

YUKON UTILITIES BOARD		
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Submission to Yukon Utilities Board

Regarding

Yukon Energy 20 Year Resource Plan

By

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November 15, 2006

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This submission provides my brief comments and observations on matters contained in the Yukon Energy 20 Year Resource Plan that I consider to be the most relevant. My recommendations to the Board are presented following a discussion on each topic.

New Capacity Planning Criteria

Yukon Energy has adopted a new planning capacity criteria of a loss of load expectation (LOLE) of 2 hours per year and an emergency and an emergency (N-1) criterion of each system being able to carry the peak load (excluding industrial loads) under the largest single contingency. These criteria make good sense to me, the experience of the loss of the Aishihik plant last January illustrates the wisdom of the N-1 criterion in particular.

Recommendation: that the Yukon Utilities Board (the Board) endorse the new planning capacity criteria adopted by Yukon Energy.

Twinning of the Aishihik Power Line

The loss of the 30 MW Aishihik power plant to the WAF system is the largest single contingency that the Whitehorse area is exposed to. We are told that the transmission line is by far the component most at risk of failure, and thus the construction of a parallel line (at a cost of \$16 to \$19 million; likely higher given the updates on the Carmacks Stewart Crossing line) would remove that risk. I am pleased that Yukon Energy has decided not to pursue this option. My feeling is that while the line may be the largest single risk component of getting Aishihik power to the system, some of the power line failure causes (lightning, forest fires, earthquake induced land slides) are really limited to summer conditions when the plant is not critical to the system and some of these could equally affect both lines. There are also a number of other components in the Aishihik supply link that can fail – as we experienced with the power cable failure last January. It would give me a greater sense of security if there was just a heightened maintenance of the line, and indeed the entire power delivery system, and the provision of adequate diesel back-up in or near Whitehorse.

Recommendation: that the Board endorse the Yukon Energy decision not to twin the Aishihik line and endorse the decision to provide an adequate supply of diesel back-up, principally in or near Whitehorse.

Mirrlees Life Extension Project

Yukon Energy is requesting that the Board approve the staged Mirrlees life extension work. If this turns out to be feasible based on the first unit to be overhauled, this is the most cost effective new capacity supply available to the WAF system in order to meet the N-1 criterion. I agree that this project should proceed.

Recommendation: that the Board approve Yukon Energy's staged Mirrlees Life Extension project.

Carmacks – Stewart Crossing Transmission Project

Yukon Energy has requested that the Board allows them to proceed with the staged planning for and, under the appropriate circumstances, construction this transmission line. Yukon Energy proposes to do this in two stages, first to Pelly Crossing and second on from there to Stewart Crossing. This project would take advantage of the opportunity of serving one confirmed new mine and one probable new mine. It is presently proposed that this line be built to a 138kV standard. I agree with Yukon Energy that Yukon's most valuable power infrastructure, the benefits of which we are enjoying now, was initially built to serve opportunistic mining loads. I endorse taking advantage of this opportunity to build infrastructure that will benefit Yukoners for a long time to come. However, if there are to be significant long term benefits, I believe that the line must be built to 138kV standards as presently proposed rather than 34.5 kV to serve only one mine. As Yukon Energy cannot justify all of the construction cost at this time the government needs to play a role in this project too.

Recommendation 1: that the Board approve Yukon Energy's proposal to proceed with the planning for and, under the appropriate circumstances, construct a 138kV line from Carmacks to Stewart Crossing in two stages, on the condition that it is a 138kV line and not a 34.5 kV line.

Recommendation 2: that the Board recommend to the Yukon government that it contributes financially to this 138kV line project as required (through YDC or as appropriate) to ensure that it is viable in the short term from a ratepayer perspective, for the long term benefit of all Yukoners.

