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THE MARKET FOR LED LIGHTING IN CANADA'S PARKING INFRASTRUCTURE

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1. EXECUTIVE SUMMARY

LightSavers Canada is a market transformation initiative of the Canadian Urban Institute (CUI) to accelerate the adoption and deployment of LED lighting and adaptive control technologies across Canada. It was originated by the Toronto Atmospheric Fund and is being funded by Natural Resources Canada (NRCan) to produce this report. LightSavers initially concentrated on LED lighting for municipal street lights. In the fall of 2014, the LightSavers program expanded to LED lighting in parking lots and parking garages.

As part of this work, CUI has produced this report as the first in-depth scan of Canadian parking assets and parking lighting infrastructure, which demonstrates the potential opportunity for LED conversion of parking lighting in Canada. This report was produced using a combination of: publicly available data and reports (e.g. the 2011 report by Navigant Consulting on the US market); surveys of lighting suppliers and parking asset owners; and satellite imagery to determine the current inventory and the fixtures available for LED conversions. Parking inventory data was collected from eight sectors: Multi-Unit Residential, Hospitals, Commercial, Industrial, Airports, Universities, Commuter Transit and Municipalities.

This study estimates Canada's total number of parking stalls to be between 42 million and 85 million stalls, as seen in **Figure 1**. This range accounts for possible inaccuracies and overlaps in the available data, meaning that the actual number of parking stalls is somewhere within the range given. **Figure 2** displays the total number of parking stalls, including number of stalls in lots vs garages. Parking lots were estimated to have an average of one light per twenty stalls, and garages an average of one light per three stalls. These averages were then applied to all sectors, with the exception of the Airports sector where manually collected data was used in the extrapolation process. An estimate of parking lot and garage lighting inventory is shown in **Figure 3**.

Figure 1- Parking Inventory Scenarios

	SCENARIO A	SCENARIO B
Total Parking Stalls	41,600,000	84,700,000
Parking lots	240,000	480,000
Parking lot stalls	35,800,000	72,000,000
Parking garages	9,600	21,200
Parking garage stalls	5,800,000	12,700,000

Figure 2- Breakdown of Lot and Garage Stalls

SECTORS	PARKING LOTS		PARKING GARAGES		TOTAL
	STALLS	%	STALLS	%	
Municipalities	250,000	85%	44,000	15%	294,000
Post-Secondary Education	255,000	85%	45,000	15%	300,000
Airports	41,000	56%	32,000	44%	73,000
Commuter Transit	129,000	85%	21,000	15%	150,000
Hospitals	185,000	85%	33,000	15%	218,000
Multi-Unit Residential	3,140,000	85%	560,000	15%	3,700,000
Industrial	3,200,000	100%	0	0%	3,200,000
Commercial	28,600,000	85%	5,000,000	15%	33,600,000
Approximate Total	36 M		6 M		42 M

Figure 3- Lighting Inventory Scenarios

	SCENARIO A	SCENARIO B
Total parking lighting	3,700,000	7,800,000
Parking lot lights	1,800,000	3,600,000
Parking garage lights	1,900,000	4,200,000

2. INTRODUCTION

2.1 PURPOSE

This report presents the results of CUI's analysis of the current scale of parking lighting across Canada, in order for policy makers, energy agencies and facility owners to identify the full potential for conversion to LED lighting in this market. For this, the report attempts to answer the following questions:

- What is the total number of stalls in parking lots in Canada?
- What is the total number of stalls in parking garages in Canada?
- What is the typical lighting per stall in parking garages and parking lots?
- What is the total market for parking lighting fixtures in Canada?
- Who are the main stakeholders for parking lighting?

2.2 DEFINITIONS:

Parking Lots: Public or private parking facilities that are not roofed or enclosed (outdoors)

Parking Garage: Any roofed parking facility that is at least partially enclosed, including multi-level structures and underground garages.

Parking Stall: A parking space for a single vehicle located in a parking garage or lot.

