

# Proven Delivery Models for LED Public Lighting:

Joint Procurement Delivery Model Case Study

Ontario, Canada

**Pedzi Makumbe, Debbie K. Weyl, and Andrew Eil, Jie Li**

Standard ESMAP text placeholder

# Contents

- Figures ..... 4
- Acronyms and Abbreviations ..... 5
- Acknowledgements ..... 6
- Joint Procurement Delivery Model Case Study ..... 7
- Ontario, Canada ..... 7
  - Introduction ..... 7
  - Context ..... 8
  - Tracing the Implementation Process ..... 10
    - Project Development ..... 10
    - Financing ..... 11
    - Procurement Processes ..... 13
    - Installation ..... 16
  - Lessons Learned ..... 18

# Figures

Figure 18: Implementation flow chart – Ontario Local Administration Services (LAS) EE street lighting project .....10

Figure 19: Key notional flows in the Ontario LED joint procurement project ..... 13

## Acronyms and Abbreviations

AMO	Association of Municipalities of Ontario
C\$	Canadian dollar
CDCF	Community Development Carbon Fund
CIDA	Canadian International Development Agency
DUT	design-upgrade-transfer
EPC	energy performance contract
ESCO	energy service company
ESMAP	Energy Sector Management Assistance Program
GAM	Global Adjustment Mechanism (Ontario)
GENDR	Environment and Natural Resources Global Practice
GIS	geographic information system
GSURR	Urban, Rural, and Social Development and Resilience (Global Practice)
HPS	high-pressure sodium
IESL	Innisfil Energy Services Limited
IESNA	Illuminating Engineering Society of North America
IESO	independent electricity system operator
IGA	investment grade audit
JI	joint implementation
kWh	kilowatt-hour
LAS	Local Authority Services, Inc.
LDCs	local distribution companies
LED	light-emitting diode
OPA	Ontario Power Authority
RTE	RealTerm Energy
SOE	Save on Energy
TWh	terawatt-hours

## Acknowledgements

This case study was written by Pedzi Makumbe, Debbie K. Weyl, Andrew Eil, and Jie Li, with funding from the World Bank's Energy Sector Management Assistance Program (ESMAP) and the Community Development Carbon Fund (CDCF), both of which are multi-donor technical assistance trust funds administered by the World Bank. The work was led by ESMAP in close collaboration with the Social, Urban, Rural, and Resilience Global Practice (GSURR) and the Environment and Natural Resources Global Practice (GENDR) of the World Bank Group. The authors would like to thank Kerry Wilson of RealTerm Energy; Phil Jessup of LightSavers Canada; Scott Vokey of Local Authority Services (LAS), Ontario; George Shaparew of InnPower (Innisfil, Ontario); and Brian Aaltonen of the Municipality of Greenstone, Ontario.

The report benefited tremendously from support and comments by Rohit Khanna, ESMAP Practice Manager, World Bank. It also significantly benefited from comments by Wendy Hughes, Lead Energy Economist, ESMAP, World Bank; Ivan Jaques, Senior Energy Economist, ESMAP, World Bank; Martina Bosi, Senior Energy Economist, ESMAP, World Bank; Ashok Sarkar, Senior Energy Specialist, World Bank; and Luiz Maurer, Principal Industry Specialist, International Finance Corporation.

# Joint Procurement Delivery Model Case Study

## Ontario, Canada

<b>City name</b>	<b>Association of Municipalities of Ontario</b>
<b>Project dates</b>	<b>Fall 2013 – Fall 2016</b>
<b>Project size</b>	<b>127 municipalities in Ontario as of August 2015</b>
<b>Implementing agency</b>	<b>RealTerm Energy (RTE) – ESCO and operator/service provider; Local Advisory Services, Inc. (LAS) – joint procurement agency</b>
<b>Funding mechanism</b>	<b>Municipality financing and ESCO</b>
<b>Implementation/procurement process</b>	<b>Joint contracting of ESCO, and procurement of luminaires; individualized municipality contracts with ESCO</b>
<b>Expected energy savings</b>	<b>40–60%</b>

### Introduction

The Province of Ontario, in east-central Canada, consists of 444 municipalities and represents 13.6 million residents, or more than one-third of Canada’s population. Roughly two-thirds of these municipalities are small, containing fewer than 10,000 residents and fewer than 2,500 streetlights (luminaires); about 100 of the municipalities are mid-sized; and 41 are large municipalities of 50,000 residents or more. Almost all the province’s municipalities are dues-paying members of the nonprofit Association of Municipalities of Ontario (AMO), which helps to lobby the provincial and national government on behalf of municipalities. AMO has a wholly-owned nonprofit corporation, Local Authority Services, Inc. (LAS) that does bulk procurements of a number of commodities, products and services for AMO’s constituent municipalities, which comprise 360 of Ontario’s municipalities.

