



**Demand Estimation Technical Work Group**  
**EUC Modelling 2019/20**  
**Large NDM Single Year Modelling Results**

**13<sup>th</sup> May 2019**

## 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 2019/20
- 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 (c12% of total AQ)

## Section 4 part 1:

Large NDM Consumption Bands: 5 to 9

AQ Range: >2,196 MWh pa

Single Year Results for 2018/19 sample data

# Large NDM Consumption Bands: Agreed Modelling Runs

EUC Bands: Range	Comments on 2018/19 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) <b>AND</b> Individual LDZ analysis (NW/WN and WS/SW combined)
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	Individual LDZs with the following WS/SW, EA/NT, SE/SO and NO/NW/WN combined <b>AND</b> 5 LDZ GROUP with SC as an Individual LDZ
Band 9: >58,600 MWh pa	National

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

# Large NDM Modelling Results: EUC Band 5

2,196 to 5,860 MWh pa	Indicative Load Factor (ILF)	R <sup>2</sup> Multiple Correlation Coefficient (All days)	Sample Size (Supply Points)
SC	43%	98%	223
NO	43%	97%	101
NW / WN	42%	97%	133
NE	44%	97%	130
EM	43%	97%	109
WM	40%	98%	107
WS	41%	95%	38
EA	42%	96%	80
NT	41%	97%	125
SE	41%	97%	145
SO	38%	97%	97
SW	43%	96%	69

- Good results overall for individual LDZs with R<sup>2</sup> values in the range 95%-98%
- Note: LDZ WS has a small sample size of 38 but produces model with R<sup>2</sup> of 95%

# 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)		
	ILF	R <sup>2</sup>	Sample Size	ILF	R <sup>2</sup>	Sample Size
SC	50%	96%	92	50%	96%	92
NO	51%	96%	43	51%	96%	43
NW / WN	54%	96%	54	54%	96%	54
NE	56%	94%	48	56%	94%	48
EM	48%	97%	52	48%	97%	52
WM	46%	96%	46	46%	96%	46
EA	51%	88%	27	51%	88%	27
NT	49%	95%	41	49%	95%	41
SE	47%	94%	39	47%	94%	39
SO	42%	95%	44	42%	95%	44
WS	47%	96%	18	50%	96%	54
SW	51%	94%	36			

**Indicative Load Factor (ILF)** : **R<sup>2</sup> 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

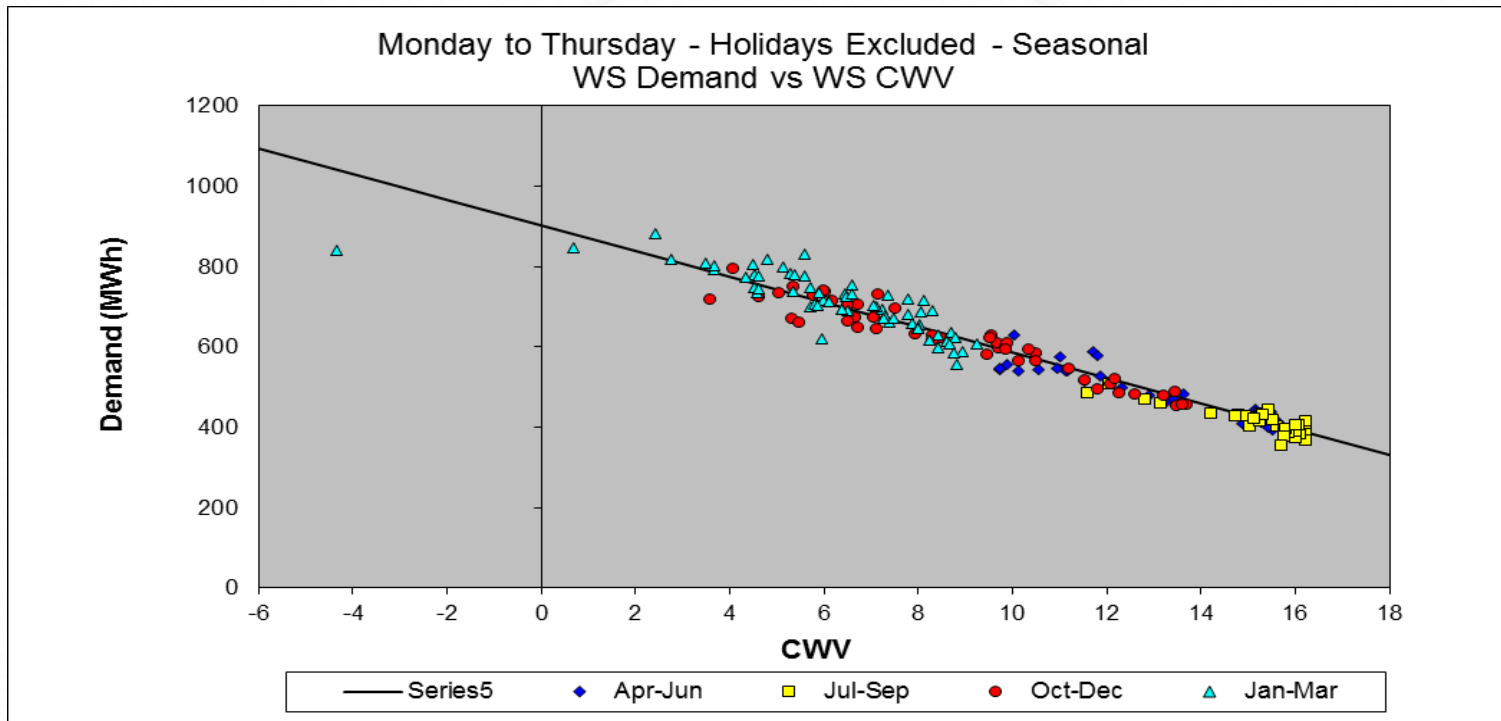
Large NDM Consumption Band 6  
AQ Range: 5,860 to 14,650 MWh

(Individual with NW/WN combined  
or

Individual with NW/WN and WS/SW combined)

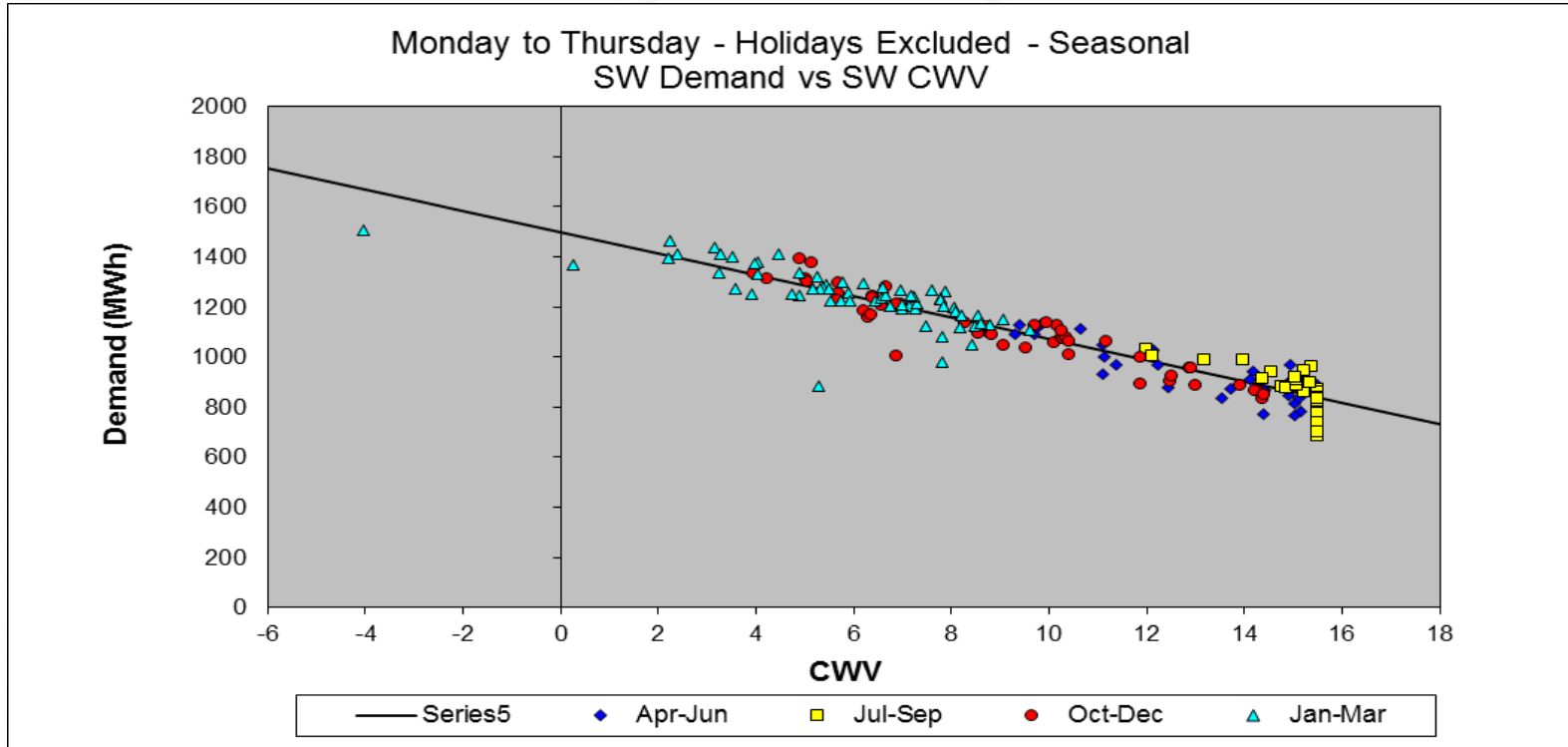


# WS LDZ, EUC Band 6: 5,860 – 14,650 MWh pa



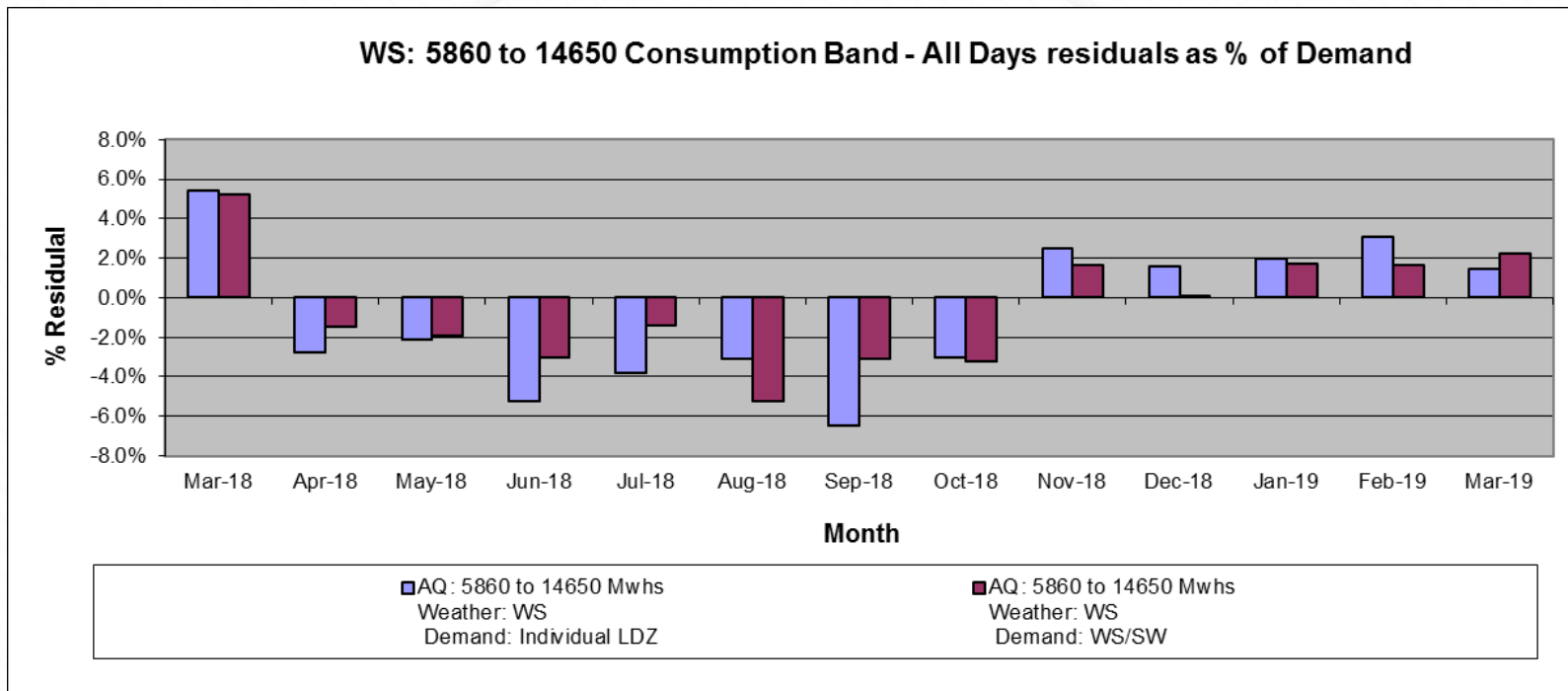
Run	ILF	R <sup>2</sup> (All days)	Sample
WS	47%	96%	18
WS / SW	50%	96%	54

