Demand Estimation Sub Committee Review of Summer Modelling performance

15th February 2017

Agenda

- Background & high level re-cap on the November presentation (Phase 1)

- Explanation of the various modelling approaches tested and the subsequent results when compared with the actual sample consumption (Phase 2)

- Results of UG analysis when trialing different approaches

- Conclusions and Recommendations

Background

- In addition to standard work plan items DESC approved the following areas as priorities for this Autumn / Winter work schedule

  - Support to UK Link replacement, including ongoing simulation of UG levels

  - Establish process for Algorithm Performance measures for 'new world' algorithm

  - Update to modelling systems to accommodate new UK Link data structure

  - Consider possible measures to improve algorithm performance over summer (encompassing adhoc work items 'TWG 23/05/12' and 'TWG 26/06/13')

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Re-cap on Approach to Analysis

- 1) Collate results for the current modelling profiles in order to have a baseline to compare to when trialing changes. Achieve this by…

    - 1.1) Reviewing previous algorithm performance results (NDM sample strand) over recent gas years to confirm any patterns/trends in summer across the bands ✓ Update provided at November DESC

    - 1.2) Reviewing previous similar DESC analysis and its conclusions to confirm why current parameters / test criteria are used
      ✓ Update provided at November DESC

    - 1.3) Reviewing results from simulated UG analysis in order to provide additional understanding on how demand models are performing
      ✓ Update provided at November DESC

    - 1.4) Seeking feedback from DESC/TWG for any additional information / evidence they have that could assist with investigations
      ✓ Update provided at November DESC

Re-cap on Approach to Analysis

- 2) Understand what changes in approach are possible within existing modelling system. Achieve this by…
  - 2.1) Confirming all parameters available within existing modelling system influencing summer profiles e.g. summer reductions, cut offs, holidays
    - ✓ Update provided at November DESC

- 3) Create new profiles using different parameters and test them by replicating the NDM algorithm and comparing to the sample data over a number of years. Achieve this by…

  - Perform modelling using different parameters to create revised ALPs/DAFs
  - Re-run algorithm performance NDM sample strand for 3 gas yrs (12/13-14/15)
  - Compare results to 'base-lined' position
  - Output presented similar to that provided in Section 12 of the NDM report

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Re-cap from November DESC meeting

- At the meeting we discussed the performance of the current models for EUC 01B. This provided a baseline position to compare any revised models to. The results from the current models showed that over the 3 years analysed they were generally <u>over</u> allocating in the <u>summer</u> and <u>under</u> allocating in the <u>winter</u>

- Reviewed the summary of previous analyses performed by DESC in this area

- Reviewed the relationship between the levels of 01B allocation accuracy and the simulated levels of UG concluding that there was an association and therefore an added benefit of smaller UG levels should an improvement be possible

- Discussed feedback received from DESC / TWG of their experiences of the models in action

Re-cap from November DESC meeting cont.

- DESC then reviewed the parameters available to Xoserve in the current modelling system which could be amended in order to improve performance of the models.

- This included the criteria used for assessing whether models should have a summer reduction and/or cut-off and whether holidays are included in the main Monday to Thursday regression

  As a reminder the current approach for 01B is as follows:

  Holidays included: Yes
  Single Year Summer Reduction Test: 0.95 *(i.e. 5% reduction in demand)*
  Smoothed Model Summer Reduction Test: 0.90 *(i.e. 10% reduction)*
  Cut-Off allowed: No

- DESC concluded that they would like to see revised ALPs and DAFs produced from models which have different conditions around the Holidays and Summer Reduction tests

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Alternative Modelling Approaches

Results for Alternative modelling approaches (Model 1) – Treatment of Holidays for 01B

Baseline Model: Current Approach

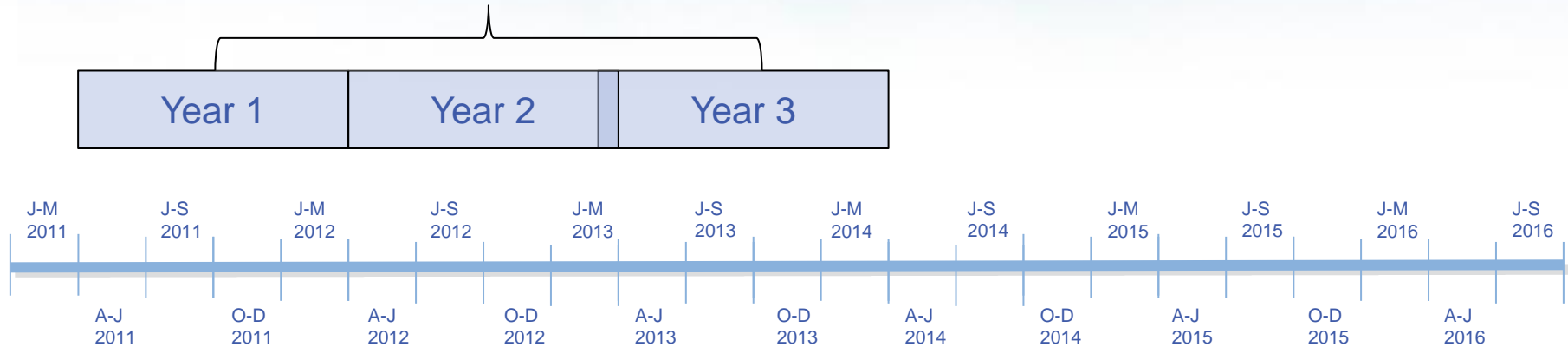| Scenario	Modelling Ref.	Spring Analysis	Individual Years used	Modelling Approach - Parameters					Comment
				Hols incl.	Cut Off	Warm Weather Cut-Off	Sum. Red. Ind. Test	Sum. Red. Smo. Test	
Establish baseline position for 01B results	Baseline	2014	Apr'11 to Mar'12 Apr'12 to Mar'13 Mar'13 to Mar'14	Y	N	2	5%	10%	Represents current Spring Approach. This model was used to derive ALPs, DAFs used in November DESC baseline analysis

- The table above represents the data and models that were used to create the ALPs and DAFs which were used in the analysis presented in November last year

- The parameters displayed above represent the approach for the 01B models currently defined in the Spring Approach document

- In order for any comparison to the 'baseline results' to be relevant the same source data should be used

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Explanation of data used in Spring 2014 analysis

Model training data used to develop Smoothed model

Year 1	Year 2	Year 3

J-M 2011 · A-J 2011 · J-S 2011 · O-D 2011 · J-M 2012 · A-J 2012 · J-S 2012 · O-D 2012 · J-M 2013 · A-J 2013 · J-S 2013 · O-D 2013 · J-M 2014 · A-J 2014 · J-S 2014 · O-D 2014 · J-M 2015 · A-J 2015 · J-S 2015 · O-D 2015 · J-M 2016 · A-J 2016 · J-S 2016

NDM Allocation re-run using new ALPs/DAFs

GY 12/13	GY 13/14	GY 14/15	GY 15/16
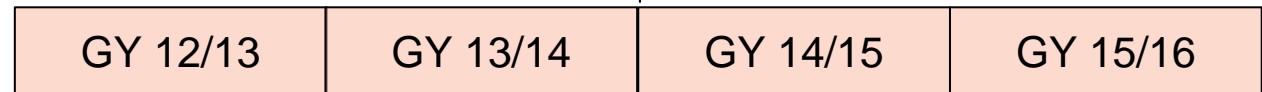
- Diagram above shows that Smoothed Model and subsequent ALPs/DAFs are derived from the weather experienced in Summer 2011, 2012 and 2013
- NDM Allocation re-run using revised ALPs/DAFs tested against Summer 2013, 2014, 2015 and 2016

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Weather Summaries for Summers 2013-2016

Summer 2013
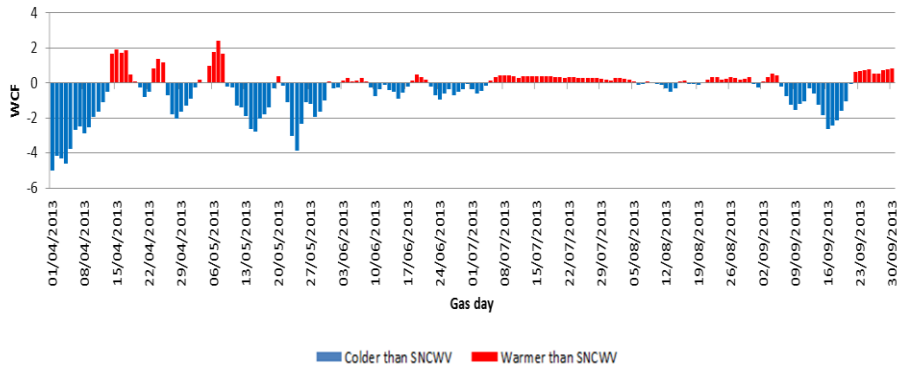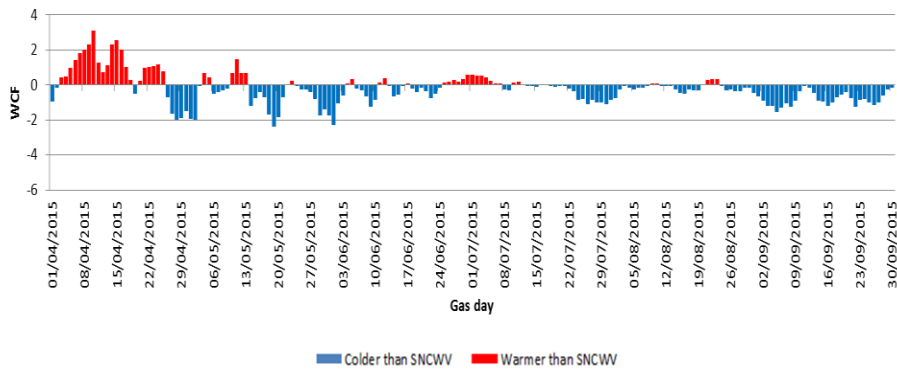
Summer 2014

Summer 2015

Summer 2016
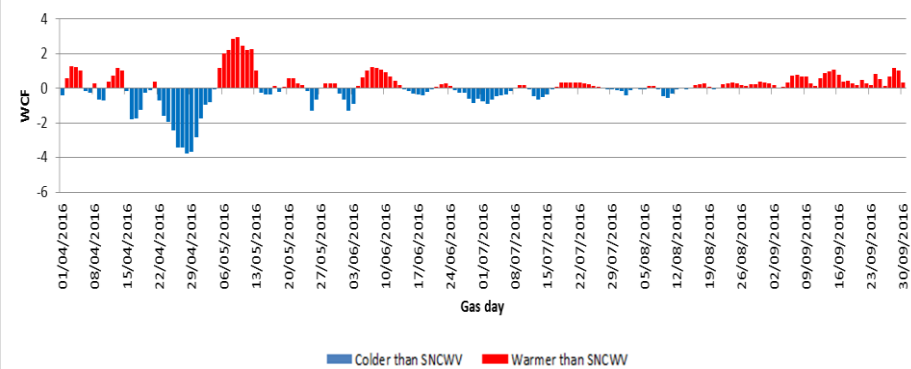
- Charts above provide summaries of the 'GB WCF' so to understand some weather context when reviewing results

Model 1 Approach

- The first scenario tested produced revised 01B models using identical criteria for all parameters except '*Holidays included*' was set to 'No' - see table below:

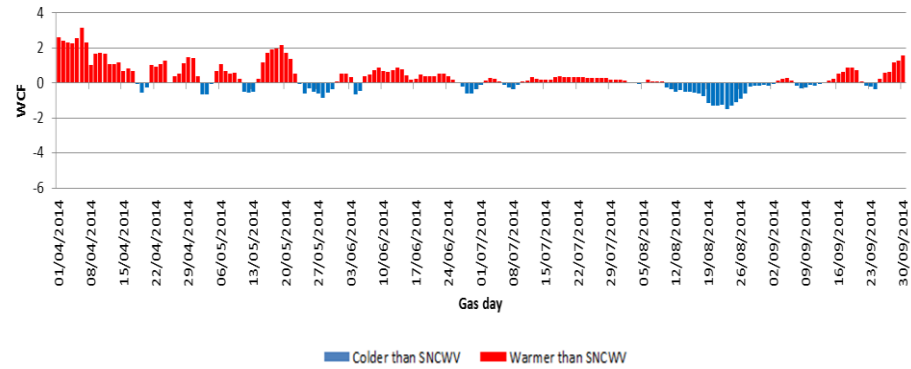| Scenario	Modelling Ref.	Spring Analysis	Individual Years used	Modelling Approach - Parameters					Comment
				Hols incl.	Cut Off	Warm Weather Cut-Off	Sum. Red. Ind. Test	Sum. Red. Smo. Test	
Establish baseline position for 01B results	Baseline	2014	Apr'11 to Mar'12 Apr'12 to Mar'13 Mar'13 to Mar'14	Y	N	2	5%	10%	Represents current Spring Approach. This model was used to derive ALPs, DAFs used in November DESC baseline analysis
Holidays excluded, all other parameters the same	Model 1 (NW2014_HOL_EX)	2014	Apr'11 to Mar'12 Apr'12 to Mar'13 Mar'13 to Mar'14	N	N	2	5%	10%	Requested by DESC at November meeting

- In practice this means the core Monday to Thursday model will reduce from approximately 210 days to approx 170 days

- A set of holiday factors are created for the various holiday codes as defined by the modelling system

Current Approach: Hols included in regression

Monday to Thursday - Holidays Included - Seasonal
WM Demand vs WM CWV
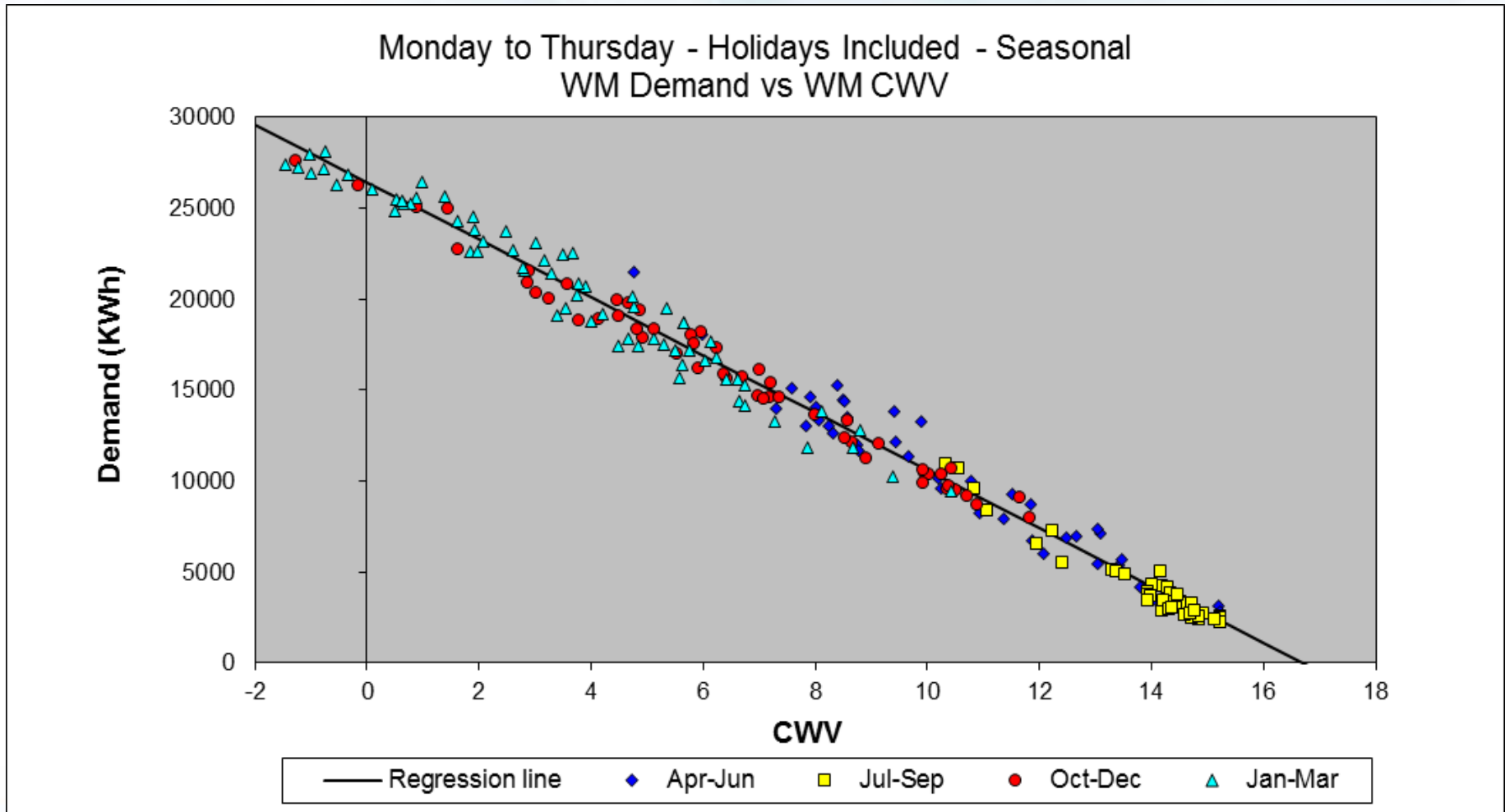
- Example above – core model based on 208 days
- Exclusions: All Fridays, Saturdays and Sundays

