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Leveraging Gas Smart Meter Technology to Improve Energy Choice

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Developing a gas delivery forecast process that reduces commodity, planning and cost risk exposure

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I. Introduction

Baltimore Gas and Electric (BGE) like many Gas and Electric Utilities in the U.S. offers customers competitive energy supply options through its Energy Choice Programs. Customers may choose a third party provider to supply their gas or electricity, while BGE remains responsible for delivering gas or electricity to customers via BGE's gas pipe or electric wires. Customers not electing a third party supplier will remain with BGE for their gas or electricity supply needs. Energy Choice suppliers, unlike BGE, are not subject to price regulation by the Maryland Public Service Commission, the administrative body that regulates public utility companies in Maryland. Suppliers operate in a competitive environment where they are able to offer a wide variety of gas and/or electricity commodity options. Options may include variable pricing where the gas or electricity cost is tied to an index that can change monthly; fixed term pricing for a year or more; "green" products such as solar or wind generated electricity; sign up incentives such as discounts, air miles, gift cards and affinity programs that provide discounts for seniors or veterans or monetary incentives for referring other customers. These options are not available within the utility regulated standard offer price framework for both gas and electricity.

Customers selecting an Energy Choice supplier develop a separate relationship and contract directly with the supplier for their energy needs. Suppliers then enroll the customer and notify the utility that the Energy Choice supplier will be providing the customer's gas or electricity supply. In this three way relationship the utility is responsible for delivering the supplier provided energy to the customer's meter and to provide metered gas or electric consumption data to the supplier to enable the supplier to calculate the customer's gas or electric charges for that month. In most instances monthly supplier charges for energy used by their customer are billed directly on the customer's existing utility bill by the supplier. This consolidated utility billing arrangement eliminates the need for a supplier to provide a separate bill to the customer. It also removes the inconvenience of sending two separate payments – one to the utility for delivery service, and another to the supplier.

In most, if not all Gas Choice programs, the charges billed by the supplier are for gas used by the customer as metered by the utility.[1] For a given monthly billing period gas used by Choice customers will rarely equal gas delivered to the customer by the supplier. The difference between gas used and gas delivered volumes may be significant from a percentage basis. Depending on number and types of customers served by a supplier the variance between gas used and gas delivered may be significant in total volume as well. The size of that variance between supplier delivered gas and customer used gas each billing period is almost always the result of supplier delivery requirement rules developed and enforced by the utility where Gas suppliers must deliver gas volumes to BGE that match a delivery forecast developed and communicated by the utility.

It's worth noting here that the price of natural gas may fluctuate significantly from month to month. Monthly fluctuations and unpredictability of natural gas prices are similar (but may be much more volatile) to monthly price fluctuations you would experience when filling up your car at the gasoline pump. A fairly recent extreme example of natural gas price volatility (and unpredictability) occurred during the January 2014 Polar Vortex event in the mid-Atlantic region. Daily prices during this time period ballooned from a norm of ~$5.00 per dekatherm of natural gas (~1,000 cubic feet) to twenty times that price settling on a price well in excess of $100.00 per dekatherm.

II. Background

1. Forecast Development

The BGE mass market Gas Choice option is available to all ~650,000 gas customers. In January 2016 BGE's Gas Choice Program consisted of 30 participating suppliers serving ~156,000 residential customers (23% of the residential population) and 32 participating suppliers serving ~14,000 commercial customers (32% of the commercial population). Most of these gas suppliers serve

[1] One exception would be where a Gas Supplier has placed a customer into a budget billing program resulting in a fixed monthly bill, which is adjusted either higher or lower on certain months to reflect the customer's actual usage.

both residential and commercial customers. Gas suppliers deliver a BGE specified volume of gas each day to serve their customers. Prior to October 2014 those volumes changed daily during the winter season - October through May, and then changed to an identical fixed daily volume each calendar month during the summer season - June through September.[2]

Following is an explanation of the seasonal forecast calculations:

During the winter season BGE would forecast supplier delivery requirements at a customer class level.[3] The forecasts were developed via regression analysis that plotted daily customer usage (y axis) against average daily temperature (x axis) for each of the five customer classes. Customer usage was approximated through reads from ~ 700 sample meters installed across BGE service territory (see APPENDIX A). The sample meters, unlike regular BGE meters that only provide customer usage during a monthly meter reading, were able to transmit daily usage via a dedicated phone line connection. The next day's gas delivery requirement number for each customer class was derived by plotting the next gas day's forecasted temperature onto the regression line established over the prior seven days. Individual gas supplier delivery requirements for the next gas day (10am to 10am ET) were then calculated by multiplying the number of customers in each individual customer class served by a supplier times the forecast for that customer class. The forecasts for each customer class were summed for suppliers servicing multiple residential and/or commercial customer classes to derive a single volume of gas in dekatherms that the supplier would be required to deliver that next gas day. Suppliers received their gas delivery requirement numbers at noon the day prior to the next gas day.

