City Centre District Energy Utility (CCDEU) Summary and System Overview

Summary

The City Centre District Energy Utility (CCDEU) is a municipally owned, low-carbon thermal energy system serving the high-density downtown core of Richmond, British Columbia. Owned by Lulu Island Energy Company (LIEC), a City of Richmond corporation, CCDEU replaces traditional natural gas-based heating and cooling systems in new buildings with centralized, energy-efficient, and low-emission alternatives. Designed to align with the City's climate action and densification goals, the system reduces greenhouse gas (GHG) emissions while providing scalable and resilient service.

CCDEU currently serves 18 buildings totaling over 5.3 million ft² of residential and mixed-use space, equating to approximately 4,723 residential units. The system uses air-source heat pumps and high-efficiency backup natural gas boilers to provide heating, cooling, and domestic hot water. Energy is delivered through a closed-loop hydronic distribution network that supports redundancy and staged expansion. Modular energy centres are located throughout the service area, including Low-Carbon Energy Plants (LCEPs) designed for future connection to the central network.

By 2050, CCDEU is expected to expand to over 170 development sites covering approximately 48 million ft². The system is also preparing to integrate sewer heat recovery by 2028 and is pre-designed for future adoption of geo-exchange and river heat recovery technologies. Operated through a public-private partnership with Corix, the system benefits from private-sector expertise while ensuring public oversight, customer affordability, and long-term financial sustainability. The project has received $175 million in low-interest financing from the Canada Infrastructure Bank and $6.2 million in grant funding from CleanBC.

CCDEU demonstrates how coordinated utility planning and strong municipal policy can drive large-scale decarbonization and energy resilience. The system is already delivering measurable environmental and economic benefits to the community.

System Background and Technical Overview

The CCDEU was developed as part of the City of Richmond's long-term strategy to reduce GHG emissions and improve energy efficiency in its rapidly urbanizing city centre. Prior to the system's implementation, new buildings in the area typically relied on decentralized, building-level natural gas boilers and electric resistance heating—technologies associated with high emissions and limited flexibility.

With growing demand for space heating, cooling, and domestic hot water in dense developments, Richmond recognized the need for a centralized thermal energy solution. Since 2022, Lulu Island Energy Company has been actively expanding the CCDEU to align with new construction and support large-scale decarbonization through phased infrastructure development.

System Configuration: Production Units and Energy Centres

The CCDEU consists of multiple modular energy centres located throughout the service area. These include centralized district energy plants and Low-Carbon Energy Plants (LCEPs), which are smaller, standalone facilities within newly constructed buildings. LCEPs use air-source heat pumps as the primary heating and cooling source, supported by high-efficiency natural gas boilers during peak loads or cold weather.

Air-source heat pumps provide excellent seasonal efficiency and reduce reliance on fossil fuels. As of 2024, sewer heat recovery is scheduled to be incorporated into the system by 2028. Future phases will also explore integration with geo-exchange fields and river heat recovery. This multi-source approach allows CCDEU to remain adaptable and future-ready.

Each plant includes mechanical equipment such as heat pump compressors, VFD pumps, controls, and hydronic loops. The thermal output is transferred to connected buildings via energy transfer stations (ETS), which act as the interface between the DEU and the building's internal hydronic systems.

Distribution Network

Thermal energy is distributed through a closed-loop, twin-pipe hydronic network that circulates heated or chilled water to customer buildings. The network has been engineered for staged expansion, redundancy, and long-term performance. Redundant piping loops and strategic interconnections ensure service continuity during maintenance or peak periods. The modular approach allows new developments to connect as the area densifies.

The network is pre-zoned for expansion and has been installed in phases to align with development growth. Several interim energy centres have been built to serve developments in areas awaiting connection to the main network. These centres are designed for seamless future integration.

