

A photograph of sunlight filtering through a dense canopy of trees, creating a dappled light effect. The sun is positioned in the lower center, with rays of light spreading upwards and outwards, illuminating the leaves and branches. The overall tone is warm and hopeful, with a mix of bright yellow and orange light against a dark background of green and brown foliage.

2020 Foresight: Building a Better Tomorrow Begins Today!

British Columbia Building Envelope Council

Annual General Meeting

K.D. Pressnail

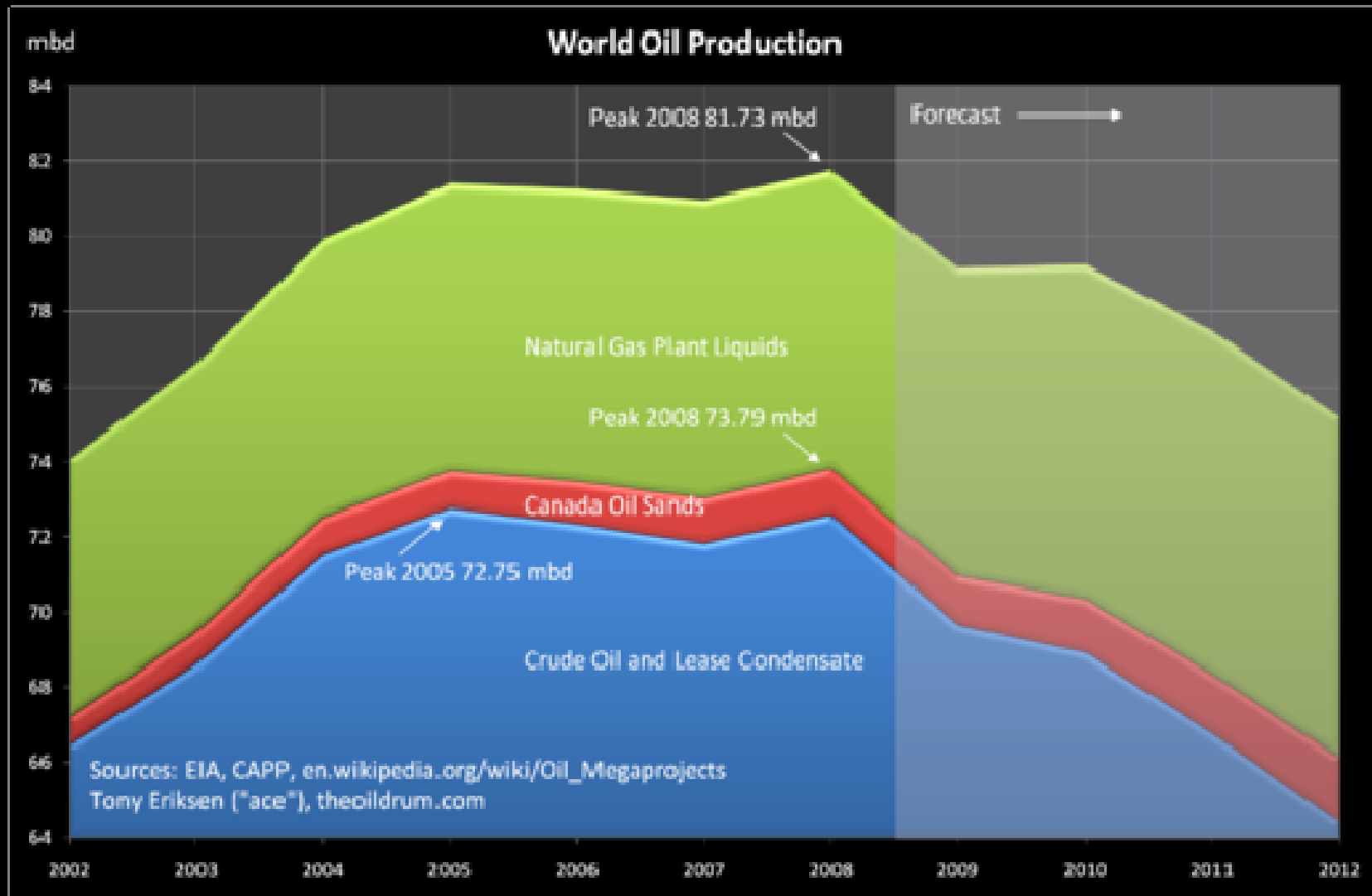
September 22, 2009

Back to the Future...

Imagine the World in 2020?

