

Columbia Gas of Pennsylvania, Inc.  
2020 General Rate Case  
Docket No. R-2020-3018835  
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.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

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

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-002:

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

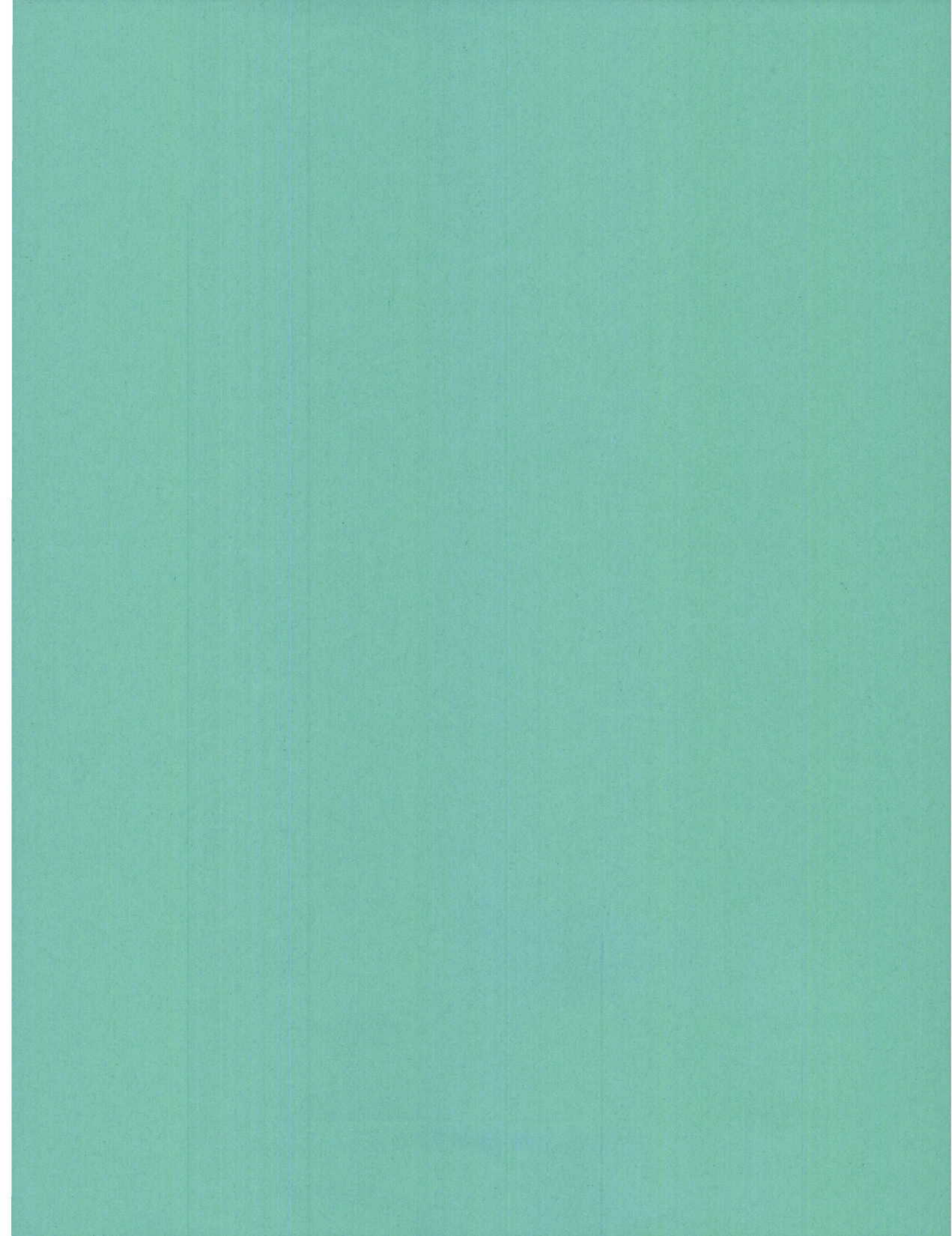
Response:

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

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

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

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



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

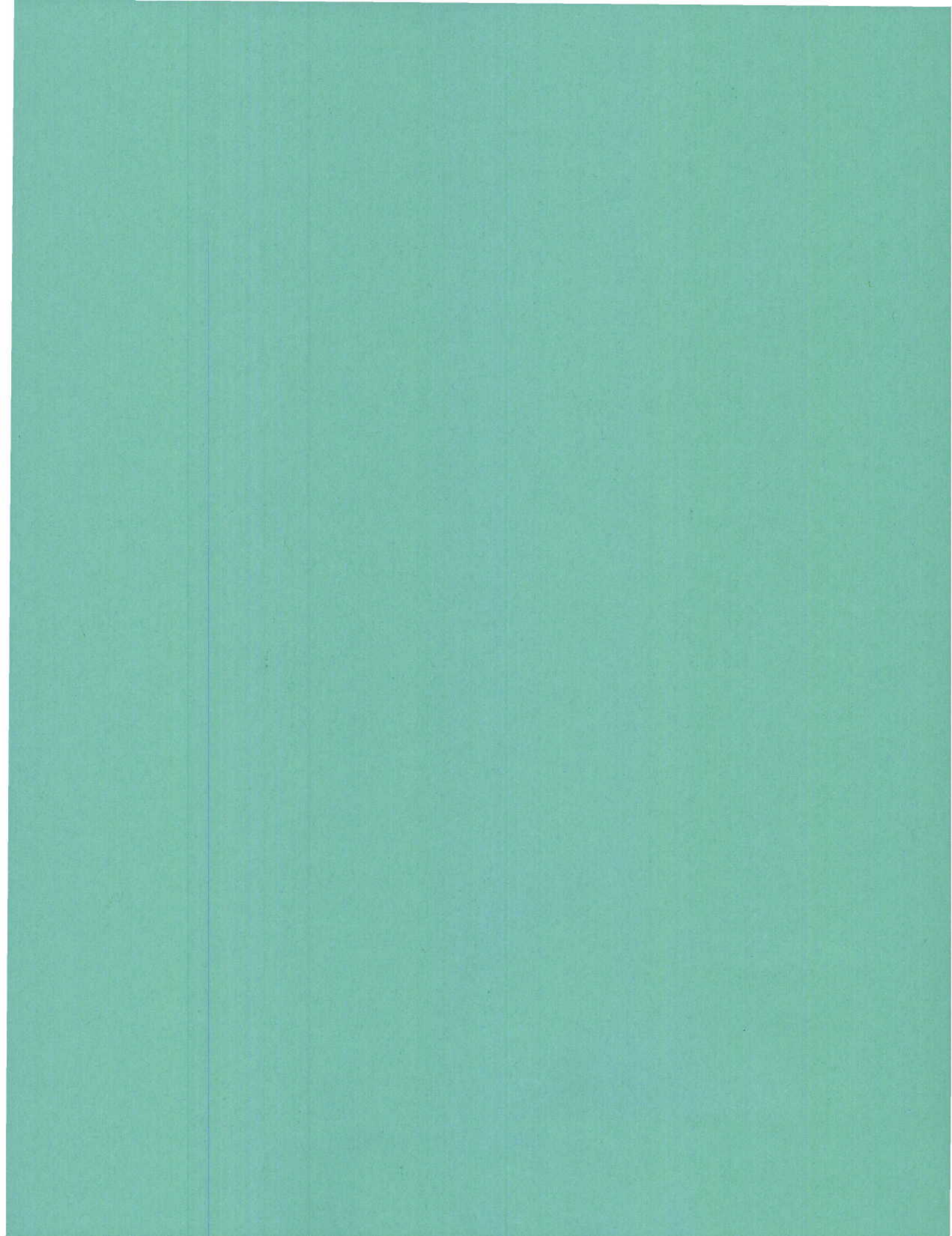
Cost of Service

Question No. GAS-COS-003:

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

Response:

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



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-004:

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

Response:

The requested breakdown is as follows:

<u>Diameter</u>	<u>Quantity (Feet)</u>	<u>Amount \$</u>
1/2"	3	233
3/4"	6,553	12,038
1"	59,611	241,409
1-1/8"	1,151	5,619
1-1/4"	609,454	2,830,566
1-1/2"	8,627	11,796
2"	14,259,323	254,703,199
2-1/2"	3,880	18,811
3"	3,084,172	29,519,259
3-1/4"	653	3,764
3-1/2"	3,649	20,815
4"	11,750,664	442,927,286
4-1/2"	1,458	18,124
4-7/8"	8,032	17,413
5"	40,004	39,834
5-1/4"	67	344
5-3/16"	16,976	36,066
5-5/8"	12,354	14,502
6"	5,779,530	275,985,654
6-1/4"	15,981	5,618
6-5/8"	102,989	655,674
7-5/8"	636	25,405
8"	3,055,590	248,524,140

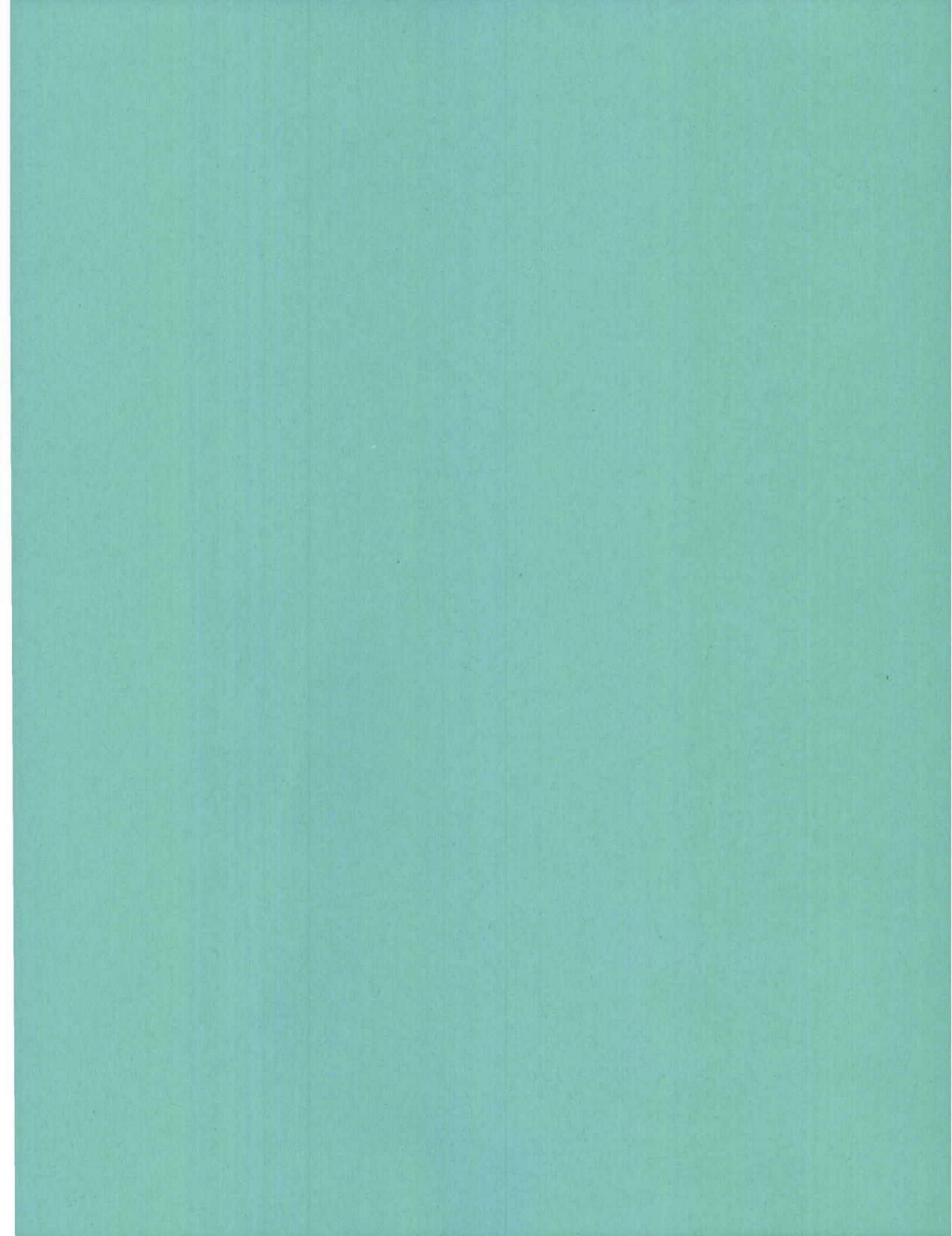


Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

8-1/4"	282	2,429
8-5/8"	8,232	361,804
9-5/8"	1,269	7,380
10"	769,949	33,890,540
12"	436,500	52,094,569
14"	450	5,167
16"	338,345	36,449,275
20"	<u>33,575</u>	<u>6,378,737</u>
Total Pipe	40,409,960	1,384,807,468
<b>Other Costs (Valves, Castings, etc.) and 106 Unclassified</b>		<b>\$391,969,690</b>
<b>Per Exhibit 8, Schedule 1, Page 1, Col. 8 Total Gas In Service, Lines 30 thru 33.</b>		<b>\$1,776,777,159</b>



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

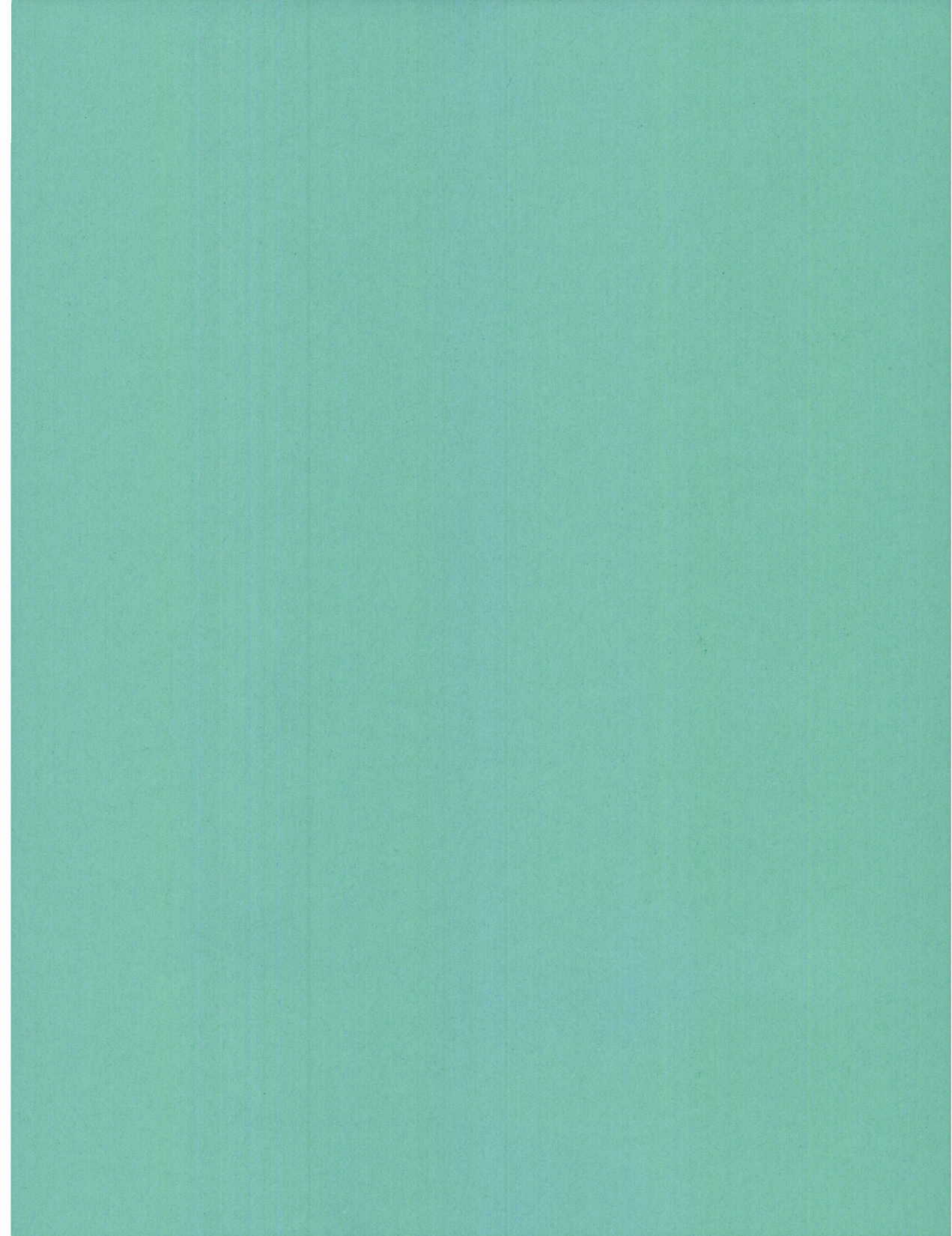
Cost of Service

Question No. GAS-COS-005:

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

Response:

