Richmond recognized early the benefits of district energy as a key strategic initiative for advancing sustainable community energy systems which reduce long-term costs, energy use and greenhouse gas (GHG) emissions. In 2009, the City started by completing a number of studies to assess the potential for a district energy for space heating and cooling and domestic hot water using alternative energy sources. Eight years later, the City has:

- Implemented the Alexandra District Energy Utility (ADEU) system that uses ground source energy (geo-exchange system) to serve over 1.65 million square feet of building floor area;
- Incorporated a wholly-owned corporation – Lulu Island Energy Company (LIEC) – for managing district energy initiatives on the City's behalf;
- Implemented the Oval Village District Energy Utility (OVDEU) system that is designed, financed, built and operated through novel partnership between the LIEC and a private utility;
- Secured over 8,000 "district energy-ready" residential units through rezoning, ensuring the necessary demand for energy services needed to support a low-risk investment environment;
- Completed a thermal energy load map to assess opportunities and assessed renewable heat recovery opportunities from the Lulu Island WastewaterTreatment Plant;
- Initiated a process to select a partner to servce City Centre North, which will service over 10 million square feet of residential and commercial buildings at build out;
- Iniitated a community-wide sewer heat assessment for exploring district energy across the community, using heat from City forcemains;
- Developed an engaging website and brand for LIEC to inform customers and Richmond residents, including a kids corner page compelte with a mascot and informative videos.

District energy systems are phased to provide "just in time" connections of utility services to match the pace of development to avoid deploying capital unnecessarily. As demand for services grow in the service areas, capital expenditures will be offset by additional revenues generating a positive rate of return. All costs are fully recovered through user fees applied to serviced properties only. The latest results of the ADEU business model show 11 per cent internal rate of return over a 30 year period with payback period of 17 years.

District energy systems are adaptable to future technologies and sustainable energy sources such as ground source energy, ground water energy, river/ocean energy, solar or any new developed technologies. Conventional in-building energy systems such as electrical baseboard and natural gas make up air units are not.

District energy systems like Alexandra DEU increase energy use efficiency by matching the energy source with the use. They also increase community energy resiliency by reducing reliance on external energy sources. Hydronic heating and cooling is generally considered more comfortable than conventional in-building energy systems such as electrical baseboard and natural gas make up air units.

Individual buildings connected to district energy systems require smaller sized boilers, chillers, or cooling towers, or none at all. This results in reduced ongoing operating, maintenance and labour costs.

Table 1 below shows the overall energy efficiency for Alexandra District Energy system from 2013 to 2015 in terms of useful energy delivered to end use customers divided by fuel and energy input to production process. The high efficiency percentages indicate that the majority of the deliverable energy comes from the two geo-exchange fields that produce natural renewable energy from the ground.

	(Output) Deliverable Energy MWh	(Input) ADEU Energy Input MWh	Efficiency %
2013 Total	**2030.90**	**216.74**	**937.03%**
2014 Total	**2092.60**	**238.16**	**878.67%**
2015 Total	**2930.10**	**309.79**	**945.82%**

A district energy utility is a good candidate for municipal investment. The City has proven expertise in building and maintaining utility infrastructure, such as sewer and water. A district energy utility is simply another form of community utility structure. Energy utilities are characterized by high up-front capital costs, generally low operating costs, and long term stable revenue. Once built, a utility provides a long term income stream to pay back capital and on-going operating costs. With regular maintenance and mechanical replacements, the installed DEU infrastructure could be expected to outlast the buildings it services. The district energy systems in Richmond are generating revenue and have a positive rate of return, and therefore they are not a financial burden on taxpayers. In addition, by encorporating the Lulu Island Energy Company, the City has created a non-tax base revenue that can be invested in alternative investments.

Economic benefits to the community are multiple:

- District energy generates revenue and reduces municipal fiscal dependency on taxes
- District energy helps to avoid greenhouse gas carbon offset costs
- District energy acts as a network component for a growing district energy utility network, creating an important asset for the Richmond community
- District energy supplied by locally sourced renewable energy keeps energy dollars in the local economy

The use of renewable geothermal energy for space heating, cooling and domestic hot water heating avoids atmospheric changes caused by greenhouse gas emissions. ADEU enables building owners to conserve energy and improve operating efficiency, thus protecting the environment. By reducing the need to burn natural gas, ADEU also significantly reduces air pollutants. District energy systems are adaptable to future technologies and sustainable energy sources such as ground source heat, ground water heat, sewer heat and solar all serving to reduce the City's dependency on non-renewable energy.

District energy systems provide new employment opportunities during the construction and operation. It is estimated that the OVDEU and ADEU projects have generated approximately 500 jobs to date at different stages of the design and construction, with many going to the City's residents. Local artists are involved during the design to incorporate public art into the energy plant buildings' exteriors. Around 10 operations related jobs will turn into full time positions over the duration of the investments. Furthermore, about 25% of the contractors have headquarters in Richmond and district energy jobs provide a strong incentive for them to continue anchoring their businesses in our community.

Community leadership by Council and senior administration is key to the success of any innovation, such as City's district energy implementation program. It is important to have clear criteria for decision making (i.e. define acceptable financial expectations such as payback time and rate structure, as well as community and environmental benefits, etc.) so that the municipality can make sound decisions in a timely manner when opportunities to collaborate with stakeholders arise.

Richmond Council is the regulator of district energy systems in the community, making decisions on district energy development and customer rates. Council's main objective to support district energy initiatives is that utility costs to customers have to be comparable to conventional energy systems costs for the same level of service. City Council members directly report to the City's constituency and therefore they have greater accountability to Richmond citizens when decisions are made on district energy rates than, for example when BC Hydro or Fortis makes decisions on their energy rates. In 2007, City Council advanced sustainability as a corporate priority and adopted an Enhanced Corporate Sustainability Initiative. The initiative has resulted in the City adopted key performance targets including:

• 10% reduction in community energy use from 2007 levels by 2020
• 33% reduction in community greenhouse gas emission levels from 2007 by 2020 and 80% reduction by 2050.

Council also integrated district energy into their Council Term Goals. In 2009, Council directed staff to issue requests for expressions of interest to provide implementation and operational support of DEU in partnership with the City, developers, and others.

District energy concepts and opportunities are continuously explored and the City has been working closely with the development community in order to make this program succesful. The barrier the City has encountered was resistance by developers to move away from inexpensive electrical baseboard heating and implement a more expensive hydronic heating system. Electrical baseboard heating is inexpensive to install, but very energy inefficient, and it is not compatible with district energy distribution systems. To address additional in-building capital costs, the City provided incentives in the form of density bonuses to in-stream developments.

Simultaneously, City has completed in partnership with Metro Vancouver several assessments of effluent heat recovery from the Lulu Island sewerage area to provide thermal energy source for the City’s district energy systems.