National Grid

Boston Gas Company
Essex Gas Company
Colonial Gas Company

INVESTIGATION AS TO THE PROPRIETY OF PROPOSED TARIFF CHANGES

Testimony and Exhibits of:

Dr. Lawrence R. Kaufmann
Paul R. Moul

Book 4 of 11

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nationalgrid

Testimony of
Lawrence R. Kaufmann

Exhibit NG-LRK-1

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

D.P.U. 10-55

DIRECT TESTIMONY OF DR. LAWRENCE R. KAUFMANN

IN SUPPORT OF

OPERATING COST
NET INFLATION ADJUSTMENT MECHANISM

EXHIBIT NG-LRK-1

APRIL 16, 2010

DIRECT TESTIMONY OF DR. LAWRENCE R. KAUFMANN

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I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Lawrence R. Kaufmann. My business address is 22 East Mifflin, Suite 302, Madison, WI, 53703.

Q. By whom are you employed and what is your expertise?

A. I am a Senior Advisor to Pacific Economics Group LLC ("PEG") and to Navigant Consulting. My work includes designing and providing empirical support on performance-based regulation ("PBR") plans for energy utility clients. My specific duties include designing regulatory plans that create strong performance incentives, supervising research on the productivity and input price trends of utility industries, benchmarking utility cost performance and providing expert witness testimony. I have been involved in PBR-related projects for a large number of gas and electric utility clients.

Q. What is your professional and educational background?

A. Prior to co-founding the Madison office of PEG in 1998, I was employed from 1993 through 1998 as a Senior Economist at Christensen Associates, which is an economic consulting firm based in Madison. I received a PhD in Economics from the University of Wisconsin in 1993.

Q. Have you previously testified before the Massachusetts Department of Public Utilities?

A. Yes. I prepared both direct and rebuttal testimony on the PBR plan proposed by Boston Gas Company in Boston Gas Company, D.T.E. 03-40 (2003) and by Bay State Gas Company ("Bay State") in Bay State Gas Company, D.T.E. 05-27 (2005). I also testified in Bay State Gas Company, D.P.U. 09-30 (2009) ("D.P.U. 09-30") (base rate proceeding and revenue decoupling), Bay State Gas Company, D.T.E. 06-77 (2006) (PBR exogenous cost recovery), and in Bay State Gas Company, D.P.U. 07-89 (2008) (PBR-related petition for base-rate change). In 2007, I testified on behalf of a group of Massachusetts utilities in relation to the Department's examination of revenue decoupling and the efficient deployment of demand resources in Revenue Decoupling, D.P.U. 07-50 (2008). I also testified before the Department in Service Quality, D.T.E. 99-84 (2001) on PBR-related service-quality issues, with specific focus on a report that I co-authored and submitted to the Department in that docket on behalf of a group of Massachusetts gas and electric companies.

Q. Have you testified before other public utility commissions?

A. Yes. I have testified on PBR issues in Michigan, Rhode Island, Kansas, Hawaii, Oklahoma, and Kentucky. I have co-authored reports that were attached to PBR testimony in California and British Columbia. I have also testified overseas in Australia and New Zealand on PBR issues.

Q. Would you please explain the naming conventions that you will be using in your testimony and associated exhibits to identify the various National Grid USA entities involved in this proceeding?

A. Yes. This proceeding is a ratemaking proceeding for Boston Gas Company, Essex Gas Company, and Colonial Gas Company, which together represent the entirety of the regulated gas distribution operations conducted in Massachusetts by National Grid USA, as the associated parent company. In my testimony, I will refer to these three regulated entities as "National Grid" or the "Company," where the reference is to all three companies on a collective basis. Where the term "Boston Gas" is used in this proceeding, the Company will be referring to the consolidated operations of Boston Gas Company and Essex Gas Company. Where there is a need to refer to the legacy, "stand-alone" or individual operations of Boston Gas Company or Essex Gas Company, the Company will use the designation "BOS" and "ESX", respectively. The term "Colonial" or "COL" will reference the Colonial operations as an individual entity. Where the Company is referring to "National Grid USA" or "National Grid plc," it will use those precise terms.

Q. What is the purpose of your testimony?

A. My testimony is designed to accomplish the following: (1) discuss the rationale for a mechanism that recovers the growth in operation and maintenance ("O&M") expenses experienced by National Grid's Massachusetts gas operations arising from the impact of inflation and productivity; (2) explain the appropriate formula for adjusting O&M expenses for Boston Gas and Colonial on an annual basis, and (3) present an

appropriate value for the ”X factor” to be used in an O&M net inflation adjustment formula for National Grid’s Massachusetts gas distribution operations.

Q. How is your testimony organized?

A. The introduction to my testimony is presented in Section I. Section II briefly describes the PBR Plan currently in effect for the BOS system. Section III discusses the rationale for a net inflation adjustment formula for O&M expenses. Section IV explains the appropriate O&M adjustment formula for National Grid. Section V discusses O&M input price and productivity trends for natural gas distributors. Section VI presents my recommended X factor in National Grid’s O&M net inflation adjustment mechanism.

II. EXISTING PBR PLAN

Q. Would you please provide an overview of the existing PBR Plan applicable to the BOS system?

A. Yes. In D.T.E. 03-40, the Department approved a PBR Plan for BOS that adjusts base distribution rates annually by indexing prices (not revenues). The PBR Plan took effect on November 1, 2003 and was approved by the Department for a 10-year term. The allowed change in rates under the PBR Plan is set by a price cap index (“PCI”) formula, which is determined by the growth in an inflation factor minus an “X factor.” The inflation factor is equal to the percentage change in the GDP-PI index, as measured by the average of the current and prior year’s four quarterly GDP-PI index values, as of the second quarter of each year. The X factor is equal to 0.41

per cent, which is in turn equal to the sum of: 1) a productivity differential of -0.19 percent; 2) an inflation differential of 0.3 per cent, and 3) a consumer dividend of 0.3 per cent. The plan also includes other features such as an earnings sharing mechanism, which factors earnings deficiencies under a 6 percent return on equity, and excess earnings over a 14 percent return on equity, into the annual price change.