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



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-006

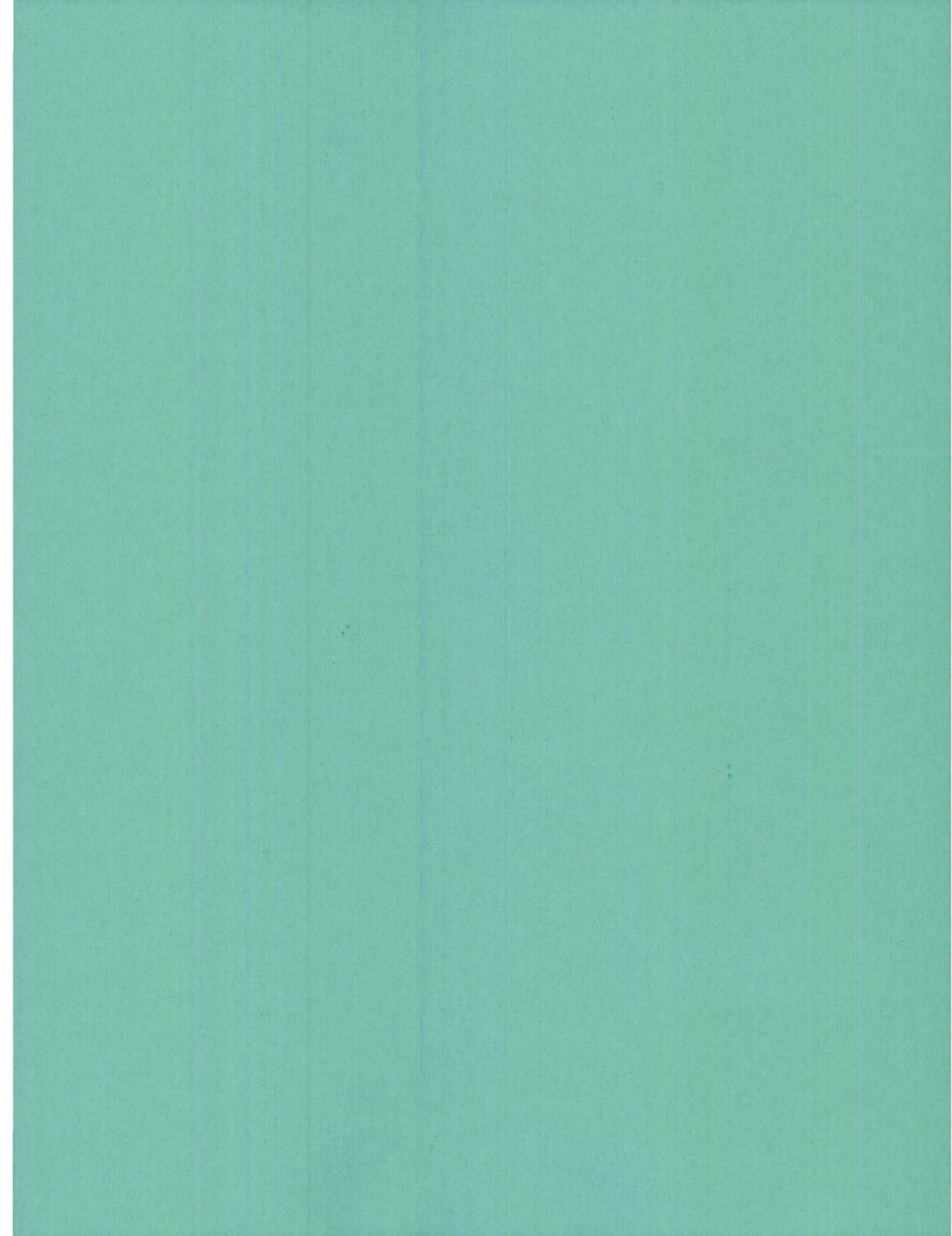
Please provide a breakdown of services investment by service line diameter, and a breakdown of services by size and customer class.

Response:

The table below summarizes the Company's investment in service lines by size, as of November 30, 2019. 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

<u>Size</u>	<u>Amount</u>
OTHER	92,334.42
UNDER 3"	576,762,768.45
3"	977,880.30
3-1/8"	5,671.61
3-1/2"	2,099.46
4"	2,842,685.33
4-1/2"	5,979.60
5"	3,062.39
6"	306,372.19
6-5/8"	2,649.94
8"	94,385.82
8-5/8"	663.31
10"	111.64
12"	488,787.75
20"	158.03
Total Account 380 Services	581,585,610.24



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost Of Service

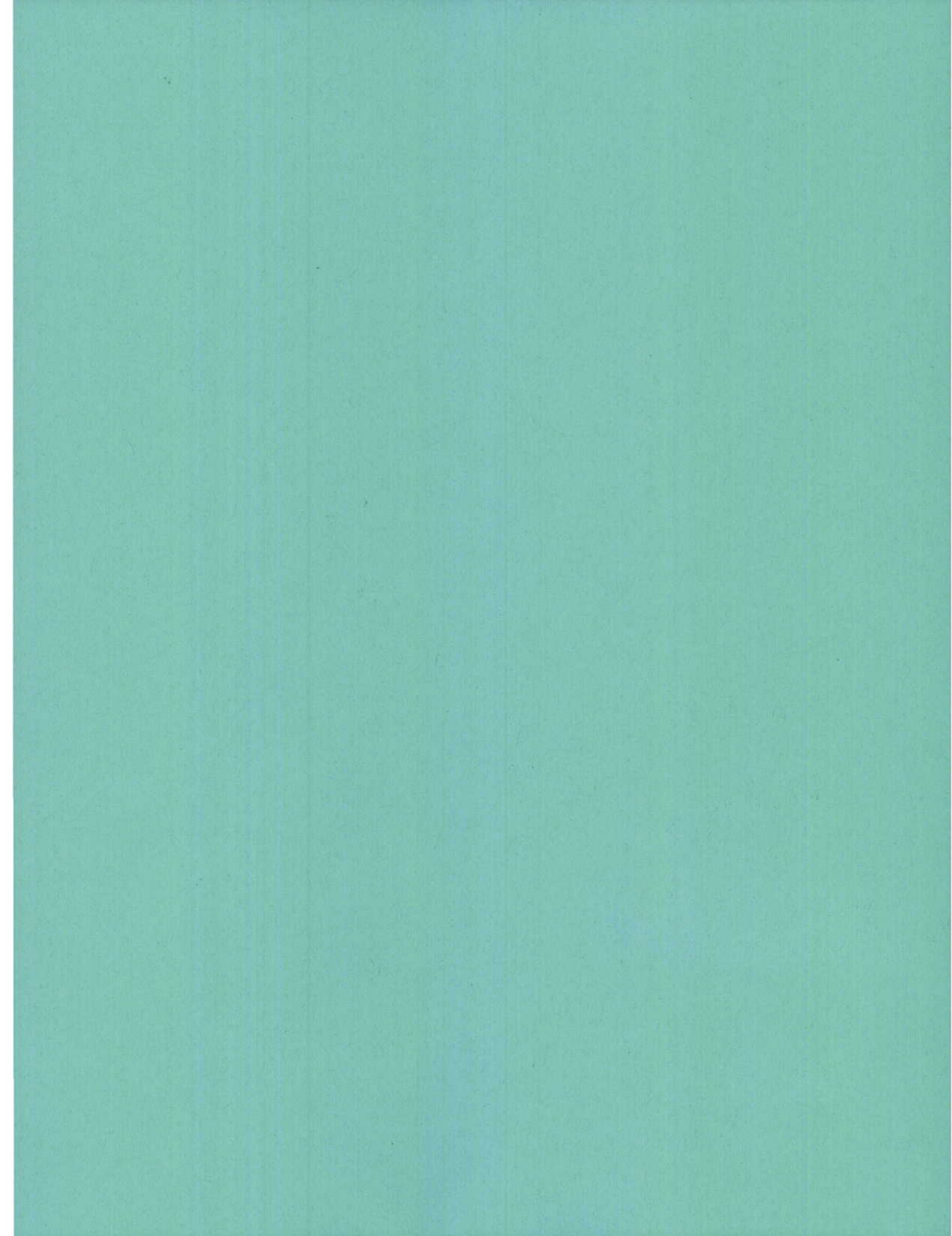
Question GAS-COS-007:

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

Response:

The table below lists the Company's investments in meters, Account 381, by size as identified on the Company's books and records as of November 30, 2019. 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.

<u>Size</u> <u>Cubic Feet Per</u> <u>Hour</u>	<u>Investment</u> \$
0 - 500	24,479,136
501 - 1000	5,641,559
1001 - 1500	979,328
Over 1500	6,878,869
Unclassified	<u>1,197,401</u>
Total Account      381	<u><u>39,176,293</u></u>





Columbia Gas of Pennsylvania, Inc.

Standard Data Request

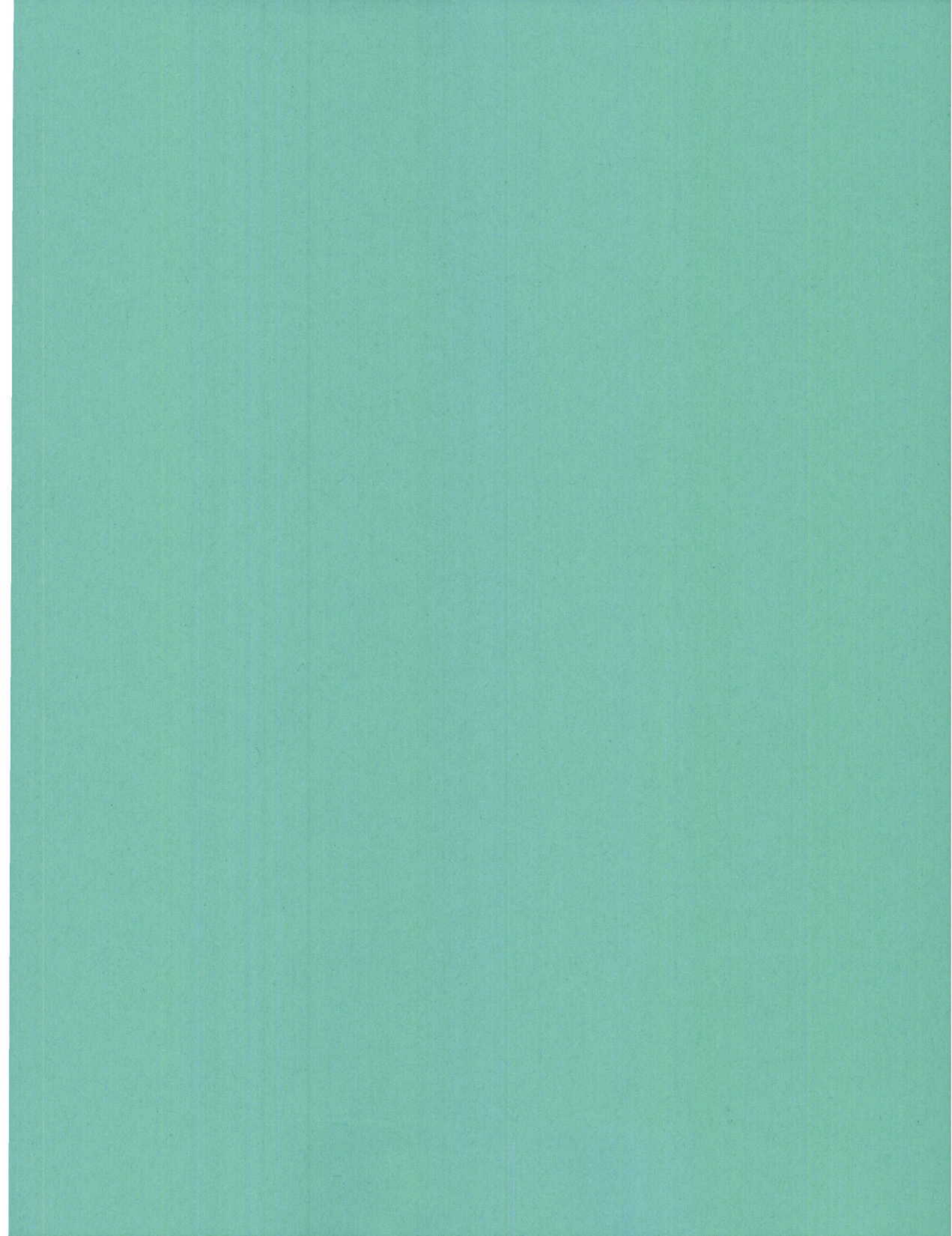
Cost of Service

Question No. GAS-COS-008:

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

Response:

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



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-009:

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

Response:

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

**8. Extensions**

**8.1 Service Connections**

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

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

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

**8.2 Capital Expenditure Policy**

**8.2.1 Residential Distribution Service**

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

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

When abnormal underground conditions or unusual permitting requirements exist, as determined by the Company, the applicant(s) will be required to pay a refundable cash deposit in an amount determined by the Company.

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

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

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

**8.2.2 Commercial and Industrial Distribution Service**

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

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

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

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

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

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

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

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

**8.2.3 Reduction or Elimination of Deposit**

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

**8.2.4 Payment Period of Deposit**

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

**8.2.5 Taxes on Deposits for Construction & Customer Advances**

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

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

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

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

**Project Summary**

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

**Investment Description**

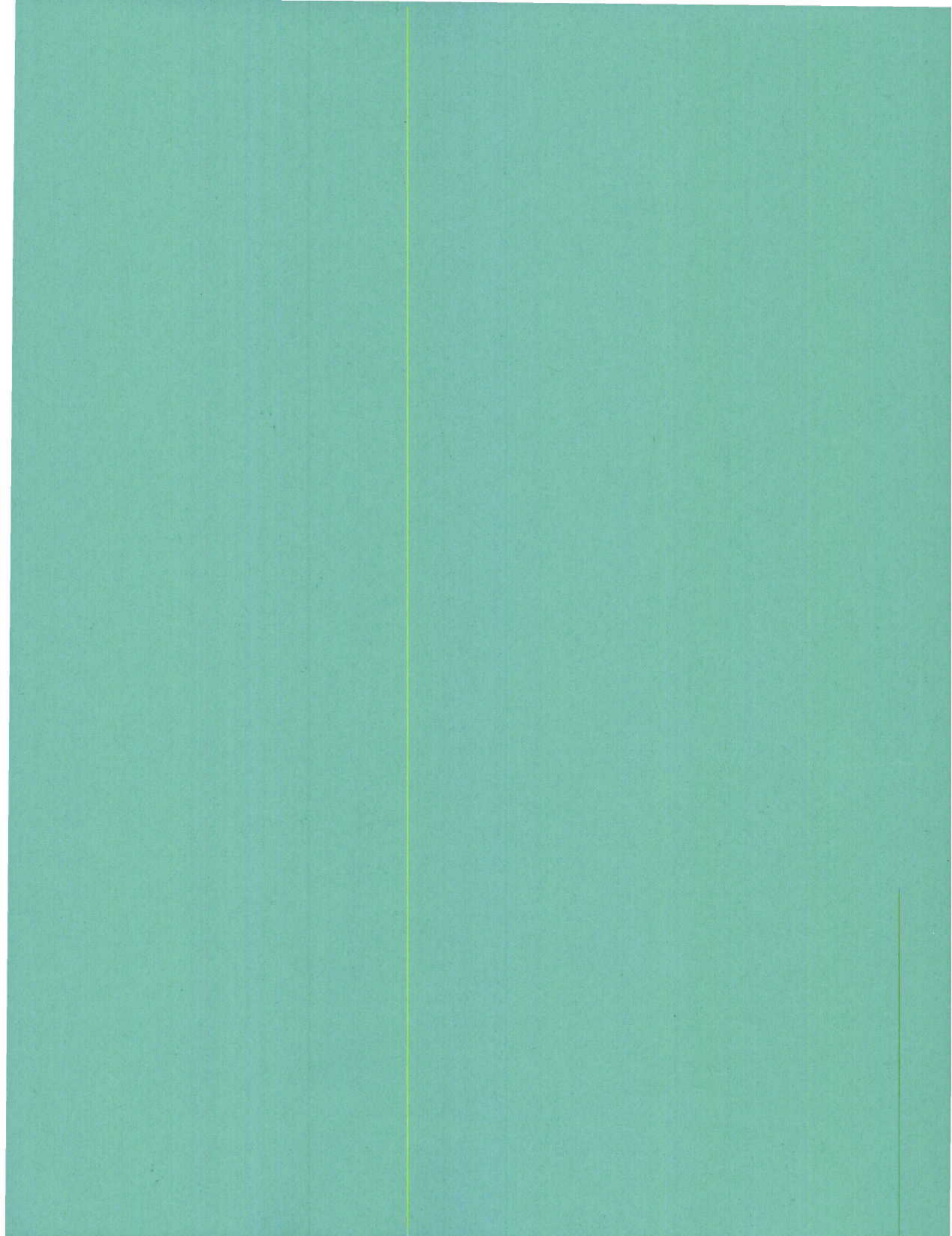
Install 1439'-2" PMMP

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





Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-10:

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

Response:

Attachment A to this response provides the actual peak day requirements and associated supplies by source for the Company's peak day each winter for the 2016/2017 through 2018/2019 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 2016/2017 through 2018/2019 heating seasons.

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

Attachment D to this response provides by revenue class the peak day requirements for Winter 2019-2020 as expected at the Company's design day conditions. Also shown are the supply sources required by the Company to meet its design peak day firm service obligations.

Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Attachment E to this response provides the winter 2019-2020 forecasted design peak day requirements, as contained on GAS-COS-010 Attachment D, segregated by rate schedule and service type.

