Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-001:

Please explain the Company's policy with regard to when customer advances and contributions in aid of construction must be made.

Response:

The Company's policy with regard to when customer advances and contributions in aid of construction must be made is defined within Tariff Pa. P.U.C. No. 9 currently on file with the Pennsylvania Public Utility Commission ("Commission"), specifically, Section 8.2 Capital Expenditure Policy. The Company may install up to 150 feet of distribution main per residential applicant(s) without charging the applicant(s) a deposit. In circumstances where a deposit is required for service, residential customers may elect to use Pilot Rider New Area Service to pay the deposit over a 20 year time period or pay the deposit up front. When applicable, Commercial and Industrial ("C&I") customers electing service shall pay a refundable cash deposit to the Company equal to the difference between the minimum capital investment required to serve the applicant's gas requirement and the amount of capital that the Company can justify investing in the project, based on the anticipated gas requirements of the applicant(s). The minimum capital investment is the capital expenditure required to serve only the gas requirement requested by the particular applicant(s).

The maximum allowable investment is the amount of capital expenditure which the estimated revenues generated from a proposed project would support and still provide the necessary return to the company, taking into consideration the estimated additional annual volumes, rate schedule, cost of gas, operating and maintenance expense, interest and taxes.

Subparagraph 8.2.3 Reduction or Elimination of Deposit of Section 8.2 Capital Expenditure Policy of the Company's tariff, provides that in any case where a deposit is required, it may be reduced or eliminated, if in the Company's

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

judgment, the institution of such service will benefit other customers within a reasonable period of time.

Additionally, in the Company's last base rate case in 2016 at Docket No. R-2016-2529660, subparagraph 8.2.4 Payment Period of Deposit of Section 8.2 was added to the Company's tariff. Under this provision, C&I customers that are unable to pay the full deposit associated with a contribution in aid of construction upfront, may pay the remaining balance over a period that is agreed to by the applicant and the Company, on a case by case basis, but not to exceed ten (10) years.

Please see Exhibit No. 14, Schedule No. 2, for a complete copy of Columbia's current tariff.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-002:

Please provide a detailed explanation describing how contributions in aid of construction and customer advances are reflected in the Company's cost of service study.

Response:

Customer Advances for Construction have been classified to one of two different 252 sub-accounts. Account 252-15561 has been used as a classification for Customer Advances since January 2000. Account 252-15560 was used prior to January 2000. Use of account 252-15561 began with the adoption of a revised method of accounting for Customer Advances. A reduction to rate base has been properly included for Customer Advances pertaining to both 252 sub-accounts.

A debit is made to 101-Gas Plant in Service once plant is placed in service regardless of the accounting treatment for Customer Advances. A credit is made to 101-Gas Plant in Service in recognition of Customer Advances since January 2000. Therefore, a reduction to rate base has already been included related to account 252-15561 by including the net 101-Gas Plant in Service per books.

Prior to January 2000, there was no 101-Gas Plant in Service offset for Customer Advances. As such, rate base would not be reduced through Account 101 for Customer Advances prior to January 2000. The reduction to rate base for these Customer Advances is made by including account 252-15560 in rate base.

The following table provides a summary of the entries described above.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Entries for Customer Advances not Refunded 1/	**Prior to January 2000**		**After January 2000**	
	Debit	Credit	Debit	Credit
Record Cost of Construction	101	131	101	131
Record Billing for Customer Advance	143	252	143	101
Customer Advance Received	131	143	131	143
Record Liability for Customer Advance			186	252
Both methods show customer advances received at this point and a liability recorded in 252. However, the net entries are different	101	252	186	252
Record Customer Advances not Refunded	252	101	252	186
Once a Customer Advance is deemed non-refundable it becomes a Contribution in Aid of Construction and there are no remaining entries on the books in recognition of a liability.				
1/ Entries are not shown as running through 107–Construction Work in Progress for simplicity purposes				

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-003:

Please provide a breakdown of contributions in aid of construction by customer class and plant account number for the most recent year available.

Response:

Please see Exhibit No. 8, Schedule No. 1, for contributions in aid of construction by plant account for the historic test year. Contributions in aid of construction are not recorded on the Company's books by customer class.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-004:

Please provide a breakdown of transmission and distribution mains investment by pipe diameter.

Response:

The requested breakdown is as follows:

Diameter	Quantity (Feet)	Amount $
1/2"	3	233
3/4"	6,759	12,070
1"	63,187	256,342
1-1/8"	1,202	5,709
1-1/4"	629,164	2,884,755
1-1/2"	9,320	12,257
2"	13,782,793	188,980,321
2-1/2"	4,065	18,863
3"	3,186,890	30,055,856
3-1/4"	653	3,764
3-1/2"	8,138	27,318
4"	11,631,972	344,725,648
4-1/2"	1,458	18,124
4-7/8"	9,234	17,856
5"	40,875	40,674
5-1/4"	67	344
5-3/16"	18,340	37,170
5-1/2"	0	343
5-5/8"	15,155	16,497
6"	5,803,421	226,018,385
6-1/4"	17,814	5,778
6-5/8"	108,742	670,856
7"	23	13,436

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

7-5/8"	873	12,224
8"	3,009,072	196,885,088
8-1/4"	282	2,429
8-5/8"	8,243	361,804
9-5/8"	1,269	7,380
10"	796,163	26,423,173
12"	424,900	40,251,683
14"	450	5,167
16"	345,789	27,018,151
20"	33,728	6,400,832
Total Pipe	39,960,044	1,091,190,531
Other Costs (Valves, Castings, etc.) and 106 Unclassified		**$319,695,543**
Per Exhibit 8, Schedule 1, Page 1, Col. 8 Total Gas In Service, Lines 30 thru 33.		**$1,410,886,074**

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-005:

Please provide a breakdown of customer advances by customer class for the most recent year available.

Response:

Customer Advances are not recorded on Columbia's books by customer class.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-006

Please provide a breakdown of services investment by service line diameter, and a breakdown of services by size and customer class.

Response:

The table below summarizes the Company's investment in service lines by size, as of November 30, 2017. The company does not maintain on its books and records, the service line investment by size, by customer class. Please see Columbia Statement No. 11 for an explanation of the assignment of services to the various rate schedules for the Company's Class Cost of Service Studies.

101-1000 Gas Plant in Service

Size	Amount
OTHER	$83,100.69
UNDER 3"	481,397,329.41
3"	886,551.12
3-1/8"	5,671.61
3-1/2"	2,099.46
4"	2,190,288.99
4-1/2"	5,979.60
5"	3,062.39
6"	233,876.61
6-5/8"	2,649.94
8"	95,032.23
8-5/8"	663.31
10"	111.64
12"	466,633.05
20"	158.03
Total Account 380 Services 1/	$485,373,208.08

1/ The amount ties to Gas Plant In Service for Account 380 – Services for the historic test year as shown on Exh. No. 8, Sch. No. 1, Pg. 1 of 2, Col. 'Account 101.1000', Ln. 39.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost Of Service

Question GAS-COS-007:

If available, please provide a breakdown of meter investment by meter size, and a breakdown of meters by size and customer class.

Response:

The table below lists the Company's investments in meters, Account 381, by size as identified on the Company's books and records as of November 30, 2017. The amount ties to the amount included in Exhibit No. 8, Schedule No. 1, Page 2 of 2. The Company's books and records do not identify the assignment of meters to the various customer classes. Please see Columbia Statement No. 11 for an explanation of the assignment of meters to each customer rate class for the Class Cost of Service studies.

Size Cubic Feet Per Hour		**Investment $**
0 - 500		23,611,054
501 - 1000		5,425,065
1001 - 1500		1,010,327
Over 1500		6,513,769
Unclassified		1,148,471
Total Account	381	37,708,686

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-008:

Please provide the Company's rate design models and cost of service study on an IBM PC-compatible computer disk in Lotus 1-2-3 or Quattro format. If the models consist of more than one file, please include information on all files on the disk and what they contain. If not available in Lotus 1-2-3 or Quattro format, please provide in ASCII format.

Response:

Please see the enclosed CD containing Excel files of the Company's rate design and allocated cost of service studies.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-009:

Please provide a copy of the Company's current customer extension policy. Provide a representative sample of the analyses conducted by the Company when deciding whether service to a new customer qualifies under the Company's customer extension policy.

Response:

8. Extensions

8.1 Service Connections

The Company will install the service line from its main to point of delivery, as defined in the Point of Delivery section of this tariff; provided, however;

(a) In the territories formerly served under Tariff Gas--Pa. P.U.C. No. 6 and Tariff Gas--Pa.P.U.C. No. 7, the Company will install at its expense the service line from its main to a convenient point approximately one-hundred fifty (150) feet inside the customer's property line, absent any abnormal underground conditions or excessive permitting requirements. (See the description of Territory section of this tariff to identify territory formerly served under Tariff Gas--Pa. P.U.C. No. 6 and Tariff Gas--Pa. P.U.C. No. 7.)

(b) In rural areas, where service is not available directly from the Company, service may be provided from a transmission or production line. It is the sole discretion of the owner of the transmission or production line to allow service from their facilities to the customer. If connection is allowed, the Company's service connection will consist of a tap on the line and a service valve.

8.2 Capital Expenditure Policy

8.2.1 Residential Distribution Service

The Company, at its discretion, may extend its distribution mains up to a distance of one-hundred fifty (150) feet on any dedicated street or highway without cost to an applicant(s), absent any abnormal underground conditions or unusual permitting requirements. When abnormal underground conditions or unusual permitting

requirements exist, as determined by the Company, the applicant(s) will be required to pay a refundable cash deposit in an amount determined by the Company.

The applicant(s) will be required to pay a cash deposit to the Company when it is necessary to extend the main line more than one-hundred fifty (150) feet per applicant. The cash deposit will be equal to the difference between the minimum capital investment required to serve the applicant(s)'s gas requirements, excluding the one-hundred fifty (150) foot main allotment per applicant, and the amount of capital that the Company can justify investing in the project, based on the anticipated gas requirements of the applicant(s). The minimum capital investment is the capital expenditure required to serve only the gas requirements requested by the particular applicant(s).

The maximum allowable investment is the amount of capital expenditure which the estimated revenues generated from a proposed project would support and still provide the necessary return to the Company, taking into consideration the estimated additional annual quantities, rate schedule, cost of gas, operating and maintenance expense, interest and taxes.

If the net present value of the project is greater than $1,000 per applicant, the Company may, at its sole discretion, provide a contribution up to $1,000 per applicant, to offset installation costs of gas piping incurred by the applicant(s).

8.2.2 Commercial and Industrial Distribution Service

The applicants will be required to provide a refundable cash deposit to the Company equal to the difference between the minimum capital investment required to serve the applicant's gas requirements and the amount of capital that the Company can justify investing in the project, based on the anticipated gas requirements of the applicant(s). Minimum capital investment is the capital expenditure required to serve only the gas requirements requested by the particular applicant(s).

(a) Projects Where the Net Present Value of the Cash Flows, Using the Minimum Capital Investment, is Equal to or Greater than Zero.

Such projects are economically feasible provided that there are assurances that the applicant will use the projected quantities of gas for the minimum time period

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

stated in the agreement. Such assurances may be provided in the form of a minimum use agreement, in which applicant contractually agrees to take delivery of certain minimum quantities of gas, and to pay the applicable distribution charges for such quantities, irrespective of applicant's actual consumption of gas. At the Company's sole discretion, a deposit may be required if the Company is not certain that the applicant will use the quantity of gas, as projected, for the entire Minimum Time Period. The maximum required deposit shall be no more than the minimum capital investment.

(b) Projects Where the Net Present Value of the Cash Flows, Using the Minimum Capital Investment, is Less than Zero.

The Company shall require a refundable deposit in the amount that the net present value is below zero. For example, if the net present value of a project is -$1,000, the Company shall require a $1,000 refundable deposit. In addition, if there is uncertainty that the applicant will use the projected quantity of gas for the minimum time period stated in the agreement, the Company may, in its sole discretion, (1) require the Applicant to pay an additional refundable deposit, or (2) require the applicant to enter into a minimum use agreement, in which applicant contractually agrees to take delivery of certain minimum quantities of gas, and to pay the applicable distribution charges for such quantity, irrespective of applicant's actual consumption of gas. The additional refundable deposit, if required, shall be no more than the combined total of the Company's minimum capital investment and the net present value. For example, if the Company's minimum capital investment is $10,000 and the net present value of the project is -$1,000, the applicant shall be required to provide an additional $9,000 deposit.

For purposes of subsection (a) and (b), above, the maximum allowable investment is the amount of capital expenditure which the estimated revenues generated from a proposed project would support and still provide the necessary return to the Company, taking into consideration the estimated additional annual quantity, rate schedule, cost of gas, operating and maintenance expense, interest and taxes.

8.2.3 Reduction or Elimination of Deposit

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

In any case where a deposit is required, it may be reduced or eliminated, if in the Company's judgment, the institution of such service will benefit other customers within a reasonable period of time.

8.2.4 Payment Period of Deposit

When an applicant's projected annual usage is greater than 64,400 therms, the Company and the applicant may negotiate the period over which the deposit will be paid. If the applicant pays thirty percent (30%) of the deposit prior to commencement of the line extension construction, the remaining balance of the deposit may be paid over a period that is agreed upon between the Company and the applicant. Otherwise, the payment period will not exceed ten (10) years. The terms of any payment period will be memorialized in an agreement between the applicant and the Company. The installment amount will be added to and include in the Customer Change line item on the customer's bill.

8.2.5 Taxes on Deposits for Construction & Customer Advances

Any deposit, advance or other like amounts received from the applicant which shall constitute taxable income as defined by the Internal Revenue Service will have the income taxes segregated in a deferred account for inclusion in rate base in a future rate case proceeding. Such income taxes associated with a deposit or advance will not be charged to the specific depositor of the capital.

Please see Attachment A for a sample of the analyses conducted by the Company when deciding whether service to a new customer qualifies under the Company's customer extension policy. The Company's customer extension policy appears in the current tariff on pages 48-50 which may also be found in Exhibit 14, Schedule 2, Attachment 1.

Project Summary: A 1,555'- 2"PMMP main line extension required to serve seven customers located on an existing street.

Project Name	Saxton Drive Conversions
WMS Project ID	WMS1642388
Company	7-Columbia Gas of Pennsylvania, Inc.
Location	2451- State College

Project Summary

	Minimum	Recommended
Max Term of Cash Flow Analysis (Years)	40	
Total Added Connect Load (Dth/Hr)	0.88	
Total Added Max Hour (Dth/Hr)	0.88	
Total Added Max Day (Dth)	2.47	
Total Annual Load Increase (Dth)	429.00	
Services Count	7	7
Meters/Regulators Count	7	7
Service and M/R Costs	$2,688.00	$24,150.00
Extension Costs	$36,454.00	$112,249.00
Betterment Costs	$0.00	$0.00
Relocation Costs	$0.00	$0.00
Total Plant Investment	$39,142.00	$136,399.00 *
Net Present Value (NPV) Cash Flow	$12,621.52	($41,737.95)
Required CIAC	$0.00	$41,737.95
Required CIAC with Gross Up	* * *	* * *
NASR Amount	**$0.00**	
Actual CIAC	**$0.00**	
IRR without Deposit	8.23 %	1.16 %
IRR with Deposit	8.23 %	5.00 %
Discounted Payback Years	17	71
Total Annual Revenue Addition	$3,378.34	$3,378.34
Cost of Capital %	5.00 %	5.00 %

Investment Description

install 1555'-2" PMMP

every customer requires the following:
1" service line
700 series EFV
AC-250 meter
5/4" B-42-IMR
3/16" orifice
Brown spring

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-10:

Please provide a detailed supply and requirement schedule for the Company's three most recent annual peak days and for design day. The schedules should include deliveries by source and requirements by rate schedule. Identify sources and requirements for transportation customers separately. Also include the Company's daily sendout sheet for each peak day and applicable weather data.

Response:

Attachment A to this response provides the actual peak day requirements and associated supplies by source for the Company's peak day each winter for the 2014/2015 through 2016/2017 heating seasons. The requirements shown represent the Company's total throughput. The breakdown by class is an estimate since actual daily-metered volumes are not available for all customers and are based on an analysis of both daily and monthly billing data for the Company's customers. Also shown for each day are the actual weather conditions of most significance (current day average temperature, prior day average temperature, and current day average wind speed).

Attachment B to this response separately provides the estimated requirements of the Company's Gas Distribution Service customers by rate schedule and their associated supply for the Company's actual peak days each winter for the 2014/2015 through 2016/2017 heating seasons.

Attachment C to this response provides the peak day requirements, as contained on COS-010 Attachment A, segregated by rate schedule and service type (Sales, Choice, and Gas Distribution Service). The allocation of requirements by rate schedule and service type is estimated based on actual monthly billing information.

Attachment D to this response provides by revenue class the peak day requirements for Winter 2017/2018 as expected at the Company's design day conditions. Also shown are the supply sources required by the Company to meet its design peak day firm service obligations.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Attachment E to this response provides the winter 2017/2018 forecasted design peak day requirements, as contained on COS-010 Attachment D, segregated by rate schedule and service type.

Columbia Gas of Pennsylvania

Historical Peak Day

Units are in MDth/Day

	Historical Winter Season		
	2016 / 17	**2015 / 16**	**2014 / 15**
Day of Week	Thu	Sat	Thu
Date	Dec. 15	Feb. 13	Feb. 19
Current Day Average Temp	11° F	7° F	1° F
Prior Day Average Temp	23° F	16° F	12° F
Current Day Average Wind Speed	12 mph	5 mph	14 mph
Requirements [1]			
Residential	345.8	366.3	405.3
Commercial	211.9	206.0	248.4
Industrial	81.7	57.8	85.6
Total Retail:	**639.4**	**630.1**	**739.3**
Company Use:	0.6	0.5	0.5
Unaccounted For:	1.1	0.7	0.5
Total Requirements:	**641.1**	**631.3**	**740.3**
Supply [2]			
Columbia Gas Transmission Corp.	520.7	515.5	616.1
Dominion	32.2	28.0	24.0
Equitrans	14.0	14.0	9.1
National Fuel Gas Supply Corp.	4.6	5.4	6.0
Tennessee Gas Pipeline	22.4	22.3	27.3
Texas Eastern Transmission	43.1	42.1	48.5
Direct Local	4.1	4.0	5.0
Blackhawk Storage	0.0	0.0	4.3
Total Supply:	**641.1**	**631.3**	**740.3**

[1] Total actual throughput; breakdown by category/class is an estimate.

[2] Actual supplies via identified sources.

Columbia Gas of Pennsylvania

Historical Peak Day Requirements of Delivery Service Customers by Rate Schedule and Associated Supply by Source [1]

Units are in MDth

	Historical Winter Season		
	2016 / 17	**2015 / 16**	**2014 / 15**
Day of Week	Thu	Sat	Thu
Date	Dec. 15	Feb. 13	Feb. 19
Current Day Average Temp	11° F	7° F	1° F
Prior Day Average Temp	23° F	16° F	12° F
Current Day Average Wind Speed	12 mph	5 mph	14 mph
Requirements [2]			
Commercial			
SGDS	29.8	32.4	32.7
LDS	23.6	19.2	18.5
MLDS	0.4	0.8	0.8
NCS	0.1	0.2	0.0
SDS	33.6	34.6	40.9
Total Commercial	**87.5**	**87.1**	**92.9**
Industrial			
SGDS	0.6	0.6	0.8
LDS	53.5	37.1	41.7
MLDS	17.4	10.7	17.9
NCS	7.0	0.0	13.6
SDS	9.8	8.3	10.8
Total Industrial	**88.3**	**56.7**	**84.8**
Requirements	**175.8**	**143.8**	**177.7**
Supply [3]			
Columbia Gas Transmission Corp.	142.8	117.5	147.9
Dominion Transmission Inc.	8.8	6.4	5.8
Equitrans	3.8	3.2	2.2
National Fuel Gas Supply Corp.	1.3	1.2	1.5
Tennessee Gas Pipeline	6.1	5.1	6.6
Texas Eastern Transmission	11.8	9.6	11.6
Direct Local	1.1	0.9	1.2
Blackhawk Storage	0.0	0.0	1.0
Total Supply:	**175.8**	**143.8**	**177.7**

[1] Excludes Choice quantities (SCD).