Q. What was the basis for the approved X factor?

A. The X factor approved by the Department was based on evidence I presented in D.T.E. 03-40. In particular, values for the productivity differential and inflation differential were based on my study of total factor productivity (TFP) and overall input price trends for gas distributors in the Northeast United States over the years 1990 through 2001. The Consumer Dividend was supported by an econometric benchmarking study that I conducted for BOS, which estimated that BOS's previous PBR plan (approved in D.P.U. 96-50) reduced its overall costs by an average of 0.3 per cent per annum, independent of all other factors. Although the Department's reasoning regarding the appropriate Consumer Dividend differed from the Company's, the Department approved a Consumer Dividend of 0.3 percent (D.P.U. 03-40, at 487).

III. PROPOSED MECHANISM

Q. Please describe the proposed O&M net inflation adjustment mechanism in general terms.

A. National Grid is proposing to terminate its existing PBR plan and, instead, apply formula-based adjustments to O&M costs only. The O&M net inflation adjustment mechanism will adjust the O&M reflected in the initial, overall revenue target used to calculate the per customer "target" for revenue decoupling purposes. This base-revenue level will be set to recover what the Department deems to be a reasonable and representative level of O&M costs for ratemaking purposes.

Q. Why is it appropriate to have a net inflation adjustment mechanism that applies to O&M expenses?

A. The prices of O&M inputs purchased by National Grid and other gas distributors increase over time. This input price inflation includes, but is not limited to, increases in the wages and benefits paid to National Grid workers; inflation in the prices paid for insurance; and inflation in prices paid for fuel that is used in National Grid trucks and other vehicles. Some of these input prices, particularly for labor and benefits, routinely increase at rates that exceed the overall rate of GDP-PI inflation. National Grid has little or no control over the increases in O&M costs associated with these price increases. This implies that input price inflation will put upward pressure on National Grid's O&M costs over time.

In the absence of an O&M net inflation adjustment mechanism, the Company will be forced to file more frequent general rate cases to recover the increase in their O&M costs. These rate filings will themselves involve administrative and regulatory costs that are ultimately recovered from ratepayers. In addition, frequent rate case filings make it more difficult and less rewarding for managers to pursue long-term strategies that contain the growth in O&M costs. A formula-based O&M adjustment mechanism is a more efficient means of recovering the inevitable growth in National Grid's O&M costs than the alternative of more frequent rate case filings. A formula-based O&M adjustment mechanism therefore tends to assist in keeping O&M costs lower than would otherwise be the case.

Q. Is the application of net inflation adjustment formulas to O&M expenses consistent with current Department policy?

A. Yes. The Department addressed this issue in D.P.U. 07-5-0-A. Specifically, in D.P.U. 07-50-A, the Department found that:

> An increase in costs to provide service can also occur as a result of inflationary pressures between base rate proceedings. In an effort to control costs, increase efficiency, and keep distribution companies out of rate cases for a reasonable period of time, the Department has approved various PBR plans that adjust a company's rates and associated revenues commensurate with inflation. The Department's straw proposal set a fixed revenue target per customer for each distribution company and, therefore, does not account for possible upward cost pressures in the revenue target. Eliminating an inflation adjustment to revenues could, in theory, lead to more frequent rate case filings to the extent a distribution company's ability to recover its allowed revenue requirement in the years after a rate case diminishes" (D.P.U. 07-50-A at 49).

Consequently, the Department found that it "will consider company-specific ratemaking proposals that account for: 1) the impact of capital spending on a company's revenue target, and 2) the inflationary pressures with respect to the prices of goods and services used by distribution companies" (D.P.U. 07-50-A at 50). National Grid's proposed O&M net inflation adjustment mechanism accounts for "inflationary pressures with respect to the prices of" O&M inputs used to provide gas distribution services and is therefore compatible with Department policy.

IV. THE NET INFLATION ADJUSTMENT FORMULA

Q. In general terms, what factors will be included in the formula used to adjust National Grid's O&M cost target?

A. The initial cost target will be adjusted each year to reflect two factors: 1) the annual growth in an inflation measure, which can grow at different rates each year; *minus* 2) an X factor, which will be fixed for all the years that the mechanism is in effect.

Q. Please describe the Company's proposed inflation measure.

A. The proposed inflation measure is the annual growth in the gross domestic product price index (GDP-PI). Inflation will be measured as the percentage change in the average of the four quarterly measures of the GDP-PI, relative to this same average in the prior year, as of the second quarter of each year.

Q. Why is the GDP-PI an appropriate inflation measure?

A. The GDP-PI is an official measure of price inflation in the US economy. It is considered to be a more accurate and more stable measure of economy-wide inflation

than other broad inflation measures, such as the consumer price index. The GDP-PI is also available in a timely fashion. In addition, there is ample precedent for the use of the GDP-PI in Massachusetts, since the Department has approved this inflation measure in rate indexing plans for Boston Gas (in D.P.U. 96-50 and D.T.E. 03-40), Bay State, NSTAR Electric Company, The Berkshire Gas Company and Blackstone Gas Company.

Q. Given the use of the GDP-PI as the inflation measure, what variables should be included in the X factor in National Grid's O&M net inflation adjustment mechanism?

A. When the GDP-PI is used as the inflation measure, the X factor in National Grid's proposed net inflation adjustment mechanism should be set using information on: 1) the difference between GDP-PI inflation and O&M input price inflation for gas distributors; and 2) the trend in O&M productivity for gas distribution companies.

The trend in O&M productivity is also referred to as the growth in O&M "partial factor productivity," or PFP, since O&M does not include the costs of capital inputs. In contrast, "total factor productivity", or TFP, measures the productivity of both O&M and capital inputs. Because National Grid is proposing to use a formula to adjust O&M only, it is appropriate for this O&M net inflation adjustment mechanism to use information on gas distributors' O&M PFP trends and not their TFP trends. Gas distribution TFP and overall input price trends would reflect changes in

distributors' capital input quantities and capital input prices that are not relevant when O&M costs are updated over time to reflect net inflationary pressures.

Q. Why is it appropriate to use information on O&M PFP growth and the difference between GDP-PI and O&M input price inflation to set the X factor in National Grid's proposed O&M net inflation mechanism?