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



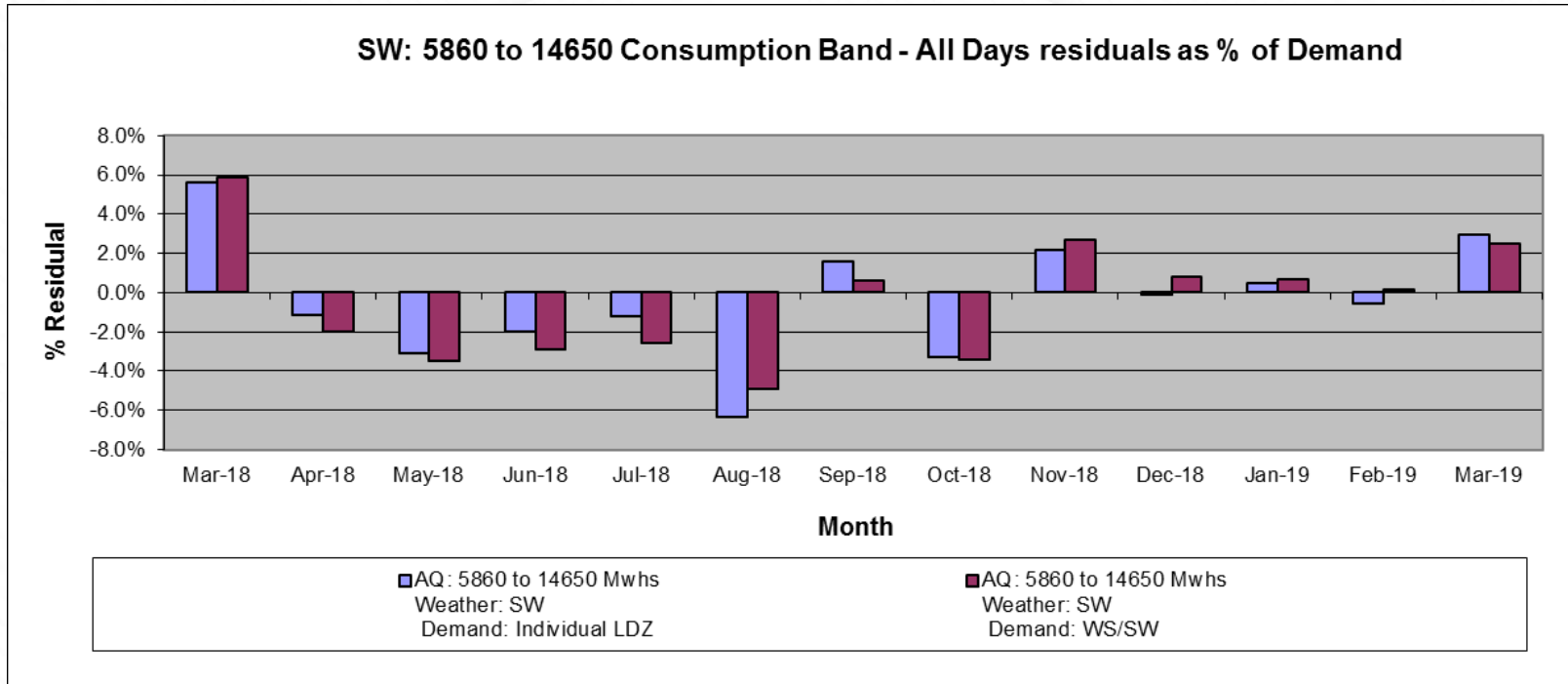
Run	ILF	R <sup>2</sup> (All days)	Sample
SW	51%	94%	36
WS / SW	50%	96%	54

# 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
- Aggregation of WS/SW mostly reduces residuals (benefit from characteristics of LDZ SW)

# 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
- Residuals not as good following aggregation due to poorer characteristics of LDZ WS
- TWG to decide on preferred model

## TWG Decision

Large NDM Consumption Band 7 and 8  
AQ Range:14,650 to 58,600 MWh

4 individual LDZs and 4 Groups: SC, NE, EM, WM and WS/SW, EA/NT, SE/SO,  
NO/NW/WN)

or

5 Groups: SC, NO/NW/WN, NE/EM/WM, EA/NT/SE and WS/SO/SW

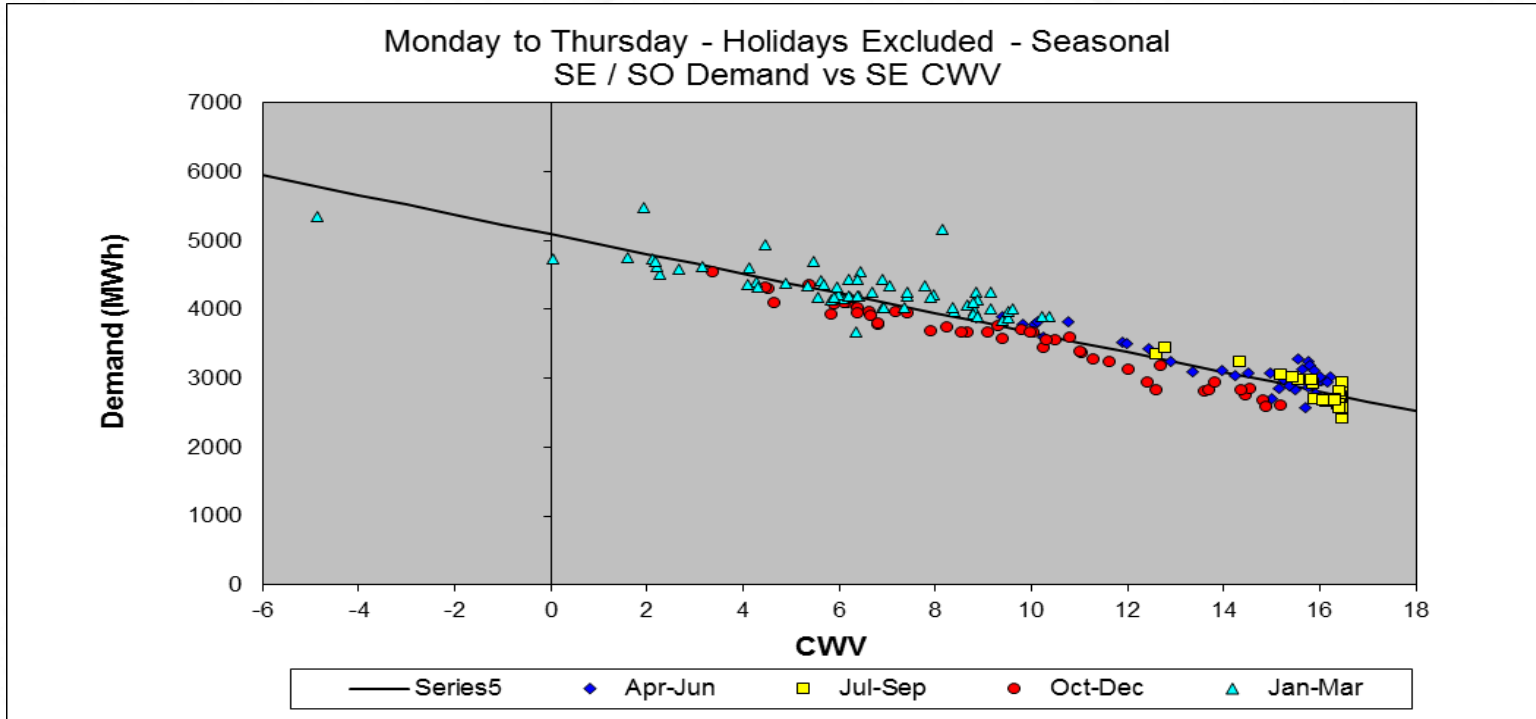
# Large NDM Modelling Results: EUC Band 7 and 8

14,650 to 58,600 MWh pa	Run1: Individual LDZ (4 Groups)			Run 2: Individual LDZ (5 Groups)		
SC	67%	78%	48	67%	78%	48
NO / NW / WN	64%	89%	59	64%	89%	59
NE	74%	86%	36	65%	94%	137
EM	67%	89%	54			
WM	58%	92%	47			
EA	60%	89%	34	59%	92%	59
NT						
SE	52%	91%	41	56%	91%	44
SO						
WS						
SW	64%	89%	28			

**Indicative Load Factor (ILF)** : **R<sup>2</sup> Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

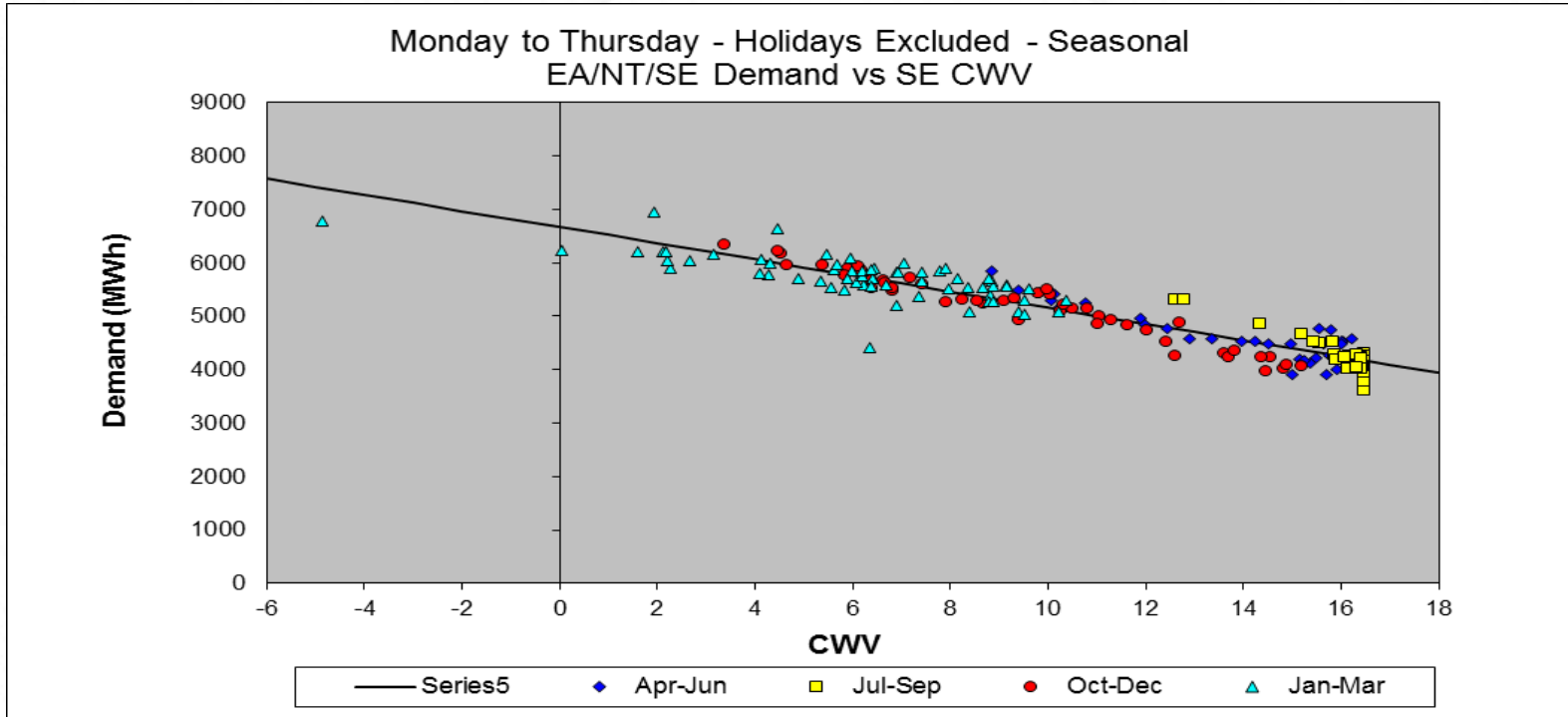
- Good results overall for majority of individual LDZs.
- Highlighted results for SE and WS models are shown in more detail on subsequent slides

