



a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

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UBC Okanagan Campus
Energy Team
Quarterly Report
October 2019 – December 2019

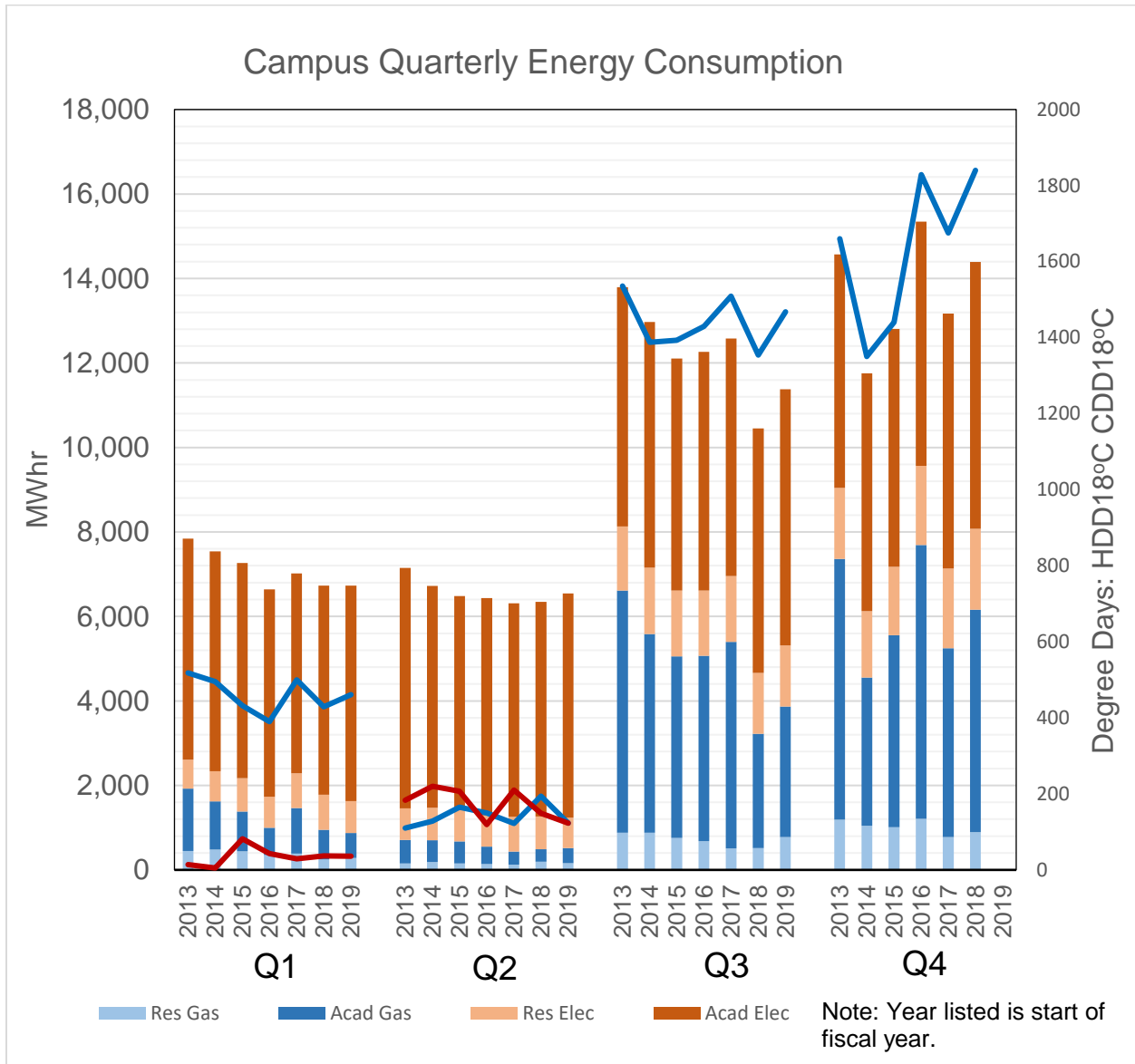
Report Date: 2020-01-31



1. Overview of Q3 of FY19/20

Campus natural gas consumption over the past quarter was 13,700 GJ compared to 11,600 GJ for Q3 last year, a 15.5% year over year increase. Electricity usage on campus for Q3 was 7,500 MWhr compared to 7,200 MWhr in FY18/19, a 3.7% year over year increase.

