

ADVANCED ENERGY CENTRE
MaRS Cleantech | Ontario, Canada



Hydro Ottawa Energy Innovation Design Charette Results and Findings



Urban energy systems are undergoing a dramatic transformation. Cities must take action on carbon emissions, adapt to a new digital reality, and plan intelligently for the future. There is a need for new collaboration models in the sector, and utilities must start thinking outside of the box.

The Advanced Energy Centre, in partnership with Hydro Ottawa, convened a group of innovators and industry experts on May 20th for a design charrette focused on identifying and discussing innovative concepts for implementation into the energy system at Zibi, and to support the community's aspirations to become the world's most sustainable and eco-friendly community.

Located in the heart of our Nation's capital, Zibi is an ambitious mixed-use brownfield redevelopment project that represents an opportunity for Hydro Ottawa to deploy innovative technologies and tools that will result in heightened consumer engagement, decreased carbon emissions, cost-savings, and increased resource efficiency. Led by Windmill Development Group and Dream Unlimited Corporation, the Zibi community has been identified by Bioregional as Canada's first One Planet Community and only the tenth worldwide, representing the project's unrelenting commitment to sustainability.

In particular, the One Planet Action Plan focuses on achieving zero-carbon and zero-waste within the lifetime of the development, but also emphasizes the importance of sustainable transport, local food, social equity and a vibrant local economy. The project will be one of Canada's largest urban renewal master-planned projects, and will focus on the revitalization of the industrial lands on the Chaudière and Albert Islands, and the downtown Gatineau riverfront. The 40-acre site will include a mix of commercial and retail properties, condominium developments, a hotel, waterfront parks and open spaces, and a network of pedestrian and cycling paths.

DESIGNING THE HUMAN EXPERIENCE

Lifestyle choices and responsible energy consumption patterns are integral factors in achieving the objectives laid out in the One Planet Action Plan. As such, it is essential that we start with defining the human experience for the energy system, and examine how tools and technologies can augment or enable good behavioral choices.

In the morning session, facilitators prompted attendees to envision themselves in different roles, and to capture daily interactions with Zibi's local energy system. These roles were selected to ensure that the system would be designed with multiple user-groups in mind.

- Condo resident
- District utility energy manager
- Commercial tenant

Following this visioning exercise, attendees were prompted to draw linkages between activities and the resultant impact upon greenhouse-gas (GHG) emissions and energy consumption. This would set the stage for our afternoon session, which focused on enabling technologies and systems that could reduce or mitigate impact.

ENABLING TECHNOLOGIES AND TOOLS

In the afternoon, attendees came together to brainstorm solutions and tools that could enable the vision for Zibi's energy system - with a focus on three categories:

- Grid of the Future: Innovative tools that integrate with Hydro Ottawa's distribution grid and create a local energy system that aligns with Windmill's vision for a One Planet community;
- Home Automation: Systems that interface with the residential customer through connected suites and a holistic and stress-free approach to sustainable lifestyle for Zibi residents;
- Social Engagement: Initiatives and programs that encourage a culture of sustainability and conservation amongst residents and commercial tenants in the community;

Within these categories, groups projected timelines for cost-effective deployment of each system or two, to ensure that Hydro Ottawa and Windmill plan for technologies that may be several years away.

INTEGRATING TECHNOLOGY TO CREATE COMMUNITY SOLUTIONS



Technology alone will not solve a problem. However, by bringing together a portfolio of innovative tools into integrated solutions, we can create powerful outcomes. In the third session, facilitators prompted attendees to examine the linkages and alignment between different ideas – and create cohesive suites of technology that could achieve Windmill and Hydro Ottawa’s objectives for Zibi. Curated results are summarized below:

