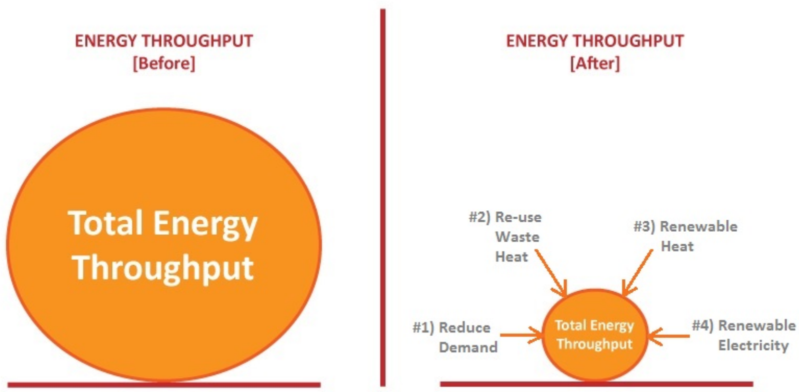
FACTOR FOUR ENERGY PLAN

School of Construction and the Environment

British Columbia Institute of Technology

EXECUTIVE SUMMARY

BCIT's School of Construction and the Environment is leading the Factor Four Initiative in the buildings it occupies in the northeast section of Burnaby campus: the "Factor Four Area." The purpose is to explore whether a factor four (fourfold) improvement in energy- and materials-related resource productivity can be achieved without compromising service levels (i.e., building occupant health and comfort, and educational program delivery).



To achieve a factor four energy reduction (approximately 30,000 GJ/year) a set of projects have been identified following the methodology shown in the image above. Listed below are the key projects that must be implemented:

1) Sub-metering of all Factor Four buildings
2) Dust Collection System Retrofit in NE2 and NE4
3) Heating System Retrofit in NE6
4) Heat and Light Awareness Campaigns in Trade Shops
5) Street and Outdoor Light Retrofit
6) Welding Ventilation Retrofit
7) Wood Waste-to-Energy project
8) Outdoor Pipe Welding project
9) Trades Shops and Canopy Lighting Redesign
10) NE1 Passivhaus Building project

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BACKGROUND

In 1972, the Club of Rome – a global think tank concerned with the future of humanity and the planet – published a book titled *The Limits to Growth*. Through computer modeling, *The Limits to Growth* demonstrated that unchecked economic and population growth in a global system of limited resources is unsustainable. As a possible solution to the challenges identified in *The Limits to Growth*, Ernst von Weizäcker of the Wuppertal Institute (Germany) and Amory and Hunter Lovins of the Rocky Mountain Institute (USA) published – *Factor Four: Doubling Wealth, Halving Resource Use – Report to the Club of Rome* in 1995. *Factor Four* develops the concept of resource productivity: the amount of "wealth" we can extract from the resources we use. The rationale is to halve global resource consumption while doubling global welfare thereby achieving a fourfold improvement in resource productivity. Factor Four demonstrates how improvements in resource productivity are essential in building a just and sustainable global society.

Inspired by the Factor Four concept, BCIT's School of Construction and the Environment is leading a Factor Four Initiative in the buildings it occupies in the northeast section of Burnaby campus: the "Factor Four Area." The purpose is to explore whether a factor four (fourfold) improvement in energy- and materials-related resource productivity can be achieved without compromising service levels (building occupant health and comfort, and educational program delivery).

What is Factor Four?
The Factor Four project aims for a four-fold (75%) reduction in levels of energy and materials consumption in order to achieve ecological sustainability.

To reach a factor four improvement in energy-related resource productivity, i.e. a 75% reduction in energy throughput, there are numerous projects that can be implemented to improve energy efficiency, reduce energy waste, and generate renewable energy within the Factor Four area. The project selection process for BCIT's Factor Four Energy Plan included performing an internal and external situation analysis, adopting a strategic framework, setting an energy reduction goal, and establishing success metrics. These elements are presented in the following sections.

About BCIT

The Factor Four strategic plan must be aligned with BCIT's sustainability goals, educational mission and financial constraints (Policy 1010). The Institute aims to reduce its ecological footprint and work towards achieving the following seven sustainability goals while respecting its core business, current commitments, and the limits of BCIT resources.

