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Canadian Urban Institute

*Community Energy Systems: Greening your
bottom line*
June 5-8, 2009

Energy Planning: A Role For Municipalities

Connecting Energy, Land-Use,
and Transportation Decision-
Making

June 5, 2009



Energy and the Canadian Urban Institute



- The CUI is Canada's applied urban policy institute.
- Encourages the application and integration of energy into the decision-making process at the municipal level.
- Leads a visionary program of research into the long-term solutions for urban transportation and energy problems.



How do Municipalities Plan for Energy?



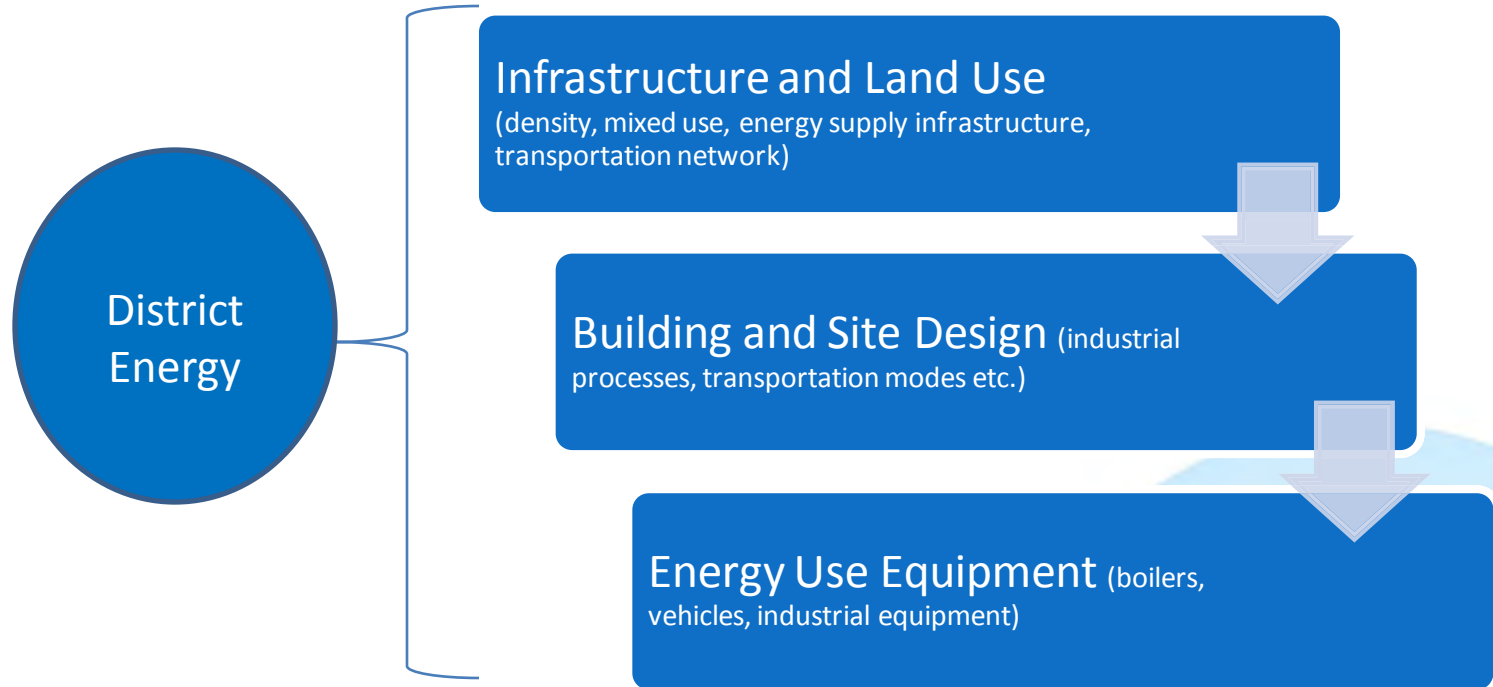
- Energy has traditionally been planned by specialized agencies, such as local utilities.
- Municipalities are involved in energy planning in two ways:
 - Directly
 - establishing energy services (e.g. district energy corporations, lighting energy efficiency etc).
 - Indirectly
 - promoting built form that supports integrated urban energy systems (IUES) (e.g. compact urban mixed use development, transportation oriented development etc).



How Does Land-Use and Transportation Impact Energy Decisions?



- Most energy-related decisions and effects within a municipality start from specific policies and land-use decisions.

