Columbia Gas of Pennsylvania, Inc.
2021 General Rate Case
Docket No. R-2021-3024296
Standard Data Request
GASCOS No. 01-21
Volume 1 of 1

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.

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

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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.

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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.

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Question No. GAS-COS-004:

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

Response:

The requested breakdown is as follows:

Diameter	Quantity (Feet)	Amount $
1/2"	3	233
3/4"	6,101	11,390
1"	55,692	238,020
1-1/8"	1,151	5,619
1-1/4"	602,388	2,835,391
1-1/2"	8,319	11,473
2"	14,419,497	297,367,441
2-1/2"	3,773	18,811
3"	2,981,747	29,098,901
3-1/4"	0	3,764
3-1/2"	3,649	20,815
4"	11,793,181	501,673,568
4-1/2"	1,458	18,124
4-7/8"	7,635	17,413
5"	31,965	32,845
5-1/4"	11	344
5-3/16"	16,898	35,878
5-5/8"	11,180	13,923
6"	5,862,831	304,461,790
6-1/4"	15,930	5,618
6-5/8"	88,404	643,886
7-5/8"	636	25,405
8"	3,148,214	277,338,781

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	8-1/4"	282	2,429
	8-5/8"	8,232	361,804
	9-5/8"	1,269	7,380
	10"	733,280	33,972,854
	12"	428,860	53,083,404
	14"	450	5,167
	16"	341,599	36,428,783
	20"	33,775	6,378,737
Total Pipe		40,608,411	1,544,119,990

$448,485,484

Other Costs (Valves, Castings, etc.) and 106 Unclassified

Per Exhibit 8, Schedule 1, Page 1, Col. 8 Total Gas In Service, Lines 30 thru 33. **$1,992,605,474**

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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.

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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, 2020. The company does not maintain on its books and records, the service line investment by size, by customer class. Please see Columbia Statement No. 11 for an explanation of the assignment of services to the various rate schedules for the Company's Class Cost of Service Studies.

101-1000 Gas Plant in Service

SIZE	**COST**
OTHER	95,226
UNDER 3"	626,251,297
3"	976,707
3-1/8"	5,672
3-1/2"	2,099
4"	3,063,581
4-1/2"	5,980
5"	3,062
6"	364,776
6-5/8"	2,650
8"	93,262
8-5/8"	663
10"	112
11-1/8"	0
12"	488,788
16"	0
20"	158
TOTAL ACCOUNT 380	631,354,032

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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, 2020. The Company's books and records do not identify the assignment of meters to the various customer classes. Please see Columbia Statement No. 11 for an explanation of the assignment of meters to each customer rate class for the Class Cost of Service studies.

Size Cubic Feet Per Hour		**Investment $**
0 - 500		25,667,074
501 - 1000		5,685,741
1001 - 1500		961,604
Over 1500		7,213,123
Unclassified		1,215,462
Total Account	381	40,743,004

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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.

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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.

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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.

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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.

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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: A 1,439' 2" PMMP main line extension required to serve 6 customers located on an existing street.

Project Name	Kern Rd Conversions
WMS Project ID	WMS1854966
Company	37 - Columbia Gas of Pennsylvania, Inc.
Location	2421 - York

Project Summary

	Minimum	Recommended
Max Term of Cash Flow Analysis (Years)	40	
Total Added Connect Load (Dth/Hr)	0.79	
Total Added Max Hour (Dth/Hr)	0.34	
Total Added Max Day (Dth)	2.28	
Total Annual Load Increase (Dth)	393.00	
Services Count	6	6
Meters/Regulators Count	6	6
Service and M/R Costs	$11,426.00	$31,604.00
Extension Costs	$29,418.00	$79,540.00
Betterment Costs	$0.00	$0.00
Relocation Costs	$0.00	$0.00
Total Plant Investment	$40,844.00	$111,144.00 *
Net Present Value (NPV) Cash Flow	$6,268.63	($34,121.82)
Required CIAC	$0.00	$34,121.82
Required CIAC with Gross Up	* * *	* * *
NASR Amount	**$0.00**	
Actual CIAC	**$0.00**	
IRR without Deposit	7.53 %	2.40 %
IRR with Deposit	7.53 %	6.00 %
Discounted Payback Years	22	71
Total Annual Revenue Addition	$3,302.18	$3,302.18
Cost of Capital %	6.00 %	6.00 %

Investment Description

Install 1439'-2" PMMP
Install Ac 250 meter to all 5 customers
Install 1-1/4" B-42 IMR regulator; 3/16" orifice; brown spring to all 5 customers

Project estimated to be installed in the grass; including 3 road crossings

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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 2017/2018 through 2019/2020 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 2017/2018 through 2019/2020 eating 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 peak day requirements.

Attachment D to this response provides by revenue class the peak day requirements for Winter 2020-2021 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.

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Attachment E to this response provides the winter 2020-2021 forecasted design peak day requirements, as contained on GAS-COS-010 Attachment D, segregated by rate schedule and service type.

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Historical Peak Day

Units are in MDth/Day

	Historical Winter Season		
	2019 / 20	**2018 / 19**	**2017 / 18**
Day of Week	Wed	Wed	Fri
Date	Dec. 18	Jan. 30	Jan. 5
Current Day Average Temp	20° F	1° F	5° F
Prior Day Average Temp	29° F	17° F	10° F
Current Day Average Wind Speed	15 mph	13 mph	16 mph
Requirements (1)			
Residential	299.5	412.6	417.6
Commercial	168.5	242.3	245.3
Industrial	82.1	91.9	81.9
Total Retail:	**550.1**	**746.8**	**744.8**
Company Use:	0.7	0.5	0.5
Unaccounted For:	1.8	1.6	1.1
Total Requirements:	**552.6**	**748.9**	**746.4**
Supply (2)			
Columbia Gas Transmission Corp.	444.9	599.8	589.5
Dominion	39.7	44.4	37.6
Equitrans	10.5	12.5	12.6
National Fuel Gas Supply Corp.	4.4	6.3	5.7
Tennessee Gas Pipeline	18.9	28.1	25.0
Texas Eastern Transmission	29.9	53.1	71.9
Direct Local	3.1	4.7	3.8
Blackhawk Storage	1.2	0.0	0.0
Total Supply:	**552.6**	**748.9**	**746.6**

(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		
	2019 / 20	**2018 / 19**	**2017 / 18**
Day of Week	Wed	Wed	Fri
Date	Dec. 18	Jan. 30	Jan. 5
Current Day Average Temp	20° F	1° F	5° F
Prior Day Average Temp	29° F	17° F	10° F
Current Day Average Wind Speed	15 mph	13 mph	16 mph
Requirements (2)			
Commercial			
SGDS	25.8	36.4	37.7
LDS	40.0	48.9	26.8
MLDS	0.6	0.8	0.8
NCS	0.3	0.3	0.4
SDS	10.3	14.5	30.4
Total Commercial	**77.0**	**101.0**	**96.1**
Industrial			
SGDS	0.7	1.0	1.2
LDS	64.5	70.5	55.2
MLDS	14.3	18.7	14.5
NCS	0.0	0.0	0.0
SDS	1.3	1.1	10.5
Total Industrial	**80.9**	**91.4**	**81.4**
Requirements	**158.0**	**192.4**	**177.5**
Supply (3)			
Columbia Gas Transmission Corp.	127.2	154.1	140.2
Dominion Transmission Inc.	11.3	11.4	8.9
Equitrans	3.0	3.2	3.0
National Fuel Gas Supply Corp.	1.3	1.6	1.4
Tennessee Gas Pipeline	5.4	7.2	5.9
Texas Eastern Transmission	8.5	13.6	17.1
Direct Local	0.9	1.2	0.9
Blackhawk Storage	0.3	0.0	0.0
Total Supply:	**158.0**	**192.4**	**177.5**

[1] Excludes Choice quantities (SCD).

