City of Richmond

Report to Committee

To:	Public Works and Transportation Committee	**Date:**	December 15, 2017
From:	John Irving, P.Eng., MPA Director, Engineering	**File:**	10-6600-10-02/2017-Vol 01
Re:	**Lulu Island Energy Company – 2017 District Energy Operational Update**		

Staff Recommendation

That the Lulu Island Energy Company report titled "Lulu Island Energy Company – 2017 District Energy Operational Update" dated December 15, 2017 from the Director, Engineering be received for information.

John Irving, P.Eng., MPA
Director, Engineering and
Chief Operating Officer, Lulu Island Energy Company
(604-276-4140)

Att. 1

REPORT CONCURRENCE	
CONCURRENCE OF GENERAL MANAGER	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: CJ
APPROVED BY CAO	

Richmond

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LuluIsland ENERGY COMPANY

6911 NO. 3 ROAD
RICHMOND, BC V6Y 2C1

Report

DATE: December 8, 2017

TO: LIEC Board of Directors

FROM: Alen Postolka, P.Eng., District Energy Manager

Re: **Lulu Island Energy Company – 2017 District Energy Operational Update**

Staff Recommendation

1. That the report titled "Lulu Island Energy Company – 2017 District Energy Operational Update" dated December 8, 2017 be received by the LIEC Board for information; and

2. That staff be directed to present the report titled "Lulu Island Energy Company – 2017 District Energy Operational Update" dated December 8, 2017 to the City of Richmond Council for information.

Background

In operation since 2012, the ADEU is a sustainable energy system which provides a centralized energy source for heating, cooling and domestic hot water heating for residential and commercial customers located in the Alexandra/West Cambie neighbourhood. Currently, almost all of the energy provided to customers is produced locally from the geo-exchange fields that are located within the nearby greenway corridor and in West Cambie Park. The backup and peaking natural gas boilers and cooling towers in the energy centre have operated only for a few hours throughout the system's operation to date. The system currently provides energy to six residential buildings, the "Central at Garden City" commercial development, the Richmond Jamatkhana temple and Fire Hall #3, in total connecting over 1450 residential units and over 1.6 million square feet of floor area.

At the OVDEU, energy for space heating and domestic hot water heating is currently being supplied from two interim energy centres which use natural gas boilers. When enough buildings are connected to the system, a permanent energy centre will be built which will produce low carbon energy, expected to be harnessed from the Gilbert Trunk sanitary force main sewer. At the present time, there are eight buildings with over 1,675 residential units and 1.8 million square feet of floor are receiving energy from the OVDEU.

Both systems continue to experience rapid growth in order to meet the growing demand of the neighbourhood's they service.

The purpose of this report is to provide an operational update for the ADEU and OVDEU for the period of October 2016 to September 2017

Analysis

As part of regular reporting, this report provides information about the operation of both the Oval Village District Energy Utility (OVDEU) and the Alexandra District Energy Utility (ADEU). Specifically, this report analyzes and compares the Utilities' performance on a year over year basis, with each year in this comparison spanning from September until October of the following year in order to allow for a full 12 month comparison. This comparison takes into account the energy use of connected buildings as well as the impact of seasonal temperatures through the analysis of heating and cooling degree days. Details on the heating and cooling degree day data is included in Attachment 1.

ADEU Operational Report

Figure 1 below shows a year over year comparison of energy delivered by the ADEU to customer buildings. This includes space heating, cooling and domestic hot water heating energy. Analysis of heating degree day data shows that the 2016/17 period was colder than the 2015/16 period. Additionally, the cooling degree data shows that 2016/17 had a hotter summer season than 2015/16. However, the main factor contributing to the increased energy illustrated in Figure 1 is the fact that the ADEU has seen significant growth over the past years with the addition of several new building connections. During the 2016/17 season, the ADEU provided continuous service to customer buildings and did not experience any service outages that impacted customers. Planned, preventive maintenance and unplanned, corrective work activities were conducted while the system maintained service.

