respect › commitment › teamwork

DESC Technical Work Group

EUC Modelling 2017/18: Single Year Modelling Results

TWG 17th May 2017

Agenda

- Section 1: Background, Timetable and Objectives of Meeting
- Section 2: Introduction to Modelling Results
- Section 3: Small NDM Sector Modelling Results (2016/17 sample data)
  - Part 1: Small NDM Consumption Bands
  - Part 2: Small NDM WAR Bands
- Section 4: Large NDM Sector Modelling Results (2016/17 sample data)
  - Part 1: Large NDM Consumption Bands
  - Part 2: Large NDM WAR Bands
- Section 5: Next Steps

Section 1:

Background, Timetable and Objectives of Meeting

Demand Estimation: 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 (ALPs & DAFs)

- Provide a means of determining NDM Supply Point capacity
  i.e. NDM EUC Load Factors

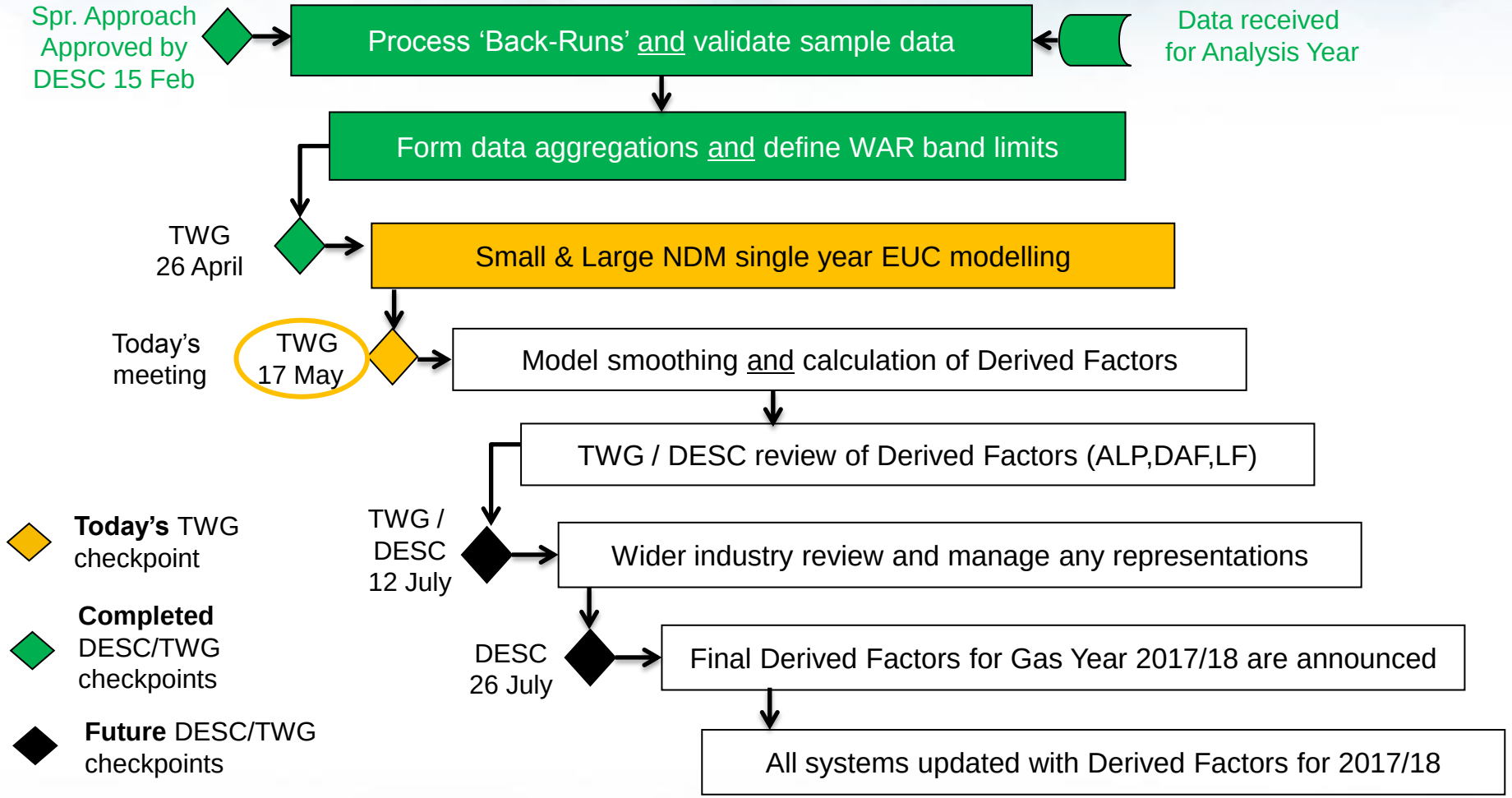
- The underlying NDM EUC and aggregate NDM demand models derived each year are intended to deliver these obligations only

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

Demand Estimation: Role of DESC, TWG and CDSP

- DESC collectively required by UNC Section H to:
  - Submit proposals to Transporters and Users for each Gas Year comprising:
    - End User Category (EUC) Definitions
    - NDM Profiling Parameters
    - Capacity Estimation Parameters
  - In addition:
    - Analysis of accuracy of the allocation process
    - Derivation of CWV and Seasonal Normal
    - Consultation with Industry
- Xoserve, as the appointed Common Data Services Provider (CDSP), is required to perform the analysis to support DESC's UNC requirements

Demand Estimation: Agreed Work Plan for 2017



- Work plan for 2017 Modelling included as part of Spring Approach document which was confirmed and agreed at 15th February DESC meeting
- Work plan provides more transparency of process and includes checkpoints for DESC/TWG review

Demand Estimation: Objectives of this Meeting

- Key objectives of May TWG meeting:
  - Provide TWG with overview of all EUC model results from single year modelling (2016/17 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

Demand Estimation: UNC Modification 0432

- UNC Modification 432 is due to be implemented at 5am on 1st June 2017, 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

Section 2:

Introduction to Modelling Results

Demand Estimation: Basis of 2017 Modelling (1)

- 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 2017 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 2016 (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

Demand Estimation: Basis of 2017 Modelling (2)

- The approach to modelling for Band 01B in previous years has been to include all holiday days in the core Monday to Thursday models

- As part of the 16/17 autumn / winter adhoc work plan, which included a review of 01B models performance during summer months, analysis was presented to DESC which indicated that it may be beneficial to exclude holidays from the core model

- Following a review of this analysis, DESC agreed at its meeting on 15th February 2017, to exclude holidays from the regression models for 01B EUCs, bringing them in line with the practice used for 02B EUCs and above. This practice is now in place for the Spring 2017 analysis

Demand Estimation: Basis of 2017 Modelling (3)

- 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. 29th May to 25th September 2016
  - 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)

Demand Estimation: 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

Demand Estimation: Indicative Load Factors

- Indicative Load Factors (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

Section 3:

Small NDM Sector Modelling Results

Small NDM Sector: (<2,196 MWh pa)

- Small NDM for Demand Estimation purposes <2,196 MWh
- EUC consumption ranges not prescribed in Uniform Network Code, however there are no proposed changes to EUC definitions for Gas Year 2017/18
- Current EUC Bands / Consumption Ranges for Small NDM:
  - Consumption Band 1: 0 – 73.2 MWh pa
  - Consumption Band 2: 73.2 – 293 MWh pa
  - Consumption Band 3: 293 – 732 MWh pa *
  - Consumption Band 4: 732 – 2,196 MWh pa *
  - Note: Bands 3 and 4 also include 4 x Winter Annual Ratio (WAR) Bands alongside the Consumption Band EUC
- Small NDM is the main component of the overall NDM (89% of total AQ)

Section 3 part 1:

Small NDM Consumption Bands: 1 to 4

AQ Range: <2,196 MWh pa

Single Year Results for 2016/17 sample data

Small NDM Consumption Bands: Agreed Modelling Runs

EUC Bands: Range	Comments on 2016/17 data TWG Agreed Modelling Runs
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)
Band 4: 732 to 2,196 MWh pa	Individual LDZ analysis (NW/WN combined)

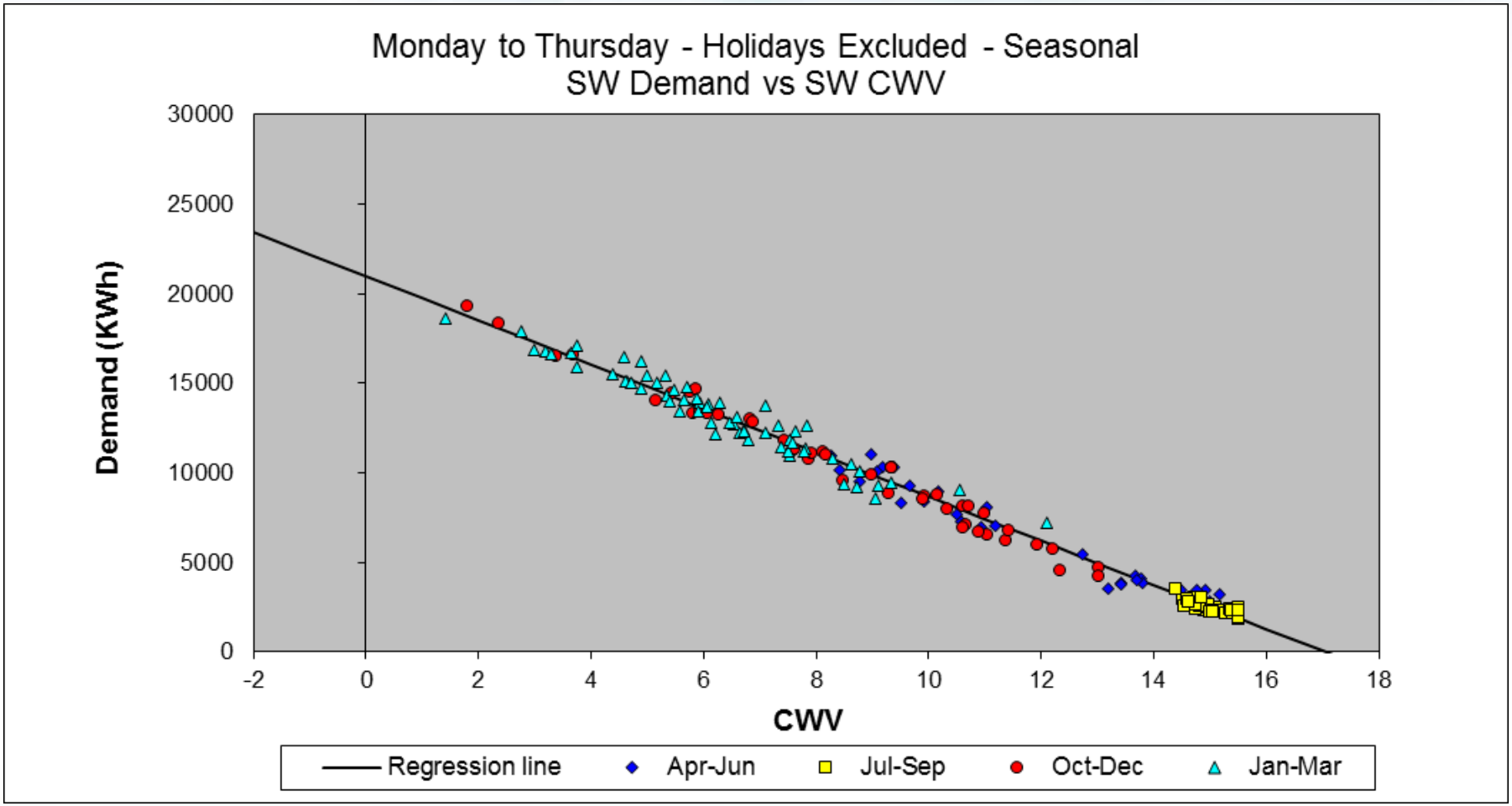
- Modelling Runs agreed at April TWG. Main discussion point this year was around reduction in Band 1 numbers
- Sufficient data available to allow individual LDZ analysis for all Bands

Small NDM Modelling Results: EUC Band 1

0 to 73.2 MWh pa Domestic Sites	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	36%	98%	188
NO	36%	98%	179
NW / WN	33%	98%	185
NE	35%	97%	189
EM	32%	98%	208
WM	31%	99%	201
WS	32%	98%	185
EA	32%	99%	233
NT	30%	99%	194
SE	29%	99%	196
SO	29%	99%	218
SW	30%	99%	201

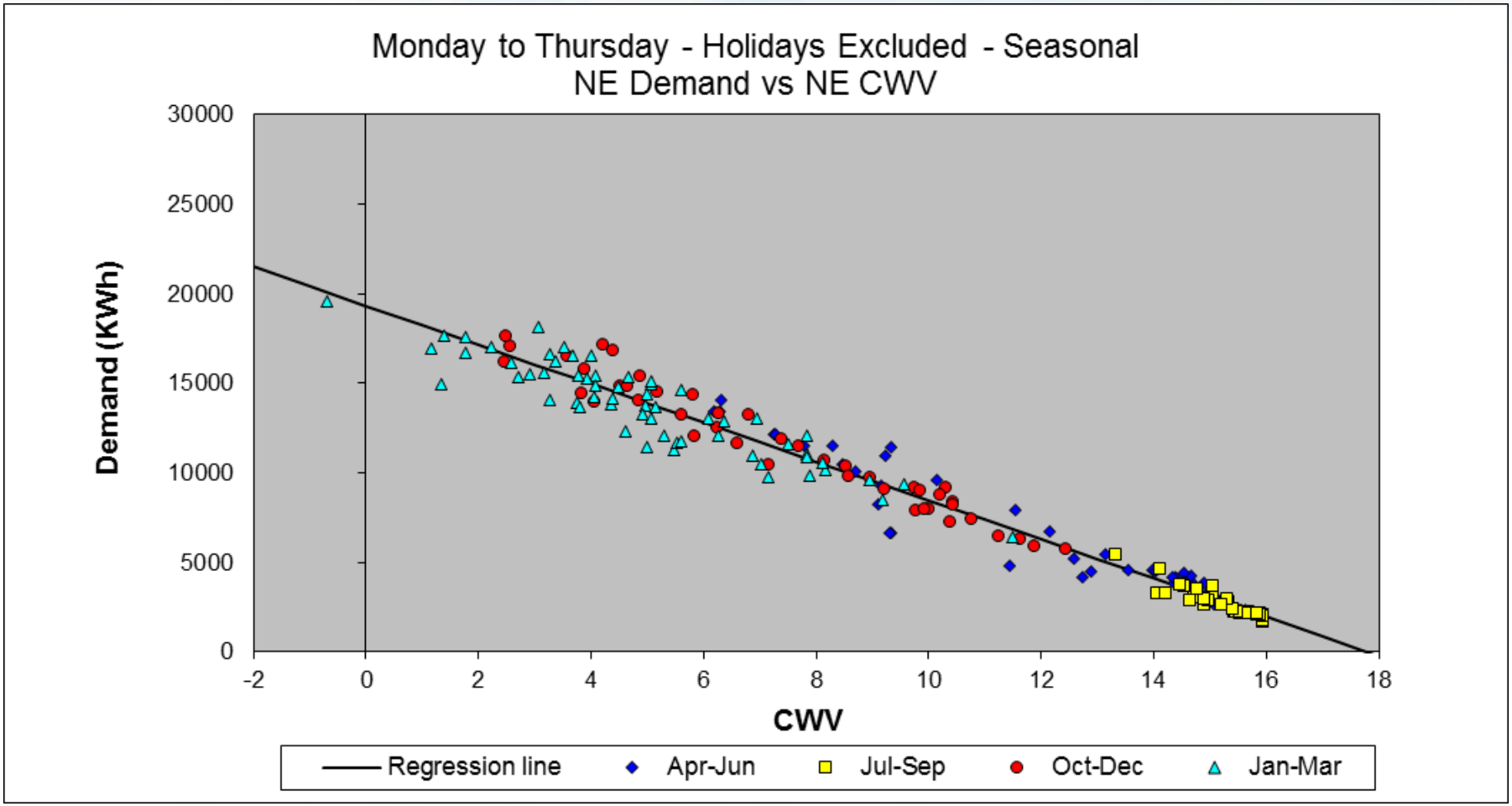
- ILFs generally in line with last year
- R^2 on average slightly higher than last year
- No TWG decision required for this EUC Band
- Results for highlighted LDZs showing more detail to follow

