REPORT TO THE RÉGIE DE L'ÉNERGIE ON

ANALYSIS OF LONG RUN MARGINAL COST OF SERVICE DELIVERY

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1. Introduction

My name is Richard Baudino, consultant with J. Kennedy and Associates, Inc. I was retained by the Fédération canadienne de l'entreprise indépendante (FCEI) as an expert witness in file R-3867-2013 phase 3A. My mandate is to review the long-run marginal cost studies presented by Gaz Metro (GM) and Black and Veatch (B&V) and to make recommendations regarding the long run marginal operating and maintenance (O&M) costs for Gaz Metro.

In D-2016-106, the Régie de l'énergie (the "Régie") divided consideration of Gaz Metro's profitability analysis into two phases: Phase 3A considers "the method of determining the marginal costs of long-term service delivery"; Phase 3B considers the "methodology for evaluating the cost-effectiveness of network extension projects".

This report will thus focus on the long-run marginal O&M costs related to a service connection, evaluate the studies proffered by Gaz Metro and Black and Veatch, and recommend a method for the Régie to determine the marginal costs of long-term service delivery.

In preparing this report to the Régie, I reviewed the following material:

- English translation of the Régie's relevant decisions bearing on Phase 3A and 3B, including D-2016-169, D-2013-106, and D-2017-009.
- The study submitted by GM entitled "The Study Of The Marginal Costs Of Long-Term Service Delivery Applied To The Profitability Analysis (Follow-Up To Decisions D-2013-106 and D-2015-048)", October 4, 2016.

- The study submitted by B&V entitled "Marginal Costs of Long Term Service Delivery", October 4, 2016.
- The report entitled "Methodology For Evaluating The Profitability of System Extension Projects" from Gaz Metro dated February 16, 2017.
- English translation of information requests and responses submitted by the Régie and the intervenors.
- Other associated background material.

I also participated in a working group that the Régie created consisting of consultants for GM, FCEI, the ROEE, and the OC. This was a highly productive process and greatly informed the preparation and writing of this report. Dr. Edwin Overcast prepared a group report that provided the findings and conclusions of the group. My report is consistent with the agreements in the group report and presents my additional findings and conclusions separately.

2. Short-Run Marginal Costs (SRMC) and Long-Run Marginal Costs (LRMC)

In its decision D-2013-106, Phase 2, the Régie agreed with FCEI that it is appropriate to evaluate LRMC with respect to GM's profitability analyses. Specifically, the Régie found the following:

"[26] The Régie concurs with the FCEI's opinion regarding the use of long-term marginal costs. As the profitability analysis of the development plan bears on a 40-year period, it would seem logical to use long-term costs. The Régie believes that in the absence of a precise evaluation of long-term marginal operating costs, it would be expedient to retain the value of $157, as proposed by the FCEI."

The application of LRMC to the regulation of public utilities was described by Dr. Charles F. Phillips as follows:

"Put another way, price-output decisions should be governed by short-run marginal costs. Such costs, however, are extremely volatile. As the volume of output expands, for example, short-run marginal costs change more rapidly than do average costs. Rates, in turn would have to be changed frequently in accordance with variations in the volume of output. *Further, it is long-run marginal costs that should govern investment decisions.* (italics added)

There is a variant of the theoretical marginal cost principle that has greater practical application; that is, the long-run incremental cost (LRIC) concept. This concept, unlike the concept of short-run marginal cost, recognizes that utilities add capacity in discrete units and on a continuous basis. The long-run incremental cost concept thus includes the future costs of supplying utility services, as opposed to the average cost of serving existing customers."[1]

Alternatively, B&V's study stated the following on page 3:

"Essentially B&V concludes that the Gaz Metro exercise of estimating these O&M marginal costs to comply with the regulatory requirements overstates the actual long-run marginal costs and unduly burdens line extension policies to the detriment of all existing customers.

Economic theory holds that efficient prices equal short-run marginal cost not long-run marginal costs. The use of long-run marginal cost to evaluate line extension creates a timing mismatch between costs for ratemaking (the first year carrying costs that will be in revenue requirement) and the levelized costs over the life of the assets used in calculating long-run marginal costs. This timing mismatch raises revenue requirements in the short-run but over time reduces the revenue requirement for economic connections of new customers."

[1] Charles F. Phillips, Jr., *The Regulation of Public Utilities*, Public Utilities Reports, Inc., 1993, 444.

Though B&V takes a contrary view, the finding of the Régie is indeed consistent with economic theory as applied to LRMC pricing for utilities in general and, specifically for Gaz Metro. In fact, LRMC is a superior measure to SRMC given the lumpiness of capacity additions by utilities and the inability of SRMC to properly reflect those additions.