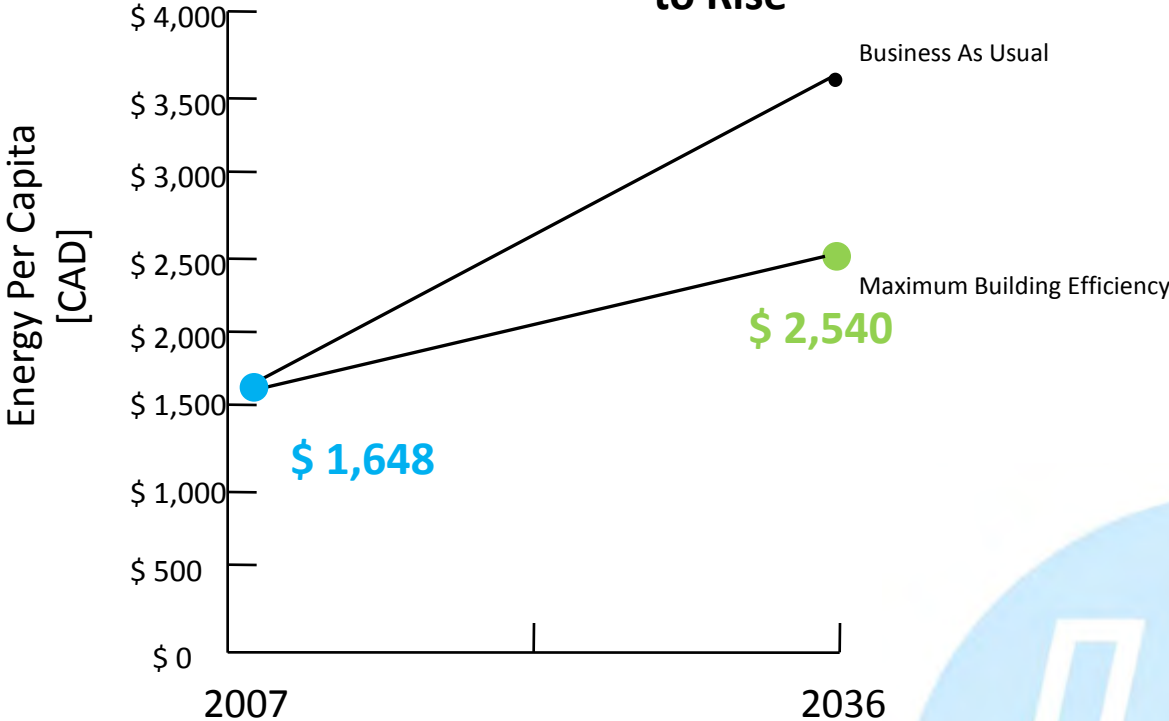


Can We Afford Where We Live Today?



With Improvements in Energy Efficiency

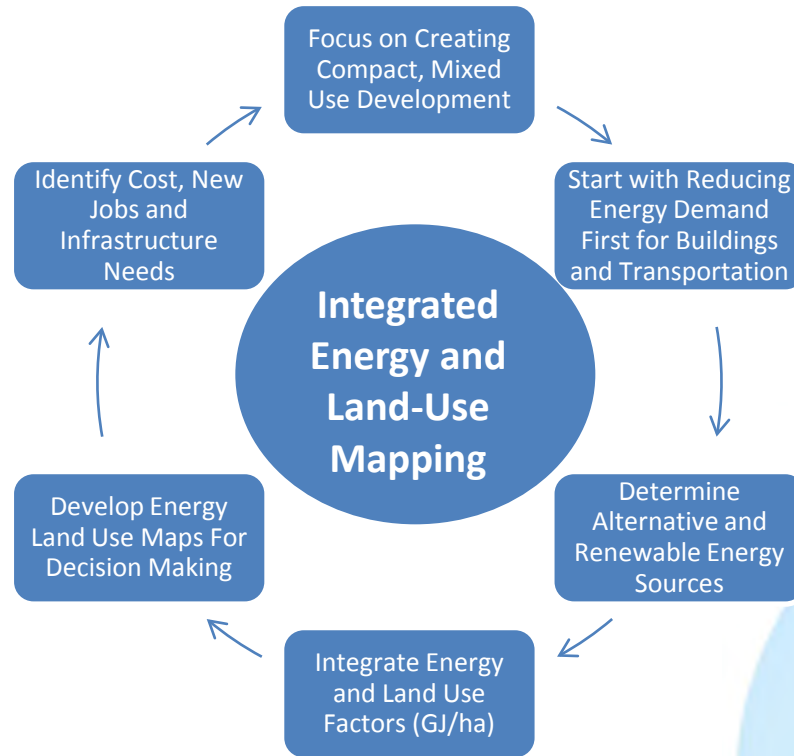
Energy Cost per Capita are Expected to Rise



How Can Energy and Land-Use Mapping Help?



- Energy mapping can provide an effective way to develop an *Integrated Community Energy Plan* to improve energy efficiency through the use of better building standards, transportation and renewable energy sources.





What We Were Asked To Do

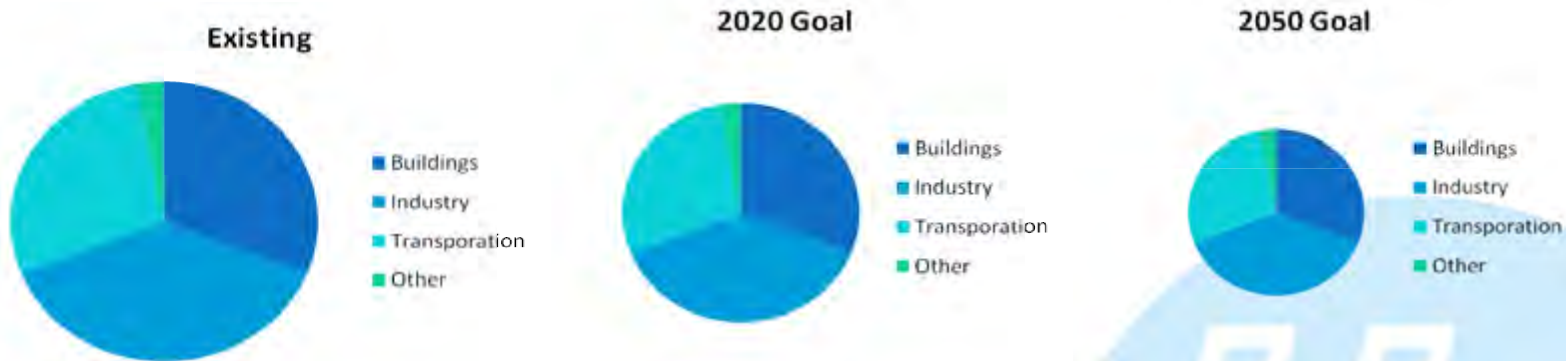
- Determine the types of alternative energy sources applicable to Calgary's built environment and where they should go.
- Prepare an energy land-use map based on the results.
- Set out land-use and mobility policies to support the implementation of the energy map.



