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, Chapter 8. Extensions, Section 8.2 Capital Expenditure Policy and Section 8.3 Deposits and Refunds. The Company may install up to 150 feet of distribution main per residential applicant(s) without charging the applicant(s) a deposit.

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

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

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 are classified to the 252 and 186 account. This includes advances by customers for construction which are to be refunded either wholly or in part.

Once the customer advance is received it is journalized as a credit into the 252 account and a debit to Cash (Account 131). The next month a journal entry is made to debit the 186 account and credit the Capital asset (Account 101).

The calculation of rate base includes the Customer Advance 252 and 186 accounts as well as the Capital Asset (Account 101). Therefore, rate base has appropriately reduced amounts paid by Customers.

If the advance is refunded a debit is made against the Capital asset (Account 101) and the customer is issued a refund. Additionally, an entry is made to reduce the balances in Account 186 and 252. However, if the customer advance is deemed non-refundable it becomes a Contribution in Aid of Construction and remains as a credit to the Capital asset.

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:

Please see GAS-COS-004 Attachment A for the requested information.

Diameter	Quantity (Feet)		Amount $
1/2"	320		233
3/4"	7,468		11,536
1"	66,053		279,213
1-1/8"	1,831		5,619
1-1/4"	594,103		2,790,731
1-1/2"	10,140		10,987
2"	14,749,600		332,598,581
2-1/2"	4,296		20,213
3"	2,932,791		28,685,764
3-1/4"	20,698		3,959
3-1/2"	14,256		20,815
4"	11,894,811		555,772,351
4-1/2"	4,845		18,124
4-7/8"	22,069		17,352
5"	32,840		26,513
5-1/4"	582		344
5-3/16"	13,417		18,418
5-1/2"	632		343
5-5/8"	17,939		13,579
6"	5,875,518		339,625,215
6-1/4"	7,094		5,618
6-5/8"	155,865		643,157
7"	1		13,436
7-5/8"	16,056		11,971
8"	3,249,064		312,880,891
8-1/4"	1,345		2,429
8-5/8"	10,801		361,804
9-5/8"	6,678		7,380
10"	723,019		34,440,441
12"	446,514		52,857,179
14"	450		5,167
16"	350,115		36,391,117
20"	32,976		6,407,184
Total Pipe	**41,264,187**	**$**	**1,703,947,663**

Other Costs (Valves, Castings, etc) and 106 Unclassified	**$**	**462,665,477**
Per Exhibit 8, Schedule 1, Page 1, Column 9, Total Gas Plant in Service, Lines 31 thru 34	**$**	**2,166,613,140**

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, 2021. The company does not maintain on its books and records, the service line investment by size, by customer class. Please see Columbia Statement No. 6 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	**COST**
OTHER	95,059
UNDER 3"	683,309,125
3"	987,425
3-1/8"	5,672
3-1/2"	2,099
4"	3,155,111
4-1/2"	5,980
5"	139
6"	442,710
6-5/8"	2,501
8"	91,795
8-5/8"	252
10"	112
11-1/8"	0
12"	488,788
16"	0
20"	158
TOTAL ACCOUNT 380	688,586,925

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, 2021. The Company's books and records do not identify the assignment of meters to the various customer classes. Please see Columbia Statement No. 6 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		26,275,604
501 - 1000		5,935,619
1001 - 1500		934,473
Over 1500		7,676,944
Unclassified		1,566,915
Total Account	381	42,389,554

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 corresponding 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:

Under its Tariff, the Company's current customer extension policy is as follows:

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 street or highway without cost to an applicant(s), absent any abnormal underground conditions or unusual permitting requirements.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

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.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

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 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.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

8.2.3 Reduction or Elimination of Deposit

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

Prinland Heights Ph. 1 (WMS2075138) / Revision 1

Project Name	Prinland Heights Ph. 1
WMS Project ID	WMS2075138
Revision	1
Company	37 - Columbia Gas of Pennsylvania, Inc.
Location	2421 - York
Competition	
Number of Data Sheets	1
Economic Model Version	45

Project Summary

	Minimum	Recommended
Max Term of Cash Flow Analysis (Years)	40	
Total Added Connect Load (Dth/Hr)	1.98	
Total Added Max Hour (Dth/Hr)	1.98	
Total Added Max Day (Dth)	13.79	
Total Annual Load Increase (Dth)	2178.00	
Services Count	33	33
Meters/Regulators Count	33	33
Service and M/R Costs	$0.00	$121,308.00
Extension Costs	$0.00	$117,506.00
Betterment Costs	$0.00	$0.00
Relocation Costs	$0.00	$0.00
Total Plant Investment	$0.00	$238,814.00 *
Net Present Value (NPV) Cash Flow	$193,654.25	$46,329.44
Required CIAC	$0.00	$0.00
Required CIAC with Gross Up	* * *	* * *
NASR Amount Change	**$0.00**	
Actual CIAC Change	**$0.00**	
IRR without Deposit	* * *	9.45 %
IRR with Deposit	* * *	9.45 %
Discounted Payback Years	0	20
Total Annual Revenue Addition	$22,006.06	$22,006.06
Cost of Capital %	7.41 %	7.41 %
Last Calculated	5/25/2021 1:06:10 PM	

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 2018/2019 through 2020/2021 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 2018/2019 through 2020/2021 heating seasons.

Attachment C to this response provides the peak day requirements, as contained on GAS-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 design day requirements.

Attachment D to this response provides by revenue class the peak day requirements for Winter 2021-2022 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 2021-2022 forecasted design peak day requirements, as contained on GAS-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		
	2020 / 21	**2019 / 20**	**2018 / 19**
Day of Week	Thur	Wed	Wed
Date	Jan. 28	Dec. 18	Jan. 30
Current Day Average Temp	22° F	20° F	1° F
Prior Day Average Temp	28° F	29° F	17° F
Current Day Average Wind Speed	17 mph	15 mph	13 mph
Requirements (1)			
Residential	289.1	299.5	412.6
Commercial	169.8	168.5	242.3
Industrial	77.9	82.1	91.9
Total Retail:	**536.7**	**550.1**	**746.8**
Company Use:	0.6	0.7	0.5
Unaccounted For:	1.8	1.8	1.6
Total Requirements:	**539.2**	**552.6**	**748.9**
Supply (2)			
Columbia Gas Transmission Corp.	431.7	444.9	599.8
Dominion	33.3	39.7	44.4
Equitrans	6.0	10.5	12.5
National Fuel Gas Supply Corp.	4.2	4.4	6.3
Tennessee Gas Pipeline	19.6	18.9	28.1
Texas Eastern Transmission	40.3	29.9	53.1
Direct Local	3.8	3.1	4.7
Blackhawk Storage	0.2	1.2	0.0
Total Supply:	**539.2**	**552.6**	**748.9**

(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		
	2020 / 21	**2019 / 20**	**2018 / 19**
Day of Week	Thur	Wed	Wed
Date	Jan. 28	Dec. 18	Jan. 30
Current Day Average Temp	22° F	20° F	1° F
Prior Day Average Temp	28° F	29° F	17° F
Current Day Average Wind Speed	17 mph	15 mph	13 mph
Requirements [2]			
Commercial			
SGDS	24.5	25.8	36.4
LDS	10.1	40.0	48.9
MLDS	0.6	0.6	0.8
NCS	0.2	0.3	0.3
SDS	37.3	10.3	14.5
Total Commercial	**72.7**	**77.0**	**101.0**
Industrial			
SGDS	0.8	0.7	1.0
LDS	22.5	64.5	70.5
MLDS	16.7	14.3	18.7
NCS	0.1	0.0	0.0
SDS	35.2	1.3	1.1
Total Industrial	**75.3**	**80.9**	**91.4**
Requirements	**148.0**	**158.0**	**192.4**
Supply [3]			
Columbia Gas Transmission Corp.	118.5	127.2	154.1
Dominion Transmission Inc.	9.1	11.3	11.4
Equitrans	1.7	3.0	3.2
National Fuel Gas Supply Corp.	1.2	1.3	1.6
Tennessee Gas Pipeline	5.4	5.4	7.2
Texas Eastern Transmission	11.1	8.5	13.6
Direct Local	1.0	0.9	1.2
Blackhawk Storage	0.0	0.3	0.0
Total Supply:	**148.0**	**158.0**	**192.4**

