



Integrated Energy Master Plan (IEMP) Update & Next Steps

Executive Team Meeting

Presenters:

Spencer Wood
Director, Facilities Management

Aman Hehar
Manager, Energy Efficiency

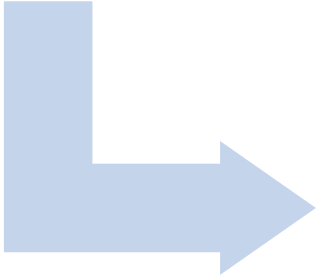
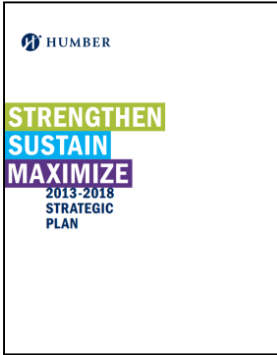
16^h June 2020



IEMP Overview

Strategic Plan Initiative (Then)

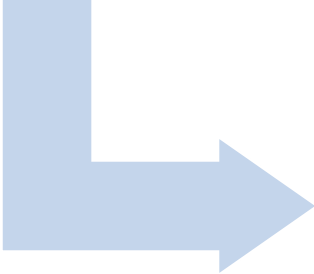
Strategic Plan
2013-2018



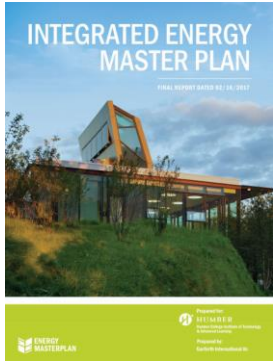
Sustainability
Plan
2014-2019



- Aggressive Energy Efficiency Targets



IEMP
2014-34



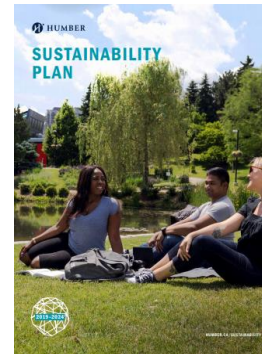
Strategic Plan Initiative (Now)

Strategic Plan
2018-2023



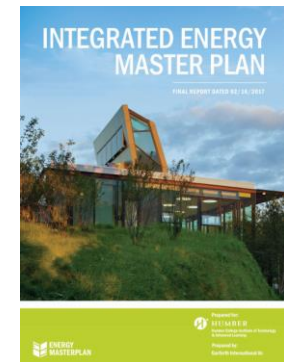
Strategic Priority 8.1:
*“Provide national leadership
in developing sustainable
campuses”*

Sustainability
Plan
2019-2024



- Aggressive Energy Efficiency Targets

IEMP
2014-34



Framing Goals

Performance by 2034 , Baseline 2014

- Energy Efficiency
 - **At least 50% reduction per ft²**
- Water Efficiency
 - **Further 50% reduction per student**
- Carbon Footprint
 - **30% reduction in greenhouse gas emissions**
- Academic
 - Offer **world-class** academic courses addressing integrated energy, water and climate solutions

IEMP Recommended Solution - 2015

Efficient Buildings

- Metering & Control
- Active Energy Management
- Low cost/no cost measures
- Energy Retrofits
- New Buildings

