DISTRIBUTION SYSTEM DESIGN AND OPERATING CRITERIA

(Follow-up to Decisions D-2012-158, D-2013-106 and D-2013-135)

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INTRODUCTION

Prior to the winter of 2012-2013, Société en commandite Gaz Métro (Gaz Métro) noted that interruptible customer behaviour could jeopardize reliability of service to some customers in certain regions during the coldest days of upcoming winters, taking into account TCPL/TQM contract pressure. If, upon receipt of an interruption notice, customers decided to continue using natural gas, the capacity of some systems could no longer meet firm customer demand.

To ensure that interruptible customers comply with interruption notices, Gaz Métro proposed amendments to interruption rules and penalties in the 2013 Rate Case. The Régie de l'énergie (the Régie) "determined that the distributor has primary responsibility for the security of its system and that, accordingly, it should take all necessary steps to ensure supply for its system customers" (paragraph 109), and approved most of the amendments proposed by Decision D-2012-158. However, the Régie directed Gaz Métro to provide follow-up on two issues.

First, on the "matter of system security, which is associated with compliance with interruption notices, and in order to monitor developments in system saturation, a critical situation, in certain areas of the Distributor's franchise" (paragraph 118), the Régie directed Gaz Métro to provide it with annual follow-up on this matter, as of its 2012 Annual Report, "for as long as system saturation remains a critical situation in at least one region served by the system" (paragraph 118). The first follow-up was filed February 2, 2013.[1]

Second, because of its concerns over the "specific consideration given to interruptible customers in its [customer supply] planning criteria," the Régie directed Gaz Métro to file at the 2014 Rate Case a "document describing the criteria it applies to the design and operation of its distribution system" (paragraph 110).

> [110] The Régie has concerns over the specific consideration given to interruptible customers in its planning criteria. Accordingly, the Régie directs Gaz Métro to file, for the next rate case, a document describing the criteria it applies to the design and operation of its distribution system.

With respect to the Régie's request, Gaz Métro refers to the following definitions related to the system's design and operation:

- Design criteria are aimed at selecting the most appropriate infrastructure for meeting the needs of existing and future customers; and
- Operating criteria are aimed at determining how to use existing infrastructure to ensure reliability of supply.

The follow-up requested by the Régie is timely, since some sections of the transmission system are approaching capacity and could require upgrades to ensure future development, and for

[1] System saturation levels, by region, follow-up to Decision D-2012-158, 2012 Annual Report, R-3831-2012, B-0107, Gaz Métro-34, Document 1

operational reliability considerations. Gaz Métro is being asked to monitor changes in natural gas demand much more closely on certain sections of its system.

1 SYSTEM DESIGN

The design process involves selecting the most appropriate infrastructure, such as the compressor, mains, etc., that will meet current and future needs of customers. A system's design can take many forms, but is primarily aimed at:

a. Upgrading the system, as presented in the asset management file:

i. Risks

ii. Compliance with requirements (internal and external)

iii. Customer issues (hydraulic capacity), and

iv. Asset upgrades; and

b. Meeting development needs:

i. Supply for one or more new customers,

ii. Increased load for one or more existing customers, and

iii. Rate migration (move from interruptible to firm service).

2 DESIGN CRITERIA

Gaz Métro applies a number of criteria when designing its system for upgrading[2] or development projects. As part of its design activities, Gaz Métro identifies customer needs, validates the system's capacity before designing it, and analyses the costs. The criteria considered during the system design process were categorized as follows:

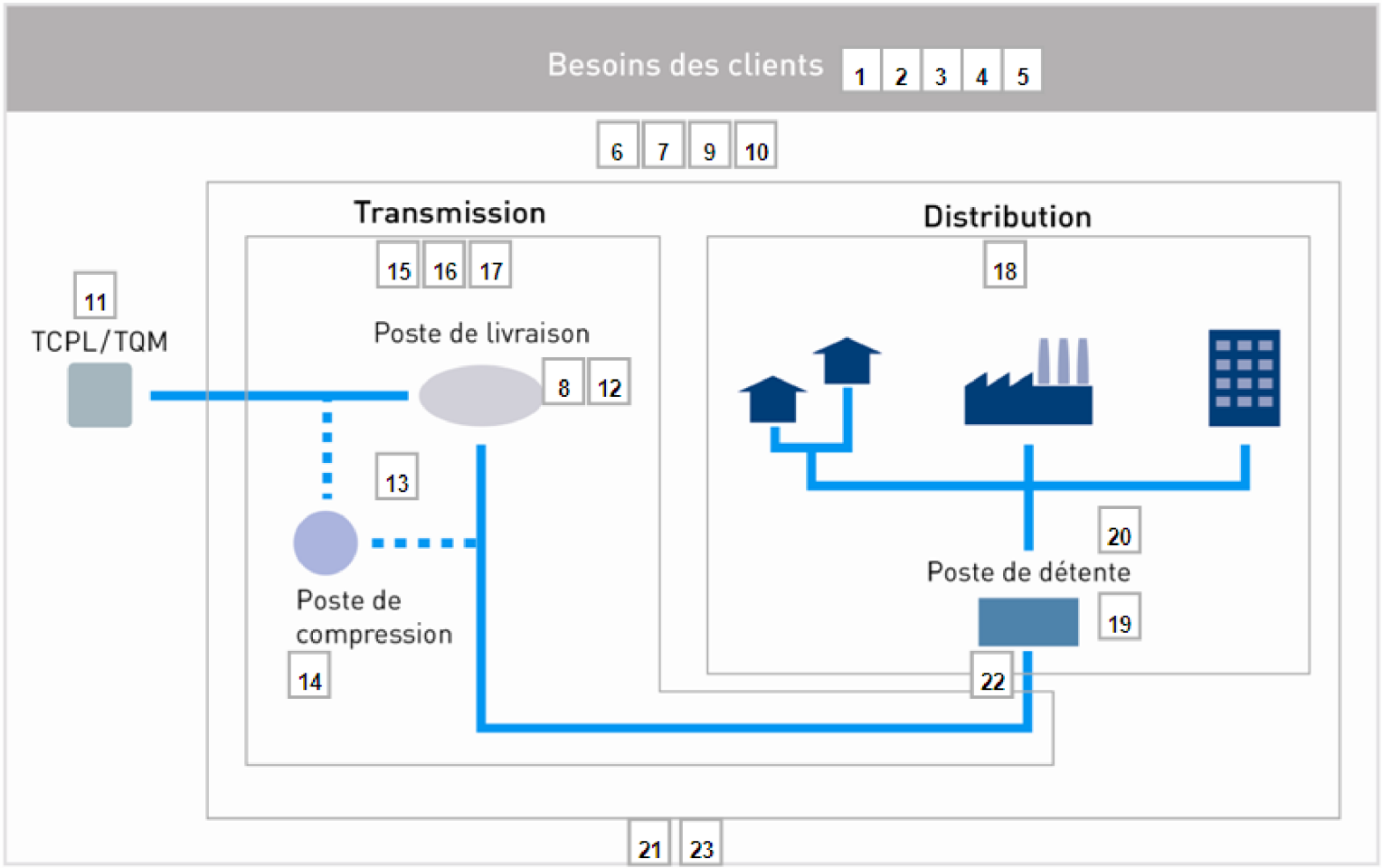
1. Customer needs
2. Validation of system capacity
3. System design, and
4. Cost analysis.

