The Energy Plan for Toronto

EXTERNAL STAKEHOLDER FOCUS GROUPS

Monday, April 30, 2007

Meeting Agenda

1. Introductions (10 minutes)
2. Energy In Toronto – Challenges and Opportunities (20 minutes)
    1. The process to develop the energy plan
    2. Key Energy Challenges that Toronto is Facing
3. Development of the Energy Plan – Key Findings (20 minutes)
    1. Energy Forecast – Business as Usual
    2. Energy Opportunities - Sustainable Energy Potential
4. Building the Energy Plan
    1. Four Key Questions (30 minutes)
    2. Building Toronto's Sustainable Energy LEADERship (30 minutes)
5. Wrap Up and Next Steps (10 minutes)

The Context of the Energy Plan for Toronto (EP4T)

- Directive from City Council for staff to develop an Energy Plan
  - Energy Efficiency Office is the lead
  - The preferred energy state is energy efficiency first, with new energy supplies coming from renewable energy sources
- Ontario Bill 21: Energy Conservation Responsibility Act
  - Ontario municipalities must now submit energy plans to the province
- The growing challenges that Toronto faces on energy issues

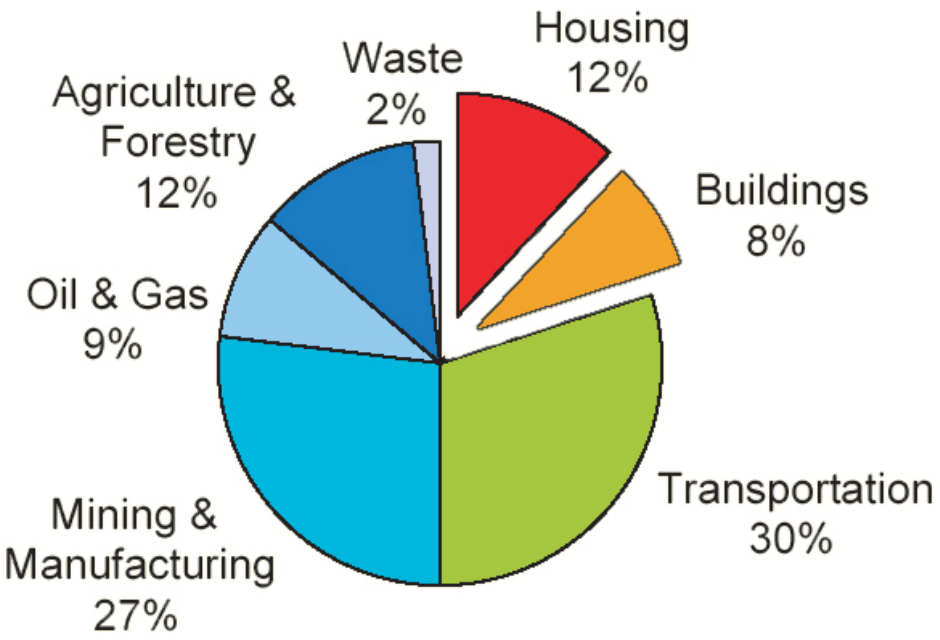
An Energy Plan for Toronto (EP4T)

- The Energy Plan includes:
  - Both energy in the corporate City and the community
  - All energy useage (electrical and thermal) except for transportation energy
    - Focus short term is on electrical due to immediate concerns surrounding electricity supply
  - Will include short term, medium term and long term goals, objectives and actions – through to 2030

