

PWU #1

INTERROGATORY

Ref: PEG Report

**Issue Number: 8**

**Issue: Term of the Plan**

- a. Please explain the relationship in general between the term of an IR plan and the incentives provided to a regulated utility to increase productivity.
- b. Please explain the intent of the five-year term in the proposed IR plan.
- c. Would PEG expect the IR incentives to be higher under a five-year term than under a two-year term?
- d. Would PEG expect the IR incentives to be higher under a five-year term than under a three-year term?

RESPONSE

- a. The performance incentives generated by an IR plan are generally stronger the longer is the plan term. This relationship, which is widely recognized in the academic literature, is substantiated by our incentive power research. See our response to Enbridge question 45 for details of this research. Please note that access to the code requires the signing of a confidentiality agreement.
- b. The proposed plan term generates considerably stronger performance incentives than the regulatory systems under which the companies currently operate. Incentives are especially strengthened for initiatives with longer (e.g. four or five year) payback periods. Regulatory cost would be substantially reduced. These benefits are especially great for Enbridge, which has recently been filing annual rate cases.
- c. Yes. Please see the incentive power results in our response to Enbridge question 45 for details.

Witness: Mark Lowry

- d. Yes. Please see the incentive power results in our response to Enbridge question 45 for details.

PWU #2

INTERROGATORY

Ref: PEG Report

**Issue Number: 3.1**

**Issue: How should the X factor be determined?**

- a. Please confirm that in both the 3/30 and the 6/08 reports PEG undertook an analysis of both Enbridge's and Union's historical TFP performance.
- b. Please confirm that in both the 3/30 and the 6/08 reports PEG undertook a benchmarking of both Enbridge and Union using a peer group analysis approach to TFP performance.
- c. Please confirm that in both the 3/30 and the 6/08 reports PEG undertook a TFP analysis of both Enbridge and Union using an econometric cost model in order to develop "projected" estimates of TFP.
- d. Please confirm that in the 3/30 report, the GD productivity target for Enbridge was set using the econometric model projection only.
- e. Please confirm that in the 3/30 report, the GD productivity target for Union was set using an average of the econometric model projection and the companies' calculated TFP growth.
- f. Please confirm that in the 3/30 report, the COS productivity target for Enbridge was set using an adjustment to its GD productivity target: the GD econometric model projection was averaged together with the GD and COS TFP trend calculations for the company.
- g. Please confirm that in the 3/30 report, the COS productivity target for Union was set using an adjustment to its GD productivity target: the GD econometric model projection was averaged together with the GD and COS TFP trend calculations for the company.
- h. Please confirm that in the 6/08 report, both the GD and COS productivity targets were set using only the econometric model projections and that the

Witness: Mark Lowry

companies' calculated TFP growth and the companies' benchmarking peer groups were not used to set the productivity targets.

- i. The Exhibit below summarizes the companies' US Peer Groups TFP performance as calculated by PEG using the COS method. Please confirm that the values are accurate.

**PEG Estimates of Union's and Enbridge's US Peer Group TFP Performance with COS: 1994 to 2004**

		US Peers	
	March 30		June 8
Enbridge	1.34		2.13
Union	0.94		2.04

Source: PEG March 30 and June 8, 2007 reports.

- j. Given that the sample of utilities is similar and the calculations cover the same period, please explain in detail what the causes are of the large differences between the 3/30 and the 6/08 reports, e.g. why was Union's benchmark peer group's estimated TFP 0.94 in the March report and 2.04 in the June report?
- k. The Exhibit below summarizes the companies' cost model projected TFP performance as calculated by PEG using the COS method. Please confirm that the values are accurate.

**PEG Estimates of Union's and Enbridge's Cost Model Projected TFP Performance with COS: 2000 to 2005**

		Projected TFP	
	March 30		June 8
Enbridge	1.37		2.10
Union	1.29		1.73

Source: PEG March 30 and June 8, 2007 reports.

- l. Given that the projections come from PEG's US LDC cost model and the calculations cover the same period, please explain in detail what the

Witness: Mark Lowry

causes are of the large differences between the 3/30 and the 6/08 reports, e.g. why was Enbridge's projected TFP benchmark estimated to be 1.37 in the March report and 2.10 in the June report?

- m. The Exhibit below summarizes the companies' TFP performance as calculated by PEG using the GD method. Please confirm that the values are accurate.

**PEG Estimates of Union's and Enbridge's TFP Performance with GD: 2000 to 2005**

		Calculated TFP	
	March 30		June 8
Enbridge	1.03		0.83
Union	1.98		1.76

Source: PEG March 30 and June 8, 2007 reports.

- n. Given that the calculations cover the same period, please explain in detail what are the causes of the differences between the 3/30 and the 6/08 reports, e.g. why was Enbridge's TFP estimated to be 1.03 in the March report and 0.83 in the June report?
- o. The 6/08 PEG report calculates that Union's TFP averaged 1.87 percent per year from 2000 to 2005 and 2.28 percent from 1999 to 2005 using the COS capital price approach. (See Exhibit below.) Furthermore, PEG calculates that Union's US Peer Group had annual average TFP growth of 2.04 percent annually from 1994-2004. Please confirm that these values are accurate.

**PEG Estimates of Union's TFP Performance, US Peer Group Performance and "Modeled" TFP Performance from the US LDC Statistical Cost Model**

	COS TFP	US Peers	Econometric Cost Model
1999-2005	2.28		
2000-2005	1.87		1.73
1994-2004		2.04	

Witness: Mark Lowry

Source: PEG June 8, 2007 Report.

