

**Summary Meeting Notes: Corporate Energy Managers Webinar, March 31, 2021**

**Webinar Proceedings**

**Case Study Presentations**

* Adam McMullin, City of Barrie: Advancing Net -Zero Buildings ([pdf of presentation](https://cleanairpartnership.org/cac/wp-content/uploads/2021/04/COB-CAP-Presentation-30.03.2021.pdf))([video of presentation](https://vimeo.com/531366915))
* Amanda Webster Martin, City of Markham: Net-Zero Energy Emissions Study and Pilot ([pdf of presentation](https://cleanairpartnership.org/cac/wp-content/uploads/2021/04/CAP-NZEE-Study-and-Fire-Station-Pilot-Presentation-Mar-2021.pdf))([video of presentation](https://vimeo.com/531366915))
* Bryan Ho-Yan, City of Guelph: Advancing Net-Zero Municipal Buildings ([pdf of presentation](https://cleanairpartnership.org/cac/wp-content/uploads/2021/04/20210331-CAP-Net-Zero.pdf)) ([video of presentation](https://vimeo.com/531366915))
* Kathryn Wilson, Mayor’s Megawatt Challenge: Practical Pathways to Net Zero Carbon Buildings ([pdf of presentation](https://cleanairpartnership.org/cac/wp-content/uploads/2021/04/MMC-slides-for-CAP-March-31-webinar-Final.pdf)) ([video of presentation](https://vimeo.com/531366915))

## Introduction

Municipalities are advancing net zero carbon targets within their own facilities. As part of this effort municipalities are retrofitting existing facilities as well as advancing net zero new builds. There are significant benefits from municipalities sharing business plans, procurement strategies, experiences and learnings.

## **Adam McMullin, City of Barrie: Advancing Net -Zero Buildings**

Advancing net-zero buildings is a relatively new concept with a lot of lessons to be learnt in terms of planning and budgeting. While there are a lot of published studies on residential buildings or houses, there is limited published literature on the costs of getting from a base or LEED building to a net zero building.

### Project example: Transit Hub

The City of Barrie is constructing a small building approximately 2,000 ft² that will replace the existing transit terminal and house the City’s bus fleet in a better and more accessible location.

In 2018, City of Barrie did a feasibility study on class D costing and this study relied heavily on 2017 and 2016 construction figures. In 2019, they applied for the Investing in Canada Infrastructure Program (ICIP) funding to help support the project. In the same year, council declared a climate emergencyFunding for the project was not approved until 2020 and the project validation and design was approved in 2021.

These long timelines and timeframes created a challenge in advancing net zero buildings because the project relied on numbers from 2017 and by the time construction starts, it will be 2022. The lesson learnt from the challenge of having long timelines in advancing net zero buildings is to consider looking 5 years into the future while planning.

The 2018 Feasibility study by City of Barrie was conducted for the following reasons:

* Compare between a standard building code construction design (reference/baseline) and a net zero and passive house construction design;
* Establish which features are needed in a building to get to net-zero;
* Perform an economic analysis on each of the recommended features;
* Investigate renewable energy generation options on site;
* Quantify the environmental, social, and economic impacts of implementing net zero sustainable construction features; and
* Quantify the incremental costs of achieving net zero construction and the life-cycle operational implications of constructing a net zero facility.

### *The study recommends that*

* The city pursues a net zero design pathway with an estimated a 3 – 5% cost premium;
* Additional energy cost savings associated with passive house pathway does not justify increased capital investment;
* The most efficient design option would be a Passive House design;
* Air Handling Unit + in floor heating + Energy Recovery Ventilator (84%);
* Variable Refrigerant Flow HVAC system with ground source heat pump;
* Similar embodied carbon between net zero and passive house;
* Small differences in efficiency between air source and ground source heat exchangers; and
* System requires a 25 – 30kW solar PV system to fully offset energy usage.

### *Takeaways from the study*

To begin with, modeling a building without preliminary design limits the usefulness of recommendations and analysis. Secondly, there are distinct differences between the modelling methodology of Passive House and Net Zero Buildings and the Canada Green Building Council (CaGBC) certification does not require 100% renewable energy. Further, for smaller sized buildings, ground source heat exchange and added envelope insulation did not represent best investment value and investing in higher efficiency ERV and utilizing VRF heating /cooling system provides presented a better return. Overall, the energy costs savings potential is limited for smaller sized building due to the lower energy costs of smaller buildings.

 It is still unclear if pursuing formal certification is necessary. It is something to consider but not a necessity. Performance and business case is the priority focus. The sustainable design pathway and associated incremental constructions costs will likely vary substantially from project to project and evaluations of each sustainable design element should be considered during the building design phase of the project. The last take away from the City of Barrie’s feasibility study is that compiling actual constructions costs for passive house and for net zero buildings will assist budgeting into the future.

## Amanda Webster Martin, City of Markham: Net-Zero Energy Emissions Study and Pilot

Markham is undertaking a study to retrofit 5 fire halls to net zero. They chose fire stations for their pilot study because they have been considered for solar PV studies, have common sizes and building characteristics and also because fire stations are essential services and remain fully operational 24/7 so have higher energy use than more time constrained facilities. As such, fire stations were selected based on energy/GHG intensity, capital renewal schedule, and renewable energy potential.

