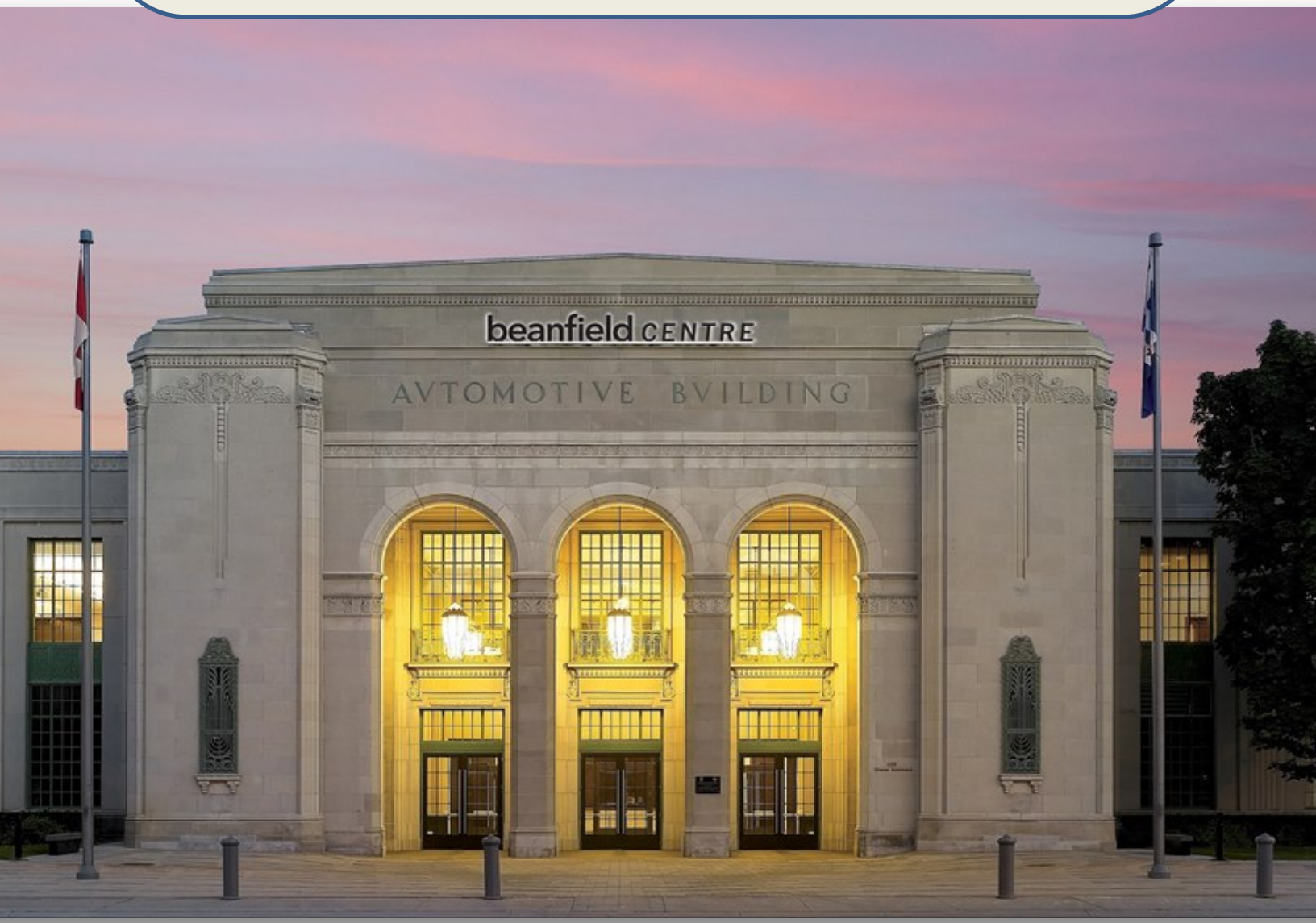
Exhibition Place

# Beanfield Centre

# GreenSmart Energy Performance Report

# 2014 - 2016




A GreenSmart Energy Initiative

GreenSmart

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# INTRODUCTION

Exhibition Place, as part of our 2014 – 2016 Strategic Plan has set a goal to reduce the impact of our operations and our business on all aspects of the environment. To meet this goal, we recognize the critical importance of improving the efficiency of existing buildings and reducing our energy consumption.

Three of the main steps towards reducing energy consumption are as follows;

- Firstly, ensure we have systems in place to improve efficiency of our energy use.
- Secondly, effectively tracking energy use to understand existing conditions and trends in order to forecast for the future to improve efficiencies.
- Thirdly, produce clean energy using solar, wind, geothermal and waste steam to reduce our greenhouse gas emissions.

This report covers the energy use for the Beanfield Centre (formerly the Allstream Centre) for calendar years 2014, 2015 and 2016.

This facility was the former Automotive Building constructed in 1929 and designated a heritage structure under the Ontario Heritage Act. In 2009, the Automotive Building underwent $56.0M of renovations and reopened as the first conference centre in Canada certified as LEED Silver. Beanfield Centre consists of 20 meeting rooms and a 43,900 sq. ft. ballroom with full kitchen amenities.

