Demand Estimation Technical Work Group

Gas Demand EUC Modelling Results
Gas Year 2020/21

(2 of 3) Results – Small NDM

22nd May 2020

6: Results - Small NDM (<2,196 MWh pa)

- Small NDM for Demand Estimation purposes <2,196 MWh

- EUC consumption ranges are not prescribed in Uniform Network Code. There are no proposed changes to the AQ ranges used in EUC definitions for Gas Year 2020/21.

- 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 (c88% of total AQ)

6: Results - Small NDM: Agreed Modelling Runs (1)

Description / Range / EUC	Option 1	Option 2
Band 1 PPM Domestic **0 to 73.2 MWh pa** **01BPD**	Individual LDZ analysis (using 'MOD451AV' Profile)	National analysis (using limited current data)
Band 1 Non-PPM Domestic **0 to 73.2 MWh pa** **01BND**	Individual LDZ analysis	n/a
Band 1 PPM I&C **0 to 73.2 MWh pa** **01BPI**	n/a (No model viable due to lack of data)	n/a
Band 1 Non-PPM I&C **0 to 73.2 MWh pa** **01BNI**	Individual LDZ analysis	n/a

- **Note:** For Band 1 PPM Domestic an additional run was undertaken using the limited current dataset (21 supply points)

3

6: Results - Small NDM: Agreed Modelling Runs (2)

Description / Range / EUC	Option 1	Option 2
Band 2 PPM Domestic **73.2 to 293 MWh pa** **02BPD**	n/a (No model viable due to lack of data)	n/a
Band 2 Non-PPM Domestic **73.2 to 293 MWh pa** **02BND**	2 LDZ Group (SC/NO/NW/WN/NE/EM/WM and EA/NT/SE/WS/SO/SW)	National analysis
Band 2 PPM I&C **73.2 to 293 MWh pa** **02BPI**	n/a (No model viable due to lack of data)	n/a
Band 2 Non-PPM I&C **73.2 to 293 MWh pa** **02BNI**	Individual LDZ analysis	LDZ WN (using WN/NW demands)
Band 3 **293 to 732 MWh pa** **03B**	Individual LDZ analysis	n/a
Band 4 **732 to 2,196 MWh pa** **04B**	Individual LDZ analysis	n/a

6: Results - Small NDM (01BPD - Summary)

LDZ	01BPD (Band 1 PPM Domestic - 0 to 73.2 MWh pa)					
	Indicative Load Factor (ILF)		R2 Multiple Correlation Coefficient (All days)		Sample Size (Supply Points)	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
SC	38.1	36.3	98.9%	91.2%		21
NO	37.9	37.9	99.2%	90.3%		21
NW	35.3	35.0	98.5%	92.0%		21
NE	35.9	36.6	99.1%	92.2%		21
EM	34.6	36.3	99.4%	91.0%		21
WM	34.0	35.0	99.2%	91.6%		21
WN	36.0	35.6	98.1%	91.6%		21
WS	34.4	35.8	98.7%	88.2%		21
EA	33.7	35.8	99.4%	90.0%		21
NT	34.9	35.4	99.5%	91.3%		21
SE	33.4	35.0	99.5%	88.9%		21
SO	31.0	33.3	99.3%	87.2%		21
SW	32.3	36.1	98.7%	82.9%		21

R^2 value min & max range summary:
- Option 1: 98.1% to 99.5%
- Option 2: 82.9% to 92.2%
- Charts provided for highlighted LDZ / Option on next 2 slides

ILF observations:
- Both options are consistent with values from previous year

Sample size observations:
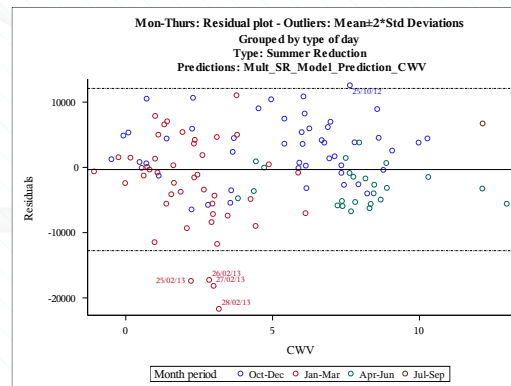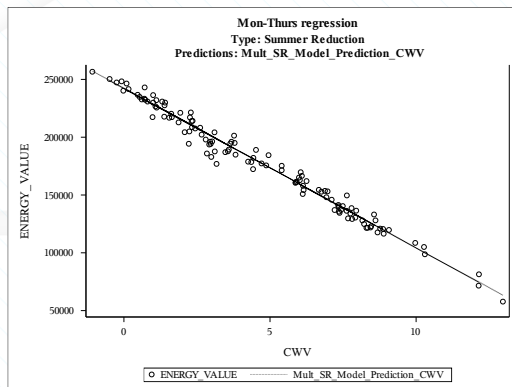- Option 1 based on MOD451AV dataset

