EVALUATION OF ALGORITHM PERFORMANCE – 2011/12 GAS YEAR SCALING FACTOR AND WEATHER CORRECTION FACTOR

1.0 Background

The annual gas year algorithm performance evaluation normally considers three sources of information as follows:

- daily values of scaling factor (SF) and weather correction factor (WCF)
- reconciliation variance data for each end user category (EUC)
- daily consumption data collected from the NDM sample

The material presented here refers only to SF and WCF data. The other strands of this evaluation will be available for consideration at a subsequent DESC meeting.

At the outset, it is worth setting out the characteristics of the key variables: the scaling factor (SF) and the weather correction factor (WCF).

The SF is a multiplier used to ensure that within each LDZ, aggregate NDM allocations equal total actual NDM demand. The ideal value of the SF is one, but variations may occur for a number of reasons including imperfections in the algorithms, but also errors in aggregate AQs and in measured LDZ and DM consumption (because aggregate NDM consumption is determined by difference: i.e. LDZ consumption-DM consumption), and deviations in aggregate NDM demand in the LDZ under average weather conditions away from the sum (for all end user categories (EUCs) in the LDZ) of ALP weighted daily average consumption based on EUC AQs. If other factors (most notably AQs) are not material, a scaling factor of less than one indicates a tendency of the NDM profiling algorithms to over allocate.

Up to the end of gas year 2007/08, the WCF represented the extent to which actual aggregate NDM demand in the LDZ differed from the forecast (before the year) seasonal normal demand (SND) for aggregate NDM in the LDZ. When actual aggregate NDM demand equalled seasonal normal demand, then WCF was zero. Typically, demand would have been above SND when it was colder than normal and below SND when it was warmer, and the WCF responded accordingly. However, if there had been an unforeseen growth in demand, then this would have been reflected in generally higher values of WCF than implied by the weather alone. Similarly, if demand had been unseasonably depressed (e.g. with early heating load switch-off or sustained demand loss due to high energy prices), then the WCF would have taken on a value lower than that expected solely due to the weather.

As a result of adoption of UNC Modification 204, the WCF applied from the start of gas year 2008/09 was redefined. WCF is now the extent to which actual aggregate NDM demand in the LDZ differs from the sum for all EUCs of ALP weighted daily average consumption based on EUC AQs in each LDZ. In the computation of WCF, the sum of ALP weighted daily average consumption for all EUCs in each LDZ (based on EUC AQs at the start of the gas year and potentially subject to revision periodically within the gas year) replaced year ahead forecast aggregate NDM SND in each LDZ. Broadly, WCF is still expected to take on positive values under conditions of cold weather and negative values under conditions of warm weather. Moreover, the effect on WCF of unforeseen growth in demand or unseasonably depressed demand would also broadly remain the same as before, with WCF respectively taking on higher or lower values than otherwise in these instances. However, the sum of ALP weighted daily average consumption for all EUCs in a LDZ is clearly not the same as a forecast value of aggregate NDM SND in the LDZ. Thus, the effect on WCF of unforeseen growth in demand or unseasonably depressed demand is now less clear. An excess in EUC AQs would tend to depress WCF and a deficit would tend to inflate WCF from the values it would otherwise have taken. So, UNC Modification 204 has replaced one potential source of error in the WCF calculation with another.

Up to the end of gas year 2007/08, any bias in WCF caused by seasonal normal demands for aggregate NDM in the LDZ being under or overstated would be observed by monitoring the quantity WCF-EWCF. The EWCF (estimated weather correction factor) is calculated directly from the demand model for aggregate NDM in the LDZ and captures the effects of weather alone on demand. The difference between WCF and EWCF thus isolates the non-weather component of the WCF. From 1st October 2008 onwards, WCF-EWCF merely reflects the difference between actual NDM demand relative to ALP weighted daily average demand (based on EUC AQs) and computed NDM demand relative to NDM SND. The EWCF (derived from a demand model for aggregate NDM as before) still captures the impact of weather alone on demand, but, for gas years 2008/09 onwards, the difference WCF-EWCF is no longer a measure of bias in the WCF due to SND for aggregate NDM in the LDZ being under or overstated. An equivalent measure to WCF-ECWF that captures the bias in the new definition of WCF due to EUC AQ error cannot be formulated, since there is no means of

separately and differently computing in a manner free of EUC AQ error, the sum for all EUCs of ALP weighted daily average consumption based on EUC AQs in each LDZ.

Figures 1 to 13 show graphs of the daily values of SF and WCF for each LDZ for two whole gas years 2010/11 and 2011/12. Please note that the scale used to display SF and WCF has been amended slightly in these figures to ensure all data points are displayed. Tables of average values of SF, WCF-EWCF and WCF, for gas years 2010/11 and 2011/12, along with the improvement or degradation in these averages between the two gas years, are presented in Tables 1 to 9. It should also be noted that SF and WCF values have been obtained for the period 1st to 10th October 2012 (the start of the new gas year 2012/13) and appended to the graphs of the previous two completed gas years. The root mean square deviation of SF from 1 has also been computed for each discrete month during the previous gas years 2010/11 and 2011/12, and the respective figures can be found in Tables 10 and 11. The differences in these RMS values between the two gas years are presented in Table 12. These figures provide a very useful measure of the variability of SFs about one (the ideal value). In addition, Tables 13 and 14 provide monthly values of weather corrected NDM demand expressed as a percentage of aggregate NDM seasonal normal demand (SND) for each month of gas years 2010/11 and 2011/12 respectively.

2.0 Overall Results

These various graphs and tables indicate the following notable points:

- During gas year 2010/11 average SF values were lower than one (over days of the week, weekends, winter and summer) in all LDZs. During gas year 2011/12 average SF values were lower or equal to one (over days of the week, Saturdays and winter) in all LDZs.
- For 6 out of 13 LDZs on Mondays to Thursdays, and 8 out of 13 LDZs on Fridays, Saturdays and Sundays, average values of SF were improved in 2011/12 (i.e. were closer to one) compared to the previous gas year (2010/11). WS LDZ showed deterioration from the previous gas year on all days of the week, NO and SE were the same on weekend days. Also, LDZs SC, WN, SE and SO all displayed deterioration over Mondays to Thursdays.
- Average SF values for all of winter 2011/12 showed deterioration over winter 2010/11 in all 13 LDZs, with the smallest deterioration being 0.004 (in LDZ WM) and largest being 0.017 (in LDZ WN).
- Over the summer period of 2011/12 for 12 out of the 13 LDZs average values of SF were closer to the ideal value of one than over the summer period of the previous gas year (2010/11) and further away from one in 1 LDZs (namely WS).
- The RMS deviation of SF from the ideal value of one provides a measure of the variability of SFs. During winter 2011/12, October 2011 was warmer than the current seasonal normal basis (the 8th warmest in the last 100 years). November 2011 was also warmer than seasonal normal and ranked as the 2nd warmest November in the last 100 years. December 2011 was slightly warmer than seasonal normal (the 9th warmest in the last 50 years) with January 2012 was also slightly warmer than seasonal normal. February 2012 was a mixed month (the first half of the month being much colder than current seasonal normal and the second half being much warmer) resulting in it being ranking as the 24th warmest in the last 50 years. March 2012 was much warmer than seasonal normal (the warmest March in the last 50 years). During the unusually warm winter period (October to March) of gas year 2011/12, the majority of individual LDZs and all LDZs considered overall showed worse RMS deviations of SF (from the ideal value of one) compared to the corresponding periods of the previous gas year.
- RMS deviations of SF from the ideal value of one exhibited a somewhat mixed picture during the summer period (April to September) of gas year 2011/12. For April and September, RMS deviations improved over the previous gas year (2010/11) in all 13 and 10 LDZs respectively and overall across all LDZs compared to the corresponding months of the previous gas year. In a majority (at least 11 out of 13) of LDZs and overall across all LDZs, the RMS deviation of SF from the ideal value of one was worse in May, June, July and August than in gas year 2010/11. In contrast to the warmer than usual winter period, the summer period of gas year 2011/12 was generally colder than normal. April 2012 was unusually colder than March 2012, ranking as the 12th coldest April in the last 50 years. May 2012 was a mixed month beginning with a 3 week period of consistently colder than normal temperatures and concluding with a week of much warmer than normal temperatures. The months of June 2012 and July 2012 were both generally colder than seasonal normal and August 2012 was generally close to current seasonal normal. September 2012 was colder than seasonal normal with a notable cold period at the end of the month.

