



Demand Estimation Technical Forum

4th June 2010

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)

- 4 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 23rd 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 2010 – Ongoing Analysis

- UNC obligation to consult and seek agreement with DESC in June on the current state of analysis
 - Key objective of Technical Forum:
 - Inform DESC of numbers of validated data sets collected
 - Consider most appropriate aggregations to apply to the most recently available sample data i.e. 2009/10
 - Small NDM (up to 2,196 MWh pa)
 - Large NDM (> 2,196 MWh pa)
- } Validation & Analysis
} Considered Separately

Modelling Basis 1

- Key aspects of EUC demand modelling basis for Spring 2010 analysis:
 - 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 datalogger data sets (2009/10)
 - Data sets cover April to March
(2008/09 covered March to March to ensure inclusion of Easter holiday period)
 - 12 month analysis for datarecorder data sets (2009/10)
 - Data sets always cover mid-March to mid March
- Following review of CWV and SNCWV the revised CWV definitions and new seasonal normal basis have been applied to Spring 2010 analysis

Modelling Basis 2

- Aggregate NDM demand models:
 - Historical aggregate NDM demand models based on data from 3 previous gas years will be used to compute DAFs
 - Previous practice has used results from a forecast model for the target gas year
 - UNC does not explicitly state the aggregate NDM demand value should be based on a forecast or historical model
 - Accordingly, for NDM proposals 2010/11 the aggregate NDM models used are models obtained from the average of 3 previous gas years aggregate NDM data modelled against weather (2006/07, 2007/08, 2008/09)
 - The historical model has been applied to the appropriate day of the week and holiday pattern of the target gas year 2010/11 - no forecast element added to the model

Modelling Basis 3

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 presented to DESC in February
- 3 year Model smoothing removes the impact of any extreme instances during a single year
- DESC confirmed in November 2009 to continue to apply model smoothing
 - Next assessment of model smoothing due in Autumn 2011

Modelling Basis 4

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

- Summer reductions can apply to EUC models over the period 29th May to 25th 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 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 (2009/10 was much colder than 2008/09)
- This year the limits defining WAR band EUCs are therefore higher than those of last year – i.e. moved towards one
- This is essential because supply points will be assigned these newly defined WAR band EUCs (for 2010/11) based on their (Dec-Mar) consumption behaviour over winter 2009/10.

Small NDM Analysis <2,196,000 kWh

Small NDM Analysis (<2,196 MWh pa)

- Small NDM for Demand Estimation purposes <2,196,000 kWh
- Represents 90% of total NDM load (74% <73,200) and 99.96% 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 of analysis:
 - Present validated sample data available and proposed data sets
 - View of results so far, proposed EUCs and proposed aggregations
 - Highlight any issues raised

Available Sample Data: Small NDM DATA RECORDERS

Active Data Recorders at 17/03/09	4,307
Previous 12 Months:	
▪ Net change in sample (commissions / closures)	-164
Active Data Recorders at 16/03/10	4,143
Data Recorders with data successfully gathered	4,092
Total No. of Validated Data Recorders	<u>3,612</u>
Total No. of Validated Supply Points (3,752 Spring 2009)	<u>3,612</u>
<i>(2,909 classified Domestic & in 0-73.2 MWh pa range. 548 in the 73.2-293 MWh pa range)</i>	

- 480 data recorders failed validation - missing days / consecutive zeros / spikes

Sample Data Available: Small NDM DATALOGGERS

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

Total Number of Small NDM Validated Dataloggers	6,541
Total Number of Validated Supply Points:	5,482 (5,562)
73.2 to 293 MWh pa Range <i>(Combined with Datarecorders: 1,208)</i>	660 (621)
293 to 2,196 MWh pa Range	4,822 (4,941)

- *2009 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	2,909 Supply Points <i>(Domestic sub-set)</i>
73.2 to 293 MWh pa (EUC Band 2)	12 Months Combined Data Recorder & Datalogger Data	1,208 Supply Points
293 to 2,196 MWh pa (EUC Band 3 & 4)	12 Months Datalogger Data	4,822 Supply Points

- Small NDM Analysis undertaken at individual LDZ level
- Band 1 decreased (47) Bands 2 to 4 decreased (170)
- Sufficient sample data to allow analysis

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 2009 - no significant reason for changing the EUC bandings from 'current'
 - 2010 Investigates:
 - Split Band 2 at 145 MWh pa
 - Split Band 4 at 1,465 MWh pa
- Spring approach document confirmed Band 01B would be modelled as one band using 'domestic' only data to current band definitions – informed by previous analysis (Autumn 2007 and 2008)

Representing 0 - 73.2 MWh pa

Previous analysis

- Spring 2007 NDM analysis, 0-73.2 MWh pa consumption range:
 - Sample sub-divided by LDZ rather than by consumption sub-band (4 bands: 0-10,10-20,20-30,30-73.2 MWh pa)
- Autumn 2007 analysis
 - Investigated splitting 0-73.2 consumption band at 20 MWh pa and 30 MWh pa
 - i.e. 0-20 and 20-73.2 and 0-30 and 30-73.2
- Autumn 2008 analysis
 - Investigated splits of the 0-293 MWh pa range at 30 and 60 MWh pa
 - i.e 0-30 and 30-293 and 0-60 and 60-293
- January 2009 analysis
 - Applying band 01 profiles to domestics in band 02 and applying band 02 profiles to non domestics in band 01
- In all cases there were no compelling statistical grounds to change current arrangements for 0-73.2 band - All results available on Joint Office website