- greenhouse gas neutral (i.e., avoid, reduce, absorb, offset emissions)
- a net energy producer (i.e. generate more energy on campus than we use)
- zero waste (i.e. rethink, reduce, reuse, recycle, and eliminate toxics)
- water balanced (i.e. stay within the capacity of natural hydrological flows)
- ecologically restored (i.e. restore campus ecosystems and native species)
- equitable and socially responsible
- accessible to and safe for all students, faculty, employees, alumni, contractors, and visitors

If ultimately Factor Four yields financial, social and environmental gains, the initiative could be a clear example of how BCIT can achieve its sustainability goals. Lessons learned in Factor Four could be applied to similar work across the entire campus.

In addition to the sustainability goals, BCIT aims to become a Living Lab in sustainability. The living lab concept focuses on "developing a collaborative approach to hands-on learning that uses the campus as a vehicle to engage students, faculty and staff in solving real-world challenges." Factor Four is a good opportunity to engage students, faculty, and staff in exploring how a community adaptively restructures their built environment and changes behavior to support a 75% reduction in energy and material consumption. Therefore, every project in the Factor Four initiative will have the additional component of creating learning opportunities and be part of the living lab concept when possible.

Finally, BCIT's strategic plan calls for internal entrepreneurship, innovation and non-traditional revenue sources; pursuit of public and private funding; campus renewal; sponsorship and advertising. These are all important elements influencing the vision for Factor Four.

About SoCE

The School of Construction and the Environment (SoCE) offers a substantial range of courses and programs that are concerned with the natural environment, the built environment and the relationship between them.

The School of Construction and the Environment's goal is to provide students with the knowledge and skills required to address the issues of today and the future: sustainable development and environmental stewardship, housing and habitat technologies, natural resource management, building science and construction management.

The School has adopted a sustainability framework showing its commitment to forming global citizens. The sustainability framework is premised on the global challenge to live within the Earth's carrying capacity, to provide equal opportunity to the world's population, and to account for all costs and benefits of decisions.

Factor Four is a strategic initiative of the School to validate its commitment to sustainable practices and demonstrate how the built and natural environment can advance through one initiative. In addition, through Factor Four, the school can apply the concepts that lead to building ecocities, as established by the International Ecocity Framework and Standards (IEFS).

2009 Student Charrette

The Factor Four initiative started in 2009 when School of Construction and the Environment Architectural Science students and faculty worked with Richard Register and Ecocity Builders as well as BCIT staff from Facilities Management, Food Services and Campus Planning to explore what a factor four improvement in resource productivity could look like on campus. Faculty and staff from the following research centers also participated: the Centre for Architectural Ecology, Building Science Centre of Excellence, Centre for Energy Systems Applications, Center for Infrastructure Management, and the Canadian Housing and Construction Centre. Recommendations from the charrette included the need to improve metering and do benchmarking and baselining.

FACTOR FOUR AREA

BCIT's Factor Four Area is a quadrant composed of seven buildings in the northeast part of BCIT's Burnaby Campus (see Figure 1 on page 8). In these buildings, the School of Construction and the Environment houses most of its programs including: trades and apprenticeship, engineering and technical, and applied and natural sciences. The buildings are intense in energy use, have diverse applications and stakeholders (see table 1 below), and can be considered a representation of a micro community. Two types of energy, i) electricity and ii) natural gas (used directly and indirectly in the form of space heating through hot water from the campus plant) are consumed in these buildings to provide services to the building occupants. Services predominantly comprise lighting, space heating, space cooling, ventilation, and educational services.

