



# **Demand Estimation Technical Work Group**

**Gas Demand EUC Modelling Results  
Analysis Year 2021/22  
(3 of 3) Results – Large NDM**

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## **RESULTS: LARGE NDM SUMMARY**

# Total NDM Population Counts: AQ and Supply Point

Small NDM is the main component of the overall NDM:

- Band 1 (0-73.2 MWh pa) constitutes nearly 3/4 of overall NDM (on an AQ basis)
- Bands 1 to 2 (0-293 MWh pa) constitutes nearly 4/5 of overall NDM
- Bands 1 to 4 (0-2196 MWh pa) constitutes nearly 9/10 of overall NDM

Large NDM is very much a minority component of overall NDM

EUC Bands: Range	% of Total NDM	
	Total AQ	Total SP Count
<b>Band 1:</b> 0 to 73.2 MWh p.a.	73.03%	98.90%
<b>Bands 1 and 2:</b> 0 to 293 MWh p.a.	79.16%	99.72%
<b>Bands 1 to 4:</b> 0 to 2,196 MWh p.a.	88.36%	99.97%
<b>Bands 5 to 9:</b> >2,196 MWh p.a.	11.64%	0.03%

# Proposed EUC Bands / Consumption Ranges

- End User Category (EUC) definitions are not prescribed in Uniform Network Code and are the responsibility of DESC to review and confirm. This year's Modelling Approach document did not propose any changes to the EUC definitions for Gas Year 2022/23

Band / Range	Description	Meter Point Count
Band 5 2,196 to 5,860 MWh p.a.	All NDM Supply Points	4,373
Band 6 5,860 to 14,650 MWh p.a.		1,419
Bands 7 and 8 14,650 to 58,600 MWh p.a.		845
Band 9 over 58,600 MWh p.a.		21

- Bands 5-8 above also include 4 x Winter Annual Ratio (WAR) Bands alongside the Consumption Band EUC
- Large NDM is very much a minority component of overall NDM (c12% of total AQ)

# Results – Large NDM: Agreed Modelling Runs

Band / Range	Description	EUC	Option 1	Option 2
Band 5 2,196 to 5,860 MWh p.a.	All NDM Supply Points	05B	Individual LDZ analysis with WN using sample data for WN/NW	Individual LDZ analysis with WN using sample data for WN/NW WS using sample data for WS/SW
Band 6 5,860 to 14,650 MWh p.a.		06B	Individual LDZ analysis with WN using sample data for WN/NW WS using sample data for WS/SW	N/A
Bands 7 and 8 14,650 to 58,600 MWh p.a.		07B and 08B	Individual LDZ analysis with WN using sample data for WN/NW WS and SW Combined EA and NT Combined SE and SO Combined	N/A
Band 9 over 58,600 MWh p.a.		09B	National	N/A



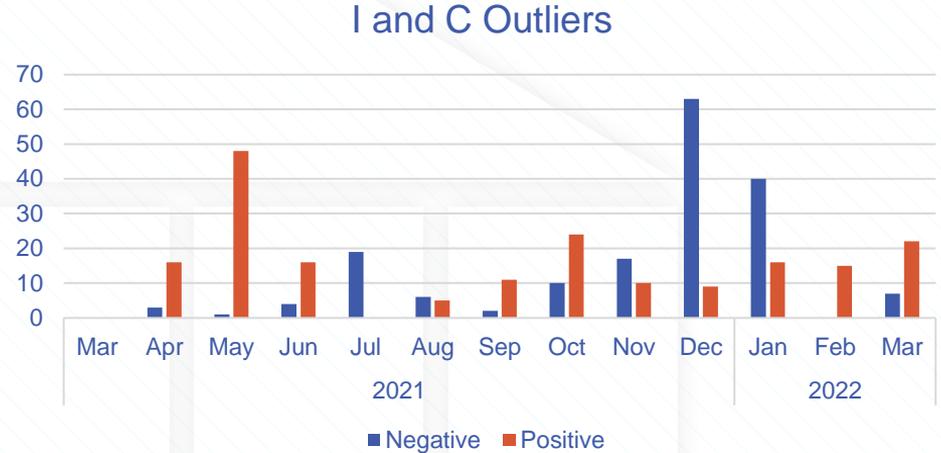
# RESULTS LARGE NDM CONSUMPTION BANDS

# Results – Large NDM Outliers

- The chart on the right shows the number of outliers for 05B, 06B and 07/08B (combined model) by calendar month

- May outliers are related to unusually cold weather

- The December outliers are almost all between the 20<sup>th</sup> and 22<sup>nd</sup>; days that were previously holiday code 4 but are no longer classed as holidays. At the time of the holiday code review the data used suggested these days should not be classed as holidays, however 2021 was not available. The residuals are smaller (c. -7% to -34%) than the holiday factors (c. -4% to -40%)



# Results – Large NDM: 05B Summary

## Option 1

- Individual LDZ analysis with WN using both WN and NW sample data
- R<sup>2</sup> values are between 96.0% and 98.6%
- ILF values are generally slightly higher than previously, with 2 LDZs seeing an increase in excess of 3 percentage points (4.0 and 4.8)

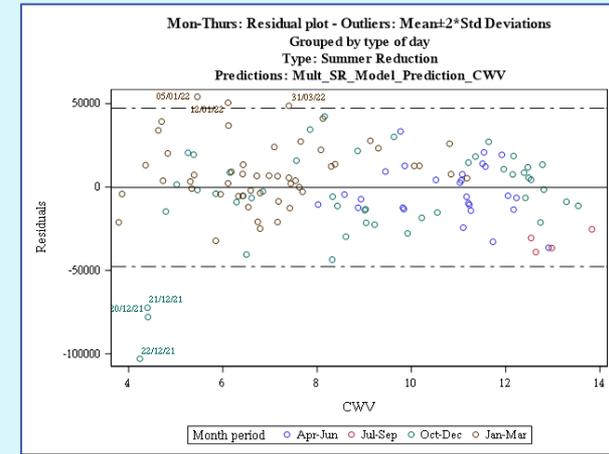
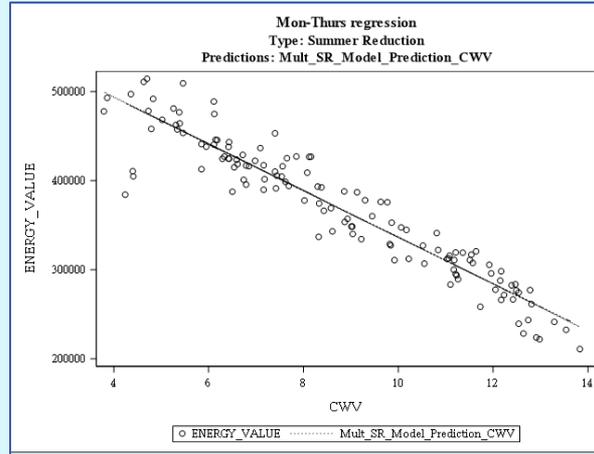
## Option 2

