



# Kelowna Renewable District Heat Pre-feasibility Study

October 8, 2009

# Community Energy Association

*Connecting communities, energy and sustainability*

## Supporters



## Members



# Provincial Greenhouse Gas Reduction Targets

## Greenhouse Gas Reduction Targets Act (GGRTA)

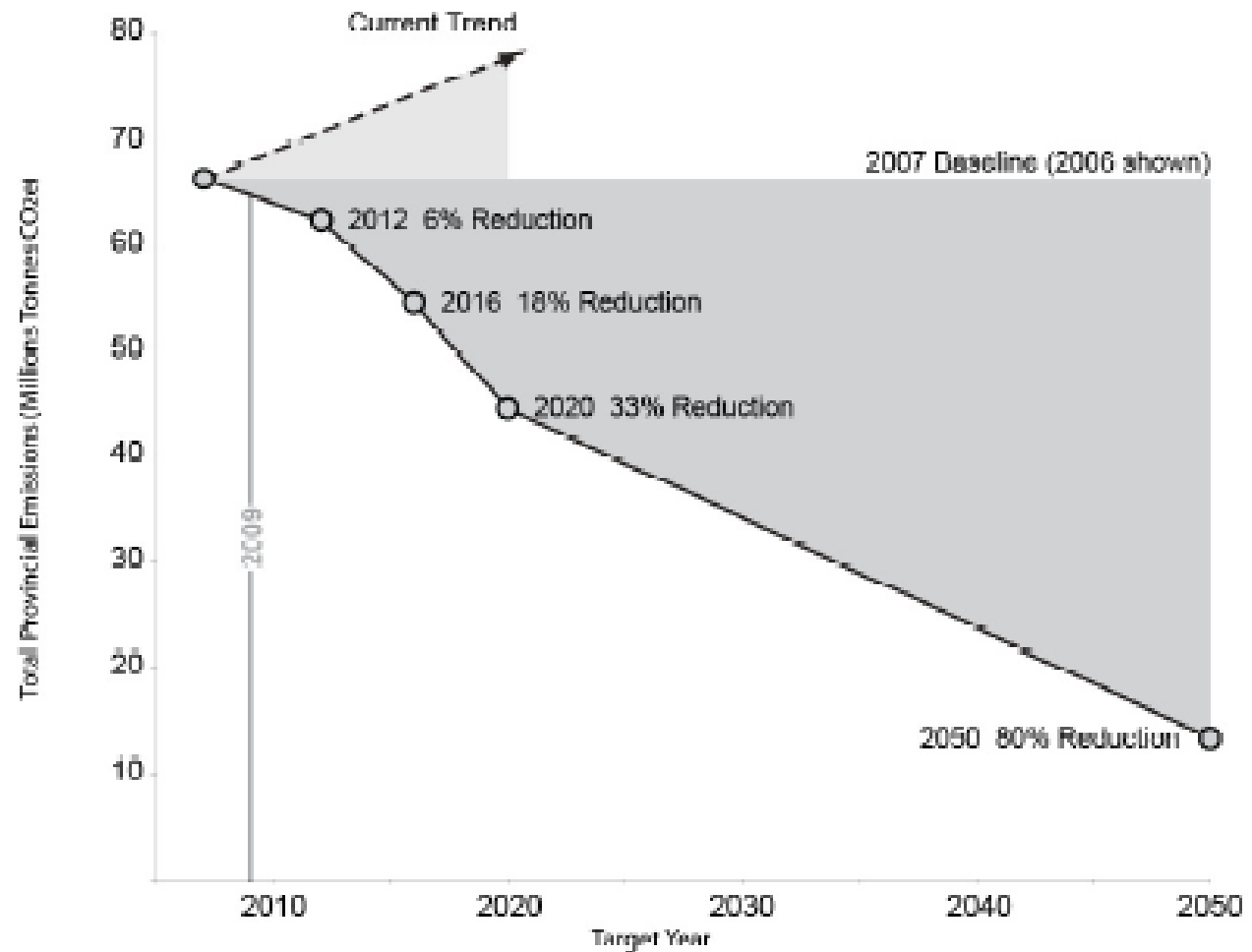
-33% reduction by 2020

-80% by 2050

Interim targets:

