Bruce Power's "*Saskatchewan 2020. Clean Energy. New Opportunity*":

The Nuclear Way: FUDGING STATISTICS, DENYING EMISSIONS, IGNORING WATER and OBSCURING ENERGY CHOICES

By Jim Harding, Ph.D.

Bruce Power (BP) is distributing a 24-page promotional pamphlet along the North Saskatchewan River – from the Lloydminster to North Battleford to Prince Albert regions. BP introduces itself as "*Canada's only private nuclear generator…a partnership of TransCanada, Cameco*", nuclear power workers and professionals (p. 5). We should be skeptical of such a highly integrated consortium of electrical transmission, uranium fuel and nuclear technocrats. What is BP pitching?

Will We Need Nuclear Power?

Without details on assumptions or method, BP simply says "*up to 2,200 Megawatts (MW) of new electricity could be required by 2020*" in Saskatchewan (p. 6). This would be more than a 60% growth in today's 3,500 MW grid. Their own figures, however, suggest that 812 MW might be enough. BP's intent is not to do serious analysis of demand reduction or new supply options, but to create a self-fulfilling need for one or two of their nuclear reactors.

We've seen this pseudo-science before. In 1989, during the Grant Devine government which created massive public debt, another private consortium - Western Projects Development Associates (WPDA), backed by Atomic Energy of Canada Limited (AECL), proposed nuclear plants for Saskatchewan. In 1991, an AECL-commissioned study concluded Saskatchewan would need three of AECL's drawing-board 450 MW Candu-3 nuclear plants.[i] Sound familiar? The study predicted one plant would be required by 2000 due to a 400 MW shortfall in electrical capacity, with a second by 2005. These opportunistic and urgent "forecasts" of unmet demand ignored the potential of conservation, efficiency (demand side reduction), and non-nuclear, renewable alternatives.[ii] BP is repeating the same self-interested projections and errors.

It's noteworthy that nearing 2010 Saskatchewan has no nuclear power plants. Saskatchewan creates more than half (57%) of its electricity from coal, one-fifth (21%) from hydro and the rest from gas, wind, purchased power and imports. Great potential exists for energy efficiency, co-generation, biomass, small hydro and wind. We presently generate a mere 3% from wind, even though southern Saskatchewan is one of the highest

inland wind potential areas of Canada.[iii] By increasing this to 30% of total capacity, plus a more rational use of electricity, any increase in demand would be met. This 30% target is realistic given similar accomplishments in countries like Denmark and regions of Germany, which is embracing renewable energy while phasing our nuclear power. We can do the same while phasing out coal. If Saskatchewan created the 1,000 MW wind capacity already existing in Alberta, we would be on our way. Such capacity would be ecologically and socially sustainable, costing half as much as nuclear power, without the destructive impacts of uranium mining and creation of toxic nuclear waste.

Fudging Statistics

BP fudges polling data to create the appearance of support for nuclear power among Saskatchewan people. BP's own polling found 94-95% of Saskatchewan people support wind and solar power (p. 13), but they prefer to highlight support for nuclear as "second highest" in Canada". This comes as no surprise since Cameco, AECL, the Canadian Nuclear Association (CNA) and BP have all targeted Saskatchewan with nuclear expansion promotions for years. Furthermore, the Sask Party government's *Saskatchewan Uranium Development Partnership (*SUDP), stacked with nuclear industry CEO's, will make recommendations on adding economic value to uranium mining. The fox truly is in charge of the chicken coop.

A February 2008 industry poll puts Saskatchewan support for nuclear power at 55%, while a July 2008 poll shows support declining to 52% (p. 11). A poll in May 2008 commissioned for the *Regina Leader Post* shows a slight decline for the nuclear industry in Saskatchewan since 2006.[iv] What BP doesn't mention is that this poll reveals women oppose nuclear power, and when asked about Lake Diefenbaker as a potential site, 40.5% overall opposed nuclear power, compared with 38% in support. And only 25% support the involvement of a private corporation (like BP) in a nuclear project and among these, a major concern is "cost". The largest grouping (40%) believe such electrical generating projects should be spearheaded by the public utility Sask Power. As Saskatchewan people access independent information about nuclear power and renewables, and recognize that BP's plan is privatization through the back door, public opinion will continue its shift in a non-nuclear direction.