Efficient Supply

- Low Temperature Heating Supply
- Heat Recovery
- Heat Pumps

Renewable Energy

- Solar Photovoltaic

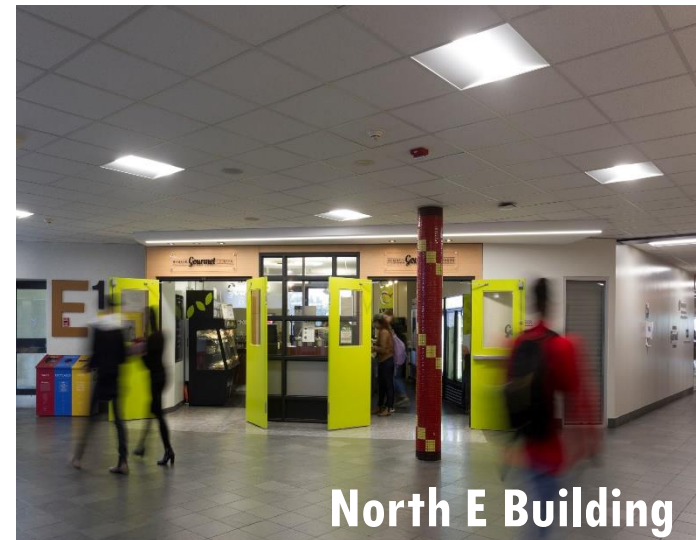
IEMP Progress to Date

IEMP Delivery to Date

- Delivered in 3 Major Phases:
 - Phase 1: July 2016 to November 2018
 - Phase 2: January 2018 to October 2019
 - Phase 3: April 2019 to March 2020
- Over 25 major projects delivered

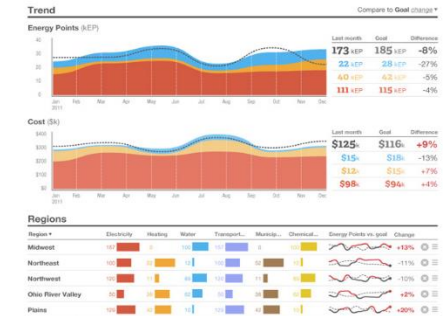
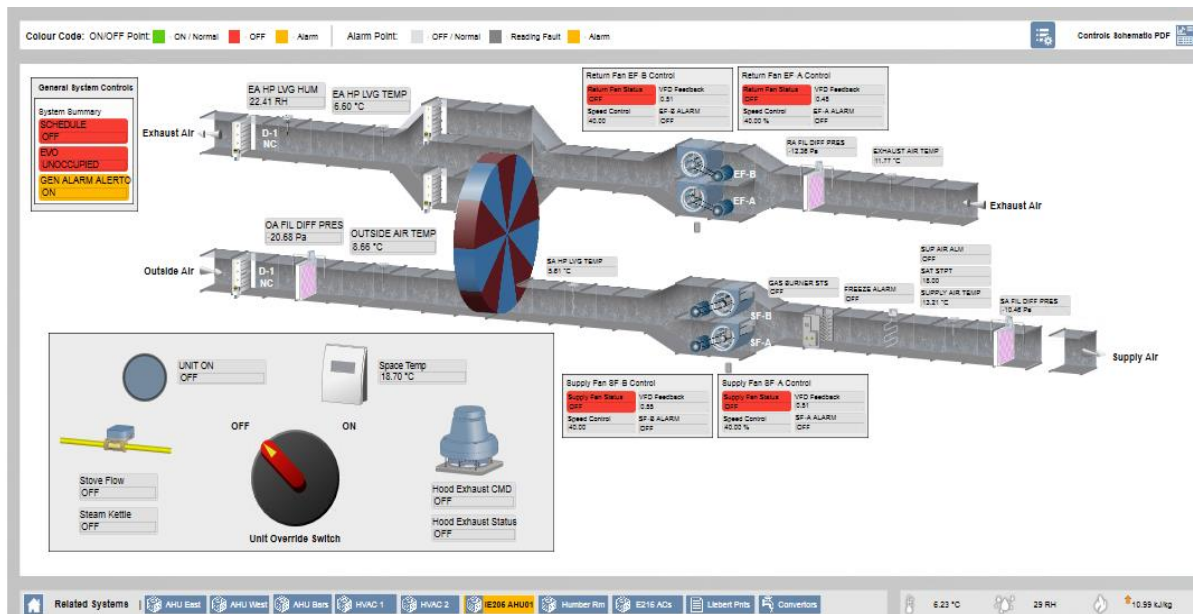
IEMP Project Examples - Lighting