- Considered overall SFs during 201/12 generally were slightly more variable than over the previous gas year.
- Examination of the average weekday and weekend day values of WCF-EWCF in Tables 4, 5 and 6 indicates that the deviation of WCF from EWCF, appeared to be less marked (i.e. closer to zero) for 3 LDZs (SC, NW and WM) and more marked (i.e. further from zero) for the more southern LDZs (namely EM, EA, NT, SE, SO and SW), compared to that over the equivalent days of the previous gas year. For winter 2011/12 as a whole the deviation of WCF from EWCF was more marked than for winter 2010/11 in 8 LDZs. For summer 2011/12 as a whole the deviation of WCF from EWCF was less marked over that for summer 2010/11 in all LDZs apart from 2 LDZs (SE and SO). However, as previously explained WCF-EWCF is no longer a measure of bias in the WCF due to SND for aggregate NDM in the LDZ being under or overstated.
- WCF is the difference between actual aggregate NDM demand and ALP weighted daily average consumption in each LDZ (based on EUC AQs) divided by the ALP weighted daily average consumption in each LDZ. During gas year 2010/11 average WCF values were positive for all LDZs on all days of the week (except for 7 LDZs on Fridays and 2 LDZs on Saturdays) and for all LDZs during the winter period, but were negative for all LDZs in the summer period (See Table 7). Positive values can be caused by factors such as the EUC AQs being too low or by the weather being colder than seasonal normal.
- During gas year 2011/12 average WCF values were positive for all LDZs on Fridays, Saturdays and Sundays (except for 2 LDZs on Fridays and 1 LDZs on Saturdays) and for all LDZs during the summer period, but were negative for 9 out of 13 LDZs on Mondays to Thursdays and all LDZs in the winter period (See Table 8). Negative values can be caused by factors such as the EUC AQs being too high or by the weather being warmer than seasonal normal.
- WCF was closer to zero in 2011/12 than in 2010/11 on Mondays to Thursdays and Sundays in 10 LDZs, on Fridays in 3 LDZs and on Saturdays in 5 LDZs (see Table 9). In winter 2011/12 WCF was closer to zero in 7 out of 13 LDZs, but was further away from zero in summer 2011/12 in all LDZs. The differences between the years are the result of differences in factors such as weather or EUC AQ excess.
- There was no notable step change in WCF values following implementation of revised pseudo SND values on 1st April 2012 (LDZs SC & SW) and 1st July 2012 (LDZs SO, WN & WS).
- Comparison of weather corrected aggregate NDM demand as a percentage of aggregate NDM SND in 2010/11 (Table 13) and 2011/12 (Table 14) indicates that for the majority of the month/LDZ combinations in the winter months the percentages for 2011/12 are lower than those for 2010/11. This suggests that relative to observed demand on a weather corrected basis, the SND values that applied (for computing DAFs for example) in 2011/12 were generally higher than in 2010/11. In contrast the opposite was true for the majority of the summer months where the percentages for 2011/12 are higher than those for 2010/11. This suggests that relative to observed demand on a weather corrected basis, the SND values that applied in the summer of 2011/12 were generally lower than in 2010/11.

3.0 Commentary

It is customary in this note on WCF and SF values to identify and provide a commentary on any unusual occurrences of SF and WCF-EWCF values, in the most recent gas year (2011/12). In part, these instances (up to May 2012) have previously been reported in Appendix 13 of the NDM report published on 5th July 2012. They are all included here for completeness. This is not a comprehensive set of all observed perturbations, instead it is a set of the more marked instances along with examples of typical cases:

- Nationally, the month of October 2011 was warmer than the current seasonal normal basis overall. According to the Met. Office, it was the warmest October since 2006 and the eighth warmest in the last 100 years. However, in the period from 18th to 22nd most of the UK experienced unseasonably cold weather and during this period the increase in total NDM demand resulted in sharply positive WCF values across all LDZs.
- November 2011 was the 2nd warmest November in the last 100 years with particularly warm periods occurring between 1st to 5th, 9th to 14th and at the end of the month (17th onwards). Most LDZs show a trough in WCFs during these warm periods.

  In the northern LDZs (SC, NO, NW, NE, EM, WM, WN) there was a sharp positive spike in the WCF on 7th November 2012. This is attributed to a cold air frost which occurred in northern areas (temperatures dropped to -6℃ in Northumberland) which forced NDM demand up.

- Overall, the month of December 2011 was the 9th warmest December in the last 50 years although a cold period was evident from 5th to 20th (there was snow fall in Scotland on 5th and 6th December). The days 18th and 19th December were particularly cold, with a notable positive spike in WCF across all LDZs. According to the Met. Office, northern and western Scotland had one of the wettest Decembers in the last 100 years (and in western Scotland the number of days with rain was among the highest for December in the last 50 years).
- The month of January 2012 began with very mild conditions which preceded a major winter storm during the third week (affecting southern Scotland in particular). The month ended with the last 4 days being particularly cold but, overall, the month ranked as the 9th warmest January in the last 50 years. During the cold periods increased total NDM demand in all LDZs resulted in sharply positive WCF values.
- February 2012 began with a very cold spell during the first 12 days which included some sharp frosts and snowfall, especially across England, resulting in an increase in total NDM demand (and sharply positive WCF values) in all LDZs. The remainder of the month gave generally milder weather, occasionally very mild during the last 10 days. During this milder period total NDM demand was depressed, resulting in negative WCF values. While the reduction in WCF would have tended to increase the SF, the direct effect on the SF of the reduced total NDM demand resulted in small decreases in the SF during this period in most LDZs.
- Nationally, the month of March 2012 was the warmest March in the past 50 years and according to the Met. Office, the 3rd warmest since 1910. Although the majority of the month was substantially warmer than the current seasonal normal basis, there were short unsettled spells around 3rd to 6th and 17th to 18th. Much of the month was dry with the exception of eastern England on the 4th, 5th and 17th and as a result, total NDM demand was depressed and WCF was negative in all LDZs on nearly all days in the month. The 26th to 30th were unseasonably warm and remarkably sunny across virtually the whole of the UK. As a result, sharply negative WCF values may be observed during these periods in most LDZs.
- Unusually, April 2012 was colder than March 2012 with the temperature failing to reach 20°C anywhere in the UK and was the 12th coldest April in the last 50 years. Most of England, Wales and eastern Scotland were much wetter than normal and according to the Met. Office, making it the wettest April on record across the UK. Broadly the month as a whole was colder than average (relative to the seasonal normal basis) after a very brief warm start to the month. The effect of this unusually cold month resulted in an increase in total NDM demand and consequently WCF became positive in most LDZs. The increased WCF would have tended to deflate the SF, but again the direct effect on the SF of inflated total NDM demand resulted in a corresponding increase in SF in most LDZs.

  On 29th April in all LDZs, there is a notable sharp positive spike in the WCF (and an increased SF value). This day (a Sunday) was particularly cold which also saw very strong winds which may have been a contributing factor to in an increase to the total NDM demand.
- Overall, May 2012 was slightly colder than the current seasonal normal basis and around the average over the last 50 years. The month began with an extended (3 week) period of consistently colder than normal temperatures (continuing the wet theme of much of April) with particularly cold weather occurring during the periods of the 4th to 7th and 14th to 20th. The final week of the month (22nd to 31st) saw temperatures creep high above seasonal normal, offsetting the earlier cool conditions, resulting in low total NDM demand. This reduction in demand resulted in correspondingly extreme negative spikes in WCF (and a reduced SF value) noticeable around the 28th in all LDZs. Although the reduced value of WCF acts to increase SF, the direct effect of the reduced total NDM demand predominated, leading to sharp reductions in SF in all LDZs around the same period.

  In WS LDZ on 30th May 2012 there was a sharp negative spike in the WCF (and a decreased SF value). This was probably caused by an erroneous high consumption reading for a single very large DM supply point in this LDZ. This resulted in a corresponding error in actual total NDM consumption (total LDZ demand less shrinkage less the sum of DM consumption) which was incorrectly too low giving in turn a WCF value that was much too low.
- June 2012 was the 11th coldest June in the last 50 years and, according to the Met Office, the coolest since 1991. Throughout most of the month it was colder than current seasonal normal, with the first half of the month being colder than the second half. The combination of cold and wet weather resulted in unusually high NDM demand which consequently increased SF and WCF figures across many LDZs.

