CAARS WEST KOOTENAY POWER LTD. GAS TURBINE FEB.24, 1989

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1.0 BACKGROUND

1.1 <u>The Company</u>

West Kootenay Power Ltd. ("WKP", "West Kootenay", "the Company", "the Applicant") with its Head Office in Trail, B.C., is an electric utility regulated under the provisions of the Utilities Commission Act ("the Act"). The Company was incorporated by an Act of the British Columbia Legislature on May 8, 1897 and is authorized to generate, transmit and distribute electric power within a radius of 150 miles of Rossland, British Columbia. WKP became a wholly-owned subsidiary of UtiliCorp British Columbia Ltd. (a whollyowned subsidiary of UtiliCorp United Inc.) on September 2, 1987. WKP directly serves over 60,000 residential, commercial, irrigation, street lighting, and industrial customers in a service area roughly described as extending from Princeton in the west to Creston in the east, and from the U.S. Boundary north to Kelowna and Kaslo. In addition, the Company indirectly supplies approximately 37,000 consumers through wholesale power sales to electric utility operations conducted by the Cities of Grand Forks, Kelowna, Nelson and Penticton, and the District of Summerland. Princeton Light and Power Company, Limited, a privately-owned utility serving Princeton and vicinity, purchases its electric power requirements from WKP.

WKP presently has three principal sources of supply: its own plants, Cominco Ltd. ("Cominco"), and the British Columbia Hydro and Power Authority ("B.C. Hydro"). The Company has also purchased small amounts from Bonneville Power Administration ("BPA").

1.2 <u>WKP Generation</u>

WKP owns four hydroelectric plants which supply the bulk of its power requirements. Plant No. 1 at Lower Bonnington has been owned continuously by WKP. In 1982, following a decision of the Commission and pursuant to an Order of the Minister of Energy, Mines and Petroleum Resources ("MEMPR" or "the Ministry"), WKP acquired from its then parent company, Cominco Ltd.,

three power plants: Upper Bonnington (No. 2), South Slocan (No. 3) and Corra Linn (No. 4), all located on the Kootenay River. WKP also acquired the right to expand generating capacity for its purposes at existing plants of Cominco at Brilliant and Waneta. WKP operates Brilliant and Waneta for Cominco and receives a fee for its services.

Since 1975 electrical generation from the West Kootenay's plants has been coordinated with the operation of B.C. Hydro's system. West Kootenay receives predetermined fixed monthly entitlements of electricity approximately equal to the historical output of its four plants. The entitlement is satisfied by generation at the plants, supplemented if necessary by electricity supplied by B.C. Hydro. The Canal Plant Agreement which incorporates these arrangements expires on September 30, 2005. If the agreement is not extended or renewed, West Kootenay is entitled to resume independent operation of its hydroelectric plants under its existing water licences.

1.3 Cominco Supply

Under the Sale of Surplus Power Agreement, West Kootenay may until December 31, 1990, annually elect to purchase from Cominco 75 average annual megawatts on a firm basis. WKP until September 30, 2005, has a right of first refusal to purchase all interruptible energy that is generated by the two Cominco plants if it is not required by Cominco's operations. The price for this electricity is established annually by a formula directly relating to changes in costs. Pursuant to this agreement, power purchased from Cominco may not be sold outside West Kootenay's service area. However, by agreement executed with Cominco in 1987, WKP is permitted to store some of this electricity with B.C. Hydro for future return to its system.

The WKP/Cominco integrated system consists of the following generation plants:

<u>Plant No.</u>	Name	Capacity MW	Energy Entitlement (GW.h)*	Location
1	Lower Bonnington	41.4	329.3	Kootenay R.
2	Upper Bonnington	59.4	429.6	Kootenay R.
3	South Slocan	53.2	422.9	Kootenay R.
4	Corra Linn	51.2	343.2	Kootenay R.
5	Brilliant **	128.9	853.4	Kootenay R.
6	Waneta **	373.9 d'Oreille	2,465.4Pend	-

* Source - Canal Plant Sub-Agreement

** Cominco Facilities

1.4 B.C. Hydro Supply

West Kootenay has purchased power from B.C. Hydro in recent years, primarily at the time of the winter system peak. Negotiations between West Kootenay and B.C. Hydro concerning a long-term supply contract led to public hearings before the Commission in May, 1986, and a Decision was issued October 15, 1986 ("the Dispute Decision"). The Decision required both parties to enter into a long-term contract which recognizes a transitional period to September 30, 1990, followed by a conventional period to the end of 2005. Rates for electric power and wheeling purchased by WKP from B.C. Hydro for the transitional period were established by the Commission. Amongst other matters, the transitional period was intended to provide WKP the opportunity to assess and evaluate its options for supplying future loads.

The Commission also concluded that beyond the transitional period to 1990, the principles employed in determining the power purchase rate should be the same as those used to determine the rates applicable to other B.C. Hydro customers. In negotiating with respect to rates for the period beyond 1990, the parties were to bear in mind the Commission's conclusion that the long-term rate should not be based on incremental costs.

