

A Presentation to the New Brunswick Commission on Hydraulic Fracturing

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**Putting key factors in context as
New Brunswickers decide whether
to allow hydraulic fracturing**

**If hydraulic fracturing is approved,
how long will it take to have
1000 (or 10,000) gas wells in New
Brunswick?**

The Exploration Timeline

Year 1 - Assess geology, fiscal terms, infrastructure and local support

Year 2 - Negotiate and sign license

Year 3 - Aeromag and gravity flights (not in mature areas)

Year 4 - Acquire Seismic

Year 5 - Analyse seismic data and...

- Possibly, drill 1-2 exploration wells
- More likely, acquire more seismic

Year 6 - Analyse all data and...

- Relinquish license or...
- Drill 1-2 exploration wells or...
- Drill appraisal well(s) – maybe 3

Year 7 - If indicators (geological and economic) are positive...

- Drill a few development wells (maybe 10)

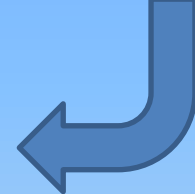
Year 8 - Construct facilities & pipeline tie-in and...

- Drill a few more wells (maybe 10)

Year 9 - Initial production and...

- More drilling (maybe 20-30 wells)

Year 10 - An expanded drilling program (50-100 wells)



Exploration...

- **is high-risk, high-cost and proceeds in measured steps over many years**
- **leases are often relinquished after just a few years (after obligations are fulfilled)**
- **initial production takes years even with full “green lights” to proceed**

If exploration was allowed to proceed in New Brunswick (and was successful) there could be several hundred, possibly a thousand, wells in NB within 20 years.

10,000 well scenarios for New Brunswick are not realistic

- **if production per well is low,
development will not proceed**
- **if production per well is high,
fewer wells will be required**
- **local markets and M&NE capacity
impose a limit**

(A possible exception)

If an Atlantic Canada LNG export project comes to fruition:

- **M&NE pipeline capacity could be utilized for LNG feedstock requirements leading to fewer wells in New Brunswick...or**
- **Local gas supplies could be sought to supplement imported feedstock gas which would lead to more wells in New Brunswick**

See Government of BC link which indicates world scale LNG projects being considered in that province –even with huge gas reserves, major producers and customers as investors and proximity to markets, LNG production in BC is several years way:

<http://engage.gov.bc.ca/lnginbc/lng-projects/>

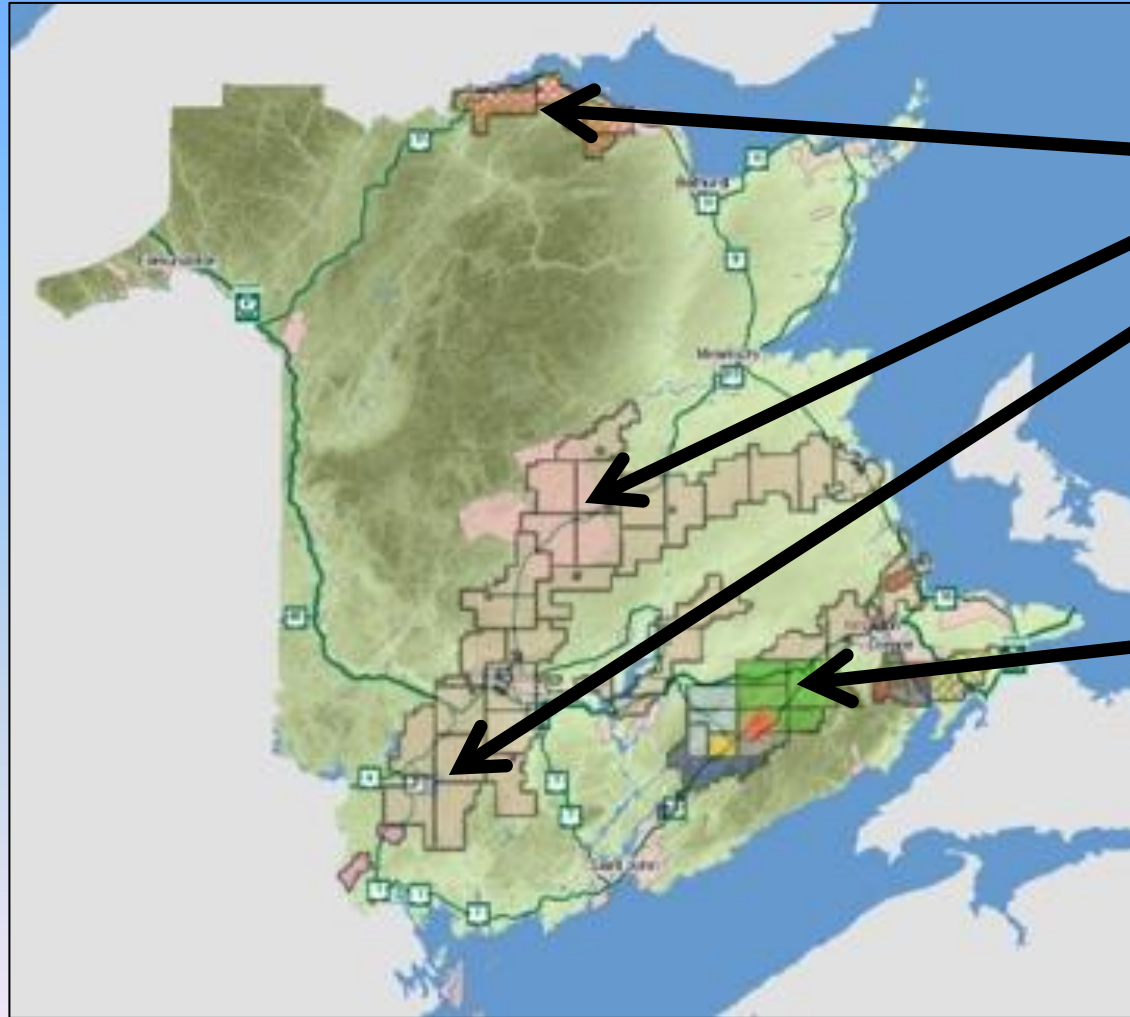
New Brunswick Oil and Gas Well Drilling in Perspective

