EB-2007-0606/EB-2007-0615

ONTARIO ENERGY BOARD

IN THE MATTER OF the Ontario Energy Board Act, 1998, S.O. 1998, c. O.15, Sch. B;

AND IN THE MATTER OF an Application by Enbridge Gas Distribution Inc. for an Order or Orders approving or fixing rates for the sale, distribution, transmission and storage of gas commenting January 1, 2008.

AND IN THE MATTER OF an Application by Union Gas Ltd. ("Union Gas") for an Order or Orders approving or fixing rates for the sale, distribution, transmission and storage of gas commenting January 1, 2008.

AND IN THE MATTER OF a combined proceeding of the Board pursuant to section 21(1) of the Ontario Energy Board Act, 1998.

EVIDENCE OF ROBERT LOUBE
ON BEHALF OF THE CONSUMERS COUNCIL OF CANADA
THE VULNERABLE ENERGY CONSUMERS COALITION AND
AND THE CITY OF KITCHENER

1. Introduction and Summary

Union Gas Limited ("Union") and Enbridge Gas Distribution Inc. ("EGD") have applied to the Ontario Energy Board ("Board" or OEB") for approval of rates effective January 1, 2008, using multi-year incentive rate mechanisms. Union has applied for a price cap index and EGD has applied for a revenue cap index. The OEB Staff retained Pacific Economic Group Economics Group ("PEG") to undertake input price and productivity research to support the development of an X factor, and to provide

recommendations for the design of rate and revenue cap indexes for EGD and Union. The PEG study was first released on March 30 and updated on June 20, 2007.

I have been asked by City of Kitchener ("Kitchener"), the Consumers Council of Canada ("CCC") and the Vulnerable Energy Consumers Coalition ("VECC") to review the PEG studies, and the EGD and Union testimony to ensure that the proposed multi-year incentive regulation plans contain adequate protection for the interests of residential consumers, as measured by at least the following criteria:

a. Reasonable rates in the circumstances;

b. A reasonable and not excessive, return for the companies;

c. A reasonable and fair sharing with residential consumers and utilities like the City of Kitchener that represent residential consumers, of any efficiencies generated by the companies during the term of their plans;

d. The existence of mechanisms by which residential consumers may assess the operation of the incentive plans to ensure that their interests are adequately protected;

e. The existence of mechanisms which can be used by residential consumers to obtain changes in the incentive plans, in the event that these plans are not operating in the bests interests of those consumers.

Upon review of these materials, I recommend that the OEB adopt an incentive plan for both EGDI and Union that includes an earnings sharing mechanism ("ESM") and that establishes a price index formula where the X-factor equals the inflation factor. I also recommend that the OEB decline to adopt the PEG service class rate design recommendation. Instead, the investigation of rate design changes should be postponed until the revenue requirement is rebased at the end of the incentive plan.

The plan of my testimony is, first, to provide a short summary of the Staff Discussion Paper. Second, I discuss price cap regulation in theory and practice. This

discussion highlights not only the positive incentive features of price cap regulation but also some of the unintended consequences of that regulation. Third, I show how an earnings sharing mechanism works in coordination with a price cap regime. In particular, I show that the earnings sharing mechanism limits some of the unintended consequences of price cap regulation. Fourth, I argue that revenue cap regulation is inferior to price cap incentive programs, because revenue cap regulation allows for higher rates than price cap regulation and dampens the incentive to reduce cost. Fifth, I discuss the design of a price index and show that the EGD calculated price index of its own rates is not consistent with standard price index design standards. Sixth, I review the alternative X-factor estimates including the econometric analysis provided by PEG and the component parts of the X-factor. This review highlights the range of X-factors that have been proposed. Because of that range, which includes X-factors that would generate annual rate decreases, I recommend that it is reasonable to set the X-factor equal to the inflation factor. Seventh, I examine the PEG proposal to establish service group price cap indexes ("PCI"). I show how the PEG method is flawed because it assumes that it is possible to determine service specific growth rates. Therefore, I recommend that the OEB reject the proposal. Finally, I address the use of Y and Z factors. I note that extended use of such factors would cause the incentive plan to revert back to COS regulation, and that the use of a Y factor in order to pass through capital cost is not necessary.

2. <u>The Staff Discussion Paper</u>

The Staff Discussion Paper, dated January 5, 2007, presents the Board Staff's initial outline of a potential incentive regulatory framework. This framework focuses on

price cap regulation, while also providing for an alternative revenue cap scheme. In developing a price cap regulatory framework, the discussion paper notes that to implement a price cap regulatory scheme, it is necessary to make decisions regarding:

1. Inflation Factor
2. X-Factor
3. Single or Multiple Price Caps
4. Rate Design
5. Routine or Non-Routine Adjustments designated as Z and Y Factor Adjustments
6. Term of the Plan
7. Off-Ramps

The Staff engaged PEG to investigate these issues and to file a study with recommendations regarding these issues. PEG filed an initial study in March 2007 and a revised study in June 2007. The PEG studies provide estimates of recommended inflation and X-factors, discuss the relationships among various price cap formulas and provide a method for establishing alternative rate caps by service group.