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

[3] Transportation supplies via identified sources.

Columbia Gas Of Pennsylvania

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

	Dec. 18, 2019 Total Demand			Jan. 30, 2019 Total Demand			Jan. 5, 2018 Total Demand		
	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput
Residential									
RS	211.6	0.0	211.6	285.5	0.0	285.5	284.5	0.0	284.5
RCC	19.9	0.0	19.9	28.6	0.0	28.6	28.5	0.0	28.5
RTC	0.0	68.0	68.0	0.0	98.5	98.5	0.0	98.1	98.1
Residential Total	**231.5**	**68.0**	**299.5**	**314.1**	**98.5**	**412.6**	**313.0**	**98.1**	**411.1**
Commercial									
LDS/LGSS	0.0	11.0	11.0	0.0	16.0	16.0	0.0	16.6	16.6
LDS FLEX	0.0	9.2	9.2	0.0	13.0	13.0	0.0	13.5	13.5
MDS	0.0	0.5	0.5	0.7	0.8	1.5	0.7	0.8	1.5
SDS/LGSS	0.0	30.8	30.8	11.2	30.4	41.6	11.6	31.6	43.2
SDS/LGSS FLEX	0.0	0.0	0.0	0.0	1.0	1.0	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	0.0	65.8	65.8	50.3	0.0	50.3	52.3	0.0	52.3
SGS1	0.0	51.5	51.5	50.4	0.0	50.4	52.4	0.0	52.4
SGDS1 FLEX	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	19.1	19.1	0.0	19.8	19.8
SCD2	0.0	0.0	0.0	0.0	16.9	16.9	0.0	17.6	17.6
SGDS1	0.0	0.0	0.0	0.0	2.1	2.1	0.0	2.1	2.1
SGDS2	0.0	0.0	0.0	0.0	30.5	30.5	0.0	31.7	31.7
SGDS2 FLEX	0.0	0.0	0.0	0.0	0.1	0.1	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	**0.0**	**168.8**	**168.8**	**112.5**	**129.8**	**242.3**	**117.0**	**134.9**	**251.9**
Industrial									
LDS/LGSS	0.0	26.6	26.6	0.0	27.2	27.2	0.0	24.2	24.2
LDS FLEX	0.0	28.7	28.7	0.0	36.2	36.2	0.0	32.3	32.3
MDS	0.0	3.9	3.9	0.0	2.1	2.1	0.0	1.9	1.9
MDS FLEX	0.0	11.7	11.7	0.0	14.6	14.6	0.0	13.0	13.0
SDS/LGSS	0.5	9.0	9.5	0.2	10.3	10.5	0.2	9.2	9.4
SDS/LGSS FLEX	0.0	0.0	0.0	0.0	0.1	0.1	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	0.7	0.7	1.4	0.4	0.0	0.4	0.3	0.0	0.3
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	0.7	0.7	0.0	0.7	0.7
SS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Industrial	**1.2**	**80.6**	**81.8**	**0.6**	**91.3**	**91.9**	**0.5**	**81.4**	**81.9**
Other	**2.5**	**0.0**	**2.5**	**2.1**	**0.0**	**2.1**	**1.7**	**0.0**	**1.7**
2019/20 Design Day	**235.2**	**317.4**	**552.6**	**429.3**	**319.6**	**748.9**	**432.1**	**314.4**	**746.6**

Note: Allocation based on Design Day breakout.

Columbia Gas of Pennsylvania

Forecasted Design Day Requirements and Supply
For 2020/21 Heating Season
Units are in MDth/Day

	Total Design Day Demand
	2020 / 21
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	465.0
Commercial (2)	156.4
Industrial (2)	1.3
Company Use	0.7
Unaccounted For Gas	1.8
Total Firm:	**625.2**
Non-Firm: Residential	0.0
Commercial	98.0
Industrial	87.9
Total Non-Firm:	**185.9**
Total Requirements:	**811.1**
Supply (3)	
Columbia Gas Transmission Corp.	481.7
Dominion	34.1
Equitrans	55.0
National Fuel Gas Supply Corp.	4.2
Tennessee Gas Pipeline	19.3
Texas Eastern Transmission	19.3
Direct Local	0.7
Blackhawk Storage	0.0
Total Supply:	**614.2**
Imbalance (4)	**196.9**

(1) Per CPA's "2019 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

2020 Design Day Forecast, 2020/21 - 2024/25

2020/21 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	328.6	0.0	328.6	328.6	0.0	328.6	0.0	0.0	0.0
RCC	30.9	0.0	30.9	30.9	0.0	30.9	0.0	0.0	0.0
RTC	0.0	105.5	105.5	0.0	105.5	105.5	0.0	0.0	0.0
Residential Total	**359.5**	**105.5**	**465.0**	**359.5**	**105.5**	**465.0**	**0.0**	**0.0**	**0.0**
Commercial									
LDS/LGSS (2)	0.2	16.5	16.7	0.2	0.0	0.2	0.0	16.5	16.5
LDS FLEX	0.0	13.7	13.7	0.0	0.0	0.0	0.0	13.7	13.7
MDS	0.7	0.7	1.4	0.7	0.0	0.7	0.0	0.7	0.7
SDS/LGSS	11.8	33.7	45.5	11.8	0.0	11.8	0.0	33.7	33.7
SGS1/SCD1/SGD1	54.5	23.2	77.7	54.5	20.7	75.2	0.0	2.5	2.5
SGS2/SCD2/SGD2	51.6	47.8	99.4	51.6	17.0	68.6	0.0	30.8	30.8
Total Commercial	**118.8**	**135.6**	**254.4**	**118.8**	**37.7**	**156.5**	**0.0**	**97.9**	**97.9**
Industrial									
LDS/LGSS (2)	0.0	29.0	29.0	0.0	0.0	0.0	0.0	29.0	29.0
LDS FLEX	0.0	31.5	31.5	0.0	0.0	0.0	0.0	31.5	31.5
MDS (2)	0.0	4.2	4.2	0.0	0.0	0.0	0.0	4.2	4.2
MDS FLEX	0.0	12.8	12.8	0.0	0.0	0.0	0.0	12.8	12.8
SDS/LGSS	0.5	9.9	10.4	0.5	0.0	0.5	0.0	9.9	9.9
SGS2/SCD2/SGD2	0.8	0.8	1.6	0.8	0.0	0.8	0.0	0.8	0.8
Total Industrial	**1.3**	**88.2**	**89.5**	**1.3**	**0.0**	**1.3**	**0.0**	**88.2**	**88.2**
Other	**2.5**	**0.0**	**2.5**	**2.5**	**0.0**	**2.5**	**0.0**	**0.0**	**0.0**
2020/21 Design Day	**482.1**	**329.3**	**811.4**	**482.1**	**143.2**	**625.3**	**0.0**	**186.1**	**186.1**

(2) 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, 2019 through March 31, 2020.

