BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

VOLUME II

TESTIMONY AND EXHIBITS

ON BEHALF OF
PHILADELPHIA GAS WORKS

PHILADELPHIA GAS WORKS

R-2017-2586783

FEBRUARY 2017

Philadelphia Gas Works
2017 Base Rate Case

Docket No. R-2017-2586783

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BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

DIRECT TESTIMONY OF

GREGORY STUNDER

ON BEHALF OF
PHILADELPHIA GAS WORKS

Docket No. R-2017-2586783

Philadelphia Gas Works

General Rate Increase Request

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February 2017

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND CURRENT POSITION WITH PGW.

A. My name is Gregory Stunder. My position with PGW is Vice President, Regulatory and Legislative Affairs.

Q. PLEASE SUMMARIZE YOUR BACKGROUND AND EXPERIENCE.

A. I have been employed with PGW since 2001. I became Vice President, Regulatory and Legislative Affairs in January 2015. Prior to that, I was a Senior Attorney from 2003 to 2015 and a Staff Attorney from 2001 to 2003. I received my Juris Doctor (J.D.) from Temple University - James E. Beasley School of Law in 1995, and my Bachelor's Degree, Accounting, from La Salle University in 1985.

Q. HAVE YOU EVER PROVIDED TESTIMONY BEFORE THIS COMMISSION?

A. No.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I will provide the Commission with an overview of PGW's base rate filing and discuss the objectives that PGW seeks to accomplish in this proceeding. I will also introduce PGW's other witnesses who provide detailed testimony and supporting documentation for revenues, expenses and rate base items included in the fully projected future test year used in this base rate filing.

II. OVERVIEW OF REASONS FOR RATE FILING

Q. PLEASE DISCUSS THE RATE RELIEF THAT PGW IS REQUESTING.

A. PGW is requesting an increase in its annual base rate operating revenues of $70 million, or 11.6 percent on a total revenue basis, with a proposed effective date of April 28, 2017. Consistent with its mandatory budget process, the base rate increase requested in this

filing is based on a fully projected future test year starting on September 1, 2017 ("FPFTY").[1]

Q. ON WHAT BASIS IS PGW'S REQUESTED RATE RELIEF TO BE CONSIDERED?

A. PGW is a "City Natural Gas Distribution Operation" as that term is defined in the Public Utility Code.[2] As such, just and reasonable rates for PGW are determined using the Cash Flow Method. PGW has no shareholders and does not pay a dividend or a rate of return to its owner (instead it remits a fixed annual payment to the City of Philadelphia). Accordingly, all of the funds it needs to run the Company come from ratepayers or from borrowing (the costs of which then must be paid by ratepayers). Therefore, rather than having its revenue requirement determined on the basis of a fair rate of return on a used and useful rate base, PGW's rates are set by determining the appropriate levels of cash and other financial metrics necessary to enable PGW to pay its bills and maintain access to the capital markets at reasonable rates. The PUC issued a policy statement more fully setting forth these criteria and the financial and other considerations that are to be looked to in setting PGW's base rates at just and reasonable levels.[3]

Q. WHY HAS PGW MADE THIS FILING?

A. PGW's last base rate increase was filed in 2009 and settled in 2010 and, by the time that the PUC is expected to rule on this request, over seven years will have passed. In the

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1 The statutory definition of FPFTY, 66 Pa.C.S. § 315(e), would require that the FPFTY commence in November 2017 and continue for 12 months. So, simultaneously with the filing of general base case, PGW has filed a Petition requesting that the Commission waive the application of the statutory definition of fully projected future test year ("FPFTY") so as to permit PGW to use a FPFTY beginning on September 1, 2017 in this proceeding.

2 66 Pa.C.S. § 102 (definitions).

3 52 Pa. Code § 69.2702, 2703.

2008 period PGW was in financial crisis. The Commission's decision to award PGW a $60 million "extraordinary rate increase" in 2008 and to then subsequently make that emergency rate increase permanent (along with an additional $16 million to begin to fund PGW's OPEB obligation) stabilized the Company and put it on the path back to financial solvency. Since that time, PGW has improved its financial health and, in turn, this has given PGW the ability to concentrate on modernizing its distribution system, improving safety, increasing efficiency and trying to enhance customer service. However, after seven years, PGW needs additional revenues in order to address declining financial metrics and improve them to acceptable levels in order to continue its efforts on behalf of its customers.

Q. WHAT ARE THE KEY REASONS FOR THE NEED FOR ADDITIONAL REVENUES NOW?

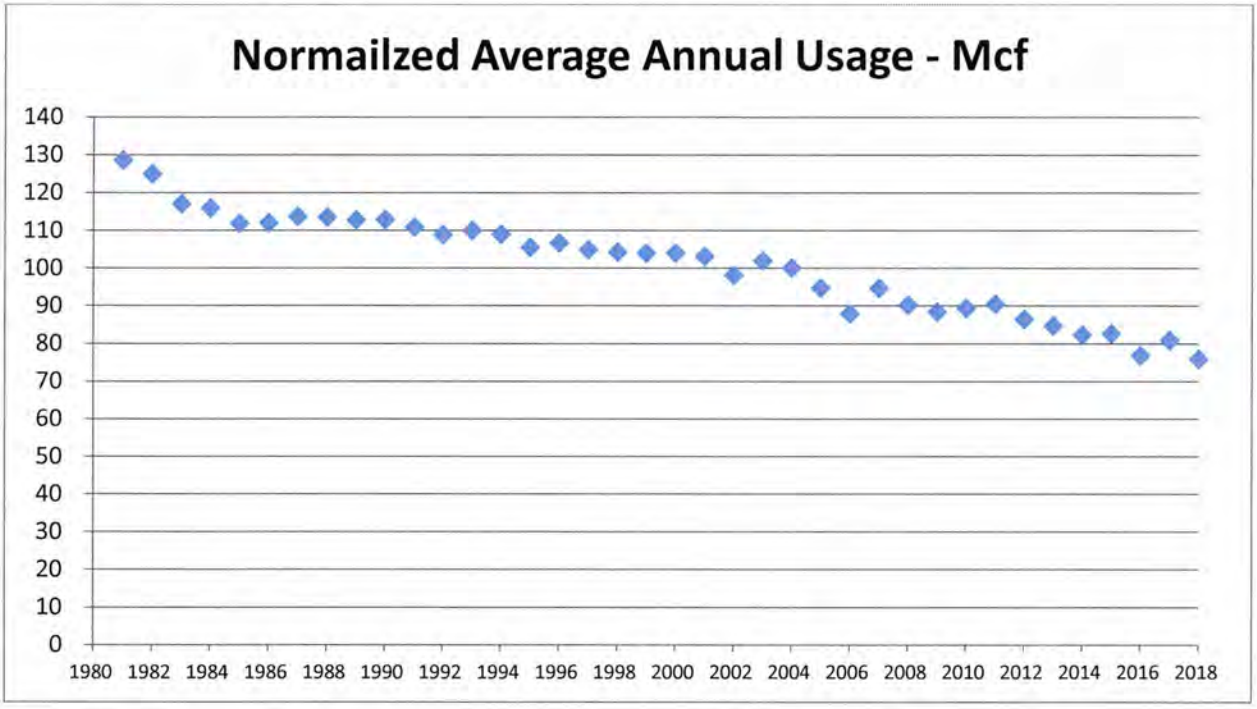
A. There are two key factors causing the need for additional revenues: increasing operational and capital costs and decreasing consumption. As PGW witness Golden explains in more detail, a combination of increasing costs over time and decreasing revenues caused chiefly by progressively warmer temperatures in PGW's service territory, resulting in less use of natural gas for heating, makes additional revenues imperative if PGW is going to avoid sliding back to a time before the Commission provided extraordinary rate relief.

Q. HOW HAVE INCREASED WARMING TRENDS AFFECTED PGW?

A. PGW is facing declining sales, which leads to not only declining revenues but also declining cash flow and bond coverages. Warmer weather is contributing to significant decreases in consumption. Fiscal Year (FY) 2016 reflected a 20.8% warmer than normal winter and 24.5% warmer than the prior year. In fact, since 2010, the average annual usage of PGW's residential heating customer has decreased by 15.38% from 91 Mcf (for

2010-2011) to 77 Mcf (for 2015-2016).[4] This decreased level of degree days represents a loss of about six Bcf of normal sales or roughly $36 million in lost margin.

And this trend has been long–term. As the graph below[5] shows, the average residential heating customer using 76 Mcf/year in 2017-2018 compared to 129 Mcf/year in 1980-1981.



This clear trend prompted PGW to utilize a ten year average of degree days in order to calculate normal weather for fully projected future test year purposes. Both PGW witnesses Dybalski and Hanser discuss this issue in their testimony.

Q. WHAT IS THE OTHER MAJOR REASON FOR PGW'S NEED FOR RATE RELIEF?

A. The second major reason for the requested rate relief is increased costs. PGW has not requested a base rate increase since 2009 because: it has maintained control of payroll

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4 *See* Exhibit KSD-1.

5 See Exhibit KSD-1.

costs through attrition with operational efficiencies; it has held operations and maintenance expense increases at levels lower than inflation; and it has maintained collection levels. Nonetheless, PGW has experienced a number of major cost increases that it could not continue to absorb. For example, even though PGW's average number of employees has decreased since 2010 from 1686 to 1650 projected for FY 2017-18, payroll costs have increased (e.g., payroll costs ranged from $106 million in 2010 to $113 million in 2016). PGW also engaged in a concerted effort to hold the line on operating expenses and was successful in limiting increases to 5% from 2010 to 2016, while the inflation rate over that same period was 10.4%. However, PGW's expenses could have been much higher if it had not taken several steps to reduce costs. PGW witness Moser explains many of the efforts that the Company undertook to hold down expenses. For example, PGW was able to save over $77 million by self-insuring its employee health care plan during FY 2012 to FY 2016. Projection of savings from self-insurance for the period FY 2017 and FY 2018 totals an additional $48.02 million for a total savings for the seven years of $125.4 million. It also reduced pension expense by incenting employees to move to a defined contribution pension plan and dramatically reduced the number of employees that will receive post-retirement health care benefits. Those and other changes will reduce PGW's OPEB responsibility by some $55 million.[6] In addition, PGW's interest expense on long term debt has decreased from the 2009/2010 base rate case when compared to the FPFTY (FY 2018) by $12.6 million ($61.8 million reduced to $49.2 million annually). The net effect of reduced revenues and increased expenses resulted in PGW's determination that it needed to increase rates in order to

[6] PGW St. 7, Exh. DAM-2.

maintain its efforts to manage costs and improve system performance while continuing to safely and reliably deliver natural gas to its customers.

III. OBJECTIVES

Q. PLEASE SUMMARIZE PGW'S MAJOR OBJECTIVES IN THIS PROCEEDING.

A. PGW seeks Commission approval to establish rate levels adequate to continue its efforts to modernize its system and to provide safe and adequate service by making its system safer and more efficient and improving customer service. To do this, PGW must be able to have the cash to pay its bills and provide for other obligations such as pensions and OPEBs and to achieve financial metrics that will enable it to maintain its present bond ratings and, if possible, improve its rating. As both PGW witnesses Hartman and Golden explain, an improved bond rating will reduce borrowing costs which, in turn will reduce costs that customers will have to bear over the life of PGW's 30-year bonds. An improved bond rating could also result in PGW considering additional system modernization steps, such as increasing the pace of cast iron main replacement. Further, approval of this request will demonstrate to the investment community that the Commission continues to support the need for intensified focus on pipeline safety matters as well as the need for reasonable and predictable earnings.

Q. DOES PGW HAVE ANY OTHER OBJECTIVES IN THIS PROCEEDING?

A. Yes, the Company is seeking several tariff changes. The Company seeks to add a Technology and Economic Development ("TED") Rider and a "Backup Service" rate. It also seeks to simplify its rate design by eliminating existing rate schedules that are no longer necessary or appropriate. It is also proposing that in the future, Interruptible

Transportation delivery rates be set on a negotiated basis, taking into account the customer's alternative cost of energy as well as the cost of firm transportation service.

IV. MANAGEMENT QUALITY, EFFICIENCY AND EFFECTIVENESS

Q. PLEASE SUMMARIZE THE COMPANY'S INITIATIVES AND ACTIVITIES RELATED TO MANAGEMENT AND PROVIDING QUALITY SERVICE TO CUSTOMERS.

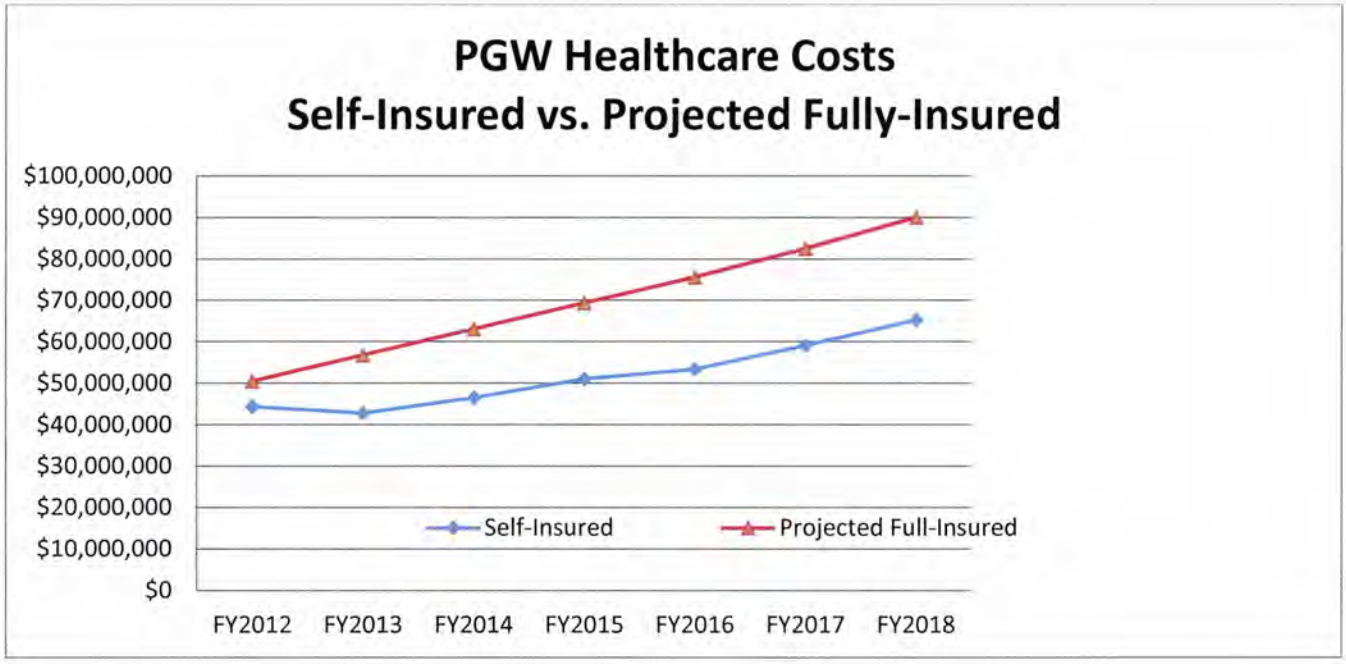
A. The Company has focused on a number of areas that demonstrate the quality and effectiveness of PGW's current management performance and its management's focus on safe, reliable, and outstanding service, as well as a strong commitment to growth – these are set forth below:

- PGW is committed to providing safe, reliable natural gas service to the City of Philadelphia. Since its last rate case, in order to assure safety and reliability, PGW has sought and obtained Commission approval for several actions that will allow for faster replacement of at-risk pipelines,[7] including the increase in the Distribution System Improvement Charge (DSIC) cap for infrastructure replacement purposes from 5% to 7.5%. PGW's efforts, as well as steps it has taken to enhance customer understanding and awareness of its accelerated main replacement program are explained by PGW witness Moser.

- PGW has enhanced its efforts to detect and appropriately respond to natural gas leaks on its system. As a result, PGW is seeing a reduction in the number of hazardous leaks. These efforts are explained in greater detail by PGW witness Moser.

[7] Docket Nos. P-2015-2501500; C-2015-2504092.

- As noted above, PGW has worked hard to manage costs and improve system performance while continuing its commitment to safely and reliably delivering natural gas to its customers. PGW witness Moser gives more details on the multi-faceted program undertaken to build efficiencies into its employee benefit programs. Some of the most significant include the implementation of a Health Care Cost self-insurance initiative. This one initiative alone will save the Company over $125 million through the Fully Projected Future Test Year. The following chart from Exhibit DAM-1 shows:



- Proposing to implement a new rider, the TED Rider, which would increase access and expand the use of natural gas by giving customers more options to obtain natural gas services, including combined heat and power ("CHP") projects, natural gas vehicles ("NGVs") and fuel cells.

- Proposing to implement a pilot Micro-Combined Heat and Power ("Micro-CHP") Incentive Program for small and medium sized properties to incent market development and market acceptance of small targeted fuel-switching projects to increase the ability of these customers to expand natural gas usage.

Q. HAS THE COMPANY UNDERTAKEN INITIATIVES TO ASSIST LOW INCOME CUSTOMERS TO AFFORD THEIR NATURAL GAS SERVICE?

A. The provision of services to low income customers starts with a robust "Customer Assistance Program" ("CAP") which PGW calls its "Customer Responsibility Program" ("CRP"). CRP is a Percentage of Income Payment Program (PIPP). The CRP provides discounts to CRP participants and establishes affordability limits at 8% (for households with income at or below 50% of Federal Poverty Level ("FPL"); 9% (for households with income between 51%-100% of FPL); and, 10% (for households with income between 101-150% of FPL).

PGW also provides the largest Low Income Usage Reduction Program ("LIURP") of any natural gas utility. Named CRP Home Comfort, the program seeks to provide cost-effective energy savings to low-income customers and make customers' homes more energy efficient, safe and comfortable.

Q. HAS THE COMPANY MADE OTHER EFFORTS TO MAKE THE COMPANY'S SERVICE MORE ECONOMIC FOR ITS CUSTOMERS?

Yes. EnergySense is the demand side management program voluntarily offered by the Company. It offers easy, affordable ways that residential and business customers can conserve energy and save money. Its CRP Home Comfort Program is the largest Low Income Usage Reduction Program ("LIURP") of any natural gas utility and provides cost effective energy savings to over 14,000 homes since its inception.

Q. WHAT STEPS HAS PGW TAKEN TO IMPROVE THE SERVICE IT PROVIDES TO ITS CUSTOMERS WITH RESPECT TO BILLING, COLLECTIONS AND INQUIRIES?

Q. PGW has worked hard to improve its billing, collection and inquiry interactions with its customers. In that regard, PGW has worked to provide better and more comprehensive training of customer service field and collection staff and also engaged in a replacement of its phone system. Some expected benefits of this replacement are improved reporting that will assist with coaching and analyzing call center performance and providing a more user friendly service representative interface. PGW has also upgraded its workforce planning software, which will assist PGW in more efficiently and effectively handling high call volume.

Q. PLEASE DISCUSS THE IMPACTS OF THE REQUESTED RATE RELIEF

A. PGW is requesting an increase in the delivery charge as well as the customer charge for most customer classes. For example, the Company is proposing a residential customer charge (under Rate GS) of $18.00 per month, as compared to the current charge of $12.00 per month to better reflect the direct customer costs per customer as calculated by PGW's cost of service witness, Mr. Hanser. Customer charge increases are also discussed in greater detail by PGW witness Dybalski.

The requested residential customer charge compares to the monthly charges of other NGDCs as follows:

Residential Customer Charge Comparison Residential Heating 15 MCF (monthly bill)		
NGDC	**Customer Charge**	**Notes**
PGW	$18.00 (P)	Current $12.00
Columbia	$16.75	Increased in December 2016; R-2016-252966
National Fuel Gas	$12.00	Last Increase: R-00061493 (2006)
PECO (Gas)	$11.75	Last Increase: R-2010-2161592
Peoples	$13.95	Last Increase: R-2012-2285985
Peoples - Equitable	$13.25	Last Increase: R-2008-2029325
Peoples TWP	$15.75	Last Increase: R-2013-2355886
UGI Central Penn	$14.60	Last Increase: R-2010-2214415
UGI Penn Natural Gas	$13.17	**$18.50 proposed** in January 2017; R-2016-2580030
UGI Utilities (Gas)	$11.75	Increased in October 2016; R-2015-2518438
Sources: NGDC Tariffs filed with the Commission and made available online by each NGDC; and Pennsylvania Public Utility Commission Rate Comparison Reports, which are available at: http://www.puc.pa.gov/filing_resources/rate_comparison_report.aspx		

The Company is also proposing increases to delivery charges. The increase for each customer class is discussed in greater detail by PGW witness Dybalski. I would like to highlight certain proposed increases in delivery charges from Table 3 of his testimony:

Delivery Charge			
Rate Class	**Current ($/MCF)**	**% Increase from Current**	**Proposed ($/MCF)***
Residential	6.0067	12.0%	6.7275
Commercial	4.5984	4.6%	4.8108
Industrial	4.5332	**-15.8%**	3.8170
PHA GS	4.9441	32.7%	6.5603
Municipal	3.3661	14.0%	3.8365
PHA (Rate 8)	4.1101	**-6.7%**	3.8365
* The proposed delivery charge ($/MCF) does not include the Merchant Function Charge ("MFC") and the Gas Procurement Charge ("GPC")			

In addition, I would note that the average impacts for the increased distribution rates are as follows:

- If PGW's base rate case is approved, the bill for a typical PGW residential heating customer who uses 76 Mcf per year will increase $10.59 per month from $94.06 to $104.65 per month or by 11.3%.

- The bill for a typical PGW commercial heating customer who uses 332 Mcf per year will increase $15.08 per month from $327.07 to $342.15 per month or by 4.6%.

- The bill for a typical PGW industrial customer who uses 717 Mcf year will decrease by $18.23 per month from $712.81 to $694.58 per month or by (2.6)%.

The following chart compares the total charge for an average residential heating customer if the rate increase is approved compared to the same charges in 2010 and 2014:

	GCR*	Total Rate	Notes
September 2010	$6.9050	$15.9847[1]	(Before DSIC)
June 2014	$6.5642	$15.6439[1]	
November 2017	$4.8152	$14.2389[2]	(Includes DSIC)
* Purchased Gas Cost Rate Data for PGW compiled by the Bureau of Investigation & Enforcement which is available at: http://www.puc.pa.gov/NaturalGas/pdf/PGC.pdf			
[1] GCR plus RC&E ($0.0259) plus Delivery Charge ($6.3863) plus OPEB (0.2997) plus USC ($2.3678)2			
[2] GCR plus MFC ($0.0228) plus GPC ($0.2165) plus Delivery Charge ($6.7322) plus OPEB ($0.3386) plus ECR ($0.0315) plus USC (1.3392) plus DSIC ($0.743)			

This shows that, even if the full $70 million is permitted by the PUC, the average residential customer will pay some 12% less on a total bill basis than they paid for the same amount of gas some seven years ago.

V. SUMMARY OF FILING

Q. PLEASE INDICATE WHO THE WITNESSES WILL BE FOR PGW IN THIS PROCEEDING AND THEIR RESPONSIBILITIES FOR THE FILING?

A. PGW's direct testimony is Volume II of the Filing. The witnesses and a summary of their testimony are as follows:

- Mr. Joseph F. Golden, Jr., (PGW Statement 2) is PGW's Executive Vice President and Acting Chief Financial Officer. Mr. Golden provides documentation and supporting methodology for the schedules and exhibits that are included in PGW's base rate filing. He describes PGW's financial results for the FPFTY (comprised of the period from September 1, 2017 through August 31, 2018). He also details and provides supporting justification for PGW's requested annual increase in existing base rate of $70 million.

- Mr. Daniel J. Hartman (PGW Statement 3) is a Managing Director and Partner with PFM Financial Advisors LLC ("PFM"). He is an expert on financial markets and financial instruments. Mr. Hartman testifies to the importance of obtaining the rate increase being sought, in order to maintain its bond ratings, access to the municipal capital markets at reasonable pricing, and to ensure there are not unforeseen impacts to PGW's capital structure. Specifically, his testimony focuses on the adverse financial consequences to PGW, which could be considerable and broadly based, if the Company does not receive full approval of its needed and requested rate increase.

- Mr. Frank C. Graves (PGW Statement 4) is a Principal with The Brattle Group. He is an expert on financial economics and specializes in regulatory and financial

economics, especially for electric and gas utilities. Mr. Graves discusses the results of a comparable utility analysis. His testimony benchmarks the financial performance of PGW over the 2011-2015 time period, and he analyzes both average performance over the time period and also trends over the time period. The benchmarking, among other things, (i) indicates that PGW lags its peers on key metrics such as debt to total capitalization and Days Cash; (ii) shows that a failure to grant a rate increase would return PGW's financial position to pre-2009 levels; and (iii) shows that there is a continued need to support PGW's financial stability with timely and appropriate rate increases.

- Mr. Philip Q. Hanser (PGW Statement 5) is a Principal with The Brattle Group. Mr. Hanser presents the Company's class cost of service study ("CCOSS"), which is Volume III of the Filing. The primary purpose of the present CCOSS is to allocate the Company's costs of providing service to each Rate Class. The purpose of his testimony is to describe the principles, methodology, and data used in the present CCOSS, which was developed with the aim to move towards cost allocations and rate design that more closely reflect cost causation. Mr. Hanser also shows the monthly fixed customer cost per class. Finally, Mr. Hanser explains why normal weather for PGW is best reflected as the 10-year average of degree days experienced in PGW's service territory.

- Mr. Kenneth S. Dybalski (PGW Statement 6) is the Vice President - Energy Planning & Technical Compliance at PGW. Mr. Dybalski describes and supports (i) the process used to develop the sales forecast for the test year; (ii) the

allocation of the proposed base rate increase by customer class; and (iii) the proposed customer charges by class.

- Mr. Douglas A. Moser (PGW Statement 7) is PGW's Executive Vice President and Acting Chief Operating Officer. Mr. Moser provides an overview of PGW's operations. He discusses PGW's initiatives taken to improve its overall safety and compliance efforts. In addition, he describes PGW's existing universal service programs and provides data on cost offsets related to CRP requested by the PUC. He also addresses certain tariff changes proposed by PGW including PGW's proposal to establish Interruptible Transportation rates on negotiated basis within a range of cost of service and the comparable firm transportation rate.

- Mr. Florian Teme (PGW Statement 8) is PGW's Vice President, Marketing and Sales. Mr. Teme explains and provides support for the Company's proposed TED Rider and the pilot Micro-CHP Incentive Program.

In addition to these statements, PGW is submitting the information and data required by the PUC's filing requirements (Volume I) and its proposed Tariff Supplement No. 100 to Gas Service Tariff No 2, (Volume IV) which sets forth all of the changes and rate increases proposed by PGW as part of this case.

VI. CONCLUSION

Q. DOES THAT COMPLETE YOUR DIRECT TESTIMONY?

A. Yes.

PGW St. No. 2

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

TESTIMONY OF

JOSEPH F. GOLDEN, JR.

ON BEHALF OF
PHILADELPHIA GAS WORKS

Docket No. R-2017-2586783

Philadelphia Gas Works

General Rate Increase Request

Financial Condition
Supporting Justification for Requested Increase

February 2017

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND POSITION WITH THE COMPANY.

A. My name is Joseph F. Golden, Jr. My position is Executive Vice President and Acting Chief Financial Officer for Philadelphia Gas Works ("PGW" or "Company").

Q. HOW LONG HAVE YOU HELD THIS POSITION?

A. I was appointed Executive Vice President and Acting Chief Financial Officer in March 2012. I started with PGW in August 1986. My prior titles at PGW include: Controller, Treasurer, Manager Treasury Department, Senior Staff Accountant, and Staff Accountant. Before starting with PGW, I had prior work experience in public accounting, treasury accounting and cash management, and cost accounting for a manufacturing company.

Q. WHAT ARE YOUR VARIOUS JOB RESPONSIBILITIES?

A. In my present position, I am responsible for the treasury, accounting, and budgeting functions.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND.

A. I hold a Bachelor of Science degree in Accounting from Villanova University, a Master of Business Administration degree from Drexel University, and a Juris Doctor degree, *cum laude*, from Temple University School of Law.

Q. HAVE YOU EVER PROVIDED TESTIMONY BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION ("COMMISSION")?

A. Yes. I submitted rebuttal testimony on behalf of PGW in the Petition of Philadelphia Gas Works for Waiver of Provisions of Act 11 to Increase the

Distribution System Improvement Charge Cap and to Permit Levelization of DSIC Charges (Docket No. P-2015-2501500).

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to: 1) provide the documentation and supporting methodology for the schedules and exhibits that are included in PGW's base rate filing; 2) describe PGW's financial results for the fully projected future test year (comprised of the period from September 1, 2017 through August 31, 2018); and 3) detail and provide supporting justification for PGW's requested increase in existing annual base rates of $70.0 million (in year one).

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. Since PGW's last base rate case in 2009/2010, the Company has undertaken a number of initiatives to modernize its infrastructure, make its system safer and more efficient and improve customer service. While some of those efforts have been financed through surcharges (i.e., the acceleration of PGW's main replacement program), PGW has undertaken numerous other efforts that have been financed through base rates or additional borrowing. At the same time, PGW has experienced material increases in operating costs while seeing weather normalized levels of sales and associated revenues dramatically decrease. During this period, PGW's financial health has continued to improve, compared to 2008 levels. However, PGW's pro forma results clearly demonstrate that a rate increase is needed if the Company is going to maintain its financial status and current favorable bond ratings and be able to continue with its significant efforts to improve the safety, efficiency and reliability of its system and continue to work to improve customer service.

II. BACKGROUND FOR CONSIDERATION OF RATE REQUEST

Financial Condition

Q. PLEASE PROVIDE THE BACKGROUND OF PGW'S CURRENT FINANCIAL CONDITION.

A. Since its last general rate increase in 2010, PGW's financial strength has slowly improved such that it has achieved revenue bond upgrades from all three rating agencies[1] that rate the City of Philadelphia Gas Works Revenue Bonds ("PGW's Bonds"):

S&P: to A- (Positive Outlook) from BBB+ (Stable Outlook)
Moody's to Baa1 (Stable Outlook) from Baa2 (Stable Outlook)
Fitch to BBB+ (Stable Outlook) from BBB (Stable Outlook)

In addition, S&P has improved its "outlook" for PGW's Bonds from "Stable" to "Positive". But, as Mr. Douglas Moser, PGW St. No. 7, explains, as its financial health has improved, PGW has steadily increased its efforts to improve safety, reliability, and customer service on its system. As Mr. Daniel Hartman, PGW St. No. 3, also explains, it is crucially important that PGW, at least, maintain these bond ratings – or, ideally, improve them – so that it can continue to have access to the capital markets on acceptable terms and to finance a portion of these improvements through internally generated funds. Since 2009, PGW has been able to finance about $185 million in capital additions through internally generated funds, which otherwise would have had to come from additional long term borrowing. Mr. Hartman describes the important financial metrics PGW must maintain in order to do this. Thus, the rate increase requested by PGW is critically necessary to place the Company in a position to continue to

[1] *See* Exhibit JFG-3.

modernize its infrastructure, take additional steps to make its distribution system safer and more efficient, and continue to improve customer service.

Long-Term Debt

Q. PLEASE SUMMARIZE RECENT ACTIVITY REGARDING PGW'S LONG-TERM DEBT ISSUANCES.

A. PGW successfully completed revenue bond refunding transactions in August of 2016 and 2015 in the amounts of $312.4 million and $261.8 million, respectively. The long-term debt refunding completed in August 2016 achieved gross savings of $71.1 million and net present value ("NPV") savings of $38.2 million. With level debt service savings, this transaction lowered debt service and the costs that will be imposed on customers, by approximately $4.05 million ($2.7 million in debt service and $1.35 million in debt service coverage at 1.5x) per year for the next 22 years.

The transaction completed in August 2015 achieved gross savings of $74.1 million and NPV savings of $34.3 million. With level debt service savings, this transaction lowered debt service and charges to ratepayers by approximately $4.95 million ($3.3 million in debt service and $1.65 million in debt service coverage at 1.5x) per year for the next 19 years. As Mr. Hartman explains, PGW's ability to continue to take advantage of an attractive interest rate environment and refinance existing debt requires that PGW maintain or improve its current financial condition. It is noteworthy that interest expense has decreased from the 2009/2010 base rate case when compared to the FPFTY (FY 2018) by $12.6 million ($61.8 million reduced to $49.2 million annually) because

PGW: 1) has refinanced long term debt at lower interest rates; and 2) reduced long term debt by normal amortization.

Q. WHAT PLANS DOES PGW HAVE TO SELL BONDS IN THE FORESEEABLE FUTURE?

A. PGW anticipates issuing City of Philadelphia Gas Works Revenue Bonds in the par amount of $270.0 million in its fiscal year ("FY") 2017, the 12 months ended August 31, 2017. The exact timing of the issuance would be subject to market conditions. The next bond issuance is projected to be in FY 2020 and in the amount of $180 million.

III. PRO FORMA FINANCIAL RESULTS

Q. HAVE YOU PREPARED A PRO FORMA TEST YEAR INCOME STATEMENT, CASH FLOW, DEBT SERVICE COVERAGE AND BALANCE SHEET THAT PROJECTS THE COMPANY'S STATUS IN THE CURRENT YEAR AS WELL AS ON A PROJECTED BASIS?

A. Yes.

Q. FIRST, PLEASE EXPLAIN THE TEST YEAR ON WHICH PGW'S CLAIMED REVENUE REQUIREMENT IS BASED.

A. As permitted by Act 11 of 2012, PGW has based its claimed revenue requirement on the fully forecasted 12 months ending August 31, 2018, referred to as the Fully Projected Future Test Year ("FPFTY"). The Future Test Year ("FTY") is FY 2016-2017 or FY 2017 and the Historical Test Year ("HTY") is FY 2015-2016 or FY 2016. Those results are displayed on Exhibit JFG-1. Each page of this exhibit shows data for: (1) the HTY, the 12 months ended August 31, 2016 or FY 2016; (2) the FTY, the 12 months ended August 31, 2017 or FY 2017; and (3) the FPFTY, the 12 months ended August 31, 2018 or FY 2018. The Exhibit also shows projections for FY 2019 through FY 2022 (which I will refer to as the

"Forecast Period"). Page 1 of Exhibit JFG-1 displays operating revenues, operating expenses and net earnings (Statement of Income); page 2 displays PGW's Cash Flow Statement, page 3 shows Debt Service Coverage; and page 4 shows the Company's Balance Sheet and capitalization ratios.

Q. PLEASE DESCRIBE HOW THE DATA FOR THE HISTORIC TEST YEAR WERE DERIVED.

A. The HTY is the actual audited results for FY 2015-2016. Note that these data are not adjusted for normal weather.

Q. PLEASE DESCRIBE HOW THE FUTURE TEST YEAR AND FULLY PROJECTED FUTURE TEST YEAR RESULTS WERE CREATED.

A. The FTY and FPFTY results were derived by starting with PGW's current (FY 2016-2017) Budget ("Budget year"), approved by the Philadelphia Gas Commission ("PGC"). PGW develops its annual Budget generally, as follows:

1. PGW's Marketing and Gas Planning departments calculate revenues and sales by class for the Budget year, and provide projections for the forecast years. This process is fully described in the testimony of Kenneth Dybalski (PGW St. 6). Revenue-related expenses (chiefly natural gas) are then calculated.

2. The Budget year expenses are then determined. Each department submits its view of the expense levels it will experience in the budget year. Where a specific cost category increase or changes affecting the expense level was identified, those levels were used to establish the expense for the respective Budget year. For example, PGW utilized the annual wage increases established in its current collective bargaining agreement to calculate wage expense for various departments. Also, PGW utilized information provided by its benefits consultant

to project health care costs and other benefit costs, including Other Post-Employment Benefits ("OPEB"). Long-term debt interest expense and debt amortization was also adjusted to reflect more recent information concerning the results of the recent debt refinancing. These results were then used to prepare four key financial schedules for FY 2016-2017: income statement; cash flow statement; debt service coverage; and the balance sheet.

Q. DOES PGW ALSO PREPARE A FIVE YEAR FORECAST OF FINANCIAL OPERATIONS?

A. Yes. Using the Budget year as the base year, PGW rolls forward its budgeted operating results to create a five-year forecast, taking account of any known rate or other changes that might affect the results in a particular year. PGW used the first year of its five year forecast, FY 2017-2018, as its FPFTY.

Q. WHAT IS THE REVIEW AND APPROVAL PROCESS ASSOCIATED WITH THIS BUDGET AND FIVE YEAR FORECAST?

A. In addition to an internal review and approval process by the PGW executive team, PGW is required to obtain approval of its annual budget from both the Philadelphia Facilities Management Corporation ("PFMC") (the equivalent of PGW's Board of Directors) and the PGC. PGW's capital budget must be approved by the PFMC, the PGC, and Philadelphia City Council.

Q. HOW ARE THE AMOUNTS SHOWN ON JFG-1 DIFFERENT THAN THOSE APPROVED BY PFMC, PGC, AND PHILADELPHIA CITY COUNCIL?

A. For the FPFTY (FY 2017-2018) and the Forecast Period (FYs 2019, 2020, 2021 and 2022), and as explained more fully by Mr. Kenneth Dybalski, PGW St. No. 6, pro forma revenues have been adjusted to reflect normal weather using a ten-year average for heating degree days and the estimated impact of gas cost changes.

Test year expenses have also been updated for known changes, the most significant of which is the effect of GASB 75 on the FY 2017-2018 year.

Q. PLEASE EXPLAIN GASB 75 AND ITS EFFECT ON PGW.

A. Both privately and publicly owned companies are required to adhere to General Accepted Accounting Principles ("GAAP") established by accounting review boards. Investor owned utilities must adhere to GAAP established by the Financial Accounting Standards Board ("FASB"). States and municipalities must adhere to similar standards promulgated by the Governmental Accounting Standards Board ("GASB"). GASB 75, the equivalent of FASB for municipalities, mandated that starting in FY 2017-2018, OPEB costs for retirees be shown as deferred inflows of funds and deferred outflows of funds on the balance sheet rather than as current expenses. The necessary adjustments were made in the FPFTY to reflect these accounting mandates. Importantly, this accounting change relates to compliance with GAAP and does not eliminate or change PGW's obligation to continue to pay the appropriate level of cash outlays as calculated by the actuary.

Q. WHAT OTHER ITEMS HAVE BEEN UPDATED?

A. The cost of PGW's most recent refinancing has been reflected in the FPFTY. In addition, PGW's rate case expense has been amortized over three years.

IV. CALCULATION OF REVENUE REQUIREMENT

Q. PLEASE EXPLAIN THE BASIS ON WHICH PGW HAS CALCULATED ITS REVENUE REQUIREMENT FOR THE FPFTY.

A. As noted, PGW is not regulated on the basis of a fair rate of return on a used and useful rate base as are investor-owned utilities; instead, the Company's revenue

requirement is established on the basis of the "Cash Flow Method." While I am informed that the use of the Cash Flow Method is mandated by the Gas Choice Act,[2] the Commission has explained how it intends to implement that standard for PGW. In its 2010 Policy Statement, the Commission described the requirements of the Cash Flow Method as follows:

> (b) The Commission is obligated under law to use the cash flow methodology to determine PGW's just and reasonable rates. Included in that requirement is the subsidiary obligation to provide revenue allowances from rates adequate to cover its reasonable and prudent operating expenses, depreciation allowances and debt service, as well as sufficient margins to meet bond coverage requirements and other internally generated funds over and above its bond coverage requirements, as the Commission deems appropriate and in the public interest for purposes such as capital improvements, retirement of debt and working capital.[3]

The Commission also stated that, in determining just and reasonable rate levels for PGW it would consider, among other relevant factors, the following financial factors:

- PGW's test year-end and (as a check) projected future levels of non-borrowed year-end cash.
- Available short term borrowing capacity and internal generation of funds to fund construction.
- Debt to equity ratios and financial performance of similarly situated utility enterprises.
- Level of financial performance needed to maintain or improve PGW's bond rating thereby permitting PGW to access the capital markets at the lowest reasonable costs to customers over time.[4]

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2 66 Pa.C.S. § 2212(e); 52 Pa.Code § 69.2702(b) ("The Commission is obligated under law to use the cash flow methodology to determine PGW's just and reasonable rates.").

3 52 Pa.Code § 69.2702.

4 52 Pa.Code § 69.2703.

Q. PLEASE EXPLAIN HOW PGW HAS APPLIED THIS GUIDANCE IN DETERMINING ITS REVENUE REQUIREMENT.

A. As a "cash flow" regulated company, PGW's operations are entirely funded from rates, either indirectly as a result of short-term or long-term borrowing (which then must be paid back by ratepayers) or directly through charges to customers. Accordingly, PGW's most important financial metrics are:

1) debt service coverage ratios; and

2) end of year days cash on hand; and, separately,

3) liquidity balance.

First, PGW's debt service coverage levels are crucial because if the Company falls below the 1.5x minimum requirement in its bond covenants, reflected in the City of Philadelphia Ordinance that establishes the requirements for PGW's bonds[5] then it will be in technical default and its access to capital markets will evaporate. However, it needs higher levels of coverage (above the 1.5x minimum) in order to meet cash requirements not contained in the Bond Ordinance calculation or in the operating expense category of the income statement.

Second, PGW's end of year cash balance is also crucial because PGW needs an accumulated balance of cash in its accounts at fiscal year-end to pay its

[5] The General Gas Works Revenue Bond Ordinance of 1998, approved on May 30, 1998, Bill No. 980232, as amended and supplemented from time to time (the "1998 General Ordinance") and the General Gas Works Revenue Bond Ordinance of 1975, approved on May 30, 1975, Bill No. 1871, as amended and supplemented from time to time (the "1975 General Ordinance") (collectively referred to as the "Bond Ordinance").

substantial obligations (the largest of which are invoices for natural gas and upstream pipeline capacity used by its customers) and working capital requirements beginning in the fall and continuing into the winter, prior to collecting revenues for the winter heating season.

Third, PGW's year-end liquidity (cash plus available short-term borrowing capacity) is also important to meet its substantial obligations during the winter prior to receiving revenues from customers, and to provide a responsible and reasonable measure of cushion for unforeseen circumstances.

In addition to the three metrics discussed above, the other indices that are important are the Company's capitalization ratio and its sources of internally generated funds to fund construction. Both of these factors are listed in the Commission's 2010 Policy Statement and are among the main focus points that are considered by the bond rating agencies in evaluating the creditworthiness of PGW.[6]

Q. HOW DO THE OPERATING RESULTS SHOWN ON THE ATTACHED EXHIBITS TREAT THE CITY PAYMENT OF $18.0 MILLION?

A. The City Payment is shown as an expense of the Company since PGW is legally obligated to make this payment.[7] While the City of Philadelphia "granted back" this payment during PGW's financial crisis in the late 2000s, it has, since 2010, ended the grant back. Based upon the latest budget and forecast information

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6 *See, e.g.,* Exhibit JFG-3 at Moody's Investors Service, Philadelphia (City of) PA Gas Works, Credit Opinion (August 8, 2016); S & P Global RatingsDirect, Philadelphia; Gas; Joint Criteria (August 10, 2016).

7 *See* 66 Pa.C.S. 2212(f).

submitted by the City, it intends to continue to have PGW remit this fee for the foreseeable future. Accordingly, the City Payment is treated as a "known and definite" expense in PGW's operating results and resulting financial metrics.

Non-Borrowed Year-End Cash

Q. WHAT LEVELS OF YEAR END CASH IS PGW PROJECTING IT WILL EXPERIENCE IN THE FPFTY?

A. In FY 2017-2018, PGW is projecting that it will end the year with just $47.4 million in cash; this projection dramatically decreases in the Forecast Period. This equates to just 35.7 days of cash on hand[8] with the cash balance quickly turning negative in the Forecast Period. As more fully explained by Mr. Hartman, the bond rating agencies that closely follow PGW's financial performance have indicated that a cash balance of between 70 and 90 days of cash on hand is adequate for PGW to maintain its existing bond rating and not be downgraded.[9] Therefore, a cash balance of only 36 days would not only be extremely concerning to the rating agencies, it would also pose real challenges to the Company's ability to meet all of its obligations when they came due.

It is important to understand that the measurement of 36 days cash on hand is being presented as of August 31, 2018, PGW's fiscal year-end. PGW's cash balance changes throughout the fiscal year and is at a low point in the middle of the fiscal year (including in FY 2017-2018, the FPFTY). Maintaining a days' cash on hand balance of 70 to 90 days at August 31st will be followed by a lower

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8 Days of cash on hand calculation: Total Operating Expenses, less non-cash items, depreciation and amortized pensions, divided by 365, divided into cash balance.

9 Exhibit JFG-3 at Moody's Rating Action, August 8, 2016, p. 5 (Moody's forecasts that direct cash liquidity will remain in the 70 to 90 days range).

balance in the middle of PGW's fiscal year. Thus, the FPFTY's balance of just 36 days cash on hand at fiscal year-end would result in just 22.6 days of cash on hand ($30 million) at the low point in December of that year, leaving very little ability to respond to contingencies such as lower than pro forma sales or unanticipated expenditures.

Q. PLEASE DISCUSS PGW'S DEBT SERVICE COVERAGE RATIOS IN THE FPFTY AND IN THE FORECAST PERIOD.

A. Turning back to the first important financial metric, at present rates, PGW's debt service coverage ratios are just minimally above its Bond Ordinance coverage requirement of 1.5x in the FPFTY. This coverage calculation does not take account of certain cash obligations that are not in the operating expense section of the income statement, including the City Payment, and certain pension and OPEB obligations, all of which must be paid out of the cash that is part of the "coverage" in excess of the debt service. PGW's calculations show that it needs coverages at 2.0x and above in order to produce enough cash to be able to meet all of its obligations throughout the year, including the City Payment, pensions, OPEBs, capital funding from internally generated funds, and additional funds for working capital.

Q. PLEASE EXPLAIN PGW'S USE OF THE CASH GENERATED BY THE DEBT SERVICE COVERAGE RATIO REQUIREMENT IN EXCESS OF 1.0 TIMES COVERAGE.

A. Under the Bond Ordinance, PGW has a mandatory debt service coverage ratio of 1.5x the debt service, which is calculated by subtracting operating expenses from total funds available to derive total funds available to cover debt service. The cash generated by this ratio (funds available to cover debt service) is used to pay

other expenses that do not appear on the Statement of Income, but influences the debt service coverage calculation. These payments include the $18.0 million City Payment, $18.5 million to the OPEB Trust Fund, $2.0 to $3.0 million to the pension fund, and $5.0 million towards retiree health care cost. Additionally, PGW continues to utilize internally generated funds ("IGF") for capital construction to reduce its dependence on long-term debt financing and contributes approximately $50.0 million to $60.0 million towards IGF. As of August 2016 this has saved PGW approximately $12.5 million in interest costs over the last five fiscal years.

Q. WOULD THE RATING AGENCIES VIEW A DEBT SERVICE COVERAGE LEVEL JUST ABOVE 1.5X AS CAUSE FOR A DOWNGRADE?

A. Yes, most definitely. The rating agencies calculate PGW coverages differently than in the Bond Ordinance, accurately treating the $18.0 million City Payment as a fixed obligation. When the Company's debt service coverage is calculated including the $18.0 million as a fixed obligation, PGW's debt service coverage falls to just above 1.3x in the FPFTY and drops to below 1.3x in the Forecast Period:

FPFTY	2019 Forecast	2020 Forecast	2021 Forecast	2022 Forecast
1.33	1.39	1.34	1.39	1.26

Since these coverage levels are materially below the 1.5-1.6x level that Moody's has observed for PGW, they would very likely cause a downgrade by Moody's, followed by similar negative ratings action by the other bond rating agencies. PGW Witness Hartman discusses this in detail in his testimony.

Borrowing Capacity And Internal Generation Of Funds

Q. HOW WOULD THESE FINANCIAL RESULTS AFFECT PGW'S ABILITY TO USE NON-DSIC INTERNALLY GENERATED FUNDS TO FUND CONSTRUCTION?

A. These financial results would reduce the IGF to below $30 million per year ($26.4 million in the FPFTY). This compares unfavorably to the level of non-DSIC IGF the Company experienced in FY 2015-2016 of $33.1. At this level of revenues PGW would not be able to maintain the 50/50 balance of funding for capital programs that the rating agencies have commented on with favor. The Company would have to either cut back on capital projects or issue more debt.

Q. WHY HAS PGW CHOSEN A FINANCING STRATEGY FOR CAPITAL SPENDING COMPRISED OF 50 PERCENT OF FUNDS FROM INTERNALLY GENERATED FUNDS AND 50 PERCENT OF FUNDS FROM DEBT?

A. PGW has chosen the financing strategy for capital spending comprised of 50 percent of funds from internally generated funds and 50 percent of funds from debt in order to spread out some payments over time rather than have the ratepayers finance all capital improvements on a "pay-go" basis. This combination financing strategy allows PGW to use long-term debt, its tax-exempt commercial paper program, and internally generated funds to finance the improvements to its infrastructure.

Q. IF PGW WERE FORCED TO UTILIZE DEBT FINANCING RATHER THAN INTERNALLY GENERATED FUNDS FOR THE NEXT FOUR YEARS WHAT WOULD THE IMPACT BE ON PROJECTED DEBT SERVICE AND THE DEBT SERVICE COVERAGE RATIO REQUIREMENT?

A. PGW would experience a decrease in its debt service coverage ratio for an incremental increase in debt service. Debt service on a bond issuance of $100.0 million at a composite rate of approximately 4% would be approximately $7.0

million per year. The bond covenant that mandates a 1.5x debt service coverage would require additional revenues of $10.5 million per year to take account of this requirement. After several bond issuances the debt service coverage requirement would exceed a "pay as you go" financing strategy. This significant savings to ratepayers over time is also why PGW does not finance its construction program using entirely long-term bonds. In addition, any increase in the level of debt PGW is already projecting will drive its debt to total capitalization ratio to unacceptable levels.

Debt To Equity Ratio and Financial Performance

Q. WHAT IS PGW'S PROJECTED DEBT TO TOTAL CAPITALIZATION RATIO FOR THE FULLY PROJECTED FUTURE TEST YEAR?

A. PGW's debt to total capitalization ratio in the FPFTY is approximately 90%, well above its actual level in the historic test year, 76.3%. While by FY 2022 the debt to total capitalization ratio is projected to move to 88.5%. PGW would be very concerned about increasing its debt burden, resulting in even higher levels of debt, if it were required to do so to compensate for reduced levels of available IGF. Recall that PGW has had a goal of reducing its debt to equity level to under 60% of total capitalization, and the Commission Staff has opined that a level of 70% was not unreasonable.[10]

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10 Pennsylvania Public Utility Commission, Staff Report: Inquiry into the Philadelphia Gas Works' Pipeline Replacement Program, dated April 21, 2015, p. 6, 44, 50.

Bond Ratings

Q. WHAT WOULD HAPPEN IF PGW WERE TO EXPERIENCE THE FINANCIAL RESULTS PROJECTED FOR THE FY 2018 FPFTY?

A. PGW would be in serious risk of not being able to meet its cash obligations—and absent some timely emergency action—having its debt service coverage levels fall below the level mandated in the Bond Ordinance. If either of these events occurred, it would be entirely realistic for the rating agencies to downgrade or put a negative outlook on PGW's bonds. Such adverse actions by the rating agencies would add to PGW's borrowing costs and could trigger increased rates on PGW's variable rate debt (the Fifth Series A-2 Bonds and the Eighth Series B, C, D and E Bonds). The increased costs and/or the Company's liquidity profile would limit PGW's reasonable access to capital markets. More importantly, the projected level of cash is not an adequate level for a firm with over $600.0 million in revenues and $500.0 million in operating expenses. If actual expenses were to exceed "normal" levels because of abnormally cold weather or an unanticipated spike in gas prices, PGW could be left having to rely on its limited short-term commercial paper for liquidity. Although PGW has the ability to issue up to $120.0 million of commercial paper on a short-term basis, this approach would add costs to customers and remove PGW's only source of short-term protection against a failure to be able to pay its bills when due.

Q. HOW DOES PGW CURRENTLY USE ITS COMMERCIAL PAPER?

A. Currently PGW utilizes its commercial paper for capital financing. This strategy allows PGW to hold off the issuance of long-term debt, thus putting off the associated costs, and also so that it can issue bonds at the optimal time relative to

the long term bond market. Such optimal market timing can also reduce the costs of long term borrowing. Utilization of commercial paper for working capital would deny PGW the ability to reduce ratepayer costs by using the commercial paper for capital projects.

The Company would also have to seriously consider issuing more debt in order to continue its existing capital program. The Company does not believe that issuing more debt would be prudent or viewed with favor by the bond rating agencies. Cutting back on capital projects – the only other prudent alternative – would have a materially adverse effect on the ability of PGW to continue to modernize and increase the safety of its distribution network, as well as to attempt to improve customer service.

Q. WHAT ARE YOUR CONCLUSIONS BASED ON THE FINANCIAL RESULTS AT PRESENT RATES FOR THE FPFTY AND THE FORECAST PERIOD?

A. It is crucially important that PGW obtain rate relief in order to repair these financial indicators, as well as to have sufficient cash in order to prudently operate the Company. A failure to improve these results with additional revenues would almost certainly result in a bond rating downgrade, which would raise the costs of borrowing and limit PGW's access to capital markets.

Q. WHAT LEVEL OF RATE RELIEF DOES PGW REQUIRE TO MAINTAIN ITS FINANCIAL INDICATORS AT THE APPROPRIATE LEVELS AND HAVE SUFFICIENT CASH TO PRUDENTLY OPERATE THE COMPANY?

A. PGW has determined that an increase of $70.0 million would provide sufficient additional revenues to enable it to maintain its financial metrics at adequate levels and maintain its existing bond rating.

Q. HAVE YOU CALCULATED PGW'S FINANCIAL RESULTS IN THE FPFTY AS WELL AS IN THE FORECAST PERIOD IF ITS PROPOSED $70.0 MILLION RATE INCREASE IS GRANTED?

A. Yes, those results are shown on Exhibit JFG-2. At $70.0 million, PGW would have coverages that exceed 2.0x in the FPFTY and in the Forecast Period. Including the City Payment as an expense, PGW's coverage for the FPFTY would be almost at the desired 2.0x range, and would go above that minimum required level in subsequent years. As I indicated above, coverages at this level are required to permit PGW to have the funds it needs throughout the year to satisfy all of its obligations. The proposed rate increase would also produce about $114.0 million in year-end cash, or about 84 days of cash on hand at the end of the FPFTY. This is slightly better than the level that Moody's observed for PGW for FY 2015 (77 days of cash on hand) and is in the range (70 to 90 days) that Moody's has indicated it expects for a company rated at Baa1. This is consistent with Moody's August 2016 Credit Opinion. Finally, a $70.0 million rate increase would produce enough IGF so that PGW could continue to fund its construction budget from both long-term debt and IGF on an equal basis.

Q. HOW WOULD THE RATE INCREASE AFFECT PGW'S FINANCIAL PERFORMANCE DURING THE FORECAST PERIOD?

A. It would similarly keep PGW at the levels it was experiencing in the historic test year and the levels on which the rating agencies have commented favorably. For example, cash on hand would improve in FY 2018 to 85.7 days on hand and then slowly decrease to 57.3 days on hand in FY 2022. Debt service coverage would stay above 2.0x in the Forecast Period and PGW's debt to total capitalization would slowly modulate to 74% in FY 2022. This highlights the fact that any

Commission rate increase granted in 2017 will make steady improvement in PGW's financials because 100% of the excess over costs is retained by the Company. This is essentially what is shown by the improved cash flow and debt service numbers.

Q. ARE THERE CIRCUMSTANCES THAT COULD MATERIALLY AFFECT THE FINANCIAL INDICATORS THAT YOU HAVE PROJECTED?

A. Yes, PGW's pro forma income statement is calculated assuming a 4% bad debt expense rate and a 96% collection rate. These projections do not assume any material change in PGW's collection practices. However, there may be a material change in the FPFTY to one of its key tools – its ability to place a lien on properties where the delinquent customer of record is not the owner of the property. Part of the Company's collection strategy is to use its municipal lien ability to lien properties to secure overdue amounts, including locations at which tenants are responsible for the natural gas bill and the lien is placed on properties owned by landlords. PGW is typically paid for its lien upon transfer of the property or it can try to reduce the lien to a money judgment and execute on the judgment. In this way PGW can eventually obtain payment for at least some of these arrearages and reduce the bad debt expense that other customers otherwise would have to bear. At the present time, PGW collects about $22 million each year from accounts associated with liens. However, on January 5, 2017 a federal district judge issued a Permanent Injunction/Order that arrested PGW's ability to continue to lien properties where the customer of record was not the owner. While this decision is being appealed, at the present time, it is not clear how this ruling, as well as another PUC order affecting liened arrearages, will ultimately

affect PGW's liening ability, and, correspondingly, its ability to collect these arrearages from the responsible parties. If PGW's liening ability with respect to non-owner occupied properties is materially reduced or otherwise affected, PGW's bad debt expense could increase by as much as one or more percentage points (i.e., from 4% to 5%, or greater). While PGW has not made an adjustment to its pro forma results to account for this potential at the present time, it reserves the right to do so if the effects of these legal proceedings become more "known and definite."

V. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Exhibit JFG-1

PHILADELPHIA GAS WORKS
STATEMENT OF INCOME
(Dollars in Thousands)

LINE NO.		ACTUAL 2014-15	HTY 2015-16	FTY 2016-17	FPFTY 2017-18	FORECAST 2018-19	FORECAST 2019-20	FORECAST 2020-21	FORECAST 2021-22	LINE NO.
	OPERATING REVENUES									
1.	Non-Heating	$ 30,753	$ 21,873	$ 26,425	$ 26,230	$ 25,378	$ 24,494	$ 23,651	$ 22,873	1.
2.	Gas Transport Service	39,962	38,550	45,674	44,614	46,222	47,594	48,853	50,055	2.
3.	Heating	618,164	472,275	524,234	534,832	543,666	552,484	561,520	571,396	3.
4.	Weather Normalization Adjustment	(10,747)	41,479	5,905	-	-	-	-	-	4.
5.	Unbilled Adjustment	(2,105)	(1,830)	1,673	315	104	83	119	109	5.
6.	Total Gas Revenues	676,027	572,347	603,911	605,991	615,370	624,655	634,143	644,433	6.
7.	Appliance Repair & Other Revenues	8,727	7,962	8,182	8,265	8,347	8,431	8,515	8,601	7.
8.	Other Operating Revenues	12,493	10,928	13,023	12,757	12,903	13,044	13,186	13,339	8.
9.	Total Other Operating Revenues	21,220	18,890	21,205	21,022	21,250	21,475	21,701	21,940	9.
10.	**Total Operating Revenues**	697,247	591,237	625,116	627,013	636,620	646,130	655,844	666,373	10.
	OPERATING EXPENSES									
11.	Natural Gas	252,158	146,515	176,731	184,960	191,471	197,808	204,518	211,904	11.
12.	Other Raw Material	11	9	10	10	10	10	10	10	12.
13.	Sub-Total Fuel	252,169	146,524	176,741	184,970	191,481	197,818	204,528	211,914	13.
14.	**CONTRIBUTION MARGINS**	**445,078**	**444,713**	**448,375**	**442,043**	**445,139**	**448,312**	**451,316**	**454,459**	14.
15.	Gas Processing	18,180	17,948	17,666	17,521	17,837	18,216	18,457	18,857	15.
16.	Field Services	36,874	36,276	39,369	40,340	41,299	42,096	42,611	43,456	16.
17.	Distribution	38,629	37,173	41,690	42,562	43,528	44,358	44,925	45,824	17.
18.	Collection	3,457	3,341	4,354	4,420	4,519	4,609	4,651	4,695	18.
19.	Customer Service	12,262	12,432	13,503	13,807	14,126	14,408	14,627	14,919	19.
20.	Account Management	7,735	7,571	8,399	8,487	8,671	8,844	8,977	9,157	20.
21.	Bad Debt Expense	34,833	27,133	30,654	26,956	27,639	28,347	28,804	28,834	21.
22.	Marketing	6,956	3,671	4,355	4,439	4,538	4,625	4,694	4,785	22.
23.	Administrative & General	60,253	67,139	69,025	66,334	66,160	67,162	67,518	68,595	23.
24.	Health Insurance	51,051	53,370	58,305	30,811	33,641	36,627	39,880	43,424	24.
25.	Environmental Remediation	-	-	-	-	2,045	1,696	927	997	25.
26.	Capitalized Fringe Benefits	(8,860)	(10,077)	(11,537)	(11,620)	(12,238)	(12,937)	(13,744)	(14,613)	26.
27.	Capitalized Administrative Charges	(9,097)	(10,778)	(15,791)	(12,945)	(13,738)	(13,409)	(14,032)	(15,579)	27.
28.	Pensions	43,748	62,336	65,022	51,800	40,308	39,678	22,691	20,383	28.
29.	Taxes	7,823	7,521	8,232	8,437	8,647	8,821	8,997	9,177	29.
30.	Other Post Employment Benefits	6,726	9,929	6,632	31,028	29,663	28,023	26,045	23,683	30.
31.	Cost / Labor Savings	-	-	(2,073)	-	-	-	-	-	31.
32.	Sub-Total Other Operating & Maintenance	310,570	324,985	337,805	322,377	316,645	321,164	306,028	306,594	32.
33.	Depreciation	46,474	47,894	48,842	50,596	52,436	54,244	56,019	57,827	33.
34.	Cost of Removal	2,897	3,785	4,100	4,100	4,100	4,100	4,100	4,100	34.
35.	To Clearing Accounts	(5,584)	(6,231)	(6,771)	(7,516)	(7,562)	(7,579)	(7,219)	(7,186)	35.
36.	Net Depreciation	43,787	45,448	46,171	47,180	48,974	50,765	52,900	54,741	36.
37.	**Sub-Total Other Operating Expenses**	354,357	370,433	383,976	369,557	365,619	371,929	358,928	361,335	37.
38.	**TOTAL OPERATING EXPENSES**	606,526	516,957	560,717	554,527	557,100	569,747	563,456	573,249	38.
39.	OPERATING INCOME	90,721	74,280	64,399	72,486	79,520	76,383	92,388	93,124	39.
40.	**Interest Gain / (Loss) and Other Income**	3,784	1,393	2,898	3,031	2,684	2,879	3,291	2,890	40.
41.	INCOME BEFORE INTEREST	94,505	75,673	67,297	75,517	82,204	79,262	95,679	96,014	41.
	INTEREST									
42.	Long-Term Debt	45,756	40,295	44,834	49,160	46,807	48,738	50,601	47,766	42.
43.	Other	7,448	3,966	(4,059)	(6,893)	(6,252)	(5,519)	(4,784)	(4,004)	43.
44.	AFUDC	(761)	(1,120)	(1,136)	(920)	(985)	(964)	(997)	(1,030)	44.
45.	Loss From Extinguishment of Debt	4,100	4,478	6,081	5,666	5,300	4,894	4,490	4,072	45.
46.	**Total Interest**	56,523	47,619	45,720	47,013	44,870	47,149	49,310	46,804	46.
47.	**NET INCOME**	**37,982**	**28,054**	**21,577**	**28,504**	**37,334**	**32,113**	**46,369**	**49,210**	47.
48.	City Payment	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	48.
49.	**NET EARNINGS**	**$ 19,982**	**$ 10,054**	**$ 3,577**	**$ 10,504**	**$ 19,334**	**$ 14,113**	**$ 28,369**	**$ 31,210**	49.

PHILADELPHIA GAS WORKS
CASH FLOW STATEMENT
(Dollars in Thousands)

LINE NO.		ACTUAL 2014-15	HTY 2015-16	FTY 2016-17	FPFTY 2017-18	FORECAST 2018-19	FORECAST 2019-20	FORECAST 2020-21	FORECAST 2021-22	LINE NO.
	SOURCES									
1.	Net Income	$ 37,982	$ 28,054	$ 21,577	$ 28,504	$ 37,334	$ 32,113	$ 46,369	$ 49,210	1.
2.	Depreciation & Amortization	53,258	50,371	45,049	47,000	49,114	51,246	53,350	55,518	2.
3.	Earnings on Restricted Funds Withdrawal/(No Withdrawal)	7,051	23	(1,663)	(1,324)	(958)	(1,133)	(1,224)	(1,104)	3.
4.	Proceeds from Bond Refunding to Pay Cost of Issuance	-	-	2,700	-	-	500	-	-	4.
5.	Increased/(Decreased) Other Assets/Liabilities	23,696	28,209	29,078	(5,274)	(18,246)	(31,091)	(46,024)	(53,725)	5.
6.	Available From Operations	121,987	106,657	96,741	68,906	67,244	51,635	52,471	49,899	6.
7.	Drawdown of Bond Proceeds	-	-	65,000	52,000	57,000	55,000	57,000	59,000	7.
8.	Release of Restricted Fund Assets	8,562	6,673	-	-	-	-	-	-	8.
9.	Release of Bond Proceeds to Pay Temporary Financing	-	-	71,000	-	-	-	-	-	9.
10.	Temporary Financing	30,000	41,000	-	-	-	-	-	-	10.
11.	TOTAL SOURCES	160,549	154,330	232,741	120,906	124,244	106,635	109,471	108,899	11.
	USES									
12.	Net Construction Expenditures	85,499	100,333	132,632	109,010	115,628	113,149	117,009	120,996	12.
13.	Funded Debt Reduction:	13,503	-	-	-	-	-	-	-	13.
14.	Revenue Bonds	62,190	53,825	34,790	51,834	47,747	62,905	44,084	57,749	14.
15.	Temporary Financing Repayment	-	-	71,000	-	-	-	-	-	15.
16.	Distribution of Earnings	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	16.
17.	Additions To (Reductions of) Non-Cash Working Capital	(27,236)	4,756	(37,738)	423	1,149	(2,783)	(564)	175	17.
18.	Cash Needs	151,956	176,914	218,684	179,267	182,524	191,271	178,529	196,920	18.
19.	Cash Surplus (Shortfall)	8,593	(22,584)	14,057	(58,361)	(58,280)	(84,636)	(69,058)	(88,021)	19.
20.	TOTAL USES	160,549	154,330	232,741	120,906	124,244	106,635	109,471	108,899	20.
21.	Cash - Beginning of Period	105,734	114,327	91,743	105,800	47,439	(10,841)	(95,477)	(164,535)	21.
22.	Cash - Surplus (Shortfall)	8,593	(22,584)	14,057	(58,361)	(58,280)	(84,636)	(69,058)	(88,021)	22.
23.	**ENDING CASH**	**$ 114,327**	**$ 91,743**	**105,800**	**$ 47,439**	**$ (10,841)**	**$ (95,477)**	**$ (164,535)**	**$ (252,555)**	23.
24.	**Outstanding Commercial Paper**	-	-	-	-	-	-	-	-	24.
25.	**Outstanding Commercial Paper - Capital**	30,000	71,000	-	-	-	-	-	-	25.
26.	**DSIC Revenue**	13,764	26,253	32,541	30,579	30,895	31,214	31,518	31,846	26.
27.	**Internally Generated Funds**	31,735	33,080	35,091	26,431	27,733	26,935	28,491	30,150	27.
28.	**TOTAL IGF + Incremental DSIC Revenue**	45,499	59,333	67,632	57,010	58,628	58,149	60,009	61,996	28.

PHILADELPHIA GAS WORKS
DEBT SERVICE COVERAGE
(Dollars in Thousands)

LINE NO.		ACTUAL 2014-15	HTY 2015-16	FTY 2016-17	FPFTY 2017-18	FORECAST 2018-19	FORECAST 2019-20	FORECAST 2020-21	FORECAST 2021-22	LINE NO.
	FUNDS PROVIDED									
1.	Total Gas Revenues	$ 676,027	$ 572,347	$ 603,911	$ 605,991	$ 615,370	$ 624,655	$ 634,143	$ 644,433	1.
2.	Other Operating Revenues	21,220	18,890	21,205	21,022	21,250	21,475	21,701	21,940	2.
3.	Total Operating Revenues	697,247	591,237	625,116	627,013	636,620	646,130	655,844	666,373	3.
4.	Other Income Incr. / (Decr.) Restricted Funds	10,835	1,416	1,235	1,707	1,726	1,746	2,067	1,786	4.
5.	City Grant	-	-	-	-	-	-	-	-	5.
6.	AFUDC (Interest)	781	1,120	1,136	920	985	964	997	1,030	6.
7.	TOTAL FUNDS PROVIDED	708,863	593,773	627,487	629,640	639,331	648,840	658,908	669,189	7.
	FUNDS APPLIED									
8.	Fuel Costs	252,169	146,524	176,741	184,970	191,481	197,818	204,528	211,914	8.
9.	Other Operating Costs	354,357	370,433	383,976	369,557	365,619	371,929	358,928	361,335	9.
10.	Total Operating Expenses	606,526	516,957	560,717	554,527	557,100	569,747	563,456	573,249	10.
11.	Less: Non-Cash Expenses	74,535	89,059	92,630	78,214	68,463	69,770	55,503	55,924	11.
12.	TOTAL FUNDS APPLIED	531,991	427,898	468,087	476,313	488,637	499,977	507,953	517,325	12.
13.	Funds Available to Cover Debt Service	176,872	165,875	159,400	153,327	150,694	148,863	150,955	151,864	13.
14.	1975 Ordinance Bonds Debt Service	26,904	-	-	-	-	-	-	-	14.
15.	**Debt Service Coverage 1975 Bonds**	**6.57**	-	-	-	-	-	-	-	15.
16.	Net Available after Prior Debt Service	149,968	165,875	159,400	153,327	150,694	148,863	150,955	151,864	16.
17.	Equipment Leasing Debt Service	-	-	-	-	-	-	-	-	17.
18.	Net Available after Prior Capital Leases	149,968	165,875	159,400	153,327	150,694	148,863	150,955	151,864	18.
19.	1998 Ordinance Bonds Debt Service	70,139	77,867	66,868	101,720	95,276	97,858	95,459	106,342	19.
20.	1999 Ordinance Subordinate Bonds Debt Service - (TXCP)	-	-	-	-	-	-	-	-	20.
21.	Total 1998 Ordinance Debt Service	70,139	77,867	66,868	101,720	95,276	97,858	95,459	106,342	21.
22.	**Debt Service Coverage 1998 Bonds**	**2.14**	**2.13**	**2.38**	**1.51**	**1.58**	**1.52**	**1.58**	**1.43**	22.
23.	Net Available after 1998 Debt Service	79,829	88,008	92,532	51,607	55,418	51,005	55,496	45,522	23.
24.	Aggregate Debt Service	97,043	77,867	66,868	101,720	95,276	97,858	95,459	106,342	24.
25.	Debt Service Coverage (Combined liens)	1.82	2.13	2.38	1.51	1.58	1.52	1.58	1.43	25.
26.	Debt Service Coverage (Combined liens with $18.0 City Fee)	**1.64**	**1.90**	**2.11**	**1.33**	**1.39**	**1.34**	**1.39**	**1.26**	26.