Model 1 Approach: Hols excluded from regression[14]

Monday to Thursday - Holidays Excluded - Seasonal
WM Demand vs WM CWV
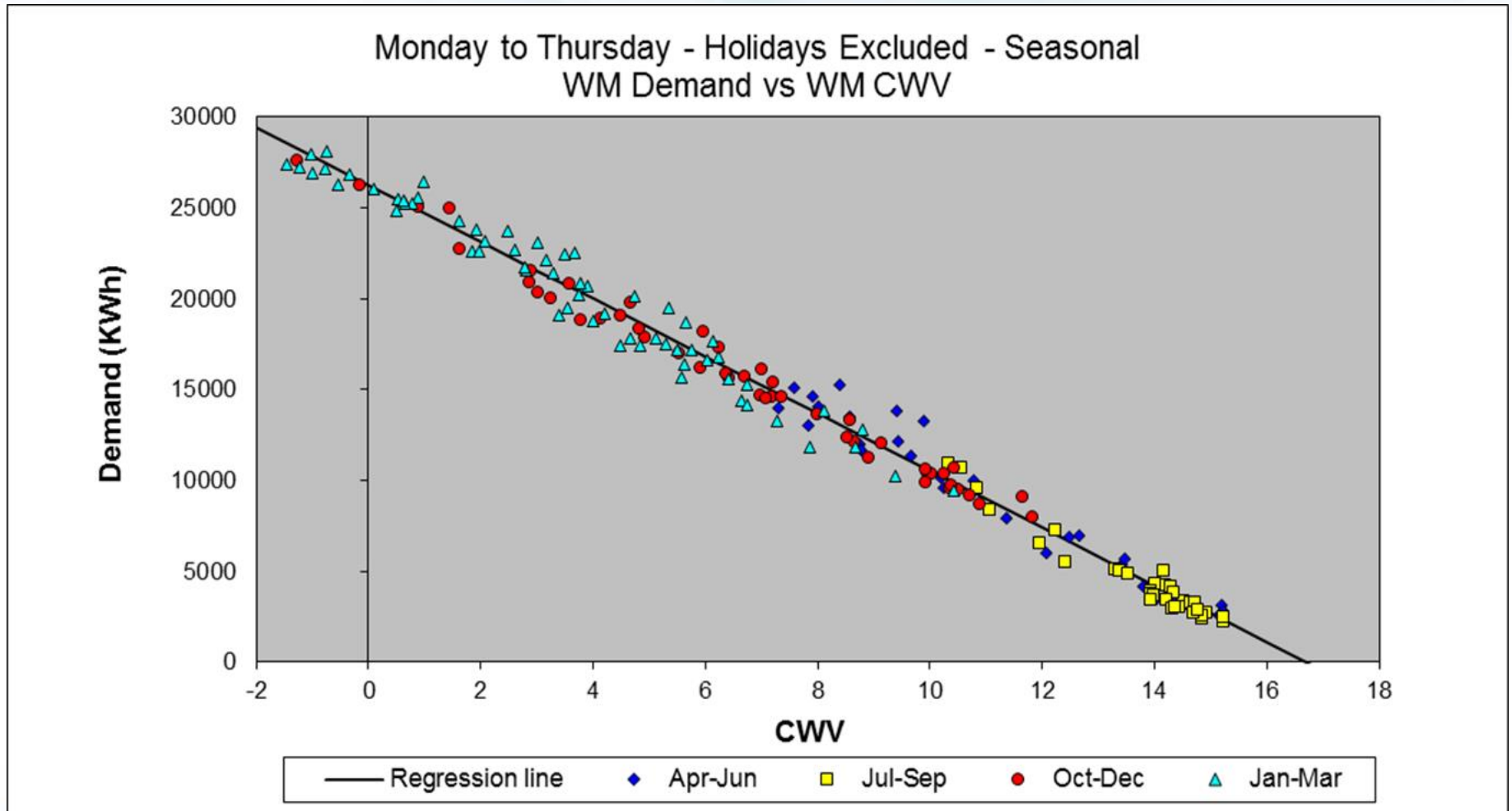
- Example above – core model based on 170 days
- Exclusions: All Fridays, Saturdays and Sundays and 'Holidays'

Model 1 statistics for 3 years vs Baseline model

	Lower than Baseline
🟥	Lower than Baseline
🟩	Higher than Baseline

LDZ	Year 1 (11/12) All days R_2		Year 2 (12/13) All days R_2		Year 3 (13/14) All days R_2	
	Baseline	Hol_EX	Baseline	Hol_EX	Baseline	Hol_EX
SC	97.9	97.7	97.5	97.4	98	97.7
NO	97.6	97.6	97.5	97.5	97.3	96.8
NW	98.5	98.6	97.9	98	98	97.7
NE	97.5	97.5	96.9	97	97.6	97.4
EM	98.8	98.9	98.1	98.2	98.5	98.4
WM	98.9	99	98.6	98.7	98.3	98
WN	98.5	98.6	97.9	98	98	97.7
WS	97.5	97.2	96.5	97	97.2	96.8
EA	98.7	98.8	98.4	98.5	98.1	97.9
NT	99	99	98.8	98.9	97.9	97.9
SE	98.9	98.8	98.8	98.9	98.2	98.2
SO	98.9	98.9	98.5	98.6	97.8	97.7
SW	98.7	98.7	98.4	98.5	97.5	97.4

- Table summarises the individual year model 'fits' for the 3 contributing years

- Year 1 differences very small, although more LDZs improved

- Year 2 results improved for majority of LDZs but again differences small

- Year 3 results worse for majority of LDZs and differences slightly bigger than Years 1 and 2

- Table summarises the individual year model 'fits' for the 3 contributing years
- *Note: Results for NW and WN are the same (same model)*

Model 1: Smoothed Holiday Factors

Mean (of 3 years)	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
Christmas (1)	1	1	0.997	0.984	0.97	1	0.997	0.959	0.995	0.977	0.96	0.977	0.971
Christmas (2)	1	1	1	1	1	1	1	0.999	1	1	1	0.998	0.989
Christmas (3)	1	1	1	1	0.999	1	1	0.999	1	1	1	0.999	0.973
Christmas (4)	1	1	0.997	1	1	0.998	0.997	0.994	1	0.997	0.984	0.979	0.993
Christmas (5)	1	0.998	0.99	0.973	0.994	0.994	0.99	0.988	1	0.985	0.995	0.972	0.995
Easter (1)	0.994	0.925	0.97	0.93	1	1	0.97	0.906	1	1	1	1	1
Easter (2)	0.978	0.969	0.978	0.955	0.994	1	0.978	0.941	1	1	1	1	1
Easter (3)	0.944	0.926	0.954	0.909	0.972	0.968	0.954	0.938	1	0.992	0.974	0.985	0.962
May Day (1)	0.991	0.975	0.951	0.937	0.98	1	0.951	1	0.999	1	1	1	1
May Day (2)	0.976	0.97	0.939	0.962	0.959	0.959	0.939	1	0.992	1	0.982	0.958	1
Spring Bank (1)	0.958	0.979	0.978	0.906	0.962	0.98	0.978	0.98	0.983	0.944	0.959	0.965	0.972
Spring Bank (2)	0.995	0.983	0.975	0.903	0.981	0.974	0.975	0.979	0.998	0.995	0.978	0.978	0.966
General Summer (1)	0.972	0.917	0.915	0.743	0.914	0.97	0.915	0.904	0.968	1	1	0.984	0.982
General Summer (2)	0.954	0.911	0.906	0.763	0.875	0.968	0.906	0.915	0.971	0.977	0.985	0.935	0.968
August Bank (1)	0.935	0.996	0.978	0.824	0.962	0.984	0.978	0.976	0.949	1	0.981	1	1
August Bank (2)	0.92	0.909	0.918	0.783	0.925	0.95	0.918	0.957	0.94	0.993	0.972	0.974	1
Summer reductions Mon-Thurs	1	1	1	0.869	1	1	1	1	1	1	1	1	1
Summer reductions Fri	1	1	1.008	0.877	1	1	1.008	1.013	1	1	1.011	1	1
Summer reductions Sat	1.01	1	1.033	0.869	1.012	1.037	1.033	1	1.037	1.009	1.043	1	1
Summer reductions Sun	1.024	1.026	1.036	0.88	1.037	1.051	1.036	1.027	1.048	1.041	1.056	1.047	1.045
LDZ Mean (of 3 years)	0.976	0.966	0.965	0.911	0.968	0.984	0.965	0.965	0.987	0.991	0.986	0.982	0.986

Overall Mean (of 3 years)	0.972

Overall Mean incl.SR (of 3 years)	0.978

- Overall mean for all Holiday Factors across all LDZs is 0.972

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Model 1: Example ALP for NW
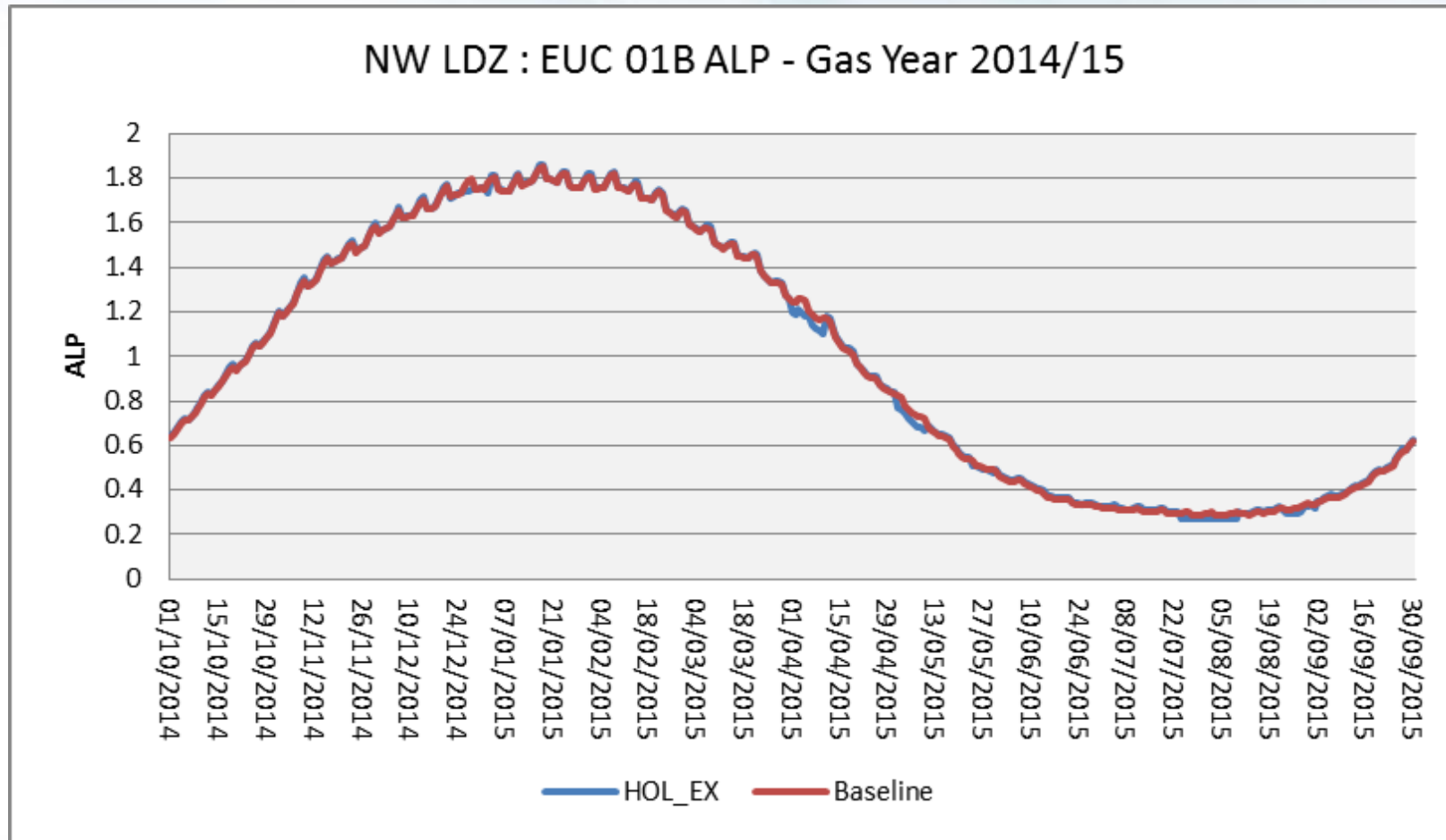
NW LDZ : EUC 01B ALP - Gas Year 2014/15

- The chart displays the smoothed model ALP for the different approaches – 'Baseline' and Model 1 (HOL_EX)

Model 1: Allocation Results

- The following slides compare the results of the baseline approach (reported in November) and the Model 1 approach <u>vs</u> the actual consumption from the sample data for the selected gas years
  - A positive % difference represents an over allocation from the estimate
  - A negative % difference represents an under allocation from the estimate

- A comparison of the differences in the results between the two approaches are also presented in order to assess whether the Model 1 approach is closer to the actual data

- Gas Years 2012/13, 2013/14, 2014/15 and 2015/16* have been tested
  - * Note: The sample data for 2015/16 has recently become available and is therefore an additional year available for testing since the last DESC in November

- Results are aggregated at 'Season' and 'Quarter' level

Note: 'Season' results for Gas Years 2012/13, 2013/14 and 2014/15 are provided as an Appendix at the end of the presentation

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Model 1: Results by Season – Gas Year 2015/16

GAS YEAR 2015	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.76%	0.12%	-1.82%	-1.49%	-1.54%	-0.47%	-1.41%	-0.12%	-2.36%	-1.33%	-0.46%	-0.77%	-1.02%
Summer	1.32%	-2.15%	4.18%	3.63%	2.80%	-1.49%	1.98%	-1.67%	3.92%	1.52%	-0.56%	0.22%	1.11%

NW2014_HOL_EX													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.82%	0.04%	-1.75%	-1.46%	-1.56%	-0.40%	-1.40%	0.00%	-2.33%	-1.29%	-0.40%	-0.73%	-0.99%
Summer	1.49%	-1.75%	4.11%	3.71%	2.23%	-1.61%	2.00%	-1.90%	3.91%	1.57%	-0.60%	0.22%	1.07%

Differences													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	0.06%	-0.08%	-0.07%	-0.03%	0.02%	-0.07%	-0.01%	-0.11%	-0.03%	-0.04%	-0.07%	-0.04%	-0.03%
Summer	0.17%	-0.39%	-0.07%	0.08%	-0.57%	0.12%	0.03%	0.23%	-0.01%	0.05%	0.04%	0.00%	-0.03%

SEASONS IMPROVED	0	2	2	1	1	1	1	1	2	1	1	1	2

- Overall, both seasons have a slightly smaller error compared with actual demand
  - 3 LDZs show an improvement in both seasons
  - 1 LDZ is worse in both seasons
  - 8 LDZs reveal mixed results of 1 season improving and 1 season worsening