- WS only, using sample data from WS and SW
- R<sup>2</sup> value is slightly better than Option 1
- ILF value is a bigger change than Option 1 but still similar to previously.
- Recommendation is Option 1

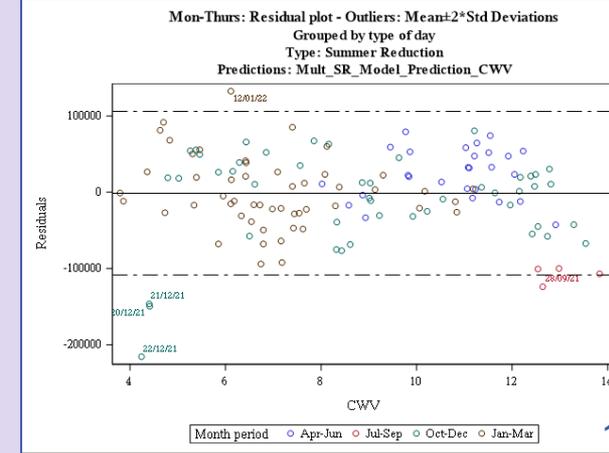
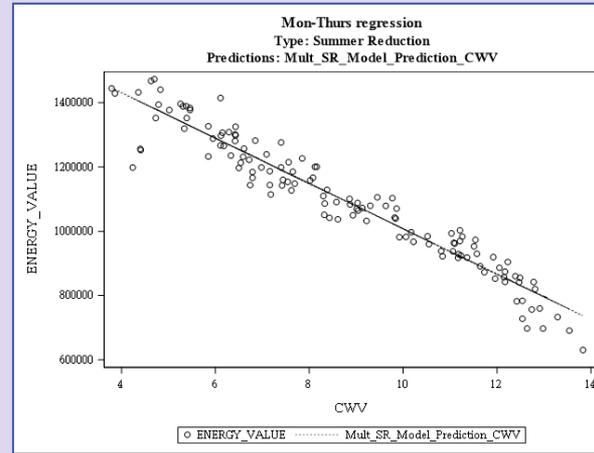
LDZ	Demand	R <sup>2</sup> (All Days)	Sample Size	Indicative Load Factor (ILF)
SC	SC	97.7%	216	44.0
NO	NO	97.4%	93	42.3
NW	NW	97.7%	111	45.1
NE	NE	97.9%	104	41.7
EM	EM	96.5%	85	42.6
WM	WM	97.4%	108	38.7
WN	WN/NW	97.4%	127	46.5
WS Option 1	WS	96.0%	28	39.7
WS Option 2	WS/SW	97.4%	86	43.2
EA	EA	96.4%	74	41.6
NT	NT	98.6%	122	43.0
SE	SE	97.8%	119	43.3
SO	SO	97.4%	99	39.6
SW	SW	96.5%	58	44.2