Representing 0 - 73.2 MWh pa Scaling Factor effects

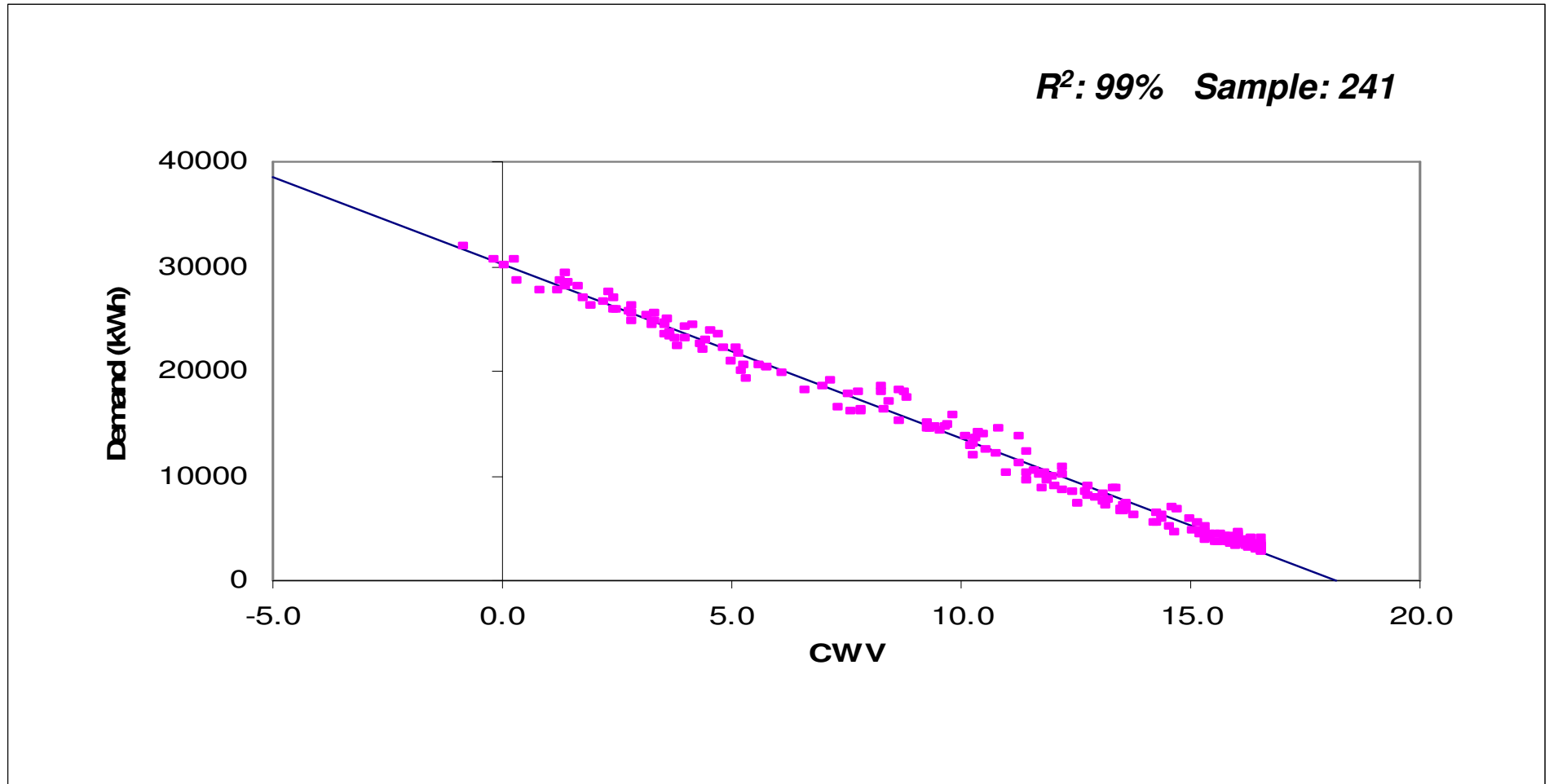
- Post UNC Modification 204 daily SF values (weekday and weekend) are closer to one
- However, weekend (Fri, Sat, Sun) SF offsets still occur, they are just smaller than before due to the beneficial effects of Mod 204
- Weekend SF patterns indicate under-estimation of demand
- Inclusion of a proportion of non-domestic sample points leads to lower positive or even negative weekend factors in the resulting “01B” model
- This leads to greater weekend positive SF offsets
- A further reason for using domestic only datasets

0-73.2 MWh pa: Small NDM Indicative Load Factors (Domestic sites only)

	PROPOSED - Dataset: Domestic Sites Only		
SC	39%	99%	237
NO	33%	99%	230
NW / WN	34%	99%	215
NE	35%	98%	258
EM	34%	99%	250
WM	31%	99%	235
WS	33%	98%	253
EA	32%	99%	257
NT	32%	99%	230
SE	31%	99%	241
SO	28%	99%	261
SW	30%	99%	242

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

Demand against CWV, Monday to Thursday, holidays included, SE 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

- Proposed approach is: *(same as spring 2009 & previous years)*
 - Domestic supply point only smoothed model for 0 – 73.2 MWh band
 - Consistently positive Fri/Sat/Sun weekend factors in smoothed model
 - Consistent with previous years analysis and approach
 - Analysis was carried out including some non-domestics – results were in line with previous years i.e. adverse effects on weekend scaling factor values

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	40%	98%	81	41%	97%	48	39%	98%	33
	NO / NW / WN	31%	96%	230	32%	95%	112	31%	95%	118
	NE / EM/ WM	30%	97%	302	31%	98%	159	29%	97%	143
	EA / NT / SE	31%	97%	363	33%	98%	176	30%	97%	187
	WS / SO / SW	30%	97%	232	30%	98%	126	29%	97%	106

- 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

	2009/10		2008/09		2007/08	
	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%	39%	43%	37%	39%	39%
NO / NW / WN	32%	31%	32%	30%	31%	30%
NE / EM / WM	31%	29%	30%	29%	29%	30%
EA / NT / SE	33%	30%	32%	33%	31%	32%
WS / SO / SW	30%	29%	30%	29%	30%	31%

- Differences in ILF values across the sub-bands are inconsistent across LDZ groups both within and between years
 - Note: Previous years' ILF values restated in terms of new seasonal normal basis
- 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 2009/10 Data Set			
	NO SPLIT 73.2 to 293	SPLIT 73.2 to 145 145 to 293	Improvement (+) or Degradation (-) Using Two Bands	
			CURRENT: 2009/10	2008/09
SC	454348.2	548453.9	-20.7%	-9.5%
NO / NW / WN	1238910.5	1315835.5	-6.2%	-3.5%
NE / EM / WM	1474335.9	1517537.6	-2.9%	-5.3%
EA / NT / SE	1835537.7	1821888.1	0.7%	-4.4%
WS / SO / SW	986994.4	1028350.0	-4.2%	-3.0%
OVERALL	545291.8	557016.0	-2.2%	-4.3%

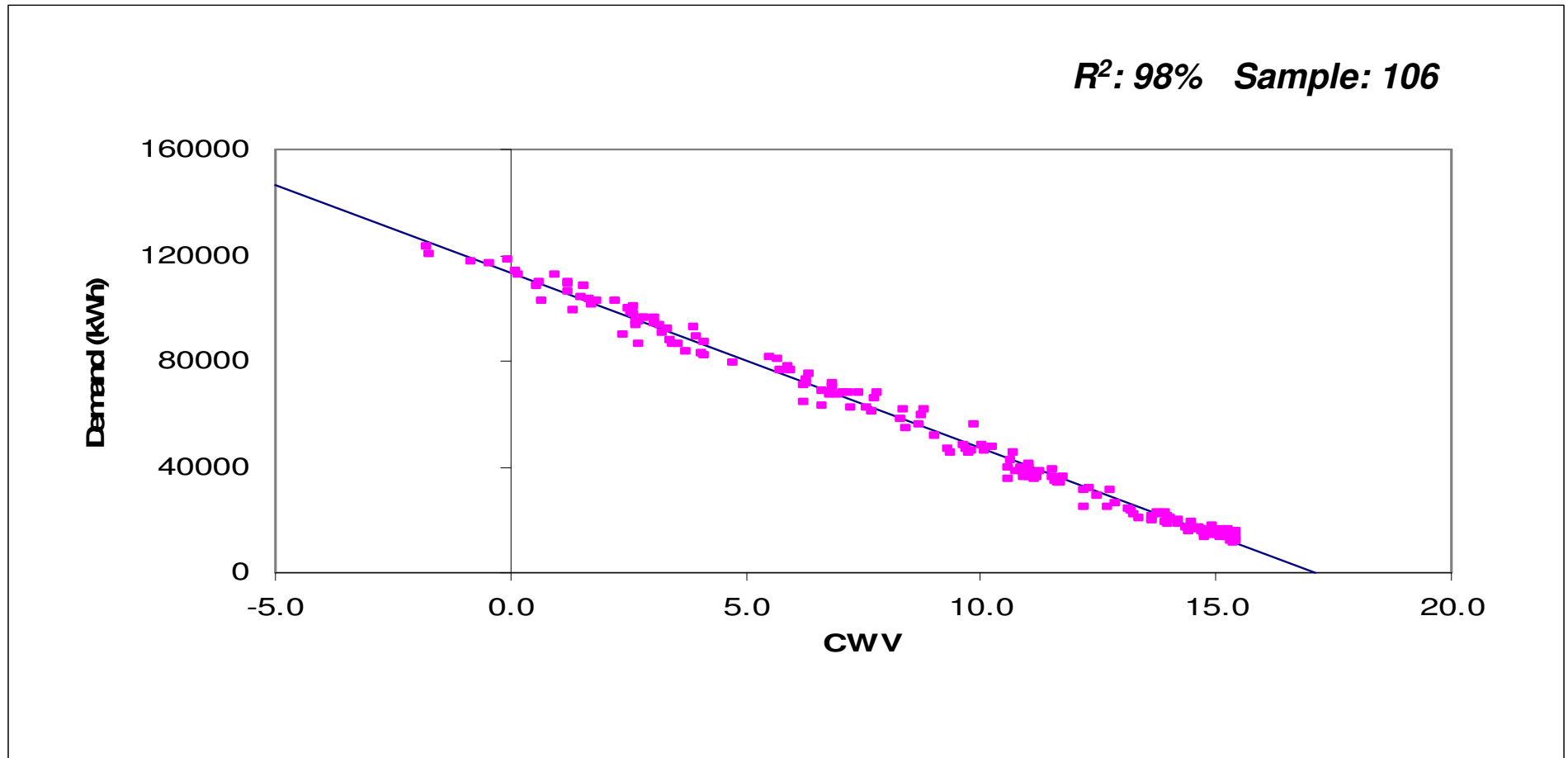
- No overall improvement in 'goodness of fit' by representing 73.2-293 MWh pa range using two sub-bands with breakpoint at 145 MWh pa
- RMSE analysis shows a degradation in model/profile accuracy when splitting EUC Band 2

