Demand Estimation Sub Committee

3.0 Gas Demand EUC Modelling Results
(3 of 3) Large NDM Results
22 May 2024

Contents

Gas Demand EUC Modelling Results

LARGE NDM BACKGROUND

Large NDM Population - AQ & Supply Point Count

- 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**
Band 1: 0 to 73.2 MWh pa	71.48%	99.02%
Bands 1 to 2: 0 to 293 MWh pa	77.95%	99.75%
Bands 1 to 4: 0 to 2,196 MWh pa	87.41%	99.98%
Bands 5 to 9: >2,196 MWh pa	12.59%	0.02%

Population Size - April 2024 NDM

- The table below highlights the current population size (Class 3 and 4 only) for each LDZ and EUC combination
- These values are used to calculate the Target Sample Size

EUC Band	Customer Type	LDZ													Total
		SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	
5	**All**	402	201	453	231	380	385	44	132	252	678	329	236	191	**3,914**
6	**All**	116	75	159	97	174	124	25	45	109	176	79	86	91	**1,356**
7	**All**	50	32	82	36	82	55	11	27	47	42	25	30	40	**559**
8	**All**	10	15	41	17	47	29	7	12	24	20	18	10	17	**267**
9	**All**	0	0	1	1	2	0	0	0	1	1	2	2	2	**12**
Large NDM Total		**578**	**323**	**736**	**382**	**685**	**593**	**87**	**216**	**433**	**917**	**453**	**364**	**341**	6,108

EUC Bands / Consumption Ranges for Large NDM (>2,196 MWh pa)

- The EUC Bands and Consumption Ranges are not prescribed in Uniform Network Code and are the responsibility of DESC to agree ahead of each Gas Year
- The following summarises what DESC agreed as part of approving this year's Modelling Approach document:

Consumption Range (kWh P.A.)		EUC Description					No. of Models Required
From	To	Bucket Band	WAR Band 1	WAR Band 2	WAR Band 3	WAR Band 4	
2,196,001	5,860,000	xx:Eyy05B	xx:Eyy05W01	xx:Eyy05W02	xx:Eyy05W03	xx:Eyy05W04	5
5,860,001	14,650,000	xx:Eyy06B	xx:Eyy06W01	xx:Eyy06W02	xx:Eyy06W03	xx:Eyy06W04	5
14,650,001	29,300,000	xx:Eyy07B	xx:Eyy07W01	xx:Eyy07W02	xx:Eyy07W03	xx:Eyy07W04	5
29,300,001	58,600,000	xx:Eyy08B	xx:Eyy08W01	xx:Eyy08W02	xx:Eyy08W03	xx:Eyy08W04	5
58,600,001		xx:Eyy09B					1

Summary of Validated Data

- Validated sample counts post-stratification – numbers provided are supply points

EUC Bands: AQ Range Source data	2023/24 data		2022/23 data	
Band 1: 0 to 73.2 MWh pa Third party provided and Class 3 (Domestic Pre-Payment only)	**Domestic**	**4,904**	Domestic	4,541
	Non-Domestic	**3,267**	Non-Domestic	4,634
	Domestic Prepayment	**4,287**	Domestic Prepayment	3,863
	Non-Domestic Pre-payment	**6**	Non-Domestic Pre-payment	2
Band 2: 73.2 to 293 MWh pa Transporter-managed and Third party provided	**Domestic**	**476**	Domestic	359
	Non-Domestic	**4,239**	Non-Domestic	4,515
	Domestic Prepayment	**1**	Domestic Prepayment	1
	Non-Domestic Pre-payment	**0**	Non-Domestic Pre-payment	1
Bands 3 to 4: 293 to 2,196 MWh pa Transporter-managed and Third party provided	**5,519**		6,201	
Bands 5 to 9: > 2,196 MWh pa Transporter-managed and Third party provided	**1,301**		1,866	
TOTAL	**24,000**		25,983	

- Overall, this year there were fewer sample points available for modelling. Bands 5 to 9 have been particularly impacted which is likely to mean more modelling aggregations will be required

Gas Demand EUC Modelling Results

LARGE NDM CONSUMPTION BAND RESULTS

Large NDM : Consumption Band Agreed Modelling Runs

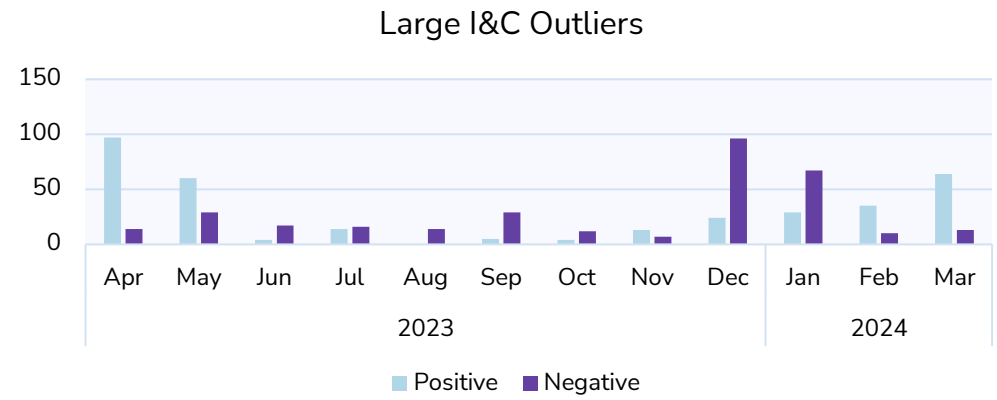
EUC Bands: Range	EUC	Modelling Runs
Band 5: 2,196 to 5,860 MWh pa	05B	Individual LDZ analysis except WN (+NW) and WS (+SW)*
Band 6: 5,860 to 14,650 MWh pa	06B	Individual LDZ analysis except WN (+NW), WS (+SW), EA (+NT), NT (+SE), SE (+NT), SW (+WS) and NO (+NE)*
Band 7 and Band 8 (combined): 14,650 to 58,600 MWh pa	07B and 08B	Individual LDZ for EM, SC (+NO+NE)*, NO (+NE), NW (+WN+WM), NE (+NO), WM (+NW), WN (+NW+WM) Southern LDZs all grouped
Band 9: >58,600 MWh pa	09B	N/A – Band 7 and 8 data to be used

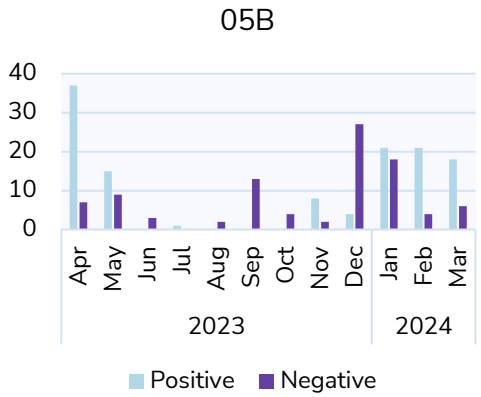
* These Modelling Runs were amended after the initial run due to poor results

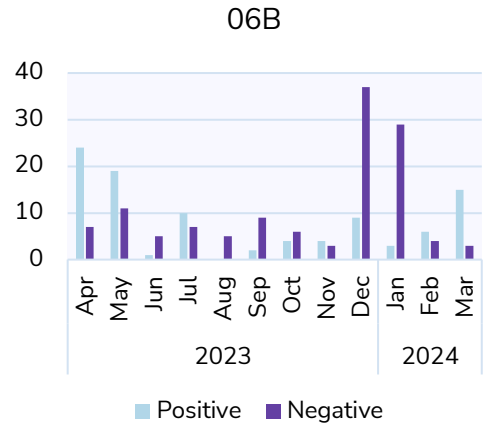
EUC	Validated Sample Count by LDZ													Total
	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	
05B	86	60	77	73	75	75	12	32	56	91	63	53	45	**798**
06B	38	27	32	28	45	29	4	12	23	19	11	26	23	**317**
07B	14	11	12	19	28	13	0	4	6	4	4	5	11	**131**
08B	0	2	5	4	16	10	1	5	4	2	3	0	1	**53**
09B	0	0	0	0	1	0	0	0	0	0	1	0	0	**2**

Results : Large NDM Outliers

- The chart on the right shows the frequency of outliers by month
  - Negative outliers are where consumption was much lower than the model predicted
  - Positive outliers are where consumption was much higher than the model predicted
- In all LDZs we have seen an increase in positive outliers at the beginning of the Analysis Period
  - Potential outlier count is 39 Large NDM models (13 LDZs x 3, 05B, 06B and 07/08B) x the number of days in the month, so the outlier counts are quite low
  - 05B and 06B show a similar pattern in outliers, suggesting similar behaviour
- We are happy that the outliers are genuine and so the recommendation is to retain all days in the Analysis Period





