HYDRO-QUÉBEC DISTRIBUTION RESPONSES TO QUESTIONS FROM PARTICIPANTS

Table of Contents

List of Tables

List of Figures

INTRODUCTION

Among the questions selected by the Régie in the D-2011-168 decision of November 2, 2011, several relate to achieving the savings linked to eliminating the positions mentioned in the proof, on the economic analysis of the project and on IT security. In order to provide complete responses to these questions and to facilitate the reading by the Régie and participants, the Distributor has grouped its responses to the questions relating to these subjects in the following document as follows:

- Section 1 presents the Distributor's answers to questions on achieving the efficiency savings linked to the AMI scenario by presenting the details of the positions eliminated
- Section 2 presents the Distributor's answers to questions on the economic analysis, both for the reference scenario and for the AMI scenario
- Section 3 presents the Distributor’s answers to questions about IT security

1. ACHIEVING THE EFFICIENCY SAVINGS FROM THE AMI SCENARIO

The Distributor confirms its capacity to achieve efficiency savings principally by eliminating the positions affected by the AMI implementation; the salary fleet represents 75% of the savings anticipated by the Distributor.

For this purpose, the Distributor's strategy consists of first converting all the permanent positions freed up by the turnover of personnel into temporary positions, thereby filling them with temporary employees. The Distributor will subsequently proceed with the elimination of the positions according to the progress of the deployment work and by ceasing the manual meter reading routes resulting from it. At this stage, it is appropriate to indicate that only permanent employees will be relocated.

In this respect and considering the high turnover rate observed for these personnel in 2011 (see Table 1 below) it is important to recall[1] the annual turnover rate is calculated as follows: the number of departures of permanent employees during the year over the total number of permanent positions at the beginning of the year. It involves movements of

[1] See answer to question 6.2 from OC on part B-043-HQD-4, Document 6.

permanent employees such as leaving on retirement, leaving the organization to take up another position within the company or resignation of the employee. The average from 2009 to 2010 was 21% whereas for 2011 the rate is 36%.

It should be noted that meter reader positions at the Distributor are entry-level positions. In fact, several people are willing to take a position that includes some undesirable conditions (physical outdoor work) in order to get their foot in the door with Hydro-Québec and become permanent employees. Consequently, a significant number of these new employees quickly seek better paying positions or terminate their employment. This explains the historically high turnover rate for this position. This rate is calculated only for permanent employees.

Since the announcement of the LAD project, all the permanent positions being abandoned due to personnel turnover (departures due to retirement in particular) are being converted into temporary positions. In fact, given the nature of the LAD project, the Distributor's needs relating to the targeted positions is limited to the project deployment period. Only permanent employees will be relocated whereas the temporary positions will be eliminated.

The following table details the conversion of 270 permanent positions into temporary ones. The percentage of temporary positions has gone from 10 to 37% for all targeted positions.

Table 1: Number of Positions Affected by Employee Title

Employee Title	on December 31, 2009			On December 31, 2011		
	Total	Temporary or vacant positions		Total	Temporary or vacant positions	
	(Number)	(Number)	(%)	(Number)	(Number)	(%)
Meter reader	484	75	15%	484	214	44%
Clerk	78	0	0%	78	25	32%
Main reading agent	25	0	0%	25	8	32%
Manager or adviser	31	0	0%	31	3	10%
Collection agent representative	87	0	0%	87	20	23%
Client service representative (residential)	21	0	0%	21	0	0%
Total	726	75	10%	726	270	37%

The distributor anticipates eliminating the permanent positions when people retire from meter reading positions. In addition to eliminating these positions, they will further reduce the number of permanent employees affected by the project, as demonstrated by the following table.

Table 2: Number of Positions Affected by the LAD Project

Description		Number
Total number of positions		726
Temporary positions on October 31, 2011	-	270
Remaining permanent positions on October 31, 2011		456
Permanent positions eliminated or converted into temporary positions in 2012[1]	**-**	**96**
Remaining permanent positions		360
Retirements announced by people holding the position between 2012 and 2017	**-**	**120**
Eligible and early retirements between 2012 and 2017	**-**	**60**
Number of permanent employees to be relocated between 2012 and 2017		**180**

Note 1: 21% turnover rate used

By 2017, the number of permanent employees affected by the LAD project and who would need relocation could be as high as 180, which is distinctly less than the 300 which was initially planned[2]. As a measure of prudence, from 2013 to 2017 the distributor has not included a rollover rate for this number on the assumption that the most mobile employees started to move first and that the "career" meter readers will be the last to seek relocation.

