1996-9

# YUKON UTILITIES BOARD

## DECISION 1996 - 9

**October 7, 1996**

**RE:**

**UTILITIES CONSUMERS' GROUP**
**WATER MANAGEMENT COMPLAINT**

IN THE MATTER of the *Public Utilities Act*
Revised Statutes, 1986, c. 143, as amended

and

A Complaint filed by the Utilities Consumers' Group

**BOARD ORDER 1996 - 9**

**BEFORE:** B. Morris, Chairperson: and )
G. Duncan, Acting Vice-Chair ) March 18, 1996

**WHEREAS:**

A. The Utilities Consumers' Group filed a Complaint with the Board on May 2, 1995 alleging the Yukon Electrical Company Limited ("YECL") and the Yukon Energy Corporation ("YEC") mismanaged the storage of the Aishihik Reservoir in 1993 and 1994;

B. The Board decided on November 29, 1995 to hear this complaint in conjunction with the hearing for the General Rate Application filed by YEC and YECL;

C. The Board set the date of hearing for the General Rate Application as March 18, 1996; and

D. The Board has heard the testimony of the interested parties and reviewed the evidence.

**NOW THEREFORE** the Board orders as follows:

1. The Board determines that the YECL and the YEC did not act imprudently with respect to the management of the storage of water in Aishihik Reservoir as alleged in the Complaint.

2. The Board also determines that the quality of information and decision support tools used by the YECL and the YEC for making water management decisions is inadequate to maximize the management of stored water for the customers benefit.

3. The Board therefore orders the YECL and the YEC to file, by November 30, 1996, for approval a plan to address the inadequacies identified in the Reasons for Decision attached as Appendix A to this Order.

4. YEC/YECL will comply with all directions given in the Reasons for Decision accompanying this Order.

DATED at the City of Whitehorse, in the Yukon Territory, this 7 day of October, 1996.

BY ORDER

Brian Morris
Chairperson

# YUKON UTILITIES BOARD

# REASONS FOR DECISION

# AISHIHIK LAKE WATER MANAGEMENT COMPLAINT

## BACKGROUND

In a letter of May 2, 1995, the Utilities Consumers' Group ("UCG") requested the Yukon Utilities Board ("the Board") to investigate and hold a public review of the water management practices of the Yukon Electrical Company ("YECL") and the Yukon Energy Corporation ("YEC"), (collectively "the Companies, the Utilities"). In that letter the UCG alleged that the Companies wasted approximately two feet of water in Aishihik Lake in 1993 and 1994 and estimated the loss to be worth approximately three million dollars.

After an initial response by YEC/YECL and further representations by the UCG, the Yukon Utilities Board retained B.C. Hydro International Limited ("BCHIL") to "provide a preliminary opinion and assistance in determining what further information is required regarding the complaint filed by UCG against YEC alleging negligence in its management of its water resources at Aishihik Lake". Subsequently Mr. D. Druce of BCHIL submitted a report to the Board entitled "Preliminary Opinion of the Water Management of Aishihik Lake in 1993 and 1994".

In November 1995, YEC/YECL filed a General Rate Application (GRA). The Board determined that the complaint would be reviewed during the hearings for that application. Order 1995-3 set down a date of March 18, 1996, for a public hearing into issues relating to the GRA.

On December 11, 1995, the Board released the Druce report to interested parties. YEC/YECL responded to the concerns raised in Mr. Druce's report by submitting a report to the Yukon Utilities Board prepared by Acres International Limited on February 2, 1996. On February 16, 1996, Mr. Druce, at the request of the Board staff consultants, reviewed the Acres report to comment on outstanding issues and the need for additional information.

On March 4, 1996, workshops were held to share information and to discuss procedures for the hearing. The hearing for the GRA and the Water Complaint began on March 18, 1996.

## DESCRIPTION OF FACILITIES

Aishihik Lake is a reservoir for the Aishihik generation plant and is controlled by a dam at the south end of the Lake (maximum operating level is 915.17 m elevation). The discharge from Aishihik Lake flows into Canyon Lake through the Aishihik control gates. Water is diverted from Canyon Lake through a diversion canal to the Aishihik Generation Station or through the Canyon Lake Control Structure (CLCS) to Otter Falls. The Whitehorse Rapids Generation Station is a run of the river generation station on the Yukon River. The electricity generated at

Aishihik and at the Whitehorse Rapids Plant (WRP) is fed into the Whitehorse-Aishihik-Faro integrated electrical grid.