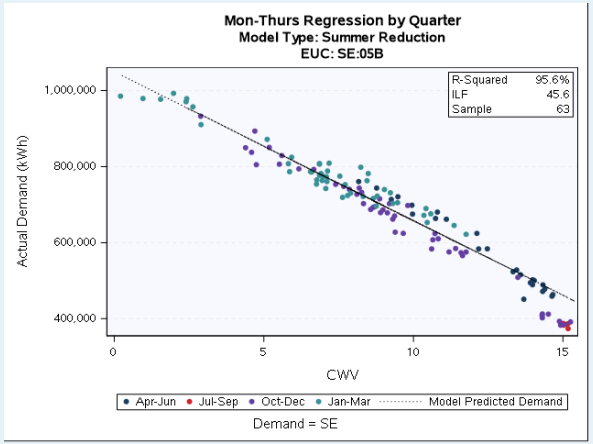


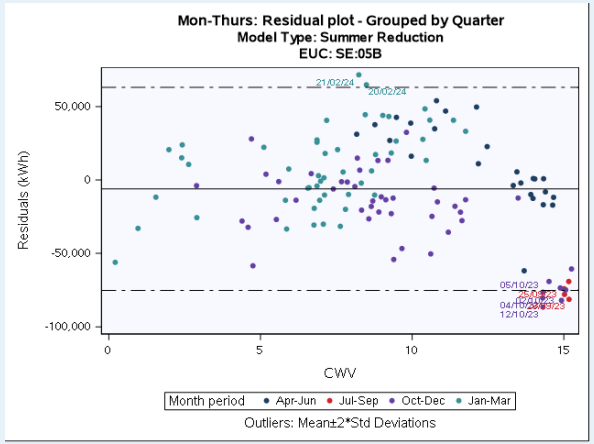
Results - Large NDM : 05B Summary

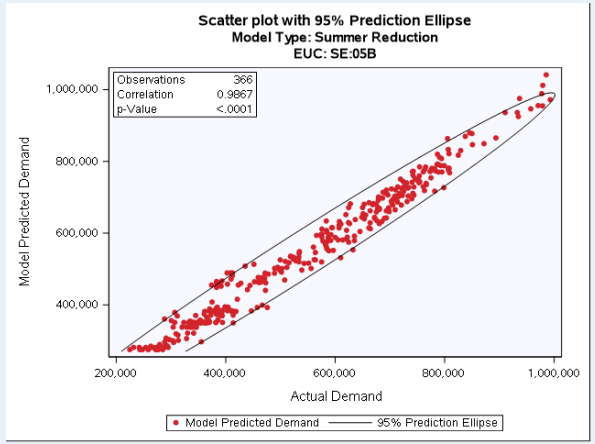
- Sample Grouping - Individual LDZ analysis except WN (+NW) and WS (+SW)
- Sample Sizes are close to or equal to the target for all LDZs
- Previous 2 years used in average are 2021/22 and 2022/23
- R^2 values are in line with previous years (+/- 1.2%)
- ILF values are similar to previous years
  - SO has dropped a little compared to the rest of the LDZs, however SO tends to have a low ILF compared to the other LDZs for all EUCs

	R^2			Sample Size		ILF		
LDZ	Avg. prev 2 years	2023/24		2023/24		Avg. prev 2 years	2023/24	
SC	97.3%	↘	**96.6%**	●	86	44.0	↑	**44.1**
NO	96.8%	↗	**97.0%**	●	60	42.8	↑	**44.7**
NW	96.7%	↗	**97.5%**	●	76	44.0	↓	**43.4**
NE	97.1%	↘	**96.9%**	●	73	43.3	↓	**41.7**
EM	96.8%	↘	**96.7%**	●	75	43.2	↓	**41.0**
WM	96.9%	↘	**96.1%**	●	75	39.4	↑	**41.6**
WN	96.8%	↗	**97.8%**	●	88	45.0	↓	**42.7**
WS	95.6%	↗	**96.7%**	●	77	41.6	↑	**41.9**
EA	96.3%	↘	**95.8%**	●	56	41.4	↓	**38.4**
NT	97.8%	↗	**98.5%**	●	91	43.0	↓	**42.9**
SE	96.1%	↘	**95.6%**	●	63	45.0	↑	**45.6**
SO	97.1%	↘	**96.6%**	●	53	39.8	↓	**36.0**
SW	97.0%	↘	**96.1%**	●	45	42.1	↓	**39.9**