- Change in approach not providing significant improvements for this Gas Year

Model 1: Results by Quarter – Gas Year 2015/16

GAS YEAR 2015	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-1.09%	0.42%	-2.99%	-0.54%	-2.01%	-0.79%	0.36%	-2.41%	-3.14%	-2.35%	0.50%	1.71%	-1.10%
Jan-Mar	-0.51%	-0.10%	-0.99%	-2.16%	-1.20%	-0.26%	-2.57%	1.39%	-1.86%	-0.67%	-1.07%	-2.29%	-0.97%
Apr-Jun	-2.92%	-6.09%	1.64%	0.78%	-1.07%	-2.65%	-1.38%	-5.13%	2.78%	0.31%	-2.33%	-1.37%	-1.61%
Jul-Sep	10.25%	8.82%	9.95%	10.80%	14.05%	1.53%	9.90%	7.50%	6.78%	4.62%	3.74%	3.91%	7.87%

NW2014_HOL_EX	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.88%	0.79%	-2.55%	0.04%	-2.43%	-0.52%	0.79%	-2.21%	-3.00%	-2.17%	0.72%	1.80%	-0.88%
Jan-Mar	-0.77%	-0.51%	-1.18%	-2.53%	-0.95%	-0.32%	-2.84%	1.46%	-1.89%	-0.72%	-1.10%	-2.28%	-1.07%
Apr-Jun	-2.74%	-5.86%	1.60%	1.19%	-1.60%	-2.77%	-0.99%	-5.13%	2.75%	0.23%	-2.34%	-1.32%	-1.58%
Jul-Sep	10.40%	9.68%	9.81%	10.06%	13.37%	1.44%	9.08%	6.68%	6.81%	5.01%	3.61%	3.82%	7.68%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.21%	0.38%	-0.44%	-0.50%	0.41%	-0.27%	0.43%	-0.20%	-0.14%	-0.18%	0.22%	0.08%	-0.22%
Jan-Mar	0.27%	0.41%	0.19%	0.37%	-0.25%	0.06%	0.27%	0.07%	0.03%	0.05%	0.03%	-0.01%	0.10%
Apr-Jun	-0.18%	-0.22%	-0.04%	0.40%	0.53%	0.13%	-0.39%	0.00%	-0.03%	-0.08%	0.01%	-0.05%	-0.03%
Jul-Sep	0.16%	0.86%	-0.14%	-0.74%	-0.68%	-0.09%	-0.82%	-0.82%	0.04%	0.38%	-0.13%	-0.10%	-0.19%

QUARTERS IMPROVED	2	1	3	2	2	2	2	2	2	2	1	3	3

- Overall, 3 of 4 quarters have a slightly smaller error compared with actual demand
- Mixed bag of results across the LDZs and quarters for this Gas Year

Model 1: Results by Quarter – Gas Year 2014/15

GAS YEAR 2014	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-1.03%	-0.10%	-1.86%	-1.00%	-0.78%	-0.66%	-2.99%	-0.93%	-0.10%	0.14%	0.97%	-0.73%	-0.75%
Jan-Mar	-2.10%	-2.34%	-2.81%	-3.31%	-1.58%	-1.19%	-3.60%	0.49%	-1.03%	-0.88%	0.00%	-2.34%	-1.67%
Apr-Jun	2.53%	3.33%	2.13%	5.05%	3.86%	3.49%	9.68%	-0.17%	4.06%	3.48%	-0.30%	6.55%	3.47%
Jul-Sep	8.77%	4.87%	16.62%	7.05%	2.17%	4.96%	11.18%	1.27%	-1.43%	-2.17%	-3.28%	3.96%	4.46%

NW2014_HOL_EX	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.88%	0.16%	-1.60%	-0.61%	-1.11%	-0.55%	-2.72%	-0.86%	-0.09%	0.13%	1.03%	-0.81%	-0.65%
Jan-Mar	-2.02%	-2.22%	-2.59%	-2.98%	-1.13%	-0.96%	-3.25%	0.70%	-0.91%	-0.68%	0.16%	-2.05%	-1.44%
Apr-Jun	1.90%	2.45%	1.15%	4.14%	3.43%	2.73%	8.75%	-0.43%	3.74%	2.86%	-0.64%	6.03%	2.84%
Jul-Sep	8.49%	4.77%	15.75%	5.91%	3.71%	4.50%	9.95%	0.30%	-1.55%	-2.10%	-3.67%	3.70%	4.10%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.15%	0.06%	-0.26%	-0.39%	0.33%	-0.11%	-0.27%	-0.06%	-0.01%	0.00%	0.06%	0.08%	-0.09%
Jan-Mar	-0.08%	-0.13%	-0.21%	-0.33%	-0.46%	-0.22%	-0.35%	0.20%	-0.12%	-0.21%	0.16%	-0.29%	-0.23%
Apr-Jun	-0.63%	-0.89%	-0.98%	-0.91%	-0.44%	-0.75%	-0.92%	0.26%	-0.32%	-0.61%	0.34%	-0.52%	-0.63%
Jul-Sep	-0.28%	-0.11%	-0.87%	-1.14%	1.54%	-0.46%	-1.24%	-0.96%	0.12%	-0.07%	0.39%	-0.26%	-0.36%

QUARTERS IMPROVED	4	3	4	4	2	4	4	2	3	4	0	3	4

- Overall, all 4 quarters have a slightly smaller error compared with actual demand
- Majority of LDZs and quarters show an improvement for this Gas Year

Model 1: Results by Quarter – Gas Year 2013/14

GAS YEAR 2013	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-4.54%	-3.49%	-3.88%	-3.00%	-3.55%	-2.20%	-3.05%	-3.73%	-3.70%	-4.35%	-1.27%	-1.49%	-3.19%
Jan-Mar	-0.76%	-1.47%	-5.15%	-2.56%	-2.66%	-2.42%	-5.54%	-0.91%	-0.33%	-1.48%	-3.38%	-3.01%	-2.47%
Apr-Jun	0.73%	-2.37%	2.33%	0.50%	0.12%	-1.37%	-0.31%	2.60%	3.79%	4.03%	-2.49%	2.20%	0.73%
Jul-Sep	13.44%	6.25%	19.06%	7.19%	5.32%	8.37%	14.11%	0.88%	-5.98%	2.79%	-0.12%	4.17%	6.06%

NW2014_HOL_EX	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-4.48%	-3.35%	-3.72%	-2.71%	-3.90%	-2.19%	-2.88%	-3.74%	-3.73%	-4.45%	-1.27%	-1.64%	-3.18%
Jan-Mar	-0.66%	-1.31%	-4.91%	-2.24%	-2.36%	-2.17%	-5.21%	-0.67%	-0.20%	-1.23%	-3.21%	-2.71%	-2.24%
Apr-Jun	0.39%	-2.92%	1.56%	-0.29%	-1.26%	-2.06%	-1.14%	2.33%	3.46%	3.42%	-2.79%	1.68%	0.12%
Jul-Sep	13.27%	6.54%	18.35%	6.01%	6.06%	7.86%	13.17%	-0.16%	-6.03%	2.89%	-0.38%	4.00%	5.72%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.06%	-0.14%	-0.16%	-0.29%	0.35%	-0.01%	-0.17%	0.01%	0.03%	0.10%	-0.01%	0.16%	-0.02%
Jan-Mar	-0.10%	-0.16%	-0.25%	-0.32%	-0.30%	-0.25%	-0.33%	-0.24%	-0.14%	-0.25%	-0.17%	-0.31%	-0.23%
Apr-Jun	-0.34%	0.56%	-0.77%	-0.21%	1.14%	0.69%	0.83%	-0.27%	-0.34%	-0.61%	0.30%	-0.53%	-0.61%
Jul-Sep	-0.17%	0.29%	-0.72%	-1.18%	0.74%	-0.51%	-0.94%	-0.71%	0.05%	0.11%	0.26%	-0.17%	-0.34%

QUARTERS IMPROVED	4	2	4	4	1	3	3	3	2	2	2	3	4

- Overall, all 4 quarters have a slightly smaller error compared with actual demand
- Majority of LDZs and quarters show an improvement for this Gas Year

Model 1: Results by Quarter – Gas Year 2012/13

GAS YEAR 2012	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-3.61%	-0.98%	-2.74%	-4.15%	-2.03%	1.99%	-1.70%	0.16%	1.38%	1.20%	0.17%	-0.59%	-1.00%
Jan-Mar	0.09%	-0.36%	-1.20%	-1.47%	-1.22%	0.28%	-0.83%	-0.15%	1.83%	-0.14%	-0.96%	1.14%	-0.26%
Apr-Jun	1.48%	1.07%	0.01%	3.95%	0.56%	-0.66%	-1.13%	0.92%	-0.01%	0.21%	-2.26%	-0.38%	0.33%
Jul-Sep	9.26%	10.53%	15.67%	12.92%	8.35%	8.64%	7.93%	1.22%	-6.91%	-0.10%	1.12%	8.91%	6.30%

NW2014_HOL_EX	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-3.56%	-0.84%	-2.56%	-3.80%	-2.06%	2.09%	-1.43%	0.22%	1.40%	1.21%	0.25%	-0.60%	-0.90%
Jan-Mar	-0.05%	-0.66%	-1.26%	-1.61%	-0.68%	0.36%	-0.94%	-0.01%	1.88%	-0.08%	-0.91%	1.31%	-0.23%
Apr-Jun	1.14%	0.71%	-0.52%	3.47%	0.33%	-1.10%	-1.54%	0.89%	-0.18%	-0.15%	-2.47%	-0.76%	0.00%
Jul-Sep	9.62%	11.64%	15.80%	12.50%	9.94%	8.61%	7.54%	0.54%	-6.88%	0.23%	0.96%	8.85%	6.43%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.05%	-0.14%	-0.18%	-0.35%	0.03%	0.10%	-0.27%	0.05%	0.03%	0.00%	0.08%	0.01%	-0.11%
Jan-Mar	-0.03%	0.30%	0.06%	0.14%	-0.54%	0.07%	0.11%	-0.14%	0.05%	-0.06%	-0.05%	0.17%	-0.03%
Apr-Jun	-0.34%	-0.36%	0.50%	-0.49%	-0.23%	0.44%	0.41%	-0.02%	0.16%	-0.06%	0.22%	0.38%	-0.33%
Jul-Sep	0.36%	1.11%	0.14%	-0.41%	1.59%	-0.02%	-0.39%	-0.68%	-0.04%	0.13%	-0.16%	-0.06%	0.13%

QUARTERS IMPROVED	3	2	1	3	2	1	2	3	1	2	2	1	3

- Overall, 3 of 4 quarters have a slightly smaller error compared with actual demand
- Mixed bag of results across the LDZs and quarters for this Gas Year

Model 1: Conclusions

- When considering the results for "All LDZs" for the 'Seasons' all 4 Gas Years show a marginal improvement

- When considering the results for "All LDZs" for the 'Quarters', 14 of the 16 quarters showed a marginal improvement

- At an LDZ level 2 of the 4 Gas Years showed a consistent improvement with the other 2 Gas Years revealing more of a mixed picture of results

- Over the 4 years analysed it appears there may be some benefit in adopting this approach for 01B (excluding holidays) although improvements are not statistically significant (confirmed by a t-test).

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Alternative Modelling Approaches

Results for Alternative modelling approaches (Model 2) – Summer Reductions analysis

Model 2: Summer Reductions Overview

- The summer reduction principle is present in the modelling system to test for those EUCs for which the demand does not flatten off at warm temperatures but rather falls away to lower than expected values

- To identify these cases a test is carried out by calculating a summer multiplier and comparing this to a defined threshold

- The summer multiplier is calculated using Monday to Thursday data from the period to which summer reductions are considered to apply (starts on the Sunday before the Spring Bank Holiday Monday and ends on the last Sunday in September)

- Summer multiplier = $\dfrac{\text{Sum of demands}}{\text{Sum of fitted values}}$

Model 2: Summer Reductions Overview

- The current approach for the summer multiplier test is:
  - 5% reduction in single year regression
  - 10% reduction in smoothed model (over 3 years)

- The criteria applied in making the decision as to whether to apply summer reductions to the final smoothed is as follows:

  - The summer multipliers for the 3 individual year models for the EUC are averaged
  - If this average summer multiplier is less than the critical value of 0.9 (a 10% reduction) then summer reductions are applied in the smoothed model
  - If the average summer multiplier is greater than or equal to the critical value then summer reductions are not applied to the smoothed model

Model 2 Approach

- The second scenario tested (Model 2) produced revised 01B models using identical criteria for all parameters except the tolerance criteria for the Summer Reduction tests were amended - see table below:

Scenario	Modelling Ref.	Spring Analysis	Individual Years used	Modelling Approach - Parameters					Comment
				Hols incl.	Cut Off	Warm Weather Cut-Off	Sum. Red. Ind. Test	Sum. Red. Smo. Test	
Establish baseline position for 01B results	Baseline	2014	Apr'11 to Mar'12 Apr'12 to Mar'13 Mar'13 to Mar'14	Y	N	2	5%	10%	Represents current Spring Approach. This model was used to derive ALPs, DAFs used in November DESC baseline analysis
Revise Summer Reduction tests	Model 2 (NW2014_SR)	2014	Apr'11 to Mar'12 Apr'12 to Mar'13 Mar'13 to Mar'14	Y	N	2	2.5%	5%	Requested by DESC at November meeting

- For this approach, the individual year test was halved from 5% to 2.5% and the smoothed year test was halved from 10% to 5%

- The core Monday to Thursday (M to T) model will be based on the same number of days (approx. 210) but where a model has shown a summer reduction, those affected days will have been adjusted prior to contributing to the M to T model

Model 2: Summer Reduction Results

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Baseline Test	Ind. Yr SR Test	0.95	Sm. SR Test	0.9
Model 2 Test	Ind. Yr SR Test	0.975	Sm. SR Test	0.95

	Year 1 (11/12)		Year 2 (12/13)		Year 3 (13/14)		Smoothed Model	
	Baseline	SR	Baseline	SR	Baseline	SR	Baseline	SR
SC	1	1	0.854	0.854	0.902	0.902	0.919	0.919
NO	1	1	0.869	0.869	1	0.951	0.956	0.94
NW	1	1	0.868	0.868	0.946	0.946	0.938	0.938
NE	1	1	0.783	0.783	0.806	0.806	0.863	0.863
EM	1	1	0.824	0.824	0.864	0.864	0.896	0.896
WM	1	1	0.904	0.904	1	0.97	0.968	0.958
WN	1	1	0.868	0.868	0.946	0.946	0.938	0.938
WS	1	1	0.834	0.834	1	1	0.945	0.945
EA	1	1	0.868	0.868	1	1	0.956	0.956
NT	1	1	1	1	1	1	1	1
SE	1	1	0.906	0.906	1	1	0.969	0.969
SO	1	1	1	0.955	1	1	1	0.985
SW	1	1	0.838	0.838	1	1	0.946	0.946

- By reducing the tolerance tests the smoothed models for LDZ SC, NO, NW, WN, WS and SW now have a Summer Reduction

Model 2 statistics for 3 years vs Baseline model

	Red	Lower than Baseline
	Green	Higher than Baseline

LDZ	Year 1 (11/12) All days R_2		Year 2 (12/13) All days R_2		Year 3 (13/14) All days R_2	
	Baseline	SR	Baseline	SR	Baseline	SR
SC	97.9	97.9	97.5	97.5	98	98
NO	97.6	97.6	97.5	97.5	97.3	97.2
NW	98.5	98.5	97.9	97.9	98	98
NE	97.5	97.5	96.9	96.9	97.6	97.6
EM	98.8	98.8	98.1	98.1	98.5	98.5
WM	98.9	98.9	98.6	98.6	98.3	98.3
WN	98.5	98.5	97.9	97.9	98	98
WS	97.5	97.5	96.5	96.5	97.2	97.2
EA	98.7	98.7	98.4	98.4	98.1	98.1
NT	99	99	98.8	98.8	97.9	97.9
SE	98.9	98.9	98.8	98.8	98.2	98.2
SO	98.9	98.9	98.5	98.5	97.8	97.8
SW	98.7	98.7	98.4	98.4	97.5	97.5

- Majority of models were not impacted by change in threshold from 5% to 2.5%

- Year 1 results the same as zero models indicated a Summer Reduction

- Year 2 results the same although outcome for LDZ SO changed to a Summer Reduction model (no change to R_2 though)

- Year 3 results the same for all LDZs except NO. Outcomes for LDZ 'NO' and 'WM' changed to a Summer Reduction model

