PROVINCE OF QUEBEC

BEFORE THE RÉGIE DE L'ÉNERGIE

Gaz Métro	)	
Cost Allocation and Rate Structure	)	**R-3876-2013, phase 1**
	)	
	)	

DIRECT EXPERT TESTIMONY OF

PAUL CHERNICK

ON BEHALF OF

REGROUPEMENT DES ORGANISMES ENVIRONNEMENTAUX EN ÉNERGIE

AND

UNION DES CONSOMMATEURS

Resource Insight, Inc.

FEBRUARY 26, 2015

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I. Identification

Q: Mr. Chernick, please state your name, occupation, and business address.

A: I am Paul L. Chernick. I am the president of Resource Insight, Inc., 5 Water St, Arlington, Massachusetts.

Q: Summarize your professional education and experience.

A: I received an SB degree from the Massachusetts Institute of Technology in June 1974 from the Civil Engineering Department, and an SM degree from the Massachusetts Institute of Technology in February 1978 in technology and policy.

For more than 37 years, I have been engaged in the analysis of energy-utility planning and ratemaking. I was a utility analyst for the Massachusetts Attorney General for more than three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options. Since 1981, I have been a consultant in gas- and electric-utility regulation and planning, first as a research associate at Analysis and Inference, and after 1986 in my current position at Resource Insight (which was known as PLC, Inc., until 1990). In these capacities, I have advised a variety of clients on utility matters, including government-sponsored and non-profit consumer advocates, regulatory agencies, environmental organizations, energy-efficiency advocates, power-plant developers, large energy consumers, and utilities.

My work has considered a wide range of topics in the regulation of electric and gas utilities, including load forecasting, supply planning, conservation program design, cost recovery for utility efficiency programs, estimation of the benefits of energy-efficiency programs, the valuation of environmental externalities from energy production and use, allocation of costs of service between rate classes and jurisdictions, design of retail and wholesale rates, and performance-based ratemaking and cost recovery in restructured gas and electric industries. My professional qualifications are further detailed in my resume, already filed as Document C-ROEÉ-0007.

Q: Have you testified previously in utility proceedings?

A: Yes. I have testified as an expert witness more than 275 times on utility issues before various regulatory, legislative, and judicial bodies, including utility regulators in five Canadian provinces (Nova Scotia, Ontario, Manitoba, British Columbia, and Alberta), thirty-five states, and two U.S. Federal agencies.

Q: Have you testified previously regarding the allocation of utility costs?

A: Yes. I have provided expert testimony in about 25 proceedings on utility cost allocation, in four Canadian provinces (Nova Scotia, Manitoba, Ontario, Alberta) and seven U.S. jurisdictions (Massachusetts, Utah, Maryland, New York, Texas, DC, New Orleans), as listed in my resume.

II. Introduction and Summary

Q: On whose behalf are you testifying?

A: I have been engaged by the Regroupement des organismes environnementaux en énergie (ROEÉ) and Union des consommateurs (UC), to provide my independent expert testimony and opinion.

Q: What is the purpose of your testimony?

A: The purpose of my testimony in this phase is to assist the Régie de l'énergie in assessing and understanding the issues raised by the cost allocation phase of this hearing, to allocate costs appropriately among classes, and to develop cost-causation concepts that may be important in the subsequent rate-design proceeding. To that end, I respond to various aspects of the classification and allocation of costs proposed by Gaz Métro in its application. Specifically, I respond to the following issues and costs:

- the classification of mains costs between demand and access,
- the choice of the allocator for access-related mains costs (the number of customers or the number of customer connections),
- the choice of the allocator for demand-related mains costs (specifically, whether interruptible load should be assigned to mains costs),
- billing and meter-reading costs,
- gas supply expenses,
- energy-efficiency costs,
- the following overhead costs:
    - engineering and planning,
    - regulatory affairs, accounting and public affairs, and
    - the sales force, advertising, and promotion of natural gas.

Most cost-allocation studies deal with the allocation of costs among rate classes. Due to the unusual definition of Gaz Métro's rate classes, its cost-of-service study allocates costs among 19 rate classes and 9 annual consumption levels within the D_1 rate class. For simplicity, I will refer to these categories of customers as classes or rate groups.

Q: What important principles should guide the development of a cost-allocation methodology?

A: While the fundamental considerations could be summarized in many ways, the following list covers most of the important factors:

- The study should serve only as a guide to cost allocation, not as the sole determinant. Any set of allocation decisions represents a set of judgments, reflecting the following considerations:
    - the conflicting objectives of cost allocation, such as the desire to charge costs to the rate groups that caused them, and also to the groups that use and benefit from the equipment and expenditures, while also avoiding free riders;
    - the limitations of data regarding cost drivers;
    - the difficulty of linking many costs to data that would be available by rate group;
    - the lack of connection between the characteristics of existing customers and the causes of some costs related to past or future customers and conditions.
- Cost allocation should also not necessary lead mechanically to the allocation of revenue among the rate groups. In setting the revenue target for any group of customers in a particular rate proceeding, the Régie may wish to consider issues of inter-class equity, gradualism, economic and social effects, and the adequacy of class revenue requirements for providing appropriate price signals for efficiency and environmental purposes. Those issues should be separated from the allocation of costs.[1]

[1] In its decision D-2013-1064, paragraph 22, the Régie emphasized that it intends that the allocation of costs result in the most realistic allocation of costs between the different rate categories on the basis of cost causation, and required that any other consideration of a social, economic or environmental nature not be considered at this stage, but rather in the subsequent determination of rate structure and strategy.

- While the cost-allocation methodology should be based on cost causation and related concerns, and not the social, economic or environmental effects of the revenue-requirements allocation, there are situations in which social, economic, or environmental considerations are the cause of investments or expenditures. For example, energy-efficiency and gas-promotion programs may be justified, in part, on meeting province-wide greenhouse-gas targets; those costs may thus be driven by the environmental-protection burden that various customer groups would incur without the programs. Similarly, some costs (e.g., energy-efficiency and other assistance for low-income customers) are driven not by the characteristics of other customers, but by social considerations. In these cases, determination of cost causation requires recognition of the social, economic and environmental drivers of the costs.
- Cost allocation should generally not be driven by rate-design concerns, nor should cost allocation drive rate design. Rate design should primarily reflect marginal costs and the effect of rate structure on customer behaviour, rather than embedded cost. Similarly, costs classified as customer-related for the purposes of cost allocation to customer rate groups may not actually be caused by the number of customers and may not be appropriately recovered through a fixed monthly customer charge.
- The principal objective of a cost-of-service study is to reflect cost causation, driven by the most realistic practical view of cost drivers. Simplified concepts of cost causation should not be allowed to distort allocation in identifiable ways.