The purpose of the pilot study is to create pathways for facilities to achieve Net-Zero Energy Emissions (NZEE) through energy conservation, energy efficiency (including electrification and heat recovery), on-site renewable energy, and also through purchasing local renewable energy credits.

To see what it will take to get to net zero, the pilot study will pick a middle of the road (halfway into net zero fire station) and treat the fire station as a large, detached home and anticipate that some practises can be used for regular homes.

### Objectives of the pilot study

* Retrofit (and construct) buildings to NZEE (environmental)
* Reduce utility bills, maintenance costs, and mitigate capital costs (economic)
* Improve building quality, comfort, health and resilience (social)
* Increase internal communication, awareness, and capacity
* Support sector transformation

After receiving the report and recommendations from the pilot study, the City of Markham plans to take the following steps:

* Solicit services from a consultant to complete the recommendations from the report per RFP Scope.
	+ Create a baseline and NZEE archetypal models
	+ Contrast and recommend design standards/certifications
	+ Set performance metrics
	+ Complete energy audits and net-zero studies at each pilot facility
	+ Identify cost-effective solutions
	+ Develop a modular net-zero retrofit framework, design, tender spec/language, and analysis tools (financial, energy, GHG)
	+ Create customized net-zero retrofit roadmaps
	+ Facilitate stakeholder engagement and capacity building including a report & presentation to Council
* Review retrofit options and select preferred roadmap to achieve NZEE for each facility
* Discuss how to address the incremental capital cost.

Between December 2021 and January 2022, Markham will review retrofit options and select preferred pathways to NZEE and discuss how to address the incremental capital cost and apply for grant funding (if available) between January and May 2022. By 2023 through to 2031, Markham plans to design and retrofit facilities to net zero energy emissions.

## Bryan Ho-Yan, City of Guelph: Advancing Net-Zero Municipal Buildings

While Guelph’s corporate target is 100% renewable energy by 2050, their approach is energy conservation first, followed by renewable energy targets. The City of Guelph is looking at two opportunities for the overall refreshing of their building stock.

* The lifecycle of a facility
* New facilities that come with the City’s growth.

### *Guelph’s approach*

Like other cities across Canada, the setting of targets in the city of Guelph was accelerated by their climate emergency declaration. Guelph is moving towards zero carbon design standard but is looking to address the building envelope first. The city plans to normalize projects to include energy as part of the design process from the beginning and to include energy modeling in design review.

### *Challenges*

Some of the challenges in moving towards net zero buildings in Guelph include:

* *Specifications-* This is a challenge in terms of collecting the building specifications, refining them and communicating them.
* *Ground water/Electrical demand-* Issues with Geothermal approvals within the city
* *Budget and scheduling-* The City of Guelph faces similar challenges to the City of Barrie in terms of long gaps in the planning of net zero projects and relying on figures from past years. It takes some time for projects to start, and hence necessary to plan and budget into the future.

The City of Guelph is trying to move away from the linear building process (design-bid-build) and instead embrace the zero carbon building design (design-build). The emphasis is on incorporating renewable energy and zero carbon standards early in the building design as opposed to adding them later.

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## Kathryn Wilson, Mayor’s Megawatt Challenge

Identifying priority buildings can be done by examining buildings with high GHG reduction potential, and buildings with planned capital improvements. To add on to that, it is important to consider the replacement of equipment in the building. Further, bundling similar buildings together and considering the availability of data is very necessary to helping develop a robust business case. Lastly, municipalities will also need to review the availability of staff that will be involved in the project.

Getting the entire municipal portfolio to net zero is achievable by proper planning which includes consideration of total lifecycle cost. Proper organization and planning involve net zero carbon readiness and understanding the importance of building activation systems.

* *Net Zero Carbon readiness*
* Understanding building design and current operations and performance is first step in net zero carbon readiness
* Key drawings - mechanical, refrigeration, electrical (lighting), architectural, schematics previous energy audits, summary of recent measures completed
* Current operating conditions and occupancy schedules
* Building condition assessments
* Asset management plan/capital plan
* Data (can be monthly for 2 years or Interval, if available for 2 years or submetering or datalogging high energy using equipment and systems
* Target and savings potential
* *Importance of building activation systems (BAS)*
* *Trends* - Set up trend logs and archive them for a minimum of 2 of the most recent years. If equipment is not connected to the BAS, use temporary or permanent data loggers to collect operational and energy data
* *Sequence of operations/controls sequences -* Have these been documented*?* If not, use building automation system (BAS) trending, data logging, and facility staff interviews to document sequences (scheduling, temperature resets, setpoints)
* *Building automation system procurement* - Compatibility with existing controllers and systems, consider open source or servicing capability and outcome-based maintenance requirements

In conclusion, the road map to net zero carbon approach will require incorporating specifications and integration into long-term capital plans for each major piece of equipment or design element. Lifecycle cost analysis and subsequent alignment will trigger opportunities such as end-of-life for the equipment. Constant review of opportunities to shift operations to lower carbon and bundling of building types as seen through the pilot study of fire stations by City of Markham, present a great opportunity for scaling up the effort and building a more robust business case.