Small NDM Modelling Results: SW LDZ, EUC Band 1



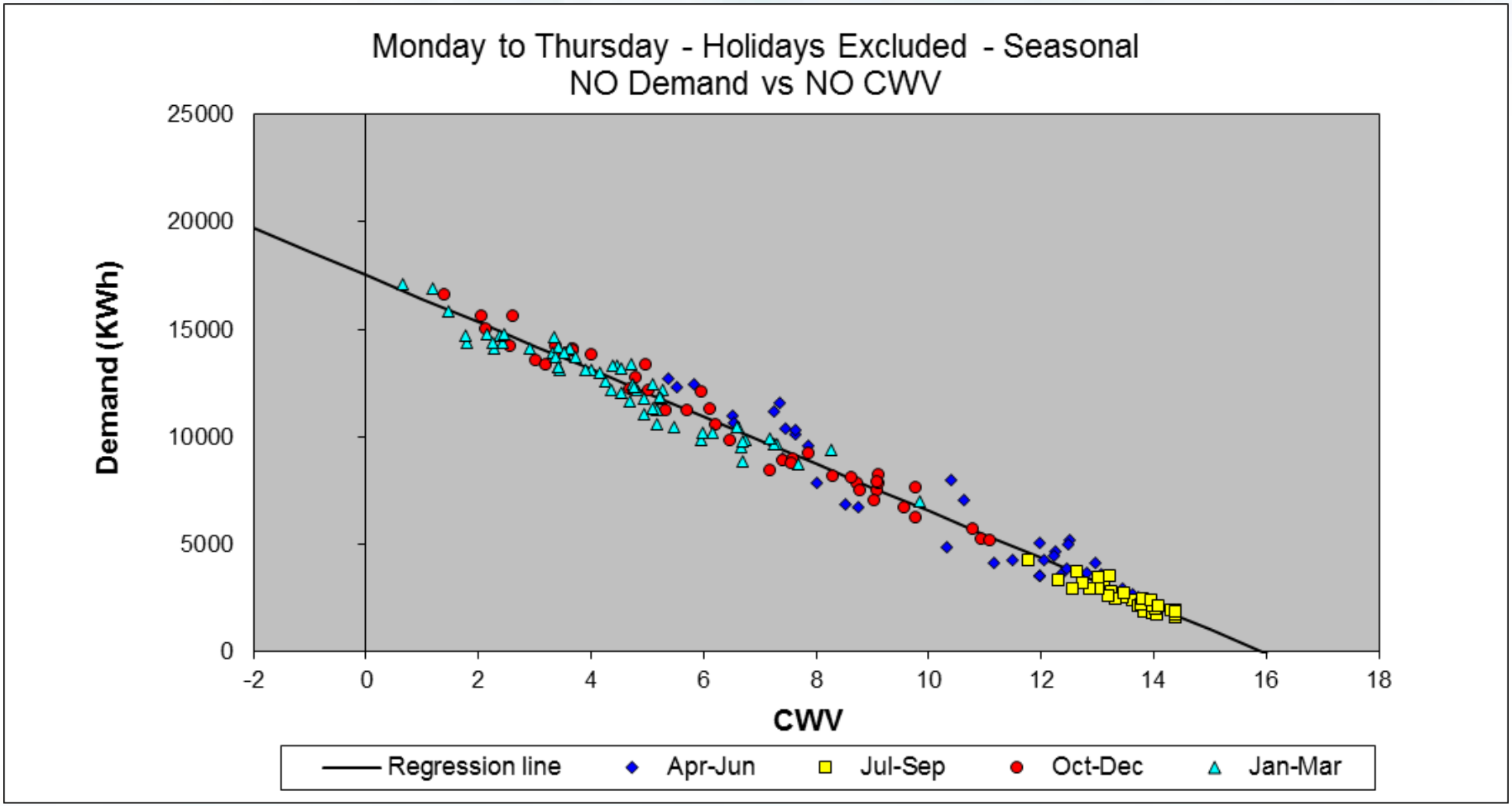
- SW has highest R^2 value of models in this band – 99% (all days)
- Note: Holidays are excluded from Band 1 this year, which means there are fewer data points in the Mon-Thu model

Small NDM Modelling Results: NE LDZ, EUC Band 1



- NE has the lowest R^2 of the models in this band – 97%
- More scatter evident

Small NDM Modelling Results: NO LDZ, EUC Band 1



- LDZ NO has the smallest sample size for this band - 179 sites, which is a decrease of 29 compared to last year
- Model has R^2 value of 98%

xoserve

respect > commitment > teamwork

Small NDM Modelling Results: EUC Band 2

73.2 to 293 MWh pa	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	35%	97%	132
NO	33%	96%	105
NW / WN	30%	95%	141
NE	32%	96%	117
EM	31%	97%	169
WM	28%	96%	131
WS	29%	96%	81
EA	31%	96%	173
NT	35%	97%	182
SE	30%	97%	170
SO	27%	97%	162
SW	30%	97%	147

- ILFs for majority of LDZs are comparable to last year
- R^2 on average has remained the same as last year with good results
- No TWG decision required for this EUC Band

Small NDM Modelling Results: EUC Band 3

293 to 732 MWh pa	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	35%	97%	172
NO	34%	96%	114
NW / WN	29%	94%	153
NE	33%	96%	132
EM	31%	97%	166
WM	27%	95%	119
WS	28%	95%	32
EA	29%	96%	181
NT	32%	97%	173
SE	29%	98%	210
SO	28%	97%	152
SW	29%	97%	111

- ILFs for majority of LDZs are comparable to last year
- R^2 on average has decreased very slightly this year
- No TWG decision required for this EUC Band
- Note: Sample size for NT and SE reduced marginally due to data issue (see Appendix), negligible impact to model statistics

Small NDM Modelling Results: EUC Band 4

732 to 2,196 MWh pa	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	34%	96%	319
NO	36%	97%	231
NW / WN	32%	96%	265
NE	37%	96%	320
EM	34%	98%	221
WM	30%	96%	215
WS	34%	97%	73
EA	35%	98%	217
NT	35%	98%	239
SE	34%	98%	299
SO	31%	98%	275
SW	35%	97%	122

- ILFs for majority of LDZs are comparable to last year
- R^2 on average has decreased very slightly this year
- No TWG decision required for this EUC Band
- Note: Sample size for NT and SE reduced marginally due to data issue (see Appendix), negligible impact to model statistics

Section 3 part 2:

Small NDM WAR Bands: 3 to 4

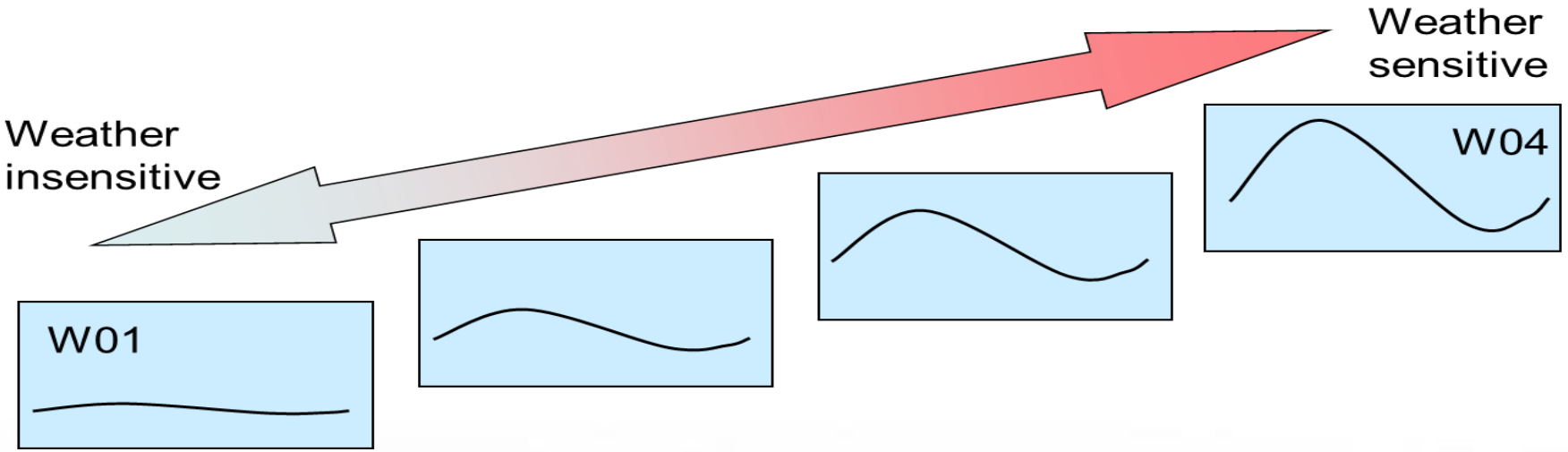
AQ Range: 293 to 2,196 MWh pa

Single Year Results for 2016/17 sample data

Winter Annual Ratio (WAR) Bands

- Higher AQ Bands where meter points are monthly read have a consumption band 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

- WAR Band limits for Spring 2017 analysis were discussed and agreed at April TWG



Small NDM WAR Bands: Agreed Modelling Runs

EUC Bands: Range	Comments on 2016/17 data TWG Agreed Modelling Runs
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 SW/WS combined) Agreed WAR Ratios: 0.421; 0.491 and 0.573

- Modelling Runs agreed at April TWG.
- Sufficient data available to allow individual LDZ analysis except for WS which has had to be combined with SW

Small NDM Modelling Results: EUC Band 3 and 4 WARs

	WAR Band: 293 to 2196 MWh pa											
	Band 1 0.00 – 0.421			Band 2 0.421 – 0.491			Band 3 0.491 – 0.573			Band 4 0.573 – 1.00		
SC	53%	93%	123	38%	96%	185	27%	95%	136	22%	89%	47
NO	54%	89%	107	39%	97%	107	27%	96%	104	22%	94%	27
NW /WN	55%	95%	82	41%	97%	101	27%	95%	144	21%	92%	91
NE	55%	94%	115	42%	96%	139	30%	95%	139	23%	93%	59
EM	55%	92%	75	41%	97%	108	28%	97%	127	22%	93%	77
WM	55%	93%	63	36%	96%	85	27%	96%	94	20%	92%	92
WS / SW	63%	88%	61	41%	96%	96	29%	96%	84	22%	94%	97
EA	57%	93%	64	42%	96%	103	30%	97%	127	23%	90%	104
NT	65%	89%	75	42%	97%	131	30%	98%	123	22%	93%	83
SE	61%	87%	62	42%	97%	179	29%	97%	142	22%	94%	126
SO	55%	89%	67	39%	98%	113	27%	97%	134	21%	94%	113

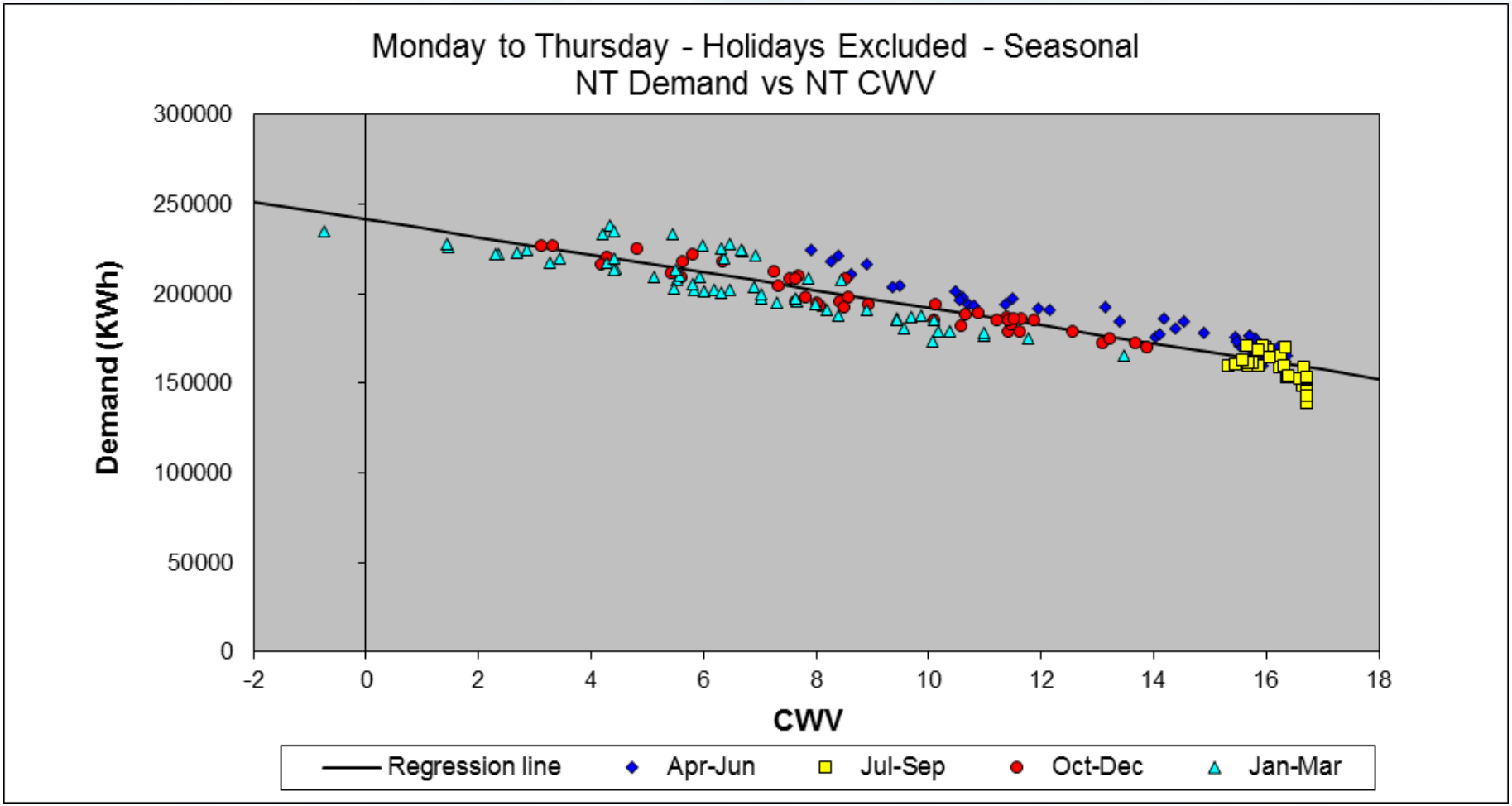
Indicative Load Factor (ILF) : **R^2 Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- ILFs show clear distinction across WAR bands for all LDZs
- No TWG decision required for these EUC Bands
- Results for NT and SE models are highlighted due to initial poor results (lower R^2 values/unusual data patterns – see Appendix)

xoserve

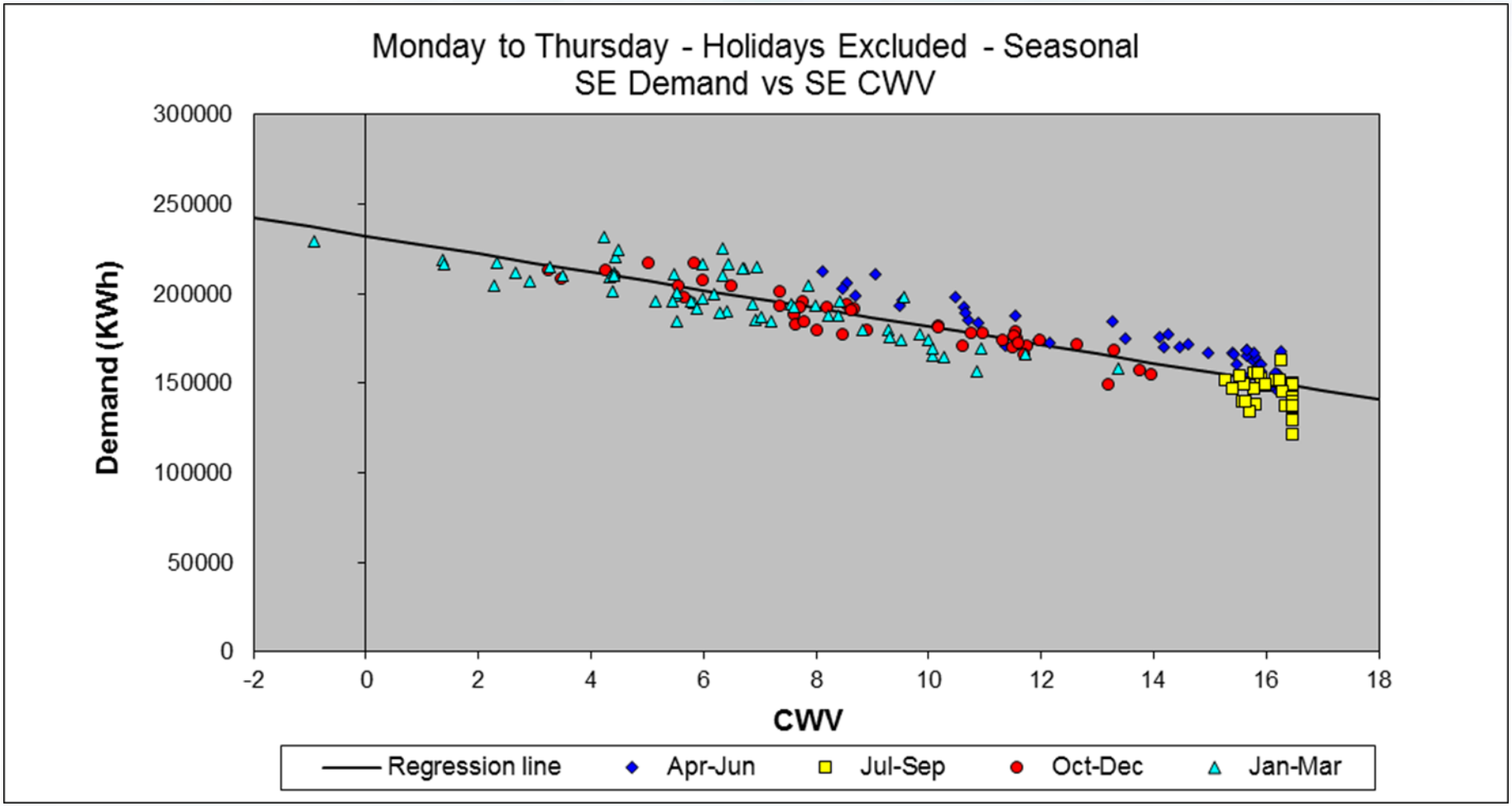
respect > commitment > teamwork

Small NDM Modelling Results: NT LDZ, EUC Band 3 – 4 WAR Band 1 – Revised Model



- 6 supply points with erroneous data streams removed
- Revised model results has increased R^2 for this model from 68% to 89%

Small NDM Modelling Results: SE LDZ, EUC Band 3 – 4 WAR Band 1 – Revised Model



- 4 supply points with erroneous data streams removed
- Revised model results has increased R^2 for this model from 77% to 87%
- Are TWG happy with Xoserve's approach for these 2 models?

Small NDM Modelling Results: 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. 7 of 12 LDZs now have less than 200 sites in the sample. There has been sufficient numbers to produce robust models this year by individual LDZ (desire to see an increase in Band 1 no.'s for future analysis was covered at April TWG meeting)
- For EUC Bands 2 to 4 there has been a small overall drop in sample numbers available, however we have been able to continue mostly with individual LDZs, providing good robust models for both Consumption Bands and WAR Band EUCs
- Topic of enhancing sample data quality checks can be added to the ad-hoc work log in the summer and feed into our internal discussions when replacing our existing processes / systems
- Are TWG happy to move to model smoothing phase with the Small NDM modelling results presented today ?