A. This is demonstrated by considering the indexing logic that illustrates what factors account for the growth in O&M cost over time. Before presenting this algebra, however, it should be noted that the initial, overall revenue target approved by the Department in this proceeding will be applied on a per customer basis, and therefore, implicitly includes the recovery of an O&M per customer target. Consequently, the adjustment formula should be consistent with this application of initial "cast off" rates.

In that regard, O&M costs will be equal to an index of prices paid for O&M inputs multiplied by an index of the quantity of O&M inputs that are purchased, or:

$$Cost^{O\&M} = Input\ Prices^{O\&M} * Input\ Quantities^{O\&M} \quad [1]$$

Equation [1] can also be expressed on a rate of change basis. When this is done, the percentage change in O&M cost is equal to the percentage change in an index of O&M input prices plus the percentage change in an index of O&M input quantity:

$$\Delta Cost^{O\&M} = \Delta\ Input\ Prices^{O\&M} + \Delta\ Input\ Quantities^{O\&M} \quad [2]$$

Equation [2] will obviously not be changed if we subtract the percentage change in customers from both sides of the equation. Doing so yields:

$$\Delta Cost^{O\&M} - \Delta Customers = \Delta Input\ Prices^{O\&M} + \Delta Input\ Quantities^{O\&M} - \Delta Customers \quad [3]$$

The left hand side of equation [3] can be re-expressed as:

$$\Delta\left(\frac{Cost^{O\&M}}{Customer}\right) = \Delta Input\ Prices^{O\&M} + \Delta Input\ Quantities^{O\&M} - \Delta Customers \quad [4]$$

Equation [4] is, in turn, equivalent to:

$$\Delta\left(Cost^{O\&M}/Customer\right) = \Delta Input\ Prices^{O\&M} - \Delta PFP^{O\&M} \quad [5]$$

In equation [5], the change in O&M PFP $\left(\Delta PFP^{O\&M}\right)$ is measured as the percentage change in customer numbers $\left(\Delta N\right)$ minus the percentage in O&M input quantity $\left(\Delta Input\ Quantities^{O\&M}\right)$. If we add and subtract the growth in GDP-PI from the right-hand side of [5], this equation is unchanged. Doing so leads to the following expression:

$$\Delta\left(Cost^{O\&M}/Customer\right) = GDPPI + \Delta Input\ Prices^{O\&M} - GDPPI - \Delta PFP^{O\&M} \quad [6]$$

Equation [6] can be re-expressed as:

$$\Delta\left(Cost^{O\&M}/Customer\right) = GDPPI - X \quad [7]$$

Where $X = \Delta PFP^{O\&M} + \left(GDPPI - \Delta Input\ Prices^{O\&M}\right)$. Thus, the X factor will depend on: 1) the growth in O&M partial factor productivity, and 2) the difference

between the growth in the GDP-PI and the growth in O&M input prices for gas distributors.

Q. What is the intuitive rationale for including these two components of the X factor in the O&M net inflation adjustment mechanism?

A. The O&M inflation adjustment mechanism should be "net" of O&M PFP gains that gas distributors can be expected to make since, all else equal, these PFP gains reduce O&M costs. The O&M inflation mechanism should also reflect inflation in the prices paid for the O&M inputs that are purchased directly by gas distributors. The GDP-PI measures inflation in the prices paid for *outputs* in the overall US economy, not gas distributors' O&M inputs. GDP-PI inflation can differ from O&M input inflation for gas distributors, and the second component of the X factor is designed to capture this differential and make the mechanism better reflect gas distributors' actual O&M input price inflation.

Q. If the O&M net inflation mechanism is designed to reflect O&M input price inflation, why is a measure of gas distributors' O&M input price inflation not used directly in the adjustment formula?

A. The net inflation adjustment formula does not use gas distribution O&M input price inflation directly because this information is not publicly available in a timely fashion, as are GDP-PI data. However, detailed information on gas distributors' O&M input prices can be purchased from private sources, and an appropriate index of gas distributors' O&M input prices can be developed using this data. This is the approach I used. I estimated the historical difference between GDP-PI inflation and this

constructed measure of gas distribution O&M input prices and used this result for setting the X factor in National Grid's proposed O&M net inflation mechanism.

Q. Is this approach to measuring the inflation differential consistent with Department precedent?

A. Yes. As previously discussed, in the PBR Plan approved for BOS in D.T.E. 03-40 (as well as in D.P.U. 96-50), the X factor included an "inflation differential" term. The purpose of this term was to help the overall indexing mechanism reflect input price and (total factor) productivity trends in the gas distribution industry, even though the selected inflation measure was the GDP-PI and not a direct measure of industry input price trends. This inflation differential was measured using historical data and became a fixed component of the X factor. My approach for National Grid's O&M net inflation mechanism is consistent with this Department precedent, although it clearly applies to the difference between GDP-PI and O&M input price inflation rather than the overall input price differential.

V. MEASURED O&M INPUT PRICE AND PRODUCTIVITY TRENDS

Q. Please describe your research on gas distribution O&M input price trends.

A. I developed an index of O&M input prices for a regional sample of 22 gas distributors in the Northeast US using Global Insight data. In its previous determinations for BOS, the Department set the X factor using a regional rather than national definition of the gas distribution industry. This decision was affirmed in D.T.E. 05-27. Further

details of this work are presented in my report *O&M Productivity and Input Price Analysis for National Grid*, provided as Exhibit NG-LRK-2.

Global Insight presents information on input price trends for 46 components of gas distribution O&M inputs. I computed an overall measure of O&M input price inflation, as a cost share-weighted average of the change in Global Insight's individual O&M input price subindices. The weight applied to any individual input price subindex was its share of the relevant gas distribution O&M cost.

Q. How was the relevant gas distribution O&M cost defined?

A. Relevant gas distribution O&M cost comprised all individual FERC Form 2 accounts between Account Numbers 870 and 935, with one exception. The costs of Account 926, Employee Pensions and Benefits, were excluded from the analysis. Under Department ratemaking practice, Employee Pension and Benefits costs are recovered outside of base rates through a reconciling mechanism. It would therefore not be appropriate for changes in the prices of these inputs to be reflected in my O&M input price study, since the net O&M adjustment mechanism will not apply to this category of costs.