3. Price Cap Regulation

Price cap regulation was initially proposed as an alternative to cost of service rate of return regulation ("COS regulation") as a method to regulate recently privatized companies such as British Telecom. Price cap regulation was conceived as a method to avoid alleged problems with COS regulation.

The alleged problems with COS regulation include the inability to constrain cost, the incentive to over-invest in plant, the failure to adopt new technologies as these

technologies become available, the use of cost shifting procedures, the limits on pricing flexibility, and the extensive resources required by the regulatory scheme.[1]

These problems are generated by the basic formula used to determine the COS revenue requirement. This formula sums the warranted expenses, depreciation, taxes and the return on a rate base. Because regulators have less information about the warranted expenses than the regulated company and because all expenses can be recovered from the customers, there is an incentive for the company to enhance the expenses. The fact that the reported and recovered expenses are greater than the expenses that could be sustained by a firm operating in a competitive market means the regulated firm is inefficient. The difference between the regulated company's expenses and the expenses of a firm operating in a competitive market is called an x-inefficiency.

In addition, because the regulated company's profits are equal to the return times the rate base, the regulated company has an incentive to maintain the largest possible rate base. This incentive may manifest itself in two ways. First, the regulated company may choose to use relatively more capital and less labor than a similarly situated competitive company. This decision is known as the Averch-Johnson effect ("A-J effect"). Second, the regulated firm may delay the adoption of capital saving technological changes. This delay allows the regulated firm to completely depreciate its more capital intensive resources. For example, the regulated monopoly telecommunications firm could delay the adoption of fiber optic cable while maintaining its copper cable. In the same situation, a competitive firm would have been forced to write off the copper cable and to switch to fiber cable.

[1] D. Sappington "Price Regulation," in The Handbook of Telecommunications Economics, edited by M. Cave, S. Majumdar and I. Vogelsang, 2002, Amsterdam, Netherlands: Elsevier Science.

Finally, the COS regulated company's prices are established to allow the company to recover the revenue requirement. Thus, there is a direct link between the prices charged and the reported cost.

The purpose of price cap regulation is to break the direct link between price and reported cost. The future price that the regulated company can charge is set equal to the current price times a price index formula. The price index formula attempts to track the cost increases that a competitive firm would incur. The regulated firm controls its own costs. If the firm is able to constrain its costs to grow at a slower rate than the price index formula, it will retain the additional profits. If the firm does not constrain its costs, it will incur losses. The pursuit of profit and the fear of loss are the incentives that drive the firm to eliminate inefficiencies, both x-inefficiencies and inefficiencies associated with investment decisions. As the firm becomes more efficient, it retains the profits associated with its internal decision making.

The price cap formula is the combination of two factors. First, there is an inflation factor that allows price to increase with inflation. Second, there is an X-factor. The immediate purpose of the X-factor is to reduce prices so that prices reflect cost savings associated with productivity gains. The X-factor also contains a variety of other factors included for the purpose of ensuring that price formula is consistent with its intended purposes. For example, the inflation factor should reflect only the inflation related to the inputs used by the regulated industry. However, because indexes of industry input prices have been unstable in the past, a more general measure of output inflation is used as the measure of inflation. Thus, the X-factor must contain input price and productivity differentials to ensure that the price formula is measuring its intended

purpose of the trend in industry cost. The X-factor also contains an adjustment that reflects the difference between revenue weighted and cost elasticity weighted outputs.

While I will discuss whether the proposed PEG, EGD or Union X-factors and price index formulas are reasonable later in my testimony, it is important to note here the consequences of adopting the wrong X-factor. If the X-factor is too low, the regulated company will have the opportunity to earn excessive profits. On the other hand, if the X-factor is too high, the regulated company's profit may not be sufficient to provide the company with the funds and the incentive to invest. Contrary to EGD's claim, price cap regulation is not inherently in conflict with reasonable investment policy.[2] The price cap regulatory regime starts at the company's current price, and that current price supports adequate investment. The price cap regime then changes the price in line with price changes associated with the normal cost changes affecting competitive companies, where competitive companies would be able to fund future investment programs. Thus, given a properly determined X-factor, the price cap regulated company should be able to fund its investment commitments.

Theoretically, consumers also benefit from the adoption of price cap regulation in two ways. First, consumers are ensured that the increases in prices will not be excessive because the allowed price increases are those associated with an efficient firm and not price increases associated with inefficient practices. Second, the regulators include a 'stretch factor" in the price cap formula. The stretch factor reduces the allowed increases in price, and thus shares the regulated firm's efficiency gains with its customers.

Price caps, however, can also be harmful, because there is no inherent constraint to the incentive to reduce expenses even though some of the expenses that are eliminated

[2] EB-2007-0615, Exhibit B, Tab 1, Schedule 1, page 11-15.

are expenses that an efficient firm would incur in the normal course of doing business. Thus, service quality and the long term efficiency of the company can suffer because the regulated company is induced to reduce its expenses during the term of the plan. For example, a regulated company may find that using subcontractors reduces immediate expenses, but because subcontracting reduces the firm's internal knowledge base such a practice may lead to long term increases in expenses.[3] Alternatively, the regulated firm may install automatic call answering phones at its business offices, reducing the number of employees answering customer calls. Substituting these devices for humans reduces the costs to the regulated company. However, because the wait time to have an inquiry satisfactorily answered increases substantially, this practice increases the total cost of service to the consumer. In addition, by eliminating the incentive to invest capital that is associated with COS regulation, price-cap regulated companies may change their investment behavior such that equipment that should be replaced remains in service and funds generated by the company are transferred to other lines of business.

