

POWER. FULL BENEFITS.

6/26/2014

Affordable. Reliable. Abundant.

The Case for Conventional Power in Alberta.



Power. Full Benefits.

AFFORDABLE. RELIABLE. ABUNDANT.

CONSUMER ALERT.

Misrepresentative statistics & hidden costs of the ‘Power to Change.’

A Critical Review of “Power to Change”

The case for current forms of renewable energy is rapidly dwindling as new climate evidence shows there has been no global warming in 16+ years despite a rise in CO2.

Pembina Institute’s recent “Power to Change” and related media commentary make many claims that, on closer look, are insupportable. Coal is demonized while wind power is touted as an alternative.

Wind is not so clean, green or cost-efficient, nor does it reduce CO2, or decrease medical costs. If anything, coal-fired power saves thousands of lives by providing reliable, affordable power.



Wind requires conventional power 24/7.

Germany, once the bastion of green energy, is now building more than 20 coal-fired plants,ⁱ super-critical design like the modern plants of Albertaⁱⁱ. Why? Green energy is killing industry and the economy; Germany, like Alberta, has lots of coal - affordable and reliable.

See how a supercritical coal-fired plant works:

<http://youtu.be/fJVhwg5o0vA>



Conventional power does not require wind.



Check Reality. Not Models.

Residential fireplaces put out 2-3 times the PM 2.5 of coal.

The claim on page 6 of “Power to Change” that coal results in \$300 million in health costs is based on models, not reality, and is highly misleading to the public and politicians alike.

Economist Ross McKittrick and Friends of Science reviewed Pembina Institute’s previous report “Costly Diagnosis” and found that it had wrongly assigned a 6% PM 2.5 emissions figure (particulate matter) - in fact coal plants emit only 0.4% of all human-caused emissions of particulate PM2.5 pollution in Alberta.

Residential fireplace emit 2 times the PM 2.5 of coal - 3,400 tonnes.

Environment Canada data shows that coal-fired plants in Alberta emitted 1,800 tonnes (2011). The total man-made emissions were 400,600 tonnes.

Pembina Institute omitted 369,500 tonnes of the man-made particulate emissions from their calculation.

The major omissions were:

- Roads 223,100 tonnes
- Construction 129,900 tonnes
- Agriculture 15,300 tonnes

How can the Pembina Institute not consider driving on roads, construction and agriculture human activities? Forest fires - half of which are human caused, contributed substantially more particulate matter.

Clearly, there is a very large discrepancy between what the Pembina Institute ‘modelled’ and what Environment Canada actually reported.

“These are modeling studies,” says Dr. McKittrick. “They don’t track actual individuals. Before using such model predictions you need to ask if the numbers make sense, and here is where the problems start to arise.”



“It appears the Pembina clean-energy activists are attributing 1 death for every 18 tonnes,” says McKittrick. “That same year in Alberta there were 3400 tonnes of fine particulate emissions from residential fireplaces, 7,000 tonnes from forest fires and 209,000 tonnes from driving on unpaved roads. So by their reasoning these sources caused about 12,200 deaths. Since there were only about 22,000 deaths from all causes in Alberta in 2011, the **Pembina model attributes over half the annual deaths in the province to airborne fine particulates.**”

“I find this implausible, to say the least,” says McKittrick.

Questionable Graphs.

Improbable scenarios for replacement power.

Hidden costs. Unexpected consequences.

Ambitious Claims. Insupportable.

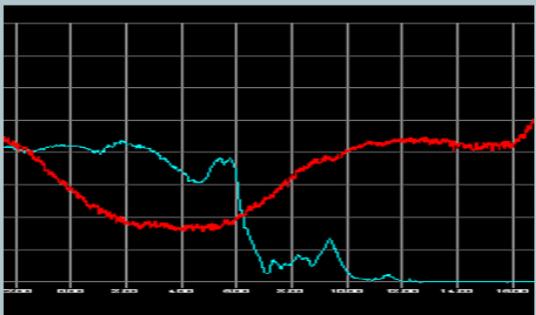
Some of the more ambitious claims are presented in the graph on page 15 of the report “Power to Change,” wherein a rosy picture is painted of renewables and an alleged ‘efficiency gain’ displacing conventional power. In fact, renewables require **equal capacity** thermal or conventional (hydro/nuclear) power back-up. It is a pipe dream to suggest such a “Clean Power Transformation” scenario can exist, a fact recognized long ago by the AESO - Alberta Electricity Systems Operator in 2007. ⁱⁱⁱ

Challenges to Integrating Wind



- **Supply-demand balancing is complicated by wind power** – wind can increase or decrease rapidly and patterns can be counter to load
- **Limits to how much wind a system can accommodate** – wind needs conventional generation as backup
- **Transmission upgrades** – need upgrades in southern part of the province
- **Worked with industry to agree on framework and now implementing:**
 - Wind forecasting
 - Ramping resources
 - Wind power management
 - Operational rules and tools





