Carbon Neutral Action Report 2017

SFU

This report was produced by Simon Fraser University. It provides a high-level overview of the actions taken by the SFU campuses to reduce greenhouse gas emissions and promote a culture of sustainability.

For more information about sustainability programs at SFU, please visit:
www.sfu.ca/sustainability

SFU

Strand Hall Annex 600
8888 University Drive
Burnaby, British Columbia
V5A 1S6

ACKNOWLEDGEMENTS

Contributors
Louis Ballarin, Kayla Blok, Bernard Chan, Lorenzo Costantino, Trina Forrest, Hanif Kassam, Erica Lay, Wendy Lee, Travis Vilac, Mike Williams

SMARTTool Greenhouse Gas Emissions Data Management Team
Louis Ballarin, Bernard Chan, Irinel Filip, Trina Forrest, Dennis Kong, Wendy Lee, Larry Waddell

Writer
Pegah Djamzad

Contents

Executive Summary

In 2017, Simon Fraser University (SFU) focused on long-term strategic planning, capacity building, and implemented numerous energy efficiency projects to further greenhouse gas (GHG) emission reductions at the University. While emissions from paper and fleet decreased in 2017, SFU saw an increase in its buildings emissions by 4.6% compared to the previous year. Despite this, SFU has maintained a reduction of 20% below the 2007 baseline and has met the interim target of 18% reduction by 2016. With an ambitious renewable energy project on the horizon, SFU remains on track with its long-term GHG reduction targets of 33% and 80% below the 2007 baseline by the year 2020 and 2050 respectively.

With its three campuses rapidly expanding, SFU has set ambitious new building energy conservation and efficiency targets through its Strategic Energy Management Plan 2016/17 – 2020/21 (SEMP) as well as its 5-Year Capital Plan (2018 – 2023). All new construction and major renewal projects at SFU place significant emphasis on GHG emission reduction and integrate sustainability principles throughout the planning and design phases. Presently, SFU's new Student Union Building (SUB) as well as the Sustainable Energy and Engineering Building (SE3P) on the Surrey Campus are targeting LEED Gold certification. Furthermore, as articulated in its SEMP, SFU has set an energy reduction target of 2% per year for the next five years using a 2012/13 baseline and has committed to shifting 70% of the fossil-fuel based energy to renewables by 2020.

With over 97% of SFU's emissions linked to its building operations, the SFU community of students, staff and faculty are integral to keeping SFU on track with its energy reduction and conservation commitments. In 2017, SFU expanded on its highly successful Green Offices and Green Labs program and launched the Sustainable Spaces Program. Through this program, SFU engages with and further educates the SFU community on energy conservation, waste reduction and diversion opportunities at offices, labs, events and dining halls/vendor spaces. With over 30 spaces certified in 2017 alone, the SFU community will continue to contribute to the reduction of GHG emissions through demand-side energy management in the years to come.

SFU will continue to plan for and identify opportunities to integrate and implement energy conservation and reduction into its business operations and utilize its strength in community engagement to involve its community in the transition towards a more environmentally benign and renewable energy future for its three campuses.

Overview

This is the Carbon Neutral Action Report for Simon Fraser University. This report contains our 2017 emissions profile, offsets purchased, the actions we have taken in 2017 to reduce our greenhouse gas emissions, and our plans to continue reducing emissions in 2018 and beyond.

By June 30, 2018, Simon Fraser University's final CNAR will be posted to our website: http://www.sfu.ca/fs/Sustainable-Operations/GHG-Emissions/Carbon-Neutral-Action-Reports.html

Martin Pochurko, Vice-President Finance and Administration

May 31, 2018

1.0 GREENHOUSE GAS EMISSIONS AND OFFSETS

1.1 Greenhouse Gas Emission in 2017

Total absolute greenhouse gas (GHG) emissions for Simon Fraser University's operations in 2017 were 15,426 tCO2e[1]. Emissions increased by approximately 4% overall compared to 2016 levels; this is largely due to a 14% increase in heating degree days (cooler and longer winter) in comparison to 2016. The impact of the colder winter in 2017 on GHG emissions is visible in the increase in GHG emissions from building sources. Despite the slight increase in GHG emissions between 2017 and 2016, SFU remains on track for long-term emission reductions, with GHG emissions for 2017 approximately 20% lower than the 2007 baseline (see Table 1).