The practical outcome of price cap regulation is best seen in a review of two of the longest price cap regimes. The two experiments are the regulation of British Telecom and the Federal Communications Commission's ("FCC") regulation of the major U.S. telecommunications carriers. In the case of British Telecom, every review of British Telecom has brought with it a higher and higher X-factor.[4] The consequence of these X-factor increases was that, for all practical purposes, British Telecom has been subject to COS service regulation with periods of regulatory lag. In the periods of

[3] Sub-contracting may be especially attractive to U.S. firms because the practice eliminates health benefits paid to company employees.
[4] M.E. Beesley and S.C. Littlechild, "The regulation of privatized monopolies in the United Kingdom," Rand Journal of Economics, Vol. 20, No. 3, Autumn 1989.

regulatory lag, price flexibility has been allowed under the conditions of the price cap formula.

The FCC's regulatory regime has brought substantial change in the rates paid to telecommunications carriers. However, these rate changes have been affected by changes in the FCC rules.[5] Rule changes are exogenous factors and not directly part of the price cap scheme. These changes have led to very large decreases in the per-minute access rates and increases in per-line rates as illustrated in attached schedules 1 and 2. The most recent rule changes established settlement rates for switched access that were much lower than the switched access rates generated by the action of the price cap formula. With minor exceptions, the switched access rates have remained constant since the CALLS order was fully implemented. [6]

At the same time, usage of the network as measured by switched minutes and the number of lines has been decreasing.[7] The result of the price freeze and decreases in usage, however, has not been damaging to the companies' bottom line. Instead the rate of return on capital is soaring. In 2006, Qwest earned a 42.19 percent return on capital, while AT&T's return was 26.41 percent and Verizon's return was 21.19 percent.[8] Contributing to these high returns were substantial decreases in employees and net capital. From 1996 to 2006 these firms employed 135,167 fewer persons, a decrease of 33 percent.[9] Simultaneously, net investment decreased from $30.7 billion to $24.7

[5] See for example, In the Matter of Access Charge Reform, Sixth Report and Order, CC Dockets No. 96-262, FCC 00-193 released May 31, 2000, ("CALLS Order"); In the Matter of Access Charge Reform, CC Docket No. 96-262, First Report and Order, 12 FCC Rcd 15982, 16010, (1997).
[6] CALLS stands for the Coalition for Affordable Local and Long Distance services. Members of the coalition were: AT&T, Bell Atlantic, BellSouth, GTE, SBC, and Sprint.
[7] See Schedule 3
[8] Id.
[9] Id.

billion, a decrease of 19 percent.[10] The decrease in employees reduces operating expenses and increases the return. The decrease in net investment increases the percentage return on investment for any given level of return.

However, the decline in investment also has some unintended consequences. For example, according to the OECD, the United States now ranks 15 out of 30 nations in the provisioning of high-speed internet services.[11] This low value appears to be related to price cap regulation, because where comparisons are available, small rate of return carriers outperform price cap carriers in making high-speed internet services available to customers. For example, in Maine, over 90 percent of the customers of COS carriers could purchase high-speed service, while only 65 percent of the customers of the price cap carrier could purchase high-speed service.[12]

Clearly, price cap regulation in the Telecom sector has been associated with excessive returns. In the British Telecom experience, the regulator increased the X-factor to bring the return back to acceptable levels.[13] In the U.S. case, the FCC has allowed the carriers to retain the excessive returns.

Translating the experience of the telecommunications industry into a prediction of events in the gas distribution industry is extremely difficult. However, it is important to note that even under COS regulation, gas utilities have achieved above allowed returns.[14]

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[10] Id.
[11] http://www.oecd.org/document/7/0,3343,en_2649_37441_38446855_1_1_1_37441,00.html
[12] R. Loube, testimony on behalf of the Maine Office of the Public Advocate, in Investigation into Line Sharing, Maine Public Utilities Commission Docket No. 2004-809..
[13] Armstrong, M., S. Cowan and J. Vickers, 1994, Regulatory Reform: Economic Analysis and the British Experience, Cambridge, MA: MIT Press.
[14] Board Staff Discussion Paper, page 24.

4. Earnings Sharing Mechanisms

Earnings sharing mechanisms ("ESM") allow the regulated company to retain part or all of the earnings up to a certain level above the allowed return. ESM also requires the company to be responsible for earnings below the allowed return until a certain limit is reached. ESMs can be a combination of several different sharing levels. For example, there can be a dead-band around the allowed return where the company retains 100 percent of the over-earnings and is responsible for 100 percent of the under-earnings. Additional bands would then share the earnings at less than 100 percent. At some point, the company is constrained to not earn above a certain level, and is protected so that earnings do not decrease below a specified minimum level. In addition, the bands can be symmetric or asymmetric. Symmetric bands require the band width to be the same above and below the allowed rate of return, while asymmetric bands allow the band width above the allowed return to differ from the band width below the allowed return.

