption Band Analysis: Statistical RMSE Comparison

	Population AQ Weighted RMSE Values Models Based on 2007/08 Data Set			
	NO SPLIT 732 to 2196	SPLIT 732 to 1465 1465 to 2196	Improvement (+) or Degradation (-) Using Two Bands	
			CURRENT: 07/08	06/07
SC	407512.4	421915.1	3.5%	-3.4%
NO	263188.6	272110.6	3.4%	-2.6%
NW / WN	508346.7	535439.0	5.3%	-2.4%
NE	360571.7	372436.3	3.3%	-3.9%
EM	430857.5	461535.5	-7.1%	-2.1%
WM	469287.8	507814.4	-8.2%	-4.4%
EA	167404.6	182580.0	-9.1%	-4.4%
NT	356700.7	368406.4	-3.3%	-1.6%
SE	555936.1	583709.0	-5.0%	-3.1%
WS	385943.4	412031.2	-6.8%	-0.8%
SO	296962.1	314038.7	-5.8%	-3.6%
SW	256159.7	267005.2	-4.2%	-2.7%
Overall	391135.8	414498.4	-6.0%	-3.6%

- No overall improvement in RMSE ('goodness of fit') when splitting Band 4

- In the 4 LDZs where improvement, ILFs are the same for both sub-bands in 3 of 4 LDZs

- Only NW/WN shows improvement and significant ILF difference

- Retain current approach

- EUC split at 1,465 is not proposed

Winter Annual Ratio: WAR Band Analysis

- WAR Band – Winter Annual Ratio profiles
 - Profile split by consumption in winter as a ratio of total consumption
- Applied to Supply Points where Consumption >293 MWh pa
 - Band 3 and above
 - 2 Small NDM EUC Bands have WAR Bands
 - 293 to 732 MWh pa and 732 to 2,196 MWh pa
 - BUT - Grouped to allow individual LDZ analysis
 - 4 bands defined as 20:30:30:20 percentage split of sample population
 - WAR Band definitions change by Consumption Band and by year
 - Analysis – War Band limits have moved towards one as a result of the ‘colder’ winter in 07/08 compared with 06/07

Small NDM EUC Band 3&4: 293 to 2,196 MWh pa WAR Band Analyses

Count of Validated Sample Numbers per WAR Band

	WAR Banding				Total
	0.00 – 0.43	0.43 – 0.51	0.51 – 0.60	0.60 – 1.00	
SC	100	124	100	48	372
NO	56	101	133	45	335
NW / WN	131	127	140	108	506
NE	73	96	83	97	349
EM	74	108	141	111	434
WM	92	71	111	83	357
EA	73	132	118	89	412
NT	113	153	124	103	493
SE	70	168	135	113	486
WS	35	54	72	56	217
SO	71	101	66	75	313
SW	65	80	78	81	304
Total	953	1315	1301	1009	4578

- Model whole consumption band as one - No LDZ aggregation required (more appropriate)

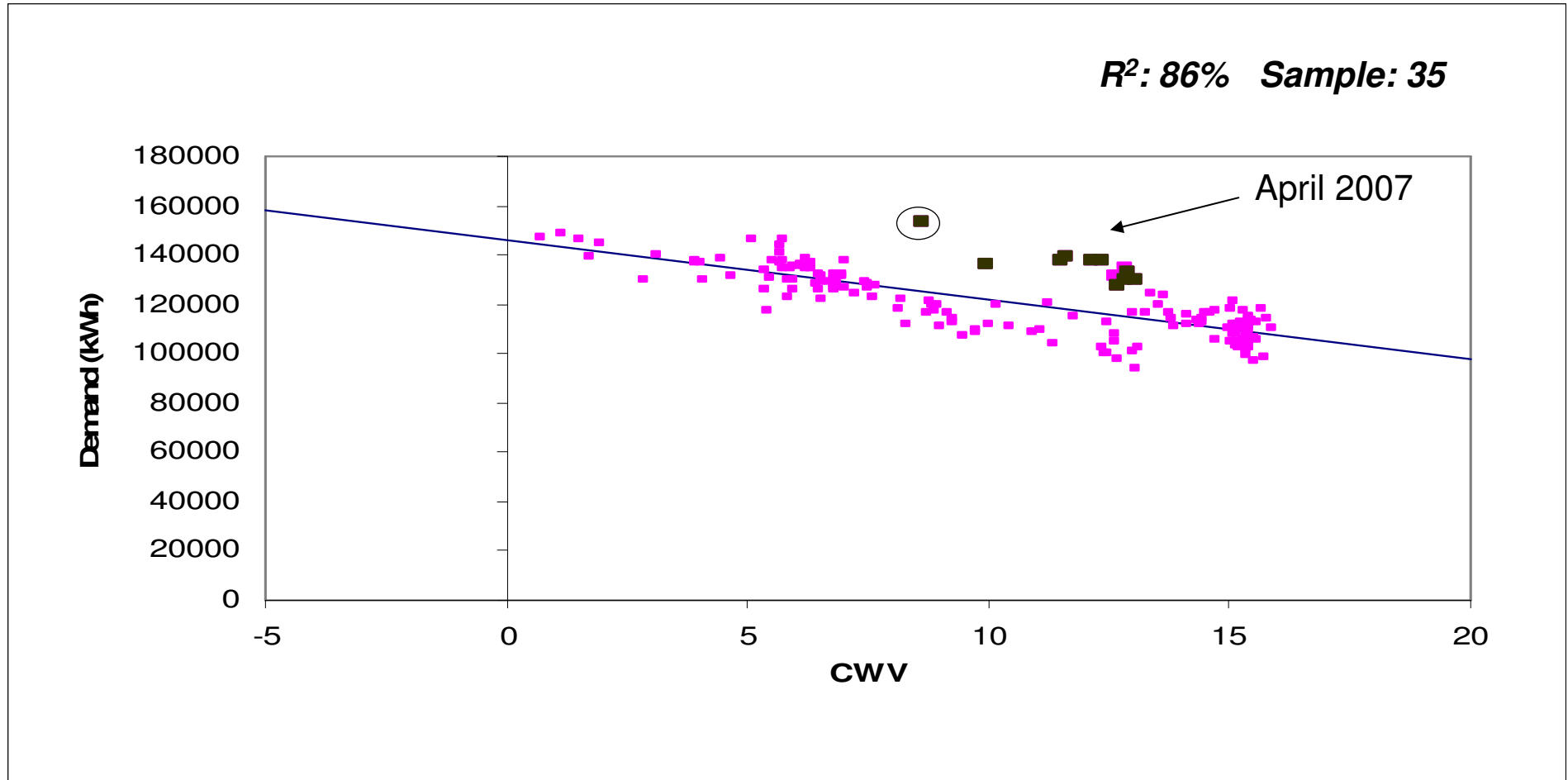
Small NDM EUC Band 4: 293 to 2,196 MWh pa WAR Band Analyses

