EB-2018-0218

Ontario Energy Board

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

AND IN THE MATTER OF an Application by Hydro One Sault Ste. Marie Inc. on behalf of Hydro One Sault Ste. Marie Limited Partnership for an Order or Orders pursuant to section 78 of the Ontario Energy Board Act, 1998 for 2019 transmission rates and related matters.

Argument

of

ENERGY PROBE RESEARCH FOUNDATION

April 12, 2019

The following is the Argument of Energy Probe Research Foundation ("Energy Probe"). The Argument is organized as submissions on specific issues

A. GENERAL

Issue 1. Has Hydro One SSM responded appropriately to all relevant OEB directions from previous proceedings?

Energy Probe believes that in general, Hydro One SSM has responded appropriately to all relevant OEB directions from previous proceedings. However, Energy Probe believes that the Transmission System Plan is inadequate, and that the Scorecard is incomplete as explained in its submission under those issues.

Issue 2. Has the 2019 revenue requirement been calculated appropriately, in accordance with OEB policies and practices?

The proposed 2019 revenue requirement was calculated by the application of a revenue cap formula. Energy Probe supports the use of a revenue cap formula by a transmitter like Hydro One SSM. However, Energy Probe has concerns regarding the proposed formula inputs as explained in its submission under section B. Revenue Cap Proposal.

Issue 3. Are the associated 2019 total bill impacts reasonable?

As Hydro One SSM is small relative to the size of the entire transmission system in Ontario, its impact on the UTR will also be small. That does not make the impact reasonable on its own as Hydro One SSM claims[1]. The assessment of the reasonableness of bill impacts requires that their method of calculation also be considered. Energy Probe believes that some of the parameters proposed by Power System Engineering that underpin the calculation of 2019 total bill impacts are not reasonable as discussed in Energy Probe's submission on section B. Revenue Cap Proposal.

B. REVENUE CAP PROPOSAL

Issue 4. Are the elements of Hydro One SSM's revenue cap framework proposal reasonable and in accordance with prior decisions and with OEB policy, including its proposed future earnings sharing mechanism, incremental capital funding options, Z-factors, and any other mechanisms?

[1] EB-2018-0218 Argument-in-Chief, page 9

Energy Probe believes that the elements of Hydro One SSM revenue cap framework proposal are reasonable and in accordance with prior decisions and with OEB policy.

Issue 5. Are the parameters of Hydro One SSM's proposed revenue cap plan, and more specifically, the inflation factor with transmission sector-specific weightings, and the proposed base productivity and stretch factors, as supported by Power System Engineering's Total Cost Benchmarking and Total Factor Productivity Study reasonable?

Energy Probe disagrees with Hydro One SSM's proposed base productivity and stretch factors as supported by the report of Power System Engineering. Energy Probe's suggestion that Issue 6 be added to the Issues List was accepted; Energy Probe discusses these elements under Issue 6 below. In Appendix A, Energy Probe also questions whether it is appropriate that PSE's inflation factor is stated as an annual percentage change while its base productivity factor is a logarithmic percentage change.

Issue 6. Is the Power System Engineering's sample of comparator utilities for Total Cost Benchmarking and Total Factor Productivity appropriate for Hydro One SSM?

Energy Probe's final submissions on this Issue address the determination of the appropriate Total-Factor Productivity ("TFP") growth rate for the forthcoming incentive-regulation regime for Hydro One SSM.

In Energy Probe's view, the estimated TFP growth rates advanced by the PSE Report (for Hydro One SSM) and by the PEG Report (for Board Staff) fail to meet the Board's requirement for a long-term industry trend. Because both reports derive their estimated TFP growth rates from samples of U.S. transmission utilities, those estimates are directly and heavily reflective of the cyclical economic trends in the United States during their respective study periods.

As detailed below and as raised in Energy Probe's interrogatories, productivity growth rates have a strongly cyclical component.

In Energy Probe's view, the PEG Report for Board Staff errs in the same way as the PSE Report. The only significant difference is that PEG's study period is somewhat longer that PSE's.

<u>The Board's Requirement: Structural vs. Cyclical Factors</u>
Energy Probe questions whether either of the experts has met the Board's expectations for the TFP growth rate as stated most recently in its Report in EB-2010-0379 (hereinafter, the "Distributor Decision").[2]

As stated in the Distributor Decision, the Board first described the components of an X-factor in its 3rd Generation IR report *inter alia* as follows:

> *"The productivity component of the X-factor is intended to be the external benchmark which all distributors are required to achieve. It should be derived from objective,*

[2] EB-2010-0370. Report of the Board, Issued November 21, 2013 and as corrected December 4, 2013.

> *data-based analysis that is **transparent and replicable**. Productivity factors are typically measured using estimates of the **long-run trend** in TFP growth for the **regulated industry**.*
>
> *The RRF Report stated that X-factors for individual distributors under this next version of IR ("Price Cap IR") will continue to consist of an **empirically derived industry productivity trend** (productivity factor) and a stretch factor." (**Bold** emphasis added.)*

It is clearly the Board's view that a long-run trend is desired and is therefore to be independent of interim, short-term cyclical influences. Indeed, PSE refers to certain structural variables that are fundamental to long-term productivity growth, such as demographics, home electrification, adoption of computers but, as shown below, its analysis and evidence are entirely short-run and cyclical. Similarly, PEG cites important statutory/regulatory changes that do influence the long-term trend, but its data are also short-run and cyclical.

This concern is particularly relevant to TFP growth rate studies because productivity is highly-cyclical. As noted in recent research from the U.S. Bureau of Labor Statistics ("Below trend: the U.S. productivity slowdown since the Great Recession", 2017)[3]

> *"Now let us look at the productivity growth data of the current business cycle. Why are we looking at business cycles, you may be wondering? This is because, being based on the highly cyclical output and hours data, productivity data tend to possess a cyclical element. …"*[4]

As Energy Probe pointed out in its interrogatories to PEG, that study by the U.S. Bureau of Labor Statistics analyzes the cyclical effect on productivity of the continuing "Great Recession" in the U.S. and states

> *"During the current business cycle, which started in the fourth quarter of 2007, labor productivity has grown at an annualized rate of 1.1 percent. This growth rate is notably low compared with the rates of the 10 completed business cycles since 1947—only a brief six-quarter cycle during the early 1980s posted a cyclical growth rate that low (also increasing 1.1 percent). Of course, the current business cycle is not yet over, and its rate of growth is likely to change as more quarters of data are added. However, an analysis up to this point is warranted, given that this business cycle is now the fourth-longest cycle since 1947. …*[5]
>
> *For this article, in which we are focusing specifically on the Great Recession and the subsequent recovery, the business cycles have been defined as extending from peak to peak so that this recession and its aftermath are both included in the analysis of the*