## NATURE OF THE COMPLAINT

In their amended final submission of May 1996, the UCG summarized the amounts of water that they alleged to have been mismanaged by YEC/YECL as follows:

| Description | Date | Quantity | Energy | Cost |
|---|---|---|---|---|
| 1993 Early Release | May 13 - June 6, 1993 | 16.53 mcm | 6.91 GW.h | $ 704,800 |
| 1994 Early Release | May 11 - June, 1994 | 12.46 mcm | 5.2 GW.h | $ 531,300 |
| CLCS Tests | mid July - mid Aug., 1994 | 11.9 mcm | 4.98 GW.h | $ 507,400 |
| WRP Unit Outage (WH 4) | mid Aug. to Sept., 1994 | 3.5 mcm | 1.46 GW.h | $ 149,200 |
| | | 44.39 mcm | 18.56 GW.h | $1 ,892,700 |

mcm - million cubic meters
GW.h - Gigawatt hours

The above quantity of water represents approximately 1 foot of elevation in Aishihik Lake reservoir.

The quantities and cost of water in contention during the above time periods are not necessarily agreed to by the parties. For example, the Utilities contend that the water used during the CLCS tests was 8.2 mcm and had a replacement value of $220,000.

## ISSUES AFFECTING THE DECISIONS FOR THE RELEASE OF WATER

The early water releases in 1993 and 1994 and the CLCS releases in 1994 were made to achieve non-power production objectives. The early releases were made to avoid abrupt releases which might have been required later to simulate spring freshets for fisheries concerns and to avoid shoreline erosion on parts of Aishihik Lake (exhibit 74 - Acres report p. 5, T 0466). The CLCS releases were made to calibrate the release valves for the CLCS and were an alternative to constructing hydraulic models for calibration. Water releases from Aishihik reservoir in mid August 1994 to September of 1994 were also made to produce power to compensate for generation outages and restrictions at the Whitehorse Rapids Plant.

YEC/YECL testified that the early releases and the CLCS releases were taken in the belief that the value of water would be minimal or zero. This valuation was based on the forecast of inflows to Aishihik Lake and the forecast of power requirements for load at the time the releases were made.

The Board believes that the prudency of a management decision must be determined by evaluating the reasonableness of the decision in the context in which it was made. Therefore, issues to be considered in evaluating imprudence in these decisions include the following:

1. Were the forecasts of water inflow and load requirements (in particular the Curragh Mine) reasonable at the time they were made?

2. Were the non power producing objectives reasonable and/or the best alternative?

3. Did YEC/YECL unreasonably restrict the operation of Whitehorse Rapids Plant generator #4?

## 1. Forecasts of Inflows and Load Requirements

Forecasts of Inflows:

YEC/YECL's 1993/94 Annual Forecast to the Yukon Territory Water Board dated June 1993 forecast inflows for 1993 to be average. They also forecast that under the reduced load of Curragh Mine they expected the lake elevation to reach full level by the fall of 1993. This report acknowledged the difficulty in preparing forecasts with a lack of snowpack and precipitation gauges and recommended a continuing program to install more snowpack and precipitation stations. This report also tabled a monthly operational strategy but did not explicitly mention an early release strategy. The reservoir subsequently refilled to within 3 inches of full. The prediction for average inflow was reasonably correct; however, it is not clear that the use of average summer inflows is a good planning method to be used in the future.

The 1994/95 Annual Forecast, prepared in June 1994, also suggested using average inflow value as the suggested forecast. However, YEC/YECL also prepared a sensitivity analysis in this report with the inflows predicted at 60% of average. The results predicted the reservoir to refill to an elevation of 915.051 m in September of 1994 (0.12 m below maximum) under the assumption that the Curragh load would be off. This sensitivity analysis was not discussed further in the report. With the assumed scenario of no Curragh load and average water inflows, YEC/YECL predicted Aishihik Lake to refill to a level of 915.162 m in September of 1994. This report also stated that the operational strategy for 1994 was to spill all surplus water at Whitehorse and to fill Aishihik as quickly as possible in the spring and summer period. The report, however, does not mention an early release strategy. The report again recommended a continuing program of improving snow and precipitation readings. As it turned out the inflow for 1994 was 67% less than the forecast and the reservoir only filled to 914.77 m.