Indicative Load Factors

	WAR Banding											
	0.00 – 0.43			0.43 – 0.51			0.51 – 0.60			0.61 – 1.00		
SC	61%	97%	100	44%	98%	124	32%	97%	100	25%	96%	48
NO	60%	92%	56	37%	97%	101	26%	94%	133	22%	96%	45
NW / WN	59%	97%	131	42%	98%	127	29%	96%	140	23%	96%	108
NE	57%	97%	73	43%	97%	96	30%	96%	83	23%	93%	97
EM	61%	97%	74	43%	98%	108	30%	97%	141	23%	95%	111
WM	52%	96%	92	38%	98%	71	26%	96%	111	20%	96%	83
EA	61%	94%	73	43%	98%	132	28%	96%	118	23%	96%	89
NT	61%	93%	113	42%	98%	153	30%	97%	124	23%	95%	103
SE	57%	95%	70	42%	98%	168	30%	97%	135	22%	94%	113
WS	69%	86%	35	40%	96%	54	28%	95%	72	21%	93%	56
SO	53%	94%	71	39%	98%	101	26%	96%	66	20%	96%	75
SW	63%	95%	65	41%	98%	80	29%	97%	78	22%	95%	81

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

Demand against CWV, Monday to Thursday, holidays excluded, WS LDZ, 293 – 2,196 MWh pa, WAR band 1



- Band 3-4 WAR Band 1 – Low R squared value due to ‘scatter’

Small NDM - WAR Band Analysis 293 – 2,196 MWh pa

- Modelling 293 - 2196 MWh pa consumption range for WAR band analysis allows individual LDZ analyses (NW/WN combined).
- Sample sizes are reasonable for all 48 data sets.
- Same basis was used in 2007 & 2006 (and previous years).
- Model fits (R^2 values) for 47/48 data sets 92% or better, 39/48 are 95% or better.
- One data set has R^2 value of 86% - due to scatter in data set.
- Last year two data sets had model fits below 90% and these were adopted.
- Proposal is to retain this approach. WAR band models derived for 293 - 2196 MWh pa range on an individual LDZ basis.

Small NDM: EUC Smoothed Models - Provisional Results

- Review of provisional model results

Number 'Straight' (no cut-offs, no summer reductions)	52	(41)
Number with Warm Weather Cut-Off	35	(54)
Number with Summer Reduction	45	(89)
Number with no Slope (weather insensitive)	0	(0)
Number with Cut-Offs and Reductions	24	(28)
Last years figures in (x)		

- No cut-offs are applied to EUCs in consumption bands 0-73.2 and 73.2 to 293 MWh pa (which represents nearly 80% of the overall NDM load)
- Cut-offs have been primarily applied for the peakier WAR bands (3 & 4) across consumption range 293 to 2,196 MWh pa (75%)
- Modelling is undertaken as reflected by the sample data

Small NDM – Proposals for Analysis

- Therefore:
 - 0 to 73.2 MWh pa
 - Consumption Band Analysis by LDZ
 - Use Domestic sites only – do not use I&C
 - 73.2 to 293 MWh pa
 - Analysis by LDZ
 - No additional split at 145 MWh pa
 - 293 to 732 and 732 to 2,196 MWh pa
 - Consumption & WAR Band analysis by LDZ
 - Consumption Band analysis for 293 – 732 and 732 – 2,196
 - WAR Band analysis across whole band 293 – 2,196
 - No additional split at 1,465 MWh pa
- No change from previous year as analysis has not highlighted any requirements for change

Large NDM
>2,196,000 kWh

Large NDM Analysis (>2,196 MWh pa)

- Defined Demand Estimation purposes > 2,196,000 kWh
 - Prescribed EUCs for Large NDM (in respect of consumption range) defined (UNC) as:
 - 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
- Identify sample data available pre and post validation and proposed aggregations

