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DESC Technical Work Group

EUC Modelling 2016/17 – Single Year Modelling Results

17th May 2016

Agenda

- Overview of Demand Estimation & Timetable
- Presentation of current completed analysis
  - Modelling basis
  - Single year modelling results for 2015/16 sample data
    - Small NDM analysis
    - Large NDM analysis
- Conclusions and recap on decisions made
- Next Steps

Demand Estimation changes for this year

- UNC Modification 432 is due to be implemented at 5am on 1st October 2016, along with UK Link replacement and changes to the Gemini system.
- The changes in this Modification include a revision of the NDM Nominations and Allocation formula – see new arrangements below:

Supply Point Demand =
(AQ/365) * ALP * (1 + [DAF * WCF])

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

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 **bottom up** estimate of aggregate NDM demand (by EUC / shipper / LDZ) to allow the daily balancing regime to work

  i.e. NDM profiles - Annual Load Profiles (ALPs) and Daily Adjustment Factors (DAFs)

  Note: We will produce both “old” and “new” DAFs for the whole year to cover the transition between regimes

- Provide a means of determining NDM Supply Point capacity

  i.e. NDM EUC Peak Load Factors

- The underlying NDM EUC and aggregate NDM demand models derived each year are intended to deliver these obligations only

- NDM allocation is an initial estimate of demand which will be corrected by Reconciliation

Role of DESC and TWG

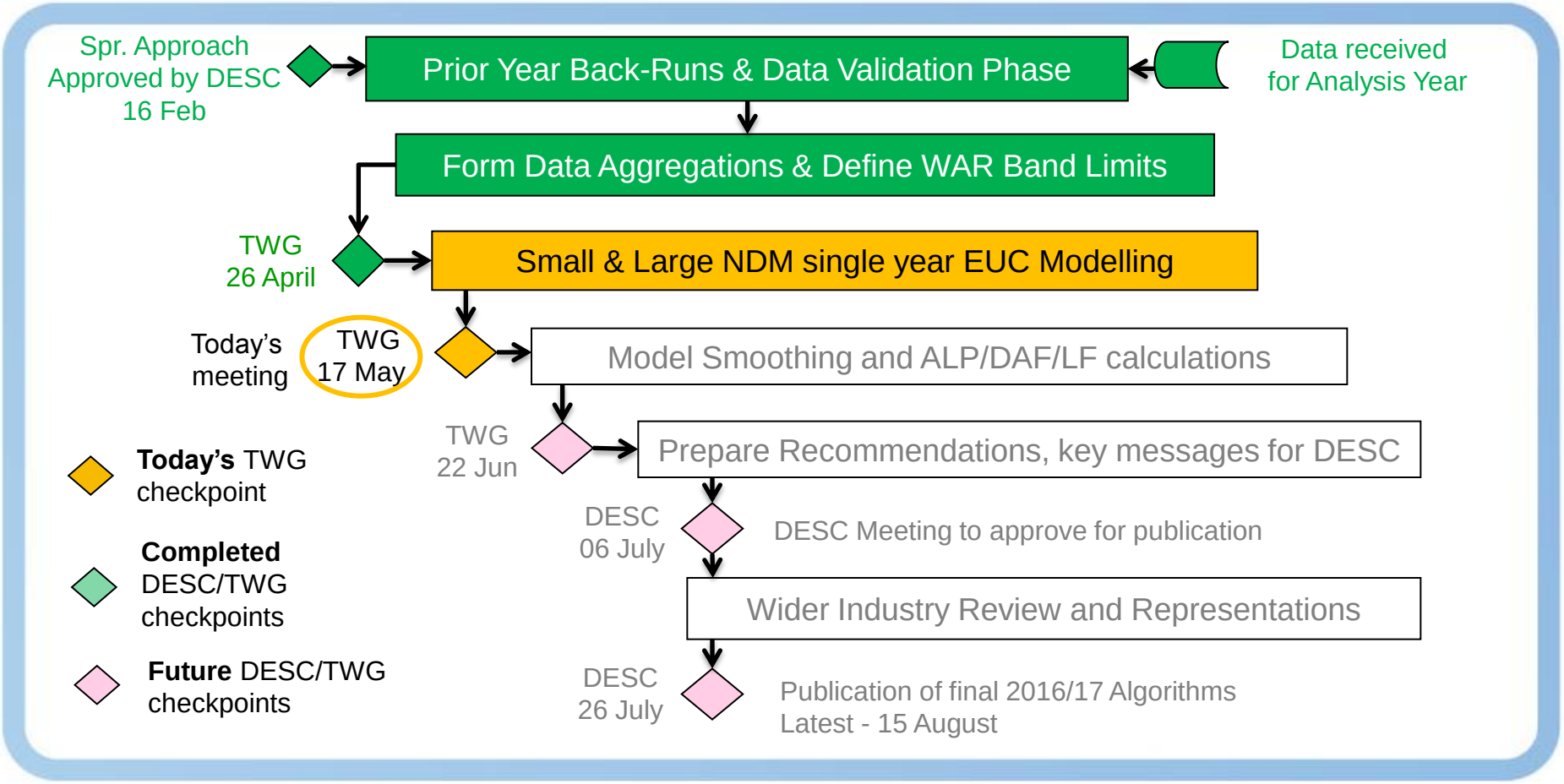
- Responsibilities for Demand Estimation changed following implementation of UNC Modification 331 on 3rd January 2012
- DESC collectively required by UNC to:
  - Submit proposals to Transporters and Users for each Gas Year comprising:
    - EUC Definitions
    - NDM Profiling Parameters (ALPs and DAFs)
    - Capacity Estimation Parameters (PLFs)
  - 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 2016 Modelling Work plan

- Work plan for 2016 Modelling included as part of Spring Approach document which was confirmed and agreed at 16th February DESC meeting

- Work plan provides more transparency of process and includes checkpoints for DESC/TWG review

Agreed 2016 Timetable



Objectives of this Meeting

- Key objectives of May TWG meeting:
  - Provide TWG with overview of all EUC model results from single year modelling (2015/16 data) for both Small and Large NDM
  - TWG to review results and where more than one modelling run has been produced for an EUC band, confirm which should be selected as the final model
- Required Outcome:
  - TWG agreement of all single year models – needed prior to commencing next phase, namely model smoothing

Basis of 2016 Modelling

- The main principles for this year's modelling is described in the 'Spring Approach' document - approved at February DESC meeting
- Key aspects of EUC demand modelling basis for Spring 2016 analysis:
  - Sample data this year has been boosted by Third party provided data, once validated, options for aggregations were agreed by TWG during April
  - In line with last year we shall be using Composite Weather Variable (CWV) definitions and Seasonal Normal basis (SNCWV) agreed by DESC at the end of 2014 and effective from 1st October 2015
  - Holiday codes and rules applicable to Christmas / New Year period are same as used in Spring 2015 (changes last made at Nov 2011 DESC)
  - All demand modelling is data driven – if the modelling results indicate then Holiday & Weekend Factors, Summer Reductions & Cut-Offs will be applied

Basis of 2016 Modelling

- Warm-weather cut-offs:
  - Not applied to EUC models < 293 MWh pa
  - Meaning 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 Sunday before Spring Bank Holiday Monday to last Sunday in September – i.e. 24th May to 27th September 2015
  - Applies along with the more general summer holiday period in July and August
  - Applied by modelling results over 3 years
- Modelling methodology in NDM Algorithms Booklet (Sections 3 & 4)

Purpose of Analysis

- Analysis carried out aims to assist in the creation of profiles based on the relationship between demand and weather
- Opportunity to view results so far and identify the best fit model based on available data samples
- 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 (ILFs)
  - Charts of Monday to Thursday demands vs CWVs with seasons highlighted
  - In some instances to support decision making Monthly Residuals also provided

Indicative Load Factors (ILF) & Peak Load Factors (PLF)

- ILFs provide an indication of the weather sensitivity for a model
- ILFs are only used to compare prospective demand models as an aid to making decisions on model choice. There should be distinguishable ILF values between consumption and WAR bandings
- ILFs are not the same as proper PLFs and their values are not an indicator of the values of proper PLFs (ILFs not used for determining NDM capacities). Formulas below:
  - PLF = average daily demand (i.e. AQ/365) / 1 in 20 peak demand
  - ILF = (AQ/365) / model demand corresponding to 1 in 20 CWV

Small NDM Analysis

EUC Bands: 1 to 4

Range: <2,196 MWh

Small NDM Analysis

- Current EUC Bands / Consumption Ranges for Small NDM:
  - Band 1: 0 – 73.2 MWh pa
  - Band 2: 73.2 – 293 MWh pa
  - Band 3: 293 – 732 MWh pa
  - Band 4: 732 – 2,196 MWh pa
- There are no proposed changes to EUC definitions for Gas Year 2016/17

Total NDM Population Counts: Supply Point & AQ

EUC Bands: Range	% of Total NDM	
	Total AQ	Total SP Count
Band 1: 0 to 73.2 MWh pa	71.6%	98.78%
Bands 1 to 2: 0 to 293 MWh pa	78.1%	99.67%
Bands 1 to 4: 0 to 2,196 MWh pa	88.6%	99.97%
Bands 5 to 9: >2,196 MWh pa	11.4%	0.03%

- On an AQ basis:
  - Small NDM is by far the main component of the overall NDM sector
  - The range 0-73.2 MWh pa constitutes nearly 3/4 of overall NDM
  - The range 0-293 MWh pa constitutes nearly 4/5 of overall NDM
  - The range 0-2196 MWh pa constitutes nearly 9/10 of overall NDM
  - Large NDM is very much a minority component of overall NDM

Small NDM Analysis

EUC Consumption Bands: 1 to 4

Range: <2,196 MWh

Small NDM Supply Points (<2,196 MWh pa)

Agreed Sample Data Aggregations

EUC Bands: Range	Comments on 2015/16 data TWG Agreed Aggregations
Band 1: 0 to 73.2 MWh pa	Individual LDZ analysis (NW/WN combined)
Band 2: 73.2 to 293 MWh pa	Individual LDZ analysis (NW/WN combined)
Band 3: 293 to 732 MWh pa	Individual LDZ analysis (NW/WN combined) **AND** Individual LDZ analysis (NW/WN and WS/SW combined)
Band 4: 732 to 2,196 MWh pa	Individual LDZ analysis (NW/WN combined)

- Aggregations as agreed at April TWG
- In the main sufficient data available to allow individual LDZ analysis
- Low sample number in WS in Band 03, therefore 2 modelling runs undertaken

Small NDM Modelling Results

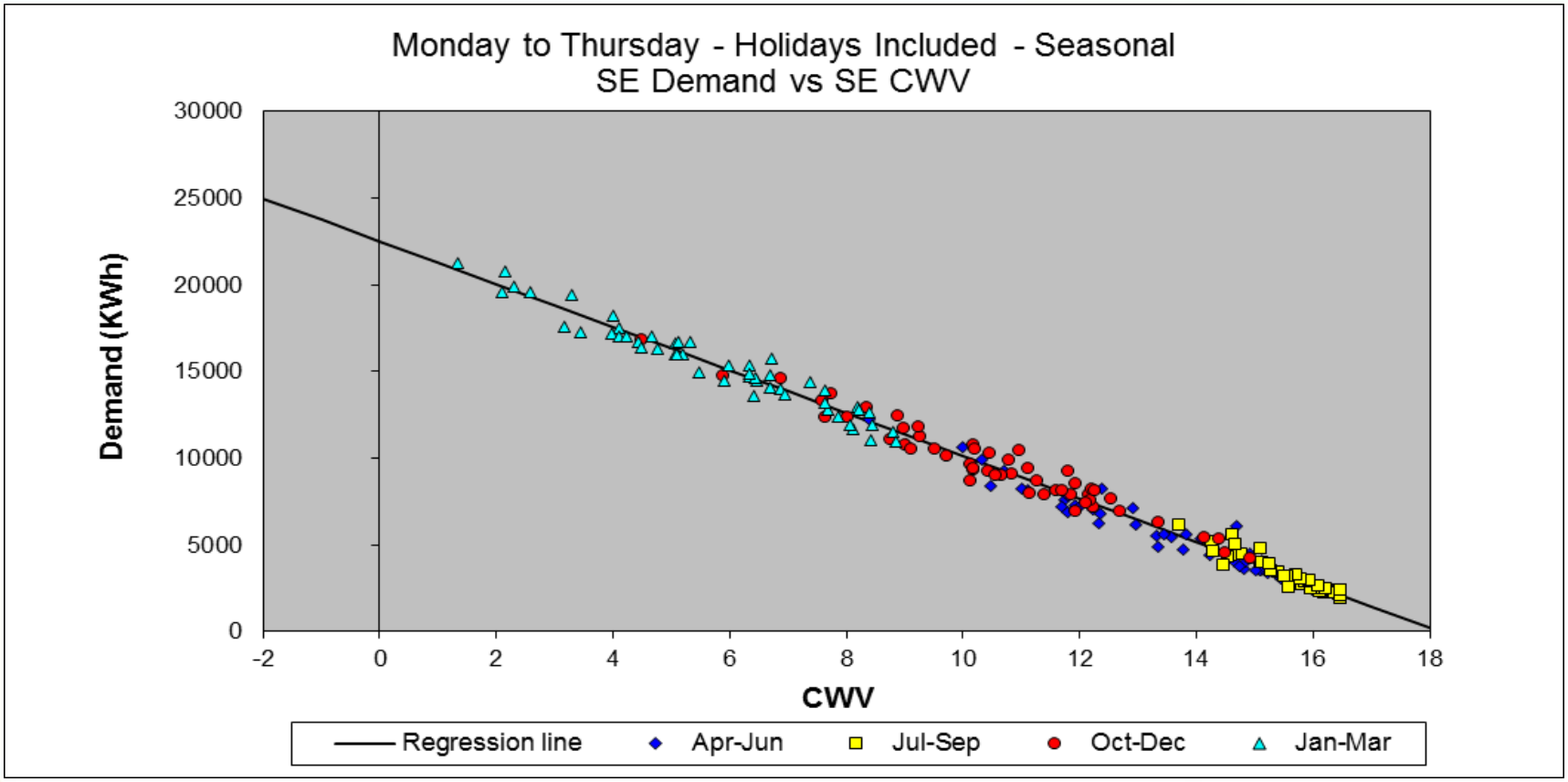
EUC Band 1: 0 – 73.2 MWh pa Domestic Sites

	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	34%	98%	211
NO	35%	98%	208
NW / WN	32%	97%	209
NE	34%	97%	218
EM	32%	98%	234
WM	31%	98%	218
WS	31%	97%	210
EA	32%	98%	250
NT	30%	99%	213
SE	29%	99%	207
SO	29%	99%	224
SW	29%	98%	214

- ILFs generally in line with last year
- R^2 on average slightly lower than last year but remain good results
- No TWG decision required for this EUC Band
- Results for highlighted LDZs showing more detail to follow

Small NDM Modelling Results

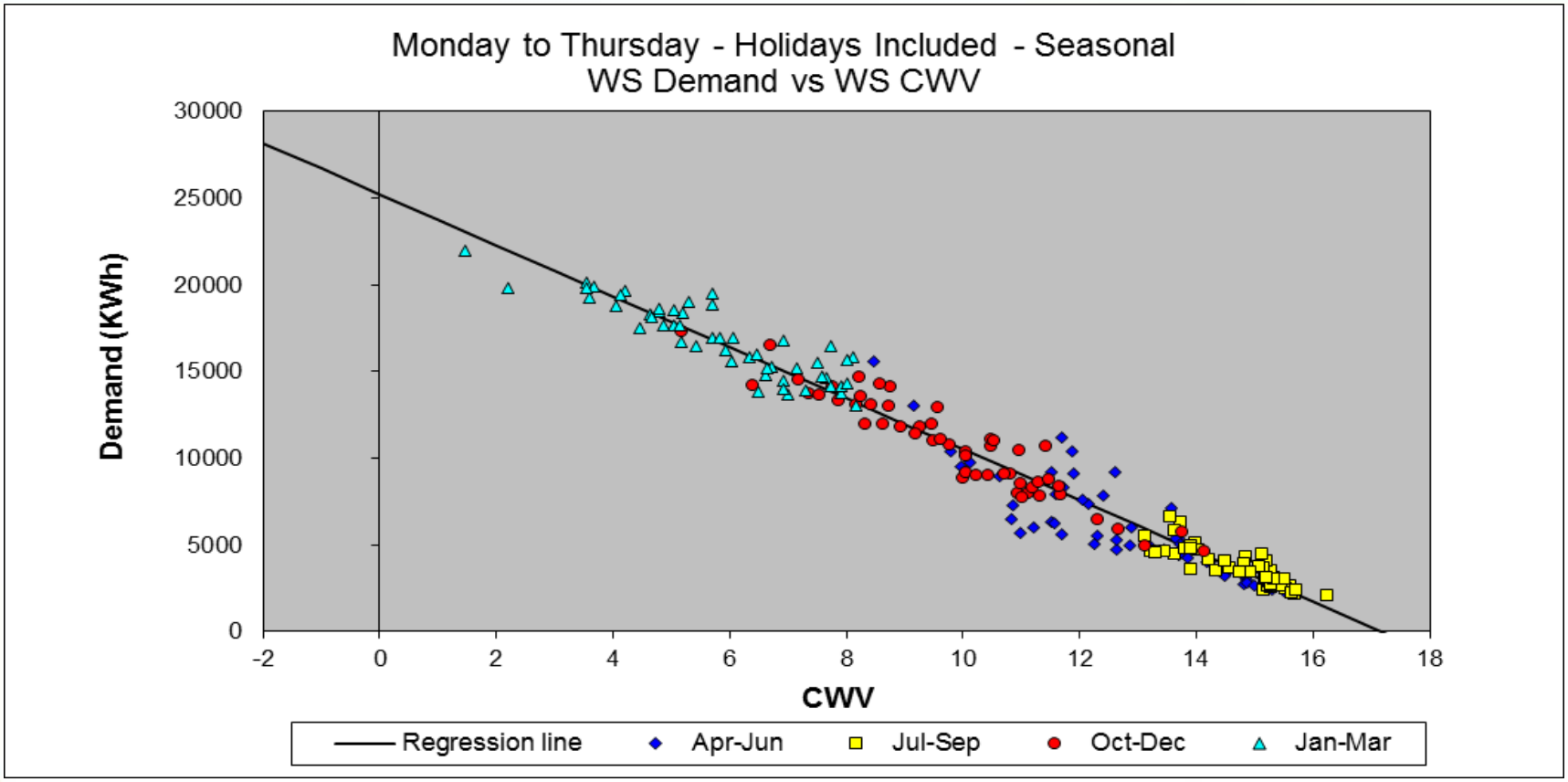
SE LDZ, EUC Band 1: 0 - 73.2 MWh pa



- SE has highest R^2 of the models in this band – 99% (all days)

Small NDM Modelling Results

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



- WS has lowest R^2 of the models in this band – 97% (all days)
- More scatter evident

Small NDM Modelling Results

EUC Band 2: 73.2 – 293 MWh pa

	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	35%	97%	132
NO	38%	97%	125
NW / WN	33%	95%	185
NE	33%	96%	120
EM	29%	96%	185
WM	30%	96%	140
WS	29%	97%	71
EA	30%	96%	197
NT	34%	97%	196
SE	34%	96%	171
SO	28%	97%	148
SW	31%	96%	134

- ILFs for majority of LDZs are comparable to last year
- R^2 on average slightly lower than last year but remain good results
- No TWG decision required for this EUC Band

EUC Band 3: 293 – 732 MWh pa
Comparison of Runs

Modelling Run Decisions	Progress
Small NDM EUC Band 3 (CB)	NEXT
Large NDM EUC Band 5 (CB)	
Large NDM EUC Band 6 (CB)	
Large NDM EUC Band 7 & 8 (CB)	
Large NDM EUC Band 5 (WB)	
Large NDM EUC Band 6 (WB)	

Small NDM Modelling Results

DECISION: EUC Band 3: 293 – 732 MWh pa

	Run1: Individual LDZ (NW/WN Combined)			Run 2: Individual LDZ (NW/WN and WS/SW Combined)		
SC	35%	97%	170	35%	97%	170
NO	34%	97%	118	34%	97%	118
NW / WN	32%	95%	176	32%	95%	176
NE	34%	96%	123	34%	96%	123
EM	30%	96%	166	30%	96%	166
WM	28%	96%	130	28%	96%	130
EA	30%	97%	185	30%	97%	185
NT	33%	98%	186	33%	98%	186
SE	31%	97%	205	31%	97%	205
SO	27%	96%	173	27%	96%	173
WS	33%	96%	20	30%	97%	120
SW	29%	97%	100			

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- Results above for both modelling runs including for combined WS/SW
- Good results overall for individual LDZs
- Highlighted results for WS and SW models are shown in more detail on subsequent slides to assist TWG with decision

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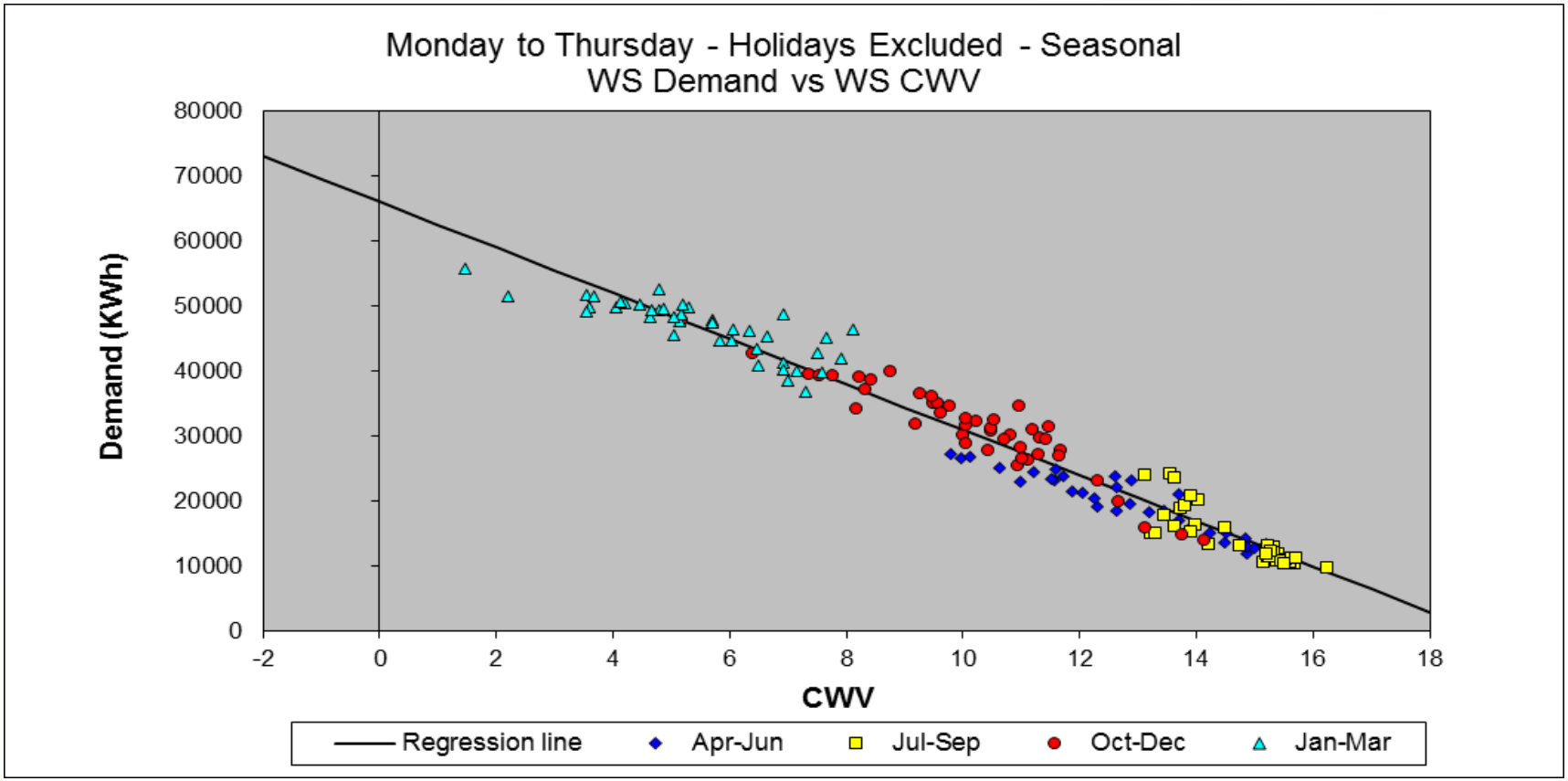
EUC Band 3: 293 – 732 MWh pa