[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

	Jan. 28, 2021 Total Demand			Dec. 18, 2019 Total Demand			Jan. 30, 2019 Total Demand		
	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput
Residential									
RS	198.5	0.0	198.5	211.6	0.0	211.6	285.5	0.0	285.5
RC2	18.9	0.0	18.9	19.9	0.0	19.9	28.6	0.0	28.6
RTC	0.0	71.7	71.7	0.0	68.0	68.0	0.0	98.5	98.5
Residential Total	**217.4**	**71.7**	**289.1**	**231.5**	**68.0**	**299.5**	**314.1**	**98.5**	**412.6**
Commercial									
LDS/LGSS	0.0	9.8	9.8	0.0	11.0	11.0	0.0	16.0	16.0
LDS FLEX	0.0	8.5	8.5	0.0	9.2	9.2	0.0	13.0	13.0
MDS	0.4	0.4	0.9	0.0	0.5	0.5	0.7	0.8	1.5
SDS/LGSS	6.9	24.0	30.9	0.0	30.8	30.8	11.2	30.4	41.6
SDS/LGSS FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
SGDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGS2	31.4	33.9	65.3	0.0	65.8	65.8	50.3	0.0	50.3
SGS1	36.5	17.9	54.3	0.0	51.5	51.5	50.4	0.0	50.4
SGDS1 FLEX	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
SCD1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.1	19.1
SCD2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.9	16.9
SGDS1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.1
SGDS2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.5	30.5
SGDS2 FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
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	**75.2**	**94.6**	**169.8**	**0.0**	**168.8**	**168.8**	**112.5**	**129.8**	**242.3**
Industrial									
LDS/LGSS	0.0	26.6	26.6	0.0	26.6	26.6	0.0	27.2	27.2
LDS FLEX	0.0	25.1	25.1	0.0	28.7	28.7	0.0	36.2	36.2
MDS	0.0	6.0	6.0	0.0	3.9	3.9	0.0	2.1	2.1
MDS FLEX	0.0	9.7	9.7	0.0	11.7	11.7	0.0	14.6	14.6
SDS/LGSS	0.4	8.7	9.1	0.5	9.0	9.5	0.2	10.3	10.5
SDS/LGSS FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
SGDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGS2	0.5	0.8	1.3	0.7	0.7	1.4	0.4	0.0	0.4
SGS1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCD1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCD2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGDS1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGDS2	0.0	0.0	0.0	0.0	0.0	0.0	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 Industrial	**0.9**	**77.0**	**77.9**	**1.2**	**80.6**	**81.8**	**0.6**	**91.3**	**91.9**
Other	**2.4**	**0.0**	**2.4**	**2.5**	**0.0**	**2.5**	**2.1**	**0.0**	**2.1**
2020/21 Design Day	**295.9**	**243.3**	**539.2**	**235.2**	**317.4**	**552.6**	**429.3**	**319.6**	**748.9**

Note: Allocation based on Design Day breakout.

Columbia Gas of Pennsylvania

Forecasted Design Day Requirements and Supply
For 2021/22 Heating Season
Units are in MDth/Day

	Total Design Day Demand
	2021 / 22
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	448.7
Commercial [2]	168.1
Industrial [2]	1.1
Company Use	0.6
Unaccounted For Gas	1.8
Total Firm:	**620.4**
Non-Firm: Residential	0.0
Commercial	97.8
Industrial	95.4
Total Non-Firm:	**193.2**
Total Requirements:	**813.6**
Supply [3]	
Columbia Gas Transmission Corp.	481.7
Dominion	34.1
Equitrans	55.0
National Fuel Gas Supply Corp.	8.2
Tennessee Gas Pipeline	19.3
Texas Eastern Transmission	20.5
Direct Local	0.7
Blackhawk Storage	0.0
Total Supply:	**619.4**
Imbalance [4]	**194.1**

[1] Per CPA's "2021 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

2021 Design Day Forecast, 2021/22 - 2025/26

2021/22 Design Day Requirements by Rate Schedule
Volume in MDth/Day

	Total Demand			Firm Demand			Non-Firm Demand		
	Tariff	GTS / Choice	Total Throughput	Tariff	Choice	Total Throughput	Tariff	GTS	Total Throughput
Residential									
RS	308.1	0.0	308.1	308.1	0.0	308.1	0.0	0.0	0.0
RC2	29.4	0.0	29.4	29.4	0.0	29.4	0.0	0.0	0.0
RTC	0.0	111.3	111.3	0.0	111.3	111.3	0.0	0.0	0.0
Residential Total	**337.5**	**111.3**	**448.8**	**337.5**	**111.3**	**448.8**	**0.0**	**0.0**	**0.0**
Commercial									
LDS/LGSS (1)	0.0	14.5	14.5	0.0	0.0	0.0	0.0	14.5	14.5
LDS FLEX	0.0	13.6	13.6	0.0	0.0	0.0	0.0	13.6	13.6
MDS	0.7	0.7	1.4	0.7	0.0	0.7	0.0	0.7	0.7
SDS/LGSS	11.0	33.8	44.8	11.0	0.0	11.0	0.0	33.8	33.8
SGS1/SCD1/SGD1	58.4	28.6	87.0	58.4	25.5	83.9	0.0	3.1	3.1
SGS2/SCD2/SGD2	50.3	54.3	104.6	50.3	22.2	72.5	0.0	32.1	32.1
SGDS2 FLEX	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1
Total Commercial	**120.4**	**145.6**	**266.0**	**120.4**	**47.7**	**168.1**	**0.0**	**97.9**	**97.9**
Industrial									
LDS/LGSS (1)	0.0	33.1	33.1	0.0	0.0	0.0	0.0	33.1	33.1
LDS FLEX	0.0	31.2	31.2	0.0	0.0	0.0	0.0	31.2	31.2
MDS (1)	0.0	7.2	7.2	0.0	0.0	0.0	0.0	7.2	7.2
MDS FLEX	0.0	12.1	12.1	0.0	0.0	0.0	0.0	12.1	12.1
SDS/LGSS	0.5	10.8	11.3	0.5	0.0	0.5	0.0	10.8	10.8
SGS2/SCD2/SGD2	0.6	1.0	1.6	0.6	0.0	0.6	0.0	1.0	1.0
Total Industrial	**1.1**	**95.4**	**96.5**	**1.1**	**0.0**	**1.1**	**0.0**	**95.4**	**95.4**
Other	**2.4**	**0.0**	**2.4**	**2.4**	**0.0**	**2.4**	**0.0**	**0.0**	**0.0**
2021/22 Design Day	**461.4**	**352.3**	**813.7**	**461.4**	**159.0**	**620.4**	**0.0**	**193.3**	**193.3**

(1) Rate Schedule less FLEX customers

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, 2020 through March 31, 2021.

Columbia Gas of Pennsylvania
Heating Season November 2020 Through March 2021
Daily Dth Sendout

Date	Dth
11/01/20	296,261
11/02/20	329,217
11/03/20	256,549
11/04/20	198,147
11/05/20	172,851
11/06/20	165,574
11/07/20	153,899
11/08/20	158,474
11/09/20	151,407
11/10/20	122,015
11/11/20	152,203
11/12/20	252,371
11/13/20	252,890
11/14/20	237,012
11/15/20	241,197
11/16/20	290,881
11/17/20	372,354
11/18/20	375,232
11/19/20	248,136
11/20/20	178,197
11/21/20	228,425
11/22/20	235,283
11/23/20	336,654
11/24/20	303,414
11/25/20	201,960
11/26/20	176,521
11/27/20	212,461
11/28/20	278,264
11/29/20	244,099
11/30/20	302,535
12/01/20	407,114
12/02/20	402,862
12/03/20	341,472
12/04/20	303,062
12/05/20	341,240
12/06/20	391,694
12/07/20	423,086
12/08/20	417,831
12/09/20	367,015
12/10/20	330,708
12/11/20	258,518
12/12/20	212,488
12/13/20	299,314
12/14/20	409,156

Columbia Gas of Pennsylvania
Heating Season November 2020 Through March 2021
Daily Dth Sendout

Date	Dth
12/15/20	428,447
12/16/20	437,743
12/17/20	413,326
12/18/20	428,023
12/19/20	387,597
12/20/20	362,512
12/21/20	356,037
12/22/20	372,608
12/23/20	278,314
12/24/20	291,400
12/25/20	482,428
12/26/20	484,236
12/27/20	353,729
12/28/20	360,072
12/29/20	413,590
12/30/20	311,990
12/31/20	372,296
01/01/21	335,193
01/02/21	311,750
01/03/21	349,296
01/04/21	369,386
01/05/21	384,783
01/06/21	404,204
01/07/21	416,997
01/08/21	442,877
01/09/21	396,607
01/10/21	405,199
01/11/21	424,235
01/12/21	440,420
01/13/21	368,258
01/14/21	342,747
01/15/21	351,280
01/16/21	367,414
01/17/21	370,868
01/18/21	421,747
01/19/21	389,918
01/20/21	468,930
01/21/21	364,907
01/22/21	430,531
01/23/21	494,397
01/24/21	442,996
01/25/21	414,584
01/26/21	390,572
01/27/21	462,199

