EVALUATION OF ALGORITHM PERFORMANCE – 2008/09 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. 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.

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 year 2008/09, 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. Thus, direct comparison of WCF-EWCF between the two gas years could be slightly misleading on this occasion.

The SF and WCF-EWCF graphs this year range over two whole gas years 2007/08 and 2008/09. These graphs are presented in their now standard form for each LDZ, in Figures 1 to 13 of this note. Tables of average values of the SF and WCF-EWCF, for gas years 2007/08 and 2008/09, along with the improvement or degradation in these averages between the two gas years, are presented in Tables 1 to 6. It should also be noted that SF and WCF values have been obtained for the period 1st to 10th October 2009 (the start of the new gas year 2009/10) 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 2007/08 and 2008/09, and the respective figures can be found in Tables 7 and 8. The differences in these RMS values between the two gas years are presented in Table 9. These figures provide a very useful measure of the variability of SFs about one (the ideal value). In addition, Tables 10 and 11 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 2007/08 and 2008/09 respectively.

2.0 Overall Results

These various graphs and tables indicate the following notable points:

- During gas year 2008/09 most SF values were lower than one (over days of the week, weekends, winter and summer). Exceptions were limited to two LDZs: NO and WN. In contrast, most SF values during gas year 2007/08 were greater than one.
- For all LDZs over the winter period as a whole average, values of SF for the current gas year (2008/09) were closer to the ideal value of one than in the previous gas year (2007/08). However, over the summer period average values of SF were less well behaved than in the winter, leading to a mixed picture in terms of average values over the whole year for weekdays (Mon-Thurs) and weekend days (Friday, Saturday and Sunday).
- Over the summer period of gas year 2008/09 in 6 of the13 LDZs (namely NO, NE, WN, NT, SO and SW) average values of SF were closer to the ideal value of one than over the summer period of the previous gas year (2007/08).
- The RMS deviation of SF from the ideal value of one provides a measure of the variability of SFs. Over the winter period of gas year 2008/09, in almost all LDZs in each individual month, the RMS deviation of SFs was notably lower, than during the previous gas year. There were very few exceptions during the winter period and these were limited to WS LDZ in the month of February and SW LDZ in February and March.
- RMS deviations of SF from the ideal value of one exhibited a mixed picture during the summer period of gas year 2008/09. In each summer month, considered overall across all LDZs, the RMS deviation of SF from the ideal value of one was better than in gas year 2007/08. However, in April and June the RMS deviation of SF from the ideal value of one was worse than the same month of the previous gas year in 7 of the 13 LDZs. In July and August 4 of 13 LDZs were worse and in both May and September one LDZ was worse, than in 2007/08.
- Considered overall SFs during 2008/09 generally were closer to one and less variable than over the previous gas year. This broad improvement was due to the effects of UNC Modification 204 which changed the definition of WCF from the start of gas year 2008/09.
- Examination of the average weekday and weekend day values of WCF-EWCF in Tables 4 and 5, indicates that the deviation of WCF from EWCF, appeared broadly to be worse, compared to that over the equivalent days of the previous gas year. However, due to implementation of UNC Modification 204, the definition of WCF in the current gas year (2008/09) is different from that which applied in the previous gas year (2007/08). Consequently, for gas year 2008/09 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.
- Weekday (Monday to Thursday) and Friday WCF deviations were worse in most LDZs (WN and EA excepted). Weekend WCF deviations were worse on Saturdays in all LDZs except WN, EA and NT and worse on Sundays in all LDZs except WN, EA, NT and SW. Over the winter as a whole WCF deviations were worse in most LDZs (better in just SC, WN and WS). Over the summer period of gas year 2008/09 WCF deviations were worse for all LDZs except WN, EA and SW.
- Comparison of weather corrected aggregate NDM demand as a percentage of aggregate NDM SND in 2007/08 (Table 10) and 2008/09 (Table 11) indicates that for more than 70% of the month/LDZ combinations these percentages for 2008/09 are lower than those for 2007/08. This suggests that *relative to observed demand on a weather corrected basis,* the SND values that applied (for computing DAFs for example) in 2008/09 were higher than in 2007/08. This is also consistent with the generally greater WCF-EWCF deviations observed in 2008/09 compared to 2007/08 (see Table 6).

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 (2008/09). In part, these instances (up to May 2009) have previously been reported in Appendix 13 of the NDM report published on 26th June 2009. 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:

- In almost all LDZs (most notably in LDZs: NE, EM, WM and EA but also in LDZs: NW, WS, NT, SE and SW) there was some perturbation in the observed SF values over approximately the first half of the month of October 2008. In these LDZs, SF values during the first week of the month showed a positive offset (from their typical average level during gas year 2008/09) and then showed a negative offset (from their typical average level) for the next ten days or so before rising back up to their typical level. The observed pattern of SF values may be related to the prevailing weather in most LDZs during this time and the resultant effect on NDM demand. The first week of October was colder than average; this was followed by a few days at close to seasonal normal and was in turn followed by a further week of weather than was warmer than seasonal normal. During the colder weather NDM demand appeared to have been higher than expected leading to the observed positive SF offsets. During the subsequent warmer period NDM demand fell below expected levels for the weather experienced, which thus led to the observed negative SF offsets.
- In NO LDZ for nearly all of the month of December 2008, the SF exhibited a very slightly lower level than its more usual average level over the months immediately before and after the month. This was due to an error in the AQ of a single CSEP site in NO LDZ. The period over which this error applied corresponded with the observed period of the perturbation in SF and was then corrected on the Gemini system. The perturbation in SF values occurred because of the mismatch between the EUC AQs (including the erroneous CSEP AQ) used in demand attribution on the affected days and the EUC AQs in the LDZ as at 1st October 2008, which were used to compute the sum of ALP weighted daily average consumptions for these same days (which in turn were used to compute the WCF in the LDZ for these days).
- In WS LDZ on Saturday 4th October 2008 there was a sharp positive spike in the WCF-EWCF difference. This was caused by an erroneous zero consumption reading for a single very large DM supply point in the LDZ. This resulted in a corresponding error in actual aggregate NDM consumption (total LDZ demand less LDZ shrinkage less sum of DM consumption) which was incorrectly too high giving in turn a WCF value that was much too high and hence the observed positive spike. It should be noted that the resultant SF value on 4th October 2008 was almost the same as the SF value on the following day, when WCF returned to a more typical value. The imperceptible impact may partly also have been because this was a weekend and the relative weekend factors of the relevant underlying EUC models may also have contributed to masking any impact.
- In WN LDZ on Monday 16th March 2009 there was a sharp negative spike in the WCF-EWCF difference. This was caused by an erroneously high consumption reading for a single very large DM supply point in the LDZ. This resulted in a corresponding error in actual aggregate NDM consumption (total LDZ demand less LDZ shrinkage less sum of DM consumption) which was incorrectly too low by nearly a third on its expected level, giving in turn a WCF value that was much too low and hence the observed negative spike. Since this error constituted a high proportion of total NDM consumption in the LDZ, there was as a result a small consequential impact on the SF value on 16th March 2009 which was a little higher than the SF on adjacent days.
- Nationally, the month of April 2009 was the second warmest April in gas industry records (April 2007 was the warmest). The impact on SF of this sustained warmer than normal weather was most evident in the period approximately from 19th to 26th April during which there was a sharp decline in actual NDM demand in most LDZs (a greater fall than expected due to the warm weather, perhaps due to weather sensitive load shutting down). Such unseasonal demand decline acts directly on the SF to depress its value but also acts indirectly on the SF by lowering the WCF which in turn would tend to increase the SF. The observed SF in each LDZ is the net result of these two opposing effects. In many LDZs (e.g. NW, NE, EM, WM, EA, NT, SE, SW) the SF showed a decline from more normal levels during this period. In the other LDZs (i.e. SC, NO, WN, WS and SO) the impact on SF was less evident as the two effects appeared to balance out.
- Nationally, the month of May 2009 was the 5th warmest in the last 10 years. Weather during the month was broadly near seasonal normal with warmer than seasonal normal spells at the beginning and end of the month (1st to 7th May and 22nd to 31st May). Within each of these two warmer periods there was an interlude of relatively colder weather of one or two day's duration around 4th May and 27th May respectively. Actual (and weather corrected) aggregate NDM demand was depressed (relative to the

