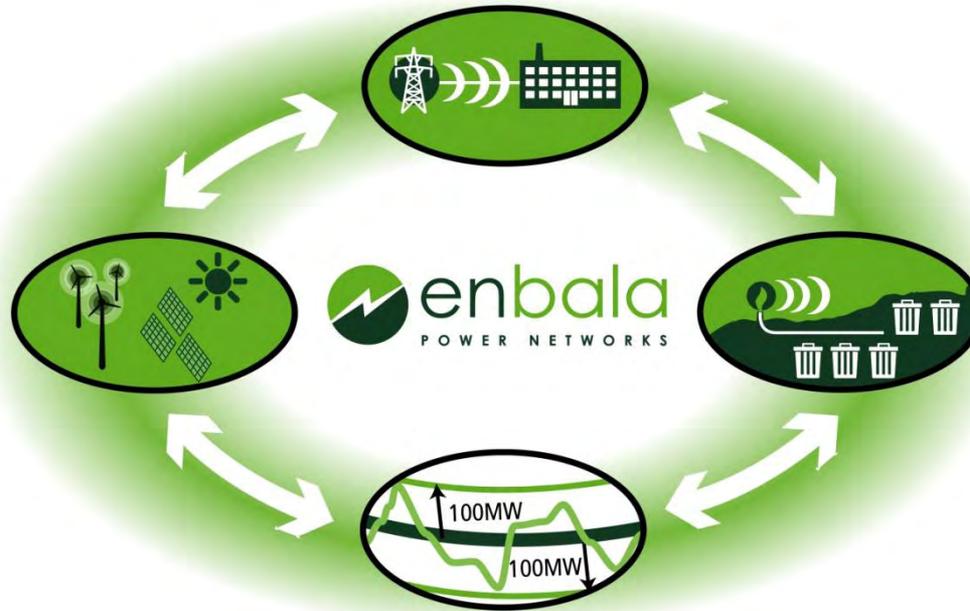


# Energy – Economics – Environment A Challenging Balance

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# We live in times of Rapid Change...

- In the early 1980s... Load forecast methods saw large increases in demand...
  - We prepared for rapid growth... By 1982, the Canada and the US were in recession...
  - By 1985, ENRON had started a massive restructuring of the way things “were done...” This led MANY changes - including deregulation that spilled into Canada...
- Now... Growth has returned somewhat...
  - Pressures to use reduce GHG emissions
  - Integration of renewable power sources
  - Reduced use (in some areas) of Nuclear power..
- BUT the most remarkable change... Who is leading the change...
  - It is NOT the utilities – although some are near the front line...
  - Some non utility companies – such as ENRON, EnerNOC, Comverge, etc..
  - But most remarkable of all – some real leadership is coming from the Regulator!!! – the US FEDERAL ENERGY REGULATORY COMMISSION (FERC)...

**Our World is Rapidly – in directions that we may not expect**

# Canada is “Rich” in Energy..??

- In 2010
  - Current Exports total approximately \$399B annually
  - Of this \$299B is for exports to the US
  - Energy Exports total \$94B (2010) – 93% went to the US
    - Coal
    - Oil
    - Natural Gas
  - Electricity
- The value of Canada’s energy exports in 2010 rose by about \$18B – driven almost entirely by an increase in the price of oil
- Only Coal (\$5B) is sold offshore... And the amount is relatively small...