It should be noted that the criteria for transmission systems[3] and for distribution systems[4] may differ. The following table gives a list of design criteria.

[2] Upgrade projects concerning existing customers' issues (hydraulic capacity).
[3] Transmission system: pressure rating between 4 000 kPa and 10 000 kPa.
[4] Distribution system: pressure rating under 2 900 kPa.

DESIGN				
Categories	**No.**	**Criteria**	**Transmission**	**Distribution**
Customer needs	1	Throughput requested (maximum hourly throughput)	x	x
	2	Effective contract delivery pressure	x	x
	3	Specific conditions requested by the customer	x	x
	4	Customer interruptibility	x	
	5	Future potential throughput	x	x
Validation of system capacity	6	Technical specifications	x	x
	7	Gas flow speed in the mains	x	x
	8	Maximum one-hour throughput at city gates	x	x
	9	Minimum system pressure	x	x
	10	Minimum temperature previous winter	x	x
	11	Minimum contract supply pressure (TCPL & TQM)	x	
	12	Capacity of ancillary delivery equipment	x	
	13	Redundancy of critical transmission equipment	x	
	14	Compression / maximum throughput ratio	x	
	15	Observed (coincident) peak hourly throughput	x	
	16	Class location	x	
	17	Margin of flexibility	x	
	18	Maximum 7-hour throughput of customers 500 m3/hr and over		x
	19	Capacity of ancillary equipment at pressure regulator stations (regulation)		x
	20	Redundancy of critical distribution equipment		x
System design	21	System location	x	x
	22	System integration		x
Cost analysis	23	Cost	x	x

The different design criteria are shown below to facilitate understanding.[5]



[5] The image represents situations in which Gaz Métro has a transmission system. See legend below.

Legend: Besoins des clients = Customer needs

Poste de livraison = City gate

Poste de compression = Compressor station

Poste de détente = Gas pressure regulator station

2.1 CUSTOMER NEEDS

This section presents system design criteria used to identify customer needs.

2.1.1 No. 1 — Throughput requested (transmission & distribution)

The hourly throughput requested by the customer equals the additional consumption analysed in the hydraulic models in order to validate the system's capacity to carry this new load and thus ensure reliable supply and maintain adequate pressure across the system.

For commercial and industrial customers, this throughput equals total loads originating from equipment connected to the system that is liable to operate simultaneously. This throughput is contractual and the customer commits not to exceed it.

For residential customers, the contractual framework is the same, except that standard values less than the total for equipment connected to the system are used in simulation models to reflect the coincidence of these customers' equipment.

2.1.2 No. 2 — Effective contract delivery pressure (transmission & distribution)

Effective delivery pressure equals the adjustment pressure of the regulator in the customer's metering station.

To maintain this minimum value at all times, the system pressure upstream of the customer's regulator must remain significantly higher than delivery pressure. This is required to offset load losses in the building's service line and in the equipment associated with the metering station, and to ensure effective operation of regulation equipment used to lower and stabilize customer pressure. This pressure is defined in technical specification 21.02.0 1[6] (*System design pressure*).

2.1.3 No. 3 — Specific customer conditions (transmission & distribution)

New customers are connected in accordance with standardized methods defined in all Engineering Department technical specifications.[7] However, the connection of some industrial customers may require specific measures. For example, a customer may request no odorant in their gas.

Each specific condition is subject to evaluation by an engineer and must comply with internal specifications and with CSA Z662.

2.1.4 No. 4 — Customer interruptibility (transmission)

For a reduced rate, an interruptible customer's gas supply can be interrupted for a certain number of days during winter peak period to maintain the system's security of supply. System design for interruptible customers varies depending on whether the design is for a transmission system or a distribution system.

[6] Technical specification based on Engineering Department expertise and compliant with CSA Z662.
[7] See criterion no. 6 – Technical specifications, on page 12 for more detail.

2.1.4.1 Transmission

Transmission system design takes customer interruptibility into account. First, the transmission system's saturation level is assessed to identify overall capacity available to accept additional load, while maintaining minimum operating conditions that will ensure continued supply to firm customers. If a firm service customer wants to add load to a transmission system, the assessment of available capacity does not take into account the needs of interruptible customers, but it does stay within the number of interruption days set out in the Conditions of Service and Tariff. Gaz Métro thus provides for the interruption of interruptible customers during peak periods before considering investing in a system upgrade.

Also, if a transmission system is saturated during peak period, Gaz Métro does not provide for any system upgrade if an interruptible customer wants to add load to the system. The interruptible customers would have to agree to a firm service contract for Gaz Métro to initiate the process of investing in a system upgrade, or remain on interruptible status, knowing that they will be interrupted regularly during peak period.

2.1.4.2 Distribution

From the city gate to the customer's metering station, the distribution system is designed to meet the customer's maximum hourly throughput, i.e., for its firm and interruptible hourly throughput.

2.1.5 No. 5 — Future potential throughput (transmission & distribution)

Obviously, transmission and distribution system design takes into account the throughputs actually consumed by customers, but can also include future potential throughputs for development projects.

During the design process, various scenarios are analysed to assess the potential gain associated with the different infrastructures. These scenarios are based on forecasts generated by the various internal departments, such as Sales and Marketing.

2.2 VALIDATION OF SYSTEM CAPACITY

The various criteria considered in the system design process automatically include validation of the system's capacity. The following criteria are considered for this validation.

2.2.1 No. 6 — Technical specifications (transmission & distribution)

The technical specifications are developed to ensure that Gaz Métro's facilities are built and operated in accordance with safety criteria and natural gas industry codes. Among others, technical specification subsections 21-System design and 22 – System management are used when validating the system's capacity.

2.2.2 No. 7 — Gas flow speed in the mains (transmission & distribution)

The speed of gas flow within the mains influences pressure loss in these mains. The higher the speed, the greater the pressure loss.

Also, the flow speed of a fluid within mains must be limited to prevent erosion of the main wall. This speed limit is based on the pressure of the gas within the main.