Under the rules from the collective bargaining agreements, the assignment of a position following posting is done according to seniority. Depending on the positions obtained, employees could receive improvement training if required. This would allow them to perform the tasks required for their new assignment, as provided for in the collective bargaining agreement. As mentioned in proof[3], the number of employees eligible for retirement from the company during 2012-2017 is estimated at 800 within the Distribution division and 1350 in the other Hydro-Québec divisions at the beginning of 2011. It should be noted that the pool of available positions take into account the employee profiles to be relocated and their accessibility to the positions. With this item it is possible to conclude

[2] See page 17 from part B-006-HQD-1, Document 1.
[3] See page 31 from part B-006-HQD-1, Document 1.

that the business has the capacity to transfer the 180 employees into other activities, even if efficiency measures were to be implemented in other divisions of the company.

The strategy chosen by the Distributor for assuring efficiency savings is already working and generating the expected results. The turnover of personnel seen in 2011, paired with the conversion of some 195 permanent positions into temporary positions is proof of the Distributor's willingness to act quickly and eliminate positions and ensure the achievement of efficiency savings. The trend observed concerning staff rollover seems to be firmly established which argues in favour of a massive deployment starting in 2012 while thereby minimizing the impact on the human resources by the AMI implementation.

2. ECONOMIC ANALYSIS

2.1. Reference Scenario

The reference scenario reflects the objective of sustaining a fleet of meters in the context of an aging fleet and the application of a new Measurement Canada sampling standard, while renewing the fleet of apparatuses over 20 years. This scenario anticipates a higher annual replacement rate – varying between 342,500 and 370,400 units – during the first five years (2012-2016) in order to maintain a replacement rate of 138,415 units over the next15 years.

2.1.1 Managing the Fleet of meters

The electricity measurement function is vital for the Distributor because it ensures that the delivered electricity can be billed adequately. It is therefore the fleet of our revenue. Because of this, the Distributor rigorously manages its fleet and replaces its meters according to various strategies, including the replacement of lots of meters according to risk scenarios. The Distributor tends to maintain the fleet with a limited number of meters presenting failure risks. Thus when an old lot shows a low confidence level, the Distributor will proceed with its preventative replacement before the meters can fail.

As the Distributor indicated in its proof[4], the operation of a worn-out fleet includes several risks and disadvantages:

- Increased risk of meter failure
- Increase in corrective maintenance operations to the detriment of preventive maintenance
- Potential difficulties for hardware supply and obtaining services for technology which is no longer supported
- In the context of many retirements, new expertise is falling behind the development of new technology

The Distributor's fleet of 3.75 million meters includes two types of devices: electromechanical meters which represent a little over 3 million units (79%) and electronic meters (21%). The accounting lifetimes have been set respectively at 25 years and 15 years for the two types of devices[5].

In 2011, the average age of the electromechanical meters was 26.8 years. In order to assure its clients receive accurate and reliable measurement of the consumption, the Distributor performs proactive maintenance on its fleet of meters. The results of earlier analyses and the age of the devices constitute important criteria in this respect.

The Distributor's reference scenario aims to replace the oldest electromechanical meters first, in order to lower the overall age of the fleet. This approach is realistic and responsible. If the Distributor did not immediately precede with lowering the age of the fleet, the number of electromechanical meters aged 25 years and more would be 2.2 million meters in 2016. This reality led the Distributor to set the replacement rate for the reference scenario at about 370,000 meters per year between 2012 and 2016 inclusively. This would effectively level out the work load over five years instead of being faced with conducting a massive replacement in 2014.

[4] See the answer to question 1.4 in part B-016-HQD-2, Document 1 from information request number 1 from the Régie.
[5] See page 14 from part B-006-HQD-1, Document 1.

2.1.2 New Sampling Standard from Measurement Canada

The distributor is subject to regulation by Measurement Canada; the maintenance of the embedded fleet and the replacement of meters are conducted in compliance with the standards[6].