Digital Sustainability Concierge	Create mobile application that features data and insights on sustainability initiatives within the community, including resource consumption data for each suite or business, and allows for social benchmarking. Use the app to issue rewards and incentives (e.g. discount at local coffee shop), and push carbon intensity or pricing notifications to users, and allow them to remotely control smart devices or plugs in their home. Employ the One Planet framework to give consumers personalized targets and baseline information for each aspect (e.g. zero carbon, sustainable water use, equity and local economy), as well as tricks and tips for living sustainably.
Hackathons and Youth Engagement	Engage with students and youth entrepreneurs to develop new applications that leverage big data to enhance the sustainability of Zibi. Host hackathons with groups such as Invest Ottawa, MaRS Discovery District, HUB Ottawa, local universities, high schools, and colleges.
Energy Innovation District / Test Zone	Launch an Energy Innovation District within Zibi to showcase and test next-generation clean technologies from Canadian entrepreneurs. Encourage Zibi residents and prospective buyers to learn about the technologies through hands-on interaction and demonstrations, and emphasize how these systems can enable a transition to a low-carbon energy system.
Social Incentives and Benchmarking	Across the Zibi community, launch an incentives and reward platform that will encourage conservation and responsible resource consumption (electricity, natural gas, and water). Create friendly competitions between residents or commercial tenants with similar demographic profiles (e.g. competing only against other three-person families in a 1,500 sq. ft. condo) to win the title of ‘Zibi Sustainable Family of the Month’ with a profile in community newsletter.
Aggregated Community Demand Response	Using plug-level control and data, as well as smart appliances, aggregate load within the community to provide peak-shaving and ancillary services to the IESO. Notify customers that the program is ‘opt-out’ and that upon moving in, they will automatically be supporting the community’s sustainability targets. This system could be managed by the district utility energy manager, and would leverage standardized smart appliances and controllable loads within Zibi’s residential and commercial facilities (similar to Peaksaver in Ontario).
Next-Generation EV Charging Infrastructure	In order to encourage residents and visitors to avoid use of fossil-fuel powered vehicles, the community should be equipped with advanced EV infrastructure including the nomadic billing (recognizes your car and bills you directly), EV car-sharing with priority parking locations, and wireless charging for residents.

Combined Single Billing Experience	The district utility should create a combined billing experience for commercial and residential consumers in the community, including electricity, heat, natural gas, water, and potentially other services such as high-speed internet. As well, greenhouse gas emissions data should be consistently displayed on bills, to empower smart consumer decision-making (e.g. swap gas stove for electricity).
Integrating Public Art and Visualization	Zibi could incorporate visualizations of energy consumption patterns, social impacts, and environmental outcomes to give residents an indication of Zibi's sustainability in real-time, in an aesthetically pleasing way. Artistic data-driven visualizations may also fulfill City of Ottawa requirements for public art within new developments, create opportunities for celebrating cultural heritage, and could be combined with an artistic residency program.
Local Vendor Portal	The Zibi mobile application should include information on local vendors and businesses, to reduce the carbon impact of purchasing decisions by residents and empower a vibrant local economy - resulting in lower energy consumption and decreased GHG emissions overall.
Weekly One Planet Report Card	Weekly One Planet "Report Cards" will give residents an indication of their overall sustainability performance, based on factors listed in the Bioregional framework (e.g. zero carbon, zero waste, sustainable water use, buying local) and prompt conservation and resource efficiency. For example, a consumer might not react to gradually increasing consumption habits, but would realize that we'd need more than three planets to sustain ourselves - prompting that individual to make lifestyle changes.
Cooperative Energy Asset Ownership Models	Offering alternative financing and ownership models for renewable energy infrastructure will create a collective responsibility for the cost and benefits of those assets. This could be managed through on-bill financing or the creation of a local Zibi renewable energy co-operative, through another group, such as the Ottawa Renewable Energy Cooperative or Wintergreen Renewable Energy Cooperative.
Local Zibi CO2-Based Energy Market	The district utility could create and manage a localized Zibi energy market with different characteristics than provincial electricity markets, including a priority on minimizing carbon intensity or other targets, such as maximizing solar use. Hydro Ottawa could offer this opt-in billing alternative to encourage electricity consumption during low carbon periods, and could be based on IESO data and set up with customized different on/off peak pricing brackets.
Microgrid for Public Space Resiliency	The district utility could create a hyper-localized microgrid within Zibi to serve as a 'safe haven' for public use during extreme weather or emergencies, likely with support from the City of Ottawa. This resilient location could be within a community centre or another public space, and could be co-located with the Energy Innovation District to utilize energy storage and off-grid technology for uninterrupted backup power.
Carbon Market Participation for Zibi	In collaboration with Zibi condo corporation(s), the district utility could buy and sell carbon credits into Ontario and Quebec's cap and trade market. This would require a complex structure, but would serve as an alternative revenue stream for the community.
Alternative Clean Generation Resources	In some cases, local businesses or residents may wish to supply electricity back into the Zibi grid, and there should be a structure in place to empower local residents to self-generate using different technologies. For example, residents should be able to integrate home energy storage such as the Tesla Powerwall, fitness centers should be able to harvest electricity from stationary bicycles or ellipticals, and larger businesses should be able to self-generation using micro-CHP plants or rooftop solar PV.
Integrated Payment and Identification Systems	Residents should be able to pay for EV charging or other Zibi services as well as access private space using near-field communications (e.g. RFID/cell phone). There should also be biometric identification (e.g. retina, finger prints) to enable instant payments and community access.
Sharing Energy management Settings	Residents should be able to share effective energy management settings with their neighbours using the Zibi portal application, almost like a playlist. This would allow condo owners with similar characteristics (e.g. 3 bedroom with two children in elementary school) to adopt proven settings in their unit.
Waste Heat Recovery	The district utility should prioritize consumption of heat from nearby industrial facilities, as well as explore the viability of waste sewer heat recovery. When cost-effective, there should be installed capabilities to convert low-carbon electricity into heat for the district-heating loop.