The Commission concluded that the terms and conditions attached to the transitional rate should reflect the unique characteristics of the B.C. Hydro/WKP relationship, and should remain for the long-term. The Power Purchase and Wheeling contracts resulting from this Decision were finalized in March, 1988.

1.5 <u>Transmission</u>

West Kootenay owns and operates a high voltage system (60 kV to 230 kV) for transmission of electricity from its generating plants to the major load centers in its service area. The Company's system is interconnected with systems owned by Cominco, B.C. Hydro and indirectly with BPA in the State of Washington, and TransAlta Utilities Corporation ("TransAlta") in the Province of Alberta. West Kootenay also transmits electricity to points within its service area using B.C. Hydro transmission lines for a fee under its Wheeling Contracts with that utility. Specifically, these contracts are the General Wheeling Agreement pursuant to the 1986 Dispute Decision, and the Koch Creek Agreement which provides for wheeling of WKP power from South Slocan to Vernon. Cominco and West Kootenay also have an agreement for the common use of transmission and switching facilities so that facilities owned by either party can be operated as an integrated system.

1.6 Energy Project Certificate

West Kootenay, pursuant to Section 18 of the Utilities Commission Act and in conformity with the requirements of B.C. Regulation 388/80, applied to the Minister of Energy, Mines and Petroleum Resources for an Energy Project Certificate for an Okanagan Gas Turbine Generation Plant on December 15, 1987.

The Minister of Energy, Mines and Petroleum Resources, with the concurrence of the Minister of Environment and Parks, referred the Application to the Commission, pursuant to Sections 19(1)(a) and 20 of the Act, for review at a

public hearing in accordance with specific Terms of Reference (Appendix 1). On conclusion of the hearing, the Commission is to submit a report and recommendations to the Lieutenant Governor in Council. Commission Order No. G-20-88 had accordingly set down a public hearing to commence April 26, 1988 in Kelowna, B.C.

Pursuant to Commission Order No. G-37-88, the hearing was subsequently adjourned to May 31, 1988 at the request of the Applicant, to permit a proper appraisal of an offer by B.C. Hydro to supply WKP with 130 MW of firm capacity over a 3-year period (1989/90-1991/92) as an alternative to its proposed Okanagan gas turbine. In addition, the deferment would provide additional time for WKP to address environmental issues and finalize its proposed turbine site in the Kelowna area. Kelowna is a city of approximately 63,000 people, located in the centre of the Okanagan Valley.

By letter dated May 5, 1988 WKP requested that the Commission grant a further postponement of the hearing for the reasons set forth in their letter, as follows:

"Firstly, on May 3, 1988 the Kelowna City Council accepted in full a staff report which recommended removal of West Kootenay's preferred site for the gas turbine from the Agricultural Land Reserve, but which also recommended that the site not be zoned for West Kootenay's intended use. The official reason given was that West Kootenay's use was not the highest and best use of this land. West Kootenay has asked to be permitted to make further representations to City Council with our environmental consultants, to have the Council reconsider this decision or accept a rezoning application for an alternative site near the Hiram Walker plant in the northern part of Kelowna.

Secondly, to date the Company has been unable to complete the securing of an alternative site for the gas turbine on Indian reserve land in the south Okanagan. We have been advised by their agent that our offer is acceptable to the Band and believe agreement will be reached shortly. Environmental studies for this site have been completed. However, more time would allow us to secure this alternative site, and Commission staff and intervenors would need additional time to properly assess it.

Finally, with respect to the deadline imposed by the Minister for the Commission to make its recommendations, West Kootenay's main concern was to have a decision made in time to give the Company the opportunity to acquire suitable reconditioned gas turbines currently on the market. Our purchasing agents for these units have recently advised that a delay into the fall is not likely to hinder our chances to take advantage of this opportunity."

Pursuant to Commission Order No. G-49-88 dated May 10, 1988 the request by WKP for a postponement was granted. In granting the postponement the Commission stated in the Order:

paragraph 2

"A new date for the hearing will not be set until WKPL submits comprehensive information to update its Application and supporting material, including firm site and full environmental data."

paragraph 4

"Costs incurred by the Commission, external to Commission staff costs, will be billed to the Applicant. The determination of whether these costs are to be allowed for recovery in the rates of WKPL will be considered by the panel following the completion of the hearing, or withdrawal of the Energy Project Application, whichever first occurs."

On October 3, 1988, West Kootenay filed an Amended Application dated September 29, 1988 for an Energy Project Certificate to construct and operate a Gas Turbine Project to be located in the Oliver Industrial Park in Oliver, B.C. Pursuant to Section 20 of the Act, the Commission ordered (No. G-94-88) a public hearing to commence at 9:00 a.m., local time, Tuesday, November 22, 1988 in Oliver, B.C.

The Village of Oliver, with a population of approximately 4,300 (1986 census), is located in the southern portion of the Okanagan Valley approximately 40 kilometres south of Penticton. Compared to Kelowna the valley narrows at this point and the industrial park (proposed site) is located in the river valley. The vast majority of residences are located on the benches above the valley floor.