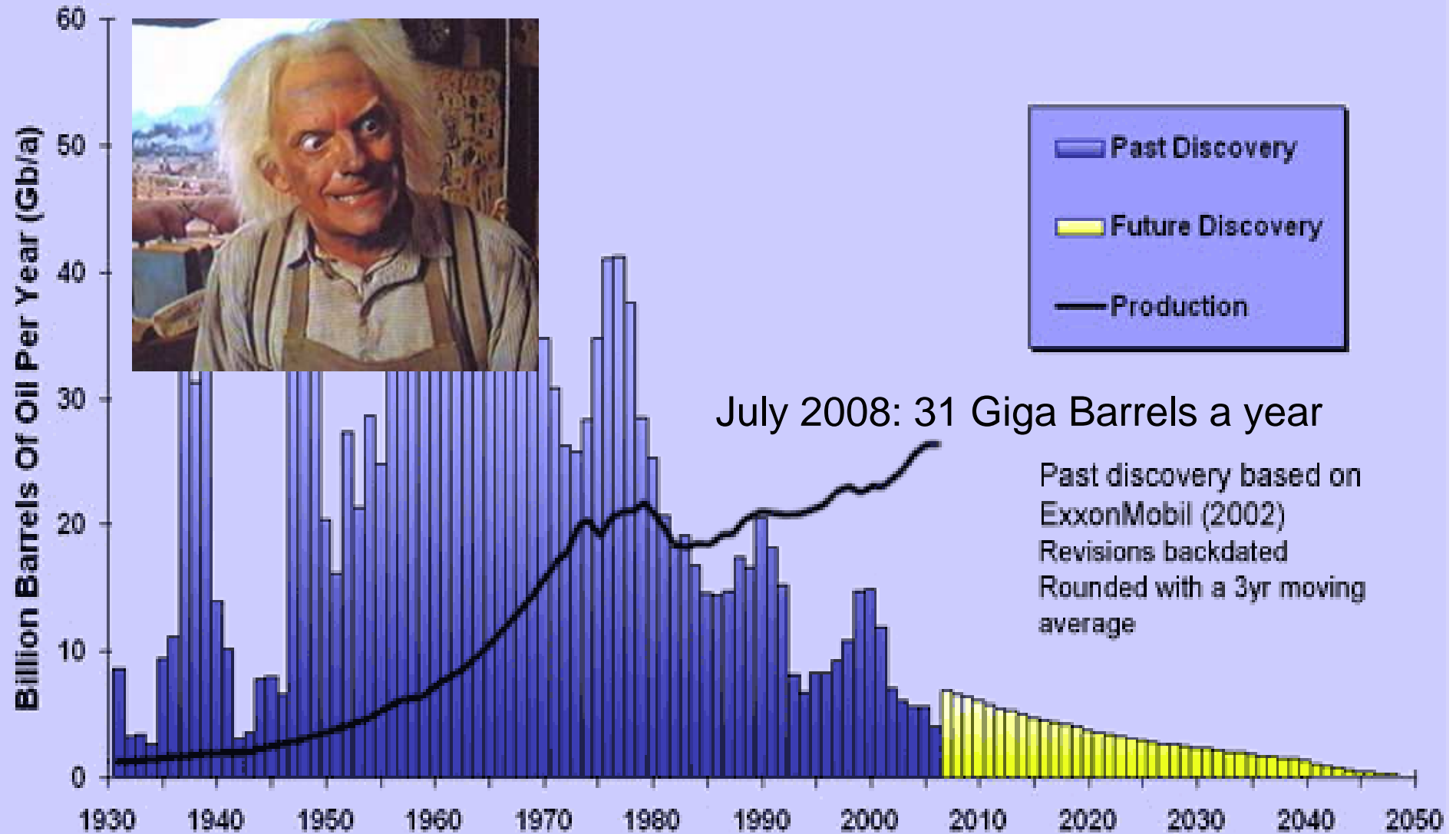


World Oil Production Profiles



THE GROWING GAP

Regular Conventional Oil: Discovery & Production



GAS

UNLEADED

LOL $\frac{9}{10}$

PLUS

OMG $\frac{9}{10}$

PREMIUM

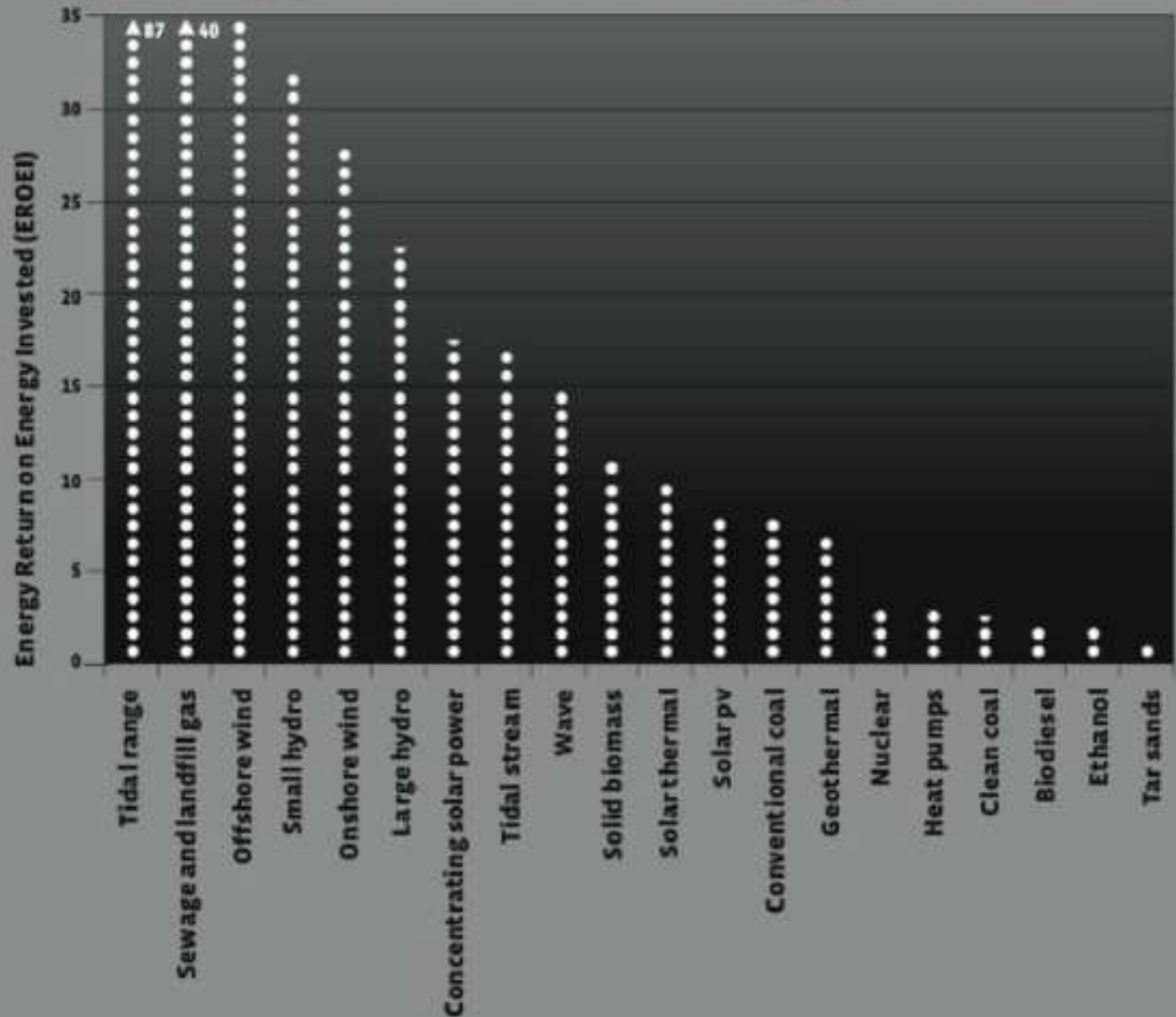
WTF $\frac{9}{10}$

Courtesy:
Greg Allen
P.Eng. 2008

Designer of
“Responsible
Buildings”

See
“Engineering a
Post Carbon
World”

Energy return on energy invested



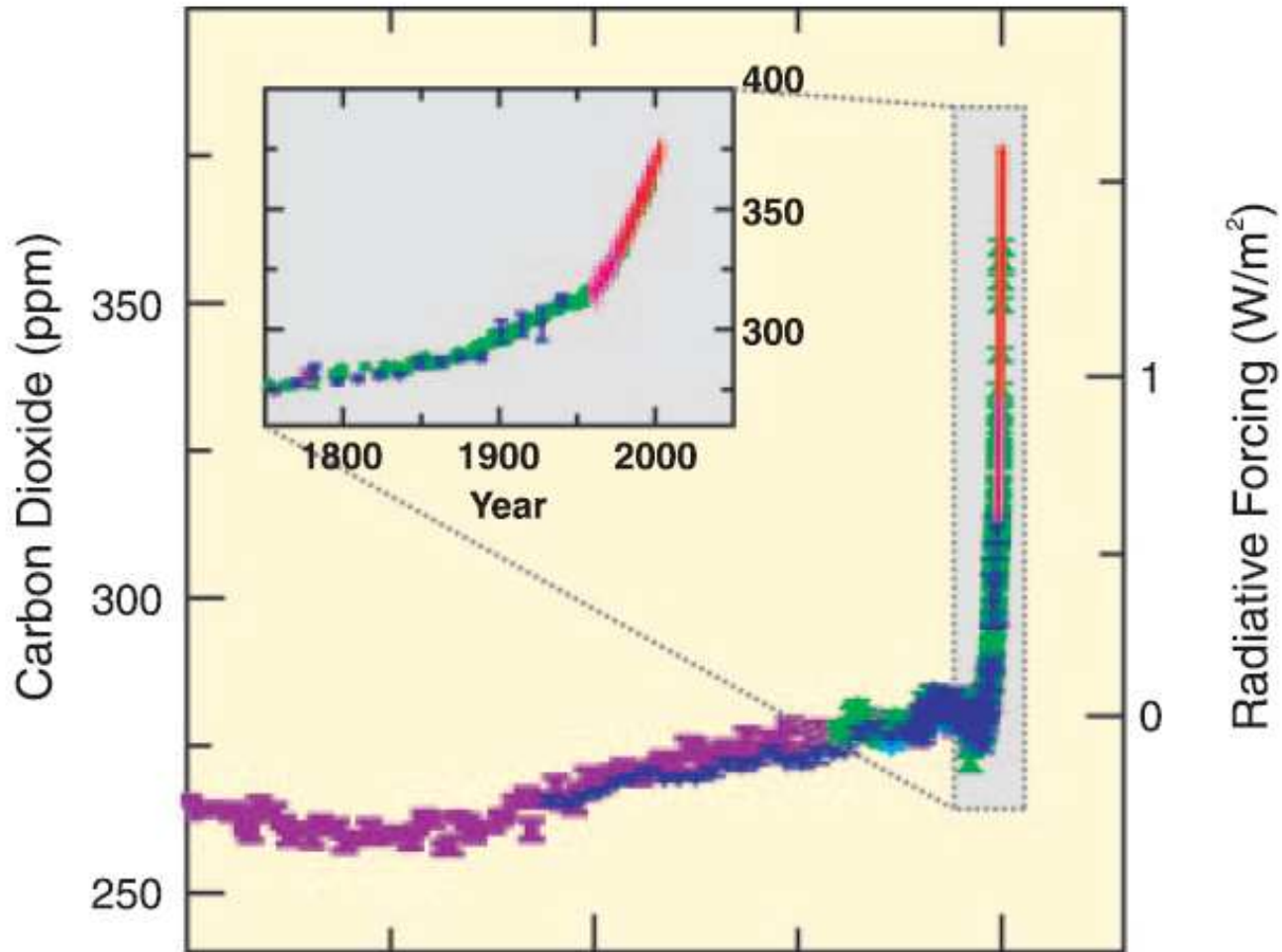


Science Fiction so far...