2.2.3 No. 8 — Maximum one-hour throughput at city gates (transmission & distribution)

The throughput recorded at the city gates equals the volume consumed over a given period of time. The maximum throughput of a station varies depending on the period of time selected. The shorter the period of time, the higher the maximum throughput.

A period of one hour is used to model consumption at city gates. The duration is based on experience and on ad hoc analyses used to establish that the duration is long enough to affect the volume of gas in a system (linepack).

These maximum throughputs are updated monthly and used as a design value for the current year, both for transmission and distribution systems.

2.2.4 No. 9 — Minimum system pressure (transmission & distribution)

Minimum system pressures are defined in technical specification 21.02.01.[8] (*System design pressure*). Minimum and maximum gas pressures are recorded based on the main's pressure rating and diameter. These pressure limits must always be respected, because the mains, regulators and other components installed on the system are designed on the basis of these pressures.

2.2.5 No. 10 — Minimum temperature previous winter (transmission & distribution)

The minimum temperature recorded during the previous winter is considered in the hydraulic analyses and is used as a design value to adjust the hourly throughput observed at the city gate upwards.

2.2.6 No. 11 — Minimum contract supply pressure (TCPL & TQM) (transmission)

Gaz Métro's transmission system is supplied by TCPL/TQM at a pressure that can vary over time (observed pressure), but which cannot fall below a specific value (the minimum contract value), except in the case of force majeur.

This minimum contract value is used in the hydraulic analyses of transmission system capacity to ensure reliability of supply to all customers at all times.

[8] Technical specification based on Engineering Department expertise and compliant with CSA Z662.

2.2.7 No. 12 — Capacity of ancillary delivery equipment (transmission)

The effective operation of a city gate requires appropriate sizing of these components, such as regulation and overpressure protection, metering, odorization and heating equipment.

When a substantial load (500 m^3/h and over) is added, the capacity of this equipment is checked and any corrective action required is taken.

Additionally, each year an engineer reviews the equipment and ensures that their capacity is sufficient for the upcoming peak period.

2.2.8 No. 13 — Redundancy of critical transmission equipment (transmission)

The transmission system is designed and operated so that parallel equipment is always installed, each of which can meet 100% of demand in the event of a critical equipment failure. Critical transmission equipment includes the compressor, the control valve and the pressure regulator.

2.2.9 No. 14 — Compression / maximum throughput ratio (transmission)

In the evaluation of the maximum loads that can be connected to a transmission system on which a compressor station is installed, the operating ranges of the compressors (ratio of compression to downstream pressure/upstream pressure, maximum throughput) are validated.

Physical field verifications may then be done to confirm the maximum capacities of each compressor.

The confirmed values are then used as boundary conditions in the hydraulic models used in the design and operation of the transmission system.

2.2.10 No. 15 — Observed (coincident) peak hourly throughput (transmission)

The observed peak hourly throughput is the maximum throughput measured by totalling throughput at a transmission system's city gates. In other words, this throughput is the maximum coincident throughput over one hour for the transmission system.

2.2.11 No. 16 — Class location (transmission)

In CSA Z662, a class location is defined as a geographic area classified based on dwelling density and other characteristics, such as places occupied by 20 or more persons and buildings with four or more stories. The class location affects the safety factor, which is the location factor, and also the nominal requirements for mains. The class location can change over the years with urban development near rights-of-way. A change in class location for mains could reduce the maximum operating pressure and thereby reduce the system's capacity.

2.2.12 No. 17 — Margin of flexibility (transmission)

The margin of flexibility is used in transmission to take into account uncertainties associated with the assumptions used when validating the capacity and design of transmission mains. For example, the observed one-hour throughput at city gates, customer throughput during that hour, coincident customer consumption, the outside temperature during that hour, the time required to conduct certain operations during winter peak (start up compressors, start up gasification at the LSR plant, etc.) are all elements that can vary from year to year and are considered within a margin of flexibility. Gaz Métro is therefore reviewing the required margins of flexibility.

2.2.13 No. 18 — Maximum 7-hour throughput of customers 500 m3/h and over (distribution)

The maximum throughput observed over a period of seven hours is calculated to reflect, as accurately as possible, the consumption profile of customers 500 m^3/h and over in the hydraulic simulation models. This time period (seven hours) is considered to be the most representative when used in hydraulic models to simulate and analyze the impact of these customers on system capacity. Ad hoc validations of results obtained by simulation and field measurements are used to confirm this value.

2.2.14 No. 19 — Capacity of ancillary equipment at pressure regulator stations (distribution)

The capacity of ancillary equipment (regulation and overpressure protection) at pressure regulator stations is validated when an addition of 500 m^3/h or more is requested on the system. Also, to protect against the impacts of a number of small additions to the system, the capacity of all stations is validated annually based on the maximum consumption estimated using hydraulic models. If, in the harshest conditions (minimum system pressure at the pressure regulator station inlet), the ancillary equipment is unable to support forecasted demand, upgrades are done to remedy the situation.

2.2.15 No. 20 — Redundancy of critical distribution equipment (distribution)

The distribution system is designed and operated so that parallel equipment is always installed, each of which can meet 100% of demand in the event of a critical equipment failure. Critical distribution equipment constitutes the pressure regulators.

2.3 SYSTEM DESIGN

The system can be designed once customer needs are identified and the system's capacity is validated. The criteria used to design the system are as follows.

2.3.1 No. 21 — Location of the system/mains (transmission & distribution)

The route for the line to be installed must take into account various elements that can affect the project's costs in the short or long term. Length of route, type of soil, number of

road or watercourse crossings and type of crossing are elements analysed when a system is being designed.

2.3.2 No. 22 — Integration within the system (distribution)

Some system expansion criteria are defined in technical specification 21.01.01[9] (*Master plan design*). A minimum pipe diameter is required depending on sector (residential, commercial or industrial) and type of street (boulevard, primary or secondary route, cul-de-sac).

2.4 COST ANALYSIS

Once the system is designed, a cost analysis is done.

2.4.1 No. 23 — Cost (transmission & distribution)

A cost analysis is done for each project. It takes current needs into account and can include future needs of customers. Where several options are available, the costs and additional capacity of each project are taken into account in determining the solution to be implemented.

[9] Technical specification based on Engineering Department expertise and compliant with CSA Z662.

3 SYSTEM OPERATION

Operating criteria are aimed at determining how to use existing infrastructure to ensure reliability of supply. A system's operation can take a number of forms, but primarily involves:

a. Operational requirements;
b. Responding to new customer connection requests or additional load requests from existing system customers, which do not require any changes to the existing system (no design required);
c. Managing interruptions of interruptible customers; and
d. Managing the volume of gas in the mains.

