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Case Studies in District Energy

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Outline

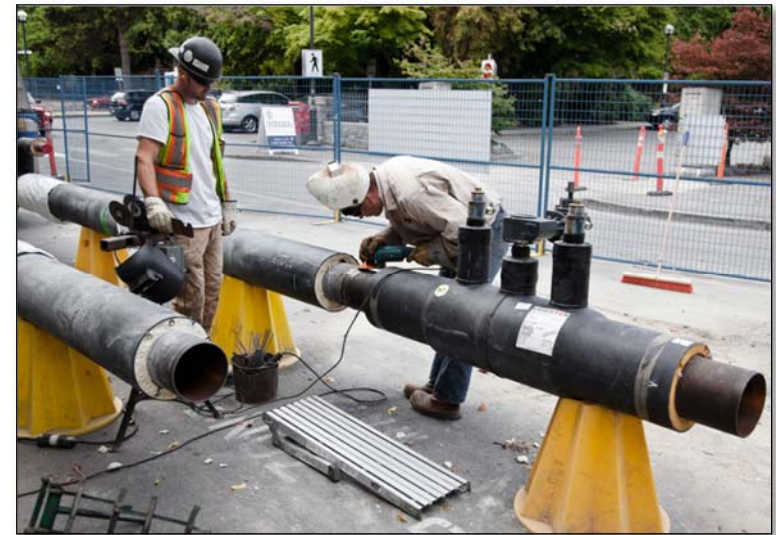
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What is district energy?

When does district energy make sense?

Case Studies

- City of Surrey
- University of British Columbia





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What is District Energy?

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District Energy Systems have:

- one or more heating and/or cooling plants
- distribution system
- energy transfer systems in the buildings





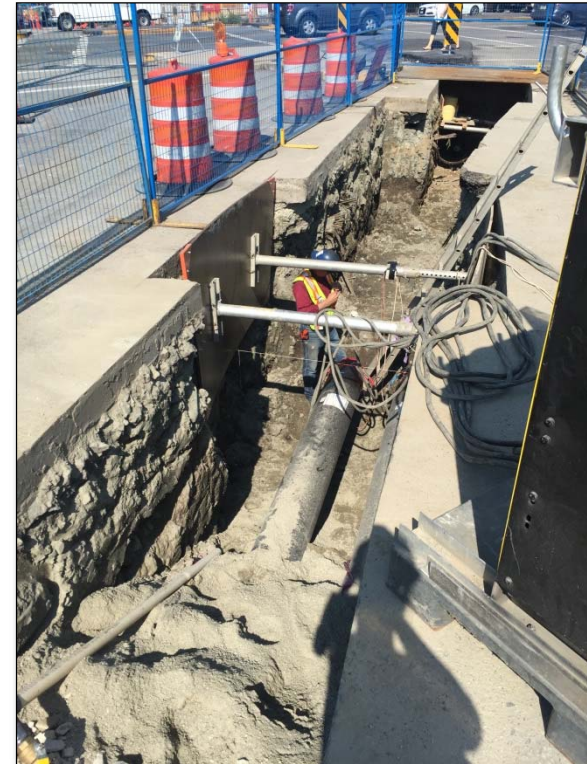
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Why District Energy?

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District Energy makes sense when there is:

- high density (to reduce the cost of the distribution system)
- new development (easier than conversions)
- renewable or waste energy source
- green/environmental/energy efficiency objectives



