L1.EGD/Union.5 - Calculating Capital

References:

a. Alberta Utilities Commission Rate Regulation Initiative, Proceeding 566, Transcript Volume 13, May 12, 2012, p. 2590, lines 8-17:

Dr. Lowry: "You haven't noticed, but I don't think Dr. Makholm or any other party using their approach to capital costing to shed light on the proper design of the inflation measure, because those other approaches to capital costing like the geometric decay that Dr. Schoech often favours and that I've used in the past and the one hoss shay that Dr.
Makholm uses, the input prices that go along with those don't remotely resemble the way input prices affect costs growth under regulatory accounting, whereas my approach is expressly designed to be relevant for that purpose."

b. Alberta Utilities Commission Rate Regulation Initiative, Proceeding 566, Transcript Volume 13, May 12, 2012, p. 2744, line 5 to p. 2745, line 24:

Question from Mr. L. Smith, Q.C., Counsel for ATCO Electric Ltd. and ATCO Gas: "Okay. Now, when I look at the TFP growth rates for 1999 -- and then I think what I'm going to ask you to do, Dr. Lowry and Mr. Chairman and members, is just sort of focus on '99 to 2004, which is the period in which TFP -- now, this is U.S. national gas industry total factor productivity growth rates, are reproduced from the four studies which Dr.
Lowry has prepared. We see from '99 through 2004 what I would put to you to be widely varying results, sir.

Would you agree? Let's go through it."

Answer from Dr. Mark Lowry, witness for Consumers Coalition of Alberta: "No, I can respond to that. The year-to-year results are sometimes quite different. The trends are much more similar. We -- I think I've got this calculated right. We looked at the trends over the common periods and found that the one in this proceeding was 1.21 percent. The more recent San Diego study was 1.08. The Ontario study before that was 1.08, and the only one that was more of an outlier was the SoCalGas study over that period.

As for those year-to-year differences, I said before they were -- a big part of that is due to -- a lot of reasons. I've already given you a lot of reasons why they could be different, but the biggest thing to take note of is the difference between the studies that used the geometric decay approach and the one that used the cost of service approach to capital costing and which of the two yields numbers that raise the eyebrow a little bit, like TFP declining by 1 percent in a few years, why that would be the geometric decay approach.

And that's an example of the greater instability of the geometric decay approach because the cost shares on capital vary wildly under geometric decay.

And why? Because they include capital gains, which, obviously, are not a consideration under traditional regulation, but they can really swing a result in a year. Some years capital has

surprisingly little weight because of capital gains and then other years it will be a much bigger amount.

Well, this is one of the reasons that I stepped away from using geometric decay except in a context where people really appreciate the tradition of having always done it that way. The cost of service approach on a year-to-year basis -- well, in the long run the trends are similar. On a year-to-year basis everything is a little more sensible, and that goes for the input price index as well as the productivity index. I think this is what you're seeing here."

c. Alberta Utilities Commission Rate Regulation Initiative, Proceeding 566, Transcript Volume 13, May 12, 2012, p. 2746, lines 2-21:

Question from Mr. L. Smith, Q.C., Counsel for ATCO Electric Ltd. and ATCO Gas: "I have the evidence you filed in this proceeding with a TFP of .21 and a SoCalGas negative 1.19, and I have San Diego results which are a negative .65 and the Ontario results which are a positive .52.

Now, we're supposed to be measuring the same thing, aren't we?"

Answer from Dr. Mark Lowry, witness for Consumers Coalition of Alberta: "Well, these indexes are designed to measure trends in the longer term, and as I just tried to explain, with the geometric decay approach, you can expect to see more volatility than you will with a cost of service approach.

And I think that's what you're looking at. I mean, you're going from a COS to a geometric decay and then to a COS and then back to a geometric decay, and the two geometric decay ones are not so different from each other.

And also, as I have just said, the trends over this period actually are pretty similar, excepting the SoCalGas study which uses those regional weights and has the maximum number of differences from the present. There are a lot of things done differently in that study."

d. Alberta Utilities Commission Rate Regulation Initiative, Proceeding 566, Transcript Volume 13, May 2, 2012, p. 2748, lines 8-25:

Question from Mr. L. Smith, Q.C., Counsel for ATCO Electric Ltd. and ATCO Gas: "So five years from now, when we have to revisit all this and see if we got the right TFP growth rates and so on, which one do we go back to?"

