Metro Vancouver's vibrant district energy market

Across the greater Vancouver, B.C., area, neighborhood energy systems are growing in size and number and increasing their use of renewable energy technologies.

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Photo IStock.

Editor's note: *IDEA's 2018 Annual Conference and Trade Show offers attendees the opportunity to tour a few key district energy systems in the Metro Vancouver, B.C., region.* District Energy *previews these systems with a look at some of their most recent developments.*

The mountain-backed seaport of Vancouver, B.C., on Canada's Pacific coast is recognized as one of the most livable, environmentally conscious cities in the world. The birthplace of Greenpeace nearly 50 years ago, Vancouver has long been focused on mitigating the effects of climate change. It has the lowest per capita carbon emissions of any major city in North America, and its sights are set on becoming the greenest city on the globe. The city of Vancouver has enacted a number of policies and initiatives in support of that goal.

Among them is the Renewable City Strategy announced in 2015, with its two overarching objectives to be reached before 2050: to reduce greenhouse gas emissions by at least 80 percent below 2007 levels and derive 100 percent of the energy used citywide from renewable sources. The development and expansion of low-carbon district energy networks, or neighborhood energy systems, is a key strategy for meeting these targets.

District energy providers across Metro Vancouver have already been taking the lead in establishing new low-carbon systems and upgrading existing ones. The area is home to a vibrant district energy market (fig. 1), reflecting a diverse array of settings and technologies. A closer look at a sampling of these systems – in Vancouver, Richmond and Burnaby – illustrates just how active and forward-thinking they are as they contribute to preserving Metro Vancouver as one of Canada's greenest and most beautiful regions.

CREATIVE ENERGY, DOWNTOWN VANCOUVER

In downtown Vancouver, the district heating system is marking a major milestone in 2018: 50 years in service. Established by a group of engineers in 1968 as Central Heat Distribution Ltd., this privately held steam system has been growing along with the developing city and helping reduce its greenhouse gas emissions. In 2014, Central Heat was acquired by the Vancouver-based utility Creative Energy, which has been expanding its district energy platform to provide flexible, low-carbon neighborhood energy systems in Metro Vancouver and beyond. Building on this, early this year, Creative Energy collaborated with InstarAGF Asset Management in a 50/50 partnership that will further expand the downtown system's portfolio, with energy infrastructure that supports urban growth while enhancing sustainability and livability for Vancouver citizens.

Creative Energy's central plant at 720 Beatty St. currently supplies steam for space heating and domestic hot water to more than 210 customer buildings – among them, high-rise hotels, residences and downtown landmarks. Six boilers firing on natural gas provide 1.1 billion lb of steam annually, distributed via 9.0 miles of pipelines. For over 40 years, the system has maintained a 99.9 percent reliability track record. For the past 25 years, its reliability rate has been 100 percent.

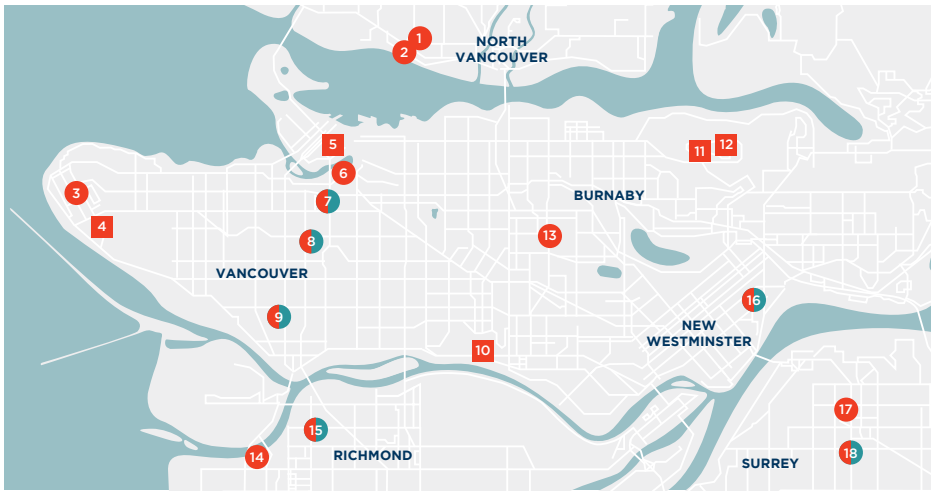
Since acquiring the system, Creative Energy has extended its service area to include four buildings in the adjacent Northeast False Creek neighborhood. Two steam-to-hot-water converter stations were installed near the Beatty Street plant to supply hot water service to those buildings, totaling around 1.5 million sq ft of space. Looking ahead, the company has future plans to further support communities and governments in achieving their low-carbon goals with a potential fuel switch to urban wood waste at the Beatty Street plant.