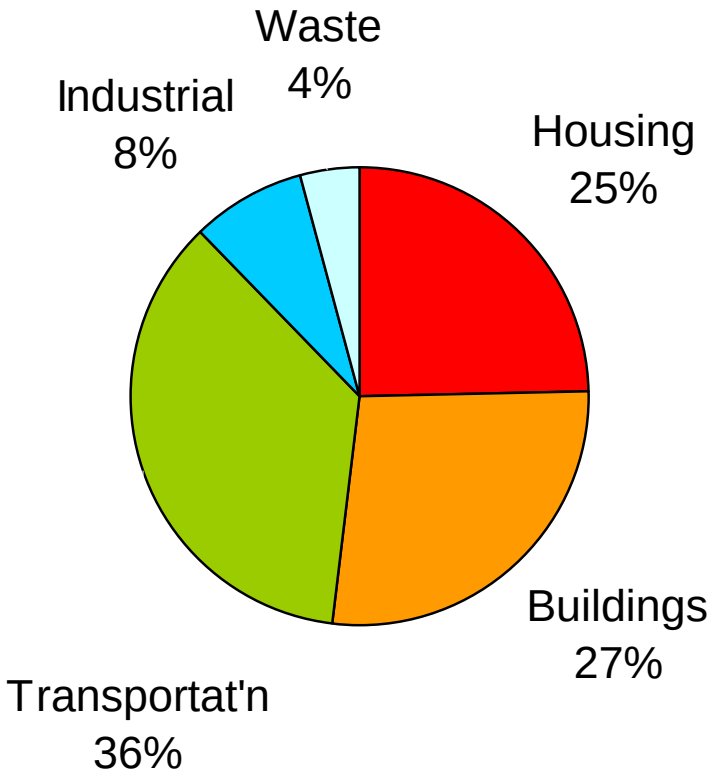
2. Energy In Toronto

Turning Challenges into Opportunities

GHG Emissions from Sectors



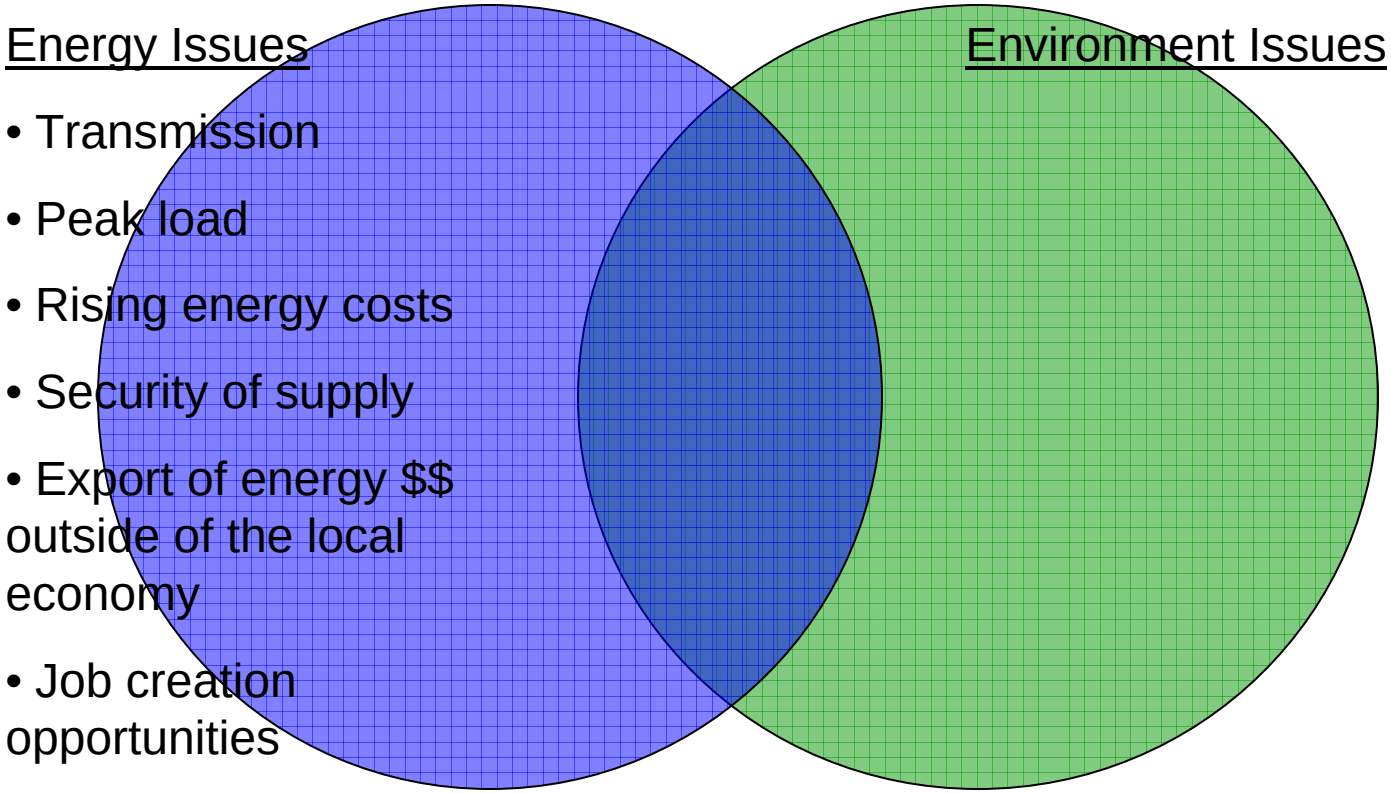
Canada - 20% from Buildings



Toronto - 53% from Buildings

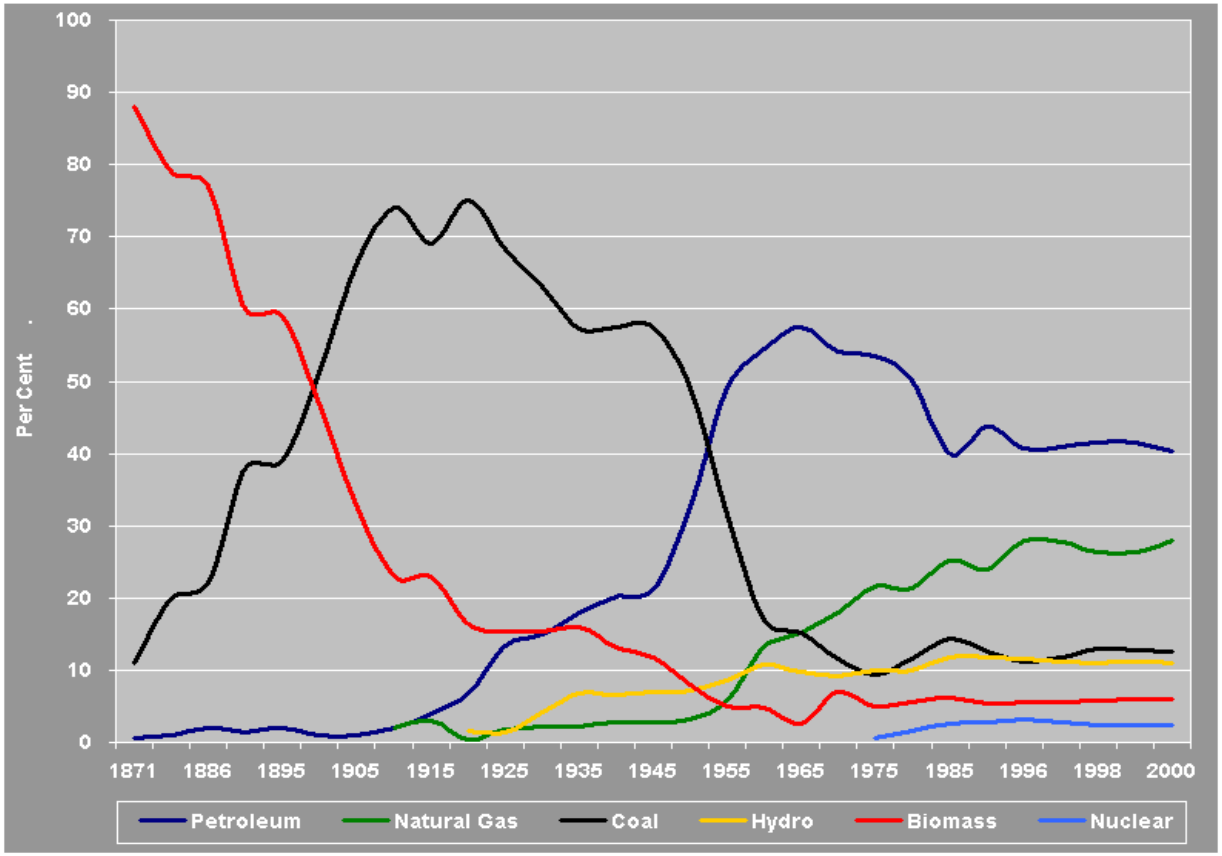
Energy & the Environment

While there is an overlap – there are also distinct issues



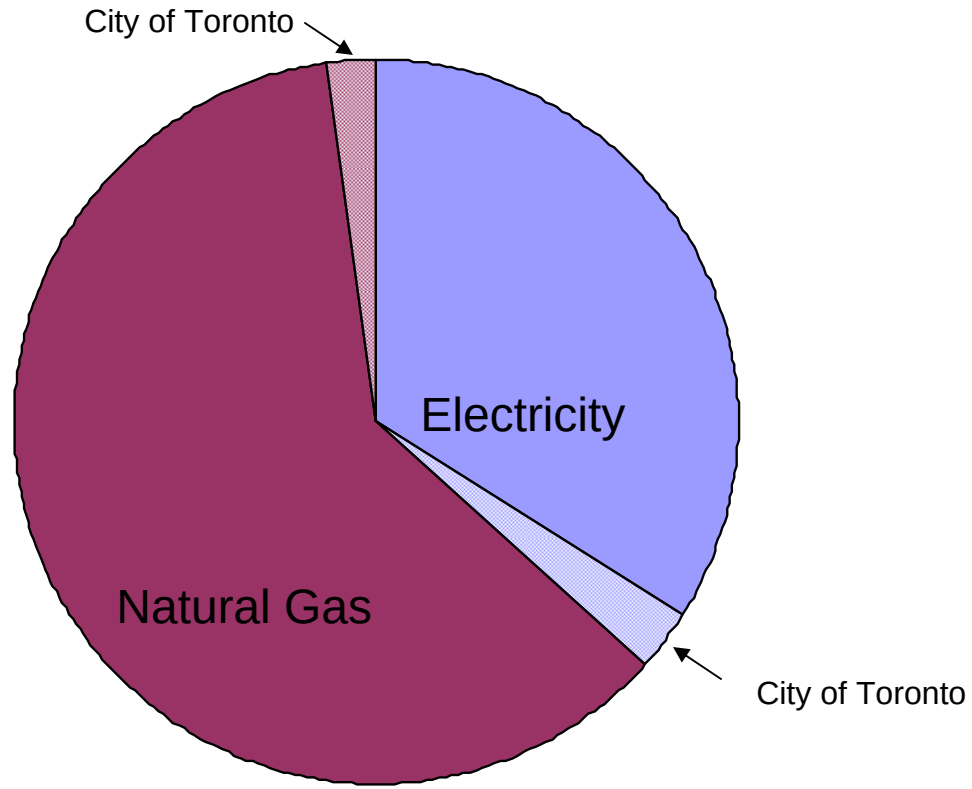
Energy Sources in Canada

- Moving from the oil age to the natural gas age



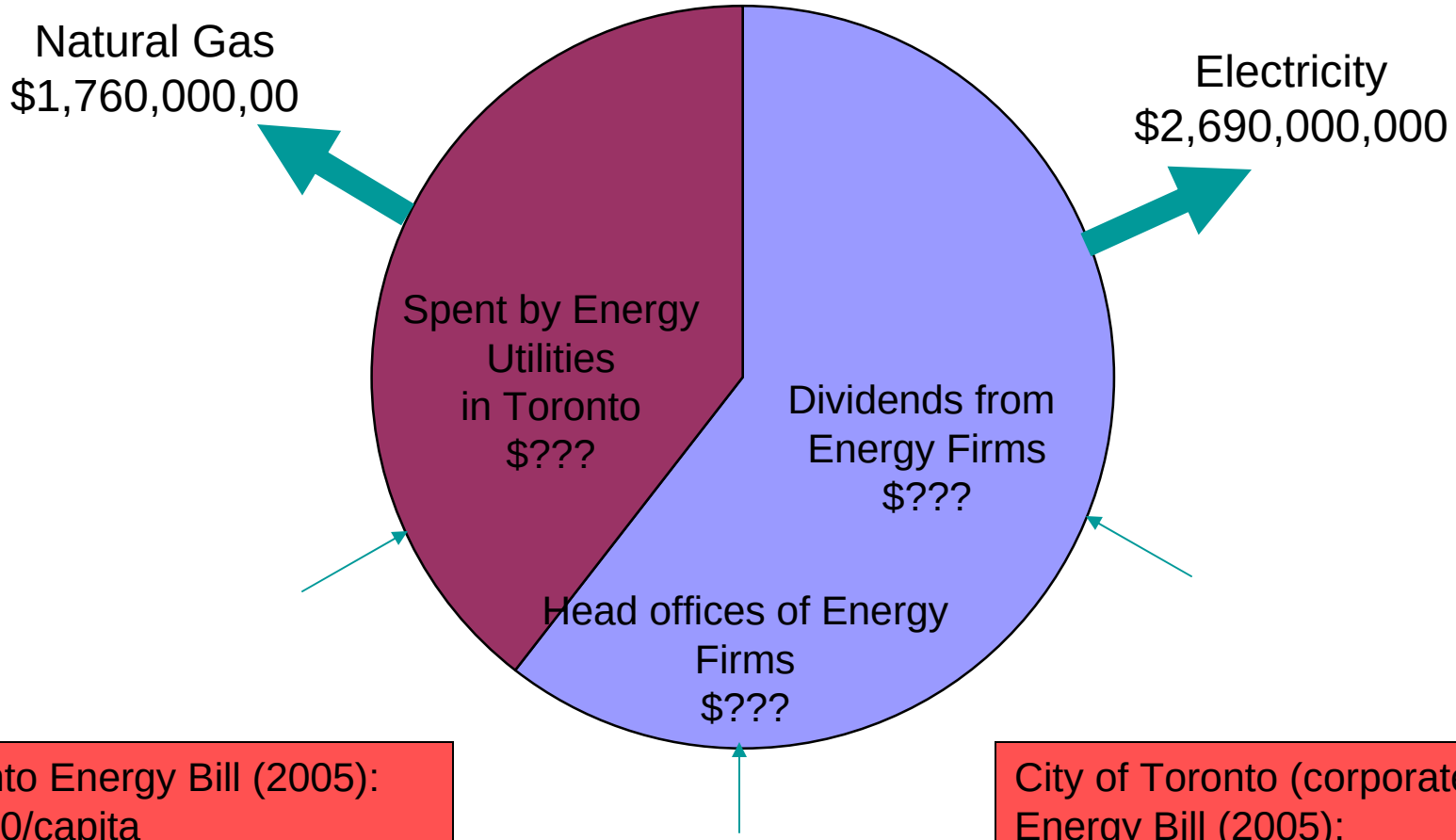
Energy in Toronto

- Total energy consumption = 72,000,000,000 kWh/year
- Note: Deep water cooling provides 89,000,000 kWh/year (0.1% of total)