In the Energy Performance Report 2013 – 2015, the following directions were set to improve the energy efficiency:

- An efficiency direction highlighted in the 2014-2016 Strategic Plan was to upgrade building lighting to more efficient LED technology. While it was not completed at the end of 2016, the intent is still to convert pot lights from CFL to LED in 2017
- Shut off freights elevator when schedule permits
- Work with Cerise management to conduct “event tasting / sales” in areas other than the Ballroom, in order to reduce lighting levels
- Reduce fresh air make-up during minimal use period

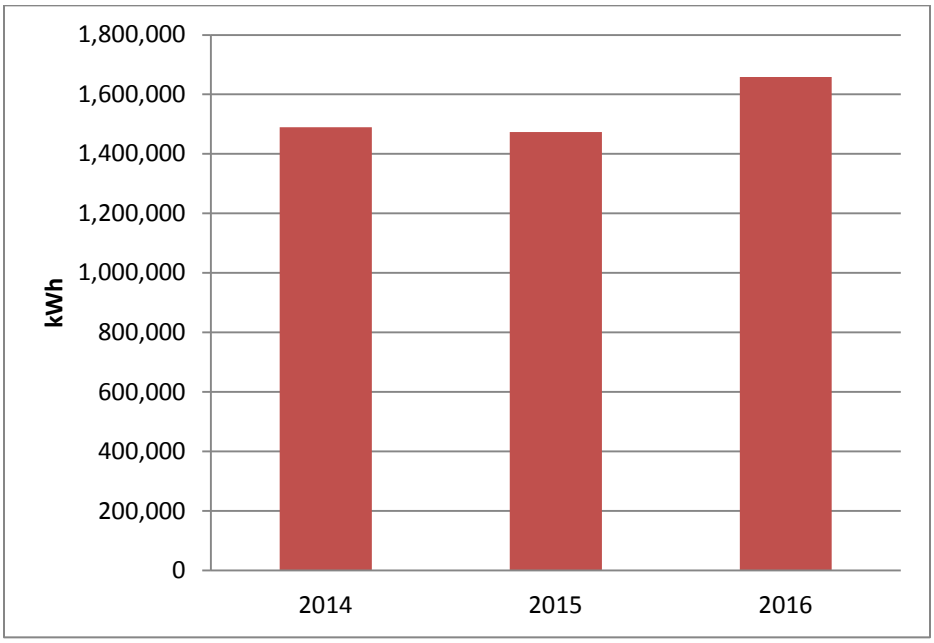
## ELECTRICAL CONSUMPTION

Figure 1 below compares the total yearly electricity consumption and the total monthly electricity consumption (Figure 2) for the Beanfield Centre over the reporting period 2014, 2015 and 2016.

The electrical consumption includes the following:

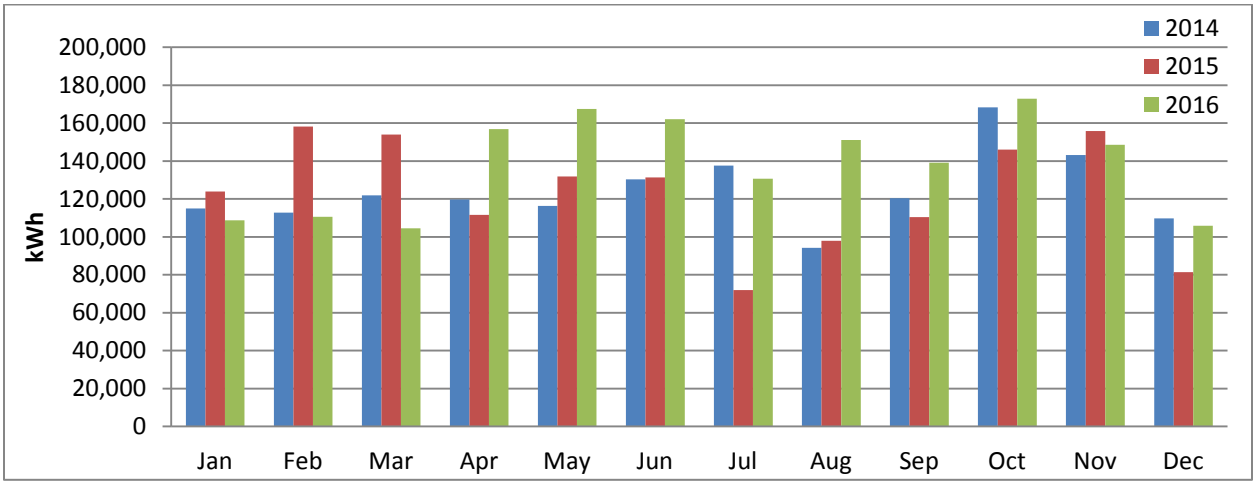
- Kitchen
- Building Power and Systems
- Heat Pumps
- Roof Top Units

### Figure 1 – Yearly Electricity Consumption Comparison




| Years | % Increase |
|---|---|
| 2016 vs. 2015 | 12% |
| 2016 vs. 2014 | 11% |
| 2015 vs. 2014 | -1% |