The increase in gas consumption is believed to be due to a number of factors. Colder weather resulted in an over 8% increase in heating degree days compared to 2018. There were also operational problems in the CCS building that resulted in the building being heating using its boilers rather than its heatpumps. Additional gas was also used in the central heating plant during commissioning of the new connection between the central heating plant and the low temperature district energy system. The more moderate increase in electrical consumption is attributed to increased use in the EME building and new construction taking place on campus (Skeena and Nechako residences combined used about 1.3% of overall campus electricity). A review of the operational settings of the heatpumps in EME is underway in order to improve their efficiency. A recommissioning process to identify and correct inefficiencies for the EME, RHS and UCH buildings is also underway.





2. Strategic Work and 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 that is intended to guide how district energy systems on campus evolve to meet the requirements of an expanding campus is currently under development. The first phase of the strategy is expected to be completed in the fall of 2019.

It is expected that the District Energy Strategy will help inform the UBC Okanagan Campus Climate Action Plan that is currently in development. It is expected that these plans will provide significant direction for actions to be taken in response to the climate emergency declaration made by UBC in December 2019.

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. Ensuring timely development, review and acceptance of rigorous Owner's Project Requirements documents will be an important part of this work.

2.3. Technical Guidelines

Technical Guidelines are intended to provide minimum standards for campus projects. There are a large number of guidelines that cover both UBC as a whole and some that are specific to the Okanagan campus. The energy team is working to update several that are specific to energy performance and monitoring.

2.4. Strategic Energy Master Plan (SEMP)

Five-year SEMPs were created in 2016 and 2018. Currently a ten-year SEMP is under development in order to allow for longer-term planning. Once the longer term SEMP has been developed, a more detailed update to the five-year plan will be made.



3. Energy Conservation Projects

The energy team has been involved in a number of projects over the past quarter. The table below summarizes the projects underway that are being funded by the Energy Team.

Energy Team Funded Projects FY2019-2020									
PROJECT	Cost	Potential External Incentive	Net Cost	Payback	Payback After Incentive	Annual Savings			
						\$	GJ	kWh	GHG
Lighting ¹	\$50,000	\$0	\$50,000	6.0	6.0	\$8,400	0	100,000	1
Science Ventilation Continued ²	\$60,000	\$25,000	\$35,176	4.9	2.9	\$12,300	750	58,000	38
Infiltration Basin Upgrade Pilot	\$50,000	\$0	\$50,000	4.4	4.4	\$11,300	1,500	-42,000	75
LDES Low Flow Pump	\$30,000	\$0	\$30,000	11.9	11.9	\$2,500	0	30,000	0
Data Analytics	\$15,000	\$0	\$15,000						
Summary of projects	\$205,000	\$25,000	\$180,000	5.9	5.2	\$34,500	2250	146,000	115
Notes:									
1) Lighting point of sale incentives show as a reduced cost.									
2) Funding for this project from multiple sources. Savings shown are prorated based on funding proportions.									

The Energy Team applies for and tracks energy efficiency incentives received from FortisBC for both projects funded by the team and other energy efficiency measures implemented on campus. In general there is a delay between project completion and receipt of incentives. No incentives were received during the past quarter. In contrast approximately \$25k of incentives were received in the previous quarter and \$150k of incentives are currently expected for the next quarter.

3.1. Projects Completed

3.1.1. 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 has been made between the library data centre and the new adjacent Commons (TLC) 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 and 53 MWhr of electricity consumption annually.

3.1.2. Lighting Upgrades

Upgrades of existing campus lighting to LED lights is ongoing. To date this year, UBCO electricians have been replacing fluorescent tubes in the Fipke and ASc buildings as well as outdoor street lights with LED replacements.

3.1.3. Science Ventilation Upgrade

Upgrades and optimization of ventilation systems within the Science building are expected to save \$52,000 in energy costs per year (2,600 GJ of gas and



415,000 kWhr of electricity). This 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 and key fumehoods have been upgraded to variable air volume flow. These changes have successfully allowed one of the three main exhaust fans serving the building to be turned off most of the time.