An ESM with very small bands is essentially COS regulation, and if the bands are very wide, then the ESM allows the company to earn monopoly profit.[15] An intermediate level of band sizes transforms COS regulation into incentive regulation while retaining the beneficial attributes of COS regulation. This transformation occurs because allowing the company to retain earnings above the regulated return provides an incentive to reduce cost and become more efficient. The company receives the same incentive to reduce cost when it cannot request a rate increase when earnings fall below the allowed rate.

An ESM retains the beneficial properties of COS regulation because it prohibits companies from earning excessive profits and protects companies from the risk of very

[15] W.K. Viscusi, J. Harrington, and J.M. Vernon, Economics of Regulation and Antitrust, 4th edition, 2005, Cambridge, MA: MIT Press.

low returns. An ESM protects consumers and investors to the extent that the initial plan parameters may not be right.

An ESM also retains the incentive to invest in plant while at the same time creating an incentive to reduce cost. This dual incentive pattern is illustrated by the following example. First, assume that the allowed return is 8 percent and the net investment is $1 million. Thus, the allowed return is $80,000. Second, assume that company is just earning its allowed return with revenue equal to $500,000 and expenses equal to $420,000. Third, assume that the regulator adopts an ESM that allows the company to earn a 10 percent return. In response to the incentive to reduce cost, the company reduces cost by $40,000, earning $120,000 or a 12 percent return. Under the ESM, the company would only be allowed to keep $20,000 of the cost reduction and would be required to pass through the other $20,000 to its customers. Because the company is not allowed to keep the entire cost reduction, it is claimed that ESM dampens the incentive to reduce cost. However, this conclusion is correct only at first glance, because the company has the ability to retain the entire cost reduction if it increases its net investment. In this illustration, if the company had increased its net investment to $1,200,000, it would earn the top return allowed by ESM and retain all of the cost savings.

Moreover, an ESM is an appropriate form of regulation for a gas utility because it retains the beneficial attributes of COS regulation. The incentive regulatory scheme for a gas utility should include an incentive to maintain and upgrade the existing network, because failure to do so could lead to accidents. Second, expansion of the network requires additional capital expenditures. Expansion is beneficial because more customers

receive service. An ESM, which retains the COS service incentive to invest, maintains the incentive to invest in facilities that enhance the safety of the network and expand the network to meet new customer demand.

The Staff discussion paper suggests that a band width of 400 basis points may be acceptable. However, because that band width would include returns that are lower than the current bond rates, the suggested band width is excessive and may hinder the company's ability to invest. A review of recent earned returns[16] shows that in only a few instances did the return exceed 200 basis point above the allowed return. Therefore I recommend that the dead-band for the ESM be 200 basis points above and below the allowed rate of return.

5. Revenue Cap Plans

Two forms of revenue cap plans have been proposed in this proceeding. The PEG study discusses a cap on total revenue and the EGD testimony supports a revenue per customer cap. Under these plans, the allowed increase in revenue, or revenue per customer is set according to an index formula. The variables in the index formula are similar to the variables in the price cap index formula. That is, the formula contains an inflation factor and an X-factor. In addition, the revenue cap formula also includes a growth factor.

Revenue cap plans are inferior to price cap plans because the revenue plans allow prices to increase at a faster rate than price cap plans and because revenue plans dampen

[16] EB-2007-0606, Exhibits C23.14 & C23.15;RP-2003-0063, Exhibit F5, Tab 4, Schedule 1, Corrected; EB 2002-0484, Exhibit J2.31,

the incentive to reduce cost relative to a price cap plan.[17] Table 1 illustrates how a revenue cap scheme would increase rates at a faster rate than a price cap scheme.

Table 1: Impact of Revenue Cap per Line and Price Cap Regulation on a Typical Residential Customer

average rate increase	volume rate increase	fixed rate increase	fixed revenue weight	volume revenue weight	months	rate	fixed revenue	volume	volume rate	volume rev	total rev.	year	incentive scheme
					12	11.95	143.4	3000	0.090	270	413.40	1	revenue per customer cap
2.6%	2.6%	2.6%	0.35	0.65	12	12.27	147.23	2970	0.0924	274.44	421.67	2	revenue per customer cap
					12	11.95	143.4	3000	0.090	270	413.40	1	price cap
2.0%	2.0%	2%	0.35	0.65	12	12.19	146.32	2970	0.0919	272.80	419.11	2	price cap

The first two rows of data depict the revenue cap scheme and the last two rows depict the price cap scheme. The starting point, year one (or rows 1 and 3), is the same for each scheme. The data depicts a typical residential gas consumer. The consumer pays a fixed charge of $11.95 per month, and a volume charge of $0.09 per cubic meter and consumes 3,000 cubic meters annually. The total payment, which is the total annual revenue from the customer, is $413.40. Two further assumptions are made in the illustration. First, the index formula allows for either a 2 percent increase in revenue in the revenue cap scheme or a 2 percent rate increase in the price cap scheme. Second, average usage decreases by 1 percent, from 3,000 cubic meters to 2,970 cubic meters.