PHILADELPHIA GAS WORKS
BALANCE SHEET
(Dollars in Thousands)

LINE NO.		ACTUAL 8/31/15	HTY 8/31/16	FTY 8/31/17	FPFTY 8/31/18	FORECAST 8/31/19	FORECAST 8/31/20	FORECAST 8/31/21	FORECAST 8/31/22	LINE NO.
	ASSETS									
1.	Utility Plant Net	1,232,370	1,284,810	1,368,600	1,427,014	1,490,206	1,549,111	1,610,101	1,673,270	1.
2.	Sinking Fund Reserve	90,141	86,652	105,196	106,253	107,320	120,248	121,456	122,676	2.
3.	Capital Improvement Fund	-	-	113,603	61,864	4,742	117,435	60,431	1,295	3.
4.	Workers' Compensation Fund & Health Insurance Escrow	5,820	2,603	2,610	2,616	2,629	2,642	2,662	2,682	4.
5.	Cash	114,327	91,743	105,800	47,439	(10,841)	(95,477)	(164,535)	(252,555)	5.
	Accounts Receivable:									
6.	Gas	182,433	142,435	136,100	133,168	129,686	126,572	122,911	119,664	6.
7.	Other	1,250	2,046	1,500	1,525	1,550	1,575	1,600	1,625	7.
8.	Accrued Gas Revenues	5,199	3,368	5,041	5,356	5,460	5,543	5,662	5,771	8.
9.	Reserve for Uncollectible	(102,029)	(74,286)	(71,890)	(70,484)	(68,805)	(67,813)	(66,338)	(64,880)	9.
10.	Total Accounts Receivable:	86,853	73,563	70,751	69,565	67,891	65,877	63,835	62,180	10.
11.	Materials & Supplies	50,908	47,891	47,005	49,220	50,734	52,002	53,509	54,872	11.
12.	Other Current Assets	460	1,642	455	459	463	467	471	475	12.
13.	Deferred Debits	13,135	29,376	4,782	4,987	4,489	4,464	4,348	4,311	13.
14.	Unamortized Bond Issuance Expense	3,473	512	393	341	303	270	241	215	14.
15.	Unamortized Loss on Reacquired Debt	30,953	53,946	47,865	42,199	36,899	32,005	27,515	23,443	15.
16.	Deferred Environmental	29,609	28,425	28,767	28,767	26,722	25,026	24,099	23,102	16.
17.	Deferred Pension Outflows	78,129	88,043	41,908	13,952	-	-	-	-	17.
18.	Other Assets	35,503	24,357	39,720	40,604	42,007	43,378	44,799	46,216	18.
19.	**TOTAL ASSETS**	1,771,681	1,813,563	1,977,455	1,895,280	1,823,564	1,917,448	1,848,932	1,762,182	19.
	EQUITY & LIABILITIES									
20.	City Equity	277,984	288,038	30,427	40,931	60,265	74,378	102,747	133,957	20.
21.	Revenue Bonds	915,175	837,830	1,073,041	1,021,208	973,460	1,090,557	1,046,473	988,724	21.
	TECA Accretions	-								
22.	Unamortized Discount	(787)	(110)	(875)	(825)	(778)	(732)	(686)	(641)	22.
23.	Unamortized Premium	43,360	88,703	78,667	69,303	60,595	52,623	45,389	38,938	23.
24.	Long Term Debt	957,748	926,423	1,150,833	1,089,686	1,033,277	1,142,448	1,091,176	1,027,021	24.
25.	Notes Payable	30,000	71,000	-	-	-	-	-	-	25.
26.	Accounts Payable	56,027	55,870	56,084	57,221	57,434	56,011	56,216	56,144	26.
27.	Customer Deposits	2,858	3,308	3,000	2,870	2,747	2,630	2,519	2,413	27.
28.	Other Current Liabilities	6,196	7,792	4,930	4,932	4,936	4,941	4,946	4,922	28.
29.	Pension Liability	239,869	296,093	291,253	285,870	280,051	274,416	267,534	260,380	29.
30.	Deferred Credits	7,895	5,999	2,091	4,497	2,791	2,018	2,084	2,080	30.
31.	Deferred Pension Inflows	11,653	-	-	-	2,813	11,120	12,290	12,302	31.
32.	Accrued Interest	6,709	2,808	15,564	14,839	14,117	17,903	17,129	16,303	32.
33.	Accrued Taxes & Wages	3,342	3,609	5,975	4,100	4,631	5,170	5,696	6,228	33.
34.	Accrued Distribution to City	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	34.
35.	Other Liabilities	168,400	149,623	414,298	387,334	357,502	323,413	283,595	237,432	35.
36.	**TOTAL EQUITY & LIABILITIES**	1,771,681	1,813,563	1,977,455	1,895,280	1,823,564	1,917,448	1,848,932	1,762,182	36.
	CAPITALIZATION									
37.	Total Capitalization	1,235,732	1,214,461	1,181,260	1,130,617	1,093,542	1,216,826	1,193,923	1,160,978	37.
38.	Total Long Term Debt	957,748	926,423	1,150,833	1,089,686	1,033,277	1,142,448	1,091,176	1,027,021	38.
39.	Debt to Equity Ratio	77.50%	76.28%	97.42%	96.38%	94.49%	93.89%	91.39%	88.46%	39.
40.	Capitalization Ratio	3.45	3.22	37.82	26.62	17.15	15.36	10.62	7.67	40.

Exhibit JFG-2

PHILADELPHIA GAS WORKS
STATEMENT OF INCOME
(Dollars in Thousands)

LINE NO.		ACTUAL 2014-15	HTY 2015-16	FTY 2016-17	FPFTY 2017-18	FORECAST 2018-19	FORECAST 2019-20	FORECAST 2020-21	FORECAST 2021-22	LINE NO.
	OPERATING REVENUES									
1.	Non-Heating	$ 30,753	$ 21,873	$ 26,425	$ 26,230	$ 25,378	$ 24,494	$ 23,651	$ 22,873	1.
2.	Gas Transport Service	39,962	38,550	45,674	44,614	46,222	47,594	48,853	50,055	2.
3.	Heating	618,164	472,275	524,234	534,832	543,666	552,484	561,520	571,396	3.
4.	Revenue Enhancement / Cost Reduction	-	-	-	70,000	70,000	70,000	70,000	70,000	4.
5.	Weather Normalization Adjustment	(10,747)	41,479	5,905	-	-	-	-	-	5.
6.	Unbilled Adjustment	(2,105)	(1,830)	1,673	315	104	83	119	109	6.
7.	Total Gas Revenues	676,027	572,347	603,911	675,991	685,370	694,655	704,143	714,433	7.
8.	Appliance Repair & Other Revenues	8,727	7,962	8,182	8,265	8,347	8,431	8,515	8,601	8.
9.	Other Operating Revenues	12,493	10,928	13,023	12,757	12,903	13,044	13,186	13,339	9.
10.	Total Other Operating Revenues	21,220	18,890	21,205	21,022	21,250	21,475	21,701	21,940	10.
11.	**Total Operating Revenues**	697,247	591,237	625,116	697,013	706,620	716,130	725,844	736,373	11.
	OPERATING EXPENSES									
12.	Natural Gas	252,158	146,515	176,731	184,960	191,471	197,808	204,518	211,904	12.
13.	Other Raw Material	11	9	10	10	10	10	10	10	13.
14.	Sub-Total Fuel	252,169	146,524	176,741	184,970	191,481	197,818	204,528	211,914	14.
15.	**CONTRIBUTION MARGINS**	**445,078**	**444,713**	**448,375**	**512,043**	**515,139**	**518,312**	**521,316**	**524,459**	15.
16.	Gas Processing	18,180	17,948	17,666	17,521	17,837	18,216	18,457	18,857	16.
17.	Field Services	36,874	36,276	39,369	40,340	41,299	42,096	42,611	43,456	17.
18.	Distribution	38,629	37,173	41,690	42,562	43,528	44,358	44,925	45,824	18.
19.	Collection	3,457	3,341	4,354	4,420	4,519	4,609	4,651	4,695	19.
20.	Customer Service	12,262	12,432	13,503	13,807	14,126	14,408	14,627	14,919	20.
21.	Account Management	7,735	7,571	8,399	8,487	8,671	8,844	8,977	9,157	21.
22.	Bad Debt Expense	34,833	27,133	30,654	30,073	30,784	31,524	31,984	31,967	22.
23.	Marketing	6,956	3,671	4,355	4,439	4,538	4,625	4,694	4,785	23.
24.	Administrative & General	60,253	67,139	69,025	66,334	66,160	67,162	67,518	68,595	24.
25.	Health Insurance	51,051	53,370	58,305	30,811	33,641	36,627	39,880	43,424	25.
26.	Environmental	-	-	-	-	2,045	1,696	927	997	26.
27.	Capitalized Fringe Benefits	(8,860)	(10,077)	(11,537)	(11,620)	(12,238)	(12,937)	(13,744)	(14,613)	27.
28.	Capitalized Administrative Charges	(9,097)	(10,778)	(15,791)	(12,945)	(13,738)	(13,409)	(14,032)	(15,579)	28.
29.	Pensions	43,748	62,336	65,022	51,800	40,308	39,678	22,691	20,383	29.
30.	Taxes	7,823	7,521	8,232	8,437	8,647	8,821	8,997	9,177	30.
31.	Other Post Employment Benefits	6,726	9,929	6,632	31,028	29,663	28,023	26,045	23,683	31.
32.	Cost / Labor Savings	-	-	(2,073)	-	-	-	-	-	32.
33.	Sub-Total Other Operating & Maintenance	310,570	324,985	337,805	325,494	319,790	324,341	309,208	309,727	33.
34.	Depreciation	46,474	47,894	48,842	50,596	52,436	54,244	56,019	57,827	34.
35.	Cost of Removal	2,897	3,785	4,100	4,100	4,100	4,100	4,100	4,100	35.
36.	To Clearing Accounts	(5,584)	(6,231)	(6,771)	(7,516)	(7,562)	(7,579)	(7,219)	(7,186)	36.
37.	Net Depreciation	43,787	45,448	46,171	47,180	48,974	50,765	52,900	54,741	37.
38.	**Sub-Total Other Operating Expenses**	354,357	370,433	383,976	372,674	368,764	375,106	362,108	364,468	38.
39.	**TOTAL OPERATING EXPENSES**	606,526	516,957	560,717	557,644	560,245	572,924	566,636	576,382	39.
40.	OPERATING INCOME	90,721	74,280	64,399	139,369	146,375	143,206	159,208	159,991	40.
41.	**Interest Gain / (Loss) and Other Income**	3,784	1,393	2,898	3,031	2,684	2,879	3,291	2,890	41.
42.	INCOME BEFORE INTEREST	94,505	75,673	67,297	142,400	149,059	146,085	162,499	162,881	42.
	INTEREST									
43.	Long-Term Debt	45,756	40,295	44,834	49,160	46,807	48,738	50,601	47,766	43.
44.	Other	7,448	3,966	(4,059)	(6,893)	(6,252)	(5,519)	(4,784)	(4,004)	44.
45.	AFUDC	(781)	(1,120)	(1,136)	(920)	(985)	(964)	(997)	(1,030)	45.
46.	Loss From Extinguishment of Debt	4,100	4,478	6,081	5,666	5,300	4,894	4,490	4,072	46.
47.	**Total Interest**	56,523	47,619	45,720	47,013	44,870	47,149	49,310	46,804	47.
48.	**NET INCOME**	**37,982**	**28,054**	**21,577**	**95,387**	**104,189**	**98,936**	**113,189**	**116,077**	48.
49.	City Payment	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	49.
50.	**NET EARNINGS**	**$ 19,982**	**$ 10,054**	**$ 3,577**	**$ 77,387**	**$ 86,189**	**$ 80,936**	**$ 95,189**	**$ 98,077**	50.

PHILADELPHIA GAS WORKS
CASH FLOW STATEMENT
(Dollars in Thousands)

LINE NO.		ACTUAL 2014-15	HTY 2015-16	FTY 2016-17	FPFTY 2017-18	FORECAST 2018-19	FORECAST 2019-20	FORECAST 2020-21	FORECAST 2021-22	LINE NO.
	SOURCES									
1.	Net Income	$ 37,982	$ 28,054	$ 21,577	$ 95,387	$ 104,189	$ 98,936	$ 113,189	$ 116,077	1.
2.	Depreciation & Amortization	53,258	50,371	45,049	47,000	49,114	51,246	53,350	55,518	2.
3.	Earnings on Restricted Funds Withdrawal/(No Withdrawal	7,051	23	(1,663)	(1,324)	(958)	(1,133)	(1,224)	(1,104)	3.
4.	Proceeds from Bond Refunding to Pay Cost of Issuance	-		2,700	-	-	500	-	-	4.
5.	Increased/(Decreased) Other Assets/Liabilities	23,696	28,209	29,078	(5,274)	(18,246)	(31,091)	(46,024)	(53,725)	5.
6.	Available From Operations	121,987	106,657	96,741	135,789	134,099	118,458	119,291	116,766	6.
7.	Drawdown of Bond Proceeds	-	-	65,000	52,000	57,000	55,000	57,000	59,000	7.
8.	Release of Restricted Fund Asset	8,562	6,673	-	-	-	-	-	-	8.
9.	Release of Bond Proceeds to Pay Temporary Financing	-	-	71,000	-	-	-	-	-	9.
10.	Temporary Financing	30,000	41,000	-	-	-	-	-	-	10.
11.	TOTAL SOURCES	160,549	154,330	232,741	187,789	191,099	173,458	176,291	175,766	11.
	USES									
12.	Net Construction Expenditures	85,499	100,333	132,632	109,010	115,628	113,149	117,009	120,996	12.
13.	Funded Debt Reduction:	13,503	-	-	-	-	-	-	-	13.
14.	Revenue Bonds	62,190	53,825	34,790	51,834	47,747	62,905	44,084	57,749	14.
15.	Temporary Financing Repayment	-	-	71,000	-	-	-	-	-	15.
16.	Distribution of Earnings	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	16.
17.	Additions To (Reductions of) Non-Cash Working Capital	(27,236)	4,756	(37,738)	188	886	(3,078)	(862)	(76)	17.
18.	Cash Needs	151,956	176,914	218,684	179,032	182,261	190,976	178,231	196,669	18.
19.	Cash Surplus (Shortfall)	8,593	(22,584)	14,057	8,757	8,838	(17,518)	(1,940)	(20,903)	19.
20.	TOTAL USES	160,549	154,330	232,741	187,789	191,099	173,458	176,291	175,766	20.
21.	Cash - Beginning of Period	105,734	114,327	91,743	105,800	114,557	123,395	105,877	103,937	21.
22.	Cash - Surplus (Shortfall)	8,593	(22,584)	14,057	8,757	8,838	(17,518)	(1,940)	(20,903)	22.
23.	**ENDING CASH**	**$ 114,327**	**$ 91,743**	**105,800**	**$ 114,557**	**$ 123,395**	**$ 105,877**	**$ 103,937**	**$ 83,035**	23.
24.	**Outstanding Commercial Paper**	-	-	-	-	-	-	-	-	24.
25.	**Outstanding Commercial Paper - Capital**	30,000	71,000	-	-	-	-	-	-	25.
26.	**DSIC Revenue**	13,764	26,253	32,541	30,579	30,895	31,214	31,518	31,846	26.
27.	**Internally Generated Funds**	31,735	33,080	35,091	26,431	27,733	26,935	28,491	30,150	27.
28.	**TOTAL IGF + Incremental DSIC Revenue**	45,499	59,333	67,632	57,010	58,628	58,149	60,009	61,996	28.

PHILADELPHIA GAS WORKS
DEBT SERVICE COVERAGE
(Dollars in Thousands)

LINE NO.		ACTUAL 2014-15	HTY 2015-16	FTY 2016-17	FPFTY 2017-18	FORECAST 2018-19	FORECAST 2019-20	FORECAST 2020-21	FORECAST 2021-22	LINE NO.
	FUNDS PROVIDED									
1.	Total Gas Revenues	$ 676,027	$ 572,347	$ 603,911	$ 675,991	$ 685,370	$ 694,655	$ 704,143	$ 714,433	1.
2.	Other Operating Revenues	21,220	18,890	21,205	21,022	21,250	21,475	21,701	21,940	2.
3.	Total Operating Revenues	697,247	591,237	625,116	697,013	706,620	716,130	725,844	736,373	3.
4.	Other Income Incr. / (Decr.) Restricted Funds	10,835	1,416	1,235	1,707	1,726	1,746	2,067	1,786	4.
5.	City Grant	-	-	-	-	-	-	-	-	5.
6.	AFUDC (Interest)	781	1,120	1,136	920	985	964	997	1,030	6.
7.	TOTAL FUNDS PROVIDED	708,863	593,773	627,487	699,640	709,331	718,840	728,908	739,189	7.
	FUNDS APPLIED									
8.	Fuel Costs	252,169	146,524	176,741	184,970	191,481	197,818	204,528	211,914	8.
9.	Other Operating Costs	354,357	370,433	383,976	372,674	368,764	375,106	362,108	364,468	9.
10.	Total Operating Expenses	606,526	516,957	560,717	557,644	560,245	572,924	566,636	576,382	10.
11.	Less: Non-Cash Expenses	74,535	89,059	92,630	78,214	68,463	69,770	55,503	55,924	11.
12.	TOTAL FUNDS APPLIED	531,991	427,898	468,087	479,430	491,782	503,154	511,133	520,458	12.
13.	Funds Available to Cover Debt Service	176,872	165,875	159,400	220,210	217,549	215,686	217,775	218,731	13.
14.	1975 Ordinance Bonds Debt Service	26,904	-	-	-	-	-	-	-	14.
15.	**Debt Service Coverage 1975 Bonds**	**6.57**	-	-	-	-	-	-	-	15.
16.	Net Available after Prior Debt Service	149,968	165,875	159,400	220,210	217,549	215,686	217,775	218,731	16.
17.	Equipment Leasing Debt Service	-	-	-	-	-	-	-	-	17.
18.	Net Available after Prior Capital Leases	149,968	165,875	159,400	220,210	217,549	215,686	217,775	218,731	18.
19.	1998 Ordinance Bonds Debt Service	70,139	77,867	66,868	101,720	95,276	97,858	95,459	106,342	19.
20.	1999 Ordinance Subordinate Bonds Debt Service - (TXCF	-	-	-	-	-	-	-	-	20.
21.	Total 1998 Ordinance Debt Service	70,139	77,867	66,868	101,720	95,276	97,858	95,459	106,342	21.
22.	**Debt Service Coverage 1998 Bonds**	**2.14**	**2.13**	**2.38**	**2.16**	**2.28**	**2.20**	**2.28**	**2.06**	22.
23.	Net Available after 1998 Debt Service	79,829	88,008	92,532	118,490	122,273	117,828	122,316	112,389	23.
24.	Aggregate Debt Service	97,043	77,867	66,868	101,720	95,276	97,858	95,459	106,342	24.
25.	Debt Service Coverage (Combined liens)	1.82	2.13	2.38	2.16	2.28	2.20	2.28	2.06	25.
26.	Debt Service Coverage (Combined liens with $18.0 City F	**1.64**	**1.90**	**2.11**	**1.99**	**2.09**	**2.02**	**2.09**	**1.89**	26.

PHILADELPHIA GAS WORKS
BALANCE SHEET
(Dollars in Thousands)

LINE NO.		ACTUAL 8/31/15	HTY 8/31/16	FTY 8/31/17	FPFTY 8/31/18	FORECAST 8/31/19	FORECAST 8/31/20	FORECAST 8/31/21	FORECAST 8/31/22	LINE NO.
	ASSETS									
1.	Utility Plant Net	1,232,370	1,284,810	1,368,600	1,427,014	1,490,206	1,549,111	1,610,101	1,673,270	1.
2.	Sinking Fund Reserve	90,141	86,652	105,196	106,253	107,320	120,248	121,456	122,676	2.
3.	Capital Improvement Fund	-	-	113,603	61,864	4,742	117,435	60,431	1,295	3.
4.	Workers' Compensation Fund & Health Insurance Escrow	5,820	2,603	2,610	2,616	2,629	2,642	2,662	2,682	4.
5.	Cash	114,327	91,743	105,800	114,557	123,395	105,877	103,937	83,035	5.
	Accounts Receivable:									
6.	Gas	182,433	142,435	136,100	132,838	128,969	125,516	121,461	117,870	6.
7.	Other	1,250	2,046	1,500	1,525	1,550	1,575	1,600	1,625	7.
8.	Accrued Gas Revenues	5,199	3,368	5,041	5,356	5,460	5,543	5,662	5,771	8.
9.	Reserve for Uncollectible	(102,029)	(74,286)	(71,890)	(70,389)	(68,586)	(67,550)	(65,979)	(64,428)	9.
10.	Total Accounts Receivable:	86,853	73,563	70,751	69,330	67,393	65,084	62,744	60,838	10.
11.	Materials & Supplies	50,908	47,891	47,005	49,220	50,734	52,002	53,509	54,872	11.
12.	Other Current Assets	460	1,642	455	459	463	467	471	475	12.
13.	Deferred Debits	13,135	29,376	4,782	4,987	4,489	4,464	4,348	4,311	13.
14.	Unamortized Bond Issuance Expense	3,473	512	393	341	303	270	241	215	14.
15.	Unamortized Loss on Reacquired Debt	30,953	53,946	47,865	42,199	36,899	32,005	27,515	23,443	15.
16.	Deferred Environmental	29,609	28,425	28,767	28,767	26,722	25,026	24,099	23,102	16.
17.	Deferred Pension Outflows	78,129	88,043	41,908	13,952	-	-	-	-	17.
18.	Other Assets	35,503	24,357	39,720	40,604	42,007	43,378	44,799	46,216	18.
19.	**TOTAL ASSETS**	1,771,681	1,813,563	1,977,455	1,962,163	1,957,302	2,118,009	2,116,313	2,096,430	19.
	EQUITY & LIABILITIES									
20.	City Equity	277,984	288,038	30,427	107,814	194,003	274,939	370,128	468,205	20.
21.	Revenue Bonds	915,175	837,830	1,073,041	1,021,208	973,460	1,090,557	1,046,473	988,724	21.
	TECA Accretions	-								
22.	Unamortized Discount	(787)	(110)	(875)	(825)	(778)	(732)	(686)	(641)	22.
23.	Unamortized Premium	43,360	88,703	78,667	69,303	60,595	52,623	45,389	38,938	23.
24.	Long Term Debt	957,748	926,423	1,150,833	1,089,686	1,033,277	1,142,448	1,091,176	1,027,021	24.
25.	Notes Payable	30,000	71,000	-	-	-	-	-	-	25.
26.	Accounts Payable	56,027	55,870	56,084	57,221	57,434	56,011	56,216	56,144	26.
27.	Customer Deposits	2,858	3,308	3,000	2,870	2,747	2,630	2,519	2,413	27.
28.	Other Current Liabilities	6,196	7,792	4,930	4,932	4,936	4,941	4,946	4,922	28.
29.	Pension Liability	239,869	296,093	291,253	285,870	280,051	274,416	267,534	260,380	29.
30.	Deferred Credits	7,895	5,999	2,091	4,497	2,791	2,018	2,084	2,080	30.
31.	Deferred Pension Inflows	11,653	-	-	-	2,813	11,120	12,290	12,302	31.
32.	Accrued Interest	6,709	2,808	15,564	14,839	14,117	17,903	17,129	16,303	32.
33.	Accrued Taxes & Wages	3,342	3,609	5,975	4,100	4,631	5,170	5,696	6,228	33.
34.	Accrued Distribution to City	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	34.
35.	Other Liabilities	168,400	149,623	414,298	387,334	357,502	323,413	283,595	237,432	35.
36.	**TOTAL EQUITY & LIABILITIES**	1,771,681	1,813,563	1,977,455	1,962,163	1,957,302	2,118,009	2,116,313	2,096,430	36.
	CAPITALIZATION									
37.	Total Capitalization	1,235,732	1,214,461	1,181,260	1,197,500	1,227,280	1,417,387	1,461,304	1,495,226	37.
38.	Total Long Term Debt	957,748	926,423	1,150,833	1,089,686	1,033,277	1,142,448	1,091,176	1,027,021	38.
39.	Debt to Equity Ratio	77.50%	76.28%	97.42%	91.00%	84.19%	80.60%	74.67%	68.69%	39.
40.	Capitalization Ratio	3.45	3.22	37.82	10.11	5.33	4.16	2.95	2.19	40.

Exhibit JFG-3

U.S. PUBLIC FINANCE

MOODY'S
INVESTORS SERVICE

CREDIT OPINION
8 August 2016

New Issue

Rate this Research

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Philadelphia (City of) PA Gas Works

New Sale: Moody's revises PGW's outlook to positive; Assigns Baa1 to $220 mil Gas Works Rev. Refunding Bds., 14th Series

Moody's Investors Service has revised the outlook to positive from stable and assigned a Baa1 rating to the Philadelphia Gas Work's (PGW) $220 million Gas Works Revenue Refunding Bonds, Fourteenth Series (1998 General Ordinance). Concurrently, Moody's has affirmed the Baa1 rating on approximately $903 million of PGW's pre-refunding 1998 Ordinance bonds outstanding.

Summary Rating Rationale

The change in outlook to positive from stable recognizes PGW's strengthened financial position that is expected to continue owing to sound operational and cost management, a solid liquidity position and credit supportive rate regulation that improves cost recovery, evidenced by the further increase in the distribution system improvement charge (DSIC) that allows for greater cash funding of ongoing capital expenditures.

PGW's rating recognizes the utility's credit supportive regulatory environment that has increased the utility's asset base and supported an acceleration to its main replacement program; a stable financial position that is expected to be maintained; a sizeable low income and stagnant customer base; and the utility's position as a supplier of last resort, which yields consistently above average retail rates. The rating also incorporates the utility's sound management that has enhanced PGW's operating efficiencies resulting in recurring cost savings. The rating further considers PGW's outstanding indebtedness which has declined in recent years but is forecast to rise given the issuance of new debt to finance capital improvements through 2020. The moderately higher leverage profile is manageable given about $50 million of annual principal amortization, a declining debt service repayment schedule, and the fact that assets will be added to the balance sheet from the capital improvement program.

PGW's state rate regulation constrains its cost recovery framework in comparison to the majority of municipally owned gas utilities in the US, which benefit from local unregulated rate setting. Thus, the rating heavily factors the constructive relationship PGW has with the Pennsylvania Public Utility Commission (PUC) and the fact that the PUC must approve rates sufficient for PGW to satisfy its indenture required 1.5 times debt service coverage ratio (DSCR) rate covenant.

Rating Outlook

The positive outlook reflects Moody's view that PGW's sound fiscal management and credit supportive regulatory environment should continue to result in stable financial metrics and improved operations despite a forecast increase in leverage related to ongoing capital expenditures as well as the execution of the Liquefied Natural Gas (LNG) expansion project.

Factors that Could Lead to an Upgrade

» Prudent management of the potential LNG expansion project

» PGW's financial metrics are maintained at or near current levels

Factors that Could Lead to a Downgrade

» Financial metrics narrow due to higher than expected costs and/or weaker revenue collections

» A less credit supportive rate regulatory environment

» Increased leverage without sufficient cost recovery or a material decline in liquidity

Credit Strengths

» Supportive rate regulatory environment and history of an effective working relationship with the state regulatory board and the City of Philadelphia (A2, stable)

» Strong 1.5 times rate covenant and The Public Utility Code requires the state regulatory board to establish rates that meet bond ordinance requirements

» Ongoing operating improvements contain costs and support PGW's recent financial improvement

» Low natural gas prices, strategic location of its LNG assets, and significant storage capacity allow for effective gas cost management and has already yielded new revenues from off-system LNG sales since 2013

» Aggressive strategy for collections of receivables has yielded strong and stable collection rates above 95%, except for a decline to 91.9% in FY 2013, reportedly due to timing differences in the calculation

» The City can only increase the $18 million City payment by 10% or $1.8 million with PUC approval

Credit Challenges

» Sizable low income residential population contributes to delinquencies that may grow if federal assistance programs are cut and these residents face higher monthly bills

» Customer base remains stagnant, despite the city's expanding economy and declining unemployment rate

» Above average retail rates compared to peers

» High system leverage, while declining, is expected to remain above average, despite increased cash funded capital expenditures

» Maintaining sufficient available liquidity to balance exposures to gas prices, variable rate debt liquidity risks, high receivable levels and other general liquidity needs

Key Indicators

Exhibit 1
Key Financial Metrics for Philadelphia Gas Works

	2012	2013	2014	2015
Operating Revenues ($'000)	644,983	693,471	759,136	697,247
Debt Outstanding ($'000)	1,093,440	1,065,720	1,015,920	915,175
Debt to Operating Revenue (x)	1.70	1.54	1.34	1.31
Days Cash on Hand	54	69	65	77
Adjusted Days Liquidity on Hand (incl. Bank Lines)	97	110	138	138
Moody's Net Revenue Total Debt Service Coverage Ratio (x)	1.25	1.89	1.55	1.51
Bond Ordinance Total Debt Service Coverage Ratio (x)	1.75	2.90	2.11	2.14

Source: PGW Audited Financial Statements and Moody's Investors Service

Recent Developments

In January 2016, the PUC approved PGW's request to increase the Distribution System Improvement Charge (DSIC) to 7.5% from 5% of the non-gas component of a customer's bill. This additional $11 million enables PGW to further accelerate its long-term cast iron main replacement program while fully recovering about $33 million annually through the DSIC. In addition to the DSIC increase, the PUC issued an order in July 2016 to allow PGW to recover past under collections of the DSIC over a period of two years starting in October 2016. The recoverable amount, anticipated to be $11.4 million total, will also help fund the main replacement program. The PUC also approved continuation of the OPEB surcharge beyond 2015 and PGW will continue to fund their OPEB obligation $18.5 million annually.

There is no material change regarding PGW's expansion plan to increase its liquefaction capacity at one of its LNG plants in order to improve gas supply cost management while also enhancing PGW's ability to sell excess LNG into the local market. PGW commissioned a study by Pace Global to assess the potential regional LNG market demand for the expanded capacity at the Richmond LNG plant. The current LNG liquefaction facilities were put into service in 2005 to replace the older, and more energy intensive, liquefaction plant that was then at the end of its useful life. The current Richmond plant was originally planned as a two phase project with the second phase intended to increase PGW's liquefaction capacity, this was not completed during the original construction. The current construction approach and timing of the potential expansion has yet to be finalized.

The potential addition of a new modern liquefier with 21,000 Mcf per day of capacity will double PGW's liquefying capacity, allowing the utility to take full advantage of its 4 Bcf storage capacity that is only about 50% utilized currently. The potential new liquefier also provides redundancy with the 2005 vintage existing liquefier, but uses more energy. The existing liquefier technology utilizes rapid pressure reduction to cool down the gas, thus limiting the energy usage during the liquefaction process compared to the new liquefier that requires more energy to cool down the gas.

PGW is forecast to issue new debt to fund this potential liquefaction expansion along with other capital improvements over the next five years. Given the annual principal repayment of about $50 million a year and a declining debt service amortization schedule, the new debt is not expected to notably weaken coverage or leverage metrics. However, the new debt would reverse a multi-year deleveraging trend. Management reports it is unlikely to move forward with the expansion unless a few long-term contracts are signed to ensure new revenues are generated to at least cover the debt service on the debt issued to fund the expansion. Further, there are many layers of approval required from all of PGW's multiple oversight boards , including the City Council that has 7 new members before PGW can issue debt to finance the LNG expansion plan.

PGW signed a new five year collective bargaining agreement (CBA) on June 17, 2015, effective May 15, 2015. The new contract includes manageable wage increases between 2.0% to 2.5% annually. A key modification to the CBA allows PGW to hire outside contractors to perform work including work to replace the steel and cast iron mains. Outside contractors may also be used to perform main abandonment projects regulated by the PUC.

Detailed Rating Considerations

Revenue Generating Base

PGW serves approximately 500,000 customers in the Philadelphia area by supplying, storing and transporting natural gas. As the largest municipally owned regulated gas distribution utility in the US, PGW has a distribution monopoly, yet their residents have the ability to choose their gas supplier. If customers use another gas supplier, PGW is paid a transportation fee for the use of its lines. PGW is also the regional supplier of last resort.

Per moodyseconomy.com, Philadelphia's economy is performing well. Job growth is now outpacing the national average with employment up in most sectors. Income growth has improved and spurred spending as the labor market tightens and the single and multifamily housing market is its strongest since the mid 2000s.

Favorably, low natural gas prices have helped keep bills relatively low and the weather normalization adjustment (WNA) mechanism has also helped keep margins stable. The weather normalization adjustment is key to the utility's financial stability. While the WNA tempers PGW's revenue upside during cold periods, it also limits the downside risk during warm years. For example, the 2012 year was reportedly the warmest year on record and the WNA added $45 million of revenues in 2012 that helped mitigate the loss of $121 million of top line revenue due to the notably lower demand. Conversely, in the colder 2014 year, the WNA resulted in a refund to customers of $12.3 million. We view the WNA as a favorable driver of credit stability.

In addition to the WNA, PGW's current rate structure benefits from historic regulatory support that has provided the utility with a demand side management (DSM) program, the DSIC, and an Other Post Employment Benefit (OPEB) rate to fund the outstanding OPEB liability. The combination of these adjustment mechanisms along with prudent fiscal management is forecast to enable the utility to avoid another base rate increase until fiscal 2018. This credit supportive rate regulatory history and PGW's current rate structure is considered to be satisfactory and right sized for full cost recovery and the generation of adequate excess cash flow to fund capital reinvestment.

The PUC support of PGW grew post 2000 when the PUC and PGW settled an appeal and the PUC adopted a new provision when setting PGW's rates. The provision requires the PUC to allow PGW to charge sufficient rates to satisfy its bond covenants, including the 1.5 times debt service coverage ratio rate covenant. Moody's calculation of net revenue debt service coverage treats the $18 million annual payment to the city as an operating expense, which results in a lower DSCR than the bond ordinance calculation.

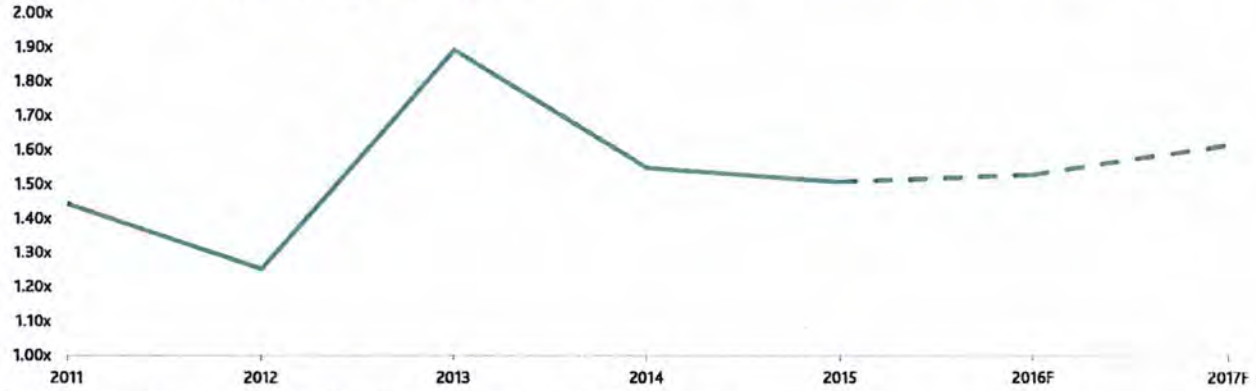
Operational and Financial Performance

FY 2015 operating revenues were down 8% over FY 2014 as low gas prices coupled with a modest winter which lowered demand drove revenue down. These factors also lead to a decrease in operating expenses particularly for natural gas purchases leaving net revenues before debt service in line with previous years, albeit slightly below 2014. For this reason Moody's calculated total net revenue debt service coverage on all PGW revenue bonds in 2015 of 1.51 times was marginally lower than the 1.55 times in 2014. Moody's DSCR includes the $18 million payment to the city as an operating expense, which lowers Moody's DSCR compared to the bond ordinance DSCR of 2.14 times for FY 2015.

PGW's forecast DSCR for FY 2016 (ending August 31) is likely to be in close to the DSCR for the last two years, but will improve in 2017 given the advance retirement of debt service in 2016. Thereafter, DSCRs are forecast to be in the 1.5 to 1.6 times range or stronger following a forecast base rate increase in FY 2018.

Exhibit 2

Moody's calculated Debt Service Coverage Ratio, which includes PGW's payment to the city as an operating expense, is expected to continue to be in the 1.5-1.6 times range through FY 2017.



Source: PGW Audited Financial Statements, Black & Veatch Engineering Report, and Moody's Investors Service

LIQUIDITY

Days cash on hand increased to 77 days in FY 2015 from 65 days in FY 2014 as this improvement was driven by lower operating expenses from lower sales and a moderate winter as well as a modest increase in unrestricted cash. PGW also had $90 million of available commercial paper capacity backed by a letter of credit as of the end of FY 2015. This is forecast to decline to about $50 million by the end FY 2016 as PGW draws on the program to partially fund capital spending. The commercial paper program is currently supported by letters of credit in the amount of $50 million from JP Morgan Chase Bank, N.A. (Aa2(cr), stable) and $70 million from PNC Bank, N.A. (A1(cr), stable). Moody's forecast for days liquidity on hand will likely remain in the 110 to 150 days range with direct cash liquidity remaining in the 70 to 90 days range, depending on the amount of excess cash flow or commercial paper used to fund capital investments.

Debt and Other Liabilities

PGW's outstanding debt continued to decline and is at its lowest debt level in about two decades in FY 2015 despite still having relatively high leverage compared to other gas utilities. PGW's capital plan, covering FY 2017 to FY 2021, totals about $587 million with the majority (82% or $483 million) dedicated to the distribution system, which is primarily the cast iron main replacement program. About half of the current plan will be funded with debt while the balance will come from the DSIC and internally generated funds.

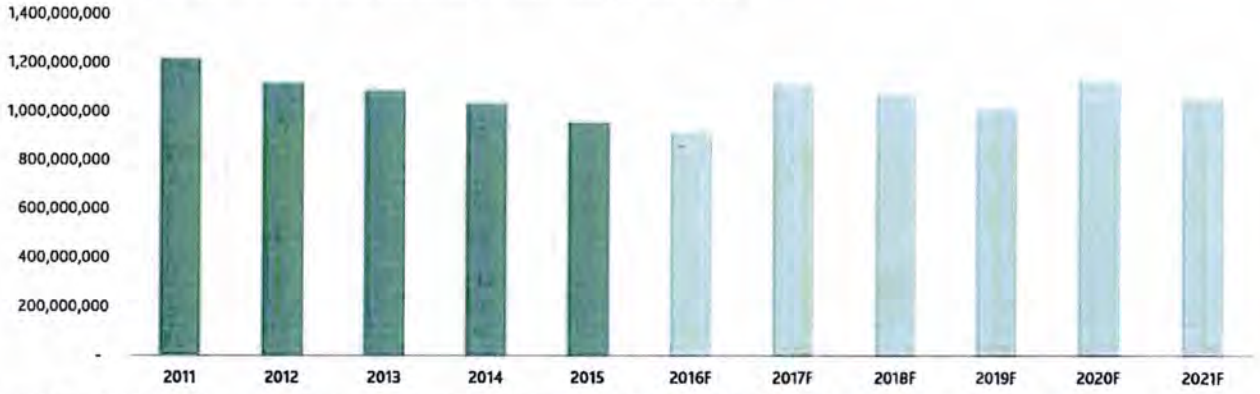
DEBT STRUCTURE

While PGW repays about $50 million in debt principal annually, new debt for capital improvements of about $270 million in FY 2017 and $180 million in FY 2020 will increase the utility's debt levels back to FY 2011 levels. PGW's debt service repayment schedule, post refunding, is declining overall with final maturity in FY 2040. This amortization profile provides PGW with the flexibility to layer in new debt service payments for new debt without notably raising annual debt service costs that would require a base rate increase. PGW's debt is primarily fixed rate with variable rate demand bonds accounting for about a quarter of the outstanding debt in recent years.

The current refunding fixes the interest rate on a portion of the variable Series 8B, 8C, 8D and 8E, of the 1998 Ordinance Bonds, which constitute most of PGW's variable rate debt, along with reducing the notional amount of the associated swap agreements. PGW's only other remaining variable debt, Series 5A-2 of the 1998 Ordinance Bonds, will remain unchanged and has approximately $30 million outstanding.

Exhibit 3

PGW's current capital plan increases debt outstanding to historically higher levels



Source: PGW Audited Financial Statement, PGW Fourteenth Series Preliminary Offering Statement, and Moody's Investors Service

DEBT-RELATED DERIVATIVES

PGW currently has one outstanding floating-to-fixed rate swap with JP Morgan Chase Bank, N.A. (Aa2(cr), stable) for a $225.5 million notional amount that synthetically fixes the variable interest rate on $225.5 million of outstanding variable rate demand bonds. This amount will be reduced to match the amount of variable rate debt still outstanding post refunding. Under the swap agreement, PGW pays JP Morgan semiannual fixed rate payments of 3.6745% and receives floating payments based on 70% of 1-month LIBOR. The mark-to-market value on the swap was a negative $50.6 million as of June 30, 2016. PGW has no collateral posting requirement and the swap is insured by Assured Guaranty Municipal Corp (A2, stable), whose rating is considered under the swap's additional termination events should the insurer's rating fall below A2/A and PGW's rating would also have to fall below Baa2/BBB.

PENSIONS AND OPEB

The City of Philadelphia sponsors PGW's single employer defined-benefit pension plan, the Philadelphia Gas Works Pension plan. In December 2011, the City passed an ordinance to offer all new PGW employees a one-time option of entering into a deferred compensation plan with an employer contribution equal to 5.5% of applicable wages or the defined-benefit pension plan with an employee contribution of 6% of applicable wages. PGW's defined-benefit pension funded ratio was decreased to about 68% in FY 2015 from about 74% in FY 2014 due to the adoption of GASB 68 in 2015 that changed the underlying assumptions including a 30 basis points reduction in the assumed discount rate and adjustments to life expectancies. The 68% funded status is also about even with the post-recession low seen in FY 2010. While PGW continues to pay its annual actuarial required contribution (ARC), the current funded ratio remains below pre-recession levels that averaged about 86%.

As of FY 2015 PGW's OPEB funded ratio is line with the prior year at about 21% but is an improvement from zero five years prior as a result of the PUC approved OPEB rate surcharge. We would expect this ratio to continue to annually improve given the PUC's approval to extend the OPEB surcharge beyond 2015 which would correspondingly lower the annual OPEB costs to the utility but note than an increase in unfunded liabilities in 2015. PGW's OPEB plan includes healthcare and life insurance benefits in accordance with their retiree medical program.

Management and Governance

PGW is municipally owned by the City of Philadelphia, but unlike other municipally owned utilities, PGW's rates are regulated by the state's PUC. PGW has a monopoly over gas distribution in its 134 square mile service territory. PGW is responsible for the day-to-day operation, management and maintenance of the gas system, yet several other entities have oversight over PGW's operations, including budgetary and rate approval. The state's PUC regulates PGW's rates, services and safety, while the seven member board of the Philadelphia Facilities Management Corporation (PMFC) is the executive management and operational director of PGW. The Philadelphia Gas Commission (PGC) is a five member oversight board who approves PGW's operating budget and some PFMC personnel, as well as reviewing the capital budget, real estate transactions and gas supply contracts for approval by the City Council. The five member PGC board is made up of the City Controller, two mayoral appointees, and two city council appointees. The City

Council enacts legislation to approve PGW's capital budget and gas supply contracts, as well as other material operating changes, real estate transactions and capital investments.

Legal Security

The 1998 Ordinance bonds are secured by net revenues of the system. There is a strong rate covenant and additional bonds test requiring net revenues to be 150% of annual debt service costs and a cash funded debt service reserve fund at maximum annual debt service. The indentures requires PGW to operate and maintain the Gas Works System as long as any bonds or notes are outstanding, effectively restricting the sale of PGW's assets unless the outstanding debt is paid in full.

Use of Proceeds

Bond proceeds will refund approximately $180 million fixed rate 7th Series Bonds, $3.3 million fixed rate 9th Series Bonds, $4 million fixed rate 8th Series A and about $63.5 million of the variable rate 8th Series Bonds. This will reduce PGW's variable rate exposure from about 28% of total debt as of the end of FY 2015 to about 22% as of the end of FY 2016, assuming the sale closes before the end of the fiscal year on August 31. The corresponding $63.5 million notional amount of the floating-to-fixed rate swap that synthetically fixes the interest rate on the 8th Series Bonds will be terminated. The letters of credit available to support a potential failed remarketing of the variable rate demand bonds will also be reduced by $63.5 million. PGW will also use about $14 million of cash on hand to advance redeem 2017 maturities in 2016, increasing the net present value savings of the transaction. The refunding is estimated to be about $220 million for an estimated net present value savings of 10.4% taken over the life of the debt. Bond proceeds will also fund issuance costs and a debt service reserve fund.

Obligor Profile

PGW is a municipally owned regulated gas distribution utility that supplies and transports natural gas to 500,000 primarily residential customers within the City of Philadelphia. PGW has a distribution monopoly in the City and serves as the supplier of last resort given there is gas supplier choice in Pennsylvania. If customers use another gas supplier, PGW is paid a transportation fee for the use of its lines. PGW's gas distribution system consists of approximately 3,032 miles of gas mains, 475,010 service lines, and 202 regulator stations. Approximately 48% (by length) of the gas mains are cast iron, 33% are steel, 4% are ductile iron and 15% are plastic. Of the steel lines, 50% are wrapped, coated and cathodically protected. About 29% of the service lines are steel and 71% are plastic. PGW also operates two LNG facilities for liquefaction, storage, and regasification of natural gas, which is used during the winter in addition to the utility's firm take from two interstate pipelines. The utility has laddered firm gas supply contracts and has a relatively balanced gas supply mix with half coming from the Spectra pipeline and the other half coming from the Transco-Williams pipeline. The proposed expansion to the LNG facility should further enable PGW to manage fluctuations in demand due to weather while also providing a physical hedge against price fluctuations.

Methodology

The principal methodology used in this rating was US Municipal Utility Revenue Debt published in December 2014. Please see the Ratings Methodologies page on www.moodys.com for a copy of this methodology.

Ratings

Exhibit 4

Philadelphia (City of) PA Gas Works

Issue	Rating
Gas Works Revenue Refunding Bonds, Fourteenth Series (1998 General Ordinance)	Baa1
Rating Type	Underlying LT
Sale Amount	$220,485,000
Expected Sale Date	08/18/2016
Rating Description	Revenue: Government Enterprise

Source: Moody's Investors Service

REPORT NUMBER 1036427

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MOODY'S
INVESTORS SERVICE

Rating Action: Moody's revises PGW's outlook to positive; Assigns Baa1 to $220 mil Gas Works Rev. Refunding Bds., 14th Series

Global Credit Research - 08 Aug 2016

New York, August 08, 2016 -- Issue: Gas Works Revenue Refunding Bonds, Fourteenth Series (1998 General Ordinance); Rating: Baa1; Rating Type: Underlying LT; Sale Amount: $220,485,000; Expected Sale Date: 08/18/2016; Rating Description: Revenue: Government Enterprise;

Moody's Investors Service has revised the outlook to positive from stable and assigned a Baa1 rating to the Philadelphia Gas Work's (PGW) $220 million Gas Works Revenue Refunding Bonds, Fourteenth Series (1998 General Ordinance). Concurrently, Moody's has affirmed the Baa1 rating on approximately $903 million of PGW's pre-refunding 1998 Ordinance bonds outstanding.

Summary Rating Rationale

The change in outlook to positive from stable recognizes PGW's strengthened financial position that is expected to continue owing to sound operational and cost management, a solid liquidity position and credit supportive rate regulation that improves cost recovery, evidenced by the further increase in the distribution system improvement charge (DSIC) that allows for greater cash funding of ongoing capital expenditures.

PGW's rating recognizes the utility's credit supportive regulatory environment that has increased the utility's asset base and supported an acceleration to its main replacement program; a stable financial position that is expected to be maintained; a sizeable low income and stagnant customer base; and the utility's position as a supplier of last resort, which yields consistently above average retail rates. The rating also incorporates the utility's sound management that has enhanced PGW's operating efficiencies resulting in recurring cost savings. The rating further considers PGW's outstanding indebtedness which has declined in recent years but is forecast to rise given the issuance of new debt to finance capital improvements through 2020. The moderately higher leverage profile is manageable given about $50 million of annual principal amortization, a declining debt service repayment schedule, and the fact that assets will be added to the balance sheet from the capital improvement program.

PGW's state rate regulation constrains its cost recovery framework in comparison to the majority of municipally owned gas utilities in the US, which benefit from local unregulated rate setting. Thus, the rating heavily factors the constructive relationship PGW has with the Pennsylvania Public Utility Commission (PUC) and the fact that the PUC must approve rates sufficient for PGW to satisfy its indenture required 1.5 times debt service coverage ratio (DSCR) rate covenant.

Rating Outlook

The positive outlook reflects Moody's view that PGW's sound fiscal management and credit supportive regulatory environment should continue to result in stable financial metrics and improved operations despite a forecast increase in leverage related to ongoing capital expenditures as well as the execution of the Liquefied Natural Gas (LNG) expansion project.

Factors that Could Lead to an Upgrade

Prudent management of the potential LNG expansion project

PGW's financial metrics are maintained at or near current levels

Factors that Could Lead to a Downgrade

Financial metrics narrow due to higher than expected costs and/or weaker revenue collections

A less credit supportive rate regulatory environment

Increased leverage without sufficient cost recovery or a material decline in liquidity

Legal Security

The 1998 Ordinance bonds are secured by net revenues of the system. There is a strong rate covenant and additional bonds test requiring net revenues to be 150% of annual debt service costs and a cash funded debt service reserve fund at maximum annual debt service. The indentures requires PGW to operate and maintain the Gas Works System as long as any bonds or notes are outstanding, effectively restricting the sale of PGW's assets unless the outstanding debt is paid in full.

Use of Proceeds

Bond proceeds will refund approximately $180 million fixed rate 7th Series Bonds, $3.3 million fixed rate 9th Series Bonds, $4 million fixed rate 8th Series A and about $63.5 million of the variable rate 8th Series Bonds. This will reduce PGW's variable rate exposure from about 28% of total debt as of the end of FY 2015 to about 22% as of the end of FY 2016, assuming the sale closes before the end of the fiscal year on August 31. The corresponding $63.5 million notional amount of the floating-to-fixed rate swap that synthetically fixes the interest rate on the 8th Series Bonds will be terminated. The letters of credit available to support a potential failed remarketing of the variable rate demand bonds will also be reduced by $63.5 million. PGW will also use about $14 million of cash on hand to advance redeem 2017 maturities in 2016, increasing the net present value savings of the transaction. The refunding is estimated to be about $220 million for an estimated net present value savings of 10.4% taken over the life of the debt. Bond proceeds will also fund issuance costs and a debt service reserve fund.

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Methodology

The principal methodology used in this rating was US Municipal Utility Revenue Debt published in December 2014. Please see the Ratings Methodologies page on www.moodys.com for a copy of this methodology.

Regulatory Disclosures

For ratings issued on a program, series or category/class of debt, this announcement provides certain regulatory disclosures in relation to each rating of a subsequently issued bond or note of the same series or category/class of debt or pursuant to a program for which the ratings are derived exclusively from existing ratings in accordance with Moody's rating practices. For ratings issued on a support provider, this announcement provides certain regulatory disclosures in relation to the credit rating action on the support provider and in relation to each particular credit rating action for securities that derive their credit ratings from the support provider's credit rating. For provisional ratings, this announcement provides certain regulatory disclosures in relation to the provisional rating assigned, and in relation to a definitive rating that may be assigned subsequent to the final issuance of the debt, in each case where the transaction structure and terms have not changed prior to the assignment of the definitive rating in a manner that would have affected the rating. For further information please see the ratings tab on the issuer/entity page for the respective issuer on www.moodys.com.

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S&P Global
Ratings

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Philadelphia's Gas Works Revenue Bonds Upgraded To 'A' From 'A-' On Stronger Fixed Cost Coverage

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NEW YORK (S&P Global Ratings) Aug. 10, 2016--S&P Global Ratings has raised its rating on the City of Philadelphia's gas works (PGW) revenue bonds, issued under its 1998 ordinance, to 'A' from 'A-'. At the same time, S&P Global Ratings has assigned its 'A' rating to Philadelphia's revenue refunding bonds, 14th series, issued under the Philadelphia Gas Works' (PGW) 1998 ordinances. The outlook is stable.

S&P Global Ratings has also raised its rating on the following issues rated under our joint support criteria (low correlation):

- 1998 ordinance, 8th series D bonds, jointly supported by a letter of credit from Royal Bank of Canada, to 'AA+/A-1+' from 'AA/A-1+'
- 1998 ordinance, 8th series B bonds, jointly supported by a letter of credit from Wells Fargo Bank N.A., to 'AA+/A-1+' from 'AA/A-1+'
- 1998 ordinance, 8th series C bonds, jointly supported by a letter of credit from Barclays Bank PLC, to 'AA/A-2' from 'AA-/A-2'

Finally, S&P Global Ratings affirmed its 'AA/A-1' rating on the 1998 ordinance 8th series C bonds, jointly supported (low correlation) by a letter of credit from PNC Bank N.A.

"The upgrade reflects strengthened coverage of fixed costs, and our expectation of additional improvement over the next five years," said S&P Global Ratings credit analyst Jeff Panger.

We understand that a portion of the proceeds of 14th series bonds will refund debt outstanding (including the 8th series B, C, D, and E bonds), and make an estimated $6.6 million in termination payments on $63.5 million in notional swaps.

PGW is the nation's largest municipally owned gas utility, serving approximately 500,000 customers in Philadelphia. Low collection rates had plagued it for several years, although this has improved recently. We believe that the improvement has resulted from low natural gas prices and lower demand associated with generally warmer weather, driving down customer bills and reducing delinquencies. While we also believe that the general improvement in collection rates has been in part due to the implementation of more stringent enforcement to address delinquent accounts, we remain uncertain as to whether this trend will continue under less optimal circumstances.

The stable outlook reflects our view of improved coverage levels over the past two years, and projection of further improvement, which we believe will preserve credit quality at the higher rating.

We do not expect to raise the rating further over the next two years, even if the utility gains full approval for its requested base-rate increase (resulting in higher coverage), because this would not lead to an appreciable improvement in credit quality for the rating.

Although unlikely, downward rating pressure could result if financial metrics (coverage and liquidity) fall materially below recent recorded levels.

Certain terms used in this report, particularly certain adjectives used to express our view on rating relevant factors, have specific meanings ascribed to them in our criteria, and should therefore be read in conjunction with such criteria. Please see Ratings Criteria at www.standardandpoors.com for further information. Complete ratings information is available to subscribers of RatingsDirect at www.globalcreditportal.com and at www.spcapitaliq.com. All ratings affected by this rating action can be found on the S&P Global Ratings' public website at www.standardandpoors.com. Use the Ratings search box located in the left column.

S&P Global
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Summary:

Philadelphia; Gas; Joint Criteria

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Summary:

Philadelphia; Gas; Joint Criteria

Credit Profile		
US$220.5 mil gas wks rev rfdg bnds 14th series (1998 gen ordinance) ser 2016 due 10/01/2037		
Long Term Rating	A/Stable	New
Philadelphia gas wks (Gen Ordinance)		
Unenhanced Rating	A(SPUR)/Stable	Upgraded
Philadelphia gas wks (1998 General Ordinance)		
Unenhanced Rating	A(SPUR)/Stable	Upgraded
Philadelphia gas wks 4th series (1998 Gen Ordinance)		
Unenhanced Rating	A(SPUR)/Stable	Upgraded

Rationale

S&P Global Ratings has raised its rating on the City of Philadelphia's gas works (PGW) revenue bonds, issued under its 1998 ordinance, to 'A' from 'A-'. At the same time, S&P Global Ratings has assigned its 'A' rating to Philadelphia's revenue refunding bonds, 14th series, issued under the Philadelphia Gas Works' (PGW) 1998 ordinances. The outlook is stable.

S&P Global Ratings has also raised its rating on the following issues rated under our joint support criteria (low correlation):

- 1998 ordinance, 8th series D bonds, jointly supported by a letter of credit from Royal Bank of Canada, to 'AA+/A-1+' from 'AA/A-1+'
- 1998 ordinance, 8th series B bonds, jointly supported by a letter of credit from Wells Fargo Bank N.A., to 'AA+/A-1+' from 'AA/A-1+'
- 1998 ordinance, 8th series C bonds, jointly supported by a letter of credit from Barclays Bank PLC, to 'AA/A-2' from 'AA-/A-2'

Finally, S&P Global Ratings affirmed its 'AA/A-1' rating on the 1998 ordinance 8th series C bonds, jointly supported (low correlation) by a letter of credit from PNC Bank N.A.

The upgrade reflects strengthened coverage of fixed costs, and our expectation of additional improvement over the next five years.

The 1998 ordinance bonds, although rated as working-lien bonds, were subordinate to the closed senior lien 1975 ordinance debt. They are now effectively senior-lien obligations because the 1975 ordinance bonds have been refunded.

We understand that a portion of the proceeds of 14th series bonds will refund debt outstanding (including the 8th

series B, C, D, and E bonds), and make an estimated $6.6 million in termination payments on $63.5 million in notional swaps.

The ratings reflect what we view as PGW's credit strengths:

- Solid coverage of debt service requirements over fiscal years 2013 through 2015 (after the annual payment to Philadelphia's general fund). Management estimates strengthening coverage in fiscal year 2016, and we expect this to continue over fiscal years 2017-2021. However, the out-year coverage levels depend on the utility receiving Pennsylvania Public Utility Commission (PAPUC) approval to increase base rates $40 million increase for fiscal 2018. While the prospect of approval in full is uncertain, the PAPUC has been significantly more supportive of PGW rate filings in recent years;
- Good liquidity, with $114 million in unrestricted cash, (measuring an adequate 76 days of operating expenses), which we project will remain steady through 2021. A $120 million commercial paper (CP) program the utility can use to provide working capital, as well as capital purposes, also bolsters liquidity;
- Moderate capital spending planned for the next five years, with a prudent mix of debt-financing and internally generated funding helping to further reduce PGW's debt-to-capitalization ratio, though debt burden per customer is expected to increase;
- Generally solid collections that have enhanced the utility's financial stability. The improved collections are partially due to above-average temperatures and, to a greater extent, lower and more stable gas prices. These conditions have made bills generally more affordable, but cannot necessarily be counted on. However, the improved collections are also a function of the PGW's enhanced billing and collection procedures, which are expected to continue;
- A credit supportive rate structure that insulates margins from weather variability and automatically passes on gas costs to ratepayers through quarterly adjustments; and
- The utility's strong management team.

Constraining further credit improvement are the following factors:

- Weak service area demographics and above-average rates , historically exposing PGW to collection difficulties during periods of high gas costs or below-average temperatures, while also limiting financial flexibility;
- Dependence on the PAPUC for approval for base-rate increases, with a mixed history of support for filings, although this has improved recently;
- Very high user rates; and,
- We consider debt levels moderately high.

PGW's rates are subject to PAPUC approval, which we view as a credit weakness. From 2000 (when the commission began regulating the utility's rates) to October 2008, the PAPUC approved just 42% of the total amount of base-rate increases PGW requested, although all gas cost rate adjustments have been received in full and on time.

In July, 2010, the PAPUC approved a settlement between PGW and six interveners to make permanent a $60 million extraordinary base-rate increase and a $16 million surcharge to build funding of the annually required contribution for other postemployment benefits. As part of the approved settlement, the utility agreed not to seek another base rate increase for two years, and not issue additional new money debt three.

We believe that the 2010 settlement resulted in improved cash flow and financial flexibility, and PGW has received approvals in full for several surcharges filed with PAPUC over the past several years. The utility expects to seek a $40

million base-rate increase in January 2017 (effective for fiscal 2018). We believe that PGW's recent track record indicates a more supportive regulatory environment. Moreover, we believe that even if the utility receives less than its full request, financial metrics will continue to support the higher rating.

PGW has not issued new money debt since 2010, and debt ratios have shown steady improvement. Debt per customer has declined nearly 20% since 2011, to $1,973, while debt has decline to 78% of total capitalization in 2015, down from 82% in 2010. The utility expects to issue about $41 million of CP to provide interim financing of capital needs in fiscal 2016; long-term debt issuance plans include a $270 million issuance in fiscal 2017 (new money and CP take-out) and $180 million in fiscal 2020 (we note that the latter issuance is $80 million higher than previously planned). PGW expects debt-to-capitalization will continue declining, reaching a projected 64% by 2021. However, this is higher than previously expected, because the anticipated 2020 issuance has been upsized.

We understand that PGW is exploring the possibility of increasing its current liquefaction capabilities at its existing Richmond liquefied natural gas facility, and estimates a roughly $120 million capital cost, $110 million of which would be debt-financed and amortized over 25 to 30 years. Management expects that it will proceed with the project only if it is able to secure firm bilateral contracts (of 15 to 20 years) that would enable them to break-even through the sale of roughly 40% of the expanded liquefaction capabilities over the (longer) life of the debt. Although the project would provide some operational benefits (creating redundancies and providing a possible replacement to its current aging liquefier, for example), we believe that it does increase risk. However, we believe the risks are manageable within the context of PGW's improved financial profile and increased costs associated with the project should the utility fail to make sufficient sales at projected prices.

PGW's residential heating rates range from 21% to 92% higher than those of other Pennsylvania utilities. We believe this is a function of historically weak collections, sizable bad debt expense, and customer responsibility and senior citizen discount programs. Similar disparities exist among other customer classes as well. As such, much of the utility's growth is for unbundled service, with about 37% of load supplied by alternate suppliers.

In our opinion, PGW has a mutually interdependent relationship with Philadelphia. Historically, the city received an $18 million annual payment from the utility, but with PGW facing cash flow problems, the city forgave the payment in 2004, and annually granted the payment back to PGW from 2005 through 2010. From fiscal years 2011-2015, Philadelphia retained the payment, a decision that we believe was made in light of the utility's improving financial condition and the impact of the economy on the city's budget. Philadelphia's five-year financial plan anticipates the continuation of the annual payment.

Coverage levels have shown steady improvement, and are at levels that we consider both supportive of a higher rating and sustainable. S&P Global Ratings evaluates PGW's financial metrics assuming the annual payment is made, treating it as an operating expense. Since 2012, coverage levels have ranged from 1.25x (2012) to 1.91x (2013), with the low partially explained by above-average temperatures, and the high explained by a one-year dip in debt service requirements. Coverage levels were solid in 2015 at 1.54x, consistent with that of the previous year, and our expectations at our most recent review. PGW estimates 2016 coverage at 1.77x, and projects coverages ranging from 1.8x to 2.0x through 2021, levels we consider strong. Although these projections assume PAPUC approval of PGW's expected $40 million base-rate increase request for fiscal 2018, we believe coverage levels will continue to support the

higher rating even if the utility does not receive full approval of its rate request.

We consider PGW's liquidity to be adequate. About $114 million in unrestricted cash and investments provides 76 days of operating expenses, and a $120 million CP program that can be used for working capital purposes supplements this. Management's projections suggest that unrestricted cash levels should continue over the next five years.

PGW is the nation's largest municipally owned gas utility, serving approximately 500,000 customers in Philadelphia. Low collection rates had plagued it for several years, although this has improved recently. We believe that the improvement has resulted from low natural gas prices and lower demand associated with generally warmer weather, driving down customer bills and reducing delinquencies. While we also believe that the general improvement in collection rates has been in part due to the implementation of more stringent enforcement to address delinquent accounts, we remain uncertain as to whether this trend will continue under less optimal circumstances.

Outlook

The stable outlook reflects our view of improved coverage levels over the past two years, and projection of further improvement, which we believe will preserve credit quality at the higher rating.

Upside scenario

We do not expect to raise the rating further over the next two years, even if the utility gains full approval for its requested base-rate increase (resulting in higher coverage), because this would not lead to an appreciable improvement in credit quality for the rating.

Downside scenario

Although unlikely, downward rating pressure could result if financial metrics (coverage and liquidity) fall materially below recent recorded levels.

Ratings Detail (As Of August 10, 2016)

Philadelphia gas wks (1998 Gen Ordinance)		
Long Term Rating	A/Stable	Upgraded
Philadelphia gas wks (1998 Gen Ord) (wrap of insured) (AMBAC & AGM) (SEC MKT)		
Unenhanced Rating	A(SPUR)/Stable	Upgraded
Philadelphia gas works rev bnds (1975 Gen Ordinance) ser 19TH dtd 05/15/2007 due 10/01/2021-2023		
Unenhanced Rating	NR(SPUR)	
Philadelphia gas works rev bnds (1975 Gen Ordinance) ser 19TH dtd 05/15/2007 due 10/01/2021-2023		
Unenhanced Rating	NR(SPUR)	
Philadelphia JOINTCRIT		
Long Term Rating	AA+/A-1+	Upgraded
Unenhanced Rating	A(SPUR)/Stable	Upgraded
Philadelphia JOINTCRIT		
Long Term Rating	AA/A-1	Affirmed
Unenhanced Rating	A(SPUR)/Stable	Upgraded

Ratings Detail (As Of August 10, 2016) (cont.)

City of Philadelphia, Pennsylvania, Gas Works Revenue Refunding Bonds, Eighth Series C (1998 General Ordinance)

Unenhanced Rating	A(SPUR)/Stable	Upgraded
Long Term Rating	AA/A-2	Upgraded

City of Philadelphia, Pennsylvania, Gas Works Revenue Refunding Bonds, Eighth Series D (1998 General Ordinance)

Unenhanced Rating	A(SPUR)/Stable	Upgraded
Long Term Rating	AA+/A-1+	Upgraded

Philadelphia gas wks (1975 Gen Ordinance) Seventeenth ser

Unenhanced Rating	NR(SPUR)

Many issues are enhanced by bond insurance.

Certain terms used in this report, particularly certain adjectives used to express our view on rating relevant factors, have specific meanings ascribed to them in our criteria, and should therefore be read in conjunction with such criteria. Please see Ratings Criteria at www.standardandpoors.com for further information. Complete ratings information is available to subscribers of RatingsDirect at www.globalcreditportal.com. All ratings affected by this rating action can be found on the S&P Global Ratings' public website at www.standardandpoors.com. Use the Ratings search box located in the left column.

RATES PHILADELPHIA, PA'S GAS WORKS REV REFUNDING BONDS; OUTLOOK STABLE

Fitch Ratings-New York-08 August 2016: Fitch Ratings has assigned a 'BBB+' rating to the following revenue bonds issued by the city of Philadelphia on behalf of the Philadelphia Gas Works (PGW):

--Approximately $220,550,000 Gas Works Revenue Refunding Bonds, Fourteenth Series (1998 General Ordinance).

The bonds are scheduled to price via negotiation August 20. The bonds will refund a portion of outstanding parity bonds (Seventh Series, Ninth Series and Eighth Series A-E) for interest cost savings, fund termination payments related to corresponding swap agreements and pay issuance costs.

In addition, Fitch affirms the following rating:

--$915,175,000 million gas works revenue refunding bonds, various series (senior 1998 general ordinance) at 'BBB+'.

The Rating Outlook is Stable.

SECURITY

The 1998 general ordinance bonds are secured by net revenues of the gas works utility.

KEY RATING DRIVERS

LARGE GAS DISTRIBUTION SYSTEM: PGW is the largest municipally-owned gas distribution utility in the nation serving slightly more than 500,000 accounts located entirely within the City of Philadelphia (general obligation bonds rated 'A-'/Stable Outlook). The system provides natural gas on a retail basis to a considerably diverse and largely residential customer base exhibiting no concentration among users.