[3] U.S. Bureau of Labor Statistics. "Below trend: the U.S. productivity slowdown since the Great Recession" in Beyond The Numbers, Vol. 6, No. 2, January 2017
[4] ibid., p.2
[5] ibid., p.3

> *current cycle. In the current business cycle, the peak of the last business cycle was in the fourth quarter of 2007; the Great Recession, which followed this peak, continued until the second quarter of 2009, which was the trough quarter, and the subsequent expansion has continued through the third quarter of 2016.* ***The current business cycle is not yet over*** *and will continue until the National Bureau of Economic Research (NBER), the official arbiter of beginning and ending dates of recessions declares that the expansion is over and we have entered a new recession."*[6] *(**Bold** emphasis added)*

Energy Probe contends that the negative TFP growth rates reported in the PSE Report and the PEG Report do not reflect the long-term structural trend in productivity growth that the Board is concerned with. Rather, their data and time periods overlap with the fourth-longest business cycle in U.S. history, one that had not recovered to its previous peak even as late as the end of their study periods in 2016.

Energy Probe expands below on the reliance of the experts' reports on cyclically-sensitive data rather than on structural factors.

Comments on the PSE Report's TFP Growth Rate

Although PSE's index research leads to an industry TFP growth rate of -1.71%, it proposes an X factor of 0.0% to accord with previous Board practice. To ensure that the X factor accepted by the Board does not fall below 0.0%, PSE further proposes an "implicit stretch factor" of 1.71% for the IR formula for the CIR period.

PSE's Sample of Comparator Utilities

PSE's TFP sample is comprised of 48 utilities: 47 U.S. utilities and Hydro One Transmission.[7]

The inclusion of Hydro One Transmission in the TFP sample is surprising. As the PSE Report states,

> *"The X Factor should be based on an external measure of the industry TFP trend. The utility that it is being applied to should have no (or very little) impact on the measured industry TFP trend. This is because incentive regulation seeks to decouple the link between a utility's cost increases to the allowed revenue escalation. If a utility's own TFP is used within the formula, it will significantly weaken the incentives to enhance productivity and reduce costs."*[8]

Including Hydro One Transmission in a sample designed to measure the industry TFP trend for the determination of the X Factor for Hydro One SSM achieves precisely what PSE declares is undesirable.

[6] ibid., p.11, fn.4
[7] PSE Report, Table 6, p.34
[8] PSE Report, p.15-16

Moreover, by PSE's calculations, its sample produced an industry TFP growth rate of 1.71%, but Hydro One's own TFP growth rate over the sample period was only -0.31% for the same period.[9] Including Hydro One Transmission in its TFP sample leads to the conclusion that PSE's TFP growth rate estimate of -1.71% is too high.

In Energy Probe's view, PSE's TFP sample should not have included Hydro One Transmission.

PSE's Study Period and Reported Industry TFP Growth Rates

PSE's study period is 2004-2016. PSE calculates an industry TFP index for each year as shown in the table below which is Table 12 of the PSE Report. The annual changes in that industry index are shown with rounding by year in the middle column of that table. PEG calculates and presents those annual changes as logarithmic percentage changes.

The simple arithmetic average of those 12 rounded annual logarithmic growth rates is -1.6%. However, calculating the annual changes directly from the index levels in the table, Energy Probe confirms that the simple arithmetic average of those annual logarithmic percentage change is -1.71%.[10]

Table 12 Industry and Hydro One TFP Results

Year	Industry TFP Index	Industry TFP Growth Rate	Hydro One TFP Index	Hydro One TFP Growth Rate
2004	1.000		1.000	
2005	0.945	-5.6%	1.026	2.6%
2006	0.963	1.9%	1.024	-0.2%
2007	0.987	2.5%	1.000	-2.4%
2008	0.971	-1.6%	1.042	4.1%
2009	0.967	-0.5%	1.003	-3.8%
2010	0.940	-2.8%	0.992	-1.2%
2011	0.946	0.6%	0.992	0.0%
2012	0.922	-2.6%	0.971	-2.1%
2013	0.893	-3.2%	0.962	-1.0%
2014	0.871	-2.4%	0.967	0.5%
2015	0.841	-3.5%	0.956	-1.1%
2016	0.814	-3.3%	0.964	0.8%
2017 (projected)	NA	NA	0.958	-0.6%
2018 (projected)	NA	NA	0.954	-0.4%
2019 (projected)	NA	NA	0.945	-1.0%
2020 (projected)	NA	NA	0.933	-1.3%
2021 (projected)	NA	NA	0.920	-1.4%
2022 (projected)	NA	NA	0.906	-1.6%
Average Annual Growth Rate				
2004-2016	-1.71%		-0.31%	
2010-2016	-2.40%		-0.47%	
2004-2018	NA		-0.33%	
2019-2022	NA		-1.43%	

[9] PSE Report, Table 3, p.10 and Table 12, p.46

[10] Alternatively, PSE may have obtained -1.71% by solving the equation: $0.814 = 1e^{r12}$ for r which is the logarithmic growth rate.

PSE's reported TFP growth rates are negative in 2005, positive in 2006, 2007 and 2011, and otherwise negative.

As noted in the above-reference study by the U.S. Bureau of Labor Statistics, the years 2006 and 2007 of this study period are the final years of cyclical recovery from the business cycle that started in the first quarter of 2001. The remaining years of PSE's study period lie wholly within the business cycle that peaked in the fourth quarter of 2007, fell following the Great Recession to its trough in 2009 and has yet to cover.

Table 12 of the PSE Report also reports annual industry TFP growth rates for the 7-year sub-period 2010-2016. As a result, it is not surprising that for that period, PSE's annual industry TFP growth estimate is -2.4%[11], much lower than the -1.71% for the period 2004-2016.

It is telling that the PSE Report does not refer to U.S. cyclical business and economic conditions during its study period at all. However, it does note that its negative TPF growth rate results from its transmission Output Quantity Index growing at an annual average rate of 0.72%[12] during the study period, while its Input Quantity Index grew at 2.43%[13].

