The Opportunity and Need for Renewables in Heritage Buildings

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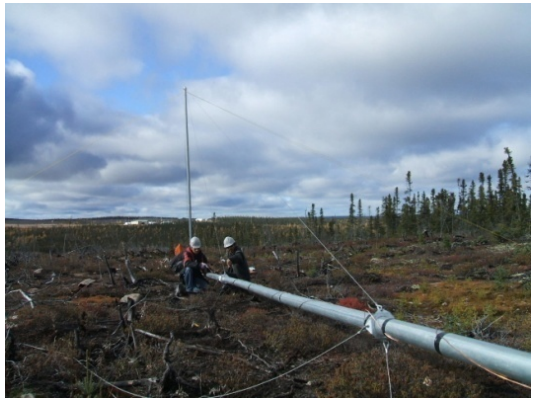
Presentation Outline

- Climate change challenges
- The need for heritage buildings to be a part of the solution
- Opportunities
  - Efficiency, CHP, Solar, etc
- Heritage buildings as a showcase for clean energy
  - Edmonton's Whyte Ave project – goals, partners and progress to date
- Ontario's Green Energy Act

About Tim

- Professional Engineer
- Director of renewable energy and energy efficiency research
- M.Sc. research on ice adhesion to wind turbine blades
- Ph.D. research on remote wind power



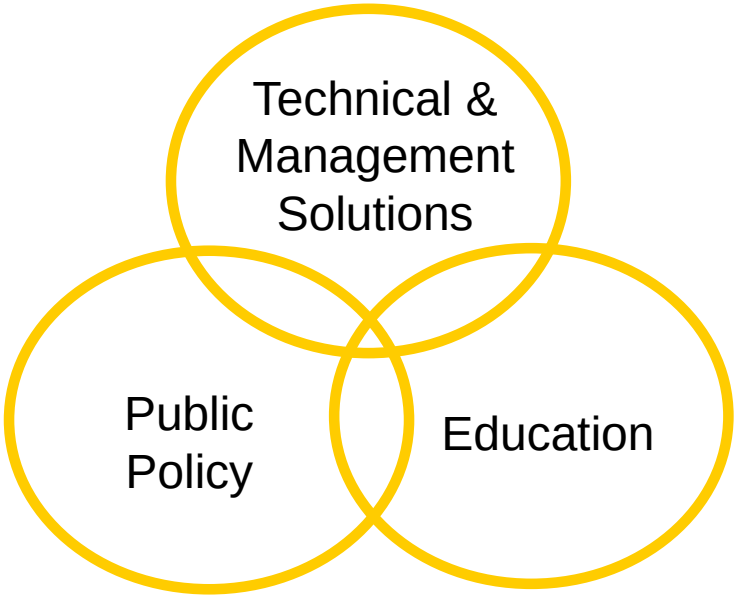
About Pembina

The Pembina Institute is a *Sustainable Energy Think Tank* with the goal of:

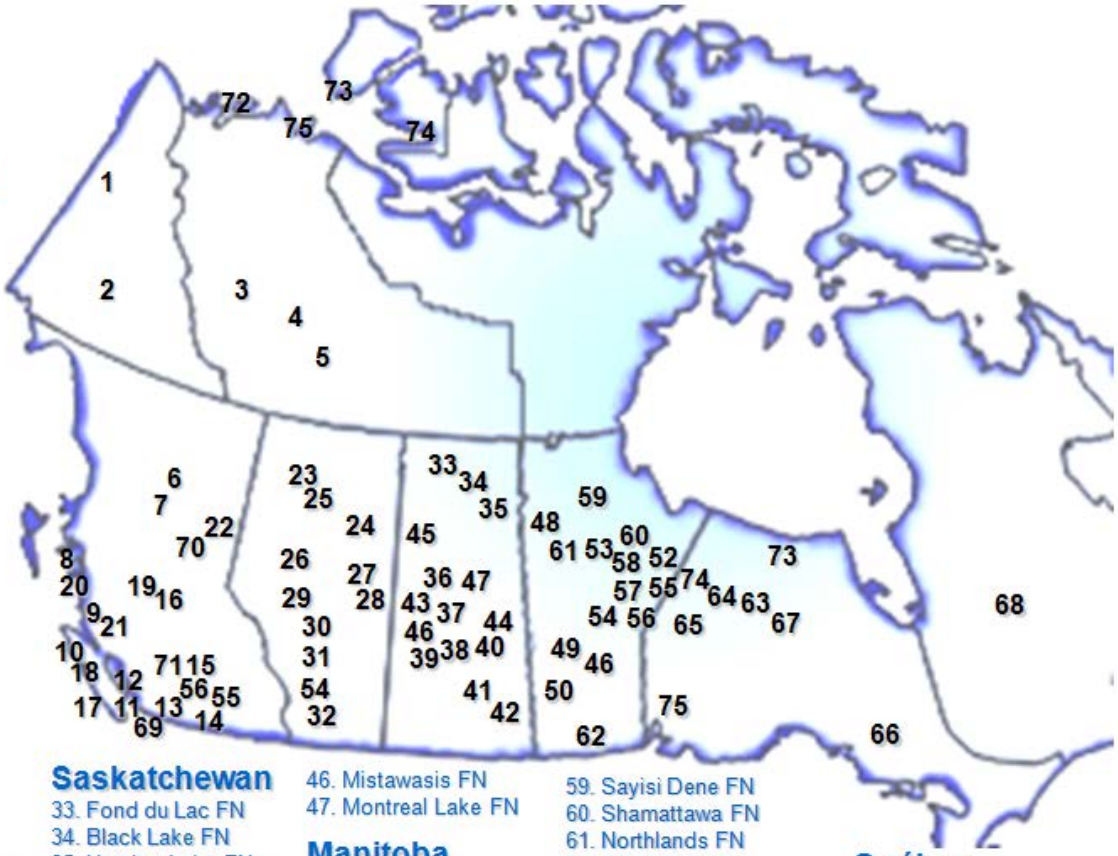
"advancing sustainable energy solutions through research, education, consulting and advocacy."

- Non-profit
- Independent
- Non-partisan

Offices:
Gatineau, Toronto, Calgary, Canmore, Drayton Valley, Edmonton, Vancouver, Yellowknife



Communities Program



Yukon
1. Old Crow
2. Pelly Crossing

British Columbia
6. Kwadacha FN
7. Tsay Keh FN
8. Gitga'at FN
9. Oweekeno FN
10. Ka:'yu:'k't'h' / Che:k:tles7et'h' FN
11. Hupacasath FN
12. Bowen Island
13. Tsleil-Waututh FN
14. Douglas FN
15. Xeni Gwet'in FN
16. Quesnel
17. Uchucklesaht FN
18. Ehattesaht FN
19. Kluskus FN
20. Kitasoo FN
21. Tsawatanaieuk FN
22. Dawson Creek
55. Skatin FN
56. Samahquam FN
69. Abottsford
70. Hudon's Hope
71. Salmon Arm

Alberta
23. Little Red River Cree FN
24. Chipewyan Prairie FN
25. Tallcree FN
26. Driftpile FN
27. Beaver Lake FN
28. Kikino Metis Settlement
29. Alexander FN
30. Enoch FN
31. Samson FN
32. Blood FN
54. Tsuu T'ina FN

