

# Comments for the NWT Electricity Review

---

*Keeping the house warm, the lights on and getting from A to B without breaking the bank or the planet.*

April 24, 2009

## Introduction

The Arctic Energy Alliance (AEA) is a not-for-profit society that was incorporated under the Societies Act of the Northwest Territories on July 29, 1997. While our membership does include several GNWT departments, these comments do not reflect their opinions or a GNWT position. The comments we provide here are based on AEA's experience in advising individuals, businesses and institutions and in developing Community Energy Plans (CEPs). The comments are also confined to areas that fall within the scope of our vision and mission as approved by the Board of Directors in July, 2008.

The Arctic Energy Alliance vision is that *"the NWT will become a global leader in clean, efficient, sustainable energy practice."* The AEA Mission statement defines our role as *"Promoting and facilitating the adoption of efficient, renewable and carbon neutral energy practices by all members of NWT society."* Progress towards our vision can be measured by 2 key indicators – energy affordability and greenhouse gas emissions.

## Affordability – Look at the total cost

How do we define "affordable"? There are 2 ways to measure the affordability of energy:

1. The cost per unit, measured in \$/kWh of electricity or \$/litre of gasoline or heating fuel.
2. The total cost of providing "energy needs". For example – how much does it cost to heat, light and power an average NWT home for 1 year? How much does it cost to heat, light & power a community? How much does it cost to move people from A to B?

In our years of experience providing energy advice and developing CEPs, it is clear that people are ultimately interested in the total cost. They really don't care how much a unit of energy costs as long as their house is warm, the lights work and they can get from "A" to "B" without being broke at the end of the day. Therefore, we always encourage people to look at the total cost of the options they are considering, rather than the price per litre or kWh.

It sounds obvious, but it is really important – we'll be mentioning it again.

## Greenhouse Gas Reductions – Look for the Win-Win

Many people come to the Arctic Energy Alliance with question about how to reduce their greenhouse gas emissions. The North and the NWT in particular is warming faster than anywhere on the planet – so more and more people are asking us what can be done. There are many options but some are more affordable than others. The key is to look for win-win situations – how can we help people keep their houses warm, keep the lights on and get from A to B at a lower total cost AND reduce greenhouse gas emissions?

It sounds difficult, but there are a surprising number of options that do offer a win-win.

## Community Energy Plans - 3 strategies for 3 regions

The AEA has been working with NWT communities on energy plans (CEPs) for the last 5 years. Community energy planning looks at energy use at a community scale and is guided by a committee of local people. Successful CEPs are created by finding the win-win options that make energy more affordable and reduce emissions at the same time. CEPs look at all aspects of energy use in a community – including electricity. In looking at these plans, it becomes clear that NWT communities can be divided into 3 groups in terms of which “win-win” strategy they identify for electricity.

The 3 regions are defined by how electricity is generated and how much excess hydro generation capacity there is in the system:

1. Thermal communities – generate their electricity by burning diesel or natural gas. In this case, using more electricity uses more fuel and therefore the total cost and emissions also increase. Deline is a “thermal community” and their CEP provides useful insight.<sup>1</sup>
2. Yellowknife grid communities – generate their electricity from the Snare and Bluefish hydro systems. These hydro systems do not have much excess capacity so if electricity use increases diesel generators will be used to produce the required power. There is potential to add more capacity, but there needs to be a guarantee of significant increased demand to finance an expansion. Yellowknife has developed a CEP that has interesting suggestions for how to manage electricity supply & use in their unique situation.<sup>2</sup>
3. Taltson grid communities – generate their electricity from the Taltson hydro system. This system has excess capacity and the potential to significantly expand capacity. Using more electricity would not immediately require the use of diesel generators as the system has enough excess capacity. Enterprise has developed a draft CEP that looks at electricity from the Taltson grid perspective.<sup>3</sup>

3 regions with unique situations require 3 different approaches – there are “win-win” solutions for each, but they are different. In the South, provinces are all on the same grid and a single approach might work well, but the same approach in the NWT would produce unintended consequences in some of the

---

<sup>1</sup> See *Community Energy Plan - Deline*, 2007

<sup>2</sup> See *Community Energy Plan – Enterprise – Draft*, March 14 2007

<sup>3</sup> See *Yellowknife Community Energy Plan*, 2006

regions. The current system recognises 2 regions as there are subsidies and some rebates available in thermal communities, while the Yellowknife and Taltson systems are not subsidised and have different rebates.

