Exhibition Place

Enercare Centre

Energy Performance Report

2013 - 2015

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INTRODUCTION

Exhibition Place, as part of the 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.

Two 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 track energy use to understand existing conditions and trends in order to forecast for the future to improve efficiencies.

This report covers the energy use for Enercare Centre for calendar years 2013, 2014 and 2015.

Enercare Centre was constructed and opened in 1997 and is the largest exhibition centre in Canada and the 6th largest in North America with 599,703 sq. ft of contiguous exhibit floor space. From an energy consumption perspective, the gross floor space of the complex consists of 1,282,820 sq. ft. of new space completed in 1997. This space is joined to 602,240 sq. ft. of heritage space built in 1922.

Since its opening, Exhibition Place has undertaken several initiatives within the Enercare Centre to reduce its energy load. Some of these initiatives include the following:

- Energy efficiency retrofits
- Energy policies
- HVAC retrofits
- Water savings programs

In 2014, Enercare Centre achieved LEED Gold EBOM certification and was the first exhibition centre in Canada to achieve this designation.

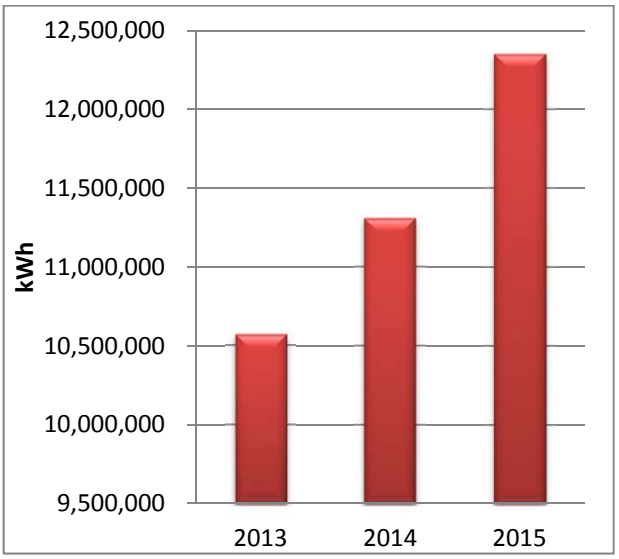
In the Energy Performance Report 2012 – 2014, the following directions were set to improve the energy efficiency of the Enercare Centre:

- Replace existing lighting in the Halls in the Enercare Centre with higher energy efficiency lighting.
- Complete the automation of the rapid roll-up doors.
- Upgrade existing District Energy System to add additional boiler and to provide heating and cooling to the new hotel.

TOTAL ELECTRICAL CONSUMPTION

Figure 1 compares the total electricity consumption of Enercare Centre over the reporting period 2013, 2014 and 2015.

Figure 1 – Total electricity consumption



Years	% Increase
2015 vs. 2013	17%
2015 vs. 2014	9%
2014 vs. 2013	7%

FACTORS CONTRIBUTING TO INCREASES:

- The largest increase in energy consumption is primarily due to Toronto 2015 Pan Am Games (TO2015) in June and July 2015.

- The search lights in the Enercare Centre towers were on daily from June 22 to July 27 from dusk until 1:30 am during TO2015. These lights consist of four (4) 14000 watt lights using 56000 kwh. In addition, loading docks lighting were active during the period of the TO2015, which is typically a slower event time for Exhibition Place.

- Chillers consumption went up in 2015 due to TO2015 as shown in Figure 4.

- Weather temperatures play an important role in the electricity consumption of Enercare Centre. Roof de-icing and snow melting devices are part of Enercare Centre electrical load and consume more electricity in cold weather and during the snow season. Weather temperature in the winter months of 2015 (January, February, March) was colder by 3C and 7C respectively compared to 2014 and 2013 as shown in Figure 3.

- A new Fire System was installed in Enercare Centre prior to June 2015 and commissioning had to take place during the nights when there was no activity in the Centre which resulted in lights being on during periods which would normally only have emergency lighting in effect.

- Permanent staff relocation from the Queen Elizabeth Building to Enercare Centre in August 2014 resulted in increased air conditioning loads, increase lighting, as well as exhaust fan use, due to increase parking garage activity during the entire 2015 year.

