Making the Shift: Lessons Learned in Moving from a Resource Acquisition Evaluation Framework to a Market Transformation Framework in Commercial Lighting

Jillian Mallory, Econoler, Quebec, Canada
Genevieve Lavigne, Econoler, Quebec, Canada
Marie Couture-Roy, Econoler, Quebec, Canada
Andrée Lemarier, Hydro-Québec
Bernard Schmitt, Hydro-Québec

ABSTRACT

Over the 2003-2015 period, Hydro-Québec (HQ) invested over $900 M in energy efficiency programs to enable activities targeted at the commercial, industrial and institutional (CII) sector. HQ investments in lighting technologies funded resource acquisition programs as well as enabling activities intended to transform the CII lighting market in Quebec. Initially, like many program administrators, HQ evaluated its program portfolio on a resource acquisition basis. In 2017, the utility mandated an evaluation to assess its overall contribution to transforming the commercial lighting market and quantify the associated energy savings.

Using a Delphi panel and web survey with market experts as primary data collection tools, this study estimated a posteriori the energy savings associated with market transformation for the 2012-2016 period generated by high performance electronic ballasts, T5-HO and T8 high bay fixtures, LED bulbs, and linear LED tubes in the CII sector. For each product, the team adopted a systematic approach to document HQ activities intended to transform the market, assess progress toward market transformation, identify which factors impacted the state of the market and estimate HQ influence on these factors.

The methodology outlined in this paper enabled estimating market transformation savings a posteriori. The methodology served to confirm that HQ intended to transform the market and that HQ activities quantifiably contributed to the factors most important to market transformation. For all lighting technologies, savings were found to be substantial. We recommend limiting the scope of future such studies to one or two technologies to increase the robustness of savings estimates.

Introduction

As savings from traditional resource acquisition programs aimed at lighting technologies decrease due to market transformation, program administrators increasingly look for ways to quantify the results of their efforts in transforming lighting markets.

Over the 2003-2015 period, Hydro-Québec (HQ) invested over $900 M in energy efficiency programs to enable activities targeted at the commercial, industrial and institutional (CII) sector. HQ investments in lighting technologies funded resource acquisition programs as well as enabling activities intended to transform the CII lighting market in Quebec. Past evaluations revealed high direct and indirect program savings from these activities. Results indicated that market transformation savings likely resulted from HQ investments in the CII lighting market, namely for high performance electronic ballasts, T5-HO and T8 high bay fixtures, LED bulbs, and linear LED tubes. The main objectives of this study were to understand to what extent HQ transformed the CII lighting market for these four products and apply a methodology to quantify market transformation savings.

Ideally, program administrators intent on establishing market transformation savings due to their efforts establish a market baseline, as well as document intentions, market goals and indicators prior to undertaking market transformation activities. However, as is the case for many program administrators, HQ decided to evaluate their impact on market transformation after the fact. Shifting from a resource acquisition evaluation framework to a market transformation framework led to several challenges to conducting this study, notably:

- Documenting the strategic intent of HQ programs and activities prior to assessing any market transformation savings.
- Assessing the baseline for targeted products retrospectively.
- Avoiding double-counting of savings reported in past evaluations.

Evaluation Approach

For each of the four targeted products, the team undertook a systematic approach to assess HQ's strategic intent for market transformation, assess progress toward market transformation, and estimate HQ's impact on the market. An overview of the research steps is provided below in Figure 1.

Validate HQ's strategic intent for market transformation
- Review HQ strategies intended to transform the CII market
- Develop a logic model to demonstrate how HQ activities could lead to market transformation

Assess progress toward market transformation
- Select and analyze market indicators to assess whether adoption barriers had been diminished and markets transformed

Estimate the contribution of HQ to market transformation
- Identify which factors (e.g. cost, product availability, etc.) impacted the state of the market and their importance
- Estimate how much HQ efforts contributed to each market transformation factor over the evaluation period
- Estimate the percentage of product sales that could be attributed to HQ efforts (*HQ influence*)