### Figure 2 – Monthly Electricity Consumption Comparison

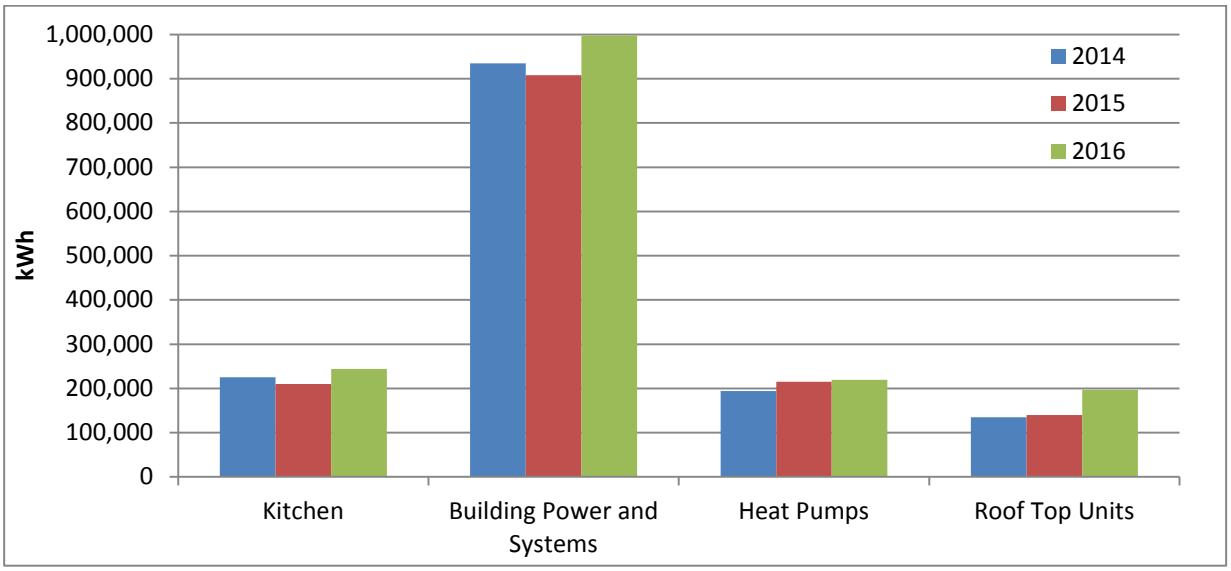


## ELECTRICAL ENERGY DISTRIBUTION

Figure 3 illustrates the total electricity consumption distribution of the Beanfield Centre over the reporting period.

Total consumption of Beanfield Centre is calculated by combining the electrical loads measured by the sub-meters at Kitchen, Building Power and Systems, Heat Pumps and Roof Top Units.

**Figure 3 – Electricity Consumption Distribution**



## BUILDING POWER AND SYSTEMS

Figure 4 shows the monthly breakdown of the Building Power and Systems monthly electricity consumption which is the highest category of consumption in the Centre. Show power and plug loads, elevators and escalators are included in this category.

The consumption in this category is dependent on the occupancy of the building and hours of operation. Building Power and Systems consume almost 60% of total building electricity usage. Generally, the more events / visitors that are in the Beanfield Centre on any given day, the higher the electrical load will be. This is expected because as the number of people increases, the fans and pumps consumption need to increase accordingly to service the extra load along with room lighting and plug use.

The baseline consumption of the building corresponds to unoccupied weekend days or no show days at about 1,200 kWh/day for Building Power and Systems shown in Figure 4.

### Figure 4 – Comparison of Building Power and Systems Electric Consumption (kWh)

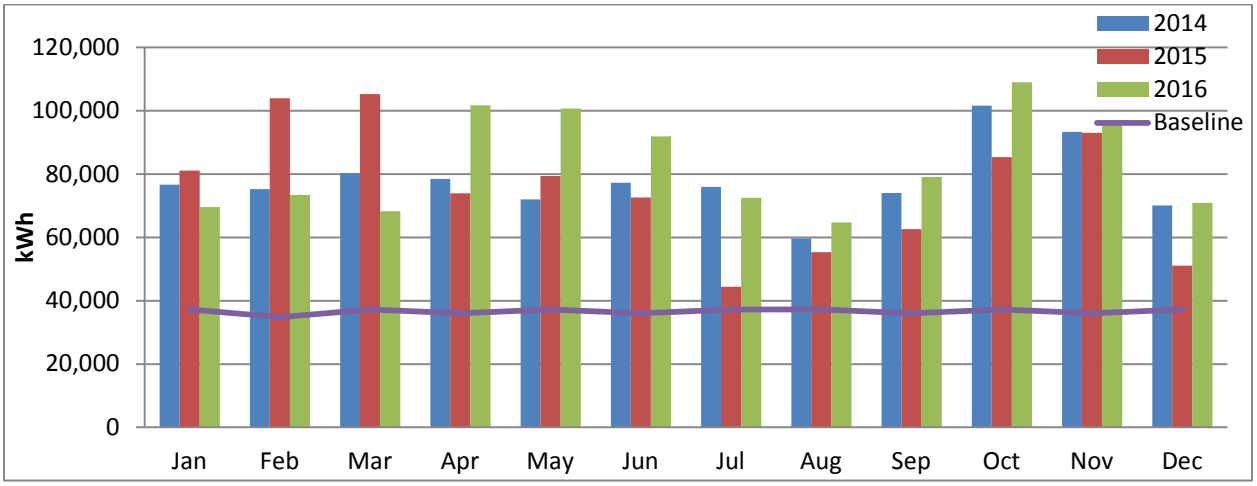



Figure 5 below compares the number of the show days in a month over the reporting period.