Section 4:

Large NDM Sector Modelling Results

Large NDM Sector: (>2,196 MWh pa)

- Large NDM for Demand Estimation purposes >2,196 MWh
- EUC consumption ranges not prescribed in Uniform Network Code, however there are no proposed changes to EUC definitions for Gas Year 2017/18
- Current EUC Bands / Consumption Ranges for Large NDM:
  - Consumption Band 5: 2,196 to 5,860 MWh pa
  - Consumption Band 6: 5,860 to 14,650 MWh pa
  - Consumption Band 7: 14,650 to 29,300 MWh pa
  - Consumption Band 8: 29,300 to 58,600 MWh pa

    All above also include 4 x Winter Annual Ratio (WAR) Bands alongside the Consumption Band EUC
  - Consumption Band 9: >58,600 MWh pa
- Large NDM is very much a minority component of overall NDM (11% of total AQ)

Section 4 part 1:

Large NDM Consumption Bands: 5 to 9

AQ Range: >2,196 MWh pa

Single Year Results for 2016/17 sample data

Large NDM Consumption Bands: Agreed Modelling Runs

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)
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

- Modelling Runs agreed at April TWG
- Decisions to be made on models for Consumption Bands 6 and 7 and 8

Large NDM Modelling Results: EUC Band 5

2,196 to 5,860 MWh pa	Indicative Load Factor (ILF)	R^2 Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	42%	97%	239
NO	41%	97%	114
NW / WN	40%	98%	158
NE	43%	97%	145
EM	39%	98%	131
WM	38%	98%	144
WS	39%	97%	33
EA	38%	98%	79
NT	38%	98%	147
SE	39%	99%	145
SO	36%	98%	104
SW	39%	98%	70

- Good results overall for individual LDZs with R^2 values in the range 97%-99%
- Note: Model for SC reduced to 239 from 247 due to data issue in SC Band 5 WAR Band 4 (see Appendix)

Large NDM Modelling Results: EUC Band 6

5,860 to 14,650 MWh pa	Run1: Individual LDZ (NW/WN Combined)			Run 2: Individual LDZ (NW/WN and WS/SW Combined)		
SC	43%	97%	84	43%	97%	84
NO	47%	97%	60	47%	97%	60
NW / WN	46%	98%	92	46%	98%	92
NE	55%	94%	77	55%	94%	77
EM	48%	98%	79	48%	98%	79
WM	43%	98%	80	43%	98%	80
EA	49%	96%	46	49%	96%	46
NT	46%	98%	56	46%	98%	56
SE	44%	97%	46	44%	97%	46
SO	42%	96%	48	42%	96%	48
WS	50%	97%	21	43%	98%	75
SW	41%	97%	54			

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

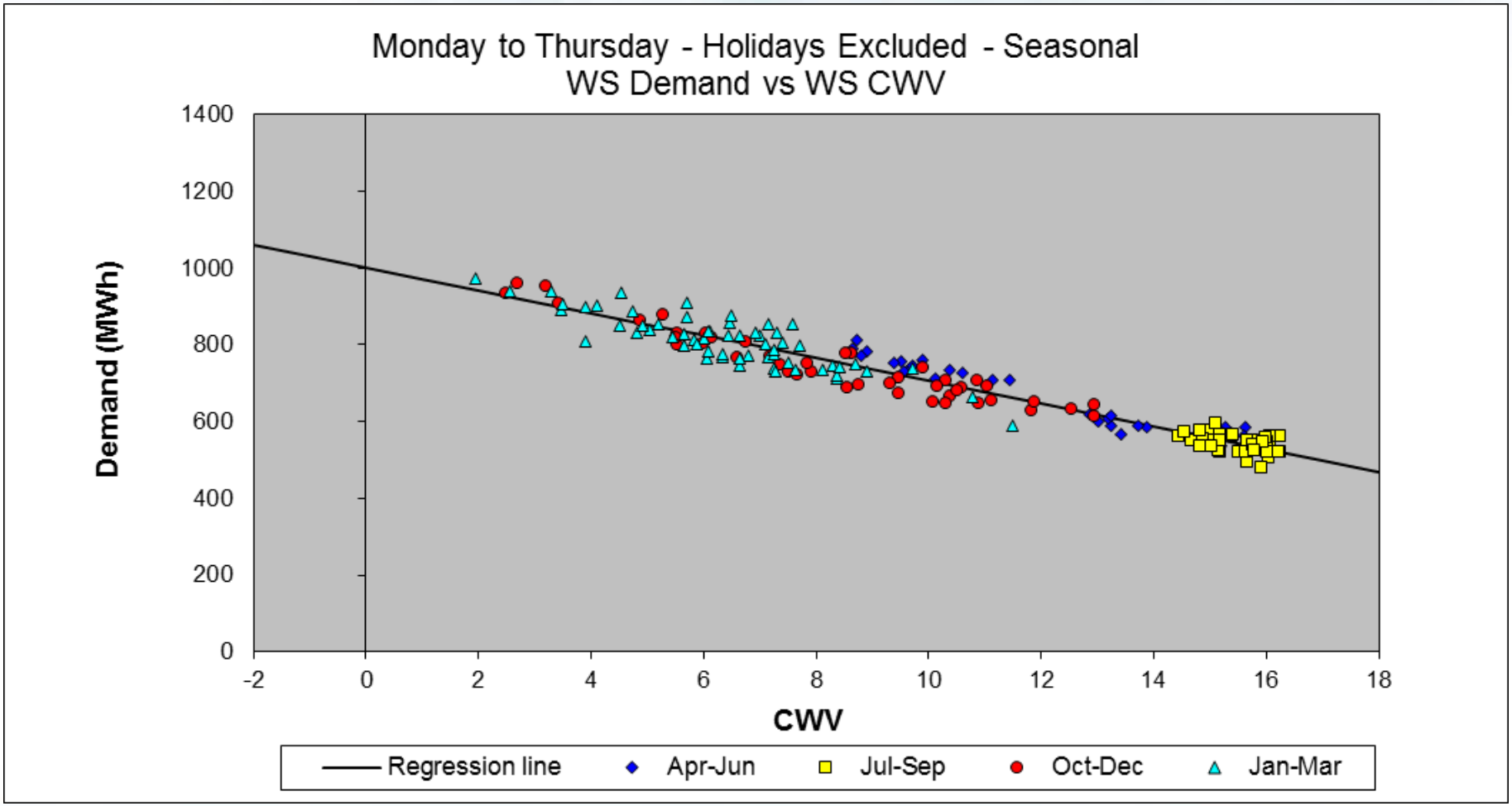
TWG Decision

Large NDM Consumption Band 6

AQ Range: 5,860 to 14,650 MWh

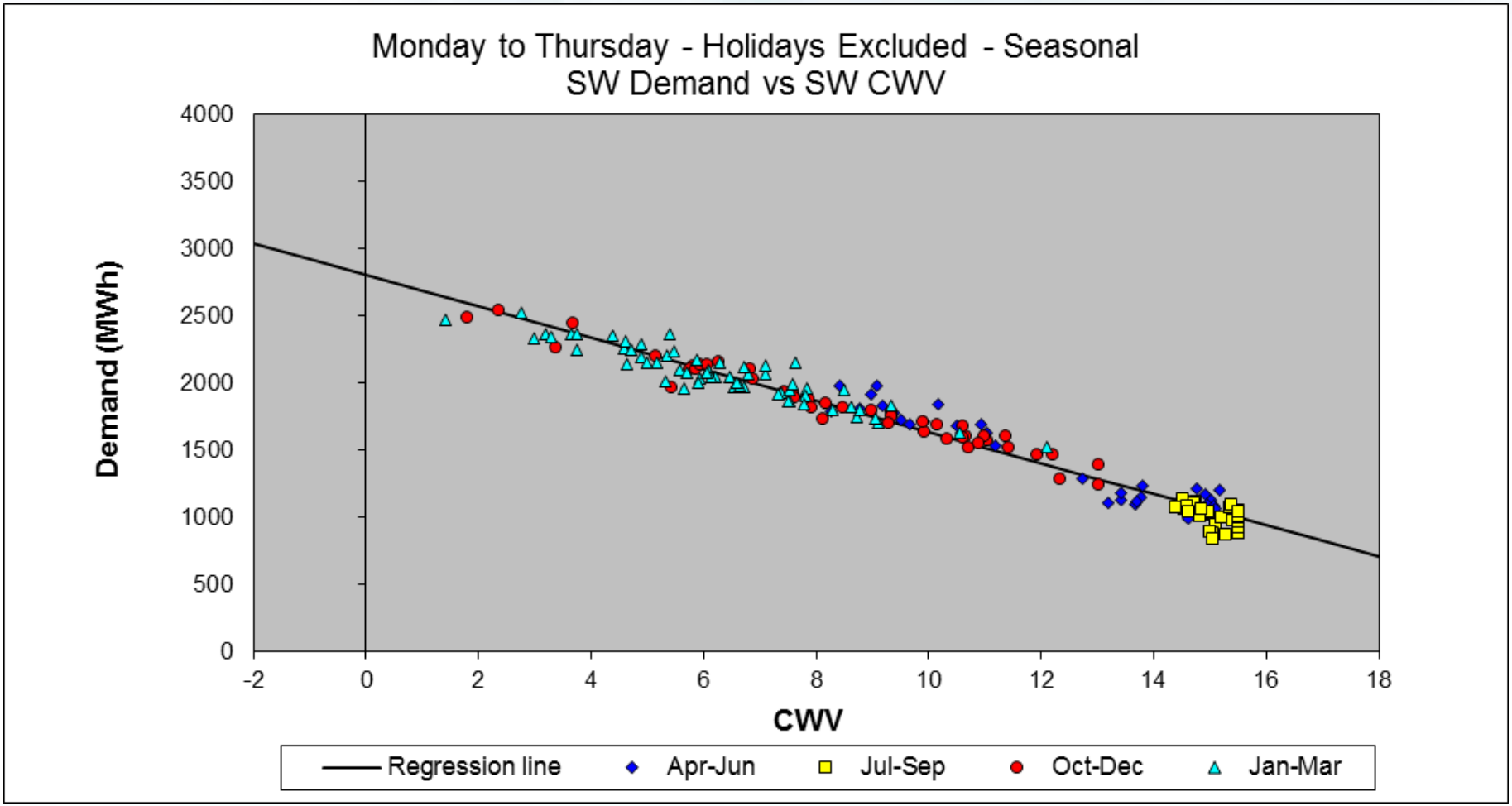
Run 1: Individual LDZ (NW/WN combined)

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



Run	ILF	R^2 (All days)	Sample
WS	50%	97%	21
WS / SW	43%	98%	75

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



Run	ILF	R^2 (All days)	Sample
SW	41%	97%	54
WS / SW	43%	98%	75

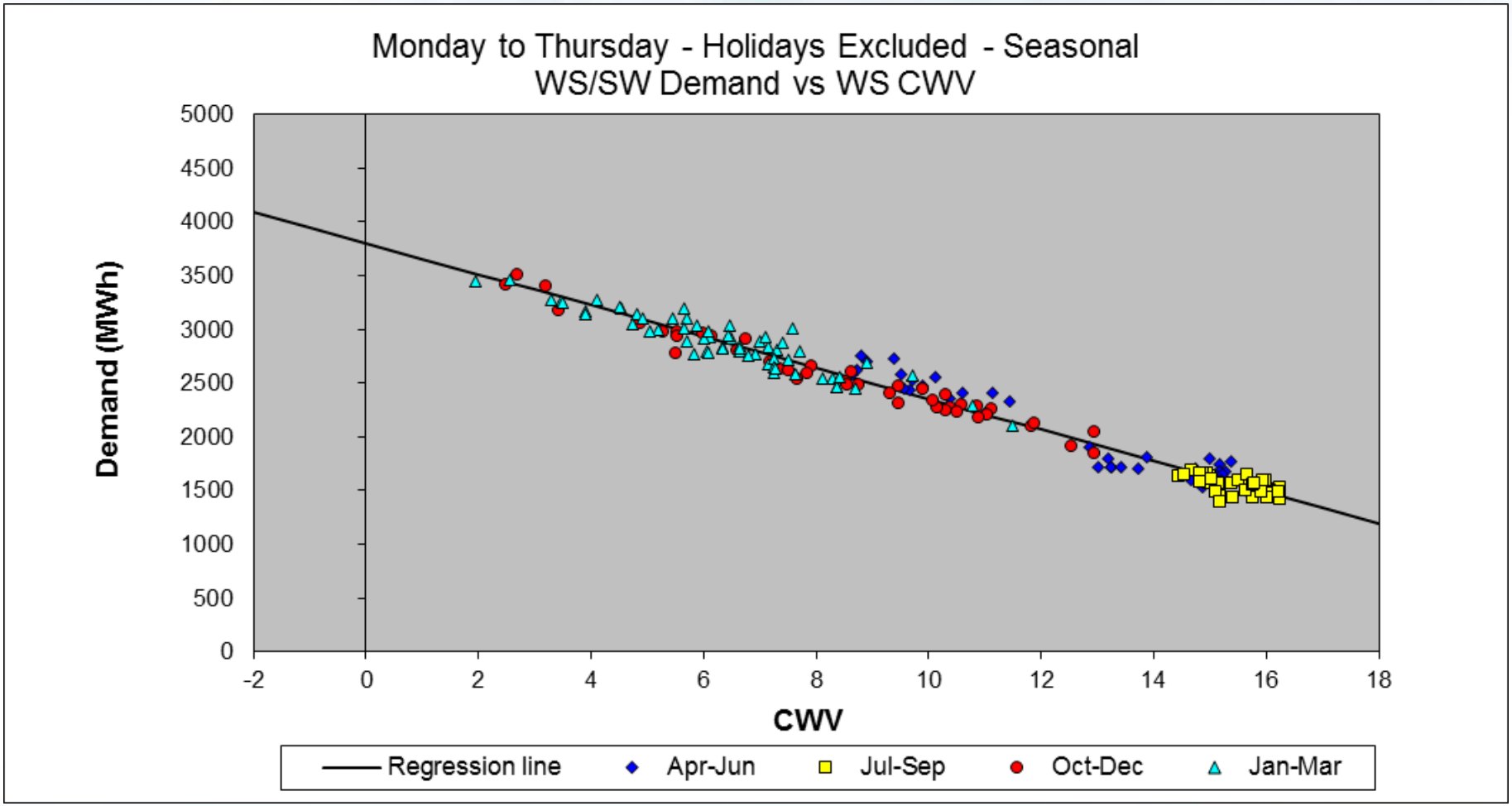
TWG Decision

Large NDM Consumption Band 6

AQ Range: 5,860 to 14,650 MWh

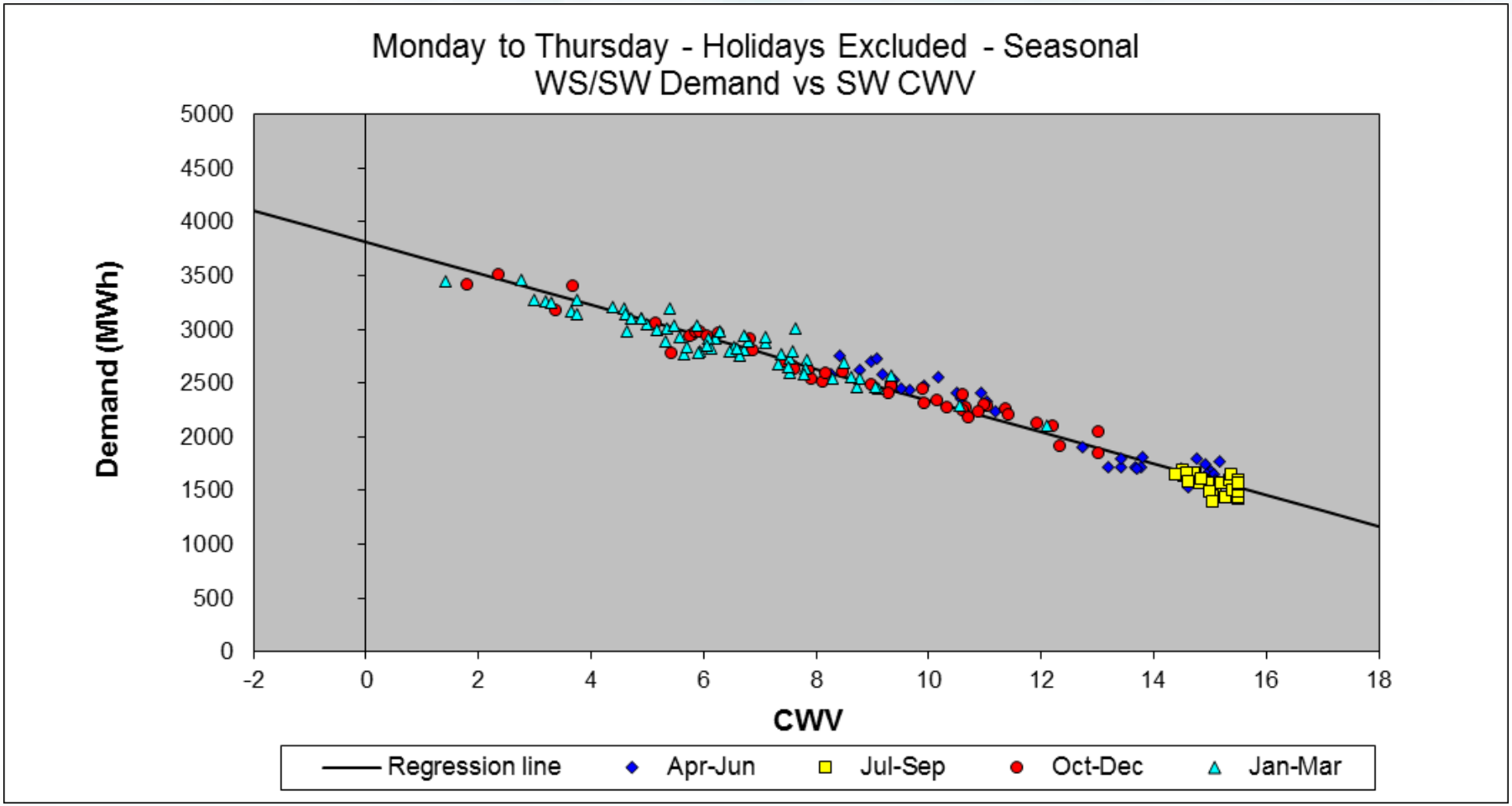
Run 2: Individual LDZ (NW/WN and WS/SW combined)

