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Facilities Management
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UBC Okanagan Campus
Energy Team
Quarterly Report
July 2018 – September 2018

Report Date: 2018-10-15

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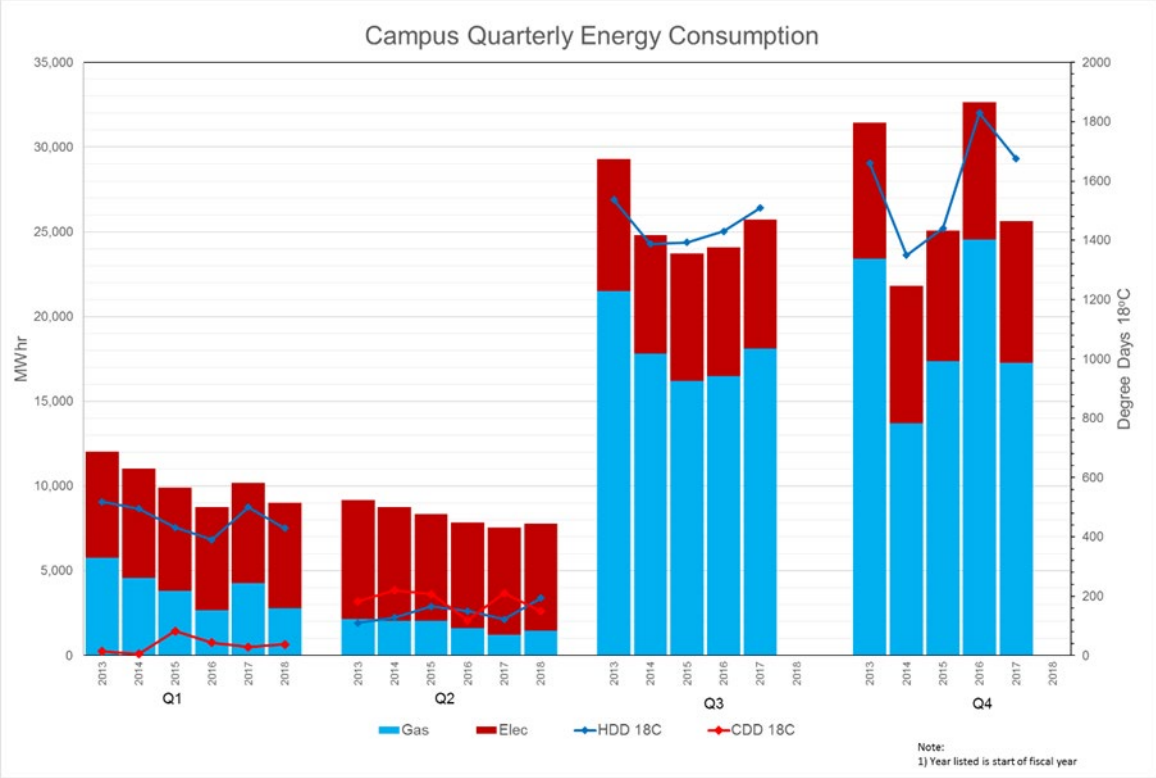
1. Summary of the Second Quarter of FY2018-2019

The most significant energy project completed in second quarter of FY2018-2019 was the installation of a new heat recovery system in the Science building. Glycol conversions in EME and RHS are also nearly complete which will allow for significantly increased heat extraction from groundwater once completed.

As can be seen in the graph below, campus energy consumption over the past quarter has been fairly constant compared to the same quarter in the prior two years.



A number of issues caused electricity consumption increases over the past quarter. These issues include:

- Ongoing reliability issues with the WIFI occupancy controlled ventilation system. Software issues have resulted in significant downtime of the system resulting in increased ventilation system run times.
- The cooling plants in ASC, Fipke and UNC were all in full operation in contrast to the summer of 2017 when project work reduced available cooling in these buildings.

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The relatively constant overall campus electricity consumption indicates that increases due to the factors listed above have been roughly balanced out by savings due to other conservation measures implemented such as lighting upgrades.