Available Sample Data: Large NDM Dataloggers

	TOTAL	Small NDM	Large NDM
Number of Active Dataloggers As At 01/04/2007	15,209	10,675	4,534
Number of Validated Dataloggers	12,927	8,465	4,462
Number of Supply Points After Validation	2008 Analysis	2007 Analysis	
Large NDM	3,923	4,751	
Small NDM	5,120	5,708	
Total	9,043	10,459	

- Small NDM Dataloggers used in Small NDM analysis (previously reviewed)
- Large NDM Dataloggers has reduced by 828 since 2007
- Result of site terminations and the increased impact of missing read periods
- Still a good representation of the population
- Following slides highlight aggregations as a result – no change & no modelling impact

Large NDM: Sample Data Aggregations

- Aggregation of sample data to allow sufficient sample analysis
- Comparable with 2007 - values shown (x)

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

Available Sample Data: Large NDM Dataloggers *Count Per Consumption Band (+ Aggregations)*

	2,196 - 5,860	5,860 – 14,650	14,650 – 29,300	29,300 – 58,600	>58,600
SC	142	69	22	6	9
NO	172	71	20	14	15
NW & WN	351	128	35	29	18
NE	184	77	39	17	6
EM	229	105	48	30	17
WM	297	119	48	29	27
EA	169	78	24	14	4
NT	274	88	11	7	6
SE	183	58	5	11	4
WS	74	44	15	8	7
SO	102	53	20	8	6
SW	163	68	30	10	6
TOTAL	2,340	958	317	183	125

- Aggregations highlighted

Large NDM: Count of Sample Supply Points to Total Market Supply Points Comparison

Consumption Range	Validated Sample	Firm Supply Point Population (1)
2,196 to 5,860 MWh pa	2,340 (37%)	6,270
5,860 to 14,650 MWh pa	958 (51%)	1,890
14,650 to 29,300 MWh pa	317 (60%)	530
29,300 to 58,600 MWh pa	183 (70%)	260
>58,600 MWh pa	125 (78%)	160

Notes:

1. Approx. for all Firm supply points at April 2008 : >2,196 MWh represents 10.4% of NDM load (0.04% of Supply Points)
2. Sample data includes all firm supply points passing data validation because there are too few NDM supply points with AQ>58,600 MWh pa. Supply points >58,600 MWh pa should be DM.
3. Number of NDM supply points with AQ>58,600 MWh pa as at April 2008 was 13 (~0.20% of aggregate NDM AQ).

Total NDM Population Counts: Supply Point & AQ

Consumption Range	% of Total NDM	
	Total AQ	Total Count
0 – 73.2 MWh pa	73.2%	98.33%
0 – 2,196 MWh pa	89.6%	99.96%
>2,196 MWh pa	10.4%	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
 - Large NDM is a minority component of overall NDM
 - BUT – requires NDM modelling, sample counts have allowed this

Large NDM Supply Points (>2,196 MWh pa) Consumption Band Analyses – Indicative Load Factors