- While the conversion of existing 450 watt lighting in the Halls in the Enercare Centre to higher energy efficiency 150 watt LED lighting was completed in December 2015, the full savings of these new LED fixtures will not occur until 2016.

- Increased lighting use due to installation of the new PA system, the new power feed to Hotel X and welding for the District Energy Pipe lines. Lights were on at night in these areas because of the capital work.

MONTHLY ELECTRICAL CONSUMPTION

Figure 2A compares the monthly electricity consumption of Enercare Centre over the reporting period 2013, 2014 and 2015.

Figure 2A: Monthly electrical consumption

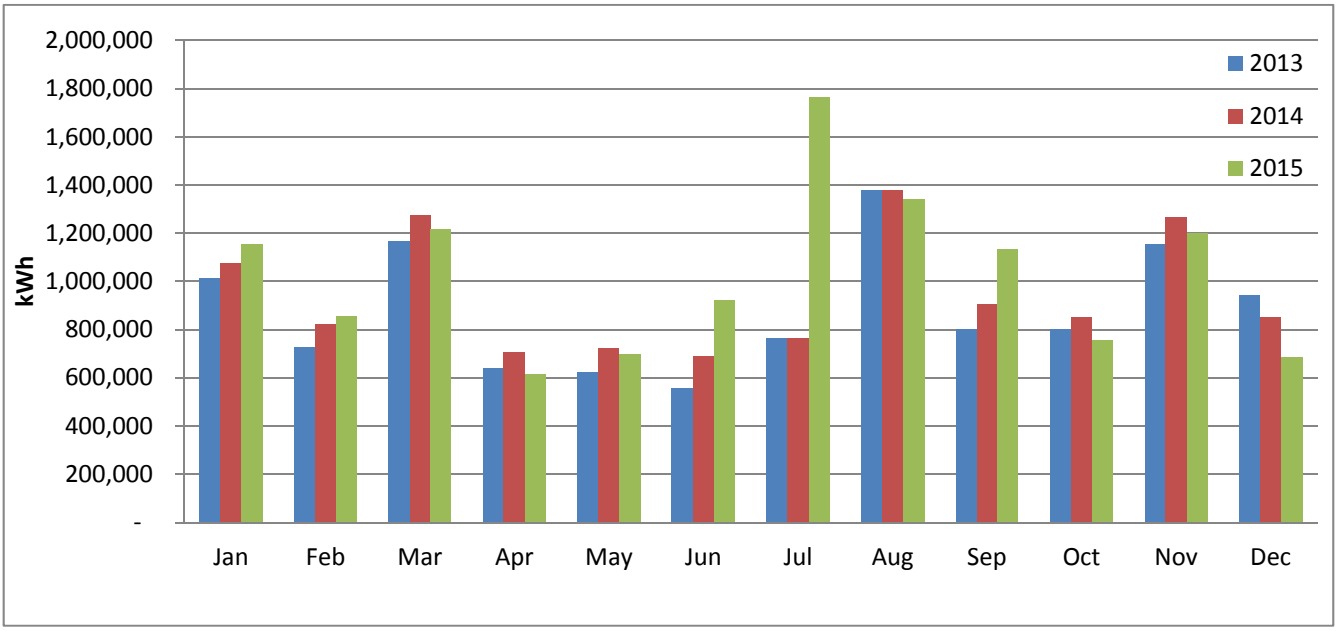
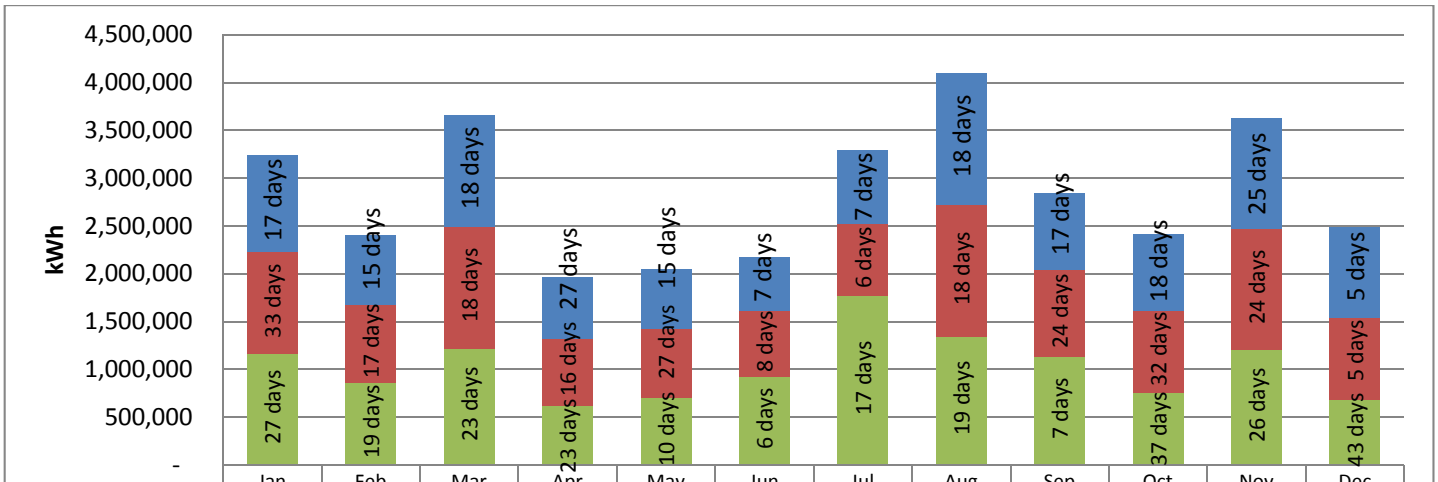