Estimate market size
- Estimate annual product sales over the evaluation period

Estimate market transformation savings from HQ efforts
- Calculate the number of sold units influenced by HQ
*Sold Units Influenced by HQ = Market Size * HQ Influence*
- Calculate market transformation savings, removing those sold units attributed in past program evaluations
HQ Market Transformation Savings
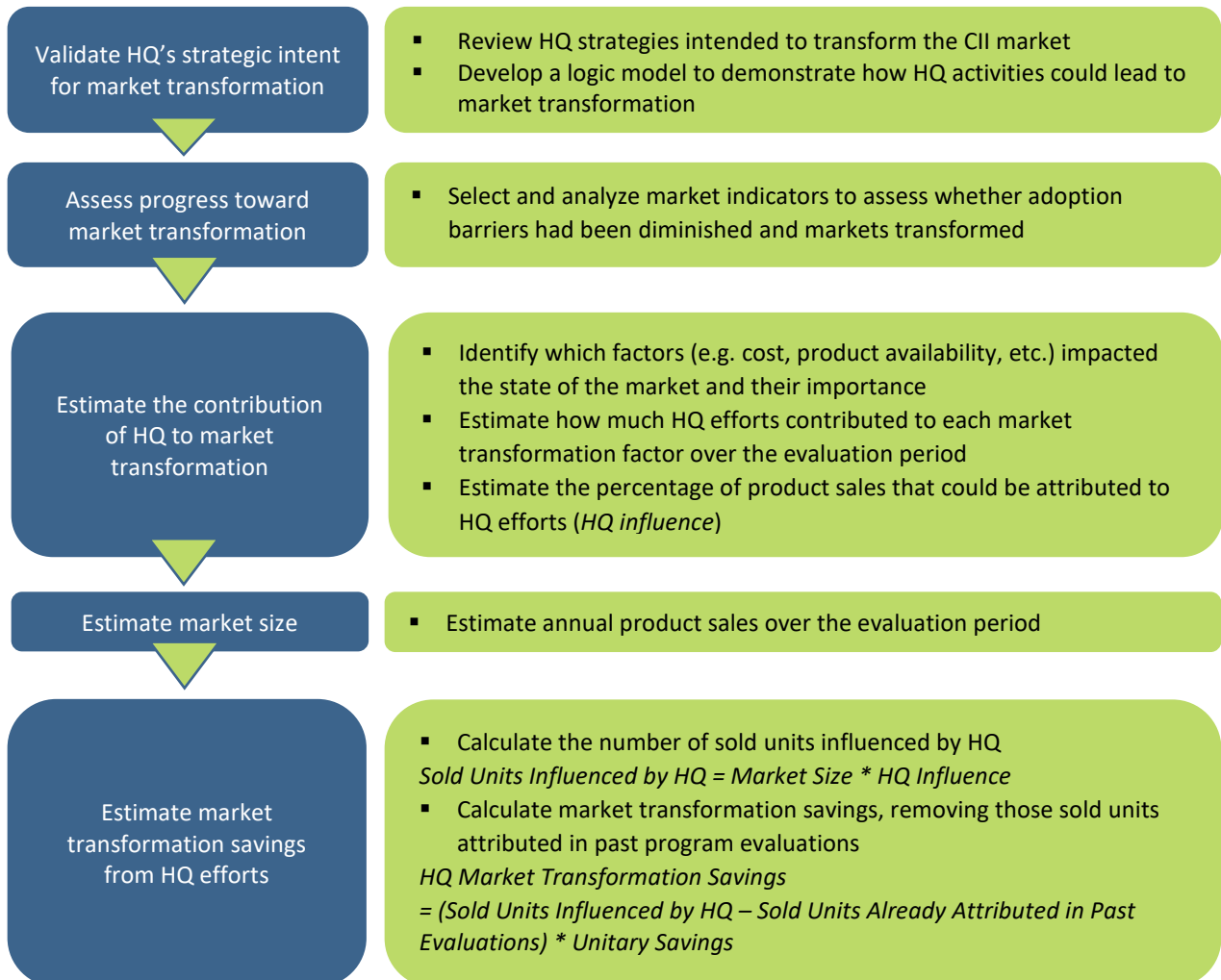*= (Sold Units Influenced by HQ – Sold Units Already Attributed in Past Evaluations) * Unitary Savings*

Figure 1. Evaluation approach

To determine a method to assess HQ contribution to market transformation, the team reviewed the literature. Rosenberg & Hoefgen (2009) identify four well-established evaluation methods to estimate persistent market effects associated with market transformation:

1. Surveys of program participants and non-participants.
2. Cross-sectional comparisons that use indicators of measure adoption from regions with no active energy efficiency programs.
3. Expert judging methods such as the Delphi process.
4. Historical tracing to reconstruct a case study.

The first method, surveying program participants and non-participants, was not considered since the study was focused at the market level rather than on individual participants. The team attempted to identify a comparable region for the cross-sectional method; however, a suitable region that had no program influence was not found. This result echoes other evaluators' findings that identifying a comparison area (non-program) is becoming increasingly difficult (Vine, 2013).

Therefore, the team selected a Delphi panel with and a web survey of market experts as the primary method to estimate market effects and market transformation savings. The team also used data sources typically used in historical tracing, namely a documentation review, secondary market data, and interviews with utility staff. The web survey of and Delphi panel with market experts are described below.

Web Survey with Market Experts

The team conducted a web survey of market actors from a variety of sectors in order to include perspectives covering the full range of HQ programs and enabling activities carried out in the CII lighting market from 2004-2016. To build the list of contacts, the team asked HQ for the names and contact information of all market actors that had interacted with them over the years, for example through training, stakeholder engagement, or participation in committees. The team also included the names and contact information of market actors from previous resource acquisition evaluation work. We sent the survey to a total of 103 email addresses, of which 15 emails bounced. Of the 88 people who received the survey invitation, 41 people responded, 26 of whom fully responded and 15 partially responded.

Surveyed market experts included manufacturers, lighting distributors, engineering firms specializing in energy efficiency, and organizations working in codes and standards or managing government EE programs. Market experts were surveyed on their perception of the role of HQ in the energy efficient lighting market in the CII sector, factors contributing to the adoption of EE products, HQ influence on these factors and lighting market size.