# SE LDZ, EUC Band 7 & 8 : 14,650 to 58,600 MWh



Run	ILF	R <sup>2</sup> (All days)	Sample
SE / SO	52%	91%	41
EA / NT / SE	59%	92%	59

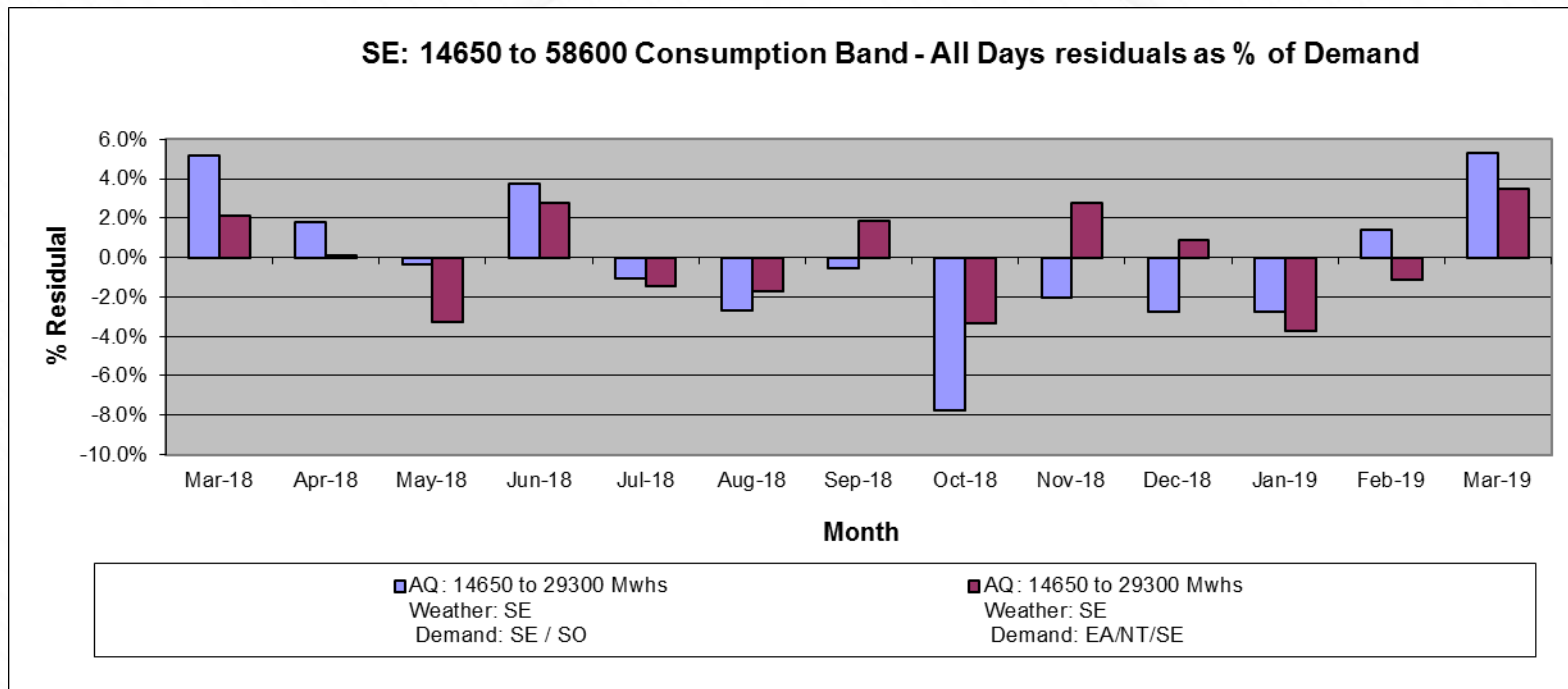
# SE LDZ, EUC Band 7 & 8 : 14,650 to 58,600 MWh



Run	ILF	R <sup>2</sup> (All days)	Sample
SE / SO	52%	91%	41
EA / NT / SE	<b>59%</b>	<b>92%</b>	<b>59</b>

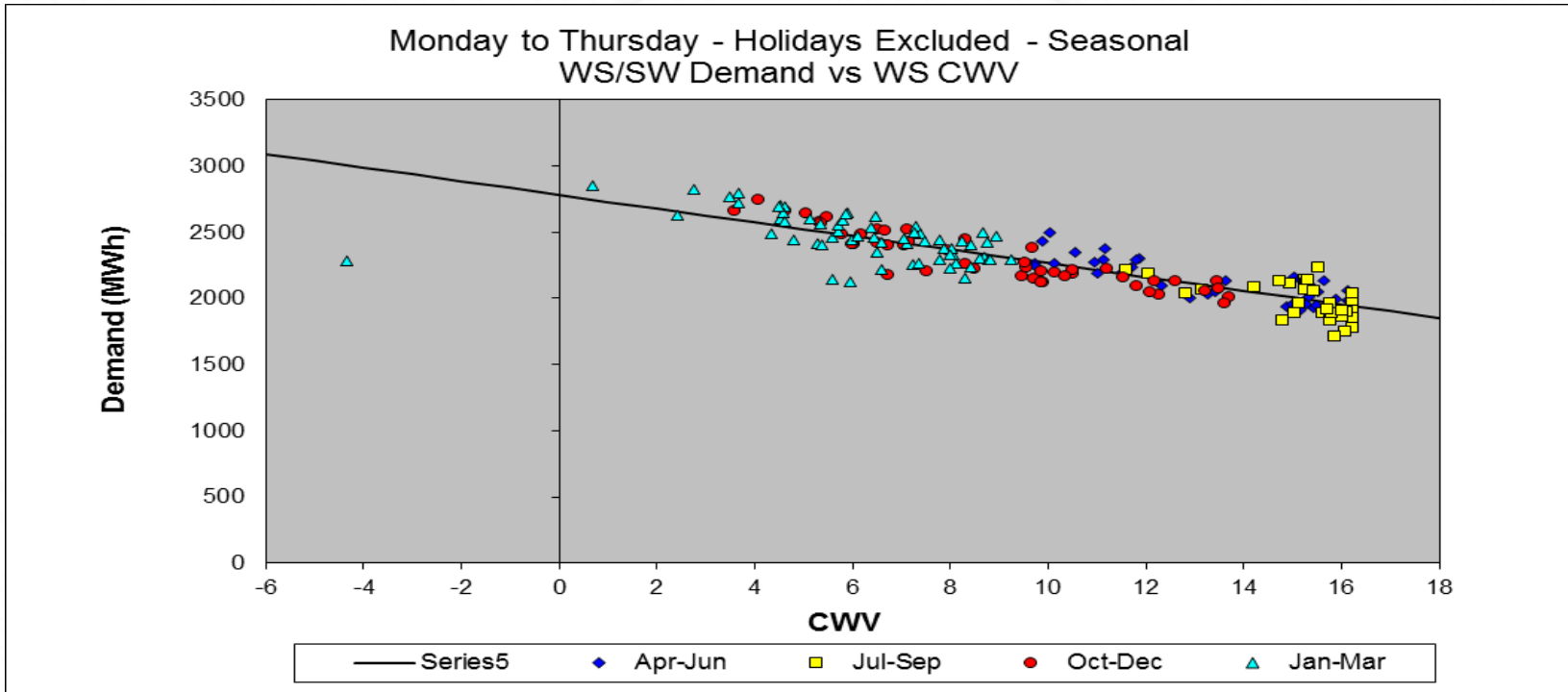


# SE LDZ, EUC Band 7 & 8 : 14,650 to 58,600 MWh



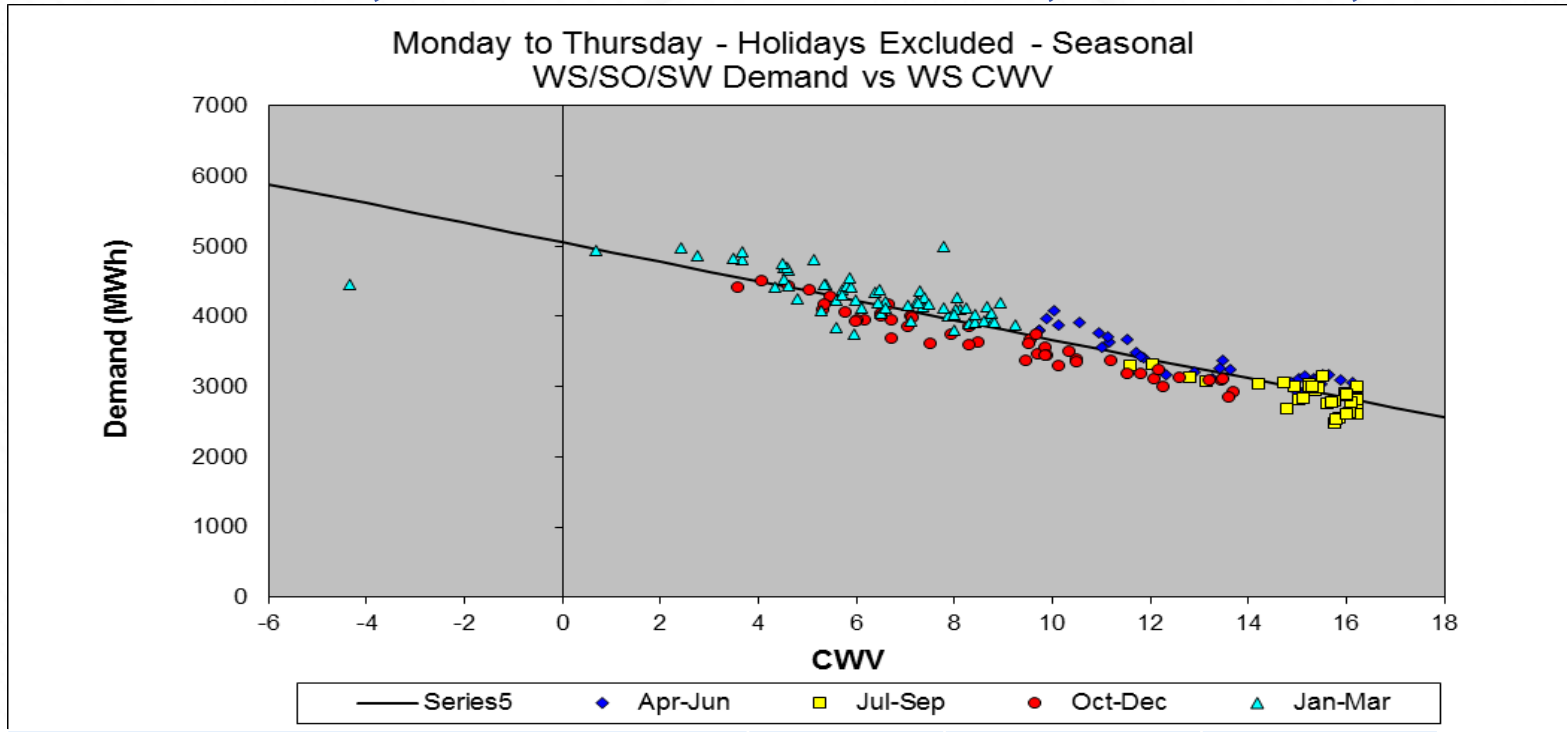
- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested
- Residuals mostly improve following aggregation with LDZ EA/NT/SE