Figure 2B compares building power loads against total monthly show days for the reporting years 2013, 2014 and 2015. In both Figure 2A and 2B, the days listed may reflect multiple events in different areas of the Enercare Centre.

Figure 2B - Building Power Loads vs. Show days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	1,013,81	726,426	1,166,53	640,673	623,421	556,957	763,936	1,380,40	802,030	801,307	1,154,98	943,108
2014	1,074,17	821,889	1,277,80	706,595	723,082	688,972	764,319	1,377,62	904,993	854,154	1,267,17	851,258
2015	1,156,08	857,318	1,215,93	616,931	700,732	921,830	1,763,42	1,342,21	1,133,90	758,141	1,201,35	687,565

Figure 2C shows a comparison of activity days (move-in/show days/move-out days) for the reporting year 2013, 2014 and 2015.

Figure 2C – Activity days comparison 2013, 2014, 2015

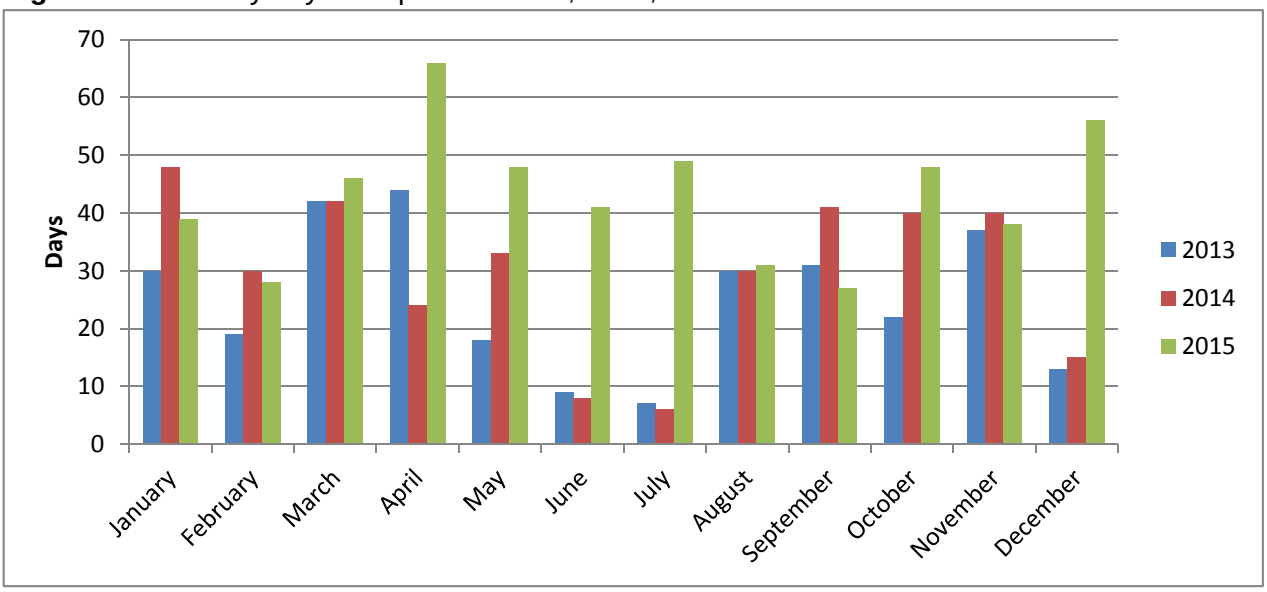


Figure 3 below shows the comparison of the average temperature for 2013, 2014 and 2015

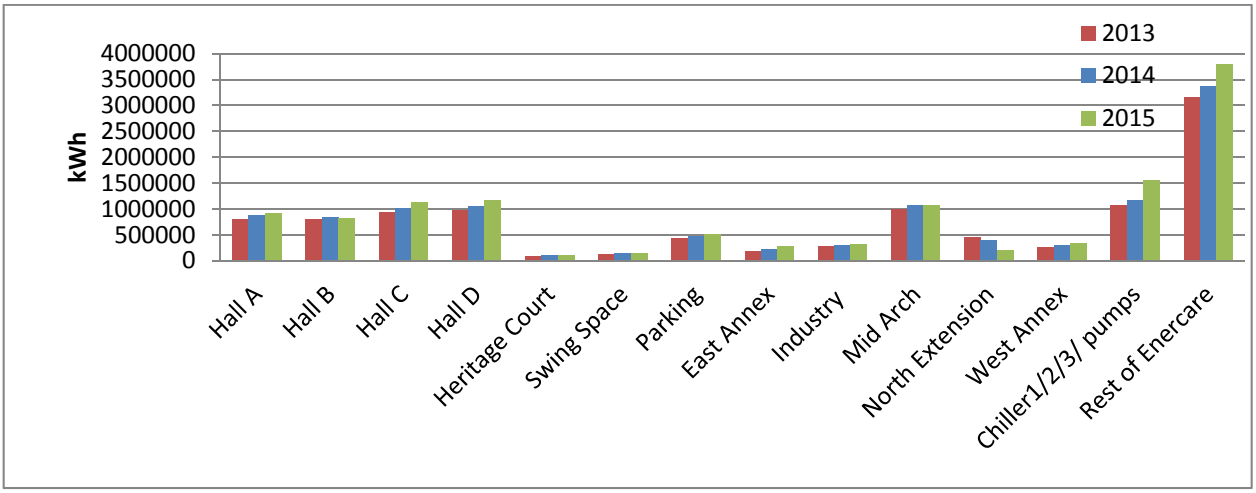
Figure 3 - Average temperature for 2013, 2014 and 2015

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2013	-1	-3	1	7	16	19	23	21	17	12	3	-3
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

ELECTRICAL ENERGY DISTRIBUTION

Figure 4 compares the electricity consumption distribution of Enercare Centre for the reporting period.

Figure 4: Electricity consumption distribution



Note:

- Part of Mid Arch consumption includes the corporate offices of the Royal Agricultural Winter Fair (RAWF) and electricity usage in these offices is not sub metered.
- Part of West Annex consumption is the storage usage for Maple Leaf Sports & Entertainment (MLSE) on the first and second floor which is not sub metered.

- The "Rest of Enercare" category is the largest sector of energy used in the Enercare Centre and represents 30% of the total building load in 2013 and 2014, and 31% in 2015. Some of the areas that are not sub metered are:
    - Mechanical rooms
    - Search lights in the Towers
    - Kitchen
    - One of the concessions
    - Cooling towers
    - Chiller 4
    - Roof De-icing system
    - Roof Snow Melting system
    - Salons and meeting / board rooms used by events and staff
    - Offices
    - Elevators and Escalators

- Because these loads are not separately sub-metered the end use cannot be determined. More studies should be done to specify all the areas/devices that are not sub metered to determine if any conservation measures should be put in place.