weather experienced) during these warm spells and this was particularly so in the second spell in late May. However, aggregate NDM demand also recovered sharply in the relatively colder interludes of a day or two within these two warm periods. Thus, there was significant volatility in actual aggregate NDM demand during the month, which is not atypical of a shoulder month with changeable weather conditions. Observed SF behaviour during May 2009 in individual LDZs was a consequence of the outcome of two opposing effects, both driven by the level of actual aggregate NDM demand. Depressed aggregate NDM demand acts directly on the SF to reduce its value but also acts indirectly on the SF by lowering the WCF which in turn would tend to increase the SF. Conversely, inflated aggregate NDM demand acts directly on the SF to increase its value but also acts indirectly on the SF by raising the WCF which in turn would tend to decrease the SF. During May 2009, SF values were more variable in LDZs NE, EM, WM, EA, NT, SE and SW. Moreover, many LDZs showed spikes in the WCF– EWCF difference on (or around) 4th May and 27th May (within the two warm periods, these were days of relatively colder weather with increased aggregate NDM demand which thus gave higher WCF values). In some LDZs a corresponding spike in SF was also observed on one or both of these days (most evident in NE, EM, WM and WN on both days, WS on 4th May and in EA, NT, SE and SO on 27th May).

- In the month of June 2009 which was warmer than seasonal normal, a colder spell (than normal for the time of year) was experienced nationally during the period 5th to 11th June. The coldest days of the spell did not coincide in all LDZs but during this period at least one day showed a marked negative spike in the WCF deviation in most LDZs. At least one such spike may be clearly seen, for example, in LDZs: NO, NW, NE, WN, SE, SO and SW. In the affected LDZs, colder weather led to an increase in aggregate NDM demand and thus to positive WCF values, but NDM demand did not actually increase by as much as the colder weather experienced should have implied. Thus, WCF-EWCF was negative and, taking SW LDZ as an example, strongly so on 7th and 8th June. In this case, there was also a very slight increase in SF from immediately recent levels bringing the SF closer to one. WN LDZ was another LDZ where negative spikes in WCF deviation occurred on 5th and 11th June, for the same underlying reason.
- On 17th July 2009, north east England experienced exceptionally high rainfall and local flooding occurred in some areas. On this day in NO LDZ, colder than normal weather (following a period of warm days prior to that) led to aggregate NDM demand that was sharply higher, more so than the prevailing weather should have implied. WCF was positive leading to a sharp positive spike in WCF deviation and SF also increased slightly over the level observed on immediately previous days. The increase in WCF would have tended to depress SF but the direct impact on SF of increased aggregate NDM demand was the stronger effect.
- In SE LDZ on 6th, 10th and 11th August aggregate NDM demand was artificially depressed due to DM metering errors in two different individual DM meters with one DM meter affected on 10th August and another DM meter affected on 6th and 11th August. Total DM demand on these days was consequently significantly greater than should have been the case, thereby depressing aggregate NDM demand. Thus, WCF was negative and WCF deviation showed negative spikes. Although the negative WCF would have tended to increase SF, the direct effect of depressed aggregate NDM demand on SF controlled the observed effect on these days, driving SF slightly lower than on adjacent days.
- In September 2009 moderate positive spikes in the WCF deviation were observed on a number of days. Some illustrative examples of this were: in NO LDZ on 21st September, in WS LDZ on 22nd September and in NT LDZ on 15th September. These instances were due to aggregate NDM demand being somewhat higher than expected for the prevailing weather conditions. Some negative spikes in WCF deviation of lesser extent were also observed in September 2009: for example in WS and NT LDZs on 26th September and in SW LDZ on 24th September. These instances were due to aggregate NDM demand being somewhat lower than expected for the prevailing weather conditions. No significant consequential impacts on SFs appeared to have resulted in any of these instances.

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 causes 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 imposed change is the main reason for the improved values of SF in all LDZs for 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.

Hitherto, EUC demand models with summer reductions also gave rise to summer scaling factor volatility. Here, the mechanism involved the ALP parameter. If weather on a day in summer was significantly different from normal for that time of year, the ALP value that was applied on that day to EUCs with summer reductions may not have been appropriate for the prevailing weather. Thus, overall the ALP*(AQ/365) terms in the demand attribution formula may have been too low or too high and the scaling factor changed abnormally to compensate. However, with the change to WCF resulting from Modification 204, errors in the ALP*(AQ/365) terms should be (at least partly) compensated for in the revised definition of WCF. Thus, this effect is now expected to not contribute as significantly to summer scaling factor volatility as was previously the case.

In previous years, 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 12 shows the percentage changes in aggregate NDM AQs at the start of gas year 2009/10 as observed on the Gemini system. It is clear that a significant reduction in aggregate NDM AQs has taken place for gas year 2009/10. The reduction is 4.4% overall across all LDZs and the reductions range from 3.2% in NT LDZ to 5.4% in SO LDZ.