3. METHODOLOGY

This report was produced using a combination of: publicly available data, existing reports like the 2011 report by Navigant Consulting on the US market, surveys of lighting suppliers and parking owners, and satellite imagery, to determine the current inventory and the fixtures available for LED conversions. Parking inventory data was collected from eight sectors: Multi-Unit Residential, Hospitals, Commercial, Industrial, Airports, Post-Secondary Education, Commuter Transit and Municipalities.

In sectors where there was insufficient data to determine a breakdown between lot stalls and garage stalls, we assumed 85% of the total parking stall inventory is represented by parking lots (i.e. surface lots). This assumption was developed based on a commonly cited research paper for asset surveys on parking lots, entitled, “Parking Infrastructure: Energy, Emissions, and Automobile Life-Cycle Environmental Accounting” by Chester et al.¹ For the Industrial sector, we assumed that there were no parking garages, and therefore applied a percentage of 100% for parking lots.

Using the inventory data acquired from the parking inventory analysis portion of this report, a detailed estimate of parking lot and garage lighting inventory was established. Parking lots were estimated to have an average of one light per twenty stalls, and garages to have an average of one light per three stalls. These averages were applied to all sectors, with the exception of the Airport sector.²

¹ Chester, M., Horvath, A., & Madanat, S. (2010). Parking Infrastructure: Energy, Emissions, and Automobile Life-Cycle Environmental Accounting. *Environmental Research Letters*, 5.

² Navigant Consulting. (2011). *Energy Savings Estimates of Light Emitting Diodes in Niche Lighting Applications*.

4. ANALYSIS

4.1 AIRPORTS (13,000)

a) PARKING INVENTORY

This sector was assessed using a sample of 26 Canadian Airports representing 93.4% of Canada's total air passenger traffic in 2013.³ Total air passenger traffic was used because it presents an accurate measure of the number of parking stalls an airport has since it demonstrates airport usage and size, which are reflected in demand management issues like parking capacity. With the use of publicly available information such as airport websites and satellite imagery, we were able to obtain and cross check a total of 68,972 parking stalls. Further analysis using a slightly smaller sample representing 86% of passenger traffic showed that 55.6% of the total stalls were represented by parking lots. After extrapolating these findings to represent 100% of Canada's air passenger traffic for 2013, the Airport sector had by far the smallest amount of parking stall inventory (73,316, comprised of 40,763 parking lot stalls and 32,552 garage stalls). This was the only sector where there was sufficient data to properly assess the ratio of parking garages (44%) to parking lots (56%). The study by Chester et al. for the US found their ratio to be 15%, or less than half of the ratio for Canadian Airports.

PROVINCE OR TERRITORY	PASSENGER TRAFFIC FOR 2013			# OF PARKING STALLS	
	TOTAL SECTOR	SAMPLE TOTAL	Sample %	SAMPLE	TOTAL STALLS
Alberta	22,700,000	22,500,000	99%	14,800	14,900
British Columbia	24,000,000	21,500,000	90%	11,800	13,200
Manitoba	3,700,000	3,500,000	93%	2,600	2,800
New Brunswick	1,200,000	1,200,000	100%	2,000	2,000
Newfoundland	2,250,000	1,500,000	66%	950	1,400
Northwest Territories	570,000	360,000	63%	220	360
Nova Scotia	3,670,000	3,600,000	98%	4,600	4,700
Nunavut	371,000	120,000	32%	30	90
Ontario	44,900,000	41,700,000	93%	22,500	24,200
Prince Edward Island	295,000	295,000	100%	500	500
Quebec	15,800,000	15,600,000	99%	6,600	6,700
Saskatchewan	2,650,000	2,600,000	99%	2,300	2,340
Canada Approximate	122,000,000	114,000,000	93%	69,000	73,000

b) LIGHTING INVENTORY

There are an estimated 13,000 parking lights in airports across Canada; 16 % of the total luminaires are estimated to be in parking lots that represent 57% of all Canadian Airport parking stalls. The largest 26 Canadian Airports together, excluding London, represent 90 % of the total parking lot lights in Airport parking lots in Canada and 94 % of all Airport garage lights, based on 93 % of all air passenger traffic in 2013. This section had the highest percentage of garages and thus garage lighting.