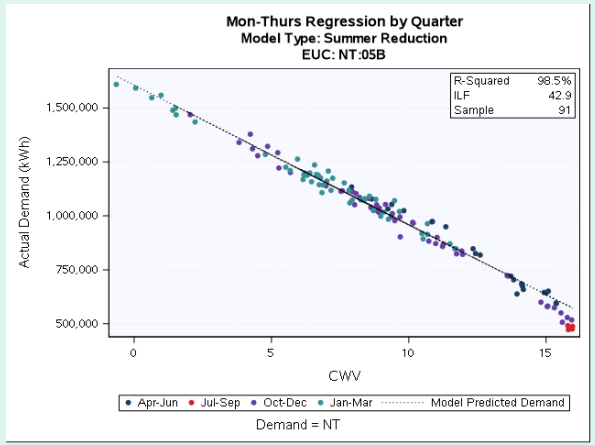
Results – Large NDM : 05B Selected LDZs

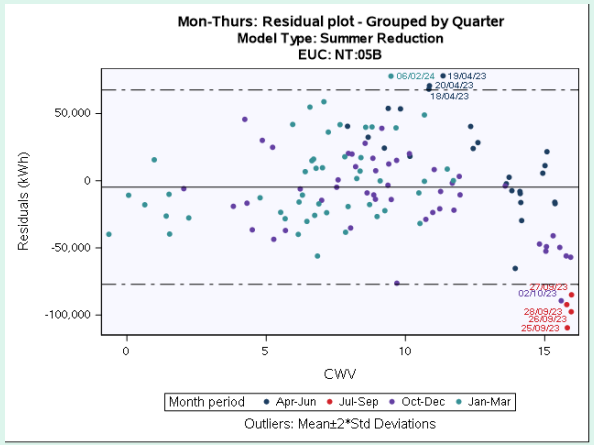


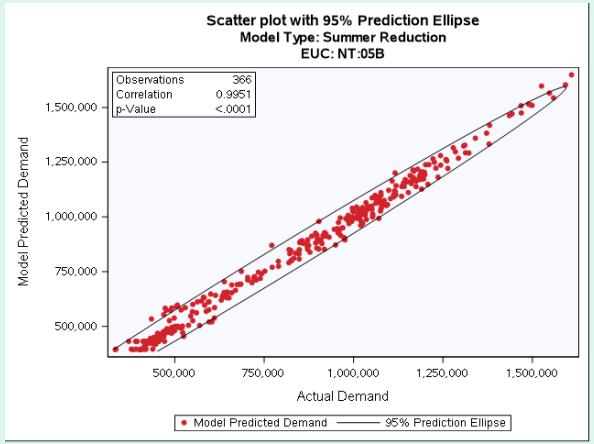




Lowest R^2

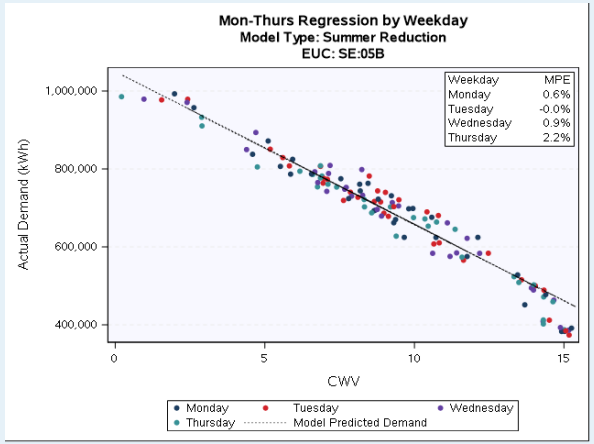


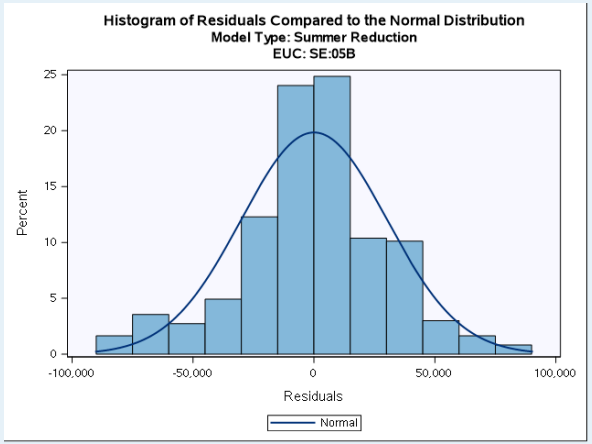


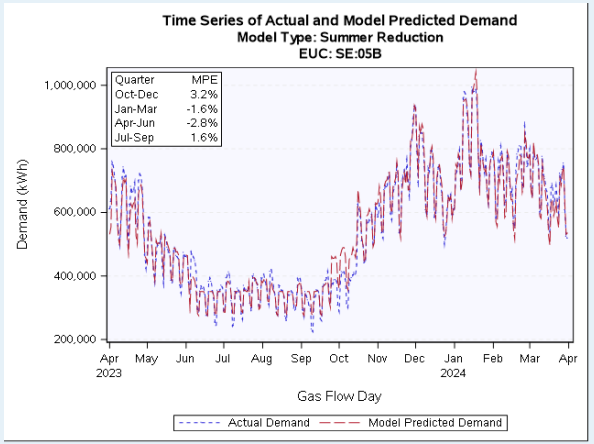


Highest R^2

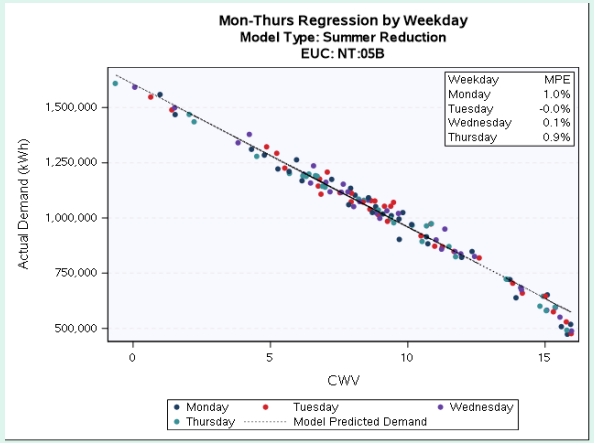
Results – Large NDM : 05B Selected LDZs

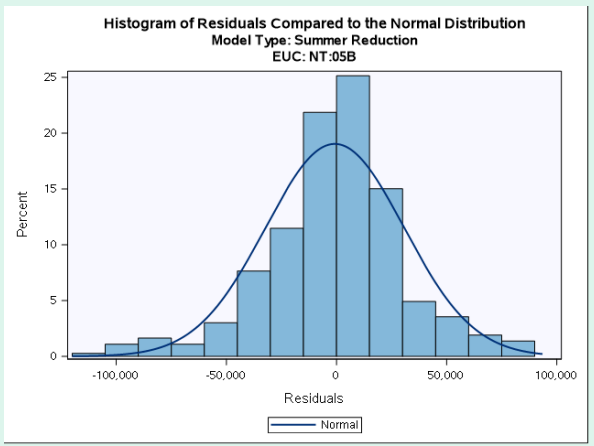


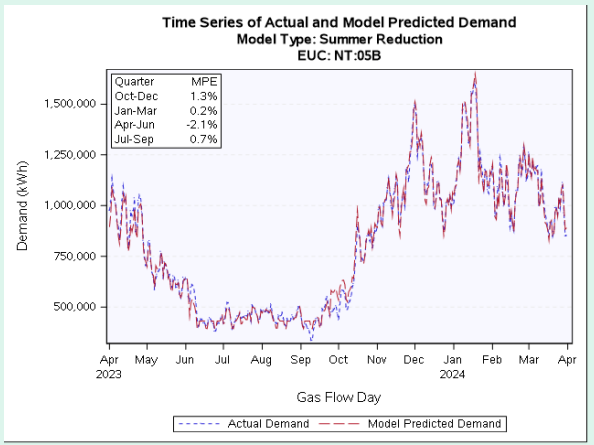




Lowest R^2







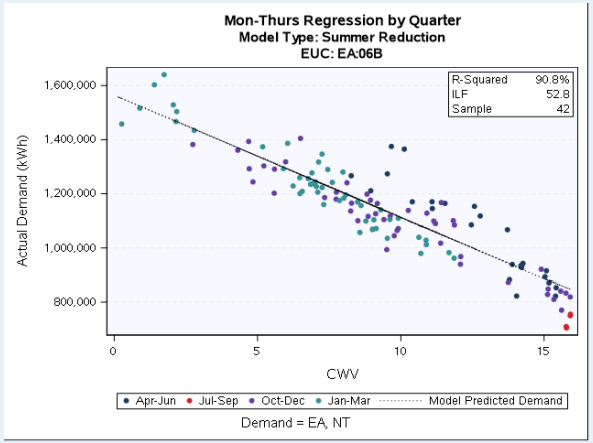
Highest R^2

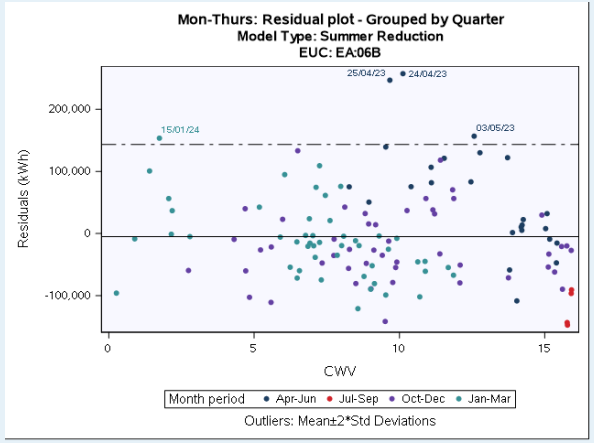
Results - Large NDM : 06B Summary

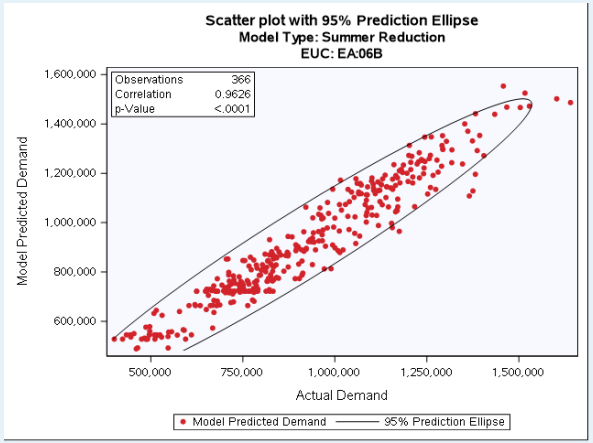
- Sample Grouping - Individual LDZ analysis except WN (+NW), WS (+SW), EA (+NT), NT (+SE), SE (+NT), SW (+WS) and NO (+NE)
- Sample Sizes are low and most LDZs required some aggregation to produce adequate numbers for modelling
- Previous 2 years used in average are 2021/22 and 2022/23
- R^2 values are generally down a little on previous years, however they are all still considered to be good for Band 6 (90%+)
  - This could be a result of the falling sample count
- ILF values are in a similar range to previous years

	R^2			Sample Size		ILF		
LDZ	Avg. prev 2 years	2023/24		2023/24		Avg. prev 2 years	2023/24	
SC	96.0%	↓	**92.2%**	●	38	50.6	↑	**54.5**
NO	93.0%	↗	**93.6%**	●	55	53.4	↑	**55.9**
NW	96.0%	↘	**94.7%**	●	32	51.7	↑	**53.9**
NE	95.1%	↗	**95.3%**	●	28	59.2	↓	**56.4**
EM	94.6%	↘	**94.0%**	●	45	52.1	↑	**54.1**
WM	89.4%	↗	**91.2%**	●	29	49.2	↓	**45.8**
WN	96.2%	↘	**95.1%**	●	36	52.3	↑	**54.2**
WS	96.6%	↘	**95.5%**	●	35	48.6	↓	**45.3**
EA	93.9%	↓	**90.8%**	●	42	50.7	↑	**52.8**
NT	95.5%	↘	**94.4%**	●	30	47.6	↑	**49.8**
SE	95.8%	↓	**93.4%**	●	30	48.2	↑	**49.3**
SO	95.6%	↓	**92.0%**	●	26	45.0	↑	**45.0**
SW	96.0%	↘	**95.5%**	●	35	46.6	↓	**44.6**