- Cost causation should reflect why costs were incurred and not just how the facilities are used currently.[2] The determination of cost causation must be tied to a realistic understanding of the historical, engineering, and economic factors that caused the cost. For example,
    - Lines that were extended based on the volumes and revenues expected from large customers should be charged primarily to those customers' rate groups, not to small users who may have been connected subsequently.
    - The cost of cleaning up a former coal gasification site is attribute-able to the volume of gas it produced, even if the site is now used for meter repair or some other very different purpose.
    - If bimonthly billing would be adequate for small customers, but the utility chooses to bill all customers monthly for administrative convenience, the small customers do not cause the extra monthly billing costs.
- Equity can also sometimes be furthered by considering the extent to which various groups of customers benefit from the activities causing specific costs.[3]
- Cost causation should distinguish between complementary or alternative investments, which substitute for one another, and incremental investments, which add costs to the system.

[2]Gaz Métro notes that the Régie established in Docket R-3323-95 that allocation should be based on the "most direct causal relationship between costs and the customers that generated such costs" (Document B-0023 at 12).

[3]This point is related to the Régie's prohibition of free riders (Document B-0023 at 12).

- Allocation should strive for geographic equity, treating rate groups similarly, regardless of the historical accidents of the vintage and design of the system across the service territories. This principle is the cost-allocation corollary of postage-stamp rate design.
- The factors used in the cost-of-service study should be derived from straightforward methods that can be revised in the future to reflect changes in customer characteristics, loads, and changes in system characteristics.

Q: Have you identified any characteristics of Gaz Métro's service territory that distinguish it from many other utilities, in a manner relevant to cost allocation?

A: Yes. Gaz Métro (along with the distribution companies it acquired) has greatly extended its service territory since the 1980s, as shown in Gaz Métro's response to my question 37 (Document B-0068). Thus, much of the existing Gaz Métro distribution plant is related to extension of service to new parts of the province, rather than to increasing density of load within an established service territory. The latter would be more typical for many urban and suburban electric utilities as well as gas utilities serving communities that were largely built out and served by the 1980s

Some urban areas had widespread availability of manufactured gas prior to connection to the natural-gas pipeline system. A cost-allocation approach that might have some superficial appeal for allocating the area-spanning costs of some other electric and gas utilities would be inappropriate for Gaz Métro.

Q: What are your conclusions regarding Gaz Métro's proposals?

A: My most important conclusion is that Gaz Métro's classification of the costs of mains assigns far too large a share of the costs to the access category, and hence to small customers, as I explain in Sections III.A and III.B. I support Gaz Métro's recommendations to allocate mains access costs on customer connections, rather than customer number, and to include interruptible loads in the mains demand allocator. I also recommend the following allocations:

- gas supply expenses on volume rather than demand;
- engineering and planning costs in proportion to the total investment in mains and access roads;
- regulatory affairs, accounting, and public affairs in proportion to an equal three-way weighting of total investments, mains investment, and peak demand, pending further analysis;
- sales force, advertising, and promotion of natural gas on revenues.

Finally, I recommend additional analysis of the allocation of energy-efficiency costs (to reflect the distribution of direct and indirect benefits among rate groups, as well as the motivation for low-income program expenditures) and billing and meter-reading costs (to reflect the higher costs of hourly metering).

III. Allocation of Mains Costs

A. Classification of the Area-Spanning System

Q: How does Gaz Métro propose to allocate the costs of its distribution mains?

A: Gaz Métro proposes to allocate approximately 74% of the costs of distribution mains among rate groups in proportion to the number of service lines serving each customer group, and the remaining 26% on the basis of demand (Document B-0041, filed in translation as Document C-ROEÉ-0031).

Including the supply mains (which I will discuss in Section III.D), Gaz Métro proposes to allocate 63% on access (measured by service lines) and 37% on demand Document B-0040, filed in translation as C-ROEÉ-0030, tab CONDPRIN).

These values result from Gaz Métro's assumption that the cost of building a 2-inch system of mains is driven by the number of customer connections and that the additional costs of the actual system are due to the expense of upgrading most lines from 2 inches to their actual size. As a result, Gaz Métro proposes to allocate almost all of the diseconomies of trenching to the small customers based on their number. This treatment violates the Régie's mandate of a "fair and equitable sharing of savings and diseconomies," as well as the requirement for using the "most direct causal relationship between costs and the customers that generated such costs." (Document B-0023 at 12)

Q: Is the allocation of the costs of mains on the number of customers or connections reasonable?

A: No. Neither customer number nor the number of connections drives a significant portion of mains costs. Increasing the number of customers along a stretch of main (or potential customers along a stretch of road under which a main might be laid) does not increase the cost of the main, or increase the likelihood that the main would be built, unless the customers also result in higher loads or higher revenue.

Q: For a typical existing main, would reducing the number of customers without reducing load have reduced the costs of installing those mains?

A: Not in most cases. Removing customers, without reducing the demand in an area, might eliminate a small length of main in a few cases, if the customers happened to include those at the end of a line. Most of the time, removing customers would have no effect on line investment.

Much of the cost of a distribution system is required to cover an area and is not really sensitive to either load or customer number. The distribution system is built to cover an area, because the total load expected to be served will justify the expansion. The distribution cost of serving a geographical area for a given load is roughly the same whether that load is from concentrated commercial loads at various points along the mains or dispersed residential customers.

In addition, the number of customers and connections per kilometer varies with customer size. In an urban residential area, a main running one block may serve over a dozen residential connections. The next block, occupied by a service station, supermarket, or small school, would require the same length of main to serve one customer. In an affluent suburban residential area, with larger houses on larger lots, one block of pipe may serve four or five customers. And larger schools, commercial complexes, and factories may require the equivalent of two or three blocks to serve one customer and run on to connect additional customers.

The minimum-system approach assumes that the minimum system would consist of the same metres of pipe as the actual system. In reality, load levels help determine the *length* of pipes, as well as their size. As load grows, utilities add distribution mains to parallel or loop existing mains and increase capacity to serve the load.[4]

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[4]For example, Gaz Métro requested approval of 24 km of supply mains in Docket R-3763-2011 to ensure security of supply on the island of Montreal and the South Shore.

Q: Is the cost of the area-spanning system essentially the sum of the cost of building a system that would reach every D_1 customer using less than 36,500 cubic metres annually, plus the cost of a system to reach every D_1 customer using more than 36,500 cubic metres annually, plus another 18 systems that would reach every customer on each of the other tariffs?

A: No. The same section of distribution main may be needed to serve both large and small D_1 customers and several other rate classes as well. The basic costs of laying a main (e.g., trenching, filling and resurfacing) generally provide joint and inseparable services to multiple rate groups.

Q: Is the minimum-system approach based on a realistic view of the most-direct causal relationship between the costs of a utility distribution system and the customers that generated such costs, as the Régie required in Docket R-3323-95?