[2] Allocation of daily rate schedule requirement based on actual rate schedule demand for month.

[3] Transportation supplies via identified sources.

Columbia Gas Of Pennsylvania

Historical Peak Day Requirements by Rate Schedule
Volume in MDth/Day

	Dec. 15, 2016 Total Demand			Feb. 13, 2016 Total Demand			Feb. 19, 2015 Total Demand		
	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput
Residential									
RCC	0.0	21.5	21.5	0.0	22.1	22.1	0.0	17.5	17.5
RS	263.0	0.0	263.0	257.7	0.0	257.7	275.8	0.0	275.8
RTC	0.0	61.3	61.3	0.0	66.0	66.0	0.0	52.5	52.5
Residential Total	**263.0**	**82.7**	**345.8**	**257.7**	**88.0**	**345.8**	**275.8**	**70.0**	**345.8**
Commercial									
LDS FLEX	0.0	13.3	13.3	0.0	8.3	8.3	0.0	6.7	6.7
LG1	3.8	0.0	3.8	3.5	0.0	3.5	4.5	0.0	4.5
LG2	4.3	0.0	4.3	4.5	0.0	4.5	5.1	0.0	5.1
LG4	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	1.3
NSI	0.6	0.0	0.6	0.6	0.0	0.6	0.6	0.0	0.6
SC2	0.0	11.8	11.8	0.0	11.7	11.7	0.0	0.0	0.0
SC3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	7.5
SCC	0.0	16.1	16.1	0.0	18.1	18.1	0.0	13.8	13.8
SDS FLEX	0.0	1.2	1.2	0.0	1.1	1.1	0.0	0.6	0.6
SG2	41.7	0.0	41.7	44.0	0.0	44.0	52.8	0.0	52.8
SGDS1 FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGDS2 FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.2	1.0
SGS	43.5	0.0	43.5	43.7	0.0	43.7	50.2	0.0	50.2
SGT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TAG1	0.0	0.2	0.2	0.0	0.2	0.2	0.0	0.1	0.1
TAG2	0.0	5.4	5.4	0.0	5.3	5.3	0.0	4.0	4.0
TAG5	0.0	1.3	1.3	0.0	1.6	1.6	0.0	1.2	1.2
TAG6	0.0	20.5	20.5	0.0	22.7	22.7	0.0	20.0	20.0
TI4	0.0	11.0	11.0	0.0	12.0	12.0	0.0	0.0	0.0
TI5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	10.9
TI8	0.0	7.2	7.2	0.0	6.5	6.5	0.0	0.0	0.0
TI9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	5.1
TIB	0.0	20.1	20.1	0.0	19.9	19.9	0.0	19.7	19.7
TIF	0.0	9.1	9.1	0.0	7.5	7.5	0.0	6.1	6.1
TM3	0.0	0.7	0.7	0.0	0.7	0.7	0.0	0.7	0.7
SS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Commercial	**93.9**	**118.0**	**211.9**	**96.3**	**115.6**	**211.9**	**115.4**	**96.5**	**211.9**
Industrial									
LDS FLEX	0.0	24.0	24.0	0.0	20.6	20.6	0.0	24.6	24.6
LG1	0.0	0.0	0.0	0.3	0.0	0.3	0.2	0.0	0.2
LG2	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.2
LG3	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
MDS FLEX	0.0	17.7	17.7	0.0	18.3	18.3	0.0	17.1	17.1
SDS FLEX	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.3	0.3
SG3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
SG4	0.2	0.0	0.2	0.3	0.0	0.3	0.2	0.0	0.2
SGS	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0
SGT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TAG5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TAG6	0.0	0.4	0.4	0.0	0.6	0.6	0.0	0.6	0.6
TI4	0.0	1.0	1.0	0.0	1.2	1.2	0.0	0.0	0.0
TI5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
TI8	0.0	7.7	7.7	0.0	10.4	10.4	0.0	0.0	0.0

Columbia Gas of Pennsylvania

Forecasted Design Day Requirements and Supply
For 2017/18 Heating Season
Units are in MDth/Day

		Total Design Day Demand
		2017 / 18
Day of Week		Weekday
Current Day Average Temp		-5° F
Prior Day Average Temp		6° F
Current Day Average Wind Speed		11mph
Requirements [1]		
Firm :	Residential	447.7
	Commercial [2]	156.6
	Industrial [2]	0.3
	Company Use	0.6
	Unaccounted For Gas	1.1
	Total Firm:	**606.3**
Non-Firm:	Residential	0.0
	Commercial	115.7
	Industrial	87.4
	Total Non-Firm:	**203.1**
	Total Requirements:	**809.4**
Supply [3]		
Columbia Gas Transmission Corp.		529.0
Dominion		33.8
Equitrans		14.3
National Fuel Gas Supply Corp.		4.3
Tennessee Gas Pipeline		19.3
Texas Eastern Transmission		19.3
Direct Local		0.7
Blackhawk Storage		0.0
	Total Supply:	**620.7**
	Imbalance [4]	**188.7**

[1] Per CPA's "2015 Design Day Forecast."

[2] Includes Standby Service and Elective Balancing Service quantities.

[3] Supply provided by CPA and Natural Gas Suppliers.

[4] Represents customer demand of a non-firm nature, for which the Company has no dedicated supply/capacity assets, that would have to be accounted for by customers or suppliers acting on their behalf.

Columbia Gas Of Pennsylvania

2017 Peak Day Forecast, 2017/18 - 2021/22

2017/18 Peak Day Requirements by Rate Schedule

Volume in MDth/Day

	Total Demand			Firm Demand			Non-Firm Demand			Additional Firm Obligation	Total Firm Obligation
	Tariff	GTS	Total Throughput	Tariff	GTS	Total Throughput	Tariff	GTS	Total Throughput		
Residential											
RCC	0.0	27.8	27.8	0.0	27.8	27.8	0.0	0.0	0.0	0.0	27.8
RS	340.6	0.0	340.6	340.6	0.0	340.6	0.0	0.0	0.0	0.0	340.6
RTC	0.0	79.3	79.3	0.0	79.3	79.3	0.0	0.0	0.0	0.0	79.3
Residential Total	**340.6**	**107.1**	**447.7**	**340.6**	**107.1**	**447.7**	**0.0**	**0.0**	**0.0**	**0.0**	**447.7**
Commercial											
LDS FLEX	0.0	17.1	17.1	0.0	0.0	0.0	0.0	17.1	17.1	0.0	0.0
LG1	4.9	0.0	4.9	4.9	0.0	4.9	0.0	0.0	0.0	0.0	4.9
LG2	5.5	0.0	5.5	5.5	0.0	5.5	0.0	0.0	0.0	0.0	5.5
LG4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NSI	0.7	0.0	0.7	0.7	0.0	0.7	0.0	0.0	0.0	0.0	0.7
SC2	0.0	15.2	15.2	0.0	15.2	15.2	0.0	0.0	0.0	0.0	15.2
SC3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCC	0.0	20.7	20.7	0.0	20.7	20.7	0.0	0.0	0.0	0.0	20.7
SDS FLEX	0.0	1.5	1.5	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0
SG2	53.5	0.0	53.5	53.5	0.0	53.5	0.0	0.0	0.0	0.0	53.5
SGDS1 FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGDS2 FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGS	55.9	0.0	55.9	55.9	0.0	55.9	0.0	0.0	0.0	0.0	55.9
SGT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TAG1	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0
TAG2	0.0	7.0	7.0	0.0	0.0	0.0	0.0	7.0	7.0	0.0	0.0
TAG5	0.0	1.6	1.6	0.0	0.0	0.0	0.0	1.6	1.6	0.0	0.0
TAG6	0.0	26.4	26.4	0.0	0.0	0.0	0.0	26.4	26.4	0.0	0.0
TI4	0.0	14.1	14.1	0.0	0.0	0.0	0.0	14.1	14.1	0.0	0.0
TI5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TI8	0.0	9.3	9.3	0.0	0.0	0.0	0.0	9.3	9.3	0.0	0.0
TI9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TIB	0.0	25.8	25.8	0.0	0.0	0.0	0.0	25.8	25.8	0.0	0.0
TIF	0.0	11.7	11.7	0.0	0.0	0.0	0.0	11.7	11.7	0.0	0.0
TM3	0.0	0.9	0.9	0.0	0.0	0.0	0.0	0.9	0.9	0.0	0.0
SS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0
EBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.8
Total Commercial	**120.6**	**151.6**	**272.2**	**120.6**	**35.9**	**156.5**	**0.0**	**115.7**	**115.7**	**8.8**	**165.3**
Industrial											
LDS FLEX	0.0	25.7	25.7	0.0	0.0	0.0	0.0	25.7	25.7	0.0	0.0
LG1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LG2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LG3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MDS FLEX	0.0	19.0	19.0	0.0	0.0	0.0	0.0	19.0	19.0	0.0	0.0
SDS FLEX	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
SG3	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
SG4	0.2	0.0	0.2	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.2
SGS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TAG5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TAG6	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0
TI4	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0
TI5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TI8	0.0	8.3	8.3	0.0	0.0	0.0	0.0	8.3	8.3	0.0	0.0
TI9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TIB	0.0	7.9	7.9	0.0	0.0	0.0	0.0	7.9	7.9	0.0	0.0
TIF	0.0	14.8	14.8	0.0	0.0	0.0	0.0	14.8	14.8	0.0	0.0
TIF-EFACT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TIG	0.0	5.9	5.9	0.0	0.0	0.0	0.0	5.9	5.9	0.0	0.0
TIH	0.0	4.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0
TM2	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
TMA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6
Total Industrial	**0.3**	**87.4**	**87.7**	**0.3**	**0.0**	**0.3**	**0.0**	**87.4**	**87.4**	**6.7**	**7.0**
Other	**1.6**	**0.0**	**1.6**	**1.6**	**0.0**	**1.6**	**0.0**	**0.0**	**0.0**	**0.0**	**1.6**
2017/18 Design Day	**463.1**	**346.1**	**809.2**	**463.1**	**143.0**	**606.1**	**0.0**	**203.1**	**203.1**	**15.5**	**621.6**

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-11:

Please provide copies of the Company's daily sendout sheets for November through March of the most recent heating season.

Response:

Please see GAS-COS-11 Attachment A showing the actual daily Dth sendout during the period November 1, 2016 through March 31, 2017.

Columbia Gas of Pennsylvania
Heating Season November 2016 Through March 2017
Daily Dth Sendout

Date	Dth
11/01/16	157,374
11/02/16	119,091
11/03/16	151,887
11/04/16	199,896
11/05/16	183,287
11/06/16	193,511
11/07/16	217,770
11/08/16	170,065
11/09/16	246,516
11/10/16	212,104
11/11/16	260,754
11/12/16	276,455
11/13/16	272,728
11/14/16	260,283
11/15/16	238,426
11/16/16	249,248
11/17/16	239,143
11/18/16	170,481
11/19/16	291,578
11/20/16	409,152
11/21/16	406,150
11/22/16	380,384
11/23/16	277,148
11/24/16	213,492
11/25/16	256,540
11/26/16	291,499
11/27/16	311,194
11/28/16	264,220
11/29/16	203,899
11/30/16	215,438
12/01/16	322,070
12/02/16	328,367
12/03/16	312,740
12/04/16	305,816
12/05/16	339,740
12/06/16	343,604
12/07/16	343,259
12/08/16	440,476
12/09/16	456,685
12/10/16	436,375
12/11/16	387,008
12/12/16	391,029
12/13/16	410,466
12/14/16	502,710

Columbia Gas of Pennsylvania
Heating Season November 2016 Through March 2017
Daily Dth Sendout

Date	Dth
12/15/16	641,074
12/16/16	535,187
12/17/16	319,808
12/18/16	446,500
12/19/16	521,808
12/20/16	447,639
12/21/16	388,086
12/22/16	371,135
12/23/16	311,933
12/24/16	280,151
12/25/16	295,442
12/26/16	224,866
12/27/16	297,673
12/28/16	336,838
12/29/16	367,184
12/30/16	406,498
12/31/16	332,656
01/01/17	293,526
01/02/17	293,998
01/03/17	291,839
01/04/17	423,996
01/05/17	506,945
01/06/17	551,205
01/07/17	578,140
01/08/17	607,435
01/09/17	537,437
01/10/17	406,528
01/11/17	254,705
01/12/17	249,718
01/13/17	375,993
01/14/17	383,588
01/15/17	400,012
01/16/17	360,623
01/17/17	273,002
01/18/17	324,860
01/19/17	341,687
01/20/17	278,101
01/21/17	205,430
01/22/17	227,840
01/23/17	350,046
01/24/17	359,915
01/25/17	276,029
01/26/17	379,586
01/27/17	418,072

Columbia Gas of Pennsylvania
Heating Season November 2016 Through March 2017
Daily Dth Sendout

Date	Dth
01/28/17	394,778
01/29/17	420,729
01/30/17	479,618
01/31/17	382,741
02/01/17	386,587
02/02/17	456,261
02/03/17	502,259
02/04/17	427,704
02/05/17	371,881
02/06/17	287,147
02/07/17	224,796
02/08/17	339,263
02/09/17	512,897
02/10/17	430,033
02/11/17	259,513
02/12/17	359,949
02/13/17	427,602
02/14/17	356,014
02/15/17	439,962
02/16/17	483,567
02/17/17	329,302
02/18/17	200,068
02/19/17	210,818
02/20/17	245,500
02/21/17	228,047
02/22/17	191,624
02/23/17	163,369
02/24/17	134,496
02/25/17	286,532
02/26/17	357,418
02/27/17	305,845
02/28/17	213,391
03/01/17	264,917
03/02/17	391,180
03/03/17	459,854
03/04/17	438,392
03/05/17	360,286
03/06/17	276,502
03/07/17	251,098
03/08/17	262,687
03/09/17	277,152
03/10/17	452,111
03/11/17	458,544
03/12/17	467,853

Columbia Gas of Pennsylvania
Heating Season November 2016 Through March 2017
Daily Dth Sendout

Date	Dth
03/13/17	403,153
03/14/17	513,793
03/15/17	532,837
03/16/17	452,447
03/17/17	361,772
03/18/17	331,045
03/19/17	338,510
03/20/17	285,564
03/21/17	285,125
03/22/17	418,613
03/23/17	337,460
03/24/17	187,669
03/25/17	148,198
03/26/17	205,710
03/27/17	172,816
03/28/17	208,972
03/29/17	224,279
03/30/17	252,223
03/31/17	252,335

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-12:

Please provide a copy of the load duration curve used by the Company for capacity planning purposes. Please also identify the numerical data points shown for each day on the curve.

Response:

The Company's basic supply and capacity analysis tool is the SENDOUT® Gas Planning System provided by ABB Enterprise Software of Atlanta, Georgia. SENDOUT® determines the "optimum," time-dependent levels of pipeline transportation service and storage service to be utilized to meet the Company's prospective demand under various weather-related scenarios and meets that demand with a least cost mix of supplies. SENDOUT® recognizes specific demand regions within the Company's service territory and the pipeline capacity and supply sources available to each region. The Company updates supply prices, storage balances, and other input data in SENDOUT® on an ongoing basis from a variety of published and private sources. The Company utilizes SENDOUT® for both long-range and short term operational planning. The Normal Weather Firm Demands are shown in GAS-COS-12 Attachment A. The attachment shows the Normal Weather Firm Demands as follows:

Page 1. Chronological order for the 12 months ending November 2018,
Page 2. Graphically for the 12 months ending November 2018,
Page 3. Sorted high to low for the 12 months ending November 2018,
Page 4. Graphically for the 12 months ending November 2018.

Normal Weather Firm Demand - Chonological - 12 Months Ending November 2018

Date	Firm Demand (MDth)
1-Dec-2017	223.7
2-Dec-2017	266.8
3-Dec-2017	230.9
4-Dec-2017	216.5
5-Dec-2017	302.8
6-Dec-2017	317.2
7-Dec-2017	331.5
8-Dec-2017	310.0
9-Dec-2017	166.2
10-Dec-2017	180.6
11-Dec-2017	245.3
12-Dec-2017	274.0
13-Dec-2017	310.0
14-Dec-2017	209.3
15-Dec-2017	130.2
16-Dec-2017	274.0
17-Dec-2017	238.1
18-Dec-2017	245.3
19-Dec-2017	216.5
20-Dec-2017	295.6
21-Dec-2017	302.8
22-Dec-2017	410.6
23-Dec-2017	331.5
24-Dec-2017	180.6
25-Dec-2017	266.8
26-Dec-2017	230.9
27-Dec-2017	101.5
28-Dec-2017	130.2
29-Dec-2017	216.5
30-Dec-2017	230.9
31-Dec-2017	288.4
1-Jan-2018	398.8
2-Jan-2018	398.8
3-Jan-2018	312.6
4-Jan-2018	422.3
5-Jan-2018	477.2
6-Jan-2018	383.2
7-Jan-2018	383.2
8-Jan-2018	344.0
9-Jan-2018	336.1
10-Jan-2018	406.7
11-Jan-2018	422.3
12-Jan-2018	242.1
13-Jan-2018	273.5
14-Jan-2018	344.0
15-Jan-2018	367.5
16-Jan-2018	281.3
17-Jan-2018	250.0
18-Jan-2018	226.4
19-Jan-2018	250.0
20-Jan-2018	257.8
21-Jan-2018	257.8
22-Jan-2018	163.8
23-Jan-2018	116.7
24-Jan-2018	210.8
25-Jan-2018	257.8
26-Jan-2018	265.6
27-Jan-2018	202.9
28-Jan-2018	171.6
29-Jan-2018	273.5
30-Jan-2018	297.0
31-Jan-2018	304.8