Table 1: Inventory of Factor Four Buildings and their Uses

Building	Size (m^2)	Year Built	Use	Stakeholders*
NE1 J W Inglis Building	20,077	1977	Classrooms, workshops, laboratory, faculty and staff office space, dining and food preparation.	Faculty and students from multiple programs. Some students are transient while others are based in the building. Food services and retail employees. Staff in charge of labs and workshops.
NE2 Joinery	1,877	1957	Woodworking shop, faculty and staff offices.	Instructors have a tight community and sense of ownership; the chief instructor manages the building; students spend the majority of their time in shop.
NE3 Center for Architectural Ecology	648	1971	Classroom space, faculty and staff offices and laboratory space.	Managed by faculty, home of a number of graduate students that perform research in the building.
NE3 Demonstration home	186	2000	Office, meeting space and energy systems research/ demonstration facility.	Three SoCE employees and researchers that have installed equipment in the house.
NE4 Carpentry	2,057	1959	Woodworking shop, faculty and staff offices.	Instructors have a tight community and sense of ownership; the chief instructor manages the building; students spend the majority of their time in shop.
NE6 Piping	2,571	1961	Piping workshop, faculty and staff offices, and classrooms.	Instructors have a tight community and sense of ownership; the chief instructor manages the building; students spend the majority of their time in shop.
NE8 Welding	2,395	1981	Welding workstations, faculty and staff offices, and classrooms.	Instructors have a tight community and sense of ownership; the chief instructor manages the building; students spend the majority of their time in shop.
Factor Four Total	**29,784**	**1957-2000**	**Commercial, residential and industrial.**	**Students, faculty and staff.**

*Facilities and Campus Development department is in charge of planning, maintaining and operating all buildings.