Xoserve proposals:
- Preference of TWG was to use Option 1 and this looks to be the best option
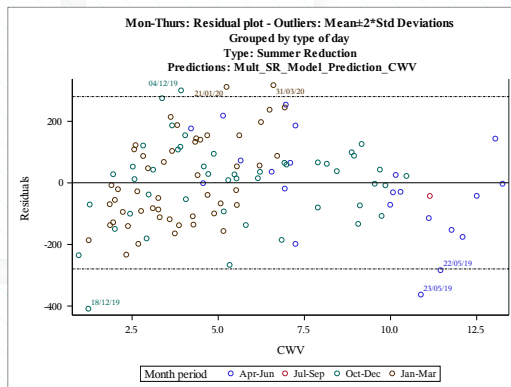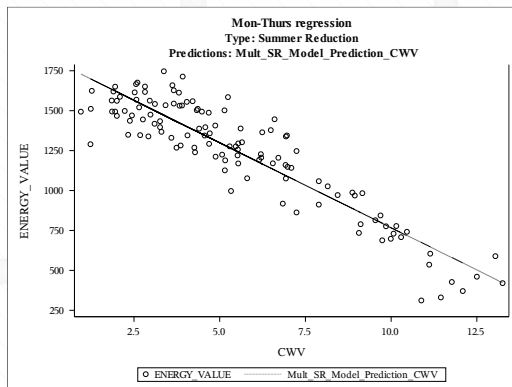
01BPD; LDZ SC; Option 1

Model: Summer Reduction
EUC: 01BPD
LDZ: SC
Demand: SC
Sample: 01/10/2012 – 30/09/2013
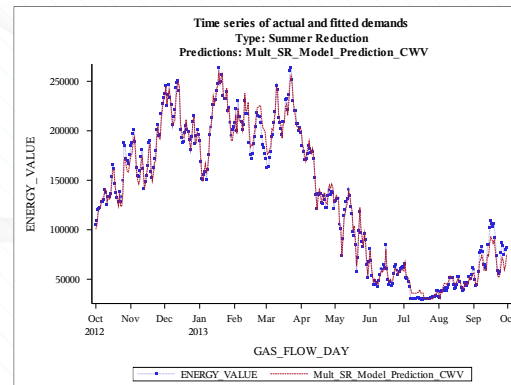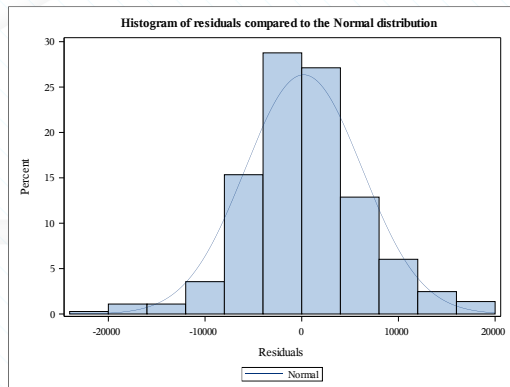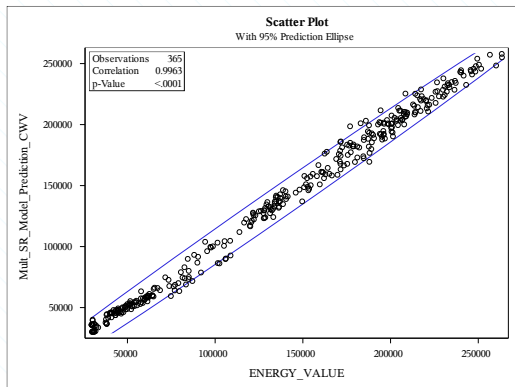R² = 98.9%
ILF = 38.1
Sample Points = MOD451AV

01BPD; LDZ SC; Option 2

Model: Summer Reduction
EUC: 01BPD
LDZ: SC
Demand: National
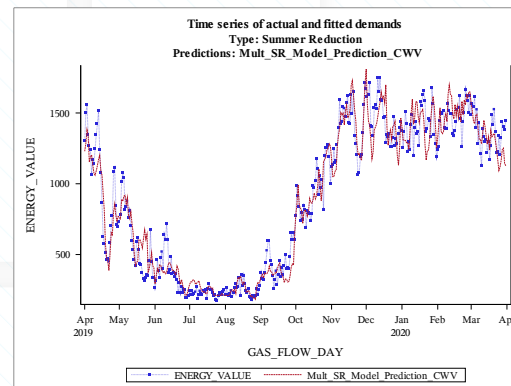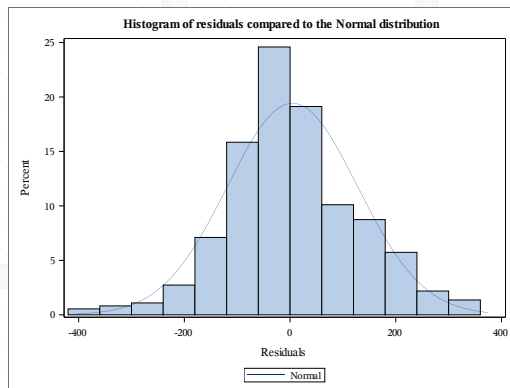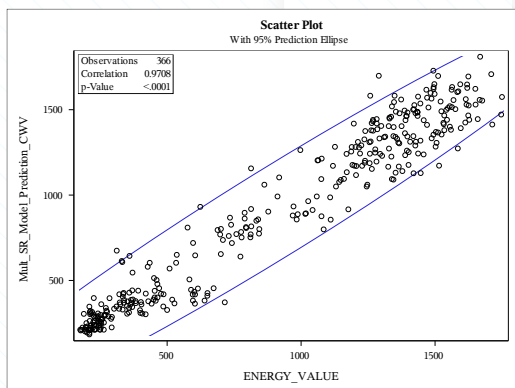Sample: 01/04/2019 – 31/03/2020
R² = 91.2%
ILF = 36.3
Sample Points = 21