4 OPERATING CRITERIA

Gaz Métro applies a number of criteria to the operation of its system. The criteria considered in the system's operation were categorized as follows:

1. Operational requirements;
2. Connection requests from new customers or requests for additional load from existing customers;
3. System surveillance; and
4. Interruption of interruptible customers.

4.1 OPERATIONAL REQUIREMENTS

Gaz Métro applies a number of hydraulic simulation models for system operations. These models are used for the management and day-to-day operation of the system and assist in making the following decisions, among others:

- Closing a pressure regulator station for maintenance;
- Drafting pressure drop procedures;
- Drafting emergency response plans;
- Calculating bypass line diameter during connection work; and
- Calculating atmospheric emissions resulting from a third-party rupture.

The following criteria are used to update these models and to conduct the simulations required to make the above-mentioned operational decisions. The definitions used in the design section also apply to operation.

OPERATION					
Category	Sub-category	No.	Criteria	Transmission	Distribution
Operational requirements	Validation of system capacity	6	Technical specifications	x	x
		7	Gas flow speed in the mains	x	x
		8	Maximum one-hour throughput at city gates	x	x
		9	Minimum system pressure	x	x
		12	Capacity of ancillary delivery equipment	x	
		14	Compression / maximum throughput ratio	x	
		15	Observed (coincident) peak hourly throughput	x	
		18	Maximum 7-hour throughput of customers 500 m^3/h and over		x
		19	Capacity of ancillary equipment at pressure regulator stations (regulation)		x

4.2 CONNECTION REQUESTS FROM NEW CUSTOMERS OR REQUESTS FOR ADDITIONAL VOLUME FROM EXISTING CUSTOMERS

Where Gaz Métro accepts a new customer on the system or agrees to an existing customer increasing its gas consumption, Gaz Métro once again determines how this new load will affect the system, using hydraulic simulation models. The criteria used for this validation are as follows:

OPERATION					
Category	**Sub-category**	**No.**	**Criteria**	**Transmission**	**Distribution**
Additional load or new customers on the system	Customer needs	1	Throughput requested (maximum hourly throughput)	x	x
		2	Effective contract delivery pressure	x	x
		3	Specific conditions requested by the customer	x	x
		4	Customer interruptibility	x	
		5	Future potential throughput	x	x
	Validation of system capacity	6	Technical specifications	x	x
		7	Gas flow speed in the mains	x	x
		8	Maximum one-hour throughput at city gates	x	x
		9	Minimum system pressure	x	x
		10	Minimum temperature previous winter	x	x
		11	Minimum contract supply pressure (TCPL & TQM)	x	
		12	Capacity of ancillary delivery equipment	x	
		13	Redundancy of critical transmission equipment	x	
		14	Compression / maximum throughput ratio	x	
		15	Observed (coincident) peak hourly throughput	x	
		16	Class location	x	
		17	Margin of flexibility	x	
		18	Maximum 7-hour throughput of customers 500 m^3/h and over		x
		19	Capacity of ancillary equipment at pressure regulator stations (regulation)		x
		20	Redundancy of critical distribution equipment		x
	Cost analysis	23	Cost	x	x

4.3 SYSTEM SURVEILLANCE

For a day-to-day perspective, the system control centre monitors the system continuously and physically manages throughput, pressure, odorant injection and gas heating, where required, at

different locations on the system. For each reading point, alarms are defined by Engineering to provide advance warning of potentially risky situations and to provide sufficient time to take action. For the Abitibi and Saguenay systems, the compressors can be started based on throughputs and pressures observed at various locations on the system. Remote-controlled section valves can also be activated in the event of an incident or if gas flow has to be interrupted. As part of daily gas management, operators have to adhere to the transmission provider's contract limits and ensure that the volumes withdrawn from the transmission system are within a margin of flexibility of 2%. To do this, the operators can slightly increase or decrease pressure in the transmission systems within the minimum and maximum values identified by Engineering. The criteria for determining alarm levels are as follows:

OPERATIONS					
Category	**Sub-category**	**No.**	**Criteria**	**Transmission**	**Distribution**
System surveillance	Validation of system capacity	6	Technical specifications	x	x
		7	Gas flow speed in the mains	x	x
		9	Minimum system pressure	x	x
		11	Minimum contract supply pressure TCPL & TQM)	x	
		12	Capacity of ancillary delivery equipment	x	
		14	Compression / maximum throughput ratio	x	
		17	Margin of flexibility	x	
		19	Capacity of ancillary equipment at pressure regulator stations (regulation)		x

4.4 INTERRUPTION OF INTERRUPTIBLE CUSTOMERS

The Gas Supply Department conducts daily operational planning, based on weather forecasts and projected consumption based on anticipated conditions and the period in question (weekday, holiday). This planning also takes into account consumption observed on previous days. If projected consumption exceeds the supply provided by transmission capacity and withdrawals at Saint-Flavien and Pointe-du-Lac, an interruption notice is issued. The customers in question will be selected on the basis of their sub-rates and the number of cumulative interruption days is monitored to ensure compliance with the maximum number of days forecasted and customer equity. On peak days, all interruptible customers are interrupted. They generally receive an interruption notice the day prior to the interruption day. Customers who want to maintain their consumption can use the make-up gas service to offset an interruption if the distributor can accept these deliveries. The customers who use the Competitive Make-up Gas (GAC) service also receive an interruption notice. During an interruption day, GAC

customers must commit to delivering to the distributor, during this day, a contractual daily volume equal to the customer's consumption on the same day.

Interruptible customers are therefore managed on an overall basis, not a geographical basis. If Engineering identifies transmission system constraints, the interruptible customers on the segment in question are identified and tracked separately based on temperature values identified by Engineering. Depending on the values identified, make-up gas service to offset an interruption may not be available for these customers and interruptions for transmission system constraints may be initiated.

As mentioned previously, effective pressure in the transmission mains can be modulated to stay within the transmission provider's contract limits and to provide a slight cushion to meet demand on peak days. Engineering calculates the maximum and minimum pressures within which the pressure can fluctuate, taking into account mains specifications and the reaction time for starting up compressors, where applicable. The pressure can also be reduced in the event of work on the system.

5 CONCLUSION ON FOLLOW-UP TO THE DECISION

As a careful and prudent operator, Gaz Métro is reviewing its procedures. The refinement of analyses has assisted in establishing a better diagnostic of saturation rates in various regions. Also, an analysis of design and operating criteria will be conducted in the fall so that criteria can be revised and added, where necessary.

5.1 CONCLUSION SOUGHT

Gaz Métro asks the Régie to take note of the follow-up.