SUSTAINED IMPROVEMENT IN FINANCIAL PERFORMANCE: A sustained improvement in financial metrics and a continued reduction in debt levels resulted in a rating upgrade in 2015. Contributing factors include prior rate relief, greater cost recovery through various surcharges, historically low natural gas prices and PGW's ability to current fund its capital needs and maintain healthier collection rates. Fitch expects these trends will continue based on the latest financial forecast.

STABLE FINANCIAL METRICS: Fitch calculated debt service coverage has averaged a solid 1.52x over the prior five years while coverage of full obligations, which reflects the annual transfer made to the city's general fund, has also remained at a healthy level, averaging 1.37x since 2010. Liquidity continued at an acceptable level in fiscal 2015, equal to 74 days of cash on hand.

RATE REGULATED: PGW's ability to establish its rates is subject to oversight by Pennsylvania Utility Commission (PUC), potentially limiting needed rate increases and overall financial flexibility. Positively, the utility's relationship with the PUC has remained constructive and supportive in recent years.

WEAK BUT STABLE DEMOGRAPHICS: The city's economy continues to strengthen and is well anchored by several large health care and higher education institutions. However, wealth indicators for the service area remain are generally weak, contributing to chronically below average collection rates and sizeable write-offs, and compounding PGW's high rates.

RATING SENSITIVITIES

LIMITED FINANCIAL FLEXIBILITY: Despite the overall improvement in Philadelphia Gas Works' credit quality in recent years, Fitch expects the utility's exceptionally high rates, the service area's low income levels and a regulatory environment that includes state and local oversight will continue to limit financial flexibility. A return to weaker collection rates, diminished cash flow and an inability to gain needed rate relief and recover costs would exert downward pressure on the ratings.

FORECAST RESULTS REALIZED: PGW's ability to generate financial results included in its latest financial forecast, which hinge on gaining rate relief and further sustaining its trend of improved revenue collection could ultimately warrant positive rating consideration.

CREDIT PROFILE

IMPROVED CREDIT QUAILITY

PGW's financial performance since gaining rate relief beginning in fiscal 2010 has exhibited a generally more favorable trend with metrics supportive of the 'BBB+' rating. Fitch calculated debt service coverage of both senior and subordinate lien obligations has averaged 1.52x over that span, compared to 1.1x between fiscal 2006 and 2009. Coverage of full obligations, which reflects the annual transfer made to the city's general fund, has also remained at a healthy level, averaging 1.37x since 2010.

Liquidity is somewhat low but still adequate for the rating category. Unrestricted cash and investments peaked at 74 days in fiscal 2015 and have remained at no less than 55 days since 2010, despite management's prudent decision to use cash flow to defease or accelerate bond principal by approximately $50 million in recent years.

MANAGEABLE CAPITAL PROGRAM

PGW's capital improvement program (CIP) through fiscal 2021 appears manageable with spending levels moderately higher compared with historical programs. Planned spending spanning fiscal years 2017-2021 totals $587.2 million, the vast majority of which will be to reduce the inventory of cast iron mains. PGW remains committed to an ongoing cast iron main replacement program that has accelerated in recent years following the implementation and subsequent increase of a distribution system improvement charge.

Capital program funding sources will be almost evenly split between excess cash flow and debt issuances planned for midway through fiscal 2017 and the second half of fiscal 2020. Leverage ratios have fluctuated over the years but have generally exhibited gradual improvement with the current funding of capital projects leading to a steady decline in total debt outstanding. The ratios of equity to capitalization and debt to funds available for debt service (FADS) progressed to 22% and 7.1x, respectively, at the close of fiscal 2015 compared to 17.8% and 8.8x, respectively, in 2010.

Fitch expects a moderate increase in total debt outstanding by 2020 based on the additional borrowings plans; however, the related change in leverage ratios should be tolerable at the current

rating category. Additional debt associated with a tentatively planned expansion of existing liquefied natural gas (LNG) facilities would likely pressure debt metrics further. However, the potential for higher LNG sales as a result of the expansion could enhance cash flow and sufficiently mitigate any rating concerns.

SOCIOECONIOMIC CHARACTERISTICS COMPOUND HIGH RATES

PGW's exceptionally high rates, the city's challenging demographics and the state's regulation of retails rates continue to constrain PGW's operating flexibility. Residential rates are more than 50%higher than all other gas distribution systems operating within the state in part due to historically weak collections and extensive utility-sponsored discount programs that benefit low-income customers. The city's nearly 27% poverty rate is nearly twice the national rate, and median household income (MHI) approximates just 70% of the state and national averages. Consequently, PGW's accounts receivable balances and annual write-offs are routinely high relative to most utilities. Fitch notes, however, that after remaining consistently below 90% prior to 2004, revenue collection has averaged a more acceptable 96% over the prior 10 years.

HEIGHTENED REGULATORY ENVIRONMENT

PGW operates within a heightened regulatory environment with the gas commission, city council and the PUC maintaining oversight of the utility's operations and the PUC retaining rate setting authority.. While the regulatory bodies have been increasingly more supportive over the last several years, Fitch believes the multiple layers of oversight will continue to limit the utility's financial flexibility,

Fitch notes the PUC's ratemaking methodology is designed to ensure PGW recovers its costs, meets its rate covenant of 1.5x coverage on senior and subordinate lien obligations, and continues to fund a required $18 million annual utility payment to the city.

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PGW St. No. 3

BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

TESTIMONY OF

DANIEL J. HARTMAN

ON BEHALF OF

PHILADELPHIA GAS WORKS

DOCKET No. R-2017-2586783

February 2017

Q. PLEASE STATE YOUR NAME, POSITION AND BUSINESS ADDRESS.

A. Daniel J. Hartman, Managing Director, PFM Financial Advisors LLC, 4350 North Fairfax Road, Arlington, Virginia 22203, (703) 741-0175. I am a financial advisor to state and local governments and authorities.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by The PFM Group and work in its municipal advisory practice through its subsidiary PFM Financial Advisors LLC ("PFM"). I am a Managing Director and shareholder in the firm.

Q. SUMMARIZE YOUR PROFESSIONAL QUALIFICATIONS.

A. At PFM, I co-lead the national Public Utilities group, which assists our clients on all aspects of capital markets transactions – debt structuring, rating agency and investor communication, and transaction execution. PFM is the nation's largest independent financial advisor to state and local governments and a registered municipal advisor with the SEC and MSRB. PFM is the leading advisor to public utility clients (gas, power, water and sewer) and participates in a greater share of capital markets transactions for public utility clients than any other firm in the municipal capital markets. Prior to re-joining PFM in 2006, I was a Managing Director for Bear Stearns Capital Markets and Citigroup Global Markets, where I provided investment banking and advisory services to utility clients.

As the co-head of PFM's public utilities group, I have been involved in over $50 billion of debt transactions, many of which are for the largest gas systems throughout the United States. These include advisory roles to the Philadelphia Gas Works (PGW), CPS Energy (San Antonio Electric and Gas), Long Beach (CA) Gas & Oil, and Colorado

Springs Utilities. Several billion dollars of these financings have been undertaken to finance gas distribution system improvements and natural gas supply.

In addition to my general expertise on public utility capital markets transactions, I have extensive experience working on debt structuring, credit structuring and rating/investor issues for utility systems that have similar characteristics as the PGW's system. PFM has particular expertise in providing advisory services for capital markets transactions and routinely works on several billion of municipal utility financings at any point in time that provide direct interface with rating analysts from the three major rating agencies as well as large institutional investors active in the municipal bond market.

Q. DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A. I have a Bachelor of Arts degree from the University of North Carolina – Chapel Hill in Economics. I also studied at the London School of Economics.

Q. HAVE YOU EVER TESTIFIED BEFORE ANY REGULATORY AGENCIES OR LEGAL PROCEEDINGS?

A. Yes, I have testified before the California Public Utilities Commission on certain matters relating to electric deregulation restructuring and its impact on municipal utilities. I have also been an expert witness in certain public utility bankruptcy proceedings.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose my testimony is four fold: 1) to provide an update on PGW's standing in the municipal capital markets and the critical role of maintaining its financial standing with rating agencies and investors; 2) to explain why it is crucial that the Pennsylvania Public Utility Commission (the "Commission") grant PGW's requested rate increase in order to maintain PGW's level of financial performance, such as debt service coverage and liquidity, at necessary levels to ensure access to the municipal capital markets; 3) to

identify the financial consequences, both positive and negative, if the Commission approves or does not approve the a substantial portion of the requested rate amount; and 4) to explain why it is crucial and necessary for the Commission to consider and approve the actions that PGW is undertaking to fund its future capital improvement program and prior debt obligations.

Q. PLEASE PROVIDE AN OVERVIEW OF KEY FINANCIAL EVENTS FOR PGW SINCE THE COMMISSION GRANTED PGW EXTRAORDINARY RATE RELIEF IN 2008.

A. PGW has undergone a significant financial and management turnaround in the last several years, particularly since November 2008 when PGW received extraordinary rate relief, which was subsequently made permanent. At the point of the recession and credit crisis in 2008, PGW's finances were near a disastrous position, with ratings teetering on the brink of "junk" status (below Baa3/BBB-) and PGW's access to capital markets all but gone. Only with the clear backing of the Commission in 2008 with the extraordinary rate relief did PGW stave off the potential for an event of default on its debt and the acceleration of certain financial obligations. As has been stated in testimony from PFM previously in 2010, the 2008 extraordinary rate relief effectively saved PGW financially by maintaining its access to the commercial paper market with its commercial paper program and to the fixed rate bond market, as well as the ability to procure credit facilities for its variable rate programs. This Commission action was critical to the stabilization of PGW's finances, allowing PGW to arrest and reverse the deterioration in its financial position.

Over the course of the next eight years since the extraordinary rate relief of $60 million, the Commission has objectively reviewed and supported a number of rate requests put forward by PGW. These measures have stabilized PGW's finances and

afforded PGW the ability the regain its footing in the municipal market, both with respect to procuring necessary credit facilities and to maintaining access in the fixed rate bond market with lower borrowing costs.

Critical to the stabilization of PGW's finances were the prior Commission rate actions in July 2010 to make permanent the extraordinary rate relief of $60 million granted in 2008, the 2010 decision (and subsequent actions) that allowed PGW to start funding its significant other post-employment benefit (OPEB) liability, and the 2013 implementation of the Distribution System Improvement Charge (DSIC) and subsequent positive actions to increase the funding of its distribution system improvements. These stabilizing actions by the Commission allowed PGW to improve its financial performance and metrics consistent with its "A" rated municipal utility peers. This had simply not been the case in the period of 1995-2008.

Q. WHAT WAS THE RESPONSE FROM THE CAPITAL MARKETS, PARTICULARLY BOND INVESTORS AND RATING AGENCIES?

A. Reflecting this stabilization of PGW's finances, the major bond rating agencies of Moody's Investor Service (Moody's), Standard & Poor's Ratings Group (S&P) and Fitch Investor Service (Fitch) have all improved their bond ratings from the precipice of junk status (below Baa3 or BBB-) to at least a couple of rating notches above that mark. In 2010, PGW had ratings of Baa2/BBB+/BBB for their senior lien rating, and those have now risen to Baa1/A/BBB+. While still at rating levels below most of their municipal utility peers, the improvement of PGW's bond ratings reflect both the constructive support of the Commission and management's ability to implement its financial plan.

Specific to the rating criteria and the rating agency's actions with respect to PGW, the rating agencies have each cited the strong track record of regulatory approval of

required rate increases to meet required cost recovery and its bond ordinance rate covenant. Without any question, the current and improving investment grade ratings are predicated on the Commission's careful review of PGW's finances and its appropriate support of PGW rate increases necessary to comply with its legal covenants and to support the credit position of bondholders.

Ratings for municipal utilities – which in turn provide access to the capital markets and determine the cost of those borrowed funds – are heavily weighted on the willingness and ability of the governing body to permit the utility to charge rates that cover its costs and maintain its financial stability, particularly since all but a few municipal utilities set their own rates without regulatory oversight from a public utility commission. Thus, in the case of PGW, the application of the municipal utility rating methodology simply shifts this analysis of willingness and ability to raise rates to include the Commission. The rating agencies have repeatedly stated in public reports that the very constructive relationship between PGW and the Commission, and the necessary rate support in the last few years is the most critical factor that has allowed PGW's rating to stabilize and improve to its current bond rating levels.

Q. WHAT WOULD HAPPEN IF THE COMMISSION DID NOT CONTINUE TO EVIDENCE ITS SUPPORT FOR PGW?

A. While the Commission's rate support during 2008-2016 has been very constructive in stabilizing PGW's finances, any wavering of the Commission support for PGW's necessary rate increases will be met with a decisively negative reaction. Often in the area of municipal utility ratings, the minute that a governing body fails to objectively review and support a necessary rate increase, credit ratings and access to capital markets quickly deteriorate. Municipal credit ratings are often very slow to rise (as evidenced by the slow

recovery of PGW's ratings over the last eight years), but can go down precipitously. Thus, it is critical to assure rating agencies and investors of the long-term commitment to cost recovery and stability of PGW's finances, not just sufficiency for any given year.

Bond investors and credit facility providers also react similarly to any failure to support needed rate increases by a governing political or regulatory body. So while PGW has been able to maintain access to, and improve its borrowing costs for, long-term bond transactions in the last few years, as well as maintain access to credit facilities for its variable rate and commercial paper programs, there is certainly no guarantee that the favorable support will continue. And the frequency with which PGW must access the bond market and/or renew its credit facilities emphasize the criticality of maintaining investor and credit provider confidence in the rate setting function of the utility.

Q. HOW HAVE THE PRIOR COMMISSION ACTIONS TRANSLATED TO PGW'S FINANCIAL METRICS AND CURRENT FINANCIAL POSITION?

A. As discussed considerably above, PGW maintains a significant amount of risk to its ongoing ability to obtain regulatory approval from the Commission for its requested rate increases. Failure to get approval of requested cost recovery certainly entails much greater scrutiny from investors and rating agencies that financial margins and liquidity will not be maintained. This is particularly true for PGW, as many of its financial metrics, such as days cash on hand, are already fairly modest to begin with, and debt to capitalization ratios already at the high end of the spectrum. Without PGW's ability to secure necessary rate support, this significantly increases the chance of a credit downgrade.

While PGW's financial metrics have improved materially in the last five years, they are not at levels that allow much margin of error. One key metric is the debt service

coverage ratio, which is net revenues of PGW divided by debt service, a measure of protection that bondholders have to changes in net revenues. PGW's debt service coverage over the last five years has risen to slightly over 2.0x coverage in FY 2016 from 1.75x in FY 2012 (and above the minimum 1.50x legal requirement in PGW's bond ordinance), pushing up PGW's bond ratings and outlook along the way. However, the apparent strength of this credit metric is masked by PGW's financial commitment to transfer $18 million of net revenue to the City of Philadelphia General Fund, the obligation to fund PGW's OPEB required annual contribution of $18.5 million, and the $33 million of cash funded annual capital improvement from the dedicated DSIC. These obligations, all of which have been approved by the Commission, effectively usurp much of the current financial margin in the 2.0x coverage ratio, let alone the minimum 1.50x in the legal covenants that the Commission methodology explicitly allows. That is, much of the apparent cushion between the minimum 1.50x coverage and the 2.0x coverage ratio is absorbed by the three continuing obligations listed above. When looking at the core debt coverage and the rating agencies' adjusted coverage metrics, PGW is well below that of its peers at the "A" level and more in line with poorly rated and financially challenged utilities in the lower "BBB" rating levels. PGW's financial forecast now requires at least $70 million to maintain the debt coverage levels that exist today at or just above the 2.0x coverage level. Without that rate support from the Commission, PGW's debt service coverage metric falls rapidly to bare minimum levels of 1.50x and exposes PGW to significant financial difficulties in funding ongoing operations and its capital program, particularly the Commission-supported main replacement program. If a substantial portion of the amount of the requested levels cannot be obtained, it clearly has negative

implications for maintaining the same protections for investors moving forward and allowing PGW's bond rating to stay in the same rating category.

A second metric that also improved in the past five years, but exhibits the potential weakness, is the amount of leverage (total debt) that PGW maintains. PGW has reduced its total debt in recent years, based on debt to capitalization ratios, with the ratio going from 80% to 75% . The rating agencies have all cited the high debt burden as a limiting factor in the ratings, since a high debt burden minimizes the ability to fund necessary programs, if pay as you go funding (from current operations) is not viable moving forward. In other words, PGW cannot simply keep borrowing an ever increasing amount of dollars if the corresponding rate support is not evident.

Assuming PGW receives the requested rate increase, the Company's projections continue to show significant de-leveraging in the system – particularly with the Commission approved cash funding for the distribution system repair and improvement program – and total debt to capitalization is projected to be lowered to 65% by FY 2021. To the extent that a material portion of PGW's requested rates are not received, it will force substantial additional leverage back on the system, quickly reversing the favorable trend and the flexibility that PGW would have obtained moving forward.

A third financial metric that has shown improvement for PGW, but remains financially susceptible if approved rates do not provide substantial cost recovery, is its liquidity or days cash on hand. PGW ended FY2016 with actual days cash on hand of $91 million (77 days cash on hand), which is up from $75 million in FY 2012 (54 days cash), but not at rating agency medians for "A" to "AAA" rated municipal utilities (150 days cash on hand). Further, for certain rating agency metrics calculations, PGW's

commercial paper program provides an additional $75-120 million of liquidity (typically reserved for emergency needs), depending upon the amount drawn for other capital purposes. But at current liquidity levels, there is very little margin of error in PGW's financing plan. Even while the Commission has approved cost recovery in prior rate cases, such as making the extraordinary rate relief permanent, PGW would exhaust its liquidity very quickly without the rate support requested. To the extent that PGW does not get the rate recovery that it is seeking currently, it would immediately put significant pressure on liquidity to cover shortfalls in operations and the capital improvement program. While PGW could shift to additional debt funding to absorb some of the shortfalls, the immediate front line impact is on PGW's liquidity position. At its cash position in the pro forma test year, failure to get approved rates will cause PGW to effectively run out of cash, demonstrated by the negative cash position of PGW in the Forecast Period (the fiscal years FY 2019 through FY 2022), as shown in Exhibit JFG-1. To offset that negative cash flow would require substantial structural changes in PGW's financial plan, which are likely not to be feasible. Given these improving but still susceptible financial metrics, it is highly likely that any failure of the PUC to provide substantial rate support for needed cost recovery would generate troubling rating downgrades for PGW. Each of the rating agencies repeatedly cites the factors that would lead to downgrades, and all three of the rating agencies have identified a less supportive rate regulatory environment as the critical factor that could lead to a credit downgrade or change in credit profile. Further, associated with that less supportive rate regulatory environment are greater leverage, less debt coverage, and reduced liquidity, all of which are expected immediate by-products of a less supportive regulatory environment. It

would be hard to imagine that PGW could keep the improvements in its bond ratings to Baa1/A/BBB+ that it has achieved, and would quickly fall back in the "BBB" category near junk status without Commission rate support.

Q. WHAT ARE THE POTENTIAL POSITIVE IMPACTS OF PGW'S ABILITY TO GAIN APPROVAL OF ITS FULL REQUESTED RATE INCREASE?

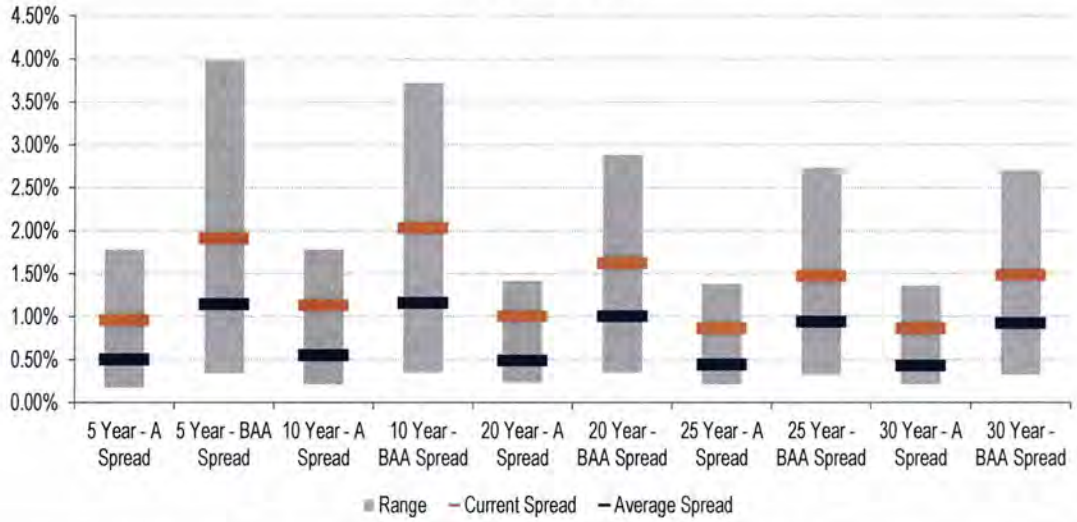
A. The full requested rate increase is needed for the day to day operational needs of PGW and to fund its ongoing capital improvement program, including the cast iron main replacement program. As such, the approval of the requested rate increase ensures funding for the safety and reliability of the system. However, if the rate increase did unexpectedly generate more net revenue for PGW or if PGW was able to capture greater operating efficiencies moving forward, any additional income would stay with the PGW system and be used for system purposes (because PGW does not have shareholders like an investor owned utility (IOU)). PGW may decide to further accelerate the implementation of the main replacement program and/or reduce or delay future rate increases. Additionally, the continuation of Commission support for PGW's financial performance will also preserve the financial metric improvement of the last few years and may allow further improvement in PGW's bond ratings, particularly the Moody's and Fitch ratings at Baa1/BBB+. By demonstrating the ability to consistently achieve the current financial metrics through PGW's forecast period, it may allow PGW to push its bond ratings into the "A" rating category from all of the rating agencies. Certainly, with such potential rating upgrades, PGW could access the municipal capital markets at lower costs for its financing and credit facility needs. Again, such improvements in reducing PGW's financing costs would inure to the full benefit of PGW's ratepayers and its system needs, not to a third party or outside investor.

Q. WHAT ARE THE CONSEQUENCES OF LIMITING OR REDUCING PGW'S REQUESTED RATE INCREASE?

A. Without the a substantial cost recovery that PGW is seeking in its current rate case of $70 million annually, there would be immediate and substantial consequences to such a regulatory action. These actions may start with rating downgrades of PGW and then impose immediate financial costs to PGW in the form of substantially higher borrowing costs, limited opportunities for PGW to refinance its existing debt costs, the imposition of higher credit facility fees, and potential termination and acceleration of certain financial arrangements.

The costs of rating downgrades are certain to ripple across all aspects of PGW's operations, but the most certain and immediate costs will be recognized in its municipal bond offerings to fund PGW's capital improvement program. PGW has identified bond transactions of approximately $450 million over the next four years - $270 million in late FY 2017 and $180 million in FY 2020 - for its capital improvement program. With the expectation that PGW's failure to get positive regulatory rate support now would lead to downgrades across the Board into the "BBB" rating category by all agencies, it is expected that PGW's borrowing costs would rise substantially. The following table effectively shows the impact to the borrowing cost of PGW for its bond transaction with "BBB" category ratings from all agencies, with the assumption that they would average "BBB" for 1998 Bond Ordinance senior lien. Since PGW is expected to borrow over time, it is not clear where interest rates will be at each borrowing, so the graphic effectively shows the expected additional costs based upon both current market and historical credit spreads for all "BBB" ratings vs the current "Baa1/A/BBB+" ratings:

Current and Historical Credit Spreads to AAA MMD[1]
(1/19/2007 - 1/18/2017)



Statistic	5 Year - A Spread	5 Year - BAA Spread	10 Year - A Spread	10 Year - BAA Spread	20 Year - A Spread	20 Year - BAA Spread	25 Year - A Spread	25 Year - BAA Spread	30 Year - A Spread	30 Year - BAA Spread
1/13/2017	0.41%	0.72%	0.59%	0.95%	0.63%	0.99%	0.63%	0.99%	0.63%	0.99%
Average	0.65%	1.47%	0.81%	1.56%	0.79%	1.41%	0.74%	1.32%	0.72%	1.30%
Spread to Avg.	-0.24%	-0.75%	-0.22%	-0.61%	-0.16%	-0.42%	-0.11%	-0.33%	-0.09%	-0.31%
Minimum	0.20%	0.34%	0.21%	0.35%	0.23%	0.35%	0.21%	0.32%	0.21%	0.32%
Spread to Min.	0.21%	0.38%	0.38%	0.60%	0.40%	0.64%	0.42%	0.67%	0.42%	0.67%
Maximum	1.78%	3.98%	1.78%	3.72%	1.42%	2.88%	1.38%	2.73%	1.36%	2.70%
Spread to Max.	-1.37%	-3.26%	-1.19%	-2.77%	-0.79%	-1.89%	-0.75%	-1.74%	-0.73%	-1.71%

1. MMD is the benchmark tax-exempt index for long-term debt with the AAA-rated GO MMD index as the key index against which credit spread are measured.

Based upon these current and historical increases in borrowing costs that PGW should expect to result from the inability to get substantial regulatory rate approval, the following table shows the range of gross and present value debt increases over the life of the $450 million planned borrowings.

Credit Spreads	PGW - Current Rating			PGW - Downgrade to BBB		
	Average (10-yr History)	Minimum (10-yr History)	Maximum (10-yr History)	Average (10-yr History)	Minimum (10-yr History)	Maximum (10-yr History)
Base Rates	10-yr Average MMD	10-yr Average MMD	10-yr Average MMD	10-yr Average MMD	10-yr Average MMD	10-yr Average MMD
Total Debt Service	$ 679,450,853	$ 786,818,553	$ 718,508,793	$ 711,377,096	$ 792,309,813	$ 831,925,868
PV of Debt Service to August 2017 (4.0%)	$ 432,825,932	$ 496,393,792	$ 457,856,798	$ 453,281,252	$ 499,882,779	$ 530,276,187
All-in TIC	4.07%	3.71%	4.66%	4.55%	3.79%	6.37%

Credit Spreads	Difference in Cost if PGW Downgraded		
	Average (10-yr History)	Minimum (10-yr History)	Maximum (10-yr History)
Base Rates	10-yr Average MMD	10-yr Average MMD	10-yr Average MMD
Total Debt Service	$ 31,926,242	$ 5,491,260	$ 113,417,075
PV of Debt Service to August 2017 (4.0%)	$ 20,455,320	$ 3,488,987	$ 72,419,389
All-in TIC	0.48%	0.07%	1.71%

Note: Assumes bond issues funding projects of $270,000,000 and $180,000,000, respectively, in August 2017 and August 2020. Cost of issuance assumed at $500,000 plus assumed $4/bond underwriter's discount. Assumes base MMD scale of 10-year average AAA MMD, plus credit spreads.

PGW has also utilized a number of credit facilities historically, including various letters of credit on its variable rate bonds and its commercial paper program. These include the Series 5A-2, Series 8B, Series 8C, Series 8D, and Series 8E, which currently total $152.8 million outstanding. PGW has procured five different banks to secure these letters of credit, with an average annual cost of approximately 0.80% on the total principal outstanding. PGW also maintains $120 million in letters of credit for its commercial paper program at a similar cost. More than half of these facilities expire within the next year or eighteen months, and almost all of these agreements have termination clauses and cost escalation clauses should PGW's ratings fall below certain ratings thresholds. To the extent that PGW's credit rating is downgraded to the "BBB" level as a result of the inability to get rate approvals, PGW could face a sizeable problem with these facilities.

Not only would the cost go up substantially and exact annual cost increases of over $1 million annually to maintain these letters of credit, there is also the possibility that PGW may not be able to extend some or all of these letters of credit. In such a scenario (and noting that the agreements are slightly different), there is the potential for all of the outstanding principal amounts to be accelerated over five years in equal semi-annual installments. These "term out" options would force enormous accelerated debt costs of up to $35 million annually into the next five years, fully eroding PGW's liquidity position. While other financing options may exist to refinance the bonds, it underscores the importance of maintaining stronger investment grade ratings, and the potential for significant problems should PGW's bond ratings be downgraded only a few notches from their existing levels.

In addition to the variable rate bond programs maintained by PGW, many of these bonds were issued in coordination with interest rate swap agreements, which at the time of their use, generated substantially lower cost funding for PGW. However, much like the credit facilities that support the variable rate bond programs, these interest rate swaps which total approximately $122.8 million of notional amount, corresponding to the Series 8B, Series 8C, Series 8D, and Series 8E Bonds, have events of defaults triggered by PGW related credit events and Assured Guaranty, which insures the swap payments. Each of these interest rate swaps has a termination event if both the swap insurer Assured Guaranty has its ratings falls below A2/A, and PGW's ratings are downgraded below Baa2/BBB. At this current time, Assured's Moody's rating is right at the minimum threshold, potentially leaving the termination event for the swaps only dependent upon PGW's ratings. And clearly, falling below Baa2 or BBB is not a big leap, if PGW's

regulatory rate process no longer affords it the substantial cost recovery it needs. As such, like the acceleration of the credit facility amount, a PGW downgrade could lead to the termination of the interest rate swaps, and the current market value requires payment by PGW to its interest rate swap counterparty of $22.74 million as of January 1, 2017. PGW might be able to bond finance that amount; however, at a time of increased leverage, reduced rate support and other accelerated obligations, PGW would face a difficult time trying to come up with the necessary funds to repay the termination value on the interest rate swaps.

The credit downgrade would also simply limit PGW's refinancing options moving forward. Whether for simple refinancings of existing debt for debt service savings or related to unforeseen terminations and accelerated principal amortization or termination fees, the access to the municipal capital markets at a rating of "BBB" or below is considerably more difficult, particularly given the negative events for PGW that would be driving such a scenario. As noted several times before, investors' willingness to buy PGW long-term debt is predicated upon the ability of PGW to recover its just and reasonable costs through regulatory rate support, and any doubt cast on that central tenet quickly leads to investors and other credit providers being unwilling to lend more or charging considerably greater cost to do so. That effectively limits PGW from borrowing substantially greater amounts than already outstanding and puts even greater pressure on pay as you go funding from internally generated funds. Thus, there is a very quick negative spiral that stems from a lack of regulatory rate support and lower municipal bond ratings.

The failure of Commission rate support for PGW ultimately results in greater increases in costs to PGW ratepayers over the long-term. Failure to get timely cost recovery through the regulatory process is likely to lead to bond credit downgrades that will cause investors and other credit providers to charge significantly higher costs starting immediately and extending over the next 5-10 years. These increased costs will almost certainly compound the issue of rate recovery and require even greater rate support moving forward. Thus, it remains extremely important to maintain the constructive relationship between PGW and the Commission that has existed in the past several years to avoid significant deterioration in PGW's ongoing path to financial stability.

Q. PLEASE SUMMARIZE YOUR TESTIMONY?

A. Notwithstanding the substantial improvement that PGW's finances and its bond rating have shown in the period between FY 2010 – FY 2016, PGW still has limited financial flexibility and its projected financial results for FY 2018, the fully projected future test year (FPFTY), show that PGW requires the requested rate increase in order to maintain its financial metrics at the levels needed to justify its current bond rating.

The inability of PGW to obtain necessary rate relief and cost recovery for its operating and capital requirements would cause immediate financial damage to PGW and breach the most critical component of municipal utility rating criteria in the current environment. The likely results of such a scenario with respect to PGW's rate case are substantially greater financing costs due to credit downgrades by the financial community, and the remedy of that is a substantial process that requires long-term positive performance (a by-product of which is larger and more frequent rate increases). The granting of a substantial portion of the requested amount will send a positive signal

of support and could help to improve PGW's current bond rating, a move that would save customers tens of millions of dollars over time.

Ultimately, it is critical that PGW and the Commission maintain a constructive regulatory process in which appropriate cost recovery approval is maintained. That course of action will result in continued improvement in PGW's credit, maintaining a capital structure that produces the lowest debt service cost to PGW, and minimizing future debt service costs to PGW. This, in turn, will mitigate the size and need of future rate requests, thus maintaining the most just and reasonable rates possible for PGW's customers and ratepayers.

Q. DOES THIS COMPLETE YOUR TESTIMONY?

A. Yes.

Exhibit DJH-1

Exhibit DJH-1

Professional Bio

The PFM Group

DANIEL J. HARTMAN

Role
- Managing Director

Expertise
- Capital Market Transactions
- Public Utility Finance
- Municipal bond ratings
- Capital Planning and Debt Structuring

Education
- BA – Economics, from University of North Carolina – Chapel Hill

PROFESSIONAL BACKGROUND

- Managing Director, Public Financial Management, Inc., 2006 to present
- Managing Director, Bear Stearns Capital Markets, 2005-2006
- Director, Citigroup Global Markets, 1999-2005
- Managing Director, Public Financial Management, Inc., 1991-1999

EDUCATION

- University of North Carolina – Chapel Hill, BA 1991
- Memphis University School, Memphis, TN

Dan Hartman is a Managing Director in the Washington DC area office. Mr. Hartman worked for PFM from 1990-1999, and rejoined the firm in 2006. Mr. Hartman currently co-heads the firm's national utilities group and works exclusively with utility clients across the country.

Mr. Hartman has served as a financial advisor or senior managing underwriter to many of the largest water, wastewater, gas and public power agencies throughout the United States. These clients have included, among others, DC Water, the Los Angeles Department of Water and Power, Orlando Utilities Commission, the Great Lakes Water Authority, and the San Antonio Water System. For these clients, Mr. Hartman has been directly involved in the issuance of over $50 billion of utility bonds and has worked on some of the largest and most complex transactions in the municipal market.

As part of Mr. Hartman's client engagements, he has managed the development of complex financing plans for large capital programs, led educational workshops with Boards and elected officials, devised and implemented rating and investor strategies for new and existing credits, evaluated and implemented derivative product applications. On behalf of his municipal clients, Mr. Hartman has also provided expert witness testimony to legislative and regulatory bodies.

Mr. Hartman served as a Managing Director with Bear Stearns and Citigroup Global Markets from 1999-2006, where he worked extensively with utility issuers.

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

TESTIMONY OF

FRANK C. GRAVES

ON BEHALF OF
PHILADELPHIA GAS WORKS

DOCKET No. R-2017-2586783

February 2017

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BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

I. INTRODUCTION

Q1. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS ADDRESS.

A1. My name is Frank C. Graves. I am a Principal at the economic consulting firm The Brattle Group, where I am also the leader of the utility practice group. The Brattle Group is located at 40 Brattle Street in Cambridge, Massachusetts.

Q2. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A2. I specialize in regulatory and financial economics, especially for gas and electric utilities. I have over 30 years of experience assisting utilities in forecasting, valuation, and risk analysis of many kinds of long range planning and service design decisions, such as generation and network capacity expansion, supply procurement and cost recovery mechanisms, network flow modeling, renewable asset selection and contracting, and hedging strategies. I have testified before many state regulatory commissions, including the Pennsylvania Public Utility Commission ("Commission"), and the FERC, as well as in state and federal courts and arbitration proceedings, on such matters as integrated resource planning (IRPs), energy contract disputes, the prudence of utility investment and contracting decisions, risk management goals, practices and outcomes, costs and benefits of new services, policy options for industry restructuring, adequacy of market competition, and competitive implications of proposed mergers and acquisitions.

In the area of financial economics, I have assisted and testified in civil cases in regard to contract damages estimation, securities litigation suits, special purpose audits, tax disputes, risk management, and cost of capital estimation, and I have testified in criminal cases regarding corporate executives' culpability for securities fraud.

I received an M.S. with a concentration in finance from the M.I.T. Sloan School of Management in 1980, and a B.A. in Mathematics from Indiana University in 1975. I have included my detailed resume in Appendix 1.

Q3. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A3. My testimony benchmarks the financial performance of Philadelphia Gas Works ("PGW" or "Company") over the 2011-2015 time period. This period covers most of the time from the prior PGW rate case to the present, subject to the availability of complete annual financial data on the companies reviewed. I analyzed both average performance over that time period and also trends from its beginning to end. Through the analysis, I will demonstrate that PGW's financial performance improved and then stabilized following the 2009/10 rate case. However, the benchmarking also indicates that PGW lags its peers on some key metrics such as debt to total capitalization ("Debt/Capitalization") and days of cash on hand to cover operating expenses ("Days Cash"). I also review the benchmarking metrics of financial performance that are expected by PGW under the proposed rate increase. Although those projections are not my primary focus, they show that there is a continuing need to support PGW's financial stability with timely and appropriate rate increases, given the changes in required accounting of the other postemployment benefits ("OPEB") liability that affect PGW's balance sheet and cash requirements in the fully projected future test year (FPFTY) and the subsequent Forecast Period (fiscal years 2019 through 2022).

Q4. WHAT IS THE PURPOSE OF BENCHMARKING?

A4. Benchmarking serves at least four purposes: satisfying Commission requirements, establishing trends in PGW's performance, comparing those PGW trends and levels to peers' performance, and identifying risk factors. Benchmarking involves reports on recent past levels and trends for financial metrics that the Commission has stated should be considered in ratemaking procedures. This is appropriate because one of the goals of effective ratemaking -- complementary and equal to the goal of setting just and reasonable rates -- is assuring financial viability for utilities, achieved by placing them in parity with the financial performance being achieved by other companies and their

securities of similar risk. Benchmarking reveals how well that is being accomplished. For this purpose, according to the Commission's Cash Flow Ratemaking Statement of Policy, the Commission will consider year-end cash, short term borrowing capacity, internal generation of funds to fund construction, debt to equity ratios, financial performance of similarly situated utility enterprises, levels of operating and other expenses, and levels of financial performance needed to maintain or improve PGW's credit rating, amongst other relevant factors in deciding upon the financial considerations in setting just and reasonable rates.[1]

What is of interest in these metrics is whether PGW is improving and whether it has reached threshold levels for financial health that have materially shifted (ideally, improved) from past rate cases. As I discuss later, this is generally true for PGW, as it has improved and stabilized somewhat over the past few years, but it has not achieved levels that should be considered comfortable resting places.

While benchmarking does not project these values for the test-year and beyond, it establishes current and historical industry-wide levels for these metrics. These indicate whether PGW is improving or declining in financial health relative to desirable thresholds and whether it is performing at a level comparable to peers. The relevant metrics can also be derived in Company projections to see if its requested rate adjustments accomplish reasonable ongoing performance.

Benchmarking assesses the significance of trends in performance by comparing metrics from PGW to those of similarly situated peers over time (trends or longitudinal analysis) and for a given snapshot of time (cross-sectional studies). Comparative trend analyses help to determine how much of the changes in a utility's performance are due to its own business operations and financial allowances or ratemaking practices versus

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[1] The policy also states that the Commission will consider service quality, service reliability, and effects on universal service. I do not address these factors in my testimony here.

Pennsylvania Public Utility Commission, *Petition of Philadelphia Gas Works for a Statement of Policy on the Application of Philadelphia Gas Works' Cash Flow Ratemaking Method*, No. P-2009-2136508, § 69.2703.

being due to general participation in industry-wide trends, such as coming out of a recession. For example, PGW's metrics could be improving, but PGW could still be falling behind if it does not keep up with overall trends. By contrast, cross-sectional analyses compare the value of a give metric across companies for just a single time period or for value averaged across a few time periods. Unlike the performance trends, this data does not focus on how performance has evolved over time but instead focuses on the absolute level of performance. Both relative and absolute performance are relevant to investors and lenders.

Finally, benchmarking can identify risk factors to PGW's future financial performance. For example, a constant but highly levered financial structure, or an increasingly levered financial structure, could increase risk to investors, result in a credit rating decrease, and/or result in increased lending costs. Likewise, low liquidity levels and high operating expenses could put a utility at risk for cash limitations during price shocks. Benchmarking may not identify the shock, but it does indicate whether or not the levels of liquidity are reasonable given norms and levels held by peers.

Q5. PLEASE SUMMARIZE YOUR OVERALL APPROACH TO BENCHMARKING AND TESTIMONY OVERVIEW.

A5. My approach to benchmarking and its description in this testimony have five components: (1) identifying a set of relevant benchmarking peers, (2) developing metrics for benchmarking, (3) analyzing cross-sectional comparisons of metric values, (4) identifying time-trends in metrics for the target utility versus its peers, and (5) identifying risks based on benchmarking patterns and projections.

In Section II (Analysis Foundations), I will discuss the process of identifying peers and the metrics used for the study of their performance in comparison to PGW. As foundation, I will discuss the characteristics of PGW that make it unique amongst gas utilities and that necessitate a wide group of benchmarking peers. Next, I will describe the selection of three groups of utility peers for benchmarking, each which matches some of the key PGW characteristics. These groups are composed of Pennsylvania investor owned utilities (IOUs), non-Pennsylvania investor owned utilities with aging

urban infrastructures, and municipal utilities. None of course are perfectly analogous to PGW, so I will comment on some differences that remain that may affect the comparisons. In this section, I will also describe the categories of financial and operating metrics that I use to compare these peer groups, and the relation of these metrics to norms and thresholds used by credit rating agencies to evaluate the safety of bonds. Since PGW relies exclusively on debt financing, satisfying reasonable credit rating expectations is important to PGW's financial flexibility.

In Section III (Benchmarking Results), I will describe and discuss the results of the benchmarking through cross-sectional and performance trend analyses. Although I will review full results across all metrics, I will focus on three key metrics: Debt/Capitalization, Days Cash, and debt service coverage ratios that do provide the most significant financial information. As discussed in PGW Witness Hartman's testimony, these ratios are also key indicators to credit rating agencies. I will show how these ratios have improved since 2009/10 and their overall position relative to peers. I also will show how these ratios interact with the Company's needs for capital improvements to its distribution infrastructure.

Next, in Section IV (Projected Metrics with and without Rate Increase), I will consider the impact of the proposed rate increase on key ratios to demonstrate the need for continued financial stability and the beneficial impact on key ratios if the requested rate increase is granted.

Finally, in Section V, I will present my conclusions based on both the historical benchmarking analyses and the projected metrics with and without a rate increase. Additional supporting figures follow the testimony.

Q6. PLEASE SUMMARIZE YOUR CONCLUSIONS FROM THE STUDY.

A6. PGW's financial health has improved substantially from levels it was experiencing prior to the 2009/10 rate case, and with continued support from the Commission, it will be able to maintain or improve this overall level of financial health. Conversely,

without that support, its financial strength could atrophy considerably, back to weak and constraining levels.

Below, in FCG Figure – 1, I have summarized three key financial metrics for PGW at four snapshots over time, first in financial year ending August 31, 2008 (prior to the 2009/10 rate case), then in the recent financial year ending in August 2015, the FPFTY ending August 31, 2018, and finally for the last year of the Forecast Period, ending August 31, 2022. The financial metrics for the projected years are shown both with and without the requested rate increase. The columns with the boxes around them are for the FPFTY.

FCG Figure – 1
Historical and Projected Financial Metrics

	Historical		Projected			
	2007/08	2014/15	2017/18	2021/22	2017/18	2021/22
Rate Increase Granted			$0 MM	$0 MM	$70 MM	$70 MM
Debt/Capitalization	85%	78%	96%	88%	91%	69%
Days Cash	24	74	34	-178	82	58
Debt Service Coverage (Principal & Interest)	1.01	1.29	1.24	1.44	1.92	2.08

Sources and Notes:
PGW-provided historical and pro forma financial statements; PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015.
The fully projected future test year metrics with and without the proposed rate increase are shown as boxed. This year-end Days Cash metric varies from the corresponding amounts presented in Mr. Golden's testimony due to a variation in metric calculation. The Days Cash used in Mr. Golden's testimony removes amortized pension expenses from operating expenses. I do not exclude this amortized amount from the Days Cash metric because it is not feasible to make that some adjustment on all the benchmarking peers.

As seen in the first two columns of FCG Figure – 1, PGW's financial health improved following the rate increase granted by the Commission. Specifically, PGW's Debt Service Coverage (Principal & Interest) improved from 1.01 in 2008 to 1.29 in 2015,[2] while PGW's Debt/Capitalization correspondingly decreased from 85% in 2008 to 78% in 2015. Higher coverage means the debt is more immune from unfavorable revenue or

[2] Note that this metric is a standard formulation used for benchmarking that varies from the PGW's covenant calculation.

operating expense variances, while a lower debt ratio means that there are fewer creditor claims against PGW per dollar of revenues and assets. However (but not shown above) PGW is still more leveraged than most of its municipal peers and more than all of its investor owned utility (IOU) peers. Also, PGW's Debt/Capitalization will be increasing in the 2017 financial year as a result of revised OPEB accounting requirements, which will reduce PGW's equity.

Another dimension that has improved since the last rate case is PGW's liquidity, observed in the fact that its Days Cash metric grew from 24 days in 2008 to 74 days in 2015. But again, while this is a substantial improvement, PGW lags its municipal peers, and it is below a normative level of around 100 days, which rating agencies would likely require for PGW to improve its credit rating, and well below a target of around 150 days ratings agencies expect for A to AAA rated companies (as discussed in Mr. Hartman's testimony).

As shown in the first boxed column of FCG Figure-1 labeled "2017/18 $0 MM," without the proposed rate increase both the capitalization ratios and Days Cash for PGW would be at levels close to or worse in the FPFTY than they were in 2008. In fact, without the rate increase, PGW's Days Cash would become negative in 2019 and is projected to be significantly negative (-174 days) by 2022, the end of the Forecasted Period. This circumstance would be untenable, requiring either a need to drastically cut expenditures or to try to issue debt under highly unappealing circumstances. However, in contrast, with the $70 million proposed rate increase (seen in the second boxed column), PGW's Days Cash is at a much healthier 83 days in the 2018 FPFTY and the capital structure has begun to both recover from the loss of equity in the 2017 financial year and improve by the end of the Forecast Period in 2022 to 69%. With the requested rate increase, the 69% debt to total capitalization ratio at the end of the Forecast Period is in line with the 70% debt to total capital ratio that Commission Staff have discussed as not unreasonable (as I understand from Mr. Golden's testimony), and on the path to achieving PGW's aspirational target of below 60% debt to total capitalization.

Maintaining or improving these ratios, as occurs with the rate request, is important to achieving credit scores that allow reliable access to capital markets at low cost. As discussed in Mr. Hartman's testimony, since 2010 PGW's credit rating has improved from a Baa2 to Baa1 from Moody's, from BBB to BBB+ from Fitch, and from BBB+ to A from S&P. As a of the underlying rate increases that caused that result, PGW has been able to pursue improvements in its infrastructure and meet growing obligations and expenses. However, as noted PGW's ratings are closer but not to the level of its utility peers, and PGW has significant future needs over the next few years for cash and reliable borrowing capacity in order to achieve its ongoing planned upgrades in system infrastructure. With approval of the proposed rates, PGW should be able to meet these growing needs for capital and cash. That said, it is important to appreciate that this requested increase and resulting outlook involves operating only slightly above a level of financial health that could constrain the progress PGW has made or even cause it to slide back to impaired access to capital, if there were any unplanned shocks that increased funding needs or decreased receipts.

In short, my benchmarking analysis indicates that PGW's past rate increases have been effective in improving its financial health and allowing more infrastructure improvements, and that the requested rate increase is sized appropriately for continuing that progress.

II. ANALYSIS FOUNDATIONS

Q7. PLEASE EXPLAIN HOW PEER GROUPS ARE SELECTED FOR BENCHMARKING.

A7. Peer utilities are intended to provide a comparison group for benchmarking the financial strengths and weaknesses of the target utility, and in order for this comparison to be meaningful, peer companies should share similar financial and operating characteristics that influence or constrain performance over time. The specific characteristics used will be dependent upon the utility being benchmarked; however, they may include physical characteristics of the system, customer profiles, regulatory structures, financial structures, climate, or notable past events, such as storm damage or

bankruptcy. Availability of comprehensive and similarly compiled financial data will also affect who can be a peer.

Q8. WHAT CHARACTERISTICS MAKE PGW UNIQUE FROM A BENCHMARKING PERSPECTIVE?

A8. While PGW has many similarities to other gas utilities in terms of basic services and principles it uses for pricing and cost recovery, PGW's size, density, age and type of infrastructure, customer mix, and its financial structure, amongst other characteristics, make it distinct in important ways that require benchmarking it with a few different kinds of peers. For instance:

- PGW is the largest gas municipal in the country and one of the few that is solely involved in gas services (as opposed to being a joint gas and electric company);
- Though a municipal utility, PGW is price-regulated by the Pennsylvania Public Utility Commission rather than its city board, while its budgets and gas supply plans are reviewed by the Philadelphia Gas Commission;
- Of the 100 largest gas munis in the US, PGW is the only one located in Pennsylvania, and thus its muni peers face different regulatory and market conditions;
- PGW has a denser, more residential, more low income customer base than many similar sized utilities;
- PGW has a substantial quantity of old, cast iron pipe to replace; and
- PGW was in below-average financial health in 2009 (its last rate case) so even with the economic recovery, it is not as strong as many similar utilities.

The characteristics important to choosing comparable peers for PGW are summarized in FCG Figure – 2. Due to PGW's unique position, any peer selected will be comparable on a subset of the characteristics. This necessitates a broad range of peers and metrics, and not all metrics will be comparable to PGW's given the diversity of characteristics.

FCG Figure – 2
Peer Selection Criteria

Characteristic	Metric	Significance
Climate	MidAtlantic/East Coast, or Nationwide	Seasonal usage patterns and exposure to weather-related risk
Company Size	Total Revenues	Availability of financing products and risk levels
Customer Composition	Percentage Residential Send-Out	Seasonal usage patterns, exposure to weather-related risk, and extent of regulatory protection for vulnerable customers
Infrastructure Age	Percentage of Cast Iron Pipes	Capital investment requirements and operating costs
System Density	Customers/Mile	High unit cost of capital investments and operating costs
Regulatory Environment	Pennsylvania or Nationwide	Rate structures and regulatory requirements
Utility Type	Muni or IOU	Availability of financing products, ratemaking idiosyncrasies, and risk thresholds

Q9. HOW DID THE CHARACTERISTICS OF PGW INFLUENCE YOUR CHOICE OF BENCHMARKING PEERS?

A9. Because PGW is hard to compare on all relevant dimensions simultaneously to many other utilities, I have developed three groups of utility peers for comparison: Pennsylvania Investor Owned Utilities ("PA IOUs"), non-Pennsylvania investor owned utilities that are also urban systems with aging infrastructure and exposure to similar weather extremes as PGW (dubbed the Aging Urban Investor Owned Utilities "AU IOUs"), and municipals ("Munis"). Each of these groups was designed to be comparable to PGW across a subset of the criteria listed in FCG Figure – 2; the main criteria used to select each peer group are shown in FCG Figure – 3. For example, I developed the AU IOU group to be reflective of PGW's physical infrastructure, selecting utilities for infrastructure age by the percentage of cast iron pipes and system density measured by customers per mile of main. On the other hand, the PA IOU group was developed to reflect similar regulatory oversight. I will note that where possible I restricted the peer groups to gas-only utilities, but in order to get sufficient breadth of

observations for meaningful comparisons, I had to include some gas-electric utilities or even electric-only utilities in a few cases. In those circumstances, I focus on financial performance metrics that largely exclude the effect of the type of commodity being sold.

FCG Figure – 3
Peer Group Characteristics

Peer Group	Key Characteristics	
PA IOU	• Regulatory Environment (State)	• Company Size
AU IOU	• Infrastructure Age • System Density • Climate	• Customer Composition • Company Size
Muni	• Utility Type • Financing Practices	• Company Size

Q10. HOW WERE INDIVIDUAL UTILITIES SELECTED IN EACH OF THE GROUPS DESCRIBED ABOVE?

A10. As the groups were developed to reflect different characteristics of PGW, I will discuss the selection of utilities on a group by group basis. In addition to the structural considerations for each group that I will explain in the following text, I limited my selection to peer utilities with financial data largely available across the 2011-2015 time horizon.

The development of the PA IOU peer group was tailored to reflect the regulatory environment that PGW operates within. This group of utilities is familiar to the Commission and likely to most interveners. To develop this peer group, I considered all 15 natural gas distribution companies regulated by the Commission in the state of Pennsylvania and then filtered to exclude those utilities that are not comparable or have financial anomalies due to mergers or other events. For similarity of size, I filtered this group to include only utilities with annual gas operating revenues exceeding $100 million across the time period of 2011 to 2015. As shown in FCG Figure – 4, which depicts both the total revenues and customer density of PA IOU group, this cuts out about half of the population, leaving seven gas distribution companies: Columbia Gas

("Columbia"), National Fuel Gas Distribution ("National Fuel Gas"), PECO, UGI Central Penn Gas ("Central Penn"), UGI Penn Natural Gas ("Penn Natural Gas"), Peoples T.W. Phillips ("Peoples TWP"), and Peoples Natural Gas Company ("Peoples").[3] Compared to its peers in FCG Figure – 4, PGW is the largest of these from a gas revenue perspective with average annual gas revenues of about $680 million, and PECO is the second largest, with average annual gas revenues of about $590 million.

FCG Figure – 4
PA IOU Annual Gas Operating Revenues and Customer Density
(Average 2011-2015)

	Gas Operating Revenue ($000)	Customer Density (customers/mile)
PGW	$683,195	165
Central Penn	$138,982	21
Columbia	$504,575	57
National Fuel Gas	$228,918	44
PECO	$590,497	74
Penn Natural Gas	$273,517	64
Peoples	$387,668	53
Peoples TWP	$94,756	23

Sources and Notes:
PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data.
Central Penn and Penn Natural Gas show averages for 2012-2015. Peoples shows average for 2011-2013. Peoples TWP had gas revenues exceeding $100M in 2011 and 2014. Residential, commercial, industrial, and all other customer types (as used in EIA 176 filings) included in customer count. Miles represent length of pipeline mains operated by each utility.

[3] Dominion Peoples, Equitable Gas Company, and UGI Utilities were included in the 2009/10 benchmarking set. Dominion Peoples is no longer owned by Dominion and is included above as "Peoples." Equitable Gas Company was excluded due to data unavailability following the 2013 merger with Peoples Natural Gas Company. UGI Utilities, Inc. acquired Central Penn (formerly PPL Gas Utilities) in October 2008 and acquired Penn Natural Gas (formerly PG Energy) in August 2006; these two subsidiaries are included, but the parent itself is excluded due to post-merger accounting anomalies.

While usefully similar, these utilities are mostly much less affected by older infrastructure and have substantially lower customer density. PGW is the most customer-dense system in Pennsylvania, as shown in FCG Figure – 4. Likewise, PGW has the highest percentage of cast iron pipes of the PA IOUs.[4] These two characteristics most likely imply higher operating and maintenance costs to compensate for maintaining the older infrastructure within a city environment, and to account for higher capital spending requirements to replace the cast iron and uncoated steel pipes in regions that may not be experiencing much customer growth to absorb the cost increases, so I need to turn to a different peer group to find better proxies for that consideration.[5] These are described next.

Q11. PLEASE DESCRIBE THE BASIS FOR THE AU IOU GROUP.

A11. I developed the second peer group, the AU IOU peer group, to be comparable on an infrastructure and a climate basis; that is, the gas infrastructure's age, composition, and location within an urban area should be similar to PGW. Also, where possible I focused on coastal, Atlantic cities for more similarity in weather conditions. In order to identify utilities with these characteristics, I needed to consider utilities outside of Pennsylvania.

To select the AU IOU peer group, I considered 62 candidate gas utilities located across New England, the Mid-Atlantic, and other regions with potentially similar utilities. Of this group, I selected those with similar size, percentage of cast iron mains, system density, weather patterns and percentages of residential sendout. This process resulted in the selection of five AU IOU peers: Baltimore Gas and Electric ("BGE"), Boston

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[4] According to a report by the Commission staff, PGW carried the highest percentage of at-risk pipeline by a factor of at least two compared to peers in Pennsylvania as of 2013. At that time, PGW operated approximately 1,500 miles of cast iron mains and an additional 493 miles of unprotected coated steel mains.

Pennsylvania Public Utility Commission, *Inquiry into Philadelphia Gas Works' Pipeline Replacement Program*, (Philadelphia, 2015), 19-20, http://www.puc.pa.gov/NaturalGas/pdf/PGW_Staff_Report_042115.pdf

[5] *Id* 4.

Gas Company ("Boston Gas"), Brooklyn Union Gas Company ("BUG Co"), Consolidated Edison ("ConEd"), and Public Service Electric and Gas ("PSEG"). As shown in FCG Figure – 5, these five companies had percentages of cast iron pipe on a mileage basis that range from 18% to 39% -- still below, but more comparable to 49% for PGW. PGW is in the middle of the AU IOU peer group for both customer density and percentage of residential sendout; however, it is one of the smaller companies in terms of revenue. Only BGE is smaller on a revenue basis. I also compiled information (not shown but discussed later) on their regulatory processes and rate structures for utilities within the AU IOU peer group. This information informs risk and may help explain their financial strength and/or relative position to PGW.

FCG Figure – 5
AU IOU Key Characteristics Group Comparability
(2011-2015 Averages)

	State	Gas Operating Revenue ($000)	% Residential Total Sendout	% Mains: Cast Iron	Customer Density (customers/mile)
PGW	PA	$683,195	49%	49%	165
BGE	MD	$646,778	44%	18%	92
Boston Gas	MA	$1,194,086	53%	32%	108
BUG Co	NY	$1,507,483	62%	39%	294
ConEd	NY	$1,565,613	23%	28%	250
PSEG	NJ	$1,932,245	30%	23%	101

Sources and Notes:
PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data.
"%Mains: Cast Iron" denotes cast iron's share of total mileage of mains operated by each utility.

Q12. THAT LEAVES THE MUNI PEERS. COULD YOU PLEASE DESCRIBE THE SELECTION OF UTILITIES FOR THIS GROUP?

A12. The Muni group was needed to mirror the financial structure of PGW, since ratemaking for utilities is a bit different than for investor owned utilities. In particular, munis do not have investor equity, so their revenue requirements are driven largely by the need to satisfy financial obligations or guidelines (over a few years at a time) via debt solvency and liquidity performance targets that if satisfied, maintain their reliable, low cost access to debt capital (their only source of long term external financing). They must

collect more in revenues than their operating expenses, cost of interest, and depreciation so that they have material debt service coverage and can accrue cash for working capital contingencies in excess of due-course operating expenses. (IOUs accomplish a similar goal by having an allowed return on equity, which is capital not needing the same kinds of assured payback as debt. This usually assures that the debt is secure.) However, munis are not all alike in the way they raise and support their debt. Some (like PGW) are stand-alone entities covering their borrowings solely with their own utility revenues, while others are more embedded in the financial structure, needs and revenue sources of their municipality. I selected municipal utilities of similar size with similar financing approaches.

To identify similar peers, I started with the eight largest gas municipal providers: PGW; CPS Energy (TX, "CPS"); Memphis Light, Gas & Water (TN); Citizens Energy Group (IN, "Citizens"); Metropolitan Utilities District (NE); Colorado Springs Utilities (CO, "Colorado Springs"); Long Beach Gas and Oil (CA); and the Richmond Department of Public Utilities (VA, "Richmond"). These utilities all have at least 100,000 customers; however, I excluded Memphis Light, Gas and Water; Metropolitan Utilities District; and Long Beach Gas and Oil because their financing is sufficiently different from PGW's.[6,7]

In addition the extent of available financial and operating data on municipals is more heterogeneous and in some cases more limited than for IOUs. This stems from the fact that municipals are generally regulated by their own boards or by their township, hence

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[6] Customer counts based on 2013 data.

"100 Largest Public Power Utilities by Electric Customers Served, 2013," *American Public Power Association*, accessed February 19, 2017

https://www.publicpower.org/files/PDFs/100LargestPublicPowerUtilitiesbyElectricCustomersServed.pdf.

[7] At a high level, the financing and resulting ratios for these utilities are extremely different from others. Memphis Light, Gas, & Water ("MLGW") lacks a long-term debt track record; until August 2016, MLGW's gas division had not issued any bonds since 1984. Metropolitan Utilities District employs abnormally low levels of debt financing (debt/capital ratio <1% for 2011-2015). Long Beach Gas and Oil ("LBGO") reported negative change in net position for all five years in 2011-2015 as a result of operating transfers out.

they are not all required to submit standardized filings in the same manner as IOUs. As a result and in order to form a larger benchmarking group, I extended the Muni group to include three electric municipal utilities. Although these utilities provide a different type of energy service, their financial performance should be similar to municipal gas utilities because they are financed and set rates on the same basis, i.e. to maintain adequate financial coverage against funding that is entirely driven by debt issues and retained income. In my benchmarking, I also generally make comparisons using non-commodity metrics. This means that although electricity supply service may have different risk characteristics than gas, the differences are largely filtered out of the metrics that I use, which focus more on distribution assets and their financing. Comparing across different kinds of munis is also practiced by ratings organizations, which use the same metrics to evaluate and compare municipal electric, gas, and water utilities.[8]

There are more than 100 electric municipal utilities in the U.S. ranging in size from those that serve more than 1.4 million customers to some serving fewer than 30,000. I focused on utilities that have approximately the same number or somewhat fewer customers than PGW; specifically, I started with customer counts no greater than 750,000 since PGW has approximately 500,000 customers.[9] This excluded four utilities and led to a group of six candidate utilities with customer counts over 400,000. Upon further reviewing this group for comparable financing and data availability I excluded three because they were already part of the benchmarking group (CPS), had financing practices significantly different than PGW (MLGW), or had data availability concerns (Austin Energy). As a result, I narrowed to a selection of three, specifically the Sacramento Municipal Utility District ("SMUD"), Jacksonville Electric Authority ("JEA"), and Seattle City Light ("Seattle City").

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[8] Peter Murphy, Jeffrey Panger, and Olga Kalinina, "Electric and Gas Utility Ratings," Standard & Poor's, December 16, 2014

Edward Damutz *et al.*, "US Municipal Utility Revenue Debt," Moody's, December 15, 2014

[9] Philadelphia Gas Works, 2016 Audited Financial Report, p. 8

Combining the gas and electric utilities resulted in a group of seven muni peers. As shown in FCG Figure – 6, this group of utilities includes two pure gas utilities, two combined electric and gas utilities, and three pure electric utilities. This peer group only includes utilities that issue bonds that do not have municipal backing.[10] From a gas revenue perspective, each of these peers is smaller than PGW; however, PGW is in the middle of the group when considering both electric and gas revenue streams, as shown in FCG Figure – 7. For example, Colorado Springs is smaller than PGW considering only average annual gas revenues (about $200 million annually compared to $680 million for PGW); however, Colorado Springs combined gas and electric revenues are comparable to PGW's annual revenue (about $615 million). That said, there is a broad range across the Muni peer group; average total revenues for the Muni group range from less than $200 million to more than $2.4 billion. This peer group is not designed to include utilities with similar aging infrastructures in dense urban environments, and as a result, they are not likely to be comparable on such measures as how much liquidity they require for contingencies or for the size of capital expenditure programs to upgrade their systems.

[10] Technically, PGW bonds are issued by the City of Philadelphia, but they are purely revenue bonds backed by the PGW sales, not by any additional guarantees from the City.

FCG Figure – 6
Muni Peer Descriptions and Annual Revenues by Business
(2011-2015 Average)

	State	Muni Type	Gas Operating Revenue ($000)	Electric Operating Revenue ($000)
PGW	PA	Gas	$683,195	n/a
Citizens	IN	Gas	$285,048	n/a
Richmond	VA	Gas	$152,406	n/a
Colorado Springs	CO	Gas + Electric	$203,415	$412,014
CPS	TX	Gas + Electric	$207,381	$2,111,482
SMUD	CA	Electric	n/a	$1,434,838
JEA	FL	Electric	n/a	$1,498,281
Seattle City	WA	Electric	n/a	$852,950

Sources: PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data for Citizens; Brattle analysis of annual financial reports for Richmond, Colorado Springs, CPS, SMUD, JEA, Seattle City. Gas Operating Revenue marked n/a for electric-only utilities; Electric Operating Revenue marked n/a for gas-only utilities.

FCG Figure – 7
Muni Average Operating Characteristics
(2011-2015 Average)

	Total Operating Revenues ($000)	Non-Commodity Operating Revenues ($000)	Customer Count	% Residential Sendout
PGW	$712,223	$436,950	498,650	49%
Citizens	$285,048	$151,057	264,016	44%
Richmond	$152,406	$70,489	n/a	n/a
Colorado Springs	$840,739	$664,188	193,330	54%
CPS	$2,318,863	$1,520,921	333,953	43%
SMUD	$1,434,838	$1,163,294	609,103	n/a
JEA	$1,498,281	$913,635	429,482	n/a
Seattle City	$852,950	$625,850	409,870	n/a

Sources and Notes:

PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data for Citizens; Brattle analysis of annual financial reports for Richmond, Colorado Springs, CPS, SMUD, JEA, Seattle City.

Total Operating Revenues account for all services rendered by utility, including but not limited to electric, gas, water, and sewer. Non-Commodity Operating Revenues is the difference between Total Operating Revenues and purchased commodity costs. Customer count reflects number of gas customers for PGW, Citizens, Colorado Springs, and CPS (gas customer count not available for Richmond); customer count reflects number of electric customers for SMUD, JEA, and Seattle City. n/a denotes data unavailability for Richmond; % Residential Sendout not measured for electric utilities (i.e., SMUD, JEA, and Seattle City).

Q13. ARE THERE CHARACTERISTICS OF PGW NOT CAPTURED BY THE BENCHMARKING GROUPS?

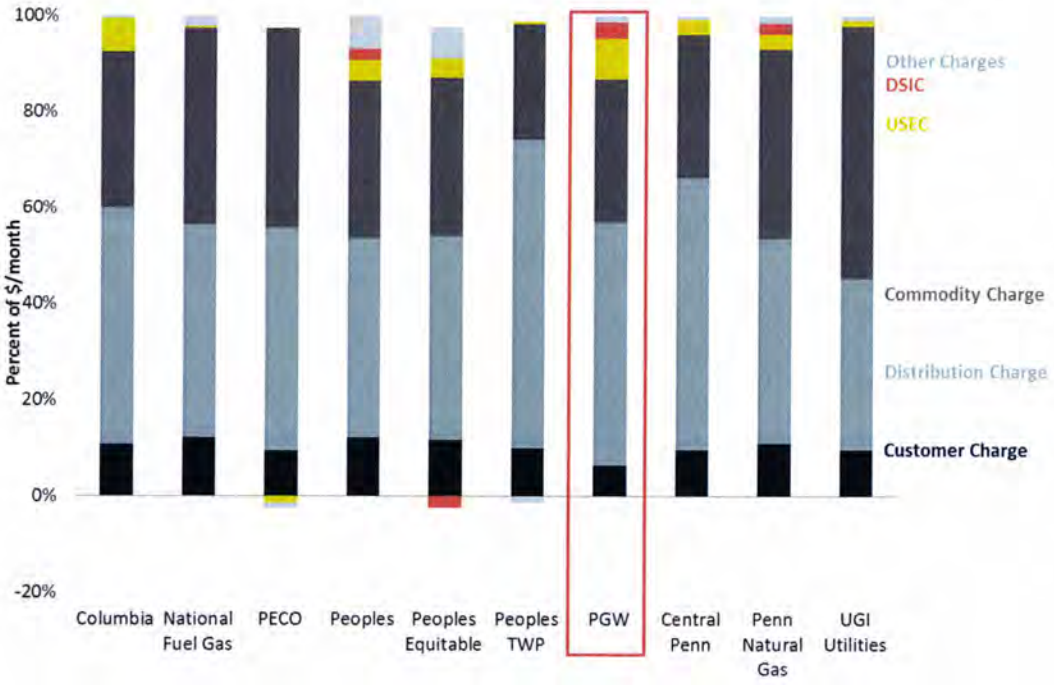
A13. Yes. PGW has a different financial basis for ratemaking than either set of the IOU peers. PGW's ratemaking is based on a Cash Flow Ratemaking Method. That is, its revenue requirements are determined by having adequate cash flow rather than by having a target accrued return on equity. As a consequence, of the factors that the Commission will consider; three of these may be especially critical to how PGW sets rates: (1) levels of non-borrowed year-end cash, (2) capital structure (debt to equity and related ratios), and (3) ability to satisfy bond covenants, which is measured by interest and debt service coverage ratios .

PGW also has a larger emphasis on rate support for low income customers than other PA IOUs.[11] This is evident in the income-support rates for PGW as compared to other Pennsylvania utilities. Specifically, PGW has the largest Universal Service and Energy Conservation charge, as a percentage of its PA peers, as shown in FCG Figure – 8 for residential rates.

[11] Almost one in three households in Philadelphia qualifies as low-income.

"LIHEAP Opens Today and Philadelphia Gas Works Urges Low-Income Customers to Apply," Philadelphia Gas Works, accessed January 12, 2017, http://www.pgworks.com/residential/about-us/newsroom/blog/liheap-opens-today-and-philadelphia-gas-works-urges-low-income-customers-to.

FCG Figure – 8
Monthly Bill for Residential Heating Customer (15 mcf/month)



Sources and Notes:
2016 Pennsylvania Public Utility Commission Rate Comparison Report.
Note that Peoples Equitable and UGI Utilities are not included in our benchmark group but are included here for completeness. Only those DSIC charges actually incurred by customers in 2016 are shown above; Columbia, PECO, and Central Penn have also been approved for DSIC charges but did not levy DSIC charges in 2016.