**Columbia Gas of Pennsylvania**

**Historical Peak Day**

Units are in MDth/Day

				<b>Historical Winter Season</b>		
				<b>2018 / 19</b>	<b>2017 / 18</b>	<b>2016 / 17</b>
<b>Day of Week</b>				Wed	Fri	Thu
<b>Date</b>				Jan. 30	Jan. 5	Dec. 15
<b>Current Day Average Temp</b>				1° F	5° F	11° F
<b>Prior Day Average Temp</b>				17° F	10° F	23° F
<b>Current Day Average Wind Speed</b>				13 mph	16 mph	12 mph
<b>Requirements <sup>(1)</sup></b>						
Residential				412.6	411.1	345.8
Commercial				242.3	251.9	211.9
Industrial				91.9	81.9	81.7
<b>Total Retail:</b>				<b>746.8</b>	<b>744.9</b>	<b>639.4</b>
<b>Company Use:</b>				0.5	0.6	0.6
<b>Unaccounted For:</b>				1.6	1.1	1.1
<b>Total Requirements:</b>				<b>748.9</b>	<b>746.6</b>	<b>641.1</b>
<b>Supply <sup>(2)</sup></b>						
Columbia Gas Transmission Corp.				599.8	589.9	520.7
Dominion				44.4	37.6	32.2
Equitrans				12.5	12.6	14.0
National Fuel Gas Supply Corp.				6.3	5.7	4.6
Tennessee Gas Pipeline				28.1	25.0	22.4
Texas Eastern Transmission				53.1	71.9	43.1
Direct Local				4.7	3.8	4.1
Blackhawk Storage				0.0	0.0	0.0
<b>Total Supply:</b>				<b>748.9</b>	<b>746.6</b>	<b>641.1</b>

<sup>(1)</sup> Total actual throughput; breakdown by category/class is an estimate.

<sup>(2)</sup> 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 <sup>(1)</sup>**

Units are in MDth

		Historical Winter Season		
		2018 / 19	2017 / 18	2016 / 17
Day of Week	Wed		Fri	Thu
Date	Jan. 30		Jan. 5	Dec. 15
Current Day Average Temp	1° F		5° F	11° F
Prior Day Average Temp	17° F		10° F	23° F
Current Day Average Wind Speed	13 mph		16 mph	12 mph
<b>Requirements <sup>(2)</sup></b>				
<b>Commercial</b>				
SGDS	36.4	37.7	29.8	
LDS	48.9	26.8	23.6	
MLDS	0.8	0.8	0.4	
NCS	0.3	0.4	0.1	
SDS	14.5	30.4	33.6	
<b>Total Commercial</b>	<b>101.0</b>	<b>96.1</b>	<b>87.5</b>	
<b>Industrial</b>				
SGDS	1.0	1.2	0.6	
LDS	70.5	55.2	53.5	
MLDS	18.7	14.5	17.4	
NCS	0.0	0.0	7.0	
SDS	1.1	10.5	9.8	
<b>Total Industrial</b>	<b>91.4</b>	<b>81.4</b>	<b>88.3</b>	
<b>Requirements</b>	<b>192.4</b>	<b>177.5</b>	<b>175.8</b>	
<b>Supply <sup>(3)</sup></b>				
Columbia Gas Transmission Corp.	154.1	140.2	142.8	
Dominion Transmission Inc.	11.4	8.9	8.8	
Equitrans	3.2	3.0	3.8	
National Fuel Gas Supply Corp.	1.6	1.4	1.3	
Tennessee Gas Pipeline	7.2	5.9	6.1	
Texas Eastern Transmission	13.6	17.1	11.8	
Direct Local	1.2	0.9	1.1	
Blackhawk Storage	0.0	0.0	0.0	
<b>Total Supply:</b>	<b>192.4</b>	<b>177.5</b>	<b>175.8</b>	

<sup>(1)</sup> Excludes Choice quantities (SCD).

<sup>(2)</sup> Allocation of daily rate schedule requirement based on actual rate schedule demand for month.

<sup>(3)</sup> Transportation supplies via identified sources.

## Columbia Gas Of Pennsylvania

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

	Jan. 30, 2019 Total Demand			Jan. 5, 2018 Total Demand			Dec. 15, 2016 Total Demand		
	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput	Tariff	Choice/GDS	Total Throughput
<b>Residential</b>									
RS	285.5	0.0	285.5	284.5	0.0	284.5	263.0	0.0	263.0
RCC	28.6	0.0	28.6	28.5	0.0	28.5	21.5	0.0	21.5
RTC	0.0	98.5	98.5	0.0	98.1	98.1	0.0	61.3	61.3
<b>Residential Total</b>	<b>314.1</b>	<b>98.5</b>	<b>412.6</b>	<b>313.0</b>	<b>98.1</b>	<b>411.1</b>	<b>284.5</b>	<b>61.3</b>	<b>345.8</b>
<b>Commercial</b>									
LDS/LGSS	0.0	16.0	16.0	0.0	16.6	16.6	0.0	14.6	14.6
LDS FLEX	0.0	13.0	13.0	0.0	13.5	13.5	0.0	11.8	11.8
MDS	0.7	0.8	1.5	0.7	0.8	1.5	0.6	0.7	1.3
SDS/LGSS	11.2	30.4	41.6	11.6	31.6	43.2	9.3	27.6	36.9
SDS/LGSS FLEX	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.9	0.9
SGDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGS2	50.3	0.0	50.3	52.3	0.0	52.3	42.0	0.0	42.0
SGS1	50.4	0.0	50.4	52.4	0.0	52.4	42.0	0.0	42.0
SGDS1 FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCD1	0.0	19.1	19.1	0.0	19.8	19.8	0.0	17.3	17.3
SCD2	0.0	16.9	16.9	0.0	17.6	17.6	0.0	15.4	15.4
SGDS1	0.0	2.1	2.1	0.0	2.1	2.1	0.0	1.9	1.9
SGDS2	0.0	30.5	30.5	0.0	31.7	31.7	0.0	27.7	27.7
SGDS2 FLEX	0.0	0.1	0.1	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
<b>Total Commercial</b>	<b>112.5</b>	<b>129.8</b>	<b>242.3</b>	<b>117.0</b>	<b>134.9</b>	<b>251.9</b>	<b>93.9</b>	<b>118.0</b>	<b>211.9</b>
<b>Industrial</b>									
LDS/LGSS	0.0	27.2	27.2	0.0	24.2	24.2	0.0	24.3	24.3
LDS FLEX	0.0	36.2	36.2	0.0	32.3	32.3	0.0	32.3	32.3
MDS	0.0	2.1	2.1	0.0	1.9	1.9	0.0	1.9	1.9
MDS FLEX	0.0	14.6	14.6	0.0	13.0	13.0	0.0	13.0	13.0
SDS/LGSS	0.2	10.3	10.5	0.2	9.2	9.4	0.1	9.2	9.3
SDS/LGSS FLEX	0.0	0.1	0.1	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	0.4	0.0	0.4	0.3	0.0	0.3	0.2	0.0	0.2
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	0.7	0.7	0.0	0.7	0.7	0.0	0.7	0.7
SS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total Industrial</b>	<b>0.6</b>	<b>91.3</b>	<b>91.9</b>	<b>0.5</b>	<b>81.4</b>	<b>81.9</b>	<b>0.3</b>	<b>81.5</b>	<b>81.7</b>
<b>Other</b>	<b>2.1</b>	<b>0.0</b>	<b>2.1</b>	<b>1.7</b>	<b>0.0</b>	<b>1.7</b>	<b>1.7</b>	<b>0.0</b>	<b>1.7</b>
<b>2019/20 Design Day</b>	<b>429.3</b>	<b>319.6</b>	<b>748.9</b>	<b>432.1</b>	<b>314.4</b>	<b>746.6</b>	<b>380.4</b>	<b>260.8</b>	<b>641.1</b>

Note: Allocation based on Design Day breakout.

**Columbia Gas of Pennsylvania**

**Forecasted Design Day Requirements and Supply  
For 2019/20 Heating Season  
Units are in MDth/Day**

		Total Design Day Demand	
		2019 / 20	
Day of Week		Weekday	
Current Day Average Temp		-5° F	
Prior Day Average Temp		6° F	
Current Day Average Wind Speed		11mph	
<b>Requirements <sup>(1)</sup></b>			
Firm :			
Residential		452.9	
Commercial <sup>(2)</sup>		162.6	
Industrial <sup>(2)</sup>		0.6	
Company Use		0.6	
Unaccounted For Gas		1.6	
<b>Total Firm:</b>		<b>618.3</b>	
Non-Firm:			
Residential		0.0	
Commercial		102.8	
Industrial		92.3	
<b>Total Non-Firm:</b>		<b>195.1</b>	
<b>Total Requirements:</b>		<b>813.4</b>	
<b>Supply <sup>(3)</sup></b>			
Columbia Gas Transmission Corp.		527.2	
Dominion		33.8	
Equitrans		14.3	
National Fuel Gas Supply Corp.		4.2	
Tennessee Gas Pipeline		23.6	
Texas Eastern Transmission		19.3	
Direct Local		0.7	
Blackhawk Storage		0.0	
<b>Total Supply:</b>		<b>623.1</b>	
<b>Imbalance <sup>(4)</sup></b>		<b>190.3</b>	

<sup>(1)</sup> Per CPA's "2019 Design Day Forecast."

<sup>(2)</sup> Includes Standby Service and Elective Balancing Service quantities.

<sup>(3)</sup> Supply provided by CPA and Natural Gas Suppliers.

<sup>(4)</sup> 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**  
2019 Design Day Forecast, 2019/20 - 2023/24

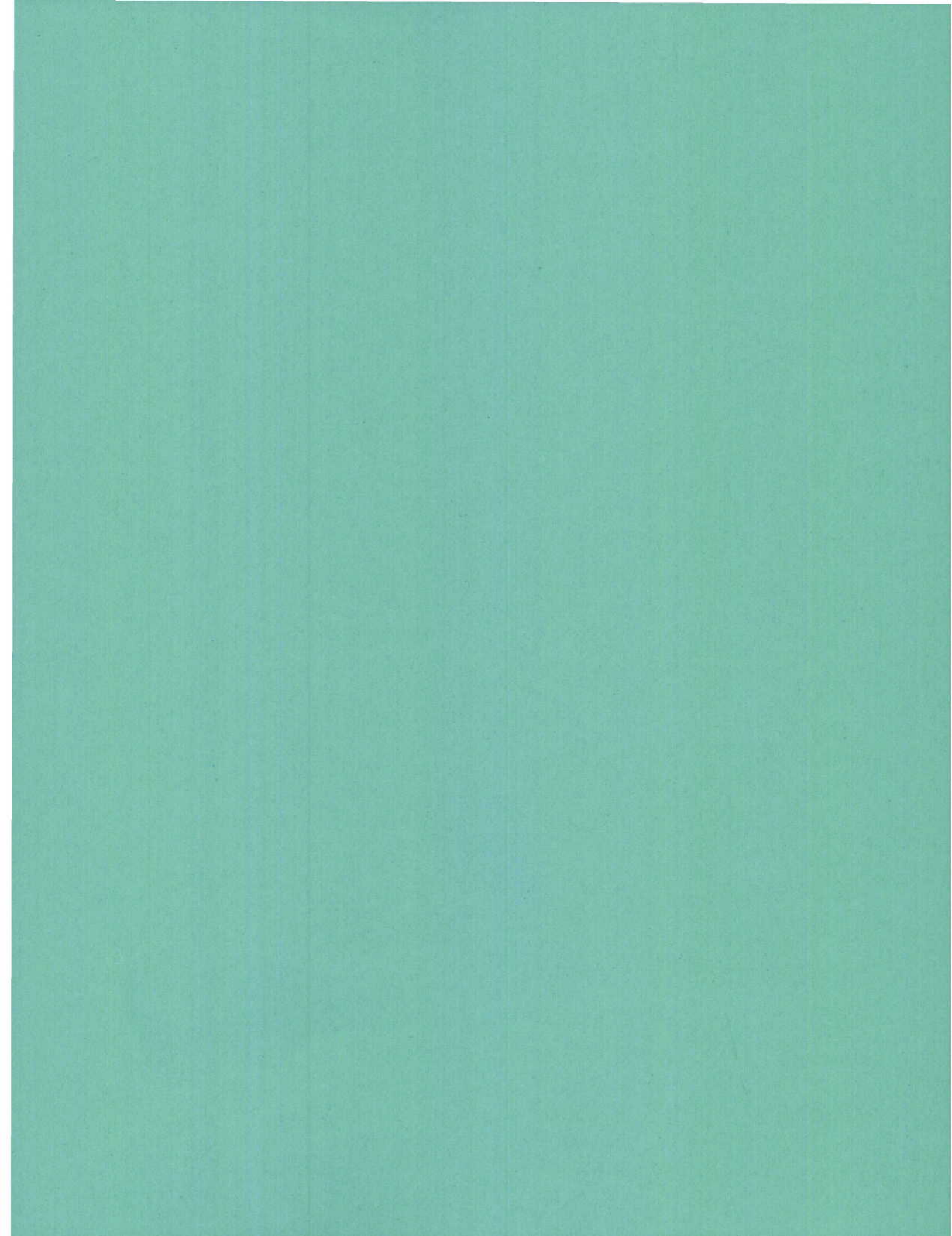
**2019/20 Design Day Requirements by Rate Schedule**  
**Volume in MDth/Day**

	Total Demand			Firm Demand			Non-Firm Demand			Additional Firm Obligation	Total Firm Obligation
	Tariff	GTS / Choice	Total Throughput	Tariff	Choice	Total Throughput	Tariff	GTS	Total Throughput		
<b>Residential</b>											
RS	313.4	0.0	313.4	313.4	0.0	313.4	0.0	0.0	0.0	0.0	313.4
RCC	31.4	0.0	31.4	31.4	0.0	31.4	0.0	0.0	0.0	0.0	31.4
RTC	0.0	108.1	108.1	0.0	108.1	108.1	0.0	0.0	0.0	0.0	108.1
<b>Residential Total</b>	<b>344.8</b>	<b>108.1</b>	<b>452.9</b>	<b>344.8</b>	<b>108.1</b>	<b>452.9</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>452.9</b>
<b>Commercial</b>											
LDS/LGSS <sup>(1)</sup>	0.0	17.5	17.5	0.0	0.0	0.0	0.0	17.5	17.5	0.0	0.0
LDS FLEX	0.0	14.3	14.3	0.0	0.0	0.0	0.0	14.3	14.3	0.0	0.0
MDS	0.8	0.8	1.6	0.8	0.0	0.8	0.0	0.8	0.8	0.0	0.8
SDS/LGSS	12.2	33.3	45.5	12.2	0.0	12.2	0.0	33.3	33.3	0.0	12.2
SDS/LGSS FLEX	0.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0
SGDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGS2	55.1	0.0	55.1	55.1	0.0	55.1	0.0	0.0	0.0	0.0	55.1
SGS1	55.2	0.0	55.2	55.2	0.0	55.2	0.0	0.0	0.0	0.0	55.2
SGDS1 FLEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCD1	0.0	20.9	20.9	0.0	20.9	20.9	0.0	0.0	0.0	0.0	20.9
SCD2	0.0	18.5	18.5	0.0	18.5	18.5	0.0	0.0	0.0	0.0	18.5
SGDS1	0.0	2.3	2.3	0.0	0.0	0.0	0.0	2.3	2.3	0.0	0.0
SGDS2 <sup>(2)</sup>	0.0	33.4	33.4	0.0	0.0	0.0	0.0	33.4	33.4	0.0	0.0
SGDS2 FLEX	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
SS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	5.4
EBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	4.1
<b>Total Commercial</b>	<b>123.3</b>	<b>142.3</b>	<b>265.6</b>	<b>123.3</b>	<b>39.5</b>	<b>162.8</b>	<b>0.0</b>	<b>102.8</b>	<b>102.8</b>	<b>9.5</b>	<b>172.3</b>
<b>Industrial</b>											
LDS/LGSS <sup>(2)</sup>	0.0	27.5	27.5	0.0	0.0	0.0	0.0	27.5	27.5	0.0	0.0
LDS FLEX	0.0	36.6	36.6	0.0	0.0	0.0	0.0	36.6	36.6	0.0	0.0
MDS <sup>(2)</sup>	0.0	2.1	2.1	0.0	0.0	0.0	0.0	2.1	2.1	0.0	0.0
MDS FLEX	0.0	14.8	14.8	0.0	0.0	0.0	0.0	14.8	14.8	0.0	0.0
SDS/LGSS	0.2	10.4	10.7	0.2	0.0	0.2	0.0	10.4	10.4	0.0	0.2
SDS/LGSS FLEX	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	1.0	1.0
SGDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SGS2	0.4	0.0	0.4	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.4
SGS1	0.0	0.0	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	0.0	0.0
SCD2	0.0	0.0	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	0.0	0.0
SGDS2	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0
SS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	6.7
<b>Total Industrial</b>	<b>0.6</b>	<b>92.3</b>	<b>92.9</b>	<b>0.6</b>	<b>0.0</b>	<b>0.6</b>	<b>0.0</b>	<b>92.3</b>	<b>92.3</b>	<b>7.7</b>	<b>8.3</b>
<b>Other</b>	<b>2.2</b>	<b>0.0</b>	<b>2.2</b>	<b>2.2</b>	<b>0.0</b>	<b>2.2</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>2.2</b>
<b>2019/20 Design Day</b>	<b>470.9</b>	<b>342.7</b>	<b>813.6</b>	<b>470.9</b>	<b>147.6</b>	<b>618.5</b>	<b>0.0</b>	<b>195.1</b>	<b>195.1</b>	<b>17.2</b>	<b>635.7</b>

(1) Standby and Elective Balancing Service Quantities

(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, 2018 through March 31, 2019.