Columbia Gas of Pennsylvania
Heating Season November 2020 Through March 2021
Daily Dth Sendout

Date	Dth
01/28/21	539,160
01/29/21	527,835
01/30/21	424,720
01/31/21	441,495
02/01/21	434,326
02/02/21	468,794
02/03/21	472,187
02/04/21	395,059
02/05/21	412,209
02/06/21	412,231
02/07/21	502,415
02/08/21	473,573
02/09/21	457,991
02/10/21	454,316
02/11/21	457,277
02/12/21	456,787
02/13/21	444,253
02/14/21	440,775
02/15/21	429,586
02/16/21	521,404
02/17/21	486,868
02/18/21	461,389
02/19/21	482,589
02/20/21	526,691
02/21/21	420,548
02/22/21	411,833
02/23/21	367,535
02/24/21	293,455
02/25/21	356,017
02/26/21	323,901
02/27/21	279,671
02/28/21	276,552
03/01/21	423,159
03/02/21	419,168
03/03/21	305,618
03/04/21	456,994
03/05/21	429,786
03/06/21	420,811
03/07/21	408,009
03/08/21	303,215
03/09/21	241,949
03/10/21	183,136
03/11/21	176,384
03/12/21	229,699

Columbia Gas of Pennsylvania
Heating Season November 2020 Through March 2021
Daily Dth Sendout

Date	Dth
03/13/21	262,425
03/14/21	329,096
03/15/21	349,869
03/16/21	291,431
03/17/21	225,515
03/18/21	324,615
03/19/21	344,577
03/20/21	266,186
03/21/21	230,207
03/22/21	217,587
03/23/21	165,359
03/24/21	158,935
03/25/21	130,842
03/26/21	164,267
03/27/21	122,574
03/28/21	239,561
03/29/21	272,904
03/30/21	157,188
03/31/21	238,765

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:

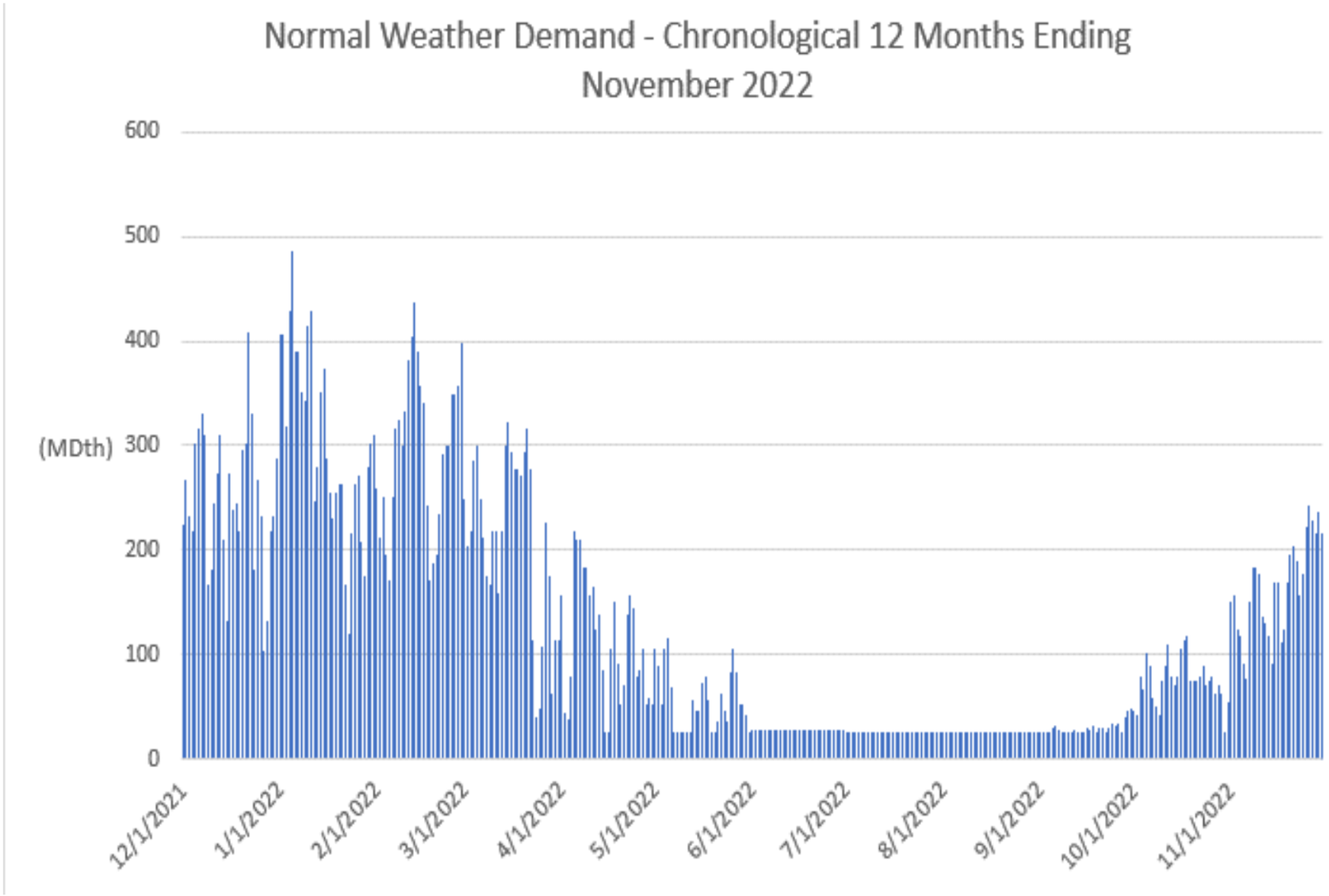
The Company's basic supply and capacity analysis tool is the PLEXOS® Software. PLEXOS® determines the "optimum," time-dependent levels of pipeline transportation service and storage service to be utilized to meet the Company's prospective demand under various weather-related scenarios and meets that demand with a least cost mix of supplies. PLEXOS® 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 PLEXOS® on an ongoing basis from a variety of published and private sources. The Company utilizes PLEXOS® for both long-range and short-term operational planning. The Normal Weather Firm Demands are shown in GAS-COS-012 Attachment A. The attachment shows the Normal Weather Firm Demands as follows:

Pages 1-2. Chronological order for the 12 months ending November 2022.
Page 3. Graphically for the 12 months ending November 2022.
Pages 4-5. Sorted high to low for the 12 months ending November 2022.
Page 6. Graphically for the 12 months ending November 2022.

