GETTING TO ZERO: A COMPREHENSIVE APPROACH

Occupant Engagement

Another key element of the Net Zero strategy was to reduce energy consumption by engaging occupants to use less energy, since a building's energy consumption in kilowatt-hours is determined in part by the design of the building, and in part by the occupant (see diagram). "We covered everything on this project, from design to influencing occupants' behaviour. How we took care of the 'hours' part of the equation is a great part of the story," says Bicol, referring to the element of the energy consumption equation that is determined by the occupant's consumption pattern.

In the SEFC Net Zero building, occupants will be informed of the goals of the building, and encouraged to change their behaviour to reduce their consumption and help the project maintain its Net Zero balance. A large part of this strategy will be achieved through the installation of energy meters in every suite (see 'Resource Management' in Chapter 5). By looking at the meters, occupants have real-time feedback about how much energy they are using.

"We considered how the occupants and operations and maintenance people would use the building. This is not common practice. What you see most often is that people will design a building and then just leave it. In the case of this project, we put systems in place to make sure it operated properly. There should be an educational component for the people that live in such a high-performing building," says Bicol. In the SEFC Net Zero building, the City of Vancouver will provide a users' manual for occupants and operations people, detailing how user activity affects energy consumption.

Measuring Energy Performance

kWh/m²/year

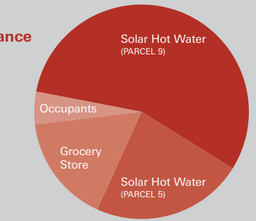
The most accurate way of determining a building's level of energy consumption is kWh/m²/year – that is, annual energy use per area. The kWh/m²/yr measurement is a common unit used to assess and compare the energy performance of buildings.

kW = kilowatt, the amount of energy consumed. This is determined by the design team. Efficient design will lower total kilowatts consumed.

h = hours. This is determined by the user. The hours number is determined by the energy use pattern of the occupant. For example, if the occupant leaves the TV on 24 hours a day, the number will go up.

m² = the area, which provides an indication of the energy intensity of the building design. The lower the usage of energy *per area*, the more energy efficient the building. The importance of this standardized metric for energy efficiency is the ability to compare different buildings and different designs to each other, and determine which provides the best efficiency per unit of space.

Net Zero Energy Balance



A BALANCING ACT

First, Reduce Demand

The approach to achieving the Net Zero goal includes three overarching elements: energy-efficient design, occupant engagement and energy generation. Using data from BC Housing and BC Hydro, the design team determined the annual energy consumption of a conventional building in order to establish a baseline annual consumption. The estimate reflected average energy use in similar type buildings – affordable seniors' housing of a similar size and proportion.

Energy loads were broken down into uses, so that the team would be able to address each end-use individually, as well as the building's overall performance. For example, energy loads for appliances such as washer-dryers were managed by specifying low energy models. On the whole-building level, performance was addressed by looking at the building's systems, such as the design of its envelope and mechanical systems.

Second, Generate Energy Onsite

To balance the Net Zero equation, the team looked for opportunities to source energy onsite. "The best move is to first look for opportunities to recycle energy," says Bicol. "You need to think outside of the box: look for synergies, turn waste into a resource."

The ground floor of Parcel 9, the site of Net Zero building, is occupied by a large grocery store. This became a valuable energy resource for the Net Zero building. "One of the greatest opportunities we took advantage of was using the discarded heat from the grocery store," says Stu Lyon of gBL Architects. Using a heat recovery system, the project team re-purposed waste heat from the grocery store's refrigeration system, using it to preheat the residential hot potable water.

The team then explored renewable energy opportunities. A solar photovoltaic (PV) system was considered, but proved to be unfeasible. "One lesson we learned is that in a small urban site, we are limited in the amount of area on site that we have for typical renewable energy systems – it's difficult to achieve enough area of those products on your own site to meet your energy needs," says Lyon. "We talked about cladding the building in PV, things like that. Unfortunately, although we had a south-facing building, the building has limited access to sun, with over-shadowing from other buildings. And forget wind turbines – you'd need a field of those."

After much investigation, the team concluded that solar thermal was the most appropriate technology for this project. Solar thermal systems use the sun's energy to heat water. A 480-square-foot solar thermal system, made up of 72 panels, each with 16 vacuum tubes, was installed in two parts – on the roof of the building and on the roof of an adjacent affordable housing building on Parcel 5. Combined with the reduction strategy and heat recovery technology, the solar thermal system provides the balance of the annual energy equation.

The Net Zero rooftop solar hot water array, view from street level.

CHALLENGE For landlords or property managers to provide education to building occupants about conservation options and responsible resource management in all buildings.