The Village of Oliver in Exhibit 38 stated:

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"Based on our visual inspection, our trust in your commission and our provincial environment people, we felt comfortable enough to sign an interim agreement with West Kootenay Power subject to meeting all the standards that are set by our Province.

The turbine project will undoubtedly be a major economic boost to local businesses and contractors, as well as provide a substantial tax revenue based on assessed value. We, as Council, feel we have made a proper decision in selling our land and welcoming industry with the necessary safeguards built in."

Mr. N.L. Barlee, MLA, an intervenor in these proceedings described the area as follows:

"It is generally conceded, I think, in academic circles that this particular section of the Okanagan is extremely sensitive ecologically. It is rather a vulnerable area. This unique area was at one time called the northern extension of the Great American Desert or the Great Basin Desert, and so really what it is essentially, it's a pocket desert and this pocket desert extends from the United States border north to Skaha Lake, which is just south of Penticton, and there's also a fraction of it on the other side of the Richter Pass in the Similkameen Valley as well. It has an annual rainfall of under ten inches per year, and the temperatures in the summer reach about 110 degrees Fahrenheit. So it's really guite unique and guite unusual, and it has evolved into what I consider a very special region. It has unique flora and fauna in the region which I think are very important. It has, to name a few, animals like rubber boas and blue skinks and spayed-foot toads and chuckar partridges and sage thrashers and brewer sparrows and many other species of birds and bats and reptiles and lizards and so on. The flora, also, is rather unusual and the flora, if one examines the area very closely and wanders through it, has in most areas remained relatively unchanged since the 1850's, and we have some historical records to indicate that."

Dr. Ford, from a medical perspective, gave the following evidence related to the popularity of the area with patients with chronic respiratory ailments:

"It is important for the Commission to understand that as well that the South Okanagan region has a large population of such patients. This stems in part from our status as a retirement area, and in part from the fact that this area is considered specifically favourable to patients with lung disease. This special status derives from its air quality. Our clean, dry, desert air is especially suitable to people with chronic lung disorders, just as Arizona is considered favourable to this group of people in the United States. All physicians in Oliver and Osoyoos are familiar with new patients arriving in our area from Ontario, or other parts of Canada, because they have been told by their doctors that this is a healthy place to live. Physicians across Canada recognize our region as unique in this regard. We have one of the finest climates in Canada with our clean, dry, desert air."

Mr. Sagert, a witness for the Applicant on environmental matters was of the opinion that

". . . whether it is a pocket desert or not is subject to some interpretation in terms of climate factors and I believe that was one of the points that we addressed you know, in response to Mr. Casorso".

The hearing commenced on November 22 and continued through December 9, 1988 when it was adjourned until January 10, 1989. Following final submission of evidence by the Applicant and Intervenors before the Commission during 17 days of the public hearing, Argument commenced on January 13, 1989.

In the interest of expediency and fairness it was determined that Oral Argument should be given by those prepared to proceed, but that Written Argument would be accepted and should be provided as soon as possible. Counsel for the Applicant will have the right of Oral and Written Rebuttal as required.

For convenience, the Commission has included as Appendices 6, 7 and 8 of its Report and Recommendations, a summary of all such arguments.

On November 23, 1988 a motion was made by R.J. Bauman, supported by Ms. J.E. Vance and others that B.C. Hydro, Cominco and Inland Natural Gas Co. Ltd. ("Inland") be required to appear and provide evidence with regard to their respective forms of energy and the costs thereof.

Argument in support of the motion was presented to the Commission on November 30, 1988. The Commission decided on December 7, 1988 that Inland would be required to appear and give evidence but that in view of the October, 1986 Decision which is in full force and effect, B.C. Hydro was not required to appear and give evidence. Similarly, since Cominco's position as a supplier of energy to WKP is fully defined by existing agreements, Cominco was not required to appear.

Local participation was significant both at the hearing and through written material received. In view of this high level of local interest, several new initiatives were taken, namely: the preparation of an executive summary; the establishment of a public resources room wherein the Application and supporting material to exhibits and transcripts were available; a summary of alternate procedures prepared by Commission Counsel; seminars as to procedure given by Commission Counsel; and, the making available to interested parties of Commission Counsel, Commission staff and Commission consultants to assist in technical areas. These initiatives, in conjunction with the co-operation of all participants, significantly shortened the time required to hear the Application and reduced the expense thereof.

2.0 THE APPLICATION

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The Energy Project Certificate Application is made by the Applicant on the basis of the results of its 1987 Resource Study.

2.1 <u>1987 Resource Study</u>

In August, 1987, West Kootenay completed its 1987 Resource Study (Exhibit 6) which examined 16 generation options and 10 demand-reduction options available for meeting its future load growth. These options are tabulated in Tables 2.1.1 and 2.1.2 respectively (see pp. 13 and 14).

The generation options include eight conventional hydro, six conventional thermal and two non-conventional projects. The demand-reduction options include those projects which WKP envisages would receive some measure of customer acceptance.

Tables 2.1.3 and 2.1.4 present the Applicant's economic comparison of the various options (see pp. 15 and 16).