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	40%	98%	81
NO	30%	94%	104
NW / WN	32%	96%	126
NE	31%	96%	91
EM	31%	98%	106
WM	27%	96%	105
WS	29%	97%	56
EA	31%	97%	117
NT	32%	98%	137
SE	30%	97%	109
SO	31%	97%	89
SW	29%	97%	87

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



- Band 2 example – good sample size and very good fit

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	39%	98%	149	39%	98%	200	40%	98%	155	39%	98%	355
NO	30%	96%	94	30%	97%	119	33%	97%	91	31%	97%	210
NW / WN	33%	97%	135	33%	97%	205	36%	98%	181	35%	98%	386
NE	30%	97%	84	33%	97%	133	36%	98%	81	35%	97%	214
EM	31%	98%	150	31%	97%	203	34%	97%	123	32%	98%	326
WM	26%	96%	86	28%	97%	166	32%	97%	145	30%	97%	311
EA	30%	97%	119	32%	98%	191	34%	98%	122	33%	98%	313
NT	32%	97%	156	32%	98%	198	35%	99%	180	34%	99%	378
SE	30%	98%	172	33%	99%	231	35%	98%	127	34%	99%	358
WS	29%	94%	41	29%	97%	73	31%	97%	46	30%	97%	119
SO	28%	98%	109	28%	98%	157	30%	99%	112	29%	98%	269
SW	28%	98%	87	31%	98%	123	31%	99%	78	31%	99%	201

- 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

	2009/10		2008/09		2007/08	
	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	39%	40%	39%	39%	38%	38%
NO	30%	33%	32%	36%	31%	34%
NW / WN	33%	36%	32%	36%	31%	34%
NE	33%	36%	31%	33%	30%	33%
EM	31%	34%	31%	33%	30%	33%
WM	28%	32%	31%	33%	30%	33%
EA	32%	34%	33%	36%	33%	34%
NT	32%	35%	33%	36%	33%	34%
SE	33%	35%	33%	36%	33%	34%
WS	29%	31%	29%	32%	29%	33%
SO	28%	30%	29%	32%	29%	33%
SW	31%	31%	29%	32%	29%	33%

- 7 LDZs indicate $\geq 2\%$ points ILF difference across all 3 years
- Consider 'goodness of fit' analysis.....

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 2009/10 Data Set				
	NO SPLIT 732 to 2196	SPLIT 732 to 1465 1465 to 2196	Improvement (+) or Degradation (-) Using Two Bands	
			CURRENT: 09/10	08/09
SC	438370.7	456178.8	-4.1%	-10.2%
NO	242499.0	256174.1	-5.6%	-6.8%
NW / WN	494942.8	535739.3	-8.2%	-5.9%
NE	292877.5	310732.2	-6.1%	-3.3%
EM	393216.0	407798.0	-3.7%	-4.8%
WM	481382.0	521313.6	-8.3%	-7.2%
EA	160548.3	169480.5	-5.6%	-7.5%
NT	396225.6	414576.1	-4.6%	-4.6%
SE	540729.8	613812.1	-13.5%	-6.0%
WS	373196.7	385917.1	-3.4%	-7.7%
SO	374897.3	393365.5	-4.9%	-1.8%
SW	227807.5	238693.3	-4.8%	-6.5%
Overall	395141.8	417817.2	-5.7%	-6.3%

- No overall improvement in RMSE ('goodness of fit') when splitting Band 4
- Retain current approach
- EUC split at 1,465 is not proposed

Small NDM <2,196,000 kWh WAR Band Analysis

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 cold winter in 09/10 (colder than 08/09)

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 – 0.50	0.50 – 0.59	0.59 – 0.70	0.70 – 1.00	
SC	162	147	133	62	504
NO	65	98	97	44	304
NW / WN	156	142	137	86	521
NE	76	75	82	65	298
EM	109	107	132	128	476
WM	89	86	111	111	397
EA	94	97	125	116	432
NT	131	158	123	122	534
SE	119	149	138	124	530
WS	28	41	43	48	160
SO	73	84	108	113	378
SW	48	72	80	88	288
Total	1150	1256	1309	1107	4822

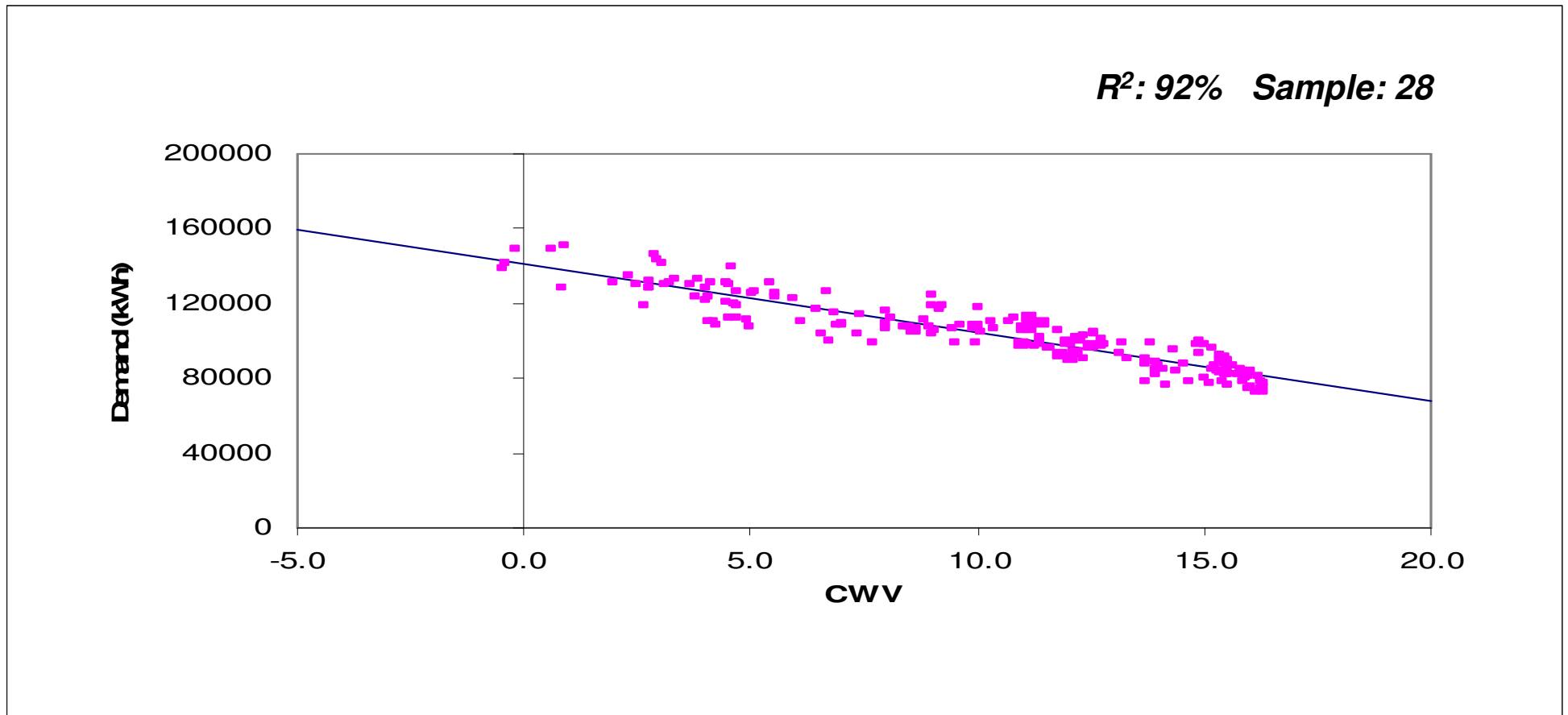
- Model whole consumption band as one - LDZ analysis is then feasible