PSE's finding that transmission output grew much more slowly in its study period than inputs is entirely consistent with an economy in recession. The same U.S. Bureau of Labor Statistics study notes that in the current cycle:

> *"the output growth rate of the current cycle: at 1.4 percent, it is the second lowest output growth rate in the historical period and well below the average-cycle output growth rate of 3.4%.[14]"*

In its Interrogatory #23, Energy Probe asked PSE whether its reported average annual TFP growth rate of -1.71% (for 2004-2016) accurately reflect the historical long-term trend for electricity transmission. PSE's response is somewhat confusing[15]:

> *"PSE contends the -1.71% and -2.40% results accurately reflect the TFP trends of the electric transmission industry during the 2004-2016 and 2010-2016 time period, respectively. PSE's objective in calculating the industry's TFP trend is to provide an empirical and external basis for our productivity factor recommendation during the CIR period of 2019 to 2022. Given the TFP trend results, we find it most reasonable to assume a continuation of zero or negative TFP within the industry for the 2019 to 2022 CIR time frame."*

[11] PSE Report, Table 12, p.46
[12] PSE Report, Table 7, p.37
[13] PSE Report, Table 9, p.40
[14] op. cit., pp.2-3
[15] Exhibit I, Tab 3, Schedule 23, p.1

Here, PSE does not claim its -1.71% industry TFP growth rate is an historical long-term growth rate. Rather, it is the TFP growth rate that PSE expects will prevail during the CIR period 2019-2022.

In response to Energy Probe Interrogatory #26 about long-term multi-factor productivity growth rates in the Canadian and U.S. business sectors, PSE states that a long-term period would not provide a good indicator of what will happen in the next 3-5 years:

> *"PSE would agree that the longer time periods provide a more historical look at MFP in the business sectors. However, this does not mean that the longer time period should be used to formulate an expectation of what will happen in the next three to five years. In both the Canadian and U.S. cases, there does appear to be a pronounced slowdown in MFP in more recent years. Perhaps underlying factors have changed in more recent years (e.g., slowing birth rates, full adoption of computers) that make the more historical MFP less relevant to predicting the MFP for upcoming years.* [16]"

Energy Probe submits that PSE has not met the Board's requirement for a long-term historical TFP growth rate. Rather, it has chosen a study period in which TFP growth yields a negative TFP growth rate and simply labels it a long-term historical growth rate.

PSE does not, in any way, qualify its TFP growth estimate from the 12 observations from the years 2005-2016 to acknowledge the cyclical slowdown in the U.S. economy. Rather, it relies on the fact that its study period is somewhat longer than the one used in a study of transmission productivity by the Australian Energy Regulator.[17]

Energy Probe moreover submits that PSE's reported annual industry TFP growth rate is a result of overlapping of its study period with the Great Recession in the U.S. and its aftermath. The PSE Report gives no reason to think that the declining productivity at either the national level (as measured by the U.S. BLS) or at industry level (as measured by PSE) will continue into the long-term future.

Accordingly, PSE's -1.71% annual TFP growth estimate is certainly not an historically-based, long-term industry TFP growth rate trend that the Board requires. The Board should reject it.

PSE's "Implicit Stretch Factor"

PSE's estimated -1.71% industry TFP growth rate is problematic because, as it notes, the Board disapproves of negative X factors. Accordingly, PSE therefore recommends a 0.00% X factor.[18]

PSE then points out that in so doing, the Board is effectively imposing an "implicit X factor" of 1.71% that Hydro One will need in order to exceed

[16] Exhibit I, Tab 3, Schedule 26, p.2
[17] Exhibit I, Tab 3, Schedule 23, p.2
[18] PSE Report, p.17

the historic industry TFP trend by 1.71% during the CIR period in order to achieve the allowed rate of return in the escalation formula. …[19]

PSE's statement is very confusing. First, Energy Probe is of the view that if the Board wishes to adopt a stretch factor of 1.71% it should do so on the merits, and not simply because doing so mechanically brings the X-factor up to the minimum level that the Board can accept.

Secondly, PSE's approach is inconsistent with the very purpose of incentive regulation. In particular, it is not the purpose of incentive regulation to allow Hydro One to achieve any particular rate of return.

Thirdly, since PSE's TFP growth rate of -1.71% is not an estimate of the long-term historical growth rate that the Board has called for, the adoption of an implicit stretch factor of 1.71% cannot be correct.

Comments on the PEG Report's MFP Growth Rate

On the basis of its productivity research, PEG recommends an annual, industry-wide productivity trend of -0.34% (its "base productivity trend") and a stretch factor of 0.30%. Its recommended X-factor is therefore 0.00%.[20]

PEG's Study Period and Reported Industry MFP Growth Rates

For its productivity research, PEG adopts the years 1996-2016 as its study period. It uses a sample consisting of Hydro One Networks and 44 U.S. transmission utilities but the industry productivity estimate that it reports is derived from the U.S. utilities only.