Where We Started



- Met with staff to determine an energy and GHG target.
- City of Calgary CO₂ emissions goals.
 - 20% below 2005 by 2020
 - 50% below 2005 by 2050



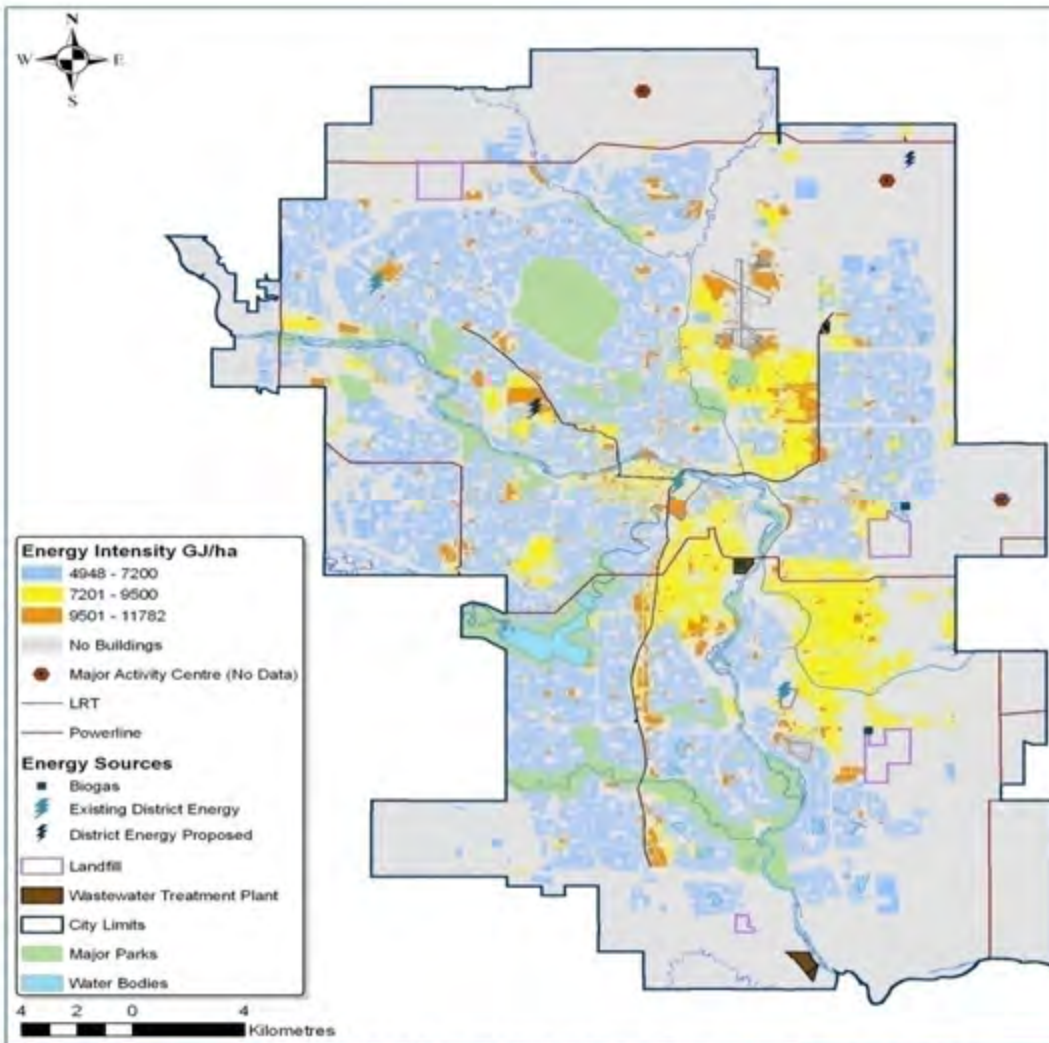
What Our Research Revealed

(Energy Baseline & Analysis)