Run 1: Individual LDZ (NW/WN combined)

Small NDM Modelling Results

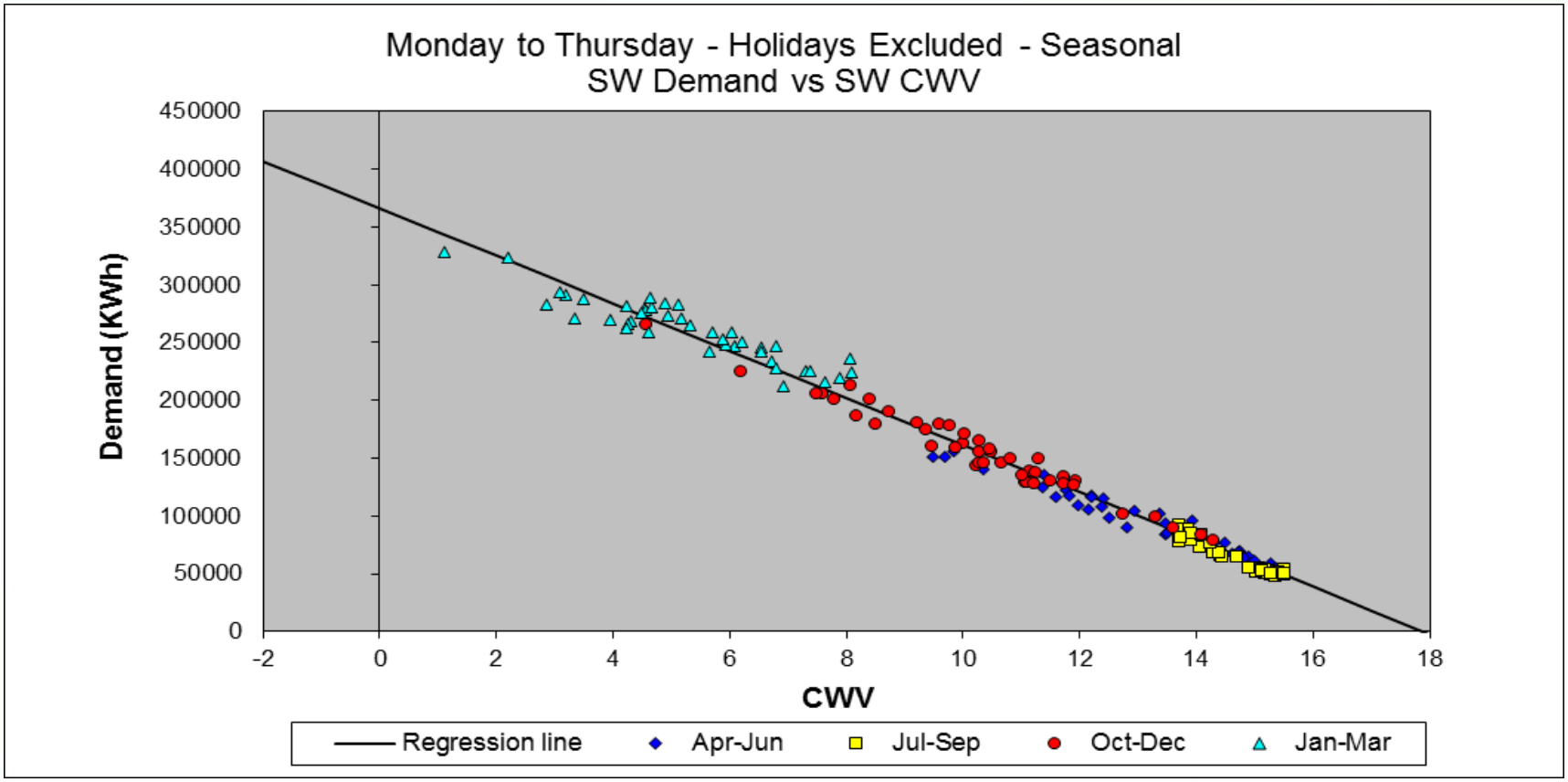
WS LDZ, EUC Band 3: 293 - 732 MWh pa



Run	ILF	R^2 (All days)	Sample
WS	33%	96%	20
WS / SW	30%	97%	120

Small NDM Modelling Results

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



Run	ILF	R^2 (All days)	Sample
SW	29%	97%	100
WS / SW	30%	97%	120

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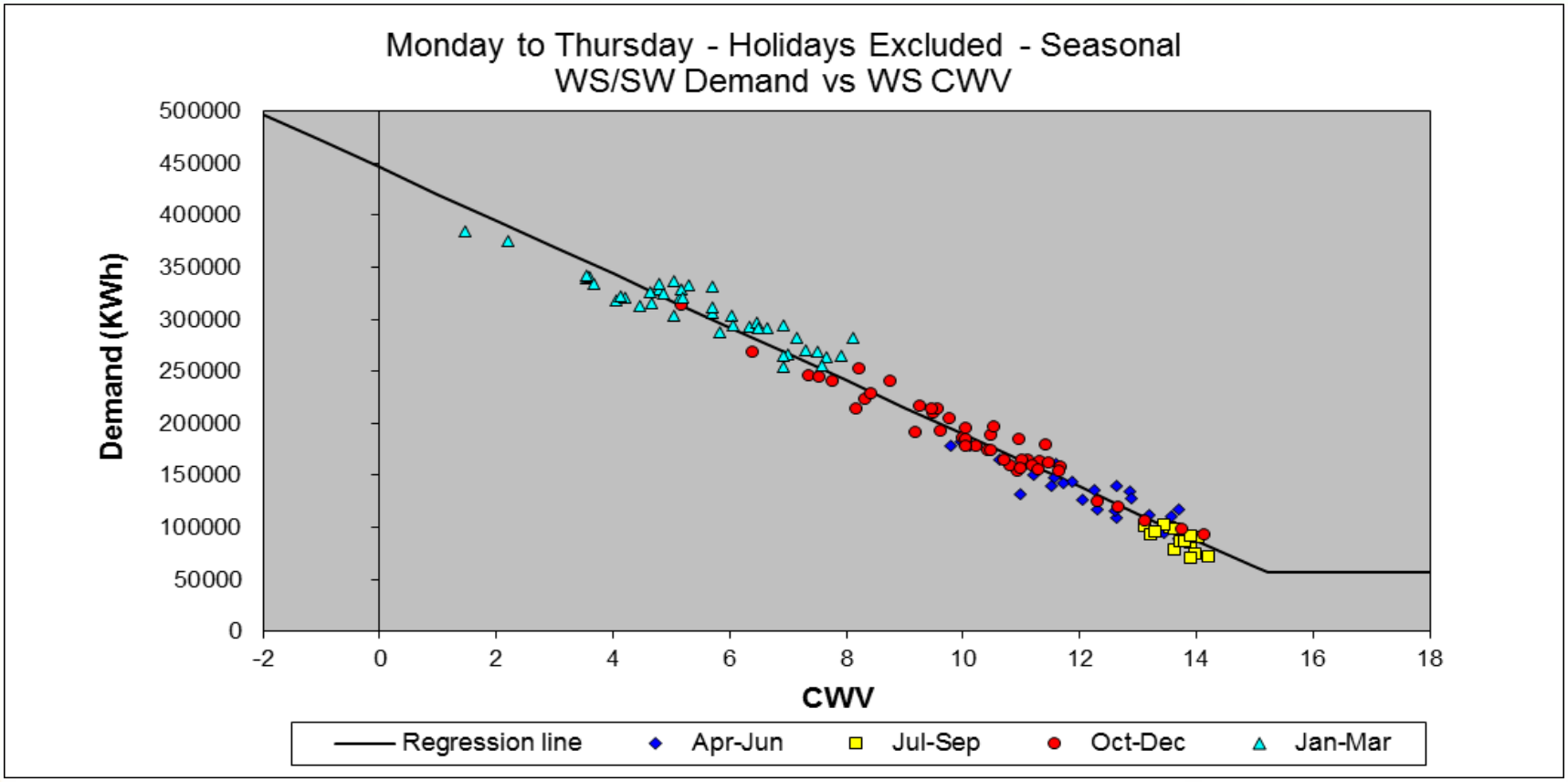
EUC Band 3: 293 – 732 MWh pa

Run 2: Individual LDZ (NW/WN and WS/SW combined)

Small NDM Modelling Results

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



Run	ILF	R^2 (All days)	Sample
WS	33%	96%	20
WS / SW	30%	97%	120

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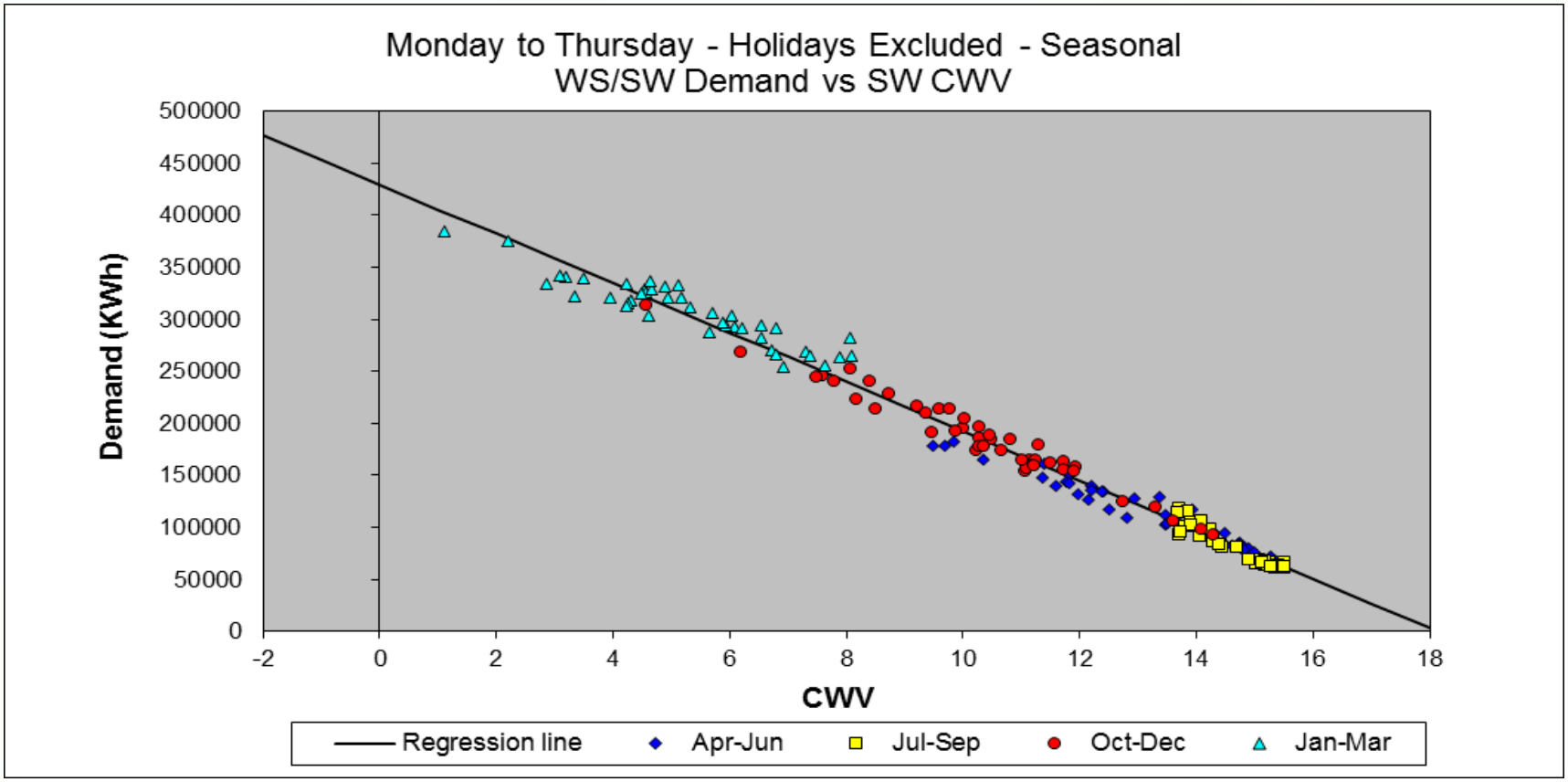
Small NDM Modelling Results

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



Run	ILF	R^2 (All days)	Sample
SW	29%	97%	100
WS / SW	30%	97%	120

xoserve

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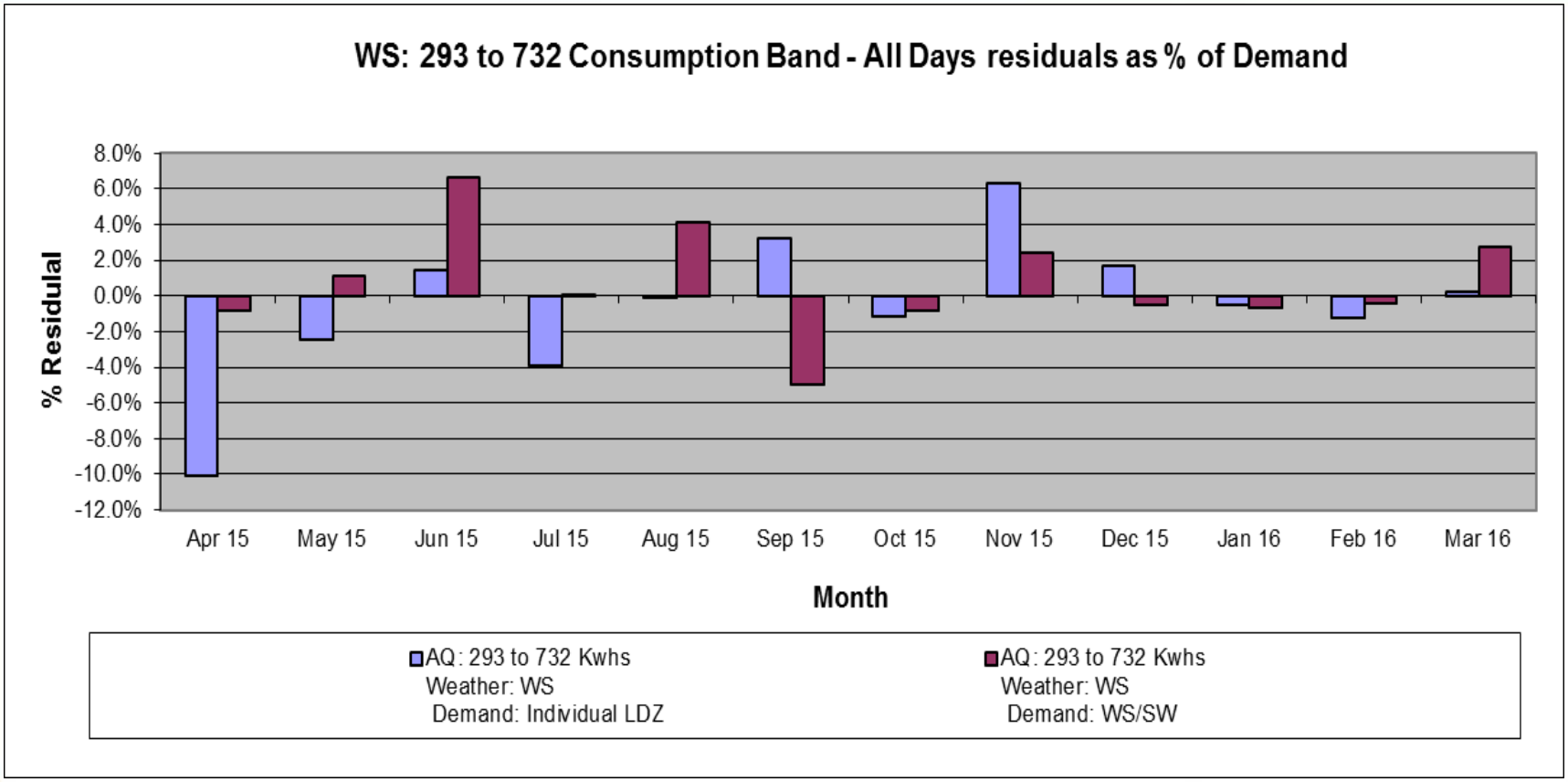
Small NDM Modelling Results

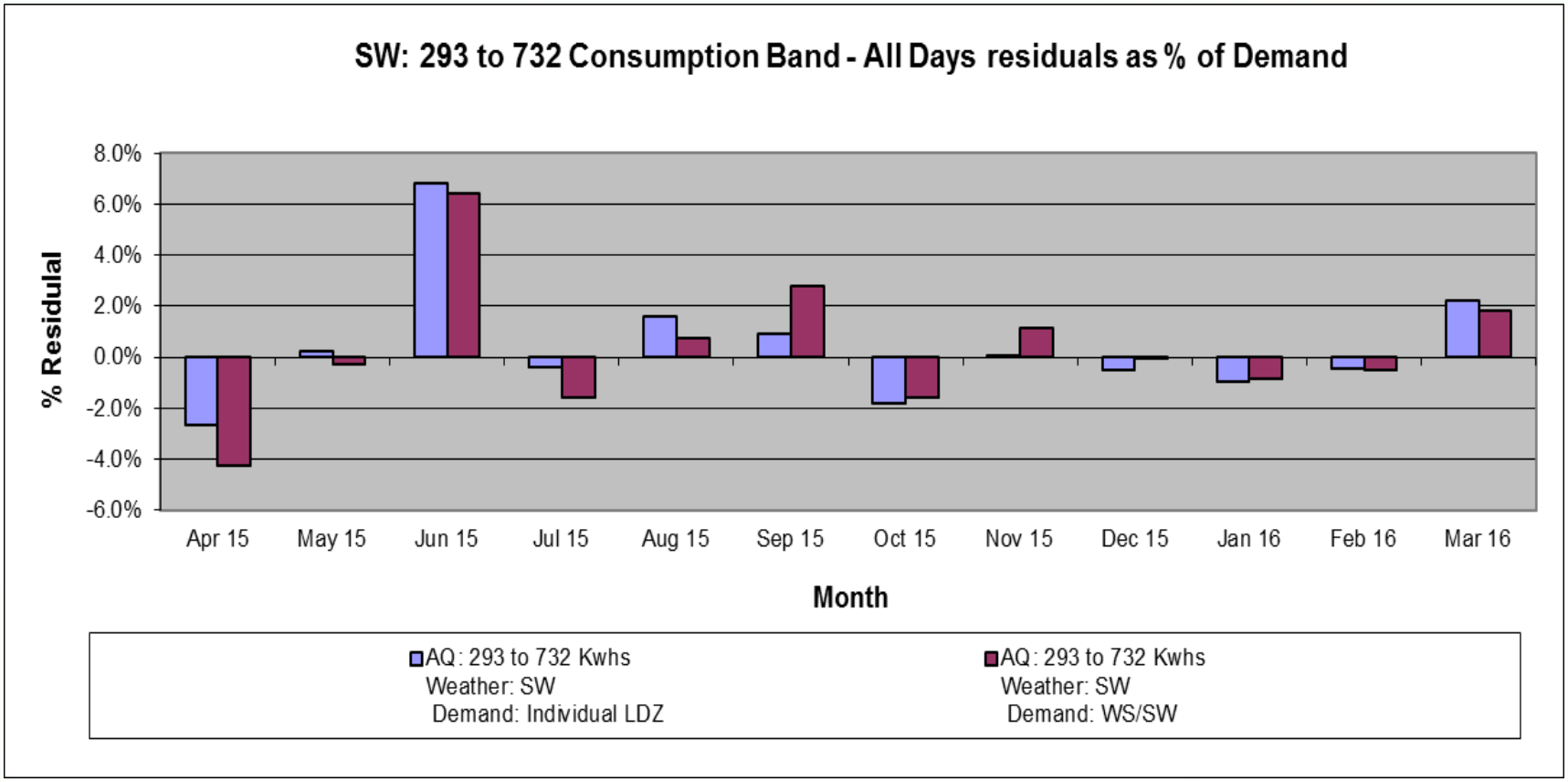
Comparison: WS LDZ, EUC Band 3: 293 - 732 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested

Small NDM Modelling Results

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



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested
- **TWG to decide on preferred model**

Small NDM Modelling Results

EUC Band 4: 732 – 2196 MWh pa

	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	35%	97%	325
NO	34%	97%	164
NW / WN	34%	96%	287
NE	34%	96%	221
EM	35%	98%	216
WM	32%	96%	241
WS	31%	96%	49
EA	35%	98%	237
NT	36%	98%	292
SE	35%	98%	287
SO	31%	98%	259
SW	34%	98%	116

- ILFs for majority of LDZs are comparable to last year
- R^2 on average slightly lower than last year but remain good results
- No TWG decision required for this EUC Band

