HEAT DISTRIBUTION AT A GLANCE

Efficiency and Adaptability

All buildings at the Olympic Village are connected to the NEU by a system of underground piping that distributes the thermal energy. There are three main components to the NEU: the NEU Energy Centre, distribution pipe system and energy transfer stations. The following is an overview of the energy transfer process:

1. The sewage heat recovery process is co-located with a sewage pump station at the False Creek Community Energy Centre, under the south end of the Cambie Street Bridge. On cold days when the heat demand is the highest, the system will be augmented by heat produced by three high-efficiency natural gas boilers. Using natural gas for backup and peak demands ensures reliability and competitive costs.
2. Distribution pipes circulate hot water from the energy centre to buildings and return slightly cooler water back to the energy centre. The pipes are well insulated to minimize energy loss during the distribution process.
3. Energy Transfer Stations located within each SEFC building produce space heat and domestic hot water to be distributed to occupants by the customer building's mechanical system. Metering will be incorporated in the Energy Transfer Stations for energy measurement and billing purposes.

This distribution diagram shows the central piping network that connects each building to the NEU and locates the three solar array systems on site.

Future-proofing

The NEU is designed to service all 32 hectares of SEFC: an estimated 16,000 people, plus commercial and institutional facilities. The NEU was built in such a way that it can be expanded to meet growing demand. At the moment, its primary energy source is sewer heat recovery. The system will also accept heat energy from a variety of waste heat and renewable energy sources, and was designed on the basis that new energy supply would be added as the system expands in the future. This flexibility enables the system to keep pace with technology advancements, future-proofing customer buildings and ensuring long-term energy security and affordability. "This project could become a real benchmark system in North America," says Tarnai.

INCORPORATING RENEWABLE TECHNOLOGIES

Integrated Renewable Energy: Thermal Net Metering

Three of the buildings at the Olympic Village feature roof-mounted solar thermal arrays. This technology captures the energy from the sun for domestic hot water heating. During peak sunlight periods, the solar systems will generate a surplus of heat energy – in excess of the building's demand for hot water. Rather than waste this free, renewable energy, excess heat from the solar arrays is sold to the NEU through energy transfer stations. The energy is then redistributed through the NEU pipes for use in other buildings. The energy transfer is regulated through a 'thermal net metering' provision in the City's Energy Utility System Bylaw, whereby the NEU purchases excess energy from the individual customer. This two-way energy transfer system design enables any micro-producer of thermal energy that is connected to the system to sell their excess energy to the utility.

Long-Term Outlook

District energy systems are not new. Vancouver has a number of legacy steam heat systems that serve the downtown core, and three of the city's large hospital sites. The City of Vancouver is exploring future opportunities to introduce the district energy model, with staff mapping potential future sites and identifying sources of waste heat as part of a city-wide district energy study. Areas that are being developed to support a dense population are prime candidates for an infrastructure and utility program similar to the NEU. In addition, the City is exploring the opportunity of switching the local legacy steam heat systems from fossil fuels to renewable energy sources.

Photos of the solar array structure being installed on the roof of the Net Zero building on parcel 9.

PROFILE

Kieran McConnell

PEng, LEED AP
NEU Systems Engineer, City of Vancouver

As Systems Engineer for the NEU, one of Kieran McConnell's responsibilities during the design of the utility and the Olympic Village was to integrate the NEU system with the buildings at SEFC. "You don't design buildings independently [of their energy systems]," says McConnell, who spent a good deal of time liaising with the engineers and architects of the Olympic Village buildings.

McConnell provided technical oversight for the entire project. There were a number of challenges in designing the system, largely because "low temperature district energy is new territory for Vancouver's engineering community." Where there were no precedents to some of the engineering challenges that arose, McConnell worked with the team to arrive at alternate solutions.

McConnell says that when the community moves into the Olympic Village and the NEU is operational, he is "looking forward to seeing actual usage data – how much (energy) is being used and at what time – and how our system is able to meet the demand."