As can been seen in the graph, natural gas consumption is relatively low in the summer months.

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2. Policy Development

Appropriate policies and guidelines assist in meeting campus energy goals and as such are championed by the energy team. Significant developments in energy-related campus guidelines and policies that occurred in the past quarter are described below.

2.1. Campus District Energy Strategy

A Campus District Energy Strategy is being developed by UBCO Facilities Management. This plan is intended to guide how district energy systems on campus evolve to meet the requirements of an expanding campus.

2.2. Future Campus Construction

In order to ensure that future campus energy goals and targets are met, it is important that new buildings constructed on campus are designed and built to be consistent with the Whole Systems Infrastructure plan as well as other campus plans and goals. As such, the energy team has been involved in providing technical reviews and setting goals, targets and strategies as early as possible for future campus expansions.

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3. Completed Projects

The following projects have been completed over the last quarter:

3.1. Cooling Plant Expansion

Funding from the federal government ($1M) was received for installation of an additional cooling tower for the LDES system. This tower increases the air-cooled capacity of the LDES system. Construction was mostly completed in the fall of 2017 with final commissioning completed during spring 2018. Final deficiencies for this project remain to be completed.

3.2. Science Building Exhaust Air Heat Recovery

A glycol run around heat recovery system has been installed to recover heat from the building's central exhaust fans. This project was completed in August 2018 and is expected to save over 2000GJ of natural gas consumption per year.

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4. Projects in Progress

The following are energy conservation projects that are currently in progress.

4.1. Science Ventilation Upgrade

Various building changes that have accrued over time have reduced the efficiency of the ventilation in this building which includes a large number of laboratories. Optimization of the Science building's ventilation is currently estimated to save $52,000 in energy costs per year (2,600 GJ of gas and 415,000 kWhr of electricity). The project has been approved for $25,815 in FortisBC electrical incentives and $55,681 in FortisBC gas incentives. Rebalancing of laboratory airflows has been completed as well as installation of variable-frequency drives on the building's main exhaust fan motors. Additionally, several laboratories have been connected to a system that monitors laboratory exhaust chemical content in order to allow for ventilation rate optimization. Measures still remaining to be completed as part of this project include upgrading key fumehoods to variable air volume flow and the addition of occupancy sensors in low-hazard laboratories.

4.2. LDES Optimization: EME & RHS

Currently the effectiveness of the LDES is compromised due to limitations on LDES supply and return water temperatures required by campus buildings. In order to effectively utilize both the heating and cooling capacity of the geothermal system and cooling capacity of cooling towers, EME and RHS hydronic loops need to be converted to glycol. This work is currently underway and these systems are expected to be converted to glycol this fall.

4.3. ASC Exhaust Heat Recovery

While a glycol run around system was installed in order to recover heat from laboratory exhaust air, it has not been operational for some time due to deficiencies in the original construction.

A mechanical consultant was contracted to evaluate the system and has provided recommended remedial actions required in order to activate and operate the system.

4.4. Library Data Center Heat Recovery

Data centers on campus produce a significant amount of heat year-round. In order to utilize this heat during cold weather, a hydronic connection is being made between the library data centre and the new adjacent Commons building's central heating/cooling plant. With this connection, cooling for the data centre will be provided by the Commons' central plant with the heat being available for use in the Commons building. This system is expected to save 480 GJ of natural gas consumption annually.

4.5. Electric Demand Management

Electricity costs for the campus are a mixture of charges for energy consumption (kWhr) and peak demand (kW). As such, reducing electrical demand at peak times can have significant impacts on campus energy costs. Initial control sequences that are intended to limit peak electric demand are currently in place. Results so far have

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been disappointing and these sequences are being modified as experience indicates is appropriate.

As a part of this project, it has been found that campus daily demand peaks tend to be of a long duration rather than a sharp peak. These sustained peaks curtail many peak demand limiting strategies. However, it has been noted that the campus peak demand is somewhat offset from the regional electric grid's peak. Strategies for reducing campus electrical demand to respond to regional electric grid peaks for shorter periods of time are currently being investigated.