Delphi Panel

The study was based on the Delphi approach to refine and confirm the results of the other collection methods, which included secondary market data and the web survey. The team selected those experts among the market actors who demonstrated thorough knowledge of the market in their responses to the web survey. A total of 13 experts were consulted through in-depth telephone interviews. The experts consisted of seven distributors, three regulatory organizations, and three manufacturers. The experts reviewed the preliminary findings from the aggregated web survey and provided additional insights on the market size of lighting products, HQ influence on factors contributing to the adoption of EE products, and the evolution of HQ influence over the years. The experts took part in two rounds of questions and were provided a $100 cash incentive to participate in the process.

Methodology and Results

This section presents further details on the methodology of each research step as well as interim results ultimately enabling the estimation of market transformation savings.

Validate Hydro Quebec's Strategic Intent for Market Transformation

The first step of this research was to validate that HQ had strategic intent to transform the lighting market with their activities. This validation was crucial to the integrity and coherency of this study. The evaluation team reviewed program documentation and performed in-depth interviews with HQ staff to understand which strategies, if any, the utility adopted with the intention of transforming the market. Table 1 and Table 2 below outline the HQ programs and enabling activities connected to energy efficient lighting in the CII sector from 2004-2016. From 2004-2010, HQ offered a prescriptive rebate lighting program in addition to its performance-based programs (Building Optimization and Industrial). The Prescriptive Lighting program was very successful in increasing the uptake of high performance ballasts and T8 and T5-HO high bay fixtures. In 2011, HQ stopped offering prescriptive rebate programs in the CII sector to only focus on performance-based programs (Integrated Offer).

Table 1. Hydro Quebec programs with offers targeting energy efficient lighting in the CII sector

Product	Programs				
	Prescriptive Lighting	Building Optimization	Industrial	Integrated Offer – C&I Buildings	Integrated Offer - Industrial
High performance electronic ballasts	2004-2010	2004-2010	2004-2010	2011-2013	2011-2013
T5-HO and T8 high bay fixtures	2004-2010	2004-2010	2004-2010	2011-2015	2011-2015
LED bulbs				2011-2015	2014-2016
LED tubes				2013-2016	2013-2016

Table 2. Summary of enabling activities targeted at energy efficient lighting in the CII sector (2004-2016)

Enabling activities	Description
Development of codes and standards	• Participation in codes and standards committees (e.g. Canadian Standards Association, DesignLights Consortium, Northeast Energy Efficiency Partnership)
Research and development and demonstration projects	• Contribution to R&D of EE technologies • Demonstration of project funding • Development of products and performance tests • Feasibility studies for new technologies and applications (e.g. lighting in arenas, greenhouses, etc.)
Training and partnerships	• Training and support for market actors
Tool development	• Development and promotion of calculation tools for market actors and CII customers
Education and awareness	• Awareness campaigns • Organization of and participation in various conferences and workshops (e.g. ASHRAE) • Creation and promotion of energy efficiency labelling (e.g. list of premium DesignLights Consortium products, labelling for high performance ballasts)