Aishihik Third Turbine

Yukon Energy has requested that the Board approve the Aishihik third turbine project. The project is the planning for, and if economic, the construction of a 7 MW turbine at a cost of about \$7.2 million. This is almost certainly lower than the cost of new diesel generators in a new building (new diesels in the existing building are forecast to cost \$0.93 million per MW) and would provide an additional 5.4 GWh per year of low cost hydro energy to the system. It is my view that such enhancements to existing hydro plants are very desirable and will provide significant long term benefits. I do realize that this will not contribute useful capacity to meet the N-1 planning criterion, however. Yukon Energy could reduce the risk of loss of the entire Aishihik plant to the system (such as happened last January) by designing (or redesigning as the case may be) the electrical power delivery system from the powerhouse to the substation in such a way that as much as possible of the system is paralled so the entire plant capacity would not be lost if a single component failed (such as the single cable failure last January).

Recommendation: that the Board approve the Aishihik Third Turbine project subject to the electrical design incorporating as much paralleled electrical delivery components between the generator and the substation as practically possible to minimize the risk of the loss of the entire plant by the failure of one component such as occurred last January.

Existing Hydro Enhancements

Yukon Energy has mentioned in its resource plan (Appendix B) various other opportunities to enhance the capacity and or energy supply or both through upgrading at various existing facilities. Examples include new turbines (“runners” or “wheels”) at Aishihik and Whitehorse. These measures are almost always done at opportune times (such as the Mayo plant upgrading prior to the M-DC transmission line going into service), and make very good long term sense to do.

Recommendation: that the Board encourages Yukon Energy to take advantage of any appropriate opportunities to enhance the output of existing hydro facilities.

Demand Side Management

The role that demand side management DSM plays in the resource plan is in appropriately small, and contrary to the assertion in the resource plan (page 4-38) DSM can reduce capacity requirements. I suggest to the Board that there are a number of cost effective DSM measures that could be instituted immediately.

First example: the Mirrlees life extension work is going to cost about \$457,000 per MW or \$457 per kW. A typical 40 gallon water heater has a 1.5 kW of heating element on when it is working. Historical information suggests that about 1/3 of water heaters are on during peak load hours, or an average of 0.5 kW. This means that simply turning off a water heater during an N-1 emergency will save 0.5 kW and \$228.50 (one half of \$457). I believe that a project to remotely turn off large numbers of water heaters during emergencies at \$228.50 per water heater is very much within reach. If we are installing new diesels we could afford to spend \$465 per water heater (one half of \$930 per kW). And there are no lost revenues for the utility to worry about.

Second example: I was shown a new home in the Copper Ridge subdivision last week, and guess what, it had electric baseboard heaters! This home is going to add 5 to 10 kW to the peak load, including during an N-1 emergency. This will cost Yukon Energy and rate payers about \$2,285 to \$4,570 in Mirrlees life extension work or \$\$4,650 to \$9,300 in new diesels. Add to this the cost of peaking diesel at \$0.20 per kWh or more to serve this customer in the coldest winter months. I submit to you that the discouragement and prevention of this kind of installation can be done very cost effectively.

Any winter peak demand reduction on the system has benefits, and I believe that there are likely to be a number of other DSM activities ~~that~~ are cost effective today. And a little lost energy sales will only slow the rate of growth and provide a bit more energy for secondary sales.

The utilities like to talk about how they are assisting the rate payers by choosing the least expensive options for meeting system requirements, well I believe a little direct assistance to rate payers to benefit the system as well as the individual

But Yukon Energy should not be alone in DSM, I believe that The Yukon Electrical Company Limited (YECL) and the Yukon government have at least equally significant roles to play.

Recommendation 1: that the Board instruct Yukon Energy to identify and pursue cost effective and appropriate DSM measures for present rate payers and future new rate payers by working with partners as appropriate. Yukon Energy should also pursue opportunities for power savings within its own facilities.

Recommendation 2: that the Board (through the government if necessary) similarly instruct YECL.

Recommendation 3: that the Board recommend to government that its department of Energy Mines and Resources (through the Energy Solutions Centre) work with the utilities and contribute financially to appropriate DSM measures starting immediately.