Q. What did your results show?

A. My results showed that O&M input prices for Northeast gas distributors increased at an average annual rate of 2.97 per cent over the period 1998 through 2008.

Q. What was GDP-PI inflation over this same period?

A. The GDP-PI, computed by the Bureau of Economic Analysis within the U.S. Department of Commerce, increased at an average annual rate of 2.38 per cent over the years 1998 through 2008. Thus, my results show that annual inflation in O&M input prices for gas distributors in the Northeast U.S. exceeded GDP-PI inflation by 0.59 per cent on average. Thus, the inflation differential component of the X factor would be -0.59 per cent (*i.e.* 2.38% - 2.97% = -0.59%).

Q. Why is this component of the X factor negative?

A. This component of the X factor is negative simply because gas distributors' O&M input prices tend to grow more rapidly than the GDP-PI. Thus, if an O&M net inflation adjustment mechanism uses GDP-PI as the inflation measure, the selected inflation measure tends to under-compensate gas distributors for the growth in O&M input prices. A negative component of the X factor would have the effect of ensuring that the O&M net inflation mechanism better tracks the actual growth in O&M input prices and would compensate gas distributors appropriately for the O&M input price inflation that they experience.

Q. Please describe your research on gas distribution O&M partial factor productivity trends.

A. I developed an index of O&M PFP growth for the Northeast gas distribution industry. The trend in O&M PFP was measured as the growth in customer numbers minus the growth in O&M input quantity. Growth in gas distribution customer numbers was

measured using information from the Energy Information Administration Form 176. The growth in gas distribution O&M quantity was measured as the growth in relevant gas distribution O&M cost minus the growth in the corresponding O&M input price index. Both the relevant gas distribution O&M cost and the associated O&M input price index exclude pensions and benefits since National Grid proposes to exclude recovery of these costs from the net O&M inflation adjustment mechanism. Further details of this work are presented in my report *O&M Productivity and Input Price Analysis for National Grid*, provided as Exhibit NG-LRK-2.

Q. What did your results show?

A. My results showed that O&M PFP for gas distributors in the Northeast U.S. increased at an average annual rate of 0.51 per cent in the years 1998 through 2008.

VI. RECOMMENDED X FACTOR

Q. What value do you recommend for the X factor in the O&M net indexing mechanism for National Grid?

A. I recommend an X factor of 0.52 per cent for National Grid's O&M net inflation adjustment formula. This X factor is based on: 1) the estimated differential between GDP-PI inflation and O&M input prices for Northeast gas distributors of -0.59 per cent; plus 2) the estimated O&M PFP trend for Northeast gas distributors of 0.51 per cent, and 3) a Consumer Dividend of 0.60 per cent. The sum of these three components is 0.52 per cent (*i.e.* -0.59% + 0.51% + 0.60% = 0.52%)

Q. What is the basis of your recommended Consumer Dividend?

A. My recommended Consumer Dividend is informed by relevant regulatory precedents in Massachusetts and other jurisdictions, empirical study and professional judgment.

Q. What are the relevant regulatory precedents and empirical study that informed your recommendation?

A. My recommendation is informed by a decision rendered on PBR by the Ontario Energy Board ("OEB") in the Canadian Province of Ontario. This decision established PBR plans for more than 80 separate electricity distributors in the Province. I was advising the OEB Staff in that proceeding.

In that proceeding, I recommended that different Consumer Dividends be established for separate "cohorts" of distributors. These cohorts were determined using benchmarking evidence on Ontario distributors' relative O&M cost performance. The benchmarking studies were conducted by PEG for OEB Staff as part of a separate but related project.

The OEB used this evidence to determine three separate "cohorts" of distributors that were differentiated by their relative levels of O&M cost efficiency. For the most efficient distributor cohort, the Consumer Dividend approved by the OEB was 0.20 per cent. For distributors of average efficiency, the Consumer Dividend approved by the OEB was 0.40 per cent. For the least efficient distributors in Ontario, the Consumer Dividend approved by the OEB was 0.60 per cent. Thus, in the OEB's

judgment, the maximum reasonable consumer dividend for electricity distributors in Ontario was 0.60 per cent. I believe this precedent also supports a maximum Consumer Dividend of 0.60 per cent for National Grid at this time.

Q. Why is this regulatory precedent relevant for determining a Consumer Dividend to be used in the net inflation adjustment mechanism for National Grid?

A. Based on my understanding of the analysis that underlies the OEB's determination, I believe the OEB precedent can inform judgments about an appropriate Consumer Dividend in National Grid's O&M net inflation mechanism for several reasons. First, the OEB is one of the leading and most experienced PBR jurisdictions in North America. This proceeding constituted the "third generation" set of PBR plans that the OEB approved for electricity distributors in the Province.

Second, the research and analysis that I produced on behalf of OEB Staff in that proceeding was subject to considerable review and consultation by stakeholders. These stakeholders included distribution companies that would be subject to the PBR plan, the Power Workers' Union, and about half a dozen separate customer groups. My evidence and recommendations were also independently reviewed and approved by the Board itself.

Third, this is a recent regulatory decision. These Consumer Dividend levels were approved by the Board in September 2008 and, therefore, are informed by evidence

that is more current than what was considered by the Department in 2003 when it set the Consumer Dividend in D.T.E. 03-40.

Lastly, the Consumer Dividends were linked directly to benchmarking evidence on utilities' O&M cost performance. This increases their relevance to a net inflation adjustment mechanism that specifically applies to O&M costs.

Q. Is there any other precedent that is informing your decision?

A. Yes. In D.T.E. 03-40, the Department's decision regarding the Consumer Dividend was supported by an econometric benchmarking study that I conducted for BOS. This study estimated that the previous BOS PBR plan reduced the Company's overall costs by an average of 0.3 per cent per annum. Although, the Department found that 0.3 per cent was the minimum cost savings attributable to the previous PBR plan, it concluded that a Consumer Dividend of 0.3 per cent was "reasonable and warranted in the record before us" (D.T.E. 03-40 at 487). Based on benchmarking work done since the BOS study presented in D.T.E. 03-40, I believe 0.60 per cent is the *maximum* Consumer Dividend that could be supported for National Grid at this time.