After analyzing the information collected, the team developed a logic model (Figure 2) demonstrating how HQ programs and enabling activities could influence the market and ultimately lead to market transformation.
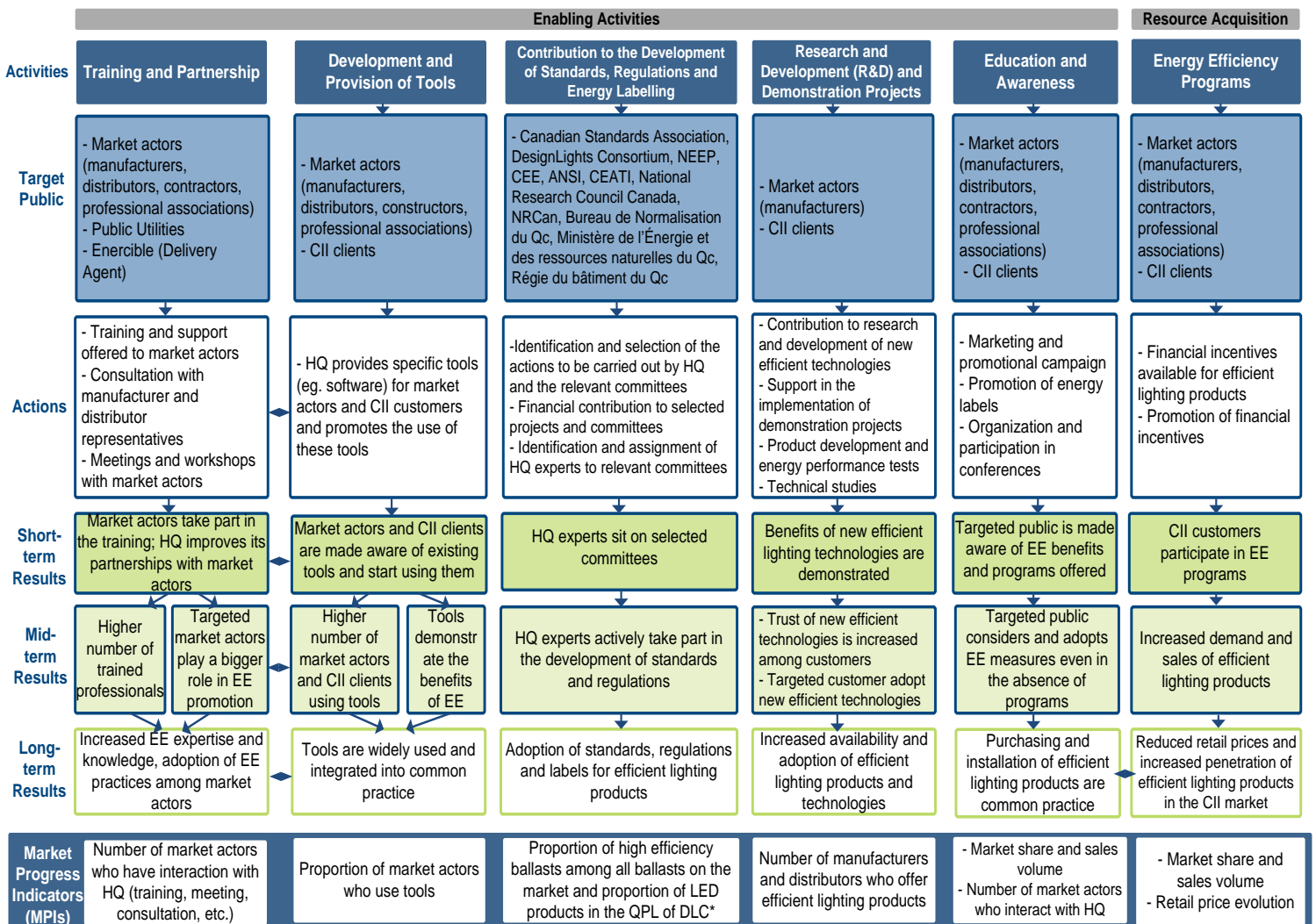
	Enabling Activities					Resource Acquisition
Activities	**Training and Partnership**	**Development and Provision of Tools**	**Contribution to the Development of Standards, Regulations and Energy Labelling**	**Research and Development (R&D) and Demonstration Projects**	**Education and Awareness**	**Energy Efficiency Programs**
Target Public	- Market actors (manufacturers, distributors, contractors, professional associations) - Public Utilities - Enercible (Delivery Agent)	- Market actors (manufacturers, distributors, constructors, professional associations) - CII clients	- Canadian Standards Association, DesignLights Consortium, NEEP, CEE, ANSI, CEATI, National Research Council Canada, NRCan, Bureau de Normalisation du Qc, Ministère de l'Énergie et des ressources naturelles du Qc, Régie du bâtiment du Qc	- Market actors (manufacturers) - CII clients	- Market actors (manufacturers, distributors, contractors, professional associations) - CII clients	- Market actors (manufacturers, distributors, contractors, professional associations) - CII clients
Actions	- Training and support offered to market actors - Consultation with manufacturer and distributor representatives - Meetings and workshops with market actors	- HQ provides specific tools (eg. software) for market actors and CII customers and promotes the use of these tools	- Identification and selection of the actions to be carried out by HQ and the relevant committees - Financial contribution to selected projects and committees - Identification and assignment of HQ experts to relevant committees	- Contribution to research and development of new efficient technologies - Support in the implementation of demonstration projects - Product development and energy performance tests - Technical studies	- Marketing and promotional campaign - Promotion of energy labels - Organization and participation in conferences	- Financial incentives available for efficient lighting products - Promotion of financial incentives
Short-term Results	Market actors take part in the training; HQ improves its partnerships with market actors	Market actors and CII clients are made aware of existing tools and start using them	HQ experts sit on selected committees	Benefits of new efficient lighting technologies are demonstrated	Targeted public is made aware of EE benefits and programs offered	CII customers participate in EE programs
Mid-term Results	Higher number of trained professionals / Targeted market actors play a bigger role in EE promotion	Higher number of market actors and CII clients using tools / Tools demonstrate the benefits of EE	HQ experts actively take part in the development of standards and regulations	- Trust of new efficient technologies is increased among customers - Targeted customer adopt new efficient technologies	Targeted public considers and adopts EE measures even in the absence of programs	Increased demand and sales of efficient lighting products
Long-term Results	Increased EE expertise and knowledge, adoption of EE practices among market actors	Tools are widely used and integrated into common practice	Adoption of standards, regulations and labels for efficient lighting products	Increased availability and adoption of efficient lighting products and technologies	Purchasing and installation of efficient lighting products are common practice	Reduced retail prices and increased penetration of efficient lighting products in the CII market
Market Progress Indicators (MPIs)	Number of market actors who have interaction with HQ (training, meeting, consultation, etc.)	Proportion of market actors who use tools	Proportion of high efficiency ballasts among all ballasts on the market and proportion of LED products in the QPL of DLC*	Number of manufacturers and distributors who offer efficient lighting products	- Market share and sales volume - Number of market actors who interact with HQ	- Market share and sales volume - Retail price evolution

Figure 2. CII sector market transformation logic model for energy efficient lighting

Assess Progress Toward Market Transformation

The logic model established how HQ investments were intended to transform the market. The next step was to validate that the market for the four targeted lighting products had indeed been transformed. Using the logic model as well as the team's market research experience, the team selected several indicators to assess the state of the CII sector lighting market in Quebec:

- Number of manufacturers and distributors who offer efficient lighting.
- Level of market actor and customer familiarity with efficient lighting products.
- Retail price evolution.
- Market share and sales evolution.
- Status of the targeted products on the innovation adoptive curve.