During the summer season BGE determined a daily gas delivery requirement for each gas supplier at a customer class level based on those customers average

[2] Gas smart meter driven forecasting process was implemented October 1, 2014
[3] Total of 5 customer classes = 2 residential (gas heat, gas non-heat) and 3 commercial classes (gas heat, gas non-heat, large commercial)

historic gas usage during the same month in prior years. The daily summer season gas delivery requirement remained unchanged for that summer calendar month. A new daily requirement would be established on the first day of each subsequent summer month to coincide with first of month customer migration among suppliers which included new customer enrollments, customer switches between suppliers and customers leaving a supplier to return to BGE gas supply (see APPENDIX B). Suppliers received from BGE a fixed daily delivery requirement for the next summer month approximately one week prior to the next first of month.

BGE's rationale for incorporating a more robust forecasting process in the winter was an acknowledgement that customers using gas heat would see dramatic overall increases in usage which can also vary significantly day to day along with changes in temperature. A secondary rationale was the recognition that historically gas prices tend to be much higher overall and much more volatile during the winter heating season.

2. Variance identification

In both seasonal periods there were daily variances between what customers use versus what suppliers delivered to BGE to serve those customers. The delivery/usage variances were captured each time a bill is generated for the customer. Customers would bill at monthly intervals as their meters were read. The population of BGE gas customers is grouped into one of 21 different bill cycles that complete sequentially on separate days from the beginning through the end of each calendar month. Having separate bill groups spread throughout each month supports an equitable distribution of accounts in each bill group which improves efficiencies in both meter reading and billing areas. Each time a bill cycle completes Gas Choice customer bills run through a variance assessment process where gas usage is prorated on a straight calendar day basis and compared against gas deliveries during the same time period. Variances are then identified and grouped on a calendar month basis and assigned to the customer's respective supplier for a future reconciliation, or true-up. This variance identification process lags the gas delivery month by up to two months due to the inherent limitation of capturing calendar month variances using non-calendar month usage associated with 21 staggered bill cycles (see APPENDIX C).

3. Variance true-up process

Variances captured on a calendar month basis as described above would accrue each month April through March. Ideally large positive monthly variances would be offset by similarly large negative variances to net closer to zero at the end of each one year accrual period. Unfortunately, often times variances tended to accrue in the same direction (positive or negative) throughout the twelve month variance capture period on a supplier basis, class basis, and sometimes aggregate basis resulting in large accrued annual variance volumes that require true-up. The true-up process was to allocate a supplier's total annual variance volume among the 122 summer days June 1 through September 30 and include the daily true-up volume as part of the supplier' daily delivery requirement (see APPENDIX D).

III. Problem Description

At BGE the goal of forecasting a gas supplier delivery requirement follows a basic business tenet – the amount of gas delivered by a supplier each day should match the amount of gas used by their customers. When the two pieces of this transaction do not match on a consistent basis, requiring future transactions to true-up the mismatches, then a level of risk has been introduced into the process. The risk resides in both the commodity side and cost side of the supplier operations. Additionally the total supplier aggregate (38 suppliers) of daily variances must be resolved by BGE gas operations and gas supply to support BGE's responsibility ensuring that gas customers receive the energy they need each day to remain comfortable in their homes and to operate their businesses. As with most business risks the projected costs of the risk are priced into the cost of the commodity and impact customer prices. Large unplanned forecast inaccuracy and delayed true-up of that inaccuracy negatively impact planning, efficiency and economics of a business creating negative price impacts for consumers.

The BGE forecasting, variance identification, and true-up processes, which were developed in an attempt to match supplier daily gas deliveries to customers' daily gas usage, suffer from several inherent problems.

First the forecast process is dependent on a small number of sample meters calling in daily to develop the winter regression analysis forecast on a customer class basis. This population of sample meters which when broken out ideally represents in general gas usage for each customer class often times does not sufficiently capture specific customer demographics unique to each of the 38 participating gas suppliers. Examples of differing residential customer demographics among suppliers that would result in vastly different actual gas usage include: supplier A serving residential gas customers that mostly live in condos in the city; supplier B serving residential gas customers residing in larger homes in the extreme northern part of the service territory; and supplier C serving town house communities located in the western part of the service territory. While the various residential customer types all belong to the same customer class and would share an identical regression analysis graph (where the sample meter data populating the regressions analysis may predominately represent mid-size single homes in a central county area) the actual usage volumes of these separate residential customer types will vary significantly not only from each other but also from the regression analysis derived delivery requirements forecast. Similar demographic differences arise in the commercial classes where individual suppliers may primarily be serving customers in one of the following categories - churches, dry cleaners, restaurants, super markets - while the regression analysis for the same commercial class is populated by sample meters mostly from commercial offices. Overarching both residential and commercial energy demographics is the customer location where on a given day or extended time period winter temperatures may vary widely among different regions within the BGE service territory impacting gas used by customers for heating purposes.

For reasons noted there are always variances in the BGE forecasted supplier delivery requirement and what customers actually use. The variances can differ significantly among suppliers and among customer classes. The initial factor contributing to variances is developing an accurate winter forecast on a supplier by supplier basis with a process dependent on a relatively small group of sample meters. The problem with summer forecasting is that there are only calendar month changes in delivery volumes and the delivery requirement is based upon potentially outdated historical customer usage data from prior years. A second factor in variance calculation is the time that elapses in capturing variances and the inaccurate proration of variances into calendar months due to usage being obtained from non-calendar month meter reads. The third and final part of the problem is that variance "true-up" periods can start over a year past when a variance was incurred resulting in potential large winter variances "truing-up" out of season during the summer months. Compounding forecast inaccuracy, variance capture delays, and the lengthy true-up period is the price volatility associated with natural gas. Not just day to day, but month to month and season to season (winter to summer). The greater the variance and the longer it takes to identify and true-up the variance the more vulnerable suppliers are to cost risk and gas procurement planning risk impacting prices.