Figure 1

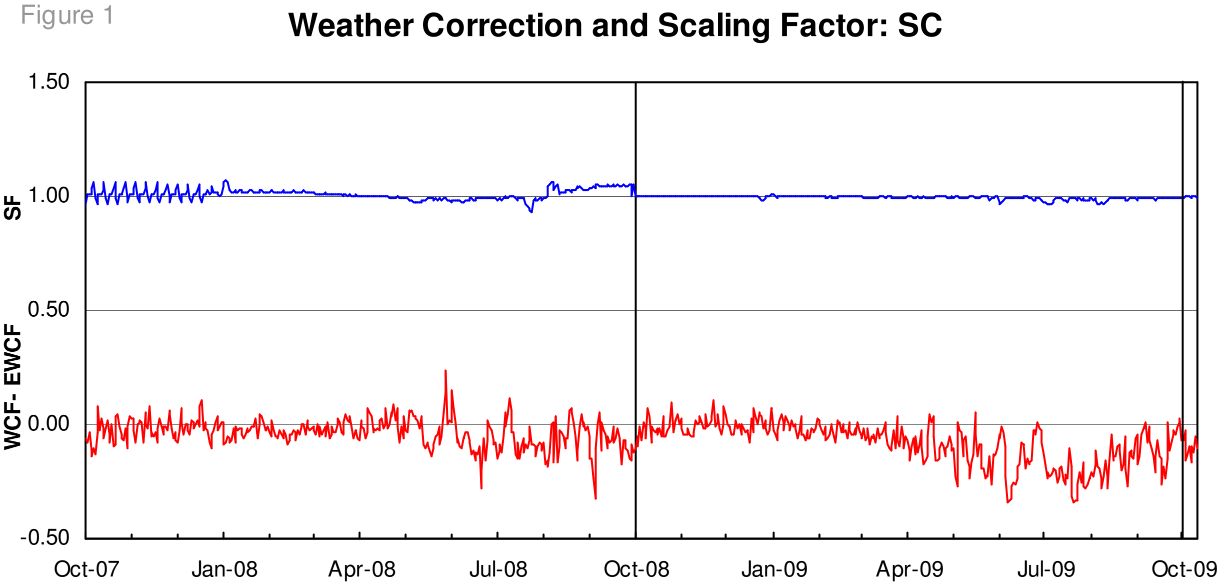

Figure 2

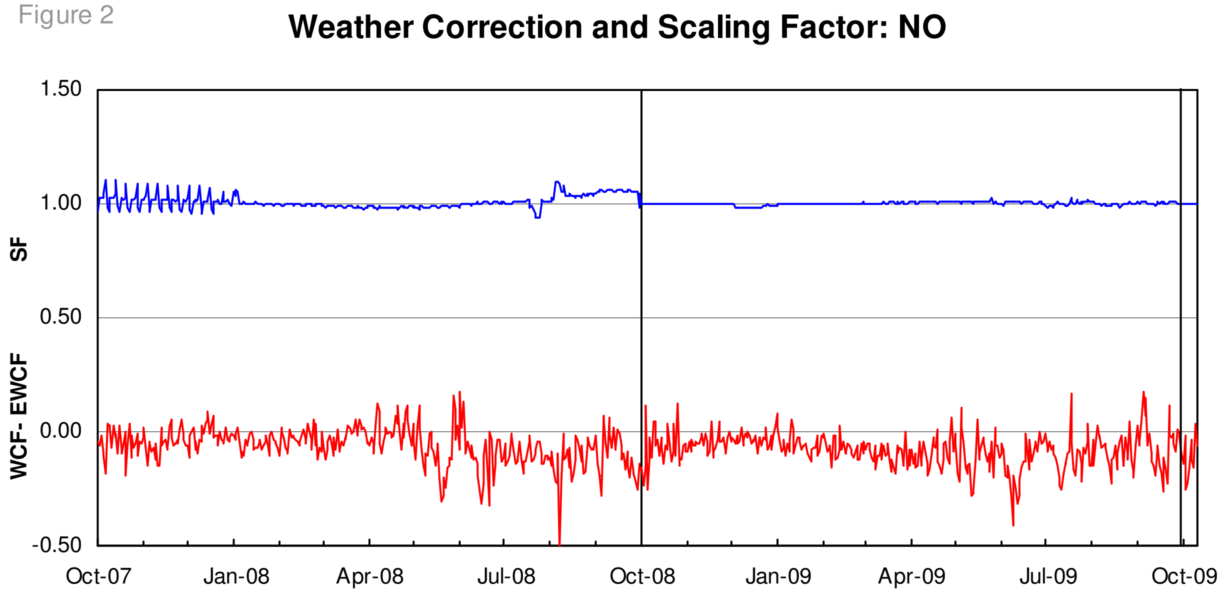

Figure 3

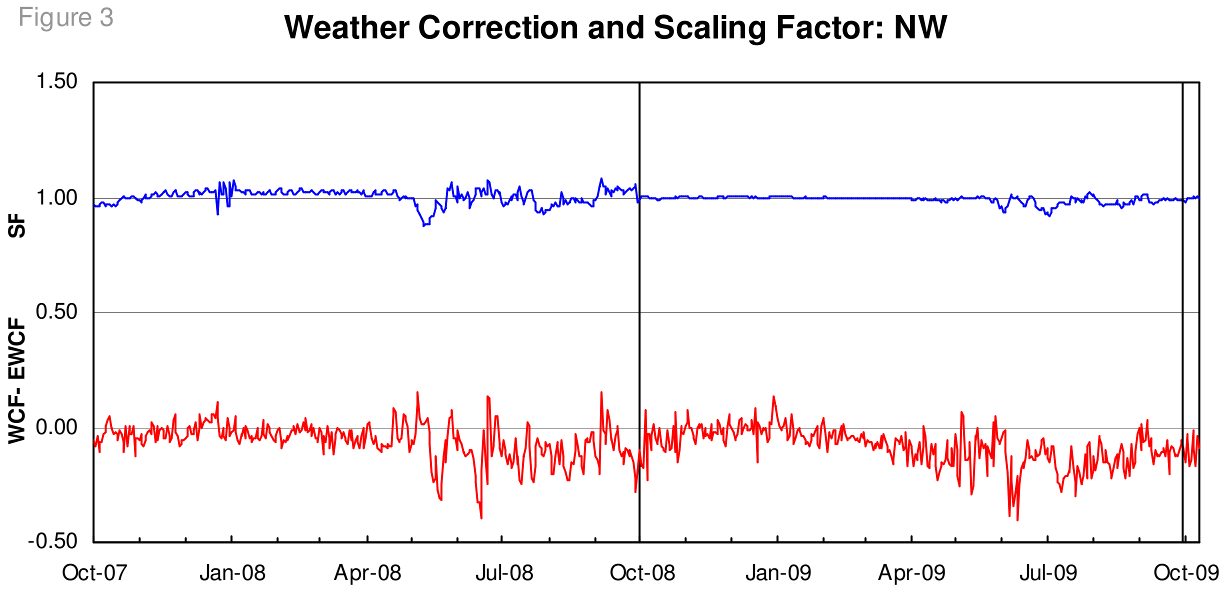

Figure 4

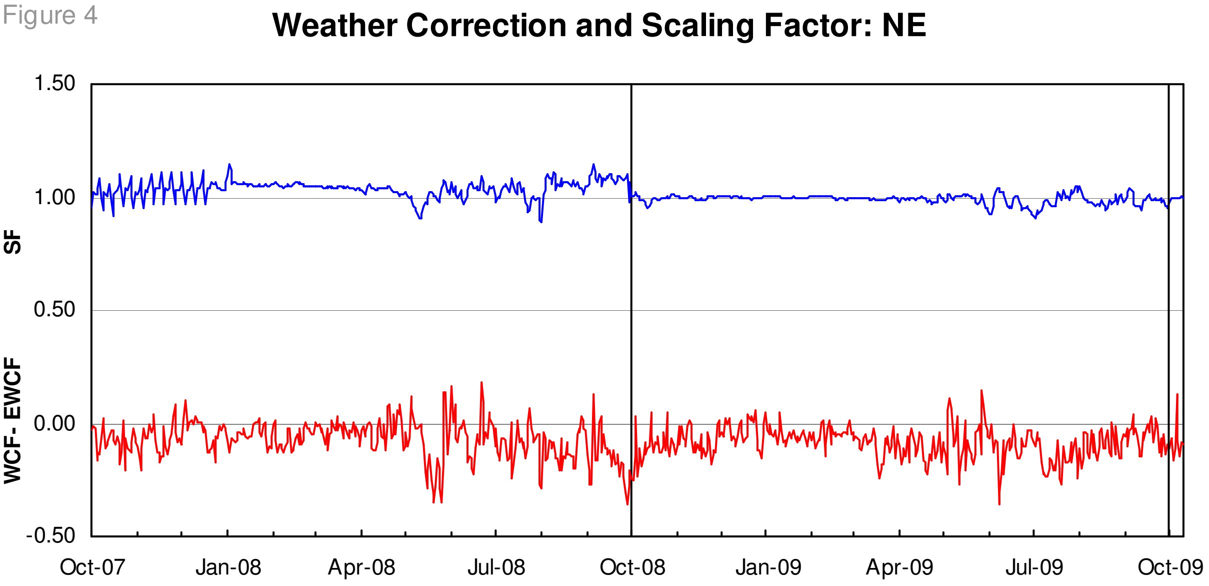

Figure 5

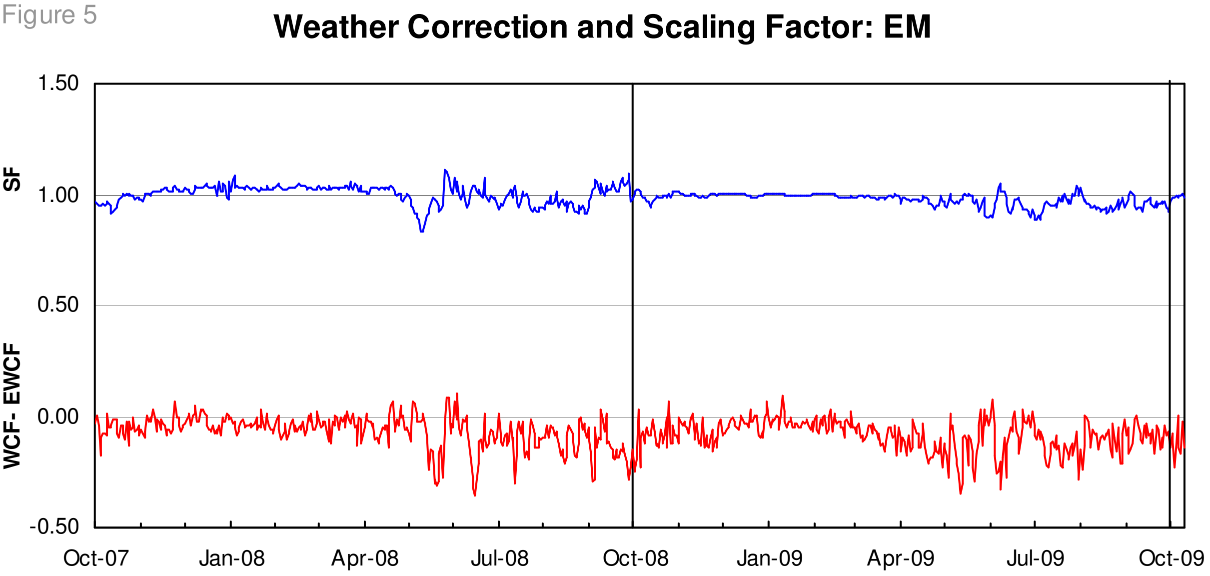

Figure 6

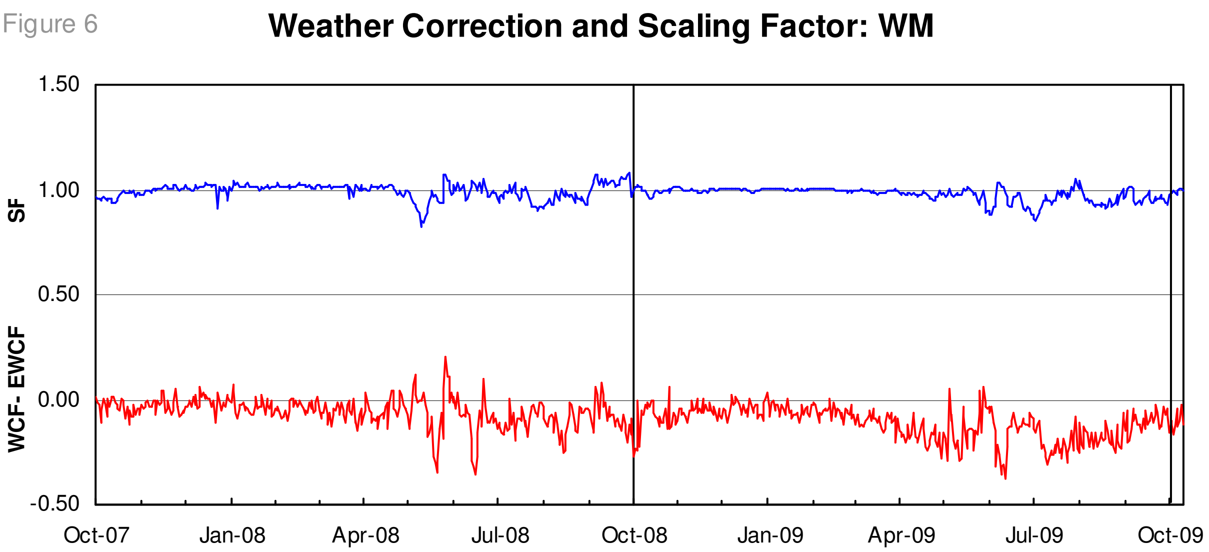

Figure 7

Weather Correction and Scaling Factor: WN

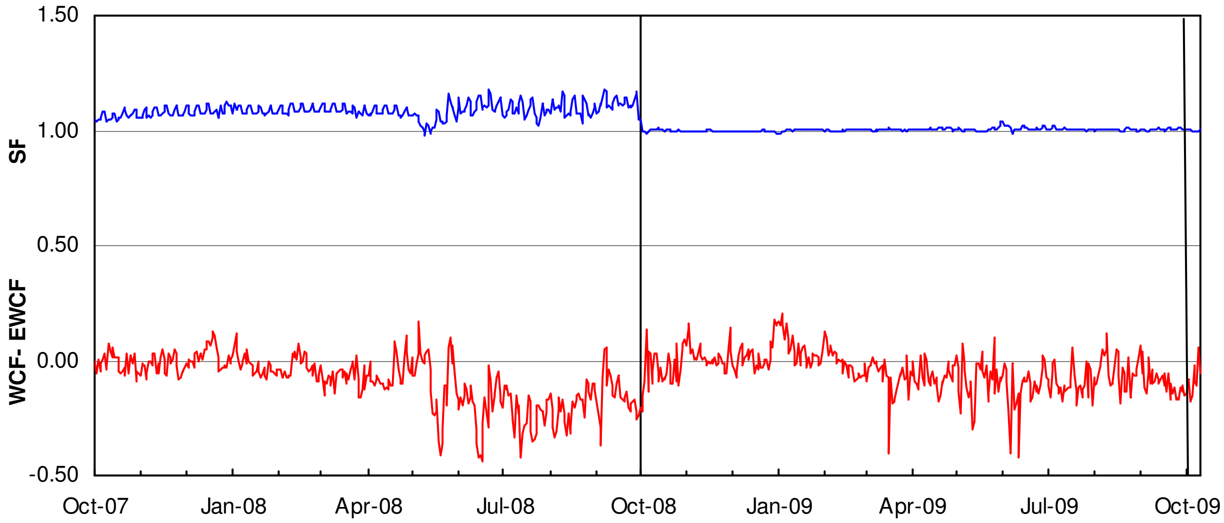

Figure 8

Weather Correction and Scaling Factor: WS

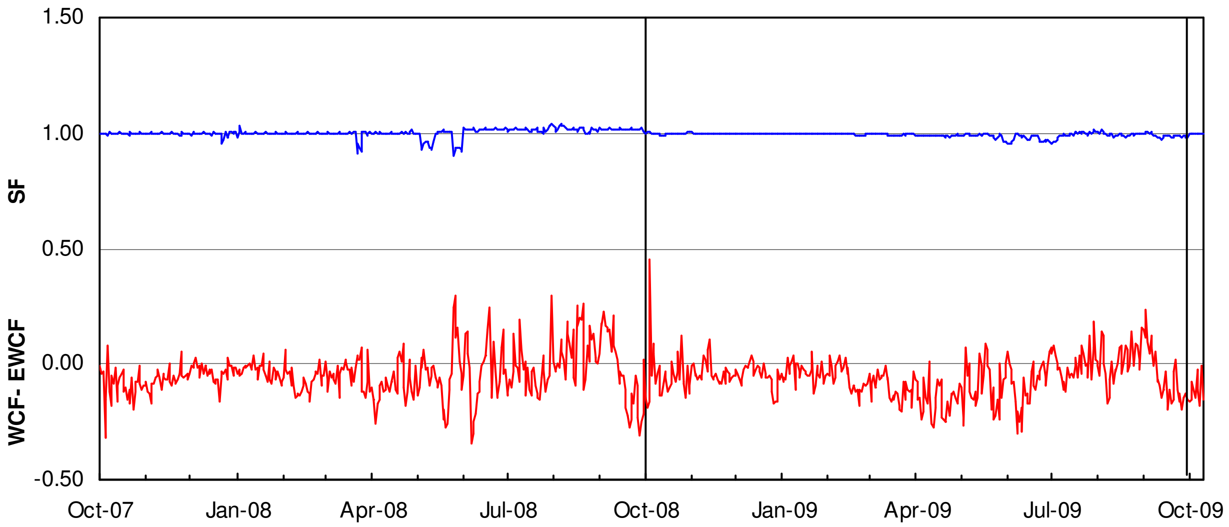

Figure 9

Weather Correction and Scaling Factor: EA

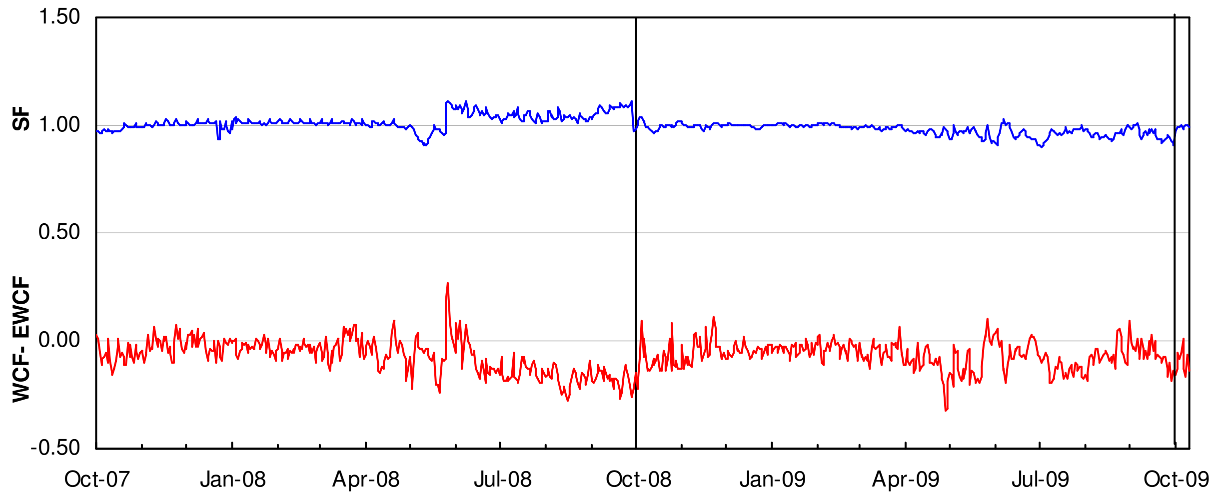

Figure 10

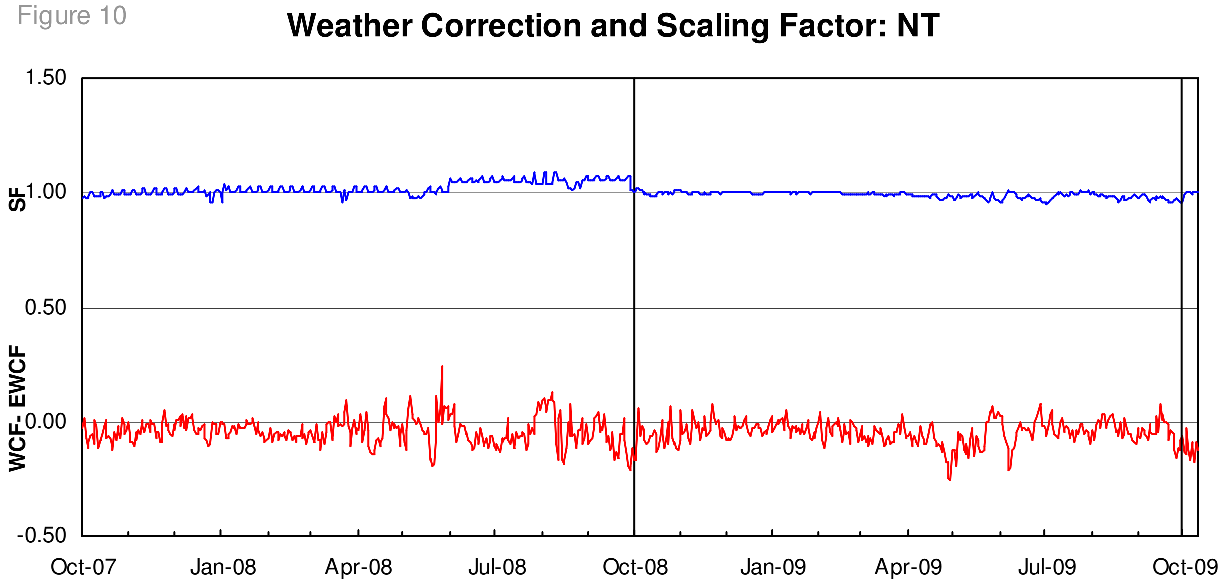

Figure 11

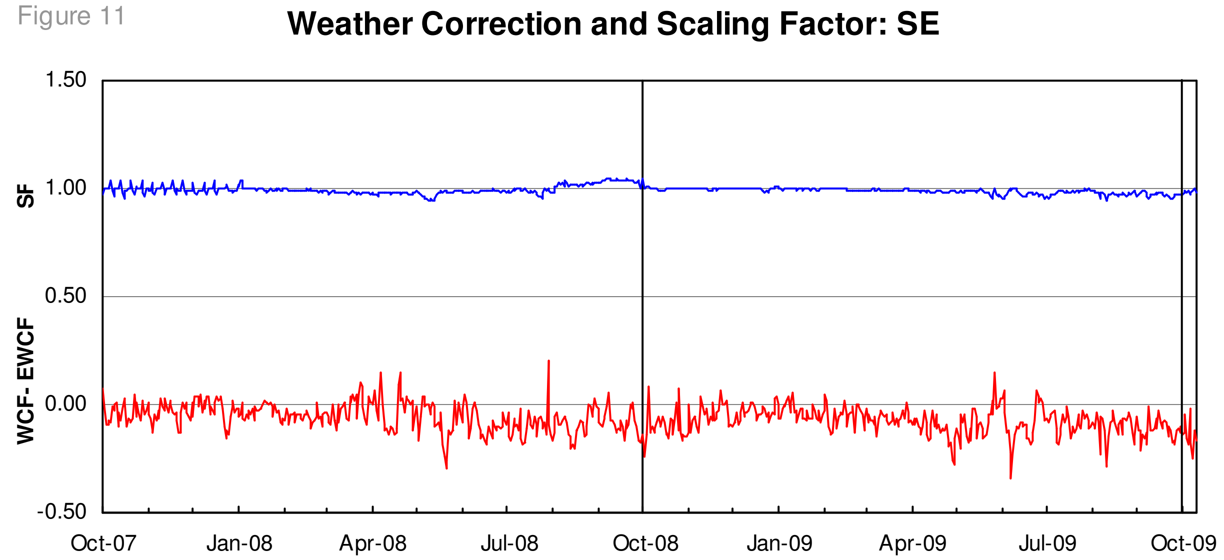

Figure 12

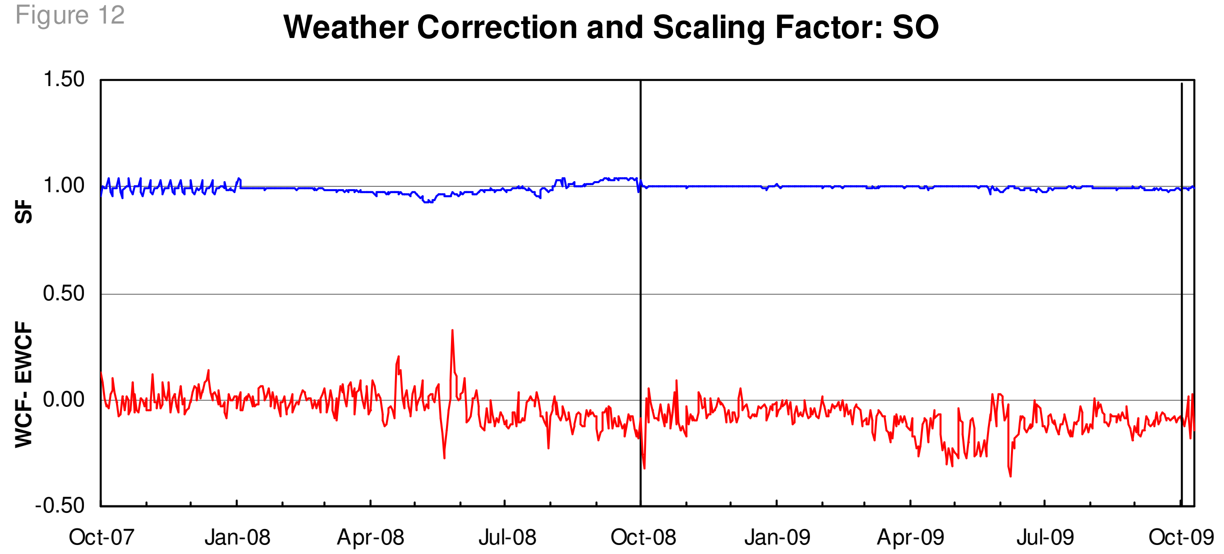