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

	WAR Banding											
	0.00 – 0.50			0.50 – 0.59			0.59 – 0.70			0.70 – 1.00		
SC	57%	97%	162	43%	98%	147	32%	98%	133	25%	97%	62
NO	53%	94%	65	34%	96%	98	26%	95%	97	21%	97%	44
NW / WN	55%	98%	156	40%	99%	142	28%	96%	137	22%	96%	86
NE	52%	97%	76	41%	98%	75	30%	96%	82	22%	96%	65
EM	55%	96%	109	41%	99%	107	29%	97%	132	22%	96%	128
WM	52%	97%	89	36%	98%	86	27%	97%	111	20%	96%	111
EA	54%	93%	94	40%	97%	97	29%	98%	125	23%	97%	116
NT	56%	98%	131	40%	98%	158	29%	98%	123	22%	97%	122
SE	54%	96%	119	40%	98%	149	29%	98%	138	22%	97%	124
WS	55%	92%	28	40%	98%	41	27%	96%	43	22%	96%	48
SO	53%	95%	73	38%	99%	84	28%	98%	108	20%	97%	113
SW	55%	91%	48	40%	99%	72	28%	98%	80	22%	97%	88

- 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



- Small sample size – Slightly lower R squared value of 92% due to some scatter
- Overall no issues with this model

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 2009 & 2008 (and previous years).
- Model fits (R^2 values) for all WAR band 2,3 and 4 data sets are 95% or better
- In WAR band 1 there are single instances of 91%,92%,93% and 94%. All other models have values of 95% or greater
- 2009 analysis contained greater scatter due to non-weather related demand effects occurring over the time span of the data set
- Proposal is to retain this approach:
WAR band models derived for 293 - 2196 MWh pa range on an individual LDZ basis.

Small NDM Analysis
<2,196,000 kWh
Summary

Small NDM: EUC Smoothed Models - Provisional Results

- Review of provisional model results

Number 'Straight' (no cut-offs, no summer reductions)	51	(56)
Number with Warm Weather Cut-Off	43	(41)
Number with Summer Reduction	54	(37)
Number with no Slope (weather insensitive)	0	(0)
Number with Cut-Offs and Reductions	8	(22)
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 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 (74%)
- 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
 - Domestic sites only
 - 73.2 to 293 MWh pa
 - Consumption Band 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
- However, 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
- Identify sample data available post validation and proposed aggregations

Available Sample Data: Large NDM Dataloggers

	TOTAL		
Number of Active Dataloggers As At 01/03/2009	16,268		
Number of Validated Dataloggers	11,585	6,541	5,044
Number of Supply Points After Validation	2010 Analysis	2009 Analysis	
Large NDM	3,621	4,001	
Small NDM	5,482	5,562	
Total	9,104	9,563	

- Both Large & Small validated sample have decreased since 2009
- Overall decrease of 459 validated supply points
- Different spread of sample across various bands
- 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
- Overall comparable with 2009 - values shown (x)
 - Note: SC no longer able to be modelled separately for Band 07B

	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 4 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	263	76	15	7	3
NO	120	50	12	8	13
NW & WN	312	100	36	27	10
NE	129	63	33	9	4
EM	206	90	38	27	13
WM	259	94	33	29	10
EA	158	69	12	6	6
NT	277	89	15	14	6
SE	184	60	17	6	3
WS	64	34	7	8	7
SO	173	66	21	5	0
SW	139	52	18	10	6
TOTAL	2,284	843	257	156	81

- Aggregations of validated sample for 2010 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, 284 (39%)	5,830
5,860 to 14,650 MWh pa	843 (49%)	1,710
14,650 to 29,300 MWh pa	257 (50%)	510
29,300 to 58,600 MWh pa	156 (71%)	220
>58,600 MWh pa	81 ⁽²⁾ (58%)	140 ⁽³⁾

Notes:

1. Approx. for all Firm supply points at April 2010: >2,196 MWh represents 9.9% 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 2010 was 8 (~0.13% of aggregate NDM AQ).
4. Sample numbers and AQ are on new seasonal normal basis whereas population figures are on current 17 year seasonal normal basis

Total NDM Population Counts: Supply Point & AQ

Consumption Range	% of Total NDM	
	Total AQ	Total Count
0 – 73.2 MWh pa	74.1%	98.58%
0 – 293 MWh pa	80.1%	99.63%
0 – 2,196 MWh pa	90.1%	99.96%
>2,196 MWh pa	9.9%	0.04%