  In SE LDZ on 20th June 2012 there was a sharp negative spike in WCF and a decrease in SF. This was probably caused by an erroneous high consumption reading for a single very large DM supply point in

this LDZ. This resulted in a corresponding error in actual total NDM consumption which was incorrectly too low giving in turn a WCF value that was much too low.

- July 2012 continued with the wet theme of the previous month and, overall, the month was slightly colder than current seasonal normal, ranking 13th coolest in the last 50 years. The most notable cold period fell from 10th to the 21st, with a notable positive spike in WCF across all LDZs. In contrast, the period 23rd to 27th was slightly warmer that seasonal normal, resulting in lower NDM demand, forcing WCF values down in all LDZs.
- Overall, the month of August 2012 ranked as the 15th warmest August over the last 50 years and, according to the Met Office, had longer periods of rain on many days especially in the west and north, with the south-east of England having the driest and warmest weather. The month started and ended with temperatures being slightly colder than seasonal normal but this was offset somewhat by a two week period of slightly warmer than normal temperatures during the middle of the month. The effect of this warmer than usual period resulted in decreased total NDM demand and consequently WCF became negative in most LDZs. Also, the last few days of the month (29th, 30th and 31st) saw temperatures fall further below seasonal normal and as a result, aggregate NDM demand was increased and consequently there was a positive spike in WCF in all LDZs, particularly in SC on 31st.
- Taken as a whole, the month of September 2012 was much cooler than current seasonal normal and was the 9th coldest in the last 50 years. The Met Office stated that the first half of the month was reasonably warm, except in north-western areas, but the month became progressively more unsettled and quite cool for all of the UK. During the period from 23rd to 26th many areas experienced particularly cold, wet and windy weather, resulting in an increase in total NDM demand. As a result, sharp positive WCF values may be observed during this period in all most LDZs.

4.0 Assessment

In the demand attribution process as currently formulated, it is principally deviations of scaling factor from the perfect value of one that cause misallocations of aggregate NDM demand to individual EUCs. Scaling factor deviations from one (offsets from one and also day to day volatility) are related to the closeness of correspondence (or otherwise) between aggregate NDM seasonal normal demand on the day and the sum for all EUCs of ALP weighted daily average demand on the day (in other words the ALP*(AQ/365) term in the NDM demand attribution formula summed across all EUCs in the LDZ). Since NDM SND has hitherto been a forecast quantity while AQ is a backward looking quantity based on historical meter read data, this correspondence could never be perfect. However, adoption of Modification 204 has resulted in this correspondence now essentially being met - except for perturbations due to small day to day changes in EUC AQs and unexpectedly high or low actual NDM demand levels (whether these are real or due to LDZ or DM measurement error). This is the main reason for the markedly improved SF behaviour since the start of gas year 2008/09.

Prior to 1st October 2008, the ratio of aggregate NDM SND to the sum across all EUCs of ALP weighted daily average demand [$\sum_{EUC} ALP * (AQ / 365)$] was broadly inversely related to the deviation of SF from the ideal value of one. However, the effect was more pronounced in summer than in winter, and moreover, the summer was also affected by warm weather cut-off and summer reduction effects in some EUC models.

Warm weather cut-offs in EUC demand models give rise to summer scaling factor volatility by a mechanism involving the DAF parameter. If weather on a day in summer is significantly different from normal for that time of year, the DAF value that is applied on that day to EUCs with cut-offs may not be appropriate for the prevailing weather. Thus overall the (1 + WCF*DAF) terms in the demand attribution formula may be either too low or too high and the scaling factor has to change abnormally to compensate. This effect is not mitigated by the changes brought about by Modification 204. Thus, greater scaling factor volatility may still be seen in a number of LDZs in the summer in gas years 2010/11 and 2011/12.

In years prior to 2008/09, examination of the average monthly value of WCF-EWCF and weather corrected aggregate NDM demand as a percentage of aggregate NDM SND allowed an approximate assessment to be made of the “equilibrium level” of SF in each LDZ; that is to say the likely level of SF if any WCF deviation is discounted. This assessment was an approximate one and was based on identifying a period (of a month’s duration preferably during the winter period) over which WCF deviation was small (at or near zero) and weather corrected aggregate NDM demand was close to (~100% of) aggregate NDM seasonal normal demand over the period, then identifying the average value of SF that applied to the period and adjusting this SF for any residual WCF deviation that applied in the period. When applicable to a LDZ, this assessment then provided an approximate indication of the prevailing level of aggregate NDM AQ in the LDZ.

As previously noted, with the implementation of UNC Modification 204 the difference WCF-EWCF is no longer a measure of bias in the WCF due to SND for aggregate NDM in the LDZ being under or overstated. From 1st October 2008 onwards, WCF-EWCF merely reflects the difference between actual NDM demand

relative to ALP weighted daily average demand (based on EUC AQs) and computed NDM demand relative to NDM SND. In other words, the WCF itself now depends on NDM EUC AQs, and therefore assessing and removing the impact of a notional WCF "bias" on observed SF values to ascertain the impact of the prevailing level of aggregate NDM AQ on the residual SF is no longer feasible. One consequence of this is that the previously applied approach to inferring AQ excess or deficiency in each LDZ from an assessment of the impact of WCF bias on SF values, is no longer valid.

Table 15 shows the percentage changes in aggregate NDM AQs at the start of gas year 2012/13 as observed on the Gemini system. From this it can be seen that a reduction in aggregate NDM AQs has taken place for gas year 2012/13 in all LDZs. The reduction is 5.8% overall across all LDZs and the changes range from a 4.5% decrease in NE LDZ to 8.0% reduction in WN LDZ.