DISTRICT ENERGY DESIGN & CONSTRUCTION



Lonsdale Energy
Corporation



Creative Energy
Downtown Vancouver



University of
British Columbia



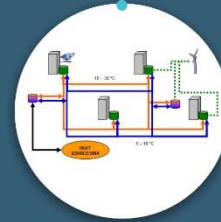
City of Richmond



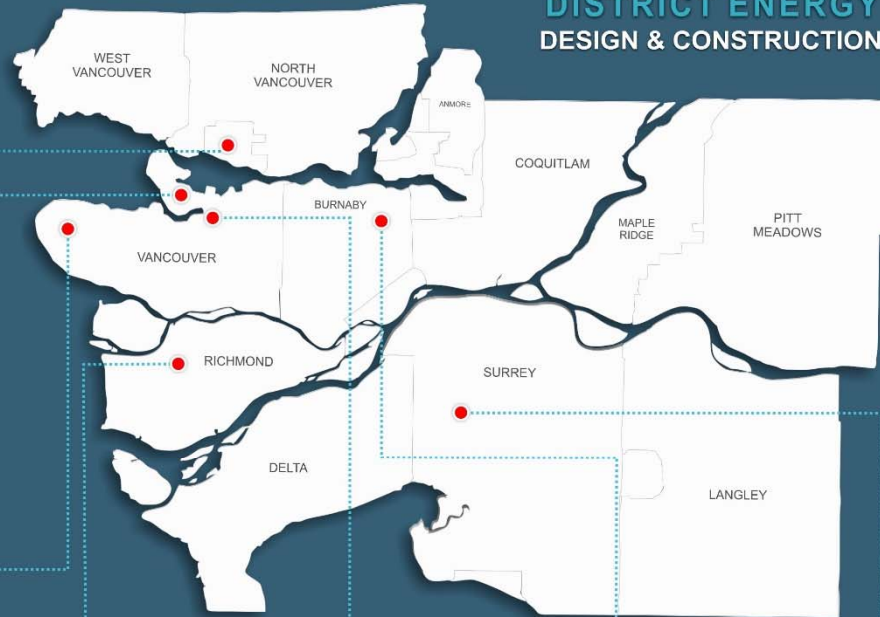
City of Vancouver



Simon Fraser
University



City of Surrey



DISTRICT ENERGY PLANNING



System	Owner	BCUC Regulation	Fuel	Heating	Cooling
UBC – Academic	UBC	No	Natural Gas, Renewable Natural Gas, Biomass	Hot Water (was Steam)	No
UBC – Neighbourhood	Corix	Yes	Natural Gas, Considering Waste Heat Recovery	Hot Water	No
Surrey	City of Surrey	No	Natural Gas, Considering Biomass and Sewer Heat	Hot Water	No
Vancouver - Downtown	Creative Energy	Yes	Natural Gas, Considering Biomass	Steam, Hot Water for Some Expansion	No
Vancouver - SE False Creek	City of Vancouver	No	Sewer Heat and Natural Gas	Hot Water	No
Vancouver - River District	Wesgroup Properties	Yes	Natural Gas, Considering Renewable Options	Hot Water	No
Lonsdale	Lonsdale Energy (City of North Vancouver)	No	Natural Gas, Connection to Extract Heat from Lions Gate Waste Water Treatment Plant Planned	Hot Water	No
SFU - Academic	SFU	No	Natural Gas and Biomass for Future	Hot Water	No
SFU - UniverCity	Corix	Yes	Natural Gas	Hot Water	No
Richmond	Lulu Island Energy (City of Richmond)	No	Geo-exchange, Natural Gas	Ambient Temperature	Yes



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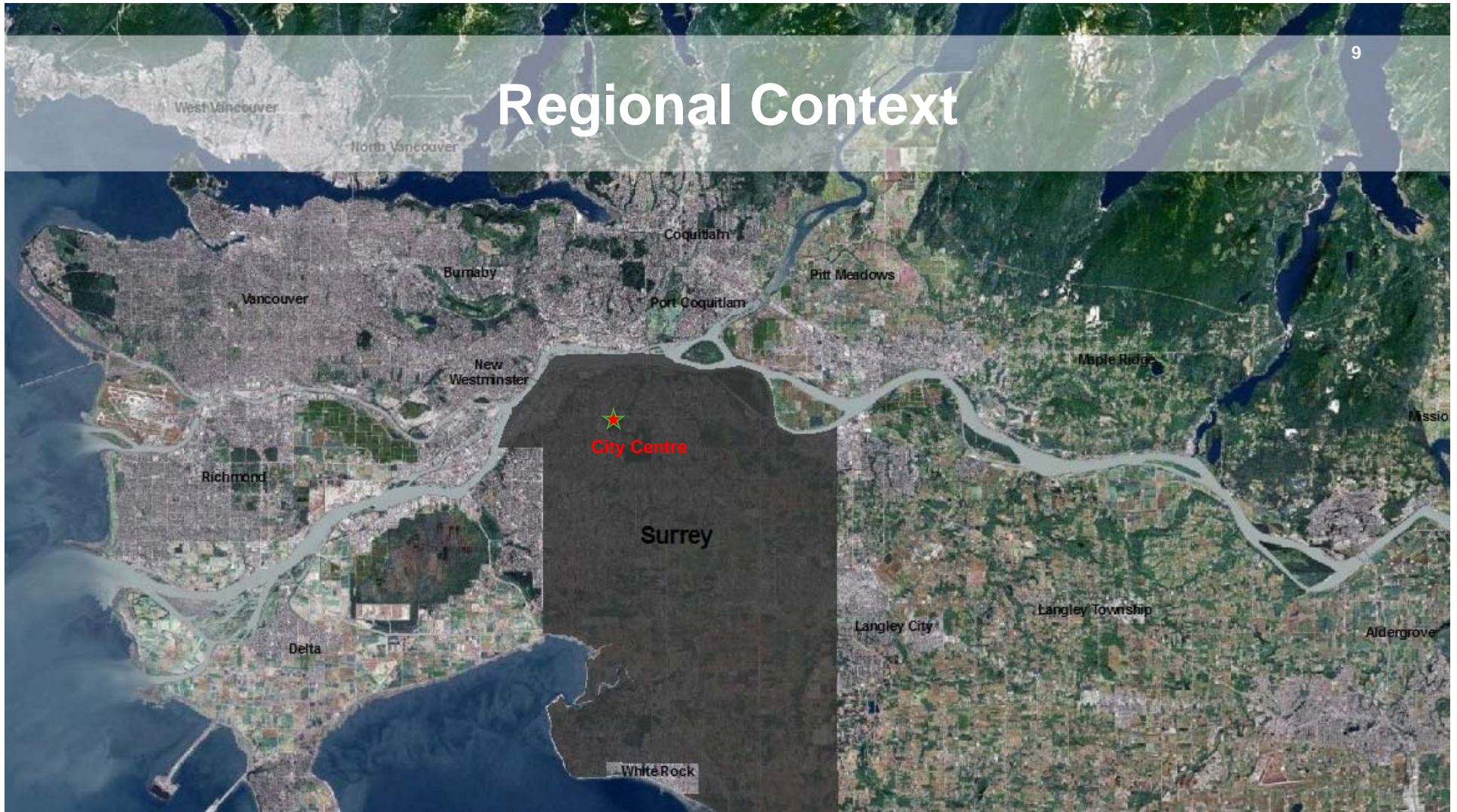
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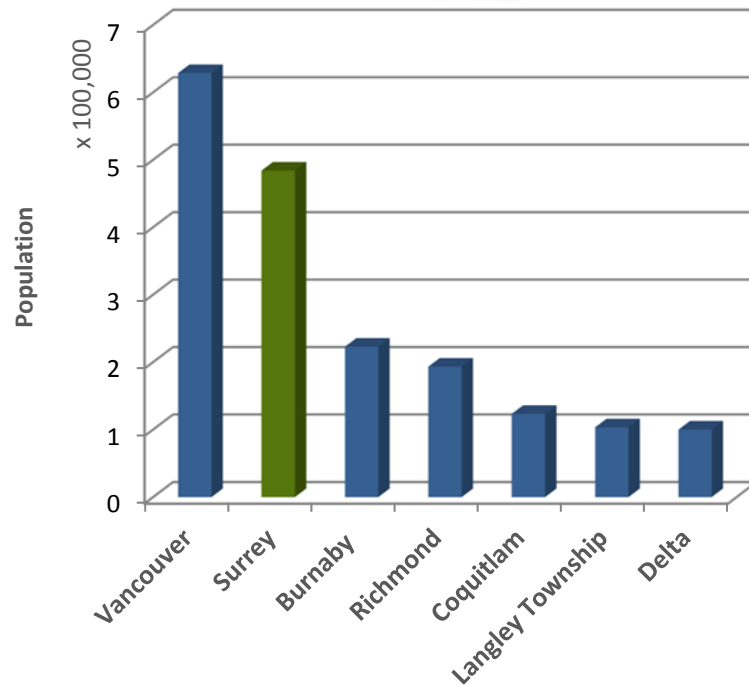
- Hot-water district energy in City Centre
- 100% Municipally-owned
- Operational unit of Engineering Dpt.