# WS LDZ, EUC Band 7 & 8 : 14,650 to 58,600 MWh



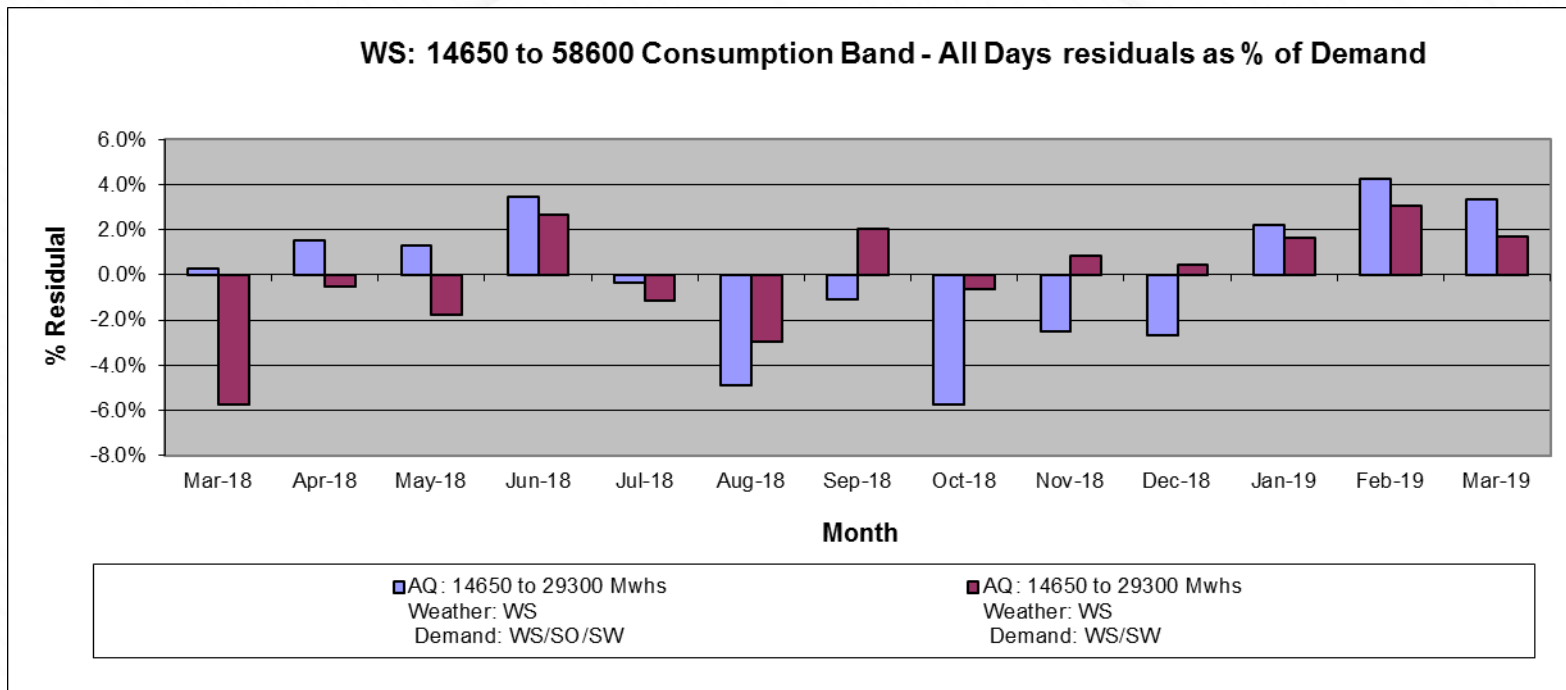
Run	ILF	R <sup>2</sup> (All days)	Sample
WS / SW	64%	89%	28
WS / SO / SW	56%	91%	44

# WS LDZ, EUC Band 7 & 8 : 14,650 to 58,600 MWh



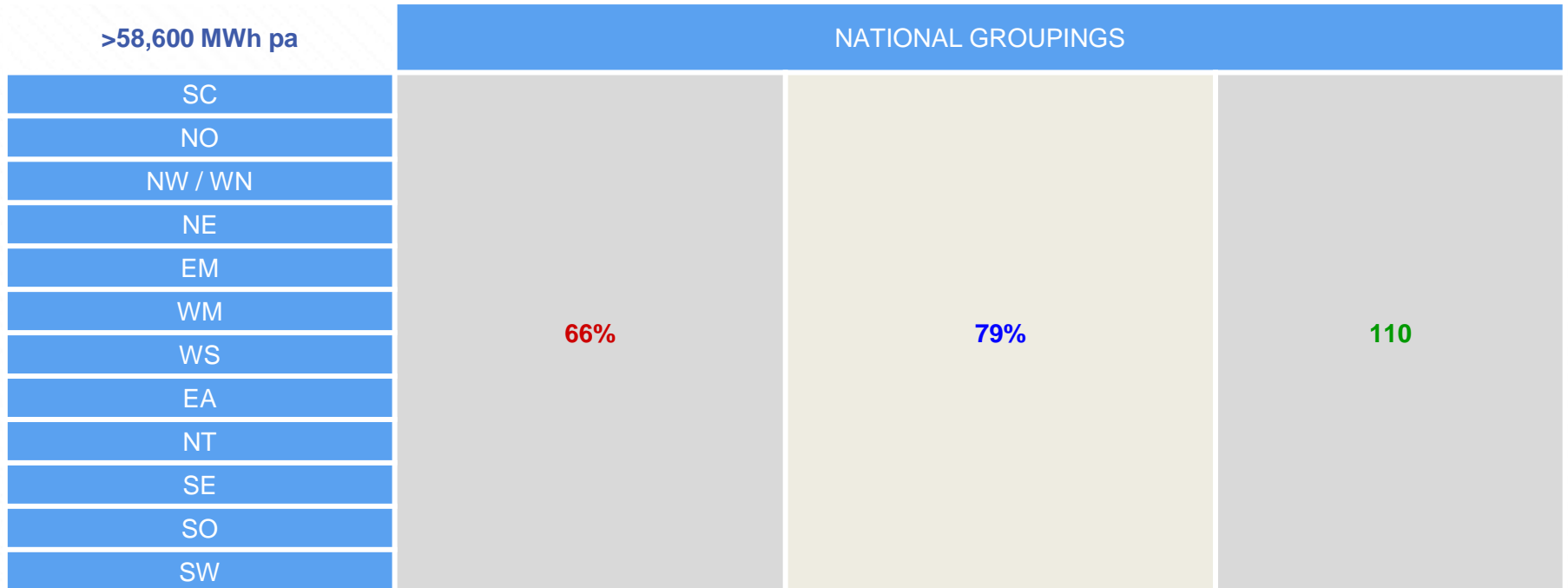
Run	ILF	R <sup>2</sup> (All days)	Sample
WS / SW	64%	89%	28
WS / SO / SW	<b>56%</b>	<b>91%</b>	<b>44</b>

# WS LDZ, EUC Band 7 & 8 : 14,650 to 58,600 MWh



- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested
- Residuals mostly improve following aggregation with LDZ WS/SO/SW

# Large NDM Modelling Results: EUC Band 9



**Indicative Load Factor (ILF)** : **R<sup>2</sup> 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 2018/19 sample data

# Large NDM WAR Bands: Agreed Modelling Runs

EUC Bands: Range	Comments on 2018/19 data TWG Agreed Aggregations
Band 5: 2,196 to 5,860 MWh pa	<p>5 LDZ Group (SC, NO/NW/WN, NE/EM/WM, EA/NT/SE and WS/SO/SW)</p> <p>Agreed WAR Ratios: 0.370; 0.437 and 0.506</p>
Band 6: 5,860 to 14,650 MWh pa	<p>3 LDZ Group (SC/NO/NW/WN, NE/EM/WM, EA/NT/SE/WS/SO/SW) <u>AND</u>                      2 LDZ Group (SC/NO/NW/WN/NE/EM/WM &amp; EA/NT/SE/WS/SO/SW)</p> <p>Agreed WAR Ratios: 0.331, 0.395 and 0.474</p>
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	<p>National <u>AND</u></p> <p>2 LDZ Group (SC/NO/NW/WN/NE/EM/WM, EA/NT/SE/WS/SO/SW)</p> <p>Agreed WAR Ratios: 0.322, 0.350 and 0.415</p>

- Aggregations as agreed at April TWG.
- Decision to be made on models for Band 6 and also Band 7 and 8

# Large NDM Modelling Results: EUC Band 5 WARs

2,196 to 5,860 MWh pa	WAR Banding											
	Band 1 0.00 – 0.370			Band 2 0.370 – 0.437			Band 3 0.437 – 0.506			Band 4 0.506 – 1.000		
SC	71%	86%	33	54%	96%	67	38%	97%	87	29%	96%	36
NO / NW / WN	66%	92%	60	49%	96%	74	38%	97%	57	25%	95%	43
NE / EM / WM	65%	96%	91	49%	96%	100	37%	98%	92	28%	97%	63
EA / NT / SE	69%	86%	46	53%	95%	108	39%	97%	123	27%	98%	73
WS / SO / SW	72%	90%	41	52%	90%	58	37%	96%	50	28%	96%	55

**Indicative Load Factor (ILF)** : **R<sup>2</sup> Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- The results show R<sup>2</sup> values range between 86% and 98%. The lowest R<sup>2</sup> is 86% in SC and EA/NT/SE WAR Band 1
- ILFs demonstrate distinct levels between WAR bands



## TWG Decision

Large NDM WAR Band

AQ Range: 5,860 to 14,650 MWh (Consumption Band 6)

2 LDZ Group: SC/NO/NW/WN/NE/EM/WM and EA/NT/SE/WS/SO/SW

or

3 LDZ Group: SC/NO/NW/WN, NE/EM/WM and EA/NT/SE/WS/SO/SW

# Large NDM Modelling Results: EUC Band 6 WARs Run 1

5,860 to 14,650 MWh pa	WAR Banding (3 Groups)											
	Band 1 0.00 – 0.331			Band 2 0.331 – 0.395			Band 3 0.395 – 0.474			Band 4 0.474 – 1.000		
SC/NO/NW/WN	82%	93%	36	63%	96%	60	46%	96%	67	31%	95%	26
NE/EM/WM	82%	92%	41	58%	96%	49	43%	96%	27	28%	96%	29
WS/EA/NT/SE/SO/SW	71%	87%	31	64%	93%	53	46%	97%	68	32%	96%	53

**Indicative Load Factor (ILF)** : **R<sup>2</sup> Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

- The results showed reasonably good R<sup>2</sup> values with the lowest of 87% for the WS/EA/NT/SE/SO/SW WAR band 1 group.
- ILFs demonstrate distinct levels between WAR bands.