Figure 1

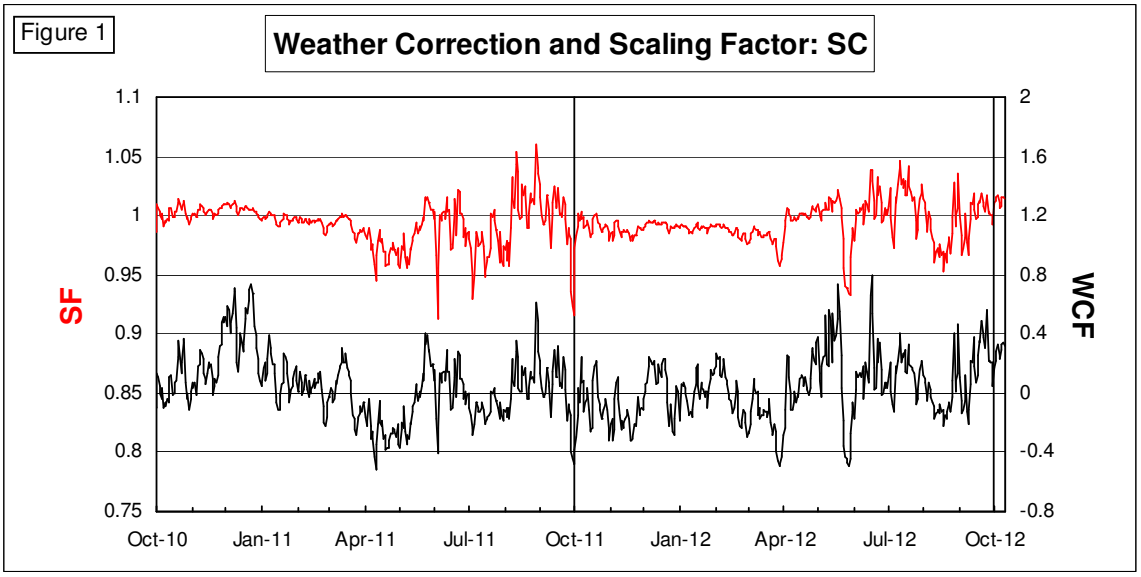

Figure 2

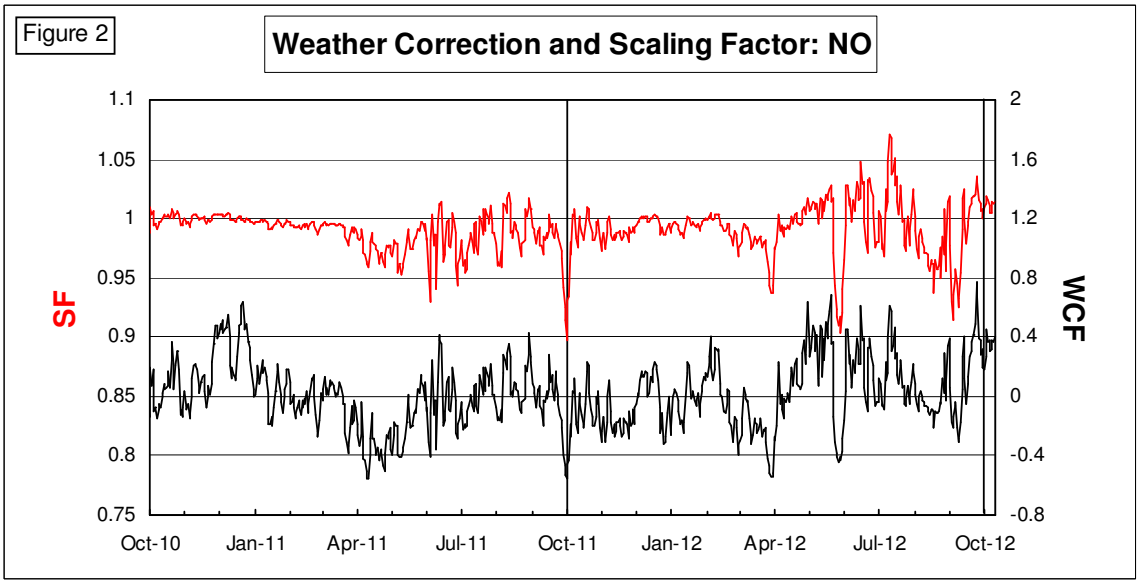

Figure 3

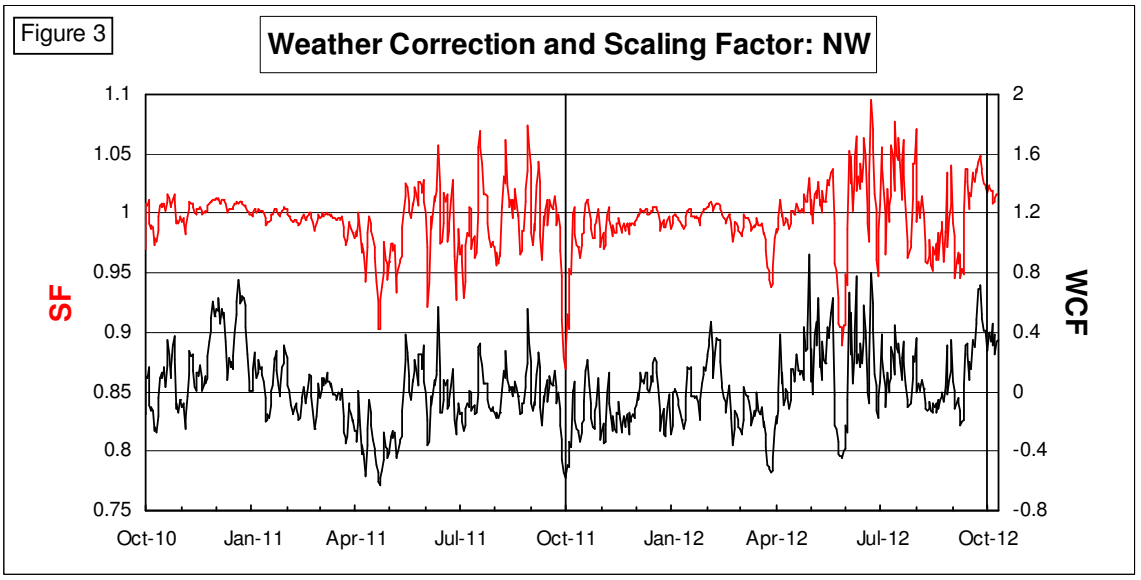

Figure 4

Weather Correction and Scaling Factor: NE

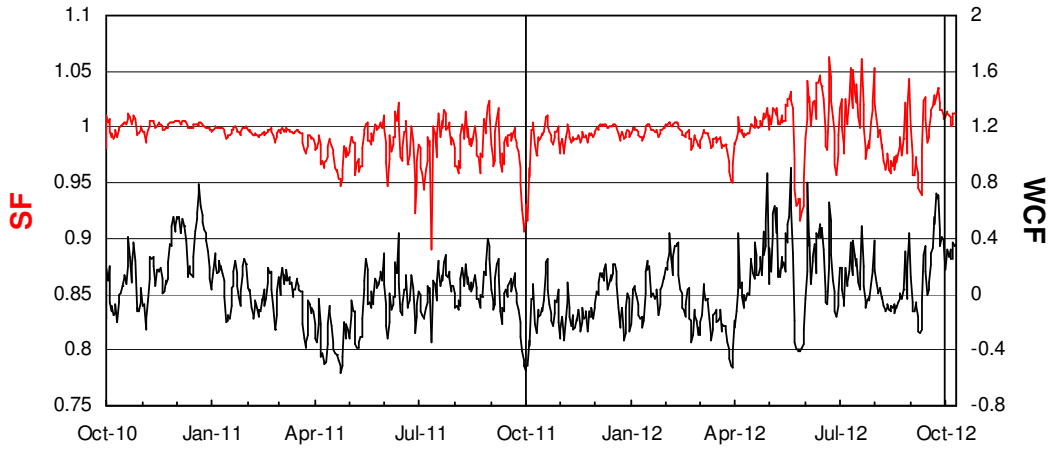

Figure 5

Weather Correction and Scaling Factor: EM

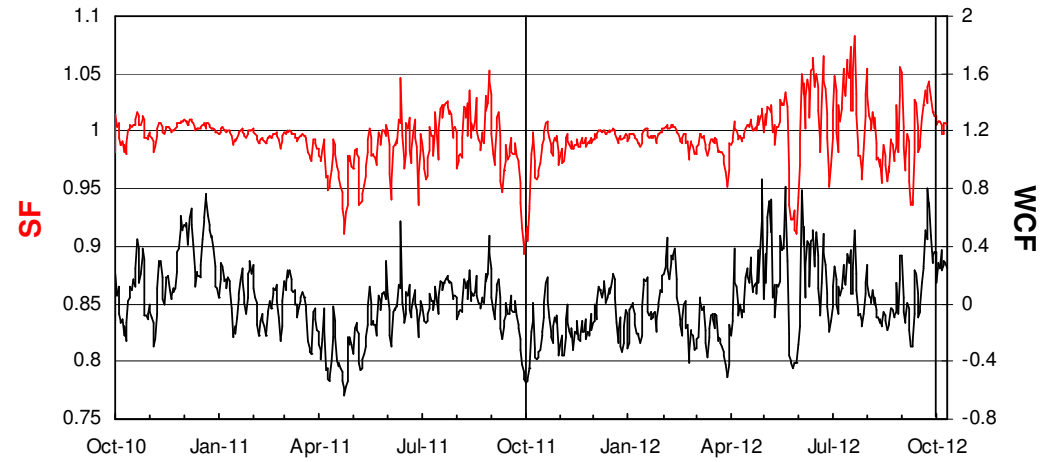

Figure 6

Weather Correction and Scaling Factor: WM

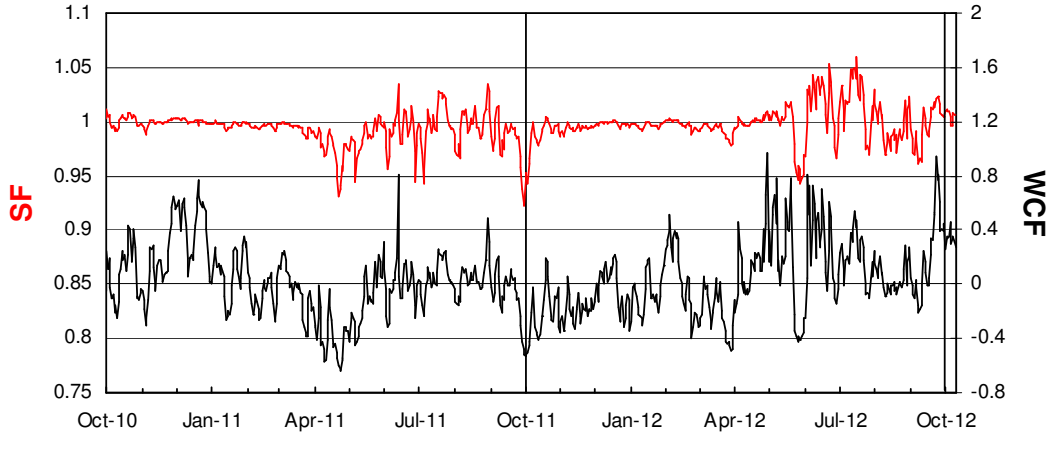

Figure 7

Weather Correction and Scaling Factor: WN

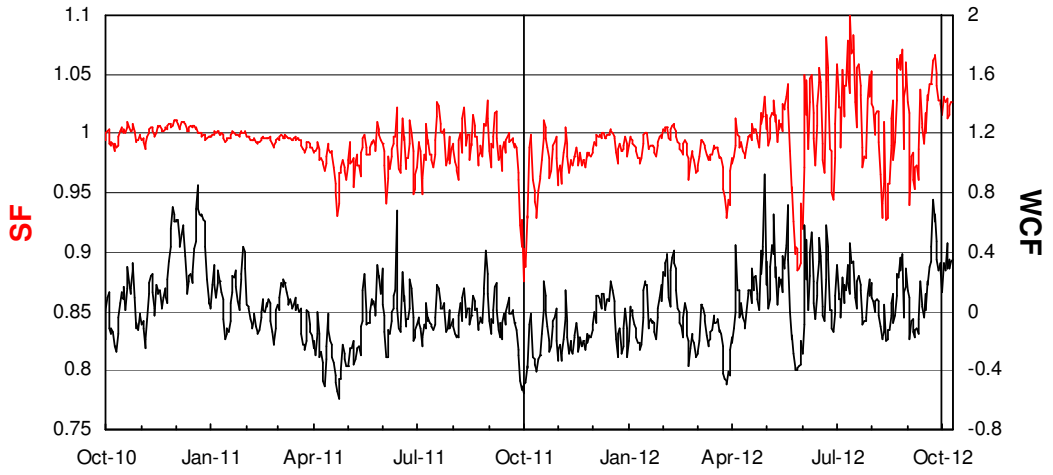

Figure 8

Weather Correction and Scaling Factor: WS

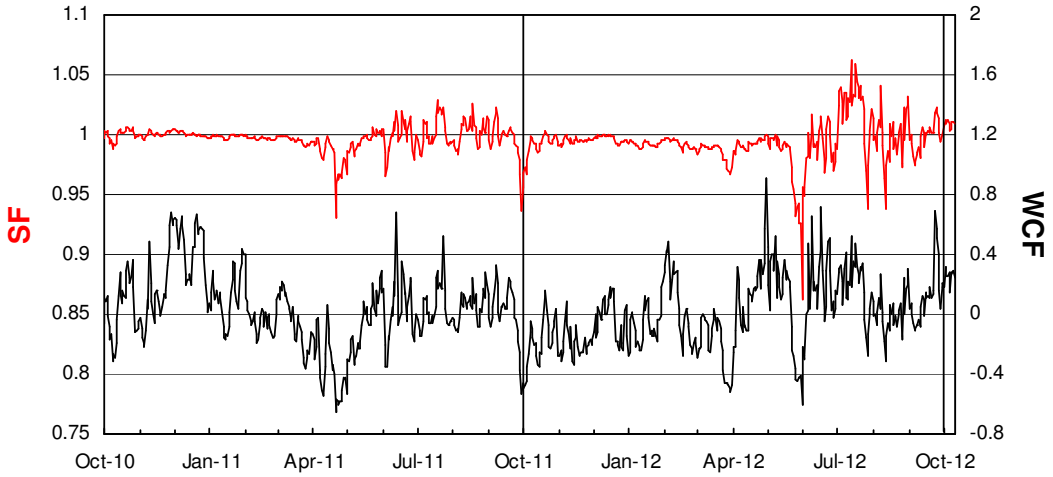

Figure 9

Weather Correction and Scaling Factor: EA

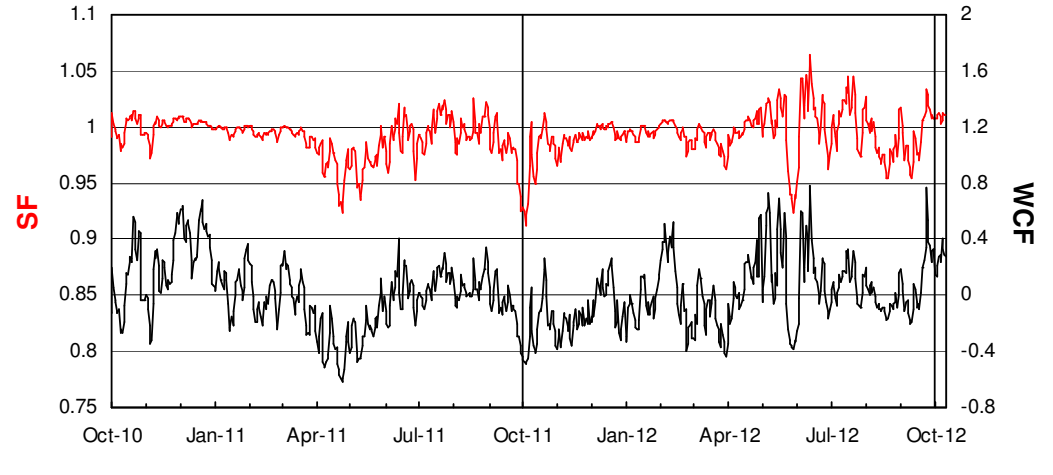

Figure 10

Weather Correction and Scaling Factor: NT

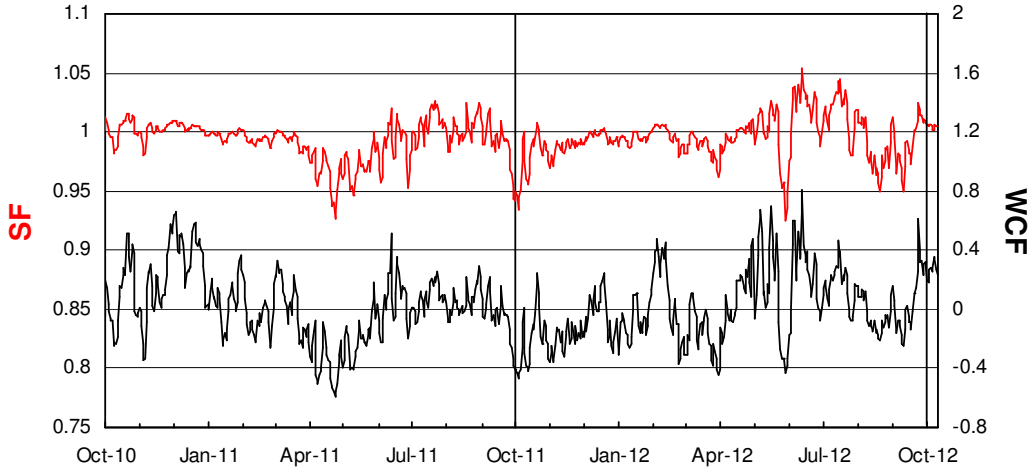

Figure 11

Weather Correction and Scaling Factor: SE

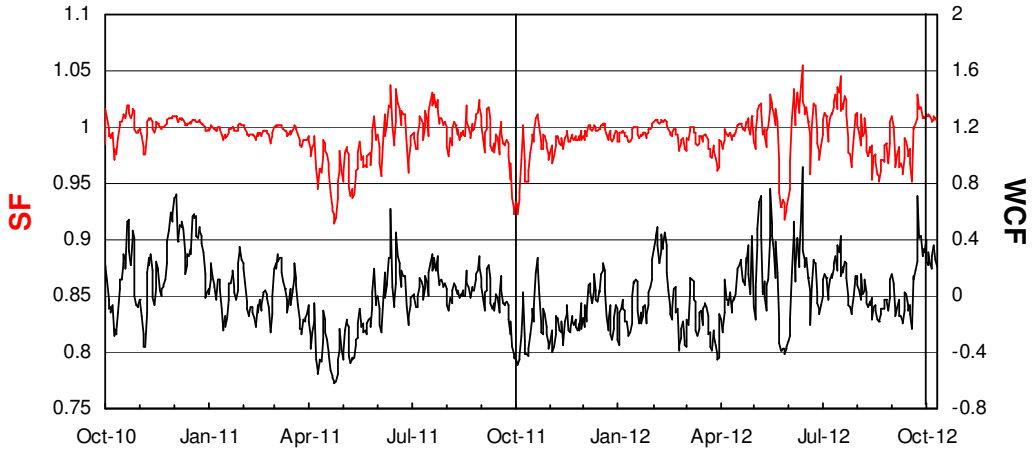

Figure 12

Weather Correction and Scaling Factor: SO

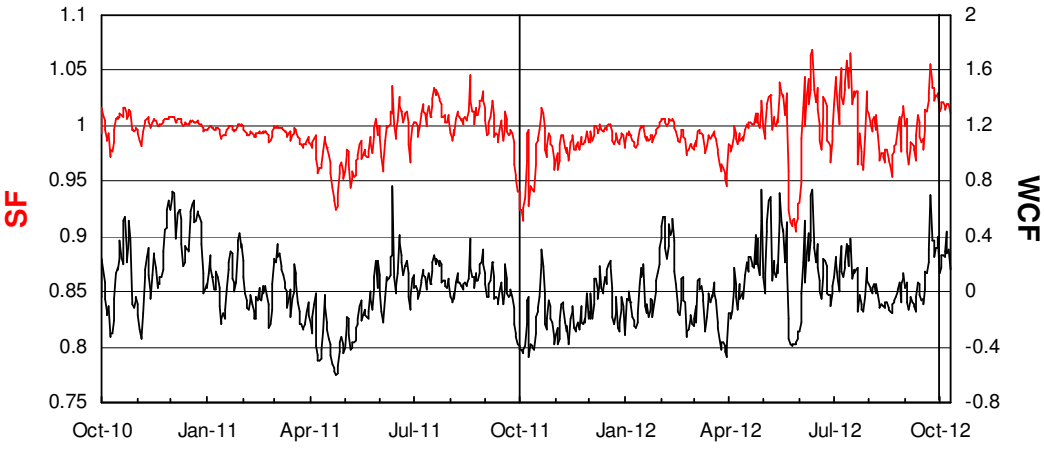

Figure 13

Weather Correction and Scaling Factor: SW

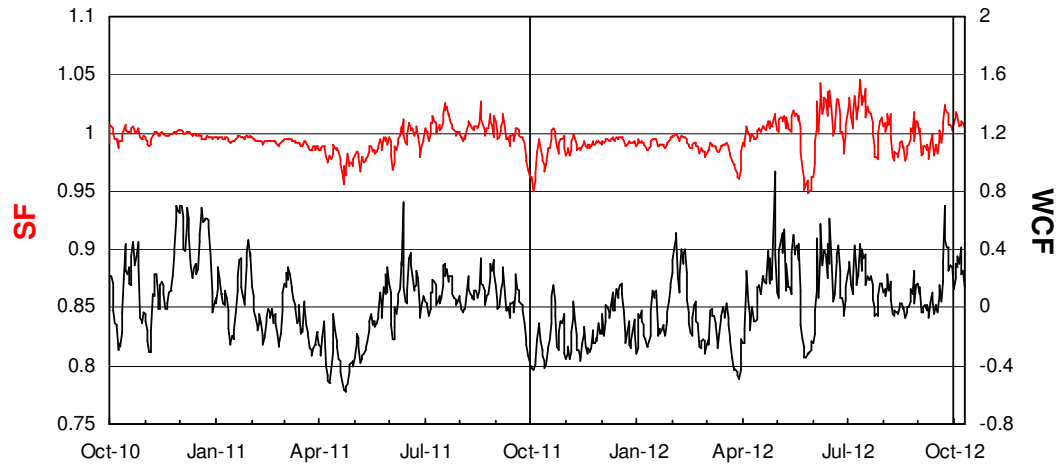

Table 1: Average Values of SF Gas Year 2010/11

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	0.995	0.991	0.991	0.994	0.999	0.988
NO	0.989	0.988	0.991	0.991	0.997	0.982
NW	0.994	0.989	0.995	0.999	0.999	0.989
NE	0.989	0.989	0.990	0.992	0.998	0.982
EM	0.992	0.989	0.990	0.994	0.998	0.984
WM	0.993	0.991	0.993	0.996	0.998	0.988
WN	0.991	0.990	0.994	0.996	0.999	0.985
WS	0.998	0.996	0.996	0.997	0.999	0.996
EA	0.991	0.989	0.991	0.993	0.998	0.984