Between 2016 and 2017, SFU's university physical space increased by approximately 0.6%. Overall, the university's physical space has increased by about 10% since the 2007 baseline[2].

Fugitive emissions from cooling are estimated to comprise less than 1% of Simon Fraser University's total emissions and the fugitive emissions data are onerous to collect; therefore, these emissions are considered out of scope, as per section 8.3 of the 2016/17 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions.

1 Tonnes of carbon dioxide equivalent (tCO2e) is a standard unit of measurement in which all types of greenhouse gases are expressed based on their global warming potential relative to carbon dioxide.
2 From SFU's Annual Space Report.

TABLE 1. Simon Fraser University Greenhouse Gas Emissions by Source per Year

SOURCE [3]	2007 (tCO_2e) BASELINE YEAR [4]	2015(tCO_2e)	2016(tCO_2e)	2017 (tCO_2e) CURRENT YEAR
Buildings – Stationary Fuel Combustion and Purchased Energy	17,995	13,932	14,307	15,004
Fleet – Mobile Fuel Combustion	940	251	277	231
Paper – Office Supplies	357	100	219	190
Total Emissions Calendar Year	**19,292**	**14,284**	**14,803**	**15,426**
Carbon Neutral or Offset Exempt	N/A	-8	-9	-8
Total Emissions Requiring Offset Payments	**N/A**	**14,275**	**14,793**	**15,418**
Offset carry-over from Previous Year	N/A	0	0	0
Total Emissions Offsets Purchased	**N/A**	**14,275**	**14,793**	**15,418**

1.2 Offsets Applied to become Carbon Neutral in 2017

In 2017, as reported in the BC Provincial Government's SMARTTool, SFU purchased 15,418 tonnes of carbon offsets at the price of $25 per tonne; this amounted to $385,450 of offsets plus GST.

Eight tonnes CO_2 equivalent emissions from the combustion of biomass fuels were reported as part of our total greenhouse gas emissions profile in 2017. As stated in the 2016/17 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions, the carbon dioxide emissions resulting from the combustion of biogenic fuel sources must be reported but do not require offsets.

1.3 Changes to Greenhouse Gas Emissions and Offset Reporting from Previous Years

At this time, there are no changes to Simon Fraser University's 2017 greenhouse gas emissions from previous years.

3 Emissions data (2015, 2016, 2017) are values reported in SMARTTool. For simplicity, values with decimals have been rounded off.
4 2007 baseline set from Willis Energy: SFU GHG Inventory.

2.0 ACTIONS TAKEN TO REDUCE GREENHOUSE GAS EMISSIONS IN 2017

2.1 BUILDING EMISSIONS

2.1.1 Planning for Reductions

The Strategic Energy Management Plan 2016/17 – 2020/21 (SEMP) supports SFU's University Energy Utilization Policy (GP 43) and SFU's long-term commitment to energy efficiency, conservation, and GHG emissions reduction. The SEMP builds on the strong foundation of its predecessor, SEMP 2013/14 – 2015/16, and sets further targets and lays the roadmap towards achieving these new and ambitious goals. Namely, SFU is committed to reducing the energy intensity of the Burnaby Campus by 16% from the 2012/13 baseline and strives to displace 70% of the fossil-based energy to renewables by 2020/21. Achieving these targets will enable SFU to surpass the Provincial target of 33% GHG reduction by 2020 and set the path to reach the 80% reduction target by 2050.

2.1.2 New Buildings and Major Renewal of Existing Buildings

SFU released its Five-Year Capital Plan (2018 – 2023) in 2017, outlining its priority expansion projects, replacement/renewal projects and capital innovation projects. This plan adopts a holistic approach, balancing functionality, safety and sustainability of existing and future facilities at SFU.