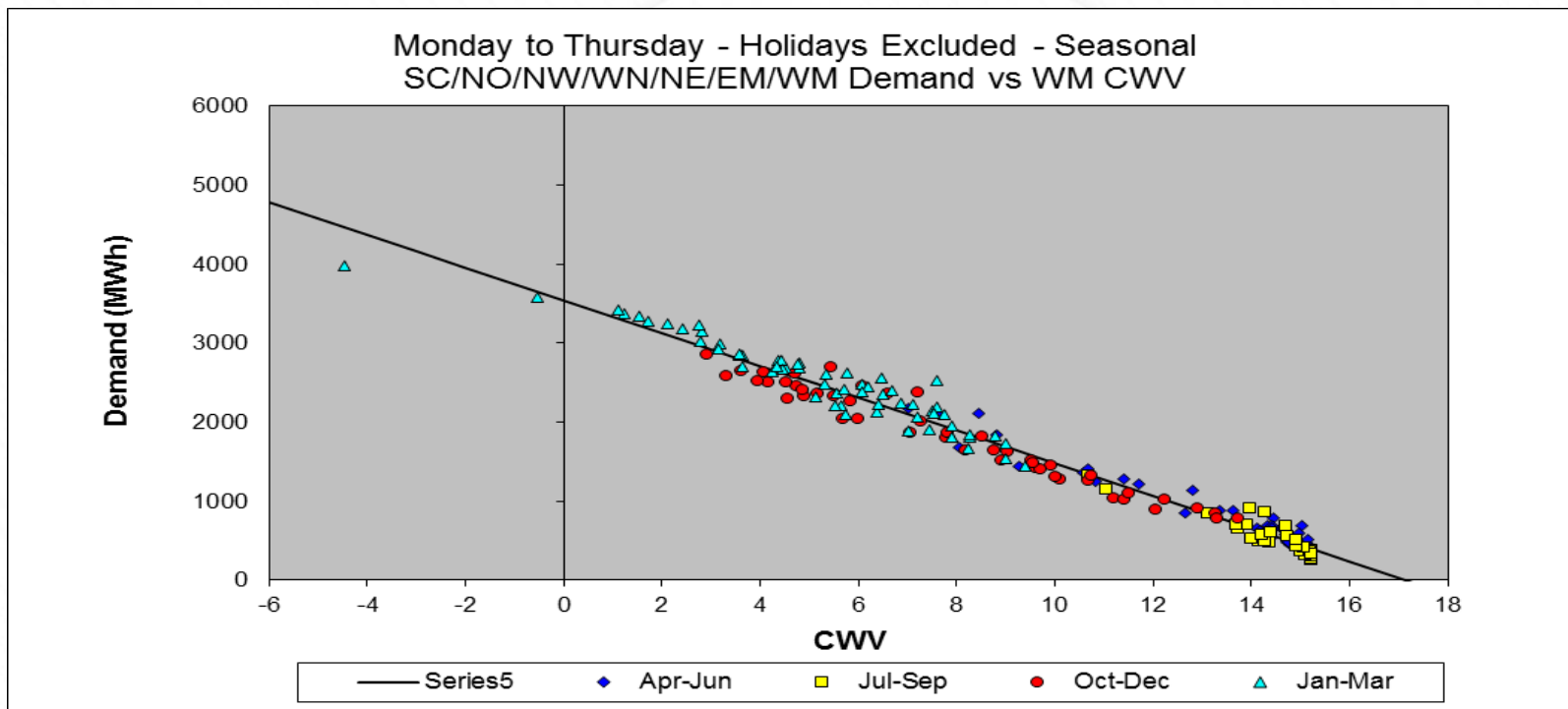
# Large NDM Modelling Results: EUC Band 6 WARs Run 2

5,860 to 14,650 MWh pa	WAR Banding (2 Groups)											
	Band 1 0.00 – 0.331			Band 2 0.331 – 0.395			Band 3 0.395 – 0.474			Band 4 0.474 – 1.000		
SC/NO/NW/WN/NE/WM/EM	82%	95%	77	61%	97%	109	46%	97%	94	29%	97%	55
WS/EA/NT/SE/SO/SW	71%	87%	31	64%	93%	53	46%	97%	68	32%	96%	53

**Indicative Load Factor (ILF)** : **R<sup>2</sup> Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

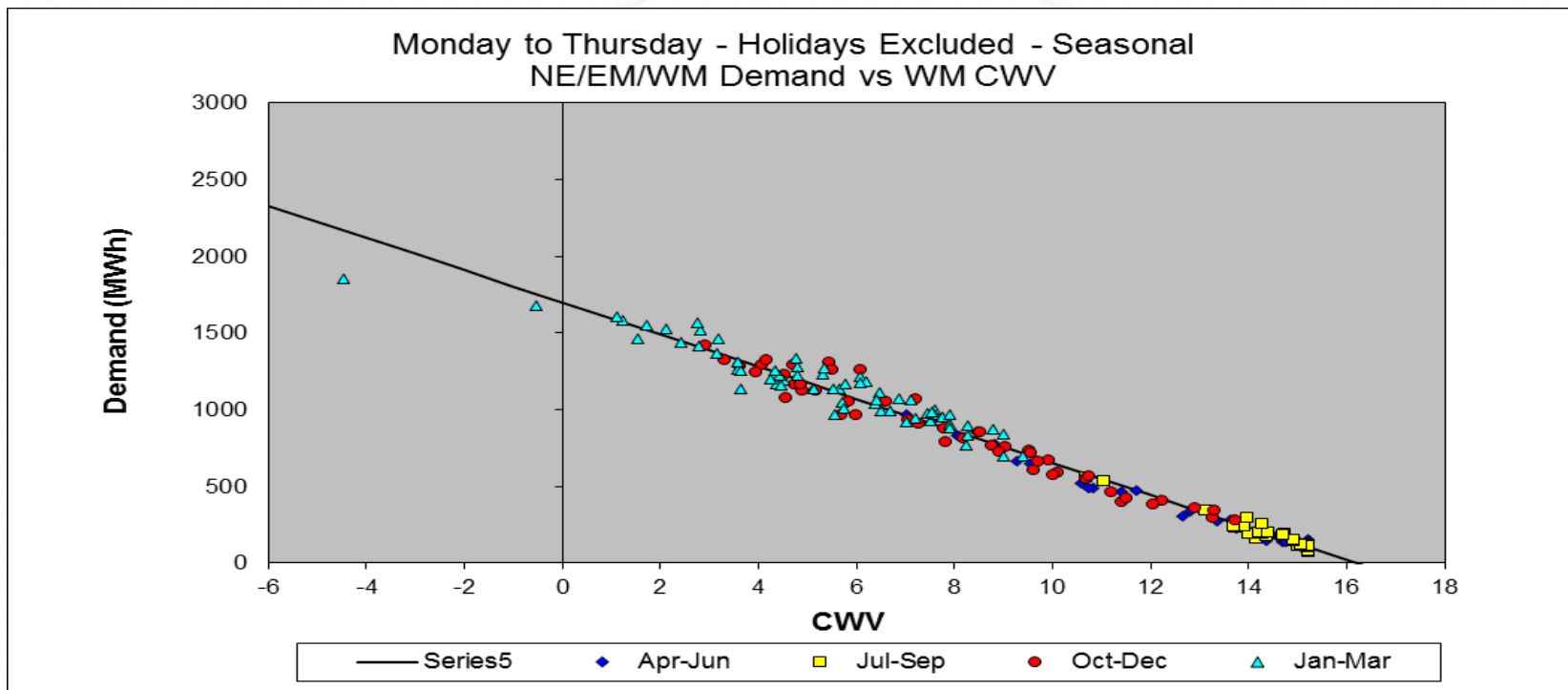
- The results show R<sup>2</sup> values range between 87% and 97%. The lowest R<sup>2</sup> is 87% in WS/EA/NT/SE/SO/SW WAR Band 1
- ILFs demonstrate distinct levels between WAR bands

# WM LDZ, WAR Band 4: 5,860 – 14,650 MWh pa



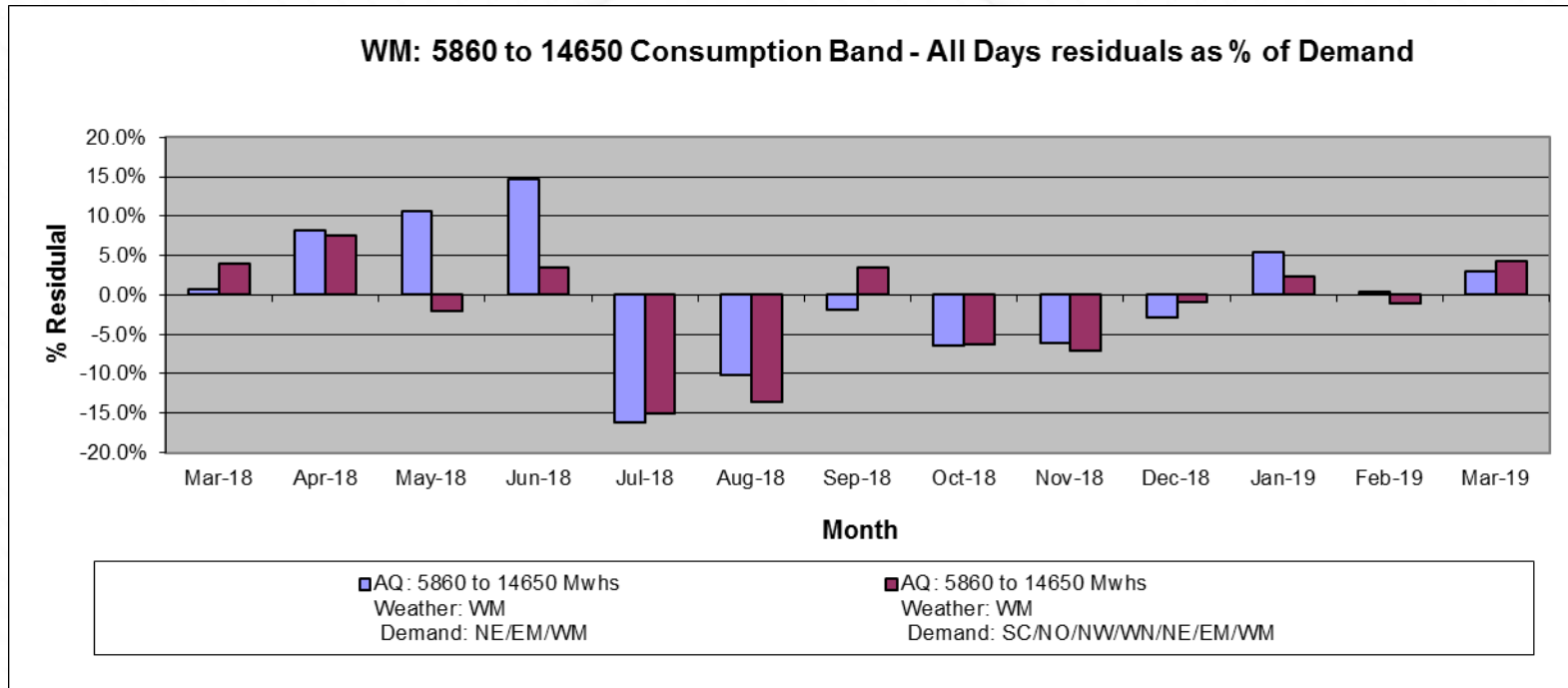
Run	ILF	R <sup>2</sup> (All days)	Sample
SC/NO/NW/WN/NE/EM/WM	29%	97%	55
NE/EM/WM	28%	96%	29

