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**IN THE MATTER OF THE YUKON ENERGY CORPORATION
2012-2013 GENERAL RATE APPLICATION**

Heard before the

YUKON UTILITIES BOARD

November 12 - 14, 2012

**FINAL ARGUMENT OF JOHN MAISSAN
LEADING EDGE PROJECTS**

Final Argument introductory comments

In the preparation of this written final argument the transcript is referenced by page and line numbers and whenever possible. This reference will appear in brackets as Tr for transcript, p for page number, and Lxx-yy for line numbers. For example a reference to the transcript at page 428 lines 17 to 19 would appear as (Tr p428 L17-19). The Yukon Utilities Board is referred to as “the Board”. Interrogatory responses (IR) will be referenced by their identifying numbers.

In this argument Leading Edge will be addressing a few issues that may be outside the authority of the Board and should be addressed by the Yukon government. The Board is requested to pass these on.

In its argument Leading Edge addresses both issues in which it is in agreement with the applicant and issues on which Leading Edge has a differing view or with which it disagrees. Leading Edge’s silence on issues and requests of the Applicant, Yukon Energy Corporation (Yukon Energy), in this argument are not to be interpreted as agreement with or support of Yukon Energy’s request or position. Leading Edge leaves these matters to others, including the Board to address.

General Comments

1. Need for senior technical people on Witness Panel

Yukon Energy’s witness panel was composed of one consultant, the Chief Executive Officer (CEO), and the Chief Financial Officer (CFO). The consultant and the CEO were able to speak to all issues at the executive level, as they should, but were clearly outside of their area of comfort speaking to any technical/engineering or operational details. The CFO was able to clearly address all financial matters that were raised. It is Leading Edge’s view that a similar level of competence in the technical/engineering and operational areas needs to be present on a witness panel.

Various examples come to mind, first is the discussion on the wind study [Tr. p360 L10 to 21], a second is reservoir water management involved in the modeling used to estimate hydro availability and by difference diesel requirements [Tr p461 L20 to p464 L5]. I doubt very much that Yukon Energy’s reservoir management system is fully contained in a model used for repeated runs of the nature under discussion here or as used in the Resource Plan discussed subsequently. Third would be the difficulty the panel had with the power system single line electrical diagram [Tr p497 L16 to p500 L24]. A third is the difficulty with the question on whether the Aishihik third turbine is used for electrical grid stability on the grid [Tr p513 L5 to p514 L16].

Recommendation: That the Board order Yukon Energy (and by extension The Yukon Electrical Company Limited) to make available on future witness panel appropriate senior level technical and operational staff.

Credibility of information provided

2. First requested increase in Yukon Energy firm retail rates since 1998-1999 period

Yukon Energy indicates that this General Rate Application (GRA) requests the first increase in Yukon Energy firm retail rates for non-industrial customers since the 1998-1999 rate review [Application p2]. Both Leading Edge and UCG explored this assertion in IRs [LE-YEC-1-1, LE-YEC-2-1, UCG-YEC-1-5]. It appears that this assertion is only true if Rider F which transfers the fuel price risk from the utilities to the ratepayers is not considered a rate. Yet Yukon Energy itself acknowledges that diesel fuel costs are a component of rates [LE-YEC-2-3, YUB-YEC-1-3] and that Riders are rates [UCG-YEC-1-4]. This is truly a case of communications “spin doctoring”.

Recommendation: That the Board order Yukon Energy to refrain from “spin doctoring” and to either stick to communicating facts or remain silent on such issues.

3. Capital projects greater than \$3 million to go to the Board

In LE-YEC-1-18 Leading Edge explored Yukon Energy’s commitment in the 2006 Resource plan / proceeding to have the Board review all projects costing more than \$3 million. In this GRA we see a number of projects costing more than \$3 million that had not had specific Board review. Yukon Energy’s response to the IR indicated that this was on a “best efforts” basis, and that there is no policy on the matter. Consequently there are a number of relatively large projects included that were not subject to prior scrutiny as to prudence, scope, and cost. When is a commitment not a commitment?

Recommendation: That the Board order Yukon Energy to clarify their approach on Board review of capital projects costing more than \$3 million in a written policy.

4. Water flows and hydro generation

In LE-YEC-1-14 Leading Edge explored statements regarding secondary sales and hydro / diesel generation requirements. The answer provided initially said that precipitation was below average for 2011 although the data in the table indicated otherwise (later corrected in response to LE-YEC-2-4). Further analyses indicated that the actual WAF hydro generation in each of the seven months from November 2010 through May 2011 was above the figures considered long term average in the 1996-1997 GRA when the Faro mine was operating and total WAF load was in the order of 450 GWh per year. This issue was discussed in the hearing [Tr. p466 L5 to p475 L1] and an undertaking (#21) provided. The undertaking response provides information on colder than average temperatures; problems at Mayo (NOT connected to WAF at this time so would not affect WAF hydro output but probably influencing Yukon Energy’s diesel generation in Mayo and Dawson City); some downstream problems at Whitehorse rapids. It also hinted at above long term average hydro generation at Aishihik “...which reduced Aishihik reservoir compared to previous years...” but not said explicitly although asked.

In YUB-YEC-1-9 and YUB-YEC-1-10 Yukon Energy also references low water conditions as a reason for additional diesel generation, but we now know that

precipitation was above average in 2011. Diesel generation on the WAF system during colder than average conditions (according to Yukon Energy) was probably kept lower than it would otherwise have been by using water from storage in the Aishihik reservoir. All of which also indicates that diesel probably was on the margin in 2011 despite Yukon Energy's previous assertions to the contrary.

Without detailed analyses what really happened during the winter of 2010 – 2011 would not have come to light. This illustrates that reservoir status information and monthly hydro generation numbers at each and every plant is critical information for the monitoring of Yukon Energy's system operations and for ensuring that the DCF is properly administered.

Recommendation: That the Board orders that monthly hydro and diesel generation from each and every Yukon Energy plant, and month-end water levels in the lakes (Marsh Lake, Schwatka, Lake, Aishihik Lake, Canyon Lake, Mayo Lake, and Wareham Lake) be recorded individually and filed with the Board on no less than an annual basis as part of the DCF documentation.

Yukon Energy system sales and generation

5. Major industrial customers – more revenues than costs

In Yukon Energy's Application on page 2-2 says "Industrial load growth to date has continued to bring higher revenues that tend to more than offset any related incremental costs." Various parties in this GRA proceeding have probed this assertion in IRs [LE-YEC-1-6, YUB-YEC-1-2, CW-YEC-1-1, UCG-YEC-1-2, etc.]. In support of this assertion Yukon Energy provides in response to YUB-YEC-1-2 a calculation that groups, the Minto mine, the Alexco mine, and the yet to be connected Eagle Industrial minerals into one and shows that as a group they bring in more revenues than costs.

In cross examination the incremental cost of diesel generation is established (\$0.3168 per kWh), the 2012 energy generation load is established (415.9 GWh) and the percentage of diesel required to serve incremental load growth between 415 GWh and 420 GWh is established at 49% at long term average hydro availability. In 2013 Eagle Industrial Minerals is forecast to be connected to the system and have a load of 4.77 GWh (plus line losses of 8.7%). At long term average hydro generation it was clearly established that this industrial customer will bring in less revenues (\$0.118 per kWh of sales – Table 2.1, Application page 2-17) than costs of about \$0.170 (49% of \$0.3168 increased by 8.7% for line losses). Leading Edge accepts that a similar calculation for other customers would yield similar results, this is not an issue limited to industrial customers. Using 2013 diesel percentage (56%) the incremental costs are higher yet. Yukon Energy should either have stated that present industrial customers have brought in more incremental revenues than costs but future ones (like Eagle Industrial Minerals) will not at long term average hydro generation, or they should not have made any incremental cost and revenue claims for this customer class at all.