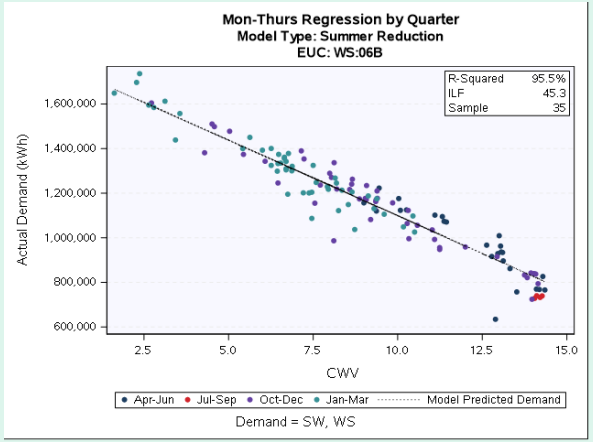
Results – Large NDM : 06B Selected LDZs

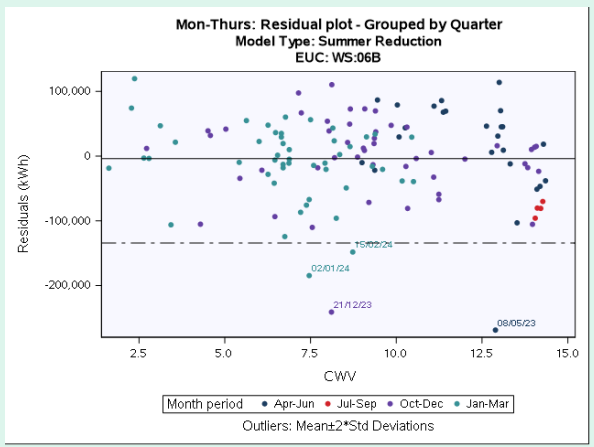


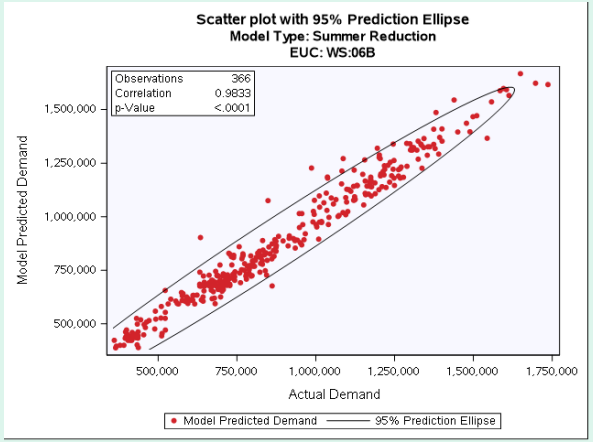




Lowest R^2

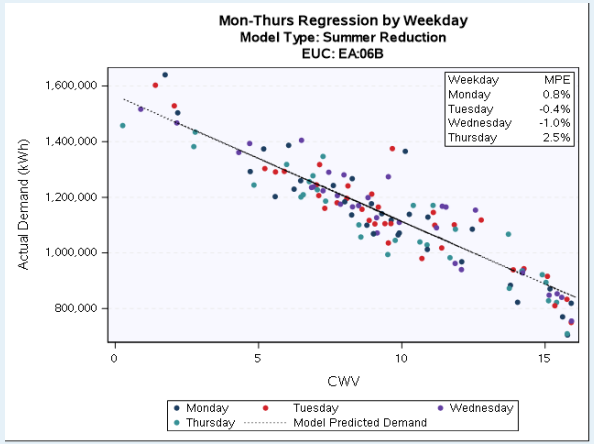


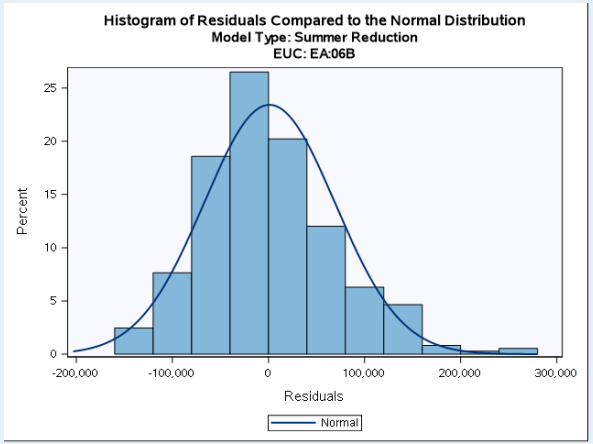


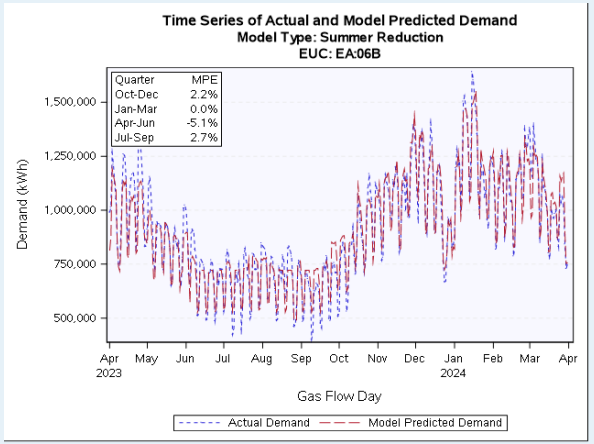


Highest R^2

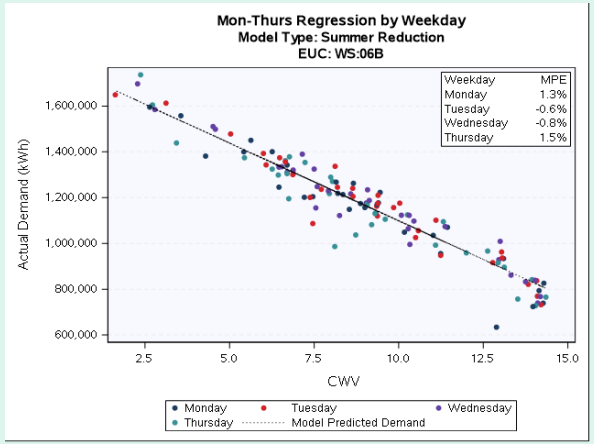
Results – Large NDM : 06B Selected LDZs

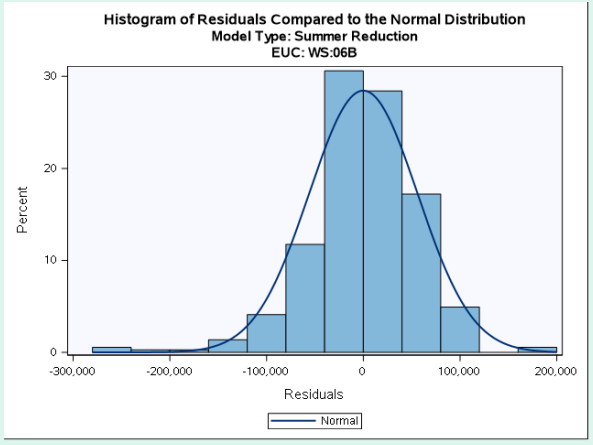


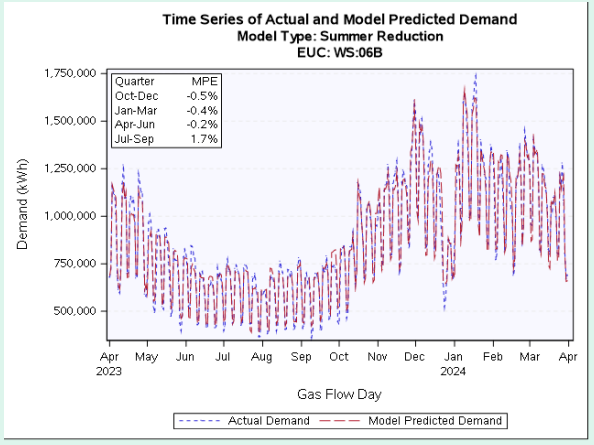




Lowest R^2







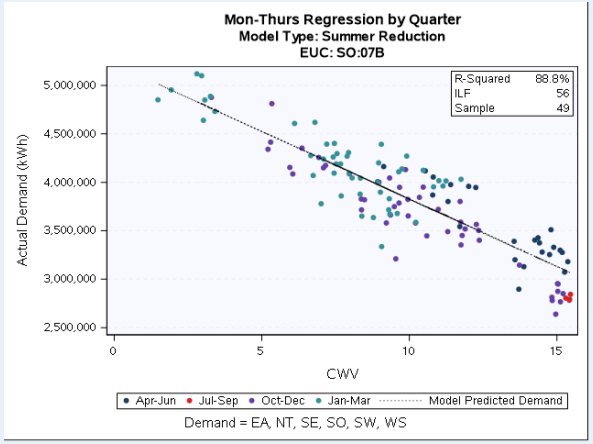
Highest R^2

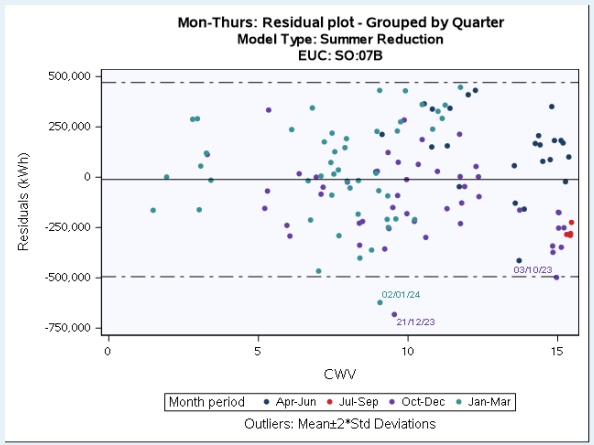
Results - Large NDM : 07B and 08B Summary

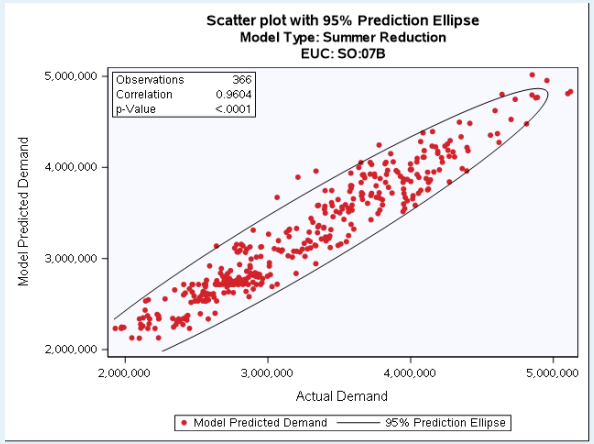
- Sample Grouping - Individual LDZ for EM, SC (+NO+NE), NO (+NE), NW (+WN+WM), NE (+NO), WM (+NW), WN (+NW+WM) Southern LDZs all grouped
- Sample Sizes are low as is the population
  - Bands 07 and 08 are combined for modelling but almost all LDZs still required aggregation to meet the minimum sample count
- Previous 2 years used in average are 2021/22 and 2022/23
- R^2 values are generally a little better than previous years, all results are acceptable
- ILF values are in a similar range to previous years

	R^2			Sample Size		ILF		
LDZ	Avg. prev 2 years		2023/24		2023/24	Avg. prev 2 years		2023/24
SC	92.6%	↓	**90.5%**	●	50	64.0	↑	**64.3**
NO	88.2%	↑	**91.3%**	●	36	68.5	↓	**61.4**
NW	85.2%	↑	**89.5%**	●	41	63.6	↑	**68.1**
NE	88.7%	↑	**91.1%**	●	36	68.6	↓	**60.4**
EM	91.3%	↘	**89.4%**	●	44	63.8	↑	**65.3**
WM	92.7%	↓	**89.9%**	●	40	62.1	↑	**66.6**
WN	85.4%	↑	**90.4%**	●	41	64.6	↑	**66.4**
WS	83.4%	↑	**88.2%**	●	49	63.4	↓	**58.8**
EA	94.1%	↓	**89.3%**	●	49	55.6	↑	**58.9**
NT	94.4%	↓	**89.8%**	●	49	55.5	↑	**58.6**
SE	88.8%	↔	**88.8%**	●	49	58.0	↑	**58.0**
SO	88.6%	↗	**88.8%**	●	49	56.0	↑	**56.0**
SW	84.1%	↑	**87.8%**	●	49	62.3	↓	**58.3**

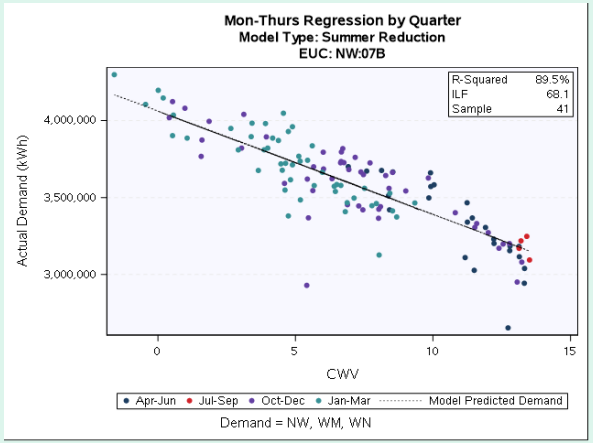
Results – Large NDM : 07B and 08B Selected LDZs