Q. How has your professional judgment factored into this recommendation?

A. In D.T.E. 03-40 the Department found that:

> The consumer dividend serves as a "future" productivity factor because it is intended to reflect expected consumer gains in productivity due to the move from cost-of-service regulation to performance-based regulation….Predicting the "expected future gains in productivity" for

> Boston Gas is difficult because of uncertainty about economic conditions in the future (D.T.E. 03-40 at 480).

This is an important point because determining an appropriate "future productivity factor" involves making judgments about future conditions that can never be known with certainty. In my opinion, the "uncertainty about economic conditions in the future" is far greater today than in 2003, when the Department approved the BOS PBR plan. In light of these more uncertain times, I believe it is important for judgments about Consumer Dividends to be grounded in the recent experience of regulated industries, which is how I have approached my recommendation in this case.

Q. In your opinion, is 0.60 per cent an aggressive but achievable Consumer Dividend for National Grid at this time?

A. Yes, I believe it is. The Consumer Dividend in the current BOS PBR Plan is 0.30 per cent. A consumer dividend of 0.60 per cent would therefore represent a doubling of the "stretch" productivity goal that is reflected in the existing BOS PBR plan.

In addition, it should be noted that a 0.60 Consumer Dividend represents a "stretch" productivity goal that is, in fact, greater than the current O&M PFP trend for Northeastern gas distributors. I estimate that O&M PFP for the Northeast gas distribution industry grew at an average rate of 0.51 per cent over the 1998 to 2008 period. These measured O&M PFP gains reflect cost savings that have resulted from mergers between sampled distribution companies in the Northeast U.S. during this

period, as well as other factors. Adding a "stretch" productivity goal of 0.60 per cent to a measured 0.51 per cent PFP trend therefore effectively embodies an overall productivity target for National Grid that is more than double the industry's recent O&M productivity trend.

Lastly, it should be noted that BOS has been subject to PBR since 1997 and has therefore been subject to a form of regulation that creates strong performance incentives for a sustained period of time. This experience implies that the National Grid gas distributors in Massachusetts have relatively little ability to achieve incremental PFP gains compared with the Northeast gas distribution industry. When the BOS PBR Plan was updated, the Department reduced the Consumer Dividend for Boston Gas from 0.5 per cent (in the plan approved in D.P.U. 96-50) to its current value of 0.3 per cent. This reduction was made because of the cost-cutting gains that Boston Gas made under its first PBR plan, which reduce the potential opportunities to cut costs further in the future. This rationale could, in theory, apply in this instance as well and argue for a further reduction in the consumer dividend. However, I am not recommending a further reduction in the Company's Consumer Dividend and, instead, I am recommending an increase. This effectively makes the "stretch" goal for incremental productivity gains even more aggressive than what the Department approved in the BOS PBR plan in 2003.

Q. Does this conclude your testimony?

A. Yes, it does.

Exhibit NG-LRK-2

O&M Productivity and Input Price Analysis for National Grid

Pacific Economics Group Research, LLC

O&M Productivity and Input Price Analysis for National Grid

April 16, 2010

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1. INTRODUCTION AND SUMMARY

1.1 Introduction

National Grid is proposing that the recovery of its operations and maintenance (O&M) expenses be adjusted over time to reflect the impact of inflation and productivity. National Grid asked Pacific Economics Group Research LLC ("PEG") to recommend an appropriate formula for adjusting the recovery of its O&M expenses. This formula would include an inflation measure and an X factor which reflects the impact of O&M partial factor productivity (PFP) growth.

This report presents the results of PEG's analysis for National Grid. Following a brief summary of the work, Section 2 discusses the data used in our study. Section 3 presents our calculation of O&M input price trends for gas distributors in the Northeast US and compares these trends to contemporaneous GDP-PI inflation. Section 4 calculates O&M PFP trends for gas distributors in the Northeast. Section 5 presents our recommended X factor in an O&M net inflation adjustment mechanism for National Grid.

1.2 Summary of Research

PEG developed estimates of O&M input price and PFP trends for the Northeast gas distribution industry. There were 22 gas distributors in our Northeastern US sample. These companies serve 76% of gas distribution customers in the region.

PEG developed a measure of O&M input price trends using Global Insight (GI) data. We excluded pensions and benefits from the calculation of O&M input prices because National Grid is proposing to recover changes in these costs directly through a reconciling mechanism. The O&M net inflation formula will accordingly not be applied to pension costs.

O&M PFP growth is defined as the growth in output quantity minus the growth in the quantity of O&M inputs. We used the change in total number of gas distribution customers to measure the growth in output quantity. The growth in O&M input quantity

was measured as the growth in gas distributors' relevant O&M cost minus the growth in the associated O&M input price index. Pension costs were excluded from distributors' O&M costs as well as the associated input price index since these costs will be recovered directly through a reconciling mechanism.

PEG estimates that O&M input prices grew at an average rate of 2.97% per annum for Northeastern gas distributors over the 1998-2008 period. The GDP-PI grew at an average rate of 2.38% per annum over the same period. Therefore, O&M input price inflation for gas distributors in the Northeast US has exceeded GDP-PI inflation by 0.59% per annum over the 1998-2008 period.

PEG estimates that O&M PFP grew at an average annual rate of 0.51% per annum for gas distributors in the Northeast US over the 1998-2008 period. Customers grew by 0.92% per annum over this period, while input quantity grew at an average rate of 0.41% per annum. There was, however, a marked decline in gas distributors' O&M PFP growth in later sample years.

The appropriate X factor in an O&M net inflation formula for National Grid is the sum of: 1) the difference between GDP-PI inflation and the growth in industry O&M input prices; 2) the growth in the industry's O&M partial factor productivity; and 3) a consumer dividend. We estimate that the difference between GDDPI inflation and O&M input prices is -0.59%, and gas distributors' O&M PFP trend is 0.51%. We also recommend a 0.60% customer dividend. PEG therefore recommends an X factor of 0.52% (*i.e.* 0.52% =-0.59% + 0.51% + 0.60%) in the O&M net inflation mechanism for National Grid.