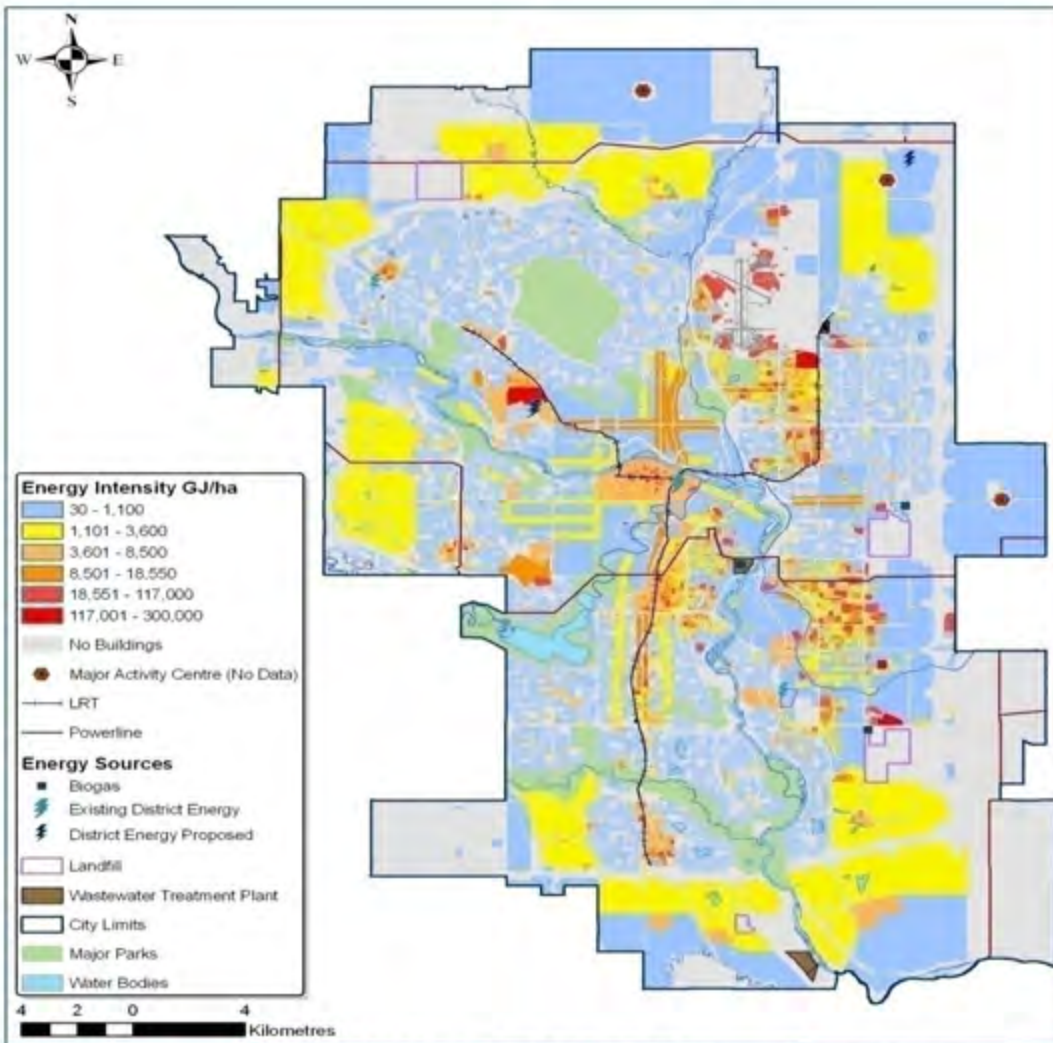


- Reduce GHG emissions from 17,180 kt/year to 8,590 kt/year to meet 2050 goal.
- Population is increasing from 1,000,000 in 2005 to over 1,600,000 in 2036 (almost 2%/year).
- To meet 2050 goal, building emissions need to be reduced from 11,543 kt/year to 5,772 kt/year.
- Primary source of energy for electricity generation today for Calgary is coal fired power production.
- Space and water heating represent the largest areas of growth in energy use.

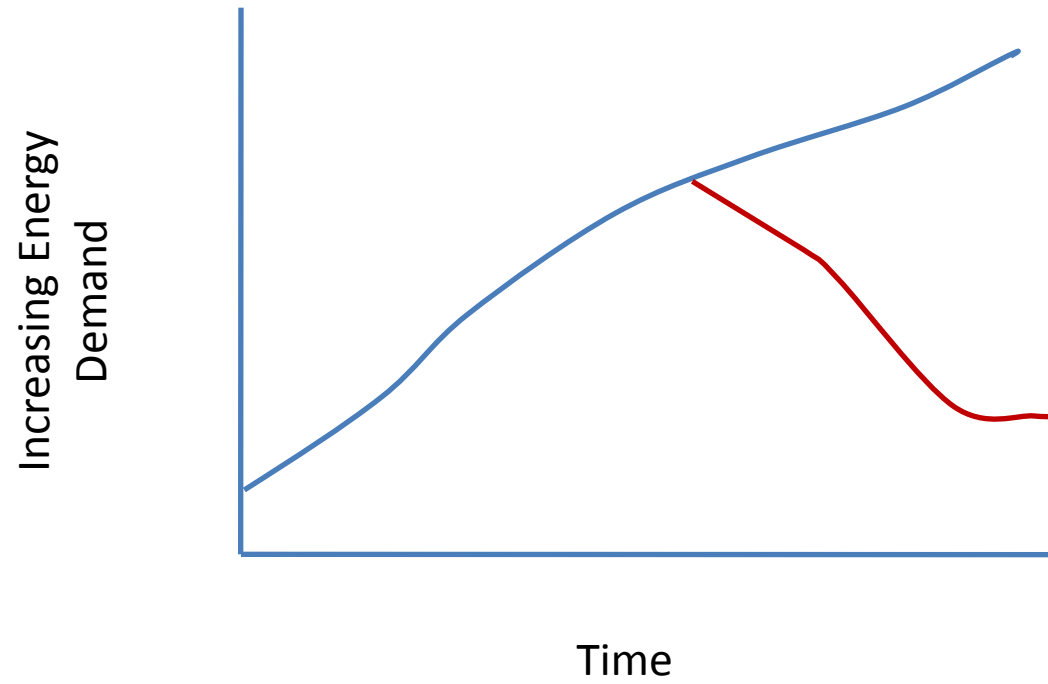




Calgary Energy Map Existing Energy Intensity



Calgary Energy Map Business as Usual 2036



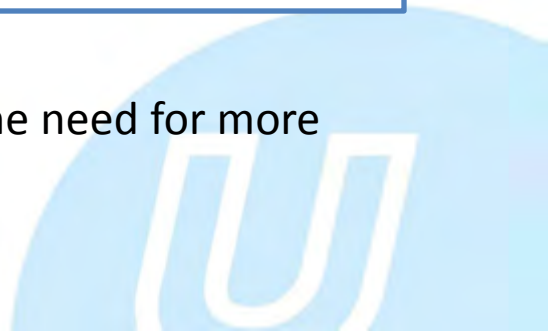
What we project 2036:

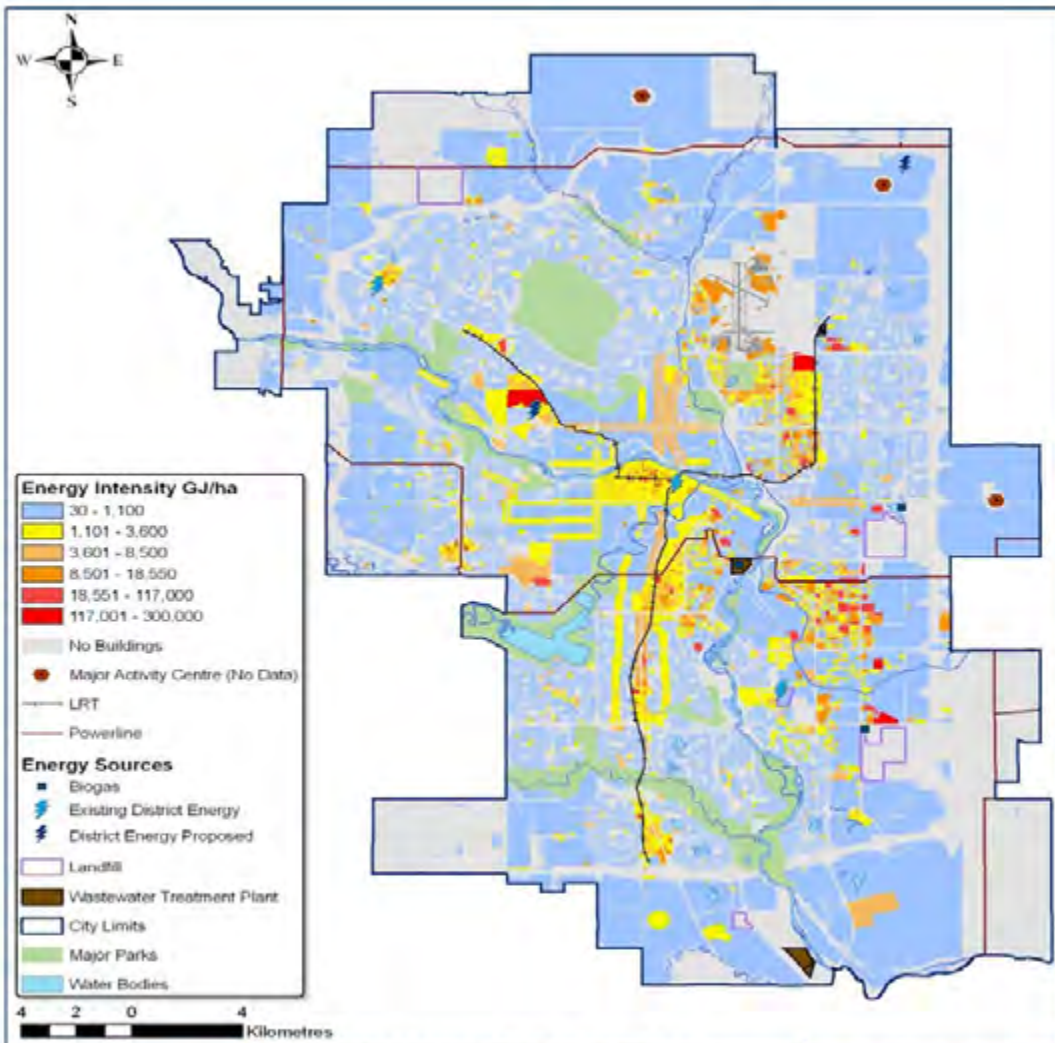


- Best approach: improve energy efficiency in built environment first before attempting to locate relevant alternative energy sources.
- Most cost effective and energy efficient building scenario:

Existing Buildings **Less 25 %**
+
New Buildings to achieve **MNECB Plus 50%**

- Reducing energy demand first reduced the need for more expensive alternative energy sources.





