

BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION

REBUTTAL TESTIMONY OF

**H. GIL PEACH**

ON BEHALF OF  
PHILADELPHIA GAS WORKS

Docket No. R-2020-3017206

Philadelphia Gas Works

General Rate Increase Request

TOPICS:

PGW's Low-Income Customer Service Performance  
Collections Rate  
Commercial Sales Volume Forecast

July 13, 2020

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1 **I. INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAME AND TITLE.**

3 A. My name is Hugh Gilbert Peach. I am President of H. Gil Peach & Associates LLC. My  
4 office is at 16232 NW Oakhills Drive, Beaverton, OR 97006.

5 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND WORK  
6 HISTORY.**

7 A. I received the PhD in Sociology from New York University with specialties in study of  
8 economic sociology, social control, and social statistics. I received a M.A. in Economics  
9 from the New School for Social Research. I received a M.A. and B.S. in Sociology from  
10 Michigan State University. I also completed the equivalent of a minor in physics from  
11 Michigan Technological University and one year of Metropolitan Urban Service Training  
12 from Union Theological Seminary.

13 **Q. PLEASE DESCRIBE YOUR EARLY WORK HISTORY.**

14 A. From 1969-1980: New York Public Library – Page; New York Stock Exchange – Sr.  
15 Clerk; New York City Housing & Development Administration – series of civil service  
16 positions working on housing statistics, urban renewal and development of training  
17 programs; New York City Health Department/Addiction Services Agency – Program  
18 Research Analyst and Sr. Quantitative Analyst, evaluating programs; The Fund for the  
19 City of New York – Research Statistician/Computer Analyst, working for the foundation  
20 to improve the efficiency and effectiveness in several areas of city services through  
21 management studies.

22 **Q. PLEASE DESCRIBE YOUR LATER WORK HISTORY IN THE AREA OF  
23 UTILITIES AND UTILITY REGULATION**

24 A. From 1980 – 1988/89: Pacific Power – At Pacific, I worked in load research and  
25 regulatory affairs and received training in all Rate Department functions, including a

1 continuing education in rate fundamentals at Indiana University and expert witness  
2 training. In 1982, I moved to Customer Service where I became Coordinator, then  
3 Manager of Evaluation for energy conservation. The major project was the Hood River  
4 Conservation Project, the largest US public/private home energy retrofit project of that  
5 decade, designed to reach maximum participation levels at the then current state of  
6 technology. In addition, I supervised the engineering team that developed the demand-  
7 side of the company's integrated resource plan.

8 From 1988/1989 to 2017: In 1988/1989 I started consulting for the Conservation  
9 Law Foundation as they introduced first generation Demand-Side Management in Maine,  
10 Vermont, Massachusetts, and Connecticut. I left Pacific Power in 1989 to continue to  
11 consult directly for utilities.

12 In Pennsylvania, I was evaluator for some of the early low-income pilot programs  
13 that eventually evolved to become today's Customer Assistance Programs and Low-  
14 Income Usage Reduction Programs and I have followed and participated in  
15 program/policy evaluation for these programs since 1990. I have completed one or more  
16 program/policy evaluations for West Penn Power, Duquesne Light, PECO Energy, all of  
17 the First Energy Utilities in Pennsylvania, PPL, Pennsylvania American Water Company,  
18 Equitable Gas, Columbia Gas, Peoples Natural Gas and the Philadelphia Gas Works.  
19 My practice includes primarily work in the US and Canada and encompasses all parts of  
20 low-income program and demand-side management program design, potential/planning  
21 studies, management and staffing studies, decoupling and policy studies and verification  
22 studies. In addition to studies for utilities, I have conducted low-income evaluations for  
23 the US Department of Health & Human Services and have served on the US Department

1 of Energy peer review committees for the design of major national low-income  
2 weatherization evaluations; also on the peer review committee for vetting of evaluation  
3 results from these studies prior to release of the evaluations.

4 On the regulatory side, I have served as an evaluation and/or savings verification and  
5 related policy expert for the California, New York, New Hampshire, Massachusetts, and  
6 Nova Scotia public utility commissions. Since 2011, I have also been involved in climate  
7 adaptation analysis.

8 **Q. HAVE YOU SUBMITTED TESTIMONY AT ANY REGULATORY BODIES**  
9 **BEFORE?**

10 A. Yes. A list of the testimony I have provided is attached as PGW Exhibit HGP-1.

11 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

12 A. My testimony is submitted on behalf of Philadelphia Gas Works (“PGW” or  
13 “Company”).

14 **Q. DID YOU SUBMIT DIRECT TESTIMONY IN THIS MATTER?**

15 A. No.

16 **Q. PLEASE SUMMARIZE THE PURPOSE OF YOUR TESTIMONY.**

17 A. The purpose of my testimony is as follows.

18 Part 1: The purpose of the first section is to show that PGW performance in the low-  
19 income area is adequate and sound.

20 Part 2: The purpose of the second part of the testimony is to extend the analysis of  
21 service quality in a critique of Roger Colton’s argument on PGW Performance (Service  
22 Quality).

23 Part 3: The purpose of the third section is to provide a response to criticism of several of  
24 the OCA witnesses, and chiefly OCA witness Garrett, for declining to provide an analysis

1 of the economic effects of the COVID-19 pandemic on its operations and financials. Our  
2 analysis estimates the impact of the COVID-19 pandemic on PGW's collections rate on  
3 billed revenue during the 2021 fiscal year based on the data available at this time.

4 Part 4: The purpose of the fourth section is to provide a response to similar questions  
5 raised by OCA witnesses regarding non-residential accounts.

1 **II. RESPONSE TO COLTON ON PGW PERFORMANCE**

2 **Q. PLEASE DESCRIBE ROGER COLTON'S ARGUMENT ON PGW**  
3 **PERFORMANCE (SERVICE QUALITY).**

4 A. Colton first cites the Commission's Policy Statement as a basis for his analysis.  
5 Specifically, Section 2703(a)(7) of the policy statement states that service quality (among  
6 other factors) will be considered in determining just and reasonable rate levels for PGW.  
7 Colton then presents a perspective on service quality [Colton Direct, Part 3, Section B  
8 (Service Quality), Page 45, beginning at Line 8 through Page 51, Line 5]. Colton's  
9 discussion of service quality is based on his review of the PUC's 2018 Customer Service  
10 Performance Report for Pennsylvania electric and natural gas distribution companies.<sup>1</sup>  
11 Information from the same report for a prior year is also used. Colton's claim is that  
12 PGW's customer service indicators are low ranked. Specifically, that "Using data from  
13 the PUC's own 'customer service performance' reports [Colton's] discussion finds that  
14 PGW provides the lowest quality of 'customer service performance'...." [Colton Direct,  
15 Page 50, Line 23 to Page 51, Line 3]. From this argument, Colton concludes that PGW  
16 service quality is low.

17 **Q. DO YOU AGREE WITH THIS ANALYSIS AND CONCLUSION?**

18 A. No.

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<sup>1</sup> Pennsylvania PUC, Bureau of Consumer Services, Customer Service Performance Report: Pennsylvania Electric & Natural Gas Distribution Companies (annual). These annual studies are hereinafter referred to as BCS Reports.

1 **Q. DOES COLTON ASSERT THAT HIS ANALYSIS AND CONCLUSION IS THE**  
2 **SAME AS THE ANALYSIS AND CONCLUSIONS OF THE BUREAU OF**  
3 **CUSTOMER SERVICE?**

4 A. No. Colton uses data from the BCS reports, but he does not assert that his analysis and  
5 conclusions are the same as the analysis and conclusions of BCS.

6 **Q. IS COLTON'S ANALYSIS DIFFERENT FROM THE BCS ANALYSIS?**

7 A. Yes, Colton selects seven of the twenty-three indicators analyzed by BCS and performs a  
8 much more limited type of analysis than BCS.

9 **Q. IS COLTON'S CONCLUSION DIFFERENT FROM THE CONCLUSIONS IN**  
10 **THE BCS ANALYSIS?**

11 A. Yes. Colton asserts that PGW has poor performance for service quality based on analysis  
12 of seven selected indicators. BCS does not come to that conclusion based on analysis of  
13 all twenty-three indicators.

14 **Q. WHAT IS ONE OF THE BASIC PROBLEMS WITH COLTON'S ANALYSIS?**

15 A. Colton's method is limited to selection of a subset of indicators and the method of  
16 ranking.

17 **Q. PLEASE DESCRIBE WHY YOU FIND COLTON'S RANKING APPROACH TO**  
18 **BE LESS ADEQUATE THAN THE BCS RANGE OF RESULTS APPROACH.**

19 A. Knowing that a company is lowest rank is not enough information on which to base an  
20 assessment. What is missing is the range of results. To understand how well a company  
21 is doing on an indicator, the success rate on the indicator and the rank for the company  
22 has to be understood in the context of the results for other NGDCs. This is the way the  
23 annual BCS Reports present results. The value of the indicators is as a flag to an area  
24 that requires improvement so that resources can be directed to that area. However, a  
25 value for a particular NGDC on an indicator is of little use except in the context of  
26 knowing the range of results. And rankings do not mean anything in isolation from



1 knowledge of the range of results. Generally, throughout the indicators reported by BCS,  
2 the results on each particular indicator tend to cluster, with company results being quite  
3 close to each other. The usefulness of the indicators is when one company stands out  
4 from the cluster of other companies by a large scoring distance. This can serve as a flag  
5 for a service quality problem in a particular area.

6 On nearly all service quality indicators, for nearly all years, all of the NGDCs cluster  
7 with small distances between numerical scores and with all companies at a high success  
8 rate.

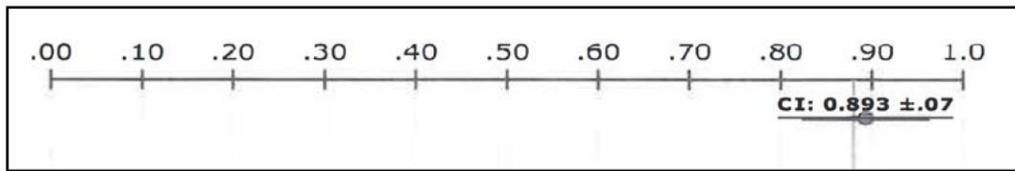
9 Using only the scores for one company and creating a rank order does not convey the  
10 information on service quality as reported by BCS. This is an error of misplaced  
11 adequacy; using the less appropriate of two or more classes of truth tests, when, instead, a  
12 more appropriate truth test should have been employed.<sup>2</sup>

13 **Q. DOES THE PRECISION OF ESTIMATES PRESENT A PROBLEM TO USING A**  
14 **RANKING METHOD?**

15 A. Yes. As noted in Figure 1, below, for service quality indicator scores for which the  
16 estimate of service quality is constructed from survey results, the surveys analyzed by  
17 BCS were designed to produce scores with a precision of plus or minus five percentage  
18 points. A reported score for an individual NGDC on a service quality indicator is a point  
19 estimate. The calculated point estimate has an associated precision. For the surveys used  
20 in the BCS Reports, the planned precision is plus or minus 5%. An image of what this  
21 means is shown in Figure 1, where precision is plus or minus seven percent because the  
22 useful sample size is much smaller than planned.

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<sup>2</sup> See Dunn, William N., *Reforms as Arguments. Knowledge: Creation, Diffusion, Utilization*, Vol. 3, No. 3, March 1982 293-326; Page 318, Figure 3: Threats to Usable Knowledge.



**Figure 1: Precision of Results.**

The plus or minus 5% is a design criterion to set precision of estimates. The actual confidence interval about each score depends on the useful sample size for the calculation (the number of relevant and completed surveys relevant to each specific survey question, which will vary by question). Because customers are split between those who call in with credit and collection issues and all other issues, the actual number used will vary across the different service quality indicators. Within these two groups, there will be smaller subsets of customers relevant to each question.

The precision problem means that a PGW score of 5% on Call Abandonment Rate, for example, represents a population score of 0 to 10%; or, put in terms of success rate, this is 90% to 100%. Knowing this limitation of the data makes ranking *essentially meaningless*. When scores considered together (across companies) nearly all of the time and on nearly all of the measures, the scores (considering precision) for the companies on an indicator all overlap.

The value of the BCS Report is to flag years and areas where this is not so. *What the BCS Reports show is solid performance by all of the NGDCs for almost all years on almost all indicators including PGW.*

1 **Q. DOES THE COLTON ANALYSIS MIS-CLASSIFY DATA IN COMPARISON TO**  
2 **THE METHOD USED BY BCS?**

3 A. Yes. In assigning cases to a positive result for reporting customer satisfaction, Colton  
4 reports results using a different classification system for BCS data than the classification  
5 system used by BCS, without clearly explaining that in this (Colton's) system, positive  
6 performance is downgraded from positive performance as reported by BCS (Figure 2).  
7 This change in classification of responses affects six of the seven indicators used in the  
8 Colton testimony. Colton uses the data from the BCS Reports but, without clearly calling  
9 attention to this change, he develops results that understate performance on the indicators.

10 **Q. HOW, SPECIFICALLY DOES COLTON DOWNGRADE PGW'S**  
11 **PERFORMANCE FROM PERFORMANCE AS ANALYZED AND PRESENTED**  
12 **BY BCS?**

13 A. For reporting results on the six scales, BCS combines "very satisfied" and "somewhat  
14 satisfied" to indicate satisfaction. In contrast, Colton selects only responses for "very  
15 satisfied" to indicate satisfaction. This truncated classification is unusual for a  
16 satisfaction scale. Usually, studies combine all responses on the positive side of a  
17 satisfaction scale to report satisfaction. In some studies, a secondary table is then  
18 presented for responses of "very satisfied."  
19 BCS Reports on positive performance following the pattern generally used in analysis by  
20 academics and professional survey companies for performance studies. Colton classifies  
21 responses in an unusual way that forces the apparent performance he reports downward  
22 by fourteen to thirty-six percent, as shown in the third row for each service quality  
23 indicator in Figure 2.

<b>PGW Performance (BCS Reports compared with Colton Direct)</b>						
		<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
1		<b>Satisfaction with Ease of Reaching the Company</b>				
	<b>BCS Report</b>	75	82	80	86	88
	<b>Colton</b>	48	61	57	67	68
	<b>% Missed</b>	36%	26%	29%	22%	23%
2		<b>Satisfaction with Using NGDC's Automated Phone System</b>				
	<b>BCS Report</b>	77	77	82	83	85
	<b>Colton</b>	52	51	60	60	59
	<b>% Missed</b>	32%	34%	27%	28%	31%
3		<b>Satisfaction with NGDC Representative's Handling of Contact</b>				
	<b>BCS Report</b>	82	87	92	92	91
	<b>Colton</b>	66	74	78	79	79
	<b>% Missed</b>	20%	15%	15%	14%	13%
4		<b>Call Center Representative's Courtesy</b>				
	<b>BCS Report</b>	88	92	93	93	93
	<b>Colton</b>	70	81	81	81	81
	<b>% Missed</b>	20%	12%	13%	13%	13%
5		<b>Call Center Representative's Knowledge</b>				
	<b>BCS Report</b>	87	91	94	92	92
	<b>Colton</b>	71	78	79	79	79
	<b>% Missed</b>	18%	14%	16%	14%	14%
6		<b>Overall Satisfaction with Contact (Combined)</b>				
	<b>BCS Report</b>	79	86	91	89	89
	<b>Colton</b>	60	72	70	70	70
	<b>% Missed</b>	24%	16%	23%	21%	21%

Figure 2: Classifying to Lower Reporting of Quality of Service.

1  
2  
3

1 **Q. PLEASE SUMMARIZE YOUR CONCLUSIONS FROM COMPARISON OF**  
2 **COLTON’S METHOD OF ANALYSIS AND RESULTS WITH THE BCS**  
3 **METHOD OF ANALYSIS AND RESULTS.**

4 A. Conclusions:

5 (1) **Solid Performance.** Analyzing service quality performance for PGW, I find *solid*  
6 *performance on the indicators plus indication of good management response when a*  
7 *problem arises (in that the problem is solved), as problems will over the years in every*  
8 *ongoing large-scale organization.*

9 (2) **Positive, Narrow Range, High End of Scales.** I find that according to the indicators  
10 *in the BCS Reports, the general performance on the indicators is positive performance,*  
11 *with the companies typically clustering together with success rates with narrow range*  
12 *results at the high end of the percentage scales.*

13 (3) **My Findings are Consistent With the BCS Findings; Not Colton’s:** My findings are  
14 consistent with the conclusion in the 2018 BCS Report, which states that “[t]he survey  
15 results show that, for the most part, customers are satisfied with the service they receive  
16 from their companies. Nevertheless, the company-reported performance data indicates  
17 there is room for improvement on the part of Pennsylvania’s major electric and gas  
18 companies.”<sup>3</sup> These are appropriate conclusions based on the data in the BCS Reports.  
19 Of course, it is in the nature of performance indicators that there is always room for  
20 improvement and over the years there will be problems in some areas of all large-scale  
21 organizations and there will also be management response. Both of these factors are

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<sup>3</sup> Pennsylvania PUC, Bureau of Consumer Services, Customer Service Performance Report: Pennsylvania Electric & Natural Gas Distribution Companies (annual), Report for 2018, Page 30, ¶3.

1 evident and normal in the BCS presentation. I find the same kinds and level of results as  
2 BCS in my independent analysis. Colton does not.

3 **(4) Colton's Analysis is Weak and Less Adequate.** Colton's analysis, in contrast, is  
4 weak and less adequate. The BCS analysis and the analysis conducted here are adequate,  
5 strong, and suited to the data and to the analysis of performance indicators.

6  
7 We have demonstrated five ways in which Colton's analysis is less appropriate than the  
8 analysis conducted by BCS and less appropriate than the analysis conducted here, which  
9 follows the approach used by BCS. Accordingly, these solidly positive performance  
10 results for PGW, and for the NGDCs are one factor that should be considered in  
11 determining just and reasonable rates, in accordance with the Commission's Policy  
12 Statement (Section 2703(a)(7)). In no event could the Commission reach a conclusion  
13 that PGW is providing inadequate or unreasonable service based on the results of this  
14 report, or, in my view and based on my knowledge of the Company and its operations, on  
15 any other basis.

16 **Q. CAN YOU PRESENT YOUR ANALYSIS IN MORE DETAIL?**

17 A. Yes. The analysis is submitted in the paper, PGW Performance (Service Quality). I am  
18 including this detailed analysis as Exhibit HGP-2.

19

1 **III. PGW'S LOW-INCOME PERFORMANCE IS ADEQUATE AND**  
2 **SOUND**

3 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY ON PGW SERVICE TO**  
4 **LOW-INCOME CUSTOMERS?**

5 A. The purpose of this testimony is to show that PGW service to low-income customers is  
6 adequate and sound.

7 **Q. WHAT AREAS WILL YOU COVER?**

8 A. I will discuss the following areas: First, the soundness and adequacy of PGW's program  
9 implementation. Second, the adequacy of PGW's low-income work by zip code. Third,  
10 the record on enrollment in the Customer Responsibility Program (CRP) low-income  
11 program focused on discussion of changing participation levels. Fourth, a consideration  
12 of unidentified low-income households. Fifth, usage by low-income customers.

13 **Q. YOU HAVE SAID THAT THE PURPOSE OF THIS TESTIMONY IS TO SHOW**  
14 **THAT PGW SERVICE TO LOW-INCOME CUSTOMERS IS ADEQUATE AND**  
15 **SOUND. CONSIDERING THE DESIGN OF THE LOW-INCOME PROGRAM,**  
16 **IS IT YOUR OPINION THAT THE DESIGN OF PGW'S LOW-INCOME**  
17 **PROGRAMS ARE SOUND AND ADEQUATE?**

18 A. Yes. I have followed the design of PGW's low-income programs since 2001 and I have  
19 researched the program going back to 1996. I have not completed a traditional program  
20 evaluation of PGW low-income programs, but I did complete an extensive policy  
21 evaluation in 2001-2002 to help the company revise its program designs to comply with  
22 Pennsylvania PUC policy guidance for such programs. Based on this fairly extensive  
23 study, I find that the design of the programs was good from 1996 through 2002. In my  
24 opinion, the design was further improved for the transition from City regulation to  
25 regulation by the PA PUC.