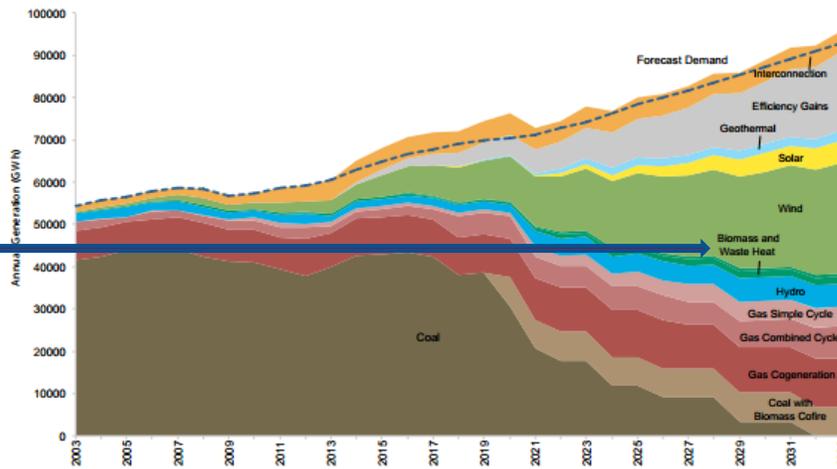
W i n d p o w e r a n d
l o a d d o n o t
c o r r e l a t e w e l l

AESO has spent a great deal of time and study on the issue and problems of wind integration - about 33% delivery of stated ‘capacity.’^{iv}

Speculative efficiency factors.

Inoperable margins of renewables to thermal.

Figure 5: Projection of annual generation by fuel source under the Clean Power Transformation scenario



This margin of renewables to thermal is unrealistic and inoperable based on known capacity, integration and load factors.

This claimed efficiency is on the demand side and appears to be highly speculative.

In Figure 5, in the "Clean Power Transformation" scenario, by 2033 they forecast ~9,000 MWs of wind generation and ~5,000 MWs of solar generation with only ~13,000 MWs of coal and natural gas generation.

This scenario would be completely impractical because what would be available to meet electricity demand when the wind is not blowing and/or the sun is not shining?

The underlining premise that natural gas prices are just too volatile to justify the transition to natural gas fired generation is highly questionable.

While natural gas prices can be volatile, there is a very well established forward market that would allow generators to purchase their supply in advance (in comparison, the forward market for Alberta power is very thin).

Furthermore, there is also an argument to be made that Albertans have a "natural hedge" to natural gas prices due to the fact that it is a big driver to Alberta's economy.

Fair. Efficient. Open. Competitive. ✓

FEOC is the rule of ISO-Independent System Operator.

Wind & solar proponents are asking for special treatment.



Wind power integration raises a number of challenges for the electricity industry, and while a range of technical solutions generally exist, there are high level questions surrounding what the FEOC operation of the market means with respect to wind integration.

The legislative and policy background provides general guidance for market design along with specific guidance for the integration of wind energy. The 2005 Market Framework states:⁶

The Department does not support one type of generation over another but rather allows competitive market forces to determine the appropriate generation mix (e.g. no fuel use policy). As a result, the Department does not support market refinements that will create an uneven playing field or be detrimental to the development of renewable resources. Environmentally friendly power generation benefits all customers with a cleaner environment and reduction in environment-related health problems. It also assists Alberta in meeting environmental emission targets under Clean Air Strategic Alliance (CASA).

The 2005 Market Framework also makes clear that all fuel sources should be free to compete in the market on an equivalent basis:

Suppliers using diverse fuel sources will compete for the opportunity to sell their products, based on a straightforward and transparent market framework, minimal barriers to entry, and a level playing field.

vi

Renewable advocates appear to be relying on the ‘social license’ to try and negotiate a more favorable deal for their industries.

The build-out of ~14,000 MWs of wind and solar power would require significant additional costs for additional transmission lines and these additional costs seem to have been completely ignored in “Power to Change.” Transmission costs will already significantly increase in Alberta in the next 20 years as aging lines and new capacity lines are installed.

Albertans have to ask themselves if this is a reasonable cost-benefit equation.

Billions in transmission line investment for a \$5-10 price difference.

Wind with natural gas back-up is no cleaner than natural gas alone.

Page 18 of the report “Power to Change” offers comparative bar graphs showing that a move to wind will benefit Albertans by perhaps \$5/Mwh. This scenario does not account for the hidden trillions of investment, unaccounted for in new transmission lines that would be required to be built for proposed new wind power/solar facilities.

The text also suggests that natural gas prices ‘will rise’ - presenting a cost to consumers. Ironically, what will make prices rise is the cost of installing natural gas-fired plants - such as Calgary’s new Shepard plant at an estimated \$2 billion^{vii} - required to manage wind’s variability. Such ‘peaking’ plants can ramp up and down to fill in for wind as it stops and starts - but this is a very inefficient, expensive and dirty way to use natural gas.