- 6% by 2012

-18% by 2016



# Whatever you build will be here **AFTER** fossil fuels

Planning for Unavoidable Surprises

2000

2020

2040

2080

2100

## Lifespan of Communities

Street Layout

Buildings

Infrastructure

## Unavoidable Surprises

Global Peak Oil

Doubling of global warming

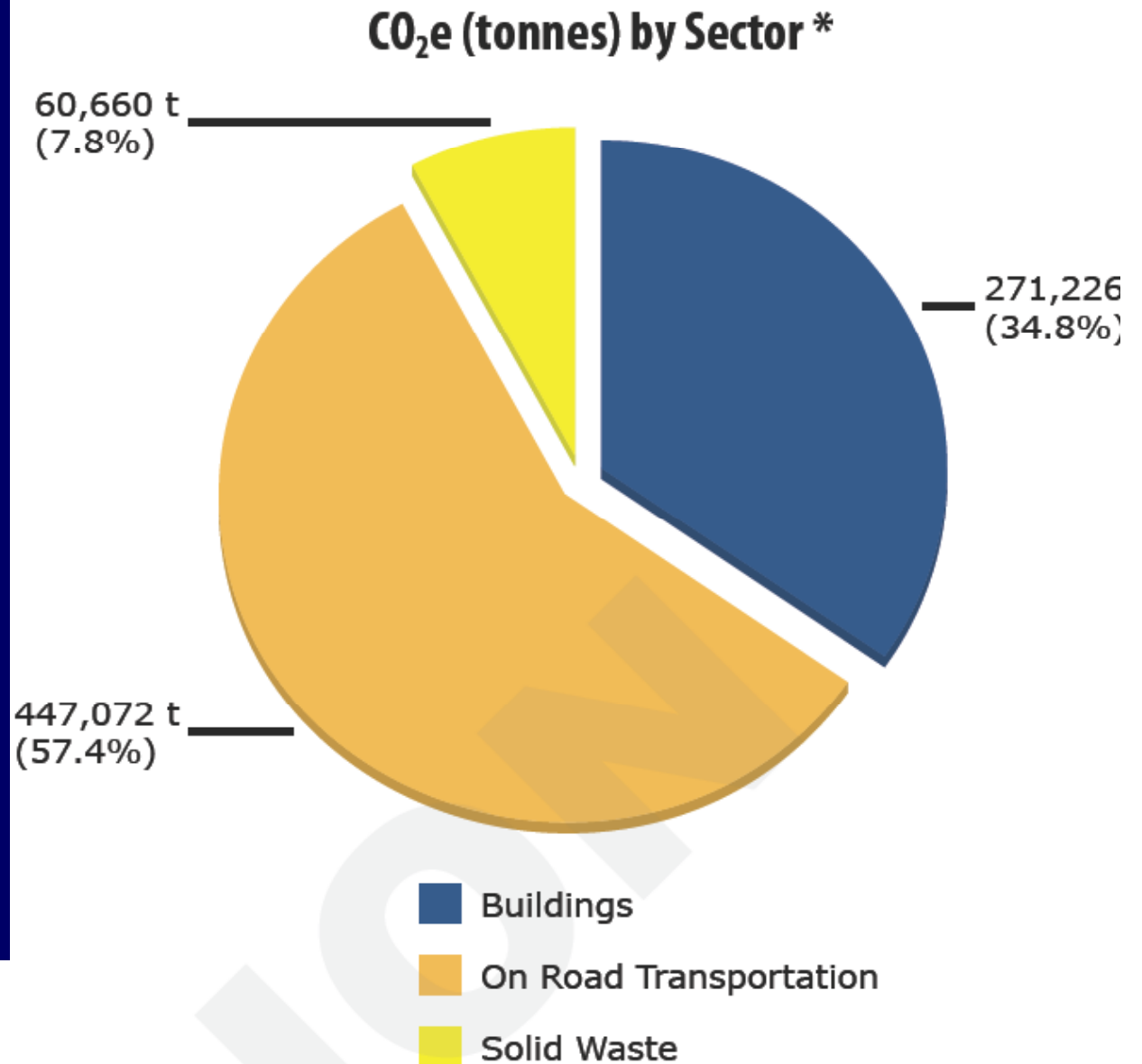
Global -50% emissions

(-80% to -96% here)



# Energy and Emissions Starting Point

- Buildings account for over 1/3 of Kelowna's community emissions



# Energy and Emissions in Buildings Across Kelowna

Building	Fuel	Consumption	Energy (GJ)	CO2e (t)	%
Residential	Electricity	512,785,174 kWh	1,846,027 GJ	11,281	53%
	Natural Gas	2,517,235 GJ	2,517,235 GJ	128,755	
Commercial	Electricity	337,867,647 kWh	1,216,324 GJ	7,433	35%
	Natural Gas	1,678,749 GJ	1,678,749 GJ	85,867	
Industrial	Electricity	78,825,294 kWh	283,771 GJ	1,734	12%
	Natural Gas	581,329 GJ	581,329 GJ	29,735	
TOTAL			9,174,109 GJ	271,226	