- p. Please confirm that in the 6/08 report the proposed X factor for Union relies on the 1.73 average annual TFP growth estimated by PEG for Union from its statistical cost model.
- q. Please confirm that the data underlying the statistical cost model come from LDCs operating across most of the regions of the US.
- r. In particular, please confirm that no data from Union were used to estimate the model.
- s. Was data from any Canadian LDC used to estimate the statistical cost model used by PEG?
- t. Please explain in more detail the rationale behind the inclusion of the US LDCs that are used to estimate PEG's statistical cost model.
- u. Please explain the rationale behind the exclusion of Canadian LDCs from the data used to estimate the statistical cost model used to develop Union's TFP for its X factor proposal.
- v. Please explain in more detail the rationale behind the selection of the US LDCs that are used to form the Peer Group of LDCs to benchmark Union.
- w. Please explain the rationale behind the exclusion of Canadian LDCs from the Peer Group of LDCs used to benchmark Union.
- x. Please confirm that in the 6/08 report the 1.73 average annual TFP growth used to set Union's X factor is less than the average annual TFP growth calculated by PEG for Union over the 1999 to 2005.
- y. Please confirm that in the 6/08 report the 1.73 average annual TFP growth used to set Union's X factor is less than the average annual TFP growth calculated by PEG for Union over the 2000 to 2005 periods.
- z. Please confirm that the 1.73 average annual TFP growth used to set Union's X factor is less than the average annual TFP growth calculated by PEG for Union's US Peer Group over the 1994 to 2004 period.
- aa. Please confirm that PEG's calculated TFP performance for Union over the 1999 to 2005 period is .55 percent per year higher than the 1.73

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“predicted TFP value” from PEG’s cost model that is used to set the X factor for Union. That is, please confirm that the X factor proposed by Union would need to be raised by .55 in order to equal the TFP growth calculated by PEG for Union from 1999 to 2005.

- bb. Please confirm that PEG’s US Peer Group for Union has an average TFP growth .31 percent per year greater than the 1.73 statistical cost model result from PEG’s estimated cost model. That is, please confirm that the X factor proposed by Union would need to be raised by .31 in order to equal the TFP growth calculated by PEG for its Union Peer Group from 1994 to 2004.
- cc. The Board has stated in the NGF report that it expects rate payers to share immediately in the efficiency gains from the IR and that it would be particularly diligent in its review of the parameters of the IR like the X factor to ensure that such sharing be effective from the beginning of the IR and not rely on rebasing alone at the end of the term to accomplish this. Furthermore, Board Staff in their discussion paper have noted that no one would be made worse off from the IR compared to COS. According to PEG’s calculations, the average TFP growth rate over the 1999 to 2005 period for Union was 2.28 percent per year. The recommended X factor of 1.73 falls far short of the company’s performance under the then operative COS and PBR frameworks. Even the addition of the recommended stretch factor of 0.5 produces an X factor of 2.23, still less than the company’s calculated performance since 1999. Please explain how ratepayers would be made better off if the targeted X factor is less than what the company achieved under its COS and PBR terms?
- dd. PEG is also recommending a residential rate class adjustment of -0.61 to the operative X factor effectively lowering the proposed company productivity target to 1.62. Please explain how ratepayers would be made better off if the targeted X factor is significantly less than what the company achieved under its COS and PBR terms?
- ee. The Exhibit below summarizes PEG’s results for Enbridge for the COS TFP, US peer group calculated TFP, and projected TFP for the PEG cost model. Please confirm that the values are accurate.

**PEG Estimates of Enbridge's TFP Performance, US Peer Group  
Performance and "Modeled" TFP Performance from the US LDC Statistical  
Cost Model**

	<b>COS TFP</b>	<b>US Peers</b>	<b>Econometric Cost Model</b>
<b>1999-2005</b>	NA		
<b>2000-2005</b>	0.71		2.10
<b>1994-2004</b>		2.13	

Source: PEG June 8, 2007 Report.

- ff. Please confirm that according to PEG's calculations, Enbridge had a positive O&M PFP growth from 2000 to 2002.
- i. What was the annual growth rate over the 2000 to 2002 period?

Please provide the sub-indexes for input quantities for both companies over as long a period as possible including the indexes for capital, labor, materials, and gas.

**RESPONSE**

- a) Confirmed
- b) Confirmed
- c) Confirmed
- d) Confirmed
- e) Confirmed
- f) Confirmed
- g) Confirmed
- h) Confirmed
- i) No. No peer group results were reported in the March study using the COS approach to capital costing.
- j) The changes in the TFP targets were due chiefly to two methodological advances. One was an upgrade of the elasticity estimates used to weight the output quantity index. This was accomplished by using company-specific

Witness: Mark Lowry

elasticities and by simplifying the econometric model to obtain better elasticity estimates. The other salient change was the move from GD to COS capital costing as the basis for the U.S. results.

- k) Confirmed
- l) The chief causes were, once again, an upgrade in the elasticity estimates used to calculate output quantity indexes and the move to COS capital costing.
- m) Confirmed
- n) The chief cause of these modest differences was the move to company-specific cost elasticities in the calculation of the output quantity index.
- o) Confirmed
- p) Confirmed
- q) Confirmed
- r) Confirmed
- s) No.
- t) The number and diversity of the sampled US gas utilities provide an excellent database from which the parameters of a cost function can be estimated. Please note also that the quality of the data available for these companies is unusually good.
- u) It is common practice to exclude the subject of benchmarking from the estimation of the parameters of the model used to establish the benchmark. Please note also that a lot of additional work would have been required (e.g. difficult input price comparisons) to include these companies in the model and that their inclusion would have had little impact on model results. Furthermore, the requisite data are not available for Canadian utilities outside Ontario.
- v) We started with the sample associated with our US TFP trend estimation presented before the California Public Utilities Commission. We then excluded 3 companies for which we were unable to gather a breakdown of deliveries into residential/commercial and other deliveries. From the remaining companies we chose those with the greatest similarity in the external business conditions that are known to drive TFP growth.