- Peaking plants, using combustion turbines,³ are relatively inefficient and burn expensive natural gas. They run only as needed to meet the highest loads.⁴

viii

A related, recent news article showed a graph that claimed wind was a low cost source - in fact a closer look reveals the graph is showing the value earned by wind - so low because wind power typically blows at night, a time of off-peak demand and the least money is earned. That does not make wind the cheapest option - but does show its power output fails to match consumer's daily power requirements.

Further, conventional plants incur a one-time cost of construction, leaving them operational for up to 60 years; wind farms last only 20 years - and as in the case of the short-lived, 7 year, Taylor wind-farm, leave tonnes of waste cement behind - in that case 60,000 tonnes.

Claims that wind energy offers ‘the lowest price supply’ are clearly misleading to the public. Since all wind is backed-up and can only exist via the conventional grid, price volatility will always potentially affect consumers. There is no true advantage, and even today, rising transmission and distribution costs on Albertans’ power bill are substantially related to the current propagation of wind power. If more wind is added, more conventional capacity is equally required.

Wind over conventional?

What is the rationale?

The Rationale for Renewables is based in diminishing supply of hundreds of years of fossil fuels and the 1990's claims that human use of fossil fuels is emitting greenhouse gases (GHGs), principally carbon dioxide (CO₂) that was said to lead to significant global warming. Some even said the result would be catastrophic. This led to a search for energy sources that would be 'renewable' (i.e. wind/solar appear to be 'free' sources of power), 'clean' - non-emitting of GHGs, especially not carbon dioxide, and 'green' - little or no environmental impact. Meantime, new reserves of oil, shale gas, and new developments in thorium and other power generation make the case for renewables less desperate. New evidence such as space weather research and 16+ years with no global warming despite a rise in CO₂, weaken the theory of "Dangerous" Anthropogenic Global Warming (AGW). The climate sensitivity of CO₂ likely has been greatly overestimated. Some 30 years later, what does the evidence show about how, or if, 'renewables' meet the assumed rationale?

"Stop global warming"...

Global warming stopped naturally 16+ years ago before Kyoto was implemented.

"Wind is free"...

Wind costs 3-10 times the cost of conventional power when costs of back-up facilities and transmission lines are included; look at skyrocketing power prices in the UK/EU and Ontario.

"Wind is clean and green"...

The people of Baotou, China live in toxic devastation of the rare earth mineral mines where the raw materials for wind turbine magnets is mined - with no environmental management.



"Reduce particulate matter, save medical costs and reduce deaths"...

In Alberta, residential fireplaces emit 2-3 times the PM 2.5 of coal plants. Forest fire ash and smoke, agricultural dust, unpaved roads contribute thousands times more.

Coal-fired plants emit just 0.4% of all human-caused PM 2.5 emissions.

If anything, coal and gas-fired power plants contribute abundant social and economic benefits: reliable and affordable power that facilitates things like complex, life-saving surgeries.

Alberta's modern coal plants are advanced, high-efficiency performers, not at all like the aging US fleet they are often compared to by critics.

Canada is a winter country.

Wind won't work here when it's freezing.

In Pembina Institute's "Power to Change" the authors claim that it is possible for Alberta to simply replace coal generation with wind power, natural gas and 'efficiencies' - thus cutting carbon emissions in half and 'saving' Canada's environmental reputation so that the oil sands can thrive.

This is faulty logic and has fatal consequences.

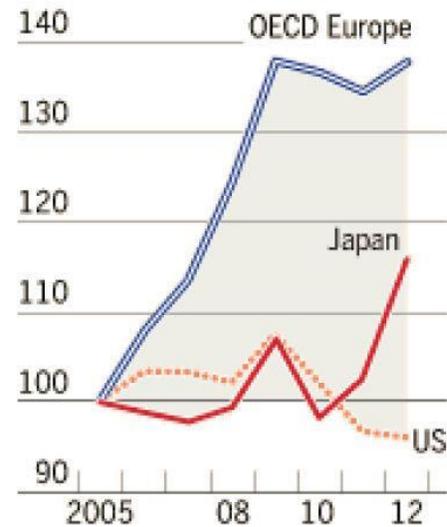
Look at the UK and EU. They shuttered coal plants to reach GHG emission targets - power prices skyrocketed 37% in 8 years.

In UK winters, some 30,000 people died due to being pushed into 'heat-or-eat' poverty.

In the end in 2013, the UK had to restart a shuttered coal plant just to get by. On the frosty 12th of March, 2014 - when power was desperately required - the entire UK fleet of ~5,000 wind turbines only managed to squeak out 0.3% of the power demand.

Electricity prices

Rebased (2005 = 100)



Source: European Commission

Canada - Alberta in particular - is rich in coal and natural gas reserves; hundreds of years of them. We also have stringent environmental controls and modern coal and gas fired plants.