# Results – Large NDM: 05B – WS Options 1 and 2 (a)

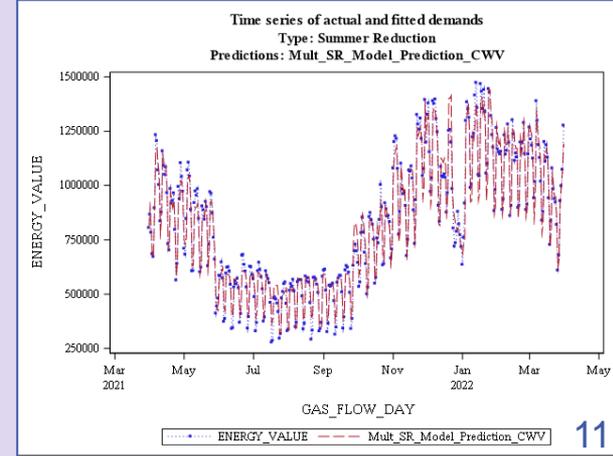
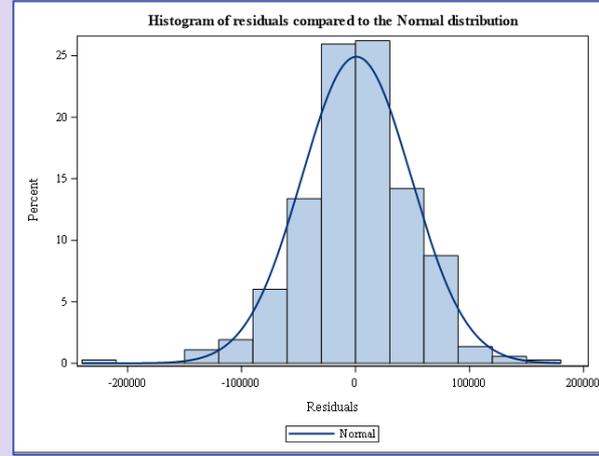
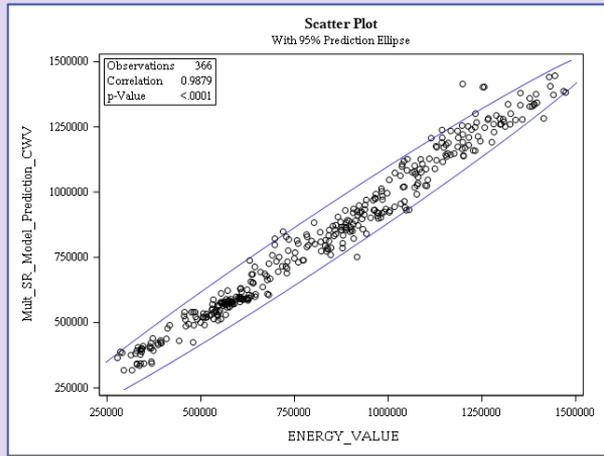
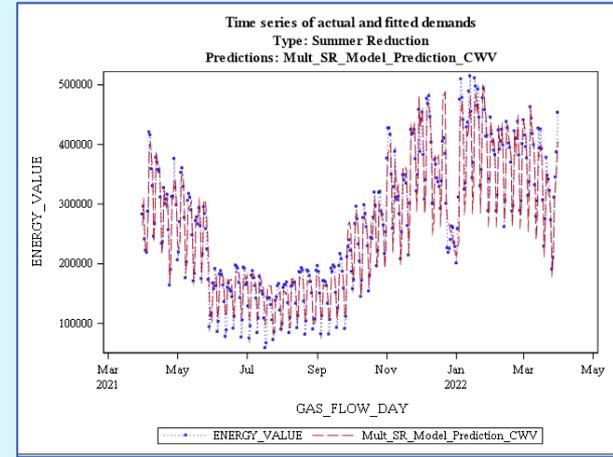
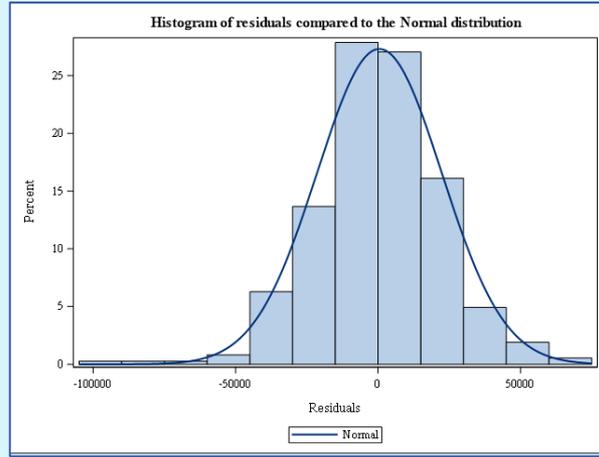
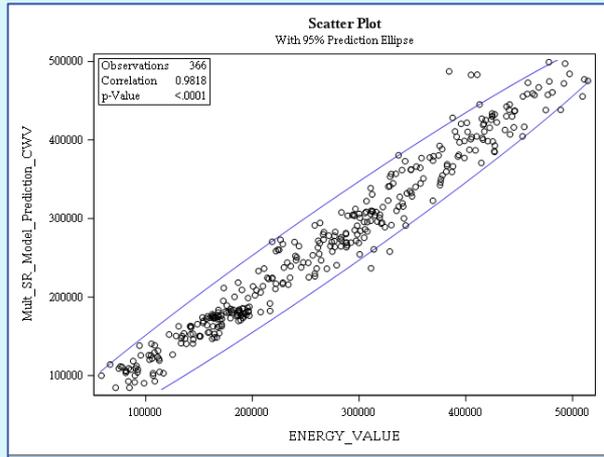
Model: Summer Reduction  
EUC: 05B  
LDZ: WS  
Demand: WS  
R<sup>2</sup>: 96.0%  
ILF: 39.7  
Sample Points: 28  
Option: 1 (**Recommended**)



Model: Summer Reduction  
EUC: 05B  
LDZ: WS  
Demand: WS and SW  
R<sup>2</sup>: 97.3%  
ILF: 43.2  
Sample Points: 86  
Option: 2



# Results – Large NDM: 05B – WS Options 1 and 2 (b)



# Results – Large NDM: 06B Summary

## R<sup>2</sup> values

- are between 88.9% and 97.0%
- Previously between 94.6% and 97.1%
- WM has seen a reduction in R<sup>2</sup>, however the outliers and residuals are not showing anything of concern (shown on following slides)

## ILF values

- On average are slightly higher than previously
- 6 LDZs have seen an increase in excess of 3 percentage points (between 3 and 9)
- the values are still within a normal range for the EUC

Model performance is fairly strong and no alternatives were needed

LDZ	Demand	R <sup>2</sup> (All Days)	Sample Size	Indicative Load Factor (ILF)
SC	SC	97.0%	78	48.7
NO	NO	93.0%	40	54.7
NW	NW	96.3%	53	49.4
NE	NE	96.2%	48	59.3
EM	EM	95.0%	55	50.4
WM	WM	88.9%	37	52.6
WN	WN/NW	96.4%	55	49.4
WS	WS/SW	96.4%	49	48.3
EA	EA	93.0%	32	53.7
NT	NT	96.3%	32	50.4
SE	SE	96.3%	30	47.2
SO	SO	95.7%	46	45.6
SW	SW	96.5%	31	46.3