Despite expensive pro-nuclear campaigning, support for nuclear power in Saskatchewan lags far behind that for renewable energy. To manoeuvre around these findings, BP says it supports other forms of energy. BP asserts "there is a role for nuclear in the province's energy mix by 2020" (p. 6), and says it will examine a "*clean energy hub*" where it can generate hydrogen with wind and solar. (p. 13). "Clean energy hub" is a code phrase for BP's long-term business plan to create huge centralized nuclear energy conglomerates with the capacity to reprocess spent nuclear fuel. AECL's Engineer Emeritus D.A. Meneley says such "*An energy centre should be built step by step, according to a broad but adaptable overall plan. The Bruce site on Lake Huron provides a good example of how such a complex might begin. The site now includes about 7 Gwe*

of generation plus a number of support facilities. Some years ago, a conceptual plan was put forward for a multi-stage energy cascade system adjacent to the site. On-site fuel storage facilities are already in place."[v] This sounds strangely similar to what the Canada West Foundation recommended for Alberta and Saskatchewan in its 2008 pronuclear report.[vi]

Can Nuclear Save Us From Global Warming?

There is no credibility to how BP's approaches the pressing need for Greenhouse gas (GHGs) reduction. In its brochure, BP presents a bar graph suggesting "life cycle emissions" of CO2 per Gigawatt-hours of electricity generated are similar for nuclear power, solar, hydro and wind. It even suggests "*nuclear produced less emission than solar when entire life cycle is considered"* (p. 16), with coal and natural gas-generated electricity presented as the culprits. BP states says "*these conclusions were made by the University of Wisconsin-Madison*" but fails to reveal who did the study, how it was conducted and who paid for it. The public has rightly become skeptical of corporate "facts" such as those commissioned by the oil industry to dispute global warming, or cigarette companies to dispute their primary role in lung cancer.

After some tracing[vii] I found out this bar graph came from a 2002 study done at this University. But BP has been free and easy with its data. Its bar graph has estimated emission comparisons for coal, natural gas, solar, hydo, nuclear and wind (p. 16), whereas the report it's presumably from has estimates for coal, natural gas, photovoltaic (PV) solar, fission, wind and fusion.[viii] The study is only identified as being from the University of Madison-Wisconsin, whereas it was actually from the *Fusion Technology Institute* at that University. Perhaps BP is trying to hide the nuclear connection by taking estimates for "fusion" completely out. Furthermore the actual study only directly estimated emissions from natural gas and PV solar. Concentrated solar, which builds up thermal heat for electrical generation, should be treated separately from PV solar, which is known to be less efficient. Also, when you actually read the 2002 study you find that the emission estimates for nuclear and wind were taken from research going back to 1998 at the *Fusion Technology Institute*. And I still have no idea where BP got its emission estimates for hydro. Combining these estimates into one graph without being candid about multiple sources and methods obscures vital research issues involved in estimating full energy system emissions.

Recent, more transparent and independent research comes to very different conclusions. A 2008 study done at Stanford University estimated the carbon resulting from ten different sources of electricity if used to fuel all U.S. vehicles. Clean coal did poorest after bio-fuels, and nuclear came third worst, creating 25 times the carbon as wind, which did the best. Solar (concentrated-thermal), geothermal, tidal, solar (PV), wave and hydro were next best.[ix] Even if we look only at the GHG-free nuclear plant we find it is more cost-effective to reduce GHGs using non-nuclear technology. While a nuclear plant can totally reduce the estimated .9 kg of CO2 from each 1 kwh of electricity produced by

coal, so can wind. Since wind is cheaper it can reduce more than nuclear (about 1.5 times) for the same investment. While natural gas reduces less than nuclear (e.g. .7 kg of the .9 kg of CO2 for each 1 kwh of electricity from coal), it reduces about 1.4 kg for the same investment as nuclear. Energy efficiency can reduce up to 10 times the carbon as does nuclear per amount invested.[x]