	Wells drilled last 5 years	Wells drilled last 10 years
Canada	55,056	139,884
New Brunswick	4	46

Sources; gnb; caodc

New Brunswick's natural gas potential in perspective

How much natural gas is in New Brunswick's basement?



?

Corridor Resources Area

- 45 billion cubic feet "proved reserves"
- 67 trillion cubic feet "potential resources"

“Reserves” and “Resources”

Reserves are:

- known from direct evidence (flow-tested wells and sometimes adjacent seismic)
- “bankable” for building infrastructure or signing sales contracts
- recoverable (i.e., net of a recovery factor)

Resources are:

- speculative based on a comparative view of the geology in similar areas
- relevant to exploration companies and resource owners, but not to consumers
- sometimes net of a recovery factor or sometimes “in-place” (gas recovery factors in shale are 5-20% of in-place resources)

New Brunswick's natural gas “reserves” and “resources” in perspective

	Proved Reserves (bcf)	Potential Resources (tcf)
New Brunswick (Corridor Area)	45	67 (in-place)
Alberta	32,400¹	223 (recoverable)²
Montney Formation (BC & Alberta)	under evaluation³	449 (recoverable)³ 4274 (in-place)³

¹Alberta Energy Regulator (AER)

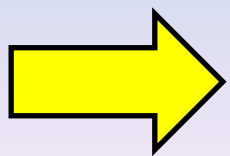
²AER; not including coalbed methane (500 est) or shale (approx 1000; under evaluation)

³billions being spent by Shell, Exxon, etc to quantify threshold proved reserves for LNG export possibilities

³ National Energy Board, British Columbia Oil & Gas Commission, AER

New Brunswick's natural gas reserves

- Virtually unexplored so are a potential resource only at this point
- Modest by western Canada standards but significant within the Atlantic Canada and New England region
- Being pursued because of strong markets and available infrastructure



M&NE excess capacity may be New Brunswick's most significant hidden asset

How should we maintain our natural gas supply?

Our natural gas consumption:

- 32 million cubic feet per day average
- equivalent to 6 million barrels of oil per year

Our natural gas supply today

- 10% is equivalent to New Brunswick's production (Corridor)
- 90% from Nova Scotia; declining
- periodic line reversals from New England and/or LNG

Our FUTURE natural gas supply

- LNG
- From US or Alberta via Boston
- Go back to oil
- Explore our backyard

Cost: \$500 million per year
Benefits: out of province

Investment: private sector
Benefits: jobs, GDP, (maybe) royalties



New Brunswick is facing a natural gas issue – aside from hydraulic fracturing

- **Natural gas is well accepted in most parts of North America. It is often resisted in New Brunswick**
- **We are major natural gas users**
- **A supply crunch is looming**
- **We either import or develop local supplies**

What sort of royalties should New Brunswick be charging?

Disclosure: author was subcontracted to do economic modelling for current New Brunswick royalty model

Royalties are great...



...if you can get them

Large royalties are earned by providing a product

- that no one else can or
- at lower cost than others

Royalties are great (but perceptions are even greater)