2. DATA

PEG used what we believed were the best available data to estimate O&M input price and PFP trends for Northeastern gas distributors. For both O&M input price and PFP computations, we excluded data related to pensions. The reason is that National Grid proposes to recover changes in pension costs using a reconciling mechanism rather than through the O&M net inflation mechanism. The input price and PFP measures used to adjust O&M costs would therefore be distorted if they reflected input prices and cost pressures associated with pension costs and these input price or cost pressures differed from other O&M cost categories. Because the O&M adjustment formula will not be applied to pension costs, it is appropriate for pensions to be excluded from the calculations of O&M input price and PFP trends used to set the terms of National Grid's O&M net inflation adjustment mechanism.

It should also be recognized that O&M PFP growth is defined as the growth in output quantity minus the growth in the quantity of O&M inputs. We used the change in total number of gas distribution customers to measure the growth in output quantity. The growth in O&M input quantity was measured as the growth in gas distributors' relevant O&M cost minus the growth in the associated O&M input price index.

PEG's analysis used separate data sources for O&M prices, O&M costs, and customer numbers. We calculated O&M input prices using data developed by Global Insight (GI). GI compiles and publishes information on input price trends for 46 components of gas distribution O&M costs. We believe this represents the most detailed available data on O&M input price trends for US gas distributors.

Our source for data on O&M costs was SNL. The applicable cost measure was gas distribution operation and maintenance expenses plus allocated administrative and general costs. The operations corresponding to this definition of cost include gas delivery, customer account, and customer information services of distributors. Costs exclude gas procurement, gas storage, gas transmission expenses, and pension expenses. Our data source for customer numbers was the Form 176, compiled by the Energy Information Administration of the US Department of Energy.

PEG identified a sample of 22 gas distributors in the Northeast US which reported the necessary O&M cost and customer numbers consistently, and had high quality data, over the 1998 to 2008 period. The Northeastern United States was defined to be New England, New York, New Jersey and Pennsylvania. Our sample includes most of the larger distributors in the Northeast region and covers 76% of gas distribution customers in the region. The sampled distributors are listed in Table 1.

Table One

GAS DISTRIBUTION SAMPLE

Bay State Gas Company	287,164
Boston Gas Company	615,321
Brooklyn Union Gas Company	1,191,600
Central Hudson Gas & Electric Corp	74,159
Colonial Gas	196,198
Columbia Gas of Pennsylvania, Inc.	412,450
Connecticut Natural Gas Corporation	156,594
Consolidated Edison Company of New York, Inc.	1,068,720
New Jersey Natural Gas Company	486,089
New York State Electric and Gas	258,822
Niagara Mohawk Power Corporation	575,428
NSTAR Gas Company	260,419
Orange and Rockland Utilities, Inc.	127,363
PECO Energy Company	483,457
Peoples Natural Gas Company	357,038
Public Service Electric and Gas Company	1,742,030
Rochester Gas and Electric Corp	297,778
South Jersey Gas Company	337,146
Southern Connecticut Gas Company	175,040
UGI Penn Natural Gas, Inc.	160,801
UGI Utilities, Inc.	329,947
Yankee Gas Services Company	204,835
Total Sampled Customers Northeast (2008)	**9,798,399**
Total Gas Distribution Customers Northeast US (2008)[1]	**12,900,331**
Percent of Customers in Sample	**76.0%**

[1]Source: Natural Gas Annual 2008 Pg. 42

3. O&M INPUT PRICE MEASURES

We used a two-step process for developing an O&M input price index. First, we developed O&M input price indices for every company in our sample. Each selected GI input price subindex was weighted by the share of the associated O&M cost category in the gas distributor's own O&M cost (net of pensions, which were excluded entirely from the analysis).

The second step was to develop an O&M input price index for the Northeast sample using the O&M input price indexes constructed for individual gas distributors. The O&M price index for the entire sample was constructed as a cost-share weighted index of the individual distributor O&M price indices. The weight applied to each gas distributor when computing this index was equal to its share of overall O&M cost (net of pensions) for the sample.

Table Two provides details on the individual indices used in the construction of the non-labor input price index for gas distribution O&M. The weights are those that correspond to the share of non-labor O&M costs associated with each of these O&M cost categories. Table Three provides details on the inflation in components of O&M input price inflation. These subindexes were constructed by PEG from GI information on input price trends for different components of O&M cost. Labor's share of O&M cost was calculated from available SNL data from sampled companies.

The appropriate X factor in the O&M net inflation adjustment mechanism for National Grid depends on the difference between GDP-PI inflation and O&M input price inflation. The GDP-PI is a measure of economy-wide output price inflation that is estimated by the US Bureau of Economic Analysis. We compared the growth in the GDP-PI over the 1998-2008 period to contemporaneous O&M input price inflation for our sampled gas distributors. The O&M input price index for these sampled distributors was constructed using the process described above. The comparison of GDP-PI and O&M input price inflation for sampled distributors is presented in Table Four.