- Table summarises the individual year model 'fits' for the 3 contributing years

Model 2: Example ALP for SC
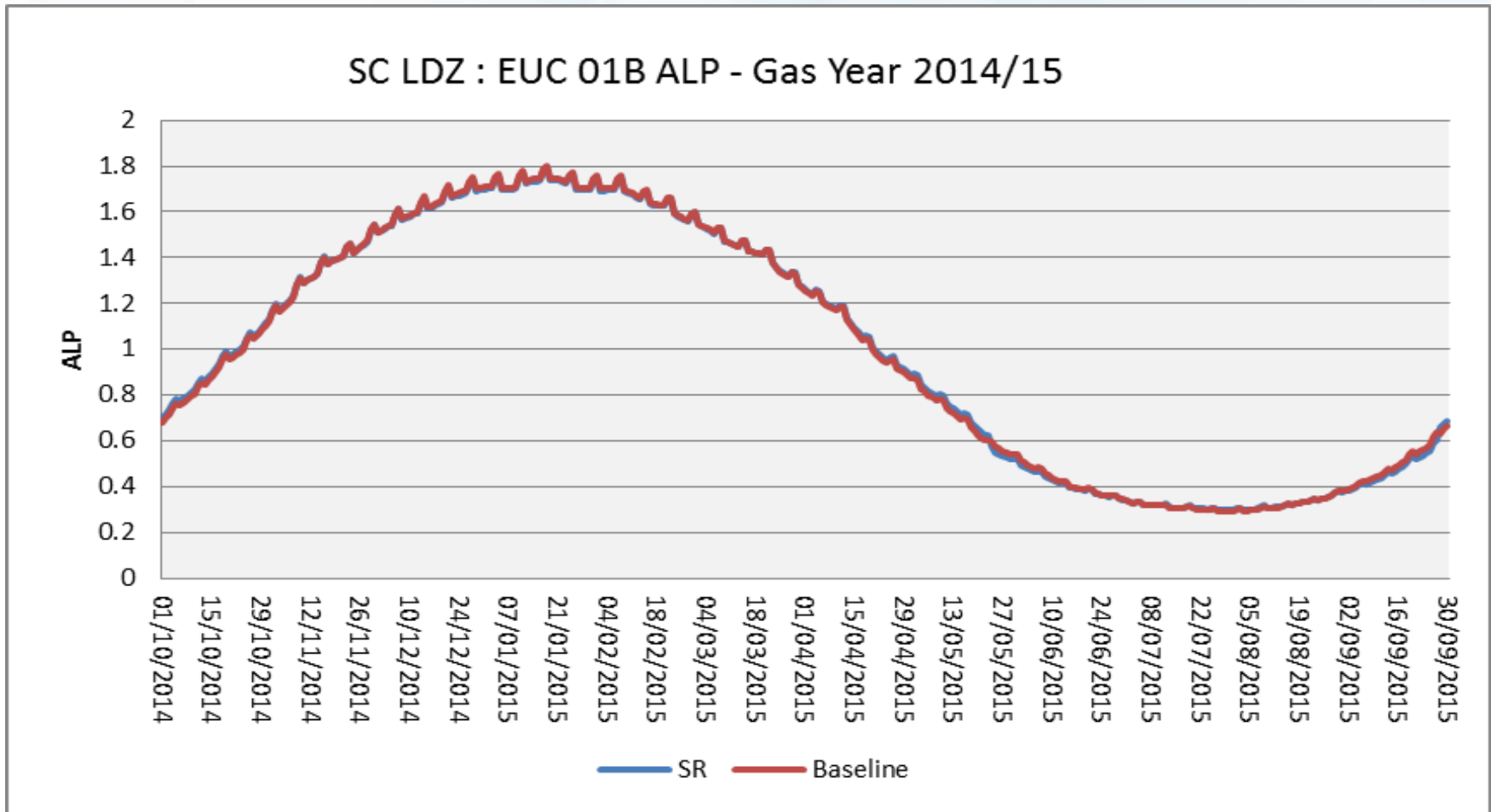
SC LDZ : EUC 01B ALP - Gas Year 2014/15

- The chart displays the smoothed model ALP for the different approaches – 'Baseline' and Model 2 (SR)

Model 2: Allocation Results

- The following slides compare the results of the baseline approach (reported in November) and the Model 2 approach <u>vs</u> the actual consumption from the sample data for the selected gas years

- The differences in the results between the two approaches are also compared in order to assess whether the Model 2 approach is closer to the actual data

- Results are aggregated at 'Season' and 'Quarter' level

- Gas Years 2012/13, 2013/14, 2014/15 and 2015/16* have been tested
  - * Note: The sample data for 2015/16 has recently become available and is therefore an additional year available for testing since the last DESC in November

- *Note: 'Season' results for Gas Years 2012/13, 2013/14 and 2014/15 are provided as an Appendix at the end of the presentation*

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Model 2: Results by Season – Gas Year 2015/16

GAS YEAR 2015	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.76%	0.12%	-1.82%	-1.49%	-1.54%	-0.47%	-1.41%	-0.12%	-2.36%	-1.33%	-0.46%	-0.77%	-1.02%
Summer	1.32%	-2.15%	4.18%	3.63%	2.80%	-1.49%	1.98%	-1.67%	3.92%	1.52%	-0.56%	0.22%	1.11%

NW2014_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.84%	0.14%	-1.80%	-1.49%	-1.54%	-0.47%	-1.46%	-0.12%	-2.36%	-1.33%	-0.46%	-0.79%	-1.03%
Summer	1.64%	-1.84%	4.60%	3.63%	2.80%	-1.49%	2.78%	-1.67%	3.92%	1.52%	-0.56%	0.78%	1.30%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	0.08%	0.02%	-0.02%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.02%	0.01%
Summer	0.32%	-0.30%	0.42%	0.00%	0.00%	0.00%	0.80%	0.00%	0.00%	0.00%	0.00%	0.56%	0.19%

SEASONS IMPROVED	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
	0	1	1	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	0	0

- Overall, both seasons have a slightly larger error compared with actual demand
  - 0 LDZs show an improvement in both seasons
  - 3 LDZ are worse in both seasons
  - 2 LDZs reveal mixed results of 1 season improving and 1 season worsening
  - 7 LDZs were identical models because the change in SR threshold had no impact

- Change in approach not providing improvement for this Gas Year

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Model 2: Results by Quarter – Gas Year 2015/16

GAS YEAR 2015	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-1.09%	0.42%	-2.99%	-0.54%	-2.01%	-0.79%	0.36%	-2.41%	-3.14%	-2.35%	0.50%	1.71%	-1.10%
Jan-Mar	-0.51%	-0.10%	-0.99%	-2.16%	-1.20%	-0.26%	-2.57%	1.39%	-1.86%	-0.67%	-1.07%	-2.29%	-0.97%
Apr-Jun	-2.92%	-6.09%	1.64%	0.78%	-1.07%	-2.65%	-1.38%	-5.13%	2.78%	0.31%	-2.33%	-1.37%	-1.61%
Jul-Sep	10.25%	8.82%	9.95%	10.80%	14.05%	1.53%	9.90%	7.50%	6.78%	4.62%	3.74%	3.91%	7.87%

NW2014_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.74%	0.76%	-2.56%	-0.54%	-2.01%	-0.79%	0.77%	-2.41%	-3.14%	-2.35%	0.50%	2.15%	-0.94%
Jan-Mar	-0.92%	-0.31%	-1.26%	-2.16%	-1.20%	-0.26%	-2.92%	1.39%	-1.86%	-0.67%	-1.07%	-2.59%	-1.10%
Apr-Jun	-2.08%	-5.83%	2.29%	0.78%	-1.07%	-2.65%	-0.61%	-5.13%	2.78%	0.31%	-2.33%	-0.76%	-1.36%
Jul-Sep	9.49%	9.27%	9.84%	10.80%	14.05%	1.53%	10.77%	7.50%	6.78%	4.62%	3.74%	4.36%	7.91%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.34%	0.35%	-0.43%	0.00%	0.00%	0.00%	0.41%	0.00%	0.00%	0.00%	0.00%	0.43%	-0.16%
Jan-Mar	0.41%	0.22%	0.27%	0.00%	0.00%	0.00%	0.36%	0.00%	0.00%	0.00%	0.00%	0.31%	0.13%
Apr-Jun	-0.83%	-0.25%	0.65%	0.00%	0.00%	0.00%	-0.77%	0.00%	0.00%	0.00%	0.00%	-0.61%	-0.26%
Jul-Sep	-0.76%	0.45%	-0.11%	0.00%	0.00%	0.00%	0.87%	0.00%	0.00%	0.00%	0.00%	0.45%	0.04%

QUARTERS IMPROVED	3	1	2	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	1	2

- Overall, 2 of 4 quarters have a smaller error compared with actual demand
- Mixed bag of results across the LDZs and quarters for this Gas Year

GAS YEAR 2014	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-1.03%	-0.10%	-1.86%	-1.00%	-0.78%	-0.66%	-2.99%	-0.93%	-0.10%	0.14%	0.97%	-0.73%	-0.75%
Jan-Mar	-2.10%	-2.34%	-2.81%	-3.31%	-1.58%	-1.19%	-3.60%	0.49%	-1.03%	-0.88%	0.00%	-2.34%	-1.67%
Apr-Jun	2.53%	3.33%	2.13%	5.05%	3.86%	3.49%	9.68%	-0.17%	4.06%	3.48%	-0.30%	6.55%	3.47%
Jul-Sep	8.77%	4.87%	16.62%	7.05%	2.17%	4.96%	11.18%	1.27%	-1.43%	-2.17%	-3.28%	3.96%	4.46%

NW2014_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.66%	0.20%	-1.58%	-1.00%	-0.78%	-0.66%	-2.77%	-0.93%	-0.10%	0.14%	0.97%	-0.53%	-0.64%
Jan-Mar	-2.48%	-2.54%	-3.08%	-3.31%	-1.58%	-1.19%	-3.94%	0.49%	-1.03%	-0.88%	0.00%	-2.64%	-1.79%
Apr-Jun	2.03%	3.29%	2.02%	5.05%	3.86%	3.49%	9.96%	-0.17%	4.06%	3.48%	-0.30%	6.85%	3.44%
Jul-Sep	6.44%	3.47%	14.53%	7.05%	2.17%	4.96%	10.17%	1.27%	-1.43%	-2.17%	-3.28%	3.06%	3.81%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.37%	0.10%	-0.28%	0.00%	0.00%	0.00%	-0.22%	0.00%	0.00%	0.00%	0.00%	-0.19%	-0.11%
Jan-Mar	0.38%	0.19%	0.28%	0.00%	0.00%	0.00%	0.34%	0.00%	0.00%	0.00%	0.00%	0.30%	0.12%
Apr-Jun	-0.50%	-0.04%	-0.11%	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.00%	0.00%	0.30%	-0.03%
Jul-Sep	-2.32%	-1.41%	-2.08%	0.00%	0.00%	0.00%	-1.01%	0.00%	0.00%	0.00%	0.00%	-0.90%	-0.66%

| QUARTERS IMPROVED | 3 | 2 | 3 | N/A | N/A | N/A | 2 | N/A | N/A | N/A | N/A | 2 | 3 |

- Overall, 3 of 4 quarters have a slightly smaller error compared with actual demand
- 2 LDZs showed improvement for 3 of 4 quarters for this Gas Year

Model 2: Results by Quarter – Gas Year 2013/14

GAS YEAR 2013	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-4.54%	-3.49%	-3.88%	-3.00%	-3.55%	-2.20%	-3.05%	-3.73%	-3.70%	-4.35%	-1.27%	-1.49%	-3.19%
Jan-Mar	-0.76%	-1.47%	-5.15%	-2.56%	-2.66%	-2.42%	-5.54%	-0.91%	-0.33%	-1.48%	-3.38%	-3.01%	-2.47%
Apr-Jun	0.73%	-2.37%	2.33%	0.50%	0.12%	-1.37%	-0.31%	2.60%	3.79%	4.03%	-2.49%	2.20%	0.73%
Jul-Sep	13.44%	6.25%	19.06%	7.19%	5.32%	8.37%	14.11%	0.88%	-5.98%	2.79%	-0.12%	4.17%	6.06%

NW2014_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-4.26%	-3.24%	-3.65%	-3.00%	-3.55%	-2.20%	-2.86%	-3.73%	-3.70%	-4.35%	-1.27%	-1.33%	-3.11%
Jan-Mar	-1.00%	-1.54%	-5.28%	-2.56%	-2.66%	-2.42%	-5.76%	-0.91%	-0.33%	-1.48%	-3.38%	-3.23%	-2.55%
Apr-Jun	1.84%	-1.54%	3.09%	0.50%	0.12%	-1.37%	0.58%	2.60%	3.79%	4.03%	-2.49%	2.93%	1.09%
Jul-Sep	12.54%	5.80%	17.76%	7.19%	5.32%	8.37%	14.62%	0.88%	-5.98%	2.79%	-0.12%	4.10%	5.87%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.28%	-0.25%	-0.24%	0.00%	0.00%	0.00%	-0.19%	0.00%	0.00%	0.00%	0.00%	-0.16%	-0.09%
Jan-Mar	0.24%	0.08%	0.13%	0.00%	0.00%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.21%	0.07%
Apr-Jun	1.11%	-0.83%	0.76%	0.00%	0.00%	0.00%	0.27%	0.00%	0.00%	0.00%	0.00%	0.73%	0.36%
Jul-Sep	-0.90%	-0.46%	-1.30%	0.00%	0.00%	0.00%	0.51%	0.00%	0.00%	0.00%	0.00%	-0.08%	-0.19%

| QUARTERS IMPROVED | 2 | 3 | 2 | N/A | N/A | N/A | 1 | N/A | N/A | N/A | N/A | 2 | 2 |

- Overall, 2 of 4 quarters have a slightly smaller error compared with actual demand
- Mixed bag of results across the LDZs and quarters for this Gas Year

Model 2: Results by Quarter – Gas Year 2012/13

GAS YEAR 2012	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-3.61%	-0.98%	-2.74%	-4.15%	-2.03%	1.99%	-1.70%	0.16%	1.38%	1.20%	0.17%	-0.59%	-1.00%
Jan-Mar	0.09%	-0.36%	-1.20%	-1.47%	-1.22%	0.28%	-0.83%	-0.15%	1.83%	-0.14%	-0.96%	1.14%	-0.26%
Apr-Jun	1.48%	1.07%	0.01%	3.95%	0.56%	-0.66%	-1.13%	0.92%	-0.01%	0.21%	-2.26%	-0.38%	0.33%
Jul-Sep	9.26%	10.53%	15.67%	12.92%	8.35%	8.64%	7.93%	1.22%	-6.91%	-0.10%	1.12%	8.91%	6.30%

NW2014_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-3.62%	-0.94%	-2.71%	-4.15%	-2.03%	1.99%	-1.73%	0.16%	1.38%	1.20%	0.17%	-0.61%	-1.00%
Jan-Mar	-0.43%	-0.67%	-1.58%	-1.47%	-1.22%	0.28%	-1.33%	-0.15%	1.83%	-0.14%	-0.96%	0.70%	-0.43%
Apr-Jun	1.63%	1.33%	0.03%	3.95%	0.56%	-0.66%	-1.13%	0.92%	-0.01%	0.21%	-2.26%	-0.40%	0.36%
Jul-Sep	7.92%	9.96%	14.58%	12.92%	8.35%	8.64%	8.40%	1.22%	-6.91%	-0.10%	1.12%	8.72%	6.05%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	0.00%	-0.04%	-0.03%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%
Jan-Mar	0.34%	0.31%	0.38%	0.00%	0.00%	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%	-0.45%	0.17%
Apr-Jun	0.15%	0.26%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.03%
Jul-Sep	-1.34%	-0.57%	-1.09%	0.00%	0.00%	0.00%	0.47%	0.00%	0.00%	0.00%	0.00%	-0.19%	-0.25%

QUARTERS IMPROVED	1	2	2	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	2	2

- Overall, 2 of 4 quarters have a slightly smaller error compared with actual demand
- Mixed bag of results across the LDZs and quarters for this Gas Year

Model 2: Conclusions

- When considering the results for "All LDZs" for the 'Seasons' there were no gas years where both seasons showed an improvement

- When considering the results for "All LDZs" for the 'Quarters', 9 of the 16 quarters showed a marginal improvement

- At an LDZ level some LDZs showed improvement in the July to September quarter for 2 of the Gas Years

- The change in tolerance for summer reductions did not affect 7 models for all 4 gas years

- Over the 4 years analysed it does not appear that this change on its own would bring significant benefits