As mentioned above, the consumption is dependent on the occupancy of the building and hours of operation. Each event is unique and not necessarily comparable. An event may be held over several days, occupy more space and as a result use more Building Power and Systems compared to the other shows that may have the same duration but occupy less space.

### Figure 5 – Comparison of Show Days by Month and Total

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 4 | 7 | 16 | 14 | 14 | 16 | 10 | 20 | 16 | 20 | 22 | 8 | 167 |
| 2015 | 9 | 16 | 16 | 12 | 17 | 18 | 3 | 12 | 13 | 19 | 24 | 3 | 162 |
| 2016 | 13 | 15 | 14 | 22 | 25 | 24 | 13 | 11 | 15 | 24 | 24 | 12 | 212 |

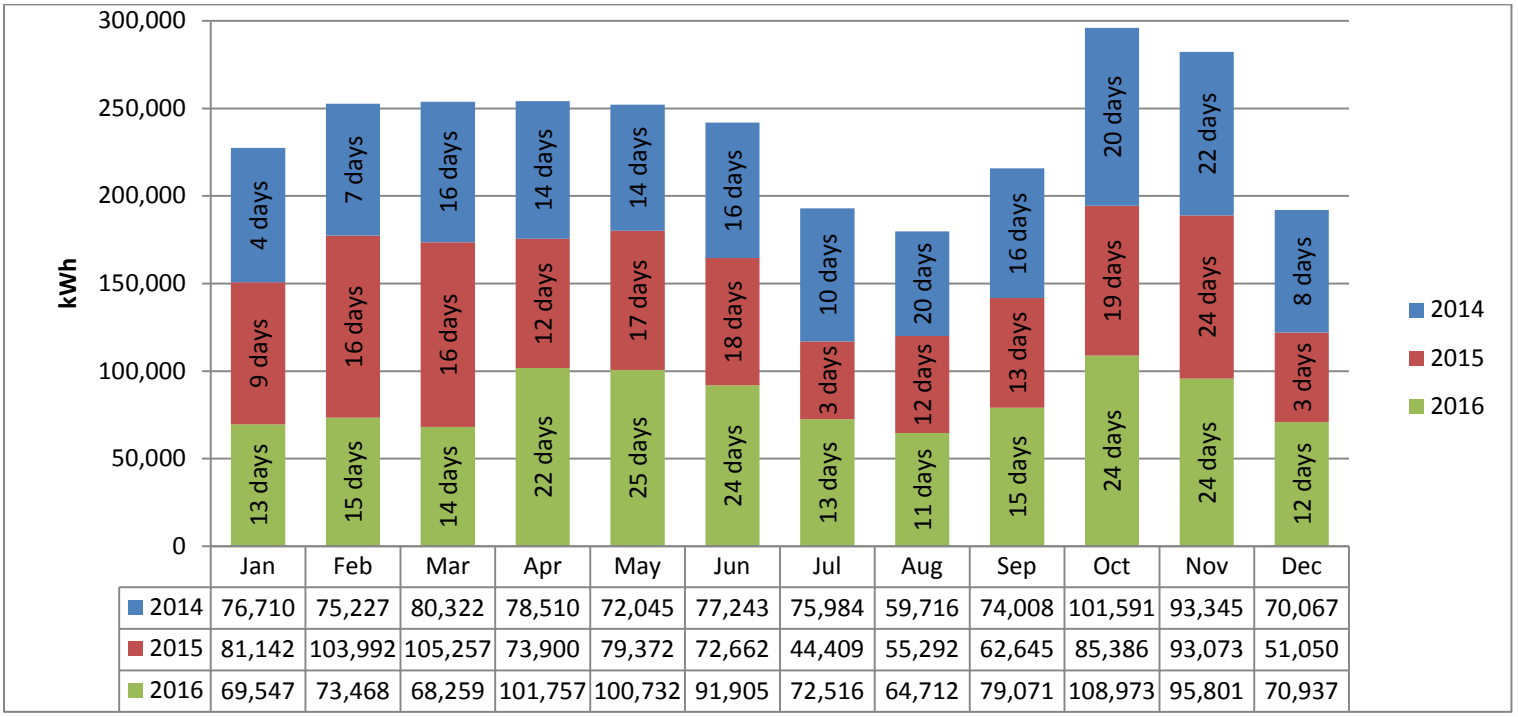
Figure 6 shows the percentage of Building Power and Systems consumption increase and decrease over the reporting period.

### Figure 6 – Building Power and System Loads

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2015 vs 2014 (% increase) | 6% | 38% | 31% | -6% | 10% | -6% | -42% | -7% | -15% | -16% | 0% | -27% |
| 2016 vs 2015 (% increase) | -14% | -29% | -35% | 38% | 27% | 26% | 63% | 17% | 26% | 28% | 3% | 39% |

The electrical consumption of the Building Power and Systems increased from 2016 over 2015 by 10% and the number of show days increased by 31% from 2016 over 2015. Figure 7 shows the effect of Building Power and System loads against number of event days in a month.

