



Exhibition Place

District Energy System GreenSmart Energy Performance Report 2016 - 2018



A GreenSmart Energy Initiative



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INTRODUCTION

Exhibition Place, as part of the 2017 – 2019 Strategic Plan, has set a goal to reduce the environmental impact of operations and businesses. 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 track 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 and generation relating to the District Energy System (DES) at Exhibition Place.

District Energy Systems, also called low-carbon thermal energy networks, are systems that distribute thermal energy to multiple buildings in an area or neighborhood. These systems typically consist of a heating and cooling centre, and a thermal network of pipes connected to a group of buildings. This allows multiple facilities that are in close proximity to benefit from a single boiler/chiller plant.

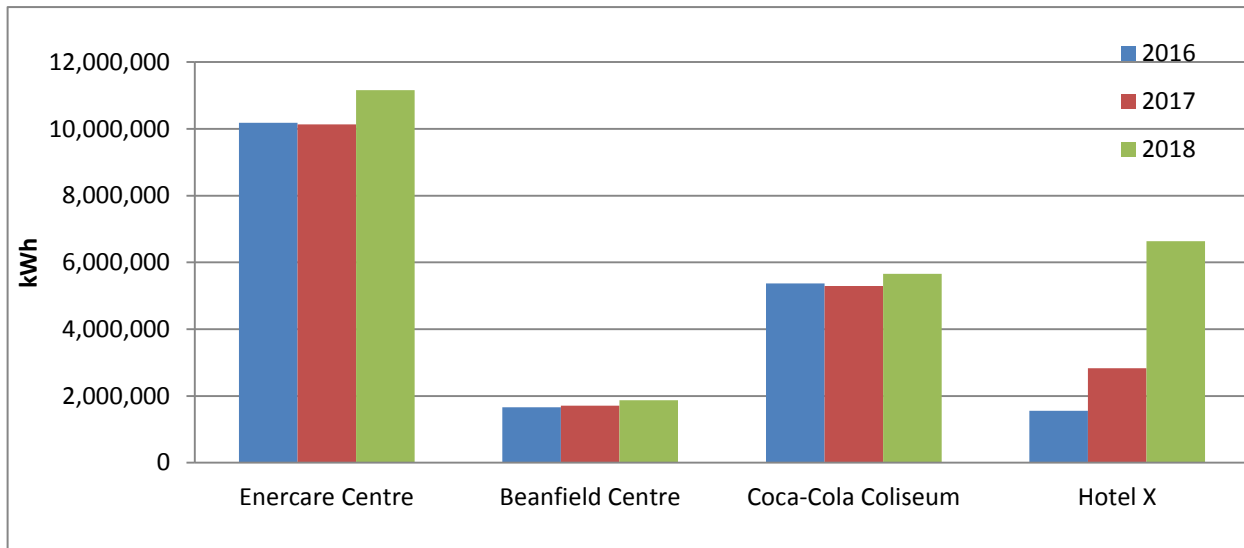
The District Energy System at Exhibition Place encompasses the Enercare Centre, Coca-Cola Coliseum, Beanfield Centre and Hotel X. Cold and hot water is produced by the cooling/ and heating plant located at the Enercare Centre and provided to these facilities to sustain their operational requirements. In addition to cold/hot water connections, Hotel X is also connected to the Enercare Centre's electrical grid.

This project is part of the Exhibition Place GreenSmart Energy Initiatives for the purpose of increasing equipment efficiencies and promoting sustainable development.

ELECTRICAL CONSUMPTION BREAKDOWN BY BUILDING

Figure 1 and 2 compare the gross electricity consumption of the facilities included in the DES over the reporting period 2016, 2017 and 2018.

Figure 1 – Yearly Gross Electrical Consumption Breakdown by Building



Notes:

- Electrical consumption associated with the DES has been allocated to the receiving facility. i.e. energy use from supplying chilled water to the hotel through the DES will be allocated to the hotel, and not from the Enercare Centre where it was produced.
- Electrical consumption across all four facilities increased in 2018 largely as a result of the warmer summer temperatures as shown in figures 3 and 4.