**Columbia Gas of Pennsylvania**  
**Heating Season November 2018 Through March 2019**  
**Daily Dth Sendout**

<u>Date</u>	<u>Dth</u>
11/01/18	146,079
11/02/18	190,123
11/03/18	259,140
11/04/18	213,181
11/05/18	195,174
11/06/18	203,538
11/07/18	266,983
11/08/18	286,114
11/09/18	316,414
11/10/18	379,454
11/11/18	349,896
11/12/18	335,458
11/13/18	381,689
11/14/18	403,361
11/15/18	404,695
11/16/18	375,895
11/17/18	327,928
11/18/18	302,567
11/19/18	321,514
11/20/18	379,254
11/21/18	406,340
11/22/18	431,543
11/23/18	356,910
11/24/18	289,363
11/25/18	246,132
11/26/18	348,741
11/27/18	457,226
11/28/18	483,138
11/29/18	402,432
11/30/18	339,554
12/01/18	290,000
12/02/18	240,507
12/03/18	353,976
12/04/18	422,956
12/05/18	446,465
12/06/18	426,636
12/07/18	455,591
12/08/18	462,904
12/09/18	476,116
12/10/18	492,810
12/11/18	423,303
12/12/18	387,340
12/13/18	360,185
12/14/18	292,798

**Columbia Gas of Pennsylvania  
Heating Season November 2018 Through March 2019  
Daily Dth Sendout**

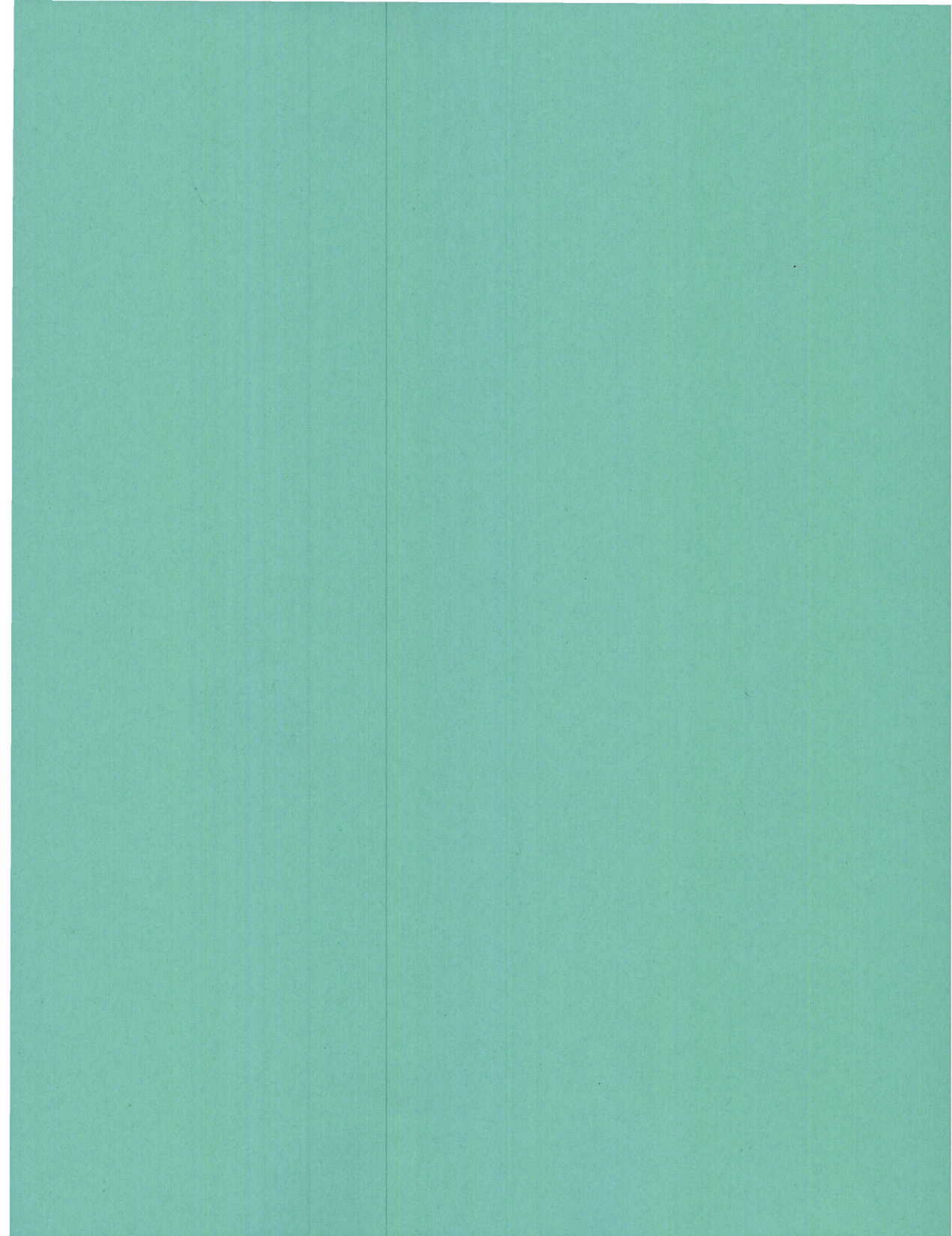
<u>Date</u>	<u>Dth</u>
12/15/18	283,109
12/16/18	338,013
12/17/18	380,273
12/18/18	418,864
12/19/18	389,205
12/20/18	300,186
12/21/18	296,087
12/22/18	357,572
12/23/18	311,755
12/24/18	373,998
12/25/18	377,940
12/26/18	372,094
12/27/18	297,758
12/28/18	254,298
12/29/18	348,263
12/30/18	344,656
12/31/18	262,067
01/01/19	308,675
01/02/19	342,518
01/03/19	402,130
01/04/19	334,688
01/05/19	292,518
01/06/19	362,279
01/07/19	364,867
01/08/19	306,652
01/09/19	476,381
01/10/19	512,250
01/11/19	481,881
01/12/19	440,623
01/13/19	457,528
01/14/19	455,877
01/15/19	459,894
01/16/19	453,232
01/17/19	435,653
01/18/19	401,210
01/19/19	397,751
01/20/19	620,647
01/21/19	675,521
01/22/19	493,046
01/23/19	349,841
01/24/19	458,751
01/25/19	528,903
01/26/19	472,261
01/27/19	493,618

**Columbia Gas of Pennsylvania**  
**Heating Season November 2018 Through March 2019**  
**Daily Dth Sendout**

<b><u>Date</u></b>	<b><u>Dth</u></b>
01/28/19	441,471
01/29/19	564,851
01/30/19	748,895
01/31/19	681,801
02/01/19	622,606
02/02/19	432,295
02/03/19	336,601
02/04/19	256,537
02/05/19	277,824
02/06/19	281,315
02/07/19	245,284
02/08/19	472,708
02/09/19	502,976
02/10/19	443,065
02/11/19	421,849
02/12/19	415,728
02/13/19	483,316
02/14/19	354,378
02/15/19	344,103
02/16/19	428,925
02/17/19	414,440
02/18/19	504,494
02/19/19	464,282
02/20/19	416,496
02/21/19	349,569
02/22/19	361,908
02/23/19	336,555
02/24/19	398,776
02/25/19	460,998
02/26/19	450,682
02/27/19	390,186
02/28/19	402,456
03/01/19	397,527
03/02/19	374,281
03/03/19	437,453
03/04/19	535,120
03/05/19	570,706
03/06/19	566,147
03/07/19	479,063
03/08/19	415,717
03/09/19	292,680
03/10/19	297,624
03/11/19	352,175
03/12/19	374,671

**Columbia Gas of Pennsylvania  
Heating Season November 2018 Through March 2019  
Daily Dth Sendout**

<b><u>Date</u></b>	<b><u>Dth</u></b>
03/13/19	280,704
03/14/19	166,268
03/15/19	231,360
03/16/19	349,559
03/17/19	339,596
03/18/19	378,257
03/19/19	352,257
03/20/19	285,478
03/21/19	311,253
03/22/19	392,609
03/23/19	336,524
03/24/19	246,044
03/25/19	353,574
03/26/19	366,868
03/27/19	298,886
03/28/19	224,471
03/29/19	190,819
03/30/19	165,755
03/31/19	379,662



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-12:

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

Response:

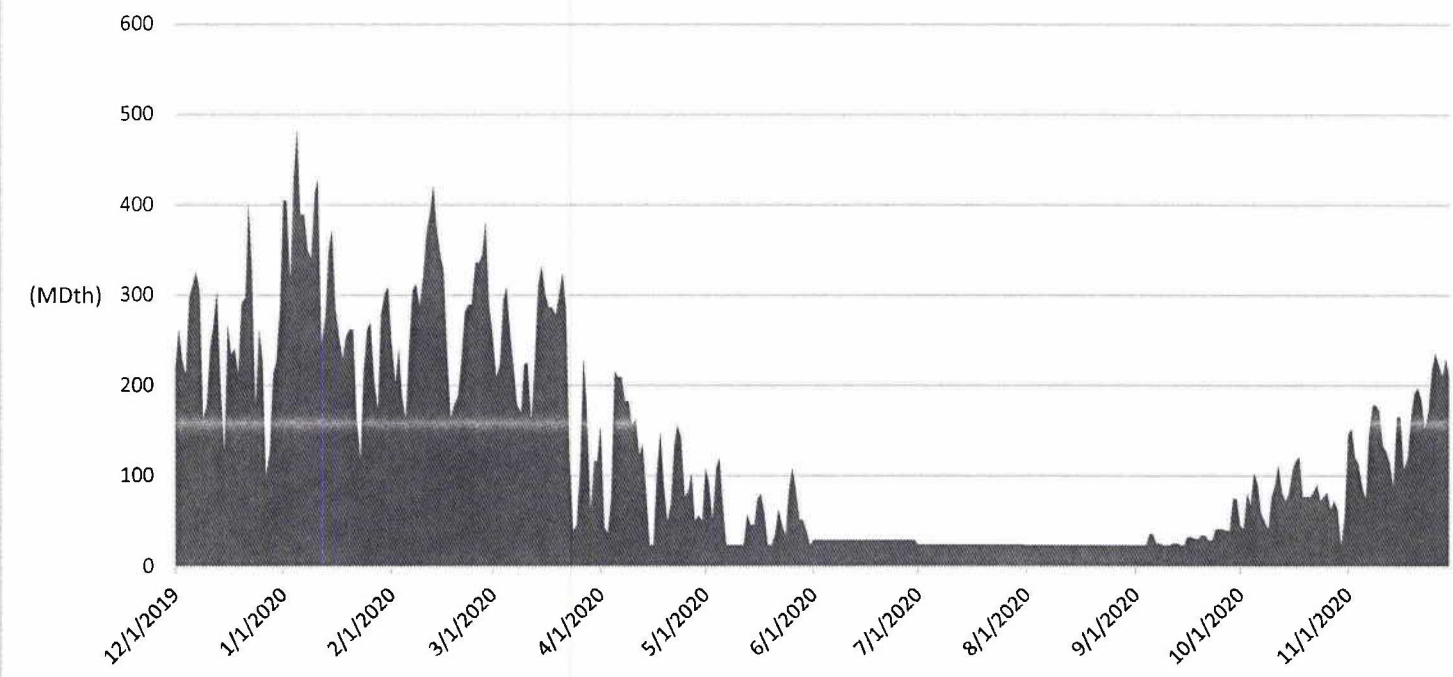
The Company's basic supply and capacity analysis tool is the SENDOUT® Gas Planning System provided by ABB Enterprise Software of Atlanta, Georgia. SENDOUT® determines the "optimum," time-dependent levels of pipeline transportation service and storage service to be utilized to meet the Company's prospective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

- Page 1. Chronological order for the 12 months ending November 2020,
- Page 2. Graphically for the 12 months ending November 2020,
- Page 3. Sorted high to low for the 12 months ending November 2020,
- Page 4. Graphically for the 12 months ending November 2020.





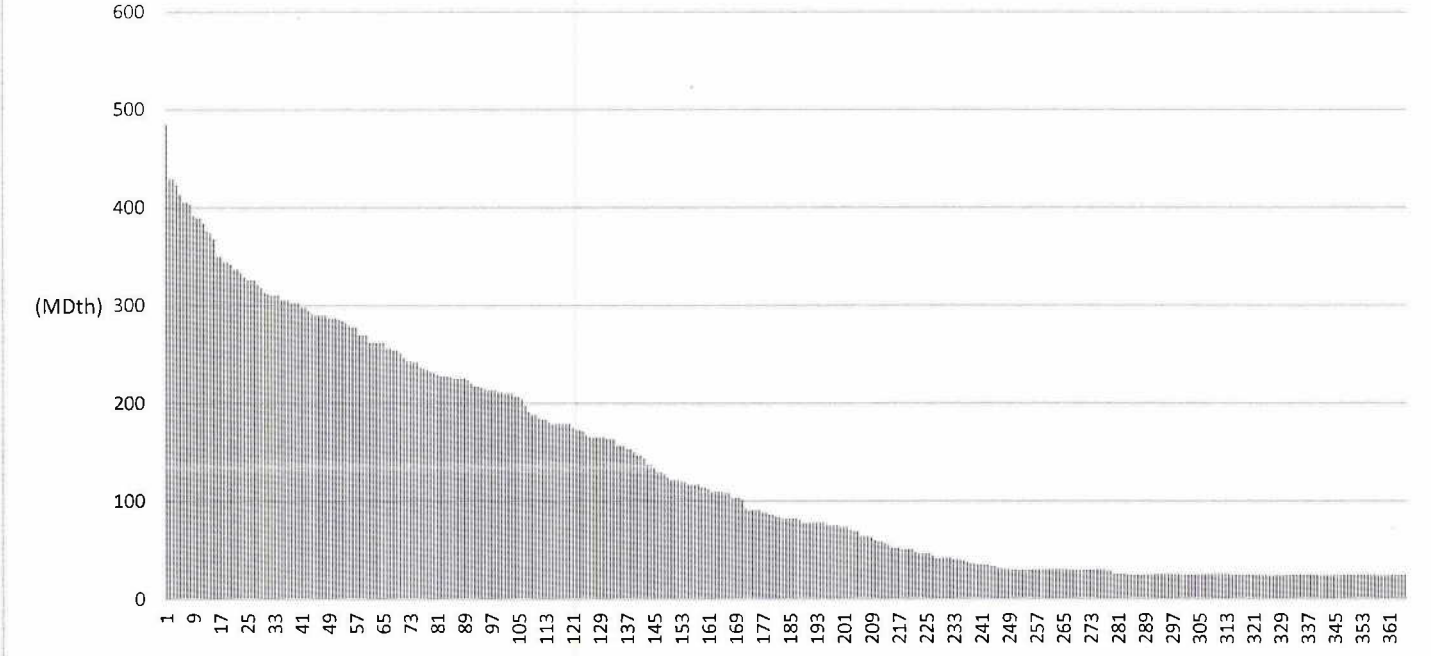
Normal Weather Demand - Chronological 12 Months Ending  
November 2020