But a far larger project has been proposed for the downtown system. Pending approval from the British Columbia Utilities Commissions, Creative Energy will embark on a major renewal and redevelopment of the aging Beatty Street facility that will lower the downtown energy system's greenhouse gas emissions by 6,500 tonnes each year – equivalent to removing 1,350 cars from the road annually.

The project will effectively split apart the Beatty Street plant, moving half the boiler capacity across the street to a new plant at the base of BC Place stadium (home of B.C. Lions football and Vancouver Whitecaps soccer). This facility will be sited in now-empty storage space where fans that once inflated the stadium roof were stored, before BC Place got its retractable roof. Pipelines will be installed to transport steam back to the existing plant for distribution. The company is targeting late 2018 for the start of construction on this phase of the project.

When that first stage is commissioned, the other half of the boiler capacity at the existing plant will be retained for peaking

FIGURE 1. District energy networks in Metro Vancouver, B.C.*



EXISTING METRO VANCOUVER NETWORKS

1. Lions Gate Hospital System, North Vancouver
2. North Vancouver System (Lonsdale Energy Corp.)
3. University of British Columbia Academic System
4. University of British Columbia Neighbourhood System (Corix)
5. Downtown Vancouver System (Creative Energy)
6. Southeast False Creek (City of Vancouver)
7. Vancouver General Hospital System
8. BC Children's and Women's Hospital System
9. Shannon Estates (Shannon Wall Centre)
10. River District System (River District Energy)
11. Burnaby Mountain District Energy Utility (Corix)
12. Simon Fraser University Campus System
13. British Columbia Institute of Technology Burnaby Campus
14. Oval Village District Energy Utility (Lulu Island Energy Co.)
15. Alexandra District Energy Utility (Lulu Island Energy Co.)
16. Royal Columbian Hospital System
17. Surrey City Centre (City of Surrey)
18. Surrey Memorial Hospital System

SYSTEM OWNERSHIP
public
private

SYSTEM TYPE
heating
heating & cooling

10 km
10 mi

* This map is a compilation of systems currently in operation; others in planning stages or on-site are not included. Many networks serve as platforms for the adoption of renewable energy technologies like waste heat recovery, biomass, geoexchange and solar thermal.

Source: Reshape Strategies.

FIGURE 2. Rendering of the proposed new Creative Energy plant at the redeveloped Beatty Street site.

Source: B.I.G.

System snapshot: Creative Energy, Downtown Vancouver System

	Steam system
Startup year	1968 – began operation as Central Heat Distribution Ltd. 2014 – acquired by Creative Energy 2018 – partnered with InstarAGF Asset Management
Number of buildings served	More than 210
Total square footage served	45 million sq ft
Plant capacity	1.8 million lb/hr steam
Number of boilers	6 boilers
Fuel types	Natural gas and renewable natural gas, No.2 oil for backup
Distribution network length	9.0 miles
Piping type	Direct-buried steel
Piping diameter range	¾ inch to 20 inches
System pressure	Most 185 psig, parts 150 psig
System temperature	380 F

Source: Creative Energy.