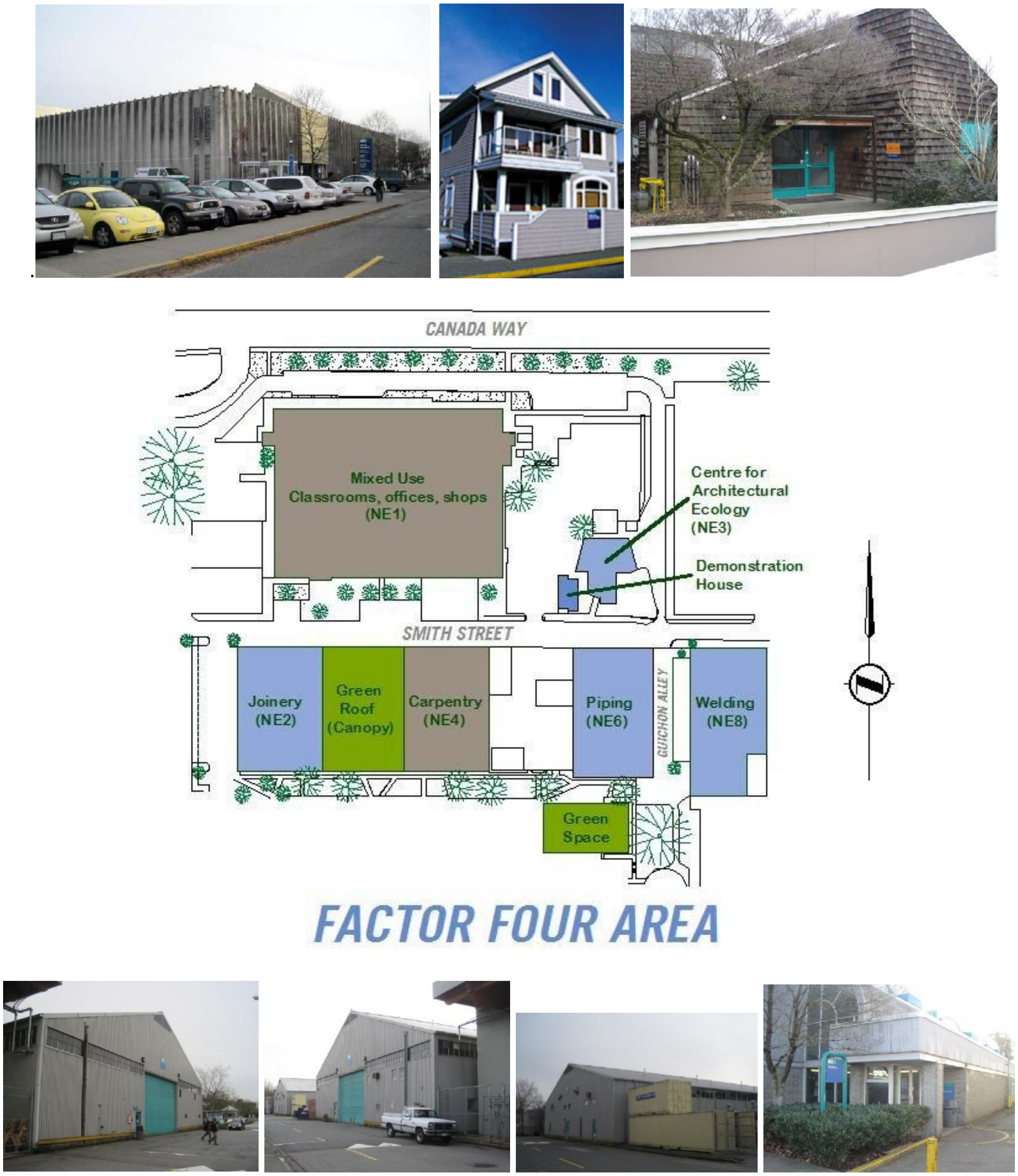

Figure 1: Factor Four Map and Buildings

An advantage of working on a quadrant is that the changes that are made can achieve more visible impact since the efforts are concentrated. In terms of energy there is also the possibility of having interaction between the buildings' energy systems to reduce consumption.

SYNERGISTIC OPPORTUNITY ASSESSMENT

It is often difficult to finance energy projects in BC due to the low energy cost, capital investment in energy retrofits have a low return on investment (ROI) and long simple payback. In order to overcome this financial barrier, an assessment of opportunities to piggy-back on other initiatives was conducted. The material reviewed included:

- Workers' Compensation Board (WCB) reports.
- Facility Condition Assessment Summary Reports (by VFA).
- BCIT's Five Year Capital Plan (2014-2018).
- Interviews with stakeholders.

In the Factor Four area, the following work had already been identified by other groups as needed:

- Dust extraction system replacement in NE2 due to WCB order.
- NE6 office heating source removal due to neighboring building (NE27) demolition.
- Welding ventilation system replacement due to WCB order and incompatible remediation instructions.
- Outdoor lights due to maintenance cost and end of life.
- NE2 compressor replacement due to repetitive failures.
- NE2 and NE4 garage doors replacement due to safety.
- NE1 replacement due to high deferred maintenance cost and high seismic risk.

ENERGY PLANNING FRAMEWORK

Having in mind that Factor Four can be considered a micro-community, best practices in community energy planning were reviewed to select Factor Four's energy planning framework. From this analysis, the 4Rs of Sustainable Community Energy Planning developed by the British Columbia Community Energy Association was adopted.

The 4Rs of Sustainable Community Energy Planning provides a process to build communities in British Columbia that, from an energy perspective, are more sustainable. The pyramid structure of the 4Rs of Sustainable Community Energy Planning highlights the importance of a systematic approach to community energy planning. The effort put into the lower levels provides a solid foundation upon which to build subsequent levels higher on the pyramid. Preferably, each level is completed before moving up the pyramid. Each of these levels is explained subsequently.

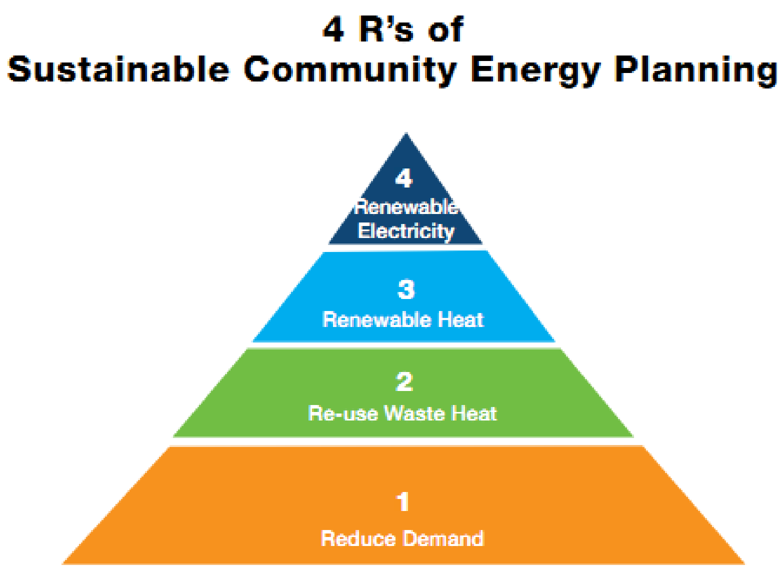

Figure 2: Energy Planning Framework (Source: Community Energy & Emissions Planning – A Guide for B.C. Local Governments, September 2008)