PGW also has a relatively greater need to upgrade its infrastructure, which can also be inferred in part from the residential rates, as well as from information on pipe infrastructure.[12] PGW has the highest Distribution System Improvement Charge (DSIC), as a percentage of residential bills. The DSIC allows for accelerated capital investment in the gas distribution system. Three other PA utilities have DSIC charges: Peoples, UGI Penn Natural Gas, and Peoples Equitable. The last of the three, however, implemented a negative DSIC charge of 3.87% on August 1, 2015 to refund over-collection of DSIC revenues during an eight month period from July 2014 to March

[12] Over 2011-2015, cast iron mains represented 49% of the total mileage of mains operated by PGW. The 2011-2015 averages for peers are as follows: Columbia (2%), National Fuel Gas (3%), PECO (11%), Peoples (1%), Peoples Equitable (N/A), Peoples TWP (0%), Central Penn (0%), Penn Natural Gas (4%), UGI Utilities (6%). Data from Brattle analysis of SNL data.

2015.[13] PGW's DSIC charge also differs from the other utilities' charges because it is implemented on a pay-as-you-go ("PAYGO") basis, meaning that these costs are recovered as expenses rather than as capital expenditures. This recovery is different than many of PGW's other capital expenditure where the new assets are financed and depreciated over decades, and it is also unlike IOUs, which place such assets in ratebase and then earn a return on the underlying equity.

Q14. ARE THE AVERAGE COSTS TO SERVE DEMAND COMPARABLE ACROSS YOUR PEER GROUPS?

A14. PGW's costs (exclusive of the energy commodity, gas or electricity, i.e., just its distribution service costs) to serve demand are in the range of its AU IOU peers but are somewhat higher than the PA IOUs. Insufficient data was available from the Muni peer group to make comparisons meaningful.[14] As shown in FCG Figure – 9, PGW's 2011-2015 average of $4.46/mcf is in the upper part of the range of the AU IOU peer set, which ranges from $1.59 (PSEG) to $4.58/mcf (Boston Gas). It is unsurprising that PGW's costs to serve demand are more in line with the AU IOU peers since that group was selected for system comparability, and these utilities are characterized by aging infrastructure in an urban environment. The lower costs of PSEG and ConEd in the AU IOU peer group may be influenced by the lower percentage of residential sendout (giving them a higher average volume per customer, including non-residentials, hence spreading their non-gas costs more thinly in my calculation). As shown previously in FCG Figure – 5, ConEd and PSEG substantially differ on the percentage of total residential sendout (ConEd 23%, PSEG 30%, PGW 49%).

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[13] Pennsylvania Public Utility Commission, *Peoples Natural Gas Company LLC – Equitable Division Supplement No. 31 to Tariff Gas – PA P.U.C. No. 46*, Docket No. P-2015-2486463, http://www.puc.pa.gov/pcdocs/1374658.pdf

[14] For combined electric and gas utilities, I only included the reported operating expenses for the gas business.

FCG Figure – 9
Non-Gas Operating Expenses per Volume of Total Sendout (mcf)
(2011-2015 Averages)

PA		AU IOU		Muni	
PGW	4.46	PGW	4.46	PGW	4.46
Central Penn	2.97	BGE*	3.27	Citizens	2.66
Columbia	2.33	Boston Gas	4.58	Richmond	n/a
National Fuel Gas	2.73	BUG Co	3.91	Colorado Springs*	n/a
PECO*	2.35	ConEd*	2.00	CPS*	n/a
Penn Natural Gas	1.91	PSEG*	1.59	SMUD	n/a
Peoples	2.93			JEA	n/a
Peoples TWP	2.08			Seattle City	n/a

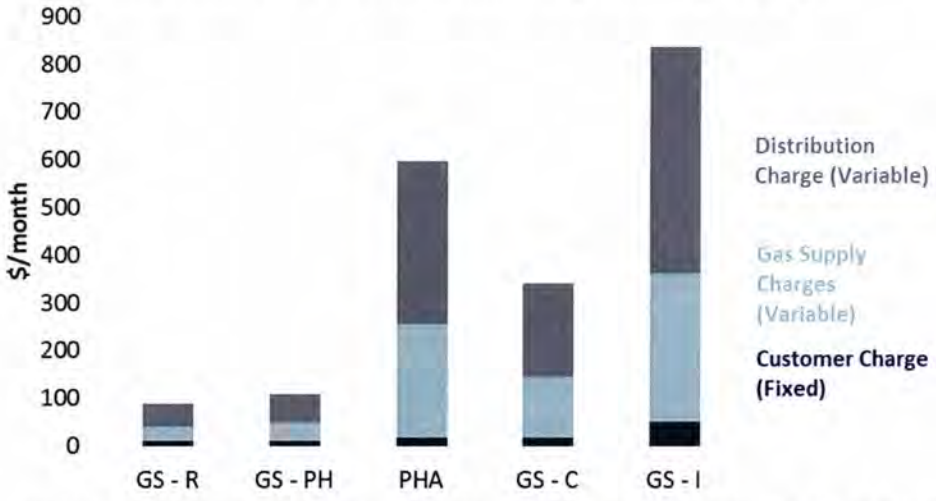
Sources and Notes:
PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data.
n/a reflects that either gas operating expenses were not reported separately from total operating expenses, or that volume data was not available. Gas operating expenses exclude purchased gas costs. Volume (mcf) measures total sendout. Asterisks (*) denote utilities providing services (e.g., electric) in addition to distribution of gas.

Q15. HOW DOES PGW'S RATE STRUCTURE COMPARE WITH ITS PA IOU PEERS?

A15. As shown previously in FCG Figure – 8, PA gas utilities have rate structures with low fixed monthly customer charges and high distribution charges that are billed on a per unit usage (variable) basis. All else held equal, a rate structure with low fixed charges implies more variance in utility revenues than a rate structure with higher fixed charges (hence more risk to creditors and investors). PGW has this same structure of low fixed cost and high variable charge pricing across its rate classes, as shown in FCG Figure – 10. Residential and commercial gas service accounts for the majority (73%) of PGW's revenues, and variable charges make up about 80% and 91%, respectively, of residential and commercial gas revenues to PGW. Across all rate classes except transportation, PGW's revenue is composed of approximately 80% variable charges and 20% fixed charges.[15]

[15] Based on Brattle analysis of *City of Philadelphia, Pennsylvania Gas Works Revenue Refunding Bonds Fourteenth Series (1998 General Ordinance)* ("2015 Engineers' Report").

FCG Figure – 10
Illustrative PGW Non-Commodity Monthly Charges



Sources: Constructed using PGW rate and volume data from City of Philadelphia, Pennsylvania Gas Works Revenue Refunding Bonds Fourteenth Series (1998 General Ordinance) ("2015 Engineers' Report").

PGW's fixed customer charges per customer month are lower than the majority of its Pennsylvania peers. As shown in FCG Figure – 11, at $12/customer-month PGW's residential customer charge is $1.50/month below the 2016 average residential customer charge and more than $4.00/month below Columbia's 2016 charge of $16.75/month. PGW's commercial customer charge is more than $10/month below the 2016 Pennsylvania average and more than $45/month lower than the highest 2016 customer charge from Peoples TWP. In combination with having a large portion of its load being residential, this volumetric pricing likely makes PGW more exposed to financial (cash flow) variance from abnormal weather than its peers.

FCG Figure – 11
PA Residential and Commercial Customer Charges ($/month)

	Residential		Commercial	
	6-yr. Average	2016	6-yr. Average	2016
PGW	$12.00	$12.00	$18.00	$18.00
Columbia	$16.66	$16.75	$20.18	$21.25
National Fuel Gas	$12.00	$12.00	$27.53	$27.53
PECO	$11.75	$11.75	$28.55	$28.55
Peoples	$13.18	$13.95	$24.88	$27.00
Peoples Equitable	$13.25	$13.25	$28.00	$28.00
Peoples TWP	$14.14	$15.75	$62.36	$65.00
Central Penn	$14.46	$14.60	$29.34	$30.40
Penn Natural Gas	$13.18	$13.17	$32.43	$32.41
UGI Utilities	$9.08	$11.75	$9.79	$16.00
Mean	$12.97	$13.50	$28.11	$29.41

Sources and Notes:
2016 Pennsylvania Public Utility Commission Rate Comparison Report.
Note that Peoples Equitable and UGI Utilities are not included in our benchmark group but are included here for completeness. UGI's customer charge increased in late 2016 and is reflected in the figures presented.

Q16. THUS FAR, YOU HAVE FOCUSED ON RATE STRUCTURE DIFFERENCES AND SIMILARITIES WITH THE PA IOU PEERS. ARE THERE ALSO REGULATORY TREATMENTS THAT DIFFER ACROSS THE AU IOU PEERS?

A16. Four of the five utilities in the AU IOU peer group have full decoupling. Generically, utilities with full decoupling have a lower risk profile, especially for cash flow, than those without decoupling because any revenue shortfalls in one period due to conservation and sometimes other causes are transferred and recovered (trued up) in future periods. However, these utilities may still encounter financial risks due to unanticipated expenses, such as higher than predicted operating and maintenance costs that are not covered by the decoupling true-ups. As shown in FCG Figure – 12, BGE, Boston Gas, BUG Co, and ConEd all have full decoupling.[16] PSEG has partial

[16] Utilities are considered to have full decoupling by Regulatory Research Associates if unexpected sales reductions are offset when caused by "energy efficiency programs, deviations from "normal" temperature patterns or economic conditions."

decoupling through weather normalization clauses.[17] Within Pennsylvania, only Columbia and PGW have partial decoupling through weather normalization clauses.[18] This partial decoupling reduces utility investment risk but to a lesser extent than full decoupling. Utilities without decoupling may need more cash on hand than utilities with decoupling.

FCG Figure – 12
Revenue Riders by Utility

State	Company	Peer Group	Gas Commodity	Conservation Program Expense	Decoupling: Full	Decoupling: Partial	Generic Infrastructure
PA	PGW	PA	Y	Y		Y	Y
PA	Columbia	PA	Y			Y	Y
PA	Peoples Equitable		Y				Y
PA	National Fuel Gas	PA	Y				
PA	PECO	PA	Y	Y			Y
PA	Peoples	PA	Y				Y
PA	Central Penn	PA	Y				Y
PA	Penn Natural Gas	PA	Y				Y
PA	UGI Utilities		Y	Y			
MD	BGE	AU IOU	Y	Y	Y		Y
MA	Boston Gas	AU IOU	Y	Y	Y		Y
NY	BUG Co	AU IOU	Y		Y		
NY	ConEd	AU IOU	Y		Y		
NJ	PSEG	AU IOU	Y	Y		Y	Y

Sources and Notes:
SNL Regulatory Research Associates, "Adjustment Clauses – A State-by-State Overview," 22 August 2016.
Generic Infrastructure include any infrastructure upgrade or replacement programs that authorize additional utility spending.

Q17. WITH THE PEERS SELECTED, PLEASE DESCRIBE HOW YOU SELECTED THE METRICS TO BE BENCHMARKED.

A17. Before selecting individual metrics for comparison, I developed four performance attributes to benchmark across PGW and its peers. All else held equal, a utility

[17] SNL Regulatory Research Associates, "Adjustment Clauses – A State-by-State Overview," 22 August 2016.

[18] Columbia's weather normalization clause was established in 2013 as a pilot program for residential customers that would continue until a final order is issued in the first rate case filed after May 31, 2016.

performing well across all of these attributes would be expected to be attractive to investors and have reliable, relatively low cost access to capital markets. Conversely, weak metrics could interfere with access to capital or raise the interest rate on available funds. With the categories defined, I then selected a few metrics that reflect each of these attributes. The benchmarking categories, shown in FCG Figure – 13, provide a holistic description of PGW's financial performance and comparison to peers. The calculation details for each metric are given in FCG Figure A – 1. In addition to these metrics, I also considered credit ratings for PGW and its peers. These ratings serve as a proxy for overall financial health and are themselves an indicator of PGW's financial performance.

FCG Figure – 13
Categories for Benchmarking Metrics

Attribute	Insight
Leverage & Risk	Profitability and default risk of the company
Liquidity	Ability to absorb unanticipated costs and finance capital investments
Solvency	Ability to pay debts
Turnover/Efficiency	Capital investment levels

The metric formulas identified in FCG Figure – 14 are generic measures, applied in a consistent fashion and not modified to reflect the calculation approaches that any individual utility may use for its own accounting or bond covenant purposes. I used this generic calculation approach to ensure that the utilities can be compared on an apples-to-apples basis.

FCG Figure – 14
Metrics Considered by Attribute

Attribute	Metrics
Leverage & Risk	• Debt / Capitalization • Operating Margin
Liquidity	• Days Cash • Internally Generated Funds/Revenues • Funds from Operation/Capital Expenditures
Solvency	• Funds from Operations/Debt • Funds from Operations Coverage • EBIT Coverage • Interest-Only Debt Service Coverage • Debt Service Coverage (Principal & Interest)
Turnover/Efficiency	• Capital Expenditures/(Depreciation + Amortization) • Net Plant/Gross Plant • Capital Expenditures/Net Plant

Q18. ARE THESE FINANCIAL METRICS COMPARABLE TO THE FINANCIAL USED BY CREDIT AGENCIES?

A18. The metrics credit rating agencies consider to determine a credit rating vary from agency to agency, though they are similar. The metrics I selected span the major financial performance attribute groups included by the three major credit agencies (Moody's, Fitch, and S&P) relating to solvency (leverage and risk), liquidity, profitability and the like. I understand from the testimony of Mr. Hartman on behalf of PGW that the three major metrics most important to rating agencies for evaluating munis include debt to equity ratios, debt service coverage, and Days Cash, and each of these metrics is included in my benchmarking set. As the investment risk profile varies by utility type, municipal versus IOU, the expected level on each of these metrics will vary and may carry different weight in the rating process. I have included a comparison of the metrics considered by the credit agencies as compared to the metrics in FCG Figure A – 2 and FCG Figure A – 3.

III. BENCHMARKING RESULTS

Q19. PLEASE GIVE AND OVERVIEW OF HOW YOU WILL DISCUSS YOUR BENCHMARKING RESULTS.

A19. I will explain my results in two major sections. First, I will provide a high level overview of how PGW's financial performance has evolved since 2009 as demonstrated through changes in its credit rating. Second, I will discuss the four categories of metrics (Leverage & Risk, Liquidity, Solvency, and Turnover/Efficiency) that both inform credit ratings and the overall financial performance of the Company. For each metric category, I will describe PGW's trends in performance as well as its average performance relative to the peer groups over the 2011-2015 time period. I have provided full supporting details for the calculations in FCG Figure A – 1.

Q20. HOW HAS PGW'S FINANCIAL PERFORMANCE EVOLVED SINCE THE LAST RATE CASE?

A20. PGW's financial performance began improving with the revenue increase granted in the 2009/10 rate case and it stabilized at these higher performance levels over the 2011-2015 time period, as shown earlier in my testimony in FCG Figure – 1. Consistent with these metrics, PGW's credit ratings improved one to two levels for each credit rating agency following the 2009/10 rate case, as shown in FCG Figure – 15.

FCG Figure – 15
Improvement in Credit Ratings

	Moody's	S&P	Fitch
2009	Baa2	BBB-	n/a
2015	Baa1	A-	BBB+

Sources and Notes:
2009 ratings from Exhibit FJH-1, Schedule 3, page 1 in the prepared direct testimony of Frank J. Hanley, CRRA (December 2009);
2015 ratings from PGW-provided credit rating history.

Q21. WITH ITS IMPROVED PERFORMANCE, IS PGW'S OVERALL FINANCIAL PERFORMANCE IN LINE WITH PEERS?

A21. Although PGW's financial health has improved, it has generally not kept pace (or caught up) with its peers on either the overall ratings or on the specific financial benchmarking metrics that I analyzed, especially with respect to leverage, solvency, and liquidity. PGW and most of its peers were affected by the recession and financial

stress that was in effect in 2009. Since then, most have improved and by 2015, PGW's credit rating from Moody's was closer to, but still lower than all IOU peers by 1-2 levels and similar on both Fitch and S&P ratings, as shown in FCG Figure – 16. However, compared to its Muni peers, PGW's 2015 credit rating from Moody's was lower by 4-6 levels. By comparison, all of PGW's municipal peers are Aa rated companies.

FCG Figure – 16
2015 Credit Ratings for Select Peers

Utility	Moodys	Fitch	S&P
IOUs			
PGW	Baa1	BBB+	A-
BGE	A3	BBB+	A-
Boston Gas Co	A3		
ConEd	A2	BBB+	A-
PECO	A2	BBB+	BBB
PSEG	A2	A-	BBB+
UGI Utilities	A2		
Munis			
PGW	Baa1	BBB+	A-
Colorado Springs Utilities	Aa2	AA	AA
CPS Energy	Aa1	AA+	AA
Jacksonville Electric Authority	Aa2		
Richmond Department of Public Utilities	Aa2	AA	AA
Sacramento Municipal Utility District	Aa3	AA-	AA-
Seattle City Light	Aa2		AA

Sources and Notes:
PGW-provided credit rating history; IOU ratings reflect LT (long-term) ratings from Bloomberg; muni ratings reflect most recent revenue bond ratings as recorded in EMMA (Electronic Municipal Market Access).
Blank denotes lack of rating in 2015.

Q22. CAN YOU DEPICT HOW PGW'S RATINGS HAVE IMPROVED RELATIVE TO ITS PEERS?

A22. Yes, but in order to do so I need to switch from relying on the similar but inconsistent letter grading that ratings agencies use to an equivalent numerical (ordinal, not cardinal) scheme. I developed this by assigning each credit rating a normalized numerical score in half point increments for all bond ratings considered investment

grade or above. This scale and the equivalent credit ratings across rating agencies are shown in FCG Figure – 17. A score below 5.5 in my scale would be below investment grade.

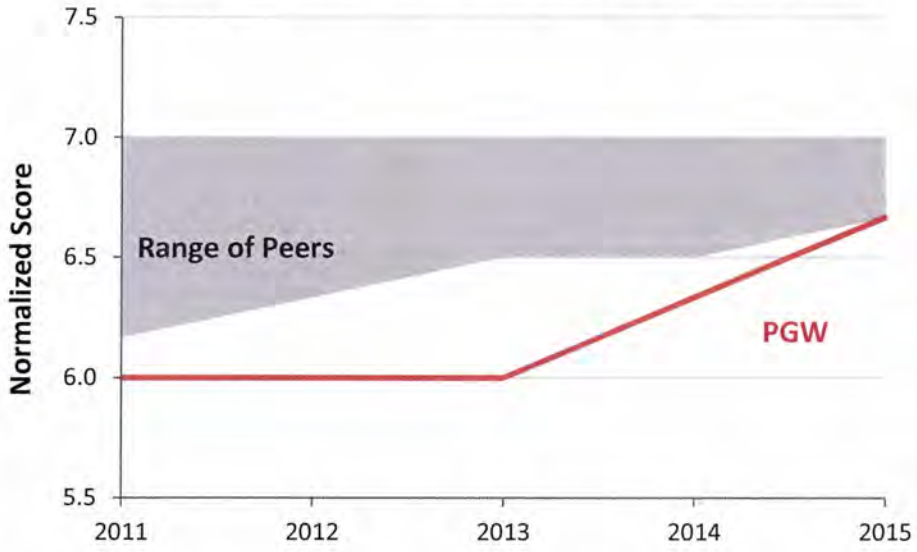
FCG Figure – 17
Credit Agency Rating Comparisons and Normalization

Moodys	Fitch	S&P	Score
Aaa	AAA	AAA	10
Aa1	AA+	AA+	9.5
Aa2	AA	AA	9
Aa3	AA-	AA-	8.5
A1	A+	A+	8
A2	A	A	7.5
A3	A-	A-	7
Baa1	BBB+	BBB+	6.5
Baa2	BBB	BBB	6
Baa3	BBB-	BBB-	5.5

Q23. GIVEN THAT NUMERICAL CONVERSION OF RATINGS, HOW DID PGW COMPARE TO ITS PEERS?

A23. FCG Figure – 18 below depicts the relative improvement of PGW compared to group of its IOU peers (PECO, BGE, Boston Gas, ConEd, and PSEG). As shown in FCG Figure – 18, PGW's normalized credit rating improved between 2013 and 2015, and the low end of its peers also improved; PGW's normalized credit rating reached the level of the low end of its peers in 2015. While relative position is not as important as absolute ratings, it is beneficial to be in the upper portion of your peer group rather than the lower, because when credit conditions tighten, there tends to be a "flight to quality" (giving superior access to the better performers).

FCG Figure – 18
Normalized Credit Rating for Select IOU Peers 2011-2015



Sources and Notes:
PGW-provided credit rating history; LT (long-term) ratings from Bloomberg.
Agency credit ratings normalized by Brattle numerical score. Ratings shown only for PECO, BGE, Boston Gas, ConEd, and PSEG. LT company-level credit ratings not available on Bloomberg for other IOUs; credit ratings at the parent company level not included.

Q24. HOW HAS PGW'S LEVERAGE CHANGED SINCE THE LAST RATE CASE?

A24. PGW has reduced its debt to total assets or total capital ratios through gains in customer equity since the 2009/10 rate case, which has likely helped increase credit ratings and lower borrowing costs. Generally speaking, when a utility operates with a higher percentage of debt relative to its peers, the cost of issuing debt increases. This occurs because the debt may be more risky to investors when the debt service represents a bigger claim against available cash flow. If there are actual equity shareholders as in an IOU but not a muni, using more debt also increases the volatility of the residual profits per dollar of equity. Greater leverage also affects value in the event of default, where a larger debt ratio means there is more risk that liquidated or restructured assets will not cover the full debt investment creditors have put into the company. Prior to the

2009/10 rate case, PGW had a 5-year average Debt/Capitalization of 84%.[19] That leverage decreased to an average of 78% over the 2011-2015 time horizon.

Q25. IS THE PGW LEVEL OF DEBT NOW IN LINE WITH BENCHMARKING PEERS?

A25. PGW's Debt/Capitalization has improved from levels prior to the 2009/10 rate case at 85% in 2008 to a more desirable value of 78% in 2015. More generally over the 2011-2015 time period, compared to the Muni peer group, PGW had a slightly higher than average ratio (78% PGW, 73% average across all peers 2011-2015) of debt in its capital structure, but it was within the range of those Muni peers (from a low of 61% for CPS to a high of 91% for Citizens Energy, both values reflecting a 2011-2015 average).[20] The higher level of Debt/Capitalization at the Munis compared to IOUs is not surprising since municipal utilities are generally debt financed and so carry higher levels of debt than their IOU peers (which have equity investors). Compared to its PA IOU peers over the 2011-2015 time period, PGW is more levered, with PA IOU peers ranging from 36% (National Fuel Gas) to 50% (Peoples TWP) on average over the 2011-2015 time period. Similarly, the AU IOU peer group has 2011-2015 average Debt/Capitalization of 30% (Boston Gas) to 49% (ConEd).

While PGW's Debt/Capitalization has held relatively constant over the 2011-2015 time horizon, the general trend in the muni peer group has been toward lower Debt/Capitalization. As shown in FCG Figure – 19, the high-end of the Muni peer group's annual average Debt/Capitalization decreased from 98% to 81% between 2011 and 2015. While PGW is still in the range of its Muni peer group, it is now at the higher end of its peers.

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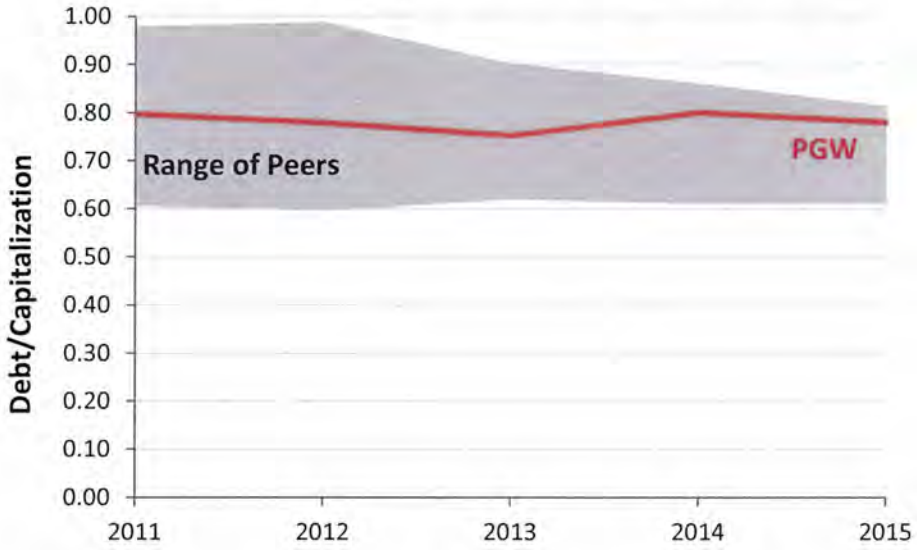
[19] Pennsylvania Public Utility Commission, *Prepared Direct Testimony of Frank J. Hanley, CRRA*, Docket No. R-2009-2139884.

[20] All values reflect averages from 2011-2015.

FCG Figure – 19
Muni Peer Debt/Capitalization Ratios 2011-2015



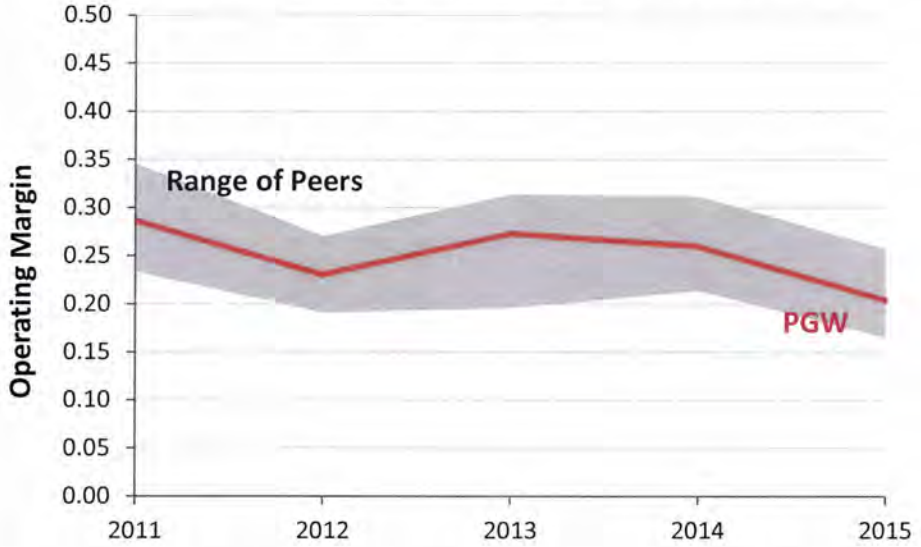
Sources: PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data for Citizens; Brattle analysis of annual financial reports for Richmond, Colorado Springs, CPS, SMUD, JEA, Seattle City.

Q26. HAS PGW'S PERFORMANCE LAGGED ON THE OTHER RISK & LEVERAGE METRIC CONSIDERED?

A26. PGW was largely in line with its peers for operating margins, the other risk and leverage metric that I considered. Operating margins are a proxy for firm profitability when normalized as the ratio of operating income to operating revenues. Higher operating margins indicate more cash flow for fixed costs, hence a lower risk profile as the utility has a greater buffer to cover costs and compensate debt and equity holders. Equivalently, having a higher margin means there is less sensitivity to variances in revenues for cash flow available for non-operating costs. PGW's 2011-2015 average operating margin (25%) was in line with both its PA IOU peers (ranging from 22-29%, average values over the 2011-2015 time period) and municipal peers (ranging from 17-35%, average values over the same time period). Both the PA IOU and Muni peer group margins were higher on average than the AU IOU peers (ranging from 15-26%, average values over the 2011-2015 time period). PGW's operating margin varied between 20% and 29% over the 2011 to 2015 time period, and these variations mirrored those in other PA utilities, as shown in FCG Figure – 20. Because these fluctuations are similar over time for PGW and the PA IOUs, they most likely reflect

weather-driven or macroeconomic revenue effects rather than variation in PGW's operational efficiency.

FCG Figure – 20
PA IOU Peer Operating Margins 2011-2015



Sources: PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data for Columbia, National Fuel Gas, PECO, Central Penn, Penn Natural Gas, Peoples, and Peoples TWP.

Q27. HOW DO PGW'S LIQUIDITY LEVELS COMPARE TO BENCHMARKED PEERS'?

A27. Liquidity is about having cash or ready access to cash-equivalent borrowings and securities on short notice. I developed metrics to look at liquidity in two different ways: availability to meet short-term funding requirements through the metric of Days Cash (year-end cash balance divided by average daily operating expenses including commodity costs but net of depreciation and amortization), as well as the ability to rely on funds internally generated by the company (from operations) to fund capital expenditures. In the period studied, PGW had lower liquidity than its peers on a Days Cash basis and comparable liquidity to its peers for capital expenditures. I will first discuss the Days Cash metric and then the metrics related to funds available for capital expenditures.

The Days Cash metric indicates how many days of operating expenses the utility could cover with its year end cash balances. I understand from Mr. Hartman's testimony that the median Days Cash for A to AAA ratings is 150 days. This level would allow a utility to keep covering its costs even if its receivables from customers were delayed for a few weeks, and it could also cover a month or more of higher than anticipated gas commodity purchases, e.g., during a colder than average month. In this example, the utility must have sufficient liquidity to cover the gas cost until the reimbursement from customers occurs.

PGW had Days Cash on the low-end of the Muni peer group 2011-2015, and the Muni group generally had higher Days Cash than IOUs or PA IOUs.[21,22] Specifically, PGW had a five year average 65 Days Cash on hand in 2011-2015, and over that same time horizon, the Muni peers ranged on average from 25 to 201 days. As shown in FCG Figure – 21, PGW's Days Cash was on the low-end of its Muni groups for each year from 2011-2015; it was also 35-78 days below the peer group average in every year 2011-2015.[23] With fewer Days Cash, PGW was more exposed to short term liquidity risks than its Muni peers. In contrast, PGW had, on average, considerably higher Days Cash than its IOU peers. PA IOUs ranged from average Days Cash values 2011-2015 of 4 to 114 Days Cash (average 31), and over the same time period, AU IOUs ranged from 2 to 25 Days Cash (average 10).

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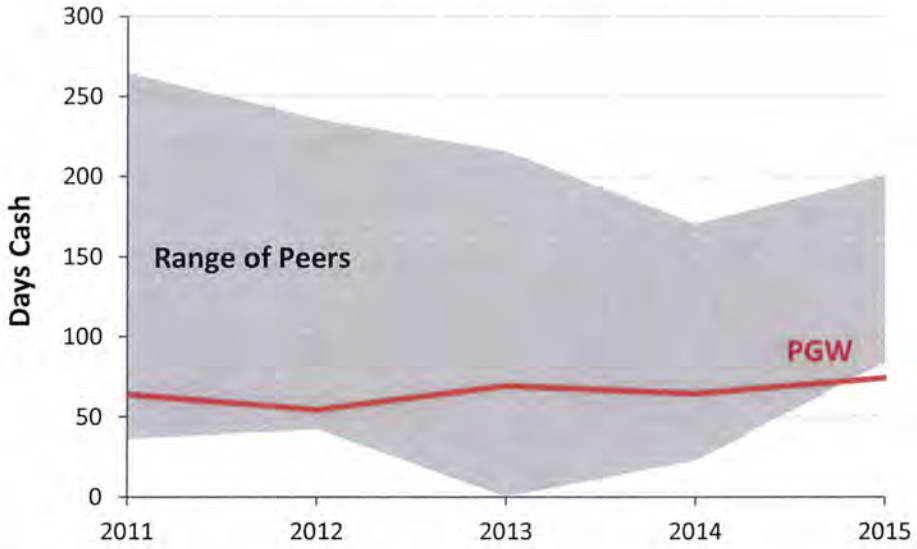
[21] These Days Cash figures are inclusive of commodity costs and exclusive of depreciation and amortization.

[22] It is important to note here that the municipal utilities have differing financial years that likely affect the year-end cash balances. A utility with a financial year ending in the winter would generally be expected to have less cash on hand due to payment for commodity costs not yet recovered from ratepayers. On the other hand, a utility such as PGW with a summer or early fall financial year (September-August) would generally be expected to have greater cash on hand. Peer Munis have the following financial years: Citizens (January-December), Richmond (July-June), Colorado (January-December), CPS (February-January), SMUD (January-December), JEA (November-September), Seattle City (January-December).

[23] In 2011, PGW had 64 Days Cash; the peer group Days Cash average was 136. In 2012, PGW had 54 Days Cash; the peer group Days Cash average was 133. In 2013, PGW had 69 Days Cash; the peer group Days Cash average was 116. In 2014, PGW had 64 Days Cash; the peer group Days Cash average was 99. In 2015, PGW had 74 Days Cash in 2015; the peer group Days Cash average was 125.

FCG Figure – 21
Muni Peer Days Cash 2011-2015



Sources: PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data for Citizens; Brattle analysis of annual financial reports for Richmond, Colorado Springs, CPS, SMUD, JEA, Seattle City.

Q28. PLEASE DISCUSS WHY THE DAYS CASH METRIC IS NOT SO COMPARABLE BETWEEN MUNICIPAL UTILITIES AND IOUs?

A28. Comparing liquidity levels on a Days Cash basis between municipal utilities and IOUs is complicated by the differing financing strategies and access to short term financing. IOUs may need to carry fewer cash reserves than municipals due to intercompany pools, since many of them are subsidiaries of a larger holding company which frequently has access to a cash reserves at the holding company level. These can be less expensive than external financing that smaller, less diversified munis might need to do, both because of scale and because of diversity across many lines or locations of business. (Because cash needs probably are not perfectly correlated across all subsidiaries, the total amount required by the holding company per dollar of assets may be less.) I am aware that 8 of the 12 peer IOU utilities in the benchmarking study have access to cash pooling arrangements, and the other 4 may have access to pooling arrangements.[24]

[24] The 8 of 12 peer IOUs have access to cash pooling arrangements: Columbia Gas, National Fuel Gas,

In addition, several of the IOUs in the peer groups have regulatory mechanisms that help them maintain steady cash levels even if they experience variances. In particular, as noted in my introductory description of the peers, several have decoupling, which helps immunize them against reductions in sales. This helps reduce their need for cash balances.

By contrast, municipal utilities do not have access to the same types of financial pooling (in a holding company) and may also require a more fixed quantity of cash on hand due to political or structural considerations in budget setting. Unlike IOUs, budgets and financing plans for municipal entities may be set or require approval by a board or other entity at irregular intervals, via a complex political review process, and so they may have inherently less flexibility than an IOU. Without this flexibility, municipals may need to have more conservative (higher) levels of cash available. Finally, municipals may need to carry larger cash balances if they do not have a sufficiently large debt service reserve fund.[25]

Q29. WAS PGW BELOW PEER LEVELS IN REGARD TO INTERNAL FUNDS AVAILABLE FOR CAPITAL EXPENDITURES?

A29. PGW's comparison to peer groups on liquidity for internally funding capital expenditures is not as clear as the Days Cash comparison. Here, PGW's health was on par with peers on one metric and higher than most non-PA peers on another. For this comparison, I considered the ratio of internally generated funds (IGF) to revenues as well as funds from operations (FFO) to capital expenditures ("CapEx"). The first measure describes what percentage of pre-tax revenues could be available as cash for investment, and the second provides insight as to the extent to which a utility needs to

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PECO, Central Penn, Penn Natural Gas, BGE, ConEd, and PSEG. Columbia Gas, National Fuel Gas, BGE, and ConEd make no explicit references to cash pooling but have dividend arrangements and/or cross-default provisions with their holding companies that may include some form of ad hoc cash sharing.

PGW 2015 Comprehensive Annual Financial Report; NiSource 2015 10-K; National Fuel Gas Company 2015 10-K; Exelon 2015 10-K; UGI Corporation 2015 Annual Report; Con Edison 2015 Annual Report; PSEG 2015 10-K.

[25] Edward Damutz *et al.*, "US Municipal Utility Revenue Debt," Moody's, December 15, 2014, 13

borrow in order to fund its CapEx.[26] The metrics, as well as their constituent financial descriptions, are defined below in FCG Figure – 22.

FCG Figure – 22
Financial Definitions for Liquidity

Quantity/Metric	Definition
Operating Income	Operating Revenues – Operating Expenses
CapEx	Purchase of Capital Assets (as found in cash flow statement)
IGF	Operating Income + Depreciation + Amortization
FFO	Net Income + Depreciation + Amortization
IGF/Revenues	(Operating Income + Depreciation + Amortization) / (Operating Revenues – Purchased Commodity Costs)
FFO/CapEx	(Net Income + Depreciation + Amortization) / CapEx

Notes: Purchased commodity costs excluded from Operating Revenues in IGF/Revenues metric. If cash flow statement was not available, CapEx was calculated according to the following: Current Year Property, Plant, Equipment (PPE) – Previous Year PPE + Current Year Depreciation.

Generally, utilities with lower IGF as a percent of revenues available for CapEx will tend to need to issue more debt (raising the end cost to ratepayers for a muni) to fund CapEx programs, or they may choose to perform fewer or slower CapEx projects, such as main replacements in order to live within their overall financing budgets. With a 34% 5-year average IGF/Revenues percentage, PGW is comparable to all of its peers: with the PA IOU group ranging from 30% to 43%, the AU IOU group ranging from 26% to 40%, and the Muni peer group ranging from 33% to 61%.[27]

Comparing FFO to CapEx, PGW's 5-year average value (1.05) is on the higher end of the Muni peer group (0.68-2.72) as four of the seven peers have FFO/CapEx ratios of less than one. Likewise, PGW has higher internal funding than all utilities in the AU IOU peer group, which all have 5-year average FFO/CapEx ratios of less than one (0.56-0.85). In the PA IOU peer group, 5-year average FFO/CapEx ratios range from 0.51 (Columbia) to 1.75 (National Fuel Gas), and PGW is slightly below the 5-year average group average of 1.07.

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[26] If the FFO/CapEx ratio is less than one the, funds generated by the utility are less than the capital expenditures.

[27] All numbers cited reflect an average over the 2011-2015 time period.

Q30. WHAT IS YOUR OVERALL CONCLUSION ABOUT PGW'S LIQUIDITY VERSUS ITS PEERS?

A30. Over the 2011-2015 time period, PGW's Days Cash and internal funding were both comparable to IOUs, but both measures were a bit low compared to Munis. Of these peer groups, the municipal comparison is the more apt and important one. PGW's somewhat low cash might not be a problem if there are no "hiccups" in operations over the next few years, but it leaves the Company with less flexibility or resiliency than other Munis may enjoy and ratings agencies may recommend. I understand that the proposed rate increase is targeted in large part to address this.

Q31. GIVEN DIFFERENCES IN FINANCIAL STRUCTURE AND REQUIREMENTS, HOW DID YOU COMPARE SOLVENCY ACROSS THE BENCHMARKING GROUPS?

A31. Solvency refers to how much confidence creditors can have in the ability of their borrowers to meet their debt service obligations. This is measured by variations on metrics that compare alternative layers of operating income to interest expense or debt service, possibly by level of subordination. Often these are measured directly the way bond covenants are specified, since default can be triggered if some solvency ratios fall below minimum thresholds. However, those covenant-based metrics are particular to each company and not always public, so instead of using these, I developed five generic metrics that reflect solvency across firms on an apples-to-apples basis. These metrics, shown below in FCG Figure – 23, reflect multiple measures of funds available to cover debt and three debt measurements.

FCG Figure – 23
Financial Definitions for Solvency

Quantity/Metric	Definition
FFO	Net Income + Depreciation + Amortization
EBIT	Net Income + Interest + Taxes
FFO/Debt	(FFO) / 2-Year Average Total Debt
FFO Coverage	(FFO + Interest) / Interest
EBIT Coverage	(Net Income + Interest + Taxes) / Interest
Interest-Only Debt Service Coverage	(Operating Income + Depreciation + Amortization + Interest Income) / Interest
Debt Service Coverage (Principal + Interest)	(Operating Income + Depreciation + Amortization + Interest Income) / (Interest + Principal Paid on Long-Term Debt)

Notes: 2-Year Average Total Debt is the two-year average of the sum of long-term debt and short-term debt.

Q32. HOW DOES PGW STAND ON THESE MEASURES OF SOLVENCY IN ABSOLUTE TERMS, RELATIVE TO ITS COVENANTS?

A32. Prior to 2015, PGW had outstanding long-term debt issued under a 1975 Ordinance and a 1998 Ordinance.[28] Both the 1975 Ordinance and the 1998 Ordinance required a debt service coverage ratio of 1.5x, and this coverage ratio was calculated separately for debt issued under each ordinance. As the senior bond, the debt service coverage ratio for the 1975 Ordinance debt in August of 2008 was 4.28, and this improved to 6.57 in August of 2015. While improved, this ratio is somewhat misleading as the size of the debt service reduced as 1975 Ordinance debt was retired. The debt service coverage ratio for the 1998 Ordinance debt is more indicative of overall health, and it improved from 1.88 in August of 2008 to 2.14 in 2015. Typically, PGW reports the debt service coverage ratio for all long term debt. This "aggregate" debt service coverage ratio also improved from 1.53 in August 2008 to 1.82 in August 2015.

Q33. WHY DOES THE AGGREGATE CALCULATION SHOW A LOWER DEBT SERVICE COVERAGE RATIO THAN EITHER OF THE INDIVIDUAL ORDINANCES?

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[28] There is no 1975 Ordinance debt outstanding as of August 31, 2015.

Philadelphia Gas Works, Comprehensive Annual Financial Report for the Fiscal Year Ended August 31, 2015.

A33. The coverage ratios for individual ordinances are higher than the aggregate coverage because the separate calculations allow a single dollar to provide coverage for both ordinances. PGW first calculates the coverage ratio for the 1975 Ordinance debt using all available funds to cover debt service. To calculate the funds available for coverage of the 1998 Ordinance debt, PGW then takes all funds available to cover debt service and subtracts the 1975 debt service requirements; this subtraction includes only the interest and principal payments for the 1975 Ordinance debt. It does not include the additional funds required to meet the 1.5x coverage ratio under the covenant. As a result, funds "used" to meet the 1.5x ratio for the 1975 Ordinance debt are also counted as available to meet coverage requirements for the 1998 Ordinance debt.

On the other hand, when the aggregate debt service coverage is calculated, all debt is considered at once, and as a result, a single dollar may only be counted towards both debt service coverages once. This produces a lower overall aggregate debt coverage ratio. Historically, an aggregate debt service coverage ratio of 1.5 has correlated with a debt service coverage for the 1998 Ordinance debt of approximately 1.75-2.0.

Q34. WHICH OF YOUR METRICS IS MOST CLOSELY ALIGNED WITH PGW'S AGGREGATE DEBT SERVICE COVERAGE RATIO?

A34. Of the metrics I considered, the Debt Service Coverage (Principal & Interest) metric most closely aligns with PGW's aggregate debt service coverage ratio. My Debt Service Coverage (Principal & Interest) metric is lower than PGW's aggregate debt service coverage ratio due to revenue recognitions in PGW's coverage ratio that we cannot imitate in applying such a test to its peers.

Q35. HOW DO PGW SOLVENCY MEASURES COMPARE TO THE PA OR AU IOUS?

A35. On the solvency metrics that I considered, IOUs (PA IOUs and AU IOUs) generally had stronger solvency metrics than municipals (including PGW) in the benchmarking groups. For example, the FFO/Debt ratios for IOUs (averaged 2011-2015) ranged from 0.18 (Peoples Division) to 0.49 (Boston Gas), while the Munis' range was lower, from

0.06 (Richmond) to 0.12 (Citizens). Over the same time period, average FFO Coverage ratios for IOUs ranged from 3.55 (Penn Natural Gas) to 7.88 (Boston Gas), while Munis went from 2.16 (PGW) to 3.7 (Seattle).[29] This difference between Munis and IOUs was unsurprising because municipals are more highly leveraged and thus have higher debt levels to cover.[30] The absolute levels for PGW and its comparisons to munis are probably more significant on these measures..

Q36. DOES YOUR BENCHMARKING INDICATE THAT PGW'S SOLVENCY HAS IMPROVED TO THE LEVELS OF ITS MUNI PEERS?

A36. PGW lagged its Muni peer group in each solvency metric considered excluding Debt Service Coverage (Principal & Interest). As shown in FCG Figure – 24, PGW had the lowest average FFO Coverage and Interest-Only Debt Service Coverage in the Muni peer group and FFO/Debt and EBIT Coverage were below average. While PGW did not lag its Muni peers on the Interest & Principal Coverage metric, there may be idiosyncratic financing reflected in this measure as both Richmond and SMUD appear to have ratios below 1.0, which would indicate that the utilities were unable to cover their interest and principal payments.

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[29] Likewise, Penn Natural Gas had an FFO Coverage ratio of 3.55; this ratio is lower than Seattle (3.7) and equal to Colorado Springs (3.55). Penn Natural Gas had a lower Interest-Only Debt Service Coverage ratio than four Muni peers. Peoples had a lower Interest-Only Debt Service Coverage ratio than one muni peer.

[30] The relative performance of PA IOUs to Munis on Debt Service Coverage (Principal & Interest) is difficult to assess due to data availability.

FCG Figure – 24
Muni Peer Group Solvency Metrics
(2011-2015 Average)

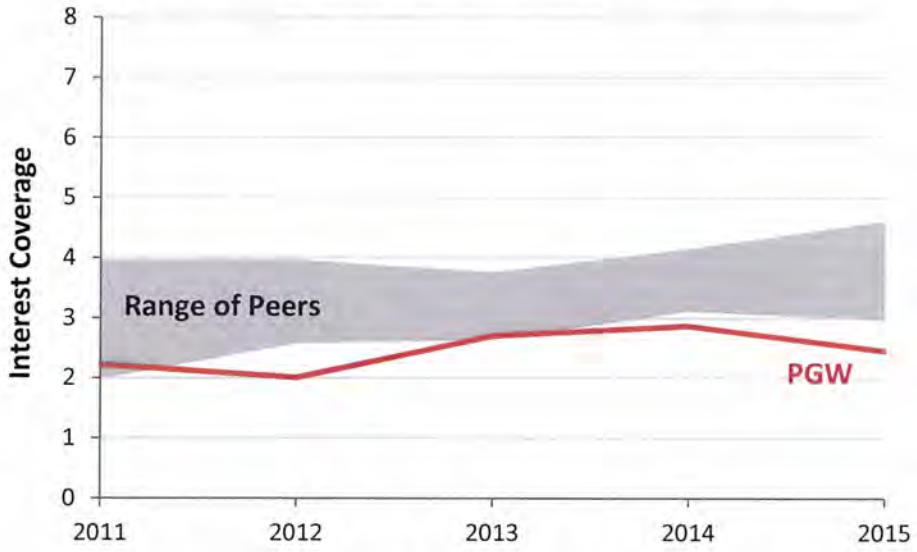
	FFO to Debt	FFO Coverage	EBIT Coverage	Interest-Only Debt Service Coverage	Debt Service Coverage (Principal + Interest)
PGW	0.07	2.16	1.91	2.45	1.39
Citizens	0.12	3.22	2.40	3.27	NA
Richmond	0.06	2.57	1.36	2.71	0.99
Colorado Springs	0.09	3.55	2.51	3.47	1.30
CPS	0.08	2.95	2.68	3.97	2.09
SMUD	0.09	3.40	1.97	3.18	0.91
JEA	0.09	3.17	2.19	3.60	1.59
Seattle City	0.11	3.70	3.38	3.07	1.38
Peer Average	0.09	3.22	2.35	3.32	1.38

Sources and Notes:
PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data for Citizens; Brattle analysis of annual financial reports for Richmond, Colorado Springs, CPS, SMUD, JEA, and Seattle City.
Peer Average denotes average of each column, excluding PGW.

Q37. DID PGW'S INTEREST-ONLY DEBT SERVICE COVERAGE IMPROVE OVER TIME?

A37. PGW's Interest-Only Debt Service Coverage, which obviously must always be above 1.0 to make payments, fluctuated between 2.0 and 3.0 over the 2011-2015 time horizon, and these levels were an improvement from levels prior to the 2009/10 rate case where the Interest-Only Debt Service Coverage ratio had a value of 1.6 in 2008. But even with the improvement, PGW's metric level remained below or at the low range of Munis peers from 2011-2015. As shown in FCG Figure – 25, the range of Interest-Only Debt Service Coverage ratios for municipals improved on the low end from about 2 to 3 and increased on the high end from about 4 to 4.5. Over the same time period, PGW's ratio fluctuated without an overall upward trend.

FCG Figure – 25
Muni Interest-Only Debt Service Coverage Band



Sources: PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015; Brattle analysis of SNL data for Citizens; Brattle analysis of annual financial reports for Richmond, Colorado Springs, CPS, SMUD, JEA, Seattle City.

Q38. THE RATIOS DISCUSSED SO FAR HAVE BEEN ENTIRELY ON THE FINANCIAL HEALTH OF PGW AND ITS PEERS. HOW DOES THIS INFORMATION RELATE TO IMPROVEMENTS IN THE PHYSICAL INFRASTRUCTURE OF A UTILITY?

A38. When planning infrastructure improvements, such as replacing cast iron pipe, utilities balance the physical health of the system (e.g., age, material condition, capabilities, etc.) against the financial health of the utility. When a municipal utility increases its investment in infrastructure upgrades, the CapEx will impact the utility through a combination of increased debt financing, decreased customer equity, and decreased liquidity. If the utility has tenuous financial health on an absolute basis prior to the investment, this increased strain may diminish financial metrics and result in a credit rating downgrade and other adverse impacts related to the utility's ability to issue debt at low costs. Conversely, if a utility tries to protect its financial health by cutting back on maintenance or reducing capital improvements in the system, the riskiness of the utility will increase as potential liabilities related to unanticipated capital expenditures, costs related to service degradation, later increases in operational and maintenance costs, and other liabilities related to aging infrastructure that may also increase. Thus,

even with the dedicated DSIC funding for some iron main replacement, there are ongoing, competing needs for funding that require overall financial strength.

Q39. IS PGW KEEPING PACE WITH ITS PEERS ON REINVESTMENT INTO THE GAS SYSTEM?

A39. With the Commission's approval of PGW's Long Term Infrastructure Improvement Plan and DSIC surcharge, PGW has been able to increase its capital expenditures program as discussed in Mr. Moser's testimony. However, based on my analysis, PGW is investing into its infrastructure at a slower pace than peers. These results carry the caveat that the DSIC funding is not fully reflected in the benchmarking analysis as a result of the time period considered and that PGW may have been limited in its ability to invest due to overall financial performance. I considered three different metrics that inform the similarities and differences between the peer companies, via relationships between capital expenditures, depreciation, and revenues. Specifically, I considered the ratios of Net Plant to Gross Plant ("Net Plant/Gross Plant"), CapEx to Net Plant ("CapEx/Net Plant") and CapEx to Depreciation and Amortization ("CapEx/DA"), which are defined below in FCG Figure – 26. Each of these ratios describes one aspect of reinvestment into the system. For example, the ratio of net plant to gross plant describes the age of the system on a financial basis. If the net plant divided by gross plant is high, the values are relatively similar and few assets have been depreciated; the lower the number, the older and more depreciated the assets are, everything else being equal. (This can also be low if a utility is not capitalizing assets to the same extent as its peers.)

FCG Figure – 26
Financial Definitions for Efficiency/Turnover

Quantity/Metric	Definition
Net Plant/Gross Plant	Net Plant / Gross Plant
CapEx/Net Plant	CapEx / Net Plant
CapEx/DA	CapEx / (Depreciation + Amortization)

On most of these metrics, PGW was lower than average across 2011-2015 compared to PA IOU peers, and it was the lowest on all of them amongst the AU IOU peers, as

shown in FCG Figure – 27. This indicates to me that PGW is replacing its older main at a slower pace than its peers. As I discussed previously, a lower Net Plant/Gross Plant metric generally indicates an older age of a system, and by this metric, PGW had the oldest system in the PA IOU and AU IOU peer groups. PGW also had the lowest CapEx/Net Plant metric for the IOU peer groups, indicating that on a percentage basis, it was reinvesting a at a slower rate relative to the size of its system. Finally, PGW had the lowest CapEx/DA ratio of both the PA and AU IOU peers, which indicates that relative to its peers, it was depreciating its system faster than it was reinvesting.

FCG Figure – 27
Efficiency/Turnover Metrics for IOU Peer Groups Average 2011-2015

	CapEx / DA	Net Plant / Gross Plant	CapEx / Net Plant
PA IOUs			
PGW	1.68	0.57	0.06
Central Penn	2.26	0.68	0.08
Columbia	4.86	0.77	0.16
National Fuel Gas	1.92	0.63	0.07
PECO	2.43	0.69	0.08
Penn Natural Gas	2.59	0.71	0.07
Peoples	3.14	0.68	0.06
Peoples TWP	2.27	0.66	0.09
Peer Average	2.78	0.69	0.09
AU IOUs			
PGW	1.68	0.57	0.06
BGE	2.33	0.64	0.11
Boston Gas	2.28	0.62	0.13
BUG Co	3.17	0.67	0.11
ConEd	2.58	0.78	0.09
PSEG	4.52	0.72	0.16
Peer Average	2.98	0.69	0.12

Sources and Notes:
PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015;
Brattle analysis of SNL data.
Peer Average denotes average of each column, excluding PGW.

As I discussed previously, the extent of a utility to invest in its infrastructure is quite sensitive to its financial metrics, so despite its goals of system improvement, PGW's relative speed of investment may have been tempered by the need to maintain its

financial health. For example, additional debt financing for greater reinvestment would have decreased coverage ratios, and increased the leverage of its capital structure. Likewise, using a greater percentage of internally generated funds for CapEx would have removed those funds for other liquidity needs and exposed PGW to greater risks from revenue variances. With maintained or improved financial health going forward, PGW will be in a position to continue or accelerate its replacement of cast iron and unprotected steel pipes.

Q40. PLEASE SUMMARIZE YOUR OVERALL IMPRESSIONS OF PGW'S ABSOLUTE AND RELATIVE FINANCIAL HEALTH, BASED ON THE BENCHMARKING YOU HAVE DESCRIBED.

A40. It is clear that PGW is considerably healthier today than it was in 2009, as noted by improvements in its bond ratings and in the majority of the benchmarking metrics I have evaluated. However, both the IOU peers and the muni peers have also improved in the last few years, and in the case of the munis, they have often improved as much or more than PGW – and PGW started towards the bottom of the ranges in 2009 with metrics that were fragile. Thus even with improvements, it still is less attractive than some of its peers, and it has only a modest cushion for adverse variances that could occur. This is particularly notable in Days Cash and bond coverage, which I understand are key metrics of concern to ratings agencies.

IV. PROJECTED METRICS WITH AND WITHOUT PROPOSED RATE INCREASE

Q41. HOW WOULD THE PROPOSED RATE INCREASE IMPACT PGW'S BENCHMARKED RATIOS?

A41. The proposed rate increase would allow PGW to maintain liquidity levels in the FPFTY and recover a more balanced capital structure in the longer term. I drew these conclusions by considering the evolution of PGW's financial health across four time periods: the Historical Test Year ("HTY," September 1, 2015 – August 31, 2016), the Future Test Year ("FTY," September 1, 2016 – August 31, 2017), the FPFTY (September 1, 2017 – August 31, 2018), and the Forecast Period (September 1, 2019 –

August 31, 2022.) As shown in FCG Figure – 28, I considered the Debt/Capitalization, Days Cash, and Debt Service Coverage (Principal & Interest) metrics in each period, as well as these metrics in the FTFPY and Forecast Period with and without the proposed $70 million rate increase.

Even without any financial shocks, PGW is facing significant changes to its balance and cash balances. PGW will show a FTY (FY 2016-17) year-end decrease of approximately $260 million in equity, which I understand is largely to satisfy its OPEB funding requirements. This decrease in equity will substantially affect PGW's debt to capitalization structure, taking it from 78% to 97% at the end of the FTY, as shown in FCG Figure – 28. Without a rate increase, PGW will remain highly levered from the FTY through the end of the Forecast Period with 88% Debt/Capitalization at the end of August 2022. With a $70 million rate increase, the Debt/Capitalization ratio in the FPFTY would be 91% (compared to 96% without) and down to 69% by the end of August 2022.

FCG Figure – 28
Historical and Projected Metrics for PGW

Metric	Rate Increase ($MM)	HTY 2015/16	FTY 2016/17	FPFTY 2017/18	Forecast Period 2018/19	2019/20	2020/21	2021/22
Debt/Capitalization	0	78%	97%	96%	94%	94%	91%	88%
	70	78%	97%	91%	84%	81%	75%	69%
Days Cash	0	62	75	34	-8	-67	-118	-178
	70	62	75	82	88	74	74	58
Debt Service Coverage (Principal & Interest)	0	1.6	1.4	1.2	1.4	1.3	1.4	1.4
	70	1.6	1.4	1.9	2.1	2.0	2.1	2.1

Sources and Notes:
PGW-provided pro forma financial statements.
Projected metrics comparable to historical metrics; both calculated using definitions outlined in FCG Figure A – 1. Fully projected future test year is boxed. The FTY relies on a 30 year normal; all subsequent time periods including the FPFTY use 10 year weather normals. Due to differences in calculation, the Debt Service Coverage (Principal & Interest) metric understates PGW's covenanted debt service coverage calculation. This year-end Days Cash metric varies from the corresponding amounts presented in Mr. Golden's testimony due to a variation in metric calculation. The Days Cash used in Mr. Golden's testimony removes amortized pension expenses from operating expenses. I do not exclude this amortized amount from the Days Cash metric because it is not feasible to make that some adjustment on all the benchmarking peers.

In addition to impacts on equity, the OPEB requirements will significantly impact PGW's liquidity in the Forecast Period. As shown in FCG Figure – 28, without a rate increase, PGW is projected to have 34 Days Cash at the end of the FPFTY (2017/18);

this approximately half of the average Days Cash over the 2011-2015 time period.[31] At the end of FY 2019, PGW would have negative Days Cash, indicating a strong need (if feasible) to issue more debt (on top of the 96% Debt/Capitalization or to obtain immediate rate relief). If PGW is granted a $70 million rate increase, PGW would have cash to cover 82 days of operating expenses in at the end of the FTFPY (2017/18).

The Interest-Only Debt Service Coverage ratio is superficially unaffected without a rate increase; however, this is due to accounting practice than a sign of solvency. In its accounting, PGW treated the OPEB changes as a balance sheet only transaction – that is, it did not occur as a cost on the income statement. Because it does not show as a cost on the income statement, the total funds available to cover debt service coverage are not affected.

V. CONCLUSIONS

Q42. PLEASE SUMMARIZE YOUR ANALYSIS AND RESULTS.

A42. My analysis demonstrates that PGW's financial performance improved following the 2009/10 rate case and stabilized over the 2011-2015 time period at performance levels lagging peers. Compared to average performance of its peers over the 2011-2015 time period, PGW was more levered; less liquid on a Days Cash basis; and less solvent on multiple coverage ratios. These performance metrics are reflected in PGW's credit ratings that improved 1-3 levels following the 2009/10 rate case but remain 1-2 levels below IOU peers and 4-6 levels between municipal peers. If PGW were to continue to earn revenues at current rates going forward, liquidity and equity metrics would be lower than pre-2009/10 levels as a result of OPEB liabilities. With the requested rate increase, PGW would maintain its liquidity levels and recover a more balanced capital structure more quickly.

[31] Note that this year-end Days Cash metric varies from the figure presented in Mr. Golden's testimony due to a variation in metric calculation. The days cash metric used in Mr. Golden's testimony removes amortization of pension expenses from operating expenses; I do not exclude this amortized amount from the Days Cash metric calculation.

It is also important to appreciate that if PGW receives the requested rate relief and enjoys low stress operating conditions over the next few years, the benefit of having improved its financial health will not be lost to customers. That is, unlike an IOU, the gains from profitability that the company may enjoy will redound back to the customers of a municipal utility in one of several forms: It may be able to internally fund (and possibly accelerate) improvements to its system, thereby avoiding future debt issuance and the associated interest expenses. It may gain a better debt rating that reduces the interest cost of new debt, of which a fair amount (approximately $270 million) is required by PGW over the next few years. And it may be able to avoid or reduce a future rate increase. In short, the funds that will secure PGW's financial health are ultimately repaid to ratepayers, unlike the situation in an IOU where the gains from extra revenue are generally split between ratepayers and third-party equity investors.

Q43. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A43. Yes, it does.

APPENDIX 1: RESUME OF FRANK C. GRAVES

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FRANK C. GRAVES
Principal

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Mr. Frank C. Graves is a Principal of The Brattle Group and the leader of its Utility Practice Area line of business. He specializes in regulatory and financial economics, especially for electric and gas utilities, and in litigation matters related to securities litigation, damages from breached energy contracts, and risk management.

He has over 30 years of experience assisting utilities in forecasting, valuation, and risk analysis of many kinds of long range planning and service design decisions, such as generation and network capacity expansion, fuel and gas supply procurement, pricing and cost recovery mechanisms, cost and performance benchmarking, network flow modeling, renewable asset selection and contracting, and hedging strategies. He has testified before many state regulatory commissions and the FERC as well as in state and federal courts and arbitration proceedings on such matters as integrated resource planning (IRPs), energy contract disputes, the prudence of investment and contracting decisions, risk management, costs and benefits of new services, policy options for industry restructuring, adequacy of market competition, and competitive implications of proposed mergers and acquisitions.

In the area of financial economics, he has assisted and testified in civil cases in regard to contract damages estimation, securities litigation suits, special purpose audits, tax disputes, risk management, and cost of capital estimation, and he has testified in criminal cases regarding corporate executives' culpability for securities fraud.

He received an M.S. with a concentration in finance from the M.I.T. Sloan School of Management in 1980, and a B.A. in Mathematics from Indiana University in 1975.

AREAS OF EXPERTISE

Utility Planning and Operations

Regulated Industry Policy and Restructuring

Energy Market Competition

Electric and Gas Transmission

Financial Analysis and Commercial Litigation

PROFESSIONAL AFFILIATIONS

IEEE Power Engineering Society

Mathematical Association of America

American Finance Association

REPRESENTATIVE ENGAGEMENTS

Utility Planning and Operations

- Mr. Graves developed a valuation and risk analysis model showing that a utility's RFP for new generation could be better served by deferring new plant construction for a few years via a less costly and less risky transitional market-based power supply contract with price and quantity terms shaped to match the shifting needs over time until supply shortfalls were large enough to justify the investment in a new power plant at efficient scale. The parties negotiated a multi-year contract along these lines in lieu of pursuing the construction alternative that initially came out of the RFP selection.
- In Maryland the electric distribution companies administer SOS (Standard Offer Service) supply procurement and accounting to backup customers who do not use a competitive retail power supplier. The utilities are authorized to recover both the direct and financing costs of that service plus a return on equity. Mr. Graves developed a method for sizing an appropriate equity return for the SOS risks and administrative services based on analogies to various intermediation businesses on the internet, such as EBay, PayPal, and others—in which, like SOS intermediation, the businesses do not take ownership for the products conveyed. Testimony was provided.
- Mr. Graves co-lead a team of Brattle analysts to assess the relative influence of different factors that were affected by the "Polar Vortex" cold snap of early 2014 that caused dramatic spikes in local power and gas prices in parts of the mid-Atlantic and northeastern US. The risks of similar recurring events were assessed in light of pending expansions of the electric and gas transmission grids, as well as likely coal plant retirements.
- For the Board of Directors or executive management teams of several utilities, Mr. Graves has lead strategic retreats on disruptive issues facing the electric industry in the future and how a utility should choose which risks and opportunities to embrace vs. avoid.
- Air quality and other power plant environmental regulations are being tightened considerably in the period from about 2014-2018. Mr. Graves has co-developed a market and financial model for determining what power plants are most likely to retire vs. retrofit with new environmental controls, and how much this may alter their profitability. This has been used to help several power market participants assess future capacity needs, as well as to adjust their price forecasts for the coming decade.
- Successful merchant power plant development and financing depends in part on obtaining a long term power purchase agreement. Mr. Graves directed a study of what pricing points and risk-sharing terms should be attractive to potential buyers of long-term power supply contracts from a large baseload facility.

- Many utilities are pursuing smart meters and time-of-use pricing to increase customer ability to consume electricity economically. Mr. Graves has led a study of the costs and benefits of different scales and timing of installation of such meters, to determine the appropriate pace. He has also evaluated how various customer incentives to increase conservation and demand response might be provided over the internet, and how much they might increase the participation rates in smart meter programs.
- Wind resources are a critical part of the generation expansion plans and contracting interests of many utilities, in order to satisfy renewable portfolio standards and to reduce long run exposure to carbon prices and fuel cost uncertainty. Mr. Graves has applied Brattle's risk modeling capabilities to simulate the impacts of on- and off-shore wind resources on the potential range of costs for portfolios of wholesale power contracts designed to serve retail electricity loads. These impacts were compared to gas CCs and CTs and to simply buying more from the wholesale market to identify the most economical supply strategy.
- For a municipal utility with an opportunity to invest in a nuclear power plant expansion, Mr. Graves lead an analysis of how the proposed plant fit the needs of the company, what market and regulatory (environmental) conditions would be required for the plant to be more economical than conventional fossil-fired generation, and how the development risks could be shared among co-owners to better match their needs and risk tolerances. He also assessed the market for potential off-take contracts to recover some of the costs and capacity that would be available for a few years, ahead of the needs of the municipal utility.
- The potential introduction of environmental restrictions or fees for CO2 emissions has made generation expansion decisions much more complex and risky. He helped one utility assess these risks in regard to a planned baseload coal plant, finding that the value of flexibility in other technologies was high enough to prefer not building a conventional coal plant.
- Mr. Graves helped design, implement, and gain regulatory approvals for a natural gas procurement hedging program for a western U.S. gas and electric utility. A model of how gas forward prices evolve over time was estimated and combined with a statistical model of the term structure of gas volatility to simulate the uncertainty in the annual cost of gas at various times during its procurement, and the resulting impact on the range of potential customer costs.
- Generation planning for utilities has become very complex and risky due to high natural gas prices and potential CO2 restrictions of emission allowances. Some of the scenarios that must be considered would radically alter system operations relative to current patterns of use. Mr. Graves has assisted utilities with long range planning for how to measure and cope with these risks, including how to build and value contingency plans in their resource selection criteria, and what

kinds of regulatory communications to pursue to manage expectations in this difficult environment.

- For a Midwestern utility proposing to divest a nuclear plant, Mr. Graves analyzed the reasonableness of the proposed power buyback agreement and the effects on risks to utility customers from continued ownership vs. divestiture. The decommissioning funds were also assessed as to whether their transfer altered the appropriate purchase price.
- Several utilities with coal-fired power plants have faced allegations from the U.S. EPA that they have conducted past maintenance on these plants which should be deemed "major modifications", thereby triggering New Source Review standards for air quality controls. Mr. Graves has helped one such utility assess limitations on the way in which GADS data can be used retrospectively to quantify comparisons between past actual and projected future emissions. For another utility, Mr. Graves developed retrospective estimates of changes in emissions before and after repairs using production costing simulations. In a third, he reviewed contemporaneous corporate planning documents to show that no increase in emissions would have been expected from the repairs, due to projected reductions in future use of the plant as well as higher efficiency. In all three cases, testimony was presented.
- The U.S. Government is contractually obligated to dispose of spent nuclear fuel at commercial reactors after January 1998, but it has not fulfilled this duty. As a result, nuclear facilities that are shutdown or facing full spent fuel pools are facing burdensome costs and risks. Mr. Graves prepared developed an economic model of the performance that could have reasonably been expected of the government, had it not breached its contract to remove the spent fuel.
- Capturing the full value of hydroelectric generation assets in a competitive power market is heavily dependent on operating practices that astutely shift between real power and ancillary services markets, while still observing a host of non-electric hydrological constraints. Mr. Graves led studies for several major hydro generation owners in regard to forecasting of market conditions and corresponding hydro schedule optimization. He has also designed transfer pricing procedures that create an internal market for diverting hydro assets from real power to system support services firms that do not yet have explicit, observable market prices.
- Mr. Graves led a gas distribution company in the development of an incentive ratemaking system to replace all aspects of its traditional cost of service regulation. The base rates (for non-fuel operating and capital costs) were indexed on a price-cap basis (RPI-X), while the gas and upstream transportation costs allowances were tied to optimal average annual usage of a reference portfolio of supply and transportation contracts. The gas program also included numerous adjustments to the gas company's rate design, such as designing new standby rates so that customer choice will not be distorted by pricing inefficiencies.