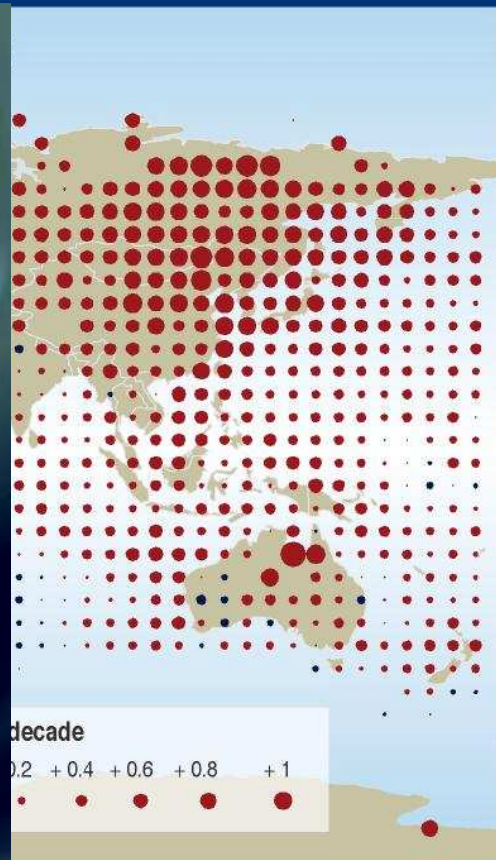
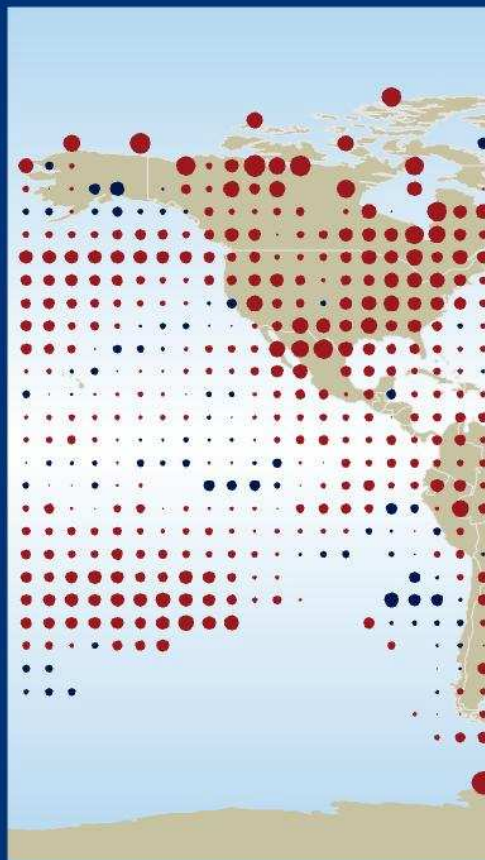
Conclusion? Besides flux capacitors and the sun, there are no saviour energy sources ... yet!

Changes in GHGs from ice core and modern data



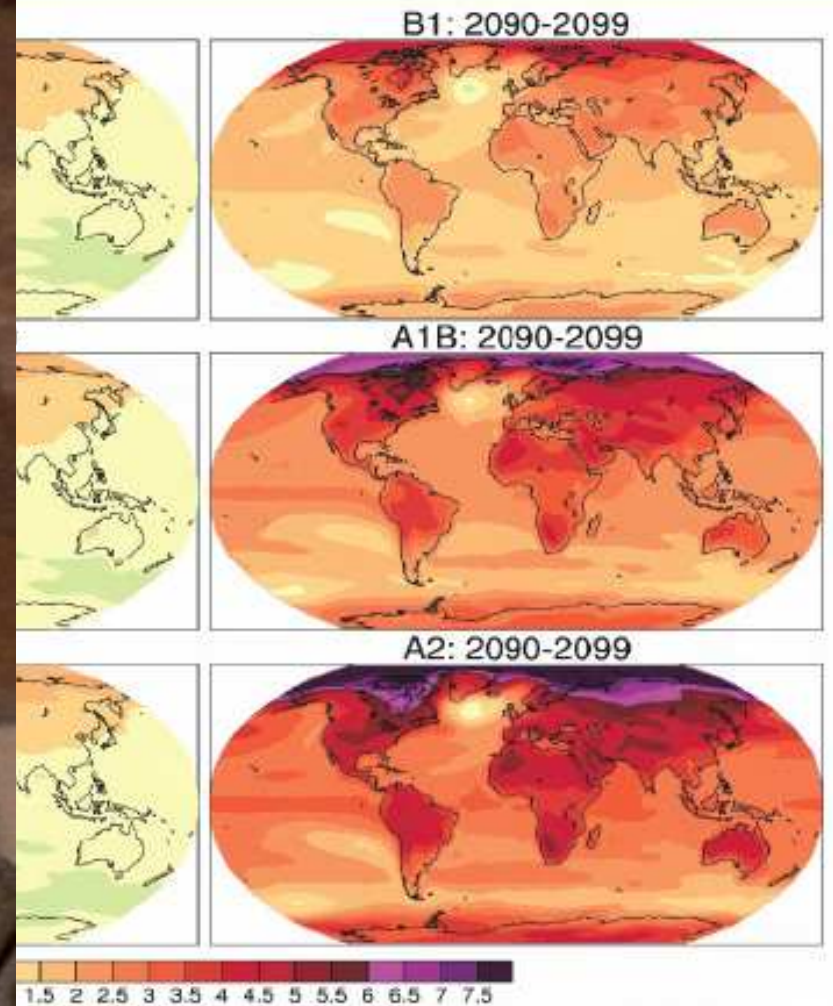
CO2 Levels from 10,000 years ago to 2005!





SYR - FIGURE 2-6b

Projections of Future Changes in Climate





SET DATE: August 13, 1941



August 13, 1941: Muir Glacier, Alaska. Photo by W.O. Field

SET DATE: August 31, 2004



Muir Glacier, Alaska, August 31, 2004, photo by B.F. Molnia

Sometimes people act like they're
the only life on the planet...



Blind to Science*?

“84% of Scientists agree that human activity is responsible for global warming...”

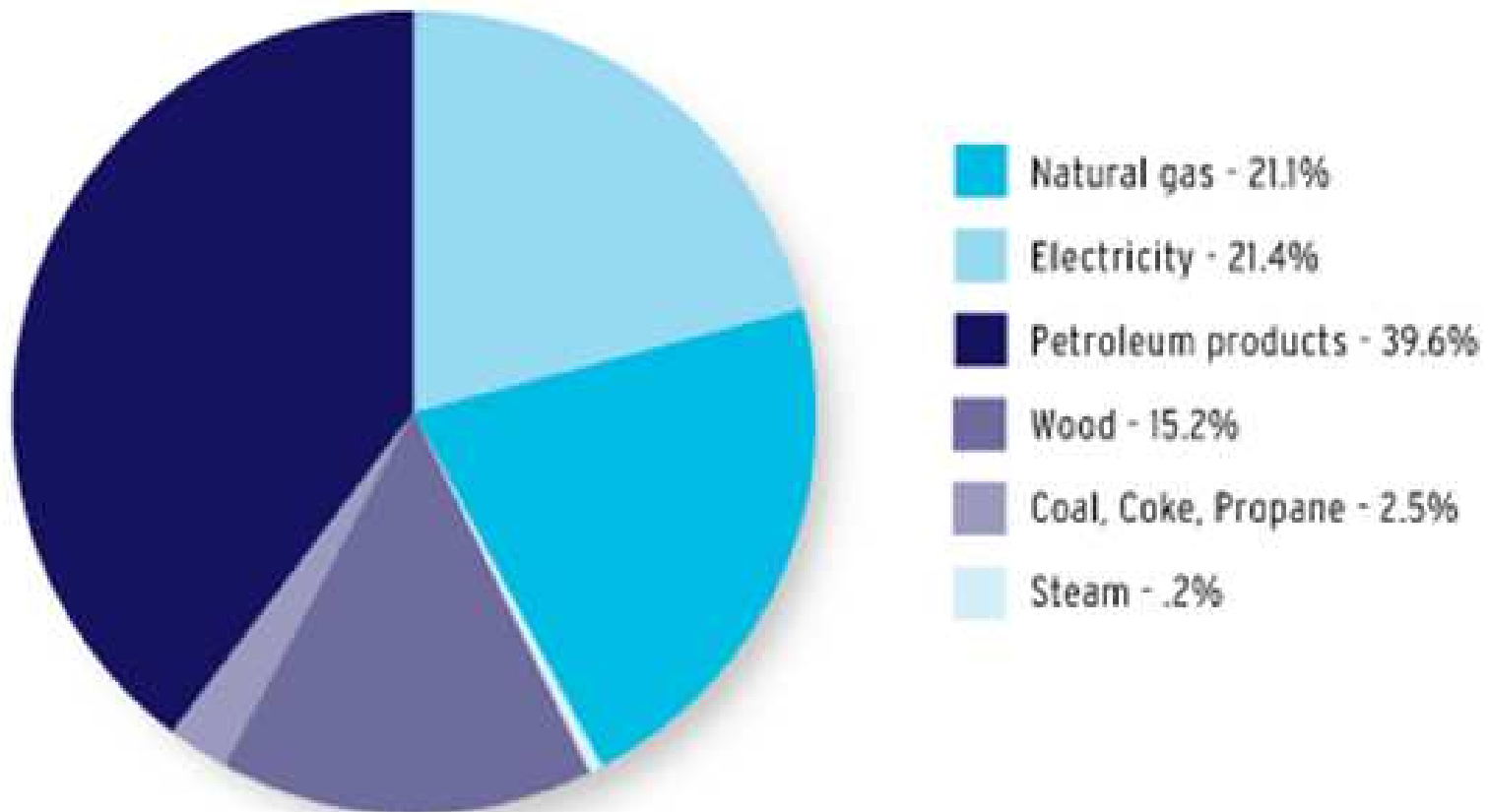
“49% of ‘ordinary Americans’ agree that human activity is responsible for global warming...”