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Model 3 Approach

- The third scenario tested produced revised 01B models where the approaches used for Models 1 and 2 were combined, see table below:

Scenario	Modelling Ref.	Spring Analysis	Individual Years used	Modelling Approach - Parameters					Comment
				Hols incl.	Cut Off	Warm Weather Cut-Off	Sum. Red. Ind. Test	Sum. Red. Smo. Test	
Establish baseline position for 01B results	Baseline	2014	Apr'11 to Mar'12 Apr'12 to Mar'13 Mar'13 to Mar'14	Y	N	2	5%	10%	Represents current Spring Approach. This model was used to derive ALPs, DAFs used in November DESC baseline analysis
Holidays excluded, revise Summer Reduction tests	Model 3 (NW2014_HOL_SR)	2014	Apr'11 to Mar'12 Apr'12 to Mar'13 Mar'13 to Mar'14	N	N	2	2.5%	5%	Alternative approach combining both parameters changing

- In practice this means the core Monday to Thursday model will reduce from approximately 210 days to approx 170 days

- A set of holiday factors are created for the various holiday codes as defined by the modelling system

Model 3: Summer Reduction Results

Baseline Test	Ind. Yr SR Test	0.95		Sm. SR Test	0.9
Model 3 Test	Ind. Yr SR Test	0.975		Sm. SR Test	0.95

	Year 1 (11/12)		Year 2 (12/13)		Year 3 (13/14)		Smoothed Model	
	Baseline	HOL_SR	Baseline	HOL_SR	Baseline	HOL_SR	Baseline	HOL_SR
SC	1	1	0.854	0.863	0.902	0.88	0.919	0.914
NO	1	1	0.869	0.871	1	0.886	0.956	0.919
NW	1	1	0.868	0.873	0.946	0.917	0.938	0.93
NE	1	1	0.783	0.808	0.806	0.799	0.863	0.869
EM	1	1	0.824	0.841	0.864	0.861	0.896	0.901
WM	1	1	0.904	0.929	1	0.915	0.968	0.948
WN	1	1	0.868	0.873	0.946	0.917	0.938	0.93
WS	1	1	0.834	0.88	1	0.93	0.945	0.937
EA	1	1	0.868	0.901	1	1	0.956	0.967
NT	1	1	1	1	1	1	1	1
SE	1	1	0.906	0.934	1	1	0.969	0.978
SO	1	1	1	1	1	1	1	1
SW	1	1	0.838	0.853	1	1	0.946	0.951

- By reducing the tolerance tests the smoothed models for LDZ SC, NO, NW, WM, WN and WS now have a Summer Reduction

Model 3 statistics for 3 years vs Baseline model

	Lower than Baseline
	Higher than Baseline

LDZ	Year 1 (11/12) All days R$_2$		Year 2 (12/13) All days R$_2$		Year 3 (13/14) All days R$_2$	
	Baseline	HOL_SR	Baseline	HOL_SR	Baseline	HOL_SR
SC	97.9	97.7	97.5	97.4	98	97.7
NO	97.6	97.6	97.5	97.5	97.3	96.8
NW	98.5	98.6	97.9	98	98	97.7
NE	97.5	97.5	96.9	97	97.6	97.4
EM	98.8	98.9	98.1	98.2	98.5	98.4
WM	98.9	99	98.6	98.7	98.3	98
WN	98.5	98.6	97.9	98	98	97.7
WS	97.5	97.2	96.5	97	97.2	96.8
EA	98.7	98.8	98.4	98.5	98.1	97.9
NT	99	99	98.8	98.9	97.9	97.9
SE	98.9	98.8	98.8	98.9	98.2	98.2
SO	98.9	98.9	98.5	98.6	97.8	97.7
SW	98.7	98.7	98.4	98.5	97.5	97.4

- Table summarises the individual year model 'fits' for the 3 contributing years

- Year 1 differences very small, although more LDZs improved

- Year 2 results improved for majority of LDZs but again differences small

- Year 3 results worse for majority of LDZs and differences slightly bigger than Years 1 and 2

- Table summarises the individual year model 'fits' for the 3 contributing years

Model 3: Example ALP for NO
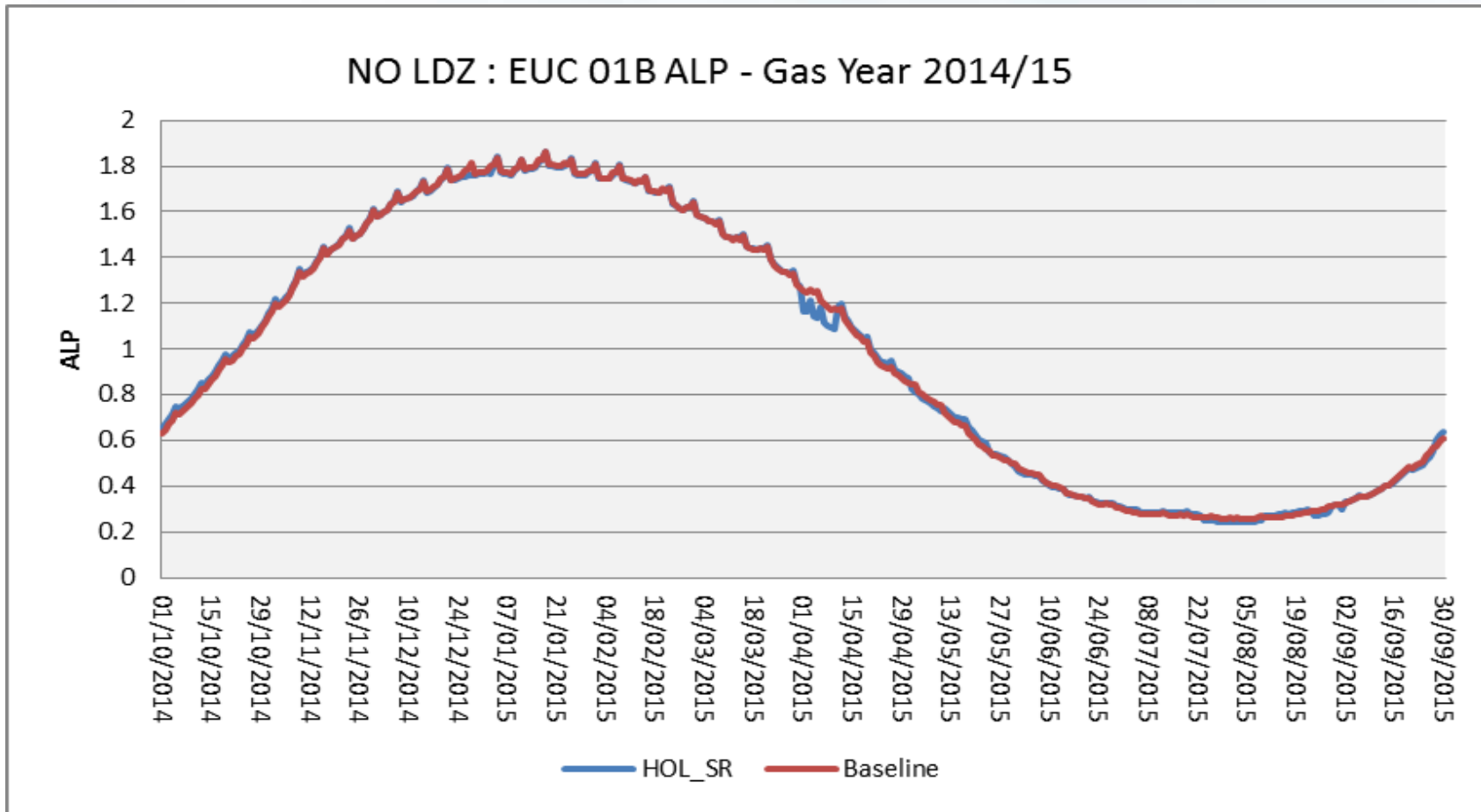
NO LDZ : EUC 01B ALP - Gas Year 2014/15

- The chart displays the smoothed model ALP for the different approaches – 'Baseline' and Model 3 (HOL_SR)

GAS YEAR 2015	SEASONS	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Baseline		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		-0.76%	0.12%	-1.82%	-1.49%	-1.54%	-0.47%	-1.41%	-0.12%	-2.36%	-1.33%	-0.46%	-0.77%	-1.02%
Summer		1.32%	-2.15%	4.18%	3.63%	2.80%	-1.49%	1.98%	-1.67%	3.92%	1.52%	-0.56%	0.22%	1.11%

NW2014_HOL_SR		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		-0.95%	0.10%	-1.74%	-1.46%	-1.50%	-0.43%	-1.40%	0.00%	-2.33%	-1.29%	-0.40%	-0.73%	-1.00%
Summer		1.87%	-1.37%	4.58%	3.71%	2.95%	-1.10%	2.60%	-1.90%	3.91%	1.57%	-0.60%	0.22%	1.33%

Differences		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		0.19%	-0.02%	-0.08%	-0.03%	-0.03%	-0.05%	-0.01%	-0.11%	-0.03%	-0.04%	-0.07%	-0.04%	-0.02%
Summer		0.56%	-0.78%	0.40%	0.08%	0.15%	-0.39%	0.62%	0.23%	-0.01%	0.05%	0.04%	0.00%	0.23%

SEASONS IMPROVED		0	2	1	1	1	2	1	1	2	1	1	1	1

- Overall, winter has a slightly smaller error compared with actual demand
  - 3 LDZs show an improvement in both seasons
  - 1 LDZ is worse in both seasons
  - 8 LDZs reveal mixed results of 1 season improving and 1 season worsening

- Change in approach not providing significant improvements for this Gas Year

GAS YEAR 2015	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-1.09%	0.42%	-2.99%	-0.54%	-2.01%	-0.79%	0.36%	-2.41%	-3.14%	-2.35%	0.50%	1.71%	-1.10%
Jan-Mar	-0.51%	-0.10%	-0.99%	-2.16%	-1.20%	-0.26%	-2.57%	1.39%	-1.86%	-0.67%	-1.07%	-2.29%	-0.97%
Apr-Jun	-2.92%	-6.09%	1.64%	0.78%	-1.07%	-2.65%	-1.38%	-5.13%	2.78%	0.31%	-2.33%	-1.37%	-1.61%
Jul-Sep	10.25%	8.82%	9.95%	10.80%	14.05%	1.53%	9.90%	7.50%	6.78%	4.62%	3.74%	3.91%	7.87%

NW2014_HOL_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.54%	1.30%	-2.08%	0.04%	-1.79%	-0.26%	1.24%	-2.21%	-3.00%	-2.17%	0.72%	1.80%	-0.65%
Jan-Mar	-1.26%	-0.78%	-1.50%	-2.53%	-1.30%	-0.54%	-3.14%	1.46%	-1.89%	-0.72%	-1.10%	-2.28%	-1.24%
Apr-Jun	-1.68%	-5.32%	2.53%	1.19%	-0.62%	-2.21%	-0.15%	-5.13%	2.75%	0.23%	-2.34%	-1.32%	-1.16%
Jul-Sep	9.37%	9.62%	9.26%	10.06%	13.32%	1.81%	9.07%	6.68%	6.81%	5.01%	3.61%	3.82%	7.53%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.54%	0.88%	-0.90%	-0.50%	-0.22%	-0.53%	0.88%	-0.20%	-0.14%	-0.18%	0.22%	0.08%	-0.45%
Jan-Mar	0.75%	0.68%	0.51%	0.37%	0.10%	0.28%	0.57%	0.07%	0.03%	0.05%	0.03%	-0.01%	0.27%
Apr-Jun	-1.24%	-0.77%	0.89%	0.40%	-0.45%	-0.44%	-1.23%	0.00%	-0.03%	-0.08%	0.01%	-0.05%	-0.46%
Jul-Sep	-0.88%	0.80%	-0.69%	-0.74%	-0.72%	0.28%	-0.82%	-0.82%	0.04%	0.38%	-0.13%	-0.10%	-0.34%

QUARTERS IMPROVED	3	1	2	2	3	2	2	2	2	2	1	3	3

- Overall, 3 of 4 quarters have a slightly smaller error compared with actual demand
- Mixed bag of results across the LDZs and quarters for this Gas Year

Model 3: Results by Quarter – Gas Year 2014/15

GAS YEAR 2014	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-1.03%	-0.10%	-1.86%	-1.00%	-0.78%	-0.66%	-2.99%	-0.93%	-0.10%	0.14%	0.97%	-0.73%	-0.75%
Jan-Mar	-2.10%	-2.34%	-2.81%	-3.31%	-1.58%	-1.19%	-3.60%	0.49%	-1.03%	-0.88%	0.00%	-2.34%	-1.67%
Apr-Jun	2.53%	3.33%	2.13%	5.05%	3.86%	3.49%	9.68%	-0.17%	4.06%	3.48%	-0.30%	6.55%	3.47%
Jul-Sep	8.77%	4.87%	16.62%	7.05%	2.17%	4.96%	11.18%	1.27%	-1.43%	-2.17%	-3.28%	3.96%	4.46%

NW2014_HOL_SR													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.53%	0.59%	-1.31%	-0.61%	-0.71%	-0.42%	-2.46%	-0.86%	-0.09%	0.13%	1.03%	-0.81%	-0.50%
Jan-Mar	-2.45%	-2.44%	-2.90%	-2.98%	-1.46%	-1.17%	-3.52%	0.70%	-0.91%	-0.68%	0.16%	-2.05%	-1.58%
Apr-Jun	1.76%	2.56%	1.38%	4.14%	3.88%	2.98%	9.18%	-0.43%	3.74%	2.86%	-0.64%	6.03%	2.94%
Jul-Sep	5.87%	2.42%	13.10%	5.91%	1.14%	3.15%	8.16%	0.30%	-1.55%	-2.10%	-3.67%	3.70%	2.99%

Differences													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.50%	0.49%	-0.55%	-0.39%	-0.08%	-0.24%	-0.53%	-0.06%	-0.01%	0.00%	0.06%	0.08%	-0.25%
Jan-Mar	0.35%	0.09%	0.09%	-0.33%	-0.12%	-0.02%	-0.08%	0.20%	-0.12%	-0.21%	0.16%	-0.29%	-0.09%
Apr-Jun	-0.77%	-0.78%	-0.75%	-0.91%	0.02%	-0.51%	-0.50%	0.26%	-0.32%	-0.61%	0.34%	-0.52%	-0.52%
Jul-Sep	-2.89%	-2.46%	-3.52%	-1.14%	-1.04%	-1.81%	-3.02%	-0.96%	0.12%	-0.07%	0.39%	-0.26%	-1.48%

QUARTERS IMPROVED	3	2	3	4	3	4	4	2	3	4	0	3	4

- Overall, all 4 quarters have a slightly smaller error compared with actual demand
- July to September results show a marked improvement for this Gas Year

Model 3: Results by Quarter – Gas Year 2013/14

GAS YEAR 2013	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-4.54%	-3.49%	-3.88%	-3.00%	-3.55%	-2.20%	-3.05%	-3.73%	-3.70%	-4.35%	-1.27%	-1.49%	-3.19%
Jan-Mar	-0.76%	-1.47%	-5.15%	-2.56%	-2.66%	-2.42%	-5.54%	-0.91%	-0.33%	-1.48%	-3.38%	-3.01%	-2.47%
Apr-Jun	0.73%	-2.37%	2.33%	0.50%	0.12%	-1.37%	-0.31%	2.60%	3.79%	4.03%	-2.49%	2.20%	0.73%
Jul-Sep	13.44%	6.25%	19.06%	7.19%	5.32%	8.37%	14.11%	0.88%	-5.98%	2.79%	-0.12%	4.17%	6.06%

NW2014_HOL_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-4.21%	-2.98%	-3.48%	-2.71%	-3.55%	-2.09%	-2.64%	-3.74%	-3.73%	-4.45%	-1.27%	-1.64%	-3.05%
Jan-Mar	-0.93%	-1.38%	-5.05%	-2.24%	-2.52%	-2.29%	-5.37%	-0.67%	-0.20%	-1.23%	-3.21%	-2.71%	-2.32%
Apr-Jun	1.84%	-1.71%	2.69%	-0.29%	0.31%	-1.34%	-0.12%	2.33%	3.46%	3.42%	-2.79%	1.68%	0.72%
Jul-Sep	12.13%	5.37%	16.56%	6.01%	4.36%	7.31%	12.71%	-0.16%	-6.03%	2.89%	-0.38%	4.00%	5.16%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.33%	-0.51%	-0.40%	-0.29%	0.00%	-0.11%	-0.41%	0.01%	0.03%	0.10%	-0.01%	0.16%	-0.14%
Jan-Mar	0.17%	-0.09%	-0.10%	-0.32%	-0.14%	-0.13%	-0.17%	-0.24%	-0.14%	-0.25%	-0.17%	-0.31%	-0.16%
Apr-Jun	1.11%	-0.66%	0.36%	-0.21%	0.19%	-0.03%	-0.19%	-0.27%	-0.34%	-0.61%	0.30%	-0.53%	-0.01%
Jul-Sep	-1.31%	-0.88%	-2.50%	-1.18%	-0.96%	-1.06%	-1.40%	-0.71%	0.05%	0.11%	0.26%	-0.17%	-0.90%