IV. Leveraging Gas Smart Meter Technology

BGE began installing gas smart meters throughout the service territory in 2012 with full implementation scheduled for completion in December 2014. Gas smart meters electronically transmit customers' gas usage each day. Gas smart meter technology provides a significant shift from prior legacy meter technology where gas usage was only obtainable on a monthly basis at the time the meter index was read. Unlike smart meters, legacy meters could not provide customer's actual daily gas usage. For variance identification on a calendar month BGE performed a straight day calendar pro-ration of the monthly legacy meter provided volumes to "bucket" usage into calendar months. In the legacy meter proration process impactful temperature differences between months were ignored.[4] Developing an innovative leveraging of gas smart meter technology presented a unique opportunity to solve forecasting, variance capture, and true-up problems relating to supplier gas deliveries. In 2011 BGE's Gas Choice team reached out to - its gas suppliers many of whom were active in gas choice programs across the U.S., other utilities that had implemented or were planning to implement gas smart meter technology, and smart meter software providers to see whether any other utility had leveraged this emerging technology in an effort to improve forecasting accuracy for gas supplier delivery requirements. The response from all parties was that they were not aware of any similar smart meter - leveraged forecasting solutions planned or underway at other gas utilities.

V. Solutions:

1. Forecasting Solution

BGE Gas Choice developed and proposed a process where each gas choice customer's daily smart meter data would be collected. As part of the process the usage data, available in hourly intervals would be grouped into the industry standard gas day (10 am ET to 10am ET). This grouping alone was something that had not been considered previously in the design of gas smart meter applications data capture and required systems programming changes. We also required that each residential and commercial gas choice customer meter would be identified and sub-grouped according to the supplier with which they were currently enrolled (see APPENDIX E). In a final parsing procedure customers and their associated daily gas usage would be sorted and grouped according to the customer class. Daily smart meter usage data from each supplier/customer group was collected in aggregate. The average use per customer derived from the number of customers in each of these supplier/customer class groupings was used to populate a regression analysis. The customer demographics issues were

[4] Example of a legacy straight day calendar proration error would be a meter read on January 15 with volume of 100 units for period December 15 to January 15 where calendar month proration would be 50 units for December and 50 units for January however for a heating customer where December was warmer than normal and January was colder than normal a more accurate proration would have 25 units allocated to December and 75 units allocated to January.

thereby resolved in this new forecasting process – the Supplier A regression analysis and associated forecast only included usage data from their actual customers residing in down town condos, while Supplier B forecast was driven from their customer usage data in larger homes in the extreme north of the territory and so on. For commercial customers, the Supplier X regression analysis and associated forecast only included usage data from their actual customers that were primarily restaurants, while the Supplier Y forecast was driven by their customer data in the office buildings which they had enrolled and so on. The 700 sample meters used in the prior forecasting process were rendered obsolete as BGE would now be leveraging daily smart meter data from a population of ~170,000 equivalent sample meters. In the new grouping of gas smart meter data we would be running ~100 separate regression analysis forecasts that capture unique customer demographics versus the 5 that were utilized during the legacy meter forecasting process (see APPENDIX F).

2. Variance Capture Solution

Leveraging Gas smart meter technology to support gas supplier delivery forecasts also enabled the delivery/usage variance capture process to evolve. Variance identification that had previously taken up to two months could now be reduced to two days! The proration of monthly customer usage to daily usage would no longer be required since actual daily customer usage would be available via smart meters the following day. A daily routine comparing customer usage against the same day supplier delivery produced a daily variance.

3. True-up Solution

The gas usage/delivery variances captured two days after each supplier delivery were subsequently <u>trued up within 24 hours</u> by rolling the variance (positive or negative) into the next day's delivery requirement. In total this new process resulted in a mere three day lag between each delivery and the associated true-up. In the old legacy meter world the final day of true-up could take up to 17 months after the first variance occurred in the delivery cycle. As significant as the extended reconciliation period was in BGE's legacy process, it none the less represented the norm for many U.S. gas choice programs. At this time - almost five years after proposing the smart meter driven delivery forecasting project and a year and a half after implementation - we know of no other gas utility contemplating a similar leveraging of existing or planned gas smart meter technology to support gas choice programs.

VI. Adjustments Solution (cancel/rebills)

Regardless of inherent meter accuracy in both legacy and smart meters there are always a small percentage of meter errors requiring correction. These adjustments which at BGE occur through a process referred to as "cancel/rebills", where the customer's bills during the time the error occurred are cancelled and then re-issued by BGE, were also completed much more quickly via implementing the gas smart meter driven forecasting process. Where in the prior legacy meter process adjustments were treated similarly to variances (accumulating April through March) and reconciled during the summer true-up process (June through September) we now incorporate adjustments into the next day delivery requirement. A final true-up occurs as bill cycles complete and usage volumes are compared against previous true-up volumes during the same time period. This step is added in an effort to capture individual meters that may have missed daily calls during the prior true-up where the missing usage later appears at the time the meter bills.