Calgary Energy Map Ultra-High Efficiency 2036

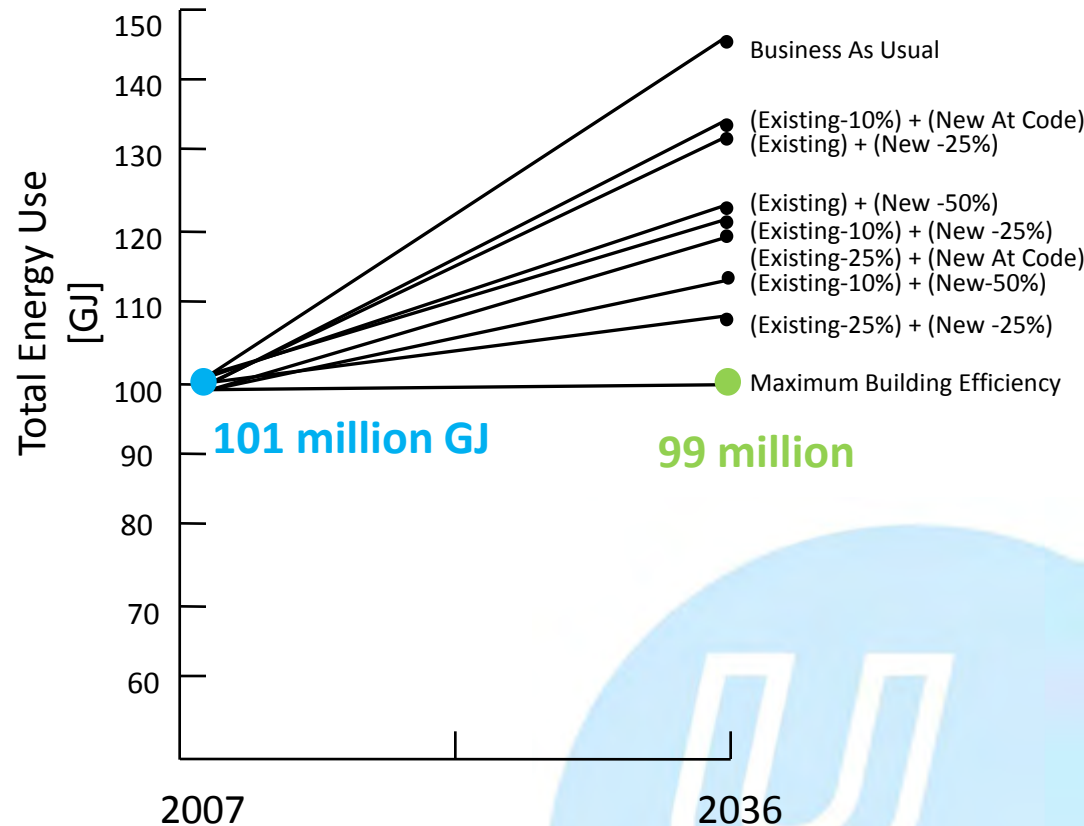
Cost Effective Selection Process

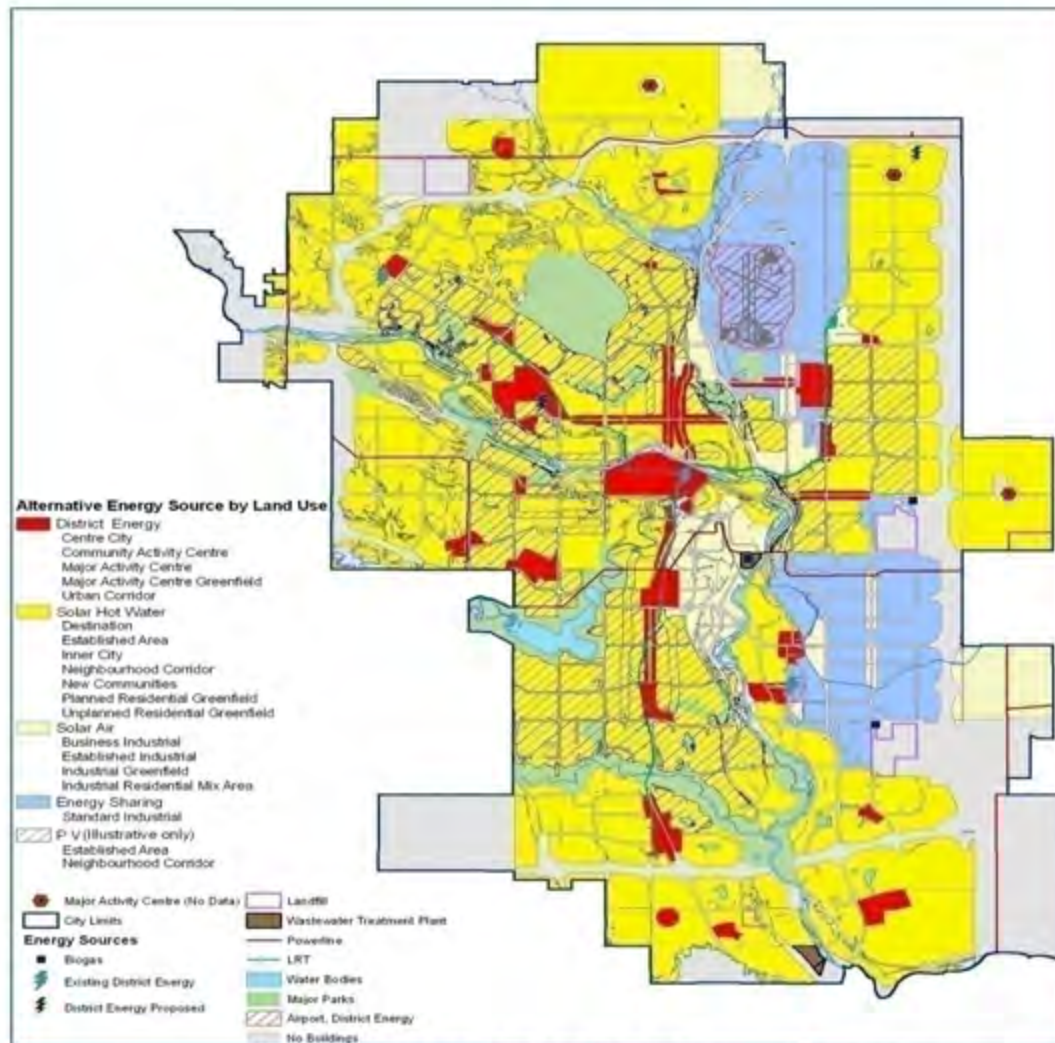


- Approach based on lowest cost per tonne of CO₂ when considering operating cost plus debt repayment on capital cost.

- Maximizing energy efficiency improvements in buildings contributes to only cancelling out energy increases associated with a population Increase.