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



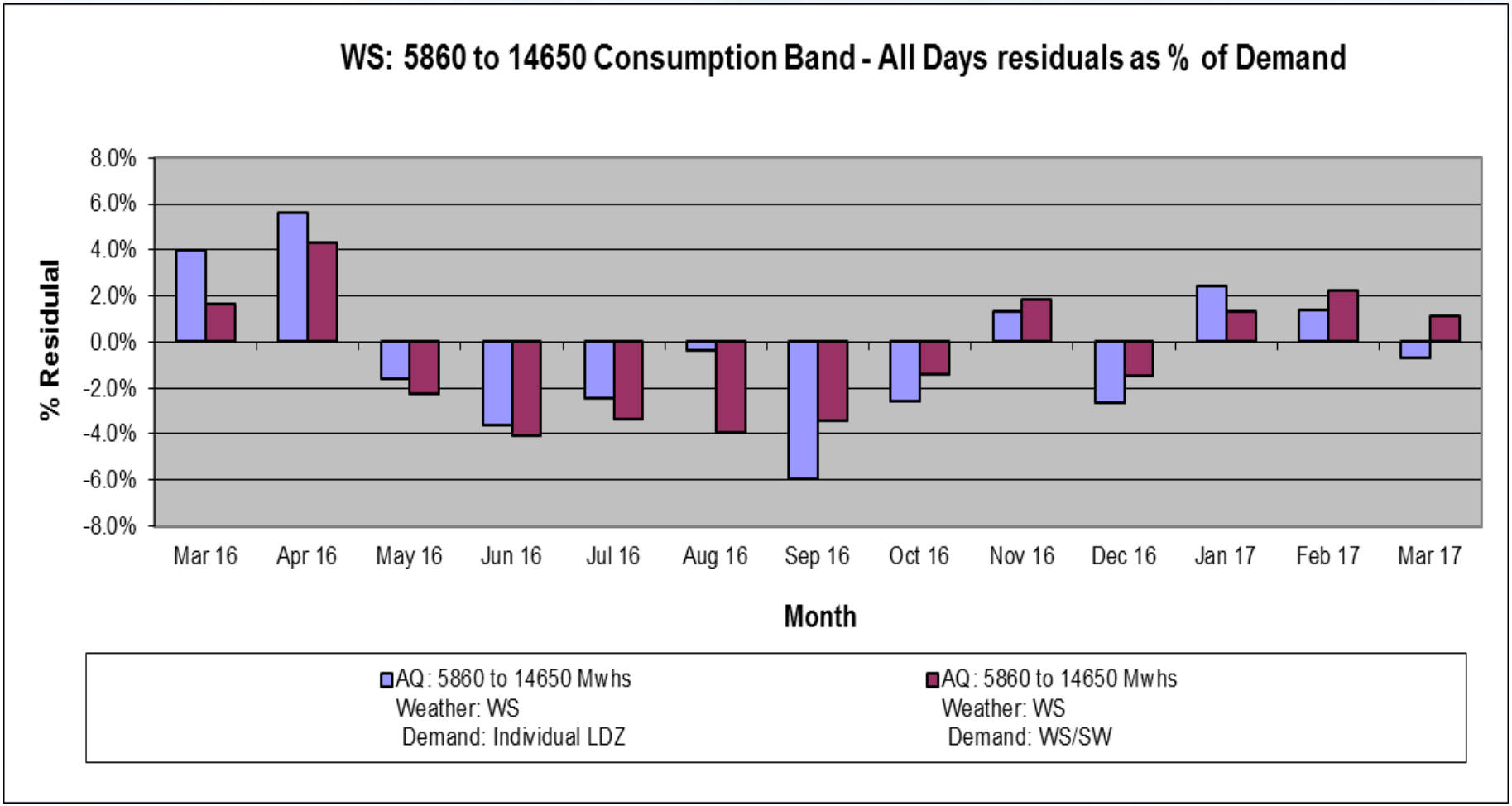
Run	ILF	R^2 (All days)	Sample
WS	50%	97%	21
WS / SW	43%	98%	75

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



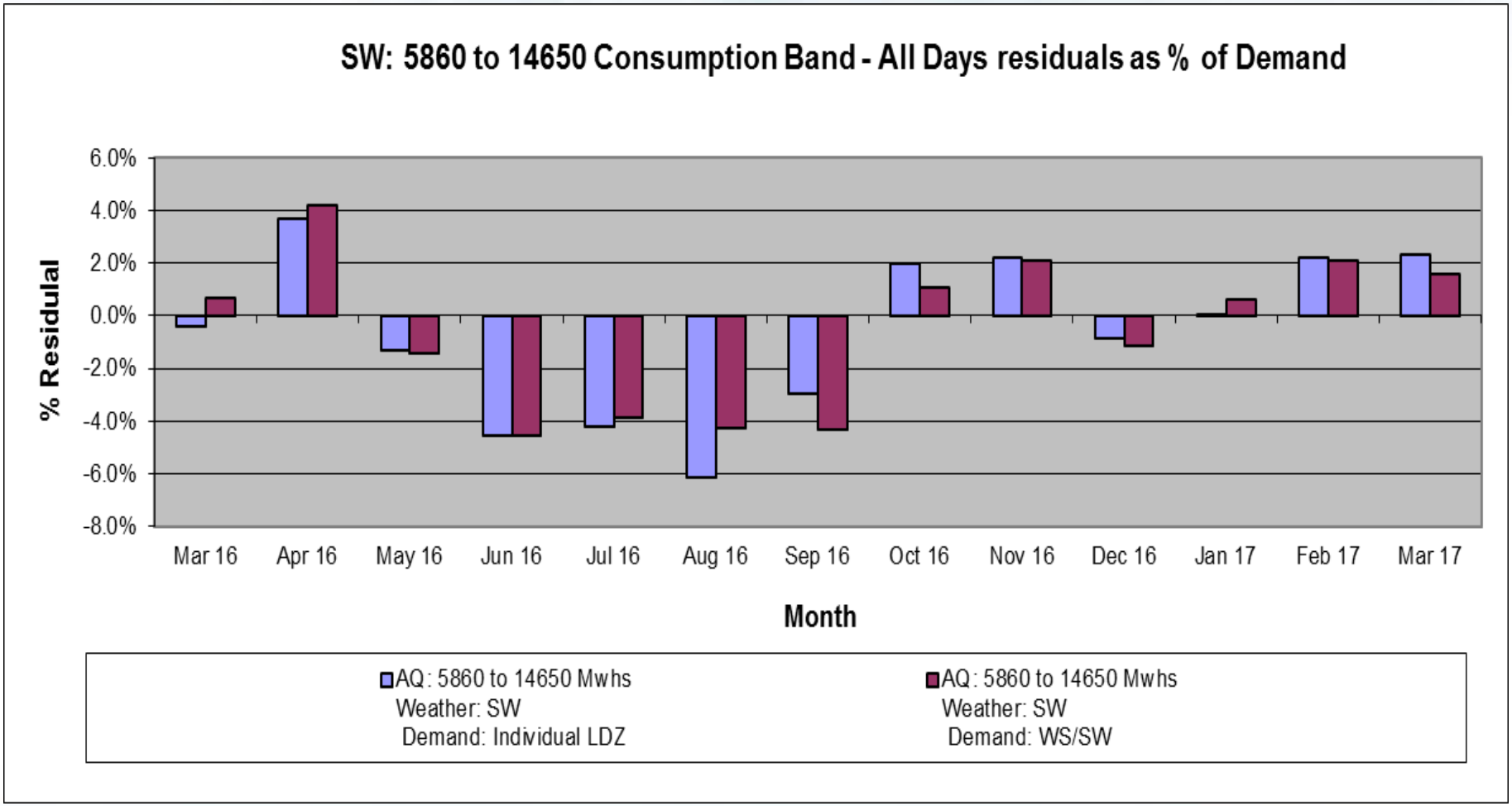
Run	ILF	R^2 (All days)	Sample
SW	41%	97%	54
WS / SW	43%	98%	75

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



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

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



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

Large NDM Modelling Results: EUC Band 7 and 8

14,650 to 58,600 MWh pa	Run1: Individual LDZ (NW/WN Combined)			Run 2: Individual LDZ (NW/WN, WS/SW and SE/SO Combined)		
SC	65%	77%	36	65%	77%	36
NO	67%	89%	38	67%	89%	38
NW / WN	58%	95%	92	58%	95%	92
NE	70%	93%	70	70%	93%	70
EM	57%	95%	93	57%	95%	93
WM	61%	95%	74	61%	95%	74
EA	56%	87%	42	56%	87%	42
NT	44%	97%	36	44%	97%	36
SE	45%	84%	20	43%	94%	45
SO	42%	91%	25			
WS	58%	91%	26	56%	91%	66
SW	57%	82%	40			

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

- Good results overall for majority of individual LDZs.
- Highlighted results for SE / SO and WS / SW models are shown in more detail on subsequent slides

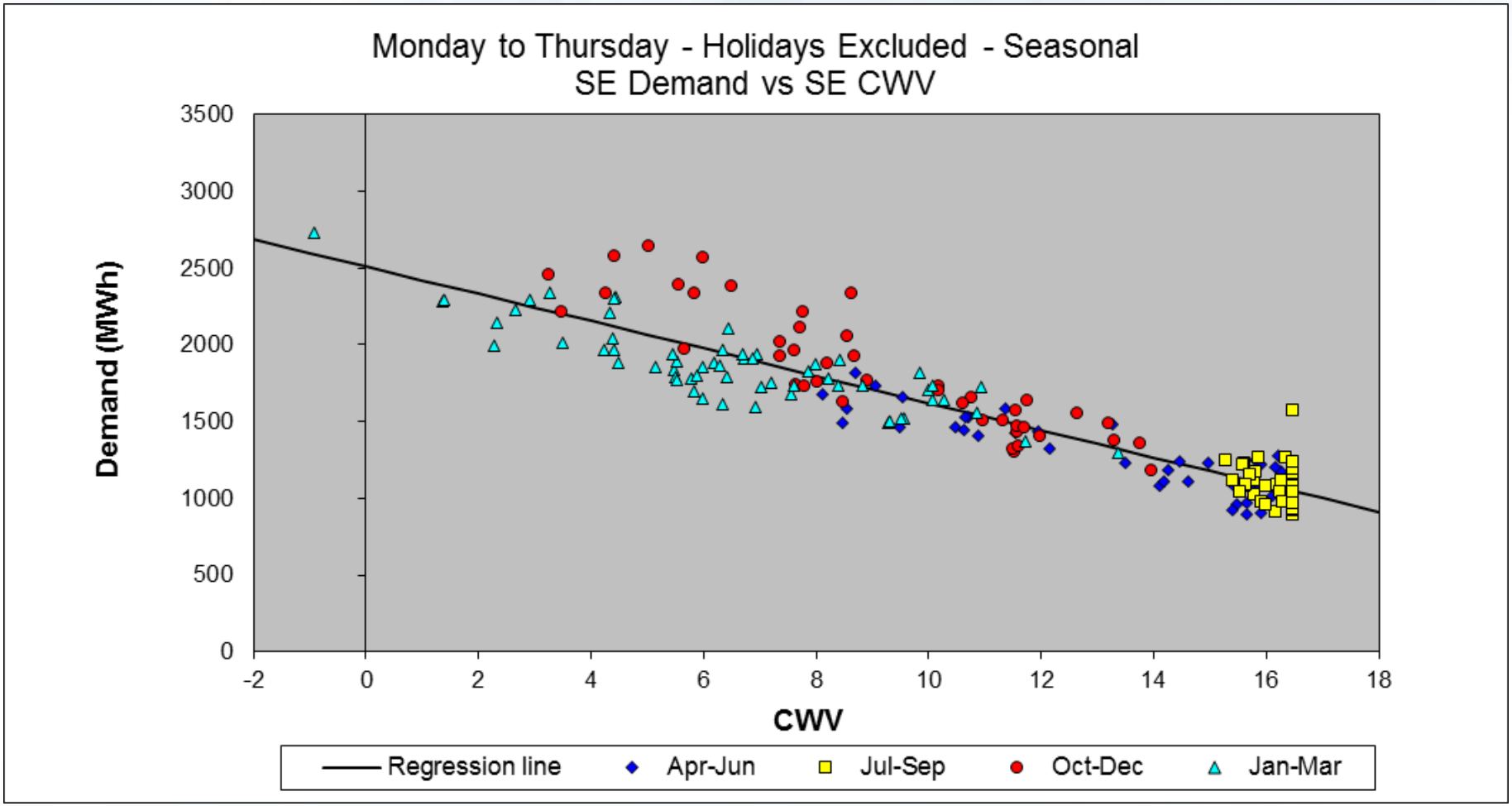
TWG Decision

Large NDM Consumption Band 7 and 8

AQ Range: 14,650 to 58,600MWh

Run 1: Individual LDZ (NW/WN combined)