2.2 The Project

The project proposed is a 140 MW gas turbine in the South Okanagan Valley. This was the determination of WKP's 1987 Resource Study. The site selected is a 5.6 hectare parcel in the Oliver Industrial Park, the location of which is shown on Figure 2.1 (p. 81). The generation facility is rated for 140 MW but will only be able to contribute a net winter capacity of 130 MW after spinning reserve requirements have been deducted. Adaptation for synchronous condenser operation (for voltage control) is also contemplated.

The project will comprise two Turbo Power and Marine "Twin Pac" gas turbine power plants, each with a rating of 70 MW. Each 70 MW generator will be

driven by two opposed, directly-connected Pratt & Whitney FT4C-3F gas turbine engines connected through clutches and flexible couplings to opposite ends of the generator shaft.

The turbine units are equipped for dual fuel operation---natural gas and #2 fuel oil. The units will be operated primarily on natural gas and WKP has signed a "Letter of Intent" (Exhibit 98) with respect to prices and conditions of a gas supply from the local distribution company, Inland. The eventual contract would require regulatory approval.

Each "Twin Pac" unit (generator and two turbines) is contained in a steel enclosure which is lined for sound attenuation. The turbine air inlet stacks are acoustically treated and fitted with sound attenuating baffles. The exhaust stacks are also fitted with sound attenuating baffles which are constructed of stainless steel.

The plant will be operated primarily to provide capacity to meet winter peak loads. A secondary function of the plant would be to "back-up" inexpensive non-firm energy from Cominco or other sources. In this connection, the plant would only operate when less expensive non-firm energy is unavailable. WKP would have considerable flexibility in the scheduling of generation for the latter purpose.

Initially WKP's plan was to operate the plant for about 84 days during a typical winter period for between 7 and 17 hours a day as dictated by the daily loads. WKP has now decided on a new operating regime which calls for 150 days of operation per year but for shorter daily duration of operation. The implication of this change is that the units will incur higher operation and maintenance costs. The higher frequency of starts could also create more of a social disturbance.

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The plant will be equipped for remote operation from WKP's System Control Centre in Warfield. However, should special emission control equipment be required on the units (to satisfy the requirements of the Pollution Control Branch), then such equipment will probably necessitate regular attention by local staff.

In its peaking capacity mode, the plant is expected to generate 28 GW.h/year whereas for non-firm back-up the anticipated output is 565 GW.h/year (Exhibit 61). The assumptions for peaking duty are that 95% of the plant output would be generated using natural gas, and the remaining 5% on fuel oil. WKP has assumed 100% natural gas operation if the plant is called into service to replace non-firm energy.

SUPPLY-SIDE ALTERNATIVES

	Net available		
Option	First Year	capacity (MW)	Firm Energy
	<u>available</u>	(note 1)	_(GW.h)
Conventional Hydro:			
Murphy Creek	1992	285	1,700
Keenleyside	1992	200	830
Waneta Expansion	1992	(note 3)	441
Brilliant Expansion	1992	114	432
Shuswap Diversion	1992	52	315
Beatrice Lake	1992	29	156
Pumped Hydro Storage	1992	57	24
Goat River	1991	(note 3)	23
Conventional Thermal:			
Coal 200	1993	186	1,275
Combined Cycle	1990	158	1,190
Fording Coal (note 2)	1991	76	653
Biomass (Woodwaste)	1990	37	264
Gas Turbine-Okanagan	1989	130	45
Port Mann Gas Turbine	1989	81	40
Non-Conventional:			
Solar	1989	(note 3)	35
Wind	1989	(note 3)	90

Notes:

- (1) Gross generation less reserve requirements.
- (2) Fording Coal Project capacity and energy are the amounts available to WKP after deducting the mine load.
- (3) These projects are not credited with capacity because it is not available on a firm basis over winter peak.
- (4) All of the above data is extracted from Exhibit 6.

DEMAND-SIDE ALTERNATIVES

	Capacity Impact (MW)	Energy Impact (GW.h)	First Year <u>in Service</u>	Project Life <u>(years)</u>	C C -
Weatherization Campaign (1)	4.7	11.1	1988	5-20	{
 a) Ceiling Insulation b) Wall Insulation c) Basement Insulation d) Weatherstripping e) Water Tank Blankets f) Window Upgrading 	0.5 0.1 1.2 2.5 0.4 1.7	1.0 0.3 3.0 6.0 0.8 4.0	1988 1988 1988 1988 1988 1988	20 20 20 5 10 20	
Water Heater Control	7.2	.0	1988	20 n/a	2,:
Time of Day Rates Interruptible Rates HPS Street Lights	50.0 2.0 1.0	- 4.5	1988 1988 0ngoing	30 2 30 n/a	0,(
Ads and Promotion Energy Efficient Motors	- 1.0	- 3.0	ongoing n/a	n/a n/a	

Notes:

- (1) Administration and promotion expense has been allocated against the Weatherization Campaign, not against individual sub-options.
- (2) All data extracted from Exhibit 6.