³ <http://www.statcan.gc.ca/pub/51-203-x/2013000/t003-eng.htm>

AIRPORT PARKING STALLS & LIGHTS			
	<i>Total</i>	<i>Lots</i>	<i>Garages</i>
Parking stalls	73,000	41,000	32,000
Parking lights	13,000	2,000	11,000

4.2 COMMUTER TRANSIT (14,000)

a) PARKING INVENTORY

In this sector, seven systems were evaluated, including three commuter rail lines and four municipal public transportation systems in Ontario, Quebec, Alberta, and British Columbia. Each organization had parking inventory data available, totalling 150,000. (Since BC's Translink and Quebec's AMT did not have a breakdown of their parking assets between commuter rail and their urban transit system their transportation systems were only counted once to produce the total). These four provinces together represent 86% of Canada's national population and most of the country's commuter rail infrastructure with a service population of 18 M or 51% of Canada's population. Hence, extrapolation was not applied to this sector.

Due to the limited amount of data publicly available, about the distinction between lot and garage stalls, we used the representations developed by Chester et al. and the 2011 study by Navigant Consulting. This resulted in a breakdown of 129,000 parking lot stalls and 21,000 garage stalls.

This sector had the second smallest representation of parking stall inventory.

COMMUTER RAIL		
ORGANIZATION	PROVINCE	# OF PARKING STALLS
Agence Metropolitaine de Transport (AMT)	Quebec	35,000
GO Transit	Ontario	65,000
West Coast Express (Translink)	British Columbia	8,000
TOTAL REGIONAL RAIL		108,000
PUBLIC TRANSIT		
ORGANIZATION	PROVINCE	# OF PARKING STALLS
TTC	Ontario	13,000
C-Train	Alberta	17,000
Edmonton LRT	Alberta	5,000
Ottawa (OC Transpo)	Ontario	8,000
TOTAL PUBLIC TRANSIT		42,000
TOTAL		150,000

b) LIGHTING INVENTORY

The Commuter Transit sector has an estimated 152,129 parking stalls and 14,072 lights in approximately 40 garages and 860 parking lots in Ontario, Quebec and British Columbia.

COMMUTER TRANSIT PARKING STALLS & LIGHTS			
	<i>Total</i>	<i>Lots</i>	<i>Garages</i>
Parking stalls	150,000	129,000	21,000
Parking lights	14,000	6,400	7,600

4.3 HOSPITALS (20,000)

a) PARKING INVENTORY

According to the Hospital Beds report by the Canadian Institute for Health Information (CIHI) for the fiscal year 2012-2013, there were a total of 73,589 hospital beds in 603 Canadian hospitals excluding Quebec and Nunavut.⁴ With the use of publicly available data such as hospital websites, provincial websites, open data and satellite imagery, a sample of 72 hospitals (22,500 beds) was further analyzed and found to have 55,228 parking stalls. Comparing our sample with CIHI's report showed a parking stall to bed ratio of 2.3:1. This ratio was then applied to the remaining 531 hospitals that were not part of our sample. We then extrapolated our findings to include Quebec and Nunavut by using data on hospital beds from the Organisation for Economic Co-operation and Development (OECD): Quebec (20,753) and Nunavut (45).⁵

Based on this methodology, this sector has a total parking stall inventory of 218,000 (185,000 parking lot stalls and 33,000 garage stalls).

⁴ www.cihi.ca/web/resource/en/hfp_beds_staffed_2014_en.xlsx

⁵ http://stats.oecd.org/index.aspx?DataSetCode=HEALTH_STAT

PROVINCE	TOTAL HOSPITAL BEDS		SAMPLE %	# OF PARKING STALLS	
	Total Sector	Sample		Sample	Total Stalls
Alberta	11,300	300	3%	400	15,800
British Columbia	13,800	5,200	38%	12,200	32,300
Manitoba	4,300	1,600	38%	2,400	6,300
New Brunswick	2,800	400	14%	1,100	7,900
Newfoundland	2,400	130	5%	350	6,500
Northwest Territories	150	140	88%	200	220
Nova Scotia	3,200	1,200	36%	1,500	4,200
Nunavut	50	0	0%	0	100
Ontario	31,400	11,500	37%	30,500	83,200
Prince Edward Island	500	250	50%	1,600	3,200
Quebec	20,700	0	0%	0	47,700
Saskatchewan	3,700	1,700	46%	4,700	10,200
Yukon	50	50	100%	230	230
Canada (approximate)	94,300	22,500	24%	55,200	218,000