Royalty Perceptions

- Western Canada = 35%
- Norway = 80%
- New Brunswick is too low

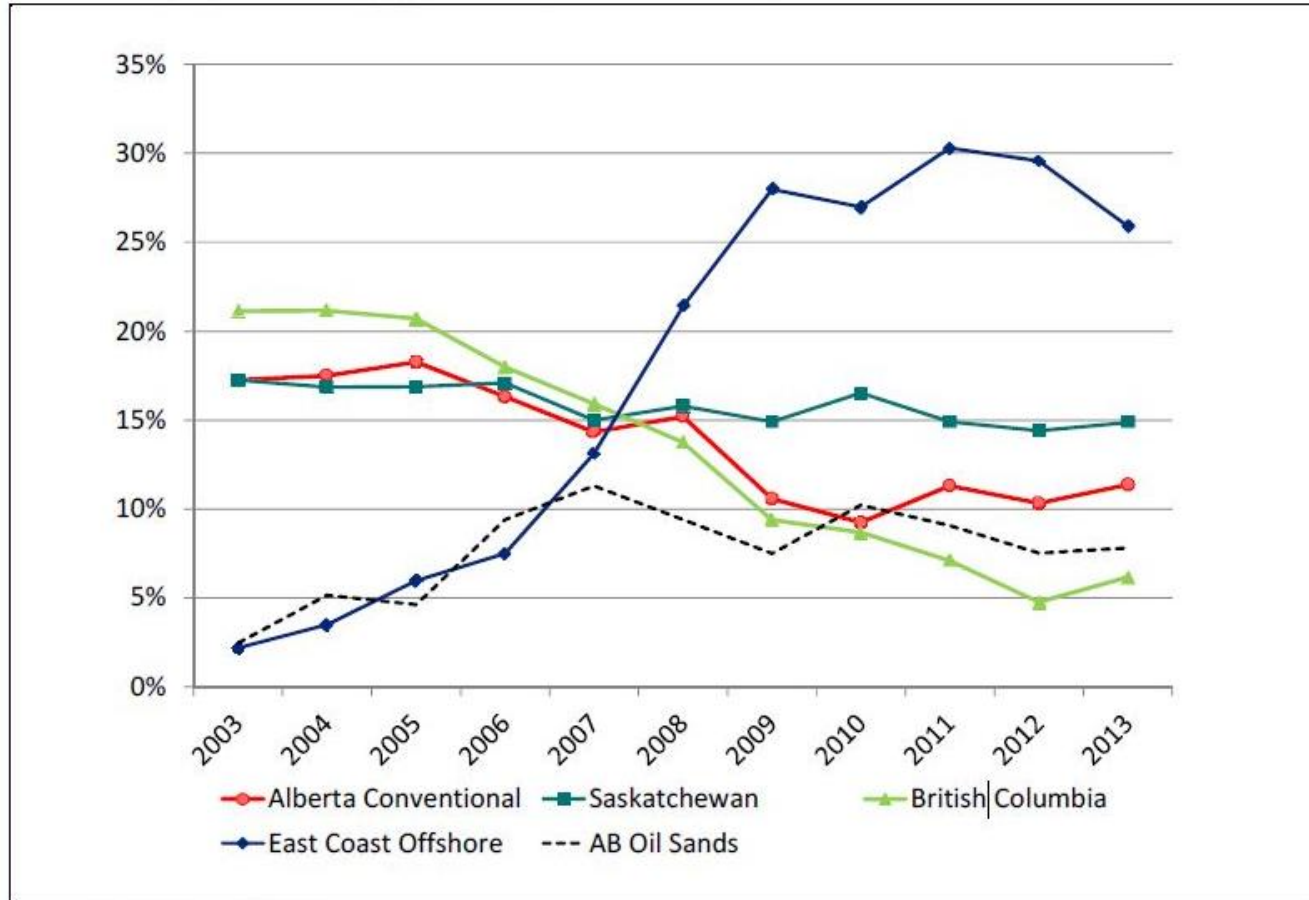
Royalty Realities

- BC, AB, SK = 6%, 11% and 15%
(oil and gas average rate ; gas is always lower)
- Norway royalty = 0%
(tax on profits can approach 80%)
- New Brunswick royalties need to reflect the stage of exploration as well as rates in other jurisdictions

Royalty Rates by Province

(includes oil and gas; gas always lower)

Chart 13: Royalty Rate History by Province (% Gross Revenue)



Source: CAPP, BMO Capital Markets

- Flat to declining over time (per well royalty)
- East Coast increase due to pre-payout/after-payout royalty structure (per project royalty)

Alberta's Shale Gas Royalty – and the reasons behind it

“While there may exist large potential in Alberta, shale gas production is in the very early stages and commercial development is not likely to occur in Alberta for a number of years.

The intent of the Shale Gas New Well Royalty Rate is to encourage new exploration, development, and production from Alberta's shale gas resources.

This extension of the 5% royalty rate is designed to accelerate the acquisition of knowledge and ultimately to achieve commercial natural gas production from shale deposits. ``

Is Royalty Sharing with Landowners a Good Idea?¹

- The Canadian royalty regime, with resources (largely) owned publicly is predictable and fair
- The US royalty regime, with resources (in many places) privately owned is full of distortions
- Hybridizing US components to the proven Canadian system is not advised. Disruptions within communities will occur
 - cheques will arrive based on luck of what's below one's land
 - some property values will increase; some won't
 - complex and uncharted territory
 - legality may be challenged

¹ See letter provided to Shale Gas Public Consultations - 2012

What about emissions, leaks, spills, radioactivity and toxins

- No one wants to live in a province where people or wildlife are exposed to a dangerous fog or soup of air or water borne contaminants
- Perspective on each is critical
 - What is leaking/being emitted?
 - How much has been released?
 - How does that compare to things we know?