VII. Implementation (and Stakeholder Reception)

There was no existing blue print for a project to leverage gas smart meter technology as a means to provide a more detailed and accurate daily delivery forecast for gas choice suppliers. Intuitively the caching of data on a gas day basis, the association of customers and their usage to the supplier responsible for their gas delivery, and the creation of regression analysis unique to each customer class for the individual supplier[5] appeared to better achieve BGE's goal of matching gas delivery to customer usage. Since there were no known industry examples of this forecasting process and there would be numerous system changes required by BGE to put this plan into action Gas Choice developed a business case highlighting requirements, costs and benefits. We presented the case and obtained broad organizational support (Gas Supply, Legal, Gas Tariffs, Gas Ops) as well as corporate support and funding from Exelon Corp to move forward. At BGE's 2013 annual Gas Supplier Communications Meeting we again introduced the proposed changes to suppliers reconfirming that the concept was new to the group of national suppliers who confirmed again this was something new within the Gas Choice industry. During the meeting presentation and subsequent Q&A, gas suppliers were both intrigued and generally very receptive to the project. Several participants offered to assist BGE in pre-implementation systems testing. We then drafted revised gas service tariffs to reflect the project changes and presented the tariff revisions along with a description of the project for approval to the Maryland Public Service Commission. During the approval hearing one of the Commissioners noted that BGE should be acknowledged and credited with proactively proposing use of an emerging technology to benefit Choice suppliers and customers.

VIII. Results

Thus far feedback from suppliers has been very favorable. In addition to the process changes described throughout this paper, suppliers are provided with custom reports via a shared internet portal which detail average daily temperature for each gas day alongside that day's forecasted delivery requirement, associated variance and other adjustments. Providing this level of transparency and detail supports supplier efforts to predict future BGE gas delivery requirements on their own which can assist them in procurement and financial planning. The efforts made by BGE in sponsoring a project to reduce supplier commodity costs and cost risks are viewed as a value added service among most

[5] The use of regression analysis to forecast daily requirements which was previously only done in winter months forecasts was expanded October 2014 to occur daily on a year round basis to further improve delivery requirements forecast accuracy

suppliers. We continue to monitor and tweak the forecasting process and procedures in a normal continuous improvement effort. The consensus among both internal and external stakeholders is that BGE has taken a significant step forward in its efforts to match supplier delivery and customer usage with the implementation of this project on October 1, 2014 and in the process taken steps towards setting a new industry standard for Gas Choice Supplier delivery forecasting. (see APPENDIX G).

IX. Next Steps – But wait there’s more?

There are a number of items still being considered that have potential to improve our current process. One would be a quicker turnaround in variance capture to reduce from two days to one. Another would be to perform a regression analysis that placed different weights on weekday vs weekend forecasts for customers that operate primarily during the week or vice versa. A third consideration would be an application of Autoregressive Conditional Heteroskedasticity (ARCH) supporting quicker recognition during shoulder months when we transition into or out of heating periods (i.e first cold day in October/November when many folks turn on heat) (see systems flow APPENDIX H).

APPENDIX A – Regression analysis forecast used in winter prior to October 2014

The Daily Requirement for an individual marketer (supplier) was previously based upon a set of linear regression equations for each customer class (D, DH, C, CH and CLX), which were generated daily based on the most recent seven day's temperature and sample meter consumption per customer data. Two "stabilizer points", input manually, are added to this sample. The independent variable "X" was the average daily temperature and the dependent variable "Y" was the average daily consumption per customer. The actual average consumption and temperature data points used in the regression analysis, were the most recent days for which both consumption and temperature data existed.

The linear regression equations for each customer class are described below:

n = number of data points used in regression calculation

X = average daily temperature (deg F)

Y = average daily consumption at the burner tip per customer (Dt/customer)

Sum X = sum of the average daily temperatures over the last "n" days

Sum Y = sum of the average daily consumption per customer over the last "n" days

Sum XY = sum of the product of daily temp and daily consumption over the last "n" days

Slope = [(sum XY) - (1/n)(sum X)(sum Y)] / [(sum X^2) - (1/n)((sum X)^2)]

Intercept = (1/n)(sum Y) - (1/n)(sum X)(slope)