At the higher than long term average levels of hydro generation proposed by Yukon Energy for 2012 and 2013, the incremental costs will drop to just below incremental

revenues in 2012 and the incremental costs and revenues are essentially breakeven in 2013. It should be noted for the record that Leading Edge does not support the use of hydro generation above the long term average unless the DCF is credited with the savings.

In response to IRs Yukon Energy has stated that until December 31, 2013 industrial rates are to remain fixed as required by OIC 2012/68 [YUB-YEC-1-60, YECL-YEC-1-34, CW-YEC-2-1]. It also states that it cannot charge a new customer a different rate than it charges an existing customer in the same class [LE-YEC-1-38].

Recommendation: See recommendations following 6 below.

6. Major industrial customers – obligation to serve

Yukon Energy in response to IR LE-YEC-1-37 Leading Edge explored Yukon Energy's views on its obligation to serve industrial customers. Yukon Energy's response is clear – "...it has an obligation to serve industrial loads as well as non-industrial loads that are able to connect to the integrated grid ..." and no qualifications are provided. This obligation was explored further in cross examination at the hearing [Tr p489 L1 to p497 L6].

During cross examination Leading Edge filed two exhibits (C4-13 and C4-14) of media coverage in which a company spokesperson indicated that Yukon Energy would not take on a new customer if it meant increasing rates. Yukon Energy officials qualified its obligation to serve indicating that it was subject to a "reasonableness test" and indicating that if the result would be a significant rate increase they would not be served because "there is no unlimited anything here". It is not clear to Leading Edge whether this would be legally possible under the *Public Utilities Act*.

From section 5 above it appears that while the existing industrial customers did bring in more revenue than they incurred costs, the same will not be true for the next industrial customer, Eagle Industrial Minerals (Whitehorse Copper Tailings reprocessing), expected to be connected to the grid in the 2013 test year. So the comment made by a Yukon Energy spokesperson to two different media is a position that Yukon Energy no longer holds.

Leading Edge accepts the reality that any new customer, regardless of class, will incur higher costs than they bring in revenues. However, any major industrial customer usually has a relatively high load (by definition) and if that industrial customer is a mine, its expected life may be relatively short (5 to 10 years) making it difficult to service with new capital intensive long term but lower cost renewable energy supply. Victoria Gold alone would increase the integrated Yukon system energy load by roughly 25%, not easy to deal with, especially on a short term basis. By contrast residential and general service customers tend to be small but very long term, and their energy load increases more slowly over time.

It is Leading Edge's view that it is unfair and inappropriate for Yukon Energy to have to deal with issues related to extending power service to major industrial customers. It should be the responsibility of the elected members of the Yukon Government to develop

policies and regulations regarding the extension of service to major industrial customers. These policies and regulations should address the issues of benefits (in terms of long term infrastructure developments facilitated by industrial load), rate impacts to non-industrial customers, rates to be paid by industrial customers, and security industrial customers are to provide – if any.

Recommendation: That the Board requires the Yukon Government to deal with policy issues regarding service to major industrial customers by either dealing directly with their minister on the matter or requiring Yukon Energy to deal with their minister on the matter.

Recommendation: That the Board order Yukon Energy to refrain from making unsupportable claims (“spin doctoring”) and to either stick to communicating facts or remain silent on such issues.

7. Eagle Industrial Minerals (Whitehorse Copper tailings reprocessing)

Yukon Energy and The Yukon Electrical Company Limited (YECL) both want to provide power service to this new industrial customer expected to connect to the grid in 2013. Yukon Energy’s view is that industrial customers would be customers of the generating utility [Tr. P109 L14-16] however, there appears to be no written documentation that it must be so [Tr. P114 L12-15]. Yukon Energy acknowledges that YECL owns the power distribution lines from which this customer would be served [Tr. P115 L25 to p116 L5] but does not see wheeling power over YECL lines as an issue [Tr. P116 L8-17].

In Attachment 2 to Exhibit B15 Yukon Energy calculates potential impacts on ratepayers if YECL were to serve Eagle Industrial Minerals. It appears from the discussion in the hearing that these calculations are predicated on YECL not filing a GRA that includes 2013 or subsequent years in which this industrial customer would be operating [Tr. P118 L13 to p120 L5]. It is disappointing that Yukon Energy did not make this clear in their calculations. It may also be possible that this additional source of revenue would enable YECL to defer a GRA and thereby save the ratepayers some money. And finally the Board may have some options as to the treatment of the additional YECL revenue should YECL serve this customer, to ensure that the ratepayers are not disadvantaged by having YECL serve Eagle Industrial Minerals.

Recommendation: That the Board considers the facts of the situation and the arguments of all parties to decide which utility is to serve Eagle Industrial Minerals and to ensure that the ratepayers are not disadvantaged either way.

8. Hydro generation

In its Application [page2-11] Yukon Energy explains its proposal to use 101% of long term average hydro generation (at forecast load) in 2012 and 101.8% of long term average hydro generation (at forecast load) in 2013. Yukon Energy proposes this as a “transition” [Application p2-13 L8] to long term average hydro generation as otherwise the required rate increase would be larger [Application p2-12 footnote 26]. In the Rider F

proceeding before the Board Yukon Energy repeatedly claimed that diesel was not on the margin in 2011, therefore there should be no need or justification for a “transition”.

Furthermore, using above long term average hydro generation essentially subsidizes rates with funds that should be going into the DCF. In Yukon Energy’s Application in Appendix 3.2 at page 3.2-4, they show that under drought conditions the diesel requirement could be as much as 100GWh per year. At the DCF proposed diesel cost of \$0.3168 [LE-YEC-1-17] this could mean a cost of \$31.68 million in a drought year. With the potential of such large sums to be collected from ratepayers in future years we should be building up the DCF at every opportunity. It is inappropriate to exchange this short term gain for a larger pain in a future year.

Recommendation: That the Board orders Yukon Energy to base its hydro and diesel energy generation requirements on exactly 100.0% of long term average hydro generation for the forecast load.

Revenue requirement

9. Wind production costs

Wind production costs as outlined in Table 3.5 on page 3-7 of Yukon Energy’s application have been minimal (\$5,000 to \$8,000 per year) from 2009 through 2011. It is proposed that this be increased to \$27,000 and \$18,000 in 2012 and 2013 respectively.

The Haeckel Hill wind facility was developed to learn how to cope with rime ice and low temperatures but it has been essentially ignored in recent years resulting in dismal wind turbine performance [Exhibit C5-7] and thus more winter diesel generation than necessary. In 2009 Yukon Energy purchased a large tracked vehicle (a Nodwell for \$421,000), with a good heated cab, for work on transmission lines even in the coldest winter weather. This vehicle can and should also be used for winter maintenance work on the wind turbines which Yukon Energy says is an issue [YCS-YEC-1-10]. Yukon Energy should be using the Haeckel Hill wind facility to gain experience and develop expertise with a facility close to technical support before developing a larger scale wind farm so that they can operate it with confidence when the time comes.

Exhibit C5-7 indicates that the Haeckel Hill facility is forecast to generate at about 0.7GWh per year less energy now than when it was receiving a more reasonable level of attention. Since most of this reduction is in winter production the difference has a diesel displacement value of over \$200,000 per year. With this much potential revenue on the line Yukon Energy can justify spending substantially more time and attention on this facility, including the installation of a remote terminal unit (RTU) for these turbines so that they can be controlled and monitored on SCADA by the system control operator.

Recommendation: That the Board approves the production expenditure of \$27,000 proposed for 2012 and that the Board orders Yukon Energy to increase the time and attention spent on the Haeckel Hill wind facility to improve production to at least 0.80 GWh per year in 2013 (still only a capacity factor of 14% for the Vestas turbine alone) and to budget up to \$100,000 in 2013 to achieve this.