Canada Measurement has established a new sampling standard (standard S-S-06[7]). This standard has been in effect since January 2011 for electronic meters. Although legally, the new standard only applies to electromechanical meters in 2014, the Distributor reference scenario includes beginning the replacement in 2012 in order to be able to comply with the new standard when it goes into effect.

The objective set by the new standard is to achieve a 95% confidence level (19 times out of 20) and that the lots in service do not include more than 1% of meters outside the legal limit of a 3% deviation.

Compared to the former standard, the new standard imposes much more stringent requirements on all Canadian industry. A much larger volume of samples will need to be taken from the client fleet, depending on the lot size.

The lot acceptance criteria for the fleet based on the results of the sampling are also tightened, thereby increasing the risks of rejecting a lot. In fact, the sampling results are subject to two criteria for determining what will become of a lot. The first criterion sets the limit number of meters with metrological precision at greater than 2% deviation and the second criterion sets the limit number of meters with metrological precision at 2.9% deviation. In the former standard, only the second criterion was taken into consideration.

Finally the length of the extension of the validity period of the Measurement Canada seal is regressive with time; this means that with each sampling of a lot, the amount of time for which the meter is valid is extended for shorter and shorter lengths. This change limits the number of years during which the device may be in-service.

[6] See the answer to question 21.1 from RNCREQ in part B-044-HQD-4, Document 7
[7] Idem

Table 3: Plan for Compliance Testing by Sampling

Test	Seal Validity Time
Initial seal	10 years
First compliance test	Eight year extension
Second compliance test	Six-year extension
Third compliance test	Four-year extension
Fourth compliance test	Two-year extension

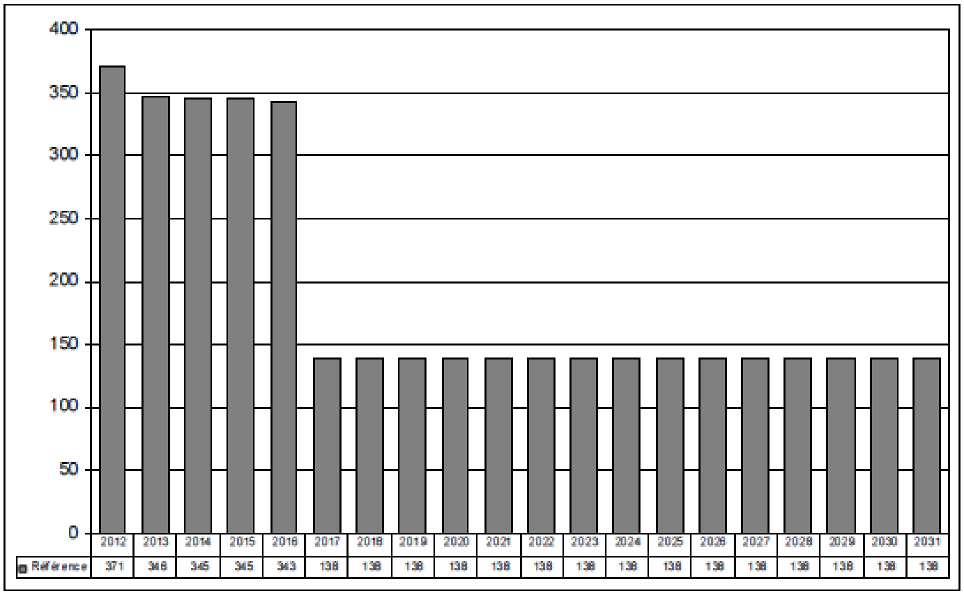
If a lot is rejected following a sample analysis, the entire lot of meters throughout the province is required to be replaced before the expiry date given on their seal.

The age of the devices in the current embedded fleet, and the implementation of the new standard have increased the risk of rejected lots for a significant number of devices. In order to properly manage this risk and to level out the work load, the current meter replacement strategy called for in the reference scenario over the next five years is essential. This proactive management will make it possible to subsequently make the annual meter replacements uniform from 2017 to 2031. The Distributor has produced the following graph[8] in order to make it easier to read the reference scenario meter replacement rate.

As the Distributor indicates at the end of section 2.2.3 of the present document, even if the reference scenario was based on a uniform replacement rate over 20 years, the economic analysis would still show significant savings for the AMI scenario.

[8] See the answer to commitment number 6 from part B-029-HQD-3, Document 2, page 13.