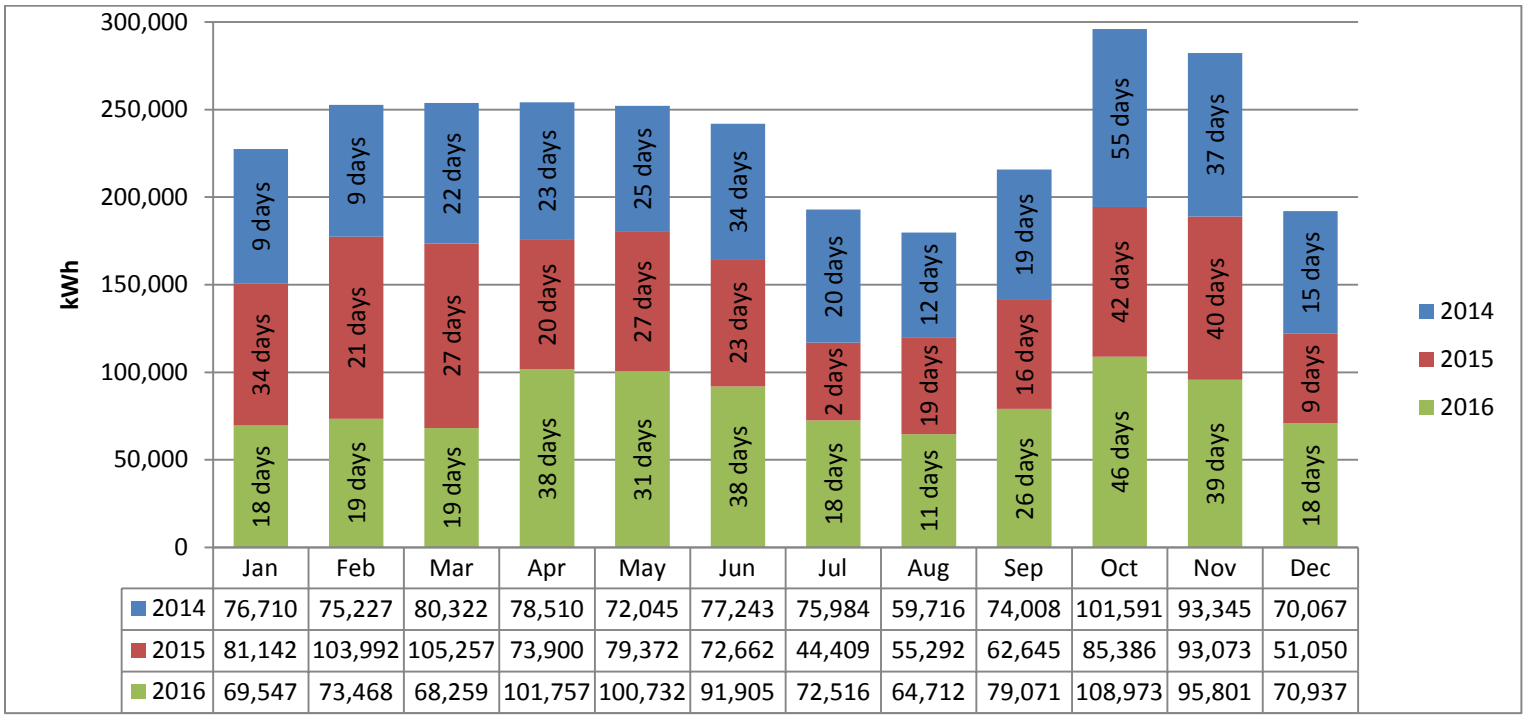
### Figure 7 – Building Power Loads vs. Event days




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 76,710 | 75,227 | 80,322 | 78,510 | 72,045 | 77,243 | 75,984 | 59,716 | 74,008 | 101,591 | 93,345 | 70,067 |
| 2015 | 81,142 | 103,992 | 105,257 | 73,900 | 79,372 | 72,662 | 44,409 | 55,292 | 62,645 | 85,386 | 93,073 | 51,050 |
| 2016 | 69,547 | 73,468 | 68,259 | 101,757 | 100,732 | 91,905 | 72,516 | 64,712 | 79,071 | 108,973 | 95,801 | 70,937 |

Figure 8 shows a comparison of building power loads against activity days (combination of move-in days, events days and move-out days) for the reporting year 2014, 2015 and 2016.

### Figure 8 – Building Power Loads vs. Activity days




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 76,710 | 75,227 | 80,322 | 78,510 | 72,045 | 77,243 | 75,984 | 59,716 | 74,008 | 101,591 | 93,345 | 70,067 |
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| 2016 | 69,547 | 73,468 | 68,259 | 101,757 | 100,732 | 91,905 | 72,516 | 64,712 | 79,071 | 108,973 | 95,801 | 70,937 |

## WEATHER TEMPERATURE AS A FACTOR CONTRIBUTING TO ENERGY CONSUMPTION INCREASE

- As shown in Figure 3 the highest consumption in the Beanfield Centre is Building Power and Systems. Weather temperature has a direct effect on the performance of these systems.
- Heat pumps consume almost 12% of total electricity use of the building. Heat pumps consumption in 2016 increased by 2% and 13%, respectively compared to 2015 and 2014. This increase not only comes from the summer temperature increase, but also is driven by the number of events; the more events there are, the more air conditioning is required.
- Weather temperature in the summer months of 2016 (July, August, September) was hotter by 1°C and 2°C respectively compared to 2015 and 2014 as shown in Figure 9 below.
- Temperature affects boiler gas consumption. However, outside temperature is independent of kitchen use and domestic hot water requirements, they are dependent on occupancy.