Total Energy Use





Calgary Energy Map

Alternative Technologies Sources 2036

Five Important Insights:



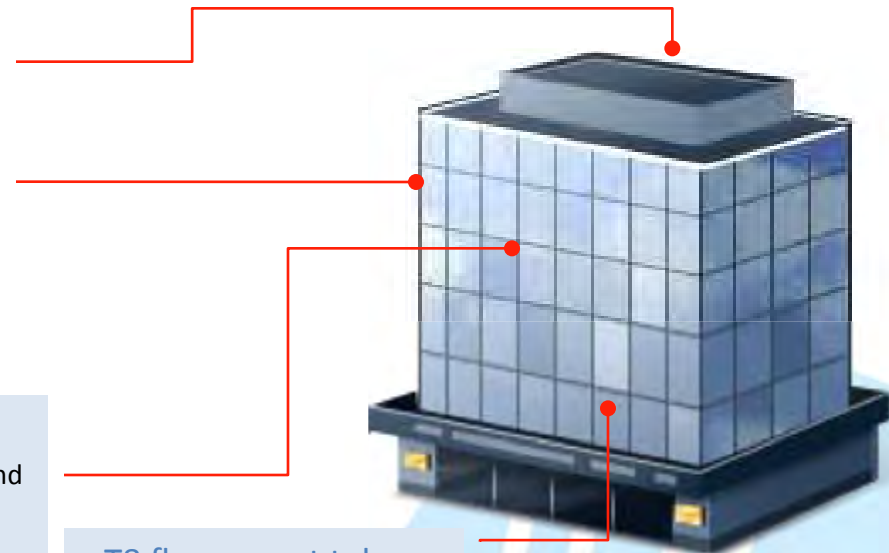
1. Improvements in built environment needed first.

- **Greater Insulation** in the building envelope (i.e. exterior walls and roof)

- **Balanced approach to windows**, optimize the window to wall ratio (avoid excessive glass), use tints and coatings to control solar gain.

- **Improved HVAC system**, radiant heating and cooling, high efficiency equipment

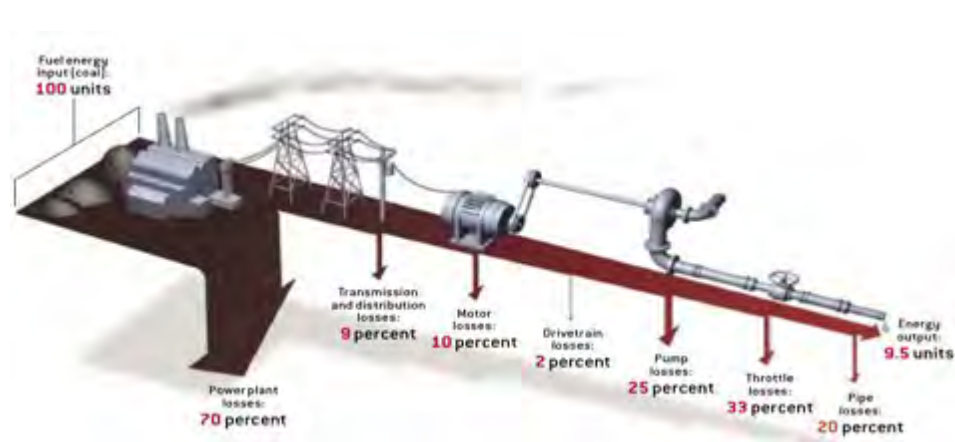
- **T8 fluorescent tube lighting**, to replace T12 and halogen systems



Five Important Insights:



2. Increased efficiency can lead to improved energy security and more local energy generation.



Benefits of Local Generation



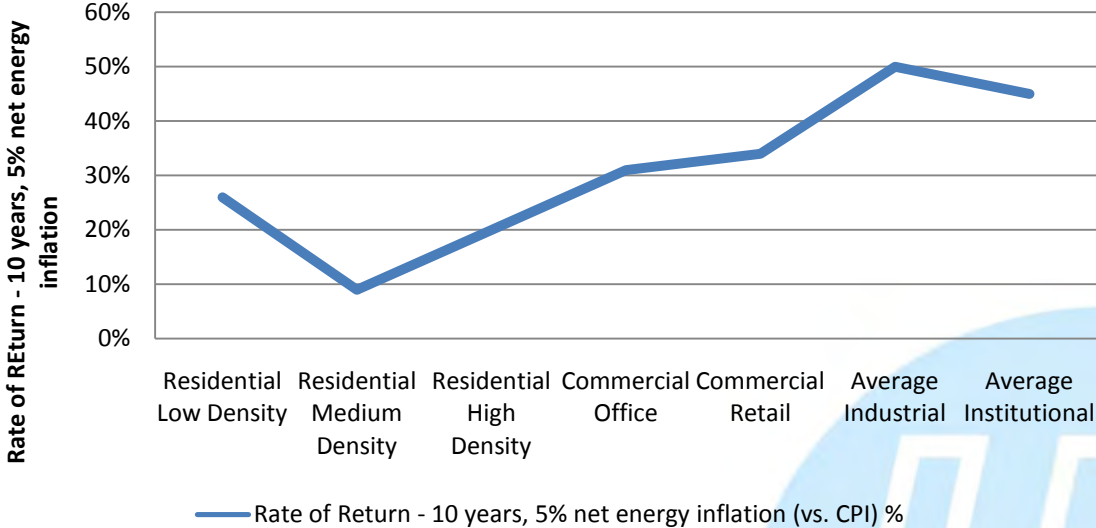
(US Dollars)	Generation	Transmission & Distribution	Total/kW of Generation	KW required/ kW Load	Total costs/ kW New Load
Central Generation	\$890	\$1380	\$2270	1.44	\$3,269
Local Generation	<u>\$1,200</u>	<u>\$138</u>	<u>\$1338</u>	<u>1.07</u>	<u>\$1,432</u>
Savings (Excess) of Central vs. Local Generation	\$310	\$1,242	\$1,068	0.37	\$1,837
Central Generation as a % of local capital	74%	1000%	213%	135%	228%