4.6. HVAC System Efficiency Maintenance

The energy team has employed a HVAC Efficiency Technician since the spring of 2017. This technician has been cleaning heat exchangers and other campus HVAC equipment. Improved operational efficiencies are expected as the technician has found and cleaned significantly fouled equipment. Trends in the fouling of equipment are being noted. As systems with faster/slower fouling rates are identified, cleaning schedules can be optimized.

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5. New Construction Projects

The energy team is involved in the design and construction process for new construction on campus. The energy team's goal is to ensure that the design and construction of new buildings on campus are consistent with the campus Whole Systems Plan in terms of energy targets and sources. The energy team also co-ordinates the pursuit of energy efficiency incentives from FortisBC.

5.1. The Commons

The new Commons building (formerly referred to as the Teaching and Learning Centre) is currently under construction with completion expected in late fall 2018. The final amount of the Fortis incentives available for this project is still being determined. Current estimates are that the Commons building will consume less than half the energy compared to a minimally code compliant reference building.

5.2. Nechako Residence Commons

The Nechako building is a new residence building with a large cafeteria and other campus amenities included. Completion of this building is expected for summer 2020. The energy performance and potential FortisBC incentives for this building are still being evaluated.

5.3. Skeena Residence

The Skeena Residence is a new residence building that is planned to be the first Passive House Certified building on campus. Completion of this building is expected for summer of 2020. The energy performance and potential FortisBC incentives for this building are still being evaluated.

5.4. Greenhouse

A research greenhouse is planned for construction near Mountain Weather Office. It is expected that due to cost constraints, this building will be built in phases with the final indoor growing area being 1000 m^2 total. The energy team is currently involved in evaluating energy conservation measures that will minimize the energy costs and greenhouse gas emissions of this facility.

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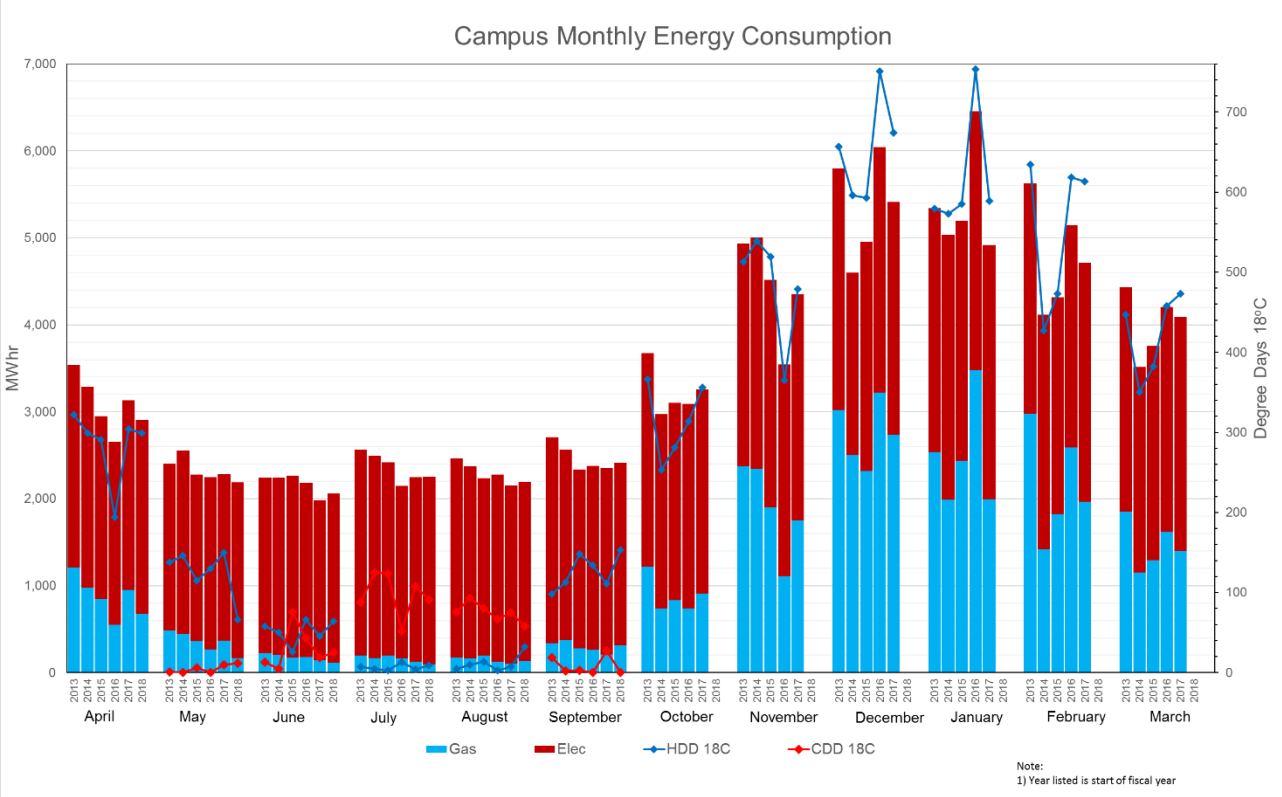
5.5. Energy Performance Graphs