Figure 1: Number of Meters Replaced Annually in the Reference Scenario (in Thousands of Meters)



2.2. AMI Scenario

2.2.1 20 Year Analysis Period

The economic analysis from the AMI scenario presented by the Distributor was done over 20 years. The economic analysis must be conducted on the basis of the equipment with the longest useful lifetime, which in the AMI scenario is the lifetime of the new generation meters. Since the deployment of the LAD project was completed after five years, the Distributor conducted their economic analysis to the end of the fifth year following the installation of the last meters. The analysis period is therefore from 2012 to 2031.

This 20 year period is appropriate and reasonable because all the savings generated by the project can be kept track of. A period less than 20 years would be unduly penalizing. As the Distributor will indicate below, an analysis done over 15 years would nonetheless demonstrate that executing the LAD project is more advantageous than the reference scenario.

2.2.2 28% Replacement at the End of the Accounting Lifetime

An amount of $250 million is included in the economic analysis planned for the replacement of new generation meters at the end of the seal validity period for some lots of meters. This amount corresponds to the replacement estimate of about 1,075,000 new generation meters between 2027 and 2031.

A benchmark for the industry indicates that the accounting lifetime of new generation meters varies between 15 and 20 years for a similar kind of project[9]. However, another benchmark indicates that the meters are not systematically replaced at the end of their accounting lifetime - after 15 years in particular. In fact, the replacement history in the market as a function of this benchmark indicates an average 3.5% replacement rate per year between the 15th and 20th year for a total of about 17.5% over five years. Recall that the Distributor called for a conservative assumption of 28%, which is a little less than twice the rate observed by the companies from this benchmark.

Finally, the Distributor is working from the experience they acquired with the management of its electromechanical meters. The following table demonstrates that the rejection percentage, based on the former Measurement Canada standard, for the various lots of electromechanical meters sampled during the last four years is on average 0.7% per year. Over five years, the total rejection proportion would vary between 3.5 and 4.0%.

[9] See the answer to question 1.2 from the request for information number 1 from the Régie to the part B-016-HQD-2, Document 1, Attachment A.

Table 4: Rejection Rate for Lots of Electromechanical Meters

Sampling Program

Years	Levels Reached					Total	Rejected/total (in %)
	1	2	3	4	Rejected		
2008	551,091	324,085	47,592	3661	7512	934,661	0.8%
2009	327,462	75,946	22,462	1128	1900:	428,900	0.4%
2010	213,849	98,889	6960	10,460	6774	336,932	2.0%
2011	292,227	133,193	18,322	33,703	0	477,445	0.0%
2008-2011	1,384,629	632,833	95,336	48,952	16,188	2,177,938	0.7%

Although it is difficult to draw conclusions for new generation meters based on past experience with electromechanical meters, the Distributor is relying on a conservative assumption of a rejection rate (seven times higher) to take into consideration the risk related to the new technology.

2.2.3 Sensitivity Analysis

In the following table, the Distributor gives the economic analyses requested by the participants in the question selected by the Régie. As an illustration, it is adding a fourth hypothetical scenario for a uniform annual replacement of current meters with electronic meters based on the reference scenario.

Table 5: Results of Various Economic Analyses

M$ (actualized to 2011) Analysis period: 2011-2031 Unless indicated otherwise	IT infrastructure (1)	AMI Scenario (2)	Reference Scenario (3)	Savings Reference - AMI (4) = (3) - (2)	NPV (5) = (1) + (4)
Distributor's economic analysis over 20 years[1]	**(87.8)**	1001.3	1291.0	**289.7**	**201.9**
Distributor's economic analysis over 15 years[2]	**(87.8)**	973.2	1189.6	**2016.4**	**128.6**
Hypothetical scenarios					
Replacement of new generation meters, routers and collectors from the AMI scenario after 15 years[3]	**(87.8)**	1046.4	1291.0	**244.6**	**156.8**
Uniform replacement of the current meters by electronic meters from the reference scenario	**(87.8)**	1001.3	1222.5	**221.2**	**133.4**

Notes:
(1): Analysis done at the request of OC (question 4.1 from OC on part HQD-4, document 6.1).
(2): Analysis done at the request of UC (question 21.1 from UC on part HQD-4, Document 11.1).
(3): Hypothetical scenario done at the request of FCEI (question 1.10 from the FCEI on part HQD-4 document 4.1)

The various economic analyses presented in the above table clearly demonstrate the robustness of the LAD project. In fact, regardless of the modifications made to the assumptions of the AMI and reference scenarios, the execution of the LAD project remains beneficial for the Distributor and its clients compared to the reference scenario; the net present value varies between $129 and $290 million, whether the IT infrastructure costs are presented separately or with all the other costs.