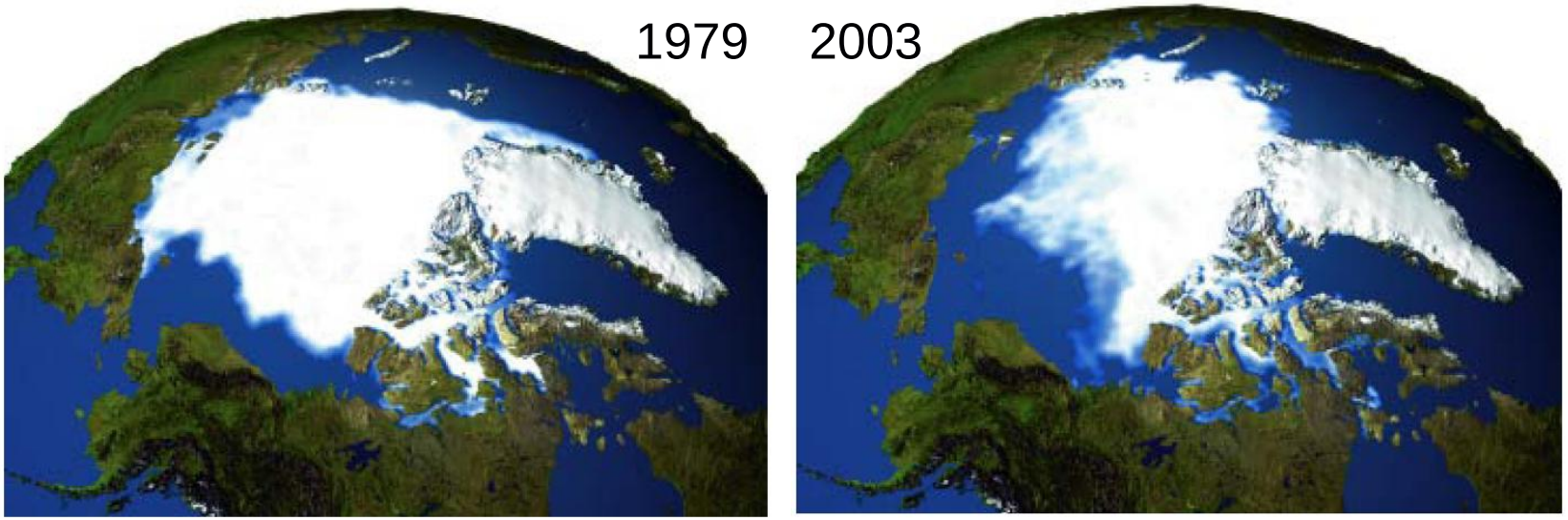
Saskatchewan
33. Fond du Lac FN
34. Black Lake FN
35. Hatchet Lake FN
36. Waterhen FN
37. Ahtakakoop FN
38. Beardy's and Okemasis FN
39. Red Pheasant FN
40. James Smith FN
41. Gordon FN
42. Cowessess FN
43. Flying Dust FN
44. Kinistin FN
45. Birch Narrows FN
46. Mistawasis FN
47. Montreal Lake FN

Manitoba
48. Barren Lands FN
49. Skownan FN
50. Rolling River FN
51. Peguis FN
52. Manto Sipi FN
53. Bunibonibee FN
54. Wasagamack FN
55. Red Sucker Lake FN
56. St. Theresa Point FN
57. Garden Hill FN
58. God's Lake FN
59. Sayisi Dene FN
60. Shamattawa FN
61. Northlands FN
62. Swan Lake FN

Ontario
63. Wapekeka FN
64. Kitchenuhmaykoosib Inninuwug FN
65. Keewaywin FN
66. Pic Mobert FN
67. Kasabonika Lake FN
73. Weenusk, FN
74. Muskrat Dam, FN
75. North Spirit Lake, FN