SUPPLY-SIDE ALTERNATIVES - ECONOMIC COMPARISON

	Capital Cost (1)	Year	Benefit/Cos	Levelized st Cost(2)
	<u>(\$ million)</u>	comprete	Kallo	<u>(</u> \$/1000KW•II)
Economic Projects				
Gas Turbines - Okanaga	n 2.9	1989	1.43	- 1.74
Port Mann Gas Turbines	14.5	1989	1.18	- 0.75
Non-Economic Projects				
Combined Cycle	132	1990	.95	0.47
Fording Coal	144	1991	.78	2.16
Brilliant Expansion	219	1992	.74	2.50
Waneta Expansion	176	1992	.58	3.32
Keenleyside	530	1992	.57	9.65
Beatrice Lake	113	1992	.49	2.43
Goat River	18	1991	.44	0.35
Shuswap Diversion	267	1992	.42	6.44
Murphy Creek 1	,170	1992	.42	28.07
Biomass (Woodwaste)	133	1990	.37	5.82
Wind	65	1989	.24	2.73
Coal 200	351	1993/4	.23	48.21
Pumped Hydro Storage	144	1992	.21	4.85
Solar	121	1989	0.4	7.71

Notes:

- (1) Capital costs cover the expected totals of completion of the project including interest charges which occur during construction.
- (2) The Levelized Cost indicates the decrease or increase that the project would have on a customer's bill over the life of the project.
- (3) All data extracted from Exhibit 6.

DEMAND-SIDE ALTERNATIVES - ECONOMIC COMPARISON

	Capital		
Levelized <u>Option</u> <u>kW.h)</u>	Cost (\$)	Benefit/Cost Ratio	Cost <u>(\$/1000</u>
Economic Projects			
Weatherization Campaign	840 , 000	5.7	- 0.08
Ceiling Insulation	30,000	19.0	- 0.02
Wall Insulation	20,000	7.4	0.
Basement Insulation	250,000	6.3	- 0.04
Weatherstripping	200,000	4.7	- 0.02
Water Tank Blankets	40,000	6.4	- 0.01
Water Heater Control	2,200,000	1.2	- 0.02
Seasonal Rates	0	n/a	- 0.86

Note:

(1) All data extracted from Exhibit 6.

3.0 LOAD PROJECTIONS

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3.1 WKP Load Projections and Resources

In the 1987 Resource Study (Exhibit 6, p. 5) WKP presents an illustration of its 20-year system load forecast. This forecast estimated a probable growth rate of 1.8% per annum bounded by a probable low rate of 0.9% and a probable high rate of 2.5%. In prepared testimony (Exhibit 7, Tab 2, p. 2) WKP has reduced the probable forecast to 1.4% over the period 1989-2008. This reduction was made in recognition of lower anticipated population growth, and the incorporation of load management benefits.

If the anticipated growth rate of 1.4% is achieved, WKP's peak load will increase from an estimated 546 MW in 1989 to approximately 721 MW in 2008, with the corresponding energy requirement increasing from 2623 GW.h in 1989 to 3464 GW.h in 2008. This escalation means increased reliance on load management, external sources, or new generation to meet the load. Reliance on these sources increases from 376 MW to 551 MW and from 1103 GW.h to 1944 GW.h in terms of capacity and energy respectively over the 20-year period.

With specific regard to the load forecast, no explicit recognition has been given by the Applicant to the impact of co-generation and Independent Power Producers displacing electricity currently provided by West Kootenay. In addition, the forecast has not accounted for the potential of higher natural gas prices leading to a switching from this fuel to electricity.

3.2 Supply

WKP will require both capacity and energy to meet its total system load growth. After utilizing its Net Entitlement under the Canal Plant Agreement, WKP currently purchases its additional requirements primarily from Cominco and B.C. Hydro. If no new generation is added, WKP's purchase requirement increases over time. This deficiency (demand/supply gap) is illustrated in Figure 2b of Exhibit 6, as purchases from Cominco and B.C. Hydro. Estimates of WKP's resource deficits for the years 1989/90 through 2007/08 are shown in the Base Case Load-Resource Balance given in Appendix 2 of Exhibit 5, also as purchases from Cominco and B.C. Hydro.

In Exhibit 6, WKP has elaborated on the various alternatives investigated and evaluated to supply its capacity and energy deficit. It is WKP's contention that the subject gas turbine and the options afforded by its installation, provide the most cost effective means of meeting its requirements. The gas turbine does not eliminate the need for purchased power even in a low load growth scenario. The gas turbine would effectively improve the load factor of future power purchases, and due to the substantial capacity charges that would exist, the unit cost for energy would be reduced.

3.2.1 Cominco Power Contract

WKP purchases power from Cominco in accordance with the West Kootenay/Cominco Sale of Surplus Power Agreement dated February 21, 1980. The recently executed revision to that Agreement commits Cominco to offer to WKP power from Cominco's Brilliant and Waneta hydroelectric plants which is surplus to Cominco's actual and possible future industrial requirements. Surplus energy from Cominco is considered to be firm on a five-year rolling basis. Beyond the five-year time period, any surplus energy is considered to be non-firm. Details of the Sale of Surplus Power Agreement are given in the response to Question A14 in Exhibit 11 - Appendix B. The latest WKP estimates of monthly firm and non-firm energy available from Cominco through September 2008 are given in Table B.6.1 on p. 44 of Exhibit 14. WKP expects the non-firm component to have a 70% probability of actually becoming available.