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

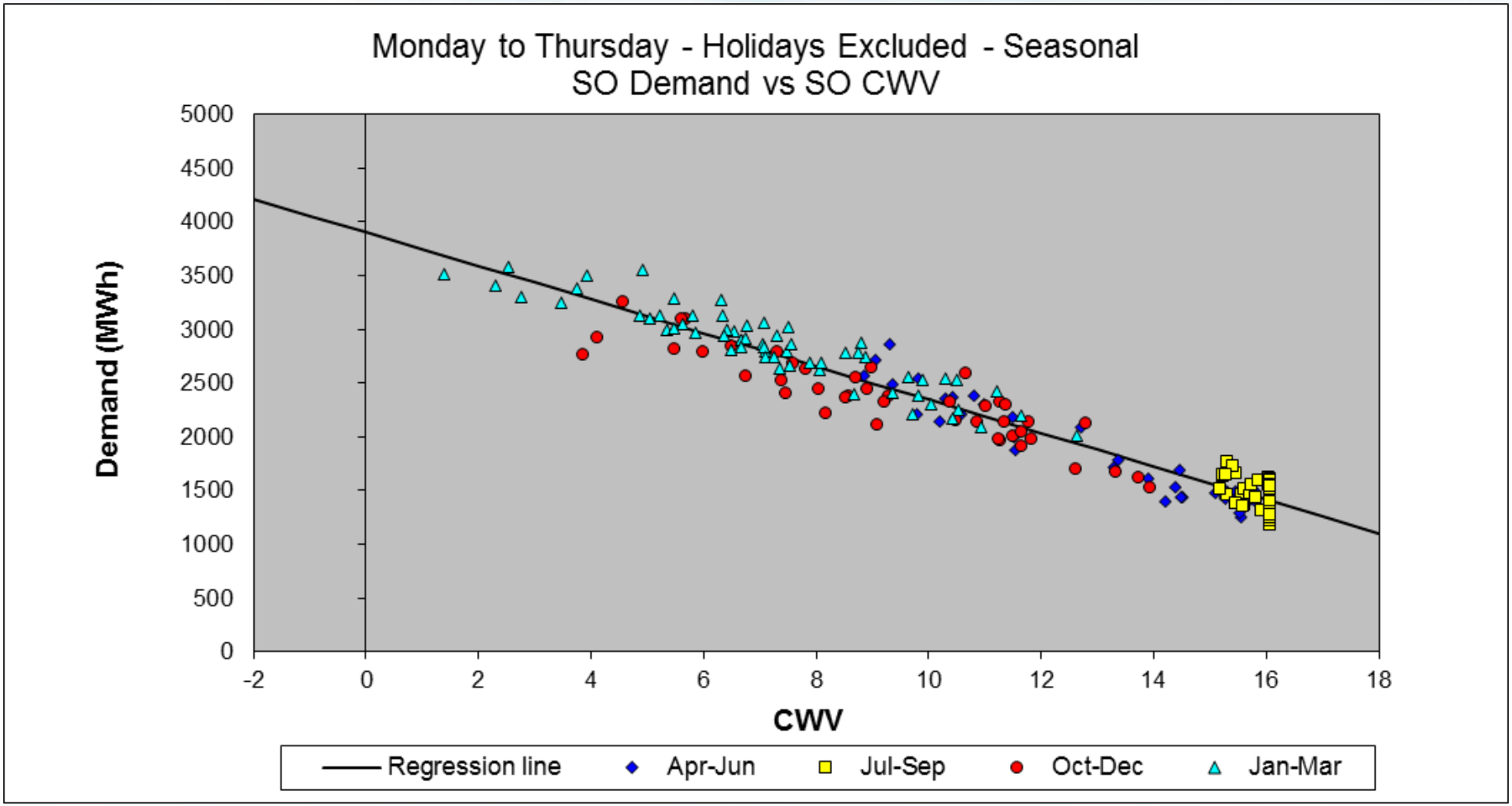


Run	ILF	R^2 (All days)	Sample
SE	45%	84%	20
SE / SO	43%	94%	45

xoserve

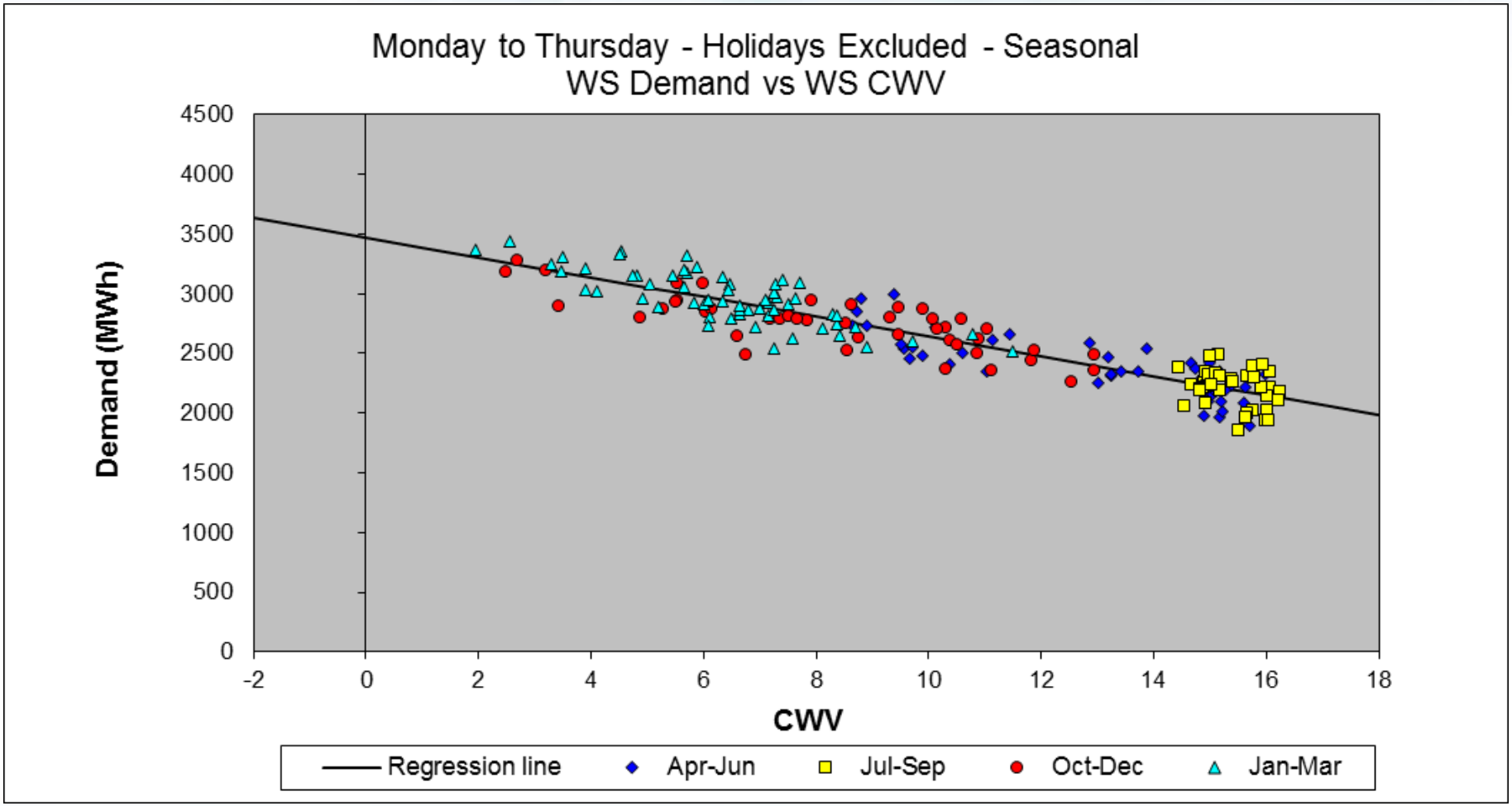
respect > commitment > teamwork

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



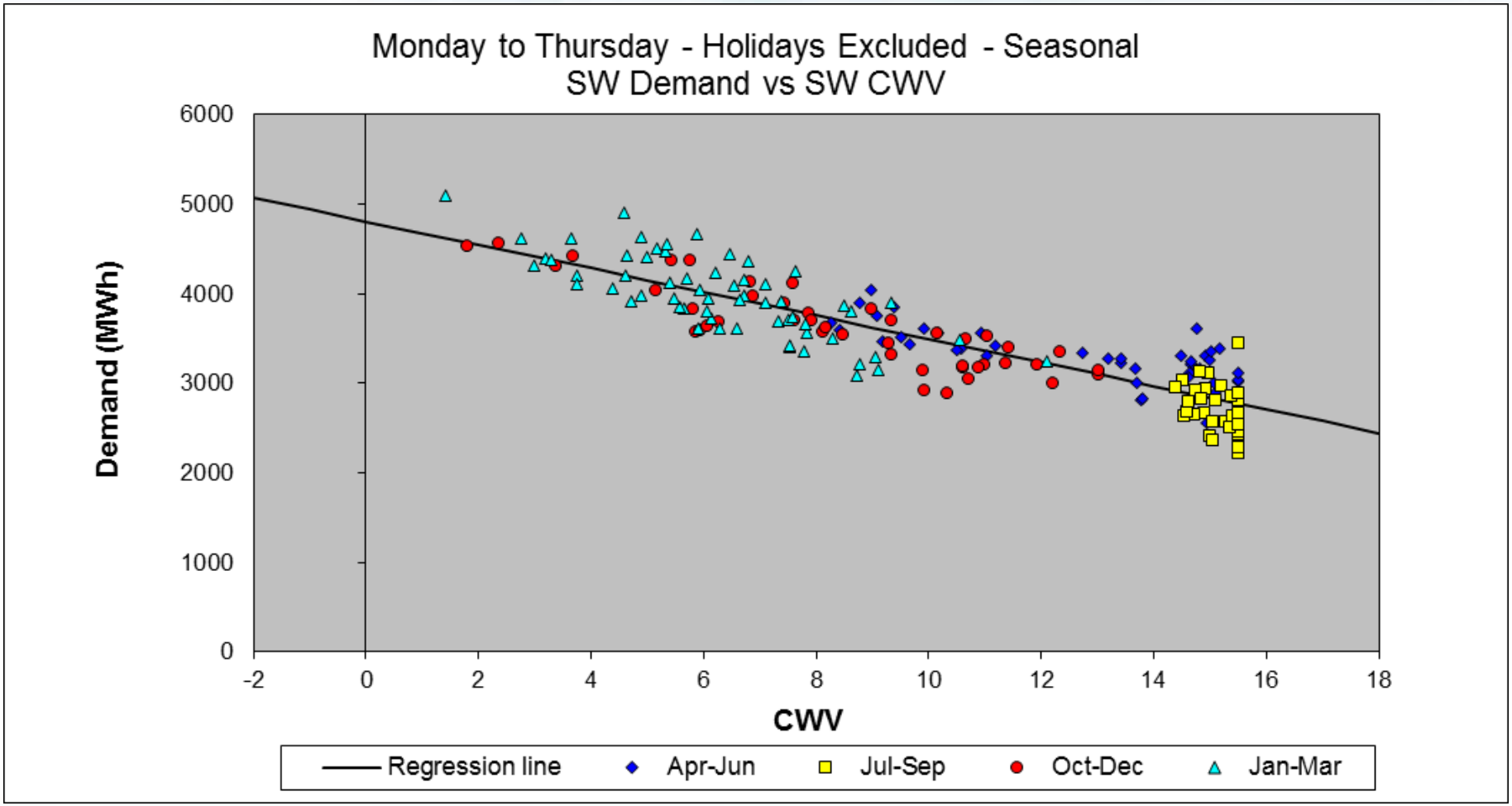
Run	ILF	R^2 (All days)	Sample
SO	42%	91%	25
SE / SO	43%	94%	45

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



Run	ILF	R^2 (All days)	Sample
WS	58%	91%	26
WS / SW	56%	92%	66

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



Run	ILF	R^2 (All days)	Sample
SW	57%	82%	40
WS / SW	56%	92%	66

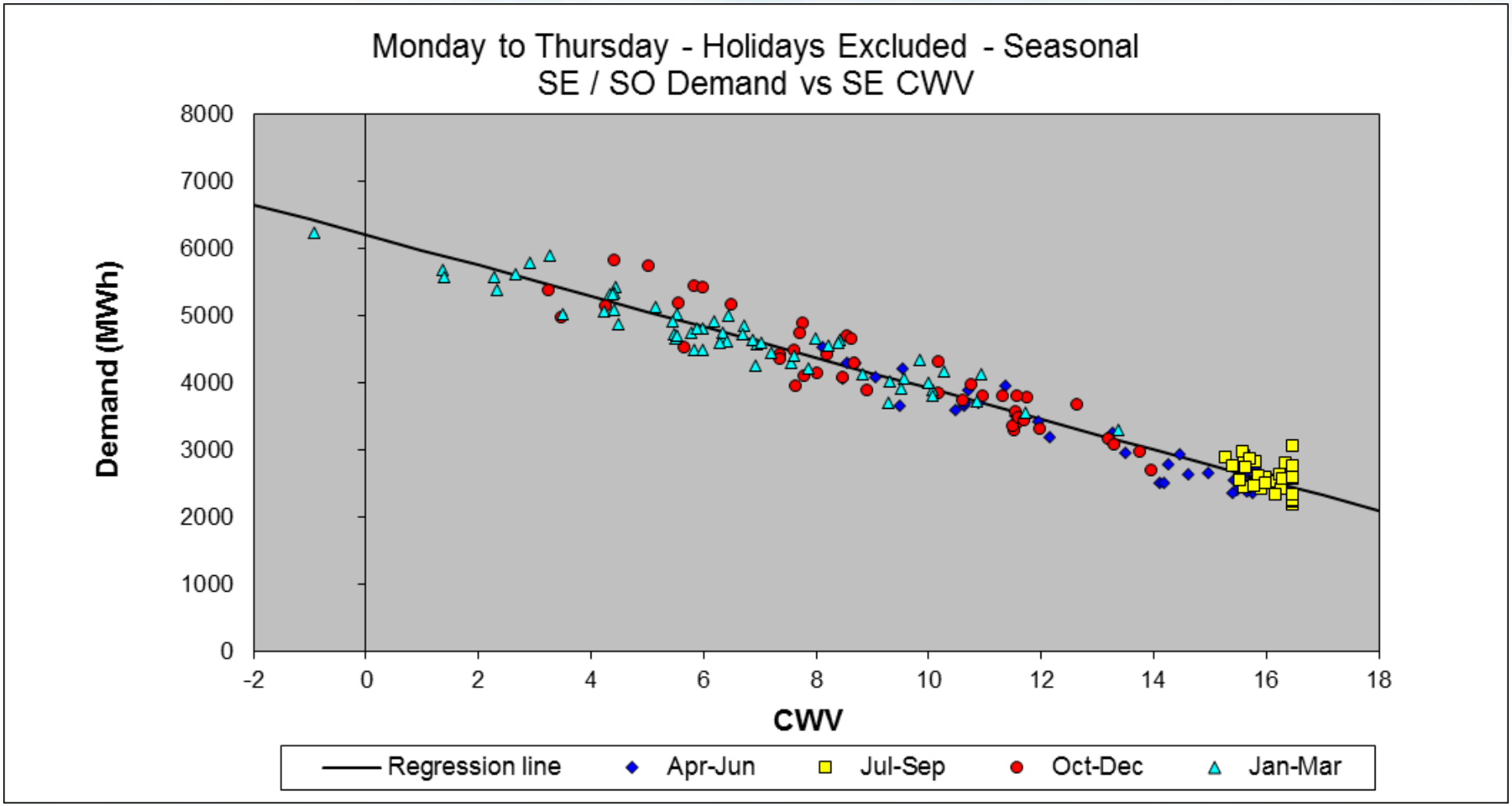
TWG Decision

Large NDM Consumption Band 7 and 8

AQ Range: 14,650 to 58,600MWh

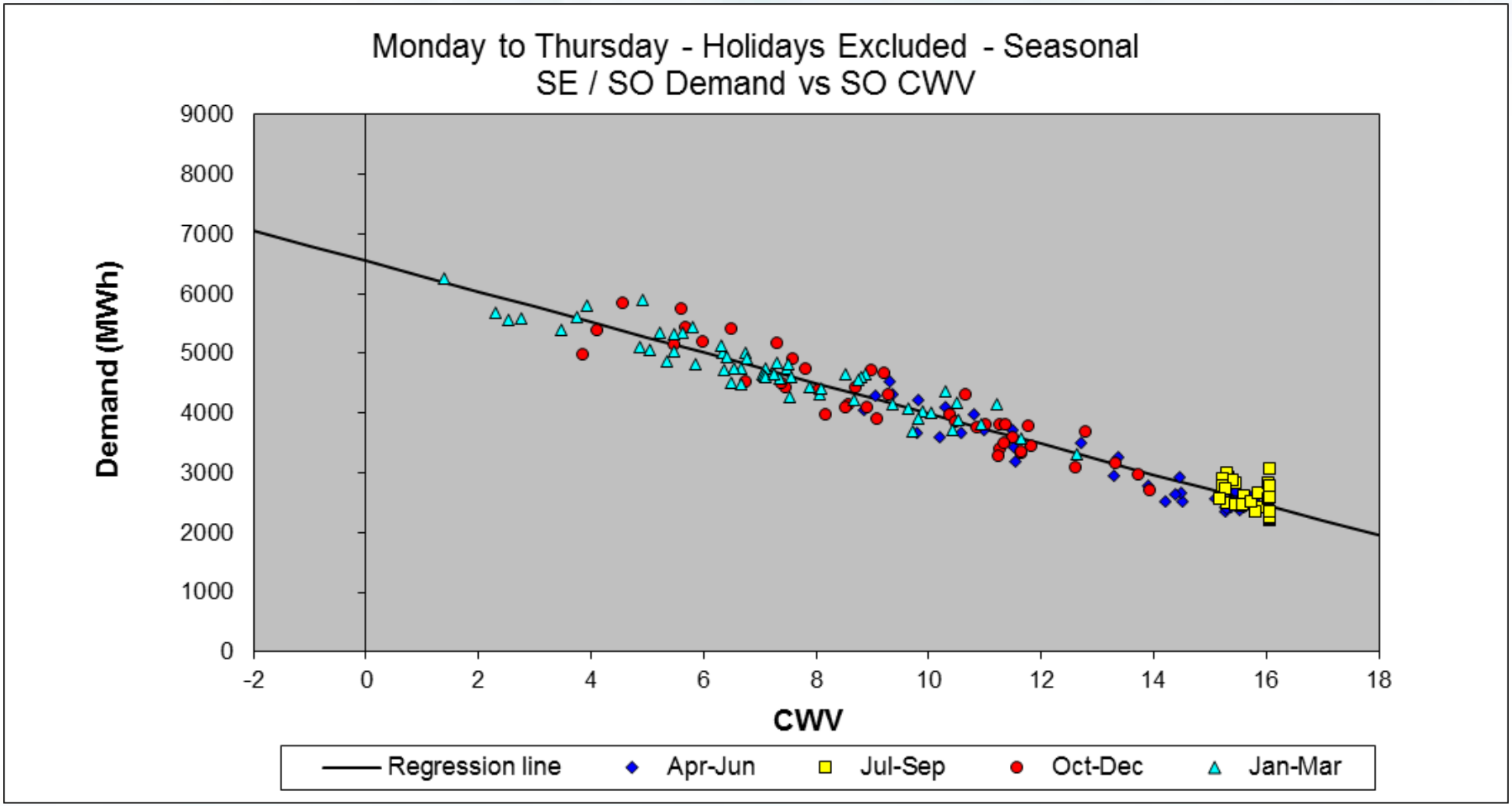
Run 2: Individual LDZ (NW/WN, WS/SW and SE/SO combined)

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



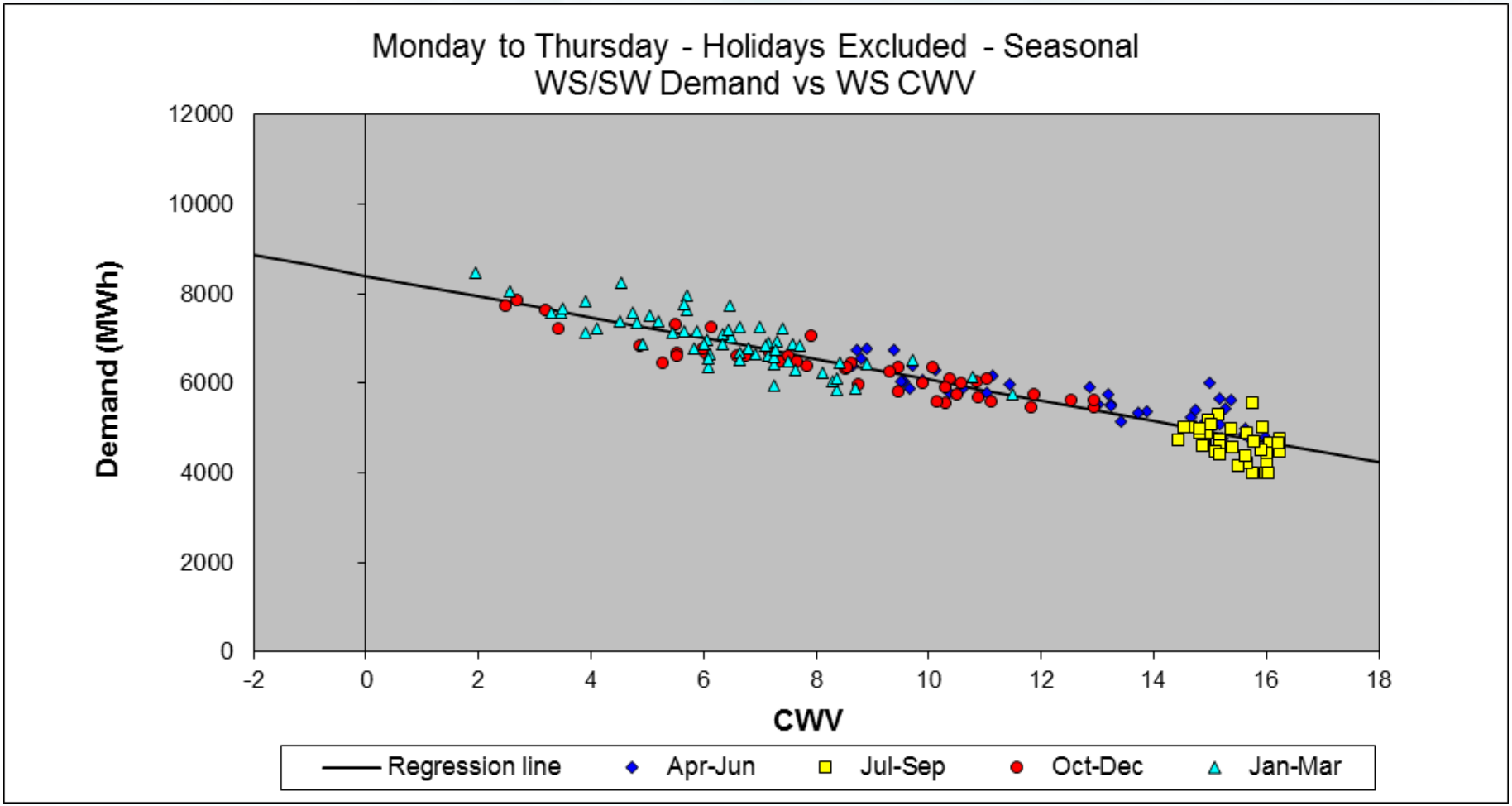
Run	ILF	R^2 (All days)	Sample
SE	45%	84%	20
SE / SO	43%	94%	45