Figure 13

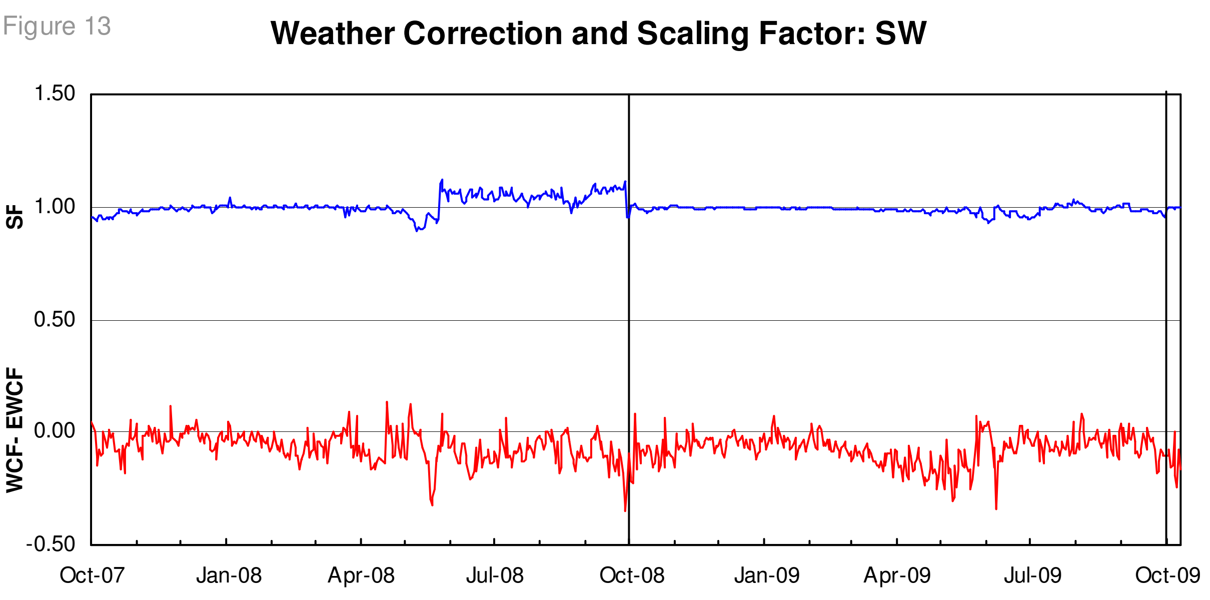
Weather Correction and Scaling Factor: SW
SF
WCF- EWCF
1.50
1.00
0.50
0.00
-0.50
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09

Table 1: Average Values of SF Gas Year 2007/08

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	1.007	1.014	1.021	1.004	1.015	1.004
NO	1.008	1.008	1.022	0.998	1.005	1.011
NW	0.999	1.005	1.009	1.012	1.012	0.995
NE	1.032	1.039	1.056	1.040	1.042	1.033
EM	1.001	0.999	1.008	1.003	1.017	0.987
WM	0.992	0.994	1.001	0.992	1.003	0.985
WN	1.072	1.085	1.115	1.116	1.082	1.090
WS	1.002	0.999	0.996	1.004	0.996	1.006
EA	1.013	1.016	1.031	1.024	1.004	1.031
NT	1.014	1.018	1.035	1.037	1.004	1.037
SE	0.994	0.994	1.006	0.992	0.994	0.997