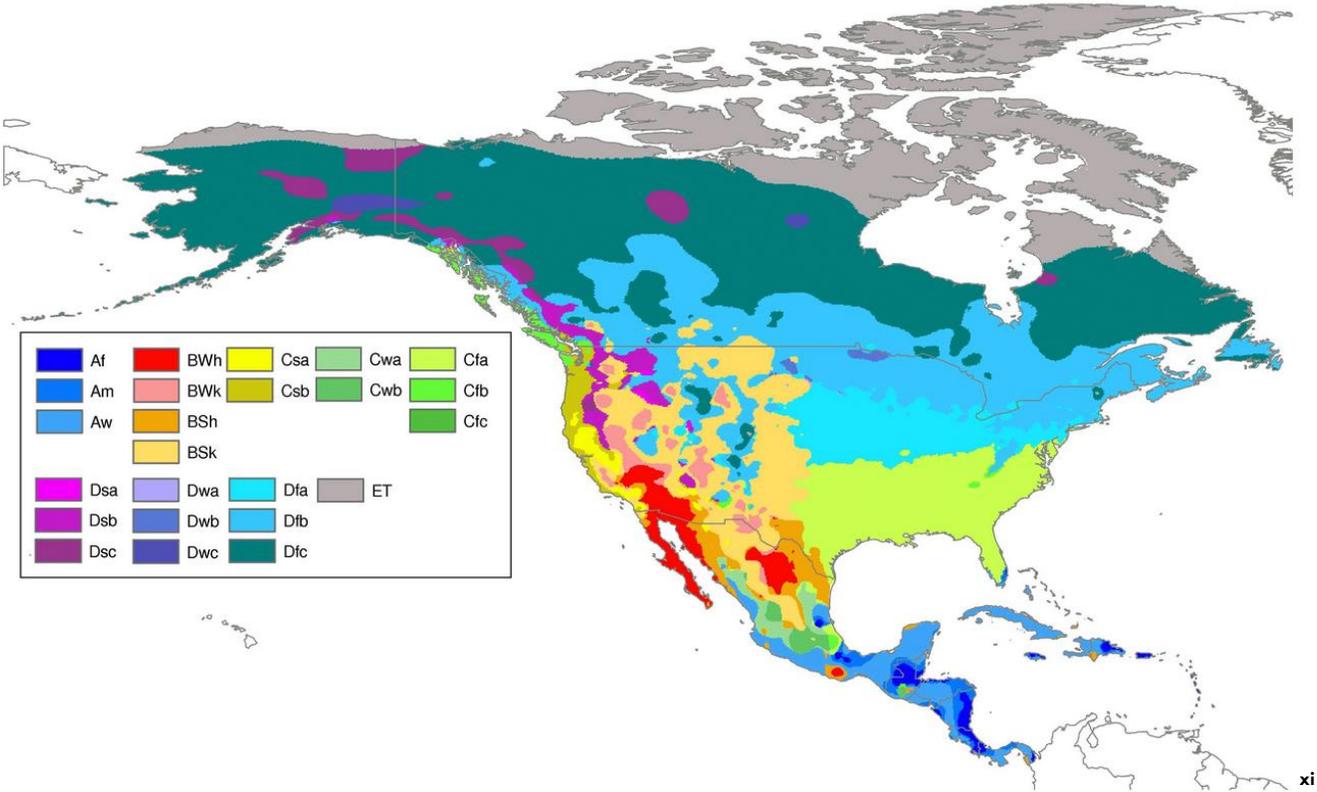
Global warming stopped 16+ years ago, despite a 9.6% rise in CO2 in the atmosphere since 1997; so it seems the environmental case is weakened,^{ix} especially when coal provides the reliable power to deal with many more significant human pollution factors such as waste treatment plant operations and water purification.

Canada should not follow US climate change policies.

Our climate is much colder.

Many wind power advocates claim Alberta 'should' follow the US lead on coal and renewables. Despite the US being our biggest trading partner, most of the USA has a much more temperate climate than Canada's. Due to their larger population, the US also has a much larger infrastructure of roads and cost-efficient bulk delivery of goods and services.

By contrast, Canada's vast regions and sparse population require a much greater investment in transportation, at less cost-efficiencies. Likewise, reliable and affordable power distribution to the remotely spaced population, and in Alberta's case, the northern industrial operations of oil sands, upgrading and refining facilities mean that cheap, affordable, conventional power is a must.



xi

Alberta was 1st with wind in Canada.

After 20 years, wind is still power-less.

Albertans have paid for 7.9% of our generating capacity in wind power but this has only generated 3.62% of our power. Why are we putting in such costly power generation and then only using half the capacity?

At current prices for coal and our new 40% efficient supercritical pulverized coal fired power plants the generating cost from coal is just 2.5 cents/kWh. Natural gas at 36% efficiency at today's price is 4.8 cents/kWh.