3.2. Projects in Progress

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

3.2.1. Groundwater Upgrade

The current geothermal groundwater injection system limits the quantity of groundwater that can be used for heating. In order to increase the capacity of the system, upgrades to the current infiltration basins are under consideration. A single recharge well is currently being tested to evaluate the amount of capacity increase that may be possible. If the results are deemed successful, more recharge wells will be considered for addition to the existing infiltration basin.

3.2.2. LDES Low Flow Pump

Currently, 125hp pumps are used to circulate water in the LDES loop. The minimum flow of these pumps is higher than the minimum flow required in the system. Installation of a 15hp pump intended to operate during low flow conditions will save pumping energy as well as pump wear and tear. Additionally, geothermal heat extraction effectiveness will be improved during shoulder seasons. Overall energy savings are expected to be 30 000 kWhr/year.

3.2.3. Recommissioning of EME, RHS and UCH Buildings

Prism engineering is currently completing a recommissioning study in three campus academic buildings: EME, RHS and UCH (UCH is the new name for the former MWO). This investigation is expected to be complete in February 2020. The scope and timing of remedial work and the potential benefits will be better understood once the investigation is complete.

3.3. 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.

3.3.1. Nechako Residence Commons

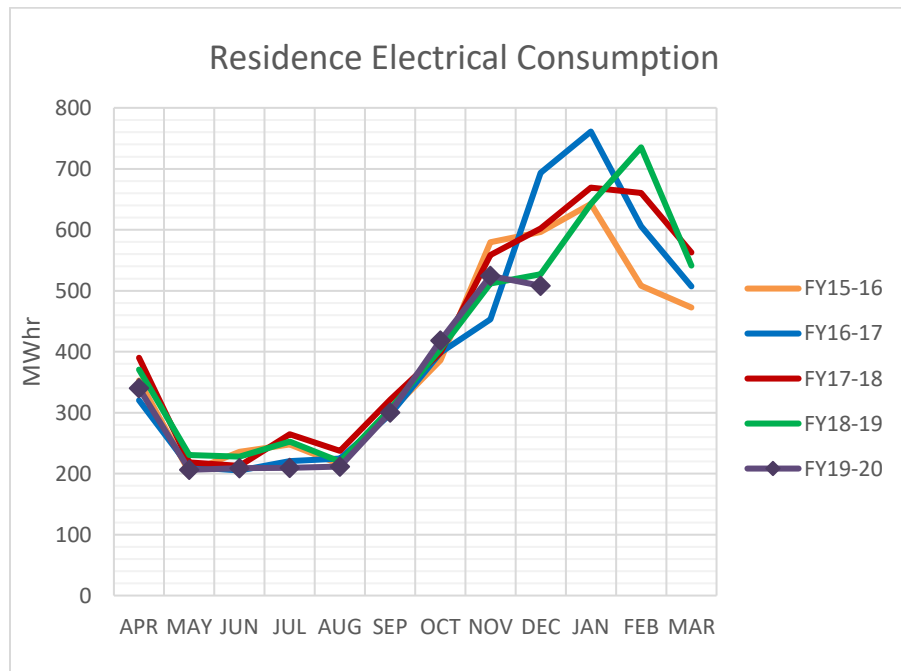
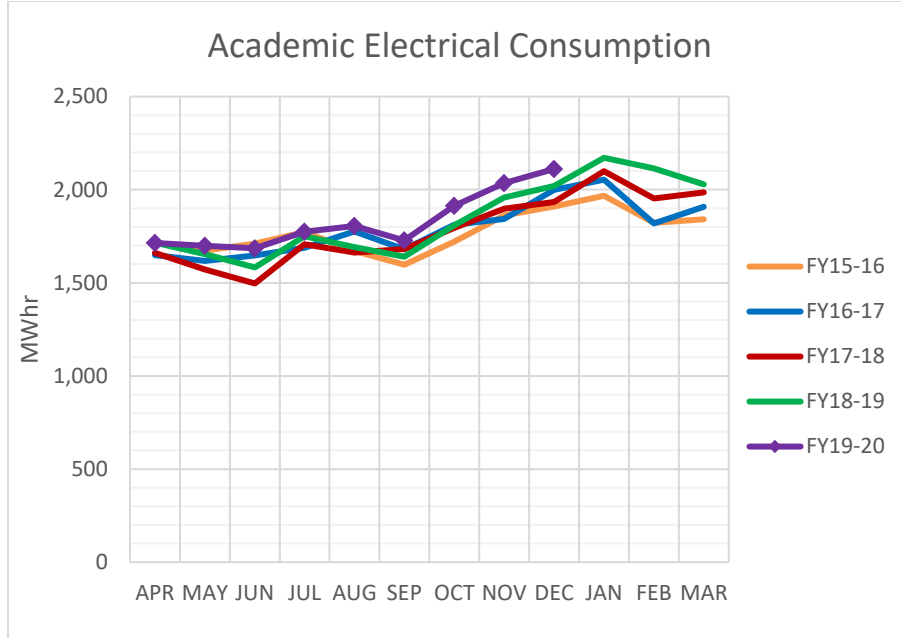
The Nechako building is a new residence building with a large cafeteria and other campus amenities included. While the energy team has provided detailed feedback on the design of this building, as a residence building, decisions for this building are the responsibility of UBC Student Housing and Hospitality Services. Completion of this building is expected for summer 2021. FortisBC energy efficiency incentives of over \$167 000 have been approved for this building.