**We depend on US markets for most of our energy exports...**  
**Our infrastructure (pipes and wires) all point south...**

# What is Happening in the Markets??

- Natural gas prices have declined dramatically and sources supply sources are changing...
- Electricity prices (driven by cheap US natural gas supplies)
  - Day-night spreads have declined – reducing opportunities for short term trading...
  - Overall US electricity prices have fallen
- Oil Prices have declined somewhat... and forecasters are split – some suggesting increases coming... others predicting further declines

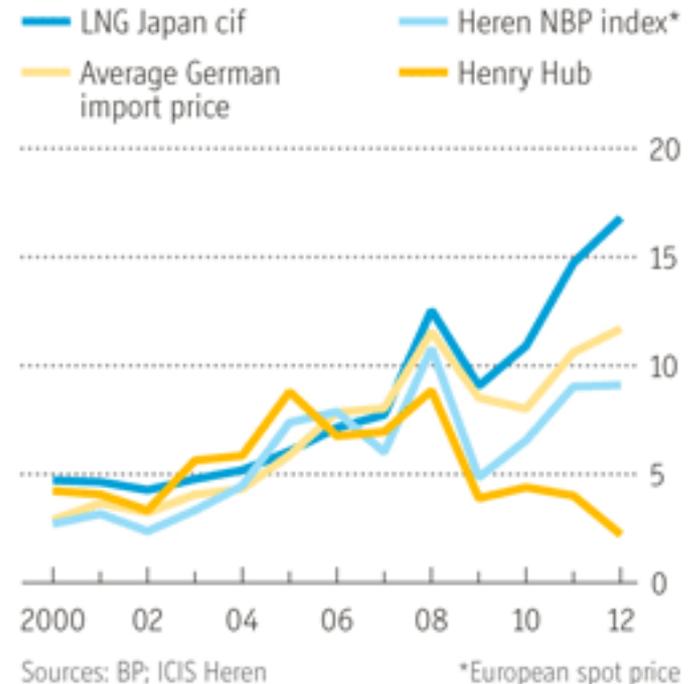
## What does this mean for Canada??

# Natural Gas is a Key Resource

- The US now has extensive reserves of natural gas...
  - “On August 1, the U.S. Energy Information Administration (EIA) released its summary of the nation's [proved reserves of oil and natural gas for 2010](#). Proved reserves of both oil and natural gas in 2010 rose by the highest amounts ever recorded in the 35 years EIA has been publishing proved reserves estimates.”
  - US natural gas production is up 24% between 2006 and 2010, and the rate of increase has increased since that time (The Economist – Aug 3, 2012)
- US Natural Gas prices have declined, driven by dramatic domestic supply increases... at low costs.
- Forecasts suggest that prices will remain low for an extended period of time