Economic Analysis Does Not Distinguish the IT Infrastructure Costs

Though the presentation of this analysis does not distinguish IT infrastructure costs from other costs, it doesn't alter the conclusion of the economic analysis. The effect of this is that the AMI scenario procures substantial savings relative to the reference scenario[10]. The following table presents the details of this analysis. It confirms, as the distributor mentioned in its proof, that "an actualized initial investment of $88 million will however be

[10] See question 4.1 from OC on part HQD-4, Document 6.1

required for implementing the AMI IT which will support the deployment of the new generation meters"[11].

Table 6: Results of the LAD Project Economic Analysis
(not distinguishing the costs of the IT infrastructure)

M$ (actualized to 2011) analysis period: 2011-2031	AMI Scenario	IT Infrastructure	Reference Scenario	Difference
Investments	720.1	87.8	500.4	**307.5**
Operating charges	365.3	-	871.8	**(506.5)**
Tax on public services	1.5	-	-	**1.5**
Residual values	(85.6)	-	(81.2)	**(4.4)**
Total	**1,001.3**	**87.8**	**1,291.0**	**(201.9)**

Sources of data: B-006-HQD-1, Document 1, pages 39 and 40.

<u>Economic Analysis over 15 Years</u>

The following table shows the results of the economic analysis conducted over 15 years instead of over 20 years, as requested by UC[12]. In contrast to the analysis requested by the Régie which only covers the initial purchase and installation of the new generation meters over a period of 15 years[13], UC requests the inclusion of all the costs over the same period. For the purposes of this exercise, the distributor made the following assumptions:

- No replacement of new generation meters at the end of their accounting lifetime in the AMI scenario
- Replacement of the entire fleet of meters from the reference scenario over 15 years instead of over 20 years, by maintaining the same rate of replacements during the first five years as the reference scenario from the proof

[11] See lines 3 to 5 on page 40 of part B-006-HQD-1, Document 1.
[12] See question 22.1 from the request for information number 1 from UC, on part HQD-4, Document 11.1.
[13] See the answer to question 6.2 from the request for information number 1 from the Régie, on part B-016-HQD-2, Document 1.

Table 7:
Results of the Economic Analysis over 15 Years

M$ (actualized to 2011) analysis period: 2011-2031	AMI Scenario*	Reference Scenario	Difference
Investments	635.9	508.2	**127.7**
Operating charges	349.8	740.8	**(391.0)**
Tax on public services	1.5	-	**1.5**
Residual values	(14.0)	(59.4)	**45.3**
Total	**973.2**	**1189.6**	**(216.4)**
*Excluding IT infrastructure			

It should be noted that the actualized overall cost of IT infrastructure is $88 million; the investments planned over the analysis period in consideration remain exactly the same.

Conducting the analysis over 15 rather than 20 years restricts the savings made from the AMI deployment. In fact, only the savings obtained by the first year of deployment are fully credited. Despite that, the present analysis shows the robustness of the LAD project because the AMI scenario remains very advantageous compared to the reference scenario, showing a savings of $216.4 million

Hypothetical replacement scenario for new generation meters and telecommunications equipment from the AMI scenario after 15 years

Table 8 shows the results of the economic analysis by assuming the new generation meters and the telecommunications equipment (collectors and routers) from the AMI scenario installed between 2012 and 2017 are replaced after 15 years, between 2027 and 2031, as requested by the FCEI[14].

For the purposes of this exercise, the Distributor has transposed the purchase and installation costs of equipment (new generation meters, collectors and routers) from 2012-2017 to 2027-2031 using the following assumptions:

[14] See question 1.10 from FCEI on part HQD-4, Document 4.1.