Columbia Gas of Pennsylvania
Heating Season November 2019 Through March 2020
Daily Dth Sendout

Date	Dth
11/01/19	303,166
11/02/19	256,848
11/03/19	277,728
11/04/19	233,857
11/05/19	282,423
11/06/19	256,336
11/07/19	338,062
11/08/19	394,216
11/09/19	321,437
11/10/19	240,590
11/11/19	251,598
11/12/19	464,712
11/13/19	446,799
11/14/19	394,091
11/15/19	336,268
11/16/19	358,881
11/17/19	334,656
11/18/19	323,412
11/19/19	312,938
11/20/19	353,525
11/21/19	265,559
11/22/19	351,411
11/23/19	310,966
11/24/19	340,278
11/25/19	288,438
11/26/19	232,245
11/27/19	252,549
11/28/19	306,846
11/29/19	319,082
11/30/19	301,164
12/01/19	316,243
12/02/19	381,341
12/03/19	398,852
12/04/19	399,745
12/05/19	397,770
12/06/19	371,252
12/07/19	394,876
12/08/19	310,300
12/09/19	251,286
12/10/19	394,083
12/11/19	490,412
12/12/19	432,941
12/13/19	348,612
12/14/19	330,468

Columbia Gas of Pennsylvania
Heating Season November 2019 Through March 2020
Daily Dth Sendout

Date	Dth
12/15/19	393,893
12/16/19	404,717
12/17/19	445,823
12/18/19	552,599
12/19/19	532,730
12/20/19	451,546
12/21/19	405,662
12/22/19	356,449
12/23/19	330,269
12/24/19	342,507
12/25/19	323,813
12/26/19	248,880
12/27/19	250,329
12/28/19	266,733
12/29/19	223,651
12/30/19	281,877
12/31/19	353,268
01/01/20	373,968
01/02/20	297,390
01/03/20	242,012
01/04/20	324,890
01/05/20	388,511
01/06/20	380,505
01/07/20	417,712
01/08/20	496,442
01/09/20	399,233
01/10/20	247,380
01/11/20	154,270
01/12/20	294,118
01/13/20	325,190
01/14/20	316,183
01/15/20	267,836
01/16/20	433,324
01/17/20	455,868
01/18/20	400,721
01/19/20	525,473
01/20/20	532,968
01/21/20	540,483
01/22/20	474,223
01/23/20	396,593
01/24/20	321,209
01/25/20	343,385
01/26/20	382,994
01/27/20	396,791

Columbia Gas of Pennsylvania
Heating Season November 2019 Through March 2020
Daily Dth Sendout

Date	Dth
01/28/20	408,575
01/29/20	440,772
01/30/20	420,201
01/31/20	369,481
02/01/20	355,185
02/02/20	305,165
02/03/20	220,531
02/04/20	291,694
02/05/20	372,377
02/06/20	360,321
02/07/20	439,006
02/08/20	395,854
02/09/20	348,551
02/10/20	323,286
02/11/20	367,035
02/12/20	373,120
02/13/20	420,625
02/14/20	536,503
02/15/20	413,944
02/16/20	388,176
02/17/20	315,686
02/18/20	330,219
02/19/20	410,024
02/20/20	510,155
02/21/20	450,487
02/22/20	369,747
02/23/20	317,324
02/24/20	268,832
02/25/20	275,951
02/26/20	342,931
02/27/20	487,589
02/28/20	465,559
02/29/20	463,141
03/01/20	331,339
03/02/20	251,666
03/03/20	290,060
03/04/20	318,864
03/05/20	315,093
03/06/20	370,917
03/07/20	330,887
03/08/20	249,799
03/09/20	180,826
03/10/20	251,494
03/11/20	282,472

Columbia Gas of Pennsylvania
Heating Season November 2019 Through March 2020
Daily Dth Sendout

Date	Dth
03/12/20	180,446
03/13/20	224,742
03/14/20	283,556
03/15/20	301,395
03/16/20	286,625
03/17/20	301,939
03/18/20	229,148
03/19/20	170,273
03/20/20	187,139
03/21/20	315,147
03/22/20	270,025
03/23/20	301,618
03/24/20	273,321
03/25/20	266,261
03/26/20	171,730
03/27/20	155,212
03/28/20	142,713
03/29/20	144,149
03/30/20	225,548

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-12:

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

Response:

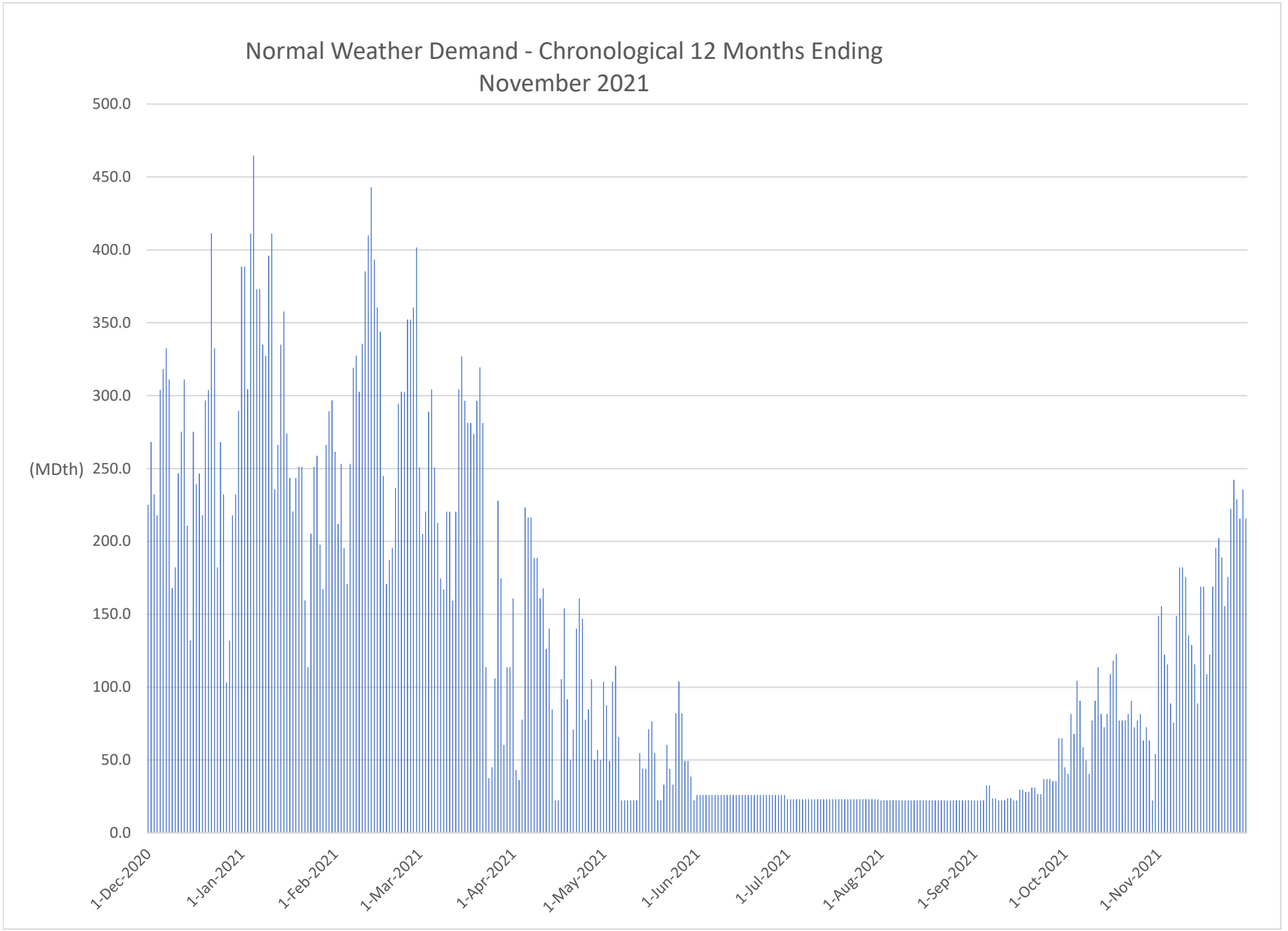
The Company's basic supply and capacity analysis tool is the SENDOUT® Gas Planning System provided by ABB Enterprise Software of Atlanta, Georgia. SENDOUT® determines the "optimum," time-dependent levels of pipeline transportation service and storage service to be utilized to meet the Company's prospective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

Pages 1-2. Chronological order for the 12 months ending November 2021.
Page 3. Graphically for the 12 months ending November 2021.
Pages 4-5. Sorted high to low for the 12 months ending November 2021.
Page 6. Graphically for the 12 months ending November 2021.

