GAZ MÉTRO COST OF SERVICE ALLOCATION

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1 BACKGROUND AND SCOPE OF DOCUMENT

In response to Decision D-2013-106 of the Régie de l'énergie (the "Régie"), Société en commandite Gaz Métro ("Gaz Métro") filed an application in November 2013 concerning the cost allocation and rate design generic application. Gaz Métro asked the regulator to authorize working sessions so it could begin studying the matter and filed a discussion paper concerning Gaz Métro's cost of service allocation along with a report prepared by Dr. Edward Overcast, the expert retained in this regard.

In light of the many elements to discuss and given that the Régie considered it best that each pivotal step in the process be approved, it ordered that the proceeding be divided into two phases. The first phase would address the cost allocation methods[2] and the second, customer segmentation and the rate design.

This document, which deals only with phase 1, was prepared following the working sessions held at the Régie during which most of the changes contemplated to the cost allocation methods were presented. The proposals presented in this document take into account the comments of the intervenors and Régie representatives regarding these elements.

In its discussion paper on cost allocation (Exhibit B-0006, Gaz Métro-1, Document 2), Gaz Métro stated that its work with Dr. Overcast led it to take a critical look at some long-standing practices and to add elements it had not originally intended to include in its reflection. While the changes it initially contemplated were very specific, following its analyses, Gaz Métro decided to expand its reflection process to include all distribution costs.

In this document, Gaz Métro will therefore present additional analyses not included in the discussion paper filed earlier and submit its proposals concerning the distribution cost allocation methods.

This document will first discuss the purpose of the cost allocation exercise and the principles selected to evaluate the proposed methods. Then, the processes and allocation methods of each distribution cost component and the rate base are described and the corresponding proposals presented.

Given that mains are a major component of distribution costs and the rate base, and given the complexity of the related allocation principles, the allocation of distribution and transmission costs will be discussed first. The proposals concerning operating expenses and other cost of service elements will then be presented.

A summary of the proposed changes to the allocation of distribution costs is presented in Exhibit Gaz Métro-2, Document 3.

2 GENERAL OBJECTIVES

Gaz Métro has three objectives in reviewing its cost allocation methods:

- Examine how it allocates costs and calculates certain factors in accordance with the recommendations of Dr. Overcast and the Gaz Métro's analyses;
- Transfer cost allocation operations to a more flexible and user-friendly computer platform. Currently, costs are allocated by performing a series of scheduled tasks using SA. In the past, SAS was necessary because electronic spreadsheets were not well developed and could not support massive databases or perform sophisticated statistical operations. Moreover, SAS requires advanced programming knowledge and is no longer widely used. Gaz Métro would like to streamline the cost allocation process by transferring it to EXCEL and SPSS software; and
- Streamlining cost allocation operations and revising the allocation factors should reduce the time required to produce a cost allocation study to just a few weeks, saving a substantial amount of time. Gaz Métro considers that the outcome of this study could be used not to determine the extent of the cross-subsidization created by the previous year's rates but rather to serve as the starting point for setting annual rates and estimating the cross-subsidization resulting from such rates.

3 PURPOSE OF THE COST ALLOCATION STUDY

> "*The purpose of a cost allocation study is to assign all the costs that make up the distributor's cost of service to the various customer classes by identifying how the services offered to these customers generate the observed costs.*"[1]

In Order G-429, which established the cost of service allocation principles, the Régie stated that:

> "*[…] The purpose of a cost of service study is to determine, as part of a rate case, the difference (up or down) between the annual revenue provided by each rate class and the annual cost of service it receives; this cost includes shareholder ROI.*"[2]

In the same decision, the Régie stated that a cost of service study should be based on historical data because its purpose is to produce a measurement of the cross-subsidization generated by the previous year's rates rather than an input to set the rate strategy for the upcoming year. The distributed costs must therefore be historical costs.

> "*The Régie believes that a cost of service study should be based on historical data because such a study is intended to shed light on the type of changes required to the old rates in order to make them more equitable. It should be noted that the results of the cost of service study presented in a rate case do not reflect the cross-subsidization generated by the new rates set by the Régie as a result of this rate case. However, this information can be approximated by deducting from the results of the study the effect of the changes made to the old rates."*[3]

Historically and still today, a cost of service study makes it possible to estimate the cross-subsidization generated by the previous year's rates. Costs are therefore allocated based on the most recent budget approved by the Régie. The amounts are those projected and approved in the rate case for the year preceding the one in which the cost of service study was filed. For example, for the 2014 rate case, the costs of the 2012/2013 budget approved by the Régie were allocated to the various rates and rate levels.

Gaz Métro proposes, going forward, to use the cost allocation study as the starting point for establishing the rates in rate cases. The proposed approach is based on the pricing method called "fully distributed costs."[4] Under this method, the projected costs are assigned to the various rate

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[1] D-97-47, p. 16.
[2] Order G-429, p. 59.
[3] Order G-429, p. 60.
[4] Fully distributed costs.

classes and the result is then used as a starting point for establishing rates, although the assigned costs are not the only factor considered.

> "*A determination of the cost of serving each customer class is a major factor in a gas company's rates. Such a cost of service study assigns or apportions to each of the utility's homogeneous classes or jurisdictions all of the company's expenses and investments dedicated to serving the utility's customers. These cost allocations are used to determine the revenue requirements of specific customers or rate classes."*[5]

Since transferring operations to a more flexible and user-friendly computer platform will streamline the entire process of producing the cost of service allocation study, Gaz Métro proposes that this report be produced annually and serve as a starting point for establishing rates in a rate case. Gaz Métro therefore suggests that the cost of service study be conducted with projected data relating to the rate case for the year in which the study is filed rather than with data from the previous year. The cost of service study will also make it possible to determine the extent of the cross-subsidization generated by the proposed annual rates rather than the cross-subsidization generated by the old rates.

Gaz Métro plans to continue taking into account other considerations besides the cost of service allocation study in preparing its rate strategy. According to the proposed approach, the allocated costs serve as a starting point in establishing rates that are then adjusted to incorporate a " desirable" and justifiable type of discrimination.

> *"The particular cost relationship apparently sought by most cost analysts is one that would measure those rate relationships which could be called completely non discriminatory. These hypothetical, cost related rates could then be used as points of departure from which to derive actual rates which would incorporate desirable types and degrees of discrimination while avoiding discrimination that could be deemed unjust or undue."*[6]

Such an approach broadens the objective of the cost allocation study, whose purpose would be to serve as a starting point in setting a rate strategy and gauge the extent of the cross-subsidization generated by the proposed rates. In this context, the projected rate case costs rather than historical costs should be distributed.

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[5] Gas Rate Fundamentals, American Gas Association, Fourth edition, p. 131.
[6] Bonbright, Danielsen, Kamerschen, Principles of Public Utility Rates, Public Utilities Reports Inc., 1988, p. 484.

The literature makes reference to this approach, used by many Canadian natural gas and electric utilities.

"Where a cost of service study is made in connection with a rate case proceeding, the costs that are distributed to the various classes of service should be the costs used in determining the utility's overall earnings position."[7]

Authors Bonbright, Danielson and Kamerschen, who advocate pricing on the basis of marginal costs rather than fully distributed costs, also point to the usefulness of a cost of service study in rate design.

"The analyst may first distribute total annual costs among many classes of service, more or less: residential, commercial, industrial power, street lighting, etc.. The analyst may then redistribute the costs of each class among the units of service within this class, distinguishing among customer units, energy units (kilowatt-hours), and maximum-demand units (kilowatts). The first apportionment is supposed to indicate the aggregate revenues that would be due from each class of service if rates were based solely on costs of production. The second apportionment is supposed to serve as a guide to the determination of the pattern of each class rate – a pattern that may be composed of a minimum monthly charge per customer, a set of declining block-energy charges, and (for larger customers) a set of declining block demand charges."[8]

This approach is used by many gas and electric utilities. For example, the Enbridge utilities in Ontario and New Brunswick both use this approach, as attested by the following texts:

"*The Study allocates the test year revenue requirement to the customer rate classes acting as a guide to rate design.*"[9]

"*The second step in the determination of cost based rates is the allocation of costs*."[10]

Hydro-Québec Distribution also conducts the cost of service study based on projected rate case data.

Gaz Métro believes that conducting a cost of service study based on historical costs is no longer relevant. The exercise would be more effective and useful if it were based on projected rate case

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[7] Electric Utility Cost Allocation Manual, National Association of Regulatory Utility Commissioners, Washington, D.C., 1973, p. 2.

[8] Bonbright, Danielsen, Kamerschen, Principles of Public Utility Rates, Public Utilities Reports Inc., 1988, p. 480.

[9] EB-2011-0354, Exhibit G1, Tab 1, Schedule 1, p. 1.

[10] Decision - Application by Enbridge Gas New Brunswick to change its Small General Service, Mid-General Service, Large General Service, Contract General Service, Industrial Contract General Service and Off-Peak Service Distribution Rates and for approval of its 2012 regulatory financial statements. (Matter No. 225). April 17, 2014, p. 15.

costs and if it had the twofold objective of serving as a starting point for establishing a rate strategy and measuring the extent of the cross-subsidization generated by the proposed rates.

Gaz Métro is requesting that the Régie approve the use of the cost allocation study as a starting point for setting the rate strategy and as a tool to measure the cross-subsidization generated by the rates proposed in the rate case. Consequently, Gaz Métro is asking the Régie to approve that the cost of service study be conducted annually based on projected rate case data rather than on the previous year's budget.

4 GUIDING PRINCIPLES

As mentioned earlier, the purpose of allocating distribution costs is to assign to the rate classes, the cost associated with the service they receive by establishing cause and effect relationships between these rate classes and the costs incurred to serve them. Gaz Métro submits that the cost causation principle remains the guiding principle on which the exercise must be based.

The principle stems from section 51 of the *Act Respecting the Régie de l'énergie* (the "Act"), which stipulates that a distributor cannot impose, for natural gas transmission, higher rates than are necessary to cover its costs and provide it with a reasonable return. This was the guiding principle based on which the cost of service allocation principles were established in application R-3028-85, which led to Order G-429. This principle is timeless and just as relevant today. Moreover, in its procedural decision D-2014-011, submitted in this application, the Régie stresses the importance it places on cost causation as a guiding principle in a cost allocation study:

> "*The Régie would like to stress that a cost allocation study must make it possible to allocate costs as faithfully as possible to the various rate classes according to the cost causation principle*."[11]

In application R-3323-95, which sought approval for changes to the cost of service allocation method, the Régie chose the following three principles for the cost allocation exercise:

- The most direct causal relationship between costs and the customers that generated such costs;
- The absence of free riding;
- A fair and equitable sharing of savings and diseconomies.[12]

According to the causation principle, customers that affect costs in the same way will be allocated the same share of costs, thus ensuring that they are treated fairly.

The allocation method must also be as simple as possible even if the application methods can, at times, be complex. There must be a balance between the desired level of precision and the

[11] D-2014-011, p. 8, paragraph 2.
[12] D-97-47, p. 15.

significance of the amounts at issue and not be so laborious as to compromise the proposed objective of the exercise.

5 COST ALLOCATION OF DISTRIBUTION MAINS

The cost of mains is currently allocated using the CONDPRIN factor, which considers the customer and demand components of mains cost. The "access" (customer) component is the share of mains cost attributable to having access to the gas system while the "capacity" (demand) component is associated with the potential volume available to customers.

The share of mains cost associated with system access is currently assigned to the various rate classes based on the relative number of customers. Demand component costs are assigned to each rate class based on a measure of available capacity.

The first step in establishing the CONDPRIN factor is to determine the share of mains cost that will be allocated based on the number of customers and the share that will be allocated based on demand. The first part of this section therefore discusses the method for estimating the customer component. A discussion of the estimation method for the demand component will follow. Improvements will also be proposed for both components. Lastly, the matter of whether a regional aspect should be included in the CONDPRIN calculation and the treatment of supply mains will also be discussed and proposals made.

5.1 IMPORTANCE OF THE CUSTOMER COMPONENT OVER TIME

In 1987, following the implementation of the methods and terms established by Order G-429, the customer component was estimated at 63%[13] of the total cost of mains. Changes to the methodology made in subsequent years have significantly reduced the share of the cost allocated based on the number of customers, with the result that the percentage has hovered at 45% for the last several years.

[13] R-3104-86, GMI-20, Document 5, p. 3.

Table 1

Customer Component - Historical Data

Application	Value of Hypothetical Zero-Diameter System	Total System Value	Customer Component for All Regions
	(1981 $M)	*(1981 $M)*	*(%)*
1987[1]	153.2	244.3	62.7%
2001-2002	229.5	533.2	43.0%
2008-2009	253.2	574.7	44.1%
2010-2011	249.0	565.8	44.0%
2013-2014	258.2	579.3	44.6%

[1]Source: Gaz Métro, Pricing Department, R-3104-86, GMI-20, Document 5, p. 3; Pricing Department.

It bears mentioning that some experts believe that the customer component, as it is currently applied, is understated. For instance, Dr. Overcast says the following in his report:

> "*Black &Veatch is also concerned that the method for reflecting customer and demand is not reasonable. The method likely understates the customer component of cost and overstates the demand component*."[14]

Moreover, as early as 1985, the Régie was aware that the model used to estimate the customer component could cause it to be understated. For this reason, it had approved a model that uses square diameter as an explanatory variable for the average cost of a linear metre of main. This variable represented the delivery capacity of mains. The Régie stated the following on this topic:

> "*GMi proposes to extrapolate the linear costs of mains based on their diameter rather than their square diameter to determine the delivery capacity of a main. The Régie believes that this variant must be set aside because it understates the share of costs attributable to the customer component*"[15]

In 1997 the model was changed to the one currently in use: the diameter rather than the square diameter of mains was adopted as an explanatory variable. This change significantly reduced the share of the customer component attributed to mains cost. This model is still used today.

[14] Black&Veatch, *Review of Gaz Metro's Cost of Service and Rate Design*, p. 17.
[15] Order G-429, p. 76.

5.2 DETERMINATION OF THE CUSTOMER COMPONENT

The customer component is determined by the ratio of the cost of a minimum distribution system to the total cost of the distribution system.

Equation 1 $$\text{Customer component} = \frac{\text{Cost of a minimum distribution system}}{\text{Cost of entire distribution system}}$$

A few simple transformations results in the following:

Equation 2[16] $$\text{Customer component} = \frac{\text{Average cost per linear foot of minimum system}}{\text{Average cost per linear metre of total system}}$$

The complexity of the estimation method for the customer component resides in the calculation of the average costs of the minimum system and the total system and in the definition of the minimum system.

Historically, two approaches have been used to define a minimum system. According to the zero intercept approach, the minimum system has no capacity to carry gas, i.e. the distribution mains have a zero-diameter. According to the alternate approach (minimum system), the minimum system consists of the smallest diameter mains typically installed.

The customer component is currently estimated using the zero intercept method.[17] According to this approach, the average cost of a zero-diameter main is calculated by regression analysis, using an equation to describe the relationship between the diameters of the mains and their average costs.

Equation 3 $$\text{Average linear cost of mains} = \text{Constant} + \beta \text{ pipe diameter}$$

The constant obtained with this estimate, also referred to as the intercept, is the theoretical value of a main with no capacity to carry gas.

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[16] $$\text{Customer component} = \frac{\text{Average cost per linear foot of minimum system * Number of linear metres}}{\text{Average cost per linear metre * Number of linear metres}}$$

[17] See Exhibit B-0006, Gaz Métro-1, Document 2, p. 30, for an explanation of the zero intercept method.

5.2.1 Limits of the zero intercept approach

The preliminary analyses presented in the discussion paper showed the limits of the zero intercept approach in terms of practical application. Problems relating to accounting data and the statistical validity of the results led Gaz Métro to rethink the use of this approach to estimate the customer component of mains cost. Moreover, Dr. Overcast's firm recommendation that the minimum system approach be used instead and the fact that this approach is widely used by gas and electric utilities across North America further confirms the need to reconsider the method used.

The technical difficulties associated with the zero intercept approach, documented in the discussion paper, [18]are as follows:

- Statistical validity of the estimate: The value of the intercept has not been significantly different from zero for many regions in the past few years. The low number of observations is the main reason for the technical difficulties associated with the zero intercept method.
- Reliability of results: The method sometimes produces unreliable results. For example, the intercept can take a negative value or the value can be greater than the cost of a two-inch main.

In the past, Gaz Métro has reported major problems with the use of the zero intercept method. For example, in a 1997 request to have changes to the cost allocation method approved, the distributor requested and received approval to make changes to the existing regression model, which at the time, used the square diameter of mains as an explanatory variable for average linear cost. Gaz Métro believed that the model led to an overstatement of the customer component and therefore requested that the equation used to estimate the zero intercept be changed.

> "*The first improvement relates to the basic calculation of the piping required to connect customers. This cost is currently overstated as it is higher than the cost of a 2-inch diameter main, which would be sufficient not only to connect customers but also to meet the annual and peak consumption needs of many small customers. The current method therefore*

[18] B-0006, Gaz Métro-1, Document 2, p. 30 to 37.

overstates costs allocated to small customers, mainly residential customers. The proposed method corrects this shortcoming."[19]

The model used to estimate the zero intercept was therefore changed in 1997.[20] Despite the changes, difficulties remain concerning the validity of results.

5.2.2 Corrections to the zero intercept approach

Although Gaz Métro is proposing to switch to the minimum system approach (presented later) to calculate the customer component in distribution costs, the results obtained using the zero intercept approach will also be presented for comparison purposes. However, an improvement was made to the manner in which the data used is cleaned to ensure the validity of the results.