All future projects at SFU will be executed in accordance with campus planning principles, design standards and functional requirements, and the government mandate to achieve LEED Gold, or equivalent, for new construction and LEED Silver for major renovation and Renewal projects.

Surrey Sustainable Energy and Engineering Building (Target Completion in 2019)

The construction of the 16,000-square-metre Surrey Sustainable Energy and Engineering Building (SE3P) is on track for completion in early 2019, with fit out and occupancy schedule for the end of 2019. The building will host a new innovative program in sustainable energy and engineering and house teaching and research in SFU's Mechatronic Systems Engineering. To minimize the carbon footprint of this new space, the building is designed and being constructed to meet high green building standards and is targeted for LEED Gold Certification.

Student Union Building (Target Completion in 2019)

SFU's new 10,300-square-metre Student Union Building (SUB) on its Burnaby campus is nearing completion with planned occupancy in early 2019 and is targeting a LEED Gold certification. This building was planned and designed with students through extensive consultation, and is entirely devoted to students with lounges, study areas, meeting rooms and recreational spaces that were designed with sustainability goals in mind, integrating natural lighting, healthy construction materials as well as high efficiency building support systems.

Academic Quadrangle Lecture Theaters (Ongoing)

Renovations to seven mid-size (approximately 110-seat) lecture theaters were completed at SFU's Burnaby Campus as part of its Classroom Upgrade Program. Energy efficient lighting and multiple mechanical systems upgrades were implemented along with the interior refurbishment of the classrooms, and installation of new teaching and learning technology. By implementing free cooling strategies, SFU was able to avoid adding extra energy load from mechanical cooling to these spaces while also providing more fresh air and better air circulation.

Water Tower Building Data Centre Major Upgrade (Completed)

In 2017, SFU became home to one of Canada's most powerful academic super computer, Cedar. Housed in the renewed and repurposed Water Tower Building, Cedar will serve Canadian researchers from across the country by providing expanded computing, storage and cloud resources. It also houses all of SFU's administrative systems. Located in the heart of SFU's UniverCity community, this project was made possible through extensive community consultation and innovative engineering. For example, SFU addressed concerns of noise pollution from the data centre by placing all of the equipment indoors, an unorthodox practice for data centres of this magnitude.

With a power usage effectiveness (PUE) of 1.08, this data centre is one of the most energy efficient of its kind. In addition to conventional mechanical cooling, a free cooling strategy was implemented to further reduce the electricity consumption of the building. SFU recycled over 5,000 Kgs of packaging from the Cedar construction process.

Demolition of Louis Riel House (Completed)

In 2017, SFU completed the demolition of Louis Riel House, a 60-unit student residence building on Burnaby Campus built in 1969. SFU is planning for a 350-bed residence hall on the Louis Riel site for first-year and international students and will be integrating energy conservation and management principles throughout the planning and design of this project.

2.1.3 Energy Efficiency and Conservation Projects

In 2017, SFU implemented the following measures throughout its campuses to achieve energy efficiency and GHG emissions reductions:

Building Envelope Projects

Shrum Science Centre Kinesiology Building View Glass Pilot Project (Completed)

The original single pane windows along the south facing wing of the Shrum Science Centre - Kinesiology Building contributed to high heat loss and cold drafts in the winter, and extreme heat in the summer. This caused discomfort to the occupants and resulted in energy loss and inefficiency. The installation of a mechanical air-conditioning unit was originally considered, but in order to avoid adding energy loads, SFU looked for a more innovative solution. The solution was to use Dynamic glass (electrochromic windows) that automatically tint to reduce heat gain and glare while maximizing natural light. Together with high efficiency insulating aluminum window frames, the project succeeded in providing users with a comfortable environment while also avoiding adding energy loads.

Maggie Benston Centre Vestibule Project (Completed)

Open doors are a constant source of air leakage from buildings and contribute to energy loss. In 2017, as a pilot project partially funded through Climate Action Secretariat's Carbon Neutral Carbon Project (CNCP) funding, SFU installed an entrance vestibule to the main entrance of the Maggie Benston Centre. This vestibule has improved the airtightness of this high-traffic building.