3.2.2 Peaking Relief from B.C. Hydro

WKP's long-term strategy for the cheapest possible rates for its customers involves purchasing a component of its capacity and energy from B.C. Hydro, rather than installing new base load hydroelectric or thermal plants to the extent of its future load demands. Such purchases are primarily for peaking capacity which B.C. Hydro should be able to supply if certain prerequisites respecting WKP's system enhancement have been implemented.

The typical monthly distribution of capacity load in the WKP system is illustrated in Figure 2c of Exhibit 6. This Exhibit shows that the annual system peak load occurs in January, while peak loads in the summer months are some 60% of the January level. In all months of all years throughout the study period, it will be necessary for WKP to have access to an additional firm capacity resource to meet its forecast load. The monthly distribution of this additional capacity requirement is highly variable. For example, as shown in the Base Case Load-Resource Balance contained in Appendix 2 of Exhibit 5, the additional capacity resource requirement in January 1992 is 244 MW but in the following July is only 69 MW.

The price which WKP pays B.C. Hydro for peaking capacity is stipulated in the BCUC 1986 Dispute Decision. In accordance with the Dispute Decision, the monthly capacity that WKP must purchase from B.C. Hydro is subject to a "ratchet" which by 1991 will be 50%. If, in 1991/92, WKP were purchasing firm capacity from B.C. Hydro to meet its entire capacity deficit, then WKP would have to pay B.C. Hydro for at least 122 MW (50% of 244 MW) in each of the 11 months following January 1992, even though WKP's actual requirement to meet its capacity load in each of the six months from April through September 1992 is less than 122 MW. In the 1991/92 year, WKP's total capacity requirement from B.C. Hydro to meet load would be 1721 MW.months but, because of the ratchet, WKP would have to pay for 1900 MW. months.

If WKP had a generating resource available to it which enabled it to reduce its capacity purchase from B.C. Hydro in the winter months, then it would pay less to B.C. Hydro for capacity in all months of the year. The Base Case with gas turbines, the Load-Resource Balance contained in Appendix 2 of Exhibit 5, illustrates that with 112 MW of gas turbine capacity used to meet load in January 1991, the capacity purchase from B.C. Hydro for the year 1991/92 would be reduced to 836 MW.months, with the ratchet. Similar reductions would be realized in all years of the study period.

3.2.3 Security of Service

At present, power can be delivered to the Okanagan Valley from the WKP terminal at Oliver in the south and/or from the B.C. Hydro terminal at Vernon in the north. The transmission lines from Oliver north to Penticton operate at voltages of 60 kV and 160 kV, while those from Vernon south to Penticton are at voltages up to 230 kV.

WKP has advised that the anticipated load growth in the Okanagan service area will necessitate some system reinforcement if security of service is to be assured in the South Okanagan. A proposed high voltage substation (500/230 kV) off B.C. Hydro's 500 kV Nicola-Selkirk transmission line at Vaseux Lake, and new 230 kV lines emanating from the substation will provide the system security needed. WKP has been collaborating with B.C. Hydro as to the timing and detailed requirements of this expansion.

WKP studies have indicated that if the proposed Gas Turbine is installed in the South Okanagan, it would be possible to defer construction of the Vaseux Lake substation from 1991 to 2001 and the 230 kV lines from 1992 to 1996 without compromising the overall security of service to the area. Such deferral of expenditure would represent a benefit in present value terms which would be attributable to the gas turbine installation.

214.0 RESOURCE ALTERNATIVES

The 1987 Resource Study indicated that WKP investigated several supplyside alternatives other than purchases from Cominco and B.C. Hydro. At the Hearing, many intervenors questioned WKP's thoroughness in exploring generation sources other than a fossil fuelled plant in the Okanagan. Some intervenors even mentioned their unreserved willingness to pay a premium on their rate if it would obviate the need for the gas turbines. Following are some of the supply side alternatives that offer possibilities for WKP.

4.1 <u>Conventional Hydro</u>

In 1981, WKP commissioned a private consultant to conduct an overview study of potential hydroelectric and thermal generation sources to supply its growing load. The study identified over 70 potential hydroelectric sites of which the eight listed in Table 2.1.1 were the only ones considered to merit further investigation.

Hydroelectric projects have traditionally been categorized as having high capital costs and low operating costs. This is substantiated when the capital costs shown in Table 2.1.3 are compared with the net available capacity indicated in Table 2.1.1. Since WKP is primarily capacity-constrained, the thrust of its efforts is understandably focussed on projects which offer sizeable capacity at a modest capital cost. Application of this criteria to Tables 2.1.1 and 2.1.3 show that all the hydroelectric projects fail especially when measured against the gas turbine thermal projects. This is even true for the expansion proposal for the two Cominco owned plants - Waneta and Brilliant.