The revenue cap per customer scheme increases by 2 percent from $413.40 to $421.67. Given that usage declines by 1 percent, rates must increase by 2.6 percent to

[17] M. Crew and P. Kleindorfer, "Price Caps and Revenue Caps: Incentives and Disincentives for Efficiency," in Pricing and Regulatory Innovations Under Competition, Edited by M. Crew, 1996, Norwell, MA: Kluwer Academic Publishers.

generate the additional revenue. The price cap scheme increases rates by 2 percent or 0.6 percent less than the revenue cap per customer scheme. The total revenue increases by 1.4 percent to $419.11.

This example serves to illustrate that the rates and the total bill are lower under the price cap scheme than under the revenue cap per customer scheme. The difference in revenues also contributes to the strength of the incentive to reduce cost. Because the price cap scheme generates less revenue, the price cap company must be more efficient than the revenue cap company in order to earn the same profit.

Moreover, the initial purpose of revenue cap schemes was not to make companies more efficient. Instead, the revenue cap proposals were designed to de-couple revenue from usage.[18] This design condition was applied to change the direction of electric utility companies. Under normal COS regulation, electric companies have an incentive to promote usage between rate cases because after the rate case establishes the rate, the best way to increase revenue is to promote increased usage. The revenue cap allows the electric utility to increase revenues while restricting usage and encouraging conservation. Thus, the rationale for revenue cap regulation is the desire to encourage conservation. However, in the case of a gas distribution utility, usage decreases result from the purchase of new appliances, the installation of better insulation, and the reaction to higher fuel prices. Moreover, both EGD and Union have approved Demand Side Management Program (DSM) plans and there is a regulatory framework in place to support the continuation of those plans. Thus, there is no need to adopt another regulatory scheme that has as its chief benefit an incentive to reduce usage. Given that a DSM program

[18] J. Eto, S. Stoft, and T. Belden, "The Theory and Practice of Decoupling," Lawrence Berkely Laboratory, January, 1994.

exists, and that a revenue cap scheme increases rates and dampens the incentive to reduce costs compared to a price cap scheme, my recommendation is that the OEB should not adopt a revenue cap or a revenue cap per customer regulatory plan.

6. Price Indexes

Price Indexes are not part of the incentive plans. Rather price indexes are used to judge the reasonableness of the index formula. For example, PEG determined that the rate of price increase for EGD was 1.37 percent and for Union was 0.87 percent. PEG then noted that "the notional PCI (price cap index) trend is, for each company, quite similar to the overall trend in their actual rates during the 2000-2005 period."[19] EGD, on the other hand, determined that its unit rates increased by 3.8%.[20] It notes that its rate increases as measured by its proposed index would be higher than the rate increases that would have been allowed if the PEG summary index had been used. Then the testimony states: "This context demonstrates the reasonableness of the Company's proposal compared to PEG's recommendation."[21]

Given the large difference between the PEG and EGD price index trends and the implications of those trends, it is important to understand, first, what a price index is and second, whether either or both of the PEG and EGD proposed index match the criteria for a price index.

A price index is supposed to be representative of all the prices in any particular basket. In this case, the basket is the rates for services purchased by EGD's customers. The commonly accepted method for representing all of the prices is to determine a

[19] PEG "Rate Adjustment Indexes for Ontario's Natural Gas Utilities," June 20, 2007, page iii.
[20] Enbrdge, Exhibit B, Tab 1, Schedule 1, page 9.
[21] Id., page 15.

weighted average of the prices or changes in the prices. Differences between various types of indexes depend on what types of weights are used.[22]

The EGD proposed price index is calculated as the total revenue divided by the total volume. It provides information related to the average revenue per volume of gas sales. It would be a price index only if EGD had only one volume price. However, EGD has multiple volume prices for its various rate classes. In addition, EGD has fixed charges and demand charges that vary by rate class. Because the EGD index is not related to all of its many rates, and changes in any of those rates would affect revenue, the index does not fulfill its purpose of being a guide to the reasonableness of its revenue index formula.

The PEG study uses a Tornqvist index of prices. This index is a weighted index of the log of price changes. In the PEG study, the weights are fixed at the 2005 revenue shares. The more conventional method of determining weights is to allow the weights to change annually, equal to .5 * (the current revenue share plus the revenue share lagged one year). Employing the more conventional weights, I determined that the EGD prices increased at an annual rate of 1.13 percent, slightly lower than the 1.37 percent rate reported in the PEG study. Thus, the PEG proposed price index is a price index and fulfills its purpose of being a guide to the reasonableness of the PEG proposed price index formula.

7. X-factor

The X-factor is combination of the productivity differential, the input price differential, the average use factor, and the stretch factor. The productivity differential

[22] W. Diewert, "Index Number," in The New Palgrave: A Dictionary of Economics, edited by J. Eatwell, M. Milgate, and P. Newman, 1987.

relies on the estimated total factor productivity of the gas industry. In this section I discuss each of the component parts of the X-factor.

7.(A) TFP Estimation

A large number of estimates for the total factor productivity ("TFP") of the gas utility industry have been presented by PEG and by EGD. Some estimates rely on econometric analysis, others on algebraic combinations of factors. Some estimates rely on industry aggregates, others on individual company data. Within the industry aggregate estimates, there are differences related to what other companies are considered to be within the peer group of EGD and Union. Choosing the correct industry TFP out of this jumble of numbers is a difficult task. Below I will identify problems with the estimates and provide guidelines that will inform a reasonable decision regarding this important variable.