- ~750,000ft² retrofitted to LED
- 80% reduction in lighting energy
- Reduced maintenance costs
- Advanced Lighting Control System Installed



IEMP Project Examples – Metering & Controls

- Implemented college-wide metering system
- Upgraded legacy HVAC control systems



IEMP Project Examples - New Construction



- New buildings to target “global best practice” in energy efficiency
- Barrett CTI
 - 70% less energy use than average Humber Building
 - 2nd Largest Net Zero Energy Building in Canada

IEMP Project Examples – Solar PV

- 1.1MW installed capacity at North Campus

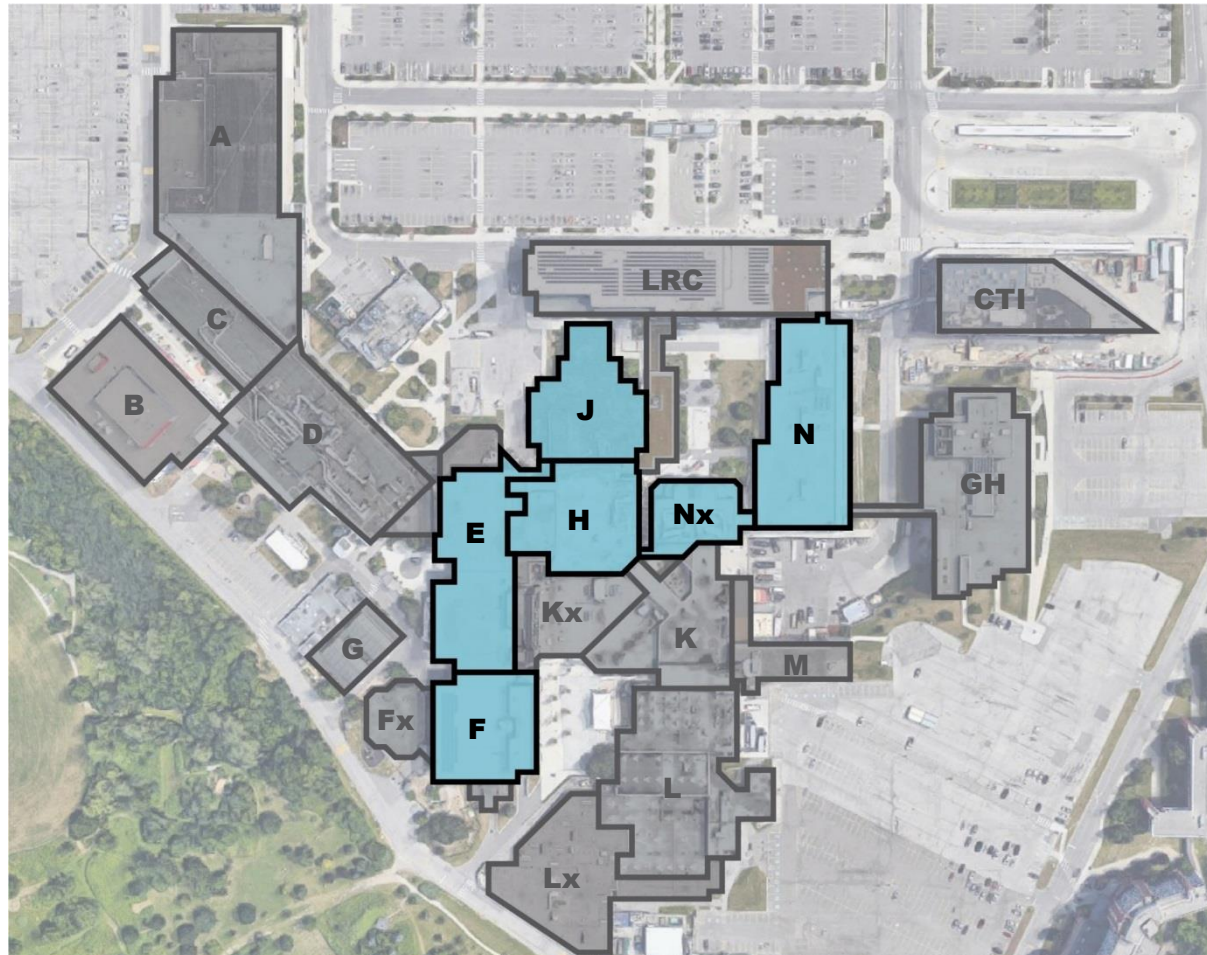


IEMP Project Examples – Building Envelope



IEMP Project Examples – Building Envelope

- North Campus Impact



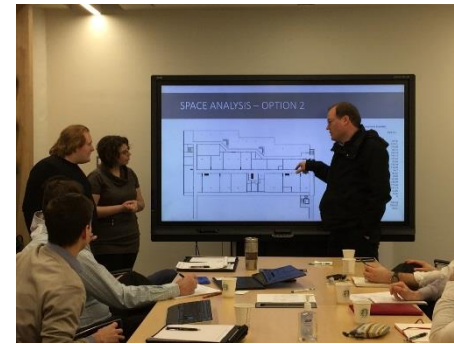
IEMP Project Examples – Building Envelope



- Nx Building Example
 - First Zero Carbon Retrofit in Canada
 - 70% reduction in energy use
 - First Institutional Passive House Retrofit in North America
 - Winner of National Leadership Award for Excellence in Green Building

IEMP Progress – Student Engagement

- Academic Participation Example
 - Multi-Disciplinary Student Team formed to complete a design in parallel with the actual project.



IEMP Delivery to Date

- IEMP Spend to Date:

Sources of Funds (Approx)	Amount