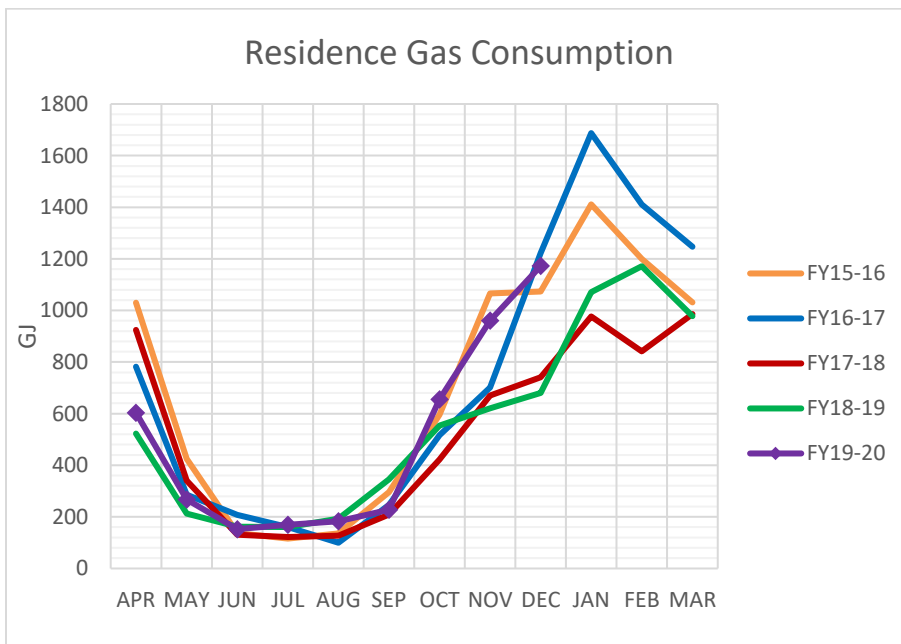
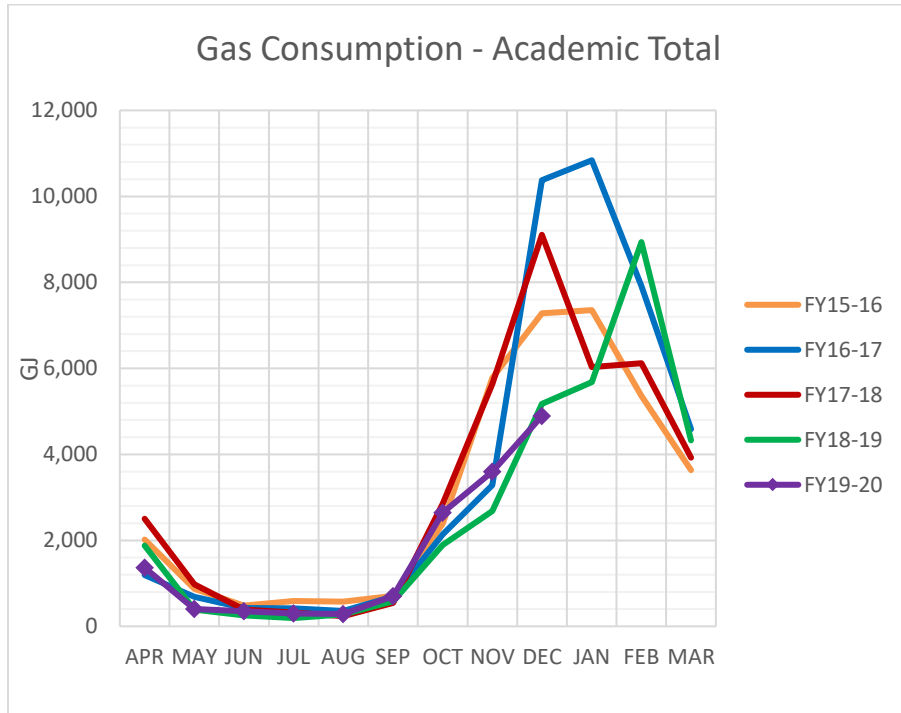
3.3.2. Skeena Residence