7. (A)(i)Econometric Analysis

PEG's econometric analysis starts with the estimation of a cost function. A cost function is the relationship among the total cost of providing a service and the prices of inputs used to produce the service and the quantity of the service produced. The precise relationship among the variables must also be determined. The relationship can be specified by a simple linear equation, such as c= a*pk + bpl +c*pm + d*Q, where pk, pl, pm are the prices of capital, labor, and materials and Q is the quantity produced. PEG chose to use a more complicated function form called a trans-log function. In this function every variable appears as the log of the original value. The log variable appears not only by itself but also as a squared variable and as an interaction term with all other variables. PEG also chose to add business condition variables and time trend to the

function. The benefits of using a trans-log function are that the economies of scale are not pre-determined by the function and the output elasticities are combinations of the estimated coefficients.

As output variables, PEG uses the number of customers, the volumes of gas purchased by residential and commercial customers, and the volume of gas purchased by all other customers. These are not true outputs. Rather, they are proxies for outputs that are conventionally used as outputs. These variables are used because data associated with these variables are collected on a regular basis. The output of the gas distribution system is the transport of gas from a city gate to the customers. The transport cost is directly associated with the density of the customers and the level of demand at each customer location. A simple thought experiment highlights that relationship. Suppose the gas company serves 100 residential customers. Each residential customer lives on a ½ acre lot. Estimate the cost of the gas distribution network. Now suppose the gas company serves the same 100 residential customers and each customer lives on a two acre lot. Re-estimate the cost of the gas distribution network. Obviously, the cost of the second network is greater than the cost of the first network, even though the number of customers and volumes delivered, the outputs in the PEG econometric study, are the same.

Engineering-economic models of other network industries confirm that density is an important variable in determining cost. For example, in the telephone industry, engineering-economic models begin with customer location and demand at those locations. The models build an economically efficient plant including poles, conduit, wires and switches to serve the customers. The models that have been tested in

regulatory proceedings (the FCC Synthesis, the BellSouth, Sprint/Embrak, and Verizon models) exhibit decreases in cost as density increases. An engineering-economic model of a district heating network also exhibits decreases in cost as density increases.[23]

PEG uses a dummy variable related to the existence of an urban core as a proxy for density. EGD substitutes miles of distribution mains for the urban core dummy.[24] PEG indicated at the technical conference its intent to revise its study again, and one of the revisions may be to use the miles of distribution mains variable. This substitution may be beneficial. However, a better proxy would be a weighted average of miles of distribution mains, where the weights are the sizes of pipes because the pipe size, given standard pressures, measures the amount of gas that could flow through the pipe.

PEG uses multiple volume outputs (a "residential plus commercial" variable and an "all other" variable) in an effort to differentiate between EGD and Union. However, PEG did not include all of the interaction terms between the quantities in its regression equations. PEG notes that the reason it excluded those interaction terms (truncated the equation) was that the inclusion of the interaction "generated some unreasonable values."[25] The unreasonable values turned out to be negative output elasticities for a number of the companies. The negative output elasticity results appear to related to the level of correlation among the output variables. EGD attempted to offset this problem by reducing the number of output variables. Instead of two volume variables, EGD suggests that only one volume variable should be used. The regression results using only one

[23] A district heating network is a system of pipes that delivers hot water for heating purposes to residential and commercial customers; See R. Loube "The U.S. District Heating Industry: A Case Study of Corporate Strategy and Public Utility Regulation, Dissertation, Michigan State University, 1983.
[24] EB-2007-0615, Exhibit B, Tab 3, Schedule 4, page 14
[25] PEG June 2007 Study, page 82.

volume variable did not produce the negative elasticities, and thus, with regard to the volume variable, the EGD equation provides better results.

7.(A)(ii) Level of Analysis

The level of analysis refers to whether the TFP for the gas industry is based on a individual company statistics, or a group of companies called a peer group, or on all the companies included in the regression analysis. EGD supports adopting its individual company historical TFP. However, consultants for EGD discuss the use of the econometric analysis in conjunction with a Northeastern United States peer group. PEG suggests that the econometric analysis should be the basis for the selection. However, it develops different TFP estimates for EGD and Union. The company-specific TFP estimates are generated by combining the industry regression coefficients with company-specific variables to calculate company specific output elasticities. These output elasticities are then used to calculate a company-specific economies of scale factor that is added to the industry technological trend variable to determine the company specific TFP.

Neither of these approaches is consistent with the purpose of incentive regulation. That purpose is to create an index that matches the cost trend of a competitive industry. The EGD self-referencing TFP directly contradicts the purpose of the incentive regulation. It does not provide an industry standard that would force enhanced performance on the individual company. On the other hand, EGD has pointed out that the industry used by PEG is a U.S. industry and that U.S. productivity trends have in general been higher than Canadian trends. This argument suggests that using U.S. trends raises the bar too high for a Canadian company. On the other hand, the fact that productivity is

higher in the United States provides the Canadian company with a guide to more efficient operations, and therefore the Canadian company would have an easier time accelerating its productivity growth in the future relative to the U.S. companies.[26]

The PEG approach is a hybrid of individual company and industry statistics. The PEG approach can be upgraded to only include industry statistics. Moreover, because the EGD estimating equation appears to be better than the PEG equation, the coefficients from the EGD equation should be adopted. The sum of the output elasticities using the EGD coefficients evaluated at the industry mean values is 0.855.using COS weights and 0.853 using the GD weights. Combining these elasticities and the US output productivities results in economies of scale effects of 0.2 for the COS weights and 0.19 for the GD weights. Adding the respective trend variables to the economies of scale estimates generates a 1.6 percent industry TFP for the COS weights and a 1.3 percent industry TFP for the GD weights.