Level 1: Reduce Energy Demand

This first level focuses on reducing the amount of energy used by the buildings to provide the required services. The reduction of energy demand, commonly known as "Demand-Side Management", is the critical first level at the base of the pyramid because the more demand can be reduced, the greater the impact of the subsequent levels higher on the pyramid.

In Demand Side Management, BCIT has adopted an expanded version of this Level. This more detailed version was deemed necessary to achieve a reduction goal as bold as factor four. The four categories of activities added under the Level 1 of the energy planning framework are:

- *Capital Investments* – Upgrading energy inefficient systems (e.g. lighting) to more energy efficient systems.
- *Changes to Business Practices* – Ensuring that energy efficiency becomes an integral component in the organisation's policies and procedures (e.g. adopting an Energy Star purchasing policy for office equipment, teaching using virtual welding, moving to a four-day workweek, etc.).
- *Operational Changes* – Making changes to how energy systems (i.e. building systems) are operating to improve energy efficiency and reduce waste (e.g. lowering the overnight temperatures in buildings).
- *Behavioural Changes* – Encouraging building occupants to alter their behaviour to conserve energy (e.g. encouraging to turn off lights when they are last to leave a room).

Level 2: Re-use Waste Heat to heat buildings and hot water

The second level is about recovering as much heat as practically possible and re-injecting it in the system. Heat can often be recovered from waste streams that leave buildings e.g. in ventilation air; in wastewater; in flue gases from combustion processes. The premise here is that energy has been used to produce this heat so it should be recovered and re-used whenever economically feasible.

Level 3: Renewable Heat Sources to heat buildings and hot water

The third level is about investing in renewable heat systems. Non-renewable fossil fuels are predominantly used to heat buildings and hot water in British Columbia. The use of non-renewable resources is unsustainable by definition. Renewable resources such as biomass (material derived from living, or recently living organisms such as wood), and solar thermal energy should be considered in Level 3 to provide these services.

Level 4: Renewable Energy for Electricity

Once Levels 1 through 3 have been fully-developed, options should be considered for generating electricity from renewable sources such as biomass, micro-hydro, wind, solar, tidal and geothermal. The lower priority for renewable electricity in BC's communities is due to the low cost of electricity which makes renewable energy projects rarely financially competitive. Additionally, on-site renewable electricity projects do not have a great GHG emissions reduction potential in BC as 90% of electricity is already produced from renewable sources (i.e. hydro). On the other hand, the growing demand for electricity and the possibility of developing local green economies makes this last level in the pyramid a relevant step once all other levels are completed.

RESTORATION AND A SENSE OF PLACE

The stakeholders buy-in into the initiatiative is a big component for any energy conservation project to be successful. The users have control over some energy consuming systems plus they could bring ideas that may be unique to each building. For people to be motivated and willing to invest time and energy in the project, it is important that they feel a sense of owenership and pride in their working environment. Through interviews and consultation, it was identified for the occupants to enhance their sense of community, an improvement in the urban and ecological enviroment in the Factor Four area was necessary. Therefore a restauration piece will also be part of the Factor Four initiative. The restauration piece is out of the scope of this Energy plan but will take place in parallel with the plan's implementation.

ENERGY METERING

As the Factor Four initiative has a measurable energy target, for this exercise to be meaningful it is essential to be able to measure the energy baseline and the progress in energy reduction. Additionally, having granular energy information creates opportunities for optimization and user feedback.

Prior to the beginning of the Factor Four initiative, the energy metering in place did not allow establishing a measured baseline for the Factor Four area as a whole, only one building out of 7 was fully sub-metered (for all sources of energy consumed). The installation of smart meters for electricity and natural gas (including delivery of hot water) was therefore included in the Factor Four Initiative.

