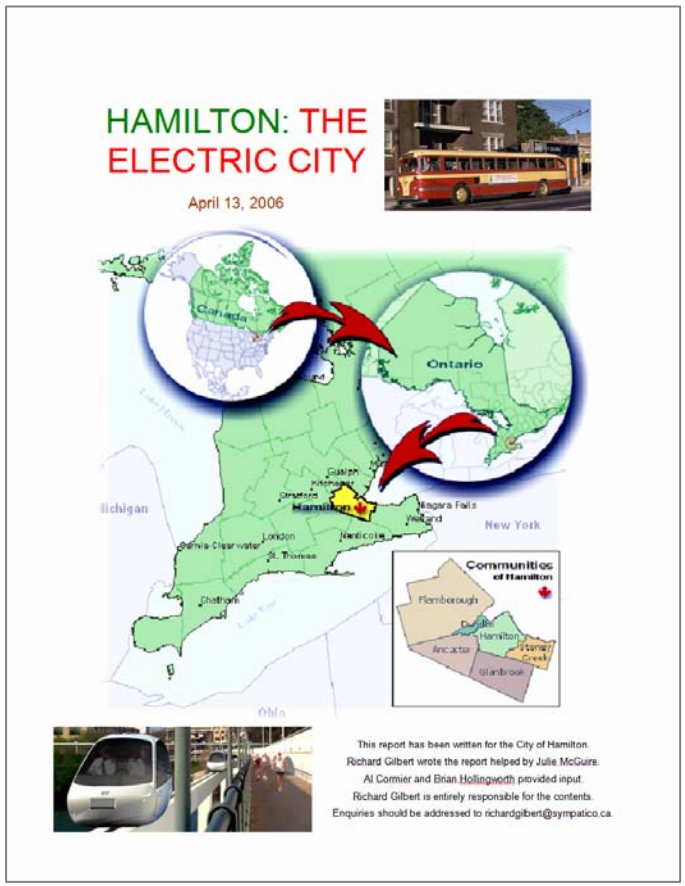
Hamilton: The Electric City



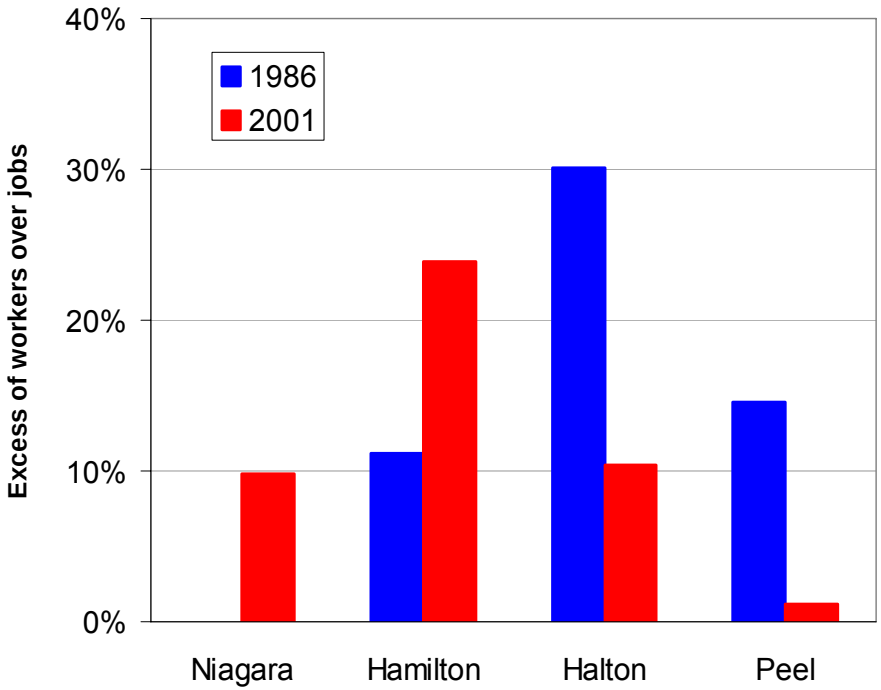
Richard Gilbert

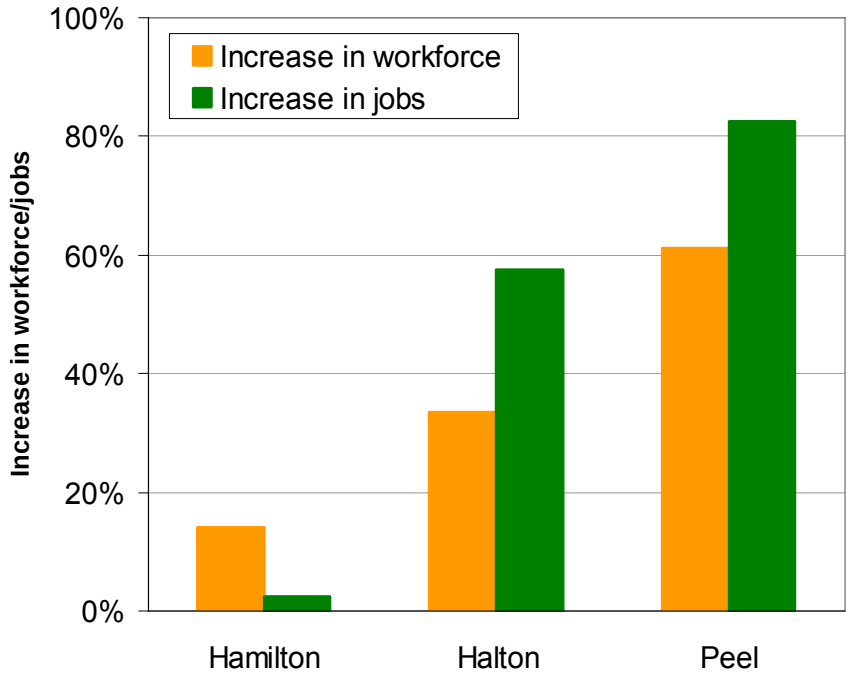
Presentation to the
Committee of the Whole
Hamilton City Council
City Hall, Hamilton
April 28, 2006

(with Council's action on May 13
added as the last slide)

Enquiries to Richard Gilbert at richardgilbert@sympatico.ca or 416 923 8839

Here's the nub of Hamilton's economic challenge: the growing jobs deficit





Data source for both charts: *Transportation Tomorrow Survey 1986 and 2001*, Joint Program in Transportation, University of Toronto, 2006

The left-hand chart shows that increasingly Hamilton residents must travel out of the city to work. Halton and Peel are reducing the gap between workforce and jobs. Niagara Region (no 1986 data) has a much smaller gap than Hamilton.

The right-hand chart shows the same thing in a different way. Between 1986 and 2001, Halton and Peel added many more jobs than workers. Hamilton, with much lower growth in the workforce, added even fewer jobs.

Enquiries to richardgilbert@sympatico.ca

Hamilton 'The Electric City'

1. In the 1890s, Hamilton was one of the first cities in the world to have wide-spread electric light—for streets, homes, and businesses. In June 1899, Mayor James Vernall Teetzel welcomed the 9th Convention of the Canadian Electrical Association, characterizing Hamilton as 'The Electric City'.

2. Hamilton could again be 'The Electric City', in the forefront of the transition to electric transport, new electricity generation, and greatly reduced reliance on fossil fuels.

3. The City could foster major R&D centres for the coming energy-constrained world, with development of vehicle systems (e.g., PRT), building systems (e.g., geoexchange), and small-scale electricity generation. The whole city could become a test bed for our energy-poor, electric future.

4. The thrust of this presentation is that embracing the 'Electric City' vision could be a plausible, job-rich economic strategy for a community that chooses to face the likely energy realities of the 21st century.

Special issue of the *Industrial Recorder of Canada*, May 1901, featuring Hamilton as 'The Electric City'

THE INDUSTRIAL RECORDER OF CANADA

AN ILLUSTRATED RECORD OF CANADIAN ACHIEVEMENTS IN COMMERCE, MANUFACTURE, SCIENCE AND ART

SPECIAL NUMBER. HAMILTON, ONT., MAY, 1901. ILLUSTRATED.

HAMILTON—THE ELECTRIC CITY

HISTORY, GOVERNMENT AND PROSPERITY OF THE BIRMINGHAM OF CANADA

APART from its importance as an industrial center, the City of Hamilton has many points of attraction for the visitor and tourist, being surrounded by scenes of great beauty and invested with peculiar interest on account of its historic associations.

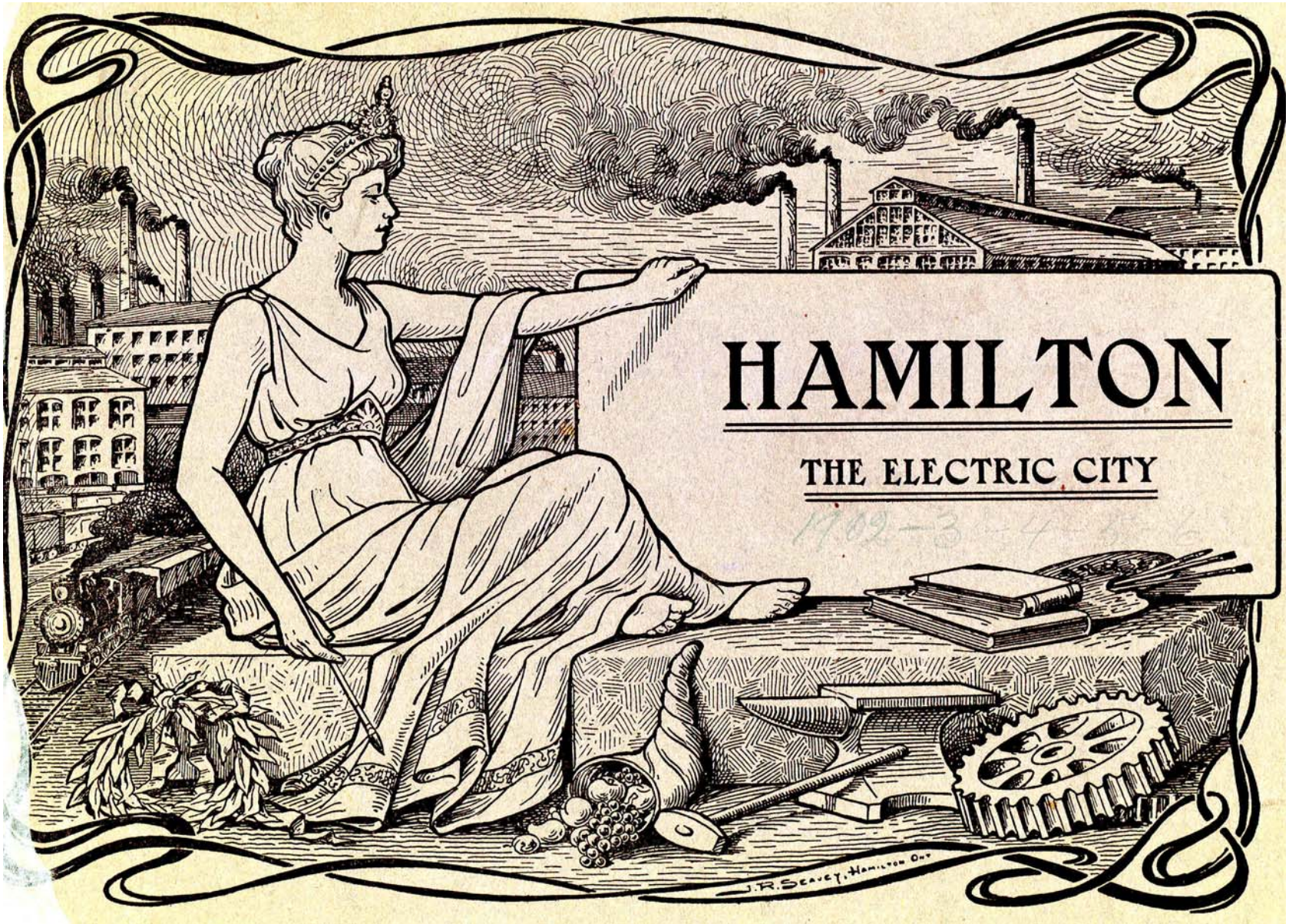
The original settlement of the district, like many other places in Canada, is shrouded in more or less mystery. Robert Cavalier, Sieur de La Salle, appears to have been the first white man to visit the waters of Mikassa, as the Burlington Bay was called, in 1626. While a monument has been erected to Richard Beasley as the first settler at the head of Lake Ontario, E. E. Charl-