01BPD; LDZ SC; Option 1

01BPD; LDZ SC; Option 2

6: Results - Small NDM (01BND - Summary)

LDZ	01BND (Band 1 Non-PPM Domestic - 0 to 73.2 MWh pa)					
---	Indicative Load Factor (ILF)		R2 Multiple Correlation Coefficient (All days)		Sample Size (Supply Points)	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
SC	34.2	.	98.7%	.	274	.
NO	34.2	.	98.6%	.	176	.
NW	32.0	.	98.3%	.	267	.
NE	33.4	.	97.1%	.	275	.
EM	30.5	.	98.9%	.	222	.
WM	29.2	.	99.2%	.	247	.
WN	31.5	.	97.5%	.	130	.
WS	30.0	.	98.3%	.	257	.
EA	31.8	.	98.5%	.	241	.
NT	31.6	.	98.9%	.	207	.
SE	29.6	.	99.1%	.	263	.
SO	27.1	.	98.8%	.	218	.
SW	30.0	.	96.7%	.	295	.

R^2 value min & max range summary:
- Option 1: 96.7% to 99.2%
- Charts provided for highlighted LDZ / Option on next 2 slides

ILF observations:
- Similar to previous year – no issues

Sample size observations:
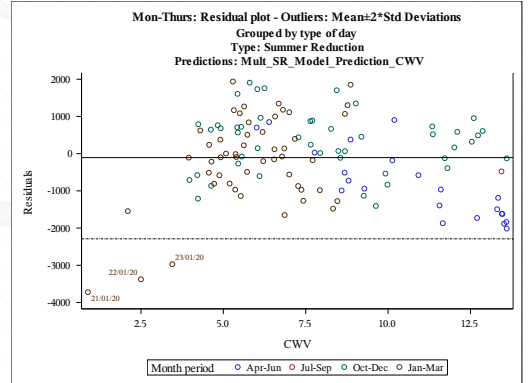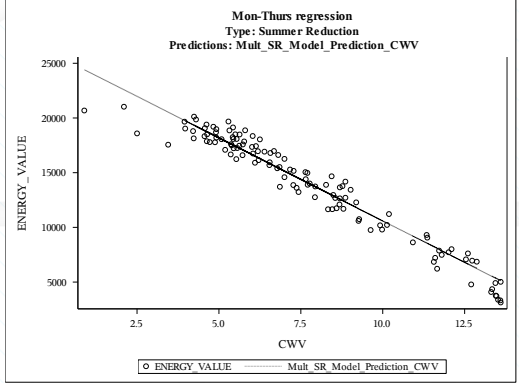- Sample size ranges from 130 to 295 – no issues

Xoserve proposals:
- Strong model performance and with no other alternative identified by TWG - Option 1
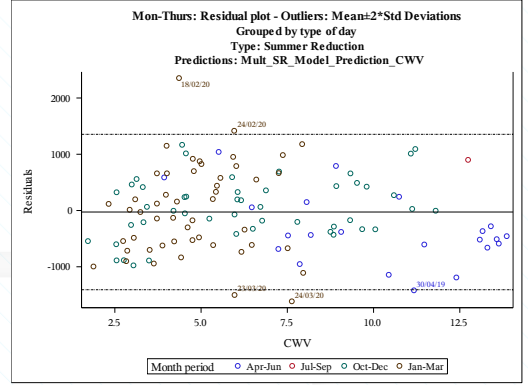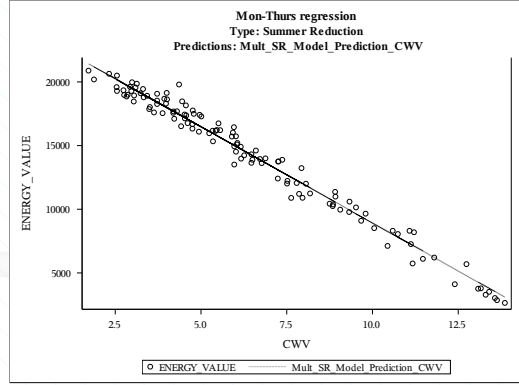
01BND; LDZ SW; Option 1 (i.e. scenario with **lowest** R^2 value)

Model: Summer Reduction
EUC: 01BND
LDZ: SW
Demand: SW
R^2 = 96.7%
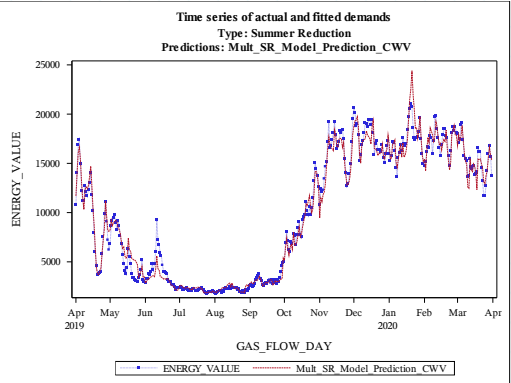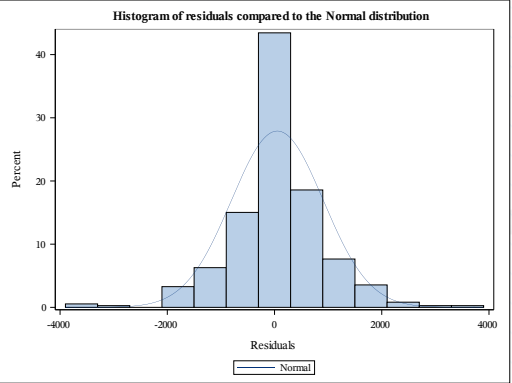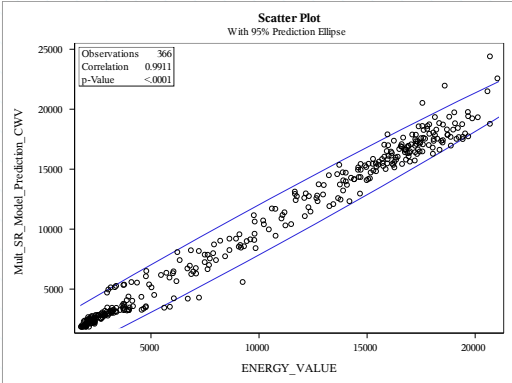ILF = 30
Sample Points = 295