Several factors drove AMO to launch its LED lighting program. The high operating costs associated with Ontario’s public lighting—mostly high-pressure sodium (HPS) lamps, which consume a significant amount of electricity—were a key challenge. There are approximately 70 different utilities in Ontario, and each utility charges a different rate for electricity. Each rate is further divided into volumetric and fixed charges. In some small utilities’ coverage areas, volumetric charges are low and fixed charges are high, making it difficult for customers to save money by saving energy. In those towns, maintenance cost for old, HPS streetlights tend to be particularly high. For instance, in the municipality of Greenstone, in the remote northwest of Ontario, the nearest repair crews are at least three hours away by car, making it costly and slow to request service when lights break. The old infrastructure, which had not been updated for several years, only exacerbated the problem.

AMO and LAS were also driven by the activism of nonprofit groups such as LightSavers, an energy-efficient street lighting advocacy organization. LightSavers secured the support of several key stakeholders such as Natural Resources Canada (Federal Ministry of Natural Resources), the Toronto Atmospheric Fund, and the Canadian Urban Institute. Together, they supported cities by offering training, publishing reports, and implementing pilots using funding from programs such as the Technology Development Fund.

Opportunities also encouraged AMO and LAS. For instance, as discussed in the next section, there were substantial federal incentives for energy efficiency, as well as provincial incentives established by the then Ontario Power Authority, now the Independent Electricity System Operator (IESO). Prices of LED lights were dropping steeply and cities were warming to the concept of joint procurement.

After assessing their options, AMO and LAS chose to adopt the joint procurement model on behalf of their municipalities in order to (a) leverage their scale and buying power to secure lower prices and (b) relieve smaller municipalities of the burden of designing and managing a complex, two-stage procurement of energy services and luminaires.

As of August 2015, 127 municipalities had participated in the LAS LED joint procurement, and more than 101,000 fixtures had been purchased. The first group of municipalities participating was virtually all small towns in northern Ontario, with an average of 300 luminaires per municipality. RealTerm Energy (RTE) had installed more than 25,000 fixtures in 40 municipalities, and expected to reach 75,000 by the end of the year. The remaining municipalities installing or expected to install by early-to-mid 2016 will exceed 100,000 luminaires, for an average of nearly 1,000 luminaires per municipality.

## Context

The context in Ontario was encouraging for LED programs at federal, provincial and municipal levels. At the federal level, there were a number of incentive programs funded by the Federal Gas Tax that municipalities tapped into for municipal energy efficiency retrofits and upgrades. The Federal gas tax is a transfer from the government of Canada each year to each municipality based on population; it is an environmental measure aimed at reducing greenhouse gases. The gas tax funds can be used on expenditures in a number of eligible categories, including community energy projects; because street lights fall within “community energy,” they have benefitted from the program.

At the provincial level, Ontario Power Authority (OPA), now merged with IESO, made a significant commitment to energy efficiency. IESO has a comprehensive master plan with ambitious energy efficiency goals, implemented with both environmental and economic rationales in mind. Known as “Conservation First,” this energy efficiency approach puts “conservation at the forefront of Ontario’s energy planning and procurement processes, ensuring it is the first option to be considered in planning for electricity needs.” IESO’s Conservation First Framework, developed in 2014, “maps out Ontario’s energy conservation goals” from 2014 to 2020, “emphasizing a coordinated effort within all stages of energy planning, as well as more effective teamwork among sector partners, particularly in support of local distribution companies (LDCs).”<sup>1</sup>

The framework targets a total electricity use reduction of 8.7 terawatt-hours (TWh) in Ontario between January 2015 and December 2020: 1.7 TWh to be achieved through conservation projects with transmission-connected customers, and 7 TWh from conservation programs delivered by LDCs to residential and business customers across the province. It expects investments of US\$2.2 billion of electricity ratepayer funds, often in the form of subsidies and rebates, to deliver benefits of at least

---

<sup>1</sup> IESO website, “Conservation First Framework”, accessed August 18, 2015.  
<http://www.ieso.ca/Pages/Conservation/Conservaton-First-Framework/default.aspx>



US\$3.1 billion.<sup>2</sup> The subsidies are paid out of a large public fund, the Ontario Global Adjustment Mechanism (GAM), which is replenished by surcharges levied on all rate-paying electricity customers in the province. The GAM, which varies annually, accounts for the differences between the market price and the rates paid to regulated and contracted generators. The GAM fund covers various initiatives including the province's energy conservation and demand management programs.

As part of this commitment to energy conservation, IESO provides very significant fiscal incentives of up to 30 percent for energy efficiency in the form of energy efficiency infrastructure rebates through a program called "saveONenergy" (SOE). (While SOE existed before the new Conservation First framework, IESO has continued it and absorbed it into Conservation First.) SOE rebates are available to a range of players in the energy space: businesses, municipalities, utilities, and LDCs. The IESO committee that oversees the SOE program decided, in consultation with local utilities, to create incentives to adopt LED streetlights that mitigate LEDs' initially higher capital costs (compared to incumbent technologies). IESO intends to continue LEDs' inclusion in the SOE program, as local utilities submit rebate plans for late 2015 and early 2016. However, it is possible that IESO will lower the amount of the "outdoor lighting incentive," as it is known, to reflect the growing cost-competitiveness of LEDs in the market without incentives.