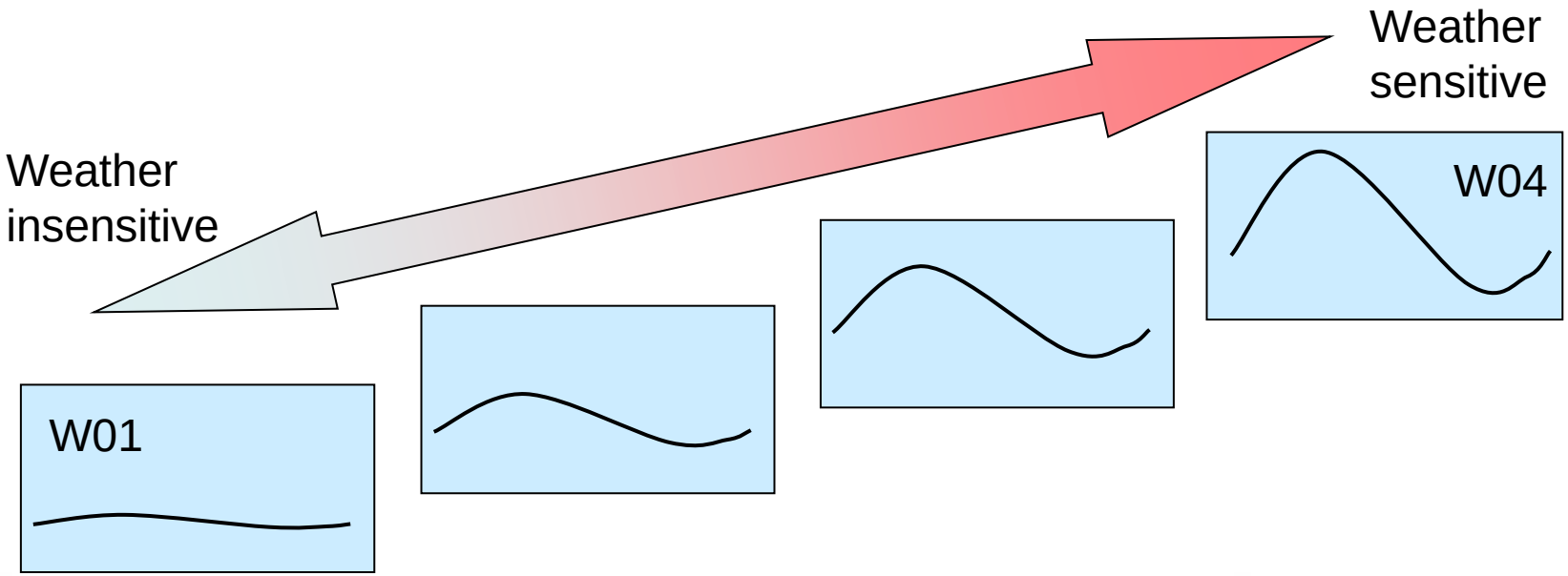
Small NDM Analysis

EUC WAR Bands: 3 to 4

Range: 293 to 2,196 MWh

Winter: Annual Ratio (WAR) Band EUCs

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



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 2015/16)
  - This is essential because supply points will be assigned to these newly defined WAR band EUCs (for 2016/17) based on their (Dec-Mar) consumption behaviour over winter 2015/16
  - 2015/16 was warmer than 2014/15, so thresholds can expect to decrease this year
- WAR Band limits for Spring 2016 Analysis were discussed and agreed at April TWG

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

EUC Bands: Range	Comments on 2015/16 data TWG Agreed Aggregations
Band 1: 0 to 73.2 MWh pa	Not generally Monthly read – no WAR Bands
Band 2: 73.2 to 293 MWh pa	Not generally Monthly read – no WAR Bands
Band 3 and Band 4 (combined): 293 to 2196 MWh pa	Individual LDZ analysis (NW/WN and WS/SW combined)

- Aggregations as agreed at April TWG

Small NDM Modelling Results

WAR Band Analysis: 293 to 2196 MWh pa

	WAR Banding											
	0.00 – 0.412			0.412 – 0.488			0.488 – 0.587			0.587 – 1.00		
SC	66%	90%	70	44%	98%	176	30%	96%	180	22%	95%	69
NO	63%	82%	48	45%	97%	79	31%	97%	94	21%	94%	61
NW / WN	60%	93%	95	43%	96%	136	28%	94%	144	20%	95%	88
NE	57%	95%	60	45%	97%	111	30%	96%	95	21%	92%	78
EM	62%	96%	75	42%	98%	122	29%	98%	111	19%	94%	74
WM	57%	97%	78	39%	97%	108	28%	96%	89	19%	95%	96
WS / SW	63%	89%	74	42%	97%	66	28%	97%	67	20%	95%	78
EA	63%	91%	77	43%	97%	119	29%	97%	144	20%	95%	82
NT	67%	94%	125	41%	97%	137	30%	98%	144	19%	95%	72
SE	61%	91%	104	43%	96%	156	28%	97%	138	20%	95%	94
SO	57%	87%	90	37%	96%	129	26%	97%	126	18%	95%	87

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- ILFs show clear distinction across WAR bands for all LDZs
- Overall boost to Small NDM sample sizes has meant WAR Band models are well sampled e.g. NO WAR Band 4 last year only had 18 supply points
- No TWG decision required for this EUC Band

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Small NDM Analysis Summary

- Good R^2 Coefficients for majority of Consumption Band and WAR Band models
- Decrease in sample numbers available for modelling for EUC Band 1 however still more than sufficient to produce robust models this year for individual LDZ analysis
- For EUC Bands 2 to 4 there has been a significant increase in sample numbers available, enabling us to continue mostly with individual LDZ analysis and providing good robust models
- *Recap on decision made for EUC Band 3 (WS / SW LDZ)*
- Are TWG happy to move to model smoothing phase with the Small NDM modelling results presented today ?

Large NDM Analysis

EUC Bands: 5 to 9
Range: >2,196 MWh

Large NDM Analysis (>2,196 MWh pa)

- Current EUC Bands / Consumption Ranges for Large NDM:
  - Band 5: 2,196 to 5,860 MWh
  - Band 6: 5,860 to 14,650 MWh
  - Band 7: 14,650 to 29,300 MWh
  - Band 8: 29,300 to 58,600 MWh

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

  - Band 9: >58,600 MWh — 1 Contingency Band for sites which should be DM
- Large NDM represents approx. 11.4% of total NDM load and 0.03% of supply points.
- Subsequently, lower sample numbers available in Large NDM sector so underlying demand modelling can be done on basis of more broadly aggregated bands
  - As from Spring Approach 2014 DESC agreed to combine the models for the ranges 14,650 to 29,300 and 29,300 to 58,600 MWh (for modelling purposes only)

Total NDM Population Counts: Supply Point & AQ

EUC Bands: Range	% of Total NDM	
	Total AQ	Total SP Count
Band 1: 0 to 73.2 MWh pa	71.6%	98.78%
Bands 1 to 2: 0 to 293 MWh pa	78.1%	99.67%
Bands 1 to 4: 0 to 2,196 MWh pa	88.6%	99.97%
Bands 5 to 9: >2,196 MWh pa	11.4%	0.03%

- On an AQ basis:
  - Small NDM is by far the main component of the overall NDM sector
  - The range 0-73.2 MWh pa constitutes nearly 3/4 of overall NDM
  - The range 0-293 MWh pa constitutes nearly 4/5 of overall NDM
  - The range 0-2196 MWh pa constitutes nearly 9/10 of overall NDM
  - Large NDM is very much a minority component of overall NDM

Large NDM Analysis

EUC Consumption Bands: 5 to 9
Range: >2,196 MWh

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

EUC Bands: Range	Comments on 2015/16 data TWG Agreed Aggregations
Band 5: 2,196 to 5,860 MWh pa	Individual LDZ analysis (NW/WN combined) **AND** Individual LDZ analysis (NW/WN and WS/SW combined)
Band 6: 5,860 to 14,650 MWh pa	Individual LDZ analysis (NW/WN combined) **AND** Individual LDZ analysis (NW/WN and WS/SW combined)
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	Individual LDZ analysis (NW/WN combined) **AND** Individual LDZ analysis (NW/WN,WS/SW and SE/SO combined)
Band 9: >58,600 MWh pa	National

- Aggregations as agreed at April TWG
- Decisions to be made on models for Consumption bands 5, 6 , 7 and 8

EUC Band 5: 2,196 – 5,860 MWh pa
Comparison of Runs

Modelling Run Decisions	Progress
Small NDM EUC Band 3 (CB)	
Large NDM EUC Band 5 (CB)	NEXT
Large NDM EUC Band 6 (CB)	
Large NDM EUC Band 7 & 8 (CB)	
Large NDM EUC Band 5 (WB)	
Large NDM EUC Band 6 (WB)	

Large NDM Modelling Results

DECISION: EUC Band 5: 2,196 – 5,860 MWh pa

	Run1: Individual LDZ (NW/WN Combined)			Run 2: Individual LDZ (NW/WN and WS/SW Combined)		
SC	40%	98%	233	40%	98%	233
NO	39%	97%	97	39%	97%	97
NW / WN	39%	97%	172	39%	97%	172
NE	39%	97%	113	39%	97%	113
EM	39%	97%	145	39%	97%	145
WM	36%	98%	168	36%	98%	168
EA	41%	97%	84	41%	97%	84
NT	39%	98%	160	39%	98%	160
SE	42%	98%	139	42%	98%	139
SO	39%	98%	113	39%	98%	113
WS	38%	97%	27	38%	97%	93
SW	38%	96%	66			

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- Results above for both modelling runs including for combined WS/SW
- Good results overall for individual LDZs
- Highlighted results for WS and SW models are shown in more detail on subsequent slides to assist TWG with decision

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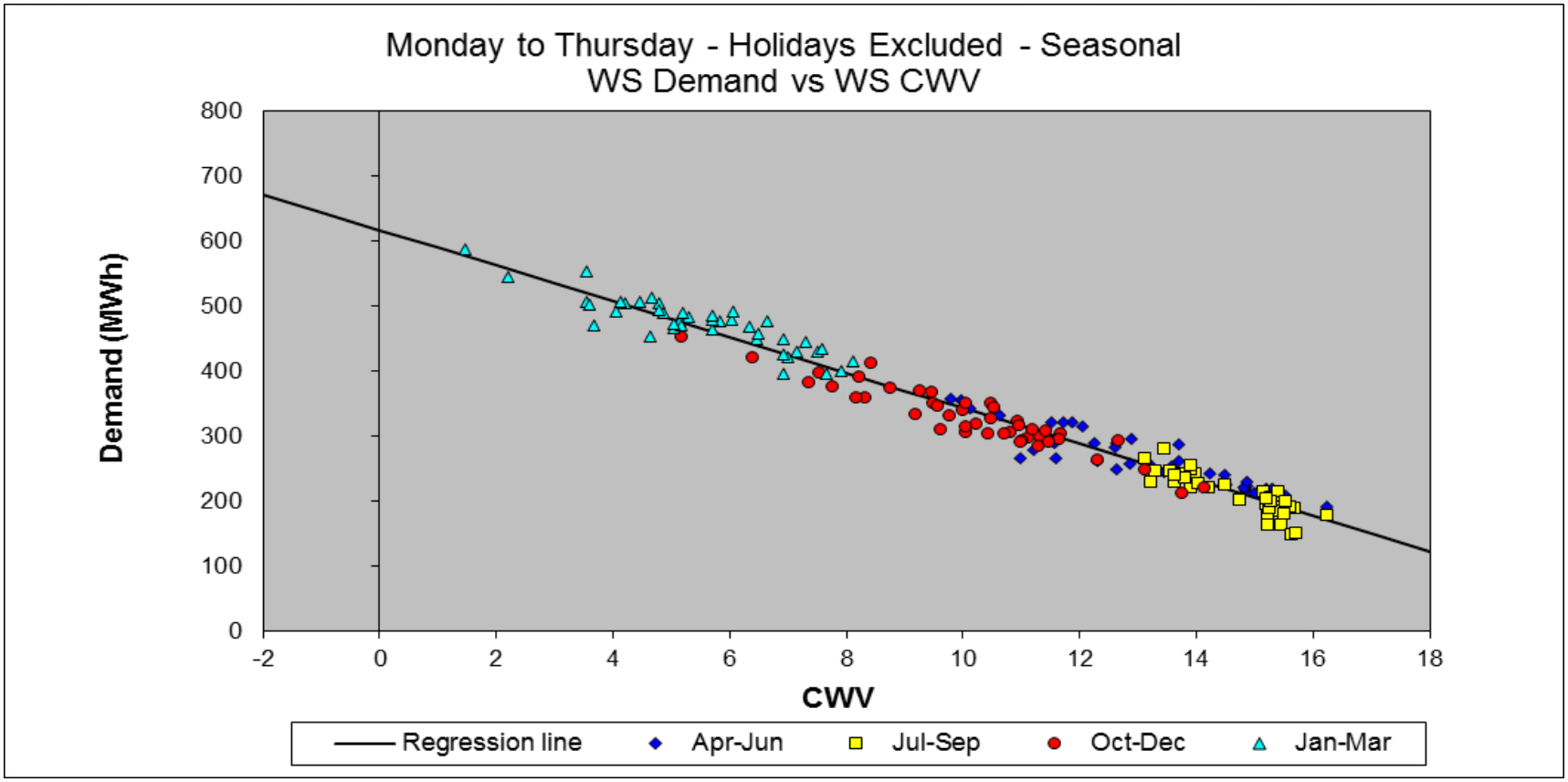
EUC Band 5: 2,196 – 5,860 MWh pa

Run 1: Individual LDZ (NW/WN combined)

Large NDM Modelling Results

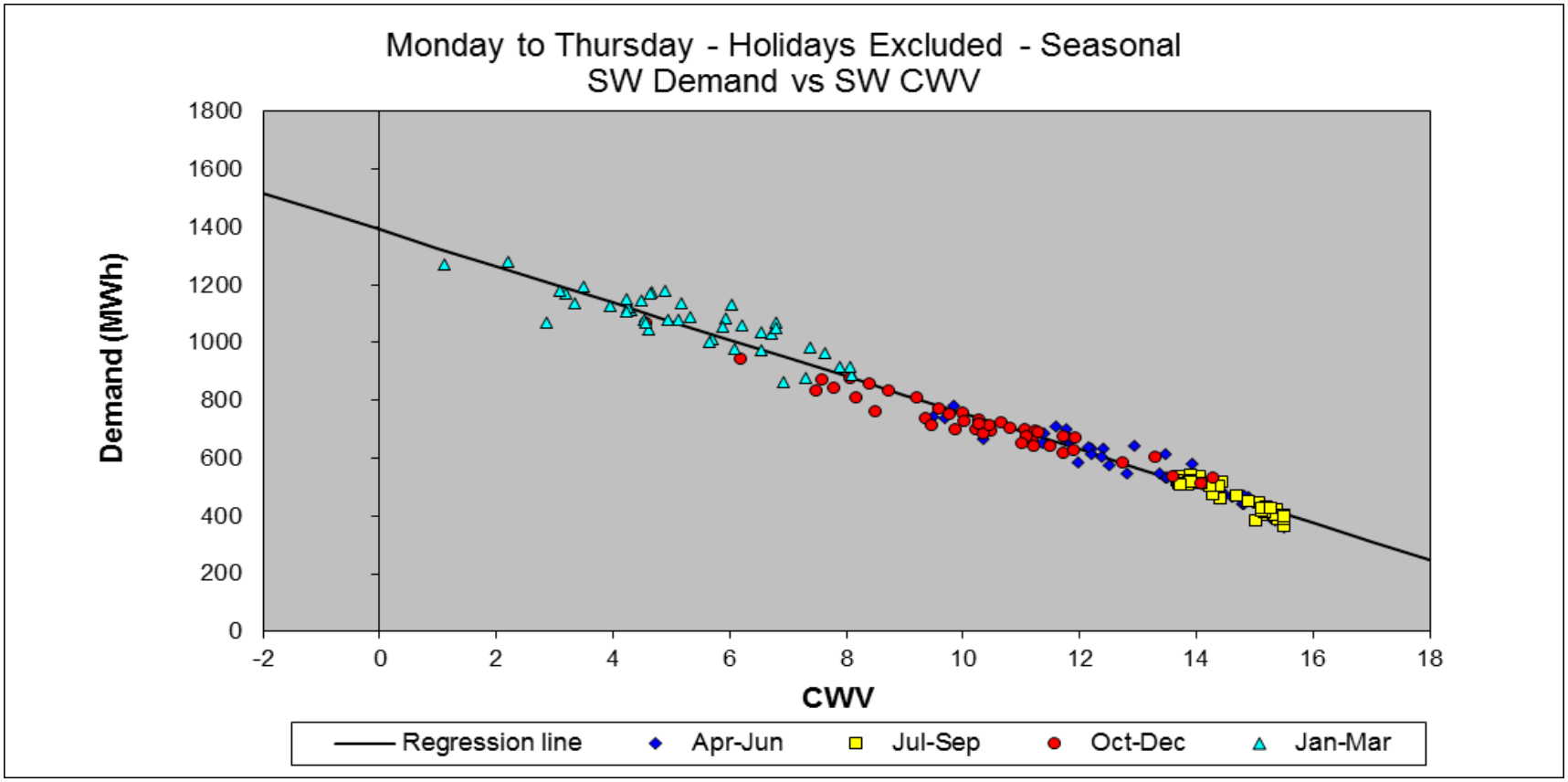
WS LDZ, EUC Band 5: 2,196 – 5,860 MWh pa



Run	ILF	R^2 (All days)	Sample
WS	38%	97%	27
WS / SW	38%	97%	93

Large NDM Modelling Results

SW LDZ, EUC Band 5: 2,196 – 5,860 MWh pa



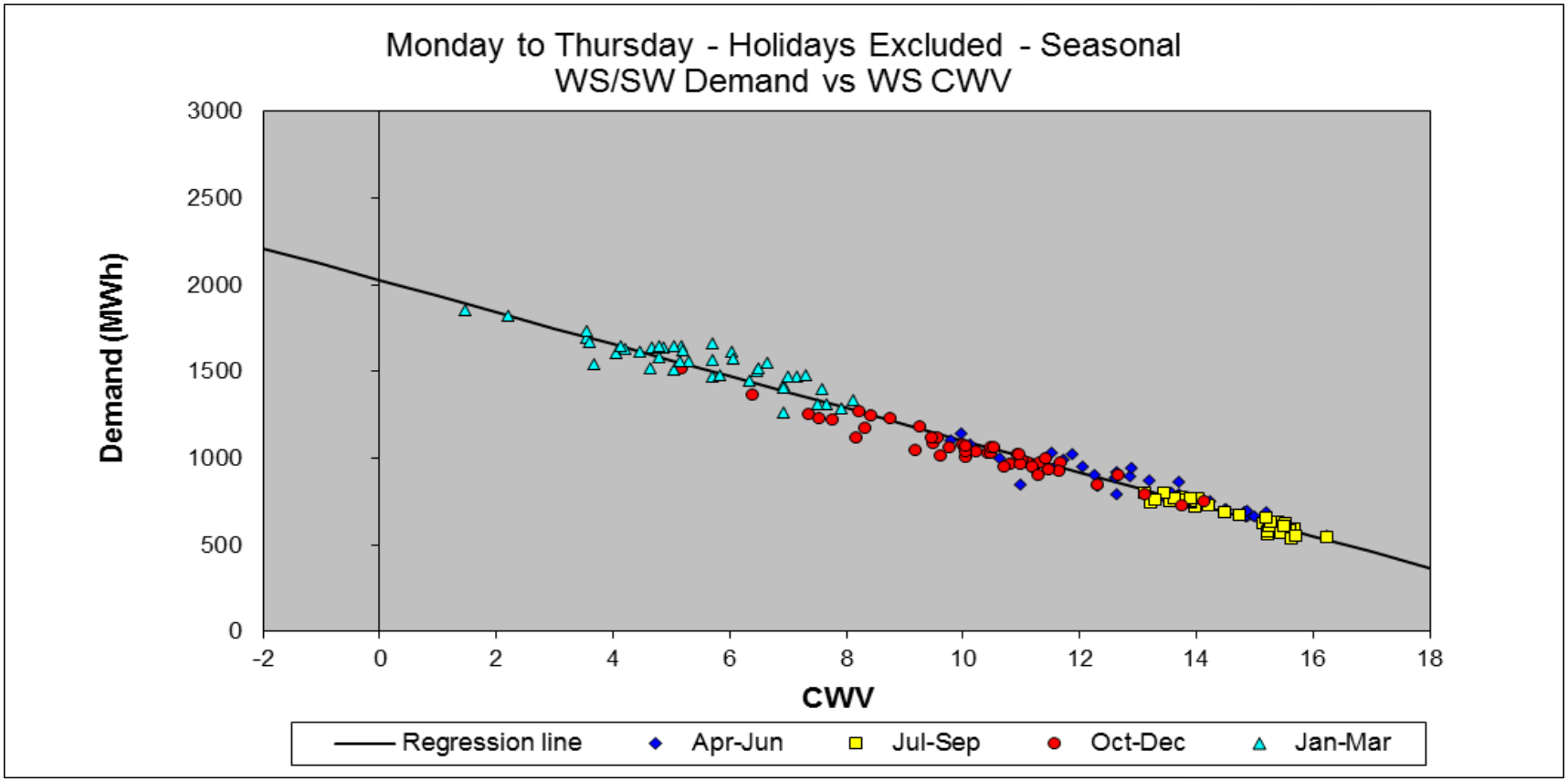
Run	ILF	R^2 (All days)	Sample
SW	38%	96%	66
WS / SW	38%	97%	93

EUC Band 5: 2,196 – 5,860 MWh pa

Run 2: Individual LDZ (NW/WN and WS/SW combined)

Large NDM Modelling Results

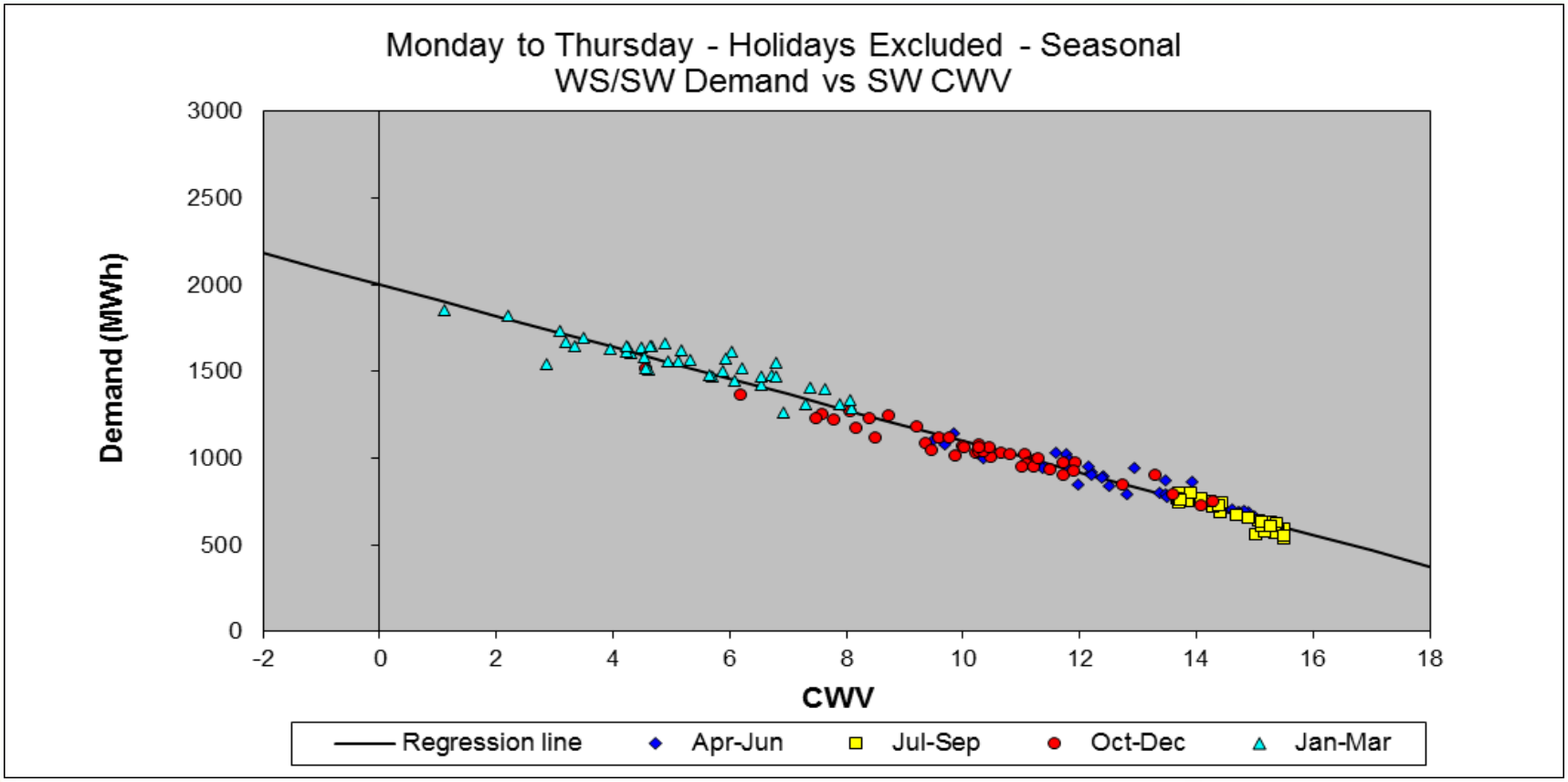
WS LDZ, EUC Band 5: 2,196 – 5,860 MWh pa