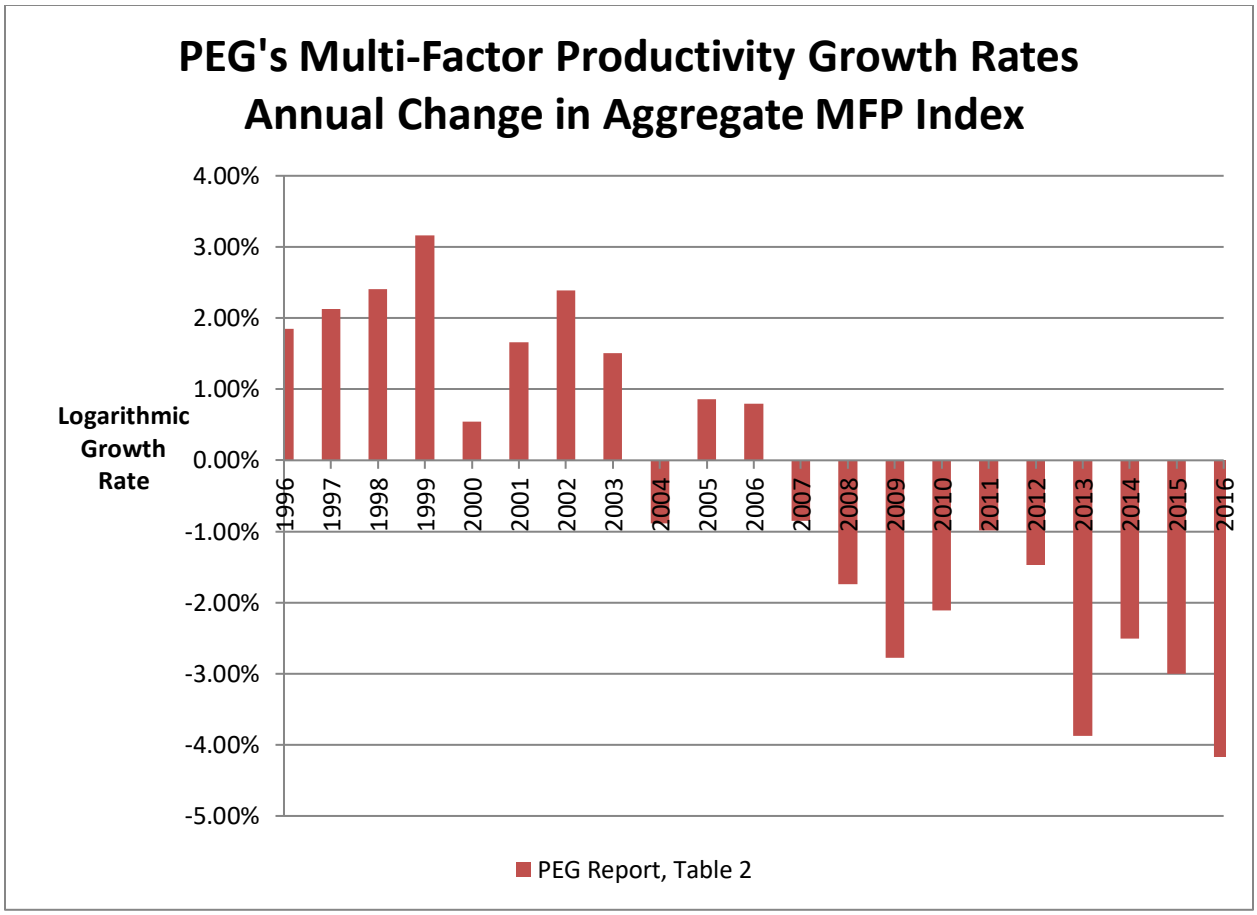
From this sample of U.S. utilities, PEG creates an aggregate, industry-wide, multi-factor productivity ("MFP") index. PEG reports the average annual change in this index of -0.34% for the twelve years of observations 1996-2016 in its study period. For the sub-period 2005-2016 which overlaps PSE's study period, PEG reports an MFP growth rate of -1.82%[21] which is slightly lower than PSE's own estimate of -1.71%.

For the purposes of this proceeding, Energy Probe uses the terms "TFP" and "MFP" interchangeably, as neither PSE nor PEG notes any differences between them.

It is clear that the research methodologies adopted by PSE and PEG differ in several respects. However, from Energy Probe's perspective, the most significant difference is PEG's longer study period.

In the chart below, Energy Probe displays the annual changes in PEG's MPF index that PEG reports in Table 2 of its report.

[19] ibid.
[20] PEG Report, p.6
[21] ibid., p.19



Energy Probe included this chart in its Interrogatory #6 to PEG[22]. PEG included it in its interrogatory response thereto.[23]

As part of the interrogatory process, Energy Probe requested data on the company-specific MFP indexes that PEG had created but which were not included in its Working Papers.

PEG did provide this additional data, which Energy Probe then used to check PEG's index-based results by analyzing the utility-specific data in the sample more rigorously. Energy Probe reports its research in Appendix A.

Interpretation of PEG's Productivity Results

Having regard to the above chart of annual changes in PEG's MFP Index, the problem those data pose is easily seen. *It is the same problem that Energy Probe raised in its review of PSE's research. Both reports interpret their results as informative of the long-term trend in transmission productivity, but their results demonstrate only the effects of cyclical economic conditions on productivity.*

[22] Interrogatories of Energy Probe on the Expert Evidence of the Pacific Economics Group on behalf of OEB Staff. M1-EP-6

[23] Exhibit L1, Tab 2 Schedule 6, p.1

As discussed above PSE's results for the period 2004-2016 consist of 12 observations of the industry-wide TFP growth rate averaging -1.71%. During and after 2008, PSE's reported annual growth rates are negative in all years except 2011. As Energy Probe submitted above, this reflects the severe cyclical downturn in the U.S. economy and the unusually slow and lengthy recovery which had not ended by 2016.

While PEG's study period 1996-2016 is longer than PSE's, the PEG Report fails to point out (i) that its own annual productivity growth estimates have been negative since 2007, and (ii) that with the exception of 2004, its growth rates were positive from 1996 to 2006.

The cause of PEG's reported average annual growth rate of -0.34% is that, in averaging over its entire study period, the years of negative growth starting in 2007 more than outweighed the years of positive growth 1996-2006.

Energy Probe submits that PEG's industry growth rate of -0.34% is a mere artifact of its averaging procedure. Like the PSE Report, it provides no information on the long-term growth rate that the Board is looking for.

To its credit and unlike PSE, PEG recognizes the impact of short-run cyclical conditions on industry productivity growth, not in the PEG Report, but in its interrogatory responses to Energy Probe.[24]

In its response to Energy Probe interrogatory #5(a), PEG states that it agrees that productivity can vary with the business cycle[25]

In its response to Energy Probe interrogatory #5(b), PEG acknowledges that the recovery of the economy from the recession of 2008-9 has been slow and this has "probably affected" U.S. transmission utility productivity growth[26]

In its response to Energy Probe interrogatory #6(a), PEG acknowledges that the transmission industry achieved strong productivity growth in "some of the earlier years of its sample period"[27]

In its response to Energy Probe interrogatory #6(b), PEG states that productivity growth was "more typically negative in the latter years of the sample period"[28]

[24] Exhibit L1, Tab 2
[25] ibid., Schedule 5
[26] ibid.

[27] ibid., Schedule 6
[28] ibid.

In its response to Energy Probe interrogatory #6(c), PEG re-states that "The severe recession and usually slow recovery have probably slowed transmission industry productivity growth." In addition, PEG here calls attention to other factors "at play" that contributed to the industry productivity slowdown including, inter alia, the Energy Policy Act of 2005.[29]

In Energy Probe's understanding, such legislative/regulatory changes are important determinants of long-run productivity growth rate and PEG's emphasis on the Energy Policy Act of 2005 is warranted. However, providing an estimate of the impact of that Act on productivity growth would have been more informative and helpful than simply taking note of it. Hence, we do not know how much of PEG's productivity-growth estimate of -0.34% is due to the Act and how much is due to the cyclical business and economic conditions during its study period.