* Pew Research Centre for People and the Press and the American Association for the Advancement of Science as cited in Globe and Mail's Green Living Magazine, Sept. 14, 2009

Time for a Low-Carb Diet?



Annual energy consumption in BC



Source: Natural Resources Canada Office of Energy Efficiency; Energy Statistics and Analysis, Energy Use and Consumption Database for B.C.

Imagine British Columbia with 1/3 of the energy...

Long Distance Travel?

Heating/Cooling?

Commuting?

Hot water?

Shopping?

Food?

Shelter?



“Peak Everything: Waking Up to a Century of Declines”

Richard Heinberg

In addition to Oil and Natural Gas, globally we're approaching peaks:

- 1) **copper**,
- 2) **phosphorous**,
- 3) **fish** catches,
- 4) **grain** production,
- 5) per capita **fresh water**,
- 6) **uranium** to name but a few ...

“This is no coincidence. We have been consuming the world's resources at an unprecedented rate.”

“Hot, Flat and Crowded”

by Thomas L. Friedman

- Climate change & rising competition for energy – interrelated crises that could poison our world if we do not act quickly and collectively...
- Geo-greenism:
 - needed to save the planet from overheating;
 - needed to make America healthier, richer, more innovative, more productive, and more secure in the coming “Energy-Climate Era”.

According to Friedman, our response so far:

“We’re not having a ‘Green Revolution’...
...we’re having a ‘Green Party!’”



Magna Founder, Frank Stronach:

“Look for God’s sake, time is running out!” *Globe and Mail* April 26, 2005

... speaking of the embattled domestic automobile industry, rising oil prices and the reliance on full sized SUV’s as a main profit centre.

December 2008:

Magna to close 3 plants:

(2 in Aurora On. and 1 in Sydney N.S.)

June 2009: GM goes bankrupt!



What got us to 2009?

- Selfish, short term thinking! Look what it did for GM, Chrysler, U.S. Banks...our planet?



Change is taking place!





Obama's Inaugural Address!

January 20, 2009

And to those nations like ours that enjoy relative plenty, we say we can no longer... consume the world's resources without regard to effect.

...each day brings further evidence that the ways we use energy strengthen our adversaries and threaten our planet.

What is required of us now is a new “Era of Responsibility”.



The New Era of Responsibility?

- Riding the Energy Descent: Terzakian ...another oil spike on the horizon as the economy recovers – likely a return to triple digit oil prices.”

Macleans June 8, 2009 “Energy Shock and Oil Myths”

- The Green Revolution gathers “Renewable Energy”?



The Upside of the new “Era of Responsibility”?

According to Jeff Rubin (Former Chief Economist at CIBC):

- Manufacturing jobs will return home...
- Suburbs will be reclaimed by farms for local food production
- We may be energy poor, but we are innovation rich...

To this I'll add:

- We will have an opportunity to look beyond “Me and Now” and consider the needs of future people too...

2020 Foresight?

- “Energy inefficiency is our greatest failing, but it is also our greatest opportunity for change.”

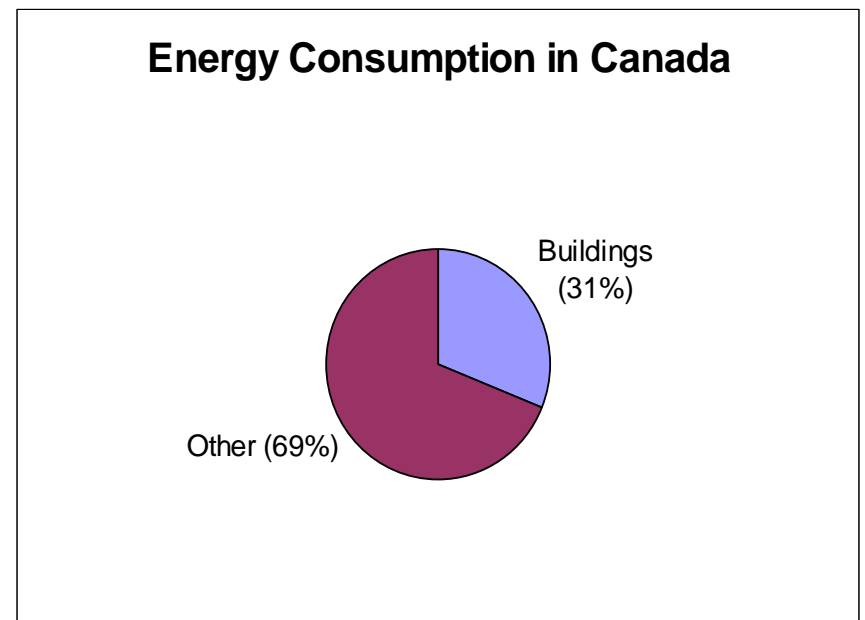
Chief Energy Economist ARC Financial Corp. Peter Terzakian, “The End of Energy Obesity”

- “Today’s energy technologies are a lot like colour TV’s in the 1950’s. They exist, but people don’t have a compelling reason to rush out and buy them - at least not yet...”



Buildings and the “New Era of Responsibility”?

- Buildings account for about 30% of Canada’s total energy use...
- Saving building energy is seen as “the lowest hanging fruit”.
- We already have the technology to build better, more responsibly NOW!



In 2020...wishful thinking

- We'll be serious about reducing greenhouse gases and reducing our carbon footprint...
- We'll be serious about saving energy...
(we won't be able to afford to squander it!)
- Demand management strategies will lead to better buildings...

By 2020 we will...



realize (again!) that is cheaper to save electricity than it is to produce it!

Energy “Upgrades”?

Upgrade Cost, OBC to R2000:	\$5600
Annual Energy Savings:	\$820
Initial Return on Investment:	14%
Annual Carbon Saved:	~ 5t
“NegaWatts” (Peak)	\$920 / kW

Save heating energy or build ...