The township of Barton, in which Hamilton is situated, was first surveyed in 1791, by Augustus Jones, a deputy provincial surveyor. His survey is dated Oct. 25, 1791, and shows that the land was allotted to thirty-one families, among them being Beasley, and Robert Land, and others whose names still live in the persons of their progeny and are closely associated with the prosperity of the municipality. The Governor-General, Lord Dorchester, by an Order-in-Council confirmed the grant of these lands and declared it was made to "put a mark of honor upon the families who had adhered to the unity of the Empire and joined the Royal Standard in America before the treaty of separation in 1783." One of Richard Beasley's descendants, Thomas Beasley, has occupied the position of City Clerk for many years.

morning. The "Spectator" is Conservative, the "Times" Liberal and the others independent in politics.

Hamilton, now the second city of the Province of Ontario and the third in importance within the Dominion of Canada, is situated on the south of Hamilton, formerly called Burlington Bay, and lies on a level plain between its shores and the overhanging brow of the Niagara escarpment, popularly known as the Mountain, with Lake Ontario on the east and Ancaster and Flamboro Heights on the west. The city is several hundred miles south of London, Eng., and Paris, France, and a little east of the 80th degree of longitude and north of the 43d parallel of latitude. Its area is about 1,000 acres. The climate is healthful, though somewhat variable in temperature, like all inland districts, the maximum

Cover illustration by Julian Ruggles Seavey of 42-page document in McMaster Library [1907?]



Inside that document

HAMILTON, ONTARIO

A Descriptive Sketch of its Wonderful Growth, Showing the Great Opportunities Existing for the Safe and Legitimate Investment of Capital and the Advantages Offered for the Establishment and Development of All Branches of Commerce and Industry.

THE day of sentiment and history has passed and the world is looking for "facts" as they pertain to positive things and point to the "right place" to invest money and energy. The history of Hamilton is a repetition of struggles with pioneer hardships and triumph through bravery and persistent "hammering, hammering on." Somehow Hamilton has managed to keep in the forefront in all that is successful and progressive and has never allowed her name to suffer reproach. It has been an incorporated town since 1847, a center of industry, and one of the substantial commercial points in the Dominion. Geographically it has the advantage over almost any point in the Dominion. It is located on the bank of Burlington Bay, with canal outlet to Lake Ontario, and the finest natural harbor on the lake. This canal floats the greatest boats on the lakes, and is spanned by the largest single span swing bridge in the world. The bridge is almost 400 feet long and weighs over one hundred thousand tons. It is operated perfectly—an example of how things are done in Hamilton.

A few years ago when it was suggested that electric power might be generated at DeCew Falls and transmitted to Hamilton, 35 miles away, it was hooted at as a wild fancy. Men of expansive ideas and advanced thought, backed by undaunted will, persisted in the discussion until capital enough to make the trial was secured. To-day all the light and railway power and most of the factories are operated by electric current from this source. The success of this undertaking has placed Hamilton on a pinnacle as the "Electric City of Canada." A recent undertaking has proved as successful in bringing natural gas from Guelph.

A few years ago when it was suggested that electric power be generated at DeCew Falls and transmitted to Hamilton, 85 miles away, it was hooted at as a wild fancy. Men of expansive ideas and advanced thought, backed by undaunted will, persisted in the discussion until capital enough to make the trial was secured. Today all the light and railway power and most of the factories are operated by electric current from this source. The success of this undertaking has placed Hamilton on a pinnacle as the 'Electric City of Canada'. A recent undertaking has proved as successful in bringing natural gas from Guelph.

First School in Hamilton.

The citizens of Hamilton laugh at difficulties and make stepping stones of obstacles. When an idea is conceived it is not discussed with fear and quaking, but if it is suggestive of advancement it is nourished into a healthy plan and put into practical

Ancaster Falls.

made Hamilton the commercial and creative center of the Dominion and the most vigorous city in Canada. Factories are coming from all points of the compass, from the States and Dominion, bringing multitudes of people with them. Over a hundred different industries are represented already, including some of the largest in the world of their kind. "Variety is the spice of life," says some one; truly it is the life of trade. These concerns combine talent and energy from north, south, east and west, representing energy, chivalry and hospitality, shrewd business instinct, daring and courage. Nothing succeeds like success. Hamilton has won the laurels in every commercial contest and is not ashamed to hoist her banners and say "follow." The survey of the city, the character of architecture, the uniformity of city improvements and all that city building means shows a broad minded and solid citizenship. Anything that is well managed in Hamilton prospers. There is more American capital invested in Hamilton in the production of world necessities than in all the cities of the province combined. This

Canada. Tourists visit the great fruit gardens about Hamilton as one of the wonders of the world. Raw material for many products are abundant. The world over Hamilton products are famous for uniform excellence. Cheap fuel and power, railway and water transportation, ideal climate and industrial peace place Hamilton beyond compare for manufacturers of any description. These are cold facts that look the world square in the face and influence men of decision.

Schools, churches, and all that goes to make up a well rounded city are in harmony with commercial development and meet the needs of humanity fully. Educational advantages equal to any in the land are sufficient for any demand. Social distinction is based on personal merit, and fraternal orders embody the highest sentiments of brotherhood.

The "Hamilton Spirit" is evident even to a stranger. Municipal government watches closely all that is done and allows no interest to develop at the expense of another. One feature of mighty strides in the right direction is the installment of Sewage Disposal Works, the only ones in operation in the Dominion. These receive the flow from 71 miles of sewer pipes and separate the liquids from solids, treating each chemically and leaving the final flow into the lake as clean as filtered water. This is one of the most commendable acts of the city. The works cost over $100,000. Hamilton does nothing by halves. What is done is well done. The water supply is managed with the same skill and satisfaction, health and sanitary conditions rigidly enforced.

Hamilton is the center of the most perfect electric railway system in operation. Lines are projected and will be in operation as soon as human endeavor can build them, which will connect the city with all points of consequence from Buffalo to Toronto and as far west. Parks and points of interest in and around Hamilton are numerous and furnish as entrancing and varied landscape effect as the blue hills of Switzerland. Nature seems to have lavished all that is beautiful in

Regatta at Burlington Beach.

JR Seavey's illustration of Hamilton in 2003, from the perspective of 1903

Illustration for an article in the *Hamilton Spectator* [1903?] depicting Hamilton in 2003, predicting that Hamilton would become the industrial capital of North America. It could still happen.

This presentation has four main parts

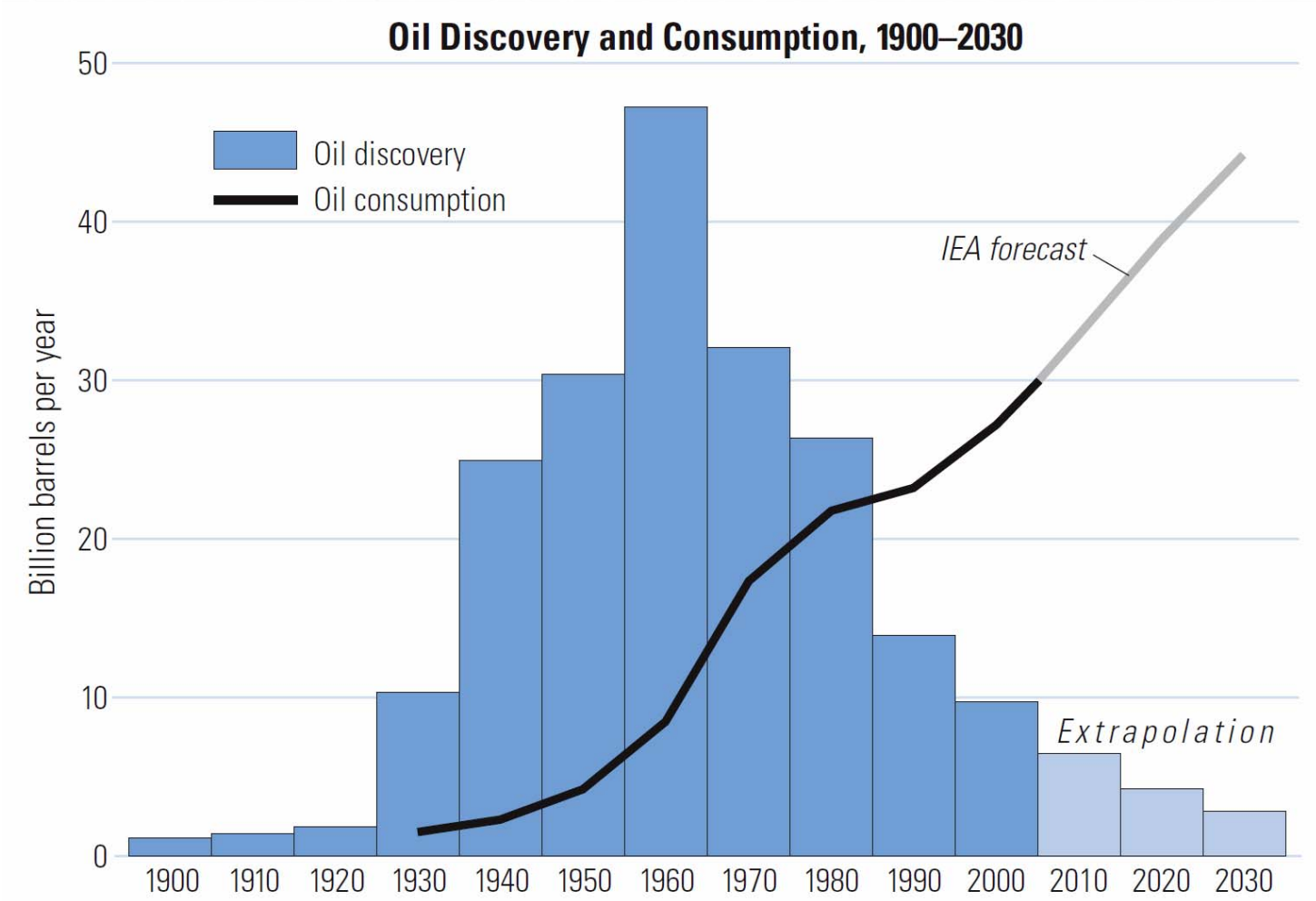
1. Energy challenges: Why there could be fourfold increases in retail prices from peaking in oil and natural gas production.