SO	0.988	0.989	1.001	0.986	0.991	0.988
SW	1.004	1.003	1.019	1.020	0.990	1.026
AVG	**1.010**	**1.013**	**1.024**	**1.018**	**1.012**	**1.015**

Table 2: Average Values of SF Gas Year 2008/09

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	0.993	0.994	0.994	0.993	0.997	0.990
NO	1.001	1.003	1.001	1.001	0.999	1.004
NW	0.989	0.992	0.993	0.992	0.999	0.983
NE	0.990	0.995	0.992	0.991	0.996	0.986
EM	0.978	0.979	0.977	0.978	0.996	0.960
WM	0.978	0.980	0.980	0.980	0.998	0.960
WN	1.002	1.002	1.004	1.004	0.999	1.006
WS	0.992	0.993	0.993	0.993	0.997	0.988
EA	0.977	0.979	0.981	0.980	0.996	0.960
NT	0.989	0.991	0.992	0.991	0.999	0.982
SE	0.987	0.989	0.991	0.989	0.997	0.980
SO	0.995	0.996	0.997	0.997	0.999	0.993
SW	0.987	0.989	0.990	0.989	0.994	0.983
AVG	**0.989**	**0.991**	**0.991**	**0.991**	**0.997**	**0.983**

Table 3: Difference Between Average Values of SF in Gas Year 2007/08 and 2008/09

LDZ	MON-THUR	FRIDAY	SATURDAY	SUNDAY	WINTER	SUMMER
SC	0.000	0.008	0.015	-0.003	0.012	-0.006
NO	0.007	0.005	0.021	0.001	0.004	0.007
NW	-0.010	-0.003	0.002	0.004	0.011	-0.012
NE	0.022	0.034	0.048	0.031	0.038	0.019
EM	-0.021	-0.020	-0.015	-0.019	0.013	-0.027
WM	-0.014	-0.014	-0.019	-0.012	0.001	-0.025
WN	0.070	0.083	0.111	0.112	0.081	0.084
WS	-0.006	-0.006	-0.003	-0.003	0.001	-0.006
EA	-0.010	-0.005	0.012	0.004	0.000	-0.009
NT	0.003	0.009	0.027	0.028	0.003	0.019
SE	-0.007	-0.005	-0.003	-0.003	0.003	-0.017
SO	0.007	0.007	-0.002	0.011	0.008	0.005
SW	-0.009	-0.008	0.009	0.009	0.004	0.009