The team analyzed the selected indicators using secondary data sources and results from the web survey with market actors. Analysis of the indicators for electronic ballasts and T5-HO and T8 high bay fixtures indicated that these markets were very mature and had been fully transformed. By contrast, the market for LED bulbs and tubes was still growing, suggesting the market was not fully transformed. Survey results did indicate that the market for these LED products had changed significantly and that barriers had been removed for LED bulbs and were declining for LED tubes. These results demonstrated that there had been a quantifiable reduction in adoption barriers for the four targeted products. The next step was to assess causal relationships between HQ activities and market changes.

Identify Market Transformation Factors

The team identified which factors impacted the state of the market for the targeted products. First, the team consulted both the CII market transformation logic model and the literature (evaluation reports and market transformation studies) to identify applicable factors. Next, the team surveyed the market experts on the importance of the list of factors identified in the literature and whether other unlisted factors had impacts on the state of the market. This resulted in six key factors impacting the state of the CII lighting market in Quebec:

1. Presence of standards, regulations or energy efficiency labels.
2. Availability of energy efficient lighting products from distributors.
3. Improvements in the quality and reliability of efficient lighting products.
4. Cost reductions of efficient lighting products over time.
5. Increased knowledge of products and their benefits among customers and market actors (distributors, builders, contractors, etc.).
6. Increased environmental awareness among CII customers.

As part of the Delphi panel, experts were asked to rank the importance of the six factors for each targeted product. Figure 3 below illustrates the importance percentage experts believed each factor had in the market transformation of the four targeted products. Experts believed that cost reductions and increased knowledge about efficient products had the highest impacts on the state of the market across all four products.
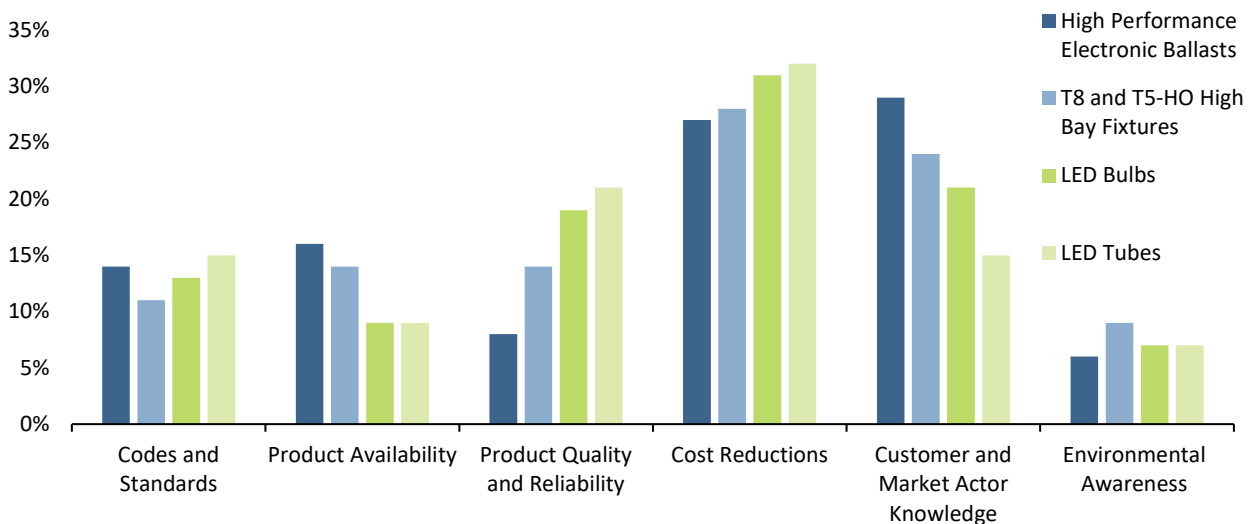
Figure 3. Ranked importance of factors contributing to market transformation in the Quebec CII lighting market

Estimate the Contribution of Hydro Quebec to Market Transformation

To estimate how much HQ investments contributed to each market transformation factor identified above, the team asked Delphi panel participants to estimate the impact on that factor, as a percentage, that could be attributed to HQ over the study period (2012-2016) for each targeted product.

One sizable challenge in conducting this study was the large amount of data points necessary to calculate the contribution of HQ on market transformation factors for each targeted product and for each study year. For each product, the method involved six market transformation factors over five years (30 data points in total for each product), and it was not feasible to ask market experts to provide a percentage for each data point.

The team asked market experts for the average HQ contribution over the 2012-2016 period for each factor and extrapolated the results for each year based on an evolution curve. The evolution curve was established for each product based on the preliminary data collected through the web survey and the documentation review. Each evolution curve was presented during the Delphi panel, and experts were asked to provide their insights to refine the results and allocate HQ contribution over the five years studied. A more limited study scope (either in study years or targeted products) would have enabled a deeper exploration of each influence factor for a given product or study year.