This report to the Régie takes the perspective that long-run marginal operating costs should include all costs associated with adding new load over time. With respect to the relevant period over which LRMC may be measured, Dr. Phillips provided additional guidance, citing Dr. Alfred Kahn:

"The relevant future time frame is largely a matter of judgment. Argues Kahn:

> What we are trying to measure is how costs will differ, after a span of time sufficiently long for the system planners to adapt the supplying system to the change, by virtue of taking on some specified incremental block of sales on a continuing basis, as compared with not taking it on. Measurement is, to be sure, another matter. What I suspect we are likely to have, mainly, is a measure of the average, full additional costs, for all additional sales undertaken on a continuing basis, over whatever is the reasonable period for additions to capacity – possibly on the order of then to twelve years for electricity, perhaps three to five years in communications."[2]

The 40-year horizon considered by GM and the Régie is certainly consistent with LRMC. Over this period, the utility will not only be adding new customers through line extensions on its existing system, it will also likely expand its entire system, including capacity such as distribution mains. LRMC studies would measure the marginal costs of adding capacity as well as the impacts on all operating costs. However, in Phase 3A we do not have such a study available and Gaz Metro has not performed such a study.[3]

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2 Phillips, 444 – 445.

3 See Gaz Metro's response to Mr. Chernick's Information Request No. 2.2

Therefore, the perspective of Phase 3A will be to examine long run marginal costs associated with the service extensions irrespective of the long run marginal costs associated with upstream capacity. I recommend that the Régie more fully evaluate the O&M costs associated with capacity additions in Phase 3B.

3. Long-Run Marginal Cost of Service Delivery in the Gaz Metro and B&V Studies

On page 5 of 10 in Section 3.1 of the original Gaz Metro study, the marginal cost of service delivery was defined as "the set of costs that can be linked to a customer once he or she has agreed to become a Gaz metro customer. It includes the marginal costs the customer generates and the associated internal costs for the maintenance of its facilities and the services that are directly supplied." Gaz Metro further described its methodology for measuring those costs and in the Appendices presented the results of its analyses for the Residential, Commercial, Institutional, and Industrial (CII), and Major Industries markets.

In Section 3.2 of the original Gaz Metro study, the Company noted that it found differences between the costs associated with service delivery in the first year, and the cost for subsequent years because some of the activities occur only in the first year while others are ongoing. The marginal costs presented in Appendix 1 set forth the categories of costs measured by Gaz Metro for "Year 1" and "Year 2+".

The B&V study used Gaz Metro's original study as a basis for its study and eliminated certain costs that in the view of B&V did not properly constitute long-run marginal costs. Page 4 of the B&V study noted the following:

"Black & Veatch has used its economic, planning, and operating experience and expertise to evaluate and review the O&M costs as required by the Régie for reasonableness despite our reservations that such costs are not properly considered part of the line extension policy as discussed above. In any event for new facilities, these costs rarely occur at the margin in the near term and certainly are zero for plant O&M and even some

customer services in the early years. This conclusion recognizes the importance of scale economies and lumpy additions as the relate to determining marginal costs."

The B&V study recommended changes described on page 8. Those changes are summarized as follows:

- Removed cost of reading a meter
- Removed cost of processing a standard customer call in Year 1
- Removed bad debt and collection and recovery costs
- Preventive and corrective maintenance on service lines – recommended zero for Year 1 and zero for the minimum for Year 2+
- Removed customer retention costs from the CII and Major Industries classes

Gaz Metro adopted the modification in the B&V study.[4]

4. Response to the Original GM study and the B&V Study and Recommendations to the Régie

Reviewing the approach taken in the original GM study, I recommend that the Régie use the methodology contained in that study as a reasonable starting point for measuring the marginal costs of long-term service delivery. GM's approach is an improvement to using the $157 value for marginal costs for all markets, as GM estimated and quantified the marginal cost of activities needed to connect a customer to its system. Using the "Year 1" and "Year 2+" framework enabled further refinement with respect to costs that recur each year and costs that only occur in the first year that a new customer is connected to the system. GM's analysis also evaluated marginal costs by major market, rather than making the simplifying assumption that the marginal cost was the same for all customers, small and large. GM also proposes to further refine its analysis on a project specific

[4] *Study of the Marginal Costs of Long-Term Service Delivery Applied to the Profitability Analysis, (Follow-Up to Decisions D-2013-106 and D-2015-048)*, Oct. 4, 2016.

basis. This is another enhancement compared to its previous methodology. This general methodological approach should assist the Régie in developing line extension charges and customer charges in Phase 3B and future proceedings.