BASELINING AND BENCHMARKING

Creating a baseline is the only way to quantify the energy value (i.e. in energy units) of the 75% energy reduction goal. Additionally, having energy data at the building level provides benchmarking information, in terms of total consumption and intensity. Benchmarking is an effective way of prioritizing the work where the energy intensity is highest.

The energy baseline was created in two stages as meters were not in place when the Factor Four initiative started in 2008. The first baseline was thus created using the meters that were available and a series of assumptions. The original baseline was estimated at 44,000 GJ per year. After the meter installation, the energy consumption baseline was back-calculated for each building and added to a more accurate value of 40,498 GJ in the 2008/2009 fiscal year (see table 2).

Based on the 40,498 GJ/year baseline and assuming that the services remain constant over time, a 30,373 GJ reduction in energy throughput (the amount of electricity and natural gas imported into the Factor Four Area) would be required to meet the fourfold improvement in resource (energy) productivity targeted by Factor Four.

Table 2: Energy Consumption Baseline (2008/2009 Fiscal Year)

Building	Size (m^2)	Year Built	Annual Energy Consumption	Energy Intensity	Electricity/Natural Gas Ratio
NE1 J W Inglis Building	20,077	1977	17,455 GJ (4,853 MWh)	0.87 GJ/m^2 (242 kWh/m^2)	1.2
NE2 Joinery	1,877	1957	2,158 GJ (600 MWh)	1.15 GJ/m^2 (320 kWh/m^2)	1.2
NE3 Center for Architectural Ecology	648	1971	395 GJ (110 MWh)	0.82 GJ/m^2 (227 kWh/m^2)	2.7
NE3 Demonstration home	186	2000	56 GJ (16 MWh)	0.30 GJ/m^2 (84 kWh/m^2)	0
NE4 Carpentry	2,057	1959	2,050 GJ (570 MWh)	1.00 GJ/m^2 (277 kWh/m^2)	1.0
NE6 Piping	2,571	1961	2,490 GJ (692 MWh)	0.92 GJ/m^2 (256 kWh/m^2)	2.9
NE8 Welding	2,395	1981	15,893 GJ (4,418 MWh)	6.64 GJ/m^2 (1845 kWh/m^2)	2.0
Factor Four Total/Average	**29,784**	**1957-2000**	**40,498 GJ (11,256 MWh)**	**1.40 GJ/m^2 (388 kWh/m^2)**	**1.5**

GOALS AND TRACKING METRICS

Factor Four aims to reduce energy and material throughput by 75% in the Factor Four area without compromising service levels and with a majority of projects completed under the living lab concept, allowing students to learn as we implement solutions. For Factor Four's energy piece to achieve this mandate the following statements have to be true once the initiative is completed:

- Buildings operate on 25 % of the energy relative to 2008/2009 fiscal year energy throughput.
- The area remains a diverse community where trades and technology programs are delivered.

- The instructors working conditions and the quality of their services were not compromised due to the Factor Four energy projects.
- BCIT students from varied programs were involved in all projects at different levels.
- Key staff is aware of Factor Four's projects and energy reduction targets.
- All Factor Four projects can be replicated and are financially viable.

To determine the accomplishment of these statements, the following energy reduction goal and success metrics were established and are tracked annually by completing the form in Appendix A.

Energy Reduction Goal

Buildings NE1, NE2, N3 (Afresh and Centre for Architectural Ecology), NE4, NE6 and NE8 operate on 10,125 GJ of energy throughput by 2018.

Success Metrics

- The number of trade and technology students does not change by more than ±25% with respect to the 2008/2009 ratio.
- When instructors are asked about the quality of their work environment the level of satisfaction does not decline with time.
- At least 15 BCIT students per year are involved in the Factor Four initiative through a course related project.
- When Factor Four is completed, students from a minimum of ten different programs were involved.
- 100% of the SoCE Associate Deans, Directors, Program Heads, Chief Instructors, with an office in Factor Four or in charge of a program in Factor Four, and Facilities and Campus Planning Management have been informed of Factor Four's energy consumption and energy plan once per year.
- All projects as implemented (i.e. bundled projects if implemented together) have a positive NPV using a 3% discount rate.