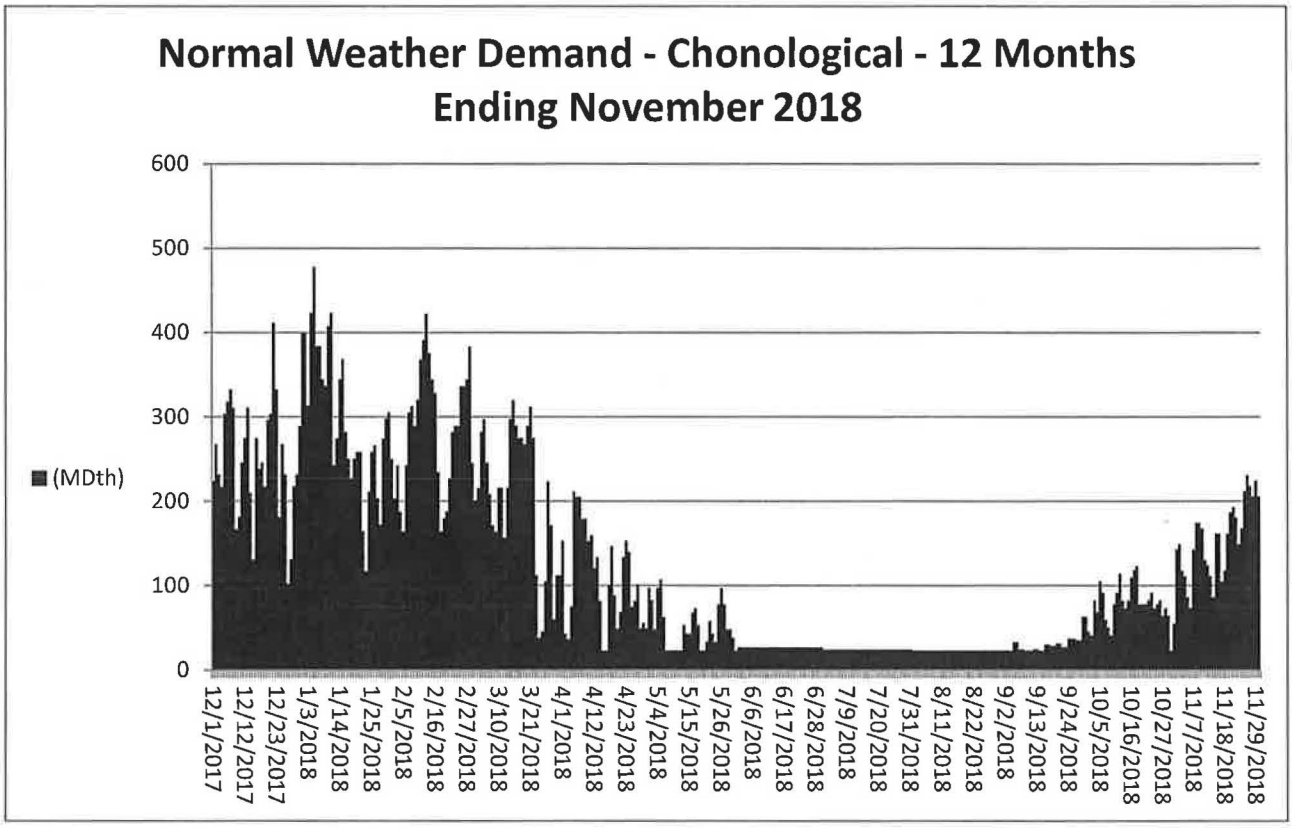
Date	Firm Demand (MDth)
1-Feb-2018	249.5
2-Feb-2018	202.6
3-Feb-2018	241.7
4-Feb-2018	186.9
5-Feb-2018	163.5
6-Feb-2018	241.7
7-Feb-2018	304.2
8-Feb-2018	312.1
9-Feb-2018	288.6
10-Feb-2018	319.9
11-Feb-2018	366.8
12-Feb-2018	390.3
13-Feb-2018	421.5
14-Feb-2018	374.6
15-Feb-2018	343.3
16-Feb-2018	327.7
17-Feb-2018	233.9
18-Feb-2018	163.5
19-Feb-2018	179.1
20-Feb-2018	186.9
21-Feb-2018	226.0
22-Feb-2018	280.8
23-Feb-2018	288.6
24-Feb-2018	288.6
25-Feb-2018	335.5
26-Feb-2018	335.5
27-Feb-2018	343.3
28-Feb-2018	382.4
1-Mar-2018	244.6
2-Mar-2018	200.2
3-Mar-2018	215.0
4-Mar-2018	281.6
5-Mar-2018	296.4
6-Mar-2018	244.6
7-Mar-2018	207.6
8-Mar-2018	170.6
9-Mar-2018	163.2
10-Mar-2018	215.0
11-Mar-2018	215.0
12-Mar-2018	155.8
13-Mar-2018	215.0
14-Mar-2018	296.4
15-Mar-2018	318.6
16-Mar-2018	289.0
17-Mar-2018	274.2
18-Mar-2018	274.2
19-Mar-2018	266.8
20-Mar-2018	289.0
21-Mar-2018	311.2
22-Mar-2018	274.2
23-Mar-2018	111.5
24-Mar-2018	37.5
25-Mar-2018	44.9
26-Mar-2018	104.1
27-Mar-2018	222.4
28-Mar-2018	170.6
29-Mar-2018	59.7
30-Mar-2018	111.5
31-Mar-2018	111.5

Date	Firm Demand (MDth)
1-Apr-2018	152.4
2-Apr-2018	42.2
3-Apr-2018	35.7
4-Apr-2018	74.6
5-Apr-2018	210.8
6-Apr-2018	204.3
7-Apr-2018	204.3
8-Apr-2018	178.4
9-Apr-2018	178.4
10-Apr-2018	152.4
11-Apr-2018	158.9
12-Apr-2018	120.0
13-Apr-2018	133.0
14-Apr-2018	81.1
15-Apr-2018	22.7
16-Apr-2018	22.7
17-Apr-2018	100.5
18-Apr-2018	145.9
19-Apr-2018	87.6
20-Apr-2018	48.6
21-Apr-2018	68.1
22-Apr-2018	133.0
23-Apr-2018	152.4
24-Apr-2018	139.4
25-Apr-2018	74.6
26-Apr-2018	81.1
27-Apr-2018	100.5
28-Apr-2018	48.6
29-Apr-2018	55.1
30-Apr-2018	48.6
1-May-2018	96.7
2-May-2018	81.9
3-May-2018	47.4
4-May-2018	96.7
5-May-2018	106.6
6-May-2018	62.2
7-May-2018	22.7
8-May-2018	22.7
9-May-2018	22.7
10-May-2018	22.7
11-May-2018	22.7
12-May-2018	22.7
13-May-2018	52.3
14-May-2018	42.4
15-May-2018	42.4
16-May-2018	67.1
17-May-2018	72.0
18-May-2018	52.3
19-May-2018	22.7
20-May-2018	22.7
21-May-2018	32.6
22-May-2018	57.2
23-May-2018	42.4
24-May-2018	32.6
25-May-2018	77.0
26-May-2018	96.7
27-May-2018	77.0
28-May-2018	47.4
29-May-2018	47.4
30-May-2018	37.5
31-May-2018	22.7

Date	Firm Demand (MDth)
1-Jun-2018	25.9
2-Jun-2018	25.9
3-Jun-2018	25.9
4-Jun-2018	25.9
5-Jun-2018	25.9
6-Jun-2018	25.9
7-Jun-2018	25.9
8-Jun-2018	25.9
9-Jun-2018	25.9
10-Jun-2018	25.9
11-Jun-2018	25.9
12-Jun-2018	25.9
13-Jun-2018	25.9
14-Jun-2018	25.9
15-Jun-2018	25.9
16-Jun-2018	25.9
17-Jun-2018	25.9
18-Jun-2018	25.9
19-Jun-2018	25.9
20-Jun-2018	25.9
21-Jun-2018	25.9
22-Jun-2018	25.9
23-Jun-2018	25.9
24-Jun-2018	25.9
25-Jun-2018	25.9
26-Jun-2018	25.9
27-Jun-2018	25.9
28-Jun-2018	25.9
29-Jun-2018	25.9
30-Jun-2018	25.9
1-Jul-2018	23.6
2-Jul-2018	23.6
3-Jul-2018	23.6
4-Jul-2018	23.6
5-Jul-2018	23.6
6-Jul-2018	23.6
7-Jul-2018	23.6
8-Jul-2018	23.6
9-Jul-2018	23.6
10-Jul-2018	23.6
11-Jul-2018	23.6
12-Jul-2018	23.6
13-Jul-2018	23.6
14-Jul-2018	23.6
15-Jul-2018	23.6
16-Jul-2018	23.6
17-Jul-2018	23.6
18-Jul-2018	23.6
19-Jul-2018	23.6
20-Jul-2018	23.6
21-Jul-2018	23.6
22-Jul-2018	23.6
23-Jul-2018	23.6
24-Jul-2018	23.6
25-Jul-2018	23.6
26-Jul-2018	23.6
27-Jul-2018	23.6
28-Jul-2018	23.6
29-Jul-2018	23.6
30-Jul-2018	23.6
31-Jul-2018	23.6

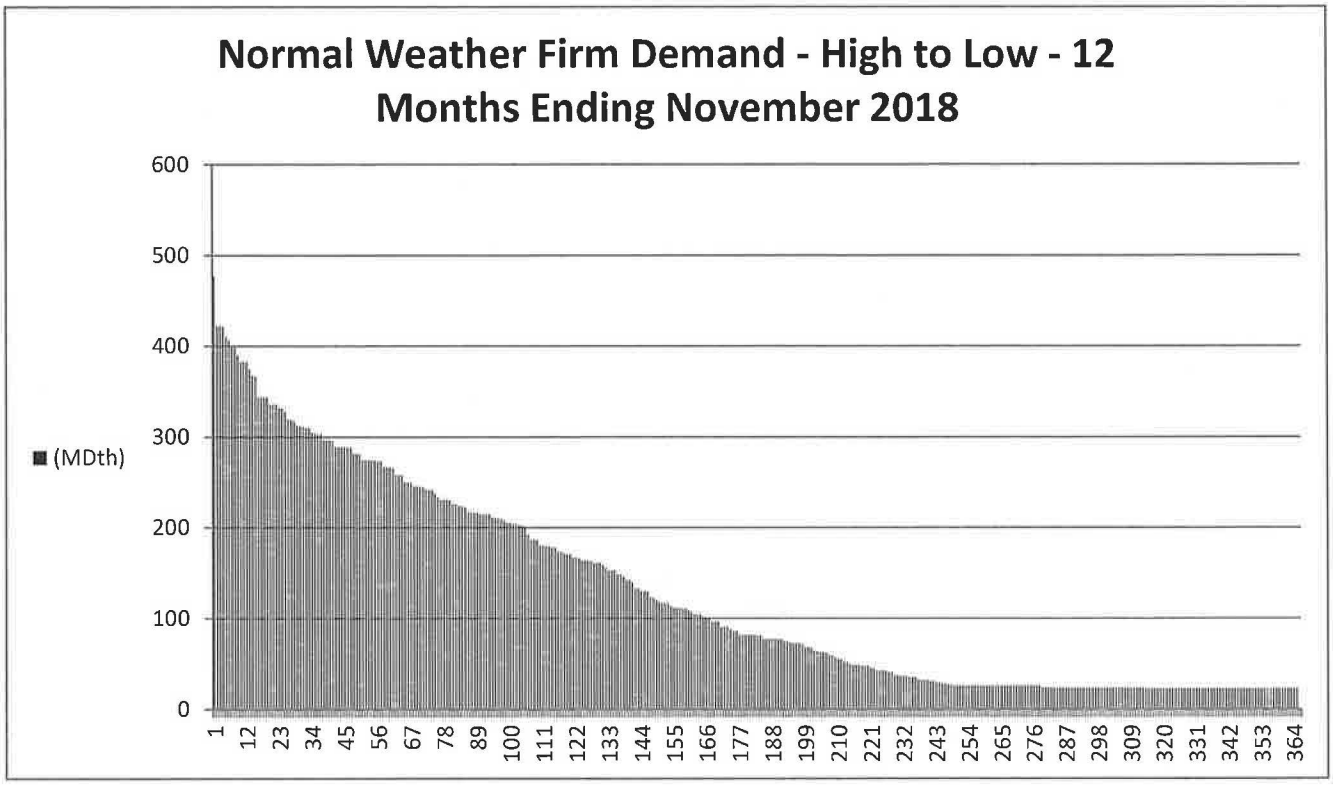
Date	Firm Demand (MDth)
1-Aug-2018	22.7
2-Aug-2018	22.7
3-Aug-2018	22.7
4-Aug-2018	22.7
5-Aug-2018	22.7
6-Aug-2018	22.7
7-Aug-2018	22.7
8-Aug-2018	22.7
9-Aug-2018	22.7
10-Aug-2018	22.7
11-Aug-2018	22.7
12-Aug-2018	22.7
13-Aug-2018	22.7
14-Aug-2018	22.7
15-Aug-2018	22.7
16-Aug-2018	22.7
17-Aug-2018	22.7
18-Aug-2018	22.7
19-Aug-2018	22.7
20-Aug-2018	22.7
21-Aug-2018	22.7
22-Aug-2018	22.7
23-Aug-2018	22.7
24-Aug-2018	22.7
25-Aug-2018	22.7
26-Aug-2018	22.7
27-Aug-2018	22.7
28-Aug-2018	22.7
29-Aug-2018	22.7
30-Aug-2018	22.7
31-Aug-2018	22.7
1-Sep-2018	22.7
2-Sep-2018	22.7
3-Sep-2018	22.7
4-Sep-2018	22.7
5-Sep-2018	32.3
6-Sep-2018	32.3
7-Sep-2018	24.1
8-Sep-2018	24.1
9-Sep-2018	22.7
10-Sep-2018	22.7
11-Sep-2018	22.7
12-Sep-2018	24.1
13-Sep-2018	24.1
14-Sep-2018	22.7
15-Sep-2018	22.7
16-Sep-2018	29.5
17-Sep-2018	29.5
18-Sep-2018	28.2
19-Sep-2018	28.2
20-Sep-2018	30.9
21-Sep-2018	30.9
22-Sep-2018	26.8
23-Sep-2018	26.8
24-Sep-2018	36.4
25-Sep-2018	36.4
26-Sep-2018	36.4
27-Sep-2018	35.0
28-Sep-2018	35.0
29-Sep-2018	62.4
30-Sep-2018	62.4

Date	Firm Demand (MDth)
1-Oct-2018	45.4
2-Oct-2018	40.8
3-Oct-2018	81.7
4-Oct-2018	68.1
5-Oct-2018	104.3
6-Oct-2018	90.7
7-Oct-2018	59.0
8-Oct-2018	49.9
9-Oct-2018	40.8
10-Oct-2018	77.1
11-Oct-2018	90.7
12-Oct-2018	113.4
13-Oct-2018	81.7
14-Oct-2018	72.6
15-Oct-2018	81.7
16-Oct-2018	108.9
17-Oct-2018	117.9
18-Oct-2018	122.5
19-Oct-2018	77.1
20-Oct-2018	77.1
21-Oct-2018	77.1
22-Oct-2018	81.7
23-Oct-2018	90.7
24-Oct-2018	72.6
25-Oct-2018	77.1
26-Oct-2018	81.7
27-Oct-2018	63.5
28-Oct-2018	72.6
29-Oct-2018	63.5
30-Oct-2018	22.7
31-Oct-2018	54.4
1-Nov-2018	142.2
2-Nov-2018	148.5
3-Nov-2018	117.0
4-Nov-2018	110.7
5-Nov-2018	85.6
6-Nov-2018	73.0
7-Nov-2018	142.2
8-Nov-2018	173.6
9-Nov-2018	173.6
10-Nov-2018	167.3
11-Nov-2018	129.6
12-Nov-2018	123.3
13-Nov-2018	110.7
14-Nov-2018	85.6
15-Nov-2018	161.0
16-Nov-2018	161.0
17-Nov-2018	104.4
18-Nov-2018	117.0
19-Nov-2018	161.0
20-Nov-2018	186.2
21-Nov-2018	192.5
22-Nov-2018	179.9
23-Nov-2018	148.5
24-Nov-2018	167.3
25-Nov-2018	211.3
26-Nov-2018	230.2
27-Nov-2018	217.6
28-Nov-2018	205.0
29-Nov-2018	223.9
30-Nov-2018	205.0


Normal Weather Demand - Chonological - 12 Months Ending November 2018
600
500
400
300
200
100
0
(MDth)
12/1/2017
12/12/2017
12/23/2017
1/3/2018
1/14/2018
1/25/2018
2/5/2018
2/16/2018
2/27/2018
3/10/2018
3/21/2018
4/1/2018
4/12/2018
4/23/2018
5/4/2018
5/15/2018
5/26/2018
6/6/2018
6/17/2018
6/28/2018
7/9/2018
7/20/2018
7/31/2018
8/11/2018
8/22/2018
9/2/2018
9/13/2018
9/24/2018
10/5/2018
10/16/2018
10/27/2018
11/7/2018
11/18/2018
11/29/2018

Normal Weather Firm Demand - High to Low - 12 Months Ending November 2018

Day #	Firm Demand (MDth)	Day #	Firm Demand (MDth)	Day #	Firm Demand (MDth)	Day #	Firm Demand (MDth)	Day #	Firm Demand (MDth)	Day #	Firm Demand (MDth)
1	477.2	62	257.8	123	166.2	184	81.1	245	28.2	306	23.6
2	422.3	63	257.8	124	163.8	185	77.1	246	28.2	307	23.6
3	422.3	64	257.8	125	163.5	186	77.1	247	26.8	308	23.6
4	421.5	65	250.0	126	163.5	187	77.1	248	26.8	309	23.6
5	410.6	66	250.0	127	163.2	188	77.1	249	25.9	310	23.6
6	406.7	67	249.5	128	161.0	189	77.1	250	25.9	311	23.6
7	398.8	68	245.3	129	161.0	190	77.0	251	25.9	312	23.6
8	398.8	69	245.3	130	161.0	191	77.0	252	25.9	313	23.6
9	390.3	70	244.6	131	158.9	192	74.6	253	25.9	314	22.7
10	383.2	71	244.6	132	155.8	193	74.6	254	25.9	315	22.7
11	383.2	72	242.1	133	152.4	194	73.0	255	25.9	316	22.7
12	382.4	73	241.7	134	152.4	195	72.6	256	25.9	317	22.7
13	374.6	74	241.7	135	152.4	196	72.6	257	25.9	318	22.7
14	367.5	75	238.1	136	148.5	197	72.6	258	25.9	319	22.7
15	366.8	76	233.9	137	148.5	198	72.0	259	25.9	320	22.7
16	344.0	77	230.9	138	145.9	199	68.1	260	25.9	321	22.7
17	344.0	78	230.9	139	142.2	200	68.1	261	25.9	322	22.7
18	343.3	79	230.9	140	142.2	201	67.1	262	25.9	323	22.7
19	343.3	80	230.2	141	139.4	202	63.5	263	25.9	324	22.7
20	336.1	81	226.4	142	133.0	203	63.5	264	25.9	325	22.7
21	335.5	82	226.0	143	133.0	204	62.4	265	25.9	326	22.7
22	335.5	83	223.9	144	130.2	205	62.4	266	25.9	327	22.7
23	331.5	84	223.7	145	130.2	206	62.2	267	25.9	328	22.7
24	331.5	85	222.4	146	129.6	207	59.7	268	25.9	329	22.7
25	327.7	86	217.6	147	123.3	208	59.0	269	25.9	330	22.7
26	319.9	87	216.5	148	122.5	209	57.2	270	25.9	331	22.7
27	318.6	88	216.5	149	120.0	210	55.1	271	25.9	332	22.7
28	317.2	89	216.5	150	117.9	211	54.4	272	25.9	333	22.7
29	312.6	90	215.0	151	117.0	212	52.3	273	25.9	334	22.7
30	312.1	91	215.0	152	117.0	213	52.3	274	25.9	335	22.7
31	311.2	92	215.0	153	116.7	214	49.9	275	25.9	336	22.7
32	310.0	93	215.0	154	113.4	215	48.6	276	25.9	337	22.7
33	310.0	94	211.3	155	111.5	216	48.6	277	25.9	338	22.7
34	304.8	95	210.8	156	111.5	217	48.6	278	25.9	339	22.7
35	304.2	96	210.8	157	111.5	218	47.4	279	24.1	340	22.7
36	302.8	97	209.3	158	110.7	219	47.4	280	24.1	341	22.7
37	302.8	98	207.6	159	110.7	220	47.4	281	24.1	342	22.7
38	297.0	99	205.0	160	108.9	221	45.4	282	24.1	343	22.7
39	296.4	100	205.0	161	106.6	222	44.9	283	23.6	344	22.7
40	296.4	101	204.3	162	104.4	223	42.4	284	23.6	345	22.7
41	295.6	102	204.3	163	104.3	224	42.4	285	23.6	346	22.7
42	289.0	103	202.9	164	104.1	225	42.4	286	23.6	347	22.7
43	289.0	104	202.6	165	101.5	226	42.2	287	23.6	348	22.7
44	288.6	105	200.2	166	100.5	227	40.8	288	23.6	349	22.7
45	288.6	106	192.5	167	100.5	228	40.8	289	23.6	350	22.7
46	288.6	107	186.9	168	96.7	229	37.5	290	23.6	351	22.7
47	288.4	108	186.9	169	96.7	230	37.5	291	23.6	352	22.7
48	281.6	109	186.2	170	96.7	231	36.4	292	23.6	353	22.7
49	281.3	110	180.6	171	90.7	232	36.4	293	23.6	354	22.7
50	280.8	111	180.6	172	90.7	233	36.4	294	23.6	355	22.7
51	274.2	112	179.9	173	90.7	234	35.7	295	23.6	356	22.7
52	274.2	113	179.1	174	87.6	235	35.0	296	23.6	357	22.7
53	274.2	114	178.4	175	85.6	236	35.0	297	23.6	358	22.7
54	274.0	115	178.4	176	85.6	237	32.6	298	23.6	359	22.7
55	274.0	116	173.6	177	81.9	238	32.6	299	23.6	360	22.7
56	273.5	117	173.6	178	81.7	239	32.3	300	23.6	361	22.7
57	273.5	118	171.6	179	81.7	240	32.3	301	23.6	362	22.7
58	266.8	119	170.6	180	81.7	241	30.9	302	23.6	363	22.7
59	266.8	120	170.6	181	81.7	242	30.9	303	23.6	364	22.7
60	266.8	121	167.3	182	81.7	243	29.5	304	23.6	365	22.7
61	265.6	122	167.3	183	81.1	244	29.5	305	23.6		


Normal Weather Firm Demand - High to Low - 12 Months Ending November 2018
600
500
400
300
200
100
0
(MDth)
1
12
23
34
45
56
67
78
89
100
111
122
133
144
155
166
177
188
199
210
221
232
243
254
265
276
287
298
309
320
331
342
353
364

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-13:

Please provide the following for the Company's ten largest transportation customers during peak month of the most recent heating season:

a. actual consumption

b. volume delivered to the Company on their behalf, if applicable

c. daily nomination

Response:

Please see GAS-COS-013 Attachment A.

