# Brief to Standing Committee on Crown & Central agencies Review of Energy Options

## Presented by Don Mitchell on behalf of Moose Jaw Chapter, Council of Canadians, October 7, 2009

**Introduction**: Thanks for including us in your schedule on short notice. We consider the work of this committee to be a small but important first step in examining the broad range of renewable energy options which are available to Saskatchewan. Like so many other residents across Saskatchewan, I participated in the hearings of the Uranium Development Partnership that promoted nuclear power as the central and overriding option to address projected future short-falls in Saskatchewan's energy supply.

In our view, the UDP process was flawed on several counts which I'll reference in passing:

1) The report and recommendations were developed by a stacked and biased panel of nuclear industry associates.
2) The bald assertion by Sask Power that Saskatchewan energy demand would double over the next 10 years was accepted without question and became the sole basis of measuring future needs.
3) There was no serious examination of renewable energy technologies and options in spite of the fact that globally, and especially in Europe, this is the single largest source of recent growth in energy supply.

In the short time available for this presentation, I will focus on the renewable alternatives to the dominant current energy sources of coal-fired electrical power plants. I won't reintroduce the volume of evidence on cost, safety and environmental impacts which weigh against the nuclear option and which I know you will hear about from others.

As mentioned, we consider the declaration of Sask Power management that energy demand will double over 10 years is irresponsible. If every industrial jurisdiction were to assume that it can and will double its energy consumption in the short term, all of the global efforts and treaties to act on climate change will be blown away. It is our view that conservation and concerted energy efficiencies can actually reduce demand over the next ten years, and we will illustrate some of those options. Finally, by way of introductory comment I want to emphasize that in the public assessment of choices there is near consensus on the priority of renewable energy as a focus for public policy. In an Environics poll commissioned and carried out in January 2009 on the question, Do *you strongly support, somewhat support, somewhat oppose or strongly oppose the Canadian government developing a comprehensive strategy to create more "green jobs" through*

*improved energy efficiency and the expansion of renewable energy sources? The results were : support 93%; oppose 5%; don't know/refused 2%.*

This broad public approval for renewable energy comes from the recognition that on all the major issues surrounding energy--costs, safety, environmental impact, job creation, and long term sustainability--renewable energy ranks far higher than fossil fuel generated electricity or nuclear generation. In other jurisdictions the renewable options have been well studied and are being implemented. A study close at hand that I would highly recommend to you is the "Greening the Grid" report by Alberta's Pembina Institute as revised in April 2009.

This study sets out a menu of ways to green the grid. I'll borrow from their report to illustrate choices for your attention here. We have much in common with Alberta, the only province with a higher density of greenhouse gas emissions than we have and similarly huge untapped resources to move to renewables.

## 1) **Efficiency or conservation**, first in the menu of cleaner options.

The term "efficiency" covers a very broad spectrum of technologies from higher R value insulation materials to compact fluorescent light bulbs in houses to variable frequency motors or improved natural gas compressors. Opportunities to improve electricity efficiency exist across all sectors.

**Buildings and Homes**

There are significant opportunities to increase electrical efficiency in homes and buildings. The largest gains can be achieved in commercial and institutional facilities where even new buildings are seldom operated as efficiently as they could be. Using high efficiency lighting, heating and air conditioning and office equipment can improve the efficiency of a building by over 30%. Some energy efficiency options in homes include switching light bulbs, installing energy efficient fridges, freezers and furnace fan motors and eliminating stand-by losses in home entertainment and computer systems. An important conservation measure recently passed in Ontario is to ensure that homeowners are not constrained by neighbourhood regulations to hang dry their laundry outdoors as opposed to using clothes dryers, while launching an advertising campaign to encourage this.

**Farms**

Many options exist for farms to improve their energy efficiency including accurately sizing irrigation pumps and improvements to hog, chicken and dairy operations.

## 2) **Wind** Saskatchewan has one of Canada's best wind resources,

but we only get about 1% of our electricity supply from wind. Denmark, by comparison, has generated close to 20% of its supply from wind since 2004.