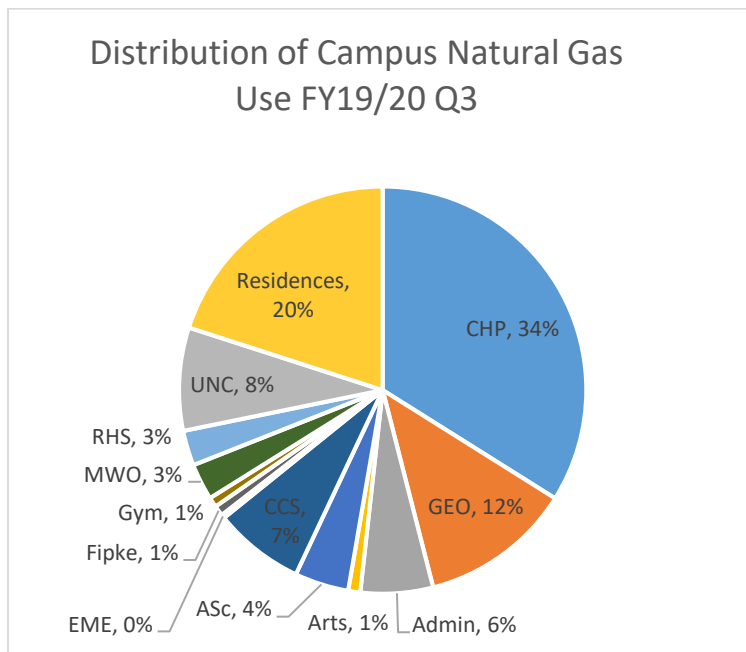
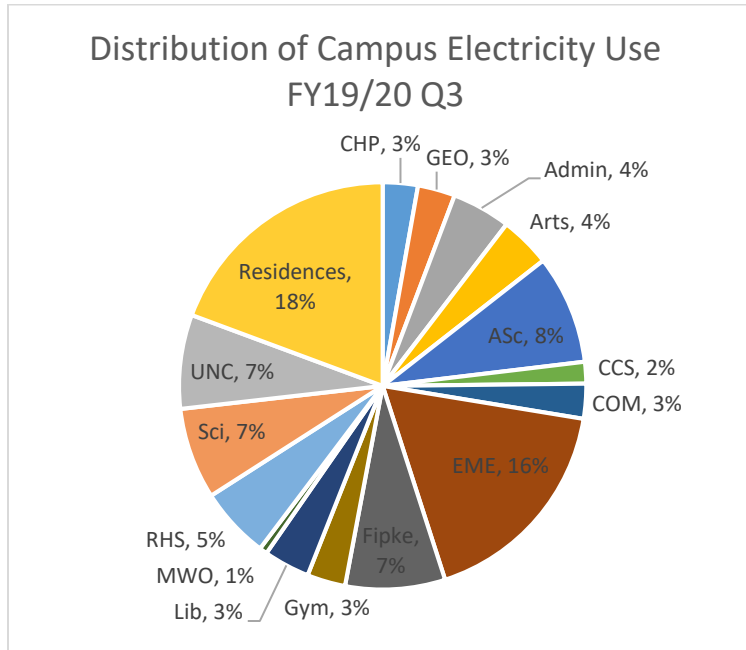
The Skeena Residence is a new residence building that is planned to be the first Passive House Certified building on campus. The energy team has provided detailed feedback on the design of this building. Completion of this building is expected for summer of 2020. FortisBC energy efficiency incentives of over \$157 000 have been approved for this building.