2. Energy consumption in Hamilton, in buildings and for transport: How they should/could be substantially reduced, with electricity's share rising from 20% of end use now to more than 50% by 2018 (remaining about the same overall).

3. Energy production in Hamilton: Raise the share produced in Hamilton from essentially zero now to 100% for electricity and 50% for other energy.

4. Energy opportunities: On both the consumption and production sides, situate Hamilton ahead of the wave rather than drowning in it; put energy first in all planning; develop and implement an economic development strategy that makes Hamilton again 'The Electric City'.

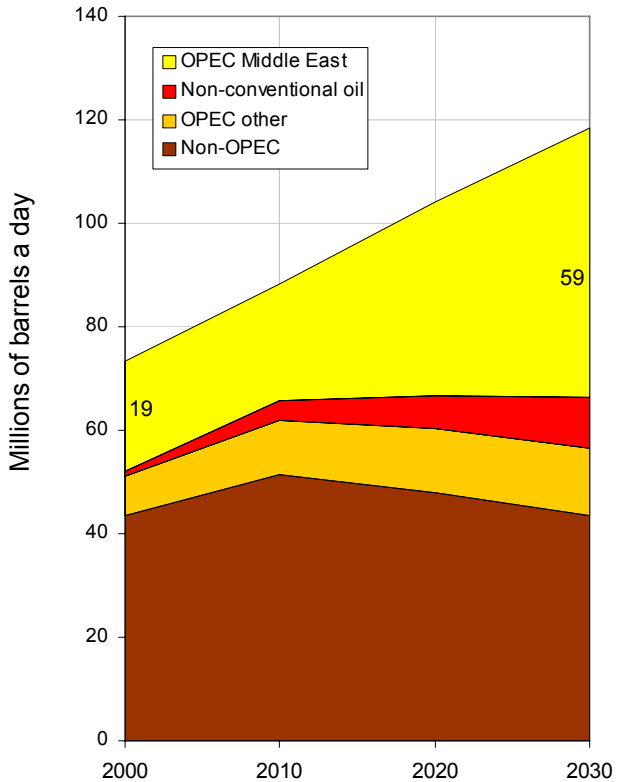
Here's the nub of the oil problem: discoveries are not keeping up with consumption



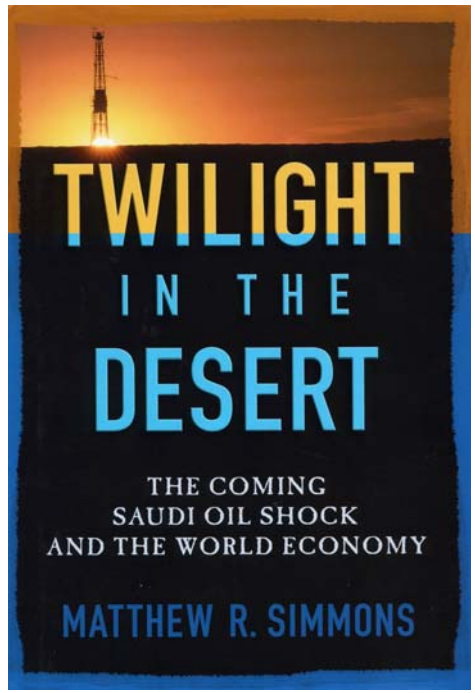
Source: Kjell Aleklett, Oil: a bumpy road ahead. *World Watch*, 19(1), 10-12, 2006

IEA says almost all of the new oil will come from the Middle East

IEA's view of world oil production by source, 2000-2030

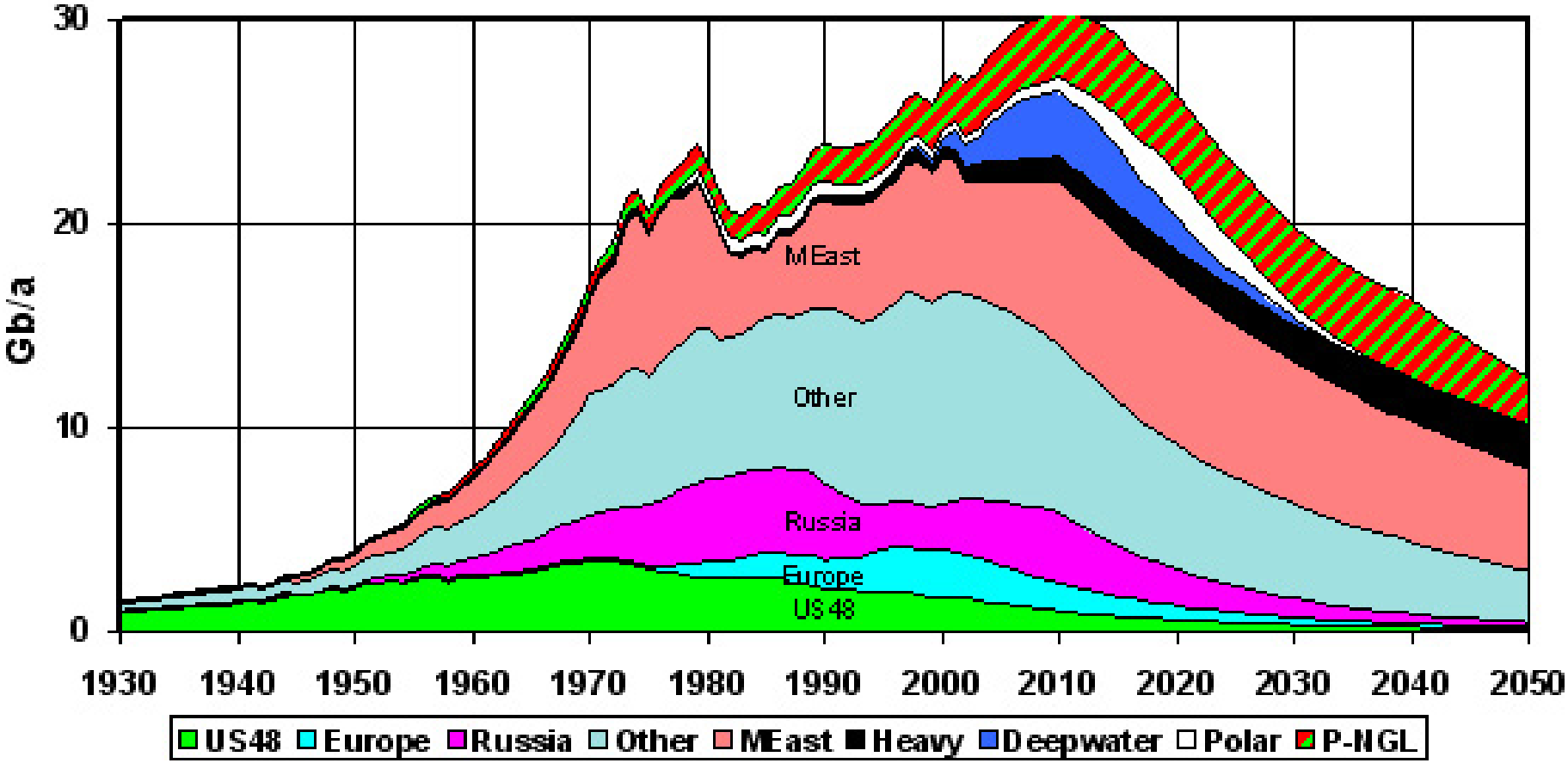


Simmons says there is doubt whether Saudi Arabia can even maintain the current production of 9.5 mb/d.



IEA: "Of the projected 31 mb/d rise in world oil demand between 2010 and 2030, 29 mb/d will come from OPEC Middle East … Saudi Arabia, Iraq, and Iran are likely to contribute most of the increase." On April 10, 2006, according to *Platts Oilgram News,* Saudi Aramco announced that its "composite decline rate of producing fields" is 2%/year, after "remedial actions and the development of new fields".