Run	ILF	R^2 (All days)	Sample
WS	38%	97%	27
WS / SW	38%	97%	93

Large NDM Modelling Results

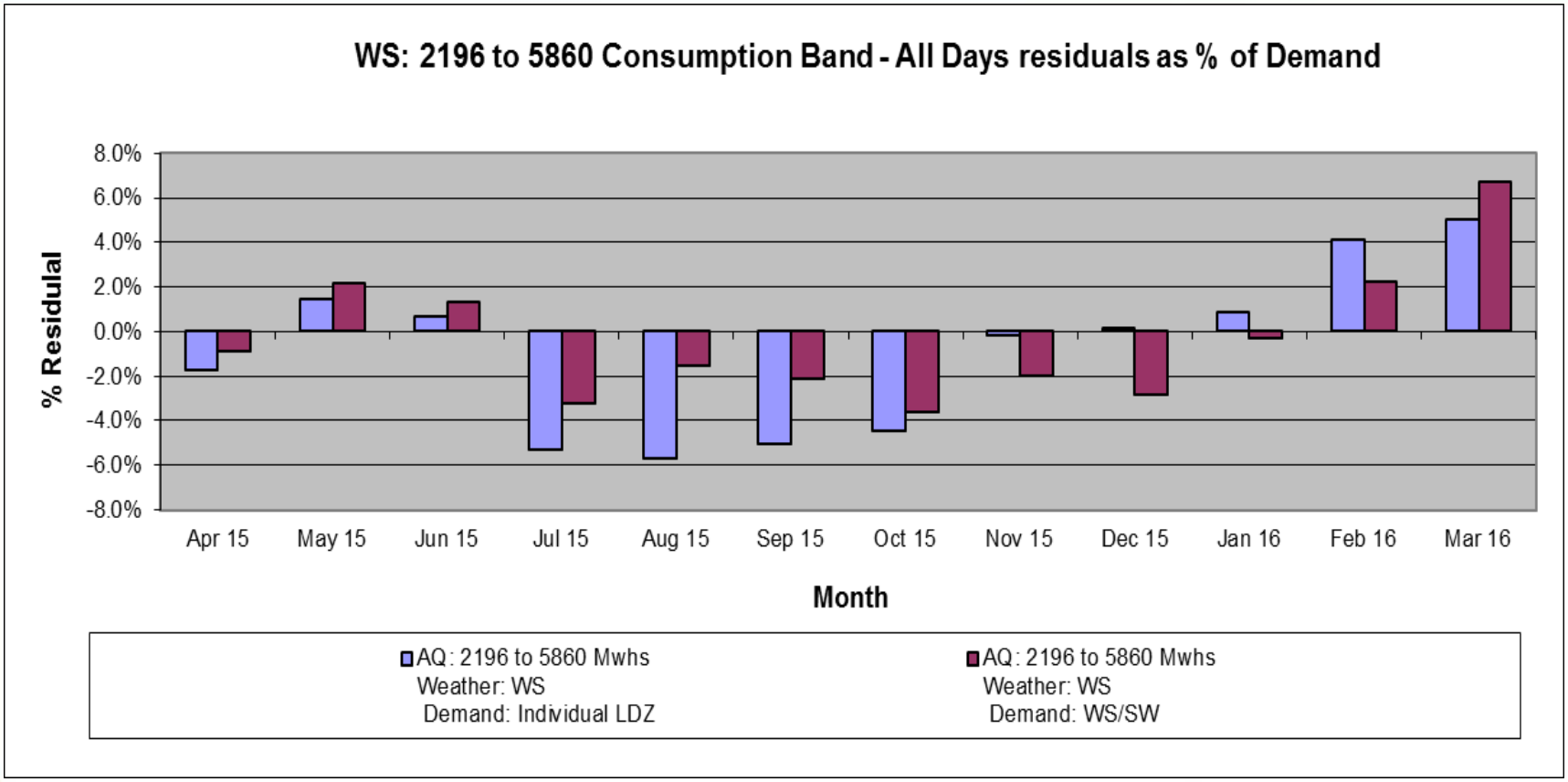
SW LDZ, EUC Band 5: 2,196 – 5,860 MWh pa



Run	ILF	R^2 (All days)	Sample
SW	38%	96%	66
WS / SW	38%	97%	93

Large NDM Modelling Results

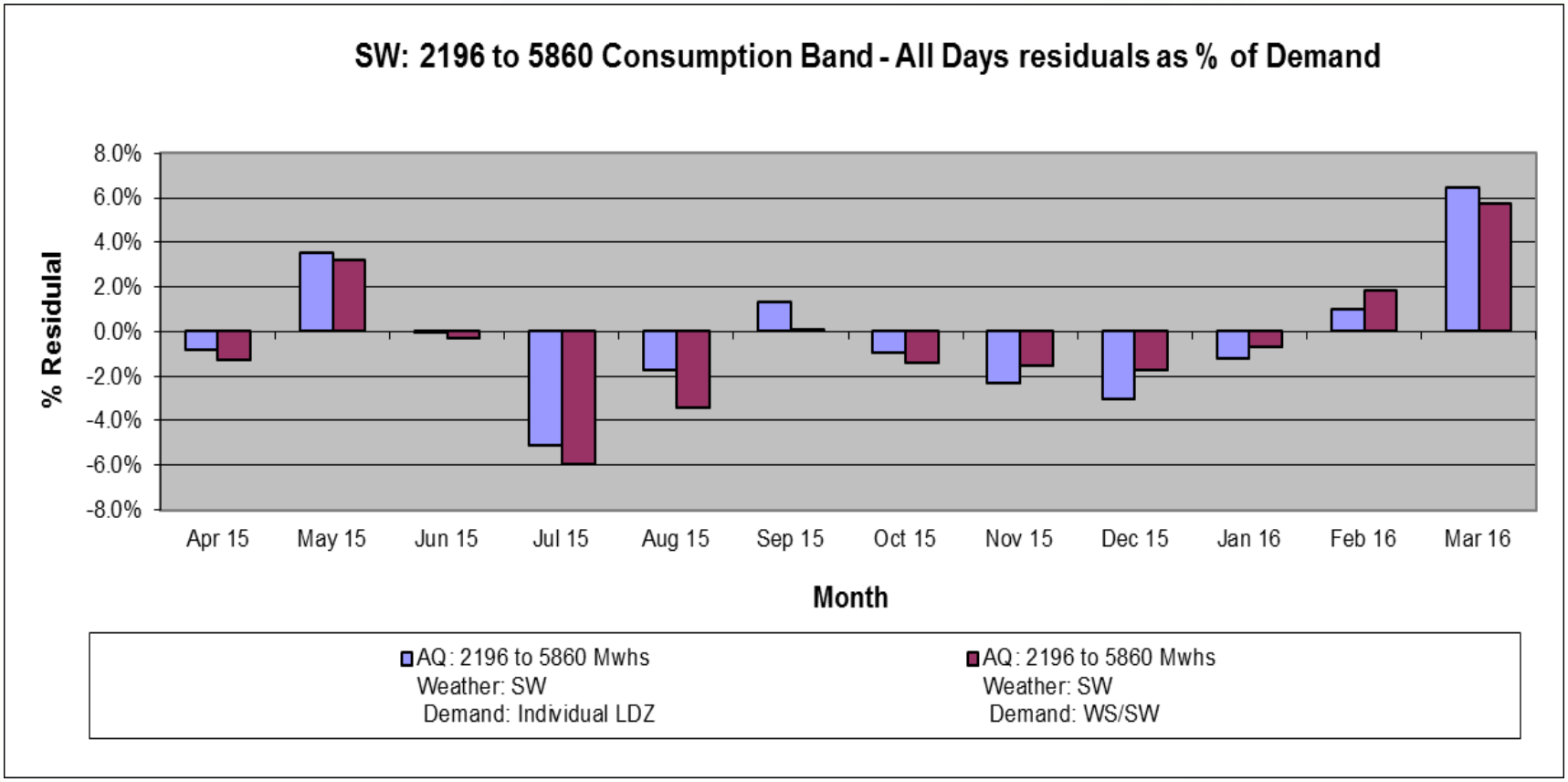
Comparison: WS LDZ, EUC Band 5: 2,196 – 5,860 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested

Large NDM Modelling Results

Comparison: SW LDZ, EUC Band 5: 2,196 – 5,860 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested
- **TWG to decide on preferred model**

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EUC Band 6: 5,860-14,650 MWh pa
Comparison of Runs

Modelling Run Decisions	Progress
Small NDM EUC Band 3 (CB)	
Large NDM EUC Band 5 (CB)	
Large NDM EUC Band 6 (CB)	NEXT
Large NDM EUC Band 7 & 8 (CB)	
Large NDM EUC Band 5 (WB)	
Large NDM EUC Band 6 (WB)	

Large NDM Modelling Results

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

	Run1: Individual LDZ (NW/WN Combined)			Run 2: Individual LDZ (NW/WN and WS/SW Combined)		
SC	46%	97%	85	46%	97%	85
NO	48%	96%	49	48%	96%	49
NW / WN	47%	97%	83	47%	97%	83
NE	54%	96%	80	54%	96%	80
EM	48%	98%	78	48%	98%	78
WM	45%	98%	83	45%	98%	83
EA	51%	96%	59	51%	96%	59
NT	41%	97%	60	41%	97%	60
SE	44%	98%	40	44%	98%	40
SO	38%	97%	44	38%	97%	44
WS	48%	97%	20	42%	97%	71
SW	40%	96%	51			

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- Results above for both modelling runs including for combined WS/SW
- Good results overall for individual LDZs
- Highlighted results for WS and SW models are shown in more detail on subsequent slides to assist TWG with decision

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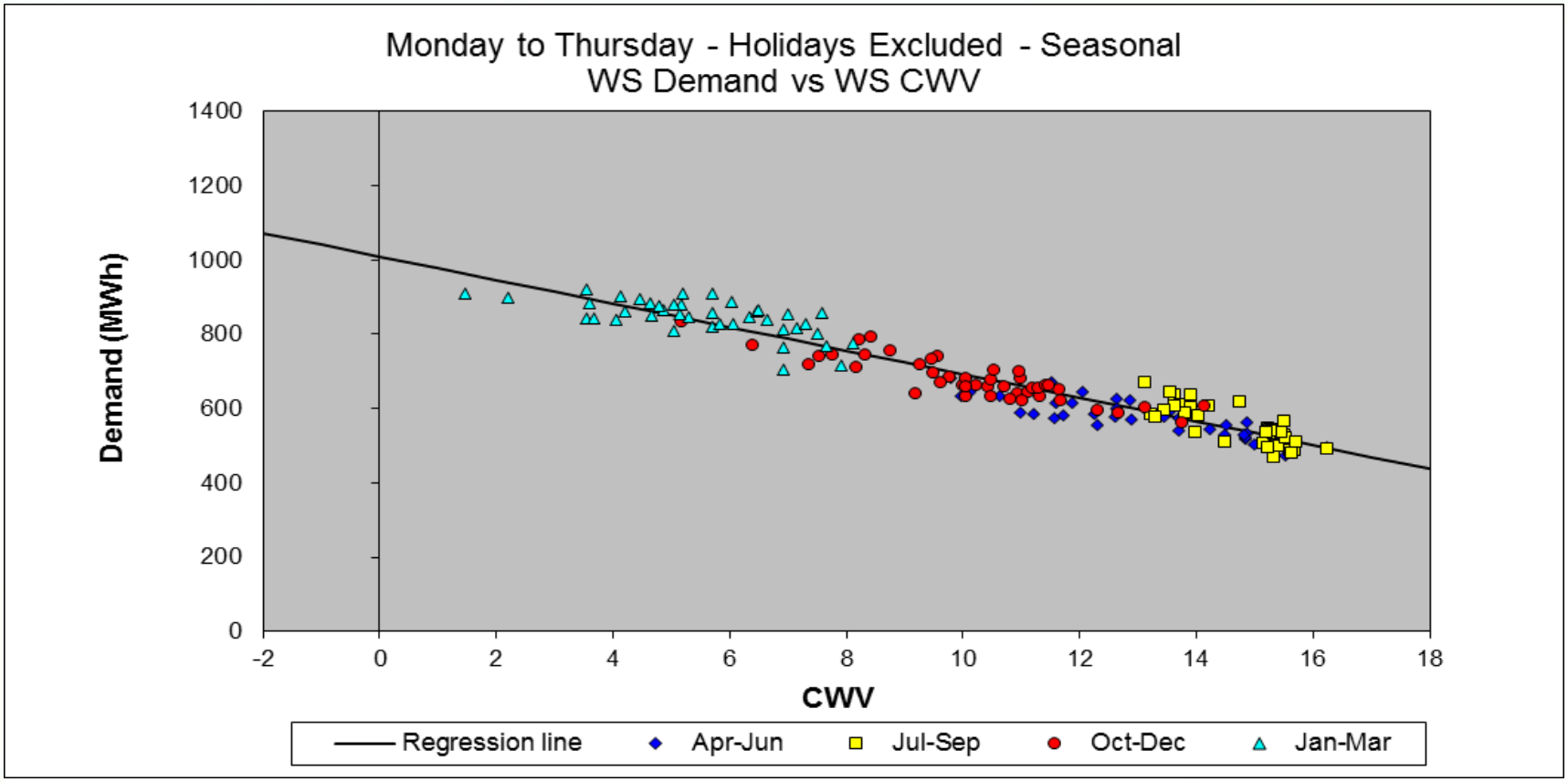
EUC Band 6: 5,860 – 14,650 MWh pa

Run 1: Individual LDZ (NW/WN combined)

Large NDM Modelling Results

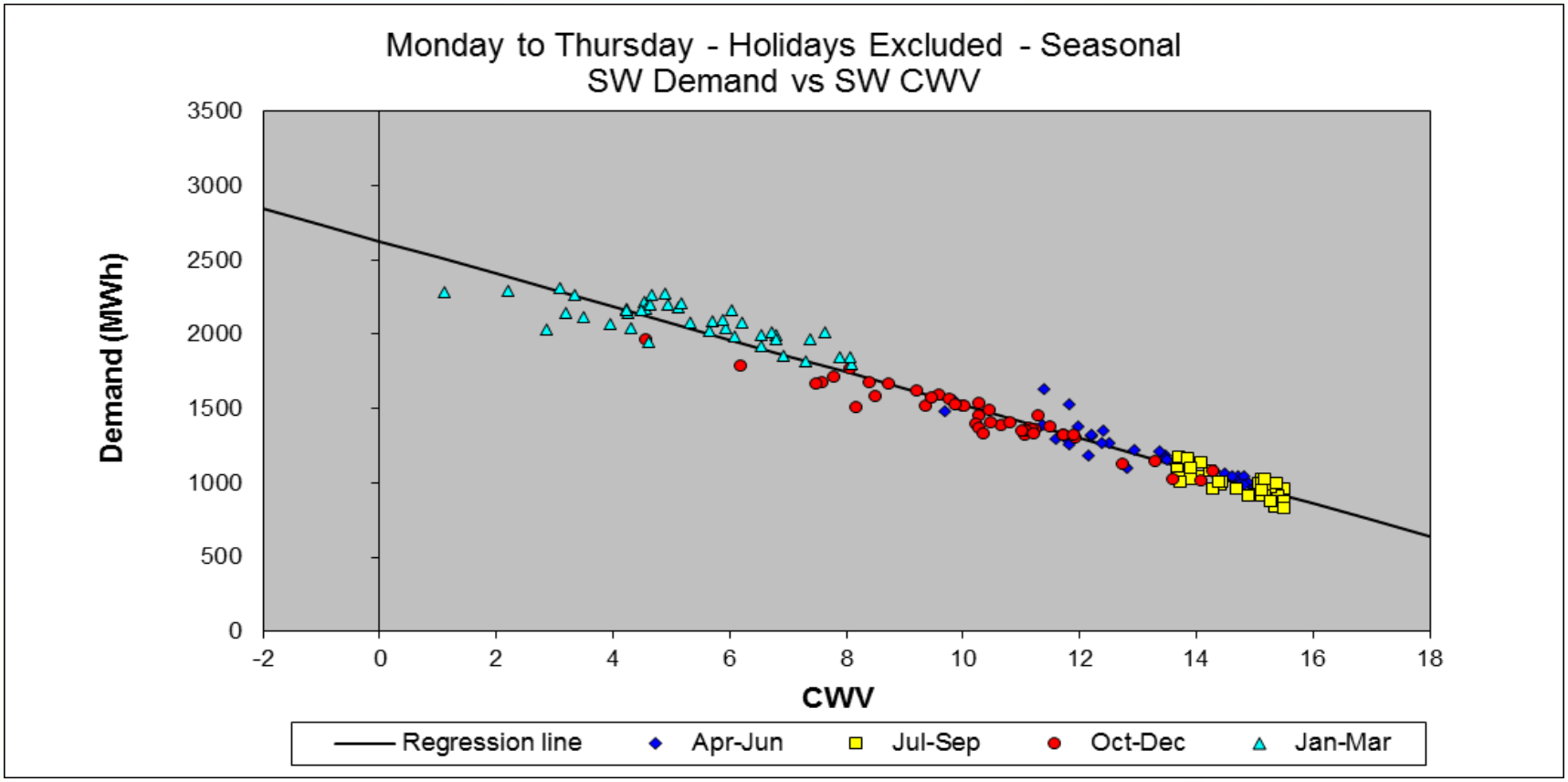
WS LDZ, EUC Band 6: 5,860 – 14,650 MWh pa



Run	ILF	R^2 (All days)	Sample
WS	48%	97%	20
WS / SW	42%	97%	71

Large NDM Modelling Results

SW LDZ, EUC Band 6: 5,860 – 14,650 MWh pa



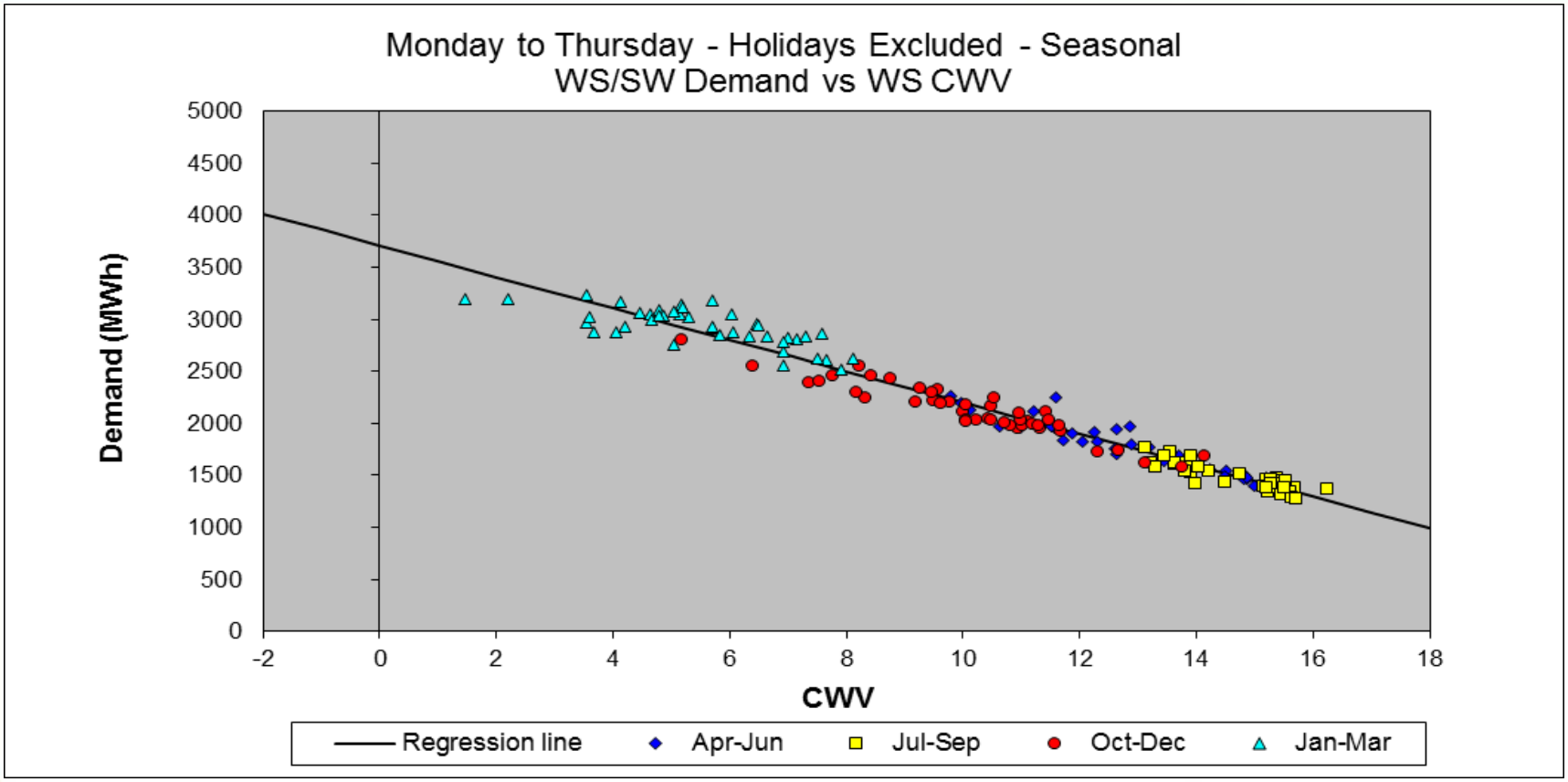
Run	ILF	R^2 (All days)	Sample
SW	40%	96%	51
WS / SW	42%	97%	71

EUC Band 6: 5,860 – 14,650 MWh pa

Run 2: Individual LDZ (NW/WN and WS/SW combined)