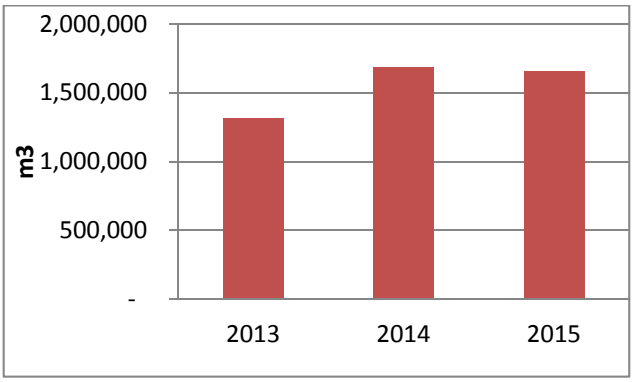
NATURAL GAS CONSUMPTION

Figure 5 compares the total gas consumption of Enercare Centre over the reporting period. The Natural Gas Consumption of the Enercare Centre is tracked monthly by the following five meters:

- Enercare Centre
- North Extension
- Mid Arch
- Industry Building
- East Annex

The entire base heating of the Enercare Centre is provided by Natural Gas with electric fans used to distribute this heat.

Figure 5: Comparison of total gas consumption



Years	% Increase
2015 vs. 2014	-2%
2015 vs. 2013	26%
2014 vs. 2013	28%

Figures 6 compares the monthly gas consumption of the Mid Arch meter over the reporting period 2013 – 2015 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 6: Mid Arch meter monthly consumption comparison

Month	2013 (m^3)	2013 HDD	2014 (m^3)	2014 HDD	2015 (m^3)	2015 HDD
Jan	93015	589	114907	649	123303	792
Feb	87861	588	114996	677	147428	857
Mar	92522	515	124984	619	122116	616
Apr	53696	334	70257	312	80562	314
May	3149	97	20511	117	525	89
Jun	0	26	0	7	729	34
Jul	0	0	0	2	671	4
Aug	0	1	0	4	120	4
Sep	0	71	0	56	188	31
Oct	3682	167	2228	203	1776	250
Nov	46151	408	75211	440	44490	345
Dec	92752	637	106754	514	88391	430
Total	**472828**	**3432**	**629848**	**3600**	**610299**	**3766**

- Mid Arch gas consumption decreased by 3% in 2015 compared to 2014. This was mainly due to the optimization of the Back Pressure Steam Turbine in 2015, to allow better efficiency of the boiler operation.

- The Mid Arch gas meter shows the gas consumption of the three boilers located in MidArch and also the gas usage of the boiler that heats the corporate offices of the RAWF.

- The natural gas consumption is heavily dependent on weather and events that require the use of natural gas. The colder it is outside, the more energy is required to heat buildings. Again, as noted in Figure 3, the weather temperature in the winter months of 2015 (January, February, March) was colder by an average of 3C compared to 2014.

Figure 7 compares the monthly gas consumption of Enercare Centre over the reporting period 2013 – 2015 by Heating Degree Day (HDD).

Figure 7: Enercare Centre meter monthly consumption comparison by HDD

Month	2013 (m^3)	2013 HDD	2014 (m^3)	2014 HDD	2015 (m^3)	2015 HDD
Jan	144747	589	181342	649	235620	792
Feb	126514	588	188611	677	200950	857
Mar	122628	515	226357	619	228970	616
Apr	50052	334	82759	312	76682	314
May	16414	97	15571	117	26421	89
Jun	2195	26	3723	7	7890	34
Jul	3812	0	2198	2	7681	4
Aug	3724	1	4547	4	3495	4
Sep	16201	71	11117	56	2046	31
Oct	63680	167	25851	203	33247	250
Nov	127190	408	175440	440	122143	345
Dec	152625	637	124073	514	84818	430
Total	**829589**	**3432**	**1041589**	**3600**	**1029963**	**3766**

In 2015, the natural gas consumption in the Enercare Centre decreased by 3% compared to 2014. This was mainly due to the optimization of the boiler for the District Energy System, which was done by combining two heating systems into one, and this allowed the system to operate more efficiently.

DISTRICT ENERGY SYSTEM

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.

Through the Air Handling Units in the Enercare Centre, the DES provides cooling by supplying chilled water to Enercare Centre, Allstream Centre, Ricoh Coliseum and Hotel X. In 2014 and 2015, the total of 224,615 and 538,816 Ton-Hour of chilled water was provided by the DES to Enercare Centre. This was mainly due to the increase in the amount of cooling that had to be used for TO2015. There is no data recorded for the years 2012 or 2013. The Air Handling Units use electrical power and all the electricity consumed to make the chilled water and transport it across the grounds for the DES is recorded under the Enercare data.