01BND; LDZ WM; Option 1 (i.e. scenario with **highest** R^2 value)

Model: Summer Reduction
EUC: 01BND
LDZ: WM
Demand: WM
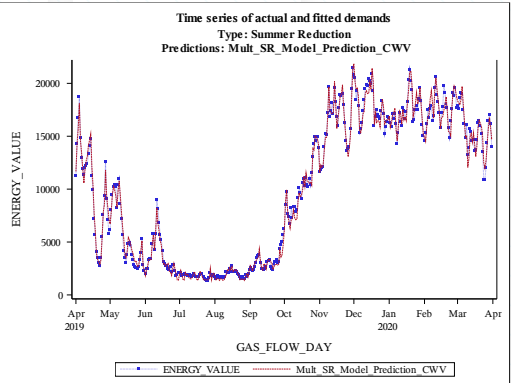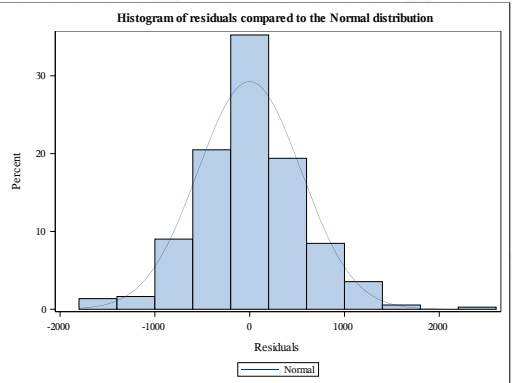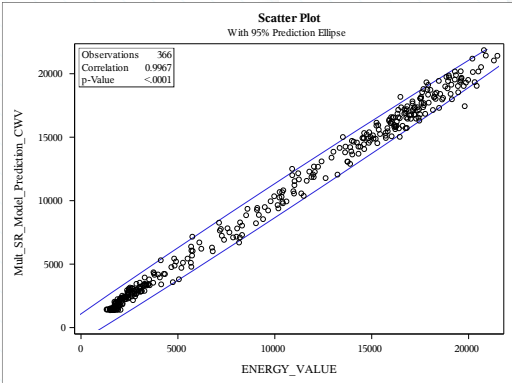R^2 = 99.2%
ILF = 29.2
Sample Points = 247

6: Results - Small NDM (01BND – Charts for LDZ SW & WM)

01BND; LDZ SW; Option 1 (i.e. scenario with **lowest** R^2 value)

01BND; LDZ WM; Option 1 (i.e. scenario with **highest** R^2 value)

6: Results - Small NDM (01BNI - Summary)

LDZ	01BNI (Band 1 Non-PPM I&C - 0 to 73.2 MWh pa)					
	Indicative Load Factor (ILF)		R2 Multiple Correlation Coefficient (All days)		Sample Size (Supply Points)	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
SC	33.0	.	97.0%	.	380	.
NO	33.1	.	96.8%	.	210	.
NW	31.0	.	97.7%	.	350	.
NE	31.0	.	96.7%	.	218	.
EM	29.1	.	96.2%	.	285	.
WM	28.9	.	97.3%	.	262	.
WN	31.1	.	94.6%	.	46	.
WS	31.1	.	96.7%	.	118	.
EA	30.9	.	96.8%	.	381	.
NT	32.2	.	97.8%	.	268	.
SE	28.4	.	98.4%	.	356	.
SO	25.6	.	97.3%	.	197	.
SW	29.7	.	96.1%	.	196	.

R^2 value min & max range summary:
- Option 1: 94.6% to 98.4%

ILF observations:
- Similar to previous year – no issues

Sample size observations:
- WN was the lowest at 46 with other LDZs having good sample sizes

Xoserve proposals:
- No issues identified
- Strong model performance and with no other alternative identified by TWG - Option 1

6: Results - Small NDM (02BND - Summary)

02BND (Band 2 Non-PPM Domestic - 73.2 to 293 MWh pa)					
LDZ	**Indicative Load Factor (ILF)**		**R2 Multiple Correlation Coefficient (All days)**		**Sample Size (Supply Points)**	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
SC	39.5	38.9	96.6%	96.0%	62	109
NO	40.9	40.1	96.7%	96.7%	62	109
NW	38.6	37.6	96.0%	97.4%	62	109
NE	39.9	38.7	96.2%	98.0%	62	109
EM	39.6	38.3	95.4%	97.5%	62	109
WM	38.8	37.2	94.8%	97.4%	62	109
WN	39.3	38.3	95.5%	97.2%	62	109
WS	36.6	38.2	96.0%	95.0%	47	109
EA	36.9	38.6	97.1%	94.9%	47	109
NT	36.6	38.1	97.5%	95.6%	47	109
SE	36.0	37.7	96.9%	94.5%	47	109
SO	34.2	36.2	95.5%	92.8%	47	109
SW	36.9	39.1	93.9%	90.6%	47	109