With respect to the cost items that were removed in the B&V report and listed previously, I recommend that they be added back in except for customer retention costs. In general, the B&V report does not take enough of a long run perspective and focuses on short run and near term effect of costs associated with line extensions. It may be the case that in the near term, existing capacity can accommodate a single new customer at zero marginal cost for such items as meter reading. However, over the longer term, with system expansion enough new customers will incur marginal meter reading costs. A long run analyses needs to capture such a cost.

I recommend including the following costs:

- Cost of reading a meter – Meter reading costs may increase in a stepwise manner as stated in the B&V report, but this should be captured in a long run marginal cost analysis. Although it may be correct that a single customer is unlikely to increase current meter reading costs, enough new customers added over time are likely to increase these costs. Omitting meter reading costs would understate the long run marginal operating costs.
- Cost of processing a standard customer call – On page 8, B&V asserted that "not all customers make calls to the utility so we recommend changing the minimum range to zero." Since a long run marginal cost analysis estimates incremental costs over time, the cost of processing customer calls must be included, as it is a valid and necessary expense in providing customer service over time. Even if a one new customer does not call the utility, it is reasonable to assume that others will and the cost of processing these calls should be reflected in long run marginal operating costs.
- Bad debt and collection and recovery costs – Bad debt write-offs and collection and recovery costs are actual costs to the utility and should be reflected in long

run marginal operating costs. Once again, as the system expands over time, these costs will increase on the margin as new customers are added. One customer may not increase bad debt and/or collection costs, but some incremental block of customers will over time.

- Preventive and Corrective Maintenance – These maintenance expenses should reflect long run costs of the system over time and should be included in operating expenses in all years.

A comparison between the B&V report and my recommendations are contained in Tables 1 – 3 at the end of this report. I agree with the B&V recommendation on page 7 that the numbers should be updated for current costs if approved for use.

Tables 1 – 3 note that the numbers do not contain long run marginal costs associated with distribution mains O&M. As GM's system expands over the longer term, additional O&M costs will likely be incurred to meet the additional loads placed on the system. This component of O&M should be included. I recommend that these O&M costs be evaluate in Phase 3B.

Regarding customer retention costs, it is not clear at this point as to the elements that constitute these retention costs and whether these costs should be included in the marginal costs of long term delivery service. I sought additional support for these costs in my Information Request No. 8 (e). Gaz Metro responded with references to its response to question 1.1 of the Régie's request for information No. 5 and its response to question 1.4 of Mr. Chernick's information request. However, these referenced responses did not provide the additional details I required. Therefore, I did not include customer retention costs in my recommendation to the Régie.

Other Considerations

In its study filed on October 4, 2016, GM showed a comparison between the profitability results using the B&V study and GM's original study. The bottom line results were very

close between the two studies, showing that the exclusions in the B&V report did not affect the profitability results in a significant way.

In addition, since the expected marginal costs for small customers are lower than for larger customers, it makes intuitive sense that the Residential profitability results would improve compared to using the $157 marginal cost proxy that was used by Gaz Metro in the past.

5. Summary of Results of Consultants Working Group

The Régie ordered that the consultants for the intervenors and Gaz Metro meet as a working group to see if there could be agreement on the components to include in marginal costs of long-term service. The group met on several occasions and agreed on several cost components to include in marginal costs for the purposes of a profitability analysis. This agreement is captured in a separate document, which was prepared by Dr. Overcast.

I found the group approach to be very productive and helpful in evaluating and understanding different perspectives on marginal cost of long term service delivery for Gaz Metro. I appreciate the Régie for providing the consultants with an opportunity to candidly share their views and achieve an agreement on many aspects of the GM and B&V studies.

As this report mentioned earlier, marginal distribution mains O&M costs should be considered in Phase 3B. Given that capital costs will be dealt with in Phase 3B, it was logical to consider distribution mains O&M in that forum. I recommend that marginal distribution mains O&M be included in the marginal costs of long-term service delivery.