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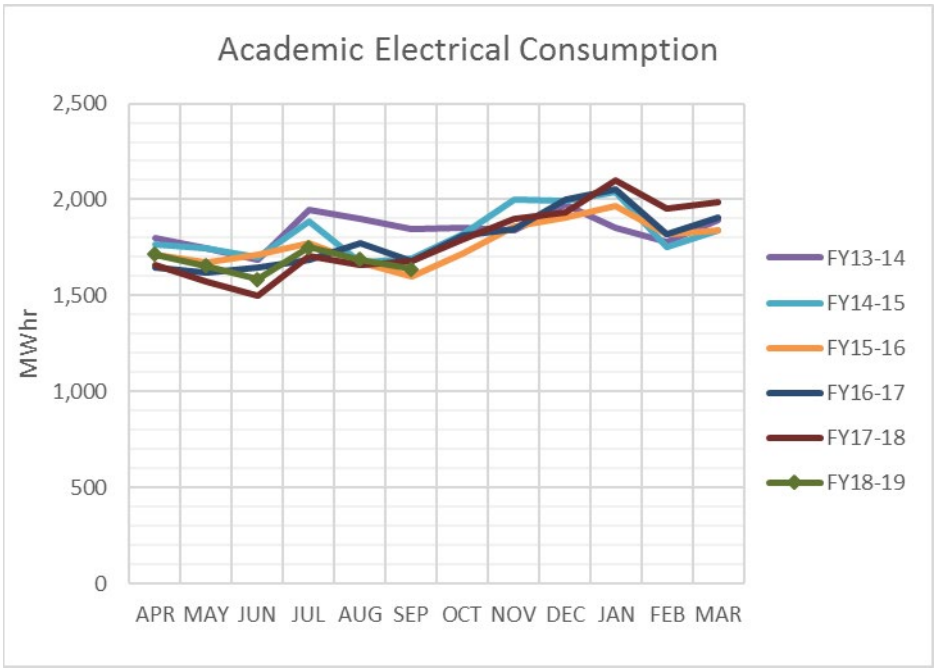