Interior of Creative Energy's downtown Vancouver plant at 720 Beatty St.

and backup supply; but a new seismically sound structure will be constructed around and above it as part of Creative Energy's proposal for the larger redevelopment of its 720 Beatty St. location (fig. 2). While plans are still on the drawing board for this, the new building may house up to 18 stories of office and retail space on top of the basement-level plant. Project completion is expected in 2020.

Creative Energy is also partnering with building developers and other institutions requiring energy – municipalities, universities, schools or hospitals – to design systems for additional neighborhoods. The company has a total of CA$400 million ($311.5 million) in district energy projects now in the development pipeline across Canada. Outside of downtown, they include design of a geoexchange heating and cooling system with cooling heat recovery to serve Vancouver's Oakridge community; an ocean geoexchange heating and cooling system for Horseshoe Bay in West Vancouver; and a combined heating, cooling and power system for Mirvish Village in Toronto.

UNIVERSITY OF BRITISH COLUMBIA'S CAMPUS ENERGY SYSTEM

At the western tip of Point Grey peninsula, the University of British Columbia in Vancouver is a 30-minute drive from the city's downtown core. This stunning 100-year-old campus serves a student population exceeding 54,000. In 1925, UBC's Powerhouse began supplying steam to heat academic buildings, first fired by coal and later by natural gas. By 2010, the plant had a peak steam load of 250,000 lb/hr and served 133 campus buildings. But the aging system was a seismic risk, had a deferred maintenance liability of CA$190 million and needed significant capital renewal. It was also identified as the primary source of campus greenhouse gas emissions – producing more than 50,000 tonnes of carbon dioxide annually.

To address its carbon footprint, UBC in 2010 announced aggressive greenhouse gas reduction targets (over 2007 levels) as part of its Climate Action Plan: 33 percent by 2015, 67 percent by 2020 and 100 percent by 2050. Among other components, the plan called for installation of a cleaner, greener campus heating system: the new hot water Academic District Energy System (ADES).

Construction of the CA$88 million ADES, begun in 2011 and completed in 2015, involved replacing UBC's steam infrastructure with a more efficient medium-temperature hot water system. The project included installation of new insulated piping, 105 energy transfer stations and a 154-MMBtu/hr natural gas-fired Campus Energy Centre able to meet all campus heating needs. At project completion, the new system was providing space heating and domestic hot water for 115 buildings totaling more than 9.0 million sq ft of floor space. It was instrumental in enabling UBC to achieve its 2015 greenhouse gas emissions reduction target.

The new Campus Energy Centre, which earned LEED Gold certification, is designed with a host of future expansion expectations in mind. It includes four boiler bays, each large enough for a 75-MMBtu/hr unit, as well as space to add a 25 MW cogeneration plant (75 MMBtu/hr hot water capacity) in five to 10 years.

Before the hot water conversion, UBC had already invested in another major

System snapshot: University of British Columbia Academic District Energy System

	Hot water/CHP system
Startup year	1925 – Powerhouse started steam production 2012 – Bioenergy Research and Development Facility operational 2015 – Academic District Energy System including Campus Energy Centre completed
Number of buildings served	120
Total square footage served	9.9 million sq ft
Plant capacity	CEC: 154 MMBtu/hr hot water BRDF: 34,500 lb/hr steam, 37.5 MMBtu/hr heat recovery hot water, 2 MW electricity
Number of boilers	CEC: 3 hot water boilers BRDF: 2 steam boilers, 1 heat recovery steam generator, 1 engine hot water heat recovery heat exchanger system (All steam production converted to hot water via steam-to-hot-water heat exchangers)
Fuel types	CEC: Natural gas BRDF: Biomass, renewable natural gas, natural gas
Distribution network length	7.5+ trench miles
Piping type	Direct-buried insulated steel
Piping diameter range	4 to 16 inches
System pressure	100 psi average
System temperature	158-239 F supply design range

Source: University of British Columbia.

Courtesy University of British Columbia. Photo Robert Stefanowicz.