Capital Costs of Electricity Generation	
<small>The California Energy Commission + Connecticut Integrated Resource Plan CC&C = Carbon Capture and Storage</small>	<i>Capital Cost (US\$/kW)</i>
Nuclear	2000- 5000
Supercritical Coal + CC&S	3500 - 4500
Gas-combined cycle + CC&S	1400- 1600
Gas combined Cycle	850- 950
Fuel Cell	3,500- 10,000
Photovoltaic	4,500- 6,000
Wind Turbine	800- 3,500



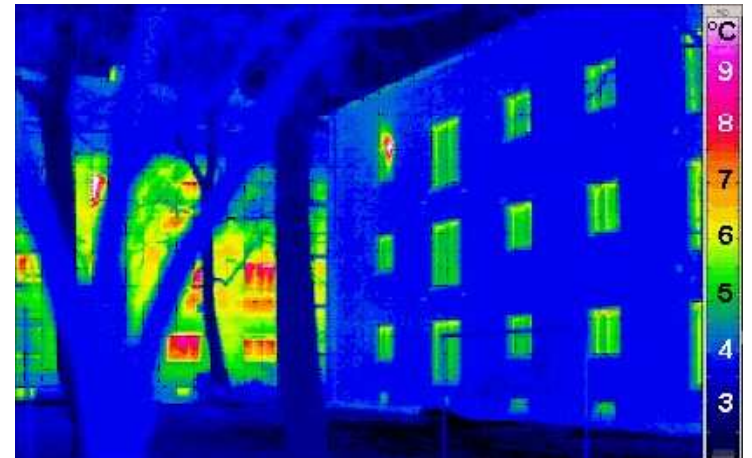
Efficient Electrical use in 2020?

- Fuel switching from hydrocarbons to electricity?
COP's
 - a) ground source heat pumps
 - b) water source heat pumps
 - c) air source using “Clever” designs
- Our buildings will be smarter than the smart meters?
- Monitor and Control Centres?



New Buildings in 2020?

- Today we are still building buildings that should be energy-retrofitted today.
- Fewer than 5% of all buildings built in Canada are energy-efficient...
- Will we do better in 2020?



Consumers in 2020?

- Consumers will change?
- Just as they balked at buying fuel inefficient vehicles in 2008 when gasoline prices rose... Will energy-efficient buildings be worth more in the marketplace?



New Buildings in 2020?

- Will the Building Code require low-energy, low impact buildings?
- Will rating systems recognize the need for low-energy buildings?
- Will we recognize the need to design for 2050... now?



A photograph of sunlight filtering through a dense canopy of trees, creating a dramatic scene of light rays and shadows. The sun is positioned in the lower-left quadrant, casting bright, golden rays upwards and outwards. The leaves are dark and silhouetted against the bright light, creating a high-contrast, textured background. The overall mood is serene and hopeful.

Rays of Hope...

New Buildings

Factor 9 Home: A New Prairie Approach



Figure 1 The Factor 9 Home viewed from the south east. The view is of the back side of the house. The solar thermal panels (1.5 metres tall) are in a horizontal band between the upper and lower windows.

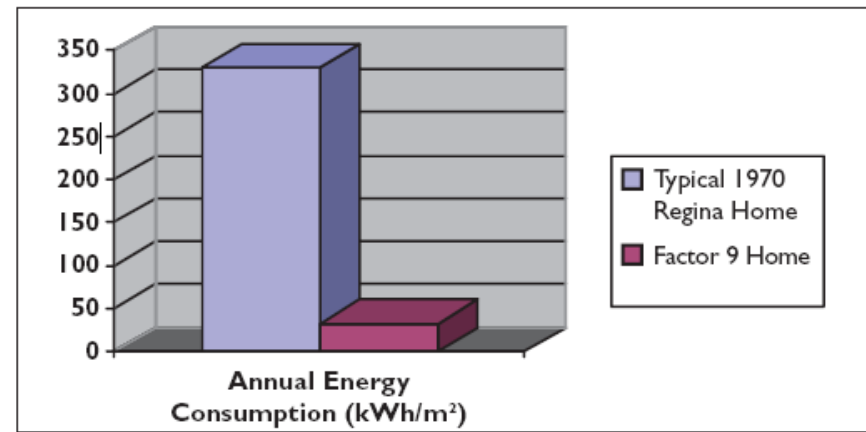


Figure 2 Comparison of the annual purchased energy consumption of a typical 1970 Regina Home with the Factor 9 Home

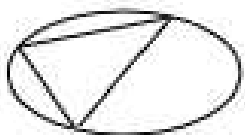
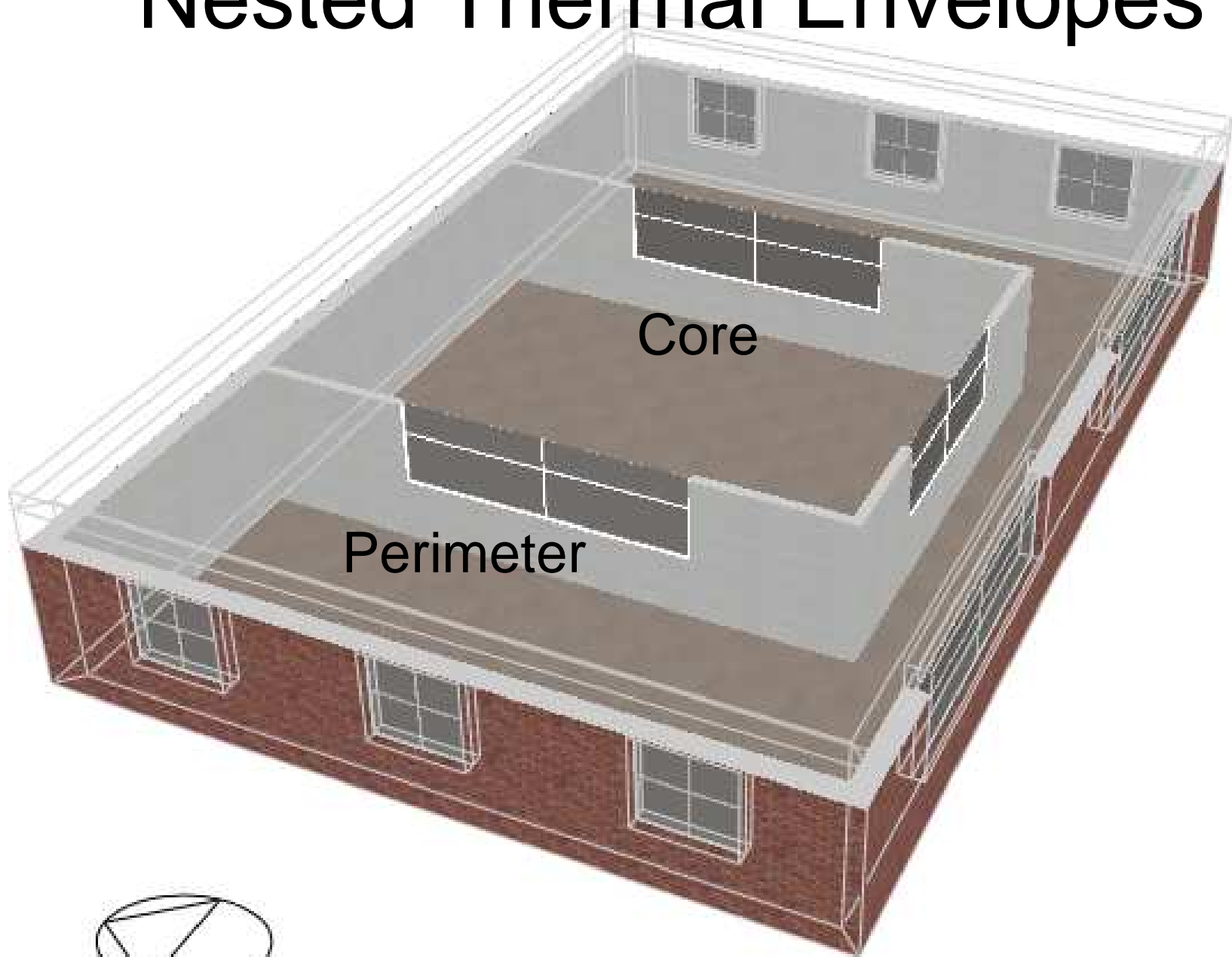
Net-Zero Energy?

- Net-Zero Energy is achievable as energy demands are reduced.
- The technology already exists!
- Several approaches are possible...
- “Gemini”, a “building within a building” is a solution ... one of many.