Witness: Mark Lowry

The conditions driving TFP growth are discussed on pp. 6 and 7 of our June report. This analysis is based on a classic mathematical treatment by a respected University of Toronto economist which is cited in the report. Our econometric model provides the basis for quantifying two such conditions that are applicable to Enbridge and Union: technological change and the realization of scale economies. We assumed that technological change was the same for all companies and therefore chose as peers those companies that realized scale economy effects, during the sample period, which were similar to those recently realized by Enbridge and Union. The resultant peer group therefore has a solid foundation in economic theory and empirical research.

- w) We could in principle have added Enbridge to the list of candidate peers for Union. Please note, however, that we did not ultimately propose to base the TFP targets on peer group results.
- x) Confirmed. Please note, however, that the cost impact of Union's exit from the appliance business reflects productivity index growth from 1999 to 2000.
- y) Confirmed. Please note, however, that the difference is small.
- z) Confirmed
- aa) Confirmed
- bb) Confirmed
- cc) The 2.28% average annual growth rate in Union's TFP index from 1999-2005 reflect special circumstances, as noted in our response to sub-part (x). We believe that the 2000-2005 period, in which Union achieved a 1.87% average annual TFP growth rate, is more reflective of the company's current operating conditions. This is very similar to the proposed TFP target. Union should not be penalized if it achieved superior productivity growth over the sample period. That is why we use an external standard for setting the TFP target. The proposed productivity target is well above the average annual TFP growth rate of the sampled U.S. utilities.
- dd) The proposed price cap index is expressly designed to share with customers the benefits of expected efficiency gains.
- ee) Confirmed
- ff) Confirmed. The average annual growth in Enbridge PFP was 2.87% per year from 2000-2002. Please see section 1.1 and 1.2 of the working papers provided in response to Enbridge question 2.

Witness: Mark Lowry

PWU #3

INTERROGATORY

Ref: PEG Report

**Issue Number: 3.2**

**Issue: What are the Appropriate Components of an X factor?**

- a. Please confirm that PEG's proposal entails some service groups having differing X factors from the company-wide X factor proposed for each company.
- b. Please confirm that PEG has recommended that the X factor for each company's residential rate classes have an adjustment made to the overall company X factor which would lower the effective X factor that is applied to this rate class.
- c. Please confirm that PEG has recommended that the X factor for each company's nonresidential rate classes not be adjusted from the sum of common terms.
- d. The Exhibit below summarizes the proposed X factor adjustments from the 3/20, 6/08, and 6/20 reports. Please confirm that this information is correct.
  - i. Please explain in detail why every calculated X factor adjustment for individual rate classes changed between the 3/20 report and the 6/08 report.
  - ii. Please explain in detail why four of the five calculated X factor adjustments for individual rate classes changed between the 6/08 report and the 6/20 report.
  - iii. Please explain in detail how the signs of the calculated X factors (i.e., positive or negative) of two rate classes switched between the 3/20 and the 6/08 reports
  - iv. Please explain the consequences on the PCI of an adjustment going from a (-) sign to a (+).
  - v. Please explain the consequences on the PCI of an adjustment going from a (+) sign to a (-) sign.

Witness: Mark Lowry

PEG's Proposed Service Group PCIs						
	March 20		June 8		June 20	
	X factor	ADJ	X factor	ADJ	X factor	ADJ
<b>Enbridge</b>						
<b>Rate 1</b>	-0.19	-0.74	0.85	-0.41	0.85	-0.48
<b>Nonresidential</b>	-0.19	1.36	0.85	0.69	0.85	0.69
<b>Union</b>						
<b>Rate M2</b>	-0.50	0.37	0.52	-0.61	0.52	-0.65
<b>Rate 01</b>	-0.50	-0.32	0.52	-0.61	0.52	-0.65
<b>Nonresidential</b>	-0.50	-0.52	0.52	1.20	0.52	1.26

Source: PEG March 30, June 8, and June 20, 2007 reports.

- e. Please confirm that in the 3/20 report Enbridge's Rate 1 rate class had a calculated adjustment of -0.74.
  - i. Had such an adjustment been made, what would have been the effect of such an adjustment on the rate relative to not having such an adjustment?
- f. Please confirm that in the 6/08 report the calculated adjustment is -.041 and that in the 6/20 report the adjustment is -.048.
- g. Please confirm that in the 3/20 report Union's M2 rate class had a calculated adjustment of 0.37.
- h. Please confirm that in the 6/08 report the calculated adjustment is now -0.61 and that in the 6/20 report the adjustment is -0.65.
  - i. Had these adjustment been made, what would have been the effect of the 3/20 adjustment on the rate relative to the 6/20? That is, would the 3/20 adjustment have lowered the resulting PCI while the 6/20 adjustment would have increased the resulting PCI?
- i. Over a term of 5 years, please calculative the difference in the PCI based on the 3/20 rate with its adjustment and the PCI based on the 6/20 rate with its adjustment?
- j. Please confirm that in the 3/20 report Union's 01 rate class had a calculated adjustment of -0.32?