In addition, the DES provides heating and domestic hot water for Enercare Centre and also provides heating for the ballroom and the building make up air of the Allstream Centre. There is no data recorded for the years 2013, 2014 or 2015 for the consumption during these years, however, the baseline consumption is averaged at 111,200 m^3. While partially supplying Allstream Centre, all gas consumption for the DES and all cost of that consumption is recorded under the Enercare Centre and reported in Figure 5.

GREENHOUSE GASES

The City of Toronto has established aggressive targets to reduce Greenhouse Gas (GHG) emissions as set out in Figure 8 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 8 -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 or agency 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 Enercare Centre is shown in Figure 9 and the total greenhouse gas emissions is shown in Figure 10.

Figure 9 - Green House Gas Emissions

Year	Electricity			Gas		
	Co2	NOx	SOx	Co2	NOx	SOx
	Ton	Ton	Ton	Ton	Ton	Ton
2013	2580	3.7	0.7	2637	2	0.01
2014	2760	3.9	0.7	3382	3	0.02
2015	3015	4.3	0.8	3319	3	0.02

Figure 10 -Total Green House Gas Emissions

Year	Co2	NOx	SOx
	Ton	Ton	Ton
2013	5217	5.79	0.68
2014	6142	6.64	0.73
2015	6333	6.95	0.79

HYDRO EXEPENSE

The total hydro consumption is shown in Figure 4 and consists of Enercare, East Annex, MidArch, Industry, North Extension, West Annex and all electricity consumption for DES.

The total hydro cost for the consumption noted above is shown in Figure 11.

Figure 11 - Hydro cost

Year	Total Consumption	Average Rate per Kwh	Total Hydro Expense
	[kWh]	$	$
2013	10,573,590	0.1096	1,158,865
2014	11,312,031	0.1106	1,251,111
2015	12,355,425	0.1181	1,459,176

GAS EXPENSES

The total Natural Gas Consumption is tracked by five meters monthly: Enercare Centre, North Extension, Mid Arch, Industry Building, and East Annex.

Enercare gas meter shows the consumption of the kitchen, Trigen and Enercare Centre. It also includes gas usage of District Energy System (DES) located on the third floor of Enercare Centre that provides heating for Enercare Centre and part of Allstream Centre, as well as domestic hot water for Enercare Centre.

The Mid Arch gas meter shows the gas consumption of the three boilers located in MidArch and also the gas usage of the boiler used to heat the corporate offices for the RAWF.

Total gas consumption is shown in Figure 5 and the cost of that consumption is shown in Figure 12.

Figure 12: Gas Cost

Year	M3	Average Rate/M3	$
2013	1,313,903	0.233	306,139
2014	1,685,087	0.273	460,029
2015	1,653,463	0.33	545,643

REDUCTION INITIATIVES STATUS UPDATE

Listed below is a status update on reduction initiatives undertaken as identified in the 2012 – 2014 Enercare Centre Energy Performance Report.

	DESCRIPTION	STATUS UPDATE
1	Replace existing lighting in the Halls in the Enercare Centre with higher energy efficiency lighting.	In December 2015, the plan to change out the exhibit hall high bay lighting from 400 watt fixtures to 150 watt LED fixtures with individual dimming control was completed.
2	Complete the automation of the rapid roll-up doors	Automation of the rapid roll-up doors was completed on 2 doors in 2015, with the remainder slated for completion in 2016, budget permitting.
3	Upgrade existing District Energy System to add additional boiler and to provide heating and cooling to the new hotel.	This project has commenced and due to be completed in 2016

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 2016 to help us meet this goal.

- Optimize the minimum level required for emergency lights
- Investigate removing search lights, as they consume a huge amount of electricity.
- Use the Encilium system, instead of the Johnsons Control system to control lighting use.
- Change the tunnel lights in the garage to LED
- Investigate third floor hallway lighting energy reduction
- Optimize winter temperature in the parking garage.
- Complete the automation of the rapid roll-up doors to prevent the loss of air conditioning and heat conditioning air through roll up doors that have been left open.