YEC/YECL have testified that they first became aware of lower than average inflows in mid-June 1994 and adjusted the Aishihik releases accordingly (UCG-YEC/YECL-1-126). The records show the inflows to the reservoir started deteriorating in May and became progressively worse throughout the summer and fall.

In testimony Mr. Druce suggested that if he were doing the forecasting based on the snowpack readings of 1994, he probably would have predicted a slightly below normal inflow (T 0345). Mr. Cowley suggested that the forecast of average water was reasonable (T 0405, T 0407).

Both Mr. Cowley and Mr. Druce commented on YEC/YECL's inability to forecast inflows based on snowpack readings. Mr. Druce's analysis noted that the snowpack data at Canyon Lake only

accounted for 14% of the variation in annual inflow volumes and Mr. Cowley testified that it is not possible to do effective forecasting for inflow that is due to rain. To further illustrate the difficulty YEC/YECL have had in forecasting inflows to the Aishihik reservoir, YEC/YECL, in response to information request YUB-YEC/YECL-1-9 provided an analysis of forecast variances from 1988 to 1995. This analysis shows a variance of 83% more than forecast to 67% less than forecast with only two years of the eight being within 10% of forecast.

The above evidence and testimony demonstrate a highly inaccurate forecasting ability; however, it does not in itself suggest an unreasonable forecast given the data used. The lack of appropriate data and modeling has been belatedly recognized by YEC/YECL in their reports to the Water Board and in testimony at the GRA hearing in March , 1996. Mr. Kerslake has committed YEC/YECL to the development of a plan to implement hydraulic forecasting and decision support systems and to report that plan to the Board by November of 1996 (T 0417). **The Board accepts this commitment and orders the plan to be filed by November 30, 1996.**

The Board accepts that the results of water inflows in 1993 were reasonably close to estimate. The circumstances in 1994 proved more problematic as historic low inflows occurred. The inadequacies of the forecasting capabilities became obvious but it must be recognized that the wide variance in inflows will continue to make forecasting difficult even if more snow gauges are installed. **The Board accepts that, with the methods in use, the extent of shortfall could not have been reasonably forecast in the spring of 1994. However, the Board also finds that the Companies should explicitly recognize the substantial potential inflow variance in future planning.**

Forecasts of the Curragh Mine Load

The UCG has maintained that YEC/YECL should have placed more weight on the possibility of Anvil Range successfully purchasing the Curragh Mine in 1994 and they should have had a contingency plan ready if the Mine went ahead. YEC/YECL submitted a chronology of events (Exhibit 170) which summarized what they considered to be important events in the eventual purchase and start up of the Curragh Mine. The UCG in their final argument (p 3-5 to 3-7) also summarized these events. These two summaries essentially agree with the exception that the Companies did not believe the court approvals for the sale of Curragh that occurred in June 1994 to be significant. Throughout these events YEC/YECL were kept informed of the sale and status of the proceedings by their lawyers and by the Department of Finance (T 0509). YEC/YECL have testified that they were skeptical that the Anvil Range Mine would succeed and it was not until November, when the sale actually closed, that they were certain the Mine would reopen. YEC/YECL have also testified that they believed the amount of power consumption required by the Mine would be minimal for the first 10 months, as they believed Anvil would have to strip the Grum deposits first (T 0511, 0512). Anvil Range Mine reopened in November of 1994 and resumed full production in August 1995.

The Companies' Reply Argument states that:

"Based on the available evidence, there should similarly be no reasonable dispute as to the water management practices carried out by the Companies through the spring and early summer of

1994, insofar as such practices were based on assumptions with respect to the re-opening of the Faro mine" (Tab 3-10).

However, YEC/YECL had no direct contact with Anvil Range and its assumptions were inappropriate. In the Board's opinion, it should not have been necessary for the Companies to be certain that the mine would reopen. As noted in UCG's Final Submission, UCG believed the Companies knew in May 1994 that:

- Unit 1 would be out of service due to delayed repairs;
- Unit 2 would be out of service indefinitely due to delayed repairs;
- The Aishihik watershed was dry and the lake levels were not increasing;
- The Court approved Anvil's exclusive negotiations with the Receiver; and
- Anvil executives were in Whitehorse working on re-opening the mine.

