Demand Estimation Sub Committee

Action 1202 WS:02BNI Update

Algorithm Performance Gas Year 2021/22

Strand 3 – NDM Sample Analysis

1st March 2023

Background

- At the DESC meeting on the 13th December the results of the NDM Algorithm Performance for Gas Year 2021/22 were presented

- The results of 02BNI for Wales South were unusual (see following slides) and we took an action (1202) to investigate and report back

- This slide pack covers the results of the investigation

RECAP from DESC 13ᵗʰ Dec 22 – 02BNI – WS

The results for Wales South are not as expected and worse than previous years

- There are a large number of sample meters with 0 consumption on Saturdays
- Most of the Sample Meters have consumption on Sunday so the weekend does not fit with normal consumption trends

  - These have been investigated but there is no clear error or issue we can identify
  - A possible driver of this could be early working days putting Monday consumption into Sunday

- There are almost 3 times as many Sample Meters in the Algorithm Performance compared to the forecast
  - Lack of data is not an issue
  - Reducing the count using random sampling, however, did remove the problem

- We will continue to investigate and report back any finding to DESC

RECAP – 02BNI – Gas Year Time Series - EA and WS

The charts compare the aggregated view of daily actual demands, with the allocated demands produced by the NDM Algorithm for EA and WS
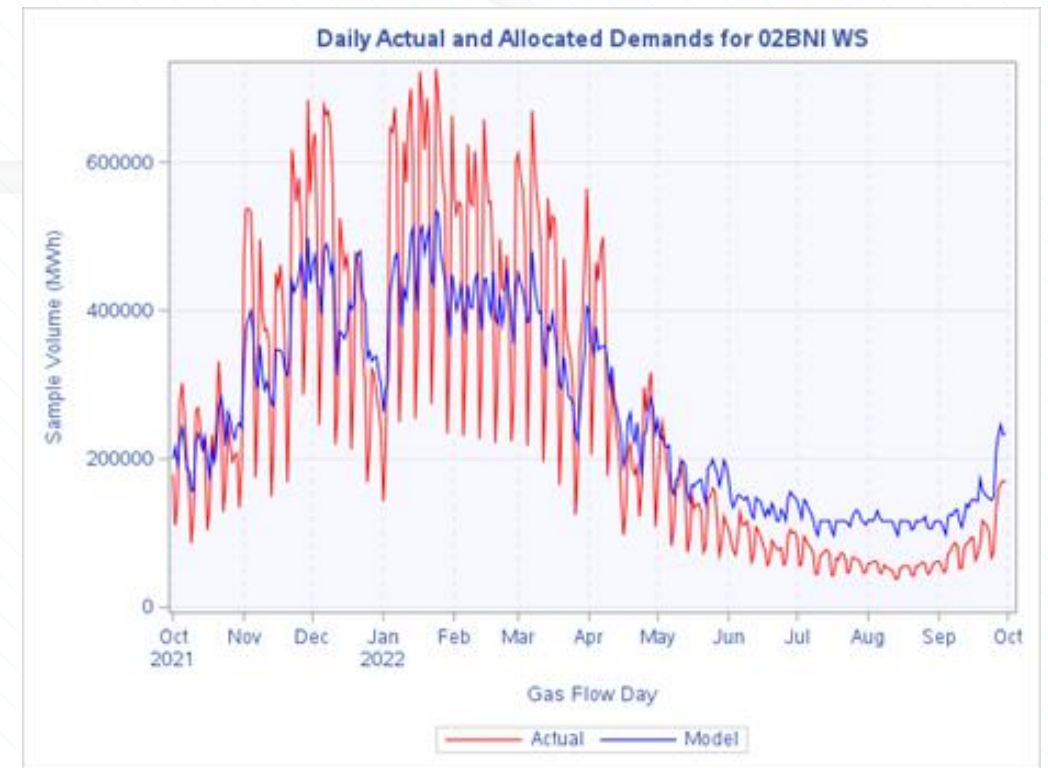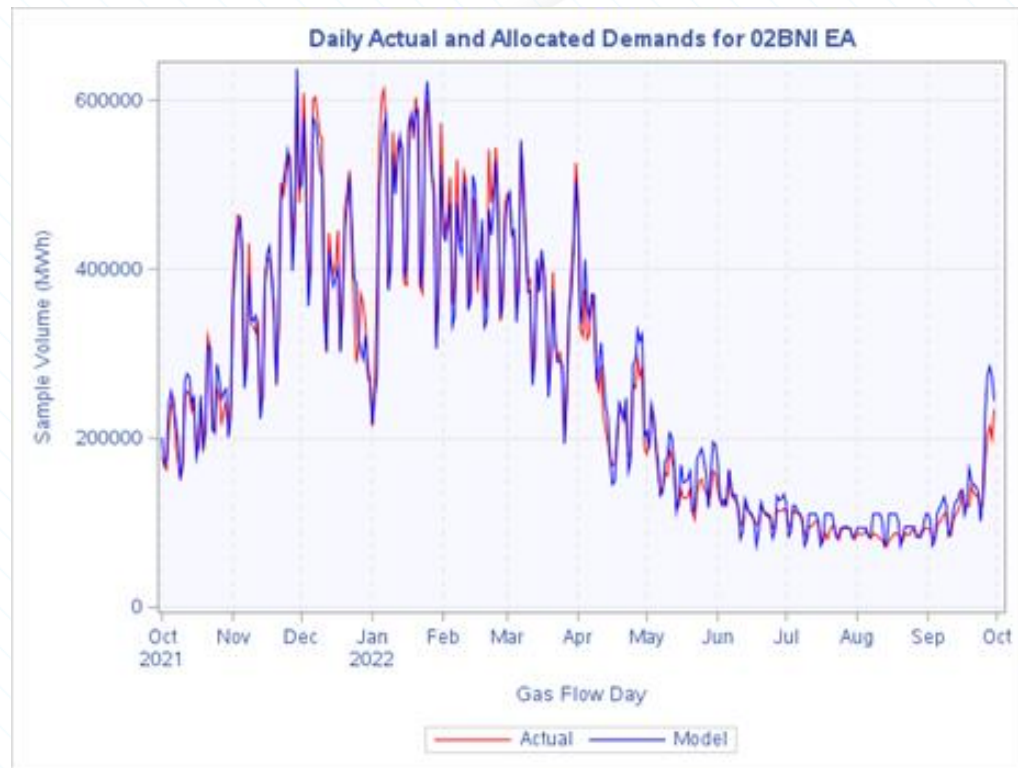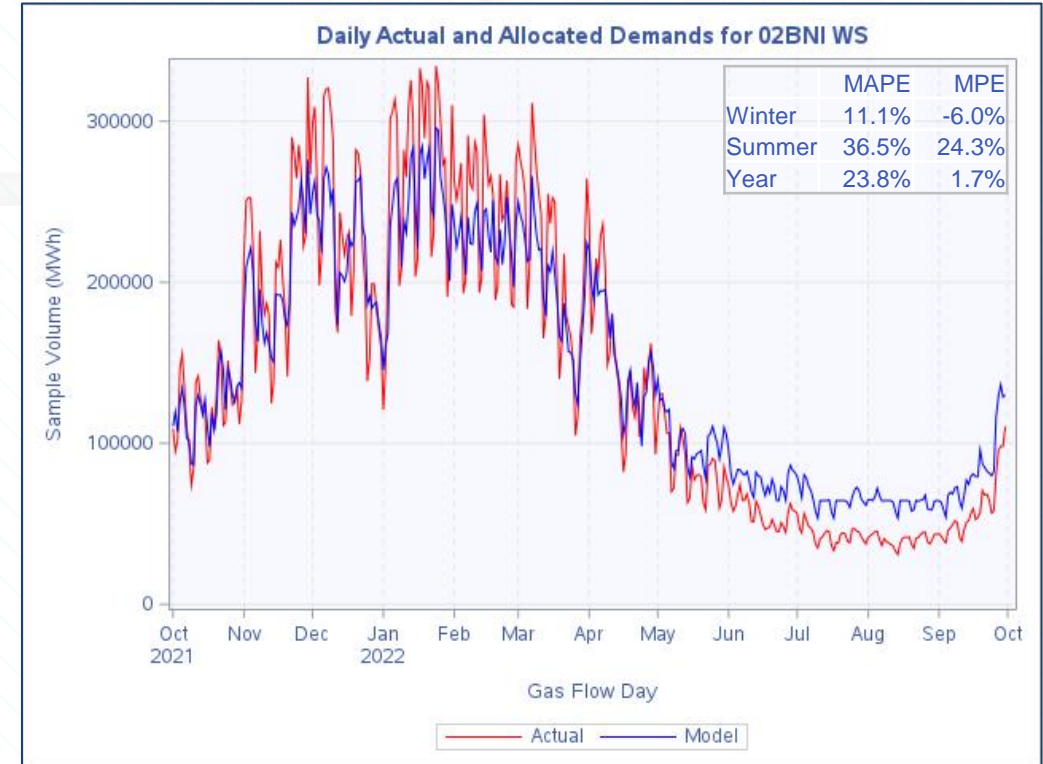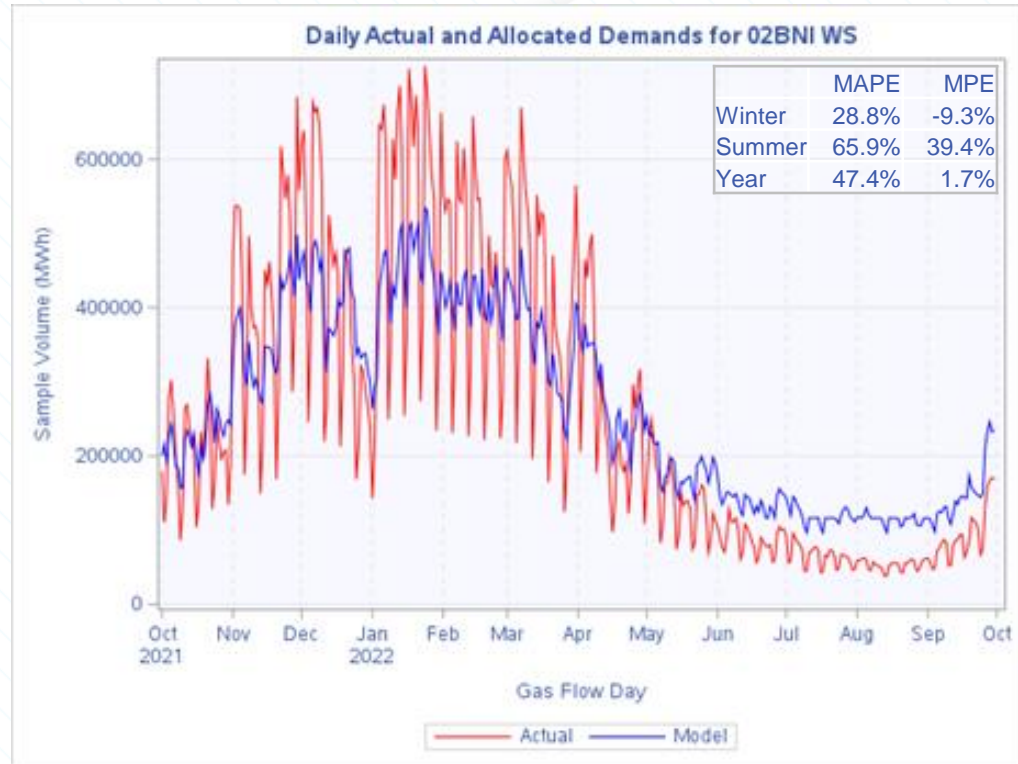