- Increase of the equipment (new generation meters, collectors and routers) installation costs by 3% per year in order to calculate the 2027 to 2031 installation costs (same assumption as that from the Distributor's proof for 2012-2017)
- Maintain equipment (new generation meters, collectors and routers) acquisition costs at the level of the prices planned for 2012-2017. As shown in proof[15], the prices are following a downward trend since 2005.

Table 8:
Results of the Economic Analysis of a Hypothetical Scenario for the Replacement of Equipment[1] from the AMI Scenario after 15 Years

M$ (actualized to 2011) analysis period: 2011-2031	AMI Scenario*	Reference Scenario	Difference
Investments	899.8	500.4	**399.4**
Operating charges	365.3	871.8	**(500.6)**
Tax on public services	1.5	-	**1.5**
Residual values	(220.2)	(81.2)	**(138.9**
Total	**1046.4**	**1291.0**	**(244.6)**
*Excluding IT infrastructure			

Note 1: New generation meters, collectors and routers.

As previously mentioned in the Distributor's AMI scenario, the replacement of the equipment, in particular the new generation meters is not based solely on the basis of their end of accounting lifetime. The hypothetical AMI scenario from the FCEI is highly advantageous relative to the reference scenario and show savings of $244.6 million.

[15] See page 13 from part B-006-HQD-1, Document 1

<u>Hypothetical scenario of uniform annual replacement of current meters with electronic meters from the reference scenario</u>

In addition to its responses concerning the criteria for meter replacement, the Distributor constructed a hypothetical reference scenario based on the assumption that the current meters are replaced with electronic meters at a uniform rate of 191,262 meters per year over 20 years.

Table 9:
Results of the Economic Analysis of a Hypothetical Scenario of Linear Replacement of Meters from the Reference Scenario

M$ (actualized to 2011) analysis period: 2011-2031	AMI Scenario*	Reference Scenario	Difference
Investments	720.1	459.3	**260.8**
Operating charges	365.3	871.8	**(506.6)**
Tax on public services	1.5	-	**1.5**
Residual values	(85.6)	(108.7)	**23.0**
Total	**1001.3**	**1222.5**	**(221.2)**

*Excluding IT infrastructure

Despite this hypothetical 20 year uniform replacement scenario for the meters from the reference scenario, the AMI scenario still remains widely advantageous compared to the reference scenario with savings of $221.2 million.

2.2.4 Items Not Included

Two items have not been included in the LAD project economic analysis:

- Reinvestments of electronic meters in the reference scenario
- Labour costs relative to information technology

Of the 3.8 million meters replaced, no reinvestment has been considered beyond 2027 to 2031. A portion of the electronic meters installed from 2012 to 2017 therefore will have to be replaced in the reference scenario at the end of the 15 year accounting lifetime (reinvestment) in order to make the two scenarios perfectly comparable. However, by not considering these reinvestments, the Distributor can integrate the implicit up-front cost associated with the replacement of meters over five years from the AMI scenario instead of 20 years from the reference scenario.

The Distributor notes[16] that the costs of certain work relative to information technology, for an amount evaluated at $30 million, would be fully recoverable whatever the outcome of the preparatory work. In particular this work includes:

- Acquisition of the data warehouse and its integration with legacy systems, SAP and the billing system
- Acquisition of the data acquisition system and its integration with the meter reading data security module

The incorporation of these elements would have improved the savings from the AMI scenario compared to the reference scenario.

3. SECURITY MEASURES

From the outset, the Distributor specified that the security of the data and equipment has been vital to them. This concern is reflected in all the items required for its various requests for proposals. The Distributor claimed the right to exclude any proposals that did not comply with its requirements in this matter.

As a part of the AMI solution, the Distributor is among the first in the world to opt for the implementation of advanced security that allows it to reinforce the security of all points of information contained in its databases, but also the data that will pass between the new generation meters, collectors and routers.

[16] Answer to question 3.1 from the Régie on part D-3-HQD-1, Document 1 of the file R-3723-2010.