The customer component using the zero intercept or minimum system approach is calculated using an accounting database containing all installed mains. Currently, the database is cleaned manually. Extreme or unreliable data (for example, negative capitalized cost inputs) are identified and removed to ensure they do not affect the average cost of mains. However, no specific rule is followed to determine which values are deemed extreme or unreliable.

To ensure that the database does not contain extreme or unreliable data, the cleaning has been systematized by defining criteria for removing extreme data.

Mains with a real linear cost per metre that is more or less than two standard deviations from the average linear cost per metre of all mains were removed. The difference between a datum and average data, also referred to as the Z score (standard score), measures the position of an object in relation to the group.

[19] R-3323-94, GMi-1, Document 1.1, p. 9 of 18.
[20] D-97-47.

$$CoteZ = \frac{X - \mu}{\sigma}$$

Where:

X = Cost per linear metre of main

μ = Average cost per linear metre of all mains

σ = Standard deviation of costs per linear metre of main

Gaz Métro therefore proposes to exclude from the database all mains for which the Z score is more or less than 2. This criterion will be systematically applied to clean the database, regardless of the approach used to calculate the customer component (zero intercept or minimum system).

This type of correction is routinely made by users of the zero intercept approach, which is known to often produce unreliable or invalid results. The need to clean the data used is mentioned in the literature. As an example, the National Association of Regulatory Utilities Commissioners, which published a cost allocation manual, talks about the adjustments that must be made to the database to correct data validity and reliability issues.

> "*The (zero-intercept) method can sometimes produce statistically unreliable results. The extension of the regression equation beyond the boundaries of the data normally will intercept the Y axis at a positive value. In some cases, because of incorrect accounting data or some other abnormality in the data, the regression equation will intercept the Y axis at a negative value. When this happens, a review of the accounting data must be made, and suspect data deleted."* [21]

5.2.3 Arguments in favour of the minimum system approach based on 2-inch mains

The inherent difficulties of the zero intercept approach militate in favour of switching to the minimum system approach. However, the main arguments in favour of the minimum system approach do not stem solely from these technical difficulties but also from the cost causation principle and the significant economies of scale that characterize natural gas distribution.

[21] *Electric Utility Cost Allocation Manual*, National Association of Regulatory Utility Commissioners, January 1992, p. 95.

Cost causation

The minimum system approach allows for a fairer application of the cost causation principle because it ensures that the cost floor of the smallest system possible is allocated to customers. A system made up of 2-inch plastic mains is the simplest and smallest system that can reasonably be installed. The cost of this system is therefore the distributor's minimum installation cost and regardless of the capacity used by customers, they will have to absorb this minimum cost.

With the zero intercept approach, a demand component of mains cost associated with a system smaller than the minimum 2-inch main system can be added to the rate classes with low annual volumes. The fact is that the minimum system cost is a minimum fixed floor price that must be fully distributed among the rate classes. The rate classes with low annual consumption must be assigned their share of the minimum system and not a share equal to a smaller system. In this sense, the minimum system approach proposed by Dr. Overcast is preferable to the zero intercept method as it is more consistent with the cost causation principle.

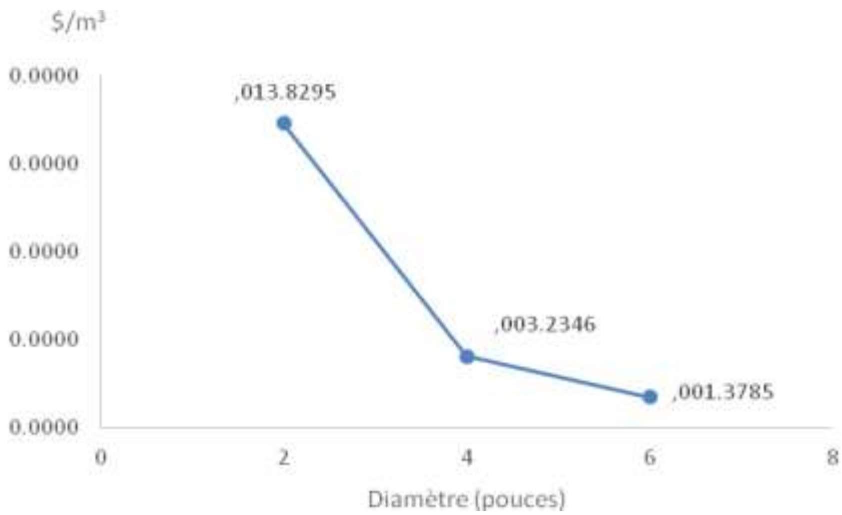
Economies of scale

The gas sector is characterized by the presence of significant economies of scale. The fact is, a system made up of four-inch lines mains have approximately four times the delivery capacity of the minimum system while its cost would only be slightly higher. The cost per cubic metre of a minimum system would therefore be much higher than the cost per cubic metre of a system made up of four-inch mains.

The following graph shows the cost per cubic metre of mains by size and illustrates the significant difference between the unit costs of small versus larger mains

Graph1

Unit Cost of a Main Installation



Dr. Overcast submits that due to these substantial economies of scale, customers whose needs can be served by the minimum system should be classified in a single rate class. This rate class groups together homogeneous customers on a cost basis Gaz Métro plans to examine this recommendation concerning segmentation in the second phase of this application.

<u>Ease of application</u>

Unlike the zero intercept approach, the minimum system does not present any technical difficulties in terms of application because the average cost of a two-inch plastic main is calculated with cleaned data, with no need for linear regression. Difficulties arising from a model's statistical validity therefore do not apply and it is impossible to obtain a zero or negative average cost.

As mentioned in the discussion paper, two caveats are usually mentioned regarding the minimum system approach[22]. First, the approach requires that the minimum system be defined. In the case of a gas system, defining the minimum system is not complicated since

[22] B-0006, Gaz Métro-1, Document 2, p. 37-38.

there are few pieces of equipment to define. Second, with the minimum system approach, it is difficult to accurately separate the customer and demand components. The fact is that a minimum system has delivery capacity unlike a theoretical zero diameter system estimated using the zero intercept method, where there is no delivery capacity. This is the main reason the Régie did not select the minimum system approach in 1985 and why the zero intercept method is considered more theoretically accurate.

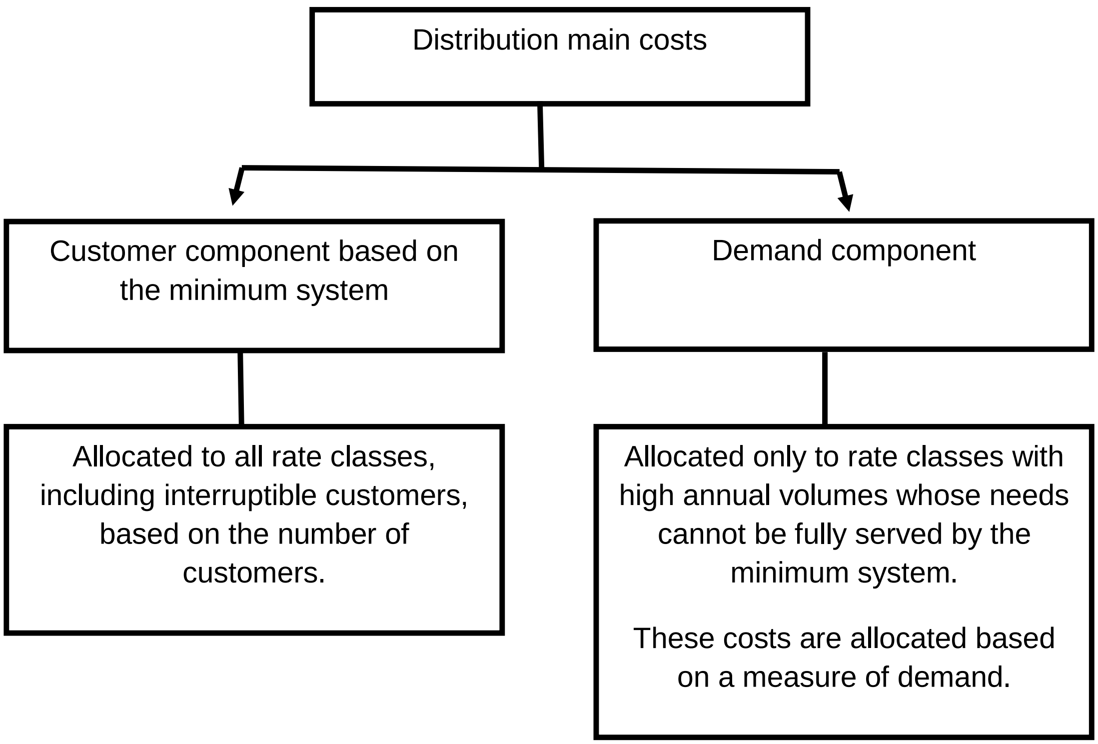
A correction to the minimum system approach is therefore proposed and should be applied in order to prevent the potential double allocation of the demand component for rate classes with low annual volumes.

5.2.4 Modified minimum system approach

Dr. Overcast proposes that no other demand component other than the one included in customers costs be allocated to customers whose needs can be fully served by the minimum system. Given that customer costs also include the demand costs of a minimum system, customers whose needs can be fully served by the minimum system do not have to assume additional demand-related costs. Only the rate classes whose needs exceed the capacity of the minimum system should be allocated excess demand costs. In this way, there would be no double allocation of costs associated with the capacity to deliver gas and the problem cited by the Régie in Order G-429 would be avoided.[23] The following figure illustrates Dr. Overcast's recommendation.

[23] Order G-429, p. 76.

Figure 1
Allocation of Mains Cost



The following table shows how the modified minimum system approach would be applied. The share of capacity allocated to customers whose demand can be fully served by the minimum system, for example, to customers withdrawing annual volumes of less than 36,500 m³, would be set at zero. The share allocated to the other customer classes would be based on the capacity associated with these customers (represented by the % symbol in the following table). The limit of 36,500 m³ was initially selected for illustration purposes and may be subject to change in phase two of this application.

Table 2

Modified Minimum System Approach

Rate	Level *(m^3/year)*	Customer Component *(%)*	Demand Component *(%)*
D_1	0-3,650	(%)	0.00
	3,650-36,500	(%)	0.00
	36,500 and +	(%)	(%)
D_3		(%)	(%)
D_4		(%)	(%)
D_5		(%)	(%)

5.2.5 Definition of minimum system

Under the minimum system approach, the characteristics of the system must be defined.[24] Should it be based on the minimum size of the equipment actually installed or on the size of mains historically installed?

Gaz Métro believes the minimum system should be defined based on the smallest mains currently installed. While some mains smaller than two inches (60.3 mm) were installed in the past, they are no longer the standard at Gaz Métro. Moreover, Dr. Overcast was firm in his recommendation that the minimum system should be defined as a system of two-inch plastic mains. Such a system would be able to meet the needs of the first customer segment, i.e. customers withdrawing less than 36,500 m^3/year.[25]

5.3 Minimum System Study

The minimum system study compares the results of allocating distribution line costs using the zero intercept approach and the minimum system approach. The calculations are based on the accounting data produced by the accounting department and technical data produced by the engineering department. The accounting data are used to produce average mains cost by type

[24] B-0006, Gaz Métro-1, Document 2, p.38

[25] B-0005, Gaz Métro-1, Document 1, p. 11, for a customer density of 20 customers per kilometer of line and a 25% coefficient of use.

and diameter. The engineering data are used to produce the number of linear metres for each type of main.

5.3.1 Data used for simulations of main cost allocation

Data from the accounting and engineering departments are used to build a database of the required mains information.

The accounting data used contain the following information about each main:

- Installation year;
- Length;
- Region;
- Diameter of a main;
- Main meterial; and
- Initial capitalized cost.

These data are cleaned using the criterion described in section 5.2.2 which excludes any main for which the standard score (Z score) is more or less than two.[26]

The initial capitalized cost of each main is transposed into dollars of a given year, i.e. 2012 in the present case, using the index of natural gas utility construction costs[27] (the index is presented in Appendix 1). The cost per linear metre of each main is then obtained by dividing the capitalized cost of the main by its length.

Mains of different sizes and materials are grouped together and the average cost of each category of main is calculated. This average cost equals the average cost per linear metre weighted by the relative length of each main. As such, a very long main will have more weight in determining the average cost for its category than a main of just a few hundred metres. For example, to calculate the average cost of two-inch mains (60.3 mm), the cost per linear metre of each main in this group is weighted by its relative size in determining the

[26] According to a normal distribution, 5% of data are more or less than two standard deviations from the average, i.e. 2.5% below and 2.5% above the average.

[27] Handy-Whitman Index of Gas Utility Construction Costs, North Atlantic Region, Distribution Plant, Steel Mains and Plastic Mains.

average cost for this group of mains. The simulations were run using weighted averages. The following table illustrates the weighting method used and is presented as an example of the weighting applied based on data for four 60.3 mm plastic mains.

Table 3

Average Cost of 60.3 mm Plastic Mains

Actual Capitalized Value ***($)***	**Cost/Linear Metre** ***($)***	**Length** ***(m)***	**Weight in Calculation of Average Cost** **(%)**
56,432,383.69	143.82	392,371	94.7
7,770,003.96	598.94	12,973	3.1
5,477,624.24	641.05	8,545	2.1
199,672.02	460.93	433	0.1
Weighted average	168.66		
Unweighted average	461.19		

The following table reproduces the actual weighted average costs obtained for each type and size of main based on accounting data. These costs were used for the simulated calculation of the customer component using the zero intercept and minimum system approaches.

Table 4

Weighted Average Cost of Mains by Type and Diameter

Type	Diameter *(mm)*	Average Cost *($/m)*	Length *(m)*
Plastic	42.2	157	273,026
Plastic	60.3	171	1,635,496
Plastic	88.9	181	181,768
Plastic	114.3	206	1,982,986
Plastic	168.3	229	708,512
Plastic	219.1	235	41,996
Steel	88.9	321	37,296
Steel	114.3	370	648,848
Steel	168.3	412	841,648
Steel	219.1	547	490,139
Steel	323.9	508	194,196
Steel	406.4	603	342,762

Source: Accounting data, Gaz Métro

The total value of the distribution system must be estimated in order to calculate the customer component. The data produced by the engineering department help provide an accurate picture of this system.

The average costs derived from the accounting data (Table 4) are combined with the engineering data regarding the lengths of mains in order to estimate the total value of the system. The value for each type of main is obtained by multiplying the weighted average costs obtained from accounting data by the number of linear metres for each type of main. The system value is the sum of the values of each main category.

The following table presents a picture of Gaz Métro's existing distribution system and the estimated value of its components.

Table 5

System Value by Type of Main

Type	Diameter *(mm)*	Length *(m)*	2012 Value *($/m)*	2012 Value *($)*
Plastic	26.7	362	156	56,317
Plastic	42.2	281,133	157	44,206,158
Plastic	60.3	2,237,170	171	382,430,716
Plastic	88.9	196,174	181	35,465,496
Plastic	114.3	2,431,771	206	500,702,692
Plastic	168.3	953,548	229	218,293,188
Plastic	219.1	64,475	235	15,145,998
Steel	26.7	5,031	304	1,530,574
Steel	33.4	28,106	310	8,703,182
Steel	42.2	26,326	317	8,338,659
Steel	48.3	97,293	322	31,296,588
Steel	60.3	317,847	331	105,319,106
Steel	88.9	201,668	321	64,819,948
Steel	114.3	348,989	370	129,219,640
Steel	168.3	310,381	412	127,894,695
Steel	219.1	129,675	547	70,880,203
Steel	273.1	6,865	503	3,453,088
Steel	323.9	28,777	508	14,619,940
Steel	406.4	11,270	603	6,799,716
Total		**7,676,861**	**230**	**1,769,175,903**

Source: Taken from data provided by Gaz Métro's accounting and engineering departments.

When accounting data are not sufficient to calculate the average cost of a given type of main, it is estimated by linear regression. For example, the actual cost per linear metre for 26.7 mm plastic mains is estimated by linear regression using the six mains coordinates in Table Table 4 The shaded data in Table 5 are data that could not be obtained from the accounting department data presented in Table 4 and for which the average cost was estimated by linear regression.

The total system value, expressed in real 2012 dollars, is therefore $1,769 million.

5.3.2 Calculation of customer component using the zero intercept approach

This section presents the calculation of the customer component using the zero intercept approach.

The linear regressions, which plot the relationship between the diameter of mains and their linear cost per metre, were estimated based on the data in Table 4

Two regressions were calculated The first considers only plastic mains while the second considers both steel and plastic mains. The results are presented in the following table.