Energy Probe submits that, when taken together with PEG's interrogatory responses noted above, the PEG Report provides no useful assistance to the Board as to the appropriate estimate of the long-term productivity growth in transmission. Its proposed industry annual productivity growth rate -0.34% should be rejected.

PEG's Stretch Factor

PEG's recommendation is to combine its -0.34% MFP growth trend with a 0.30% stretch factor.[30] Accordingly, its proposed X factor is 0.00%, which is identical to PSE's proposed X factor.

It is not clear how PEG arrives at its recommended stretch factor 0.30%. In Appendix B of its report, PEG provides its reasoning that for a utility of average efficiency, the stretch factor should be in the range 0.50% to 1.01%.[31] Nevertheless, PEG recommends a 0.30% stretch factor "if the results for our full sample period are used."[32]

As discussed above, Energy Probe criticized PSE's proposed stretch factor of 1.71% on the basis that it was determined retroactively, to justify nothing higher than an X factor of 0.00%.

Energy Probe is now concerned that PEG's proposed stretch factor is also determined retroactively, to justify nothing lower than an X factor of 0.00%.

Energy Probe can say only that the Board should impose a stretch factor on the merits, not on the basis of ex post reasoning that the chosen stretch factor would enable the Board to set an X factor of 0.00%, especially since neither expert report presents any useful information on the long-run industry productivity growth factor.

[29] ibid., and PEG Report, p.39-40
[30] PEG Report, p.6
[31] PEG Report, p.23 and p.49
[32] PEG Report, p.23

WHAT SHOULD THE BOARD DO?

In its Interrogatory #26 to PSE, Energy Probe provided the following table presenting multifactor productivity growth rates in the aggregate business sectors of Canada and the United States and in their respective utility sectors.[33] The growth rates presented are taken, or calculated, from Statistics Canada and the U.S. Bureau of Labor Statistics data on their respective MFP indexes.

CANADA			UNITED STATES		
Business Sector MFP Growth[34]	Average Annual Growth Rate		Private Business Sector[35]	Average Annual Growth Rate	
1961-2016	0.475%		1987-2017	0.9%	
1961-2004	0.675%		1987-2005	1.1%	
2005-2016	-0.241%	Most recent 12 years	2006-2017	0.5%	Most recent 12 years
Utilities Sector MFP Growth[36]			Utilities Sector MFP Growth[37]		
1961-2016	0.556%		1987-2016	0.6%	
1961-2004	0.961%		1987-2004	1.341%	
2005-2016	-0.897%	Most recent 12 years	2005-2016	0.058%	Most recent 12 years

In its interrogatory response, PSE did not challenge the correctness of these data or Energy Probe's calculations thereon. It questioned the relevance of these data and, in so doing, it called

[33] Interrogatories of Energy Probe, November 20, 2018, D1-EP-26.

[34] Source: CANSIM Table: 36-10-0208-01. Energy Probe calculations of growth rates for all periods shown.

[35] Source: US Bureau of Labor Statistics, Multifactor Productivity Tables, 1987-2017 Major Sector Multifactor Productivity, Private Business and Private Nonfarm Business Multifactor Productivity Tables, Spreadsheets PG Indexes=100.000 (levels) and PG % Change Year Ago (growth rates); Energy Probe calculations of growth rates for sub-periods 1987-2005 and 2006-2017.

[36] Source: CANSIM Table: 36-10-0208-01. Energy Probe calculations of growth rates for all periods shown.

[37] Source: US Bureau of Labor Statistics, Multifactor Productivity Tables, 1987-2016
Combined Sector and Industry Multifactor Productivity, Combined Sectors and Industry KLEMS Multifactor Productivity Tables by Measure, Spreadsheets 1-10.2 (level) and 1-10.3 (growth rates); Energy Probe calculations of growth rates for sub-periods 1987-2004 and 2005-2016.

its own efforts to adduce a long-term trend into question.[38] Energy Probe maintains that the Board seeks a long-term productivity trend, not an estimate of what productivity growth will be in the CIR period.

The U.S. data in the above table illustrate the slowdown in private-sector productivity growth, which was 0.9% annually in the period 1987-2017 but only 0.5% for the sub-period 2006-2017. Similarly, utility-sector productivity growth fell from 0.6% per annum in 1987-2016 to 0.058% in the period 2005-2016. These data show how atypical the period 2005-2016 was, and are the source of the problems in the PSE Report and the PEG Report.

Energy Probe recognizes that Statistics Canada and the U.S. Bureau of Labor Statistics define "utilities sector" differently. It also recognizes that the Statistics Canada MFP growth rates shown here consist of electric, gas and water utilities:

> This sector comprises establishments primarily engaged in operating electric, gas and water utilities. These establishments generate, transmit, control and distribute electric power; distribute natural gas; treat and distribute water; operate sewer systems and sewage treatment facilities; and provide related services, generally through a permanent infrastructure of lines, pipes and treatment and processing facilities.[39]

Energy Probe understands that Statistics Canada does not provide public information for sub-sectors of this industry classification.

However, as neither the PSE Report nor the PEG Report provide any useful information on the long-term productivity growth rate in electricity transmission, the available information above, which was provided and tested in the interrogatory process, can be useful to the Board.

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[38] Exhibit I, Tab 3, Schedule 26. Of particular note is PSE's assertion:

> PSE would agree that the longer time periods provide a more historical look at MFP in the business sectors. However, this does not mean that the longer time period should be used to formulate an expectation of what will happen in the next three to five years. In both the Canadian and U.S. cases, there does appear to be a pronounced slowdown in MFP in more recent years. Perhaps underlying factors have changed in more recent years (e.g., slowing birth rates, full adoption of computers) that make the more historical MFP less relevant to predicting the MFP for upcoming years. (p.2)

Here, PSE shows once again that its goal is to produce a productivity estimate for the next 3-5 years, rather that meeting the Board's requirement for a long-term industry growth rate

[39] Statistics Canada. North American Industry Classification System (NAICS) Canada, 2017 Version 3.0, Catalogue no. 12-501-X, ISBN 978-0-660-27121-7

For example, while the long-term average annual MFP growth for Canadian utilities in the period 1961-2016 is 0.556%, the figure for the most recent 12 years is -0.897%. This latter negative datum accords with the negative TFP/MFP growth rates proposed by PSE and PEG. Indeed, -0.897% is higher than PSE's -1.71% but lower than PEG's -0.34% for their respective study periods. So, it is well within the bounds of the expert evidence for their study periods.