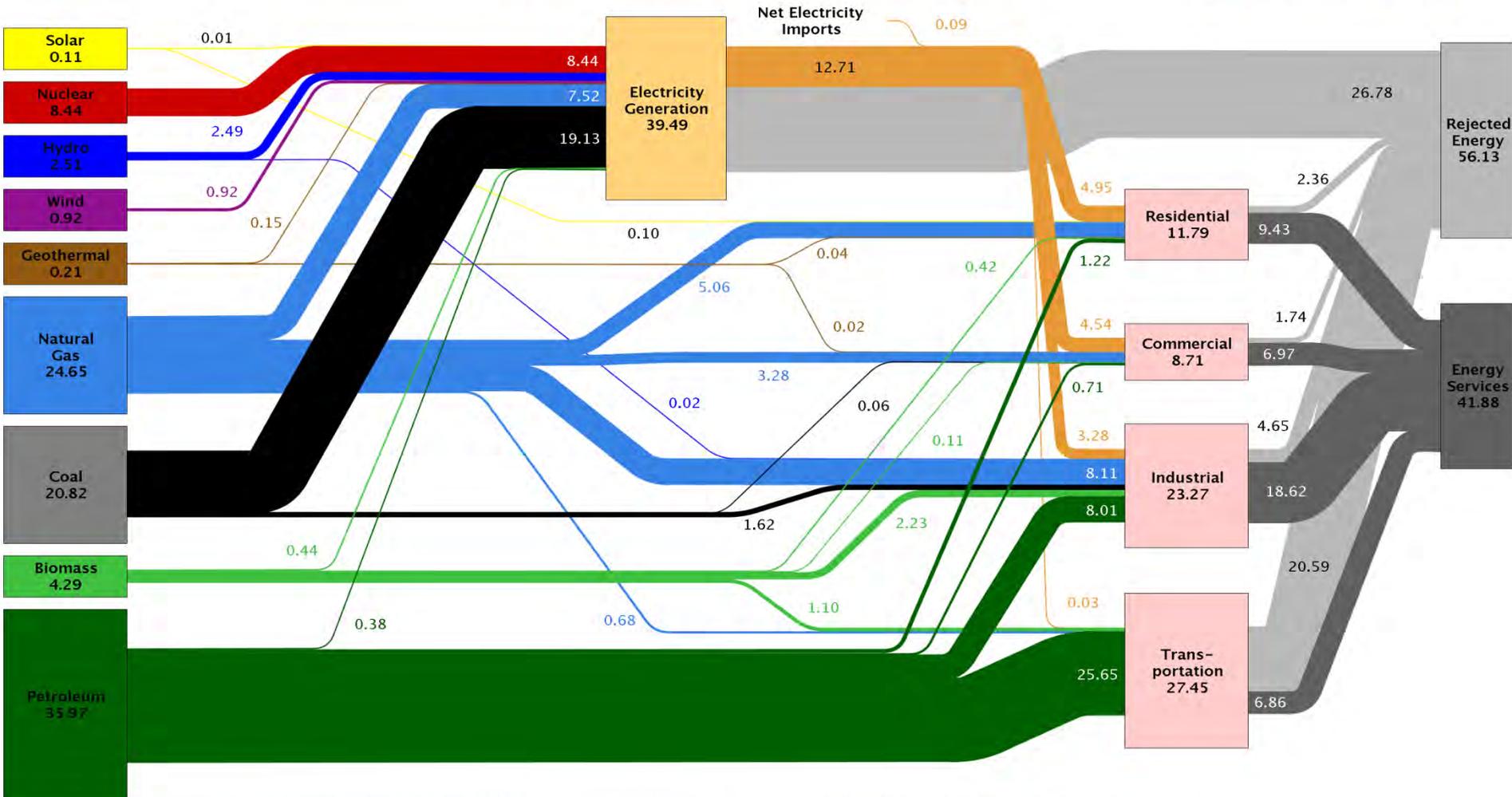
## The great divergence

Gas prices, \$ per million Btu



# What have low gas prices done in the US?

Estimated U.S. Energy Use in 2010: ~98.0 Quads



Source: LLNL 2011. Data is based on DOE/EIA-0384(2010), October 2011. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for hydro, wind, solar and geothermal in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." (see EIA report for explanation of change to geothermal in 2010). The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

# What have low gas prices done in the US?

- In 2010 – Livermore Labs estimated gas produced 19% of electricity
  - UP from 4.5% ten years ago (2002)
  - Now (2012) estimated at 35-40% of total electricity production
  - Natural gas has displaced oil production of electricity and has reduced coal use – to an almost 50-50% split. (Coal used to provide 49%)
  - Marginal peak fuel... but not any more.
    - Gas used to drive peak hour prices for electricity... coal was at the margin at night
    - Gas is now at the margin 7/24 in many locations... price spreads are almost gone
  - Despite a large change in demand for gas, the supply is growing rapidly
    - prices remain low – driven up only by electricity demand for air conditioning in the recent hot weather...
    - Demand for imported gas has fallen dramatically
  - The Economist estimates that the US will become self sufficient in Natural Gas in less than 10 years...