1 **Q. DO YOU HAVE EXPERIENCE WITH PGW'S PROGRAM DESIGNS AND**  
2 **OPERATIONS SINCE 2002?**

3 A. Yes, I have conducted several policy decision support studies periodically for the  
4 company over the years from 2002 to 2020. Although I have not conducted a program  
5 evaluation of the programs, I fully understand their design and Commission guidance.

6 **Q. DOES PGW FOLLOW GUIDANCE FROM THE PUC?**

7 A. Yes, in working with management and staff at PGW, I have witnessed a commitment of  
8 officers, management, and staff to learning and following policy guidance from the PUC.  
9 In Pennsylvania, the design of low-income utility program should be in conformance  
10 with the guidelines established in the Pennsylvania Code, Secretarial Letters, and  
11 direction from the Commission. I believe part of the reason for the quality of the  
12 program is that PGW takes seriously the responsibility to comply with the provisions of  
13 Pennsylvania Code as relevant to its low-income programs. I can also state that PGW has  
14 faithfully followed current Commission direction in the recent changes to the CAP Policy  
15 Statement at 52 Pa. Code § 69.261—69.267 resulting from the Commission proceeding  
16 on Energy Affordability for Low-Income Customers, Docket No. M-2017-2587711, and  
17 Review of Universal Service and Energy Conservation Programs, Docket No. M-2017-  
18 2596907, to conduct a comprehensive review of the policies, practices, and procedures of  
19 Pennsylvania's universal service programs, including Customer Assistance Programs  
20 (CAPs). These changes are discussed in detail in Ms. Adamucci's rebuttal testimony.

21 **Q. BASED ON YOUR OBSERVATIONS, SOUND DESIGN AND FAITHFUL**  
22 **IMPLEMENTATION OF COMMISSION DIRECTION ARE TWO ASPECTS OF**  
23 **PGW LOW-INCOME PROGRAM PERFORMANCE. WHAT ABOUT THE**  
24 **SOUNDNESS AND ADEQUACY OF PROGRAM IMPLEMENTATION?**

25 A. To the best of my knowledge, PGW's program implementation and operations are sound  
26 and adequate. APPRISE has been the evaluator for the CRP program since 2004. I have



1 reviewed the periodic APPRISE evaluations of CRP, including the 2019 program  
2 evaluation.<sup>4</sup> These evaluations surface normal problems. While each makes  
3 recommendations for improvement as evaluations generally do, they convey information  
4 on a program that is working well. I have known the principals at APPRISE for about 25  
5 years and have read many of the evaluations in addition to the evaluations they carry out  
6 for PGW. They are well respected. I trust their evaluation results.

7 I have also reviewed the BCS Customer Service Performance Reports for 2015 through  
8 2018, produced by the PUC Bureau of Consumer Services. The conclusions are  
9 exemplified by the conclusion in the 2018 report. In the report, BCS says (emphasis  
10 added) *“The survey results show that, for the most part, customers are satisfied with the  
11 service they receive from their companies. Nevertheless, the company-reported  
12 performance data indicates there is room for improvement on the part of Pennsylvania’s  
13 major electric and gas companies.”* This summary of overall results from examining a  
14 series of twenty-three performance indicators is normal professional language indicating  
15 that things are working well (but could be improved). If there had been any problem with  
16 outlier values on the indicators from any company, it would have been treated in the  
17 reports.

18 Also, I have worked with Pennsylvania electric, water and natural gas low-income  
19 programs since the late 1980’s, both as an evaluator and in providing policy analysis and  
20 decision support. I am familiar with the evolution of Pennsylvania programs. PGW has  
21 always had a reputation among its peers for having a hard-working staff and working

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<sup>4</sup> Applied Public Policy Institute for Study and Evaluation, *Philadelphia Gas Works Universal Service Programs Impact Evaluation Final Report*, March 2019.

1 seriously to accomplish home energy affordability goals. For these reasons, I believe  
2 PGW's program implementation and operations are sound and adequate.

3 **Q. WHAT ABOUT THE ISSUE OF PGW LOW-INCOME PERFORMANCE BY ZIP**  
4 **CODE AS RAISED BY ROGER COLTON? DO YOU AGREE THAT THIS**  
5 **REVEALS A PROBLEM THAT NEEDS TO BE ADDRESSED?**

6 A. Yes, if the analytic results were true. But, in fact, the situation is the opposite.

7 **Q. PLEASE SUMMARIZE COLTON'S ZIP CODE ANALYSIS.**

8 A. In an analysis of "pockets of poverty" using the zip code data, Colton contrasts CRP  
9 participants with the estimated number of low-income customers for the zip code [Colton  
10 Direct, Page 54, beginning at Line 13 to Page 57, Line 17]. Colton says these series are  
11 correlated so that in zip codes where there are more CRP participants, there are more  
12 estimated cases that are not served. Based on a graph of this information, Colton asserts  
13 that "as the number of low-income accounts gets larger...[by] zip code [zip codes are  
14 rank ordered for the graph] the number of CRP participants does not keep up." Based on  
15 this analysis, Colton expressed this relationship: "Neighborhoods in Philadelphia with  
16 deep pockets of Poverty do not have correspondingly high levels of CRP enrollment." In  
17 this connection, Colton says that "PGW engages in no targeted outreach of any sort,"  
18 though it would be possible to target outreach by zip code [Colton Direct Page 56 Lines  
19 1-5].

20 To emphasize, Colton argues above that "as the number of low-income customers  
21 becomes larger and larger in a zip code, the number of CRP participants does not keep  
22 up." [Colton Direct, Page 55, Lines 8-10].

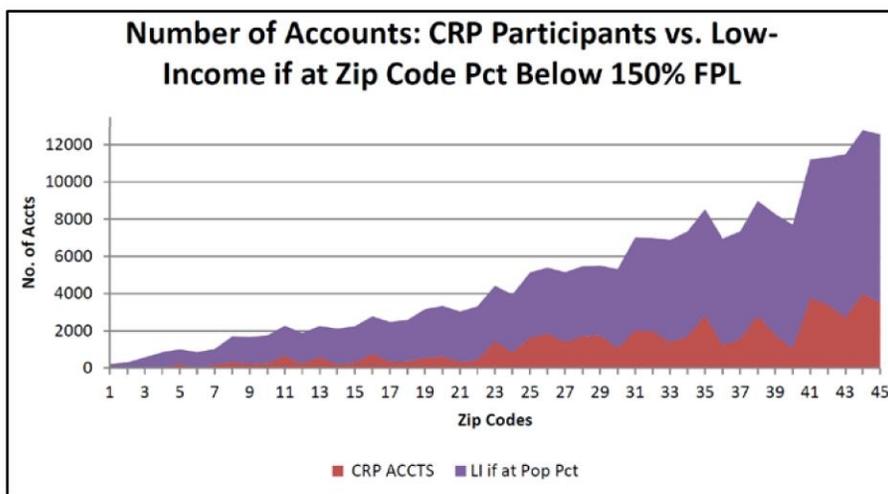
23 **Q. IS THIS CORRECT?**

24 A. No. The opposite is true: the percentage of low-income accounts enrolled in CRP is  
25 higher in zip codes with higher numbers of low-income accounts.

1 **Q. WHAT IS THE ERROR IN COLTON'S ANALYSIS?**

2 A. Colton plots the number of CRP accounts and the total number of low-income accounts  
 3 by zip code ordered by the number of income qualifying accounts from lowest to highest  
 4 (Figure 3). However, Colton incorrectly uses a stacked line chart on Page 55 by  
 5 including the total number of low-income accounts on top of the number of CRP  
 6 accounts.

7



8

9 **Figure 3: Colton Chart (From Colton Page 55).**

10

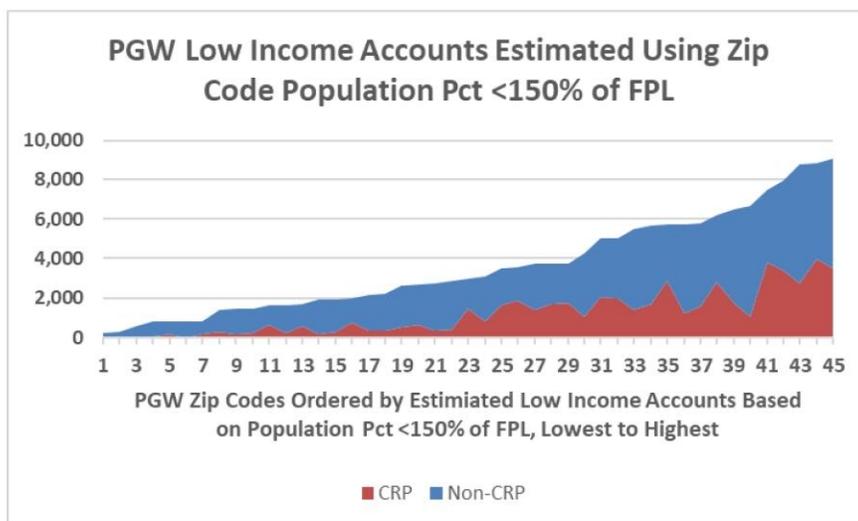
11

12 The result of this error in analysis is that the chart visually overstates the total number of  
 13 low-income accounts in each zip code and visually understates the proportion of low-  
 14 income accounts participating in CRP (CRP accounts are shown twice; once in the red  
 15 area and once in the blue area.) To see the error, notice that the chart on page 55 shows  
 16 five zip codes with over 10,000 total low income accounts (far right end of graph)  
 17 although the data in Colton's workpapers show that no zip code has more than 10,000  
 18 low-income accounts.

1 Another way to see the impact of the error is to consider a hypothetical zip code with  
 2 1,000 low-income accounts and all 1,000 accounts participating in CRP (100% CRP  
 3 coverage). Using the incorrect way Colton constructed the chart on page 55, the total of  
 4 1,000 accounts are stacked on top of 1,000 CRP participants resulting in a total of 2,000  
 5 accounts for that zip code. Readers are given the incorrect impression that PGW is only  
 6 serving 50% of low-income accounts instead of the accurate 100% coverage for the  
 7 hypothetical zip code.

8 **Q. WHAT IS THE CORRECT WAY TO COMPLETE THE ANALYSIS?**

9 A. The correct way to construct the stacked area chart is shown in Figure 4 below. In this  
 10 figure, CRP accounts and income qualifying non-CRP accounts are stacked together for  
 11 each of the 45 zip codes using the same order used by Colton. When the data are  
 12 accurately presented, it is easier to see that PGW is more than keeping up in zip codes  
 13 with high levels of low-income families. CRP accounts appear to make up a higher  
 14 proportion of total accounts in zip codes with larger numbers of low-income accounts  
 15 than in zip codes where the number of low-income accounts is smaller.



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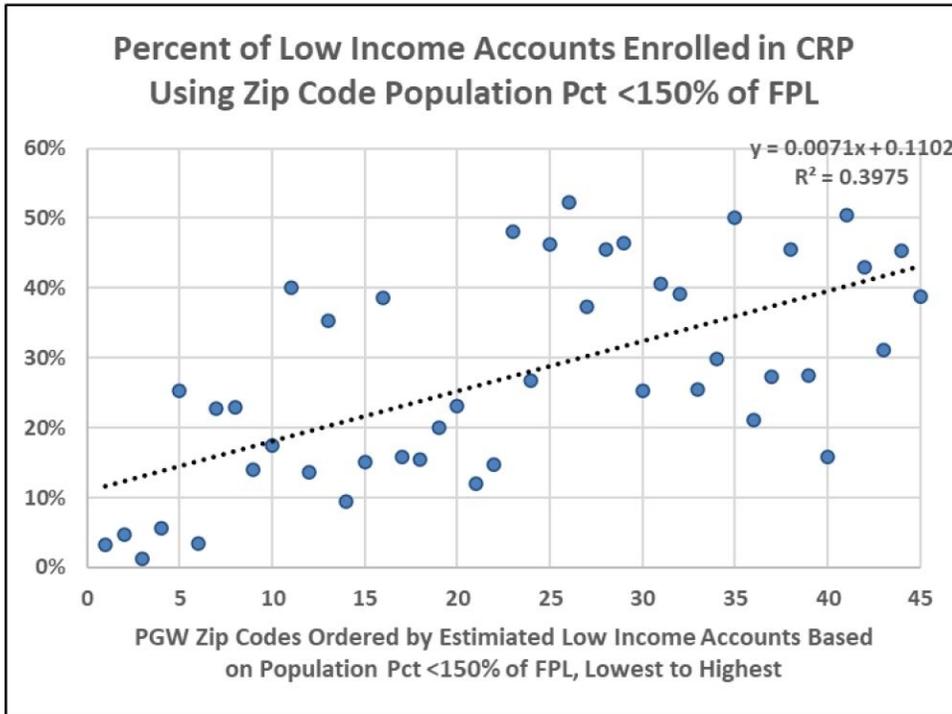
**Figure 4: Correct Chart.**

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To better see and examine the relationship between the size of the need (number of low-income accounts) and CRP enrollment, the percentage of CRP participation in each zip code is shown in Figure 4.

The dots in Figure 5 below show the percentage of the estimated low-income accounts that participate in CRP.

As in Figure 3 & Figure 4, the zip codes are ordered by the estimated number of low-income accounts in each zip code, from lowest to highest. As can be seen in Figure 5, there is a clear pattern of lower CRP percentages in zip codes with the smallest levels of low-income accounts and higher CRP penetration as the number of low-income accounts increases. This is shown in the statistically derived upward trendline in the chart.



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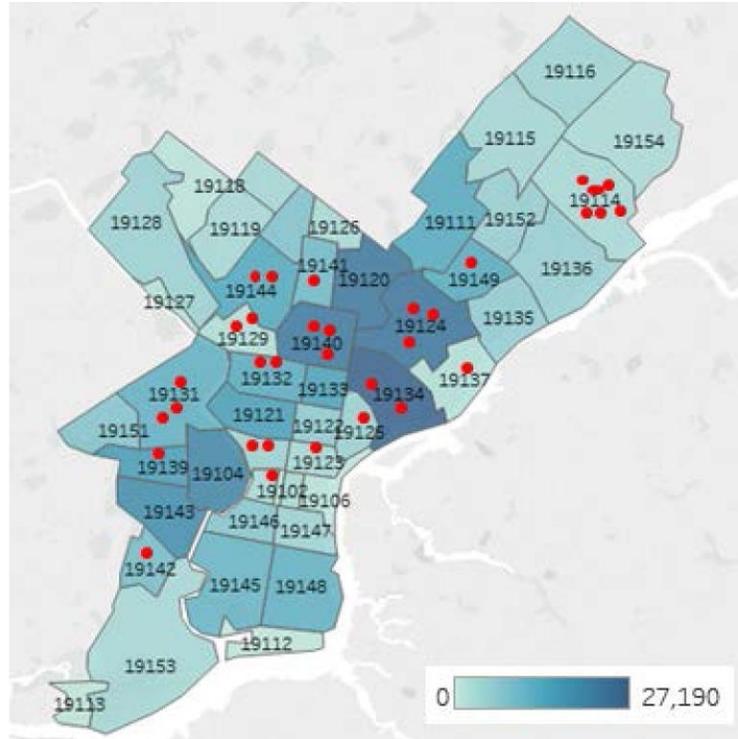
**Figure 5: Trend Line shoeing highest service where it is needed the most.**

1 The estimated trend is highly statistically significant ( $p > t$  less than 0.0001) and *shows*  
2 *that PGW has the greatest penetration of CRP where it is needed the most, in*  
3 *neighborhoods with high levels of low-income accounts.* Contrary to Colton, there is no  
4 performance problem here. The correct analysis (Figure 4 and Figure 5) clearly shows  
5 that PGW enrolls a higher percentage of low-income customers in the zip codes with  
6 more low-income households. This is a direct result of the low-income neighborhood  
7 targeting PGW does on the census-tract level and is contrary to Mr. Colton's conclusions.  
8 The result shows a pattern of good CRP performance by PGW.

9 **Q. DO YOU HAVE ANY OTHER OBSERVATION ON THE ANALYSIS OF**  
10 **SERVICE BY ZIP CODE?**

11 A. Yes, Colton mentions that there could be targeting of need. In fact, PGW has  
12 consistently for more than two decades been known for its extensive work in  
13 communities. Below is a map indicating community meetings aimed at encouraging and  
14 facilitating participation in PGW's low-income programs. PGW conducts on-site  
15 outreach and attends various community events in partnership with local community  
16 groups, consumer advocate groups such as Community Legal Services ("CLS"), schools,  
17 elected officials, and employers. These events specifically target low-income individuals  
18 and are most often held directly in low-income communities. The map (Figure 6) shows  
19 the number of low-income individuals by zip code and is overlaid with the locations of  
20 community outreach events from the current fiscal year.

21



**Figure 6: Community Outreach Events for FY2020.**

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 4 Some community outreach events are done in coordination with employers and the event  
 5 location is based on where the low-income population works, rather than lives. The  
 6 multiple events located in the Far Northeast are examples of this. These provided onsite  
 7 application assistance for CRP and LIHEAP and were held at factories and distribution  
 8 centers that employed large numbers of minimum wage workers who were likely to  
 9 qualify for low-income programs. It is also indicative of the type of outreach PGW  
 10 engages in, and one that cannot be understood by simply looking at census data based on  
 11 home addresses; but involves more sophisticated planning. It relies on hands-on  
 12 experience that takes into account not just the census data for the area surrounding a  
 13 home address, but how people commute, where they live, shop, socialize as well as the  
 14 locations of schools, day cares, and community events.

1 **Q. WHAT ABOUT THE OBSERVATION THAT PGW’S LOW-INCOME CAP**  
2 **PAYMENT ASSISTANCE PROGRAM (CUSTOMER RESPONSIBILITY**  
3 **PROGRAM OR CRP) IS SHOWING RECENT PARTICIPATION LEVELS**  
4 **LOWER THAN IN THE PAST? IS THIS CORRECT?**

5 A. Yes. Colton observes that in more recent years CRP participation is lower in number of  
6 households than in past years [Colton Direct, beginning at Page 52, line 2 to Page 54,  
7 Line 11.]

