Deep Emissions Z Retrofit Dialogue

zebx

BC Hydro Power smart

Best Practices for Large Buildings

Tue, Sep 21, 2021 from 12.30pm - 2.30 pm PDT Free webinar I zebx.org

Song: Swoonwalk – A Band Called Success



Decarb Lunch Series

Zebx BC Hydro Power smart

Putting a Label on High-Performance Tue Sep 28, 2021, from 12- 1pm PDT Free Webinar I zebx.org

> CANADIAN HOME BUILDERS' ASSOCIATION BRITISH COLUMBIA

ENERGY PROGRAMS

Be part of it first. Join the Building to Electrification Coalition launch event

Sep 29, 2021 11am- 12pm PDT Free Webinar

Building zebx Electrification



825 Pacific Street

Net-Zero Energy-Ready Challenge Winners Series Sep 2021



NET-ZERO ENERGY-READY CHALLENGE

WINNERS SERIES

Supporting, promoting and celebrating the design and construction of net-zero energy-ready buildings



CONSTRUCTION COST ANALYSIS OF HIGH-PERFORMANCE MULTI-UNIT RESIDENTIAL BUILDINGS IN BRITISH COLUMBIA

JUNE 2021

www.zebx.org/resources

Overall Cost Comparison





Categories:

Articles
 Case Studies
 Past Events
 Reports
 Videos & Slides

Series:

NZER Challenge Playbook Series
 NZER Challenge Winners Series

Systems:

Building Enclosure
 Domestic Hot Water Heat Pump
 Geothermal
 Mechanical

Subjects:

Solar Energy

- All-Electric Building
 BC Energy Step Code
- Construction
- Design
- Embodied Carbon
 LEED
- Part 3 Building
 Part 9 Building
- Passive House
- Retrofit
- Step 4

POLL 1 Tell us about yourself!

Three-part anonymous poll







Who is **BOMA BC**?

FOUNDED



BC's largest commercial real estate association

CONTRIBUTION

Industry \$200B+ II Value • Employing 37K+ in BC

OUR MEMBERS

Represent



of BC's commercial real estate professionals

Own or manage

of BC's commercial real estate



Building Owners and Managers Association of British Columbia









GREATER VICTORIA 2030 DISTRICT[®]

TOTAL WASTE MANAGEMENT



POLL 1 What did you tell us about yourself?





Context

- Why is there a growing focus on *existing* buildings?
- Why focus on deep **emissions** retrofits as opposed to deep **energy** retrofits?
- What does the future hold for emissions from buildings?



Why Focus on Existing Buildings?

- "Assuming projected demolition rates of ~1.4% per year, around 50% of existing buildings will still be in use by 2050." – Pembina Institute, Building Energy Retrofit Potential in BC, 2016
- "Assuming historical demolition rates will continue at a similar pace, around 60% of existing buildings will still be in use by 2050." - City of Vancouver Climate Emergency Action Plan, 2020



Why Prioritize Emissions?

• Energy is a proxy for emissions that makes more sense in areas where the electrical grid is high-carbon.

• The focus on emissions in areas where the electrical grid is low-carbon allows for a second emissionsreduction strategy: electrification.



What's in Store?

- "By 2030, the carbon pollution from building operations will be cut in half from 2007 levels." - City of Vancouver Climate Emergency Action Plan, 2020
- The first set of requirements for the most polluting buildings could come as early as 2025.
- Exceeding the maximum allowable emissions limit would incur fines.



What's in Store?

CLIMATE 2050 BUILDINGS ROADMAP ACTION TIMELINE



© Metro Vancouver

Decarbonization Case Study 1075 West Georgia St, Vancouver

Deep Emissions Retrofit Dialogue – ZEBx/ BOMA BC Nicky Arthur – Colliers Energy & Sustainability Manager September 2021

Colliers

Accelerating success.



Colliers Managed Portfolio

62



Million SF under

management across Canada



30 **Million SF** office under management



Million SF retail under management

12



16 **Million SF** industrial under management



Governance

Helping Our Clients Achieve their Goals:

By providing our clients with comprehensive sustainability strategies, we help them improve the performance of their properties and achieve better environmental, social and economic outcomes.



1075 West Georgia St The Opportunity

Background

- 1968 iconic downtown Vancouver building (Arthur Erickson architect)
- 359,143 sqft multi-tenant
- 26 floors
- LEED Platinum certified (EB:O&M)

The Competition

- Client-hosted 'Innovation in Sustainability' competition with \$50k prize.
- Vertical riser replacement and Domestic Hot Water (DHW) in CAPEX for 2020.
- Partnered with SES Consulting to identify a competition project for 2020.