Estimate the Influence of Hydro Quebec on the CII Lighting Market

The method described above served to gather the data required to estimate the evolution of HQ influence over the 2012-2016 period on the sales of the four targeted lighting products (i.e. the data for columns A and B in Table 3 below). The annual influence is the portion of product sales that could be attributed to HQ efforts. The table below demonstrates how the annual HQ influence on each lighting product was calculated, by multiplying the importance of each market transformation factor to the state of the market (column A) with HQ contribution to that factor over each year (column B). The total HQ influence in each year is the sum of influence on each of the six factors.

Table 3. Calculation of HQ influence

Factors	A. Importance of factors (%)	B. Contribution of HQ to factors (%)					C. HQ influence (A X B) (%)				
		2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
1. Presence of standards, regulations or energy efficient labels											
2. Availability of energy efficient lighting products from distributors											
3. Improvements in the quality and reliability of efficient lighting products											
4. Cost reductions of efficient lighting products over time											
5. Increased knowledge of products and their benefits among customers and market actors (distributors, builders, contractors, etc.)											
6. Increased environmental awareness among CII customers											

Figure 4 below presents the overall HQ influence estimated by the Delphi panel for the four targeted products from 2012 to 2016.
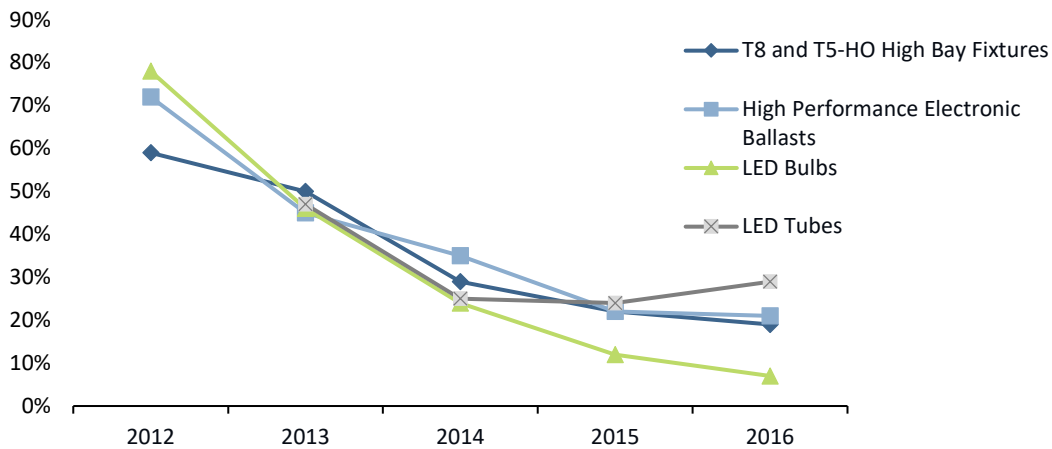

Figure 4. Annual HQ influence on the CII lighting market

The Delphi panel experts reported that HQ had a significant influence on the CII lighting market in 2012-2016. For example, for 2012, the study estimated that almost 60% of T8 and T5-HO high bay fixture sales could be attributed to HQ activities, including programs. HQ influence ranged from 7 to 78%, depending on the product and year. The experts reported that HQ had the largest influence on the lighting market in 2012, with influence decreasing sharply over time for all four products.

HQ incentive programs were not included as one of the six factors impacting market transformation. Instead, programs were considered as a potential influence on the market transformation factors identified because programs not only lower the price of technologies for participants through incentives, but also increase knowledge about lighting technologies among customers and market actors.

The market experts believed the programs to be very influential on the market and, indeed, HQ influence was found to be highest in years during which greater program effort was deployed. Furthermore, market actors perceived decreased HQ influence as programs were diminished or removed from the market and due to other forces, such as natural conservation.

The study found that HQ had the highest influence on the market for high performance ballasts during the study period. For this product, in addition to programs incenting this technology, HQ developed energy efficient labels and assigned one staff person to work closely with distributors. The influence of HQ on T8 and T5-HO high bay fixtures followed a similar trend, but to a lesser degree.

The influence of HQ on LED bulbs was found to be higher in 2012 when the technology was first introduced in Quebec but decreased as LED bulbs grew more and more popular and prices fell rapidly. The influence of HQ on LED tubes varied over time with the highest HQ influence aligning with when HQ incentives for this product were first introduced.

Estimate Market Size

To quantify market transformation savings, the team estimated the size of the CII market across the study period for the four lighting products. The team used secondary market data from the Electro Federation of Canada, an organization that provides an estimate of annual lighting product shipments by its members to Quebec, as well as input from the Delphi panel to estimate the market size of these products. The Electro Federation data provided a starting point for the analysis but needed to be further

refined because the data did not cover the entire market and higher efficiency products were not broken down for certain product categories.

The team selected a web survey format for the first round of questions to assess, among other topics, market size. The web survey format enabled the team to present a lot of data to respondents, including market data, which would have been difficult to share effectively over the phone. The web survey additionally structured many questions in table format, which was an effective means of collecting a high volume of data. This was particularly useful given the team needed to collect data for a five-year period.