Daily Nominations for 1/2017 in Dth

Customer	Usage 01/17 (Dth)	Nominations 01/17 (Dth)	01/01/17 Day 1 (Dth)	01/02/17 Day 2 (Dth)	01/03/17 Day 3 (Dth)	01/04/17 Day 4 (Dth)	01/05/17 Day 5 (Dth)	01/06/17 Day 6 (Dth)	01/07/17 Day 7 (Dth)	01/08/17 Day 8 (Dth)	01/09/17 Day 9 (Dth)	01/10/17 Day 10 (Dth)	01/11/17 Day 11 (Dth)	01/12/17 Day 12 (Dth)	01/13/17 Day 13 (Dth)	01/14/17 Day 14 (Dth)	01/15/17 Day 15 (Dth)	01/16/17 Day 16 (Dth)
A	50,029	**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	51,327	*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	53,192	67,000	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161
D	56,257	*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E	65,494	66,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
F	67,100	*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G	69,130	79,102	4,558	4,558	4,558	4,558	4,558	4,558	4,558	4,558	4,558	4,558	4,558	4,558	0	0	0	0
H	97,931	104,005	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355
I	192,425	204,680	5,060	5,060	5,060	5,060	5,060	5,060	9,000	9,000	9,000	5,060	5,060	5,060	5,060	7,060	7,060	7,060
J	259,819	**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Customer	01/17/17 Day 17 (Dth)	01/18/17 Day 18 (Dth)	01/19/17 Day 19 (Dth)	01/20/17 Day 20 (Dth)	01/21/17 Day 21 (Dth)	01/22/17 Day 22 (Dth)	01/23/17 Day 23 (Dth)	01/24/17 Day 24 (Dth)	01/25/17 Day 25 (Dth)	01/26/17 Day 26 (Dth)	01/27/17 Day 27 (Dth)	01/28/17 Day 28 (Dth)	01/29/17 Day 29 (Dth)	01/30/17 Day 30 (Dth)	01/31/17 Day 31 (Dth)
A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,170
D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E	2,000	2,000	2,000	2,000	2,000	2,000	2,000	4,000	4,000	2,000	2,000	2,000	2,000	2,000	2,000
F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G	0	0	0	4,558	2,058	2,058	2,058	4,558	4,558	0	0	0	0	0	4,558
H	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355	3,355
I	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060	7,060
J	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note:
* Customer account within Aggregation Group
** Multiple customer accounts within Stand Alone Nomination Group

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-14:

Please provide a summary identifying the salient features of each of the following. Salient features include contract party, effective term and applicable contract quantities (daily, annual, seasonal, etc.).

a. All firm transportation agreements by type greater than one month in length. Indicate whether the capacity is available at the Company's citygate to meet design day requirements or is upstream capacity. Identify the downstream pipeline for each upstream arrangement.

b. All firm storage, gathering and exchange agreements. Indicate if each agreement provides design day capacity at the citygate or requires separate transportation (identify) service to effectuate delivery. Include on-system storage and peak shaving facilities used by the Company and identify all ratcheting provisions applicable to the Company's contractual and on-system storage arrangements.

Response:

Please see GAS-COS-014 Attachment A for the requested information.

COLUMBIA GAS OF PENNSYLVANIA, INC.

FIRM CITY GATE TRANSPORTATION AGREEMENTS

TRANSPORTER	CONTRACT NUMBER	RATE SCHEDULE	EFFECTIVE DATE	PRIMARY TERMINATION DATE		CONTRACT QUANTITY DTH/D	RECEIPT POINT	REC POINT QUANTITY DTH/D	CITY GATE DELIVERY POINT	DEL POINT QUANTITY DTH/D
COLUMBIA GAS	80136	FTS	11/01/16	10/31/19		90,788	A05 DELMONT AGG	3,641	CPA CITY GATE	90,788
							A06 MCCLELL AGG	21,596		
							LEACH	39,496		
							B15 UNIONVILLE	12,283		
							C16 DELMONT	13,772		
			11/01/19	10/31/22		60,551	LEACH	39,496	CPA CITY GATE	60,551
							B15 UNIONVILLE	12,283		
							C16 DELMONT	8,772		
			11/01/22	10/31/25		21,055	B15 UNIONVILLE	12,283	CPA CITY GATE	21,055
							C16 DELMONT	8,772		
COLUMBIA GAS	50675	FTS	11/01/97	10/31/21		13,334	BROADRUN	13,334	CPA CITY GATE	13,334
COLUMBIA GAS	56741	FTS	11/01/98	10/31/22		11,666	GRANT STATION	10,000	CPA CITY GATE	11,666
							BROADRUN	1,666		
COLUMBIA GAS	56742	FTS	11/01/99	10/31/121		10,000	LEACH	10,000	CPA CITY GATE	10,000
COLUMBIA GAS	80264	FTS	11/01/04	10/31/19		1,800	LEACH	1,800	CPA CITY GATE	1,800
COLUMBIA GAS (4)	82610	SST	04/01/05	03/31/20	OCT-MAR	456,876	STORAGE O-M	456,876	CPA CITY GATE	456,876
					APR-SEPT	228,438	STORAGE A-S	228,438		
DOMINION TRANSMISSION	700034	FTNN-GSS	06/01/05	03/31/23(1)	NOV-MAR	6,000	GSS STORAGE	6,000	CPA @ WARRENDALE/DARLINGTON	6,000
DOMINION TRANSMISSION	200539	FT	11/01/09	10/31/19(1)	NOV-MAR	3,000	OAKFORD	3,000	CPA @ WARRENDALE	3,000
					APR-OCT	2,000				
DOMINION TRANSMISSION	100121	FTNN-GSS	4/1/2014	3/31/24(1)	NOV-OCT	4,800	GSS STORAGE	4,800	PLEASANT GAP	4,800
DOMINION TRANSMISSION	100122	FTNN-GSS	5/1/2015	3/31/30(1)	NOV-OCT	15,000	GSS STORAGE	15,000	PLEASANT GAP	15,000
DOMINION TRANSMISSION	200687	FT	5/1/2015	3/31/30(1)	NOV-OCT	5,000	TRANSCO LEIDY	5,000	PLEASANT GAP	5,000
EQUITRANS	EQTR10375-391	FTS	04/01/14	03/31/19(1)	NOV-MAR	14,348	STORAGE	14,348	CPA @ GROVETON	14,348
					APR-OCT	7,500	RHINEHART	7,500	STORAGE	7,500
NATIONAL FUEL (3)	F02091	FT	11/01/98	10/31/18(2)		4,304	TRANSCO LEIDY	4,304	CPA @ WARREN	4,304
TENNESSEE GAS	30920	FT-A	11/01/00	10/31/19		16,000	500 LINE	7,600	CPA @ NEW CASTLE	16,000
							800 LINE	8,400		
TENNESSEE GAS	63409	FT-A	11/01/12	10/31/22		7,600	ZONE 4 POOL	7,600	CPA @ PITT TERMINAL	7,600
TEXAS EASTERN	800387R2	CDS	11/01/06	10/31/19(1)		2,342	VENICE	941	CPA @ ROCKWOOD	287
							ST LANDRY	1,401	CPA @ ST COLLEGE	2,342
									CPA @ EMIGSVILLE	2,342
									CPA @ CHAMBERSBURG	219
									COL GAS @ EAGLE (6)	2,342
TEXAS EASTERN	910464R1	CDS	11/01/06	10/31/23(1)		5,000	MRPL	5,000	CPA @ ROCKWOOD	2,758
									CPA @ CHAMBERSBURG	2,242
TEXAS EASTERN	910463R1	CDS	11/01/06	10/31/23(1)		158	MRPL	158	CPA @ CHAMBERSBURG	158
TEXAS EASTERN	910951R1	FT-1	11/01/12	10/31/22(1)		11,753	ELA, M1	11,753	CPA @ UNIONTOWN (5)	11,753
TEXAS EASTERN (4)	830049R1	FT	12/01/98	03/31/21(1)	DEC-MAR	10,000	COL GAS @ EAGLE	10,000	CPA @ ST COLLEGE	1,658
									CPA @ ROCKWOOD	8,242
									CPA @ CHAMBERSBURG	100

(1) YEAR TO YEAR THEREAFTER
(2) MONTH TO MONTH THEREAFTER
(3) NET CITY GATE DELIVERY IS 4,245 DTH/D
(4) CPA HAS THE ABILITY TO DELIVER 10,000 DTH PER DAY TO TEXAS EASTERN AT EAGLE UNDER COLUMBIA GAS CONTRACT NO. 82610 WHICH IS THEN DELIVERED BY TEXAS EASTERN UNDER CONTRACT NO. 830049R1 TO THE CPA CITY GATE.

COLUMBIA GAS OF PENNSYLVANIA, INC.

FIRM UPSTREAM TRANSPORTATION AGREEMENTS

TRANSPORTER	CONTRACT NUMBER	RATE SCHEDULE	EFFECTIVE DATE	PRIMARY TERMINATION DATE	CONTRACT QUANTITY DTH/D	RECEIPT POINT	REC POINT QUANTITY DTH/D	DELIVERY POINT INTO DOWNSTREAM PIPELINE	DEL POINT QUANTITY DTH/D
COLUMBIA GULF	79919	FTS-1	11/01/04	10/31/19	43,632	RAYNE	43,632	COL GAS @ LEACH	43,632
TEXAS EASTERN	910951R1	FT-1	11/01/12	10/31/22(1)	3,082	ELA, M1	3,082	COL GAS @ DELMONT	3,082

(1) YEAR TO YEAR THEREAFTER

STORAGE

COUNTERPARTY	CONTRACT NUMBER	RATE SCHEDULE	EFFECTIVE DATE	PRIMARY TERMINATION DATE		CONTRACT QUANTITY DTH/D	
COLUMBIA GAS	82512	FSS	04/01/05	03/31/20	MDQ SCQ	456,876 25,341,126	REQUIRES COLUMBIA GAS SST FOR DELIVERY TO THE CITY GATE
DOMINION TRANSMISSION	600037	GSS	06/01/05	03/31/23(1)	MDQ SCQ	9,000 941,176	REQUIRES DTI FTNN-GSS AND FT FOR DELIVERY TO THE CITY GATE
DOMINION TRANSMISSION	300195	GSS	3/31/2014	03/31/24 (1)	MDQ SCQ	4,800 240,000	REQUIRES DTI FTNN-GSS FOR DELIVERY TO THE CITY GATE
DOMINION TRANSMISSION	300206	GSS	5/1/2015	03/31/30 (1)	MDQ SCQ	15,000 930,000	REQUIRES DTI FTNN-GSS FOR DELIVERY TO THE CITY GATE
EQUITRANS	EQTR10379-390	115SS	04/01/14	03/31/19(1)	INJ WTH ANN	7,500 14,348 1,500,000	REQUIRES EQUITRANS FTS FOR DELIVERY TO THE CITY GATE
BLACKHAWK					MDQ SCQ	10,000 30,000	ON SYSTEM STORAGE

(1) YEAR TO YEAR THEREAFTER

EXCHANGES

COUNTERPARTY	EFFECTIVE DATE	PRIMARY TERMINATION DATE	CONTRACT QUANTITY DTH/D	
PEOPLES NATURAL	10/08/93	10/07/19(1)	NOT SPEC	CITY GATE EXCHANGE
NATIONAL FUEL DIST	12/02/74	(2)	NOT SPEC	CITY GATE EXCHANGE

(1) YEAR TO YEAR THEREAFTER (2) THEREAFTER UNTIL TERMINATED

STORAGE RATCHET PROVISIONS

COLUMBIA FSS

SCQ LEVEL	MDQ
100% TO 30%	100 % OF MDQ
<30% TO 20%	80% OF MDQ
<20% TO 10%	65% OF MDQ
<10% TO 0%	50% OF MDQ

DTI GSS

SCQ LEVEL	MDQ
100% TO 35%	100 % OF MDQ
<35% TO 16%	92% OF MDQ
<16% TO 10%	70% OF MDQ
<10% TO 0%	63% OF MDQ

LIMITED ON A MONTHLY BASIS TO 87.5% OF THE TOTAL MONTHLY WITHDRAWAL CAPABILITY.

EQUITRANS 115SS

SCQ LEVEL	MDQ
100% TO 35%	100 % OF MDQ
<35% TO 16%	92% OF MDQ
<16% TO 10%	70% OF MDQ
<10% TO 0%	63% OF MDQ

BLACKHAWK RATCHETS DO NOT APPLY

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-015:

For the most recent annual period available, please identify the applicable monthly volumes and revenues under each rate schedule which were:

a. Sold under a negotiated or market-based rate

b. Transported under a negotiated or market based rate

c. Transported at full margin transportation rates

Response:

a. Please see the attached spreadsheet (GAS-COS-015 Attachment A) showing actual billed (invoiced) quantities and revenue sold under a negotiated or market-based rate for the 12 Months Ended November 30, 2017.

b. Please see the attached spreadsheet (GAS-COS-015 Attachment B) showing actual billed (invoiced) quantities and revenue transported under a negotiated or market based rate for the 12 Months Ended November 30, 2017.

c. Please see the attached spreadsheet (GAS-COS-015 Attachment C) showing actual billed (invoiced) quantities and revenue transported at full margin transportation rates for the 12 Months Ended November 30, 2017.

Columbia Gas of Pennsylvania, Inc.

Actual Billed Volumes and Revenues Billed - Sold Under a Negotiated or Market Based Rate

For the 12 Months Ending November 30, 2017

	Volumes											
	Dec-16 DTH	Jan-17 DTH	Feb-17 DTH	Mar-17 DTH	Apr-17 DTH	May-17 DTH	Jun-17 DTH	Jul-17 DTH	Aug-17 DTH	Sep-17 DTH	Oct-17 DTH	Nov-17 DTH
NSS	7,243.0	9,262.0	10,212.0	8,473.0	6,869.0	4,001.0	2,572.0	2,313.0	2,367.0	2,448.0	2,527.0	6,636.0

	Revenues											
	Dec-16 $	Jan-17 $	Feb-17 $	Mar-17 $	Apr-17 $	May-17 $	Jun-17 $	Jul-17 $	Aug-17 $	Sep-17 $	Oct-17 $	Nov-17 $
NSS	34,069.96	49,596.17	49,018.88	34,463.86	32,003.31	19,162.29	13,118.90	11,571.10	11,572.59	11,895.26	12,268.34	28,330.79

Columbia Gas of Pennsylvania, Inc.

Actual Billed Volumes and Revenues Billed - Transported Under a Negotiated or Market Based Rate

For the 12 Months Ending November 30, 2017

Volumes

	Dec-16 DTH	Jan-17 DTH	Feb-17 DTH	Mar-17 DTH	Apr-17 DTH	May-17 DTH	Jun-17 DTH	Jul-17 DTH	Aug-17 DTH	Sep-17 DTH	Oct-17 DTH	Nov-17 DTH
LDS FLEX	743,994.0	871,967.0	1,045,450.0	1,001,326.0	843,340.0	825,379.0	747,711.0	715,375.0	737,280.0	819,578.0	820,424.0	996,749.0
MLDS I FLEX	190,448.0	192,425.0	218,139.0	205,694.0	209,438.0	203,179.0	196,044.0	182,038.0	197,735.0	158,089.0	178,580.0	199,999.0
MLDS II FLEX	237,809.0	253,731.0	251,251.0	242,479.0	223,396.0	217,925.0	218,769.0	190,602.0	225,005.0	207,753.0	234,678.0	238,722.0
SDS FLEX	22,249.0	25,656.0	26,154.0	22,880.0	17,859.0	14,725.0	13,746.0	11,468.0	13,028.0	12,492.0	12,445.0	20,029.0
SGDS FLEX	3,143.0	5,056.0	3,757.0	3,103.0	2,508.0	926.0	495.0	323.0	335.0	276.0	409.0	1,435.0

Revenues

	Dec-16 $	Jan-17 $	Feb-17 $	Mar-17 $	Apr-17 $	May-17 $	Jun-17 $	Jul-17 $	Aug-17 $	Sep-17 $	Oct-17 $	Nov-17 $
LDS FLEX	330,373.83	343,892.96	378,760.12	335,245.15	320,255.22	331,734.53	339,696.97	331,819.41	342,453.29	409,699.10	333,442.00	349,592.71
MLDS I FLEX	25,128.89	25,313.74	60,473.93	26,595.53	26,946.34	26,359.87	25,691.32	24,378.96	25,849.77	22,134.94	24,054.95	26,061.91
MLDS II FLEX	77,758.41	83,488.17	83,727.16	82,122.98	76,815.95	74,695.03	75,860.40	68,434.38	77,289.80	74,006.47	79,680.04	81,739.23
SDS FLEX	23,513.60	26,852.25	26,945.81	24,128.37	19,191.68	16,727.74	15,155.28	13,590.40	14,767.04	14,599.58	14,972.02	22,114.92
SGDS FLEX	5,407.33	8,739.66	6,395.59	5,430.79	4,608.37	1,910.62	1,273.05	919.62	916.78	911.05	1,042.76	2,491.50

Columbia Gas of Pennsylvania, Inc.