Witness: Mark Lowry

- i. Please explain why your calculations in the 3/20 report found that the adjustment sign for the M2 rate class should be (+) while the adjustment sign for the 01 rate class should be (-).
  - ii. Please confirm that in the 6/08 report the calculated adjustment for the 01 rate class is now -0.61 and that in the 6/20 report the adjustment is -0.65.
- k. Please confirm that in the 3/20 report Union's nonresidential rate class had a calculated adjustment of -0.52?
- l. Please confirm that in the 6/08 report the calculated adjustment is now 1.20 and that in the 6/20 report the adjustment is 1.26.
- m. Please confirm that in the case of Enbridge, PEG has recommended in the third proposed adjustment that the residential rate class (i.e., Rate 1) would have a -0.48 percent adjustment to the overall proposed company-wide X factor.
- n. Please confirm that in the case of Union, PEG has recommended in the third proposed adjustment that the residential rate classes (i.e., Rate M2 and Rate 1) would have a -0.65 percent adjustment to the overall proposed company-wide X factor.
  - i. Please confirm that in the case of Enbridge this would result in a "total" X factor of 0.37 for the residential classes.
  - ii. Please confirm that in the case of Union this would result in an X factor of -0.13 for the residential classes.
- o. Please confirm that for Enbridge, the proposed adjustments have been equal to in excess of 60 percent of the value of the proposed productivity target (i.e., 1.36/2.1).
- p. Please confirm that for Union, the proposed adjustments have been equal to in excess of 70 percent of the value of the proposed productivity target (i.e., 1.26/1.73).
- q. Please provide references to all IR plans that PEG is familiar with that implemented a negative X factor (i.e., the X factor was additive to the price index which meant rates increased faster than inflation).
- r. Please confirm that this adjustment for Union's residential classes would result in an increase in the PCI of 1.49 percent per year versus an increase in the recent GDPPI trend of 1.86.

- s. Please confirm that this adjustment for Union's nonresidential classes would result in an increase in the PCI of 0.08 percent per year versus an increase in the recent GDPPI trend of 1.86.
- t. Please confirm that this adjustment for Enbridge's residential classes would result in an increase in the PCI of 1.99 percent per year versus an increase in the recent GDPPI trend of 1.86.
- u. Please explain how the company was able to develop and propose X factors which varied by rate classes thus assigning different rate increases to different rate classes without doing a comprehensive cost of service-cost allocation study.
- v. Please take the total rate change in dollar terms under the proposed IR plan and compare the percentage increases for each rate class, e.g. under the proposed IR plan rate class X would be assigned 35 per cent of the proposed increase, rate class B 25 percent, etc.
- w. Please compare the distribution of percentage changes obtained in (v) to those under each company's most recent COS filing.
- x. Please provide references to other plans that used the adjustment approach being proposed by PEG?
- y. What other data is employed in PEG's calculations for determining the adjustment factor other than revenue shares by class and the cost elasticity estimate from PEG's US LDC cost model?

RESPONSE

- a) Confirmed
- b) Confirmed
- c) No. In fact, rates for non-residential service classes would have an X factor above the sum of the common terms.

Witness: Mark Lowry

- d) Confirmed, the information in the table is correct. The common x-factors and the adjustments to them, by rate class, are the ones presented in each of the three PEG reports.
- i. The calculated x-factor adjustment for individual rate classes changed between the 3/20 and 6/08 reports because company specific output elasticities applied to produce them were computed using output interaction terms in the earlier report. Since such interaction terms were, however, producing unreasonable elasticities, such as large negative ones, they were excluded from model estimation and the computation of output elasticities. As a result, the calculated x-factor adjustment in the 6/08 and 6/20 reports are different from, and more sensible than, the 3/20 ones. In addition, we updated our weather normalization method in the 6/08 report, which resulted in improved weather adjusted throughputs that also affected the calculations.
  - ii. The main difference between the x-factor adjustments for individual rate classes between the 6/08 and 6/20 reports is the switch from geometric decay to cost of service capital costing method in model estimation and the adjustment calculations. In the 6/08 report, the adjustment factor was based on the geometric decay to capital costing method whereas in the 6/20 report it was based on the cost of service to capital costing method.
  - iii. Please see the answers to (i) and (ii) above.
  - iv. When an x-factor adjustment goes from a (-) sign to a (+) sign PCI growth slows.
  - v. When an x-factor adjustment goes from a (+) sign to a (-) sign, PCI growth accelerates.
- e) Confirmed, this value was -0.74.
- i. Had such an adjustment not been made, the x-factor would be equal to the common x-factor term of -0.19 instead of the class specific x-factor of -0.93. As a result, the PCI would have increased at a more rapid rate.

- f) No, the 6/08 report had an adjustment rate of -0.41 and not -0.041 for rate class 1, and the 6/20 report had an adjustment rate of -0.48 and not -0.048 for rate class 1.
- g) Confirmed, rate class M2 had an adjustment rate of 0.37 in the 3/20 report.
- h) Confirmed, the rate class M2 adjustments are -0.61 in the 6/08 report and -0.65 in the 6/20 report. Do note though that the x-factor adjustment for this rate class is the same -0.13%. (-0.50-0.37 for the 3/20 case and 0.52-0.65 for the 6/20 case).
  - i. The 3/20 adjustment (0.37) makes the x-factor less negative or more positive, and hence slows the rate of PCI growth. The 6/20 adjustment (-0.65) makes the x-factor more negative and make the rate of PCI growth more rapid. However, as stated above the net effect of each adjustment on the total x-factor is the same as the common x-factor terms also changed from the one report to the other.
- i) Since rate class M2 has an x-factor of -0.13% under both the 3/20 and 6/20 reports there is no difference
- j) Confirmed, Union's 01 rate class in the 3/20 report had a calculated adjustment of -0.32%.
  - ii. As detailed in d(i), these adjustments were based on company specific output elasticity estimates that were unreasonable. Once the more accurate estimates were used, the signs on the adjustment terms for the two residential classes of Union had the same sign.
  - iii. Confirmed, the calculated adjustment for the 01 rate class is -0.61 in the 6/08 report and -0.65 in the 6/20 report.
- k) Confirmed, Union's nonresidential rate class had a calculated adjustment of -0.52 in the 3/20 report.
- l) Confirmed, the calculated adjustment for the nonresidential class is 1.20 in the 6/08 report and 1.26 in the 6/20 report.