## Prices, Subsidies and Incentives – the levers on the system

Currently, the GNWT uses residential power subsidies to ensure that electricity remains affordable for private homeowners. The subsidy applies to all power used under 700kWh in a month – which provides a strong financial incentive to keep power use under 700 kWh per month. The GNWT currently spends more than \$10 million per year in power subsidies – which amounts to several thousand dollars per household.

This \$10 million subsidy is part of the total cost of keeping homes warm, the lights on and getting people from A to B in the territory. If the same services could be provided using less than 700 Kwh per month, the total subsidy could be reduced and the extra money spent on making another aspect of living in the north more affordable.

The GNWT has recognised this and has created a program (administered by the AEA) – the Energy Efficiency Incentive Program (EEIP) that provides rebates to people who purchase more efficient appliances. In 2008/09, \$14,800 in rebates were given for 138 EnergyStar fridges, \$23,500 was paid out for 200 EnergyStar washing machines and \$1,800 was paid for 8 oil fired water heaters<sup>4</sup>. These are the only EEIP rebates targeted at reducing electricity use – a total of \$40,100.

The GNWT has also introduced renewable energy generation incentive programs that pay a percentage of the capital costs for installing the systems. The total incentives paid out last year for grid connected renewable energy systems was \$27K<sup>5</sup>.

## Potential for Efficiency

### Electric Hot Water Heaters and Energy Star Washing Machines

AEA has shown<sup>6</sup> that a typical NWT household with EnergyStar appliances could easily manage with 500 kWh per month<sup>7</sup> – unless they are using an electric hot water heater. Electric hot water heaters are estimated to use about 450 kWh per month. If a family is using an electric hot water heater, they will very likely consume more than the current subsidy limit of 700kWh per month – even if they are using EnergyStar appliances.

---

<sup>4</sup> Rebates are given for installing an oil or gas fired water heater in diesel communities with the hope that it will be used to encourage people to switch from electric hot water heaters.

<sup>5</sup> Personal conversation, Wade Carpenter – ENR Program Manager, April 24, 2009

<sup>6</sup> See “*Can a household live comfortably using less than 700kWh/month?*”

<sup>7</sup> Assuming that a month is 30 days – extending a billing cycle to 35 days makes it more difficult to stay under the limit.

Replacing an electric hot water heater (in a community with a diesel generator) with an oil-fired one is estimated to reduce CO<sub>2</sub> emissions by 3000 kg, reduce electricity consumption by about 5,500 kWh per year and increase heating oil use by 750 litres. The AEA estimates that there are 1,000 electric hot water heaters in private homes in thermal communities. Based on an electricity price of \$0.80/kWh and a heating oil price of \$1.33/litre, replacing 1,000 electric hot water heaters would save a total of \$3.4 million per year. If we estimate that replacement would cost \$3,500 per unit it would cost \$3.5 million with a payback of just over 1 year.

These savings would be split between the territorial subsidy program and the homeowner as the average monthly consumption would drop below 700 Kwh.

EnergyStar washing machines offer a similar but smaller opportunity as they save 300-500 kWh per year over current models and also reduce dryer time because clothes come out dryer. They have the additional advantage of using 50% less water which is a huge cost in communities with trucked water (usually the same communities that use diesel generators). If 3,000 washers in thermal communities could be replaced at \$0.80/kWh, another ~\$1 million could be saved in annual electricity bills and CO<sub>2</sub> emissions would be reduced by 900 tonnes.<sup>8</sup>

This is an example of a win-win situation for thermal communities. If a significant effort were made in to:

- replace 1,000 electric water heaters with fuel-fired water heaters,
- replace 3,000 older washers with EnergyStar washers

The total cost of providing people with hot water and clean clothes would be reduced by about \$4.5 million per year for a total cost of about \$6.5 million. Annual emissions reductions would be 3,900 tonnes of CO<sub>2</sub>.