Table 6

Linear Regression Results

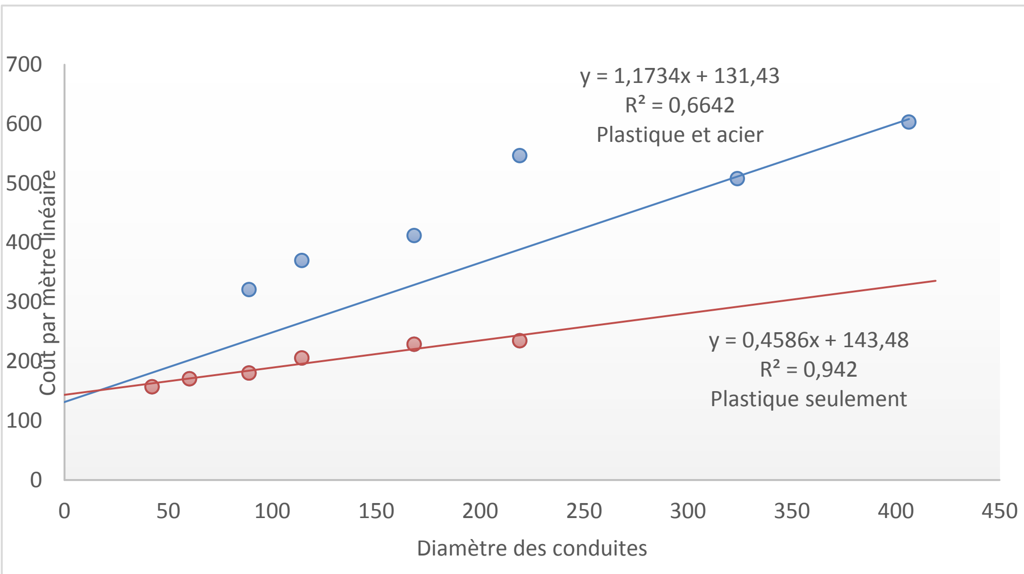
Plastic mains only	
Intercept value	$143
R squared	0.94
Student's T constant	19.3
Customer component	143 / 230 =62 %
Plastic and steel mains	
Intercept value	$131
R squared	0.66
Student's T constant	2.52
Customer component	131 / 230 =57%

The great disparity between the costs of plastic and steel mains explains the unsatisfactory results of the second regression, which factors in all mains. Moreover, the regression calculated on only the coordinates of plastic mains presents satisfactory results and the Student's t-test is high enough to allow us to reject the null hypothesis.

The following graph shows the results of the two regressions and sheds light on why the regression applied to steel and plastic main coordinates generates unsatisfactory and unreliable results. In fact, the graph shows that the value of the intercept obtained by this regression is low and seemingly unreliable. This intercept is invalid according to the Student t-test.

Graph 2

Regression Line, Steel and Plastic Mains



The regression considering plastic mains only is selected to calculate the customer component given that the statistical results are satisfactory (Student' T-test).

The value of the intercept is therefore estimated at $143 per linear metre. The customer component is calculated according toEquation 2 in this document. As such, the customer component using the zero intercept approach accounts for 62% of the cost given that the average cost of all the distribution mains, estimated in Table Table 5 is $230 per linear metre. The difference of 38% is therefore the share allocated on the basis of demand.

5.3.3 <u>Calculation of customer component using the minimum system approach</u>

As indicated in Table 5 the cost per linear metre of two-inch plastic mains is $171. Consequently, since it is the smallest possible system, the customer component, according to the minimum system approach, accounts for 74% of the cost ($171/$230) and the share allocated to capacity is 26%. The following table reiterates the results obtained.

Table 7

Minimum System Comprised of Two-Inch Plastic Mains

Cost per linear metre - minimum system (2012 dollars)	$171
Cost per linear metre - total system (2012 dollars)	$230
Number of linear metres in the distribution system	7,676,861 metres
Value of two-inch minimum system (2012 dollars)	$1,312,743,231
Value of total system (2012 dollars)	$1,769,175,903
Customer component	74%

TableTable 8 compares the distribution of the customer component calculated according to the two approaches among large customers. Allocation of the customer component based on the zero intercept approach is obtained by multiplying the relative weight of each rate class, in terms of number of customers by the customer proportion, calculated at 62% (Table 6 Allocation of the customer component using the minimum system approach is obtained by multiplying the relative weight of each rate class by the customer proportion calculated at 74% (Table 7

Table 8

Allocation of the Customer Component of Distribution Main Costs

Rate	Level *(m³/year)*	Zero Intercept *(%)*	Minimum System *(%)*
D_1	0-3,650	43.11	51.45
	3,650-36,500	15.05	17.96
	36,500 and +	3.30	3.94
D_3		0.07	0.08
D_4		0.03	0.03
D_5		0.02	0.03
D_{RT}		0.43	0.51
Total		62.00[28]	74.00

The final impact of using the minimum system approach on the allocation of distribution main costs cannot, however, be deduced solely on the basis of these results since the allocation of the demand component must be taken into account. Although the customer component is higher when estimated based on the minimum system approach, one must also consider that with the modified minimum system approach, no demand component is allocated to customers who consume less than 36,500 m³.

5.3.4 Effect of both approaches on allocation of distribution main costs

The demand component must be included in order to properly compare the results of the two approaches. To allocate the "demand" portion of the costs among the various rates and levels, Gaz Métro uses data pertaining to capacity attributed and used (CAU), presented later.

The following tables show the allocation of distribution main costs based on each approach.

[28] For simplification purposes, the total customer amount was rounded in all the tables of the evidence submitted.

Table 9

Allocation of Distribution Main Costs - Zero Intercept

Rate	Level *(m³/year)*	Customers *(%)*	Customer Component *(%)*	CAU *(m³)*	Demand Component *(%)*	Total *(%)*
D_1	0-3,650	69.53	43.11	712,971,088	2.04	45.15
	3,650-36,500	24.27	15.05	2,016,464,855	5.79	20.84
	36, 500 and +	5.32	3.30	3,602,199,744	10.34	13.64
D_{RT}		0.69	0.43	1,320,931,194	3.79	4.22
D_3		0.11	0.07	187,930,194	0.54	0.61
D_4		0.04	0.03	4,576,649,746	13.13	13.16
D_5		0.04	0.02	821,821,137	2.36	2.38
			62.00		38.00	100.00

Table 10

Allocation of Distribution Main Costs - Two-Inch Minimum System

Rate	Level *(m³/year)*	Customers *(%)*	Customer Component *(%)*	CAU *(m³)*	Demand Component *(%)*	Total *(%)*
D_1	0-3,650	69.53	51.45	0	0.00	51.45
	3,650-36,500	24.27	17.96	0	0.00	17.96
	36,500 and +	5.32	3.94	3,511,853,999	8.86	12.80
D_{RT}		0.69	0.51	1, 294, 640,348	3.27	3.78
D_3		0.11	0.08	187,208,161	0.47	0.55
D_4		0.04	0.03	4,486,249,979	11.32	11.35
D_5		0.04	0.03	821,821,137	2.07	2.10
			74.00		26.00	100.00

Although the results are comparable, with the minimum system approach, a slightly larger share of the costs is allocated to low-volume customers and in particular to customers withdrawing less than 3,650 m³ per year.

This result is not surprising given that, as mentioned earlier, with the minimum system approach, low-volume customers are allocated their share of the minimum system's costs.

Under the zero intercept approach, these customers are allocated a share of the costs of a system that is smaller than a minimum system. In this regard, the minimum system approach is more equitable and more closely reflects the distributor's reality in terms of costs.

Gaz Métro is of the view that the modified minimum system approach more accurately reflects the costs incurred for the distribution system because it allocates to customers with smaller annual volumes, their fair share of the costs of the smallest installed system.

Gaz Métro is requesting that the Régie approve the use of the modified minimum system rather than the zero intercept approach for estimating the customer component of the cost of mains.

Gaz Métro is asking the Régie to approve that the minimum system be defined as comprising 2-inch (60.3 mm) diameter plastic mains.

5.3.5 Allocation by customer versus by connection

The allocation of the customer component of mains cost is based on the relative number of customers in each rate class. In Gaz Métro's view, a change is needed to correct a bias against small consumers. This bias has become more pronounced in the past 10 years as the average number of customers per connection[29] has increased due to the growth of the condo market. In 2013, there were on average four customers per connection for customers consuming less than 365 m^3/year and two customers per connection for customers consuming less than 1,095 m^3/year. For volumes over 1,095 m^3, the number of customers and connections was the same. Gaz Métro began wondering whether the number of customers should be used in this allocation factor

[29] The connection is a small pipe that carries gas from the main to the customers' connection equipment.

Table 11

Average Number of Customers Per Connection - 2013

Rate	Level	Average Number of Customers Per Connection
D_1	0-365	4
	365-1,095	2
	1,095 and more	1
D_3		1
D_4		1
D_5		1

When connecting a building, sometimes only one meter is installed for the entire building while in others a meter is installed for each customer. In the first case, there is only one customer and in the second there are as many customers as there are meters.

Because distribution mains are allocated based on the number of customers, a greater portion of their costs is allocated to a building with many meters (customers) than to a building with just one meter. Yet, the costs incurred to serve the buildings are the same in both cases[30]. Gaz Métro believes that both buildings should be treated in the same way. Whether they have one or many meters, buildings served by a single connection and that have the same consumption make the same use of the distribution mains.

Of course a building with many meters should be allocated the cost of all the meters in place and similarly, where only one meter is installed, only the cost of this meter should be allocated to the building. This will be taken into account when allocating the cost of meters. However, in both cases, distribution main costs are allocated in the same way.

According to the equal treatment of equivalents and cost causation principles, customers who affect costs in the same way should be allocated the same share of distribution costs.

[30] Note that the factor pertains only to distribution mains and that a separate factor deals with the allocation of meters and connections.

This is not the case when the customer component of mains costs is based on the number of customers. The rate classes with more than one customer per connection, in particular the first levels of Rate D_1, are at a disadvantage and are assigned more than their fair share of costs.

In order to correct this inequity, the number of connections should be used to calculate the customer component of distribution main costs.

As a result of this change, a slightly larger share of customer costs would be allocated to larger volume customers and the share assigned to customers withdrawing less than 3,650 m³ annually would be reduced. The following table shows the allocation of the customer component based on the minimum system approach and using the number of connections rather than the number of customers as an input in the allocation factor.

Table 12

Allocation of the Customer Component of Distribution Main Costs

Rate	**Level** *(m³/year)*	**Connections** *(NO)*	**Customer Component** *(%)*	***Customers*** *(NO)*	**Customer Component** *(%)*
D_1	0-3,650	83,124	46.71	*137,539*	51.45
	3,650-36,500	37,986	21.34	48, 006	17.96
	36,500 and +	9,018	5.07	10,521	3.94
D_3		193	0.11	216	0.08
D_4		73	0.04	86	0.03
D_5		68	0.04	78	0.03
D_M		1,231	0.69	1,369	0.51
			74.00		**74.00**

The following table shows the allocation of mains cost taking into account the demand component of these costs. Using the number of connections rather than the number of customers to allocate the cost of mains reduces the share allocated to very small consumers and in so doing corrects the inequity in their regard. The resulting allocation more accurately reflects the causal relationship between the costs of distribution mains.

Table 13

Allocation of Distribution Main Costs - Two-Inch Minimum System

Rate	**Level** *(m³/year)*	**Connections** *(%)*	**Customer Component** *(%)*	**CAU** *(m³)*	**Demand Component** *(%)*	**Total** *(%)*
D_1	0-3,650	63.12	46.71	0	0.00	46.71
	3,650-36,500	28.84	21.34	0	0.00	21.34
	36,500 and +	6.85	5.07	3,511,853,999	8.86	13.93
D_3		0.15	0.11	187,208,161	0.47	0.58
D_4		0.06	0.04	4,486,249,979	11.32	11.36
D_5		0.05	0.04	821,821,137	2.07	2.11
D_{RT}		0.93	0.69	1, 294, 640,348	3.27	3.96
			74.00		**26.00**	**100.00**

Gaz Métro is asking the Régie to approve that the allocation of mains costs be based on the number of connections rather than on the number of customers.

5.4 THE "DEMAND" COMPONENT OF THE COST OF MAINS

The allocation of the demand component is currently based on capacity attributed and used (CAU),[31] which takes into account the capacity to which customers have access (CA) but also the volumes withdrawn annually (CU).

Capacity attributed (CA) is defined as the contribution of each rate class to peak demand. Peak demand may be calculated on a coincident or non-coincident basis. As explained in the discussion paper, the coincident peak is the day on which the highest volume is achieved (peak day).[32] When the capacity attributed is defined on a coincident peak basis, the demand component is allocated based on the relative contribution of each rate class to the total peak day volume. The non-coincident peak is the maximum theoretical volume that could be demanded by all customers.

[31] B-0006, Gaz Métro-1, Document 2, p. 40 to 44.

[32] See Exhibit B-0006, Gaz Métro-1, Document 2, p. 40 for a discussion of peak concepts.

Currently, the coincident peak of customers with monthly meter readings is calculated based on the estimated maximum daily demand (MDD), for which the methodology is presented later.

Equation 4 $CA = MDD * 365$

For customers with daily meter readings, the peak is estimated based on maximum hourly demand (MHD).

The capacity used (CU) takes into account the volumes withdrawn by each rate class and is determined by the difference between the annual volume withdrawn and the peak volume.

An adjustment taking into account volumes consumed above and below the CA is made to obtain the CAU. With this approach, interruptible customers are allocated a share of the demand component of mains cost based on their consumption. If the capacity used were not considered in the calculation of the demand component, interruptible customers would not contribute to this component of mains cost since their consumption is zero on the peak day.

The share of the demand component assigned to interruptible customers therefore equals the annual volumes for this customer class divided by the capacity attributed for all the other rate classes. This capacity attributed to interruptible customers is subtracted from the share assigned to the other rate classes based on the relative size of their volume deficits or surpluses in relation to their capacity attributed. The CAU calculation for each rate class is expressed by the following equations.

Equation 5 : $CAU_{rc} = CA_{rc} \pm Adjust\ CUr_{c}$

Where:

rc = rate class

Adjust CU_{rc} = Adjustment taking into account the CU by rate class

Equation 6 : $Adjust\ CU_{rc} = Max(CU_{rc}-CA_{rc};0) - Max(CA_{rc}-CU_{rc};0) * (Total\ excess/Total\ deficit)$

Where:

rc = Rate class

Surplus = Sum of [Max (CU_{rc}-CA_{rc};0)]

Deficit = Sum of [Max (CA_{rc}-CU_{rc};0)]

Dr. Overcast suggests that pursuant to the cost causation principle, the demand component of distribution main costs should be allocated based on capacity attributed (CA) only. However, he proposes an adjustment to take into account the non-coincident peak of interruptible customers.

> *"For firm customers, the costs are allocated using the CA method. For interruptible customers, the costs are allocated based on peak load. This method captures the costs for serving the non-coincident peaks (NCP) on the system."*[33]

The proposed approach primarily affects interruptible customers who are currently allocated a portion of the demand component of distribution main costs based on capacity used (CU) rather than their peak load or capacity attributed as is the case for the other rate classes. The expert states that although interruptible customers are not taken into account in transmission main design, they are factored into the design of supply and distribution mains. Therefore, supply and distribution main costs must be allocated to them as to all other rate classes.

> *"As we discuss below, the transmission system is designed to meet the design day requirements. Where large industrial customers are served under the interruptible rates, their cost should reflect either the dedicated cost of their own distribution line or their share of the costs of a line designed to provide adequate delivery capacity to their facility whenever that delivery capacity is used. When any capacity is built to meet the customers design day demand requirements the customer causes those costs even if the design day is not coincident with the system design day."*[34]

Gaz Métro's Engineering Department confirms that interruptible customers are taken into account in the design of the distribution system and hence taken into account in determining its cost. To this effect, Gaz Métro stated:

> "*From the delivery station to the customer's meter, the distribution system is designed to meet the customer's maximum hourly flow requirements, i.e. its firm and interruptible hourly flow.*"[35]

The costs associated with the demand component of the distribution mains must therefore be allocated to interruptible customers based on their capacity attributed, as is the case for the other rate classes.

[33] Black&Veatch, Review of Gaz Metro's Cost of Service and Rate Design, p. 17.
[34] B-0005, Gaz Métro-1, Document 1, p.8
[35] R-3837-2013, Gaz Métro-2, Document 14, p.12

5.4.1 Estimating peak volumes

Given that most Gaz Métro consists of primarily monthly reading customers, daily volumes are not known and the peak cannot simply be observed by rate class. A coincident peak is therefore estimated by linear regression based on monthly volumes for Rates D_1 and D_3 with monthly meter readings.

The model used to estimate the MDD for customers with monthly readings is presented in Equation 7 below. The equation establishes a relationship between the dependent variable (monthly volumes) and the independent variable (number of degree days). The MDD is extrapolated by assigning a value of 39 to the number of degree days, i.e. the number of heating degree days for the peak day, which is defined as -26°Celsius[36].

Equation 7: $C = \beta_0 + \beta_1 DD$

Where:

C = Monthly consumption

β_0 = Monthly base volume

β_1 = Sensitivity to one additional heating degree day

DD = Degree days per month

In the case of Rate D_3 customers with daily readings, and D_4 and D_5 customers, the peak is estimated based on maximum hourly demand (MHD) set out in the contracts. The MHD is multiplied by 24 to obtain the MDD for these rate classes.

5.4.1.1 MDD results based on the current model

The following table shows the statistical results for each level of Rate D_1. Note that the coefficient of determination (R^2) is very high for all the rate levels and that the Student's T-test is such that the null hypothesis is rejected for all the rate classes. The constant and the number of degree days are therefore all statistically significant. The results show that the current model produces satisfactory results with a coefficient of determination of more than 96% for all the levels and sublevels of Rate D_1.

[36] B-0006, Gaz Métro-1, Document 2, p. 49 to 51.

Table 14

Statistical Results for Current Model (Equation 7)

D_1 Levels	β_0	β_0 Student's T	β_1 (DD)	β_1 Student's T	R^2	MDD
365	190,867	13.74	761	16.96	0.966	35,960
1,095	535,851	10.50	5,839	35.41	0.992	245,339
3,650	2,812,216	14.28	44,356	69.67	0.998	1,822,321
10,950	3,162,286	25.46	48,114	119.86	0.999	1,980,409
36,500	9,110,576	21.64	93,937	69.02	0.998	3,963,079
109,500	11,443,786	12.97	115,534	40.51	0.994	4,882,058
365,000	8,091,721	10.14	82,455	31.98	0.990	3,481,787
1,095,000	4,922,511	12.29	32,968	25.47	0.985	1,447,585
3,650,000	3,046,729	15.66	11,568	18.40	0.971	551,307
10,950,000	656,885	8.33	5,546	21.75	0.979	237,895
Total - D_1	**43,973,428**	**17.76**	**441,078**	**55.10**	**0.997**	**18,647,740**

5.4.1.2 Alternative model contemplated

Gaz Métro also uses a model to estimate the daily or monthly consumption of the rate classes as part of its revenue normalization and peak day demand calculations for gas supply purposes.