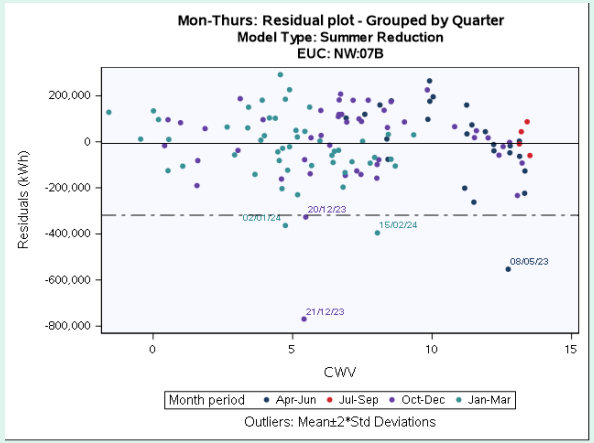


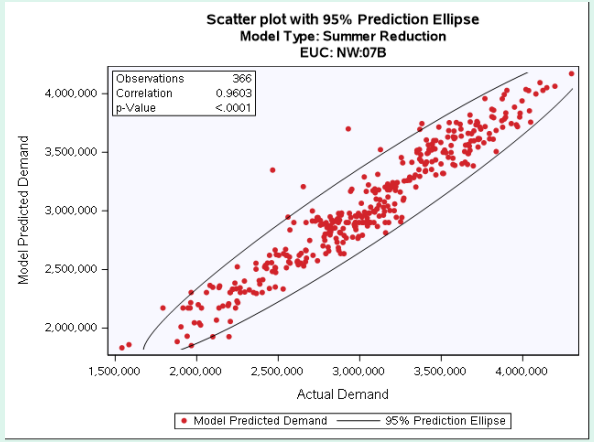




Lowest ILF

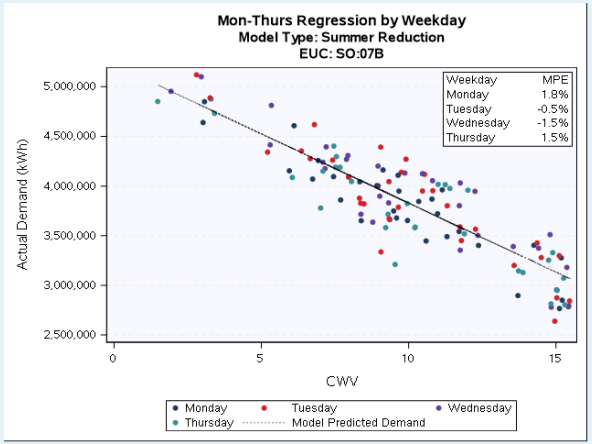


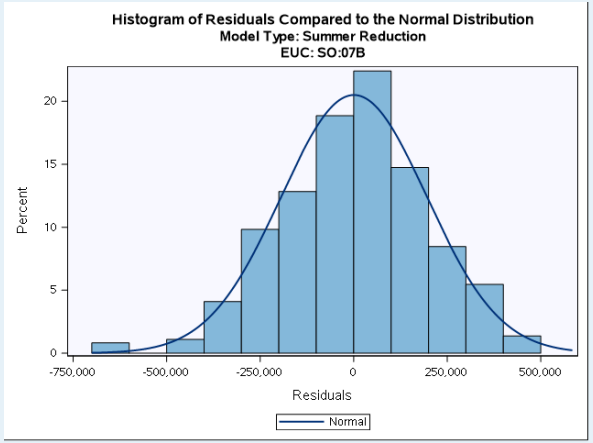


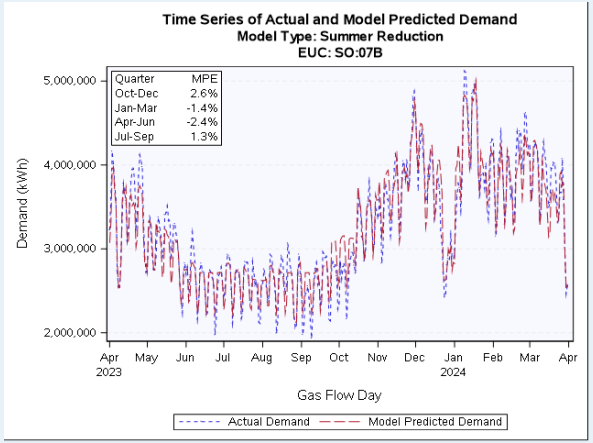


Highest ILF

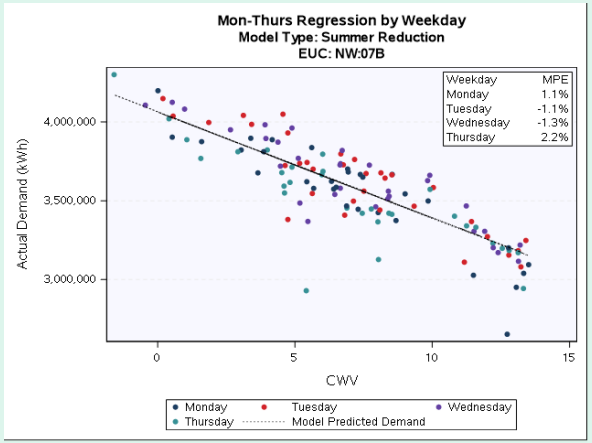
Results – Large NDM : 07B and 08B Selected LDZs

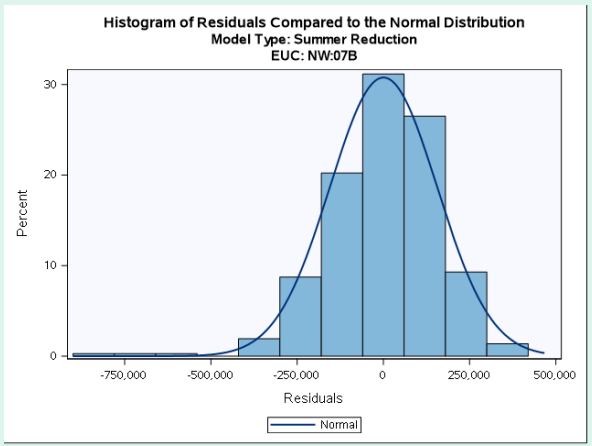


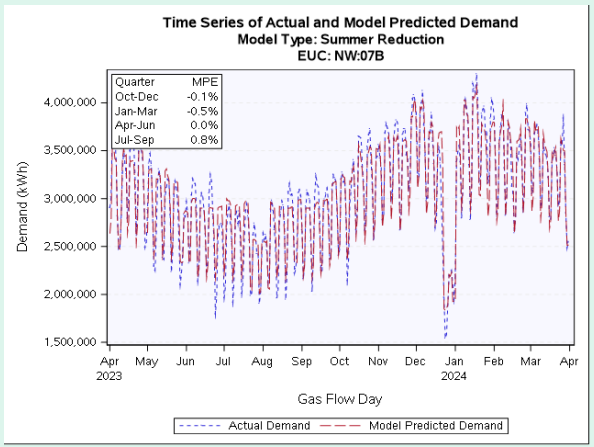




Lowest ILF







Highest ILF

Gas Demand EUC Modelling Results

LARGE NDM WAR BAND RESULTS

Large NDM: Agreed WAR Band Runs

EUC Bands: Range	EUC	Modelling Runs
Band 5: 2,196 to 5,860 MWh pa	05W01-04	EA(+NT+SE), EM(+WM), NE(+NO+NW), NO(+NE+SE), NT(EA+SE), NW(+NO+NE), SE(+NO+NE), SE(+SO+EA), SO(+SE+EA), SW(+WS+SO), WM(+EM), WN(+NW+NO), WS(+SW+SO)
Bands 6, 7 and Band 8 (combined): 5,860 to 58,600 MWh pa	06W01-04 07W01-04 08W01-04	Individual LDZ s except SC(+NO), EA(+NT+SE), NE(+NO), NO(+NE), NT(+EA+SE), NW(+WN+WM), SE(+SO+NT), SO(+SE+NT), SW(+WS+WM), WN(+NW+WM), WS(+SW+WM)

Validated Supply Point Counts Band 5 W01-04					
LDZ	0.000 - 0.346	0.347 - 0.427	0.428 - 0.498	0.499 - 1.000	Total
SC	12	23	36	15	**86**
NO	14	14	23	9	**60**
NW	21	21	16	19	**77**
NE	15	22	17	19	**73**
EM	18	18	20	19	**75**
WM	21	25	16	13	**75**
WN	1	1	6	4	**12**
WS	10	15	4	3	**32**
EA	12	14	17	13	**56**
NT	4	30	46	11	**91**
SE	12	23	19	9	**63**
SO	10	17	12	14	**53**
SW	10	16	8	11	**45**
Total	160	239	240	159	**798**
%	**20.1%**	**29.9%**	**30.1%**	**19.9%**	**100.0%**
Target	**20.0%**	**30.0%**	**30.0%**	**20.0%**	

Validated Supply Point Counts Bands 5 – 8 (for bands 6-8 W01-04)					
LDZ	0.000 - 0.320	0.321 - 0.400	0.401 - 0.486	0.487 - 1.000	Total
SC	27	30	57	24	**138**
NO	25	29	31	15	**100**
NW	26	46	25	29	**126**
NE	27	40	30	27	**124**
EM	44	60	29	31	**164**
WM	36	35	31	25	**127**
WN	2	3	8	4	**17**
WS	15	19	11	8	**53**
EA	20	25	26	18	**89**
NT	6	29	61	20	**116**
SE	11	19	38	13	**81**
SO	9	26	26	23	**84**
SW	13	28	17	22	**80**
Total	261	389	390	259	**1299**
%	**20.1%**	**29.9%**	**30.0%**	**19.9%**	**100.0%**
Target	**20.0%**	**30.0%**	**30.0%**	**20.0%**	