Education Building Envelope Upgrade (Ongoing)

Extensive building envelope upgrade and revitalization is underway for SFU's Education Building. Project highlights include new increased wall insulation and rain screen cladding on exterior walls as well as the installation of thermally sealed windows.

Controls Upgrade

South East Classroom Block (SECB)

Motion sensors were added in five classrooms in the SECB to optimize the heating, ventilation, and air conditioning (HVAC) systems which significantly reduce the energy consumption of the building.

TASC 2 Fault Detection and Diagnosis (FDD) Pilot

This pilot program enabled real time energy management strategy for TASC 2 building using the FDD system by detecting and diagnosing equipment faults, sensor failures and control errors in HVAC systems, and by providing a data-rich surveillance platform that is integral to optimizing overall system performance.

Shrum Science Zones Heating Valves Upgrade

Ninety-six pneumatic heating valves were replaced with electronic control valves in the Shrum Science Buildings to reduce heat leakage.

Diamond Alumni Centre Controls Upgrade

The Diamond Alumni Centre's building control was integrated into the campus-wide control system and pneumatic control valves were replaced by electronic control valves.

Equipment Upgrade

Animal Care Facility Boiler Upgrade and Pilot Project

SFU collaborated with FortisBC to pilot a heating additive to the boiler in the animal care facility with the goal of improving heat transfer from boiler to building. Furthermore, it completed the installation and the commissioning of the condensing boilers at this facility.

Faculty of Science -80°C Freezer Replacement

All existing -80°C freezers were replaced with ENERGY STAR certified freezers reducing electricity consumption by 70% compared to existing models.

Heating Valve Replacements in South Science Building Heating

One hundred and thirty-three pneumatic heating valves were replaced in the South Science Building to avoid hot water leakage.

Airflow Fine Tuning in Shrum Science Centre

Aging fume hoods in Shrum Science Centre were re-commissioned to have face velocities that are within the specifications of current safety standards, reducing the amount of infiltration.

Lighting Efficiency Projects

Lighting upgrades are one of the key strategies adopted by SFU to reduce electricity consumption. LED lighting instillations across the SFU campus have contributed to an overall electricity savings of 700,000 kWh, which is equivalent to the annual electricity consumption of 64 households in British Columbia. Lighting upgrade projects were implemented in:

- Discovery 2 and visitor parkades
- Shrum Science Centre corridors
- Shrum Science Centre, Kinesiology study lounge
- Academic Quadrangle computer labs
- Gym corridors
- Facilities Services warehouse
- Stairwell lighting across the campus
- WAC Library 6th and 7th floors

Furthermore, SFU replaced a number of aging power and distribution transformers with more energy efficient models across the campus in 2017.

Other Projects

Water Fixture Retrofits

SFU continues to replace its dated water fixtures with efficient ones that ensure 80% less water use per fixture. Through such retrofits, SFU has saved 159.5 GJ of gas and 890.2 m^3 per year of water, which equates to 7.95 tCO_2e.

2.1.4 Behaviour Change

Launch of Sustainable Spaces Program

In 2016, SFU began reviewing its Green Office and Labs program to identify opportunities for expansion. Given the growing demand and interest on behalf of the SFU community to participate in the certification of various spaces on campus, SFU developed the 'Sustainable Spaces Program', which launched in early 2017. This expansion aligns with BC Hydro's new Energy Wise Network program, which aims to increase energy conservation awareness at the workplace and inspire action and leadership among communities to contribute to demand-side energy use management.

SFU launched the Sustainable Spaces program in 2017 to recognize and celebrate sustainability efforts initiated at SFU. The existing Green Offices and Labs program formed the foundation of the Sustainable Spaces program and was modified in order to incorporate SFU's holistic definition of sustainability into programming, which includes not just ecological, but economic and social perspectives, and to expand the scope of the program to include dining and food vendors, and events.

There are four certification programs (Sustainable Offices, Sustainable Labs, Sustainable Dining and Sustainable Events) and three certification levels (Gold, Silver, and Bronze) available under the Sustainable Spaces program.