As well, the parties reached a Purchase Agreement requiring Anvil Range to pay $2.5 million by August 26, 1994, with the first payment ($100,000) made in June 1994.

**The Board believes that the Companies' reluctance to recognize the significance of the events in the spring and summer of 1994, accompanied by their continued insistence upon forecasting normal flows, understated the opportunity value of the water and led to premature release. However, a regulator must start from a presumption of prudent action by the utility and determine, without benefit of hindsight, that the actions of the utility were clearly imprudent. The Board is unable to find the Companies' actions in relation to this complaint to be imprudent as understood in utility regulation.**

## 2. Objectives for Non-Power Uses

Objectives for the Early Releases

The effect of high lake levels on shoreline erosion was recognized in the Aishihik Hydroelectric Project Re-licensing Proposed Studies Outline prepared in August 1992 by Sigma Engineering. This outline recommended that studies be done to find ways to mitigate this problem (UCG-YEC/YECL 1-108A). In a company memo dated September 16, 1992, (UCG-YEC/YECL 1-140, p 13) the company expressed concerns with criticism received from fisheries' officials regarding high release patterns in 1991 and from other unnamed agencies in 1992 and suggested a program of early releases to smooth out the effect of sudden discharges. However, YEC/YECL has also testified that the early releases were not part of a formalized strategy or policy (T 0466 - 0467).

Mr. Druce, however, in an exchange with Mr. McRobb, had the following opinion:

> "Q Okay. What's your interpretation of the decision to release water in the spring of '94 given the speculation surrounding the reopening of the mine, the two feet of room in the reservoir, and the forecasts of a dry year?
>
> MR. DRUCE: At the time that the release was made in May and June of '94 the

> reservoir was certainly below the levels where they had indicated that they might initiate a pre-spill program; so from that point of view, I thought it was premature.
> The indications were that the water supply for subsequent months wasn't going to be all that much; so from that point of view, it was also premature.
> At the spring time I'm not sure that the information available about the mining load being there or not was sufficient to enter into the decision-making.
> I guess if they felt that they were doing this to help out fish and reduce the risk of erosion, that would have some bearing on their decision to release the water. But I think that the economics on the energy side, without the mine load, would have, in my mind, pointed them in the other direction. That they probably would have been better off not to release the water, just from that point of view." (T 0342)

The lack of documentation or analysis of an early release strategy indicates that the decisions for the early releases were made on an ad hoc basis.

YEC/YECL have also testified that when the decision to release this water was made, the value was minimal to zero. They based this evaluation on the expectation that the water would have to be spilled later because of forecasted normal inflows and a lack of load. Mr. Druce has testified that water will always have some opportunity value unless it is in imminent spill condition and the value of the water will depend in part upon variability of hydrological conditions. Mr. Druce also testified that the water could have a negative value if the cost of externalities (such as erosion problems) were greater than the expected value of the power produced.

**The Board believes that the objectives of the Companies in performing early releases were not unreasonable; however, the lack of quantified benefits or costs and the ad hoc nature of the decision-making created an environment where decisions were made in an intuitive manner. The parties must endeavour to make reasonable estimates of the value of water releases for non-power uses to compare with the probable value of the water for electricity generation. The Board also notes that the terms of reference for the re-licensing studies include a study of the Hydrology/Project Operations that purports to study the impacts of various operating regimes under differing scenarios. These studies should include assessments of the benefits and costs of the early release scenarios. If they do not, the Board directs the Companies to add these assessments and to file the results of the full study with the Utilities Board.**

Objectives for the Canyon Lake Control Structure Calibrations

The releases to calibrate the CLCS valves took place from July 1994 to mid August 1995. The calibration of these valves was identified by Acres in the "Proposed Studies Outline" as a requirement of the hydrologic studies and needed to support the re-licensing activities. This calibration could have been accomplished by releasing water through valves and measuring it or by building a model and performing laboratory tests. Mr. Cowley testified that either method was technically feasible and would produce acceptable results. YEC/YECL concluded that the field tests would save between $20,000 and $50,000 based on the assumptions that the value of water was zero and laboratory tests would cost approximately $50,000.