Moreover, the Statistics Canada utility data above show conclusively that *any productivity estimate drawn from the most recent 12-year period diverges substantially from the long-term MFP growth rate in the utility sector*.

This means that if a proponent advocates a negative long-term MFP growth rate for electricity transmission utilities in Canada, then, at the very least, that proponent must justify why transmission-sector productivity growth should be different than for the sector as a whole.

Accordingly, Energy Probe submits that the Board should adopt Statistics Canada's MFP-growth estimate of 0.556% for the period 1961-2016 as the long-term productivity growth rate for transmission in this case. This estimate is the only plausible long-term estimate for transmission on the record in these proceedings.

Energy Probe makes no recommendation on the stretch factor. Whatever action the Board may take in this regard should be based on the merits, and not simply on an ex post attempt to bring the X factor to 0.00% as both experts in this case have done.

Issue 7. Is Hydro One SSM's proposal to maintain the current approved load forecast and resulting charge determinants for the purposes of setting Uniform Transmission Rates over the entirety of the deferred rebasing period appropriate?

Energy Probe does not have a submission on this issue.

C. TRANSMISSION SYSTEM PLAN

Issue 8. Does the Transmission System Plan adequately address the OEB's Renewed Regulatory Framework objectives?

On the surface it appears that the TSP does address the OEB's RRFE objectives. When one digs deeper there are concerns about TSP and the METSCO report on which it is based were produced.

Hydro One SSM claims that its Transmission System Plan ("TSP") is "robust and appropriate"[40]. It bases this claim on the statement that "the proposed spending levels are in line with the needs

[40] Argument-in-Chief, page 15

of the asset base as demonstrated by the Asset Condition Study performed by METSCO Inc." [41] Yet METSCO's Asset Condition Study, also referred to as Asset Condition Assessment ("ACA") does not inspire much confidence.

ACA was only undertaken to fulfill a regulatory filing commitment[42] not to provide "the needs of the asset base". METSCO was engaged by a manager in Hydro One Regulatory Affairs not by someone responsible for engineering or operations of Hydro One SSM. METSCO report uses colourful graphics but produces no meaningful conclusions. METSCO staff made only one site visit [43]and did not collect any information on the current condition of the assets[44]. It based the report on the outdated information in the files of Hydro One SSM. For example, the information METSCO used for protection relays was obtained from a 2008 report[45] which was likely based on data collected prior to 2008. It used data from the Needs Assessment Report[46] that was prepared in 2014 using 2013 data.

METSCO staff who prepared the ACA do not appear to have much experience in asset condition assessment work [47]. METSCO witness who was in charge of the ACA seemed unfamiliar with the work many aspects of the work.

The TSP was prepared concurrently with the ACA, not after the ACA. This can be seen from the dates of the Challenge Sessions[48]. Therefore, ACA could not have influenced the TSP. This puts in question the value of the ACA and raises questions about the TSP. Energy Probe believes that both the TSP and the ACA were produced only to meet a regulatory filing requirement and not to fulfill the intended purpose of such documents. It seems from the evidence that decisions about the operation of Hydro One SSM and investments in its assets are being made by the Redirection Committee composed of Hydro One managers who do not appear to be guided by the TSP or the ACA.

Issue 9. Is the level of planned 2019 to 2026 expenditures appropriate and is the rationale for planning and pacing choices appropriate and adequately explained in the Transmission System Plan? Is Hydro One SSM's asset management process reasonable and has it been adequately supported by its Transmission System Plan?

[41] Argument-in-Chief, page 15
[42] Exhibit I, Tab 3, Schedule 11, Attachment 1
[43] Exhibit I, Tab 3, Schedule 12
[44] Tr. Vol 2, January 15, 2019, pages 18 to 20
[45] Exhibit B1, Tab 1, Schedule 1, Appendix E, Exhibit I, Tab 3, Schedule 21
[46] Exhibit B1, Tab 1, Schedule 1, Appendix D, Pages 3 and 4, Exhibit 1, Tab 3, Schedule 20
[47] Exhibit I, Tab 3, Schedule 16
[48] Exhibit I, Tab 3, Schedule 2

The TSP appears to have been put together during a series of meetings referred to as Challenge Sessions . The witnesses were not able to explain the process used or the information available to the individuals at the Challenge Sessions [49]. It appears that major decisions were made without adequate consideration or information. The Board can not have confidence in a TSP that seems to have been put together quickly with such inadequate management process.

It appears that most important decisions are made by the Redirection Committee[50] composed of Hydro One people[51]. There are no Hydro One SSM representatives on it. It is not clear if they in their decisions would need to conform with the TSP.

Hydro One SSM management has a very limited role. Mr. Lewis mentioned that he has asset fiduciary responsibility[52]. The following is the definition of fiduciary.

The relationship of one person to another, where the former is bound to exercise rights and powers in good faith for the benefit of the latter; e.g. as between trustee and beneficiary. [53]

Mr. Lewis is the managing director of Hydro One SSM. He is an employee of Hydro One but his fiduciary responsibility appears to be to the bondholders of the GLPT, the predecessor company of Hydro One SSM. According to the definition of fiduciary, he is exercising his rights and powers for the benefit of bondholders. He does not seem to have any duty to ratepayers or to the customers of Hydro One SSM. Although he is listed as having attended Challenge Sessions [54] where decisions were made on the TSP, Mr. Lewis pointed out that he was actually not at the sessions and was only asked to sign off on the results [55]. He also pointed out that he is not on the Redirection Committee [56]

Although there are services agreements [57] between Hydro One and Hydro One SSM it is not clear who is providing management oversight to ensure that the interests of Hydro One SSM, its customers and ratepayers are protected. This was one of the issues that Energy Probe hoped to address in the oral hearing. Since there was no oral hearing there remains a question that the OEB needs to ask itself.

[49] Tr. Vol. 2, Redacted, January 15, 2019, pages 1 to 19
[50] Tr. Vol. 1, January 14, 2019, page 18
[51] Exhibit I, Tab 3, Schedule 4
[52] Tr. Vol. 1, January 14, 2019, page 13
[53] Osborn's Concise Law Dictionary, Sixth Edition,1976
[54] Exhibit I, Tab 3, Schedule 2
[55] Tr. Vol. 2, Redacted, January 15, 2019, pages 14 and 15
[56] Tr. Vol. 1, January 14, 2019, page 18
[57] Exhibit JT 1.1

For the above reasons, Energy Probe believes that there is inadequate evidence on the record to answer the questions posed in Issue 9 in the affirmative.

