A case study in community energy planning:
Planning for the expansion of a campus district energy network

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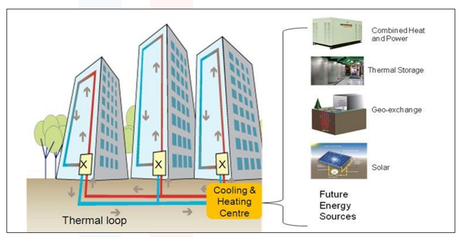
(1) Introduction

- Places to Grow: intense building development not matched by investments in infrastructure
- Constrained, aging electricity grid vulnerable to low probability, high impact events (July 8th flooding in Toronto)
- Localized opposition to large generation projects (e.g. wind farms, gas plants)
- Heating and cooling of buildings a major source of urban GHG emissions (~50%)
- Province recognizing municipal role in energy planning (Regional electricity consultations and Municipal Energy Plan funding – Summer 2013)

(2) DE and CEP



Better Buildings Partnership, City of Toronto (n.d.). *District/Community Energy Systems (DES) schematic.*

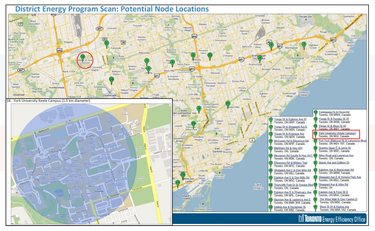
- Embedded solutions that address load growth at the source and as it occurs
- Shared services strengthen energy security and local economic investment
- Fuel efficiency reduces emissions and economies of scale create a platform to renewable fuels

CEP in Toronto

environmental studies | YORK UNIVERSITÉ UNIVERSITY
TORONTO
INTERNATIONAL DISTRICT ENERGY ASSOCIATION

(3) Case Study: York U Keele Campus

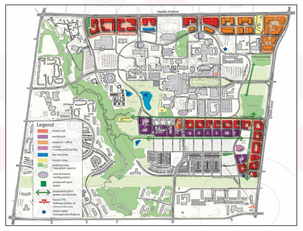
Context



Genivar Consultants LP (2010). *Potential District Energy Scan in the City of Toronto*

The Keele Campus was identified as one of 27 DE nodes in Toronto. YUS subway extension will drive growth by increasing land value.

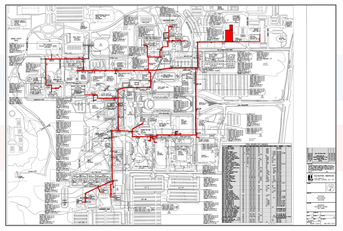
Concept Plan



Brook McIlroy Inc. (2009). York University *Secondary Plan Background Document and Transportation Master Plan*

15 million sq. ft. mixed-use development (avg. FSI of 2.33) located near existing infrastructure.

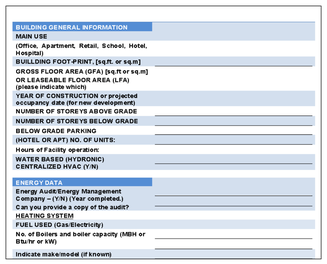
DE Network



Adapted from York U Facilities Services (2013). *Mechanical Distribution Services and Tunnel* drawing.

Existing network: approx. 3.5 km; 90 buildings (7 mil. sq. ft.). Gas-fired steam boilers; electric chillers; two CHP turbines.

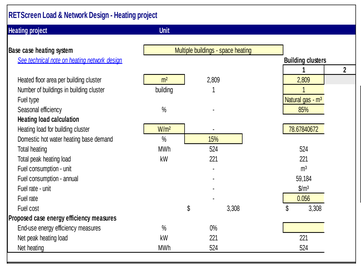
Building Data



Survey of:
- Ownership
- Use
- Utility data
- HVAC equipment

Adapted from Energy Efficiency Office (2012). *Building Survey Information*

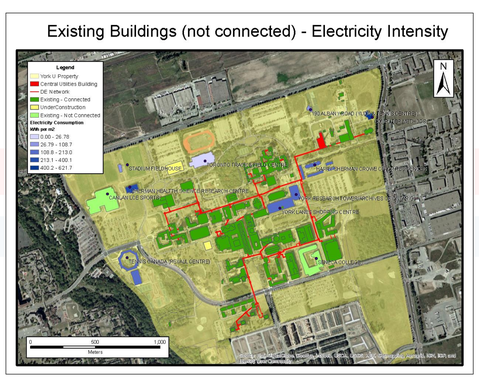
Energy Data



Use benchmark values or input known values to estimate:
- Consumption
- Demand
- Intensity

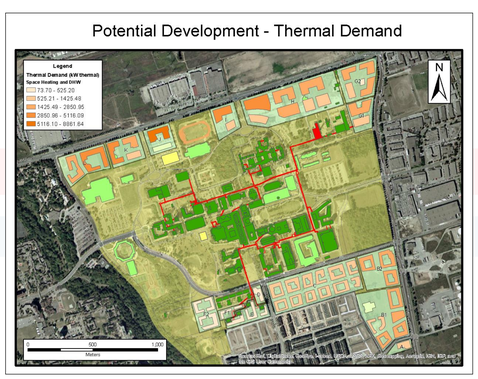
Screenshot from RETScreen Clean Energy Project Analysis software program (2013).

Data on buildings (existing and new) and energy (metered and predicted) form the basis for analysis and forecasting in a community energy plan. When actual data is unavailable, benchmark values can be substituted provided assumptions are listed (Survey: City of Toronto; Energy Model: RETScreen Software).



Energy Mapping

A GIS can assist with planning by visualizing quantitative and qualitative data simultaneously.

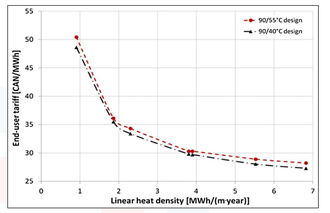


"Spatializing" building and energy data can assist with identifying opportunities for expansion by providing a sense of what and where the loads are as well as what the physical implications of expansion might be.

(4) Planning & DE

Density

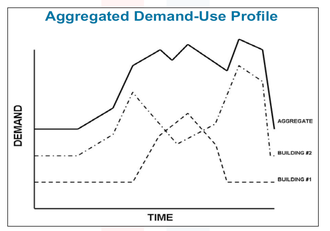
Building density = Load density (↑density = ↓cost)



Dalla Rosa et. al. (2012). *District heating (DH) network design and operation toward a system-wide methodology for optimizing renewable energy solutions (SMORES) in Canada: A case study.*

Mixed-use

Mix of uses = Load consistency (↑consistency = ↑revenue)



Church (2007). *Is District Energy Right For Your Community?*

(5) Conclusions

- High quality data is difficult to acquire
- Analysis requires assumptions, introduces error
- A GIS as a spatial decision assistant

Benefits to York U

- Long-term, stable source of revenue
- Improved inter-university sustainability rankings
- Modern, interdisciplinary, practical curriculum

Future Considerations

- Planning does not guarantee implementation
- Recognizing "energy" as strategic priority
- Engaging the broader York U community

Poster & Handout

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