EXAMPLE OF CALCULATION

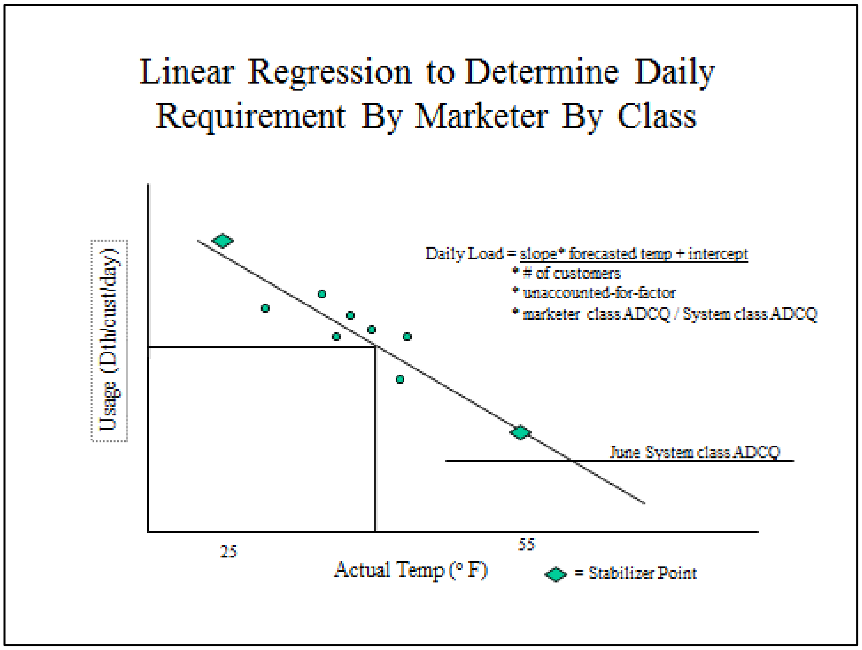
DAY	**Temp (X)**	**Load (Y)**	**Temp*Load (XY)**	**X^2**
1	50.5	2.67	134.83	2550.25
2	48.2	2.77	133.51	2323.24
3	46.4	2.60	120.64	2152.96
4	37.8	4.27	161.41	1428.84
5	39.3	4.08	160.34	1544.49
6	37.5	4.10	153.75	1406.25
7	39.1	3.76	147.02	1528.81
8	25.0	6.08	152.00	625.00
9	55.0	2.07	113.85	3025.00
Sum	**378.9**	**32.39**	**1277.70**	**16584.84**

Slope = [(1277.7)-(1/9)(378.9)(32.39)]/[(16584.84)-(1/9)(378.9^2)]

Slope = -0.1357

Intercept = (1/9)(32.39)-(1/9)(378.9)(-0.1357)

Intercept = 9.31



The forecasted daily load for each customer class will be generated using the following equation:

> $\text{Daily Load}_{\text{Class}} = [(\text{slope}_{\text{Class}} * \text{forecast temp}) + \text{intercept}_{\text{Class}}]$
>
> * # of class customers
>
> * (1/(1-unaccounted for factor))
>
> * (marketers average class $\text{ADCQ}_{\textit{month}}$ / system average class $\text{ADCQ}_{\textit{month}}$)[6]

[6] ADCQ Average Daily Contract Quantity is the average daily usage in dekatherms for the same month over the past two years, Unaccounted for Factor – difference in gas volumes entering BGE system and total measured at all meters in aggregate

APPENDIX B – Historic usage forecast used in summer prior to October 2014

During the summer months of June through September, the linear regression equations were not used. The Daily Requirement for each customer class was determined by the customer class ADCQ for the respective month, plus the Daily Requirement Adjustment to reconcile for the annual true-up[7]. The Daily Requirement was the same volume for each day throughout the month.

The equations for each customer class are described below.

Daily $\text{Load}_{\text{Class}}$ = [marketer class D ADCQ (month)]
* # of Class customers
* (1/(1-unaccounted for factor))
* (marketers average class ADCQ_{month} / system average class ADCQ_{month})
+ Daily Requirement Adjustment

[7] Daily Requirement Adjustment is the total annual true-up volume divided by 122 (the number of days in the summer season)

APPENDIX C – Variance capture and accumulation prior to October 2014

On the 3rd work day of each month, BGE reconciled Daily Requirements Service (DRS)[8] supplier's daily requirement deliveries and actual customer usage for each customer class through a process called the variance capture. The supplier's daily requirement deliveries were determined by summing the daily requirement and peak shaving volumes by class, for the respective month. The supplier's actual customer usage was determined by class, after it is converted from a billing month basis to a calendar month basis. The customer class variance was the sum of the supplier's actual customer usage (adjusted by city gate volume by dividing by 1 minus the unaccounted for factor) subtracted from the sum of the supplier's daily requirement deliveries plus any allocated peak shaving. The customer class variances were summed and the total was the supplier's variance for the month.

The supplier's monthly variance reflected their daily requirement deliveries and actual customer usage from the calendar month 2 months prior. This was due to the time required to get actual metered readings. For example: if a customer's meter is read on June 15th the reading will have actual usage from May and June, then on July 15th actual usage will be for June and July. Therefore, BGE waited until the August variance capture to process total actual usage for the calendar month of June.

Each supplier's monthly variances were summed for a 12-month period to determine their annual true-up. The 12-month period included the June true-up for April deliveries and usage through the May true-up for March deliveries and usage.

[8] Daily Requirements Service - Residential and commercial Gas Choice customers where BGE determines a daily gas supplier delivery volume, Peak Shaving – the volume of gas on a day when the forecast Daily Requirement is greater than the Maximum Daily Requirement (Peak Shaving = Daily Requirement – Maximum Daily Requirement)

APPENDIX D – True-up process prior to October 2014

To reconcile the annual true-up, BGE adjusted each supplier's Daily Requirement for 122 days (the number of days in June, July, August and September) during the summer months (Jun – Sep) to reconcile the annual true-up volume. The Daily Requirement adjustment was calculated by dividing the annual true-up volume by 122. Over the next 122-days, beginning on June 1, this adjustment was added to (for an accumulated under-delivery) or subtracted from (for an accumulated over-delivery) the Daily Requirement calculated for the respective supplier.