In the Yellowknife and Taltson regions the situation is different. Many people use electric hot water heaters, but the rates are lower so the savings from switching are not as large. In addition, switching to fuel fired water heaters would increase greenhouse gas emissions.

### **“Saving electricity makes the rates go up”**

There has been a lot of discussion around the idea that reducing electricity use causes rates to increase – so there is no point in saving. There is some truth to this, but if you look at things carefully there is more to it.

Firstly, “thermal communities” are different from hydro communities because they burn fuel. Secondly, the picture changes depending on whether you look at the issue from a perspective of total cost – or price per kWh.

In a thermal community reducing power use will reduce fuel use. This means that the total cost of providing power will be less because the utility didn’t burn as much fuel. The utility will still need to

---

<sup>8</sup> The 3,000 estimated washers includes 2,000 for privately own homes and 1,000 for public housing.

cover the cost of all its equipment and staff so they will ask for a rate increase – but they are not allowed to ask for more than they need – so the total paid by the community for power will still be less – because the utility is not allowed to bill for fuel it didn't burn. Since by saving, the consumer has ensured that they stay below the 700kWh limit, they will not pay the increased power rate in any case.

In the Yellowknife region the costs of generation do not include much fuel so the short term impact of saving is that rates must be increased to generate enough revenue to pay for equipment and staff. However, Yellowknife is in danger of switching from a hydro community to a “thermal community”. If that happens, the cost of providing power will increase because the utility will be burning expensive diesel fuel. Saving electricity in the Yellowknife region prevents future potential increases.

This concept of investing in efficiency to prevent costly future increases in generating capacity applies to all regions. The idea has been recognised throughout the world and many places vigorously invest in efficiency measures to avoid the future cost of having to build ever larger generating plants.

The above ideas apply equally well to customers who generate some of their own power while connected to the grid. “Microgeneration” of power will drive the rates up, but will also generate savings in the longer term. The total cost of operating the system from the community's perspective will be lower because the customer covers the full capital cost of their generating equipment.

A final opportunity would be to introduce time of use rates and metering. This would not necessarily reduce consumption in terms of kWh, but could be used to reduce the peak demand in kW. A large part of the cost of electricity comes from the requirement to maintain a full back-up system – that can meet peak demand. If loads could be spread out, the peak demand would be reduced – which would significantly reduce the cost of back-up equipment in the long run.

## **Potential for new markets – within existing communities**

Another way to reduce the total cost of heating homes, lighting lights and getting from A to B is to look for new markets to generate extra revenue from the generating equipment that you have already installed. Greenhouse gas emissions in the NWT come primarily from the heating and transportation sectors. There is an excellent win-win opportunity in using the electricity generation system to provide emissions free sources of energy for heat and transportation.

Looking at the CEPs from the 3 different regions reveals 4 different approaches:

1. Thermal communities (such as Deline) could displace heating oil with waste heat from their Diesel generators. Buildings that are close to the power plant could be heated through district heating systems. Buildings that are further away from the plant could be powered by “micro-cogeneration” systems that would be connected to the local grid to supply both heat and power. Micro cogeneration is usually seen as a threat to the community system, but it could also be viewed as a revenue source if the local utility ran the micro-cogeneration system.