6 GAZ MÉTRO SYSTEM

Until the early 1980s, Gaz Métro's system was limited to the Montreal area. Major expansions took place at that time thanks to the federal government's grant program for petroleum product substitution, among other things. There was significant surplus capacity in the transmission systems in those days. Thereafter, during the 1980s, a number of extensions to the distribution system made it possible to connect new municipalities. By the early 1990s, it had become more difficult to achieve profitability on those extensions and the government instituted assistance programs such as the *Programme de subvention des infrastructures*. Gaz Métro submitted a number of applications, enabling it to extend the distribution system into the Tremblant, Val-d'Or, Amos, Beauce and Saint-Félicien regions, as well as complete other projects on the north and south shores of Montreal.

At one time, the transmission systems had sufficient capacity, having been designed and built according to a long-term vision that would allow for future development in line with Gaz Métro's obligation as a public utility to serve as many customers as possible in all categories, everywhere in Quebec where it has operations. Over time, the growth in demand has eaten away at the transmission systems' surplus capacity and Gaz Métro is now obliged to find solutions to deal with that reality.

6.1 WINTER 2012-2013 SYSTEM SATURATION

Gaz Métro would like to submit the state of the transmission system for the end of winter 2012-2013 now, rather than wait for its next annual report, as requested by the Régie in its decision D-2012-158.

Following on our report to the Régie on the state of the transmission system for winter 2011-2012, these data are established using the same methodology and highlight values observed at the end of winter 2012-2013. As indicated earlier, refining our analyses has made it possible to develop a more precise assessment of the saturation rate in certain regions. Thus, the Estrie region has been separated into two segments (Sabrevois/Courval and Waterloo/Windsor), while the Bécancour region is shown with and without TCE, since TCE's contract provisions allow it to use a significantly higher amount of natural gas.

2012-2013 System Saturation by Region

	Abitibi	Estrie Total	Estrie Sabrevois /Courval	Estrie Waterloo /Windsor	Saguenay
Peak hourly throughput (m^3/hr)[10]	26,422	138,311	75,770	62,541	124,435
Maximum hourly throughput (m^3/hr)	37,500[11]	122,982[12]	79,332[12]	43,650[12]	115,000[13]
Saturation (%)	70.5	**112.5**	95.5	**143.3**	**108.2**

	Bécancour	Bécancour with TCE	Montérégie	Montreal	St-Nicolas /St-Flavien
Peak hourly throughput (m^3/hr)	25,080	141,406	192,507	98,945	3,019
Maximum hourly throughput (m^3/hr)	214,285[14]	214,285[14]	230,000[15]	262,650[16]	29,724
Saturation (%)	11.7	66.0	83.7	37.7	10.2

[10] In addition to the refined analyses, the location of loads on the system influences the maximum capacity for maximum hourly throughput.

[11] This capacity includes a safety margin in the event of failure of one of the compressors.

[12] Gaz Métro had an agreement for 5,200 kPa with TCPL for the Sabrevois city gate and minimum throughput of 30,000 m^3/hr at the Waterloo station. Under the agreement, the maximum hourly throughput for Estrie Total increased from 122,982 m^3/hr to 154,070 m^3/hr, whereas saturation dropped from 112.5% to 89.8%. For the Sabrevois/Courval segment, the maximum hourly throughput increased from 79,332 m^3/hr to 104,814 m^3/hr, while saturation dropped from 95.5% to 72.3%. On the Waterloo/Windsor segment, maximum hourly throughput grew from 43,650 m^3/hr to 49,256 m^3/hr, while saturation decreased from 143.3% to 127%.

[13] This capacity includes a safety margin in the event of failure of one of the compressors. Gaz Métro had an agreement for 4,650 kPa with TCPL for the Saint-Maurice city gate. Under the agreement, the maximum hourly throughput increased from 115,000 m^3/hr to 128,150 m^3/hr, while saturation dropped from 108.2% to 97.2%.

[14] Maximum hourly throughput increased from the maximum hourly throughput presented in the 2012 annual report, because the minimum system pressure was changed to take into account the customer TCE.

[15] Maximum hourly throughput increased from the maximum hourly throughput presented in the 2012 annual report, because the simulation method was refined and now takes into account all branches of the system rather than just the main branch.

[16] Maximum hourly throughput decreased from the maximum hourly throughput presented in the 2012 annual report, considering gas flow speed in the mains.

2012-2013 System Saturation by Region, Excluding Interruptible Customers

	Abitibi	Estrie Total	Estrie Sabrevois /Courval	Estrie Waterloo /Windsor	Saguenay
Peak hourly throughput (m^3/hr)	26,422	117,001	68,937	48,064	113,352
Maximum hourly throughput (m^3/hr)	37,500[17]	122,982[18]	79,332[18]	43,650[18]	115,000[19]
Saturation (%)	70.5	95.1	86.9	**110.1**[20]	98.6

	Bécancour	Bécancour with TCE	Montérégie	Montreal	St-Nicolas /St-Flavien
Peak hourly throughput (m^3/hr)	25,080	141,406	188,556	59,032	3,019
Maximum hourly throughput (m^3/hr)	214,285	214,285	230,000	262,650	29,724
Saturation (%)	11.7	66.0	82.0	22.5	10.2

System capacity is based on contract pressure of 4,000 kPa at the city gate inlet and not on the pressure observed at the peak. This explains why a saturation rate above 100% is recorded on the Waterloo/Windsor segment in Estrie.

The peak hourly throughput corresponds to the actual throughput observed in each region and the time of that peak is different from one system to another.

[17] This capacity includes a safety margin in the event of failure of one of the compressors.

[18] Gaz Métro had an agreement for 5,200 kPa with TCPL for the Sabrevois city gate and a minimum throughput of 30,000 m^3/hr at the Waterloo station. Under the agreement, the maximum hourly throughput for Estrie Total increased from 122,982 m^3/hr. to 154,070 m^3/hr, whereas saturation dropped from 95.1% to 75.9%. For the Sabrevois/Courval segment, the maximum hourly throughput increased from 79,332 m^3/hr to 104,814 m^3/hr, while saturation dropped from 86.9% to 65.8%. On the Waterloo/Windsor segment, maximum hourly throughput grew from 43,650 m^3/hr to 49,256 m^3/hr, while saturation decreased from 110.1% to 97.6%.

[19] This capacity includes a safety margin in the event of failure of one of the compressors. Gaz Métro had a "Best Effort" agreement for 4,650 kPa for the Saint-Maurice city gate. With "Best Effort", the maximum hourly throughput increased from 115,000 m^3/hr to 128,150 m^3/hr, while saturation decreased from 98.6% to 88.5%.