b) LIGHTING INVENTORY

With 185,000 parking lot stalls and 33,000 garage stalls, there are an estimated total of 20,000 lights (9,300 lot lights and 11,000 garage lights) in approximately 55 parking garages and 1,250 parking lots.

AIRPORT PARKING STALLS & LIGHTS			
	<i>Total</i>	<i>Lots</i>	<i>Garages</i>
Parking stalls	218,000	185,000	33,000
Parking lights	20,000	9,300	11,000

4.4 MUNICIPALITIES (27,000)

a) PARKING INVENTORY

This sector was assessed by sampling 28 Canadian cities, representing a population of 11 million in 2011, or 33% of Canada's total population. This sector includes parking in public works facilities, parking provided by municipal parking authorities such as the Toronto Parking Authority (TPA), and municipally owned parking structures.

Through the use of municipal websites, open licensed data, and a survey sent to municipalities across Canada, we estimate a total of 98,000 parking stalls. This number was then extrapolated to the rest of Canada, resulting in a total of 294,000 parking stalls (250,000 parking lot stalls and 44,000 garage stalls).

POPULATION		SAMPLE %	# OF PARKING STALLS	
<i>Sample Size</i>	<i>Total</i>		<i>Sample</i>	<i>Total Stalls</i>
11,140,000	33,500,000	33%	98,000	294,000

b) LIGHTING INVENTORY

There are an estimated total of 27,000 luminaires in the 294,00 parking stalls; 46% or 12,500 luminaires are in approximately 1,650 parking lots, and the remaining 54%, or 14,500, are located in approximately 75 municipal garages.

MUNICIPAL PARKING STALLS & LIGHTS			
	<i>Total</i>	<i>Lots</i>	<i>Garages</i>
Parking stalls	294,000	250,000	44,000
Parking lights	27,000	12,500	14,500

4.5 POST-SECONDARY EDUCATION (29,000)

a) PARKING INVENTORY

According to Statscan, there were a total of 2 million post-secondary students in the school year of 2012-2013.⁶ Using publicly available information such as school websites, previous studies and satellite imagery, we were able to sample forty-two schools representing 132,126 parking stalls and 710,105 students, or 35 % of all post-secondary students in Canada. After extrapolating to the rest of Canada, this methodology led to an estimated total of 314,000 parking stalls (267,000 parking lot stalls and 47,000 garage stalls).

⁶ <http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=4770033>

	STUDENT POPULATION			Stalls per Student	Sample %	STALLS BY %	
	Sample	Stalls (sample)	Census 2012-2013			Extrapolated	Total
AB	71,000	22,000	135,000	0.31	53%	19,600	41,600
BC	173,000	44,000	226,000	0.25	77%	13,000	57,000
MB	62,000	9,500	62,000	0.15	100%	N/A	9,500
NB	2,500	300	25,300	0.10	10%	2,300	2,600
NS	27,000	3,600	45,500	0.13	59%	2,400	6,000
ON	309,000	44,300	635,100	0.14	49%	46,700	91,000
QC	32,500	2,200	395,200	0.07	8%	24,300	26,500
SK	30,800	6,200	37,500	0.20	82%	1,300	7,500
Subtotal	707,800	132,100	1,600,000	0.18	45%	110,000	240,000
Other			400,000	0.15	N/A	N/A	60,000
TOTAL			2,000,000	0.15			300,000

b) LIGHTING INVENTORY

There were an estimated total of 300,000 stalls across Canada in slightly more than 80 garages and 1,750 parking lots servicing two million post-secondary students in the school year of 2012-2013.