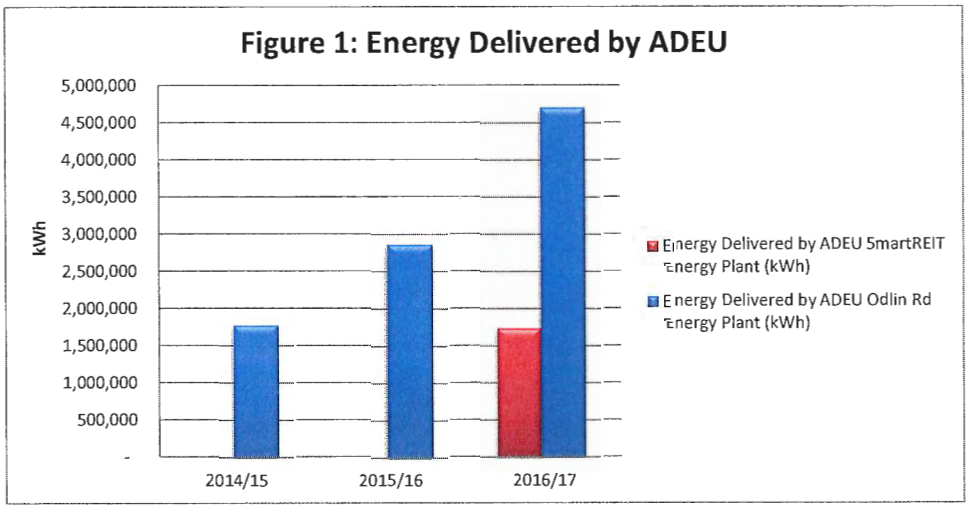

Figure 1: ADEU Operations

Figure 1 also shows the energy delivered to commercial customers by the ADEU SmartREIT plant. As 2016/17 was the first year of operation for this plant, it is the only data shown on this chart.

To date, it is estimated that ADEU has eliminated 2336 tonnes of GHG emissions[1] to the community when compared to the business-as-usual scenario with no DEU connection. The cumulative GHG emission reduction estimate is summarized in Figure 2 below.

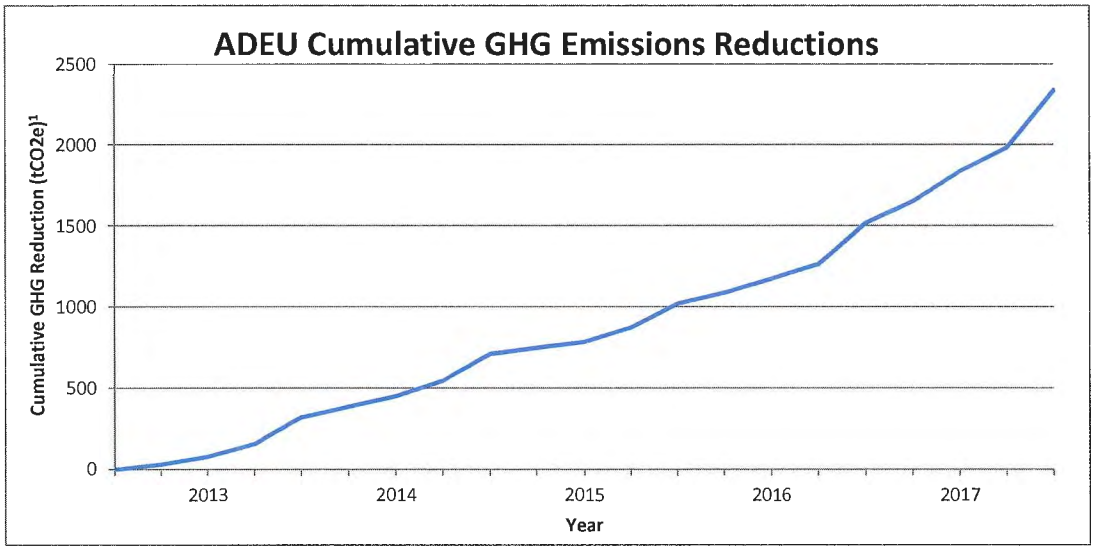

Figure 2: ADEU Cumulative GHG Emissions Reductions

OVDEU Operational Report

Figure 2 below shows a year over year comparison of energy delivered by OVDEU to customer buildings. This includes heating energy for space conditioning and domestic hot water.