10. Vegetation management / brushing

Good vegetation management practices on transmission lines and in distribution systems are very important to achieving reliable operation and to avoid more costly emergency work and repairs. Leading Edge believes that Yukon Energy has made significant strides in this area with recent work and should be encouraged to continue. Leading Edge strongly supports Yukon Energy's proposed vegetation management plans.

Recommendation: That the Board approves Yukon Energy's proposed vegetation management plans and budgets.

11. Labour costs

In IRs YUB-YEC-1-13 and IRs YUB-YEC-1-14 the Board sought information that compared the Whitehorse CPI and the labour increments to Yukon Energy staff. Yukon Energy staff wage increases have been outpacing inflation by a wide margin. In addition we have information that 42 union and 29 out of scope employees (total 71 – the vast majority of YEC employees) will receive compensation packages in excess of \$100,000 in 2012 [UCG-YEC-1-25(b) Attachment 1].

The Application in section 3.3 outlines the labour costs and the new positions added or proposed to be added since 2009. Virtually all of this growth is in the office or upper levels of the corporation and very little is at the operational and maintenance end – despite the additions to and expansion of various Yukon Energy's facilities.

Leading Edge does not believe that all of this increasing labour cost, particularly at the top, is supportable, but did not analyze this matter in detail. Leading Edge will thus defer to other parties' recommendations with respect to labour compliment and costs.

12. Communications costs

In response to YUB-YEC-1-20(a) Yukon Energy describes its communications objectives and plans. Leading Edge supports initiatives such as the improved website, the social media initiative and the "ask Janet" feature. However, in Leading Edge's view there has been far more Yukon Energy newspaper ads than necessary to make people aware of Yukon Energy. Leading Edge is also concerned that there appears to be a fair bit of "spin doctoring" going on, which in our view, is inappropriate for a public utility. Furthermore to ask for an increase of about \$200,000 over previous annual budgets of about \$100,000 at a time when rates are increasing is inappropriate.

Recommendation: That the Board orders Yukon Energy to limit corporate communication costs to \$175,000 in each of 2012 and 2013.

13. Reserve for Injuries and damages (RFID)

Yukon Energy requests that the annual appropriation to the RFID be increased to \$195,000 [Application p3-18]. Yukon Energy also proposed to transfer the \$398,000 in

the Faro Mine Dewatering Deferral account into the RFID to reduce the negative balance which was negative \$578,000 at year end 2011; and to amortize the remaining negative balance of \$180,000 over 5 years (\$36,000 per year). From Table 3.11 [Application p3-19] the 10 year average annual charge to the RFID is \$229,000 which is above the requested annual allocation, but approximately equal to the requested annual allocation plus the annual amortization.

Leading Edge supports the transfer of the funds remaining in the Faro Mine Dewatering account into the RFID. This “orphan” account has been around long enough and can now be used to the benefit of ratepayers.

It seems that in every proceeding there needs to be an increase in the allocation to the RFID, it is time to get realistic. Leading Edge does not support amortizing the balance of the RFID over 5 years but Leading Edge would support the increase in the annual appropriation to the RFID to \$210,000 per year instead. This will reduce the short term negative rate impact on ratepayers (compared to amortization) and hopefully make the annual appropriation more realistic.

Recommendation: That the Board authorizes Yukon Energy to transfer the balance in the Faro Mine Dewatering account into the RFID.

Recommendation: That the Board orders Yukon Energy not to amortize the negative \$180,000 reserve balance but to increase their annual appropriation to the RFID to \$210,000 instead.

14. Depreciation

Yukon Energy retained KPMG to perform a review of its depreciation rates and provisions. Depreciation rates were reviewed by Gannett Fleming in 2005, only 7 years ago. The KPMG study resulted in a 33% reduction in depreciation expense. Yukon Energy’s response to CW-YEC-1-22 REVISED in Table 1 shows that the largest changes are to “structures and improvements” which go from a 40 year amortization to 72 years, and “reservoirs, dams, and waterways” which go from a 50 year amortization to 103 years. In response to LE-YEC-1-31 Yukon Energy lists the capital costs related to each of Mayo hydro plant, Whitehorse Rapids hydro plant, and the Aishihik hydro plant over the past 12 years. We are aware of some significant expenditures on these plants over the years prior to 2000.

When asked specifically if KPMG had access to the year by year reinvestments made by Yukon Energy in these facilities the answers were “we provided them with our asset information and our retirement history” and “yes, the asset values, yes” [Tr. P510, L5 to 15]. On re-reading this part of the transcript it is still not clear to me whether KPMG got one figure, the asset value, or a series of figures which are the initial capital costs and the year by year reinvestments since they were built. These three facilities range in age from about 59 years (Mayo) to 37 years (Aishihik) and already there is a fairly significant stream of capital costs going back into them. The Mayo Lake wooden crib control dam/weir received a major rebuild in 1988-1989 and the wooden part of this dam/weir would certainly not last 103 years. The small hydro facilities in Yukon probably should

not be compared to the very large facilities that Manitoba Hydro, BC Hydro and other provincial utilities have, so I believe that 103 years is too long when in a review only 7 years ago the number was left unchanged at 50 years. Similarly “structures and improvements” at 72 years appears to be too long compared to 40 years as reviewed just 7 years ago.

Recommendation: That the Board reviews the depreciation information critically and considers the views of the other parties in determining appropriate and realistic depreciation rates for Yukon Energy’s facilities.

15. Return on rate base

Yukon Energy’s proposed return on equity at 8.77% seems too high compared to the 2009 allowed return on equity of 8.49% and continued low interest rates and weak economic conditions. Yukon Energy’s proposed cost of debt is very modest thanks to YDC flexible debt on the Mayo B loan, and the refinancing by YDC of other debts down to 4.25% (even though it raised money with a bond at 5%, effectively subsidizing power rates). In the longer term interest costs will increase.

Recommendation: That the Board reviews the return on equity information critically and considers the views of the other parties in determining the appropriate return on equity for Yukon Energy.

16. Diesel contingency fund (DCF)

Leading Edge supports the DCF as proposed by Yukon Energy with two variations. The first is that the wind generation is based on the newer Vestas 660kW wind turbine producing no less than 0.8GWh per year. This figure represents a capacity factor of only 14% and should be readily achievable if Yukon Energy is serious about the possibility of wind generation. The second is that Yukon Energy files on no less than an annual basis the information suggested in the recommendation following No. 4 above, and monthly wind generation as well. Leading Edge is of the view that the DCF cap should be at about +\$20 million and the negative cap at about -\$5 million – i.e. it should be kept with a positive balance because of huge potential costs of a drought.

Recommendation: That the Board orders Yukon Energy to use an annual wind generation of no less than 0.8GWh in its calculation of the DCF, and that the fund positive cap should be set at \$20 million and the negative cap at \$5 million.

Recommendation: That the Board orders that monthly hydro, diesel, and wind generation from each and every Yukon Energy plant, and month-end water levels in the lakes (Marsh Lake, Schwatka, Lake, Aishihik Lake, Canyon Lake, Mayo Lake, and Wareham Lake) be recorded individually and filed with the Board on no less than an annual basis as part of the DCF documentation.