Answer from Dr. Mark Lowry, witness for Consumers Coalition of Alberta: "We'll do -- if I'm involved, we'll do whatever makes the most sense at the time."

Question from Mr. L. Smith, Q.C., Counsel for ATCO Electric Ltd. and ATCO Gas: "For whom?"

Answer from Dr. Mark Lowry, witness for Consumers Coalition of Alberta: "For the calibration of an X factor in Alberta. Likely will include the COS because I've been using the COS consistently in regulatory applications that produce X factors. The one exception is California, but that's not used for X factor calibration. It's just an informational aid to the Commission. And by the way, the other two big utilities in California have gotten out of filing these studies. They say it's a waste of time because it's not even used in the regulatory arena, which is true.

I mean, it's not used to set their rates, and so they say, 'Why do we even have to do these studies?' And they've been given permission to stop doing them."

e. Alberta Utilities Commission Rate Regulation Initiative, Proceeding 566, Interrogatory NERA-CCA-2:

Reference: PBR Plans for Alberta Energy Distributors – Pacific Economics Group Research LLC – Index Research and Incentive Regulation, Price and Productivity Indexes, Calculating Capital Costs, Section 2.1.4, p. 14

Preamble: PEG states that
"The cost of service ("COS") approach to calculating capital cost, prices, and quantities is designed to approximate the way that capital cost is calculated in utility regulation.
This approach is based on the assumption of straight line depreciation and the historic (book) valuation of capital. The capital price is a function not simply of the *current* construction price but, rather, of a weighted average of current and past prices. The intuition is that inflation in the rate base results from the fact that the cost of constructing plant that is two, four, and twenty years old is higher than it was last year. The weight for a given year is larger the larger is its representation in the current value of the rate base. Weights tend to be larger for more recent years than for earlier years. The COS capital price also depends on the weighted average cost of acquiring funds in capital markets."

Request:

a. Please describe and explain PEG's views on what drives "the way that capital cost is calculated in utility regulation" in the United States and Canada.

b. Does the calculation of capital costs for productivity measurement purposes differ in a fundamental way from the way that capital costs are derived by regulators and courts of law for ratemaking purposes? Please fully explain your response.

Response:

a. Dr. Lowry has not considered what "drives" the way that capital cost is calculated in utility regulation in the United States and Canada.

b. There are numerous ways to calculate capital cost for use in productivity measurement. The recommended approach depends upon the use of the study. When the study is for use in the selection of an X factor for a multi-year rate plan, Dr. Lowry believes that it is advantageous to use a methodology that mirrors how capital cost is calculated in rate cases.

Preamble: The companies would like to understand Dr. Lowry's use of geometric decay and cost of service for measuring capital quantity.

Questions:

a. Confirm that in AUC Proceeding 566, Dr. Lowry used the "cost of service" or "COS" method for measuring capital quantity. If not confirmed, explain why.

b. Confirm that in this proceeding, Dr. Lowry used the "geometric decay" or "GD" method for

measuring capital quantity. If not confirmed, explain why.

c. Confirm that in **references b and c**, Dr. Lowry provided examples of results with greater instability because of the geometric decay approach and that he steps away from using that approach except in situations where people appreciate the tradition of having always used such an approach. If not confirmed, explain why.

d. Confirm that in **reference d**, Dr. Lowry stated that he would likely use COS because he has used that method consistently in regulatory applications that produce X factors. If not confirmed, explain why.

e. Confirm that Dr. Lowry believes that it is advantageous in a multi-year rate plan to use a methodology that mirrors how capital cost is calculated in rate cases. If not confirmed, explain why.

f. Confirm that Dr. Lowry understands that the current proceeding involves setting a rate mechanism for multiple years. If not confirmed, explain why.

g. Explain the discrepancy between Dr. Lowry's use of COS in AUC Proceeding 566 and GD in this proceeding. If not confirmed, explain why.