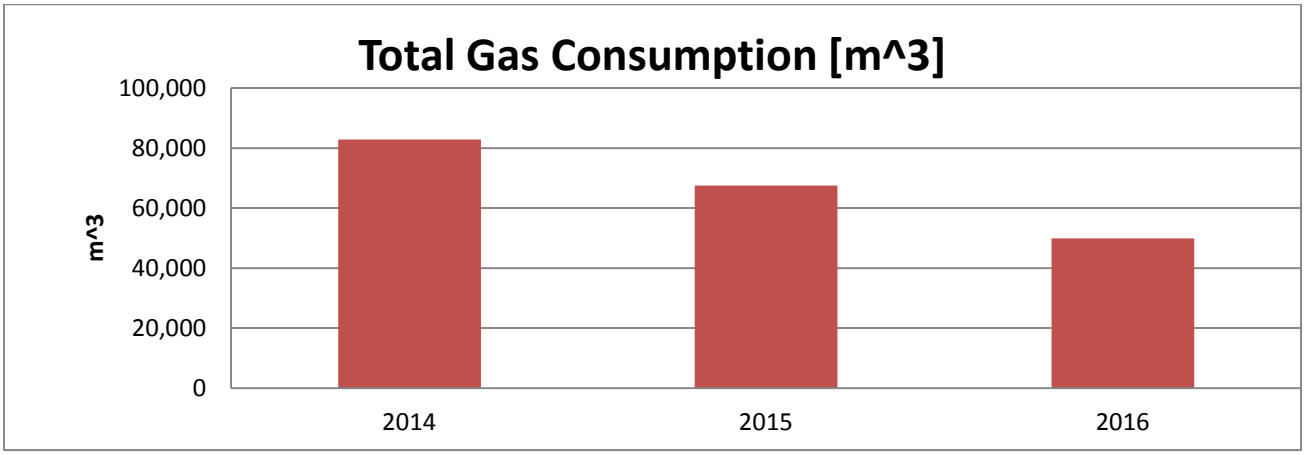
**Figure 9 – Comparison of Average Temperature (°C)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | -6 | -6 | -3 | 7 | 15 | 20 | 21 | 21 | 17 | 12 | 3 | 1 |
| 2015 | -8 | -13 | -2 | 8 | 16 | 18 | 22 | 21 | 20 | 10 | 7 | 4 |
| 2016 | -2 | -1 | 3 | 5 | 14 | 19 | 22 | 24 | 20 | 13 | 8 | 0 |

## NATURAL GAS CONSUMPTION

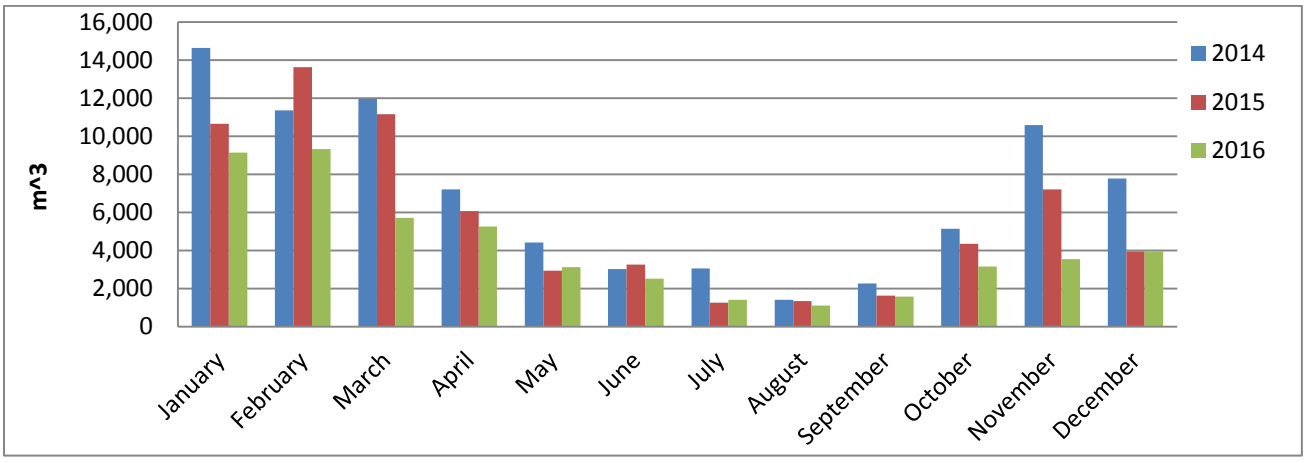
Figure 10 and Figure 11 compare the total and monthly natural gas consumption over the reporting period. Natural gas is used in the Beanfield Centre in the Kitchen for food preparation and also by the Boilers for heat. In addition, natural gas is used to power the District Energy System as explained later in this report.The natural gas consumption is heavily dependent on weather and events that require the use of natural gas.

### Figure 10 – Comparison of Total Gas Consumption by Year




The weather temperature in the winter months of 2016 (January, February, March) was warmer by 7°C and 5°C, respectively, compared to 2015 and 2014. Building heating boiler gas consumption in 2016 decreased by 26% and 51% compared to 2015 and 2014. This reduction was not only the result of increase in weather temperature, but also the initiatives taken all year to reduce energy loads by shutting down the building when not in use, as well as reducing set point temperatures during non-event periods. Kitchen gas consumption also decreased by 26% and 24%, as shown in Figure 12 on the next page.