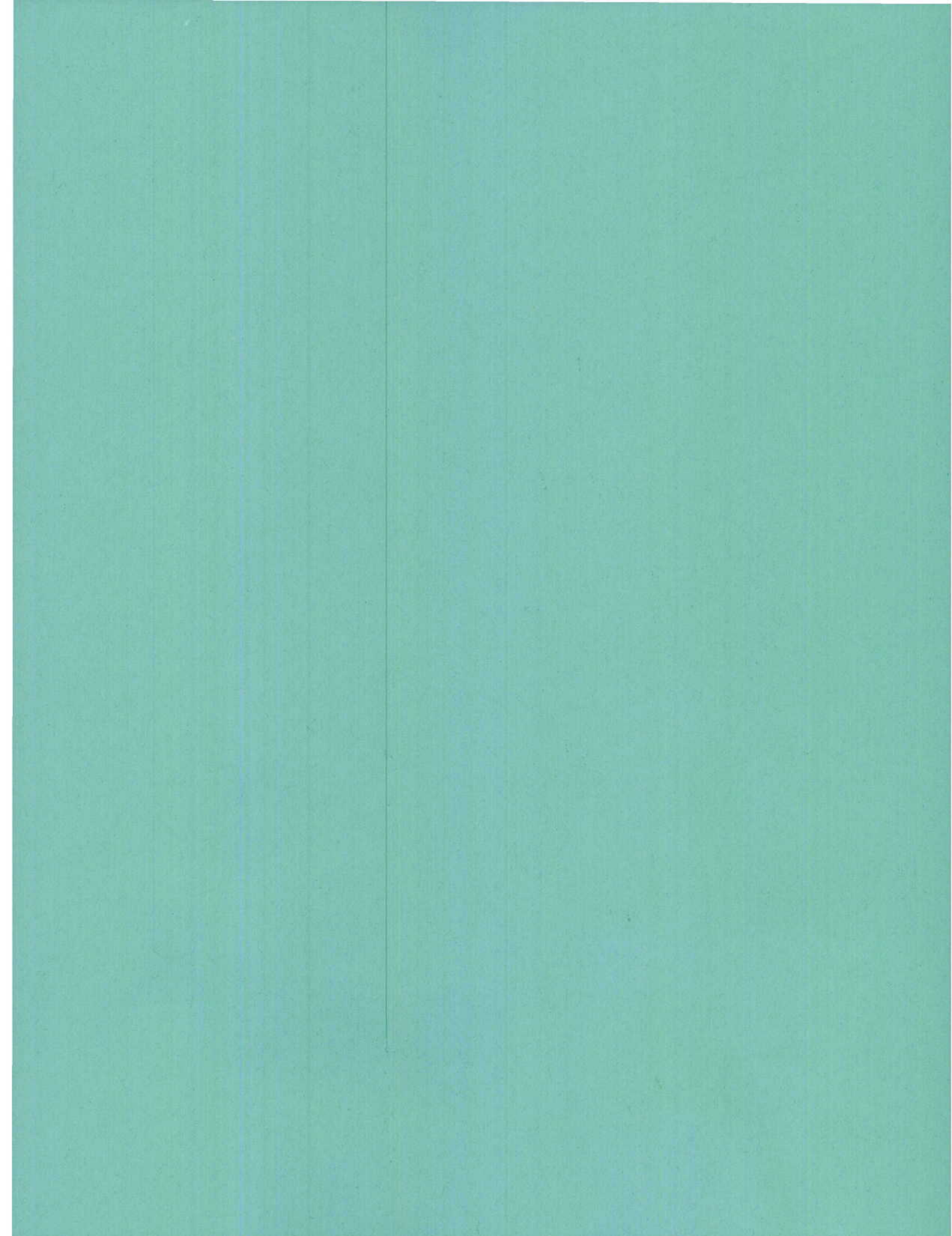


Normal Weather Firm Demand - High to Low - 12 Months Ending November 2020

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	484.8	62	262.7	123	172.0	184	81.5	245	32.7	306	24.7
2	429.2	63	262.3	124	170.8	185	81.5	246	30.9	307	24.7
3	429.2	64	262.3	125	166.9	186	81.5	247	30.9	308	24.7
4	422.7	65	262.3	126	165.6	187	81.5	248	29.5	309	24.7
5	413.3	66	255.8	127	165.6	188	80.6	249	29.5	310	24.7
6	405.4	67	255.8	128	165.6	189	77.1	250	29.5	311	24.7
7	405.4	68	254.3	129	164.6	190	77.1	251	29.5	312	24.7
8	403.6	69	254.3	130	164.6	191	77.1	252	29.5	313	24.7
9	391.4	70	250.6	131	164.1	192	77.1	253	29.5	314	24.7
10	389.5	71	246.4	132	163.1	193	77.1	254	29.5	315	23.9
11	389.5	72	242.8	133	163.0	194	76.9	255	29.5	316	23.9
12	383.6	73	242.8	134	156.5	195	76.9	256	29.5	317	23.9
13	375.8	74	241.6	135	156.5	196	75.4	257	29.5	318	23.9
14	373.6	75	241.6	136	156.5	197	75.2	258	29.5	319	23.9
15	367.9	76	236.5	137	152.7	198	75.2	259	29.5	320	23.9
16	349.7	77	235.0	138	152.7	199	74.9	260	29.5	321	23.9
17	349.7	78	234.5	139	149.8	200	72.6	261	29.5	322	23.9
18	344.5	79	232.6	140	146.3	201	72.6	262	29.5	323	23.9
19	344.5	80	230.5	141	146.3	202	72.6	263	29.5	324	23.9
20	341.8	81	230.1	142	143.2	203	70.2	264	29.5	325	23.9
21	336.6	82	227.5	143	136.6	204	69.2	265	29.5	326	23.9
22	336.6	83	227.5	144	136.6	205	68.2	266	29.5	327	23.9
23	333.2	84	227.5	145	133.4	206	63.8	267	29.5	328	23.9
24	328.8	85	227.2	146	128.9	207	63.8	268	29.5	329	23.9
25	326.1	86	224.9	147	128.9	208	63.5	269	29.5	330	23.9
26	326.1	87	224.9	148	126.9	209	62.5	270	29.5	331	23.9
27	325.5	88	224.9	149	123.3	210	59.3	271	29.5	332	23.9
28	321.0	89	224.9	150	121.5	211	57.9	272	29.5	333	23.9
29	317.9	90	223.6	151	120.5	212	57.9	273	29.5	334	23.9
30	313.2	91	220.4	152	120.5	213	57.0	274	29.5	335	23.9
31	312.0	92	217.2	153	120.3	214	54.9	275	29.5	336	23.9
32	310.0	93	217.2	154	119.2	215	52.2	276	29.5	337	23.9
33	310.0	94	216.1	155	117.0	216	52.2	277	29.5	338	23.9
34	310.0	95	214.6	156	116.6	217	52.2	278	29.1	339	23.9
35	305.4	96	213.4	157	116.6	218	50.5	279	29.1	340	23.9
36	305.0	97	213.4	158	116.6	219	50.3	280	25.6	341	23.9
37	305.0	98	213.4	159	114.0	220	50.3	281	25.6	342	23.9
38	302.3	99	210.7	160	114.0	221	50.3	282	25.6	343	23.9
39	302.3	100	210.7	161	112.6	222	47.0	283	25.6	344	23.9
40	302.0	101	209.5	162	108.9	223	46.5	284	24.7	345	23.9
41	297.9	102	209.5	163	108.9	224	46.5	285	24.7	346	23.8
42	297.9	103	209.4	164	108.9	225	46.5	286	24.7	347	23.8
43	294.5	104	206.6	165	108.9	226	46.0	287	24.7	348	23.8
44	290.9	105	206.4	166	108.2	227	43.7	288	24.7	349	23.8
45	289.7	106	203.7	167	107.6	228	41.6	289	24.7	350	23.8
46	289.7	107	197.8	168	103.7	229	41.6	290	24.7	351	23.8
47	289.7	108	191.4	169	103.4	230	41.6	291	24.7	352	23.8
48	289.7	109	188.1	170	103.4	231	41.6	292	24.7	353	23.8
49	286.8	110	188.1	171	100.7	232	41.6	293	24.7	354	23.8
50	286.8	111	184.9	172	91.9	233	40.8	294	24.7	355	23.8
51	286.8	112	183.0	173	90.4	234	39.8	295	24.7	356	23.8
52	286.1	113	183.0	174	90.4	235	39.8	296	24.7	357	23.8
53	283.8	114	180.2	175	90.4	236	39.3	297	24.7	358	23.8
54	281.9	115	178.5	176	90.1	237	37.1	298	24.7	359	23.8
55	279.1	116	178.5	177	88.3	238	36.2	299	24.7	360	23.8
56	278.2	117	178.5	178	88.3	239	36.2	300	24.7	361	23.8
57	278.2	118	178.5	179	86.2	240	35.2	301	24.7	362	23.8
58	270.2	119	178.2	180	86.2	241	35.2	302	24.7	363	23.8
59	269.7	120	178.2	181	83.5	242	34.5	303	24.7	364	23.8
60	269.7	121	174.8	182	83.5	243	34.5	304	24.7	365	23.8
61	262.7	122	172.0	183	81.5	244	32.7	305	24.7	366	23.8

### Normal Weather Firm Demand - High to Low - 12 Months Ending November 2020





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.

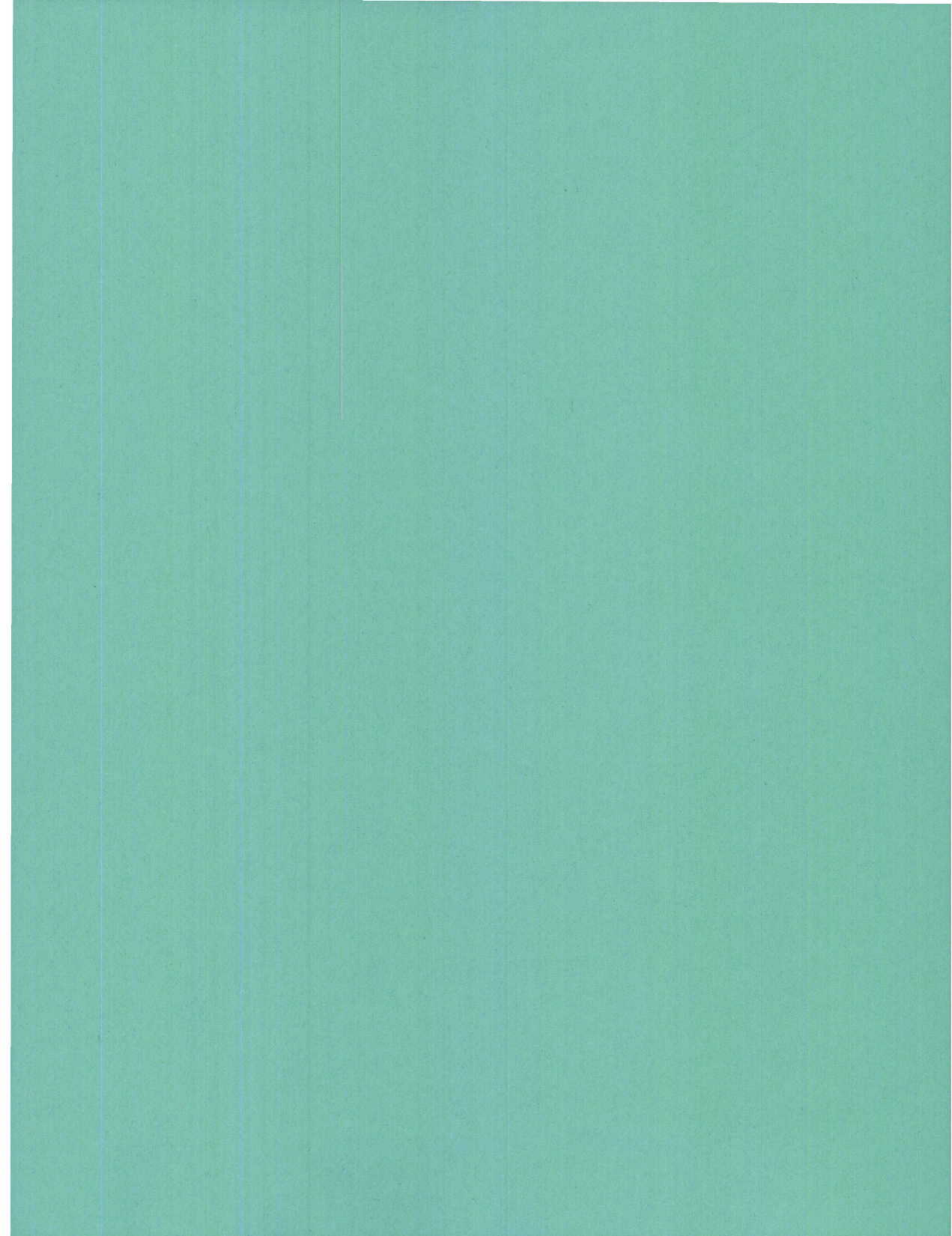
Daily Nominations for 1/2019 in Dth

Customer	Usage 01/19 (Dth)	Nominations 01/19 (Dth)	Daily Nominations for 1/2019 in Dth																	
			Day 1 (Dth)	Day 2 (Dth)	Day 3 (Dth)	Day 4 (Dth)	Day 5 (Dth)	Day 6 (Dth)	Day 7 (Dth)	Day 8 (Dth)	Day 9 (Dth)	Day 10 (Dth)	Day 11 (Dth)	Day 12 (Dth)	Day 13 (Dth)	Day 14 (Dth)	Day 15 (Dth)	Day 16 (Dth)		
A	49,424	**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
B	51,192	*	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	N/A	
C	58,823	*	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	N/A	
D	63,472	64,600	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
E	65,051	*	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	N/A	
F	72,380	*	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	N/A	
G	105,138	105,595	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	3,226	
H	215,366	231,008	5,690	5,690	5,690	5,690	5,690	5,690	5,690	5,000	5,690	5,690	7,690	7,690	7,690	7,690	7,690	7,690	8,690	
I	245,501	**	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	N/A	N/A
J	276,050	307,800	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	9,929	9,929	9,929	
			01/17/19	01/18/19	01/19/19	01/20/19	01/21/19	01/22/19	01/23/19	01/24/19	01/25/19	01/26/19	01/27/19	01/28/19	01/29/19	01/30/19	01/31/19			
Customer			Day 17 (Dth)	Day 18 (Dth)	Day 19 (Dth)	Day 20 (Dth)	Day 21 (Dth)	Day 22 (Dth)	Day 23 (Dth)	Day 24 (Dth)	Day 25 (Dth)	Day 26 (Dth)	Day 27 (Dth)	Day 28 (Dth)	Day 29 (Dth)	Day 30 (Dth)	Day 31 (Dth)			
A			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
B			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
C			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	N/A	
D			2,000	2,100	2,100	2,100	2,100	2,100	2,000	2,000	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	
E			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
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	N/A	N/A	
G			3,226	3,400	3,400	3,400	3,400	3,400	3,226	3,226	3,900	3,900	3,900	3,900	3,900	3,900	3,901	3,901	3,901	
H			8,215	6,690	8,990	8,990	8,990	8,990	5,690	5,690	9,533	9,533	9,533	9,533	9,533	9,533	10,215	10,215	10,215	
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	N/A	N/A	
J			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	9,929	9,929	9,929	

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		CONTRACT QUANTITY		REC POINT QUANTITY		DEL POINT QUANTITY
				DATE	SEASONAL	DTH/D	RECEIPT POINT	DTH/D	CITY GATE DELIVERY POINT	
COLUMBIA GAS	80136-Tier1	FTS	11/01/04	03/31/20	12 Mos	90,788	801 TCO-LEACH A05 DELMONT AGG A06 MCCLELL AGG B15 UNIONVILLE C16 DELMONT	39,496 3,641 21,596 12,283 13,772	CPA CITY GATE	90,788
	80136-Tier2		04/01/20	10/31/22	12 Mos	60,551	801 TCO-LEACH B15 UNIONVILLE C16 DELMONT	39,496 12,283 8,772	CPA CITY GATE	60,551
	80136-Tier3		11/01/22	10/31/25	12 Mos	21,055	B15 UNIONVILLE C16 DELMONT	12,283 8,772	CPA CITY GATE	21,055
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 STATION BROADRUN	10,000 1,666	CPA CITY GATE	11,666
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	03/31/20	OCT-MAR APR-SEPT	456,876 228,438	STORAGE O-M STORAGE A-S	456,876 228,438	CPA CITY GATE	456,876 10,000
DOMINION TRANSMISSION	700034	FTNN-GSS	06/01/05	3/31/2023 (1)	NOV-MAR	6,000	GSS STORAGE	6,000	CPA @ WARRENDALE/DARLINGTON	6,000
DOMINION TRANSMISSION	100121	FTNN	04/01/14	3/31/2024 (1)	12 Mos	4,800	GSS STORAGE	4,800	PLEASANT GAP	4,800
DOMINION TRANSMISSION	100122	FTNN	05/01/15	3/31/1930 (1)	12 Mos	15,000	GSS STORAGE	15,000	PLEASANT GAP	15,000
DOMINION TRANSMISSION	200687	FT	05/01/15	3/31/1930 (1)	12 Mos	5,000	TRANSCO LEIDY	5,000	PLEASANT GAP	5,000
DOMINION TRANSMISSION	200539	FT	11/01/09	10/31/2024 (1)	NOV-MAR APR-OCT	3,000 2,000	OAKFORD	3,000	CPA @ WARRENDALE	3,000
DOMINION TRANSMISSION	200754	FT	04/01/20	3/31/2030 (1)	12 Mos	255	DETI Loudoun	255	CPA @ CENTRE HALL	255
EQUITRANS	EQTR10375-391	FTS	04/01/14	3/31/2020 (1)	NOV-MAR	14,348	STORAGE	14,348	CPA @ GROVETON	14,348
EQUITRANS	1588	FTS	04/01/20	3/31/2025 (1)	NOV-MAR	18,870	Rhinehart m11183	18,870	CPA @ SPARTON	18,870
EQUITRANS	1590	NOFT	04/01/20	3/31/2025 (1)	NOV-MAR APRIL & OCT MAY - SEPT	36,130 32,000 20,000	Storage m90003 Rhinehart m11183 Rhinehart m11183	36,130 32,000 20,000	CPA @ SPARTON CPA @ SPARTON CPA @ SPARTON	36,180 32,000 20,000
NATIONAL FUEL (2)	F02091	FT	11/01/98	10/31/20 (2)	12 Mos	4,304	TRANSCO LEIDY	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	10/31/2021 (1)	12 Mos	2,342	VENICE ST LANDRY	941 1,401	COL GAS @ ROCKWOOD CPA @ ST COLLEGE CPA @ EMIGSVILLE COL GAS @ EAGLE CPA @ CHAMBERSBURG	2,342
TEXAS EASTERN	910464	CDS	11/01/06	10/31/2025 (1)	12 Mos	5,000	MRPL	5,000	CPA @ ROCKWOOD/CHANMBERSBURG	5,000
TEXAS EASTERN	910463	CDS	11/01/06	10/31/2025 (1)	12 Mos	158	MRPL	158	CPA @ CHAMBERSBURG	158
TEXAS EASTERN	910951	FT-1	11/01/12	10/31/2022 (1)	12 Mos	11,753	ELA, M1	11,753	CPA @ UNIONTOWN	11,753
TEXAS EASTERN	830049	FT-1	12/01/98	11/30/2022 (1)	DEC-MAR	10,000	EAGLE	10,000	CPA @ ST COLLEGE CPA @ ROCKWOOD CPA @ CHAMBERSBURG	1,658 8,242 100
TEXAS EASTERN	911660	FT-1	11/01/19	10/31/2022 (1)	12 Mos	100	79965 Marietta Extension H/L	100	CPA @ JOHNSON RD	100

TERM NOTES:

- (1) YEAR TO YEAR THEREAFTER
- (2) NET CITY GATE DELIVERY IS 4.2,45 DTH/D

**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	14,835	ELA, MI	14,835	COL GAS @ DELMONT	3,082

**STORAGE**

COUNTERPARTY	CONTRACT NUMBER	RATE SCHEDULE	EFFECTIVE DATE	PRIMARY TERMINATION DATE	SEASONAL	CONTRACT QUANTITY DTH/D	RECEIPT POINT
COLUMBIA GAS	82512	FSS	04/01/05	03/31/20	MDO SCQ	456,876 25,341,126	REQUIRES COLUMBIA GAS SST FOR DELIVERY TO THE CITY GATE
DOMINION TRANSMISSION	600037	GSS	06/01/05	3/31/2023 (1)	MDO SCQ	9,000 941,176	REQUIRES DTI FTNN-GSS AND FT FOR DELIVERY TO THE CITY GATE
DOMINION TRANSMISSION	300195	GSS	04/01/14	3/31/2024 (1)	MDO SCQ	4,800 240,000	REQUIRES DTI FTNN-GSS FOR DELIVERY TO THE CITY GATE
DOMINION TRANSMISSION	300206	GSS	05/01/15	3/31/2030 (1)	MDO SCQ	15,000 930,000	REQUIRES DTI FTNN-GSS FOR DELIVERY TO THE CITY GATE
EQUITRANS	EQTR10379-390	115SS	04/01/14	3/31/2020 (1)	MDO SCQ	14,348 1,500,000	REQUIRES EQUITRANS FTS FOR DELIVERY TO THE CITY GATE
EQUITRANS	1589	115SS	04/01/20	3/31/2025 (1)	MDO SCQ	19,130 2,000,000	REQUIRES EQUITRANS FTS FOR DELIVERY TO THE CITY GATE
BLACKHAWK					MDO SCQ	10,000 30,000	ON SYSTEM STORAGE

**EXCHANGES**

COUNTERPARTY	EFFECTIVE DATE	PRIMARY TERMINATION DATE	CONTRACT QUANTITY DTH/D	RECEIPT POINT
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

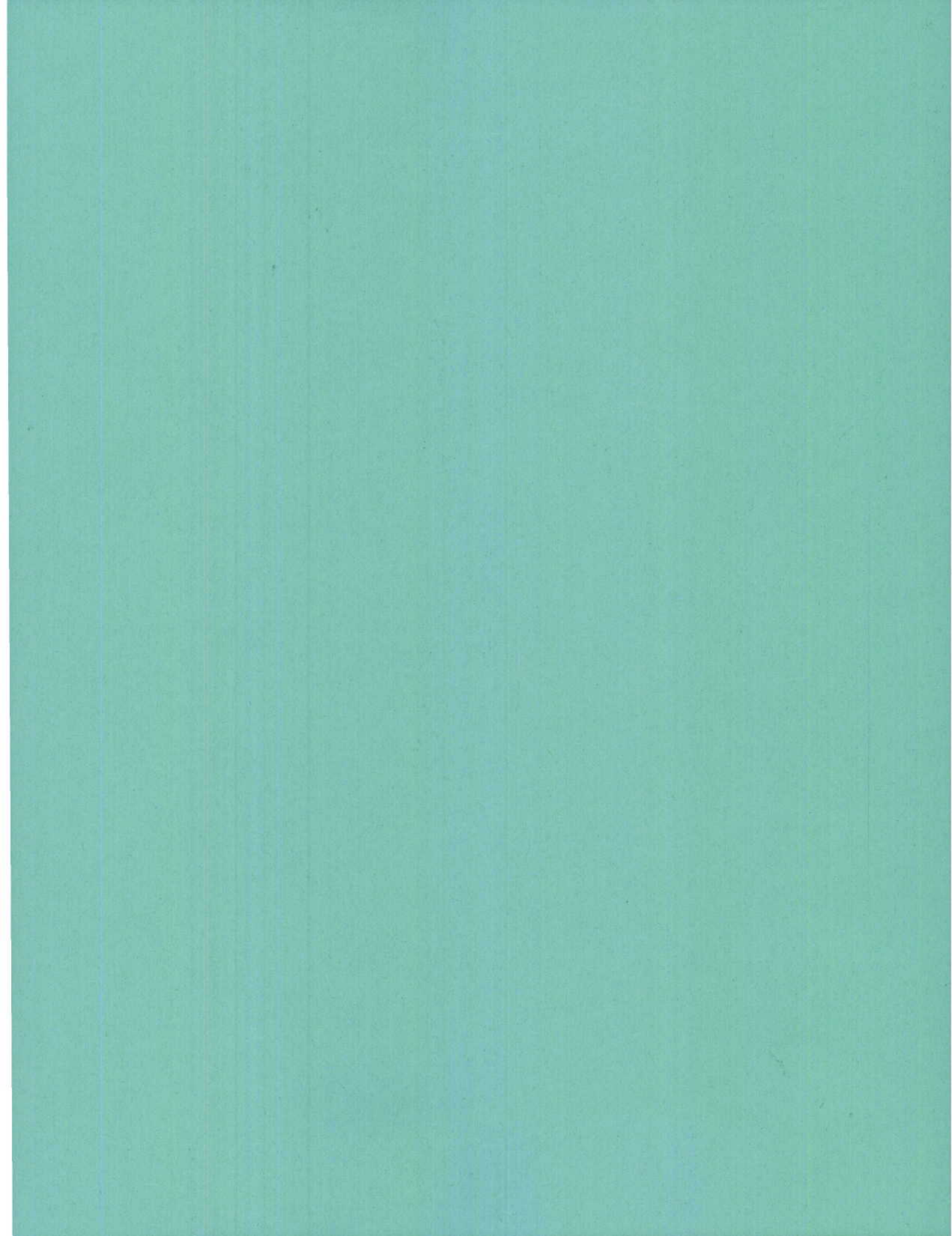
**STORAGE RATCHET PROVISIONS**

<b>COLUMBIA FSS</b>	SCQ LEVEL 100% TO 30% <30% TO 20% <20% TO 10% <10% TO 0%	MDO 100 % OF MDO 80% OF MDO 65% OF MDO 50% OF MDO	<b>EQUITRANS 115SS</b> SCQ LEVEL 100% TO 35% <35% TO 16% <16% TO 10% <10% TO 0%	MDO 100 % OF MDO 92% OF MDO 70% OF MDO 63% OF MDO
<b>DTI GSS</b>	SCQ LEVEL 100% TO 35% <35% TO 16% <16% TO 10% <10% TO 0%	MDO 100 % OF MDO 92% OF MDO 70% OF MDO 63% OF MDO	<b>BLACKHAWK</b> RATCHETS DO NOT APPLY	

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

**TERM NOTES:**

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



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, 2019.
- 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, 2019.
- 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, 2019.

**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, 2019**

		<b>Volumes</b>											
		Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19
		DTH	DTH	DTH	DTH	DTH	DTH	DTH	DTH	DTH	DTH	DTH	DTH
NSS		9,850.0	9,950.0	10,412.0	8,831.0	7,452.0	3,848.0	2,553.0	2,324.0	2,351.0	2,359.0	3,172.0	7,794.0

		<b>Revenues</b>											
		Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19
		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
NSS		60,365.04	50,129.12	45,807.89	37,711.82	31,478.50	16,180.84	11,198.55	9,985.97	9,495.69	9,782.45	13,284.69	31,527.58

**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, 2019**

	Volumes											
	Dec-18 DTH	Jan-19 DTH	Feb-19 DTH	Mar-19 DTH	Apr-19 DTH	May-19 DTH	Jun-19 DTH	Jul-19 DTH	Aug-19 DTH	Sep-19 DTH	Oct-19 DTH	Nov-19 DTH
LDS FLEX	1,070,237.0	1,086,860.0	1,090,011.0	1,000,679.0	922,124.0	837,085.0	760,395.0	717,599.0	709,656.0	839,995.0	819,166.0	892,603.0
MLDS I FLEX	201,659.0	215,366.0	240,310.0	213,156.0	221,473.0	201,001.0	179,418.0	165,278.0	162,971.0	160,433.0	152,603.0	180,571.0
MLDS II FLEX	164,603.0	175,066.0	176,429.0	120,407.0	111,885.0	55,852.0	89,522.0	82,681.0	100,711.0	93,985.0	101,444.0	110,379.0
SDS FLEX	20,881.0	20,558.0	23,983.0	17,063.0	13,613.0	10,317.0	8,837.0	11,415.0	5,506.0	5,888.0	7,517.0	11,491.0
SGDS FLEX	2,368.0	2,361.0	1,894.0	1,774.0	1,371.0	535.0	322.0	273.0	255.0	214.0	227.0	802.0

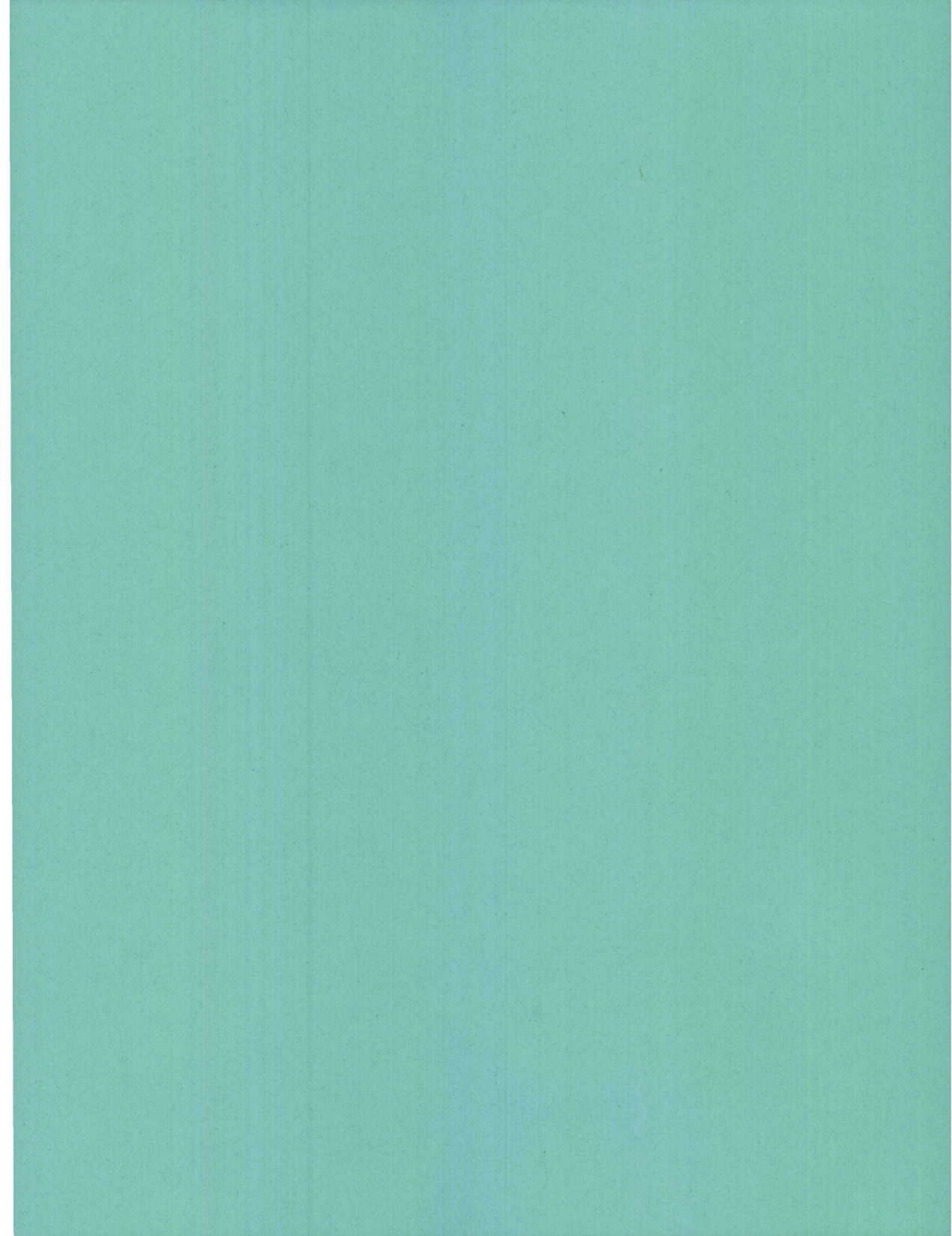
	Revenues											
	Dec-18 \$	Jan-19 \$	Feb-19 \$	Mar-19 \$	Apr-19 \$	May-19 \$	Jun-19 \$	Jul-19 \$	Aug-19 \$	Sep-19 \$	Oct-19 \$	Nov-19 \$
LDS FLEX	356,004	365,945	372,196	357,971	374,744	342,516	344,661	312,825	303,185	372,252	309,494	320,976
MLDS I FLEX	26,217	27,502	29,839	27,295	28,074	26,156	24,133	22,809	22,592	22,355	21,621	24,242
MLDS II FLEX	54,049	58,080	57,919	34,285	32,569	21,980	28,055	25,647	29,978	28,410	30,113	32,349
SDS FLEX	26,266	26,503	28,562	23,702	20,477	17,798	16,498	16,747	11,752	12,024	13,225	16,216
SGDS FLEX	2,645	2,658	2,339	2,267	1,737	944	708	639	609	508	530	1,199

**Columbia Gas of Pennsylvania, Inc.**  
**Actual Billed Volumes and Revenues Billed - Transported at Full Margin Transportation Rates**  
**For the 12 Months Ending November 30, 2019**

	Volumes											
	Dec-18 DTH	Jan-19 DTH	Feb-19 DTH	Mar-19 DTH	Apr-19 DTH	May-19 DTH	Jun-19 DTH	Jul-19 DTH	Aug-19 DTH	Sep-19 DTH	Oct-19 DTH	Nov-19 DTH
LDS	973,560.0	933,059.0	1,058,090.0	1,007,386.0	931,745.0	829,612.0	753,386.0	736,259.0	771,008.0	770,217.0	856,636.0	946,072.0
MLDS I	17,694.0	18,778.0	20,276.0	68,725.0	68,615.0	56,091.0	9,588.0	8,197.0	8,716.0	8,651.0	10,159.0	13,758.0
MLDS II	42,181.0	43,864.0	38,196.0	40,356.0	34,961.0	34,929.0	76,942.0	80,659.0	78,170.0	53,744.0	51,210.0	72,678.0
RDS	932,906.3	1,017,971.7	1,101,265.3	942,290.8	549,747.2	220,775.5	122,696.1	91,522.4	76,668.2	84,334.6	120,109.7	409,437.3
SCD	426,272.6	490,263.7	562,715.9	459,820.2	267,275.4	115,496.1	74,119.2	62,114.1	59,414.2	65,305.9	83,146.0	223,028.1
SDS	748,342.0	812,358.0	896,744.0	747,270.0	555,101.0	405,450.0	327,660.0	309,384.0	306,705.0	327,359.0	359,666.0	567,423.0
SGDS	640,671.0	631,368.0	692,149.0	587,669.0	358,678.0	171,397.0	115,623.0	92,705.0	86,171.0	96,787.0	123,559.0	294,932.0

	Revenues											
	Dec-18 \$	Jan-19 \$	Feb-19 \$	Mar-19 \$	Apr-19 \$	May-19 \$	Jun-19 \$	Jul-19 \$	Aug-19 \$	Sep-19 \$	Oct-19 \$	Nov-19 \$
LDS	1,288,659.80	1,338,825.68	1,443,865.55	1,362,328.10	1,270,053.73	1,139,947.94	1,052,925.17	1,032,824.42	1,071,185.03	1,071,554.27	1,175,681.69	1,289,916.83
MLDS I	3,255.24	3,255.76	3,391.06	12,511.09	12,049.08	10,883.73	2,431.82	2,305.89	2,352.87	2,346.99	2,483.52	2,809.36
MLDS II	20,436.92	21,088.91	18,893.13	19,729.91	17,044.72	17,032.74	105,232.25	38,108.61	37,176.91	28,033.55	27,084.99	35,121.11
RDS	8,443,073.73	9,101,351.44	9,753,478.26	8,504,652.12	5,338,318.75	2,776,143.81	2,009,771.61	1,769,074.68	1,649,172.16	1,704,604.74	1,990,512.52	4,273,707.89
SCD	2,239,695.53	2,533,528.63	2,888,502.07	2,395,782.75	1,501,780.30	783,532.94	586,810.59	533,850.35	526,588.56	557,796.42	651,986.32	1,368,619.52
SDS	1,868,267.75	2,137,387.50	2,351,161.87	1,992,423.08	1,532,349.29	1,166,966.32	978,258.03	936,660.29	932,190.85	988,790.35	1,064,176.46	1,562,658.58
SGDS	2,400,283.28	2,345,144.44	2,567,207.35	2,186,719.61	1,375,832.58	704,322.47	505,127.62	423,921.56	400,511.47	438,557.79	534,621.29	1,148,610.41





Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

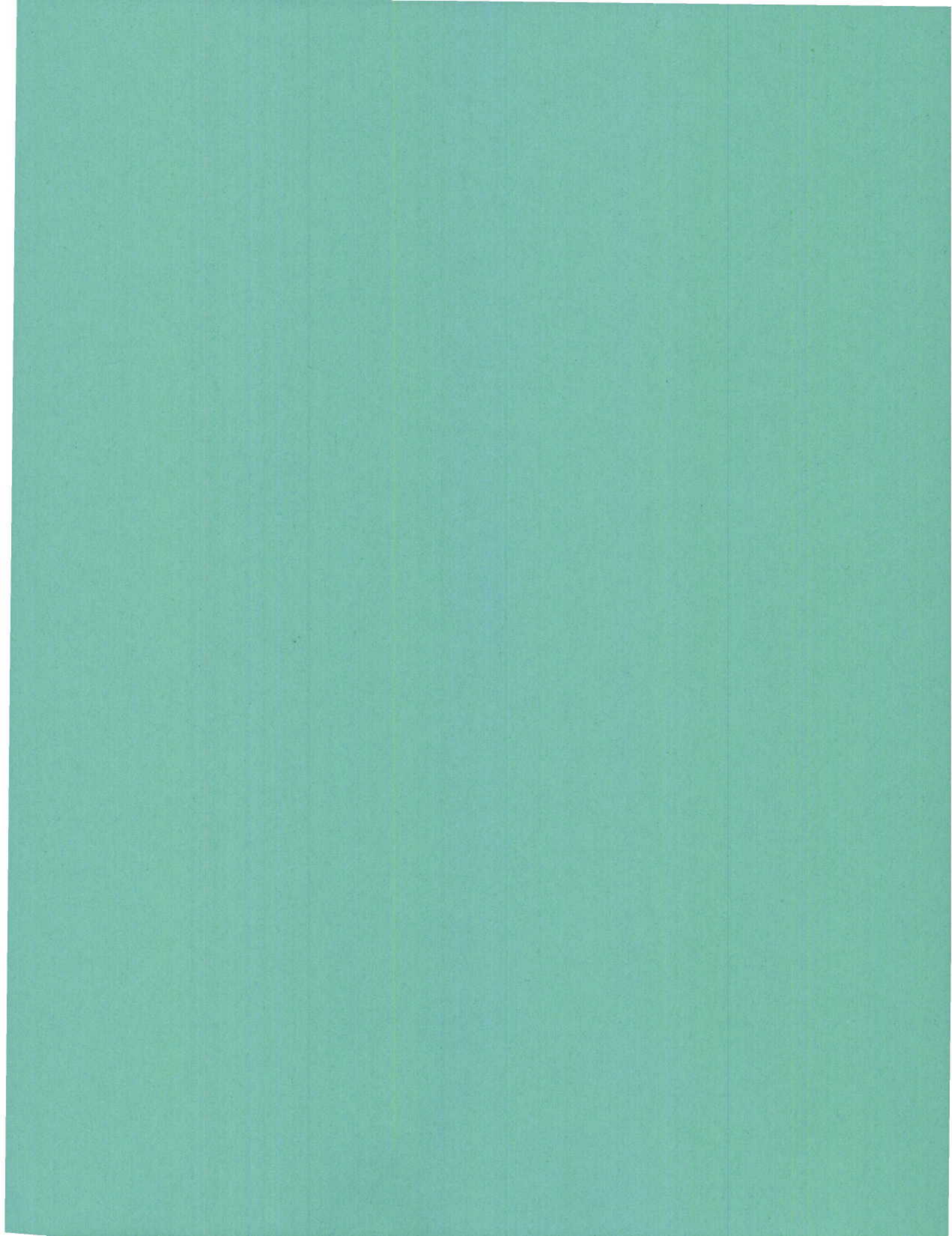
Question No. GAS-COS-16:

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 <sup>(1)</sup>**

TCO Market Area	Pipeline Area	Location	2015 Station Weighting	Company (Gumbel 1-in-15)			
				Historical Period	Current Day Temp	Prior Day Temp <sup>(2)</sup>	Wind Speed <sup>(2)</sup>
25	Lancaster	Harrisburg, PA	95.1311	1925-2015	2	10	12
		Hagerstown, MD	4.8689	1925-2015	0	10	12
		<b>Total</b>	<b>100.0000</b>		<b>2</b>	<b>10</b>	<b>12</b>
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
		<b>Total</b>	<b>100.0000</b>		<b>-7</b>	<b>5</b>	<b>10</b>
36	Olean	Pittsburgh, PA	2.8939	1925-2015	-7	5	11
		Bradford, PA	97.1061	1941-2015	-15	-2	11
		<b>Total</b>	<b>100.0000</b>		<b>-15</b>	<b>-2</b>	<b>11</b>
38	Rimersburg	Pittsburgh, PA	56.1941	1925-2015	-7	5	11
		Bradford, PA	43.8059	1941-2015	-15	-2	7
		<b>Total</b>	<b>100.0000</b>		<b>-11</b>	<b>2</b>	<b>9</b>
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
		<b>Total</b>	<b>100.0000</b>		<b>-6</b>	<b>5</b>	<b>7</b>
<b>CPA Total</b>		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
		<b>Total Co</b>	<b>100.0000</b>		<b>-5</b>	<b>6</b>	<b>11</b>

(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	17	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	16	16	17	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	5	6	7	8	10	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	1	2	2	3	4	4	6	7	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	16	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	10	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	-3	-2	0	0	1	2	2	2	3	3	6	6	7
1979	152	-6	-6	-5	3	3	5	5	6	7	7	9	9	9	9	10	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	16	16	16	16	16	18
1983	152	-11	-7	-3	0	0	0	2	2	2	3	3	4	5	5	6	6	6	6	6	6
1984	151	-10	-9	4	5	5	6	8	8	10	11	11	12	12	13	13	13	13	14	15	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	14	14	14	14	15	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	15	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	15	15	15	15	16
1995	152	-5	-1	-1	1	3	4	4	4	4	5	6	6	7	7	8	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	15	15	15
1999	152	1	3	4	5	7	9	9	11	12	13	13	13	14	14	15	15	15	17	17	17
2000	151	8	9	12	12	12	13	13	13	13	14	14	15	15	15	15	16	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	16	17	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	16	16	16	16	16
2010	151	3	3	4	7	9	10	10	11	12	12	12	13	13	13	14	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	10
2014	151	-9	-4	-4	-3	-1	3	4	4	4	5	5	6	7	8	8	8	9	10	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

Rank	Gumbel Curve parameters and probabilities							
	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

Rank	Normal Curve parameters and probabilities							
	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	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	24	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	20	20	21	21	22	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	23	23	23	23	24
1966	151	10	13	14	15	15	17	19	19	19	20	21	22	22	22	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	21	22	23	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	16	18	19	19	19	19	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	16	17	18	19	19	20	22	22	22	23	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	24	26
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	25	25	25	25	25	25	26	26	26	26	26	26	26
1992	151	15	18	18	19	20	20	21	21	21	21	23	23	23	24	25	25	25	25	25	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	33
1998	151	17	17	20	20	21	22	23	23	23	24	24	24	25	25	25	25	26	26	26	26	27
1999	152	17	17	18	18	21	23	23	23	23	24	24	24	25	25	25	27	28	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	23	24
2001	151	21	22	22	23	24	25	26	26	27	27	27	28	28	28	28	29	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	22
2003	152	10	10	13	14	14	15	16	16	17	18	18	18	20	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	24	25	25
2005	151	16	18	19	21	23	23	24	24	25	25	26	27	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	23
2007	152	16	17	18	20	21	21	21	22	22	23	25	26	27	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	25	26
2009	151	19	19	19	21	21	23	23	24	25	25	25	25	26	26	26	26	26	26	26	27	27
2010	151	15	18	19	19	20	22	22	22	22	23	23	23	23	23	24	25	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	32	33	33
2012	151	15	16	17	18	20	22	23	24	26	27	27	27	27	28	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	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	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

Rank	Gumbel Curve parameters and probabilities							
	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

Rank	Normal Curve parameters and probabilities							
	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	25	25	26
1928	151	13	17	18	22	22	23	23	23	24	24	24	24	25	25	25	25	25	25	25	26
1929	151	13	14	15	16	18	19	19	20	20	20	20	21	21	21	22	23	24	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	18	18	18	19	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	16	17	17	18	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	26	26
1939	152	10	10	14	14	16	16	17	19	19	20	20	20	20	20	20	21	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	25	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	30	30	30	30	31	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	17	18	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	20	21	21	22	22	22	22
1964	151	7	8	15	15	15	16	17	18	19	19	21	21	21	21	22	22	24	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	25	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	28	28	28	28
1975	152	14	15	17	19	19	21	21	22	22	22	23	23	24	25	25	25	25	26	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	23	23	24	24	25	25	25	25	26	26
1980	151	7	8	8	9	10	12	12	13	15	16	16	16	16	17	17	17	18	19	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	21	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	18	18	18	19	19	19
1994	151	13	15	16	18	18	19	19	23	23	24	24	25	25	26	26	26	27	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	27	28	29	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	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	26
1999	152	14	16	16	16	17	20	20	20	20	22	22	23	23	23	25	25	25	25	26	26	26
2000	151	17	19	19	19	19	20	21	21	21	21	21	22	23	23	23	23	23	24	25	25	25
2001	151	22	23	24	25	26	26	27	27	27	27	27	27	28	28	29	29	29	30	30	30	30
2002	151	13	13	14	14	16	18	19	19	20	20	21	21	21	21	21	21	22	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	22
2004	151	12	14	16	16	16	17	18	18	20	22	22	22	22	24	24	25	25	25	26	26	26
2005	151	14	17	20	21	23	25	26	26	26	27	27	27	27	27	28	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	25
2007	152	16	19	20	20	22	23	23	24	25	25	26	27	27	27	27	28	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	24	25	25
2009	151	18	19	22	22	23	23	24	24	25	25	26	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	25
2011	152	20	22	25	25	25	26	26	27	28	28	29	29	30	30	31	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	28	29	29
2013	151	6	8	10	13	13	14	15	15	15	16	16	17	18	19	20	21	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	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

Rank	Gumbel Curve parameters and probabilities							
	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

Rank	Normal Curve parameters and probabilities							
	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	20	21	22	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	15	16	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	20	20
1961	151	5	6	10	12	12	13	15	16	16	17	17	20	21	22	22	23	23	23	24	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	13	13	15	16	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	18	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	23	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	19	19	19	19	20	21	22	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	19	19	19	20	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

Rank	Gumbel Curve parameters and probabilities							
	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

Rank	Normal Curve parameters and probabilities							
	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	21
1926	151	10	11	13	17	18	19	19	20	21	21	21	22	22	22	23	23	23	24	25	25	25
1927	152	7	8	12	12	12	13	14	14	15	17	17	17	18	18	19	20	20	21	23	23	23
1928	151	13	15	16	17	17	17	18	19	20	20	20	21	22	22	23	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	21
1930	151	13	13	16	17	19	19	19	21	22	22	23	23	23	23	24	24	24	24	25	25	25
1931	152	9	12	14	17	18	18	18	18	22	22	25	26	26	29	29	29	29	30	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	25
1933	151	-1	4	5	5	5	6	9	9	10	12	14	14	15	15	15	17	17	17	18	18	18
1934	151	9	13	15	15	17	17	18	20	21	21	21	22	22	23	23	23	24	24	25	25	25
1935	152	-9	-2	-2	1	2	4	5	6	7	8	9	9	9	10	10	10	11	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	26
1937	151	9	13	13	14	15	15	16	16	16	17	17	17	17	18	19	20	23	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	24
1939	152	-3	5	7	8	10	11	11	11	11	12	13	13	13	14	15	16	16	17	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	22
1941	151	-1	5	7	9	10	10	11	12	12	13	13	17	18	19	21	21	22	22	23	23	23
1942	151	2	5	8	8	10	11	11	12	12	14	15	16	17	17	17	18	19	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	22
1944	151	6	9	9	11	13	13	14	16	17	17	17	17	18	18	19	19	19	19	20	20	20
1945	151	9	10	11	13	13	14	14	17	17	18	19	20	20	20	20	20	21	21	21	22	22
1946	151	3	4	9	10	15	16	17	17	17	18	19	19	19	21	21	21	21	21	21	22	22
1947	152	5	7	9	9	10	10	11	11	12	13	13	13	15	16	16	16	17	19	20	21	21
1948	151	14	16	18	20	20	22	23	24	24	24	25	25	25	26	26	26	26	27	27	27	27
1949	151	13	13	15	16	17	19	20	21	21	22	22	22	25	26	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	21
1951	152	1	13	13	13	19	19	20	20	21	22	23	23	24	24	25	25	26	26	26	26	26
1952	151	18	19	21	22	22	23	23	24	25	25	25	25	25	25	25	25	25	25	26	26	26
1953	151	12	13	13	15	17	17	18	20	21	21	21	21	21	22	22	22	22	22	23	23	23
1954	151	6	7	7	8	9	10	13	13	15	17	17	17	19	19	20	20	21	21	22	22	22
1955	152	14	15	16	17	18	18	18	19	19	19	20	21	21	21	21	22	22	22	22	23	23
1956	151	3	8	12	12	14	15	17	18	18	18	19	21	21	22	23	23	23	23	23	24	24
1957	151	-1	7	7	8	9	9	11	12	13	14	15	16	16	17	17	18	18	20	20	20	20
1958	151	0	3	6	6	9	9	10	10	10	10	10	11	13	14	14	15	16	16	16	17	17
1959	152	13	14	14	14	15	16	16	16	16	16	17	18	18	18	18	18	18	19	19	20	20
1960	151	0	2	5	5	5	5	7	7	8	8	10	10	11	12	12	14	17	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	14	15	15	16	17
1968	151	7	8	9	11	12	12	13	15	15	16	16	16	16	16	16	17	17	17	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	21	21	22	22	22
1972	151	5	12	14	14	15	15	15	15	16	16	16	16	17	17	19	21	21	22	22	23
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	13	14	14	14	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	13	14
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	16	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	28	29	29
1998	151	4	11	12	14	15	15	16	17	17	17	18	18	19	19	19	20	21	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	24
2000	151	10	11	12	12	15	15	16	17	18	18	18	18	19	19	19	20	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	26
2002	151	7	8	9	11	12	14	14	15	16	16	16	16	17	18	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	22
2004	151	7	8	9	10	11	12	14	15	15	17	18	18	18	19	19	20	21	21	21	21	22
2005	151	12	16	16	16	17	18	19	20	20	20	21	21	23	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	20
2007	152	10	10	15	15	16	16	17	17	18	19	20	21	21	21	21	23	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	21
2009	151	10	12	12	13	15	15	15	16	17	17	19	19	19	20	20	21	22	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	21
2011	152	15	17	19	20	20	20	21	22	23	24	26	26	26	27	27	27	28	28	29	29	29
2012	151	8	10	15	15	15	16	18	19	20	20	20	21	21	21	22	22	24	25	26	26	26
2013	151	-2	1	5	7	9	10	11	12	13	14	15	15	15	15	15	15	15	16	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	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

Rank	Gumbel Curve parameters and probabilities							
	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

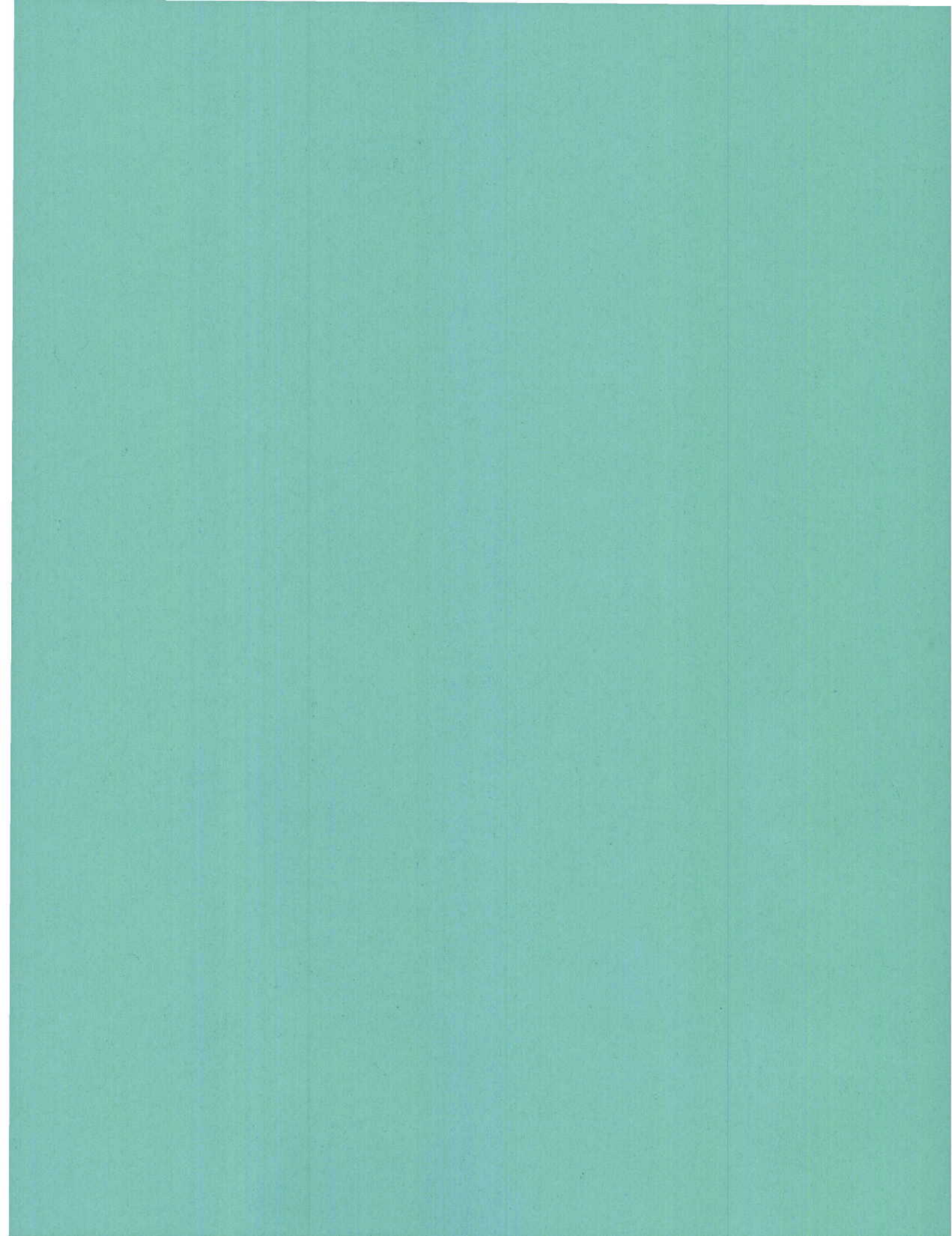
Normal Analysis

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

Rank	Normal Curve parameters and probabilities							
	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:

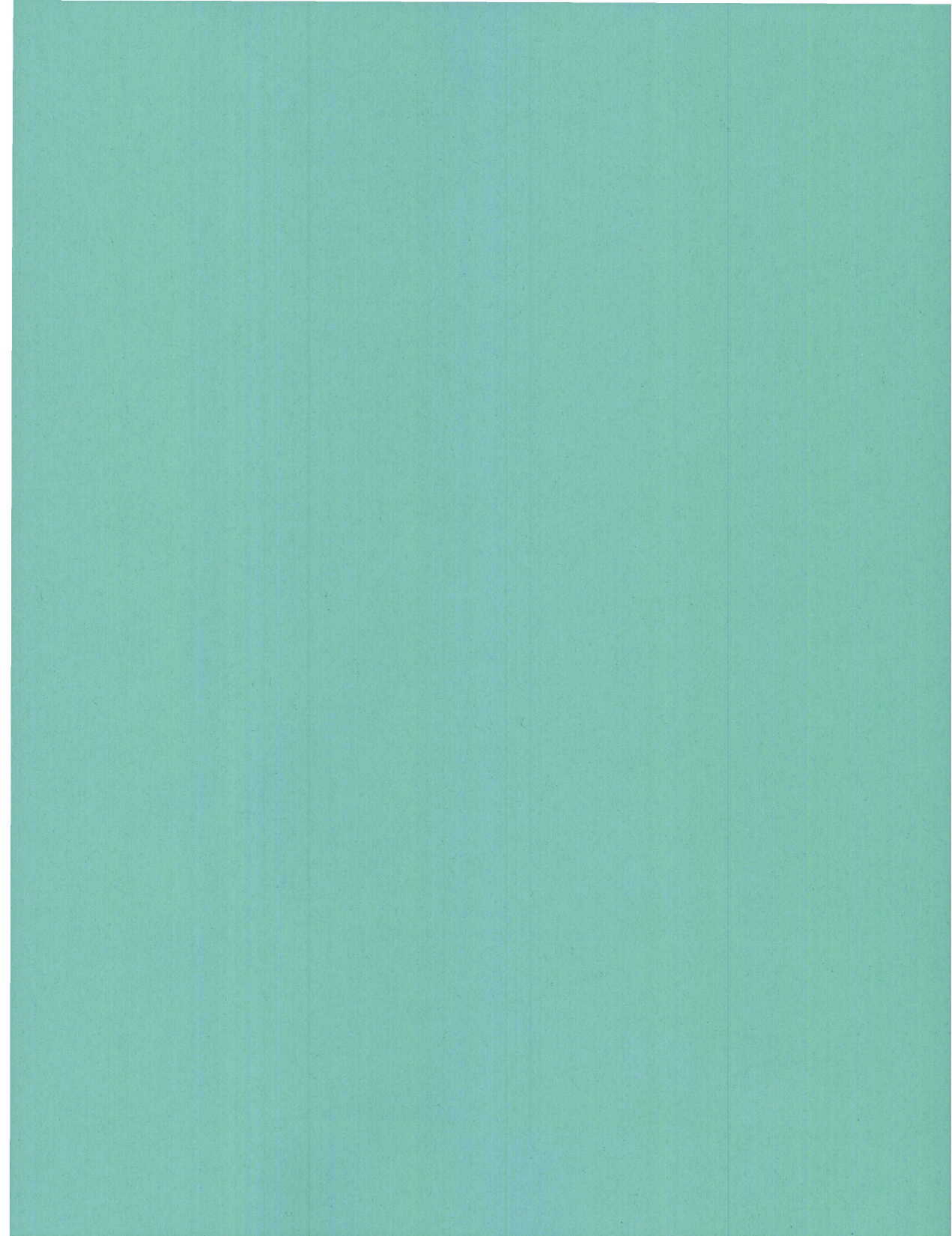
For each customer class contained in the cost of service study, please provide monthly throughput by class.

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, 2021

		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	506,053.2	519,004.4	440,502.2	297,213.3	144,438.2	65,845.9	37,911.6	35,862.2	38,308.7	68,678.3	191,659.5	370,981.6	2,716,459.1
LDS	COM	280,800.0	278,600.0	240,600.0	209,600.0	179,000.0	153,900.0	140,700.0	152,400.0	153,400.0	175,000.0	218,400.0	259,600.0	2,442,000.0
LDS	IND	598,400.0	645,400.0	676,000.0	660,300.0	632,300.0	610,900.0	572,400.0	591,400.0	612,700.0	644,200.0	662,100.0	617,900.0	7,524,000.0
LDS FLEX	COM	260,000.0	255,000.0	215,000.0	180,000.0	115,000.0	100,000.0	120,000.0	95,000.0	100,000.0	115,000.0	155,000.0	204,000.0	1,914,000.0
LDS FLEX	IND	817,000.0	843,000.0	781,200.0	661,100.0	669,500.0	670,400.0	643,600.0	636,600.0	674,400.0	687,700.0	708,000.0	729,500.0	8,522,000.0
LGSS	COM	157,065.1	164,091.2	134,311.5	75,808.4	34,387.9	16,615.7	10,006.7	7,754.5	9,564.3	18,285.6	49,656.1	115,737.3	793,284.3
LGSS	IND	8,908.1	7,113.0	5,017.4	3,751.9	2,623.8	1,793.6	1,440.4	1,438.8	1,707.8	2,058.3	3,131.1	5,504.1	44,488.3
MLDS I	COM	15,000.0	14,000.0	11,000.0	9,000.0	7,000.0	6,000.0	5,000.0	4,000.0	6,000.0	6,000.0	10,000.0	10,000.0	103,000.0
MLDS I	IND	4,900.0	5,400.0	4,700.0	4,000.0	4,100.0	4,000.0	3,500.0	3,800.0	3,700.0	3,500.0	4,200.0	4,200.0	50,000.0
MLDS I FLEX	IND	200,000.0	220,000.0	210,000.0	210,000.0	200,000.0	200,000.0	170,000.0	180,000.0	180,000.0	180,000.0	180,000.0	190,000.0	2,320,000.0
MLDS II	IND	42,000.0	40,000.0	40,000.0	34,000.0	35,000.0	32,000.0	34,000.0	33,000.0	33,000.0	36,000.0	38,000.0	42,000.0	439,000.0
MLDS II FLEX	IND	168,000.0	164,000.0	163,000.0	158,000.0	154,000.0	145,000.0	123,000.0	138,000.0	132,000.0	128,000.0	149,000.0	147,000.0	1,769,000.0
NSS	COM	13,700.0	10,200.0	9,300.0	7,400.0	5,200.0	2,700.0	2,300.0	2,300.0	2,300.0	3,600.0	5,900.0	7,800.0	72,700.0
RDS	RES	1,239,000.0	1,234,000.0	1,014,000.0	668,000.0	311,000.0	165,000.0	100,000.0	97,000.0	103,000.0	157,000.0	448,000.0	881,000.0	6,417,000.0
RSS	RES	4,975,946.8	4,940,995.6	4,047,497.8	2,656,786.7	1,230,561.8	666,154.1	407,088.4	394,137.8	419,691.3	628,321.7	1,791,340.5	3,525,018.4	25,683,540.9
SCD	COM	383,000.5	385,004.6	313,003.7	216,000.0	126,997.1	81,001.9	69,994.4	66,006.5	68,973.2	92,980.7	163,996.5	275,995.2	2,242,954.3
SDS	COM	481,901.8	505,600.8	413,899.7	328,856.0	239,913.9	205,404.8	171,423.2	175,809.2	186,588.9	237,966.6	317,992.5	412,329.2	3,677,686.6
SDS	IND	211,377.6	215,251.4	204,607.2	194,826.9	195,939.3	201,527.9	202,569.2	206,093.6	192,860.1	196,349.7	201,395.1	202,903.4	2,425,701.4
SDS FLEX	COM	19,100.0	18,400.0	14,800.0	12,000.0	8,600.0	7,600.0	6,500.0	7,000.0	6,900.0	8,400.0	11,600.0	14,100.0	135,000.0
SDS FLEX	IND	5,600.0	7,100.0	5,700.0	5,900.0	4,500.0	4,300.0	3,500.0	3,500.0	4,300.0	4,500.0	4,900.0	5,200.0	59,000.0
SGDS FLEX	COM	2,480.0	2,400.0	1,950.0	1,225.0	560.0	360.0	310.0	270.0	270.0	335.0	880.0	1,890.0	12,930.0
SGDS	COM	652,718.3	640,998.0	513,751.1	403,322.5	245,924.1	152,737.8	126,076.4	121,529.8	126,832.3	181,301.3	317,130.9	498,080.9	3,980,403.4
SGDS	IND	18,723.0	16,848.5	13,792.9	13,874.0	8,660.9	4,872.5	4,430.8	4,606.5	5,040.2	4,750.3	8,404.9	14,296.9	118,301.4
SGSS	COM	1,858,243.8	1,875,688.1	1,508,393.3	879,816.5	405,426.0	149,735.0	99,698.4	73,868.2	83,948.0	161,165.5	517,457.7	1,176,434.1	8,789,874.6
SGSS	IND	27,092.0	19,887.0	13,982.8	9,247.5	5,376.3	3,206.3	2,559.9	2,561.3	3,292.1	5,941.9	9,868.7	13,496.2	116,512.0
Total		12,947,010.2	13,027,982.6	10,996,009.6	7,900,028.7	4,966,009.3	3,651,055.5	3,058,009.4	3,033,938.4	3,148,776.9	3,747,034.9	6,168,013.5	9,724,967.3	82,368,836.3



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost Of Service

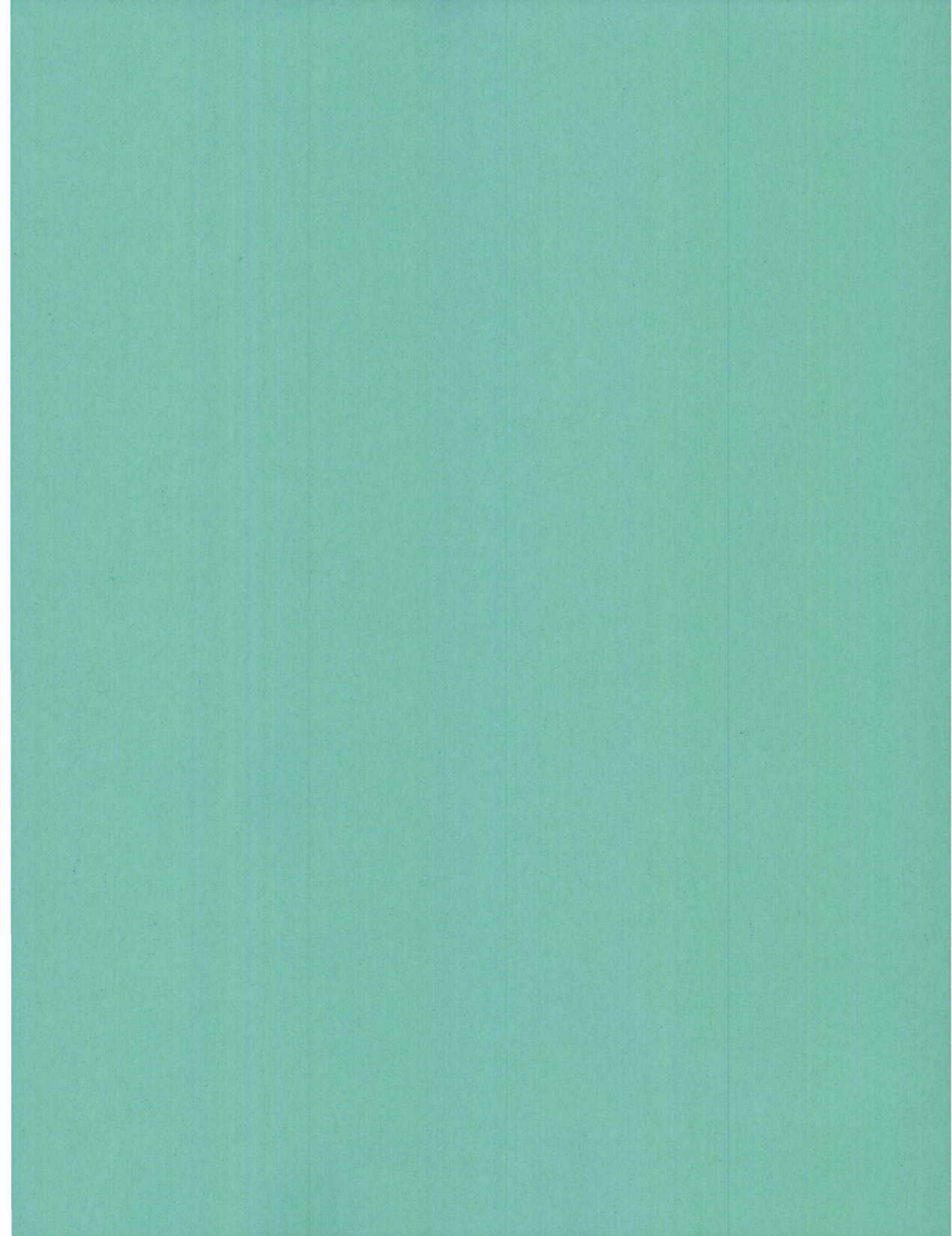
Question No. GAS-COS-019:

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 a CD containing Excel files of the Company's allocated cost of service studies.



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

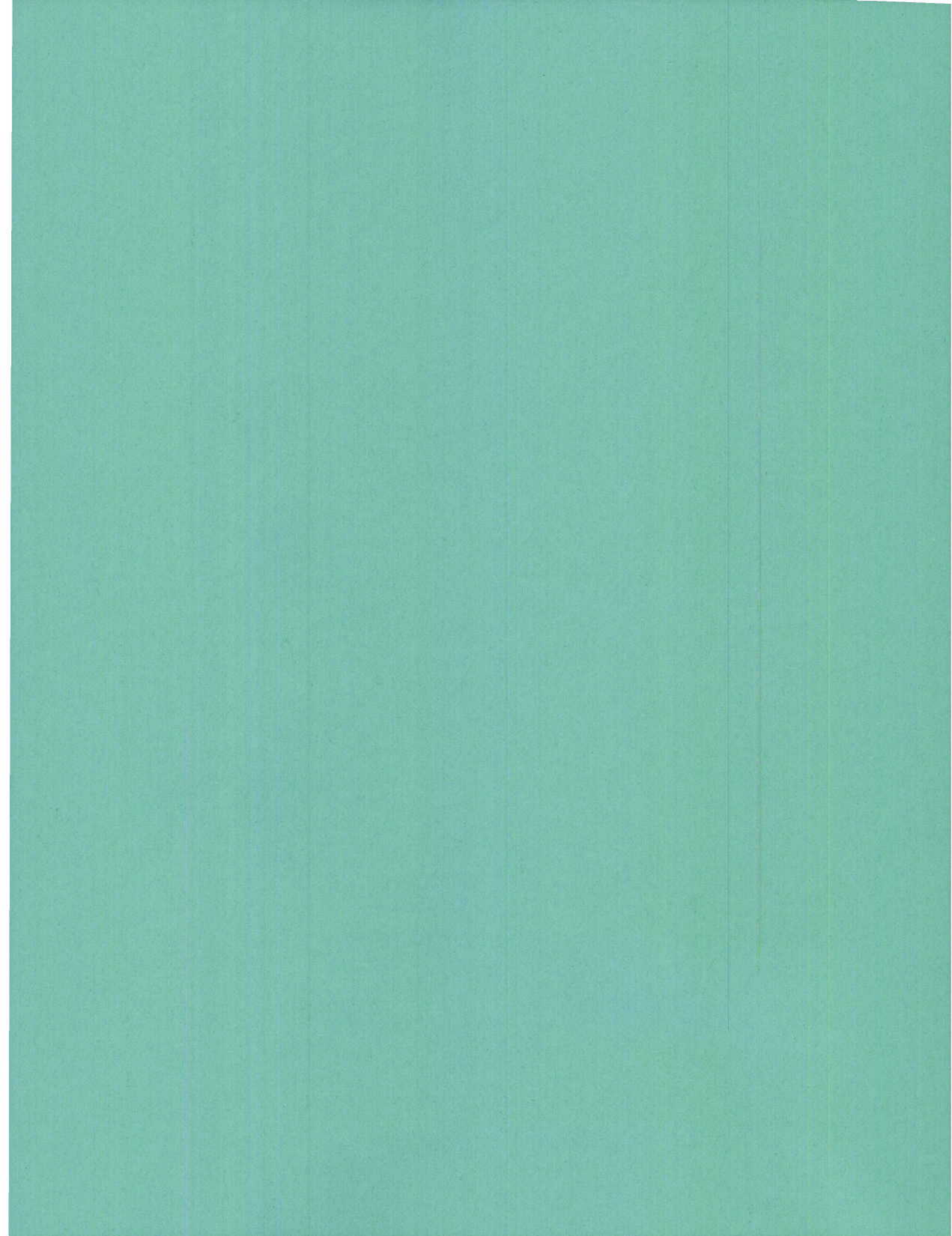
Cost of Service

Question No. GAS-COS-20:

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

Response:

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



Columbia Gas of Pennsylvania, Inc.

Standard Data Request

Cost of Service

Question No. GAS-COS-021:

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

Response:

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