Buildings and Customers Served

As of 2024, CCDEU serves 18 buildings with over 5.3 million ft² of connected floor area. These include residential, mixed-use, and commercial buildings, amounting to approximately 4,723 residential units. Connection to the system is mandatory for new developments within the City Centre DEU service area, ensuring a growing and consistent customer base.

By 2050, the system is projected to serve over 170 development sites encompassing 48 million ft² of connected space. This aligns with the City's Official Community Plan, which targets high-density, transit-oriented growth in the downtown core.

System Age and Performance

The CCDEU framework, system, and project as it exists today was established in September 2022, following the formalization of the delivery agreement between Lulu Island Energy Company and Corix. While some district energy infrastructure from earlier initiatives remains under 10 years old and has been integrated into the CCDEU, the active service expansion, governance structure, and technical standards all stem from this 2022 launch. The average age of system components remains low, contributing to high reliability and efficiency.

In 2024, the centralized DEU achieved an overall efficiency of approximately 82%, with some individual LCEPs achieving seasonal efficiencies over 300% due to the performance of air-source heat pumps. The system's projected renewable and surplus heat fraction (Rdh) exceeds 70% at full buildout.

Financial Structure and Governance

CCDEU operates under a unique public-private partnership model. Lulu Island Energy Company retains ownership and governance responsibilities, while Corix provides technical services, construction management, and operations. This structure allows for risk-sharing, financial stability, and customer rate control.

Financing is achieved through a blend of municipal investment, private equity, and long-term debt. The project secured $175 million in ultra-low interest loans from the Canada Infrastructure Bank and $6.2 million in provincial grants. Developer contributions also fund on-site infrastructure. This structure ensures affordability while supporting rapid system expansion.

Community and Environmental Impact

CCDEU plays a key role in achieving Richmond's GHG reduction targets by displacing fossil fuel combustion at the building level. The centralized system also reduces local air pollutants such as NOx and particulate matter, improving air quality and public health.

By eliminating the need for rooftop or in-suite gas equipment, CCDEU reduces noise and emissions impacts within buildings. It also supports local economic development by creating

jobs in engineering, construction, and operations. Over 50 local jobs have been supported through construction to date.

Policy and Replicability

The CCDEU is backed by mandatory connection bylaws, integrated land use planning, and long-term utility regulation. It is embedded in Richmond's broader growth and climate strategy, offering a proven pathway for other municipalities seeking scalable, low-carbon energy solutions.

Its modular design, blended financing model, and governance structure offer a replicable framework for cities across Canada and beyond.

Project Highlights Since 2022 Expansion

Since the expansion phase began in 2022, CCDEU has successfully commissioned several interim energy centres, including the Keltic, One Park, and Richmond Centre Phase 1B Low-Carbon Energy Plants. These plants use high-performance air-source heat pumps and have demonstrated excellent seasonal performance. These facilities serve new developments outside the main distribution loop and are fully designed for future integration.

The City has also implemented updated technical requirements for DEU-ready buildings, streamlining the connection process and ensuring consistency in ETS layouts and mechanical room sizing. This provides greater consistency for developers and facilitates smoother project delivery.

The sewer heat recovery integration project—scheduled for commissioning in 2028—is currently in advanced design. It will be the largest low-carbon energy plant in the CCDEU system, supporting future decarbonization goals and significantly increasing the share of renewable thermal energy across the network.

The expansion has also been supported by extensive community engagement. Through public outreach at Richmond's Capital Projects Story Maps and Public Works Open House, CCDEU has increased visibility and awareness of clean energy investments. Educational signage and interpretive materials have been incorporated at plant sites, along with public art, to foster community pride and transparency.

As a whole, the expansion activities since 2022 demonstrate the flexibility and scalability of the CCDEU model. In addition to the 18 buildings currently served, over 20 more developments are now in the planning or construction phase and are expected to connect to the DEU in the coming years. These upcoming projects will significantly expand the system's reach in the city centre. The system continues to evolve in alignment with policy, development, and climate imperatives—positioning Richmond as a national leader in municipal district energy innovation.