NT	0.993	0.992	0.994	0.995	0.999	0.988
SE	0.992	0.990	0.993	0.994	0.999	0.986
SO	0.995	0.993	0.995	0.996	0.998	0.992
SW	0.995	0.994	0.995	0.996	0.996	0.994
AVG	**0.993**	**0.991**	**0.993**	**0.995**	**0.998**	**0.988**

Table 2: Average Values of SF Gas Year 2011/12

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	0.994	0.993	0.993	0.994	0.988	0.999
NO	0.991	0.994	0.991	0.991	0.988	0.994
NW	0.994	1.000	0.998	1.000	0.990	1.003
NE	0.994	0.999	0.996	0.996	0.991	1.000
EM	0.996	0.999	0.996	0.998	0.989	1.004
WM	0.998	0.999	0.999	1.000	0.994	1.003
WN	0.990	0.999	0.999	1.002	0.982	1.006
WS	0.993	0.994	0.993	0.995	0.992	0.995
EA	0.993	0.994	0.995	0.996	0.989	0.998
NT	0.994	0.996	0.997	0.997	0.990	1.000
SE	0.991	0.992	0.993	0.994	0.989	0.994
SO	0.991	0.993	0.994	0.994	0.985	1.000
SW	0.995	0.995	0.997	0.997	0.988	1.002
AVG	**0.993**	**0.996**	**0.995**	**0.996**	**0.989**	**1.000**

Table 3: Difference Between Average Values of SF in Gas Year 2010/11 and 2011/12

LDZ	MON-THUR	FRIDAY	SATURDAY	SUNDAY	WINTER	SUMMER
SC	-0.001	0.002	0.002	0.000	-0.011	0.011
NO	0.002	0.006	0.000	0.000	-0.009	0.012
NW	0.000	0.011	0.003	0.001	-0.009	0.008
NE	0.005	0.010	0.006	0.004	-0.007	0.018
EM	0.004	0.010	0.006	0.004	-0.009	0.012
WM	0.005	0.008	0.006	0.004	-0.004	0.009
WN	-0.001	0.009	0.005	0.002	-0.017	0.009
WS	-0.005	-0.002	-0.003	-0.002	-0.007	-0.001
EA	0.002	0.005	0.004	0.003	-0.009	0.014
NT	0.001	0.004	0.003	0.002	-0.009	0.012
SE	-0.001	0.002	0.000	0.000	-0.010	0.008
SO	-0.004	0.000	-0.001	-0.002	-0.013	0.008