The following are examples of the calculation of the Daily Requirement Adjustment.

Note: Annual true-up volumes were calculated on the 3rd workday of May and included deliveries from April of the previous year to March of the current year.

Overdelivery (Daily Requirement = 1,000 Dth)

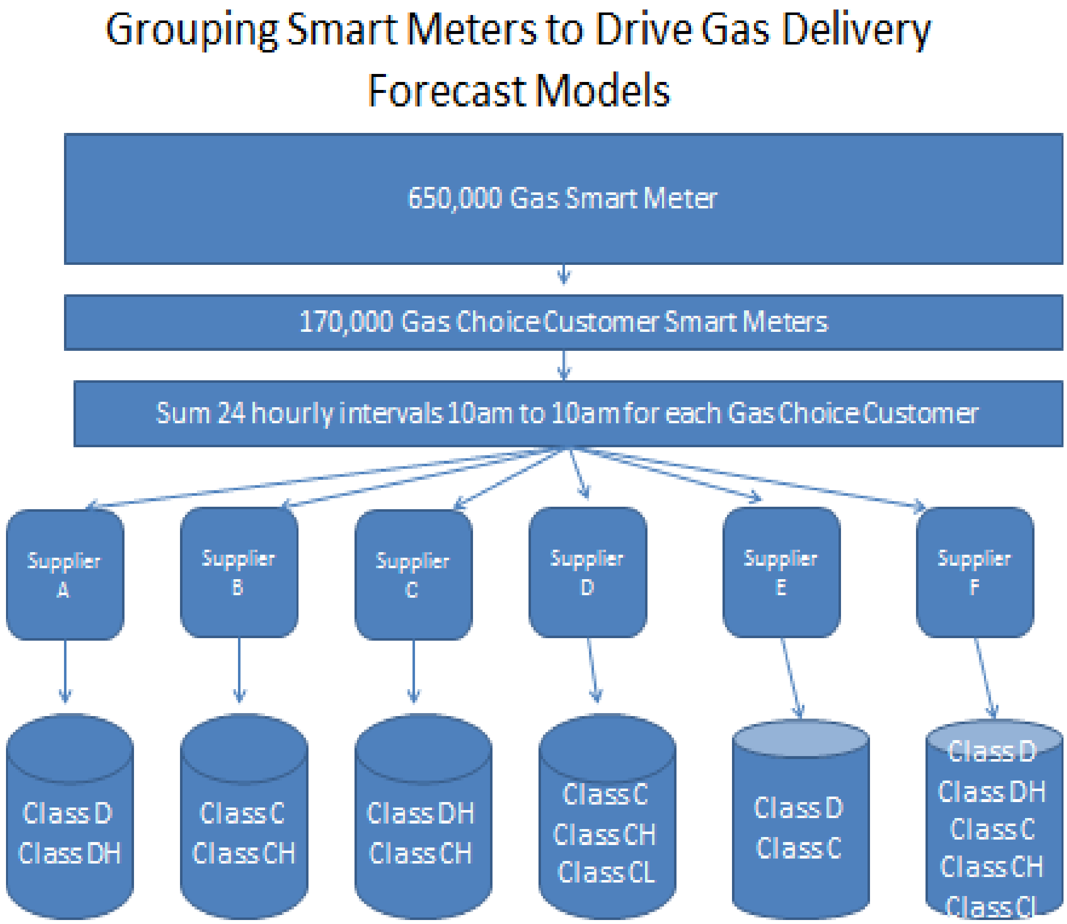
- Supplier overdelivered by 10,500 Dth over the prior 12-month period.
- Daily Requirement Adjustment = 10,500 Dth / 122 days = 86 Dth
- Adjusted Daily Requirement = 1,000 Dth - 86 Dth = 914 Dth

Underdelivery (Daily Requirement = 1,000 Dth)

- Supplier underdelivered by 8,500 Dth over the prior 12-month period.
- Daily Requirement Adjustment = -8,500 Dth / 122 days = -70 Dth
- Adjusted Daily Requirement = 1,000 Dth + 70 Dth = 1,070 Dth

APPENDIX E – Smart Meter Grouping for Daily Requirement Forecast

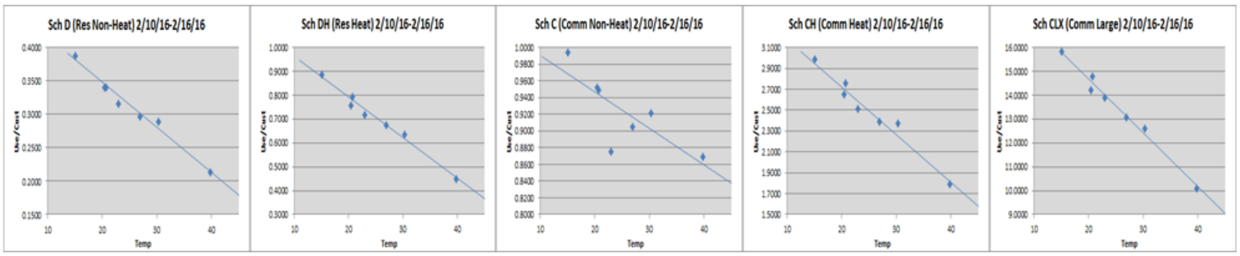
The diagram below shows the grouping by Supplier by Class that is used to forecast Daily Requirement volumes.