How Much are We Spending on Energy? $4.5 Billion

and where it goes…

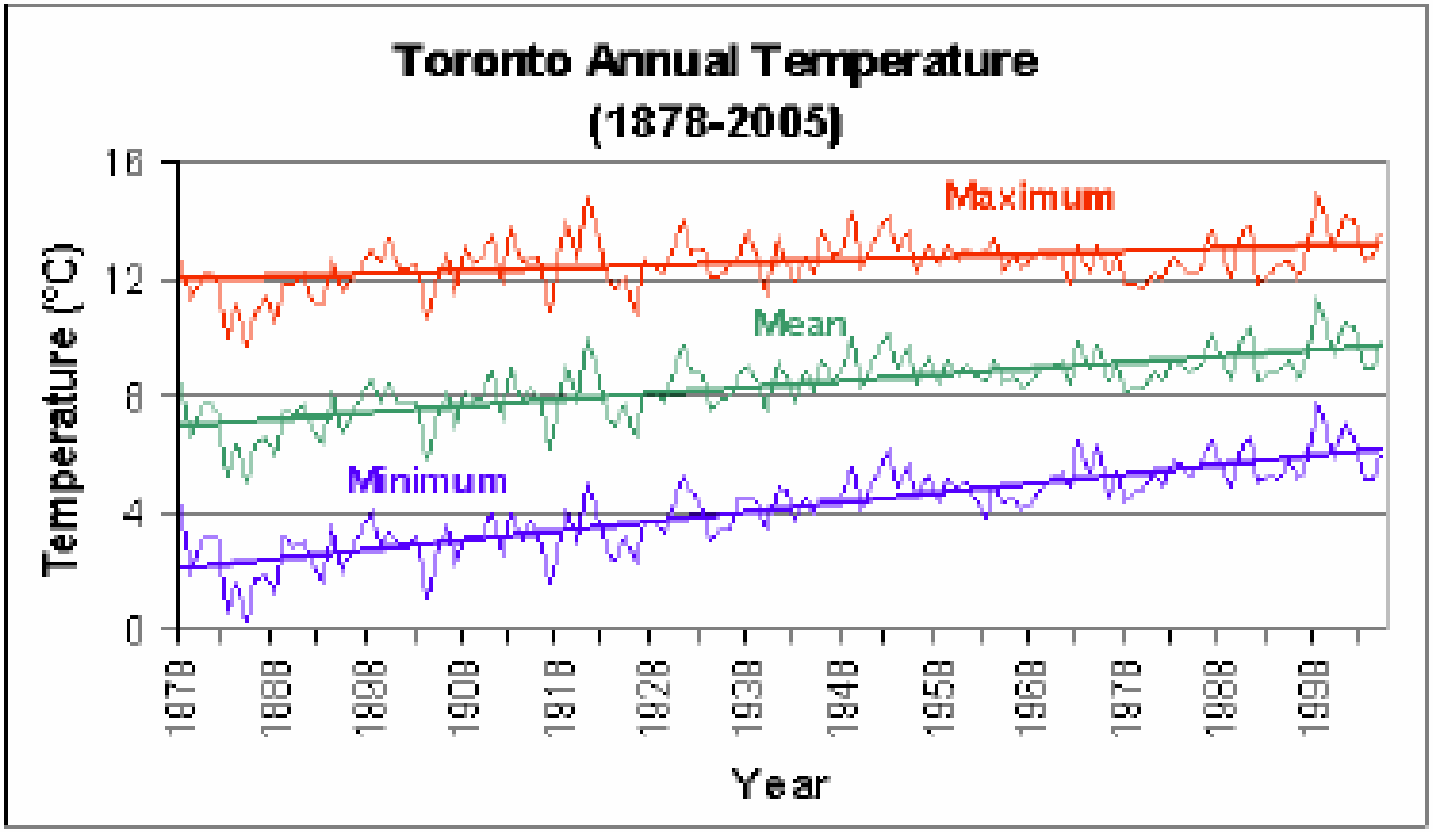


Toronto Energy Bill (2005):
$1,700/capita

City of Toronto (corporate) Energy Bill (2005):
$232,000,000

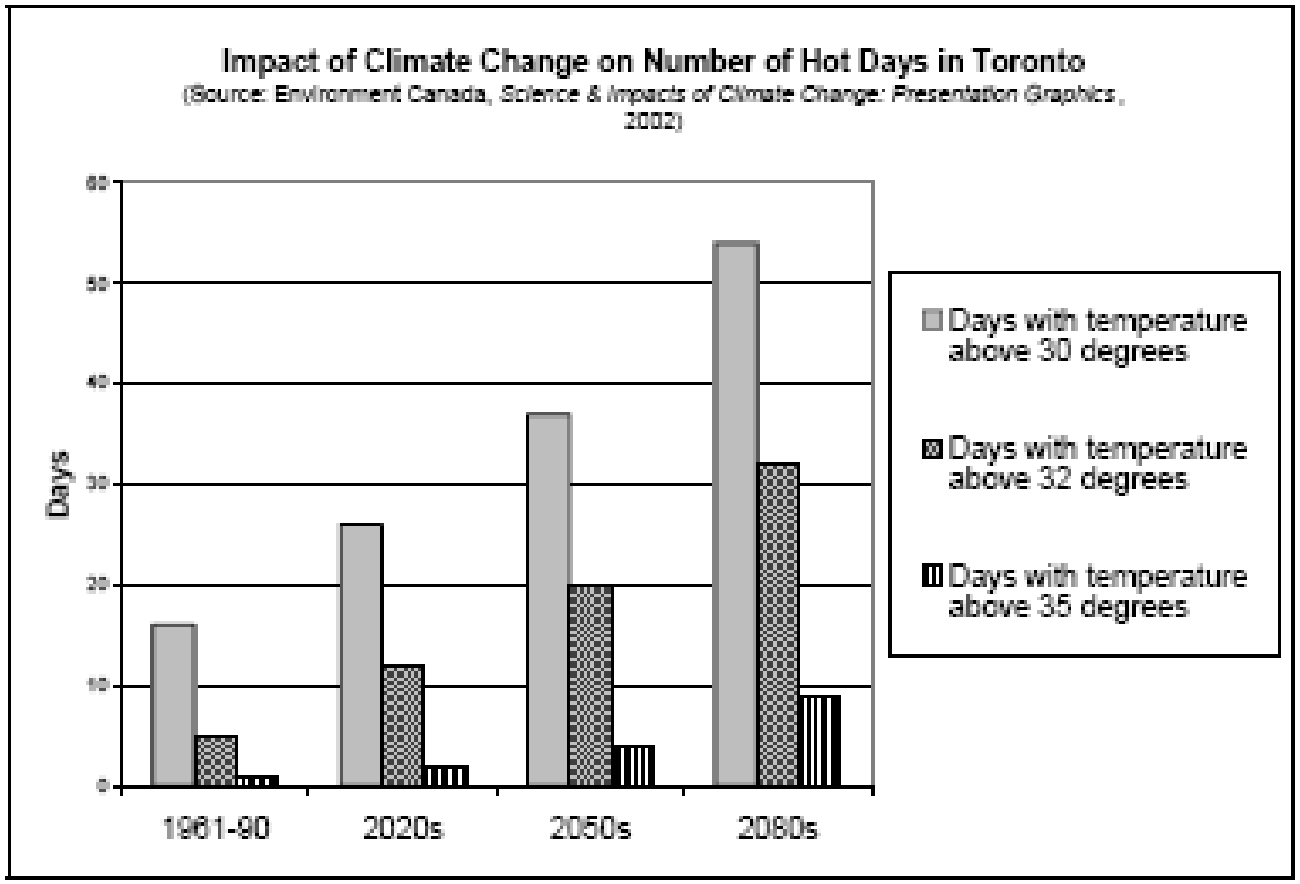
Toronto is Warming Up

Climate Change will accelerate this trend – 5-8ºC by 2100



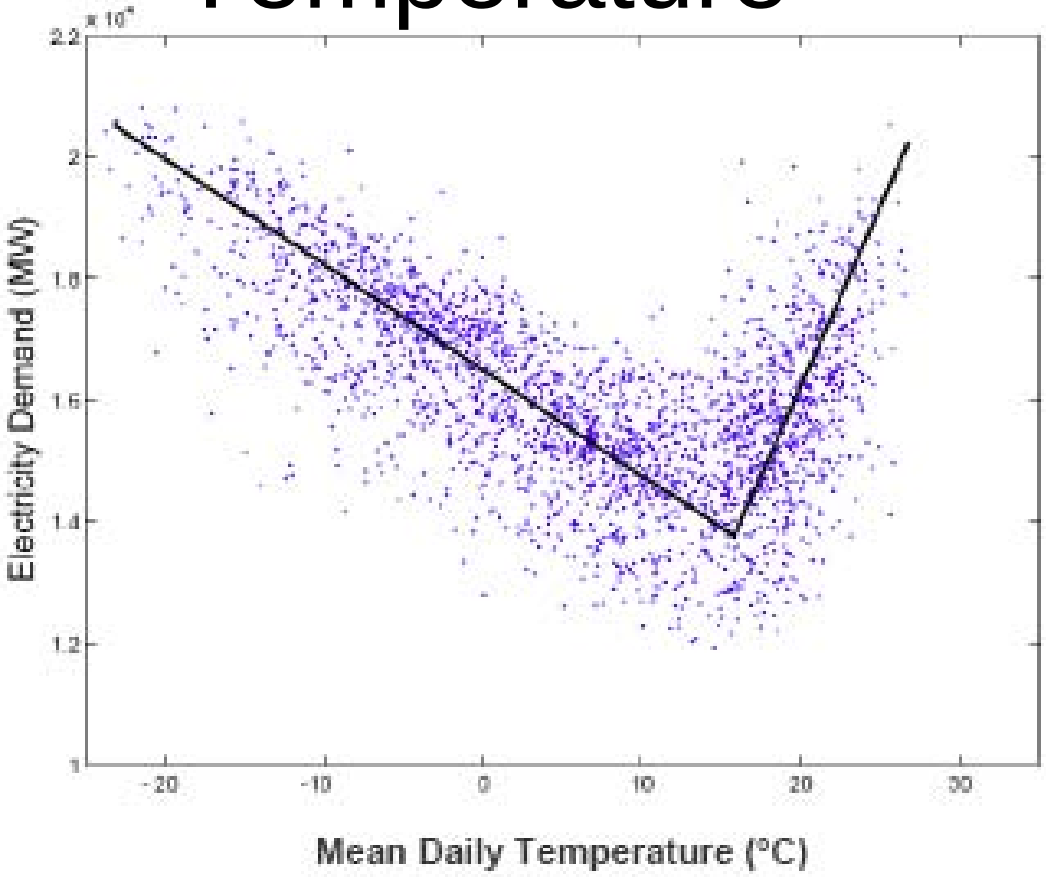
Environment Canada

Climate Change will Impact the Number of Hot Days



1. A Scan of Climate Change Impacts on Toronto – Clean Air Foundation

Electricity Demand vs Daily Temperature



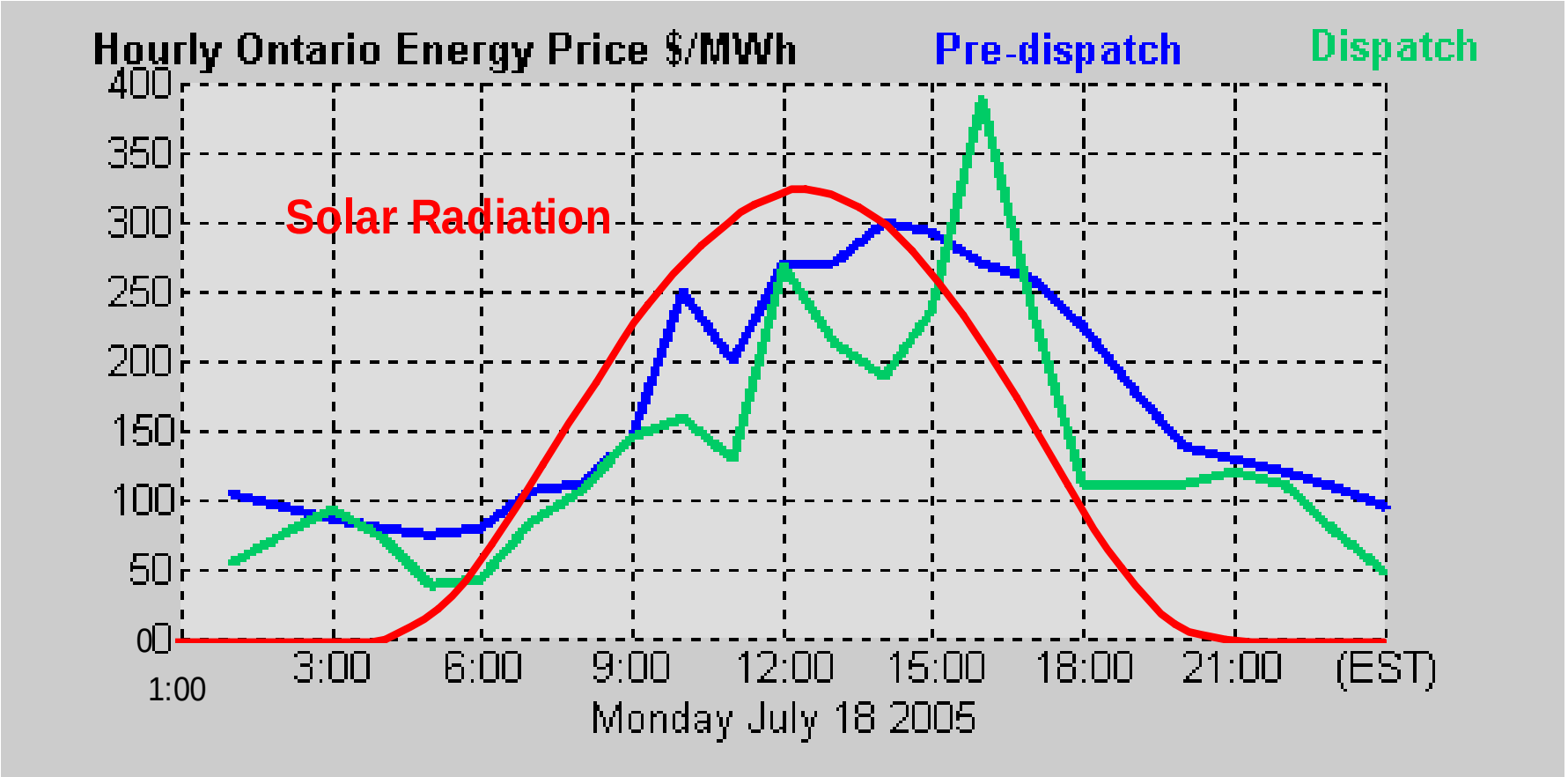
Electricity demand decreases as temperature rises until the point which air conditioners kick it

Source: Liu 2003 – 1994-2000 Toronto data

The Challenge of Climate Change

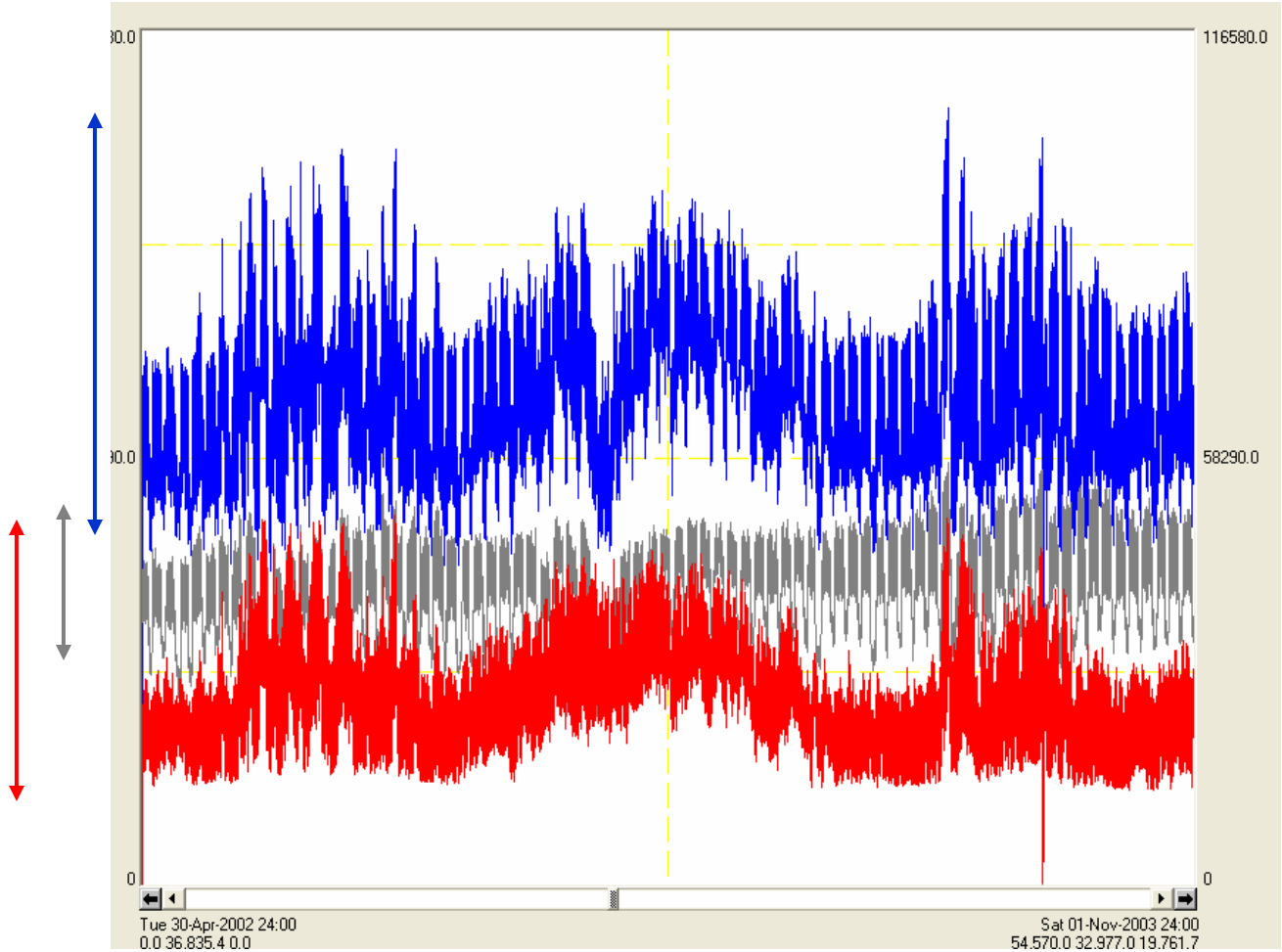
- Increasing number of major weather events
- Average temperatures in Toronto are increasing
  - Reducing the need for heating
  - Increasing the need for air conditioning
  - However Energy Forecasting (at almost all levels in Canada) is not taking Climate Change impacts into account.
- Increased stress on the electrical grid
  - Increased load and peak
  - Reduced efficiency of power transformers
  - Reduced carrying capacity of transmission lines
- What other Climate Change impacts can we expect?

Toronto is Now a Summer (and Mid-Day) Peaking Region



The price of electricity at peak capacity can be > $0.42 per kWh

The Challenge to the Electrical Grid is Fluctuations in Residential Load



May 1,2002 to Nov1,2003.
Blue = Milton Hydro's total load curve

Grey = aggregate load profile of all customers--commercial /industrial--with average monthly peak demands > 50 kW

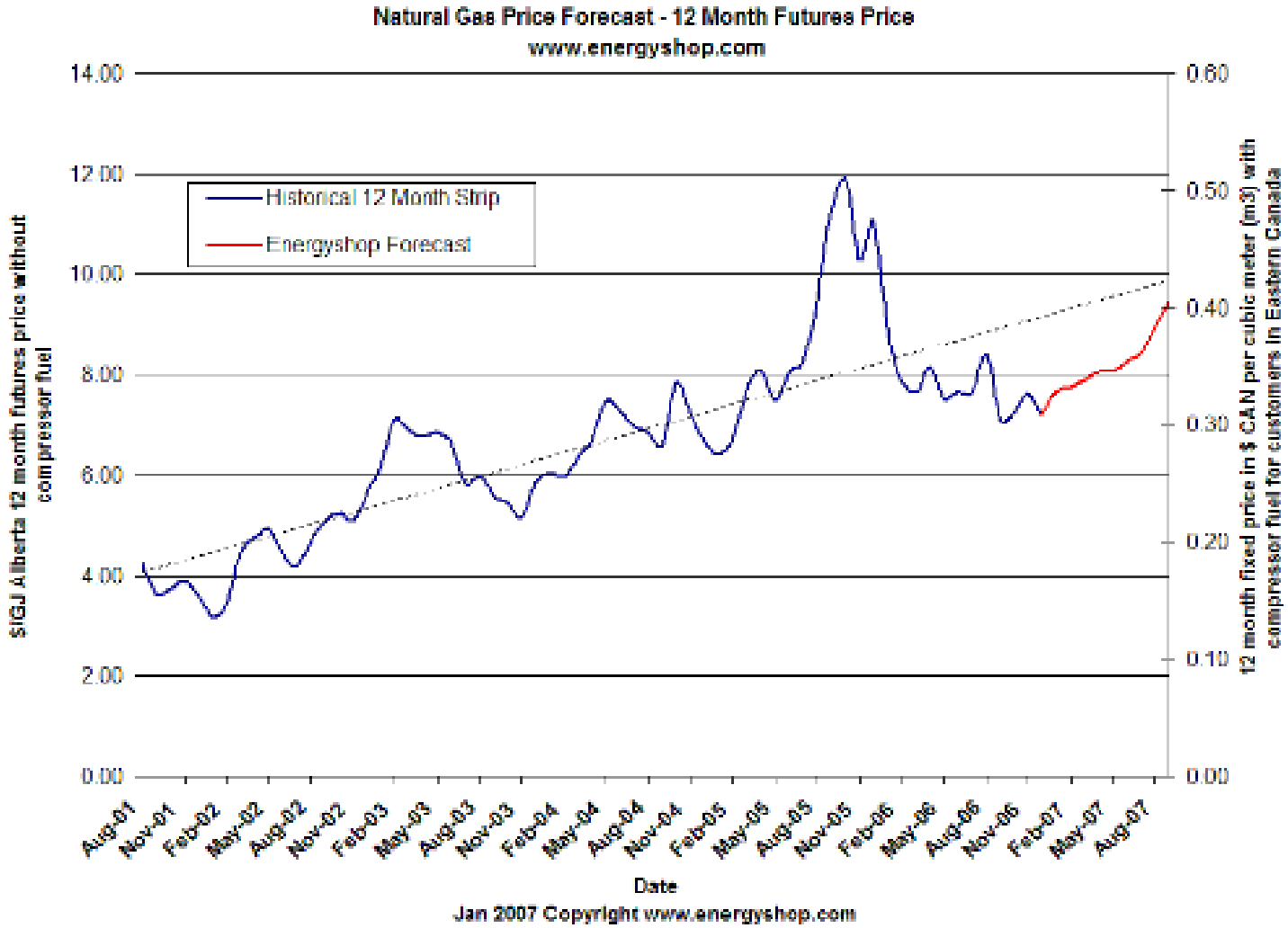
Red = all consumers (65 to 70% residential) with demands < 50 kW.