SW	0.000	0.001	0.002	0.001	-0.008	0.004

Table 4: Average Values of WCF – EWCF Gas Year 2010/11

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	-0.024	-0.032	-0.043	-0.029	0.037	-0.094
NO	-0.052	-0.047	-0.062	-0.036	0.007	-0.107
NW	-0.065	-0.076	-0.059	-0.028	0.017	-0.138
NE	-0.012	-0.005	-0.010	0.018	0.044	-0.056
EM	-0.010	-0.018	-0.028	0.009	0.038	-0.059
WM	-0.033	-0.035	-0.042	-0.003	0.020	-0.081
WN	-0.055	-0.046	-0.031	-0.002	0.043	-0.128
WS	-0.028	-0.033	-0.029	-0.006	0.016	-0.067
EA	-0.025	-0.028	-0.021	-0.007	0.033	-0.077
NT	-0.019	-0.016	-0.003	0.011	0.028	-0.051
SE	-0.030	-0.026	-0.018	-0.006	0.019	-0.068
SO	-0.015	-0.014	-0.011	0.005	0.014	-0.037
SW	-0.028	-0.018	-0.003	0.003	0.012	-0.050
AVG	**-0.030**	**-0.030**	**-0.028**	**-0.005**	**0.025**	**-0.078**

Table 5: Average Values of WCF – EWCF Gas Year 2011/12

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	-0.010	-0.004	-0.012	-0.020	-0.010	-0.012
NO	-0.019	-0.024	-0.030	-0.039	-0.019	-0.029
NW	-0.052	-0.034	-0.031	-0.023	-0.028	-0.056
NE	-0.021	-0.011	-0.011	-0.012	-0.006	-0.027
EM	-0.045	-0.044	-0.049	-0.037	-0.036	-0.053
WM	-0.028	-0.018	-0.013	0.001	-0.027	-0.013
WN	-0.064	-0.043	-0.033	-0.017	-0.042	-0.058
WS	-0.031	-0.014	-0.028	-0.027	-0.044	-0.011
EA	-0.044	-0.039	-0.028	-0.026	-0.033	-0.043
NT	-0.041	-0.029	-0.016	-0.019	-0.041	-0.023
SE	-0.063	-0.061	-0.052	-0.050	-0.049	-0.069
SO	-0.038	-0.033	-0.035	-0.035	-0.026	-0.047
SW	-0.048	-0.049	-0.029	-0.035	-0.057	-0.031
AVG	**-0.039**	**-0.031**	**-0.028**	**-0.026**	**-0.032**	**-0.036**