Actual Billed Volumes and Revenues Billed - Transported at Full Margin Transportation Rates

For the 12 Months Ending November 30, 2017

Volumes

	Dec-16 DTH	Jan-17 DTH	Feb-17 DTH	Mar-17 DTH	Apr-17 DTH	May-17 DTH	Jun-17 DTH	Jul-17 DTH	Aug-17 DTH	Sep-17 DTH	Oct-17 DTH	Nov-17 DTH
LDS	974,926.0	869,902.0	905,159.0	956,872.0	855,493.0	835,525.0	779,282.0	730,813.0	789,713.0	757,924.0	820,788.0	890,240.0
MLDS I	16,236.0	17,072.0	17,028.0	15,290.0	11,938.0	11,023.0	9,956.0	12,410.0	8,450.0	21,777.0	9,495.0	14,017.0
MLDS II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RDGDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RDS	965,669.9	1,298,077.0	1,046,194.8	890,748.2	625,128.5	269,354.3	166,259.8	109,420.9	98,923.6	114,027.3	126,840.2	432,008.6
SCD	309,383.9	438,120.1	353,916.1	295,306.9	213,246.5	93,433.8	65,678.0	50,140.5	48,096.6	53,840.2	58,894.2	148,455.4
SDS	719,742.0	781,552.0	706,459.0	633,781.0	497,718.0	366,504.0	308,966.0	271,282.0	299,930.0	311,906.0	335,690.0	498,652.0
SGDS	479,089.0	733,721.0	605,966.0	520,100.0	379,723.0	184,689.0	129,510.0	95,308.0	91,694.0	104,955.0	116,638.0	286,646.0

Revenues

	Dec-16 $	Jan-17 $	Feb-17 $	Mar-17 $	Apr-17 $	May-17 $	Jun-17 $	Jul-17 $	Aug-17 $	Sep-17 $	Oct-17 $	Nov-17 $
LDS	1,225,550.38	1,213,548.50	1,208,134.61	1,250,227.80	1,126,987.38	1,100,527.19	1,036,677.30	975,764.56	1,044,526.20	1,014,701.77	1,083,302.60	1,183,771.96
MLDS I	4,720.32	4,798.65	4,159.63	5,104.41	4,786.93	4,796.35	6,164.85	5,007.89	4,460.10	5,708.84	4,561.42	4,981.73
MLDS II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RDGDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RDS	7,609,751.75	10,557,039.02	9,922,430.01	8,449,368.83	5,987,264.41	3,356,168.42	2,474,135.90	2,057,897.26	1,983,218.54	2,086,796.93	2,381,420.03	4,571,105.07
SCD	1,559,849.60	2,266,241.90	1,900,747.09	1,615,244.51	1,223,372.06	650,506.43	513,276.30	438,836.18	429,137.36	456,515.80	474,567.83	902,672.95
SDS	1,639,187.41	1,880,370.84	1,737,265.76	1,575,034.42	1,274,093.03	984,206.00	854,403.30	771,548.17	834,412.39	861,334.90	912,300.78	1,273,494.60
SGDS	1,647,682.60	2,638,820.80	2,233,362.67	1,929,601.98	1,433,620.30	744,138.21	549,335.32	428,760.91	416,708.22	463,168.65	503,812.45	1,103,191.32

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-16:

Please provide the following for each curtailment during the last three years:

a. Dates of curtailment

b. Type of curtailment (firm service, interruptible service, both)

c. Whether curtailment was related to amount of capacity on the Company's system, other capacity or supply related

d. Rate schedule that curtailed volumes would have been billed under

e. Curtailed volumes by rate schedule

f. Actual volumes moved by rate schedule

Response:

a.) – f.) As described in the Gas Emergency Rules section of the Company's tariff, curtailment is an action the Company may take regarding Company provided services in the event of an "emergency." As further defined in the Company's tariff, an emergency is a situation wherein the aggregate customer demand on the Company's system, or confined segment of the system, exceeds or threatens to exceed the gas supply or capacity that is actually and lawfully available to the Company to meet the demands, and the actual or threatened excess in demand creates an immediate threat to the Company's system operating integrity with respect to Priority 1 customers. While the Company has asked several customers to voluntarily reduce their load on cold days in the past to avoid the necessity of a curtailment, there have been no incidents during the last three years requiring the Company to curtail its services or customers.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-17:

Please identify the Company's design day planning criteria and the probability of design day occurrence. Include any available documentation supporting the Company's claimed probability of occurrence.

Response:

Columbia's design day planning criteria are based on Design Current Day Temperature, Design Prior Day Temperature, Design Current Day Wind Speed, and assume occurrence on a weekday.

Columbia's design day weather conditions were last updated in 2015. The aforementioned design day weather conditions are premised upon all available historical weather data through the winter of 2014/15. COS-17 Attachment A shows the Design Temperatures, Design Wind Speed, the historical temperature period considered and the weights of the National Weather Service locations used to arrive at the Design Weather Conditions for each of Columbia's market areas. The weather stations used for this determination are those located at Hagerstown, Maryland, Morgantown, West Virginia, and Harrisburg, Pittsburgh, and Bradford, Pennsylvania. These weather stations are used because of length of available, consistent weather history and their proximity to Columbia's customers. The following paragraphs provide detail on the development of GAS-COS-17 Attachment A.

Columbia's Design Current Day Temperature is that temperature having a 1 in 15 probability or a 6.7 percent risk level. That is, the probability is 1 in 15, or 6.7 percent that any given winter will have one or more days with an average daily temperature equal to or colder than the Design Temperature. Columbia uses the Gumbel, or double exponential, distribution to calculate the probabilities. This skewed distribution is selected because the distribution of historical coldest temperatures is skewed.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Columbia has developed temperature probability distributions for eight Pipeline Scheduling Points (PSP) in Pennsylvania. These PSPs correspond to geographically defined markets in Columbia Gas Transmission's (TCO) FERC-approved Tariff. The development of a Design PSP Temperature is a two-step process. First, for each weather station within the PSP, all available history is used to develop an associated design temperature. Next, the design temperatures for each weather station are weighted based on the firm demand associated with each weather station. The weighted temperatures are then summed to arrive at the PSP design average temperature. Columbia's system wide Design Current Day Temperature is minus 5 degrees Fahrenheit. The same method is used to develop design prior day temperature and design current day wind speed by PSP and for Columbia in total.

GAS-COS-17 Attachment B is the supporting probability of occurrence analyses for the weather station Design Temperatures. For each analysis, the heating season's days are ranked coldest to warmest. Shown are the twenty coldest days of each season. The coldest day of each season, denoted by "Rank 1" on the "20 Coldest" Report, is used in the Gumbel Analysis. Provided for each analysis are the Gumbel Curve parameters and probabilities considered.

The condition of Design Prior Day Temperature results from the mean temperature difference between historical "cold days" and their associated prior days. A "Cold Day" is defined as a day as cold as or colder than the Design Current Day Temperature, plus 5 degrees Fahrenheit. Using the Pittsburgh, Pennsylvania Design Current Day Temperature of minus 7 degrees Fahrenheit as an example, a "Cold Day" would be any day having an average temperature of minus 2 degrees Fahrenheit or colder. The average difference, prior day temperature less current day temperature, is added to the Design Current Day Temperature to provide Design Prior Day Temperature. The Pittsburgh, Pennsylvania average difference is 12 degrees Fahrenheit, so the Design Prior Day Temperature is -7 + 12 = 5 degrees Fahrenheit. To obtain the total company Design Prior Day Temperature, weather station weighting is then applied to each weather station's Design Prior Day Temperature and summed for a total company design. Columbia's system wide Design Prior Day Temperature is 6 degrees Fahrenheit.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Consistent with the Prior Day Design Temperature methodology, the approach to use an average of "Cold Days" is used to establish Design Wind Speed. However, because Wind Speed data has only been available since 1991/92, a "Cold Day" is defined as Design Current Day Temperature plus 15 degrees Fahrenheit. Again, the design is developed at the weather station level, and then weighted for the total company design. Columbia's system wide Design Wind speed is 11 mph.

Columbia Gas of Pennsylvania

Company Winter Monthly Design Day Conditions [1]

TCO Market Area	Pipeline Area	Location	2015 Station Weighting	Company (Gumbel 1-in-15) Historical Period	Current Day Temp	Prior Day Temp [2]	Wind Speed [2]
25	Lancaster	Harrisburg, PA	95.1311	1925-2015	2	10	12
		Hagerstown, MD	4.8689	1925-2015	0	10	12
		Total	**100.0000**		**2**	**10**	**12**
26	Bedford	Morgantown, WV	**100.0000**	1949-2015	**-6**	**5**	**7**
29	Downingtown	Harrisburg, PA	**100.0000**	1925-2015	**2**	**10**	**12**
35	Pittsburgh	Pittsburgh, PA	74.9116	1925-2015	-7	5	11
		Morgantown, WV	25.0884	1949-2015	-6	5	7
		Total	**100.0000**		**-7**	**5**	**10**
36	Olean	Pittsburgh, PA	2.8939	1925-2015	-7	5	11
		Bradford, PA	97.1061	1941-2015	-15	-2	11
		Total	**100.0000**		**-15**	**-2**	**11**
38	Rimersburg	Pittsburgh, PA	56.1941	1925-2015	-7	5	11
		Bradford, PA	43.8059	1941-2015	-15	-2	7
		Total	**100.0000**		**-11**	**2**	**9**
39	New Castle	Pittsburgh, PA	**100.0000**	1925-2015	**-7**	**5**	**11**
40	PA/WV Misc.	Pittsburgh, PA	3.1982	1925-2015	-7	5	11
		Morgantown, WV	96.8018	1949-2015	-6	5	7
		Total	**100.0000**		**-6**	**5**	**7**
CPA Total		Harrisburg	24.9422	1925-2015	2	10	12
		Pittsburgh	51.3767	1925-2015	-7	5	11
		Hagerstown	1.2765	1925-2015	0	10	12
		Bradford	6.5920	1941-2015	-15	-2	11
		Morgantown	15.8126	1949-2015	-6	5	7
			100.0000	**Total Co**	**-5**	**6**	**11**

(1) Using all available temperature data through March 2015 and weather station weights based on actual firm customer demand from December 2014 through February 2015.

(2) In the 2015 Study, Prior Day Temperature was developed using a 5 degree range for Cold Days; Wind Speed was developed using 15 degree range for Cold Days.

Gumbel Analysis | Table 1 | January 6, 2016

Weather Station 37-BRADFORD, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1941 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1941	151	-8	0	0	2	5	5	6	9	9	9	11	12	13	14	15	15	17	17	17	18
1942	151	-13	-4	1	1	5	6	6	7	9	9	11	11	11	12	13	13	14	15	15	15
1943	152	-1	2	5	6	8	9	9	9	10	10	10	12	13	13	14	14	15	15	16	17
1944	151	-10	-3	0	1	3	4	8	8	8	8	9	9	9	11	12	12	13	13	13	14
1945	151	4	5	6	6	7	8	8	9	9	10	11	11	12	12	13	14	15	15	15	16
1946	151	2	6	6	9	10	10	13	13	13	14	14	14	15	15	15	15	15	17	17	18
1947	152	-5	-3	-2	-2	1	1	1	2	5	5	6	6	7	8	9	10	10	11	12	13
1948	151	2	11	11	15	16	17	18	19	19	19	20	20	20	20	21	22	22	22	22	22
1949	151	5	7	7	8	8	8	11	13	13	14	15	15	16	17	17	18	18	19	19	19
1950	151	-1	1	3	3	6	9	10	11	11	11	11	12	13	13	14	16	16	17	17	18
1951	152	3	4	4	7	8	9	10	12	12	12	13	13	13	14	15	15	16	16	17	17
1952	151	7	11	13	14	15	17	19	19	19	20	20	20	20	20	20	20	20	21	21	21
1953	151	4	4	6	9	10	10	11	12	12	12	12	13	14	14	15	16	16	17	18	18
1954	151	-2	-1	0	0	3	4	5	7	8	8	8	10	12	13	14	14	14	14	14	15
1955	152	2	9	9	10	10	11	11	13	13	13	13	13	13	13	14	14	14	15	15	15
1956	151	-7	-5	-3	-1	5	9	11	11	14	15	15	15	16	16	16	16	18	18	18	18
1957	151	-4	0	1	1	2	3	3	4	4	6	6	7	9	9	9	10	11	11	12	13
1958	151	0	3	3	4	4	4	4	4	4	5	5	6	7	7	8	8	8	8	8	9
1959	152	6	6	7	8	8	9	9	10	10	10	11	11	12	12	12	12	12	13	14	14
1960	151	-3	-2	0	1	1	2	2	2	3	3	3	4	4	4	4	5	6	7	8	10
1961	151	-1	3	4	4	4	5	7	7	7	8	8	9	9	9	10	10	12	12	13	13
1962	151	-13	-4	-2	-2	-1	0	0	0	0	1	2	2	3	4	4	6	7	7	7	7
1963	152	1	2	5	5	6	6	7	8	8	8	10	10	11	11	11	11	12	12	12	12
1964	151	-3	-1	-1	0	0	0	2	2	6	6	6	7	7	9	10	10	12	12	12	12
1965	151	-3	0	1	4	5	5	6	7	8	10	11	11	11	12	12	13	14	14	14	15
1966	151	2	2	3	3	3	4	6	7	8	8	8	9	10	10	11	14	15	15	16	16
1967	152	-1	-1	0	0	2	2	4	5	5	6	7	7	7	8	8	8	8	9	9	10
1968	151	-2	1	2	5	5	6	6	6	8	9	9	9	10	10	11	11	11	12	12	12
1969	151	-4	-2	1	1	2	2	3	4	4	4	8	8	9	9	10	10	10	10	12	13
1970	151	-4	-4	-2	0	3	4	4	5	6	7	8	8	9	9	9	10	11	11	12	12
1971	152	-4	0	1	3	3	4	5	6	7	7	7	9	9	9	9	10	10	10	10	11
1972	151	-2	2	3	4	4	4	5	6	7	8	9	9	10	10	11	11	12	12	14	14
1973	151	2	6	7	10	10	11	11	11	12	13	13	13	13	14	14	14	15	15	16	16
1974	151	1	6	7	7	8	8	9	12	13	14	14	16	16	16	16	16	16	16	17	17
1975	152	-5	-3	0	0	2	3	6	6	6	7	8	9	10	11	11	12	13	13	13	13
1976	151	-15	-15	-9	-7	-4	-3	-3	-3	-3	-3	-2	-1	1	2	2	3	4	4	4	4

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 37-BRADFORD, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1941 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1977	151	-2	0	3	3	3	4	4	5	5	5	5	6	6	6	6	6	6	7	7	8
1978	151	-12	-11	-10	-9	-8	-6	-4	-4	-3	-2	0	0	1	2	2	2	3	3	6	7
1979	152	-6	-6	-5	3	3	5	5	6	6	7	7	9	9	9	9	10	10	11	11	12
1980	151	-9	-8	-5	-4	-4	-1	-1	0	0	0	1	1	2	2	3	4	4	4	6	7
1981	151	-21	-7	-7	-6	3	4	5	5	5	6	7	7	7	8	8	9	9	9	9	10
1982	151	5	5	6	7	10	12	12	13	14	14	15	15	15	15	15	16	16	16	16	18
1983	152	-11	-7	-3	0	0	0	2	2	2	3	3	4	5	5	5	6	6	6	6	6
1984	151	-10	-9	4	5	5	6	8	8	10	11	11	12	12	12	13	13	13	13	14	15
1985	151	1	2	3	4	4	6	7	7	8	8	9	9	10	10	11	11	11	11	12	12
1986	151	-2	-1	3	7	7	9	9	11	11	12	15	15	16	17	17	17	18	18	19	19
1987	152	-1	0	1	2	2	4	6	8	10	10	11	11	12	12	12	13	13	14	15	15
1988	151	-4	5	8	8	10	10	10	11	11	12	13	13	13	14	14	14	14	15	15	15
1989	151	0	1	2	2	4	4	6	6	7	7	8	9	9	10	10	11	12	12	13	14
1990	151	0	5	7	9	11	12	13	15	15	15	16	16	16	17	17	18	18	18	19	19
1991	152	2	5	7	8	8	8	11	12	13	13	13	14	14	14	14	14	15	15	15	15
1992	151	1	6	6	7	9	9	10	10	11	11	12	12	13	13	14	14	15	15	15	16
1993	151	-15	-8	-5	-3	-3	-2	2	4	4	6	6	7	7	7	8	8	8	8	9	10
1994	151	-1	0	2	3	6	7	8	8	11	11	13	13	13	14	14	14	15	15	15	16
1995	152	-5	-1	-1	1	3	4	4	4	4	5	6	6	7	7	7	8	8	8	8	10
1996	151	-3	-2	4	6	7	8	10	11	11	12	12	14	14	16	16	17	17	17	17	18
1997	151	11	13	15	15	17	20	21	21	21	21	21	21	22	22	23	23	23	23	23	23
1998	151	3	6	7	8	8	9	9	10	11	11	11	11	11	12	13	14	14	14	15	15
1999	152	1	3	4	5	7	9	9	11	12	13	13	13	14	14	14	15	15	17	17	17
2000	151	8	9	12	12	12	13	13	13	13	14	14	15	15	15	15	15	16	16	16	16
2001	151	14	14	14	15	16	17	17	17	17	18	18	18	19	19	19	20	20	20	21	21
2002	151	1	1	2	3	4	5	6	6	6	7	7	7	7	9	9	9	9	10	10	10
2003	152	-5	0	2	2	2	3	4	5	6	7	8	9	9	10	12	12	12	12	13	13
2004	151	-1	0	0	2	4	5	5	5	8	9	9	11	11	13	14	14	14	15	15	15
2005	151	5	7	8	10	10	12	13	13	15	15	15	15	15	15	15	16	17	17	17	17
2006	151	-2	0	0	3	4	5	7	7	7	8	9	10	10	10	10	10	11	11	11	12
2007	152	0	4	5	8	9	9	10	11	11	12	12	13	13	13	13	14	15	15	16	16
2008	151	-5	0	2	3	6	6	6	7	8	8	8	9	9	10	10	11	12	13	13	13
2009	151	4	5	6	7	7	10	11	11	12	13	13	13	15	15	15	15	16	16	16	16
2010	151	3	3	4	7	9	10	10	11	12	12	12	13	13	13	13	14	14	14	14	14
2011	152	4	7	13	14	16	16	17	19	19	19	19	20	21	22	22	23	23	23	24	24
2012	151	4	4	5	6	12	12	13	15	15	15	15	16	17	17	18	19	20	20	20	20

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 37-BRADFORD, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1941 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2013	151	-8	-3	-1	0	1	2	3	3	3	4	5	5	5	6	7	9	9	10	10	10
2014	151	-9	-4	-4	-3	-1	3	4	4	4	5	5	6	7	8	8	8	9	10	10	10

Gumbel Analysis | Table 2 | January 6, 2016

Weather Station 37-BRADFORD, PA. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Gumbel Distribution
Overall Range Beginning Years: 1941 to 2014; Period Range: 11-01 to 03-31

	Gumbel Curve parameters and probabilities							
Rank	Alpha	Gamma	1/1.25	1/2.0	1/5.0	1/10.0	1/15.0	1/20.0
1	0.78139	0.1715996	3.6	-1.4	-8.1	-12.3	-14.9	-16.5
2	2.92184	0.1341198	6.0	1.6	-3.8	-7.0	-8.8	-10.0
3	4.25546	0.1146846	7.4	3.3	-1.7	-4.5	-6.1	-7.1
4	5.40643	0.0999519	8.7	4.6	-0.2	-2.9	-4.4	-5.3
5	6.60261	0.0918836	9.9	5.9	1.3	-1.2	-2.6	-3.5
6	7.52662	0.0823387	10.9	6.8	2.2	-0.3	-1.7	-2.6
7	8.43413	0.0769368	11.9	7.8	3.3	0.8	-0.5	-1.4
8	9.16230	0.0709217	12.7	8.6	4.0	1.5	0.2	-0.7
9	9.74853	0.0689490	13.2	9.2	4.8	2.4	1.1	0.3
10	10.24749	0.0667739	13.7	9.7	5.4	3.1	1.9	1.1

Normal Analysis | Table 3 | January 6, 2016

Weather Station 37-BRADFORD, PA. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Normal Distribution
Overall Range Beginning Years: 1941 to 2014; Period Range: 11-01 to 03-31