The analysis of peer groups, while interesting, is not informative to the analysis. PEG establishes its peer groups based on relative potential to capture economies of scale. However, it admits that using its criterion does not produce a definitive peer group for EGD. On the other hand, EGD suggests that a peer group should include only Northeastern companies. That peer group reflects the relative similarity in heating degree days but does not reflect the relative dissimilarity in customer growth, and it is customer growth that will probably allow a company to become more productive. Moreover, because neither PEG nor EGD use the peer group analysis to support their respective recommendations, the discussion of peer groups is not relevant.

[26] EB-2007-0615, Exhibit B, Tab 3, Schedule 1, ¶¶ 7-14.

7. (B) Productivity Differentiation

The productivity differential is the difference between the TFP for the industry and the TFP for the economy. Both PEG and EGD support the use of the multifactor productivity index for the Canadian private business sector as the measure of the economy's TFP growth. The productivity growth rate depends on the start and stop years over which the growth rate is calculated. For the time period 1998-2005 that PEG used, the growth rate was 1.2%. However, EGD used the 2000-2005 growth and calculated a 0.72 percent productivity growth rate. Thus, the difference between the two in the starting position reduced the Canadian TFP growth rate by 0.49 percent.

Subtracting the TFP for the economy from the TFP for gas distribution generates a range of estimates. When using the COS weights, the productivity differential varies from 0.39 percent to 0.87 percent, and when using the GD weights, the differential varies from 0.08 percent to 0.56 percent. Thus, the choice of weights and starting points determines the productivity differential.

7.(C) Input Price Differential

The input price differential is the difference between an index of prices measured across the entire economy and an index of the price of inputs purchased by gas companies. In this proceeding, PEG develops two indexes of prices of inputs purchased by gas companies (the industry input price index).[27] The difference between the indexes is that one includes a gas input price index (the index used for Union) and the other does not include a gas input price (the index used for EGD). The gas industry indexes are weighted indexes of the input prices, while the economy price is calculated as the sum of the increase in the GDP-IPI FDD and the multi-factor productivity of the business sector.

[27] PEG June Study, pages 50-61.

EGD and PEG do not differ on the method used to develop the differential. Rather they differ with regard to the time over which to measure the differential. EGD uses 2000-2005 in an effort to maintain the same start and stop for each series in the analysis. PEG uses 1998-2005 for its COS weighted differential and 1999-2005 for its GD weighted differential. PEG chose the 1998 start date for the COS weighted differential because "the weighted average cost of funds in that year is similar to that in 2005. This approach is based on the premise that the weighted average costs of funds won't change over the sample period."[28] Using similar logic regarding the real rate of return, PEG chose the 1999 start date for the GD differential.

7.(D) The Average Use Factor ("AUF") as part of the company X-factor

The AUF is the difference between a revenue weighted quantity index and a cost weighted quantity index. This factor is included in the X-factor because the PEG method of estimating the TFP is based on using the cost elasticity weighted quantity index, while a price cap formula requires the use of a revenue weighted TFP. Adding the AUF to the X-factor is an algebraic correction so that the calculation of the X-factor meets the requirement to use a revenue weighted index. PEG estimates the AUF to be -0.81 percent for the COS calculation, and the GD AUF can be calculated as -0.72 percent.

7.(E)The Stretch Factor

The stretch factor is used to share the benefits of incentive regulation with consumers during the term of the plan, rather than simply at the end of the plan. Both Union and EGD oppose using a stretch factor. PEG supports a stretch factor equal to 0.5 percent. It asserts that amount is indicative of standard commission practice.

[28] PEG June Study, page 57.

7.(F) Summary of X-factor calculations

Table 2

Alternative X-factors for EGD				
	COS Weights		GD Weights	
	High	Low	high	low
Productivity Differential	0.87	0.39	0.56	0.08
Input Price Differential	2.41	0.27	1.17	0.86
AUF	-0.81	-0.81	-0.72	-0.72
Stretch Factor	0.5	0.5	0.5	0.5
X-factor	2.97	0.35	1.51	0.72
Alternative X-factors for Union				
	COS Weights		GD Weights	
	High	Low	High	low
Productivity Differential	0.87	0.39	0.56	0.08
Input Price Differential	1.44	0.22	1.11	0.54
AUF	-0.72	-0.72	-0.63	-0.63
Stretch Factor	0.5	0.5	0.5	0.5
X-factor	2.09	0.39	1.54	0.49

Table 2 summarizes the different X-factor estimates that are discussed in this testimony. The range is very large. It includes estimates that are greater than recent trends in inflation, implying that a reasonable result would be annual reductions in rates over the term of the plan. The range is determined by the different start points used to calculate the trends, the estimate of the total factor productivity, and the choice of weights used to determine that varies weighted averages used in the analysis. Professional judgment is used to inform decisions regarding the proper starting points, proper productivity measure, and the selection of the weighting scheme. Picking and choosing among these assorted professional judgments is a difficult task.