In 2011, the OPA/IESO set the incentive for energy efficiency upgrades at C\$0.05 per kilowatt-hour (kWh). A municipality calculates the project costs and benefits, applies to IESO, gets pre-approved, and then can procure the product. The municipality then verifies savings after installation to secure its rebate. In 2014, IESO changed the incentive to a tier-based system based on the wattage of fixtures, which effectively increased the size of the rebate by a factor of five. The C\$0.25/kWh incentive has had a big impact in terms of driving participation in the LED public procurement. The incentive alone is covering 18–20 percent of the project cost (or more). Though a sunset date has not been announced, many officials in Ontario are anticipating the incentive will not for a long time.

At the municipal level, municipalities tend to own and maintain their streetlights (there are only two exceptions in the province where streetlights are owned by utilities: the cities of Toronto and Sault Sainte Marie). They generally pay the utilities monthly for electricity for street lighting. As streetlights are very seldom metered, the payments are negotiated between municipalities and utilities based on the estimated amount of electricity consumed; this is derived from the number of luminaires, their wattage, and number of hours in operation. For most municipalities, the consumption component of the electricity bill can be significant, so there is a strong incentive to be energy efficient. When retrofitting and upgrading the network, RTE offers to work with its municipality customers to renegotiate their street lighting electricity payments.

Also helpful was the presence of a strong regional association of municipalities, AMO, and its nonprofit corporation LAS. The mandate of LAS is to help municipalities save money, make money, and build capacity; as such, the goal of its programs and services is to leverage economies of scale that result in increased revenues and/or decreased costs for these organizations. LAS' services are overseen by a board of directors composed of elected officials and staff from municipalities from all

---

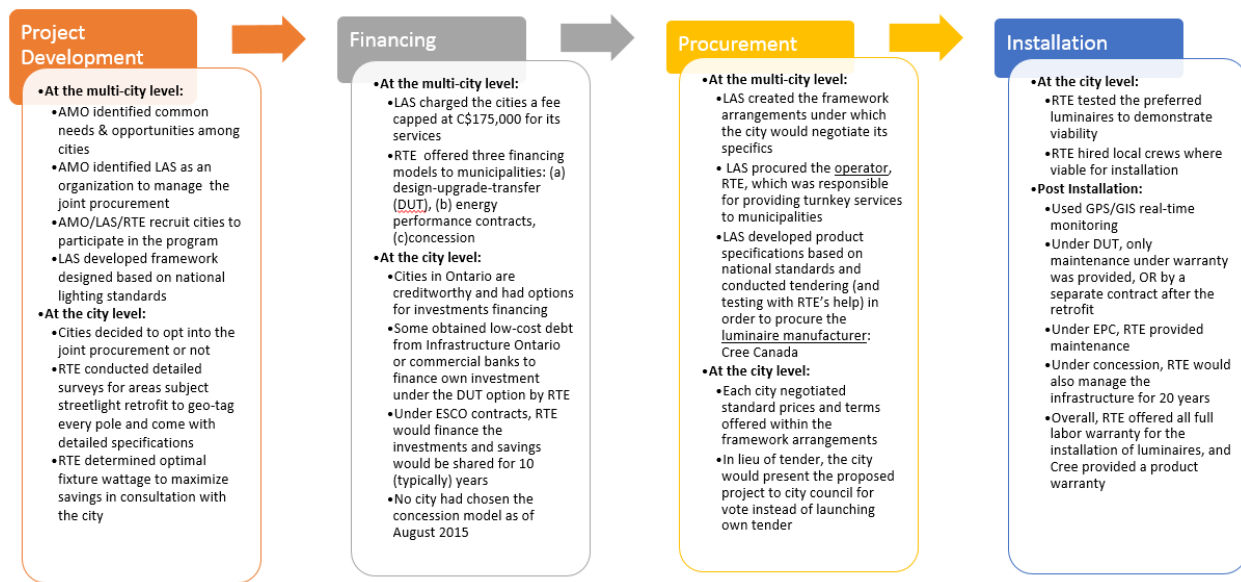
<sup>2</sup> [http://www.powerauthority.on.ca/sites/default/files/page/Conservation-First-Framework-Update\\_0.pdf](http://www.powerauthority.on.ca/sites/default/files/page/Conservation-First-Framework-Update_0.pdf)

across Ontario. LAS provides a suite of 14 different goods and services, including bulk procurement of fuel and electricity, to more than 350 municipalities in the province.

For the streetlights program, LAS and its selected operator, RTE, directly approached municipalities to propose street lighting upgrade programs. Participating in the program would enable municipalities to navigate the process of upgrading their lighting infrastructure with few difficulties. LAS’ track record of providing municipal services in energy and other areas facilitated this arrangement. Once city managers were convinced, LAS and RTE were often able to directly present their value proposition to city councils, enabling expedited decision-making.

## Tracing the Implementation Process

The implementation process in Ontario is summarized in Figure 1.