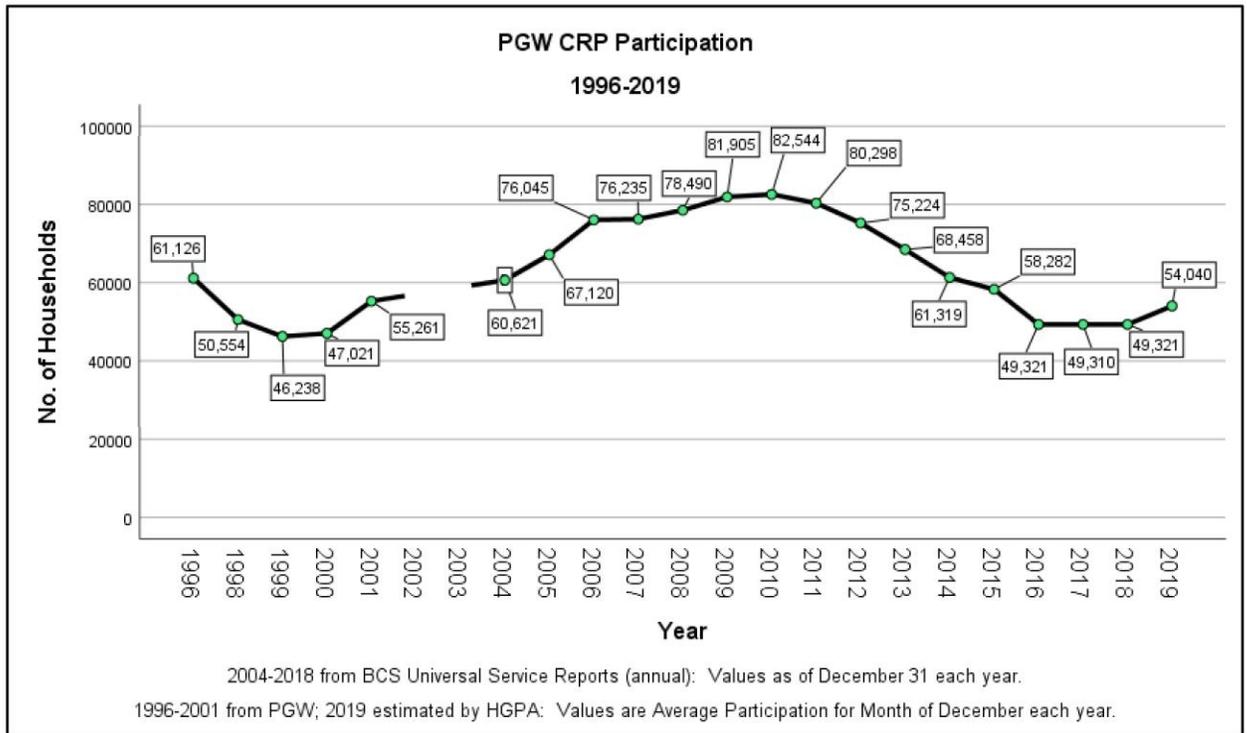
8 We show our results for CRP by year in Figure 7. The values from 1996 to 2001 and for  
9 2019 are average values for the month of December. The values from 2004 through 2018  
10 are as reported by BCS in the annual Report on Universal Service Program & Collections  
11 Performance.<sup>5</sup>

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<sup>5</sup> It is likely that December average participant values are slightly higher than December 31<sup>st</sup> values. If so, the first five values on the graph in Figure 7, and the value for 2019 Figure 7 would be about 2000 participants lower than shown. Prior to 2004, PGW was under City regulation and the “December 31<sup>st</sup> convention” used by BCS was not used by City regulators. The value for 2019 is an estimate. When the value for December 31, 2020 is reported to BCS for the 2020 Universal Service Program & Collections Performance report it may be slightly different. The missing data points for 2002 and 2003 are during transition from City to State PUC regulation.



1



2

3 **Figure 7: Participation by Year.**

4

5 **Q. IF THE RANGE OF PARTICIPATION VARIES OVER TWENTY YEARS AS**  
 6 **SHOWN IN FIGURE 5, IS THIS PROBLEMATIC?**

7 A. No. The important thing is that the window is always open for customers who qualify for  
 8 CRP and for households that encounter payment problems. When there is a payment  
 9 problem there is customer contact and CRP is encouraged as an option for customers who  
 10 would pay less on CRP than on Budget Billing. Note that the company has improved  
 11 CRP by offering an Average Billing option within CRP so that customers whose payment  
 12 would be lower on what is calculated in the same way as a Budget Billing charge is  
 13 calculated can take advantage of CRP progressive arrearage forgiveness.  
 14 The CRP program does not require mandatory participation. It is voluntary. As with all  
 15 voluntary economic services programs, it is normal for participation to vary with changes  
 16 in the general economic conditions of the City, for example the unemployment rate.

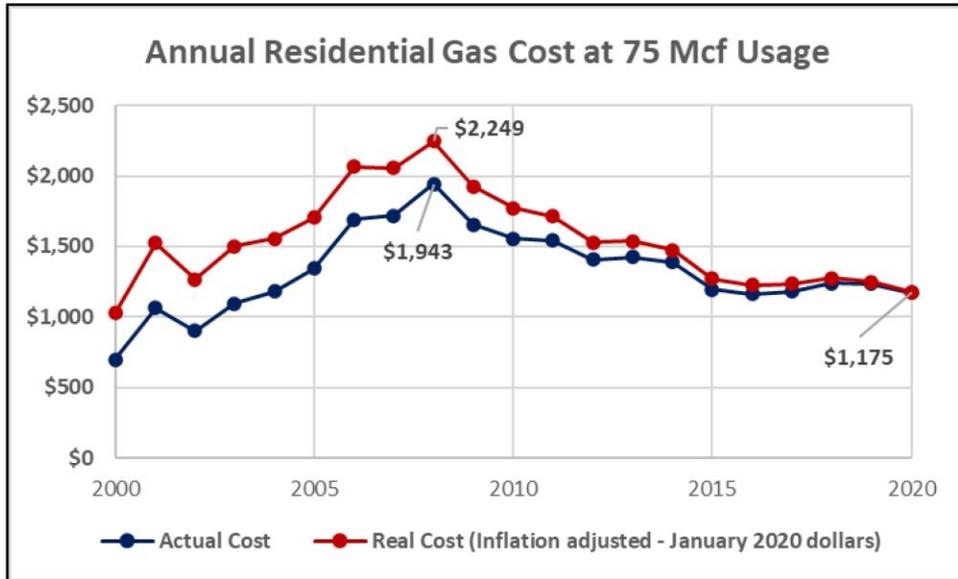
1 Within any year, participation in low-income programs is also known to vary with season  
2 of the year. For CRP, the price of natural gas service is a major factor for understanding  
3 participation.

4 **Q. ARE YOU SAYING THAT WILLINGNESS TO PARTICIPATE IN CRP IS**  
5 **PARTLY A FUNCTION OF THE COST OF NATURAL GAS SERVICE?**

6 A. Yes. There is nothing out of the ordinary about this. It is Economics 101. As the price  
7 of natural gas service decreases, more and more households find that they can pay their  
8 monthly cost-of-service natural gas bills. When the price of natural gas service decreases  
9 a lot, thousands of households find it simpler to just be on normal service. Conversely,  
10 when the price of natural gas service rises, households at the margin that have been  
11 paying monthly bills find that is important to participate in CRP.

12 **Q. DID THE PRICE OF NATURAL GAS SERVICE FROM PGW DROP OVER A**  
13 **PERIOD OF YEARS?**

14 A. Yes. Service today for a residential customer using 75 Mcf costs about half what it did in  
15 2008 in constant dollars. This is a major price drop. The annual cost to a residential  
16 customer using 75 Mcf of gas at prevailing rates is calculated by PGW with each change  
17 in rates. This results in a series of annual cost estimates that are typically revised five to  
18 six times a year as billing components such as the cost of gas change. Annual costs  
19 estimates include the fixed monthly customer charge and volumetric charges. A monthly  
20 time series was constructed by holding the annual cost estimate constant for months  
21 between rate changes. The annual cost to a residential customer using 75 Mcf was  
22 summarized by year by averaging the monthly values. The result of these calculations is  
23 shown in the chart below along with inflation adjusted annual costs.



**Figure 8: Annual PGW Residential Gas Cost at 75 Mcf Usage, 2000-2020.**

The actual cost of annual gas service calculated as described above is shown by the blue line in Figure 8. Since reaching a peak of \$1,943 in 2008 the annual cost of residential service declined through 2015 and has been nearly flat since. It is not entirely reasonable to only compare the actual cost of natural gas service over time because of inflation. Just looking at actual prices over time makes it difficult to know how much the price has actually changed and how much of the change is due to overall price inflation.

Prices adjusted by removing changes due to inflation are referred to as real prices. The actual cost of natural gas was adjusted for inflation using the Consumer Price Index (CPI) for the Philadelphia-Camden-Wilmington Metropolitan Statistical Area (PCW MSA).

The real (inflation adjusted) cost of gas service is shown by the red line in Figure 1 and expresses gas cost in terms of the general price level as of January 2020. The drop in annual cost has been even more pronounced using inflation adjusted dollars, falling to nearly one-half of their 2008 peak of over \$2,200.

1 **Q. HOW STRONG IS THE RELATIONSHIP BETWEEN CRP PARTICIPATION**  
 2 **AND THE PRICE OF NATURAL GAS SERVICE?**

3 A. Very strong. As shown in Figure 9, the correlation between CRP participation and the  
 4 cost of natural gas service is about  $R=85\%$ , which means  $R^2=73\%$  or, in words, seventy-  
 5 three percent of the variation in CRP participation over twenty years can be explained by  
 6 variation in the cost of natural gas service.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.855 <sup>a</sup>	.731	.717	6781.637

a. Predictors: Inflation adjusted price of natural gas service.

8  
 9 **Figure 9: Relationship of CRP Participation and Cost of Natural Gas Service.**

10  
 11 **Q. IS THERE ALSO VISUAL INFORMATION ON THE STRENGTH OF THIS**  
 12 **RELATIONSHIP OF CRP PARTICIPATION AND THE COST OF NATURAL**  
 13 **GAS SERVICE?**

14 A. Yes. The bottom curve in Figure 10 is the curve of CRP participation by year, displayed  
 15 as a percent of the number of CRP participants in 1996. The top curve is the curve of  
 16 cost of natural gas service, displayed as a percent of the cost of natural gas service in  
 17 1996. The shapes of these curves are similar. Change in participation follow change in  
 18 cost of natural gas service, with a lag.

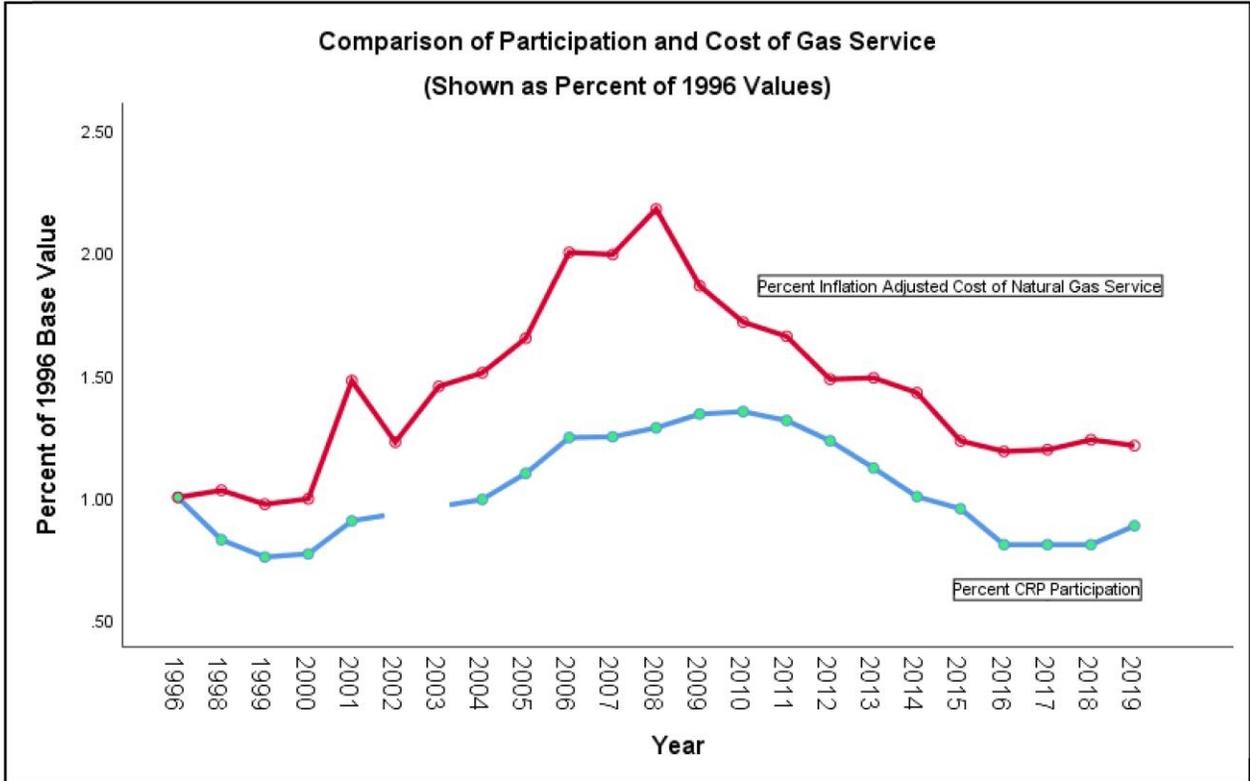


Figure 10: Visual Relation of CRP Participation Curve to Cost of Natural Gas Service Curve.

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5 **Q. ARE YOU ASSERTING THIS ANALYSIS AS A MODEL FOR CRP**  
6 **PARTICIPATION?**

7 A. No. A working model would need to include four or five other variables and several time  
8 series variables (for example, unemployment) would have be tested with various lags.  
9 The purpose here is to demonstrate that participation in low-income programs is related  
10 to the cost of natural gas service and to broaden consideration of participation to include  
11 cost of natural gas service in the City. Increases and decreases in low-income program  
12 participation are not only indications of outreach efforts but are influenced in a major  
13 way by cost of natural gas service, and, by analogy, other variables that reflect economic  
14 conditions in the City. So, the decrease in participation noted by Colton would be  
15 expected in any economic analysis and cannot logically or reasonably be interpreted as an

1 outreach performance problem. Cost of natural gas service is an important driver, and  
2 likely the unemployment rate is another. Together, these drive participation with much  
3 more force than outreach efforts. This analysis does not prove this, but it does provide  
4 evidence that the discussion needs to be opened up considerably to increase accurate  
5 understanding.

6 **Q. COLTON SUGGESTS THAT PGW HAS A PROBLEM IN IDENTIFYING LOW-**  
7 **INCOME CUSTOMERS [COLTON DIRECT, PAGE 52, LINE 2 THROUGH**  
8 **LINE 20]. DOES PGW HAVE A PROBLEM IN IDENTIFYING LOW-INCOME**  
9 **CUSTOMERS?**

10 A. No. Low-income households for whom there is no record of being low-income can  
11 contact PGW at any time and identify themselves if they want to find out about the low-  
12 income programs. Also, any customer with a payment problem will need to either  
13 contact the company or be contacted by the company if there is non-payment or less than  
14 a full payment. Thus, contact is assured by the people processing mechanism. The  
15 company has several ways of determining low-income status but there is no way to  
16 determine low-income status if a household has no payment problem and there is no  
17 record of prior participation in a low-income program. That is not a problem; it is just the  
18 reality of running any kind of low-income program.

19 **Q. HOW MANY LOW-INCOME HOUSEHOLDS ARE LIKELY UNIDENTIFIED?**

20 A. Colton uses company numbers of 473,598 residential customers and 125,911 as identified  
21 by PGW as low-income households. He then asserts (without specifying the method of  
22 estimation) that “If PGW identified its low-income customers at the same rate as they  
23 exist throughout its service territory, it would identify 163,165 customers.” [Colton  
24 Direct, Page 52, Lines 13-14] He then points out that (if this estimate were true) there

1 would be about 37,000 unidentified households and that PGW would have not identified  
2 about 25% of the 163,165 low-income customers.

3 **Q. IS THIS ESTIMATE CORRECT?**

4 A. No. We do not know the method used to create the estimate of 163,165 customers, but it  
5 is likely the old method used to derive an estimate from US Census data. There is a  
6 newer, better method using a tool specially designed by the US Department of Energy for  
7 this purpose. This is an automated tool that derives an estimate from US Census data, but  
8 with corrections.

9 To defray the high cost of housing, it is common in the low-income community to have a  
10 larger number of individuals sharing a household, be it roommates, extended family, or  
11 multi-generational living arrangements. As such, the number of people per household  
12 tends to be larger in lower-income households. For example, while the average household  
13 size in Philadelphia is 2.53 persons per household, the average household size for CRP  
14 accounts in the 0-50% of poverty level is nearly 20 percent larger. Over 60 percent of  
15 PGW customers in this CRP income group have more than three household members.  
16 Some have ten or more persons in a single household.

17 To address the complexity surrounding estimates of low-income households for energy  
18 affordability issues, the Department of Energy developed the Low-Income Energy  
19 Affordability Data (LEAD) Tool. It combines data from a variety of government sources  
20 to estimate household counts (amongst other relevant measures) with the specific purpose  
21 of guiding energy affordability policy and program administration.<sup>6</sup> The DOE LEAD  
22 Tool estimates there are 143,393 gas-utility households in Philadelphia below 150

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<sup>6</sup> The DOE LEAD Tool fact sheet is available at <https://lead.openei.org/assets/files/LEAD-Factsheet.pdf>

1 percent of the poverty line.<sup>7</sup> The 125,911 low-income customers PGW has identified  
 2 constitute nearly eighty-eight percent of this estimate, which is pretty good. This more  
 3 careful estimate is about 20,000 households less than the Colton estimate or about 17,482  
 4 households not identified (a success rate of 88%). Based on the DOE's LEAD Tool the  
 5 remaining 17,482 unidentified low-income customers constitute only 3.6 percent of  
 6 PGW's residential customer base or 12.2% of PGW low-income households.

7 **Q. ON THE BASIS OF HIS ANALYSIS, COLTON ASSERTS THAT "...37,000**  
 8 **[HOUSEHOLDS] CANNOT RECEIVE THE LOW-INCOME PROTECTIONS TO**  
 9 **WHICH THEY ARE ENTITLED UNDER PUC REGULATIONS BECAUSE PGW**  
 10 **HAS NOT IDENTIFIED THEIR STATUS AS A 'LOW-INCOME' CUSTOMER."**  
 11 **[COLTON DIRECT, PAGE 52, LINES 17-19] IS THIS CORRECT?**

12 A. No. First, CRP is not an entitlement, it is a voluntary program. Second, the number of  
 13 households that are low-income but are not identified as low-income is not 37,000, but  
 14 about 17,482 using the newer and more careful US DOE method in the DOE LEAD tool.  
 15 More importantly, however, the assertion that these households cannot receive the low-  
 16 income protections is a "false dilemma" fallacy or "fallacy of the excluded middle." It  
 17 suggests that households are either identified and so receive low-income protections or  
 18 are in the undefined catchment group of potential participants that is a normal feature of  
 19 practice for every kind of low-income program and so does not receive low-income  
 20 protections. In fact, these customers are not excluded. If they have a problem they can  
 21 self-identify to the company and, if qualified, can enter CRP if they so choose.  
 22 Alternatively, if they have a payment problem and the company identifies them as having  
 23 a payment problem, they will be contacted by the company as a normal function of the  
 24 people processing system. Then, if qualified, they may enter CRP if they so choose.

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<sup>7</sup> The LEAD Tool can be accessed at <https://www.energy.gov/eere/slsc/maps/lead-tool>.



1 Colton is using rhetoric rather than analytics here and puts forth a false dilemma.

2 Further, there is no limit on CRP participants.

3 **Q. COLTON ARGUES THAT LOW-INCOME HOUSEHOLDS TEND TO BE LOW-**  
4 **USE CUSTOMERS. [COLTON DIRECT, PAGE 13, LINE 2; PAGE 18,**  
5 **BEGINNING AT LINE 6 THROUGH PAGE 35, LINE 5]. DO YOU AGREE?**

6 A. No. Colton’s argument is not from Philadelphia data so it is not conclusive.

7 **Q. TO WHAT REGION MIGHT MR. COLTON’S ARGUMENT BE CORRECT?**

8 A. The data used to develop the conclusion is representative of the Northeast as a whole,  
9 which includes rural areas in Maine, Vermont, New Hampshire, upstate New York, and  
10 Pennsylvania, so the conclusion would be for the region as a whole.

11 **Q. WHAT IS WRONG WITH USING THIS DATA SOURCE TO DRAW**  
12 **CONCLUSIONS ABOUT THE CITY OF PHILADELPHIA?**

13 A. What is true for the region is not necessarily true for the City.

14 **Q. IN THE COLTON ARGUMENT, IS THE ASSERTION THAT PHILADELPHIA**  
15 **LOW-INCOME HOUSEHOLDS TEND TO BE LOW-USE CUSTOMERS A**  
16 **LOGICAL FALLACY?**

17 A. Yes, the application of a conclusion based on Northeast data to the City of Philadelphia is  
18 an example of the fallacy of division, “...to infer that part of a whole must have some  
19 attribute because the whole to which it belongs happens to have that attribute.”<sup>8</sup> In my  
20 experience, the question of whether low-income customers are generally low-use  
21 customers or high-use customers comes up now and then in doing low-income studies  
22 and is often accompanied by a strong belief that the answer is one way or the other.  
23 However, from experience, the answer is different for different places.

24 **Q. ARE THERE INDICATIONS THAT FOR PHILADELPHIA, LOW-INCOME**  
25 **NATURAL GAS CUSTOMER TEND TO BE HIGH-USE CUSTOMERS?**

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<sup>8</sup> Almosawi, Ali, *An Illustrated Book of Bad Arguments*. New York, The Experiment, 2013: Page 44.