	Normal Curve parameters and probabilities							
Rank	Mean	Std Dev	1/5.0	1/7.0	1/10.0	1/13.0	1/15.0	1/20.0
1	-1.8	6.2	-7.0	-8.4	-9.7	-10.6	-11.1	-12.0
2	1.1	5.4	-3.5	-4.7	-5.9	-6.6	-7.0	-7.8
3	2.9	5.0	-1.4	-2.5	-3.6	-4.3	-4.7	-5.4
4	4.2	5.0	-0.0	-1.2	-2.2	-3.0	-3.3	-4.1
5	5.5	4.8	1.5	0.4	-0.6	-1.3	-1.7	-2.4
6	6.6	4.8	2.5	1.4	0.4	-0.3	-0.7	-1.4
7	7.5	4.8	3.5	2.4	1.4	0.7	0.4	-0.3
8	8.3	4.9	4.2	3.0	2.0	1.3	0.9	0.2
9	8.9	4.9	4.9	3.8	2.7	2.0	1.7	1.0
10	9.5	4.8	5.5	4.4	3.4	2.7	2.3	1.7
11	10.1	4.6	6.2	5.2	4.2	3.5	3.2	2.5
12	10.6	4.5	6.8	5.8	4.8	4.2	3.8	3.2
13	11.2	4.5	7.4	6.4	5.5	4.8	4.5	3.9
14	11.7	4.4	8.0	7.0	6.1	5.4	5.1	4.5
15	12.1	4.4	8.4	7.4	6.5	5.8	5.5	4.9
16	12.6	4.3	9.0	8.0	7.1	6.4	6.1	5.5
17	13.1	4.3	9.5	8.5	7.6	7.0	6.7	6.0
18	13.5	4.3	9.8	8.9	7.9	7.3	7.0	6.4
19	13.9	4.2	10.4	9.4	8.5	7.9	7.6	7.0
20	14.3	4.0	10.9	10.0	9.2	8.6	8.3	7.7

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 44-HAGERSTOWN, MD Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1925	151	11	17	17	19	20	20	20	21	21	21	21	21	22	22	22	23	23	24	25	25
1926	151	14	14	17	19	20	20	20	20	22	23	24	24	24	25	25	25	25	26	26	26
1927	152	13	15	15	15	17	17	18	18	20	20	21	22	23	23	23	24	24	25	25	26
1928	151	17	18	19	20	21	21	21	21	22	23	23	23	24	24	24	25	25	25	25	25
1929	151	10	10	14	14	15	18	19	19	19	20	20	20	21	22	22	22	23	24	24	24
1930	151	17	18	21	21	21	21	22	22	22	22	23	23	23	23	24	25	26	26	26	26
1931	152	18	20	22	22	22	25	26	26	27	27	28	30	30	30	30	31	31	33	33	33
1932	151	14	16	17	18	18	20	22	24	24	24	24	25	26	27	27	27	28	28	29	29
1933	151	4	5	12	12	14	15	16	16	16	17	18	18	19	19	20	20	20	21	21	21
1934	151	4	11	11	11	15	17	17	18	18	19	20	20	21	24	25	25	26	26	26	26
1935	152	6	6	7	10	10	12	12	13	13	13	13	15	16	16	16	16	17	18	18	18
1936	151	21	24	24	25	25	25	26	26	27	27	27	28	28	28	29	29	29	30	30	30
1937	151	20	20	20	20	21	22	23	23	23	23	23	24	24	24	24	24	24	25	25	25
1938	151	17	19	20	20	20	20	23	23	23	23	24	24	25	26	26	26	27	27	27	27
1939	152	7	11	12	15	16	16	17	17	17	17	18	19	20	20	20	20	20	21	21	21
1940	151	20	21	21	22	22	23	23	23	24	24	24	24	25	26	26	26	26	26	26	26
1941	151	5	10	12	13	15	16	16	18	21	22	23	24	25	25	26	26	27	28	28	28
1942	151	7	9	12	17	17	21	21	21	21	22	22	22	23	24	24	24	24	25	26	27
1943	152	13	18	19	20	22	22	22	23	23	23	23	23	24	24	24	25	25	26	26	26
1944	151	13	13	15	16	16	17	18	18	18	19	19	19	19	19	20	21	21	21	21	22
1945	151	13	13	13	17	17	18	18	18	20	20	20	20	20	21	21	22	22	22	22	22
1946	151	8	14	16	17	20	20	21	21	21	21	22	22	23	23	24	24	24	24	24	25
1947	152	6	8	8	10	10	12	12	12	14	15	15	16	17	17	18	20	20	21	21	22
1948	151	17	19	20	21	21	22	24	25	25	25	26	27	27	27	27	28	28	28	29	29
1949	151	19	20	21	22	24	24	25	25	25	26	26	26	26	26	26	26	27	27	28	28
1950	151	10	12	14	15	15	16	17	17	18	19	19	21	21	21	22	22	22	23	24	24
1951	152	8	10	15	16	18	18	22	23	23	23	23	24	24	24	25	26	26	26	26	26
1952	151	23	23	24	25	25	25	25	26	26	27	27	28	28	28	29	29	29	29	30	30
1953	151	15	16	17	17	18	19	19	19	20	21	22	22	24	25	25	26	26	26	26	26
1954	151	11	11	12	16	16	17	19	19	20	20	21	22	22	22	23	23	24	24	25	25
1955	152	17	18	18	18	20	20	20	21	21	21	22	23	23	24	24	24	24	24	25	25
1956	151	6	7	10	18	18	21	21	22	22	23	23	23	24	24	26	27	27	28	28	28
1957	151	4	10	12	12	15	16	17	18	18	18	20	20	22	22	22	22	22	23	23	23
1958	151	10	12	14	14	16	16	16	17	17	17	18	18	19	19	20	20	21	21	22	22
1959	152	15	16	16	16	19	19	20	20	21	21	22	22	22	22	23	23	23	24	24	24
1960	151	3	3	3	8	8	8	9	10	11	11	12	12	13	13	14	14	15	15	15	17

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 44-HAGERSTOWN, MD Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1961	151	11	13	14	15	16	16	17	17	18	18	19	21	22	22	22	23	23	23	23	24
1962	151	6	7	8	9	11	13	13	13	14	16	16	18	18	18	18	18	19	19	19	19
1963	152	9	13	14	14	15	15	17	17	18	18	19	19	20	20	20	20	20	21	21	21
1964	151	7	10	12	13	14	15	16	16	17	18	20	20	20	20	21	22	22	23	23	23
1965	151	3	10	10	15	16	16	18	19	19	20	21	22	22	22	23	24	24	24	25	25
1966	151	10	13	14	15	15	17	19	19	19	20	21	22	22	23	23	23	23	23	24	24
1967	152	2	2	6	8	9	9	11	12	13	15	16	16	17	19	19	19	20	20	20	21
1968	151	15	16	16	17	19	20	21	21	21	21	21	22	22	22	22	23	23	23	23	24
1969	151	4	5	9	11	13	13	14	14	14	15	17	18	18	18	19	19	20	21	21	21
1970	151	9	10	11	11	12	13	15	15	16	16	17	18	19	19	19	20	20	20	21	21
1971	152	6	15	18	18	20	20	21	21	22	23	24	24	24	24	24	25	25	26	26	26
1972	151	15	17	19	20	20	21	21	21	21	22	23	23	23	24	24	26	26	26	27	27
1973	151	17	24	24	24	24	25	25	26	26	27	27	27	27	28	28	28	28	29	29	29
1974	151	11	17	20	23	25	25	26	27	27	27	27	28	28	28	28	29	29	29	29	29
1975	152	14	16	17	18	20	20	21	21	21	22	23	23	23	24	25	25	25	25	26	26
1976	151	4	11	11	12	13	14	15	15	16	17	17	18	18	18	19	19	19	19	19	20
1977	151	12	15	15	15	15	16	16	16	18	19	19	19	19	20	20	20	20	20	20	21
1978	151	3	8	9	10	11	14	16	16	16	16	17	18	18	18	19	19	19	20	20	20
1979	152	12	13	17	19	20	20	21	22	23	23	23	24	24	24	25	25	25	26	26	27
1980	151	6	7	7	9	12	12	13	13	13	13	14	14	14	14	15	16	18	18	20	20
1981	151	-6	2	4	8	10	13	14	15	15	15	16	17	18	19	19	19	20	22	22	23
1982	151	15	15	17	17	19	20	23	23	23	23	23	24	24	25	25	26	26	26	26	26
1983	152	-3	6	6	7	7	11	12	13	15	16	16	16	16	17	17	18	18	18	19	19
1984	151	0	3	13	17	17	18	19	19	19	20	21	21	22	22	22	23	23	23	23	24
1985	151	11	12	13	14	14	18	18	19	19	19	20	20	20	21	21	21	22	23	23	23
1986	151	9	10	10	12	19	19	20	22	23	23	23	25	25	26	26	27	27	27	27	27
1987	152	10	12	14	14	15	16	16	17	18	19	19	19	19	20	21	22	23	23	24	24
1988	151	12	13	18	20	21	22	22	22	22	22	23	23	24	24	24	24	24	24	26	27
1989	151	7	12	12	12	13	13	13	13	15	16	17	17	18	19	20	21	21	22	22	22
1990	151	17	17	20	21	21	23	23	25	25	25	25	26	27	28	28	28	29	30	30	30
1991	152	14	18	21	23	23	24	24	24	25	25	25	25	25	26	26	26	26	26	27	27
1992	151	15	18	18	19	20	20	21	21	21	21	23	23	23	24	25	25	25	25	26	26
1993	151	-5	2	3	5	6	9	16	16	17	18	18	18	18	19	19	19	19	19	20	22
1994	151	11	14	15	15	18	19	20	22	22	25	25	25	25	26	26	26	27	27	27	27
1995	152	8	9	14	14	15	17	17	18	19	19	20	20	21	21	21	21	21	22	22	23
1996	151	12	12	13	17	19	19	20	21	24	26	26	26	27	27	28	28	28	28	29	29

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 44-HAGERSTOWN, MD Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1997	151	21	25	25	26	29	29	30	30	30	31	31	32	32	32	32	33	33	33	33	33
1998	151	17	17	20	20	21	22	23	23	23	24	24	24	25	25	25	25	26	26	26	27
1999	152	17	17	18	18	21	23	23	23	23	24	24	25	25	25	25	27	28	28	28	28
2000	151	15	18	18	18	18	18	19	19	19	21	21	22	22	22	23	23	23	23	23	24
2001	151	21	22	22	23	24	25	26	26	27	27	27	28	28	28	28	29	29	29	30	30
2002	151	10	11	12	13	14	18	18	18	19	19	20	20	21	21	21	21	22	22	22	22
2003	152	10	10	13	14	14	15	16	16	17	18	18	18	20	20	20	20	20	21	21	22
2004	151	13	14	14	16	16	17	17	17	19	20	20	22	22	22	23	24	24	24	25	25
2005	151	16	18	19	21	23	23	24	24	25	25	26	27	27	27	27	27	27	28	28	28
2006	151	9	12	14	17	17	18	18	19	20	20	21	21	21	21	21	22	22	23	23	23
2007	152	16	17	18	20	21	21	21	22	22	23	25	26	27	27	27	27	28	28	29	30
2008	151	9	13	17	17	17	20	21	21	21	21	23	24	24	25	25	25	25	25	25	26
2009	151	19	19	19	21	21	23	23	24	25	25	25	25	26	26	26	26	26	26	27	27
2010	151	15	18	19	19	20	22	22	22	23	23	23	23	23	23	24	25	25	25	25	25
2011	152	20	22	23	25	26	26	26	27	28	29	30	30	30	30	31	32	32	32	33	33
2012	151	15	16	17	18	20	22	23	24	26	27	27	27	27	28	28	28	28	29	29	30
2013	151	7	7	8	11	12	13	15	15	16	17	18	19	19	19	20	21	21	22	22	23
2014	151	9	9	10	11	13	14	16	16	17	18	18	20	21	21	22	22	23	23	24	24

Gumbel Analysis | Table 2 | January 6, 2016

Weather Station 44-HAGERSTOWN, MD Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Gumbel Distribution
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

	Gumbel Curve parameters and probabilities							
Rank	Alpha	Gamma	1/1.25	1/2.0	1/5.0	1/10.0	1/15.0	1/20.0
1	13.79763	0.1909110	16.3	11.9	5.8	2.0	-0.3	-1.8
2	15.23799	0.1390350	18.2	14.0	8.8	5.7	4.0	2.8
3	16.37314	0.1235248	19.3	15.4	10.9	8.3	6.8	5.8
4	17.45952	0.1129160	20.3	16.7	12.5	10.1	8.8	7.9
5	18.44741	0.1022099	21.4	17.8	13.7	11.4	10.1	9.3
6	19.32566	0.0997233	22.1	18.8	14.9	12.9	11.7	11.0
7	20.10729	0.0957619	22.9	19.6	16.0	14.0	12.9	12.2
8	20.49003	0.0884509	23.3	20.0	16.3	14.4	13.3	12.6
9	21.06014	0.0860543	23.8	20.6	17.1	15.2	14.2	13.5
10	21.57533	0.0823038	24.3	21.2	17.7	15.8	14.8	14.1

Normal Analysis | Table 3 | January 6, 2016

Weather Station 44-HAGERSTOWN, MD Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Normal Distribution
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

	Normal Curve parameters and probabilities							
Rank	Mean	Std Dev	1/5.0	1/7.0	1/10.0	1/13.0	1/15.0	1/20.0
1	11.1	5.9	6.1	4.7	3.5	2.6	2.2	1.3
2	13.4	5.3	9.0	7.8	6.6	5.9	5.5	4.7
3	15.0	4.9	10.8	9.7	8.6	7.9	7.6	6.8
4	16.3	4.6	12.5	11.5	10.5	9.8	9.5	8.8
5	17.5	4.5	13.7	12.7	11.7	11.0	10.7	10.1
6	18.5	4.2	14.9	14.0	13.1	12.5	12.2	11.6
7	19.4	4.0	16.0	15.1	14.2	13.6	13.3	12.7
8	19.8	4.1	16.4	15.4	14.6	14.0	13.7	13.1
9	20.4	3.9	17.1	16.2	15.4	14.8	14.5	14.0
10	21.0	3.9	17.7	16.8	16.0	15.4	15.1	14.6
11	21.5	3.7	18.4	17.6	16.8	16.2	15.9	15.4
12	22.1	3.8	18.9	18.1	17.3	16.7	16.4	15.9
13	22.5	3.6	19.5	18.6	17.9	17.3	17.1	16.6
14	22.9	3.6	19.8	19.0	18.2	17.7	17.4	16.9
15	23.3	3.5	20.3	19.5	18.7	18.2	18.0	17.4
16	23.7	3.6	20.7	19.9	19.1	18.6	18.3	17.8
17	24.0	3.5	21.1	20.3	19.5	19.0	18.8	18.2
18	24.4	3.5	21.5	20.7	20.0	19.5	19.2	18.7
19	24.8	3.5	21.8	21.0	20.3	19.8	19.5	19.0
20	25.0	3.4	22.2	21.5	20.7	20.3	20.0	19.5

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 06-HARRISBURG, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1925	151	13	15	15	17	19	19	20	20	21	21	21	22	23	23	23	23	24	24	24	24
1926	151	14	14	14	18	18	19	19	19	20	20	21	21	22	24	24	25	25	25	26	26
1927	152	14	16	17	17	18	19	19	20	21	22	22	22	23	23	23	24	24	24	25	26
1928	151	13	17	18	22	22	23	23	23	23	24	24	24	24	25	25	25	25	25	25	26
1929	151	13	14	15	16	18	19	19	20	20	20	20	21	21	21	21	22	23	24	24	24
1930	151	18	19	20	21	21	21	23	23	23	24	24	24	25	26	27	27	27	27	27	28
1931	152	17	20	21	22	22	25	25	26	26	26	27	29	29	30	30	30	31	31	31	31
1932	151	14	15	15	16	18	18	19	22	22	23	23	23	23	25	25	25	25	26	26	26
1933	151	1	7	10	10	11	11	11	14	16	16	16	17	17	17	18	18	18	19	19	19
1934	151	9	11	11	12	13	13	13	14	15	19	19	19	21	22	22	23	23	23	24	24
1935	152	2	7	8	10	11	11	12	12	12	14	14	14	14	14	14	16	17	17	18	18
1936	151	20	23	24	24	24	25	26	26	26	26	27	27	27	28	29	29	29	29	29	30
1937	151	13	17	20	20	20	22	22	22	22	22	23	23	23	24	24	25	25	26	26	26
1938	151	12	18	18	19	21	21	21	21	22	24	24	24	25	25	25	25	25	25	25	26
1939	152	10	10	14	14	16	16	17	19	19	19	20	20	20	20	20	20	21	21	21	21
1940	151	20	21	21	22	22	23	23	24	24	24	24	25	25	26	26	26	26	26	27	27
1941	151	7	9	10	11	11	15	17	19	20	20	21	23	23	24	25	25	25	26	26	26
1942	151	8	9	13	14	15	19	19	19	20	22	22	23	23	23	23	23	24	24	24	24
1943	152	16	19	19	20	20	20	20	20	22	23	23	23	24	24	24	24	24	24	25	25
1944	151	11	13	14	15	15	17	18	18	20	20	21	21	21	21	21	22	22	22	22	22
1945	151	15	16	17	17	18	19	20	20	21	21	21	22	22	22	22	22	23	23	23	23
1946	151	8	15	17	18	18	21	22	22	22	22	23	23	24	24	25	25	26	26	26	26
1947	152	11	11	12	13	13	13	13	14	14	15	15	15	15	17	18	19	19	20	21	21
1948	151	15	19	20	22	22	23	26	26	26	27	27	28	28	29	29	29	29	29	29	30
1949	151	18	19	19	20	21	22	24	24	25	25	25	26	26	27	27	27	27	27	28	28
1950	151	13	14	14	14	15	19	19	20	20	21	22	22	23	23	23	23	23	24	24	24
1951	152	11	12	18	19	20	21	23	23	23	24	25	25	25	26	27	27	27	28	28	28
1952	151	22	25	25	26	28	28	28	29	29	29	29	29	29	29	30	30	30	30	31	31
1953	151	16	18	18	19	19	19	20	21	21	21	23	24	24	25	25	25	26	26	27	28
1954	151	10	14	14	17	18	19	19	19	20	20	21	21	23	24	24	25	26	26	26	26
1955	152	16	17	19	21	22	22	23	23	23	24	24	24	24	25	26	26	26	26	26	26
1956	151	7	10	11	16	19	21	22	22	23	23	24	25	25	26	26	26	27	27	27	28
1957	151	7	12	13	13	16	16	16	17	17	19	20	22	23	23	23	23	23	24	24	24
1958	151	14	14	15	15	16	16	16	17	18	18	19	20	20	20	21	21	21	21	22	22
1959	152	17	18	20	21	21	22	22	22	22	23	23	24	25	26	26	26	26	26	26	26
1960	151	5	6	7	9	10	10	10	10	11	11	12	13	13	15	15	16	16	16	17	18