- An electric utility with several out-of-market independent power contracts wanted to determine the value of making those plants dispatchable and to devise a negotiating strategy for restructuring the IPP agreements. Mr. Graves developed a range of forecasts for the delivered price of natural gas to this area of the country. Alternative ways of sharing the potential dispatch savings were proposed as incentives for the IPPs to renegotiate their utility contracts.
- For an electric utility considering the conversion of some large oil-fired units to natural gas, Mr. Graves conducted a study of the advantages of alternative means of obtaining gas supplies and gas transportation services. A combination of monthly and daily spot gas supplies, interruptible pipeline transportation over several routes, gas storage services, and "swing" (contingent) supply contracts with gas marketers was shown to be attractive. Testimony was presented on why the additional services of a local distribution company would be unneeded and uneconomic.
- A power engineering firm entered into a contract to provide operations and maintenance services for a cogenerator, with incentives fees tied to the unit's availability and operating cost. When the fees increased due to changes in the electric utility tariff to which they were tied, a dispute arose. Mr. Graves provided analysis and testimony on the avoided costs associated with improved cogeneration performance under a variety of economic scenarios and under several alternative utility tariffs.
- Mr. Graves has helped several pipelines design incentive pricing mechanisms for recovering their expected costs and reducing their regulatory burdens. Among these have been Automatic Rate Adjustment Mechanisms (ARAMs) for indexation of operations and maintenance expenses, construction-cost variance-sharing for routine capital expenditures that included a procedure for eliciting unbiased estimates of future costs, and market-based prices capped at replacement costs when near-term future expansion was an uncertain but probable need.
- For a major industrial gas user, he prepared a critique of the transportation balancing charges proposed by the local gas distribution company. Those charges were shown to be arbitrarily sensitive to the measurement period as well as to inconsistent attribution of storage versus replacement supply costs to imbalance volumes. Alternative balancing valuation and accounting methods were shown to be cheaper, more efficient, and simpler to administer. This analysis helped the parties reach a settlement based on a cash-in/cash-out design.
- The Clean Air Act Amendments authorized electric utilities to trade emission allowances (EAs) as part of their approach to complying with SO2 emissions reductions targets. For the Electric Power Research Institute (EPRI), Mr. Graves developed multi-stage planning models to illustrate how the considerable uncertainty surrounding future EA prices justifies waiting to invest in irreversible control technologies, such as scrubbers or SCRs, until the present value cost of such investments is significantly below that projected from relying on EAs.

- For an electric utility with a troubled nuclear plant, Mr. Graves presented testimony on the economic benefits likely to ensue from a major reorganization. The plant was to be spun off to a jointly-owned subsidiary that would sell available energy back to the original owner under a contract indexed to industry unit cost experience. This proposal afforded a considerable reduction of risk to ratepayers in exchange for a reasonable, but highly uncertain prospect of profits for new investors. Testimony compared the incentive benefits and potential conflicts under this arrangement to the outcomes foreseeable from more conventional incentive ratemaking arrangements.
- Mr. Graves helped design Gas Inventory Charge (GIC) tariffs for interstate pipelines seeking to reduce their risks of not recovering the full costs of multi-year gas supply contracts. The costs of holding supplies in anticipation of future, uncertain demand were evaluated with models of the pipeline's supply portfolio that reveal how many non-production costs (demand charges, take-or-pay penalties, reservation fees, or remarketing costs for released gas) would accrue under a range of demand scenarios. The expected present value of these costs provided a basis for the GIC tariff.
- Mr. Graves performed a review and critique of a state energy commission's assessment of regional natural gas and electric power markets in order to determine what kinds of pipeline expansion into the area was economic. A proposed facility under review for regulatory approval was found to depend strongly on uneconomic bypass of existing pipelines and LDCs. In testimony, modular expansion of existing pipelines was shown to have significantly lower costs and risks.
- For several electric utilities with generation capacity in excess of target reserve margins, Mr. Graves designed and supervised market analyses to identify resale opportunities by comparing the marginal operating costs of all this company's power plants not needed to meet target reserves to the marginal costs for almost 100 neighboring utilities. These cost curves were then overlaid on the corresponding curve for the client utility to identify which neighbors were competitors and which were potential customers. The strength of their relative threat or attractiveness could be quantified by the present value of the product of the amount, duration, and differential cost of capacity that was displaceable by the client utility.
- Mr. Graves specified algorithms for the enhancement of the EPRI EGEAS generation expansion optimization model, to capture the first-order effects of financial and regulatory constraints on the preferred generation mix.
- For a major electric power wholesaler, Mr. Graves developed a framework for estimating how pricing policies affect the relative attractiveness of capacity expansion alternatives. Traditional cost-recovery pricing rules can significantly distort the choice between two otherwise equivalent capacity plans, if one includes a severe "front end load" while the other does not. Price-demand

feedback loops in simulation models and quantification of consumer satisfaction measures were used to appraise the problem. This "value of service" framework was generalized for the Electric Power Research Institute.

- For a large gas and electric utility, Mr. Graves participated in coordinating and evaluating the design of a strategic and operational planning system. This included computer models of all aspects of utility operations, from demand forecasting through generation planning to financing and rate design. Efforts were split between technical contributions to model design and attention to organizational priorities and behavioral norms with which the system had to be compatible.
- For an oil and gas exploration and production firm, Mr. Graves developed a framework for identifying what industry groups were most likely to be interested in natural gas supply contracts featuring atypical risk-sharing provisions. These provisions, such as price indexing or performance requirements contingent on market conditions, are a form of product differentiation for the producer, allowing it to obtain a price premium for the insurance-like services.
- For a natural gas distribution company, Mr. Graves established procedures for redefining customer classes and for repricing gas services according to customers' similarities in load shape, access to alternative gas supplies, expected growth, and need for reliability. In this manner, natural gas service was effectively differentiated into several products, each with price and risk appropriate to a specific market. Planning tools were developed for balancing gas portfolios to customer group demands.
- For a Midwestern electric utility, Mr. Graves extended a regulatory pro forma financial model to capture the contractual and tax implications of canceling and writing off a nuclear power plant in mid-construction. This possibility was then appraised relative to completion or substitution alternatives from the viewpoints of shareholders (market value of common equity) and ratepayers (present value of revenue requirements).
- For a corporate venture capital group, Mr. Graves conducted a market-risk assessment of investing in a gas exploration and production company with contracts to an interstate pipeline. The pipeline's market growth, competitive strength, alternative suppliers, and regulatory exposure were appraised to determine whether its future would support the purchase volumes needed to make the venture attractive.
- For a natural gas production and distribution company, he developed a strategic plan to integrate the company's functional policies and to reposition its operations for the next five years. Decision analysis concepts were combined with marginal cost estimation and financial pro forma simulation to identify attractive and resilient alternatives. Recommendations included target markets, supply sources, capital budget constraints, rate design, and a planning system. A two-day

planning conference was conducted with the client's executives to refine and internalize the strategy.

- For the New Mexico Public Service Commission, he analyzed the merits of a corporate reorganization of the major New Mexico gas production and distribution company. State ownership of the company as a large public utility was considered but rejected on concerns over efficiency and the burdening of performance risks onto state and local taxpayers.

Regulated Industry Policy and Restructuring

- For a group of utilities responding to a state mandate to consider means of encouraging distributed technologies to be assessed and incentivized in parity with central station generation, Mr. Graves and others at Brattle prepared alternative means of incorporating marginal cost and externality value considerations into new cost/benefit assessment tools, procurement mechanisms, and supply contracting.
- For a mid-Atlantic gas distribution utility, Mr. Graves assessed mark to market losses that had occurred from gas supply hedges entered before spot prices declined precipitously. Concerns were voice that this outcome indicated the company's hedging practices were no longer attune to market conditions, so Mr. Graves developed and lead workshop between the company, intervener groups, and state commission staff to define new appropriate goals, mechanisms and review standards for revised risk management approach.
- For a major participant in the Japanese power industry contemplating reorganization of that country's electric sector following Fukushima, Mr. Graves lead a research project on the performance of alternative market designs around the US and around the world for vertical unbundling, RTO design, and retail choice.
- For several utilities facing the end of transitional "provider of last resort" (or POLR) prices, Mr. Graves developed forecasts and risk analyses of alternative procurement mechanisms for follow-on POLR contracts. He compared portfolio risk management approaches to full requirements outsourcing under various terms and conditions.
- For a large municipal electric and gas company considering whether to opt-in to state retail access programs, Mr. Graves lead an analysis of what changes in the level and volatility of customer rates would likely occur, what transition mechanisms would be required, and what impacts this would have on city revenues earned as a portion of local electric and gas service charges.
- Many utilities experienced significant "rate shock" when they ended "rate freeze" transition periods that had been implemented with earlier retail restructuring. The adverse customer and political reactions have led to proposals to annual procurement auctions and to return to utility-owned or managed supply

portfolios. Mr. Graves has assisted utilities and wholesale gencos with analyses of whether alternative supply procurement arrangements could be beneficial.

- The impacts of transmission open access and wholesale competition on electric generators risks and financial health are well documented. In addition, there are substantial impacts on fuel suppliers, due to revised dispatch, repowerings and retirements, changes in expansion mix, altered load shapes and load growth under more competitive pricing. For EPRI, Mr. Graves co-authored a study that projected changes in fuel use within and between ten large power market regions spanning the country under different scenarios for the pace and success of restructuring.
- As a result of vertical unbundling, many utilities must procure a substantial portion of their power from resources they do not own or operate. Market prices for such supplies are quite volatile. In addition, utilities may face future customer switching to or from their supply service, especially if they are acting as provider of last resort (POLR). This problem is a blending of risk management with the traditional least-cost Integrated Resource Planning (IRP). Regulatory standards for findings of prudence in such a hybrid environment are often not well understood or articulated, leaving utilities at risk for cost disallowances that can jeopardize their credit-worthiness. Mr. Graves has assisted several utilities in devising updated procurement mechanisms, hedging strategies, and associated regulatory guidelines that clarify the conditions for approval and cost recovery of resource plans, in order to make possible the expedited procurement of power from wholesale market suppliers.
- Public power authorities and cooperatives face risks from wholesale restructuring if their sales-for-resale customers are free to switch to or from supply contracting with other wholesale suppliers. Such switching can create difficulties in servicing the significant debt capitalization of these public power entities, as well as equitable problems with respect to non-switching customers. Mr. Graves has lead analyses of this problem, and has designed alternative product pricing, switching terms and conditions, and debt capitalization policies to cope with the risks.
- As a means of unbundling to retain ownership but not control of generation, some utilities turned to divesting output contracts. Mr. Graves was involved in the design and approval of such agreements for a utility's fleet of generation. The work entailed estimating and projecting cost functions that were likely to track the future marginal and total costs of the units and analysis of the financial risks the plant operator would bear from the output pricing formula. Testimony on risks under this form of restructuring was presented.
- Mr. Graves contributed to the design and pricing of unbundled services on several natural gas pipelines. To identify attractive alternatives, the marginal costs of possible changes in a pipeline's service mix were quantified by simulating the least-cost operating practices subject to the network's physical and contractual constraints. Such analysis helped one pipeline to justify a zone-based rate design

for its firm transportation service. Another pipeline used this technique to demonstrate that unintended degradations of system performance and increased costs could ensue from certain proposed unbundlings that were insensitive to system operations.

- For several natural gas pipeline companies, Mr. Graves evaluated the cost of equity capital in light of the requirements of FERC Order 636 to unbundle and reprice pipeline services. In addition to traditional DCF and risk positioning studies, the risk implications of different degrees of financial leverage (debt capitalization) were modeled and quantified. Aspects of rate design and cost allocation between services that also affect pipeline risk were considered.
- Mr. Graves assisted several utilities in forecasting market prices, revenues, and risks for generation assets being shifted from regulated cost recovery to competitive, deregulated wholesale power markets. Such studies have facilitated planning decisions, such as whether to divest generation or retain it, and they have been used as the basis for quantifying stranded costs associated with restructuring in regulatory hearings. Mr. Graves has assisted a leasing company with analyses of the tax-legitimacy of complex leasing transactions by reviewing the extent and quality of due diligence pursued by the lessor, the adequacy of pre-tax returns, the character, time pattern, and degree of risk borne by the buyer (lessor), the extent of defeasance, and compliance with prevailing guidelines for true-lease status.

Market Competition

- Mr. Graves assisted a nuclear plant owner with an assessment of whether a proposed merger of a company in whom it had a partial investment interest would alter the co-owner's incentives to manage the plant for maximum stand-alone value of the asset. Structural and behavioral models of the relevant market were developed to determine that there would be no material changes in incentive or ability to affect the value of the asset.
- Mr. Graves has testified on the quality of retail competition in Pennsylvania and on whether various proposals for altering Default Service might create more robust competition.
- Regulatory and legal approvals of utility mergers require evidence that the combined entity will not have undue market power. Mr. Graves assisted several utilities in evaluating the competitive impacts of potential mergers and acquisitions. He has identified ways in which transmission constraints reduce the number and type of suppliers, along with mechanisms for incorporating physical flow limits in FERC's Delivered Price Test (DPT) for mergers. He has also assessed the adequacy of mitigation measures (divestitures and conduct restrictions) under the DPT, Market-Based Rates, and other tests of potential market power arising from proposed mergers.

- A major concern associated with electric utility industry restructuring is whether or not generation markets are adequately competitive. Because of the state-dependent nature of transmission transfer capability between regions, itself a function of generation use, the quality of competition in the wholesale generation markets can vary significantly and may be susceptible to market power abuse by dominant suppliers. Mr. Graves helped one of the largest ISOs in the U.S. develop market monitoring procedures to detect and discourage market manipulations that would impair competition.
- Vertical market power arises when sufficient control of an upstream market creates a competitive advantage in a downstream market. It is possible for this problem to arise in power supply, in settings where the likely marginal generation is dependent on very few fuel suppliers who also have economic interests in the local generation market. Mr. Graves analyzed this problem in the context of the California gas and electric markets and filed testimony to explain the magnitude and manifestations of the problem.
- The increased use of transmission congestion pricing has created interest in merchant transmission facilities. Mr. Graves assisted a developer with testimony on the potential impacts of a proposed line on market competition for transmission services and adjacent generation markets. He also assisted in the design of the process for soliciting and ranking bids to buy tranches of capacity over the line.
- Many regions have misgivings about whether the preconditions for retail electric access are truly in place. In one such region, Mr. Graves assisted a group of industrial customers with a critique of retail restructuring proposals to demonstrate that the locally weak transmission grid made adequate competition among numerous generation suppliers very implausible.
- Mr. Graves assisted one of the early ISOs with its initial market performance assessment and its design of market monitoring tests for diagnosing the quality of prevailing competition.

Electric and Gas Transmission

- Substantial fleets of wind-based generation can impose significant integration costs on power systems. Mr. Graves assisted in assessing what additional amounts and costs for ancillary services would be needed for a Western utility with a large renewable fleet. The approach included a statistical analysis of how wind output was correlated with demand, and how much forecasting error in wind output was likely to be faced over different scheduling horizons. Benefits of geographic diversity of the wind fleet were also assessed.
- For a utility seeking FERC approval for the purchase of an affiliate's generating facility, Mr. Graves analyzed how transmission constraints affecting alternative supply resources altered their usefulness to the buyer.

- As part of a generation capacity planning study, he lead an analysis of how congestion premiums and discounts relative to locational marginal prices (LMPs) at load centers affected the attractiveness of different potential locations for new generation. At issue was whether the prevailing LMP differences would be stable over time, as new transmission facilities were completed, and whether new plants could exacerbate existing differentials and lead to degraded market value at other plants.
- Mr. Graves assisted a genco with its involvement in the negotiation and settlement of "regional through and out rates" (RTOR) that were to be abolished when MISO joined PJM. His team analyzed the distribution of cost impacts from several competing proposals, and they commented on administrative difficulties or advantages associated with each.
- For the electric utility regulatory commission of Colombia, S.A., Mr. Graves led a study to assess the inadequacies in the physical capabilities and economic incentives to manage voltages at adequate levels. The Brattle team developed minimum reactive power support obligations and supplement reactive power acquisition mechanisms for generators, transmission companies, and distribution companies.
- Mr. Graves conducted a cost-of-service analysis for the pricing of ancillary services provided by the New York Power Authority.
- On behalf of the Electric Power Research Institute (EPRI), Mr. Graves wrote a primer on how to define and measure the cost of electric utility transmission services for better planning, pricing, and regulatory policies. The text covers the basic electrical engineering of power circuits, utility practices to exploit transmission economies of scale, means of assuring system stability, economic dispatch subject to transmission constraints, and the estimation of marginal costs of transmission. The implications for a variety of policy issues are also discussed.
- The natural gas pipeline industry is wedged between competitive gas production and competitive resale of gas delivered to end users. In principle, the resulting basis differentials between locations around the pipeline ought to provide efficient usage and expansion signals, but traditional pricing rules prevent the pipeline companies from participating in the marginal value of their own services. Mr. Graves worked to develop alternative pricing mechanisms and service mixes for pipelines that would provide more dynamically efficient signals and incentives.
- Mr. Graves analyzed the spatial and temporal patterns of marginal costs on gas and electric utility transmission networks using optimization models of production costs and network flows. These results were used by one natural gas transmission company to design receipt-point-based transmission service tariffs, and by another to demonstrate the incremental costs and uneven distribution of impacts on customers that would result from a proposed unbundling of services.

Financial Analysis and Commercial Litigation

- For an international energy company seeking to expand its operations in the US, Mr. Graves lead an assessment of the market performance risks facing a possible acquisition target, in order to determine what contingencies or market shifts were critical to it being an attractive target. Uncertain long run wholesale energy conditions, tightening environmental regulations, and disruptive technology development prospects were considered.
- For an international technology firm that had experienced a recent bankruptcy, Mr. Graves assisted in the design of a study of how the remaining valuable assets could be deemed assignable to disparate country-specific claims. Company operating practices for research and development risk and profit sharing were evaluated to identify an equitable approach.
- For a merchant power company with a prematurely terminated development contract, Mr. Graves co-lead a team to value the lost contract. The contract included several different kinds of revenue streams of different risks, for which Brattle developed different discount rates and debt carrying-capacity assessments. The case was settled with a very large award consistent with the Brattle valuations.
- Holding company utilities with many subsidiaries in different states face differing kinds of regulatory allowances, balancing accounts with differing lags and allowed returns for cost recovery, possibly different capital structures, as well as different (and varying) operating conditions. Given such heterogeneity, it can be difficult to determine which subsidiaries are performing well vs. poorly relative to their regulatory and operational challenges. Mr. Graves developed a set of financial reporting normalization adjustments to isolate how much of each subsidiary's profitability was due to financial, vs. managerial, vs. non-recurring operational conditions, so that meaningful performance appraisal was possible.
- Many banks, insurance firms and capital management subsidiaries of large multinational corporations have entered into long term, cross border leases of properties under sale and leaseback or lease in, lease out terms. These have been deemed to be unacceptable tax shelters by the IRS, but that is an appealable claim. Mr. Graves has assisted several companies in evaluating whether their cross border leases had legitimate business purpose and economic substance, above and beyond their tax benefits, due to likelihood of potentially facing a role as equity holder with ownership risks and rewards. He has shown that this is a case-specific matter, not per se determined by the general character of these transactions.
- For a private energy hedge fund providing risk management contracts to industrial energy users, a breach of contract from one industrial customer was disputed as supposedly involving little or no loss because the fund had not been forced to liquidate positions at a loss that corresponded precisely to the abruptly terminated contract. Mr. Graves provided analysis demonstrating how the portfolio loss was borne, but other fund management metrics used to control

positions, and other unrelated hedging positions, also changed roughly concurrently in a manner that disguised the way the economic damage was realized over time. The case was settled on favorable terms for Mr. Graves' client.

- Many utilities have regulated and unregulated subsidiaries, which face different types and degrees of risk. Mr. Graves lead a study of the appropriate adjustments to corporate hurdle rates for the various lines of business of a utility with many types of operations.
- A company that incurred Windfall Tax liabilities in the U.K. regarded those taxes as creditable against U.S. income taxes, but this was disputed by the IRS. Mr. Graves lead a team that prepared reports and testimony on why the Windfall Tax had the character of a typical excess profits tax, and so should be deemed creditable in the U.S. The tax courts concurred with this opinion and allowed the claimed tax deductions in full.
- For a defendant in a sentencing hearing for securities' fraud, Mr. Graves prepared an analysis of how the defendant's role in the corporate crisis was confounded by other concurrent events and disclosures that made loss calculations unreliable. At trial, the Government stipulated that it agreed with Mr. Graves' analysis.
- For the U.S. Department of Justice, Mr. Graves prepared an event study quantifying bounds on the economic harm to shareholders that had likely ensued from revelations that Dynegy Corporation's "Project Alpha" had been improperly represented as a source of operating income rather than as a financing. The event study was presented in the re-sentencing hearing of Mr. Jamie Olis, the primary architect of Project Alpha.
- Mr. Graves has assisted leasing companies with analyses of the tax-legitimacy of complex leasing transactions. These analyses involved reviewing the extent and quality of due diligence pursued by the lessor, the adequacy of pre-tax returns, the character, time pattern, and degree of risk borne by the buyer (lessor), the extent, purpose and cost of defeasance, and compliance with prevailing guidelines for true-lease status.
- For a utility facing significant financial losses from likely future costs of its Provider of Last Resort (POLR) obligations, Mr. Graves prepared an analysis of how optimal hindsight coverage of the liability would have compared in costs to a proposed restructuring of the obligation. He also reviewed the prudence of prior, actual coverage of the obligation in light of conventional risk management practices and prevailing market conditions of credit constraints and low long-term liquidity.
- Several banks were accused of aiding and abetting Enron's fraudulent schemes and were sued for damages. Mr. Graves analyzed how the stock market had reacted to one bank's equity analyst's reports endorsing Enron as a "buy," to determine if those reports induced statistically significant positive abnormal returns. He showed that individually and collectively they did not have such an effect.

- Mr. Graves lead an analysis of whether a corporate subsidiary had been effectively under the strategic and operational control of its parent, to such an extent that it was appropriate to "pierce the corporate veil" of limited liability. The analysis investigated the presence of untenable debt capitalization in the subsidiary, overlapping management staff, the adherence to normal corporate governance protocols, and other kinds of evidence of excessive parental control.
- As a tax-revenue enhancement measure, the IRS was considering a plan to recapture deferred taxes associated with generation assets that were divested or reorganized during state restructurings for retail access. Mr. Graves prepared a white paper demonstrating the unfairness and adverse consequences of such a plan, which was instrumental in eliminating the proposal.
- For a major electronics and semiconductor firm, Mr. Graves critiqued and refined a proposed procedure for ranking the attractiveness of research and development projects. Aspects of risk peculiar to research projects were emphasized over the standards used for budgeting an already proven commercial venture.
- In a dispute over damages from a prematurely terminated long-term power tolling contract, Mr. Graves presented evidence on why calculating the present value of those damages required the use of two distinct discount rates: one (a low rate) for the revenues lost under the low-risk terminated contract and another, much higher rate, for the valuation of the replacement revenues in the risky, short-term wholesale power markets. The amount of damages was dramatically larger under a two-discount rate calculation, which was the position adopted by the court.
- The energy and telecom industries, especially in the late 1990s and early 2000s, were plagued by allegations regarding trading and accounting misrepresentations, such as wash trades, manipulations of mark-to-market valuations, premature recognition of revenues, and improper use of off-balance sheet entities. In many cases, this conduct has preceded financial collapse and subsequent shareholder suits. Mr. Graves lead research on accounting and financial evidence, including event studies of the stock price movements around the time of the contested practices, and reconstruction of accounting and economic justifications for the way asset values and revenues were recorded.
- Dramatic natural gas price increases in the U.S. have put several natural gas and electric utilities in the position of having to counter claims that they should have hedged more of their fuel supplies at times in the past. Mr. Graves developed testimony to rebut this hindsight criticism and risk management techniques for fuel (and power) procurement for utilities to apply in the future to avoid prudence challenges.
- As a means of calculating its stranded costs, a utility used a partial spin-off of its generation assets to a company that had a minority ownership from public shareholders. A dispute arose as to whether this minority ownership might be depressing the stock price, if a "control premium" was being implicitly deducted from its value. Using event studies and structural analyses, Mr. Graves identified

the key drivers of value for this partially spun-off subsidiary, and he showed that value was not being impaired by the operating, financial and strategic restrictions on the company. He also reviewed the financial economics literature on empirical evidence for control premiums, which he showed reinforced the view that no control premium de-valuation was likely to be affecting the stock.

- A large public power agency was concerned about its debt capacity in light of increasing competitive pressures to allow its resale customers to use alternative suppliers. Mr. Graves lead a team that developed an Economic Balance Sheet representation of the agency's electric assets and liabilities in market value terms, which was analyzed across several scenarios to determine safe levels of debt financing. In addition, new service pricing and upstream supply contracting arrangements were identified to help reduce risks.
- Wholesale generating companies intuitively realize that there are considerable differences in the financial risk of different kinds of power plant projects, depending on fuel type, length and duration of power purchase agreements, and tightness of local markets. However, they often are unaware of how if at all to adjust the hurdle rates applied to valuation and development decisions. Mr. Graves lead a Brattle analysis of risk-adjusted discount rates for generation; very substantial adjustments were found to be necessary.
- A major telecommunications firm was concerned about when and how to reenter the Pacific Rim for wireless ventures following the economic collapse of that region in 1997-99. Mr. Graves lead an engagement to identify prospective local partners with a governance structure that made it unlikely for them to divert capital from the venture if markets went soft. He also helped specify contracting and financing structures that create incentives for the venture to remain together should it face financial distress, while offering strong returns under good performance.
- There are many risks associated with operations in a foreign country, related to the stability of its currency, its macro economy, its foreign investment policies, and even its political system. Mr. Graves has assisted firms facing these new dimensions to assess the risks, identify strategic advantages, and choose an appropriate, risk-adjusted hurdle rate for the market conditions and contracting terms they will face.
- The glut of generation capacity that helped usher in electric industry restructuring in the US led to asset devaluations in many places, even where no retail access was allowed. In some cases, this has led to bankruptcy, especially of a few large rural electric cooperatives. Mr. Graves assisted one such coop with its long term financial modeling and rate design under its plan of reorganization, which was approved. Testimony was provided on cost-of-service justifications for the new generation and transmission prices, as well as on risks to the plan from potential environmental liabilities.

- Power plants often provide a significant contribution to the property tax revenues of the townships where they are located. A common valuation policy for such assets has been that they are worth at least their book value, because that is the foundation for their cost recovery under cost-of-service utility ratemaking. However, restructuring throws away that guarantee, requiring reappraisal of these assets. Traditional valuation methods, e.g., based on the replacement costs of comparable assets, can be misleading because they do not consider market conditions. Mr. Graves testified on such matters on behalf of the owners of a small, out-of-market coal unit in Massachusetts.
- Stranded costs and out-of-market contracts from restructuring can affect municipalities and cooperatives as well as investor-owned utilities. Mr. Graves assisted one debt-financed utility in an evaluation of its possibilities for reorganization, refinancing, and re-engineering to improve financial health and to lower rates. Sale and leaseback of generation, fuel contract renegotiation, targeted downsizing, spin-off of transmission, and new marketing programs were among the many components of the proposed new business plan.
- As a means of reducing supply commitment risk, some utilities have solicited offers for power contracts that grant the right but not the obligation to take power at some future date at a predetermined price, in exchange for an initial option premium payment. Mr. Graves assisted several of these utilities in the development of valuation models for comparing the asking prices to fair market values for option contracts. In addition, he has helped these clients develop estimates of the critical option valuation parameters, such as trend, volatility, and correlations of the future prices of electric power and the various fuel indexes proposed for pricing the optional power.
- For the World Bank and several investor-owned electric utilities, Mr. Graves presented tutorial seminars on applying methods of financial economics to the evaluation of power production investments. Techniques for using option pricing to appraise the value of flexibility (such as arises from fuel switching capability or small plant size) were emphasized. He has applied these methods in estimating the value of contingent contract terms in fuel contracts (such as price caps and floors) for natural gas pipelines.
- Mr. Graves prepared a review of empirical evidence regarding the stock market's reaction to alternative dividend, stock repurchase, and stock dividend policies for a major electric utility. Tax effects, clientele shifting, signaling, and ability to sustain any new policies into the future were evaluated. A one-time stock repurchase, with careful announcement wording, was recommended.
- For a division of a large telecommunications firm, Mr. Graves assisted in a cost benchmarking study, in which the costs and management processes for billing, service order and inventory, and software development were compared to the practices of other affiliates and competitors. Unit costs were developed at a level far more detailed than the company normally tracked, and numerical measures of

drivers that explained the structural and efficiency causes of variation in cost performance were identified. Potential costs savings of 10-50 percent were estimated, and procedures for better identification of inefficiencies were suggested.

- For an electric utility seeking to improve its plant maintenance program, Mr. Graves directed a study on the incremental value of a percentage point decrease in the expected forced outage rate at each plant owned and operated by the company. This defined an economic priority ladder for efforts to reduce outage that could be used in lieu of engineering standards for each plant's availability. The potential savings were compared to the costs of alternative schedules and contracting policies for preventive and reactive maintenance, in order to specify a cost reduction program.
- Mr. Graves conducted a study on the risk-adjusted discount rate appropriate to a publicly-owned electric utility's capacity planning. Since revenue requirements (the amounts being discounted) include operating costs in addition to capital recovery costs, the weighted average cost of capital for a comparable utility with traded securities may not be the correct rate for every alternative or scenario. The risks implicit in the utility's expansion alternatives were broken into component sources and phases, weighted, and compared to the risks of bonds and stocks to estimate project-specific discount rates and their probable bounds.

TESTIMONY

Direct testimony in regard to a claim for a share of lime consumption reduction costs obtained by Plum Point as one of SMEPA's power plant operator/suppliers, on behalf of SMEPA, before the American Arbitration Association in the matter of Southwest Mississippi Electric Power Association vs. Plum Point Energy Associates, Case No. 01-15-0002-6062, September 2016.

Direct, Rebuttal and Supplementary Rebuttal reports regarding damages from loss of a nuclear generation facility, on behalf of Southern California Edison Company, Edison Material Supply LLC., San Diego Gas and Electric Company and City of Riverside before the International Chamber of Commerce in the matter of Southern California Edison v. Mitsubishi Nuclear Energy Systems, Inc. and Mitsubishi Heavy Industries, Ltd., Case No. 19784/AGF/RD, July 27, 2015 (direct), January 19, 2016 (rebuttal) and March 14, 2016 (supplemental).

Direct report re determination of an appropriate level of return needed for Standard Offer Service (SOS), on behalf of Delmarva Power & Light Company and Potomac Electric Power Company before the Maryland Public Service, Case Nos. 9226 and 9232, July 24, 2015.

Direct testimony in regard to the prudence of its gas hedging, on behalf of Hope Gas, Inc., before the West Virginia Public Service Commission, Case No. 12-1070-G-30C, June 24, 2013.

Direct testimony on behalf of Public Service Company of New Mexico before the NM Public Regulation Commission re appropriate profit incentives for energy conservation activities, Case No. 12-00317-UT, October 5, 2012.

Rebuttal testimony on behalf of Rocky Mountain Power Company before the Public Service Commission of Utah in regard to hedging practices for natural gas supply, Docket 11-035-200, July 2012.

Rebuttal testimony on behalf of Rocky Mountain Power Company before the Public Service Commission of Wyoming in regard to gas supply hedging and loss-sharing, Docket No. 20000-405-ER-11, June 2012.

Direct testimony on behalf of Ohio Power Company before the PUC of Ohio in regard to performance of PJM capacity markets, in Ohio Power's application for its ESP service charges, Case No. 10-2929-EL-UNC, March 30, 2012.

Expert report and oral testimony on behalf of Pepco Holdings, Inc. before the Maryland Public Service Commission in regard to inadequacies in the MD PSC's RFP for new combined cycle generation development in SWMAAC, Case No. 9214, January 31, 2012.

Direct testimony on behalf of Columbus Southern Power Company and Ohio Power Company before the Public Utilities Commission of Ohio in the Matter of the Commission

Review of the Capacity Charges of Ohio Power Company and Columbus Southern Power Company, Case No. 10-2929 -EL-UNC, August 31, 2011.

Rebuttal report on spent nuclear fuel removal on behalf of Yankee Atomic Electric Company, Connecticut Yankee Atomic Power Company, Maine Yankee Atomic Power Company before the United States Court of Federal Claims, Nos. 07-876C, No. 07-875C, No. 07-877C, August 5, 2011.

Direct Testimony on rehearing regarding the allowance of swaps in Rocky Mountain Power's fuel adjustment cost recovery mechanism, on behalf of Rocky Mountain Power before the Public Service Commission of the State of Utah, July 2011.

Comments and Reply Comments on capacity procurement and transmission planning on behalf of New Jersey Electric Distribution Companies before the State of New Jersey Board of Public Utilities in the Matter of the Board's Investigation of Capacity Procurement and Transmission Planning, NJ BPU Docket No. EO11050309, June 17, 2011; July 12, 2011.

Rebuttal testimony regarding Rocky Mountain Power's hedging practices on behalf of Rocky Mountain Power before the Public Service Commission of the State of Utah, Docket No. 10-035-124, June 2011.

Expert and Rebuttal reports regarding contract termination damages, on behalf of Hess Corporation before the United States District Court for the Northern District of New York, Case No. 5:10-cv-587 (NPM/GHL), April 29, 2011, May 13, 2011.

Expert and Rebuttal reports on spent fuel removal at Rancho Seco nuclear power plant, on behalf of Sacramento Municipal Utility District before the U.S. Court of Federal Claims, No. 09-587C, October 2010, July 1, 2011.

Rebuttal testimony on the Impacts of the Merger with First Energy on retail electric competition in Pennsylvania, on behalf of Allegheny Power before the Pennsylvania Public Utility Commission, Docket Nos. A-2010-2176520 and A-2010-2176732, September 13, 2010.

Expert and Rebuttal reports on the interpretation of pricing terms in a long term power purchase agreement, on behalf of Chambers Cogeneration Limited Partnership before the Superior Court of New Jersey, Docket No. L-329-08, August 23, 2010, September 21, 2010.

Expert and Rebuttal reports on spent fuel removal at Trojan nuclear facility, on behalf of Portland General Electric Company, The City of Eugene, Oregon, and PacifiCorp before the United States Court of Federal Claims No. 04-0009C, August 2010, June 29, 2011.

Rebuttal and Rejoinder testimonies on the approval of its Smart Meter Technology Procurement and Installation Plan before the Pennsylvania Public Utility Commission on behalf of West Penn Power Company d/b/a Allegheny Power, Docket No. M-2009-2123951, October 27, 2009, November 6, 2009.

Supplemental Direct testimony on the need for an energy cost adjustment mechanism in Utah to recover the costs of fuel and purchased power, on behalf of Rocky Mountain Power before the Public Service Commission of Utah, Docket No. 09-035-15, August 2009.

Expert and Rebuttal reports on spent nuclear fuel removal on behalf of Yankee Atomic Electric Company, Connecticut Yankee Atomic Power Company, Maine Yankee Atomic Power Company before the United States Court of Federal Claims, Nos. 98-126C, No. 98-154C, No. 98-474C, April 24, 2009, July 20, 2009.

Expert report in regard to opportunistic under-collateralization of affiliated trading companies, on behalf of BJ Energy, LLC, Franklin Power LLC, GLE Trading LLC, Ocean Power LLC, Pillar Fund LLC and Accord Energy, LLC before the United States District Court for the Eastern District of Pennsylvania, No. 09-CV-3649-NS, March 2009.

Rebuttal report in regard to appropriate discount rates for different phases of long-term leveraged leases, on behalf of Wells Fargo & Co. and subsidiaries, Docket No. 06-628T, January 15, 2009.

Oral and written direct testimony regarding resource procurement and portfolio design for Standard Offer Service, on behalf of PEPCo Holdings Inc. in its Response to Maryland Public Service Commission, Case No. 9117, October 1, 2008 and December 15, 2008.

Direct testimony regarding considerations affecting the market price of generation service for Standard Service Offer (SSO) customers, on behalf of Ohio Edison Company, et al., Docket 08-125, July 24, 2008.

Direct testimony in support of Delmarva's "Application for the Approval of Land-Based Wind Contracts as a Supply Source for Standard Offer Service Customers," on behalf of Delmarva Power & Light Company before the Public Service Commission of Delaware, July 24, 2008.

Oral direct testimony in regard to the Government's performance in accepting spent nuclear fuel under contractual obligations established in 1983, on behalf of plaintiff Dairyland Power Cooperative before the United States Court of Federal Claims (No. 04-106C), July 17, 2008.

Direct testimony for Delmarva Power & Light on risk characteristics of a possible managed portfolio for Standard Offer Service, as part of Delmarva's IRP filings (PSC Docket No. 07-20), March 20, 2008 and May 15, 2008.

Oral direct testimony regarding the economic substance of a cross-border lease-to-service contract for a German waste-to-energy plant on behalf of AWG Leasing Trust and KSP Investments, Inc before U. S. District Court, Northern District of Ohio, Eastern Division, Case No. 1:07CV0857, January 2008.

Expert report (October 15, 2007) and oral testimony (September 21 and 22, 2010) in Commonwealth of Pennsylvania Department of Environmental Protection, et al., v.

Allegheny Energy Inc, et al. regarding flaws in the plaintiffs' assessment of emissions attributed to repairs at certain power plants, Civil Action No, 2:05ev1885.

Direct testimony regarding portfolio management alternatives for supplying Standard Offer Service, on behalf of Potomac Electric Power Company and Delmarva Power & Light Company before the Public Service Commission of Maryland, Case No. 9117, September 14, 2007.

Direct testimony in regard to preconditions for effective retail electric competition, on behalf of New West Energy Corporation before the Arizona Commerce Commission, Docket No. E-03964A-06-0168, August 31, 2007.

Direct and rebuttal testimonies regarding the application of OG&E for an order of commission granting preapproval to construct Red Rock Generating Facility and authorizing a recovery rider, on behalf of Oklahoma Gas & Electric Company (OG&E) before the Corporation Commission of the State of Oklahoma, Case No. PUD 200700012, January 17, 2007 and June 18, 2007.

Testimony in regard to whether defendant's role in accounting misrepresentations could be reliably associated with losses to shareholders, on behalf of defendant Mark Kaiser before U.S. District Court of New York SI:04Cr733 (TPG).

Rebuttal testimony on proposed benchmarks for evaluating the Illinois retail supply auctions, on behalf of Midwest Generation EME L.L.C. and Edison Mission Marketing and Trading before the Illinois Commerce Commission Docket No. 06-0800, April 6, 2007.

Direct and rebuttal testimonies on the shareholder impacts of Dynegy's Project Alpha for the sentencing of Jamie Olis, on behalf of the U.S. Department of Justice before the United States District Court, Southern District of Texas, Houston Division, Criminal No. H-03-217, September 12, 2006.

Direct and rebuttal testimony on the need for POLR rate cap relief for Metropolitan Edison and Pennsylvania Electric and the prudence of their past supply procurement for those obligations, on behalf of FirstEnergy Corp before the Pennsylvania Public Utility Commission, Docket Nos. R-00061366 and R-00061367, August 24, 2006.

Direct testimony regarding Deutsche Bank Entities' opposition to Enron Corp's amended motion for class certification, on behalf of the Deutsche Bank Entities before the United States District Court, Southern District of Texas, Houston Division, Docket No. H-01-3624, February 2006.

Expert and Rebuttal reports regarding the non-performance of the U.S. Department of Energy in accepting spent nuclear fuel under the terms of its contract, on behalf of Pacific Gas and Electric Company before the United States Court of Federal Claims, Docket No. 04-0074C, into which has been consolidated No. 04-0075C, November 2005.

Direct testimony regarding the appropriate load caps for a POLR auction, on behalf of Midwest Generation EME, LLC before the Illinois Commerce Commission, Docket No. 05-0159, June 8, 2005.

Affidavit regarding unmitigated market power arising from the proposed Exelon—PSEG Merger, on behalf of Dominion Energy, Inc. before the Federal Energy Regulatory Commission, Docket No. EC05-43-000, April 11, 2005.

Expert and rebuttal reports and oral testimonies before the American Arbitration Association on behalf of Liberty Electric Power, LLC, Case No. 70 198 4 00228 04, December 2004, regarding damages under termination of a long-term tolling contract.

Oral direct and rebuttal testimony before the United States Court of Federal Claims on behalf of Connecticut Yankee Atomic Power Company, Docket No. 98-154 C, July 2004 (direct) and August 2004 (rebuttal), regarding non-performance of the U.S. Department of Energy in accepting spent nuclear fuel under the terms of its contract.

Direct, supplemental and rebuttal testimony before the Public Service Commission of Wisconsin, on behalf of Wisconsin Public Service Corporation and Wisconsin Power and Light Company, Docket No. 05-EI-136, February 27, 2004 (direct), May 4, 2004 (supplemental) and May 28, 2004 (rebuttal) in regard to the benefits of the proposed sale of the Kewaunee nuclear power plant.

Testimony before the Public Utility Commission of Texas on behalf of CenterPoint Energy Houston Electric LLC, Reliant Energy Retail Services LLC, and Texas Genco LP, Docket No. 29526, March 2004 (direct) and June 2004 (rebuttal), in regard to the effect of Genco separation agreements and financial practices on stranded costs and on the value of control premiums implicit in Texas Genco Stock price.

Rebuttal and additional testimony before the Illinois Commerce Commission, on behalf of Peoples Gas Light and Coke Company, Docket No. 01-0707, November 2003 (rebuttal) and January 2005 (additional rebuttal), in regard to prudence of gas contracting and hedging practices.

Rebuttal testimony before the State Office of Administrative Hearings on behalf of Texas Genco and CenterPoint Energy, Docket No. 473-02-3473, October 23, 2003, regarding proposed exclusion of part of CenterPoint's purchased power costs on grounds of including "imputed capacity" payments in price.

Rebuttal testimony before the Federal Energy Regulatory Commission (FERC) on behalf of Ameren Energy Generating Company and Union Electric Company, Docket No. EC03-53-000, October 6, 2003, in regard to evaluation of transmission limitations and generator responsiveness in generation procurement.

Rebuttal testimony before the New Jersey Board of Public Utilities on behalf of Jersey Central Power & Light Company, Docket No. ER02080507, March 5, 2003, regarding the prudence of JCP&L's power purchasing strategy to cover its provider-of-last-resort obligation.

Oral testimony (February 17, 2003) and expert report (April 1, 2002) before the United States District Court, Southern District of Ohio, Eastern Division on behalf of Ohio Edison Company and Pennsylvania Power Company, Civil Action No. C2-99-1181, regarding coal plant maintenance projects alleged to trigger New Source Review.

Expert Report before the United States District Court on behalf of Duke Energy Corporation, Docket No. 1:00CV1262, September 16, 2002, regarding forecasting changes in air pollutant emissions following coal plant maintenance projects.

Direct testimony before the Public Utility Commission of Texas on behalf of Reliant Energy, Inc., Docket No. 26195, July 2002, regarding the appropriateness of Reliant HL&P's gas contracting, purchasing and risk management practices, and standards for assessing HL&P's gas purchases.

Direct and rebuttal testimonies before the Public Utilities Commission of the State of California on behalf of Southern California Edison, Application No. R. 01-10-024, May 1, 2002, and June 5, 2002, regarding Edison's proposed power procurement and risk management strategy, and the regulatory guidelines for reviewing its procurement purchases.

Rebuttal testimony before the Texas Public Utility Commission on behalf of Reliant Resources, Inc., Docket No. 24190, October 10, 2001, regarding the good-cause exception to the substantive rules that Reliant Resources, Inc. and the staff of the Public Utility Commission sought in their Provider of Last Resort settlement agreement.

Direct testimony before the Federal Energy Regulatory Commission (FERC) on behalf of Northeast Utilities Service Company, Docket No. ER01-2584-000, July 13, 2001, in regard to competitive impacts of a proposed merchant transmission line from Connecticut to Long Island.

Direct testimony before the Vermont Public Service Board on behalf of Vermont Gas Systems, Inc., Docket No. 6495, April 13, 2001, regarding Vermont Gas System's proposed risk management program and deferred cost recovery account for gas purchases.

Affidavit on behalf of Public Service Company of New Mexico, before the Federal Energy Regulatory Commission (FERC), Docket No. ER96-1551-000, March 26, 2001, to provide an updated application for market based rates.

Affidavit on behalf of the New York State Electric and Gas Corporation, April 19, 2000, before the New York State Public Service Commission, In the Matter of Customer Billing Arrangements, Case 99-M-0631.

Supplemental Direct and Reply Testimonies of Frank C. Graves and A. Lawrence Kolbe (jointly) on behalf of Southern California Edison Company, Docket Nos. ER97-2355-00, ER98-1261-000, ER98-1685-000, November 1, 1999, regarding risks and cost of capital for transmission services.

Expert report before the United States Court of Federal Claims on behalf of Connecticut Yankee Atomic Power Company, Connecticut Yankee Atomic Power Company, Plaintiff v. United States of America, No. 98-154 C, June 30, 1999, regarding non-performance of the U.S. Department of Energy in accepting spent nuclear fuel under the terms of its contract.

Expert report before the United States Court of Federal Claims on behalf of Maine Yankee Atomic Power Company, Maine Yankee Atomic Power Company, Plaintiff v. United States of America, No. 98-474 C, June 30, 1999, regarding the damages from non-performance of the U.S. Department of Energy in accepting spent nuclear fuel and high-level waste under the terms of its contract.

Expert report before the United States Court of Federal Claims on behalf of Yankee Atomic Electric Company, Yankee Atomic Electric Company, Plaintiff v. United States of America, No. 98-126 C, June 30, 1999, regarding the damages from non-performance of the U.S. Department of Energy in accepting spent nuclear fuel and high-level waste under the terms of its contract.

Prepared direct testimony before the Federal Energy Regulatory Commission on behalf of National Rural Utilities Cooperative Finance Corporation, Inc., Cities of Anaheim and Riverside, California v. Deseret Generation & Transmission Cooperative, Docket No. EL97-57-001, March 1999, regarding cost of service for rural cooperatives versus investor-owned utilities, and coal plant valuation.

Expert report and oral examination before the Independent Assessment Team for industry restructuring appointed by the Alberta Energy and Utilities Board on behalf of TransAlta Utilities Corporation, January 1999, regarding the cost of capital for generation under long-term, indexed power purchase agreements.

Oral testimony before the Commonwealth of Massachusetts Appellate Tax Board on behalf of Indeck Energy Services of Turners Falls, Inc., Turners Falls Limited Partnership, Appellant vs. Town of Montague, Board of Assessors, Appellee, Docket Nos. 225191-225192, 233732-233733, 240482-240483, April 1998, regarding market conditions and revenues assessment for property tax basis valuation.

Direct and joint supplemental testimony before the Pennsylvania Public Utility Commission on behalf of Pennsylvania Electric Company and Metropolitan Edison Company, No. R-00974009, et al., December 1997, regarding market clearing prices, inflation, fuel costs, and discount rates.

Direct Testimony before the Pennsylvania Public Utilities Commission on behalf of UGI Utilities, Inc., Docket No. R-00973975, August 1997, regarding forecasted wholesale market energy and capacity prices.

Testimony before the Public Utilities Commission of the State of California on behalf of the Southern California Edison Company, No. 96-10-038, August 1997, regarding anticompetitive implications of the proposed Pacific Enterprises/ENOVA mergers.

Direct and supplemental testimony before the Kentucky Public Service Commission on behalf of Big Rivers Electric Corporation, No. 97-204, June 1997, regarding wholesale generation and transmission rates under the bankruptcy plan of reorganization.

Affidavit before the Federal Energy Regulation Commission on behalf of the Southern California Edison Company in Docket No. EC97-12-000, March 28, 1997, filed as part of motion to intervene and protest the proposed merger of Enova Corporation and Pacific Enterprises.

Direct, rebuttal, and supplemental rebuttal testimony before the State of New Jersey Board of Public Utilities on behalf of GPU Energy, No. EO97070459, February 1997, regarding market clearing prices, inflation, fuel costs, and discount rates.

Oral direct testimony before the State of New York on behalf of Niagara Mohawk Corporation in Philadelphia Corporation, et al. v. Niagara Mohawk, No. 71149, November 1996, regarding interpretation of low-head hydro IPP contract quantity limits.

Oral direct testimony before the State of New York on behalf of Niagara Mohawk Corporation in Black River Limited Partnership v. Niagara Mohawk Power Corporation, No. 94-1125, July 1996, regarding interpretation of IPP contract language specifying estimated energy and capacity purchase quantities.

Oral direct testimony on behalf of Eastern Utilities Associates before the Massachusetts Department of Public Utilities, No. 96-100 and 2320, July 1996, regarding issues in restructuring of Massachusetts electric industry for retail access.

Affidavit before the Kentucky Public Service Commission on behalf of Big Rivers Electric Corporation in PSC Case No. 94-032, June 1995, regarding modifications to an environmental surcharge mechanism.

Rebuttal testimony on behalf of utility in Eastern Energy Corporation v. Commonwealth Electric Company, American Arbitration Association, No. 11 Y 198 00352 04, March 1995, regarding lack of net benefits expected from a terminated independent power project.

Direct testimony before the Pennsylvania Public Utility Commission on behalf of Pennsylvania Power & Light Company in Pennsylvania Public Utility Commission et al. v. UGI Utilities, Inc., Docket No. R-932927, March 1994, regarding inadequacies in the design and pricing of UGI's proposed unbundling of gas transportation services.

Direct testimony before the Pennsylvania Public Utility Commission, on behalf of Interstate Energy Company, Application of Interstate Energy Company for Approval to Offer Services in the Transportation of Natural Gas, Docket No. A-140200, October 1993, and rebuttal testimony, March 1994.

Direct testimony before the Pennsylvania Public Utility Commission, on behalf of Procter & Gamble Paper Products Company, Pennsylvania Public Utility Commission v. Pennsylvania Gas and Water Company, Docket No. R-932655, September 1993, regarding PG&W's proposed charges for transportation balancing.

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APPENDIX 2: SUPPORTING FIGURES

FCG Figure A – 1
Metric Formulas

Metric	Formula	Notes
Debt/Capitalization	Total Debt / Total Capitalization	Total Debt = Long-Term Debt + Short-Term Debt • Long-Term Debt includes both current and non-current portions of LT Debt, Capital Leases • Short-Term Debt includes Notes Payable, Commercial Paper, etc. Total Capitalization = Total Debt + Total Equity (or Net Position) • Net Position: Assets + Deferred Outflows – Liabilities – Deferred Inflows
Operating Margin	Operating Income / (Operating Revenues – Purchased Commodity Costs)	Operating Income = Operating Expenses – Operating Revenues Purchased commodity costs excluded
IGF/Revenues	(Operating Income + Depreciation + Amortization) / (Operating Revenues – Purchased Commodity Costs)	Purchased commodity costs excluded
FFO/CapEx	(Net Income + Depreciation + Amortization) / CapEx	CapEx corresponds to purchases of capital assets as recorded in cash flow statements; if cash flow statement is unavailable, CapEx is calculated as follows: Current Year Plant, Property, Equipment (PPE) – Previous Year PPE + Current Year Depreciation
Days Cash	Cash and Cash Equivalents / [(Operating Expenses – Depreciation – Amortization) / 365]	Purchased commodity costs included
FFO/Debt	(Net Income + Depreciation + Amortization) / 2-Year Average Total Debt	2-Year Average Total Debt = (Current Year Total Debt + Previous Year Total Debt) / 2; where Total Debt = Long-Term Debt + Short-Term Debt
FFO Coverage	(Net Income + Depreciation + Amortization + Interest) / Interest	
EBIT Coverage	(Net Income + Interest + Taxes) / Interest	
Interest-Only Debt Service Coverage	(Operating Income + Depreciation + Amortization + Interest Income) / Interest	

Debt Service Coverage (Principal & Interest)	(Operating Income + Depreciation + Amortization + Interest Income) / (Interest + Principal Paid on Long-Term Debt)	
CapEx/DA	CapEx / (Depreciation + Amortization)	
Net Plant/Gross Plant	Net Plant / Gross Plant	
CapEx/Net Plant	CapEx / Net Plant	
Gas OpEx/Volume	(Gas Operating Expenses – Purchased Commodity Costs) / Volume	Volume denotes total gas sales volume (mcf) across residential, commercial, industrial, and other customer categories used in EIA 176 filings

Sources and Notes:

Fiscal years are not consistent across benchmarked companies, resulting in differing timestamps for data collected to calculate the above metrics. PGW data is reported on a September-August Financial Year. CPS Energy data is reported on a February-January Financial Year. Richmond Department of Public Utilities data is reported on a July-June Financial Year. JEA data is reported on a November-September Financial Year. All other financial data reflect a January-December Financial Year. Equity values do not reflect anticipated changes to equity resulting from GASB implementation. Municipal utilities are generally exempt from taxes, but are sometimes responsible for "payments in lieu of taxes" to the host municipality; these alternative tax payments have been considered regular taxes for purposes of calculating the above metrics. Data availability limited the collection of Richmond data to 2011-2014, and Seattle City data to 2012-2015. Merger-related data issues limited collection of Central Penn and Penn Natural Gas data to 2012-2015, and Peoples data to 2011-2013. FFO/CapEx for Peoples is calculated only for 2011 and 2012, due to merger-related anomalies for 2013 data for plant, property, and equipment (PPE).

FCG Figure A – 2
Credit Agency Metrics: Leverage & Risk, Liquidity

Rating Agency	Leverage & Risk	Liquidity
Fitch	• Equity/Capitalization • Debt Service/Cash Operating Expenses • Debt/Customer • Variable-Rate Debt/Total Debt • Net Debt/Net Capital Assets • Operating Margin	• Days Cash on Hand • Days Liquidity on Hand
Moody's	• Debt to Operating Revenues • Oversized adjusted net pension liability relative to debt or significant actuarial required contribution* • Exposure to puttable debt, swaps, or other unusual debt structures*	• Days Cash on Hand • Constrained liquidity due to oversized transfers (includes in lieu of tax payments)*
S&P	• Debt to Equity	• Unrestricted Cash/Total Expenditures
PGW Benchmarking	• Debt / Capitalization • Operating Margin	• Internally Generated Funds/Revenues • FFO/CapEx • Days Cash

Sources and Notes:

Fitch Ratings, "U.S. Public Power Rating Criteria: Sector-Specific Criteria," May 2015, amended March 25, 2016. Moody's Investor Service, "Rating Methodology: US Municipal Revenue Debt," December 2014. Standard & Poor's Rating Services, "Ratings Direct: Electric and Gas Utility Ratings," December 2014.

Asterisk indicates metric is an additional consideration. Metrics listed for S&P should not be considered exhaustive. Moody's days cash measure excludes funds restricted for capital. Fitch also uses a separate "days liquidity" measure to account for commercial paper, short-term borrowing, etc.

FCG Figure A – 3
Credit Agency Metrics: Solvency, Efficiency/Other

Rating Agency	Solvency	Efficiency/Other
Fitch	• Debt Service Coverage • Coverage of Full Obligations • Funds Available for Debt Service • Debt/FADS	• CapEx/DA • Free Cash Flow/CapEx • General Fund Transfer/Operating Revenues
Moody's	• Debt Service Coverage • Debt Service Coverage below key indicators* • Outsized capital needs*	
S&P	• Debt Service Coverage • Fixed Charge Coverage	
PGW Benchmarking	• FFO/Debt • FFO Coverage • EBIT Coverage • Interest-Only Debt Service Coverage • Debt Service Coverage (Principal + Interest)	• CapEx/DA • Net Plant/Gross Plant • CapEx/Net Plant

Sources and Notes:

Fitch Ratings, "U.S. Public Power Rating Criteria: Sector-Specific Criteria," May 2015, amended March 25, 2016. Moody's Investor Service, "Rating Methodology: US Municipal Revenue Debt," December 2014. Standard & Poor's Rating Services, "Ratings Direct: Electric and Gas Utility Ratings," December 2014.

Asterisk indicates metric is an additional consideration. Metrics listed for S&P should not be considered exhaustive. Rating agencies use both generic debt service coverage ratios and may also consider utility-specific covenant-based ratios. Fitch calculates ratios including and excluding the effects of payments in lieu of taxes (and similar payments).

FCG Figure A – 4
PGW Supporting Financial Information

			2011	2012	2013	2014	2015
	Income Statement Items						
[1]	Operating Revenues	($000)	766,279	644,983	693,471	759,136	697,247
[2]	Operating Expenses	($000)	641,640	550,338	574,011	640,943	606,526
[3]	Gas Operating Expenses	($000)	641,640	550,338	574,011	640,943	606,526
[4]	Purchased Gas/Power	($000)	330,932	233,713	255,501	304,051	252,169
[5]	Depreciation	($000)	38,915	40,175	41,042	41,657	43,787
[6]	Amortization	($000)	0	0	0	0	0
[7]	Operating Income	($000)	124,639	94,645	119,460	118,193	90,721
[8]	Interest	($000)	75,682	69,544	59,965	57,135	56,523
[9]	Taxes	($000)	25,135	25,122	25,220	25,687	25,823
[10]	Interest Income	($000)	4,348	4,659	1,147	3,597	3,784
[11]	Net Income	($000)	35,305	11,760	42,642	46,655	19,982
	Balance Sheet Items						
[12]	Total Long-Term Debt	($000)	1,217,541	1,117,047	1,086,382	1,033,976	957,749
[13]	Total Short-Term Debt	($000)	0	0	0	0	30,000
[14]	Total Equity	($000)	309,740	315,945	358,587	258,002	277,984
[15]	Total Capitalization	($000)	1,527,281	1,432,992	1,444,969	1,291,978	1,265,733
[16]	Current Year Debt	($000)	1,217,541	1,117,047	1,086,382	1,033,976	987,749
[17]	Principal Paid on Long-Term Debt	($000)	40,459	97,608	27,720	49,800	50,975
[18]	2-Year Avg Total Debt	($000)	1,242,533	1,167,294	1,101,715	1,060,179	1,010,863
[19]	Cash & Equivalent Instruments	($000)	105,386	75,826	100,933	105,734	114,327
[20]	Net Plant	($000)	1,070,523	1,071,799	1,110,578	1,136,346	1,168,116
[21]	Gross Plant	($000)	1,856,303	1,894,129	1,951,546	2,018,234	2,093,112
	Misc						
[22]	CapEx	($000)	58,825	54,746	70,380	80,222	82,606
[23]	Total Gas Volumes	(mcf)	71,632,367	64,953,588	73,229,988	79,044,219	NA

Sources:
PGW Comprehensive Annual Financial Report 2011, 2012, 2013, 2014, 2015.

FCG Figure A – 5
PGW Annual Metric Calculation

			2011	2012	2013	2014	2015	Average
[24]	Debt/Capitalization		80%	78%	75%	80%	78%	78%
[25]	Operating Margin		29%	23%	27%	26%	20%	25%
[26]	IGF/Revenues		38%	33%	37%	35%	30%	34%
[27]	FFO/CapEx		1.26	0.95	1.19	1.10	0.77	1.05
[28]	Days Cash	(days)	64	54	69	64	74	65
[29]	FFO/Debt		0.06	0.04	0.08	0.08	0.06	0.07
[30]	FFO Coverage		1.98	1.75	2.40	2.55	2.13	2.16
[31]	EBIT Coverage		1.80	1.53	2.13	2.27	1.81	1.91
[32]	Interest-Only Debt Service Coverage		2.22	2.01	2.70	2.86	2.45	2.45
[33]	Debt Service Coverage (Principal & Interest)		1.45	0.83	1.84	1.53	1.29	1.39
[34]	CapEx/DA		151%	136%	171%	193%	189%	168%
[35]	Net Plant/Gross Plant		58%	57%	57%	56%	56%	57%
[36]	CapEx/Net Plant		5%	5%	6%	7%	7%	6%
[37]	Gas OpEx/Volume	$/mcf	4.34	4.87	4.35	4.26	NA	4.46

Notes:
[24] = ([12] + [13]) / [15]
[25] = [6] / ([1] – [4])
[26] = ([7] + [5] + [6]) / ([1] - [4])
[27] = ([11] + [5] + [6]) / [22]
[28] = [19] / ([2] – [5] – [6])
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[32] = ([7] + [5] + [6] + [10]) / [8]
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BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

DIRECT TESTIMONY OF

PHILIP Q. HANSER

ON BEHALF OF
PHILADELPHIA GAS WORKS

Docket No. R- 2017-2586783

Philadelphia Gas Works

RE: Cost of Service
Class Allocation
Customer-Related Costs

February 2017

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PREPARED DIRECT TESTIMONY OF PHILIP Q HANSER

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Philip Q Hanser. My business address is 44 Brattle Street, Cambridge, Massachusetts, 02138.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am a Principal of The Brattle Group, an economic consulting firm with offices in Cambridge, Massachusetts; Washington, D.C.; San Francisco, California; New York, New York; Toronto, Canada; London, England; Madrid, Spain, Rome, Italy; and Sydney, Australia.

Q. PLEASE DESCRIBE YOUR BACKGROUND AND EMPLOYMENT EXPERIENCE.

A. I have been involved in energy related matters for over 35 years and a Principal at The Brattle Group in its Cambridge office for the last 20 years. My practice has included issues such as market economics, transmission pricing, resource planning, environmental issues, forecasting, rate design, demand-side management, distributed resources and financial analysis.

I have appeared as an expert witness before the U.S. Federal Energy Regulatory Commission ("FERC"), and numerous state public utility commissions, environmental agencies, Canadian utility boards, as well as arbitration panels, and in federal and state courts. Since 2009, I have taught industry professionals about the principles and practice of cost of service calculations and rate design on behalf of the Edison Electric Institute in its Advanced Rates Course. I served for six years on the American Statistical Association's Advisory Committee to the Energy Information Administration ("EIA"), and am a member of IEEE ("Institute of Electronics and Electrical Engineers"), and CIGRE ("Conseil

International des Grands Reseaux Electriques") where I served on its Working Group C5-8, Working Group on Renewables and Energy Efficiency in a Deregulated Market.

Prior to joining The Brattle Group, I held teaching positions at the University of the Pacific, University of California at Davis, and Columbia University, and have served as a guest lecturer at the Massachusetts Institute of Technology, Stanford University, and the University of Chicago. I am currently a Senior Associate in the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School and lead a seminar in public policy analysis. I am also a lecturer at Boston University in the Questrom School of Business and a senior fellow at Boston University's Institute for Sustainable Energy. I have also served as the manager of the Demand-Side Management Program at the Electric Power Research Institute ("EPRI").

While at EPRI I was the final project manager for the Electric Utility Rate Design Study, the industry-sponsored multi-volume study to support utilities and commissions in implementing the Public Utilities Regulatory Policies Act of 1978. I also supervised EPRI's biennial surveys of innovative rates as well as reports addressing the measurement and evaluation of interruptible and curtailable rates, the impacts of residential time-of-use rates, the design of innovative and traditional rates, and the use of activity-based costing as a supplement to traditional utility accounting. I also served five years with the Sacramento Utility District as an economist where I performed the load research design to support both embedded and marginal cost based rates and performed or assisted in the development of the District's embedded and marginal costs of service studies. My background, publications, and prior testimony are further described in my CV, which is included as Appendix A.

Q. HAVE YOU PREVIOUSLY TESTIFIED IN PROCEEDINGS BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION ON BEHALF OF PGW?

A. No, I have not.

II. PURPOSE OF TESTIMONY

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of Philadelphia Gas Works ("PGW" or the "Company") in support of its base rate case filing with the Pennsylvania Public Utility Commission ("Commission").

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I am sponsoring the Company's class cost of service study ("CCOSS"). The primary purpose of the present CCOSS is to allocate the Company's costs of providing service to each Rate Class. The purpose of my testimony is to describe the principles, methodology, and data used in the present CCOSS.

I was also asked by PGW for a recommendation regarding the appropriate level of "normal weather" for the purposes of determining pro forma revenues. I discuss my recommendations below.

Q. WHY DOES THE COMPANY PROPOSE TO SUBMIT AN UPDATED CCOSS?

A. The Company last submitted a CCOSS in 2009, and since that filing many of the factors that drive the Company's cost of providing service have changed. This study incorporates updated information since the Company's last filing, and was developed with the aim to support the Commission's goal to move towards cost allocations and rate design that more closely reflect current cost causation.

Q. HOW DOES YOUR TESTIMONY RELATE TO THAT OF OTHER COMPANY WITNESSES?

A. Mr. Dybalski's testimony describes the customer charges that PGW has determined to propose after receiving the results of my CCOSS. It also describes PGW's goals and objectives in allocating the proposed rate increase, which I then used to determine the specific allocations. Mr. Golden's testimony supports the Company's Revenue Requirement. My testimony uses the Company's Revenue Requirement for the Fully Projected Future Test Year ("FPFTY") as a starting point. It also relies on the inputs and assumptions that went into the determination of the Revenue Requirement. The validation of the Revenue Requirement and the inputs and assumptions used to develop it are outside of the scope of my assignment.

Q. PLEASE IDENTIFY THE EXHIBITS THAT YOU ARE SPONSORING.

A. I am sponsoring the following exhibits, which are discussed in more detail in Section IV.

Exhibit PQH-1	Summary of Allocation Results
Exhibit PQH-2	Summary of Allocation Results by Functional Classification
Exhibit PQH-3	Allocation Results
Exhibit PQH-4	Classification Results
Exhibit PQH-5	Functionalization Results
Exhibit PQH-6	Summary of Factors Used
Exhibit PQH-7A	Functionalization Factor Values
Exhibit PQH-7B	Classification Factor Values
Exhibit PQH-7C	Allocation Factor Values
Exhibit PQH-8	Development of Allocation Factors
Exhibit PQH-9	Proposed Delivery Charges
Exhibit PQH-10	Computation of the Gas Procurement Charge
Exhibit PQH-11	Computation of the Merchant Function Charge

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. The remainder of my testimony is divided into five sections. Section III discusses the methodology used in the CCOSS. Section IV describes the results of the CCOSS, while Section V discusses the Company's proposed revenue allocation

and rate design. In Section VI, I discuss the nature of customer-related costs. Finally, in Section VII, I discuss the use of a 10-year weather normal.

III. PGW CLASS COST OF SERVICE STUDY

A. GENERAL CCOSS METHODOLOGY

Q. WHAT WAS THE SOURCE OF THE INFORMATION THAT YOU USED TO PERFORM THE CCOSS?

A. All of the input data used to perform the present CCOSS were provided by PGW, and I relied on the genuineness and completeness of this information. The input data used to perform the CCOSS correspond to the FPFTY (the Fiscal Year ending August 31, 2018), and fall into two broad categories. The first category consists of budgeted costs and other financial data that are discussed in detail in Mr. Golden's testimony. These data were provided by the Company and grouped in a manner consistent with the Federal Energy Regulatory Commission's Uniform System of Accounts. The budget was prepared by PGW. The second consists of certain operational data that includes forecasted sales and transportation volumes as well as forecasted customer counts.

Q. WHAT ARE THE PURPOSE AND GUIDING PRINCIPLES IN PERFORMING A CLASS COST OF SERVICE STUDY?

A. A CCOSS analyzes the components of the utility's total cost of service and aims to determine the portion that can be attributed to each Rate Class on the principle of cost-causation. Once the costs of providing services are allocated among the Rate Classes, the utility can establish rates that ensure that it recovers all of its costs. The fundamental step in a CCOSS is to develop allocators that capture the relationship between the costs of providing service and the drivers of those costs as accurately as possible.

Q. PLEASE EXPLAIN THE TERM TARIFF REVENUE REQUIREMENT.

A. In the present testimony I use the term "Tariff Revenue Requirement" to refer to the revenue that needs to be produced under PGW's Tariff in order to recover its total cost of providing service. Under the proposed rates, PGW would not collect the full Tariff Revenue Requirement because the amounts collected would be reduced by the Customer Responsibility Program Shortfall and Senior Discounts. For this reason the Tariff Revenue Requirement includes the revenue shortfall that occurs as a result of the Customer Responsibility Program and Senior Discounts.

Q. WHAT RATE CLASSES ARE INCLUDED IN THE PGW CCOSS?

A. The CCOSS includes the following Rate Classes:

- Residential Non-heating, Residential Heating
- Commercial Non-heating, Commercial Heating
- Industrial Non-heating, Industrial Heating
- Municipal Non-heating, Municipal Heating
- Philadelphia Housing Authority ("PHA") General Service ("GS")
- PHA Rate 8
- Developmental Natural Gas Vehicle Service ("NGVS")
- Interruptible Sales
- Gas Transportation Service Firm and Interruptible ("GTS/IT")

The Rate Classes in the present CCOSS are the same that were included in PGW's 2009 CCOSS, with two exceptions. First, I separate a class corresponding to Natural Gas Vehicles. Second, I separate the PHA Rate Class into PHA GS and PHA Rate 8 to capture the different service characteristics of single family and multi-family dwellings operated by the Philadelphia Housing Authority.

Q. PLEASE SUMMARIZE THE APPROACH THAT YOU FOLLOWED IN PERFORMING THE PGW CCOSS.

A. In performing the CCOSS I closely followed the principles of cost allocation set forth in Gas Rate Fundamentals published by the American Gas Association.[1] Because the investments and expenses incurred by PGW and recorded in accordance with the FERC's Uniform System of Accounts cannot, for the most part, be directly attributed to specific Rate Classes, there is a need to separate the costs into a series of components in order to appropriately apportion costs to each Rate Class in relation to the class's cost responsibility. Such a process is known as a CCOSS which aims to apportion the Company's plant investments and operating expenses in such a way that customers in each Rate Class pay for the costs that they cause the utility to incur. The CCOSS was performed using an Excel-based spreadsheet model that facilitates computations.

The present study carries out the three steps of the cost of service process, namely functionalization, classification, and allocation, which are described in more detail below. The model outputs provide cost information allocated to the different Rate Classes, and calculates the Tariff Revenue Requirements by functional classification for each Rate Class.