Examples...

“Fracking will use up all of our water”

We now realize that with rainfall of trillions of litres per year we are not short of water

“Some BC shale gas wells are “super-emitters””

These wells release about the same amount of methane per year as 100 cows (2000kg)

“Shale gas production releases radioactivity”

Everything is radioactive; shales and granites tend to be more radioactive than other rocks; compare to granite countertops for instance

What can/should New Brunswickers do about carbon?

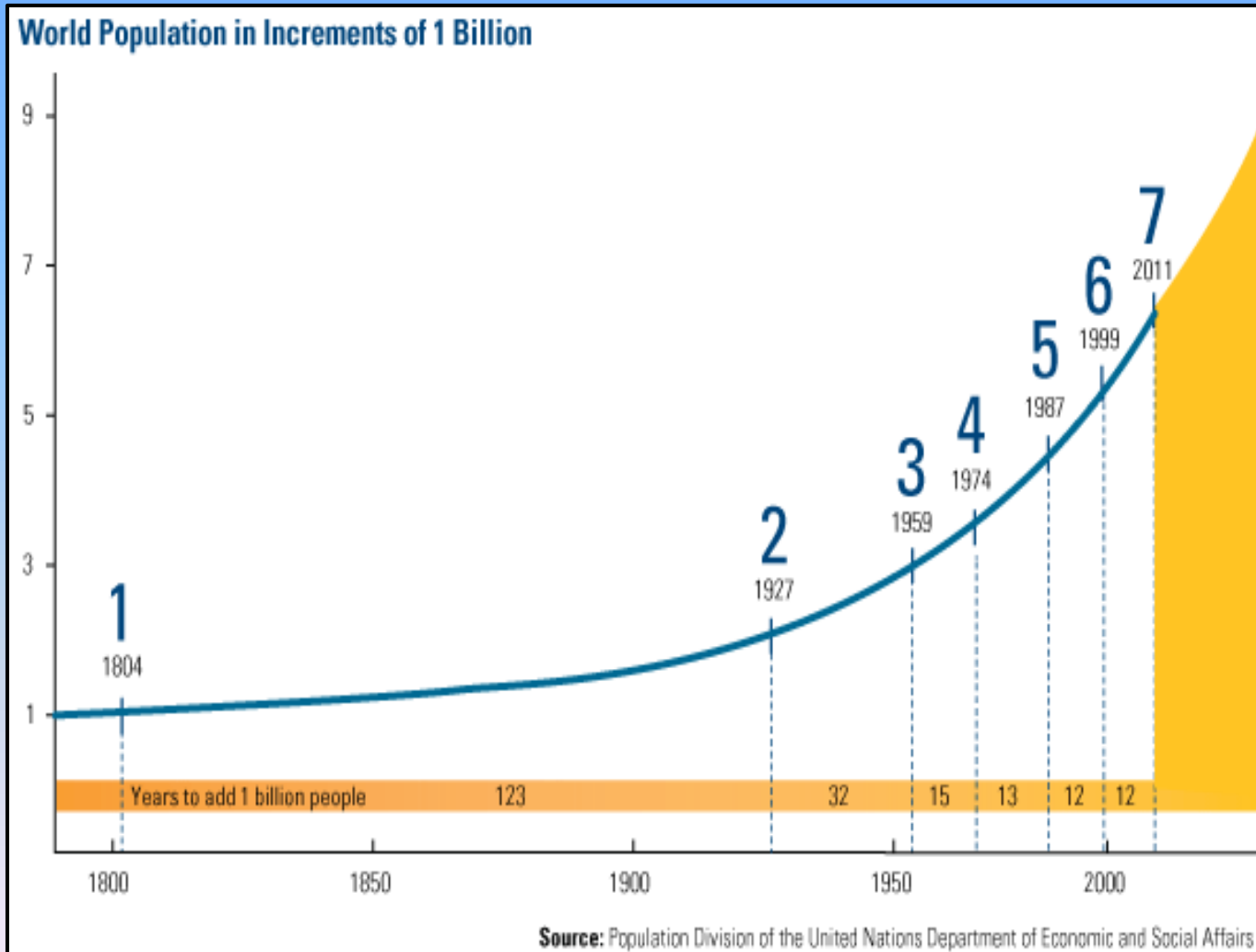
**The good, the bad
and the inevitable**

A few slides from “An Energy Backgrounder for New Brunswickers”

Because we all want our energy:

- **Plentiful**
- **Multipurpose (for transportation, heat, lights and running things)**
- **Low cost**
- **Available night and day**
- **Reliable year round**
- **With low environmental cost....at least close to home**