Figure 2 – Total Electrical Consumption Breakdown by Building

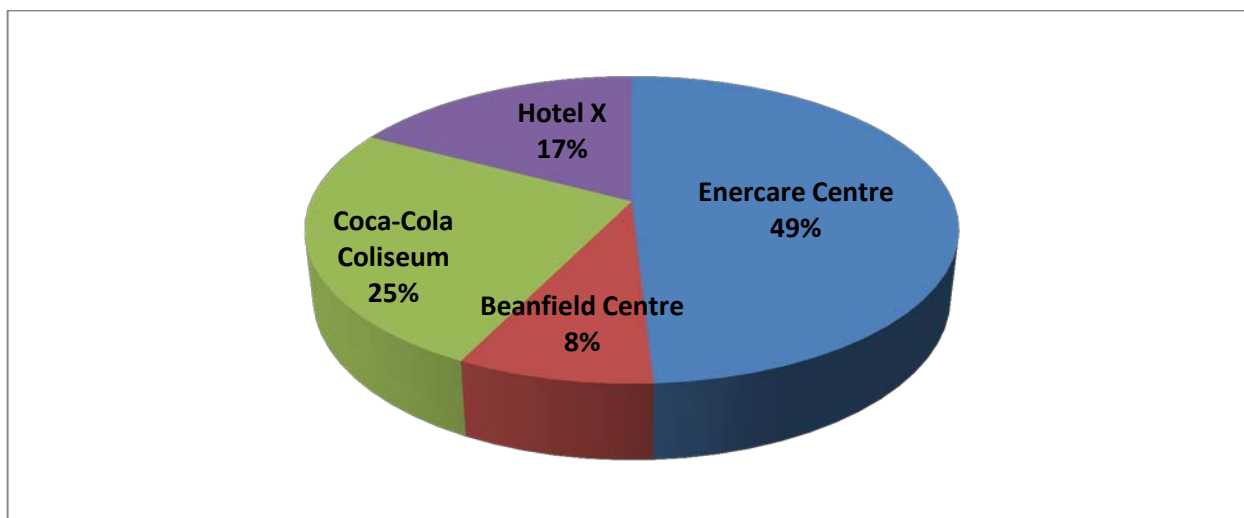


Figure 33 below shows the comparison of the average temperature for 2016, 2017 and 2018

Figure 3 – Average Temperature for 2016, 2017 and 2018

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016	-2	-1	4	6	16	20	21	24	20	13	8	-1
2017	-1	-1	0	10	12	19	22	21	19	14	5	-4
2018	-4	-1	1	5	17	20	23	24	19	10	2	1

Figure 34 below shows the comparison of the recorded for 2016, 2017 and 2018

Figure 4 – CDDs for 2016, 2017 and 2018

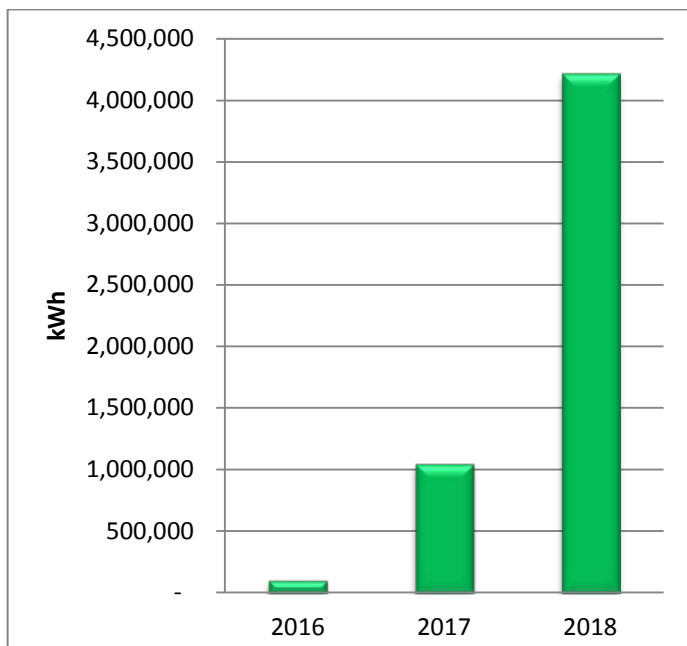
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016	0	0	0	0	43	80	180	184	70	5	0	0
2017	0	0	0	0	2	61	117	85	76	8	0	0
2018	0	0	0	0	40	62	139	170	81	7	0	0