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 06-HARRISBURG, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1961	151	10	14	14	15	16	16	17	18	19	19	19	20	20	21	21	22	22	23	23	23
1962	151	5	9	10	11	12	14	14	14	16	17	17	17	18	18	18	18	19	19	20	20
1963	152	9	11	14	14	15	17	17	18	18	18	19	19	19	19	20	21	21	22	22	22
1964	151	7	8	15	15	15	16	17	18	19	19	21	21	21	21	21	22	22	24	24	24
1965	151	6	7	12	14	16	18	18	18	19	20	20	20	21	23	23	23	23	23	23	24
1966	151	10	12	13	14	16	17	18	19	20	20	21	21	22	22	23	23	24	24	24	24
1967	152	6	8	10	10	11	11	13	14	15	16	18	18	18	18	19	19	20	20	20	21
1968	151	17	17	18	18	19	20	20	20	22	22	22	23	23	24	24	25	25	25	25	25
1969	151	5	7	11	12	13	13	14	14	15	15	16	18	18	18	19	19	19	19	21	22
1970	151	11	12	16	16	17	17	18	18	19	20	20	22	22	23	24	24	25	25	25	25
1971	152	13	18	20	20	21	22	22	23	24	24	25	25	25	27	27	27	27	27	28	28
1972	151	13	17	19	20	21	23	23	23	24	24	24	24	25	25	26	26	26	27	27	27
1973	151	20	21	22	23	23	24	24	24	24	24	25	25	25	26	27	27	27	27	28	28
1974	151	14	16	22	23	23	24	25	25	25	26	26	26	27	27	27	27	27	28	28	28
1975	152	14	15	17	19	19	21	21	22	22	22	23	23	23	24	25	25	25	25	26	26
1976	151	4	8	8	11	13	14	14	14	15	16	16	17	17	18	19	19	20	20	20	20
1977	151	13	14	15	15	17	18	18	18	18	19	19	19	19	19	19	20	20	20	20	20
1978	151	2	8	8	8	9	10	11	15	16	16	17	18	18	19	19	19	20	20	20	20
1979	152	15	18	19	20	20	21	22	22	22	22	22	23	23	24	24	25	25	25	25	26
1980	151	7	8	8	9	10	12	12	13	15	16	16	16	16	17	17	17	17	18	19	19
1981	151	0	6	7	11	12	17	17	18	18	18	18	19	19	19	19	21	21	21	22	23
1982	151	19	21	22	22	22	22	22	23	25	25	25	26	27	27	27	28	29	29	30	30
1983	152	2	5	6	8	10	10	13	14	15	15	16	17	17	18	18	19	19	19	19	21
1984	151	0	7	18	18	20	20	20	21	21	22	22	22	23	24	24	25	25	26	26	26
1985	151	12	13	15	18	19	19	19	19	20	20	20	21	21	21	22	22	22	22	22	23
1986	151	13	15	16	17	17	19	20	21	24	25	26	26	26	27	27	27	27	28	28	28
1987	152	12	13	13	14	14	14	15	15	16	17	18	18	19	20	20	20	20	21	21	22
1988	151	13	17	17	18	18	18	20	21	21	22	22	23	24	24	24	25	25	27	27	27
1989	151	11	12	12	14	14	15	16	16	17	17	17	18	19	19	21	21	21	23	23	25
1990	151	17	21	21	21	22	23	24	25	25	26	26	27	27	28	28	28	28	28	29	29
1991	152	14	17	22	22	22	23	23	23	24	24	24	24	25	25	26	26	27	27	27	27
1992	151	13	17	19	19	19	20	20	21	21	21	21	23	23	24	25	26	26	26	26	26
1993	151	-6	-2	0	5	6	9	12	14	15	15	16	17	17	17	17	18	18	18	19	19
1994	151	13	15	16	18	18	19	19	23	23	24	24	25	25	25	26	26	26	27	27	27
1995	152	9	10	14	15	15	15	16	16	17	17	17	18	19	19	19	19	20	20	21	21
1996	151	11	12	13	19	20	21	21	22	23	24	24	25	25	26	26	26	27	28	29	29

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 06-HARRISBURG, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1997	151	22	26	26	26	28	28	29	30	30	31	31	31	32	32	32	32	32	32	33	33
1998	151	15	17	18	21	21	21	21	21	21	21	22	23	23	23	25	25	25	26	26	26
1999	152	14	16	16	16	17	20	20	20	20	22	22	23	23	23	25	25	25	25	26	26
2000	151	17	19	19	19	19	20	21	21	21	21	21	22	23	23	23	23	23	24	25	25
2001	151	22	23	24	25	26	26	27	27	27	27	27	27	28	28	29	29	29	30	30	30
2002	151	13	13	14	14	16	18	19	19	20	20	20	21	21	21	21	21	22	22	22	22
2003	152	9	12	14	16	16	16	16	16	17	18	19	19	20	20	20	21	21	21	22	22
2004	151	12	14	16	16	16	17	18	18	20	22	22	22	22	24	24	25	25	25	26	26
2005	151	14	17	20	21	23	25	26	26	26	27	27	27	27	27	28	28	28	28	28	29
2006	151	11	13	16	16	18	18	19	19	19	21	21	21	22	23	23	24	24	24	25	25
2007	152	16	19	20	20	22	23	23	24	25	25	26	27	27	27	27	28	28	28	28	29
2008	151	11	13	16	18	19	19	20	20	21	21	21	22	23	23	24	24	24	24	25	25
2009	151	18	19	22	22	23	23	24	24	25	25	26	26	26	26	26	26	26	26	27	27
2010	151	14	15	16	21	22	22	22	22	23	24	24	24	24	24	24	24	25	25	25	25
2011	152	20	22	25	25	25	26	26	27	28	28	29	29	30	30	31	31	31	32	32	32
2012	151	15	16	17	19	20	21	23	25	26	26	27	27	27	28	28	28	28	28	29	29
2013	151	6	8	10	13	13	14	15	15	15	16	16	17	18	19	20	21	21	21	21	22
2014	151	6	7	8	10	12	13	14	14	15	15	16	17	17	17	18	18	19	20	21	22

Gumbel Analysis | Table 2 | January 6, 2016

Weather Station 06-HARRISBURG, PA. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Gumbel Distribution
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

	Gumbel Curve parameters and probabilities							
Rank	Alpha	Gamma	1/1.25	1/2.0	1/5.0	1/10.0	1/15.0	1/20.0
1	14.21709	0.2113989	16.5	12.5	7.0	3.6	1.5	0.2
2	15.81812	0.1465967	18.6	14.6	9.7	6.8	5.1	4.0
3	17.08256	0.1264272	19.9	16.2	11.7	9.2	7.7	6.8
4	18.03365	0.1168955	20.8	17.3	13.2	10.9	9.7	8.8
5	18.74523	0.1061730	21.6	18.1	14.1	12.0	10.7	10.0
6	19.62149	0.0997581	22.4	19.1	15.2	13.2	12.0	11.3
7	20.19157	0.0927926	23.0	19.7	15.9	13.9	12.8	12.0
8	20.71034	0.0885429	23.5	20.2	16.6	14.6	13.5	12.8
9	21.30417	0.0878808	24.0	20.9	17.4	15.6	14.5	13.9
10	21.80516	0.0848169	24.5	21.4	18.0	16.2	15.2	14.6

Normal Analysis | Table 3 | January 6, 2016

Weather Station 06-HARRISBURG, PA. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Normal Distribution
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

	Normal Curve parameters and probabilities							
Rank	Mean	Std Dev	1/5.0	1/7.0	1/10.0	1/13.0	1/15.0	1/20.0
1	11.8	5.4	7.2	6.0	4.8	4.1	3.7	2.9
2	14.1	5.0	9.9	8.7	7.7	6.9	6.6	5.8
3	15.7	4.8	11.7	10.6	9.5	8.8	8.5	7.8
4	16.9	4.5	13.2	12.2	11.2	10.5	10.2	9.6
5	17.8	4.3	14.1	13.2	12.2	11.6	11.3	10.6
6	18.8	4.3	15.2	14.2	13.3	12.7	12.4	11.8
7	19.4	4.2	15.9	15.0	14.1	13.5	13.1	12.5
8	20.0	4.1	16.6	15.7	14.8	14.2	13.9	13.3
9	20.7	3.9	17.4	16.5	15.7	15.2	14.9	14.3
10	21.2	3.8	18.0	17.2	16.4	15.8	15.5	15.0
11	21.6	3.7	18.5	17.7	16.9	16.3	16.0	15.5
12	22.2	3.6	19.1	18.3	17.5	17.0	16.7	16.2
13	22.6	3.7	19.5	18.7	17.9	17.3	17.1	16.5
14	23.1	3.7	20.0	19.2	18.4	17.9	17.6	17.1
15	23.5	3.7	20.4	19.6	18.8	18.2	18.0	17.4
16	23.8	3.5	20.9	20.1	19.3	18.8	18.6	18.1
17	24.1	3.4	21.2	20.4	19.7	19.2	18.9	18.4
18	24.4	3.4	21.5	20.8	20.0	19.5	19.3	18.8
19	24.8	3.4	22.0	21.2	20.5	20.0	19.8	19.3
20	25.1	3.3	22.3	21.5	20.8	20.4	20.1	19.6

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 38-MORGANTOWN, WV. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1949 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1949	151	15	15	17	17	19	20	20	21	21	21	22	23	25	26	26	26	26	28	28	28
1950	151	7	8	8	8	13	14	14	14	15	15	17	18	18	19	19	20	21	22	22	22
1951	152	6	12	14	16	19	21	21	22	23	24	24	25	26	26	26	27	27	27	27	27
1952	151	19	21	23	23	24	24	24	24	24	24	25	25	26	26	27	27	27	28	28	29
1953	151	13	14	15	16	17	18	18	20	20	22	23	23	24	24	24	24	24	24	25	25
1954	151	5	8	11	12	12	13	14	14	16	17	19	20	20	20	20	20	21	22	22	24
1955	152	14	16	17	17	19	19	19	20	20	20	21	21	21	22	22	22	23	23	24	24
1956	151	3	11	12	14	15	16	18	19	20	21	22	23	23	25	26	26	26	26	27	27
1957	151	0	6	7	8	12	12	12	14	14	15	16	16	16	16	16	16	17	17	19	20
1958	151	5	8	9	9	10	11	11	11	13	14	14	15	16	17	17	17	17	18	18	19
1959	152	14	15	16	16	17	17	17	18	18	19	19	20	20	20	21	21	21	21	22	22
1960	151	3	7	7	8	9	9	9	10	10	14	14	15	16	17	18	18	19	19	19	20
1961	151	5	6	10	12	12	13	15	16	16	17	17	20	21	22	22	22	23	23	23	24
1962	151	-5	4	5	6	7	8	9	9	10	11	11	11	11	12	14	15	15	15	16	16
1963	152	7	9	10	11	14	14	15	15	16	16	18	18	19	19	20	20	20	20	21	21
1964	151	4	6	7	8	8	9	11	13	14	15	15	16	16	16	16	17	17	17	18	19
1965	151	3	6	12	12	17	18	18	18	19	20	20	21	21	21	21	21	21	21	22	23
1966	151	7	10	11	12	14	15	15	17	19	19	19	20	20	21	21	22	22	23	25	25
1967	152	0	3	6	6	9	10	10	13	13	14	14	14	14	15	17	17	18	18	18	18
1968	151	11	11	13	13	13	13	15	15	15	16	16	17	18	19	19	19	19	20	20	20
1969	151	-5	-3	3	5	5	7	9	12	13	13	15	17	17	17	18	18	19	19	19	20
1970	151	2	3	8	9	9	12	12	12	14	14	14	15	15	15	18	19	21	21	21	21
1971	152	-8	4	4	11	12	12	12	12	15	15	15	17	19	19	20	20	21	21	21	21
1972	151	2	10	10	10	11	12	12	12	12	12	13	14	14	16	16	16	17	18	19	21
1973	151	12	13	14	15	16	16	17	18	19	19	20	21	21	22	22	22	22	22	23	23
1974	151	11	13	17	20	20	20	21	22	22	22	23	23	23	23	24	24	25	25	25	25
1975	152	3	7	8	11	12	13	14	16	16	17	18	18	18	21	21	23	23	23	23	24
1976	151	-5	4	5	7	8	8	10	10	10	11	12	12	12	12	13	13	15	16	16	16
1977	151	6	9	10	10	11	12	13	13	13	14	14	15	15	15	15	15	15	15	16	16
1978	151	7	7	8	10	12	12	12	13	14	15	15	15	16	16	17	18	18	19	19	19
1979	152	12	14	15	16	16	17	17	17	17	18	20	21	21	22	23	23	23	24	24	26
1980	151	3	4	6	7	7	7	8	9	11	11	11	12	14	15	15	16	19	19	19	19
1981	151	-8	-1	-1	9	13	13	14	15	16	16	17	17	17	20	21	21	21	21	22	22
1982	151	13	14	15	19	20	21	22	23	23	23	24	24	26	26	26	26	27	27	27	27
1983	152	-8	-2	2	5	6	7	10	11	12	13	15	15	16	17	17	18	19	20	20	20
1984	151	-7	-6	8	10	11	13	13	14	15	17	17	17	17	17	18	18	18	19	20	21

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 38-MORGANTOWN, WV. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1949 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1985	151	6	12	12	12	13	14	15	15	16	16	16	16	17	18	19	19	19	20	21	21
1986	151	8	11	13	16	16	17	21	22	22	23	23	23	25	26	27	28	28	28	28	29
1987	152	7	7	9	10	14	14	15	16	17	17	18	18	19	19	20	21	22	22	22	22
1988	151	12	12	16	16	18	19	21	21	21	21	22	22	22	22	23	23	23	24	24	25
1989	151	-2	4	6	6	8	12	12	13	14	15	15	16	17	18	22	23	23	23	24	24
1990	151	13	16	17	20	22	22	23	24	25	25	26	26	26	26	27	27	28	28	28	28
1991	152	12	12	17	19	20	20	21	22	22	22	23	23	23	23	24	24	24	24	25	25
1992	151	13	15	16	17	17	18	19	20	22	23	24	24	25	25	25	26	26	27	27	27
1993	151	-10	0	2	4	4	6	15	15	15	16	18	18	18	18	19	19	20	20	21	21
1994	151	9	9	11	12	15	16	16	17	20	21	22	23	24	24	24	24	25	25	25	27
1995	152	3	7	9	12	12	14	15	15	16	17	17	17	18	18	20	20	21	21	21	21
1996	151	5	7	11	12	12	13	15	18	21	21	22	22	22	23	24	25	26	26	27	27
1997	151	20	21	22	23	24	26	27	27	28	28	28	28	28	29	29	29	30	30	30	30
1998	151	11	17	18	19	20	20	20	21	21	21	21	21	22	23	23	24	24	24	25	25
1999	152	11	12	12	13	17	18	18	18	19	19	21	21	23	24	24	25	25	26	26	26
2000	151	12	12	13	13	14	16	17	18	18	18	18	19	20	21	21	21	22	22	22	22
2001	151	16	17	17	18	18	21	22	22	22	23	23	24	24	24	24	26	26	27	28	29
2002	151	9	9	9	12	14	16	17	17	17	17	18	19	19	20	20	20	20	20	21	22
2003	152	7	9	11	11	13	13	13	15	16	17	17	17	19	21	22	22	22	23	23	23
2004	151	8	9	10	12	14	16	16	19	20	20	21	22	22	22	23	24	24	24	24	25
2005	151	13	19	20	20	21	24	24	24	24	24	24	25	25	26	26	26	26	26	26	26
2006	151	5	7	13	13	14	15	15	16	16	17	17	18	19	20	21	21	22	23	23	23
2007	152	12	14	15	16	17	18	19	19	20	20	21	22	23	24	25	26	26	26	26	26
2008	151	2	9	12	13	13	16	16	16	17	17	17	19	19	20	21	22	22	22	22	23
2009	151	13	16	16	18	18	18	18	19	20	21	21	21	22	22	22	22	23	23	24	24
2010	151	13	14	17	17	18	18	18	18	19	19	19	20	20	21	22	22	22	23	23	23
2011	152	17	19	20	22	22	22	23	23	27	28	29	29	29	30	30	31	31	31	31	32
2012	151	11	13	16	17	17	19	19	22	22	24	24	25	25	26	27	27	27	27	28	28
2013	151	0	1	5	6	8	10	11	12	13	17	18	18	18	18	18	18	19	19	19	20
2014	151	4	4	4	5	8	9	11	12	13	15	15	17	17	18	18	20	20	20	20	20

Gumbel Analysis | Table 2 | January 6, 2016

Weather Station 38-MORGANTOWN, WV. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Gumbel Distribution
Overall Range Beginning Years: 1949 to 2014; Period Range: 11-01 to 03-31

	Gumbel Curve parameters and probabilities							
Rank	Alpha	Gamma	1/1.25	1/2.0	1/5.0	1/10.0	1/15.0	1/20.0
1	9.65938	0.1684901	12.5	7.5	0.6	-3.7	-6.3	-8.0
2	11.34037	0.1315181	14.5	10.0	4.5	1.3	-0.6	-1.8
3	12.82886	0.1152931	16.0	11.8	6.9	4.1	2.6	1.6
4	13.93892	0.1043014	17.1	13.1	8.5	6.0	4.6	3.6
5	15.12290	0.0972773	18.2	14.4	10.1	7.7	6.4	5.5
6	16.01750	0.0896780	19.1	15.4	11.2	8.8	7.6	6.7
7	16.76460	0.0867422	19.8	16.2	12.2	10.0	8.8	8.0
8	17.53093	0.0835989	20.5	17.0	13.1	11.1	9.9	9.2
9	18.28369	0.0792378	21.3	17.8	14.0	11.9	10.8	10.1
10	18.89878	0.0785784	21.8	18.5	14.8	12.9	11.8	11.1

Normal Analysis | Table 3 | January 6, 2016

Weather Station 38-MORGANTOWN, WV. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Normal Distribution
Overall Range Beginning Years: 1949 to 2014; Period Range: 11-01 to 03-31

	Normal Curve parameters and probabilities							
Rank	Mean	Std Dev	1/5.0	1/7.0	1/10.0	1/13.0	1/15.0	1/20.0
1	6.5	7.0	0.6	-1.0	-2.5	-3.5	-4.0	-5.0
2	9.4	5.7	4.6	3.3	2.1	1.2	0.8	-0.0
3	11.4	5.1	7.1	5.9	4.8	4.1	3.7	2.9
4	12.8	4.8	8.7	7.6	6.6	5.9	5.6	4.9
5	14.1	4.7	10.2	9.1	8.1	7.4	7.1	6.4
6	15.1	4.6	11.2	10.2	9.2	8.6	8.2	7.6
7	16.0	4.3	12.3	11.4	10.4	9.8	9.5	8.9
8	16.8	4.2	13.2	12.3	11.4	10.8	10.4	9.8
9	17.6	4.2	14.1	13.1	12.2	11.6	11.3	10.7
10	18.3	4.0	14.9	14.0	13.2	12.6	12.3	11.7
11	18.9	4.0	15.5	14.6	13.7	13.1	12.8	12.3
12	19.5	3.9	16.2	15.3	14.5	13.9	13.6	13.1
13	20.0	4.0	16.7	15.8	15.0	14.4	14.1	13.5
14	20.7	3.9	17.4	16.5	15.6	15.1	14.8	14.2
15	21.3	3.8	18.1	17.3	16.5	15.9	15.6	15.1
16	21.7	3.8	18.5	17.6	16.8	16.3	16.0	15.4
17	22.2	3.6	19.1	18.3	17.5	17.0	16.7	16.2
18	22.5	3.6	19.5	18.6	17.9	17.3	17.1	16.6
19	22.9	3.5	19.9	19.2	18.4	17.9	17.6	17.1
20	23.3	3.5	20.3	19.5	18.8	18.3	18.0	17.5