Normal Weather Firm Demand - Chonological - 12 Months Ending November 2022

Date	Firm Demand (MDth)	Date	Firm Demand (MDth)	Date	Firm Demand (MDth)	Date	Firm Demand (MDth)	Date	Firm Demand (MDth)	Date	Firm Demand (MDth)
1-Dec-2021	224.4	1-Feb-2022	259.8	1-Apr-2022	157.6	1-Jun-2022	28.4	1-Aug-2022	25.6	1-Oct-2022	46.5
2-Dec-2021	267.1	2-Feb-2022	211.3	2-Apr-2022	45.3	2-Jun-2022	28.4	2-Aug-2022	25.6	2-Oct-2022	42.3
3-Dec-2021	231.5	3-Feb-2022	251.7	3-Apr-2022	38.7	3-Jun-2022	28.4	3-Aug-2022	25.6	3-Oct-2022	80.1
4-Dec-2021	217.3	4-Feb-2022	195.1	4-Apr-2022	78.3	4-Jun-2022	28.4	4-Aug-2022	25.6	4-Oct-2022	67.5
5-Dec-2021	302.6	5-Feb-2022	170.9	5-Apr-2022	217.2	5-Jun-2022	28.4	5-Aug-2022	25.6	5-Oct-2022	101.1
6-Dec-2021	316.8	6-Feb-2022	251.7	6-Apr-2022	210.5	6-Jun-2022	28.4	6-Aug-2022	25.6	6-Oct-2022	88.5
7-Dec-2021	331.0	7-Feb-2022	316.3	7-Apr-2022	210.5	7-Jun-2022	28.4	7-Aug-2022	25.6	7-Oct-2022	59.1
8-Dec-2021	309.7	8-Feb-2022	324.4	8-Apr-2022	184.1	8-Jun-2022	28.4	8-Aug-2022	25.6	8-Oct-2022	50.7
9-Dec-2021	167.6	9-Feb-2022	300.1	9-Apr-2022	184.1	9-Jun-2022	28.4	9-Aug-2022	25.6	9-Oct-2022	42.3
10-Dec-2021	181.8	10-Feb-2022	332.5	10-Apr-2022	157.6	10-Jun-2022	28.4	10-Aug-2022	25.6	10-Oct-2022	75.9
11-Dec-2021	245.7	11-Feb-2022	381.0	11-Apr-2022	164.3	11-Jun-2022	28.4	11-Aug-2022	25.6	11-Oct-2022	88.5
12-Dec-2021	274.2	12-Feb-2022	405.2	12-Apr-2022	124.6	12-Jun-2022	28.4	12-Aug-2022	25.6	12-Oct-2022	109.5
13-Dec-2021	309.7	13-Feb-2022	437.5	13-Apr-2022	137.8	13-Jun-2022	28.4	13-Aug-2022	25.6	13-Oct-2022	80.1
14-Dec-2021	210.2	14-Feb-2022	389.0	14-Apr-2022	85.0	14-Jun-2022	28.4	14-Aug-2022	25.6	14-Oct-2022	71.7
15-Dec-2021	132.0	15-Feb-2022	356.7	15-Apr-2022	25.5	15-Jun-2022	28.4	15-Aug-2022	25.6	15-Oct-2022	80.1
16-Dec-2021	274.2	16-Feb-2022	340.6	16-Apr-2022	25.5	16-Jun-2022	28.4	16-Aug-2022	25.6	16-Oct-2022	105.4
17-Dec-2021	238.6	17-Feb-2022	243.6	17-Apr-2022	104.8	17-Jun-2022	28.4	17-Aug-2022	25.6	17-Oct-2022	113.7
18-Dec-2021	245.7	18-Feb-2022	170.9	18-Apr-2022	151.1	18-Jun-2022	28.4	18-Aug-2022	25.6	18-Oct-2022	117.9
19-Dec-2021	217.3	19-Feb-2022	187.1	19-Apr-2022	91.6	19-Jun-2022	28.4	19-Aug-2022	25.6	19-Oct-2022	75.9
20-Dec-2021	295.5	20-Feb-2022	195.1	20-Apr-2022	51.9	20-Jun-2022	28.4	20-Aug-2022	25.6	20-Oct-2022	75.9
21-Dec-2021	302.6	21-Feb-2022	235.5	21-Apr-2022	71.7	21-Jun-2022	28.4	21-Aug-2022	25.6	21-Oct-2022	75.9
22-Dec-2021	409.2	22-Feb-2022	292.1	22-Apr-2022	137.8	22-Jun-2022	28.4	22-Aug-2022	25.6	22-Oct-2022	80.1
23-Dec-2021	331.0	23-Feb-2022	300.1	23-Apr-2022	157.6	23-Jun-2022	28.4	23-Aug-2022	25.6	23-Oct-2022	88.5
24-Dec-2021	181.8	24-Feb-2022	300.1	24-Apr-2022	144.4	24-Jun-2022	28.4	24-Aug-2022	25.6	24-Oct-2022	71.7
25-Dec-2021	267.1	25-Feb-2022	348.6	25-Apr-2022	78.3	25-Jun-2022	28.4	25-Aug-2022	25.6	25-Oct-2022	75.9
26-Dec-2021	231.5	26-Feb-2022	348.6	26-Apr-2022	85.0	26-Jun-2022	28.4	26-Aug-2022	25.6	26-Oct-2022	80.1
27-Dec-2021	103.6	27-Feb-2022	356.7	27-Apr-2022	104.8	27-Jun-2022	28.4	27-Aug-2022	25.6	27-Oct-2022	63.3
28-Dec-2021	132.0	28-Feb-2022	397.1	28-Apr-2022	51.9	28-Jun-2022	28.4	28-Aug-2022	25.6	28-Oct-2022	71.7
29-Dec-2021	217.3	1-Mar-2022	248.6	29-Apr-2022	58.5	29-Jun-2022	28.4	29-Aug-2022	25.6	29-Oct-2022	63.3
30-Dec-2021	231.5	2-Mar-2022	204.0	30-Apr-2022	51.9	30-Jun-2022	28.4	30-Aug-2022	25.6	30-Oct-2022	25.5
31-Dec-2021	288.4	3-Mar-2022	218.8	1-May-2022	105.6	1-Jul-2022	26.4	31-Aug-2022	25.6	31-Oct-2022	54.9