A: No. Bonbright's *Principles of Public Utility Rates,* a standard reference for utility ratemaking, is cited by the Black and Veatch report for Gaz Métro, and also in Gaz Métro's own documents.[5] Bonbright concludes (at 491–492),

> the inclusion of the costs of a minimum-sized distribution system among the customer-related costs seems…clearly indefensible. [Cost analysts are] under impelling pressure to fudge their cost apportionments by using the category of customer costs as a dumping ground….

Indeed, Gaz Métro proposes dumping most of the costs of the mains into the customer (or more specifically, customer-connection) category.

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[5]Bonbright, James. Albert Danielsen, and David Kamerschen. 1988. *Principles of Public Utility Rates.* Arlington, Va.: Public Utilities Reports. Cited in Review of Gaz Metro's Cost of Service and Rate Design, 17 October 2013, filed in this proceeding as Document B-0005, at 24, 25 and 38; Gaz Métro Cost of Service Allocation, filed as Document B-0023, at 9 and 10.

Bonbright is cited by the Black and Veatch report for Gaz Métro, and also in Gaz Métro's own documents.

The minimum-system approach is very old technique for classifying as customer-related a large share of the cost of covering the service territory and hence burdening small customers with these joint costs.

Q: What alternative approaches exist for classifying the costs of the area-spanning system?

A: There are at least two approaches. One approach, which is used in many jurisdictions, is to treat all the area-spanning costs as demand-related to reflect the reality that the system is built out primarily to serve load, not customer number.[6]

The second approach is to examine the manner in which the gas-distribution system is actually planned, and classify costs appropriately. This latter approach requires a more-realistic view of distribution planning than the concept underlying the minimum-system approach, and hence represents the Régie's goal of identifying the most-direct causal relationship between costs and the customers driving those costs.

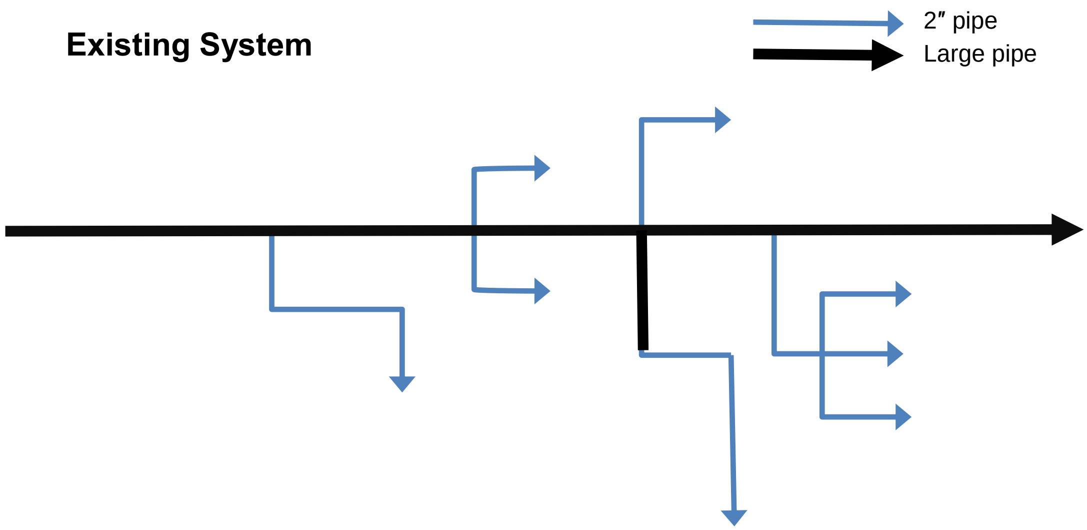
Q: What concept of distribution-system planning underlies the minimum-system approach?

A: The minimum-system approach that Gaz Métro proposes to use for allocating mains costs starts with the system as it currently exists. Figure 1 shows a

[6]A demand allocator for distribution feeders (sometimes weighted with throughput or other load-related factors) is used for electric utilities in about 30 U.S. states, Utah, Maryland, Massachusetts, Kentucky, Minnesota, Oregon, California, New York, Washington, Wyoming and Idaho. See Weston, Frederick. 2000. "Charging for Distribution Utility Services: Issues in Rate Design. Montpelier, Vt.: Regulatory Assistance Project.

simple example of a portion of the distribution system, with a large-diameter main feeding large loads and a series of small (e.g., 2-inch or 60-millimetre) mains leading from the large main to smaller customers.[7]

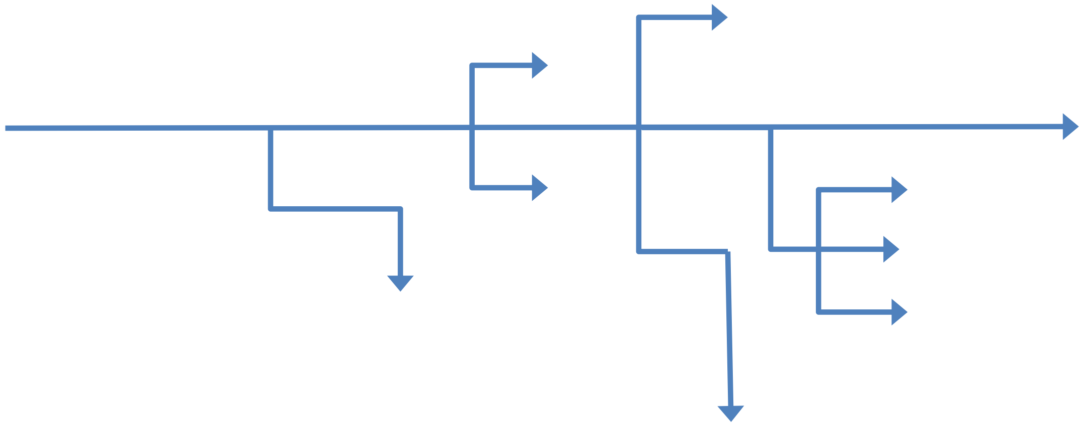
Figure 1: Section of Gas Distribution System



The minimum-system approach assumes that the planning of the system started with small-diameter lines covering the same territory as the existing system, as shown in Figure 2. In other words, the minimum system approximates the way the system would have been designed if all customers were small, and if the utility would have installed the same length of mains to serve that hypothetical system of small customers.