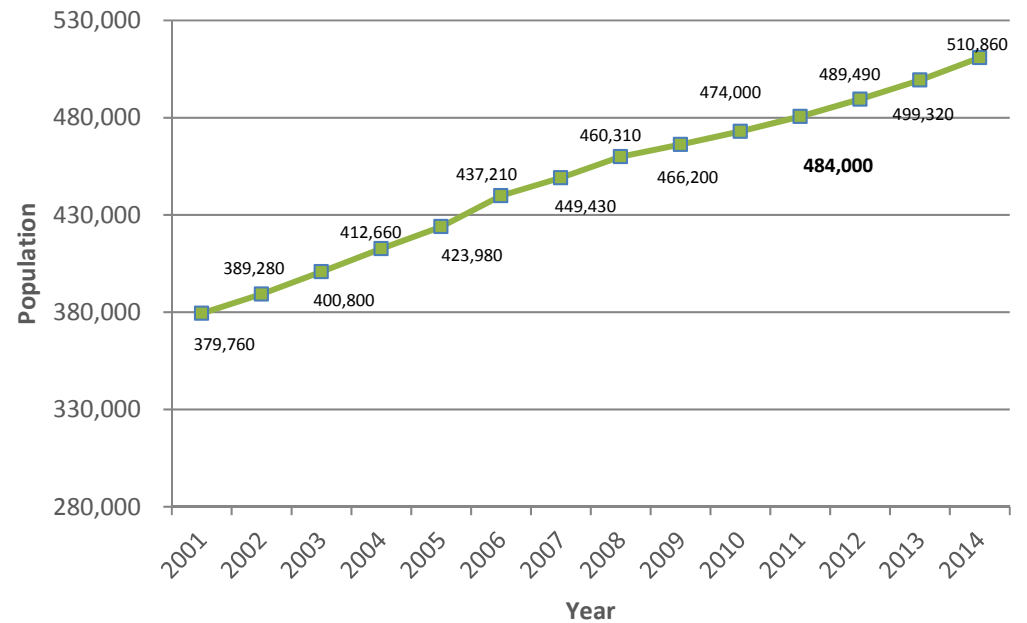
SURREY CITY
energy

Regional Context





Metro Vancouver Population



City of Surrey Population Growth

Surrey is the third fastest growing city in Canada.





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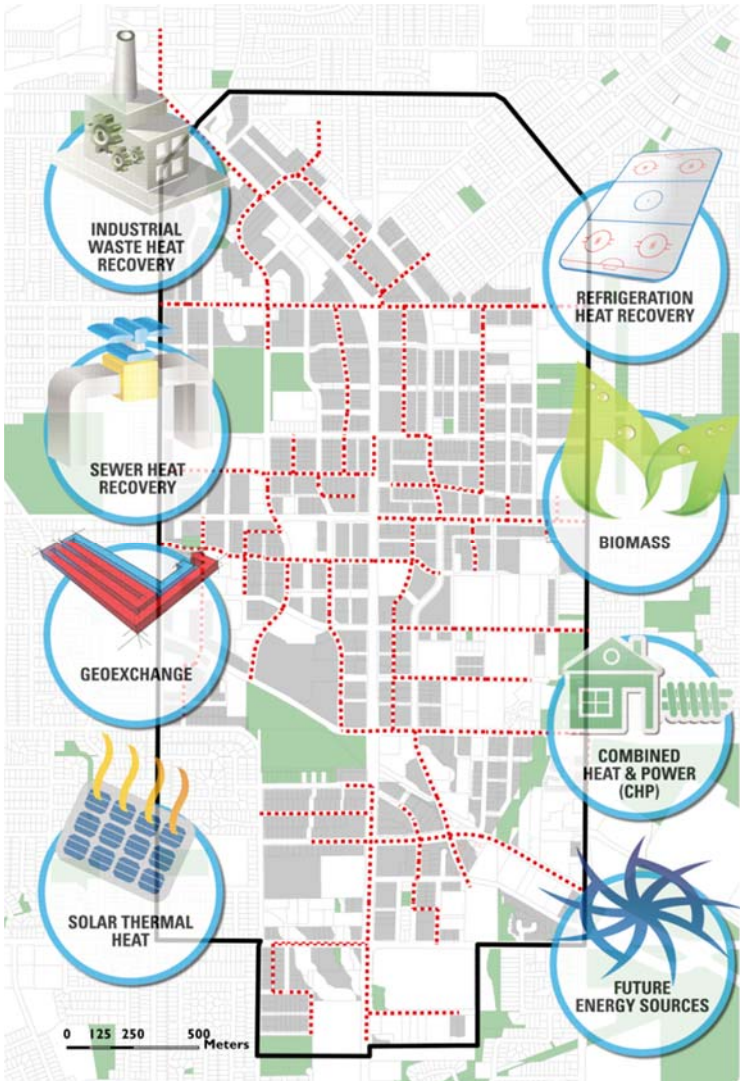