BP believes it can trick the public into believing nuclear power is the best way to reduce GHGs. But its own polling suggests this ploy isn't working since only 45% agreed with the statement "nuclear generation does not emit GHGs" (p. 13). Note the phrase "nuclear generation", which can easily be interpreted to exclude all the nuclear fuel system except for the actual nuclear plant. But even with this narrow view the statement hasn't been broadly accepted. As the public becomes better informed about the cost-effectiveness of efficiency and renewable energy in reducing GHGs, it will further doubt the claim that "nuclear is clean."

What Happened To Water?

BP's evaluation of potential sites was carried out across "the entire province", and despite consideration being given to Lake Diefenbaker, it was "*excluded due to a lack of infrastructure and population…*" (p. 8). Interestingly, there is no mention of water shortages , even though a leaked May 2008 Sask Power report points out this human-made reservoir "depends upon spring run-off from the mountains (and) should that decrease in the future, the lake may have difficulty reaching full supply level."[xi]

BP also considered Estevan, but rejected it due to its current coal-generating capacity, again with no mention of water. With no basis at all, BP concluded the North and South Saskatchewan Rivers are "*viable water sources*". "Access to growing electrical markets" especially in Alberta, however, seems to be a major factor in selecting the "*Prince Albert economic sub-region*" spanning the North Saskatchewan River from Lloydminster to the Battlefords and Prince Albert (p. 10).

BP appears to take water for granted. Nearly half our province depends on the South Saskatchewan River for domestic water supply and current summer flow levels measure 86% below those recorded in 1910. Glaciers feeding the headwaters of these two Saskatchewan Rivers have shrunk by 25 to 30% since the 1950s. The maximum depth of snow, and number of days with snow on the ground, have both declined significantly. Continued global warming will further decrease glacial runoff and spring melt, and increase evaporation on the prairies. There will be earlier peak runoff, more frequent and severe droughts and greatly reduced water flows. The semiarid regions of south-central Saskatchewan will increase and could include half of the province by 2080, creating "ecological surprises" due to crossing critical thresholds.[xii]

With projected water shortages, we shouldn't create more industrial projects requiring vast amounts of water from these vulnerable river systems. The average annual total

volume of water in the North Saskatchewan River is estimated as 6,623,000,000 cubic metres a year, but this average will likely continue to fall. BP's two proposed 1,000 MW reactors could require 5,529,600 cubic metres of water during the start-up period.[xiii] The magnitude of water is astonishing, and reminds us that the use of water for cooling thermal plants (both coal and nuclear) is presently the largest single consumer of water in Canada. While this water would be reused, it would need constant replenishing and create a toxic waste stream, with a dam or massive holding pond required as well. Heat waves in Europe and the U.S. have already forced reactors to scale back or shut-down due to reduced availability of water, increased water temperatures and evaporation.

Several prairie cities depend completely on the North Saskatchewan River: Edmonton presently requires an average of 144,758,000 cubic metres per year; North Battleford requires 2,930,000 cubic metres per year; and further downstream, Prince Albert requires 6,279,778 cubic metres per year. Based on projections of reduced flows and global warming scenarios, there will be shortages of water for human settlements. Local political and business leaders momentarily mesmerized by the short-term economic benefits of BP's nuclear mega-project must begin to think seriously about sustainability. One of the strongest arguments in favour of moving to a renewable energy system is that it doesn't require water for cooling. A bonus is that it doesn't require ecologically destructive extraction (mining) of fuels like uranium, leaving behind radioactive tailings, nor create a radioactive nuclear waste stream for future generations.

Generations of Indigenous and Settler people here deeply understand humanity's intimate relationship with water. It is worrisome that BP's document barely acknowledges the thorny issue (p. 9).