By June of 1994, YEC/YECL had realized that inflows were going to be below normal and ceased the early release program. They were also aware that if hydro power had to be replaced by diesel the cost of the released water would be the cost of diesel generation. The decision to release water for calibration was reviewed in July of 1994 and they decided to go ahead (T 0487) with releases planned for August. At this time YEC/YECL believed that the possibility of the Curragh Mine returning to production was slim and in any case would take 10 to 12 months to start up. Based on the above considerations YEC/YECL placed a minimal value (or zero value) on the water released. A further factor in their decision to proceed with the tests was their desire to remain on schedule with their re-licensing activities. This desire, although not given a monetary value, appears to have been given a heavy weighting.

In the final analysis, using the water for the tests precluded storing the water in the reservoir for some future use. The value of that future use was dependent on the probability of future low water inflows and the probability of future loads developing. In hindsight it can be seen that lower than average flows continued and the Curragh Mine load came back on in 1995. Therefore, the probabilities of these two events occurring were not zero. The probabilities that should have been assigned to these events in July of 1994 is highly debatable, and in any case, the Companies have testified that they do not use a probabilistic model to aid in the dispatch of water.

Using a zero value for the water released was clearly not a correct valuation as the possibility of unfilled storage in the reservoir was known by June and, regardless of the load requirements, stored water would have some value until it was obvious that it would have to be spilled. A quantitative analysis would have factored in the various costs of the tests including costs of delays, the probabilities of the Curragh Mine load developing, and the probability of low inflows for the remainder of the season. Depending on the values chosen, a comparison with the alternatives may still have demonstrated a preference for the field tests. The advantage of using a more quantitative decision analysis would have been to more explicitly define the risks and benefits. In this particular instance there was a clear potential for risk and the Utilities would have benefited from the ability to do a probabilistic valuation to corroborate their decision.

**The Board finds that YEC/YECL's valuation of water was made on an intuitive basis. However, the Board is not only being asked to determine if the planning process was inadequate but whether the determination was imprudent in the regulatory context. In this latter context, the Board notes that much uncertainty existed throughout the summer of 1994 and that the Companies did consider what they thought were the best interests of the customers in cost control and maintaining a schedule towards its re-licensing application. The Companies did not benefit from the determination made. Therefore, weighing all of the circumstances the Board is not able to find the actions of the YEC/YECL imprudent, as this term is understood in utility regulation.**

**The Board does find that the operational planning methods of the Utilities are inadequate to the current needs of the system and therefore, along with the order to file a plan for the development of forecasting and decision support systems by November 30, 1996, the Board directs YEC/YECL to include an operational planning model as part of the decision support systems to be considered. The Board finds that currently approved rate levels will**

**be adequate to cover development costs and therefore directs that the Companies may not apply for any increase in rates designed to recover the cost of developing these plans.**

### 3. Restrictions on the Whitehorse Rapids Unit #4

YEC/YECL testified that operating restrictions to limit the output of WH 4 to between 8 and 12 MW was placed on this unit during a period in August 1994 when the plant was experiencing high tail water conditions. YEC/YECL have had previous experience with this unit tripping out because of high vibrations under this condition. Other generator outages during this period were the result of forced outages or required maintenance (T 0452 - 0455, exhibit 104).

**The Board finds that these restrictions were clearly not foreseen and therefore must be classified as forced outages.**

## OTHER ISSUES

### Complaint Process

YEC/YECL, in their final argument, have complained that the process used to resolve this complaint should have been less adversarial and resolved in an informal, more cost effective way.

**The Board agrees that consensus is the preferred option to settling complaints where reasonably possible. Where consensus is lacking, a formal process is the only option.**

## CONCLUSION

**The Board is not able to find the Companies acted in an imprudent manner during the water releases examined in this Decision. However, the Board also notes that the consequences of the early releases in 1994 and the releases made for the Canyon Lake Control Structure calibrations had a negative effect on the cost of Power production. The Board recognizes that improved forecasting and decision support tools will not necessarily avoid similar consequences; however, the Board believes that with the aid of these tools the risks for errors will be lessened. It should be noted that as the Board has determined that YEC/YECL was not imprudent in its actions, no penalties are appropriate and therefore issues regarding the precise quantities and cost of the water are not relevant.**