1 A. Yes, there are indications. What is known is that Philadelphia housing stock is unique and  
2 is not representative of housing in the Northeast region.

- 3 • Philadelphia housing stock tends to be older. About 69% of occupied housing in  
4 Philadelphia was built in 1959 or before compared to 47% for the region.
- 5 • We know that low-income families tend to occupy older, less energy efficient housing  
6 stock. Older homes mean higher usage.
- 7 • Fewer renters in Philadelphia live in buildings with five or more apartments, than for the  
8 Northeast. Attached dwelling units in smaller buildings, mean more outside walls and  
9 more heat loss in Winter.
- 10 • Philadelphia has a lot of single-family occupancy. Detached older single-family dwelling  
11 units mean more heat loss in Winter.

12 **Q. IS THERE A DEFINITE ANSWER TO THE QUESTION OF WHETHER OR**  
13 **NOT PHILADELPHIA NATURAL GAS LOW-INCOME HOUSEHOLDS TEND**  
14 **TO BE LOW-USE OR HIGH-USE NATURAL GAS CUSTOMERS?**

15 A. Yes, but developing a solid answer requires defining this as a researchable issue. A  
16 properly framed question, followed by empirical analysis restricted to using only  
17 Philadelphia and PGW customer data should result in a clear answer to the question. Of  
18 course, we know that the answer for CRP is a tendency to high-use. The result for other  
19 identified low-income households could be calculated using customer data. For the  
20 remaining approximately 17,000 low-income households out of approximately 143,000  
21 low-income households in the City, the problem would be to try to identify those  
22 households for the analysis.

23 **Q. COULD YOU PLEASE SUMMARIZE THIS SECTION OF YOUR TESTIMONY?**

24 A. Yes. The purpose of this testimony is to show that PGW service to low income  
25 customers is adequate and sound. First, I indicated several ways in which PGW is  
26 showing adequate and sound performance and note that neither the periodic evaluations  
27 of the low-income programs nor BCS annual Customer Service Performance Reports are  
28 inconsistent with adequate and sound performance. Then, I have addressed several

1 concerns raised by Roger Colton and show in each case that the analysis is less adequate  
2 and that in each area the company is showing adequate and sound performance.

3 **IV. COLLECTIONS RATE**

4 **Q. WHY ARE YOU PRESENTING THIS ANALYSIS?**

5 A. In the direct testimony of some of the OCA witnesses, and chiefly OCA witness Garrett,  
6 PGW was criticized for declining to provide an analysis of the economic effects of the  
7 COVID-19 pandemic on its operations and financials. PGW had indicated that the  
8 effects of the pandemic were changing as we moved forward in time and that any  
9 projection would necessarily have to take what we know now of the pandemic effects and  
10 extrapolate into the Fully Projected Future Test Year (FPFTY). However, in light of the  
11 testimony submitted by OCA, PGW asked my firm to utilize the pandemic effects as we  
12 know them today and use those to analyze the effects of the pandemic related economic  
13 downturn on PGW's likely uncollectible expense.

14 **Q. WHAT DOES YOUR ANALYSIS DO?**

15 A. Our analysis estimates the impact of the COVID-19 pandemic on PGW collections rate  
16 on billed revenue during the 2021 fiscal year based on the data available at this time.

17 **Q. PLEASE DEFINE THE APPROACH TO THE ANALYSIS AND THE STEPS IN**  
18 **THE ANALYSIS.**

19 A. The approach is to empirically estimate the relationship between economic factors and  
20 PGW collections rate. Then, using that relationship, to simulate the collections rate at  
21 differing levels of economic factors. The derived collections rate is then applied to yield  
22 the associated debt coverage. This involved the following steps:

- 23 1. Collect historical data from PGW and secondary sources.
- 24 2. Visually and statistically examine relationships between variables.

1                   3. Develop model to explain monthly collections rate.

2                   4. Use coefficients from final model to simulate collections rate under different  
3                   scenarios.

4 **Q.   WHAT STATISTICAL METHOD IS USED IN THE ANALYSIS?**

5                   The analysis relies upon regression analysis, sometimes called multiple  
6                   regression/correlation analysis (MRC). With MRC, patterns in the data as the dependent  
7                   and independent variables have changed over the years are developed into a model. The  
8                   model is then used to project the test year.

9 **Q.   GIVEN THE UNCERTAINTY IN THE SITUATION, IN THAT COVID-19**  
10 **EFFECTS DO NOT SHOW IN THE FEBRUARY 2020 DATA AND DATA**  
11 **INCREMENTS OF THE TIME OF COVID-19 BECOME AVAILABLE,**  
12 **USUALLY, FROM MONTH TO MONTH, IS REGRESSION ANALYSIS**  
13 **APPROPRIATE?**

14 A.   It would be nice to have the data series from a similar major disease encounter available  
15                   so that that the only variance we need be concerned about was stochastic. We do,  
16                   however, have data that includes the Great Recession of about 2008-2010 and the  
17                   recovery. That will have to be close enough. The fact of uncertainty, or even deep  
18                   uncertainty, does not affect the responsibility to model so that the best available analysis  
19                   can provide a framework for decision support. The goal is to make available the best  
20                   tools for decision-making, and then update the model periodically as new data becomes  
21                   available. Most model-based decision support works best with iteration. Use of a test  
22                   year focuses attention on the year and that focus can improve estimation going forward.  
23                   The goal is to have a workable, practical model at each point in time.

1 **Q. PLEASE DEFINE THE COLLECTIONS RATE.**

2 A. The collections rate is defined as receipts divided by billings and is expressed as a rate or  
3 percentage.

4 **Q. DOES THE COLLECTIONS RATE VARY BY MONTH AND SEASON OF THE**  
5 **YEAR?**

6 A. Yes, the collections rate varies by month and it also shows strong seasonality. Collection  
7 rates are much lower in the winter and much higher in the summer. This pattern is due to  
8 PGW's convention of calculating billings based on metered usage at prevailing rates  
9 regardless of payment plans. In winter, usage is higher; in summer it is lower. Plus,  
10 many customers are on budget billing or average billing. So, receipts exceed bills in the  
11 summer and bills exceed receipts in the winter.

12 **Q. HOW IS THE VARIANCE BY MONTH AND SEASONALITY CONTROLLED**  
13 **IN THE ANALYSIS?**

14 A. The company uses a 24-month moving average calculation of the collections rate  
15  $(\sum \text{Receipts (last 24 months)}) / (\sum \text{Billings (last 24 months)})$  is developed to provide a  
16 stable estimate of the collections rate in recent history (last two years). In the model, we  
17 use the pattern in the heating degree days (HDD) to model the seasonality.

18 **Q. IS THERE ANY PROBLEM WITH THE COMPANY PROJECTION OF A**  
19 **COLLECTIONS RATE OF ABOUT 96% IN PRE-COVID-19 PLANNING?**

20 A. No. That estimate is well supported by the pattern in the empirical data.

21 **Q. WHAT DATA SERIES WERE TESTED FOR USE IN THE ANALYSIS?**

22 A. Data series were obtained for testing from several sources including:

- 23 • Bureau of Labor Statistics (unemployment and labor market for county and, MSAD  
24 and MSA)
- 25 • U.S. Census (Population, households, various other descriptive statistics)

- 1           • SEPTA (City of Philadelphia public transit ridership)
- 2           • Federal Reserve Bank of Philadelphia (Business conditions survey, summarized data
- 3           sets with employment, housing starts and CPI at various geographic levels)
- 4           • NOAA (weather data)

5           Various transformations of data series were also developed for testing. For example,

6           moving averages of the unemployment rate at various lengths (e.g. 2-month, 4-month, 6-

7           month etc.) were calculated and tested in model development.

8   **Q. PLEASE DESCRIBE THE RESULTANT STATISTICAL MODEL.**

9   A.   The collections rate calculation used as the dependent variable in the model is actual

10       receipts divided by billings from one month prior. A one-month lag of billings was found

11       to provide the best monthly alignment with receipts from others tested. Several

12       combinations of independent variables were tested using both judgmental and automatic

13       variable selection processes. Based on the statistical results and our judgement as to a

14       theoretically sound model, the best results were obtained with a model relating the

15       monthly collections rate to:

- 16           • Philadelphia City/County unemployment rate (expressed as a six-month moving
- 17           average)
- 18           • Monthly receipts of LIHEAP and CRISIS grants
- 19           • Heating degree days (seasonality, expressed both as a 2-month moving average and
- 20           a 4-month moving total)

1 **Q. HOW GOOD IS THE MODEL?**

2 A. The model is statistically significant and theoretically sound in that higher (lower)  
 3 unemployment is significantly related to lower (higher) PGW collections rate. The  
 4 model explains over 80% of the variation and passes standard diagnostic tests.

5 **Q. PLEASE PROVIDE THE ECONOMETRIC EQUATION OF THE MODEL AND**  
 6 **A TABLE OF PARAMETER ESTIMATES, AND THE MODEL DIAGNOSTIC**  
 7 **TABLES.**

8 A. The estimated econometric equation is:

9 Collections Rate=  $\beta_0 + \beta_1 \times UR\_MA6 + \beta_2 \times GrantDollars + \beta_3 \times HDD\_4MT +$   
 10  $\beta_4 \times HDD\_2MA$

11 B values are found in the “Parameter Estimate” column in Table 1.

12  
 13 **Table 1: Parameter Estimates.**

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t	Variance Inflation
<b>Intercept</b>	Intercept	1	1.36953	0.03748	36.54	<.0001	0
<b>UR_MA6</b>	Unemployment rate, Philadelphia City (6 month avg)	1	-0.00894	0.00423	-2.11	0.0365	1.02891
<b>GrantDollars</b>	LIHEAP and CRISIS grant dollars received	1	2.487127E-8	4.960629E-9	5.01	<.0001	1.22504
<b>HDD_4MT</b>	HDD65, 4 month moving total	1	-0.00016186	0.00001398	-11.58	<.0001	3.62756
<b>HDD65_2MA</b>	HDD65, 2 month mov avg	1	-0.00011134	0.00004886	-2.28	0.0242	3.80293

14

15

1

**Table 2: Analysis of Variance.**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
<b>Model</b>	4	6.24060	1.56015	148.55	<.0001
<b>Error</b>	139	1.45985	0.01050		
<b>Corrected Total</b>	143	7.70045			

2

3

**Table 3: R-Square and Adjusted R-Square.**

<b>Root MSE</b>	0.10248	<b>R-Square</b>	0.8104
<b>Dependent Mean</b>	1.07370	<b>Adj R-Sq</b>	0.8050
<b>Coeff Var</b>	9.54469		

4

5

**Table 4: Observations, Autocorrelation.**

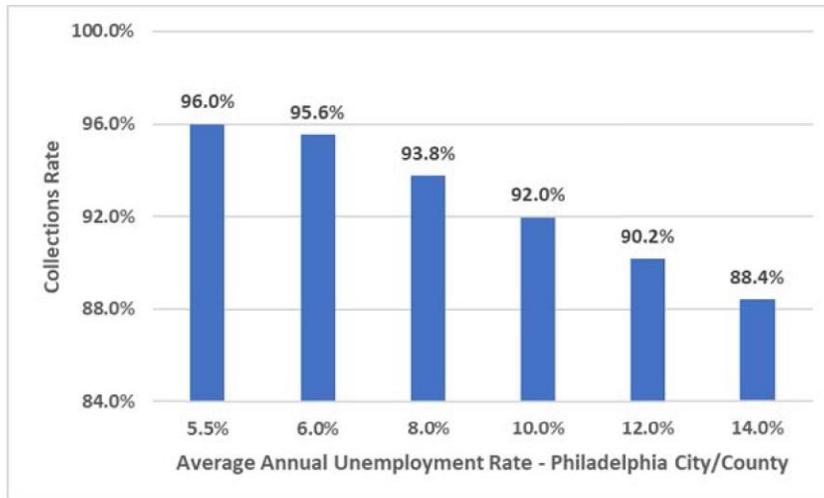
<b>Durbin-Watson D</b>	1.965
<b>Number of Observations</b>	144
<b>1st Order Autocorrelation</b>	0.017

6

7 **Q. WHEN THE ECONOMETRIC EQUATION WAS APPLIED TO PROJECTION,**  
8 **WHAT WAS THE RESULT?**

9 A. The final model shown above was used to predict the average collections rate for the  
10 2021 fiscal year (September 2020 through August 2021) at differing levels of the local  
11 unemployment rate. Results are shown in the chart below (Figure 11). In this chart,  
12 variation in the unemployment rate is used to drive the estimate of the collection rate  
13 under different conditions of unemployment.





**Figure 11: Relationship between Unemployment Rate and Collections Rate.**

Prior to the pandemic, the unemployment rate in Philadelphia averaged between 5.5% and 5.6% and the PGW collections rate stood at about 96%. This pre-pandemic state is shown by the first bar in Figure 11.

The Federal Reserve projects an increase in the U.S. unemployment rate between fourth quarter of 2020 (October-December 2020) and fourth quarter of 2021 (October-December 2021) of 4.35 percentage points over the unemployment rate projected for the same period in their December 2019 forecast. In other words, the Federal Reserve is expecting the prevailing U.S. unemployment rate over the period from fourth quarter 2020 to fourth quarter 2021 to be 4.35 percentage points higher as a result of the pandemic.

Applying the projected increase in the unemployment rate of 4.35% to the pre-pandemic unemployment rate in Philadelphia of 5.57 results in a projected average level of unemployment of 9.92% for the fourth quarter 2020 through fourth quarter 2021, rounded up to 10%. Although the fourth quarter (October-December) reference used by the Federal Reserve does not perfectly align with the PGW Fiscal Year, it is close. Centering

1 the fourth quarter references in November, the unemployment impact is over the  
2 November 2020 to November 2021 period. PGWs' 2021 Fiscal Year is September  
3 through August 2021. Given the closeness of the two time periods and uncertainty  
4 around the exact timing and level of the unemployment forecast, we have selected a 10%  
5 unemployment rate over the PGW 2021 fiscal year as the base case forecast. Given that  
6 forecast, we predict a PGW collections rate of 92% in the 2021 PGW fiscal year, all other  
7 things held constant.<sup>9</sup> This is a drop from the 96% collections rate experienced before  
8 the pandemic.

9 **Q. HOW DOES THIS COLLECTIONS RATE TRANSLATE INTO AN ESTIMATE**  
10 **OF BAD DEBT?**

11 A. By use of PGW Exhibit JFG-2, Statement of Income (Direct Testimony of Joseph F.  
12 Golden, PGW Statement No. 2). This exhibit shows that for a collections rate of 96%,  
13 PGW expects \$33.1 million dollars of bad debt. It stands to reason that doubling the bad  
14 debt percent from four percent to eight percent would also result in a doubling of the bad  
15 debt. The incremental bad debt due to a drop in the collection rate from 96% to 92% is  
16 estimated to be \$33.1 million dollars for a total bad debt of \$66.2 million dollars.

17 **Q. PLEASE SUMMARIZE YOUR TESTIMONY.**

18 A. The objective of this analysis was to develop a model to explain PGW's collections rate  
19 as a function of economic and other indicators in response to testimony from OCA that  
20 PGW has not analyzed the effects of the COVID-19 pandemic on its FPPTY operations.  
21 Using multiple regression/correlation (MRC) analysis, a model was developed that

---

<sup>9</sup> The *ceteris paribus* condition that all other conditions remain the same include things like government assistance programs. If sufficient financial aid is given to the unemployed, they will be likely to pay their bills and collections rate will not fall as much as it would otherwise.

1 explains the monthly collections rate as a function of unemployment rates, LIHEAP and  
2 CRISIS grants and heating degree days (HDD). The econometric model was then used to  
3 simulate the expected collections rate at various levels of unemployment. Based on  
4 Federal Reserve projections applied to the Philadelphia labor market, an unemployment  
5 rate of 10% for the PGW 2021 test year was projected as a base case. Using this  
6 projection of the unemployment rate, PGW can expect a collections rate of 92% in the  
7 test year, down from a pre-pandemic level of 96%. It then follows that given a 92%  
8 collections rate bad debt will increase by \$33.1 million to a level of \$66.2 million.

9 **Q. IS THERE MORE DETAILED INFORMATION ON THE DECISION SUPPORT**  
10 **CALCULATIONS ON THE ECONOMIC EFFECTS OF THE COVID-19**  
11 **PANDEMIC PRESENTED HERE?**

12 A. Yes, please see the paper, “Assessing the Impact of the Pandemic on PGW Collections  
13 Rate.pdf” as filed. I am including this detailed analysis as Exhibit HGP-3.

14 **V. COMMERCIAL SALES VOLUME FORECAST**

15 **Q. WHY ARE YOU PRESENTING THIS ANALYSIS?**

16 A. In the direct testimony of some of the OCA witnesses, and chiefly OCA witness Garrett,  
17 PGW was criticized for declining to provide an analysis of the economic effects of the  
18 COVID-19 pandemic on its operations and financials. PGW had indicated that the  
19 effects of the pandemic were changing as we moved forward in time and that any  
20 projection would necessarily have to take what we know now of the pandemic effects and  
21 extrapolate into the Fully Projected Future Test Year (FPFTY). However, in light of the  
22 testimony submitted by OCA, PGW asked my firm to utilize the pandemic effects as we  
23 know them today and use those to analyze the effects of the pandemic related economic  
24 downturn on PGW’s volumetric sales to commercial customers.

1 **Q. WHAT IS THE PURPOSE OF THE ANALYSIS?**

2 A. The purpose of the analysis is to estimate the impact of the COVID-19 pandemic on  
3 PGW volumetric sales to commercial customers during the 2021 fiscal year.

4 **Q. PLEASE DEFINE THE APPROACH TO THE ANALYSIS AND THE STEPS IN**  
5 **THE ANALYSIS.**

6 A. The approach is to empirically estimate the relationship between economic factors and  
7 volumetric sales to PGW commercial customers. Then, using that relationship, to  
8 simulate commercial sales using assumptions for fiscal 2021 with and without the  
9 pandemic. This involved the following steps:

- 10 1. Collect historical data from PGW and secondary sources.
- 11 2. Visually and statistically examine relationships between variables.
- 12 3. Develop model to explain monthly commercial sales volumes.
- 13 4. Develop projections of independent variables used in the model over fiscal  
14 with and without the pandemic.
- 15 5. Use coefficients from final model and projections of independent variables  
16 to forecast commercial sales with and without the pandemic.

17 **Q. WHAT STATISTICAL METHOD IS USED IN THE ANALYSIS?**

18 A. The analysis relies upon regression analysis, sometimes called multiple  
19 regression/correlation analysis (MRC). With MRC, patterns in the data as the dependent  
20 and independent variables have changed over the years are developed into a model. The  
21 model is then used to project the test year.

1 **Q. GIVEN THE UNCERTAINTY IN THE SITUATION, IN THAT COVID-19**  
2 **EFFECTS DO NOT SHOW IN THE FEBRUARY 2020 DATA AND AS DATA**  
3 **INCREMENTS OF THE TIME OF COVID-19 BECOME AVAILABLE,**  
4 **USUALLY, FROM MONTH TO MONTH, IS REGRESSION ANALYSIS**  
5 **APPROPRIATE?**

6 A. It would be nice to have the data series from a similar major disease encounter available  
7 so that that the only variance we need be concerned about was stochastic. We do,  
8 however, have data that includes the Great Recession of about 2008-2010 and the  
9 recovery. That will have to be close enough. The fact of uncertainty, or even deep  
10 uncertainty, does not affect the responsibility to model so that the best available analysis  
11 can provide a framework for decision support. The goal is to make available the best  
12 tools for decision-making, and then update the model periodically as new data becomes  
13 available. Most model-based decision support works best with iteration. Use of a test  
14 year focuses attention on the year and that focus can improve estimation going forward.  
15 The goal is to have a workable, practical model at each point in time.