Table 4: Average Values of WCF – EWCF Gas Year 2007/08

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	-0.030	-0.045	-0.048	-0.040	-0.024	-0.049
NO	-0.062	-0.059	-0.063	-0.059	-0.037	-0.086
NW	-0.061	-0.051	-0.052	-0.074	-0.028	-0.092
NE	-0.074	-0.071	-0.070	-0.068	-0.055	-0.089
EM	-0.065	-0.064	-0.073	-0.072	-0.038	-0.097
WM	-0.058	-0.059	-0.055	-0.061	-0.035	-0.082
WN	-0.091	-0.077	-0.077	-0.101	-0.022	-0.155
WS	-0.038	-0.055	-0.031	-0.055	-0.055	-0.028
EA	-0.070	-0.086	-0.075	-0.077	-0.032	-0.117
NT	-0.040	-0.048	-0.039	-0.050	-0.040	-0.045
SE	-0.056	-0.069	-0.049	-0.048	-0.032	-0.079
SO	-0.022	-0.029	-0.028	-0.029	0.003	-0.053
SW	-0.062	-0.060	-0.051	-0.083	-0.040	-0.087
AVG	**-0.056**	**-0.060**	**-0.055**	**-0.063**	**-0.033**	**-0.081**

Table 5: Average Values of WCF – EWCF Gas Year 2008/09

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	-0.080	-0.072	-0.089	-0.090	-0.020	-0.142
NO	-0.079	-0.080	-0.079	-0.092	-0.063	-0.098
NW	-0.085	-0.092	-0.071	-0.086	-0.037	-0.131
NE	-0.089	-0.089	-0.075	-0.080	-0.070	-0.102
EM	-0.079	-0.101	-0.091	-0.087	-0.056	-0.114
WM	-0.109	-0.128	-0.113	-0.113	-0.066	-0.160
WN	-0.054	-0.051	-0.020	-0.031	-0.005	-0.085
WS	-0.051	-0.071	-0.072	-0.068	-0.055	-0.064
EA	-0.068	-0.082	-0.064	-0.065	-0.050	-0.088
NT	-0.050	-0.058	-0.028	-0.036	-0.040	-0.052
SE	-0.079	-0.089	-0.064	-0.078	-0.056	-0.100
SO	-0.093	-0.114	-0.088	-0.097	-0.066	-0.125
SW	-0.072	-0.091	-0.070	-0.079	-0.068	-0.084
AVG	**-0.076**	**-0.086**	**-0.071**	**-0.077**	**-0.050**	**-0.103**

Table 6: Difference between average values of WCF – EWCF in Gas Year 2007/08 and 2008/09

LDZ	Mon-Thur	Friday	Saturday	Sunday	Winter	Summer
SC	-0.049	-0.026	-0.041	-0.049	0.004	-0.093
NO	-0.016	-0.021	-0.016	-0.033	-0.026	-0.013
NW	-0.024	-0.041	-0.019	-0.012	-0.009	-0.039
NE	-0.015	-0.018	-0.006	-0.013	-0.015	-0.012
EM	-0.014	-0.037	-0.018	-0.014	-0.018	-0.017
WM	-0.050	-0.068	-0.058	-0.052	-0.030	-0.078
WN	0.038	0.026	0.057	0.071	0.017	0.070
WS	-0.013	-0.016	-0.041	-0.013	0.001	-0.035
EA	0.002	0.004	0.012	0.013	-0.018	0.029
NT	-0.010	-0.010	0.011	0.014	0.000	-0.007
SE	-0.023	-0.020	-0.015	-0.029	-0.024	-0.021
SO	-0.072	-0.084	-0.060	-0.068	-0.063	-0.072
SW	-0.010	-0.031	-0.020	0.003	-0.028	0.003

Table 7: Root Mean Square Deviation of SF from 1 Gas Year 2007/08

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	0.0294	0.0278	0.0254	0.0289	0.0186	0.0087	0.0040	0.0171	0.0149	0.0246	0.0333	0.0448
NO	0.0431	0.0370	0.0316	0.0166	0.0044	0.0139	0.0169	0.0143	0.0051	0.0231	0.0503	0.0542
NW	0.0254	0.0146	0.0359	0.0261	0.0244	0.0227	0.0162	0.0663	0.0295	0.0387	0.0272	0.0370
NE	0.0453	0.0516	0.0545	0.0645	0.0543	0.0427	0.0334	0.0433	0.0410	0.0434	0.0659	0.0855
EM	0.0385	0.0191	0.0320	0.0335	0.0337	0.0332	0.0239	0.0850	0.0349	0.0442	0.0541	0.0429
WM	0.0362	0.0118	0.0291	0.0178	0.0184	0.0184	0.0144	0.0777	0.0259	0.0505	0.0486	0.0456
WN	0.0647	0.0797	0.0905	0.0872	0.0931	0.0909	0.0830	0.0642	0.1128	0.0937	0.1032	0.1222
WS	0.0043	0.0049	0.0116	0.0079	0.0035	0.0253	0.0034	0.0464	0.0159	0.0180	0.0201	0.0176
EA	0.0225	0.0094	0.0227	0.0155	0.0144	0.0131	0.0112	0.0641	0.0631	0.0407	0.0403	0.0771
NT	0.0140	0.0100	0.0147	0.0163	0.0153	0.0171	0.0142	0.0153	0.0545	0.0548	0.0533	0.0590
SE	0.0204	0.0172	0.0158	0.0109	0.0092	0.0197	0.0217	0.0311	0.0133	0.0176	0.0214	0.0369
SO	0.0245	0.0201	0.0185	0.0114	0.0093	0.0203	0.0314	0.0498	0.0233	0.0207	0.0176	0.0350
SW	0.0397	0.0154	0.0096	0.0089	0.0057	0.0124	0.0152	0.0692	0.0575	0.0486	0.0429	0.0759
AVG	**0.0314**	**0.0245**	**0.0302**	**0.0266**	**0.0234**	**0.0260**	**0.0222**	**0.0495**	**0.0378**	**0.0399**	**0.0445**	**0.0564**

Table 8: Root Mean Square Deviation of SF from 1 Gas Year 2008/09

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	0.0013	0.0010	0.0054	0.0032	0.0040	0.0048	0.0048	0.0072	0.0124	0.0194	0.0172	0.0088
NO	0.0007	0.0007	0.0128	0.0013	0.0028	0.0041	0.0063	0.0076	0.0072	0.0103	0.0058	0.0054
NW	0.0061	0.0024	0.0018	0.0014	0.0027	0.0044	0.0121	0.0157	0.0370	0.0339	0.0271	0.0146
NE	0.0163	0.0063	0.0044	0.0033	0.0062	0.0086	0.0129	0.0197	0.0423	0.0404	0.0275	0.0267
EM	0.0209	0.0074	0.0061	0.0040	0.0088	0.0119	0.0324	0.0486	0.0604	0.0535	0.0561	0.0466
WM	0.0169	0.0070	0.0063	0.0043	0.0068	0.0088	0.0262	0.0427	0.0724	0.0638	0.0585	0.0453
WN	0.0044	0.0036	0.0049	0.0044	0.0023	0.0033	0.0064	0.0118	0.0132	0.0084	0.0037	0.0070
WS	0.0040	0.0025	0.0024	0.0027	0.0048	0.0068	0.0104	0.0149	0.0282	0.0154	0.0089	0.0140
EA	0.0188	0.0094	0.0076	0.0047	0.0092	0.0124	0.0340	0.0476	0.0530	0.0466	0.0460	0.0514
NT	0.0083	0.0043	0.0037	0.0026	0.0046	0.0064	0.0171	0.0220	0.0250	0.0171	0.0206	0.0291
SE	0.0047	0.0030	0.0058	0.0037	0.0053	0.0065	0.0140	0.0198	0.0281	0.0193	0.0275	0.0295
SO	0.0012	0.0012	0.0041	0.0022	0.0019	0.0020	0.0030	0.0085	0.0157	0.0094	0.0074	0.0127
SW	0.0110	0.0066	0.0049	0.0058	0.0076	0.0126	0.0208	0.0259	0.0405	0.0208	0.0118	0.0218
AVG	**0.0088**	**0.0043**	**0.0054**	**0.0034**	**0.0052**	**0.0071**	**0.0154**	**0.0225**	**0.0335**	**0.0276**	**0.0245**	**0.0241**