UNIVERSITY PARKING STALL & LIGHTS			
	Total	Lots	Garages
Parking stalls	300,000	255,000	45,000
Parking lights	29,000	13,300	15,700

4.6 INDUSTRIAL (160,000)

a) PARKING INVENTORY

According to Avison Young's 2014 Industrial Market Report⁷, there are 2 billion square feet of industrial building space in Canada. Avison Young defines industrial land use as land used for manufacturing, processing, or storage (containers). Based on multiple municipal parking standards, the industrial parking standard is between 1.5 and 2 parking stalls per 100 square metres (1,076 square feet). For the purposes of this report we used the average of

⁷ http://www.avisonyoung.com/fileDownloader.php?file=files/content-files/Research/Links/2014/AYSpring14CanadaUSIndustrialMay13_14.pdf

1.75 stalls to develop a total of 3.2 million industrial parking stalls in Canada.⁸ For this sector it was assumed that 100% of parking areas are parking lots.

INDUSTRIAL PARKING	
Total area (sq ft)	2,000,000,000
Ratio	1.75 stalls/1076
Total parking stalls	3,200,000

b) LIGHTING INVENTORY

There are 3.2 million parking stalls in 22,000 parking lots in Canada with 160,000 lights.

INDUSTRIAL PARKING STALLS & LIGHTS (A)		
	<i>Total</i>	<i>Lots</i>
Parking stalls	3,200,000	3,200,000
Parking lights	160,000	160,00

4.7 MULTI-UNIT RESIDENTIAL (345,000)

a) PARKING INVENTORY

According to Statscan's 2011 National Housing Survey, excluding duplexes, there were about 3.6 million households and apartments in all of Canada.⁹ After applying the provincial vacancy rates provided by Statscan to the total apartments or condos/stratas in each province, there were a total of 3.7 million apartment units in 2011.¹⁰ Using the one stall per unit established in many municipal standards, we estimated a total parking stall inventory of 3.7 million. This sector has the second most parking stalls of the eight reported sectors.

2011	HOUSEHOLDS	OWNED	RENTED
Apartment ≥ 5 stories	1,250,000	30%	709%
Apartment ≤ less than 5 stories	2,350,000	23%	77%
Sub-total	3,600,000		
Vacant Units	91,000		
Total Units (equals total parking stalls at 1 stall per unit)	3,700,000		

⁸[https://www.vaughan.ca/projects/policy_planning_projects/city_wide_parking_standards_review/General%20Documents/FINAL%20DRAFT%20TTR_2010-04-15%20Web%20Version%20\(2\).pdf](https://www.vaughan.ca/projects/policy_planning_projects/city_wide_parking_standards_review/General%20Documents/FINAL%20DRAFT%20TTR_2010-04-15%20Web%20Version%20(2).pdf), <https://www.regina.ca/opencms/export/sites/regina.ca/residents/bylaw/media/pdf/chapter-14--parking-and-loading-regulations.pdf>, and http://www.edmonton.ca/city_government/documents/Mar_26-2010_Zoning_Bylaw_Parking_Study_Final_Report_with_ap.pdf

⁹ <http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/dt-id/Rp-eng.cfm?LANG=E&APATH=7&DETAIL=0&DIM=0&FL=C&FREE=0&GC=0&GID=0&GK=0&GRP=0&PID=106699&PRID=0&PTYPE=105277&S=0&SHOWALL=0&SUB=0&Temporal=2013&THEME=0&VID=0&VNAMEE=Condominium%20status%20%283%29&VNAMEF=Stat>

¹⁰ <http://www4.hrsdc.gc.ca/3ndic.1t.4r@-eng.jsp?iid=43>

b) LIGHTING INVENTORY

There are an estimated 343,993 luminaires in the 3.72 million residential parking stalls based on a one stall per unit standard.