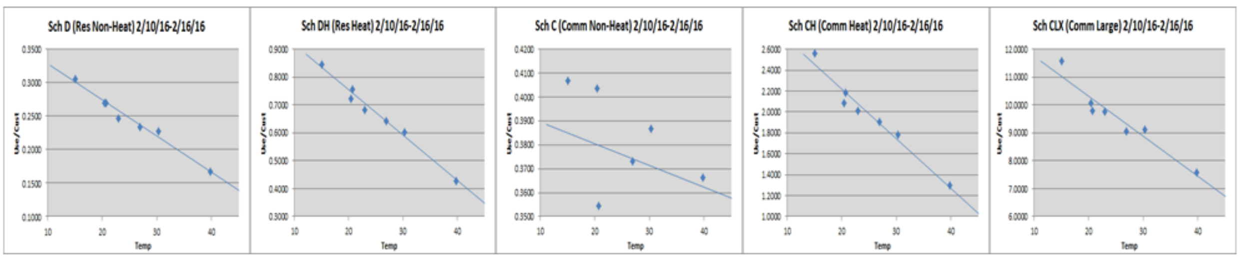
APPENDIX F – Smart Meter Multi-regression analysis graphs post October 2014

Using the Smart Meter Multi-regression analysis, each supplier's customer data will be used to forecast that supplier's Daily Requirement. Each regression equation, and forecasted slope intercept values will be unique to each of the DRS suppliers and each of that supplier's customer classes. See examples of the regression analysis graphs below.

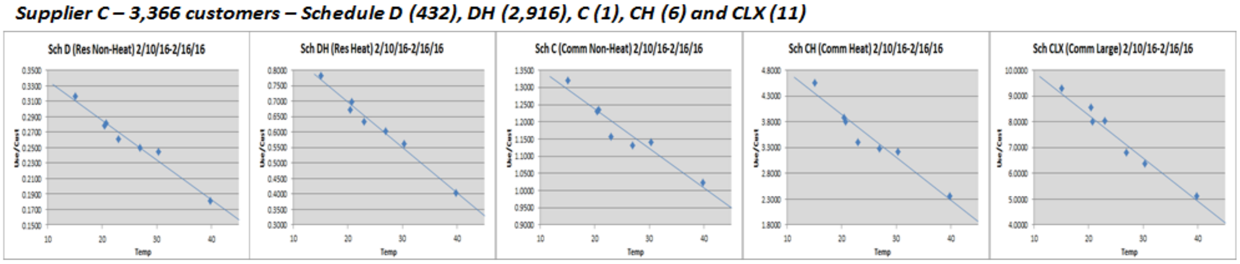
Supplier A – 16,623 customers - Schedule D (674), DH (11,670), C (1,321), CH (1,711) and CLX (1,247)



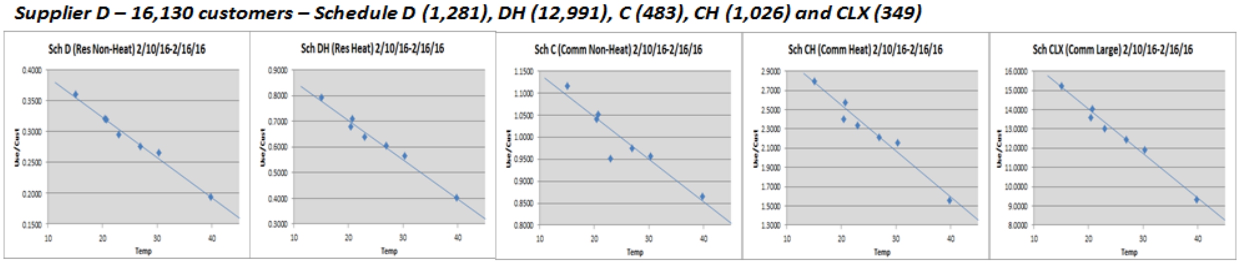
Supplier B – 37,003 customers – Schedule D (1,952), DH (34,796), C (80), CH (162) and CLX (13)



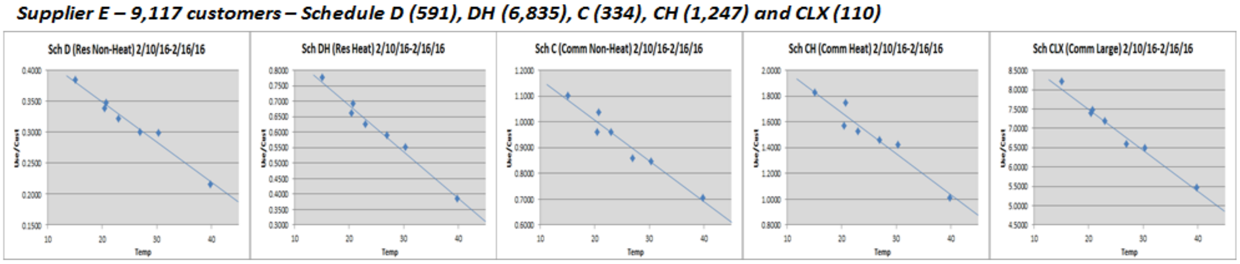
Supplier C – 3,366 customers – Schedule D (432), DH (2,916), C (1), CH (6) and CLX (11)