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 14-PITTSBURGH, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1925	151	4	8	13	14	14	14	14	16	16	17	17	18	18	19	19	19	20	21	21	21
1926	151	10	11	13	17	18	19	19	20	21	21	21	22	22	22	23	23	23	24	25	25
1927	152	7	8	12	12	12	13	14	14	15	17	17	17	18	18	19	20	20	21	23	23
1928	151	13	15	16	17	17	17	18	19	20	20	20	21	22	22	23	23	23	23	23	24
1929	151	8	8	8	11	13	15	16	16	16	17	17	17	18	18	18	18	19	19	20	21
1930	151	13	13	16	17	19	19	19	21	22	22	23	23	23	23	24	24	24	24	25	25
1931	152	9	12	14	17	18	18	18	18	22	22	25	26	26	29	29	29	29	30	30	30
1932	151	3	7	14	14	15	16	16	18	19	20	20	21	21	21	23	24	24	24	24	25
1933	151	-1	4	5	5	5	6	9	9	10	12	14	14	15	15	15	17	17	17	18	18
1934	151	9	13	15	15	17	17	18	20	21	21	21	22	22	23	23	23	24	24	25	25
1935	152	-9	-2	-2	1	2	4	5	6	7	8	9	9	9	10	10	10	11	11	11	11
1936	151	16	18	18	20	20	20	21	21	21	22	23	23	23	24	24	24	24	25	25	26
1937	151	9	13	13	14	15	15	16	16	16	17	17	17	17	18	19	20	23	23	23	23
1938	151	14	14	15	15	15	16	18	18	19	21	21	21	21	22	22	23	24	24	24	24
1939	152	-3	5	7	8	10	11	11	11	11	12	13	13	13	14	15	16	16	17	17	17
1940	151	11	12	12	13	14	15	15	19	19	19	19	19	20	20	20	20	20	20	22	22
1941	151	-1	5	7	9	10	10	11	12	12	13	13	17	18	19	21	21	22	22	23	23
1942	151	2	5	8	8	10	11	11	12	12	14	15	16	17	17	17	18	19	19	19	19
1943	152	10	11	14	15	15	15	16	16	16	17	17	19	19	20	20	20	21	21	22	22
1944	151	6	9	9	11	13	13	14	16	17	17	17	17	18	18	19	19	19	19	20	20
1945	151	9	10	11	13	13	14	14	17	17	18	19	20	20	20	20	20	21	21	21	22
1946	151	3	4	9	10	15	16	17	17	17	18	19	19	19	21	21	21	21	21	21	22
1947	152	5	7	9	9	10	10	11	11	12	12	13	13	13	15	16	16	17	19	20	21
1948	151	14	16	18	20	20	22	23	24	24	24	25	25	25	26	26	26	26	27	27	27
1949	151	13	13	15	16	17	19	20	21	21	22	22	22	25	26	26	26	26	26	26	27
1950	151	6	8	11	12	13	14	14	14	15	16	17	18	18	18	19	20	20	21	21	21
1951	152	1	13	13	13	19	19	20	20	21	22	23	23	24	24	25	25	26	26	26	26
1952	151	18	19	21	22	22	23	23	23	24	24	25	25	25	25	25	25	25	25	26	26
1953	151	12	13	13	15	17	17	18	20	21	21	21	21	21	22	22	22	22	22	23	23
1954	151	6	7	7	8	9	10	13	13	15	17	17	17	19	19	20	20	21	21	22	22
1955	152	14	15	16	17	18	18	18	19	19	19	20	21	21	21	21	22	22	22	22	23
1956	151	3	8	12	12	14	15	17	18	18	18	19	21	21	22	23	23	23	23	23	24
1957	151	-1	7	7	8	9	9	11	12	13	14	15	16	16	17	17	17	18	18	20	20
1958	151	0	3	6	6	9	9	10	10	10	10	10	11	13	14	14	15	16	16	16	17
1959	152	13	14	14	14	15	16	16	16	16	16	17	18	18	18	18	18	18	19	19	20
1960	151	0	2	5	5	5	5	7	7	8	8	10	10	11	12	12	14	17	17	17	17

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 14-PITTSBURGH, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1961	151	3	8	8	9	9	10	12	13	13	14	14	16	16	17	17	18	18	19	19	20
1962	151	-9	0	0	2	3	3	4	5	5	5	6	7	7	8	9	10	12	13	13	13
1963	152	4	6	8	9	11	11	12	12	13	13	14	15	15	16	16	18	18	19	19	20
1964	151	5	9	10	10	11	11	12	12	12	13	14	14	15	16	17	17	17	18	18	19
1965	151	-1	0	6	10	12	12	13	14	15	15	16	16	17	18	19	19	19	19	19	20
1966	151	8	9	9	11	11	12	13	13	14	14	15	15	20	21	21	21	22	22	22	22
1967	152	1	3	4	6	6	6	11	11	12	12	12	13	14	14	14	15	15	16	17	17
1968	151	7	8	9	11	12	12	13	15	15	16	16	16	16	16	17	17	17	18	18	18
1969	151	-2	1	4	4	5	8	8	9	12	12	12	13	14	14	15	15	16	16	16	17
1970	151	0	2	3	5	9	11	11	11	12	13	13	14	14	17	17	17	18	18	18	18
1971	152	-1	6	7	10	10	11	12	12	14	14	16	17	18	19	19	19	20	20	20	21
1972	151	5	12	14	14	15	15	15	15	16	16	16	16	17	17	19	21	21	22	22	22
1973	151	15	16	16	16	18	18	19	19	20	20	20	20	21	21	21	22	22	23	23	23
1974	151	11	12	15	17	18	21	21	21	22	22	22	22	23	23	24	24	25	25	25	26
1975	152	3	5	9	9	13	14	14	16	16	16	17	17	18	18	20	20	21	21	21	22
1976	151	-9	-1	0	1	2	3	4	5	6	6	6	6	7	7	7	7	8	8	9	9
1977	151	6	8	10	11	12	12	13	13	13	13	14	14	14	15	15	15	15	15	16	16
1978	151	0	0	2	2	3	3	4	5	6	6	7	7	8	12	13	13	13	13	14	15
1979	152	8	8	9	11	12	13	13	13	15	16	16	16	16	16	17	17	17	17	17	19
1980	151	-1	3	5	5	5	6	6	6	9	9	10	10	10	11	11	11	13	14	15	15
1981	151	-10	-4	-1	6	8	9	9	10	10	10	12	14	14	15	16	16	17	18	18	18
1982	151	14	15	17	19	19	19	21	21	21	22	23	23	23	23	24	24	25	25	26	26
1983	152	-5	-4	1	3	3	5	8	9	9	11	12	12	13	14	16	16	16	17	17	17
1984	151	-8	-5	10	11	11	12	13	13	14	14	14	15	15	16	16	17	17	18	18	19
1985	151	6	10	11	12	12	13	13	13	14	15	15	15	16	16	16	16	18	18	18	19
1986	151	5	11	13	16	16	18	19	20	20	21	21	22	23	24	24	25	26	27	27	28
1987	152	4	5	5	9	11	12	13	14	15	16	17	17	17	17	18	18	19	19	20	20
1988	151	13	13	15	15	16	16	17	17	18	19	20	20	20	20	21	21	21	22	22	23
1989	151	-1	0	3	3	7	9	9	10	10	11	11	15	16	17	18	20	20	20	20	21
1990	151	13	14	15	15	15	17	18	18	19	21	22	23	23	24	24	25	26	27	27	28
1991	152	8	10	14	18	18	19	19	19	19	21	21	21	22	22	22	22	23	23	23	23
1992	151	8	11	13	13	15	17	17	19	20	20	22	22	23	23	23	24	24	24	24	25
1993	151	-12	-4	-1	1	1	5	11	12	13	13	13	14	14	15	16	16	16	16	16	17
1994	151	4	6	6	9	12	12	13	13	18	19	20	20	21	21	22	22	22	22	23	23
1995	152	1	5	8	10	10	11	11	12	13	13	14	15	15	15	15	16	16	16	16	18
1996	151	3	4	9	10	10	12	13	15	19	19	20	20	21	21	22	22	25	25	25	25

Gumbel Analysis — Table 1 — January 6, 2016

Weather Station 14-PITTSBURGH, PA. Using Temperature Variable MID_MID_AVG_TMP
20 Coldest Daily Temperatures Per Period, Ranked
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

Period Begins	N days	Rank 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1997	151	18	19	20	22	23	24	24	25	26	27	27	27	28	28	28	28	28	28	29	29
1998	151	4	11	12	14	15	15	16	17	17	17	18	18	19	19	19	20	21	21	21	22
1999	152	9	10	12	13	15	16	17	18	18	18	19	20	20	21	21	22	24	24	24	24
2000	151	10	11	12	12	15	15	16	17	18	18	18	18	19	19	19	20	20	20	20	21
2001	151	15	15	17	17	19	20	21	21	21	21	22	22	22	23	24	25	25	26	26	26
2002	151	7	8	9	11	12	14	14	15	16	16	16	16	17	18	18	18	18	18	18	18
2003	152	7	8	9	10	10	11	14	14	15	15	16	17	17	18	18	18	19	19	20	22
2004	151	7	8	9	10	11	12	14	15	15	17	18	18	18	19	19	20	21	21	21	22
2005	151	12	16	16	16	17	18	19	20	20	20	21	21	23	23	23	23	23	23	24	24
2006	151	2	4	7	9	10	11	12	13	13	14	16	16	16	17	17	18	18	19	19	20
2007	152	10	10	15	15	16	16	17	17	18	19	20	21	21	21	21	23	23	23	23	23
2008	151	0	8	8	9	10	13	13	14	14	15	15	16	16	16	17	19	20	20	21	21
2009	151	10	12	12	13	15	15	15	16	17	17	19	19	19	20	20	21	22	22	22	22
2010	151	11	13	14	14	14	16	16	17	17	17	18	18	18	20	20	20	20	21	21	21
2011	152	15	17	19	20	20	20	21	22	23	24	26	26	26	27	27	27	28	28	29	29
2012	151	8	10	15	15	15	16	18	19	20	20	20	21	21	21	22	22	24	25	26	26
2013	151	-2	1	5	7	9	10	11	12	13	14	15	15	15	15	15	15	15	16	16	18
2014	151	0	2	2	3	6	8	9	9	10	12	12	12	12	14	14	15	16	16	16	16

Gumbel Analysis | Table 2 | January 6, 2016

Weather Station 14-PITTSBURGH, PA. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Gumbel Distribution
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

	Gumbel Curve parameters and probabilities							
Rank	Alpha	Gamma	1/1.25	1/2.0	1/5.0	1/10.0	1/15.0	1/20.0
1	8.45297	0.1715663	11.3	6.3	-0.4	-4.7	-7.2	-8.9
2	10.03743	0.1386572	13.0	8.8	3.5	0.5	-1.3	-2.4
3	11.59005	0.1201562	14.6	10.6	5.9	3.3	1.7	0.8
4	12.61578	0.1049150	15.7	11.8	7.2	4.7	3.3	2.4
5	13.61852	0.0971075	16.7	12.9	8.6	6.2	4.9	4.0
6	14.36702	0.0901028	17.5	13.7	9.5	7.2	6.0	5.1
7	15.18028	0.0880427	18.2	14.6	10.7	8.5	7.3	6.6
8	15.85034	0.0811926	18.9	15.3	11.3	9.2	8.0	7.3
9	16.57554	0.0772143	19.7	16.1	12.2	10.0	8.9	8.1
10	17.12359	0.0737218	20.2	16.7	12.8	10.7	9.5	8.8

Normal Analysis | Table 3 | January 6, 2016

Weather Station 14-PITTSBURGH, PA. Using Temperature Variable MID_MID_AVG_TMP
Temperature with the Indicated Probability of Occurrence for each period, per the Normal Distribution
Overall Range Beginning Years: 1925 to 2014; Period Range: 11-01 to 03-31

	Normal Curve parameters and probabilities							
Rank	Mean	Std Dev	1/5.0	1/7.0	1/10.0	1/13.0	1/15.0	1/20.0
1	5.4	6.7	-0.2	-1.7	-3.2	-4.1	-4.6	-5.6
2	8.1	5.5	3.5	2.2	1.0	0.2	-0.2	-1.0
3	10.1	5.1	5.8	4.7	3.6	2.8	2.4	1.7
4	11.4	4.9	7.2	6.1	5.1	4.4	4.0	3.3
5	12.6	4.8	8.5	7.4	6.3	5.6	5.3	4.6
6	13.4	4.7	9.5	8.4	7.4	6.7	6.4	5.7
7	14.4	4.4	10.6	9.6	8.7	8.1	7.7	7.1
8	15.1	4.5	11.3	10.3	9.3	8.7	8.3	7.7
9	15.8	4.4	12.1	11.1	10.2	9.5	9.2	8.5
10	16.4	4.4	12.7	11.7	10.8	10.1	9.8	9.2
11	17.1	4.4	13.4	12.4	11.4	10.8	10.5	9.8
12	17.6	4.3	14.0	13.0	12.1	11.4	11.1	10.5
13	18.1	4.3	14.5	13.5	12.6	12.0	11.6	11.0
14	18.8	4.2	15.3	14.3	13.4	12.8	12.5	11.9
15	19.2	4.2	15.7	14.8	13.9	13.3	13.0	12.4
16	19.7	4.1	16.2	15.3	14.5	13.9	13.6	13.0
17	20.3	4.0	16.9	16.0	15.1	14.6	14.3	13.7
18	20.6	4.0	17.3	16.4	15.5	15.0	14.7	14.1
19	21.0	4.0	17.6	16.7	15.9	15.3	15.0	14.4
20	21.4	3.9	18.1	17.2	16.4	15.8	15.5	15.0

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-018:

For each customer class contained in the cost of service study, please provide monthly throughput by class.

Response:

Please see the attached spreadsheet GAS-COS-018 Attachment A for the forecasted quantities by rate schedule by customer class by month. In addition, please see Exhibit No. 103, Schedule No. 4, Pages 7 through 9, for the monthly quantities pertaining to new customers and customer attrition. Together, the monthly quantities sum to the total fully projected future test year volumes shown in Exhibit No. 103, Page 15, Line 29, for the cost of service.

Columbia Gas of Pennsylvania, Inc.
Forecasted Volumes By Rate Schedule by Customer Class by Month
For the 12 Months Ending December 31, 2019

		January DTH	February DTH	March DTH	April DTH	May DTH	June DTH	July DTH	August DTH	September DTH	October DTH	November DTH	December DTH	Total
CAP	RES	465,148.4	469,094.1	398,424.6	277,474.4	138,028.5	70,173.2	36,665.2	35,353.0	39,860.9	71,493.1	184,498.9	338,269.3	2,524,483.6
LDS	COM	295,902.7	297,134.8	252,763.5	225,782.8	190,612.1	163,981.9	143,501.4	155,900.0	159,305.4	196,287.4	238,833.3	274,729.3	2,594,734.6
LDS	IND	596,463.2	651,195.7	677,425.5	660,175.2	626,530.8	604,197.3	576,448.1	586,068.1	613,017.9	643,716.7	662,165.7	611,152.3	7,508,556.5
LDS FLEX	COM	260,000.0	255,000.0	215,000.0	180,000.0	115,000.0	100,000.0	120,000.0	95,000.0	100,000.0	115,000.0	155,000.0	204,000.0	1,914,000.0
LDS FLEX	IND	831,799.1	858,789.5	766,508.3	694,858.2	679,894.9	676,941.9	648,467.8	632,135.1	684,220.6	692,901.5	718,257.9	749,878.1	8,634,652.9
LGSS	COM	141,580.0	149,618.9	121,974.3	70,365.1	30,749.7	15,218.2	8,291.9	7,056.8	7,776.4	23,832.6	44,867.7	97,305.2	718,636.8
LGSS	IND	9,516.6	6,484.3	5,108.1	4,143.6	3,458.4	2,254.8	1,595.4	1,413.6	2,123.6	2,514.5	3,430.0	5,373.5	47,416.4
MLDS I	COM	10,000.0	10,000.0	8,000.0	8,000.0	5,000.0	4,000.0	2,000.0	2,000.0	3,000.0	4,000.0	6,000.0	8,000.0	70,000.0
MLDS I	IND	5,400.0	5,900.0	4,700.0	4,500.0	4,100.0	14,000.0	13,800.0	14,100.0	3,700.0	4,000.0	4,900.0	4,900.0	84,000.0
MLDS I FLEX	IND	190,000.0	220,000.0	210,000.0	210,000.0	200,000.0	200,000.0	170,000.0	180,000.0	180,000.0	170,000.0	170,000.0	170,000.0	2,270,000.0
MLDS II	IND	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MLDS II FLEX	IND	262,000.0	251,000.0	252,000.0	239,000.0	237,000.0	214,000.0	184,000.0	208,000.0	210,000.0	217,500.0	231,500.0	235,000.0	2,741,000.0
NSS	COM	14,000.0	10,600.0	9,600.0	8,000.0	5,600.0	2,800.0	2,400.0	2,300.0	2,300.0	4,000.0	6,100.0	5,000.0	72,700.0
RDS	RES	1,353,000.0	1,314,000.0	1,083,000.0	730,000.0	333,000.0	180,000.0	108,000.0	105,000.0	112,000.0	181,000.0	469,000.0	957,000.0	6,925,000.0
RSS	RES	4,872,851.6	4,711,905.9	3,874,575.4	2,600,525.6	1,175,971.5	639,826.8	390,334.8	379,647.0	400,139.1	642,506.9	1,664,501.1	3,436,730.7	24,789,516.4
SCD	COM	403,996.7	399,999.2	325,989.1	232,992.0	128,006.0	86,994.3	72,988.5	69,013.1	72,990.3	109,013.8	171,997.0	291,999.6	2,365,979.6
SDS	COM	511,748.0	527,586.1	425,197.6	349,499.1	253,800.5	196,825.8	173,382.7	174,467.9	186,560.6	237,417.1	330,087.2	434,215.0	3,800,787.6
SDS	IND	199,836.8	204,573.8	194,205.4	184,968.3	183,815.9	173,884.4	172,298.9	177,814.5	176,781.7	181,593.6	186,676.4	189,794.2	2,226,243.9
SDS FLEX	COM	23,000.0	24,200.0	19,000.0	16,100.0	11,800.0	9,400.0	8,400.0	8,400.0	9,200.0	11,100.0	15,900.0	19,100.0	175,600.0
SDS FLEX	IND	3,000.0	3,000.0	4,000.0	4,000.0	3,000.0	2,500.0	2,500.0	2,500.0	2,500.0	2,500.0	2,000.0	1,500.0	33,000.0
SGDS FLEX	COM	5,300.0	5,732.3	4,927.7	2,804.2	1,328.6	596.2	420.9	356.7	394.1	680.1	1,819.8	3,737.7	28,098.3
SGDS	COM	638,048.5	626,348.2	495,111.6	401,814.1	229,455.5	164,201.3	130,290.1	124,872.5	135,539.2	174,514.1	306,367.2	494,218.5	3,920,780.8
SGDS	IND	17,500.9	15,541.8	14,161.3	11,498.3	6,658.4	5,476.5	4,485.4	4,382.7	4,780.3	4,787.9	7,499.7	12,775.9	109,549.1
SGSS	COM	1,845,421.6	1,806,787.0	1,469,426.2	895,626.3	340,624.1	152,059.0	91,396.6	70,595.8	76,870.6	239,222.7	494,063.4	1,164,690.2	8,646,783.5
SGSS	IND	27,483.1	21,515.7	14,892.1	8,856.7	5,541.5	3,745.0	2,404.8	2,586.4	3,876.6	6,485.8	9,570.2	14,626.5	121,584.4
Total		12,982,997.2	12,846,007.3	10,845,990.7	8,020,983.9	4,908,976.4	3,683,076.6	3,064,072.5	3,038,963.2	3,186,937.3	3,936,067.8	6,085,035.5	9,723,996.0	82,323,104.4

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost Of Service

Question No. GAS-COS-019:

Please provide workpapers showing the development of each allocation factor reflected in the Company's cost of service study. Include a description of each allocation factor, all calculations performed to develop the allocators and all supporting documentation, studies or other information relied upon to determine the allocators.

Response:

Statement No. 11 with related Exhibits MPB-1, MPB-2, MPB3, and MPB4 contains descriptions, calculations, and rational of the allocation factors and assignment to the various components of the Studies. Exhibit No. 111, Schedules 1, 2 & 3, contains a legend of the allocation factors.

Response to standard data request GAS-COS-008 includes a CD containing Excel files of the Company's allocated cost of service studies.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-20:

Please provide all workpapers, calculations and supporting documentation for the functionalization and classification performed for the Company's cost of service study.

Response:

Columbia Gas of Pennsylvania ("Company") follows the Federal Energy Regulatory Commission ("FERC") chart of accounts for accounting purposes. The FERC chart of accounts establishes specific functional accounts for natural gas companies, i.e., Other Gas Supply Expenses, Underground Storage Expense, Distribution Expense, Customer Accounts Expense, Customer Service & Information Expense, Sales Expense and Administrative and General Expenses. The Company's Cost of Service studies as provided in Exhibit No. 111 were prepared based on the Company's accounting records which functionalized and classified its costs consistent with the FERC chart of accounts. No specific work papers were prepared to functionalize and classify the Company's costs beyond the Company's accounting records.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-021:

If not provided elsewhere, please provide a detailed proof of revenues at both present and proposed rates.

Response:

Please see Exhibit No. 103, Pages 8 through 9.