# Results – Large NDM: 06B – WS and WM

## Biggest change in ILF

Model: No Summer Reduction

EUC: 06B

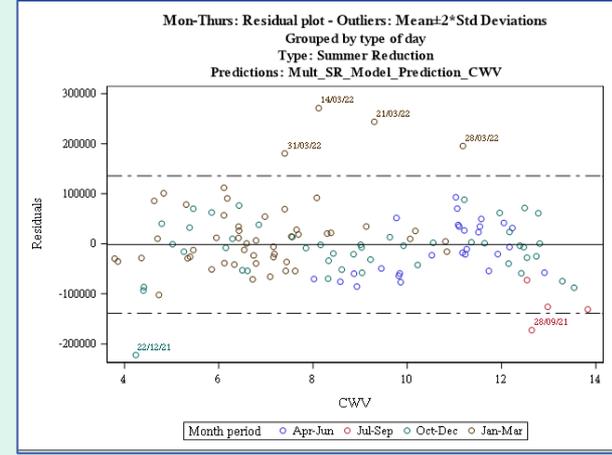
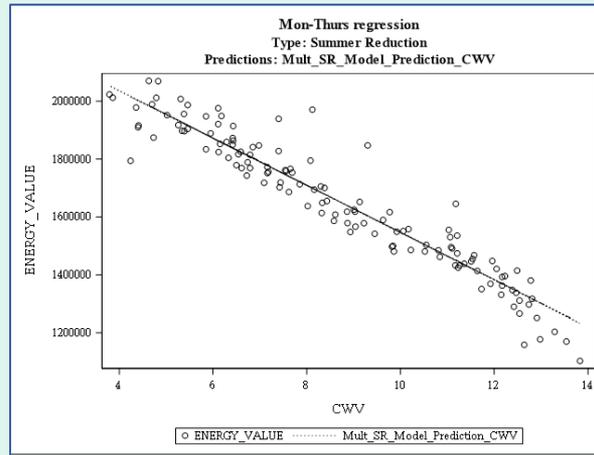
LDZ: WS

Demand: WS, SW

R<sup>2</sup>: 96.4%

ILF: 48.3

Sample Points: 49



## Lowest R<sup>2</sup>

Model: Summer Reduction

EUC: 06B

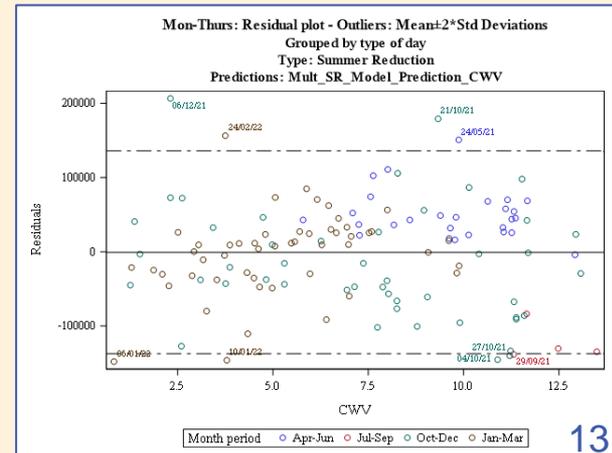
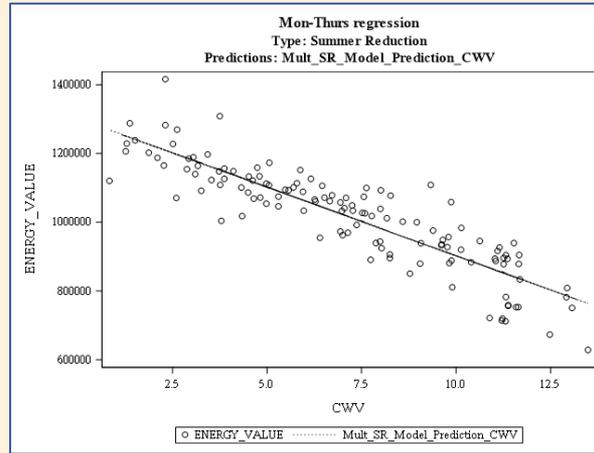
LDZ: WM

Demand: WM

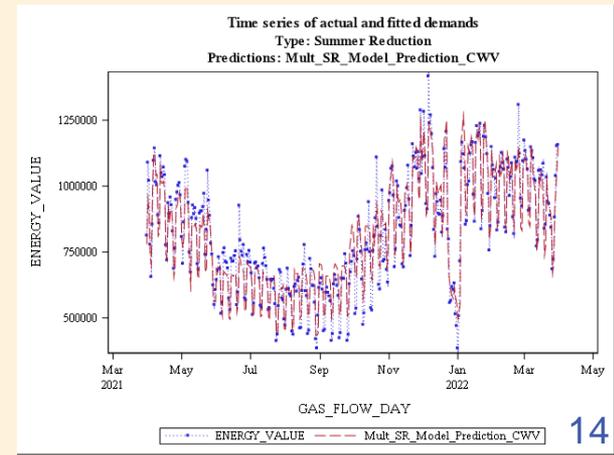
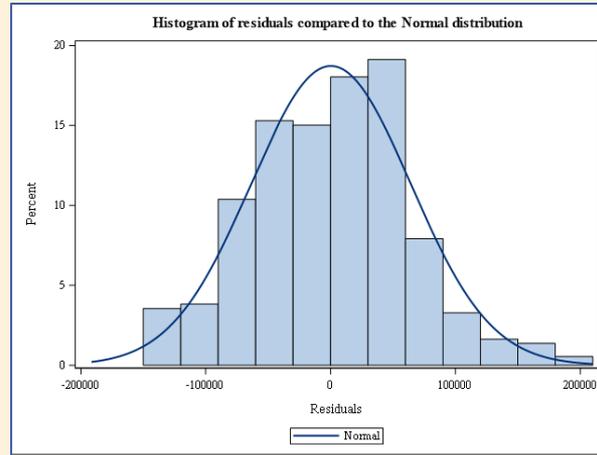
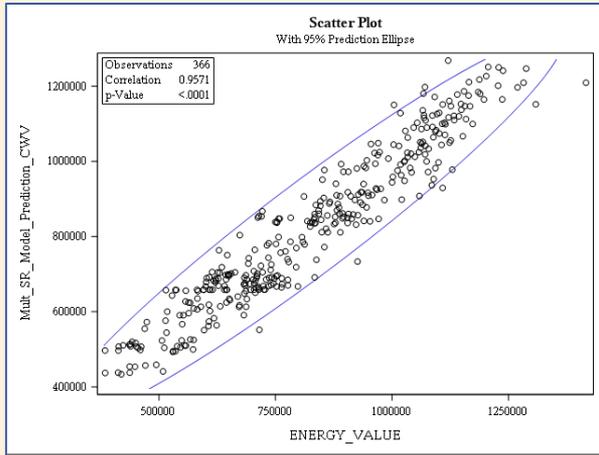
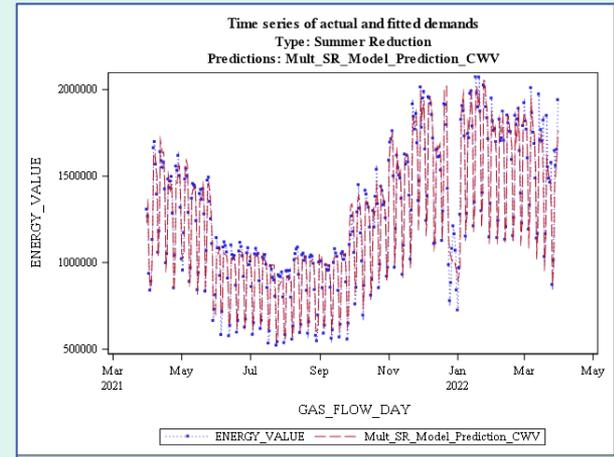
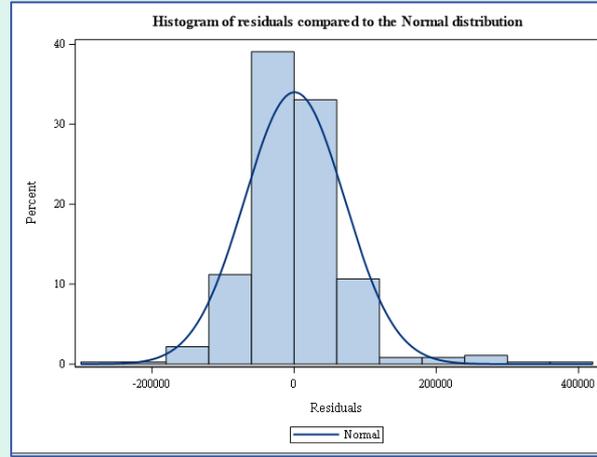
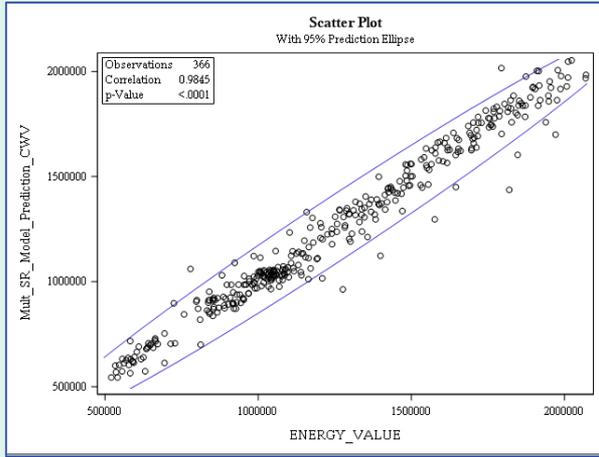
R<sup>2</sup>: 88.9%