OPPORTUNITY ASSESSMENT

Level 1: Reducing Demand Opportunities

Following the Energy Planning Framework, opportunities were identified that would reduce energy demand on Factor Four and would not affect or would improve the area services. The demand-side situation analysis was done for all of the following categories: capital investment, change in business practices, operational changes and behavioral changes. To identify the opportunities various methods were employed, including energy audits, engineering studies, and community interviews. More specifically, the following exercises were completed:

- School of Construction and the Environment (SoCE) students energy audits (walkthrough) of all Factor Four buildings except NE1.
- Various School of Business (SoB) students studies of Factor Four business practices.
- Energy study for on-demand wood dust collection.
- Detailed energy studies for interior lighting and welding ventilation.
- Multiple interviews with Chief Instructors and Associate Deans.
- Scope definition report NE1 as a Passivhaus building.

Out of all the above studies and associated opportunities, the projects that had the best fit with the Factor Four vision and goals were identified and added to the energy plan.

Level 2: Re-using wasted heat

The need for a Factor Four heat recovery feasibility study has been identified as necessary to be in accordance with the 4Rs framework. The study was in the planning but had not been completed at the time of writing this version of the plan. At this stage, the following points are being considered:

- Completing an energy savings study for recirculating the exhaust of the welding ventilation system (all exhaust except oxy-acetylene aisle) after running it through a precipitator and an air filter.

- Recovering heat from the largest Factor Four compressed air system located in NE2 (the compressor has been identified [during interviews] as in need of replacement due to end of life).
- Documenting the amount of energy available for heat recovery from the Factor Four neighboring industrial laundry facility.

The project(s) that will have the best fit with the Factor Four vision and goals will be added to the energy plan.

Level 3: On-Site Renewable Heat

Our 4Rs energy planning framework requires the study of options for on-site renewal heat. Two Factor Four programs (Joinery and Carpentry) are significant producers of wood waste (approximately 250,000 kg per year). In order to further develop this plan, the following studies were completed:

- District Energy Pre-feasibility study.
    - In order to identify options to deliver the wood waste-to-energy to the Factor Four buildings and to identify various alternatives for heat supply.
- Wood waste-to-energy costing study and schematic report.
- Wood waste-to-energy Educational building costing study.
- Wood waste-to-energy Monitoring equipment study.
- Wood waste-to-energy fuel study.
- Wood waste-to-energy ash study

The studies have demonstrated the feasibility (both financially and technically) of a wood waste-to-energy facility delivering hot water to NE1 (in a first phase; to more buildings in a second phase). The wood waste-to-energy project has therefore been included in this energy plan.

Level 4: On-Site Renewable Electricity

Within Factor Four there are solar panels installed that were operating when the project started; therefore, they are part of the baseline. Additionally there is a small wind turbine that is not producing electricity. A financial feasibility evaluation of renewable electricity in Factor Four was reported in the document listed below. It was concluded that at this point in time there is no renewable electricity technology that would satisfy Factor Four's financial metric of having a positive net present value (NPV). For example, the payback period is considerable longer than the lifetime (20 years) of solar photovoltaic technology, due to lower electricity costs, lack of incentives and lower annual average solar radiation.

- *Factor Four Renewable Electricity Financial Feasibility Study*

ENERGY PLAN

Following the Energy Planning Framework and based on the situation analysis, a set of projects were identified and evaluated in terms of energy savings potential and costs (see table 3 below). With the set of projects identified, a total of 27,895 GJs of potential savings were estimated, which is lower than the Factor Four reduction target of 30,373 GJs. An additional project was included in the plan in the Behavioural Change section titled Community Energy Saving Initiatives in which, the Factor Four team would invite the Factor Four community to create and implement ideas to reach the Factor Four reduction target.