Rates

17. Short term gain for long term pain

Yukon Energy appears to have chosen a path that provides short term gain (reduced upward rate pressure in the short term) for long term pain (longer term increased upward rate pressure). The short term gain for longer term pain factors have already been discussed above but are repeated here for the sake of completeness. Perhaps the short term gain approach was designed to accommodate the high upward impact on rates of deferred study costs that Yukon Energy wishes to recover starting in 2012 and 2013. Leading Edge's views on these are presented in the next section. The short term gain for long term pain factors are:

- (a) A hydro generation level above the long term average (LTA) to reduce diesel generation levels in the test years. This will cause a higher rate increase in a future year when we go back to LTA hydro. This also effectively subsidizes rates from the DCF so that when it is needed in future ratepayers will have this amount back to cover diesel costs. The DCF is already low compared to future potential liabilities [CW-YEC-1-13(c)].
- (b) A significantly extended depreciation period on Yukon Energy's most costly assets – it hydro “reservoirs, dams, and waterways” and “structures and improvements”. This reduces short term costs but will keep assets on the books for longer on which the ratepayers pay the cost of capital annually – so long term costs will be higher.
- (c) Having YDC provide loans to Yukon Energy at 4.25% interest when YDC has borrowed the money at 5%. This will be putting YDC into a deficit on these borrowings which will force YDC/YEC to borrow funds externally at higher rates over the long terms as YDC will not have the cash.

Although not explicitly stated Yukon Energy appears to be hoping to be able to install and operate LNG generation facilities at costs substantially below diesel generation. However it does not appear that Yukon Energy has, at this time, firm plans or confirmation that this is possible. It is certainly not possible in the test years. The Board has no jurisdiction as to how YDC is operated to subsidize Yukon Energy and rates generally, but the Board can ensure that LTA hydro generation is used to calculate diesel requirements and that the DCF is credited with the benefits if hydro generation above LTA is utilized. The Board can also ensure that depreciation rates it considers appropriate are applied.

Recommendation: That the Board express concern to the government of Yukon with respect to its financial stability which is critical to Yukon Energy's long term stability as well as to long term rate stability.

Recommendation: That the Board orders Yukon Energy to use LTA hydro generation figures in the test years and considers the long term impact on rates and rate stability if inappropriately long depreciation rates are adopted.

18. Rate Riders and Rate Schedule 42

Leading Edge Projects supports Yukon Energy's proposed adjusted Rate Schedule 42 and supports the implementation of Rider J. With respect to Rider R, it is Leading Edge's view that it should be recalculated in response to the recommendations in this Final Argument, but in no event should it be more than 6.5%. If necessary, Yukon Energy's O&M costs should be further reduced to limit Rider R to no more than 6.5%.

Recommendation: That the Board approve Rate Schedule 42 and Rider J as proposed by Yukon Energy.

Recommendation: That the Board order Yukon Energy to recalculate proposed Rider R in a compliance filing and, if necessary, to further reduce O&M costs in order to limit Rider R to no more than 6.5%.

Capital and deferred costs

19. General comment on capital and study projects

It is Leading Edge's view that Yukon Energy undertook too many projects in a very short time frame. Major projects such as Mayo B, Aishihik third turbine, and the Carmacks – Stewart Crossing transmission connection were more than enough for Yukon Energy staff to handle. Add to those three major projects a host of other upgrade projects and studies, and there was definitely project overload. In Leading Edge's view this has led to consultants and contractors supervising other consultants and contractors, and the same consultants and contractors being used over and over on different projects without project specific competitive bidding processes. Ultimately this resulted in greater capital expenditures than necessary. Yukon Energy provides insufficient detail to be able to be very specific on each and every project, but the cost overruns on the Aishihik third turbine project are indicative of what was happening.

Even while these capital projects were proceeding there were a large number of studies underway. Again the same consultants seemed to be used over and over. In Leading Edge's view there were too many studies going on at the same time to ensure that they were all being done cost effectively.

Furthermore Leading Edge is not convinced that Yukon Energy was properly taking into account the rate impacts that all of these capital and study costs would have on rates. As we see in this GRA the cumulative rate impacts of all these projects and studies is significant. Comments on individual projects and studies are outlined below. It is Leading Edge's view that some of these projects should remain as work in progress both because they still have a reasonable probability of proceeding and to mitigate the rate impacts of amortizing all these studies in one relatively short time period.

20. Mayo B

Leading Edge remains unconvinced that the Mayo B project was the wisest choice for the use of ratepayer and taxpayer funds. However, the Yukon Utilities Board approved the

project and it was built. The project should now go into rate base at \$35 million as proposed by Yukon Energy.

Recommendation: That the Board approves adding the Mayo B hydro project into rate base.

21. Aishihik third turbine

Leading Edge has always been a strong supporter of this project. It provides a substantial additional winter hydro peaking capacity which can displace diesel peaking energy and enable a greater use of intermittent renewable energy on the grid, and it provides additional energy to the grid by using lower water flows more efficiently. While it is regrettable that the capital cost ended up higher than expected, in Leading Edge's view it is still good value for money (particularly at the subsidized \$8.8 million) and will prove to be a very valuable long term asset.

Recommendation: That the Board approves adding the Aishihik third turbine into rate base.

22. Carmacks – Stewart transmission line phase 2

The interconnection of the WAF and Mayo – Dawson City power systems was necessary to provide flexibility in both serving customers and grid generating options for long term. Paying for the entire cost with taxpayer contributions may not have been necessary or desirable, but there is no reason not to add this facility to rate base at zero net cost.

Recommendation: That the Board approves adding the Carmacks – Stewart Crossing transmission line phase 2 into rate base.

23. Major projects for system safety and reliability

It would have been appropriate for a Board review of the Mayo substation enhancements and the Aishihik generating station redundancy projects. These two add up to over \$16 million in costs. There is no doubt that an Aishihik generating station redundancy project of some sort was necessary (makes far more sense than twinning the power line), but what were the options? With respect to the Mayo substation it probably needed to be upgraded but how critical was the situation how much needed to be done immediately, could it have been deferred, and could it have been done in stages over a longer period of time are all questions that deserve to have been discussed.

Leading Edge is of the view that the Mayo head gate repair was an important project to be done and should have been done concurrently with Mayo B. Similarly the Whitehorse Rapids spillway has been challenging for many years and an improved system of gate operation is warranted.

Recommendation: That the Board approves the Mayo head gate and Whitehorse Rapids spillway projects.

Recommendation: Subject to any comments on costs by other parties on the Aishihik redundancy and Mayo substation enhancement projects, that the Board approves these projects.

24. JDE system replacement

Leading Edge supports the replacement of this system with the proposed new system.

Recommendation: That the Board approves the replacement of the JDE system with the proposed Microsoft Dynamics GP system.

25. Projects \$100,000 to \$1 million

Since the Minto diesels were not purchased by Yukon Energy it was imprudent to have spent \$490,000 on improvements to these generators and SCADA for them.

Considering the impact that capital additions are having on rates, Leading Edge is of the view that capital expenditures on projects in this range of costs be limited to \$5 million in each of 2012 and 2013. Yukon Energy is in the best position to determine the priorities.

Recommendation: That the Board disallows the \$490,000 expenditure on the Minto diesels and SCADA, and orders Yukon Energy to limit spending on projects between \$100,000 and \$1 million to \$5 million in each of 2012 and 2013.

26. Major projects over \$1 million

Marsh Lake remains a possible project which would add winter capacity and energy at Whitehorse Rapids. Leading Edge sees no reason why it cannot remain as work in progress.

Gladstone diversion, if achievable by having Yukon Energy working something out with the affected First Nations, so it should remain as work in progress. It has the potential to provide very valuable winter energy to the system. Leading Edge is of the view that Yukon Energy should have solicited more specific support for the project before spending this much money, and should the project not go forward because of First Nations opposition part of this expenditure should be disallowed.

The Atlin Lake project has been known about and discussed at various times over decades. Opposition to this project has always been intense, and Yukon Energy should not have spent this much money until the possibility of developing the project was clear. Yukon Energy was in too much of a hurry and was imprudent in its expenditures. In Leading Edge's view \$1.2 million in costs should be disallowed and the remainder amortized as proposed.

Mayo Lake additional storage would add benefits to the grid through enhanced winter energy at the Mayo hydro plants. Yukon Energy has established a working relationship and agreements with the Na-cho Nyak Dun First Nation. This project should remain as work in progress and be amortized as Yukon Energy proposes when it is completed.