**Figure 1: Implementation flow chart – Ontario Local Administration Services (LAS) EE street lighting project**

## Project Development

The project development had two stages. The first was a framework design grounded in national standards, LED studies by LAS, and so on (see under “Procurement” below)—that allowed LAS to choose RTE as an operator. Roadway lighting standards are the baseline established within the industry to ensure both that lighting characteristics are fairly uniform and that the quality level meets minimum thresholds for various road types. The primary standard for streetlight installations throughout North America is the RP-8 American National Standard Practice for Roadway Lighting developed by the Illuminating Engineering Society of North America (IESNA), which is the technical authority on lighting. RP-8 is the most common lighting standard for roadways and sidewalks in Ontario.

Once RTE was on board as an operator, and a municipality had signed onto the joint procurement, project development would focus on each municipality. As part of the scoping and design work, RTE would gather GIS data on pole locations and heights to allow for robust planning and photometric design as well as real-time data management for operations and maintenance. To do this, at the outset of the design phase, RTE would hire fleet captains, called a “flex force,” using trained individuals identified locally in each municipality. RTE customized an app for GIS mapping, using Google Earth and an Esri smart-phone app, and equips all its service personnel with iPads or iPhones to geo-tag every pole. By hiring temporary labor for pole-tagging rather than outsourcing to a third party, RTE claims a savings of up to 90 percent, or roughly US\$20, per pole. RTE also records fixture height and takes video of tree cover to customize the most appropriate LED model and position for each pole, enhancing potential savings and customer satisfaction.

Most existing, older luminaires in Ontario are 250-watt high-pressure sodium (HPS) bulbs though the procurement notes that there are seven wattages subject to replacement, ranging from 75 to 400 watts, all in cobra-head configuration (some replacement fixtures are squarepacks rather than cobra-head). In some instances, where manufacturers recommended replacements with 89 or 95 watts, 25-watt LEDs were deemed appropriate by the photometric designer, depending on fixture height. A range of cobra-head LED fixtures were included in the LED hardware joint procurements LAS conducted in 2011 and again in August–September 2014, both of which were won by Cree. RTE worked with municipalities to provide other manufacturers’ luminaires for specialty “decorative” poles and fixtures.

Cree’s lights do not have pre-installed adaptive control but are compatible. Adaptive control is not currently being installed as part of the joint procurement. Some cities in Ontario are considering the use of adaptive controls on their own, though RealTerm and LAS consider current technology not to be cost-effective in terms of generating sufficient additional savings to offset costs.

## Financing

Municipalities in Canada in general, and in Ontario in particular, have good credit because of statutory provincial-level restrictions on the amount of debt municipalities can issue and carry. In Ontario, municipalities are limited to debt service payments no greater than 25 percent of total revenues. In practice, debt servicing expenditures are very low and dropping, only 3.3 percent of all municipal expenditures in 2008. Consequently, most municipalities have excellent credit ratings and the ability to secure credit at low cost from private sector institutions, including banks as well as other lenders. Infrastructure Ontario, a provincial government financing agency, also offers large-scale loans to municipalities on very competitive and often below-market terms. Infrastructure Ontario raises US\$300–400 million annually from the public, which is then distributed in debentures (general obligation bonds) at rates of 2–3 percent, in most cases significantly below market rates. Ontario municipalities apply to Infrastructure Ontario to access this debt.

In some cases, municipalities seek to fund their street lighting upgrades not through direct infrastructure loans from Infrastructure Ontario or debt issuance, but through other means. For example, the town of Innisfil turned to Innisfil Energy Services Limited (IESL), a local government-

owned corporation, to finance its street lighting upgrades. IESL in turn received a loan from a commercial bank to execute the contract with RTE, and handled the payments to RTE.

RTE offers three financing and operational models:

- A ‘design-upgrade-transfer’ (DUT) contract, sometimes called a ‘design-retrofit-transfer’ contract;
- A shared-savings ESCO contract (an energy performance contract, or EPC); and
- A concession.

Under *DUT*, the municipality supplies the capital for the project, and hires RTE for the three elements of the contract. The only maintenance that is provided is that under warranty, or by contracted arrangement thereafter; the municipality owns all infrastructure and keeps all savings after RTE is paid.

Under the *shared-savings ESCO contract*, RTE provides the capital, and savings from the street lighting system are shared at a negotiated rate for a period of up to 10 years, the typical length of a contract. Because of rapid paybacks and low interest rates, RTE is offering 5- and 7-year contracts to municipalities as well. The city shares the savings under the ESCO contract (versus retaining all savings under the DUT) because the city must pay back the principal and financing cost borne by RTE up front.

Under a *concession*, in addition to providing all the services of DUT and shared savings ESCO contracts, RTE manages the street lighting system for up to 20 years, bearing all maintenance and upkeep responsibilities, including a potentially wider range of infrastructure construction and retrofitting than under the DUT/ESCO model, in which infrastructure upgrades are more limited. (The concession option is reserved for much larger municipalities, and no cities have yet selected it.)

Because of the availability and affordability of municipal finance in Ontario, few municipalities have selected the ESCO model where financing is provided. The share of shared-savings ESCO contracts has declined; 7 of the first 35 municipalities (or 20 percent) selected EPC at the outset, with the remainder selecting DUT contracts. But as larger municipalities sign on with greater access to capital, DUT is winning out more often, with 116, or roughly 90 percent, of the 127 municipalities that have subscribed to the joint procurement.