The Sustainable Spaces program provides a framework for offices, labs, food vendors and event organizers to reduce GHG emissions through a variety of physical and behavioral changes, including temperature monitoring, seeking naturally-lit meeting rooms, and purchasing energy efficient lab equipment.

Progress to Date

In order to promote the program and engage with stakeholders, the Sustainable Offices program was launched at the Burnaby campus with a staff focused welcome event to introduce the program and encourage departments to register. The event exceeded participation levels and was well received. As a result, 14 offices certified in 2017.

Sustainable Dining was also piloted in 2017 with two dining service providers undertaking the certification. The pilot program allowed the Sustainability Office to evaluate the checklist and prepare for a full launch in 2018. In 2017, SFU changed its main food service provider. With the transition completed, SFU is working to certify a significant portion of dining services on campus though this program.

Despite minimal program promotion in 2017, the Sustainable Events stream certified 17 events which resulted in approximately 4,736 participants engaged on the sustainability efforts made by event organizers.

2.2 Fleet Emissions

Ongoing replacement of older engine model vehicles with new, fuel-efficient vehicles has contributed to a 75% reduction in emissions from fleet when compared to the 2007 baseline. In 2017, SFU added seven new vehicles to its fleet, one of which was an electric vehicle and disposed of two older model vehicles. SFU continues to reduce emissions from its fleet by encouraging staff to utilize the informal but well-practiced "buddying up" system, minimizing single occupancy in fleet vehicles.

2.3 Paper Emissions

Emissions from paper have been reduced by 46.8% since the 2007 baseline at SFU. While most of this reduction is attributed to the shift towards online and digital forms of communication, SFU continues to engage with its community through ongoing education efforts to limit the use of virgin paper on campus. For example, through the Sustainable Spaces – Office checklist, SFU community members are encouraged to choose Forest Stewardship Council (FSC) certified, alternative fibre, and/or recycled paper for printing.

The standard office paper stock for both SFU's Central Stores, the main supplier of office paper to departments across the University, and Document Solutions, SFU's print and digital services hub is 30% recycled content (RC) paper. Document Solutions has further increased the use of FSC and recycled paper to over 90% and is moving to eliminate plastic and/or vinyl materials from its large format printing and replacing those with FSC certified materials.

3.0 PLANS TO CONTINUE REDUCING GREENHOUSE GAS EMISSIONS

3.1 Building Emissions

SFU will continue to invest in retrofit projects and optimize its building performance and energy efficiency through the Sustainable Utilities Revolving Fund (SURF), the Carbon Neutral Capital Program, and through other external funding support including BC Hydro and Fortis BC. The newly introduced Sustainable Spaces program has great potential in furthering demand-side energy management.

Furthermore, SFU's new biomass district heating plant on Burnaby Campus is in its final design and permitting stages. The heating plant will burn organic material to service SFU's Burnaby Campus and the UniverCity community on the Burnaby Mountain. At build-out, the plant is expected to reduce campus greenhouse gas emissions from all sources by approximately 70%.

3.1.1 Energy Efficiency and Conservation Projects

The following projects are planned for upcoming years, and will contribute to decreased building GHG emissions:

- Academic Quadrangle – Removable insulation jackets on valves to prevent heat loss and increase safety
- Child Care Centre – Boiler retrofits for all four child care buildings
- Diamond Alumni Centre – Boiler retrofit and pneumatic controls retrofit
- East Theater Annex – Ongoing LED lighting infrastructure upgrades
- Facilities Services Building – Ongoing LED lighting infrastructure upgrades
- South Science Building – Ongoing LED lighting infrastructure upgrades
- Shrum Science Centre Biology – Replacing existing lamps with LED lamps
- Shrum Science Centre Physics – Replacing existing lamps with LED lamps
- Discovery 2 - Ongoing LED lighting infrastructure upgrades, variable speed drive upgrade for building, bypass valve for cooling tower

SFU will continue to work with BC Hydro and FortisBC to save energy and improve the operations of its Technology & Science Complex 1, South Science Building, and Applied Sciences Building through the Continuous Optimization Program, Round 2.