Using the results from the Delphi panel, the team estimated the CII market size over the 2012-2016 period for high performance electronic ballasts, T8 and T5-HO high bay fixtures, LED bulbs, and LED tubes, as illustrated below in Figure 5.
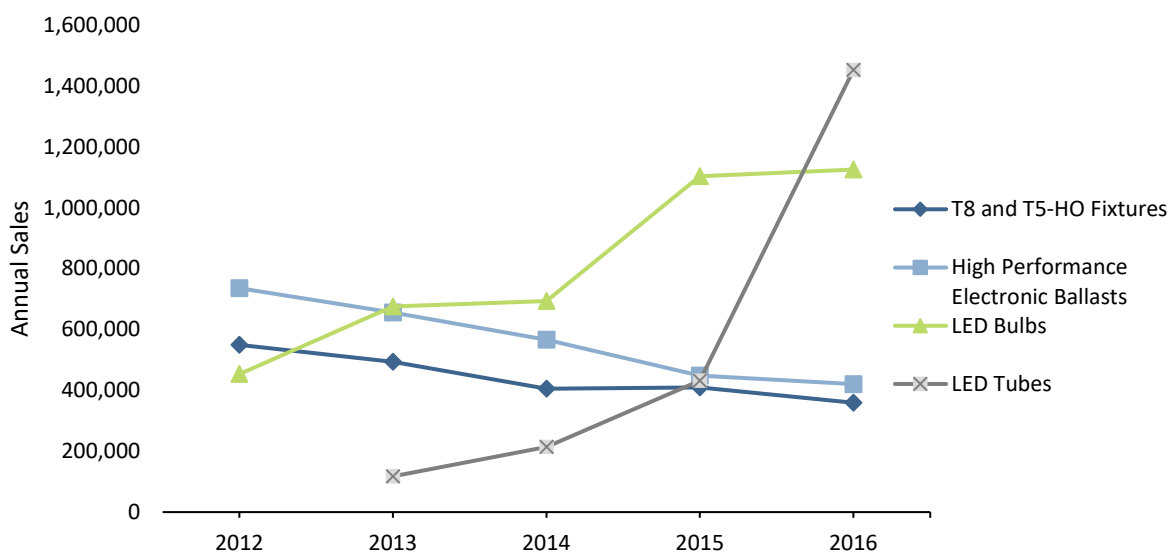
Figure 5. Estimated market size for targeted lighting products

Estimate Market Transformation Savings from HQ Efforts

As discussed in the evaluation approach section above, using the HQ influence and market size parameters, the total impact of HQ on the market was estimated for each of the four lighting products using the following equation:

$$Sold\ Units\ Influenced\ by\ HQ = Market\ Size * HQ\ Influence$$

However, the units attributed in past program evaluations needed to be removed from the savings estimates to avoid double-counting, as per the equation below.

$$\begin{aligned} HQ\ &Market\ Transformation\ Savings \\ &= (Sold\ Units\ Influenced\ by\ HQ \\ &\quad - Sold\ Units\ Already\ Attributed\ in\ Past\ Evaluations) * Unitary\ Savings \end{aligned}$$

The team invested additional effort because program savings had not been evaluated at the product level. The evaluated programs were largely integrated offers with multiple eligible measures and

had been tracked at project level. Therefore, the team could not simply subtract the evaluated products from the market transformation estimates. Consequently, the team selected representative samples of project files to estimate an average of per-project lighting units that could be extrapolated across the programs and subtracted from the units influence by HQ. The resulting value was then multiplied by the unitary savings for each targeted lighting product based on previous evaluations to establish the evaluated savings for each product.

Figure 6 below presents the estimated market transformation savings for each of the four products compared to previously evaluated savings. The difference between the two is the additional market transformation savings determined through this study. Total market-level savings were twice those of previously evaluated savings, for a total of 996 GWh over the five-year evaluation period. T8 and T5-HO had the highest estimated market level savings due to high HQ market influence and total sales over the 2012-2016 period.
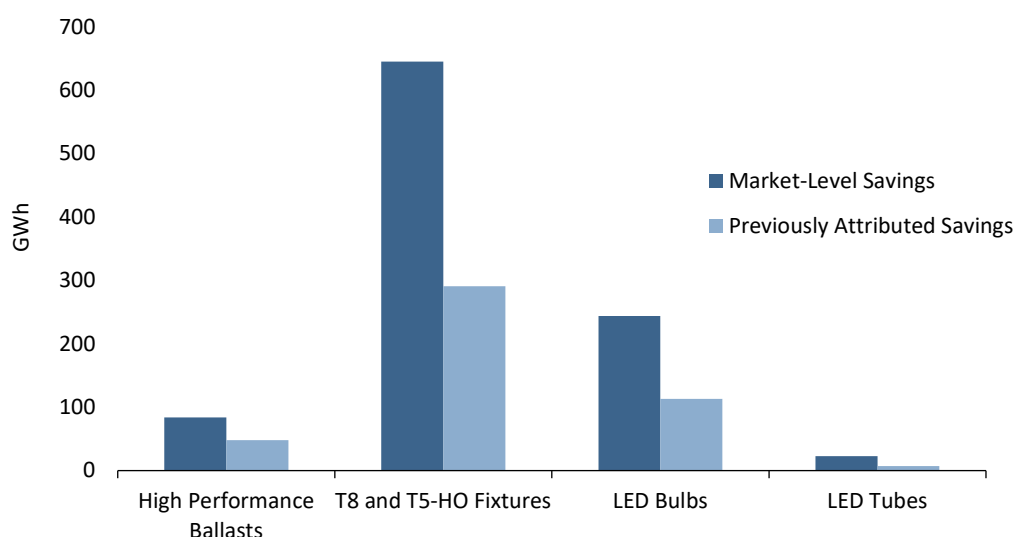
Figure 6. Market level savings for CII lighting products