Table Two

CONSTRUCTION OF THE NON-LABOR INPUT PRICE INDEX FOR GAS DISTRIBUTION O&M

	Supervision / Engineering	Load Dispatching	Compressor Stations	Compr Station Fuel & Power	Customer Installation	Mains & Services	Meter & House Regulator	Measurement / Regulation Station Equipment	Rents	Other Distribution	Maintenance: Supervision & Engineering	Maintenance: Mains	Maintenance: Meter/House Regulator	Maintenance: Other Equip	Maintenance:Structures	Maintenance: Services	Maintenance: Measurement / Regulation Station Equipment	Distribution O&M Index
Index																		
1998	1.205	1.152	1.088	0.957	1.104	1.092	1.095	1.098	1.020	1.152	1.205	1.111	1.079	1.088	1.161	1.132	1.131	1.0000
1999	1.241	1.168	1.110	1.006	1.116	1.114	1.108	1.117	1.011	1.167	1.241	1.128	1.072	1.080	1.177	1.151	1.130	1.0126
2000	1.293	1.201	1.174	1.349	1.138	1.172	1.134	1.140	1.039	1.194	1.293	1.175	1.101	1.106	1.191	1.195	1.161	1.0446
2001	1.329	1.237	1.190	1.399	1.163	1.202	1.164	1.171	1.050	1.222	1.329	1.197	1.131	1.128	1.191	1.230	1.193	1.0672
2002	1.351	1.253	1.199	1.224	1.176	1.178	1.178	1.191	1.064	1.237	1.351	1.208	1.128	1.131	1.196	1.253	1.195	1.0708
2003	1.386	1.284	1.255	1.605	1.202	1.271	1.203	1.227	1.060	1.258	1.386	1.251	1.122	1.140	1.214	1.294	1.203	1.1050
2004	1.432	1.317	1.316	1.840	1.225	1.338	1.221	1.254	1.072	1.286	1.432	1.334	1.122	1.142	1.315	1.386	1.261	1.1439
2005	1.478	1.362	1.438	2.392	1.277	1.456	1.272	1.314	1.154	1.342	1.478	1.449	1.178	1.176	1.396	1.523	1.334	1.2114
2006	1.525	1.410	1.545	2.383	1.347	1.473	1.345	1.396	1.159	1.383	1.525	1.592	1.253	1.221	1.489	1.742	1.411	1.2720
2007	1.581	1.461	1.610	2.453	1.391	1.499	1.400	1.447	1.193	1.419	1.581	1.652	1.353	1.292	1.522	1.827	1.492	1.3118
2008	1.638	1.529	1.798	3.118	1.474	1.620	1.488	1.540	1.283	1.479	1.638	1.838	1.447	1.354	1.623	2.026	1.583	1.4004
Weight	8.8%	1.9%	0.3%	0.5%	9.2%	18.6%	11.9%	2.9%	0.7%	13.2%	2.5%	14.3%	3.7%	1.1%	0.7%	7.8%	2.5%	
Growth Rate																		
1999	2.9%	1.4%	2.0%	5.0%	1.1%	2.0%	1.2%	1.7%	-0.9%	1.3%	2.9%	1.5%	-0.7%	-0.7%	1.4%	1.7%	-0.1%	1.2%
2000	4.1%	2.8%	5.6%	29.3%	2.0%	5.1%	2.3%	2.0%	2.7%	2.3%	4.1%	4.1%	2.7%	2.4%	1.2%	3.8%	2.7%	3.1%
2001	2.7%	3.0%	1.4%	3.6%	2.2%	2.5%	2.6%	2.7%	1.1%	2.3%	2.7%	1.9%	2.7%	2.0%	0.0%	2.9%	2.7%	2.1%
2002	1.6%	1.3%	0.8%	-13.4%	1.1%	-2.0%	1.2%	1.7%	1.3%	1.2%	1.6%	0.9%	-0.3%	0.3%	0.4%	1.9%	0.2%	0.3%
2003	2.6%	2.4%	4.6%	27.1%	2.2%	7.6%	2.1%	3.0%	-0.4%	1.7%	2.6%	3.5%	-0.5%	0.8%	1.5%	3.2%	0.7%	3.1%
2004	3.3%	2.5%	4.7%	13.7%	1.9%	5.1%	1.5%	2.2%	1.1%	2.2%	3.3%	6.4%	0.0%	0.2%	8.0%	6.9%	4.7%	3.5%
2005	3.2%	3.4%	8.9%	26.2%	4.2%	8.5%	4.1%	4.7%	7.4%	4.3%	3.2%	8.3%	4.9%	2.9%	6.0%	9.4%	5.6%	5.7%
2006	3.1%	3.5%	7.2%	-0.4%	5.3%	1.2%	5.6%	6.1%	0.4%	3.0%	3.1%	9.4%	6.2%	3.8%	6.4%	13.4%	5.6%	4.9%
2007	3.6%	3.6%	4.1%	2.9%	3.2%	1.7%	4.0%	3.6%	2.9%	2.6%	3.6%	3.7%	7.7%	5.7%	2.2%	4.8%	5.6%	3.1%
2008	3.5%	4.5%	11.0%	24.0%	5.8%	7.8%	6.1%	6.2%	7.3%	4.1%	3.5%	10.7%	6.7%	4.7%	6.4%	10.3%	5.9%	6.5%

Table Three

CONSTRUCTION OF THE INPUT PRICE INFLATION BY O&M CATEGORY

	Distribution			Customer Care[1]			Administration & General		
	Labor	Non-Labor	O&M	Labor	Non-Labor	O&M	Labor	Non-Labor	O&M
Weight	62%	38%		37%	63%		25%	75%	
1999	2.5%	1.5%	2.2%	2.5%	1.8%	2.0%	2.5%	2.6%	2.6%
2000	3.2%	3.5%	3.3%	3.2%	2.6%	2.8%	3.2%	3.6%	3.5%
2001	3.6%	2.4%	3.1%	3.6%	2.5%	2.9%	3.6%	3.4%	3.4%
2002	1.6%	0.5%	1.2%	1.6%	1.2%	1.4%	1.6%	2.9%	2.6%
2003	3.3%	3.4%	3.4%	3.3%	2.2%	2.6%	3.3%	3.3%	3.3%
2004	3.3%	3.8%	3.5%	3.3%	1.6%	2.2%	3.3%	3.3%	3.3%
2005	4.1%	6.1%	4.8%	4.1%	2.9%	3.4%	4.1%	3.5%	3.6%
2006	2.7%	5.2%	3.6%	2.7%	2.9%	2.8%	2.7%	3.4%	3.2%
2007	1.7%	3.5%	2.4%	1.7%	2.9%	2.5%	1.7%	3.6%	3.2%
2008	3.4%	6.9%	4.8%	3.4%	3.8%	3.7%	3.4%	3.8%	3.7%
Average Annual Growth Rate 1998-2008	2.95%	3.69%	3.23%	2.95%	2.44%	2.62%	2.95%	3.33%	3.24%

[1]Customer care is defined as the sum of customer accounts, customer service and information expenses, and sales.