Furthermore, SFU will focus on its lighting efficiency by reviewing the operation of existing lighting control systems and determining if they are fully operational and have been adapted to the changing operational needs of the facilities. SFU will also implement a test group of at least 20 central clock controlled wireless relays that will allow SFU to program and manage the operation of exterior lighting control circuits on campus to eliminate inefficiencies associated with conventional time clocks.

By reviewing the commissioning reports of completed upgrade projects, including motor control upgrades and the installation of new VFD's to control motor loads, SFU will determine if the systems have been fully commissioned.

Finally, by utilizing digital information in switchboards, SFU will closely monitor the status of electrical equipment and address potential problem such as low power factor, overloading, and equipment control problems that may otherwise go undetected.

3.1.2 Behaviour Change

With the piloting and testing of the Sustainable Spaces program completed in 2017, SFU is ready to strategically deliver a full launch of the program in 2018. Plans for the upcoming year include: a staff event for Offices at the Vancouver campus, launching the Labs and Dining streams, improving the delivery method of the Events program and working with SFU Residence and Housing to expand the Sustainable Spaces program to student residences.

For the Sustainable Spaces Office program, the Sustainability Office will engage with all three campuses and affiliate SFU programs and will connect with stakeholders through launch events, lunch and learns, and strategic campaigns to maximize participation and GHG reducing efforts.

A significant carbon contributor within SFU's buildings are lab spaces, as a result, the Sustainability Office will devote a substantial amount of effort to engaging and certifying labs across all three campuses. SFU will also explore piloting opportunities for labs such as site-specific metering and smart screens on lab equipment.

The Sustainability Office expects the success of the Sustainable Events program to continue through 2018 and will engage further with SFU's Meeting and Events department to streamline and promote the program to all employees who organize events across the institution. The ultimate goal is to ensure certification at institution-wide events such as student orientation and convocation.

There are significant opportunities for emissions reductions in student residences that can be achieved through investments such as: installing efficient lighting in residence rooms and lounges, as well as investing in energy-efficient refrigerators and appliances. Student engagement and demand-side energy management through education will be the primary focus of the Sustainable Spaces expansion into residences. The Sustainability Office will work with a multi-stakeholder group to embed energy efficiency and sustainably into residence operations and educational programs in 2018.

3.2 Fleet Emissions

SFU is currently preparing an eight-year fleet replacement plan for its Facilities Services fleet and is actively considering hybrid and/or electric options in this plan. While Facilities Services operates the majority of

SFU's fleet, numerous other departments across the institution own and manage their own fleet. Given this decentralized fleet procurement system, SFU will focus on community engagement and encourage fleet managers to consider alternative hybrid or electric vehicles moving forward.

3.3 Paper Emissions

In the 2018/19 fiscal year, SFU's Document Solutions has committed to:

- Ensure that 100% of production handled is printed on FSC certified paper and/or with at least 30% post-consumer waste content by enriching communication and awareness among the SFU community
- Research and remain current with alternatives for special stocks and to promote greener choices when clients request jobs to be laminated
- Replace shrink-wrap with paper binding whenever possible and explore solutions to eliminate shrink-wrapping all together