In its 2008 rate case, Gaz Métro proposed to include wind speed as an explanatory variable in the revenue normalization model.[37] Two years later, in its 2010 rate case, Gaz Métro again proposed to include wind speed in forecasting peak day demand for gas supply purposes.

Gaz Métro studied the possibility of following these models and including a wind speed variable in the model used to estimate MDD for Rate D_1 and D_3 customers with monthly readings for the purpose of allocating mains costs.

[37] R-3630-2007, Gaz Métro-12, Document 2, p.8

The peak and extreme cold day planning model, which is used as an input in gas supply planning, and the revenue normalization model are based on daily withdrawal observations by Gaz Métro's System Control Centre The daily volumes consumed by all customers are then determined. Since the daily volumes of Rate D_4, D_5 and D_3/D_5 customers are known (these customers' meters are read daily), the volumes of customers with monthly readings are determined by subtracting the volumes of the daily reading customers from the total daily readings. However, with this approach, it is not possible to accurately allocate withdrawals to Rate D_1 and D_3 customers by rate level. Yet this accuracy is required for the purposes of cost allocation.

To estimate MDD for cost allocation purposes, Gas Métro uses data provided by the billing department. The monthly consumption of each level of Rates D_1 and D_3 is used to estimate a peak for each rate and rate level with EquationEquation 7 The monthly peak obtained is then transposed into maximum daily demand (MDD) by multiplying it by 12 and dividing by 365.

Gaz Métro has studied a model incorporating wind speed to forecast the MDD of Rate D_1 and D_3 customers. However, given that only monthly data from the billing department are available, the cross effect of daily variations in temperature and wind speed cannot be captured as they can by revenue normalization models[38] based on daily observations. Still, the wind speed can be incorporated as an independent variable, in the same way as the number of degree days per month, based on the following model:

Equation 8: $$C = \beta_0 + \beta_1 DD + \beta_2 S$$

Where:

C = Monthly consumption

β_0 = Monthly base volume

β_1 = Sensitivity to one additional heating degree day

DD = Degree days per month

β_2 = Sensitivity to additional wind at 1 km/hr

[38] R-3630-2007, Gaz Métro-12, Document 2

S = Monthly average wind speed

This model had been selected as part of the work to determine the revenue normalization method during the 2008 rate case. The statistical results showed that adding wind speed improved the model and that this variable was significant according to the Student's T test. The model therefore used monthly consumption data provided by the billing system[39]. However, experience revealed some weaknesses in this model. It has since been modified again[40] and now uses daily volumes provided by the Network Control Centre. In its decision D-2007-116, the Régie described the model proposed by Gaz Métro which did not contain a wind variable.

> *"Gaz Métro adds that the use of monthly data does not make it possible to accurately capture the nuances in daily variations and distorts the results generated for the shoulder months of October and May, which biases the normalization. In order to remedy this problem, particularly for the month of May, where the distortion is greatest, Gaz Métro proposes not to consider the impact of wind speed in the normalization calculations for May, but to maintain the effect of temperature."*[41]

In the discussion paper filed with this application, Gaz Métro had expressed its intention to change the method used to calculate MDD.[42] Gaz Métro considered that the MDD used in the cost allocation exercise should be calculated with the same model as the one used to calculate peak day volumes and revenue normalization. However, further analysis led Gaz Métro to reconsider its conclusion. The following section presents the results of the simulation incorporating wind speed in the model based on monthly data.

5.4.1.3 Results of alternative model including wind speed

The following table presents the statistical results obtained by the model expressed bEquation 8above, which includes wind speed as an explanatory variable. Note that the wind speed coefficient takes on a higher negative value for certain Rate D_1 levels and

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[39] In its decision D-2007-116, the Régie accepted the model proposed by Gaz Métro based on monthly data but considered that the effect of wind on consumption would be better captured by using daily data and asked Gaz Métro to continue the work in this regard.

[40] R-3662-2008, Gaz Métro-12, Document 2, p.8

[41] D-2007-116, p. 42.

[42] B-0006, Gaz Métro-1, Document 2, p.51

for which the Student's T test is not sufficiently high to reject the null hypothesis that the coefficient is different from zero.

Moreover, the results obtained for Rate D_3 customers are slightly higher than those obtained without factoring in the wind, with the coefficient of determination (R^2) increasing from 96% to 98% for these customers. These results show that adding wind as a variable does not reinforce the model given that the wind variable is not significant for many levels.

Table 15

Statistical Results for Model Including Wind Speed

D_1 Levels	β_0	β_0 Student's T	β_1 (DD)	β_1 Student's T	β_2 (S)	β_2 Student's T	R^2	MDD
365	165,972	13.55	593	9.99	223	3.36	0.985	35,833
1,095	585,785	9.49	6,177	20.69	-447	1.34	0.993	245,594
3,650	3,027,174	13.03	45,812	40.73	-1,924	1.53	0.998	1,823,417
10,950	3,232,350	20.22	48,589	62.81	-627	0.72	0.999	1,980,766
36,500	8,203,969	33.11	87,796	73.21	8,113	6.05	1.000	3,958,455
109,500	9,446,383	24.05	102,004	53.65	17, 873	8.40	0.999	4,871,870
365,000	6,296,807	16.95	70,297	39.10	16,062	7.98	0.999	3,472,632
1,095,000	4,010,686	23.57	26,792	32.53	8,159	8.86	0.998	1,442,935
3,650,000	2,733,253	14.30	9,444	10.21	2,805	2.71	0.984	549,708
10,950,000	655,727	6.28	5,538	10.96	10	0.02	0.979	237,889
Total - D_1	**38,358,107**	**35.26**	**403,042**	**76.54**	**50,248**	**8.53**	**1.000**	**18,619,099**

The following table shows the MDD breakdown for Rate D_1 and D_3[43] customers base on each model.

[43] For Rate D_3, only customers with monthly readings were considered. For the other customers, the MHD was used, as explained in section 5.4.1

Table 16

MDD Breakdown for Each Model

Rate	MDD Without Wind *(%)*	MDD With Wind *(%)*
365	0.2	0.2
1,095	1.1	1.1
3,650	7.9	7.9
10,950	8.6	8.6
36,500	17.3	17.2
109,500	21.3	21.2
365,000	15.2	15.1
1,095,000	6.3	6.3
3,650,000	2.4	2.4
10,950,000	1.0	1.0
Total D_1	**81.2**	**81.1**
Total D_3	**18.8**	**18.9**

Gaz Métro's analysis shows that including wind speed as an explanatory variable has a marginal effect and little impact on the MDD calculation. In fact,the peak estimated using the models with or without wind (Equation 7 and Equation 8) is very similar and its breakdown within the rates and rate levels is the same.

5.4.1.4 Proposal concerning the MDD estimation method for customers with monthly readings

The models used for revenue normalization and the gas supply plan are based on daily readings observed by the System Control Centre. These data provide information on the volumes withdrawn each day but do not allow for accurate allocation to the various rate classes. As mentioned earlier, the volumes of Rate D_1 and D_3 customers are established by subtraction. Since the cost allocation exercise involves assigning to the rate classes and levels the costs accruing to them, it relies on data that must be broken down by rate and level. For this reason, the MDD estimate must continue to rely on monthly consumption data provided by the billing system, which provides information on the volumes withdrawn attributable to the various rate classes.

Adding a wind speed variable has a marginal effect on the MDD allocation within the rate classes and levels. Also, certain results were not statistically different from zero. While it may seem appropriate to harmonize the different models used by Gaz Métro to estimate consumption sensitivity to weather factors, the analysis shows that the calculation of MDD for the purpose of allocating costs is best served by the current approach. Gaz Métro plans to continue using the current model to estimate the peak demand of customers with monthly readings.

5.4.2 Simulation of the effect of allocation based on capacity attributed (CA)

Capacity attributed (CA) is defined as the contribution of each rate class to peak demand. Given that D_1 and D_3 customers have monthly readings, the MDD estimated by Equation Equation 7 is used to determine the CA. For customers with daily readings, the maximum hourly demand is used to estimate peak demand. No capacity is attributed to interruptible customers (D_5) at peak periods.

TTable 17 shows the CAU results obtained with the current methodology, i.e. using the CA and volumes consumed by customers in each rate class. EquatioEquation 5 and Equation 6 presented in section 5.4 are used to calculate the CAU.

Table 17

Calculation of Capacity Attributed (CA) and Capacity Attributed and Used (CAU)

Rate	Level (m³/year)	MDD (m³)	Capacity Attributed (m³)	Annual Volumes (m³)	Surplus (m³)	Deficit (m³)	Adjustment (m³)	CAU (m³)
D_1	0-3,650	2,103,620	767,821,313	174,196,753	0	593,624,560	-54,850,225	712,971,088
	3,650-36,500	5,943,488	2,169,373,022	514,502,080	0	1,654,870,943	-152,908,167	2,016,464,855
	36, 500 and +	10,600,633	3,869,230,865	979,247,599	0	2,889,983,266	-267,031,121	3,602,199,744
D_3		520,724	190,064,276	166,967,862	0	23,096,414	-2,134,082	187,930,194
D_4		13,270,796	4,843,840,540	1,952,129,193	0	2,891,711,347	-267,190,794	4,576,649,746
D_5		6,055,305	0	821,821,137	821,821,137	0	821,821,137	821,821,137
D_{Rt}		3,831,885	1,398,637,943	557,645,317	0	840,992,626	-77,706,749	1,320,931,194
			13,238,967,958	**5,166,509,939**	**821,821,137**	**8,894,279,156**	**0**	**13,238,967,958**

Dr. Overcast's proposal calls for switching from CAU to CA, factoring in the non-coincident peak of Rate D_5 customers. This change would have little impact on the allocation of mains cost. As explained earlier, only interruptible customers would be more significantly affected given that their contribution is calculated based on their peak volume (estimated based on maximum hourly demand) and not on their annual volumes, as is currently the case. Given that the distribution system was designed to take into account the capacity required by all rate classes, including interruptible service customers, there is no need to allocate a demand component based on annual volumes withdrawn to this customer class.

Table 18 compares the allocation of distribution main costs using, for the capacity portion, the current CAU allocation factor and the allocation obtained using the CA allocation factor proposed by Dr. Overcast. The simulations were run taking into account the customer component, calculated with the minimum system approach and allocated based on the relative number of connections.

Table 18

Allocation of Mains Cost – CAU versus CA

Rate	Level *(m³/year)*	Customer Component *(%)*	CAU *(m³)*	Demand Component CAU *(%)*	Total Allocation (CAU) *(%)*	CA *(m³)*	Demand Component CA *(%)*	Total Allocation *CA*
D_1	0-3,650	46.7	0	0.0	46.7	0	0.0	46.7
	3,650-36,500	21.3	0	0.0	21.3	0	0.0	21.3
	36, 500 and +	5.1	3,511,853,999	8.9	14.0	3,869,230,865	8.0	13.1
D_3		0.1	187,208,161	0.5	0.6	190,064,276	0.4	0.5
D_4		0.0	4,486,249,979	11.3	11.3	4,843,840,540	10.1	10.1
D_5		0.0	821,821,137	2.1	2.1	2,210,186,325	4.6	4.6
D_{Rt}		0.7	1, 294, 640,348	3.3	4.0	1,398,637,943	2.9	3.6
		74.0	**10,301,773,624**	**26.0**	**100.0**	**12,511,959,949**	**26.0**	**100.0**

Gaz Métro is asking the Régie to approve that the demand component be allocated based on capacity attributed (CA), factoring in the non-coincident peak of interruptible customers, estimated based on their maximum hourly demand (MHD) rather than volumes consumed.

5.5 TREATMENT OF SUPPLY MAINS

Mains can be broken down into three main categories, depending on their function and the pressure of the gas they carry.

1. Distribution mains carry natural gas from gas pressure regulator stations to customer service lines. The pressure in distribution mains ranges from 0 to 700 kPa. Seventy-four percent (74%) of all Gaz Métro mains are distribution mains.

2. The supply mains are used both to deliver natural gas to large-volume customers and to carry natural gas from the city gate to the gas pressure regulator stations. Supply mains have a pressure between 1,000 and 2,900 kPa. About 15% of the system's mains fall into this category.

3. Transmission mains are generally larger in diameter than the other two categories and carry gas to the city gate at a pressure between 4,400 and 9,928 kPa.[44] Only 8% of system mains fall into this category.[45]

Mains have two functions that respectively correspond to the "access" (customer) and "capacity" (demand) components of mains cost.

Distribution mains serve the dual function of providing access to the system and delivering or carrying natural gas.

For their part, transmission mains are not considered to provide access to the system because customers are rarely connected to them directly. These isolated cases account for just 0.003% of all customers. The cost of transmission mains is therefore allocated solely on the basis of capacity and their sole function remains to deliver natural gas.

Historically, supply mains have always been considered and treated in the same way as transmission mains because few customers were connected to them. However, a recent analysis, the results of which were presented in the cost allocation discussion paper,[46] showed that 1,000 customers are now connected directly to supply mains. These mains have the dual function of allowing access to the system and delivering natural gas, just like the distribution mains, and the determination of the mains allocation factor must reflect this reality. There is no longer a need to distinguish supply mains from distribution mains in determining the CONDPRIN factor.

Moreover, when designing the system, Gaz Métro does not distinguish between distribution and supply mains, which are included in a single system.[47] All mains with a pressure class below 2,900 kPa are considered *distribution mains*, while mains with a pressure class above 4,000 kPa are considered *transmission mains.* The classification of supply mains for cost allocation purposes should therefore be modified. These mains should be considered high-pressure distribution mains and in this regard, their costs must include both an customer and a demand component.

[44] There are no mains that carry gas at a pressure between 700 and 1,000 kPa or between 2,900 and 4,400 kPa.
[45] B-0006, Gaz Métro-1, Document 2, p.26
[46] B-0006, Gaz Métro-1, Document 2, p. 51 to 53.
[47] R-3837-2013, Gaz Métro-2, Document 14, p. 9.

5.5.1 Simulation concerning the treatment of supply mains

Treating supply mains in the same way as distribution mains will reduce the customer component of the cost of mains given that the average total system cost will increase while the average minimum system cost will remain the same. As such, since the denominator in Equation 2 will increase once the cost of supply mains is included in the total cost of the distribution system, the customer share will decrease.

The following table shows the result of the simulation based on clean data. The average cost of mains increases from $230 per linear metre to $273 per linear metre when supply mains are considered part of the distribution system.

Table 19

Treatment of Supply Mains: Effect on Customer Component

	Two-Inch Minimum System		Zero Intercept	
	Distribution and Supply Mains	Distribution Mains Only	Distribution and Supply Mains	Distribution Mains Only
Customer	63%	74%	53%	62%
Average minimum system cost	$170.94	$170.94	$143.48	$143.48
Total average system cost	$272.81	$230.46	$272.81	$230.46

The decrease in the customer component will reduce the share of costs attributed to low-volume customers and increase the share attributed to higher volume customers. Overall, based on the current approach where supply and transmission mains are treated in the same way, customers withdrawing 36,500 m³ or less absorb 68% of the mains cost. Allocating supply mains in the same way as distribution mains reduces the customer component and hence reduces the share of costs assigned to these levels to 58%. Table Table 20 compares results of the simulation.

Table 20

Treatment of Supply Mains: Effect on Cost Allocation

		Distribution Mains			**Distribution and Supply Mains**		
Rate	**Level** *(m³/year)*	**Customer Component** *(%)*	**CA** *(%)*	**Total Allocation (CA)** *(%)*	**Customer Component** *(%)*	**CA** *(%)*	**Total Allocation (CA)** *(%)*
D_1	0-3,650	46.7	0.0	46.7	39.8	0.0	39.8
	3,650-36,500	21.3	0.0	21.3	18.2	0.0	18.2
	36,500 and +	5.1	8.0	13.1	4.3	11.4	15.8
D_3		0.1	0.4	0.5	0.1	0.6	0.7
D_4		0.0	10.1	10.1	0.0	14.3	14.3
D_5		0.0	4.6	4.6	0.0	6.5	6.5
D_{RT}		0.7	2.9	3.6	0.6	4.1	4.7
		74.0	**26.0**	**100.0**	**63.0**	**37.0**	**100.0**

Gaz Métro is asking the Régie to approve that the same method be used to allocate costs for both supply and distribution mains.

5.6 FACTORING THE REGIONS INTO THE CALCULATION OF THE MAINS COST ALLOCATION FACTOR

Since 1997, the mains allocation factor has been configured such that the customer and demand components are determined on a regional basis and then combined into a global factor for the entire service area, taking into account the relative weight of its six regions (Montréal, Abitibi, Mauricie, Estrie, Québec City and Saguenay).

This approach was justified at the time by the fact that Montréal customers, particularly residential customers, were allocated a large share of the costs to develop the system in remote regions for a primarily industrial clientele.[48] Gaz Métro deemed that this method was no longer consistent with the cost causation principle and that it was time to reduce the proportion of mains cost allocated based on number of customers. It was therefore decided that the Montréal clientele, which consists primarily of residential customers, would no longer be assigned regional development costs that were incurred primarily for industrial and commercial customers.

[48] See R-3104-86, GMI-20, Document 5 for a description of the customer component calculation.