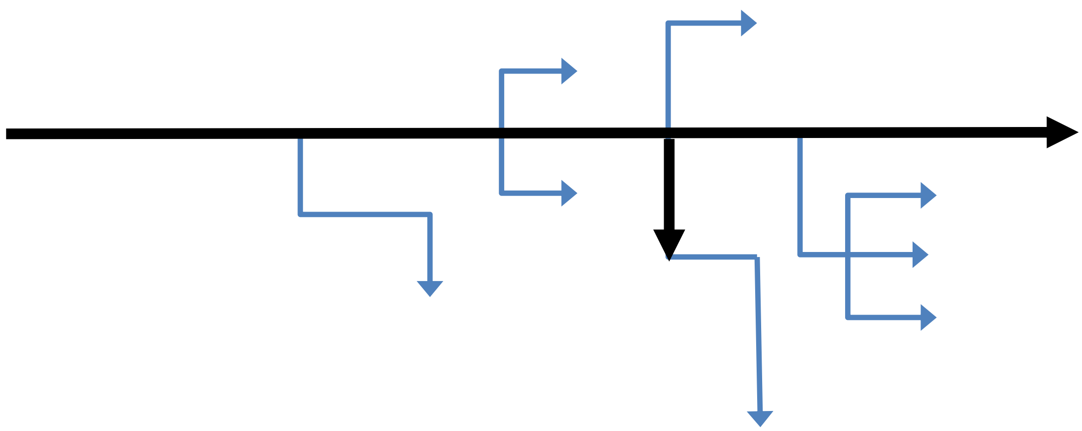
[7]For these examples, the exact definition of "small" and "large" are not critical. Gaz Métro has concluded that a system of 2-inch (or 60-millimetre) pipes would serve all the load of its customers using less than 36,500 m^3 annually. Gaz Métro has some smaller pipes, which are apparently sufficient to serve small customers in some locations. It is possible that significant portions of a system composed only of customers using less than 36,500 m^3 annually could use pipes smaller than 2 inches.

Figure 2: Gaz Métro's Step Two—Design For Small Customers



The minimum system approach then assumes that some of the small lines are replaced by larger diameter lines to serve the major customers, as shown in Figure 3. Gaz Métro does not specify whether its minimum-system model assumes that the system was originally built with small-diameter mains, which were later replaced with larger ones as the major loads contracted for gas service, or that the initial system design was upgraded to serve the large loads prior to actual construction.

Figure 3: Gaz Métro's Step One—Upgrades the Minimum System for Higher Demand



In any case, the minimum-system approach assumes that the initial design consisted entirely of small lines, and the larger mains are upgrades.

The cost of trenching is assigned to the small lines, since they came first in development of the system.

Q: Does the minimum-system model of distribution-system expansion reflect the actual causes of mains-related costs?

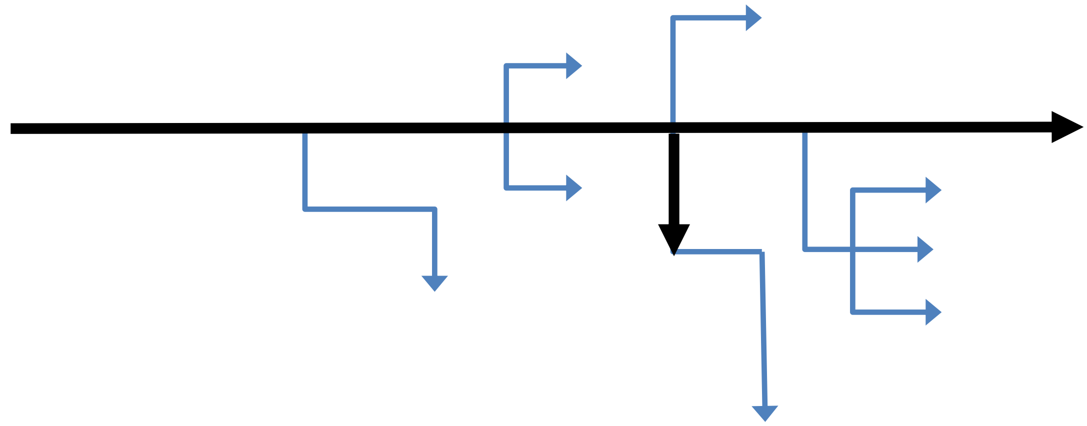
A: No. In general, gas distribution companies do not start by laying out a distribution system that would provide a small amount of gas to every building in an area, and then upgrade the small lines where needed to serve large loads. Instead, the distributor will typically identify large customers whose consumption and revenues will justify the largely fixed costs of trenching and installing the large-diameter backbone mains, and then serve small customers directly from the large mains or from smaller-diameter spurs. Those small customers can be added when the large-diameter main is installed or later (at a slightly higher cost). Thus, the basic assumption of the minimum-system approach, that the utility would have installed the same length of mains to serve a system of entirely small customers, is inconsistent with actual practice.

Figure 4 shows the initial step in planning for expansion of the gas distribution system, designing the large mains to serve the major customers.

Figure 4: Real-World Step One—Planning Mains for Large Loads

Figure 5 shows the addition of mains to serve groups of small customers, once the large pipes have been planned or build for the large loads.

Figure 5: Adding Smaller Pipe for Smaller Customers



Q: What is the implication of a real-world approach to classification of distribution mains?

A: In the real world, the small customers can be considered responsible only for the small-diameter mains (up to about 2 inches or 60 millimetres), plus the costs of the portion of the larger mains that is attributable to the additional load requirements of the small customers, above the load of the large customers who justify the large mains and the geographic expansion of the system. Since the large mains represent about 61% of the length of the distribution mains, and about 67% of the combined length of distribution and supply mains, the treatment of these large mains is very important in the allocation.

Q: How much does the cost allocated to access change with a method that realistically treats the small customers as incremental to the large-customer loads?

A: In Table 1, I calculate the access cost of distribution mains, as the sum of the costs of mains up to 60 mm diameter, plus a share of the costs of the larger mains. The length and cost data are from Gaz Métro Document B-0036. For each main size, I compute the relative flow, using the diameter-related portion of the Spitzglass formula:[8]

$$[d^5 \div (1 + 3.6 \div d + 0.03 \times d)]^{½}$$

For each type and diameter of pipe, Table 1 identifies the access-related portion of the lines larger than 60 mm as the ratio of the capacity of the 60 mm pipe to the capacity of the specific larger pipe.[9] The access-related cost is to the total cost of that category of pipe, times the access-related fraction.

The access-related portion of the cost in Table 1 is just 42%, compared to 74% in Gaz Métro's approach.

[8]In Gaz Métro's responses to my question 10, Black and Veatch refers to this formula as the "Spritzgas" formula. The relative flow rates in that response are similar to those in Table 1.

[9]In addition, some of the incremental costs of the steel lines over the cost of plastic lines may be demand-related, to allow higher pressures. In my analysis, I have implicitly assumed that the existing mix of steel and plastic would be required for a system serving any mix of customers. In doing so, I have probably overstated the access-related portion of the system.