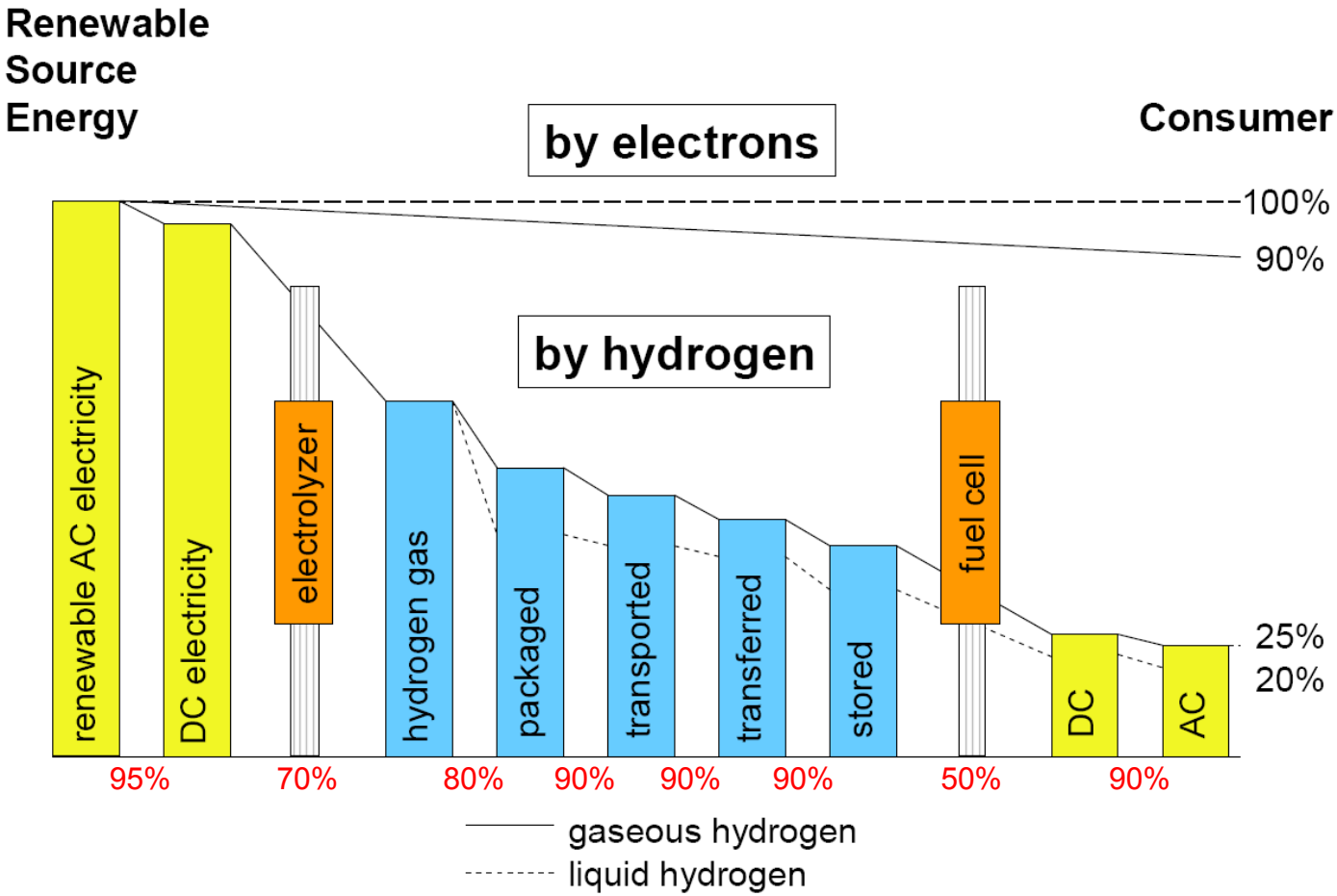
Here's the best estimate of when the world peak in liquid hydrocarbon production will occur: about 2012 (black area is oil sands)



Source: Uppsala Hydrocarbon Depletion Group, 2005

An updated analysis by Colin Campbell puts the peak in production of conventional oil in 2005 and the peak production of all liquid hydrocarbons in 2010 (ASPO newsletter, April 2006)

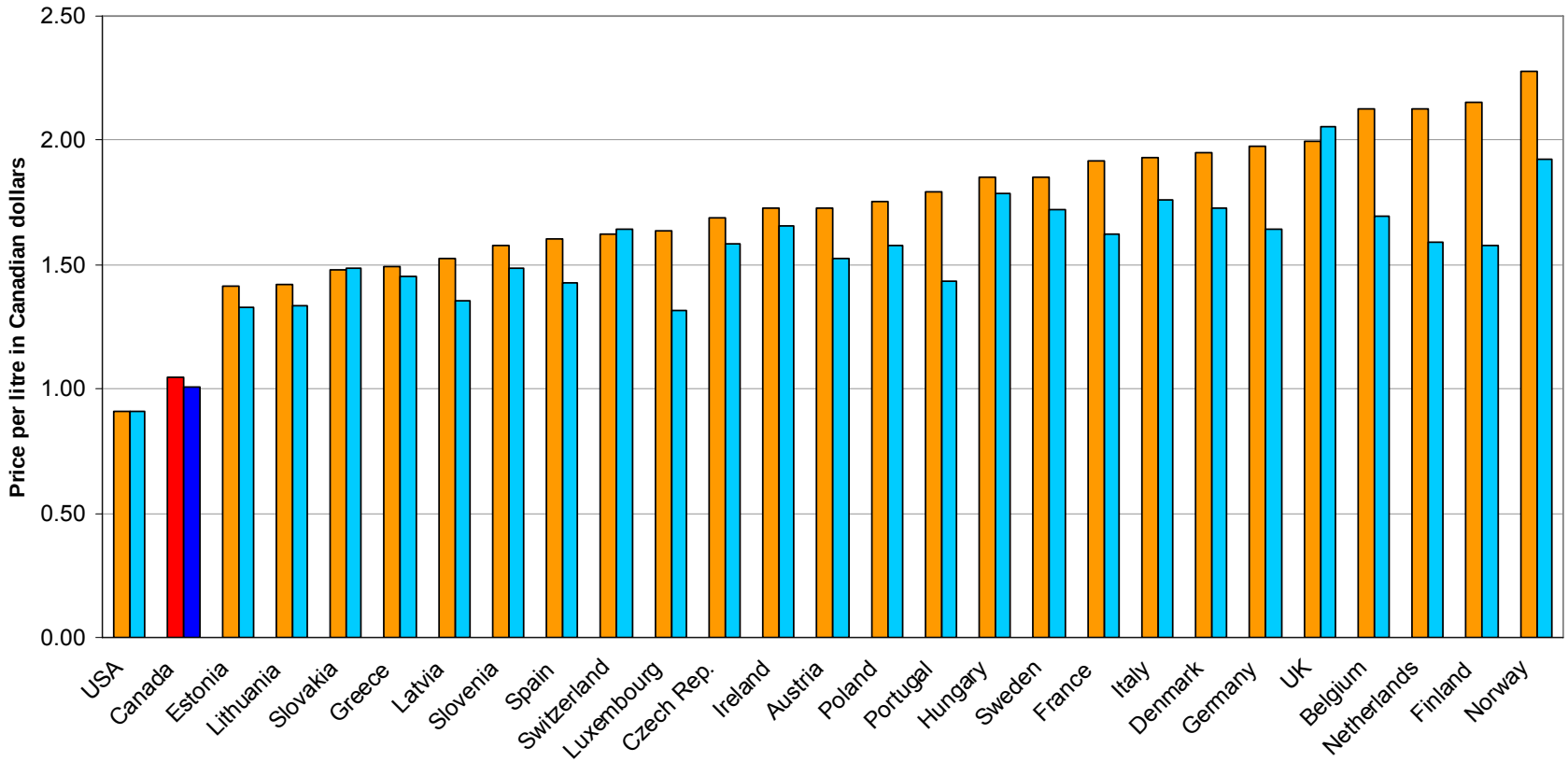
Why the hydrogen fuel cell future won't work (but grid-connected vehicles will)



Source: Bossel (2005)

Approximate efficiencies of processes are in red.

European and other gasoline prices (cheapest posted) are 150-200% of Canadian prices. The diesel fuel price difference is usually a little less. Prices below are for September 19-20, 2005, ranked by gasoline price, using official exchange rates.



Data sources: UK Automobile Association, *Japan Today*, Australian Institute of Petroleum, MJ Ervin & Associates, OANDA.com

The higher fuel prices in Europe have surprisingly little impact on travel, which is overwhelmingly by automobile on both sides of the Atlantic

Including aviation

	Kilometres travelled per person	Share by personal vehicle	Share by surface public transport	Share by aviation
Canada	16,113	81%	9%	10%
EU15	13,397	79%	15%	6%

Ignoring aviation

	Kilometres travelled per person	Share by personal vehicle	Share by surface public transport
Canada	14,529	90%	10%
EU15	12,659	84%	16%

Data sources: Natural Resources Canada, *Energy Use Data Handbook*, 2005; Statistics Canada (population data); European Commission, *Energy and Transport in Figures 2005*

Europeans have smaller, less powerful vehicles and use roughly a third less energy for each person-km.

Strategy for analysis

- Retail energy prices will have to rise about fourfold for there to be major changes in how energy is used and produced.
- What are the chances of prices rising so high during the next 25 years?
- If the odds are less than one in four, proceed with business as usual. If there are between one in four and one in two, have a 'Plan B' that puts energy first.
- If there is a more than 50% chance of prices being so high—i.e., they are more likely to happen than not—'Plan A' should be a plan that puts energy first.

Small shortfalls can mean big price increases (two analyses)

①

Based on analysis for the U.S. by the Brookings Institution	Shortfall in crude oil supply			
	0%	5%	10%	15%
Resulting increase in crude oil price	0%	30%	200%	550%
Crude oil price per barrel (US$)	$50	$65	$150	$320
Resulting gasoline pump price (Can$/litre)	$0.85	$1.00	$1.50	$2.50

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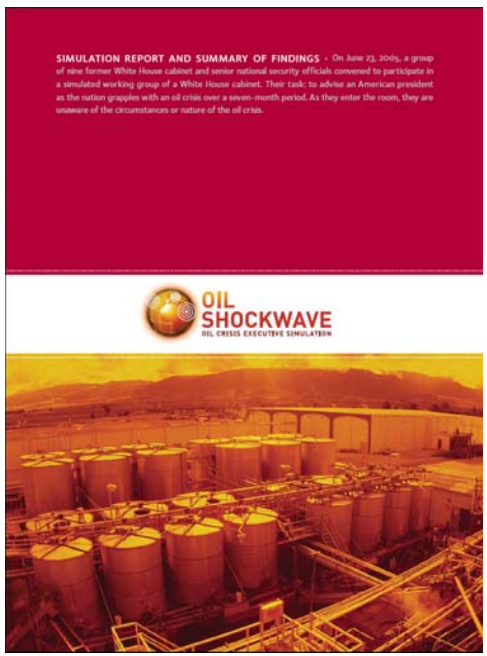
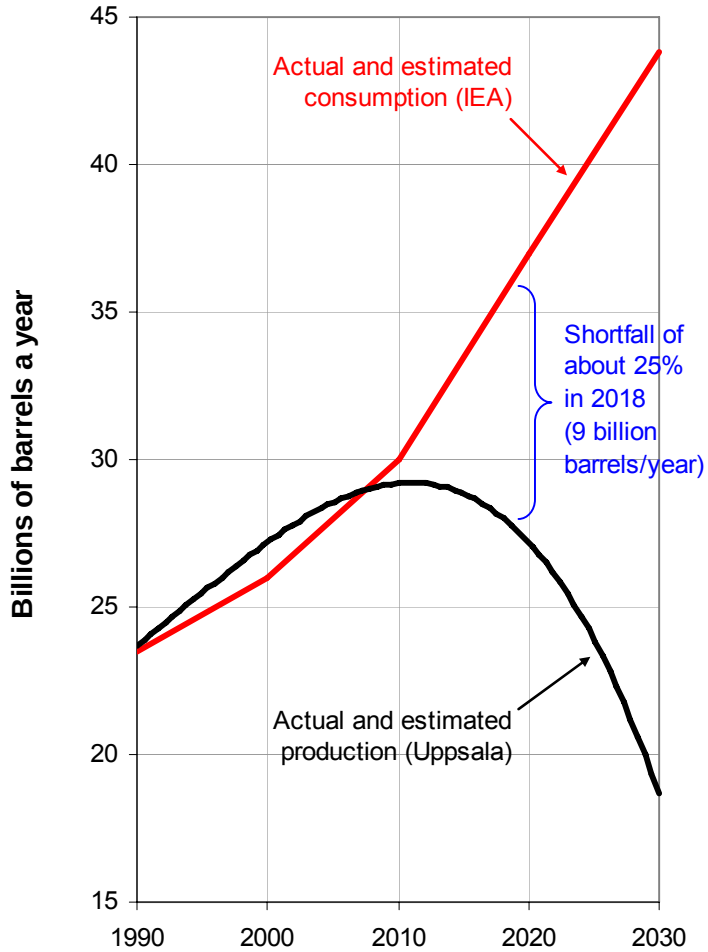
②



The U.S. National Commission on Energy Policy concluded in June 2005 that a "4 percent global shortfall in daily supply results in a 177 percent increase in the price of oil" (from $58 to $161 per barrel).