ILF: 52.6

Sample Points: 37



# Results – Large NDM: 06B – WS and WM



# Results – Large NDM: 07/08B Summary

## R<sup>2</sup> values

- are between 74.1% and 94.5%
- Previous range was 69.6% and 94.2%

## ILF values

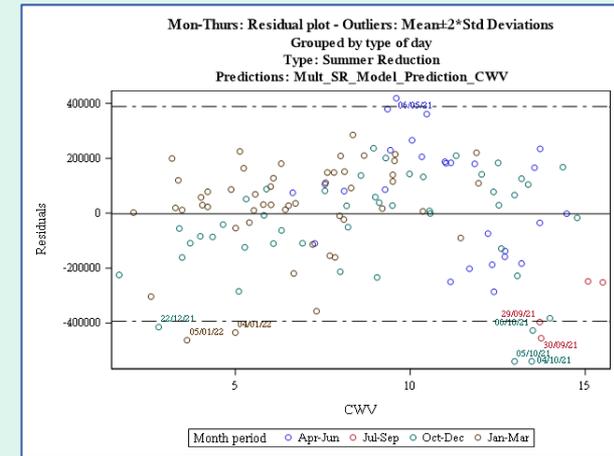
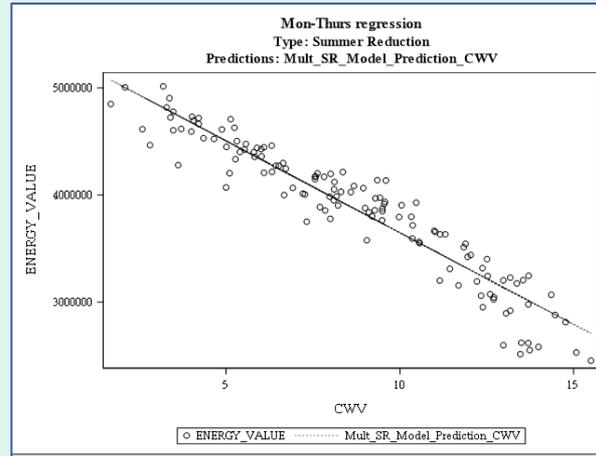
- On average are the same as previously, and within a normal range for the EUC however,
- 3 LDZs have seen an increase in excess of 3 percentage points (between 4.3 and 15.2)
- 4 LDZs have seen reduction in excess of 3 percentage points (between 3.6 and 16.8)
- The biggest movers have R<sup>2</sup> in excess of 90%