TABLE 1
RESIDENTIAL LONG RUN MARGINAL COSTS - OPERATING EXPENSES

		Black and Veatch Proposed				Baudino Proposed			
		Year 1		Year 2 and +		Year 1		Year 2 and +	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1	Mailing of subscription confirmation letter	$ 0.83	$ 0.83	$ -	$ -	$ 0.83	$ 0.83	$ -	$ -
2	Cost of mailing bill	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36
3	Cost of opening a billing file	$ 9.66	$ 9.66	$ -	$ -	$ 9.66	$ 9.66	$ -	$ -
4	Cost of reading a meter	$ -	$ -	$ -	$ -	$ 6.71	$ 6.71	$ 6.71	$ 6.71
5	Input of a new contract	$ 36.29	$ 36.29	$ -	$ -	$ 36.29	$ 36.29	$ -	$ -
6	Cost of a credit check conducted internally	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7	Annual cost of cashing a payment	$ 0.74	$ 0.74	$ 0.74	$ 0.74	$ 0.74	$ 0.74	$ 0.74	$ 0.74
8	Cost of processing a standard customer call	$ -	$ 12.84	$ -	$ 12.84	$ 12.84	$ 12.84	$ 12.84	$ 12.84
9	Cost of bad debt	$ -	$ -	$ -	$ -	$ 0.57	$ 0.57	$ 0.57	$ 0.57
10	Collection and recovery costs	$ -	$ -	$ -	$ -	$ 2.43	$ 2.43	$ 2.43	$ 2.43
11	Customer retention costs - Major accounts	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
12	Customer retention costs - Major industries	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	Preventive maintenance - Service line	$ -	$ -	$ -	$ 12.88	$ 12.88	$ 12.88	$ 12.88	$ 12.88
14	Corrective maintenance - Service line	$ -	$ -	$ -	$ 17.99	$ 17.99	$ 17.99	$ 17.99	$ 17.99
15	Processing of CRP application	$ -	$ 23.83	$ -	$ -	$ -	$ 23.83	$ -	$ -
16	Preventive maintenance - Mains	$0.22 / m				$0.22 / m			
17	Corrective maintenance - Mains	$0.37 / m				$0.37 / m			
18	Meter inspection and maintenance costs								
19	- Types of meters								
20	Turbine	$ -	$ 31.68	$ -	$ 31.68	$ -	$ 31.68	$ -	$ 31.68
21	Spin test for turbines (less than 12 in.)	$ -	$ 79.20	$ -	$ 79.20	$ -	$ 79.20	$ -	$ 79.20
22	Telemetry	$ -	$ 118.79	$ -	$ 118.79	$ -	$ 118.79	$ -	$ 118.79
23	Corrective instruments	$ -	$ 87.11	$ -	$ 87.11	$ -	$ 87.11	$ -	$ 87.11
24	Spin test for turbine (12 in and more)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
25	Cost of a cellular line - telemetry	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
26	Totals	$ 55.88	$ 409.33	$ 9.10	$ 369.59	$ 109.30	$ 449.91	$ 62.52	$ 379.30

Note: This table does not reflect Distribution Mains O&M costs, which will be included in Phase 3B

TABLE 2
CII LONG RUN MARGINAL COSTS - OPERATING EXPENSES

		Black and Veatch Proposed				Baudino Proposed			
		Year 1		Year 2 and +		Year 1		Year 2 and +	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1	Mailing of subscription confirmation letter	$ 0.83	$ 0.83	$ -	$ -	$ 0.83	$ 0.83	$ -	$ -
2	Cost of mailing bill	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36
3	Cost of opening a billing file	$ 9.66	$ 9.66	$ -	$ -	$ 9.66	$ 9.66	$ -	$ -
4	Cost of reading a meter	$ -	$ -	$ -	$ -	$ 6.71	$ 6.71	$ 6.71	$ 6.71
5	Input of a new contract	$ 52.62	$ 52.62	$ -	$ -	$ 52.62	$ 52.62	$ -	$ -
6	Cost of a credit check conducted internally	$ 17.19	$ 17.19	$ -	$ -	$ 17.19	$ 17.19	$ -	$ -
7	Annual cost of cashing a payment	$ 1.75	$ 1.75	$ 1.75	$ 1.75	$ 1.75	$ 1.75	$ 1.75	$ 1.75
8	Cost of processing a standard customer call	$ -	$ 12.84	$ -	$ 12.84	$ 12.84	$ 12.84	$ 12.84	$ 12.84
9	Cost of bad debt	$ -	$ -	$ -	$ -	$ 7.77	$ 7.77	$ 7.77	$ 7.77
10	Collection and recovery costs	$ -	$ -	$ -	$ -	$ 33.31	$ 33.31	$ 33.31	$ 33.31
11	Customer retention costs - Major accounts	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
12	Customer retention costs - Major industries	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	Preventive maintenance - Service line	$ -	$ -	$ -	$ 12.88	$ 12.88	$ 12.88	$ 12.88	$ 12.88
14	Corrective maintenance - Service line	$ -	$ -	$ -	$ 17.99	$ 17.99	$ 17.99	$ 17.99	$ 17.99
15	Processing of CRP application	$ -	$ 32.90	$ -	$ -	$ -	$ 32.90	$ -	$ -
16	Preventive maintenance - Mains	$0.22 / m				$0.22 / m			
17	Corrective maintenance - Mains	$0.37 / m				$0.37 / m			
18	Meter inspection and maintenance costs								
19	- Types of meters								
20	Turbine	$ -	$ 31.68	$ -	$ 31.68	$ -	$ 31.68	$ -	$ 31.68
21	Spin test for turbines (less than 12 in.)	$ -	$ 79.20	$ -	$ 79.20	$ -	$ 79.20	$ -	$ 79.20
22	Telemetry	$ -	$ 118.79	$ -	$ 118.79	$ -	$ 118.79	$ -	$ 118.79
23	Corrective instruments	$ -	$ 87.11	$ -	$ 87.11	$ -	$ 87.11	$ -	$ 87.11
24	Spin test for turbine (12 in and more)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
25	Cost of a cellular line - telemetry	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
26	Totals	$ 90.41	$ 452.93	$ 10.11	$ 370.60	$ 181.91	$ 531.59	$ 101.61	$ 418.39