Five Important Insights:



3. Improvements can lead to solid returns on investment.

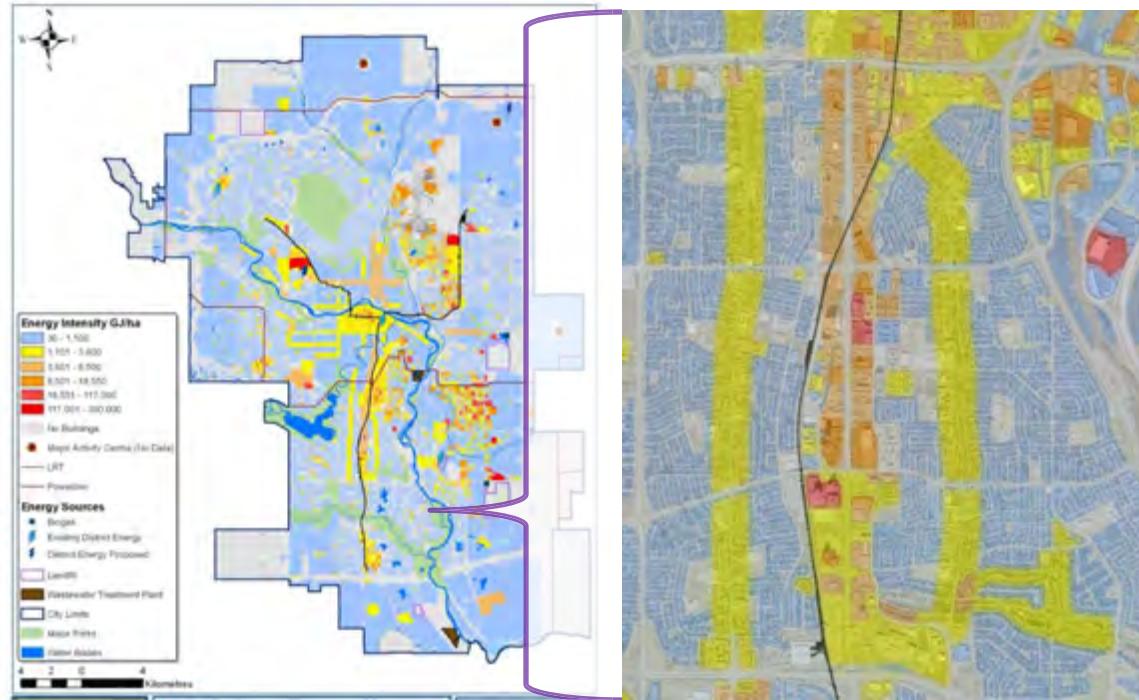
Energy Savings New Buildings MNECB plus 50%



Five Important Insights:



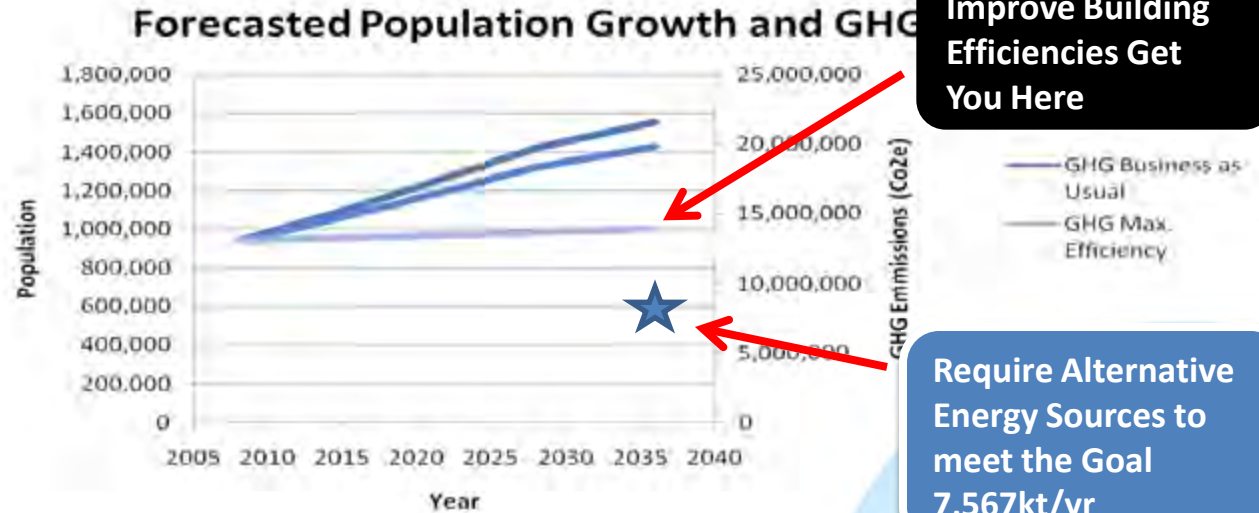
4. **Critical mass and appropriate mix of development types supports alternative energy sources and goal of rapid transit.**



Five Important Insights:



5. Land use objectives and energy goals need to be in synch.



Integrated Community Energy Planning Across Canada



Energy and Land-Use Mapping Initiatives

British Columbia

- Victoria
- Vancouver
- North Vancouver
- Kamloops
- Golden
- Nanaimo
- Bowen Island
- Whistler

Prince George, BC

Calgary, AB

Ontario

- East Gwillimburgh
- Guelph

Ontario

- Guelph
- Hamilton
- Waterloo Region
- Ottawa Region

Alberta

- Banff
- Canmore