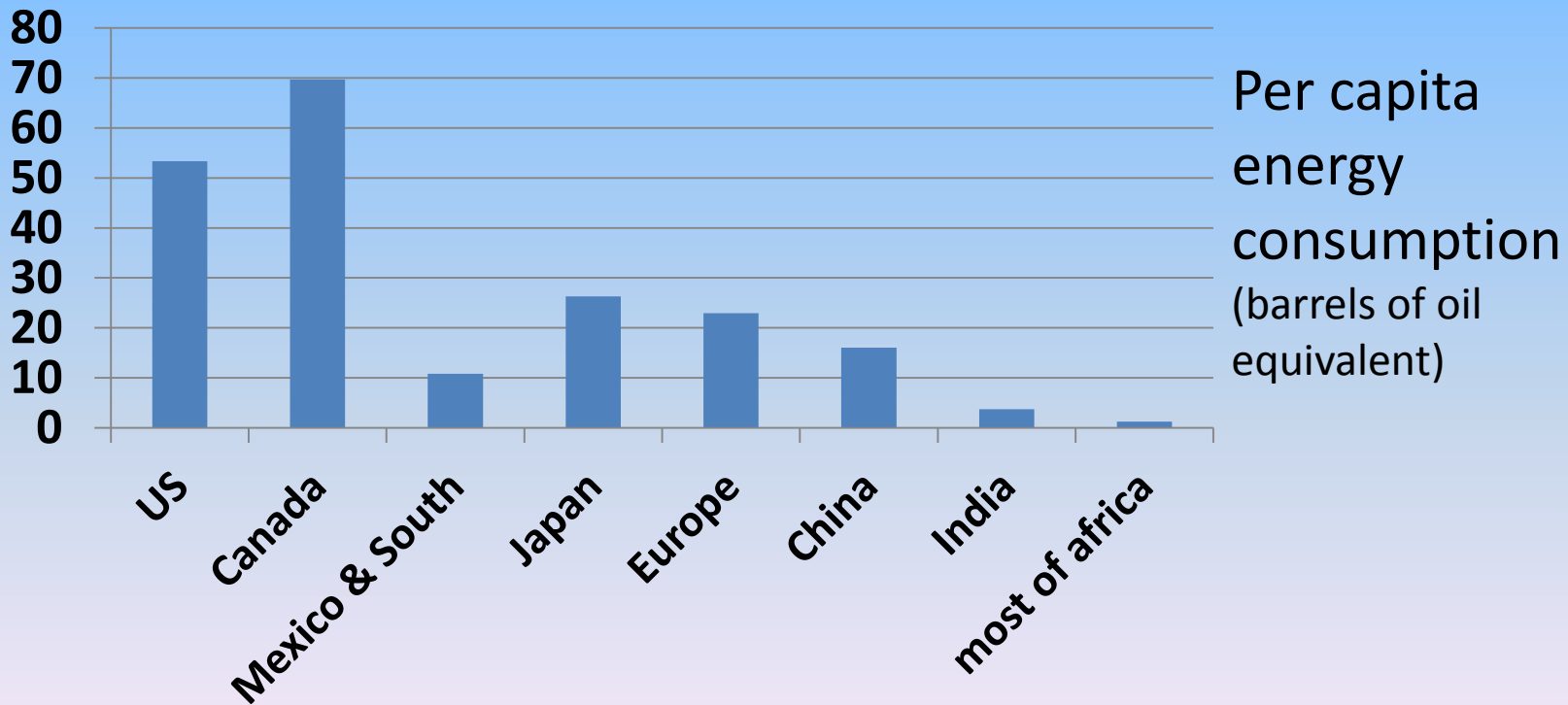
The Biggest Energy Issue – Our Population