"*With the current method, Montréal residential customers are supporting part of the development costs for other types of customers. In keeping with our system development practice, these projects were most of the time economically justified by the presence of new commercial and industrial customers. The costs of these developments, according to the current methods, are partially allocated to Montréal residential customers. The proposed improvement to our cost allocation method is intended to address this fact.*"[49]

By estimating a zero intercept value for the six regions of the service area and applying a regional weighting to the calculation of the customer component, the latter was reduced and the costs previously allocated to residential customers were shifted to high-volume industrial and commercial clienteles.

Not everyone was in favour of including a regional aspect in the calculation of the mains allocation factor. The arguments against a regional allocation of mains cost were as follows:

- The measure put in place to protect Montréal residential customers penalized the city's commercial and industrial customers, who had to absorb a larger share of the cost of mains installed in the regions. Expert Sharon Chown said the following on this topic:

  "The same argument, however, can be extended to the industrial customers served in the Montreal area. Why should industrial customers based in Montreal be allocated a portion of the costs of the mains in the Lac St. Jean area, for example, when these customers make no use of these mains? Yet, under GMi's proposed method, all industrial clients, regardless of location, will be forced to share the higher costs of these mains."[50]

- The regional weighting did not produce a genuine allocation by region, which could have led to regional pricing. The fact is that Gaz Métro does not conduct a cost of service allocation study for each of the six regions in its franchise. Instead, the regions are weighted to take into account the relative size, i.e. the length in linear metres of their systems, when calculating the allocation factor for the cost of mains. The end result is that the cost of service is allocated among the rates and levels for the entire service area and not for the six regions.

  According to some experts, there was no need for regional allocation given the postage stamp rate structure in effect for the entire service area. At the time, Gaz Métro's service area was divided into two main geographic zones, each of which had its own pricing. An

[49] R-3323-95, GMi-1, Document 1.1, p. 11.
[50] R-3323-95, Evidence of Sharon L. Chown on behalf of Approvisionnement-Montréal and Nova Gas Clearinghouse Limited, p. 30.

allocation that takes six regions into account was difficult to apply in a two-zone service area. In this regard Mr. Vander Veen said the following:

> "*I also have a concern that the proposed method may represent a form of incremental costing concepts which are being used to derive bundled average cost based rates for two (2) zones from six (6) zones. If this method were to be used to establish unbundled rates for each of the proposed zones, it could be appropriate. However, the concept is not appropriate for the establishment of unbundled service offerings at cost based rates for a two zone or a true postage stamp rate structure*."[51]

The Régie had taken concerns into account but felt that the data concerning the costs per region and per customer would be sufficiently accurate to permit regional allocation without creating unfairness towards a particular clientele.

> "*The Régie understands that under the proposed method, the cost of mains would be allocated to customers who use them in each of the regions and that the costs to serve each region"s rate class would be clearly identified.*"[52]

5.6.1 Effect of regional weighting on customer and demand components

Regional differences come into play twice in calculating the mains allocation factor.

1- First, the customer component is estimated by region. Thus, an intercept value is estimated by linear regression for each of the six regions. During the last cost allocation exercise, the intercept value varied significantly from one region to the next, i.e. from $12 per linear metre in Mauricie to $75 per linear metre in the Quebec City region.[53] However, the preliminary analysis filed by Gaz Métro in this application showed that the intercept estimated by linear regression was not valid for certain regions given that the Student's T statistic was not sufficiently high and as a result the null hypothesis could not be rejected.[54] Over the years, the intercept results for the Abitibi, Mauricie and Estrie regions have, as a rule, been statistically invalid.

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[51] R-3323-95, Pre-filed direct testimony of H.J. Vander Veen on behalf of Industrial Gas Users Association, December 15, 1995, p. 8.

[52] D-97-47, p. 17.

[53] B-0006, Gaz Métro-1, Document 2, p. 34.

[54] B-0006, Gaz Métro-1, Document 2, p. 30 to 37.

Consequently, with the current method, the significant variances between the regional intercepts do not reflect a cost reality but are instead due to a weakness in methodology.

The weak statistical results make this method unfeasible. The reality is that the number of coordinates available to perform the linear regressions is not sufficient to obtain meaningful regional results. The zero intercept approach can therefore only be used for franchise data as a whole in order to obtain robust results.

2- Next, the regional data are used to estimate the demand component. With the current approach, regional CAUs are calculated based on regional peak volumes and regional volume, which are then added to obtain the CAU for the entire service area. A global CAU is estimated based on the peak demand (MDD/MHD) and volumes of all customers.

Gaz Métro considers that weighting is necessary when calculating the average mains cost but plans to apply such weighting only when for preparing the data described in section 5.3.1. This manner of factoring in the relative importance of each main in determining average cost reflects both regional disparities and the relative importance of mains of different sizes and materials. There is therefore no reason to continue with regional weighting as the regions are correctly represented following the initial weighting.

<u>Customer component – regional versus global approach</u>
A simulation was run comparing the customer component values estimated based on a regional and global approach.

When estimated using the zero intercept approach, the average cost of mains in the Montréal area is $137/metre, which is lower than the cost calculated for the other regions. Given that the Montréal system accounts for 66% of the system, this unit value should have a proportional weight in determining the average for the entire service area. This was not the case initially, as attested by the applications in rate cases filed before 1997 when the cost of mains was not weighted.[55] Applying a weight that factors in the relative lengths of the regional systems corrected a bias in the calculation of average cost before the changes

[55] R-3104-86, GMi-20, Document 5, p. 2.

made in 1997. However, the regional approach requires that six intercepts be estimated by linear regression, which does not always produce meaningful results.

The following table compares the results obtained with a regional approach requiring six intercept estimates with those obtained using a global approach requiring just one intercept estimate for the entire service area. In both cases, the average costs used in the regression calculation were weighted to factor in pipe lengths. The regional approach produced a weighted average cost of $143/metre for the regional intercepts. The intercept value determined based on weighted global data was also $143/metre. The linear regressions do not factor in data concerning plastic mains, as indicated in the section on the simulation data (5.3.1).

Table 21

Customer Component, Regional Versus Global Approach – Zero Intercept

Region	**Intercept** **($)**	**R^2** ***(%)***	**Student's T Test**	**Length** ***(m)***	**Minimum System Value** ***($)***	**Average Cost** ***($/m)***	**Total System Value** ***($)***	**Customer Component** ***(%)***
Montréal	137	0.99	16.15	6,132,168	842,926,289	252	1,542,804,156	54.6
Abitibi	154	0.91	7.00	344,282	53,024,821	339	116,855,111	45.4
Mauricie	137	0.50	7.54	523,890	71,939,111	299	156,669,345	45.9
Estrie	163	0.99	176.7	1,124,105	183,515,832	285	319,940,023	57.4
Québec City	140	0.93	3.24	784,998	110,092,707	347	272,218,857	40.4
Saguenay	185	0.04	3.13	343,315	63,537,144	367	126,044,406	50.5
Regional approach	**143**			**9,252,757**	**1,325,037,904**	**274**	**2,534,531,897**	**52.3**
Global approach	**143**	**0.94**	**19.27**	**9,252,757**	**1,327,572,012**	**273**	**2,524,247,049**	**52.6**

Despite cleaning the database (application of the z-score criterion)[56], the Student's T statistics of the intercepts estimated for the Saguenay and Québec City regions are weak and are indicative of unreliable estimates.

[56] Section 5.2.2.

Despite small statistical variances, the result of the regional and global approaches are almost the same. These results show that when weighting that factors in relative main lengths is applied when preparing the data, weighting that factors in the relative lengths of regional systems does not improve accuracy.

The following table shows the results obtained with the regional and global approaches when the minimum system method is used. With this approach, the average cost of 2-inch plastic mains is observed and not estimated by linear regression. There are therefore no statistical validity issues.

Table 22

Customer Component, Regional Versus Global Approach – Minimum System

Region	Average Cost (2'' plastic) *($/m)*	Length (m)	Value of Minimum System *($)*	Average Cost *($/m)*	Value of Total System *($)*	Customer Component *(%)*
Montréal	169	6,132,168	1,037,822,310	252	1,542,804,156	67.3
Abitibi	194	344,282	66,630,081	339	116,855,111	57.0
Mauricie	127	523,890	66,624,246	299	156,669,345	42.5
Estrie	184	1,124,105	206,420,889	285	319,940,023	64.5
Québec City	206	784,998	161,657,826	347	272,218,857	59.4
Saguenay	164	343,315	56,292,318	367	126,044,406	44.7
Regional approach	**172**	**9,252,757**	**1,595,447,670**	**274**	**2,534,531,897**	**62.9**
Global approach	**171**	**9,252,757**	**1,581,703,106**	**273**	**2,524,247,049**	**62.7**

The value of the minimum system estimated with the regional approach is very close to the value estimated with the global approach.

Gaz Métro proposes to maintain a weighting but to apply it only when preparing the data rather than on a regional basis. The average costs calculated by type of main (diameter and material) will always be weighted to factor in the relative lengths of mains when preparing data. This approach eliminates the need for additional regional weighting and is sufficient to ensure an accurate representation of each main when calculating averages by mains category or by region.

<u>Demand component – regional versus global approach</u>

Currently, the MDD is estimated by region and for each rate and rate level. The peak of each customer class for the entire service area is obtained by combining the regional MDDs for these classes. These peaks, estimated on a regional basis, are quite similar to those obtained when the MDD is calculated based on the franchise's total volumes. The following table shows the peak values obtained by adding the regional values to the values obtained using global data for the franchise.

Table 23

MDD – Sum of Regional MDD Versus Global MDD

MDD Based on Degree Days	Rate D_1 *(10^3m^3)*	Rate D3 *(10^3m^3)*	Total *(10^3m^3)*	Variation *(%)*
By region	22,492,795	522,230	23,015,025	0.00
Global	22,479,625	520,724	23,000,349	0.06

Both approaches produce similar results, which is as it should be. Gaz Métro submits that the variances between the points estimated with the two approaches stem from statistical errors due to the fact that for some regions and rate levels, the linear regression results are less robust. Thus, the allocation of the demand component measured by CA is almost identical regardless of whether the regional MDDs are added up or whether the global MDD is estimated. Gaz Métro considers that estimating MDD on a regional basis does not provide any added value in determining CA.

5.6.2 <u>Proposal in favour of a global approach</u>

Gaz Métro believes that weighting is necessary when calculating average mains cost so that each main is properly weighted when calculating averages. When the data is weighted at the preparation stage, the values of the average costs used to calculate the customer component with the minimum system approach adequately reflect the relative weight of the regional systems. No additional weighting is necessary.

When the zero intercept approach is used, it is preferable to perform the linear regression on the franchise's global data rather than for each region. The linear regressions performed on regional data do not produce results that are statistically reliable enough to warrant continuing with this approach. Gaz Métro therefore proposes to eliminate this approach and to instead calculate the customer component using the minimum system method based on weighted global data.

As regards the demand component, the compilation of regional CAs does not improve accuracy since the variance with the global calculation is less than 0.1%. With the current approach, a linear regression is performed for each rate level and region. For Rate D_1, 60 regressions are performed to estimate the peak attributable to each of its levels since there are 10 levels and 6 regions. Most of the regressions produce satisfactory results; however, the statistical error of these 60 regressions combined nevertheless generates a certain bias. It is preferable to estimate the customer peak of each rate level for the entire franchise. The statistical error is less significant and the result is adequate.

For these reasons, Gaz Métro proposes to eliminate the regional approach in favour of a global approach to calculate the allocation factor of mains cost. This change will not compromise the fair representation of each region in the total system, which is ensured by weighting each main based on its relative length when calculating the average cost per linear metre.

Gaz Métro is asking the Régie to approve that the customer and demand components of mains cost be calculated based on data for the entire franchise instead of on regional data.

6 COST ALLOCATION OF TRANSMISSION MAINS

According to Dr. Overcast, although the mains allocation factor currently takes into account the distinction between transmission and distribution mains, it would be preferable to develop a separate factor to allocate transmission main costs.

Transmission main costs is currently allocated with the CONDPRIN factor, which is weighted to take into account the relative size of the distribution and transmission systems. As such, expenses relating to the transmission system are allocated based on a customer and on a demand component rather than solely on the basis of demand.

Gaz Métro proposes to use a separate factor to allocate transmission main costs. As recommended by Dr. Overcast and pursuant to the jurisprudence of the Régie[57], amounts relating to transmission mains would therefore be allocated based on demand only.

CAU is the method currently used to measure capacity and Gaz Métro proposes to switch to adjusted CA [58]for allocation of the demand component of distribution mains (section 5.4). Adjusted CA could also be used to measure capacity for the factor allocating transmission main costs. That said, Gaz Métro believes it would be preferable to keep the CAU method to measure capacity for the allocation of transmission main costs because of the treatment of interruptible service customers.

Unlike what is done for the distribution system,[59] the needs of interruptible service customers are not considered in transmission system design.

> "*If a firm service customer wants to connect to a transmission system, the available capacity is measured without taking into account the needs of interruptible customers but respecting the number of interruption days of interruptible customers during the peak period before contemplating an investment in capacity.*
>
> *Moreover, if a transmission system is saturated during peak periods, Gaz Métro does not plan to increase system capacity if an interruptible customer wishes to connect to the system*"[60]

[57] G-429, p. 75.

[58] Adjusted to take into account the non-coincident peak of interruptible service customers.

[59] See section 5.4.

[60] R-3837-2013, B-0082, Gaz Métro-2, Document 14, p. 11.

Interruptible customers use the excess capacity of the transmission system and therefore there is no causal relationship between the annual withdrawals of interruptible service customers and transmission system costs. In light of this, transmission system costs would not normally be allocated to this clientele. That said, the Régie established the principle of no free rider in the 1985 generic application (R-3028-85), which was reiterated during the 1997 application regarding changes to the allocation method for service cost:

> *"The Régie believes the proposal made by the ACIG witness to the effect that the peak day be used to determine the contractual capacity of firm transmission service respects the service priority criterion but would not allocate any transmission cost to interruptible customers. This particular point was addressed by the Régie in its Decision G-429 and the Régie still adheres to the principle of no free rider. Once this has been established, it becomes necessary to develop an approach that will make it possible to determine the cost attributable to this class of customers as objectively as possible*."[61]

The adjusted CA method to factor in the peak day of interruptible customers can therefore not be used to allocate transmission main costs since the capacity thus measured would exceed this system's capacity.

Gaz Métro submits that CAU is appropriate for measuring capacity for the purpose of allocating transmission main costs since with this method, interruptible customers can be allocated the portion of the capacity that is freed up by the other customer classes. Although interruptible service customers are not factored in when establishing transmission system capacity, they nevertheless use the capacity not used by firm customers. Using CAU to allocate transmission main costs prevents a situation where interruptible customers would not be allocated any of the costs of a system that they use. Interruptible customers are allocated a portion of this system's costs based on their consumption.

Applying a separate factor for transmission mains would not be easy since most mains expenses do not distinguish between amounts attributable to distribution mains and those attributable to transmission mains. For instance, operating expenses incurred in mains operation and maintenance do not distinguish between the two types of mains. Gaz Métro therefore proposes to apply the CAU method for the allocation of amounts relating specifically to transmission mains

[61] D-97-47, p. 19.

and to continue using the CONDPRIN factor for the allocation of mains-related amounts without distinguishing between the types of mains.

As such, going forward, three allocation factors would be used to allocate mains costs:

- CAU: Factor used to allocate transmission main costs only;
- CONDPRIND: Factor used to allocate distribution main costs only; and
- CONDPRIN: Factor used to allocate mains costs without distinguishing between transmission and distribution mains. This factor would be similar to the one currently used. It would combine the CAU and CONDPRIND factors and factor in the relative length of the transmission system in relation to the distribution system.

Gaz Métro is requesting that the Régie approve the allocation of transmission system costs using a separate allocation factor based on capacity allocated and used (CAU) and to keep the CONDPRIN factor, which factors in the relative length of the transmission system in relation to the distribution system for the allocation of costs relating to both transmission and distribution mains.

6.1 TREATMENT OF CUSTOMERS CONNECTED TO A TRANSMISSION MAIN

According to Dr. Overcast, customers connected directly to a transmission main should not be allocated distribution main costs. However, they should be assigned the entire cost of a transmission main dedicated exclusively to them. But if the main is part of an integrated system, a share of its costs should be allocated to these customers.

Currently, just three customers are connected to a transmission main, and in two cases, the only reason is their geographical location as they do not require the high pressure of a transmission main. These customers would ordinarily be connected to a distribution system were it not for their location.

Dr. Overcast's recommendation is aimed at customers who, contractually, must be connected directly to a transmission main and who belong to the same rate class. This is not the case for the Gaz Métro customers connected directly to a transmission main. Dr. Overcast provided the following clarification in an email correspondence regarding the question of how to treat customers connected directly to a transmission main, appended hereto as Appendix 4:

> "*The general rule I discussed is based on very large customers having their own class of service or a special contract for service at the transmission level. To the extent that the customer is served off a standard rate and has been served off this rate historically, there is no basis for now claiming a right to a new rate class consisting of one customer. Since the main is now part of the integrated system and serves other customers there is no basis for direct assignment of costs. As a note given the time that has past, it is likely that there would be no practical way to determine the directly assignable costs for this customer in any event. For that reason it is appropriate to consider that this customer is like a farm tap and should be served under the otherwise applicable rate schedule…Obviously, there are added costs to tap the transmission mainline to serve this customer and those costs have to be paid. The trade-off here is that the customer pays the standard rate and not the direct assignment costs.*"[62]

Given that customers who are connected to a transmission main have not been directly allocated the costs of these mains and do not fall under the same rate, and that these mains are integrated into the system, Gaz Métro proposes to continue with the approach currently in use for the allocation of mains cost for customers connected directly to a transmission main.