4. Energy Performance Graphs



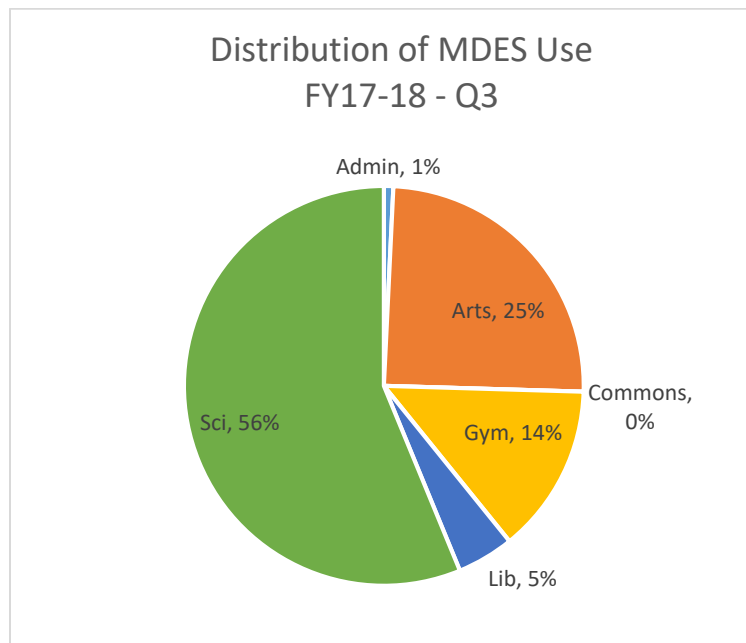
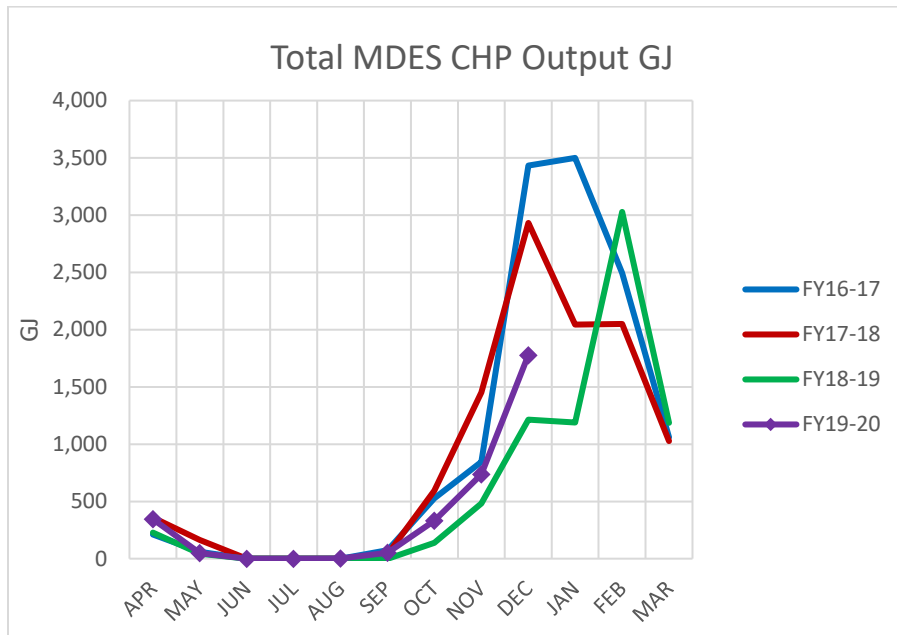




Note: Building electricity and gas consumption values shown are for consumption within the building. Indirect gas consumption via MDES & LDES is not included.