Source: 2007 CEEI

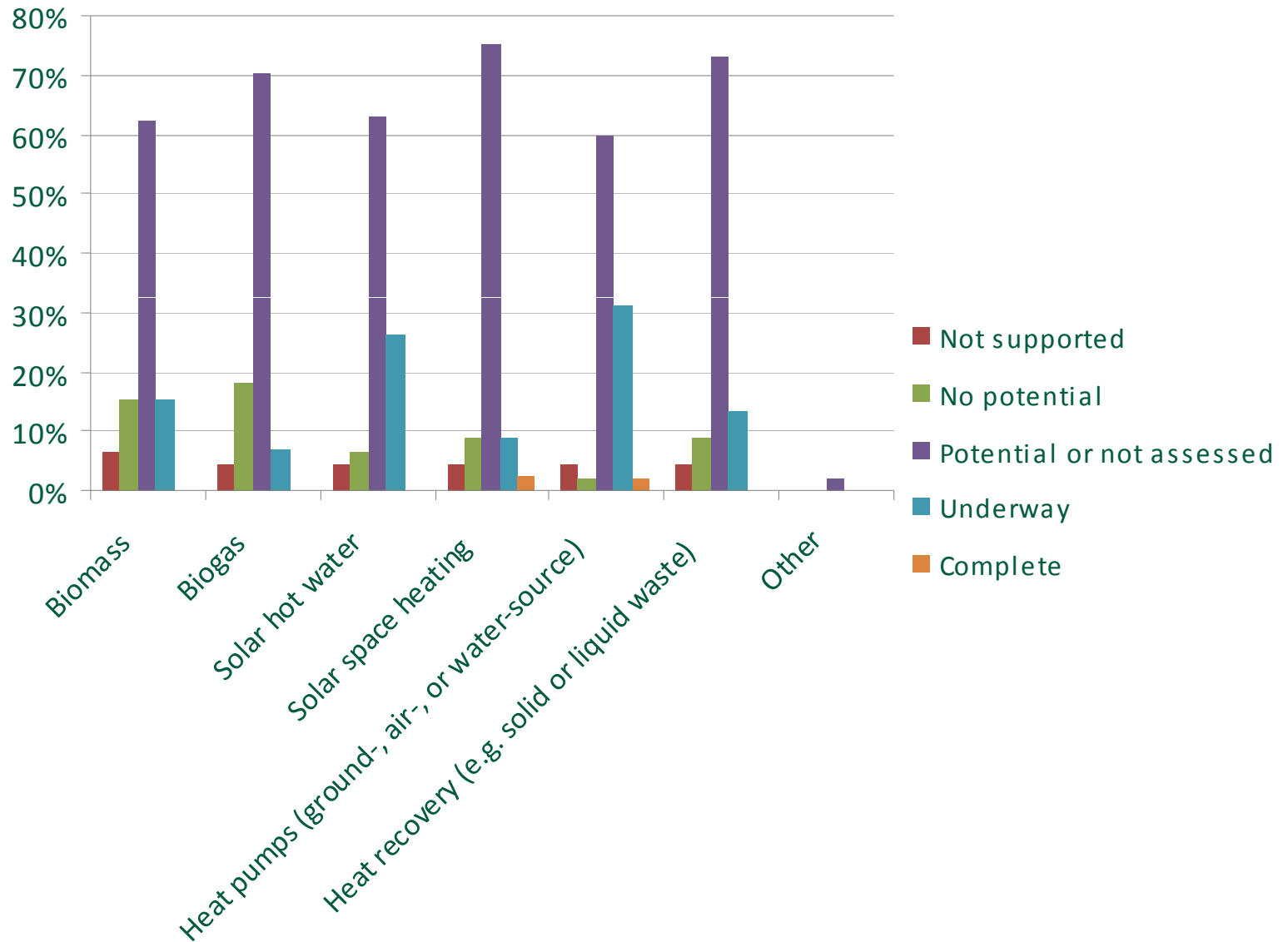
At \$0.06 per kWh and \$8 per GJ, that is about \$94 million annually

# District Energy

- Generally: A system that provides heat and / or cooling to more than one building
- For Today: The above, plus
  - Based on hot water to heat space and water in buildings
  - Primarily using the temperature differences in renewable source from water (lake, waste heat in water from industry and wastewater treatment plant) or earth (geo-exchange)
  - Using heat pumps to augment the temperatures
  - Possible natural gas or other combustion for peaking

# 2008 Local Government Energy Survey

- Survey in late 2008
- 47 BC local governments responded (25% of all BC LG's).
- 15 multi-part questions on climate and energy
- Follow-up to 2006 survey
- Available online at CEA website