Model performance is good and no alternatives were needed

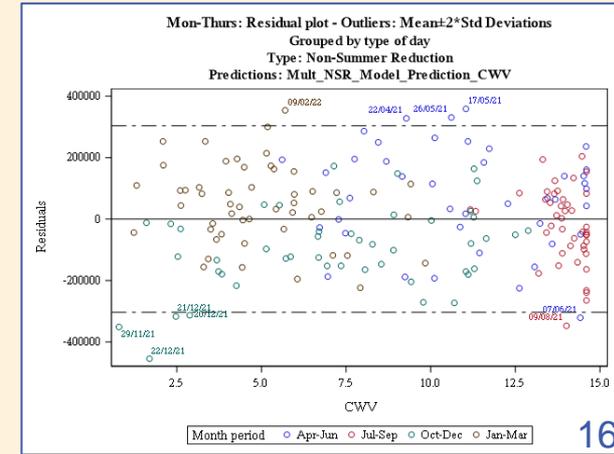
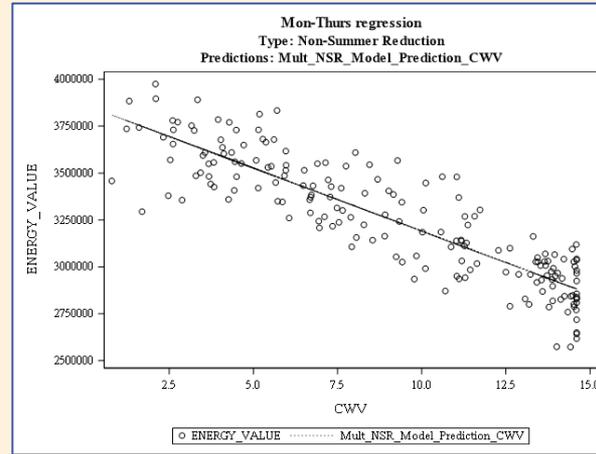
LDZ	Demand	R <sup>2</sup> (All Days)	Sample Size	Indicative Load Factor (ILF)
SC	SC	91.7%	45	63.2
NO	NO	83.5%	40	70.6
NW	NW	77.1%	47	62.6
NE	NE	83.6%	39	72.0
EM	EM	89.0%	57	62.6
WM	WM	92.3%	37	60.0
WN	WN/NW	77.1%	50	64.2
WS	WS/SW	74.1%	30	67.7
EA	EA/NT	94.3%	36	52.0
NT	EA/NT	94.5%	36	51.7
SE	SE/SO	83.9%	40	57.5
SO	SE/SO	83.7%	40	55.5
SW	WS/SW	75.4%	30	66.5

# Results – Large NDM: 07/08B – NT and NE

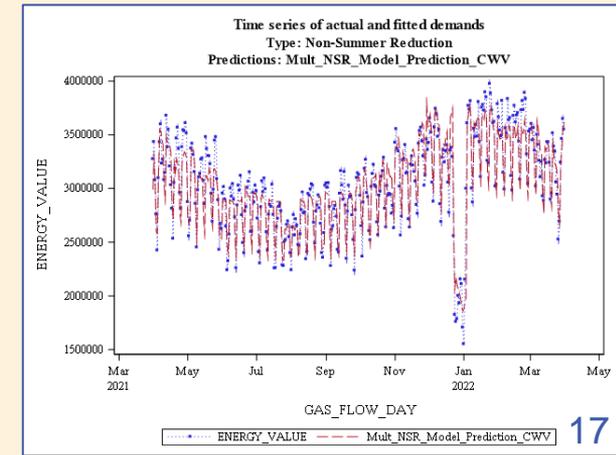
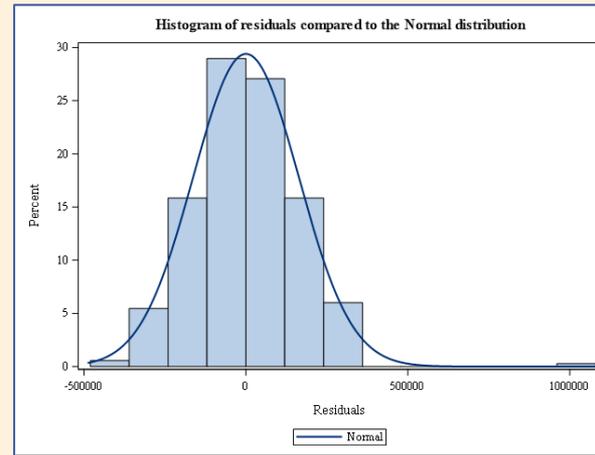
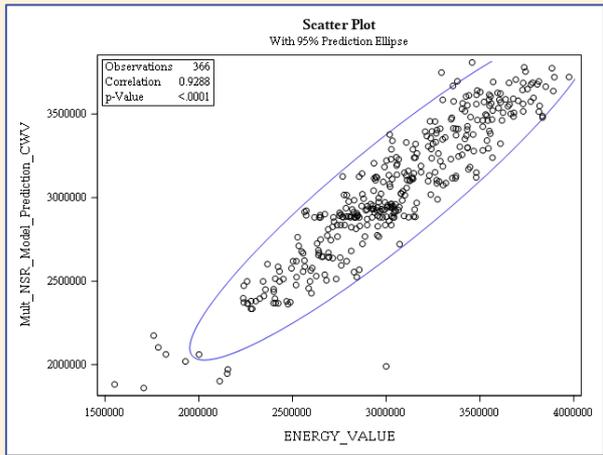
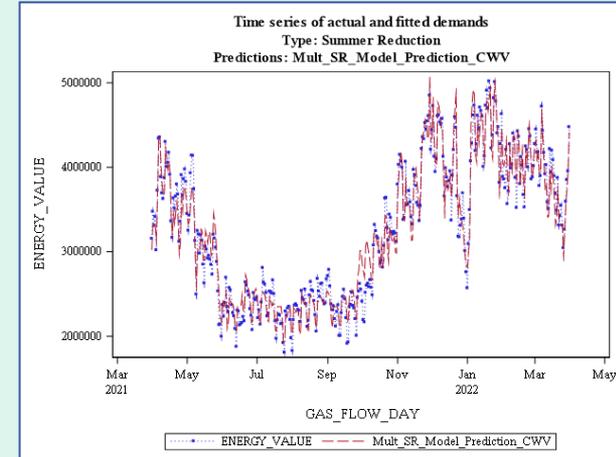
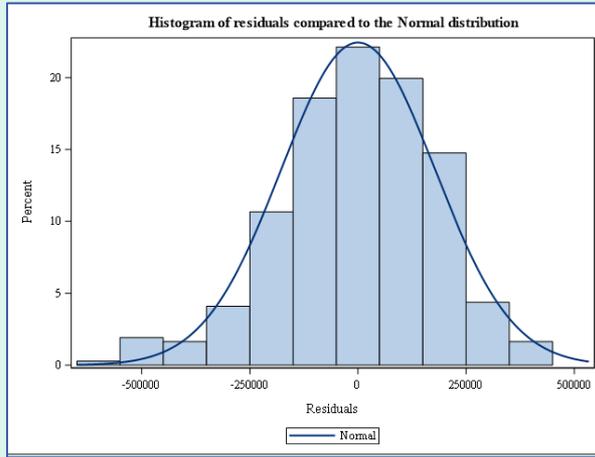
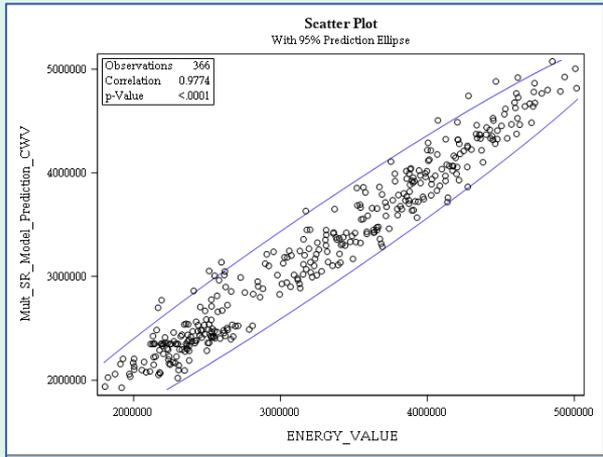
Model: Summer Reduction  
 EUC: 07/08B  
 LDZ: NT  
 Demand: NT and EA  
 $R^2$ : 94.5%  
 ILF: 51.8  
 Sample Points: 36