# WM LDZ, WAR Band 4: 5,860 – 14,650 MWh pa



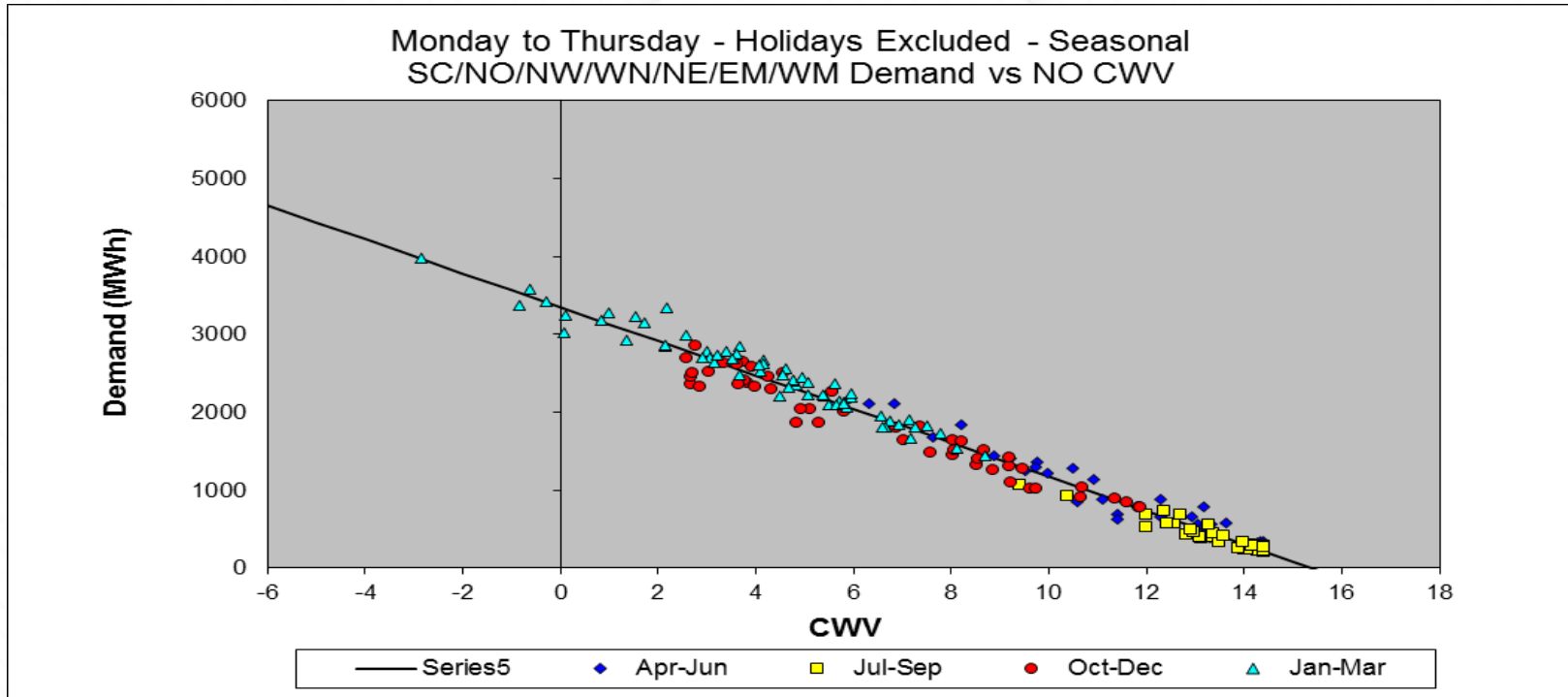
Run	ILF	R <sup>2</sup> (All days)	Sample
SC/NO/NW/WN/NE/EM/WM	29%	97%	55
NE/EM/WM	<b>28%</b>	<b>96%</b>	<b>29</b>

# WM LDZ, WAR Band 4: 5,860 – 14,650 MWh pa



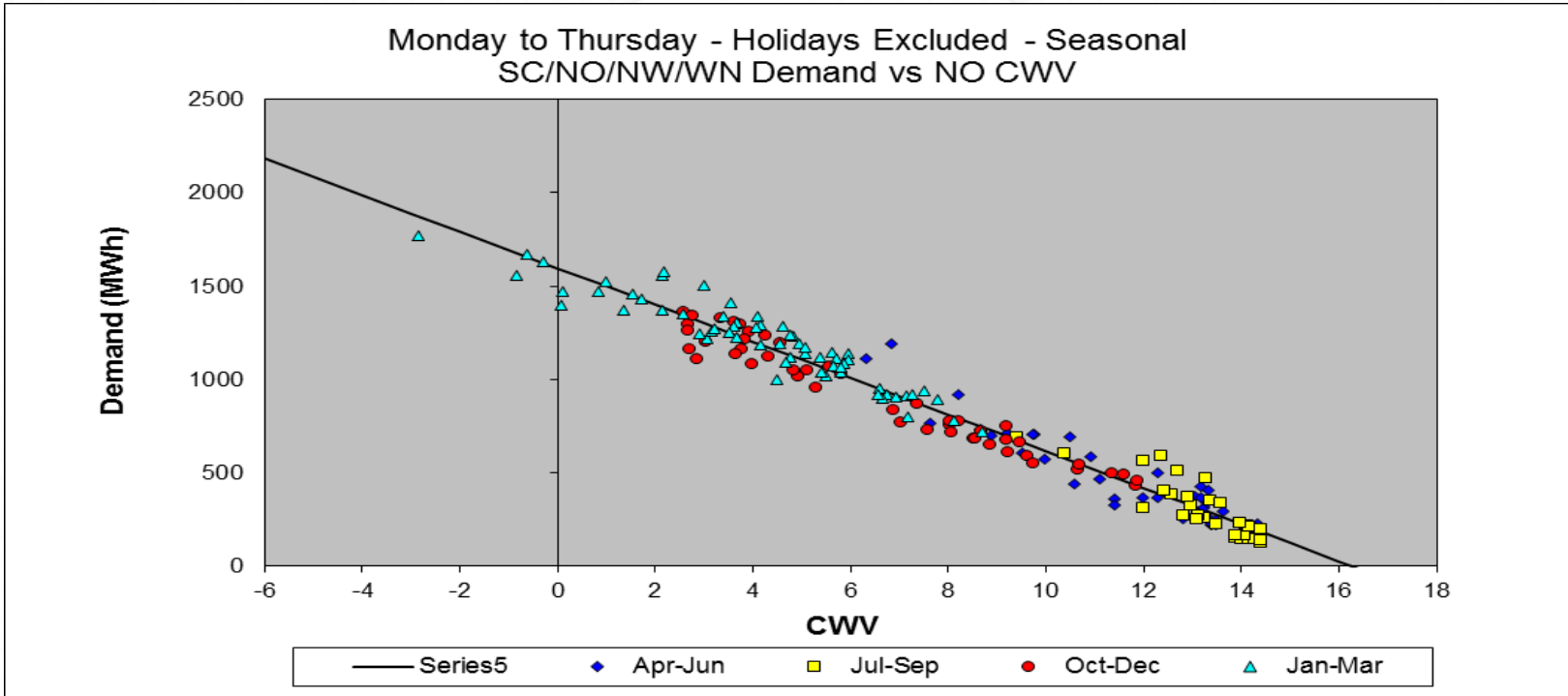
- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested.
- This LDZ shows 6/13 months having smaller residuals (3 groups) and 7/13 months having smaller residuals in the 2 group models
- **TWG to decide on preferred model**

# NO LDZ, WAR Band 4: 5,860 – 14,650 MWh pa



Run	ILF	R <sup>2</sup> (All days)	Sample
SC/NO/NW/WN/NE/EM/WM	29%	97%	55
NE/EM/WM	28%	96%	29

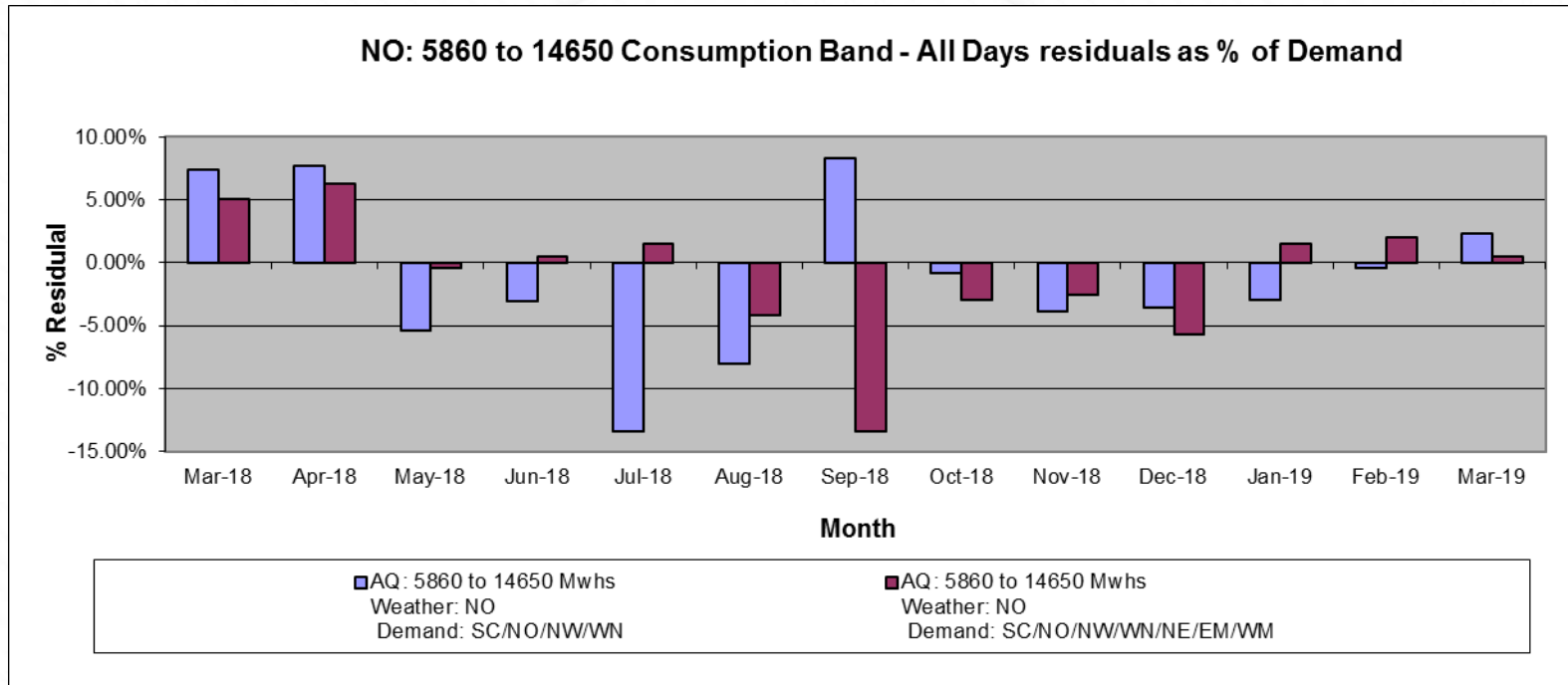
# NO LDZ, WAR Band 4: 5,860 – 14,650 MWh pa



Run	ILF	R <sup>2</sup> (All days)	Sample
SC/NO/NW/WN/NE/EM/WM	29%	97%	55
NE/EM/WM	<b>28%</b>	<b>96%</b>	<b>29</b>



# NO LDZ, WAR Band 4: 5,860 – 14,650 MWh pa



- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested.
- This LDZ shows 4/13 months having smaller residuals (3 groups) and 9/13 months having smaller residuals in the 2 group models
- **TWG to decide on preferred model**

## TWG Decision

Large NDM WAR Band

AQ Range: 14,650 to 58,600 MWh (Consumption  
Band 7 & 8)

2 LDZ Group: SC/NO/NW/WN/NE/EM/WM and EA/NT/SE/WS/SO/SW

or

National (all 13 LDZs aggregated)

# Large NDM Modelling Results: Band 7 & 8 WARs Run 1

14,650 to 58,600 MWh pa	WAR Banding											
	Band 1 0.00 – 0.322			Band 2 0.322 – 0.350			Band 3 0.350 – 0.415			Band 4 0.415 – 1.000		
SC												
NO												
NW / WN												
NE												
EM												
WM	86%	79%	66	77%	94%	104	61%	94%	106	40%	94%	71
WS												
EA												
NT												
SE												
SO												
SW												

- National aggregation shows these WAR bands (particularly WB2-4) have good R<sup>2</sup> values