However, there is an advantage to shared-savings contracts in Ontario: savings are essentially guaranteed because electricity use is calculated by formula rather than measured (luminaires are not metered in Ontario); in other words, the savings are deemed. The new street lighting charges are negotiated with the utility or local distribution company on the basis of electricity rates, luminaire wattage (according to a preapproved list of certified fixtures) and hours of operation, and are effectively codified before the project begins. Because usage is automated, and electricity and luminaire performance are reliable, there are essentially no “surprises” in savings and performance. Verification is generally limited to sight-based field visits for monitoring and verification by local distribution companies (utilities). These visits tend to rely heavily on RTE’s GIS/GPS-based geospatial inventory of fixtures, which greatly streamlines visual surveys.

Both contract structures effectively provide full warranties and maintenance. For the ESCO structure, all service within agreed parameters (e.g., product failure and natural conditions, as opposed to local

vandalism or negligence). For the DUT structure, there is a warranty period of 10 years for materials (luminaires and related electronics). RTE also provides full labor on the workmanship of the installation for the first 12 months. For the subsequent nine years, RTE’s and Cree’s warranty covers only materials; maintenance costs are additional.

As described above, incentives have played a key role in the financing of the project. For instance, the city of Innisfil, with 2,814 luminaires, has applied for a US\$300,000 incentive amount (effectively, a rebate) on a US\$1.1 million investment in LED streetlights—a subsidy of 27 percent—through the provincial “saveONenergy” program. This subsidy more than doubled the net present value of the 10-year contract for Innisfil, from US\$230,000 to US\$530,000.

Figure 2 summarizes the overall flow of financing.

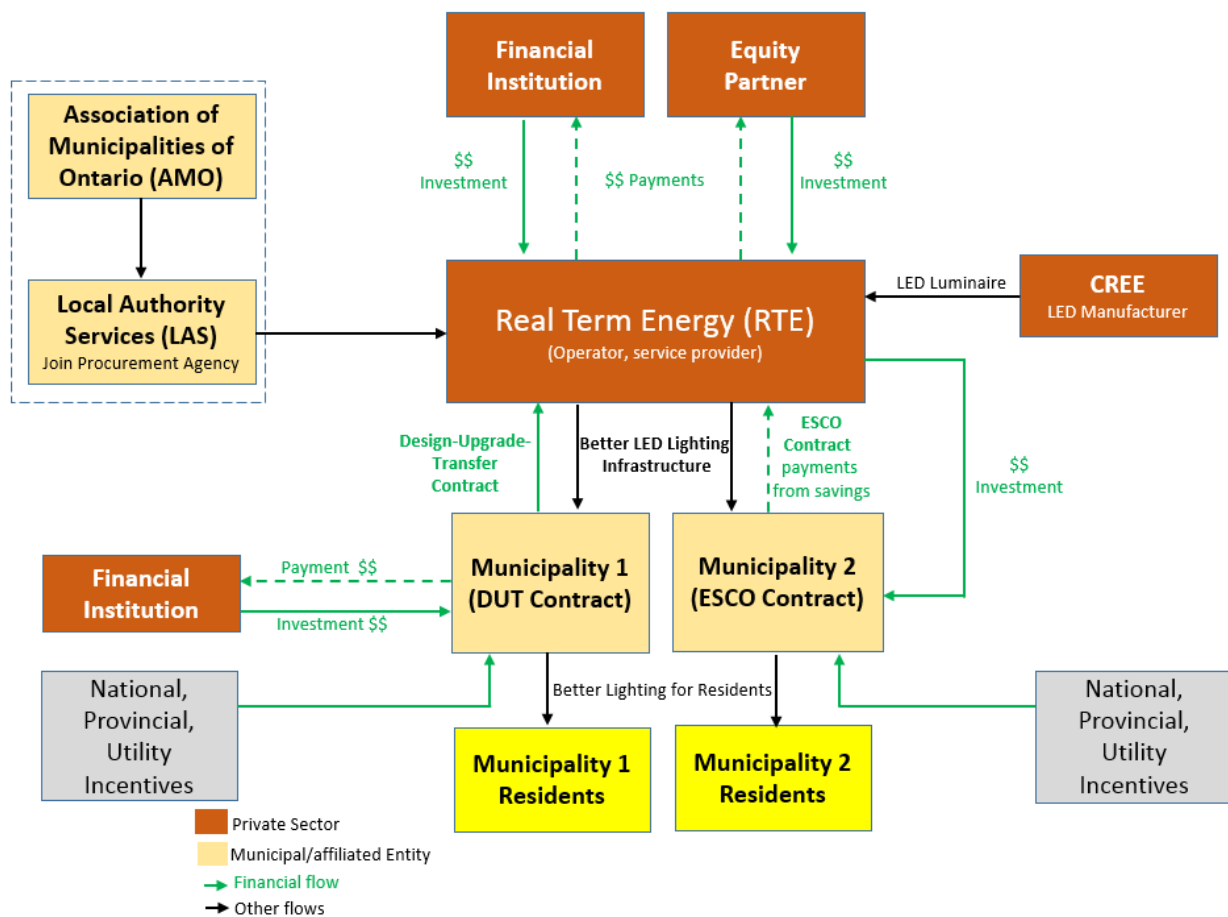


Figure 2: Key notional flows in the Ontario LED joint procurement project

### Procurement Processes

Municipalities often face transparency and competitiveness requirements when conducting public procurements, and developing specifications and evaluating tenders can take hundreds of man-hours. Smaller municipalities with limited manpower, expertise, and ability to attract high-quality