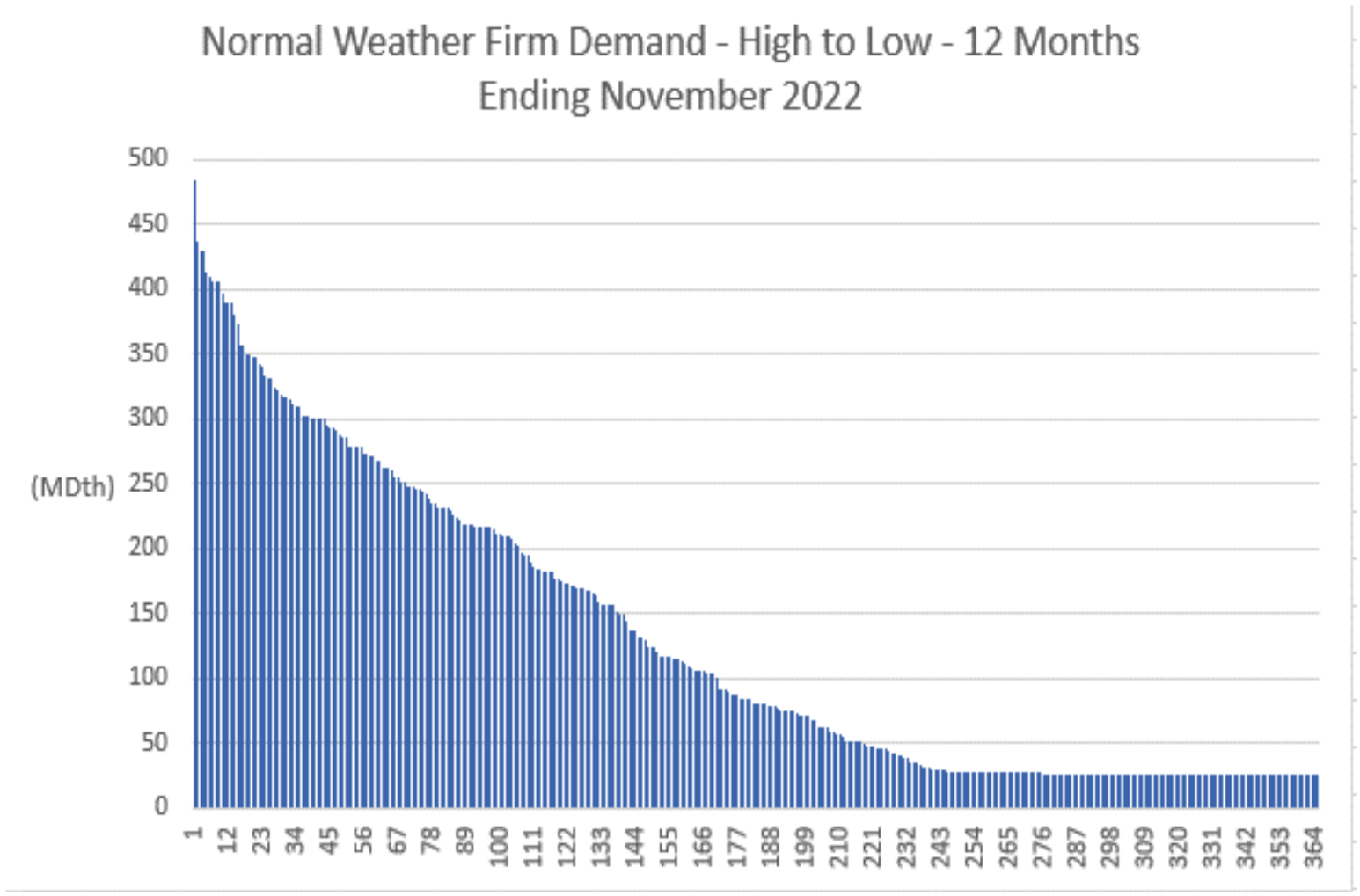
1-Jan-2022	405.7	4-Mar-2022	285.8	2-May-2022	89.6	2-Jul-2022	26.4	1-Sep-2022	25.5	1-Nov-2022	150.4
2-Jan-2022	405.7	5-Mar-2022	300.7	3-May-2022	52.2	3-Jul-2022	26.4	2-Sep-2022	25.5	2-Nov-2022	157.0
3-Jan-2022	318.6	6-Mar-2022	248.6	4-May-2022	105.6	4-Jul-2022	26.4	3-Sep-2022	25.5	3-Nov-2022	124.1
4-Jan-2022	429.5	7-Mar-2022	211.4	5-May-2022	116.3	5-Jul-2022	26.4	4-Sep-2022	25.5	4-Nov-2022	117.5
5-Jan-2022	485.0	8-Mar-2022	174.2	6-May-2022	68.2	6-Jul-2022	26.4	5-Sep-2022	30.2	5-Nov-2022	91.2
6-Jan-2022	389.9	9-Mar-2022	166.8	7-May-2022	25.5	7-Jul-2022	26.4	6-Sep-2022	31.7	6-Nov-2022	78.1
7-Jan-2022	389.9	10-Mar-2022	218.8	8-May-2022	25.5	8-Jul-2022	26.4	7-Sep-2022	27.0	7-Nov-2022	150.4
8-Jan-2022	350.3	11-Mar-2022	218.8	9-May-2022	25.5	9-Jul-2022	26.4	8-Sep-2022	25.5	8-Nov-2022	183.2
9-Jan-2022	342.4	12-Mar-2022	159.3	10-May-2022	25.5	10-Jul-2022	26.4	9-Sep-2022	25.5	9-Nov-2022	183.2
10-Jan-2022	413.7	13-Mar-2022	218.8	11-May-2022	25.5	11-Jul-2022	26.4	10-Sep-2022	25.5	10-Nov-2022	176.7
11-Jan-2022	429.5	14-Mar-2022	300.7	12-May-2022	25.5	12-Jul-2022	26.4	11-Sep-2022	25.5	11-Nov-2022	137.2
12-Jan-2022	247.3	15-Mar-2022	322.9	13-May-2022	57.5	13-Jul-2022	26.4	12-Sep-2022	27.0	12-Nov-2022	130.7
13-Jan-2022	279.0	16-Mar-2022	293.2	14-May-2022	46.8	14-Jul-2022	26.4	13-Sep-2022	25.5	13-Nov-2022	117.5
14-Jan-2022	350.3	17-Mar-2022	278.3	15-May-2022	46.8	15-Jul-2022	26.4	14-Sep-2022	25.5	14-Nov-2022	91.2
15-Jan-2022	374.1	18-Mar-2022	278.3	16-May-2022	73.5	16-Jul-2022	26.4	15-Sep-2022	25.5	15-Nov-2022	170.1
16-Jan-2022	286.9	19-Mar-2022	270.9	17-May-2022	78.9	17-Jul-2022	26.4	16-Sep-2022	30.2	16-Nov-2022	170.1
17-Jan-2022	255.2	20-Mar-2022	293.2	18-May-2022	57.5	18-Jul-2022	26.4	17-Sep-2022	28.6	17-Nov-2022	110.9
18-Jan-2022	231.4	21-Mar-2022	315.5	19-May-2022	25.5	19-Jul-2022	26.4	18-Sep-2022	31.7	18-Nov-2022	124.1
19-Jan-2022	255.2	22-Mar-2022	278.3	20-May-2022	25.5	20-Jul-2022	26.4	19-Sep-2022	25.5	19-Nov-2022	170.1
20-Jan-2022	263.2	23-Mar-2022	114.7	21-May-2022	36.2	21-Jul-2022	26.4	20-Sep-2022	30.2	20-Nov-2022	196.4
21-Jan-2022	263.2	24-Mar-2022	40.3	22-May-2022	62.9	22-Jul-2022	26.4	21-Sep-2022	30.2	21-Nov-2022	203.0
22-Jan-2022	168.1	25-Mar-2022	47.8	23-May-2022	46.8	23-Jul-2022	26.4	22-Sep-2022	25.5	22-Nov-2022	189.8
23-Jan-2022	120.5	26-Mar-2022	107.3	24-May-2022	36.2	24-Jul-2022	26.4	23-Sep-2022	30.2	23-Nov-2022	157.0
24-Jan-2022	215.6	27-Mar-2022	226.3	25-May-2022	84.2	25-Jul-2022	26.4	24-Sep-2022	34.8	24-Nov-2022	176.7
25-Jan-2022	263.2	28-Mar-2022	174.2	26-May-2022	105.6	26-Jul-2022	26.4	25-Sep-2022	31.7	25-Nov-2022	222.7
26-Jan-2022	271.1	29-Mar-2022	62.7	27-May-2022	84.2	27-Jul-2022	26.4	26-Sep-2022	33.3	26-Nov-2022	242.4
27-Jan-2022	207.7	30-Mar-2022	114.7	28-May-2022	52.2	28-Jul-2022	26.4	27-Sep-2022	25.5	27-Nov-2022	229.3
28-Jan-2022	176.0	31-Mar-2022	114.7	29-May-2022	52.2	29-Jul-2022	26.4	28-Sep-2022	39.5	28-Nov-2022	216.1
29-Jan-2022	279.0			30-May-2022	41.5	30-Jul-2022	26.4	29-Sep-2022	47.3	29-Nov-2022	235.9
30-Jan-2022	302.8			31-May-2022	25.5	31-Jul-2022	26.4	30-Sep-2022	48.9	30-Nov-2022	216.1
31-Jan-2022	310.7										


Normal Weather Demand - Chronological 12 Months Ending
November 2022
(MDth)
600
500
400
300
200
100
0
12/1/2021
1/1/2022
2/1/2022
3/1/2022
4/1/2022
5/1/2022
6/1/2022
7/1/2022
8/1/2022
9/1/2022
10/1/2022
11/1/2022

Normal Weather Firm Demand - High to Low - 12 Months Ending November 2022

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	485.0	62	263.2	123	170.9	184	80.1	245	28.6	306	26.4
2	437.5	63	263.2	124	170.9	185	80.1	246	28.4	307	26.4
3	429.5	64	263.2	125	170.1	186	80.1	247	28.4	308	26.4
4	429.5	65	259.8	126	170.1	187	78.9	248	28.4	309	25.6
5	413.7	66	255.2	127	170.1	188	78.3	249	28.4	310	25.6
6	409.2	67	255.2	128	168.1	189	78.3	250	28.4	311	25.6
7	405.7	68	251.7	129	167.6	190	78.1	251	28.4	312	25.6
8	405.7	69	251.7	130	166.8	191	75.9	252	28.4	313	25.6
9	405.2	70	248.6	131	164.3	192	75.9	253	28.4	314	25.6
10	397.1	71	248.6	132	159.3	193	75.9	254	28.4	315	25.6
11	389.9	72	247.3	133	157.6	194	75.9	255	28.4	316	25.6
12	389.9	73	245.7	134	157.6	195	75.9	256	28.4	317	25.6
13	389.0	74	245.7	135	157.6	196	73.5	257	28.4	318	25.6
14	381.0	75	243.6	136	157.0	197	71.7	258	28.4	319	25.6
15	374.1	76	242.4	137	157.0	198	71.7	259	28.4	320	25.6
16	356.7	77	238.6	138	151.1	199	71.7	260	28.4	321	25.6
17	356.7	78	235.9	139	150.4	200	71.7	261	28.4	322	25.6
18	350.3	79	235.5	140	150.4	201	68.2	262	28.4	323	25.6
19	350.3	80	231.5	141	144.4	202	67.5	263	28.4	324	25.6
20	348.6	81	231.5	142	137.8	203	63.3	264	28.4	325	25.6
21	348.6	82	231.5	143	137.8	204	63.3	265	28.4	326	25.6
22	342.4	83	231.4	144	137.2	205	62.9	266	28.4	327	25.6
23	340.6	84	229.3	145	132.0	206	62.7	267	28.4	328	25.6
24	332.5	85	226.3	146	132.0	207	59.1	268	28.4	329	25.6
25	331.0	86	224.4	147	130.7	208	58.5	269	28.4	330	25.6
26	331.0	87	222.7	148	124.6	209	57.5	270	28.4	331	25.6
27	324.4	88	218.8	149	124.1	210	57.5	271	28.4	332	25.6
28	322.9	89	218.8	150	124.1	211	54.9	272	28.4	333	25.6
29	318.6	90	218.8	151	120.5	212	52.2	273	28.4	334	25.6
30	316.8	91	218.8	152	117.9	213	52.2	274	28.4	335	25.6
31	316.3	92	217.3	153	117.5	214	52.2	275	28.4	336	25.6
32	315.5	93	217.3	154	117.5	215	51.9	276	27.0	337	25.6
33	310.7	94	217.3	155	116.3	216	51.9	277	27.0	338	25.6
34	309.7	95	217.2	156	114.7	217	51.9	278	26.4	339	25.6
35	309.7	96	216.1	157	114.7	218	50.7	279	26.4	340	25.5
36	302.8	97	216.1	158	114.7	219	48.9	280	26.4	341	25.5
37	302.6	98	215.6	159	113.7	220	47.8	281	26.4	342	25.5
38	302.6	99	211.4	160	110.9	221	47.3	282	26.4	343	25.5
39	300.7	100	211.3	161	109.5	222	46.8	283	26.4	344	25.5
40	300.7	101	210.5	162	107.3	223	46.8	284	26.4	345	25.5