Generation	Gigawatt hour (GWh)**
Coal	38,272
Natural Gas	27,238
Hydro	2,319
Wind	2,640
Biomass	2,089
Others*	359
Total	72,918

Source: AUC

Generating Capacity	Megawatt (MW)
Coal	5,690
Gas	5,784
Hydro	900
Wind	1,113
Biomass	418
Waste Heat*	86
Fuel Oil	12
Subtotal	14,003
Interconnections Capacity	
British Columbia	750
Saskatchewan	150
Subtotal	900
Grand Total	14,903

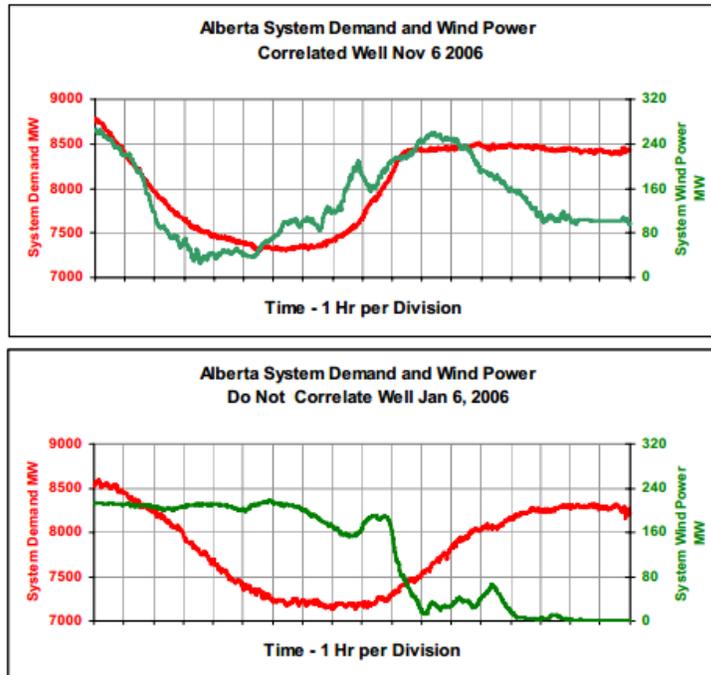
Source: The Alberta Utilities Commission (AUC) and the Alberta Electric System Operator (AESO).

*Waste heat generation is a system that produces electricity from a heat source that is a by-product of an existing industrial process, the heat that would have been otherwise wasted.

Wind. Inefficient. Unreliable.

Backed up 24/7 by conventional.

Wind turbines, because of their inefficiencies and unreliability are backed-up by conventional coal and natural gas-fired or hydro power generation. The actual cost for wind power is tricky to estimate because the capital cost of wind farms are duplicated by the capital costs of back-up power plants, which are less efficient than base load power plants as they are forced to ramp up and down power output to offset the wind variability. Gordon Hughes did an evaluation: "Why is Wind Power so Expensive?"^{xii} where he finds wind with backup costs 9 times the cost of conventional power in Britain.



At the extreme, wind power may be at full capacity during light load periods just as other generating units approach their minimum stable operating levels. These studies also illustrated how ramping (20 minute to hours) of wind generation rather than intra-hour variability presented the greatest operational challenges.

Reliable power system operation requires ongoing precise balancing of supply and demand in accordance with minimum operating criteria. The AESO system operator manages supply-demand balance on a minute-to-minute basis considering load forecasts, operating uncertainties (i.e. unit de-rates and outages) and using current resources, rules and procedures. When wind suddenly ramps up or down, generating resources (predominantly coal, gas or hydro-electric) must be immediately dispatched to offset the imbalance. In practical terms, energy from wind generation is accepted as delivered and any resulting imbalances will be offset with intra Alberta resources or potentially with power exchanged from other provinces.

xiii

Wind. Nominal net power.

What is the benefit?

Coal sells for around \$108/tonne which produces approximately 36GJ* of energy at a cost of \$3/GJ (numbers modified for simplicity).

*GJ= Gigajoule One gigajoule is one billion joules. The amount of energy consumed each year in a typical Canadian home is equivalent to 120 gigajoules. The amount of energy represented by one gigajoule is equivalent to about 30 litres of gasoline, 39 litres of propane, 278 kilowatt-hours of electricity or 45.5 kilograms of coal. The average home in Alberta uses about 120 gigajoules of natural gas per year.

http://www.energy.gov.ab.ca/about_us/1132.asp

Today's price for natural gas is \$4.63/GJ and unlike coal, the price for natural gas is highly volatile and in all likelihood will escalate as more and more gas is used for power generation in the USA. As is the case in the EU.

Natural gas-fired power plants accounting for almost 30 percent of Europe's capacity are at risk of shutting or being mothballed as utilities opt to burn cheaper coal, according to the International Center for Natural Gas Information.

--Iris Almeida, [Bloomberg, 2 June 2014](#)

Wind power is only sustainable when the wind blows; solar power is only sustainable when the sun shines and biofuels are currently consuming 6.5% of the world's grain as feedstock causing a global food crisis.

On the other hand Alberta has over 200 year supply of coal and natural gas. Coal and natural gas power generation is sustainable 24/7 365 days a year for at least the next 200 years. It is a power source that does not kill birds or bats (which are vital for our agricultural industry) as is happening with wind turbines nor does it kill the world's poor through starvation, as global food prices rise due to biofuels diverting land once dedicated to food crops.