WHERE DO WE GO FROM HERE?

The Advanced Energy Centre is now working closely with Hydro Ottawa and Windmill Developments to transform results from this open-ended brainstorm session into a strategic plan for the energy system within the Zibi community. In particular, there is an immediate need for enabling services and technologies that can be tested and deployed within the project.

It's important that we keep this conversation going. MaRS will soon be launching an online community for designers, visionaries, and developers to share ideas and updates regarding the project and receive feedback from the group. This will be open to all participants of the Design Charette, as well as other selected experts.

This digital platform will become a repository of background information on this project to provide context, and a forum for discussion about how Canadian entrepreneurs can support the transition towards sustainable development and carbon-neutral communities globally. There may also be an opportunity - within an Energy Innovation District - to test and validate new technologies within Zibi, as well as showcase tools and systems from Canadian entrepreneurs.



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We'd like to express our appreciation for the time and hard work of our design charette attendees on May 20th, and for the strong support from Hydro Ottawa and Windmill Developments throughout this exciting process.

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	Hydro Ottawa Holding Inc. (Hydro Ottawa) is wholly-owned by the City of Ottawa and governed by an independent Board of Directors appointed by its shareholder. The company's core businesses are electricity distribution, renewable energy generation and energy conservation and management services. Hydro Ottawa owns and operates two subsidiary companies: Hydro Ottawa Limited is a regulated electricity distribution company operating in the City of Ottawa and the Village of Casselman. The company is the third-largest municipally-owned electrical utility in Ontario, serving over 319,500 residential and commercial customers. Energy Ottawa Inc. is a provider of commercial energy management services, and is the largest municipally-owned producer of green power in Ontario. Energy Ottawa owns and operates six run-of-the-river hydroelectric generators at Chaudière Falls, holds interests in two landfill gas-to-energy joint ventures at the Trail Road landfill site and the Laflèche landfill site in Moose Creek, Ontario, and has a total generation capacity of more than 48 megawatts annually, which is enough to power 40,000 homes.
	Windmill is a visionary company dedicated to transforming conventional development practices by ensuring that exemplary ecological, social and financial returns are achieved in all their projects. Every Windmill development is conceived, designed and constructed to protect and enhance the local community and our ecosystem. Windmill is the only developer in North America to have achieved LEED Platinum on all its mixed-use projects. Completed projects include The Currents, a performing arts centre and modern condominium tower in Ottawa's Wellington West neighbourhood, and Dockside Green, a model sustainable community in Victoria that was named one of 16 Clinton Climate Initiative Climate Positive developments.
	Dream (TSX:DRM) is one of Canada's leading real estate companies with approximately \$14.7 billion of assets under management in North America and Europe. The scope of the business includes residential land development, housing and condominium development, asset management for three TSX-listed real estate investment trusts and one TSX-listed diversified, hard asset alternatives trust, investments in and management of Canadian renewable energy infrastructure and commercial property ownership. Dream's development projects include Toronto's Distillery Historic District as well as the 2015 Pan Parapan Athletes' Village. Dream has an established track record for being innovative and for its ability to source, structure and execute on compelling investment opportunities. For more information, please visit www.dream.ca.