16 **Q. DO VOLUMETRIC SALES TO COMMERCIAL CUSTOMERS VARY BY**  
17 **MONTH AND SEASON OF THE YEAR?**

18 A. Yes, commercial sales vary by month and exhibit strong seasonality.

19 **Q. HOW IS THE VARIANCE BY MONTH AND SEASONALITY CONTROLLED**  
20 **IN THE ANALYSIS?**

21 A. Natural gas sales to commercial customers are highly weather dependent. To control for  
22 weather, we used heating degree day (HDD) and cooling degree day (CDD) variables in  
23 the analysis. Winter heating contributes the most to seasonality, but summer cooling may  
24 also play a role in weather related seasonality. In addition to weather, seasonality related  
25 to economic variables may also be present in commercial sales. Greater economic  
26 activity in some months due to holiday shopping is one example of non-weather-related  
27 seasonality that can be present in commercial sales. Several variables were tested, and

1 employment levels were selected to capture monthly variation due to non-weather  
2 seasonality. Employment also captures cyclical and long-term trend as well as  
3 seasonality. The MRC approach discussed earlier in my testimony allows the influence  
4 of each variable in the model to be identified.

5 **Q. WHAT DATA SERIES WERE TESTED FOR USE IN THE ANALYSIS?**

6 A. Data series were obtained for testing from several sources including:

- 7 • Bureau of Labor Statistics (unemployment and labor market for county and, MSAD  
8 and MSA)
- 9 • U.S. Census (Population, households, various other descriptive statistics)
- 10 • Federal Reserve Bank of Philadelphia (Business conditions survey, summarized data  
11 sets with employment, housing starts and CPI at various geographic levels)
- 12 • NOAA (weather data)

13 Various transformations of data series were also developed for testing. For example, a  
14 two-month moving average of HDD and CDD were calculated and tested in model  
15 development to reflect the impacts of weather from the current and prior month on meter  
16 read cycle-based sales data.

17 **Q. PLEASE DESCRIBE THE RESULTANT STATISTICAL MODEL.**

18 A. The model relates monthly commercial volumetric sales to four independent variables.  
19 These variables were selected after several combinations of independent variables were  
20 tested using both judgmental and automatic variable selection processes. Based on the  
21 statistical results and our judgement as to a theoretically sound model, the best results  
22 were obtained with a model relating monthly commercial sales to:

- 23 • Philadelphia City/County employment (number of people employed)

- 1 • Heating degree days (base 65, expressed as a 2-month moving average)
- 2 • Cooling degree days (base 65, expressed as a 2-month moving average)
- 3 • Indicator for January 2018

4 Model diagnostics showed a large unexplained level of usage in January 2018 that was  
 5 judged to be an outlier. An indicator variable for that month (1 in January 2018 and zero  
 6 otherwise) was used to remove any influence the outlier may have had on model  
 7 coefficients.

8 **Q. HOW GOOD IS THE MODEL?**

9 A. The model is statistically significant and theoretically sound in that all of the coefficients  
 10 of the independent variables are correctly signed. In other words, higher levels of  
 11 employment, colder weather in the winter and hotter weather in the summer all cause  
 12 model projected sales to increase as one would expect. The model explains over 98% of  
 13 the variation in monthly commercial sales and passes standard diagnostic tests.

14 **Q. PLEASE PROVIDE THE ECONOMETRIC EQUATION OF THE MODEL AND**  
 15 **A TABLE OF PARAMETER ESTIMATES, AND THE MODEL DIAGNOSTIC**  
 16 **TABLES.**

17 A. The estimated econometric equation is:

$$18 \text{ Commercial Sales volume} = \beta_0 + \beta_1 \times \text{HDD65\_2MA} + \beta_2 \times \text{CDD65\_2MA} + \\ 19 \beta_3 \times \text{Emp\_Phil} + \beta_4 \times \text{Jan2018}$$

20 Variable labels and parameter estimates (values for Bs in equation above) are shown in  
 21 Table 5.

1

**Table 5: Parameter Estimates.**

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t	Variance Inflation
<b>Intercept</b>	Intercept	1	-484118	90442	-5.35	<.0001	0
<b>HDD65_2MA</b>	HDD65, 2 month moving avg	1	1583.86589	23.09087	68.59	<.0001	2.68015
<b>CDD65_2MA</b>	CDD65, 2 month moving avg	1	348.37540	51.50088	6.76	<.0001	2.64593
<b>Emp_Phil</b>	Philadelphia Employment	1	1.09667	0.14254	7.69	<.0001	1.00683
<b>Jan2018</b>	January 2018 Indicator (0/1)	1	390255	64117	6.09	<.0001	1.02787

2

3

4

**Table 6: Analysis of Variance.**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
<b>Model</b>	4	4.389675E13	1.097419E13	2759.94	<.0001
<b>Error</b>	167	6.640321E11	3976239973		
<b>Corrected Total</b>	171	4.456078E13			

5

6

7

**Table 7: R-Square and Adjusted R-Square.**

<b>Root MSE</b>	63057	<b>R-Square</b>	0.9851
<b>Dependent Mean</b>	833028	<b>Adj R-Sq</b>	0.9847
<b>Coeff Var</b>	7.56967		

8

9

10

**Table 8: Observations, Autocorrelation.**

<b>Durbin-Watson D</b>	1.805
<b>Number of Observations</b>	172
<b>1st Order Autocorrelation</b>	0.082

11

12

13



1 **Q. HOW WERE EMPLOYMENT LEVELS IN PGW'S FISCAL YEAR 2021 WITH**  
2 **AND WITHOUT THE PANDEMIC DETERMINED?**

3 A. The Federal Reserve released projections for U.S. unemployment in December 2019 and  
4 June 2020. Both forecasts cover the period included by PGW's 2021 fiscal year  
5 (September 2020 through August 2021). The change in the expected unemployment rate  
6 between the December 2019 forecast (pre-pandemic) and the June 2020 forecast  
7 (pandemic) was the basis for our estimates of PGW fiscal year 2021 employment without  
8 and with the pandemic, respectively. The change in Federal Reserve projected  
9 unemployment rate was applied to the Philadelphia labor market and monthly  
10 employment levels calculated. Since weather conditions are expected to be the same in  
11 2021 regardless of economic activity, Philadelphia employment projections with and  
12 without the pandemic and the model coefficient on the employment variable is all that is  
13 required to project the impact on commercial sales from the pandemic.

14 **Q. WHEN THE ECONOMETRIC EQUATION WAS APPLIED TO PROJECTION,**  
15 **WHAT WAS THE RESULT?**

16 A. The final model shown above was used to predict monthly commercial sales with and  
17 without the pandemic for the 2021 fiscal year (September 2020 through August 2021).  
18 Results show that commercial sales are expected to be 3.7% lower in 2021 due to the  
19 pandemic.

20 **Q. IS IT REASONABLE TO EXPECT A SIMILAR PANDEMIC IMPACT TO**  
21 **VOLUMETRIC SALES IN FISCAL 2021 FOR SALES TO ALL**  
22 **NONRESIDENTIAL CUSTOMERS INCLUDING MUNICIPAL AND**  
23 **INDUSTRIAL CUSTOMERS?**

24 A. Yes. The economic impact from the pandemic on commercial sales is due to lower  
25 overall levels of demand for gas as reflected in lower levels of employment. Similar  
26 economic impacts are expected across all non-residential customers including municipal

1 and industrial customers. Also, by using total Philadelphia employment as the economic  
2 driver variable in our model of commercial sales, we incorporate the broadest measure of  
3 employment that includes all sectors. Sales to industrial customers are also small in  
4 relation to commercial sales, accounting for only about 7% of the total sales to  
5 commercial and industrial customers.

6 **Q. PLEASE SUMMARIZE YOUR TESTIMONY**

7 A. The objective of this analysis was to develop a model to predict the impact of the  
8 pandemic on volumetric sales to commercial customers in the test year (September 2020  
9 through August 2021). Using multiple regression/correlation (MRC) analysis a model  
10 was developed that explains monthly commercial sales as a function of Philadelphia  
11 employment levels, heating degree days (HDD) and cooling degree days (CDD). Federal  
12 Reserve projections made before and during the pandemic were applied to the  
13 Philadelphia labor market to calculate expected employment without and with the  
14 pandemic, respectively. The difference in employment during the 2021 fiscal year was  
15 then used with the model coefficient on employment to estimate the impact on  
16 commercial sales. Volumetric sales to commercial customers are expected to be 3.7%  
17 lower than they would have been had the pandemic not happened. A similar impact on  
18 sales can be expected for the non-residential customers in total.

19 **Q. IS ADDITIONAL INFORMATION ON PREDICTION OF VOLUMETRIC**  
20 **SALES TO COMMERCIAL CUSTOMERS IN THE TEST YEAR AVAILABLE?**

21 A. Yes, please see the paper, "PGW Commercial Sales Forecasting Model and Forecast.pdf"  
22 as filed. I am including this detailed analysis as Exhibit HGP-4.

1 VI. CONCLUSION

2 Q. DOES THAT COMPLETE YOUR REBUTTAL TESTIMONY?

3 A. Yes.

**VERIFICATION**

I, Hugh Gilbert Peach, hereby state that: (1) I am President of H. Gil Peach & Associates LLC; (2) I have been retained by Philadelphia Gas Works ("PGW") for purposes of this proceeding; (3) the facts set forth in my testimony are true and correct to the best of my knowledge, information and belief; and (4) I expect to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa. C.S. § 4904 (relating to unsworn falsification to authorities).

July 13, 2020

\_\_\_\_\_  
Dated

*H. Gil Peach*

\_\_\_\_\_  
Hugh Gilbert Peach  
President of H. Gil Peach & Associates LLC

EXHIBIT  
HGP-1

# List of Testimony Previously Provided by H. Gil Peach

GIL PEACH

HGP-1	<b>List of Testimony Previously Provided by H. Gil Peach</b>		
<b>Year</b>	<b>Jurisdiction</b>	<b>Subject</b>	<b>For</b>
2017	Pennsylvania	Economics	Philadelphia Gas Works
2016	Pennsylvania	Decoupling	Pennsylvania Public Utility Commission
2015	Washington	Gas DSM	Independent Expert
2012	Nova Scotia	DSM & Low-Income	Nova Scotia Utilities and Review Board
2011	Nova Scotia	DSM & Low-Income	Nova Scotia Utilities and Review Board
2010	Nova Scotia	DSM & Low-Income	Nova Scotia Utilities and Review Board
2007	Nevada	Low-Income	Nevada Housing Division
2005	District of Columbia	DSM & Low-Income	DC Energy Office
2005	Utah	Low-Income	Salt Lake CAP & Utah Housing Division
2005	Nevada	Low-Income	NV Welfare Division & NV Housing Division
2004	Pennsylvania	Low-Income	Philadelphia Gas Works
2000	Washington	Measurement	Snohomish PUD No. 1
1999	Kentucky	Low-Income	Kentucky Association for Community Action
1990s	Connecticut	DSM	Conservation Law Foundation
1990s	Rhode Island	DSM	Conservation Law Foundation
1990s	Massachusetts	DSM	Conservation Law Foundation
1990s	Vermont	DSM	Conservation Law Foundation
1989	Massachusetts	Measurement	Northeast Utilities/Connecticut Light & Power

EXHIBIT  
HGP-2



# PGW Performance (Service Quality)

RESPONSE TO COLTON DIRECT

H. GIL PEACH

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# PGW Performance (Service Quality)

## **Colton's Argument on PGW Performance**

The relevant policy contest for assessing service quality is provided by the Commission's Policy Statement. Section 2703(a)(7) of the policy statement states that service quality (among other factors) will be considered in determining just and reasonable rate levels for PGW.

In this policy context, Roger Colton presents a perspective on service quality [Colton Direct, Part 3, Section B (Service Quality), Page 45, beginning at Line 8 through Page 51, Line 5]. Colton's discussion of service quality is based on his review of the PUC's 2018 Customer Service Performance Report for Pennsylvania electric and natural gas distribution companies.<sup>1</sup> Information from the same report for a prior year is also used.<sup>2</sup>

Here we contrast Colton's presentation of service quality with a more holistic perspective of how service quality fits within organizational development, management performance and data analysis. We call particular attention to the differences between Colton's interpretation of data presented by the Bureau of Consumer Services in the BCS Reports and the more fully developed analysis and perspective developed in the BCS Reports. We will show that Colton's method of analysis and resultant interpretations are defective in several respects.

Colton's argument is that [PGW's] customer service indicators are low ranked. Specifically, that "Using data from the PUC's own 'customer service performance' reports [Colton's] discussion finds that PGW provides the lowest quality of 'customer service performance'...." [Colton Direct, Page 50, Line 23 to Page 51, Line 3]. Colton's representation of the data from the BCS Reports is limited to his Table 18 [Colton Direct, Page 47, top of page], which is reproduced here as Figure 1.

In Figure 1, there are seven service quality indicators. The first, Call Abandonment Rate, is an average per month and apparently not based on a sample. The six other service quality indicators are based on survey data

---

<sup>1</sup> Pennsylvania PUC, Bureau of Consumer Services, Customer Service Performance Report: Pennsylvania Electric & Natural Gas Distribution Companies (annual). These annual studies are hereinafter referred to as BCS Reports.

<sup>2</sup> In the current analysis, we use the BCS Reports for 2018 (covering 2016-2018) and for 2015 (covering 2013 through 2015).

from (random) sampling. For the survey indicators, the design goal is to include 700 completed surveys per Natural Gas Distribution Company (NGDC) per year with a split of 200 for credit and collection issues and 500 for other types of issues (Figure 2).<sup>3</sup> The number of survey completions was set to provide a 95% probability that results would have a statistical precision of plus or minus five percentage points (Figure 3).<sup>4</sup>

Table 18. PGW Metrics on Customer Service Performance (2014 – 2018)					
	2014	2015	2016	2017	2018
Call abandonment	13%	9%	20%	5%	5%
PGW ranking	Lowest	Lowest	Lowest	Lowest	3 <sup>rd</sup> lowest
Ease of reaching <sup>27</sup>	48%	61%	57%	67%	68%
PGW ranking	Lowest	Lowest	Lowest	Lowest	Lowest
Use of automated phone system <sup>28</sup>	52%	51%	60%	60%	59%
PGW ranking	Lowest	Lowest	5 <sup>th</sup> lowest	3 <sup>rd</sup> lowest	Lowest
Handling of contact <sup>29</sup>	66%	74%	78%	79%	79%
PGW ranking	Lowest	Lowest	Lowest	Lowest	Lowest
Call center courtesy <sup>30</sup>	70%	81%	81%	81%	81%
PGW ranking	Lowest	Lowest	Lowest	Lowest	Lowest
Call center knowledge <sup>31</sup>	71%	78%	79%	79%	79%
PGW ranking	Lowest	Lowest	Lowest	Lowest	Lowest
Overall satisfaction <sup>32</sup>	60%	72%	70%	70%	76%
PGW ranking	Lowest	Lowest	Lowest	Lowest	Lowest

Figure 1: Colton's Presentation of BCS Data.

Survey working group members from both industries agreed that the 700 completed surveys should include 200 contacts about credit and collection issues and 500 contacts about all other types of issues. Under this plan, the credit and collection contacts do not dominate survey results. Credit and collection contacts are from customers who need to make payment agreements; customers who received termination notices or had service terminated; those who are requested to pay security deposits; and others with bill payment problems. Consumer contacts about other issues include calls about billing questions and disputes; installation of service requests; metering problems; outage reporting; questions about choosing an alternative supplier; and a variety of other reasons.

Figure 2: BCS Reports Survey Design.

<sup>3</sup> BCS Report for 2018, Page 20.

<sup>4</sup> BCS Report for 2018, Page 20.

Each year, the survey firm completes approximately 700 surveys for each EDC or NGDC. With a sample of this size, there is a 95 percent probability that the results have a statistical precision of plus or minus five percentage points of what the results would be if all customers who had contacted their EDC or NGDC had been surveyed, meeting the PUC requirements<sup>36</sup>.

Figure 3: Planned Precision for Survey Results.

## Five Problems in Colton's Method

There are five critical problems of method in Colton's assessment of service quality based on rankings:

- (1) **Selection of Indicators.** Companies rank differently on different indicators. Colton selected the Call Abandonment indicator, but in the BCS Reports there is a more thorough analysis using three indicators considered together: Call Abandonment, Busy-Out and Percentage of Calls Answered within Thirty Seconds. Put in terms of success rates, PGW was at 95% out of 100% for the first indicator, 97% out of 100% for the second and 91% out of 100% for the third for 2018. Selection of indicators is a factor in Colton's analysis.
- (2) **Ranking vs. Range of Results.** Knowing that a company is lowest rank, as PGW was for Call Abandonment in 2017 with a 95% success rate, or highest rank as PGW was in 2017 and 2018 with a 91% success rate on Percentage of Calls Answered within Thirty Seconds, is not enough information on which to base an assessment. What is missing is the range of results.

To understand how well a company is doing on an indicator, the success rate on the indicator and the rank for the company has to be understood in the context of the results for other NGDCs. This is the way the BCS Reports present results. The value of the indicators is as a flag to an area that requires improvement so that resources can be directed to that area. However, a value for a particular NDGC on an indicator is of little use except in the context of knowing the range of results. And rankings do not mean anything in isolation from knowledge of the range of results. Generally, throughout the indicators reported by BCS, the results on each particular indicator tend to cluster, with company results being quite close to each other. The usefulness of the indicators is when one company stands out from the cluster of other companies

by a large scoring distance. This can serve as a flag for a service quality problem in a particular area. On nearly all service quality indicators, for nearly all years, all of the NDGCs cluster with small distances between numerical scores and with all companies at a high success rate. Using only the scores for one company and creating a rank order does not convey the information on service quality as reported by BCS. This is an error of misplaced adequacy; using the less appropriate of two or more classes of truth tests, when, instead, a more appropriate truth test should have been employed.<sup>5</sup>

- (3) **Precision of Estimates.** As noted in Figure 4, for service quality indicator scores for which the estimate of service quality is constructed from survey results, the surveys were designed to produce scores with a precision of plus or minus five percentage points. A reported score for an individual NGDC on a service quality indicator is a point estimate. The calculated point estimate has an associated precision. For the surveys used in the BCS Reports, the planned precision is plus or minus 5%. An image of what this means is shown in Figure 4, where precision is plus or minus seven percent because the useful sample size is much smaller than planned.

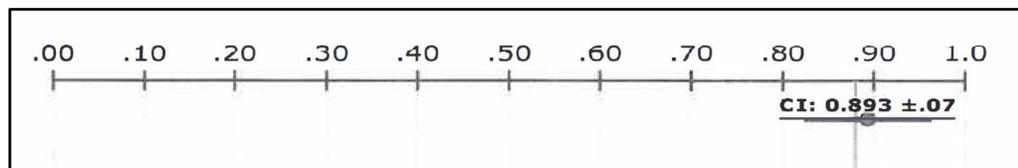


Figure 4: Precision of Results.

The plus or minus 5% is a design criterion to set precision of estimates. The actual confidence interval about each score depends on the useful sample size for the calculation (the number of completed surveys relevant to each specific survey question). Because customers are split between those who call in with credit and collection issues and all other issues, the actual number used will vary across the different service quality indicators. Within these two groups, there will be smaller subsets of customers

<sup>5</sup> See Dunn, William N., Reforms as Arguments. Knowledge: *Creation, Diffusion, Utilization*, Vol. 3, No. 3, March 1982 293-326; Page 318, Figure 3: Threats to Usable Knowledge.

relevant to each question. The precision problem means that a PGW score of 5% on Call Abandonment Rate, for example, represents a population score of 0 to 10%; put in terms of success rate, this is 90% to 100%. Knowing this limitation of the data makes ranking essentially meaningless when scores considered with precision of estimate means that nearly all of the time and on all of the measures, the scores (considering precision) for the companies on an indicator all overlap. The value of the BCS Report is to flag years and areas where this is not so. What the BCS Reports show is solid performance by all of the NGDC's for almost all years on almost all indicators.