Table Four

O&M INPUT PRICE AND GDP-PI INFLATION

	GDP-PI		O&M Inflation		Difference
	Index	% Change	Index	% Change	
1998	85.5		1.00		
1999	86.8	1.5%	1.02	2.2%	-0.7%
2000	88.6	2.1%	1.06	3.2%	-1.0%
2001	90.7	2.2%	1.09	3.1%	-0.8%
2002	92.1	1.6%	1.11	1.6%	0.0%
2003	94.1	2.1%	1.17	5.8%	-3.6%
2004	96.8	2.8%	1.17	0.2%	2.6%
2005	100.0	3.3%	1.22	3.9%	-0.6%
2006	103.3	3.2%	1.26	3.2%	0.0%
2007	106.2	2.8%	1.29	2.6%	0.2%
2008	108.5	2.1%	1.35	4.0%	-1.9%
Average Annual Growth Rate 1998-2008		2.38%		2.97%	-0.59%

It can be seen that the GDP-PI grew at an average annual rate of 2.38% over the 1998-2008 period. The O&M price index for gas distributors in the Northeast US grew by an average of 2.97% per annum over this period. Thus, O&M input price inflation for gas distributors in the Northeast US outpaced GDP-PI inflation by an average of 0.59% per year. Since the GDP-PI is the selected inflation measure for the O&M adjustment formula, these trends imply that the X factor should contain a -0.59% inflation differential (*i.e.* 2.38% - 2.97% = -0.59%). This negative differential is necessary for the net inflation formula to reflect the actual change in O&M input prices facing Northeast gas distributors.

4. O&M PRODUCTIVITY TRENDS

As discussed, O&M PFP growth is defined as the growth in output quantity minus the growth in the quantity of O&M inputs. We used the change in total number of gas distribution customers to measure the growth in output quantity. The growth in O&M input quantity was measured as the growth in gas distributors' relevant O&M cost minus the growth in the associated O&M input price index.

Table Five presents information on changes in total O&M cost (net of pensions), changes in input prices and changes in input quantity. It can be seen that O&M input quantity for Northeast gas distributors has grown by 0.41% per annum over the 1998-2008 period.

Table Six presents information on the change in customer numbers, O&M input quantity and O&M PFP for the Northeast gas distributors. It can be seen that O&M PFP grew at an average of 0.51% per annum for Northeast gas distributors over the 1998-2008 period. Output quantity (*i.e.* customer numbers) grew by 0.92% per annum while O&M input quantity grew at an average rate of 0.41% over the sample period.

It is also notable that the change in O&M PFP has declined markedly between the first and second half of the sample period. In the first half of the sample period (1998-2003), O&M PFP growth for the Northeast sample averaged 1.92% per annum. In the second half of the sample period (2003-2008), O&M PFP declined by 0.90% per annum. These results may imply that O&M PFP growth is currently decelerating for gas distributors.

Table Five

O&M Input Quantity Growth

	O&M Cost % Change	O&M Input Price % Change	O&M Input Quantity % Change
1999	1.6%	2.2%	-0.6%
2000	8.0%	3.2%	4.8%
2001	-4.3%	3.1%	-7.3%
2002	-0.4%	1.6%	-2.0%
2003	7.2%	5.8%	1.4%
2004	3.6%	0.2%	3.4%
2005	7.8%	3.9%	3.9%
2006	-1.8%	3.2%	-5.0%
2007	6.1%	2.6%	3.5%
2008	6.1%	4.0%	2.0%
Average Annual Growth Rate 1998-2008	3.38%	2.97%	0.41%

Table Six

O&M PFP Growth

	Number of Customers	O&M Input Quantity Index	PFP Index
	% Change	% Change	% Change
1999	0.7%	-0.6%	1.3%
2000	2.4%	4.8%	-2.4%
2001	1.6%	-7.3%	8.9%
2002	0.3%	-2.0%	2.3%
2003	0.9%	1.4%	-0.5%
2004	0.6%	3.4%	-2.8%
2005	0.4%	3.9%	-3.5%
2006	1.3%	-5.0%	6.3%
2007	1.1%	3.5%	-2.4%
2008	-0.1%	2.0%	-2.1%
Average Annual Growth Rate 1998-2008	0.92%	0.41%	0.51%

5. RECOMMENDED X FACTOR

National Grid will adjust the recovery of its O&M expenses using a GDP-PI minus X mechanism. The appropriate X factor in an O&M net inflation adjustment mechanism for National Grid will be the sum of: 1) the difference between GDP-PI inflation and the growth in industry O&M input prices; 2) the growth in the industry's O&M partial factor productivity; and 3) a consumer dividend.

We estimate that the difference between GDP-PI inflation and gas distributors' O&M input prices is -0.59%. We also estimate an industry O&M PFP trend of 0.51%. The sum of these two components of the X factor is -0.08%.

We also recommend that the X factor contain a consumer dividend of 0.60%. The rationale for this recommendation is explained in the accompanying testimony of Dr. Kaufmann. When this consumer dividend is added to the inflation differential and O&M PFP trend, the recommended X factor is equal to 0.52%. Table Seven presents details on the calculation of the recommended X factor.

Table Seven

X Factor Calculation

	GDPPI		O&M Input Price		O&M PFP		Consumer Dividend/O&M PFP "Stretch Factor"	Overall X Factor
	Index	Growth (A)	Index	Growth (B)	Index	Growth (C)	(D)	(A)-(B)+(C)+(D)
1998	85.5		1.000		1.000		NA	
1999	86.8	1.5%	1.022	2.2%	1.013	1%	NA	0.6%
2000	88.6	2.1%	1.055	3.2%	0.989	-2.4%	NA	-3.4%
2001	90.7	2.2%	1.088	3.1%	1.082	8.9%	NA	8.1%
2002	92.1	1.6%	1.106	1.6%	1.107	2.3%	NA	2.3%
2003	94.1	2.1%	1.171	5.8%	1.101	-0.5%	NA	-4.1%
2004	96.8	2.8%	1.174	0.2%	1.071	-2.8%	NA	-0.2%
2005	100.0	3.3%	1.221	3.9%	1.034	-3.5%	NA	-4.1%
2006	103.3	3.2%	1.260	3.2%	1.101	6.3%	NA	6.3%
2007	106.2	2.8%	1.293	2.6%	1.075	-2.4%	NA	-2.1%
2008	108.5	2.1%	1.346	4.0%	1.053	-2.1%	NA	-4.0%
Average Annual Growth Rate 1998-2008		2.38%		2.97%		0.51%	0.60%	0.52%