41	300.1	102	210.5	163	105.6	224	46.8	285	26.4	346	25.5
42	300.1	103	210.2	164	105.6	225	46.5	286	26.4	347	25.5
43	300.1	104	207.7	165	105.6	226	45.3	287	26.4	348	25.5
44	295.5	105	204.0	166	105.4	227	42.3	288	26.4	349	25.5
45	293.2	106	203.0	167	104.8	228	42.3	289	26.4	350	25.5
46	293.2	107	196.4	168	104.8	229	41.5	290	26.4	351	25.5
47	292.1	108	195.1	169	103.6	230	40.3	291	26.4	352	25.5
48	288.4	109	195.1	170	101.1	231	39.5	292	26.4	353	25.5
49	286.9	110	189.8	171	91.6	232	38.7	293	26.4	354	25.5
50	285.8	111	187.1	172	91.2	233	36.2	294	26.4	355	25.5
51	279.0	112	184.1	173	91.2	234	36.2	295	26.4	356	25.5
52	279.0	113	184.1	174	89.6	235	34.8	296	26.4	357	25.5
53	278.3	114	183.2	175	88.5	236	33.3	297	26.4	358	25.5
54	278.3	115	183.2	176	88.5	237	31.7	298	26.4	359	25.5
55	278.3	116	181.8	177	88.5	238	31.7	299	26.4	360	25.5
56	274.2	117	181.8	178	85.0	239	31.7	300	26.4	361	25.5
57	274.2	118	176.7	179	85.0	240	30.2	301	26.4	362	25.5
58	271.1	119	176.7	180	84.2	241	30.2	302	26.4	363	25.5
59	270.9	120	176.0	181	84.2	242	30.2	303	26.4	364	25.5
60	267.1	121	174.2	182	80.1	243	30.2	304	26.4	365	25.5
61	267.1	122	174.2	183	80.1	244	30.2	305	26.4		


Normal Weather Firm Demand - High to Low - 12 Months Ending November 2022
(MDth)
500
450
400
350
300
250
200
150
100
50
0
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 1/2021 in Dth

Customer	Usage 01/21 (Dth)	Nominations 01/21 (Dth)	01/01/21 Day 1 (Dth)	01/02/21 Day 2 (Dth)	01/03/21 Day 3 (Dth)	01/04/21 Day 4 (Dth)	01/05/21 Day 5 (Dth)	01/06/21 Day 6 (Dth)	01/07/21 Day 7 (Dth)	01/08/21 Day 8 (Dth)	01/09/21 Day 9 (Dth)	01/10/21 Day 10 (Dth)	01/11/21 Day 11 (Dth)	01/12/21 Day 12 (Dth)	01/13/21 Day 13 (Dth)	01/14/21 Day 14 (Dth)	01/15/21 Day 15 (Dth)	01/16/21 Day 16 (Dth)
A	315,657	304,003	8,313	8,313	8,313	8,313	8,313	13,113	8,313	8,313	9,813	9,813	9,813	8,313	8,313	14,313	14,313	9,813
B	240,677	**	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	196,532	223,892	7,458	7,458	5,492	5,492	5,492	5,492	5,492	5,492	9,492	9,492	9,492	5,492	5,492	5,492	5,492	9,984
D	65,608	*	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	58,424	*	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
F	51,544	50,300	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,748
G	51,051	105,008	2,903	2,903	2,903	2,903	2,903	2,903	2,903	3,320	3,320	3,320	3,320	3,320	3,320	3,320	3,320	3,820
H	42,852	*	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
I	42,574	*	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
J	40,670	*	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		01/17/21 Day 17 (Dth)	01/18/21 Day 18 (Dth)	01/19/21 Day 19 (Dth)	01/20/21 Day 20 (Dth)	01/21/21 Day 21 (Dth)	01/22/21 Day 22 (Dth)	01/23/21 Day 23 (Dth)	01/24/21 Day 24 (Dth)	01/25/21 Day 25 (Dth)	01/26/21 Day 26 (Dth)	01/27/21 Day 27 (Dth)	01/28/21 Day 28 (Dth)	01/29/21 Day 29 (Dth)	01/30/21 Day 30 (Dth)	01/31/21 Day 31 (Dth)
A		9,813	9,813	9,813	9,313	14,313	10,313	9,313	9,313	9,313	8,313	9,313	9,813	9,813	9,813	9,813
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		9,492	9,492	9,492	9,492	492	492	9,492	9,492	9,492	5,492	9,991	10,212	7,491	7,491	7,491
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	*	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
F		1,748	1,748	1,748	1,848	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,948	1,948	1,960
G		4,120	4,320	4,320	3,620	3,320	3,320	3,320	3,320	3,320	3,320	3,320	3,320	4,020	3,720	3,627
H	*	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
I	*	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
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	SEASONAL	CONTRACT QUANTITY DTH/D	RECEIPT POINT	REC POINT QUANTITY DTH/D	CITY GATE DELIVERY POINT	DEL POINT QUANTITY DTH/D
COLUMBIA GAS	80136-Tier1	FTS	04/01/20	10/31/22	12 Mos	60,551	801 TCO-LEACH	39,196	CPA CITY GATE	60,551
							B15 UNIONVILLE	7,583		
							C16 DELMONT	13,772		
	80136-Tier2		11/01/22	10/31/25	12 Mos	21,055	B15 UNIONVILLE	12,283	CPA CITY GATE	21,055
							C16 DELMONT	8,772		
COLUMBIA GAS	50675	FTS	11/01/97	10/31/26	12 Mos	13,334	BROADRUN	13,334	CPA CITY GATE	13,334
COLUMBIA GAS	56741	FTS	11/01/98	10/31/22	12 Mos	11,666	GRANT STATION	10,000	CPA CITY GATE	11,666
							BROADRUN	1,666		
COLUMBIA GAS	56742	FTS	11/01/99	10/31/26	12 Mos	10,000	LEACH	10,000	CPA CITY GATE	10,000
COLUMBIA GAS	82610	SST	04/01/05	03/31/22	OCT-MAR	441,576	STORAGE O-M	441,576	CPA CITY GATE	441,579
					APR-SEPT	220,788	STORAGE A-S	220,788		220,788
EASTERN GAS TRANSMISSION*	700034	FTNN-GSS	06/01/05	03/31/28	NOV-MAR	6,000	GSS STORAGE	6,000	CPA @ WARRENDALE/DARLINGTON	6,000
EASTERN GAS TRANSMISSION*	100121	FTNN	04/01/14	03/31/24	12 Mos	4,800	GSS STORAGE	4,800	PLEASANT GAP	4,800
EASTERN GAS TRANSMISSION*	100122	FTNN	05/01/15	03/31/30	12 Mos	15,000	GSS STORAGE	15,000	PLEASANT GAP	15,000
EASTERN GAS TRANSMISSION*	200687	FT	05/01/15	03/31/30	12 Mos	5,000	TRANSCO LEIDY	5,000	PLEASANT GAP	5,000
EASTERN GAS TRANSMISSION*	200539	FT	11/01/09	10/31/24	NOV-MAR	3,000	OAKFORD	3,000	CPA @ WARRENDALE	3,000
					APR-OCT	2,000				
EASTERN GAS TRANSMISSION*	200754	FT	04/01/20	03/31/30	12 Mos	255	DETI Loudoun	255	CPA @ CENTRE HALL	3,000
EQUITRANS	1588	FTS	04/01/20	03/31/25	NOV-MAR	18,870	Rhinehart m11183	18,870	CPA @ **SPARTON**	18,870
EQUITRANS	1590	NOFT	04/01/20	03/31/25	NOV-MAR	36,130	Rhinehart m11183, Storag	36,130	CPA @ **SPARTON**	36,180
					APRIL & OCT	32,000	Rhinehart m11183	32,000		32,000
					MAY - SEPT	20,000	Rhinehart m11183	20,000		20,000
NATIONAL FUEL	F02091	FT	11/01/98	10/31/21 (1)	12 Mos	4,304	TRANSCO LEIDY	4,304	CPA@WARREN	4,304
NATIONAL FUEL	E12637	EFT	10/01/21	03/31/31	12 Mos	4,000	NFSTOR/MERCER	4,000	CPA@FINDLAY TWNSHIP	4,304
TENNESSEE GAS	345027-FTATGP	FT-A	11/01/19	10/31/24	12 Mos	16,000	ZONE 4 POOL	16,000	CPA @ NEW CASTLE	16,000
TENNESSEE GAS	63409-FTATGP	FT-A	11/01/07	10/31/26	12 Mos	7,600	ZONE 4 POOL	7,600	CPA @ PITT TERMINAL	7,600
TEXAS EASTERN	800387	CDS	11/01/06	10/31/23	12 Mos	2,342	VENICE	941	COL GAS @ ROCKWOOD	2,342
							ST LANDRY	1,401	CPA @ ST COLLEGE	287
									CPA @ EMIGSVILLE	2,342
									COL GAS @ EAGLE	2,342
									CPA @ CHAMBERSBURG	219
TEXAS EASTERN	910464	CDS	11/01/06	10/31/26	12 Mos	5,000	MRPL	5,000	CPA @ ROCKWOOD/CHANMBERSBURC	2,758
TEXAS EASTERN	910463	CDS	11/01/06	10/31/26	12 Mos	158	MRPL	158	CPA @ CHAMBERSBURG	158
TEXAS EASTERN	910951	FT-1	11/01/12	10/31/22	12 Mos	11,753	ELA, M1	11,753	CPA @ UNIONTOWN	11,753
TEXAS EASTERN	830049	FT-1	12/01/98	11/30/23	DEC-MAR	10,000	EAGLE	10,000	CPA @ ST COLLEGE	1,658
									CPA @ ROCKWOOD	8,242
									CPA @ CHAMBERSBURG	100
TEXAS EASTERN	911660	FT-1	11/01/19	10/31/22	12 Mos	100	79965 Marietta Extension	100	CPA @ JOHNSON RD	100