Issue 10. Do the proposed expenditures include the consideration of factors such as customer preferences, system reliability and asset condition?

It is not clear from the evidence to what extent the proposed expenditures include consideration of factors such as customer preferences, system reliability and asset condition.

Issue 11. Has Hydro One SSM adequately addressed operational synergies and savings in the Transmission System Plan, including with respect to its operational integration with Hydro One Networks Inc.? Is Hydro One SSM's continuous improvement adequate?

Although the Maintenance Plan is approved by Mr. Lewis.[58] It appears that real decisions are made by the Redirection Committee composed of Hydro One people. Mr. Lewis does not appear to have any operational or technical experience so his review and approval is largely a formality.

Issue 12. Were Hydro One SSM's customer engagement activities adequate to enable customer needs and preferences to be considered in the formulation of its proposed spending?

Energy Probe does not have a submission on this issue.

D. PERFORMANCE SCORECARD

Issue 13. Are Hydro One SSM's proposed key performance indicators and scorecard complete, including adequate performance measure metrics, each with specific performance outcomes and implementation timelines? Do the outcomes adequately reflect customer expectations? Does Hydro One SSM's proposed scorecard reflect the OEB's requirements?

Although Hydro One SSM has made a good effort in producing a scorecard that meets OEB requirements, based on the evidence on the record the proposed scorecard of Hydro One SSM is still not complete.[59]

E. ACCOUNTING

[58] Tr. Vol.1, January 14, 2019, Page 14
[59] Tr. Vol. 2, Redacted, January 15, 2019, pages 168 to 180

Issue 14. Have all impacts of any changes in accounting standards, policies, estimates and adjustments been properly identified and recorded, and is the rate-making treatment of each of these impacts appropriate?

Energy Probe does not have a submission on this issue.

Issue 15. Are Hydro One SSM's proposals for deferral and variance accounts, including the balances in the existing accounts and their disposition, and the continuation of existing accounts appropriate?

Energy Probe does not have a submission on this issue.

Issue 16. Is the proposed new deferral account to capture revenue deficiencies appropriate?

Energy Probe does not have a submission on this issue.

F. COST ALLOCATION

Issue 17. Is the transmission cost allocation proposed by Hydro One SSM appropriate?

Energy Probe does not have a submission on this issue.

G. EFFECTIVE DATE

Issue 18. Is the proposed effective date of January 1, 2019 for Hydro One SSM's 2019 revenue requirement appropriate?

Energy Probe does not have a submission on this issue.

APPENDIX A

Energy Probe's Analysis of PEG's Sample Data

At page 10 above, Energy Probe presented a chart of the annual changes in PEG's aggregate MFP index. In this appendix, Energy Probe demonstrates that similar conclusions are reached through an analysis of 43 utility-specific MFP indexes that were calculated by

PEG.[60] As these firm-specific indexes were not included in PEG's Working Papers, Energy Probe requested additional index data which PEG then provided.

From these utility-specific indexes, Energy Probe determined that complete data for the period 1996-2016 inclusive were available for only 43 utilities. As a result, all of Energy Probe's calculations discussed below are based on these 43 U.S. utilities.

From this index data, Energy Probe then calculated the corresponding 903 observations (=43x21) of the annual MFP logarithmic growth rate. PEG confirms the correctness of Energy Probe's calculation that the average of those 903 MFP logarithmic growth rates is -0.216%[61] as compared with PEG's -0.34% average logarithmic percentage changes in its aggregate index.

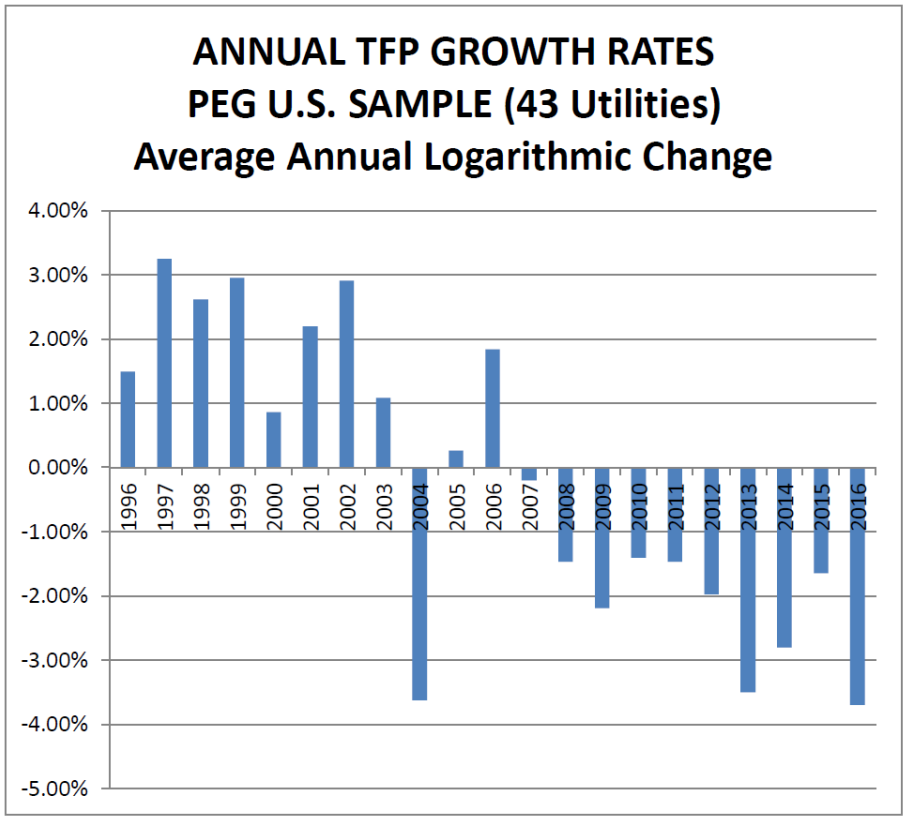
In its interrogatory response, PEG states that due to an error on its part, the sample of index data that it provided to Energy Probe unintentionally dropped several observations.[62] PEG reports that on recalculation using these missing data, the sample average MFP logarithmic growth rate is -0.1441%. PEG provides other recalculations based on its larger sample of utility-specific MFP indexes.[63]

Energy Probe accepts PEG's explanation but since PEG has not provided the missing index values, Energy Probe is not able to confirm PEG's re-calculation of the sample average or the results of any other calculations that PEG reports in its interrogatory response. As a result, Energy Probe's submissions below are based on 903 observations of PEG's annual MFP logarithmic growth rates for the 43 utilities for which complete index data were available in the data provided by PEG in response to Energy Probe's request.