Normal Weather Firm Demand - Chonological - 12 Months Ending November 2021

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-2020	225.2	1-Feb-2021	261.5	1-Apr-2021	161.0	1-Jun-2021	26.0	1-Aug-2021	22.3	1-Oct-2021	45.1
2-Dec-2020	268.1	2-Feb-2021	212.0	2-Apr-2021	43.1	2-Jun-2021	26.0	2-Aug-2021	22.3	2-Oct-2021	40.6
3-Dec-2020	232.3	3-Feb-2021	253.2	3-Apr-2021	36.2	3-Jun-2021	26.0	3-Aug-2021	22.3	3-Oct-2021	81.7
4-Dec-2020	218.0	4-Feb-2021	195.5	4-Apr-2021	77.8	4-Jun-2021	26.0	4-Aug-2021	22.3	4-Oct-2021	68.0
5-Dec-2020	303.9	5-Feb-2021	170.7	5-Apr-2021	223.4	5-Jun-2021	26.0	5-Aug-2021	22.3	5-Oct-2021	104.5
6-Dec-2020	318.3	6-Feb-2021	253.2	6-Apr-2021	216.4	6-Jun-2021	26.0	6-Aug-2021	22.3	6-Oct-2021	90.8
7-Dec-2020	332.6	7-Feb-2021	319.2	7-Apr-2021	216.4	7-Jun-2021	26.0	7-Aug-2021	22.3	7-Oct-2021	58.8
8-Dec-2020	311.1	8-Feb-2021	327.4	8-Apr-2021	188.7	8-Jun-2021	26.0	8-Aug-2021	22.3	8-Oct-2021	49.7
9-Dec-2020	167.9	9-Feb-2021	302.7	9-Apr-2021	188.7	9-Jun-2021	26.0	9-Aug-2021	22.3	9-Oct-2021	40.6
10-Dec-2020	182.2	10-Feb-2021	335.7	10-Apr-2021	161.0	10-Jun-2021	26.0	10-Aug-2021	22.3	10-Oct-2021	77.1
11-Dec-2020	246.6	11-Feb-2021	385.2	11-Apr-2021	167.9	11-Jun-2021	26.0	11-Aug-2021	22.3	11-Oct-2021	90.8
12-Dec-2020	275.3	12-Feb-2021	409.9	12-Apr-2021	126.3	12-Jun-2021	26.0	12-Aug-2021	22.3	12-Oct-2021	113.6
13-Dec-2020	311.1	13-Feb-2021	442.9	13-Apr-2021	140.2	13-Jun-2021	26.0	13-Aug-2021	22.3	13-Oct-2021	81.7
14-Dec-2020	210.8	14-Feb-2021	393.4	14-Apr-2021	84.7	14-Jun-2021	26.0	14-Aug-2021	22.3	14-Oct-2021	72.5
15-Dec-2020	132.0	15-Feb-2021	360.4	15-Apr-2021	22.3	15-Jun-2021	26.0	15-Aug-2021	22.3	15-Oct-2021	81.7
16-Dec-2020	275.3	16-Feb-2021	343.9	16-Apr-2021	22.3	16-Jun-2021	26.0	16-Aug-2021	22.3	16-Oct-2021	109.1
17-Dec-2020	239.5	17-Feb-2021	245.0	17-Apr-2021	105.5	17-Jun-2021	26.0	17-Aug-2021	22.3	17-Oct-2021	118.2
18-Dec-2020	246.6	18-Feb-2021	170.7	18-Apr-2021	154.0	18-Jun-2021	26.0	18-Aug-2021	22.3	18-Oct-2021	122.8
19-Dec-2020	218.0	19-Feb-2021	187.2	19-Apr-2021	91.6	19-Jun-2021	26.0	19-Aug-2021	22.3	19-Oct-2021	77.1
20-Dec-2020	296.8	20-Feb-2021	195.5	20-Apr-2021	50.0	20-Jun-2021	26.0	20-Aug-2021	22.3	20-Oct-2021	77.1
21-Dec-2020	303.9	21-Feb-2021	236.7	21-Apr-2021	70.8	21-Jun-2021	26.0	21-Aug-2021	22.3	21-Oct-2021	77.1
22-Dec-2020	411.4	22-Feb-2021	294.4	22-Apr-2021	140.2	22-Jun-2021	26.0	22-Aug-2021	22.3	22-Oct-2021	81.7
23-Dec-2020	332.6	23-Feb-2021	302.7	23-Apr-2021	161.0	23-Jun-2021	26.0	23-Aug-2021	22.3	23-Oct-2021	90.8
24-Dec-2020	182.2	24-Feb-2021	302.7	24-Apr-2021	147.1	24-Jun-2021	26.0	24-Aug-2021	22.3	24-Oct-2021	72.5
25-Dec-2020	268.1	25-Feb-2021	352.2	25-Apr-2021	77.8	25-Jun-2021	26.0	25-Aug-2021	22.3	25-Oct-2021	77.1
26-Dec-2020	232.3	26-Feb-2021	352.2	26-Apr-2021	84.7	26-Jun-2021	26.0	26-Aug-2021	22.3	26-Oct-2021	81.7
27-Dec-2020	103.4	27-Feb-2021	360.4	27-Apr-2021	105.5	27-Jun-2021	26.0	27-Aug-2021	22.3	27-Oct-2021	63.4
28-Dec-2020	132.0	28-Feb-2021	401.6	28-Apr-2021	50.0	28-Jun-2021	26.0	28-Aug-2021	22.3	28-Oct-2021	72.5
29-Dec-2020	218.0	1-Mar-2021	250.8	29-Apr-2021	57.0	29-Jun-2021	26.0	29-Aug-2021	22.3	29-Oct-2021	63.4
30-Dec-2020	232.3	2-Mar-2021	205.1	30-Apr-2021	50.0	30-Jun-2021	26.0	30-Aug-2021	22.3	30-Oct-2021	22.3
31-Dec-2020	289.6	3-Mar-2021	220.3	1-May-2021	103.8	1-Jul-2021	23.1	31-Aug-2021	22.3	31-Oct-2021	54.3