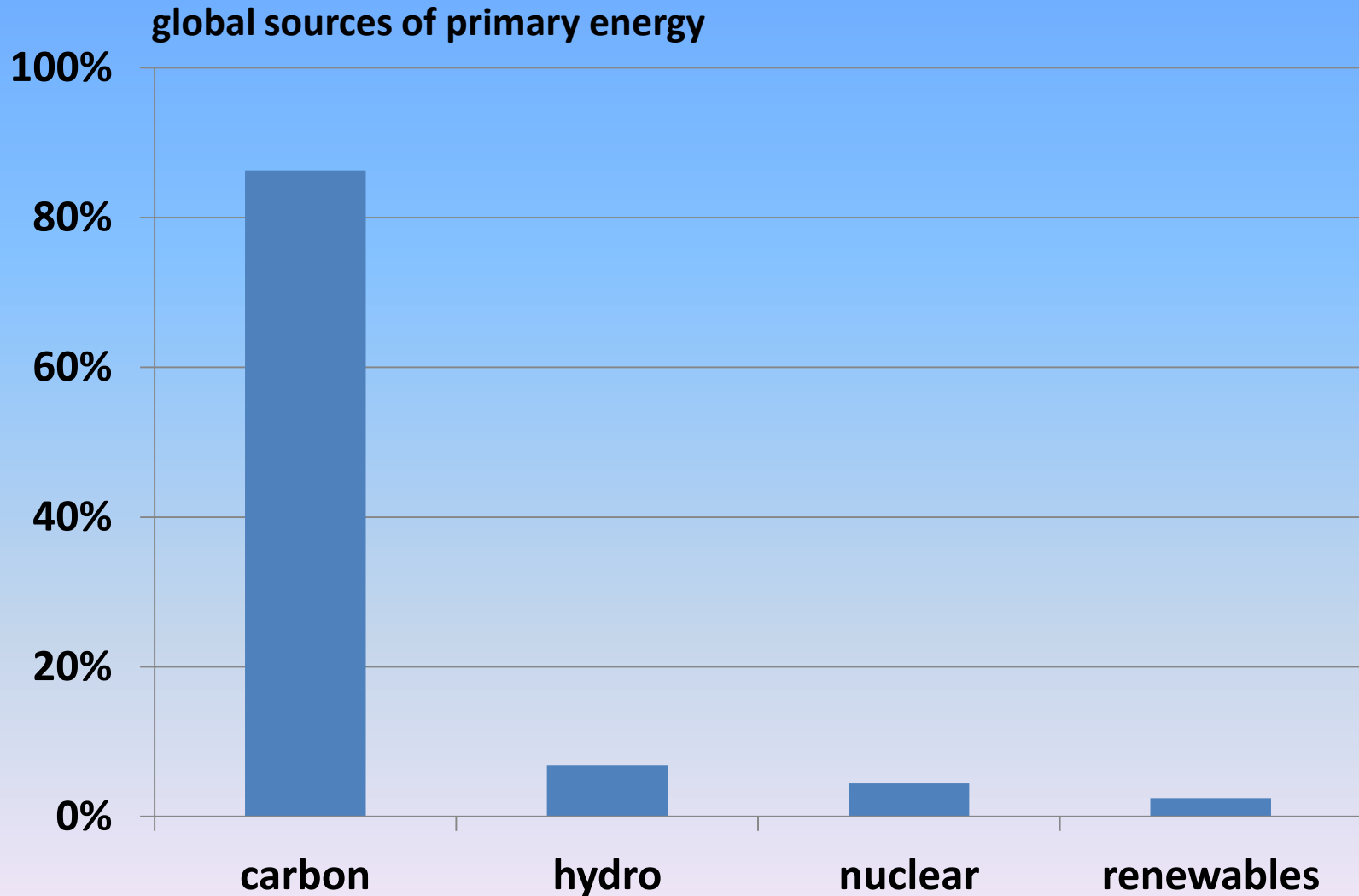
- There are now 7 billion of us
- 5 billion more than 100 years ago
- 2 billion more than in 1990