Strategic Investment Fund (SIF) – Provincial Grant	\$1.4M
Strategic Investment Fund (SIF) – Federal Grant	\$6.0M
Greenhouse Gas Retrofits Program (GGRP) – Provincial Grant	\$12.8M
Facilities Renewal Program (FRP)	\$1.0M
Utility Incentives	\$0.8M
Humber (Internally Restricted Reserve)	\$14.0M
TOTAL:	\$36M

- Over 60% of capital from external sources
- Approximately \$14M in deferred maintenance retired

IEMP Savings to Date

	2014-15 Baseline	2015-16	2016-17	2017-18	2018-19	2019-20	2034-35 IEMP Goal
Energy Savings	0.0%	6.4%	9.0%	11.0%	15.6%	20.3%	50% (Reduction in Energy Use per m ²)
Water Savings	0.0%	4.4%	3.8%	11.4%	17.2%	26.2%	50% (Reduction in Water Use per Student)
GHG Savings	0.0%	-7.4%	-4.2%	-0.8%	1.0%	3.0%	30% (Reduction in Tonnes of CO _{2e})
Annual Avoided Cost	\$0	\$299,000	\$370,000	\$413,000	\$638,000	\$965,000	
Energy Cost Intensity (\$/m²)	\$24.36	\$25.12	\$27.09	\$23.26	\$19.44	\$18.89	

- Results are Preliminary, pending 3rd Party Review

IEMP Progress – Recognition & Leadership



MORRISON HERSHFIELD

People

Culture



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Zero
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and p
retro
Build

through careful integration of architectural design, energy modelling, envelope design and