City Centre 2009



Proposed Future Development





1. Improve energy efficiency;
2. Reduce greenhouse gas emissions;
3. Increase resilience; and
4. Provide competitive and stable pricing.



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Multi-Phase DE Strategy

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Phase 1 Temporary Energy Centres



Phase 2 Permanent Energy Centre



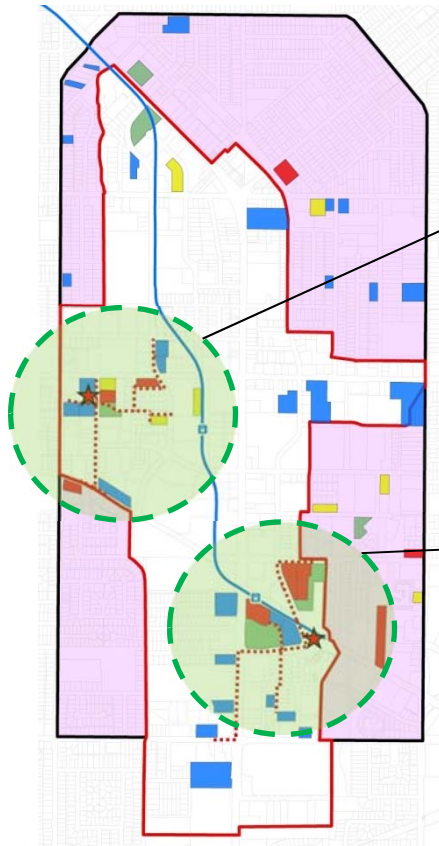
Phase 3 Renewable Energy

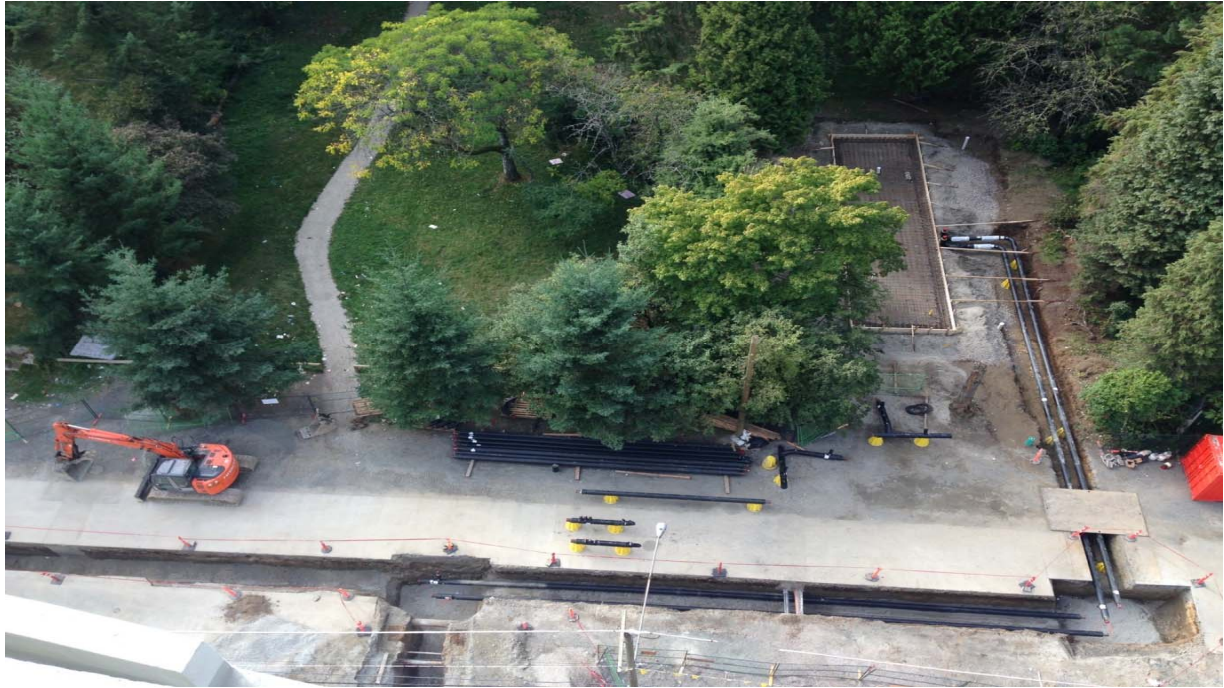


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Phase 1: Temporary Energy Centres