Supplier D – 16,130 customers – Schedule D (1,281), DH (12,991), C (483), CH (1,026) and CLX (349)



Supplier E – 9,117 customers – Schedule D (591), DH (6,835), C (334), CH (1,247) and CLX (110)



APPENDIX G – True-up Report Post October 2014

The Supplier Delivery True-Up Report is a new report that was made available to suppliers on the Reports tab of DSWeb (the internet portal where Gas Suppliers and BGE exchange information needed to serve their customers) during the implementation of the Smart Meter Driven Forecasting Project. The purpose of this report is to provide transparency for suppliers by showing daily actual temperature, usage, variance and forecast data at a class level that was used in the calculation of the daily requirement and the reconciliation of deliveries and usage volumes. The report will display all data at an individual customer class (D, DH, C, CH and CLX) level.

Below is an example of the Supplier Delivery True-Up Report.

Supplier Delivery True - up Report

Supplier A

Date Generated: 6/21/2016 2:27:45 PM

Class: C

Date	Actual Temperature *	Forecast w/o True- up	Metered Usage 3-day lag	Forecast Variance 3 Day Lag	Usage Adjust Cancel/ Corrected	Previous Day Carry Over	Total Adjust	Carry Over Cap	Carry Over	Lock Day	Daily Requirement Adjustment	Forecast Daily Requirement
06/01/2016	75.36	750	699	-19	539	0	700	375	325	N	375	1125
06/02/2016	71.84	730	654	-76	0	325	248	365	0	N	248	978
06/03/2016	71.36	730	773	36	0	0	36	365	0	N	36	766
06/04/2016	75.44	719	705	-26	0	0	-26	360	0	Y	-26	693
06/05/2016	72.88	722	692	-58	0	0	-58	361	0	Y	-58	722

Class: CH

Date	Actual Temperature *	Forecast w/o True- up	Metered Usage 3-day lag	Forecast Variance 3 Day Lag	Usage Adjust Cancel/ Corrected	Previous Day Carry Over	Total Adjust	Carry Over Cap	Carry Over	Lock Day	Daily Requirement Adjustment	Forecast Daily Requirement
06/01/2016	75.36	657	567	6	-1069	0	-612	329	-284	N	-329	329
06/02/2016	71.84	622	525	-78	0	-284	-362	311	-51	N	-311	311
06/03/2016	71.36	593	574	-54	0	-51	-105	297	0	N	-105	488
06/04/2016	75.44	577	566	-39	0	0	-39	289	0	Y	-39	538
06/05/2016	72.88	573	556	-101	0	0	-101	287	0	Y	-101	573

Class: CLX

Date	Actual Temperature *	Forecast w/o True- up	Metered Usage 3-day lag	Forecast Variance 3 Day Lag	Usage Adjust Cancel/ Corrected	Previous Day Carry Over	Total Adjust	Carry Over Cap	Carry Over	Lock Day	Daily Requirement Adjustment	Forecast Daily Requirement
06/01/2016	75.36	3563	3046	-742	5745	0	3309	1782	1527	N	1782	5345
06/02/2016	71.84	3437	3056	-732	0	1527	795	1719	0	N	795	4232
06/03/2016	71.36	3278	3095	-693	0	0	-693	1639	0	N	-693	2585
06/04/2016	75.44	3190	3216	-572	0	0	-572	1595	0	Y	-572	2618
06/05/2016	72.88	3192	3127	-436	0	0	-436	1596	0	Y	-436	3192

Class: D

Date	Actual Temperature *	Forecast w/o True- up	Metered Usage 3-day lag	Forecast Variance 3 Day Lag	Usage Adjust Cancel/ Corrected	Previous Day Carry Over	Total Adjust	Carry Over Cap	Carry Over	Lock Day	Daily Requirement Adjustment	Forecast Daily Requirement
06/01/2016	75.36	36	33	5	3	0	25	18	7	N	18	54
06/02/2016	71.84	34	31	1	0	7	7	17	0	N	7	41
06/03/2016	71.36	33	34	3	0	0	3	17	0	N	3	36
06/04/2016	75.44	32	29	-1	0	0	-1	16	0	Y	-1	31
06/05/2016	72.88	32	28	-8	0	0	-8	16	0	Y	-8	32

Class: DH

Date	Actual Temperature *	Forecast w/o True- up	Metered Usage 3-day lag	Forecast Variance 3 Day Lag	Usage Adjust Cancel/ Corrected	Previous Day Carry Over	Total Adjust	Carry Over Cap	Carry Over	Lock Day	Daily Requirement Adjustment	Forecast Daily Requirement
06/01/2016	75.36	774	661	26	143	0	225	387	0	N	225	999
06/02/2016	71.84	700	623	-12	0	0	-12	350	0	N	-12	688
06/03/2016	71.36	672	725	90	0	0	90	336	0	N	90	762
06/04/2016	75.44	660	628	-7	0	0	-7	330	0	Y	-7	653
06/05/2016	72.88	665	601	-173	0	0	-173	333	0	Y	-173	665

Appendix H – Systems Flow