[20] Saturation dropped from 110.1% to 97.6%, as explained in footnote 18.

The Abitibi and Saguenay systems require compressors to achieve the capacity set out in the above tables. The actual capacity is lower, when you consider a margin necessary to switch from one compressor to another in the event of a failure. For operational flexibility with the compressors supplying the Abitibi system, Gaz Métro has considered the time required to travel from the business office to the compressor station in order to perform a manual start. The time to handle such emergency activities has been assessed at two hours. For operational flexibility with the compressors supplying the Saguenay system, Gaz Métro has considered the time required to start the second compressor from the system control centre. The time to handle such emergency activities has been assessed at 30 minutes.

The method used to analyze system saturation levels is dynamic and can change from one year to the next, particularly in terms of the maximum hourly throughput. This is illustrated by the fact that consumption near a city gate affects the total capacity of that segment much less than a customer located at the end of the line. Thus, from one year to another, the changing consumption at the system extremities can add or remove capacity even if the total throughput remains the same.

6.2 ISSUES FOR WINTER 2013-2014

Referring to the table *2012-2013 System Saturation by Region, Excluding Interruptible Customers*, we note a lack of capacity on the Waterloo/Windsor segment in Estrie. In addition, we note that capacity is approaching the limit on the Sabrevois/Courval segment in Estrie and Saguenay. Obviously, saturation levels have been calculated using the minimum contract supply pressure of 4,000 kPa at the city gate inlet. The lack of capacity on the Waterloo/Windsor segment in Estrie and the near capacity on the Sabrevois/Courval segment in Estrie and in Saguenay would mean the following:

- It may be impossible to ensure a completely secure supply for current customers at firm rates;
- Some customers may not be able to obtain make-up gas to avoid an interruption (GAI);
- Some interruptible customers may experience more interruption days than set out in the *Conditions of Service and Tariff*; and
- It may be impossible to approval all requests to connect new customers or add volume for existing system customers or requests for GAC.

6.3 MEASURES PLANNED FOR WINTER 2013-2014

Given the saturation levels in the Saguenay and Estrie regions, steps will be taken to ensure customers are supplied for the winter of 2013-2014. Although the cost to implement these measures will be below $1.5 million, Gaz Métro would like to inform the Régie of the steps that will be taken for winter 2013-2014.

6.3.1 Operational and physical solutions

To ensure secure supply for firm service customers in Saguenay and Estrie, Gaz Métro has looked at a variety of physical or technical solutions that depart from the usual practices. The solutions selected have to do with the city gates.

First, the Windsor and Sherbrooke city gates in Estrie will be operated to reduce the outgoing pressure from the regulators, which will make it possible to operate this transmission system below the usual minimum pressure, thus increasing the maximum capacity of the Estrie transmission system.

Second, simulations designed to validate the capacity of the Estrie and Saguenay systems were carried out to identify the inlet pressure at each city gate. The simulations made it possible to determine whether the equipment currently installed at the city gates meets requirements for 2013-2014. The simulations were carried out using the consumption of all current firm customers forecasted for next winter and the minimum contract supply pressure from TCPL/TQM.

Third, physical modifications will be made to some regulator equpment in Estrie and Saguenay to increase capacity to meet requirements for winter 2013-2014. The following tables show the forecasted saturation for 2013-2014 in Estrie and Saguenay after implementation of these operational and physical solutions.

Forecasted System Saturation[21] for 2013-2014 by Region Following Implementation of Operational and Physical Solutions

	Estrie Total	Estrie Sabrevois /Courval	Estrie Waterloo /Windsor	Saguenay
Peak hourly throughput (m^3/hr)	144,866	82,504	62,362	126,677
Maximum hourly throughput (m^3/hr)	141,500	89,200[22]	52,300[23]	118,434[24]
Saturation (%)	**102.4**	92.5	**119.2**	**107.0**

Forecasted System Saturation [25] for 2013-2014 by Region Following Implementation of Operational and Physical Solutions, Excluding Interruptible Customers

	Estrie Total	Estrie Sabrevois /Courval	Estrie Waterloo /Windsor	Saguenay
Peak hourly throughput (m^3/hr)	123,556	75,671	47,885	115,594
Maximum hourly throughput (m^3/hr)	141,500	89,200[26]	52,300[27]	118,434[28]
Saturation (%)	87.3	84.8	91.6	97.6

The operational and physical modifications make it possible to achieve secure supply for current firm customers for the winter of 2013-2014, even if TCPL/TQM only delivers the minimum

[21] Based on sales concluded as of September 24, 2013.
[22] This capacity is based on a supply pressure of 4,000 kPa at the Sabrevois station inlet and temporary operation of the St-Hyacinthe and Granby city gates at lower inlet pressures than the design value.
[23] This capacity is based on a supply pressure of 4,000 kPa at the Waterloo station inlet and temporary operation of the Sherbrooke and Windsor supply systems at a lower pressure than the design value.
[24] The capacity includes a safety margin in the event of failure of one of the compressors.
[25] Based on sales concluded as of September 24, 2013.
[26] This capacity is based on a supply pressure of 4,000 kPa at the Sabrevois station inlet and temporary operation of the St-Hyacinthe and Granby city gates at lower inlet pressures than the design value.
[27] This capacity is based on a supply pressure of 4,000 kPa at the Waterloo station inlet and temporary operation of the Sherbrooke and Windsor supply systems at a lower pressure than the design value
[28] The capacity includes a safety margin in the event of failure of one of the compressors.

contract supply pressure of 4,000 kPa. However, issues nonetheless remain for the two regions for the winter of 2013-2014:

- Some customers may be unable to obtain GAI.
- Some interruptible customers may experience interruptions beyond the number of interruption days set out in the *Conditions of Service and Tariff*.
- It would be impossible to approve all requests to connect new customers or add volume for existing system customers or requests for GAC.

6.3.2 TCPL "Best Effort"

Gaz Métro asked TCPL if it would be possible to keep pressure above 4,550 kPa for the Waterloo city gate (Estrie) and 4,650 kPa for the Saint-Maurice city gate (Saguenay) at all times during the winter in order to provide a secure supply to our firm service customers. TCPL agreed to make its "Best Effort" to comply with our request.

Given TCPL's "Best Effort" agreement, criterion *#11 – Minimum Supply Pressure (TCPL & TQM)*[29] will temporarily be replaced by *"Best Effort" Supply Pressure (TCPL & TQM)* for the operational activities described in section 4 for winter 2013-2014. The use of *"Best Effort" Supply Pressure (TCPL & TQM)* impacts the saturation levels in the Saguenay and Estrie regions.

[29] Refer to criterion #11 – Minimum Contract Supply Pressure (TCPL & TQM) on page 14 for more details.