Blue = Red + Grey (adjusted for distribution losses).

The Electrical Peak Challenge

- Toronto Hydro projection is that peak will continue growing at 50 MW/year
  - Peak is summer – middle of day
  - AC load may be increasing exponentially due to climate change
  - Note Germany is installing >500 MW/y of PV – a similar level in Toronto = 12 MW/y (500 MW/80m = 12MW/2m)
- What are the challenges and opportunities of Peak Demand?

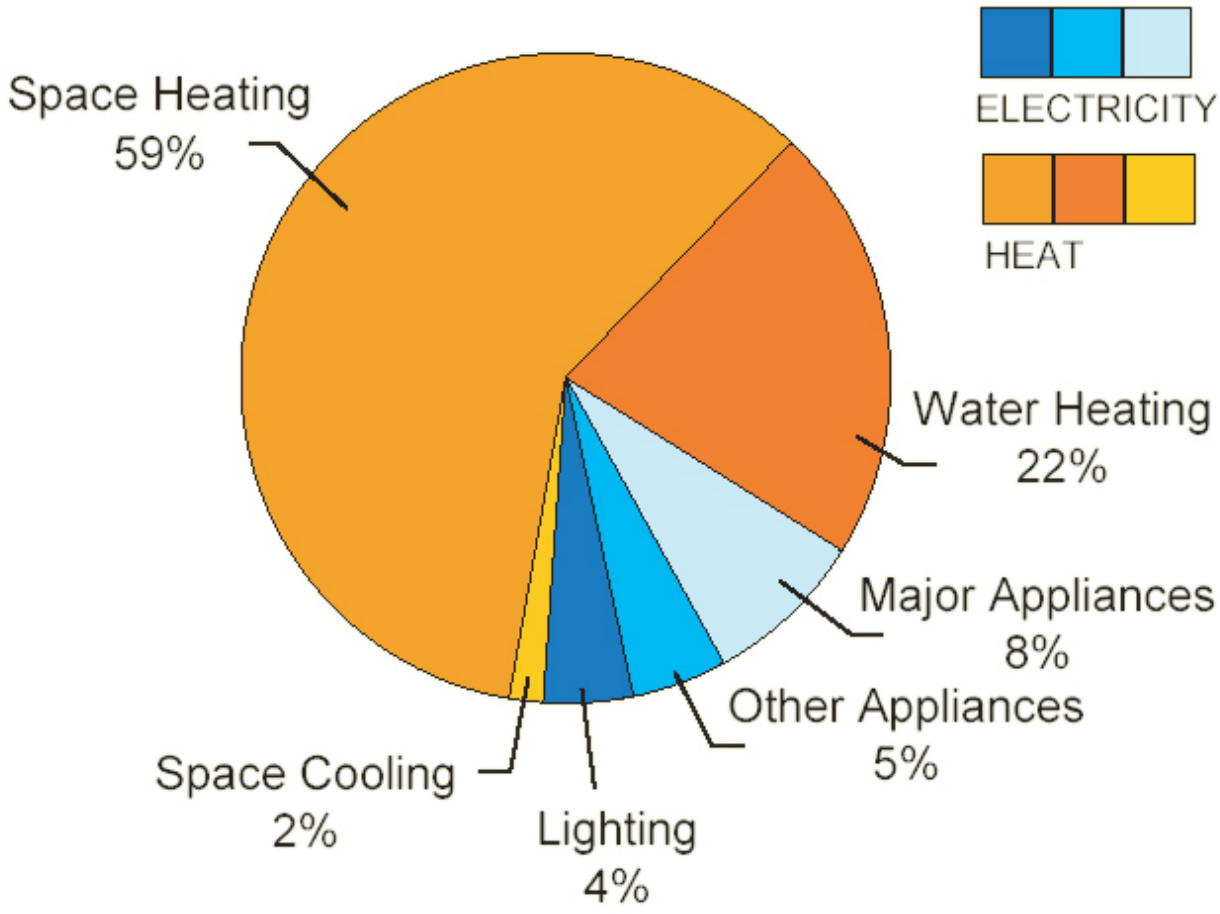
Natural Gas Prices



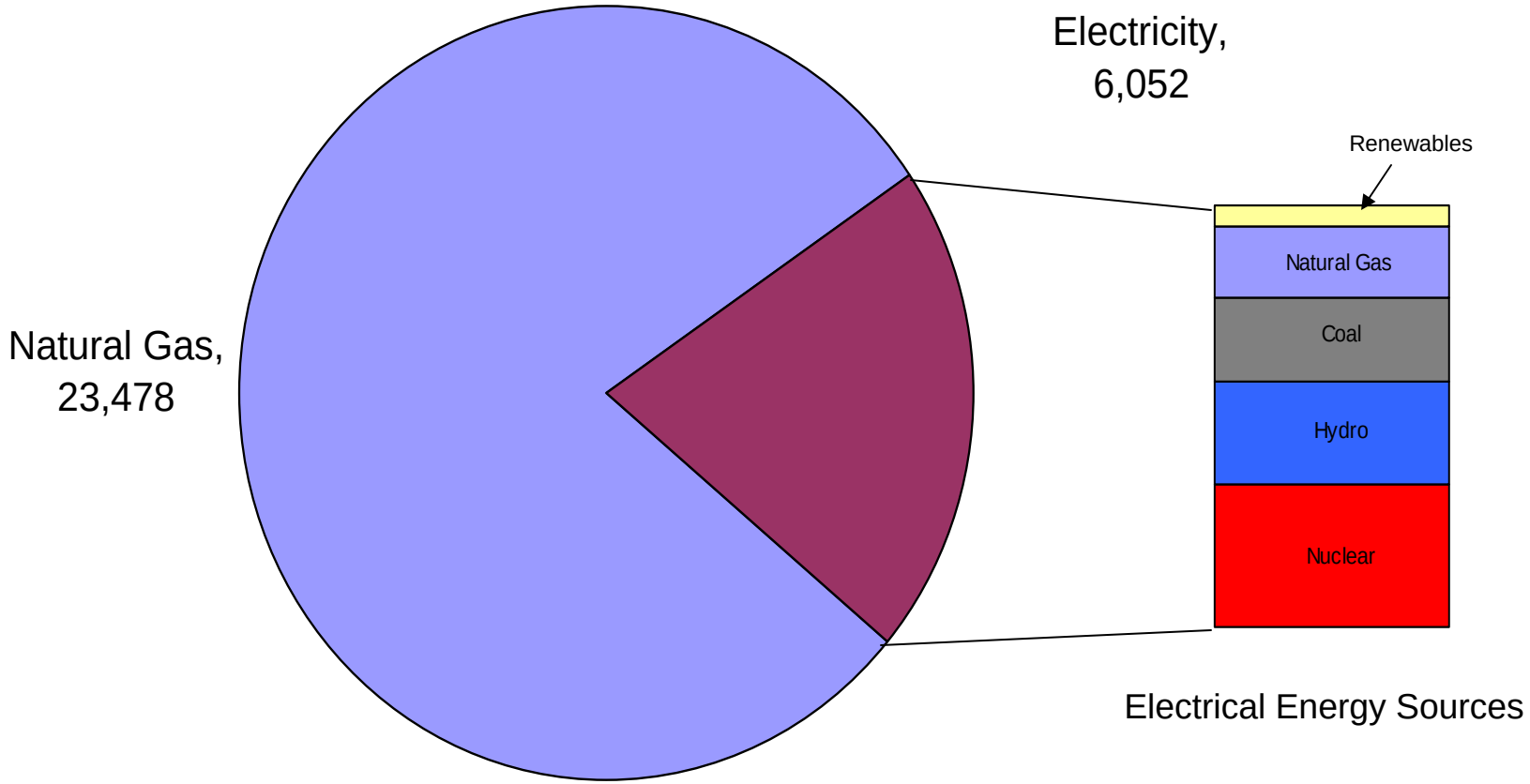
The Challenge of Natural Gas

- 75% of energy (non-transportation) in Toronto is from Natural Gas (direct or for electrical generation)
- NG is increasingly being used for electrical generation feed stock
- Heating demand may be reduced in the future due to climate change
- There may be huge price pressures on NG
- How can NG consumption be reduced?

Energy in the Typical Canadian Home



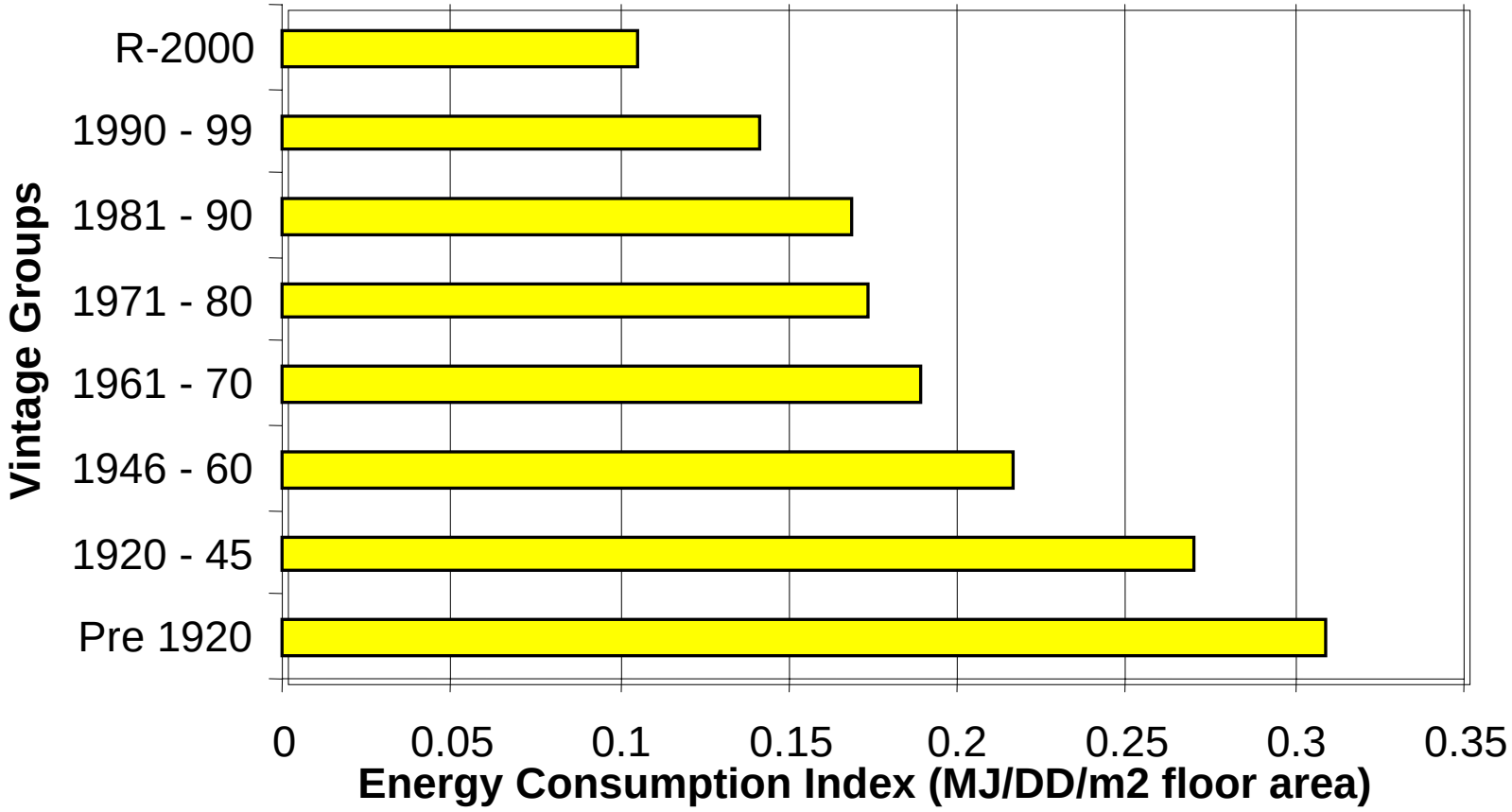
Toronto's Residential Energy Consumption (GWh/y)