Secondary Sales

Yukon Energy has indicated that it has a current hydro surplus of over 80 GWh of hydro, about 21 GWh of which is being sold as secondary energy. There remains about 60GWh of surplus hydro that is presently not being sold. This surplus hydro will increasingly be available only in the non-winter months, and eventually only in summer (and during the night). In the base case forecast significant curtailment of the present level of secondary sales starts in about 10 years, but with the Minto and Carmacks Copper mines on the system this would happen in about 2 to 3 years.

During the first day of this hearing we were told that in the mid 1990s when the Faro mine was operating we were diesel on the margin all year round. This requires clarification. During this period there was a significant drought, and water inflows to the hydro systems set some new record lows. It is my recollection that when the Faro mine was operating and there were normal water levels (normal water flows are the basis for the resource plan) there was surplus hydro energy at the very least during the summer nights. If we do have the opportunity to serve these mines, and I hope that we do, I believe that there will be periods of time through the course of a typical year when we will still have surplus hydro on the system. Any new supply facilities or hydro facility enhancements constructed that provide additional energy to the system (even if their primary intent is to supply capacity) will thus enhance the continued sale of surplus hydro.

Recommendation 1: that the Board instructs Yukon Energy that in the event that the Minto and or Carmacks Copper mines are served by the power grid, they should pursue the continued sale of surplus hydro to existing secondary sales customers on a seasonal or time of day basis; and that the Board instructs Yukon Energy to consider the revenues from such secondary sales in the economic evaluation of their capacity and or energy supply options.

Recommendation 2: that the Board instructs Yukon Energy that in the event that the Minto and Carmacks Copper mines are not served by the grid they actively pursue the sale of the remainder of the surplus hydro.

Rate Stabilization Fund

The Yukon Government funds a rate stabilization fund that dates back to the closure of the Faro Mine. Since the closure of the Faro mine there have been some very active DSM programs delivered through the Energy Solutions Centre. One of the focuses of these programs was to reduce the winter peak load and reduce the impact of increased rates to the hardest hit customers. Because of political popularity this program has been continued by the Yukon government. I believe that this program achieved its original purpose. Especially considering that the residential customer class already pays less than their cost of service, I believe that this program is now counter productive in that it is encouraging people to make choices that will cost all rate payers in the long run. An example is the installation of baseboard electric heat in new homes as mentioned under DSM. It is time to move on because it is now driving new supply options as outlined in the resource plan that the Board is now reviewing.

Recommendation: that the Board, in its report to the Yukon government, strongly recommend the termination of the rate subsidy program, and that a portion of the funds that would otherwise have gone to the rate subsidy be channelled into appropriate DSM measures through the Energy Solutions Centre working in partnership with Yukon Energy, YECL, and other partners.

Net Metering

The resource plan makes no mention of net metering opportunities, yet we know that there is a percentage of our environmentally conscious public that would like to add some solar PV or other renewable energy resource to their home. Across North America and Europe equipment and safety standards have been developed to allow this to be done safely. A number of Canadian provinces and US States now have laws that require the utilities to allow home and business owners to connect such renewable resources to their power systems if they follow specified processes and use approved equipment. While it would be difficult to determine if there is any capacity or energy benefit to the system in the short term other than on diesel served systems, there are likely to be some long term benefits (among them the high value of our hydro and grid facilities) to allowing net metering under stipulated terms. At one time in the past Yukon Energy was working towards net metering standards and a net metering policy but was not able to persuade YECL to do this jointly at that time. Given the technical advances in this field over the past number of years I believe that the time is right for the government and both utilities to put some appropriate policies in place.

Recommendation: that the Board urge the Yukon government, Yukon Energy, and YECL to implement net metering policies appropriate to the Yukon.