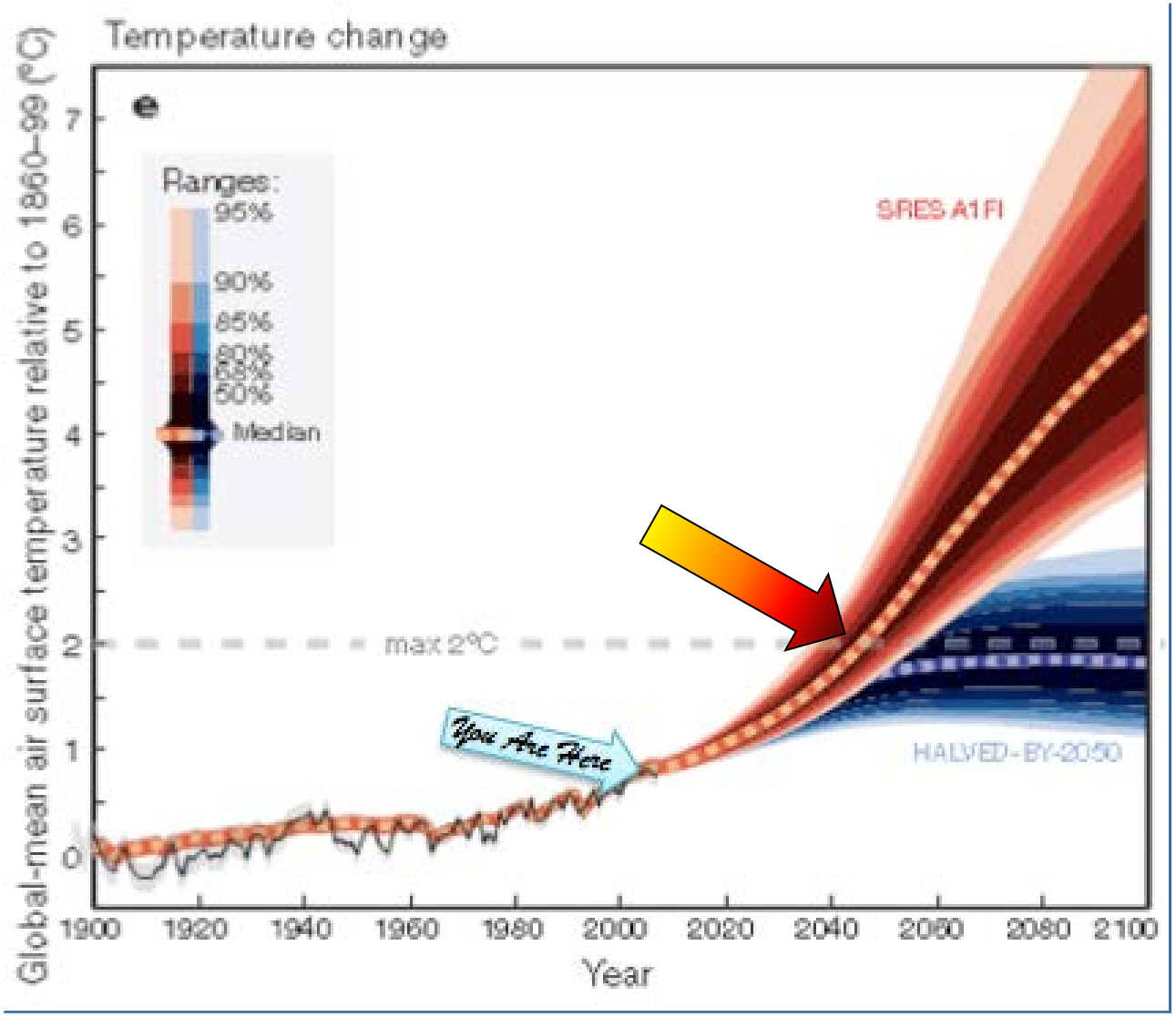
Québec
68. Nemaska FN

NWT
3. Norman Wells
4. Wha Ti
5. Yellowknife
72. Tuktoyaktuk
73. Sachs Harbor
74. Uluhuktuk
75. Paulatuk



The majority of scientific models and predictions to date have ***under-estimated*** the scale and pace of warming we are ***already*** seeing

2C “safe” limit



Responsibility as a Canadian

- Per Capita Emissions (t_{CO2}/year)
  - USA – 20.4
  - Canada – 19.0
  - Australia – 16.3
  - Germany – 9.8
  - Sweden – 6.5
  - China – 4.1
  - India – 1.1
  - Bangladesh – 0.3