IEMP Next Steps

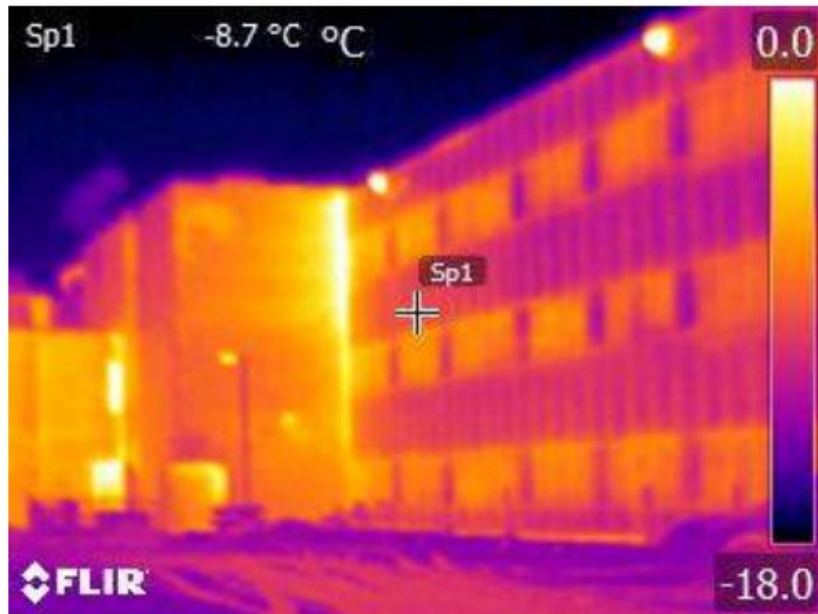
IEMP Next Steps

- Focus Areas for Capital Expenditure
 - Continue to Target Building Envelope (Energy Consumption)
 - New Construction (Lakeshore Humber Cultural Hub)
 - North Campus District Energy (Carbon Emissions)

IEMP Next Steps – Building Envelope

- Multi-year capital plan being developed
- Focus on targeted repairs

Positive Pressure



Positive Pressure



IEMP Next Steps – New Construction

- Lakeshore Humber Cultural Hub



- Anticipated largest zero carbon new building in Canada
- Heating & Cooling using Geothermal System

IEMP Next Steps – District Energy

- District Energy
 - Production and supply of heating & cooling from a central location
 - Heating and cooling distributed through a network of pipes
- North Campus is a suitable candidate

IEMP Next Steps – North Campus District Energy

- Existing System
 - Built in 1972
 - Located in I Building
 - E, D, H & J first buildings connected
 - Steam Heating System operates at:
 - *Up to 170°C*
 - *~65% Efficiency*