Witness: Mark Lowry

- m) Confirmed, in the third proposed adjustment (in the 6/20 report), PEG has recommended a -0.48% adjustment to the common X-factor for residential rate class 1 of Enbridge.
- n) Confirmed, in the third proposed adjustment (in the 6/20 report), PEG has recommend a -0.65% adjustment to the common X-factor for residential classes 01 and M2 of Union.
  - iv. Confirmed, in the case of Enbridge the adjustment to the common X-factor would result in a 'total x factor' of 0.37% for residential rate classes.
  - v. Confirmed, in the case of Union the adjustment to the common X-factor would result in a 'total x factor' of -0.13% for residential rate classes.
- o) We do not understand this question.
- p) We do not understand this one either.
- q) Negative X-factors were operative for some early plans of British power distributors and, more recently, have been operative in some plans for Australian power transcos.
- r) No. The total X-factor adjustment for Union's residential classes results in an increase in the PCI of 1.99 percent per year versus the recent 1.86% trend in the GDPPI.
- s) Confirmed. The total X-factor adjustment for Union's nonresidential classes results in an increase in the PCI of 0.08 percent per year versus the 1.86% trend in the GDPPI.
- t) No. The total X-factor adjustment for Enbridge's residential classes results in an increase in the PCI of 1.49 percent per year versus the 1.86% trend in the GDPPI.
- u) Please see the explanation for and derivation of the adjustment factor and its components, the revenue and cost effects, on pages 91-97 of PEG's 6/20 study, which detail how X-factors that vary by rate classes were developed.

- v) We do not understand this question. We are not sure how to calculate this exactly but would comment that services to residential customers will clearly shoulder the great bulk of the rate increase under the proposed indexes.
- w) Without been able to calculate v), we are not prepared to undertake this calculation,
- x) This approach has not been used in other jurisdictions.
- y) We also used heating degree days data to calculate weather adjusted throughputs.

PWU #4

INTERROGATORY

Ref: PEG Report

**Issue Number: 3.2**

**Issue: What are the Appropriate Components of an X factor?**

- a. Is it PEG's belief that the companies will have an incentive to increase productivity during the term of the plan?
- b. Please discuss the general reasoning used in IR plans for the inclusion of a stretch factor.
  - i. Would that reasoning hold in this instance of PEG's proposed IR plan for Union and EGD as well?

RESPONSE

- a. Yes.
- b. The stretch factor is design to provide customers, during the term of the IR plan, with some of the expected benefits of improved utility operating performance under the plan.
  - i. Yes.

PWU #5

INTERROGATORY

Ref: PEG Report

**Issue number: 3.2**

**Issue: What are the Appropriate Components of an X factor?**

- a. In PEG's view, can an IR framework be structured using an industry specific input price index (IPI) and industry TFP?
- b. How would the use of industry specific IPI and TFP compare in terms of theoretical appropriateness to an approach using the macro output price index approach with productivity and input price differentials recommended by PEG?
- c. Theoretically, in the macro output price index approach recommended by PEG, once the corrections are made for the productivity and input price differentials, does the approach recommended by PEG equal the approach based on the industry input price index and industry TFP? Please provide the mathematics for your answer.
- d. Please confirm that the industry specific price index approach does not require an estimate of Canadian TFP, nor an estimate of Canadian input prices, nor a macro price index like the GDPIPI.
- e. Please confirm that in the GDPIPI approach recommended by PEG an industry specific price index is required to be theoretically correct.
- f. Please confirm that the Canadian input price index employed in the correction differential in the GDPIPI approach recommended by PEG is not provided by Stats Canada or any other Government agency.
- g. If the Canadian input price index is not provided by the government, please explain how PEG obtains this information?

Witness: Mark Lowry

- h. If the Canadian input price index is created by PEG please explain the calculations.
  - i. What assumptions are involved for these calculations?
- i. If calculations are required to construct an estimated Canadian input price index by PEG, could the calculations result in errors between the actual, but not observed, Canadian input price index and the estimated Canadian input price index?
  - i. How would such errors affect the X factor?
- j. Does Stats Canada ever revise its estimate of Canadian TFP?
- k. Have revisions of national TFP estimates ever resulted in differences between the estimate used in an X factor productivity differential and what the later value was revised to?

RESPONSE

- a. Yes
- b. Both approaches rest on the same theoretical foundation.
- c. Both approaches should have the same *long* run outcome if correctly implemented. However, the approaches will yield different results in the *short* run. For example, an industry-specific input price index will be more sensitive in the short run to changes in the rate of return. The substantiation for this reasoning can be found in the June report on pages 7-14 and pp. 90-91.
- d. This statement is true. However, the GDPIPI is one candidate for the input price subindex applicable to materials and services purchased by utilities.
- e. An industry specific input price index is required in the calculation of the input price differential (IPD).
- f. This statement is true.
- g. The trend in the input prices of the Canadian economy was estimated as the sum of the trend in Canada's GDP-IPI for Final domestic Demand and the trend in the MFP (multi factor productivity) Index for the Canadian Private Business Sector. See in the June report p. 57 and table 14 for data sources and index calculation and p. 90 for a discussion of the supporting theory. .

Witness: Mark Lowry

- h. The estimate is based on the assumption that, in the long run, the trends in the cost and the revenue of the economy are the same so that the trend in input prices is the sum of the trends in GDPIPI and the productivity trend of the economy.
- i. Yes. If the estimated trend in the economy's input price index is *less than* the actual, the input price differential will be too low so that the X factor will be too low. If the estimated trend *exceeds* the actual, the IPD will be too high so that the X factor will be too high.
- j. Yes, Statistics Canada does revise economy-wide MFP estimates. Officially, all Statistics Canada MFP estimates for the business sector are considered preliminary for the first four years of their existence and may be revised.<sup>1</sup> In practice, a common reason for revision in the first three years after initial publication is the revision cycle common to all Statistics Canada output series. Less commonly, revisions may happen due to changes in the input section of MFP; for example, estimates of MFP levels fell recently when changes were made to the calculation of the labour quantity.
- k. PEG has no knowledge of such a revision.