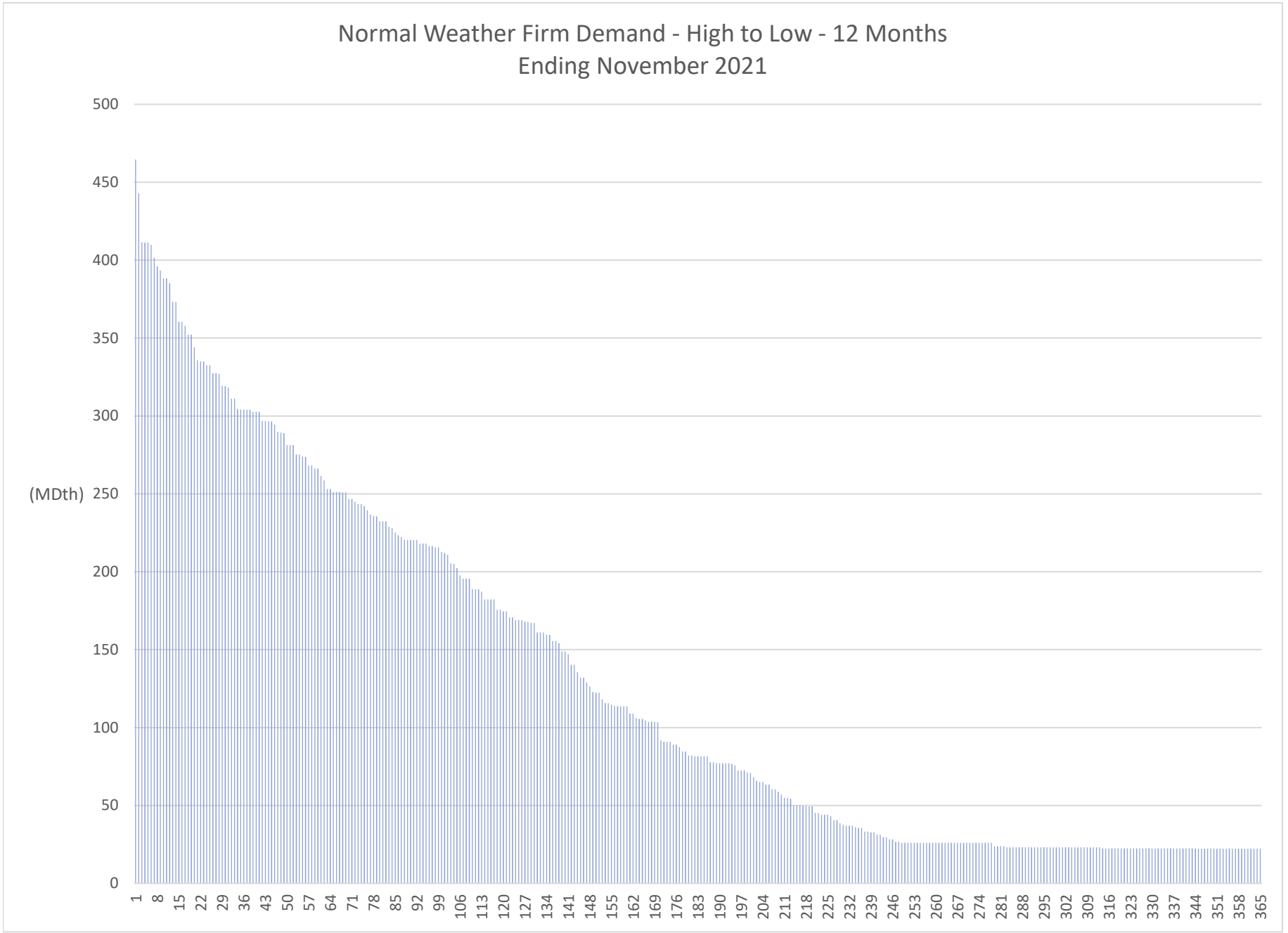
1-Jan-2021	388.3	4-Mar-2021	288.9	2-May-2021	87.5	2-Jul-2021	23.1	1-Sep-2021	22.3	1-Nov-2021	148.9
2-Jan-2021	388.3	5-Mar-2021	304.1	3-May-2021	49.5	3-Jul-2021	23.1	2-Sep-2021	22.3	2-Nov-2021	155.6
3-Jan-2021	304.5	6-Mar-2021	250.8	4-May-2021	103.8	4-Jul-2021	23.1	3-Sep-2021	22.3	3-Nov-2021	122.3
4-Jan-2021	411.2	7-Mar-2021	212.7	5-May-2021	114.6	5-Jul-2021	23.1	4-Sep-2021	22.3	4-Nov-2021	115.6
5-Jan-2021	464.6	8-Mar-2021	174.6	6-May-2021	65.8	6-Jul-2021	23.1	5-Sep-2021	32.6	5-Nov-2021	89.0
6-Jan-2021	373.1	9-Mar-2021	167.0	7-May-2021	22.3	7-Jul-2021	23.1	6-Sep-2021	32.6	6-Nov-2021	75.6
7-Jan-2021	373.1	10-Mar-2021	220.3	8-May-2021	22.3	8-Jul-2021	23.1	7-Sep-2021	23.8	7-Nov-2021	148.9
8-Jan-2021	335.0	11-Mar-2021	220.3	9-May-2021	22.3	9-Jul-2021	23.1	8-Sep-2021	23.8	8-Nov-2021	182.3
9-Jan-2021	327.3	12-Mar-2021	159.4	10-May-2021	22.3	10-Jul-2021	23.1	9-Sep-2021	22.3	9-Nov-2021	182.3
10-Jan-2021	396.0	13-Mar-2021	220.3	11-May-2021	22.3	11-Jul-2021	23.1	10-Sep-2021	22.3	10-Nov-2021	175.6
11-Jan-2021	411.2	14-Mar-2021	304.1	12-May-2021	22.3	12-Jul-2021	23.1	11-Sep-2021	22.3	11-Nov-2021	135.6
12-Jan-2021	235.8	15-Mar-2021	327.0	13-May-2021	54.9	13-Jul-2021	23.1	12-Sep-2021	23.8	12-Nov-2021	128.9
13-Jan-2021	266.3	16-Mar-2021	296.5	14-May-2021	44.0	14-Jul-2021	23.1	13-Sep-2021	23.8	13-Nov-2021	115.6
14-Jan-2021	335.0	17-Mar-2021	281.3	15-May-2021	44.0	15-Jul-2021	23.1	14-Sep-2021	22.3	14-Nov-2021	89.0
15-Jan-2021	357.8	18-Mar-2021	281.3	16-May-2021	71.2	16-Jul-2021	23.1	15-Sep-2021	22.3	15-Nov-2021	168.9
16-Jan-2021	274.0	19-Mar-2021	273.7	17-May-2021	76.6	17-Jul-2021	23.1	16-Sep-2021	29.7	16-Nov-2021	168.9
17-Jan-2021	243.5	20-Mar-2021	296.5	18-May-2021	54.9	18-Jul-2021	23.1	17-Sep-2021	29.7	17-Nov-2021	109.0
18-Jan-2021	220.6	21-Mar-2021	319.4	19-May-2021	22.3	19-Jul-2021	23.1	18-Sep-2021	28.2	18-Nov-2021	122.3
19-Jan-2021	243.5	22-Mar-2021	281.3	20-May-2021	22.3	20-Jul-2021	23.1	19-Sep-2021	28.2	19-Nov-2021	168.9
20-Jan-2021	251.1	23-Mar-2021	113.7	21-May-2021	33.2	21-Jul-2021	23.1	20-Sep-2021	31.2	20-Nov-2021	195.6
21-Jan-2021	251.1	24-Mar-2021	37.5	22-May-2021	60.3	22-Jul-2021	23.1	21-Sep-2021	31.2	21-Nov-2021	202.3
22-Jan-2021	159.6	25-Mar-2021	45.2	23-May-2021	44.0	23-Jul-2021	23.1	22-Sep-2021	26.7	22-Nov-2021	188.9
23-Jan-2021	113.8	26-Mar-2021	106.1	24-May-2021	33.2	24-Jul-2021	23.1	23-Sep-2021	26.7	23-Nov-2021	155.6
24-Jan-2021	205.3	27-Mar-2021	228.0	25-May-2021	82.0	25-Jul-2021	23.1	24-Sep-2021	37.0	24-Nov-2021	175.6
25-Jan-2021	251.1	28-Mar-2021	174.6	26-May-2021	103.8	26-Jul-2021	23.1	25-Sep-2021	37.0	25-Nov-2021	222.3
26-Jan-2021	258.7	29-Mar-2021	60.4	27-May-2021	82.0	27-Jul-2021	23.1	26-Sep-2021	37.0	26-Nov-2021	242.2
27-Jan-2021	197.7	30-Mar-2021	113.7	28-May-2021	49.5	28-Jul-2021	23.1	27-Sep-2021	35.6	27-Nov-2021	228.9
28-Jan-2021	167.2	31-Mar-2021	113.7	29-May-2021	49.5	29-Jul-2021	23.1	28-Sep-2021	35.6	28-Nov-2021	215.6
29-Jan-2021	266.3			30-May-2021	38.6	30-Jul-2021	23.1	29-Sep-2021	65.1	29-Nov-2021	235.6
30-Jan-2021	289.2			31-May-2021	22.3	31-Jul-2021	23.1	30-Sep-2021	65.1	30-Nov-2021	215.6
31-Jan-2021	296.8										