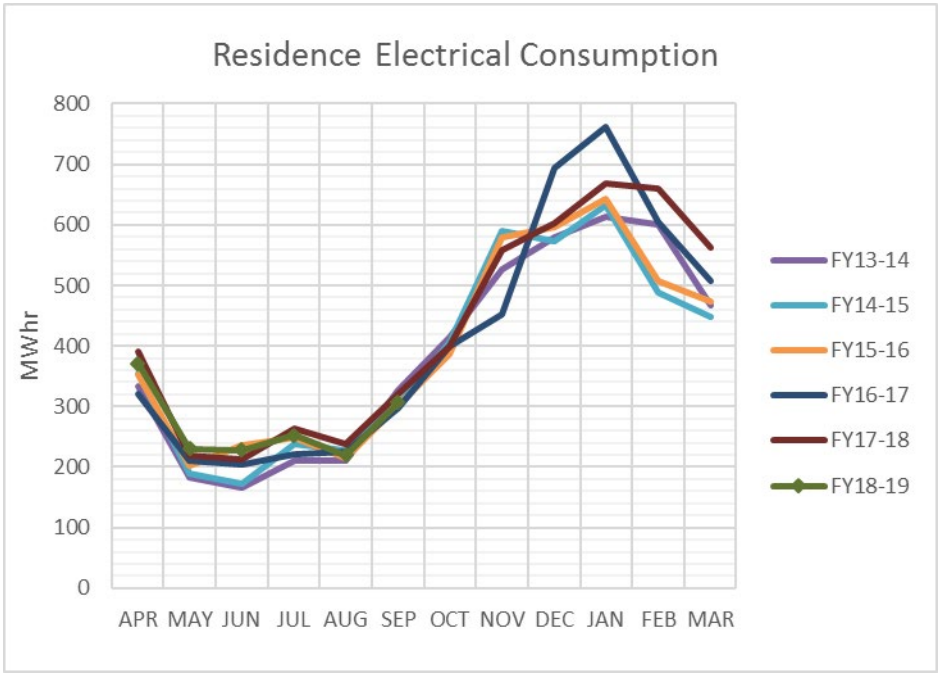

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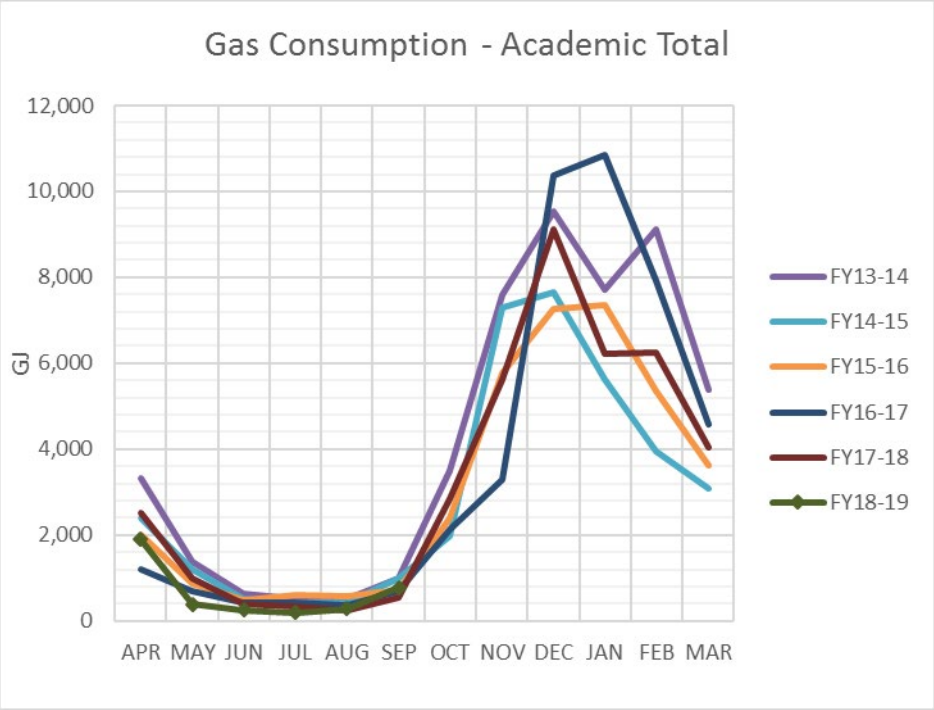