New Brunswickers are small in number, but big energy users

NB population (700 thousand)
Global population (7 billion) = 0.01%

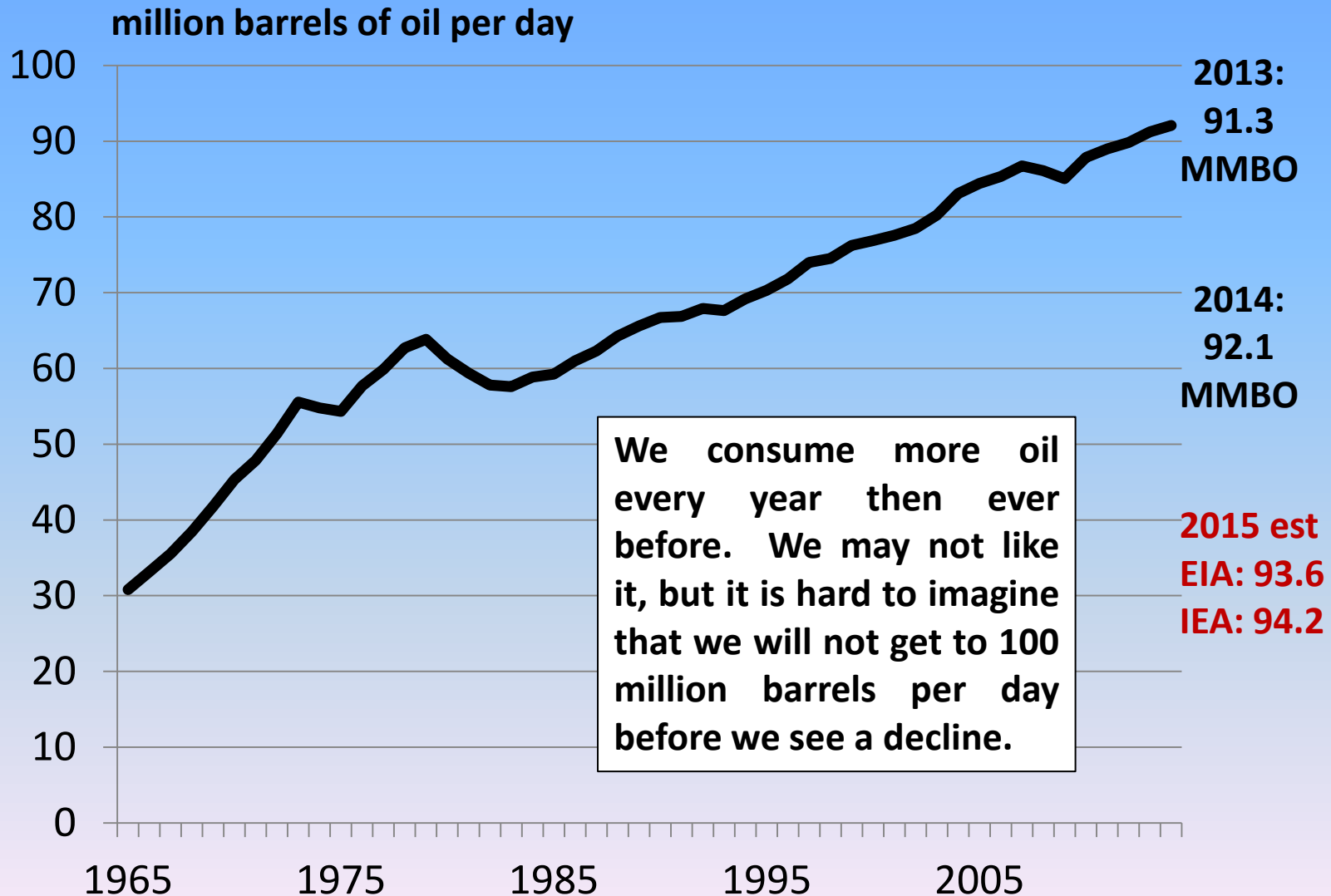


Reducing our energy sources to 50% non-carbon will be a real challenge



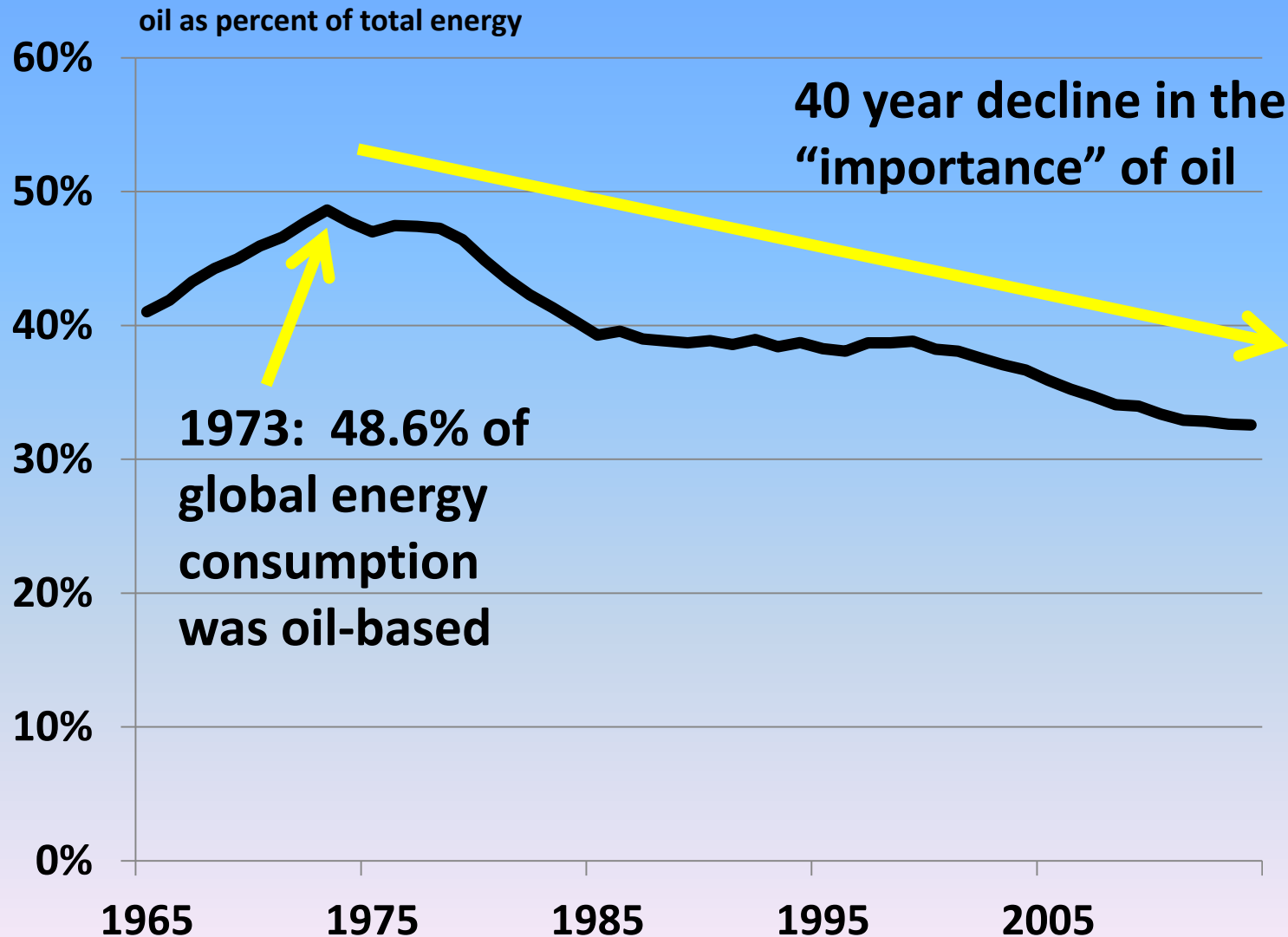
BP Statistical Review of World Energy – 2015

Oil is still our Number 1 energy source, but....