R^2 value min & max range summary:
- Option 1: 93.9% to 97.5%
- Option 2: 90.6% to 98%

ILF observations:
- Values are similar to previous year

Sample size observations:
- Limited numbers – restricting aggregations

Xoserve proposals:
- Mixed impact between options but no clear benefit for selecting option 2, therefore Option 1 is recommended

6: Results - Small NDM (02BNI - Summary)

LDZ	02BNI (Band 2 Non-PPM I&C - 73.2 to 293 MWh pa)					
	Indicative Load Factor (ILF)		R2 Multiple Correlation Coefficient (All days)		Sample Size (Supply Points)	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
SC	34.4	.	96.8%	.	319	.
NO	37.3	.	97.7%	.	175	.
NW	33.6	.	96.6%	.	270	.
NE	35.0	.	96.6%	.	152	.
EM	33.8	.	96.8%	.	336	.
WM	35.1	.	95.9%	.	313	.
WN	38.5	34.6	91.4%	96.4%	21	291
WS	33.5	.	95.9%	.	76	.
EA	32.8	.	95.8%	.	359	.
NT	38.9	.	96.9%	.	336	.
SE	33.2	.	97.2%	.	322	.
SO	31.5	.	97.5%	.	238	.
SW	34.3	.	96.3%	.	248	.

R^2 value min & max range summary:
- Option 1: 91.4% to 97.7%
- Option 2: Much improved R^2 for WN LDZ
- Charts provided for highlighted LDZ / Option on next 2 slides

ILF observations:
- Similar to previous year – no issues

Sample size observations:
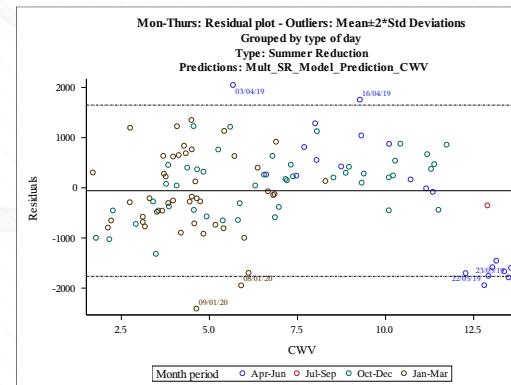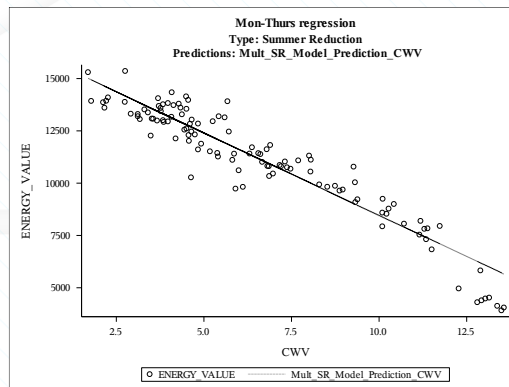- WN only has 21 supply points and 291 when combined with NW

Xoserve proposals:
- Option 1 for all LDZs except for LDZ WN (Option 2)
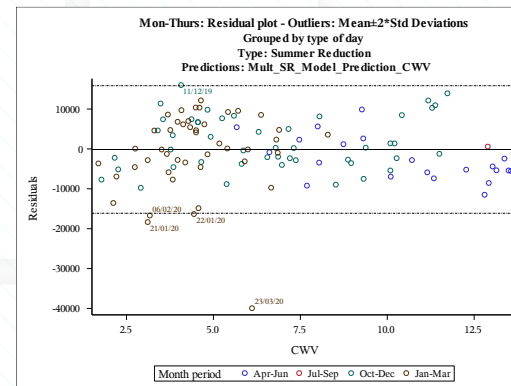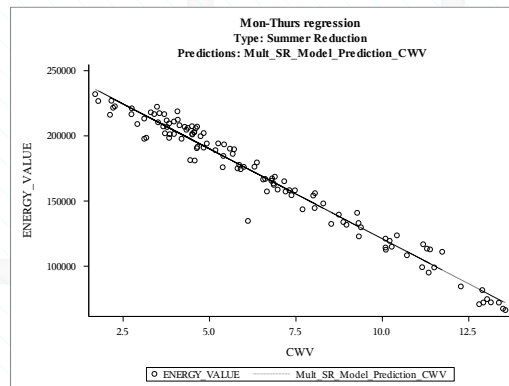
6: Results - Small NDM (02BNI – Charts for LDZ WN)