Note: This table does not reflect Distribution Mains O&M costs, which will be included in Phase 3B

TABLE 3
MAJOR INDUSTRIES LONG RUN MARGINAL COSTS - OPERATING EXPENSES

		Black and Veatch Proposed				Baudino Proposed			
		Year 1		Year 2 and +		Year 1		Year 2 and +	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1	Mailing of subscription confirmation letter	$ 0.83	$ 0.83	$ -	$ -	$ 0.83	$ 0.83	$ -	$ -
2	Cost of mailing bill	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36	$ 8.36
3	Cost of opening a billing file	$ 9.66	$ 9.66	$ -	$ -	$ 9.66	$ 9.66	$ -	$ -
4	Cost of reading a meter	$ -	$ -	$ -	$ -	$ 6.71	$ 6.71	$ 6.71	$ 6.71
5	Input of a new contract	$ 36.29	$ 36.29	$ -	$ -	$ 36.29	$ 36.29	$ -	$ -
6	Cost of a credit check conducted internally	$ 17.19	$ 17.19	$ -	$ -	$ 17.19	$ 17.19	$ -	$ -
7	Annual cost of cashing a payment	$ 1.59	$ 1.59	$ 1.59	$ 1.59	$ 1.59	$ 1.59	$ 1.59	$ 1.59
8	Cost of processing a standard customer call	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	Cost of bad debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	Collection and recovery costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11	Customer retention costs - Major accounts	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
12	Customer retention costs - Major industries	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	Preventive maintenance - Service line	$ -	$ -	$ -	$ 12.88	$ 12.88	$ 12.88	$ 12.88	$ 12.88
14	Corrective maintenance - Service line	$ -	$ -	$ -	$ 17.99	$ 17.99	$ 17.99	$ 17.99	$ 17.99
15	Processing of CRP application	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
16	Preventive maintenance - Mains	$0.22 / m				$0.22 / m			
17	Corrective maintenance - Mains	$0.37 / m				$0.37 / m			
18	Meter inspection and maintenance costs								
19	- Types of meters								
20	Turbine	$ 31.68	$ 31.68	$ 31.68	$ 31.68	$ 31.68	$ 31.68	$ 31.68	$ 31.68
21	Spin test for turbines (less than 12 in.)	$ 79.20	$ -	$ 79.20	$ -	$ 79.20	$ -	$ 79.20	$ -
22	Telemetry	$ 118.79	$ 118.79	$ 118.79	$ 118.79	$ 118.79	$ 118.79	$ 118.79	$ 118.79
23	Corrective instruments	$ 87.11	$ 87.11	$ 87.11	$ 87.11	$ 87.11	$ 87.11	$ 87.11	$ 87.11
24	Spin test for turbine (12 in and more)	$ -	$ 237.59	$ -	$ 237.59	$ -	$ 237.59	$ -	$ 237.59
25	Cost of a cellular line - telemetry	$ -	$ 186.12	$ -	$ 186.12	$ -	$ 186.12	$ -	$ 186.12
26	Totals	$ 390.70	$ 735.21	$ 326.73	$ 702.11	$ 428.28	$ 772.79	$ 364.31	$ 708.82

Note: This table does not reflect Distribution Mains O&M costs, which will be included in Phase 3B