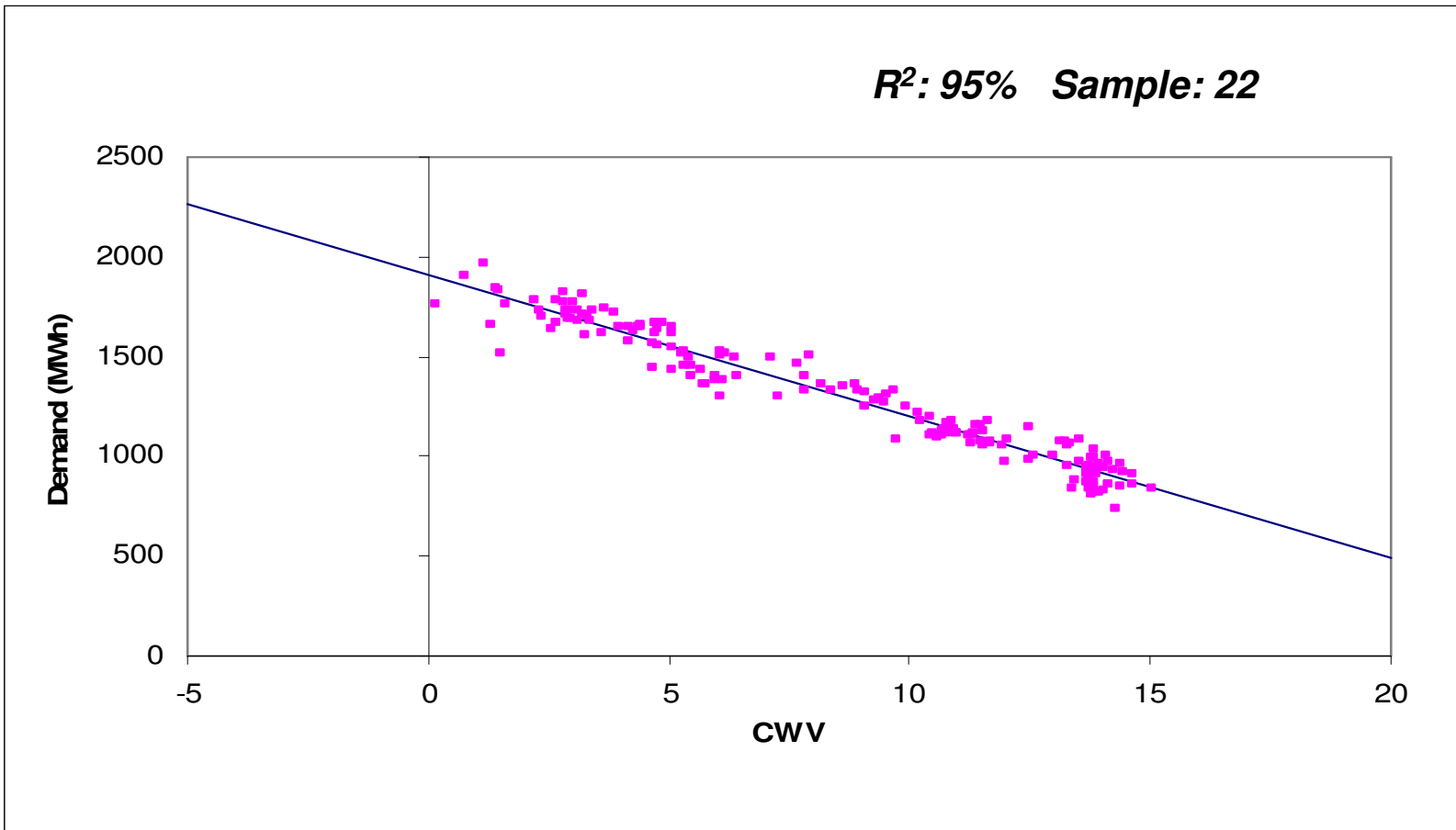
	Large NDM Consumption Band (MWh pa)																	
	2,196 TO 5,860			5,860 TO 14,650			14,650 TO 29,300			29,300 TO 58,600			>58,600					
SC	42%	98%	142	48%	97%	69	53%	95%	22	65%	91%	125						
NO	37%	97%	172	43%	97%	71	53%	98%	55							60%	94%	49
NW / WN	40%	98%	351	45%	98%	128										56%	98%	135
NE	38%	97%	184	46%	97%	77	47%	97%	40							54%	96%	58
EM	40%	98%	229	46%	98%	105												
WM	36%	98%	297	42%	98%	119	47%	97%	65							54%	96%	58
EA	39%	98%	169	41%	98%	78												
NT	41%	99%	274	46%	99%	88	47%	97%	65							54%	96%	58
SE	38%	98%	183	48%	98%	58												
WS	40%	97%	74	44%	98%	44	47%	97%	65							54%	96%	58
SO	34%	98%	102	38%	98%	53												
SW	40%	98%	163	46%	98%	68												

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

Model for SC LDZ: 14,650-29,300 MWh pa Consumption Band

- Sample size is small (22) but overall population for the band in SC LDZ is also small (37, in early April 2008 and of these only 17 were assigned to this consumption band EUC).
- The model is well behaved despite the small sample size (95% R² value).
- Moreover, the ILF for this model is identical to the ILF for the NO/NW/WN group and therefore, combining SC with NO/NW/WN yields a model with the same ILF. So, no beneficial difference in combining SC LDZ and NO/NW/WN.
- The graph that follows shows the model for SC LDZ on its own is good.

Demand Against CWV, Monday to Thursday, Non-Holiday SC LDZ (5 LDZ Group Analysis) 14,650-29,300 MWh pa, Consumption Band, SC CWV



- Lower sample count. Model appears sound

Large NDM Supply Points (2,196 to 5,860 MWh pa) Count of Validated Sample Numbers per WAR Band + Aggregations

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

	WAR Banding			
	0.00 – 0.40	0.40 – 0.47	0.47 – 0.55	0.55 – 1.00
SC	27	45	50	20
NO / NW / WN	145	149	122	107
NE / EM / WM	174	211	155	170
EA / NT / SE	109	194	180	143
WS / SO / SW	94	86	82	77
TOTAL	549	685	589	517

- Numbers in each WAR Band aggregation
- In SC LDZ, WAR Bands 1 and 4 remain small but ensuing model fit remains good....

Large NDM Supply Points (2,196 to 5,860 MWh pa) 5 LDZ Group : Aggregated WAR Band : Indicative Load Factors