Responses: The following responses were provided by PEG.

a. Dr. Lowry confirms that he used a COS approach to measuring capital costs and quantities in AUC Proceeding 566.

b. Dr. Lowry confirms that he has featured results for a geometric decay ("GD") approach to measuring capital costs and quantities in this proceeding.

c. Dr. Lowry confirms making these statements in the AUC proceeding. However, his occasional use of the COS approach has not been motivated by a perception that GD produces volatile TFP results.

Dr. Lowry initially developed the COS approach for use in Maine and Massachusetts PBR proceedings chiefly because the *input price* trends of utilities are often a central issue in these proceedings. U.S. regulators typically choose macroeconomic inflation measures such as the gross domestic product price index ("GDPPI") for rate and revenue cap indexes. In the United States, macroeconomic measures of the inflation in the prices of final goods and services tend to understate the input price growth of utilities due to the rapid productivity growth of the economy. For these reasons, there is a particular need in some U.S. PBR proceedings to consider whether an adjustment should be made to the X factor for the typical difference between macroeconomic inflation and the input price inflation of utilities. For example, this was an issue in a recent Massachusetts PBR proceeding and in a Central Maine Power proceeding in which Dr. Makholm was a witness. [10]

[10] See Massachusetts Department of Public Utilities, DPU-17-05, *Order Establishing Eversource's Revenue Requirement*, November 30, 2017 and the direct testimony of Neil Talbot and Ronald Norton for Maine's Office of the Public Advocate in Maine PUC Proceeding 99-666, May 19, 2000.

Input price indexes based on the GD and OHS approaches can be quite volatile due to the replacement valuation of assets and the consequent need for a capital gains term. The COS approach to measuring capital cost has an input price index that is much more stable and suitable for these inflation differential calculations than either the GD or the one hoss shay approach.

The need for COS specifications in X factor calibration studies has been declining, however. Index-based PBR now occurs chiefly in Canada, and regulators in Ontario and other Canadian provinces have in several recent proceedings chosen inflation measures for rate and revenue cap indexes that are more industry-specific. The AUC, for example, ruled that

> . . . since both components of the approved I factors can be considered input-based price indexes, there is no need in this case for the Commission to consider an adjustment to TFP for an input price differential or productivity differential in the calculation of the X factor.[11]

Additionally, the multifactor productivity trend of the economy places less of a drag on macroeconomic inflation measures in Canada than it does in the U.S.

Dr. Lowry has taken a fresh look at the relative volatility of capital *quantity* indexes using the GD and COS approaches. He calculated volatility metrics for the growth rates of the capital quantity indexes he has used in publicly available gas productivity studies using COS and geometric decay. He found that the volatility of the *COS* capital quantity indexes was actually greater than the volatility of the *GD* indexes. In his Alberta testimony, Dr. Lowry was thus right to point to different capital cost treatments as a source of differences in his productivity results but misstated which kind of capital quantity index tends to be more volatile.

Dr. Lowry also acknowledges that the familiarity of a regulatory community with GD would be one valid reason for using it in an X factor calibration study. GD has, for example, typically been used in productivity studies considered in Ontario, including one submitted by Enbridge Gas Distribution witness Concentric Energy Advisors.

There are many other arguments for using GD. For example, GD is mathematically much easier than COS to code and for other parties to review. The assumption of gradual decay produces productivity trends that tend to be similar to those produced by the COS approach. For example, increasing system age will tend to accelerate capital productivity growth.

d. Dr. Lowry cannot confirm this statement. He stated in the quoted passage that he reconsiders the appropriate approach to capital cost measurement in every project. He had used the COS approach in several recent proceedings at the time of his quoted Alberta remarks. However, he has used the GD method in most of his TFP and econometric total cost research and testimony over the years. He has been swinging back to the GD approach for X factor calibration studies in Canadian PBR proceedings. In the second Alberta proceeding he presented productivity results using both GD and COS. He used the GD approach in his 2017 testimony for the OEB on the productivity trends of U.S. hydroelectric power generators. He also used GD in recent cost-level benchmarking studies for Green Mountain Power and Alberta's Utilities Consumer Advocate. He is inclined to feature GD in future Canadian proceedings if industry-specific inflation measures continue to be the norm and the TFP growth of the economy remains sluggish.