CO-GENERATION SYSTEM PRODUCTION

Co-generation systems generate two forms of secondary energy: electricity and space heating. The co-gen system located on the roof of the Enercare Centre consists of a 1.6 MW natural gas-fired generator with a heat-recovery system (heating). The waste heat produced by the engine is recovered in the form of hot water to complement the main hot water boiler plant located in the Enercare Centre. This boiler plant provides heating to the Enercare Centre, Beanfield Centre, Hotel X and the Coca-Cola Coliseum.

Figure 5 compares the Total Cogeneration production from year to year. Production in 2018 is up 301% from 2017 and 3807% from 2016. This dramatic increase can be attributed to the increased electrical load Hotel X places on the DES. Previously, it was only optimal to run the cogen when the Enercare Centre had an electrical load that exceeded 1.6 MW which typically only occurred during large events. With the additional electrical load attributed to Hotel X, the combined electrical load of the Enercare Centre and Hotel X typically sits above 1.6 MW, therefore providing suitable conditions for the cogen system to run year-round.

Figure 5 – Yearly Co-Generation Production.



Years	% Increase
2018 vs. 2017	301%
2018 vs. 2016	3807%
2017 vs. 2016	873%

CHILLED WATER SUPPLY

Chilled water is processed in the Enercare Centre cooling plant and distributed to Hotel X, Coca-Cola Coliseum, and the Beanfield Centre to fulfill these facilities' operational requirements. Figures 6 and 7 compare the chilled water load (in kWh)