QUARTERS IMPROVED	2	4	3	4	3	4	4	3	2	2	2	3	4

- Overall, all 4 quarters have a slightly smaller error compared with actual demand
- Majority of LDZs and quarters show an improvement for this Gas Year

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Model 3: Results by Quarter – Gas Year 2012/13

GAS YEAR 2012	QUARTERS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-3.61%	-0.98%	-2.74%	-4.15%	-2.03%	1.99%	-1.70%	0.16%	1.38%	1.20%	0.17%	-0.59%	-1.00%
Jan-Mar	0.09%	-0.36%	-1.20%	-1.47%	-1.22%	0.28%	-0.83%	-0.15%	1.83%	-0.14%	-0.96%	1.14%	-0.26%
Apr-Jun	1.48%	1.07%	0.01%	3.95%	0.56%	-0.66%	-1.13%	0.92%	-0.01%	0.21%	-2.26%	-0.38%	0.33%
Jul-Sep	9.26%	10.53%	15.67%	12.92%	8.35%	8.64%	7.93%	1.22%	-6.91%	-0.10%	1.12%	8.91%	6.30%

NW2014_HOL_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-3.59%	-0.74%	-2.53%	-3.80%	-1.98%	2.06%	-1.39%	0.22%	1.40%	1.21%	0.25%	-0.60%	-0.88%
Jan-Mar	-0.63%	-1.05%	-1.69%	-1.61%	-1.24%	0.04%	-1.36%	-0.01%	1.88%	-0.08%	-0.91%	1.31%	-0.44%
Apr-Jun	1.56%	1.23%	-0.18%	3.47%	0.72%	-1.00%	-1.34%	0.89%	-0.18%	-0.15%	-2.47%	-0.76%	0.16%
Jul-Sep	7.92%	10.23%	14.13%	12.50%	7.87%	7.71%	7.02%	0.54%	-6.88%	0.23%	0.96%	8.85%	5.75%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Oct-Dec	-0.02%	-0.23%	-0.21%	-0.35%	-0.05%	0.07%	-0.31%	0.05%	0.03%	0.00%	0.08%	0.01%	-0.12%
Jan-Mar	0.54%	0.69%	0.48%	0.14%	0.02%	-0.24%	0.53%	-0.14%	0.05%	-0.06%	-0.05%	0.17%	0.18%
Apr-Jun	0.08%	0.16%	0.17%	-0.49%	0.16%	0.34%	0.22%	-0.02%	0.16%	-0.06%	0.22%	0.38%	-0.17%
Jul-Sep	-1.34%	-0.30%	-1.54%	-0.41%	-0.48%	-0.93%	-0.91%	-0.68%	-0.04%	0.13%	-0.16%	-0.06%	-0.56%

QUARTERS IMPROVED	2	2	2	3	2	2	2	3	1	2	2	1	3

- Overall, 3 of 4 quarters have a slightly smaller error compared with actual demand
- Mixed bag of results across the LDZs and quarters for this Gas Year

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Model 3: Conclusions

- When considering the results for "All LDZs" for the 'Seasons' there were 2 gas years where both seasons showed an improvement

- When considering the results for "All LDZs" for the 'Quarters', 14 of the 16 quarters showed a marginal improvement

- At an LDZ level 2 of the 4 Gas Years showed a consistent improvement with the other 2 Gas Years revealing more of a mixed picture of results

- The change in tolerance for summer reductions did not affect 6 models for all 4 gas years

- Over the 4 years analysed it appears there may be some benefit in adopting this approach for 01B (excluding holidays) although improvements are not statistically significant (confirmed by a t-test).

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Additional analysis undertaken

- For Models 1 and 3 some additional analysis was performed but based on the Spring 2016 smoothed models

Model training data used to develop Smoothed model

| | Year 1 | Year 2 | Year 3 |

Timeline: J-M 2011, A-J 2011, J-S 2011, O-D 2011, J-M 2012, A-J 2012, J-S 2012, O-D 2012, J-M 2013, A-J 2013, J-S 2013, O-D 2013, J-M 2014, A-J 2014, J-S 2014, O-D 2014, J-M 2015, A-J 2015, J-S 2015, O-D 2015, J-M 2016, A-J 2016, J-S 2016

NDM Allocation re-run using new ALPs/DAFs

| GY 12/13 | GY 13/14 | GY 14/15 | GY 15/16 |
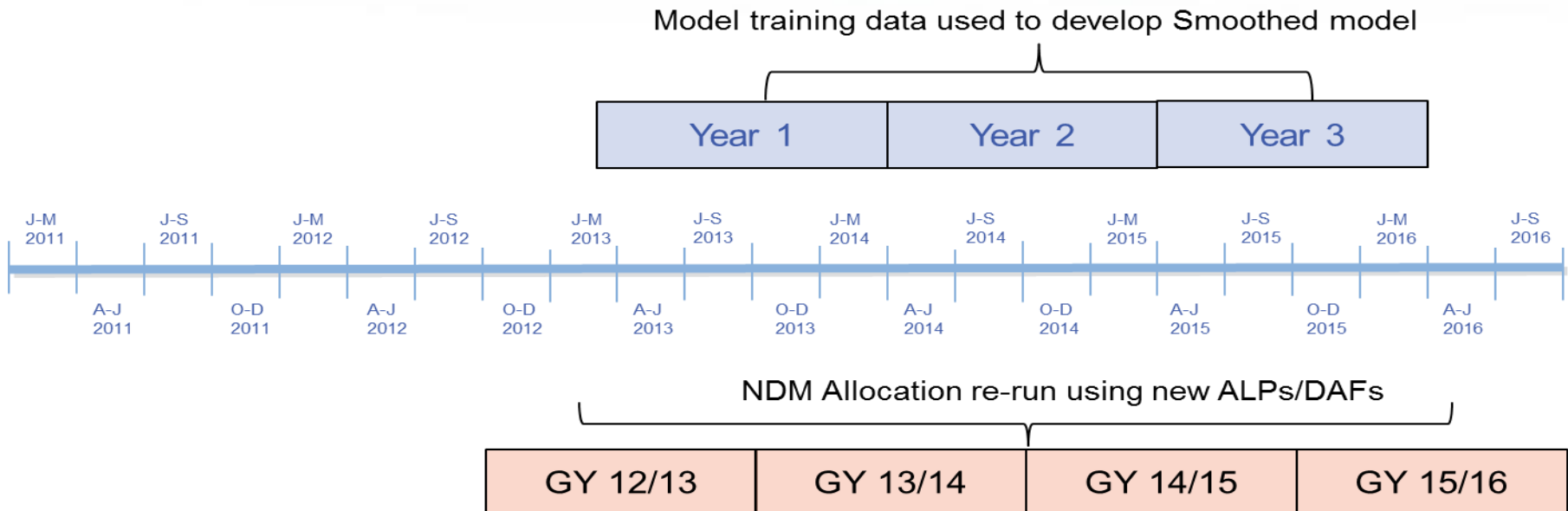
- Diagram above shows that Smoothed Model and subsequent ALPs/DAFs are derived from the weather experienced in Summer 2013, 2014 and 2015
- NDM Allocation re-run using revised ALPs/DAFs tested against Summer 2013, 2014, 2015 and 2016

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Additional analysis results

- For Models 1 and 3 some additional analysis was performed but based on the Spring 2016 smoothed models

- As seen with diagram on previous slide the issue with this approach is that it does not reflect our reality of having to use historic data to form a model, prior to using it for a future gas year

- Overall results were similar, in the sense we did not observe a significant difference by changing approaches

- Detailed results not included in this presentation as similar conclusions to Spring 2014 analysis, however they are available if DESC would like to see them

Unidentified Gas Analysis

Analysis of UG using alternative modelling approaches

Unidentified Gas

- There is a new concept of daily Unidentified Gas (UG) in the post Nexus regime. For background info on UG please refer to the DESC presentation (16th Feb 2016)

- Previous review identified that there is an association between the levels of 01B allocation accuracy and the simulated levels of UG and therefore concluding that there would be an added benefit of smaller UG levels should an improvement be possible

- To assess the impacts to UG of the different modelling approaches, allocation has been recalculated using
    - Model 1 : Holidays excluded (HOL_EX)
    - Model 3 : Holidays excluded but with modified Summer reduction test (HOL_SR)

- The next few slides show the average percentage UG for both models compared to the Baseline, by LDZ for the 4 gas years analysed.

UG Comparisons by Model – Gas Year 2012/13
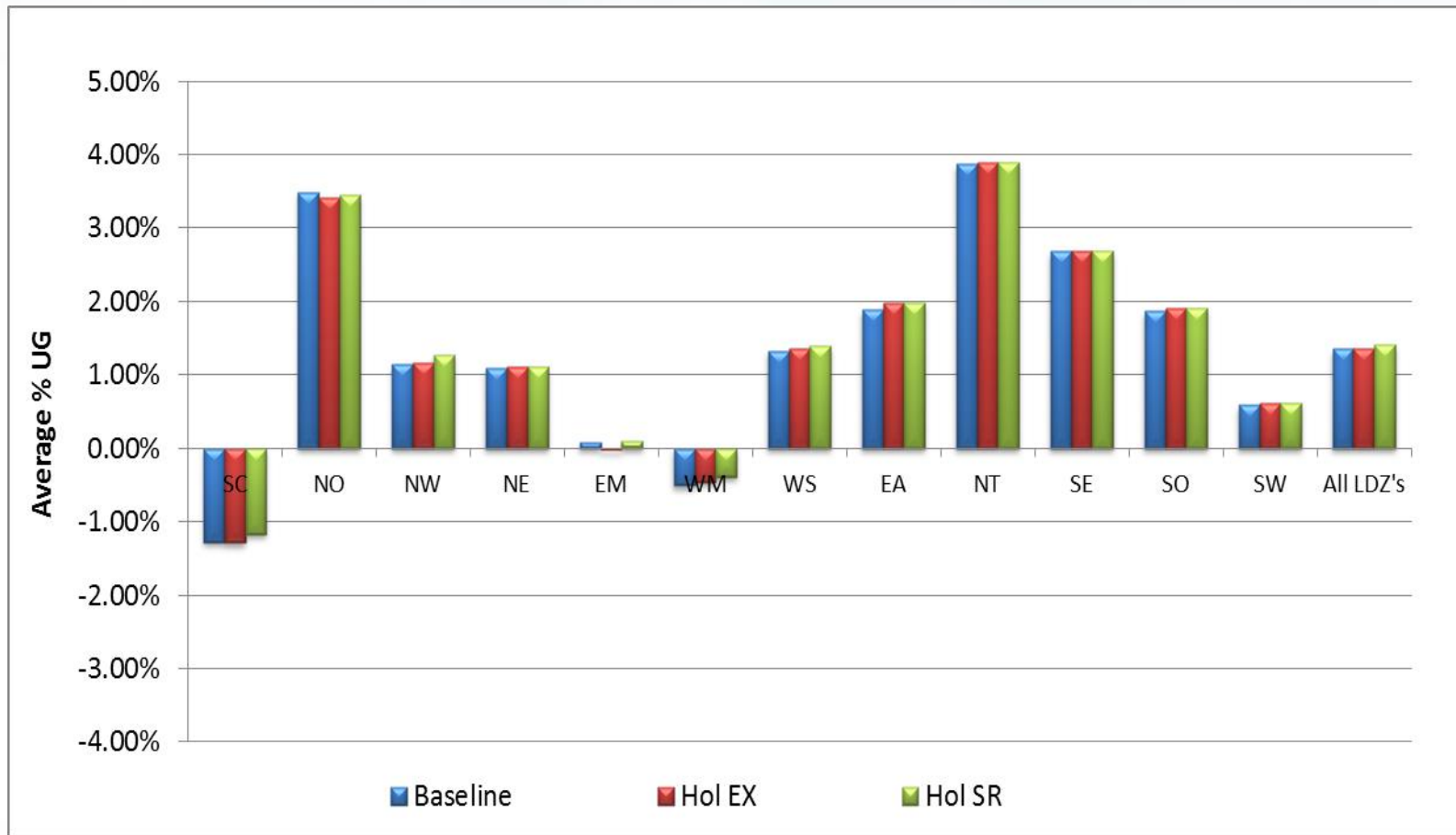
Overall, the baseline position is better than the other two models tested. The difference however, is very small. Baseline model has an average UG which is 0.01% better than HOL_EX and 0.05% better than HOL_SR.

UG Comparisons by Model – Gas Year 2013/14
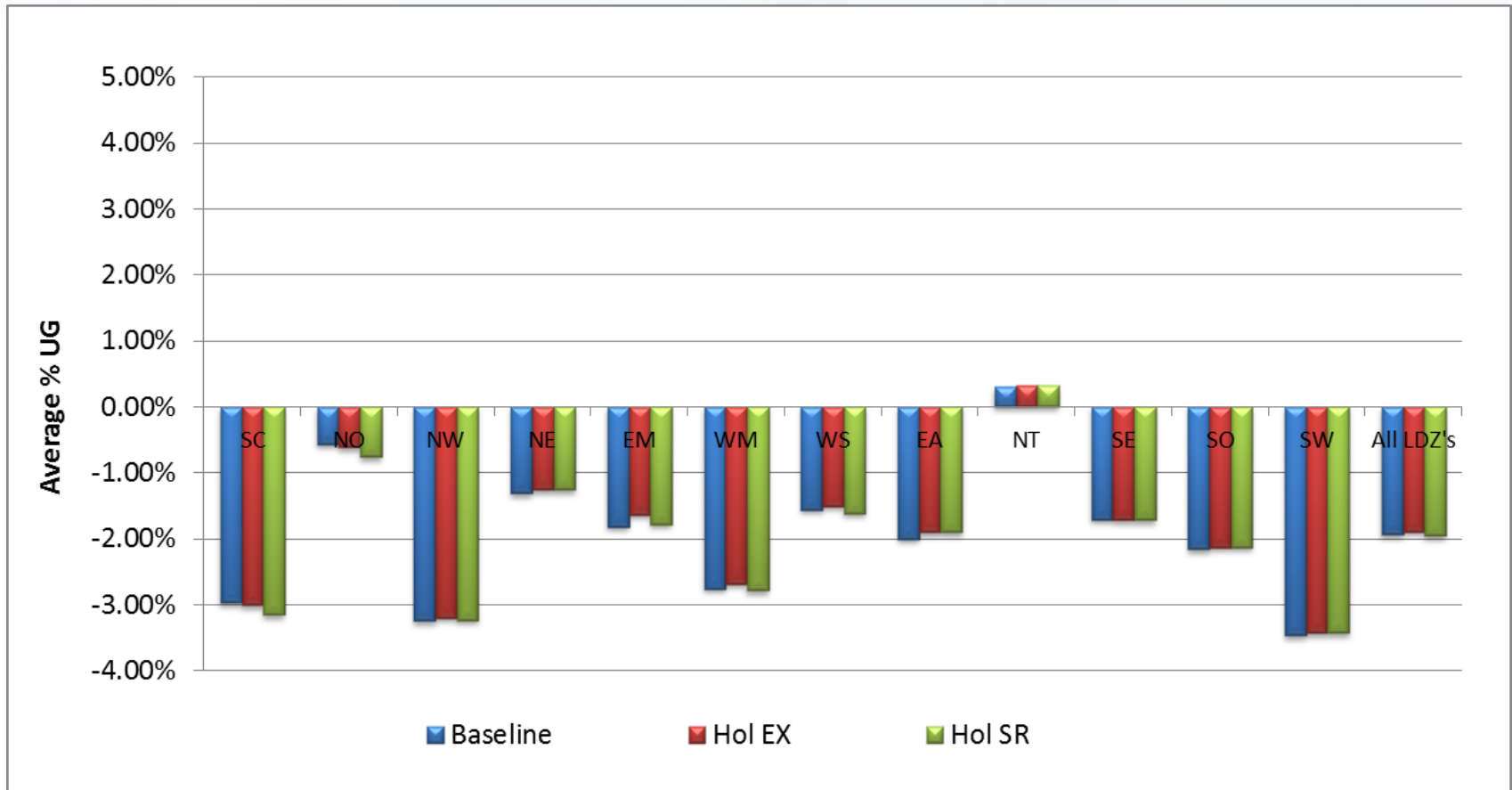
Overall, the HOL_EX model delivered a smaller UG when compared to the other two models. The difference however, is very small. HOL_EX model has an average UG which is 0.04% better than the baseline position and 0.05% better than HOL_SR.