2. The Yellowknife CEP explored the idea of paying for the development of new hydro by building a network of ground source heat pumps that could be switched on to provide a step increase in load at the same time that the hydro facility is completed. The city's current study of the feasibility of using geothermal heat from the Con Gold mine has led to the idea of creating a down-town district heating system.
3. The Enterprise CEP also looks at the idea of using heat pumps, but in the South Slave, plans for hydro expansion are already underway. A quick calculation shows that conversion of 2,700 housing units in Taltson grid communities to ground source heat pumps (at a cost of \$80 million) would heat homes for half the current cost and generate an additional \$5 million in electricity sales if the electricity were sold at current rates. The 8 million litre reduction in heating oil use would be the equivalent of 27,000 tonnes of greenhouse gas reductions. The peak load added to the grid would be 27 MW – about half the current planned Taltson hydro expansion.<sup>9</sup> Commercial and institutional buildings could add more demand. These are just rough calculations, but they show that there could be a market for Taltson hydropower right in the South Slave region.
4. A study done by the AEA for INAC in 2007<sup>10</sup> showed that an electric vehicle would be 60% cheaper to operate at Yellowknife power rates (\$0.20/kWh) than a similar mid-sized gasoline (\$1.10/litre) powered car. The economics are even better in the communities on the Taltson grid. The AEA has received numerous calls from people who are looking at electric vehicles as a cheaper way of getting around town. Toyota is planning to release a production version of a "Plug-In Hybrid" in the coming model year. Electric vehicles could be a significant source of revenue in regions with hydro power.

All of the above options are "Win-Win" – utility companies could spread the costs of equipment, staff and fuel over a larger volume of sales by displacing fossil fuels that are currently imported for heating and transportation use. The customer would still be enjoying their well heated and lit home and getting from A to B, and their total energy bills would be lower.

## How to get there?

None of the ideas we have outlined above is new. The NWT does have unique challenges because it does not have a single electricity grid and because it has a small population spread over a large area. However, much can be learned from other jurisdictions. Here are a few ideas:

1. Re-evaluate current rebates and subsidies to ensure they are designed to produce the desired affordability and reductions in greenhouse gas emissions. The current mix of programs is heavily weighted toward direct subsidies (\$10 million/year) and away from incentives to improve efficiency (\$40K/year) and incentives to increase renewable microgeneration (\$27K/year).

---

<sup>9</sup> Includes Fort Providence & Kakisa but does not include cost of line upgrades - See "Taltson Grid Heating Demand" Excel spreadsheet

<sup>10</sup> See "Energy Map of Transportation in Northern Communities", April 2007

2. Look for ways to motivate utilities to find innovative ways reduce the total cost and greenhouse gas emissions of the NWT energy system. The best way to motivate a “for profit” utility is to offer them the opportunity to share the savings that they propose. Here are 2 examples:
  - a. A utility could offer to replace electric hot water heaters in a thermal community. The program could be designed to generate a higher profit than business as usual for the utility in that the costs (plus a mark-up) of the replacement could be billed back to the customers over several years so that the utility and the customer shared the savings. As already mentioned, this might cause revenues from power sales to go down, but the utility would recover those costs through the rate application process. Customers would have lower power bills and all be under the subsidised limit, the territorial subsidy expenditures would be reduced, utility profits would increase and greenhouse gas emissions would go down. Win, win, win, win.
  - b. A utility could offer to heat local buildings with the residual heat from its generators. A rate for the heat could be determined that would pay for the system upgrades required and generate a higher profit than business as usual but also provide significant savings to the customer. Customers would save money on their heating bills, the utility would generate extra profits and greenhouse gases would be reduced. Win, win, win
  - c. A utility could offer to provide hydro generated electricity for powering ground source heat pumps or charging vehicles. A rate could be determined that would pay for any system upgrades and allow the utility to generate a higher profit than business as usual while also providing the customer with a cheaper way of heating their homes or fuelling their vehicles. Customers would save money on their heating bills, the utility would make higher profits and greenhouse gas emissions would be reduced. Win, win, win.

As mentioned above – in order to motivate a “for profit” utility, it would be wise to allow them to make a larger return on investment doing “the right thing” than they would make in the business as usual case.

## Conclusion

The AEA appreciates the opportunity to contribute to the important work of the Electricity Review Committee. We would be more than happy to discuss these suggestions with the committee.

Andrew Robinson

April 27, 2009