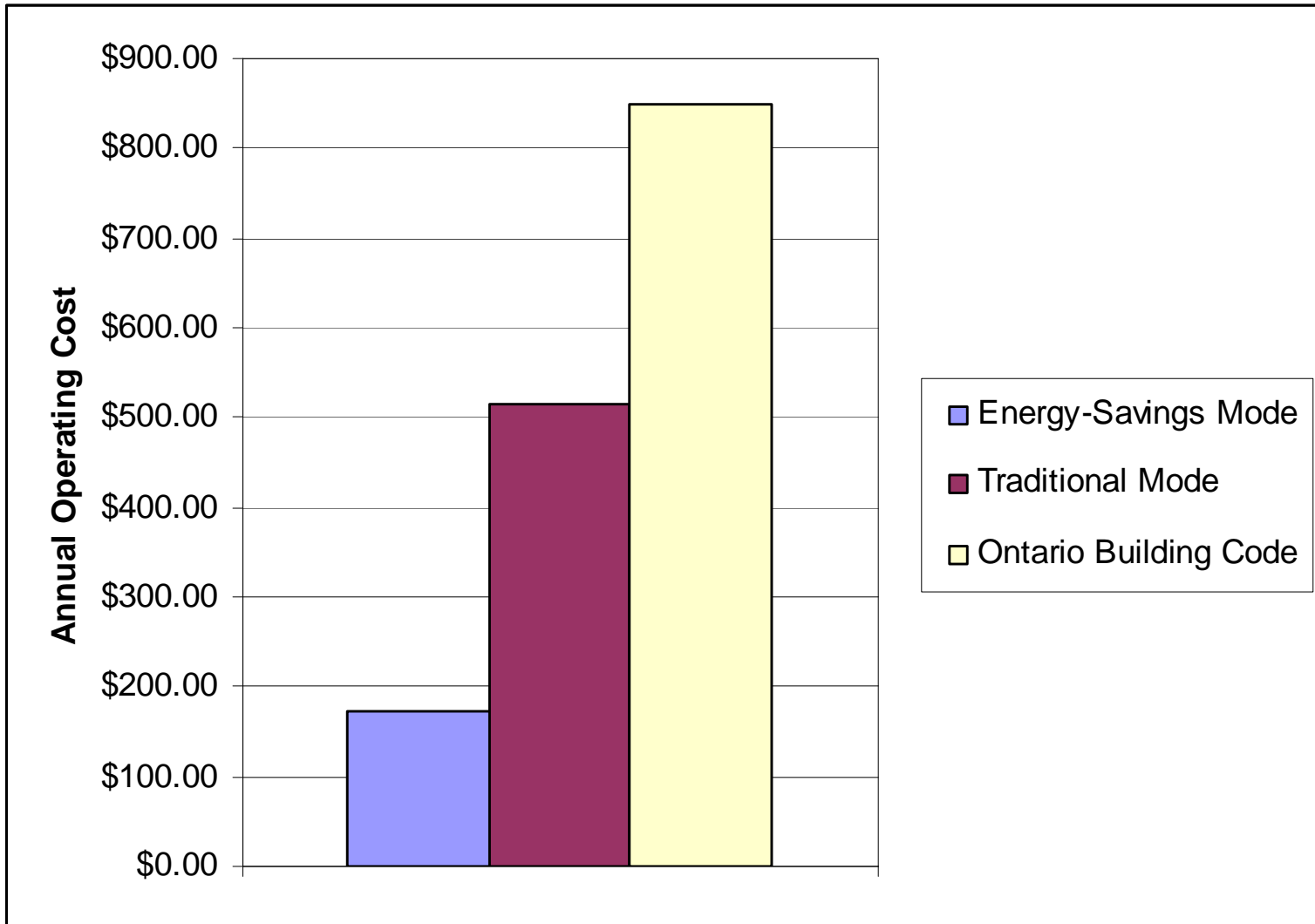
Building within a Building?

Nested Thermal Envelopes



Where is the energy saved ?

- Two well-insulated envelopes.
- Passive solar gain and storage.
- Option to heat reduced floor area.
- Core heat losses recovered from perimeter by heat pump operating at efficient temperatures.



ANNUAL HEATING COSTS BY OPERATION MODE COMPARED TO AN ONTARIO BUILDING CODE HOME (~ Factor 5)

Using R2000 Technology Factor Five⁺⁺

- Solar heat recovery through opaque elements.
- Dynamic heat recovery.
- Insulated shutter systems in core.
- Passive in-ground solar heat storage.
- Passive ventilation.
- Summer cooling stores heat for winter.

Gemini can be applied to ...

- New construction
- Existing buildings as a retrofit measure
- Low-rise residential/commercial
- Industrial/office
- Periodic occupancies

What about Existing Buildings in 2020?

- Challenges of making existing buildings low energy... 97% of our building stock is “existing”!!!
- Managing heat, moisture and air movement is much more expensive and more difficult than new construction!

Existing Buildings in 2020?

- If government incentives won't move the existing building retrofit market... energy costs will!
- Choice: Freeze in the dark or fix up your energy-inefficient building?
- Conclusion: There will always be work, fixing up existing buildings!



A photograph of sunlight filtering through a dense canopy of trees, creating a dappled light effect. The sun is positioned in the lower-left quadrant, casting bright rays and a lens flare across the scene. The overall color palette is dark with highlights of yellow and white from the sunlight.

Rays of Hope...

Existing Buildings

Second Empire Strikes Back?

- Helping an Historic Building Perform well!
- “Gemini” Retrofit an 1870’s solid masonry historic home in Toronto...





MAYOR'S TOWER RENEWAL

**OPPORTUNITIES
BOOK**

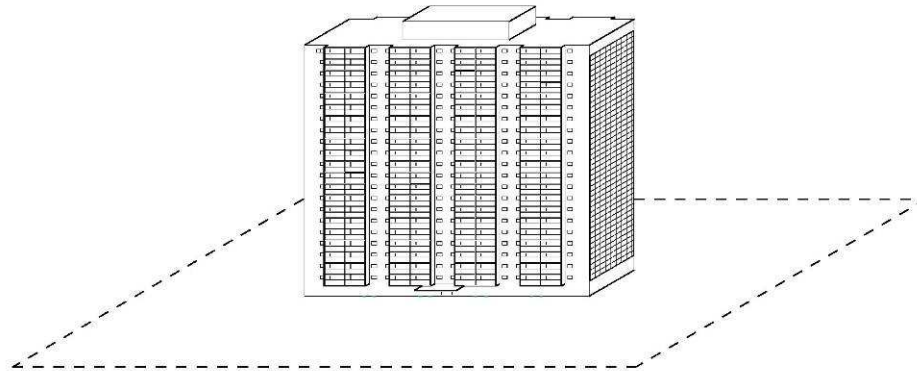
Prepared for the City of Toronto by
E.R.A. Architects and the
University of Toronto