Obscuring Our Energy Choices

BP is caught on the horns of a dilemma. It presents itself as the champion of environmental protection (e.g. GHG reduction with "clean energy"), while ignoring the fundamental issue of water quality and quantity. On the other hand it highlights the economic growth potential of its two-reactor mega-project, which shows that it's not "clean" at all. When outlining economic impact BP says the "two unit nuclear facility" will require 400,000 cubic meters of concrete. Think of the carbon footprint from this? It adds that the two-plant facility will also require 20,000 tonnes of steel, 700 KM of wiring and 70 KM of piping (p. 15). This will make cement and other supply companies and some trades people salivate, but it does not meet the criteria of sustainability. Most trade unions and trades people have already caught on that much more employment (5 times or more) and much more stable employment comes from renewable energy. In contrast to today's boom-bust economics, sustainable energy will actually stabilize local and regional economies.

BP's opportunistic motives lead to internal confusion, and contradiction. On one page it has coal having the highest carbon footprint of all (p. 16), which is true. Then on the very

next page BP says it "*applauds the province's efforts to invest in clean coal technology, which could complement nuclear base-load generation in a clean way*" (p. 17). In the Stanford study clean coal turned out to produce at least 60 times the carbon as wind power, so the term "clean coal" is an oxymoron. So is "clean nuclear", once you include radioactive toxins.

The standard promotional tactic of the nuclear industry is to counter-pose nuclear-powered thermal plants as the alternative to "dirty" coal-fired ones. There are, however, some fundamental problems with this depiction of our energy choices. Coal (like hydro) is a cost-effective way to produce reliable base-load power, i.e. turbines going 24/7. Coal can be ramped up to provide peak-load power that's cheap, reliable and flexible. In contrast, nuclear power is nowhere near as reliable as is coal, for example, eight nuclear power plants were once shut down for a whole decade in Ontario. And, nuclear power can't be ramped up to meet peak-load demand due to its inflexibility, lower safety threshold and the catastrophic implications of accidents. Furthermore, at more than twice the cost of coal (and gas) – even excluding insurance, decommissioning and waste management – it's the most expensive way to produce base-load power.

Perhaps this is why BP doesn't want to completely dissociate itself from coal-fired plants. If one or two nuclear power plants were built in Saskatchewan, as BP desires, we would probably still need coal plants running as back-up for peak-loads and in case of nuclear failures. Without this backup a nuclear shut-down would be devastating for the whole grid. So the real energy choices aren't between centralized coal and nuclear thermal plants, but between these and a smart, two-way grid. The real alternative is to shift to renewable energy, where base-load power can be provided through an integrated grid which draws on distributed renewable resources that generate electricity more efficiently nearer to end-uses. BP doesn't want us to go in this direction because, with so much potential for efficiency and renewables, which surpassed nuclear power capacity worldwide in 2005, this would quickly rule them out of the market.

BP will apparently say whatever is necessary to get its foot into the lucrative Saskatchewan-Alberta electrical market. On one page it will say it supports wind and solar, because it knows the public does. It ties to sound like it's on a renewable energy bandwagon, yet perpetuates the myth that because renewable energy is intermittent it cannot provide base-load power. On another page it will say it considers coal to be the GHG villain. Then it supports coal. There's no fundamental coherence to its argument, which is no plan at all. This is promotions based on fudging statistics, denying emissions, ignoring water and obscuring energy choices. It would therefore be foolish for Saskatchewan people to follow BP down the road to debt and radioactivity, when sustainable energy is caressing our cheeks and starring us in our faces.

The Reality Test

Can BP, as it claims, provide us with "clean, reliable and affordable electricity" (p. 4)? The definitive answer will not be found in the selective information and promotional rhetoric in its mass-produced and distributed flier but in how it runs its operations elsewhere. In Ontario, BP is behind schedule and over budget refurbishing two reactors, and the promise to have one reactor online by 2009 won't be met. Ontario's lucky electrical consumers get to pay half of the first $300 million cost overrun, which is already at $237 million.[xiv] After that they pay one-quarter. What a deal: a private corporation gets to profit using the public grid while being guaranteed public backing for going over budget. Not surprisingly BP has already raised the possibility of a partnership with the Sask Party government and/or SaskPower for its guestimated $10 billion dollar project, and there's no reason to believe similar economic risks wouldn't be borne by us.