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<sup>1</sup> Statistics Canada, *Definitions, Data Sources, and Methods – Productivity Measures and Related Variables – National(Annual)*, 2006 Release.

PWU #6

INTERROGATORY

Ref: PEG Report

**Issue number: 3.3**

**Issue: What are the expected cost and revenue changes during the IR plan that should be taken into account in determining an appropriate X factor?**

- a. Please explain the impact on rates from an IR plan with an X factor of 0.44 versus an X factor of 1.54 all else being equal.
  - i. Would rates be higher under the X factor of 0.44?
- b. Please explain the impact on profits from an IR plan with an X factor of 0.44 versus an X factor of 1.54 all else being equal.
  - i. Would rates be higher under the X factor of 0.44?
- c. Please explain the impact on rates from an IR plan with an X factor of -0.09 versus an X factor of 1.72 all else being equal.
  - i. Would rates be higher under the X factor of -.09?
- d. Please explain the impact on profits from an IR plan with an X factor of -0.09 versus an X factor of 1.72 all else being equal.
  - i. Would profits be higher with an X factor of -.09?

RESPONSE

Parts b and d of the question ignore the expected impact of higher prices on demand which, all else equal, will lower revenue and profits.

Our responses to the questions as posed are:

- a) All else equal, rates would rise 1.1% more rapidly (or fall less rapidly) each year with X = 0.44 than with X=1.54.
- b) All else equal, profits would rise 1.1% more rapidly (or fall less rapidly) each year with X = 0.44 than with X=1.54.
- c) All else equal, rates would rise 1.63% more rapidly (or fall less rapidly) each year with X = 0.09 than with X=1.72.
- d) All else equal, profits would rise 1.63% more rapidly (or fall less rapidly) each year with X = 0.09 than with X=1.72.

Witness: Mark Lowry

PWU #7

INTERROGATORY

Ref: PEG Report

**Issue number: 3.2**

**Issue: What are the Appropriate Components of an X Factor?**

- a. The Exhibit below presents alternative capital service price changes based on various calculated indexes in the 6/20 report. Please confirm that these are the price changes calculated by PEG.

<b>PEG's Alternative Capital Service Price Indexes from the 6/08 Report: Percentage Change</b>				
	<b>GD</b>		<b>COS</b>	
	<b>Actual</b>	<b>Smoothed</b>	<b>Enbridge</b>	<b>Union</b>
<b>1989</b>	-26.8			
<b>1990</b>	25.2			
<b>1991</b>	-18.9	-8.2	-0.9	0.0
<b>1992</b>	6.3	4.2	10.9	8.0
<b>1993</b>	-5.1	-6.0	0.5	-0.1
<b>1994</b>	-13.9	-3.3	7.9	7.5
<b>1995</b>	28.9	3.6	1.2	2.1
<b>1996</b>	-27.2	-4.3	0.9	-0.3
<b>1997</b>	-1.4	0.9	-5.5	-7.1
<b>1998</b>	-18.0	-15.7	-2.6	-3.6
<b>1999</b>	45.5	9.4	20.8	19.9
<b>2000</b>	-6.0	6.7	0.7	0.7
<b>2001</b>	29.5	21.5	12.1	12.0
<b>2002</b>	-23.2	-0.5	-11.3	-11.1
<b>2003</b>	12.8	6.0	2.2	2.0
<b>2004</b>	-41.6	-15.6	3.4	3.1
<b>2005</b>	2.3	-6.7	-6.0	-6.1

- b. Please comment on and explain the sizeable differences between the various indexes. For example, in 1994 the actual GD has a value of -13.9,

Witness: Mark Lowry

- the smoothed GD -3.3 while the COS values are 7.9 and 7.5. And for example in 2004 the values range from -41.6 to 3.4.
- i. Please explain the variance in the GD index which has reported values of -41.6 to 45.5 with 8 values of more then 20.0 (absolute values) and 12 values of more then 10.0 (absolute value).
  - ii. Please explain the variance in the COS indexes which range from 20.8 to -11.1.
  - iii. Please explain the variance in the GD smoothed index which ranges from 21.5 to -15.7?
- c. The Exhibit below presents alternative input price changes based on various calculated indexes in the 6/20 report. Please confirm that these are the price changes calculated by PEG?

PEG's Alternative Input Price Indices: Percentage Change						
	Enbridge			Union		
	GD		COS	GD		COS
	Actual	Smoothed		Actual	Smoothed	
<b>1989</b>	-16.1			-14.8		
<b>1990</b>	18.1			17.5		
<b>1991</b>	-10.9	-3.8	1.1	-9.7	-3.1	2.6
<b>1992</b>	4.6	3.2	7.5	4.7	3.4	5.5
<b>1993</b>	-2.8	-3.4	1.0	-2.3	-2.9	1.0
<b>1994</b>	-8.9	-1.9	5.5	-7.9	-1.3	5.2
<b>1995</b>	20.1	3.2	1.6	18.6	2.8	1.8
<b>1996</b>	-17.6	-2.4	1.1	-16.5	-2.2	0.4
<b>1997</b>	-0.4	1.1	-3.0	-0.2	1.2	-2.9
<b>1998</b>	-11.7	-10.2	-1.4	-10.6	-9.2	-1.2
<b>1999</b>	30.7	6.6	13.9	29.0	6.5	11.9
<b>2000</b>	-3.4	5.1	1.1	-2.5	5.5	1.8
<b>2001</b>	20.4	15.1	8.4	20.7	15.5	9.2
<b>2002</b>	-15.3	0.4	-6.5	-14.6	0.1	-6.2
<b>2003</b>	9.4	4.7	2.1	9.1	4.7	2.2
<b>2004</b>	-26.6	-9.5	3.0	-25.1	-8.9	2.8
<b>2005</b>	2.0	-3.6	-3.0	2.4	-2.9	-2.2

- d. Please comment on and explain the sizeable differences between the various indexes. For example, in 2004 the actual GD has values of -26.6 and -25.1, the smoothed GD has values of -9.5 and -8.9 while the COS

values are 3.0 and 2.8. And for example in 1995 the actual GD has values of 20.1 and 18.6, the smoothed GD 3.2 and 2.8 while the COS values are 1.60 and 1.8.