Gaz Métro proposes to continue allocating a share of the demand and customer components of the cost of mains to all customers who are not subject to a direct allocation and a specific rate, regardless of the type of main to which they are connected.

7 ALLOCATION OF OPERATING EXPENSES

Operating expenses encompass all the expenses incurred by the utility for its activities, such as purchases of goods and administrative and management costs related to all of Gaz Métro's organizational units, as well as employee salaries, including executive compensation.

Much like mains-related expenses, most operating expenses cannot be directly allocated and must therefore be assigned based on an allocation factor. This observation regarding the allocation of operating expenses is well documented in the literature.

> *"Operating expenses: Allocation of these costs to customer groups presents difficulties similar to those that arise in allocating investment costs. Although a few are directly allocable to a specific*

[62] For Dr. Overcast's response to a question on the allocation of mains costs for customers connected directly to a transmission main, see Appendix 4.

customer or class, in most cases it is impossible to identify any particular recipient as benefiting from them exclusively. Difficulty of allocation varies with the type of expenditure involved. For example, costs of fuel used in electric generation, or of gas purchased for distribution, can usually be allocated without difficulty to the customer using the system output, but other costs (e.g. maintenance and repair costs, administrative costs and taxes) are not easily traceable. They seldom have a direct relationship to the identifiable customers or groups and must be allocated. Depreciation expenses and its counterpart, depreciation reserve, are usually allocated on the basis of the plant to which they relate."[63]

Gaz Métro currently groups its operating costs under 13 headings based on their nature, and each heading is allocated using a factor that makes it possible to respect an established causal relationship. The 13 headings are presented and described in the following table:

[63] Regulated Utilities Manual, A Service for Regulated Utilities, Deloitte Center for Energy Solutions, February 2004, p. 20.

Table 24

Operating Expenses: Current Groupings

Mains	Payroll, materials, equipment and general expenses related to gas transmission and compression	CONDPRIN
Connections and deviations	Payroll, materials, equipment and general expenses related to system operation, design engineering, geomatics and new system construction. Costs related to the System Control Centre	FS21
Meters and regulators	Payroll, parts, devices and general expenses related to the installation of meters and regulators.	FS22
Customer service	Payroll and general expenses related to the administration and technical services of the regional offices.	FB08
Selling and entertainment expenses	Payroll and general expenses related to marketing activities (residential and industrial sales divisions, etc.)	FS27
Advertising	Payroll and expenses related to marketing, communications and demand forecasting	FS28
Customer accounts		
Contracts, customer calls and orders	Costs related to the customer information service and the corporate control office that dispatches technicians in response to system issues.	FS23
Meter readings	Meter reading costs	FS24
Customer billing	Billing costs	FS25
Credit and collection	Costs related to collection activities	FS29
Allowance – bad debts	Uncollected amounts	FS26
Other costs	Other customer accounts costs	CDA
Administrative expenses	Procurement expenses Property, fleet and garage management expenses Gas supply budgets (contracts and administration) Accounting and finance expenses Treasury expenses Employee training expenses IT expenses Expenses related to the regional offices Expenses related to the development of major projects Expenses related to regulatory affairs and pricing Expenses related to legal services Asset management expenses Budget for Gaz Métro executives (president and vice-presidents)	EXPLOITD

The current definition of each factor presented in Table 24 can be found in Exhibit R-3837-2013, B-0166, Gaz Métro-14, Document 4.

One of Dr. Overcast's recommendations pertains to allocation of employee salaries. Dr. Overcast suggests that payroll be allocated based on the nature of the employees' duties. In so doing, a certain share of the payroll could be allocated according to the CA method while another would be allocated on the basis of another factor consistent with the established causal relationship. Thus, operating expenses should not be grouped by their nature, but rather by the function of the organizational units for which these costs were incurred. According to Dr. Overcast:

> *"With respect to general plant, the use of an allocation factor based on distribution plant is not representative of the industry best practice. Land and structures are designed to house employees. These costs are typically allocated in the same way as payroll is allocated. Payroll components are allocated to customer and demand based on the underlying allocation of the functions performed. For example, customer service personnel are classified as customer and allocated on customers. Payroll associated with operation and maintenance of mains is classified on both customer and demand. Thus all payroll accounts have some underlying demand and customer component."*[64]

Gaz Métro currently groups costs by their nature and allocates them accordingly. A large portion of payroll is grouped under administrative expenses, which are allocated to the rate classes irrespective of the different duties of the employees to whom salaries are paid.

Gaz Métro proposes to review the way it groups operating expenses by primarily taking into consideration the function or activity exercised by the organizational units to which the costs are related rather than the nature of the costs incurred. Under this proposal, payroll would be allocated in the same manner as the cost of the goods and services related to that same activity.

This approach, which is consistent with Dr. Overcast's recommendation, stems from the management accounting principle known as activity-based costing. This accounting method allocates common costs or overhead to the production activities to which they relate. The rationale is that the company's activities generate the costs and therefore, costs related to a given activity have the same causal factor. Because expenses and salaries related to a given activity have the same causal factor, their costs will be allocated in the same manner.

The activity-based costing method is well documented in the literature. A recently published university manual explains the method as follows:

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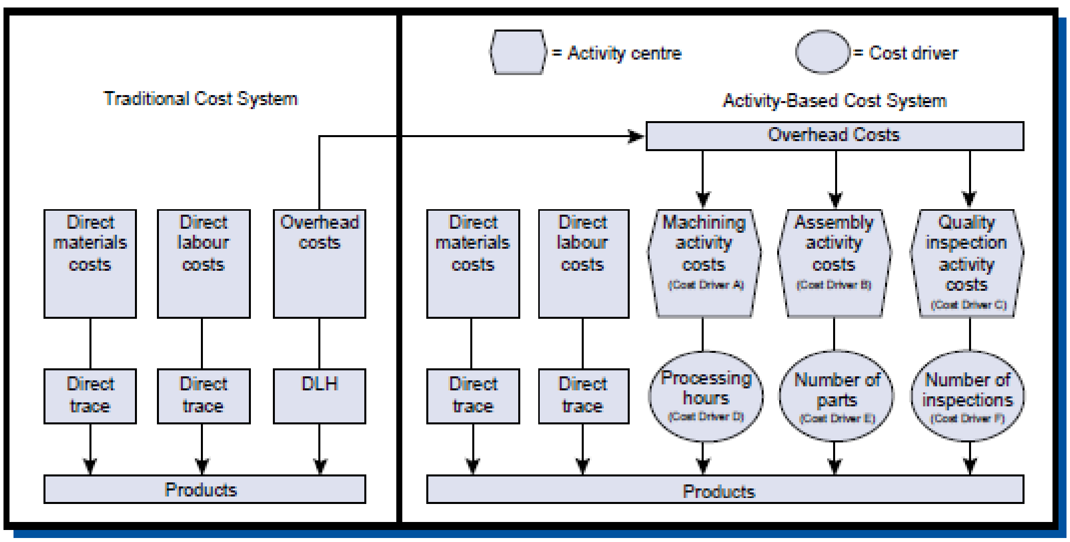
[64] B-0005, Gaz Métro-1, Document 1, p. 18.

> *"Activity-based costing (ABC) systems first accumulate overhead costs for each of the activities of an organization, and then assign the costs of activities to the products, services, or other cost objects that caused the activity. To establish a cause-effect relationship between an activity and a cost object, cost drivers are identified for each activity."*[65]

With this approach, the company's activities are first identified and described. A cost driver is then identified for each activity. Next, operating costs are recorded for each activity and assigned to rate classes based on their cost drivers.

The following illustration, taken from a manual on activity-based costing, compares the traditional approach of allocating administrative expenses to one based on activity-based costing.

Figure 2



Source: Horngren, Sundem, Stratton, Beaulieu, Management Accounting, Cost Allocation and Activity-Based Costing Systems, DLH= direct labour hours

After consulting with Gaz Métro's departments and considering the way other Canadian distributors allocate overhead, 13 general activities were identified and classified into four broad groups:

1- Activities associated with system operation and maintenance;

[65] Management Accounting, Cost Allocation and Activity-Based Costing Systems, Horngren, Sundem, Stratton, Beaulieu, Pearson Canada Inc., sixth Canadian edition, p. 196.

2- Activities associated with customer service;

3- Activities that support the organization and pertaining to external intervenors; and

4- Activities associated with sales promotion and marketing.

7.1 SYSTEM OPERATION AND MAINTENANCE

This broad group encompasses all costs related to system management and design. It contains five main activities.

7.1.1 Mains operation and maintenance

This heading comprises payroll, materials and system operating expenses related to mains. Gaz Métro proposes to assign these costs according to the new CONDPRIN factor that applies to both distribution and transmission mains.

7.1.2 Meter operation and maintenance

This heading comprises payroll, materials and general expenses related to the installation of metering devices ("meters") and to readings. Gaz Métro proposes to continue allocating these costs with factor FS22. Approved by the Régie in its Decision D-90-66, factor FS22 involves establishing the value of meters installed for each rate class proportionately to the total value. Meter value is estimated by rate and rate level by multiplying the unit cost of each type of meter by its total number for each rate class.

Gaz Métro is not proposing any changes to its cost allocation method for meters. However, the methodology used to calculate the unit cost per type of meter will be fine-tuned. This methodology is presented in Appendix 2.

7.1.3 Allocation and maintenance of connections

This heading comprises the share of payroll and machinery and equipment expenses related to connecting customers to mains. Gaz Métro proposes to continue allocating these costs with factor FS21.

The method used entails calculating a unit cost by type of connection. The total value of connections is obtained for each rate class and level by multiplying this unit cost by the number of connections. Allocation factor FS21 is defined as the relative share of the connections value for each rate class and level in relation to total cost. The calculation method for connection unit cost is presented in Appendix 3.

7.1.4 Engineering and planning

This heading comprises payroll, machinery and equipment costs, general expenses related to engineering, system design, asset management and geomatics, and costs associated with major projects. Most of these costs are currently classified under administrative expenses and allocated using the EXPLOITD factor. Gaz Métro proposes to allocate these costs based on the relative number of customers (FB08) since this factor is the most important cost driver for this activity centre. This approach is also used by other Canadian gas distributors[66].

7.1.5 Gas supply

Gaz Métro proposes to allocate costs related to the administration and operation of gas supply and system control based on estimated CA for all customers. Gaz Métro considers that the gas capacity available to the rate classes is the main cost driver for gas supply activities. These expenses are currently classified under administrative expenses and allocated using the EXPLOITD factor, with the exception of expenses related to the System Control Centre, which are assigned using the CONDPRIN and FS21 factors.

7.2 CUSTOMER SERVICE

The second broad group encompasses three types of activities associated with customer service.

7.2.1 Credit and collection

This heading comprises payroll and general expenses related to assessing and monitoring the financial position and credit ratings of customers, as well as collection activities. This heading is already used at Gaz Métro, which proposes to continue allocating the aforementioned costs based on number of customers (factor FB08), without however, distinguishing between customers with cyclical billing and those with month-end billing, as

[66] Enbridge (NBEUB Matter 178, Cost of Service Schedule 3, p. 4); Union Gas (EB-2005-0520, Exhibit G1, Tab 1, Appendix A, p. 1).

is currently the case.[67] The reason for this is that since billing was computerized with SAP, there is no longer any reason to treat customers with cyclical billing differently from other customers. Customers who were previously billed by the computerized FICH system have now been migrated to the new SAP billing system. Allocation factor FS29, which distinguishes between customers on cyclical billing and those who are not, is no longer required. Going forward, only base factor FB08 will be used.

7.2.2 Bad debts

The second heading comprises the cost of bad debts. The factor currently used to allocate costs associated with bad debts is FS26,[68] which is based on revenues generated by each rate class. Now with SAP, Gaz Métro can identify doubtful accounts. Gaz Métro therefore proposes to modify factor FS26 so that uncollectible amounts are directly allocated by rate class.

7.2.3 Customer billing and meter reading

This heading comprises all payroll and general expenses related to customer billing and meter reading, including customer information and assistance functions. These costs were previously classified under the headings *Customer accounting - contracts, customer calls and orders,* and *Administrative expenses*. All support costs related to billing and billing-related customer information service are now grouped together. Gaz Métro proposes to allocate these amounts based on number of customers, in other words, with factor FB08.

7.3 ADMINISTRATIVE SERVICES AND GENERAL EXPENSES

This group encompasses all costs stemming from support activities pertaining to Gaz Métro's internal and external customers. It also includes treasury-related costs.

7.3.1 Internal support services

This heading comprises all payroll, benefits and general expenses incurred to support Gaz Métro's internal customers, more specifically, the costs of the following services:

[67] See factor FS29, R-3837-2013, B-0166, Gaz Métro-14, Document 4, p. 21.
[68] R-3837-2013, B-0166, Gaz Métro-14, Document 4, p. 20.

- Procurement;
- Fleet management;
- Property management;
- Human resources;
- IT; and
- Gaz Métro management personnel.

These costs are currently grouped under administrative expenses and are allocated by rate class based on the total cost of operating expenses, using the EXPLOITD factor. Gaz Métro proposes to continue using this factor to allocate costs incurred for internal support services given that this factor reflects all the cost drivers for this activity.

7.3.2 Regulatory affairs, accounting and public affairs

This heading comprises all payroll and general expenses related to activities involving external intervenors, i.e. the regulator, government and public sector intervenors, and the shareholders. The heading includes the following costs:

- Accounting;
- Internal audits and finance;
- Pricing and regulation;
- Legal services;
- Corporate control;
- Public and government affairs; and
- Demand forecasting.

These costs are currently grouped under administrative expenses and are allocated using the EXPLOITD factor. Gaz Métro proposes to allocate these costs based on both the relative number of customers and capacity attributed, equally weighted, given that a certain causal relationship exists between these factors and these costs. For this heading Gaz Métro drew from the practices of other distributors that allocate costs based on number of customers[69] and/or capacity.

7.3.3 Treasury

This heading comprises treasury-related payroll and general expenses. These costs are currently classified under administrative expenses and are allocated based on the distribution of operating expenses. Gaz Métro proposes instead to allocate these costs based on rate base costs (BASETARD) since there is a relationship between treasury activities and rate base value.

7.4 SALES AND MARKETING

The last broad group encompasses two activities: sales, and promotion and advertising.

7.4.1 Sales force

This heading comprises payroll and general expenses related to marketing activities. It includes the cost of activities associated with residential, commercial and industrial sales. This grouping is similar to the one currently in use. Gaz Métro proposes to continue using allocation factor FS27[70] for these costs.

7.4.2 Advertising and promotion of natural gas

This heading comprises salaries and general expenses related to promotion, communication and marketing activities. It is the same as the current heading except for demand forecasting, which is now classified under *Administrative services and general expenses - Regulatory affairs, accounting, public affairs.* Gaz Métro proposes to continue using allocation factor FS28[71] for these costs.

7.5 EFFECTS OF THE PROPOSED CHANGES ON ALLOCATION OF OPERATING EXPENSES

The effect of the proposed changes on the allocation of operating expenses was simulated using 2012/2013 budget figures that were allocated as part of the 2014 rate application. These operating

[69] See EB-2011-0354, exhibit G2, Tab 4, schedule 1, p. 2; Fortis BC 2009 COSA, A-14, schedule 3.2, p. 2 of 2; NBEUB Matter 178, COS schedule 3, p. 4 of 5.

[70] R-3837-2013, B-0166, Gaz Métro-14, Document 4, p. 20.

[71] R-3837-2013, B-0166, Gaz Métro-14, Document 4, p. 21.

expenses were classified under the new groupings and the proposed factors applied to determine how the expense would be distributed among the rate classes. The results of the simulation show that the changes will have a minimal impact on the share of operating expenses assigned to the rate classes. Smaller customers would be assigned a slightly larger share of costs while customers under Rate D_M (transitional rebate customers - D_{RT}) would see their share decrease slightly. The reason for this is that a slightly larger share of the amounts would now be allocated directly or indirectly based on number of customers.