Normal Weather Demand - Chronological 12 Months Ending November 2021
(MDth)
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1-Dec-2020
1-Jan-2021
1-Feb-2021
1-Mar-2021
1-Apr-2021
1-May-2021
1-Jun-2021
1-Jul-2021
1-Aug-2021
1-Sep-2021
1-Oct-2021
1-Nov-2021

Normal Weather Firm Demand - High to Low - 12 Months Ending November 2021

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	464.6	62	258.7	123	170.7	184	81.7	245	28.2	306	23.1
2	442.9	63	253.2	124	168.9	185	81.7	246	28.2	307	23.1
3	411.4	64	253.2	125	168.9	186	81.7	247	26.7	308	23.1
4	411.2	65	251.1	126	168.9	187	77.8	248	26.7	309	23.1
5	411.2	66	251.1	127	167.9	188	77.8	249	26.0	310	23.1
6	409.9	67	251.1	128	167.9	189	77.1	250	26.0	311	23.1
7	401.6	68	250.8	129	167.2	190	77.1	251	26.0	312	23.1
8	396.0	69	250.8	130	167.0	191	77.1	252	26.0	313	23.1
9	393.4	70	246.6	131	161.0	192	77.1	253	26.0	314	22.3
10	388.3	71	246.6	132	161.0	193	77.1	254	26.0	315	22.3
11	388.3	72	245.0	133	161.0	194	76.6	255	26.0	316	22.3
12	385.2	73	243.5	134	159.6	195	75.6	256	26.0	317	22.3
13	373.1	74	243.5	135	159.4	196	72.5	257	26.0	318	22.3
14	373.1	75	242.2	136	155.6	197	72.5	258	26.0	319	22.3
15	360.4	76	239.5	137	155.6	198	72.5	259	26.0	320	22.3
16	360.4	77	236.7	138	154.0	199	71.2	260	26.0	321	22.3
17	357.8	78	235.8	139	148.9	200	70.8	261	26.0	322	22.3
18	352.2	79	235.6	140	148.9	201	68.0	262	26.0	323	22.3
19	352.2	80	232.3	141	147.1	202	65.8	263	26.0	324	22.3
20	343.9	81	232.3	142	140.2	203	65.1	264	26.0	325	22.3
21	335.7	82	232.3	143	140.2	204	65.1	265	26.0	326	22.3
22	335.0	83	228.9	144	135.6	205	63.4	266	26.0	327	22.3
23	335.0	84	228.0	145	132.0	206	63.4	267	26.0	328	22.3
24	332.6	85	225.2	146	132.0	207	60.4	268	26.0	329	22.3
25	332.6	86	223.4	147	128.9	208	60.3	269	26.0	330	22.3
26	327.4	87	222.3	148	126.3	209	58.8	270	26.0	331	22.3
27	327.3	88	220.6	149	122.8	210	57.0	271	26.0	332	22.3
28	327.0	89	220.3	150	122.3	211	54.9	272	26.0	333	22.3
29	319.4	90	220.3	151	122.3	212	54.9	273	26.0	334	22.3
30	319.2	91	220.3	152	118.2	213	54.3	274	26.0	335	22.3
31	318.3	92	220.3	153	115.6	214	50.0	275	26.0	336	22.3

32	311.1	93	218.0	154	115.6	215	50.0	276	26.0	337	22.3
33	311.1	94	218.0	155	114.6	216	50.0	277	26.0	338	22.3
34	304.5	95	218.0	156	113.8	217	49.7	278	26.0	339	22.3
35	304.1	96	216.4	157	113.7	218	49.5	279	23.8	340	22.3
36	304.1	97	216.4	158	113.7	219	49.5	280	23.8	341	22.3
37	303.9	98	215.6	159	113.7	220	49.5	281	23.8	342	22.3
38	303.9	99	215.6	160	113.6	221	45.2	282	23.8	343	22.3
39	302.7	100	212.7	161	109.1	222	45.1	283	23.1	344	22.3
40	302.7	101	212.0	162	109.0	223	44.0	284	23.1	345	22.3
41	302.7	102	210.8	163	106.1	224	44.0	285	23.1	346	22.3
42	296.8	103	205.3	164	105.5	225	44.0	286	23.1	347	22.3
43	296.8	104	205.1	165	105.5	226	43.1	287	23.1	348	22.3
44	296.5	105	202.3	166	104.5	227	40.6	288	23.1	349	22.3
45	296.5	106	197.7	167	103.8	228	40.6	289	23.1	350	22.3
46	294.4	107	195.6	168	103.8	229	38.6	290	23.1	351	22.3
47	289.6	108	195.5	169	103.8	230	37.5	291	23.1	352	22.3
48	289.2	109	195.5	170	103.4	231	37.0	292	23.1	353	22.3
49	288.9	110	188.9	171	91.6	232	37.0	293	23.1	354	22.3
50	281.3	111	188.7	172	90.8	233	37.0	294	23.1	355	22.3
51	281.3	112	188.7	173	90.8	234	36.2	295	23.1	356	22.3
52	281.3	113	187.2	174	90.8	235	35.6	296	23.1	357	22.3
53	275.3	114	182.3	175	89.0	236	35.6	297	23.1	358	22.3
54	275.3	115	182.3	176	89.0	237	33.2	298	23.1	359	22.3
55	274.0	116	182.2	177	87.5	238	33.2	299	23.1	360	22.3
56	273.7	117	182.2	178	84.7	239	32.6	300	23.1	361	22.3
57	268.1	118	175.6	179	84.7	240	32.6	301	23.1	362	22.3
58	268.1	119	175.6	180	82.0	241	31.2	302	23.1	363	22.3
59	266.3	120	174.6	181	82.0	242	31.2	303	23.1	364	22.3
60	266.3	121	174.6	182	81.7	243	29.7	304	23.1	365	22.3
61	261.5	122	170.7	183	81.7	244	29.7	305	23.1		


Normal Weather Firm Demand - High to Low - 12 Months
Ending November 2021
(MDth)
500
450
400
350
300
250
200
150
100
50
0
1
8
15
22
29
36
43
50
57
64
71
78
85
92
99
106
113
120
127
134
141
148
155
162
169
176
183
190
197
204
211
218
225
232
239
246
253
260
267
274
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344
351
358
365