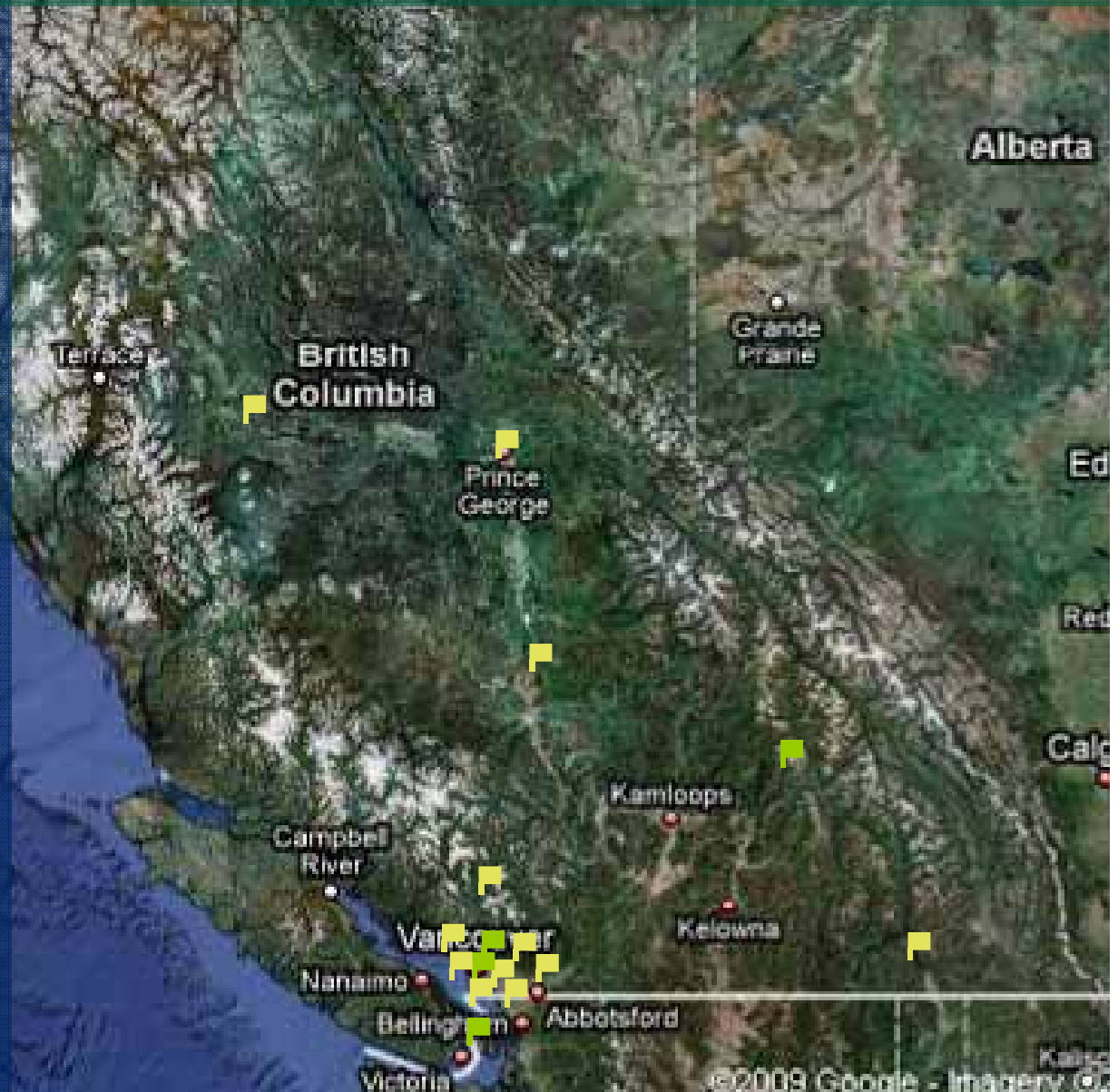
## • In Place

- Vancouver
- Revelstoke
- North Vancouver
- Victoria

## • Under Study

- Coquitlam
- Houston
- Gibsons
- Langley (Township)
- Nelson
- Prince George
- Quesnel
- Richmond
- Surrey
- Squamish
- Vancouver (2010)
- Whistler (2010)

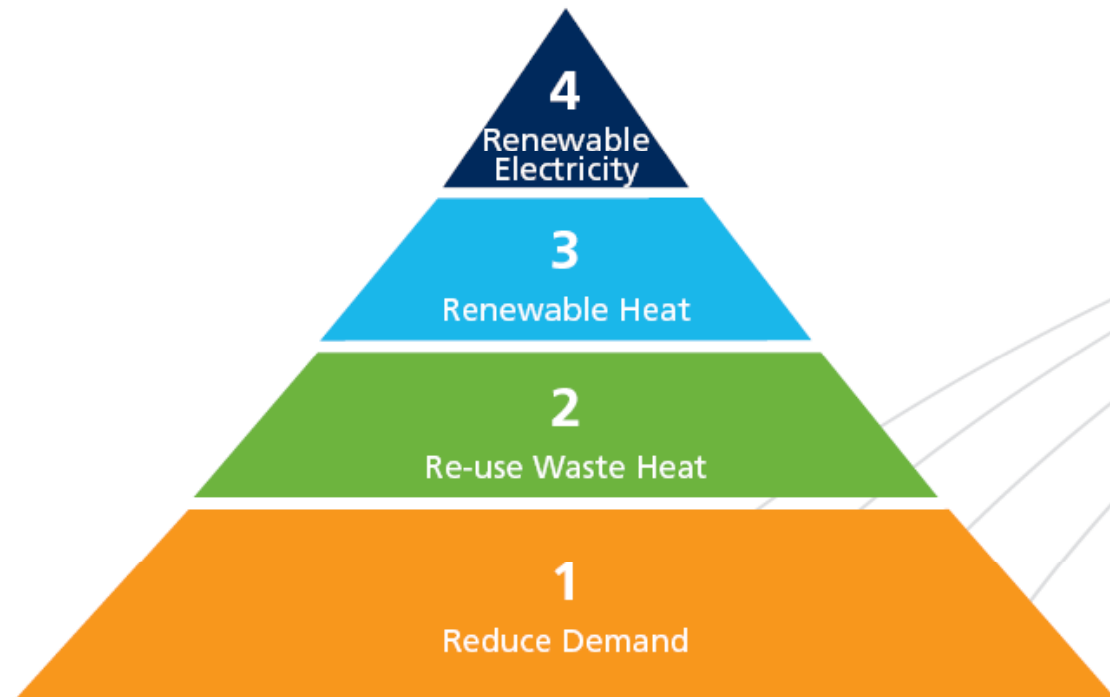
# Growing Interest in DE Around BC



# The 4 "R"s of Sustainable Community Energy Planning

Also,

- Matching the type of energy with its use;
- Optimize use of grid energy and as a resource to optimize the overall system and ensure reliability.