- i. Please explain the variance in the GD index which has reported values ranging from 30.7 to -26.6 with Enbridge's index having 4 values of more then 20.0 (absolute values) and 10 values of more then 10.0 (absolute value).
  - ii. Please explain the variance in the COS indexes which range from 13.9 to -6.5 (for Enbridge)?
  - iii. Please explain the variance in the GD smoothed index which ranges from 15.1 to -10.2 (for Enbridge)?
- e. The Exhibit below presents alternative input price changes based on various calculated indexes in the 3/20 and 6/20 reports. Please confirm that these are the price changes calculated by PEG.

Comparing IPIs Across PEG's Reports: Percentage Change								
	Enbridge				Union			
	GD		COS		GD		COS	
	3/20	6/08	3/20	6/08	3/20	6/08	3/20	6/08
1989	29.0	-16.1			27.2	-14.8		
1990	14.9	18.1			14.3	17.5		
1991	13.7	-10.9	0.9	1.1	13.2	-9.7	3.0	2.6
1992	-19.7	4.6	8.4	7.5	-17.9	4.7	6.7	5.5
1993	-2.1	-2.8	1.1	1.0	-1.7	-2.3	1.3	1.0
1994	-55.8	-8.9	6.4	5.5	-51.2	-7.9	5.9	5.2
1995	27.4	20.1	2.2	1.6	25.3	18.6	3.6	1.8
1996	60.3	-17.6	1.6	1.1	55.9	-16.5	0.7	0.4
1997	-29.9	-0.4	-2.9	-3.0	-27.5	-0.2	-2.9	-2.9
1998	-7.9	-11.7	-1.2	-1.4	-7.0	-10.6	-1.0	-1.2
1999	3.5	30.7	15.8	13.9	3.6	29.0	13.5	11.9
2000	10.7	-3.4	1.5	1.1	10.8	-2.5	2.2	1.8
2001	45.8	20.4	9.4	8.4	44.4	20.7	9.9	9.2
2002	-11.5	-15.3	-7.0	-6.5	-10.8	-14.6	-6.3	-6.2
2003	-10.4	9.4	2.4	2.1	-9.7	9.1	2.4	2.2
2004	-131.5	-26.6	3.5	3.0	-123.8	-25.1	3.2	2.8
2005	NA	2.0	-2.7	-3.0	NA	2.4	-2.1	-2.2

- f. Please comment on and explain the sizeable differences between the various indexes. For example, in 1996 the GD for Enbridge is calculated

Witness: Mark Lowry

as 60.3 in the 3/20 report but -17.6 in the 6/08 report. In 1989 the GD for Union is reported as 27.2 in the 3/20 report but -14.8 in the 6/08 report. In 1995 the COS for Union is calculated as 3.6 in the 3/20 report but as 1.8 in the 6/08.

- g. Please explain how errors in the calculated input price index would affect the X factor and, in turn the PCI.
- h. Please calculate the effect of using the IPI value of 2.0 versus an IPI value of 4.0 on the growth in the resulting PCI for a five year term.
- i. The Exhibit below presents alternative input price differentials based on various calculated values in the 3/20 and 6/20 reports. Please confirm that these are the IPI differentials reported by PEG.

PEG's Calculated Alternative Input Price Differentials						
	Enbridge			Union		
	GD		COS	GD		COS
	Actual	Smoothed		Actual	Smoothed	
6/08						
1998-2005			.27			.22
1999-2005	5.13	0.86		4.55	0.54	
3/20						
1998-2005			-0.37			-0.35
2000-2005		6.65	1.27		6.20	0.98
1993-2002	-1.81	-0.16		-1.89	-0.33	
1994-2004	6.92	-0.35		6.46	0.46	6.20

- j. Please confirm that the IPI differentials proposed by PEG in the 6/20 report are based on the COS values over the 1998 to 2005 period.
- k. Please explain the range of values reported? For example, in the 3/20 report PEG reports a GD differential of 6.92 for Enbridge over 1994 to 2004 and a value of -1.81 from 1993 to 2002. Similarly, in the 3/20 report PEG reports a COS value for Enbridge of 1.27 for the period 2000 to 2005 and a value of -0.37 for the period 1998 to 2005.

- l. Please comment on the statement that the reported differentials appear to vary greatly depending on the PEG report selected (i.e., 3/20 v. 6/08), the time period selected and the choice of GD vs. COS.
  - i. If the differential is as volatile and unstable as it appears to be from the numerous estimates reported by PEG, please comment on how the Board and other stakeholders can have any confidence in the value of the differential actually employed in PEG's proposed IR.
- m. Please confirm that in the 3/20 report PEG wrote (p55), "Results using both methods substantiate the notion that the input price trends of Ontario gas utilities are considerably more rapid than the trend in GDPIPI FDD." (both methods refers to GD and COS). Please confirm that in the 6/08 report PEG wrote (p. 61), "Results using both methods substantiate the notion that the input price trends of Ontario gas utilities are somewhat slower than the trend in GDPIPI FDD."
  - i. Please explain how the conclusion reached in the 3/20 report that the IPIs of Ontario gas companies grew "considerably more rapid" than the GDPIPI FDD is consistent with the 6/08 conclusion that the gas IPIs are growing "somewhat slower" than the GDPIPI FDD.
- n. Please explain how errors in the calculated input price differential would affect the X factor and, in turn the PCI.
- o. Please calculate the effect of using an IPI differential of -0.37 versus an IPI differential 0.27 on the growth in the resulting PCI for a five year term.
- p. Please calculate the effect of using an IPI differential of 0.27 versus an IPI differential of 1.1 on the growth in the resulting PCI for a five year term.
- q. Please comment on prior instances in either gas or electric cases where the Board has ruled on an IPI differential or it has been used in an IR rate adjustment mechanism implemented by the Board.
  - i. What were the values of the differential?
- r. Please confirm that in the industry specific input price approach, neither the Canadian input price index nor the IPI differential are required.
- s. Please list all regulatory bodies that have employed the so called COS capital service price index or COS IPI in IRs and the dates and utilities for which they were employed.