vendors find such procurements onerous. Consequently, many small municipalities rely on the AMO and LAS to conduct competitive procurements, whether in a centralized manner (distribution of goods and services to municipalities with fixed cost and terms), or through joint procurements. Joint procurements differ from centralized procurements. Centralized procurements create a single contract for procurement that is divided among all the participating entities. Joint procurements secure certain terms of procurement that lay the foundation for opt-in contracts signed directly by individual entities eligible for the procurement terms with the selected vendor. The LED street lighting procurement fits into the latter category as an opt-in joint procurement. Even when opting into the joint procurement, each municipality negotiates most of the specifics of the contract, including the selection of luminaires, with RTE, the operator.

LAS has divided the joint procurement into two primary components:

- *Procurement of an operating agent (or service provider) and hardware manufacturer.* The operating agent is responsible for handling turnkey service for municipalities, including design, installation, maintenance, and other ancillary services such as financing, data management, and interfacing with local distribution companies and utilities, per the preferences of the client municipalities and as negotiated in individual contracts.
- *Setting of standard prices and terms offered to be offered to each client municipality.* Each municipality determines its preferred contract type—service contract, shared savings ESCO contract, or concession—and negotiates its own contract (though most use a common municipal-service contract template) with RTE. In lieu of a tender, each municipality then presents the proposed project to its town or city council for review. Approved projects can proceed to implementation immediately, without a further public procurement. The manufacturer is then selected to provide LED streetlights at high volume, in a timely manner, and to certain standards with certain warranties. Pricing of a suite of LED luminaire models is fixed and available to all participating municipalities. LAS recoups the cost of its part of the program by charging a percentage fee on the fixture cost of the transaction, capped at US\$175,000 for any one transaction.

#### *The Selection of RealTerm Energy as Operating Agent/Service Provider*

Because the LED streetlights marketplace is crowded, a significant number of municipalities have requested LAS' assistance in selecting a provider for LED streetlights. LAS had been monitoring developments in streetlight technology since 2008, and ramped up this analysis in the fall 2012. Municipal staff asked LAS to develop a complete turnkey service that provided product, project management, design, finance and all other required services in one single offering. Two key considerations emerged:

- The importance of independently confirming the manufacturer's specifications, as in some instances the actual product performance did not always match manufacturers' claims; and
- The need for independent photometric design—that is, the specialized engineering of site-specific street lighting systems, including appropriate luminosity and directional positioning of light fixtures, height and location of poles, and so on—to improve luminaire appearance and suitability as well as provide deeper energy savings.

In winter 2012–13, a three-person selection committee conducted a market assessment in three steps: (a) a literature review; (b) interviews with all available providers in the Ontario marketplace and finally (c) direct negotiations with two consortiums of firms. First, the LAS Selection Committee consulted pilot studies, protocols and standards, and tender documents from many Canadian municipalities as well as institutes specializing in municipal street lighting. Second, it conducted a series of interviews with municipal representatives of all the existing LED streetlight installations in Ontario that had progressed beyond a small pilot in order to identify qualified vendors, evaluate results and determine key considerations. Common themes emerging from this exercise included the realization that product selection was only one small part of the overall project, full photometric design is essential, and it is crucial to have the local utilities involved throughout the whole process.

LAS determined that it wanted a service provider that could provide:

- Lighting design solutions that include photometric lighting layouts, 2-D line drawings, 3-D full-image drawings, material specifications, virtual streetscapes, and budget analysis—all of which must show design data at 50,000 hours or greater and focus on Downward Delivered Lumens (light pointing downward from the fixtures) using an acceptable color temperature range in accordance with IESO testing standards;
- Design work that is a complete street-by-street offering and not simply a representative sample of roadway types;
- Complete GIS/GPS mapping of existing streetlight inventory for municipal asset management purposes;
- Ready access to a contractor/installer base throughout the province;
- Complete recycling and disposal of removed products that meets or exceeds requirements under the “saveONenergy” incentive program;
- An optional financing component for interested municipalities; and
- Robust project management and quality management processes backed by delivery guarantees.

LAS identified two consortiums of firms that could offer a complete turnkey service that met or exceeded all of their requirements. LAS entered into direct negotiations with those two consortiums before selecting RealTerm Energy (RTE) in March 2013 because it was the best value-offering available (that is, the best combination of low price and high service quality) and could also provide enhanced photometric design and custom-built installation software applications. Based on the fact that RTE was the only market participant offering these services at that time, LAS declined to conduct a tender.