This plan demonstrates that a 75% energy reduction is achievable in a community through low risk (proven technology), financially viable (positive NPV) projects. The implementation of Factor Four's energy projects could:

- reduce BCIT's energy costs,
- reduce BCIT's carbon footprint, and
- improve staff and student work environment

Table 3: Energy Plan Projects

CATEGORY		PROJECT NAME	IMPACTED BUILDING(S)	ANNUAL ESTIMATED SAVINGS			PROJECT FINANCIALS	
				Energy (GJe)	GHG (TCO2e)	Cost ($)	Gross Cost	Incremental Cost
Reduce Energy Demand	Capital Investment	Dust Extraction System	NE2 - NE4	432	3.00	12,555	749,000	71,000
		Welding Ventilation	NE8	7,158	265.00	108,075	2,700,000	343,000
		LED Outdoor Lighting	All	144	1.00	4,185	40,000	*
		High Efficiency Boiler	NE6	450	22.50	4,077	5,600	5,600
		Lighting Redesign	NE2	86	0.60	2,503	53,822	53,822
		Lighting Redesign	NE3	10	0.07	296	6,004	6,004
		Lighting Redesign	N4	45	0.31	1,296	28,832	28,832
		Lighting Redesign	N4 canopy	96	0.67	2,797	41,811	41,811
		Lighting Redesign	NE6	51	0.36	1,493	4,502	4,502
		Lighting Redesign	NE8	71	0.49	2,055	23,563	23,563
		Passivhaus NE1 – New Construction**	NE1	12,694	449.93	200,951	*	*
		Shop Envelope	NE2	110	5.50	997	*	*
		Air compressor/heat recovery	NE2	108	4.63	1,339	*	*
	Operational Changes	Heat Doctors	NE4	270	13.50	2,446	3,333	*
		Heat Doctors	NE2	100	5.00	906	3,333	*
		Heat Doctors	NE6	100	5.00	906	3,333	*
		Air Tightness Improvement	NE3 - Center	39	1.95	353	*	*
		Afresh Refresh	NE3 - Home	18	0.13	523	10,000	10,000
	Behavioural Change	Light Savers Campaign	NE2-NE4	360	2.50	10,463	5,000	*
		Community Energy Saving Initiatives	All	2500	*	*	*	*
	Business Practices Changes	Virtual Welding	NE8	54	0.38	1,569	60,000	*
		Outdoor Welding	NE6	*	*	*	*	*
Re-using Wasted Heat		Heat Recovery	NE8	1,500	75.00	13,590	*	*
Renewable Heat		Wood Waste to Energy	NE1	4,000	200.00	36,240	1,500,000	500,000
		Wood Waste to Energy	NE2	0	0	0	*	*
		Wood Waste to Energy	NE3 - Center	0	0	0	*	*
		Wood Waste to Energy	NE8	0	0	0	*	*
Renewable Electricity		N/A	N/A	N/A	N/A	N/A	N/A	N/A
FACTOR FOUR TOTAL				30,395	1,057.50	409,616	5,238,133	1,083,134

*Unknown at this time **First step: develop a business case comparing Passivhaus standard vs. ASHRAE 90.1 and LEED Gold

Appendix A: Factor Four Energy Annual Metrics Form

Educational Programs and Quality

Students in NE2-NE8		Trade/Technology Students in SoCE		Instructors feedback on work environment once Factor Four is completed	Students feedback on facilities (Q7-10 of F-18309-BCIT form)
Total	Change (%)	Ratio	Change (%)		
Target = does not decline more than 10% w.r.t baseline year		Target = ratio does not vary more than 25% w.r.t baseline year		Target = no negative feedback compared to baseline year	Target = feedback average score does not decline w.r.t. baseline year

Course Related Projects

Project	Program	Instructor	Number of Students
Annual Total			
Cumulative Total			
	Target = 10 different programs (cumulative)		Target = 15 students per year

Key Stakeholder Communication

Stakeholder	Updated (Yes/No)	Method
SoCE Directors		
SoCE Faculty		
Facilities and Campus Development		
	Target = Annual update to all key stakeholder	

Energy Projects

Completed Project	Energy Reduction Potential (GJs)	NPV	Comments
		Target≥0	

Energy Consumption

Period	Electricity (kWh)	Electricity Change (%)	Natural Gas* (GJs)	Natural Gas Change (%)	Total Energy (GJs)	Total Energy Change (%)
Annual						
Cumulative						
					Target = 30,373	Target = 75%

*Weather normalized