- Eastern consumption was in line with the forecast for most of the year, with just a small reduction over the summer
- Wales South by comparison consumption shifted significantly, with Weekdays largely under allocated and weekends over-allocated

Results

- Further investigation of the sample data led to us looking at the MPRN addresses to see if this provided reason for the unusual consumption pattern

- 280 of the 654 sample sites (43%) were found to be schools
  - This is much higher than proportional representation when compared with the population
  - These MPRNs understandably have little to no consumption on weekends

- Removing these meters improved the fit of actual to forecast

- Further investigation into other EUCs with unusual weekday / weekend variances were investigated and a further 197 schools were removed from other Wales South EUCs and 380 from North West EUCs

- These were all the schools in the sample, for the EUCS in questions, identified using a search of the word 'school' (and ysgol for WS)
  - A manual check has revealed a number of schools not identified in the original search due to truncated file names or the word school not being present (e.g. academy, primary and comprehensive). These were left in the sample

Analysis – 02BNI – Gas Year Time Series - WS

The charts compare the aggregated view of daily actual demands, with the allocated demands produced by the NDM Algorithm for WS

Daily Actual and Allocated Demands for 02BNI WS

	MAPE	MPE
Winter	28.8%	-9.3%
Summer	65.9%	39.4%
Year	47.4%	1.7%

Daily Actual and Allocated Demands for 02BNI WS

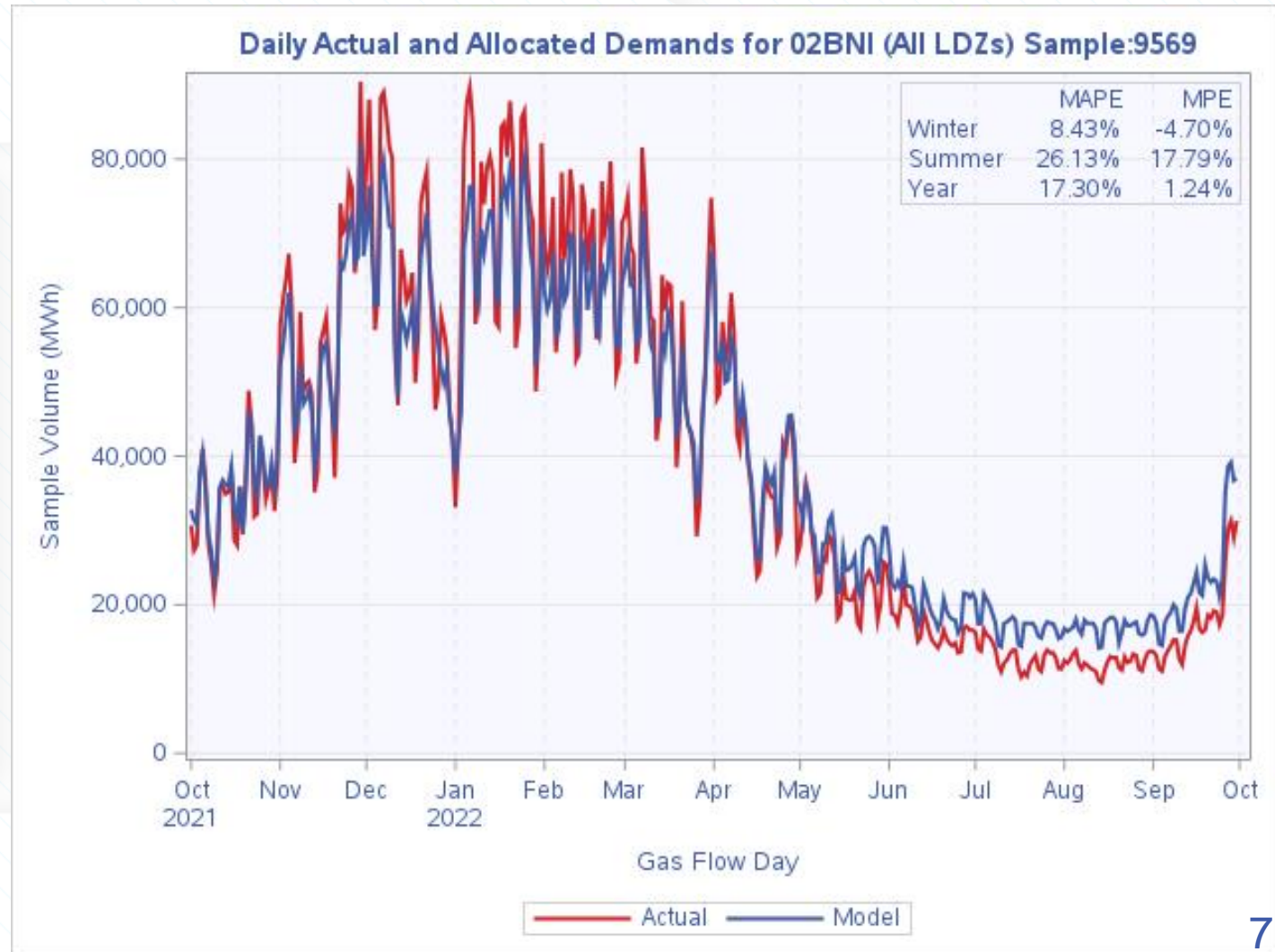|	MAPE	MPE
Winter	11.1%	-6.0%
Summer	36.5%	24.3%
Year	23.8%	1.7%

