2014 Energy Conservation & Demand Management Plan

Prepared for compliance with O.Reg. 397/11
Prepared by UTSC Facilities Management Staff
Approved by Jim Derenzis, Director, Facilities Management Dept.
July 1, 2014
EXECLUTIVE SUMMARY

FLOORSPACE: 1,397,337 GSM
NUMBER OF BUILDINGS: 17
ESTABLISHED: 1964
LATEST ADDITION: ENVIRONMENTAL SCIENCE & CHEMISTRY BUILDING (UNDER CONSTRUCTION)

University of Toronto Scarborough (UTSC) is situated on a ridge overlooking the Highland Creek in the Eastern Greater Toronto Area. Opened as an undergraduate campus of the University of Toronto in 1964, it has grown into a comprehensive institution offering both undergraduate and graduate programs. UTSC is the home campus of the University’s graduate program in environmental science, has extensive, state-of-the-art laboratory space for psychology, biology, and physical and environmental sciences, and has produced world-class research in all fields.

UTSC has been in a cycle of aggressive capital expansion for over 10 years, helping to meet the demand for increased post-secondary enrolment in the province of Ontario. UTSC has devoted significant financial and human resources to meeting this need by designing and constructing environmentally friendly buildings, where aggressive energy efficiency targets were part of the design process from the earliest stages.

We have even installed 80KW of photovoltaic capacity on the roof of the Instructional Centre, but have been unable to bring it online due to the unreliability of the OPA FIT program. This has deterred us from installing further PV capacity, though we have plans for other renewable energy technologies, such as geothermal heating & cooling.

The focus on capital expansion has left limited resources for energy retrofits, but UTSC still manages to make energy efficiency a priority for deferred maintenance projects and infrastructure renewal. These projects tend to focus on upgrading HVAC equipment in our older buildings, especially in laboratory spaces with high rates of fresh air intake. These priorities appropriately address the key drivers of campus energy consumption reflected in the figures to the right.

Going forward, our goals are as follows:
• continue to decrease energy intensity of existing buildings over time
• design & construct new buildings with lower energy intensities than our current best performers
The Main Building forms the heart of the original UTSC campus and comprises the Science Wing (1965), Humanities Wing (1965), Bladen Wing (1972), Recreation Wing (1972), Academic Resource Centre (2003), and portables (2009). It also houses UTSC’s central plant, which serves the Student Centre, Arts & Administration, Social Sciences, and Science Research buildings with steam (individually metered). The four original wings of the main building and the physical plant present the greatest opportunities for gains to energy efficiency through retrofits.

The Science Research Building was added in 2008 to increase and improve laboratory space for biological, physical, and environmental sciences as part of our recent capital expansion phase. Early on, it became clear that the building was using an unexpectedly high amount of energy, even more than would be expected for a building with such a high fraction of laboratory space. Since 2010, we have devoted considerable resources to re-commissioning the building and improving its performance, which is evident in its downward trend of energy consumption. Further retrofits are planned, but we believe we have rectified the biggest problems.
 ARTS & ADMINISTRATION, SOCIAL SCIENCES, & INSTRUCTIONAL CENTRE  

**AREA:** 62,861 GSF, 54,218 GSF, 142,686 GSF (RESPECTIVELY)  
**SPACE TYPES:** CLASSROOMS, OFFICE SPACE  
**ESTABLISHED:** 2005, 2004, 2011 (RESPECTIVELY)  

These three buildings contain most of the teaching and office space added to the campus over the last ten years during its major capital expansion phase. On account of their space types and vintage, their energy intensities are less than half that of the Main and Science Research buildings, and are thus not slated for any major energy efficiency upgrades. They do receive small upgrades with the rest of campus, such as higher efficiency light bulbs.
STUDENT CENTRE

**AREA:** 49,051 GSF  
**SPACE TYPES:** STUDENT UNION, FOOD OUTLETS, RADIO STATION, OFFICES  
**ESTABLISHED:** 2004

The Student Centre houses the Scarborough Campus Student Union, a food court, a restaurant, and the main offices for the Department of Student Life. Though it was built recently with the intention of being a top environmental performer, its energy efficiency lies between our office & classroom buildings and our science buildings on account of the large fraction of space occupied by foot outlets. As a high traffic building, the rates of infiltration and exfiltration rates precipitated by a relatively high number of door openings also contribute to the above average energy intensity. As with our other recent builds, no energy efficiency upgrades are planned sooner than normal equipment & capital renewal cycles.