Note: approximately 10% of house heating load is provided by passive solar (not shown) – this could be increased to 30% in new homes

Residential Energy Usage

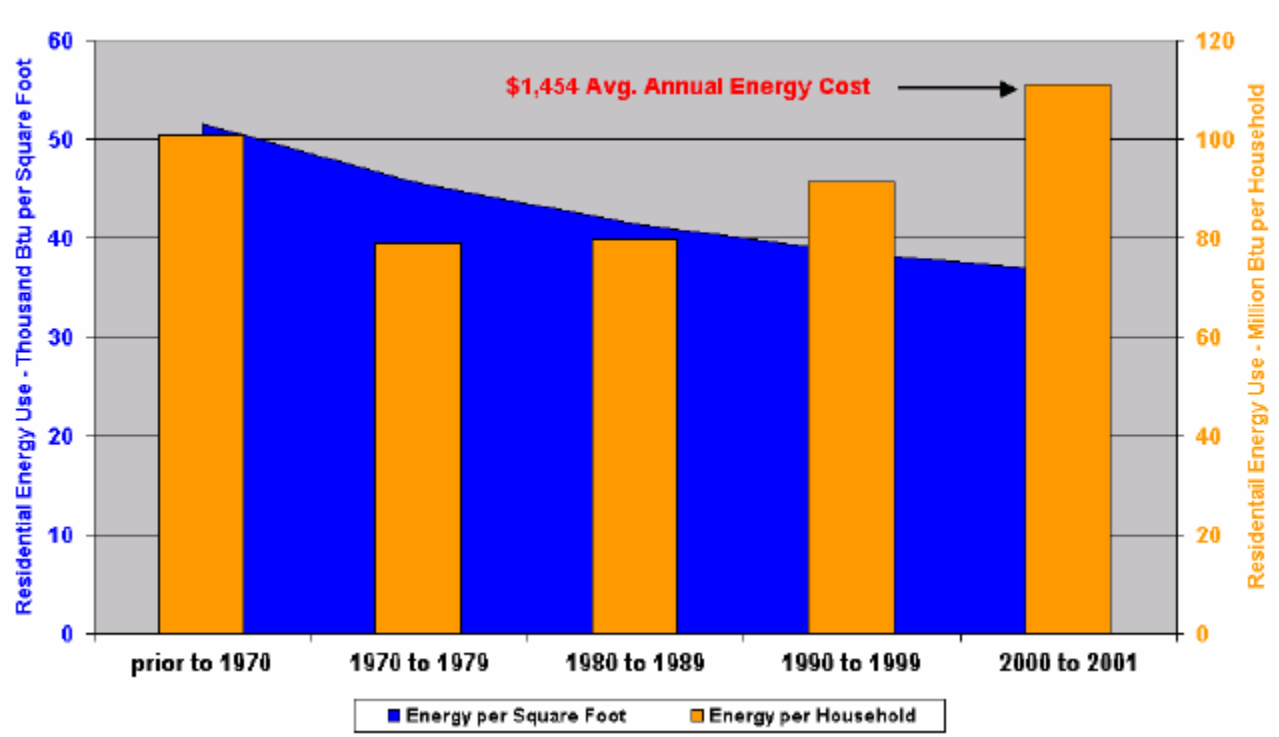
- Modern Housing Stock is more efficient…



NRCan: Based on the statistically representative data of Canadian housing stock.

But Residential Energy Use is Up

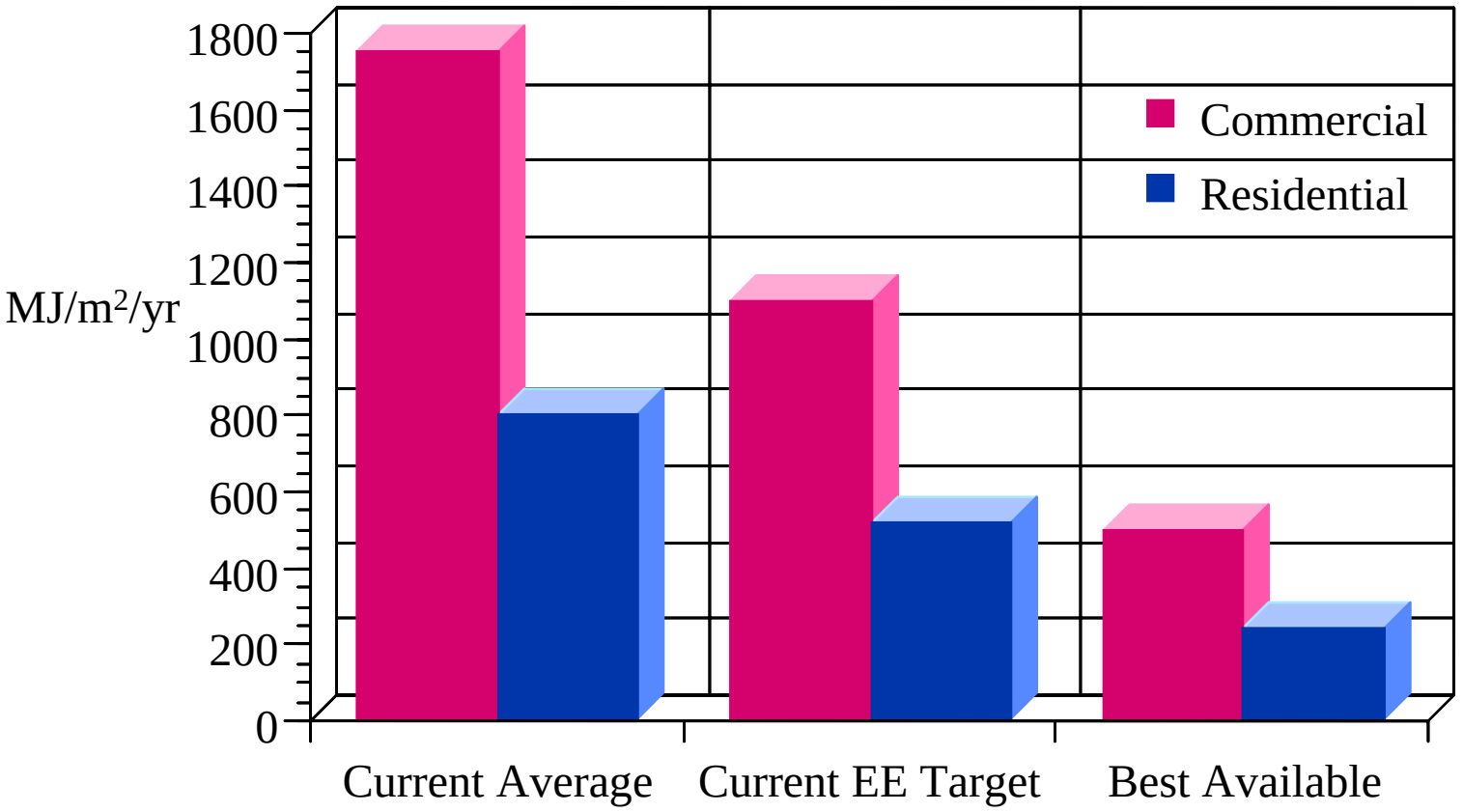
- Energy use (by area) is decreasing but total energy consumption (by household is going up)



The Challenge of Residential Energy Usage

- Trend is increased efficiency in residential buildings (both thermal and electrical)
- But houses (and apartments are getting bigger) so energy consumption is actually increasing
- There are an increased # of electrical loads in houses
- What can be done to reduce the total energy consumption downwards?

Energy Consumption in Buildings

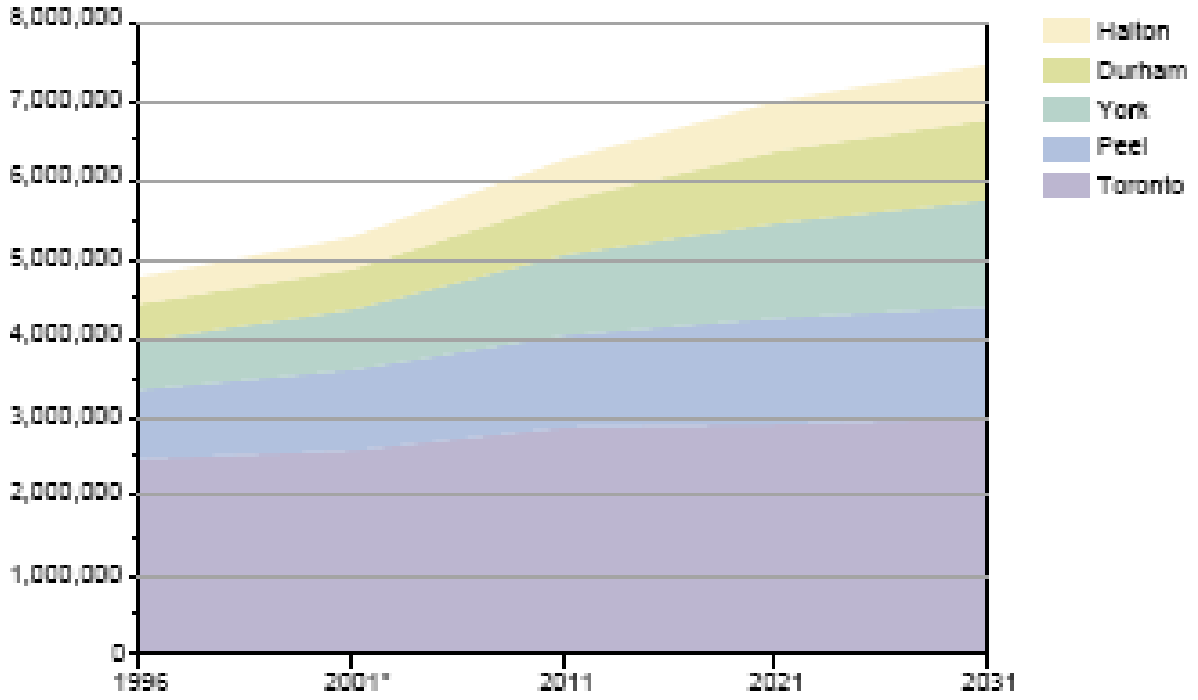


The Challenge of Existing Buildings

- Buildings last 60 – 100 years
- Toronto will need an additional 25% new residential (and business) buildings through to 2031 (plus replacement buildings)
- Older Buildings are less energy efficient
- What can Toronto do to assist in upgrading older buildings?

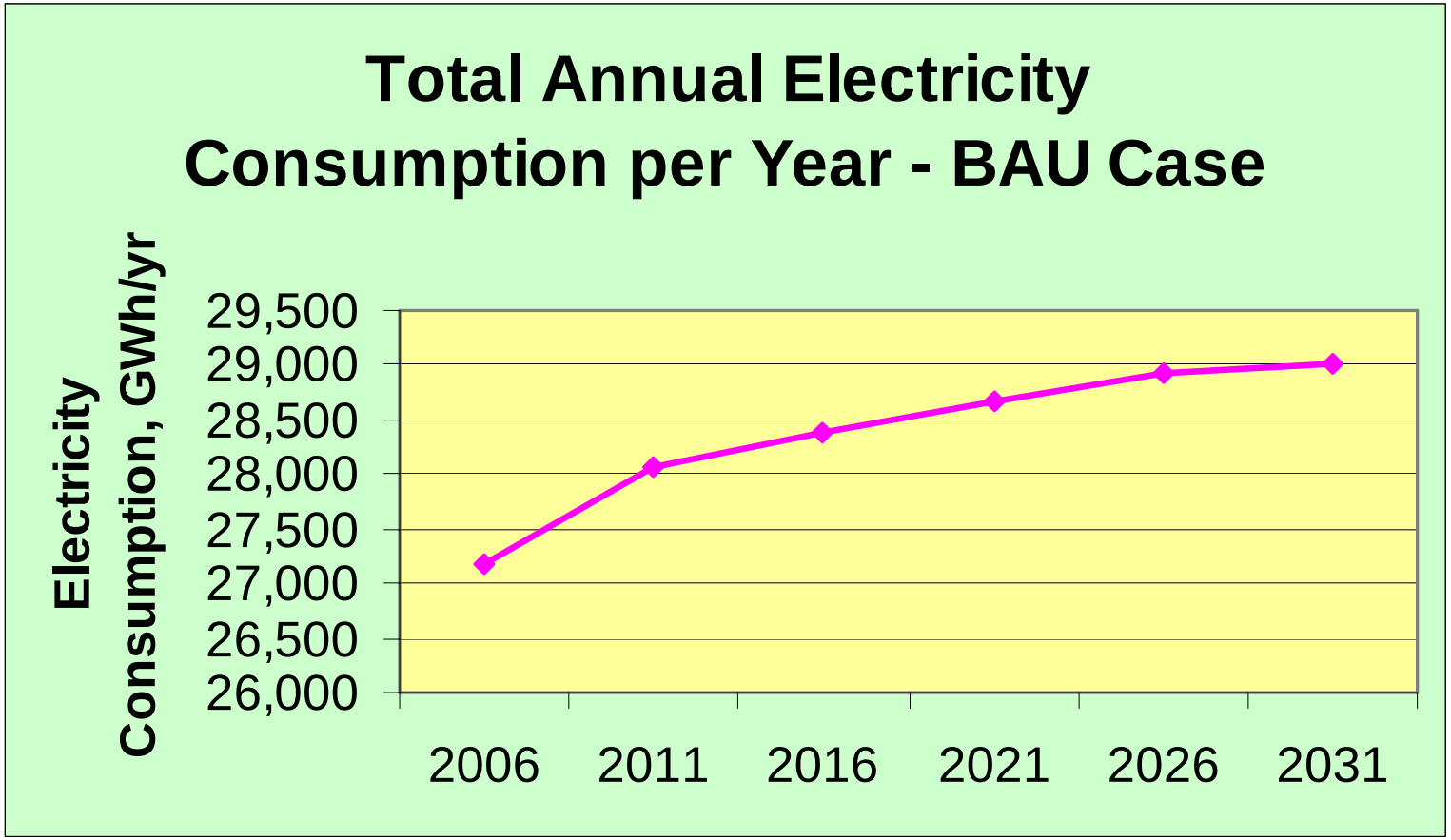

3. The Energy Plan
- Key Findings
- Opportunities
This event has been supplied with 100% green electricity through Bullfrog Power