The new UBC Campus Energy Centre houses three 51-MMBtu/hr firetube hot water boilers.

campus energy project: construction of its Bioenergy Research and Demonstration Facility (BRDF). This CA$28 million biomass cogeneration plant, operational since 2012, was developed in partnership with Nexterra Energy Corp. and GE Power and Water. Another LEED Gold facility, it serves as a "living lab" for academic research and teaching.

The BRDF uses gasification technology to turn waste wood into synthetic gas, replacing natural gas used to produce 20,400 lb/hr of steam that is subsequently converted to hot water for campus space heating. The cogeneration process uses a combination of natural gas and biomethane to fuel a GE Jenbacher engine. The engine produces 2 MW of electricity fed into


Courtesy University of British Columbia. Photo Robert Stefanowicz.

Constructed with low-carbon cross-laminated timber, the Campus Energy Centre has earned LEED Gold certification.

the campus grid and also heat recovered from the engine exhaust gas to generate 4,700 lb/hr of steam, which is directed into the ADES via steam-to-hot-water heat exchangers. A further 3.4 MMBtu/hr of heat is recovered from the engine coolant and lube oil systems and supplies the ADES via a glycol-to-hot-water heat exchanger.

Since completion of the ADES project, UBC has added another 3,281 trench ft of piping and connected another five buildings totaling 900,000 sq ft; more connections are planned or under way. At the BRDF, a second biomass boiler (40.9 MMBtu/hr) will come on line by early 2020.

The university's deployment of district energy doesn't stop at the borders of its academic campus, however. Since 2011, the university has partnered with Corix Utilities and the University Neighbourhood Association on an initiative to develop a low-carbon Neighbourhood District Energy System (NDES) to heat several residential neighborhoods set for construction on other UBC-owned lands. Corix owns, builds and operates the NDES, which at present is up and running with two of the company's temporary energy centers providing hot water heating service to Wesbrook Place (more on this in the Corix section below). Over the next 20 years, the NDES will expand to include the other yet-to-be-developed neighborhoods and a new permanent low-carbon energy center. The opportunity would then exist to possibly connect the NDES with the campus ADES and form one "megadistrict." As plans for the NDES shape up, and with the expansion of the ADES to meet academic campus growth, it's clear that district energy is thriving at the University of British Columbia.

SOUTHEAST FALSE CREEK NEIGHBOURHOOD ENERGY UTILITY

It's been nine years since the city of Vancouver built its innovative, low-carbon sewage heat recovery system to warm the athletes' living quarters at the 2010 Olympic Winter Games. The False Creek Energy Centre and the Olympic Village it served were phase one of the city's plan to redevelop a waterfront brownfield site into the sustainably designed, mixed-use community of Southeast False Creek.

Following the Olympics, the residences there were opened up to the public. Since then, the Southeast False Creek development has been growing from its original 1.5 million sq ft of building space to a projected 6 million sq ft by 2020 when it is also expected to include more than 5,000 residential units and house up to 16,000 people. The Southeast False Creek Neighbourhood Energy Utility (NEU) has been keeping pace, supplying space heating and domestic hot water to community buildings and beyond – with newly approved plans for a major service area expansion.

The Southeast False Creek NEU was designed to supply approximately 70 percent of the community's heating requirements using untreated municipal sewage as its primary heat source – making it the first raw sewage heat recovery plant in North America (and one of only three such projects in the world at the time). At NEU's False Creek Energy Centre, thermal energy is captured from the untreated sewage and wastewater at a municipal pumping station and transferred by heat pumps to the district hot water distribution network. A two-pipe closed-loop system supplies the hot water to customer buildings. Natural gas boilers, fueled with both fossil and renewable natural gas (biomethane), are used for backup and to meet peak heating loads on the coldest days of the year. The system also incorporates a modest amount of thermal energy from solar collectors atop buildings in the former Olympic Village. The energy center building itself, located under the Cambie Street Bridge, is LEED Gold-certified and designed as a showcase for sustainable technologies.