LAS and RTE signed a three-year contract in fall 2013 that expires in 2016. The joint service provider contract will be re-competed at that time if the program is to be continued. RTE’s proposal at that time included an exclusive supply contract from Cree, a U.S.-based LED manufacturer. The selection of Cree was considered part of the offering from RTE for the first year of the joint procurement program. By 2014, however, the number of players in the LED market had greatly expanded as technologies improved and prices dropped. Consequently, LAS determined it should conduct a new procurement for the LED luminaires, with the selected supplier committing to work with RTE as

service on the execution of orders, and transferring product warranties to RTE and the client municipalities.

### *The Selection of Cree as LED Luminaire Manufacturer*

In an effort to offer top-quality products at the best value possible in a rapidly evolving marketplace for LED streetlights, LAS staff commenced an RFP for streetlight products in mid-2014. The LAS pre-procurement study had concluded that LAS would pursue only those firms (or a consortium of firms) that could also offer the following:

- Products achieving significant energy reduction (at least 40 percent) and requiring reduced maintenance while meeting or exceeding all of the standards discussed earlier;
- Luminaires that can be fitted to multiple types of fixtures (cobra head and decorative, for example) that utilize the current pole/mounting system;
- Lighting design solutions that include Photometric lighting layouts, 2-D line drawings, 3-D full-image drawings, material specifications, virtual streetscapes, and budget analysis—all of which must show design data at 50,000 hours or greater and focus on Downward Delivered Lumens using acceptable color temperature range in accordance with IESO testing standards;
- Products wired with and/or capable of installing wireless controls that allow for setting light level transition times, adjusting light output levels, and notifying controllers of outages and other problems for improved maintenance;
- Ready access to a contractor/installer base throughout the province;
- Recycling and disposal of removed products where required;
- A clear description of how the warranty is triggered and who honors it (a 10-year warranty on luminaires and minimum 5-year warranty on all other components); and
- Optional financing components for interested municipalities, including an energy performance contract.

The procurement did not specify a demand for adaptive controls (to allow for real-time adjustment in light intensity).

Five bidders participated in the summer 2014 luminaire procurement, which was announced in August and closed in September. The 15 evaluators each submitted scores for the five submitted bids, which LAS averaged out. The top two bids – Cree and another manufacturer – were 0.3 points apart on a 130-point scale. To determine a clear winner, LAS and RTE simulated cost and performance for real-life Ontario municipalities participating in the joint procurement. Using data from six municipalities already mapped by RTE as LED procurement clients, LAS and RTE simulated implementation of each manufacturer's products and prices, using two different scenarios and standard terms and conditions, for each of the municipalities to project both initial project costs and life cycle costs with Cree and other manufacturer. Cree won in 11 of 12 scenarios. Consequently, in December 2014 LAS selected Cree Canada as the winning supplier.

### **Installation**

Installation did not immediately commence upon the selection of RTE in March 2013, because the procurement merely provided a framework for municipalities to sign service contracts with RTE,



rather than creating the service contract itself. Cities began to sign on to the joint procurement in late 2013 and early 2014.

The installation was ongoing as of August 2015, with the first crop of 15 municipalities having installed their luminaires roughly one year ago, with the remaining 100 or so municipalities either in the process of full installation, in the design stage, or in the queue for installation. Cities signed on, and continue to sign up, at their own pace following the completion of the services and luminaires procurements.

Despite the rapid and massive scale-up required to add more than 100 cities to the program, RTE has managed to meet demand for its services by investing heavily in its own business. It has hired nearly 40 staff, purchased 10,000 luminaires up front, and invested in its design, upgrading and maintenance infrastructure. RTE has fueled its increase in service capacity through both sustained investment by its owners and recent efforts to secure C\$6-\$7 million in bank loans at roughly 4 percent interest.

The process of signing on municipalities to the joint procurement requires a number of steps, as follows:

1. The municipality returns a questionnaire to LAS.
2. RTE prepares a proposal and a Letter of Intent to engage.
3. The municipality presents both to the City Council. (LAS and RTE are often present at such Council meetings at the municipalities' request).
4. RTE sends field surveyors to the municipality to collect all GIS/GPS data on every streetlight (pole height, fixture height, setback, arm length, etc.). After the data are sent to the design and finance teams, RTE produces an investment-grade audit (IGA) including full photometric design.
5. The municipality approves the IGA, then signs either a service contract (the DUT option) or an ESCO contract with financing (the ESCO option).
6. Incentive applications are submitted, products ordered, and installers confirmed.
7. The incentive is pre-approved, the product arrives, and then installation commences.
8. Installation is carried out.
9. Commissioning activities are carried out, including safety inspections, the incentive M&V process, utility bill adjustments, and so on.

To recruit cities, LAS and RTE have done an aggressive “road show,” visiting town and city councils and presenting their technology, turnkey services, and financial model. RTE is very transparent about its revenues and profit margins, which are under 10 percent before considering debt. They have often won over skeptical local officials with the transparency of their costs, commitment to quality, willingness to work with local road crews through subcontracting, and efficacy of their GIS-enabled, real-time data analysis of the condition of all poles and luminaires.