Large NDM Modelling Results

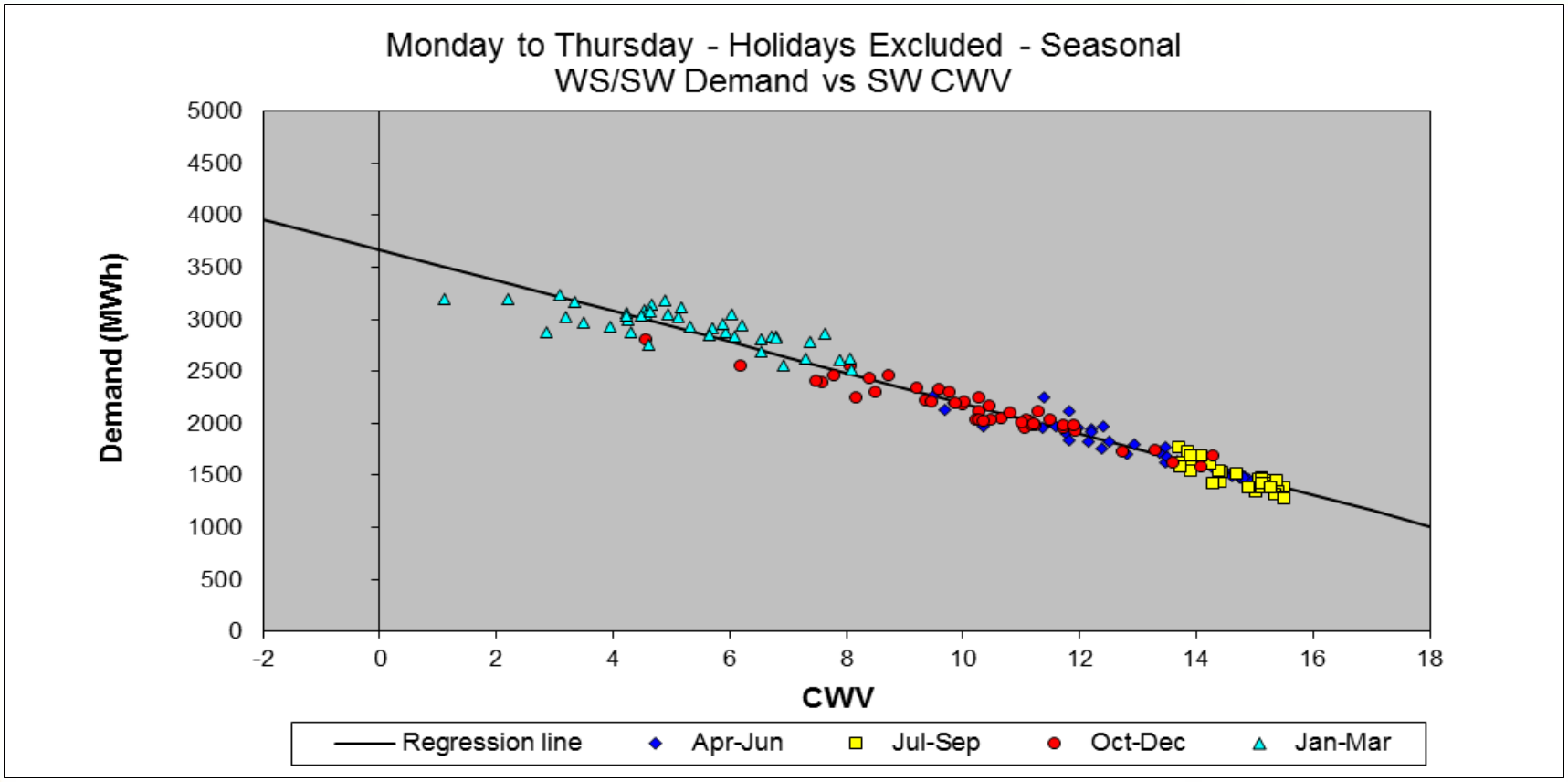
WS LDZ, EUC Band 6: 5,860 – 14,650 MWh pa



Run	ILF	R^2 (All days)	Sample
WS	48%	97%	20
WS / SW	42%	97%	71

Large NDM Modelling Results

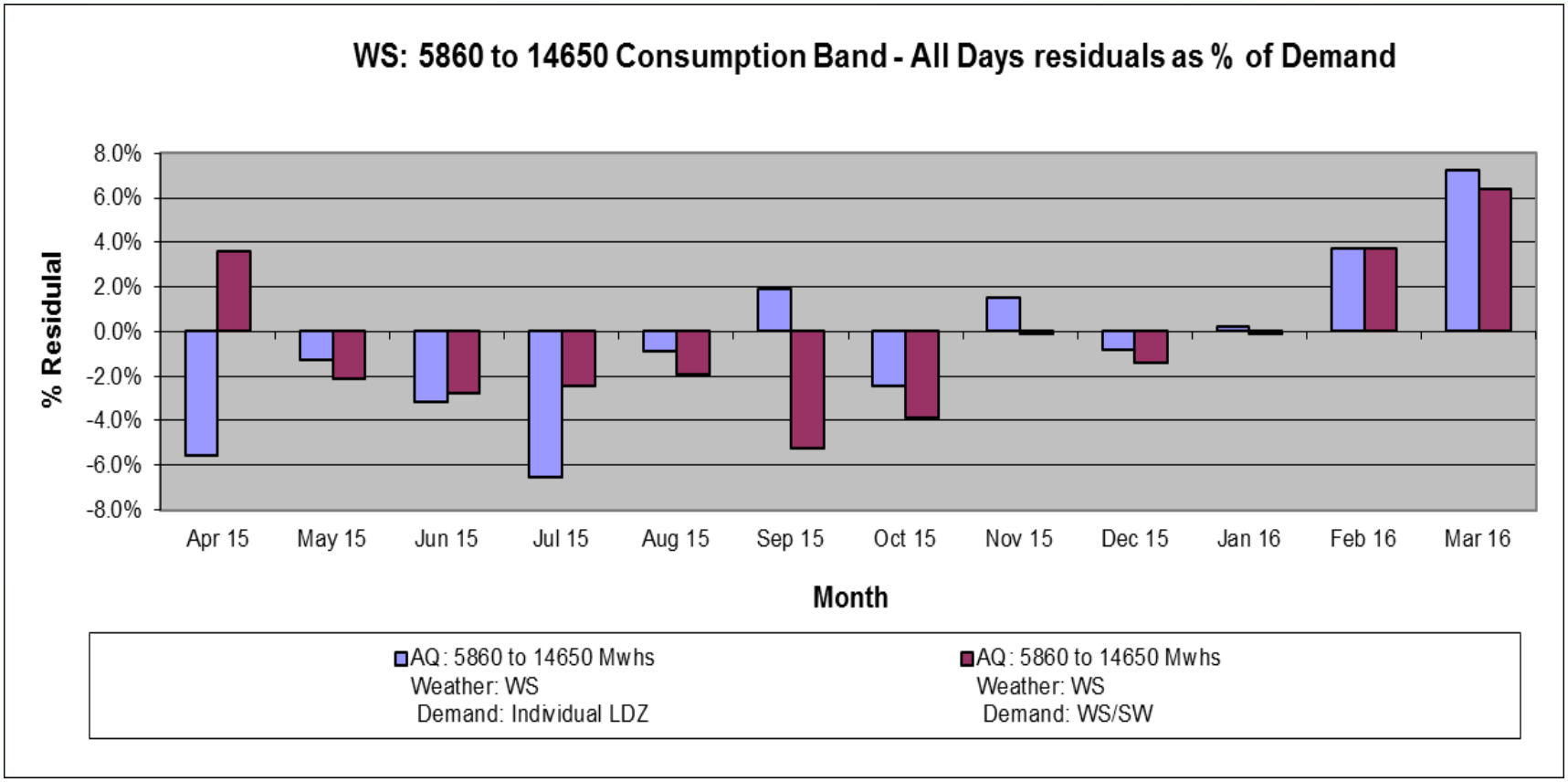
SW LDZ, EUC Band 6: 5,860 – 14,650 MWh pa



Run	ILF	R^2 (All days)	Sample
SW	40%	96%	51
WS / SW	42%	97%	71

Large NDM Modelling Results

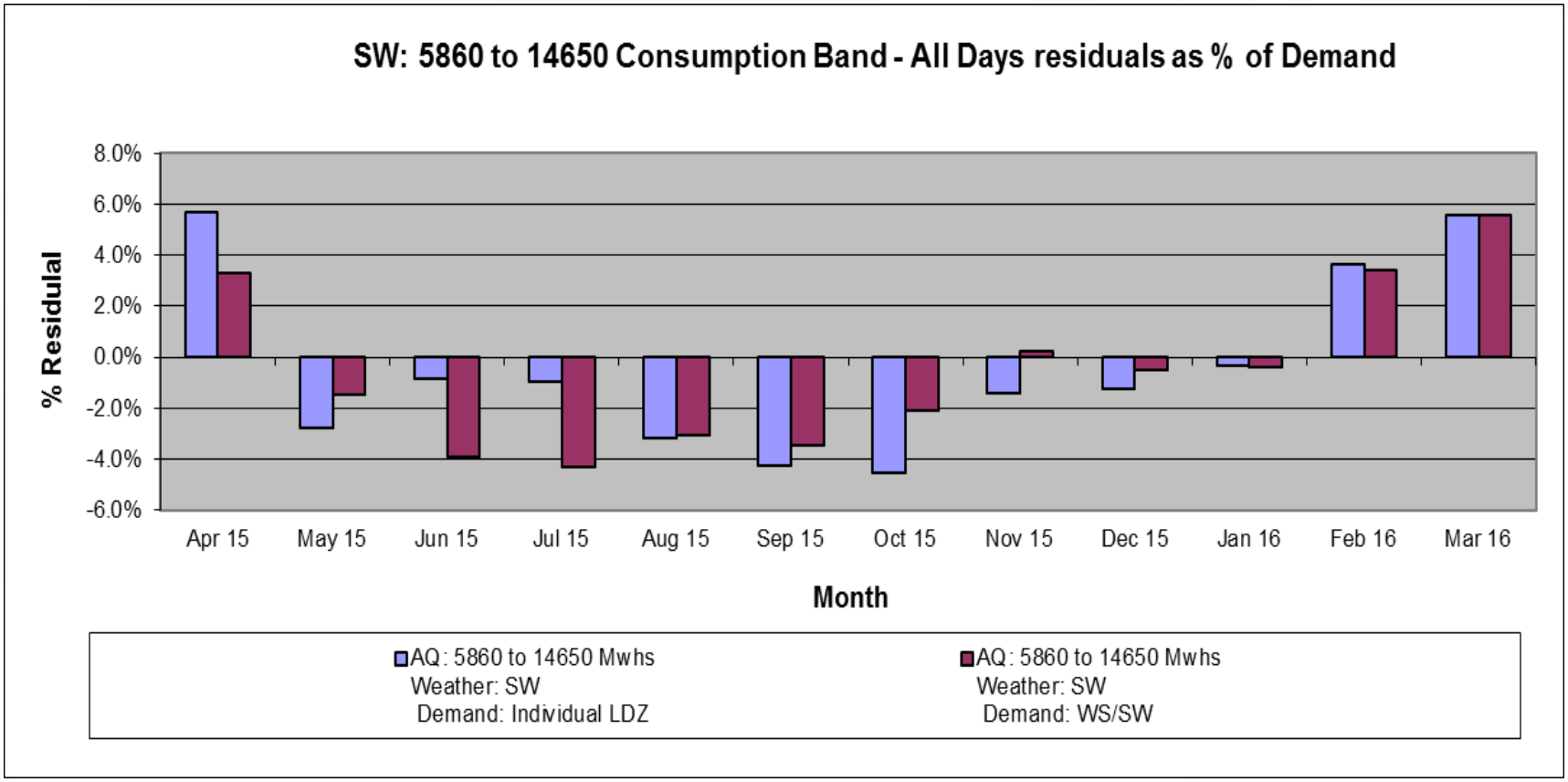
Comparison: WS LDZ, EUC Band 6: 5,860 – 14,650 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested

Large NDM Modelling Results

Comparison: SW LDZ, EUC Band 6: 5,860 – 14,650 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested
- **TWG to decide on preferred model**

EUC Band 7 and 8: 14,650-58,600 MWh pa
Comparison of Runs

Modelling Run Decisions	Progress
Small NDM EUC Band 3 (CB)	✓
Large NDM EUC Band 5 (CB)	✓
Large NDM EUC Band 6 (CB)	✓
Large NDM EUC Band 7 & 8 (CB)	NEXT
Large NDM EUC Band 5 (WB)	
Large NDM EUC Band 6 (WB)	

Large NDM Modelling Results

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

	Run1: Individual LDZ (NW/WN Combined)			Run 2: Individual LDZ (NW/WN and WS/SW Combined)		
SC	53%	89%	33	53%	89%	33
NO	67%	84%	41	67%	84%	41
NW / WN	62%	95%	100	62%	95%	100
NE	69%	87%	61	69%	87%	61
EM	61%	95%	94	61%	95%	94
WM	57%	96%	80	57%	96%	80
EA	60%	89%	42	60%	89%	42
NT	52%	91%	46	52%	91%	46
SE	48%	84%	24	44%	93%	49
SO	41%	91%	25			
WS	56%	88%	23	59%	93%	64
SW	60%	84%	41			

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

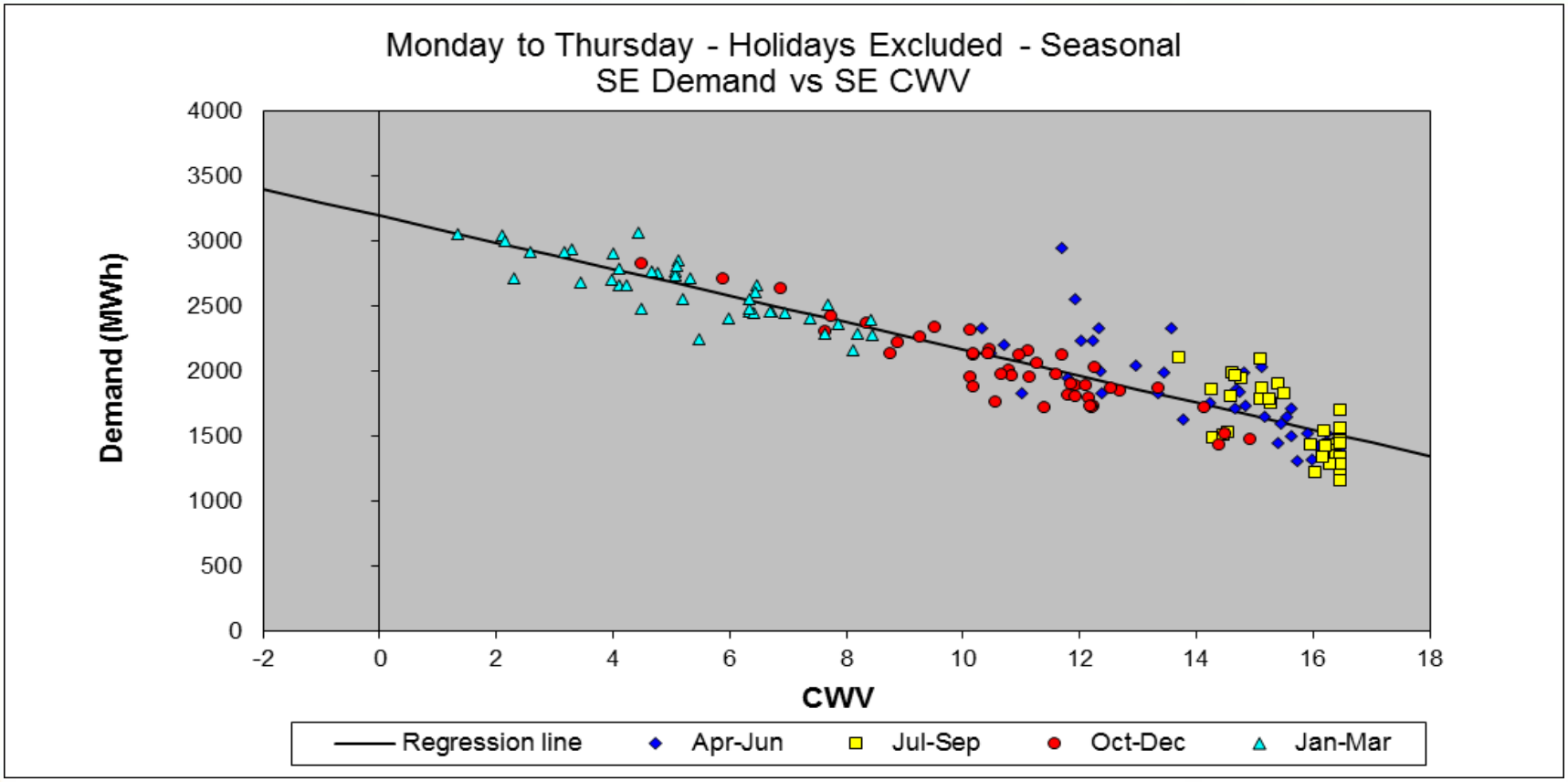
- Results above for both modelling runs
- Highlighted results for WS, SW , SE and SO models are shown in more detail on subsequent slides to assist TWG with decision
- TWG Decision is to select between Run 1 or Run 2

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

Run 1: Individual LDZ (NW/WN combined)

Large NDM Modelling Results

SE LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



Run	ILF	R^2 (All days)	Sample
SE	48%	84%	24
SE / SO	44%	93%	49

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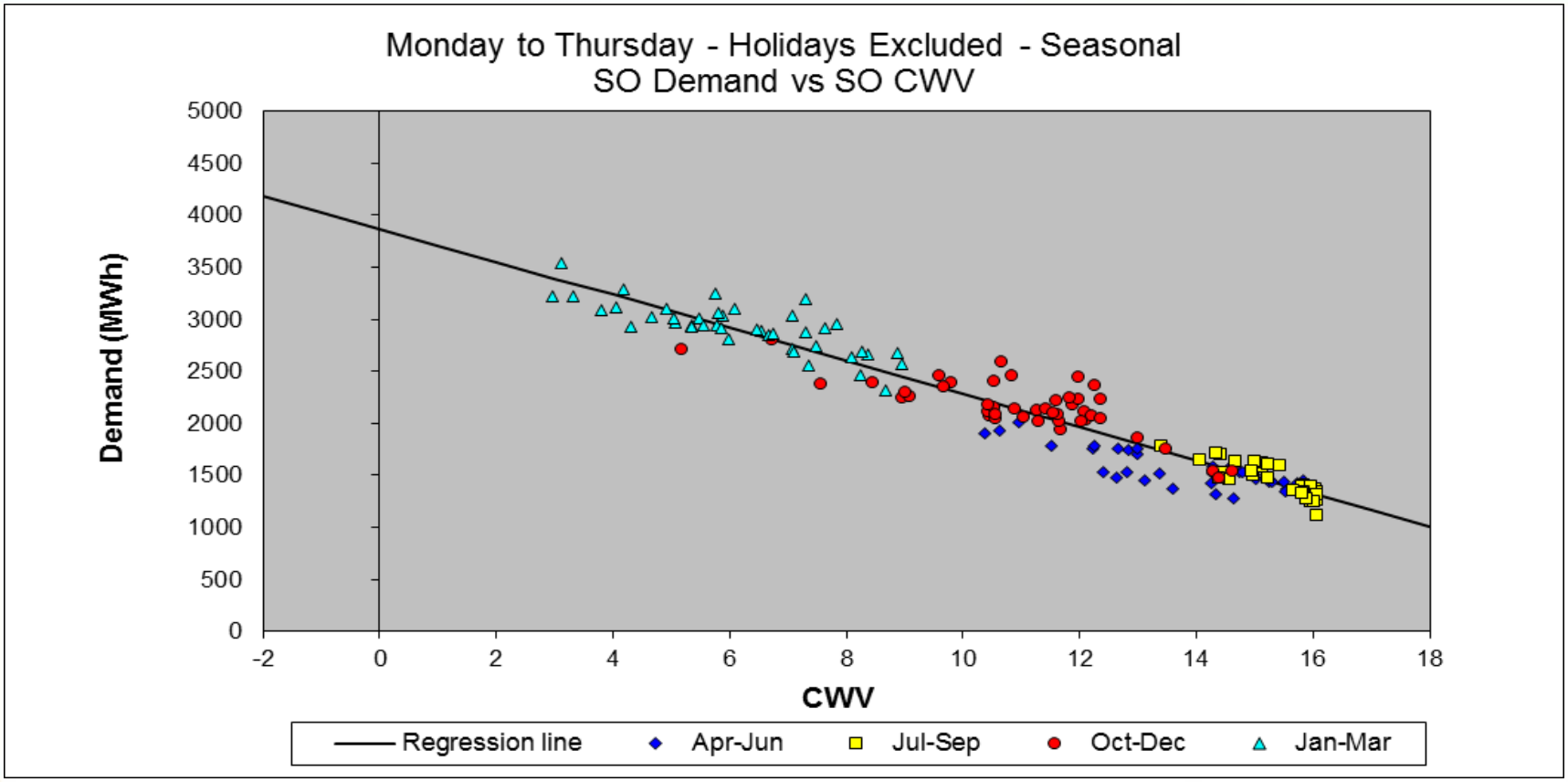
Large NDM Modelling Results

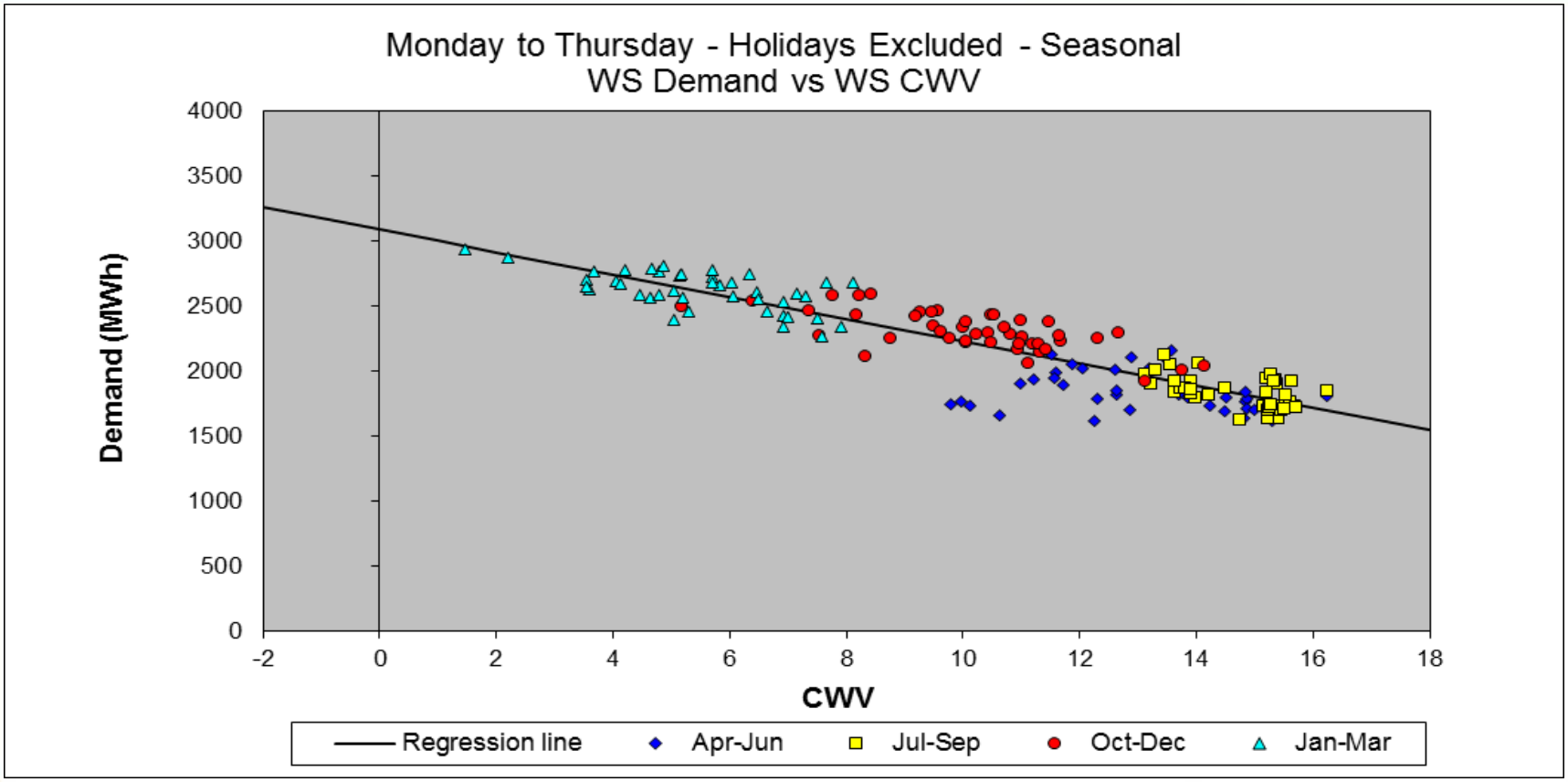
SO LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