Population Growth in Toronto

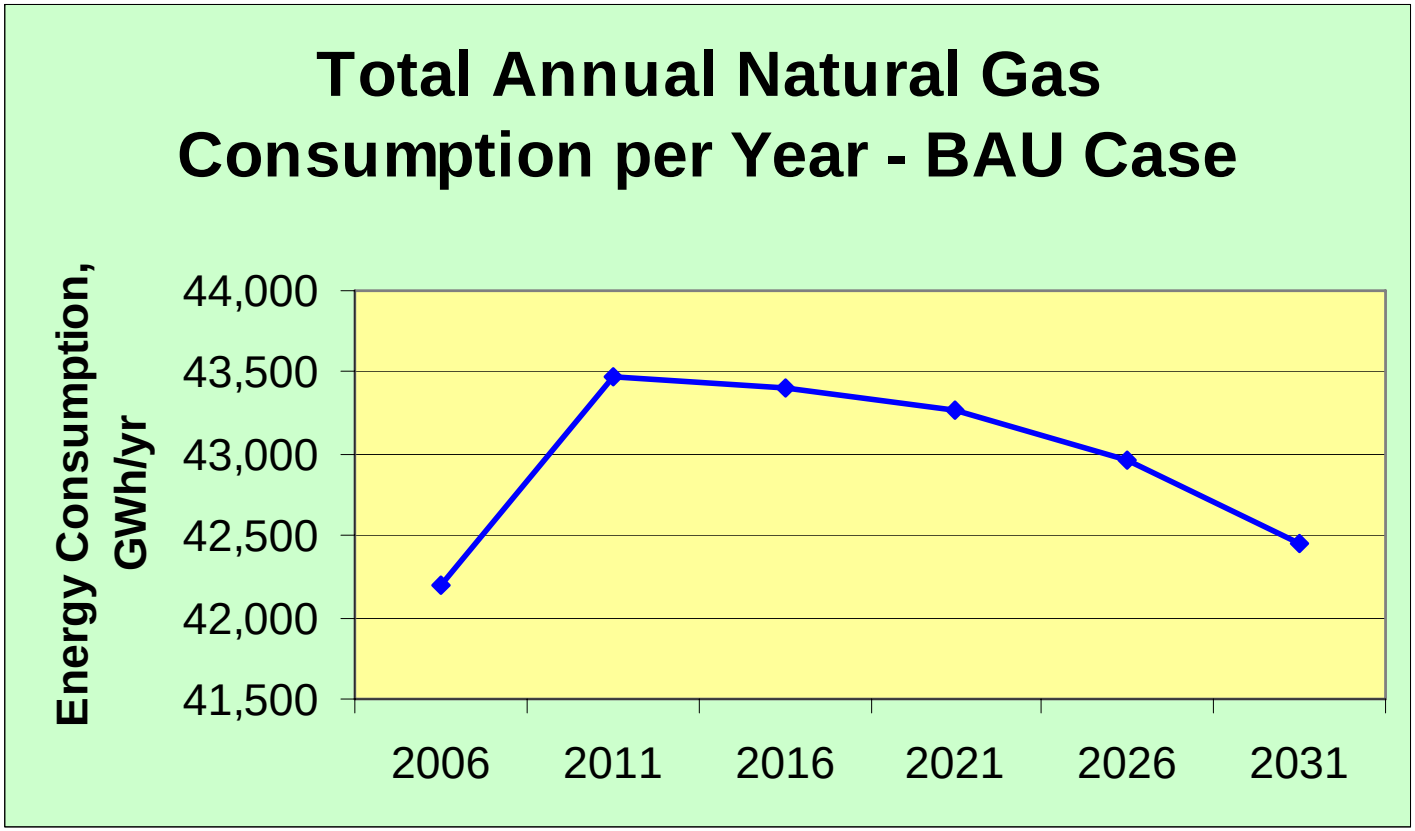


Note: Figures for 1996 are from Statistics Canada. *Figures for 2001 are unofficial.
All figures include the Census undercount.
Source: Statistics Canada; Toronto City Planning Division, Policy and Research.