MULTI-UNIT RESIDENTIAL PARKING STALLS & LIGHTS			
	<i>Total</i>	<i>Lots</i>	<i>Garages</i>
Parking stalls	3,700,000	3,140,0	560,000
Parking lights	345,000	160,000	185,000

4.8 COMMERCIAL (3,110,000)

a) PARKING INVENTORY

The Building Owners and Managers Association of Canada (BOMA Canada) has over 3,500 members across the country that oversee 2.1 billion square feet of commercial real estate, not including parking garages inside the buildings. They estimate that this equals 25%, of commercial real estate in Canada. Commercial real estate comprises a variety of different sectors with the most prominent being: retail and office. This extrapolates to a total of 8.4 billion square feet of commercial space in all of Canada. Based on multiple municipal parking regulations for commercial properties, the commercial parking standard is between 2.5 and 6 parking stalls per 100 square metres (1,076 square feet). We used a ratio of 4 stalls per 1000 square feet to develop a total of 33.6 million commercial parking stalls in Canada. This sector has by far the highest inventory of parking stalls. Six percent of the total commercial space in Canada, or 500 million square feet, is represented by shopping centres.

COMMERCIAL PARKING STALLS	
Ratio	4 stalls per 1000 square feet
Parking Stalls	33,600,000
Lot Stalls	28,600,000
Garage Stalls	5,000,000

b) LIGHTING INVENTORY

This sector is by far the largest sector with 3.1 million parking lights.

COMMERCIAL PARKING STALLS & LIGHTS (B)			
	<i>Total</i>	<i>Lots</i>	<i>Garages</i>
Parking stalls	33,600,000	28,500,000	5,000,000
Parking lights	3,110,000	1,430,000	1,680,000

5. SUMMARY OF PARKING INVENTORY

We have estimated Canada's total inventory by developing two separate scenarios to account for variations in the observed data and data that might have been missed.

The first scenario, **Scenario A**, was developed from the individual sector data. The outcomes are illustrated in **Figure 1**, which displays the total number of parking stalls broken down into parking lots and parking garages derived from the eight sectors. **Figure 2** displays the total number of parking stalls, including number of stalls in lots vs garages.

A second scenario, **Scenario B**, has been implemented to estimate the total parking stall inventory in Canada, which is not limited to the eight sectors listed above, by using a vehicle to parking ratio. This scenario uses the total number of registered Canadian vehicles to assess urban and rural parking stall inventory. There were a total of 23 million registered vehicles in 2013, 81% of which are located in urban areas where the car to parking stall ratio is 1:4; rural areas have a ratio of 1:2.2.¹¹ This equates to a total of 85 million parking stalls (75 million urban stalls and 10 million rural stalls).

Scenario **B** represents the high-end estimate for total stalls across Canada, since it attempts to include stalls that might have been missed in the other scenarios. A similar study was done in the United States, producing a total parking stall inventory of over 2 billion stalls, which has become a high-end estimate for US parking infrastructure.¹²

Figure 4- Parking Inventory Scenarios

	SCENARIO A	SCENARIO B
Total Parking Stalls	41,600,000	84,700,000
Parking lots	240,000	480,000
Parking lot stalls	35,800,000	72,000,000
Parking garages	9,600	21,200
Parking garage stalls	5,800,000	12,700,000

¹¹ <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/trade14d-eng.htm>

¹² Chester, M., Horvath, A., & Madanat, S. (2010). *Parking Infrastructure: Energy, Emissions, and Automobile Life-Cycle Environmental Accounting*. *Environmental Research Letters*, 5.

Figure 5- Breakdown of Lot and Garage Stalls

SECTORS	PARKING LOTS		PARKING GARAGES		TOTAL
	STALLS	%	STALLS	%	
Municipalities	250,000	85%	44,000	15%	294,000
Post-Secondary Education	267,000	85%	47,000	15%	314,000
Airports	41,000	56%	32,000	44%	73,000
Commuter Transit	129,000	85%	21,000	15%	150,000
Hospitals	185,000	85%	33,000	15%	218,000
Multi-Unit Residential	3,140,000	85%	560,000	15%	3,700,000
Industrial	3,200,000	100%	0	0%	3,200,000
Commercial	28,600,000	85%	5,000,000	15%	33,600,000
Total	36 M		6 M		42 M

6. SUMMARY OF LIGHTING INVENTORY

Based on the extrapolated information, **Figure 3** was configured to illustrate the two scenarios discussed earlier, with a total parking lighting inventory ranging from 3.7 million (1.7 million parking lot lights and 1.9 million garage lights) to 7.8 million (3.6 million parking lot lights and 4.2 million garage lights). In seven of the eight sectors, 46% of parking lights are located in parking lots and 54% are located in parking garages, with the exception of the Airport sector. Keep in mind that **Scenario A** is based on the eight sectors explored, whereas **Scenario B** assesses inventory based on the number of registered vehicles in Canada.