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1075 West Georgia St The Sanden Heat Pump



- Uses CO₂ as refrigerant Global Warming Potential of 1 (much lower than others).
- Typical Coefficient of Performance (COP) of 2 5.
- Operates at ambient temperatures down to -28°C (-20F).
- Delivers hot water up to 80°C (175F); typical supply temp of 65oC (150F).
- Each heat pump delivers ~15,000 BTU/hr.
- Each heat pump draws ~1kW and produces ~4.5kW.
- 119 gallon tank can deliver 135 gallons of hot water in the first hour.

1075 West Georgia St Before

Gas-supplied System

- Gas-fired domestic hot water heater primarily used for washrooms
- 828 GJ/yr or 41 tCO2e/yr (greenhouse gas emissions)
- DHW gas Cost: ~ \$8,000/yr
- Penthouse mechanical room
- Parkade space







1075 West Georgia St The Project Team

The project Team:

Property Manager:	Colliers
Mechanical Consultant:	SES Consu
Mechanical Contractor:	Pacific Me
Heat Pump Supplier:	Small Plar
Controls:	ESC Autor

Colliers SES Consulting Pacific Mechanical Small Planet Supply ESC Automation







Good communication between all team members is key.

1075 West Georgia St After



Colliers

7

Electrically-powered System

- 10 Sanden Air Source Heat Pumps (6 + 4)
- 7 x 119 gallon water storage tanks (4 + 3)
- 2 'swing' tanks
- CTs installed on each heat pump to measure electrical consumption of new system





1075 West Georgia St Measuring the Results







Colliers

9

1075 West Georgia St The Results

Project will be equivalent to removing:



• Gas Consumption: 0 GJ/yr

Results

- Anticipated electricity increase: 62,600 kWh/yr,
- Anticipated fuel cost savings: \$3,000/yr
- Anticipated building greenhouse gas reduction: 8.5%
- Simple payback ~ 15yrs
- Cost of emissions reduction: \$146/tCO₂e (lifetime)





1075 West Georgia St Lessons Learned

Key Takeaways:

- Planning around end of life equipment is key
- Have some options ready for evaluation, addressing emissions reduction, cost etc
- Can use metrics like \$/tCO2e reduced in addition to simple payback
- Understand long and short term client goals/ objectives
- Space considerations can be considerable
- Equipment right-sizing is important
- Projects require significant design and commissioning takes time!

1075 West Georgia St Next Steps

- DHW project was the First Step.
- Zero Carbon Retrofit 'Roadmap' in progress.
- Zero Carbon Building standard goal.





An engaged team, including the client, is the most important element.







Thank You

Contact

Nicky Arthur nicky.arthur@colliers.com

Accelerating success.

BOMA BC and ZEBx. Webinar

DEEP EMISSIONS RETROFIT.

1177 WEST HASTINGS STREET

PROJECTS:

- Cooling Plant
- Decoupling DHW and Electrify
- Heating Plant and Heat Recovery
- Air Handler

THE GOAL

Eliminate carbon emissions in our building.



THE HUNT

Identify the energy and its users.



THE PLAN

Intentionally replacing end of life equipment with deep energy retrofit solutions.

COOLING PLANT MODERNIZATION

We partnered with Trane to develop a cooling plant strategy that would not only take care of our cooling loads, but also provide for our future.

Optimization began with variable primary flow, VFD's on the primary chiller, all the pumps and an induced draft cooling tower, new chiller plant controls and sequence, modified piping and control valves.

DEEP ENERGY RETROFIT	BUSINESS AS USUAL REPLACEMENT
\$1,778, 773 PROJECT COST	\$1,446,973 PROJECT COST
79% ANNUAL ELECTRICITY	15% ANNUAL ELECTRICITY
REDUCTION	USAGE
\$100,083.94 ANNUAL SAVINGS	\$16,500 ANNUAL SAVINGS IN
IN ELECTRICITY	ELECTRICITY
909.854 KWH REDUCED	150,000 KWH ANNUALLY
ANNUALLY	REDUCED







DECOUPLING DHW & ELECTRIFY 2019

We planned to replace our end of life domestic hot water tanks with High Efficiency electric tanks.

This was a fuel switching project where they had been originally designed to run with the heating boilers that are natural gas fired.



Deep Energy Retrofit

\$63,000 Project Cost

Average 12,675 Gallons of DHW per month

Average 2900 kWh per month

Average \$319 per month for electricity



AIR HANDLER FAN ARRAYS

2020/2021

With a 46% reduction in electricity usage since 2007 we have been digging deep to further reduce our electrical loads. We partnered with Trane and together designed a solution for our building.

Our strategy was to modernize our air handlers, and we replaced end of life hot water coils, motors and dampers and installed new controls along with MERV 15 air filtration to support our new VFD powered fan arrays.