02BNI; LDZ WN; Option 1

Model: Summer Reduction
EUC: 02BNI
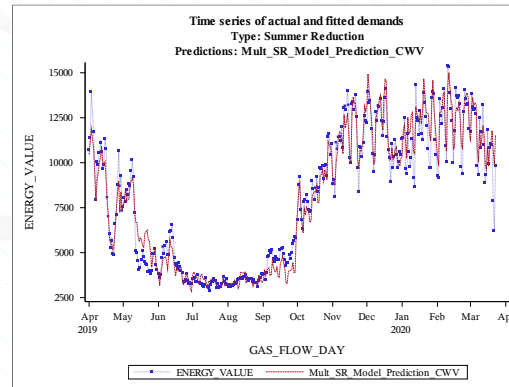LDZ: WN
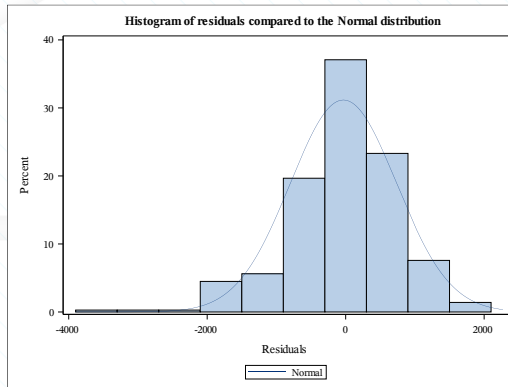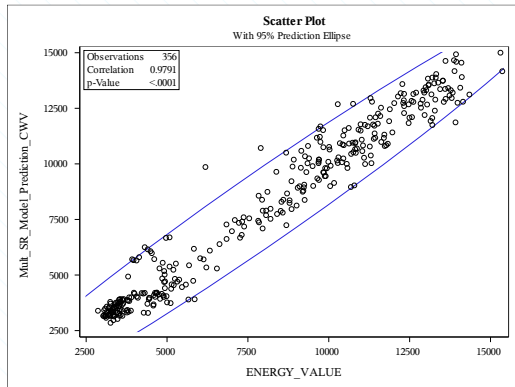Demand: WN
R^2 = 91.4%
ILF = 38.5
Sample Points = 21

02BNI; LDZ WN; Option 2

Model: Summer Reduction
EUC: 02BNI
LDZ: WN
Demand: WN & NW
R^2 = 96.4%
ILF = 34.6
Sample Points = 291

02BNI; LDZ WN; Option 1
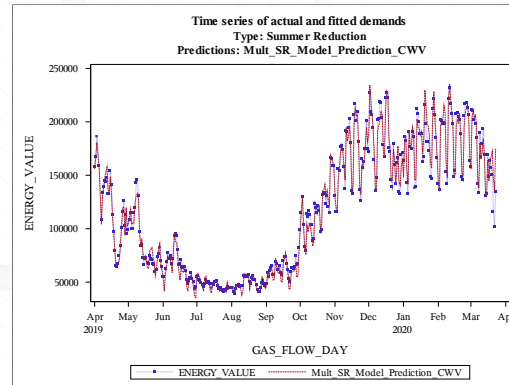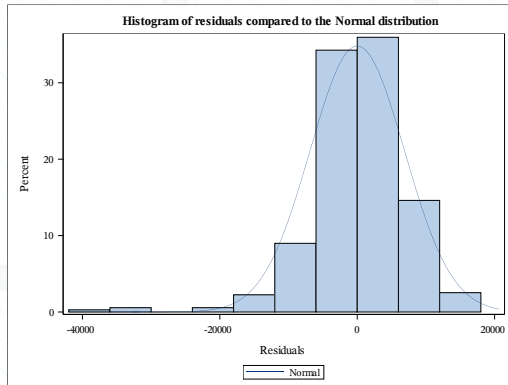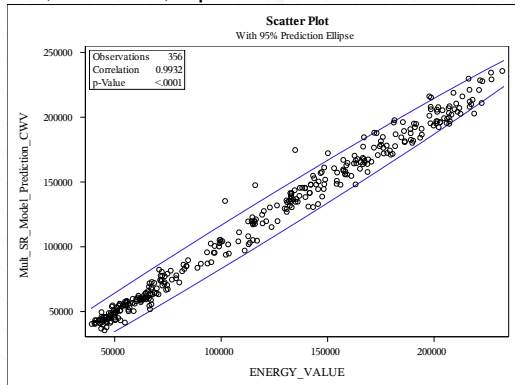

02BNI; LDZ WN; Option 2

6: Results - Small NDM (03B - Summary)

| LDZ | 03B (Band 3 - 293 to 732 MWh pa) | | | | | |
| | Indicative Load Factor (ILF) | | R2 Multiple Correlation Coefficient (All days) | | Sample Size (Supply Points) | |
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
SC	34.8	.	96.3%	.	355	.
NO	37.4	.	96.9%	.	161	.
NW	35.6	.	96.9%	.	239	.
NE	36.2	.	96.8%	.	178	.
EM	34.7	.	96.9%	.	241	.
WM	33.4	.	97.5%	.	184	.
WN	33.8	.	93.1%	.	37	.
WS	34.0	.	96.3%	.	60	.
EA	32.4	.	96.3%	.	219	.
NT	37.3	.	97.3%	.	224	.
SE	33.1	.	97.5%	.	288	.
SO	32.1	.	97.0%	.	218	.
SW	37.6	.	94.2%	.	179	.

R^2 value min & max range summary:
- Option 1: 93.1% to 97.5%

ILF observations:
- Similar to previous year – no issues

Sample size observations:
- LDZs WN and WS have lowest counts with other LDZs having good sample sizes

Xoserve proposals:
- Strong model performance and with no other alternative identified by TWG - Option 1

6: Results - Small NDM (04B - Summary)

| LDZ | 04B (Band 4 - 732 to 2,196 MWh pa) | | | | | |
| | Indicative Load Factor (ILF) | | R2 Multiple Correlation Coefficient (All days) | | Sample Size (Supply Points) | |
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
SC	36.0	.	97.2%	.	325	.
NO	37.7	.	97.8%	.	213	.
NW	36.5	.	97.5%	.	259	.
NE	35.1	.	96.3%	.	287	.
EM	37.7	.	98.1%	.	192	.
WM	34.5	.	97.0%	.	203	.
WN	38.0	.	94.3%	.	37	.
WS	34.1	.	95.8%	.	92	.
EA	36.4	.	97.3%	.	223	.
NT	38.5	.	98.2%	.	240	.
SE	36.8	.	98.2%	.	316	.
SO	30.9	.	97.6%	.	303	.
SW	36.8	.	96.5%	.	177	.