### Figure 11 – Comparison of Gas Consumption (m^3) by Months for 2014 – 2016



### Figure 12 – Comparison of Kitchen Gas Consumption (m^3) by Months for 2014 – 2016

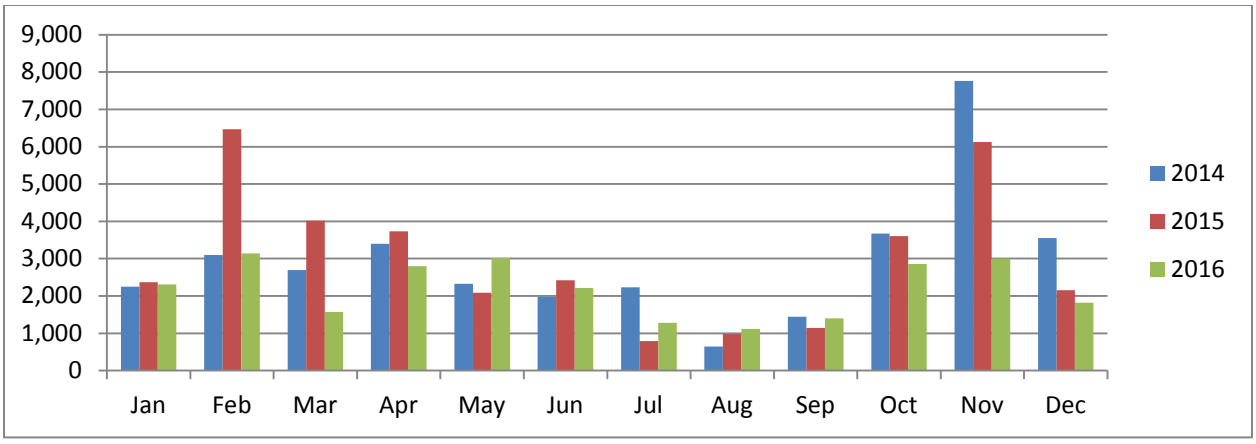



Figure 13 compares the monthly boiler gas consumption of Beanfield Centre over the reporting period 2014 – 2016 by Heating Degree Day (HDD).

A heating degree day (HDD) is a way to measure how cold it has been over a 24 hour period. It is determined by calculating the mean daily temperature for the day and subtracting it from a base temperature. Degree days are a good way to keep track of how much demand there has been for energy needed to heat buildings. The colder it is outside, the more degree days (HDD) and the more energy required to heat buildings.

### Figure 13 – Monthly Boiler Gas Consumption and Heating Degree Day

| Month | Boiler (m^3) 2014 | 2014 HDD | Boiler (m^3) 2015 | 2015 HDD | Boiler (m^3) 2016 | 2016 HDD |
|---|---|---|---|---|---|---|
| Jan | 12,384 | 649 | 8,294 | 792 | 6,834 | 670 |
| Feb | 8,261 | 677 | 7,152 | 857 | 6,189 | 588 |
| Mar | 9,267 | 619 | 7,138 | 616 | 4,142 | 476 |
| Apr | 3,811 | 312 | 2,336 | 314 | 2,458 | 395 |
| May | 2,089 | 117 | 862 | 89 | 106 | 143 |
| Jun | 1,060 | 7 | 836 | 34 | 311 | 24 |
| Jul | 832 | 2 | 477 | 4 | 122 | 0 |
| Aug | 762 | 4 | 356 | 4 | 0 | 0 |
| Sep | 820 | 56 | 487 | 31 | 187 | 26 |
| Oct | 1,482 | 203 | 757 | 250 | 303 | 195 |
| Nov | 2,818 | 440 | 1,095 | 345 | 546 | 338 |
| Dec | 4,235 | 514 | 1,806 | 430 | 2,133 | 607 |
| Total | 47,822 | 3,600 | 31,597 | 3,766 | 23,331 | 3,464 |

## DISTRICT ENERGY SYSTEM – HEATING & COOLING

The District Energy System (DES) is a thermal energy distribution system for multiple buildings and consists of a heating and cooling central plant within the Enercare Centre and a thermal network of pipes connecting groups of buildings.

The DES provides cooling by supplying chilled water to Beanfield Centre, Ricoh Coliseum and Hotel X Air Handling Units through the Enercare Centre. These Air Handling Units use electrical power. In 2015 and 2016, 570 and 822 Ton-Hour of chilled water, respectively, was provided by the DES to Beanfield Centre. The electricity consumed to make the chilled water and transport it to Beanfield Centre air handling units is part of Enercare Electricity consumption.

In addition, the heating for Beanfield Centre ballroom and the make-up air for the entire building is supplied by the central heating plant of the DES. There is no data recorded for the years 2013-2016 for the consumption during these years, however, the baseline consumption is averaged at 111,200 $m^3$. The DES gas consumption is part of Enercare Centre gas consumption records.

As stated in the 2013-2015 Report, one of the efficiency measures to be undertaken is to more accurately calculate and allocate to Beanfield Centre the consumption of the DES related directly to the Beanfield Centre to understand total consumption. This was not completed in 2016 but the intent is to have it in place for January 2017 with full results in the 2017 annual report.