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 1/2020 in Dth

Customer	Usage 01/20 (Dth)	Nominations 01/20 (Dth)	01/01/20 Day 1 (Dth)	01/02/20 Day 2 (Dth)	01/03/20 Day 3 (Dth)	01/04/20 Day 4 (Dth)	01/05/20 Day 5 (Dth)	01/06/20 Day 6 (Dth)	01/07/20 Day 7 (Dth)	01/08/20 Day 8 (Dth)	01/09/20 Day 9 (Dth)	01/10/20 Day 10 (Dth)	01/11/20 Day 11 (Dth)	01/12/20 Day 12 (Dth)	01/13/20 Day 13 (Dth)	01/14/20 Day 14 (Dth)	01/15/20 Day 15 (Dth)	01/16/20 Day 16 (Dth)
A	292,595	312,927	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	15,056	9,929	9,929	9,929	9,929	9,929	9,929	9,929
B	221,134	**	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	190,564	180,784	5,000	5,000	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296
D	78,937	*	N/A	N/A	20,200	20,200	20,200	20,200	20,200	20,200	20,200	20,200	20,200	20,200	20,200	20,200	20,200	20,200
E	71,541	72,509	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339
F	57,817	*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G	52,324	*	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
H	51,871	58,497	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
I	50,702	**	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	48,155	*	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		01/17/20 Day 17 (Dth)	01/18/20 Day 18 (Dth)	01/19/20 Day 19 (Dth)	01/20/20 Day 20 (Dth)	01/21/20 Day 21 (Dth)	01/22/20 Day 22 (Dth)	01/23/20 Day 23 (Dth)	01/24/20 Day 24 (Dth)	01/25/20 Day 25 (Dth)	01/26/20 Day 26 (Dth)	01/27/20 Day 27 (Dth)	01/28/20 Day 28 (Dth)	01/29/20 Day 29 (Dth)	01/30/20 Day 30 (Dth)	01/31/20 Day 31 (Dth)
A		9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,929	9,930
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		5,296	8,596	8,596	8,596	8,596	9,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296	5,296
D	*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E		2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339	2,339
F	*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
G	*	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
H		1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
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.

GAS-COS-14
Attachment A
Page 1 of 2

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 UNIONVILL	7,583		
							C16 DELMONT	13,772		
	80136-Tier2		11/01/22	10/31/25	12 Mos	21,055	B15 UNIONVILL	12,283	CPA CITY GATE	21,055
							C16 DELMONT	8,772		
COLUMBIA GAS	50675	FTS	11/01/97	10/31/21	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 STATIO	10,000	CPA CITY GATE	11,666
							BROADRUN	1,666		
COLUMBIA GAS	56742	FTS	11/01/99	10/31/21	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 LEID	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	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	10/31/2021 (1)	12 Mos	4,304	TRANSCO LEID	4,304	CPA@WARREN	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	10/31/22	12 Mos	7,600	ZONE 4 POOL	7,600	CPA @ PITT TERMINAL	7,600
TEXAS EASTERN	800387	CDS	11/01/06	10/31/22	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/CHANMBERSBURG	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 E	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	
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	MDQ
100% TO 30%	100 % OF MDQ
<30% TO 20%	80% OF MDQ
<20% TO 10%	65% OF MDQ
<10% TO 0%	50% OF MDQ

EASTERN GSS

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

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

EQUITRANS 115SS

SCQ LEVEL
100% TO 35%
<35% TO 16%
<16% TO 10%
<10% TO 0%

BLACKHAWK

RATCHETS DO NOT APPLY

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, 2020.

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, 2020.

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, 2020.

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, 2020

	Volumes											
	Dec-19 DTH	Jan-20 DTH	Feb-20 DTH	Mar-20 DTH	Apr-20 DTH	May-20 DTH	Jun-20 DTH	Jul-20 DTH	Aug-20 DTH	Sep-20 DTH	Oct-20 DTH	Nov-20 DTH
NSS	9,187.0	9,006.0	9,703.0	8,691.0	8,730.0	6,533.0	4,053.0	2,842.0	2,722.0	2,309.0	4,267.0	6,337.0

	Revenues											
	Dec-19 $	Jan-20 $	Feb-20 $	Mar-20 $	Apr-20 $	May-20 $	Jun-20 $	Jul-20 $	Aug-20 $	Sep-20 $	Oct-20 $	Nov-20 $
NSS	35,725.11	32,242.16	31,893.69	28,238.55	26,730.90	21,431.51	13,580.96	9,332.03	10,025.54	10,440.03	15,930.01	28,571.94

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, 2020

Volumes

	Dec-19 DTH	Jan-20 DTH	Feb-20 DTH	Mar-20 DTH	Apr-20 DTH	May-20 DTH	Jun-20 DTH	Jul-20 DTH	Aug-20 DTH	Sep-20 DTH	Oct-20 DTH	Nov-20 DTH
LDS FLEX	934,057.0	959,524.0	958,439.0	859,820.0	759,810.0	713,250.0	510,623.0	486,389.0	553,922.0	593,896.0	767,365.0	735,735.0
MLDS I FLEX	172,499.0	190,564.0	224,723.0	195,361.0	197,064.0	176,142.0	183,135.0	165,188.0	173,167.0	165,735.0	133,443.0	204,945.0
MLDS II FLEX	107,544.0	105,972.0	110,241.0	97,600.0	79,057.0	84,305.0	75,760.0	62,988.0	72,259.0	77,663.0	78,791.0	47,897.0
SDS FLEX	12,882.0	12,424.0	13,025.0	10,466.0	7,494.0	6,412.0	2,411.0	13,719.0	2,659.0	2,865.0	3,004.0	3,533.0
SGDS FLEX	1,595.0	1,656.0	1,455.0	1,458.0	1,272.0	1,170.0	393.0	225.0	205.0	217.0	419.0	956.0

Revenues

	Dec-19 $	Jan-20 $	Feb-20 $	Mar-20 $	Apr-20 $	May-20 $	Jun-20 $	Jul-20 $	Aug-20 $	Sep-20 $	Oct-20 $	Nov-20 $
LDS FLEX	289,308	306,226	338,979	311,824	270,866	258,377	250,973	235,608	237,234	248,122	266,165	256,271
MLDS I FLEX	23,485	25,178	39,205	25,627	25,787	23,827	24,482	22,800	23,548	22,851	19,826	26,525
MLDS II FLEX	31,760	31,314	33,860	30,495	26,900	26,822	24,619	21,455	23,706	25,481	25,575	17,028
SDS FLEX	17,373	17,053	17,443	15,464	11,598	10,990	7,836	30,391	8,009	8,112	8,233	8,615
SGDS FLEX	1,988	2,025	1,816	1,792	2,188	1,433	678	538	503	522	697	1,168

Columbia Gas of Pennsylvania, Inc.

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

For the 12 Months Ending November 30, 2020

Volumes

	Dec-19 DTH	Jan-20 DTH	Feb-20 DTH	Mar-20 DTH	Apr-20 DTH	May-20 DTH	Jun-20 DTH	Jul-20 DTH	Aug-20 DTH	Sep-20 DTH	Oct-20 DTH	Nov-20 DTH
LDS	982,127.0	961,336.0	992,252.0	962,408.0	838,111.0	813,542.0	801,578.0	730,417.0	766,804.0	784,439.0	827,162.0	880,314.0
MLDS I	15,995.0	15,958.0	16,770.0	14,052.0	10,285.0	11,068.0	23,111.0	10,270.0	32,328.0	10,430.0	11,530.0	21,116.0
MLDS II	71,192.0	93,214.0	83,638.0	70,626.0	58,623.0	63,109.0	65,419.0	73,718.0	79,894.0	81,978.0	80,503.0	125,487.0
RDS	857,249.3	924,020.0	862,596.2	738,086.4	464,201.2	393,875.5	161,384.3	86,244.6	74,241.8	82,200.5	138,475.0	297,134.1
SCD	515,246.8	499,199.4	491,670.7	420,679.9	236,458.2	192,740.0	87,939.0	58,001.2	59,579.5	53,757.6	86,572.4	168,591.4
SDS	794,829.0	811,553.0	820,334.0	679,634.0	485,921.0	425,573.0	298,856.0	244,477.0	264,873.0	285,876.0	345,715.0	459,549.0
SGDS	564,716.0	593,985.0	593,985.0	593,985.0	593,985.0	593,985.0	593,985.0	593,985.0	593,985.0	593,985.0	593,985.0	593,985.0