R^2 value min & max range summary:
- Option 1: 94.3% to 98.2%

ILF observations:
- Similar to previous year – no issues

Sample size observations:
- LDZs WN and WS have lowest counts with other LDZs having good sample sizes

Xoserve proposals:
- Strong model performance and with no other alternative identified by TWG - Option 1

6: Results - Winter Annual Ratio (WAR) Bands

- Higher AQ Bands where supply 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 2020 Gas Demand Modelling were discussed and agreed at April TWG

Weather insensitive

Weather sensitive

W01

W04
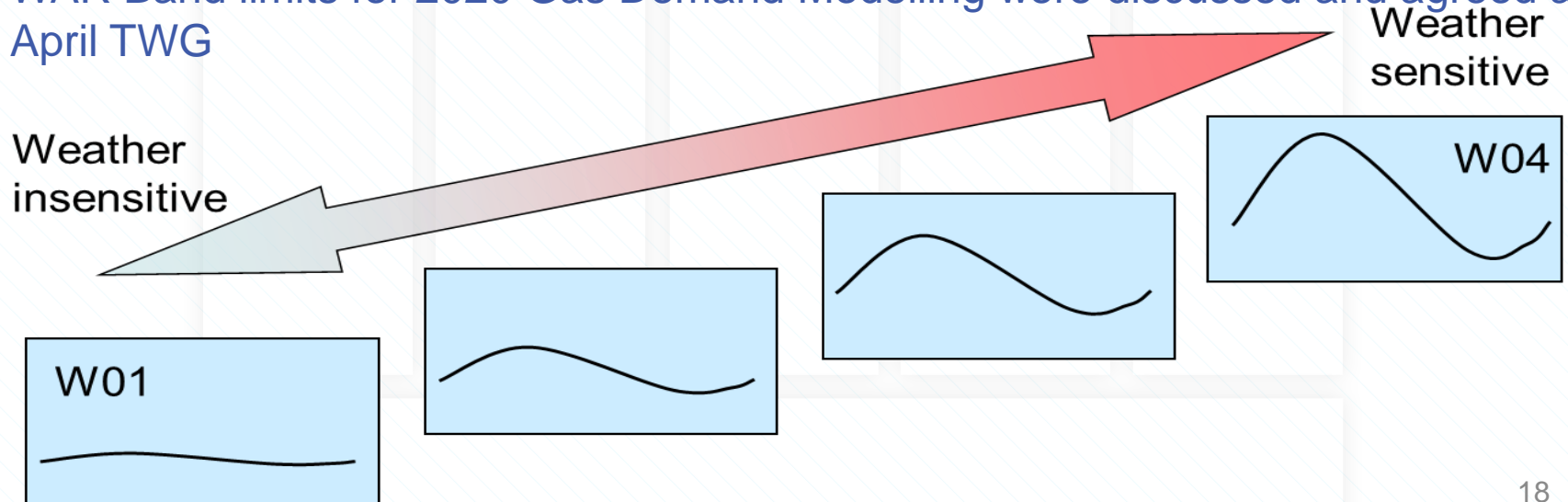
6: Results - Small NDM: Agreed Modelling Runs (3)

Description / Range / EUC(s)	Option 1	Option 2
Band 1 **0 to 73.2 MWh pa** **01BPD; 01BND; 01BPI; 01BNI**	No WAR Band Required (Not generally Monthly read)	n/a
Band 2 **73.2 to 293 MWh pa** **02BPD; 02BND; 02BPI; 02BNI**	No WAR Band Required (Not generally Monthly read)	n/a
Band 3 and Band 4 (Combined) **293 to 2196 MWh pa** **03W01 to 04; 04W01 to 04**	Individual LDZ analysis except for LDZ WN which uses WN/NW demands Agreed WAR Ratios: 0.411; 0.481 and 0.568	n/a

6: Results - Small NDM (03 and 04 WAR - Summary)

	03W01 to 04 & 04W01 to 04 (Band 3 and 4 - 293 to 2196 MWh pa)											
	OPTION 1											
LDZ	WAR Band 01 0 – 0.411			WAR Band 02 0.412 – 0.481			WAR Band 03 0.482 – 0.568			WAR Band 04 0.569 – 1.00		
	ILF	R^2	Sample	ILF	R^2	Sample	ILF	R^2	Sample	ILF	R^2	Sample
SC	61.6	91.4%	95	44.6	97.1%	191	31.4	96.0%	290	24.8	95.3%	104
NO	61.0	91.4%	100	43.0	96.7%	118	30.6	96.4%	104	23.6	92.4%	52
NW	65.2	91.3%	112	44.6	95.8%	153	32.1	96.7%	130	21.7	95.4%	103
NE	60.9	91.3%	86	44.8	94.9%	138	31.6	95.4%	149	22.8	92.8%	92
EM	62.9	92.2%	82	46.1	95.3%	131	33.1	97.0%	129	23.1	94.7%	91
WM	63.6	86.9%	84	41.2	97.0%	124	29.7	97.0%	105	20.6	94.8%	74
WN	65.9	90.0%	129	45.5	94.8%	175	32.6	95.9%	148	22.2	95.4%	120
WS	59.0	82.0%	33	42.8	93.7%	51	30.9	94.8%	34	20.8	92.3%	34
EA	60.0	85.4%	65	45.6	94.0%	123	32.2	97.1%	156	22.4	93.4%	98
NT	66.5	75.6%	120	45.3	96.8%	124	34.0	98.0%	128	22.9	94.5%	92
SE	65.4	72.4%	106	45.6	97.0%	186	32.3	97.5%	157	22.5	94.3%	155
SO	61.3	79.2%	102	40.1	96.0%	138	29.1	96.9%	159	19.9	95.1%	122
SW	62.4	87.7%	83	46.9	90.4%	112	32.1	94.7%	90	22.6	92.6%	71