Q. WHY DID YOU USE BUDGETED, WEATHER-NORMALIZED DATA FOR THE TEST YEAR IN THE PGW CCOSS?

A. As discussed in more detail in Mr. Dybalski's and Mr. Golden's testimonies, PGW assumes normal weather when developing its budget and estimates of consumption. The purpose of using weather-normalized data is to remove the effect of weather in the Company's resulting cost allocation and rate design to ensure that they are consistent with average weather predictions.

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[1] American Gas Association Rate Committee, 1987, Gas Rate Fundamentals, Fourth Edition, American Gas Association, Arlington, VA.

Q. ARE THERE NOTEWORTHY DIFFERENCES IN METHODOLOGY OR APPROACH IN THE CURRENT CCOSS FROM THE PREVIOUS CCOSS SUBMITTED BY PGW?

A. The methodology that I used is the same as that used in prior CCOSS submitted by PGW. In a few cases there were changes in the allocators selected for certain accounts, with very small effect on the results of the CCOSS.

Q. PLEASE DESCRIBE THE THREE PRIMARY STEPS OF A CCOSS.

A. Typically a CCOSS study consists of three steps, namely functionalization, classification, and allocation.

In the **functionalization** step, costs are separated by the utility's service functions which include supply, storage, transmission, distribution, and onsite (the latter includes costs related to the customer premises and include metering and customer account costs). In the present study, consistent with the 2009 PGW CCOSS I also functionalized certain costs to the Universal Service and Energy Conservation ("USEC") function. These costs are associated with revenue shortfalls from the Customer Responsibility Program, Senior Discounts, and weatherization programs for low income customers, and are recovered via the USEC surcharge. Assigning these costs to this function facilitates computations.

The second step is called **classification** and consists of dividing the functionalized costs into groups based on what caused them to be incurred. The three typical groups are demand, commodity, and customer. *Demand-related* costs are associated with the maximum gas flow requirements of the utility's customers. These are costs that are related to designing, installing and maintaining facilities operating such that they can accommodate the largest level of demand that customers could place on the system. For this reason they are typically assigned to Rate Classes based on their relative contribution to demand during the peak season or peak day demands. *Commodity-related* costs are those costs that vary with the amount of gas that the customers consume. *Customer-related* costs are

those required to serve a customer with minimal usage within each Rate Class. These costs include the costs of connecting a customer to the system, metering their gas usage, and maintaining the customer's account, and are driven by the number of customers, and not by the amount of gas consumed.

The third step is called **allocation**, and consists of apportioning the previously functionalized, classified costs among the Rate Classes. These costs are allocated in such a way as to capture the relationship between the costs and the drivers that caused the costs to be incurred for each Rate Class. For example, costs that are driven by the volume of gas consumed would be allocated among the Rate Classes based on the relative share of gas consumed or transported by each class.

Q. WHY IS THE CLASS ALLOCATION STEP NECESSARY?

A. In a few cases, certain plant investments and costs are incurred exclusively to serve a specific customer or group of customers. In such cases these costs can be directly assigned to those customers. However, most utility investments and costs are incurred to serve many different groups of customers. For this reason, without the allocation process it is not possible to assign responsibility for common costs to the different Rate Classes. If each cost could be attributed specifically to each customer group, then there would exist no need for the class allocation step of the cost of service study.

Q. HOW WERE ALLOCATORS DEVELOPED?

A. The allocators used in this study were developed using PGW's financial and operational data. The allocators and their derivation are shown in Exhibit PQH-8, and a description of each allocator is included later in my testimony. In some cases, certain accounts are allocated using a combination of allocators rather than a single allocator.

B. ALLOCATION OF THE RATE BASE

Q. WHAT IS THE RATE BASE AND WHAT ROLE DOES IT PLAY IN THE PGW CCOSS?

A. The rate base refers to a utility's investments in plant and other assets to serve customers. This term is commonly used in rate cases for investor-owned utilities, whose rates are set under a rate of return standard, and where the size of the rate base is relevant because the utility's allowed return dollars are a function of the rate base. Although PGW does not operate under rate of return regulation and, thus, PGW's Tariff Revenue Requirement is not a function of the rate base, the items that make up PGW's invested capital are used to develop allocators because such investments are driven by PGW's requirements to serve its customers. As a result, many costs are functionalized, classified or allocated among Rate Classes in proportion to their responsibility for investments in rate base. For example, interest expense on long-term debt is functionalized, classified and allocated among Rate Classes using the rate base, because interest expense is incurred to finance the purchase of the assets that comprise the rate base.

Q. WHAT ARE THE MAJOR COMPONENTS OF THE RATE BASE AND HOW DID YOU FUNCTIONALIZE, CLASSIFY AND ALLOCATE THEM AMONG RATE CLASSES?

A. Consistent with groupings in the FERC's Uniform System of Accounts, I have grouped the accounts that make up the rate base into a number of categories to facilitate discussion. These groupings are the same as those found in PGW's 2009 CCOSS, and include: *production plant, storage plant, distribution plant, general plant, depreciation reserve, working capital,* and a final catch-all category called *other rate base items*. These are discussed in more detail below.

Production plant includes investments used in connection with manufactured gas production. Production plant is sized to meet maximum daily demand and has

been functionalized to supply, classified to demand, and allocated among Rate Classes based on relative demands of each Rate Class on the design day.

Storage plant consists primarily of investments in storage and processing of LNG. Similarly to production plant, storage plant is sized to meet maximum daily demand and has been functionalized to storage, classified to demand, and allocated among Rate Classes based on relative demands of each Rate Class on the design day.

Distribution plant includes a variety of assets that are found downstream of the gas transmission system. It includes such assets as land and structures, mains, compression and regulation stations, services, meters, house regulators, industrial measuring equipment, and other equipment. Land and structures support other distribution assets that are a function of system demand, and have been functionalized to distribution, classified to demand, and allocated based on total distribution plant. Mains are used to connect customers and are sized to meet the maximum level of demand by the customer. Mains have been functionalized to distribution, and classified to both customer and demand, given the dual purpose they serve. I have allocated the demand portion of mains based on the relative use of mains of each Rate Class on the design day, and the customer component of mains based on the average number of customers in each Rate Class. Compression and regulation station equipment is used in connection with distribution system operations and measurement of gas deliveries. Items in this account have been functionalized to distribution, classified to demand, and allocated based on the relative use of mains of each Rate Class on the design day. Services connect individual customers to the system, and have been functionalized to distribution, classified as customer related costs, and allocated among Rate Classes based on the estimated total replacement cost for each Rate Class. Total replacement cost of services for a Rate Class was estimated as the product of the replacement cost of a typical service line for the Rate Class, and the number of customers in the Rate Class. Meters and related installation costs have been functionalized to the onsite function, classified as customer related costs and

allocated among Rate Classes based on the estimated total replacement cost for each Rate Class. Total replacement cost of meters for a Rate Class was estimated as the product of the replacement cost of a meter with typical size for the Rate Class and the number of customers in the Rate Class. By considering the replacement costs of services and meters, the Company presents a recent representation of the costs of acquiring these assets. If the Company were instead to use the costs of services and meters that are currently installed in, irrespective of when they were installed, it would include in its estimate costs that are no longer viable or truly representative of current service and meter costs. House regulators and related installation costs were functionalized to onsite, classified as customer-related and allocated to the Residential and PHA GS Rate Classes based on customer counts. Industrial measuring equipment was functionalized to distribution, classified as demand-related and allocated to the Industrial Rate Class based on customer counts. The account corresponding to other distribution equipment was functionalized to distribution, classified to demand, and allocated based on total distribution plant.

General plant items include structures, office furniture and equipment, as well as transportation, communication, and miscellaneous equipment tools. These assets support more than one function, and were functionalized, classified and allocated among Rate Classes primarily based on direct labor content, reflecting common utility practice.

Depreciation reserve was functionalized, classified and allocated among Rate Classes in the same ratio as the related assets.

Working capital represents cash and inventories that PGW needs in the normal course of business. PGW provided detail for the items that make up the total need for working capital, and each item was functionalized, classified and allocated among Rate Classes in the same way as the activity which caused the item to be incurred.

C. ALLOCATION OF PGW's COST OF SERVICE

Q. WHAT ARE THE MAJOR COMPONENTS OF PGW'S COST OF SERVICE?

A. Similar to my discussion of the rate base in the section above, and consistent with groupings in the FERC's Uniform System of Accounts, I have grouped the accounts that make up PGW's cost of service into a number of categories to facilitate discussion. These groupings are the same as those found in PGW's 2009 CCOSS, and include the following expenses: *production, storage and processing, distribution, customer records and customer service, administrative and general, depreciation expense, payroll tax expense, interest and surplus, and other revenues and expenses.* These are discussed in more detail below.

Q. WHAT COSTS ARE INCLUDED IN PRODUCTION AND HOW WERE THESE COSTS FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. The preset CCOSS includes production expenses related to operations and maintenance of LNG facilities, natural gas operating expenses, and commodity costs for the Interruptible Sales Rate Class. Commodity costs and certain other costs associated with gas production are collected via the Gas Cost Rate ("GCR") clause and thus are excluded in this study. Production plant is sized to meet maximum daily demand and thus the costs of operating PGW's production plant have been functionalized to supply, classified to demand, and allocated among Rate Classes based on relative demands of each Rate Class on the design day. The costs of commodity related to supplying the Interruptible Sales class was functionalized to supply, classified as commodity, and directly assigned to the Interruptible Sales class. Natural gas operating expenses and gas removed from storage support year-long gas supply were functionalized to supply, classified as commodity, and assigned to the Rate Classes based on their relative share of consumption. Other gas supply expenses, including LNG used for other utility

operations was functionalized to supply, classified to commodity, and allocated among Rate Classes based on relative share of firm sales.

Q. WHAT COSTS ARE INCLUDED IN STORAGE AND HOW WERE THESE COSTS FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Natural gas storage, terminaling, and processing expenses are the costs associated with operating PGW's LNG facilities, which are designed and operated to meet design day demand requirements. Related costs were functionalized to storage, classified as demand, and allocated among Rate Classes based on relative demands of each Rate Class on the design day.

Q. WHAT COSTS ARE INCLUDED IN PGW'S DISTRIBUTION COSTS AND HOW WERE THESE COSTS FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Distribution costs include a variety of expenses related to operation and maintenance of the distribution system. Operation supervision and engineering expenses as well as distribution rents relate to both the distribution and onsite functions, and thus were costs functionalized to distribution and onsite in proportion to the functionalization of distribution plant, and were classified and allocated among Rate Classes in proportion to the direct labor content of distribution function expenses. Distribution load dispatching expenses were functionalized to distribution, classified as commodity, and assigned to the Rate Classes based on their relative share of consumption. The costs of operating and maintaining mains, services, meters, and house regulators were functionalized, classified and allocated among Rate Classes in proportion to PGW's investments in the respective assets. Costs related to general and city gate measuring and regulating equipment were functionalized to distribution, classified to commodity and customer and allocated among Rate Classes based on design day usage of the assets and throughput. Costs related to industrial measuring and regulating

equipment were functionalized to distribution, classified to commodity and allocated to the industrial Rate Class. Costs of work performed on customer premises were functionalized to onsite and classified to customer. The portion of these costs related to PGW's parts and labor plan were allocated to the residential classes, consistent with the allocation of parts and labor plan revenue; and the remaining costs were allocated among Rate Classes based on PGW's investment in meters for each class. Other distribution costs were functionalized between distribution and onsite in proportion to the functionalization of distribution plant, and classified to customer. The distribution function portion was allocated among Rate Classes in proportion to distribution plant and classified as distribution customer and the onsite function portion was allocated in proportion to plant functionally classified as onsite customer.

Q. HOW WERE CUSTOMER ACCOUNTS COSTS FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Customer accounts costs relate to maintaining customer records and collection, uncollectible accounts, meter reading, and related supervision. Customer records and collection expenses were functionalized to onsite and classified to customer. This account was studied in detail to identify appropriate cost drivers to allocate the costs related to the different activities captured in this account. For additional detail please refer to Exhibit PQH-8. Uncollectible accounts were functionalized to distribution, classified as customer, and allocated among Rate Classes based on the share of write offs for the period between 2014 and 2016. The uncollectible amounts related to Customer Responsibility Program were functionalized to USEC and allocated among the Rate Classes based on the relative share of firm sales. Meter reading expenses and related supervision were functionalized to onsite, classified to customer and allocated among Rate Classes based on investment in meters and in number of meters. For additional detail please refer to Exhibit PQH-8.

Q. HOW WERE CUSTOMER SERVICE AND INFORMATION COSTS FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Customer assistance expenses include marketing and customer service functions, and were functionalized to onsite and classified to customer. This account was studied in detail to identify appropriate cost drivers to allocate the costs related to the different activities captured in this account. For additional detail please refer to Exhibit PQH-8. Costs related to low income customer weatherization programs, as well as Customer Responsibility Program Shortfall and Senior Discounts were functionalized to USEC and allocated among Rate Classes based on the relative share of firm sales.

Q. HOW WERE ADMINISTRATIVE AND GENERAL EXPENSES FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Administrative and general expenses include administrative and general salaries, employee healthcare, pensions, and benefits, office supplies and expenses, and miscellaneous general expenses, among others.

For the most part, administrative and general expenses serve more than one function and were thus allocated based on the share of labor costs associated with each functional classification. Some notable exceptions are listed below. Property insurance costs were functionalized, classified, and allocated among Rate Classes using plant in service in each functional classification. Regulatory commission expenses include expenses that are incurred by PGW in connection with formal cases before the Commission. These expenses were functionalized to distribution, classified to customer and allocated among Rate Classes in the same ratios as the rate base. Administrative and general expenses also include certain costs associated with funding PGW's Other Post Employment Benefit liabilities. These

were allocated among the Rate Classes based on the share of labor costs associated with each functional classification.

Q. HOW WAS DEPRECIATION EXPENSE FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Depreciation expenses include depreciation expense on plant in service, and were allocated among Rate Classes in the same ratios as plant in service.

Q. HOW WAS PAYROLL TAX EXPENSE FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Payroll taxes were allocated among the Rate Classes based on the share of labor costs associated each functional classification.

Q. HOW WERE INTEREST EXPENSE AND AFUDC CREDIT FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Debt Service and Interest expense was functionalized, classified and allocated among Rate Classes in proportion to the rate base. The Allowance for Funds Used During Construction Credit was functionalized and classified in proportion to rate base and allocated among Rate Classes in proportion to the rate base.

Q. PLEASE DESCRIBE THE SURPLUS REQUIREMENT AND HOW THIS DIFFERS FROM THAT OF A TYPICAL INVESTOR-OWNED UTILITY.

A. In a typical investor-owned utility, an important component of the revenue requirement is the overall rate of return on rate base the utility is authorized to earn. However, as a municipally-owned utility, PGW's revenue requirement is not established on the basis of a rate of return. Rather, in the case of PGW, the Tariff Revenue Requirement includes a dollar amount in excess of cost to meet certain financial requirements. As discussed in Mr. Golden's testimony, an important consideration for PGW is to earn sufficient revenue to maintain certain debt

coverage levels and levels of cash on hand and liquidity. The surplus requirement is an amount that achieves the desired level of debt coverage and days cash on hand over a period of time. It is an integral component that protects against risk from volatility in volumes. This is a requirement as it plays a role in stabilizing revenue, without which the Company is at risk of being unable to meet its financial obligations. For this reason the cost of service study treats this as a cost that must be recovered from customers.

Q. HOW WAS THE SURPLUS REQUIREMENT FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. In a typical investor-owned utility, the return to equity capital is allocated among Rate Classes in proportion to the rate base. Since PGW's surplus requirement is a function of PGW's capital requirements, it was functionalized to distribution, classified to customer and allocated among Rate Classes in proportion to the rate base.

Q. PLEASE DESCRIBE PGW'S REVENUE SOURCES.

A. The revenues obtained by PGW can be largely grouped in two categories. Operating revenues are those that PGW receives as a result of providing services to its customers, and includes gas tariff revenues as well other miscellaneous service revenues from appliance servicing and customer installations, and service restoration fees. Non-operating income includes rental income, interest income and other miscellaneous non-operating income.

Q. WHAT ROLE DO REVENUES PLAY IN THE PGW CCOSS?

A. Revenues play an important role in the computation of the Tariff Revenue Requirement, and their proper allocation is essential to measuring the extent to which each Rate Class recovers sufficient revenue to cover its respective cost of service. Non-operating revenues play the role of reducing the revenue requirement that needs to be collected under proposed rates.

Q. HOW WERE PGW'S OPERATING REVENUES AT PRESENT RATES COMPUTED AND ALLOCATED TO THE RATE CLASSES?

A. For the purposes of this study, and consistent with the groupings in the 2009 PGW CCOSS I have grouped tariff revenues into categories. Distribution revenue includes revenue from the customer charge, volumetric charge, as well as other surcharges with the exception of the USEC surcharge. It was computed by multiplying the present rates by forecasted billing units for each Rate Class. USEC revenue corresponds to revenues collected via the USEC surcharge and was computed as the product of the USEC surcharge and the volumes corresponding to the Rate Classes to which the USEC surcharge applies. Revenue related to forfeited discounts and finance charges was allocated among the Rate Classes based on the relative proportion of balances over 60 days for each Rate Class. Interruptible Sales revenue as well as GTS/IT gas revenue was computed by PGW and directly assigned to the corresponding classes. Miscellaneous service revenue, as well as other gas revenue and revenue adjustments were computed by PGW and allocated among the Rate Classes in proportion to GCR revenue. Bill paid turn-ons & dig-ups revenue was functionalized to onsite, classified to customer and allocated among Rate Classes based on average number of customers, while customer installation revenue was functionalized to onsite, classified to customer and allocated among Rate Classes based on average number of residential customers.

Q. HOW WERE NON-OPERATING REVENUES FUNCTIONALIZED, CLASSIFIED AND ALLOCATED AMONG RATE CLASSES?

A. Non-operating revenues include interest income and miscellaneous non-operating income. Interest income was functionalized, classified and allocated among Rate Classes in proportion to the rate base, consistent with the allocation of the interest expense. Miscellaneous non-operating income is related to capacity release credits, and was functionalized to supply, classified as demand and allocated

among Rate Classes in proportion to design day supply requirements. This is appropriate because these credits serve the purpose of offsetting capacity costs.

Q. ARE THERE ANY OTHER COMPONENTS TO THE PGW CCOSS THAT WARRANT DISCUSSION?

A. No, the above testimony addresses all significant components of the PGW CCOSS.

IV. RESULTS OF THE PGW CCOSS

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR WORK.

A. In the present CCOSS I have assigned the non-gas Tariff Revenue Requirement among the Rate Classes on a cost causation basis. This assignment was based on data provided by PGW including forecasted costs, physical quantities, and other operating characteristics for the Test Year. Detailed results of my analysis are provided in the exhibits. One of the main results of my work is the increase or decrease in Tariff Revenue for each Rate Class that is needed to produce the full cost of service for each Rate Class. The computation of customer related costs reveals that both the current and proposed customer charges are significantly lower than the customer charges that result from the customer related costs identified by the present CCOSS. The Company's revenue at current rates combined with the proposed allocation of costs would result in under-recoveries of non-gas Tariff Revenue Requirements for most Rate Classes.

Q. PLEASE BRIEFLY DESCRIBE THE INFORMATION IN EXHIBITS PQH-1, PQH-2, AND PQH-3.

A. Exhibit PQH-1 shows the revenue at current rates, the Tariff Revenue Requirement allocated on a cost of service basis, and the allocation of the proposed rate increase for each Rate Class. In Exhibit PQH-2 I summarize the results of allocating the Tariff Revenue Requirement by functional classification.

Exhibit PQH-3 shows the results of the class allocations by FERC account detail. This exhibit shows the allocation of each item of rate base, operating expenses, depreciation expense, as well as operating and non-operating revenues. Lastly, in this exhibit I compare revenue at current rates to the total Tariff Revenue Requirement allocated on a cost of service basis, to show the extent to which each Rate Class would produce its full Tariff Revenue Requirement at current rates. Exhibits PQH-3A through Exhibit PQH-3H provide additional detail of the allocations for each functional classification.

Q. PLEASE DESCRIBE THE INFORMATION IN EXHIBITS PQH-4 and PQH-5.

A. In Exhibit PQH-4 and Exhibit PQH-5 I show the results of performing the functionalization, and classification steps on each item of the revenue requirement grouped by FERC account. Exhibit PQH-4 shows the classification of each item of the Supply function (as demand or commodity), and each item of the Distribution function (as demand, commodity, or customer). Items functionalized to storage were classified entirely to demand, and those functionalized to onsite and USEC we classified entirely to customer, therefore these functions are not shown on the exhibit.

Q. PLEASE DESCRIBE THE INFORMATION IN EXHIBIT PQH-6 AND EXHIBIT PQH-7.

A. Exhibit PQH-6 shows the factors used in the classification, functionalization, and allocation steps of the preset CCOSS for each FERC Account. In Exhibit PQH-7 I show the values of each allocator used.

Q. PLEASE DESCRIBE THE INFORMATION IN EXHIBIT PQH-8.

A. In this exhibit I provide detail related to how I developed each of the main allocators used in the CCOSS.

V. PROPOSED REVENUE ALLOCATION AND RATE DESIGN

Q. WHAT IS THE TOPIC OF THIS SECTION OF YOUR TESTIMONY?

A. In this section I describe the allocation of the Company's proposed rate increase and the computation of the resulting rates, based on certain Company's specifications for revenue allocation and proposed rates.

Q. PLEASE DESCRIBE THE COMPANY'S APPROACH TO REVENUE ALLOCATION.

A. The Company specified the following approach for the allocation of the revenue increase:

i. Make proportional progress towards each class's respective cost of service.

ii. Avoid having any one class bear a disproportionally large portion of the rate increase.

iii. No revenue increase has been allocated to the Interruptible Sales or GTS customers, as the rates that these customers pay are governed by bilateral contracts between the customers and PGW.

iv. For the IT Rate Class, allocate a portion of the revenue increase to reflect the fact that the IT customer demand drives many of the costs associated with building and operating the system.

v. Allocate the revenue increase in such a way that would result in rates that are similar for customers that share similar service requirements but are nonetheless grouped under different Rate Classes.

The specification in (ii) was implemented in part by assigning a portion of the rate increase to the Commercial class, even though the class as a whole would over-collect relative to its cost of service. The specification in (iv) is appropriate because the IT contribution to peak demand is not appropriately captured with the allocators used in the current CCOSS, and thus the results somewhat understate

their cost responsibility. Even though the IT customers are not contributing to demand on the peak day, their needs are still being met by the distribution system. While their interruptiblity could result in avoidance of costs that are strictly related to peak capacity, it does not avoid all capacity costs imposed by these customers on the system. The specification in (v) was implemented by allocating a portion of the revenue increase to the PHA GS class in such a way that the resulting rate would move closer to, but remain below, the Residential GS rate.

Q. PLEASE DESCRIBE YOUR RECOMMENDED ALLOCATION OF THE RATE INCREASE.

A. Distribution rates were developed based on the proposed revenue allocation and the previously described goals set forth by the Company:

i. Increase the monthly fixed customer charges proportionally for each Rate Class, to more closely reflect the fixed nature of certain costs that are driven by the number of customers and that do not vary with the volume of gas consumed. As shown in Exhibit PQH-2, the proposed customer charges are significantly lower than the charges that are supported by the CCOSS. I discuss customer-related costs and customer charges in more detail in Section VI.

ii. Set volumetric delivery charges that are the same within each of the following groups, including in each case heating and non-heating, and firm sales and firm transportation: Residential; Commercial; Industrial. Monthly customer charges are also the same within each such group.

iii. A separate rate was established for Philadelphia Housing Authority General Service.

iv. A combined rate was set for Municipal Heating, Municipal Non-Heating, and Philadelphia Housing Authority Rate 8, to reflect the fact that these Rate Classes have similar service requirements.

v. A separate rate established for Natural Gas Vehicle service.

vi. For the IT class, made no changes to the monthly customer charges, and allocated the same percent increase in the volumetric rate for each of the IT Rate Classes IT-A through IT-E.

Q. DID YOU PREPARE A SCHEDULE THAT SHOWS THE COMPANY'S PROPOSED RATE DESIGN?

A. Yes. I show the results of my rate design computation in Exhibit PQH-9.

Q. WHAT IS THE GPC AND HOW WAS IT COMPUTED?

A. The Gas Procurement Charge ("GPC") is a volumetric charge that is intended to recover certain costs associated with procuring natural gas, and applies to all firm sales customers. The GPC is developed to isolate these costs from the distribution charge.

Gas procurement costs include administrative salaries related to procuring natural gas, storage gas working capital, and cash working capital. These costs are divided by the total firm sales service volumes to develop the GPC, which is the same for all firm sales customers. To ensure revenue neutrality, a separate GPC credit is computed and is applied to the volumetric rates of firm sales as well as firm transportation customers. This credit is computed by dividing the gas procurement costs by firm sales and firm transportation volumes. Details of my computations can be found in Exhibits PQH-10.

Q. WHAT IS THE MFC AND HOW WAS IT COMPUTED?

A. The Merchant Function Charge ("MFC") is a volumetric charge that is intended to recover the cost of uncollectible accounts expenses related to natural gas supply for each Rate Class. It is developed to isolate uncollectible costs from the distribution charge. The MFC applies only to firm sales customers and the charge for each Rate Class is different.

The MFC is a function of the uncollectible accounts for each Rate Class. The first step in the calculation was to compute the average percentage of uncollectible amounts for each Rate Class for Fiscal Years 2014 through 2016. This percentage was applied to the forecasted GCR revenues in the Test Year to determine the total amount of uncollectibles to be recovered via the MFC. The MFC for each Rate Class was calculated by dividing the uncollectible GCR costs for each Rate Class by the corresponding total firm sales volumes. Similarly to the GPC, a credit was computed to apply to all firm sales and firm transportation volumes. Details of my computations can be found in Exhibits PQH-11.

Q. DID YOU COMPARE THE REVENUE UNDER THE CURRENT TARIFF TO THE REVENUE UNDER THE TARIFF RATES THAT THE COMPANY IS PROPOSING?

A. I have not. This computation is presented in the testimony of Mr. Dybalski.

VI. CUSTOMER-RELATED COSTS

Q. WHAT ARE CUSTOMER-RELATED COSTS?

A. Customer-related costs are the costs incurred to connect a customer to the distribution system, the capital costs and expenses associated with metering gas usage, and the costs to maintain the customer's account and provide customer service. Customer costs vary as a function of the number of customers served, and do not depend on the amount of gas consumed by customers.

Q. WHY IS IT APPROPRIATE TO COLLECT CUSTOMER-RELATED COSTS VIA A FIXED CUSTOMER CHARGE?

A. As previously discussed, customer-related costs do not depend on the amount of gas consumed, but rather are a function of the number of customers served. For this reason, a fixed monthly charge is appropriate because it reflects the invariance of these customer costs with respect to consumption that this charge is

intended to recover. It also enhances the Tariff's ability to recover these costs in the face of changes in consumption and, thus, reduces coverage risk for fixed costs.

Q. WHAT COSTS ARE INCLUDED IN PGW'S CUSTOMER-RELATED COSTS AND HOW WERE THESE ALLOCATED AMONG RATE CLASSES?

A. Customer-related costs were allocated in a way consistent with the methodology I use to conduct the present CCOSS. The total customer-related cost is the sum of the amounts that were classified to Customer in the classification step of the PGW CCOSS. Details of the allocation of customer-related expenses can be found in Exhibit PQH-3F, Exhibit PQH-3G, and Exhibit PQH-3H. A summary of the total amount for each functional classification can be found in Exhibit PQH-2.

Q. DID YOU CALCULATE THE CUSTOMER-RELATED COSTS FOR EACH OF THE RATE CLASSES?

A. Yes, I did. In Exhibit PQH-2 I show the total dollar amount assigned to each Rate Class by functional classification, and I also compute the monthly fixed customer charge that would be supported on a cost of service basis. I do this by dividing the total customer related costs by the number of customers in each Rate Class. We relayed this information to PGW for the Company to consider as it made a determination for their proposed customer charges. For additional details please refer to the testimony of Mr. Dybalski.

Q. DID YOU COMPARE THE MONTHLY CUSTOMER CHARGES BEING PROPOSED BY PGW TO THE CUSTOMER RELATED COSTS YOU CALCULATED IN THE PGW CCOSS?

A. Yes. For every Rate Class, the proposed monthly Customer Charge is lower than the customer related costs on a per customer-month basis in the PGW CCOSS for the Fully Projected Future Test Year. In other words, on a cost causation basis, PGW would be justified to propose customer charges that are notably higher than

the ones the Company is proposing. An increase in the customer charge makes progress towards rates that more closely reflect the fixed nature of the costs related to serving individual customers and that do not vary greatly with the amount of gas consumed.

VII. THE USE OF A 10-YEAR WEATHER NORMAL

Q. PGW WITNESS DYBALSKI (PGW ST. 6) HAS INDICATED THAT THE COMPANY USED A 10-YEAR AVERAGE TO CALCULATE NORMAL DEGREE DAYS TO DETERMINE PRO FORMA REVENUES BASED ON YOUR RECOMMENDATION. WHY DID YOU RECOMMEND THAT PGW UTILIZE A 10-YEAR WEATHER NORMAL RATHER THAN THE 30-YEAR WEATHER NORMAL USED HISTORICALLY?

A. Utilities and other organizations incorporate overall climatic trends into projections for heating and cooling degree days. In order to remain consistent with changing trends, shorter time horizons (e.g. 10-year normals) and trended normals have also been adopted.[2] Weather normals with shorter time horizons adapt to current conditions but may need to be updated as climatic shifts continue, while trended normals inherently track continued climate trends. As shown below in Figure 1, a 30-year trended normal (1986-2015) based on the Richmond Station data produces a projection of 3,797 Heating Degree Days ("HDDs") in 2017 and 3,661 HDDs in 2022. The 10-year normal (2006-2015) produces 3,905 HDDs, a higher number that corresponds to colder weather, and the "30 year average" normal produces 4,247 HDDs, the coldest projection of the three.

[2] For example, the Department of Energy's 2016 Annual Energy Outlook projects residential heating and cooling degree days informed by a 30-year linear trend.

See: http://www.eia.gov/outlooks/aeo/assumptions/pdf/residential.pdf

Figure 1: Historical and Trended Weather Normals[3]

I recommend that PGW utilize the 10-year average because:

i. the 30-year average is no longer supportable as reflective of "normal" degree days in PGW's service territory;

ii. the 10-year average is a more supportable methodology compared to the current 30-year average approach, although it is likely not as accurate a forecast of HDDs as the one that would result from using a 30-year trend; and

iii. the use of an average rather than a trend is consistent with the past use of degree day averages to determine normal weather.

Q. OTHER THAN THE DATA PRESENTED ABOVE, ARE THERE OTHER REASONS TO USE A 10-YEAR WEATHER NORMAL?

A. Yes, based on its observations and feedback from the energy industry, the National Oceanic and Atmospheric Administration ("NOAA") has developed

[3] The Richmond Station Heating Degree Day data was provided by PGW. The 30-year normal and 30-year trended normal are based on the annual HDDs for 1986-2015. The 10-year normal is based on annual HDDs for 2006-2015. The annual HDDs corresponded PGW's fiscal year of September – August and included all months' HDDs.

"alternative" normals; these normals are specifically designed to better reflect current and future climate conditions than 30-year normals.[4] These alternative normals include shorter time horizons (5-20 years) as well as a trended normal, which uses a statistical approach called a Hinge Fit.[5]

Q. WHAT IS THE EFFECT ON RATES OF MOVING FROM A 30-YEAR TO A 10-YEAR WEATHER FORECAST TEST YEAR?

A. The effect of this change on proposed rates is largest for the Residential and Commercial heating classes. A move to 10-year weather normal results in a lower estimate of sales relative to that which would occur under a 30-year weather assumption (but higher than the 30-year trend). This has a dual impact on rates. On one hand, all else being equal, a higher level of sales would result in a lower volumetric rate for all Rate Classes given that the revenue requirement would be divided over a larger number of units of gas. On the other hand, the move to 10-year weather has a proportionally larger impact on the Residential and Commercial heating classes. As a result of lower volumes, in the CCOSS these classes would be allocated a relatively smaller share of those costs that are allocated based on their consumption. All else being equal this would result in a reduction in rates for these classes. The combined effect of this change on each Rate Class will depend on the difference in projected consumption for each class, and the cost characteristics of the services provided. Quantifying the effect of this change on rates was beyond the scope of my assignment.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

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[4] Anthony Arguez, Russel Vose, and Jenny Dissen, "Alternative Climate Normals: Impacts to the Energy Industry," American Meteorological Society, June 2015: 915-917.

[5] National Oceanic and Atmospheric Administration, "Defining Climate Normals in New Ways," https://www.ncdc.noaa.gov/news/defining-climate-normals-new-ways. Accessed February 15, 2017.

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Philip Q Hanser is a principal of The Brattle Group and has over thirty-five years of consulting and litigation experience in the energy industry. He specializes in regulatory and financial economics, especially for electric and gas utilities, in areas such as retail tariffs, transmission pricing, marginal and avoided costs, and integrated resource planning. He is experienced in environmental issues, forecasting, marketing and demand-side management, and other complex management and financial matters. He also provides assistance in statistical matters including sample design and data analysis.

He has appeared as an expert witness before the U.S. Federal Energy Regulatory Commission (FERC), and numerous state public utility commissions, environmental agencies, Canadian utility boards, as well as arbitration panels, and in federal and state courts. Since 2009, Mr. Hanser has taught industry professionals about the principles and practice of cost of service calculations and rate design on behalf of the Edison Electric Institute in its Advanced Rates Course. He served for six years on the American Statistical Association's Advisory Committee to the Energy Information Administration (EIA). He is a member of IEEE (Institute of Electronics and Electrical Engineers), CIGRE (Conseil International des Grands Reseaux Electriques).

Prior to joining The Brattle Group, Mr. Hanser held teaching positions at the University of the Pacific, University of California at Davis, and Columbia University, and served as a guest lecturer at the Massachusetts Institute of Technology, Stanford University, and the University of Chicago. He currently is a Senior Associate in the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School and co-leads a seminar in public policy analysis. He has also served as the manager of the Demand-Side Management Program at the Electric Power Research Institute (EPRI). He has been published widely in leading industry and economic journals.

AREAS OF EXPERTISE

- Analysis of Electricity Generation, Contracts, and Wholesale Markets
- Resource Planning and Procurement
- Environment
- Energy Efficiency, Demand-Side Management, and Renewables
- Analysis of Market Power
- RTO Design and Participation
- Forecasting and Weather Normalization
- Rate Design and Related Issues
- Transmission
- Plant Performance and Strategy
- Utility Financial Issues

EDUCATION

Ph.D. Candidacy Requirements Completed, Columbia University, NY 1975

Phil.M. (Economics and Mathematical Statistics) Columbia University 1975

A.B. (Economics and Mathematics) The Florida State University, FL 1971

University of California at Berkeley Engineering Extension Course
Time Series and Econometric Forecasting September 1979

Data Analysis and Regression, American Statistical Association
Short Course, San Diego, CA August 1978

ACADEMIC POSITIONS

Harvard Kennedy School
Senior Associate in the Mossavar-Rahmani Center for Business and Government
Co-Leader BGP-150Y Business and Government Policy Analysis Concentration Seminar 2012-present

Massachusetts Institute of Technology, Cambridge, MA
Guest Lecturer, Energy Laboratory Short Courses 1997-1998

University of California, Davis; Davis, CA
Visiting Lecturer, Department of Economics 1981-1982

University of the Pacific, Stockton, CA
Assistant Professor, Departments of Economics and Mathematics 1975-1980

EXPERIENCE

Analysis of Electricity Generation, Contracts, and Wholesale Markets

- Provided expert testimony in Massachusetts state court on the impacts of alleged violations of a wholesale power contract on a supplier in ISO-NE.
- For the California Department of Water Resources, provided expert testimony in federal bankruptcy court with regard to the public interest standard to be applied to Calpine

Corporation's rejection of its contracts. This assignment included a valuation of the contract over time through the use of a simulation model of the California market, as well as an assessment of the potential reliability implications for the California market.

- For the California Department of Water Resources and the California Attorney General's Office, provided expert testimony on damages resulting from Sempra Energy Resources breaches of its power purchase agreement in both arbitration hearings and before the California state court. Analyzed two years of hourly data on energy deliveries, market prices, ISO charges, and invoice charges to identify and evaluate performance violations and invoice overcharges. Assisted counsel in developing the theory of the case and provided general litigation support in preparation for and during arbitration.
- For Dominion Electric Marketing, Inc. (DEMI), provided assistance in their response to a complaint by United Illuminating (UI) regarding their wholesale supply contract. The dispute centered on the allocation of reliability must-run costs between UI as a load-serving entity and DEMI as wholesale supplier.
- For the California Department of Water Resources, reviewed the California ISO's proposed implementation of locational marginal pricing (LMP) and analyzed implications for "seller's choice" supply contracts. Developed a framework for quantifying the incremental congestion costs that ratepayers would face if suppliers delivered power to the lowest priced nodes, and estimated potential incremental contract costs using a third party's GE-MAPS market simulations. Made recommendations to the CAISO regarding how to address the issue.
- Provided expert testimony in Massachusetts state court on the damages incurred by a power plant developer as a result of alleged contractual violations by a supplier for a plant constructed in ISO-NE.
- For a Florida utility, provided a confidential expert report evaluating the benefits of the power from a co-generator and its potential rate implications, and assisted in the negotiation of a co-generation contract with a large industrial customer.
- Assisted a U.S. electric utility in the preparation of a bid proposal to an industrial firm for the leasing of a new power plant. The assignment included risk analysis of the proposal, assessment of financial and rate impacts, and market assessment of competitors' potential offerings.
- For a merchant generation company, provided testimony on the fairness of a resource procurement action.

Resource Planning and Procurement

- For the Edison Electric Institute, co-authored a report on the general inapplicability of standard financial portfolio theory to the resource portfolios of utilities.
- For the investor-owned utilities of Wisconsin, provided testimony before the Public Service Commission of Wisconsin on cost of capital issues for use in its statewide resource planning exercise.
- For an international development bank, evaluated generation resource needs for an Eastern European country as well as provided a determination of alternative means to meet those generation needs. This assignment included analysis of the impact of privatization on the country's economy, its import and export sectors, and future development of electricity and gas resources.
- For a western utility, developed an assessment its resource options, with a particular view towards future environmental regulation.
- For a southern utility, performed an assessment of the value of adding a gas-fired generating station.

Environment

- For an eastern U.S. utility with substantial coal-generating facilities, provided advice with regard to maintenance procedures and risk exposure to New Source Review standards under the Clean Air Act Amendments.
- For a western generator with substantial coal-generating facilities, provided assistance with regard to responding to allegations by the Environmental Protection Agency of failure to comply with the New Source Review standards under the Clean Air Act Amendments.
- For Illinois Power Company, provided expert testimony in federal court on the regulatory and rate base implications of the Clean Air Act Amendments, in support of the calculation of noncompliance economic damages arising from New Source Review.
- For a gas utility, assisted in the development of potential manufactured gas liabilities for use in insurance recovery and in estimating potential recovery under a variety of insurance allocation theories and estimated risk distribution.
- For a gas utility, assisted in the assessment of the announcement effect of environmental liabilities on its cost of capital. This assignment included estimation of changes in market betas for pre- and post- environmental liability announcement.

Energy Efficiency, Demand-Side Management, and Renewables

- For a large utility in the southern United States, prepared expert report investigating alternative cost allocation approaches for generation capacity, fuel, and demand-side management (DSM) costs, both through a review of the methods, surveys of practice, as well as the financial impacts on the utility. The cost allocation assessment included cost allocation across jurisdictions as well as within a jurisdiction.
- For Central Vermont Public Service, provided expert testimony on the impact of its DSM programs before the Vermont Public Service Board.
- For Ameren/UE's Illinois subsidiaries, provided expert testimony on the potential for gas DSM and resulting potential rate implications.
- For a northeastern utility, developed an assessment of the potential penetration rate of microturbines. For the utility service territories under consideration, evaluated the back-up generation rates and connection charges likely to be incurred for such systems to determine customer costs and benefits.
- For a utility located in WECC procuring renewable resources, provided a system integration study for a range of renewable project proposals. Used production costing and power flow models to estimate the "deliverability" of various proposals, including estimating the LMP prices and the potential congestion costs. Ranked the proposed renewable power projects by their estimated benefits and costs and delivered a formal presentation to the utility's executives at the completion of the project.
- For a power marketer and developer of independent power projects in Great Britain, assisted in the preparation of comments on proposals by the UK pool regarding the role of demand-side bidding and the pricing of transmission losses.
- For a Texas utility, provided expert testimony regarding breach of contract claims made against it by an industrial participant in an energy efficiency project. Reviewed the energy efficiency impacts of program. Calculated the net present value of the project in relation to various rate options and market prices.
- For Connecticut Light and Power, provided testimony in support of an application for a Certificate of Environmental Compatibility and Public Need for the construction of a 345-kV electric transmission line and reconstruction of an existing 115-kV electric transmission line. At issue was the use of distributed resources to substitute for the proposed lines.

Analysis of Market Power

- For the California Parties, provided litigation support and testimony regarding manipulation of energy and ancillary service market prices and the outage behavior of gas fired power plants during 2000-01. The proceeding, before the Federal Energy Regulatory Commission, involved Enron, Dynegy, Mirant, Reliant, Williams, and other suppliers in the U.S. and Canada. The analyses focused on the use by suppliers of generation outages to affect market prices through physical withholding, as well as the use of pricing to yield economic withholding.
- For the California Parties, provided litigation support and testimony regarding Enron's transmission and ancillary services market manipulation strategies, including 'Death Star' and 'Get Shorty.'
- For Southern California Edison, submitted testimony before the FERC describing the implications of manipulation of gas market prices on the electricity market.
- For Sierra Pacific Resources Company, provided expert testimony before the Public Utilities Commission of Nevada and the FERC regarding the market power implications of generation asset divestiture required for the merger of Sierra Pacific Power and Nevada Power Company. Developed a Cournot market model to assess the market power implications of selling off alternative groupings of generation.
- For the Pennsylvania-New Jersey-Maryland Interconnection, LLC (PJM), co-authored annual report on the state of its markets. The report included an assessment of the market's competitiveness and potential structural deficiencies, and identified potential instances of market abuse.
- For PJM, developed an ensemble of metrics for assessing market power in its markets. The metrics included an early warning system to permit PJM interventions into market abuse at the earliest possible stage.
- For PJM, developed software for unilateral market power assessment and assisted PJM in its preliminary implementation. Its use was demonstrated with an incident involving potential market power abuse by PJM members.

RTO Design and Participation

- For Northeast Utilities, provided testimony before the FERC with regard to the economics of imposing local installed capacity (LICAP) requirements on ISO-NE. Also provided expert testimony before the FERC in support of its applications for market-based rate authority.
- For NSTAR, provided testimony before the FERC on several matters: first, the necessity of imposing bid caps on the New England electricity market; second, replacement energy rates for generators when transfer capability into a transmission-constrained zone was reduced because of system upgrades; and third, the appropriateness of granting market-based rate authority to a generator in a transmission-constrained zone. Developed a Cournot market model to forecast the potential impact on market prices in the transmission-constrained zone in which the majority of NSTAR's service territory is located.
- For Nevada Power Company, provided expert testimony before the FERC for its market-based rate authority application.
- For Otter Tail Power Company, provided an affidavit to the FERC assessing how the Midwest ISO's proposed Transmission and Energy Market Tariff would affect Otter Tail Power, both operationally and financially. Based on the strategies that were pursued by some market participants during the 2001 California electricity market crisis, demonstrated the potential to pursue similar strategies in MISO and harm Otter Tail and its customers.
- For Edison Mission Energy's subsidiary Midwest Gen, provided expert testimony to the FERC for its market-based rate authority application.
- For a Midwest utility, examined the implications of differing configurations of the independent system operator (ISO) on potential market power concerns. The issue particularly examined was the question of seams and how different ISO configurations affected the costs of transactions.
- Co-authored a report for the New York Independent System Operator assessing the reliability implications of modifying its rules regarding installed capacity.
- Submitted testimony to the Public Utilities Commission of Texas (PUCT) regarding a proposed rule to allocate costs of procuring replacement reserves to market participants in ERCOT.
- For the Edison Electric Institute, authored a report on standard market design and its implications for utilities within regional transmission organizations.

Forecasting and Weather Normalization

- For a northeastern utility, developed an assessment of the potential penetration rate of microturbines using a statistical diffusion model. For the utility service territories under consideration, evaluated the back-up generation rates and connection charges likely to be incurred for such systems to determine customer costs and benefits.
- For the Pennsylvania-New Jersey-Maryland Interconnection, LLC (PJM), co-authored an assessment of its forecasting model
- For Florida Power and Light Co., provided testimony before the Florida Public Service Commission with regard to its forecasting methodology.
- For an electric utility in the Southeast, reviewed the existing weather normalization process and diagnosed problems with weather data and regression models. Developed alternative daily and monthly normalization models, improved degree-day specification, selection of weather stations, and regression specification to double prediction accuracy and improve stability of normalization process.
- For PJM, conducted a review of models for forecasting peak demand and re-estimated new models to validate recommendations. Models were developed for 18 individual transmission zones as well as for the entire PJM system.
- For a Southwestern utility, developed models for forecasting monthly sales and loads for residential, commercial and industrial customer classes using primary data on customer loads, weather conditions, and economic activity.
- For the Public Service Company of New Mexico, provided expert testimony before the Public Utilities Commission of New Mexico regarding the forecasted growth of the El Paso, Texas and Juarez, Mexico markets and their electricity requirements.
- For a Southeastern utility, developed a model for forecasting monthly demand that incorporated the impacts of its significantly declining housing market and which served as the basis for its treasurer's revenue forecast.

Rate Design and Related Issues

- For a Midwest utility, provided support for its rate designs, including cost of service development and certification of conformance with state regulations.
- For an industrial customer, provided testimony before a state public utility commission on the appropriate cost allocation and rate design approach for a municipal water utility.
- For a utility in PJM, performed a marginal cost/avoided cost study to be used in evaluating its demand-side management energy efficiency programs, demand responsive rates, and seasonal and time-of-use rates. Included geographic-specific assessment of marginal distribution and transmission costs.
- For intervenors in Toronto Hydro Electric System Limited (THESL), provided testimony on cost allocation issues with regard to THESL's suite metering program.
- For Ameren/UE's Missouri subsidiary provided expert testimony on its rate design before the Missouri Public Utility Commission. Assisted the development of company witnesses' rationale for the choice of cost of service allocation method, developed benchmarks for the rate increase against similarly situated utilities, as well for other commodities' escalations, and evaluated proposed demand-side management programs and rate options.
- For Ameren/UE's Illinois subsidiaries, provided expert testimony on the potential for gas demand-side management. The testimony discussed potential rate implications of such programs on the revenue of the utilities.
- For the Edison Electric Institute, co-authored a series of papers with regard to issues facing utilities. The reports covered the issues of fuel adjustment clauses, mitigating large rate increase impacts, and the Energy Policy Act of 2005.
- For the City of Vernon, California, submitted testimony to the FERC regarding its revenue requirements for transmission.
- For the Edison Electric Institute, served as an instructor in the Advanced Rates School on the topics of cost allocation, rate design, and marginal costs.
- For the ISO-NE, served as instructor on retail cost allocation and ratemaking.
- For Hydro Québec, provided testimony before the Régie d'Énérgie regarding the conformance of its Open Access Transmission Tariff with U.S. FERC regulations.
- Before staff members of the FERC, assisted in the development of a review of the implications of the restructuring in transmission assets' cost of capital and wholesale rates.

- For a power marketer and developer of independent power projects in Great Britain, assisted in the preparation of comments on proposals by the UK pool regarding the pricing of transmission losses and the role of demand-side bidding.
- For a utility in PJM with multiple jurisdictions provided an assessment of alternative demand and energy cost allocation procedures. Included separate assessments for each jurisdiction as well as an assessment for generation and transmission assets commonly shared by all jurisdictions.
- For a European transmission company, provided an analysis of the likely development of the European electricity market. Also assessed market implications for the transmission company of modifications to the transmission grid.
- For Hydro Québec, provided expert testimony before the Régie d'Énérgie regarding whether a set of privately held transmission facilities constituted a looped transmission system and, thus, was subject to requests for transmission service.
- For Omaha Public Power District, provided assistance in the performance of its cost of service study, retail and wholesale rate designs. Also redesigned its cost of service models.
- For Arizona Public Service, provided assistance in the development of a cost of service basis for separating its residential customers with rooftop solar photovoltaic into a separate rate class.
- For Nevada Power, provided assistance in the development of a cost of service basis for separating its residential customers with rooftop solar photovoltaic into a separate rate class.
- For Pacific Gas and Electric, redesigned the marginal cost of service models, as well as their software implementation, for revenue cycle services and distribution system costs.
- For Wolverine Power Cooperative, provided testimony to the FERC supporting its request for formula rates.
- For the Hawaii Electric Company, assessed alternative performance incentive mechanisms in a report which was submitted to the Hawaii Public Utility Commission.
- For FirstEnergy/Jersey Central Power and Light, provided assistance in their development of their costs of service submitted to the New Jersey Board of Public Utilities.
- For National Grid, assessed alternative performance incentive mechanisms in a report which was submitted to the Massachusetts Department of Public Utilities.

Plant Performance and Strategy

- For the Keystone-Conemaugh Project Office, performed a benchmarking analysis to identify the areas in which Keystone and Conemaugh coal units were better performing or under-performing compared to other units with similar characteristics. This involved comparing the historical

operational and cost performance of the Keystone and Conemaugh coal units against their peer groups; identifying the areas where the performance of the Keystone and Conemaugh coal units were above and below the average quartile of their peer groups; and developing metrics and methodologies to combine the results of individual comparisons across the operational and cost performance assessments.

- For a U.S. electric utility, assisted in the development of a legislative and regulatory strategy with regard to restructuring. This assignment included generation asset valuation in a competitive market, development of stand-alone transmission and distribution rates under cost-of-service and performance-based regulation, and estimation of stranded costs.

Utility Financial Issues

- For the Edison Electric Institute, co-authored a report on the general inapplicability of standard financial portfolio theory to the resource portfolios of utilities.
- For a gas utility, assisted in the assessment of the announcement effect of environmental liabilities on its cost of capital. This assignment included estimation of changes in market betas for pre- and post- environmental liability announcement.
- For the investor-owned utilities of Wisconsin, provided testimony before the Public Service Commission of Wisconsin on cost of capital issues for use in its statewide resource planning exercise.
- For the developer of a synthetic natural gas plant in Indiana, provided testimony before the Indiana Utility Regulatory Commission on the appropriate approach to assessing financial risk for the plant.
- For the developer of a synthetic natural gas plant in Illinois provided a series of testimonies before the Illinois Commerce Commission on the appropriate cost of equity for the plant.
- For the developer of a synthetic natural gas plant in Illinois, provided testimony before the Illinois Construction Development Board on the appropriate range of capital costs and operations and maintenance expenses.

Other Energy Experience

- For the Edison Electric Institute, conducted annual workshop for Electric Rate Advanced Course, "Introduction to Efficient Prices," University of Wisconsin, Madison, July 2009 - Present.

- For the Edison Electric Institute, conducted annual workshop for Electric Rate Advanced Course, "Rate Class Cost Allocation," University of Wisconsin, Madison, July 2009 - Present.
- For the Edison Electric Institute, conducted annual workshop for Electric Rate Advanced Course, "Ratemaking by Objective: It Can Be Done," University of Wisconsin, Madison, July 2009 - Present.
- For the Edison Electric Institute, conducted Pre-Course Workshop for Electric Rate Advanced Course, "Traditional Embedded Costing and Pricing Concepts," University of Wisconsin, Madison, July 26, 2009.
- For the Edison Electric Institute, conducted workshop for Electric Rate Advanced Course, "Unbundling Methodologies," University of Wisconsin, Madison, July 26, 2009.
- For the Edison Electric Institute, conducted webinar "Long-Term Energy Forecasts: Challenges and Approaches," June 17, 2009.
- For the Indiana Energy Conference, presented "It Ain't Your Father's IRP, Meeting Today's Challenges," October 2, 2008.
- For the NEPOOL Forecasting Committee Summer Meeting, presented "I'm a Forecaster – And You Can Too!," July 17, 2008.
- For the Electric Power Research Institute (EPRI), developed and directed a research program to provide electric utilities the following capabilities: marketing research, pricing and rate design, integrated resource planning, capital budgeting, environmental impacts of electric utilities and end-use technologies, load research, forecasting, and demand-side management through software tools, database development, and technology development. Assisted in the development of the Load Management Strategy Testing Model (LMSTM) and served as its project manager, served as the project manager for the development of DSManager, a software for assessing efficiency programs for electric, gas, and water utilities, enhancements to the Electric Generation Expansion Analysis Model (EGEAS). Co-wrote reports on the environmental impacts of electric technologies, environmental externalities, cost-benefit analysis of DSM programs, rate design and costing, integrated resource planning, impacts of interruptible and curtailable rates, product differentiation, activity-based costing, DSM program evaluation, efficiency program development for electric, gas, and water utilities and others.
- For EPRI, served as project manager of the Edison Electric Institute (EEI), National Rural Electric Cooperatives Association (NRECA), American Public Power Association (APPA), and National Association of Regulatory Utility Commissioners (NARUC) jointly sponsored Electric Utility

Rate Design Study (EURDS). Represented the Institute before various regulatory commissions, federal agencies, and utility executives. Also for EPRI, served on the Environmental Protection Agency's advisory committee for the Clean Air Act Amendments and as the operating agent for Annex IV, Improved Methods for Integrating Demand-Side Options into Utility Resource Planning, of the International Energy Agency Agreement on Demand-Side Management.

- For a California utility, supervised short- and long-term forecasts of sales and peak demand for use in resource and corporate planning. Supervised and helped prepare forecast documentation for public hearings before the California Energy Commission and represented the utility to the Commission on the forecast. Supervised the design and implementation of long-term strategic planning and financial models, and prepared both marginal and embedded cost of service studies for the utility and assisted in their use for the design of customer rates. Evaluated the impact of energy conservation programs and legislation on long-term system resource requirements. Designed and implemented the residential survey of appliance holdings and commercial customer equipment survey.

Statistics and Sampling

- Designed a statistically valid database sampling procedure for assessing the validity of insurance claims arising from mass tort actions. The database contained summary information on the claims and for each claim there was, at times, voluminous information on the individual cases. The sampling procedure was used to determine which records would be chosen and assessed the individual's claim eligibility.
- Assessed the liability risk of an insurance company that provided coverage relevant to a mass tort suit. A Markov chain model was developed to estimate the size of the potential population and then a risk model was developed to calculate potential exposure.
- Developed a time to failure model to test the claims of generators during the California Electricity Crisis that their outage rates were not abnormal.
- Submitted testimony in bankruptcy court regarding the estimation of inventory subject to reclamation by a wholesale pharmaceuticals supplier which was sold to a bankrupt retail drug chain. The retail chain failed to maintain proper inventory records and a statistical approach which used a combination of data on overall inventory and the shipment and replenishment records of the supplier was used to develop the estimate.

TESTIMONY AND REGULATORY FILINGS

Before the United States District Court for The District of Montana Billings Division, Case no: CV 13-32-BLG-DLC-JCL, filed "Expert Report of Philip Q Hanser on Behalf of Defendants," regarding the evaluation of potential impacts of capital maintenance, repair and replacement projects on emissions from four Colstrip Units, November 14, 2014.

Before the Hawai'i Public Utilities Commission, Docket No. 2013-0141, filed "Targeted Performance Incentives: Recommendations to the Hawaiian Electric Companies" by William P. Zarakas and Philip Q Hanser, regarding the analysis of the application of performance incentives to electric utilities, September 15, 2014.

Before the Federal Energy Regulatory Commission, Docket No. ER15-249-000, filed "Prepared Direct Testimony of Philip Q Hanser on behalf of Wolverine Power Supply Cooperative, Inc." regarding a Request for Change in Rates to Distribution Cooperative Member-Owners, October 30, 2014.

Before the Public Utilities Commission of the State of Colorado, Proceeding No. 13F-0145E, "Answer Testimony and Exhibits of Philip Q Hanser on behalf of Tri-State Generation and Transmission Association, Inc.," regarding an Analysis of Complaining Parties' Responses to Tri-State Generation and Transmission Association, Inc., September 10, 2014.

Before the Public Service Commission of Wisconsin, Docket No. 3720-WR-108, filed "Direct Rebuttal and Surrebuttal Testimony of Philip Q Hanser on behalf of MillerCoors L.L.C." regarding the Application of Milwaukee Water Works for Authority to Increase Water Rates, June 2014.

Before the District Court for the Eastern District of Missouri, Civil Action No. 4:11-cv-00077-RWS, filed "Expert Report of Philip Q Hanser on behalf of Ameren Missouri," regarding the New Source Review enforcement case, May 16, 2014.

Before the Illinois Commerce Commission of the State of Illinois, Docket No. 13-0387, filed "Rebuttal Testimony of Philip Q Hanser on behalf of Commonwealth Edison Company," regarding their tariff filing to present the Illinois Commerce Commission with an opportunity to consider revenue neutral tariff changes related to rate design authorized by subsection 16-108.5(e) of the Public Utilities Act, August 19, 2013.

Before the Public Utilities Commission of the State of South Dakota, EL 11-006, filed "Wind Integration Services - Summary of Industry Practices in North America, on behalf of NorthWestern Energy," in the Matter of the Complaint by Oak Tree Energy LLC against NorthWestern Energy for refusing to enter into a Purchase Power Agreement, July 8, 2013.

Before the Régie de l'énergie, R-3848-2013, filed "Direct Testimony of Philip Q Hanser on Behalf of Hydro-Québec Distribution" regarding their Application for approval of characteristics of Wind Integration Services and acquisition analysis of other wind integration services, June 2013, January 2014.

Before the Federal Energy Regulatory Commission, "Prepared Direct Testimony of Philip Q Hanser on behalf of NV Energy Operating Companies," regarding whether use of a 12-CP cost allocation method is appropriate for the NV Energy transmission system from a cost allocation perspective, May 2013.

Before the Federal Energy Regulatory Committee, Prepared Direct and Rebuttal Testimony and Exhibits of Philip Q Hanser in Support of the Refund Claims of the City of Seattle, Washington, for the Period January 1, 2000 through December 24, 2000, on behalf of the City of Seattle, Washington, EL01-10-085, March 12, 2013, June 3, 2013, July 26, 2013.

Before the Commonwealth of Massachusetts Department of Public Utilities, "Review and Analysis of Service Quality Plan Structure In the Massachusetts Department of Public Utilities Investigation Regarding Service Quality Guidelines for Electric Distribution Companies and Local Gas Distribution Companies," with David E. M. Sappington and William P. Zarakas, as part of the Initial Comments of National Grid, DPU12-120, March 2013.

Before the Bonneville Power Administration, Direct and Rebuttal Testimony of Philip Q Hanser, John D. Martinsen, Felicienne NG, James M. Russell, and Paul Wrigley on Behalf of Benton County Public Utility District No. 1, Iberdrola Renewables, LLC, Tacoma Power, Seattle City Light, and Snohomish County Public Utility District No. 1, Docket No. BP-14-E-JP12-01, January 28, 2013, March 11, 2013.

Before the Illinois Commerce Commission, Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Cost of Equity, October, 2011; Supplemental Report on Behalf of Chicago Clean Energy, LLC, November, 2011; Response Report of Philip Q Hanser on Behalf of Chicago Clean Energy, November, 2011, Certified Affidavit on Behalf of Chicago Clean Energy, LLC, December 2011.

Before the Louisiana Public Service Commission, Direct Testimony of Philip Q Hanser on Behalf of Calpine Corporation, Docket No. U-31971, November 22, 2011. (Testimony withdrawn as part of the settlement between Calpine and Entergy.)

Before the Illinois Construction Development Board, Supplemental Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Estimate of Capital Costs, November, 2011. Supplemental Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Estimate of Operations and Maintenance Expenses, November 2011.

Before the Indiana Utility Regulatory Commission, Rebuttal Testimony of Philip Q Hanser on Behalf of Indiana Gasification, LLC, IURC Cause No. 43976, June 2011.

Before the State of Illinois Commerce Commission, Prepared Direct Testimony of Philip Q Hanser on behalf of Interstate Power and Light Company with regard to their Petition For Approval Of Sale of Utility Assets Pursuant To Sections 7-102 Of The Public Utilities Act; and Approve the Discontinuance of Service Pursuant to 8-508 of the Public Utilities Act, 2011.

Before the Federal Energy Regulatory Commission, Supplemental Comments, Re: Notice of Proposed Rulemaking regarding Demand Response Compensation in Organized Wholesale Energy Markets," Docket Nos. RM10-17-000 and EL09-68-0, October 4, 2010, May 13, 2010.

Before the Régie de l'énergie, Prepared Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie ("HQT"), Regarding HQT's Methodology for ATC Coordination, June 2010.

Before the Commonwealth of Massachusetts Trial Court, testified on behalf of MMWEC regarding the management and ownership of investor-owned utilities ("IOUs"), MMWEC, and municipal light departments ("Municipals") in Massachusetts before and after the passage of the Electric Industry Restructuring Act of 1997, as well as the impact of electric industry restructuring in Massachusetts on IOUs, MMWEC, and Municipals with respect to contract buyouts in the matter of MASSPOWER v. Massachusetts Municipal Wholesale Electric Company (MMWEC), Civil Case No. 07-3243 BLS2, March 2010.

Before the Ontario Energy Board, Prepared Witness Statement on Behalf of the Smart Sub-Metering Working Group in the Matter of Toronto Hydro-Electric System Limited's 2010 Electricity Distribution Rate Application, December 15, 2009.

Before the Superior Court of the State of California for the County of San Diego, Prepared Second Addendum Report to Expert Report of Philip Q Hanser, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Case No. GIC 789291, September 30, 2009.

Before the Florida Public Service Commission on Behalf of Florida Power and Light Company, Prepared Rebuttal Testimony of Philip Q Hanser, Docket No. 080677-EI, August 6, 2009.

Before the Federal Energy Regulatory Commission on Behalf of the City of Vernon, California, Prepared Petition for Declaratory Order and Request for Waiver of Filing Fee of City of Vernon, California, Docket No. EL09-___-000, July 15, 2009.

Before the Régie de l'énergie, Prepared Supplemental Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie, in Response to Newfoundland and Labrador Hydro's Complaint P-110-1692, June 2009.

Before the Federal Energy Regulatory Commission, on Behalf of The People of the State of California, ex rel. Edmund G. Brown Jr., Direct Testimony of Philip Q Hanser regarding emergency purchases the state authorized the California Energy Resources Scheduling Division of the California Department of Water Resources ("CERS") to make when the California investor-owned utilities (IOUs) could not purchase the power needed to serve their customers, Docket No. EL09- __ ("Brown Complaint"), May 22, 2009.

Before the Florida Public Service Commission on Behalf of Florida Power and Light Company, Prepared Direct Testimony of Philip Q Hanser, Docket No. 080677-EI, April 23, 2009.

Before the Superior Court of the State of California for the County of San Diego, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Prepared Addendum to Expert Report of Philip Q Hanser, Case No. GIC 789291, March 31, 2009.

Before the Pennsylvania Public Utility Commission on Behalf of Pennsylvania Electric Company, Prepared Rebuttal Testimony of Philip Q Hanser and Metin Celebi Concerning the Causes and Pricing of Transmission Congestion, Docket No. P-2008-2020257, January 16, 2009, March 10, 2009.

Before the Régie de l'énergie, Prepared Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie, in Response to Newfoundland and Labrador Hydro's Complaints P-110-1565, P-110-1566, P-110-1597, P-110-1678, and P-110-1692, December 2008.

Before the Pennsylvania Public Utility Commission, on Behalf of Pennsylvania Electric Company, Prepared Direct Testimony of Philip Q Hanser Concerning the Causes and Pricing of Transmission Congestion, Docket No. P-2008-2020257, July 30, 2008.

Before the Régie de l'énérgie, Prepared Affidavit on Behalf of Hydro-Québec Regarding the Public Availability of SIS Reports Performed by a Transmission Provider, June 19, 2008.

Before the Federal Energy Regulatory Commission, Prepared Direct Testimony on Behalf of the City of Vernon's Revised Transmission Revenue Requirement Filing with the FERC, Docket No. EL08-__-000, April 3, 2008.

Before the Régie de l'énérgie, Prepared Expert Report on Behalf of Hydro-Québec TransÉnérgie to Assess Whether the Transmission Facilities Owned by ELL may be Considered as a "Radial Generator Lead," Case No. R-3636-2007, March 13, 2008.

Before the American Arbitration Association, Prepared Rebuttal Report on Behalf of the California Department of Water Resources to Evaluate the Reports that William Hogan, Jeffrey Tranen, and Ellen Wolfe Provided on Behalf of Sempra Generation, Case No. 74Y1980019606MAVI, June 4, 2007.

Before the American Arbitration Association, Prepared Expert Report on Behalf of the California Department of Water Resources to evaluate certain claims made by the California Department of Water Resources ("DWR") in its Demand for Arbitration regarding the performance of Sempra Energy Resources, now known as Sempra Generation, under the Energy Purchase Agreement between the parties, and to calculate amounts that Sempra would owe to DWR assuming liability is established, Case No. 74Y1980019606MAVI, May 14, 2007.

Before the United States Bankruptcy Court, Northern District of Ohio, Eastern Division, Prepared Expert Report in Regard to McKesson's Inventory Reclamation in the Phar-Mor Bankruptcy, Case Nos. 01-44007 Through 01-44015, March 9, 2007.

Before the Public Utility Commission of Texas, Prepared Rebuttal Testimony on Behalf of Constellation New Energy, Inc.'s Appeal and Complaint of ERCOT Decision to Approve PRR 676, PRR 674 and Request for Expedited Relief, Docket No. 33416, January 11, 2007.

Before the Public Utility Commission of Texas, Prepared Direct Testimony on Behalf of Constellation NewEnergy, Inc. to analyze and discuss the flaws and potential negative impacts of the allocation methods under Protocol Revision Request ("PRR") 676 which relates to procurement costs for

Replacement Reserve Service ("RPRS") and Out of Merit Capacity, Docket No. 33416, November 22, 2006.

Before the American Arbitration Association, Prepared Rebuttal Report on Behalf of California Department of Water Resources vs. Sempra Energy Resources, Case No. GIC 789291, July 11, 2006.

Before the State Office of Administrative Hearings, Prepared Expert Report on Behalf of TXU Energy Solutions, Regarding their Demand-side Management Program and the Difference Between the Actual and Projected Savings in the Energy Bill of University of Texas, July 7, 2006.

Before the Missouri Public Service Commission, Prepared Direct Testimony on Behalf of Union Electric Company with Regard to Ameren UE's Rate Design Proposals, Case No. ER-2007-0002, July 5, 2006.

Before the Superior Court of the State of California for the County of San Diego, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Prepared Expert Report, Case No. GIC 789291, June 9, 2006.

Before the Superior Court of the State of California, Prepared Declaration in Support of California State Agencies' Opposition to Motion on Shortened Time and Motion in Support of Preliminary Approval of Class Action Settlement, J.C.C.P. Nos. 4221, 4224, 4226 and 4228, June 8, 2006.

Before the Superior Court of the State of California, Prepared Declaration in Support of California State Agencies' Opposition to Proposed Publication Notice, J.C.C.P. Nos. 4221, 4224, 4226 and 4228, January 13, 2006.

Before the United States Bankruptcy Court, Prepared Declaration on Behalf of Calpine Corporation with Regard to the Public Interest Standard for the Rejection of the Contract, Case No. 05-60200 (BRL), December 30, 2005.

Before the FERC, Prepared Direct Testimony on Behalf of Dominion Energy Marketing, Inc. (DEMI), regarding a dispute between DEMI and The United Illuminating Company as to which party is responsible for paying certain costs associated with Reliability Must-Run agreements under a December 28, 2001 Power Supply Agreement between the two parties, Docket No. EL05-76-001, December 5, 2005.

Before the American Arbitration Association, Prepared Expert Report on Behalf of California Department of Water Resources vs. Sempra Energy Resources with Regard to Damages from Multiple Contract Breaches, Case No. 74Y1980019304VSS, May 2005.

Before the Federal Energy Regulatory Commission (FERC), Comment - "A Marginal - Value Approach to Pricing Reactive Power Services in Principles for Efficient and Reliable Reactive Power Supply and Consumption," Docket No. AD05-1-000, April 4, 2005, (with Martin Baughman and Philip Hanser).

Before the FERC, Prepared Supplemental Testimony on Behalf of the California Parties with Regard to Enron's Circular Scheduling and Paper Trading Gaming Practices, Docket No. EL03-180-000, January 31, 2005.

Before the FERC, Prepared Affidavit on Behalf of Northeast Utilities Service Company and Affiliated Companies' Market-based Rate Authorization, Docket No. ER96-496-010, et al., September 27, 2004, Revised December 9, 2004.

Before the Connecticut Siting Board, Prepared Testimony on Behalf of Connecticut Light and Power in support of its application for a Certificate of Environmental Compatibility and Public Need for the construction of a 345-kV electric transmission line and reconstruction of an existing 115-kV electric transmission line between Connecticut Light and Power Company's Plumtree Substation in Bethel, through the Towns of Redding, Weston, and Wilton, and to Norwalk Substation in Norwalk, Connecticut, Docket No. 217, November, 2004.