RESPONSE

(a) Confirmed

(b) There are sizeable differences in the methodologies used to calculate these capital service price indexes. Under the geometric decay method, for example, there is a replacement valuation of plant so that only recent values of the construction cost index are used. Such indexes can be volatile. The COS method, in contrast, mirrors book valuation of plant by employing a weighted average of past values of this index which is much more stable. Note, additionally, that replacement valuation requires the addition of a capital gains term to the capital cost calculation. The capital service price is thus a function of the real rather than the nominal rate of return (ROR). Real returns are quite volatile and are typically smoothed in cost research.

The standard deviations of the percent changes in the above table are as follows: 24.0 for the non-smoothed geometric decay method, 9.7 for the smoothed geometric decay method, 8.0 for the COS for Enbridge, and 7.8 for the COS for Union.

These variations, mainly due to fluctuations in the ROR, are the major reason why the choosing of an appropriate time period is crucial in determining an appropriate trend in input prices. Finding a period with a fairly stable ROR assures that the trend is not substantially biased by fluctuations in these factors. PEG chose periods (1999-2005 for GD, 1998-2005 for COS) such that these fluctuations do not drive our resultant input price indexes.

- i. As stated above the GD capital service index is highly sensitive to changes in the real ROR. This is why when using this method the real rate of return is typically smoothed over a number of years.
- ii. The COS capital price index is less volatile than the non-smoothed GD index method because it is based on the nominal ROR.
- iii. The smoothed GD method has much less variance than the non-smoothed GD method as shown by the above standard deviation figures.

(c) Confirmed

(d) The largest cost share weight in the industry input price indexes is the capital cost share weight. In addition to this the capital service price indexes are more volatile than the other input price sub-categories (labour, non-labour, fuel). The primary reason for the differences is thus different methods for calculating capital

Witness: Mark Lowry

service prices. We would expect the input price index based on unsmoothed GD costing to be most volatile and that based on COS to be least volatile.

(e) Confirmed. We note that the unsmoothed GD results are included but not the smoothed GD results. The smoothed GD method is preferred over the non-smoothed GD method and is the one typically used.

(f) PEG upgraded the construction cost index from the March Report to the June Report to better reflect the inflation in gas distribution construction costs in Canada. This is the major reason for the sizeable differences in the GD indexes.

(g) Errors in the calculation of the input price index can bias the X-factor and in turn the PCI. This is why caution must be exercised in choosing the methodology for the input price index and the time period for the IPD calculation.

(h) In PEG's June Report we recommended the COS approach and this showed a notional PCI growth of 1.01% for Enbridge and 1.34% for Union (Section 3.7 "Summary PCI Results" page 63 of the June Report). In this summary PEG calculated the industry IPI as 2.72% and 2.77% for Enbridge and Union respectively. If the industry IPI had been 2.00% the notional PCI would have decreased by .72% and .77% and would have been .29% for Enbridge and .57% for Union. If the industry IPI would have been 4.00% the notional PCI trend would be 2.29% and 2.57% for Enbridge and Union, respectively.

(i) PEG cannot confirm this table in regards to the 1994-2004 COS number for Union. We did not report COS results for 1994-2004 and if we had the number would not have been 6.20%. The rest of the table PEG can confirm.

(j) PEG can confirm that we recommend the COS approach in our June Report.

(k) These variations, mainly due to fluctuations in RORs, are the major reason why the choosing of an appropriate time period is crucial in determining an appropriate trend in input prices. Finding a period with a fairly stable ROR assures that the trend is not substantially biased by fluctuations in these factors. PEG chose periods (1999-2005 for GD, 1998-2005 for COS) such that these major fluctuations do not drive our resultant input price indexes.

(l) As stated in our response to subpart (k), choosing the correct time period is a crucial exercise in determining the correct IPD. A time period where the ROR is fairly stable is essential to determining the correct input price trend. If different time periods are examined that do not follow these criteria the calculated input price trends can vary widely. Since PEG took care in determining this correct

Witness: Mark Lowry

time period, stakeholders and the Board can have confidence in the recommended IPDs.

(m) Confirmed.

- i. We upgraded the construction cost index to better reflect gas distribution industry construction costs. This upgrade resulted in the industry input price growing less rapidly than the economy input price. Before this upgrade, the opposite was true.

(n) Errors in the calculation of the input price index can bias the X-factor and in turn the PCI. This is why caution must be exercised in choosing the methodology for the input price index and the time period for the IPD calculation.

(o) If the IPI differential was -0.37% rather than the recommended 0.27%, then the X-factor would decrease by 0.64% and the PCI would rise by that same amount.

(p) If the IPI differential was 1.1% rather than the recommended 0.27%, then the X-factor would increase by .83% and the PCI would fall by that same amount.

(q) In the 2001 OEB case for Union Gas.

- i. the IPI differential as accepted by the Board was 1.1%.

(r) Confirmed.

(s) This is an approach that is new to the regulatory arena. PEG knows of no regulatory body that has employed this approach in an IR plan.