Table 25

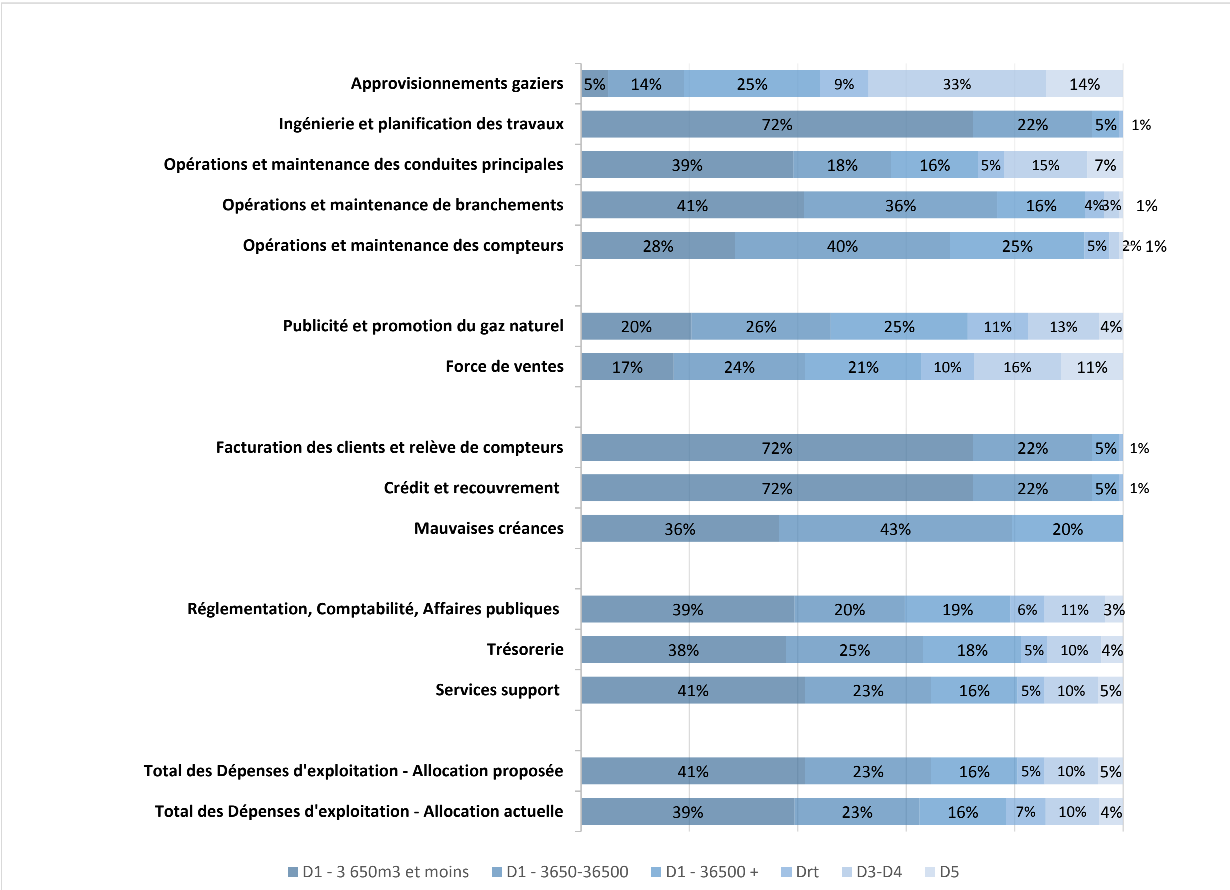
Allocation of Operating Expenses Based on 2012/2013 Budget

Rate	Level *(m³/year)*	Current Allocation *(%)*	Proposed Allocation *(%)*	Number of Customers *(%)*	Capacity (CAU %)
D_1	0-3,650	39	41	69.5	5.4
	3,650-36,500	23	23	24.3	15.2
	36,500 and +,	16	16	5.3	27.2
D_{RT}		7	5	0.7	9.9
D_3		1	1	0.1	1.4
D_4		9	9	0.0	34.6
D_5		4	5	0.0	6.2
		100	**100**	**100.0**	**100.0**

The following graph illustrates the distribution of the amounts attributable to each new heading within the rate classes. This graph distinguishes between costs assigned primarily to low volume rate classes with a large customer base from those assigned primarily to large volume rate classes but a smaller customer base.

Graph 3

Proposed Allocation of Operating Expenses



7.6 PROPOSAL REGARDING THE ALLOCATION OF OPERATING EXPENSES

The following table summarizes Gaz Métro's proposal regarding the allocation of operating expenses. It shows the proposed groupings and corresponding allocation factors.

Table 26

Operating Expenses – Proposed Groupings

	Clients	Capacité	Volumes	Dérivé	Directe	Facteurs
Opérations et maintenance du réseau						
Approvisionnements gaziers		x				CA
Ingénierie et planification des travaux	x					FB08
Opérations et maintenance des conduites principales	x	x				Condprin
Opérations et maintenance des branchements	x					FS21
Opérations et maintenance des compteurs	x					FS22
Ventes et marketing						
Publicité et promotion du gaz naturel	x		x			FS28
Force de vente	x		x			FS27
Service à la clientèle						
Facturation des clients et relève de compteurs	x					FB08
Crédit et recouvrement	x					FB08
Mauvaises créances					x	FS26
Services administratifs et dépenses générales						
Réglementation, Comptabilité, Affaires publiques et gouvernementales, Prévision de la demande	x	x				
Trésorerie				x		Basetard
Services support (TI, Gestion des ressources humaines, Secrétariat corporatif, Services juridiques)				x		Exploitd

Gaz Métro is requesting that the Régie approve the groupings proposed for operating expenses and the associated allocation factors, as presented in Table 2 Table 26**.**

8 ALLOCATION OF OTHER DISTRIBUTION SERVICE COST ITEMS

8.1 COST OF LOST AND UNACCOUNTED FOR GAS AND MERCAPTAN

The volumes of lost and unaccounted for gas considered in ratemaking are expressed as a percentage of volumes available for sale, established during the rate application. Next, the projected rate for each service considered in the lost gas, in other words, supply, compression and transportation, is applied to the volumes. The sum of these amounts is the cost of lost and unaccounted for gas to be included in the distribution revenue requirement. The cost of lost and unaccounted for gas is allocated by assigning volumes delivered to the rates and rate levels using the FB0 factor. At year-end, the real rate of lost gas is calculated and the difference from the projected rate in the rate application is included in the distribution service deferral account.

Dr. Overcast questions why these amounts are recovered through distribution rates and suggests another method for recovering the cost of lost and unaccounted for gas. He proposes that customers that provide their own natural gas directly absorb their share of the costs of the lost gas owing to them and that these costs be included in the supply rates of the other customers:

> *"It is not clear why lost and unaccounted for gas, compressor electric costs and mercaptan costs should be included in distribution rates in an unbundled system. […] Black&Veatch believes that these costs should be recovered directly from transportation customers on a volumetric basis and the remainder included in the gas cost recovery mechanism for customers who use system gas."*[72]

Gaz Métro believes that it nevertheless makes sense to continue recovering the cost of lost and unaccounted for gas through the distribution rate due to the simplicity of the approach, which it feels produces a similar result to the one proposed by Dr. Overcast. In the first case, a percentage of the volumes is allocated to distribution whereas in the second, a percentage of the volumes is requested as additional delivery for direct delivery customers. In both cases, the percentage is theoretically the same and therefore the cost is the same. The only difference is that Gaz Métro pays for the cost of the gas and then charges it back instead of the customer paying the cost directly from its supply. However, lost and unaccounted for gas varies during the year and therefore, according to Dr. Overcast's approach, the percentage of surplus volumes delivered to offset the lost gas could differ from the actual rate, which is only known at year-end. In this case,

[72] B-0005, Gaz Métro-1, Document 1, p. 20.

the difference between the requested and actual lost gas would be allocated to the remaining customers.

Dr. Overcast's suggestion is not easy to apply, making the approach difficult to manage, in particular where financial settlements related to transportation contracts are concerned. This is because these contracts can end at any time of the year but the rate of unaccounted for gas is only calculated at the end of the gas year. Consequently, the financial settlements would have to be made with a rate that is not reflective of Gaz Métro's reality. The current allocation ensures a fair and equitable distribution of costs among the customer classes.

Therefore, Dr. Overcast's suggestion could lead to an unfair distribution of the cost of lost and unaccounted for gas, not to mention an increase in administrative costs.

Dr. Overcast also addresses the issue of electric compressor and mercaptan costs. Gaz Métro is of the view that there is no connection between these costs and whether or not a customer delivers the natural gas. These costs are only related to the distribution system and cannot be distributed on a percentage basis, like lost gas. These are distribution operating costs and can therefore not be recovered through additional deliveries, as Dr. Overcast suggests.

Gaz Métro proposes to continue allocating the costs of unaccounted for gas, electric compressors and mercaptan based on volumes delivered, using the FB01 factor. With this method, costs can be assigned to customers based on the unaccounted for gas causation factor, i.e. volume delivered, without complicating administrative management.

8.2 GLOBAL ENERGY EFFICIENCY PLAN

The allocation factor for the Global Energy Efficiency Plan ("GEEP") encompasses the following four categories:

1- Financial assistance amounts;
2- Development and training, marketing, monitoring and evaluation costs;
3- Other activities, studies, consulting and administration; and
4- Deferred costs for GEEP expenses.

8.2.1 Financial assistance amounts

For Rate D_1, the amount of the financial assistance is first distributed by customer type (residential, commercial, industrial) based on the program concerned and then by rate level based on the distribution provided by the team responsible for the GEEP. The amounts are next distributed across the sub-levels of the first level on the basis of volumes delivered and relative total revenues, equally weighted.

For Rates D_3, D_4 and D_5, the amounts are first distributed by rate based on program participants as provided by the GEEP team and then by rate level on the basis of volumes delivered and relative total revenues, equally weighted.

The GEEP team can also provide a projection of the financial assistance by rate level, for all rates.[73] Despite the availability of information, Gaz Métro had decided that the costs associated with Rates D_3, D_4 and D_5 would be distributed across all customers rather than by rate level. A number of reasons justify this decision. First is the issue of confidentiality raised by some intervenors during consultations. Then there is the fact that in levels with a small customer base, customers could have ended up financing their GEEP themselves through their rates the following year, which would run counter to the objective of rate distribution.

This was an appropriate way to proceed with rate distribution. However, for the cost allocation exercise, Gaz Métro considers that detailed information by rate level is more consistent with the cost causation principle and allocates the financial assistance directly to the rate levels containing the recipients of the assistance.

The information in Gaz Métro's systems allows the utility to propose a method for allocating financial assistance to Rates D_3, D_4 and D_5 that is more consistent with the cost causation principle and is the same as the one used for Rate D_1. It also allows Gaz Métro to propose an improved allocation method for the sublevels of Rate D_1. The GEEP would allocate the

[73] Until the 2012 rate case, rate distribution factoring in, among other things, GEEP cost allocation among the rates and rate levels was taken into account directly in ratemaking (R-3752-2011, Gaz Métro-15, Document 8).

financial assistance amounts directly using the current method and applying it to the D_1 sub-levels.

8.2.2 Development and training, marketing, monitoring and evaluation costs

For all rates, development and training, marketing, monitoring and evaluation costs are distributed by customer type, (residential, commercial and industrial) based on the programs involved and information provided by the GEEP team.

For each customer type and all rates, Gaz Métro distributes the costs among rate levels and the sublevels of the first level of Rate D_1 on the basis of volumes delivered and relative total revenues, weighted equally.

Gaz Métro does not propose any change to the allocation of development, marketing, monitoring and evaluation costs.

8.2.3 Operating budget, including other activities, studies, consulting and administration

The information from the GEEP team does not include the operating budgets by rate or rate level. For all rates, Gaz Métro currently allocates the GEEP operating budgets among the rates, rate levels and sublevels on the basis of volumes delivered and relative total revenues, weighted equally.

When preparing for the rate case, the GEEP team assigns a relative weighting to each GEEP program, based on the administrative effort required to process program files. This weighting is expressed on a scale of 1 to 5, where 1 means minimum effort and 5 means maximum effort. The relative weighting is determined by comparing the administrative efforts of each program.

The resulting weighting is used to assign the GEEP operating budget and other GEEP activities to the various programs on the basis of the required efforts for each. For the distribution of operating costs by customer type, Gaz Métro therefore proposes to use this relative weighting established by the GEEP team. This approach strengthens cost causation by having each rate class assume the administrative effort devoted to developing and analyzing the programs intended for the rate class.

Then, the operating costs by customer type are distributed among the rates and rate levels using the current method, i.e. on the basis of volumes delivered and relative total revenues, equally weighted.

8.2.4 Deferred costs for GEEP expenses

For Rate D_1, the amount of deferred costs is distributed by rate level based on the distribution provided by the GEEP team. Distribution to the sublevels of the first level is based on volumes delivered and relative total revenues, equally weighted.

For Rates D_3, D_4 and D_5, the amounts are first distributed by rate based on program participants as provided by the GEEP team and then by rate level on the basis of volumes delivered and relative total revenues, equally weighted.

As for financial assistance, Gaz Métro proposes to use available information from its systems to allocate deferred costs for Rates D_3, D_4 and D_5 by rate level based on the distribution provided by the GEEP team. As well, the GEEP team will allocate the deferred costs using the current method and apply it to the sublevels of Rate D_1.

Gaz Métro is requesting that the Régie approve, for the purpose of allocating GEEP costs, the use of:

- **information available from Gaz Métro's systems to directly allocate amounts associated with *financial assistance* and *deferred costs* to Rates D_3, D_4 and D_5, and to the sub-levels of Rate D_1;**
- **the relative weighting of the efforts required based on the activities associated with the GEEP to distribute operating costs by customer type.**

8.3 AMORTIZATION EXPENSES

Amortization expenses are allocated in the same manner as the fixed assets with which they are associated. Gaz Métro does not propose to change this method.

8.3.1 Distribution system

Amortization of distribution system components is allocated in the same manner as mains cost, i.e. based on number of connections and capacity, using the CONDPRIN factor. Gaz Métro does not propose any changes to the allocation of amortization expenses related to the distribution system.

8.3.2 Connections and deviations, meters and devices

Gaz Métro proposes to amortize connection and meter costs in the same manner as mains. Only the CONDPRIN factor is used to allocate rate base items, operating expenses and amortization related to mains. Factors FS-21 ad FS-22, which are used to allocate connection and meter costs, are estimated according to the same principle as the CONDPRIN factor, in other words, in order to establish a relative value between customer types. These factors allow Gaz Métro to correctly allocate rate base costs, operating expenses and amortization associated with connections and meters respectively. By applying the methodology used for CONDPRIN to connections and meters as well, the FS-21A and FS-22A factors become unnecessary.

Gaz Métro requests that the Régie approve the use of the FS-21 and FS-22 factors for the allocation of amortization expenses related to connections and meters instead of FS-21A and FS-22A.

8.3.3 General plant

General plant includes the vehicle fleet, land, installations and buildings, including the head office and any IT equipment. These costs are currently allocated using the derivative IMMOBILD factor based on the distribution of total fixed asset costs, i.e. a general allocation of the amortization costs associated with the distribution system, connections and meters.

Dr. Overcast submits that this approach is not representative of the industry best practice. Although he considers it appropriate to use the derivative factor to allocate fleet costs, he recommends improving the manner in which general plant costs are allocated. According to Dr. Overcast, these expenses should be allocated in the same manner as payroll, in other words, taking into account the duties performed by the employees who use these fixed assets in their work. The following is an excerpt from Dr. Overcast's report:

> "*With respect to general plant, the use of an allocation factor based on distribution plant is not representative of the industry best practice. Land and structures are designed to house employees. These costs are typically allocated in the same way as payroll is allocated. Payroll components are allocated to customer and demand based on the underlying allocation of the functions performed. For example, customer service personnel are classified as customer and allocated on customers. Payroll associated with operation and maintenance expense of mains is allocated on design day demand related. Payroll associated with operation and maintenance of mains is classified on both customer and demand. Thus all payroll accounts have some underlying demand and customer component.*"[74]

The following table details costs classified under the "General Plant" heading.

Table 27

General Plant
Breakdown by Capitalized Amounts

General Plant	Capitalized Amounts (%)
Land	2%
Buildings	51%
IT equipment	7%
Furniture	7%
Machinery and equipment	8%
Vehicles	25%
Total	**100**

Therefore, general plant amounts should be allocated in the same manner as payroll rather than with the IMMOBILD factor. Given that the EXPLOITD factor is a proxy for payroll allocation[75], Gaz Métro proposes to use this factor to allocate amortization expenses related to the general plant. Regarding the fleet, Gaz Métro considers that the EXPLOITD factor is also appropriate since vehicles directly support the work of the teams responsible for the

[74] B-0005, Gaz Métro-1, Document 1, p. 18.
[75] Operating expenses consist predominantly (approximately 80%) of payroll.

operation and maintenance of mains, connections and meters. Since the weighting of these teams' salaries represents a large share of the EXPLOITD factor, the cost of the fleet would be well represented.

Gaz Métro is asking the Régie to approve that general plant amortization be allocated in the same manner as payroll and therefore to allow Gaz Métro to use the derivative EXPLOITD factor, which distributes costs based on total operating expenses.

8.4 AMORTIZATION OF DEFERRED COSTS

Each deferral account is amortized according to amortization rules approved by the Régie. Gaz Métro believes that the amortization cost of the deferral accounts should be allocated in the same manner as the corresponding rate base cost. For example, the amortization cost of the deferral account for IT expenses should be allocated in the same manner as rate base IT expenses. Gaz Métro has reviewed the amortization expenses of the deferral accounts and proposes a few changes to make the allocation more consistent with this principle or with other changes proposed in this document.

8.4.1 Intangible assets

Intangible assets consist of first establishment costs, more specifically, the cost of obtaining the franchise. This cost is amortized over the life of the franchise (30 years) and is allocated by distributing the total fixed asset cost of the total rate base using the IMMOBILD factor.

Obtaining the franchise is closely tied to Gaz Métro's regulated method of operation. Under this method, Gaz Métro's main asset is the rate base on which the utility earns a return authorized by the Régie. First establishment costs are allocated using the BASETARD factor. As regards amortization expenses, Gaz Métro proposes to also use the BASETARD factor in order to allocate these expenses in the same manner as the corresponding rate base cost.

Gaz Métro is asking the Régie to approve that amortization expenses associated with first establishment costs be allocated with the BASETARD rather than the IMMOBILD factor.

8.4.2 Severance payments

Amortization of severance payments is allocated based on the distribution of total rate base fixed asset costs using the IMMOBILD factor. Since these are payroll costs, Gaz Métro proposes to allocate them in the same manner as payroll. The EXPLOITD factor is an adequate proxy for payroll allocation. Gaz Métro therefore proposes to allocate amortizations costs associated with severance payments based on the distribution of operating expense costs.

Gaz Métro is asking the Régie to approve that amortization expenses associated with severance payments be allocated using the EXPLOITD factor instead of the IMMOBILD factor.