The existing Waneta power plant cannot accommodate extension of the power house because this would require major rock excavation which would affect the stability of the existing facility. Therefore, any expansion contemplated would involve constructing a canal from the existing dam to a new powerhouse facility on the east bank of the Columbia River. In addition, this project is not credited with capacity because the water flows available for use would not be available on a firm basis over the winter peak when WKP has its serious capacity deficit.

The Brilliant expansion proposal, in like fashion, would require a diversion of water from the Brilliant dam to a new underground powerhouse approximately 200 metres downstream from the existing Cominco power plant. Apart from its uneconomic attributes, this project is further complicated by questions relating to rights for the water flows ascribed to the operation of the upstream Duncan and Libby reservoirs.

The two other sizeable hydroelectric projects, the Murphy Creek and Keenleyside proposals, are both under active investigation by B.C. Hydro to the extent that they are incorporated in B.C. Hydro's current 20-Year Resource Plan (1988-2007). Reference to Table 2.1.3 shows that the high capital costs of these two projects yield Benefit/Cost ratios that are unacceptable, and would have a serious negative impact on WKP's customer rates. Likewise, the other hydroelectric projects show a low Benefit/Cost ratio and a negative impact on rates.

4.2 <u>Conventional Thermal</u>

Conventional thermal plants generally have moderate capital costs, but high operating and maintenance costs. Such plants are not normally suited for cyclic loading and are therefore used mainly as base-loaded plants. Since WKP's needs relate essentially to a winter peaking shortfall, where additional capacity is only required during certain months of the year, a conventional thermal plant would not be ideally suited for this application. This would not be the case however, if WKP were to enter into a joint venture arrangement (as is presently being investigated) where the other participant has a base load requirement throughout the year.

Reference to Table 2.1.3 shows that the only two economical projects that satisfy WKP's unique needs are gas turbines. On the basis of WKP's assumptions, both projects show a significant benefit over cost, and a positive impact on WKP's customer rates.

Gas turbines, with their inherently short start-up and shut-down times, are frequently used as peaking plants especially in situations such as WKP's involving low load factor loads and high capacity charges for purchased power. WKP's choice of a gas turbine for its next generation project is rationalized on the basis of an economic analysis which is closely linked to the intermittent operation planned for the plant. The feasibility of the operating assumptions are addressed in Section 5.

4.2.1 Port Mann Gas Turbines

The 1987 Resource Study showed Port Mann gas turbines to be the only other project with economic benefits similar to (though not quite as attractive) as the Okanagan gas turbines. The study considered the possibility of wheeling this power from the Lower Mainland to the Okanagan Valley via B.C. Hydro transmission lines. WKP testified that although this project was economic, its Lower Mainland location meant that the Vaseux Lake Substation would still be required in 1991, and the transmission system reinforcement in 1992. In addition, a satisfactory wheeling arrangement would have to be negotiated with B.C. Hydro.

4.2.2 <u>Coal-Fired Plant</u>

B.C.'s abundance of thermal coal from operating mines, particularly in the East Kootenays has prompted several studies by private consultants on the economic feasibility of constructing a coal-fired plant for electricity generation. In Exhibit 6, it is mentioned that WKP had investigated a joint venture project with Fording Coal Ltd., a subsidiary of C.P. Ltd., comprising a 110 MW coal-fired plant in the East Kootenays. WKP concluded that

the current high capital and operating and maintenance costs of such a project preclude it from being economically comparable with firm supply from B.C. Hydro. In addition, as explained by WKP at the hearing, an East Kootenay generation source would require the construction of expensive new transmission to transmit this power to the load centre in the Okanagan Valley.

4.2.3 <u>Co-Generators</u>

WKP gave evidence at the hearing (Transcript pp. 284, 285) that it is negotiating with Cominco and a Pulp Mill in Castlegar with respect to two joint venture co-generation projects of 10 MW and 18 MW respectively.

WKP concluded that the modest size of these two ventures would not obviate the need for the gas turbines, but would rather serve to reduce purchases from B.C. Hydro.

4.3 Non-Conventional Projects

The two projects investigated, solar thermal and wind, depend on the vagaries of nature and therefore cannot offer a firm supply to meet peak loads. In view of their significant capital costs, and the absence of a firm capacity credit, these projects were not seriously considered as viable alternatives.

4.4 <u>Other Sources</u>

4.4.1 <u>Cominco/Bonneville Intertie</u>

WKP gave evidence at the hearing of a 300 MW intertie between Cominco and BPA. WKP had on occasion utilized this intertie to secure purchases from BPA and other U.S. utilities, and intended in the future to pursue opportunities for interruptible U.S. power because of access to this intertie. The new Canada/U.S. Free Trade Agreement is anticipated to facilitate across-the-border power transactions.

4.4.2 Purchases from TransAlta

WKP testified that power purchases from TransAlta are feasible, but because the two systems are not contiguous, wheeling through B.C. Hydro's system would have to be arranged. At the instigation of the Commission (Exhibit 14, p. 1) WKP had recently made overtures to TransAlta for a firm power purchase contract as an alternative to the gas turbines. Substantial discussions ensued between the two utilities, and, as stated in Exhibit 55, TransAlta advised WKP that they were unable to supply power at a price that was competitive to B.C. Hydro's firm price.