The possibility of fourfold increases in pump prices

- The IEA projection of world consumption and the Uppsala University analysis of production together suggest that in 2018 there could be an oil production shortfall of about 25%.
- Using the more conservative of the above two analyses of the impact of shortfall on price, this translates into an eight-fold increase in oil's 'wholesale' price (i.e., to US$500-600/barrel).
- High prices force down potential demand; and pump prices vary less than crude oil prices (distribution costs, taxes).
- Nevertheless, it may be reasonable to assume that pump prices of transport fuels will be four times higher in 2018 than they are now—and a similar argument can apply to natural gas.



Four-dollar gasoline is an optimistic perspective

1. Cheap energy is so important for our way of living, large increases in energy prices could be devastating.

2. An entirely possible outcome of the end of cheap oil (and natural gas) could be a 'hard landing' into economic depression and widespread dislocation.

3. Projecting a reasonably stable price of $4/L implies that there is still demand for oil, i.e., economic and social life are continuing, albeit within a different framework. $4/L implies a 'soft landing'.

4. A reasonably stable $4/L (and $2/$m^3$) also implies an orderly process whereby the long decline in production of oil (and natural gas) is being matched by progressively more efficient use and by a measured transition to use of other fuels.

Consumption guidelines for a Plan A (transport and buildings)

- Keep household and business energy bills to no more than 50% above current levels, assuming fourfold increase in electricity prices too. (New equipment should add no more than another 50% to total energy costs.)

- This means reduce energy use per capita by just over 60%, say by two-thirds to allow a safety margin, or lower energy bills.

- But, Hamilton's population is set to increase, from about 525,000 today to about 595,000 by 2018, i.e., by about 13%. So, an absolute reduction by about 60% could be appropriate.

- Keep the total amount of electricity use at about the same level as now, but do much more with it, particularly for transport. Electricity's share of total energy use would rise from about a fifth to about a half.

- Reduce use of oil and natural gas by about 80%.

Here's what the consumption guidelines translate to

Purpose of energy use	Actual in 2003 (petajoules)				Proposed for 2018 (petajoules)				Change in total, 2003-18
	Oil/NG	Electricity	Other	Total	Oil/NG	Electricity	Other	Total	
Movement of people	20.0	0.0	0.0	20.0	3.0	3.5	0.0	6.5	-68%
Movement of freight	11.9	0.0	0.0	11.9	4.0	1.4	0.2	5.6	-53%
In residential buildings	13.9	6.9	1.0	21.8	2.7	5.1	1.1	8.9	-59%
In other buildings	10.0	7.6	0.3	17.9	1.7	4.3	0.5	6.5	-64%
Totals for transport	31.9	0.0	0.0	31.9	7.0	4.9	0.2	12.1	-62%
Totals for buildings	23.9	14.5	1.3	39.7	4.4	9.4	1.6	15.4	-61%
Overall totals	55.8	14.5	1.3	71.6	11.4	14.3	1.8	27.5	-62%

Source for 2003 data: Ontario section of Natural Resources Canada, *Comprehensive Energy Use Data*, 2006;

Here are details about the movement of people

Mode	2003				2018			
	PKM (millions)	Fuel use/ PKM (MJ)	Total petroleum use (PJ)	Total electricity use (PJ)	PKM (millions)	Fuel use/ PKM (MJ)	Total petroleum use (PJ)	Total electricity use (PJ)
Car (ICE)	7,500	2.5	19.0	0.0	2,000	1.5	3.0	0.0
Car (electric)	0				2,000	0.75	0.0	1.5
PRT	0				2,000	0.5	0.0	1.0
Transit	750	1.3	1.0	0.0	2,000	0.5	0.0	1.0
Totals	8,250		20.0	0.0	8,000		3.0	3.5

Note: PKM = Person-Kilometre. ICE = Internal Combustion Engine. PRT = Personal Rapid Transport. MJ = MegaJoule. PJ = PetaJoule

Source for 2003 data: Ontario section of Natural Resources Canada, *Comprehensive Energy Use Data*, 2006;

Here are details about the movement of freight

Mode	2003				2018			
	TKM (millions)	Fuel use/ TKM (MJ)	Total petroleum use (PJ)	Total electricity use (PJ)	PKM (millions)	Fuel use/ PKM (MJ)	Total petroleum use (PJ)	Total electricity use (PJ)
Truck (ICE)	3,300	3.2	10.7		1,250	2.5	3.1	0.0
Truck (electric)					1,000	1.0	0.0	1.0
Rail	3,200	0.2	0.7		4,000	0.1	0.0	0.4
Marine	2,000	0.4	0.5		3,000	0.3	0.9	0.0
Totals	8,500		11.9		9,250		4.0	1.4

Note: TKM = Tonne-Kilometre. ICE = Internal Combustion Engine. MJ = MegaJoule. PJ = PetaJoule

Source for 2003 data: Ontario section of Natural Resources Canada, *Comprehensive Energy Use Data*, 2006;

What are grid-connected (tethered) vehicles?

- Electrically driven vehicles that get their motive energy while moving from an overhead wire(s) or third rail rather than from an on-board source.

- They have high 'wire-to-wheel' fuel efficiency for four reasons:
  - >95% of applied energy is converted to traction
  - electric motors are lighter than internal combustion engines (ICEs)
  - constant torque at all speeds means no oversizing
  - there is no fuel to carry.

- Overall efficiency and environmental impacts depend on the distribution system (perhaps a 10% loss) and the primary fuel source, which can range from inefficient and dirty (e.g., coal) to efficient and clean (e.g., sun and wind).

- Grid-connected systems can use a wide range of fuels and switch among them without disrupting transport activity, allowing smooth transitions towards sustainable transport.

Public transit within cities

Montreal

Vehicle type	Fuel	Occupancy (pers./veh.)	Energy use (mJ/pkm)
Transit bus (U.S.)	Diesel	9.3	2.73
Trolleybus (U.S.)	Electricity	14.6	0.88
Light rail (streetcar)	Electricity	26.5	0.76
Heavy rail (subway)	Electricity		0.58

Calgary

Vancouver

Public transit between cities

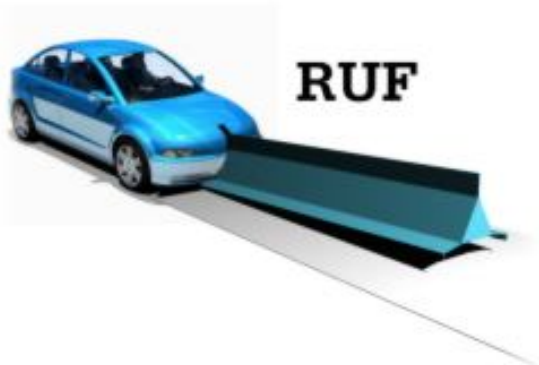
Vehicle type	Fuel	Occupancy (pers./veh.)	Energy use (mJ/pkm)
Intercity rail	Diesel		2.20
School bus	Diesel	19.5	1.02
Intercity bus	Diesel	16.8	0.90
Intercity rail	Electricity		0.64

Amtrak Acela at Boston South station

German ICE

Personal vehicles

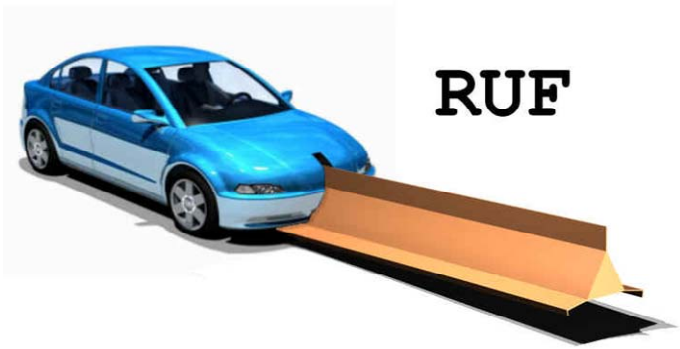
Düsseldorf Airport SkyTrain



Vehicle type	Fuel	Occupancy (pers./veh.)	Energy use (mJ/pkm)
SUVs, vans, etc.	Gasoline	1.70	3.27
Large cars	Gasoline	1.65	2.55
Small cars	Gasoline	1.65	2.02
Motorcycles	Gasoline	1.10	1.46
Fuel-cell car	Hydrogen	1.65	0.92
Hybrid electric car	Gasoline	1.65	0.90
Very small car	Diesel	1.30	0.89
Personal Rapid Transit	Electricity	1.65	0.49

Skyweb Express (Cincinnati concept)

More on PRT



Freight transport

Trolley truck operating at the Quebec Cartier iron ore mine, Lac Jeannine, 1970s

Vehicle type	Fuel	Energy use (mJ/tkm)
Truck	Diesel	0.45
Train	Diesel	0.20
Train	Electricity	0.06
Truck	Electricity	0.15?

Fuel is now >75% of shipping costs. Kites reduce fuel use by about a third. <3-year payback. Coming into use in 2007.

Source: Economist September 17, 2005

Additional guidelines for energy use in buildings

- About the same reduction in overall energy use as for transport (≈60%), and the same level of reduction in fossil fuel use (≈85%), even though more energy is used in buildings than for transport.

- As for transport, there would be a shift to electricity use. Now electricity is 37% of in-building energy use, becomes 61%. Transport energy use is now 0% electricity, becomes 54%.

- Big difference is that buildings but not vehicles can be a source of energy (discussed later).