Before the FERC, Prepared Affidavit on Behalf of Otter Tail Power Company (OTP) Regarding Problems that May Result from the Implementation of MISO's Markets Tariff in OTP's Region, Docket No. ER04-691-000, May 7, 2004.

Before the FERC, Prepared Joint Affidavit with Judy W. Chang on Behalf of Devon Power LLC, et al., Docket No. ER03-563-030, March 24, 2004.

Before the FERC, Prepared Direct Testimony on Behalf of the California Parties with Regard to Enron's Circular Scheduling and Paper Trading Gaming Practices, Docket No. EL03-180-000, February 27, 2004.

Before the Commonwealth of Massachusetts, Prepared Expert Report on Behalf of Alstom Corporation and Black and Veatch vs. Meriden Corporation, LLC, Review of *"Value of the Meriden Power Project,"* Case No. 99-6016, January 9, 2004.

Before the FERC, Prepared Declaration on Behalf of The California Parties, Re: Gaming Activities Of Modesto Irrigation District, Docket No. EL03-159-000, October 2003.

Before the FERC, Prepared Affidavit on Behalf of Otter Tail Power Company For Otter Tail Power Company, Assessing how the Midwest ISO's Proposed Transmission and Energy Market Tariff will Affect Otter Tail Power both Operationally and Financially, Docket No. ER03-118-000, September 15, 2003.

Before the Pennsylvania Environmental Hearing Board, Prepared Expert Report on Behalf of Pennsylvania Power and Light, New Jersey Department of Environmental Protection vs. Pennsylvania Department of Environmental Protection and Lower Mount Bethel Energy, LLC, Docket No. 2001-280-C, May 2, 2003.

Before the FERC, Prepared Rebuttal Testimony on Behalf of Southern California Edison for the California Parties Regarding Manipulation of Energy and Ancillary Service Market Prices and the Outage Behavior of Gas Fired Power Plants, Docket No. EL00-95-069, March 20, 2003.

Before the FERC, Prepared Testimony on Behalf of Southern California Edison for the California Parties Regarding Manipulation of Energy and Ancillary Service Market Prices and the Outage Behavior of Gas Fired Power Plants, Docket No. EL00-95-069, February 24, 2003.

Before Southern District Court of Illinois, Prepared Expert Report for Department of Justice, Environmental Protection Agency vs. Illinois Power Company and Dynegy Midwest Generation Regarding the Likely Rate Treatment of Pollution Control Equipment Expenditures, Docket No.99-833-MBR, July 29, 2002.

Before the FERC, Prepared Direct Testimony on Behalf of Edison Mission Energy and Edison Mission Marketing and Trading, Inc. on Behalf of Midwest Generation's Application for Market-based Rate Authority, Docket No. ER99-3693-000, April 1, 2002.

Before the FERC, Prepared Rebuttal Testimony on Behalf of NSTAR on the Appropriate Rates for Generators During Transmission Upgrades or Enhancements Requiring Substantial and Sustained Reduction in Transfer Capability, Docket No. ER01-890-000, September 21, 2001.

Before the FERC, Prepared Affidavit on Behalf of NSTAR, in its Intervention of the Granting of Market-based Rate Authority to Sithe, Docket No. EL01-79-000, May 2001.

Before the FERC and the Public Utilities Commission of Nevada, Prepared Affidavit on Behalf of Sierra Pacific Resources Company, Regarding the Market Power Implication of Generation Asset Divestiture Required for the Merger of Sierra Pacific Power and Nevada Power Company, Docket No. EC0-173-000, February 23, 2001.

Before the California Energy Commission, Prepared Expert Report on Behalf of Calpine Corporation, Socioeconomic Resources: Economic Benefits of the Metcalf Energy Center, October 27, 2000.

Before the FERC, Prepared Affidavit on Behalf of NSTAR with Regard to the Necessity of Imposing Bid Caps on the New England Electricity Market, Docket No. EL00-83-000, June 23, 2000.

Before the FERC, Prepared Direct Testimony on Behalf of Nevada Power Company in Support of the Divestiture of its Generation Assets, Docket No. ER99-2338-001, June 24, 1999.

Before the FERC, Prepared Direct Testimony on Behalf of Nevada Power Company in Support of the Divestiture of its Generation Assets, Docket No. ER99-2338-001, March 30, 1999.

Before the Vermont Public Service Board, Prepared Rebuttal Testimony on Behalf of Central Vermont Public Service Corporation on the Impact of its Demand-side Management Programs, Docket No. 6018, April 10, 1998.

Before the New Mexico Public Utility Commission, Prepared Direct Testimony on Behalf of the Public Service Company of New Mexico Regarding Forecasted Growth of the El Paso and Juarez, Mexico Markets, Case No. 2769, 1997.

Before the FERC, Prepared Affidavit on Behalf of Southern California Edison Describing the Implications for the Electricity Market of the Manipulation of Gas Market Prices, Docket No. RP95-363-015, 1996.

Before the Public Service Commission of Wisconsin, Prepared Direct Testimony on Behalf of Investor-owned Utilities of Wisconsin on the Utilities Cost of Capital, Docket No. 05-EP-7, May 8, 1995.

PROFESSIONAL AFFILIATIONS

Association of Energy Service Professionals, Board Member	1991-1995
Journal of ADSMP, Editor	1995
American Statistical Association	1974-current
Member of ASA Committee on Energy Statistics	1993-1999
Conseil International des Grands Reseaux Electriques (CIGRE)	2005-current
Working Group C5-8, Working Group on Renewables and Energy Efficiency in a Deregulated Market	2008-2009
Institute of Electrical and Electronics Engineers (IEEE)	

ACADEMIC HONORS AND FELLOWSHIPS

Teaching Incentive Award, University of the Pacific	1979
Teaching Assistantship in Econometrics, Columbia University	1974
National Science Foundation Research Traineeship	1972 – 1974
Undergraduate and Graduate Research Assistantships, Florida State University	1968 – 1972
Omicron Delta Epsilon, Economics Honor Society	1971

PUBLICATIONS

"I Can't Do It On My Own: The Economics of Distributed PV/Battery Systems to Reduce Grid Reliance" (with Roger Lueken, Will Gorman, James Mashal) forthcoming in *Utilities Policy*.

"Chapter 20 - The Repurposed Distribution Utility: Roadmaps to Getting There," (with Kai van Horn) in Future of Utilities: Utilities of the future (Academic Press, 2016)

"Chapter 11 - The Next Evolution of the Distribution Utility," (with Kai Van Horn), in *Distributed Generation and its Implications for the Utility Industry*, Elsevier Inc., 2014.

"Annual Report on Wholesale Market Prices and Trends in the Metropolitan Edison Company, Pennsylvania Electric Company, Pennsylvania Power Company and West Penn Power Company Service Area," (with Mariko Geronimo Aydin), prepared for Met-Ed, Penelec, Penn Power and West Penn Power, November 2015.

"Reducing Utility Rate Shocks," (with Lawrence Kolbe), *Public Utilities Fortnightly*, June 2013.

"Redefining Normal Temperatures," (with Robert E. Livezey), *Public Utilities Fortnightly*, May 2013.

"Rates, Reliability, and Region: Customer satisfaction and electric utilities," (with William P. Zarakas and Kent Diep), *Public Utilities Fortnightly*, January 2013.

"What Price, GHGs?: Calculating the implied value of CO2 abatement in green energy policies," (with Mariko Geronimo), *Public Utilities Fortnightly*, Volume 150, October 2012.

"Rate Design by Objective: A purposeful approach to setting energy prices," *Public Utilities Fortnightly*, September 2012.

"State Regulatory Hurdles to Utility Environmental Compliance," *The Electricity Journal*, Vol. 25, Issue 3, April 2012.

"Riding the Wave: Using Demand Response for Integrating Intermittent Resources" (with Kamen Madjarov, Warren Katzenstein, and Judy Chang in Smart Grid: Integrating Renewable, Distributed and Efficient Energy, F.P. Sioshansi, ed. (New York: Academic Press, 2011).

"Marginal Cost Analysis in Evolving Power Markets: The Foundation of Innovative Pricing, Energy Efficiency Programs, and Net Metering Rates" (with Metin Celebi), *The Brattle Group, Inc. 2010 No. 2 (Energy).*

"Assessing Ontario's Regulated Price Plan: A White Paper," (with Ahmad Faruqui, Ryan Hledik and Jenny Palmer), *The Brattle Group, Inc.*, December 8, 2010.

"On Dynamic Prices: A Clash of Beliefs?," *The Electricity Journal*, Vol. 23, Issue 6, July 2010.

"Virtual Bidding: The Good, the Bad and the Ugly" (with Metin Celebi and Attila Hajos), *The Electricity Journal*, Vol. 23, Issue 5, June 2010.

"Utility Supply Portfolio Diversity Requirements" (with Frank Graves), *The Electricity Journal*, Vol. 20, Issue 5, June 2007.

"Electric Utility Automatic Adjustment Clauses Revisited: Why They Are Needed More Than Ever" (with Frank Graves and Greg Basheda), *The Electricity Journal*, Vol. 20, Issue 5, June 2007.

"Rate Shock Relief" (with Frank Graves and Greg Basheda), *Electric Perspectives*, May/June 2007.

"Rate Shock Mitigation" (with Frank Graves and Greg Basheda), prepared for Edison Electric Institute, May 2007.

"Electric Utility Automatic Adjustment Clauses: Benefits and Design Considerations" (with Frank Graves and Greg Basheda), Edison Electric Institute, August 2006.

"Can Wind Work In An LMP Market?," (with Serena Hesmondhalgh and Dan Harris), *Natural Gas & Electricity*, November 2005.

"The CAISO'S Physical Validation Settlement Service: A Useful Tool for All LMP-Based Markets" (with Jared des Rosiers, Metin Celebi, Joseph Wharton), *The Electricity Journal*, September 2005.

"LMPs/FTRs Alone Will Not Solve Transmission Problems Blackout Showed," *Natural Gas and Electricity,* Volume 20, Number 4, November 2003.

"A Summary of FERC's Standard Market Design NOPR," Edison Electric Institute, August 2002.

"The Design of Tests for Horizontal Market Power in Market-Based Rate Proceedings" (with James Bohn and Metin Celebi), *The Electricity Journal*, May 2002.

"The State of Performance-Based Regulation in the U.S. Electric Industry" (with David Sappington, Johannes Pfeifenberger, and Greg Basheda), *The Electricity Journal*, October 2001.

"Deregulation and Monitoring of Electric Power Markets" (with Robert Earle and James Reitzes), *The Electricity Journal*, October 2000.

"Shortening the NYISO's Installed Capacity Procurement Period: Assessment of Reliability Impacts," NYISO, May 2000.

"PJM Market Competition Evaluation White Paper," (with Frank Graves), prepared for PJM, L.L.C., October 1998.

"Lessons from the First Year of Competition in the California Electricity Market" (with Robert Earle, W.C. Johnson, and James Reitzes), *The Electricity Journal*, October 1999.

Comments to the FERC concerning Regional Transmission Organizations Notice of Proposed Rule Making, RM99-2, (with Peter Fox-Penner), September 17, 1999.

"In What Shape is Your ISO?," (with Johannes Pfeifenberger, Greg Basheda and Peter Fox-Penner), *The Electricity Journal*, Vol. 11, No. 6, July 1998.

"What's in the Cards for Distributed Resources?," (with Johannes Pfeifenberger and Paul Ammann), in Special Issue of *The Energy Journal, Distributed Resources: Towards a New Paradigm of the Electricity Business*, January 1998.

"One-Part Markets for Electric Power: Ensuring the Benefits of Competition" (with Frank Graves, E.G. Read, and Robert Earle), in *Power Systems Restructuring: Engineering and Economics*, ed. M. Ilic, F. Galiana, and L. Fink, Boston, MA: Kluwer Academic Publishers, 1998.

Ten EPRI reports and approximately 20 articles in EPRI Reports and Conference Proceedings including:

Environmental Externalities: An Overview of Theory and Practice

Environmental Impacts of Electric Technologies

Environmental Impacts of Electric Vans (TEVan) in the Los Angeles Air Basin (South Coast Air Quality Management District)

Technical Assessment Guide (TAG), Vol.4: Cost-Benefit Analysis of End-Use Technologies

Impact and Process Assessment of Energy Efficiency Technologies

Innovative Rate Design

Integrated Value-based Resource Planning

"Insurance Recovery for Manufactured Gas Plant Liabilities," (with Gayle Koch and Kenneth Wise), *Public Utilities Fortnightly*, April 1997.

"Real-Time Pricing - Restructuring's Big Bang?," (with Joseph Wharton and Peter Fox-Penner), *Public Utilities Fortnightly*, March 1997.

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SELECTED PRESENTATIONS

"Smart EDU: Smart Technology, Smart Data, Smart Prices," SGIP Inaugural Conference Progress through Collaboration, Palm Beach Gardens, Florida, November 6, 2013.

"Customer-Facing Developments of the Smart Grid," (with Ahmad Faruqui and Sanem Sergici), Massachusetts Department of Public Utilities Electric Grid Modernization Workshop, Boston, Massachusetts, November 14, 2012.

"The Midwest ISO Capacity Market: Wither It Goest," Bruder, Gentile & Marcoux's 18th Annual FERC Briefing Midwest Edition, Chicago, Illinois, October 23, 2012.

"ISO Markets, Operations and Settlements," SNL Inside Utility Accounting Program, Charlotte, North Carolina, October 17, 2012.

"Revenue Sources," SNL Inside Utility Accounting Program, Charlotte, North Carolina, October 16, 2012.

"Impact of U.S. LNG on International Gas Prices," EIA International Natural Gas Workshop, Washington, DC, August 23, 2012.

"Framework for Assessing Capex and Opex Forecasts as Part of a "Building Blocks" Approach to Revenue/Price Determinations," (with Paul R. Carpenter, Toby Brown, and Pinar Bagci), Australian Energy Market Commission, June 2012.

"Policy Challenges Associated with Renewable Energy Integration," 2011 MITEI Symposium: Managing Large-Scale Penetration of Intermittent Renewables, (with Judy Chang, Kamen Madjarov and Peter Fox-Penner).

"Renewable Integration Model Presentation," (with Judy Chang), California Public Utilities Commission (CPUC) California Long-Term Procurement Plan Workshop, San Francisco, California, August 25, 2010.

"Renewable Integration Model and Analysis," (with Judy Chang, Kamen Madjarov, Ross Baldick, and Antonio Alvarez), IEEE 2010 Transmission and Distribution Conference and Exposition, New Orleans, Louisiana, April 21, 2010.

"Wire We Here? Coal in the West," Law Seminars International, Coal in the West Conference, Denver, Colorado, March 30, 2007.

"Does SMD Need a New Generation of Market Models? Or How I Learned to Stop Worrying and Enjoy Carrying a Pocket Protector," SMD Conference, Washington, D.C., December 5, 2002.

"Standard Market Design in the Electric Market: Some Cautionary Thoughts," SMD Conference, May 10, 2002, Chicago, Illinois.

"Multiattribute Utility Theory and Earthquake Mitigation Policy," (with T. Munroe), Western Economic Association Conference, June 1978.

Exhibit PHQ-1

To

Exhibit PHQ-11

(See Volume 3)

PGW St. No. 6

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

TESTIMONY OF

KENNETH S. DYBALSKI

ON BEHALF OF
PHILADELPHIA GAS WORKS

Docket No. R-2017-2586783

Philadelphia Gas Works

General Rate Increase Request

Test Year Sales and Revenues
Revenue Allocation

Proposed Customer Charges

February 2017

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I. QUALIFICATIONS AND PURPOSE OF TESTIMONY

Q. PLEASE STATE YOUR NAME AND POSITION WITH THE COMPANY.

A. My name is Kenneth S. Dybalski. My position is Vice President - Energy Planning & Technical Compliance at the Philadelphia Gas Works.

Q. HOW LONG HAVE YOU HELD THIS POSITION?

A. I assumed my current position in 2016. Prior to this position, I was the Director of Gas Planning & Rates from 2006 to 2016

Q. AS IT PERTAINS TO GAS PLANNING AND RATEMAKING, WHAT ARE YOUR JOB RESPONSIBILITIES?

A. In my present position, I am responsible for the short and long term planning of gas demand, gas supply, raw material expense and revenue; overseeing the preparation of sales, sendout, revenue and fuel expense projections; developing peak day/hour load projections; overseeing the development of the various filings before the Pennsylvania Public Utility Commission (PUC) and Philadelphia Gas Commission (PGC) with respect to the quarterly and annual Gas Cost Rate (GCR) filings, the Integrated Resource Planning Report, and supporting documentation for gas costs related to PGW's Operating Budget before the PGC.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND.

A. I received both a BS and MBA from Temple University in Philadelphia, Pennsylvania.

Q. HAVE YOU EVER PROVIDED TESTIMONY BEFORE THIS COMMISSION?

A. Yes. I submitted testimony for the PGW 1307(f) Annual GCR Filings in Docket Nos. R-2016-2526700, R-2015-2465656, R-2014-2404355, R-2013-2346376, R-2012-2286447, R-2011-2224739, R-2010-20157062, R-2009-2088076, and R-2008-2021348. I have also submitted testimony in PGW's most recent base rate proceeding (Docket No. R-2009-

2139884) and PGW's 2015 Distribution System Improvement Charge Cap Waiver Proceeding (Docket No. R-2015-2501500) and its 2008 Extraordinary Rate Request (Docket No. R-2008-2073938).

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to describe and support:

1) the process used to develop the sales forecast for the test year;

2) the allocation of the proposed base rate increase by customer class;

II. SALES FORECAST PROCEDURES

Q. WHAT PROCEDURES DID PGW EMPLOY WHEN FORECASTING SALES FOR THE TEST YEAR?

A. The total system-wide demand is a function of the projected gas demand per customer and the anticipated number of customers in each class. In determining customer demand, PGW projects customer usage, giving consideration to significant gains or losses in each of 47 homogeneous groups for the period being projected. PGW's Gas Planning Department attempts to determine for each customer class the level of demand related to experienced temperatures and the level of demand that is not affected by changes in temperature. Within each class the most recent summer and winter usage patterns are established from historical records. Summer data provides each class of customer's non-temperature sensitive load requirements (baseload) which can be expressed in terms of thousands of cubic feet (Mcf) per day, per customer. Similarly, winter data, after removal of the daily baseload level, determines the temperature sensitive load requirements for each class of customer.

This temperature sensitive usage primarily reflects space heating, but also includes such other temperature sensitive usage as water heating attributable to colder

water inlet temperatures due to colder ground temperatures and similar process variations, as well as supplementary heating. This overall heating requirement can be expressed in terms of the cubic feet of gas utilized per degree of temperature change on a per customer basis for each separate customer classification. In addition, consideration is given to the variation of customer utilization patterns for space heating over the year, recognizing the transitional fall start-up of heaters, the deep winter period needs and the tapering off and shut-down which occurs in the late spring. These usage patterns, taken in conjunction with anticipated customer counts and average temperature and "normal" degree day levels, form the basis of determining customer class and total system demands.

Q. WHAT IS A DEGREE DAY?

A. The term "degree days" quantifies the daily average degrees of temperature below a base level of 65 degrees Fahrenheit and is used as a tool to measure heating or cooling requirements. For example, on a day experiencing an average temperature of 40 degrees Fahrenheit, there would be 25 heating degree days.

Q. PLEASE EXPLAIN THE USE OF "NORMAL" TEMPERATURES.

A. Due to the inconsistencies of weather and weather forecasting techniques, and because test year data are required to reflect "normal" conditions, no attempt is made to predict the specific daily temperatures of the projection period. Instead, PGW has developed a normal monthly temperature pattern by analyzing statistical records of actual temperature patterns over a 10-year period. This pattern reflects 3855 degree-days annually.

Q. WHY HAS PGW USED A 10-YEAR AVERAGE TO DETERMINE NORMAL WEATHER FOR ITS SERVICE TERRITORY?

A. In preparation for this rate case, PGW, with the help of the Brattle Group, conducted an analysis of Philadelphia weather patterns and determined that its previous method of calculating "normal" weather – a 30-year rolling average – considerably overstates the actually experienced level of degree days in the Philadelphia area. PGW elected to use the 10-year average despite the fact that the 10-year average number of degree days continues to overstate the level of degree days that recent trends would indicate. Mr. Hanser of the Brattle Group explains this is more detail in his testimony.

Q. HOW IS THE 10-YEAR AVERAGE LEVEL OF DEGREE DAYS USED IN THE SALES FORECAST?

A. The annual 3855 degree-days which compose the PGW normal monthly temperature patterns form the basis of the calculation of the temperature sensitive component of demand for the Fully Projected Future Test Year.[1] Exhibit KSD-1 documents Philadelphia's 10 year monthly degree day history. The application of the above-described baseload and space heating factors and customer counts, when applied to a calendar-based daily temperature pattern, produces a daily total of customer requirements identified as sendout.

Q. HOW WILL THIS DETERMINATION OF NORMAL WEATHER AFFECT PGW'S EXISTING "WEATHER NORMALIZATION ADJUSTMENT CLAUSE"?

A. The Weather Normalization Adjustment ("WNA") clause in the Company's Tariff will be updated on a going forward basis to reflect the level of normal degree days accepted

[1] Note that the future test year (FY-2016-2017) continues to reflect 30-year "normal" temperatures because this is the data presented to and approved by the Philadelphia Gas Commission for PGW's 2016-2017 operating budget.

by the PUC in proceeding; it is this level against which PGW's actual experience will be compared annually.

III. ALLOCATION OF PROPOSED RATE INCREASE BY CUSTOMER CLASS

Q. WHAT ARE THE GOALS OF THE COMPANY'S PROPOSED REVENUE ALLOCATION AND RATE DESIGN?

A. The Company's goals in its proposed revenue allocation and rate design are:

- To implement an increase in each class's customer charge, to the extent that the results of the Class Cost of Service Study ("CCOSS") justifies such an increase, that sets the customer charge at a level that covers a greater portion of the fixed customer costs associated with providing service to each class of customer (excluding classes, such as Interruptible Sales or GTS where the rates are governed by contracts);
- To allocate the remainder of the increase to each class in a way that moves the various rate classes closer to their full cost of service while avoiding applying an unreasonably large portion of the increases to any one of the firm customer classes;
- To allocate the revenue increase in such a way that would result in rates that are similar for customers that share similar service requirements but are nonetheless grouped under different Rate Classes; and
- Recognize in the allocation of the increase any special characteristics of a customer class that makes the CCOSS results less reflective of cost causation.

Q. PLEASE DESCRIBE THE DATA SUPPLIED BY BRATTLE THAT ASSISTED PGW IN DETERMINING HOW TO IMPLEMENT THESE GOALS?

A. With respect to customer charges, Mr. Hanser provided a CCOSS that details the Company's proposals. That study provided "customer cost" results that determined the actual fixed customer cost per customer by class. These results show the level of

monthly customer charge that would be required if the Company were to recover 100% of its fixed customer related costs in a monthly customer charge. Secondly, Mr. Hanser's CCOSS provided the revenues relative to cost of service for each rate class under existing rates.

Q. WHAT ARE PGW'S PROPOSED CUSTOMER CHARGES?

A. The proposed customer charges are shown below. For each customer class, PGW attempted to move the charge closer to the full cost of service. To recognize that PGW's present rates are far removed from the total cost of service as calculated by Mr. Hanser, PGW made a decision to limit the increase in the customer charge to 50% for each class.

Table 1

Customer Charge					
Customer Group*	**Current Charge (Per Meter)**	**% Increase (Calculated)**	**Proposed Charge (As Filed)**	**Direct Customer Costs Per Bill (Cost of Service Study)**	**Proposed Charge as % of Customer-Related Costs**
Rate GS –Residential	$12.00	50%	$18.00	$50.98	35%
Rate GS - Commercial Customers	$18.00	50%	$27.00	$126.38	21%
Rate GS:- Industrial Customers	$50.00	50%	$75.00	$379.17	20%
Rate GS –Public Housing Authority Customers	$12.00	50%	$18.00	$47.46	38%
Rate MS**	$18.00	50%	$27.00	$203.79	13%
PHA(Rate 8)**	$18.00	50%	$27.00		
NGVS	$35.00	0%	$35.00	$178.50	20%
IT-A	$125.00	0%	$125.00	$616.45	20%
IT-B	$225.00	0%	$225.00	$616.45	36%
IT-C	$225.00	0%	$225.00	$616.45	36%
IT-D	$225.00	0%	$225.00	$616.45	36%
IT-E	$350.00	0%	$350.00	$616.45	57%
* Since PGW is proposing: the elimination of Rate CG, Rate LBS, and Rate BPS, those rate schedules are not included in this chart, and PGW is not proposing an increased customer charge for Rate CG, rate LBS, or Rate BPS.					
** For Municipal/PHA, the rates are not directly compatible as the class groupings has changed					

Q. DOES INCREASING THE CUSTOMER CHARGE IN THE MANNER PROPOSED PROVIDE ANY BENEFITS?

A. Yes. Charging rates that better reflect the customer-related costs for each customer more properly aligns rates with costs and provides more revenue stability. Currently, PGW is still recovering a majority of its fixed customer costs in its variable delivery charges. This makes the recovery of these costs contingent upon achieving PGW's projected normal sales volumes. Since these costs, by definition, do not vary by volume, cost recovery in this way is inefficient and distorts the price signals to customers. Greater revenue stability will also improve PGW's cash flow and make it less susceptible to weather variability.

Q. HOW IS PGW PROPOSING TO ALLOCATE THE OVERALL RATE INCREASE TO EACH CUSTOMER CLASS?

A. Based on the guidance provided by PGW, Mr. Hanser allocated the increase as set forth in the proposed tariff (KSD-2) and the tables below. The data shown there is also displayed on Mr. Hanser's Exh. PQH-1:

Table 2

Allocation Of Proposed Rate Increase		
Rate Class	**Proposed Increase ($)**	**Share of Proposed Increase (%)**
Residential	59,000,000	84%
Commercial	5,000,000	7%
Industrial	**-400,000**	**-1%**
PHA GS	400,000	1%
Municipal PHA (Rate 8)	500,000	1%
NGVS	0	0%
IT (Consolidated)	5,500,000	8%
TOTAL	**70,000,000**	**100%**

The delivery rates and percentage increases for each class are as follows:

Table 3

Delivery Charge			
Rate Class	**Current ($/MCF)**	**% Increase from Current**	**Proposed ($/MCF)***
Residential	6.0067	12.0%	6.7275
Commercial	4.5984	4.6%	4.8108
Industrial	4.5332	**-15.8%**	3.8170
PHA GS	4.9441	32.7%	6.5603
Municipal	3.3661	14.0%	3.8365
PHA (Rate 8)	4.1101	**-6.7%**	3.8365
NGVS	1.2833	1.3%	1.3005
IT-A	1.88	59.2%	2.99
IT-B	0.91	59.2%	1.45
IT-C	0.71	59.2%	1.12
IT-D	0.63	59.2%	1.01
IT-E	0.61	59.2%	0.96
* The proposed delivery charge ($/MCF) does not include the Merchant Function Charge ("MFC") and the Gas Procurement Charge ("GPC")			

IV. CONCLUSION

Q. DOES THIS COMPLETE YOUR DIRECT TESTIMONY?

A. Yes.

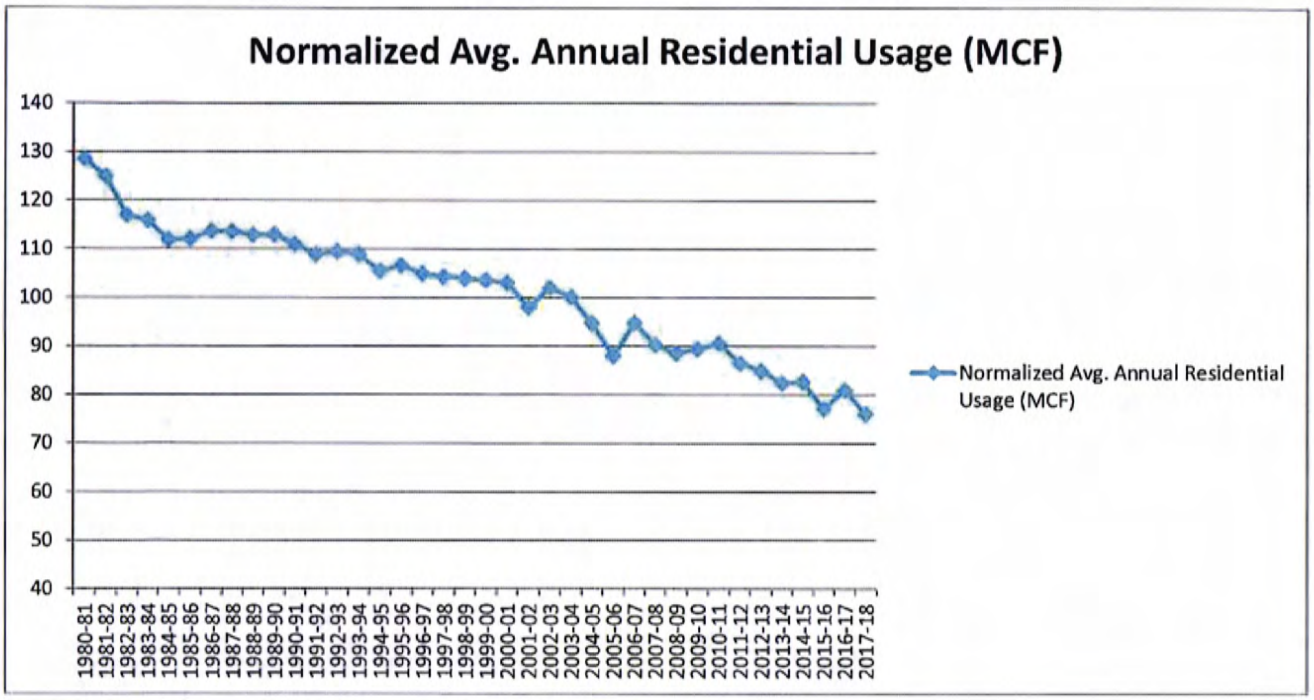
Exhibit KSD-1

Monthly Degree Day History

YEAR	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	TOTAL	Heating Season
2006-07	9	212	324	575	752	951	557	365	28	1	0	4	3,778	3,773
2007-08	6	80	499	746	842	720	538	211	104	0	0	0	3,746	3,746
2008-09	3	207	488	742	1,010	714	668	282	67	9	0	0	4,190	4,181
2009-10	16	207	349	802	908	823	411	152	62	0	0	0	3,730	3,730
2010-11	0	147	431	917	981	688	587	234	20	0	0	0	4,005	4,005
2011-12	8	180	338	583	747	606	334	220	18	3	0	0	3,037	3,034
2012-13	7	145	559	614	800	758	663	264	79	0	0	0	3,889	3,889
2013-14	20	148	520	735	1,047	879	741	285	30	0	0	0	4,405	4,405
2014-15	9	133	553	705	1,003	1,046	730	226	26	13	0	0	4,444	4,431
2015-16	0	207	330	403	892	716	401	289	116	2	0	0	3,356	3,354
10 Year Average Degree Days													3,858	3,855

KSD-1 p. 1

	Normalized Avg. Annual Residential Usage (MCFS)	
1980-81	129	
1981-82	125	
1982-83	117	
1983-84	116	
1984-85	112	
1985-86	112	
1986-87	114	
1987-88	114	
1988-89	113	
1989-90	113	
1990-91	111	
1991-92	109	
1992-93	110	
1993-94	109	
1994-95	106	
1995-96	107	
1996-97	105	
1997-98	104	
1998-99 *	104	
1999-00 *	104	
2000-01	103	
2001-02	98	
2002-03	102	
2003-04	100	
2004-05	95	
2005-06	88	
2006-07	95	
2007-08	90	
2008-09	89	
2009-10	89	
2010-11	91	
2011-12	87	
2012-13	85	
2013-14	82	
2014-15	83	
2015-16	77	
2016-17	81	Budgeted
2017-18	76	Budgeted


Normalized Avg. Annual Residential Usage (MCF)
140
130
120
110
100
90
80
70
60
50
40
1980-81
1981-82
1982-83
1983-84
1984-85
1985-86
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2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
Normalized Avg. Annual Residential Usage (MCF)

Exhibit KSD-2

(See Volume 5)

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

DIRECT TESTIMONY OF

DOUGLAS A. MOSER

ON BEHALF OF
PHILADELPHIA GAS WORKS

Docket No. R- 2017-2586783

Philadelphia Gas Works

General Rate Increase Request

System Reliability and Safety
Efficiencies and Cost Savings
Universal Service
Conservation Programs
Proposed Tariff Changes

February 2017

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND CURRENT POSITION WITH PGW.

A. My name is Douglas A. Moser. My position with Philadelphia Gas Works ("PGW" or "Company") is Executive Vice President and Acting Chief Operating Officer.

Q. PLEASE SUMMARIZE YOUR BACKGROUND AND EXPERIENCE.

A. I received a Bachelor of Science degree in Chemical Engineering from Pennsylvania State University in 1979. Also, I received a Master's in Business Administration from Widener University in 1990. I have held the following positions at PGW: Engineering Assistant; Production Engineer; Supervisor – Gas Conditioning; Operations Engineer – Gas Processing Department; Manager – Gas Control; Manager – Gas Acquisition; Senior Project Manager – Strategic Planning Department and Vice President and Senior Vice President of Gas Management.

Q. HAVE YOU EVER PROVIDED TESTIMONY BEFORE THIS COMMISSION?

A. Yes. I submitted testimony for the PGW 1307(f) Annual Gas Cost Rate ("GCR") filings before the Pennsylvania Public Utility Commission ("PUC" or "Commission") in Docket Nos. R-2012-2286447, R-2011-2224739, R-2010-20157062, R-2009-2088076, R-2008-2021348 and R-00072110 and in the Company's Distribution System Improvement Charge ("DSIC") proceedings in Docket Nos. P-2012-2337737; P-2015-2501500; and C-2015-2504092.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. My testimony will describe the numerous efforts that PGW has undertaken during the last several years to improve the safety and reliability of the PGW gas distribution system, operate more efficiently, and improve its customer service. In particular, I will describe PGW's proactive efforts to modernize its distribution system infrastructure by replacing

"as risk" pipe (cast iron and unprotected steel) with pipe that is made of modern materials, and by enhancing its efforts to detect and appropriately respond to any natural gas leaks, in order to improve the safety and the reliability of PGW's facilities. I will also review the many accomplishments that PGW has achieved to operate more efficiently, in order to maximize the use of its resources. I will discuss the several steps that PGW has been taking in order to provide its customers with better service. PGW has made all of these improvements consistent with its longstanding mission to provide the residents and businesses of Philadelphia with safe, reliable, and affordable natural gas service. PGW needs to maintain and improve its financial health through the tariff changes that are being requested in the subject rate proceeding in order to continue and to expand these accomplishments. In the last part of my testimony, I will explain several tariff modifications that PGW is proposing: the elimination of three rate schedules, Rate CG, rate LBS, and rate BPS, all of which have few or no customers and have adequate alternative rates; revision to the rate formula for interruptible transportation ("IT") customers that better recognizes the value of the interruptible service compared to alternative energy options or firm services; and a proposal to establish a new tariff provision to cover "back-up service," where a customer's primary energy source is something other than natural gas (e.g., steam or electricity) and the customer utilizes natural gas when its primary fuel source is unavailable or interrupted.

II. INFRASTRUCTURE IMPROVEMENTS TO ENHANCE SYSTEM SAFETY

Q. PLEASE PROVIDE A GENERAL DESCRIPTION OF PGW'S GAS DISTRIBUTION SYSTEM.

A. PGW's gas distribution system serves approximately 500,000 customers in Southeastern Pennsylvania in the County and City of Philadelphia, using approximately 3,000 miles of natural gas mains ("mains") and some 3,000 miles of service lines ("services"). At the end of calendar year 2016, PGW's mains were comprised of 47% cast iron, 16% plastic and protected coated steel and 37% unprotected coated steel and ductile iron.[1] The Company's services are made up of 77% plastic and protected coated steel, 19% bare steel and 4% unprotected coated steel.[2] PGW has more than double the number of miles of cast iron mains compared to any other natural gas distribution company in the Commonwealth of Pennsylvania. In fact, PGW's system accounts for approximately half of the total cast iron mains in the entire State.

Q. PLEASE DESCRIBE THE EFFORTS PGW HAS MADE SINCE ITS LAST RATE INCREASE IN 2009/2010 TO MODERNIZE ITS NATURAL GAS DISTRIBUTION SYSTEM.

A. PGW has made tremendous strides in reducing the amount of cast iron main in its system and replacing these mains with modern materials such as protected steel and plastic. Most notably, in 2010 PGW was annually replacing only approximately 18 miles of "at risk" pipe, mostly cast iron main. That replacement was financed through inclusion in PGW's base rates. With the help of the DSIC, enacted in 2013 at 5%, subsequently increased in 2016 to 7.5%, PGW has removed 111.37 miles of cast iron mains and projects that it will remove 31.35 more miles of cast iron mains in FY 2017. PGW's current projection for replacing all of its cast iron main is 47 years. PGW has broadened the prioritization process to a system-wide approach incorporating a new risk ranking strategy in its Distribution Integrity Management Program ("DIMP"), consistent with the

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1 *See*, PGW Long Term Infrastructure Improvement Plan ("LTIIP"), at 7.
2 *Id.*

U.S. Department of Transportation's ("DOT") Pipeline and Hazardous Materials Safety Administration's standards. The DIMP establishes relative risk rankings and an updated benchmarking / prioritization study to identify the poorest performing main segments, so that these mains can be targeted to be replaced at the earliest feasible times.

At the end of PGW's 5-year LTIIP in 2017, the amount of cast iron main removed from inventory is projected to be 10% above the original and modified planned amount.

Q. HOW ARE THE COSTS FOR PIPELINE REPLACEMENT RECOVERED?

A. PGW has financed these improvements both through funds made available from its current base rates as internally generated funds, debt financing, and the balance from PGW's DSIC, currently set at 7.5% of PGW's distribution revenues. Importantly, several costs incident to main replacement are not included in its DSIC and are being financed from present base rates. When PGW replaces distribution mains that are connected to the service line, PGW replaces the service lines when it encounters unprotected steel or failed plastic services. PGW replaced or reconnected some 5,522 service lines (with over 2,700 services related to accelerated main replacement) in FY 2016 and projects that it will replace or reconnect 7,500 service lines in FY 2017; that is a 57% increase in the number of service lines replaced or reconnected since 2010. To replace or reconnect these services, PGW is projecting to spend $9.9 million in FY 2017, more than half (58%) of which will come from its present base rates and the projected amount of services incorporated into LTIIP related projects in FY 2017 is more than the other years combined. PGW's total service related expenditures have increased by 36% since 2010.

Q. DID PGW TAKE ANY ACTIONS TO ENHANCE CUSTOMER UNDERSTANDING AND AWARENESS OF ITS ACCELERATED MAIN REPLACEMENT PROGRAM?

A. Yes. During FY 2016 PGW also enhanced its existing Pipeline Improvement Notification Program to implement a robust communication program with customers to better outline the Company's investment in its infrastructure, expand communication of pipeline improvement efforts, improve public perception, build stronger, more collaborative external relationships, and help to increase customer satisfaction.

The main audiences for this notification program are PGW customers, the affected public in areas where service improvements are scheduled, elected officials and key stakeholders, neighborhood associations and community organizations, local media outlets, City and State regulators, PGW contractors and PGW employees. The elements of the plan include the following:

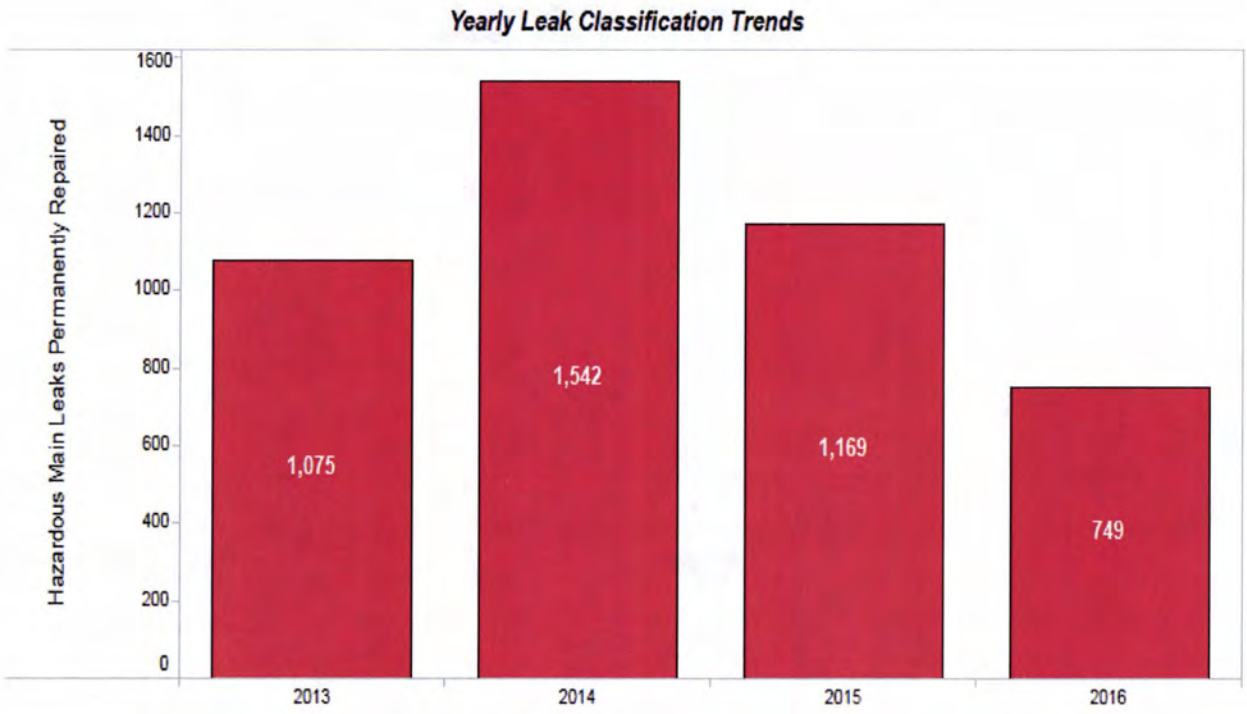
- The inclusion, on the PGW website (PGWORKS.com/worksites) of a webpage, providing infrastructure improvement information featuring an interactive worksites map and a comprehensive project listing by zip code;
- The establishment of an online survey asking customers to rate their experience with PGW in the context of an infrastructure improvement project;
- The creation of a "5-Steps of Pipeline Improvement" Customer Guide available online and as a handout;
- The use of blast messaging on Nextdoor.com mobile/email social platform in advance of each project start date;
- Contractor block by block notification using a tri-color door hanger notification system (Blue =notice of project starting, Yellow=notice of service reconnection to newly installed main, Green=final worksite restoration and paving notice);
- E-notices to community organizations and elected officials before the start of each project and the holding of community meetings as needed; and
- The creation of communications channels whereby customers and the public can get information and answer questions such as the "Public Affairs Hotline" (215-684-6880, Mon-Fri, 8 a.m. to 4 p.m.), and PGW Facebook and Twitter @MyPGW.

Q. DID THE PIPELINE REPLACEMENT PROJECT ALSO RESULT IN ENHANCED COORDINATION WITH COMMUNITY AGENCIES AND ORGANIZATIONS?

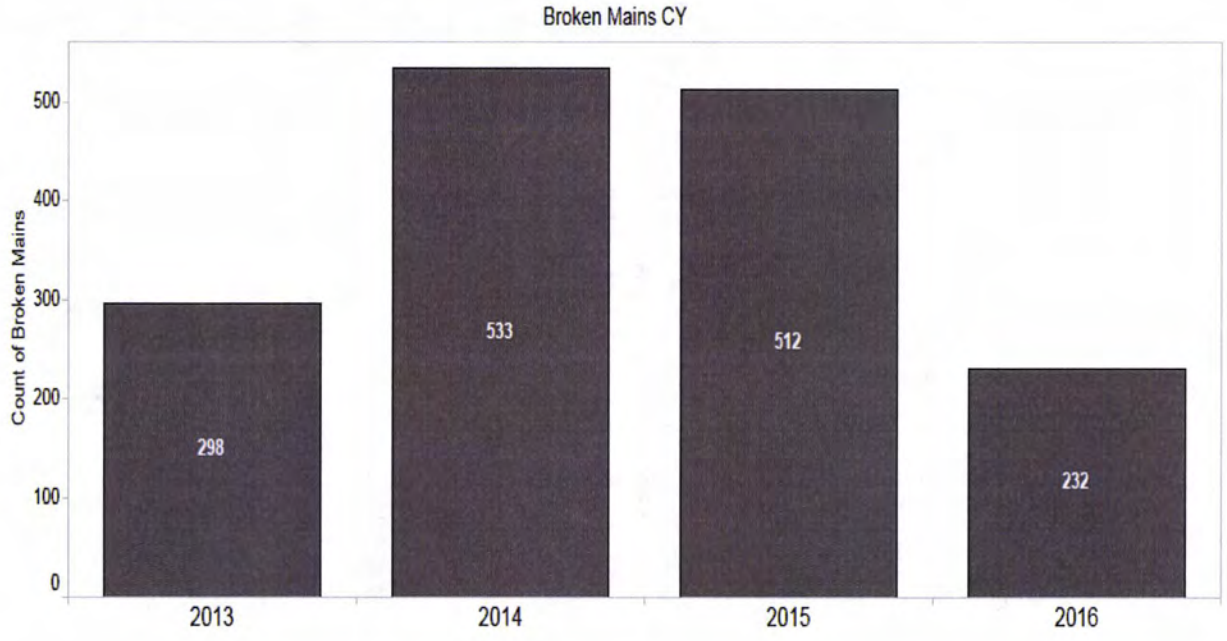
A. Yes. PGW increased its efforts to coordinate with Philadelphia agencies that might be impacted by main replacement activities, including: the Philadelphia Fire Department, the Philadelphia Streets Department, the Philadelphia Water Department, and the Philadelphia Police Department. PGW also increased its coordination work with the local electricity distribution utility, PECO, to ensure closer harmonization with PGW employees, in part, to reduce the possibility of any adverse electric issues. For example, PGW recently contracted with the Northeast Gas Association to provide a first responder E-learning portal that would be available to all first responders. This training offers a self-directed interactive online training package that provides emergency response personnel with information they need to safely identify and respond to incidents that may involve natural gas pipelines and other natural gas facilities. We are hopeful that this E-learning portal will enhance the cooperation and effectiveness of first responders in the event of a natural gas-related emergency.

Q. IS THERE ANY EVIDENCE THAT THE ACCELERATED PIPELINE REPLACEMENT PROGRAM HAS IMPROVED SAFETY?

A. Yes, some evidence is starting to develop. The total number of leaks permanently repaired for all classes of main has substantially decreased from calendar year 2014 to 2016. Most notably, the number of hazardous leaks permanently repaired has decreased. PGW attributes this decrease to the prioritized selection and removal of the most "at-risk" mains in the system and warmer than average winter seasons.



Moreover, in CY 2016, PGW experienced a four (4) year low in the amount of broken mains. Again, PGW attributes this reduction in broken mains to its prioritized removal of "at-risk" main segments and warmer than average winter seasons.



Q. HAS THE PIPELINE REPLACEMENT PROGRAM RESULTED IN ANY OTHER FAVORABLE SAFETY DEVELOPMENTS?

Yes. PGW significantly increased the number of third-party contractor work crews working on cast iron main replacement by approximately 200% since 2013, in order to facilitate the pipeline replacement operations. As a result of using these contractor employees, PGW's Full Time Equivalent ("FTE") employees have been able to focus more of their attention on pipeline safety issues, for example by increasing the number of class 2 and 3 leaks permanently repaired. This focus by PGW FTEs has enhanced the overall safety of PGW's operations. In order to utilize these contractor employees and still maintain the very highest levels of safety, PGW has successfully trained a total of 136 contractor employees from a total of 11 contractor companies. Below is a breakdown of the training classes held, number of employees successfully completing the training and total hours trained.

Class Name	# of Employees	Hours
Contractor Fusion Qualification	67	536
Live Gas Training	24	974
Relight Training	23	928
Bridge Main Inspection / Repair Training	13	104
Fusion School / Annual Fusion Class	5	40
Transmission Main Health & Safety Plan Training	4	4
Grand Total	**136**	**2,594**

III. RELIABILITY IMPROVEMENTS

Q. DID PGW TAKE ANY STEPS DURING FY 2016 TO ENHANCE THE RELIABILITY OF ITS SYSTEM?

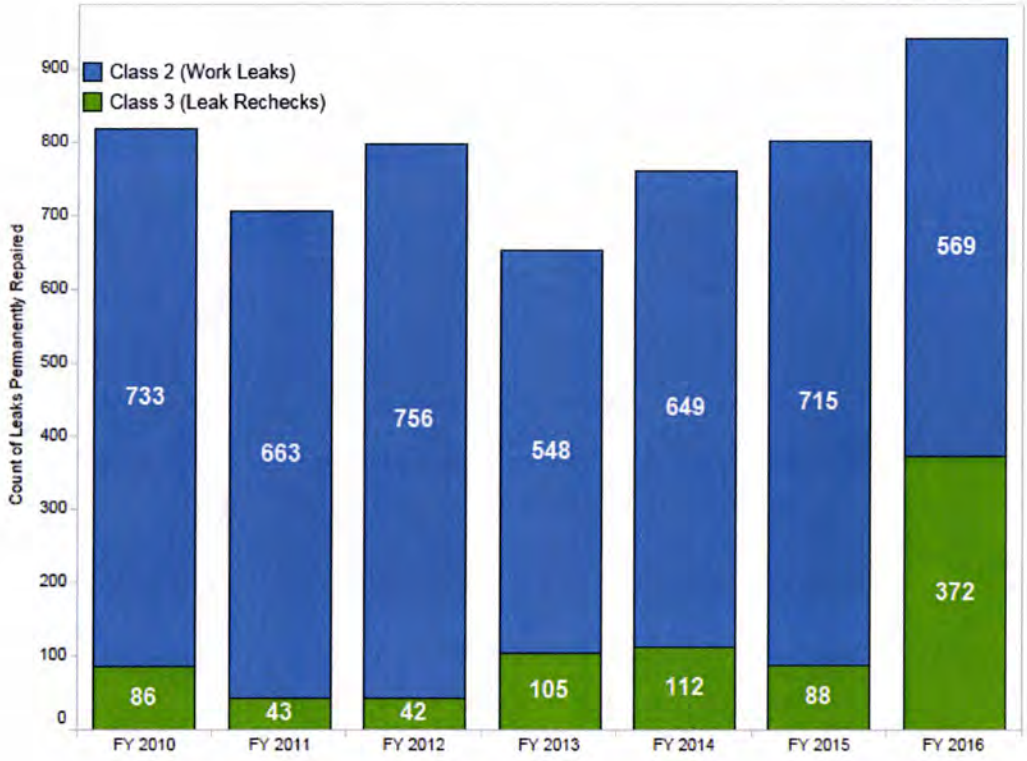
A. Yes. PGW has enhanced its efforts to detect and appropriately respond to natural gas leaks on its system.

Q. WHAT STEPS HAS PGW TAKEN TO ENHANCE ITS EFFORTS TO DETECT AND APPROPRIATELY RESPOND TO NATURAL GAS LEAKS ON ITS SYSTEM?

A. During FY 2016, PGW was able to meet leak response and construction goals even with significant changes in leadership due to abnormally high levels of retirements. PGW made great strides in reducing the number of open leaks in backlog. As noted above, the increase in contractors performing construction type work has given PGW the resources to prioritize and systematically attack these lower grade leaks. This has resulted in a lower open leak backlog and reduced the need for rechecking these open leaks.

The following chart depicts this. The portions labeled "Class 2" (Work Leaks) show the number of Class 2 leaks PGW has repaired by year. The portion of the chart labeled "Class 3" (Leak Recheck) show the number of Class 3 leaks that PGW has repaired each year. As can be seen, the total number of Class 2 and Class 3 leaks repaired has steadily grown since 2013.

CLASS 2 & 3 LEAKS REPAIRED



IV. INCREASED EFFICIENCIES AND COST SAVINGS

Q. HAS THE COMPANY TAKEN EFFORTS TO INCREASE EFFICIENCIES AND REDUCE COSTS IN THE AREA OF EMPLOYEE BENEFITS SINCE THE LAST BASE RATE CASE?

A. Yes, the Company has undertaken a multi-faceted program to build efficiencies into its employee benefit programs so as to reduce costs while maintaining an attractive employee benefits program, a step that PGW committed to taking in its last rate case. In fact, the Commission directed that the Company report on its efforts in this regard.

Q. WHAT WAS THE BACKGROUND AND NATURE OF THE REQUESTED REPORT?

A. In the 2010 Order approving the Settlement resolving PGW's last general rate increase request, the Commission approved a term in the Joint Petition for Settlement in which PGW agreed as follows: "[a]t the time of filing its next distribution base rate case, [PGW]

will report on its efforts to control the claimed employee benefit expenses so as to continue providing employee benefits that do not unduly burden the Company and its ratepayers. Such report must include documentary evidence of the Company's efforts including the measures investigated."[3]

Q. WHAT WAS THE GENESIS OF THIS AGREED UPON REPORTING REQUIREMENT?

A. In the last rate proceeding, PGW requested and received the right to create an Other Post-Employment Benefit ("OPEB") surcharge designed to begin to fund its unfunded post-retirement benefit obligations. In part to support the reasonableness of that request, PGW presented evidence of its efforts to date to control employee benefit costs. As part of the settlement of that proceeding PGW agreed to report in its next rate case concerning its continuing efforts to control employee benefit costs.

Q. HAS THE COMPANY TAKEN STEPS TO CONTROL ITS EMPLOYEE BENEFIT COSTS SINCE ITS LAST RATE CASE?

A. Yes it has. It has undertaken a host of initiatives and modifications all designed to reduce its employee benefit costs while continuing to be able to attract and retain qualified employees. It is important to point out that PGW's employee salary and benefit levels for management employees are low compared to those of other natural gas utilities (salary and benefit levels for union employees are subject to collective bargaining). Accordingly, PGW must attempt to keep employee benefit expenditures down without hurting the Company's ability to attract and maintain the qualified employees to provide safe and adequate natural gas distribution service to customers. Keeping these goals in mind, PGW was able to take material steps to reduce its employee benefit costs. Some of

[3] R-2009-2139884 Joint Petition for Settlement, ¶ 27.

the changes produced immediate savings; others produce savings over time. In all events I am confident that PGW will continue to make reasonable efforts to reduce its employee benefit costs – or to a least slow the rate of growth – without materially harming its ability to attract qualified employees.

Q. PLEASE DESCRIBE THE MOST SIGNIFICANT OF THOSE STEPS.

A. Perhaps the most significant step PGW has taken in this period was to revise its medical and dental benefits plans to become self-insured. PGW's Self Insurance Plan means that PGW pays the eligible health care and dental costs of its eligible union and non-union employees up to specified levels. PGW has put in place "stop loss" insurance that covers expenditures when costs exceed designated levels. By taking this step, PGW has been able to significantly reduce its health insurance premium costs for employees. In the five years (FY 2012- FY 2016) that PGW's Self Insurance Plan for health care has been in effect, PGW has reduced its health insurance costs by a total of $77.2 million (See, Exh. DAM-1) compared to the projected cost if PGW had remained fully insured. Projection of savings from self-insurance for the period FY 2017 and FY 2018 totals an additional $48.02 million for a total savings for the seven years of $125.4 million. It is well to note that the savings from this single step was about $18 million annually. PGW has also recently transitioned to a similar self-insurance approach for dental care for eligible covered employees. That self-insurance effort started in FY 2016 and is estimated to save approximately $200,000 annually.

Q. HAS PGW TAKEN ANY STEPS TO ATTEMPT TO CONTROL POST-RETIREMENT BENEFITS?

A. Yes. Starting in 2011, retirement benefits for new employees do not include lifetime health insurance. Instead, upon retirement, those employees receive health insurance for

five years after their retirement date. The Plan was amended to change post-retirement healthcare coverage from lifetime to five (5) years for union employees hired after 5/21/2011 and non-union employees hired after 12/21/11.

Q. HAS THIS CHANGE HAD AN EFFECT ON THE NUMBER OF PGW EMPLOYEES WHO WILL RECEIVE LIFETIME HEALTH BENEFITS WHEN THEY RETIRE?

A. Yes, the number of active employees who will receive lifetime health benefits upon their retirement has been greatly reduced. Currently, just 38% of PGW's active employees are eligible for lifetime health benefits upon retirement. In 2011, approximately 100% of its employees were eligible for this benefit. This will have a significant effect on benefit payouts. PGW's actuarial consultant has projected that savings from this and other plan changes for medical, dental, Rx, administrative expenses, life insurance, and taxes will reduce its post-retirement benefits obligation to retirees by $55.3 million through 2045 (see Exh. DAM-2).

Q. HAVE THERE BEEN ANY CHANGES IN PGW'S PENSION PLAN FOR UNION AND NON-UNION EMPLOYEES IN AN EFFORT TO CONTROL COSTS?

A. Yes. PGW's non-contributory defined benefit plan is no longer available to union employees hired as of May 22, 2011 or non-union employees hired as of December 21, 2011. As an alternative to the non-contributory defined benefit plan, new hires have two options:

1) A defined contribution 401(a) plan with the following features:
   a. PGW contributes 5.5% of an employee's applicable compensation;
   b. The employee cannot make additional contributions;
   c. The employee directs the investment of funds; and
   d. The account is fully vested at all times.

2) A contributory defined benefit plan with all of the same features as the non-contributory defined benefit plan except that the employee is required to contribute 6% of the employee's applicable compensation.

Because most new employees choose option 1 (defined contribution), the cost of the pension benefit has been significantly reduced.

Q. ARE THERE OTHER STEPS THAT THE COMPANY HAS TAKEN DESIGNED TO CONTROL BENEFIT COSTS?

A. Yes. The following is a list of the more material items (in addition to those discussed above) that PGW has put in place since 2010:

- Negotiated a new base medical insurance plan with GWEU Local 686 (PGW's union). The base plan increased the required deductibles from $5 to $15 per doctor visit.

- Implemented a new base medical insurance plan for non-union employees; as a result, co-pays for non-union employees increased from $5 to $10 per doctor visit.

- Negotiated an increase in brand drug co-pays with GWEU Local 686; the old co-pay of $10 for a branded drug was increased to $15. Similarly, an increase in brand drug co-pays for non-union employees was implemented at the same level as that negotiated with the Union ($15 per branded drug).

- Implemented an Employer Group Waiver Plan for Medicare eligible retirees on prescription drug plans. The Plan assures that PGW, as the self-insured carrier, receives credits for any portions of health care costs that Medicare-eligible employees or retirees receive.

- Implemented a prior authorization requirement for specialty and compounding drugs for prescription carrier. Prior to implementing the prior authorization requirement, PGW was experiencing several hundred thousand dollars a year to cover the cost of specialty and compounding drug prescriptions. After the prior authorization requirement was implemented, the use of such prescriptions dropped almost to zero and non-compounded, non-specialty drugs were substituted by prescribing doctors.

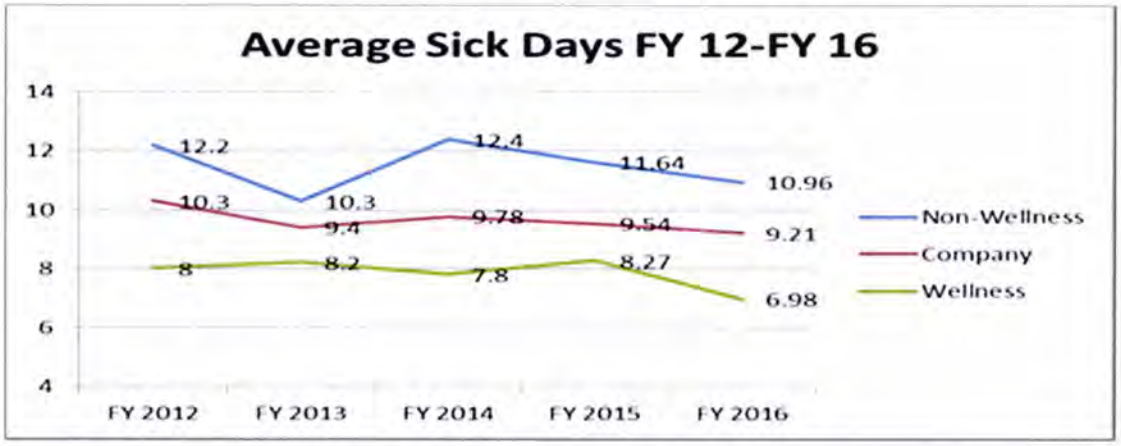
- PGW put out to bid its prescription drug program and, as a result reduced the pricing by approximately 20.86% over 3 years, for $14.7 million in savings. (The same company that had previously been providing the prescription drug program was selected – but at a significant reduction in cost to PGW.)

- Implemented a Wellness Program for employees. The Wellness Program is designed to reduce employee health care costs by providing information, opportunities and incentives to employees to improve their fitness and live a healthier lifestyle. Such lifestyle changes, in turn, will reduce covered health care costs. For example, as part of this program, PGW has installed mini-gyms on site at five of its locations. Another provision

offers decreases in certain co-pays if an employee participates in the Wellness Program, which many have done.

Q. WITH RESPECT TO THE LAST PROGRAM MENTIONED, HAS THE WELLNESS PROGRAM RESULTED IN REDUCED COSTS?

A. PGW believes that it has. The Wellness Program currently offers opportunities for employees to take charge of their individual health and well-being through fitness classes, nutrition counseling, and prevention and disease management programs and events. The tracking of absenteeism data on employees who participate in wellness activities has been ongoing since the inception of the program in 2011. An annual productivity metric for absenteeism was developed that compares the absences of non-wellness participants vs. wellness participants and the associated savings. Below is a comparison of average absences for wellness participants, non-wellness participants, and Company for the past three years, which shows the significant benefits of this program.



As one can see, at least on the basis of this metric, the Wellness Program has enabled PGW to improve its productivity by reducing used sick days. Without these cost reductions PGW's proposed rate increase would have had to have been larger than the $70 million requested.

Q. DO YOU HAVE AN OVERALL OBSERVATION CONCERNING THE VARIOUS EFFORTS YOU HAVE DESCRIBED?

A. Yes. I believe by any reasonable measure, PGW has taken substantial efforts to hold the line and/or to reduce the overall cost of employee benefits. Nonetheless, PGW's annual employee benefits costs increased by 15.6% over 6 years. The fact remains, however, that this increase would be much larger without the Company's efforts. On a national level, employee benefit costs have continued to increase, and PGW projected that its health care cost responsibility alone would have risen by 56.7% over the same time period if PGW had not changed to its Self-Insurance Plan. This means that PGW has managed to keep employee benefit cost increases lower than they otherwise would have been while still attracting and retaining qualified employees to provide safe, adequate and reasonable utility service.

Q. TURNING TO OTHER AREAS OF INCREASED EFFICIENCIES, WAS PGW ABLE TO ACHIEVE EFFICIENCIES BY OPTIMIZATION OF ITS COMPUTER RESOURCES?

A. Yes. PGW saved money by prudently upgrading its information technology resources. The new data center features a highly efficient hot aisle containment system and hosts state-of-the-art information technology equipment. It is cooled using exhaust heat from a Combined Heat and Power ("CHP") system. Waste heat is converted to cooling by using heat to condense refrigerant instead of utilizing electrically driven compressors for this purpose. PGW expects annual savings of $200,000 from the increased efficiencies produced by this project.

Q. DID THE INSTALLED CHP UNIT PRODUCE ANY OTHER BENEFITS?

A. Yes. In addition to providing cooling for PGW's information technology equipment, PGW's 200 kilowatt natural gas-fired micro-turbine CHP system produces electricity,

heat and cooling for the entire 800 West Montgomery Avenue building in Philadelphia. PGW estimates that approximately half of the building's electricity is produced by the CHP facility at approximately half the cost of the electricity purchased from an electric supplier and delivered via the local distribution grid. Waste heat from the micro-turbine's exhaust is converted via an absorber chiller into building cooling, providing additional annual operating savings. The CHP system is also used by PGW's Marketing personnel to demonstrate the advantages of CHP systems to customers in the CHP service segment.

V. PROGRAMS BENEFITING LOW INCOME CUSTOMERS

Q. PLEASE DESCRIBE SOME OF THE STEPS THAT PGW HAS TAKEN IN THE LAST SEVERAL YEARS TO IMPROVE THE QUALITY OF SERVICE PROVIDED TO LOW INCOME CUSTOMERS.

A. Certainly. The provision of services to low income customers is important to the Company and starts with a robust Customer Assistance Program ("CAP") which PGW calls its "Customer Responsibility Program" ("CRP"). PGW's goals in providing CRP are to prevent loss of service for vulnerable households and assist low-income customers with bill payment. Participants do not need to demonstrate that they are "payment troubled" in order to qualify. Furthermore, there is no limit on the number of customers who can enroll in CRP.

Q. WHAT ARE THE CUSTOMER'S REQUIREMENTS WHEN ENROLLED IN CRP?

A. Customers enrolled in CRP are required to pay a fixed monthly bill that is based on their gross household size and income.[4] Participants who have pre-program arrears are also

[4] CRP is available to all low-income residential customers with an annual gross household income at or below 150% of the Federal Poverty Level ("FPL"). Customers enrolled in CRP are required to pay a fixed

required to pay an additional $5 co-pay which is applied towards their pre-program arrears. Currently, the minimum monthly CRP payment amount is only $25, not including the $5 co-payment towards the pre-program arrears.

Q. IN ADDITION TO A MONTHLY CHARGE BASED UPON THE CRP CUSTOMER'S INCOME DOES THE CUSTOMER RECEIVE ANY OTHER BENEFIT?

A. Yes. If a customer owes any arrears at the time of enrollment, they will receive arrearage forgiveness for each monthly CRP bill that is paid in full regardless of any past due bills. Arrearage forgiveness consists of the customer's account balance being reduced by 1/36th of the pre-program balance amount which essentially eliminates the balance over a three-year period.

Q. WHAT OTHER STEPS DOES PGW TAKE TO ASSIST LOW INCOME CUSTOMERS?

A. Most significantly, PGW provides the largest Low Income Usage Reduction Program ("LIURP") of any natural gas utility. Named CRP Home Comfort, the program seeks to provide cost-effective energy savings to low-income customers and make customers' homes more energy efficient, safe and comfortable. Home Comfort does this by:

- Repairing or replacing older and less energy efficient heating systems, as feasible;
- Providing comprehensive weatherization services, such as thermal envelope and domestic hot water heating improvements, as feasible;
- Making health and safety improvements that contribute to conservation measures, and referring some customers to other programs that offer comprehensive health and safety improvements;
- Educating customers on ways to reduce their energy use along with basic health and safety information;

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monthly bill that is based on their household size and income: Residential customers with an income that is (a) 0% to 50% of the FPL pay 8% of their gross income, (b) greater than 50% to 100% of the FPL pay 9% of their gross income, (c) greater than 100% to 150% of the FPL pay 10% of their gross income.

- Raising awareness of energy conservation and encouraging the incorporation of energy saving behavior;
- Targeting high-use customers to maximize impact, increase cost-effectiveness, and optimize total savings; and
- Engaging landlords and building owners as partners in energy efficiency.

Q. DOES THE HOME COMFORT PROGRAM PRODUCE BENEFITS FOR CUSTOMERS?

A. Yes. The Program provides significant savings and improves home comfort. Homes that receive a comprehensive treatment are achieving average annual savings of approximately 34 MMBtu and 18 percent of usage. Homes that receive a more limited or "core measure" treatment result in an average annual savings of approximately 7 MMBtu and 4 percent of usage.

Q. CAN YOU PROVIDE AN EXAMPLE OF THE BENEFITS THAT AN INDIVIDUAL LOW INCOME CUSTOMER MIGHT RECEIVE UNDER THE HOME COMFORT PROGRAM?

A. Yes. Although CRP Home Comfort projects vary considerably based on site-specific conditions, the example below illustrates how individual site opportunities can be leveraged to optimize cost-effective savings and home comfort through the program. The following is just one example of the 14,865 CRP Home Comfort cases closed from inception through FY 2016. This CRP customer had an annual usage of 167 MMBtu. The conservation service provider ("CSP") (with which PGW contracted to provide conservation services) was able to reduce this usage by 60 MMBtu, or 36 percent. The conservation treatment included insulating the attic, air sealing, and better defining the thermal envelope to lower the high building leakage rate by 28 percent. The customer's original furnace had a measured efficiency of 73 percent, which was replaced with a 96 percent efficient model. Other conservation improvements included replacing an old

analog thermostat with a digital programmable model, installing water pipe insulation and low-flow faucet aerators, and reducing the unnecessarily high water temperature on the hot water heater.

In addition to the energy saving measures, work was done to improve health and safety conditions in the home. The CSP installed a carbon monoxide detector, a new chimney liner, and serviced the water heater to reduce a "spillage" problem that prevented exhaust gases from exiting properly through the flue. The CSP also remediated knob and tube wiring in the attic, allowing for the installation of attic insulation, and reducing risks of fire from outdated electrical systems. This comprehensive job package cost $7,099 and its measures averaged $4.83 per lifetime MMBtu, resulting in an estimated $8,611 in lifetime savings. In addition, the home was more energy efficient, more comfortable and safer.