System snapshot: Southeast False Creek Neighbourhood Energy Utility

	Hot water system
Startup year	2009
Number of buildings served	32
Total square footage served	5.2 million sq ft
Plant capacity	92.13 MMBtu/hr hot water
Number of boilers	5 boilers, 2 heat pumps
Fuel types/energy source	Sewage waste heat recovery, renewable natural gas, natural gas
Distribution network length	2.9 trench miles
Piping type	Direct-buried insulated steel (with small amount of PEX)
Piping diameter range	3.5 to 12 inches
System pressure	150 psig maximum
System temperature	149 F/122 F supply/return (summer), 203 F/131 F supply/return (winter)

Source: City of Vancouver, B.C.

At the False Creek Energy Centre, five exhaust stacks are arrayed like fingers pointing to the sky – with fingernail-like LED fixtures that reflect plant heat output by changing color.

A fundamental goal when the city envisioned NEU was to minimize greenhouse gas emissions in the Olympic Village and Southeast False Creek neighborhood, relative to conventional heating methods. In 2016, with its current renewable energy target of 70 percent,

Inside the False Creek Energy Centre.

the Southeast False Creek system saved 3,000 tonnes of carbon dioxide emissions, equivalent to taking 796 cars off the road.

Today NEU serves 32 buildings totaling 5.2 million sq ft, with a hot water heating capacity of 92.13 MMBtu/hr. This reflects a customer square footage increase of more than 300 percent since the system began commercial operation in January 2010. Growth has come from both the addition of new customer buildings in Southeast False Creek and a network extension to the east, completed last year, to serve Emily Carr University and two other buildings on Great Northern Way campus lands outside the system's original service area. An additional 17 MMBtu/hr of new sewage heat capacity is planned to accommodate this expansion.

This past Feb. 21, the Vancouver city council unanimously gave the green light to a proposal for NEU to further expand its service area to include parts of the Mount Pleasant, Northeast False Creek and False Creek Flats neighborhoods. These new expansion areas will require a long-term capital investment in the range of CA$45-$93 million, with flexibility for private-sector investment in new low-carbon energy plants. The plan aligns with Vancouver's Neighbourhood Energy Strategy adopted in 2012 calling for new low-carbon neighborhood energy systems in high-growth areas and requiring new developments in those areas to utilize these systems. It also supports the city's targets of achieving 100 percent renewable energy use by 2050 citywide and by 2030 for new buildings.

When buildout of this expansion is complete by the mid-2030s, the Southeast False Creek NEU will serve approximately 22 million sq ft of space. To accommodate this huge increase, it plans to add another ~68 MMBtu/hr in new low-carbon energy supply capacity, with specific technologies to be determined at a later date in alignment with customer load growth. These could include a variety of potential renewable energy sources, from additional investments in sewage heat capacity to waste heat recovered from the cooling of customer buildings.

LULU ISLAND ENERGY CO.'S RICHMOND SYSTEMS

The island city of Richmond is located where the Fraser River meets the Pacific Ocean, in an estuary rich with aquatic, bird and wildlife habitats. Protecting them is one of the city's environmental priorities. Another is lowering the city's carbon footprint, which Richmond City Council began addressing more than a decade ago, adopting provincial targets to reduce greenhouse gas emissions (over 2007 levels) by 33 percent by 2020 and 80 percent by 2050. The city's wholly owned Lulu Island Energy Co. (LIEC) is playing a major role in helping achieve these goals. It was established in 2013 to own and operate the city's low-carbon district energy systems. These include the Alexandra District Energy Utility (ADEU) in West Cambie as well as the Oval Village District Energy Utility (OVDEU) that followed. The company is also proceeding with plans to develop thermal energy services in other neighborhoods as well.