Here are details about how energy use in buildings could change

	Actual in 2003 (petajoules)				Proposed for 2018 (petajoules)				Change
	Oil/NG	Electricity	Other	Total	Oil/NG	Electricity	Other	Total	2003-18
Residential									
Space/water heating/cooling	13.9	3.2	1.0	18.1	2.7	3.7	1.1	7.6	-58%
Other	0.0	3.7	0.0	3.7	0.0	1.4	0.0	1.4	-61%
Commercial									
Space/water heating/cooling	10.0	1.6	0.3	11.9	1.7	1.9	0.5	4.1	-66%
Other	0.0	6.0	0.0	6.0	0.0	2.4	0.0	2.4	-61%
Totals	23.9	14.5	1.3	39.7	4.4	9.4	1.6	15.5	-61%

Source for 2003 data: Ontario section of Natural Resources Canada, *Comprehensive Energy Use Data*, 2006

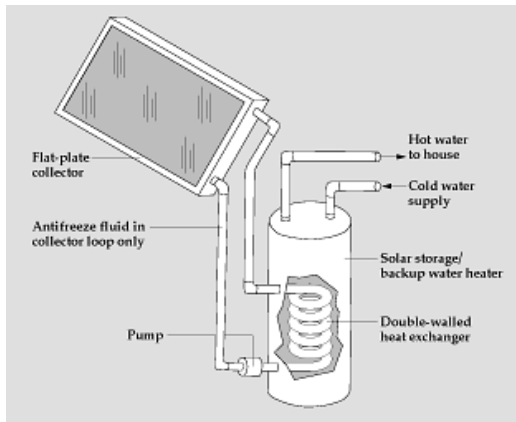
Energy production will be a priority (1)

Hamilton could become self-sufficient in electricity and produce substantial amounts of natural gas and other useful energy:

- Solar energy: electricity and hot water
- Wind energy: electricity
- Deep Lake Water Cooling (DLWC): cold water for air conditioning
- Hydroelectric power: electricity
- Geoexchange (low-temperature geothermal energy) for heating, cooling
- Energy from waste: electricity, process steam, hot water
- Biogas production: natural gas (also electricity, etc.)
- District energy: allows buildings to be heated and cooled from numerous sources (including DLWC)
- Local food production: energy for humans, reduces transport and possible shortages

Energy production will be a priority (2): solar electricity and hot water

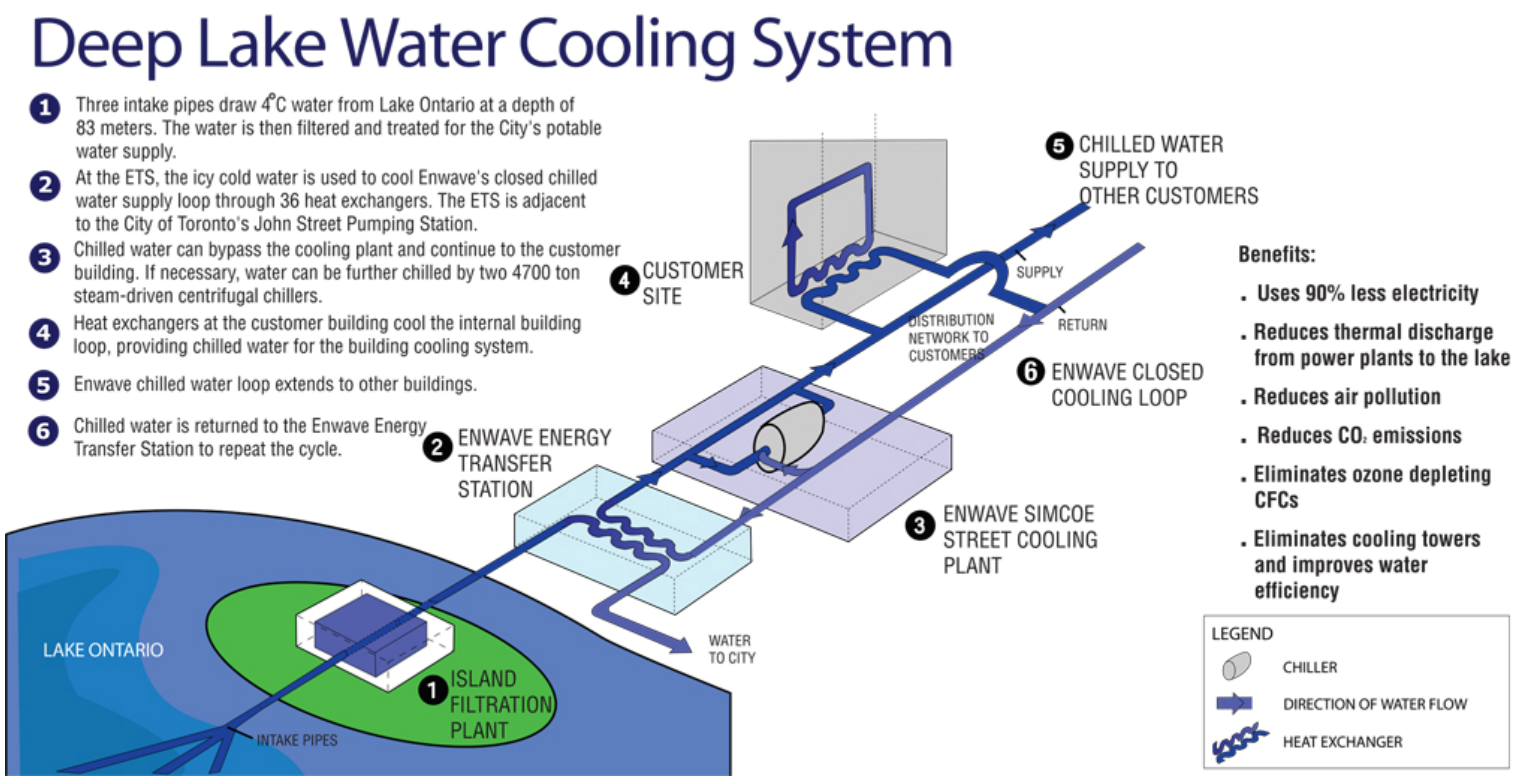
Photovoltaic panels on roofs (upper left) and walls (lower left) could provide the equivalent of most of the electricity used within Hamilton's residential buildings and more than that used in commercial buildings (in total, more than half of Hamilton's 2018 consumption). Solar water heating panels (right) could provide most of Hamilton's domestic hot water.



Energy production will be a priority (3): horizontal and vertical wind turbines

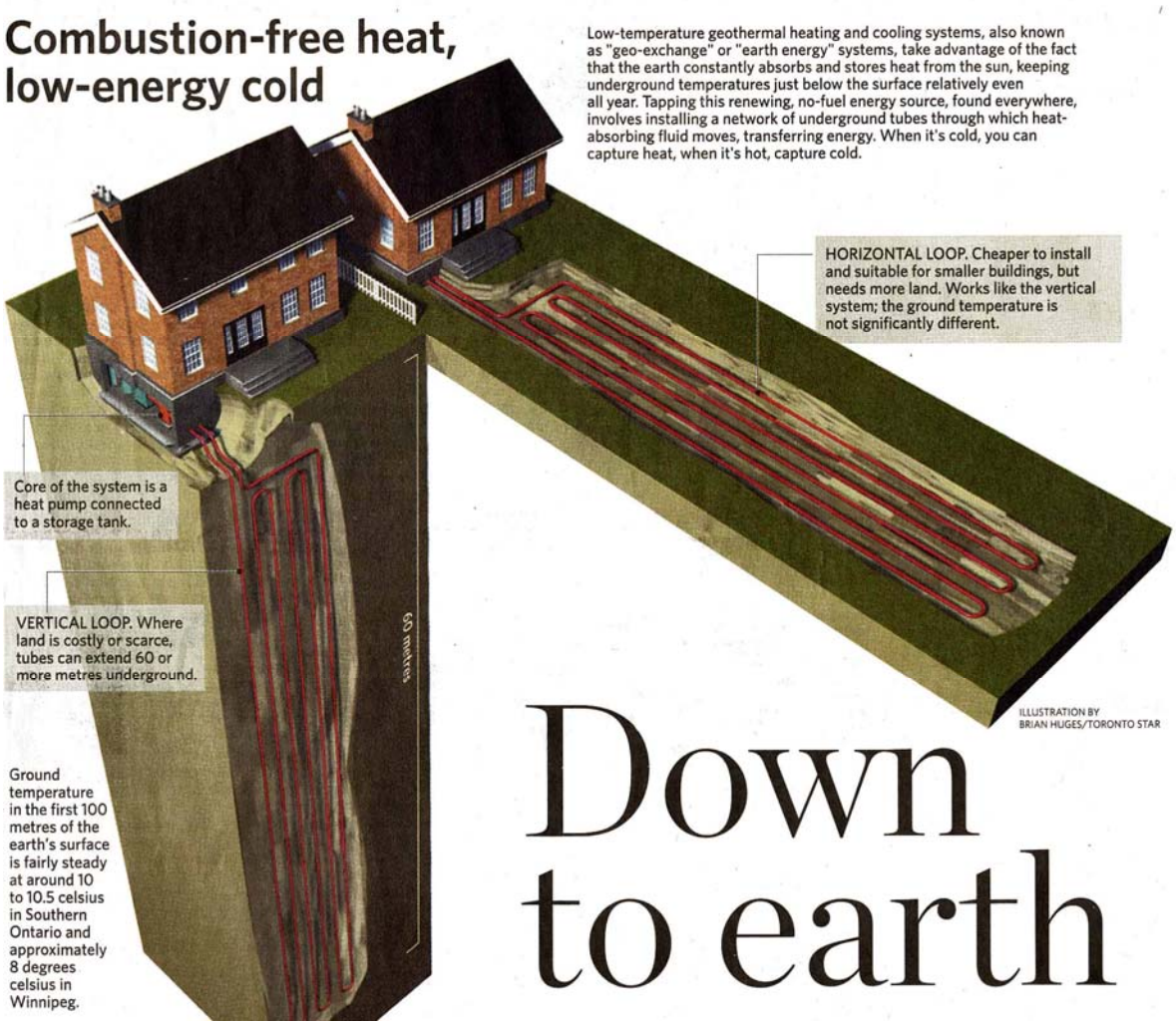
Wind turbines, over farmland (left), and especially over water (below), but also—with vertical-axis turbines—in confined spaces (right) could provide the equivalent of about a quarter of Hamilton's electricity use.

Energy production will be a priority (4):



Toronto's system provides the cooling equivalent of 250 megawatts of electric power: annually about 15% of Hamilton's proposed electricity use in 2018. Toronto's downtown is only 5 km from where Lake Ontario is 80 metres deep, Hamilton's is 20 km, but the additional underwater piping cost is relatively small and so is the temperature gain.