- (4) **Response Rate and Selection Bias.** In the 1960's, and particularly prior to the 1960's response rates to surveys was typically high. It would not then have been unusual for a utility survey to have a response rate (measured by completion of surveys administered) of 80% or more. But the era from the 1940's through the 1960's was an era in which people used to answer phones; calls were perceived to be important. Being contacted for a survey was a rare experience and many felt privileged to be asked to participate. Today, it is not unusual for a survey in any area to achieve a response rate of less than twenty percent. What this means is that the basis for using a design that achieves a precision of estimate of plus or minus five percent is undermined. When we do surveys, we all still use the calculation. But the randomness of the sample is now an unknown.

Now, when a survey is designed with a random sample, instead of drawing a random sample we randomize a data base so that the people in the database are randomized. Then we take people in list order and meet a completion target. Everyone does this; nearly all surveys in every area are like this. It is the best that can be done. But it does facilitate selection bias. Sometimes people who respond to a survey can be compared to census or full database people on selected characteristics to detect some forms of selection bias. In calling utility customers, it is not unusual to find that those who answer surveys are retired, recovering from an accident or ill at home, or at home caring for a sick child. This happens even when calling from a randomized list. This is a complicating factor when analyzing survey data.

- (5) **Misclassification.** In assigning cases to a positive result for reporting customer satisfaction, Colton reports results using a different classification system for BCS data than is used by BCS, without clearly explaining that in this system positive performance is downgraded from positive performance as reported by BCS (Figure 23).

**Analysis of Performance Indicators**

Next, the Service Quality Indicators from the BCS Reports are listed. Those analyzed by Colton are analyzed by contrast here, plus some additional BCS indicators are analyzed.

**Call Abandonment, Busy-Out and Answered within Thirty Seconds**

Next, we discuss one service quality indicator, the Call Abandonment Rate, to illustrate how the BCS Reports data can be properly used in analysis and to show by contrast that simply analyzing by means of ranking and scores from a single company is not useful.

- (1) **Call Abandonment Rate.** The call abandonment rate is the rate at which customers drop out of the queue of customers who call in to the utility and are waiting to talk to a company representative. With regard to the call abandonment rate, Colton says that “in four of the five most recent years (2014-2018), PGW was ranked lowest amongst Pennsylvania’s seven gas utilities” on this metric. Colton emphasizes, “PGW had the highest Call Abandonment Rate... (i.e., it had the worst customer service performance)...” on this metric. The portion of Colton’s Table 18 which contains this information is reproduced below.

Table 18. PGW Metrics on Customer Service Performance (2014 – 2018)					
	2014	2015	2016	2017	2018
Call abandonment	13%	9%	20%	5%	5%
PGW ranking	Lowest	Lowest	Lowest	Lowest	3 <sup>rd</sup> lowest

*Figure 5: Colton Presentation on Call Abandonment.*



However, the BCS report presents results not as ranks but according to percentages and in context by showing results for all NGDCs.<sup>6</sup> A call abandonment rate of 5% means a 95% success rate. As a critique of the ranking method, in general, 95% out of 100% is a good success rate in itself. One reason why the BCS report format is appropriate (Figure 6 & Figure 7), and Colton's presentation (Figure 5) is not appropriate is that BCS shows PGW results in relation with results including all other NGDC companies. As shown in Figure 7 and interpreted in terms of success rates, for 2018, three companies are running at a 98% success rate, one at 97%, PGW at 95%, and two other companies are running a 92% success rate. A first conclusion from a range of success rates from 92% to 98% for different companies with service territories with different characteristics is that these scores have a very narrow range at the top of the scale of possible results. Overall, this is a pattern of strong positive performance results for all NGDCs.

A factor that Colton does not appear to consider is that call abandonment is not solely caused by companies. Some percentage of abandonment occurs due to changing priorities or intervening events on the customer side of the call. It is not unlikely that over the course of a year and with all the things that happen on the customer side of a call in a great city that two to five percent of calls will be abandoned no matter what the response on the company side of the call. Performance here is strong and positive for all NGDCs.

Presenting results as if they were absolute rather than estimates with planned precision and characterizing strong positive results as negative is not the best approach to analysis of performance indicators. Rather, the results presented in the BCS Reports should be approached from the perspective of how large-scale organizations work and from the perspectives of performance management and organizational learning.

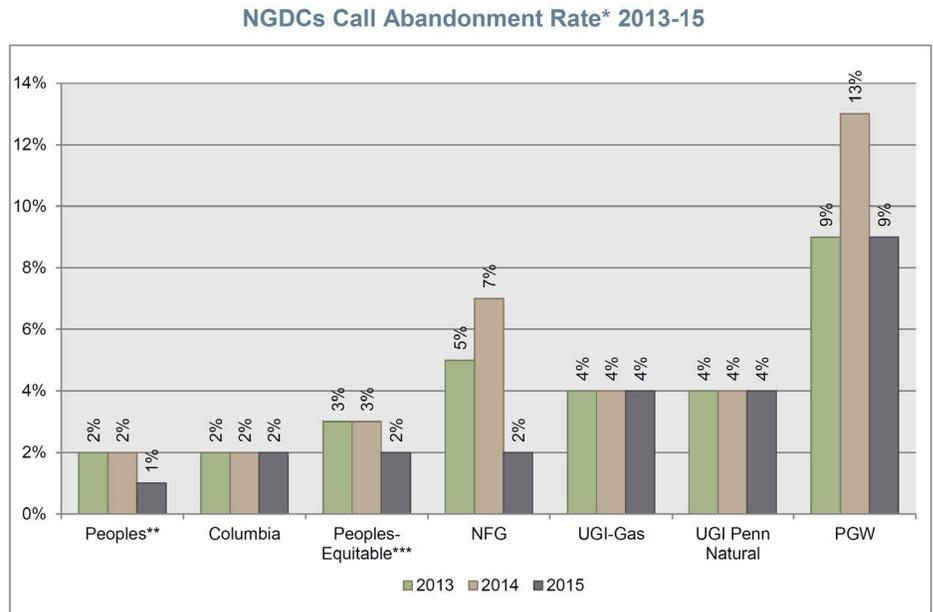
Performance indicators exist as flags and suggest where to put additional resources. Maintaining and improving performance across

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<sup>6</sup> For the call abandonment rate, the percentages provided by Colton correctly match to the percentages in the BCS reports. However, the graphical presentation format selected by BCS provides more information than Colton's ranking presentation.

the diverse departments and units of a large-scale organization is a part of ongoing normal operations and management. In this context, the twenty-three performance indicators maintained by BCS can operate to flag areas that require attention of management. It is not, as Colton seems to suggest, that any success ratio less than 100% is a failure. Rather, large-scale organizations and regulators need to monitor where there might be a performance problem and use the performance indicators to flag problem areas that will develop and require resolution by management from time to time.

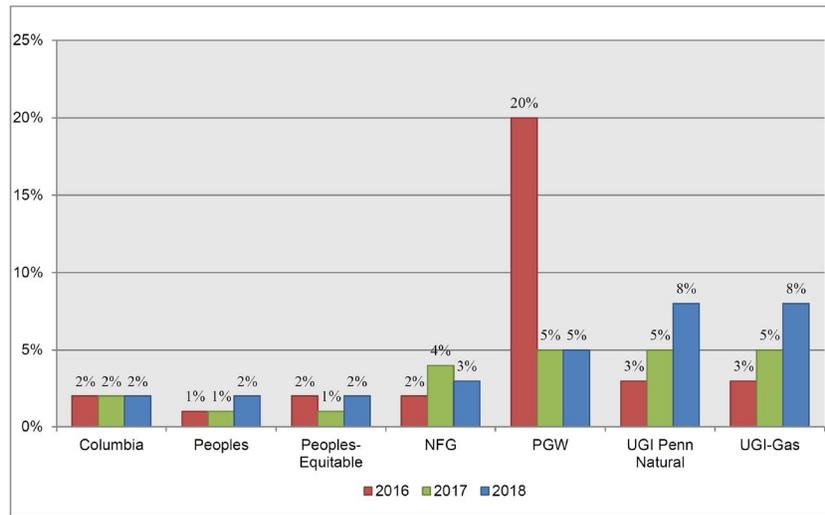
There are stories in the numbers that Colton does not fully catch. For example, as shown in the graph for 2013-2015 (Figure 2), PGW’s call abandonment rate was 9% in 2013, increased to 13% in 2014 and dropped back to 9% in 2015. Then, as shown in the graph for 2016-2018, the PGW’s call abandonment rate jumped to 20% in 2016 but dropped down to 5% for 2017 and 2018. As noted,



\*12-month average.  
 \*\* The 2015 statistics reflect six months of data (Jan. through June) for Peoples combined with six months of data for Peoples and Peoples-Equitable Division (Jul. through Dec.). See page 5 of this report for more information.  
 \*\*\*The 2015 statistics reflect only six months of data from Jan. through June. See page 5 of this report for more information.

Figure 6: Call Abandonment 2013-2015.

NGDCs Call Abandonment Rate\* 2016-18



\*12-month average.

Figure 7: Call Abandonment 2016-2018.

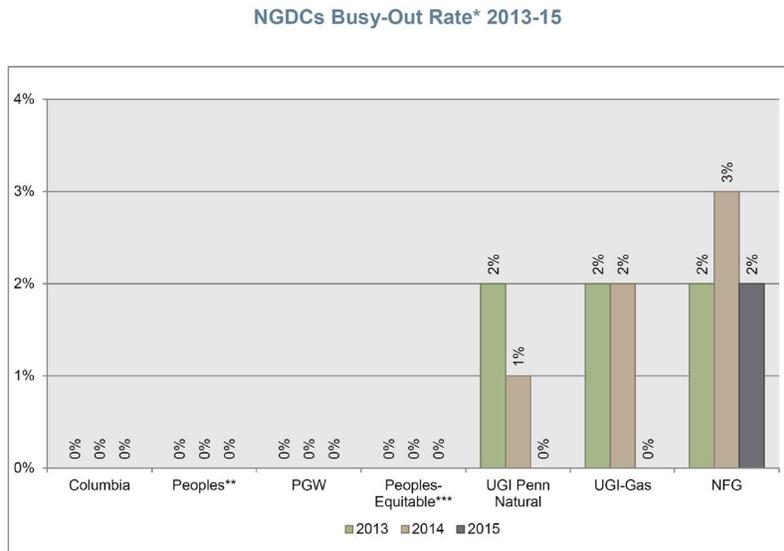
in the BCS Reports, there was a staffing problem in the PGW call center in 2014 and in 2016 the PGW phone system was being changed out. In the graphical presentation we can see a staffing problem emerging and being successfully addressed by management from 2013 through 2015 and a system changeout effect in 2016 that was successfully addressed as shown by performance going forward in 2017 and 2018.

Viewed from an organizational analysis or management study perspective, this pattern indicates active management identifying and successfully addressing problems encountered in practice. In a large-scale organization it can take a year, sometimes longer, to fix a problem once detected. Problems of staffing of particular units in large-scale organizations and problems with the changeout of physical equipment necessary to maintain service are normal problems that will recur repeatedly over the years. The pattern in the data shows the normal pattern in large-scale organizations of problems being identified and successfully addressed by management.

As already suggested, there is an additional loss of information in the format Colton selected to present results on this metric. Level of understanding of the data is increased meaningfully by including the dimension of range of results as is done in the BCS Reports. If

we look at the graph for 2016-2018, the 20% call abandonment rate for PGW in 2016 presents a meaningful difference from results for PGW from other years. The range of difference from 20% to 1% for 2016-2018 for all companies shows exactly the value of an indicator to flag a problem. However, if we examine other results in the graph, and focus on the range of results from 1% to 5% we can see a very different situation in that the range is very small. Reversing the scale to assess the success rate (calls not abandoned), this is a success rate of 95% to 99%. Viewed as a success rate, these differences are very small and are essentially in the same ballpark or cluster. A range of 95% to 99% is not a performance problem.

- (2) **Busy-Out Rate.** The busy-out rate is the rate at which calls are abandoned because the line is busy. Colton chose not to include the busy-out rate in direct testimony. The two graphs that follow show busy out rate for 2013-2018. The range of results is 0% to 5%. PGW’s results on this metric range from 0% to 3%, or a success rate of 97% to 100%. There is no performance problem here.



\*12-month average. If the 12-month average is less than 1 percent, it is shown on the chart as 0 percent.  
 \*\* The 2015 statistics reflect six months of data (Jan. through June) for Peoples combined with six months of data for Peoples and Peoples-Equitable Division (Jul. through Dec.). See page 5 of this report for more information.  
 \*\*\*The 2015 statistics reflect only six months of data from Jan. through June. See page 5 of this report for more information.

Figure 8: Busy-Out 2013-2015.

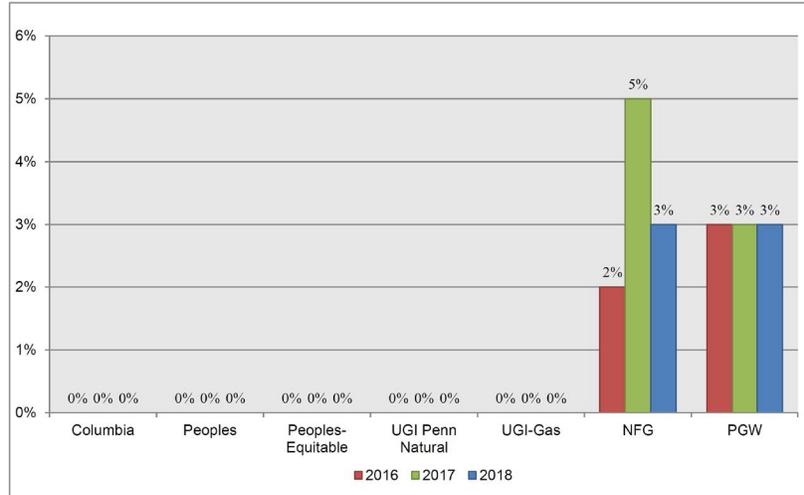
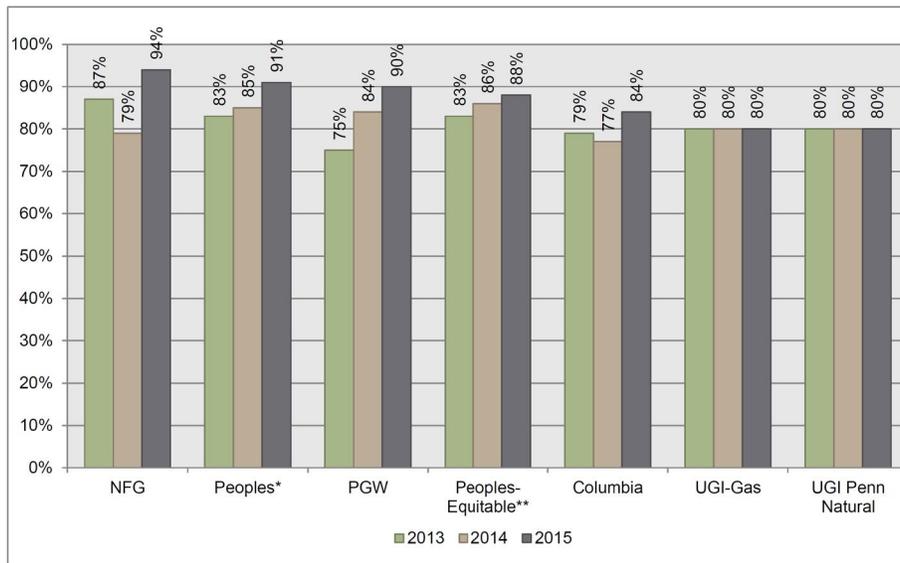


Figure 9: Busy-Out 2016-2018.

- (3) **Percent of calls answered within 30 seconds.** This metric is the rate at which calls are meaningfully engaged within 30 seconds. Colton chose not to include the metric. The two graphs that follow show results for 2013-2018 from the BCS Reports. Here, BCS orients the scale to report success rates. The range of results is from 74% to 94%. PGW's results on this metric range from 74% for 2016 (the year of the phone system changeout) to 91% in 2018. With the BCS graphs as context for assessment, PGW had the highest NDGC success rates on this metric for 2017 and 2018. Again, all NGDCs are performing well.

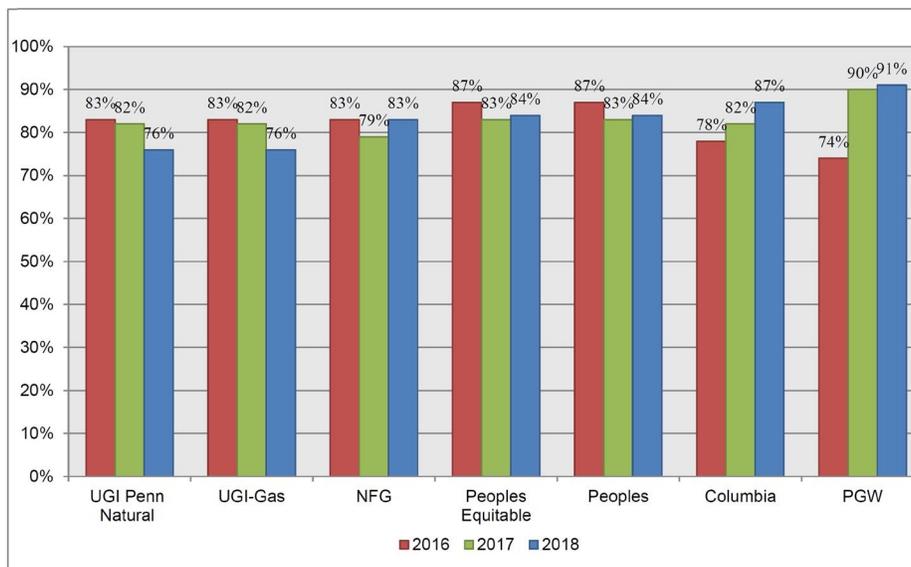
**NGDCs Percent of Calls Answered Within 30 Seconds\* 2013-15**



\*12-month average.  
 \*\* The 2015 statistics reflect six months of data (Jan. through June) for Peoples combined with six months of data for Peoples and Peoples-Equitable Division (Jul. through Dec.). See page 5 of this report for more information.  
 \*\*\*The 2015 statistics reflect only six months of data from Jan. through June. See page 5 of this report for more information.

Figure 10: Thirty Seconds 2013-2015.

**NGDCs Percent of Calls Answered Within 30 Seconds\* 2016-18**



\*12-month average.

Figure 11: 30 Seconds 2016-2018.

- (4) **Number and Percent of NGDC Residential Bills Not Rendered Once Every Billing Period.** Colton chose not to include the metric. The two graphs that follow show results for 2013-2018 from the BCS Reports. On this metric, all NGDCs are showing what has to be characterized as excellent performance.

**Number and Percent\* of NGDC Residential Bills Not Rendered Once Every Billing Period**

Company	2013		2014		2015	
	Number	Percent	Number	Percent	Number	Percent
Columbia	0	0%	0	0%	0	0%
NFG	2	.00%	2	.00%	1	.00%
Peoples-Equitable	2	.00%	1	.00%	0	0%
Peoples	1	.00%	0	.00%	0	0%
PGW	14	.00%	39	.01%	16	.00%
UGI-Gas	8	.00%	7	.00%	10	.00%
UGI Penn Natural	1	.00%	2	.00%	4	.00%

\*12-month average.

*Figure 12: Residential Bills Not Rendered.*

**Number and Percent\* of NGDC Residential Bills Not Rendered Once Every Billing Period**

Company	2016		2017		2018	
	Number	Percent	Number	Percent	Number	Percent
Columbia	0	0%	0	0%	0	0%
NFG	15	.01%	12	.01%	2	.00%
Peoples-Equitable	0	0%	0	0%	0	0%
Peoples	0	0%	0	0%	0	0%
PGW	76	.01%	21	.00%	45	.01%
UGI-Gas	5	.00%	1588	.5%	123	.04%
UGI Penn Natural	4	.00%	171	.14%	84	.06%

\*12-month average.

*Figure 13: Residential Bills Not Rendered.*

- (5) **Number and Percent of Bills to Small Business Customers Not Rendered Once Every Billing Period.** Colton chose not to include this metric. The two graphs that follow show results for 2013-2018 from the BCS Reports. On this metric, PGW and all of natural gas distribution companies show excellent performance.