Recommendation: That the Board orders the Marsh Lake, Gladstone diversion, and Mayo Lake projects to remain as work in progress until such time as they are completed or abandoned.

Recommendation: That the Board disallows \$1.2 million of expenditures on the Atlin project as imprudent and allows the amortization of the remainder as proposed.

27. Near term generation options

Demand side management (DSM) and supply side efficiencies (SSE) are very important initiatives and should be proceeding at full steam ahead. Leading Edge is of the view that the Utilities and the Yukon government have spent more money on DSM than necessary to get to the present situation. However, this initiative is too important not to push forward with it, and Leading Edge is of the view that Yukon Energy's proposal should be accepted. Leading Edge is also of the view that SSE initiatives should also be proceeding as fast as reasonably possible.

Waste to energy /biomass projects and amortization should proceed as proposed by Yukon Energy as they have the potential to be a valuable local renewable power supply in future, but there is still uncertainty as studies proceed.

District heating has great potential for the future – it is already the standard in Europe. As there is a high probability that a district heating project will go in future, these costs should be held as work in progress.

Yukon Energy appropriately proposes to hold LNG costs in work in progress for the time being.

Recommendation: That the Board orders that DSM expenditures and waste to energy/biomass study costs should be amortized as proposed by Yukon Energy.

Recommendation: That the Board orders Yukon Energy to retain district heating and LNG study costs as work in progress.

28. Long term generation options

Initial geothermal studies were very broad and considered areas over wide regions. They are now appropriately focused in meaningful areas. Leading Edge considers that a significant portion of the early work was too broad and speculative, and that some of the expenditures were imprudent. Leading Edge is of the view that \$1 million should be disallowed and the remainder should be amortized as proposed by Yukon Energy.

Recommendation: That the Board orders that \$1 million in prior costs on geothermal studies be disallowed and the remainder amortized as Yukon Energy proposes.

29. Projects between \$100,000 and \$1 million

Leading Edge is generally of the view that these studies are appropriate but does have some comments. First is that if Yukon Energy still feels that LNG is a realistic cost effective option going forward, it will need to consider what major overhauls on Faro and Whitehorse diesels are warranted as opposed to being retired from service. As well Leading Edge feels that Yukon Energy should be putting more emphasis on wind energy possibilities as wind provides the bulk of its energy in winter when diesel generation is at its highest.

Recommendation: That the Board orders Yukon Energy to proceed with these studies as generally proposed with an increased emphasis on the possibilities of wind power generation, and to amortize these costs as proposed.

30 Yukon Energy 2011-2030 Resource Plan update

Leading Edge's John Maissan has made extensive comments in a submission to Yukon Energy on the 2011-2030 Resource Plan update as a member of the public. During the hearing Yukon Energy admitted that there was an error in a graphic that they presented to the public (which shows wind energy in a worse light than it should) [Tr. p381 L22 to p382 L16]. However, no significant new information has come to light during this hearing and Leading Edge has no reason to change its views which are that the Resource Plan update is biased against wind energy in a number of ways and is slanted to favour LNG generation. The submission to Yukon Energy suggests a more objective approach to completing the Resource Plan update. Rather than repeat the lengthy comments on the Resource Plan update here, a copy of this submission is attached.

Recommendation: That the Board orders Yukon Energy to be more objective and to select more appropriate generation options in its comparison of options to meet the short term mining load boom that is the focus of the Resource Plan update.

Respectfully submitted,

John Maissan
Leading Edge Projects
November 26, 2012

ATTACHMENT 1

John Maissan submission to Yukon Energy on its 2011-2030 Resource Plan update



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October 23, 2012

To: Yukon Energy Corporation

Re: Comments on Yukon Energy Resource Plan Update 2011-2030 (December 2011 update, July 2012 Overview, and July 2012 Backgrounder)

Attached to this cover letter are my comments on the Yukon Energy Resource Plan Update. I have reviewed all three documents in preparing my comments. There are a number of areas of agreement with the Resource Plan but there are also a number of areas of significant concern as outlined in the attached document.

The analyses I have been able to complete have been limited for two reasons. First is the unavailability, at the time of writing, of the Appendices that were to accompany the December 2011 document because they are unavailable (in the process of being updated). The second is the absence of some detailed assumptions and other data that is not available at this time because the Resource Plan is before the Yukon Utilities Board as part of Yukon Energy's 2012-2013 General Rate Application.

It is possible that my comments may need to be modified or expanded once additional information is available from these two sources. If that is the case the modified or expanded comments will be provided as soon as possible after the information becomes available.

Thank you for the opportunity to provide comments on the Resource Plan. As Yukoners we are the owners of Yukon Energy Corporation and the Resource Plan is a critical and key document guiding the Corporation in its future energy development and investment decisions. The Yukon government also has a very important policy setting role with respect to Yukon's energy future. In this era of simultaneously rapid expansion in our electrical loads, increasing GHG emissions, and global warming, every energy supply decision is very important on several fronts. The opportunity for stakeholder input is thus important to the Corporation, and a responsibility for its shareholders, the Yukon public, to exercise. I appreciate the opportunity!

Yours Truly,

John Maissan

C. Hon. Brad Cathers, Minister Responsible for Yukon Development Corporation and Minister of Energy Mines and Resources

Response to and Comments on Yukon Energy Corporation 2011-2030 Resource Plan update

Areas of Agreement

1. Modeling of the hydro supply variation on the grid based on the range of water inflow experienced historically is good. The modeling showing an ability to supply increased energy with increased electrical load as done for the 2012-2013 GRA makes sense. Depending on the cost of the modeling there does need to be discretion exercised as to where it is helpful and how much is adequate.
2. Yukon Energy's proposed planning criteria (LOLE and N-1) are appropriate.
3. Yukon Energy's comments and proposals with respect to transmission are generally appropriate. However, there are a couple of areas in which a somewhat more aggressive approach may be appropriate. These are as follows:
 - a. A transmission line from Whitehorse towards Tutshi Lake may be appropriate because it has multiple potential benefits including access to a potential winter peaking or pumped storage hydro project (Moon Lake), access to other potential small hydro projects that are more likely to be economic sooner than medium or large projects, and a more reliable power supply to the Carcross Tagish area; and
 - b. A transmission line heading East of Faro that could potentially serve some of the mining loads in that general area and provide access to future potential hydro projects such as Hoole canyon – Slate Rapids, Ross Canyon, and Finlayson (and perhaps even the Francis River projects beyond that).
4. There is strong agreement with Yukon Energy's proposal to have an aggressive DSM/SSE program as the top priority "supply" option.
5. There is agreement for Yukon Energy's plan for continued work on the additional 1 meter of storage in Mayo Lake, the Marsh Lake storage enhancement project, and the plan to continue work with First Nations and regulators (and other parties as appropriate) on the possibility of developing Gladstone Lakes diversion.
6. There is agreement with Yukon Energy's continuing work to develop the necessary information on the LNG generation option for supplying electrical load that otherwise would be served by diesel generation. In particular installations that produce both power and heat that will displace heat presently sourced from fossil fuels or electricity are supported. Appropriate plant locations (or multiple smaller plant locations) within economic reach of these heating loads will need to be found (hospital; Canada Games Centre; downtown; at mines to be served?). To date Yukon Energy does not appear to have considered combined heat and power plant at grid served mine locations so that their heat loads can also be served and line losses related to remote generation reduced. Please note that there is not agreement on an expanded role for using LNG in lieu of developing new renewable resource based power generation that would have been developed had diesel been the only fossil fuel option.