FIRM UPSTREAM TRANSPORTATION AGREEMENTS

TRANSPORTER	CONTRACT NUMBER	RATE SCHEDULE	EFFECTIVE DATE	PRIMARY TERMINATION DATE	SEASONAL	CONTRACT QUANTITY DTH/D	RECEIPT POINT	REC POINT QUANTITY DTH/D	CITY GATE DELIVERY POINT	DEL POINT QUANTITY DTH/D
TEXAS EASTERN	910951R1	FT-1	11/01/12	10/31/2022 (1)	12 Mos	3,082	ELA, M1	3,082	COL GAS @ DELMONT	3,082

STORAGE

COUNTERPARTY	CONTRACT NUMBER	RATE SCHEDULE	EFFECTIVE DATE	PRIMARY TERMINATION DATE		CONTRACT QUANTITY DTH/D		
COLUMBIA GAS	82512	FSS	04/01/05	03/31/22	MDQ	441,576	REQUIRES COLUMBIA GAS SST FOR DELIVERY TO THE CITY GATE	
					SCQ	24,492,495		
EASTERN GAS TRANSMISSION*	600037	GSS	06/01/05	03/31/28	MDQ	9,000	REQUIRES DTI FTNN-GSS AND FT FOR DELIVERY TO THE CITY GATE	
					SCQ	941,176		
EASTERN GAS TRANSMISSION*	300195	GSS	04/01/14	03/31/24	MDQ	4,800	REQUIRES DTI FTNN-GSS AND FT FOR DELIVERY TO THE CITY GATE	
					SCQ	240,000		
EASTERN GAS TRANSMISSION*	300206	GSS	05/01/15	03/31/30	MDQ	15,000	REQUIRES DTI FTNN-GSS AND FT FOR DELIVERY TO THE CITY GATE	
					SCQ	930,000		
EQUITRANS	1589	115SS	04/01/20	03/31/25	MDQ	19,130	REQUIRES EQUITRANS FTS FOR DELIVERY TO THE CITY GATE	
					SCQ	2,000,000		
NATIONAL FUEL	G12636	ESS	10/01/21	03/31/31	MDQ	2,429		267,143
					SCQ	167,143		
BLACKHAWK					MDQ	10,000	ON SYSTEM STORAGE	
					SCQ	30,000		

EXCHANGES

`

COUNTERPARTY	EFFECTIVE DATE	PRIMARY TERMINATION DATE	CONTRACT QUANTITY DTH/D	
PEOPLES	10/08/93	10/07/22 (1)	NOT SPEC	CITY GATE EXCHANGE
NATIONAL FUEL DIST	12/2/1974	(2)	NOT SPEC	CITY GATE EXCHANGE

STORAGE RATCHET PROVISIONS

COLUMBIA FSS

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

EASTERN GSS

SCQ LEVEL	MDWQ
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.

BLACKHAWK

RATCHETS DO NOT APPLY

EQUITRANS 115SS

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

NATIONAL FUEL

SCQ LEVEL	MDWQ
Inventory >30%	100% OF MDWQ
Inventory 20-30%	90% OF MDWQ
Inventory 10-20%	80% OF MDWQ
Inventory <10%	70% OF MDWQ

TERM NOTES:
(1) YEAR TO YEAR THEREAFTER
(2) THEREAFTER UNTIL TERMINATED

*EASTERN GAS TRANSMISSION AND STORAGE (FORMERLY DOMINION TRANSMISSION)

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, 2021.

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, 2021.

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, 2021.

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, 2021

	Volumes											
	Dec-20 DTH	Jan-21 DTH	Feb-21 DTH	Mar-21 DTH	Apr-21 DTH	May-21 DTH	Jun-21 DTH	Jul-21 DTH	Aug-21 DTH	Sep-21 DTH	Oct-21 DTH	Nov-21 DTH
NSS	8,687.0	9,870.0	10,443.0	8,363.0	6,711.0	4,571.0	2,326.0	2,203.0	2,318.0	2,287.0	2,929.0	7,052.0

	Revenues											
	Dec-20 $	Jan-21 $	Feb-21 $	Mar-21 $	Apr-21 $	May-21 $	Jun-21 $	Jul-21 $	Aug-21 $	Sep-21 $	Oct-21 $	Nov-21 $
NSS	37,719.64	39,097.82	44,314.02	36,236.71	27,631.44	20,937.08	11,926.56	12,685.64	14,246.50	14,668.87	22,935.35	54,929.07

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, 2021

Volumes

	Dec-20 DTH	Jan-21 DTH	Feb-21 DTH	Mar-21 DTH	Apr-21 DTH	May-21 DTH	Jun-21 DTH	Jul-21 DTH	Aug-21 DTH	Sep-21 DTH	Oct-21 DTH	Nov-21 DTH
LDS FLEX	820,666.0	881,941.0	900,299.0	774,332.0	755,094.0	657,560.0	599,944.0	623,667.0	621,606.0	757,076.0	737,905.0	836,873.0
MLDS I FLEX	177,822.0	196,532.0	219,086.0	185,859.0	190,317.0	177,350.0	173,460.0	154,382.0	181,890.0	171,917.0	140,063.0	209,673.0
MLDS II FLEX	42,120.0	51,269.0	63,503.0	44,728.0	14,958.0	23,014.0	29,622.0	21,586.0	34,471.0	39,092.0	36,657.0	49,509.0
SDS FLEX	4,805.0	5,583.0	5,862.0	3,944.0	3,570.0	3,256.0	2,916.0	2,716.0	2,533.0	2,690.0	2,808.0	3,630.0
SGDS FLEX	1,315.0	1,716.0	1,654.0	1,544.0	1,020.0	549.0	378.0	235.0	224.0	232.0	276.0	665.0

Revenues

	Dec-20 $	Jan-21 $	Feb-21 $	Mar-21 $	Apr-21 $	May-21 $	Jun-21 $	Jul-21 $	Aug-21 $	Sep-21 $	Oct-21 $	Nov-21 $
LDS FLEX	248,274	264,131	273,751	269,155	256,455	279,832	260,353	260,693	237,393	275,754	280,537	280,125
MLDS I FLEX	23,984	25,737	27,850	24,737	25,155	23,940	23,575	21,788	24,365	23,431	20,446	26,968
MLDS II FLEX	15,468	17,939	21,242	16,173	8,135	10,310	12,094	9,924	13,403	14,651	13,993	17,463
SDS FLEX	9,612	10,668	10,852	9,712	9,454	9,185	8,958	8,827	8,683	8,785	8,876	4,525
SGDS FLEX	1,728	2,234	2,168	1,998	1,333	886	698	577	551	561	635	1,036

Columbia Gas of Pennsylvania, Inc.