UG Comparisons by Model – Gas Year 2014/15
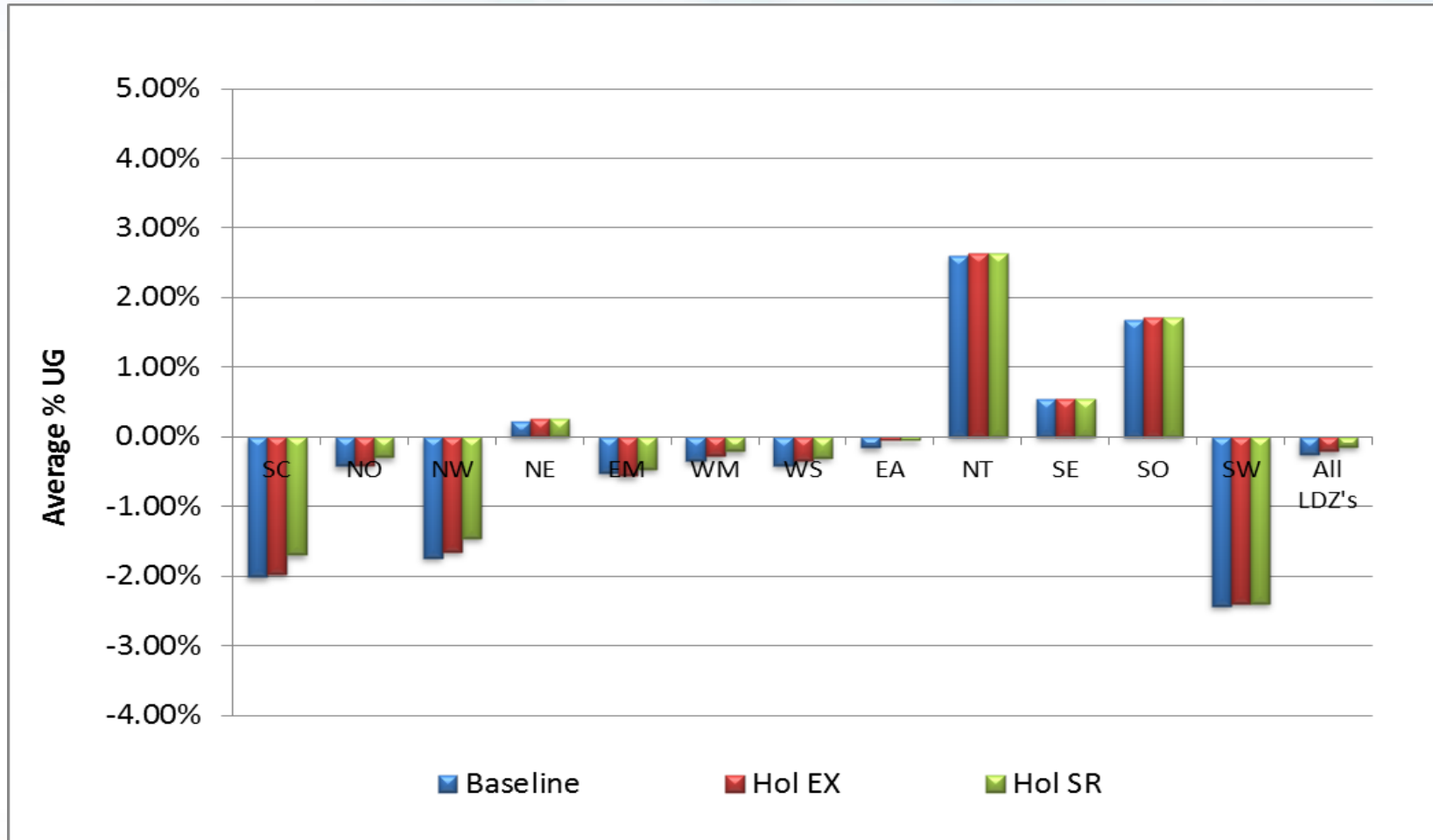
Overall, the HOL_SR model delivered a smaller UG when compared to the other two models. The difference however, is very small. HOL_SR model has an average UG which is 0.11% better than the baseline position and 0.07% better than HOL_EX.

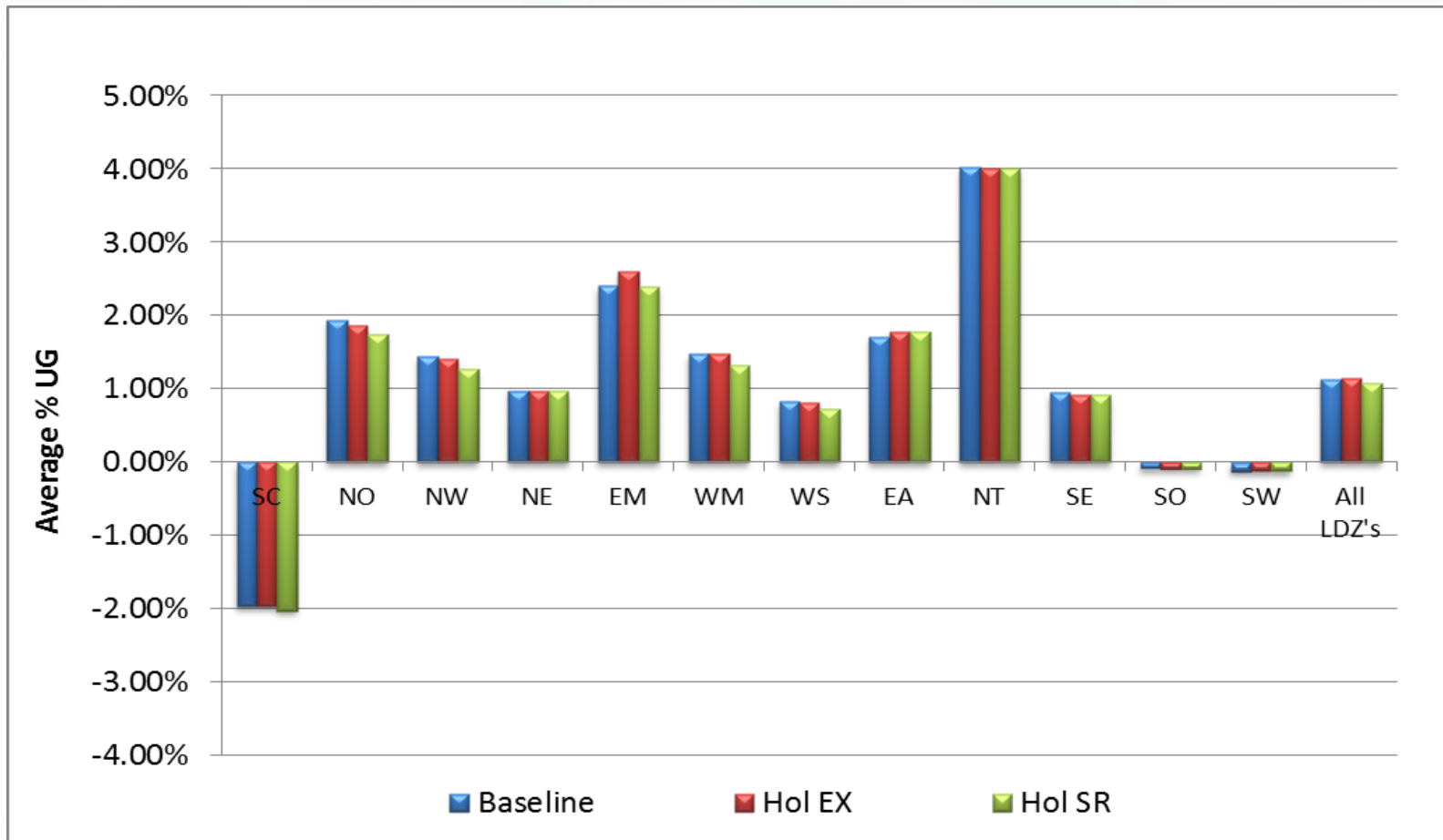# UG Comparisons by Model – Gas Year 2015/16

Overall, the HOL_SR model delivered a smaller UG when compared to the other two models. The difference however, is very small. HOL_SR model has an average UG which is 0.05% better than the baseline position and 0.06% better than HOL_EX.

Conclusions

- Supporting Document gives further results on the UG analysis by seasons and quarters.

- Overall, where there is an improvement to UG, the difference was statistically insignificant (confirmed by a t-test)

Load Factor Impacts

Analysis of Load Factor Impacts using alternative modelling approaches

Load Factors

- Changes to smoothed models will not only have an impact on ALP and DAF profiles but will also have an effect on load factors

- To assess extent of differences, load factors have been recalculated for
    - Model 1 (Holidays excluded) and
    - Model 3 (Holidays excluded but with modified Summer reduction tests)

- The recalculations were performed in the same way as they are undertaken to derive the load factors each Spring.

- The charts on the following slides show difference in Load Factor for each of the reworked models compared to the 2014 values
    - The analysis showed a potential effect on load factor.
    - The differences are described in percentage points.
    - For example for LDZ SC for model 1 the load factor changed from 34.3% rising to 34.5%. This has been expressed as an increase of 0.2%

Load Factors - changes Model 1 (HOL_EX)

Percentage Point change in 01B Load Factor for each scenario (Model 1)
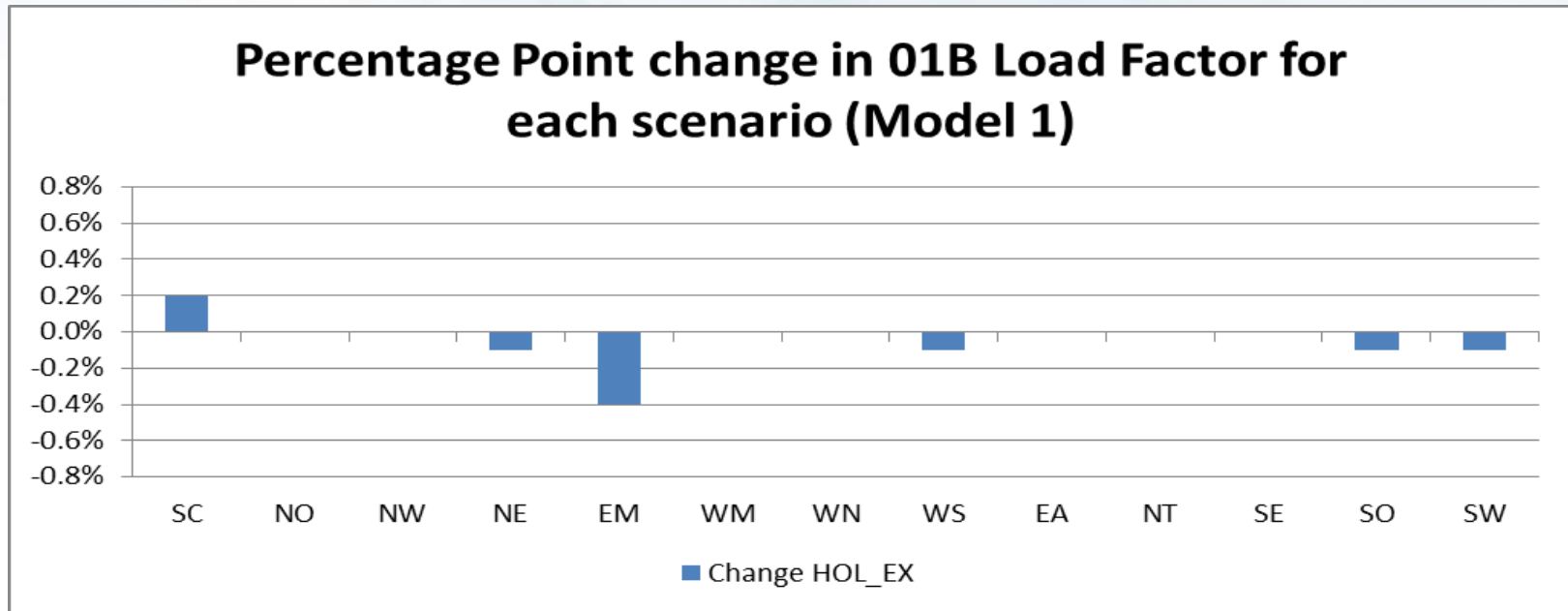
- Model 1 (HOL_EX) showed relatively small differences in load factor
  - 7 LDZs showed no change (NO, NW, WM, WN, EA, NT and SE)
  - 5 LDZs showed a decrease ranging from -0.4% for EM to -0.1% for NE, WS, SO and SW.
  - 1 LDZ, SC showed an increase of 0.2%

Load Factors - changes Model 3 (HOL_SR)

Percentage Point change in 01B Load Factor for each scenario (Model 3)
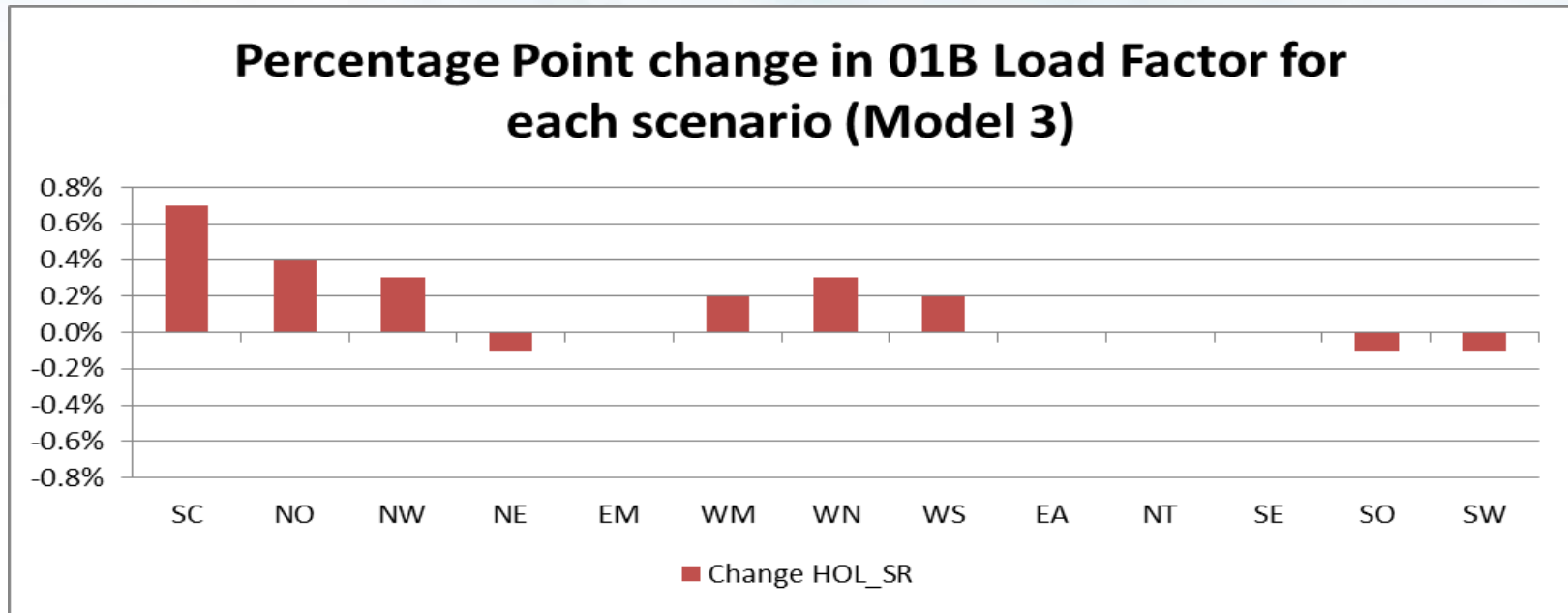
- Model 3 (HOL_SR) showed more change in load factors
  - 4 LDZs had no change (EM, EA, NT and SE)
  - 6 LDZs (SC, NO, NW, WM, WN and WS) had an increase in LF ranging from 0.2% to 0.7%
  - 3 LDZs (NE, SO and SW) had a decrease in LF each with a decrease of -0.1%

Load Factors - Summary

- This analysis shows that making either type of change will have an impact to 01B load factors.