Energy production will be a priority (5): Geoexchange

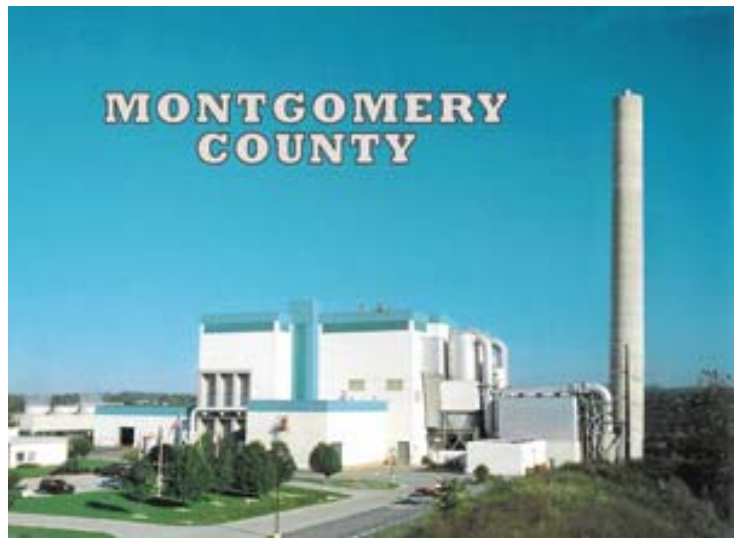


Tyler Hamilton, *Toronto Star*, April 24, 2006

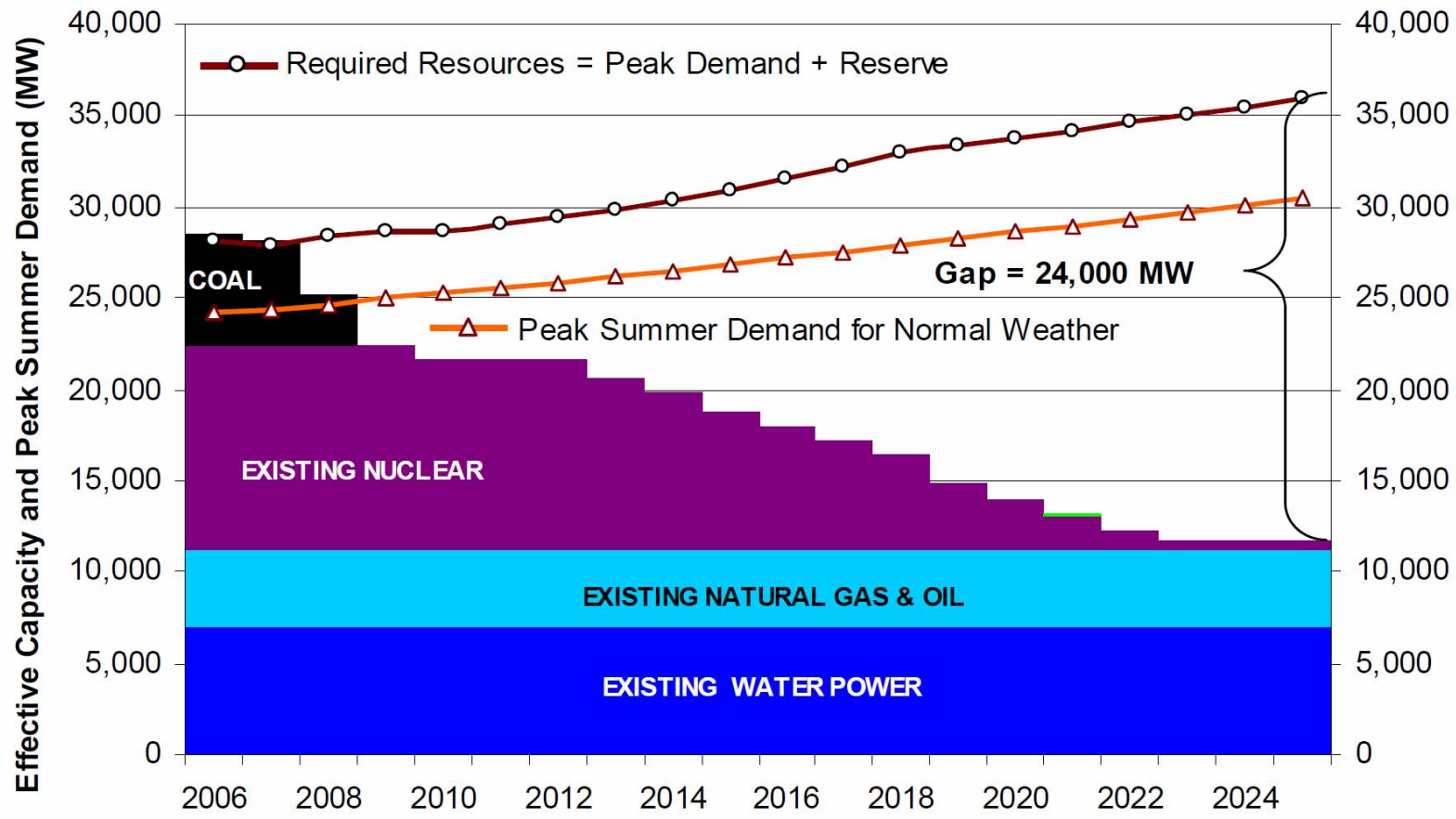
According to this article, these systems cost about $22,000 (existing or new home), save about 70% of energy use, and thus repay their costs at present fuel prices within 10 years. Available in Waterloo on a 20-year lease. If the city were to coordinate drilling, even to the point of having communal piping systems, cost could perhaps be reduced by about 50%.

Energy production will be a priority (6): Energy From Waste (EFW)

If Hamilton were to manage half of Southern Ontario's solid waste in four plants like the Florida plant on the right, all located on a port industrial site, the product would be over 40% of Hamilton's electricity requirements in 2018, hot water enough to heat *all* Hamilton's buildings (via a district energy system), and some steam for industrial processing. Municipalities and businesses would *pay* Hamilton to take this fuel. Two conditions should be imposed: (i) all non-Hamilton waste arrives by rail or water; and (ii) for more than half of the days of the year the plants act as air cleaners, i.e., the air coming out the stacks is better than the ambient air (which will be better in 2018 than now because there will be fewer internal combustion engines). The plant on the left is in Burnaby, B.C.



Ontario is open for a transformation in electricity generation



Source: Ontario Power Authority, *Supply Mix Advice*. Volume 1, Part 1-1, Page 2, Figure 1.1.2, December 9, 2005

Land-use planning principles

- Put energy first (e.g., build land uses around transport and energy production requirements)
- Avoid greenfield development
- Don’t abandon present low-density areas
- Mix uses; foster vibrant centres
- Aggressively pursue ‘brownfield’ development

Four matters highlighted by Council

- Aerotropolis: Air freight seems especially sensitive to high fuel prices; reliance on it could be risky economic development. If developed, could be 'Highway 6 Business Park' focusing on energy efficiency and energy production with low-energy freight movement.

- Moving goods: More of a challenge than moving people. Energy constraints could bring *more* local goods movement, for local manufacturing and food production. Focuses on efficiency, non-motorized transport, electric modes could serve well.

- City fleet: City has role as leader, which could be particularly true for deployment of hybrid ICE-battery heavier-duty vehicles.

- HSR: Reintroduce trolley buses, incline railways, streetcars (light rail), and explore Personal Rapid Transit.

What is happening elsewhere

SAN FRANCISCO

City and County of San Francisco
Board of Supervisors

April 11, 2006

City and County of San Francisco

Legislation Introduced

060442	**[Peak Oil Plan of Response and Preparation]**
	Resolution acknowledging the challenge of Peak Oil and the need for San Francisco to prepare a plan of response and preparation. Supervisors Mirkarimi, McGoldrick, Maxwell presented. ADOPTED.

RESOLUTION:

WHEREAS, World oil production is nearing its point of maximum production ("Peak Oil") and will enter a prolonged period of irreversible decline leading to ever-increasing prices; and

WHEREAS, The United States has only 2 percent of the world's oil reserves, produces 8 percent of the world's oil and consumes 25 percent of the world's oil, of which nearly 60 percent is imported from foreign countries; and,

WHEREAS, The decline in global oil production threatens to increase resource competition, geopolitical instability, and lead to greater impoverishment; and, ... [continued for a total of 18 clauses]

Sweden plans to be world's first oil-free economy

· 15-year limit set for switch to renewable energy
· Biofuels favoured over further nuclear power

John Vidal, environment editor
Wednesday February 8, 2006
The Guardian

Evergreen... Sweden will develop biofuels from its forests. Photograph: Mattias Klum/Getty Images

Sweden is to take the biggest energy step of any advanced western economy by trying to wean itself off oil completely within 15 years - without building a new generation of nuclear power stations.

The attempt by the country of 9 million people to become the world's first practically oil-free economy is being planned by a committee of industrialists, academics, farmers, car makers, civil servants and others, who will report to parliament in several months.

The intention, the Swedish government said yesterday, is to replace all fossil fuels with renewables before climate change destroys economies and growing oil scarcity leads to huge new price rises.

"Our dependency on oil should be broken by 2020," said Mona Sahlin, minister of sustainable development. "There shall always be better alternatives to oil, which means no house should need oil for heating, and no driver should need to turn solely to gasoline."

According to the energy committee of the Royal Swedish Academy of Sciences, there is growing concern that global oil supplies are peaking and will shortly dwindle, and that a global economic recession could result from high oil prices.

Ms Sahlin has described oil dependency as one of the greatest problems facing the world. "A Sweden free of fossil fuels would give us enormous advantages, not least by reducing the impact from fluctuations in oil prices," she said. "The price of oil has tripled since 1996."

A government official said: "We want to be both mentally and technically prepared for a world without oil. The plan is a response to global climate change, rising petroleum prices and warnings by some experts that the world may soon be running out of oil."

'Electric City', an economic development strategy

- 'Hamilton: The Electric City' means (i) embracing the prospect of very high energy prices; (ii) preparing Hamilton for the era of high-price energy; and (iii) positioning Hamilton as a leader in a new era of low energy consumption and much local production.

- This will be good for Hamilton's economic development in five ways:
  - ✓ Hamilton will function when energy prices rise steeply.
  - ✓ Less money will leave Hamilton to pay for high-cost energy
  - ✓ Reducing energy consumption and increasing energy production are labour-intensive, and the work is local
  - ✓ Hamilton could rapidly develop a large pool of R&D and implementation know-how
  - ✓ Businesses and their investors will see Hamilton as the place to be because of the critical mass of relevant activity, the available skills, and the community dedicated to being ahead of the energy wave.