Forecasted System Saturation[30] for 2013-2014 by Region Using "Best Effort"

	Estrie Total	Estrie Sabrevois /Courval	Estrie Waterloo /Windsor	Saguenay
Peak hourly throughput (m^3/hr)	144,866	82,504	62,362	126,677
Maximum hourly throughput (m^3/hr)	150,400	89,900[31]	60,500[32]	129,330[33]
Saturation (%)	96.3	91.8	**103.1**	97.9

Forecasted System Saturation [34] for 2013-2014 by Region Using "Best Effort", <u>Excluding Interruptible Customers</u>

	Estrie Total	Estrie Sabrevois /Courval	Estrie Waterloo /Windsor	Saguenay
Peak hourly throughput (m^3/hr)	123,556	75,671	47,885	115,594
Maximum hourly throughput (m^3/hr)	150,400	89,900[35]	60,500[36]	129,330[37]
Saturation (%)	82.2	84.2	81.2	89.4

Gaz Métro is aware that the use of *"Best Effort" Supply Pressure (TCPL & TQM)* for its operations does not resolve the long-term issues with its system. Clearly, the temporary measures make it possible to:

[30] Based on sales concluded as of September 24, 2013.
[31] This capacity is based on a supply pressure of 4,000 kPa at the Sabrevois station inlet and temporary operation of the St-Hyacinthe and Granby city gates at lower inlet pressures than the design value.
[32] This capacity is based on a supply pressure of 4,550 kPa at the Waterloo station inlet and temporary operation of the Sherbrooke and Windsor supply systems at a lower pressure than the design value.
[33] This capacity is based on a supply pressure of 4,650 kPa at the Saint-Maurice compressor station inlet. The capacity includes a safety margin in the event of failure of one of the compressors.
[34] Based on sales concluded as of September 24, 2013.
[35] This capacity is based on a supply pressure of 4,000 kPa at the Sabrevois station inlet and temporary operation of the St-Hyacinthe and Granby city gates at lower inlet pressures than the design value.
[36] This capacity is based on a supply pressure of 4,550 kPa at the Waterloo station inlet and temporary operation of the Sherbrooke and Windsor supply systems at a lower pressure than the design value.
[37] This capacity is based on a supply pressure of 4,650 kPa at the Saint-Maurice compressor station inlet. The capacity includes a safety margin in the event of failure of one of the compressors.

- Approve some requests not covered in the previous tables to connect new customers, add volume for existing system customers or for GAC;
- Approve some requests for GAI.

However, it is still possible that some interruptible customers may experience more interruptions than the number of interruption days set out in the *Conditions of Service and Tariff* as a result of a significant drop in the number of interruption days in 2014 compared with 2013. The following section will deal with this factor.

6.3.3 Maximum number of interruption days

As indicated in the follow-up to decision D-2010-144,[38] which specified the method for establishing the maximum number of interruption days, the days are set using supply tools upstream of Gaz Métro's coverage area and not the capacity of the system in its area.

In its follow-up to decision D-2013-106, Gaz Métro filed data regarding the forecasted number of interruption days for a normal winter and an extreme winter and the maximum number of interruption days that would apply for the year 2013-2014.

Number of Interruption Days – Year 2013-2014

Subrate D5	Forecasted number – normal winter	Forecasted number – extreme winter	Maximum number
Category A			
505	8	43	48
506	10	50	52
507	13	59	62
508	15	59	62
509	28	66	76
Category B			
535	4	20	20
536	4	20	20
537	9	30	30
538	9	30	30
539	9	30	30
GAC	28	66	76

[38] Rate Case 2012, R3752-2011, Gaz Métro-12, Document 1.

The forecasted number of interruption days during a normal winter and an extreme winter are shown for information purposes and are established using the supply plan filed during Phase 2 of the current Rate Case (Ref.: B-0054, Gaz Métro-2, Document 1).

Gaz Métro notes that the maximum number of interruption days is down significantly due to the increased transportation capacity contracted by Gaz Métro compared with 2012-2013. The number of interruption days for 2012-2013 is shown in the table below.

Number of Interruption Days – Year 2012-2013			
Subrate	**Forecasted number – normal winter**	**Forecasted number – extreme winter**	**Maximum number**
Category A			
505	11	54	54
506	19	59	67
507	29	63	77
508	30	64	78
509	38	67	84
Category B			
535	11	20	20
536	11	20	20
537	12	30	30
538	12	30	30
539	12	30	30

This decrease therefore reduces the operational flexibility that Gaz Métro has to manage its system. Thus, once the maximum number of interruption days is reached, Gaz Métro can no longer interrupt an interruptible customer, regardless of operational requirements related to system capacity, because the customer is considered a firm customer from that point on. The situation becomes critical because the Gaz Métro transmission system was not designed to meet the specific demand of interruptible customers. Thus, setting the maximum number of interruption days should not take into account solely the transportation capacity upstream of the coverage area, but also the operational requirements of the Gaz Métro system.

Given the high saturation levels noted in certain regions, Gaz Métro has studied the option of temporarily maintaining the maximum number of interruption days forecasted in the *Conditions of Service and Tariff* in effect as of August 1, 2013. This approach would mean that for all Category A interruptible customers, a higher number of interruption days would be recognized than those obtained using the gas supply plan. The A, W and P parameters used in calculating the load balancing price would thus be modified for D_5 customers taking into account the higher number of interruption days. The effect on the load balancing revenue is shown in the table below. The figures on the first line correspond to the load balancing revenue generated for each rate when the maximum number of days is

established using the 2013-2014 supply plan, as indicated in Exhibit Gaz Métro-15, Document 8, column 20. The figures on the second line correspond to the load balancing revenue generated when the maximum number of interruption days currently in effect is maintained.

LOAD BALANCING REVENUE

	D_1 ($000)	D_3 ($000)	D_4 ($000)	D_5 Category A ($000)	D_5 Category B ($000)
# days interr. 2014 (supply plan)	125,151	1,437	8,167	611	2,852
# days interr. 2013	127,984	1,476	8,361	(2,511)	2,947
Difference ($000)	2,833	39	194	(3,122)	95
Difference (%)	2.3	2.7	2.4	-510.9	3.3

Thus, the impact of maintaining the current parameters would be to increase significantly both the credit to interruptible customers (Category A) and the amount paid by other customers. To the extent that this solution is designed to solve a specific problem on certain segments of the system and the number of additional interruption days would not be used, except in the case of a few customers, Gaz Métro does not believe this approach should be adopted.