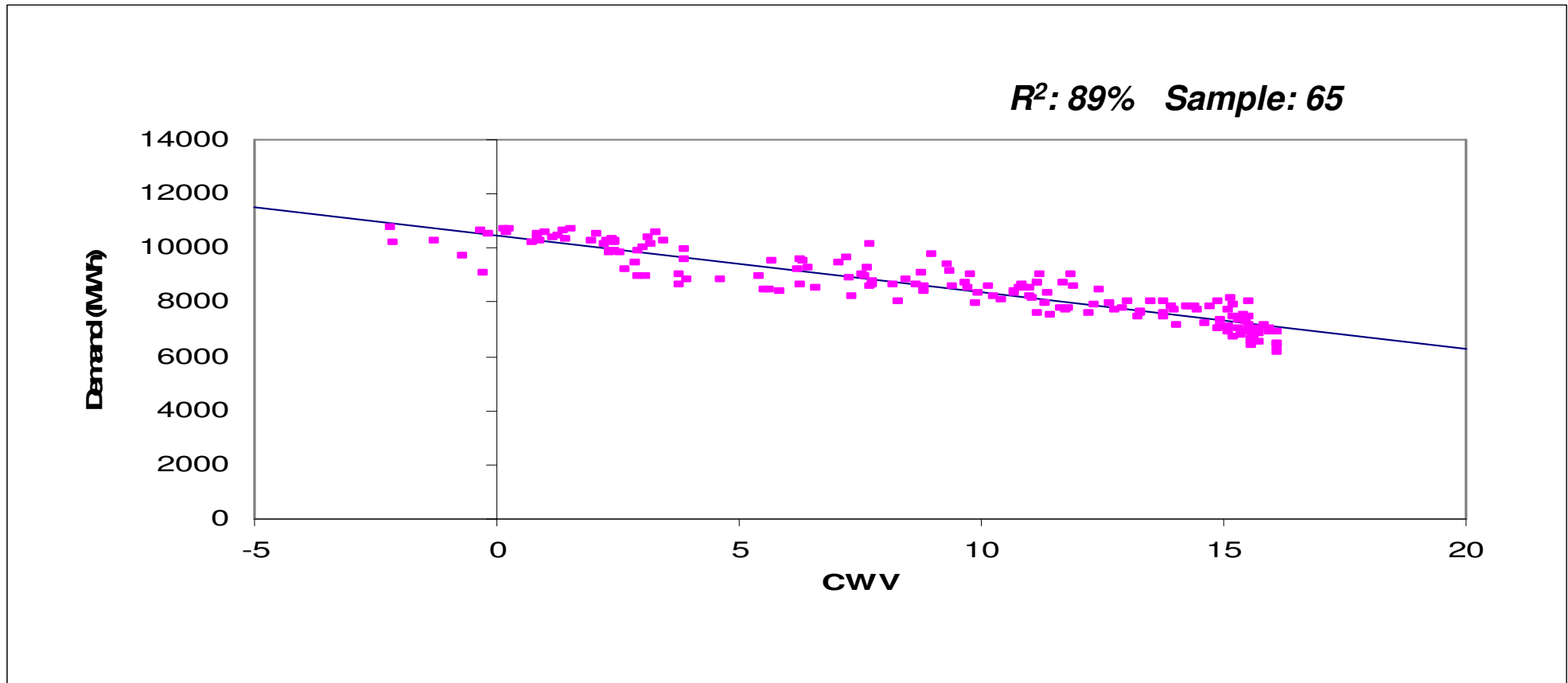
- On an AQ Basis:
 - Small NDM is by far the main component of the overall NDM sector
 - The range 0 – 73.2 MWh pa constitutes nearly 3/4 of overall NDM
 - Large NDM is a minority component of overall NDM
 - BUT – requires NDM modelling, sample counts have allowed this

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%	263	46%	98%	76	50%	96%	63	56%	93%	42	57%	86%	81
NO	35%	98%	120	41%	97%	50									
NW / WN	38%	98%	312	46%	98%	100									
NE	36%	97%	129	43%	98%	63	50%	98%	104	62%	89%	65			
EM	38%	98%	206	41%	98%	90									
WM	35%	98%	259	41%	98%	94									
EA	37%	99%	158	40%	98%	69	48%	98%	44	49%	97%	49			
NT	38%	99%	277	42%	98%	89									
SE	38%	99%	184	43%	99%	60									
WS	36%	98%	64	44%	97%	34	40%	96%	46	49%	97%	49			
SO	33%	98%	173	34%	98%	66									
SW	36%	98%	139	43%	97%	52									

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

Demand Against CWV, Monday to Thursday, Non-Holiday NE/EM/WM LDZ Group, 29300-58600 MWh pa, Consumption Band, NE CWV

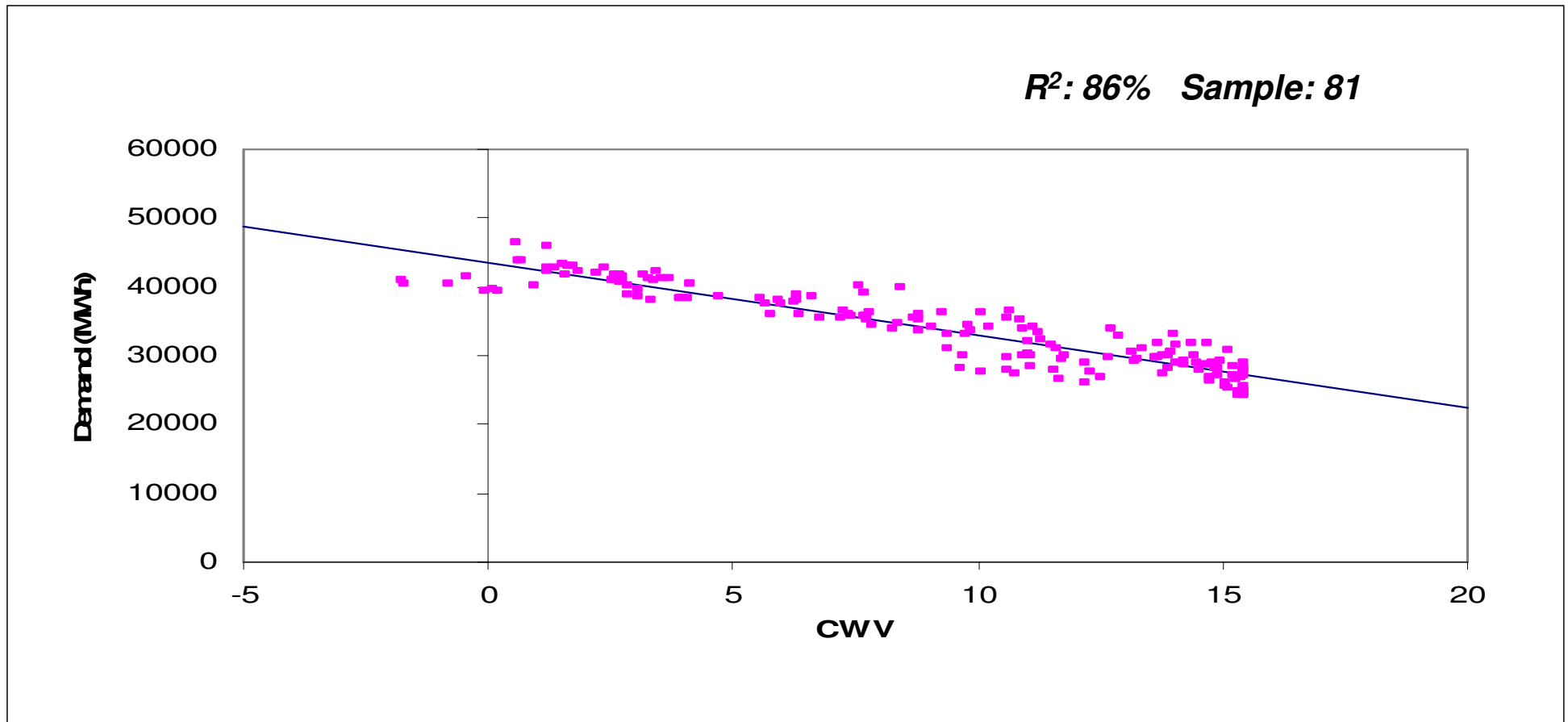


- Sample size is acceptable - Model is well behaved - R^2 value of 89% reflecting slightly greater data scatter
- Note: Low demand during cold week days of early January – some sites in this EUC probably not taking gas during those snow bound days

Model for National Aggregation: >58,600 MWh pa Consumption Band

- Supply points with AQt above 58,600 MWh pa should be mandatory DM
- As of April 2010 there are just 8 supply points in this consumption range specified as NDM on UK Link
- A model for this consumption range (09B) is still required for default use
- The NDM sample for this consumption range uses all available DM firm supply points that pass validation – no other sample supply points available
- Sample size of 81 is acceptable

Demand Against CWV, Monday to Thursday, Non-Holiday National Aggregation, >58,600 MWh pa, Consumption Band, EM CWV