Model: No Summer Reduction  
 EUC: 07/08B  
 LDZ: NE  
 Demand: NE  
 $R^2$ : 83.6%  
 ILF: 72.0  
 Sample Points: 39



# Results – Large NDM: 07/08B – NT and NE



# Results – Large NDM: 09B Summary

## R<sup>2</sup> values

- are between 80.4% and 83.1%
- Previous range was 69.9% and 83.2%

## ILF values

- are all 6-8 percentage points higher than previously
- Sample data for some DM meters is used for modelling due to the low number of meters in Band 9

Model performance is reasonable and no alternatives possible

Reminder: Band 09B is a contingency NDM EUC as sites should be DM above this AQ threshold

LDZ	Demand	R <sup>2</sup> (All Days)	Sample Size	Indicative Load Factor (ILF)
SC	National	81.3%	196	76.5
NO		81.8%		77.0
NW		83.1%		75.8
NE		82.6%		76.5
EM		82.5%		76.1
WM		82.4%		74.9
WN		83.1%		76.2
WS		83.1%		74.5
EA		80.9%		75.6
NT		80.7%		75.6
SE		80.4%		74.8
SO		80.4%		73.2
SW		81.8%		73.7



**RESULTS LARGE NDM WAR BANDS**

# Results – Large NDM WAR Bands : Agreed Modelling Runs

Band / Range	Description	EUC	Option 1	Option 2
Band 5 2,196 to 5,860 MWh p.a.	All NDM Supply Points	05W01-04	SC at LDZ Level NO, NW and WN Combined NE, EM and WM Combined EA, NT and SE Combined WS, SO and SW Combined	N/A
Band 6 5,860 to 14,650 MWh p.a.		06W01-04	SC, NO, NW, and WN Combined NE, EM and WM Combined EA, NT, SE, WS, SO and SW Combined	N/A
Bands 7 and 8 14,650 to 58,600 MWh p.a.		07/08W01-04	SC, NO, NW, NE, EM WN and WM Combined EA, NT, SE, WS, SO and SW Combined	National
Band 9 over 58,600 MWh p.a.		09B	N/A No WAR Bands	

# Results – 05W01-04 WAR Band Summary

Option 1	W01 (0 to 0.376)			W02 (0.377 to 0.446)			W03 (0.447 to 0.506)			W04 (0.507 to 1.000)		
LDZ	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF
SC	86.5%	39	71.2	96.1%	69	50.0	96.7%	76	39.7	91.5%	32	27.6
NO	94.1%	54	68.1	96.8%	77	51.3	97.9%	45	42.2	94.9%	44	27.5
NW	94.1%		67.3	96.3%		49.5	97.6%		40.1	94.5%		25.4
WN	94.0%		67.7	96.3%		50.3	97.5%		40.9	96.5%		26.0
NE	95.1%		67.9	97.0%		47.7	97.3%		39.6	96.1%		26.2
EM	95.1%	70	67.7	96.8%	89	47.1	97.2%	70	39.3	95.9%	68	26.1
WM	95.1%	42	67.1	96.9%	87	45.7	97.2%	122	37.8	96.0%	64	24.8
EA	85.5%		74.6	96.1%		53.7	97.8%		42.0	98.2%		28.4
NT	85.7%		74.4	96.5%		53.4	98.0%		41.7	98.1%		28.2
SE	85.6%		74.0	96.1%		52.7	97.6%		41.1	97.8%		27.6
WS	91.9%	42	75.4	93.6%	48	51.3	96.2%	57	39.2	97.9%	38	27.3
SO	92.0%		74.6	94.2%		49.6	96.4%		37.4	98.0%		25.4
SW	91.3%		70.3	94.5%		50.2	96.8%		38.2	98.4%		26.0

# Results – 05W01-04 WAR Band Summary

## R<sup>2</sup> values

- Are between 85.5% and 93.4%
- Previous range was 85.1% and 97.9%

## ILF Values

- Are similar to previously, with the majority within 3 percentage points
- 6 models have seen a greater than 3 pp movement, all are less than 6
- Range is wide due to the weather sensitivity of the EUCs - 24.8 to 75.4 (previous range was 23.2 to 76.6)
- Model performance is good and no alternatives were needed