Run	ILF	R^2 (All days)	Sample
SO	41%	91%	25
SE / SO	44%	93%	49

Large NDM Modelling Results

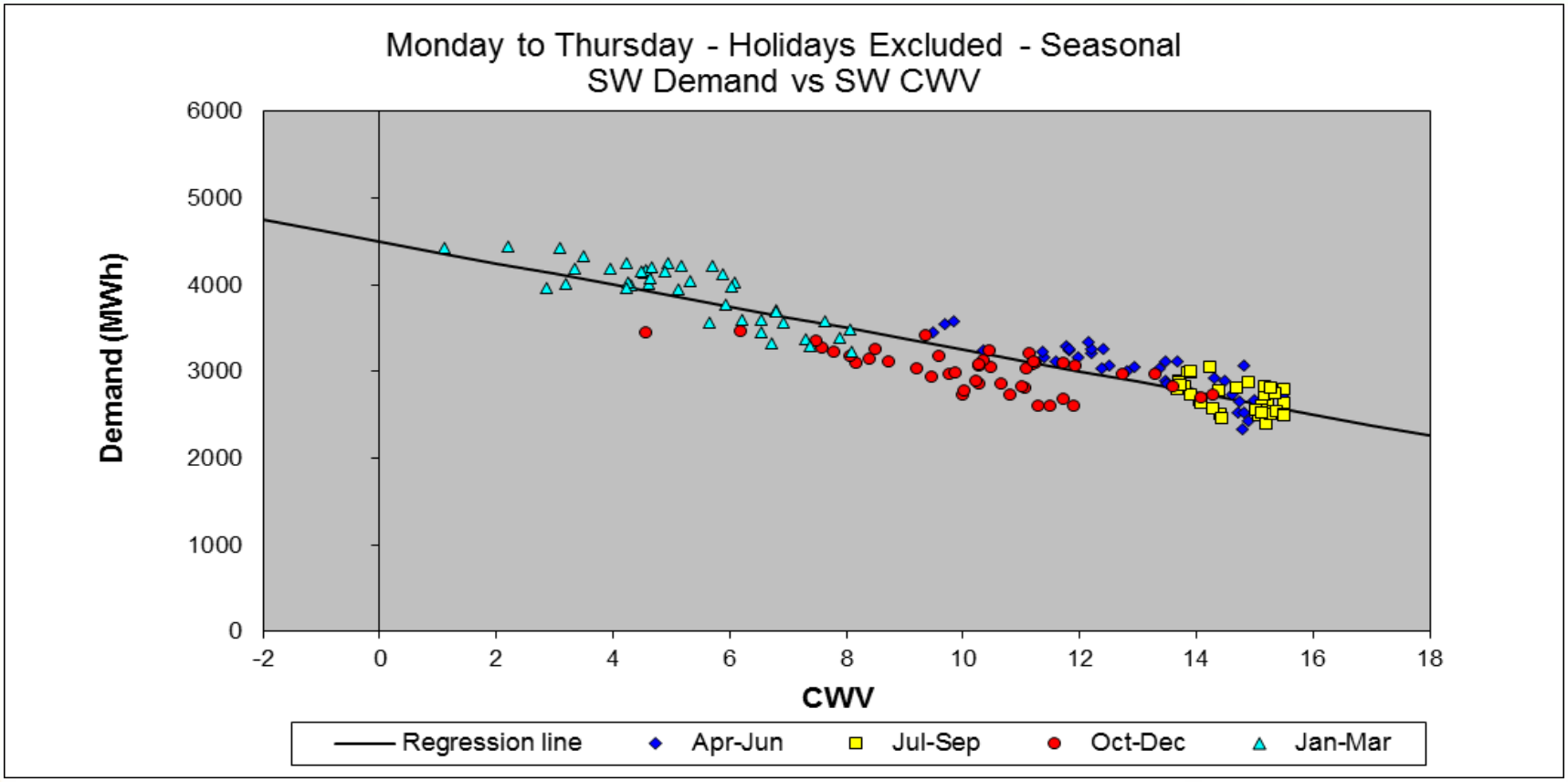
WS LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



Run	ILF	R^2 (All days)	Sample
WS	56%	88%	23
WS / SW	59%	93%	64

Large NDM Modelling Results

SW LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



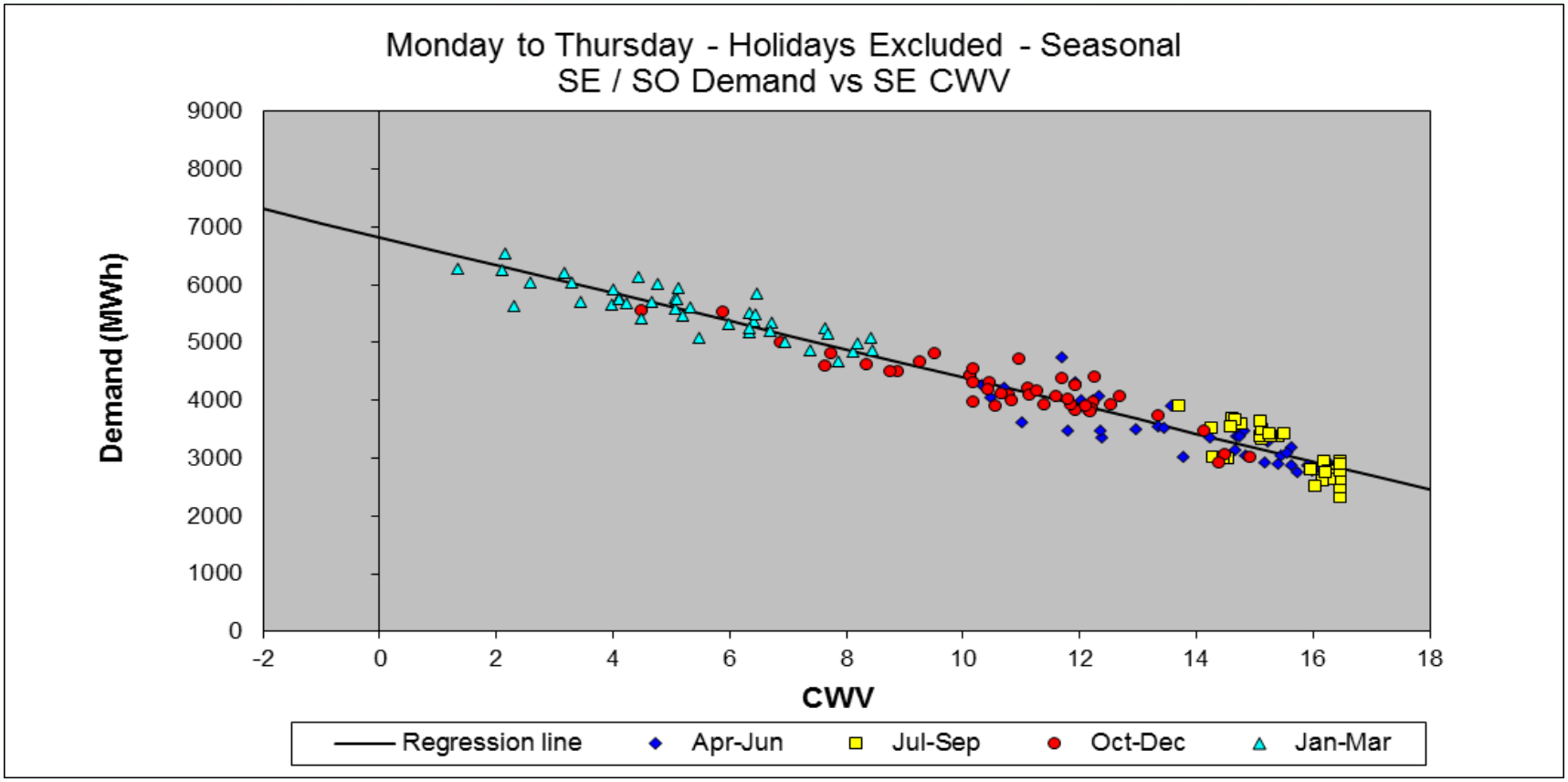
Run	ILF	R^2 (All days)	Sample
SW	60%	84%	41
WS / SW	59%	93%	64

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

Run 2: Individual LDZ (NW/WN, WS/SW and SE/SO combined)

Large NDM Modelling Results

SE LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



Run	ILF	R^2 (All days)	Sample
SE	48%	84%	24
SE / SO	44%	93%	49

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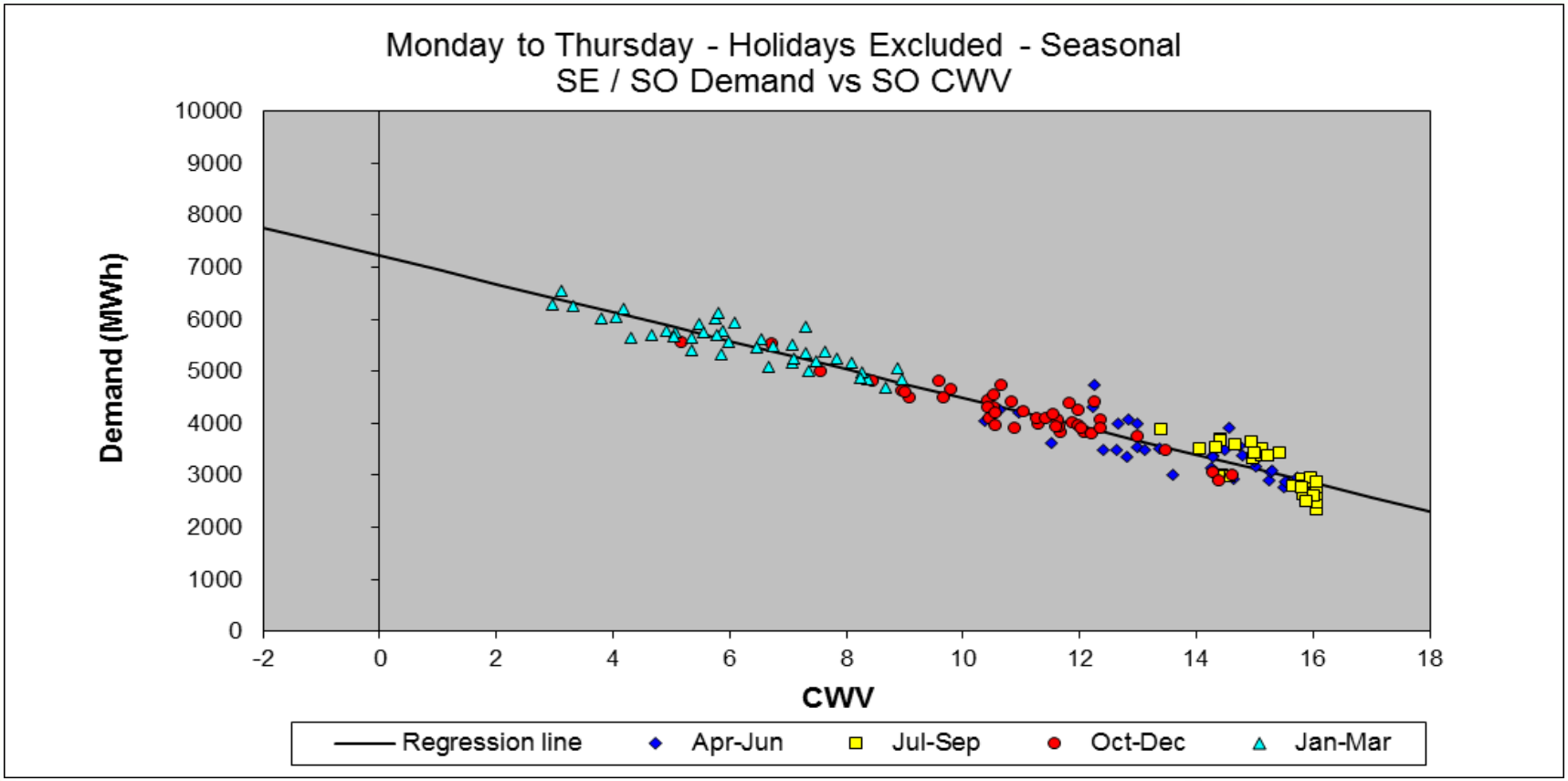
Large NDM Modelling Results

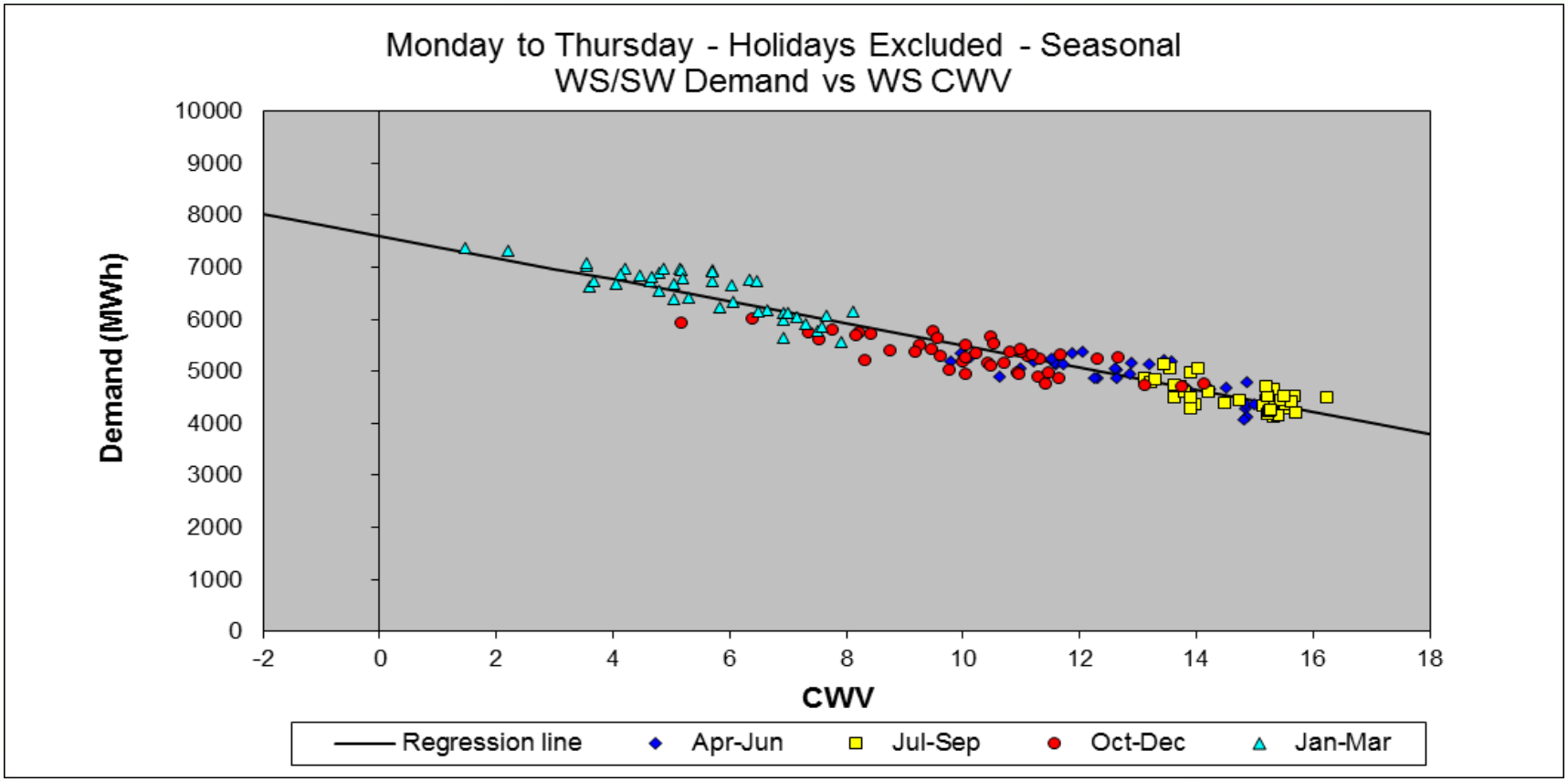
SO LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



Run	ILF	R^2 (All days)	Sample
SO	41%	91%	25
SE / SO	44%	93%	49

Large NDM Modelling Results

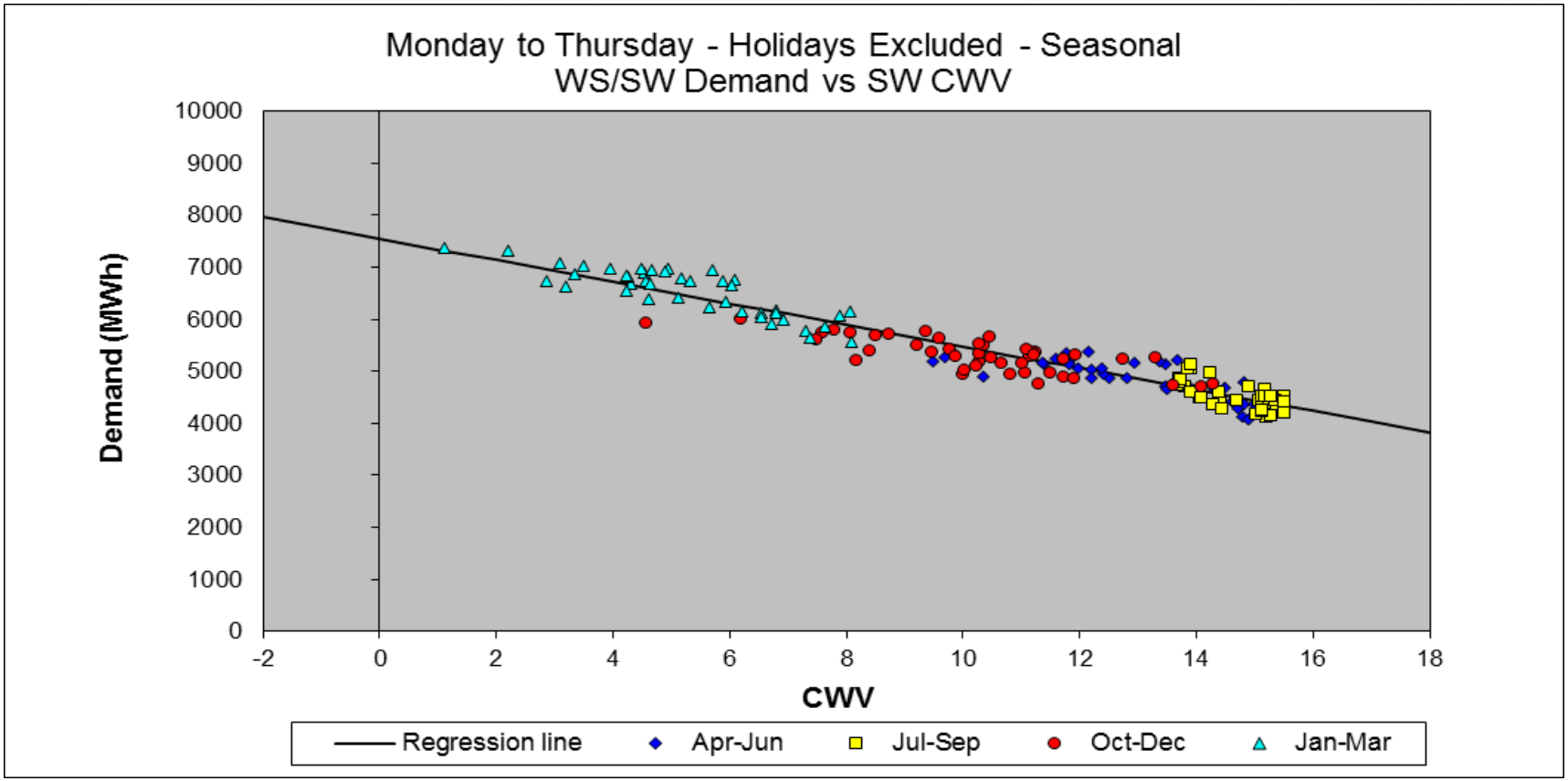
WS LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