Gaz Métro thus proposes to continue with the usual approach, which is to use the maximum number of days under the 2013-2014 gas supply plan to calculate load balancing prices. However, the maximum number of interruption days to take into consideration "operational issues" would be set using the maximum number of days in Rate Case 2013 and would also be added to the *Conditions of Service and Tariff*. This number would be substituted for the previous maximum number, where applicable. The number of additional interruption days thus generated could be used if necessary.

Sum of Subscribed Volume under Firm Service and Projected Daily Volume under Interruptible Service			Maximum Number of Interruption Days (Article 16.4.6, para. 1)				Maximum Number of Days (including operational issues)
Subrate D5	Between m^3/day	and m^3/day	Current D-2013-115		Proposed		Proposed
			Category A	Category B	Category A	Category B	Category A
5.5	3,000	10,000	54	20	48	20	54
5.6	10,000	30,000	67	20	52	20	67
5.7	30,000	100,000	77	30	62	30	77
5.8	100,000	300,000	78	30	62	30	78
5.9	300,000	or more	84	30	76	30	84

If, for a particular customer, the actual number of interruption days exceeded the maximum provided for in the supply plan, the actual number of days would be used in assessing the A, W and P parameters for use in calculating its load balancing price. The customer's new load balancing price would be set when the actual interruption needs are observed and applied to the customer retroactively. It should be noted that Category B of the interruptible rate would not be affected by this measure.

Gaz Métro acknowledges that the solution is not perfect, but it believes that it is more equitable and makes it possible to avoid assigning a heavier cost to other customers.

A more detailed analysis of the problem, along with a proposal, will be submitted in the upcoming months along with the file dealing with long-term solutions to resolve the capacity issues with its system.

The temporary measure makes it possible to:

- Recognize the maximum number of interruption days under the gas supply plan in calculating the load balancing price;
- Prevent a further restriction in Gaz Métro's operational flexibility to manage its system;
- Prevent interruptible customers from experiencing more interruption days than the number set out in the *Conditions of Service and Tariff.*

Exhibit Gaz Métro-16, Document 1, section 2, presents the changes made to the *Conditions of Service and Tariff* in order to take into account the proposed changes. Gaz Métro requests that these changes take effect upon receipt of a favourable decision from the Régie.

6.3.4 Instrumentation of major customers

Gaz Métro will instrument four major customers with rate combinations in Saguenay, as well as eight major customers in Estrie. The instrumentation will allow the system control centre to read customer throughput in real time in order to ensure that they are respecting the throughput (maximum hourly throughput at the firm rate) requested in their contracts when they experience an interruption.

6.3.5 Follow-up to Decision D-2013-135

In its decision dealing with the 2012 Annual Report,[39] the Régie asked Gaz Métro to submit its process of allocating GAI and GAC and to file a method of ensuring that its services are not made available when the saturation level in a region does not permit it.

> [178] The Régie takes note of Gaz Métro's intent to review its process of allocating GAI and GAC and to file a method of ensuring that its services are not made available when the saturation level of a region does not permit it. **The Régie finds that establishing such a method is a priority and accordingly orders the Distributor to file this method as part of Phase 2 of Rate Case 2014, to take effect for the winter of 2013-2014.**

Gaz Métro can allocate GAI up to and not exceeding the maximum saturation rate. Further, Gaz Métro allocates GAC and accepts requests to connect new customers or to add volume for existing customers on two conditions, first that the number of interruption days set out in the *Conditions of Service and Tariff* is respected and second, that the maximum saturation rate is respected.

Regarding the maximum saturation rate for allocating GAI, GAC and new sales, for the time being Gaz Métro sets the maximum saturation rate at system capacity. As mentioned earlier, an analysis of the design and operating criteria will be carried out in the fall and will make it possible to revise the criteria and the maximum saturation rate. Thus, for the winter of 2013-2014, Gaz Métro will allocate GAI, GAC and new sales if system capacity permits.

It is important to understand that Gaz Métro can interrupt a customer for transportation reasons, but also for transmission reasons. Where there are interruptions for transmission reasons, it is in order to avoid exceeding the maximum saturation rate. Obviously, it is not possible to allocate GAI in that case. However, when there are interruptions for transportation reasons, it is possible to allocate GAI to certain customers, until maximum saturation is reached. The following table shows a fictional scenario.

[39] Decision D-2013-135.

	Interruption	
	Transportation	Transmission System
Saturation before interruption	110%	110%
(-) Interruption	30%	10%
(=) Saturation after interruption	80%	100%
(+) GAI available	20%	0%
(=) Saturation after interruption and GAI	100%	100%

Thus, when Gaz Métro receives a request for GAI or GAC or to connect new customers or add volume for existing customers, it verifies whether the request is from a region where saturation could approach maximum after the interruption. If so, a system capacity validation is performed. The GAI request is approved if its falls within maximum saturation. For GAC, connection of new customers or additional volume for existing customers, the request is approved only if the requested capacity falls within maximum saturation and the number of interruption days set out in the *Conditions of Service and Tariff*.

As a general rule, Gaz Métro grants GAI and GAC based on the minimum contract supply pressure (TCPL & TQM). Given the section on "Best Effort", whereby Gaz Métro is temporarily replacing criterion *#11 – Minimum Contract Supply Pressure (TCPL & TQM)*[40] with *"Best Effort" Supply Pressure (TCPL & TQM)* for its operational activites described in section 4 for the winter of 2013-2014, the *"Best Effort" Supply Pressure (TCPL & TQM)* will temporarily be used to determine whether the system falls within the maximum saturation rate.

Based on the forecasted saturation rate for 2013-2014,[41] excluding interruptible customers, Gaz Métro will allocate GAI and GAC or will approve certain requests to connect new customers or to add volume for existing customers in Estrie and Saguenay during the winter of 2013-2014 if system capacity permits.

[40] Refer to criterion #11 – Minimum Contract Supply Pressure (TCPL & TQM) on page 14 for more details.
[41] Forecasted system saturation rate for 2013-2014, excluding interruptible customers, by region, using "Best Effort".

7 NEXT STEP

The measures planned for 2013-2014 obviously are not long-term solutions. Gaz Métro will assess the various options to resolve the capacity issues with its system. The solution may involve investing in system upgrades. Gaz Métro therefore informs the Régie that it will submit a file dealing with its system capacity issues in the upcoming months.

7.1 CONCLUSIONS SOUGHT

Gaz Métro requests that the Régie take note of the follow-ups.

Gaz Métro requests that the Régie approve the new maximum number of interruption days, consideration of a maximum number of interruption days for operational reasons for Category A as well as recognition of actual surplus interruption days in calculating the load balancing price, where applicable.

Gaz Métro requests that the Régie take note that a file dealing with its system issues will be submitted in the upcoming months.