Revenues

	Dec-19 $	Jan-20 $	Feb-20 $	Mar-20 $	Apr-20 $	May-20 $	Jun-20 $	Jul-20 $	Aug-20 $	Sep-20 $	Oct-20 $	Nov-20 $
LDS	1,347,107.64	1,375,390.09	1,389,520.37	1,316,141.92	1,128,179.64	1,136,624.45	1,122,234.71	1,041,199.88	1,125,576.20	1,158,570.49	1,241,264.59	1,331,499.41
MLDS I	3,011.9	4,332.7	4,409.6	4,160.1	3,833.7	8,799.1	10,796.7	3,875.0	24,581.6	4,033.0	4,242.0	12,797.1
MLDS II	34,564.8	42,808.3	39,223.7	34,353.0	29,974.3	31,738.3	32,608.4	36,043.3	47,190.5	48,071.2	48,685.7	71,123.2
RDS	7,891,563.9	8,270,461.0	7,784,102.3	6,803,519.0	4,720,661.5	4,155,731.8	2,295,765.3	1,688,373.8	1,584,011.7	1,638,937.3	2,082,054.8	3,342,819.5
SCD	2,844,407.9	2,779,240.9	2,654,188.5	2,452,425.3	1,929,159.7	1,824,443.5	1,509,565.0	1,416,126.3	1,409,052.9	1,423,840.1	1,499,938.3	1,744,422.9
SDS	2,114,852.7	2,156,220.4	2,152,725.8	1,927,795.0	1,564,378.0	1,436,201.1	1,156,690.2	1,066,308.5	1,086,521.7	1,135,232.6	1,288,551.9	1,541,263.0
SGDS	2,117,979.2	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14	2,225,361.14

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, 2022

		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	440,735.1	440,334.6	386,691.3	261,759.4	112,383.4	53,655.2	24,807.2	21,662.6	27,932.1	56,841.3	169,853.6	305,471.1	2,302,126.9
LDS	COM	290,483.6	281,310.9	255,963.6	228,873.1	181,339.2	156,522.0	147,989.8	151,484.3	156,869.0	178,054.4	245,223.6	278,122.3	2,552,235.8
LDS	IND	676,315.4	714,253.4	747,949.9	736,843.6	705,740.4	673,281.0	656,218.5	679,142.1	701,908.5	752,458.5	778,228.5	741,438.6	8,563,778.4
LDS FLEX	COM	265,000.0	264,000.0	206,000.0	199,000.0	126,000.0	106,000.0	97,000.0	100,000.0	106,000.0	115,000.0	196,000.0	240,000.0	2,020,000.0
LDS FLEX	IND	659,300.0	616,500.0	607,200.0	580,900.0	565,100.0	495,400.0	479,600.0	466,600.0	512,600.0	531,300.0	544,000.0	582,500.0	6,641,000.0
LGSS	COM	145,463.4	153,326.6	123,734.9	91,853.3	52,362.2	35,456.0	28,022.7	25,075.9	29,475.0	38,563.9	65,654.2	112,475.2	901,463.3
LGSS	IND	7,951.0	7,317.1	7,294.4	6,134.8	7,307.4	5,009.1	5,975.3	6,504.8	6,806.2	8,373.2	11,058.5	11,819.2	91,551.0
MLDS I	COM	14,200.0	14,600.0	12,100.0	8,900.0	7,300.0	5,700.0	4,900.0	4,700.0	5,500.0	6,200.0	10,000.0	12,900.0	107,000.0
MLDS I	IND	4,900.0	4,600.0	4,700.0	4,000.0	6,000.0	5,900.0	6,500.0	7,800.0	13,100.0	10,100.0	7,200.0	4,200.0	79,000.0
MLDS I FLEX	IND	205,000.0	230,000.0	205,000.0	215,000.0	195,000.0	190,000.0	175,000.0	180,000.0	170,000.0	165,000.0	180,000.0	200,000.0	2,310,000.0
MLDS II	IND	191,800.0	179,000.0	185,300.0	186,000.0	175,900.0	172,000.0	165,000.0	173,000.0	178,000.0	184,000.0	176,000.0	174,000.0	2,140,000.0
MLDS II FLEX	IND	58,800.0	67,100.0	58,300.0	55,900.0	49,300.0	50,200.0	35,400.0	50,100.0	44,000.0	50,600.0	57,400.0	62,900.0	640,000.0
NSS	COM	10,100.0	10,100.0	8,700.0	7,600.0	3,700.0	2,400.0	2,200.0	2,300.0	2,400.0	3,200.0	7,700.0	9,200.0	69,600.0
RDS	RES	961,909.7	954,375.6	806,508.2	524,474.6	222,757.4	112,429.8	59,409.2	53,001.4	64,940.3	105,070.5	309,887.2	669,001.0	4,843,764.9
RSS	RES	5,297,753.2	5,328,609.5	4,536,716.3	2,932,424.2	1,256,981.3	638,282.0	342,590.5	307,370.5	380,818.4	603,602.2	1,815,667.4	3,875,261.8	27,316,077.3
SCD	COM	589,538.1	574,737.1	488,519.4	300,912.2	165,688.7	93,579.1	61,403.5	61,290.9	53,321.5	89,033.4	189,761.6	435,707.0	3,103,492.5
SDS	COM	655,035.7	725,103.3	595,637.4	463,705.0	236,110.7	185,678.7	146,752.8	145,245.5	158,829.0	228,243.0	343,773.0	493,243.7	4,377,357.8
SDS	IND	220,636.8	229,978.2	206,708.2	169,877.3	153,534.9	157,812.2	140,208.8	157,395.2	140,564.3	153,358.5	190,092.2	204,312.2	2,124,478.8
SDS FLEX	COM	4,300.0	4,200.0	4,000.0	3,700.0	3,000.0	2,800.0	2,700.0	2,500.0	2,900.0	3,000.0	3,800.0	4,400.0	41,300.0
SDS FLEX	IND	100.0	100.0	100.0	0.0	0.0	0.0	5,000.0	1,000.0	1,000.0	100.0	100.0	100.0	7,600.0
SGDS	COM	640,874.0	683,441.4	559,059.9	373,971.5	174,955.7	110,683.9	79,785.3	71,802.4	85,723.6	136,561.0	247,995.7	458,508.8	3,623,363.2
SGDS	IND	21,347.6	20,206.6	17,776.7	10,161.9	8,716.1	5,784.7	4,576.6	4,521.0	3,931.6	4,540.1	8,399.0	16,955.9	126,917.8
SGSS	COM	1,456,754.8	1,441,793.2	1,214,452.5	748,132.8	412,360.9	225,273.8	140,034.9	121,975.3	139,331.2	220,763.6	469,218.8	1,061,281.6	7,651,373.4
SGSS	IND	14,222.4	14,843.4	13,707.3	10,104.9	5,202.2	1,076.4	1,518.7	508.8	927.0	6,245.4	14,748.0	20,053.1	103,157.6
Total		12,832,520.8	12,959,830.9	11,252,120.0	8,120,228.6	4,826,740.5	3,484,923.9	2,812,593.8	2,794,980.7	2,986,877.7	3,650,209.0	6,041,761.3	9,973,851.5	81,736,638.7

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost Of Service

Question No. GAS-COS-019:

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

Response:

Statement No. 11 with related Exhibits CEN-1, CEN-2, CEN-3, and CEN-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.