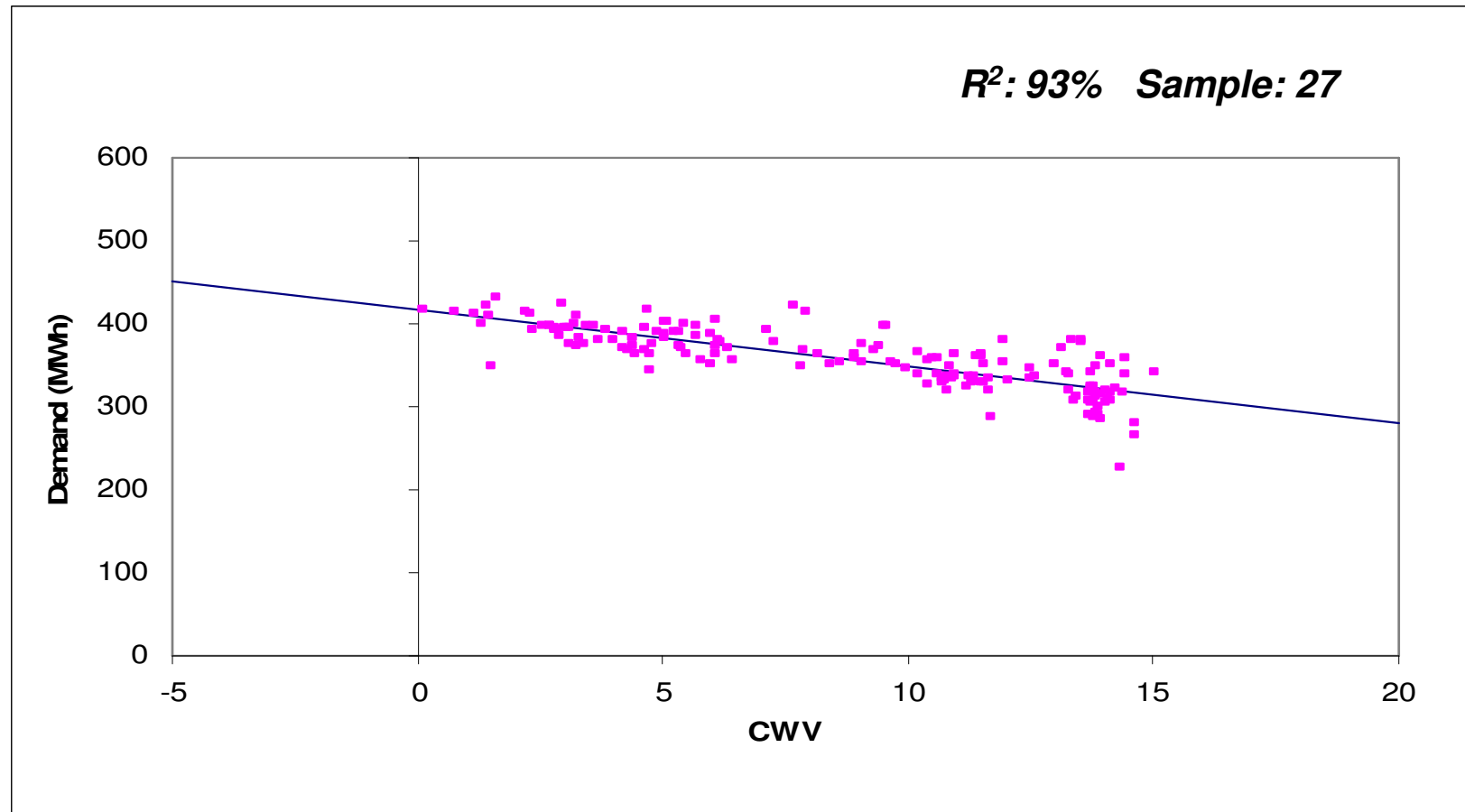
- Consumption Band 5: 2,196 to 5,860 MWh pa : 5 LDZ Aggregations Applied : ILF

	WAR Banding											
	0.00 – 0.40			0.40 – 0.47			0.47 – 0.55			0.55 – 1.00		
SC	69%	93%	27	49%	98%	45	38%	97%	50	26%	95%	20
NO / NW / WN	64%	97%	145	47%	98%	149	34%	97%	122	24%	96%	107
NE / EM / WM	63%	98%	174	45%	98%	211	34%	98%	155	24%	95%	170
EA / NT / SE	70%	95%	109	49%	98%	194	37%	98%	180	25%	95%	143
WS / SO / SW	65%	97%	94	44%	98%	86	35%	98%	82	23%	96%	77

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

Demand Against CWV, Monday to Thursday, Non-Holiday

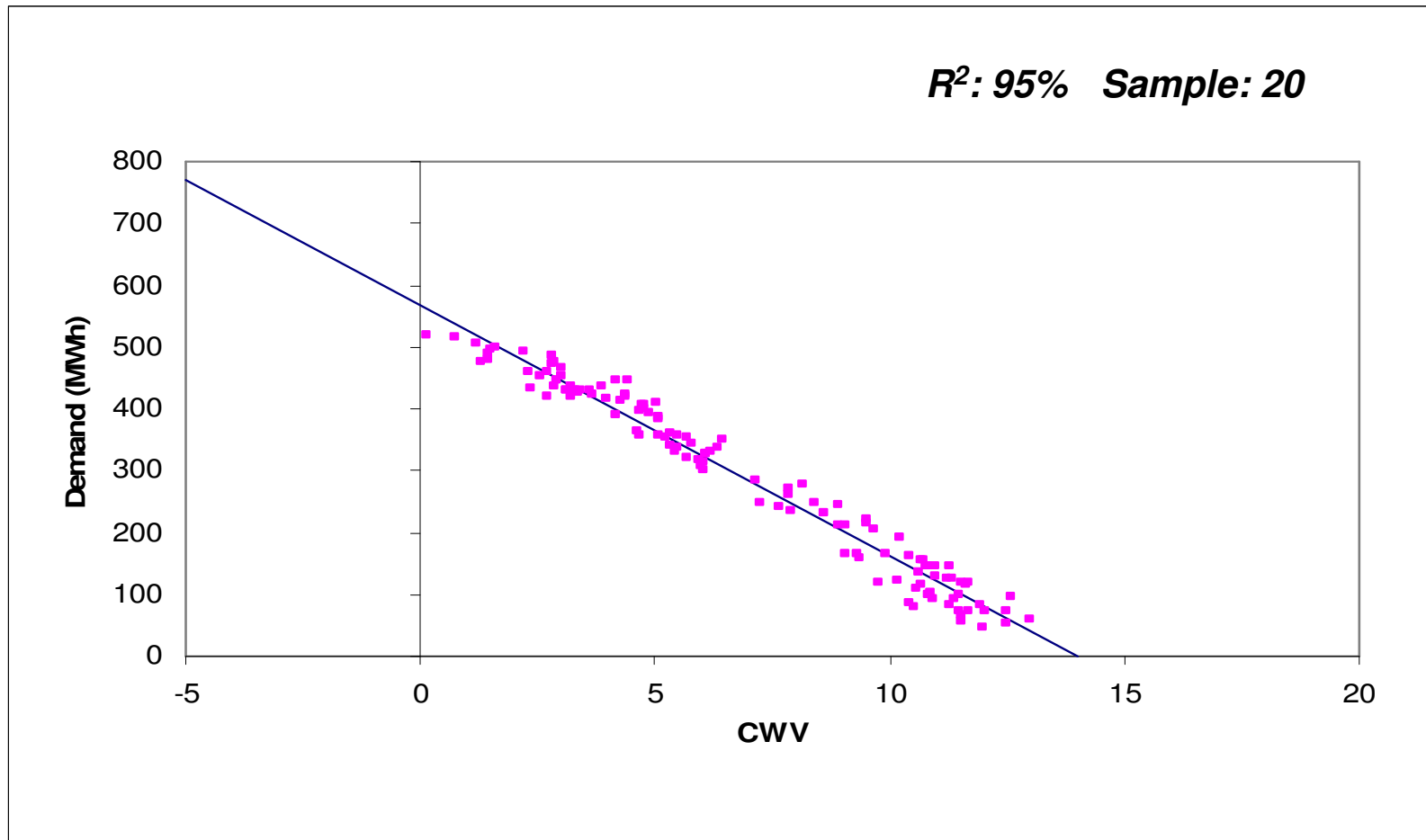
SC LDZ (5 LDZ Group Analysis) 2,196-5,860 MWh pa, WAR Band 1, SC CWV