7. There is agreement on the continued use of diesel generation (or LNG generation if found cost effective) for grid back-up and for low inflow water years. This support is limited to years that are noticeably drier than average (say 1 in 10 and drier) as there should be some cushion of renewables (preferably a diversity to minimize such risks) available at all times.
8. There is agreement on the long term desirability of hydro energy but not to the exclusion of other renewable energy sources. Strategically targeted work, particularly on winter peaking hydro options in the small to medium size project scale is appropriate in the shorter term. A lower level of effort to bring realistic information on large hydro project possibilities up to date is also appropriate.

Big Picture General Comments

With respect to the power supply and electrical load scenarios presented in the Resource Plan one cannot see the forest for the trees – the big picture is not clearly presented and it is confused by various issues. The issues that detract from clarity include: the allocation of generation options based on how quickly they can be built but inappropriate to the duration of loads proposed to be served, a bias in information on power supply technology options, an inadequate discussion on the nature of our present power supply system, and too much emphasis on green house gas (GHG) emissions from possible future mines not connected to the power grid. Also conspicuous by its absence is a lack of mention of the role that the Yukon Government (YG) needs to play in power supply development if industrial customers are to be served from the grid.

The Resource Plan does provide a lot of detailed information. But to be truly useful this information needs to be presented in a more logical and clearer manner. If this were to be done, more appropriate alignments of generation resources with electrical loads of different durations would result and some of the present inappropriate alignments based on how quickly various power supply options could be built, would drop out.

The suggested format is as follows:

1. Electrical load types to be considered are:
 - a. Short term loads (less than 10 years);
 - b. Medium term loads (15 to 25 years); and
 - c. Long term loads (30 or more years).
2. Power generation technologies to be considered are:
 - a. For short term (or longer) loads:
 - i. DSM/SSE;
 - ii. Enhancements to existing hydro plants;
 - iii. Diesel generation (short term only); and
 - iv. LNG power generation (short term only).
 - b. For medium term (or longer) loads in addition to options i and ii above:

- i. Wood biomass power generation;
 - ii. Wind energy; and
 - iii. Small hydro.
- c. For long term loads, in addition to the options provided in b. above:
 - i. Medium and large hydro.
- d. Emerging or developing technologies being monitored for future applicability: solar PV, geothermal, other.

Following a presentation of the above there should be a discussion on each of the power generation options listing the key characteristics including strengths and weaknesses.

The only electrical load cases seriously examined by Yukon Energy in this Resource Plan, including scenarios A and B, are classic 5 to 7 year short term boom and bust mining load cycles and this reality is not portrayed clearly. The real picture that can be deduced from the Resource Plan is as follows: mines that have 5 to 10 year lives that come and go at the same time in a boom and bust cycle can only be served economically with diesel or LNG generation. The exception is that small industrial loads could be served by energy “gains” from aggressive DSM/SSE programming plus enhancements to existing hydro facilities; these supply projects would also be economic serving only the non-industrial load growth.

The nature of the present hydro based power supply system hampers all new renewable power supply projects. The Whitehorse Rapids hydro plant provides about 16 MW of summertime (approximately June to October) peaking power supply when the electrical load on the grid is at its lowest. Yukon Energy evaluates any new supply project on the basis of having to fit around this four to five month 16 MW summer peak, and no secondary sales opportunities as a credit to the new supplies were considered. (Yukon Energy did use secondary sales in its economic evaluation of the Mayo B project). An alternative approach would be to consider the 16 MW summer only peak power supply as being the “surplus” used to fill in any gaps between other power supplies that it can and to provide the remainder for secondary sales. If this perspective were adopted the conclusion would be that new load due to growth could be cost effectively served by new renewable energy supplies instead of only being cost effectively served by LNG.

There are systematic biases in the Resource Plan favouring LNG and disfavouring wind energy as detailed in the specific comments further below.

The significant focus on off-grid mines producing GHGs is a distracting issue – this not Yukon Energy’s issue, it is the YG’s issue and should not get more than passing mention.

There is a role for the YG in facilitation of power supply projects that should be made clear:

- Blanket rate subsidies for residential customers are inappropriate as they encourage greater power usage which could otherwise serve new loads. It would be far better to have a targeted government run subsidy program for those who

need it. The balance of what is now spent unnecessarily on subsidies (for the majority of people who, like the author, do not need it) could be used to help cover the guarantees for industrial customers outlined in the following bullet;

- If YG wants mines to be served by renewable power that is lower in cost than the mines can generate for themselves with diesel or LNG, there should either be a YG subsidy to Yukon Energy (justified by the economic benefits that the mines provide) or there should be a YG guarantee in place that ensures that other ratepayers are not at risk if that mine shuts prematurely or if the expected mine load(s) for which generation projects are developed do not materialize;
- Perhaps the government should require that mines should play a larger role in helping Yukon Energy develop power supplies by requiring take-or-pay contracts (such as was provided by United Keno Hill Mines that allowed the second hydro unit to be installed in the original Mayo hydro plant); and
- YG needs to get on with finalizing Net Metering and Independent Power Producer (IPP) Policies. Work on these has been progressing extremely slowly, and these could add to the renewable power supply presently available on the grid.

On page 57 of the Resource Plan Overview Yukon Energy states that they will seek funding support for greenfield hydro site studies. Why not for wind, biomass, and other renewable energy projects? Yukon Energy solicited considerable federal and territorial funds for the brownfield Mayo B project, so why the bias against other non-hydro renewable resources?

Specific Comments

1. Electrical load cases examined

The three electrical load scenarios examined in the Resource Plan (Base Case, Scenario A, and Scenario B) are all “boom and bust” scenarios of varying magnitude in which mining loads come and go in a 5 to 7 year period (to 2020). Thereafter no mining related electrical loads are included. However, there are two sensitivity analyses with mining loads extended to 2025 and 2030, i.e. 10 to 15 years of mining load.

Under all three of these scenarios the conclusions that can be reached are:

1. DSM/SSE is cost effective for the utilities (and beneficial to electricity customers) and should proceed as quickly as possible;
2. Enhancements to existing hydro facilities (Mayo Lake extended storage range, Marsh Lake storage, and Gladstone diversion) are cost effective and development of these, if possible, should proceed;
3. Capital intensive energy supply projects of any significant size (wood biomass, wind, greenfield hydro) are not cost effective;
4. The only cost effective and practical manner to meet the 5 to 7 year mining loads projected to be grid connected (and short term non-industrial load growth) is with fossil fuel generation whether diesel as traditionally done (more expensive) or with lower cost LNG as Yukon Energy hopes to do; and

5. When the mining loads are projected to continue to the medium term (15 years or longer to 2030 or beyond) some capital intensive projects (notably 21 MW wind) become substantially lower in cost than diesel generation. Large biomass also drops below the cost of diesel. Based on the author's modeling (Yukon Energy's modeling could not be replicated due to lack of information) within 20 years after it commences operation the 21 MW wind project (even with the \$10 million DRUPS included) would be producing energy at lower costs than LNG generation.

2. New electrical loads

The figure on page 5 of the Resource Plan Backgrounder shows the winter peaking nature of present electrical loads. This winter peaking shape is due to non-industrial electrical load as connected industrial users' power consumption is relatively flat during the year. Yukon Energy's DSM studies have shown that the rate of electric space heat installation in new residential and commercial buildings has grown to about 80% (it is believed that about 30% of the existing older non-industrial building stock is electrically heated). This means that non-industrial load growth is likely to have a greater winter peak than the existing load profile as pictorially shown in the indicated figure.

A larger winter peak will make it even more challenging for any new hydro power projects to serve this new load profile as hydro projects are typically summer-peaking. The Resource Plan does not specifically identify any potential new hydro projects that would be able to store sufficient water to service winter loads – such as the Aishihik power plant presently does – although the author is aware that the Moon Lake project was once considered for pumped storage. The Resource Plan simply assumes that all of the power from new long term hydro projects would be used. There must be considerably more emphasis on securing winter peaking renewable energy supplies in the Resource Plan.