**Technology Description**

Wind turbines are what likely come to mind for most people when “clean electricity” is mentioned. Wind energy has been the fastest growing source of electricity worldwide for the past 10 years, led by Germany, Spain, Denmark and, recently, the United States. Turbines can range from very small individual turbines ideal for farms and acreages to huge 12 multi-million-dollar machines for wind farms that each produce enough electrical energy for over 1,200 homes. (Smaller, residential scale wind turbines are included in this brief as micropower.)

**Scale of Resource**

Saskatchewan’s wind energy resource is one of the best and most accessible land-based wind resources in Canada . The winds are strongest in the south of the province, although there are pockets of windy regions in the west and northwest.

Germany, with a land mass approximately half that of Saskatchewan, and a considerably weaker wind resource had already installed 22,250 MW of wind generation at the end of 2007. In 2007, more than a third (35%) of all new capacity additions in the United States and 40% of capacity additions in Europe were from wind. Wind capacity in China more than doubled between 2005 and 2006 and again between 2006 and 2007.

**Advantages of Wind Power**

Wind turbines have the lowest life-cycle environmental footprint of any electricity technology. Wind turbines can be deployed quickly. Wind energy has the advantage of being the most commercially attractive low impact renewable energy source and has therefore garnered significant sustained annual growth. This has resulted in continual improvements in the technology and in reliability of turbines, which are considered to be a very mature technology. In spite of the current supply constraint, it is forecast that the price of wind energy will continue to decline in coming years One of the most conducive landscapes for wind turbines in Saskatchewan is on farm land. As developers compensate farmers for the use of their land, the addition of wind turbines adds a “second cash crop” to farmers’ revenue streams. Not only are high skill jobs created in rural areas, but taxes from wind farms provide huge new sources of tax revenue to rural municipalities, benefiting all residents there.

**3) *Hydro*** Our hydro potential is very limited as compared to Manitoba, but it exists and needs to be explored, particularly using run-of-river technology.

## Advantages of Hydro

Water is a very dense material, and as a result relatively small projects can produce very large amounts of electricity. Hydroelectricity also lends itself well to storage because water can be kept in reservoirs from wet season to dry. Run-of-river hydro systems can be designed to minimize ecological impacts on the rivers where they are deployed. While water levels will vary the capacity of a hydro

plant throughout the year, the electrical output from hydro systems is very predictable on an hour-to-hour and month-to-month basis.
More significantly, surplus hydro power from Manitoba in combination with our expanded wind-supported grid would allow a more effective combined grid. This is a much more economical and sustainable partnership than a nuclear pact with Alberta.

3) ***Biomass*** Energy from agriculture and forest waste could become a sustainable fuel source for generating electricity in Saskatchewan's rural areas and in the north.

## Technology Description

Biomass, a category that includes all organic matter, can be used as a sustainable fuel for generating electricity. The term generally includes resources such as sawdust, woodchips and other forest waste, straw and other agricultural residues, as well as sources of methane such as from landfills, waste water and agricultural sources. Though burning biomass produces emissions as with any other fuel, it is considered clean because it is merely releasing carbon that was previously absorbed from the atmosphere, and so is a net-zero emission process in terms of GHG. Although the combustion of biogas releases carbon dioxide, the alternative to this combustion leaves the biomass material to decompose, which results in the release of methane, a gas with significantly higher effects on climate change.

### Scale of Resource

Although further research is needed to estimate the potential for generating electricity from biomass, it is obvious that this is a significantly under-utilized opportunity.

Germany had installed more than 3,700 biogas plants with a capacity of almost 1,300 MW as of 2007 and more than 3,000 MW of capacity is expected by 2020.

### Advantages of Biomass Systems

Biomass systems offer various advantages not only compared to conventional technologies (they are renewable), but also compared to other renewable options. Because the economics of biomass cogeneration improves as annual run-times increase, biomass can be considered a base load technology. Because fuel can be stored intra-seasonally and boilers can be stoked on demand, they can be considered "dispatchable" (unlike wind). Another distinctive benefit of biomass technologies is the promise they offer for diversifying and strengthening the economies of rural areas.