- Some scatter in data but not unusual in WAR band 1 model

Demand Against CWV, Monday to Thursday, Non-Holiday

SC LDZ (5 LDZ Group Analysis) 2,196-5,860 MWh pa, WAR Band 4, SC CWV



- Typical weather sensitive WAR Band 4 model

Large NDM Supply Points (>2,196 MWh pa)

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

- 5 LDZ group basis appropriate despite small sample sizes in WAR bands 1 and 4 in SC LDZ modelled on its own in the 5 group set.
- Model fit (R^2 value) for these two cases is very good 93% & 95% respectively for WAR bands 1 and 4.
- Graphs of data sets are well behaved.
- 5 LDZ group basis of data aggregation also applied in 2007 and in 2006

Large NDM Supply Points : Remaining Bands 5,860 to >58,600 MWh pa Count of Validated Sample Numbers per WAR Band + Aggregations

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

	WAR Banding			
	0.00 – 0.34	0.34 – 0.43	0.43 – 0.52	0.52 – 1.00
SC/NO/NW/WN	63	82	77	46
NE/EM/WM	79	93	61	68
EA/NT/SE/WS/SO/SW	70	102	152	65
TOTAL	212	277	290	179

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

	0.00 – 0.32	0.32 – 0.37	0.37 – 0.48	0.48 – 1.00
ALL LDZs	66	94	99	58

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

	0.00 – 0.32	0.32 – 0.35	0.35 – 0.43	0.43 – 1.00
ALL LDZs	45	49	50	39

Large NDM Supply Points : Remaining Bands 5,860 to >58,600 MWh pa Aggregated WAR bands : Indicative Load Factors

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

	WAR Banding											
	0.00 – 0.34			0.34 – 0.43			0.43 – 0.52			0.52 – 1.00		
SC/NO/NW/WN	78%	97%	63	53%	98%	82	42%	98%	77	26%	95%	46
NE/EM/WM	81%	97%	79	53%	97%	93	39%	98%	61	26%	96%	68
EA/NT/SE/WS/SO/SW	84%	98%	70	56%	98%	102	40%	98%	152	27%	96%	65

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

	WAR Banding											
	0.00 – 0.32			0.32 – 0.37			0.37 – 0.48			0.48 – 1.00		
ALL LDZs	88%	90%	66	66%	98%	94	48%	97%	99	30%	96%	58