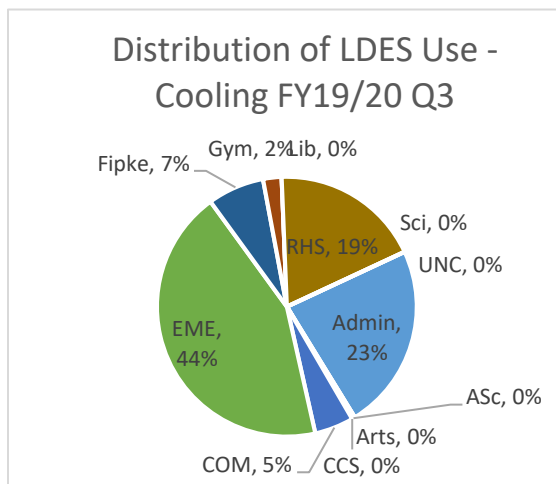
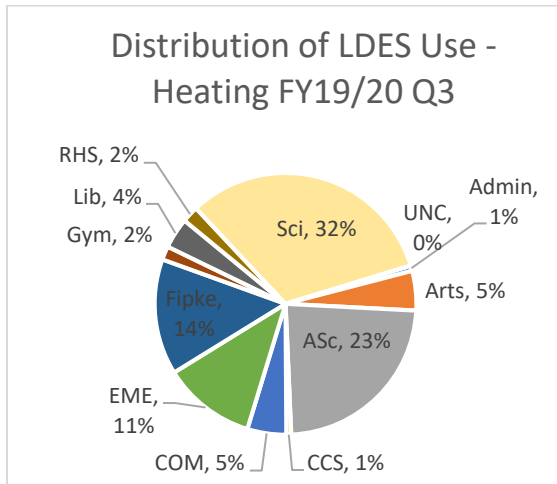
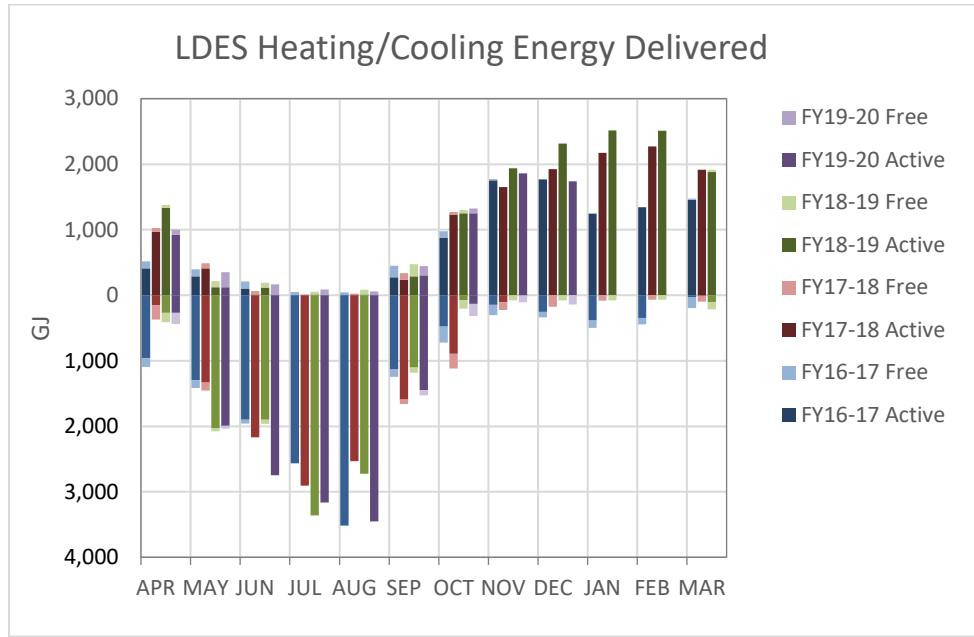


Medium Temperature District Energy System Output and Use Distribution





Low Temperature District Energy System Output and Use Distribution



Note: UNC LDES consumption is shown incorrectly due to missing metering data.