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Phase 2: Permanent Energy Centre

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West Village District Energy Centre

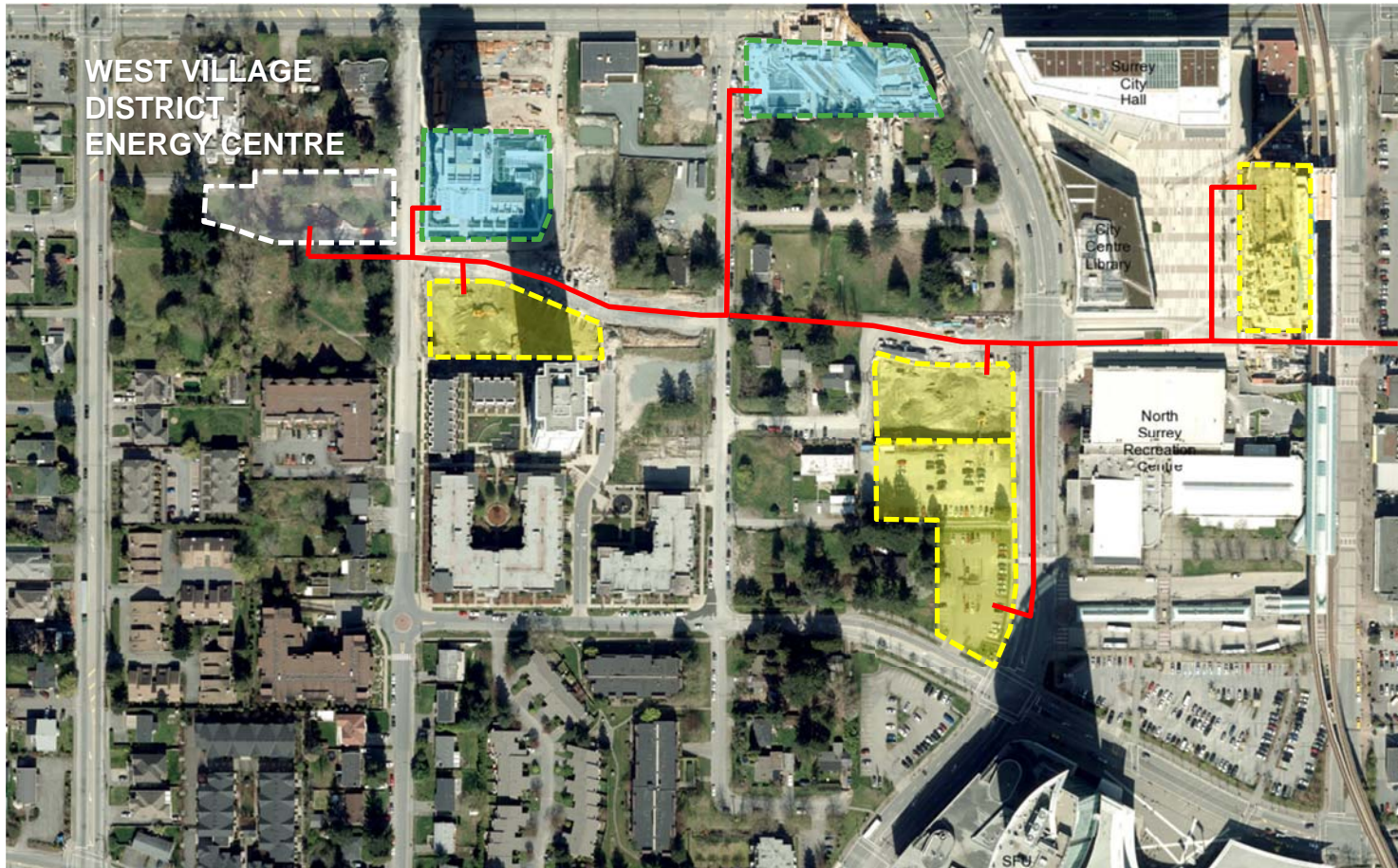




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Phase 2: Permanent Energy Centre

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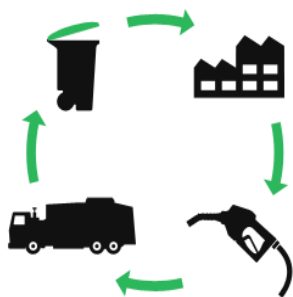
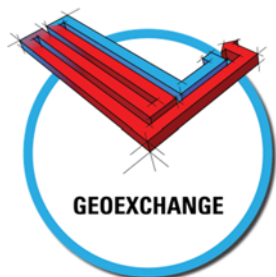




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Phase 3: Integrating Large-scale Renewables