**Number and Percent\* of NGDC Bills to Small-Business Customers Not Rendered Once Every Billing Period**

Company	2013		2014		2015	
	Number	Percent	Number	Percent	Number	Percent
Columbia	0	0%	0	0%	0	0%
NFG	0	.00%	0	.00%	0	.00%
Peoples -Equitable	0	.00%	0	.00%	0	0%
Peoples	0	0%	0	.00%	0	0%
PGW	1	.01%	0	.00%	1	.01%
UGI-Gas	4	.01%	3	.02%	4	.01%
UGI Penn Natural	1	.01%	3	.02%	3	.02%

\*12-month average.

Figure 14: Commercial Bills Not Rendered.

**Number and Percent\* of NGDC Bills to Small-Business Customers Not Rendered Once Every Billing Period**

Company	2016		2017		2018	
	Number	Percent	Number	Percent	Number	Percent
Columbia	0	0%	0	0%	0	0%
NFG	1	.01%	1	.01%	0	0%
Peoples -Equitable	0	0%	0	0%	0	0%
Peoples	0	0%	0	0%	0	0%
PGW	1	.01%	1	.01%	1	.00%
UGI-Gas	4	.01%	818	2%	27	.07%
UGI Penn Natural	3	.02%	88	.67%	12	.08%

\*12-month average.

Figure 15: Commercial Bills Not Rendered.



- (6) **Number and Percent of NGDC Residential Meters Not Read by Company or Customer in Six Months.** Colton chose not to include this metric. The two graphs that follow show results for 2013-2018 from the BCS Reports. On this metric, PGW and all of natural gas distribution companies show excellent performance.

**Number and Percent\* of NGDC Residential Meters Not Read by Company or Customer in Six Months**

Company	2013		2014		2015	
	Number	Percent	Number	Percent	Number	Percent
Columbia	10	.00%	10	.00%	4	.00%
NFG	472	.24%	507	.26%	599	.31%
Peoples-Equitable	0	.00%	0	0%	0	0%
Peoples	431	.15%	420	.12%	498	.13%
PECO (Gas)	7	.00%	49	.01%	144	.03%
PGW	123	.03%	300	.06%	140	.03%
UGI-Gas	41	.01%	49	.02%	54	.02%
UGI Penn Natural	20	.01%	26	.02%	15	.01%

\*12-month average.

Figure 16: Residential Meters Not Read - Six Months.

**Number and Percent\* of NGDC Residential Meters Not Read by Company or Customer in Six Months**

Company	2016		2017		2018	
	Number	Percent	Number	Percent	Number	Percent
Columbia	1	.00%	3	.00%	3	.00%
NFG	**	**	941	.6%	1200	.8%
Peoples-Equitable	0	0%	0	0%	0	.0%
Peoples	518	.16%	671	.19%	423	.1%
PECO (Gas)	82	.02%	16	.00%	6	.00%
PGW	67	.01%	57	.01%	62	.00%
UGI-Gas	53	.02%	62	.02%	90	.03%
UGI Penn Natural	21	.01%	26	.02%	35	.02%

\*12-month average.

\*\*Waiver requested due to the company's inability to provide the requested data. (Docket No. P-2017-2584586)

Figure 17: Residential Meters Not Read - Six Months.

- (7) **Number and Percent of NGDC Residential Meters Not Read by Company or Customer in Twelve Months.** Colton chose not to include this metric. The two graphs that follow show results for 2013-2018 from the BCS Reports. On this metric, PGW and all of the natural gas distribution companies show excellent performance.

Number and Percent\* of EDC Residential Meters Not Read in 12 Months

Company	2013		2014		2015	
	Number	Percent	Number	Percent	Number	Percent
Duquesne	0	0%	0	0%	3	.00%
Met-Ed	11	.00%	139	.03%	23	.01%
Penelec	3	.00%	3	.00%	2	.00%
Penn Power	1	.00%	7	.01%	5	.00%
PPL	8	.00%	6	.00%	22	.00%
PECO	0	0%	0	.00%	15	.00%
UGI-Electric	2	.00%	2	.00%	1	.00%
West Penn	33	.01%	52	.01%	23	.00%

\*12-month average.

Figure 18: Residential Meters Not Read - Twelve Months.

Number and Percent\* of EDC Residential Meters Not Read in 12 Months

Company	2016		2017		2018	
	Number	Percent	Number	Percent	Number	Percent
Duquesne	72	.01%	42	.01%	10	.00%
Met-Ed	1	0%	0	0%	1	.00%
Penelec	0	0%	0	0%	0	0%
Penn Power	0	0%	0	0%	0	0%
PPL	6	0%	6	.00%	35	.00%
PECO	15	0%	14	.00%	1	.00%
UGI-Electric	0	0%	0	0%	1	.00%
West Penn	6	.00%	1	.00%	0	0%

\*12-month average.

Figure 19: Residential Meters Not Read - Twelve Months.

- (8) **Number of Residential Disputes that did not receive a response within 30 Days.** Colton chose not to include this metric. The two graphs that follow show results for 2013-2018 from the BCS Reports. This indicator is not normalized to a base of number of residential disputes, so it is not analyzed here.

**Number of NGDC Residential Disputes That Did Not Receive a Response Within 30 Days**

Company	2013	2014	2015
Columbia	3	0	1
NFG	0	5	10
Peoples-Equitable	0	0	0
Peoples	0	0	0
PGW	0	2	0
UGI-Gas	0	0	0
UGI Penn Natural	0	0	0

*Figure 20: Residential Disputes - No Response 30 Days.*

**Number of NGDC Residential Disputes That Did Not Receive a Response Within 30 Days**

Company	2016	2017	2018
Columbia	0	0	2
NFG	*	1	7
Peoples-Equitable	0	0	0
Peoples	0	0	0
PGW	0	0	61
UGI-Gas	0	141	298
UGI Penn Natural	0	66	138

\*Waiver requested due to the company's inability to provide the requested data. (Docket No. P-2017-2584586)

*Figure 21: Residential Disputes - No Response 30 Days.*

### **Satisfaction and similar rating scales.**

The annual BCS performance reports (BCS Reports) include a set of rating scales to be administered to random samples of customers from each utility by means of monthly surveys. The type of questions asked by the survey firm are of the following type: "On a scale of 1-10, where 1 is very dissatisfied and 10 is very satisfied, how satisfied were you with the ease of reaching the NGDC?" For reporting results on these scales, BCS combines "very satisfied" and "somewhat satisfied" to indicate satisfaction.

### **Additional Performance Indicators Not Analyzed**

PGW performance metrics that Colton chose to not analyze are also not analyzed here. We note that PGW's score on Field Representative's Courtesy for 2018 was the top-ranking score of 100% (last row of Figure 22). However, the ranking approach loses too much information to be useful. With a design precision of plus or minus five percent, all of the 2014-2018 NGDC scores were with a ten percent range with complete overlap, small range, and high-end performance.

### **Additional Performance Indicators Analyzed**

For these six indicators (Figure 23) Colton carries out analysis differently from the analysis in the BCS Reports. Colton uses the data from the BCS Reports but, without clearly calling attention to the change he develops results that understate performance on the indicators.

For reporting results on these scales, BCS combines "very satisfied" and "somewhat satisfied" to indicate satisfaction. Colton, in contrast, selects only responses for "very satisfied" to indicate satisfaction. This truncated classification is unusual for a satisfaction scale. Usually, studies combine all responses on the positive side of a satisfaction scale to report satisfaction. In some studies, then a secondary table is presented for responses of "very satisfied".

BCS Reports on positive performance following the pattern generally used in analysis by academics and professional survey companies for performance studies. Colton classifies responses in an unusual way that forces the apparent performance he reports downward by fourteen to thirty-six percent, as shown in the third row for each indicator in Figure 23).

<b>PGW Performance on Scales in BCS Reports (Scales Missed by Colton)</b>					
<b>Performance Metric</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<b>9</b>	<b>Overall Satisfaction with Quality of Contact with NGDC</b>				
	<b>79</b>	<b>86</b>	<b>87</b>	<b>89</b>	<b>89</b>
<b>10</b>	<b>Overall Satisfaction with Contact (Credit &amp; Collection)</b>				
	<b>78</b>	<b>86</b>	<b>91</b>	<b>90</b>	<b>94</b>
<b>11</b>	<b>Overall Satisfaction with Contact (Other)</b>				
	<b>80</b>	<b>86</b>	<b>86</b>	<b>89</b>	<b>88</b>
<b>12</b>	<b>Ease of Using Automated Telephone System</b>				
	<b>79</b>	<b>77</b>	<b>83</b>	<b>83</b>	<b>84</b>
<b>13</b>	<b>Satisfaction with Choices on Automated Phone System</b>				
	<b>76</b>	<b>75</b>	<b>80</b>	<b>82</b>	<b>86</b>
<b>14</b>	<b>Satisfaction with Wait to Speak to Representative</b>				
	<b>71</b>	<b>81</b>	<b>76</b>	<b>84</b>	<b>83</b>
<b>15</b>	<b>Overall Satisfaction with way Premise Visit Handled</b>				
	<b>93</b>	<b>94</b>	<b>95</b>	<b>97</b>	<b>90</b>
<b>16</b>	<b>Satisfaction that Work Completed Promptly</b>				
	<b>80</b>	<b>76</b>	<b>89</b>	<b>88</b>	<b>90</b>
<b>17</b>	<b>Field Rep's Courtesy</b>				
	<b>90</b>	<b>93</b>	<b>95</b>	<b>97</b>	<b>100</b>

*Figure 22: Additional Performance Indicators Not Analyzed.*

<b>PGW Performance (BCS Reports compared with Colton Direct)</b>						
		<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
1		<b>Satisfaction with Ease of Reaching the Company</b>				
	<b>BCS Report</b>	75	82	80	86	88
	<b>Colton</b>	48	61	57	67	68
	<b>% Missed</b>	36%	26%	29%	22%	23%
2		<b>Satisfaction with Using NGDC's Automated Phone System</b>				
	<b>BCS Report</b>	77	77	82	83	85
	<b>Colton</b>	52	51	60	60	59
	<b>% Missed</b>	32%	34%	27%	28%	31%
3		<b>Satisfaction with NGDC Representative's Handling of Contact</b>				
	<b>BCS Report</b>	82	87	92	92	91
	<b>Colton</b>	66	74	78	79	79
	<b>% Missed</b>	20%	15%	15%	14%	13%
4		<b>Call Center Representative's Courtesy</b>				
	<b>BCS Report</b>	88	92	93	93	93
	<b>Colton</b>	70	81	81	81	81
	<b>% Missed</b>	20%	12%	13%	13%	13%
5		<b>Call Center Representative's Knowledge</b>				
	<b>BCS Report</b>	87	91	94	92	92
	<b>Colton</b>	71	78	79	79	79
	<b>% Missed</b>	18%	14%	16%	14%	14%
6		<b>Overall Satisfaction with Contact (Combined)</b>				
	<b>BCS Report</b>	79	86	91	89	89
	<b>Colton</b>	60	72	70	70	70
	<b>% Missed</b>	24%	16%	23%	21%	21%

*Figure 23: Additional Performance Indicators Analyzed.*

## **Conclusions**

Analyzing service quality performance for PGW, we find solid performance on the indicators plus good management response when a problem arises, as problems will over the years in every ongoing large-scale organization. We also note that according to the indicators in the BCS Reports, the general performance on the indicators is positive performance, with the companies typically clustering together with success rates with narrow range results at the high end of the percentage scales.

The 2018 BCS Report says, “[t]he survey results show that, for the most part, customers are satisfied with the service they receive from their companies. Nevertheless, the company-reported performance data indicates there is room for improvement on the part of Pennsylvania’s major electric and gas companies.”<sup>7</sup> These are appropriate conclusions based on the data in the BCS Reports. Of course, it is in the nature of performance indicators that there is always room for improvement and over the years there will be problems in some areas of all large-scale organizations and there will also be management response. Both of these factors are evident and normal in the BCS presentation. We find the same kind of results in the current analysis.

Colton’s analysis, in contrast, is weak and less adequate. We have demonstrated five ways in which Colton’s analysis is less appropriate than the analysis conducted by BCS and less appropriate than the analysis conducted here.

Accordingly, these solidly positive performance results for PGW, and for the NDGCs are one factor that should be considered in determining just and reasonable rates, in accordance with the Commission’s Policy Statement (Section 2703(a)(7)).

H. Gil Peach, Ph.D.

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<sup>7</sup> PUC Report for 2018, Page 30, ¶13.

EXHIBIT  
HGP-3



# Assessing the Impact of the COVID-19 Pandemic on PGW Collections Rate

JULY 10, 2020

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At the time of this writing the impact of COVID-19 on the health and livelihoods of Americans have yet to be fully experienced, let alone understood. What is fundamentally a health and medical related crisis is also having profound impacts on the financial wellbeing of millions of Americans. One measure of the COVID crisis can be seen in record high levels of weekly claims for unemployment and unemployment rates not seen since the great depression.<sup>1</sup> While there is a great deal of uncertainty around the trajectory of the virus and the economy, there is wide spread agreement that the economic fallout is turning out to be the most significant economic downturn since the 1930s. Energy utilities will be impacted in many ways, including the collection rate on billed revenue as a certain percentage of their customer base is unable to fully pay their utility bills.

The purpose of our analysis is to estimate the impact of the COVID-19 pandemic on PGW collections rate on billed revenue during the 2021 fiscal year. We approached this objective as basically one of empirically estimating the relationship between economic factors and PGW collections rate and then using that relationship to simulate the collections rate at differing levels of economic factors. This involved the following steps:

1. Collect historical data from PGW and secondary sources.
2. Visually and statistically examine relationships between variables
3. Develop model to explain monthly collections rate
4. Use coefficients from final model to simulate collections rate under different scenarios

Data sources are first discussed followed by model and simulation results.

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<sup>1</sup> The National Bureau of Economic Research estimates that the monthly unemployment rate peaked at 25.6% during the Great Depression. Since then the unemployment rate has exceeded 10% only two other times in history, in 1982 and 2009. In April 2020 the Bureau of Labor Statistics reported the U.S. unemployment rate to be 14.7%. It has since declined to 11.1% in June.

# PGW Data

We received data from PGW on monthly billings and receipts from March 2008 through April 2020 which allowed us to calculate the monthly collections rate for modeling. Other information including the cost of natural gas in rates was received and tested in various models. PGW collections rate history was sufficiently long for developing monthly models and included most of the "Great Recession" (December 2007 through June 2009) and the subsequent prolonged period of economic expansion.

The chart below shows historical monthly billings and receipts. Some important patterns are visible in the data. First of all, there is the expected season pattern with bills and receipts higher in the cold winter months and lower in the summer. A lag between the timing of billings and receipts can also be seen with receipts trailing billings by a month or two. This is also expected given the time it takes a customer to pay a PGW bill once it has been issued and delivered to the customer.

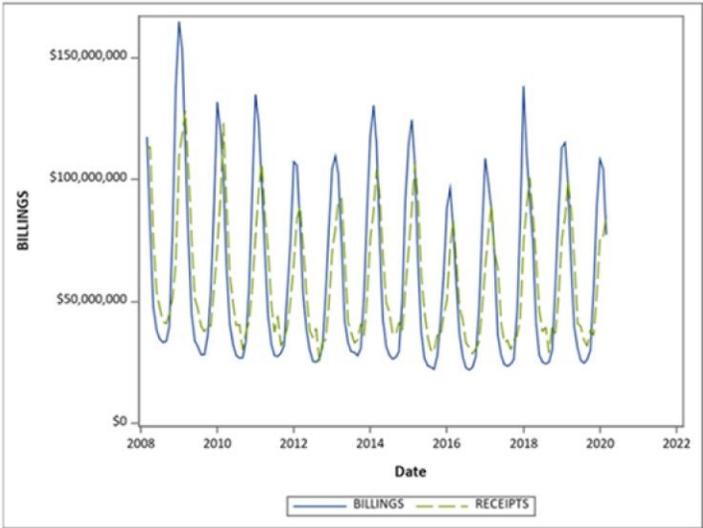


Figure 1: Monthly PGW Billings and Receipts.

Another pattern clear from the monthly data on billings and receipts is that annual range in winter highs and summer lows of billings is consistently and noticeably larger than the range in highs and lows of receipts. Receipts are always lower than billings in the winter and higher than billings in the summer. This pattern is due to PGWs' convention of calculating billings based on metered usage at prevailing

rates regardless of payment plans. Customers on budget billing, for example, pay an equal amount each month and that constant amount is reflected in PGW receipts. Billings for budget billing customers are not based on the constant amount the customer is asked to pay. Instead billings are based on actual usage at prevailing rates for the billing period.

Because the collection rate is simply receipts divided by billings, the patterns described above lead to large seasonal swings in the PGW collections rate. The magnitude of seasonality in monthly collection rates can be seen in the chart below, with much lower values in the winter and higher values in the summer.

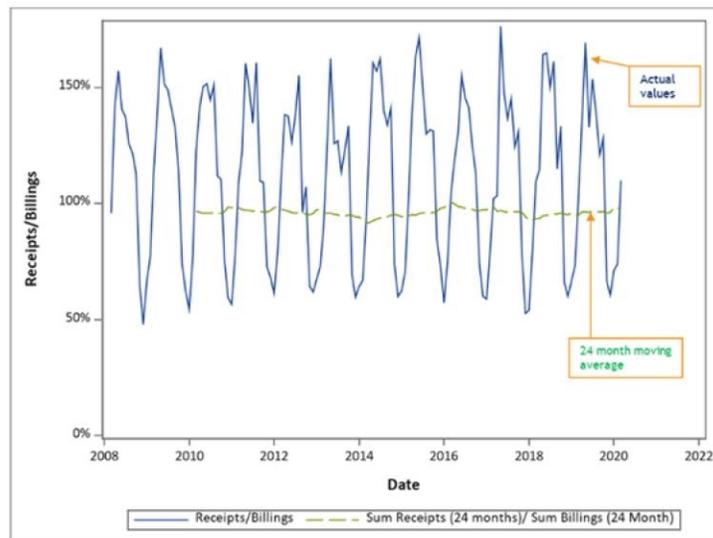


Figure 2: PGW Collections Rate.

This seasonality must be accounted for in a monthly model of the collections rate. A 24-month moving average calculation of the collections rate ( $\frac{\sum \text{Receipts (last 24 months)}}{\sum \text{Billings (last 24 months)}}$ ) is also shown in the chart and provides a stable estimate of the collections rate in recent history (last two years). For modeling purposes, we will develop our monthly model using the individual monthly values of collections rate and attempt to model the seasonality.

# Economic Data

In order to model the impacts of economic activity on PGW collection rates it was necessary to obtain data from secondary sources. Ideally these data are consistently available as monthly time series for at least as far back as PGW collections rate data and correspond geographically to the PGW service territory. The PGW service territory is defined by the boundary for the City of Philadelphia which is the same boundary as Philadelphia County. There are many county level series available including employment and the unemployment rate for Philadelphia City/County. Additional data is available for larger area of aggregation such as metropolitan statistical areas (MSA). Philadelphia City/County is a sub-area to the Philadelphia, PA Metropolitan Statistical Area Division (MSAD) which is a sub-area of the Philadelphia-Camden-Wilmington Metropolitan Statistical Area (MSA). These boundaries are shown in the map below.