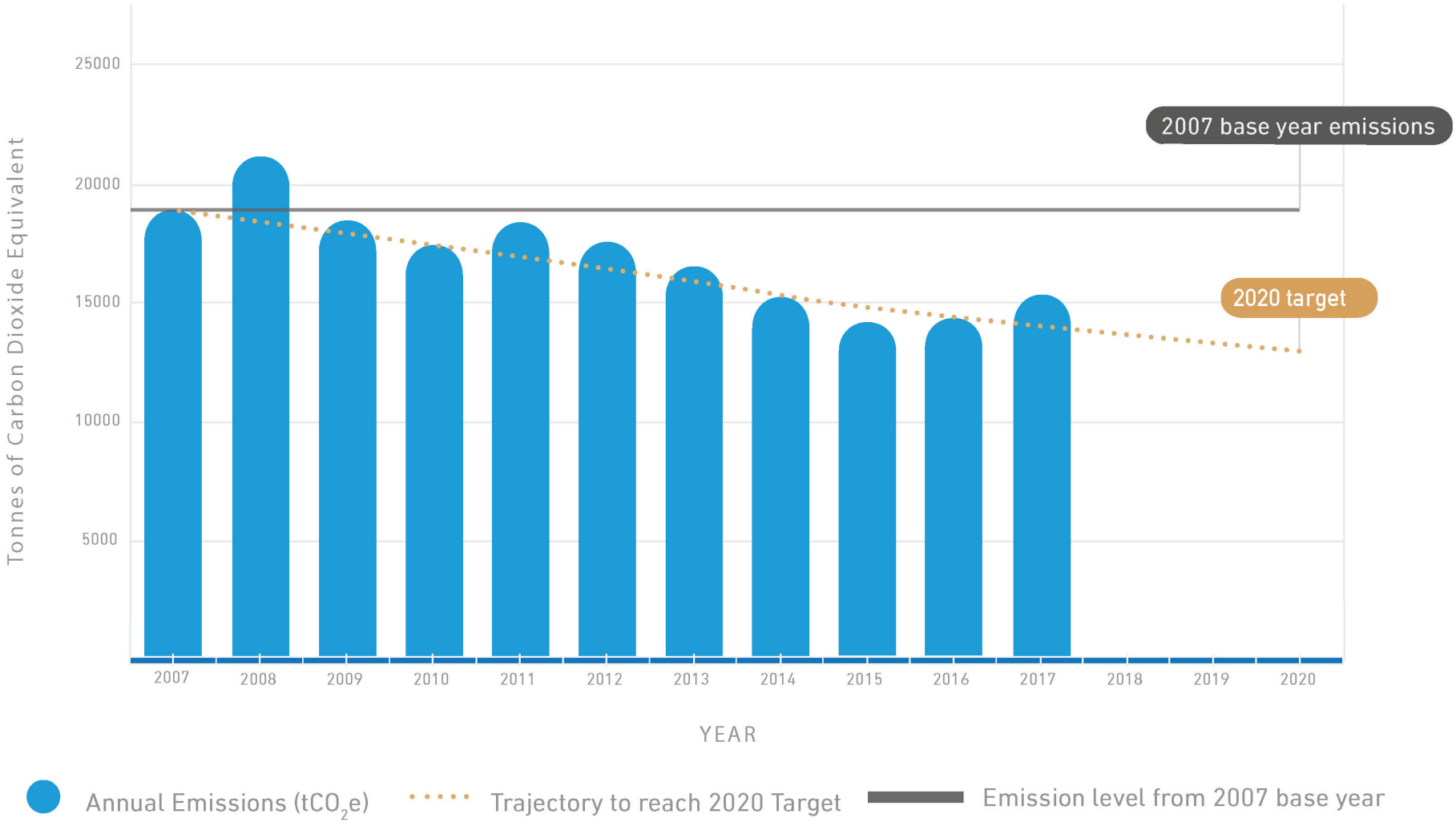
SFU will continue to educate and encourage its community to purchase sustainable and alternative paper source and to minimize overall paper use wherever possible.

With a growing number of offices ordering office paper through online ordering systems such as Staples, SFU is working closely with its providers to identify opportunities to promote recycled content paper.