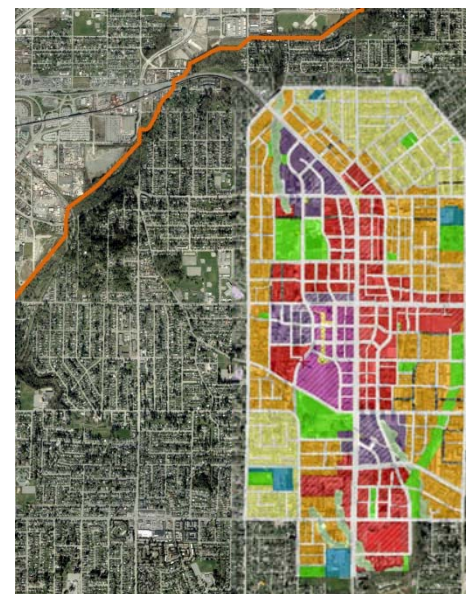
GHX/RNG



Biomass



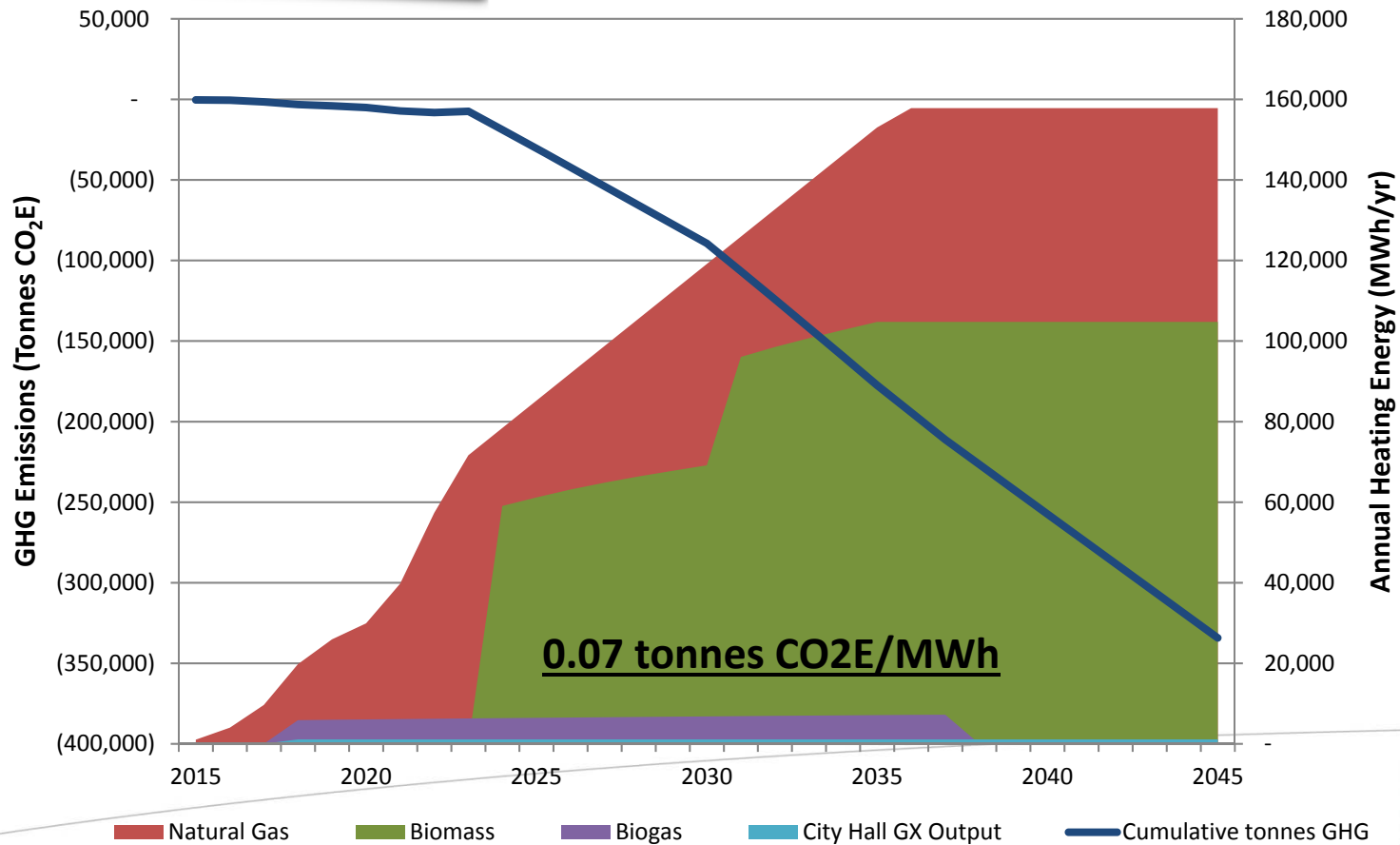
Sewer Heat

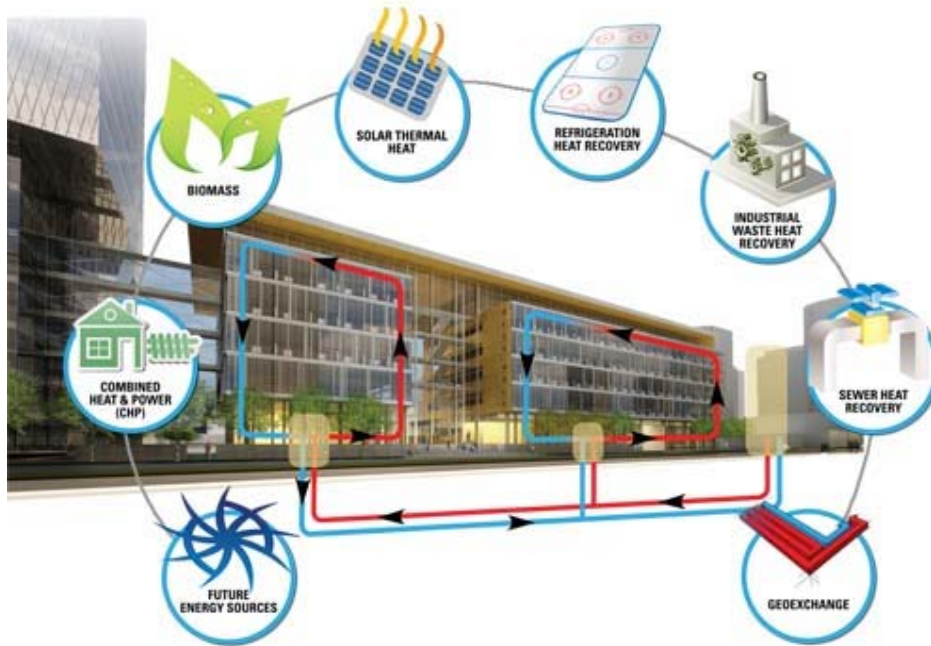




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Low-carbon / renewable energy





- *Surrey City Energy*
- Municipal Ownership:
 - Low cost of capital
 - Departmental synergies
 - Access to grants
 - Experienced utility operator
- Does not preclude future partnership opportunities



Provide objective, expert advice to the City to ensure that the rates and rate structure are consistent with the following principles:

1. Cost recovery
2. Rate competitiveness
3. Return on investment
4. Shortfall recovery
5. Low-carbon/renewable energy
6. Fairness



Steam to Hot Water Conversion Project

- Replacement of Aging Steam Infrastructure
- Integration of biomass heat and power