In its Interrogatory #6 to PEG, Energy Probe presented the chart below showing PEG's average annual logarithmic TFP growth rate across all 43 utilities for each year 1996-2016.[64]

Energy Probe notes that this chart is very similar to the chart of PEG's annual growth in its aggregate productivity index shown above at page 10. Again, the critical period is 2007-2016 when MFP growth is negative in every single year.

[60] PEG Report, p.18 and Interrogatory Response to Energy Probe-4(a), Exhibit L1, Tab 2, Schedule 4, p.3
[61] Interrogatory Response to Energy Probe-4(g), Exhibit L1, Tab 2, Schedule 4, p.3
[62] Interrogatory Response to Energy Probe-4(c), Exhibit L1, Tab 2, Schedule 4, p.3
[63] Interrogatory Response to Energy Probe-4, Exhibit L1, Tab 2, Schedule 4, p.4
[64] EB-2018-0218. Interrogatories of Energy Probe on the Expert Evidence of Pacific Economics Group on behalf of OEB Staff, Interrogatory #6


ANNUAL TFP GROWTH RATES
PEG U.S. SAMPLE (43 Utilities)
Average Annual Logarithmic Change
4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
-2.00%
-3.00%
-4.00%
-5.00%
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APPENDIX B

Measuring TFP Growth: Annual % Change v. Logarithmic Growth Rates

Both experts report their growth-rate results in the form of logarithmic percentage changes. Logarithmic percentages are not in common use and it appears that most readers disregard any potential differences between a logarithmic percentage change and the corresponding, and more familiar, annual percentage change.

As noted in the body of this report, both PSE and PEG report their productivity growth estimates as logarithmic percentage changes, -1.71% and -0.34% respectively.

Energy Probe raised the distinction between logarithmic percentage growth rates and annual percentage growth rates during the Technical Conference. As Energy Probe noted, the logarithmic percentage change will always be a smaller number than the corresponding annual percentage change. Moreover, the difference between the two growth rates may be so small as to be irrelevant in a particular circumstance. These statements were not challenged at the Technical Conference.[65]

However, Energy Probe contends that differences between logarithmic percentages and annual percentages can be significant and illustrates with an example from this case. Energy Probe further notes below that the conventional (I-X) calculation in incentive regulation must be careful to measure I and X in the same terms, whether logarithmic percentage or annual percentage.

A Brief Comparison

As noted in Appendix A above, Energy Probe calculated 903 annual MFP growth rates for the period 1996-2016 from PEG's index data for 43 U.S. utilities. These growth rates are expressed as logarithmic percentage changes following PEG's practice, and are available in Energy Probe's interrogatory #4 to PEG and in PEG's interrogatory response thereto.[66,67]

[65] Logarithmic changes may be preferred in certain circumstances. If an annual index rises from 100 to 110, the annual percentage change is 10%. If in the next year the index then falls from 110 back to 100, the annual percentage change is -9.09%. Using logarithmic changes, the former increase is 9.53% and the latter decrease is -9.53%.

[66] EB-2018-0218. Interrogatories of Energy Probe on the Expert Evidence of Pacific Economics Group on behalf of OEB Staff, Interrogatory #4(d)

[67] Interrogatory Response to Energy Probe-4(d), Exhibit L1, Tab 2, Schedule 4, p.2

As noted in Appendix A, the average of these logarithmic growth rates is -0.216%.

Energy Probe converted each of these 903 annual MFP logarithmic growth rates to annual percentage changes.[68] These recalculated growth rates appear in Energy Probe's interrogatory #7[69] and in PEG's interrogatory response[70] thereto.

In its response to Energy Probe's interrogatory, PEG confirmed that Energy Probe's calculations were correct and that the simple average of the annual percentage changes is 0.0035%.[71]

Energy Probe notes that converting its 903 growth rates from logarithmic to annual percentage changes results in a flip in the average MFP growth rate for the 43 utilities from -0.216% to 0.0035%. Energy Probe submits that this flip from a negative growth rate to a positive one is significant in the circumstances of this case.

As noted in Appendix A, PEG reports that, on its own recalculation using previously-missing data, it finds that the average MFP logarithmic growth rate for its sample is -0.1441%. However, when PEG converts those growth rates to annual percentage changes, it finds that the average thereof is 0.0721%.[72] On PEG's own data and calculations, the average MFP growth rate flips from negative to positive.

Thus, PEG's own evidence supports Energy Probe's general contention that there may be significant differences between a logarithmic percentage change and the corresponding annual percentage change.

The **(I-X)** Calculation

The difference between a positive average MFP growth rate and a negative one is very significant in determining the parameters for an incentive-rate formula, as it affects the (I-X) calculation.

Neglecting stretch factors, the basic expression of the IR formula provides that the permitted percentage rate increase is equal to **(I-X)** where **I** is the expected inflation rate and **X** is the productivity growth rate.

[68] If the annual percentage change is g and the corresponding logarithmic percentage change is r, then $g = e^r - 1$ where e is the base of the natural logarithm.
[69] EB-2018-0218. Interrogatories of Energy Probe on the Expert Evidence of the Pacific Economics Group on behalf of OEB Staff, M1-EP-7
[70] Interrogatory Responses to Energy Probe, Exhibit L1, T2, Schedule 7, p.1, M1-EP-7
[71] ibid., p.2
[72] ibid.

Although both **I** and **X** are expressed as percentages, the PSE Report appears to measure **I** as an annual percentage change of 1.4% and to measure **X** as a logarithmic percentage change -1.71%.

This practice is anomalous, because in order to subtract **X** from **I**, they must be stated in the same units.

The PEG Report does not recommend a value for the **I** factor. If PEG had recommended an I value in annual percentage terms, then using its sample data, it should use an **X** factor of 0.0721% in its **(I-X)** calculation.

If, however, PEG had proposed an **I** value in logarithmic percentage terms, then using its sample data, it should have used an **X** factor of -0.1441%.