Energy Consumption per M²

Bungalow: 1 GJ 38KG CO₂

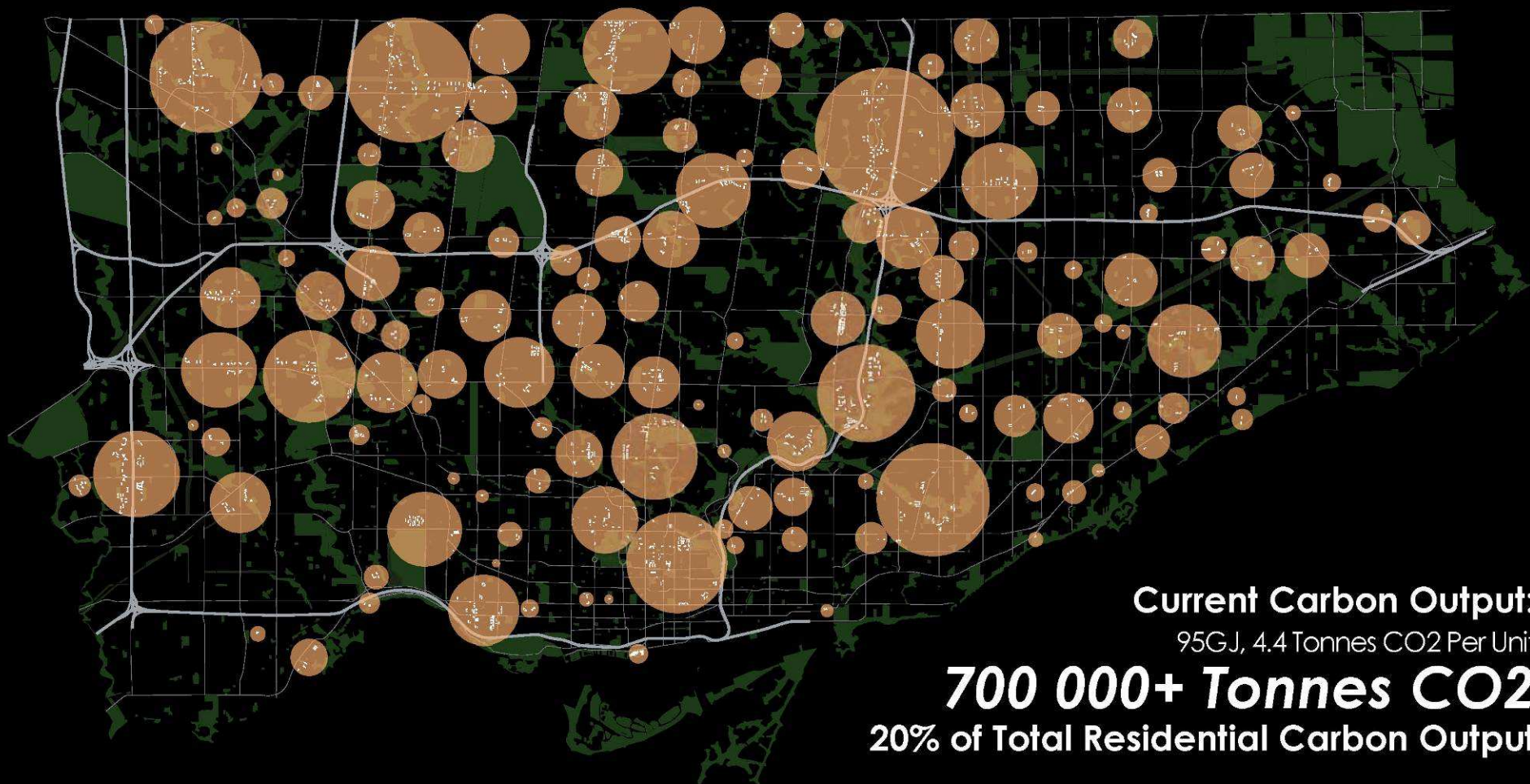
Apartment: 1.25 GJ 47KG CO₂



AVE. PER UNIT

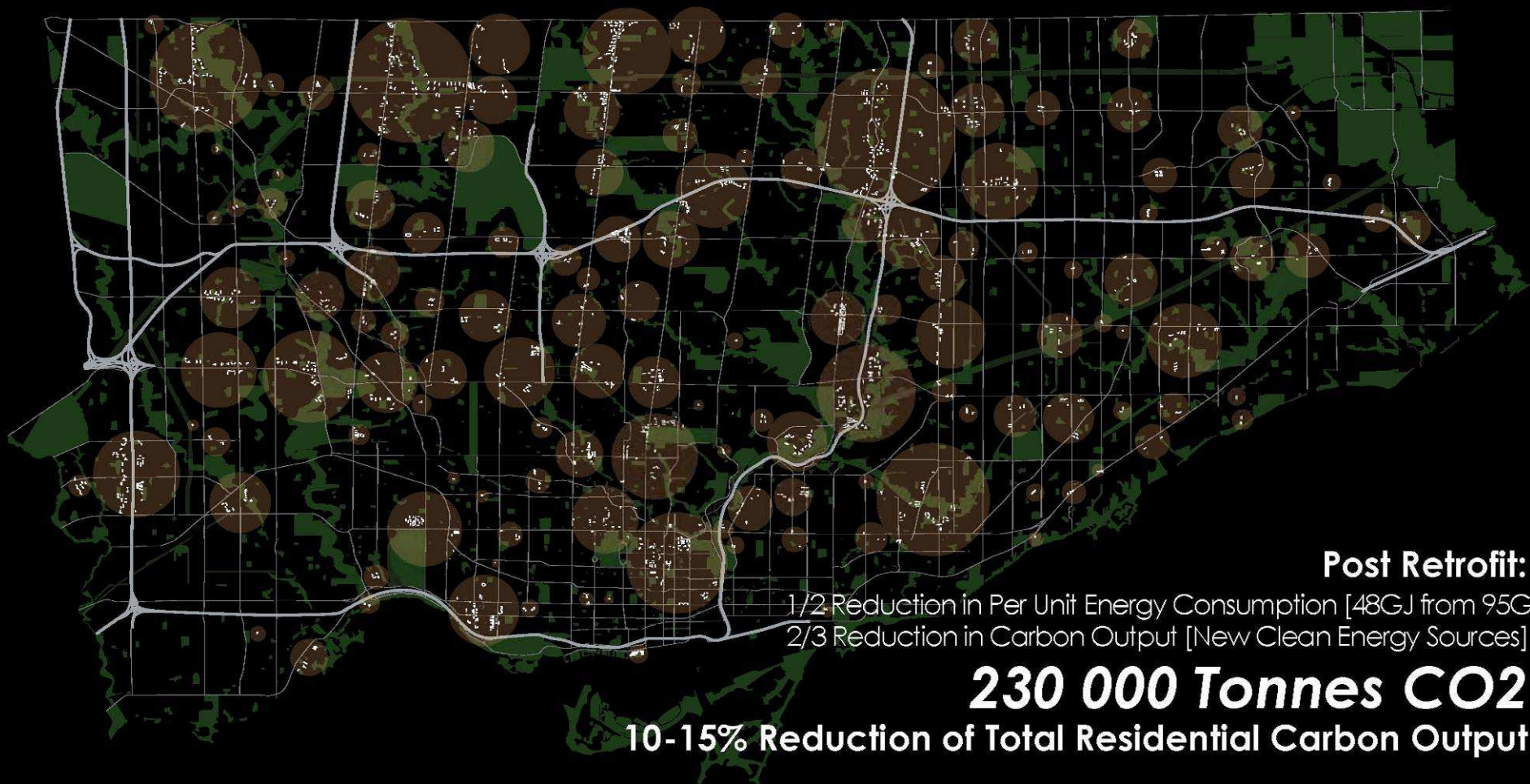
95GJ

4.4 Tonnes CO₂



Current Carbon Output:
95GJ, 4.4 Tonnes CO₂ Per Unit

700 000+ Tonnes CO₂
20% of Total Residential Carbon Output

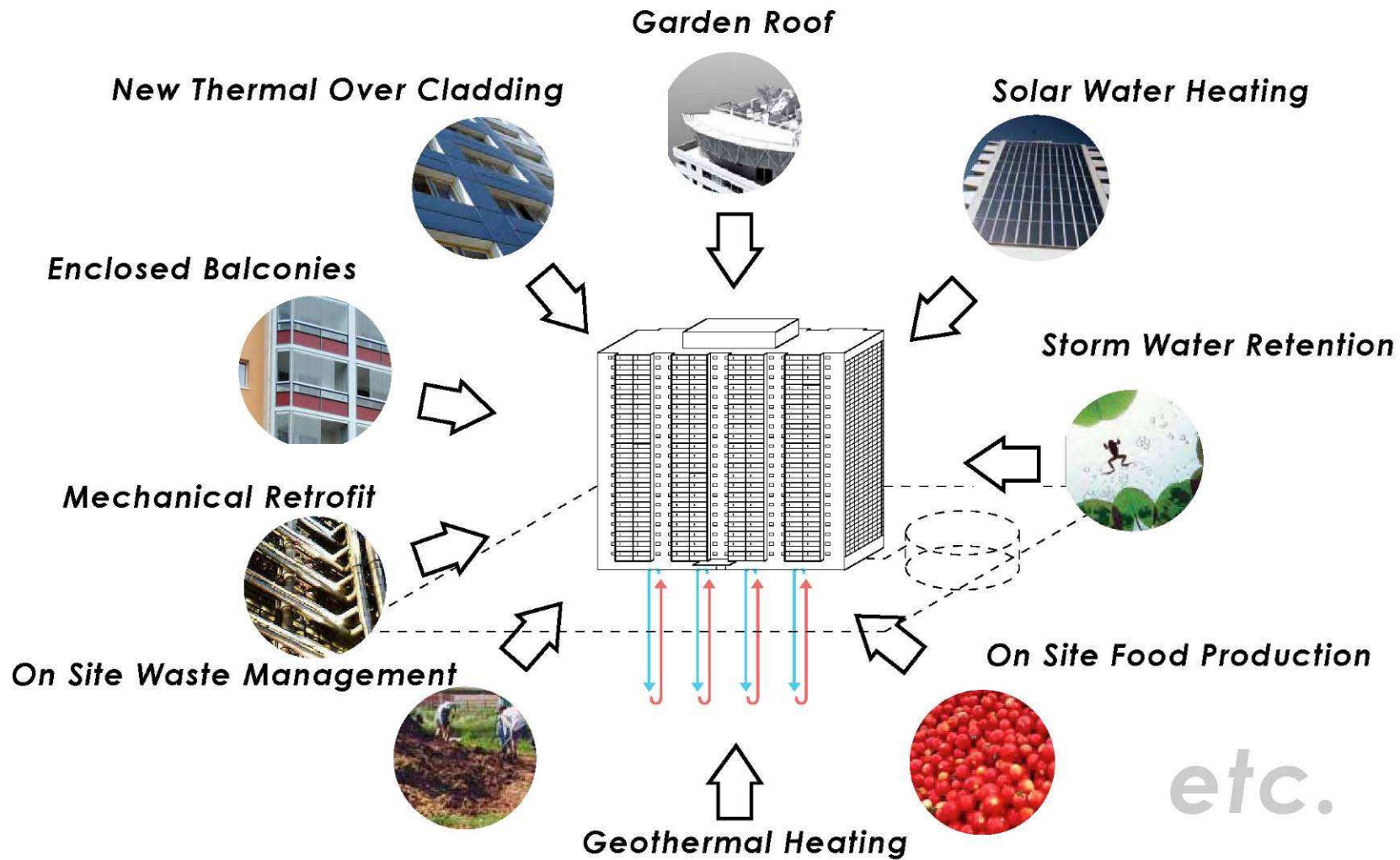


Post Retrofit:

1/2 Reduction in Per Unit Energy Consumption [48GJ from 95GJ]
2/3 Reduction in Carbon Output [New Clean Energy Sources]

230 000 Tonnes CO₂

10-15% Reduction of Total Residential Carbon Output



etc.

AVE. PER UNIT

47GJ

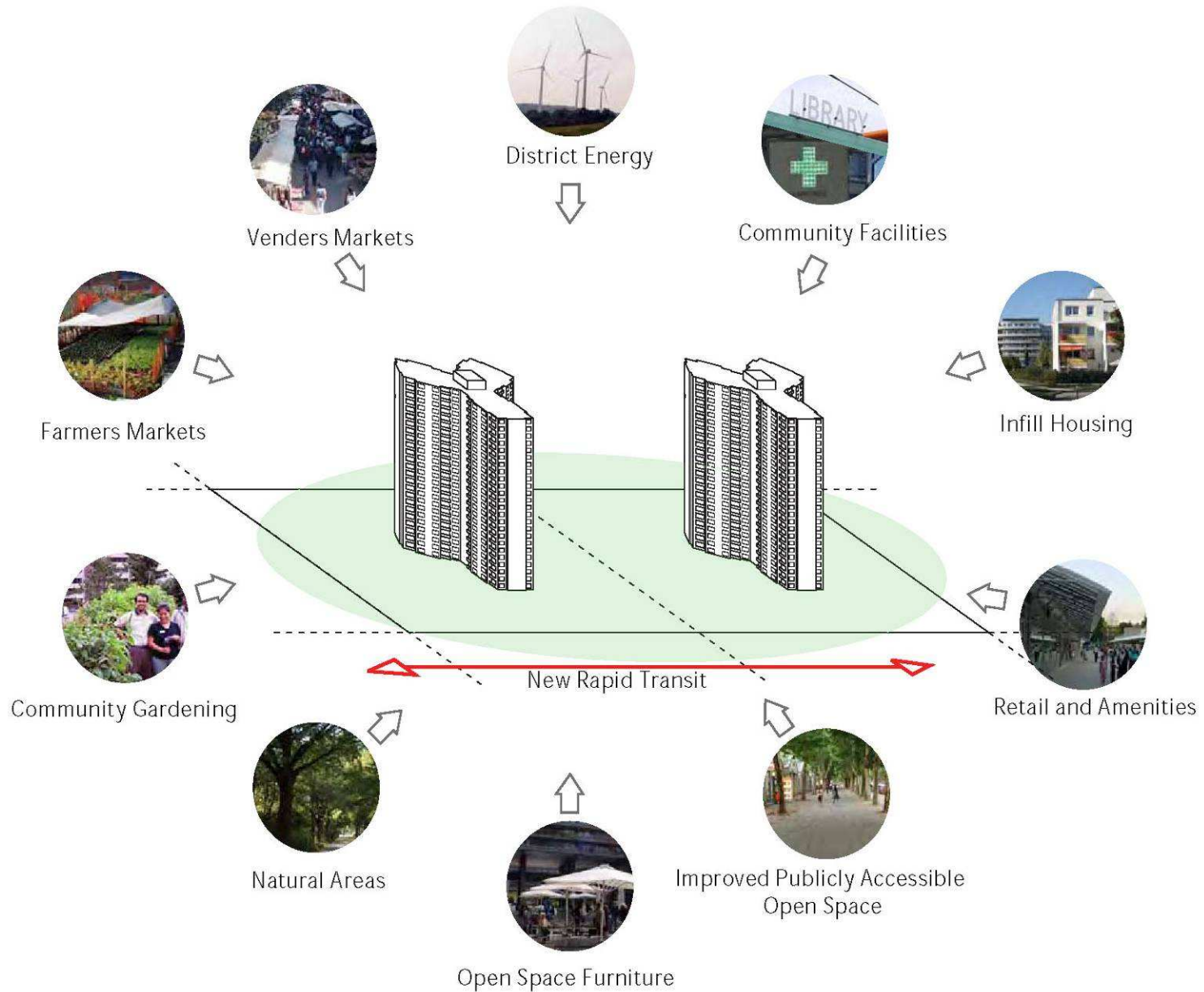
1.5 Tonnes CO2



— Rapid Transit (Existing and Proposed)

● Confluence of Modern Towers
with Rapid Transit

Creating Sustainable and Vibrant Neighbourhoods



A dark, moody photograph of a forest path. Sunlight filters through the dense canopy of trees, creating a bright, glowing path that leads into the distance. The overall atmosphere is mysterious and hopeful, with the light rays cutting through the dark shadows of the forest.

Other “Rays of Hope”?

You and your work?

Where are we headed?
2020?

I don't have a crystal ball...



Just some parting thoughts?

Prosperous firms in 2020?

- Designers/builders of low-energy buildings.
- Designers/builders of low-energy retrofits.
- Material suppliers that provide building materials that are durable from renewable sources or materials in circulation.
- Businesses that foster a culture of building for tomorrow, today.
- Innovative design firms that can make it work!

The background of the slide is a photograph of a sunset or sunrise. The sky is a gradient of colors from dark blue at the top to orange and red near the horizon. The sun is not visible, but its light creates a bright glow on the horizon. The water in the foreground is calm and reflects the colors of the sky. In the distance, there are dark silhouettes of mountains or hills.

The year 2020? Fitting into the New Era of Responsibility?

(The Sun Also Rises!)

Acknowledge that we face twin challenges:
Environment and Energy.



Design/Build for 2050, TODAY!...
In B.C. that means using 1/3 of the energy.




Look beyond “me and now”...



Finally...



A serene landscape photograph of a sunset or sunrise. The sky transitions from a deep blue at the top to a bright orange and yellow near the horizon. The sun is just below the horizon, creating a shimmering reflection on the calm water in the foreground. In the distance, a range of dark mountains is silhouetted against the bright sky. The overall mood is peaceful and contemplative.

Strive to make future generations proud of
your good works too....

Thank you!