[11] AUC Decision 2012-237, *op. cit*., p. 89.

e. Dr. Lowry believes that, *all else being equal*, an approach to measuring capital cost that mirrors how capital cost is calculated in rate cases is advantageous in TFP studies intended to calibrate X factors. This is an advantage of COS approaches to capital cost measurement. It is also an advantage of GD approaches relative to OHS approaches. However, there are other criteria for choosing an approach to capital cost measurement, as Dr. Lowry notes in Section 3.2 of his report.

f. Dr. Lowry agrees that this proceeding will establish a rate adjustment mechanism that will be applicable for several years.

g. Dr. Lowry used the GD method in this proceeding for several reasons.

- The COS approach to measuring capital cost is particularly difficult to code and review.
- He anticipated that the inflation measure in the rate or revenue cap index would be industry-specific. Even if it were not, the slower MFP growth of the economy has historically placed less drag on a macroeconomic inflation measure in Canada than it does in the States. Hence, the advantage of the COS approach in calculating inflation differentials is less germane.
- The COS approach is not ideal for measuring trends in cost efficiency since it values plant in historical dollars.
- Amongst the more stylized monetary approaches for measuring capital cost, such as the one hoss shay and geometric decay, the GD approach has numerous advantages. Dr. Lowry discusses some of these advantages in Section 3.2 of his report.
- A faster productivity growth trend was *not* a consideration of Dr. Lowry in choosing GD. Table EGD/Union.5g presents gas utility productivity results for the full sample period using a methodology that differs from that he featured in his report only in using a COS method rather than the GD method. It can be seen that the TFP growth of sampled gas utilities averaged 0.12% -- very close to zero.

Table EGD/Union.5g-Revised

Productivity Trends of U.S. Gas Distributors[1]

	Output	Input Quantities			Productivity		
Year	Customers [A]	OM&A [B]	Capital [C]	Total [D]	OM&A [A-B]	Capital [A-C]	TFP [A-D]
1999	2.16%	-0.24%	1.23%	0.89%	2.40%	0.93%	1.27%
2000	2.67%	1.25%	1.68%	1.42%	1.41%	0.99%	1.25%
2001	1.30%	-7.89%	0.67%	-2.70%	9.19%	0.63%	4.00%
2002	0.82%	-2.14%	0.64%	-0.49%	2.96%	0.18%	1.32%
2003	2.21%	3.92%	0.97%	2.06%	-1.70%	1.24%	0.15%
2004	0.94%	0.92%	0.66%	0.74%	0.02%	0.29%	0.20%
2005	1.39%	1.58%	0.37%	0.89%	-0.18%	1.03%	0.50%
2006	0.77%	-6.99%	0.46%	-2.63%	7.75%	0.31%	3.40%
2007	0.62%	6.25%	0.24%	2.78%	-5.64%	0.37%	-2.16%
2008	0.33%	-0.72%	0.53%	0.03%	1.05%	-0.19%	0.30%
2009	0.29%	5.35%	0.76%	2.75%	-5.06%	-0.48%	-2.46%
2010	0.34%	0.00%	1.08%	0.61%	0.34%	-0.74%	-0.27%
2011	0.56%	0.75%	0.96%	0.91%	-0.19%	-0.40%	-0.35%
2012	0.87%	1.29%	2.06%	2.27%	-0.43%	-1.19%	-1.40%
2013	0.66%	3.21%	2.72%	2.48%	-2.55%	-2.07%	-1.83%
2014	0.85%	2.87%	3.54%	3.24%	-2.02%	-2.69%	-2.39%
2015	0.94%	-2.31%	3.77%	1.08%	3.25%	-2.83%	-0.14%
2016	0.88%	-4.36%	3.96%	0.12%	5.24%	-3.07%	0.76%
Average Annual Growth Rates							
1999-2016	**1.03%**	**0.15%**	**1.46%**	**0.91%**	**0.88%**	**-0.43%**	**0.12%**
Coefficient of Variation							
1999-2016	**0.64**	**24.28**	**0.82**	**1.78**	**4.30**	**-3.18**	**14.46**

Notes

[1]Research used cost of service and a 1994 benchmark year for capital quantity.