The distributor wishes to remind you that the AMI network is dynamic. The path used for routing the information from a new generation meter to the enterprise system and as it passes through the telecommunications equipment can vary from one moment to another. However, regardless of whether it is in a rural environment (low client density) or urban environment (higher client density), cyber security is not based solely on the path used by a new generation meter to route its information. In fact, the data transmitted on the AMI network are encrypted from end-to-end using personalized keys and an encryption algorithm following the recommendations of the National Institute of Standards and Technology (NIST)[17]. The information being moved is divided into data packets. In order for a possible pirate to make the connection between consumption data and the client, the pirate would need to intercept and decrypt all of the data packets and associate them with an arbitrary identifier taken from the enterprise system. The equipment (new generation meters, routers or collectors), acts as a relay and does not hold any information about the topological origin of the information. It is impossible to retrace the meters based on the fragmented information being transmitted through the network. The information must be cross-referenced with other data in order to identify the consumption location and understand the content.

In order to confirm whether the selected security solution followed good practices, the Distributor had its proof of concept verified by an outside firm with expertise in the field.

The firm, Lofty Perch, was founded in 2005. A cyber security centre of excellence, this firm is a leader in security evaluation of service companies (water, natural gas and electricity) and has a solid experience in the AMI domain. The experts from this firm participate in initiatives aiming to raise AMI security, including the NERC Smart Grid Task Force, NERC CIP Cyber Security Working Group and UTC Smart Networks Security Committee. Their contact information is: 15-505 Hood Road, Markham, Ontario, Canada L3R 5V6.

The security analysis done in September 2011 by Lofty Perch does not raise any concerns about the quality of the AMI system's security measures, which this firm considers to be

[17] NIST, Special Publication 800-57, Recommendation for Key Management, Part 3 : Application-Specific Key Management Guidance : http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57_PART3_keymanagement_Dec2009.pdf

effective and robust. The report from Lofty Perch also emphasizes that the Distributor's AMI system is at the leading edge of technology. The security specialists who confirmed the proof of concept are Mark Zanotti, Director of Engineering and Mark Fabro, President and Chief Security Scientist.

The detailed report precisely describes the elements established for ensuring the solution security. The security analysis of the selected solution is considered by the Distributor to be a document which contains strategic information which must be handled with extreme confidentiality and, because of that, the document cannot be filed. This security measure is approved by Lofty Perch. Furthermore, the contract between the Distributor and Landis + Gyr contains confidentiality clauses prohibiting the Distributor from disclosing this type of information in order to protect all the Landis + Gyr clients using the same technology.

The Distributor produced the conclusions from the security analysis report prepared by Lofty Perch:

Overall, the analysis shows the current AMI solution for Hydro Québec is comprised of several notable security elements. Key elements of security strength are :

- Landis+Gyr's management and security specialists have currently shown a clear commitment to implementing and managing security in their AMI solution offering.
- • Landis+Gyr have implemented a comprehensive cryptographic framework utilized on all devices.
- • The solution is capable of End to End network encryption to Head End from Meters. There are no break points of encryption from end devices for such things as data translation or analysis.

- Effective Key Management that is decoupled from the Head End application servers makes end point attacks on meters more difficult.
- The use of the MAT Token for managing security of operational software is an effective security solution for operational risks when using Hydro-Québec laptops.
- Passwords have been changed on all WAN link (from default settings).
- The Rogers WAN link router is effectively physically protected in a secure and controlled (monitored) network centre.
- The safety analysis conducted in September 2011 has expressed no concern about the quality of the security measures of the IMA, which are effective and robust.
- The result of the solution safety analysis is considered by the Distributor as a strategic document containing information that must be treated as confidential. It can not be published as its publishing would allow malicious people to focus immediately on attacks with a greater chance of success.

The security measures established are many and varied. The following items are the main security measures:

- The description of the security measures is considered by the Distributor to be a strategic item and access to this information is restricted to the Distributor's employees if it is absolutely required in the performance of their functions
- Since the AMI network is dynamic, the information is transmitted over multiple paths
- The data which transits the AMI network is encrypted at all times using personalized keys and a specific algorithm
- The equipment (new generation meters, routers and collectors), which act as relays, do not hold any information on the topological origin of the information.

In conclusion, the distributor has taken all the steps necessary in order to minimize the type of risk linked to the security of equipment and information, in particular the risks of:

- Pirating the system by creating a communicating gateway with the "virtual meter" network[18]
- Intercepting data between the issuing meter and the meters serving as relays and between the meters and the communication network (routers, collectors)[19]

---

[18] See question 10 from the ACEF of Ottawa on part HQD-4, Document 2.1.

[19] See questions 1.26 b) and 1.26 d) from SCE-AQLPA on part HQD-4, Document 9.1.