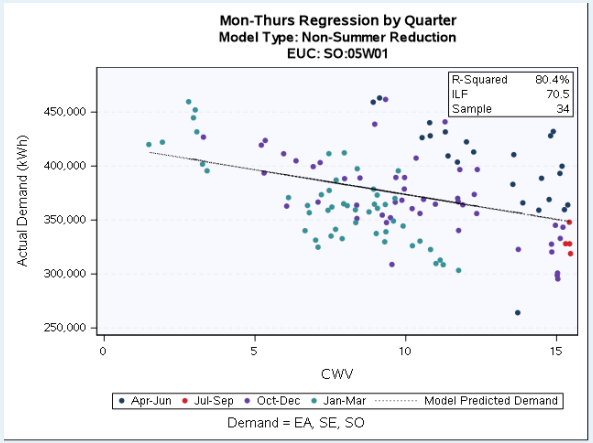
Results – Large NDM: 05W01-04 Summary

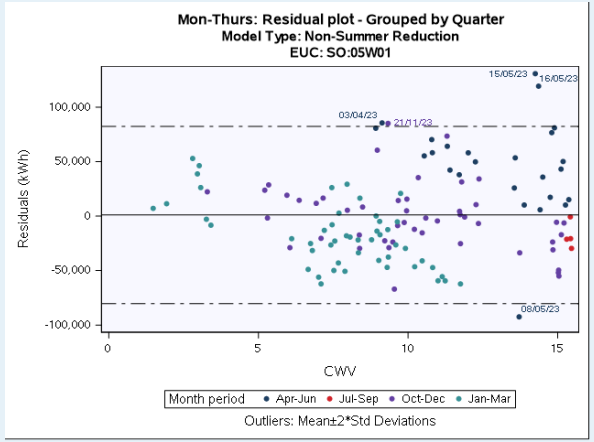
	05W01 (0 to 0.346)			05W02 (0.347 to 0.427)			05W03 (0.428 to 0.498)			05W04 (0.499 to 1)		
LDZ	R^2	Sample Size	ILF	R^2	Sample Size	ILF	R^2	Sample Size	ILF	R^2	Sample Size	ILF
SC	↑ 91.8%	41	↑ 76.5	↘ 96.3%	59	↓ 50.8	↗ 96.5%	76	↑ 40.4	↑ 94.3%	43	↑ 28.8
NO	↓ 92.0%	41	↓ 70.2	↗ 96.1%	59	↑ 51.5	↘ 97.1%	76	↓ 42.0	↘ 92.7%	43	↓ 30.8
NW	↗ 93.4%	50	↑ 72.0	↗ 95.9%	56	↑ 48.6	↗ 96.9%	56	↑ 39.4	↑ 97.2%	47	↑ 28.1
NE	↘ 93.4%	50	↓ 72.2	↗ 95.9%	56	↑ 49.8	↗ 97.1%	56	↑ 40.7	↘ 93.4%	47	↓ 29.1
EM	↘ 92.4%	39	↓ 66.1	↘ 94.6%	43	↓ 47.7	↘ 95.8%	36	↓ 38.7	↘ 95.1%	32	↓ 26.5
WM	↘ 92.4%	39	↓ 65.7	↓ 93.1%	43	↓ 45.2	↘ 96.0%	36	↓ 37.5	↘ 96.6%	32	↓ 25.9
WN	↘ 92.4%	36	↓ 73.8	↘ 93.1%	35	↓ 50.4	↗ 97.1%	45	↑ 40.6	↘ 95.2%	32	↓ 28.1
WS	↓ 86.5%	30	↓ 63.9	↗ 94.6%	48	↑ 47.6	↗ 96.6%	24	↑ 38.7	↓ 92.3%	28	↓ 25.6
EA	↓ 81.7%	28	↓ 75.1	↑ 95.7%	67	↑ 53.4	↗ 98.1%	82	↑ 40.0	↘ 96.8%	33	↓ 26.3
NT	↓ 81.8%	28	↓ 74.9	↑ 96.1%	67	↑ 53.2	↗ 98.3%	82	↑ 39.8	↘ 96.7%	33	↓ 26.2
SE	↓ 80.6%	34	↓ 71.3	↑ 95.7%	54	↑ 50.9	↗ 96.6%	48	↑ 38.4	↓ 94.5%	36	↓ 24.5
SO	↓ 80.4%	34	↓ 70.5	↑ 94.6%	54	↑ 49.1	↗ 95.6%	48	↑ 36.9	↘ 96.8%	36	↓ 23.3
SW	↓ 86.8%	30	↓ 62.9	↗ 95.5%	48	↑ 46.3	↘ 95.7%	24	↓ 38.2	↓ 92.7%	28	↓ 25.0

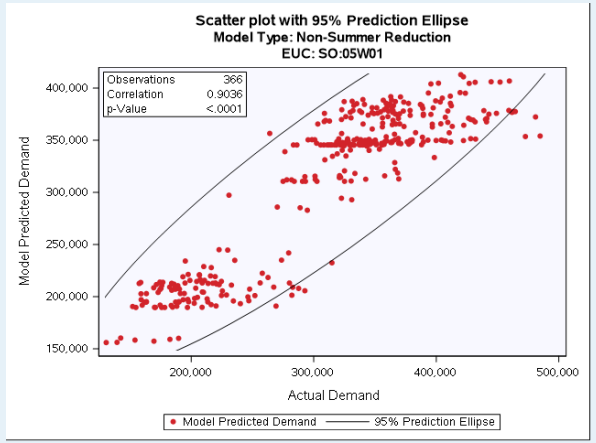
Results – Large NDM : 05W01-04 Summary

- Sample Grouping - EA(+NT+SE), EM(+WM), NE(+NO+NW), NO(+NE+SE), NT(EA+SE), NW(+NO+NE), SE(+NO+NE), SE(+SO+EA), SO(+SE+EA), SW(+WS+SO), WM(+EM), WN(+NW+NO), WS(+SW+SO)
- Sample Sizes were low, and all LDZs required aggregation. This is to be expected due to the low population count
- Previous 2 years used in average are 2021/22 and 2022/23
- R^2 values are generally in line with previous results, however WAR Bands 1 and 4 results have fallen a little but are reasonable
- ILF values are generally down for WAR Bands 1 and 4 and up a little for WAR Bands 2 and 3
  - There is still a separation between Bands however 2 and 3 are getting quite close

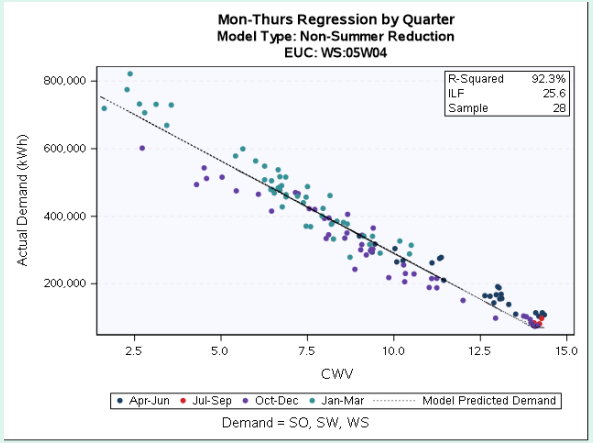
Results – Large NDM : 05W01-04 Selected LDZs