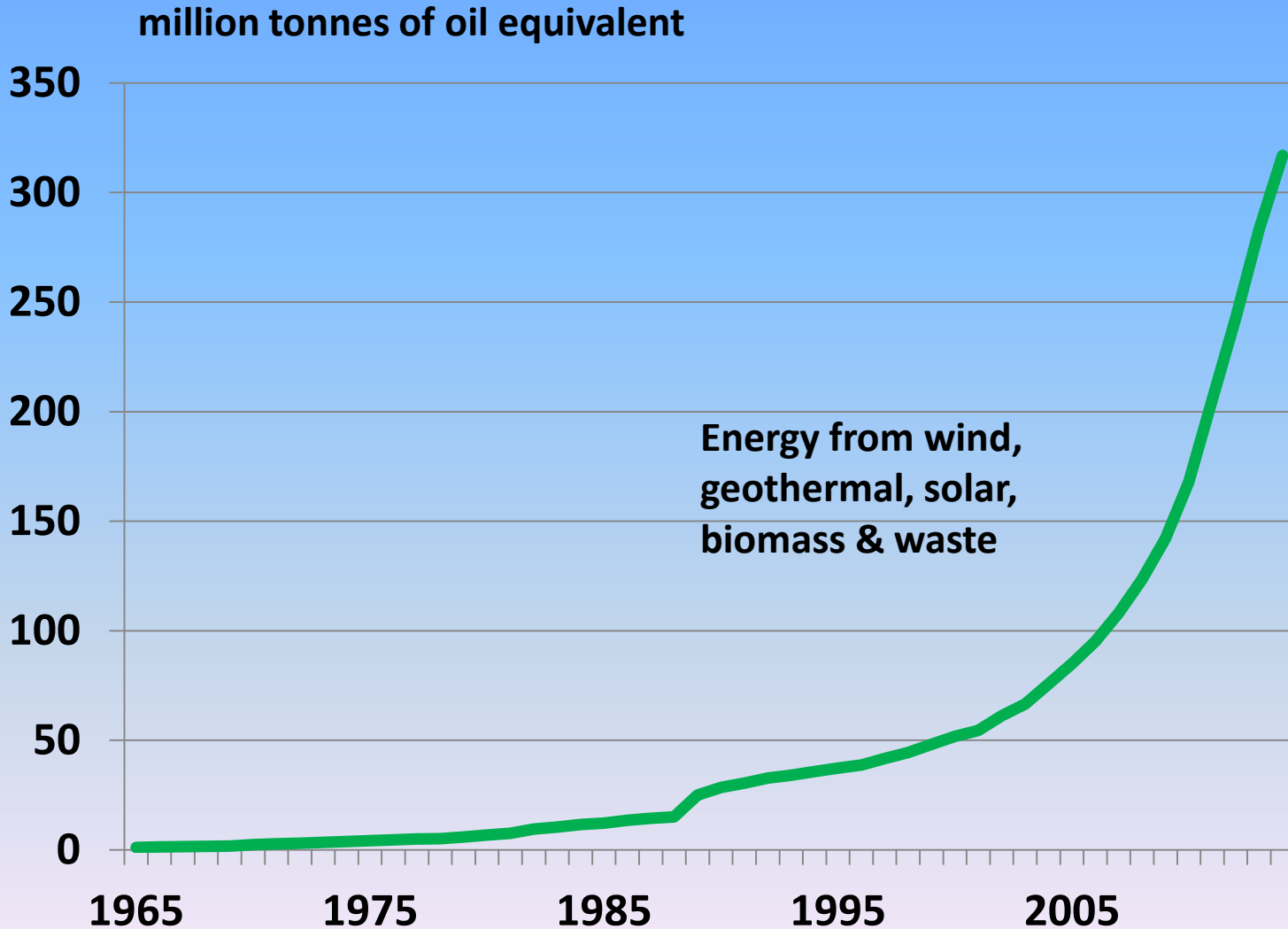


We consume more oil every year than ever before. We may not like it, but it is hard to imagine that we will not get to 100 million barrels per day before we see a decline.

...oil's importance "peaked" in 1973



Renewables are increasing rapidly



A Few Conclusions

- Knowledge level on New Brunswick's natural gas potential is low; only way to learn is to drill and test
- 1000 wells in province will take a decade or more (if exploration is successful)
- We need energy and have come to rely on gas; what is our next best supply?
- Economic activity of gas development will provide more benefit than royalties (as it does elsewhere)
- Concerns must be addressed and put in real life context
- New Brunswickers need to do their share, but can't solve global issues

We don't have to approve hydraulic fracturing, but...

properly regulated, enabling the exploration of New Brunswick's natural gas resources would lead to our own energy supply, exports to New England and a larger and more sustained economic benefit to the province than the Energy East or LNG export projects

...provided our geology holds up.