Reports of satisfaction with luminaire performance and service are widely prevalent, according to both the operator, RTE, and a survey of participating city managers. The failure rates of LED luminaires have been negligible. RTE does not yet have comprehensive savings data, but claims an average of 60–65 percent electricity (consumption) savings per municipal system. While there have been some complaints from residents about the quality of the light in the municipality of Greenstone,

the city manager suspects that this is because lights are directed onto roadways rather than illuminating private sidewalks and driveways as previous lights had—creating a new lighting need for private citizens (but one that never was the responsibility of the municipality). In general, the widespread customer satisfaction appears to be a testament to the rigor of the procurement process and the quality of services and product offered by RTE and Cree.

The combination of the LAS joint procurement, the provincial fiscal incentives, the drop in the cost of LEDs, and the market entrance of a number of high-quality implementers has led to a rapid expansion of LED street lighting in the province. The number of Ontario municipalities electing to install LED streetlights, both within and independent of the LAS/RTE joint procurement, continues to grow rapidly.

Now, moreover, larger cities are increasingly opting for LEDs. Whereas some larger cities—including Barrie (population 136,000), Aurora (53,000), and Timmins (43,000)—have joined the joint procurement, others—including London (366,000), Sudbury (160,000), and Sault Ste. Marie (75,000)—have issued their own independent tenders for LED street lighting.

## Lessons Learned

- *A centralized entity with full membership, technical capacity, and trust of the constituent municipalities was able to conduct a joint procurement and recruit city participants.* Without such a central entity, the enabling coordination mechanism among the municipalities would have been absent. The flexibility of cities to choose their own contract and financing terms with the operator (keeping luminaire costs and operator and manufacturer selection fixed) facilitated the participation of scores of municipalities.
- *The operator's (service provider's) experience, competence, and substantial capacity to execute are essential for large joint or centralized procurement to succeed.* Despite a massive scale-up in size over two years, RTE has maintained a reputation for quality and customer service.
- *Perceptions among some of an unfair tendering process biased towards a particular manufacturer may have lowered the rate of municipalities' sign-up for the program.* However, there is no evidence of any shortfall in cost or performance or any other irregularities in the procurement.
- *The operator's use of expert but cost-efficient in-house photometric designers was effective.* The designers, who provided location-specific and customized fixture selection to meet local needs, found they could reduce wattage from existing luminaires by up to 90 percent. This dramatically increasing energy savings beyond the expected standard for the HPS-to-LED transition. The photometric design added nominal costs and additional time to the project preparation, but, according to RTE, has consistently yielded 12–15 percent additional energy savings beyond those of standard LED upgrades without customized design.
- *A reported 80 percent of savings for municipalities stemmed from reduced maintenance costs.* In high-labor-cost environments or in low-density settings where sending repair crews is prohibitive, improved performance and bulb lifespan outstrips cost savings from reduced electricity.

- *The joint procurement delivery model's success is encouraging larger cities to adopt LED street lighting.* The joint procurement mechanism, which has greatly facilitated the adoption of LED street lighting in smaller municipalities, appears to have served as a catalyst and test bed for larger cities' adoption of LED street lighting. The smaller cities' success, coupled with the profusion of procurement and operational models, affordable technology and ample financing, appears to have encouraged larger cities either to join the LAS/RTE joint procurement or to model their own procurements after it.

## Series of Case Studies on Public Lighting Delivery Models

“**Joint Procurement Delivery Model Case Study; Ontario, Canada**” is one in a series of seven knowledge products produced by ESMAP in an attempt to help cities work through the challenges associated with implementing LED programs. The publications include six case studies and a synthesis report which summarizes and synthesizes the case studies. Each case study describes the context in which decisions were made, then recounts the problems encountered and solved in order to realize the implementation of the programs. The challenges include real-life examples of cities managing to attract private sector participants to provide necessary financing and technical expertise; examples of programs implemented in municipalities that are not creditworthy and have limited policy and institutional support; examples involving small municipalities of about 2,500 residents as well as cities with several million residents; examples of cities managing the perceived risk; and finally, examples of cities effectively handling the measurement and verification of electricity savings accruing from the implementation of more efficient LEDs. These case studies are available online:

Cover Image Place Holder	Cover Image Place Holder
Proven Delivery Models for LED Public Lighting: Synthesis of Six Case Studies Illustrating ESCO, Joint Procurement, PPP, Lease-to-Own, Municipal Financing, and Super-ESCO Models	Public-Private Partnership Delivery Model Case Study; Birmingham, United Kingdom
URL	URL
Cover Image Place Holder	Cover Image Place Holder
Super-ESCO Delivery Model Case Study Energy Efficiency Services Limited, Vizag, India	ESCO Delivery Model Case Study Asia Electronics Ltd. India.
URL	URL
Cover Image Place Holder	Cover Image Place Holder
Municipal Financing Delivery Model Case Study Quezon City, Philippines:	Lease-to-Own Delivery Model Case Study Guadalajara, Mexico:
URL	URL