Table 1: Distribution Mains Classification, Large Lines First, Average Costs

Type	**Diameter** (mm)	**Length** (m)	**Cost (**2012$)	**Cost/m** (2012$)	**Relative Capacity** (60mm = 1)	**Access-Related Share**	**Access-Related Cost**
Plastique	26.7	362	$56,317	$156	0.1	1.00	$56,317
Plastique	42.2	281,133	$44,206,158	$157	0.4	1.00	$44,206,158
Plastique	60.3	2,237,170	$382,430,716	$171	1.0	1.00	$382,430,716
Plastique	88.9	196,174	$35,465,496	$181	2.9	0.34	$12,202,441
Plastique	114.3	2,431,771	$500,702,692	$206	5.7	0.17	$87,527,862
Plastique	168.3	953,548	$218,293,188	$229	15.9	0.06	$13,762,816
Plastique	219.1	64,475	$15,145,998	$235	31.3	0.03	$484,380
Acier	21.3	0	$0		0.1	1.00	$0
Acier	26.7	5,031	$1,530,574	$304	0.1	1.00	$1,530,574
Acier	33.4	28,106	$8,703,182	$310	0.2	1.00	$8,703,182
Acier	42.2	26,326	$8,338,659	$317	0.4	1.00	$8,338,659
Acier	48.3	97,293	$31,296,588	$322	0.5	1.00	$31,296,588
Acier	60.3	317,847	$105,319,106	$331	1.0	1.00	$105,319,106
Acier	88.9	201,668	$64,819,948	$321	2.9	0.34	$22,302,285
Acier	114.3	348,989	$129,219,640	$370	5.7	0.17	$22,588,892
Acier	168.3	310,381	$127,894,695	$412	15.9	0.06	$8,063,427
Acier	219.1	129,675	$70,880,203	$547	31.3	0.03	$2,266,801
Acier	273.1	6,865	$3,453,088	$503	54.5	0.02	$63,308
Acier	323.9	28,777	$14,619,940	$508	83.4	0.01	$175,368
Acier	406.4	11,270	$6,799,716	$603	145.3	0.01	$46,807
Acier	508	0	$0		248.4	0.004	$0
Acier	610	0	$0		382.8	0.003	$0
Acier	762	0	$0		642.5	0.002	$0
Total		7,676,861	$1,769,175,903	$273		0.425	$751,365,687

Q: Does Table 1 represent your best estimate of the access-related portion of the distribution mains?

A: No. I believe that Table 1 overstates the access-related portion of the costs, for at least the following four reasons:

- Most of the system would never have been built solely to provide access for small customers.
- Table 1 does not adjust for the length of main between the connections for customers of different sizes.

- The cost that Table 1 attributes to access is the average cost of capacity through the pipe, times the ratio of 60-mm pipe capacity to the capacity of the larger pipe, rather than the incremental cost of that pipe size over the next smaller size.
- Some of the incremental costs of the steel lines over the cost of plastic lines may be demand-related, to allow higher pressures. Table 1 implicitly assumes that the existing mix of steel and plastic would be required for a system serving any mix of customers.

Q: Have you been able to correct that third source of overstatement of the access-related cost?

A: Yes. In Table 2, I summarize the results of a computation similar to that summarized in Table 1, but attributing to the access-related system only the portion of the incremental capacity in the line that would be carried by the 60-mm pipe. For example, for the 168-mm plastic pipe, the incremental cost over the next smaller (114-mm) pipe is $17.40/m, which provides incremental capacity 10 times the capacity of a 60 mm pipe. Adding the load of the small customers who could be served with the 60 mm pipe would impose an average cost of just $1.74/m.[10] For the 953,548 m of 168-mm plastic pipe, the incremental cost of $1.74/m would imply a cost of $1,636,594 being due to the small-customer load.

With this correction, the access-related cost is 35% of the distribution costs.

[10] Put differently, there is roughly a 10% chance that adding the small-customer load would have required the upgrade of the 114 mm pipe to the 168 mm.

Table 2: Distribution Mains Classification, Large Lines First, Incremental Costs

Type	Diameter (mm)	Length (m)	Cost (2012$)	Cost/m (2012$)	Relative Capacity (60mm = 1)	Incremental Cost per meter	Incremental Capacity as multiple of 60mm	Access-Related Cost
Plastique	26.7	362	$56,317	$156	0.1			$56,317
Plastique	42.2	281,133	$44,206,158	$157	0.4			$44,206,158
Plastique	60.3	2,237,170	$382,430,716	$171	1.0			$382,430,716
Plastique	88.9	196,174	$35,465,496	$181	2.9	$9.84	1.9	$1,012,717
Plastique	114.3	2,431,771	$500,702,692	$206	5.7	$25.11	2.8	$21,702,937
Plastique	168.3	953,548	$218,293,188	$229	15.9	$23.03	10.1	$2,165,274
Plastique	219.1	64,475	$15,145,998	$235	31.3	$5.99	15.4	$25,050
Acier	21.3	0	$0		0.1			$0
Acier	26.7	5,031	$1,530,574	$304	0.1			$1,530,574
Acier	33.4	28,106	$8,703,182	$310	0.2			$8,703,182
Acier	42.2	26,326	$8,338,659	$317	0.4			$8,338,659
Acier	48.3	97,293	$31,296,588	$322	0.5			$31,296,588
Acier	60.3	317,847	$105,319,106	$331	1.0			$105,319,106
Acier	88.9	201,668	$64,819,948	$321	2.9	−$9.93	1.9	$0
Acier	114.3	348,989	$129,219,640	$370	5.7	$48.85	2.8	$6,058,110
Acier	168.3	310,381	$127,894,695	$412	15.9	$41.79	10.1	$1,279,066
Acier	219.1	129,675	$70,880,203	$547	31.3	$134.54	15.4	$1,132,342
Acier	273.1	6,865	$3,453,088	$503	54.5	−$43.60	23.3	$0
Acier	323.9	28,777	$14,619,940	$508	83.4	$5.04	28.8	$5,031
Acier	406.4	11,270	$6,799,716	$603	145.3	$95.31	61.9	$17,352
Acier	508	0	$0		248.4		103.1	$0
Acier	610	0	$0		382.8		134.5	$0
Acier	762	0	$0		642.5		259.7	$0
Total		7,676,861	$1,769,175,903	$273				$615,279,179

Q: Have you repeated this computation for the combined cost of distribution and supply mains?

A: Yes. Table 3 repeats the average-cost computation for this larger group of mains, using the average costs of the large mains, as in Table 1. Using this approach, I estimate that 31% of the cost of the distribution and supply mains is allocable to access, compared to the 63% estimated by Gaz Métro from its unrealistic minimum-system approach.