# Results – 06W01-04 WAR Band Summary

Option 1	W01 (0 to 0.333)			W02 (0.334 to 0.394)			W03 (0.395 to 0.485)			W04 (0.486 to 1.000)		
LDZ	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF
SC	92.8%	43	80.7	93.8%	43	63.6	96.3%	57	46.9	92.8%	30	28.7
NO	92.9%		80.8	93.0%		65.0	95.8%		48.8	95.6%		31.0
NW	92.9%		80.7	93.1%		63.8	94.6%		47.1	95.3%		29.0
WN	93.0%		80.8	93.1%		64.1	94.4%		47.8	95.6%		29.5
NE	83.7%	31	86.0	95.3%	58	63.0	97.2%	24	43.5	97.1%	27	33.2
EM	83.7%		86.0	95.2%		62.6	97.1%		43.2	96.7%		32.9
WM	83.7%		86.1	95.2%		61.7	97.0%		41.8	96.4%		31.6
WS	88.2%	29	75.5	97.7%	49	68.9	95.2%	69	47.0	96.4%	42	30.3
EA	88.4%		74.8	97.7%		69.6	96.8%		47.5	96.4%		30.7
NT	88.4%		74.6	97.7%		69.5	97.0%		47.2	96.3%		30.6
SE	88.4%		74.5	97.7%		68.9	96.5%		46.6	95.9%		29.9
SO	88.3%		74.6	97.6%		67.9	96.3%		44.9	96.4%		28.4
SW	88.2%		75.3	97.7%		68.3	96.1%		45.8	96.9%		29.0

# Results – 06W01-04 WAR Band Summary

## R<sup>2</sup> values

- Are between 83.7% to 97.7%
- Previous range was 91.4% to 98.2%
- WAR Band 01 has seen a drop in R<sup>2</sup> for the 2 more southern groupings

## ILF Values

- Range is wide due to the weather sensitivity of the EUCs - 28.4 to 86.0 (previous range was 26.3 to 81.8)
- Model performance is good and no alternatives were needed
  - Option 1

# Results – 07/08W01-04 WAR Band Summary - Option 1

Option 1	W01 (0 to 0.327)			W02 (0.328 to 0.358)			W03 (0.359 to 0.426)			W04 (0.427 to 1.000)		
LDZ	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF
SC	74.7%	62	88.2	82.9%	88	76.5	88.5%	78	59.5	86.6%	40	37.6
NO	73.8%		88.2	83.5%		77.1	90.9%		60.8	91.9%		39.8
NW	73.9%		88.2	84.0%		76.1	90.5%		59.4	92.9%		37.6
NE	73.9%		88.3	84.1%		76.6	90.2%		60.3	93.3%		38.4
EM	73.9%		88.3	83.9%		76.3	93.4%		60.4	92.8%		38.2
WM	73.9%		88.3	82.3%		78.6	92.8%		59.2	92.1%		37.0
WN	74.0%		88.3	83.9%		76.4	93.8%		60.6	93.7%		38.0
WS	34.0%	14	96.1	57.1%	24	81.3	90.1%	34	58.2	94.3%	34	36.0
EA	32.5%		95.2	58.1%		81.6	93.1%		57.2	95.4%		36.5
NT	32.4%		95.0	58.4%		81.5	93.3%		57.1	95.4%		36.5
SE	32.5%		95.4	58.4%		81.0	91.8%		57.6	94.8%		35.9
SO	32.6%		95.6	58.0%		80.0	91.9%		55.7	94.6%		34.3
SW	33.2%		95.6	57.7%		80.6	91.1%		56.8	95.0%		35.0

# Results – 07/08W01-04 WAR Band Summary - Option 2

Option 2	W01 (0 to 0.327)			W02 (0.328 to 0.358)			W03 (0.359 to 0.426)			W04 (0.427 to 1.000)		
LDZ	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF	R <sup>2</sup> (All Days)	Sample Size	ILF
SC	73.1%	76	89.8	84.9%	112	77.8	88.3%	112	59.8	85.7%	74	37.8
NO	72.1%		89.9	85.3%		78.3	95.2%		61.1	93.9%		39.5
NW	72.2%		89.9	85.8%		77.4	95.6%		59.5	95.2%		37.3
NE	72.2%		90.0	86.0%		77.9	95.6%		60.4	95.6%		38.2
EM	72.2%		90.0	85.8%		77.6	95.6%		59.8	95.3%		38.1
WM	72.2%		90.0	85.8%		76.7	95.4%		58.4	95.1%		36.8
WN	72.4%		90.0	85.8%		77.7	95.9%		60.0	96.0%		37.6
WS	72.5%		90.8	83.9%		80.0	94.4%		58.1	95.1%		36.6
EA	72.1%		90.2	86.0%		77.1	94.8%		59.0	95.0%		37.4
NT	72.0%		90.0	86.2%		77.0	94.7%		58.9	95.1%		37.1
SE	72.0%		90.2	85.9%		76.4	94.5%		57.9	94.8%		36.4
SO	72.2%		90.5	85.4%		75.2	94.4%		55.9	94.5%		34.9
SW	72.4%		90.5	85.1%		75.7	94.5%		56.8	95.4%		35.4

# Results – 07/08W01-04 WAR Band Summary

## R<sup>2</sup> values

- Option 1 values are between 32.4% and 95.4%
  - The southern grouping only has 14 sample points for WAR band 1 and has produced a poor R<sup>2</sup> range (32.4% to 34.0%)
  - The other WAR Bands are better but W02 is still much lower for the southern grouping (c. 57% compared to 83% for the northern grouping)
- Option 2 Values are between 72.0% and 96.0%
  - WAR band 1 R<sup>2</sup> is much improved for the southern LDZs (+40%), but has had a small detrimental impact on the northern LDZs for (c.2%)
- Previous range was 60.6% to 96.7%

## ILF Values

- Range is wide due to the weather sensitivity of the EUCs, but similar for both options
- Option 1 values are 34.3 to 96.1, Option 2 are 34.9 to 90.8 (previous range was 34.0 to 91.2)
- The improvement to the Southern group and minimal impact on the northern group supports our recommendation of proceeding with option 2

# Results – Large NDM Conclusions

- Sample numbers are good, with the exception of the Southern grouping for 07/08 WAR Band Analysis
- Better or similar  $R^2$  coefficients for the majority of large NDM Models
- Are TWG happy to move to Demand Model Smoothing phase with the large NDM modelling results presented today?