Figure 6- Lighting Inventory Scenarios

	SCENARIO A	SCENARIO B
Total parking lighting	3,700,000	7,800,000
Parking lot lights	1,800,000	3,600,000
Parking garage lights	1,900,000	4,200,000

To determine the current state of the LED market in parking lighting, a survey was sent to luminaire suppliers across Canada. The survey received very little response, so although not statistically significant, highlights of the results are as follows:

- 50% of all luminaire sales were LED products
- 5% of these LEDs were purchased for parking lighting
- These parking LEDs were purchased mainly by the Commercial and Industrial sectors; the sectors which represent 88% of the lighting inventory estimated by this report
- LED purchasing by municipalities varied by supplier; some ranked municipalities as the greatest purchaser and others ranked them as the lowest
- Airports and Commuter Transit sectors had the largest percentage of LED luminaires installed relative to their total inventory, followed by municipalities

7. DISCUSSION

Parking stall inventories were best represented in the Airport, Multi-Unit Residential, Commuter Transit and Hospital sectors where each sample represented a large majority of its respective inventory. On the other hand, Post-Secondary Education and Municipalities were represented by roughly a third of its respective inventory. The inventories of the remaining two sectors (Commercial and Industrial) were based entirely on previous studies from reliable sources including the Building Owners and Managers Association (BOMA), Colliers International, and Navigant Consulting.

The calculated range of parking lights in Canada, 3.7 million to 7.8 million, exceeds the total number of streetlights of 3.48 million (ICF Marbek, 2014). Furthermore, over 50% of these parking lights are located in garages where luminaires are constantly operated, unlike streetlights used only at night. To estimate potential energy savings from LED conversion of national parking lighting, the following assumptions were made based on Canadian case studies:

	CONVENTIONAL LUMINAIRES (WATTS PER UNIT)	LED LUMINAIRES (WATTS PER UNIT)	ANNUAL OPERATING HOURS
Parking garage lighting	150	50	8,760
Parking lot lighting	400	120	4,015

From the survey discussed above, it is also assumed 95% of parking lighting in both lots and garages use conventional luminaires and 5% use LEDs. Using this information along with the light inventory of Scenario A, the annual energy saving potentials for Canadian parking garages and lots are found to be 1,600 GWh and 1,900 GWh, respectively. These potentials are also significant opportunity for national cost savings and reductions in greenhouse gas (GHG) emissions.

As observed, commercial land use dominates parking asset ownership. Since the commercial sector encompasses a wide variety of intensive land uses including office, retail, educational services, wholesale, accommodations, arts and entertainment, recreational facilities, and information and cultural industries, it has the largest percentage of parking stalls. This is in contrast to Airports, which represent less than 0.5% of Commercial parking stalls. Although we were not able to collect extensive public data on private parking companies, such as Impark and Vinci Park, based on rough estimates from discussions and company websites, private parking operators own less than 5% of all parking stalls in Canada. This leaves the majority of ownership in the hands of facility owners.

8. CONCLUSION

CUI has completed the first in-depth scan of national parking assets and parking lighting infrastructure that highlights opportunities for LED conversions in 8 different sectors. Although there are more parking lighting fixtures in Canada than streetlighting fixtures, parking lighting only accounts for 5% of LED sales. This is likely because the sales process is more difficult with the more distributed ownership of the parking lighting, but this does not diminish the significant potential for improved safety energy and cost savings, GHG reduction across Canada.

With the Commercial and Industrial sectors representing 83% to 92% of Canadian parking lights, market transformation initiatives are a priority for these sectors. Based on the surveys conducted, facility owners control the majority of parking lighting, meaning initiatives should demonstrate the benefits in terms that are most relevant to this audience.