Wind. Major footprint.

Minor player as power source.

Smaller Faster Lighter Denser Cheaper by Robert Bryce argues against renewables ... but purely physics and economics: that their alternative possibilities are inherently too weak as fuels to scale them up to meet the world's unceasing demand for more electricity.^{xiv}

From studies of wind farms he calculates that the average power density for wind energy is about one watt per square meter. A wind farm large enough to power just one data center for Facebook would require nearly 11 square miles of land, he says. On a far larger scale, the United States has about 300 billion watts of coal-fired generation capacity. So to replace it by wind power would sop up 300,000 square kilometers of land, about the area of Italy. Here he is tilting at windmills — no one has ever proposed shuttering the nation's coal mines and relying on wind — but the comparison serves his contention that in the big picture, wind power will always be a minor player.

-New York Times Review June 7, 2014

“The best way to protect the environment is to get richer,” [Bryce] asserts. “Wealthy countries can afford to protect the environment. Poor ones generally can’t.”

Renewable is not so doable.

Ontario learned. The hard way.^{xv}

Advanced technologies in Alberta's modern coal plants include the use of pulverized coal for a more complete burn and supercritical boiler technologies that provide an exceptional 44% efficiency.

This, combined with state of the art pollution controls eliminate over 99.9% of all pollutants.

Coal plants incorporating these technologies are among the cleanest power generating facilities anywhere in the world. This Alstrom You Tube video explains: <http://youtu.be/fJVhwg5o0vA>

With the high efficiency and low cost of coal this form of power generation would also be the least expensive.

However, due to misinformation from some ENGOs like the Pembina Institute, some Alberta coal plants have gone to natural gas instead - meaning already the cost of electricity for Albertans has gone up significantly, with no environmental benefits.

Assuming that natural gas achieves the same 44% efficiency as coal the generating cost would be 3.80 cents/kWh for natural gas compared to just 2.46 cents/kWh for coal. With all other associated costs being the same and the advanced technologies in pollution controls now in place for all Alberta's coal fired power generation the only difference between coal fired and natural gas fired power generation is the 1.34 cents/kWh difference in cost.

Albertans are already paying far too much for our electricity because of the costly inefficient wind power generating installations that have been put in place strictly for reasons of political cosmetics. They do not contribute to Alberta's overall power needs in any substantive material way. (Conventional coal and natural gas fired power generation must remain on standby duplicating the power capacity provided by wind turbines so in fact the net contribution to Alberta's power capacity is virtually zero. Natural gas-fired plants that are ramping up and down to match wind variability are less efficient than plants that run continually.)

Hidden costs. Transmission Lines.

One way.

In 2012, Alberta Energy released a report, “Review of the Cost Status of Major Transmission Projects in Alberta.” The report said, “To accommodate wind generation in southern Alberta . . . The existing capacity of the transmission system . . . is insufficient for additional wind-powered generation . . . Current Estimated Cost (is) \$2.82 billion.”

Albertans are expected to build \$2.8 billion worth of new transmission lines in the next four years that will carry a mere 32 per cent of their design capacity.

These power lines are dedicated only to wind and will result in higher electricity bills.

The once-lovely prairie and mountain vistas now defiled by these ugly transmission lines.

The billions we’ve spent so far on wind and associated power lines in Alberta have not significantly reduced carbon dioxide emissions.

To date, Albertans have paid for new transmission lines for wind-generated electricity that will carry one way power that is intermittent, wasteful, ineffective and expensive.

They are generally one way collection lines. Since they carry mostly wind generated electricity they are being used just as ineffectively as the wind turbine themselves with a very low capacity factor.

Alberta’s entire fleet of wind turbines would cost only about \$2.8 billion at \$2000/kW capacity which is the price quoted for Black Spring Ridge. Since a large amount of the cost of wind power is due to capital cost, the cost of power to consumers is roughly speaking more than doubled when transmission is taken into account. We have not even started to factor in the costs of storage to make wind power a reliable source of electricity independent of fossil fuel backup.

Bats and raptors battered to death by wind turbines.

Falcons roost at coal plants.

Wind Power - Not Eco-friendly

“A bat mortality study supervised by U of C biology professor Robert Barclay that began in 2006 has determined that the vast majority of bats found dead below turbines near Pincher Creek suffered severe injuries to their respiratory systems consistent with a sudden drop in air pressure – called barotrauma – that occurs when the animals get close to turbine blades. ...”^{xvi}



What killed this bat?

Baerwald, whose team has picked up as many as 188 dead bats a day at Summerview, says half the corpses show no outward sign of injury or contact with the blades. And some of bats they find are still alive, but are unable to fly and have blood in their mouths and noses. ^{xvii}

Rare birds like raptors and eagles are drawn to wind farms - and death.



Meanwhile falcons nest safely at coal plants.



Investors wary of wind. Why should Albertans pick up the tab?

Alberta Schools about to become wind farm owners and potential market competitors.