  - Global ‘safe’ limit – 1.2

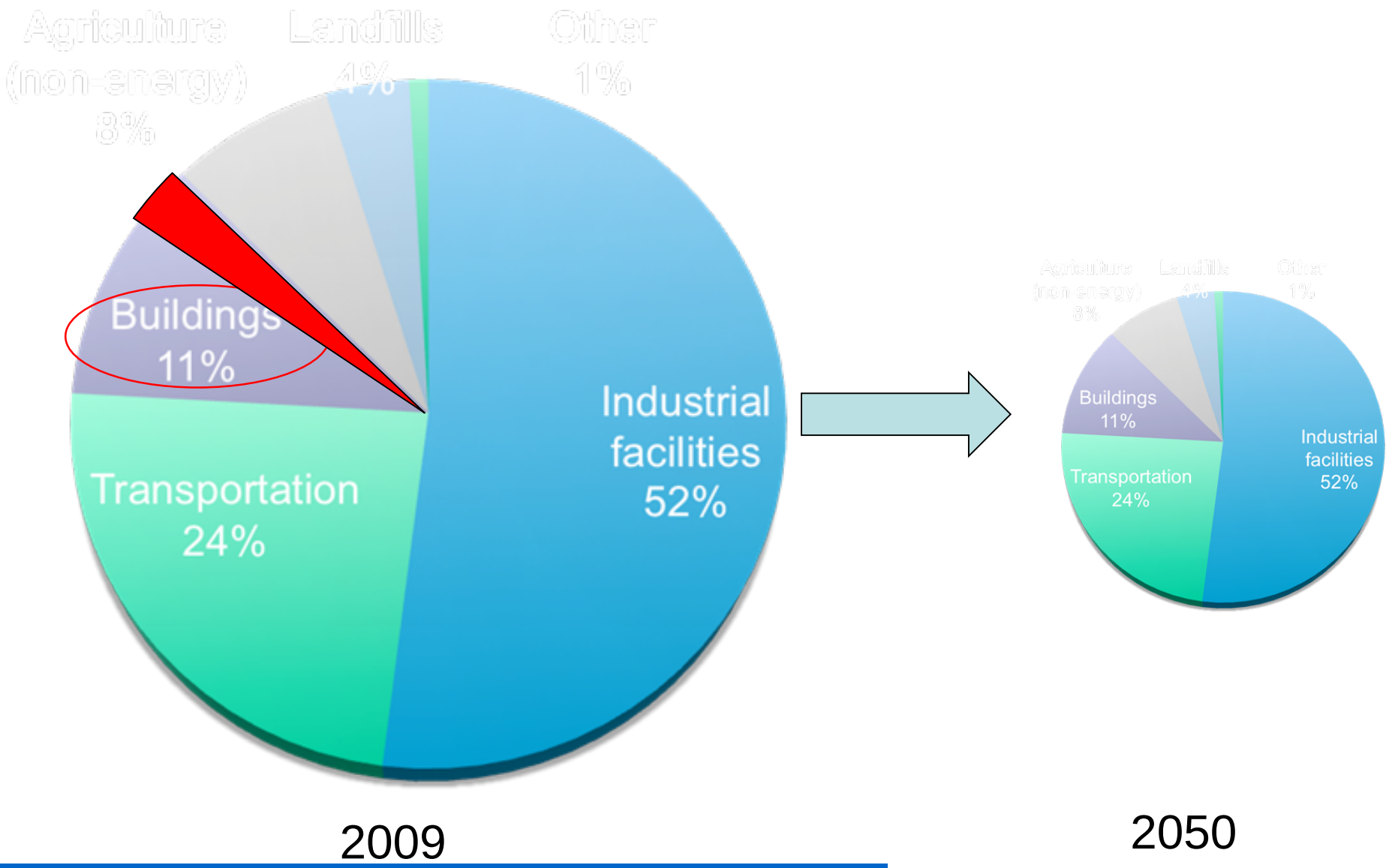
Source: US Department of Energy Information Administration

- Canada is among the top 10 global emitters – both per capita AND in absolute

Where are we now?