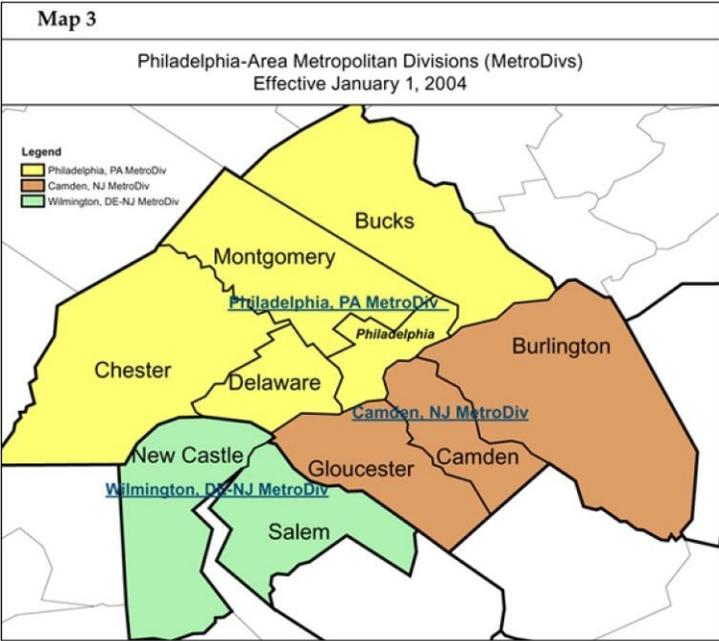


Figure 3: Statistical Boundaries of Philadelphia Area

Source: [https://www.philadelphiafed.org/community-development/publications/cascade/54/01\\_omb-statistical-definitions](https://www.philadelphiafed.org/community-development/publications/cascade/54/01_omb-statistical-definitions)

The three MSA divisions that together define the Philadelphia-Camden-Wilmington MSA are shown in the map along with the counties that comprise each of the MSA Divisions.

Based on Census data by Tract shown in Figure 2, median household income (MHI) varies widely across the Philadelphia-Camden-Wilmington MSA. Philadelphia City/County has a much higher proportion of census tracts on the lower end of the MHI range compared to other counties.

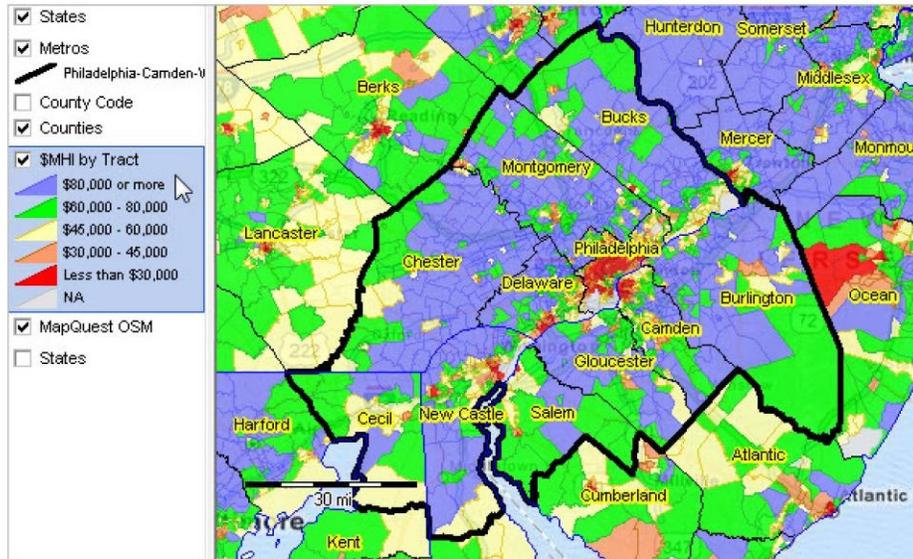


Figure 4: Median household income by census tract in the Philadelphia-Camden-Wilmington MSA  
 Source: <http://proximityone.com/metros/2013/cbsa37980.htm>

This means care must be used when describing or statistically modeling behavior of households in Philadelphia by using data series for the City/County as much as practical. However, many economic series will not be available at the City/County level yet are still thought to be important and correlated with Philadelphia conditions. We test these series and use them when logic, statistical results and our experience indicate that doing so improves our understanding of PGW collections and the larger environment confronting PGW customers.

Data series were obtained for testing from several sources including:

- Bureau of Labor Statistics (unemployment and labor market for county and, MSAD and MSA)
- U.S. Census (Population, households, various other descriptive statistics)
- SEPTA (City of Philadelphia public transit ridership)

- Federal Reserve Bank of Philadelphia (Business conditions survey, summarized data sets with employment, housing starts and CPI at various geographic levels)
- NOAA (weather data)

Various transformations of data series were also developed for testing. For example, moving averages of the unemployment rate at various lengths (e.g. 2-month, 4-month, 6-month etc.) were calculated and tested in model development

## Model Results

The collections rate calculation used as the dependent variable in our model is actual receipts divided by billings from one month prior. A one-month lag of billings was found to provide the best monthly alignment with receipts from others tested. Several combinations of independent variables were tested using both judgmental and automatic variable selection processes. Based on the statistical results and our judgement as to a theoretically sound model, the best results were obtained with a model relating the monthly collections rate to:

- Philadelphia City/County unemployment rate (expressed as a six-month moving average)
- Monthly receipts of LIHEAP and CRISIS grants
- Heating degree days (seasonality, expressed both as a 2-month moving average and a 4-month moving total)

The model is statistically significant and theoretically sound in that higher (lower) unemployment is significantly related to lower (higher) PGW collections rate. The model explains over 80% of the variation and passes standard diagnostic tests.

Estimated econometric equation:

$$\text{Collections Rate} = \beta_0 + \beta_1 \times \text{UR\_MA6} + \beta_2 \times \text{GrantDollars} + \beta_3 \times \text{HDD\_4MT} + \beta_4 \times \text{HDD\_2MA}$$

B values are found in the "Parameter Estimate" column in table below.



Table 1. PGW Collections Rate Model Parameter Estimates

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t	Variance Inflation
<b>Intercept</b>	Intercept	1	1.36953	0.03748	36.54	<.0001	0
<b>UR_MA6</b>	Unemployment rate, Philadelphia City (6 month avg)	1	-0.00894	0.00423	-2.11	0.0365	1.02891
<b>GrantDollars</b>	LIHEAP and CRISIS grant dollars received	1	2.487127E-8	4.960629E-9	5.01	<.0001	1.22504
<b>HDD_4MT</b>	HDD65, 4 month moving total	1	-0.00016186	0.00001398	-11.58	<.0001	3.62756
<b>HDD65_2MA</b>	HDD65, 2 month mov avg	1	-0.00011134	0.00004886	-2.28	0.0242	3.80293

Table 2. Model Diagnostics Tables

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
<b>Model</b>	4	6.24060	1.56015	148.55	<.0001
<b>Error</b>	139	1.45985	0.01050		
<b>Corrected Total</b>	143	7.70045			

<b>Root MSE</b>	0.10248	<b>R-Square</b>	0.8104
<b>Dependent Mean</b>	1.07370	<b>Adj R-Sq</b>	0.8050
<b>Coeff Var</b>	9.54469		

<b>Durbin-Watson D</b>	1.965
<b>Number of Observations</b>	144
<b>1st Order Autocorrelation</b>	0.017

## Simulated Collections Rate

The final model shown above was used to predict the average collections rate for the 2021 fiscal year (September 2020 through August 2021) at differing levels of the local unemployment rate. Results are shown in the chart below.

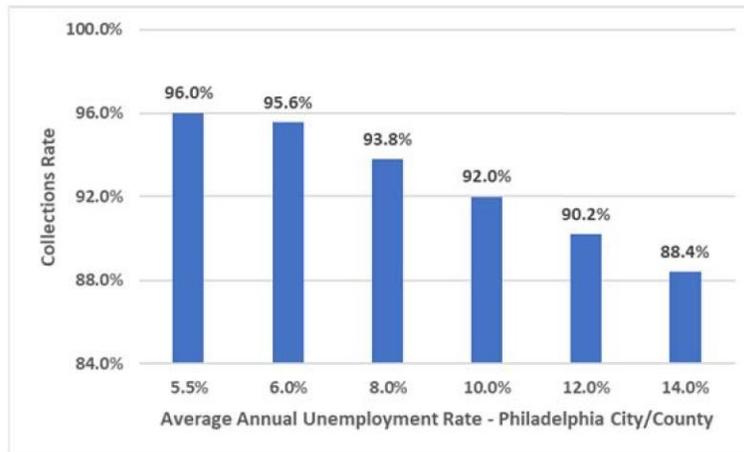


Figure 5: Model Predicted Collections Rate at Various Rates of Unemployment.

Figure 5 shows the collections rate that would result if the unemployment rate averaged at the level shown along the horizontal axis over the 2021 fiscal year.

Prior to pandemic the unemployment rate in Philadelphia averaged between 5.5% and 5.6% and the PGW collections rate stood at about 96%. This pre-pandemic state is shown by the first bar in Figure 5.

The Federal Reserve projects an increase in the U.S. unemployment rate between fourth quarter of 2020 (October-December 2020) and fourth quarter of 2021 (October-December 2021) of 4.35 percentage points over the unemployment rate projected for the same period in their December 2019 forecast. In other words, the Federal Reserve is expecting the prevailing U.S. unemployment rate over the period from fourth quarter 2020 to fourth quarter 2021 to be 4.35 percentage points higher as a result of the pandemic.

Applying the projected increase in the unemployment rate of 4.35% to the pre-pandemic unemployment rate in Philadelphia of 5.57% results in a projected average level of unemployment of 9.92% for the fourth quarter 2020 through fourth quarter 2021, rounded up to 10%.

Although the fourth quarter (October-December) reference used by the Federal Reserve does not perfectly align with the PGW Fiscal Year it is close. Centering the fourth quarter references on November, the unemployment impact is over the November 2020 to November 2021 period. PGWs' 2021 Fiscal Year is September 2020 through August 2021. Given the closeness of the two time periods and uncertainty around the exact timing and level of the unemployment forecast we have selected a 10% unemployment rate over the PGW 2021 fiscal year as the base case forecast. Given that forecast, we predict a PGW collections rate of 92% in the 2021 PGW fiscal year, all other things held constant.<sup>2</sup> This is a drop from the 96% collections rate experienced before the pandemic.

## **Bad Debt Expense**

In PGW Exhibit JFG-2, Statement of Income (Direct Testimony of Joseph F. Golden, PGW Statement No. 2), PGW expects \$33.1 million of bad debt at a collections rate of 96%. Our projected pandemic impacted collections rate of 92% over fiscal 2021 can be expressed as a doubling of the level of uncollected billings from 4% (at 96% collections rate) to 8% (at 92% collections rate). It stands to reason that doubling the uncollected billings from four percent to eight percent would also result in a doubling of the bad debt. The incremental bad debt due to a drop in the collection rate from 96% to 92% is estimated to be \$33.1 million for a total bad debt of \$66.2 million.

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<sup>2</sup> The *ceteris paribus* condition that all other conditions remain the same include things like government assistance programs. If sufficient financial aid is given to the unemployed, they will be more likely to pay their bills and the collections rate will not fall as much as it would otherwise.

EXHIBIT  
HGP-4

# PGW Commercial Sales Forecasting Model and Forecast

JULY 10, 2020

MARK E. THOMPSON AND H. GIL PEACH

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A monthly model was developed to explain and forecast the change in commercial volumetric sales expected in fiscal year 2021 (September 2020 through August 2021). Various weather and Philadelphia employment variables were tested as driver variables. Other variables such as the cost of natural gas and the unemployment rate in the City were also assessed for modeling PGW commercial sales.

Using monthly data from January 2006 through April 2020, a simple model was selected to explain commercial sales as a function of weather variables and total employment in Philadelphia. While simple, the model is statistically sound and explains 98% of the variation in monthly commercial sales. The analysis of variance table below show that the model is overall statistically significant.

*Table 1: Analysis of Variance*

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
<b>Model</b>	4	4.389675E13	1.097419E13	2759.94	<.0001
<b>Error</b>	167	6.640321E11	3976239973		
<b>Corrected Total</b>	171	4.456078E13			

Each of the variables in the model are shown in the table below along with various estimates associated with each variable.

*Table 2: Parameter Estimates*

Parameter Estimates							
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t	Variance Inflation
<b>Intercept</b>	Intercept	1	-484118	90442	-5.35	<.0001	0
<b>HDD65_2MA</b>	HDD65, 2 month moving avg	1	1583.86589	23.09087	68.59	<.0001	2.68015
<b>CDD65_2MA</b>	CDD65, 2 month moving avg	1	348.37540	51.50088	6.76	<.0001	2.64593
<b>Emp_Phil</b>	Philadelphia Employment	1	1.09667	0.14254	7.69	<.0001	1.00683
<b>Jan2018</b>	January 2018 Indicator (0/1)	1	390255	64117	6.09	<.0001	1.02787

All of the variables in the model are statistically significant. The model includes heating degree days (65 degree base) and cooling degree days (65 degree base), both expressed as an average of the current and prior month, the number of employed persons in Philadelphia city/county and an indicator variable for anomalous data in January 2018.<sup>1</sup> Expressing HDD and CDD as averages of current and prior month provides a better fit over just the current month degree days because of the dependent variable in the model, commercial sales, is based on meter reads over a calendar month. Usage from a meter read on February 15<sup>th</sup>, for example, is influenced by weather between the prior read (probably around January 15<sup>th</sup>) and February 15<sup>th</sup>. Colling degree days are included in the model because the variable is important in capturing variation in summer usage. This could be due to natural gas cooling applications in commercial buildings, natural gas fired customer generation of electricity or some other summer usage of natural gas.

## **Projecting Driver Variables**

To use the model to forecast commercial sales it is necessary to have projections of all of the variables used in the model. These are referred to as driver variables since they drive or determine the level of commercial sales in the forecast period. They are also often referred to as independent or exogenous variables.

Projections of HDD and CDD were obtained by using weather normal values of each, calculated as the average monthly values over the 30-year period, 1990 through 2019. Philadelphia city/county employment used in the model is from the Local Area Unemployment Statistics (LAUS) published by the Bureau of Labor Statistics.<sup>2</sup> LAUS include monthly estimates of the number of people in the labor force, the number employed, the number unemployed and the unemployment

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<sup>1</sup> A large residual (actual minus model estimated) occurred in January 2018 for all of the models tested. Using an indicator variable for the anomalous month effectively removes its influence from the model, thereby preventing possible bias of the parameter estimates for the other variables in the model. It may be possible to better understand the reason behind the unusually large commercial usage found for January 2018 with more research. That month was colder than normal but HDD do not explain the model residual.

<sup>2</sup> <https://www.bls.gov/data/>



rate. We developed monthly LAUS projections by projecting the labor force and unemployment rate and calculating the resulting numbers of people unemployed and employed. The number of people in the labor force was projected using an average of the prior 12 months incrementally increased by 0.1% each month. This rate of growth was selected based on a review of recent historical levels and growth.

Projections for the monthly unemployment rate were tied to the incremental changes in the U.S. unemployment rate forecast by the U.S. Federal Reserve Bank, applied to levels of the Philadelphia unemployment rate. While the end of year levels are tied to the Federal Reserve forecast in this manner, the monthly pattern (how we get there) was arbitrarily selected to reflect our best guess as to the nature of recovery. Monthly and annual average unemployment rates are shown in the table below.

Table 3: Philadelphia City/County Unemployment Rate (forecast begins June 2020)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
2019	5.7	5.2	5.2	4.5	5.2	5.7	6.3	6.4	5.6	5.8	5.6	5.4	5.6
2020	6.0	5.9	7.0	17.0	15.8	16.1	15.6	13.1	11.4	10.9	10.7	10.5	11.7
2021	10.3	10.1	9.9	9.7	9.5	9.3	9.1	8.9	8.7	8.5	8.4	8.3	9.2

The unemployment rate projection is a key determinant of Philadelphia employment used as a driver variable in the commercial sales model. Projections of the number of people employed are shown in the next table.

Table 4: Philadelphia City/County Employment (thousands, forecast begins June 2020)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
2019	676.0	680.0	679.3	681.9	677.2	675.7	678.0	676.9	685.3	691.1	692.5	690.2	682.0
2020	690.1	698.4	685.2	613.7	621.6	614.1	618.9	637.9	651.2	655.6	657.2	658.9	650.2
2021	660.9	662.5	663.6	665.1	666.4	667.7	669.5	671.2	672.9	674.5	675.4	676.2	668.8

# Forecast of Commercial Sales

The commercial sales forecast is shown in the table below by PGW fiscal year along with history and driver variables.

Table 5: Annual History and Forecast

Fiscal Year (Sep-Aug)	Annual Values (Forecast Begins May 2020)						Percent Change from Prior Year					
	Total Com Sales (Mcf)	Average Employed	HDD65	Normal HDD65	CDD65	Normal CDD65	Total Com Sales (Mcf)	Average Employed	HDD65	Normal HDD65	CDD65	Normal CDD65
2017	9,728,572	659,900	3,916	4,432	1,563	1,401						
2018	10,674,468	665,816	4,461	4,432	1,470	1,401	9.7%	0.9%	13.9%	0.0%	-5.9%	0.0%
2019	10,845,083	677,971	4,418	4,432	1,634	1,401	1.6%	1.8%	-1.0%	0.0%	11.1%	0.0%
2020	9,887,981	661,541	4,107	4,432	1,455	1,401	-8.8%	-2.4%	-7.0%	0.0%	-11.0%	0.0%
2021	10,416,644	662,486	4,432	4,432	1,401	1,401	5.3%	0.1%	7.9%	0.0%	-3.7%	0.0%

The 2020 fiscal year mixes history and forecast values with actual commercial sales used through April of 2020. Fiscal year 2020 is expected to finish down 8.8 percent from the prior year due to the economic impacts of the pandemic on employment and a warmer than normal winter. Commercial sales in fiscal year 2021 are projected to increase 5.3% from 2020. This is due primarily to a return to normal weather after a warmer than normal winter in fiscal year 2020 and a slight increase in average employment.

The largest monthly impact from the pandemic is expected to be experienced in the spring and summer of 2020. When fiscal 2021 begins in September of 2020, the unemployment rate is projected to be 11.4 percent, significantly higher than pre-pandemic levels but well off the peak unemployment rate of 17.0% in April of 2020. The economic climate as reflected by employment is expected to steadily improve throughout 2021.

The commercial sales model we developed can be used to assess the change in commercial sales due to lower employment during the pandemic. To do this we simply apply the model coefficient on the employment variable to the change in average monthly employment in 2021 due to the pandemic. Expected employment in 2021 is shown in the table immediately above.

Employment in 2021 had the pandemic not happened is estimated by adding the average growth in the number of people employed in the

last three years of history (fiscal year 2017 through 2019) to the forecast of employment in 2020 and 2021.

The resulting calculations show that projected PGW commercial sales in fiscal year 2021 are 3.7 percent lower due to economic conditions brought on by the pandemic. The change in employment of 30,354 people multiplied by the model coefficient on employment of 1.09667 results in an average monthly reduction in commercial sales of 33,289 Mcf. Multiplying by 12 yields the expected annual impact from the pandemic of a reduction in commercial sales of 399,466 Mcf. While this impact was developed for volumetric sales to commercial customers it is reasonable to expect a similar impact for industrial and municipal customers.

*Table 6: Employment and Commercial Sales Impact Due to Pandemic – 2021 Fiscal Year*

Without Pandemic Employment	692,840
With Pandemic Employment	662,486
Change in employment	-30,354
Avg monthly Mcf impact	-33,289
Annual Mcf impact	-399,466
Mcf w/o pandemic	10,816,111
Mcf with pandemic	10,416,644
- percent change due to pandemic	-3.7%

A comparison of forecasts of commercial sales during the 2021 fiscal is shown in the table below. The forecast developed from the model discussed in this paper is shown in the column labeled "Model" along with the Fully Projected Future Test Year (FPFTY) forecast.

*Table 7: Fiscal Year 2021 Forecasts of Volumetric Sales to Commercial Customers (MMcf)*

	<b>Model</b>	<b>FPFTY</b>
Commercial Sales Forecast	10,816	10,733
Modeled pandemic impact	-399.5	-399.5
Percent change	-3.7%	-3.7%

It should be noted that the "Model" forecast and the FPFTY forecast of volumetric sales are nearly identical with a Model to FPFTY ratio of 1.004. There is no meaningful or statistically significant difference between these two numbers. It is not surprising then that when the model predicted pandemic impact to commercial sales of -399.5 MMcf is expressed as a percentage of each forecast the same result of -3.7% is obtained for both forecasts. Because these forecasts for 2021 were developed independently and are essentially identical, our model and analysis lend support for the FPFTY forecast of commercial sales.