Run	ILF	R^2 (All days)	Sample
WS	56%	88%	23
WS / SW	59%	93%	64

Large NDM Modelling Results

SW LDZ, EUC Band 7 and 8: 14,650 – 58,600 MWh pa



Run	ILF	R^2 (All days)	Sample
SW	60%	84%	41
WS / SW	59%	93%	64

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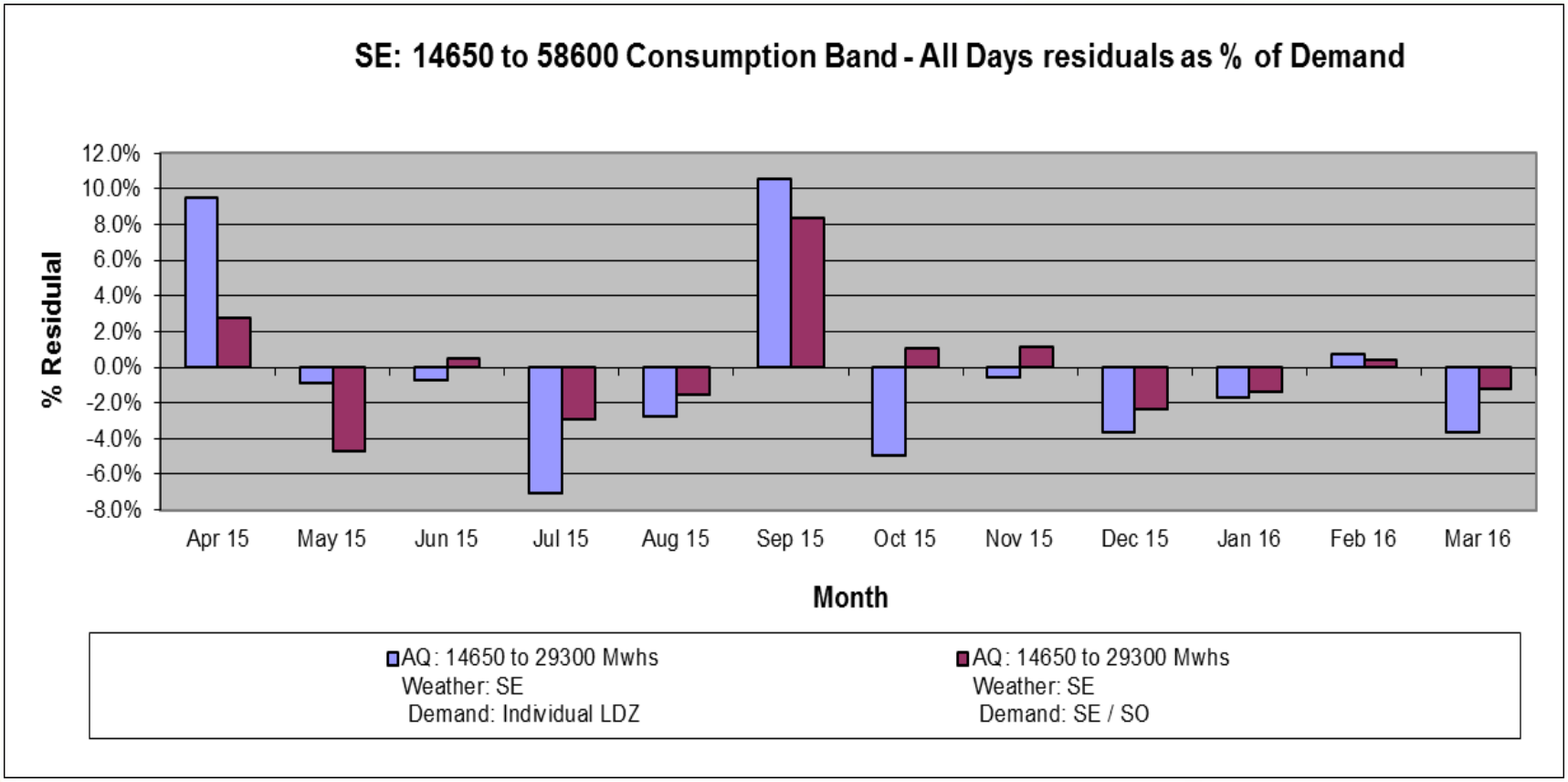
Large NDM Modelling Results

Comparison: SE LDZ, EUC Band 7&8: 14,650-58,600 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested

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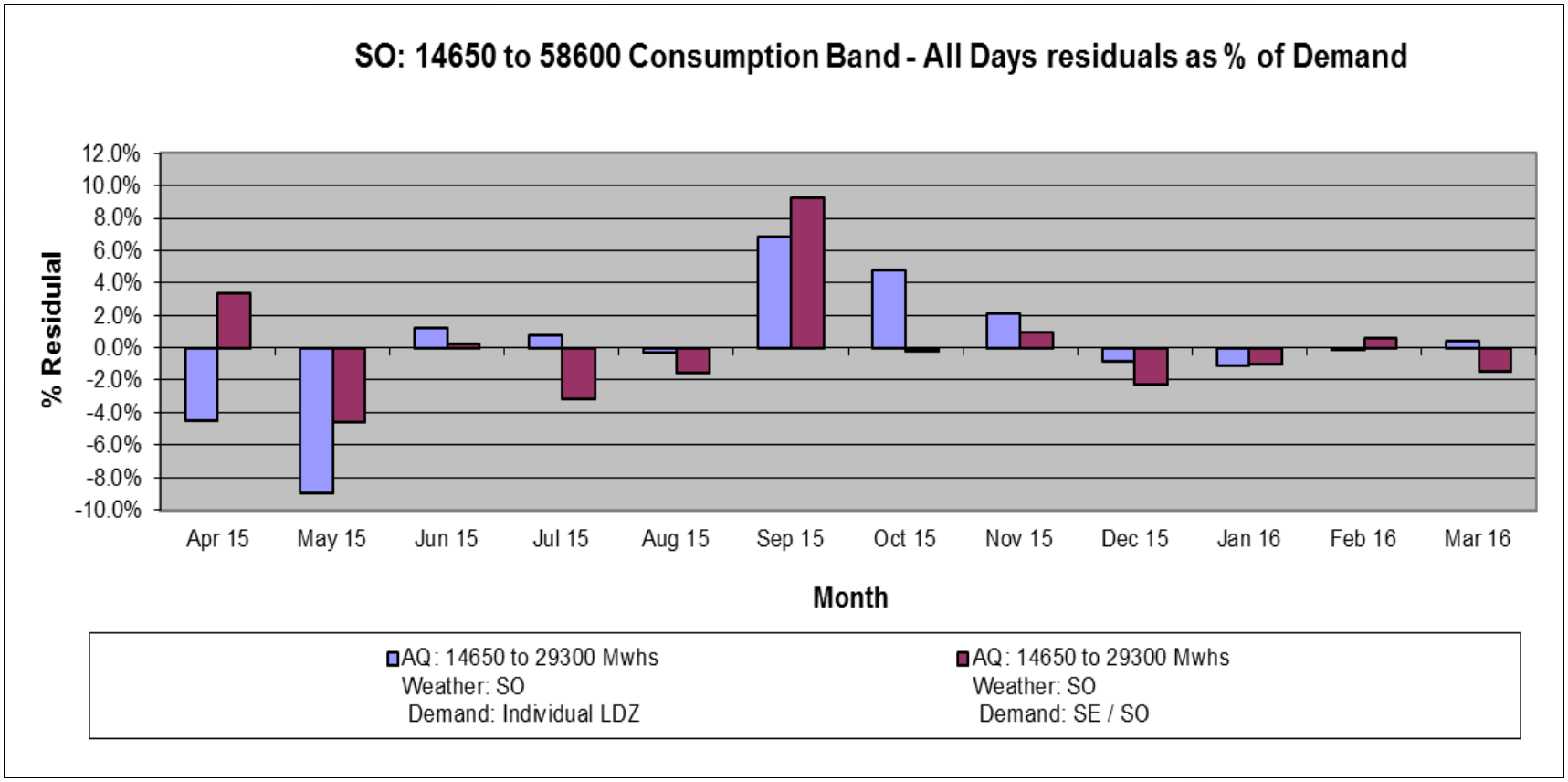
Large NDM Modelling Results

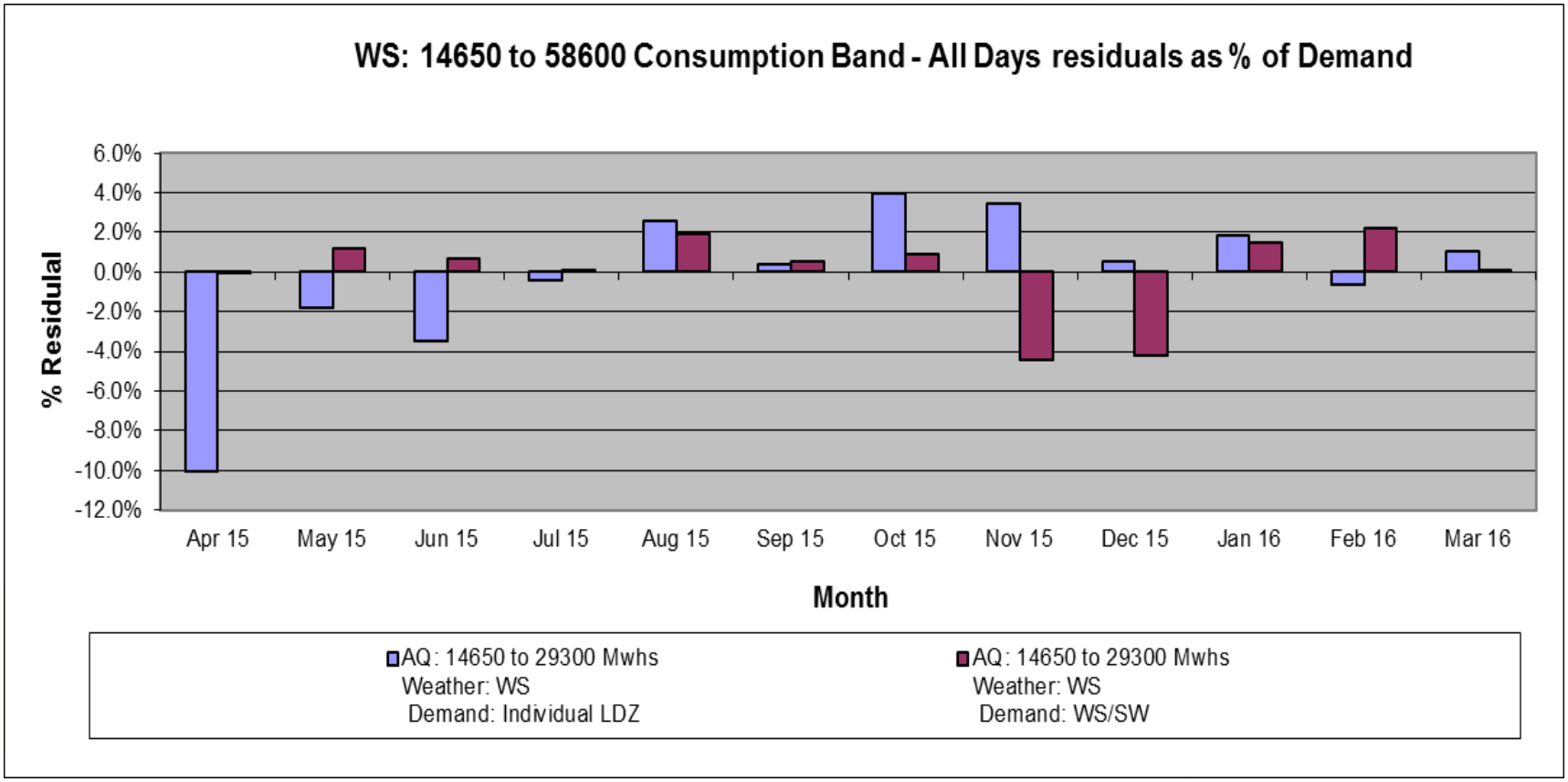
Comparison: SO LDZ, EUC Band 7&8: 14,650-58,600 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested

Large NDM Modelling Results

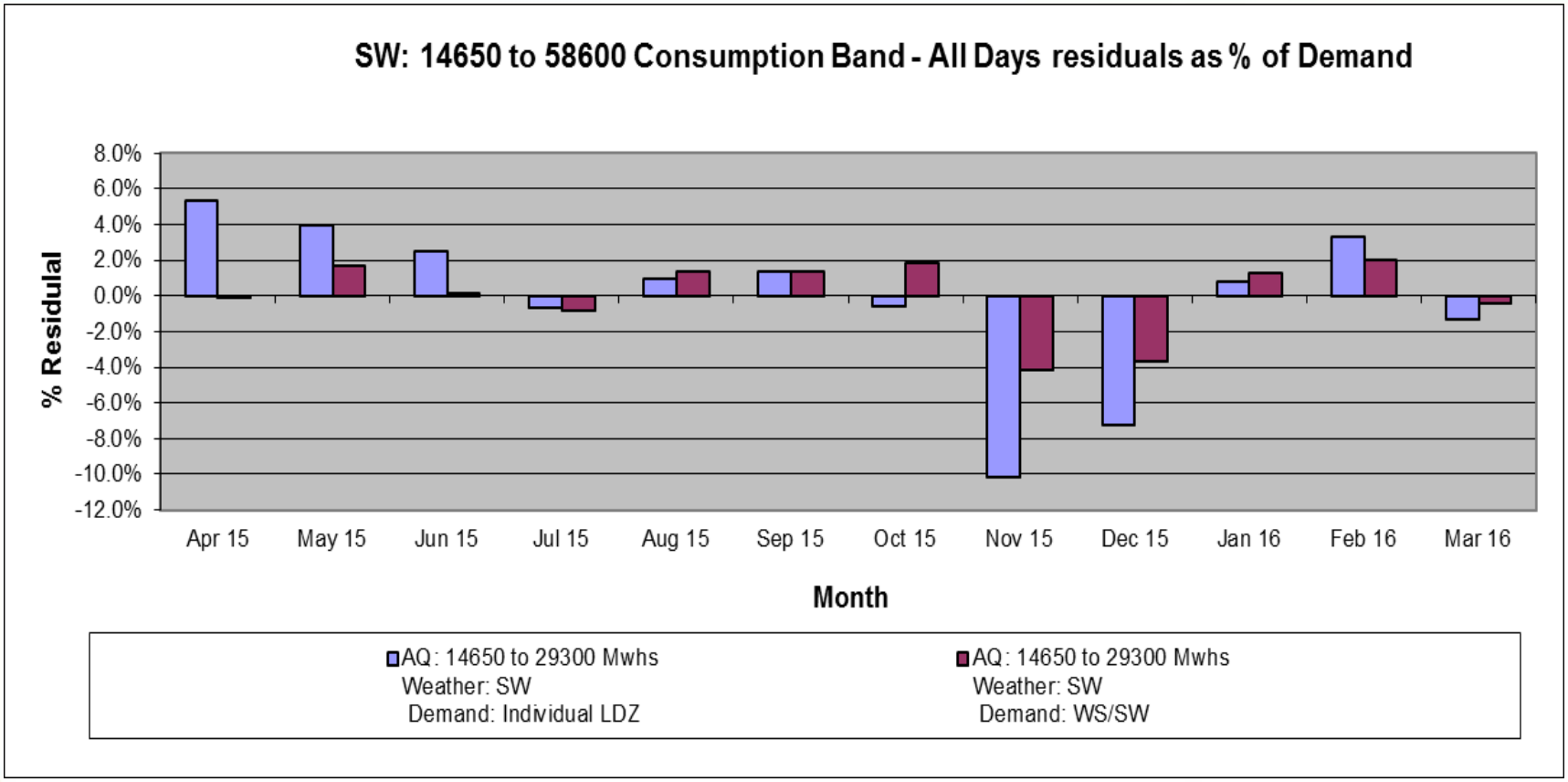
Comparison: WS LDZ, EUC Band 7&8: 14,650-58,600 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested

Large NDM Modelling Results

Comparison: SW LDZ, EUC Band 7&8: 14,650-58,600 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested
- **TWG to decide on preferred model**

Large NDM Modelling Results

Band 9: >58,600 MWh pa

	NATIONAL GROUPINGS		
SC	76%	76%	196
NO			
NW / WN			
NE			
EM			
WM			
WS			
EA			
NT			
SE			
SO			
SW			

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- As with previous years, this band is a national aggregation model
- No TWG decision required for this EUC Band

Large NDM Analysis

EUC WAR Bands: 5 to 8

Range: >2,196 MWh

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

Agreed Sample Data Aggregations

EUC Bands: Range	Comments on 2015/16 data TWG Agreed Aggregations
Band 5: 2,196 to 5,860 MWh pa	5 LDZ Group (SC, NO/NW/WN, NE/EM/WM, EA/NT/SE and WS/SO/SW) **AND** 4 LDZ Group (SC/NO/NW/WN, NE/EM/WM, EA/NT/SE and WS/SO/SW)
Band 6: 5,860 to 14,650 MWh pa	3 LDZ Group (SC/NO/NW/WN, NE/EM/WM, EA/NT/SE/WS/SO/SW) **AND** 2 LDZ Group (SC/NO/NW/WN/NE/EM/WM, EA/NT/SE/WS/SO/SW)
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	3 LDZ Group (SC/NO/NW/WN, NE/EM/WM, EA/NT/SE/WS/SO/SW)

- Aggregations as agreed at April TWG
- Decisions to be made on models for Bands 5 and 6

EUC Band 5 WAR : 2,196-5,860 MWh pa

Comparison of Runs

Modelling Run Decisions	Progress
Small NDM EUC Band 3 (CB)	✓
Large NDM EUC Band 5 (CB)	✓
Large NDM EUC Band 6 (CB)	✓
Large NDM EUC Band 7 & 8 (CB)	✓
Large NDM EUC Band 5 (WB)	NEXT
Large NDM EUC Band 6 (WB)	

Large NDM Modelling Results

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

Consumption Band 5 – WAR Band results:

Run 1: 5 LDZ Group aggregations applied

	WAR Banding											
	0.00 – 0.372			0.372 – 0.442			0.442 – 0.524			0.524 – 1.00		
SC	74%	90%	27	54%	96%	62	38%	98%	93	26%	96%	51
NO / NW / WN	67%	98%	60	49%	97%	81	38%	97%	69	22%	95%	59
NE / EM / WM	68%	98%	99	48%	98%	114	35%	97%	117	23%	96%	96
EA / NT / SE	73%	93%	60	50%	97%	143	36%	98%	121	24%	96%	59
WS / SO / SW	71%	89%	58	46%	96%	53	35%	98%	53	22%	96%	42

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- Results above for Run 1
- Highlighted results for SC WAR Band 1 which had a low sample count

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Large NDM Modelling Results

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

Consumption Band 5 – WAR Band results :

Run 2: 4 LDZ Group aggregations applied

	WAR Banding											
	0.00 – 0.372			0.372 – 0.442			0.442 – 0.524			0.524 – 1.00		
SC / NO / NW / WN	69%	98%	87	51%	97%	143	39%	96%	162	24%	95%	110
NE / EM / WM	68%	98%	99	48%	98%	114	35%	97%	117	23%	96%	96
EA / NT / SE	73%	93%	60	50%	97%	143	36%	98%	121	24%	96%	59
WS / SO / SW	71%	89%	58	46%	96%	53	35%	98%	53	22%	96%	42

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- Results above for Run 2 - highlighted results show LDZ SC now aggregated with NO / NW and WN
- More detail on subsequent slides to assist TWG with decision
- TWG Decision is to select between Run 1 or Run 2

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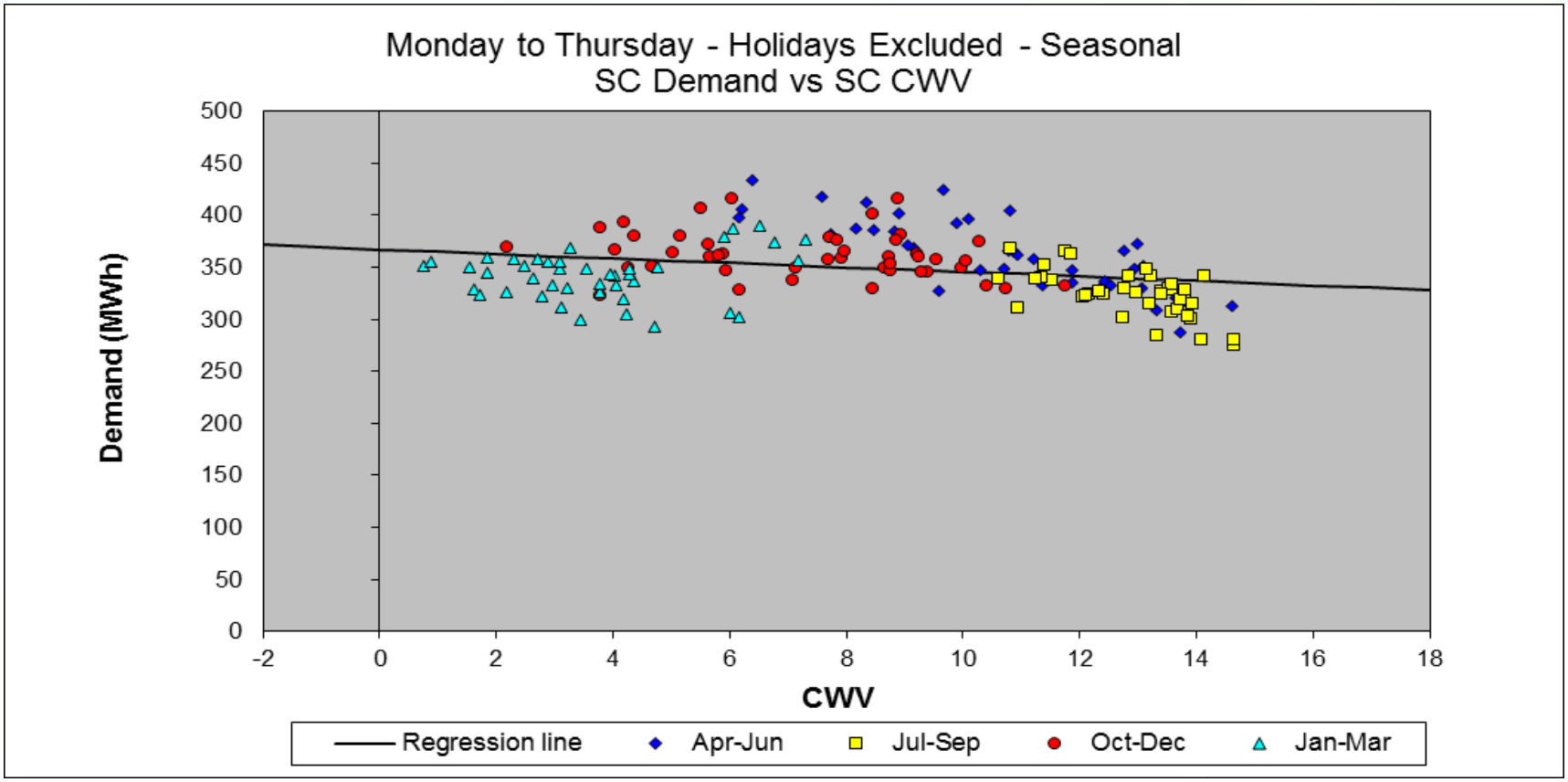
EUC Consumption Band 5: 2,196 – 5,860 MWh pa WAR Bands