- Canada is reviewing its national approach
  - Three plans in three years
  - Emissions on significant upward trend
  - Cap and trade system?
- Current Federal target of just 3% below the 1990 level by 2020
  - Kyoto goal was 6% below 1990 by 2012
- IPCC shows that we need serious emissions reductions very soon or it will be too late:
  - global peak within 10-15 yrs,
  - Canada needs to be 25-40% below 1990 levels by 2020

Emissions in Canada

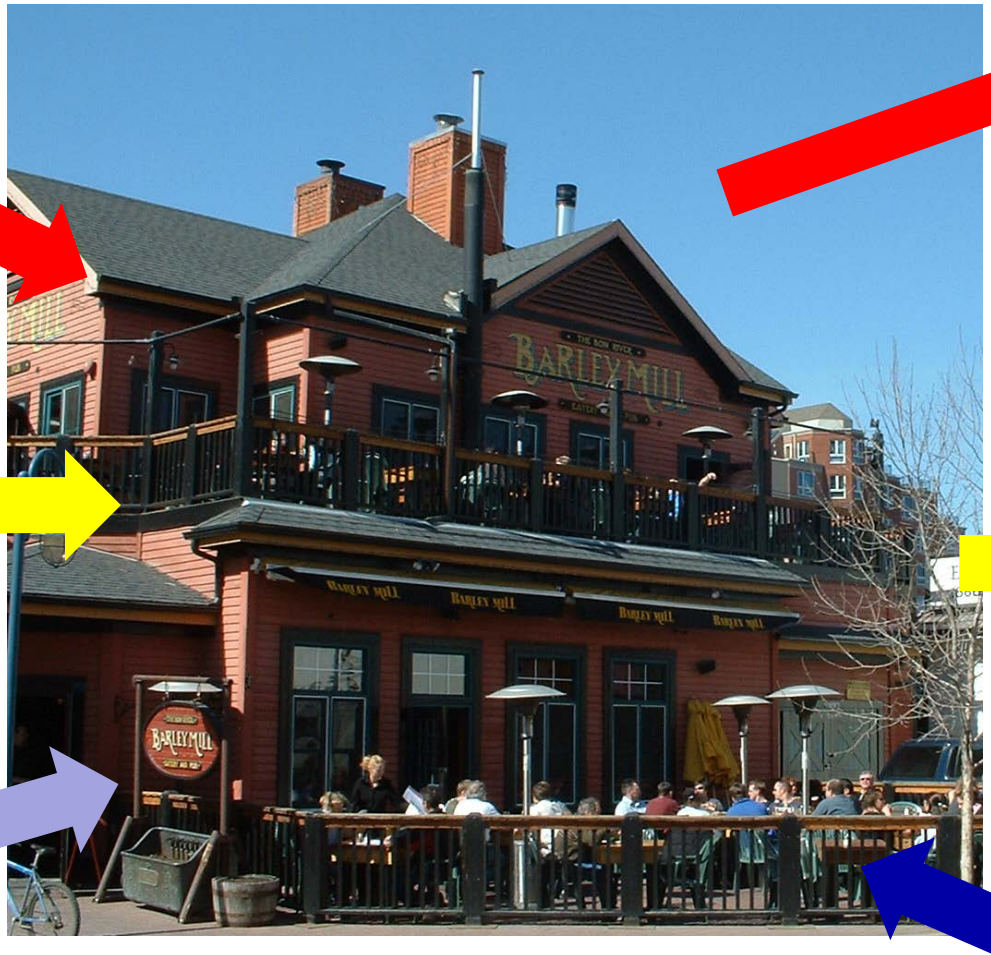


2009

2050

Source: http://climate.pembina.org/docs/canadas-ghg-emissions.html

Savings opportunities



Heating

Electricity

Cooling

Envelop Efficiency

Electricity out!

Hot Water

Savings opportunities

- Building efficiency
  - Insulation
  - Windows
  - Operations
- Heating source
  - High efficiency furnace
  - Ground source heat pump
  - District heating
  - Combined heat and power
- Buying Green power

Savings opportunities

- Hot Water
  - Solar hot water
  - High efficiency boilers
- Electricity generation
  - Combined heat and
  - Solar photovoltaics

When is a building not worth saving?