## GREENHOUSE GASES

The City of Toronto has established aggressive targets to reduce Greenhouse Gas (GHG) emissions as set out in Figure 14 below. The primary greenhouse gases are carbon dioxide (CO2), sulphur oxides (SOx), nitrous oxide (NOx), water vapor, methane and ozone. As an agency of the City of Toronto, Exhibition Place both tracks its GHG emissions and aims to reduce them to help meet the City target

**Figure 14 – The City of Toronto's Emission Reduction Targets**

| | Air Quality Contaminants (2004 Baseline) | Greenhouse Gases (1990 Baseline) |
|---|---|---|
| **2012** | 20% | 6% |
| **2020** | -- | 30% |
| **2050** | -- | 80% |

The City of Toronto has developed a greenhouse gas and air quality inventory program that has the primary purpose of tracking the progress of the City Community and the City Government (the latter as a subset of the City Community) towards achieving its adopted greenhouse gas and air quality emission reduction targets outlined above.

The targets set by the City are absolute targets rather than relative targets, meaning they are independent of population growth or decline, economic growth or decline, or weather variability (e.g., hot summers that lead to more electricity consumption for air conditioning, and cold winters that lead to more natural gas consumption for space heating). The targets apply equally to the City Community and the City Government alike, but progress toward achieving the targets is cumulative. If a sector within the City Community overachieves it may be offset by a sector that underachieves, and vice versa. Equally, if a Division of City Government overachieves it will offset those that do not.

Greenhouse gas emissions in CO2, NOx and SOx from electricity and gas use in the Beanfield Centre is shown in Figure 15 and the total greenhouse gas emissions is shown in Figure 16.

### Figure 15 – Green House Gas Emissions

| Year | Electricity | | | Gas | | |
|---|---|---|---|---|---|---|
| | CO2 | NOx | SOx | CO2 | NOx | SOx |
| | Ton | Ton | Ton | Ton | Ton | Ton |
| 2014 | 363.4 | 0.518 | 0.094 | 166.3 | 0.133 | 0.000829 |
| 2015 | 359.7 | 0.513 | 0.093 | 135.5 | 0.108 | 0.000675 |
| 2016 | 404.6 | 0.577 | 0.104 | 100.1 | 0.076 | 0.000592 |

### Figure 16 – Total Green House Gas Emissions

| | Co2 | NOx | SOx |
|---|---|---|---|
| Year | Ton | Ton | Ton |
| 2014 | 529.7 | 0.651 | 0.095 |
| 2015 | 495.1 | 0.621 | 0.094 |
| 2016 | 504.7 | 0.653 | 0.105 |

## HYDRO EXPENSES

The total hydro costs of Beanfield Centre is shown in Figure 17 and consists of the electrical loads of the Kitchen, Building Power and Systems, Heat Pumps and Roof Top Units but does not attribute any hydro costs from the DES supply.

### Figure 17 – Hydro Cost

| Year | Total Consumption [kWh] | LCD#130510 Average Rate per Kwh $ | Hydro Consumption $ | Pure Green Purchase $ | Total Hydro Expense $ |
|---|---|---|---|---|---|
| 2014 | 1,489,277 | 0.1106 | 164,714 | 17,600 | 182,314 |
| 2015 | 1,474,049 | 0.1181 | 174,085 | 15,333 | 189,418 |
| 2016 | 1,658,160 | 0.1396 | 231,434 | 16,000 | 247,434 |

## GAS EXPENSES

The total gas consumption cost is shown in Figure 18 and consists of the boiler and the kitchen located in the Beanfield Centre but does not attribute any gas costs associated with the DES supply.

### Figure 18 – Gas Cost

| Year | $ | M3 | Average Rate/M3 |
|---|---|---|---|
| 2014 | 22,627 | 82,882 | 0.273 |
| 2015 | 22,311 | 67,492 | 0.330 |
| 2016 | 16,520 | 49,878 | 0.331 |

## REDUCTION INITIATIVES STATUS UPDATE

Listed below is a status update on reduction initiatives undertaken as identified in the 2013 – 2015 Beanfield Centre GreenSmart Energy Performance Report.

| No | DESCRIPTION | STATUS UPDATE |
|---|---|---|
| 1 | Shut off freights elevator when schedule permits | Signage was posted to inform customers not to use the freight elevator. It is only used by the operator and freight handlers. |
| 2 | Work with Cerise management to conduct "event tasting / sales" in areas other than the Ballroom, in order to reduce lighting levels | The Operations Department worked with the Food and Beverage supplier to perform tastings in the south lobby rather than in the ballroom with all lights on. |
| 3 | Reduce fresh air make-up during minimal use period | Only supplied fresh air to occupied rooms. During Christmas season, air handling units were scheduled to be in unoccupied mode. |

## FUTURE DIRECTIONS

Increasing the efficiency of existing electrical systems and energy consumption are key steps towards Exhibition Place's energy reduction goal. The following projects are targeted for 2017 to help us meet this goal.

- More accurately calculate and allocate to Beanfield Centre the consumption of the DES related directly to Beanfield to understand total consumption.

- Decrease lighting levels, escalator use and other energy consuming systems, during non-priority periods.

- Upgrade building lighting to more efficient LED technology. The objective of this lighting retrofit is to replace the existing compact fluorescent lamps (CFL) with LED in Beanfield Centre. There are 420 lights to be replaced; they are mainly located in the second floor meeting rooms.