Table 9: Difference between Gas Year 2007/08 and 2008/09

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	0.0281	0.0268	0.0200	0.0257	0.0146	0.0039	-0.0008	0.0099	0.0025	0.0052	0.0161	0.0360
NO	0.0424	0.0363	0.0188	0.0153	0.0016	0.0098	0.0106	0.0067	-0.0021	0.0128	0.0445	0.0488
NW	0.0193	0.0122	0.0341	0.0247	0.0217	0.0183	0.0041	0.0506	-0.0075	0.0048	0.0001	0.0224
NE	0.0290	0.0453	0.0501	0.0612	0.0481	0.0341	0.0205	0.0236	-0.0013	0.0030	0.0384	0.0588
EM	0.0176	0.0117	0.0259	0.0295	0.0249	0.0213	-0.0085	0.0364	-0.0255	-0.0093	-0.0020	-0.0037
WM	0.0193	0.0048	0.0228	0.0135	0.0116	0.0096	-0.0118	0.0350	-0.0465	-0.0133	-0.0099	0.0003
WN	0.0603	0.0761	0.0856	0.0828	0.0908	0.0876	0.0766	0.0524	0.0996	0.0853	0.0995	0.1152
WS	0.0003	0.0024	0.0092	0.0052	-0.0013	0.0185	-0.0070	0.0315	-0.0123	0.0026	0.0112	0.0036
EA	0.0037	0.0000	0.0151	0.0108	0.0052	0.0007	-0.0228	0.0165	0.0101	-0.0059	-0.0057	0.0257
NT	0.0057	0.0057	0.0110	0.0137	0.0107	0.0107	-0.0029	-0.0067	0.0295	0.0377	0.0327	0.0299
SE	0.0157	0.0142	0.0100	0.0072	0.0039	0.0132	0.0077	0.0113	-0.0148	-0.0017	-0.0061	0.0074
SO	0.0233	0.0189	0.0144	0.0092	0.0074	0.0183	0.0284	0.0413	0.0076	0.0113	0.0102	0.0223
SW	0.0287	0.0088	0.0047	0.0031	-0.0019	-0.0002	-0.0056	0.0433	0.0170	0.0278	0.0311	0.0541
AVG	**0.0226**	**0.0202**	**0.0247**	**0.0232**	**0.0183**	**0.0189**	**0.0068**	**0.0271**	**0.0043**	**0.0123**	**0.0200**	**0.0324**

Table 10: NDM Weather Corrected Demand as % of NDM Seasonal Normal Demand Gas Year 2007/08

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	96.4%	98.5%	99.2%	97.2%	96.6%	97.9%	100.5%	99.0%	92.8%	93.1%	95.0%	90.8%
NO	95.1%	95.3%	98.4%	94.9%	96.8%	97.0%	100.1%	91.2%	90.1%	90.2%	87.9%	89.0%
NW	96.3%	96.8%	100.5%	97.0%	97.5%	95.2%	96.2%	93.2%	88.7%	88.2%	88.0%	90.2%
NE	91.8%	92.6%	96.7%	94.8%	93.7%	96.7%	97.0%	89.7%	95.9%	91.1%	89.0%	83.4%
EM	94.4%	96.5%	98.1%	96.3%	95.4%	96.2%	95.9%	90.6%	90.2%	89.9%	90.9%	84.8%
WM	96.0%	97.2%	99.1%	96.7%	96.1%	93.5%	95.2%	93.7%	89.9%	90.4%	89.3%	91.4%
WN	98.5%	98.1%	102.0%	98.0%	97.2%	92.5%	94.2%	91.1%	80.1%	77.0%	80.5%	84.2%
WS	90.7%	93.7%	96.8%	97.0%	92.9%	95.4%	91.2%	95.1%	95.8%	96.6%	106.3%	94.4%
EA	93.5%	98.1%	98.4%	97.0%	96.0%	97.9%	94.7%	93.9%	92.1%	85.4%	82.0%	81.8%
NT	94.9%	96.1%	97.5%	96.8%	94.1%	96.5%	95.6%	98.2%	94.5%	94.3%	97.7%	91.4%
SE	96.6%	96.0%	98.2%	96.8%	94.4%	98.2%	96.9%	92.3%	91.3%	90.1%	91.4%	91.0%
SO	99.6%	99.7%	102.2%	100.0%	99.4%	100.7%	99.8%	99.2%	94.2%	93.2%	92.4%	88.9%
SW	95.2%	97.3%	98.0%	97.0%	92.5%	95.9%	92.4%	93.0%	88.4%	92.0%	93.3%	87.6%

Table 11: NDM Weather Corrected Demand as % of NDM Seasonal Normal Demand Gas Year 2008/09

LDZ	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SC	98.2%	99.0%	98.4%	96.9%	96.1%	93.4%	90.0%	86.7%	86.2%	78.3%	85.6%	91.7%
NO	93.8%	95.8%	97.1%	94.5%	92.6%	89.7%	91.4%	89.7%	84.6%	88.6%	90.8%	93.2%
NW	92.5%	96.5%	97.6%	94.9%	93.7%	90.1%	87.6%	91.6%	84.9%	84.5%	90.0%	91.1%
NE	90.7%	91.7%	95.4%	93.6%	94.7%	90.2%	88.9%	93.3%	85.7%	84.2%	91.2%	90.7%
EM	90.8%	90.2%	94.3%	94.2%	93.8%	89.8%	87.3%	88.2%	89.6%	90.6%	95.2%	89.7%
WM	92.8%	94.0%	95.2%	93.1%	92.7%	89.0%	83.5%	89.2%	84.7%	85.4%	89.3%	90.6%
WN	86.3%	91.2%	91.1%	94.0%	88.8%	83.9%	85.7%	82.1%	77.9%	77.6%	81.5%	80.0%
WS	96.5%	96.8%	95.5%	96.5%	93.9%	89.5%	85.8%	93.5%	91.8%	101.2%	103.7%	93.5%
EA	93.3%	95.6%	94.7%	94.1%	94.7%	94.0%	89.4%	92.2%	97.3%	95.7%	102.0%	93.4%
NT	93.7%	96.9%	96.2%	95.9%	95.2%	93.3%	91.6%	94.1%	97.8%	101.9%	103.0%	96.7%
SE	91.2%	95.6%	96.7%	95.8%	94.0%	93.5%	88.9%	93.8%	93.8%	98.6%	96.9%	91.0%
SO	90.8%	93.4%	93.4%	92.2%	92.8%	87.8%	83.4%	84.8%	90.1%	93.1%	97.2%	91.0%
SW	92.5%	96.4%	95.6%	95.9%	95.1%	89.3%	86.0%	89.2%	91.5%	95.6%	99.2%	92.4%

Table 12: Aggregate NDM AQs at Start of Gas Year 2009/10

Based on data extracted from the Gemini system for gas days 25/09/09 and 10/10/2009

LDZ	% NDM AQ Change
SC	-3.9%
NO	-5.2%
NW	-3.8%
NE	-4.7%
EM	-5.0%
WM	-5.1%
WN	-4.8%
WS	-4.3%
EA	-4.5%
NT	-3.2%
SE	-4.2%
SO	-5.4%
SW	-4.7%
Overall	**-4.4%**