The award-winning Alexandra system, which began operation in 2012, came about after a developer approached the city in 2010 wanting to lease park space to build a geoexchange field for supplying thermal energy to his two residential buildings. City engineers had already studied and recognized district energy's potential to lower carbon emissions. So instead, the city signed an agreement with the developer to design and build a system that would serve his buildings and a few more under development in the area. The city offered a bonus for developers to connect those active developments and enacted a bylaw requiring all new buildings in the neighborhood to connect as well.

The ADEU has been expanding ever since, in phases to accommodate the growth of West Cambie. Operated for LIEC by Corix Utilities, it now serves nine customer buildings totaling nearly 1.7 million sq ft of floor space, providing 19.8 MMBtu/hr of heating and 2,160 tons of cooling capacity using ground source heat pump technology. The system includes a network of 726 vertical closed-loop boreholes from which pumps extract and transfer thermal energy to the ADEU Energy Centre near the geoexchange fields. From there, it is transported to heat pumps in connected buildings that, depending on the season, either boost temperatures for use in space heating or reject heat to the system for cooling.

Among recent developments, the ADEU has installed an innovative satellite "miniplant" at the Central at Garden City shopping mall. It is outfitted with air-source heat pumps run on low-carbon hydroelectricity that provide heating and cooling for the mall's 284,000 sq ft of retail space – including the first-ever Walmart connected to district energy. Sited on the roof of the

Air-source heat pumps power ADEU's miniplant – the first district energy project in Canada to use this technology to supply heating and cooling to large-format retail buildings.

To date, the Alexandra District Energy Utility in Richmond has won 11 awards from industry and municipal groups for innovation, sustainability and engineering excellence.

System snapshot: Lulu Island Energy Co.

	Alexandra District Energy Utility	Oval Village District Energy Utility
System type	Geoexchange heating and cooling system	Hot water heating system
Startup year	2012	2014
Number of buildings served	9	8
Total square footage served	1.68 million sq ft	1.9 million sq ft
Plant capacity	ADEU Energy Centre: > 19.8 MMBtu/hr heating (4.4 MMBtu/hr geoexchange field, 15.4 MMBtu/hr natural gas boiler for peaking/backup) > 2,160 tons cooling (700 tons geoexchange field, 1,460 tons cooling towers for peaking/backup) Central at Garden City miniplant: > 10 MMBtu/hr heating, 512 tons cooling	Temporary energy centers (2): 37.5 MMBtu/hr hot water
Number of boilers/chillers	ADEU Energy Centre: 3 boilers, 2 fluid coolers	2 boilers
Fuel types/energy source	726 boreholes in geoexchange fields, natural gas (boilers), electricity (fluid coolers)	Natural gas
Distribution network length	7,600 trench ft	5,000 trench ft
Piping type	High-density polyethylene	Insulated steel
Piping diameter range	6 to 22 inches	3 to 10 inches
System pressure	50 psi (average supply pressure)	60-70 psi (average supply pressure)
System temperature	30.2 F minimum supply at peak heating, 90.0 F maximum cooling supply at peak cooling	149 F-203 F

Source: Lulu Island Energy Co.

mall's north parkade, the miniplant is interconnected with the main ADEU system to allow for energy sharing.

Near-term plans involve further extension of the distribution network in West Cambie, connection of three more residential buildings and the design of additional geoexchange fields. Within 10-15 years, the ADEU system is expected to serve 4.5 million sq ft with up to 46 MMBtu/hr of heating and 4,600 tons of cooling capacity.

In 2017, ADEU operations were transferred from the city of Richmond to Lulu Island Energy Co. The system joined the Oval Village District Energy Utility, already under LIEC management and the first project developed under the company's oversight. The city has a concession agreement with Corix Utilities to design, build, finance and operate the OVDEU system. Currently two Corix temporary energy centers deliver up to 37.5 MMBtu/hr of hot water heating to mixed-use buildings near the Richmond Olympic Oval – site of 2010 Winter Olympics speed skating events. As construction in the Oval Village neighborhood progresses, however, and density justifies the investment, a permanent energy center will be built that utilizes sewage heat recovery from the Gilbert Trunk sanitary force main. (Read about the LIEC-Corix partnership on page 7 and more on Corix's TECs below.)