Figure 6 – Yearly Chilled Water Electrical Consumption Breakdown by Building

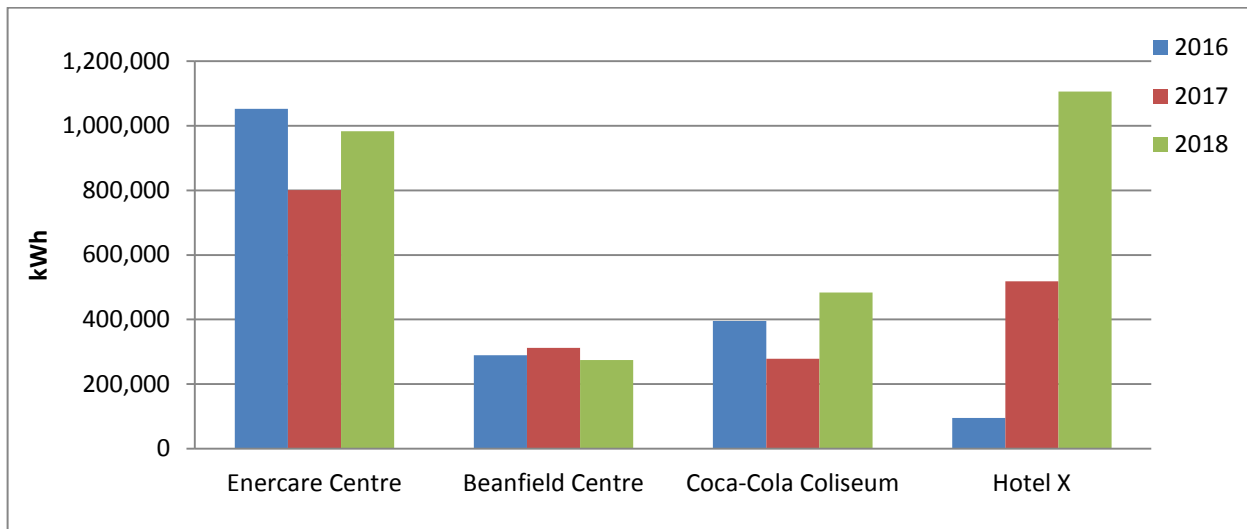
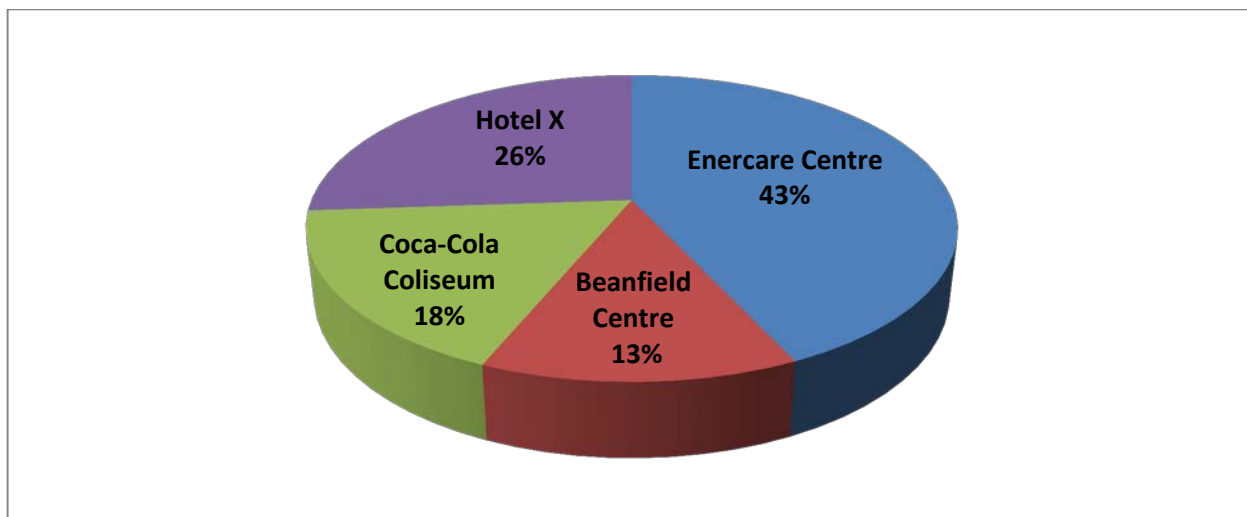


Figure 7 – Total Chilled Water Electrical Consumption Breakdown by Building



HOT WATER SUPPLY

Hot water is processed in the Enercare Centre cooling plant and distributed to Hotel X and the Beanfield Centre to fulfill these facilities' operational requirements. Figures 8 and 9 compare the hot water load (in kBtu). Unfortunately, data prior to 2018 was inadequate for comparison purposes in 2016 and 2017 and therefore only data from 2018 is provided.