- EUC demand model shows some scatter – however there is clear weather demand relationship evident

Large NDM >2,196,000 kWh WAR Band Analysis

Winter Annual Ratio: WAR Band Analysis

- WAR Band – Winter Annual Ratio profiles
 - Profile split by consumption in winter (December to March) as a ratio of total consumption
- Applied to all Large supply point bands
 - Bands 5 and above
 - 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 cold winter in 09/10 (colder than 08/09)
 - WAR Band 1 is the least weather sensitive and WAR Band 4 is the most weather sensitive

Available Sample Data: Large NDM Dataloggers

WAR Band Analysis Aggregations

	2,196 - 5,860	5,860 – 14,650	14,650 – 29,300	29,300 – 58,600	>58,600
SC	263	76	15	7	3
NO	120	50	12	8	13
NW & WN	312	100	36	27	10
NE	129	63	33	9	4
EM	206	90	38	27	13
WM	259	94	33	29	10
EA	158	69	12	6	6
NT	277	89	15	14	6
SE	184	60	17	6	3
WS	64	34	7	8	7
SO	173	66	21	5	0
SW	139	52	18	10	6
TOTAL	2,284	843	257	156	81

- Aggregations of WAR Band analysis for 2010 highlighted

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 – 0.44	0.44 – 0.54	0.54 – 0.66	0.66 – 1.00
SC	38	102	91	32
NO / NW / WN	99	155	105	73
NE / EM / WM	125	187	166	116
EA / NT / SE	92	207	193	127
WS / SO / SW	76	99	118	83
TOTAL	430	750	673	431

- Numbers in each WAR Band aggregation
- Numbers are healthy for all data sets

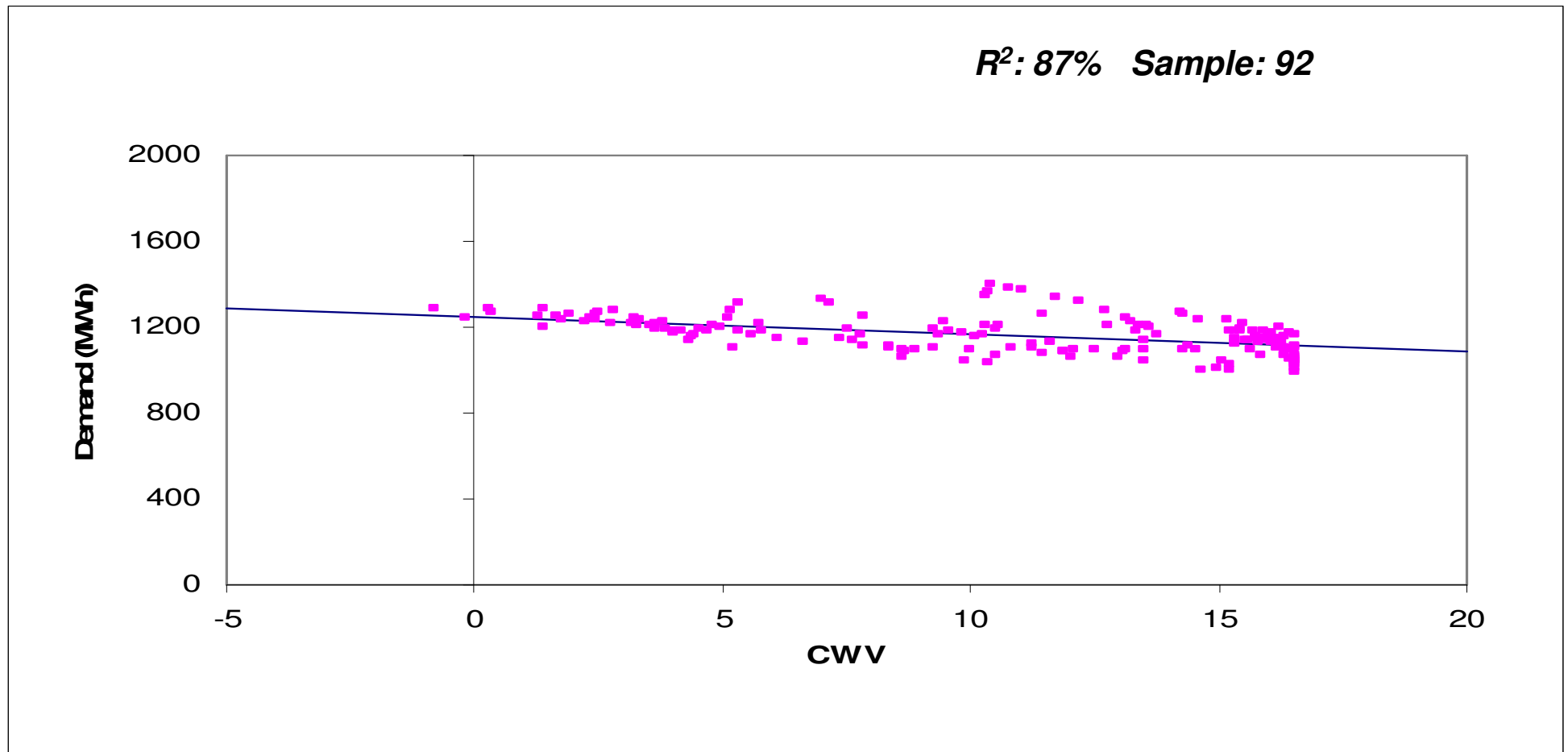
Large NDM Supply Points (2,196 to 5,860 MWh pa) 5 LDZ Group : Aggregated WAR Band : Indicative Load Factors

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

	WAR Banding											
	0.00 – 0.44			0.44 – 0.54			0.54 – 0.66			0.66 – 1.00		
SC	64%	96%	38	49%	98%	102	37%	98%	91	27%	98%	32
NO / NW / WN	66%	98%	99	44%	98%	155	32%	97%	105	21%	96%	73
NE / EM / WM	60%	99%	125	44%	98%	187	32%	98%	166	23%	97%	116
EA / NT / SE	73%	87%	92	47%	99%	207	34%	99%	193	24%	98%	127
WS / SO / SW	61%	96%	76	45%	98%	99	33%	98%	118	22%	97%	83