Implementing the 'Electric City' concept

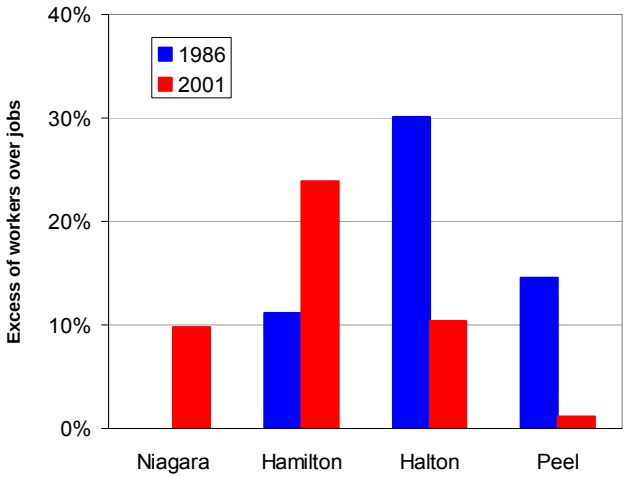
- Deepen and broaden the concept, and publicize it.
- If it captures imaginations, causes excitement, embrace the concept fully. Have it adopted as Hamilton's grand project for the 21st century, the new civic mission.
- Redo plans for land use, transport, other infrastructure, waste management, and social development, and, above all, develop a plan for economic development that puts energy first.
- Solve legal challenges. Figure out where the opportunities are and where the money will come from.

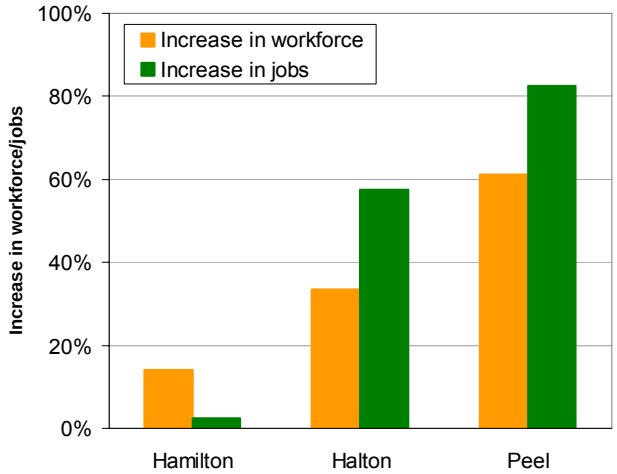
Examples of possible initiatives

- Define, promote, and develop port area and port to downtown area as major R&D centre for the coming energy-constrained world.
- Offer Hamilton as a testbed for PRT development.
- Plan for light rail or trolley buses rather than diesel bus rapid transit; build up population accordingly.
- Initiate massive 'Better Buildings Partnership' for existing commercial and residential buildings (e.g., common geoexchange).
- Request special building code provisions re. energy efficiency (as test for the rest of Ontario) for new buildings and major retrofits.
- Offer Hamilton as testbed for massive solar collector and urban wind turbine installation (including over water and farmland).
- Invite and facilitate Enwave's installation of Deep Lake Water Cooling. Move on opportunities to generate energy from waste.

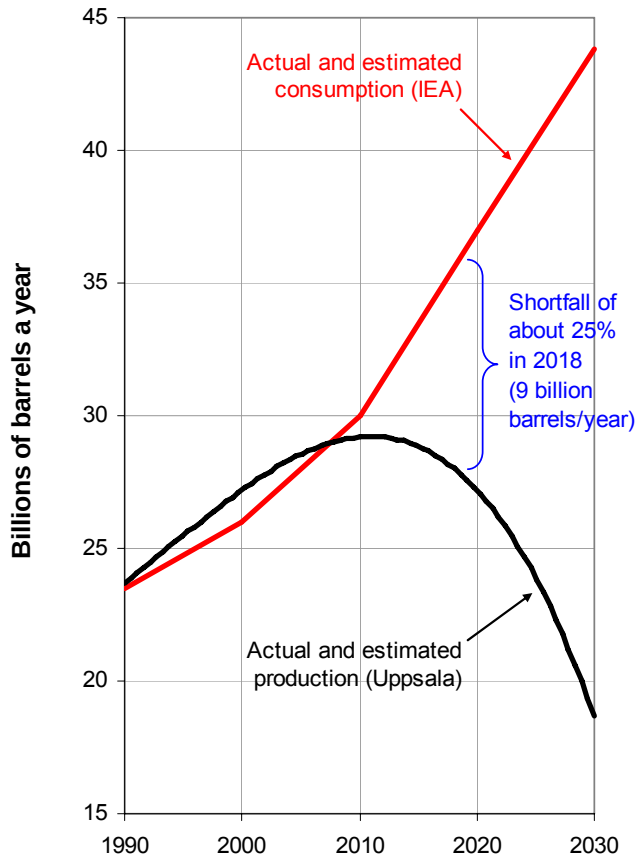
'Electric City' is a response to two basic challenges

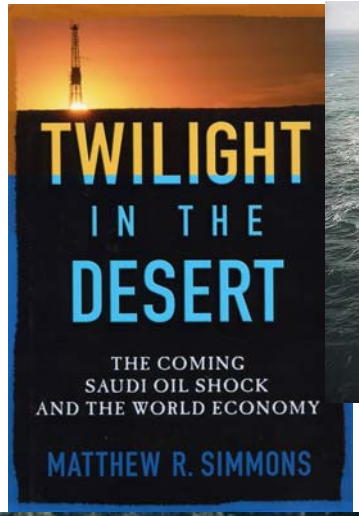
Today's jobs deficit





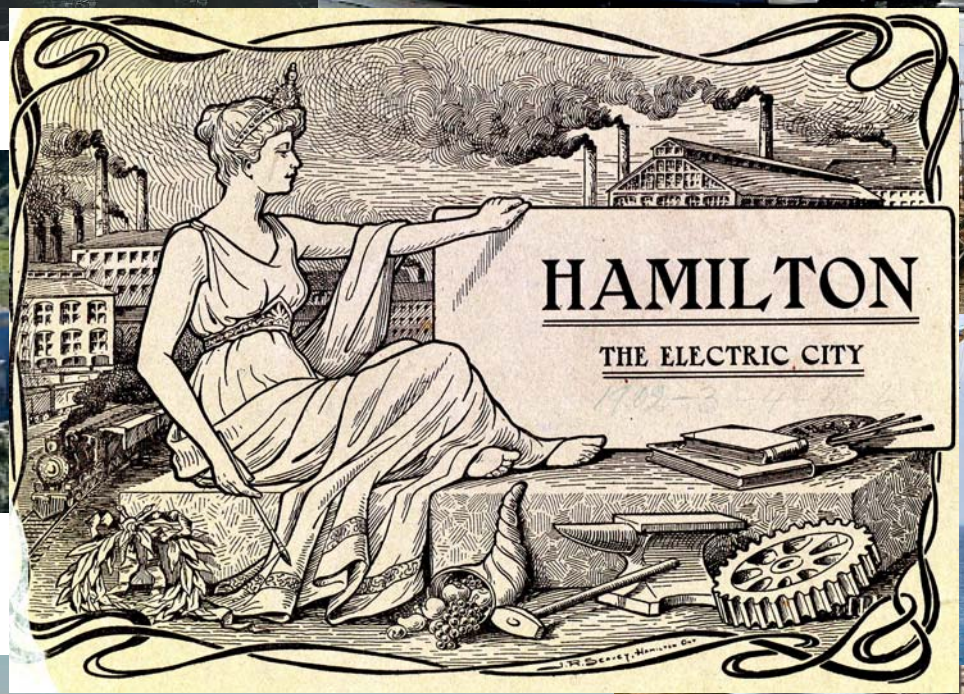
Tomorrow's energy deficit

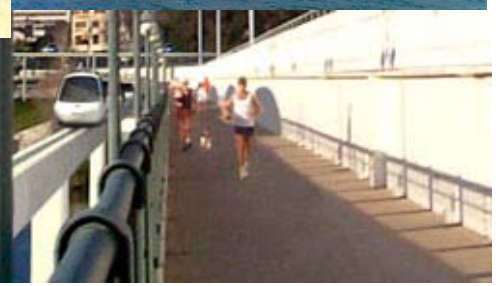



TWILIGHT
IN THE
DESERT
THE COMING
SAUDI OIL SHOCK
AND THE WORLD ECONOMY
MATTHEW R. SIMMONS

Calgary


17 Downtown


HAMILTON
THE ELECTRIC CITY



Resolution adopted by Hamilton City Council on May 13, 2006

(a) That the "Peak Oil" report be referred to the General Manager of Public Works in order for Staff to further investigate and report back to the Public Works, Infrastructure and Environment Standing Committee on the following:
  (i) That the General Manager of Public Works be directed to develop an Energy Management Policy, and forward to Council for approval;
  (ii) That the Energy Management Policy:
    aa) Recommends targets for reduced energy use in City Facilities and timelines for achieving same;
    bb) Recommends strategies to achieve those targets;
    cc) Recommends a framework for the use of renewable technologies in supplying energy to new City Facilities; and
    dd) Provides recommendations to Council on the feasibility of designing new City Facilities to LEED standards, or equivalency, including a policy to encourage LEED certification for new buildings to be constructed in Hamilton and that new buildings constructed by the City of Hamilton continue to include requirements for pricing and analysis of LEED certified consultant services within the request for proposal specifications until such time as the design standards are approved by Council;
    ee) Provides recommendations to Council on the feasibility of producing energy to operate City Facilities and/or partner facilities (e.g. co-generation facilities, district energy facilities).

(b) That the General Manager of Public Works investigate the feasibility of applying energy conservation measures currently being employed by HES for use in the City's Central fleet;

(c) That the General Manager of Public Works investigate the feasibility of using trolley buses as part of the HSR fleet.

(d) That staff report to the Planning and Economic Development Committee on the following:
  (i) The feasibility of establishing a policy to encourage LEED certification, or equivalency, for all new buildings constructed in Hamilton;
  (ii) That staff investigate the feasibility of including an Energy Cluster as a major component of the Economic Development Strategy and that this feasibility research and analysis be conducted as part of three year update and review of the Economic Development Strategy and that it include Hamilton Utilities Corporation/Horizon Utilities Corp. and all other community stakeholders

  (iii) A joint investigation by Planning and Public Works Departments on the feasibility of preparing the Glanbrook Business Park as an Eco-Park, involving possible use of a district energy system, re-use of waste materials amongst industries etc.

(e) That the Peak Oil report be forwarded to Hamilton Utilities Corporation (HUC) and Horizon Boards for their consideration;

(f) That the General Manager of Planning and Economic Development be directed to investigate the feasibility, cost and timelines for the preparation of:
  (i) economic development options based on principles outlined in the report "Hamilton: Electric City" prepared by R. Gilbert, to diversify the Hamilton economy (i.e. maximizing employment lands in the Port area, the Downtown area or attracting energy service and energy manufacturing businesses); and,
  (ii) the development of a community energy plan.

(g) That staff be directed to report back on available federal or provincial funding for projects, which may emanate from any actions that City Council might take.