Table 3: Distribution and Supply Mains Classification, Large Lines First, Average Costs

Type	Diameter (mm)	Length (m)	Cost (2012$)	Cost/m (2012$)	Relative Capacity (60mm = 1)	Access-Related Share	Access-Related Cost
Plastique	26.7	362	$56,317	$156	0.1	1.00	$56,317
Plastique	42.2	281,133	$44,206,158	$157	0.4	1.00	$44,206,158
Plastique	60.3	2,237,170	$382,430,716	$171	1.0	1.00	$382,430,716
Plastique	88.9	196,174	$35,465,496	$181	2.9	0.34	$12,202,441
Plastique	114.3	2,431,771	$500,702,692	$206	5.7	0.17	$87,527,862
Plastique	168.3	953,548	$218,293,188	$229	15.9	0.06	$13,762,816
Plastique	219.1	64,475	$15,145,998	$235	31.3	0.03	$484,380
Acier	21.3	11	$3,359	$300	0.1	1.00	$3,359
Acier	26.7	5,092	$1,549,249	$304	0.1	1.00	$1,549,249
Acier	33.4	28,110	$8,704,359	$310	0.2	1.00	$8,704,359
Acier	42.2	26,426	$8,370,397	$317	0.4	1.00	$8,370,397
Acier	48.3	99,494	$32,004,501	$322	0.5	1.00	$32,004,501
Acier	60.3	324,183	$107,418,685	$331	1.0	1.00	$107,418,685
Acier	88.9	221,227	$71,106,354	$321	2.9	0.34	$24,465,218
Acier	114.3	589,539	$218,287,547	$370	5.7	0.17	$38,158,857
Acier	168.3	820,416	$338,058,093	$412	15.9	0.06	$21,313,681
Acier	219.1	371,762	$203,205,253	$547	31.3	0.03	$6,498,654
Acier	273.1	213,394	$107,337,259	$503	54.5	0.02	$1,967,882
Acier	323.9	131,773	$66,945,763	$508	83.4	0.01	$803,021
Acier	406.4	179,133	$108,080,630	$603	145.3	0.01	$743,990
Acier	508	51,180	$35,440,510	$692	248.4	0.004	$142,690
Acier	610	18,280	$14,162,073	$775	382.8	0.003	$36,992
Acier	762	8,104	$7,272,452	$897	642.5	0.002	$11,319
Total		9,252,757	$2,524,247,049	$273		0.314	$792,863,546

Similarly, Table 4 shows the results of applying the incremental real-world approach to the combined distribution and supply mains, as I did for distribution mains alone in Table 2. This more sophisticated approach reduces to 25% the portion of distribution and supply mains allocated to access.

Table 4: Distribution and Supply Mains Classification, Large Lines First, Incremental Costs

						Incremental		
Type	**Diameter** (mm)	**Length** (m)	**Cost** (2012$)	Cost/m (2012$)	Relative Capacity (60mm = 1)	Cost per meter	Capacity as multiple of 60mm	**Access-Related Cost**
Plastique	26.7	362	$56,317	$156	0.1			$56,317
Plastique	42.2	281,133	$44,206,158	$157	0.4			$44,206,158
Plastique	60.3	2,237,170	$382,430,716	$171	1.0			$382,430,716
Plastique	88.9	196,174	$35,465,496	$181	2.9	$9.84	1.9	$1,012,717
Plastique	114.3	2,431,771	$500,702,692	$206	5.7	$25.11	2.8	$21,702,937
Plastique	168.3	953,548	$218,293,188	$229	15.9	$23.03	10.1	$2,165,274
Plastique	219.1	64,475	$15,145,998	$235	31.3	$5.99	15.4	$25,050
Acier	21.3	11	$3,359	$300	0.1			$3,359
Acier	26.7	5,092	$1,549,249	$304	0.1			$1,549,249
Acier	33.4	28,110	$8,704,359	$310	0.2			$8,704,359
Acier	42.2	26,426	$8,370,397	$317	0.4			$8,370,397
Acier	48.3	99,494	$32,004,501	$322	0.5			$32,004,501
Acier	60.3	324,183	$107,418,685	$331	1.0			$107,418,685
Acier	88.9	221,227	$71,106,354	$321	2.9	-$9.93	1.9	$0
Acier	114.3	589,539	$218,287,547	$370	5.7	$48.85	2.8	$10,233,816
Acier	168.3	820,416	$338,058,093	$412	15.9	$41.79	10.1	$3,380,896
Acier	219.1	371,762	$203,205,253	$547	31.3	$134.54	15.4	$3,246,292
Acier	273.1	213,394	$107,337,259	$503	54.5	-$43.60	23.3	$0
Acier	323.9	131,773	$66,945,763	$508	83.4	$5.04	28.8	$23,038
Acier	406.4	179,133	$108,080,630	$603	145.3	$95.31	61.9	$275,814
Acier	508	51,180	$35,440,510	$692	248.4	$89.12	103.1	$44,239
Acier	610	18,280	$14,162,073	$775	382.8	$82.27	134.5	$11,185
Acier	762	8,104	$7,272,452	$897	642.5	$122.61	259.7	$3,827
Total		9,252,757	$2,524,247,049	$273				$626,868,824

B. Access Allocator for Mains

Q: How does Gaz Métro propose to allocate the portion of costs that it identifies as being driven by requirements for customer access, that is, the area-spanning system?

A: Gaz Métro proposes to use the number of attachments to its mains (or branches from its mains), which other utilities refer to as "service lines" or "service drops," rather than the number of customers. This treatment reflects the fact that a single attachment may serve several customers, without requiring an extension of the main to reach each of them.

Q: Is this treatment superior to the use of customer number to allocate the access-related mains cost?

A: Yes. As I describe in Section III.A, the area-spanning system is not driven by the number of customers, but by the amount of load that will be served and the economics of the line extension. To the extent that the area-spanning system is to be allocated on some measure independent of usage, that measure should at least recognize that the cost of reaching several customers in a multi-customer building is no greater than the cost of reaching one customer on the same site.

Serving many customers in one multi-family building is no more expensive than serving one commercial customer of the same size, other than metering.

Q: Does this treatment of mains costs have implications for rate design?

A: Yes. Adding or subtracting one of the smallest residential customers, in multi-family housing, will generally have no effect on the cost of the area-spanning system. The same is probably also true for most of the smallest commercial customers, such as in multi-tenant office buildings. Hence, the fixed monthly customer for small customers should exclude any costs of mains.

Q: Do you have any suggestions for further improving the allocator for the access-related mains costs?

A: Yes. To the extent that the cost of the area-spanning system is driven by the need to run mains past (or at least to) each customer, the allocation of that cost should reflect the amount of main required to get past each customer to serve the next connection.

In addition, Gaz Métro is willing to extend a main further to serve a large customer than a small customer. Gaz Métro decides whether to extend a main based on expected consumption volumes, revenues and the resulting internal rate of return (Document B-0068, DDR 34). For the same construction conditions, Gaz Métro will fund a much longer extension to add a large commercial, institutional or industrial customer than it would to add a single residential customer.

Gaz Métro should further improve the access allocator by reflecting the average distance between customers (excluding small customers to whom Gaz Métro would have been extended service in the absence of larger loads beyond).