But there's more. BP's plan of two large, expensive reactors on our small grid has been severely criticized for making the grid vulnerable and requiring costly back-up power. BP showcases New Brunswick as a workable example of having a large nuclear plant on a small grid, saying "…*the Point Lepreau nuclear facility is capable of producing 25 per cent of the province's electricity. A 1000 MW nuclear facility in Saskatchewan would provide a similar percentage*…" (p. 7). But BP fails to mention that the Point Lepreau plant is shut down to undergo a $1.4 billion refurbishing, and that this is behind schedule and already costing the taxpayers an extra $90 million. Nor does BP mention that when it tried to get the refurbishing contract its proposal was $ 450 million higher that the AECL's, the one accepted, and that BP wanted to run and profit from the plant for 20 years.

What might be in store for us? BP says it's considering three reactor designs for Saskatchewan (p. 19). One, AECL's ARC-1000 exists only on paper and yet has already cost us hundreds of millions in Harper government subsidies. Westinghouse's reactor also exists only on paper. The French company Areva's EPR reactor is the only one being built, and it is three years behind schedule, $1.6 billion over budget and the Finnish government is presently seeking $3.8 billion in damages.

I hope you get the picture. Taxpayers pay front-end subsidies. We pay again for cost overruns. We pay for other sources of electricity when nuclear projects don't start on time or shut down for costly refurbishing. And then our kids will pay again for costly decommissioning and futuristic nuclear waste management. All the while there are cheaper and safer renewable options. BP's track record elsewhere suggests we should be very skeptical about becoming another guinea pig for the costly nuclear industry.

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[i]Endnotes

The Candu-3 was never built, anywhere in the world. AECL's ARC-1000 being considered by Bruce Power for Alberta and/Saskatchewan is also only a drawing-board design.

[ii]See Jim Harding, *Canada's Deadly Secret: Saskatchewan Uranium and the Global Nuclear System (*Fernwood, 2007*)*, p. 109, 151-55.

[iii]See "Stand-Alone Wind Energy Systems", *Natural Resources Canada*, 2003, p. 18.

[iv]"Uranium Refinery and a Nuclear Power Plant, and Related Issues", Sigma Analytics, May 2008,

[v]D. A. Meneley, "Transition to Large Scale Nuclear Energy Supply", AECL, n.d. This is a must read to see how far nuclear megalomania has deviated from a vision of a sustainable society.

[vi]See Duane Bratt, "*Prairie Atoms: The Opportunities and Challenges of Nuclear Power in Alberta and Saskatchewan*", Canada West Foundation, 2008; and my critique of this "*Technology that old and dangerous*", *Regina Leader Post*, October 2, 2008, B 11.

[vii]When you phone BP, at 1-866-748-4787, you are first asked by a recorded message if this is a "fire, medical or security emergency".

[viii]Paul Meier, "*Life Cycle Assessment of Electrical Generation Systems and Applications for Climate Change"*, Fusion Technology Institute, August 2002. p. 70.

[ix]See Mark Jacobson, Stanford Report, Stanford University, Dec. 10, 2008, to be published in *Energy and Environmental Science.*

[x]This analysis is outlined in Amory Lovins, *Forget Nuclear*, May 2008.

[xi]*Sask Power - Preliminary Citing of a Nuclear Power Plant,* May 2008, p. 34, 11.

xiiThese projections are compiled from W.F. Donahue, *Freshwater Issues and Challenges in Alberta*, Canadian Forest Service, Science Seminar Series, March 13, 2008.

xiiiFigures taken from Bill Adamson, "*Many Problems Associated With Nuclear Reactors On The North Saskatchewan*", March, 2009. Note I have not independently calculated these figures.

xivRob Linke, "NB Power CEO defends contract with AECL to refurbish Lepreau", *Telegraph-Journal*, February 23, 2009.