Figure 8 – Yearly Hot Water Consumption Breakdown by Building

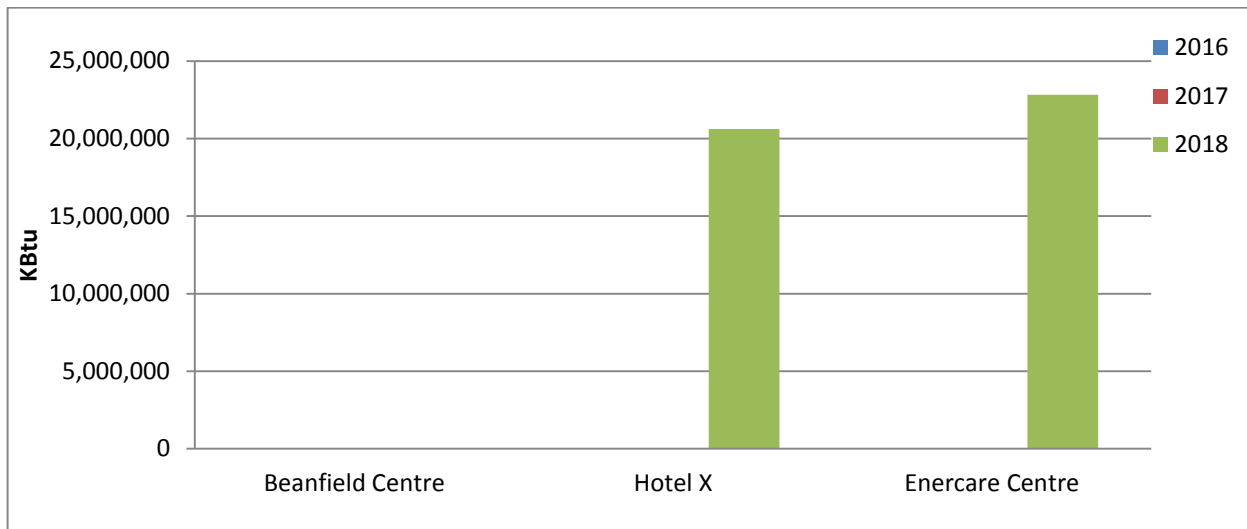
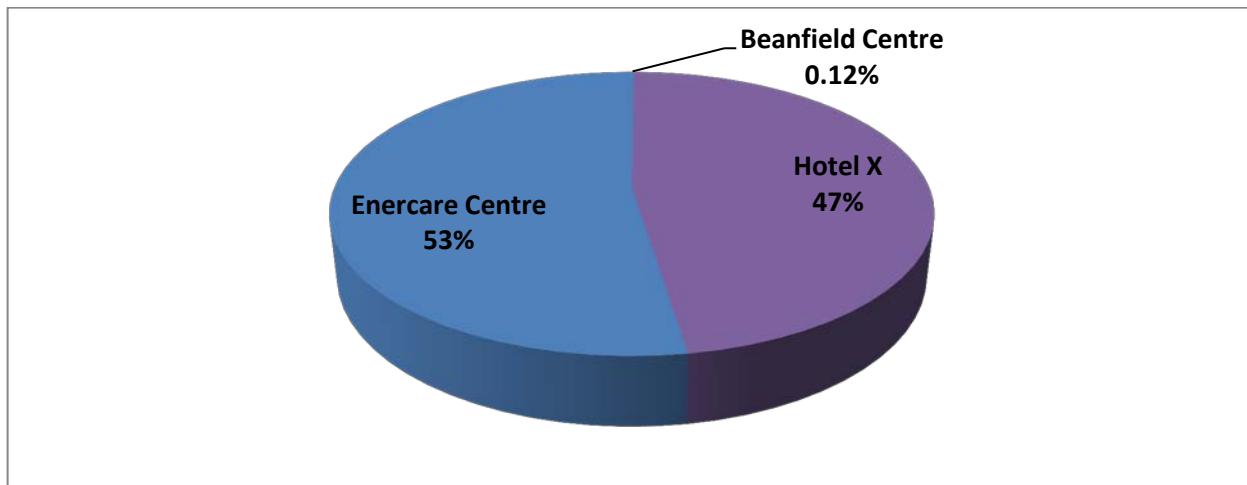


Figure 9 – Total Hot Water Consumption Breakdown by Building



FUTURE DIRECTIONS

Increasing the efficiency of existing components of the District Energy System (Heating, ventilation and air conditioning) systems is a key step towards Exhibition Place's energy reduction goal. The following projects are targeted for 2019 to help us meet our goal.

- Optimize the heat transfer from the cogen heat recovery system to the DES.
- Replace one of the 20+ year old chillers with a high efficiency magnetic bearing chiller to increase the coefficient of performance (COP) of the cooling plant.
- Install a "free cooling" system which comprises of a heat exchanger between the condenser and chilled water loops. This will take advantage of the cold air in the cooler months in order to provide cooling without the operation of the chillers.
- Cut louvres/slits into the metal barrier surrounding the cooling towers to encourage additional ventilation. This will lower rooftop temperatures and increase the efficiency of the existing cooling towers.
- Investigate the effect the cogen exhaust has on the cooling tower system efficiency and determine if the cogen exhaust should be vented further away from the cooling towers.
- Install additional metering in 2019 to better monitor and understand the effect that the DES has on the Enercare Centre's energy consumption.