Wind Energy

Everyone who knows me will know that this is a subject near and dear to my heart, but I also believe that I am quite pragmatic in what makes sense to and what does not. It is my view that wind energy could play a more prominent role in this resource plan than it does. It is true that wind does not have any dispatchable capacity to meet firm loads. It is also true that wind energy development in Yukon will need to deal with the significant challenges of very cold temperatures and icing. Wind turbine icing mitigation, although getting an increasing amount of attention in Canada and internationally, has still not been resolved in a consistent way on a commercial basis. Despite these limitations, I believe that will be opportunities for cost effective wind energy generation.

Page 5-11 of the resource plan refers to the load fit of the different supply options being considered, and refers to energy in particular. I did not see anywhere a discussion about the fact that hydro supply from run-off peaks in June, 7 months ahead of peak load requirements. In glacier melt catchments like the Yukon River at Whitehorse Rapids the peak is in August, 5 months ahead. Thus storage and regulation are required. Neither did I see any mention of the fact that wind energy availability in Yukon follows the annual electrical load profile. Wind energy is most abundant in winter when we need energy the most, and is least available in summer when we need it the least.

The resource plan on page 5-21 describes a Scenario 1 (10 MW roughly equivalent Minto and Carmacks Copper mines on the system) and the need for an average of 2 GWh per year of energy for this scenario. Now that the Marsh Lake top storage has been taken off the table there is a need for an additional 7.7 GWh per year for a total of 9.7 GWh per year of diesel energy. A 5 MW wind plant operating at about 25 % capacity factor would fill this void. All information in my possession indicates this energy could be supplied at costs substantially lower than diesel energy, even under Yukon conditions.

Furthermore there have been opportunities for the sale of green energy at a premium rate (for example to the federal government that has committed to purchasing 20% of its energy requirements from such sources) that Yukon Energy has not taken advantage of. This has the potential to add several cents per kWh to the revenue stream. Additionally there has been a federal wind power production incentive program that provides 1 cent per kWh (which is in limbo at the moment), and the Canadian Wind Energy Association is working on a program (with federal officials) which, if implemented could provide an additional 3 cents per kWh. So there are factors that support wind energy.

The problem that remains then is that of dispatchable capacity. However, installations like the Aishihik third turbine and the Whitehorse diesels that are already in place to serve the N-1 criteria provide the firm dispatchable capacity that the system needs.

Recommendation: that the Board instructs Yukon Energy to look more seriously at the benefits that wind generation can provide to the system in scenarios involving mining loads being added to the system, and to consider the timing of wind energy availability as well as the opportunities for additional revenue and cost recoveries in its economic evaluations.

Independent Power Producers

Section 5.3.1.4 of the resource plan (pages 5-36, 37) reads like these are all the reasons why Yukon Energy would not like to have an Independent Power Producer (IPP) power supplier. While valid concerns were raised in 1992 and repeated here I believe that they are very manageable concerns that may well result in cost effective power supplies for Yukon rate payers. BC Hydro, even before its decision not to develop new generation in house, was very successful in bringing on IPP supplies. It is a matter of Yukon Energy negotiating appropriate contracts for the Yukon. If Yukon Energy builds a new supply facility that becomes redundant, its costs will need to be paid for too, no different than an IPP.

There are some good reasons to consider IPPs in the appropriate circumstances. Financial risks of a construction cost overrun or of a major failure stays with the developer or operator, he takes the loss, not the rate payer as with a utility project. If a facility is not producing energy there is no revenue, and the operator has every incentive to minimize the risk of such failures and to minimize down time when a failure occurs, day or night. Examples are first New Era Hydro's Fraser Micro Hydro project. It achieved an availability of over 99% in its first 10 years of operation (probably more now). Second, virtually all wind projects in Canada are IPPs for a good reason – the operators are focused on wind technology, they know the business and they do not have other competing things to do, when a turbine breaks down they fix it.

Recommendation: that the Board instruct Yukon Energy to develop within the next year a policy that sets out the circumstances (including supply technologies and project size) in which IPPs would be solicited and the principles with respect to power pricing and other matters as necessary of any contract that would apply; and to consider IPPs seriously for supply projects of the appropriate technology and scale in load scenarios that require new capacity or energy supplies other than enhancements to existing facilities.