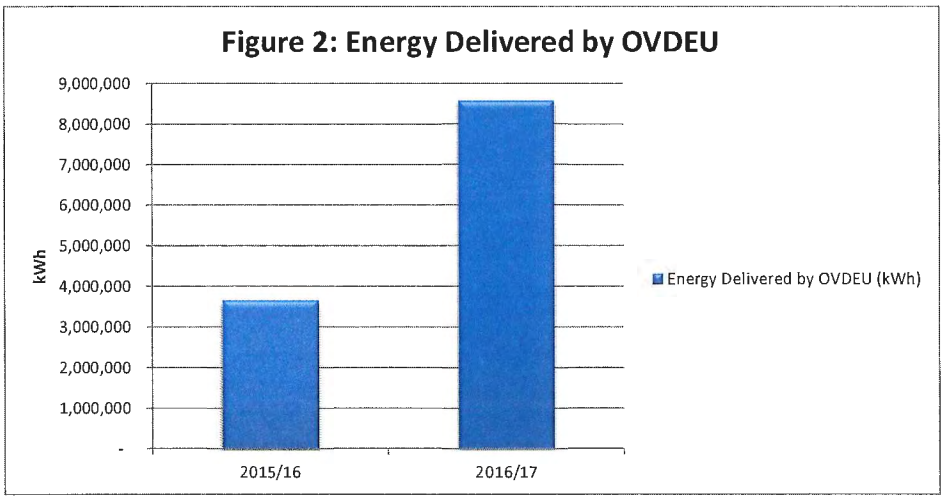

Figure 3: OVDEU Operations

As indicated in the chart, the building energy use increased during the 2016/17 period compared to the previous year. Analysis of heating degree days shows that 2016/17 was notably colder than the 2015/16 season.

[1] Assume that all energy was provided for heating. The business-as-usual (BAU) assumed that 40% of the building heating load would be provided from electricity and the remaining 60% would be from gas make-up air units.

Although this colder weather would contribute to the increase in energy use, the main factor behind this increase was the connection of four additional buildings to the district energy system since the end of the 2015/16 summer season, bringing the total number of connected buildings to eight.

During the 2016/17 season, the OVDEU provided continuous heating service to the customer buildings and did not experience significant service outages. Planned, preventive maintenance and unplanned, corrective work activities were conducted while the system maintained service. Over the course of the year, there were two unplanned interruptions due to an electrical service outage and a mechanical issue. Both these interruptions lasted less than 3 hours in length did not result in a noticeable service disruption to any OVDEU customers.

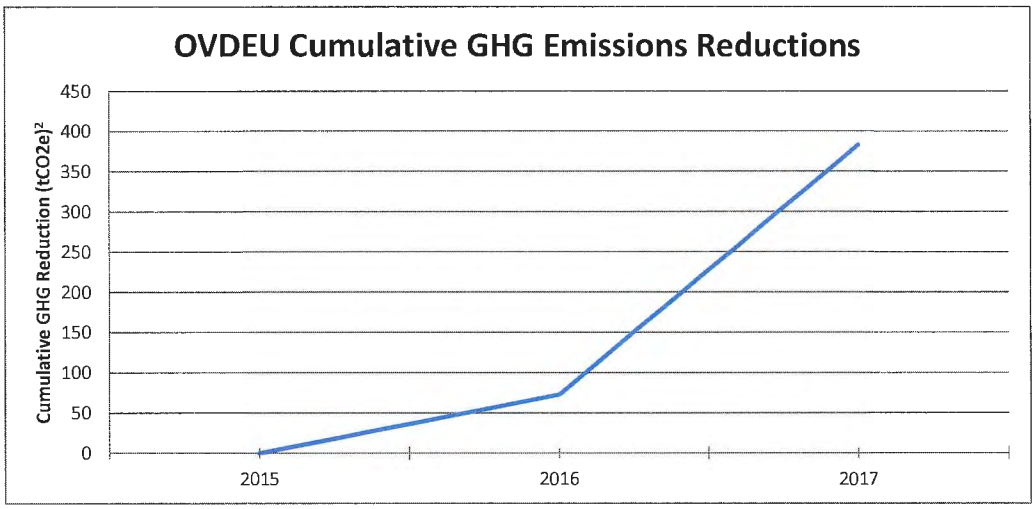

Figure 4: OVDEU Cumulative GHG Emissions Reductions

To date, it is estimated that the OVDEU has eliminated 383 tonnes of GHG emissions[2] to the community when compared to the business-as-usual scenario with no DEU connection. The cumulative GHG emission reduction estimate is summarized in Figure 4 above. These GHG emission reductions will increase greatly upon implementation of a sewer heat recovery energy source.

Financial Impact

None.