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



Run	ILF	R^2 (All days)	Sample
SO	42%	91%	25
SE / SO	43%	94%	45

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

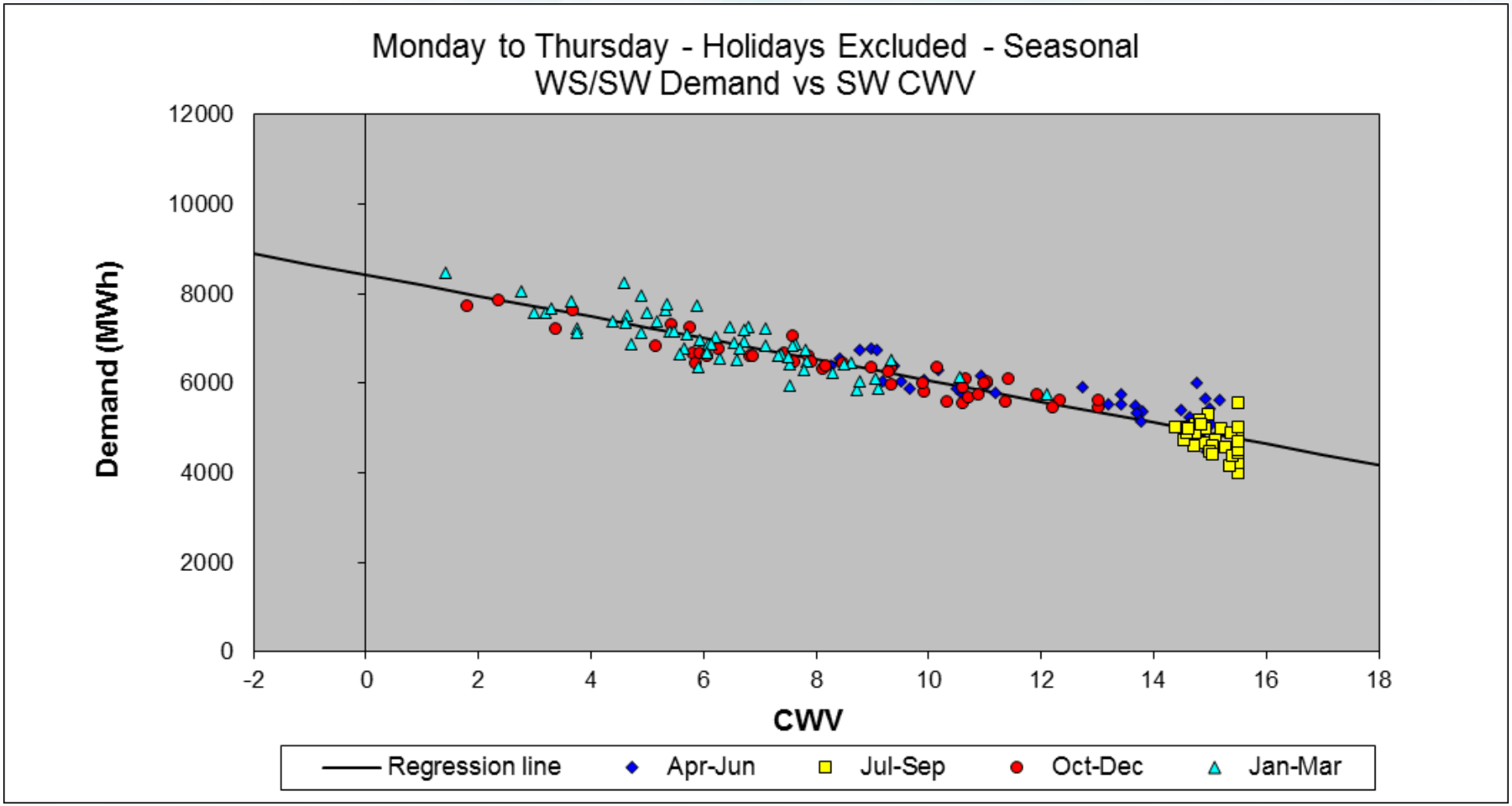


Run	ILF	R^2 (All days)	Sample
WS	58%	91%	26
WS / SW	56%	92%	66

xoserve

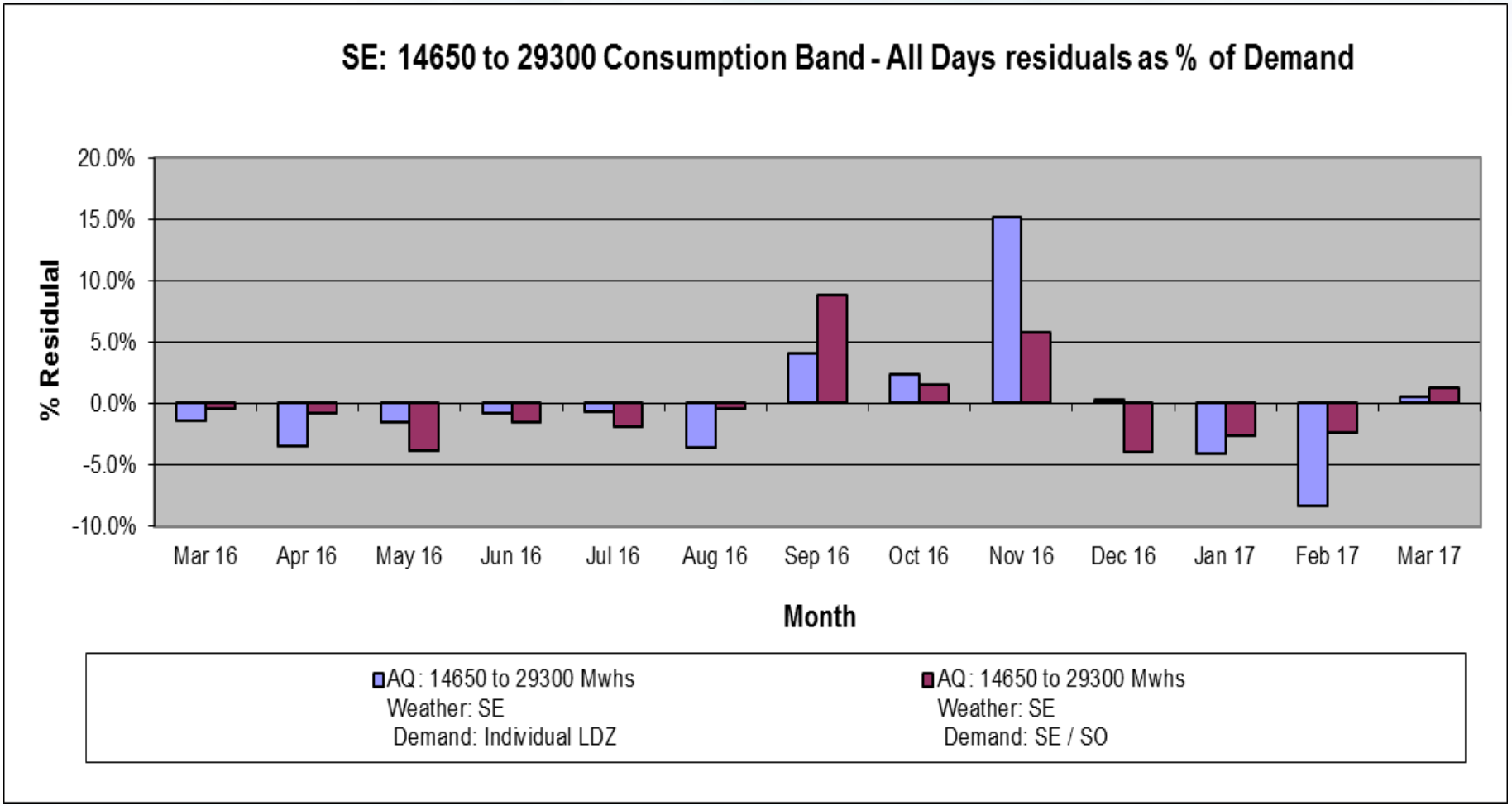
respect > commitment > teamwork

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



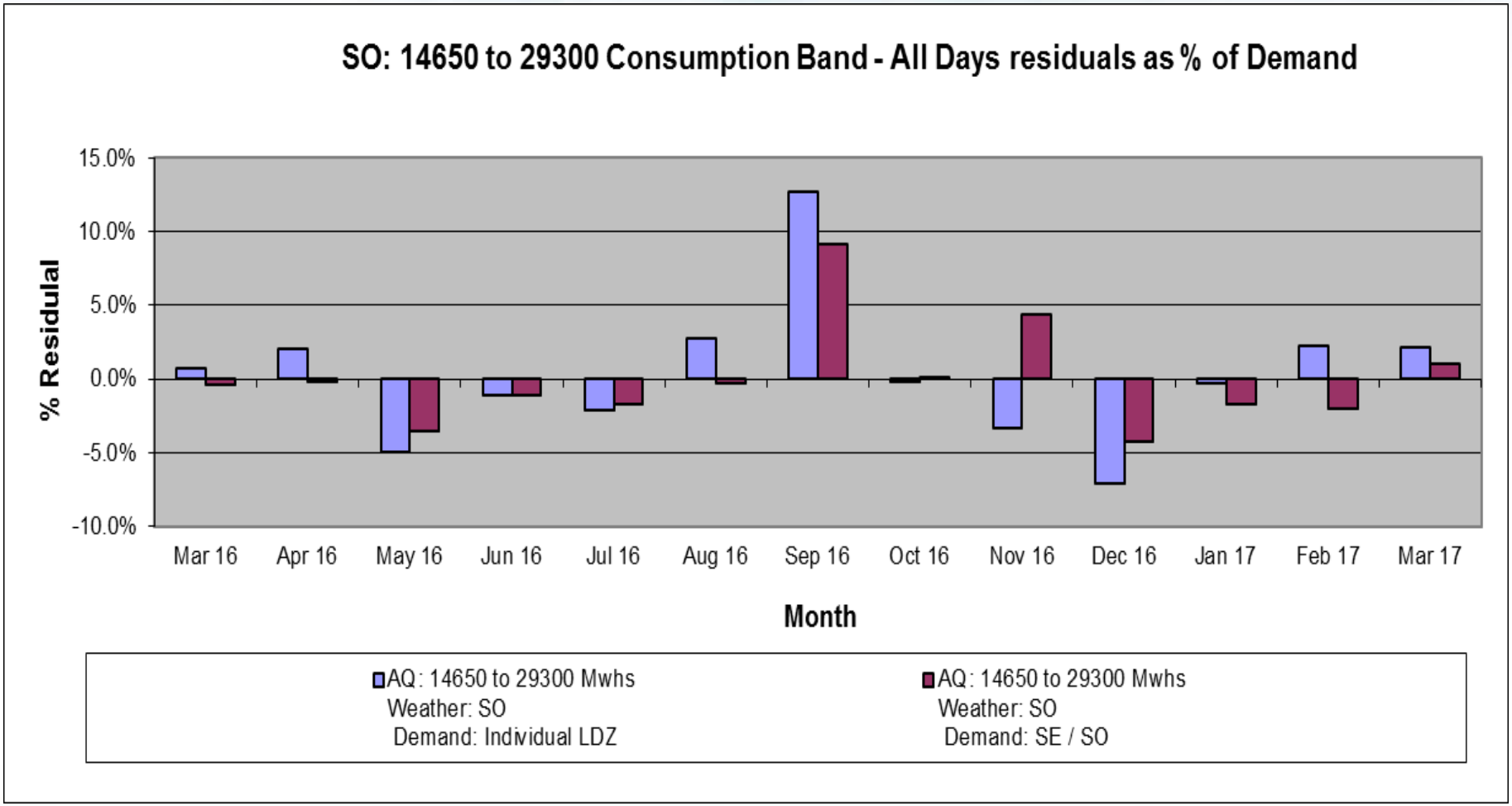
Run	ILF	R^2 (All days)	Sample
SW	57%	82%	40
WS / SW	56%	92%	66

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



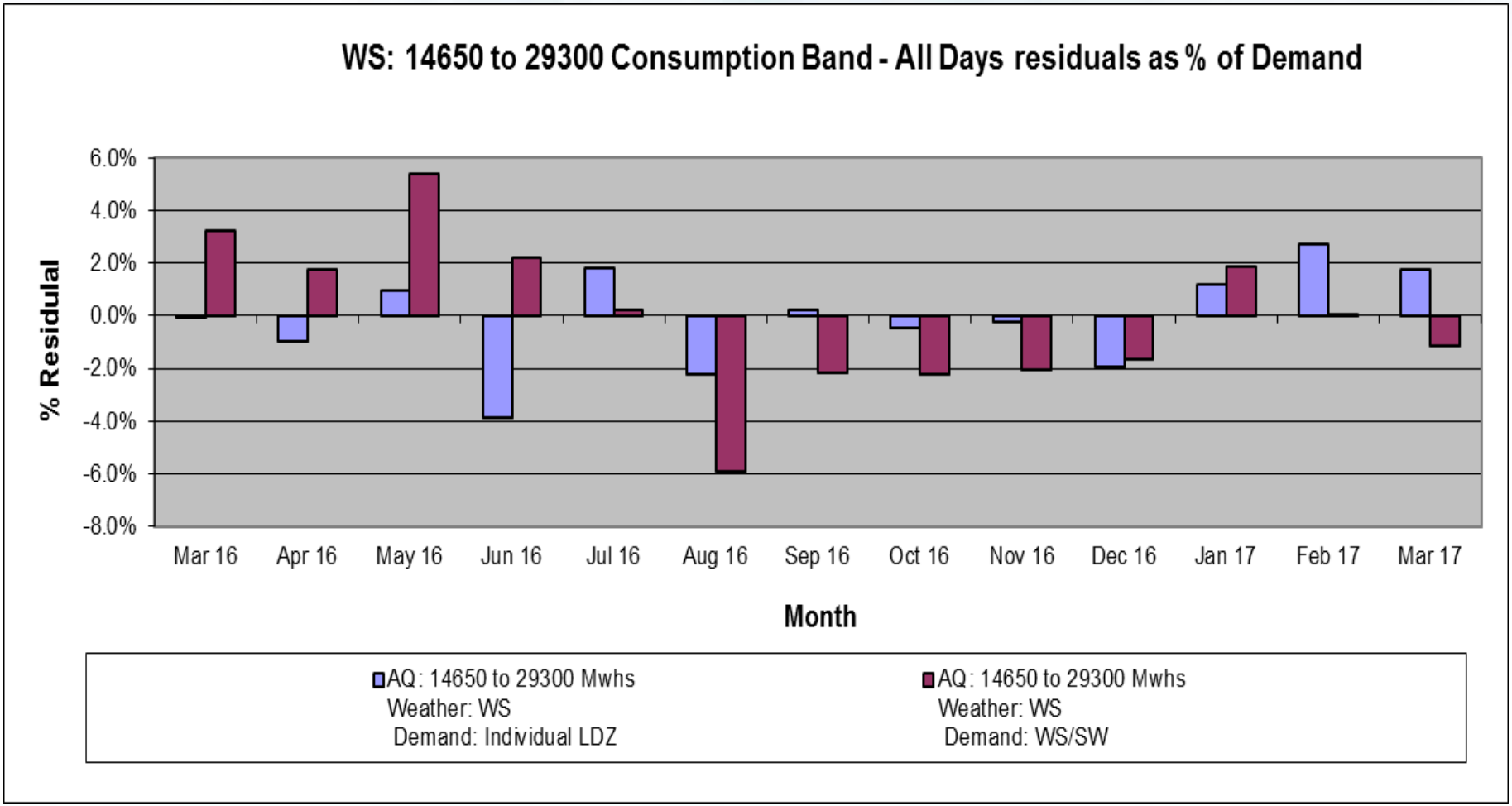
- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested

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



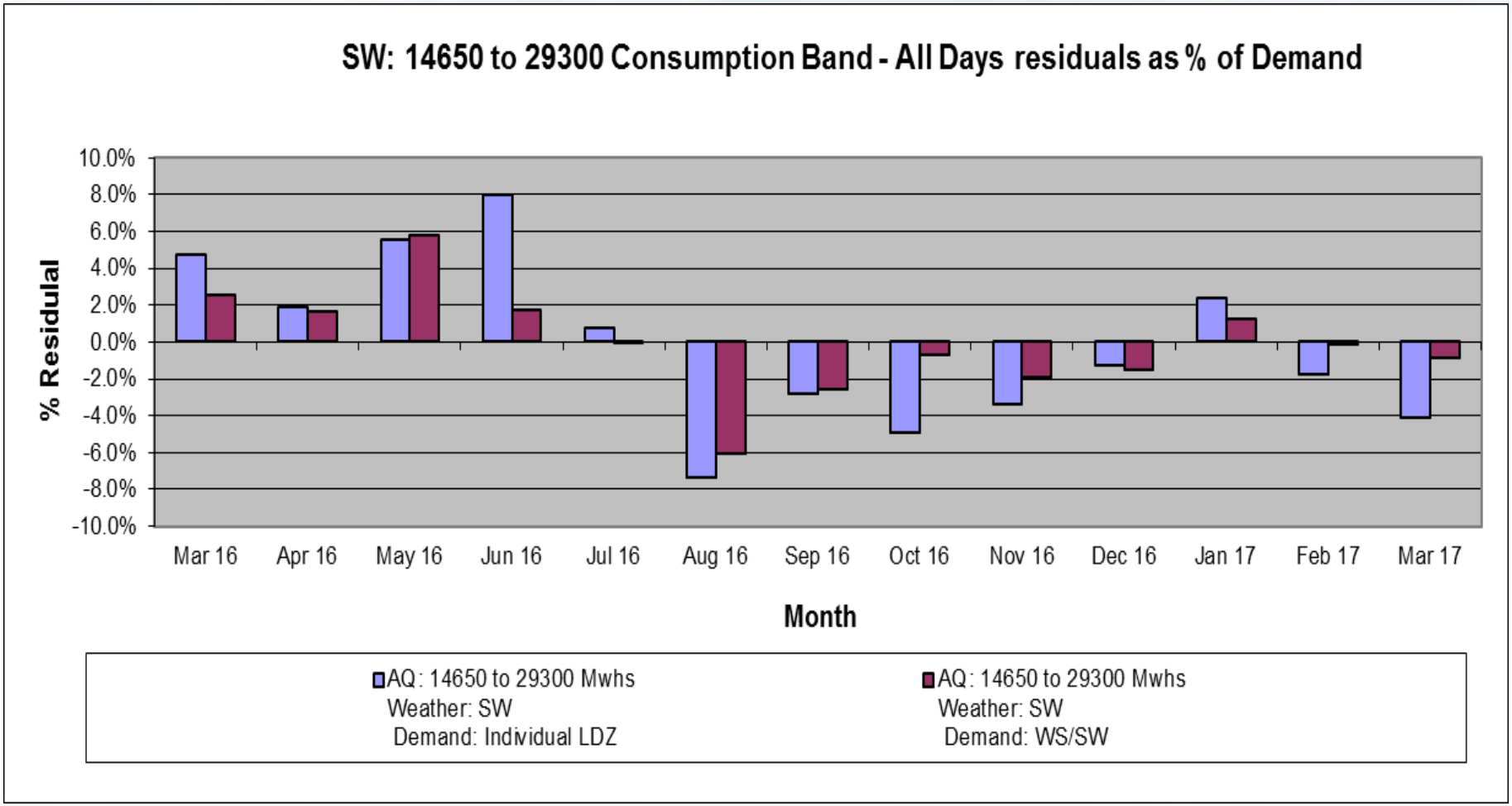
- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested

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



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

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



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

Large NDM Modelling Results: EUC Band 9

>58,600 MWh pa	NATIONAL GROUPINGS		
SC	61%	77%	95
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

Section 4 part 2:

Large NDM WAR Bands: 5 to 8

AQ Range: 2,196 to 58,600 MWh pa

Single Year Results for 2016/17 sample data

Large NDM WAR Bands: Agreed Modelling Runs

EUC Bands: Range	Comments on 2016/17 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) **Agreed WAR Ratios**: 0.373; 0.445 and 0.521
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) **Agreed WAR Ratios:** 0.346; 0.410 and 0.494
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) **Agreed WAR Ratios:** 0.333; 0.366 and 0.434

- Aggregations as agreed at April TWG.
- Decision to be made on models for Band 5

Large NDM Modelling Results: EUC Band 5 WARs

2,196 to 5,860 MWh pa	WAR Banding											
	Band 1 0.00 – 0.373			Band 2 0.373 – 0.445			Band 3 0.445 – 0.521			Band 4 0.521 – 1.00		
SC	65%	87%	42	48%	96%	94	36%	97%	82	25%	94%	21
NO / NW / WN	64%	97%	73	49%	96%	88	35%	97%	60	24%	92%	51
NE / EM / WM	62%	97%	101	48%	97%	125	35%	97%	113	24%	96%	81
EA / NT / SE	74%	88%	41	50%	94%	101	38%	98%	141	26%	88%	88
WS / SO / SW	64%	91%	42	49%	95%	49	37%	98%	61	25%	95%	55

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 4 which had a low sample count.
- Note: This model has been reduced to 21 from 29 due to data issue in this WAR band (see Appendix)

Large NDM Modelling Results: EUC Band 5 WARs

2,196 to 5,860 MWh pa	WAR Banding											
	Band 1 0.00 – 0.373			Band 2 0.373 – 0.445			Band 3 0.445 – 0.521			Band 4 0.521 – 1.00		
SC / NO / NW / WN	65%	96%	115	50%	96%	182	36%	96%	142	24%	93%	72
NE / EM / WM	62%	97%	101	48%	97%	125	35%	97%	113	24%	96%	81
EA / NT / SE	74%	88%	41	50%	94%	101	38%	98%	141	26%	88%	88
WS / SO / SW	64%	91%	42	49%	95%	49	37%	98%	61	25%	95%	55

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.
- Note: This model has been reduced to 72 from 80 due to data issue in SC WAR band 4 (see Appendix)
- TWG Decision to select between Run 1 or Run 2

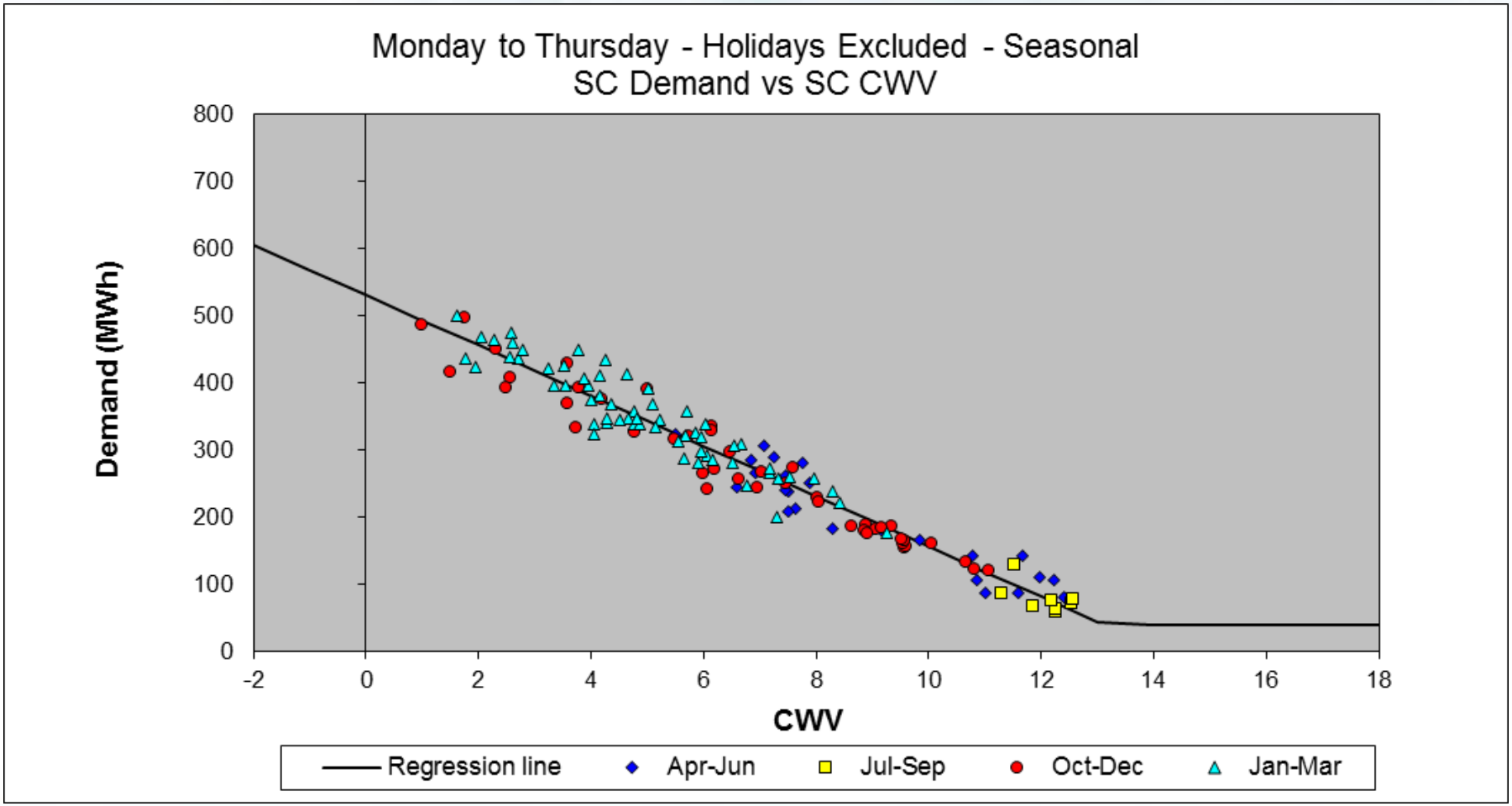
TWG Decision

Large NDM WAR Bands

AQ Range: 2,196 to 5,860 MWh

Run 1: 5 LDZ Group

SC LDZ, WAR Band 4: 2,196 – 5,860 MWh pa – Revised Model



Run	ILF	R^2 (All days)	Sample
SC	25%	94%	21
SC / NO / NW / WN	24%	93%	72

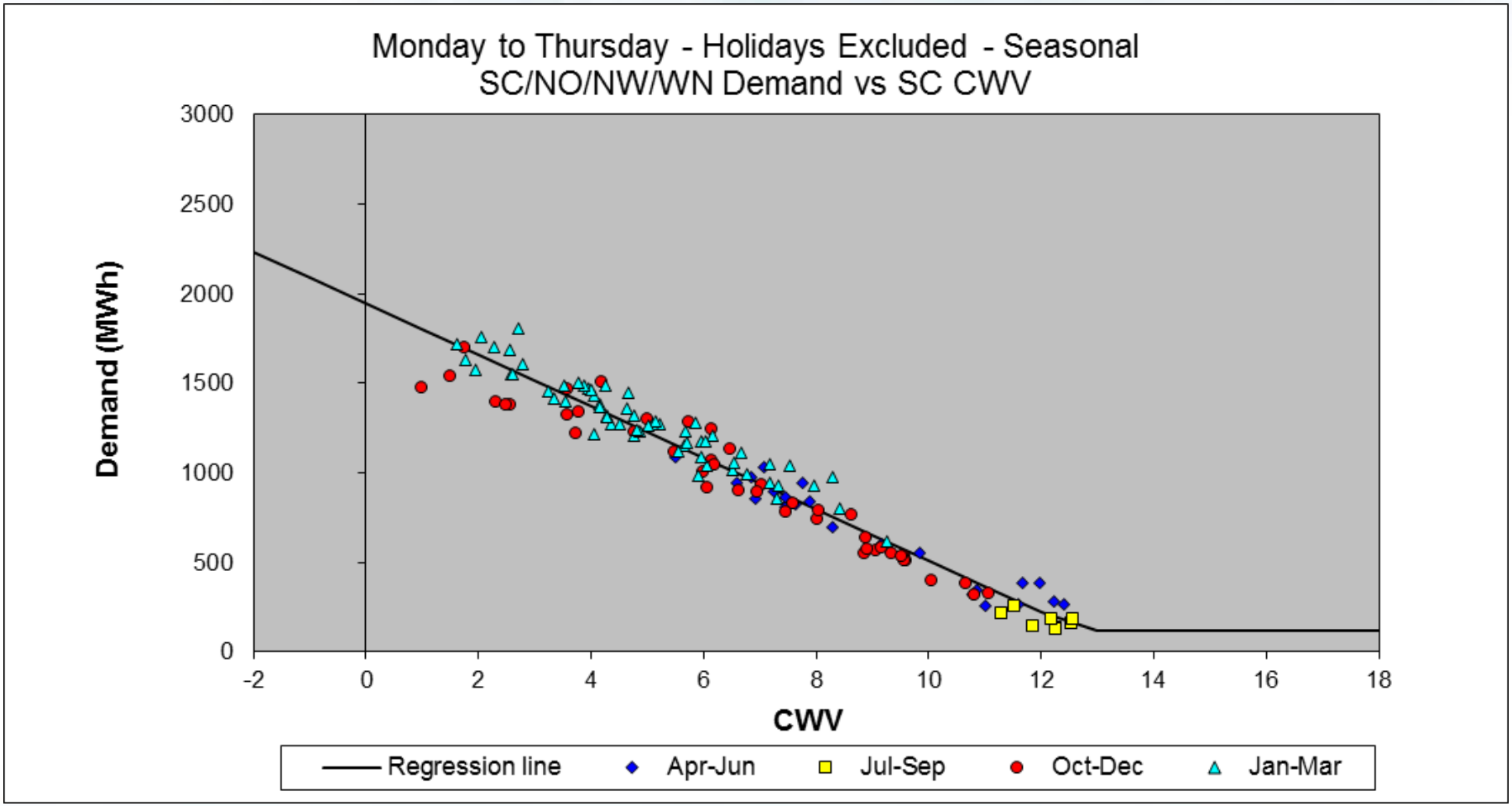
TWG Decision

Large NDM WAR Bands

AQ Range: 2,196 to 5,860 MWh

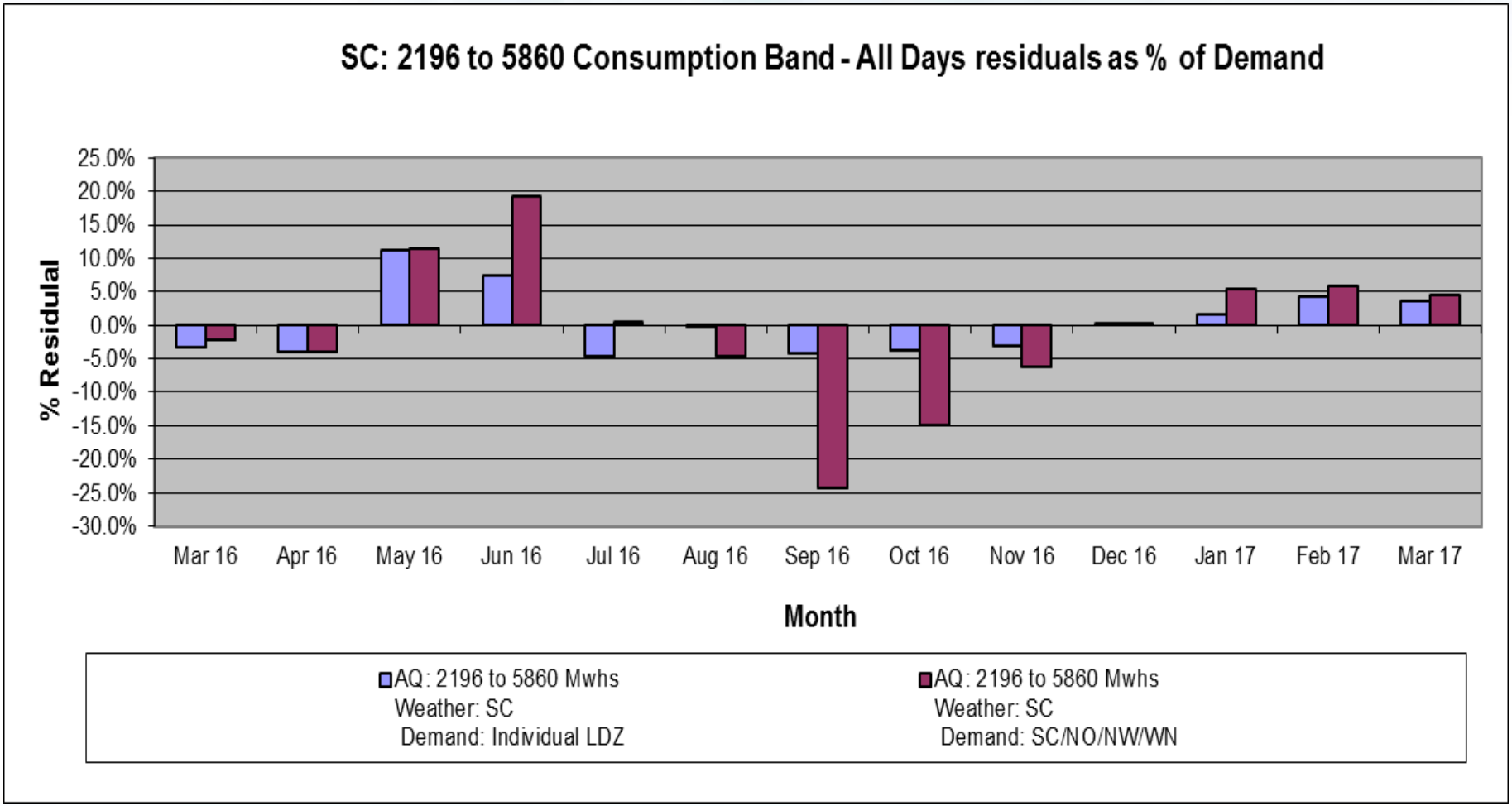
Run 2: 4 LDZ Group

SC LDZ, WAR Band 4: 2,196 – 5,860 MWh pa



Run	ILF	R^2 (All days)	Sample
SC	25%	94%	21
SC / NO / NW / WN	24%	93%	72

SC LDZ, WAR Band 4: 2,196 – 5,860 MWh pa



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

xoserve

respect > commitment > teamwork

Large NDM Modelling Results: EUC Band 6 WARs

5,860 to 14,650 MWh pa	WAR Banding											
	Band 1 0.00 – 0.346			Band 2 0.346 – 0.410			Band 3 0.410 – 0.494			Band 4 0.494 – 1.00		
SC/NO/NW/WN	71%	94%	42	58%	97%	79	41%	97%	74	29%	91%	41
NE/EM/WM	71%	93%	68	58%	98%	77	42%	98%	50	28%	88%	41
WS/EA/NT/SE/SO/SW	77%	90%	37	58%	97%	67	44%	97%	100	30%	96%	67

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

- The results showed reasonably good R^2 values with the lowest of 88% for the NE / EM / WM War band 4 group.
- ILFs demonstrate distinct levels between War bands.