- 1 Reduce Energy Demand** – through community design, green buildings, and efficient technologies.
- 2 Re-use Waste Heat to heat buildings and hot water** – e.g. industrial or commercial waste heat, sewer and wastewater heat recovery.
- 3 Renewable Heat Sources to heat buildings and hot water** – e.g. solar thermal and geo-exchange.
- 4 Renewable Energy for Electricity** – e.g. biomass/biogas combined heat and power, micro-hydro, wind, solar, tidal and geothermal.

Source: BC Hydro

# Typical Public Sector Stakeholder Needs

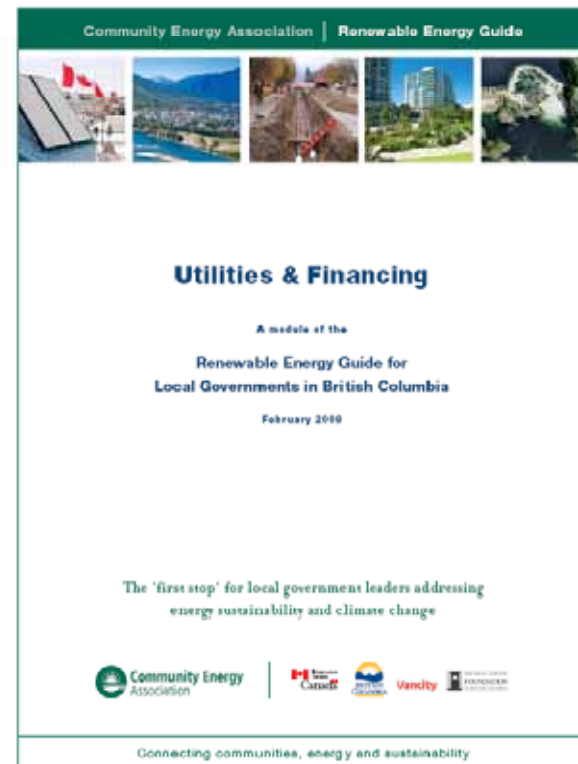
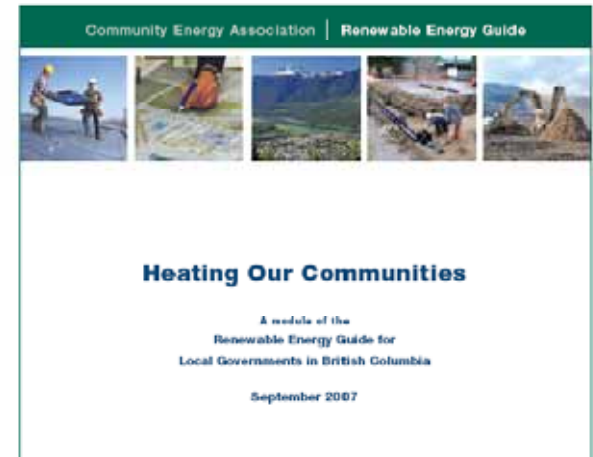
Stakeholder	Needs
Province	<ul style="list-style-type: none"><li>▪GHG reductions necessary to meet provincial targets</li><li>▪Avoiding devolution of provincial powers (building code, etc)</li></ul>
Local Government	<ul style="list-style-type: none"><li>▪GHG reductions necessary to meet community targets</li><li>▪Operational integrity of water and wastewater infrastructure</li><li>▪Contribution to financial, social, and environmental objectives</li><li>▪Renewable heat systems deployed in a way that provides flexibility for inter-connection and energy sources</li></ul>
PSO's	<ul style="list-style-type: none"><li>▪Renewable heat to meet carbon-neutral commitments</li><li>▪Maintaining or decreasing current costs</li></ul>

# Typical Private Sector Stakeholder Needs

Stakeholder	Needs
Hydro/Fortis	<ul style="list-style-type: none"><li>▪ Displacement of baseboard heaters and electric hot water tanks</li></ul>
Developers	<ul style="list-style-type: none"><li>▪ Level playing field</li><li>▪ Simple, clear rules and intentions so that developers can value land</li><li>▪ Education and support for those not familiar with renewable heat</li><li>▪ Making an appropriate profit on developments</li></ul>
Private Utilities	<ul style="list-style-type: none"><li>▪ Owning and operating renewable heat systems and</li><li>▪ Obtaining a return on capital</li></ul>
End User	<ul style="list-style-type: none"><li>▪ Performance, comfort, green attributes</li><li>▪ Initial cost not greater than other options, ongoing costs not a lot more than other options, Avoiding operation of system</li><li>▪ Education on benefits of renewable heat and addressing concerns / fears</li></ul>

# CEA Tools

- Community Energy & Emissions Planning Guide
- Renewable Energy Guide
- Buildings Policy Manual
- Funding Guide
- Case Study Guide
- Community Energy Survey
- Listserv
- Advisory Services