***5) Geothermal Electricity*** Natural heat deep under the earth's surface could provide a sustainable source of electricity.

## Technology Description

Geothermal means “ground heat.” Geothermal energy is most often associated with heating applications such as ground source heat pumps, but the term also refers to the generation of electricity using natural energy from deep within the earth.

There are two distinct types of processes to generate electricity using heat from the ground: hydrothermal and enhanced geothermal systems (EGS).

Hydrothermal electricity is widely used around the world and is considered a proven technology. Hydrothermal electricity uses naturally occurring steam or hot water to turn a turbine that generates electricity.

Enhanced geothermal systems include several sub-categories (volcanic rock, sedimentary rock, etc.). EGS involves conventional drilling of geothermal wells deep enough into the earth surface to reach temperatures hot enough to boil water. Water is then pumped from the surface into fissures in the hot rocks and the resultant steam rises to the surface to turn a turbine. In Alberta, rocks with temperatures sufficiently high to be suitable for the electricity generation are found between 3 and 10 km deep

In June 2008, France unveiled the world’s first operational EGS project. The 1.5 MW generating plant, based on injecting water into wells drilled to a depth of 4 km., is now feeding electrical energy to the grid.

### Scale of Resource

Compared to other jurisdictions, very little information has been gathered on the size of Saskatchewan’s geothermal potential. In the United States, as of 2004, already more than 2,500 MW of hydrothermal generating capacity had been installed. Over 10,000 MW of generating capacity has been installed globally. Estimates by the American Geological Survey suggest that between 95,000 and 150,000 MW of hydrothermal generating potential exists in America. This is a potential energy source that needs to be researched,

***6) Micro-power*** A diversity of small scale technologies, using solar, wind and cogeneration, could allow farms, homes and businesses to become energy independent while reducing their environmental footprint. Micro-power includes rooftop solar photovoltaics (PV), residential scale wind turbines and residential scale cogeneration.

### Technology Description

***Solar Photovoltaics***

Solar electric modules, which use the photovoltaic (PV) process, convert the energy in solar radiation directly into direct current electricity. The price of solar PV systems has been decreasing steadily over the last several decades.140 PV systems are ideally suited for onsite power production and, in countries leading the way with PV development, they are commonly integrated directly into building cladding such as roof shingles or walls. The solar PV market is the fastest growing energy sector in the world. It has been growing at 42% per year for the last 15 years. The majority of PV being installed now feed directly into the grid.

Germany, which has a land mass approximately half that of Saskatchewan, installed almost 1,300 MW of solar power in 2007.

***Microwind***
Microwind turbines are much smaller capacity versions of the large industrial-scale wind turbines described previously. The generating capacity of a typical microwind turbine would range from 0.4 kW to 100 kW. The turbines are typically mounted on poles fastened by guy-wires.

**Scale of Resource**
***Solar***
The solar resource in Saskatchewan is sufficient to meet total demand for electricity. Japan installed more than 400 MW of PV power in 2007 alone. The United States installed about 260 MW of solar in the same year, whereas Germany installed almost 1,300 MW. Saskatchewan has an advantage in average hours of sunlight over all of these jurisdictions.

***Micro-wind***
Micro-wind potential is largely rural, and such applications are ideal for farms or acreages, albeit highly conditional on the presence of a sufficient wind resource. There may also be limited potential in urban areas, including open areas, such as light industrial areas and school yards, again assuming the presence of a suitable resource. The Canadian Wind Energy Association has estimated that there is 600 MW of micro-wind potential in Canada

***7) Cogeneration*** Capturing the heat produced during electricity generation can more than double the useful energy from each unit of fuel. This cogeneration of electricity and heat from a single fuel could play a transitional role in supplying industrial heat and power and neighborhood district energy. The city of Moose Jaw and Moose Jaw Asphalt had a detailed co-generation proposal which was submitted to Sask Power in 1991 and was turned down because their policy generally opposed local contributions to the provincial grid.