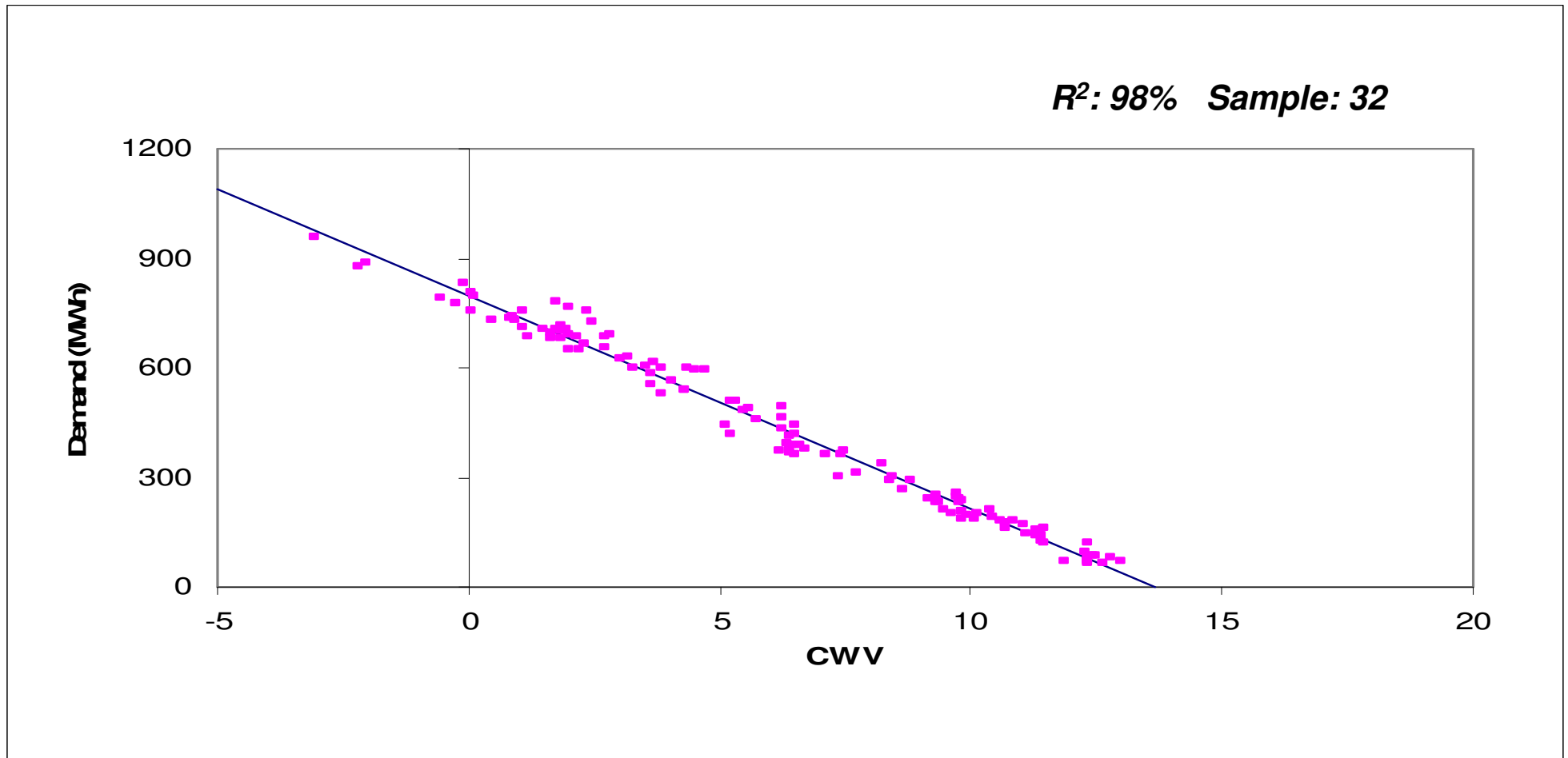
- All models give good fits and sample sizes are adequate
- Indicative Load Factor : R2 Multiple Correlation Coefficient : Sample Size

Demand Against CWV, Monday to Thursday, Non-Holiday EA/NT/SE LDZ Group Analysis, 2196-5860 MWh pa, WAR Band 1, SE CWV



- Greater data scatter resulted in a R² value of 87%

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



- Smallest of the data sets for WAR band 4 analysis

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 – 0.38	0.38 – 0.49	0.49 – 0.60	0.60 – 1.00
SC/NO/NW/WN	52	72	69	33
NE/EM/WM	59	79	51	58
EA/NT/SE/WS/SO/SW	50	111	129	80
TOTAL	161	262	249	171

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

	0.00 – 0.36	0.36 – 0.42	0.42 – 0.57	0.57 – 1.00
ALL LDZs	47	75	82	53

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

	0.00 – 0.35	0.35 – 0.39	0.39 – 0.49	0.49 – 1.00
ALL LDZs	33	40	47	36

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 – 0.38			0.38 – 0.49			0.49 – 0.60			0.60 – 1.00		
SC/NO/NW/WN	77%	95%	52	52%	98%	72	39%	98%	69	26%	96%	33
NE/EM/WM	70%	96%	59	51%	96%	79	38%	98%	51	25%	97%	58
EA/NT/SE/WS/SO/SW	73%	95%	50	52%	98%	111	39%	99%	129	26%	97%	80

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

	0.00 – 0.36			0.36 – 0.42			0.42 – 0.57			0.57 – 1.00		
	ALL LDZs	86%	88%	47	62%	97%	75	45%	97%	82	29%	96%

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

	0.00 – 0.35			0.35 – 0.39			0.39 – 0.49			0.49 – 1.00		
	ALL LDZs	93%	54%	33	69%	93%	40	55%	93%	47	35%	97%

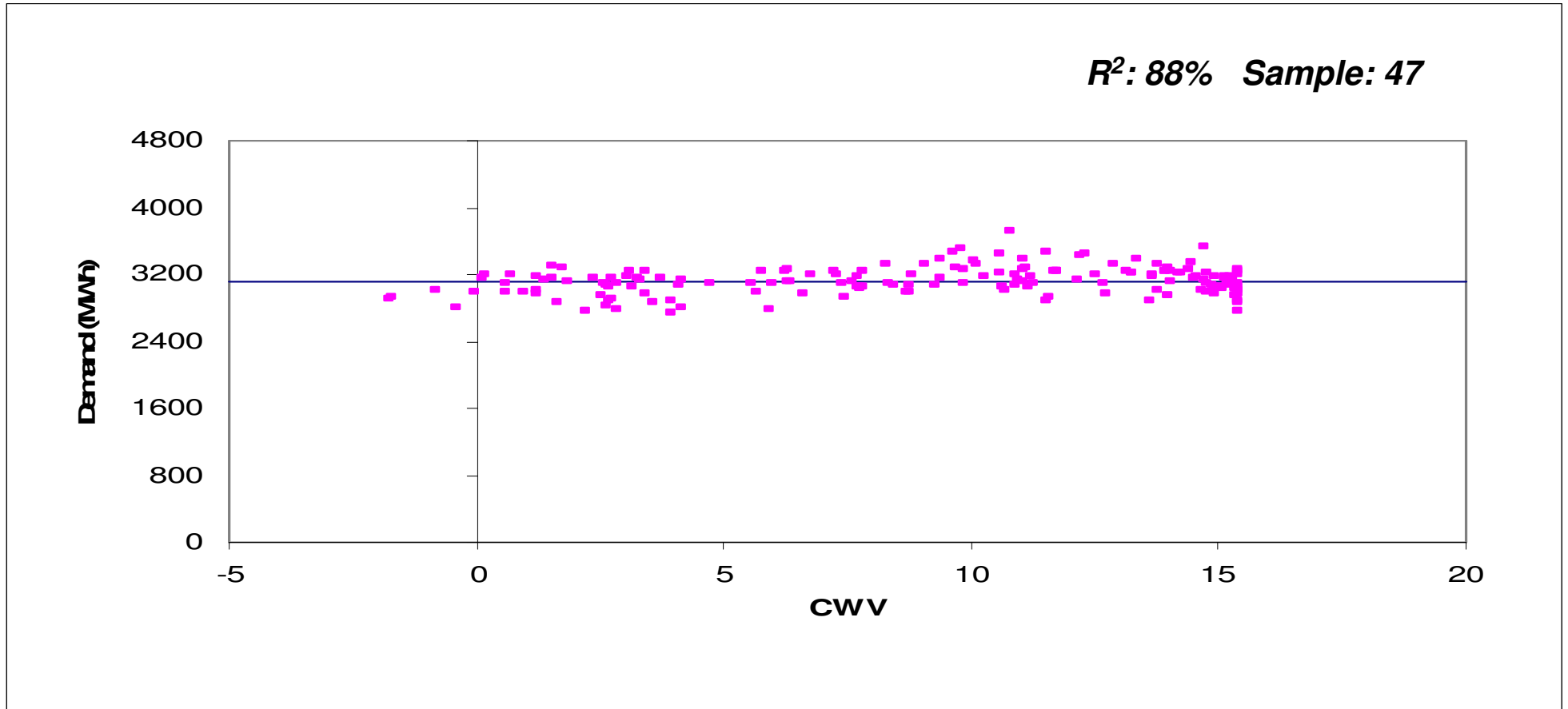
- Indicative Load Factor : R2 Multiple Correlation Coefficient : Sample Size