The Resource Plan documents do not provide the load profile(s) used for modeling new non-industrial loads, other than Eagle Industrial Minerals (Whitehorse Copper tailings reprocessing), in the assessment of new supply options. The Minto mine and Alexco mine appear to have relatively constant annual consumption patterns. Eagle Industrial Minerals will have a seasonal electrical load running from March through November of each year.

Victoria Gold's Eagle Gold Project has, with their May 2012 YESAB filing, indicated that they now plan a seasonal load pattern with reduced power consumption from December through February. The Resource Plan does not indicate whether Golden Predator (former Brewery Creek Mine) or Western Copper will have seasonal loads or steady year-round loads.

It is clear that the mines are beginning to consider seasonal load variations, probably because the very cold winter months make open pit mining operations difficult, but this is a beneficial development for everyone. Industrial loads that avoid the peak winter usage months of December through February in favour of higher loads during the remainder of the year will make them easier to serve with existing and new renewable power sources.

However, medium to long term load durations (15 years and up) are really required to make renewable resources cost competitive with diesel and / or LNG power generation.

3. Existing power system perspective hampers new projects

The Resource Plan does not consider secondary sales (in the summer when there is a significant surplus of hydro generation) in its economic evaluation of supply options. Whitehorse Rapids adds 16 MW of summer peak generation to the winter capacity of about 24 MW, but summer non-industrial electrical loads are substantially lower. There are new renewable energy supplies that would be economic if the four to five month 16 MW summer only supply peak from Whitehorse Rapids was considered to be a set-aside for secondary sales and for displacing fossil fuel usage as opportunities permit.

The two main problems with the economics of any new capital intensive greenfield project whether hydro, biomass, or wind power are these:

1. Yukon Energy tries to fit every potential new supply around the 16 MW summer only hydro peak from Whitehorse Rapids hydro plant without consideration of secondary sales (unlike Mayo B in which Yukon Energy did consider secondary sales in its economic analyses); and
2. New non-industrial secure long-term load from growth is higher in winter than summer, so any new power supply will need to be winter focused otherwise it will exacerbate the summer power surplus. Biomass plants can be turned down or shut down in summer but either the useful project life will need to be extended or a higher cost for the winter only power accepted; wind energy produces the bulk of its energy in winter but unless it is shut down in whole or in part in the summer (and the useful life of the project extended) it will still produce some summer energy; few hydro projects have adequate reservoir storage to enable summer water flows to be kept for winter usage (the Aishihik power plant is an exception).

If the YG and Yukon Energy are going to allow and serve electric heat (which has a winter peaking 30% load factor) they will need to develop pumped storage hydro projects, or similar winter focused projects, rather than conventional hydro projects.

4. Bias against wind energy

The Resource Plan contains a systematic bias against wind energy. There are several individual issues that collectively paint an inappropriately negative picture of wind energy. These include the following individual items:

1. A 21 MW wind facility with a 25 year useful life is considered as a supply option for a 5 to 7 year mining boom followed by a bust in which there is virtually no fossil fuel generation to be displaced. Using a capital intensive 25 year life project for 5 or 6 years (2015 to 2020) does not make sense. It is no wonder Yukon Energy's analyses shows that the resultant useful levelized cost of useful energy over 25 years is \$0.40 per kWh. A 25 year capital intensive project should not be used to serve a 5 or 6 year load just because it can be built in 2 years – it should only be expected to serve a load of medium duration (15 to 25 years) or longer;

2. It is inappropriate to have added a \$10 million DRUPS to the project when a somewhat smaller project (15 MW?) would not have required a DRUPS. If anything Yukon Energy should have considered the new 7 MW Aishihik third turbine as providing the necessary firming capacity for such a wind project;
3. From page 51 of the Resource Plan Overview (July 2012) (also GRA IR YCS-YEC-2-10 page 10 of 10) it appears that the life of the analyzed wind project is not extended despite the fact that there is virtually no fossil fuel generation to be displaced. If used in this inappropriate application it should at least have been planned to have been shut down completely (or seasonally) and the life extended. Biomass projects (and diesel, and LNG) are presumed to have been shut down to save costs, so why not wind;
4. Yukon Energy has stated that a wind plant could not be shut down when hydro can supply the load [Resource Plan December 2011, page 55, and Overview page 32] this is simply wrong. A wind project CAN be shut down in its entirety when not needed (just like a diesel or LNG plant) and then its useful life extends accordingly; OR it can be operated seasonally and its useful life extended; OR individual turbines can be stopped or started as desired; OR the entire output of the plant can be limited to some set limit as desired;
5. In the comparison of near term supply options in graphic figures on page 8 and 9 of the Resource Plan Backgrounder circulated at Yukon Energy's public meetings, wind is the only large capital intensive project presented, as inappropriate as it is for a 5 or 6 year load boom (followed by a complete industrial load bust). The only reason it is presented here is because it could be built in a two year period (see 7 below);
6. In addition to the ability to install wind power quickly (which advantage is used to place wind inappropriately to serve short duration loads), none of wind energy's other advantages are discussed. These include:
 - a. The predominance of winter energy over summer energy that it provides;
 - b. The ability to scale a project size by increments of 0.9 to 3 MW of capacity (depending on turbine size chosen);
 - c. The ability to expand a wind project as required in the same short time frame by the same small increments; and
 - d. Because of a 25 year useful service life of wind plant, the ability to re-power a wind project with new turbines without incurring capital costs to replace roads, power lines, and substations (and related engineering costs) which have useful lives of 40 to 100 years.
7. The box graphic on page 46 of the Resource Plan Overview (and page 8 of the Resource Plan Backgrounder) includes several errors judgment. Under Reliability, wind energy, while not providing dispatchable winter capacity, provides the bulk of its capacity and energy in winter – unlike any other renewable resource. Wind capacity can be developed in 2 years, sized to the requirement in increments of as little as 0.9 MW, and is of moderate cost. It rates at least a Medium in Reliability. Wind energy when appropriately used is at least of Medium in Affordability. With respect to Flexibility when appropriately used

- (i.e. NOT for short term loads) it is quite flexible – it can be installed at an appropriate size, it can be controlled or even shut down as desired. Again it rates at least a Medium in Flexibility.
8. In the July 2012 Resource Plan Overview (Appendix A), new mining load duration information was presented. However, this updated information was not used to correct some of the outdated information in the Resource Plan Backgrounder, in particular the wind power cost information, in the graphic on page 9 when presented to the public.
 9. In a GRA IR response (LE-YEC-1-22) Yukon Energy has asserted that the 10 MW Mayo B project could have been connected to the grid with a \$750,000 tap. There is no information to indicate if Yukon Energy had considered a 10.5 MW wind project (or any other project under 10 MW) would be connected to the grid with a \$750,000 tap or a much more expensive substation option; and
 10. There is no information to indicate if the diurnal variation in wind speed has been taken into account in the modeling. Wind speeds are typically lower at night and in the very early morning (when electrical loads are lower) and highest in the afternoons when the electrical loads are higher. So wind energy production would generally tend to follow the daily electrical load pattern.

It is recommended that Yukon Energy talks to Alaskan counterparts where three relevant size wind projects are in operation (or about to be). There is likely a lot that can be learned from our northern neighbours. If Alaskans can integrate from 4% to 10% wind energy in their systems without DRUPS or equivalent Yukon Energy should be able to do so too.

The first is the 25 MW Eva Creek wind farm (in Alaska's interior) being installed in 2012 (Commercial production expected in October 2012) by Golden Valley Electric Association (GVEA). GVEA had a peak load of about 211.5 MW in 2011, so their load is just over twice the size of Yukon Energy. The 25 MW project is costing \$93 million, is projected to have an annual operating cost of \$1.5 million and will produce about 76.7 GWh per year of energy (roughly 7.5% of GVEA's energy supply) for about \$0.095 per kWh. This was achieved with a reduced interest and an amortization period of 20 years.