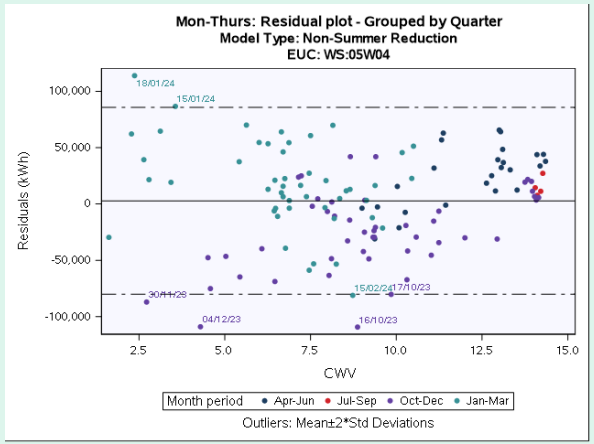


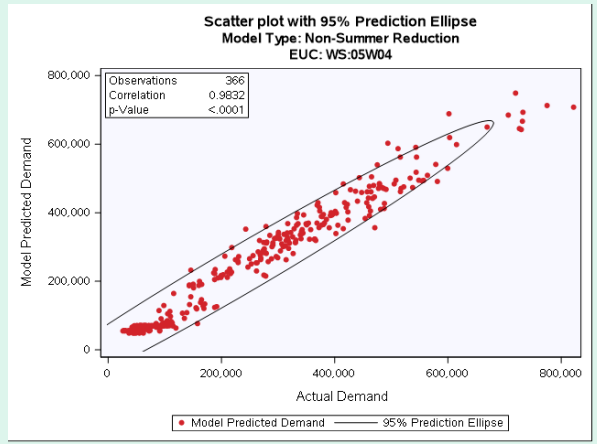




Lowest R^2 W01

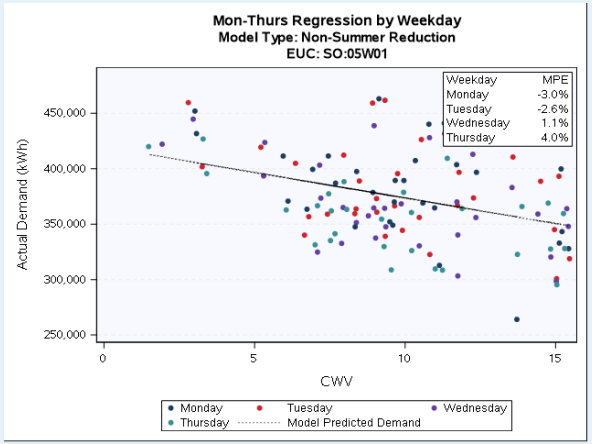


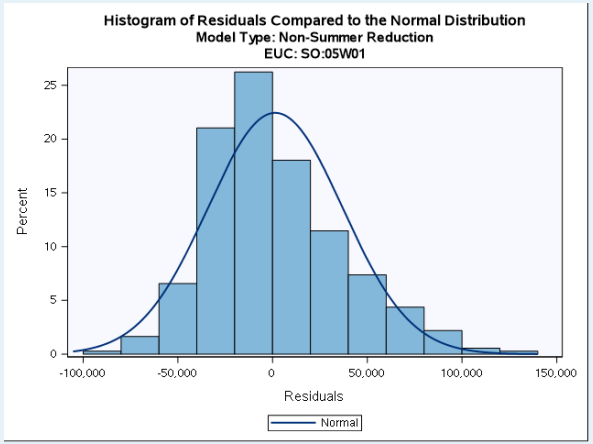


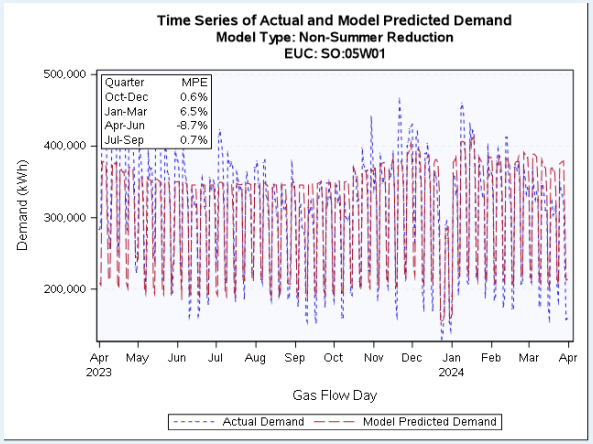


Lowest R^2 W04

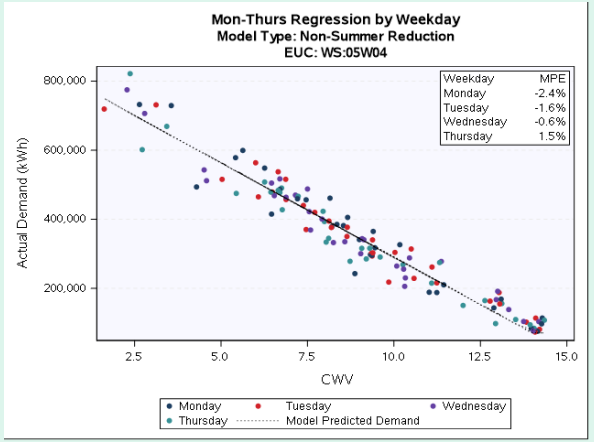
Results – Large NDM : 05W01-04 Selected LDZs

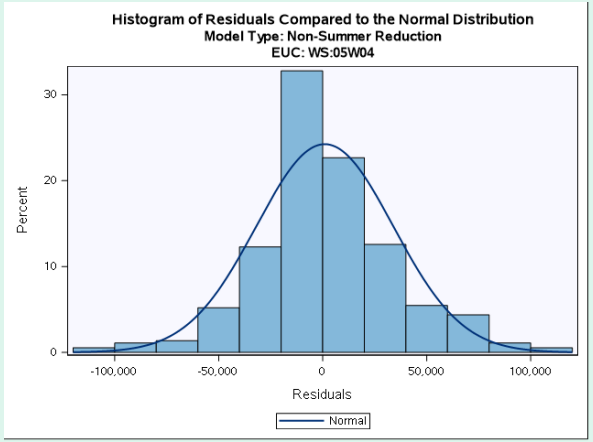


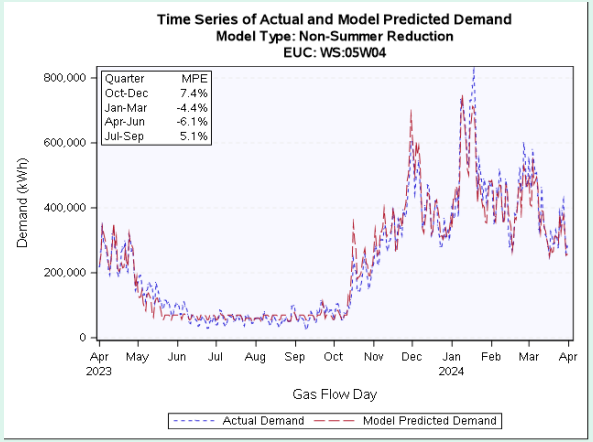




Lowest R^2 W01







Lowest R^2 W04

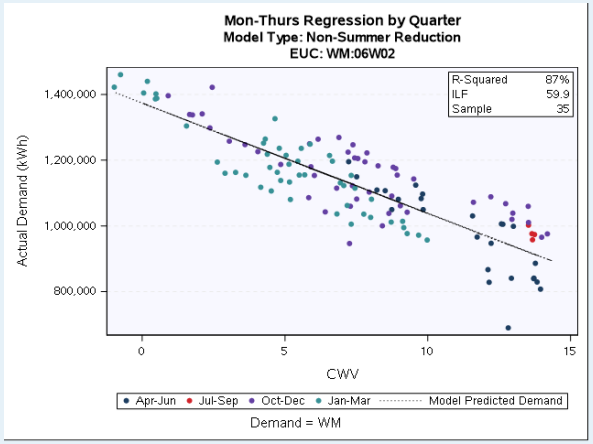
Results – Large NDM: 06-08 W01-04 Summary

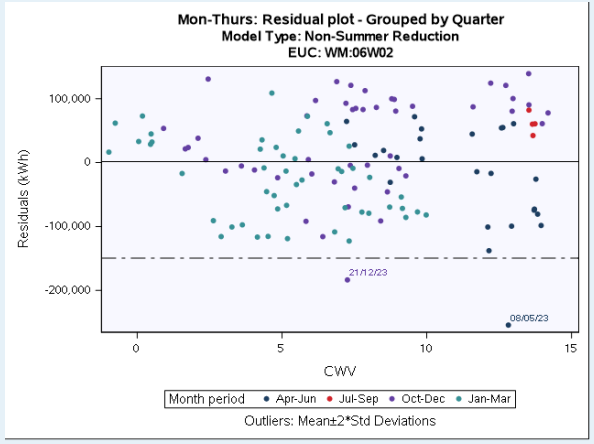
	06W01 (0 to 0.32)			06W02 (0.321 to 0.4)			06W03 (0.401 to 0.486)			06W04 (0.487 to 1)		
LDZ	R^2	Sample Size	ILF	R^2	Sample Size	ILF	R^2	Sample Size	ILF	R^2	Sample Size	ILF
SC	↓ 83.8%	52	↓ 81.4	↓ 88.4%	59	↓ 63.8	↔ 96.3%	88	↑ 44.5	↗ 94.2%	39	↑ 30.1
NO	↓ 78.9%	52	↓ 85.1	↗ 92.2%	69	↑ 59.5	↗ 97.9%	61	↑ 42.9	↓ 91.0%	42	↓ 30.1
NW	↘ 86.8%	64	↓ 82.3	↑ 94.4%	84	↑ 61.4	↑ 96.9%	63	↑ 43.4	↗ 96.7%	58	↑ 29.4
NE	↓ 78.9%	52	↓ 85.2	↓ 92.2%	69	↓ 58.5	↗ 97.5%	61	↑ 41.9	↓ 90.6%	42	↓ 29.1
EM	↑ 82.9%	44	↑ 78.9	↗ 94.7%	60	↑ 64.4	↑ 94.4%	29	↑ 43.5	↗ 96.4%	31	↑ 30.2
WM	↑ 86.1%	36	↑ 76.3	↓ 87.0%	35	↓ 59.9	↗ 97.3%	31	↑ 43.7	↘ 95.4%	25	↓ 29.5
WN	↘ 86.8%	64	↓ 82.3	↑ 94.2%	84	↑ 61.8	↑ 97.0%	63	↑ 43.9	↗ 97.1%	58	↑ 29.8
WS	↓ 79.6%	64	↓ 82.2	↓ 93.2%	82	↓ 59.8	↗ 96.8%	59	↑ 44.2	↘ 96.4%	55	↓ 28.8
EA	↓ 72.3%	37	↓ 86.3	↘ 91.5%	73	↓ 61.5	↗ 96.8%	125	↑ 43.2	↗ 97.8%	51	↑ 28.5
NT	↓ 72.3%	37	↓ 86.3	↘ 92.0%	73	↓ 61.5	↗ 97.0%	125	↑ 43.0	↗ 97.7%	51	↑ 28.4
SE	↓ 78.7%	26	↓ 87.7	↓ 93.3%	74	↓ 55.6	↘ 95.8%	125	↓ 43.7	↗ 96.6%	56	↑ 29.8
SO	↓ 78.7%	26	↓ 87.8	↓ 92.9%	74	↓ 53.6	↘ 94.4%	125	↓ 42.1	↘ 96.0%	56	↓ 28.5
SW	↗ 85.7%	60	↑ 79.7	↓ 94.4%	80	↓ 56.1	↗ 96.3%	68	↑ 42.7	↘ 94.8%	56	↓ 28.9

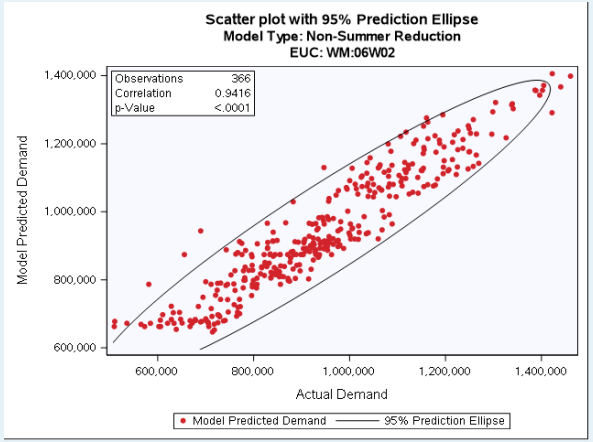
Results – Large NDM : 06-08 W01-04 Summary

- Sample Grouping - Individual LDZ analysis except SC(+NO), EA(+NT+SE), NE(+NO), NO(+NE), NT(+EA+SE), NW(+WN+WM), SE(+SO+NT), SO(+SE+NT), SW(+WS+WM), WN(+NW+WM), WS(+SW+WM)
  - Reminder: Band 5 sample data is included in the modelling runs for Band 6-8 WAR Bands as agreed by DESC in 2023
- Previous 2 years used in average are 2021/22 and 2022/23
- R^2 values are generally in line with previous results, however WAR Bands 1 and 4 results have fallen a little but are reasonable
- ILF values are generally similar to previous years, however WAR Band 2 has seen some significant falls, particularly in southern LDZs
  - There remains a clear separation between Bands