6: Results - Small NDM (03 and 04 WAR - Summary)

R^2 value min & max range summary:
- Option 1: 72.4% to 98.0% over all LDZ / WAR bands
- Charts provided for highlighted LDZ / Option on next slide

ILF observations:
- Similar to previous year – no issues

Sample size observations:
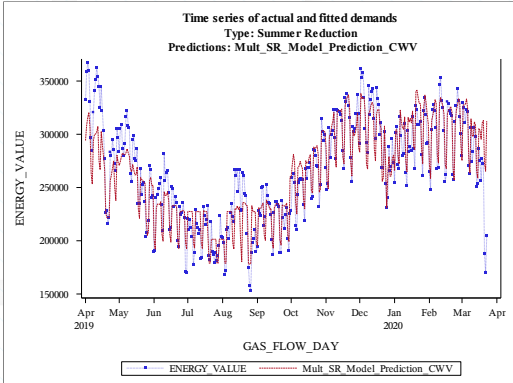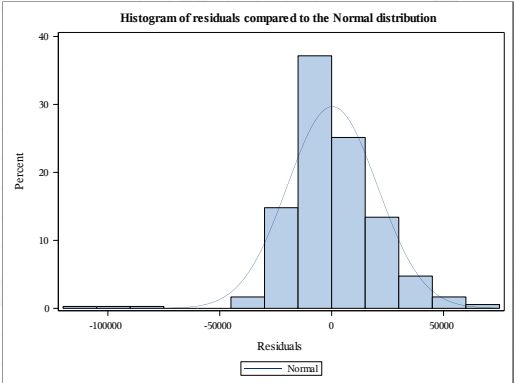- LDZ WN only has 74 supply points and 572 when combined with NW
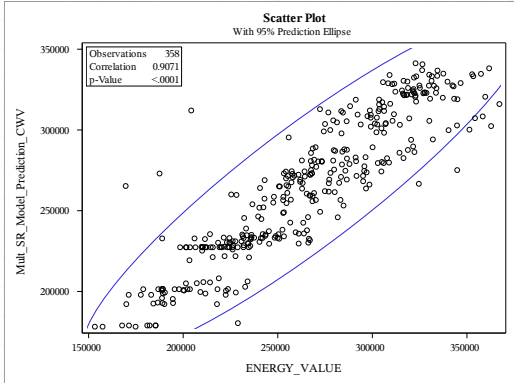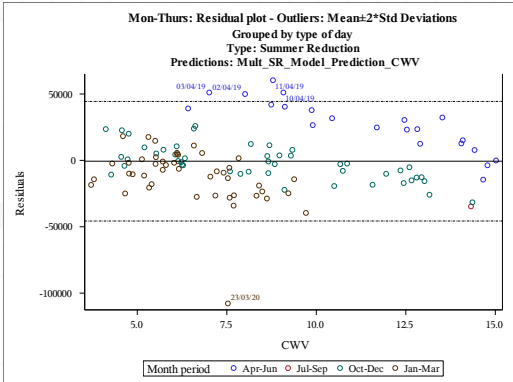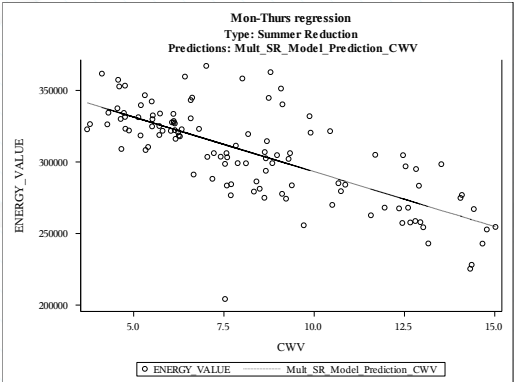
Xoserve proposals:
- Strong model performance and with no other alternative identified by TWG - Option 1

03W01 / 04W01; LDZ SE; Option 1

Model: Summer Reduction
EUC: 03W01 / 04W01
LDZ: SE
Demand: SE
R^2 = 72.4%
ILF = 65.4
Sample Points = 106

6: Results - Small NDM (Conclusions)

- Good R^2 coefficients for majority of Consumption Band and WAR Band models

- Similar number of overall sample numbers compared to previous year has again enabled individual analysis for LDZ WN for the majority of proposed models

- The Demand Estimation team has performed a number of checks across 222 options for Small NDM models, including comparisons to previous years and reviews of exceptions/outliers which has provided assurance that the models are ready for the next phase

- Are TWG happy to move to Demand Model Smoothing phase with the Small NDM modelling results presented today ?