The study found that HQ had significant influence on the market transformation for high performance ballasts and T5-HO and T8 high bay fixtures and that a sizable portion of the sales of these products from 2012-2016 was attributable to HQ actions. Since the market for these products is in decline, few future savings from these products are expected.

LED bulbs and tubes quickly penetrated the Quebec market when they were first introduced. The study found that HQ played a role in the rapid penetration and acceptance of these products by reducing costs and improving the quality of the products on the market. Market transformation savings are likely to accrue past 2016 for LED bulbs and tubes, depending on market sales.

The study found that HQ influence across all products diminished over the study period. In 2012, HQ still dedicated a large proportion of program effort at the four CII lighting products, and the market experts saw this effort as having a significant influence on the market. In later years, HQ shifted away from prescriptive lighting programs, with less emphasis on lighting incentives. This change may have influenced the responses of the market experts who perceived a decrease in HQ efforts in the market.

Conclusion

The analysis of HQ activities demonstrated an intention to transform the market and that the barriers for high performance electronic ballasts, T8 and T5-HO high bay fixtures, LED bulbs, and LED tubes

were reduced. Using a web survey with market experts and the Delphi panel, the team was also able to establish that the strategies implemented by HQ quantifiably contributed to the factors most important to market transformation.

The study provided a complete accounting of the energy impacts of HQ CII lighting programs and activities, as well as demonstrated a method for estimating market transformation savings a posteriori. While the study met the objective of estimating HQ impacts on the CII lighting market, the team identified several lessons learned in completing this study. These lessons are particularly applicable to those program administrators or evaluators looking to pursue a market transformation evaluation approach either in addition to or as a shift from a resource acquisition evaluation framework.

First, although it is possible to apply a market transformation framework retrospectively, this approach led to several challenges for the team and increased the level of effort required to obtain robust measurements. Therefore, the team reiterates the two following recommendations made by Rosenberg and Hoefgen (2009): (1) At the onset, identify programs in the utility portfolio that are likely to generate market transformation savings and focus market-oriented planning and evaluation efforts on those programs; and (2) commission initial market characterization research for the given products and services and ongoing market data research.

We recommend identifying products with market transformation savings potential and tracking these products at measure level even if they are part of a broader program that is evaluated at project level (e.g. a whole building program). This will ensure that the required data is available to reduce the level of effort when accounting for double-counting in a market transformation study.

As for the methodology used in this study, the team identified four lessons learned.

Importance of establishing the right list of market experts: Given that the web survey and Delphi panel were the primary sources of data, a lot of effort was required to build the contact list. The team found that working with utility staff to generate a list of contacts from various sectors (manufacturers, distributors, regulators, etc.) was very cost-effective. In addition, using web survey responses to identify experts with deep knowledge of the target market and who could participate in the Delphi panel was very effective.

Advantages of web survey over telephone survey and leveraging secondary data: Using a web survey rather than a phone survey allowed more data to be presented to market experts and enabled a higher volume of information to be collected from respondents. The team also found that using secondary data, when available, to initiate feedback during the web survey proved an efficient means of accelerating consensus on the results. Due to the relatively rapid convergence of results, only two rounds of the Delphi panel were necessary.

Delphi panel method is best suited to those utility efforts whereby there has been collaboration with market actors: The study found that the influence of the program administrator on the market is more easily captured through the Delphi approach for products more visibly promoted by the program administrator or that have been targeted through partnerships with market actors. Using a Delphi panel can lead to underestimating impacts on products for which program administrator efforts are less visible. The Delphi panel method is therefore suitable when program administrators work closely with various market actors, which should be the case in most efforts aimed at transforming a market.

Limit scope of studies that use a similar method to one or two products: This study served to evaluate four lighting products over five years, which required a large amount of data to be collected and meant that certain data needed to be extrapolated. The team recommends limiting similar studies to one or two technologies to enable the evaluator to collect additional data on target technologies and deepen analysis to increase the robustness of savings estimates.

References

Rosenberg, M. and Hoefgen, L. 2009. "Market Effects and Market Transformation: Their Role in Energy Efficiency Program Design and Evaluation." Prepared for CIEE Market Effects Program, California Institute for Energy and Environment.

Vine, E. 2013. "Transforming the energy efficiency market in California: Key findings, lessons learned and future directions from California's market effects studies." Energy Policy 59, pp. 702-09.