C. Demand Allocator for Mains

Q: How does Gaz Métro propose to allocate the demand-related portion of mains?

A: Gaz Métro has proposed to change the treatment of interruptible demand in the allocation of distribution and supply mains. Currently, the firm-service classes are allocated demand-related distribution main costs on the basis of their contribution to demand at design peak conditions, while the interruptible classes are allocated those costs in proportion to their average daily usage during the year.[11] Supply and transmission mains are allocated on design peak, ignoring interruptible load.

[11] Gaz Métro's current CAU allocator actually multiplies the firm customers' contributions to design peak by 365 and uses the interruptible customers' annual consumption; that allocation is equivalent to combining the firm design peaks and the interruptible average daily load.

Gaz Métro is proposing to change the treatment of the interruptible load for distribution mains to the interruptible non-coincident peaks, and to allocate the demand-related portion of the supply mains in the same manner as distribution mains.

In any case, the small customers, whose loads can be met entirely by the 60-mm system, are allocated no additional demand-related mains costs.

Q: Are Gaz Métro's proposed changes in the mains demand allocator appropriate?

A: Yes. Using the non-coincident peaks for the interruptible classes puts the firm and interruptible loads on a more consistent basis, with each class being allocated costs in proportion to a measure of peak demand. Under the existing system, the interruptible classes are charged for average load, rather than any measure of the maximum load they put on the system. Since firm and interruptible load for large customers are treated in the same manner in evaluating expansion of the distribution and supply system, the allocators should be as consistent as possible.

Q: Do you have any suggestions for improving Gaz Métro's approach to allocation of demand-related costs of distribution and supply mains?

A: Yes. While Gaz Métro recognizes that the 60-mm system, allocated through the access portion of the CONDPRIN allocator, covers all the demand of D_1 customers up to 36,500 m^3/annum, and does not allocate any additional demand-related costs to those customers, Gaz Métro does not recognize that the access-allocated system would cover a significant portion of the demand of slightly larger customers. Gaz Métro reports that the 18,465 D_1 customers in the range of 10,950–36,500 m^3/annum have a maximum daily quantity (DQM) of 3,688,522 m^3, or about 200 m^3 per customer (Document B-0041).

If the 60 mm system can accommodate 200 m^3 DQM per customer, it would cover the following shares of other customer groups:[12]

- about a third of the demand of the D_1 customers using 36,500–109,500 m^3/annum and the tariff 303 customers,
- about 10% of the demand of the D_1 customers using 109,500–365,000 m^3/annum and the tariff 304 customers,
- about 7% of the demand of the tariff 305 customers.

The DQMs for these rate groups should be adjusted downward in the development of the supply and distribution allocator.

D. Classification of Supply Mains

Q: How does Gaz Métro propose to classify the costs of the supply mains?

A: Gaz Métro proposes to change the classification from 100% demand-related to the minimum-system approach Gaz Métro has proposed for distribution mains. Using this approach, Gaz Métro proposes to classify almost half the costs of the supply mains to access, as shown in Table 5.

Table 5: Gaz Métro Classification of Mains

Line	GM Mains Classification	Access	Demand	Total
1	Distribution only[a]	70.9%	29.1%	100%
2	Distribution as % of Distribution plus Supply	53.2%	21.8%	75%
3	Distribution plus Supply[a]	65.4%	34.6%	100%
4	Supply as % of Distribution plus Supply[b]	12.2%	12.8%	25%
5	Supply only	49%	51%	100%

[a] From Document B-0041.
[b] Line 3 minus line 2

[12]The 200 m^3 DQM per customer is the average in the 10,950–36,500 m^3/annum range; the highest DQM that Gaz Métro has assumed could be accommodated by the 60 mm system may be 50% higher.

Q: What is Gaz Métro's justification for classifying 49% of supply main costs to access?

A: Gaz Métro states that supply mains serve the same functions as distribution mains, and that there is no longer any reason to distinguish between these two categories of mains (Document B-0068, DDR 51).

Q: Is this classification of supply lines appropriate?

A: No. Supply mains, even more than the distribution mains, are justified by the demand of large customers, rather than the number of customers. Only 782 customers are connected to supply mains, of which nearly 90% are connected directly to a supply main for reasons of geographic convenience (the supply line happened to be closer than a distribution main), while the other 10% required higher pressure or supply than available through the distribution mains (Document B-0068, DDR 52a). Gaz Métro is unable to identify any situations in which supply lines were extended to directly connect specific customers, let alone a situation in which a supply main was extended to serve a small customer (Document B-0068, DDR 53). The total length of Gaz Métro's supply mains is driven by customer loads—connected directly to the supply mains or through distribution mains fed by the supply lines—not the number of customer connections.

It is obvious from Gaz Métro's applications for authorization to extend service mains that those lines are installed to serve a volume of gas demand from large customers, and that connection of small customers is an afterthought. For example, in its application for the Thetford Mines expansion, Gaz Métro justifies the addition of some 52 km of 168 mm and 219 mm supply main at 2,900 kPa on the basis of the loads of about 14 large customers (R-3767-2011, Document B-0005, Tables 1–3). The application does not include any residential or small commercial customers, and notes that the determination of whether to connect those customers would depend on subsequent analyses of the profitability of extending service to them from the supply line. (ibid. at 7, 8)

Q: What would be a reasonable classification of the supply mains?

A: Gaz Métro could simply treat the supply mains as demand-related, as it has previously. Alternatively, Gaz Métro could use the combined classification method for distribution and supply mains that I present in Table 4.

IV. Allocation of Overhead and Miscellaneous Costs

Q: For which overhead and miscellaneous costs do you have comments on Gaz Métro's proposed allocation?

A: I comment on seven such classification and allocation issues, as follows:

- engineering and planning,
- gas supply expenses,
- regulatory affairs, accounting and public affairs
- billing and meter-reading costs,
- sales force,
- advertising and promotion of natural gas,
- energy-efficiency costs.

Q: What are your comments on the allocation of engineering and planning expenses?

A: These costs are related to engineering, system design, asset management, and costs associated with major projects, and have primarily been allocated on total expenses (Document B-0023 at 68). Gaz Métro is proposing to allocate these costs on customer number, on the grounds that "this factor is the most important cost driver for this activity centre" (ibid.).

Gaz Métro's assertion that customer numbers drive engineering and planning expenses is nonsensical. Adding a small customer requires a meter and sometimes a service connection, neither of which is likely to require much engineering or planning. The activities in this category are clearly related to larger projects, primarily for mains.

Nor are these costs related to operating expenses, since they are primarily incurred for capital project.

This expense category should be allocated in proportion to the total investment in mains and access roads, which are likely to dominate the costs of system design, asset management, and especially major projects. If these costs are also driven by other categories of major projects, such as the LNG plant, those investments should be included in the allocator.