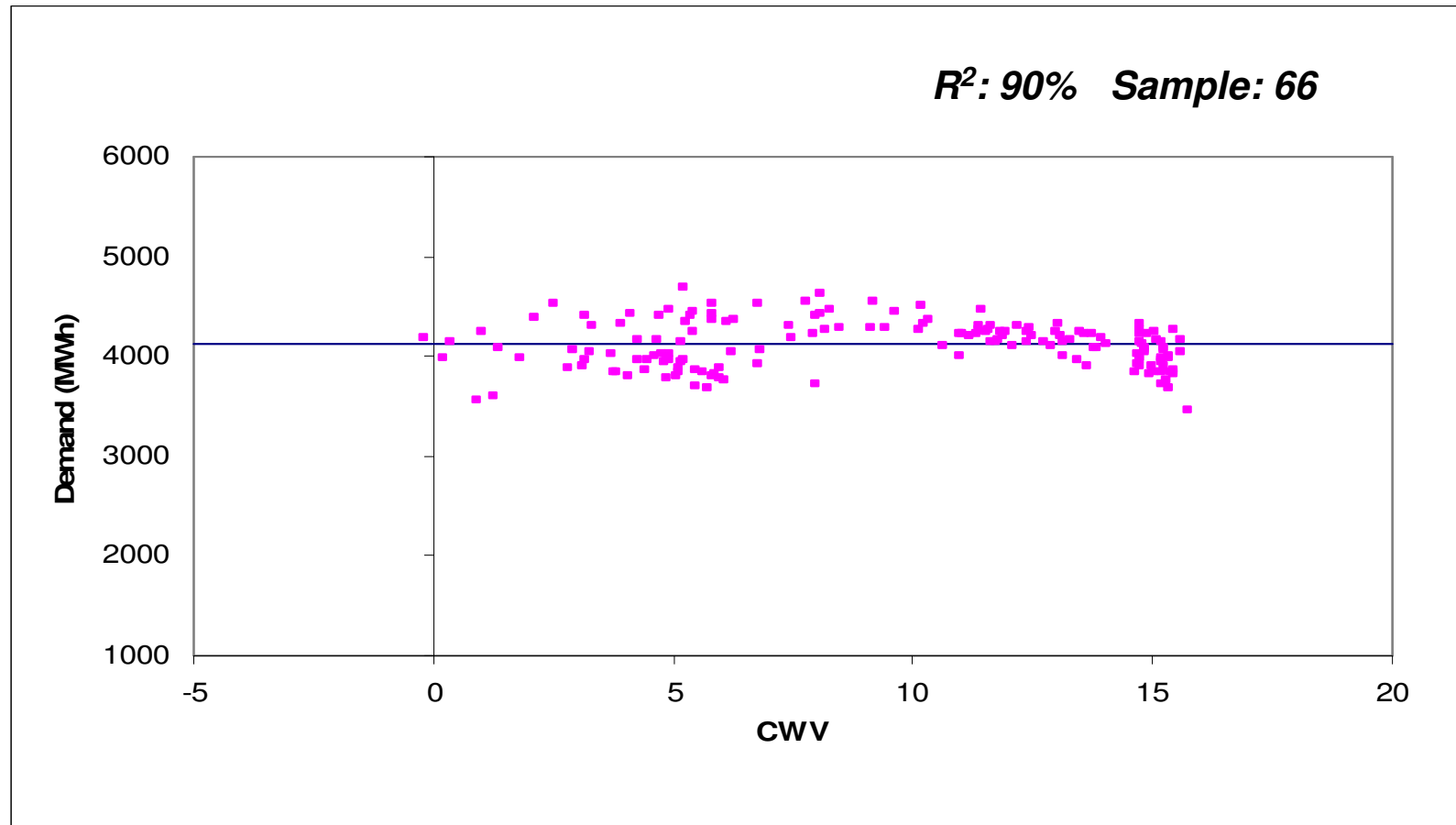
- Consumption Band 8: 29,300 to 58,600 MWh pa : National Aggregations Applied

	WAR Banding											
	0.00 – 0.32			0.32 – 0.35			0.35 – 0.43			0.43 – 1.00		
ALL LDZs	97%	79%	45	76%	92%	49	56%	96%	50	32%	95%	39

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

Demand Against CWV, Monday to Thursday, Non-Holiday

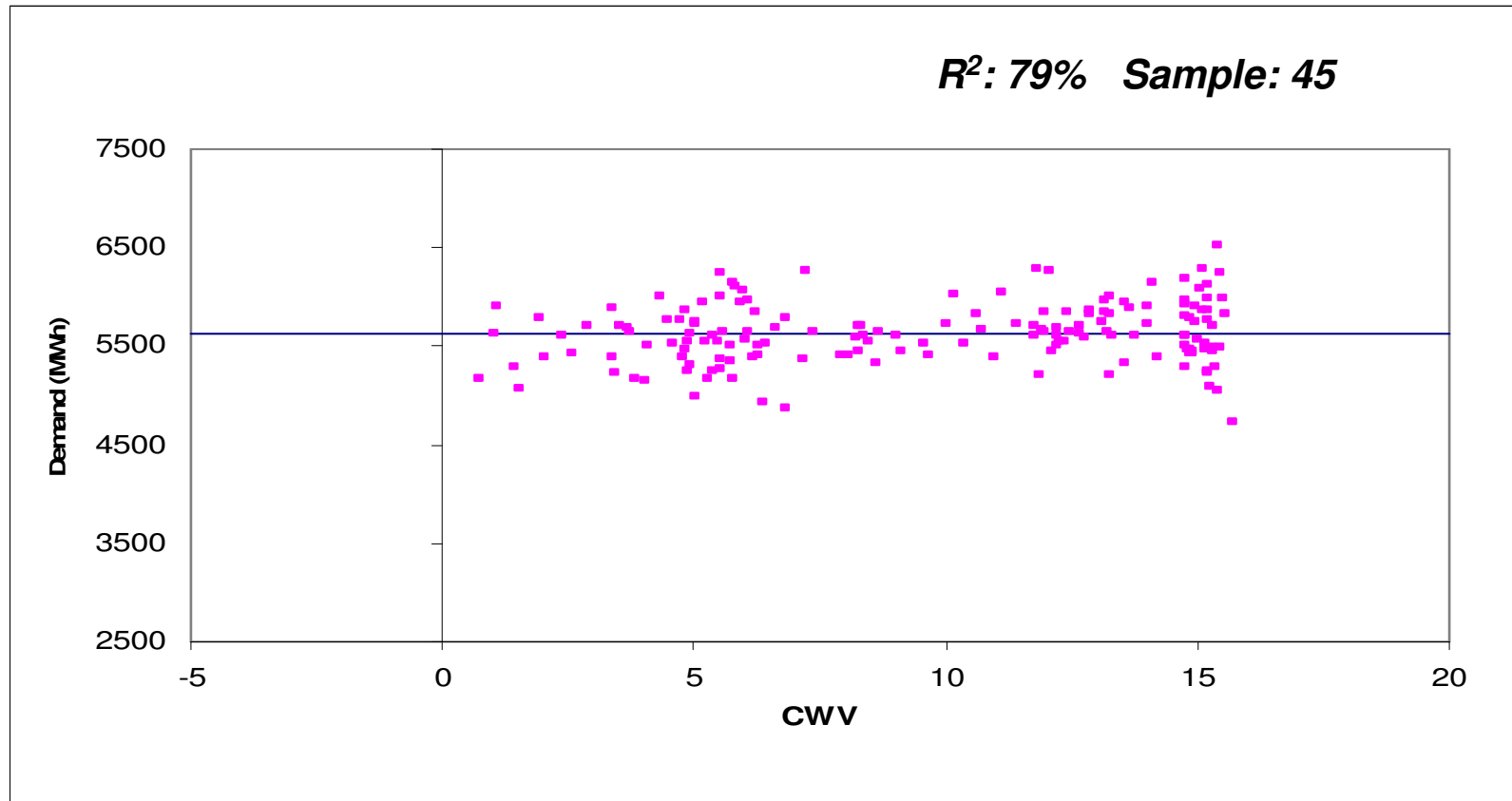
National Aggregation 14,650-29,300 MWh pa, WAR Band 1, EM CWV