- Multi-year transition (2011 to 2017)
- Over 11 km of piping and 130 buildings
- Ongoing new building connections
- Reduced operating temperature from 190 to 80 °C
- Large reduction of natural gas use
- Reduced costs >\$5M/year
- Reduced GHG Emissions >20%
- Campus Research Opportunities





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Case Study: University of British Columbia

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STEAM CONVERSION PLAN





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Case Study: University of British Columbia

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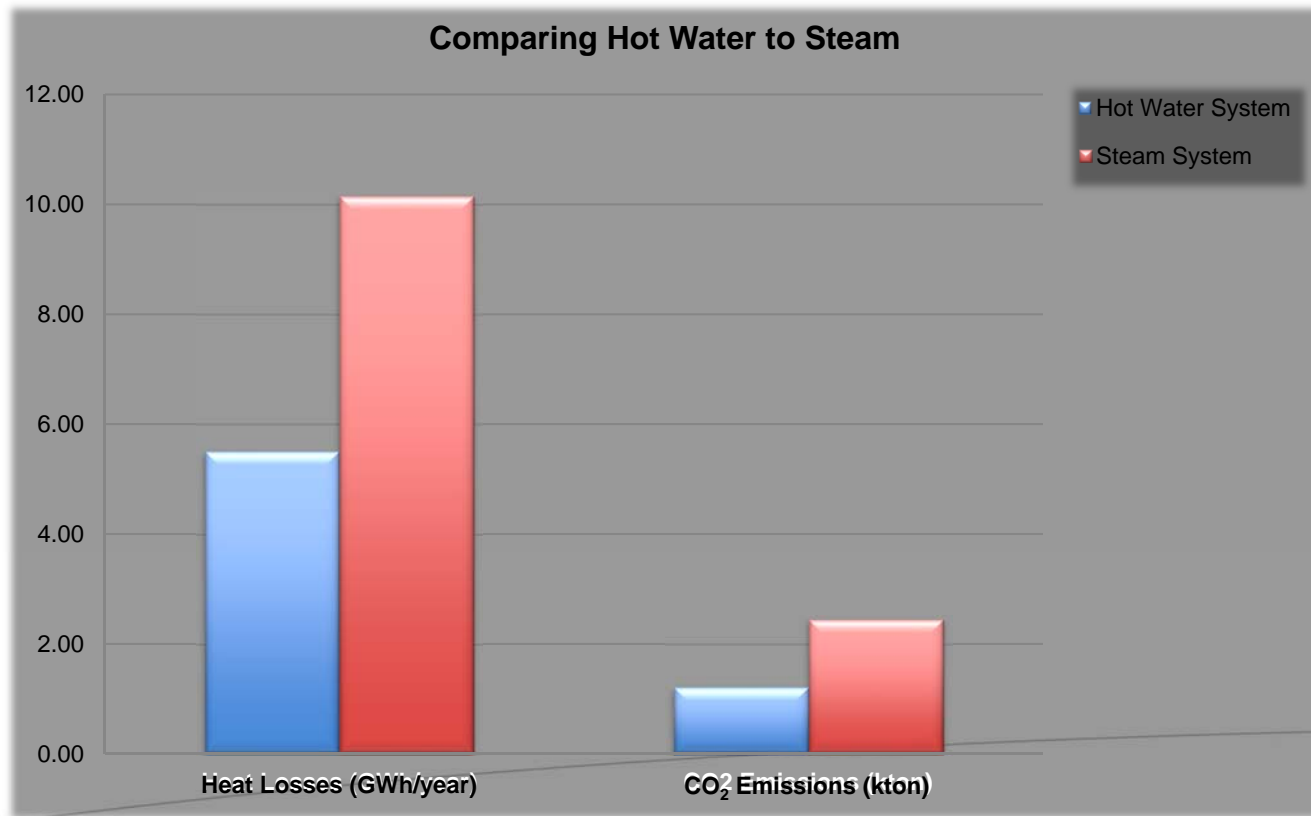
- Phased construction – temporary steam to hot water conversion plant for transition period
- Maintain process steam requirements
- New 60 MW energy centre
- Repurposed steam tunnels throughout campus