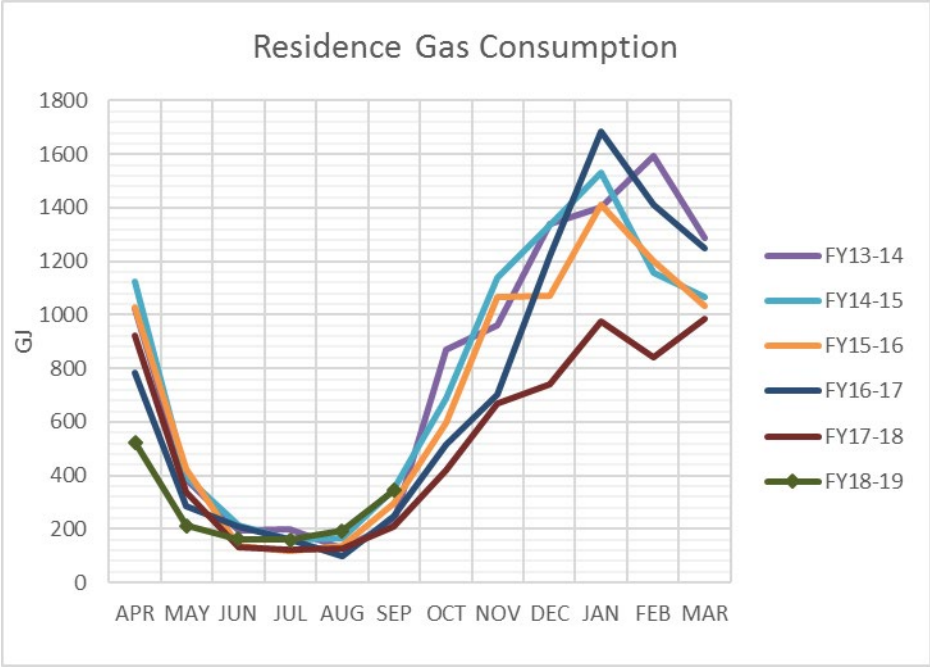

Note: Gas consumption values shown are for gas consumed within the building. Indirect gas consumption via MDES & LDES is not included in the gas plots.

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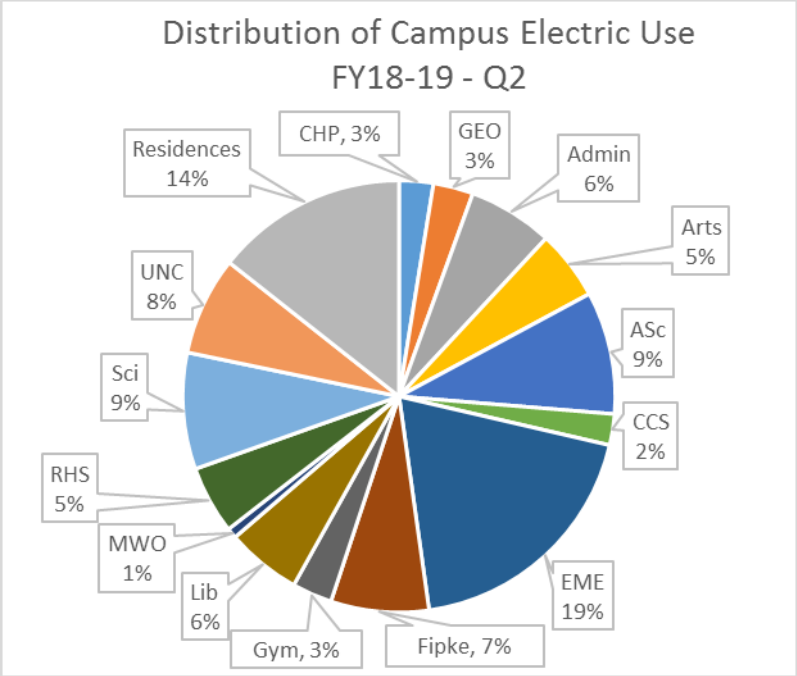