Local government leaders addressing  
climate change

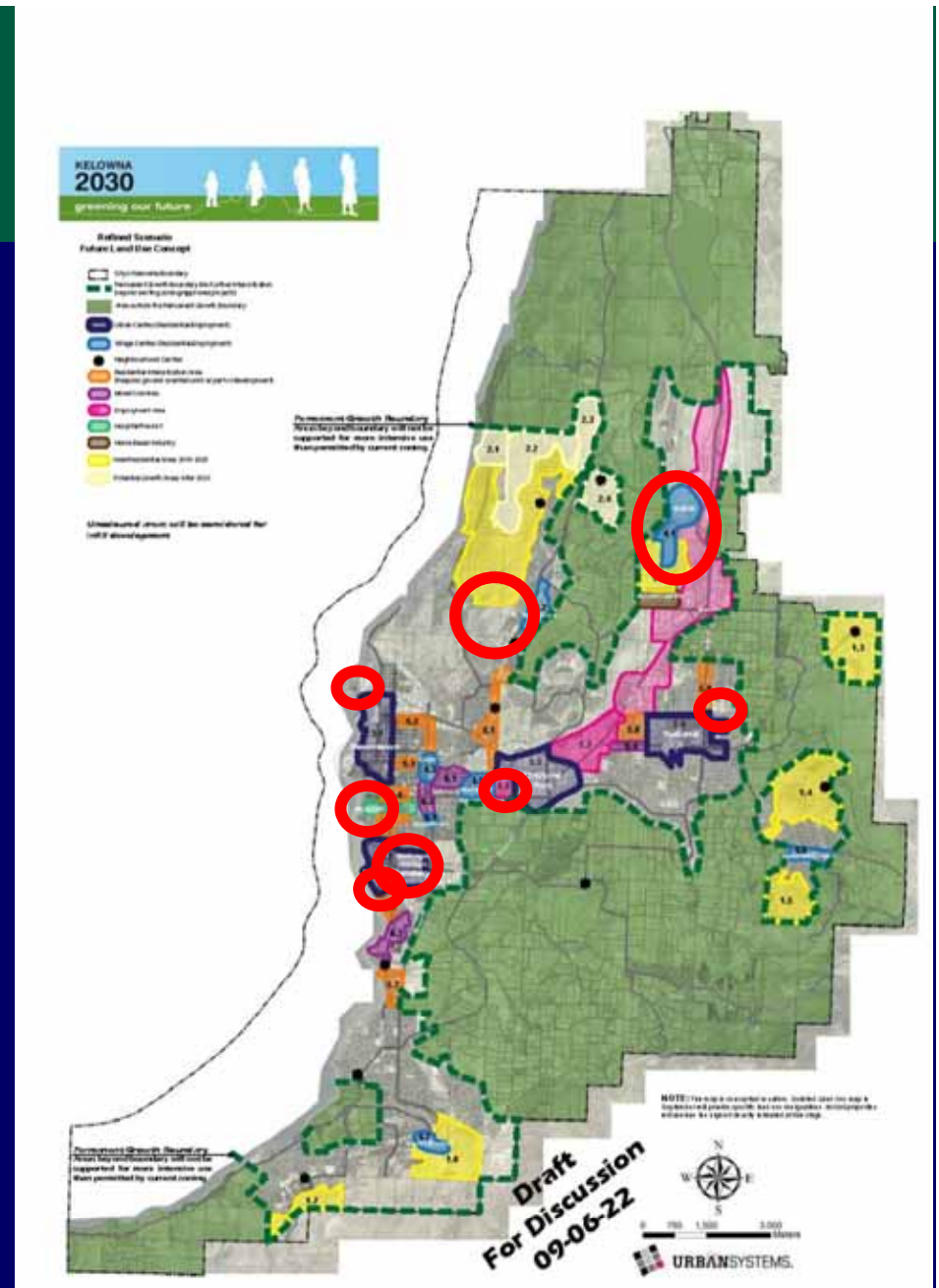


Energy and  
sustainability

# Existing Renewable Energy Systems

- Geoexchange
  - Numerous, inc UBCO & Wilden, Rutland Elementary
- Solar hot water
  - Best Western, Mode, UBCO, Kelowna Inn, OK College
- Biomass
  - Tolko, Westbank 1st Nation
- Waste heat recovery
  - Okanagan College
- Lake cooling
  - Hospital

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# Local Push for Renewable Energy