Also under way: LIEC, in partnership with Corix, is developing a new district energy node in the City Centre North neighborhood; they recently received city council approval to expand thermal energy services throughout City Centre – Richmond's new downtown core – as well. With the opportunity to serve an estimated 50 million sq ft of building space at full buildout, this project could potentially become one of the largest district energy systems in North America.

CORIX UTILITIES' METRO VANCOUVER PROJECTS

Visit Corix Utilities' district energy systems in Richmond, at the University of British Columbia and in Burnaby, and you will see a half-dozen "plants in a box" in operation. Custom-designed, built, installed and operated by Corix, they are temporary energy centers (TECs) equipped with natural gas-fired boilers used to provide hot water thermal energy in the initial stages of neighborhood and district energy system development. Constructed off-site in shipping containers, the TECs are used to bridge the timing gap until enough customer load is built and connected to justify a large, permanent central plant. This phased approach allows for scalability and flexibility during system development and enables customers to realize immediate benefits and substantial cost savings. Once a permanent plant is in operation, the TECs can be repurposed to provide peaking and

System snapshot: UBC Neighbourhood District Energy System, Corix Utilities

Startup year	**Hot water system** 2015 – Temporary energy center system started up 2024 – Permanent plant to begin service 2036 – Full system buildout	
	Current (2018)	**At full buildout (2036)**
Number of buildings served	7	105
Total square footage served	1.0 million sq ft	13.2 million sq ft
Plant capacity	Temporary energy centers (2): 49 MMBtu/hr hot water	Permanent energy center: 34 MMBtu/hr renewable hot water (137 MMBtu/hr natural gas peaking/backup hot water)
Number of boilers	5 boilers	6 boilers, 4 heat recovery heat pumps
Fuel types/energy source	Natural gas	Waste heat recovery, natural gas
Distribution network length	1.6 trench miles	4.78 trench miles
Piping type	Direct-buried preinsulated steel	Direct-buried preinsulated steel
Piping diameter range	2.5 to 8 inches	2.5 to 16 inches
System pressure	160 psig max	160 psig max
System temperature	203 F peak	203 F peak

System snapshot: Burnaby Mountain District Energy Utiliy, Corix Utilities

Startup year	**Hot water system** 2011 – Temporary energy center system started up 2019 – Permanent plant to begin service 2021 – Full system buildout	
	Current (2018)	**At full buildout (2021)**
Number of buildings served	11 (UniverCity)	22 residential buildings (UniverCity) + entire Simon Fraser University campus
Total square footage served	847,974 sq ft	20.5 million sq ft (2.3 million UniverCity + 18.2 million SFU campus)
Plant capacity	Temporary energy centers (2): 27.8 MMBtu/hr hot water	Permanent energy center: 46 MMBtu/hr biomass hot water (34 MMBtu/hr natural gas peaking/backup hot water)
Number of boilers	5 boilers	4 boilers (1 biomass, 3 natural gas)
Fuel types/energy source	Natural gas	Waste wood, natural gas (only for UniverCity peaking/backup)
Distribution network length	1.3 trench miles	2.2 trench miles
Piping type	Direct-buried preinsulated steel	Direct-buried preinsulated steel
Piping diameter range	2.5 to 8 inches	2.5 to 10 inches
System pressure	232 psig max	232 psig max
System temperature	203 F peak	248 F peak

Source: Corix Utilities.

FIGURE 3. Rendering of the Burnaby Mountain District Energy Utility plant.

Source: Corix Utilities.

Corix's TEC East plant, part of UBC's Neighbourhood District Energy System.

backup energy. At Corix's installations in the Vancouver area, these smart TEC solutions mark the early phases of three of the company's new projects.