Deep Energy Retrofit
\$1 586 489 Project Cost
\$1,500,407 110ject cost
Target 50% annual electricity reduction
\$72,000 estimated annual savings
796,986 kWh estimated annual reduction



HEATING PLANT AND HEAT RECOVERY 2020-NOW

Our main objective was to shut off the gas valve to our building.

When we heard about Zero Carbon Certification in 2017, we set our sights and got to work. Once again, we partnered with Trane to make this dream a reality. We would be turning on the heat recovery mode with our secondary chiller, through a heat exchanger we would provide 140F to our heating plant. The goal was an 80% reduction, and to date we have achieved 77%.

By this time next year our goal is to have an overall reduction of 85% in natural gas usage.

How will we do this?

- Improved sequence of operation
- Re-engineered heating loop pipe design
- Full utilization of the induction loop*
- Greater occupancy of the building for increased heat recovery



*Due to the November 3rd, 2020 pipe leak



CARBON OFFSETS



In 2021 we began to see the full effect of our hard work as 1177 produced only 311 tonnes of CO2. The purchase of carbon credits funds a project that reduces or avoids other carbon emissions; one carbon credit equals one tonne of avoided emissions.

Through our work, the total GHG emissions intensity for the building is equal to 0.96 kg CO2e/ft2. While 0.87 kg of this comes from Natural Gas, the remaining 0.09 kg is from Hydro Electricity.

Golden Properties purchased credits through the Green-e Climate platform, which features projects based in the US. Unfortunately, there were no Canadian projects on the CaGBC approved list.

These credits were approved by CaGBC as part of our Zero Carbon certification application, with an anticipated certification by the end of 2021.

AUDETTE

Thank you to Christopher and Matt from Audette, particularly for the life cycle cost calculator with a Zero Carbon scenario analysis with two options to get us off gas. This was provided to us as part of a net zero plan to submit to CaGBC, for our Zero Carbon application.

Audette Home Golden Propertie	es 🗸 1177 West Hastings 🗸		klee ∨	
🔒 Sites 🖾 Projects 🕒 Reports 🗮 Dat	a			
🗈 Upload 🗁 Download 🗏 Manage Data 🗟 Calc	ulate Points			
Energy Savings Analys	sis	GOLDEN PROPERTIES		
Site	•	Select date range •		
Electrical Energy (kWh)	Total Energy (MJ)		
Baseline Consumption The Stork of the Stork	- Electricity Savings - Electricity Savings	Fortis BC Mar 2011 May 2015 Jul 2019 Apr 2013 Jun 2017 Aug 2021		

OUR PROCESS

- Make a net-zero plan that includes capital replacements.
- Consider carbon off-setting as a step forward, rather than using this as a final solution.
- Survey your team for ideas to create new projects to further reduce your carbon footprint.
- Bring together the Operations and the Property Management team to really make these projects successful.

BY CHALLENGING "BUSINESS AS USUAL", A FULLY OCCUPIED EXISTING BUILDING CAN BECOME ZERO CARBON.

September 21st, 2021



Building Owners and Managers Association of British Columbia

zebx

Deep Emissions Retrofit Dialogue

Multi-Unit Residential



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Objectives

Semlin Gardens

- Background
- Opportunity
- Design
- Lessons Learned
- Summary

Key Takeaways

Next Steps



Objectives

- 1. Draw parallels
- 2. Utilize existing infrastructure
- 3. Prioritize projects





Design Team

We are Energy & Engineering Professionals who are passionate about making a positive impact for our clients and the environment.

We provide high performance building solutions:

- Reduce Operating Costs
- Improve Comfort
- Decarbonize Building Operations





Founding Principal Ben Mills

Lead Energy Engineer Steve Fetterly



Semlin Gardens

Social Housing Upgrade Project (Vancouver, BC)

- Building envelope renewal
- Decarbonization of mechanical systems
- LED lighting upgrade



Before









Opportunity

- Underground parkade
- Spacious mechanical room
- Low temp in-floor radiant heating
- Spare electrical capacity



After









Lessons Learned

- Electrical load metering
- Back-up natural gas
- Parkade to avoid defrost and optimize efficiency
- Exhaust air to outdoors



Energy Summary

- Predicted 98% reduction of annual natural gas use
- Predicted 95% reduction of annual GHG emissions
- Predicted annual system COP of 3.0



Key Takeaways

- 1. It's not all or nothing
- 2. Identify opportunities and capitalize
- 3. Prioritize to make the most impact

Hybrid systems achieve substantial GHG savings



What Does the Future Hold?

For Semlin Gardens:

- M&V to optimize energy/carbon savings
- Decommission natural gas

For MURBs:

- Low temp heating systems
- Electrical service upgrades for EVs, etc.
- More efficient, cheaper technology



Thank you

sfetterly@impacteng.ca | (604) 339 2650