- For the test year, Model 1 (HOL_EX)

    - 7 LDZs did not have a change in load factor

    - For the 6 that did, 5 showed a decrease in load factor (4 of 0.1% and 1 of 0.4%). This would result in an increase in SOQ

- For the test year, Model 3 (HOL_SR)

    - 9 LDZs showed a change in their load factor

    - Of these 9, 6 showed an increase starting at 0.2% to 0.7%. This would result in a decrease in SOQ.

Summary

Conclusions and Recommendations

Overall Conclusions

- Results for both the revised models allocation compared to the actual sample data and the simulated UG at population do not reveal a difference which is statistically significant

- The current Baseline approach is designed to produce models which are robust / stable. Risk of lowering Summer Reduction thresholds for individual years / smoothing is that more models will 'flip-flop' from one year to next. The aim of reducing volatility in the models and improving predictability remains a challenge

- Due to the overall results showing marginal differences, implementing a change to the modelling approach for 01B for producing models for Gas Year 2017/18 does not guarantee an improvement in performance

Recommendations

- If a change in approach was made, results indicate very little difference between Model 1 (HOL_EX) and Model 3 (HOL_SR). For stability reasons Xoserve would lean towards Model 1 (HOL_EX) although as the observed improvements are not statistically significant one option would be to continue with modelling 'as-is' for 01B ?

- This analysis has highlighted that the parameters available to us within the existing approach / system do perhaps not allow us the opportunity to improve the results significantly enough

- Xoserve are planning on upgrading their modelling processes in order to allow greater flexibility going forward to the approach to modelling. This will hopefully give us the ability to make bigger improvements in predictability ? (AOB item will reflect on this later)

- Decision from DESC on analysis required:
  - Continue with 'As-Is' approach or Model 1 or Model 3 ?

Summary

Appendix

Model 1: Results by Season – Gas Year 2014/15

GAS YEAR 2014	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.64%	-1.39%	-2.41%	-2.32%	-1.24%	-0.96%	-3.34%	-0.10%	-0.64%	-0.46%	0.40%	-1.67%	-1.28%
Summer	4.66%	3.86%	6.98%	5.74%	3.29%	4.00%	10.23%	0.34%	2.06%	1.45%	-1.38%	5.62%	3.82%

NW2014_HOL_EX	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.53%	-1.20%	-2.17%	-1.97%	-1.12%	-0.79%	-3.03%	0.04%	-0.57%	-0.34%	0.52%	-1.53%	-1.11%
Summer	4.15%	3.25%	6.04%	4.75%	3.52%	3.34%	9.19%	-0.17%	1.81%	1.08%	-1.74%	5.19%	3.28%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.11%	-0.18%	-0.23%	-0.36%	-0.12%	-0.18%	-0.31%	-0.06%	-0.07%	-0.12%	0.12%	-0.14%	-0.17%
Summer	-0.51%	-0.62%	-0.94%	-0.99%	0.23%	-0.65%	-1.04%	-0.17%	-0.25%	-0.37%	0.36%	-0.43%	-0.53%

SEASONS IMPROVED	2	2	2	2	1	2	2	2	2	2	0	2	2

- Overall, both seasons have a slightly smaller error compared with actual demand
  - 10 LDZs show an improvement in both seasons
  - 1 LDZ is worse in both seasons
  - 1 LDZ reveal mixed result of 1 season improving and 1 season worsening

- Change in approach providing consistent marginal improvements for this Gas Year

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GAS YEAR 2013	SEASONS												
Baseline		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		-2.53%	-2.40%	-4.58%	-2.76%	-3.06%	-2.32%	-4.44%	-2.21%	-1.90%	-2.80%	-2.44%	-2.34%	-2.80%
Summer		5.04%	0.49%	8.05%	2.75%	1.84%	1.73%	4.24%	1.99%	0.21%	3.60%	-1.68%	2.87%	2.53%

NW2014_HOL_EX		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		-2.44%	-2.25%	-4.37%	-2.46%	-3.06%	-2.18%	-4.18%	-2.09%	-1.84%	-2.71%	-2.34%	-2.24%	-2.67%
Summer		4.76%	0.22%	7.29%	1.83%	1.16%	1.10%	3.38%	1.45%	-0.02%	3.24%	-1.97%	2.46%	2.01%

Differences		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		-0.09%	-0.15%	-0.21%	-0.30%	0.00%	-0.14%	-0.26%	-0.13%	-0.06%	-0.09%	-0.10%	-0.10%	-0.13%
Summer		-0.28%	-0.28%	-0.75%	-0.92%	-0.68%	-0.63%	-0.86%	-0.54%	-0.18%	-0.36%	0.29%	-0.41%	-0.52%

SEASONS IMPROVED		2	2	2	2	2	2	2	2	2	2	1	2	2

- Overall, both seasons have a slightly smaller error compared with actual demand
    - 11 LDZs show an improvement in both seasons
    - 0 LDZs are worse in both seasons
    - 1 LDZ reveal mixed result of 1 season improving and 1 season worsening

- Change in approach providing consistent marginal improvements for this Gas Year

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Model 1: Results by Season – Gas Year 2012/13

GAS YEAR 2012	SEASONS												
Baseline		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		-1.63%	-0.63%	-1.89%	-2.66%	-1.57%	1.01%	-1.21%	-0.02%	1.64%	0.42%	-0.48%	0.40%	-0.58%
Summer		3.89%	3.80%	4.42%	6.52%	2.68%	1.76%	1.29%	1.00%	-2.09%	0.13%	-1.32%	2.09%	2.02%

NW2014_HOL_EX		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		-1.68%	-0.74%	-1.84%	-2.58%	-1.28%	1.09%	-1.15%	0.08%	1.68%	0.45%	-0.42%	0.49%	-0.52%
Summer		3.77%	3.87%	4.08%	6.06%	2.94%	1.43%	0.89%	0.79%	-2.19%	-0.04%	-1.52%	1.79%	1.82%

Differences		SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter		0.05%	0.10%	-0.05%	-0.08%	-0.29%	0.09%	-0.06%	0.07%	0.04%	0.03%	-0.06%	0.10%	-0.06%
Summer		-0.13%	0.06%	-0.34%	-0.47%	0.26%	-0.33%	-0.40%	-0.21%	0.10%	-0.08%	0.20%	-0.30%	-0.20%

SEASONS IMPROVED	1	0	2	2	1	1	2	1	0	1	1	1	2

- Overall, both seasons have a slightly smaller error compared with actual demand
  - 3 LDZs show an improvement in both seasons
  - 2 LDZs are worse in both seasons
  - 7 LDZ reveal mixed results of 1 season improving and 1 season worsening

- Change in approach not providing significant improvements for this Gas Year

Model 2: Results by Season – Gas Year 2014/15

GAS YEAR 2014	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.64%	-1.39%	-2.41%	-2.32%	-1.24%	-0.96%	-3.34%	-0.10%	-0.64%	-0.46%	0.40%	-1.67%	-1.28%
Summer	4.66%	3.86%	6.98%	5.74%	3.29%	4.00%	10.23%	0.34%	2.06%	1.45%	-1.38%	5.62%	3.82%

NW2014_SR													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.69%	-1.37%	-2.45%	-2.32%	-1.24%	-0.96%	-3.45%	-0.10%	-0.64%	-0.46%	0.40%	-1.77%	-1.30%
Summer	3.54%	3.35%	6.21%	5.74%	3.29%	4.00%	10.04%	0.34%	2.06%	1.45%	-1.38%	5.49%	3.57%

Differences													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	0.06%	-0.02%	0.04%	0.00%	0.00%	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	0.10%	0.02%
Summer	-1.12%	-0.51%	-0.77%	0.00%	0.00%	0.00%	-0.19%	0.00%	0.00%	0.00%	0.00%	-0.13%	-0.25%

SEASONS IMPROVED	1	2	1	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	1	1

- Overall, summer has a slightly smaller error compared with actual demand
  - 1 LDZ showed an improvement in both seasons
  - 4 LDZs reveal mixed results of 1 season improving and 1 season worsening
  - 7 LDZs were identical models because the change in SR threshold had no impact

- Change in approach providing some marginal improvements for this Gas Year

Model 2: Results by Season – Gas Year 2013/14

GAS YEAR 2013	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-2.53%	-2.40%	-4.58%	-2.76%	-3.06%	-2.32%	-4.44%	-2.21%	-1.90%	-2.80%	-2.44%	-2.34%	-2.80%
Summer	5.04%	0.49%	8.05%	2.75%	1.84%	1.73%	4.24%	1.99%	0.21%	3.60%	-1.68%	2.87%	2.53%

NW2014_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-2.52%	-2.33%	-4.55%	-2.76%	-3.06%	-2.32%	-4.48%	-2.21%	-1.90%	-2.80%	-2.44%	-2.39%	-2.80%
Summer	5.47%	0.90%	8.10%	2.75%	1.84%	1.73%	5.01%	1.99%	0.21%	3.60%	-1.68%	3.32%	2.70%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.01%	-0.07%	-0.03%	0.00%	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%
Summer	0.43%	0.40%	0.05%	0.00%	0.00%	0.00%	0.77%	0.00%	0.00%	0.00%	0.00%	0.46%	0.17%

SEASONS IMPROVED	1	1	1	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	0	1

- Overall, winter has a very slight smaller error compared with actual demand
  - 0 LDZs show an improvement in both seasons
  - 2 LDZs are worse in both seasons
  - 3 LDZ reveal mixed result of 1 season improving and 1 season worsening
  - 7 LDZs were identical models because the change in SR threshold had no impact

- Change in approach not providing improvement for this Gas Year

GAS YEAR 2012	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.63%	-0.63%	-1.89%	-2.66%	-1.57%	1.01%	-1.21%	-0.02%	1.64%	0.42%	-0.48%	0.40%	-0.58%
Summer	3.89%	3.80%	4.42%	6.52%	2.68%	1.76%	1.29%	1.00%	-2.09%	0.13%	-1.32%	2.09%	2.02%

NW2014_SR	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.91%	-0.79%	-2.08%	-2.66%	-1.57%	1.01%	-1.50%	-0.02%	1.64%	0.42%	-0.48%	0.14%	-0.68%
Summer	3.58%	3.82%	4.13%	6.52%	2.68%	1.76%	1.42%	1.00%	-2.09%	0.13%	-1.32%	2.02%	1.97%

Differences	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	0.28%	0.16%	0.20%	0.00%	0.00%	0.00%	0.29%	0.00%	0.00%	0.00%	0.00%	-0.26%	0.10%
Summer	-0.31%	0.02%	-0.29%	0.00%	0.00%	0.00%	0.12%	0.00%	0.00%	0.00%	0.00%	-0.07%	-0.05%

SEASONS IMPROVED	1	0	1	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	2	1

- Overall, summer has a slightly smaller error compared with actual demand
  - 1 LDZ showed an improvement in both seasons
  - 2 LDZs are worse in both seasons
  - 2 LDZs reveal mixed results of 1 season improving and 1 season worsening
  - 7 LDZs were identical models because the change in SR threshold had no impact

- Change in approach providing some marginal improvements for this Gas Year

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Model 3: Results by Season – Gas Year 2014/15

GAS YEAR 2014	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.64%	-1.39%	-2.41%	-2.32%	-1.24%	-0.96%	-3.34%	-0.10%	-0.64%	-0.46%	0.40%	-1.67%	-1.28%
Summer	4.66%	3.86%	6.98%	5.74%	3.29%	4.00%	10.23%	0.34%	2.06%	1.45%	-1.38%	5.62%	3.82%

NW2014_HOL_SR													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.62%	-1.15%	-2.23%	-1.97%	-1.14%	-0.85%	-3.07%	0.04%	-0.57%	-0.34%	0.52%	-1.53%	-1.12%
Summer	3.16%	2.51%	5.30%	4.75%	2.95%	3.04%	8.81%	-0.17%	1.81%	1.08%	-1.74%	5.19%	2.96%

Differences													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.02%	-0.24%	-0.18%	-0.36%	-0.10%	-0.11%	-0.27%	-0.06%	-0.07%	-0.12%	0.12%	-0.14%	-0.16%
Summer	-1.49%	-1.36%	-1.68%	-0.99%	-0.34%	-0.96%	-1.42%	-0.17%	-0.25%	-0.37%	0.36%	-0.43%	-0.86%

SEASONS IMPROVED	2	2	2	2	2	2	2	2	2	2	0	2	2

- Overall, both seasons have a smaller error compared with actual demand
  - 11 LDZs show an improvement in both seasons
  - 1 LDZ is worse in both seasons

- Change in approach providing consistent marginal improvements for this Gas Year

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GAS YEAR 2013	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-2.53%	-2.40%	-4.58%	-2.76%	-3.06%	-2.32%	-4.44%	-2.21%	-1.90%	-2.80%	-2.44%	-2.34%	-2.80%
Summer	5.04%	0.49%	8.05%	2.75%	1.84%	1.73%	4.24%	1.99%	0.21%	3.60%	-1.68%	2.87%	2.53%

NW2014_HOL_SR													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-2.47%	-2.12%	-4.34%	-2.46%	-2.98%	-2.20%	-4.16%	-2.09%	-1.84%	-2.71%	-2.34%	-2.24%	-2.65%
Summer	5.33%	0.64%	7.43%	1.83%	1.65%	1.41%	3.93%	1.45%	-0.02%	3.24%	-1.97%	2.46%	2.22%

Differences													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-0.06%	-0.28%	-0.24%	-0.30%	-0.08%	-0.12%	-0.28%	-0.13%	-0.06%	-0.09%	-0.10%	-0.10%	-0.15%
Summer	0.29%	0.15%	-0.62%	-0.92%	-0.19%	-0.32%	-0.31%	-0.54%	-0.18%	-0.36%	0.29%	-0.41%	-0.31%

SEASONS IMPROVED	1	1	2	2	2	2	2	2	2	2	1	2	2

- Overall, both seasons have a slightly smaller error compared with actual demand
  - 9 LDZs show an improvement in both seasons
  - 0 LDZs are worse in both seasons
  - 3 LDZs reveal mixed result of 1 season improving and 1 season worsening

- Change in approach providing consistent marginal improvements for this Gas Year

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Model 3: Results by Season – Gas Year 2012/13

GAS YEAR 2012	SEASONS												
Baseline	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-1.63%	-0.63%	-1.89%	-2.66%	-1.57%	1.01%	-1.21%	-0.02%	1.64%	0.42%	-0.48%	0.40%	-0.58%
Summer	3.89%	3.80%	4.42%	6.52%	2.68%	1.76%	1.29%	1.00%	-2.09%	0.13%	-1.32%	2.09%	2.02%

NW2014_HOL_SR													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	-2.00%	-0.91%	-2.06%	-2.58%	-1.56%	0.90%	-1.37%	0.08%	1.68%	0.45%	-0.42%	0.49%	-0.63%
Summer	3.53%	3.83%	3.85%	6.06%	2.66%	1.27%	0.89%	0.79%	-2.19%	-0.04%	-1.52%	1.79%	1.74%

Differences													
	SC	NO	NW	NE	EM	WM	WS	EA	NT	SE	SO	SW	All LDZs
Winter	0.37%	0.28%	0.17%	-0.08%	-0.01%	-0.11%	0.17%	0.07%	0.04%	0.03%	-0.06%	0.10%	0.05%
Summer	-0.36%	0.02%	-0.57%	-0.47%	-0.02%	-0.50%	-0.40%	-0.21%	0.10%	-0.08%	0.20%	-0.30%	-0.28%

SEASONS IMPROVED	1	0	1	2	2	2	1	1	0	1	1	1	1

- Overall, summer has a slightly smaller error compared with actual demand
  - 3 LDZs show an improvement in both seasons
  - 2 LDZs are worse in both seasons
  - 7 LDZ reveal mixed results of 1 season improving and 1 season worsening

- Change in approach not providing significant improvements for this Gas Year

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respect > commitment > teamwork