Investors are reluctant to invest in wind. In the US, wind is reportedly 'on a respirator' - surviving only due to subsidies. In Alberta, the school boards want to build a wind farm of their own at taxpayers' expense.

Are AB School Boards being the 'financier' by contract for a project that otherwise would never be financed in the open market? Is this a misuse of taxpayer's funds?

EU carbon markets recently collapse from a high of 34.90 euro in 2008 to 3.06 euro Ap. 24, 2013. What is the risk this will affect REC values worldwide?

<http://albertamsa.ca/uploads/pdf/Archive/2012/Investor%20Perspectives%20Report%20to%20MSA%20-%2017%20Augus.pdf>

- Indicated that: "Wind: Not generally attractive at this time because expected medium-term Alberta electricity prices are on average lower than the full cost of the facilities"

Wind: Investors commented that in general, they are not supportive of wind projects at this time, because prices in the Alberta electricity market have been and are expected to continue to be too low to provide a sufficient level of return on investment in a new project, if the only source of revenue were to be the hourly electricity market. There is no fuel cost in wind power facilities, and operating costs tend to be relatively low. The majority of the long-term cost of wind power is the cost of the capital employed in constructing them. Even with the historically low interest rate environment of the last few years, the full cost of new wind projects, with a reasonable return on equity capital included, is higher than the average price of electricity in the Alberta market.

- Only wind projects which have either contracts or substantial ancillary revenues will be considered for financing by any debt, equity or balance sheet investors. In the event that a wind project is given a contract by a consumer of electricity, that consumer is essentially taking on the risk that the average electricity price will rise above the wind break-even point over the long-term, therefore making the contract a sensible one. Wind projects also sometimes qualify for alternative revenue streams, such as carbon credits or other green financial attributes. If these are sizeable enough, then they could make a positive difference on investor views. At the time of writing of this report, there are more than 1,000 MW of wind projects that have received all required regulatory approvals and permits, but are not currently proceeding to construction.

- 5
- One exception is Capital Power's Halkirk wind project, which according to the company's publicly available information benefits from a long-term renewable energy credit arrangement which will provide approximately 40% of expected revenues over the life of the project.

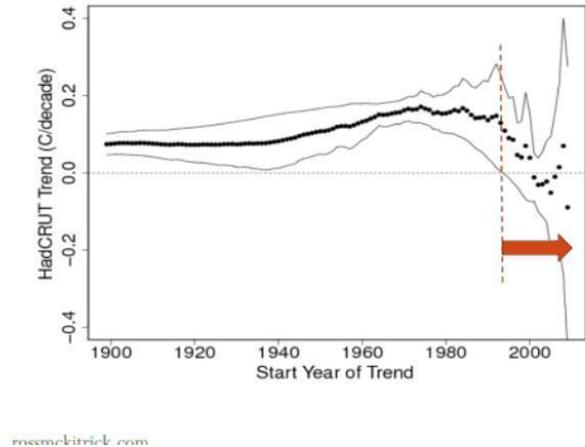
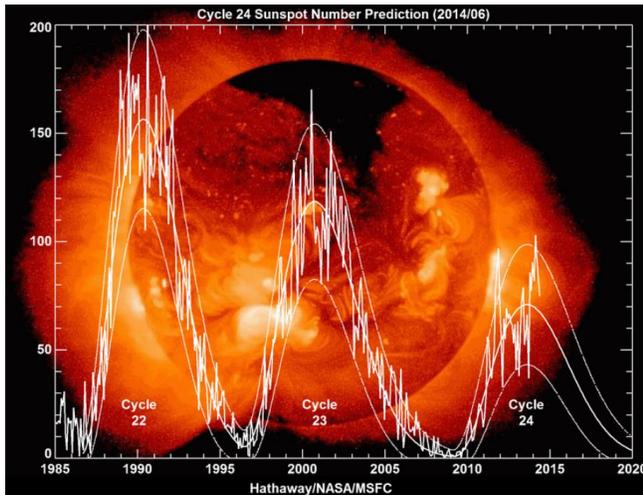
Based on an early document, Alberta Schools Commodities Purchasing Consortium are presently undertaking the construction of a purpose-built wind farm,^{xviii} a \$160 million capital cost project with a long-term 25 year PPA involving a total cost of some \$600 million over the life of the project. In addition to the wind power contract, Alberta School contractors will have to also sign a 'firming contract' to purchase conventional power to supply energy when wind is not blowing - about 67% of the time.

According to early documents and others obtained through FOIP requests, it appears that Alberta Schools CPC participants will also benefit from lowest rate debentures through Alberta Capital Finance Authority for equity investment - and will end up becoming a free market provider of wind power - seeking other clients.

How and why did a school system become an electricity provider? Why are taxpayers' dollars underwriting a competitive power provider to compete against publicly owned power companies?

Solar Cycles = global cooling.

We need power. Full benefits. Affordable. Reliable. Conventional.