8.4.3 Annual over-earnings and revenue shortfall

Cost allocation for over-earnings and revenue shortfalls is established by rate class based on revenues. Revenue contains a cross-subsidization share. Since, in principle, the goal of the cost allocation study is to establish a cost to recover without affecting the rate, Gaz Métro proposes to change the allocation factor for these items. The variation in revenues, both in terms of shortfall and over-earnings, is calculated in relation to the revenue requirement. The revenue requirement at year-end ensures the utility's return is in line with the rate of return approved by the Régie. Consequently, variances represent a surplus or a shortfall in relation to the approved return. Gaz Métro therefore proposes to use the same factor suggested for allocation of the return, i.e. BASETARD.

Gaz Métro is asking the Régie to approve that the annual over-earnings and shortfall be allocated using the derivative factor BASETARD.

8.5 TAXES AND DUTIES

8.5.1 Property taxes – place of business

Here, Gaz Métro also proposes to apply the principle whereby taxes and income taxes related to various properties would be allocated in the same manner as these assets. Property tax on the place of business relates to Gaz Métro's buildings. These costs are currently allocated with the IMMOBILD factor based on the distribution of total fixed asset costs as are general plant amortization expenses.

Gaz Métro believes that Dr. Overcast's recommendation regarding the general plant also applies to property taxes and therefore proposes to allocate these costs in the same manner as general plant amortization expenses, in other words, using the EXPLOITD factor.

Gaz Métro is asking the Régie to approve that property taxes - place of business be allocated using the derivative factor EXPLOITD.

8.6 INCOME TAX RELATED TO RETURN

Currently, expenses associated with income tax related to return are allocated using the REVNETD factor[76] based on distribution revenues. Since one of the goals of the changes proposed in the cost allocation study is to make it possible to use this study as a starting point for the rate strategy, Gaz Métro believes that in principle, the results of the study should not include rate components. The allocation represents the ideal amount, on a full cost basis, to allocate to each customer type. The cross-subsidization choices should therefore be made after this study. Gaz Métro proposes to replace the factors established on the basis of revenue.

Moreover, according to Gaz Métro, the causal element of the tax expense is the return on rate base. For example, if the rate of return were 0%, there would be no income tax related to return expense for the distributor. However, with the current income-based method, each rate class could generate a gain or a loss, depending on its level of cross-subsidization. With allocation based on net income, an expense or a credit would be allocated to each rate class even if Gaz Métro incurs no tax expense.

In fact, initially, in Order G-429, the BASETARD factor was retained for income tax to ensure the basic notion of allocation would be the ideal to strive for. The shift to a an allocation factor based on net income only came later, in application R-3173-89. The cost allocation study was then simply a tool that made it possible to establish the financial results of each rate in order to estimate the cross-subsidization[77]. In this regard, net income made it possible to estimate the after-tax

[76] R-3837-2013, B-0166, Gaz Métro-14, Document 4, p. 27.
[77] Hearings, p. 633, R-3173-89, 90-03-15.

financial results based on the level of cross-subsidization established. Moreover, the Gaz Métro witness acknowledged that with the new method it was impossible to know the allocated cost without cross-subsidization and proposed to modify an exhibit in order to preserve this crucial information.[78]

Gaz Métro therefore proposes to allocate income tax cost in the same manner as the return on rate base, using the BASETARD factor. Allocating costs in this manner is the only way to generate an allocation by customer type that is not biased by the cross-subsidization effect. This manner of allocating costs is essential if the cost allocation study is to serve as a direct input in the ratemaking process.

Gaz Métro is asking the Régie to approve that income tax related to return be allocated based on the derivative factor BASETARD.

8.7 INCOME TAX NOT RELATED TO RETURN

Income tax not related to return is the temporary tax generated by the difference between regulatory and fiscal standards. Currently, expenses associated with income tax not related to return are allocated based on the REVNETD factor[79]. As for income tax related to return, presented in the previous section, Gaz Métro proposes to allocate the temporary cost with the BASETARD factor.

Gaz Métro is asking the Régie to approve that income tax not related to return be allocated with the derivative factor BASETARD.

8.8 CONSUMPTION AND OTHER REBATES

Gaz Métro does not propose to make any changes to the allocation of consumption rebates or the clean energy subsidy account. Use of the PRC and CASEP allocation factors, respectively, is appropriate.

[78] Hearings, p. 639, R-3173-89, 90-03-15.
[79] R-3837-2013, B-0166, Gaz Métro-14, Document 4, p. 27.

8.9 RETURN ON RATE BASE

Gaz Métro does not propose to make any changes to the allocation of the return on rate base. Use of the BASETARD allocation factor is appropriate.

8.10 IT DEVELOPMENT

IT development costs are found under the heading for deferred cost amortization expense and as a component of the rate base.

Currently, the BASETARD factor is used to allocate these amounts. Gaz Métro has examined the possibility of allocating these costs more directly, in other words, to the rate classes concerned by current IT development projects and the SAP2B project in particular.

Current "IT development: costs

Gaz Métro's analysis concludes that current IT development costs cannot be associated with a market segment because the objectives of IT development projects are too generic. Essentially, these objectives are:

- To maintain or increase the productivity of Gaz Métro's plant (tangible assets) and intangible assets (computer systems); and
- To ensure the efficiency and effectiveness of operating and operational support activities (e.g. human resources management, financial management, sales).

IT development serves the needs of the entire organization and all its customers. There is no causal relationship between IT development costs and specific rate classes.

"IT development" costs associated with the SAP2B project

In the discussion paper submitted as part of this application, Gaz Métro indicated its intention to propose a change to the allocation of IT expenses related to the SAP2B project[80]. Gaz Métro felt that a large share of this project's cost was related to Rate D_1 and D_3 residential and commercial customers in particular, and therefore contemplated proposing that half the IT development costs related to SAP2B be allocated to these rate classes. However, given that the current customer

[80] B-0006, Gaz Métro-1, Document 2, p. 60-62.

segmentation is being changed in the second part of this application, Gaz Métro is reconsidering this proposal. Gaz Métro believes that at this time, it is preferable to continue with the current approach for allocating IT project costs.

9 PROPOSED CHANGES TO THE ALLOCATION OF RATE BASE COMPONENTS

Rate base components are also allocated among the rate classes even if they are not directly factored into the service cost calculation. The rate base amount determines the return, which is a cost item of distribution service that is allocated among the rate classes.

In general, distribution costs are allocated in the same manner and with the same allocation factor as the rate base components with which they are associated. For example, according to this principle, amortization, operating and maintenance expenses and rate base components related to the distribution system are allocated with the same allocation factor.

In keeping with this principle, Gaz Métro proposes a few changes to the allocation method for certain rate base components. The following table shows the rate base components for which the allocation factor would be changed.

Table 28

Rate Base Components for Which the Allocation Factor Would Be Changed

Rate Base Component	Current Factor	Proposed Factor
UNAMORTIZED COSTS		
Unamortized costs - Other		
Over-earnings - 2011	REVREQ	BASETARD
Recovery of 2012 revenue gap	REVREQ	BASETARD
FIXED ASSETS		
Distribution system		
Transmission	CONDPRIN	CAU
Contribution - transmission	CONDPRIN	CAU
Mains and deviations	CONDPRIN	CONDPRIND
General Plant		
Land, structures and improvements	IMMOBILD	EXPLOITD
Miscellaneous equipment and materials	IMMOBILD	EXPLOITD
Rolling stock and machinery	IMMOBILD	EXPLOITD
Contributions		
Contributions - infrastructures	CONDPRIN	CONDPRIND
Government subsidies	CONDPRIN	CONDPRIND
Contributions - construction	CONDPRIN	CONDPRIND
Contributions - P.E.R.D.	CONDPRIN	CONDPRIND
WORKING CAPITAL		
Lead-lag tax	REVNETD	BASETARD

Given the proposed changes to the allocation of distribution service cost, Gaz Métro is requesting that the Régie approve the changes to the allocation method for the rate base components in Table 28.

10 SIMULATED EFFECT OF THE PROPOSED CHANGES

A simulation was run based on the 2012/2013 costs for which an allocation study was filed as part of the 2014 rate case[81] to determine the impact of the proposed changes on the relative share of costs assigned to each rate class. The results of the simulation are presented on the next page.

Gaz Métro suggests caution in interpreting these results. First, the distributor would like to suggest that each proposed change be considered on its merit, in other words, how it strengthens cost causation, rather than based on its impact on the allocation among the rate classes. The fact is that the primary motivation for the proposed changes is to adhere more closely to the general principles underpinning the allocation exercise and to ensure the methodology is followed with the utmost rigour when making the calculations. The goal is to obtain the most accurate picture of the costs assignable to each rate class. Second, when interpreting the simulation, it should be borne in mind that Gaz Métro plans to propose a new customer segmentation in the second phase of this application. Consequently, the current rates and levels are likely to change significantly in the second phase such that an overly detailed analysis of the proposed changes, for instance, to the current rate levels, could be of little value since a new segmentation will almost certainly be put in place.

The following table shows the result of the cost allocation based on the costs budgeted for 2012/2013. The cost distribution among the rate levels is expressed in percentage. For example, the results show that under the current allocation methods, 29% of the distribution service cost is assigned to customers with an annual withdrawal rate of 3,650 m^3 or less. The proposed changes would bring the share to 33% for this class of customers.

[81] R-3837-2013, Gaz Métro-14.

Table 29

Effect of the Proposed Changes on Cost Allocation

Rate	Annual Volumes *(m³)*	2012/2013 Allocation[1] *(%)*	Proposed Allocation *(%)*
D_1	0-3,650	29.0	33.3
	3,650-36,500	22.6	23.4
	36,500 and +	21.6	18.9
D_{RT}		7.9	5.7
D_3		1.1	0.9
D_4		12.8	12.2
D_5		4.9	5.5
		100.0	**100.0**

[1] From R-3837-2013, Gaz Métro-14.

Overall, the effect of the proposed changes would be the assignment of a slightly larger share of distribution costs to smaller volume customers and a slight increase in the share assigned to interruptible service customers. With the switch to the minimum system method, the principal changes are to the mains costs allocation methods for the calculation of the customer component and to CA for calculation of the demand component.

The full impact on the rates and levels is presented in Gaz Métro-2, Document 2. This document also describes the impact of the changes for each modified allocation factor.

APPENDIX 1: HANDY WHITMAN INDEX

Handy Whitman Index

Handy Whitman Index
Cost Trends of Gas Utility Construction
North Atlantic Region (1973 = 100)

	Steel mains	Plastic mains
1960	53	N/A
1961	55	N/A
1962	56	68
1963	58	69
1964	60	70
1965	62	71
1966	65	74
1967	68	76
1968	71	78
1969	76	80
1970	79	84
1971	88	92
1972	97	97
1973	100	100
1974	114	112
1975	126	127
1976	136	135
1977	147	144
1978	160	154
1979	173	168
1980	186	187
1981	205	203
1982	223	218
1983	232	227
1984	243	233
1985	244	237
1986	238	241
1987	245	247
1988	265	261
1989	283	280

	Steel mains	Plastic mains
1990	290	289
1991	299	297
1992	308	302
1993	317	310
1994	337	316
1995	346	322
1996	349	330
1997	360	337
1998	366	344
1999	377	351
2000	396	358
2001	400	364
2002	408	369
2003	414	376
2004	463	389
2005	595	411
2006	624	433
2007	607	460
2008	630	480
2009	713	514
2010	687	502
2011	760	513
2012	862	536
2013	852	542

APPENDIX 2: ALLOCATION OF METER COSTS – FACTOR F S22

Four types of meters can be installed; each one provides access to a different capacity. The type of meter installed depends on two parameters: guaranteed pressure and the load connected.

1- The most commonly used meter in Gaz Métro's system is the diaphragm meter, found mainly in residential and small commercial installations. Gas flow is controlled by internal valves, whose movement activates the gas measuring mechanism. There are three types of diaphragm meters; each one can handle a different maximum load. The three types are S6T, S20T and S50T.

2- Rotary meters can handle higher volumes and pressure than diaphragm meters. These meters are equipped with two machined parts in the form of a figure "8" whose rotary movement makes it possible to calculate the gas passing through the meter. There are also different types of rotary meters that handle increasingly higher maximum capacities.

3- Turbine meters are equipped with a turbine whose rotation measures the speed of the gas flow. This type of meter can measure large quantities of gas but requires a certain flow to function.

4- Ultrasonic meters use electronic sensors to measure gas flow. The advantage of these meters is that they have no moving parts and therefore last longer.

The total cost of meter acquisition and recycling is divided by the number of meters purchased and recycled. The average unit cost for the last three years is used and an adjustment is made to compensate for the different lifespans of the different types of meters. The unit cost is calculated based on the assumption of a 20-year lifespan. The following equation is used to establish the unit cost by type of meter.

Equation:

Unit cost= [(Average Unit Cost$_{(t,\ t-1,\ t-2)}$ * 20 years) / lifespan] + Metering Equipment

Where:

Average unit cost$_{(t,\ t-1,\ t-2)}$ = Average unit cost for acquisition and recycling for the last three years

Lifespan: Estimated lifespan for this type of meter

Metering Equipment = Unit cost of metering equipment

The unit cost by type of meter thus established, the total meter acquisition and recycling cost can be calculated for each rate class and level by multiplying the number of meters per type by its corresponding unit cost. Allocation factor F22 corresponds to the relative share of the connection cost for each rate class and level in relation to the total cost

APPENDIX 3: ALLOCATION OF CONNECTION COSTS – FS21

First, the unit cost of connection by meter type is calculated based on information in the capital assets ledger. The unit cost per connection is then calculated for each rate class and level based on the weighted average cost per connection based on the type of meter. The total connection cost for each rate class is obtained by multiplying the weighted average cost by the corresponding number of connections. A meter installation cost is added for each meter without a connection.

Equation:

$$Valeur\ B_A = \sum_i \left[\left(Coût\ B_{Ai} \times \frac{N_{Ai}}{N_A} \right) + \left(Coût\ P_{Ai} \times (N_A - N_{BA}) \right) \right]$$

Where:

C = Connection

A = Rate class

i = Meter type (diaphragm, rotary, turbine) and model

I = Meter installation

The connection value thus determined for each rate class makes it possible to calculate the total connection costs. Allocation factor F21 is defined as the share of connection cost for each rate class in relation to the total value for all rate classes.

APPENDIX 4: EMAIL CORRESPONDENCE WITH DR. OVERCAST

From: Falardeau Esther [mailto:EFalardeau@gazmetro.com]
Sent: Wednesday, April 30, 2014 6:15 PM
To: Overcast, Howard E. (Edwin)
Cc: Dallaire Caroline; Tremblay Sylvain; Tremblay Jean-François; Larivée Éric
Subject: Gaz Metro's cost of service and rate design

Hello Ed

We are having difficulty with the issue of cost allocation of distribution mains for clients connected directly to transmission mains. Only three clients are connected directly to a transmission main. One of them is a major client for which the main was specifically built originally. No special contribution was required at the time the main was built.

Since its construction the transmission main has become part of Gaz Metro's integrated system as it also now provides service to other customers down the line (via distribution mains connected to this transmission main).

Your analysis proposes that no cost related to distribution mains should be allocated to clients who are connected directly to transmission mains.

"*For customers served off transmission mains there would be no allocation of distribution demand. If customers pay for their own facilities through a contribution in aid of construction there would be no further allocation of demand.*" page 8

In a later email, you added:

"*If a transmission customer is allocated costs of transmission only, there is no minimum system allocation since the minimum system is for distribution. However, transmission customers would typically have a service lateral that should be directly assigned since in all likelihood it is more expensive than the typical service and also metering is likely to be more as well.*"

Our observation has been that :

- this client does not have its own tariff but is one of hundreds in the D4 tariff,

- the transmission main is now part of our integrated system and is not dedicated solely to this client and,

- this client did not provide a contribution to pay for the extra costs of being directly connected

Therefore, we have been allocating both distribution and transmission costs to the D4 tariff and to this client in particular who is connected to a transmission line.

What would be you suggestion as to the most reasonable, fair and practicable approach?

Thank you for your light on that question

Regards

Esther

Esther Falardeau
Pricing
Gaz Métro

Esther,

This is not an unusual occurrence since even residential customers may at times be served off transmissions lines. For small customers, this type of service is referred to as a farm tap and the service is provided as a convenience to the customer. Typically, tapping a transmission main is costly and charging the residential rate is reasonable. The general rule I discussed is based on very large customers having their own class of service or a special contract for service at the transmission level. To the extent that the customer is served off a standard rate and has been served off this rate historically, there is no basis for now claiming a right to a new rate class consisting of one customer. Since the main is now part of the integrated system and serves other customers there is no basis for direct assignment of costs. As a note given the time that has past, it is likely that there would be no practical way to determine the directly assignable costs for this customer in any event. For that reason it is appropriate to consider that this customer is like a farm tap and should be served under the otherwise applicable rate schedule. The current connection to a general use transmission main is essentially a connection of convenience rather than the original direct connection. Obviously, there are added costs to tap the transmission mainline to serve this customer and those costs have to be paid. The trade-off here is that the customer pays the standard rate and not the direct assignment costs. Without a lot of analysis, it would not be possible to determine if the rate should be higher or lower than the standard rate but in any event the customer has been served on this rate for some time. Just intuitively, the cost of a large high pressure main that has capacity to serve other customers is likely to be more than the average cost of main capacity allocated to the customer even including an allocation of distribution mains. It may be worthwhile to test my intuition by costing the transmission main at the current size, meter and service that would be the direct cost assuming the customer is the only customer on the line (the original conditions) and calculating the revenue requirement per GJ of contract demand and then comparing that to the allocated cost including distribution mains per GJ of contract demand. This would give you a basis for determining if the rate is unreasonably high.

Ed

H. Edwin Overcast, Ph.D.
Director, Management Consulting Division

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