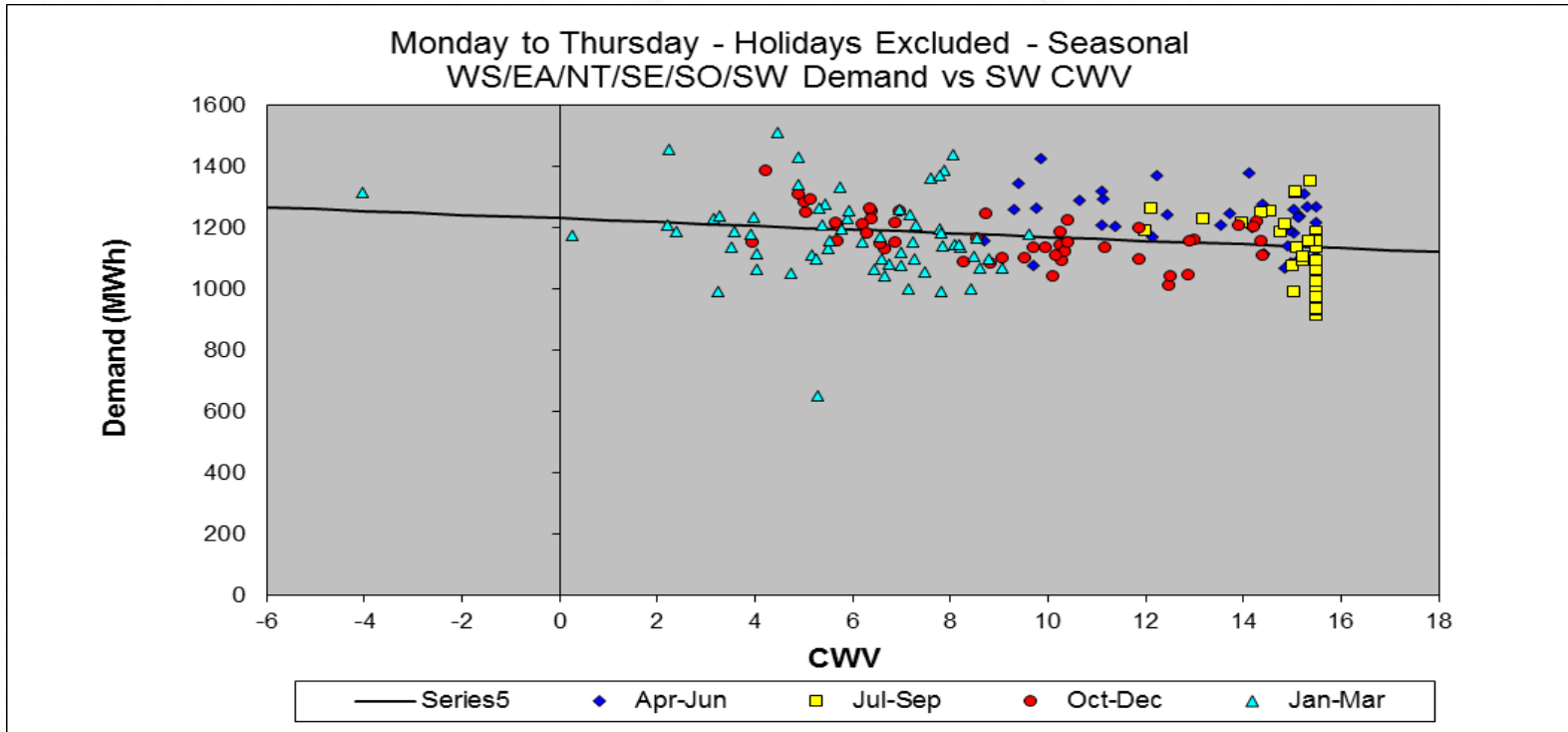
# Large NDM Modelling Results: Band 7 & 8 WARs Run 2

14,650 to 58,600 MWh pa	WAR Banding											
	Band 1 0.00 – 0.322			Band 2 0.322 – 0.350			Band 3 0.350 – 0.415			Band 4 0.415 – 1.000		
SC/NO/NW/WN NE/EM/WM	86%	79%	52	76%	91%	77	62%	93%	79	39%	93%	36
WS/EA/NT/SE/SO/SW	83%	54%	14	75%	90%	27	60%	92%	27	42%	94%	35

**Indicative Load Factor (ILF)** : **R<sup>2</sup> Multiple Correlation Coefficient (All days)** : **Sample Size (Supply Points)**

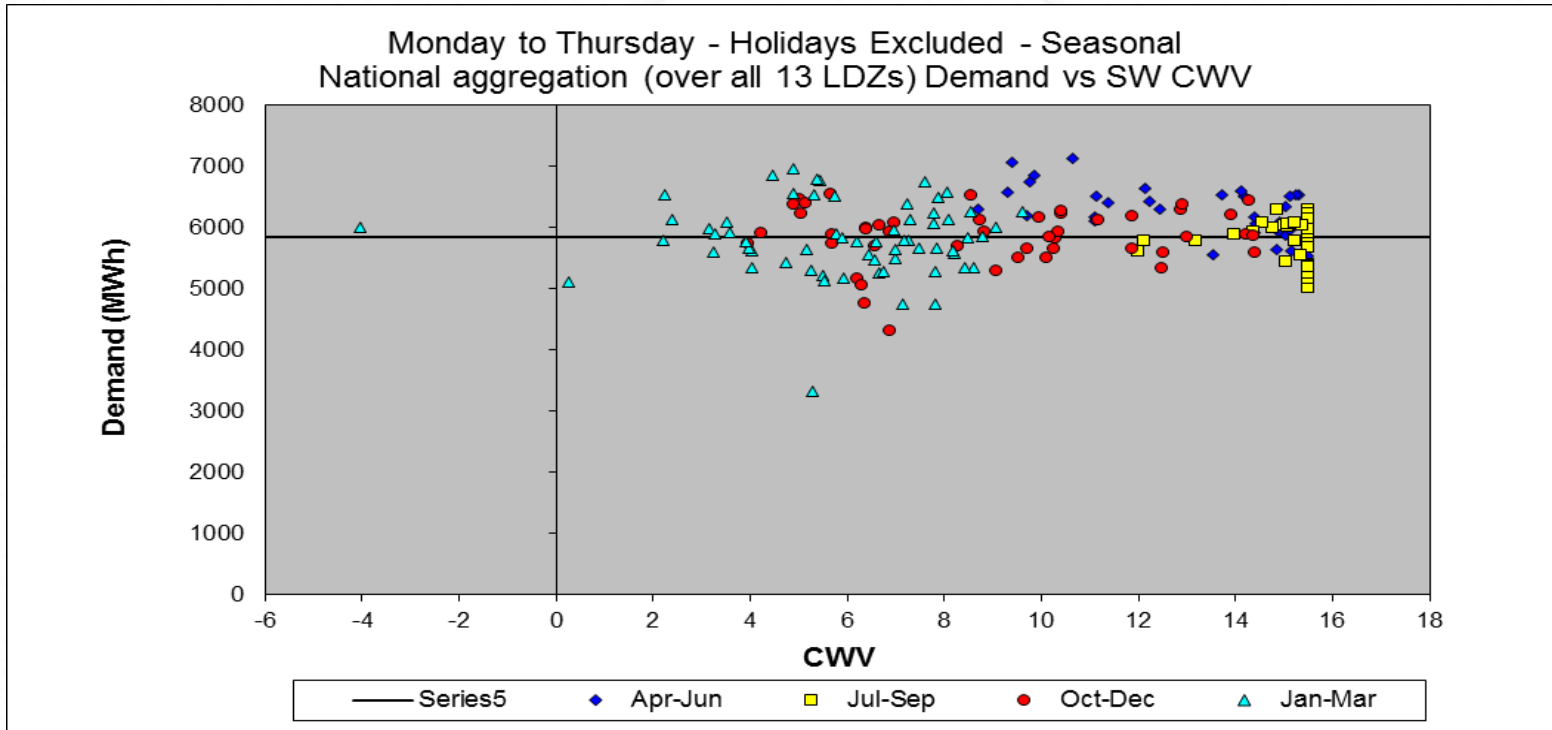
- Having 2 groups show good R2 values for WAR Bands 2-4 – but not so good for the southern group LDZs in WAR Band 1 which has an R2 of 54%
- Aggregating the two groups into a national model produces a model R2 of 79% for WAR Band 1 (79% and 54% individually).
- Charts to follow

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



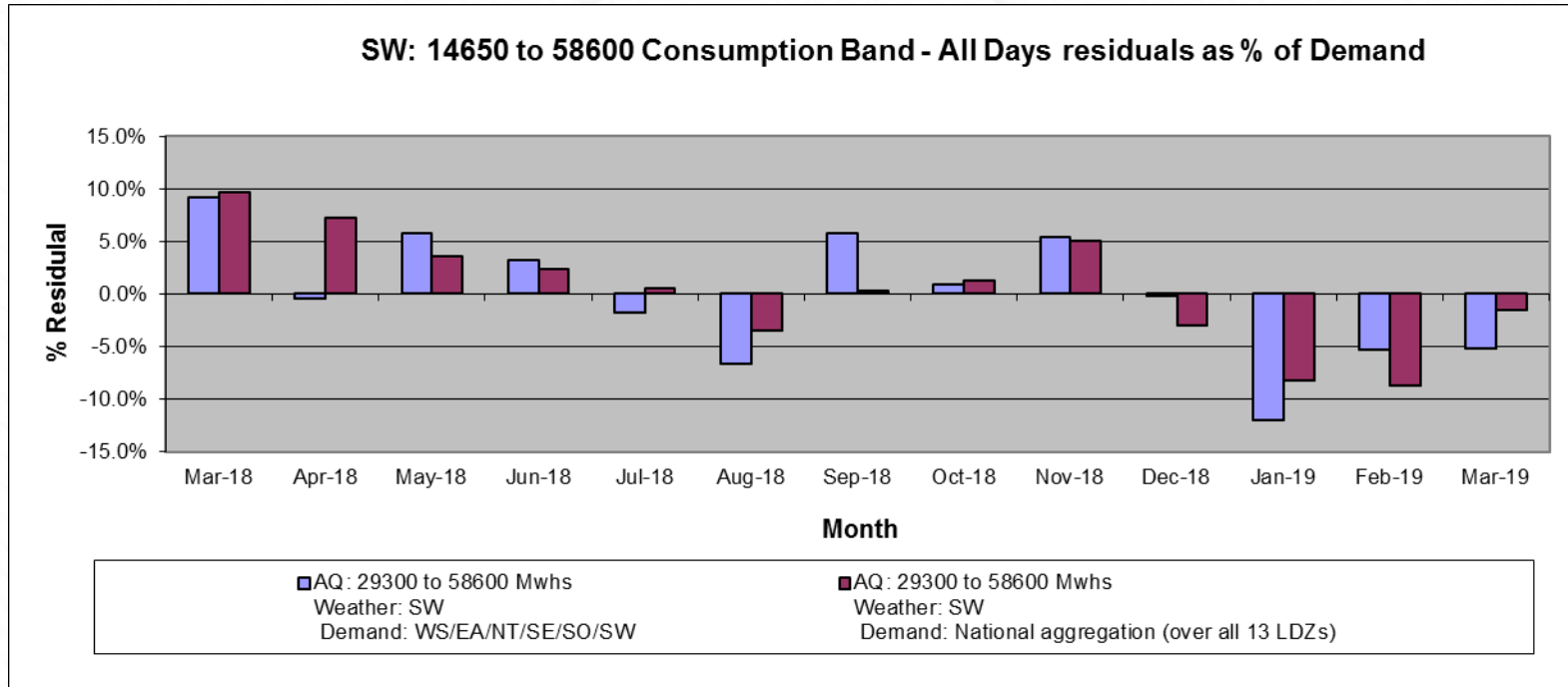
Run	ILF	R <sup>2</sup> (All days)	Sample
EA/NT/SE/WS/SO/SW	83%	54%	14
National	86%	79%	66