Q: What are your comments on the classification of gas supply expenses?

A: Gaz Métro proposes to allocate costs related to the administration and operation of gas supply and system control on the basis of design-day peak demand for firm customers and maximum demand for interruptible customers. This allocation would only be correct were the costs driven solely by expenditures for a handful of annual hours for various interruptible customer and one day every couple decades for firm customers. This is very unlikely; the staff and equipment used for these functions are required every day, and cannot be freed up for other operations on low-load days.

It is more likely that the cost of gas dispatch and system operation is driven by something close to total throughput. These costs should be allocated on throughput, rather than a capacity allocator.

Q: What are your comments on the allocation of regulatory affairs, accounting, and public affairs?

A: The category includes accounting, internal audits and finance, pricing and regulation, legal services, corporate control, public and government affairs, and demand forecasting. These costs have previously been allocated on total expenses; Gaz Métro proposes to classify half of these costs as customer-related and half as demand-related.

While the existing approach is not clearly cost-based (some categories of expenses require large amounts of these services, which others require little) Gaz Métro's proposal is not much of an improvement. The number of customers has little or nothing to do with these costs. Some of these costs (much of the accounting, internal audits and finance; some legal services; and corporate control) are related to the need to raise capital, and hence should be allocated primarily on investment levels. Most of the remaining costs are related to major projects (much of legal, regulation and public and government affairs) or to load that drives the need for those projects (and for demand forecasting). Hence, a more reasonable allocator would be a mix of total investments, mains investment (and any other plant categories that include major projects, such as the LNG plant), and peak demand. In the absence of more detail regarding the make-up of the underlying costs, the weighting of those three allocators must be somewhat arbitrary, although not as arbitrary as allocating major project costs on customer number. As an interim measure, an equal weighting of these three allocators seems reasonable.

Q: What are your comments on the allocation of billing and meter-reading costs?

A: Gaz Métro proposes to allocate customer billing and meter reading costs on customer number (Document B-0023 at 69). This allocation would only be correct if the costs of metering and billing were the same for all customers. Since D_4, D_5, and some D_3 are metered daily, the metering and billing costs for those customers are almost certainly higher than the costs for D_1 customers. The cost differences should be estimated and reflected in allocation of these costs.

Q: What are your comments on the allocation of sales-force expenses?

A: Gaz Métro proposes to continue using its allocator FS27, which is a complex composite of a measure of total revenues (FB09-CL), number of customers, and volumes. Marketing to each customer class (residential, commercial and industrial, and very high-volume) is classified 50% on the number of customers of that class in the rate group and 50% on the consumption of that class in the rate group, while general sales costs are allocated on revenues across all customer groups.

Allocating sales-force expenses is inherently problematic, since few existing customers do use the sales force, which must spend most of its efforts on encouraging potential users to switch to gas. To the extent that existing customers benefit from the sales force, it is because the resulting increase in sales spreads fixed costs over more sales, reducing rates to the existing customers. Hence, the simplest and most appropriate allocator for all the sales-force costs may be the revenue allocator.

The number of residential and general-service customers in the various D_1 groups is certainly a poor predictor of the distribution of sales efforts among those groups. The sales force is unlikely to be spending much time on individually meeting and contacting the smallest groups of D_1 customers or potential customers. To the extent that Gaz Métro continues to divide sales-force costs among the customer classes based on effort, rather than share of system benefit, the allocation of residential and commercial-industrial sales efforts to customer groups should use only the volume or revenues for that group. For the very large customers, individual meetings with customers (understanding their fuel needs, planning and investment cycles, and decision-making processes) may represent a substantial portion of the sales effort, so the number of customers (or more likely, potential customers) may be relevant in allocation based on effort level.

While I do not favour Gaz Métro's effort-based approach to allocating these costs, if the Board approves that approach it should at least remove customer number from the allocators of the residential and commercial-industrial sales-force costs.

Q: What are your comments on the allocation of expenses for advertising and promotion of natural gas?

A: Gaz Métro's approach for these expenses is quite similar to its treatment of sales-force costs. Since the split of advertising costs among general costs and residential commercial-industrial and very-large customer expenses differs from that of the sales effort, Gaz Métro develops a separate allocator (FS28) for this category.

The deficiencies in Gaz Métro's approach for this category are the same as for the sales-force expenses. As for the sales force, the appropriate allocator for advertising costs is total distribution revenue.

Q: What comments do you have on the allocation of energy-efficiency costs?

A: Gaz Métro's allocation factor for the costs of the Global Energy Efficiency Plan is not well documented. The majority of the costs (for incentives) are assigned to rate groups based on some detailed information from Gaz Métro's Global Energy Efficiency Plan team; it is not clear whether that information consists of detailed tracking reports on the mix of participants by rate group, or an allocation of each program's costs among eligible rate groups.[13] Administration and other costs are allocated among rate groups using some unspecified mix of customer number and volumes, apparently similar to the approach Gaz Métro takes with the sales-force expenses.[14] While I cannot comment on the details of Gaz Métro's allocation, I do have some observations regarding the general approach.

There are two major approaches to allocation of energy-efficiency program costs. The first allocates energy-efficiency costs to all customer groups, based on volume or demand, to reflect the fact that all customers share benefits from energy-efficiency: reduced congestion, reduced greenhouse gas emissions, reduced need to add new supply resources, and deferral of reinforcements on the local transmission and distribution system. As Black and Veatch say, "the improved efficiency of gas appliances has created available capacity to serve new loads within the existing system" (Document B-0005 at 5).

The second approach allocates energy-efficiency costs to the participating classes, since the participating class captures the bulk of the benefits

[13]The description in Document B-0006 (at 67) suggests that Gaz Métro uses both direct assignment and allocation (based on volume and revenues). This allocation may overstate the costs allocated to the smallest D_1 customers, who probably have only a gas range and little opportunity for energy-efficiency investment.

[14]I requested this derivation in my DDR 1(b) but GMI simply pointed to Documents B-0039 and B-0040, which provide no derivation of the allocator. The same is true for a number of other allocators.

of the energy-efficiency measure. In addition to the energy-efficiency benefits that all customers share, the participating class also uses less gas, directly reducing its cost allocation and bill. In addition to being relatively simple, this approach reduces conflict between customer groups over one another's energy-efficiency program designs and scope. Since each class pays for the programs that serve it, the other classes have little interest in whether the programs are efficiently designed.

Gaz Métro's approach appears to be attempting to allocate costs to the rate groups that participate in each program, which is a reasonable starting point. However, since the energy-efficiency programs also benefit other classes, some allocation on throughput or peak demand should be considered in the future. For example, in Nova Scotia, the Utility and Regulatory Board has chosen to allocate 75% of energy-efficiency costs to the participating classes and 25% on the basis of energy consumption.

Q: Does this conclude your testimony?

A: Yes.