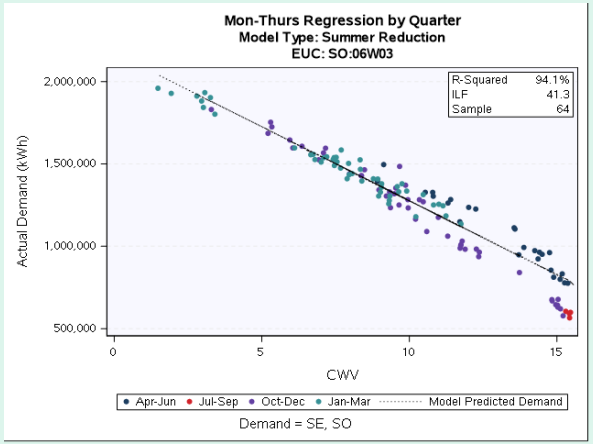
Results – Large NDM : 06-08 W01-04 Selected LDZs

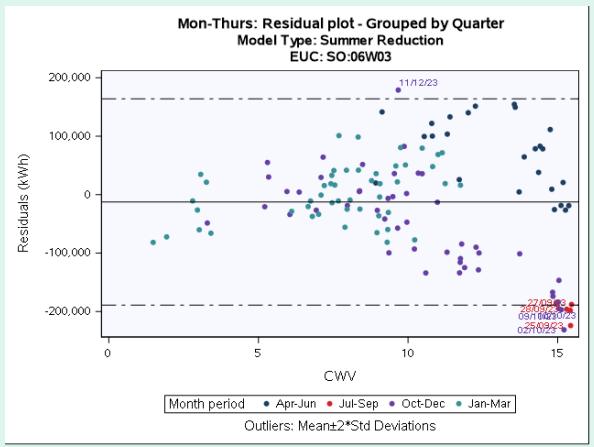


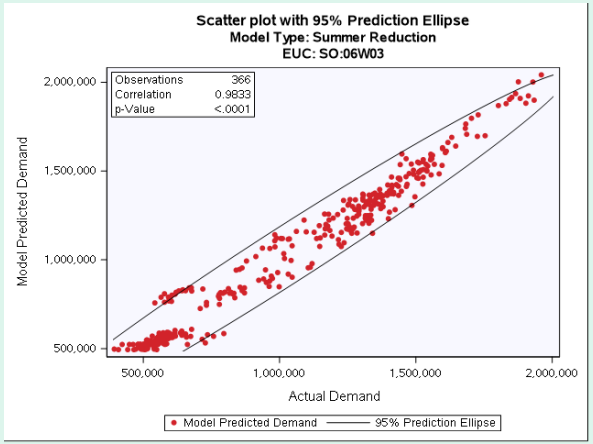




Lowest R^2 W02

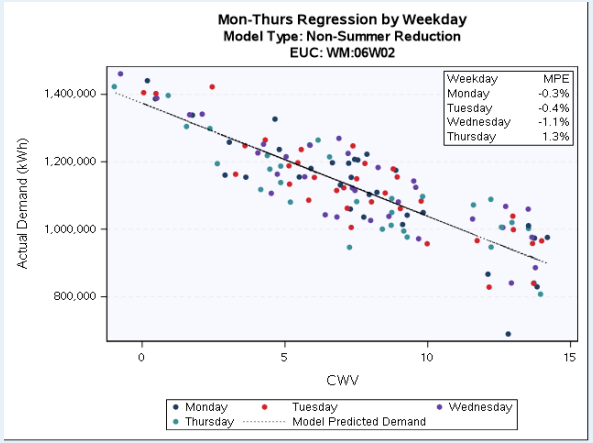


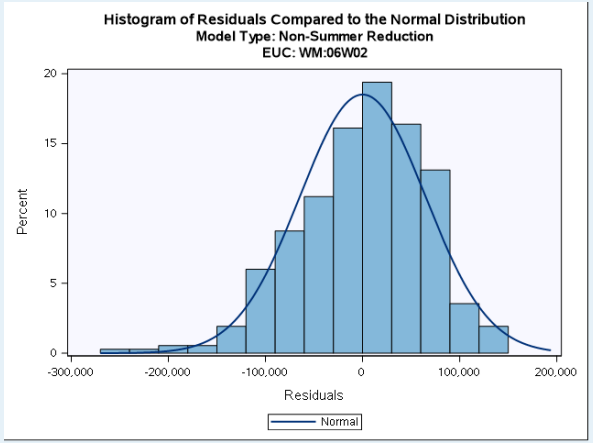


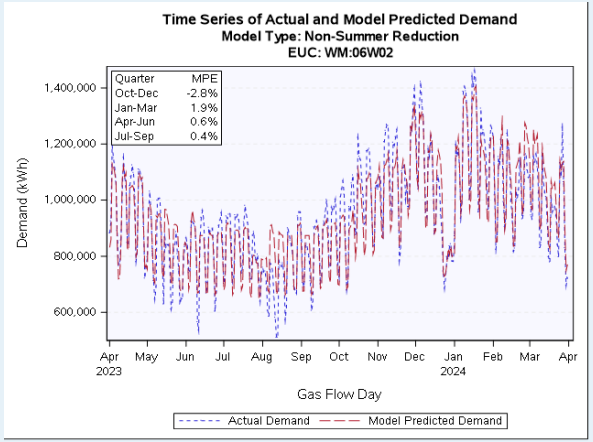


Lowest R^2 W03

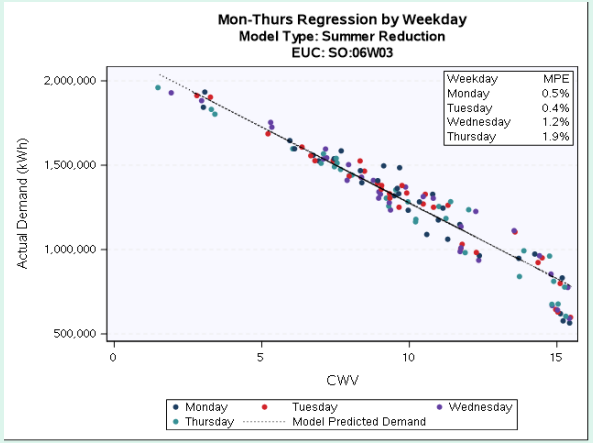
Results – Large NDM : 06-08 W01-04 Selected LDZs

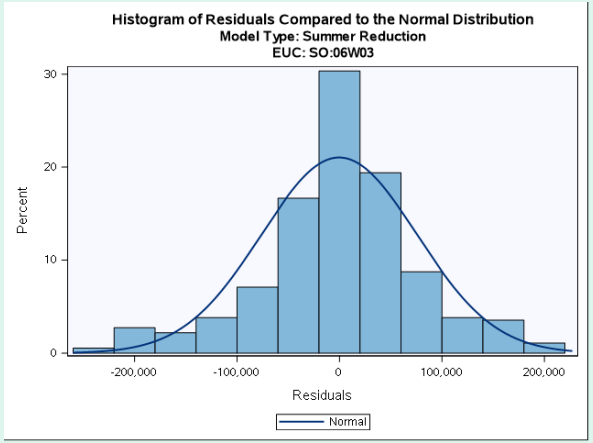


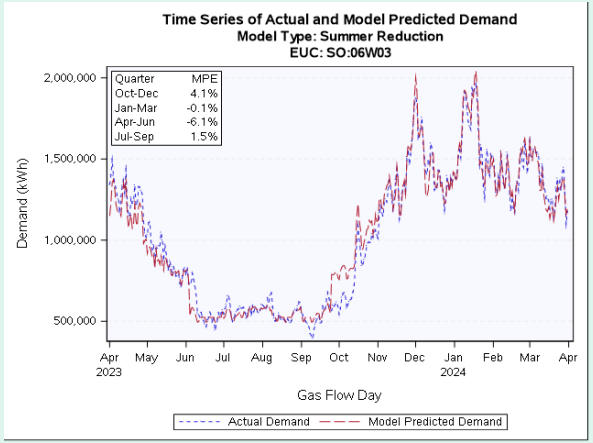




Lowest R^2 W02







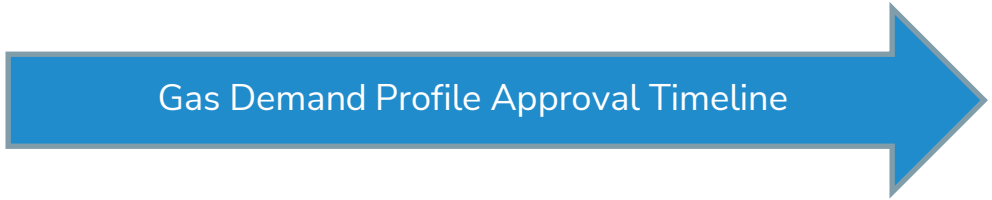
Lowest R^2 W03

Conclusions

- All Large NDM models have seen a reduction in sample data resulting in more aggregation at LDZ level
- Modelling results for Consumption Bands are good, with no significant deterioration in R^2
- Results for most WAR Bands are fairly good, however W01 for Band 05 and Bands 06-08 in Southern LDZs have seen a deterioration in R^2
- All models have produced adequate results that can be carried forward into model smoothing

• Are DESC satisfied with all the Gas Demand Models that have been selected for deployment in Demand Model Smoothing?	Approval Required

Next Steps



Model Smoothing and publication of draft Gas Demand Profiles

23 May to 7 June

DESC review of draft Gas Demand Profiles

10 June to 25 June

Seek DESC approval of draft Gas Demand Profiles

3 July

Industry review of Gas Demand Profiles

8 July to 12 July