The second project is on Pillar Mountain near Kodiak City (on Kodiak Island) built by Kodiak Electric Association (KEA). KEA has an average load of 16 MW and supplies about 140 GWh per year of energy – so they are a bit under half the size of Yukon Energy. Before the introduction of wind power their energy supply was about 80% hydro and 20% diesel. In 2009 they installed a 4.5 MW wind farm (three GE 1.5 MW turbines) at a cost of \$21.4 million to displace about half of their diesel (10% wind energy). This year KEA installed another three 1.5 MW GE turbines (now operational) for a total installed capacity of 9 MW and are installing a 3 MW Xtreme Power battery (in progress) for frequency and voltage control. Until the battery is operational the wind farm will be limited to 5MW.

The third is a 17.6 MW project (11 GE 1.6 MW turbines) built by Fire Island Wind LLC (52.8 MW permitted). It is selling power to Chugach Electric Association (CEA) under a 25 year power purchase agreement which takes effect in January 1, 2013. The contracted

net price is a flat \$0.097 per kWh over the contract period and power flow began in September 2012. CEA generates an estimated 1,200 GWh per year of electricity, 92% from natural gas and about 8% from hydro, so they are about 4 times Yukon Energy's size. The estimated annual wind energy use is 48.5 GWh per year or about 4% of their energy requirement.

5. Bias against large biomass

As with the 21 MW wind power project, serving a 5 to 7 year duration load with a capital intensive 15 MW biomass supply project with a 25 year useful life is inappropriate. Other issues in which a bias (similar to the bias against large wind) is portrayed include the ability to size the plant exactly as desired at the outset and the apparent lack of any extended life following a shut down or seasonal operation.

6. Bias for LNG

There is a bias for LNG based on LNG's projected lower cost per kWh in serving short term electrical loads compared to diesel generation and most small and large new renewable energy options. In its Background document (and Overview pages 47 and 48) Yukon Energy inappropriately sets LNG up against large wind and a small capital intensive biomass plant to meet short term loads – so of course LNG looks better than wind and biomass energy in that particular application. Notably absent from any of these comparisons are greenfield hydro projects of any size which would have looked as bad or worse than wind or biomass.

When all the inappropriate comparisons are cleared away the only conclusion to be reached is that if LNG is as cheap as Yukon Energy thinks, it will be cheaper than diesel generation. And since only diesel or LNG can be used to cost effectively serve the 5 to 7 year boom and bust loads portrayed, we should use the (expected) lower cost LNG. This is not rocket science and does not require sophisticated modeling to prove, it is something that is obvious to everyone. Large wind and biomass should not even be in the comparison.

7. LNG substitution plan

The LNG "transition" plan as presented in the Resource Plan is simply a fossil fuel substitution plan in which LNG is substituted for diesel. If Yukon Energy's expectations with respect to LNG capital and operating costs are met, this substitution will reduce fossil fuel power generation costs to about half the present diesel generation cost.

There will be a negative consequence to the substitution of LNG for diesel in power generation – related to the decrease in cost (if realized). It will significantly increase fossil fuel use and GHG emissions. The reason is that virtually all renewable energy options available to the grid cost somewhere between the projected marginal cost of LNG generation and the marginal cost of diesel generation in the short term. So contrary to the assertions in the Resource Plan update (page 173-174) and the Resource Plan overview (page 42), the result with the LNG substitution plan will be that there will be a significant delay in securing new renewable energy supplies. We will be stuck with LNG generated

power while Yukon Energy awaits larger scale lower cost power projects. Power generated by LNG will be displacing power that would otherwise be available from smaller scale renewable energy projects built sooner. This runs counter to the Yukon Government's Climate Change Action Plan, but unless the Yukon Government is prepared to take action in the form of mandating Yukon Energy and the Yukon Utilities Board to assign a higher short term value to renewable energy, or adding a "penalty" on fossil fuel use, the described result is inevitable. The LNG "transition" plan is, in effect, a fossil fuel "substitution and expansion" plan.

The appropriate installation of new diesel or LNG facilities to replace retired diesel generators and for grid back-up and dry years (and probably the inevitable short term winter peaking) will provide an opportunity to develop a new plant location from which recovered residual heat can be used in district heating. This use will displace the use of fossil fuel heating presently being used. This use of residual heat from either LNG or diesel generation is appropriate and should be encouraged.

8. New hydro

The assessment of new hydro projects based on the assumption of full power use is not realistic given the seasonal nature of our present load and the increased winter peaking nature of new non-industrial loads due to the high rate of electric heat installation. Yukon Energy needs to focus its new hydro projects on winter season energy and capacity supply whether through pumped storage or the development of large multi-year reservoirs for winter (and dry year) use. Work needs to continue on appropriate new hydro projects in conjunction and synergy with, and not to the exclusion of, other renewable energy supplies. The Resource Plan has a bit of "hydro to the exclusion of other renewables" flavour.

9. Not enough detailed information to test the modeling results

The many sophisticated modeling results presented in the documents could not be tested because there are inadequate assumption details provided.

10. No DSM/SSE or other strategies focused on load shifting or valley filling

Yukon Energy indicates that it is targeting the easiest and most cost effective energy savings in its initial DSM efforts. However, it is plain to see that there is also much to be gained by valley filling – particularly in the diurnal consumption pattern as night time loads are up to 10 MW lower than daytime loads. There would be a lot to be gained by seasonal load shifting as well – from winter to summer. Yukon Energy indicates that they will get into these target areas during subsequent DSM phases.

11. Net metering and IPP

Net metering and IPP supplies need to be considered. The YG has been working on developing Net Metering and IPP policies for some years. Yukon Energy has been involved in both, as has YECL. Yukon Energy needs to get on with getting these policies out – pressuring YG if necessary.

12. Solar PV not discussed

Solar PV is not discussed seriously as a Yukon Energy supply option but it is on their “watch” list. When YG implements its net metering policy Yukon Energy should expect to get some solar PV added to the grid supply. About 50% of the solar PV energy is available in the core fossil fuel power generation season from November to the end of May. As well solar PV is never produced during the night-time when electrical loads are at their lowest, it is only produced in the daytime when electrical loads are at their highest. Thus solar PV has the potential to have a high utilization rate in summer too (particularly during high load and low water inflow years). It is not known whether Yukon Energy modeled solar PV as a supply option, and if they did whether the diurnal supply characteristics were taken into account.

13. Graphics in Backgrounder

In addition to the errors noted in the graphic on page 8 of the Backgrounder (and the corresponding source information in the Overview and the Resource Plan (December 2011)), there are a few other corrections to be made. They are:

1. Southern Lakes Flexibility should be considered High;
2. Gladstone Diversion should rank lower than wind in Reliability as it is never available at peak loads whereas wind will be on an intermittent basis. Also Environmental Responsibility should probably be Medium rather than High based on the water issues involved; and
3. With respect to LNG the longer term affordability cannot rate higher than a Medium – certainly not High because it grows in cost and will exceed even small renewable project costs in the medium term. With respect to Environmental Responsibility LNG must rate a Low because it will result in an increase in GHG emissions in the short term because of short term costs that are lower than diesel causing a deferral of renewable energy projects.

14. Other issues

There is an inherent imbalance in the Resource Plan in having a greater focus on the reduced value of new renewable energy supplies when water inflows in the hydro plants are above average. There is a much lower focus on the increased value of new non-hydro renewable energy supplies and the negative rate impacts and GHG emission impacts from dry years [for example page 6 and pages 53 to 56 of the Resource Plan update, December 2011]. The reduction in ratepayer risks with a diversity of renewable energies in a supply portfolio (not just hydro) is not discussed. With the possible exception of pumped hydro and multi-year hydro storage we cannot protect ourselves against very low water years simply by installing more hydro – this will only exacerbate any dry year problem.