[2] The business-as-usual (BAU) assumes the use of hybrid heat pumps and natural gas boilers to provide space and domestic hot water heating

Conclusion

This report analyzes and compares the Utilities' performance during the several seasons between 2014 and the end of September 2017. The data shows that there has been a year over year increase in customer energy use over this period for both the OVDEU and ADEU. As illustrated by the heating and cooling degree day data this is due in part to climate factors, however, the main factor contributing to the increased energy use was the connection of additional buildings to the district energy systems.

Kevin Roberts
Acting Senior Project Manager
Lulu Island Energy Company

Att. 1: Heating and Cooling Degree Day Summary

Attachment 1 – Heating and Cooling Degree Day Summary

Heating Degree Days (HDD) is a standardized measure that assesses how much below a baseline temperature (18°C) the outdoor temperature is over a period of time, which allows for a comparison of heating energy production and demand over a specified period. Cooling Degree Days (CDD) is a similar measure that assesses how much above a balance temperature (18°C) the outdoor temperature is over a period of time, allowing for a comparison of cooling energy production and demand over different time periods. Degree days are a measure of how much, in degrees, and for how long, in days, the outside air temperature was below or above a certain level. They are not a measure of calendar days.

As a baseline comparison, Figure 1 shows the HDD for each of the September to October periods from 2014 to 2017. Figure 2 shows the annual summer CDD for these same periods.

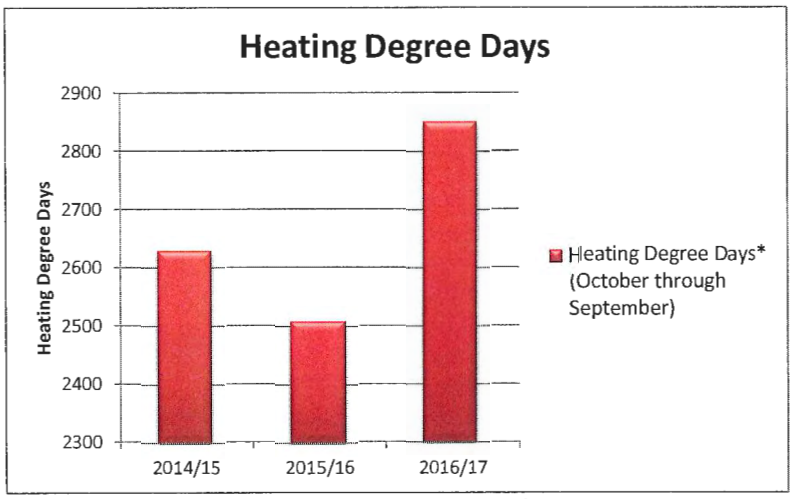

Figure 1: HDD Comparison

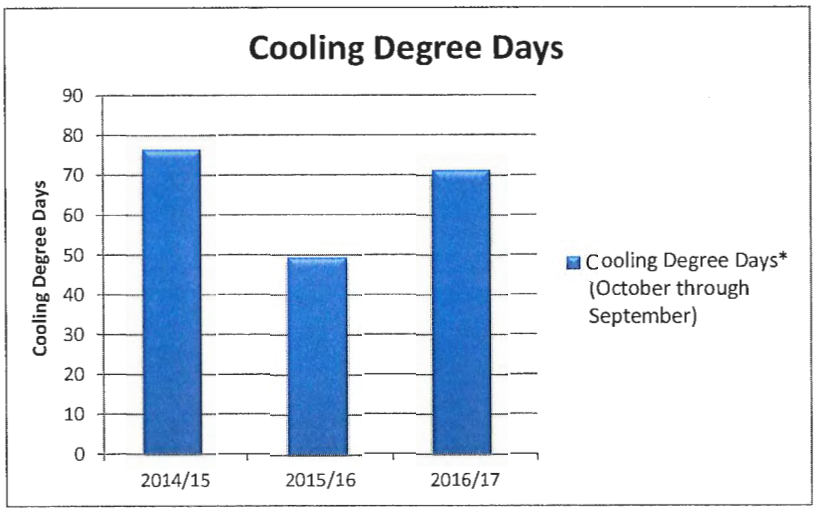

Figure 2: CDD Comparison

This data shows that the 2016/17 period was cooler than 2014/15 and 2015/16. Similarly, in the summer periods of these timeframes, 2015/15 and 2016/17 were hotter than 2015/16.