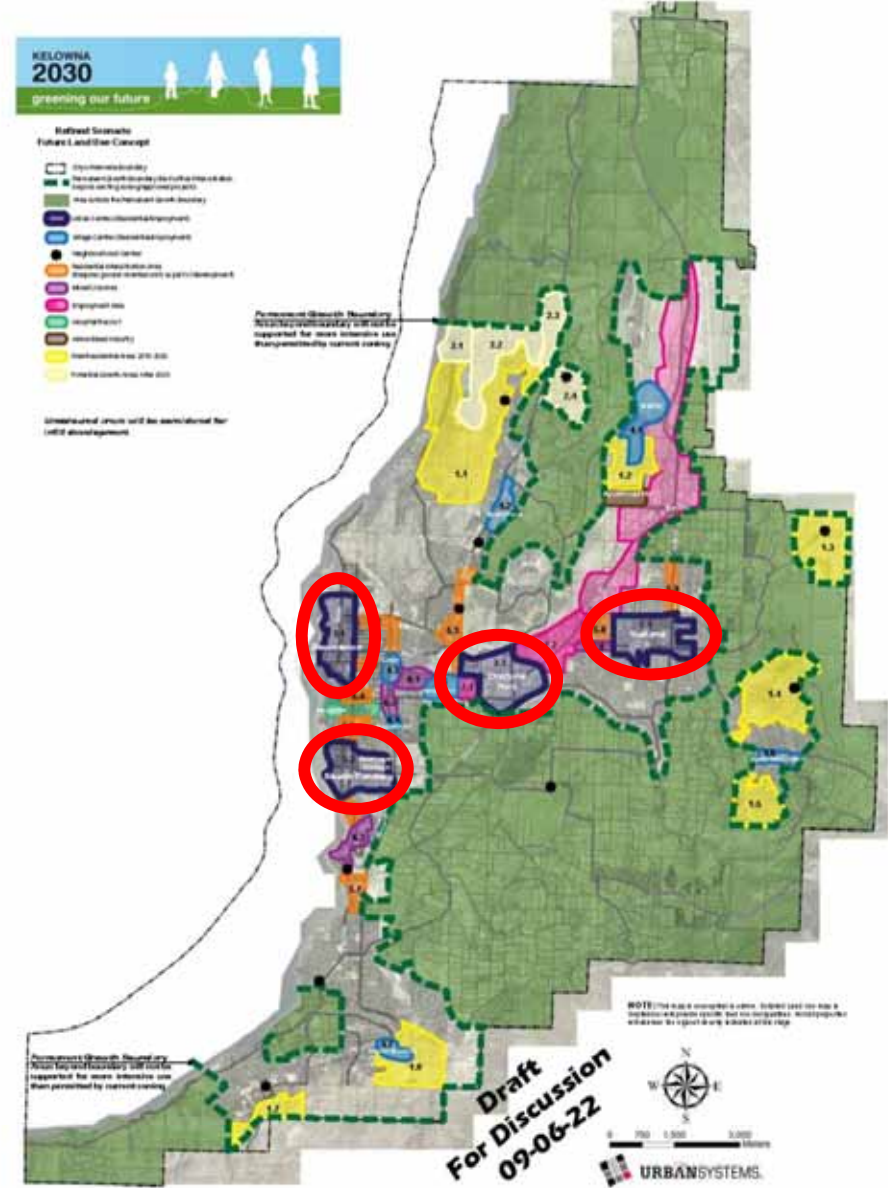
- Leading local renewable energy companies
  - & local environmental industry alliance
- Kelowna won “Solar Community of 2008” award
- Developers able to obtain rebates for solar hot water on new single-family developments
  - Offered through FortisBC PowerSense & SolarBC





# District Heat Opportunities

- The 4 urban centres:
  - City Centre
  - South Pandosy
  - Highway / Orchard Park
  - Rutland
- Plus hospital





# Renewable Energy Sources

- Waste heat sources
  - Industrial, commercial, ice arenas, wastewater treatment plant (WWTP)
- Georexchange
  - Closed, open loop
- Lake
- Biomass
  - Pellet producers in West Kelowna, Armstrong, Princeton
- Solar



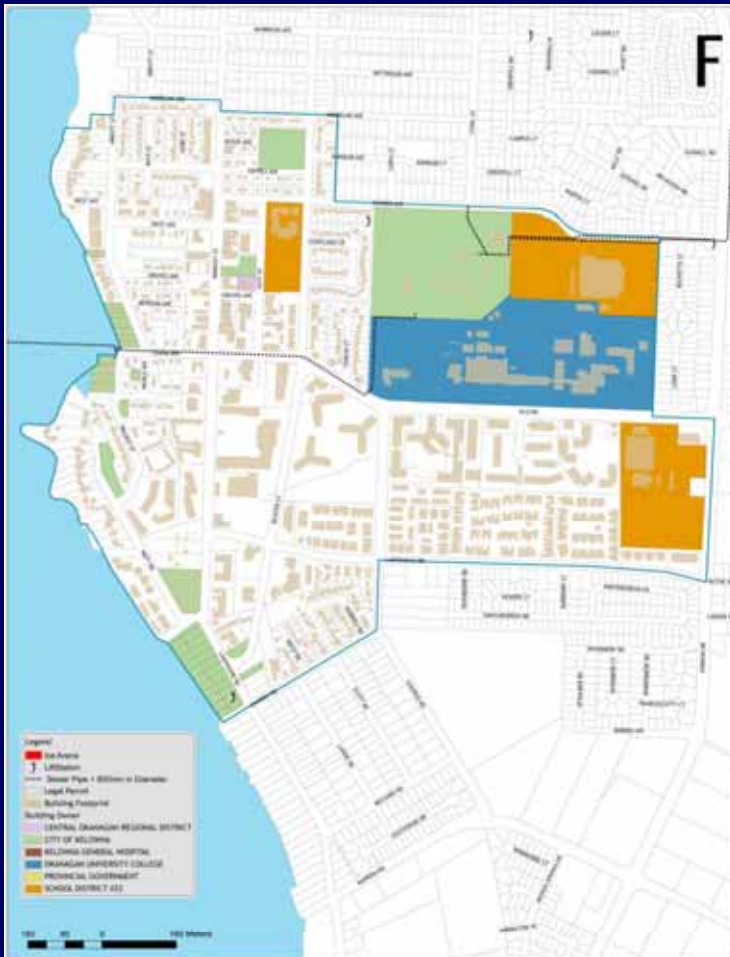
*Okanagan College heat pumps*

# City Centre



Existing Heat Demands	New Construction	Potential Heat Sources
<ul style="list-style-type: none"> <li>• High density res</li> <li>• Commercial</li> <li>• Institutional</li> <li>• Hotels</li> <li>• Industrial</li> <li>• Hospital?</li> </ul>	<ul style="list-style-type: none"> <li>• High density res ~2,300,000 ft<sup>2</sup></li> <li>• Commercial</li> </ul>	<ul style="list-style-type: none"> <li>• Waste heat:               <ul style="list-style-type: none"> <li>- Industrial</li> <li>- Ice arena</li> </ul> </li> <li>• Georexchange</li> <li>• Lake</li> </ul>