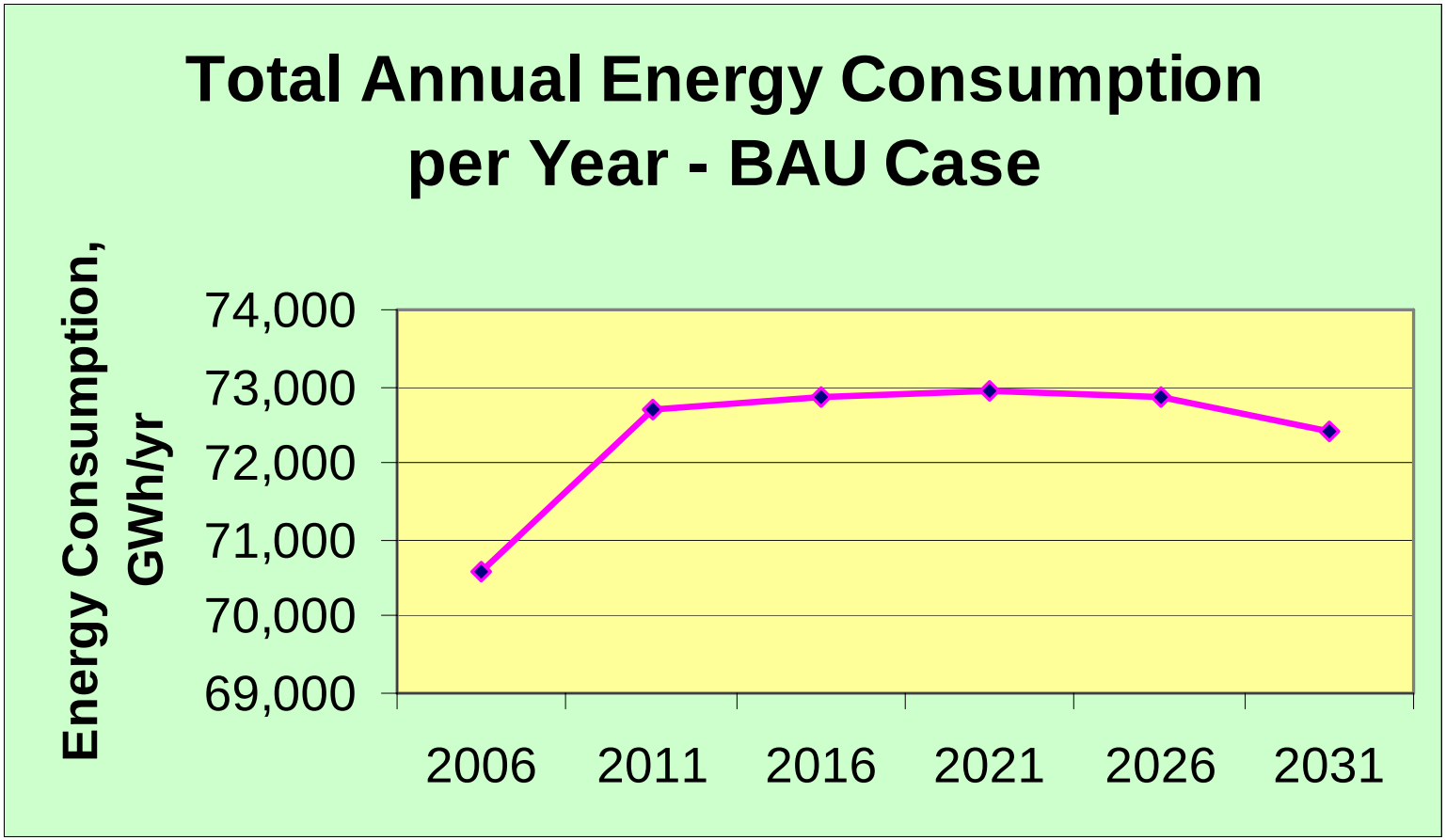
Forecast: Total Electricity Consumption



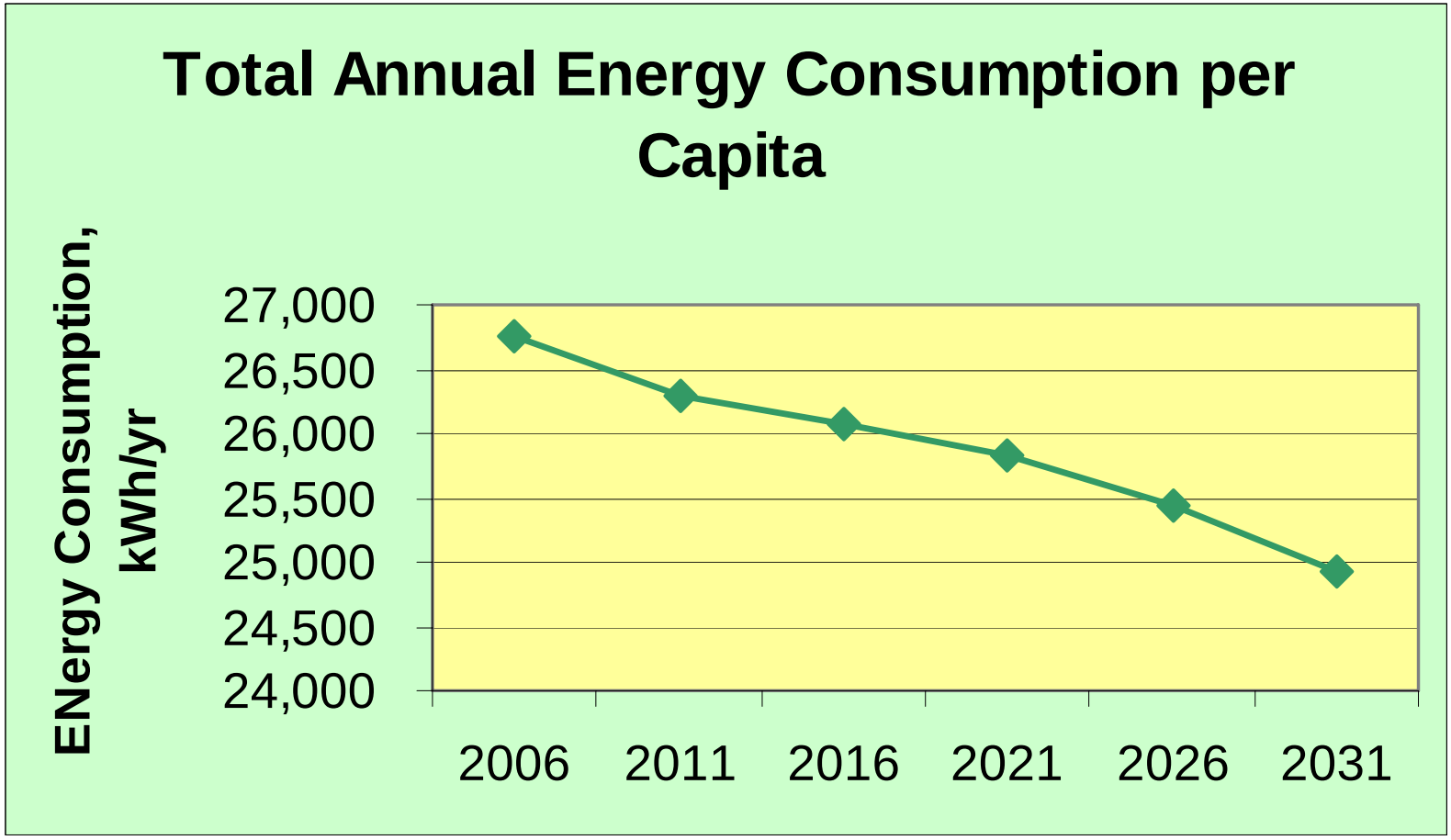
Forecast: Total Natural Gas



Forecast: Total Energy Consumption

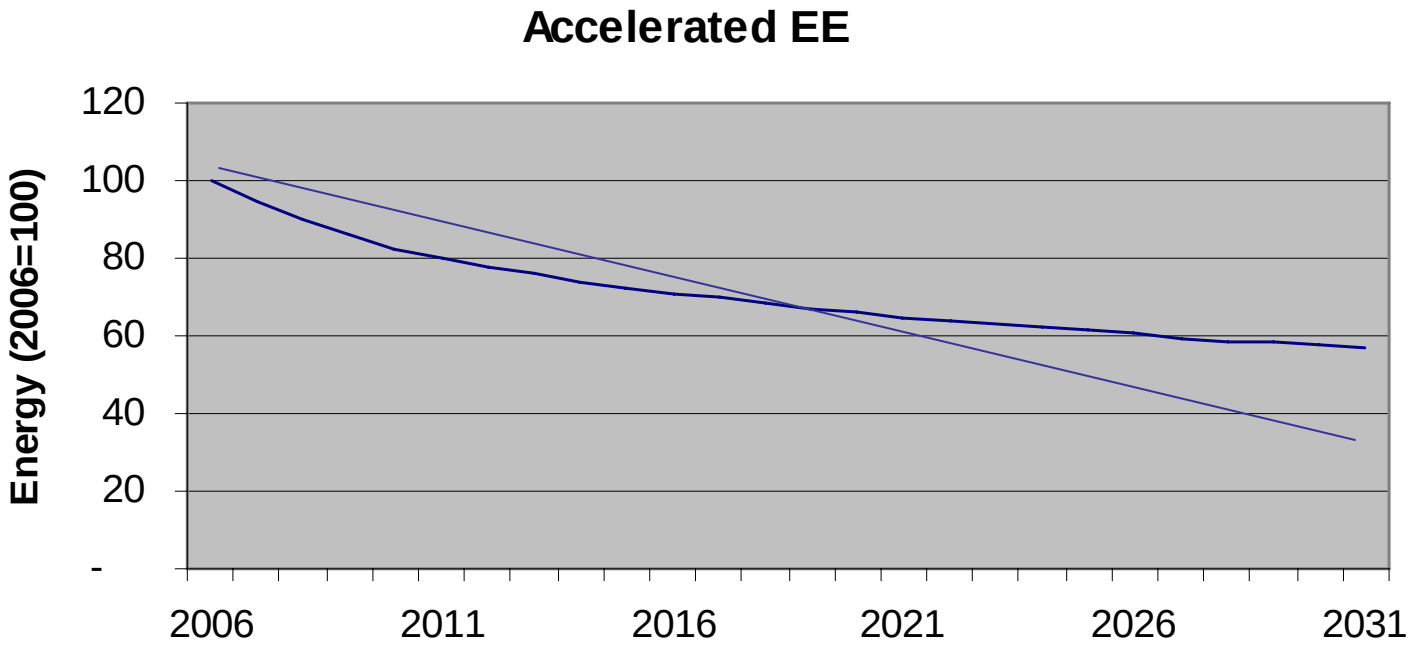


Forecast: Energy Consumption per Capita



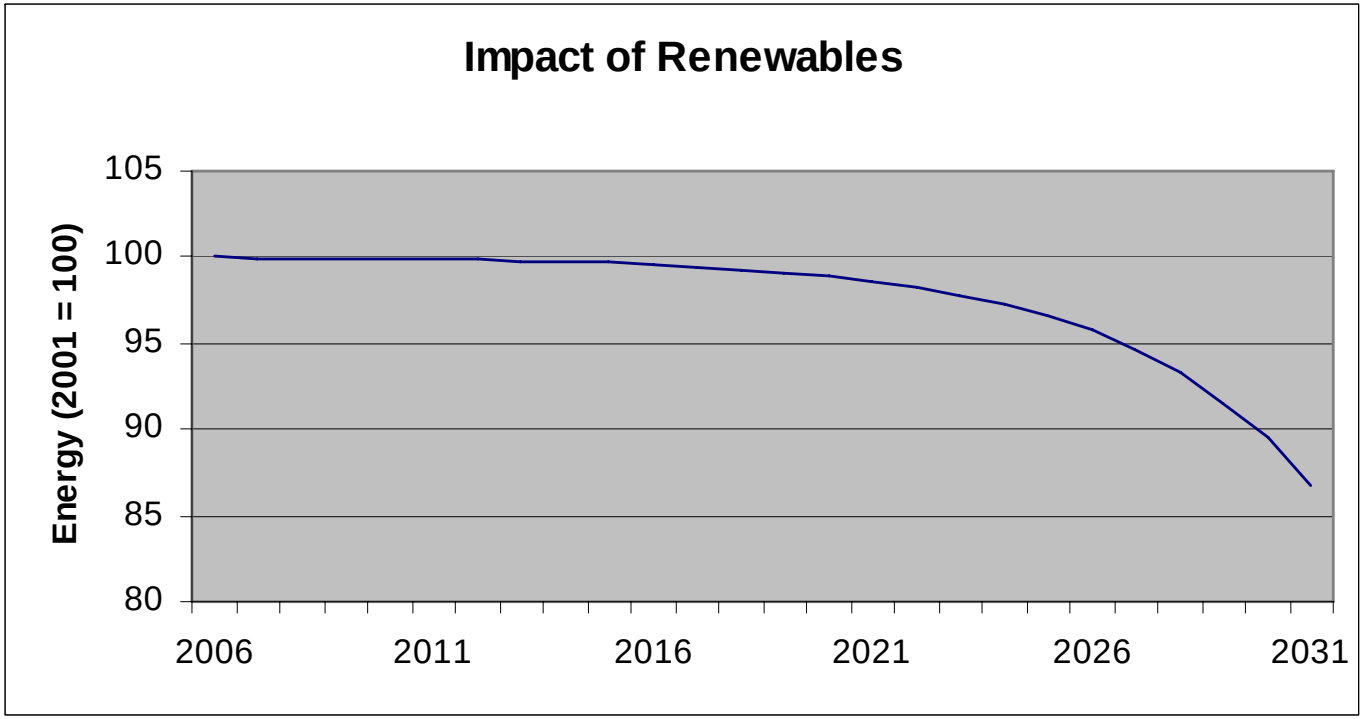
The Diminishing Return of Energy Efficiency

- Effectiveness of energy efficiency measures decreases over time:
  - Harder to find EE improvements
  - Cost effective ones are done first
  - But will this occur in the time frame of the EP4T (or still have a linear decrease)?

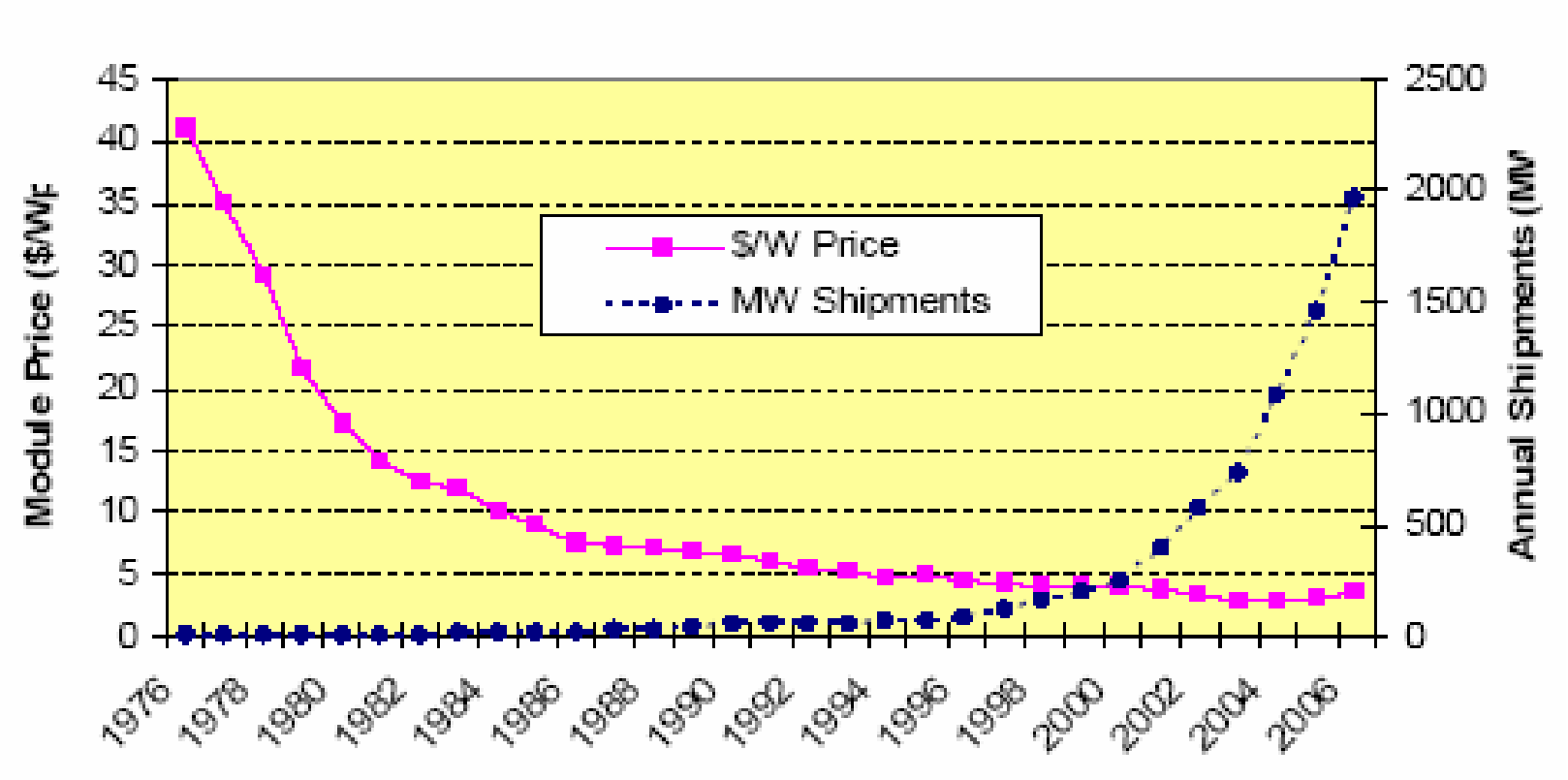


The Exponential Growth of Renewables

- Impact of renewables grows over time as more systems are installed (incremental)