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



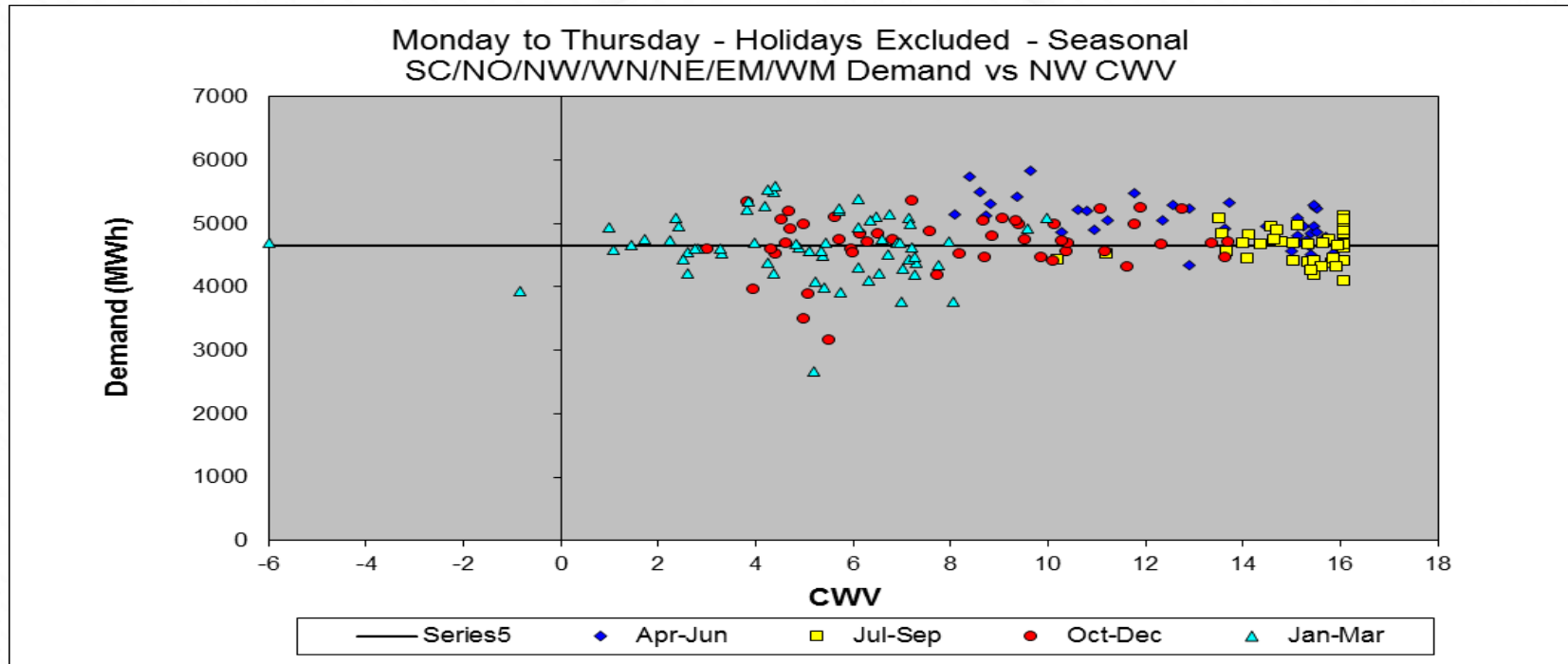
Run	ILF	R <sup>2</sup> (All days)	Sample
EA/NT/SE/WS/SO/SW	83%	54%	14
National	<b>86%</b>	<b>79%</b>	<b>66</b>

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



- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested.
- This LDZ shows 8/13 months having smaller residuals (National) and 5/13 months having smaller residuals in the 2 group models
- **TWG to decide on preferred model**

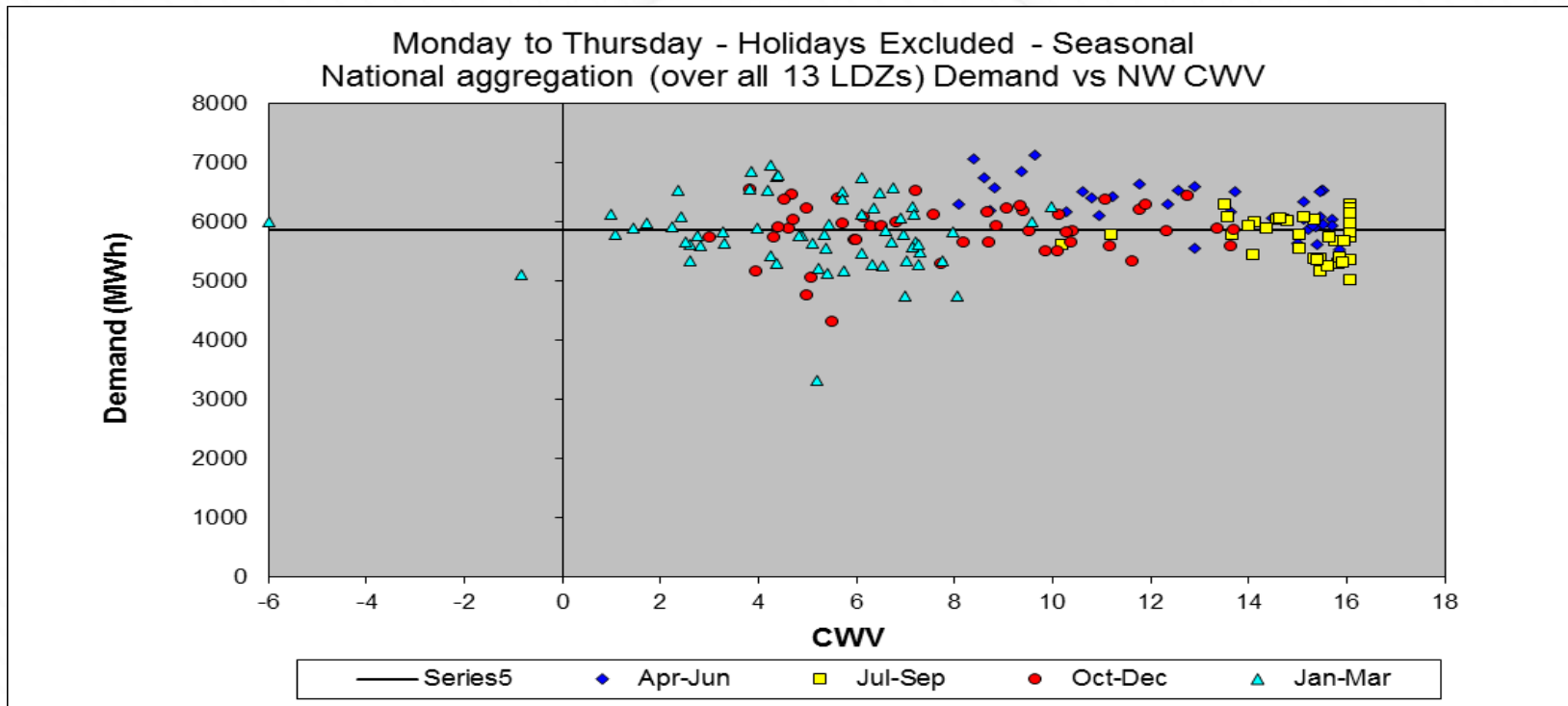
# NW LDZ, WAR Band 1: 14,650 – 58,600 MWh pa



Run	ILF	R <sup>2</sup> (All days)	Sample
SC/NO/NW/WN/NE/EM/WM	86%	79%	52
National	86%	79%	66

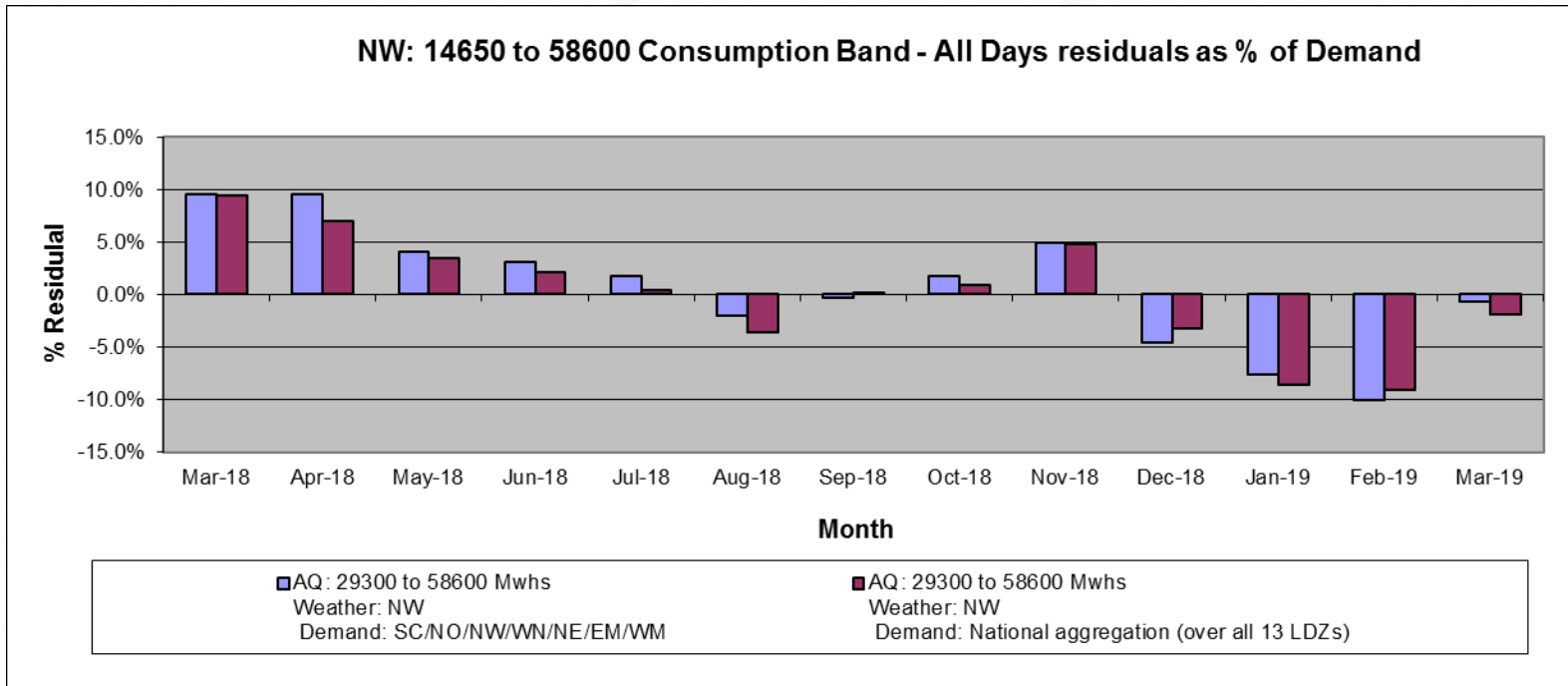


# NW LDZ, WAR Band 1: 14,650 – 58,600 MWh pa



Run	ILF	R <sup>2</sup> (All days)	Sample
SC/NO/NW/WN/NE/EM/WM	86%	79%	52
National	<b>86%</b>	<b>79%</b>	<b>66</b>

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



- Comparison of monthly residuals (all days) for the specific LDZ for the two models tested.
- This LDZ shows 10/13 months having smaller residuals (National) and 3/13 months having smaller residuals in the 2 group models
- **TWG to decide on preferred model**

# Large NDM Modelling Results: Summary

- Good R2 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 with NW/WN or Individual with NW/WN and WS / SW combined
  - Consumption Band 7&8: 5 LDZ groups or 4 Individual LDZs with 4 Groups
  - Consumption Band 6 WAR: 3 group LDZ or 2 group LDZ
  - Consumption Band 7&8 WAR: 2 group LDZ or National
- Are TWG happy to move to model smoothing phase with the Large NDM modelling results presented today ?

# Lessons Learnt – 3<sup>rd</sup> Party Data Provision

- MOD654S mandates eligible Users to provide daily consumption data and so going forward we are expecting a lot more data to be submitted for Demand Estimation purposes
- The File Format document on the DESC homepage provides structure on how the data should be submitted
- Spring Analysis 2019 has seen multiple submissions from 3rd Parties to support Demand Estimation Modelling
- There have been a number of issues with the data in terms of format and data quality, such as:
  - Data provided in different formats
  - Read Date and Gas Day mixed up
  - Multiple days consumption aggregated for one gas day
  - Energy / Reads provided not volume
- All Users who have provided data to the Demand Estimation Team will be contacted with feedback and high level reporting will be provided to Performance Assurance Committee (PAC)
- We recommend that internal reviews of consumption data files prior to their submission to Xoserve are carried out by Users
- Accurate NDM allocation depends on quality demand models and so it is imperative that the input data is as accurate as possible



Section 5:  
Next Steps

# Demand Estimation: Next Steps

- Once all single year models have been approved the “Model Application” phase commences. This begins with model smoothing i.e. the process of ‘averaging the effects’ from the 3 latest analysis years. During this phase it is possible the CDSP may need to contact TWG for further prompt decisions on modelling analysis (probably by email)
- The CDSP then use the output from the smoothed models as the basis for producing the annual Derived Factors which consist of Annual Load Profiles (ALPs), Daily Adjustment Factors (DAFs) and Peak Load Factors (PLFs)
- w/c 3<sup>rd</sup> June Xoserve to publish the draft Derived Factors 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 21<sup>st</sup> June)
- Combined TWG and DESC meeting planned for 8<sup>th</sup> July to review feedback received and seek approval to publish to wider industry participants