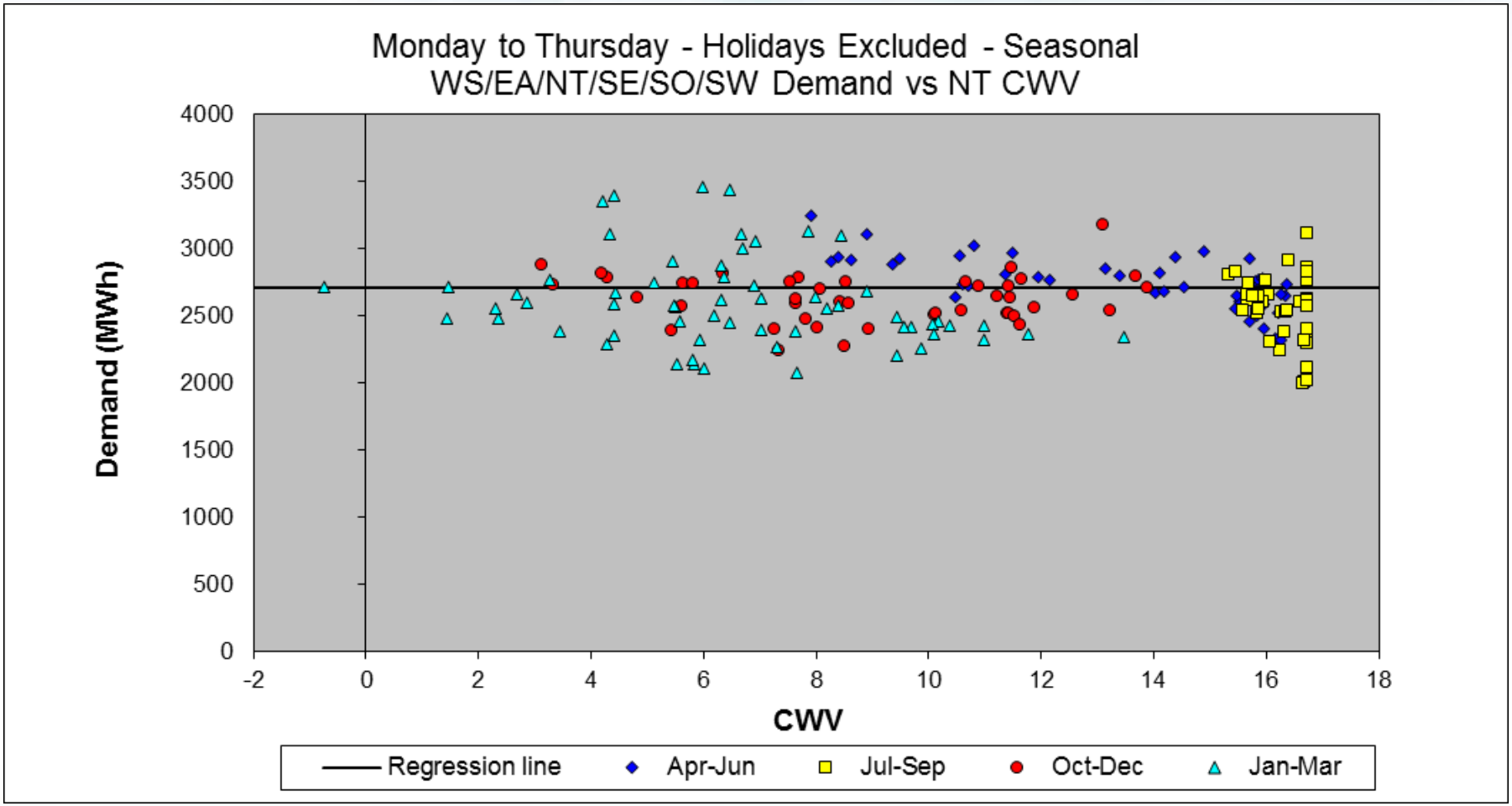
Large NDM Modelling Results: Band 7 & 8 WARs

14,650 to 58,600 MWh pa	WAR Banding											
	Band 1 0.00 – 0.333			Band 2 0.333 – 0.366			Band 3 0.366 – 0.434			Band 4 0.434 – 1.00		
SC/NO/NW/WN	86%	77%	38	77%	76%	47	57%	95%	52	37%	92%	29
NE/EM/WM	81%	84%	50	74%	94%	86	57%	96%	68	34%	92%	33
WS/EA/NT/SE/SO/SW	86%	45%	29	72%	88%	44	53%	94%	58	33%	94%	58

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

- Low R^2 value from the model for WAR band 1 that covers the LDZs WS / EA / NT / SE / SO / SW
- Chart on next side – demonstrates this is a flat model

NT LDZ, WAR Band 1: 14,650 – 58,600 MWh pa



- The variability in the data points across the different seasons is consistent with an insensitive model.
- WAR Band 1 more prevalent to scatter as less weather sensitive

Large NDM Modelling Results: 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 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*
- Topic of enhancing sample data quality checks can be added to the ad-hoc work log in the summer and feed into our internal discussions when replacing our existing processes / systems
- Are TWG happy to move to model smoothing phase with the Large NDM modelling results presented today ?

Section 5:

Next Steps

Demand Estimation: Next Steps

- Xoserve to run model smoothing once all single year models have been agreed. During this phase Xoserve may need to contact TWG for further prompt decisions on modelling analysis (probably by email)
- Xoserve then use smoothed models as the basis for producing annual Demand Estimation parameter values i.e. ALPs, DAFs and PLFs
- w/c 5th June Xoserve to publish draft Demand Estimation parameter values for DESC and TWG to review and provide feedback
- TWG and DESC have 3 weeks to review draft Demand Estimation parameter values and provide feedback (by no later than Friday 23rd June)
- Combined TWG and DESC meeting planned for 12th July to review feedback received and seek approval to publish to wider industry participants

Appendix

Additional Slides

Investigation of underlying data

- The sample validation process is designed to hopefully strike the correct balance between a) removing erroneous data streams and b) ensuring ample quality data is available for modelling purposes

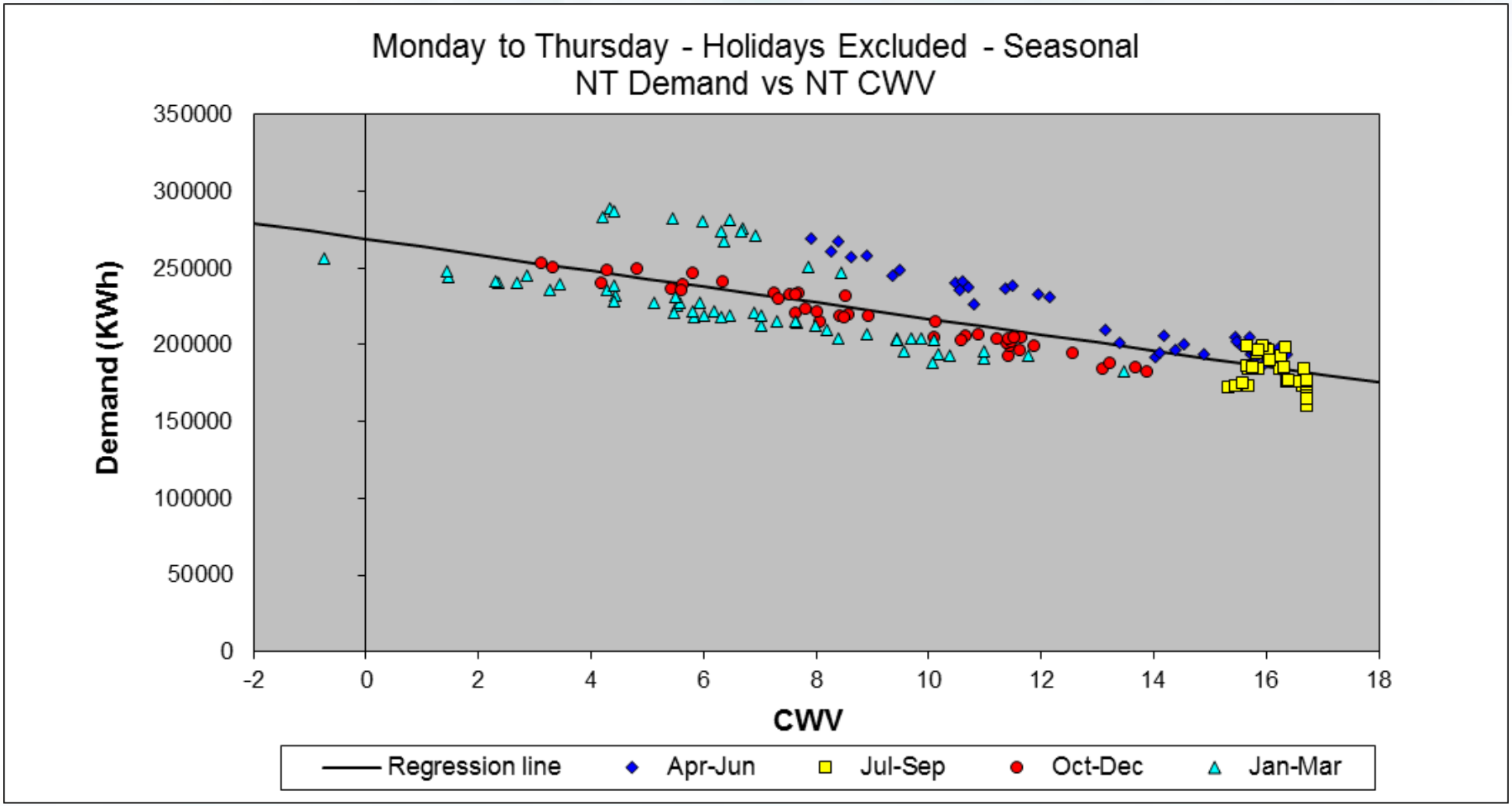
- In the main, the validation approach appears to work well, however on occasion there are some ‘data scenarios’ which can escape the validation rules. In some models such data points can be absorbed with minimal impact to the overall fit, however occasionally these errors can be more visible and are reflected in the model statistics

- During the review of this years modelling results, it became apparent that some models may be impacted by this issue. Upon further investigation of the supply points used in 2 of the Small NDM models and 1 of the Large NDM models it would appear that the models would benefit from the removal of a handful of supply points

EUC Band 3 – 4 WAR Band 1

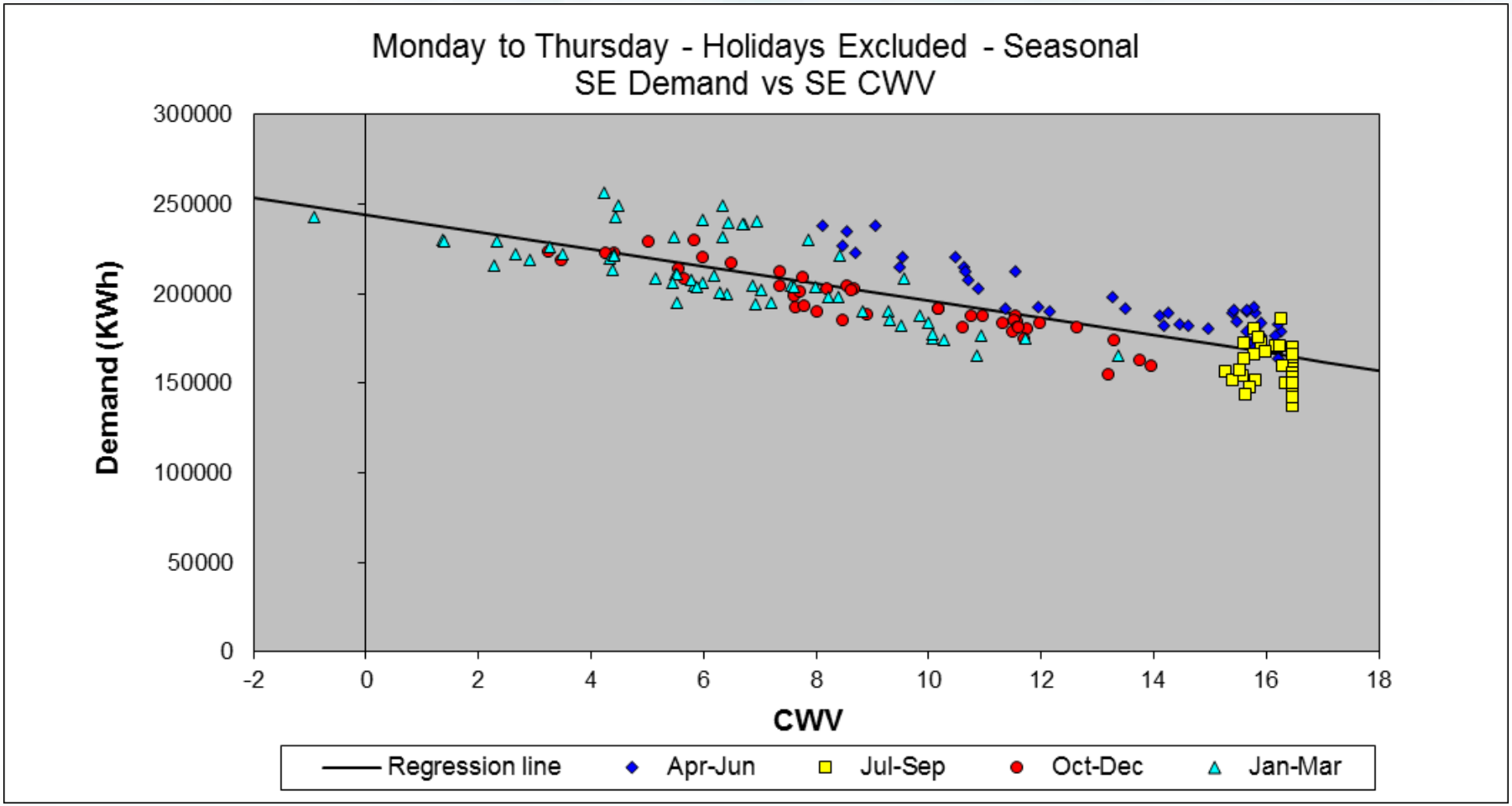
- In EUC Band 3-4 WAR Band 1, the original results for NT and SE were significantly different to the other LDZs
- A high level check of the consumption for each site in each model revealed that 6 supply points in NT and 4 supply points in SE contained unusual consumption patterns
- The following slides show the results for these 2 LDZs with these supply points included

Small NDM Modelling Results: NT LDZ, EUC Band 3 – 4 WAR Band 1 – Original Model



- R^2 for this model was 68% compared to 94% last year
- Xoserve were suspicious of the apparent 2 'levels' visible here and so investigated the underlying data
- Revised model results increased R^2 for this model by 21%

Small NDM Modelling Results: SE LDZ, EUC Band 3 – 4 WAR Band 1 – Original Model

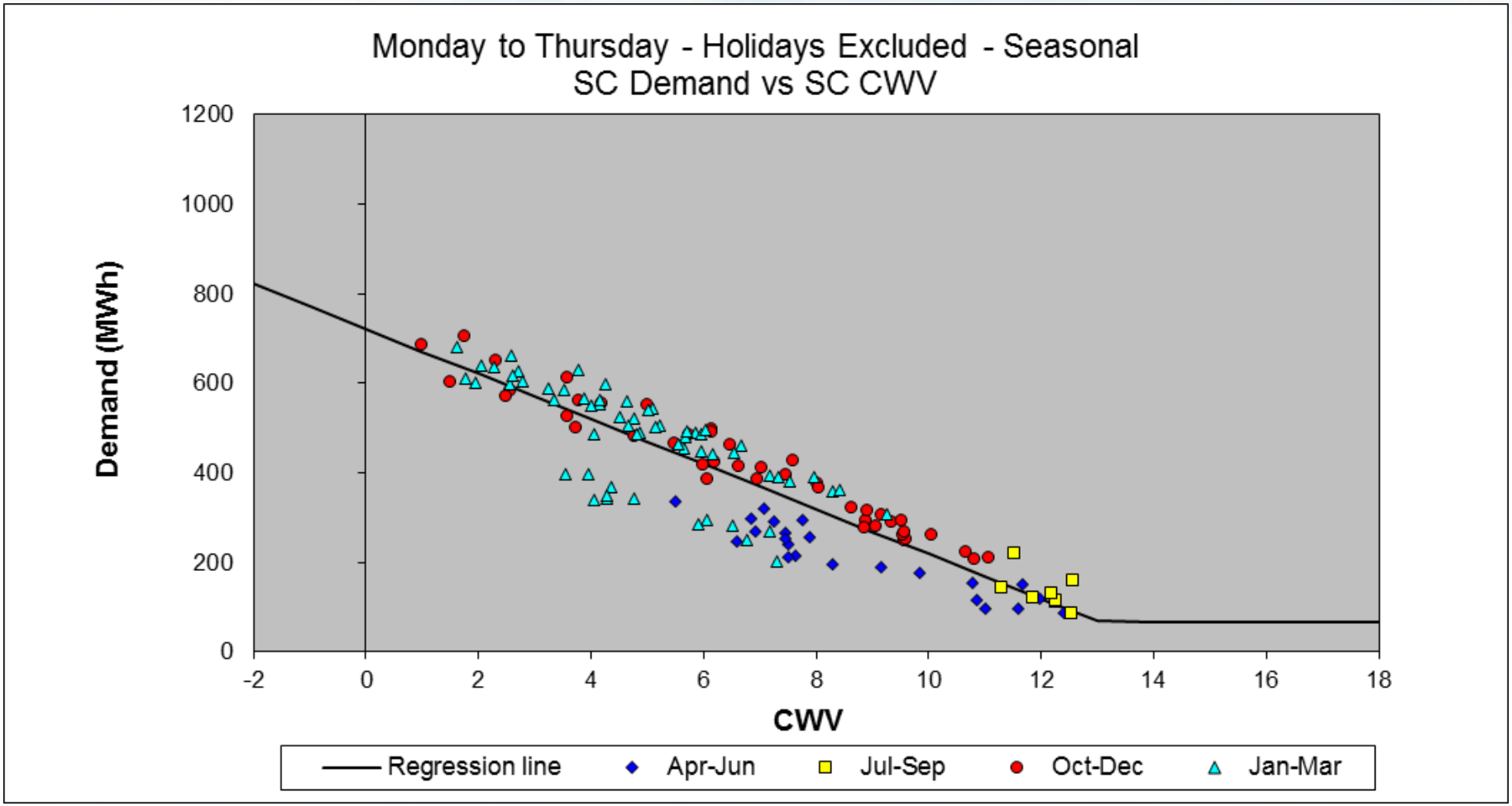


- R^2 for this model was 77% compared to 91% last year
- Xoserve were suspicious of the apparent 2 'levels' visible here and so investigated the underlying data
- Revised model results increased R^2 for this model by 10%

EUC Band 5 WAR Band 4

- In EUC Band 5 WAR Band 4, the original results for the model SC revealed unusual data with 2 apparent levels of consumption
- A high level check of the consumption for each site in this model revealed that 8 supply points contained unusual consumption patterns
- The following slide shows the results for this model with these 8 supply points included

SC LDZ, EUC Band 5 WAR Band 4: – Original Model



Run	ILF	R^2 (All days)	Sample
SC	26%	84%	29
SC / NO / NW / WN	25%	91%	80