Table 6: Difference between average values of WCF – EWCF in Gas Year 2010/11 and 2011/12

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	0.014	0.028	0.031	0.009	0.027	0.082
NO	0.032	0.023	0.032	-0.003	-0.013	0.078
NW	0.013	0.041	0.028	0.006	-0.011	0.081
NE	-0.009	-0.005	-0.001	0.007	0.038	0.029
EM	-0.036	-0.025	-0.021	-0.028	0.002	0.007
WM	0.005	0.018	0.029	0.002	-0.007	0.067
WN	-0.009	0.004	-0.002	-0.014	0.002	0.070
WS	-0.002	0.019	0.001	-0.021	-0.029	0.057
EA	-0.019	-0.011	-0.007	-0.019	0.000	0.033
NT	-0.022	-0.013	-0.013	-0.008	-0.014	0.028
SE	-0.033	-0.035	-0.034	-0.044	-0.030	-0.002
SO	-0.023	-0.019	-0.024	-0.029	-0.012	-0.010
SW	-0.020	-0.031	-0.025	-0.032	-0.044	0.019

Table 7: Average Values of WCF Gas Year 2010/11

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	0.064	0.030	0.023	0.056	0.143	-0.039
NO	0.002	-0.012	0.000	0.024	0.086	-0.081
NW	0.005	-0.034	0.000	0.045	0.093	-0.084
NE	0.025	0.003	0.016	0.051	0.109	-0.060
EM	0.025	-0.017	-0.015	0.035	0.108	-0.079
WM	0.017	-0.018	-0.011	0.043	0.102	-0.079
WN	0.007	-0.011	0.021	0.063	0.117	-0.087
WS	0.033	0.006	0.019	0.056	0.107	-0.047
EA	0.021	-0.007	0.006	0.031	0.118	-0.086
NT	0.023	0.002	0.019	0.044	0.111	-0.066
SE	0.018	-0.004	0.010	0.033	0.108	-0.076
SO	0.044	0.023	0.029	0.061	0.123	-0.040
SW	0.039	0.021	0.043	0.073	0.105	-0.021
AVG	**0.025**	**-0.001**	**0.012**	**0.047**	**0.110**	**-0.065**

Table 8: Average Values of WCF Gas Year 2011/12

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	0.023	0.031	0.018	0.014	-0.062	0.107
NO	0.016	0.039	0.025	0.014	-0.086	0.126
NW	-0.002	0.047	0.047	0.054	-0.093	0.133
NE	0.013	0.059	0.061	0.050	-0.083	0.146
EM	-0.011	0.019	0.022	0.026	-0.116	0.122
WM	0.013	0.043	0.061	0.063	-0.112	0.175
WN	-0.017	0.035	0.042	0.057	-0.105	0.125
WS	-0.001	0.014	0.004	0.010	-0.107	0.114
EA	-0.009	-0.003	0.017	0.034	-0.094	0.098
NT	-0.010	0.002	0.023	0.034	-0.102	0.107
SE	-0.025	-0.022	-0.004	0.014	-0.114	0.082
SO	-0.004	0.004	0.013	0.019	-0.096	0.102
SW	-0.002	0.005	0.032	0.027	-0.125	0.141
AVG	**-0.001**	**0.021**	**0.028**	**0.032**	**-0.100**	**0.121**

Table 9: Difference between absolute average values of WCF in Gas Year 2010/11 and 2011/12

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	0.040	-0.001	0.005	0.042	0.081	-0.068
NO	-0.014	-0.026	-0.024	0.009	0.000	-0.045
NW	0.003	-0.013	-0.046	-0.009	0.001	-0.049
NE	0.013	-0.057	-0.045	0.001	0.027	-0.086
EM	0.013	-0.003	-0.006	0.009	-0.008	-0.044
WM	0.004	-0.026	-0.050	-0.020	-0.009	-0.096
WN	-0.009	-0.024	-0.021	0.006	0.012	-0.037
WS	0.032	-0.008	0.015	0.046	0.000	-0.068
EA	0.011	0.004	-0.011	-0.003	0.024	-0.012
NT	0.013	0.000	-0.004	0.010	0.010	-0.041
SE	-0.007	-0.019	0.006	0.019	-0.006	-0.006
SO	0.040	0.019	0.015	0.042	0.027	-0.062
SW	0.037	0.016	0.011	0.046	-0.020	-0.119

Table 10: Root Mean Square Deviation of SF from 1 Gas Year 2010/11

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	0.0064	0.0053	0.0066	0.0040	0.0071	0.0100	0.0300	0.0217	0.0231	0.0314	0.0272	0.0271
NO	0.0047	0.0028	0.0025	0.0045	0.0071	0.0097	0.0277	0.0246	0.0290	0.0207	0.0204	0.0283
NW	0.0116	0.0073	0.0079	0.0041	0.0064	0.0112	0.0454	0.0280	0.0313	0.0338	0.0309	0.0418
NE	0.0064	0.0044	0.0031	0.0041	0.0066	0.0097	0.0299	0.0181	0.0277	0.0295	0.0214	0.0348
EM	0.0096	0.0066	0.0056	0.0043	0.0072	0.0114	0.0426	0.0288	0.0254	0.0195	0.0220	0.0404
WM	0.0051	0.0035	0.0019	0.0034	0.0048	0.0076	0.0317	0.0184	0.0195	0.0194	0.0163	0.0288
WN	0.0063	0.0060	0.0059	0.0025	0.0058	0.0079	0.0299	0.0180	0.0259	0.0196	0.0170	0.0304
WS	0.0047	0.0023	0.0019	0.0020	0.0034	0.0053	0.0241	0.0075	0.0131	0.0126	0.0104	0.0178
EA	0.0100	0.0090	0.0050	0.0043	0.0069	0.0092	0.0400	0.0336	0.0189	0.0130	0.0120	0.0305
NT	0.0096	0.0071	0.0052	0.0039	0.0076	0.0094	0.0393	0.0308	0.0197	0.0129	0.0113	0.0210
SE	0.0127	0.0087	0.0056	0.0044	0.0069	0.0080	0.0459	0.0338	0.0209	0.0141	0.0115	0.0281
SO	0.0122	0.0069	0.0043	0.0046	0.0076	0.0101	0.0409	0.0284	0.0174	0.0163	0.0158	0.0225
SW	0.0048	0.0040	0.0030	0.0048	0.0076	0.0099	0.0230	0.0165	0.0111	0.0102	0.0084	0.0138
AVG	**0.0080**	**0.0057**	**0.0045**	**0.0039**	**0.0065**	**0.0092**	**0.0347**	**0.0237**	**0.0218**	**0.0195**	**0.0173**	**0.0281**

Table 11: Root Mean Square Deviation of SF from 1 Gas Year 2011/12

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	0.0112	0.0141	0.0080	0.0105	0.0144	0.0224	0.0041	0.0291	0.0154	0.0227	0.0251	0.0150
NO	0.0284	0.0142	0.0064	0.0072	0.0120	0.0288	0.0092	0.0427	0.0227	0.0296	0.0321	0.0376
NW	0.0373	0.0138	0.0059	0.0056	0.0091	0.0264	0.0095	0.0498	0.0422	0.0398	0.0272	0.0352
NE	0.0287	0.0110	0.0048	0.0049	0.0087	0.0205	0.0074	0.0390	0.0295	0.0274	0.0267	0.0296
EM	0.0375	0.0130	0.0044	0.0057	0.0096	0.0199	0.0078	0.0444	0.0369	0.0382	0.0267	0.0306
WM	0.0213	0.0066	0.0026	0.0038	0.0047	0.0100	0.0039	0.0265	0.0285	0.0308	0.0165	0.0193
WN	0.0492	0.0224	0.0093	0.0117	0.0157	0.0312	0.0125	0.0535	0.0396	0.0469	0.0426	0.0366
WS	0.0123	0.0055	0.0044	0.0082	0.0088	0.0169	0.0089	0.0411	0.0197	0.0328	0.0207	0.0119
EA	0.0376	0.0145	0.0062	0.0066	0.0105	0.0164	0.0082	0.0356	0.0291	0.0218	0.0237	0.0227
NT	0.0296	0.0140	0.0057	0.0064	0.0092	0.0166	0.0074	0.0290	0.0270	0.0239	0.0242	0.0209
SE	0.0347	0.0138	0.0061	0.0071	0.0092	0.0174	0.0084	0.0396	0.0244	0.0207	0.0249	0.0236
SO	0.0423	0.0202	0.0092	0.0105	0.0123	0.0249	0.0106	0.0493	0.0321	0.0344	0.0213	0.0239
SW	0.0213	0.0110	0.0073	0.0093	0.0105	0.0199	0.0068	0.0257	0.0225	0.0214	0.0132	0.0128
AVG	**0.0301**	**0.0134**	**0.0062**	**0.0075**	**0.0104**	**0.0209**	**0.0080**	**0.0389**	**0.0284**	**0.0300**	**0.0250**	**0.0246**