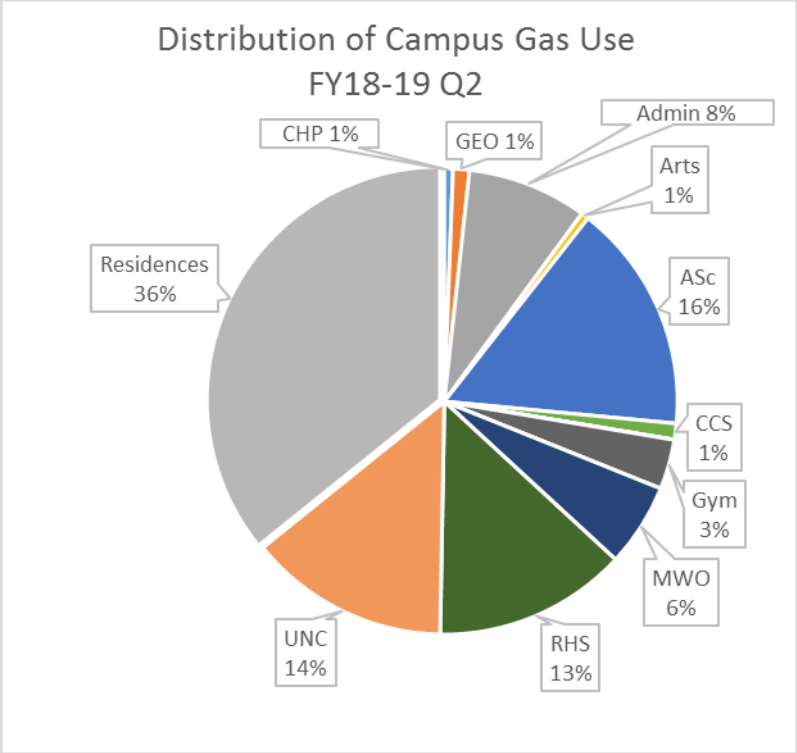

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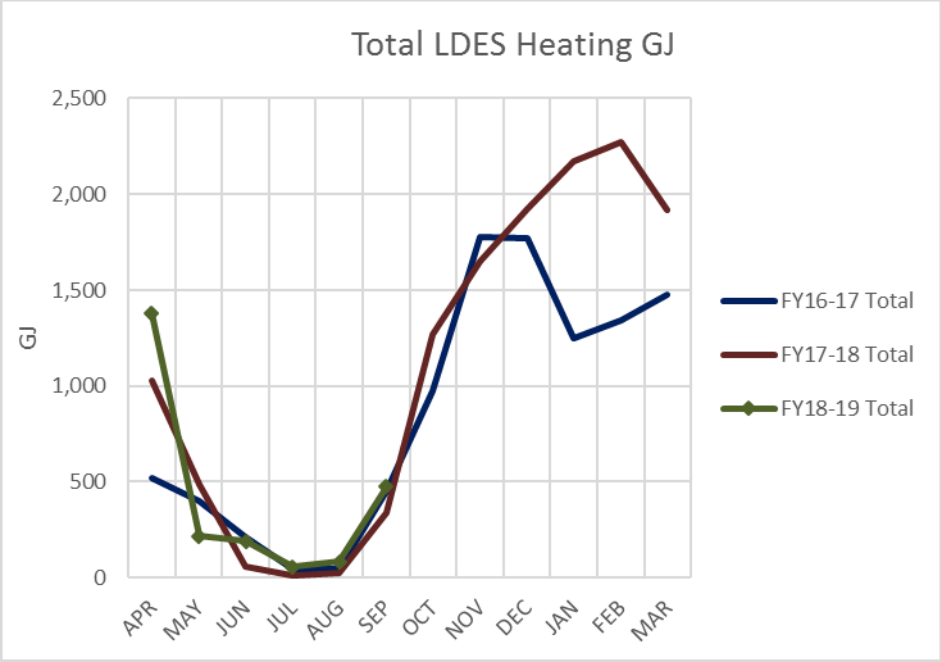
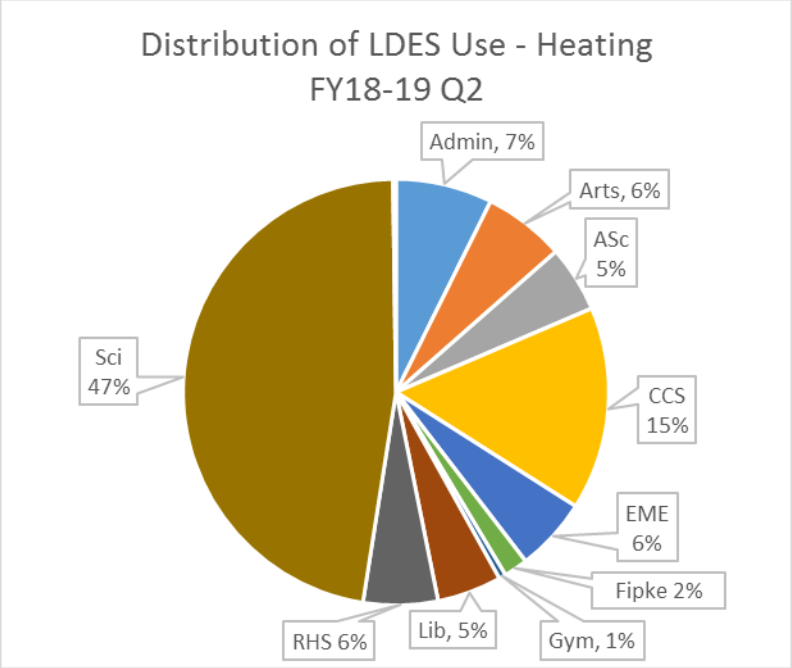