# South Pandosy



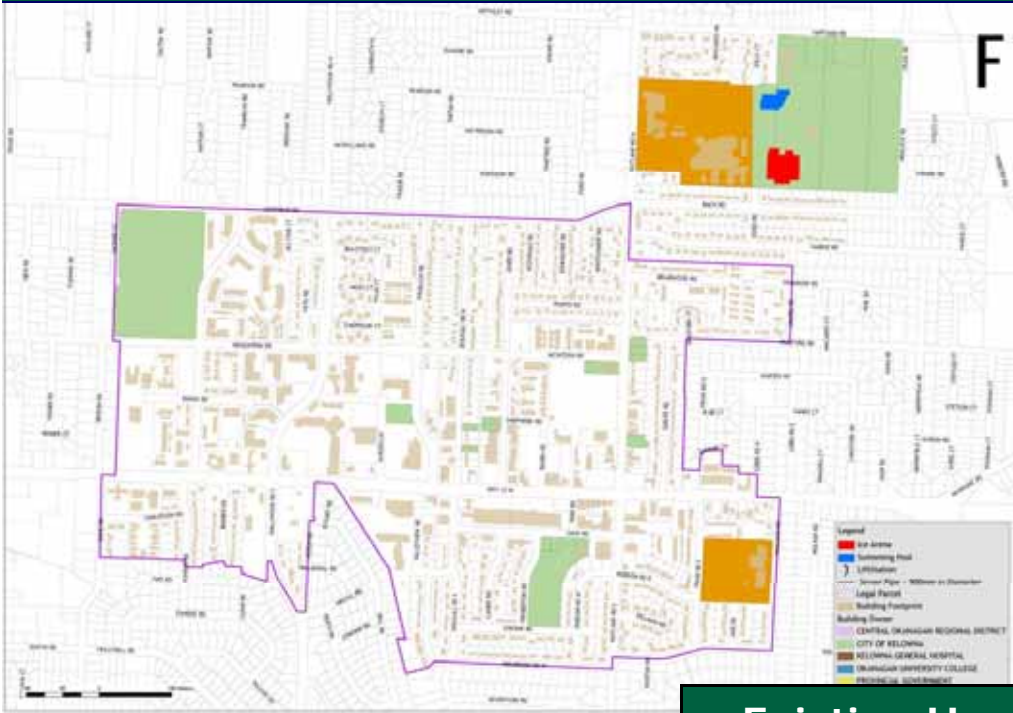
Existing Heat Demands	New Construction	Potential Heat Sources
<ul style="list-style-type: none"> <li>• High density res</li> <li>• Commercial</li> <li>• Schools</li> <li>• Hospital?</li> </ul>	<ul style="list-style-type: none"> <li>• High density res ~ 1,000,000 ft<sup>2</sup></li> <li>• Commercial</li> </ul>	<ul style="list-style-type: none"> <li>• WWTP waste heat</li> <li>• Geoexchange</li> <li>• Lake</li> </ul>

# Hospital Area



Existing Heat Demands	New Construction
<ul style="list-style-type: none"> <li>•Hospital 500,000 ft<sup>2</sup> + 400,000 ft<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Not substantial</li> </ul>

# Rutland



Existing Heat Demands	New Construction	Potential Heat Sources
<ul style="list-style-type: none"> <li>• High density res</li> <li>• Commercial</li> <li>• Schools</li> <li>• Recreation Centre</li> </ul>	<ul style="list-style-type: none"> <li>• High density res ~1,500,000 ft2</li> <li>• Commercial</li> </ul>	<ul style="list-style-type: none"> <li>• Geoexchange:               <ul style="list-style-type: none"> <li>- Closed or open</li> </ul> </li> <li>• Ice arena waste heat</li> </ul>

# Highway / Orchard Park



## Existing Heat Demands

- High density res
- Commercial
- Schools
- Recreation Centre

## New Construction

- High density res  
~2,000,000 ft<sup>2</sup>

## Potential Heat Sources

- Geoexchange:
  - Closed or open
- Waste heat:
  - Commercial
  - Data centre

# Questions for Work Groups

- **Technical viability:** *Does heating and cooling supply match demand? How can viability be improved? What risks do we need to mitigate?*
- **Financial viability:** *Based upon other relevant examples, is DE likely to be financially viable given the energy sources and infrastructure requirements? What are options for improving financial viability?*
- **Policy, regulatory, and incentives:** *What could Kelowna put in place to require or encourage adoption?*
- **Risks:** *What are they, and how can we mitigate them?*
- **Strategies for existing buildings**
- **Identify key data gaps**