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

1For the 12 Months Ending November 30, 2021

Volumes

	Dec-20 DTH	Jan-21 DTH	Feb-21 DTH	Mar-21 DTH	Apr-21 DTH	May-21 DTH	Jun-21 DTH	Jul-21 DTH	Aug-21 DTH	Sep-21 DTH	Oct-21 DTH	Nov-21 DTH
LDS	928,318.0	935,980.0	1,025,325.0	971,270.0	948,872.0	872,545.0	809,742.0	785,241.0	816,570.0	800,488.0	856,323.0	973,827.0
MLDS I	15,785.0	17,255.0	21,083.0	21,399.0	124,589.0	24,157.0	47,306.0	40,933.0	104,763.0	38,854.0	100,212.0	75,828.0
MLDS II	126,358.0	143,850.0	123,204.0	138,823.0	126,457.0	123,830.0	118,136.0	122,321.0	133,947.0	164,602.0	184,719.0	186,609.0
RDS	632,365.6	921,675.0	949,562.8	753,284.3	397,066.2	265,729.5	133,939.8	77,038.4	67,062.1	69,086.5	83,533.9	264,123.9
SCD	362,883.8	555,517.8	580,745.9	474,021.6	245,198.0	156,752.9	87,572.9	61,283.8	58,209.2	59,523.6	69,459.8	166,827.1
SDS	656,176.0	816,581.0	897,654.0	724,593.0	522,688.0	422,670.0	313,775.0	286,254.0	291,013.0	297,014.0	319,635.0	492,017.0
SGDS	446,045.0	645,061.0	686,431.0	544,757.0	305,727.0	211,444.0	120,247.0	83,371.0	80,477.0	84,146.0	99,893.0	228,305.0

Revenues

	Dec-20 $	Jan-21 $	Feb-21 $	Mar-21 $	Apr-21 $	May-21 $	Jun-21 $	Jul-21 $	Aug-21 $	Sep-21 $	Oct-21 $	Nov-21 $
LDS	1,415,805.05	1,461,532.33	1,554,065.88	1,692,854.36	1,657,592.86	1,533,280.50	1,434,045.29	1,387,821.27	1,440,224.57	1,415,411.76	1,497,657.37	1,696,169.09
MLDS I	4,657.6	3,889.7	4,266.3	4,092.8	152,312.0	4,366.9	6,543.7	5,929.0	11,915.9	13,328.4	30,808.3	57,219.0
MLDS II	71,474.9	73,568.8	65,170.7	68,118.0	63,555.4	62,534.1	60,320.3	61,786.9	67,114.0	80,848.7	89,500.0	90,445.8
RDS	6,604,539.1	9,092,191.1	9,615,400.8	8,960,022.0	5,412,474.0	3,239,170.9	2,269,632.1	1,678,663.9	1,569,626.0	1,584,720.7	1,744,796.8	3,886,549.5
SCD	2,222,657.0	3,477,442.0	3,873,451.9	3,797,338.9	1,955,893.0	1,341,941.0	861,599.7	676,985.5	654,162.9	662,721.6	734,465.3	1,439,366.0
SDS	1,916,677.7	2,341,874.9	2,558,696.0	2,483,297.4	1,848,643.1	1,541,768.9	1,197,973.3	1,106,433.9	1,121,536.3	1,139,577.6	1,209,771.4	1,746,733.2
SGDS	1,824,902.3	2,617,553.14	2,781,604.45	2,568,618.53	1,489,108.74	1,060,610.81	647,324.51	479,013.19	465,165.08	480,744.01	550,314.60	1,129,603.99

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. GAS-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, 2023

		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	510,610.7	526,821.2	454,245.7	297,368.0	152,133.3	71,677.2	37,996.1	33,223.7	33,045.6	64,416.1	195,304.4	389,176.4	2,766,018.4
LDS	COM	276,600.0	272,700.0	244,300.0	209,600.0	167,900.0	139,100.0	131,000.0	135,100.0	137,800.0	156,500.0	215,000.0	259,400.0	2,345,000.0
LDS	IND	730,522.0	779,381.8	793,759.0	773,385.9	747,564.7	694,785.7	673,197.8	701,362.7	712,805.8	753,365.2	806,600.4	773,869.2	8,940,600.2
LDS FLEX	COM	269,000.0	268,000.0	225,000.0	175,000.0	135,000.0	103,000.0	107,000.0	107,000.0	107,000.0	139,000.0	180,000.0	242,000.0	2,057,000.0
LDS FLEX	IND	668,890.2	662,289.8	652,877.7	617,748.3	550,319.7	501,765.7	470,988.6	459,381.4	510,087.8	581,181.0	644,021.1	640,781.7	6,960,333.0
LGSS	COM	147,741.6	160,663.7	122,557.4	98,595.9	54,672.5	33,908.5	29,579.9	28,596.2	31,318.7	37,197.4	69,984.1	121,828.5	936,644.4
LGSS	IND	14,041.6	13,803.7	11,429.0	9,860.0	8,465.7	7,563.9	7,465.6	8,825.7	8,193.5	9,249.3	11,450.2	15,735.2	126,083.4
MLDS I	COM	14,400.0	14,100.0	12,400.0	9,300.0	8,000.0	6,600.0	5,500.0	4,300.0	6,600.0	6,700.0	11,000.0	14,100.0	113,000.0
MLDS I	IND	39,500.0	39,200.0	38,800.0	38,800.0	43,400.0	43,500.0	43,500.0	43,600.0	43,600.0	43,900.0	39,300.0	38,900.0	496,000.0
MLDS I FLEX	IND	200,000.0	224,000.0	200,000.0	210,000.0	190,000.0	185,000.0	171,000.0	176,000.0	166,000.0	161,000.0	176,000.0	195,000.0	2,254,000.0
MLDS II	IND	218,010.3	205,401.9	210,250.3	211,559.1	201,727.6	192,943.8	189,458.1	191,443.5	214,935.1	231,611.6	238,558.0	207,214.3	2,513,113.6
MLDS II FLEX	IND	59,800.0	68,400.0	59,600.0	57,100.0	50,400.0	51,300.0	36,200.0	51,300.0	45,000.0	51,800.0	58,700.0	64,400.0	654,000.0
NSS	COM	10,100.0	10,000.0	8,800.0	8,200.0	4,600.0	2,900.0	2,300.0	2,300.0	2,300.0	3,800.0	7,500.0	9,200.0	72,000.0
RDS	RES	773,774.7	777,326.0	662,865.8	463,186.2	182,594.1	95,198.8	57,762.4	55,391.1	53,744.0	100,661.0	275,966.3	567,564.0	4,066,034.4
RSS	RES	5,351,842.6	5,504,939.9	4,591,664.4	2,838,663.1	1,421,149.3	726,408.1	430,139.3	405,949.4	405,949.5	640,993.0	1,845,068.3	3,995,641.0	28,158,407.9
SCD	COM	576,547.1	573,326.5	484,715.3	288,588.0	154,761.9	91,338.0	63,674.9	61,138.6	63,371.4	81,661.5	183,358.3	408,366.6	3,030,848.1
SDS	COM	619,412.2	651,229.1	520,484.9	424,776.5	252,519.6	182,218.5	145,958.4	147,066.8	165,360.1	209,056.4	361,778.8	515,270.1	4,195,131.4
SDS	IND	187,537.2	218,005.0	185,028.0	164,553.2	146,576.1	121,019.1	114,878.0	114,209.5	107,558.3	114,938.3	142,077.0	174,106.1	1,790,485.8
SDS FLEX	COM	4,700.0	4,500.0	4,000.0	3,700.0	3,000.0	2,800.0	2,600.0	2,500.0	2,900.0	3,050.0	3,750.0	4,500.0	42,000.0
SDS FLEX	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
SGDS	COM	637,572.4	658,339.7	519,227.5	358,079.9	194,200.1	118,152.5	81,935.7	79,256.1	91,421.2	121,602.3	266,599.0	499,131.7	3,625,518.1
SGDS	IND	15,384.6	18,005.3	15,015.6	8,657.8	5,554.8	2,923.9	2,161.5	1,687.9	1,583.5	1,953.0	4,286.5	9,634.7	86,849.1
SGDS FLEX	COM	2,045.0	1,740.0	1,515.0	1,105.0	550.0	310.0	250.0	230.0	250.0	295.0	880.0	1,530.0	10,700.0
SGSS	COM	1,471,814.4	1,506,535.4	1,279,260.4	768,709.5	407,886.0	225,545.5	162,893.9	149,565.1	162,127.4	215,726.8	497,450.0	1,029,081.3	7,876,595.7
SGSS	IND	15,839.5	17,021.5	14,390.1	8,165.3	4,522.4	1,922.2	2,462.1	2,387.1	1,503.1	3,192.7	6,335.9	21,453.8	99,195.7
Total		12,815,686.1	13,175,730.5	11,312,186.1	8,044,701.7	5,087,497.8	3,601,881.4	2,969,902.3	2,961,814.8	3,074,455.0	3,732,850.6	6,240,968.3	10,197,884.6	83,215,559.2

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. 6 with related Exhibits KLJ-1, KLJ-2, KLJ-3, and KLJ-4 contains descriptions, calculations, and rationale 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 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.