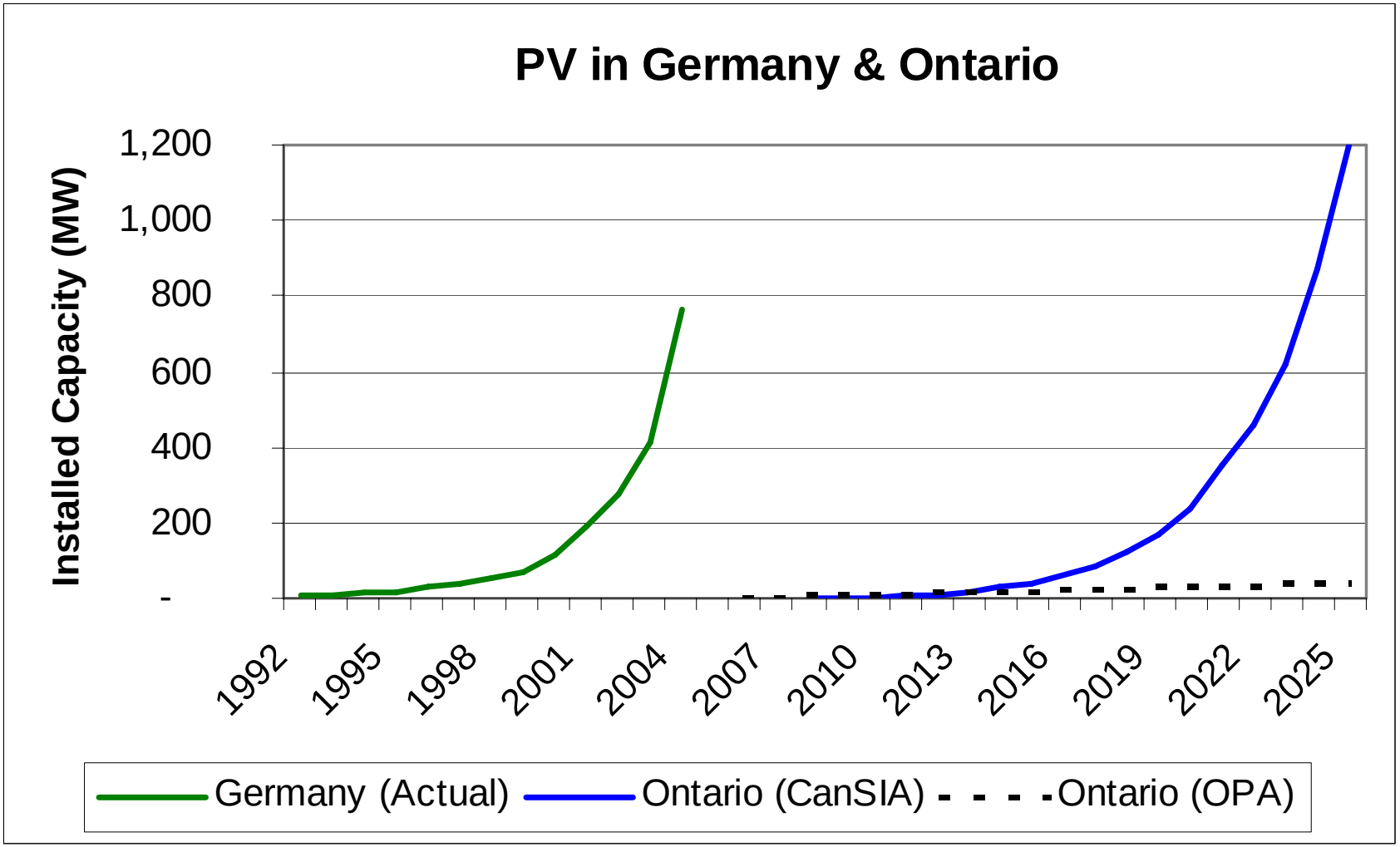


PV – A Typical Renewable Uptake

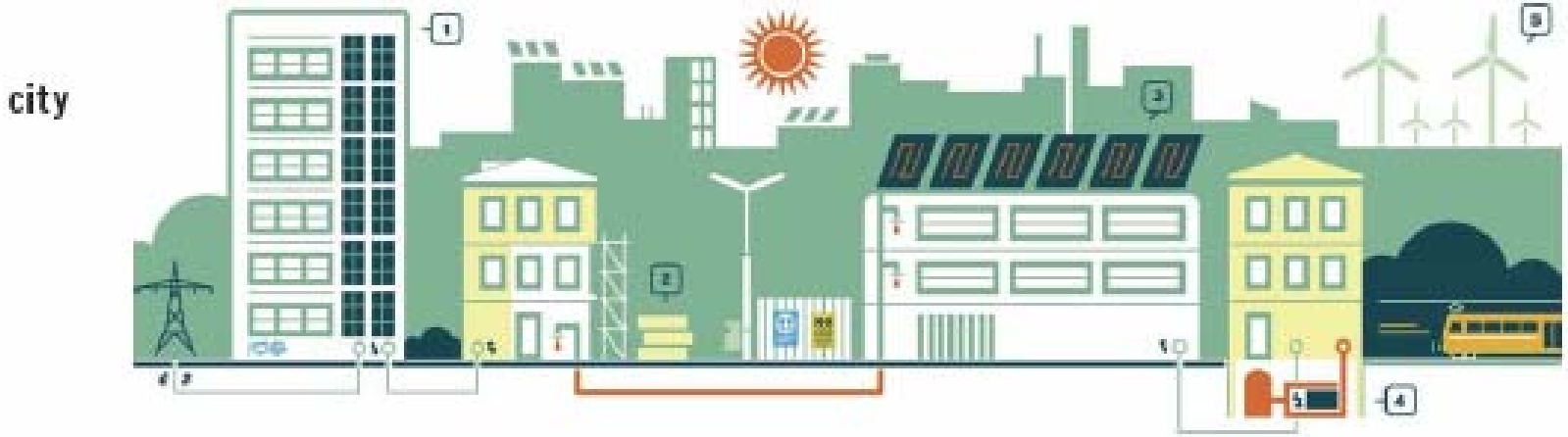


The Potential of PV in Ontario

A difference of opinion



A Vision of a Decentralized Energy Future

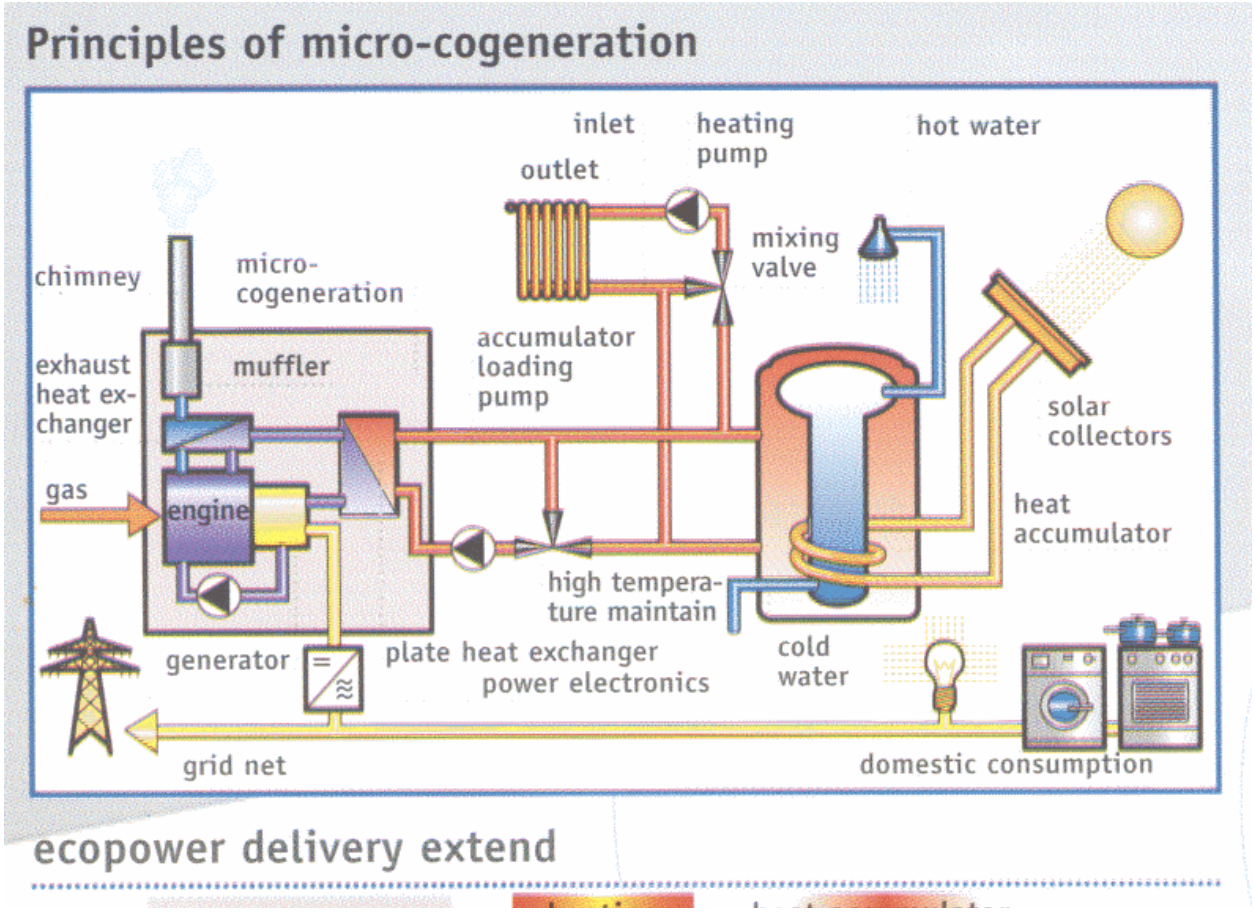


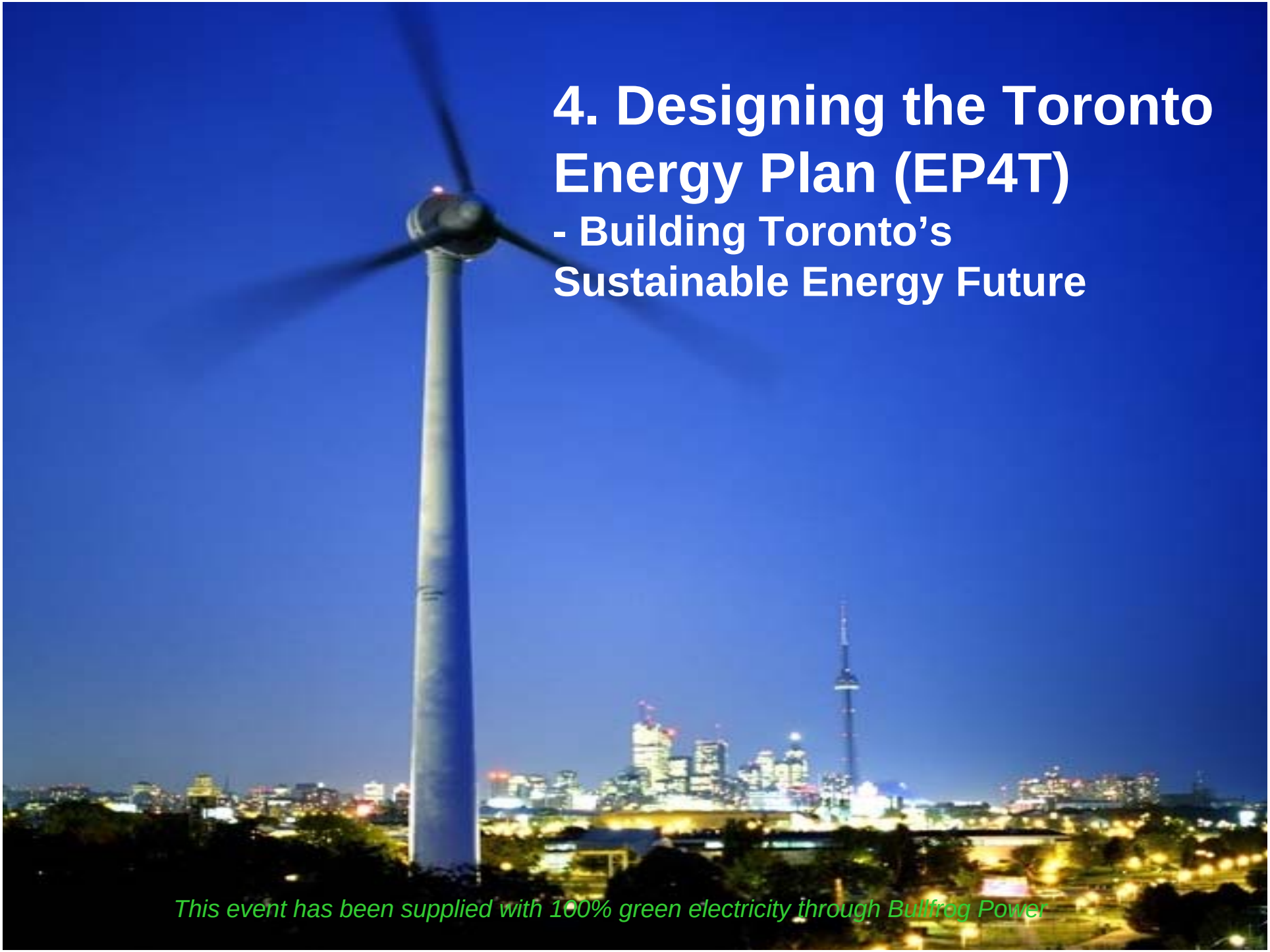
1. PHOTOVOLTAIC, SOLAR FASCADE WILL BE A DECORATIVE ELEMENT ON OFFICE AND APARTMENT BUILDINGS. PHOTOVOLTAIC SYSTEMS WILL BECOME MORE COMPETITIVE AND IMPROVED DESIGN WILL ENABLE ARCHITECTS TO USE THEM MORE WIDELY.
2. RENOVATION CAN CUT ENERGY CONSUMPTION OF OLD BUILDINGS BY AS MUCH AS 80% - WITH IMPROVED HEAT INSULATION, INSULATED WINDOWS AND MODERN VENTILATION SYSTEMS.
3. SOLAR THERMAL COLLECTORS PRODUCE HOT WATER FOR BOTH THEIR OWN AND NEIGHBOURING BUILDINGS.
4. EFFICIENT THERMAL POWER (CHP) STATIONS WILL COME IN A VARIETY OF SIZES - FITTING THE CELLAR OF A DETACHED HOUSE OR SUPPLYING WHOLE BUILDING COMPLEXES OR APARTMENT BLOCKS WITH POWER AND WARMTH WITHOUT LOSSES IN TRANSMISSION.
5. CLEAN ELECTRICITY FOR THE CITIES WILL ALSO COME FROM FARTHER AFIELD. OFFSHORE WIND PARKS AND SOLAR POWER STATIONS IN DESERTS HAVE ENORMOUS POTENTIAL.

The planning for this future has already begun in cities around the world

Could We Take Toronto “Off the Grid”

- What are the opportunities and challenges for micro-cogeneration in Toronto (residential and commercial)?
- It may solve the electrical problems but could increase the NG problems (which may be bigger in the future?)




4. Designing the Toronto Energy Plan (EP4T)
- Building Toronto's Sustainable Energy Future
This event has been supplied with 100% green electricity through Bullfrog Power

Four Key Questions

- What would you consider to be the greatest energy challenges that Toronto will face in the coming years?
- How can the city government help the community overcome future energy challenges?
- How can the city government help the community reduce the use of energy (load & peak, electricity & natural gas) and increase the use of renewable energy in the City?
- What is the role of other stakeholders in overcoming the energy challenges and reducing energy consumption?

Toronto as a Sustainable Energy LEADER

- How can the City?
  - **L**ead – put the City government's own house in order
  - **E**ncourage – provide incentives (and disincentives)
  - **A**dvocate – for legislative and other changes by the province and federal government
  - **D**evelop capacity – build the local energy infrastructure to prove more sustainable energy from local sources
  - **E**ducate - provide information
  - **R**egulate – adopt, change and modify bylaws to encourage sustainable energy practices

Primary Building Sectors in Toronto

- Residential (rental and ownership, single family – high rise)
- Commercial – Retail
- Commercial – Office
- Industrial
- MUSH (Municipal, University, Schools, Hospitals) Sector
- Other

Building Toronto's Energy LEADERship

- 6 key areas for actions
- 6 key building sectors

	Lead	Encourage	Advocate	Develop capacity	Educate	Regulate
Residential						
Commercial – Retail						
Commercial – Office						
Industry						
MUSH						
Other						

Contacts

Rob McMonagle

Energy Efficiency Office

City of Toronto

rmcmona@toronto.ca

www.toronto.ca/bbp