RESIDENCES

**AREA:** 236,364 GSF  
**SPACE TYPES:** STUDENT HOUSING  
**ESTABLISHED:** 1973

The residences at UTSC comprise four phases: three phases of townhouses, constructed in 1973, 1978, and 1988, and Foley Hall, constructed in 2003. The residences are not metered the same as the academic campus, and so only annual totals for the residences combined are available. The residences have the lowest energy intensities of all campus buildings, though their space use intensity is also low, especially the townhouses. They also use a disproportionate amount of hydro, owing to the fact that the townhouses are electrically heated (though they have recently switched over to natural gas water heaters). Due to evolving campus development plans, major energy retrofits are not planned for the residences, as complete redevelopment is also a possibility.
ENERGY RETROFITS

The table below enumerates a variety of energy retrofit projects, both completed and in development. UTSC Facilities Management staff are continually evaluating new projects and implementing them where financial and human resources are available.

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
<th>Description</th>
<th>Cost</th>
<th>Annual Savings</th>
<th>Payback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircuity Controls</td>
<td>completed</td>
<td>Retrofitted SRB labs to run demand controlled ventilation based on realtime lab air quality.</td>
<td>$500k</td>
<td>$115k</td>
<td>4.5 yrs</td>
</tr>
<tr>
<td>S-Wing Office Air Handling Upgrades</td>
<td>completed</td>
<td>Install demand controlled ventilation that delivers only the amount of air required to maintain desired CO2 levels. Cost per lecture hall</td>
<td>$85k</td>
<td>$45k</td>
<td>2 yrs</td>
</tr>
<tr>
<td>S-Wing Classroom Air Handling Upgrades</td>
<td>completed</td>
<td>Same as above.</td>
<td>$300k</td>
<td>$30k</td>
<td>10 yrs</td>
</tr>
<tr>
<td>H-Wing Classroom Air Handling Upgrades</td>
<td>in development</td>
<td>Same as above.</td>
<td>$200k</td>
<td>$10k-20k</td>
<td>10-20 yrs</td>
</tr>
<tr>
<td>H-Wing Office Air Handling Upgrades</td>
<td>in development</td>
<td>Same as above.</td>
<td>$500k</td>
<td>$50k-60k</td>
<td>8-10 yrs</td>
</tr>
<tr>
<td>Lighting Upgrades</td>
<td>in development</td>
<td>Replace existing T8 fluorescent tubes with lower energy and dimmable LED tubes. Combine with daylight sensors and other smart controls.</td>
<td>$1.5M</td>
<td>$150k</td>
<td>10 yrs</td>
</tr>
<tr>
<td>Library Occupancy Sensors</td>
<td>in development</td>
<td>Occupancy sensors will allow fresh air supplied to the library to be throttled to meet demand, saving on heating energy and fan power.</td>
<td>$85k</td>
<td>$35k</td>
<td>2.5 yrs</td>
</tr>
<tr>
<td>Central Plant - Cooling Efficiencies</td>
<td>in development</td>
<td>Specialized controls to optimize central chiller plant efficiency.</td>
<td>$200k</td>
<td>$55k</td>
<td>3.5 yrs</td>
</tr>
<tr>
<td>Central Plant - Heating Efficiencies</td>
<td>in development</td>
<td>Flue gas heat recovery, condensate vent recovery amongst other efficiencies.</td>
<td>$500k-1M</td>
<td>$50k-100k</td>
<td>5-10 yrs</td>
</tr>
</tbody>
</table>