Note: 'Total' value indicates thermal GJ of heating delivered to all buildings.



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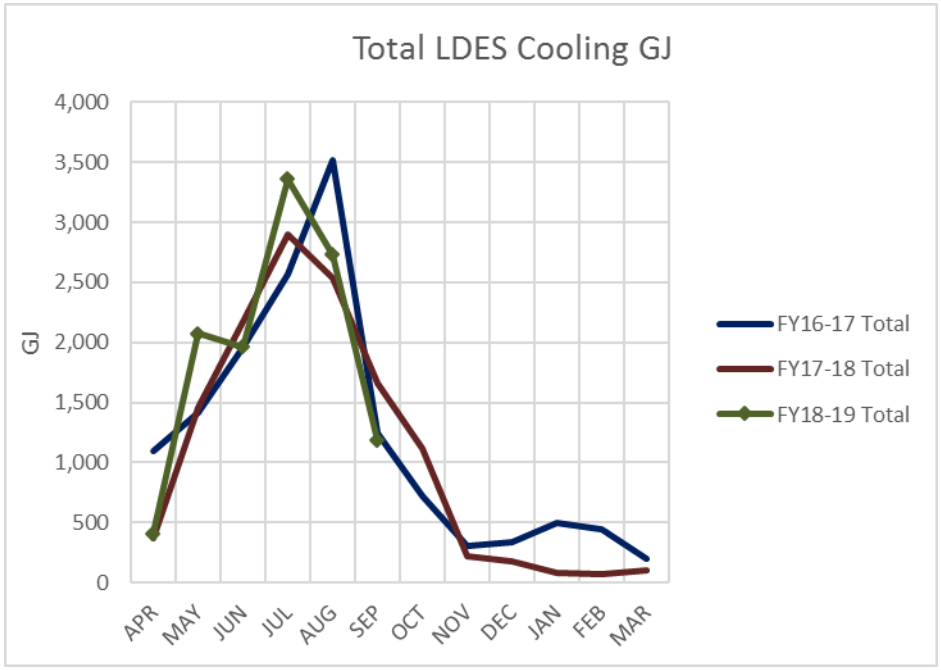

Note: 'Total' value indicates thermal GJ of cooling delivered to all buildings.