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
- Not feasible to break southern LDZ group into two i.e. NE/EM/WM & WS/SO/SW. This will give sample sizes as low as 28 and 22 in WAR Band 1
- All model fits (R^2 values) are good with 3 groups: All 95% or greater
- Same level of aggregation as applied in 2009, 2008, 2007 and 2006

Demand Against CWV, Monday to Thursday, Non-Holiday

National Aggregation, 14650-29300 MWh pa, WAR Band 1, EM CWV



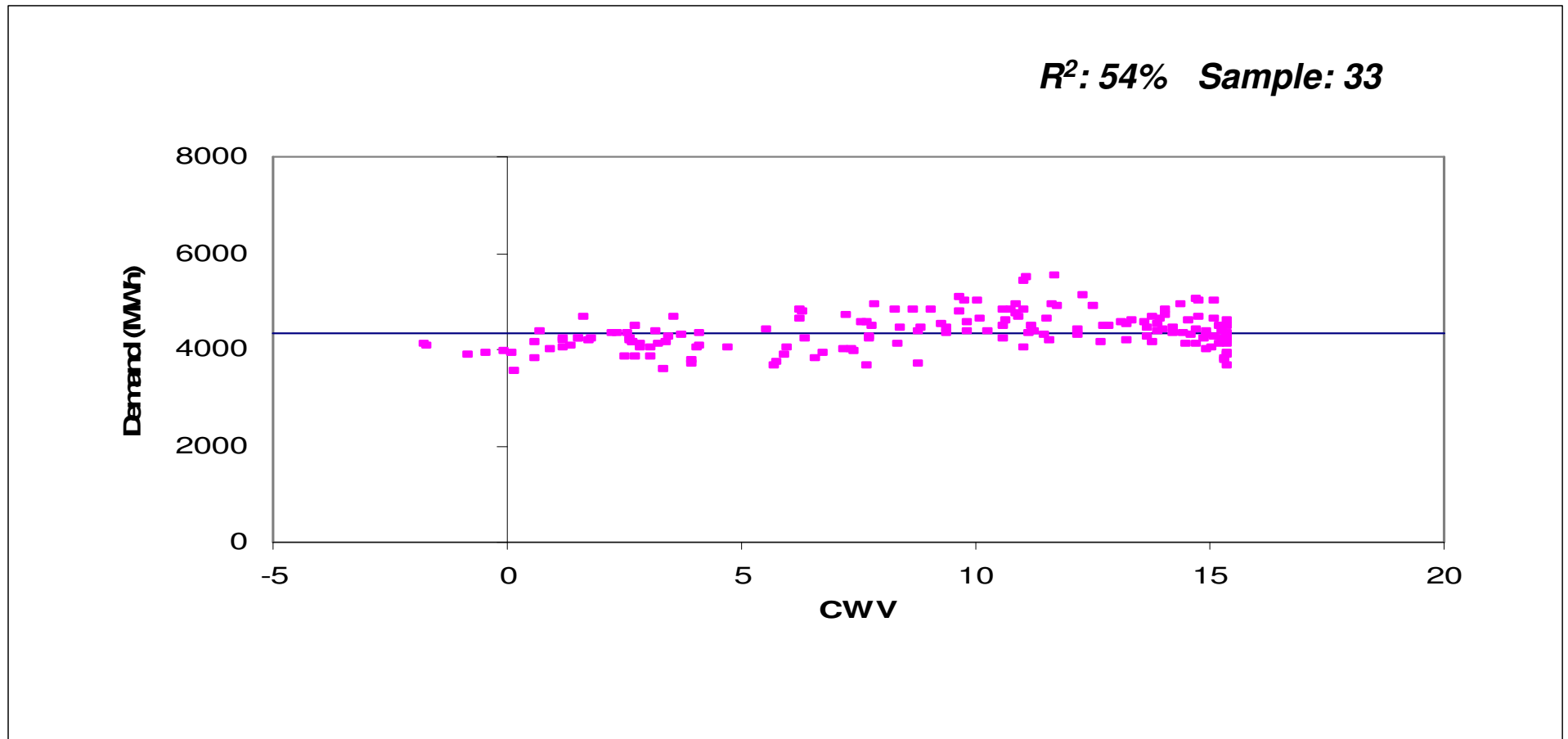
- Band 7 WAR Band 1 in EM LDZ – Weather insensitive hence low R^2 value but does have a day of the week pattern
- This year in line with previous years by showing zero or near zero slope

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 2009, 2008, 2007 and 2006.
- Sample sizes are insufficient for any lower level of aggregation.
- Model fits for WAR band 1 are good – 88% or greater – data sets not strongly weather related compared to other WAR bands.
- Model fits for WAR bands 2, 3 and 4 are 96% or greater.
- Models for WAR band 1 have zero slope (same in 2009, 2008 and 2007)

Demand Against CWV, Monday to Thursday, Non-Holiday

National Aggregation, 29300-58600 MWh pa, WAR Band 1, EM CWV



- Band 8 WAR Band 1 in EM LDZ – Weather insensitive and shows very little day of the week pattern – hence low R^2 value of 54%

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 2009, 2008, 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 93% or greater.
- Model for WAR band 1 has a zero slope and significant data scatter - hence high ILF of 93% and lower R^2 value of 54%.
- The smoothed models for this WAR band 1 EUC have had zero slope since gas year 2005/06 (gas year 2010/11 will be the same).

Large NDM Analysis
> 2,196,000 kWh
Summary

LARGE NDM: EUC Smoothed Models - Provisional Results

- Review of provisional model results

Number 'Straight' (no cut-offs, no summer reductions)	157	(157)
Number with Warm Weather Cut-Off	54	(57)
Number with Summer Reduction	33	(33)
Number with no Slope (weather insensitive)	26	(26)
Number with Cut-Offs and Reductions	3	(0)
Last years figures in (x)		

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

Large NDM – Aggregation Proposals for Analysis

- Therefore:
 - 2,196 to 5,860 MWh pa
 - Consumption Band Analysis by LDZ
 - WAR Band Analysis by 5 LDZ groups
 - 5,860 to 14,650 MWh pa
 - Consumption Band Analysis by LDZ
 - WAR Band Analysis by 3 LDZ groups
 - 14,650 to 29,300 MWh pa
 - Consumption Band Analysis by 4 LDZ groups
 - WAR Band Analysis by National Aggregation
 - 29,300 to 58,600 MWh pa
 - Consumption Band Analysis by 3 LDZ groups
 - WAR Band Analysis by National Aggregation
 - >58,600 MWh pa
 - Consumption Band Analysis by National Aggregation

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
- Model Large NDM EUC bands using similar levels of aggregation to previous years
- Publication of initial proposals: by 30th June
 - Note: Subject to DESC acceptance of data aggregations and resultant EUC demand models then it will be possible to provide an early preview of ALPs, DAFs, Load Factors, agg. NDM SND and WSENS by 11th June
 - Remaining supporting files and documentation will be to UNC deadline
- Consultation: Representations invited by 15th July
- Publication of final proposals: by 15th August