Table 12: Difference between Gas Year 2010/11 and 2011/12

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	-0.0048	-0.0088	-0.0014	-0.0065	-0.0073	-0.0124	0.0259	-0.0074	0.0077	0.0087	0.0021	0.0121
NO	-0.0237	-0.0114	-0.0039	-0.0027	-0.0049	-0.0191	0.0185	-0.0181	0.0063	-0.0089	-0.0117	-0.0093
NW	-0.0257	-0.0065	0.0020	-0.0015	-0.0027	-0.0152	0.0359	-0.0218	-0.0109	-0.0060	0.0037	0.0066
NE	-0.0223	-0.0066	-0.0017	-0.0008	-0.0021	-0.0108	0.0225	-0.0209	-0.0018	0.0021	-0.0053	0.0052
EM	-0.0279	-0.0064	0.0012	-0.0014	-0.0024	-0.0085	0.0348	-0.0156	-0.0115	-0.0187	-0.0047	0.0098
WM	-0.0162	-0.0031	-0.0007	-0.0004	0.0001	-0.0024	0.0278	-0.0081	-0.0090	-0.0114	-0.0002	0.0095
WN	-0.0429	-0.0164	-0.0034	-0.0092	-0.0099	-0.0233	0.0174	-0.0355	-0.0137	-0.0273	-0.0256	-0.0062
WS	-0.0076	-0.0032	-0.0025	-0.0062	-0.0054	-0.0116	0.0152	-0.0336	-0.0066	-0.0202	-0.0103	0.0059
EA	-0.0276	-0.0055	-0.0012	-0.0023	-0.0036	-0.0072	0.0318	-0.0020	-0.0102	-0.0088	-0.0117	0.0078
NT	-0.0200	-0.0069	-0.0005	-0.0025	-0.0016	-0.0072	0.0319	0.0018	-0.0073	-0.0110	-0.0129	0.0001
SE	-0.0220	-0.0051	-0.0005	-0.0027	-0.0023	-0.0094	0.0375	-0.0058	-0.0035	-0.0066	-0.0134	0.0045
SO	-0.0301	-0.0133	-0.0049	-0.0059	-0.0047	-0.0148	0.0303	-0.0209	-0.0147	-0.0181	-0.0055	-0.0014
SW	-0.0165	-0.0070	-0.0043	-0.0045	-0.0029	-0.0100	0.0162	-0.0092	-0.0114	-0.0112	-0.0048	0.0010
AVG	**-0.0221**	**-0.0077**	**-0.0017**	**-0.0036**	**-0.0038**	**-0.0117**	**0.0266**	**-0.0152**	**-0.0067**	**-0.0106**	**-0.0077**	**0.0035**

Table 13: NDM Weather Corrected Demand as % of NDM Seasonal Normal Demand
Gas Year 2010/11

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	103.1%	103.0%	106.2%	104.3%	102.3%	100.1%	92.8%	93.2%	95.5%	100.5%	104.8%	104.0%
NO	99.8%	99.2%	101.6%	102.3%	100.1%	95.5%	90.2%	91.2%	92.8%	89.8%	95.0%	99.7%
NW	95.5%	99.4%	108.4%	102.0%	97.7%	95.2%	91.5%	91.1%	92.1%	92.7%	98.0%	100.6%
NE	97.4%	100.9%	110.7%	104.5%	102.1%	99.2%	94.0%	97.6%	95.0%	98.5%	102.2%	106.3%
EM	98.1%	100.3%	110.0%	104.1%	100.3%	97.8%	93.9%	92.1%	99.2%	107.1%	111.5%	103.1%
WM	98.7%	100.3%	107.8%	104.0%	99.7%	97.1%	93.7%	90.7%	95.6%	98.6%	98.1%	98.9%
WN	91.8%	100.0%	107.5%	104.2%	99.0%	100.0%	94.8%	85.8%	88.4%	87.1%	88.7%	92.9%
WS	94.6%	99.0%	106.8%	103.0%	100.1%	92.9%	87.7%	90.9%	93.9%	96.8%	94.2%	104.6%
EA	99.0%	101.7%	107.3%	103.1%	101.2%	97.6%	94.6%	90.4%	93.9%	104.1%	99.0%	95.3%
NT	100.0%	100.5%	105.8%	102.0%	99.1%	100.6%	95.9%	93.5%	98.9%	103.9%	100.4%	100.1%
SE	98.4%	99.5%	106.2%	101.7%	100.1%	99.9%	95.3%	92.4%	100.0%	105.4%	99.3%	100.3%
SO	98.7%	99.9%	104.1%	101.1%	97.5%	95.5%	94.1%	90.9%	101.8%	109.5%	105.7%	101.4%
SW	100.4%	99.6%	108.7%	103.3%	99.8%	95.5%	93.2%	90.6%	99.0%	105.8%	103.0%	102.3%

Table 14: NDM Weather Corrected Demand as % of NDM Seasonal Normal Demand
Gas Year 2011/12

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	97.2%	93.9%	99.7%	99.0%	99.3%	92.9%	96.5%	105.9%	104.6%	108.2%	105.7%	100.1%
NO	96.5%	94.5%	96.0%	96.8%	99.0%	89.7%	93.5%	103.7%	104.6%	107.2%	106.3%	100.8%
NW	93.9%	90.6%	94.2%	96.5%	96.9%	89.2%	90.7%	99.8%	107.8%	109.9%	109.4%	97.7%
NE	100.0%	94.1%	98.5%	100.2%	97.7%	88.3%	96.4%	107.6%	104.9%	105.1%	106.9%	97.1%
EM	94.0%	93.3%	96.9%	97.4%	97.7%	90.8%	94.6%	105.9%	107.7%	111.9%	110.1%	96.2%
WM	92.5%	93.3%	97.1%	98.9%	98.3%	92.3%	93.5%	102.5%	110.0%	110.5%	107.4%	97.0%
WN	90.1%	90.3%	93.3%	94.7%	94.3%	92.2%	93.4%	102.2%	104.8%	116.9%	121.3%	95.8%
WS	91.7%	91.2%	95.9%	95.0%	95.6%	87.2%	94.7%	96.0%	103.9%	112.0%	108.5%	95.1%
EA	88.4%	89.9%	94.3%	95.9%	95.9%	93.8%	91.9%	105.7%	106.9%	103.0%	102.6%	91.9%
NT	89.2%	91.6%	94.3%	95.5%	97.0%	92.4%	91.6%	104.3%	114.4%	110.0%	100.0%	88.7%
SE	89.7%	90.4%	93.5%	94.5%	96.5%	92.1%	90.0%	101.3%	102.3%	105.0%	102.8%	89.6%
SO	91.9%	91.4%	95.9%	98.2%	98.6%	93.6%	93.7%	106.4%	108.0%	112.1%	109.7%	97.3%
SW	89.5%	89.3%	94.1%	93.8%	96.3%	90.2%	92.4%	102.0%	108.1%	113.1%	111.5%	91.8%

Table 15: Aggregate NDM AQs at Start of Gas Year 2012/13

Based on data extracted from the Gemini system for gas days 29/09/12 and 08/10/2012

LDZ	% NDM AQ Change
SC	-4.7%
NO	-5.6%
NW	-6.4%
NE	-4.5%
EM	-5.4%
WM	-5.0%
WN	-8.0%
WS	-6.5%
EA	-5.9%
NT	-6.0%
SE	-6.6%
SO	-5.6%
SW	-7.3%
Overall	-5.8%