Design/Construction Lessons

- Performed value engineering
 - Real-time data
 - More aggressive sizing
- Large work phases
 - Economies of scale
- Standardized system
 - EN 253 Piping, ETS
 - Consistent owner, consultant, contractor
- Reduced standard pipe cover
- Developed standing supplier agreement
- Refined form of tender





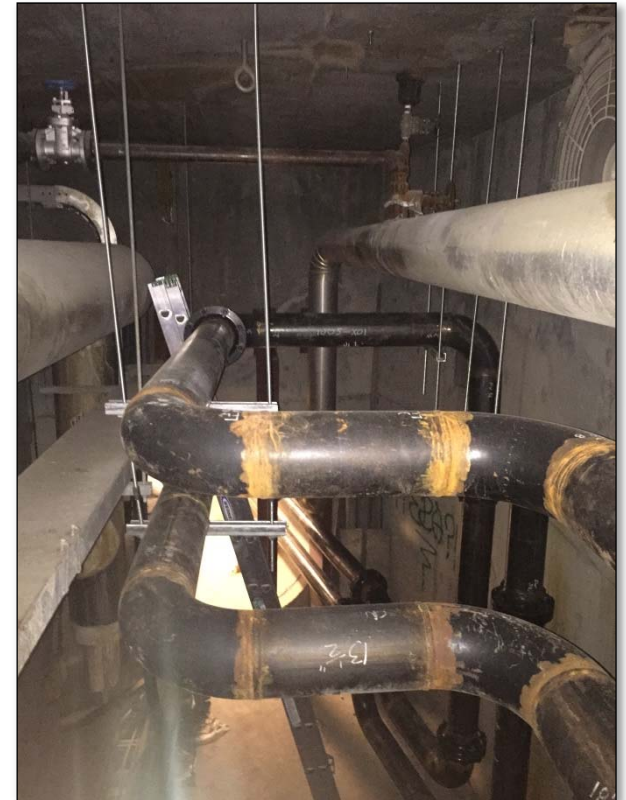


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Case Study: University of British Columbia

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- Underground Tunnels
- Direct-Buried
- Above Ground
- Repurposed Steam Tunnels →



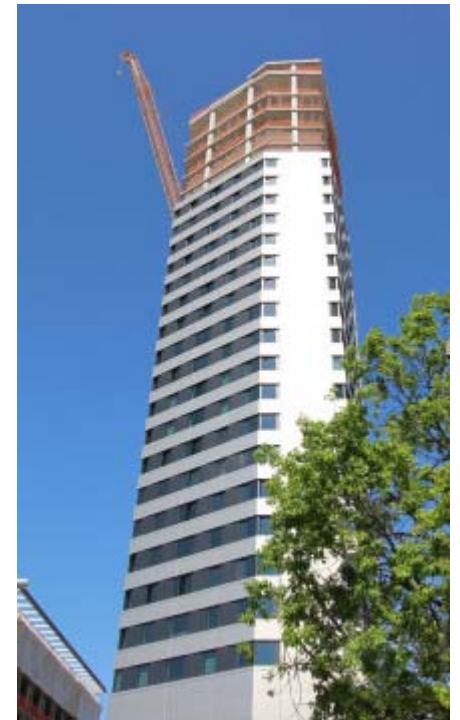
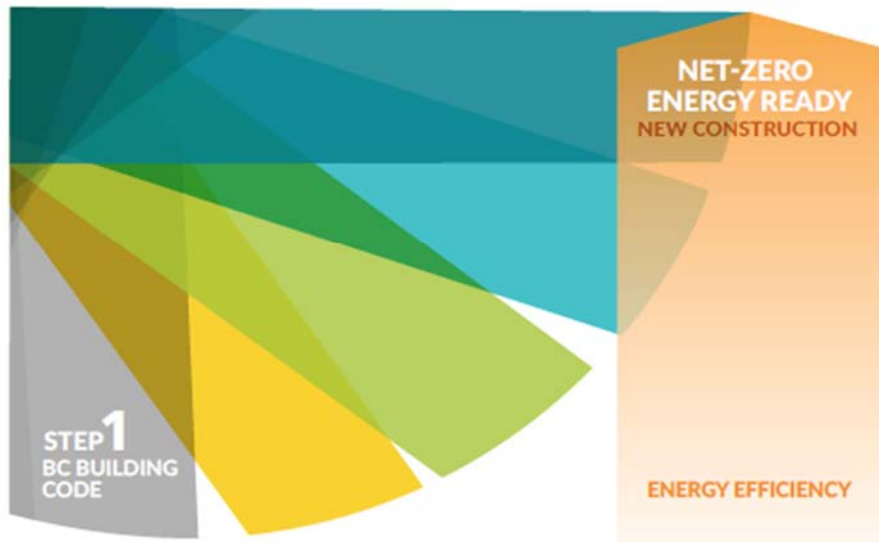


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Role for DE in a Changing Market

2017

2032





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Key Takeaways

- DE is a platform for the use of local, renewable, flexible heating sources
- DE can help communities reduce GHG's, improve energy resilience and stabilize long-term energy costs
- No one-size-fits-all solution to carbon reduction



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Questions/Discussion

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