- The chart on the right is after removing the 280 schools from the sample data
- The actual values are much closer to the allocated values
- There is still over-allocation in the summer, however this is in line with other EUCs and LDZs and a result of extremely warm temperatures and possible changes in behaviour caused by price increases

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NEW – Analysis – 02BNI – Gas Year Time Series

EUC	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW	Total
02BNI	1,269	483	1,449	606	925	956	70	**374**	617	830	700	647	643	9,569

- The chart on the right compares the aggregated view of daily actual demands, with the allocated demands produced by the NDM Algorithm

- The removal of the schools has made the actual slightly closer to the allocated demand

- The Year MAPE has improved from 19.2% to 17.3%

- The Winter and Summer MPEs have improved by 0.28% and 1.03% respectively

Daily Actual and Allocated Demands for 02BNI (All LDZs) Sample:9569

	MAPE	MPE
Winter	8.43%	-4.70%
Summer	26.13%	17.79%
Year	17.30%	1.24%

NEW – Analysis – 02BNI – Day of Week Error (MPE)

- The chart shows the modelling error (MPE - Mean Percentage Error) by day of week across the whole year for 02BNI (after change to WS)

- The overall MPE for 02BNI has also improved for Saturday and Sunday by c. 2%

- The table below shows the MPE by weekday with the new values for WS

- All days except Friday are improved as a result of the change, most noticeably for Saturday and Sunday

MPE by Weekday 02BNI (All LDZs)