Run 1: 5 LDZ Group

Large NDM Modelling Results

SC LDZ, EUC WAR Band 1: 2,196 – 5,860 MWh pa



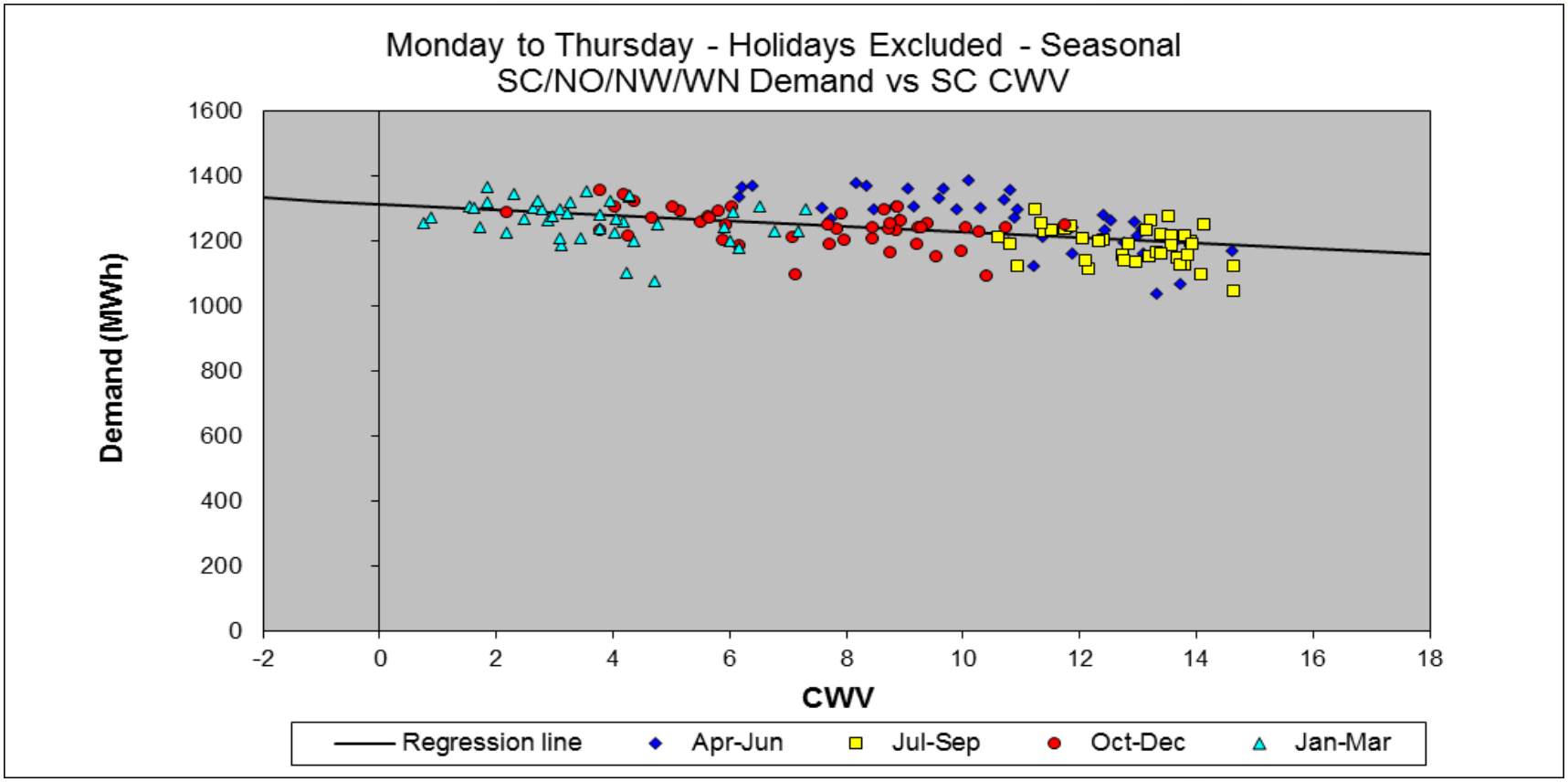
Run	ILF	R^2 (All days)	Sample
SC	74%	90%	27
SC / NO / NW / WN	69%	98%	87

EUC Consumption Band 5: 2,196 – 5,860 MWh pa WAR Bands

Run 2: 4 LDZ Group

Large NDM Modelling Results

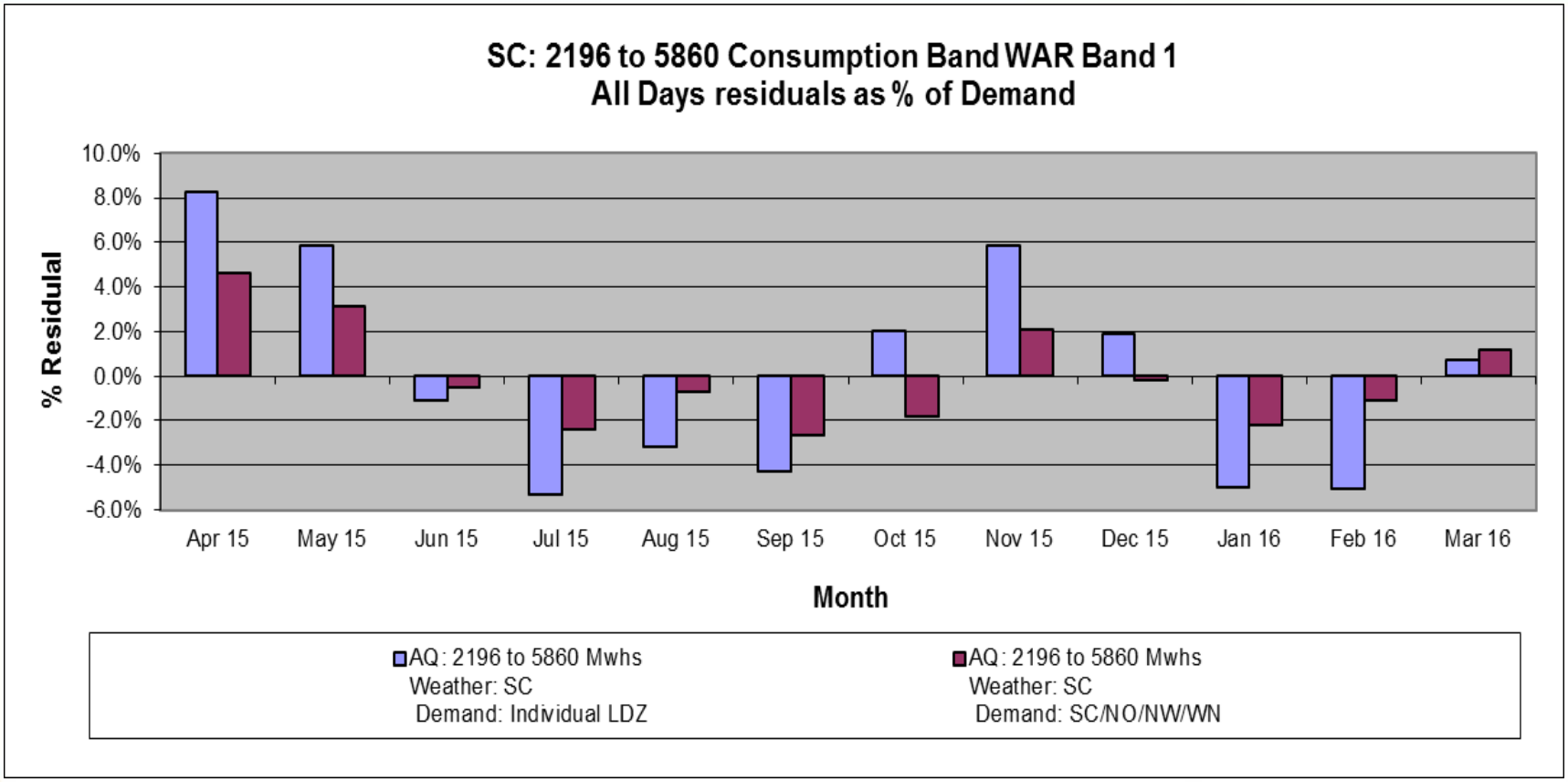
SC LDZ, EUC WAR Band 1: 2,196 – 5,860 MWh pa



Run	ILF	R^2 (All days)	Sample
SC	74%	90%	27
SC / NO / NW / WN	69%	98%	87

Large NDM Modelling Results

Comparison: SC LDZ, EUC WAR Band 1: 2,196-5,860 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested
- **TWG to decide on preferred model**

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EUC Band 6 WAR : 5,860-14,650 MWh pa
Comparison of Runs

Modelling Run Decisions	Progress
Small NDM EUC Band 3 (CB)	✓
Large NDM EUC Band 5 (CB)	✓
Large NDM EUC Band 6 (CB)	✓
Large NDM EUC Band 7 & 8 (CB)	✓
Large NDM EUC Band 5 (WB)	✓
Large NDM EUC Band 6 (WB)	NEXT

Large NDM Modelling Results

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

Consumption Band 6: Run 1: 3 LDZ Group aggregations applied

	WAR Banding											
	0.00 – 0.331			0.331 – 0.395			0.395 – 0.494			0.494 – 1.00		
SC/NO/NW/WN	81%	87%	22	61%	98%	83	44%	96%	69	29%	95%	43
NE/EM/WM	78%	97%	74	60%	98%	77	42%	97%	51	25%	96%	39
WS/EA/NT/SE/SO/SW	82%	95%	52	60%	96%	58	42%	98%	100	26%	96%	64

Consumption Band 6: Run 2: 2 LDZ Group aggregations applied

	WAR Banding											
	0.00 – 0.331			0.331 – 0.395			0.395 – 0.494			0.494 – 1.00		
SC/NO/NW/WN/NE/WM/EM	79%	96%	96	61%	98%	160	44%	97%	120	27%	95%	82
WS/EA/NT/SE/SO/SW	82%	95%	52	60%	96%	58	42%	98%	100	26%	96%	64

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

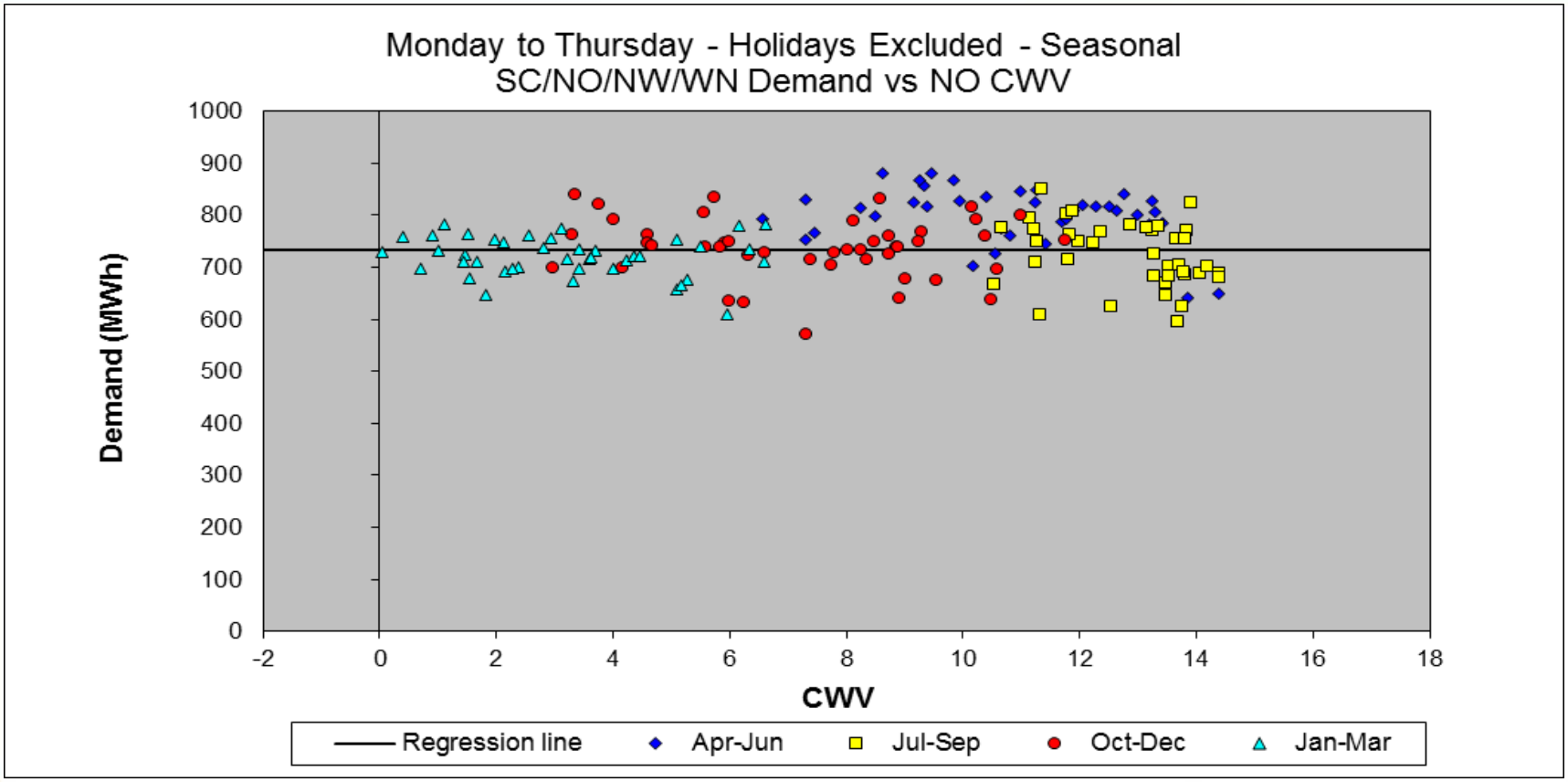
- Results above for both modelling runs
- Results for LDZ NO in Runs 1 and 2 are shown in more detail on subsequent slides to assist TWG with decision
- TWG Decision is to select between Run 1 or Run 2

EUC Consumption Band 6: 5,860–14,650 MWh pa WAR Bands

Run 1: 3 LDZ Group

Large NDM Modelling Results

NO LDZ, EUC WAR Band 1: 5,860 – 14,650 MWh pa



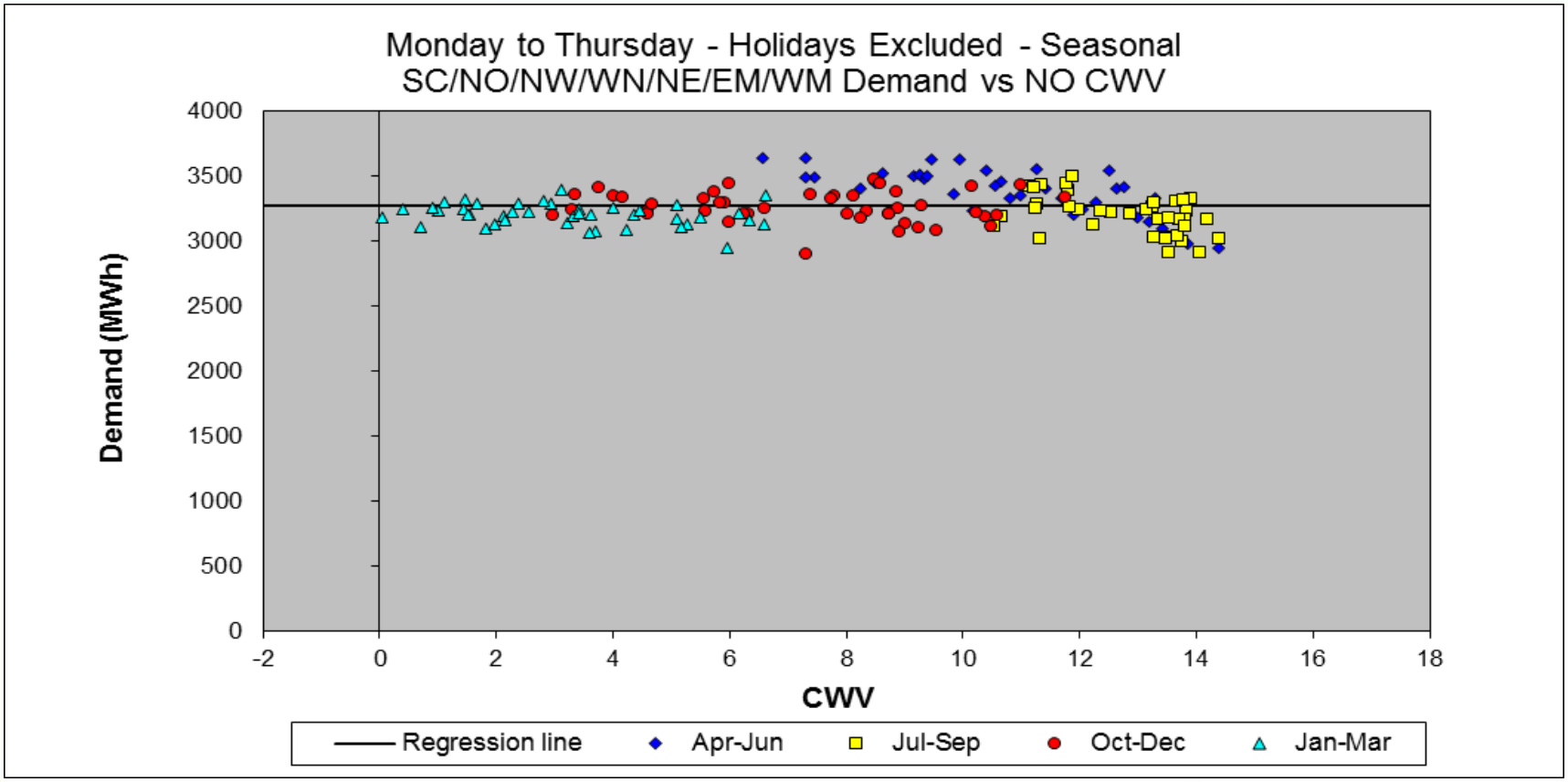
Run	ILF	R^2 (All days)	Sample
SC / NO / NW / WN	81%	87%	22
SC / NO / NW / WN / NE / EM / WM	79%	96%	96

EUC Consumption Band 6: 5,860–14,650 MWh pa WAR Bands

Run 2: 2 LDZ Group

Large NDM Modelling Results

NO LDZ, EUC WAR Band 1: 5,860 – 14,650 MWh pa



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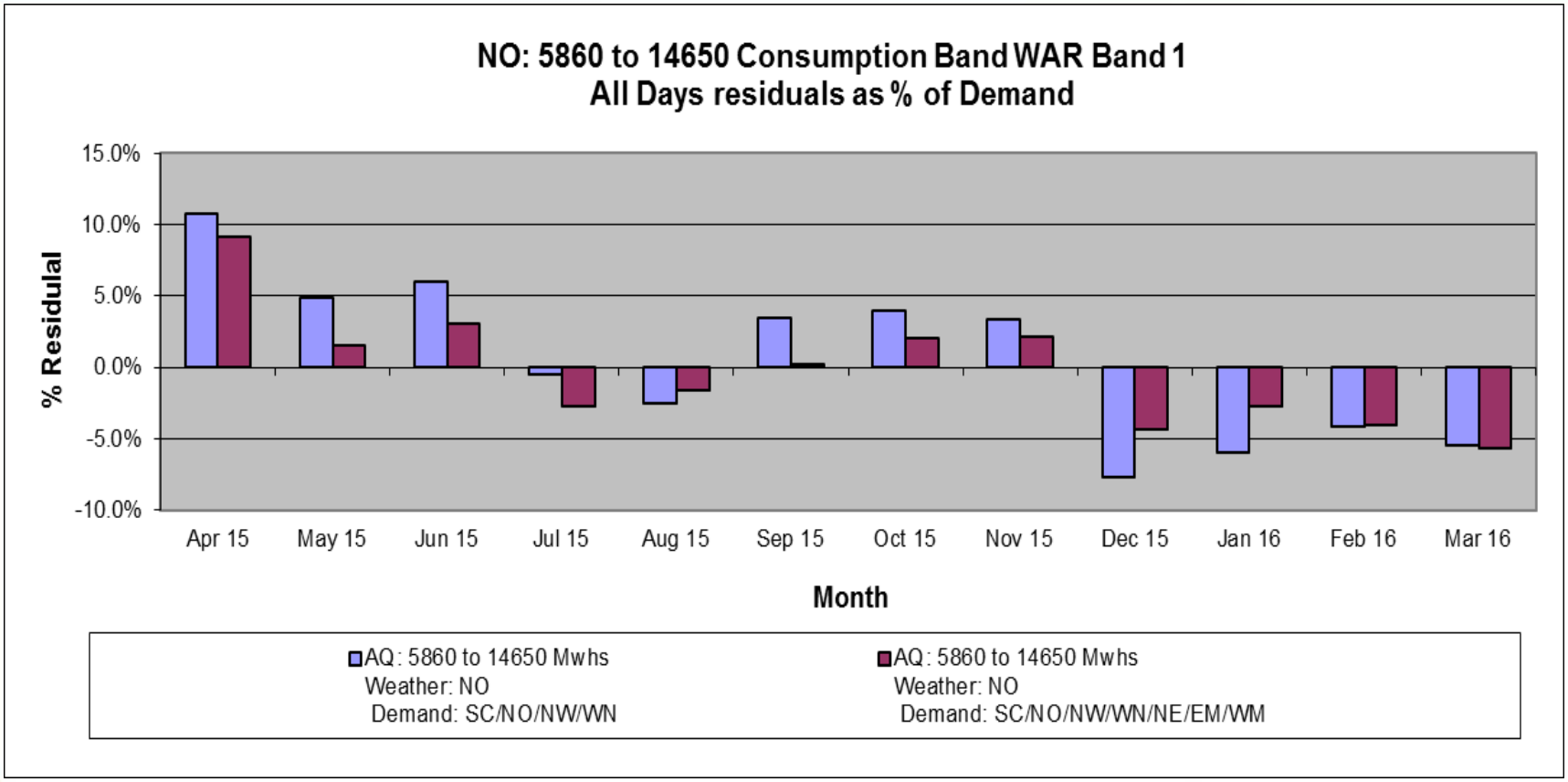
respect › commitment › teamwork

Large NDM Modelling Results

Comparison: NO LDZ, EUC WAR Band 1: 5,860-14,650 MWh pa



- Comparison of monthly residuals (all days) for the specified LDZ for the two models tested
- **TWG to decide on preferred model**

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TWG Decisions

Modelling Run Decisions	Progress
Small NDM EUC Band 3 (CB)	
Large NDM EUC Band 5 (CB)	
Large NDM EUC Band 6 (CB)	
Large NDM EUC Band 7 & 8 (CB)	
Large NDM EUC Band 5 (WB)	
Large NDM EUC Band 6 (WB)	

Large NDM Modelling Results
WAR Band Analysis: 14,650 - 58,600 MWh pa

Consumption Band 7 & 8:
3 LDZ Aggregations Applied

	WAR Banding											
	0.00 – 0.318			0.318 – 0.356			0.356 – 0.431			0.431 – 1.00		
SC/NO/NW/WN	96%	63%	31	79%	87%	44	61%	92%	64	37%	96%	35
NE/EM/WM	87%	90%	50	71%	95%	91	57%	94%	60	34%	95%	34
WS/EA/NT/SE/SO/SW	96%	64%	43	69%	86%	45	53%	91%	60	31%	96%	53

Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- Sample numbers were sufficient for a 3 LDZ group model to be run
- ILFs show clear distinction across WAR bands for all LDZs
- No TWG decision required for this EUC Band

Large NDM Analysis Summary

- Good R^2 Coefficients for majority of models, including WAR Bands, some lower values in WAR Band 1
- Merging sample data for Bands 7 and 8 for modelling purposes has helped results remain acceptable
- *Recap on decisions made:*
  - *Consumption Band 5: Individual or Individual with WS / SW combined*
  - *Consumption Band 6: Individual or Individual with WS / SW combined*
  - *Consumption Band 7&8: Individual or Individual with WS / SW, SE / SO combined*
  - *Consumption Band 5 WAR: 5 group LDZ or 4 group LDZ*
  - *Consumption Band 6 WAR: 3 group LDZ or 2 group LDZ*
- Are TWG happy to move to model smoothing phase with the Large NDM modelling results presented today ?

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 6th June Xoserve to publish draft Demand Estimation parameter values i.e. ALPs, DAFs, PLFs for DESC and TWG to review and provide feedback
- Draft parameters will also include contingency MOD 0451 PPM profiles for EUC Band 1, as per DESC meeting on 16th February 2016
- TWG meeting planned for 22nd June to review feedback received
- DESC meeting 6th July to finalise proposals in order to publish to wider industry participants