- Band 7 WAR Band 1 in EM LDZ – Weather insensitive

Demand Against CWV, Monday to Thursday, Non-Holiday

National Aggregation 29,300-58,600 MWh pa, WAR Band 1, WM CWV



- Band 8 WAR Band 1 in WM LDZ – Weather insensitive and data set shows some scatter

Large NDM Supply Points (>2,196 MWh pa) WAR Band Analysis 5,860 – 14,650 MWh pa

- 3 LDZ group basis gives adequate sample sizes for all data sets.
- All model fits (R^2 values) are 95% or greater.
- Same level of aggregation as applied in 2007 and 2006.
- Retaining the 3 LDZ group aggregation is better because they provide a more statistically robust set of models.

Large NDM Supply Points (>2,196 MWh pa) WAR Band Analysis 14,650 – 29,300 MWh pa

- National aggregation - sample sizes sufficient in all four WAR bands.
- Same level of aggregation as applied in 2007 and 2006.
- Sample sizes are insufficient for any lower level of aggregation.
- All model fits (R^2 values) are 90% or greater.
(model fits for WAR bands 2, 3 and 4 are 96% or greater)
- Model for WAR band 1 has a zero slope - hence high ILF of 88%
(ILF was 90% in the same model adopted in 2007)

Large NDM Supply Points (>2,196 MWh pa)

WAR Band Analysis 29,300 – 58,600 MWh pa

- National aggregation - sample sizes sufficient in all four WAR bands.
- Same level of aggregation as applied in 2007 and 2006.
- Sample sizes are insufficient for any lower level of aggregation.
- Model fits (R^2 values) for WAR bands 2, 3 and 4 are 92% or greater.
- Model for WAR band 1 has a zero slope and significant data scatter - hence high ILF of 97% and lower R^2 value of 79%.
- The same model adopted in 2007 had a R^2 value of 70% and a similarly high ILF of 93%.

LARGE NDM: EUC Smoothed Models - Provisional Results

- Review of provisional model results

Number 'Straight' (no cut-offs, no summer reductions)	170	(173)
Number with Warm Weather Cut-Off	53	(44)
Number with Summer Reduction	37	(46)
Number with no Slope (weather insensitive)	13	(13)
Number with Cut-Offs and Reductions	0	(3)
Last years figures in (x)		

- No significant change from previous years
- Cut-offs have been primarily applied for the peakier WAR bands (3 & 4) across consumption bands

Recommendations

Summary

- Analysis presented is an overview of the ongoing analysis
- Small and Large NDM Analysis
- Consumption and WAR Bandings
 - Derive EUCs
 - Model consumption profiles
- Draft proposals due to be published by June 30th will include:
 - In depth analysis of what has been presented here
 - Calculated profiling and capacity estimation parameters to be applied in new Gas Year
 - Available on the xoserve UK Link Docs Extranet, access via:
(www.xoserveextranet.com/uklinkdocs/default.asp)
- Recommendations at this stage.....

Recommendations

- Retain Small NDM EUC Breakdowns at same points as previous years
 - Splits degrade model / profiling accuracy & provide no significant benefit to Indicative Load Factors
- Model EUC Band 1 (0 to 73.2 MWh pa) using Domestic only dataset
 - Inclusion of non-domestic would under estimate demand for weekend periods, adverse effect on Scaling Factors, degrade model / profiling
- Model Large NDM EUC bands using similar levels of aggregation to previous years (same as 2007/08)
- Ongoing Analysis: No significant differences to previous years analysis
- Publication of initial proposals: by 30th June
- Publication of final proposals: by 15th August