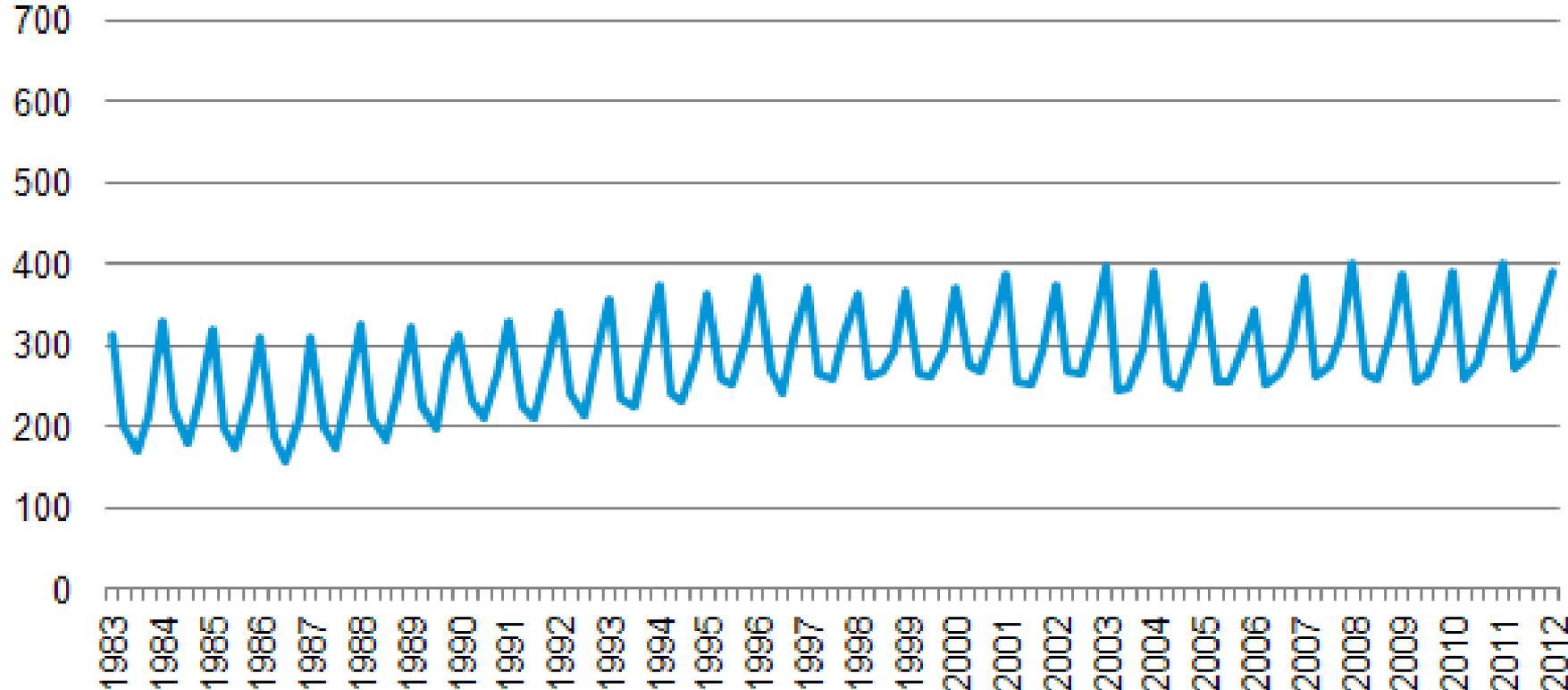
***There is no clear end to this trend...***