Negative MPE indicates under-allocation
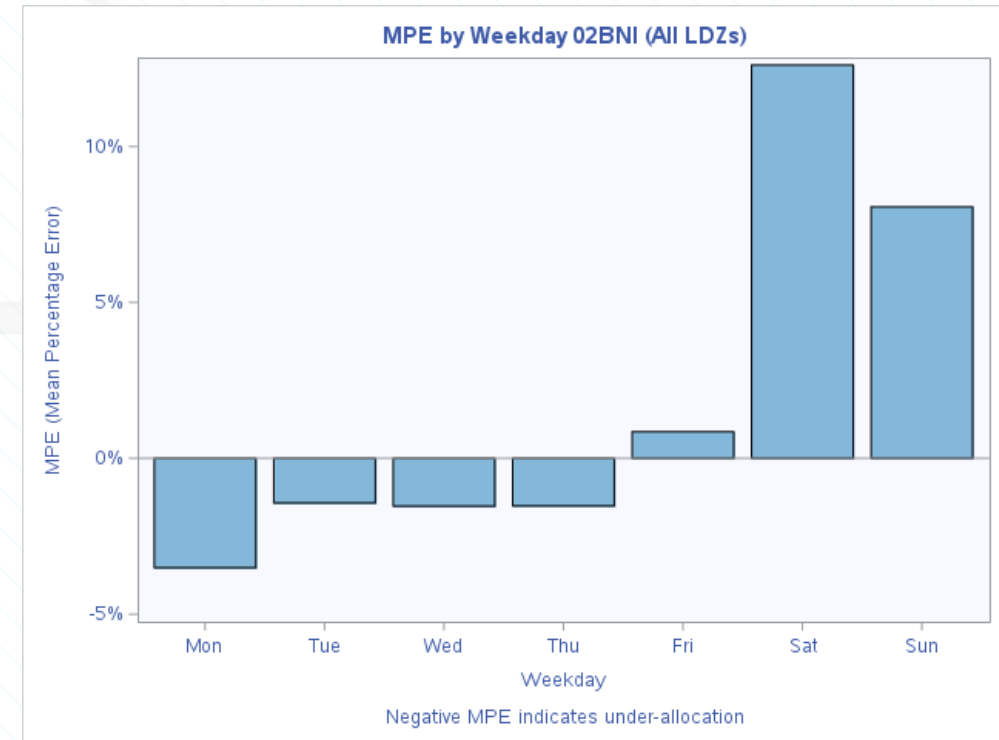
Weekday	SC	NO	NW	NE	EM	WM	WN	WS	WS - NEW	EA	NT	SE	SO	SW
Mon	-5.2%	-0.1%	-8.6%	0.0%	-1.7%	-4.2%	-1.9%	-14.1%	-5.8%	0.4%	-1.9%	-4.9%	0.5%	-2.2%
Tue	-3.1%	1.0%	-6.2%	0.8%	0.3%	-1.2%	-1.1%	-10.7%	-3.3%	2.1%	-0.7%	-1.8%	1.8%	0.4%
Wed	-2.1%	0.6%	-6.2%	-0.1%	0.4%	-0.7%	1.5%	-10.4%	-3.4%	2.0%	-1.4%	-2.4%	0.7%	-0.7%
Thu	-1.3%	0.1%	-5.8%	-0.2%	-0.5%	-1.1%	0.6%	-10.7%	-3.6%	2.2%	-1.3%	-3.3%	0.9%	-0.3%
Fri	-0.1%	1.6%	1.4%	1.2%	0.2%	0.3%	2.9%	1.6%	2.0%	0.5%	1.4%	0.6%	0.1%	2.3%
Sat	13.1%	2.4%	34.4%	3.6%	5.0%	13.4%	1.2%	87.5%	24.8%	-3.4%	11.0%	19.0%	5.8%	11.2%
Sun	7.7%	7.1%	15.5%	1.6%	5.3%	11.0%	2.7%	30.6%	10.8%	1.2%	7.9%	11.4%	6.0%	4.7%

Conclusions and Recommendations

- This investigation has highlighted the impact disproportionate sample data can have on the training and testing of demand models

  - If shippers are aware their portfolio contains a disproportionate representation of a particular business type, it would aid the modelling process if they could remove them prior to submission
  - If this is not possible, notifying us at time of submission allows Demand Estimation to perform a cleanse prior to modelling

- In future for both for Modelling and Algorithm Performance, if the sample is producing unusual results an additional check on the addresses can be carried out

- Alternatively SIC codes (Standard Industrial Classification of Economic Activities) could be used to highlight where there are unusual distributions

  - This is not 100% reliable as it only covers registered company addresses
  - We don't currently use this data and a fairly significant amount of development would be required to link the addresses in the SIC database to the MPRNs (potential adhoc workplan item)

- The full Strand 3 results (forming part of Section 12 of the NDM Algorithm Booklet) will show Wales South and North West without the schools and will be published shortly