In Richmond, where Corix has partnered with the city's Lulu Island Energy Co. to develop and operate the Oval Village District Energy Utility, two temporary energy centers are in place. A 27.3-MMBtu/hr TEC is located at the main OVDEU plant overlooking the Fraser River, and a 10.2-MMBtu/hr unit is stationed at the Carrera satellite plant some blocks away. Together they supply hot water service to 1.9 million sq ft in eight buildings. The two nodes will be connected in the future. At full buildout of the Oval Village neighborhood by 2024, a permanent central plant (82 MMBtu/hr capacity) will supply the network, incorporating sewage heat recovery as its primary heat source.

Across the river in Vancouver, Corix is building the Neighbourhood District Energy System (NDES) in conjunction with the University of British Columbia, providing space heating and domestic hot water to new residential neighborhoods being developed on the UBC endowment lands. The NDES supports UBC's goals to lower carbon emissions and create a sustainable live-work-learn community. Corix owns as well as designs, builds, finances and operates this district system. In 2015, the company installed two TECs in Wesbrook Place, the first of the new university neighborhoods under construction, which will eventually be home to 12,500 students, faculty and others associated with UBC. These two plants, TEC East (27 MMBtu/hr) and TEC West (22 MMBtu/hr), presently serve seven residential buildings.

Current forecasts indicate the next large expansion phase of the NDES project will be in 2024, including the construction of a permanent energy center with 34 MMBtu/hr of thermal energy capacity that will recover waste heat from cooling towers on campus lands. This new permanent plant will supply a total of 5.5 million sq ft of building space in Wesbrook Place, plus an additional 7.75 million sq ft in the Stadium, Acadia East and West neighborhoods and, potentially, Block F.

Over on Burnaby Mountain, east of Vancouver, Corix has two TECs now operating in tandem in the new sustainably designed UniverCity community adjacent to Simon Fraser University (SFU). As construction of the neighborhood began, Corix installed a 7.8-MMBtu/hr TEC in late 2011, followed by a 20-MMBtu/hr unit in 2016. Together they supply hot water heating and domestic hot water to 11 buildings, with a total of 22 to be connected by 2021.

These TECs at UniverCity represent just the first phase of a project that received regulatory approval last September: the new Burnaby Mountain District Energy Utility (BMDEU), a CA$33 million expansion to and rebranding of the existing utility. The BMDEU is designed, financed, built, owned and operated by Corix. Already under construction on land leased from Simon Fraser University, the BMDEU includes a biomass facility (fig. 3) with a total hot water heating capacity of 80.2 MMBtu/hr and an extension to the SFU campus. Using primarily clean urban wood waste as fuel, the new plant will provide 34 MMBtu/hr of biomass baseload to the SFU campus, helping the university decrease its carbon footprint by 85 percent. The campus will retain its current natural gas-fired boiler plant for peaking and backup. The remaining biomass capacity, 12 MMBtu/hr, will be sent to the UniverCity neighborhood and will be topped up with 34 MMBtu/hr of natural gas boiler capacity located in the biomass plant exclusively for UniverCity. The biomass plant is slated to begin service in late 2019.

Throughout the greater Vancouver area, communities and campuses like those in the city itself, Richmond and Burnaby are actively building and expanding low-carbon district energy systems – a number of them in phases as the neighborhoods they supply develop around them. They employ a noteworthy range of renewable energy sources, from biomethane and biomass to geoexchange and sewage heat recovery. In the process, these systems demonstrate the significant role district energy can play in helping cities, universities and other institutions reach their greenhouse gas emissions reduction targets and create more livable, sustainable places to live and work.

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U.S.-UNITS-TO-METRIC CONVERSIONS

1 MMBtu/hr hot water = 0.293 MWt
1 lb/hr steam = 0.000305 MWt
1 ton geothermal cooling = 0.003517 MWt
1 sq ft = 0.0929 sq m
1 mile = 1.609 km
1 inch = 25.4 mm
Fahrenheit to Celsius: (°F – 32) x 5/9 = °C