# US Carbon Emissions have declined...

U.S. quarterly carbon dioxide emissions from natural gas, 1983 to 2012



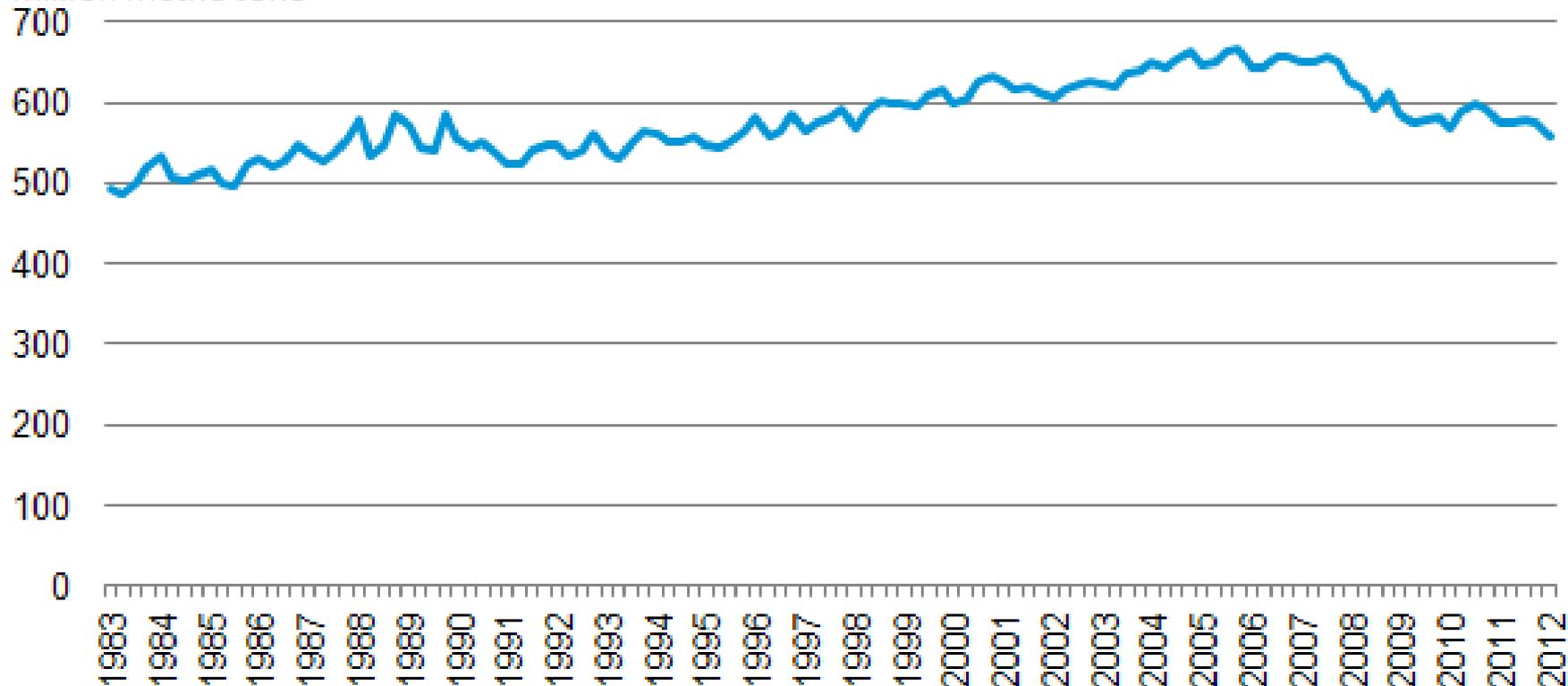
million metric tons



# US Carbon Emissions have declined...

U.S. quarterly carbon dioxide emissions from petroleum, 1983 to 2012

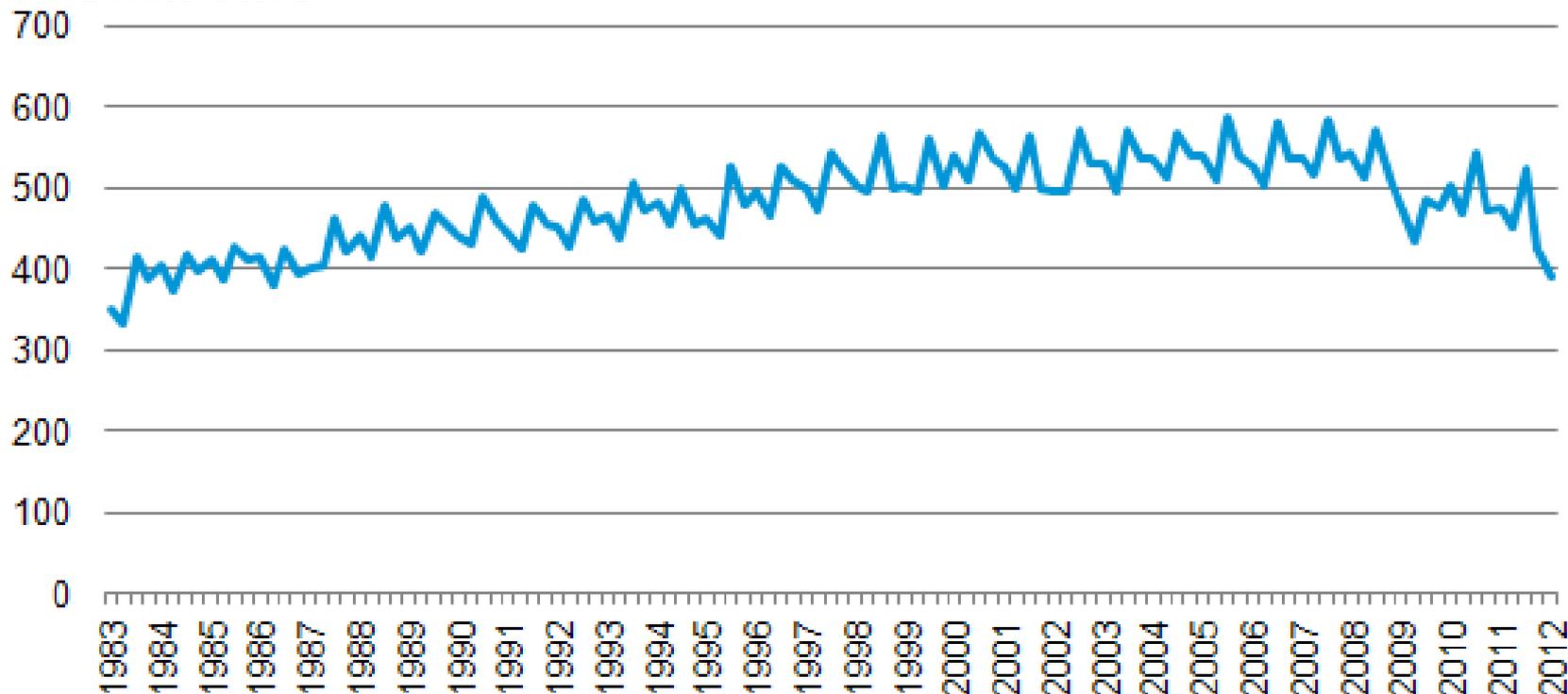
million metric tons



# US Carbon Emissions have declined...

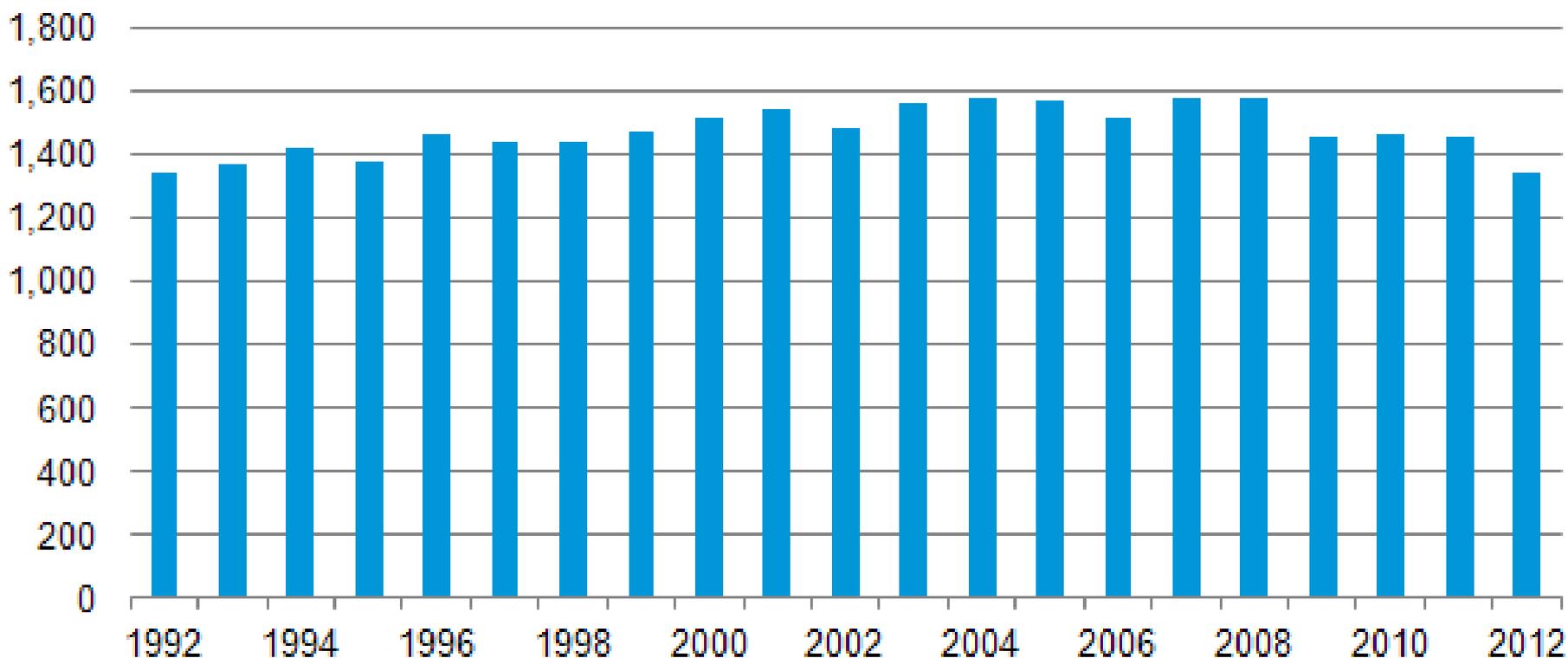
U.S. quarterly carbon dioxide emissions from coal, 1983 to 2012

million metric tons



# US Carbon Emissions have declined...

U.S. first quarter total carbon dioxide emissions from energy demand, 1992 to 2012   
million metric tons



# US Carbon Emissions have declined...

**Will the US achieve their “Kyoto” targets...  
by accident???**

# So What Does this Mean for Canada

- Natural Gas Sales to the US
  - Declining...
- We are not currently equipped to export to other markets...
- Alberta producers are finding sales “difficult..”

# BUT – Cheap US Gas has other impacts...

- Cheap gas has also had big impacts on electricity sales...
- In past years, BC Hydro has earned “several \$ hundred million” on Electricity TRADE with the US... BC is a NET IMPORTER of electricity...  
How was this done??
  - We have storage capacity that is among our best resources..
    - We have purchased low cost energy at night or during runoff periods and used it to meet our needs... Meanwhile we store energy at large hydro sites on the Peace and Columbia rivers...
    - We have sold stored energy at peak periods when prices are high
  - The day-night US electricity price used to be driven by the gas-coal cost spread... But this has disappeared... Day night spreads in electricity prices are almost gone...

BC, Manitoba and Quebec have profited on day-night Spreads... A market that is almost gone... Some other seasonal storage opportunities continue to exist..