- Savings need to be targeted at 50-80% reductions
  - Is this achievable?
  - What features of the building needs to be preserved?
  - What ones can be retrofitted?
  - What role can on-site generation play?
- Embodied energy can be 5-15 years of heating energy
  - May/may not be enough to justify avoiding major reconstruction
- Opportunity to use as a showcase?

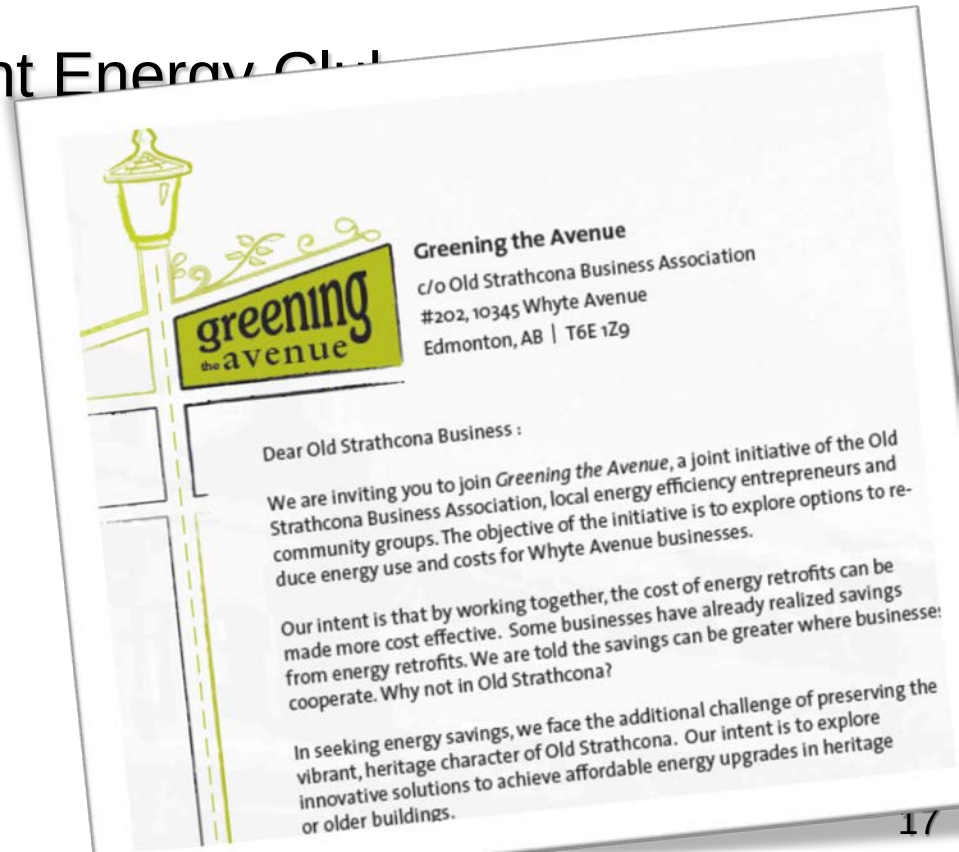
Location, location, location

Photo: Toronto Renewable Energy Co-op

Whyte (82nd) Avenue - Edmonton

- Old Strathcona
- Buildings dating from 1891
- Tourist destination
- Night life
- Farmer’s market
- Pedestrian stores
- “Blue mile”

- Old Strathcona Business Association
- Old Strathcona Foundation
- City of Edmonton (CO2RE)
- University of Alberta Student Energy Club
- City of Edmonton
- EcoAmmo
- Carbon Busters
- Sustainable Works
- Solar Energy Society
- Pembina Institute
- Linda Duncan, Federal MP



Greening the Ave Association

- Look at accessible examples of what can be done:
  - reduce their carbon footprint
  - increase their energy savings
  - showcase opportunities in highly visible and busy public area
  - economies of scale opportunities
  - spin-off opportunities – LED Xmas lights
  - “certify” (recognize) participating businesses

Greening the Ave

- Scoping meeting – July 2009
- Partnership – August 2009
- Public meeting – Fall 2009
- Questions being discussed:
  - What constitutes recognition?
  - Levels of participation?
  - Technologies to be showcased? Where?
  - Seeking financial support
  - How owners and tenants can make win-win investments?