The prediction of a 20 year cooling phase (or more) has been raised by various solar scientists, including Oxford-trained astrophysicist Dr. Jim Buckee, an early supporter of Friends of Science, who shares the view that solar cycles and cosmic influences are the main drivers of climate change. ^{xix}

Quoting from the University of Aberdeen press release, Dr. Buckee said at the time: "The climate of the last few hundred years is a continuation of normal processes and can be closely reproduced as a slow temperature increase since the Little Ice Age, due to increasing solar activity, overlaid by oceanic oscillations.

"Oceanic modulations and solar cycle length analysis now indicate we are entering a cooling period which could last until 2030 or more. This will have a significant effect on the way we lead our lives, impacting negatively on areas such as food production."

As early as January 22, 2008 Russian astronomer and mathematician Khabibullo Abdusamatov, head of a space research lab at the Pulkovo observatory in St. Petersburg, was predicting global cooling due to a decline in solar activity. ^{xx}



Data set: Remote Sensing Systems satellite lower troposphere global temperatures.

Renewable Strategy for Alberta?

Priority should be on conventional, affordable, reliable power.

Alberta is the economic engine of Canada.

Destabilizing our grid with more wind will put our industrial capacity at risk.

Our modern industrialized world needs stable, reliable, affordable power.

Renewables, as proven in Ontario, are not market ready. While small scale individual applications of wind, solar or co-generation have some merits in the right geographic context, wind has already cost Albertans a fortune in distribution lines and tie-ins - some estimates sitting at \$8 billion in hidden costs.

There is no case for a renewable energy policy in Alberta at this time, especially as we watch renewable policies and industries collapsing around the world. We know from the experience in Germany that wind and solar sudden peaks and dips have led to costly industrial equipment damage, heat-or-eat poverty for citizens as power rates spike, along with the destabilization and fall of governments.

Wind only works because conventional power backs it up 24/7. That's a duplication of effort, and an extra waste of resources....for no benefit to the environment whatsoever.

If solar scientists are correct, if the temperature trends showing cooling continue, Alberta - a winter country - will need all the power it can get from reliable, affordable, conventional sources.

Friends of Science.

Evidence-based policy is best.

About

Friends of Science have spent a decade reviewing a broad spectrum of literature on climate change and have concluded the sun is the main driver of climate change, not carbon dioxide (CO₂). The core group of the Friends of Science is made up of retired earth and atmospheric scientists.

Contact:

Friends of Science Society
P.O. Box 23167, Mission P.O.
Calgary, Alberta
Canada T2S 3B1
Toll-free Telephone: 1-888-789-9597
Web: friendsofscience.org
E-mail: [contact\(at\)friendsofscience.org](mailto:contact(at)friendsofscience.org)



ⁱ <http://www.forbes.com/sites/jamesconca/2012/08/31/germany-insane-or-just-plain-stupid/>

ⁱⁱ <https://www.capitalpower.com/generationportfolio/merchantcommercial/Pages/Genesee3.aspx>

ⁱⁱⁱ www.aeso.ca/.../CERI_The_Challenges_of_Managing_the_Transmission

^{iv} http://www.aeso.ca/downloads/Phase_II_Wind_Integration_Recommendation_-_Final.pdf

^v http://www.qp.alberta.ca/1266.cfm?page=2009_159.cfm&leg_type=Regs&isbncln=9780779747719&display=html

^{vi} http://www.aeso.ca/downloads/Phase_II_Wind_Integration_Recommendation_-_Final.pdf

^{vii} <http://www.nationalpost.com/story.html?id=f7ef4e6d-29f0-4a5e-95c3-084ff5eac8c0&>

^{viii} <http://fas.org/sgp/crs/misc/RL34746.pdf>

^{ix} http://www.epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=07472bb4-3eeb-42da-a49d-964165860275

^x <http://www.spiegel.de/international/world/interview-hans-von-storch-on-problems-with-climate-change-models-a-906721.html>

^{xi} Source: http://people.eng.unimelb.edu.au/mpeel/Koppen/North_America.jpg

^{xii} <http://www.thegwpc.org/images/stories/gwpc-reports/hughes-windpower.pdf>

^{xiii} http://www.aeso.ca/downloads/WI_Paper_-_Final.pdf pg 11

^{xiv} http://www.nytimes.com/2014/06/08/business/energy-environment/review-of-smaller-faster-lighter-denser-cheaper.html?_r=0

^{xv} <http://ontariowindperformance.wordpress.com/wind-turbines-in-the-news-denmark>

^{xvi} <http://www.ucalgary.ca/news/aug2008/batdeaths>

^{xvii} <http://www.canada.com/ottawacitizen/news/story.html?id=af37ff70-f5e7-44dc-afc2-d80a71460403>

^{xviii} http://www.holyspirit.ab.ca/_cabinet/2/59/61/December_21,_2011_Agenda_Package.pdf pg 10-33

^{xix} <http://www.abdn.ac.uk/mediareleases/release.php?id=1682>

^{xx} <http://en.ria.ru/science/20080122/97519953.html>