The proposed start points include 1998, 1999, and 2000, with higher X-factors associated with the 2000 start point. Rationales for these starting points include the need

to be consistent with other times series and the need to begin and end a certain level for a given variable.[29]

With regard to the proper productivity measure, as noted above, it is necessary to determine the proper regression equation, to choose between a single company or industry-wide measure, or to choose a peer group that is reasonably similar to a particular company.

With regard to the weighting scheme, it is necessary to determine if the weights should be the first year of series, the last year of a series or move annually. In determining the average use factor, PEG used the last year of the series to calculate the revenue weighted output. PEG could have chosen the first year or moving weights. There is no criterion that uniquely determines that one set of weights is better than any other set of weights.

Given this collection of X-factors and considering the wide range represented, I am recommending that the X-factor be set equal to the GDP-IPI-FDD. This recommendation freezes the price index formula impact on rates for the term of the plan. Rates could change if the rate of return falls below or exceeds the ESM dead-band range. Ranges could also change according to the impacts of Y and Z factor.

8. Service Group PCIs

The PEG study recommends the adoption of service group PCIs. These PCIs are based on an allocation of the AUF among the service groups. The method used to allocate the AUF assumes that it is possible to determine service-specific productivity growth rates. Given that the distribution network within any franchise/service area is a joint-use facility, service specific growth rates are not defined. This is the same problem

[29] PEG June Study, page 57; EB-2007-0615, Exhibit B, Tab 3, Schedule 3, page 17.

as allocating the joint cost of a dam among its multiple uses. In such instances, algorithms based on relative benefit from participating in the joint use of the facility may be the appropriate drivers of group cost responsibility.[30] For example, if the commercial customers had to pay for the joint use facility without help from residential customers, then the cost of the joint use facility to the commercial customers would increase significantly. Thus, the commercial customers benefit from the existence of the residential customers. The PEG suggested approach, however, does not recognize the benefits that each service class receives from participating in the joint use of the distribution.

Given the number of decisions that must be made to implement an incentive regime in this proceeding and the failure of the PEG recommended approach to address the implications of a joint-use problem, I recommend that the OEB postpone reviewing the issue of relative service group prices in this proceeding.

9. Y and Z factors

Y and Z factors make exogenous changes to the price cap formula. The Y factor is related to routine or fixed known and measurable adjustments. Prior settlement agreements or the OEB's approved DSM programs are Y factor adjustments. Z factors allow for adjustments for non-routine events. For example, if an earthquake destroys a portion of the distribution network, then the non-insured costs of rebuilding after the earthquake would be included in a Z factor adjustment.

A large number of Y and Z factors dampens the incentive to reduce cost and should be avoided. If the list of Y and Z factors is extended, the difference between

[30] R. Loube, "Public Interest Regulation, Common Costs, and Universal Service," in An Institutionalist Approach to Public Utilities Regulation, edited by E. Miller and W. Samuels, 2002, E. Lansing MI, Michigan State University Press.

incentive regulation and COS regulation is eroded, with the exception that the costs are dumped onto customers automatically under incentive regulation, while COS regulation at least requires a cost prudence review before the consumer becomes responsible for funding a particular expenditure.

A Y factor adjustment has been proposed to account for certain investments such as the replacement of cast iron mains. This proposed adjustment should be rejected. Replacement of cast-iron mains is not a special event that happens only to EGD. The other gas utilities also have transformed their network by replacing cast iron mains. The price trend established in this proceeding that supports the typical company in the industry should be sufficient to support the cast iron main replacement program.

10. Term of the Plan

I recommend that that the incentive plans should last for four years. This length allows the companies to react to the incentives established by the plans. It also allows the Board the opportunity to change the plan to correct any problems that are encountered during the plans' duration.

11. Summary

I recommend that the OEB adopt an incentive plan for both EGDI and Union that includes an earnings sharing mechanism ("ESM") and that establishes a price index formula where the X-factor equals the inflation factor. I also recommend that the OEB decline to adopt the PEG service class rate design recommendation. Instead, the investigation of rate design changes should be postponed until the revenue requirement is rebased at the end of the incentive plan.

My conclusions follow from the need to curb the unintended consequences of price cap regulation, such as excessive earnings, failures to maintain plant and equipment, and reductions in customer service relations. In addition, because of the wide range of possible X-factors, it is reasonable to equate the X-factor to the inflation factor. Finally, Y and Z factor adjustments should be minimized. These adjustments erode the need for the company to become more efficient and burden consumers with unwarranted rate increases.

APPENDIX A

Qualifications

I received a Ph.D in economics from Michigan State University in 1983. My fields of specialization include industrial organization and public utility regulation. I am currently the Vice President of the consulting firm Rolka Loube Saltzer Associates. In that position I have testified for consumer advocates and state attorneys general in proceedings regarding alternative forms of regulation, incremental cost and mergers. Prior to becoming a consultant I worked for the Federal Communications Commissions, the Public Service Commission of the District of Columbia and the Indiana Utility Regulatory Commission. I have frequently lectured at the NARUC Annual Summer Workshop. My vita is attached as schedule 4.