Q. DOES PGW TAKE STEPS TO TRY TO MAXIMIZE THE EFFICIENCY OF THE DOLLARS SPENT FOR THE CRP HOME COMFORT PROGRAM?

A. Yes. One unique design element of CRP Home Comfort is its competitive CSP model. Each CSP is evaluated semi-annually based on total natural gas savings, cost-effectiveness, work quality, and customer service metrics. The evaluations inform funding allocations for each CSP, and budgets are reallocated to reward the highest performing CSPs. This approach has been effective for PGW to drive results and improve CSP performance over time.

Q. WILL PGW'S PROPOSED BASE RATE INCREASE AFFECT THE AVAILABILITY OF THESE PROGRAMS TO LOW INCOME CUSTOMERS OR UNIVERSAL SERVICE GENERALLY?

A. No. CRP, LIURP, CARES and Hardship Funds are not proposed to be reduced or limited by virtue of the filing. As noted above, customers who are enrolled in CRP pay an

"asked to pay" amount that is calculated on the basis of the customer's family size and household income. Thus, the rate increase will not affect CRP customers. In order to assist its low-income customers, PGW has been engaged this LIHEAP season in extensive outreach, as well as advertising, and direct assistance with completing LIHEAP applications. Accordingly, as there will be no effect on the availability of universal service programs to low income customers or universal service generally from the proposed rate increase, PGW believes its proposed base rate increase will not adversely affect customers eligible for PGW's low income assistance programs.

VI. ASSISTING ALL CUSTOMERS' CONSERVATION EFFORTS

Q. DOES PGW HAVE ANY PROGRAMS TO ASSIST NON-CRP CUSTOMERS WITH ENERGY EFFICIENCY?

A. Yes. PGW voluntarily offers its customers a demand side management program – the EnergySense conservation program. These programs are available to all firm residential, commercial and industrial customers, including low income customers. In FY 2016, PGW spent $2 million on these non-LIURP gas efficiency programs, providing approximately 783 rebates/project incentives. Over the first six years of PGW's voluntary gas efficiency programs, the company spent $12.1 million. PGW expects to spend $10.6 million from FY 2017 through FY 2020 to provide an additional 4,973 rebates and project incentives.

Q. WHAT HAVE BEEN THE RESULTS OF THE ENERGY SENSE CONSERVATION PROGRAM?[5]

A. PGW's existing demand side management ("DSM") Plan has directly benefitted program participants through cost-effective energy savings. Similar to the measurement used for electric Act 129 EE&C plans, the Total Resource Cost ("TRC") test is the primary metric for measuring the cost-effectiveness of PGW's DSM Plan. Through August 2016 the DSM Plan delivered $13.2 million in TRC net benefits to customers (in 2014 dollars), achieving a benefit-cost ratio ("BCR") of 1.23. A benefit-cost ratio of 1.0 indicates that the plan is beneficial to PGW and its ratepayers on a total resources cost basis. These TRC results show that PGW has been delivering a meaningful return on investment to ratepayers and the regional economy.

Since inception through August 2016, the DSM portfolio reduced natural gas consumption by nearly 458 Bbtus (444,237 MCF), performed over 14,500 retrofits, issued over 3,600 rebates, and completed 69 commercial projects. This DSM activity is also expected to benefit the environment through the reduction of over 654,000 short tons of CO2. Consumers and participants have expressed positive impressions of the existing DSM Plan in third-party survey evaluations. A survey found that 65 percent of residential heating equipment rebate recipients felt that rebates were important in their decision to purchase high efficiency equipment. Similarly, 70 percent of contractors reported that PGW's rebates were important to their sale of high efficiency equipment. The vast majority of customers – 91 percent – reported that they were satisfied with the PGW EnergySense rebate program.

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[5] The below answer includes results from the CRP Home Comfort program. The program was included in PGW's EnergySense conservation program through the end of fiscal year 2016.

Additionally, PGW's existing DSM programs have provided broader significant benefits to the local community in terms of increased economic activity, market transformation and reductions in carbon emissions. PGW coordinates its DSM programming with a number of community organizations to, among other things, address the treatment of homes with health and safety deficiencies that prevent comprehensive weatherization. Working closely with other programs and organizations is crucial to: (1) avoid duplicating services, (2) leverage existing resources, (3) identify additional opportunities; and, (4) maximize the cost-effectiveness of the DSM Plan. PGW has committed to continuing this outreach and coordination as its DSM programs continue.

DSM also provides economic benefits and job creation in the region. Since inception, PGW's DSM programs have created approximately 293-488 jobs and paid millions of dollars to businesses throughout the region.[6] These investments have supported the growing energy efficiency industry in the Greater Philadelphia region and put more money back into the pockets of local consumers. Overall, PGW's DSM activities for CRP and non-CRP customers have produced material benefits to customers and have enhanced the quality of service they received.

VII. IMPROVING CUSTOMER SERVICE

Q. WHAT STEPS HAS PGW TAKEN TO IMPROVE THE SERVICE IT PROVIDES TO ITS CUSTOMERS WITH RESPECT TO BILLING, COLLECTIONS AND INQUIRIES?

A. PGW has worked hard to improve its billing, collection and inquiry interactions with its customers. In that regard, PGW has worked to provide better and more comprehensive

[6] Calculated based on a range of 30 to 50 jobs created for every lifetime TBtu saved. Energy Efficiency Job Creation: Real World Experiences" Bell, Casey J. American Council for an Energy-Efficiency Economy. October 2012.

training of customer service field and collection staff and also engaged in a replacement of its phone system. Some expected benefits of this replacement are improved reporting that will assist with coaching and analyzing call center performance and providing a more user friendly service representative interface. PGW has also upgraded its workforce planning software, which will assist PGW in more efficiently and effectively handling high call volume.

Q. DID PGW MAKE OTHER IMPROVEMENTS TO ITS DISTRICT OFFICES TO ENHANCE CUSTOMER SERVICES?

A. Yes. In FY 2016, PGW made improvements to District Offices (West, North, and South were totally reconstructed and the remaining District Offices are scheduled to be improved) in order to improve customer satisfaction. Also, PGW increased the number of customer service representatives in the District Offices by approximately 15 representatives. Thus, 2016 wait times improved by approximately 9 minutes over 2015 wait times and approximately 21 minutes over 2014 wait times (with an average wait time in 2016 of approximately 4.8 minutes).

Q. DID PGW MAKE ANY OTHER SYSTEM ENHANCEMENTS TO IMPROVE CUSTOMER SATISFACTION?

A. Yes. PGW has made various system enhancements to improve customer satisfaction. PGW took steps to improve accessibility by updating its customer interactive voice response ("IVR") system and to provide more self-service options for customers, including the ability for residential customers to analyze their bill, turn service on/off, opt-out of gas choice account information sharing, sign up for auto-pay or e-bill and purchase a parts and labor service program online.

Q. HAVE PGW'S EFFORTS BEEN REFLECTED IN CUSTOMER PERCEPTION OF THE SERVICE IT PROVIDES?

A. Yes, there is some evidence of this. PGW's Overall JD Power customer satisfaction trends from FY 2010 to FY 2016. PGW's results increased by 88 points during that timeframe (571 in 2010 compared to 659 in 2016); each year since 2010 PGW has shown positive growth year over year. PGW's successful efforts to improve customer service during FY 2016 are borne out by the fact that PGW's Wave 3 JD Power results Overall satisfaction during the March/April fielding period increased from 637 in FY 2014 to 709 this year. Positive growth can be attributed to several factors. In addition to the customer service enhancements described above, PGW has made significant improvements to customer communications, including: 1) the launch of a new corporate website in 2013; and 2) the introduction of social media channels – Twitter, Facebook and YouTube.

VIII. IMPROVING CUSTOMER CHOICE OPPORTUNITIES

Q. HAS PGW ALSO TAKEN STEPS TO IMPROVE CUSTOMER CHOICE AVAILABILITY FOR SMALL BUSINESS AND RESIDENTIAL CUSTOMERS?

A. Yes. PGW has, of course, offered its customers "choice" with dual billing of the customer for many years, but this program was mainly used by larger commercial and industrial customers due in some part to supplier interest. More recently, pursuant to a PUC approved settlement, PGW now offers eligible suppliers a purchase of receivables and consolidated billing option ("POR/CB") for residential and small business customers. Under the program, PGW provides a consolidated billing option to suppliers through which PGW bills both its delivery service charges as well as the supplier's commodity charges. Under this program, PGW purchases the receivables of the supplier for any enrolled customer and remits to the supplier the billed amount for the commodity, minus

discounts reflecting PGW's bad debt and administrative expenses. The POR/CB option is available for residential and small commercial and industrial (annual usage of no more than 5,000 Mcf) ratepayers, and was implemented in January 2016. As of December 2016 there were 3 suppliers participating in the POR/CB program, with a total of 130 commercial/industrial service accounts and 82 residential service accounts shopping.

IX. RATE STRUCTURE

Rate IT: Interruptible Transportation

Q. PLEASE DESCRIBE TARIFF RATE "IT" (INTERRUPTIBLE TRANSPORTATION)?

A. Rate IT is only available to transportation customers that have selected and installed an alternative fuel source. Interruptible customers are unique in that they are not dependent upon natural gas as their sole energy source. Interruption is a possible fact of life for all Rate IT customers because they explicitly and voluntarily agree that their gas service can be interrupted by the Company.

It is the customers' choice to both install and maintain an alternative fuel source and take service under Rate IT. So, as a practical matter, customers taking service under Rate IT have concluded that the value of the interruptible service is worth the price in comparison with competing fuels, not because the price for interruptible service fairly reflects the Company's costs of providing interruptible service.

Rate IT was intended to create an incentive for dual-fuel customers to use natural gas at times when the relative prices of gas and their alternative fuel (such as Fuel Oil No. 2) would otherwise have tended to encourage those customers to use their alternative fuel. Originally, this rate schedule benefits firm service customers by attracting net

revenue from customers that would otherwise have used an alternative fuel. As discussed below, this may no longer be the case.

Q. PLEASE DISCUSS THE SPECIFICS OF THE RATE DESIGN PROPOSAL FOR RATE IT.

A. The Company seeks to transition from a solely cost-based rate to a negotiated rate based on both the customer's share of system costs and the value of service that the customer is receiving from the interruptible service.

If approved by the Commission, the Company will establish stated price ranges for the distribution charge classes under Rate IT. One end of the range will be the actual cost of service as determined in this (or future) rate cases, and which allocates reasonable mains investment to interruptible customers. The other bound of the range is the equivalent firm transportation rate (since the customer would typically have the option of taking firm service). The range so established provides a reasonable framework for negotiations between the interruptible customer and the Company.

The distribution charge would be negotiated by the customer and the Company within the established range. That negotiated rate will reflect the cost of service as well as competitive considerations. Negotiations will result in a just and reasonable rate. That rate would properly reflect both cost of service and value of service pricing principles, properly reflect the competitive alternatives available to interruptible customers, provide greater revenue to the Company in exchange for assuming the ongoing risks related to serving this competitive market, and provide important benefits to all customers that would not be available under strict cost of service principles.

Importantly, PGW is proposing that the negotiating range can be either above or below the customer's cost to use alternative fuel. It would not be fair to IT customers to

establish a rate that would always be at the relative cost of their alternative fuel. If the negotiated price is below the cost to use alternative fuel, the customer can elect to receive natural gas. If the negotiated price is above the relative cost of the alternative fuel, the customer can elect to use their alternative fuel source. In either situation, PGW has the incentive to negotiate a rate that takes into consideration the customer's alternative fuel cost and induces them to continue to use natural gas, rather than their available alternative fuel.

The Company is proposing a transition period to move all Rate IT customers to the negotiated rate. Customers who are receiving service under Rate IT as of the date of the Commission's approval of the compliance tariff in this proceeding would transition to a negotiated rate following the third anniversary of said approval, or when the term of the current contract ends, whichever is later. Others, including new customers or new load, that are seeking service under Rate IT will be subject to the negotiated rate provisions as set forth in this proposal.

This proposed change is shown in the proposed tariff, which is Exhibit KSD-2.

Q. PLEASE EXPLAIN WHY PGW IS PROPOSING TO CHANGE RATE IT.

A. Using only a cost-based rate has created an incentive for customers to avoid taking firm service which is resulting in fewer and fewer transportation customers contributing to the overall costs of running the distribution system. In other words, PGW's interruptible service is competing against PGW's firm service. Interruptible transportation increased from a volume of 146,000 MCF in FY 2002 – to a volume of 4,142,000 MCF in FY 2006 – to a volume of 11,751,637 MCF in FY 2016. PGW currently provides interruptible gas service to approximately 426 Rate IT customers, comprising over 17% of annual system

throughput, that procure their own gas but have it delivered by PGW under Rate IT. This is a significant increase in Rate IT customers since PGW's 2006 Base Rate Case. In 2006, PGW only had 147 Rate IT customers, comprising just 7% of annual system throughput. In 2001, PGW had just 10 transportation customers who procured their own gas and had it delivered by PGW.

The Company expects that the shift towards Rate IT will continue in the short term because the pricing data for natural gas is, has been, and is expected to be,[7] lower than the price for common alternative fuels. For example, data from the US Energy Information Administration (EIA) shows the following for January 2017:

- The cost of 100,000 BTUs of natural gas is about $0.79 for commercial customers and about $0.41 for industrial customers.[8]
- The cost of 100,000 BTUs of propane is about $1.47 for commercial customers[9] and $1.16 for industrial customers.[10]
- The cost of 100,000 BTUs of No. 2 Fuel Oil is about $1.62.[11]

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7 US Energy Information Administration (EIA), Annual Energy Outlook 2017, Table A3 - Energy Prices by Sector and Source (release date, January 5, 2017). This report, which is available at http://www.eia.gov/outlooks/aeo/, shows model results from 2015 to 2050.

8 The 2017 cost per MMBTU ($7.884544) for commercial customer divided by the conversion factor (10) equals cost of 100,000 BTUs ($0.79). The 2017 cost per MMBTU ($4.08165) for industrial customers divided by the conversion factor (10) equals cost of 100,000 BTUs ($0.41). See footnote 7 for source of price data.

9 The 2017 cost per MMBTU ($14.65341) for commercial customers divided by conversion factor (10) equals cost of 100,000 BTUs ($1.47). See footnote 7 for source of price data.

10 The 2017 cost per MMBTU ($11.62346) for industrial customers divided by conversion factor (10) equals cost of 100,000 BTUs ($1.16). See footnote 7 for source of price data.

11 The 2017 cost per MMBTU ($16.22346) for commercial customers divided by conversion factor (10) equals cost of 100,000 BTUs ($1.62). The 2017 cost per MMBTU ($16.23147) for industrial customers divided by conversion factor (10) equals cost of 100,000 BTUs ($1.62). See footnote 7 for source of price data.

Moreover, for many years, PGW has been able to avoid interrupting IT customers, even during the winter. PGW has been able to do this both because its firm annual load has dropped due to the effects of increasing average temperatures in the Philadelphia area, and because PGW has utilized its liquefied natural gas ("LNG") resources to permit IT customers to continue to stay on the system on peak days. While PGW expects that, in the future, it will need to husband LNG during peak periods which may result in IT interruptions, the number and length of interruptions will continue to be extremely low. Thus, interruptible service on PGW's system is of virtually the same quality as firm service – but at a fraction of the price.

The strict cost of service rate structure for Rate IT has placed PGW and its firm service ratepayers in a "lose-lose" situation: If the price of alternative fuel (for 100,000 BTUs) remains higher than the price of natural gas (for 100,000 BTUs), there will be a significant incentive for customers to avoid taking firm service from PGW. If the price of alternative fuels falls below the price of natural gas for a comparable amount of energy there will be an incentive to customers to avoid taking any service from PGW and PGW and its customers will not realize any contribution to the costs of operating and maintaining the distribution system—on which the IT customers transport their gas.

The proposal provides the proper incentives to ensure the Company will strive to maximize the amount of revenue that can be achieved from interruptible service customers under higher risk and unpredictable market conditions over time. It also recovers system costs over the largest possible customer base, provides for greater rate stability to all classes, can defer the need for future base rate relief, and will shield firm customers from the possible adverse ratemaking consequence associated with the higher

risk interruptible market. In my view, this approach produces a better outcome for all customers as compared to the alternatives of not offering interruptible service at all.

Q. IS THIS PROPOSAL A COST-BASED RATE?

A. Yes. While the natural gas system generally was originally built for firm transportation and sales customers, the distribution system is now being maintained and modernized for all customers, including IT customers that represent, by far, the largest share of the commercial and industrial customers. Accordingly, a portion of the costs of maintaining and modernizing PGW's distribution system should be allocated to interruptible customers. Mr. Hanser explains this in greater detail in his direct testimony (PGW St. 5). Cost of service remains one of the primary guideposts for rate setting under this proposal. The proposal provides a fixed offset to the Company's revenue requirement, which will be an amount equal to or greater than the cost of service for the interruptible customers.

I would add that neither the restructuring proceeding in Docket M-00021612 nor the Commission's prior base rate case orders bind PGW to use only cost-based rates, in perpetuity, for interruptible service. To explain, in its restructuring proceeding, the Company was directed to develop cost-based IT rates for the Commission's consideration. Cost-based rates were implemented as part of the Company's 2006 Base Rate Case (Docket No. R-00061931), increased in the Company's Emergency Rate Case (Docket No. R-2008-2073938) and maintained in the Company's 2009/10 Base Rate Case (Docket No. R-2009-2139884). But, none of these orders should be read as establishing the goal of solely cost-based rates for interruptible customers. The Commission may approve value of service pricing for interruptible customers that have competitive alternatives. This was done for UGI in its most recent base rate case (Docket No. R-2015-2518438), and should be done for PGW. The use of combined cost/value-

based rates is consistent with the standards set forth in 52 Pa. Code § 60.2, which calls for a simple margin maximum rate for transportation of natural gas.

Q. WAS THIS PROPOSAL MODELED AFTER THE PRICING USED BY A PENNSYLVANIA NGDC FOR INTERRUPTIBLE SERVICE?

A. Yes. It was modeled after Rate IS (Interruptible Service) of UGI (Gas Division), as approved in its last base rate case (Docket No. R-2015-2518438). For UGI, the distribution charge is negotiated: The price is no less than proxy cost-of-service and is no greater than the alternative fuel price.[12]

Q. WHY DID PGW SELECT TO USE A DIFFERENT UPPER BOUNDARY THAN UGI?

A. PGW has different price structures for "firm" and "interruptible" delivery service. For example, the distribution charge for an industrial customer under Rate GS is $0.45332 per Ccf (or $4.5332 per Mcf) and the distribution charge for an industrial customer under Rate IT-A is $1.88 per Mcf. But, PGW's interruptible gas customers have only been interrupted once (in 2004) during the last 20 years. This means that PGW's interruptible customers are actually receiving a service that is nearly equivalent to the firm transportation rate at less than half the cost.

Given that interruptible customers typically have the option of taking firm service (as long as firm capacity is available on the system), thus eliminating any potential of being interrupted, PGW decided to use the equivalent firm transportation rate as the upper limit of the negotiated range. This limit is fair to both PGW and the interruptible customer because it enables (1) PGW to receive more than the strict cost of service and (2) the interruptible customer to retain any and all value between the price of firm service

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12 See UGI 2015-2016 Base Rate Case, R-2015-2518438, Statement 1.

and the price of their alternative fuel. Moreover, the use of the equivalent firm transportation rate also works to ensure that an interruptible customer will not be paying more for gas than if it was the equivalent firm transportation rate.

Q. WHY IS IT APPROPRIATE TO USE VALUE OF SERVICE PRINCIPLES FOR THE INTERRUPTIBLE MARKET?

A. Value of service pricing has long been used in utility service pricing and is appropriate for two main reasons. First, interruptible customers create higher risks than firm customers. Interruptible customers have competitive alternatives and are capable of choosing those alternatives and leaving the distribution system at any time. It is reasonable under these circumstances, in the Company's view, to charge these customers competitive prices because they have competitive alternatives. Cost of service pricing is more appropriate and indeed is designed for regulated monopoly conditions, which by definition do not exist where customers have competitive alternatives. Strict cost of service pricing is not appropriate where a customer group has verified competitive alternatives for gas service and can leave the distribution system at any time.

Meeting the needs of firm and interruptible customers creates risks and challenges for PGW. PGW and its natural gas customers are dependent upon the interstate natural gas pipeline system[13] to deliver natural gas into the PGW gas distribution system. PGW relies on interstate pipelines for all natural gas supply, storage and transportation services, except for PGW's own on-system peak shaving facilities (LNG). The original and primary current purpose of the Company's LNG facilities is to provide supply for firm

[13] PGW is served by two interstate (Spectra Energy's Texas Eastern Transmission and Williams' Transco Gas) pipelines that deliver gas to PGW's city gates. PGW has firm capacity on both pipelines. All released capacity is recallable. The winter releases are recalled on the coldest days of the winter. No capacity is reserved specifically to serve interruptible service requirements. Interruptible transportation may be available on these pipelines for third party suppliers.

residential, commercial and industrial customers during the winter operating season (November through March). Due to system design, interruptible customers can draw down the line pack pressure in the system, and can trigger the need for the Company to use LNG. The use of only cost-of-services principles keeps interruptible customers from paying their share of the LNG costs incurred and the value of the "line pack" capacity on the distribution system that they are receiving. Second, and relatedly, interruptible customers have the option to become firm customers and take service under a cost-based firm service rate if they choose to do so, and to the extent that the system has sufficient capacity to allow for a conversion to firm service or if they contribute sufficient capital to finance the investment necessary to render firm service.

Because by using PGW's current system IT customers are rarely interrupted, the Company could have allocated the costs of the distribution system to them and priced their delivery rate on fixed basis and as if it were virtually "firm." However, PGW believes that this would fail to give consideration to the interruptible customer's ability to switch to an alternative fuel and could, in the long run, drive customers off the system and be harmful to firm customers.

Q. IS THIS PROPOSAL THE SAME AS THE MARGIN BASED RATES USED IN THE PAST BY PGW?

A. No. The essence of the current proposal creates an established range of prices and requires a bilateral negotiation between PGW and the interruptible customer. PGW's goal is to price the IT service in a way that maximizes the customer's contribution to the cost of maintaining the distribution system, while recognizing that the customer, rationally, will not pay more than its price of alternative fuel. Correspondingly, the customer will be unwilling to pay more than its alternative energy cost to obtain natural

gas service, but likely will be willing to remit a price that reflects the convenience and environmental benefits of using natural gas, compared to No. 2 or No. 6 fuel oil, for example.

The prior unbundled IT rates did not have an established range and did not factor in the cost of providing IT service. The margin-based IT rates were set by simply removing the then existing price of natural gas from the bundled rate. They were developed to ensure that if all Interruptible Sales Service (ISS) customer classes customers (i.e., customers on Boiler and Power Plant Service (Rate BPS), Load Balancing Service (Rate LBS) or Cogeneration Service (Rate CG)) switched to transportation service, PGW would realize the same level of margin it received from the ISS rate classes. This proposal is distinctly different.

Q. PLEASE EXPLAIN HOW THE PROPOSAL WILL ASSIST THE COMPANY IN MANAGING RISK.

A. Interruptible customers create risks for the Company. They can use their alternative fuel option or move their facility to a different location with lower energy costs. In the past, the Company has been able to offer interruptible transportation services because the gas used for generation loads accounted for a lower percentage of the total pipeline loads, and the Company had economic incentive to provide these interruptible transportation services. As the number of interruptible customers increased, the risks and challenges of providing interruptible service also increased. Simply put, improper pricing decisions can lead to revenue losses, stranded investment, and increased rates in the future.

The proposal will permit the Company to better manage risks. To the extent that the proposal permits the Company to recover system costs, it spreads system costs over

the largest possible customer base and provides for lower rate increases and greater rate stability for all customers. This can also defer the need for future base rate relief.

To the extent that the proposal permits the Company to charge rates above the direct cost of service for the interruptible customer, it provides the Company with greater cash flows that can be used to finance operations. These increased cash flows would not be available if interruptible rates were determined strictly on cost of service principles. Moreover, as usage per firm customer has declined over time, and is expected to continue to decline, having interruptible rates above a strict cost of service may contribute to increased revenues which assist to support funding for capital projects and other operations without the need for additional base rate relief.

The rate proposal will work no detriment to PGW's firm ratepayers, and may also be advantageous to those customers in the long term by allowing PGW to maximize revenues to the benefit of firm ratepayers by attracting net revenue from customers that would otherwise have used an alternative fuel.

Q. PLEASE EXPLAIN HOW PGW PROPOSES TO IMPLEMENT ITS PROPOSED COST/VALUE OF SERVICE RATE PROPOSAL FOR INTERRUPTIBLE CUSTOMERS?

A. PGW witness Hanser has calculated the appropriate cost of service based rate for each of the IT customer classes. That rate plus the cost of natural gas for the period being considered will be listed as one bound of the negotiated rate. (Typically, the price of natural gas or other fuels can be determined by examining futures prices). The other bound will be the equivalent firm transportation rate (since the customer would typically have the option of taking firm service). The rate would then be negotiated by the Company and the customer, taking into account the customer's equivalent alternative fuel

price and other factors such as any positive or negative aspects of using natural gas versus alternative fuel.

Q. WHAT LEVEL OF REVENUES WILL BE USED TO DETERMINE THE ALLOCATION OF THE RATE INCREASE IN THIS PROCEEDING?

A. PGW has allocated the proposed rate increase assuming that each of the existing and projected incremental IT customers will pay the cost of service-based rate. If a rate is negotiated that is higher than that level, those revenues will contribute to PGW's overall cost of service and will be accounted for in PGW's next base rate case.

If the parties are not able to arrive at a mutually acceptable agreement as to rates the rate would be set at the midpoint between the cost of service based rate and the firm transportation rate.

Rate CG: Cogeneration Service

Q. WHAT IS THE COMPANY'S PROPOSAL WITH RESPECT TO TARIFF RATE "CG" (COGENERATION SERVICE)?

A. The Company seeks to update and to simplify its rate structure by "grandfathering" Rate CG for the duration of the existing contracts as long as they continue to be eligible for Rate CG.

Q. PLEASE DESCRIBE RATE CG.

A. Rate CG is a retail rate for interruptible service which is available to new or existing Commercial or Industrial Customers to purchase natural gas from PGW for use in any form of combined cooling, heating and power production where a quantity of waste heat is recovered and used in a secondary application for almost any commercial, industrial or domestic use. Rate CG customers must demonstrate the ability to utilize waste heat in a second process.

Rate CG is intended to encourage cogeneration development. It provides the same incentive for every potential cogenerator. Under Rate CG, the commodity and distribution charges are based on the average commodity cost of gas purchased and delivered to PGW's gate stations, including an allowance for unaccounted for losses plus a fixed Distribution Charge of 7.5 cents per Ccf. For Rate CG customers using over 1,000,000 Mcf of gas per year, the fixed contribution is determined by negotiation between the customer and the Company provided, however, that the contribution shall not be less than 10% of the above computed cost of gas.

Q. PLEASE EXPLAIN WHY PGW IS PROPOSING TO CLOSE RATE CG TO NEW CUSTOMERS.

A. There has been little use of Rate CG for more than a decade. There currently are only 2 customers on this rate. There has been little expressed interest by new customers in using this rate schedule, which has been largely unchanged since 2003. This lack of interest has led PGW to the conclusion that this rate option is no longer a viable basis for incentivizing incremental cogeneration service.

It is reasonable and appropriate for the Company to diversify its encouragement and incentives for cogeneration development. This can be done under the proposed Technology and Economic Development ("TED") Rider, which is discussed by PGW witness Teme (PGW St. 8), and negotiated rates pursuant to Tariff Rule 2.3.[14] But, it is no longer appropriate to continue the standardized incentive under Rate CG, which has done little to encourage cogeneration in Philadelphia for more than the last decade.

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[14] PGW Gas Service Tariff at First Revised Page No. 18.

Q. HOW DOES THE COMPANY PROPOSE TO EFFECTUATE THE CHANGES RESULTING FROM THE ELIMINATION OF RATE CG?

A. If the elimination of Rate CG is approved by the Commission, the Company will close Rate CG to new customers. See the proposed tariff, which is Exhibit KSD-2. Existing customers will be permitted to continue to receive service under Rate CG until the end of their current contract, so long as they continue to be eligible for Rate CG. At the end of their contract or eligibility, customers will migrate to the most appropriate rate schedule given their size and load profile.

Rate LBS: Load Balancing Service

Q. WHAT IS THE COMPANY'S PROPOSAL WITH RESPECT TO TARIFF RATE "LBS" (LOAD BALANCING SERVICE)?

A. The Company is proposing to simplify its rate structure by eliminating Rate LBS.

Q. PLEASE DESCRIBE RATE LBS.

A. Rate LBS is a retail rate for interruptible sales service which is available for use in industrial and commercial establishments and multi-family residential buildings for seasonal gas uses, where the Company's facilities are, or can economically be made, available to supply the service.

A customer electing service under Rate LBS must have and maintain complete and adequate standby non-natural gas energy (e.g., oil, propane, electric, steam) and equipment for alternate operation in the event of an interruption of gas service. The gas price for a customer serviced under Rate LBS is based on alternative fuel, No. 6 heating oil. That price is calculated monthly and posted on PGW's website.[15]

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15 http://www.pgworks.com/business/customer-care/rates/interruptible-service-rates

Q. PLEASE EXPLAIN WHY PGW IS PROPOSING TO ELIMINATE RATE LBS.

A. The Company is proposing to eliminate Rate LBS because there are no customers currently using it and there is no prospect of any future use. Given the lack of interest and the fact that interruptible transportation service is available to qualified customers under Rate IT, PGW has concluded that this rate is not a viable option for customers. Elimination of Rate LBS would also end the time, effort, and expense of calculating and posting the monthly prices for this rate. This proposed change is shown in the proposed tariff, which is Exhibit KSD-2.

Rate BPS: Boiler and Power Plant Service

Q. WHAT IS THE COMPANY'S PROPOSAL WITH RESPECT TO TARIFF RATE "BPS" (BOILER AND POWER PLANT SERVICE)?

A. The Company is proposing to simplify its rate structure by eliminating Rate BPS.

Q. PLEASE DESCRIBE RATE BPS.

A. Rate BPS is a retail rate for interruptible sales service which is available to customers with alternate fuel capability, where the Company's distribution system is, or can economically be made available to supply the service.

A customer electing service under this rate must have and maintain complete and adequate standby non-natural gas energy (e.g., oil, propane, electric, steam) and equipment for alternate operation in the event of an interruption of gas service. The gas price for a customer serviced under Rate BPS is based on alternative fuel. No 2 heating oil is used for Small (BPS-S) and Large (BPS-L) Rate BPS customers. No. 4 heating oil

is used for Heavy Oil (BPS-H) Rate BPS Customers. Each price is calculated monthly and posted on PGW's website.[16]

Q. PLEASE EXPLAIN WHY PGW IS PROPOSING TO ELIMINATE RATE BPS.

A. The Company is proposing to eliminate Rate BPS because there are no customers currently using it and there is no prospect of any future use. Given the lack of interest and the fact that interruptible transportation service is available to qualified customers under Rate IT, PGW has concluded that this rate is not a viable option for customers. Elimination of Rate BPS would also end the time, effort, and expense of calculating and posting the monthly prices for this rate. This proposed change is shown in the proposed tariff, which is Exhibit KSD-2.

Q. ARE THE PROPOSALS TO CLOSE RATES CG, LBS AND BPS IN THE PUBLIC INTEREST?

A. Yes. These rates no longer meet the needs of current customers; moreover, there are more attractive options and alternatives, as evidenced by the fact that there are virtually no customers using them. To be clear, Rate CG has active customers so PGW is proposing to "grandfather" its current Rate CG customers for the duration of their existing contracts, as long as they continue to be eligible for service under that rate schedule. Rates LBS and BPS do not have any customers, so those schedules can be eliminated without the need for any grandfathering.

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16 http://www.pgworks.com/business/customer-care/rates/interruptible-service-rates.

Rate BUS : Back-Up Service

Q. PLEASE DESCRIBE THE PROPOSED BACK-UP SERVICE.

A. PGW is proposing a tariff provision that would permit PGW to negotiate a rate with a customer installing any type of operable back-up or emergency equipment and that from, time to time, will require natural gas from the Company for the customer's operation of that equipment.

This service differs from existing services because the customer is not required to take any amount of gas from PGW. Customers can select the back-up level of service that is needed, and will pay a negotiated standby (or reservation) charge that would collect only those costs which standing ready to serve the generation equipment imposes on the system. If – during the term of the customer's contract with the Company – the customer requires gas to run its generator, the customer would pay the previously negotiated delivery and commodity charges.

The determination of whether the customer's usage is for back-up or emergency purposes would be within the Company's sole discretion. The use of such gas for any other purpose would be prohibited. All gas volumes received under this rate schedule would be separately metered. Service under this rate schedule would be firm. The addition of Rate BUS is shown in the proposed tariff, which is Exhibit KSD-2.

Q. IS THERE A NEED FOR BACK-UP SERVICE?

A. Yes. The Company believes that back-up generation could develop into a significant market. Customers and potential customers have the ability to install a generator to back-up their need for electricity (or other power source). Back-up generators have long been available for large commercial and industrial customers. These generators are becoming

more available to homes and small businesses who are installing generators to ensure that they have electricity during an electricity outage.

Q. WHY IS A NEGOTIATED RATE BEING PROPOSED?

A. It is anticipated that this rate schedule, if implemented, would attract new customers and encourage the use of natural gas as the means of generating backup or emergency power. Importantly, the negotiated rate will need to recognize that PGW might provide natural gas to the back-up generation customer for just a few days or hours during the year. This means that the rate will have to be structured to recover the fixed costs of providing such service in a flat or fixed monthly "standby" charge. But, in order to promote the use of natural gas, PGW will need flexibility to negotiate a standby charge that is appropriate to each customer's anticipated level of outages and expected usage during outages. Simply put, each customer with a generator is likely to have different characteristics and potential to impact the system. Moreover, by having flexibility with the other charges, the Company will be in a position to support the growth of natural gas, to respond to competitive conditions, and to accommodate customer needs.

Q. IS THE PROPOSED TARIFF REASONABLE AND IN THE PUBLIC INTEREST?

A. Yes. The addition of back-up (or emergency) generation equipment creates additional risks for the system. But, by their very nature, such generation equipment would operate infrequently. Gas would be used by the generation equipment for regular tests, but would be used primarily only during emergencies. The creation of a separate rate schedule for such equipment will: (a) create a reasonable difference between the proposed service and the Company's other services; (b) reflect the different nature of the service provided to the generation equipment; (c) allow PGW to moderate the effect on said demands on the

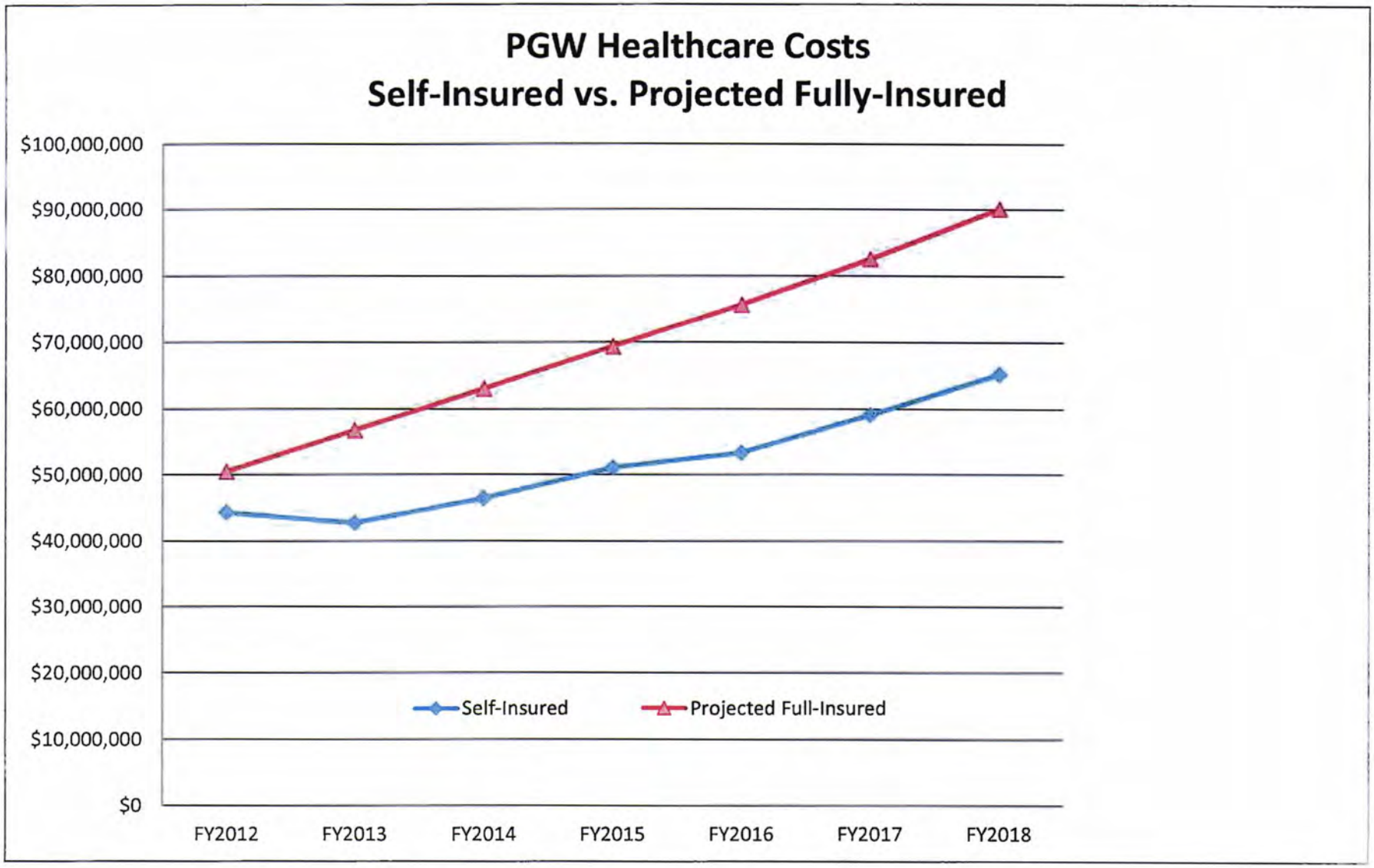
system; and (d) permit PGW to recover the costs which the generation equipment imposes on the system.

X. CONCLUSION

Q. DOES THAT COMPLETE YOUR DIRECT TESTIMONY?

A. Yes.

Exhibit DAM-1


PGW Healthcare Costs
Self-Insured vs. Projected Fully-Insured
$100,000,000
$90,000,000
$80,000,000
$70,000,000
$60,000,000
$50,000,000
$40,000,000
$30,000,000
$20,000,000
$10,000,000
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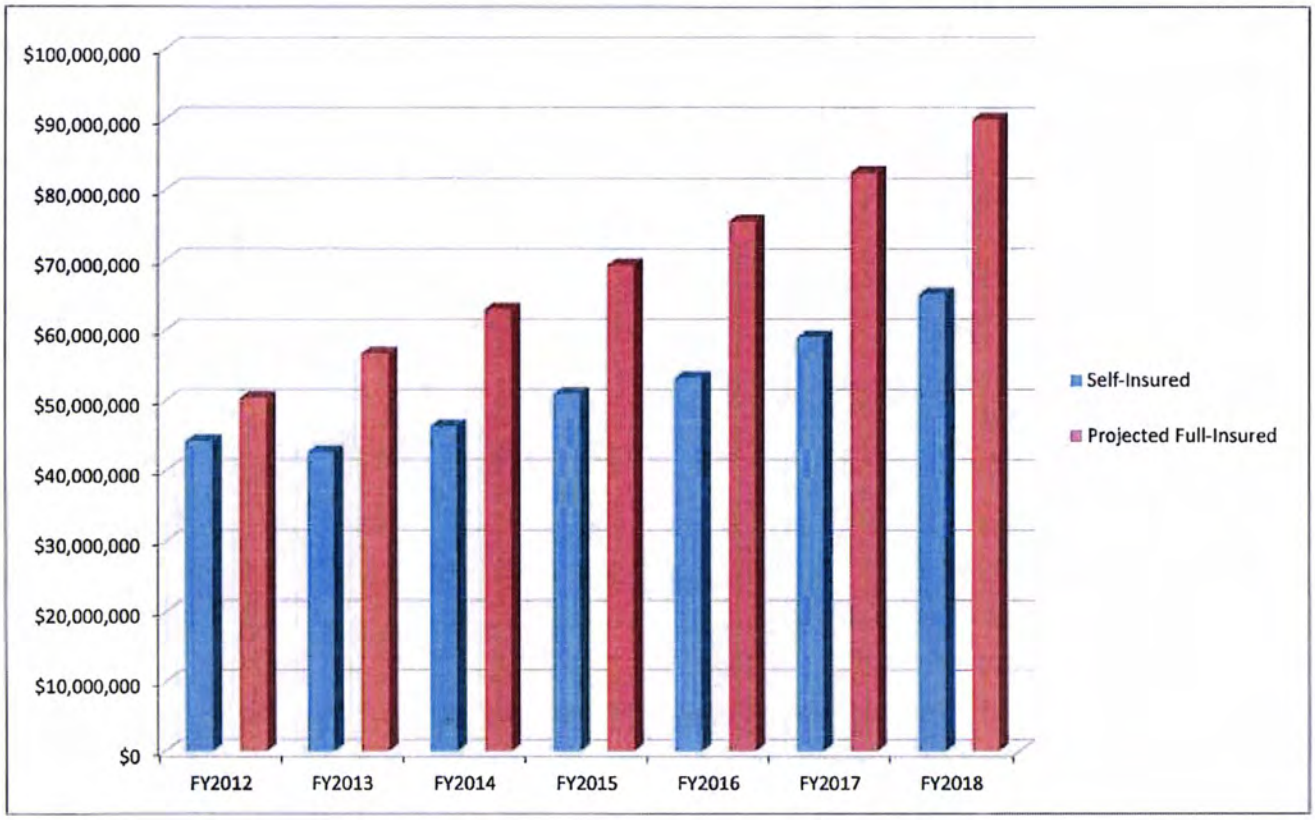
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
Self-Insured
Projected Full-Insured


$100,000,000
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$20,000,000
$10,000,000
$0
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
Self-Insured
Projected Full-Insured

PROJECTED FULLY-INSURED TO CHANGED SELF-INSURED SPENDING

	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	
Self-Insured	$44,343,201	$42,787,010	$46,483,298	$51,051,486	$53,370,213	$59,110,000	$65,259,000	
Projected Full-Insured	$50,464,000	$56,776,000	$63,041,000	$69,350,000	$75,613,000	$82,505,000	$90,033,000	
Savings	($6,120,799)	($13,988,990)	($16,557,702)	($18,298,514)	($22,242,787)	($23,395,000)	($24,774,000)	($125,377,792)

Exhibit DAM-2

Philadelphia Gas Works Health and Life Insurance Plan for Retired Employees (the "Plan")
Benefit Payout Projection (Closed Group Forecast as of September 1, 2016)
Impact of Coverage Plan Change
Current and Future Retirees

Year	Before Change	After Change	Plan Change Savings
2016	30,281,600	30,281,600	0
2017	32,053,800	32,053,800	0
2018	33,892,600	33,892,600	0
2019	35,717,600	35,717,600	0
2020	38,907,200	38,907,200	0
2021	39,847,400	39,846,300	1,100
2022	40,267,400	40,251,600	15,800
2023	40,946,900	40,917,000	29,900
2024	41,299,100	41,232,100	67,000
2025	41,756,700	41,659,500	97,200
2026	42,490,100	42,339,000	151,100
2027	43,642,800	43,434,900	207,900
2028	44,204,200	43,930,100	274,100
2029	44,775,300	44,434,700	340,600
2030	45,716,000	45,296,600	419,400
2031	46,416,300	45,839,400	576,900
2032	47,053,200	46,268,800	784,400
2033	48,099,500	46,991,100	1,108,400
2034	49,284,800	47,747,900	1,536,900
2035	50,411,000	48,381,800	2,029,200
2036	51,652,300	49,101,200	2,551,100
2037	53,004,600	49,979,600	3,025,000
2038	54,712,300	51,211,200	3,501,100
2039	55,948,900	52,015,500	3,933,400
2040	57,533,300	53,181,800	4,351,500
2041	59,747,000	54,852,800	4,894,200
2042	61,431,800	56,051,700	5,380,100
2043	63,373,100	57,422,000	5,951,100
2044	65,897,400	59,268,200	6,629,200
2045	68,296,000	60,848,900	7,447,100
	1,428,660,200	1,373,356,500	55,303,700

Payouts include: Medical, Dental, Rx, Administrative Expenses, Life Insurance and Taxes

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

DIRECT TESTIMONY OF

FLORIAN TEME

ON BEHALF OF
PHILADELPHIA GAS WORKS

Docket No. R-2017-2586783

Philadelphia Gas Works

General Rate Increase Request

Technology and Economic Development Rider
Micro-Combined Heat and Power Incentive Program

February 2017

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND CURRENT POSITION WITH PGW.

A. My name is Florian Teme. My position with PGW is Vice President, Marketing and Sales.

Q. WHAT ARE YOUR JOB RESPONSIBILITIES?

A. In my present position, I am responsible for the direction of all the marketing sales efforts and new business development, while continuing to strengthen business relations and increase customer service initiatives.

Q. PLEASE SUMMARIZE YOUR BACKGROUND AND EXPERIENCE.

A. I have been employed with PGW since August 2003. I became PGW's Vice President, Marketing and Sales in September 2016. Prior to that, I had various positions with PGW: Director, Marketing and Sales (April 2013 – September 2016), Manager, Residential and Commercial Sales, Marketing (March 2012 – April 2013); Manager, Controls and Analytics, Supply Chain (January 2010 – March 2012); Project Manager, Information Services (January 2007 – January 2010); Supply Analyst, Gas Planning (April 2005 – January 2007); and Technical Project Administrator, Marketing (August 2003 – March 2005).

I received my Bachelor of Business Administration (Management Information Systems) from Temple University - Fox School of Business and Management in 2003 and my Master of Business Administration (Business Intelligence, Six Sigma) from Saint Joseph's University - Erivan K. Haub School of Business in 2011.

Q. HAVE YOU EVER PROVIDED TESTIMONY BEFORE THIS COMMISSION?

A. No.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. My testimony will explain and provide support for the Company's proposed: (1) Technology and Economic Development ("TED") Rider; and, (2) pilot Micro-Combined Heat and Power ("Micro-CHP") Incentive Program.

II. PILOT TECHNOLOGY AND ECONOMIC DEVELOPMENT RIDER

Q. PLEASE DESCRIBE THE PROPOSED TECHNOLOGY AND ECONOMIC DEVELOPMENT RIDER.

A. PGW is proposing to implement, on a pilot basis, a TED Rider, which would increase access and expand the use of natural gas by giving commercial customers more options to obtain natural gas services, including combined heat and power ("CHP") projects, natural gas vehicles ("NGVs") and fuel cells. As proposed, the TED Rider would permit PGW to negotiate the delivery charges, as well as the customer contribution to the development and service of the infrastructure, for firm service non-residential customers on Tariff Rate Schedules for General Service ("Rate GS"), Municipal Service Rate ("Rate MS"), Philadelphia Housing Authority Service ("Rate PHA") and Developmental Natural Gas Vehicle Service ("Rate NGVS-Firm"). A copy of PGW's proposed tariff rider is included in Exh. KSD-2.

Q. ARE THERE ANY LIMITS ON THE TED RIDER?

A. Yes. The TED Rider will be applicable by request of the applicant and, with approval by PGW, would be subject to the following criteria:

1. The Rider will be applicable to usage associated with new gas load at competitive risk only.
2. The Rider will be applicable for a defined period outlined in the customer's TED Rider service agreement.

3. The Rider will be determined and applied using an economic test consistent with PGW's commercial and industrial line extension tariff provisions.

Q. WHAT IS THE PRIMARY PURPOSE OF THE TED RIDER?

A. The primary purpose of the TED Rider is to negotiate the amounts and time periods for customers' contributions to mains and services costs and their overall distribution charges to address project-specific or competitive issues in order to improve customers' access to natural gas and expand the use of natural gas in PGW's service territory. Importantly, the TED Rider will be determined and applied using an economic test that requires anticipated revenues, at a minimum, to be sufficient to justify the anticipated investment. This means that each project will have to stand on its own economic merits and should not result in any cross-subsidization by existing customers.

Q. WHAT IS THE PROPOSED TIME PERIOD FOR THE TED RIDER?

A. PGW is proposing to implement the TED Rider as a five-year pilot program. During the five-year pilot program, PGW would negotiate TED Rider service agreements with customers and maintain records on the economics of the program.

Q. DOES PGW PROPOSE TO SUBMIT REPORTS TO THE COMMISSION?

A. Yes. Six months prior to the conclusion of the five-year pilot program, PGW proposes to provide a report to the Commission on the economics of the program. In the event that PGW files a base rate case before that time, PGW proposes to include information about the economics of the program in the supporting information for that base rate case. In either instance, PGW would propose whether to continue the pilot program in its current form or with modification. If the pilot program would not continue, no additional customers would be offered service agreements; however, the customers who negotiated

agreements during the five-year period would receive the negotiated rates for the remaining periods under those agreements.

Rationale For TED Rider Proposal

Q. WHAT IS THE RATIONALE FOR PGW'S PROPOSED TED RIDER?

A. The rationale for the proposed TED Rider is that the expansion of natural gas services and incremental load growth would benefit PGW's entire customer base, as well as the City of Philadelphia and the region. Load has been declining for several years on PGW's system. By encouraging new uses of natural gas PGW will add customers, and/or new load, thereby spreading the essentially fixed non-gas costs of delivery over a larger customer base. In addition, the conversion of another energy source used by the business to natural gas – through the deployment of CHP, NGVs and fuel cells – will reduce energy costs and promote economic development. The expansion of natural gas use also benefits the environment since customer conversion to natural gas generally displaces the use of less environmentally friendly energy sources.

Q. WHY HAS LOAD BEEN DECLINING ON PGW'S SYSTEM?

A. Firm sales have decreased over recent years, in large part, due to weather. Other contributing factors include conservation and the increased efficiency of gas appliances.

Q. WHAT ARE THE ADVANTAGES OF INCREASING RELIANCE ON NATURAL GAS AS AN END-USE FUEL SOURCE?

A. Natural gas has many important advantages as an end-use fuel source in terms of efficiency and environmental benefits. The ability to generate energy on-site is more efficient because it reduces the amount of line loss that occurs when energy is generated off-site and must then be transported to a customer's location. In addition, assisting customers to increase the use of natural gas while reducing reliance on other fuel sources

is a way that states can potentially achieve a net reduction in carbon emissions and greenhouse gases, compared to those produced by the generation currently used to produce electricity for the customer. While no study has been conducted to examine the generation source for the specific electricity that could be replaced by projects included in the Pilot Project, roughly 30-40% of electricity delivered in the PJM power pool, the entity that coordinates the delivery of power throughout Pennsylvania and twelve other states (and the District of Columbia), is generated by coal with roughly 20-30% generated by natural gas.[1] By generally promoting the increased use of natural gas, these projects also promote the use of natural gas produced or processed in Pennsylvania.

Q. HAS THE COMMISSION EXPRESSED SUPPORT FOR SUCH INITIATIVES?

A. Yes. On March 9, 2016, the Commission issued a tentative order seeking comments on a proposed policy statement intended to incent electric distribution companies ("EDCs") and NGDCs – like PGW – to: (1) promote CHP investments; (2) make CHP an integral part of utility energy efficiency and resiliency plans, as well as their marketing and outreach effort; (3) encourage utilities to design interconnection and standby rates for owners and operators of CHP facilities; and, (4) promote consideration of special natural gas rates for owners and operators of CHP facilities.[2] In the Tentative Order, the Commission specifically stated: "[w]e believe the Commission should facilitate efforts to make Pennsylvania a leader in CHP deployment to more fully realize the benefits provided by CHP and the enhanced utilization of our indigenous shale gas resources."[3]

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[1] According to PJM's website, in 2016 approximately 26% was generated by natural gas and 34% was generated by coal. In 2015, approximately 23% was generated by natural gas and 36% was generated by goal. Data available at https://gats.pjm-eis.com/gats2/PublicReports/PJMSystemMix.

[2] *Proposed Policy Statement on Combined Heat and Power*, Docket No. M-2016-25304848, Proposed Policy Statement entered March 9, 2016.

[3] *Id.* at 4.

The Commissioners also referenced a study of the American Council for an Energy Efficiency Economy ("ACEEE") as confirmation that "Pennsylvania has only begun to realize the myriad of benefits that CHP can offer."[4]

Q. HOW WOULD THE TED RIDER PROMOTE LOAD GROWTH?

A. By offering incentives to applicants and customers that have alternative options to natural gas, PGW would be able to acquire load caused by new businesses and the expansion of existing businesses. These businesses may otherwise have chosen to locate operations elsewhere due to the presence of more attractive energy costs at that other location. Customer characteristics and circumstances, such as tolerance for large up-front contributions to cover the costs for the extension of facilities, can also vary considerably. Particularly, start-up businesses with minimal capital can face insurmountable challenges associated with hefty up-front customer contributions, which results in the loss of potential incremental load. Absent flexibility to adjust contributions and distribution rates to reflect the applicant's or customer's competitive alternatives, PGW will lose not only the business but also the potential for long-term contributions towards system fixed costs, which ultimately benefit all customers through economies of scale and the recovery of fixed costs from a larger customer base.[5]

Q. HOW DOES INCREASING NATURAL GAS USE BENEFIT THE COMPANY AND ITS RATEPAYERS?

A. By facilitating the increased usage of natural gas delivered by PGW, the Company will realize additional, incremental margin from the delivery charges which will help to cover

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[4] *Id.* at 6, citing The 2015 State Energy Efficiency Scorecard, October 2015, October 2015, Report U1509 available at: http://database.aceee.org/state/pennsylvania

[5] *See* National Regulatory Research Institute, *Line Extensions for Natural Gas: Regulatory Considerations*, Report No. 13-01, February 2013, pp. and 27-30.

PGW's fixed costs and offset reductions in sales volumes due to warmer weather. Thus, any additional load that the Company is able to develop through the various programs designed to encourage fuel-switching will serve to reduce the Company's future revenue requirement needs. Further, by requiring that projects approved as part of this pilot program meet a stringent economic test, all ratepayers benefit in several ways. First, they receive the benefit of the incremental increase in revenue generated by the new or expanded load. Second, because the net revenues from the project over the planning period will be required to exceed the cost of adding the new load in order to qualify for this rider, ratepayers will not be subsidizing uneconomic projects. Finally, all customers benefit from the reduction in the use of less efficient fuel sources.

Q. DO YOU SEE THE NEED FOR ADDITIONAL RATE FLEXIBILITY TO ATTRACT NEW CUSTOMERS?

A. Yes. For example, compressed natural gas ("CNG") vehicle refueling stations may start out as low volume customers, but carry the prospect for steady incremental growth as vehicles are replaced. Often, the applicant or customer will be making a significant capital investment in vehicles and refueling equipment, and may have a low tolerance for large up-front contributions for line extensions. PGW also expects to see the spread of smaller scale fuel cell, cogeneration facilities or gas-fired heat pump technologies that will require rate flexibility to meet competitive conditions.

Application of TED Rider

Q. PLEASE PROVIDE AN EXAMPLE OF HOW THE TED RIDER MIGHT BE APPLIED.

A. A company may plan to convert its fleet of vehicles to NGV vehicles over time but initially only plans to install compression facilities sufficient to serve a small number of

vehicles. This service location initially would be best served under the Developmental Natural Gas Vehicle Service ("NGVS") Rate which does not offer rate flexibility. If the company wants a line extension constructed that will be capable of serving its future needs but does not have the budget to make a large up-front payment for the line extension, the project may not proceed. Under the proposed TED Rider, PGW and the applicant could agree to a combination of contributions-in-aid-of-construction ("CIAC") to mains and services and delivery charges that accommodate the applicant's planned NGV project.

In another instance, a transit agency contemplating converting its fleet to natural gas might receive a grant that can cover any required up-front CIAC and would qualify for service under the NGVS Rate, but might need a discount from the NGVS rate to make the project economically viable. Under the proposed TED Rider, PGW and the applicant could agree to a higher CIAC and an incremental reduction of the NGVS rate to accommodate the applicant's planned NGV project. These are just some examples.

Q. WOULD THE TED RIDER BE USED TO MAKE UNECONOMIC INVESTMENTS?

A. No. As explained above, the TED Rider will be determined and applied using an economic test consistent with PGW's line extension provisions applicable to commercial and industrial gas service in Section 10.1.B. of the Gas Service Tariff. This test requires anticipated revenues, at a minimum, to be sufficient to justify the anticipated investment. This means that each project will have to stand on its own economic merits and should not result in any cross-subsidization by existing customers.

Q. IS THERE A RISK THAT A CUSTOMER COULD BECOME BANKRUPT OR INSOLVENT BEFORE ANTICIPATED REVENUES USED TO DETERMINE THE ECONOMIC VIABILITY OF THE PROJECT ARE RECEIVED?

A. In theory, a small percentage of projects could involve a customer who becomes bankrupt or insolvent before anticipated revenues used to determine the economic viability of the project, and not guaranteed through the provision of financial security, are received. However, the exact same risk applies where investments are made where no up-front CIAC payments are required pursuant to PGW policy[6] due to the anticipated distribution revenues that alone justify the investment. In addition, commercial and industrial default rates are very low and once a capital investment in gas utilization equipment is made at a service location, it is likely that a new customer would assume control of the service location and gas equipment, and apply for and receive natural gas distribution service from PGW. Any remote and speculative possibilities of the risks posed by a potential bankrupt or insolvent customer are far outweighed by the promise of the TED Rider being able to attract incremental economic customer loads which would not otherwise be served.

A far more likely possibility is that incremental customer loads made possible by the flexibility of the TED Rider will provide some incremental contribution to shared system costs to the benefit of existing customers. The TED Rider will only apply to an initial specified term, and the customer would thereafter pay the applicable tariff rate without the TED Rider adjustment.

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[6] If payments owed are less than $10,000, PGW does not require the provision of financial security.

Q. WILL USE OF THE TED RIDER RESULT IN DISCRIMINATORY TREATMENT OF EXISTING CUSTOMERS AS COMPARED TO NEW CUSTOMERS?

A. No. As new customer loads, which otherwise would not occur, are added on an economic basis as PGW is proposing, the TED Rider will be beneficial to existing customers. PGW has every incentive to maximize its revenue and will not apply the TED Rider to reduce customer rates unless it believes it is necessary to do so to capture load that would otherwise not occur.

I also note that the line extension provisions of PGW's tariff apply to existing as well as new customers. Therefore, an existing customer requesting a required system upgrade to accommodate new firm requirements at its service location would potentially qualify for a TED Rider. As a result, the benefits of the proposed TED Rider are available to existing and new customers on a non-discriminatory basis.

Q. WHEN A TED RIDER DISCOUNT IS PROVIDED, IS THE CUSTOMER RECEIVING A "SUBSIDIZED RATE"?

A. No. Existing customers will not be funding an uneconomic investment. The TED Rider would only be applied to obtain customer loads which are economic, meaning that the combination of CIAC payments and anticipated revenues must justify any related investment, thereby protecting existing customers from providing any kind of subsidy. In this regard, if a customer is willing to pay the full required CIAC, make the incremental capital investments downstream from our system to install new gas technologies such as natural gas re-fueling stations or fuel cells, and pay the full tariff distribution rate, no TED Rider will be required or applied.

However, in certain instances, a customer may be willing to pay a substantial CIAC and make the substantial downstream capital investments required to install a gas

technology, but may need a small discount from distribution rates to make its gas technology investment economic. In such instances, as long as the combination of CIAC and distribution revenues inclusive of the TED Rider fully justifies or exceeds the economic thresholds applied to PGW's new business extension tariff provisions, new loads will be added to PGW's system, which will benefit or at least not harm existing customers.

Q. WOULD THE TED RIDER PROVIDE UNFAIR ADVANTAGES TO NEW CUSTOMERS AT THE EXPENSE OF EXISTING CUSTOMERS?

A. No. Whether used to provide incremental revenues to make a PGW investment economic, or used to provide a reduced distribution rate to add incremental customer loads to PGW's system that would otherwise be lost, the TED Rider will have to provide a combination of CIAC payments and anticipated distribution revenues necessary to make any required PGW investment economic, thereby protecting and more likely benefiting existing customers.

Q. ARE TED RIDER CUSTOMERS INCLUDED IN THE FULLY PROJECTED FUTURE TEST YEAR REVENUE CALCULATIONS?

A. No. Because PGW has no means of projecting whether and to what extent the TED Rider will be utilized, PGW has not assumed that it will receive any revenues or incur any expenses in the fully projected future test year associated with the TED Rider.

III. PILOT MICRO-CHP INCENTIVE PROGRAM DETAILS

Q. PLEASE DESCRIBE PGW'S PROPOSED MICRO-CHP INCENTIVE PROGRAM.

A. PGW requests approval of a pilot Micro-CHP Incentive Program for small and medium sized commercial properties to incent market development and market acceptance of small targeted fuel-switching projects to increase the ability of these customers to expand

natural gas usage. Proposed projects will be required to satisfy an economic test (consistent with PGW's line extension provisions set forth in Section 10.1.B of its Gas Service Tariff) that require the anticipated incremental revenue to justify the incentive to be provided to the customer to undertake the project. For projects that qualify, PGW would offer up to $750 per kW for units between 20 kW and 50 kW and up to $1,000 for any units below 20 kW. PGW is not seeking to include the projected costs of these incentives in the fully projected test year revenue calculations because PGW has no means of projecting whether and to what extent the incentives will be offered. In addition, since the projects have to satisfy an economic test to justify the incentive, it is anticipated that the costs of the investment will be returned to PGW during the term of the agreement.

Q. PLEASE EXPLAIN THE DIFFERENCES BETWEEN PGW'S PROPOSED TED RIDER AND THE PROPOSED MICRO-CHP INCENTIVE.

A. Both proposals are intended to incent the development of innovative technologies and projects that will increase the ability of customers to expand natural gas usage. The TED Rider proposes to do so through project-specific negotiated delivery charges and/or customer charges and would be available to commercial customers of all sizes. However, the TED Rider alone is not likely to be attractive enough to incent smaller and medium sized commercial properties to undertake fuel-switching projects. For these customers, an additional incentive will be available through the Micro-CHP Incentive Program to further encourage the customer to undertake a fuel-switching project. By only permitting incentives to be available to customers installing Micro-CHP units (which are 50 kW and smaller), the Micro-CHP Incentive Program is specifically designed to target smaller customers. Customers qualifying to receive incentives through the Micro-CHP Incentive

Program would also be permitted to avail themselves of the TED Rider if they are able to satisfy all eligibility requirements.

Q. WHY HAS PGW FOCUSED ON MICRO-CHP PROJECTS TO DEVELOP ITS PROPOSED INCENTIVE?

A. In looking at market opportunities, PGW identified Micro-CHPs as one quantifiable way to provide an opportunity to satisfy its objectives because CHP projects achieve greater overall energy-efficiency by making use of the waste heat from electricity production that is not utilized in typical electric generation. Additionally, smaller customers interested in installing CHP units have less access to capital than larger customers interested in CHP.

Micro-CHP Incentive Program Details

Q. PLEASE DESCRIBE HOW THE PILOT WOULD OPERATE.

A. Similar to the TED Rider, PGW will evaluate proposed projects to ensure that they satisfy its proposed economic test that requires the anticipated incremental revenue to be generated to justify the incentive to be provided to the customer to undertake the project. For those projects that do qualify, PGW will provide education, technical assistance, and financial incentives for cost-effective energy-saving investments.

Q. HOW WILL PROPOSED PROJECTS BE EVALUATED TO DETERMINE WHETHER THEY SATISFY THESE REQUIREMENTS?

A. Customers seeking to avail themselves of this pilot will be required to submit project details including implementation costs, annual electricity production, gas usage before the project and anticipated gas usage after the project is completed. PGW will evaluate the proposal, verify the projections and determine whether or not the projected increased natural gas usage (and related incremental increased revenue to PGW) justify payment of the financial incentives to undertake the project.

Q. PLEASE EXPLAIN HOW PGW DERIVED THE INCENTIVES IT PROPOSES TO OFFER QUALIFYING PROJECTS.

A. PGW proposes to offer a Micro-CHP incentive of up to $750 per kW for units 20 kW - 50 kW and up to $1,000 for any units below 20 kW after estimating a range of installation and equipment costs for Micro-CHP units.[7] Existing CHP incentive programs, including those offered by the EDCs,[8] are typically structured on a dollar per-kW capacity basis. PGW used these existing program designs as a template to derive a per-kW amount that would cover the intended percentage of project upfront costs based on cost and savings data analyzed. PGW's Micro-CHP incentive is in the middle range of comparable programs identified.

Q. IS PGW SEEKING RECOVERY OF THE COSTS OF THESE PROPOSED INCENTIVES?

A. No. As stated previously, PGW is not seeking to include the projected costs of these incentives in the fully projected test year revenue calculations because PGW has no means of projecting whether and to what extent the incentives will be offered. In addition, since the projects have to satisfy an economic test to justify the incentive, it is

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[7] PGW proposes spending approximately $616,000 over the five years of the Micro-CHP pilot. This budget includes the costs of the incentives based on the assumption that approximately 25 units are installed. In addition to the incentives, the proposed budget will also fund administrative, marketing and evaluation costs which are approximately 10% of the total incentives.

[8] PECO and PPL have Act 129 programs that offer incentives for CHP. *See, PECO Energy Petition for Approval of its Act 129 Phase III Energy Efficiency and Conservation Plan*, Docket No. M-2013-251569, PECO Act 12 – Phase III Energy Efficiency and Conservation Plan (Program Years 2016-2020), avail at http://www.puc.pa.gov/pcdocs/1444592.pdf; *PPL Electric Petition for Approval of its Act 129 Phase III Energy Efficiency and Conservation Plan*, Docket No. M-2015-2515641, PPL Electric Act 129 – Phase III Energy Efficiency and Conservation Plan (Program Years 2016-2021), avail at: http://www.puc.pa.gov/pcdocs/1491907.pdf. In addition, UGI Utilities (Gas Division) and Central Penn Gas Offer a CHP incentive. *PUC v. UGI Utilities, Inc. – Gas Division*, Docket No. R-2015-2518438, Opinion and Order entered October 14, 2016 (approving CHP program); *PUC v. UGI Central Penn Gas, Inc.*, Docket No. R-2010-2214414, Opinion and Order entered July 13, 2012 (approving settlement authorizing CPG to offer rebates of $1,500 per kW of installed capacity for gas-powered CHP installations up to $100,000 per customer).

anticipated that the costs of the investment will be returned to PGW during the term of the agreement.

Q. PLEASE EXPLAIN WHY PGW IS SEEKING APPROVAL FOR A FIVE-YEAR PILOT.

A. PGW proposes to operate the pilot on a five-year basis in order to give the pilot a reasonable opportunity to develop and be meaningfully evaluated to determine whether or not it should continue beyond the five-year pilot. Micro-CHP projects are still uncommon in the market, so customers will likely require longer lead-times for project review and planning activities. In addition, more efficiencies and positive benefits will occur as a result of a longer pilot period. As the pilot matures and becomes more widely-known, it is expected that more customers will elect to participate and PGW believes program participation will increase. PGW believes that five years provides a reasonable amount of time to develop, implement, administer and assess the proposed pilot in order to provide meaningful and useful information about its effectiveness.

Logistically, as a new program, time will be needed to develop the pilot's market presence and administrative functions. Initially, PGW will perform all tasks associated with the pilot in-house, including program administration, project analysis, quality assurance, quality control, grant calculation, processing, and all marketing and business development activities.[9] PGW anticipates a six-month ramp-up period before the program is fully operational. While PGW employees will likely continue program administration and marketing activities, over time PGW may shift other responsibilities to technical assistance providers.

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[9] *Philadelphia Gas Works' Revised Petition For Approval of Energy Conservation and Demand Side Management Plan*, Docket Nos. R-2009-2139884, P-2009-2097639, Opinion and Order entered July 29, 2010.

In sum, establishing the appropriate operational and administrative protocols necessary to implement and run the pilot efficiently will take some time. Then, once established, more time is needed to allow the program to operate. The longer the period of time the program is operational, the more meaningfully the program can be assessed and evaluated.

Reporting and Evaluation for Micro-CHP Incentive Program

Q. HOW WILL PGW EVALUATE THE EFFECTIVENESS OF ITS PROPOSED PILOT?

A. Similar to the TED Rider, PGW proposes to provide a report to the Commission on the economics of the program six months prior to the end date of the pilot. In the event that PGW files a base rate case before that time, PGW proposes to include information about the economics of the Micro-CHP program in the supporting information for that base rate case. In either instance, PGW would propose whether to continue the pilot program in its current form or with modification. If the pilot program would not continue, no additional customers would be permitted to participate.

IV. CONCLUSION

Q. DOES THAT COMPLETE YOUR DIRECT TESTIMONY?

A. Yes.