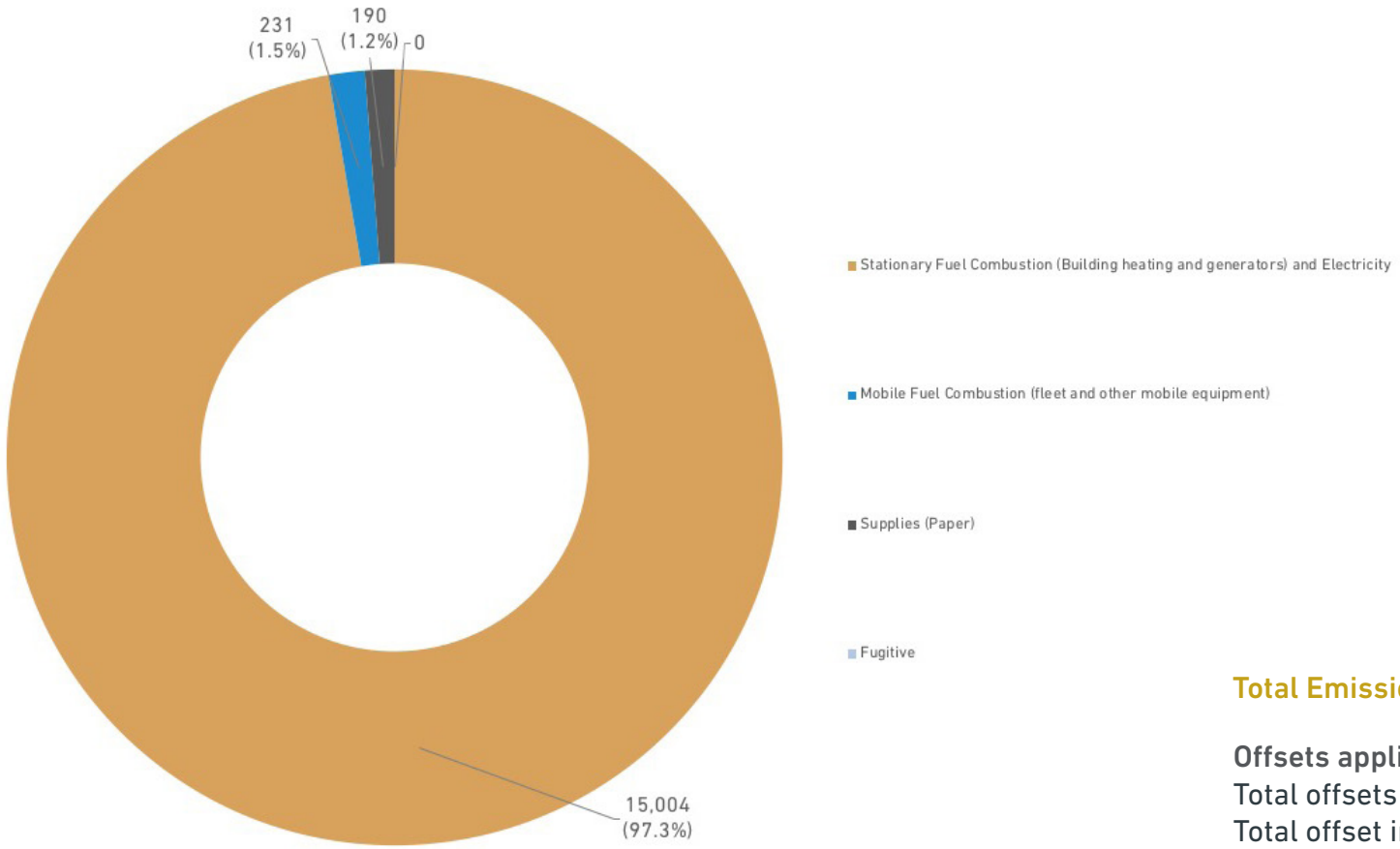
4.0 APPENDICES

1. Progress Towards Greenhouse Gas Emissions Reduction Targets
2. SFU Greenhouse Gas Emissions by Source

APPENDIX 1: PROGRESS TOWARDS GREENHOUSE GAS EMISSIONS REDUCTION TARGETS



APPENDIX 2: SFU GREENHOUSE GAS EMISSION BY SOURCE[5]



Total Emissions: 15,426 tCO_2e

Offsets applied to become Carbon Neutral in 2017
Total offsets required: 15,418
Total offset investment: $385,450 plus GST
Emissions which do not require offsets: 8*

5 Under the Carbon Neutral Government Regulation of the Greenhouse Gas Reduction Targets Act, all emissions from the sources listed above must be reported. As outlined in the regulation, some emissions do not require offsets.