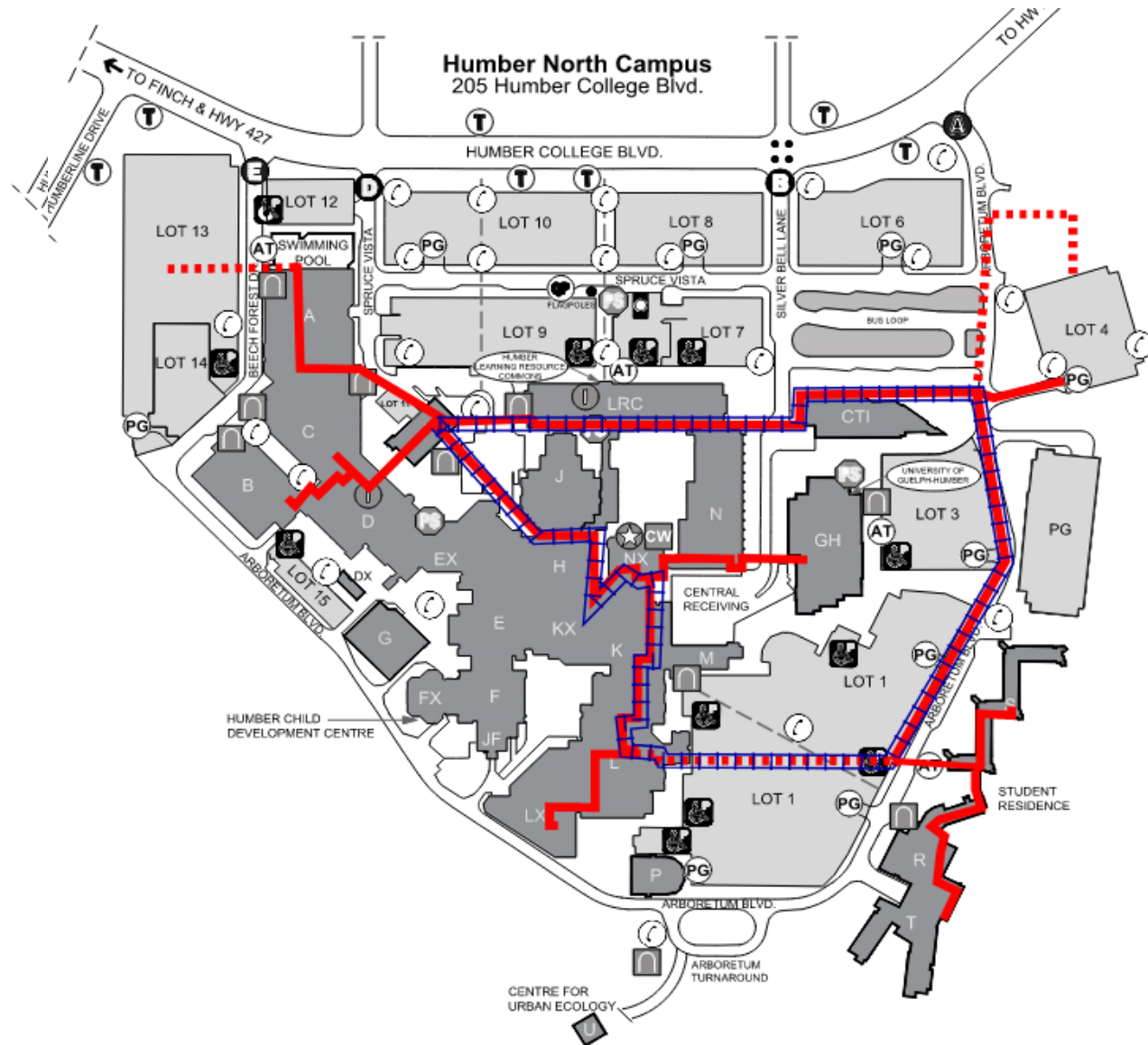
IEMP Next Steps – North Campus District Energy

- New Design
 - Replace steam pipes with hot water pipes, allowing:
 - *Operation at lower temperatures (54-75°C)*
 - *Improved efficiency (>100%)*
 - *Enabling of low carbon heat sources*
 - Connect all buildings to system
 - Future flexibility
 - Complex implementation



UNIVERSITY OF ROCHESTER EXAMPLE

IEMP Next Steps – North Campus District Energy



IEMP Next Steps – North Campus District Energy

- Current Status:
 - Engineering Feasibility Study complete
 - *Estimated \$24.5M budget*
 - *5 Year implementation expected*
 - *20% reduction in college Greenhouse Gas (GHG) emissions*

IEMP Next Steps – Other Leaders in PSE



UNIVERSITY of
ROCHESTER



DARTMOUTH

Sheridan



HUMBER

UCDAVIS

Stanford



BROWN



PRINCETON
UNIVERSITY



HARVARD
UNIVERSITY



IEMP Next Steps – North Campus District Energy

- Project Next Steps:

Timeline	Action
June 2020	Executive Approval
September 2020	RFP Release
March 2021	Audit & Finance Committee & Board Approval
2021-2026	Expected Implementation

Discussion with HSPP Partner

- Discussions with Seneca around Sustainability & Energy Efficiency are ongoing
- Humber Energy Cost Intensity 27% Lower in FY18-19

	Energy Cost Intensity (\$/m ²)
Humber	\$19.44
Seneca	\$26.46

- Equates to approximately \$2M in annual savings
- Seneca looking to Humber for leadership



Spencer Wood
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