Barriers to renewables on buildings

- Legality
  - City bylaws
    - Zoning for electricity/heritage status
  - Navigating various provincial electricity laws
- Business case
  - *Ontario's Green Energy Act*
    - Feed-in Tariff unique in Canada
- Diminished urban resources
  - Turbulence, Shading

Barriers to renewables on buildings

- Access/Orientation
  - South facing roof/façade
  - Ability to access the ground
- Human capacity
  - Quantifying resource
  - Selecting appropriate technology
    - Selecting high quality supplier
    - Selecting high quality installer
  - Proper O&M training
- Financing

Ontario's Green Energy Act

- Canada's most progressive renewable energy law
- Enables access to the grid
- 20-year guaranteed contracts for production
  - 80 ¢/kWh for rooftop solar less than 10 kW
- Combined heat and power & solar hot water not included
  - 2 year review?
- www.powerauthority.on.ca/fit

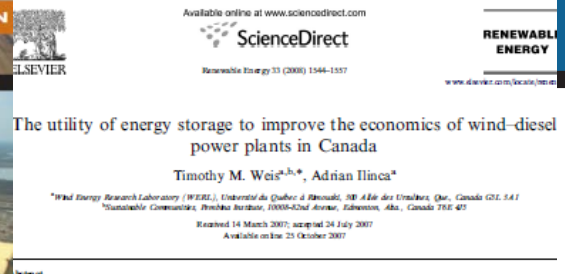
Conclusions

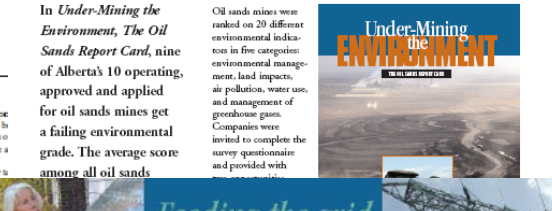
- Heritage buildings need to be a part of solution
- Major reductions required likely go beyond embodied energy in most cases
- Balancing the preservation of heritage look/use with future energy realities
- Renewables can play an important role in helping buildings become net zero, or even producers
  - Need the right policies
  - Need to understand the technology options and realities

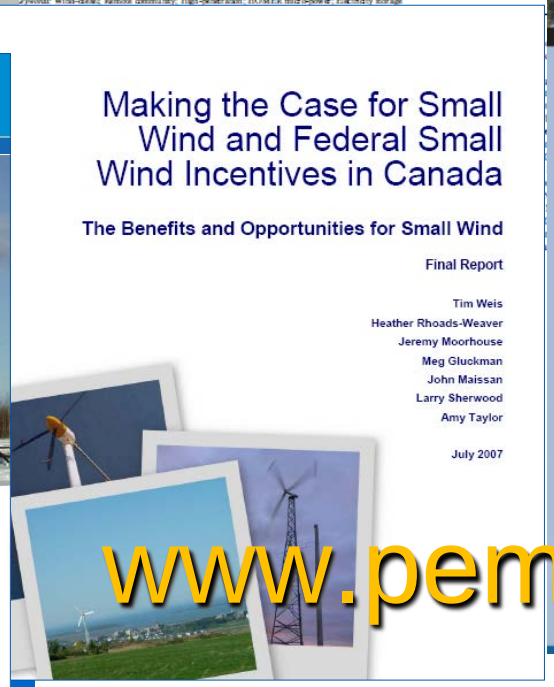
Conclusions

- “I skate to where the puck is going to be…” – Wayne Gretzky

Thank You







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