# US Markets in General...

- The economy has slowed...
- The market for natural gas appears to be in trouble...
  - The TransCanada Pipeline is operating at less than 30% capacity...
- The day-night trading on electricity is impaired...
  - TransAlta declared an unexpected loss of \$797 Million or \$3.51/share. Analysts were expecting a loss of 3 cents/share. The apparent source was “Energy Trading”  
(Financial Post – 31 July 2012)
- Oil production in the US now appears to be increasing quickly...
  - Bakken: Reserves rocket... Continental increases in-place oil reserves by 56 percent to 903 billion barrels (<http://www.petroleumnews.com/pntruncate/647143903.shtml>)

## US Markets Show Problematic Trends for Canadian Energy Exports..

### Is it Wise to rely on the US for the largest sector of our exports??

# Government Decisions on Energy...

- Germany... Claims to be a source of renewable green electricity!!
  - Shut down nuclear capacity
  - Build or refurbish 17 coal fired generating stations to replace the loss...  
<http://www.reuters.com/article/2012/04/23/germany-energy-bdew-idUSF9E7J100V20120423>
- Ontario committed to a renewable future... And now has SBG (Surplus Baseload Generation) issues
  - Wind is being purchased at the contracted rate (\$120-140/MWh)
  - Quebec is taking surplus at near zero (or perhaps lower) prices
  - Up to 300 Nuclear maneuvers take place annually...
    - Nuclear generator power output is reduced by 350 MW for about 4 hours each time
    - Nuclear reactor power capacity is unchanged
    - Excess steam is discharged into condensers and heat is dumped into Lake Huron
    - The owner of the Nuclear Power Station is paid for the lost power...

**Politicians do NOT seem to have a great record at making energy based decisions... And this is not just a recent issue...**

# Many Years Ago (1969)...

- Newfoundland wanted to export electricity through Quebec to the US...
  - Quebec blocked the idea, purchased the energy, selling it themselves.. (Long term).
  - Quebec buys the as low as \$2/MWh, and sells sells for an average of \$85/MWh.
  - Quebec is been perceived as an electricity exporter – but when the Newfoundland power has been counted as an import, Quebec has been a net importer!!!
  - This “blockade” would be illegal under current US Laws...
- Alberta routinely exports and imports power through BC to US Markets...
- BC Routinely exports and imports to California through multiple utilities in Washington and Oregon...
- NOW (2012) the Government of Canada is looking at PAYING to help put a cable from NF – NB... Essentially paying to bypass a blockade that should not be there at all...

**ARE WE REALLY A COUNTRY???**

# The Environment... and questions for BC

- Is Enbridge really as bad as the media make them look??
- Can a marine bitumen spill be effectively addressed at all??? Apparently it sinks...
- Are there other chemicals in the mix that would create serious long term damage in case of a spill?
- Should one province, with little benefit, be expected to shoulder the environmental risks – with only promises of responsibility and cleanup actions?? – when damage could far exceed their ability to address?

# We are a Country – what about CANADA?

- It appears clear that our entire country risks real revenue losses if we continue to rely on the US for the sale of energy...
- Should Canada allow on province to block something that may be in the national interest??
- Should we be basing a future on a strategy of selling crude oil – (much like selling logs) – or should we be looking at upgrading before selling...???
- Is Pipeline approval the ONLY short run result that does not lead to major economic damage??
- Is there an alternate solution that can mitigate the economic issues, and reduce at least some of the environmental risk?
- Can a secondary strategy be implemented to address and reduce future risk??
- Is this federal government prepared to act unilaterally??

# What I see...

- The Markets are changing quickly around us... Are our markets are at risk..
- How serious is the environmental risk?
- Foreign interests are investing heavily – good or bad... alternatives??...
- Do we need a short term strategy... to address failing US markets???
  - And a longer term plan to increase value – and reduce risks??

A Yes/No Decision seems focused on only a small part of the picture...

Public sentiment in BC appears strongly against the pipeline...

An Albertan told me that the Northern Gateway is as important to Canada ...as the railway was, almost 150 years ago...

***The Picture is a lot bigger than we are seeing...***

***Government may be a bad place to look for leadership...***

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