**Technical description**: Although cogeneration is not renewable (unless the fuel is biomass), it can be considered a form of energy efficiency, and it offers considerable potential for reducing emissions.
With cogeneration, more useful energy is produced from the burning fuel because heat that would otherwise be wasted is recovered. For example, a typical natural gas-fired generating plant is only about 45% efficient. A gas-fired cogeneration plant in contrast can be up to 90% efficient by recovering the waste heat for use in space or water heating or an industrial process. Any heat used in this manner also displaces fuel that would have otherwise been burned, thereby conserving fuel and reducing emissions. Cogeneration can be on any scale from very large applications in refineries to tiny machines in individual homes.

There are many large commercial and institutional buildings that could be employing cogeneration plants.

***8) Recovered Industrial Energy*** Every year the energy equivalent of millions of barrels of oil is wasted as heat that escapes up smokestacks in Saskatchewan industrial facilities. In many cases, this heat is of sufficient temperature to generate electricity.

## Technology Description

Every day Saskatchewan industries waste heat from combustion processes, steam exhausted through cooling stacks, and unutilized pressure releases from compressed gases and flares. If the energy is of sufficient quality, it is often possible to drive a turbine and generate electricity.

## Advantages of Recovered Industrial Energy

The main advantage of recovering energy from existing industrial operations is that the fuel is free. Heat that would otherwise be exhausted or pressure differentials that would be released are instead captured and used to generate electricity. As well as being free, the fuel also has zero net GHG emissions — the process just captures more value from fuel that has already been used. In some cases industrial energy recycling can also improve general plant efficiency, which helps optimize productivity.

**Jobs!** A shift to cleaner technology would result in a major new economic sector. Green jobs have grown rapidly in the last four years in Germany, from 160,000 in 2004 to 214,000 today. “Green technology” is expected to be the single largest employment sector in Germany by 2010, ahead of car manufacturing and electrical engineering. In Spain an estimated 190,000 are employed in the renewable energy sector.

A recent UN study concluded that “2.3 million people have in recent years found new jobs in the renewable energy sector alone, and the potential for job growth in the sector is huge.”

Government policies can help maximize the employment benefits of renewable and transitional technology development. In Quebec, for example, the provincial government passed a law requiring power plant developers to spend 60% of project costs in the province, which has spurred local wind turbine manufacturing and created a sustainable industry.

Worldwatch Institute states as an estimate:

***To produce 1,000 Giga-Watt hours of electricity per year creates 542 jobs with wind, 248 jobs with solar thermal, 116 jobs with coal, and only 100 jobs with nuclear fission.***

**In Conclusion, the Saskatchewan government and Sask Power can take four steps as a strategy to help reduce pollution, green the grid and expand our electrical capacity to meet future needs. This could be a constructive all-party initiative and heal the deep divisions created over the nuclear agenda.**

***1. Establish a Renewable Electricity Task Force***
Saskatchewan has already had the UDP panel examine the potential role of nuclear power. We now want to see a panel to examine renewable energy, look at what is happening in other jurisdictions and invite expert testimony.

***2. Develop a Comprehensive Energy Efficiency and Conservation Strategy***
The Saskatchewan government cannot and should not accept a forecast of doubling of electrical demand as projected by Sask Power. This is irresponsible and unsustainable. We need to seize the opportunity now to show bold leadership in making energy use more cost effective. Saskatchewan could promote a culture of smart energy users through training and outreach, loans, updated efficiency regulations and the retrofitting of energy efficient public buildings

***3. Conduct an Assessment of Renewable Energy for Saskatchewan:*** To understand how to best plan for and strategically develop our renewable resources, we need to determine the full potential for the various technologies. A Renewable Energy Assessment for Saskatchewan would provide detailed information for public and private decision-makers about the quantity, quality and location of the province's existing and potential renewable resources.

***4. Earmark Funds for Renewable Energy***

Alaska is using its fossil fuel revenues to create a quarter billion dollar "Renewable Energy Fund". With twice Alaska's population, a comparable investment in renewables in Saskatchewan would still be less than money allocated to uranium studies and carbon capture and storage. In addition, investment in research is needed to drive wind and solar applications and lesser-known renewable technologies described here. This investment would not only help Saskatchewan green its grid at home, but potentially enable us to export products and skills to the booming global renewable energy industry.