4.4.3 Purchases from Cominco

In the near term, WKP expects that its Cominco Power Contract will satisfy approximately 50% of its capacity shortfall and 30% of its energy requirements at the current favourable rate. This is by far WKP's least expensive source of purchased firm power at this time, and its availability contributes significantly to the low rates enjoyed by WKP customers. WKP also has the right of first refusal on all Cominco's surplus or non-firm power, also at very favourable rates. It is this source of low cost interruptible power that has contributed significantly to the economic viability of the gas turbine proposal. WKP therefore, plans to maximize its interruptible purchases from Cominco.

4.4.4 B.C. Hydro Supply

4.4.4.1 Firm Energy and Capacity

WKP is primarily capacity constrained. B.C. Hydro is prepared to supply all of WKP's capacity and energy needs both in the short-term and the longer term.

The continued purchase by WKP from B.C. Hydro of firm capacity and energy to supplement its Net Entitlement and purchases of firm power from Cominco

to meet all of its system load has been used by WKP as a base case against which to test the effects of alternative generation additions. The price assumptions made are those set forth in the 1986 Decision of the Commission.

The 1986 WKP/B.C. Hydro Dispute Decision provided the framework for a long-term power sales contract between these two utilities. The cost of large capacity purchases from B.C. Hydro is of some concern to WKP because of the penalty associated with the ratchet as stipulated in the Dispute Decision. This penalty tracks increases in the unit cost of capacity as it increases over time. The mechanics of the ratchet is explained in Section 3.2.2.

Having a poor load factor load (54%), WKP is understandably endeavouring to find ways to shave its peak capacity requirements in order to reduce the burden of the B.C. Hydro ratchet. The gas turbine proposal is the Applicant's chosen method of accomplishing this.

Firm power purchases from B.C. Hydro have to be determined well in advance, and all nominations covered by at least a 10-year contract. This is a B.C. Hydro requirement since it must provide adequate plant in advance of needs, and its capital expansion programs are developed on a 10-year rolling basis. B.C. Hydro's plans for the South Okanagan area include a scenario whereby the future capacity requirements of WKP (without the gas turbines) would require the introduction of the Vaseux Lake Substation in 1991 and transmission reinforcement in 1992---at costs to WKP of some \$22 million. WKP's gas turbine proposal attempts to defer these costs for as long as technically feasible without jeopardizing service to its customers.

4.4.4.2 Non-Firm Energy

In addition to the firm purchases referred to above, WKP may be able to buy non-firm surplus energy from B.C. Hydro in the future. WKP had estimated the 1988 price for such energy to be 15.6 mills/kW.h, on the basis of actual spot prices from August 1986 to May 1988. The derivation of this price is described in the responses to Questions B5 and 14 in Exhibit 14. On p. 99 of Exhibit 14, WKP assumed that the spot price for non-firm electrical energy would be tied to gas prices and that they will escalate at the same rate. However, in WKP's latest base case scenario (Exhibit 109), the 1989 nonfirm energy is priced at 17.52 mills/kW.h.

4.4.4.3 Price Escalation

Future prices of electricity from B.C. Hydro will depend on that utility's future revenue requirements, as well as on Provincial Government policy. Its revenue requirements will, in turn, depend on such factors as load growth and how this is met, export sales, inflation and exchange rates.

Between May, 1986 when the BCUC Dispute Hearing was held, and the present time, a number of projections have been made of future B.C. Hydro electricity rates. Synopses of most of these projections have been prepared by WKP and are contained on p. 27 of Exhibit 11, and in Exhibits 47 and 109.

Earlier detailed suggestions from B.C. Hydro concerning its future electricity prices are given in Exhibit 34 which is a letter to WKP dated March 23, 1988. In that letter, B.C. Hydro recommended the use of two projections of electricity rates for sensitivity purposes in the project evaluation: one by the MEMPR made in December 1987 and the other by B.C. Hydro itself made in 1987 as part of its Electric Load Forecast. At that time, B.C. Hydro considered its 1987 projections to represent the best estimate of its future prices, based on revenue requirements, and considered the MEMPR forecast (of electricity rates) to be the upper limit.

A summary of the corresponding B.C. Hydro and MEMPR forecast escalation rates is displayed in Table 4.1 (p. 30). The B.C. Hydro forecast is for zero escalation through 1994 and for escalation at general inflation thereafter. The MEMPR forecast is for electricity prices to rise at 3.5% in 1988, 1989 and 1990; at 0.0% for the following two years. WKP assumed general inflation after that.

In its Primary Assumptions Case, WKP assumed that B.C. Hydro electricity prices would escalate at MEMPR forecast rates, except that escalation in 1988 would be zero. In a Low Price Sensitivity Case, WKP investigated the effect of the B.C. Hydro 1987 Load Forecast escalation rates.

The Executive Summary of B.C. Hydro's 20-Year Resource Plan, presented as Exhibit 24, describes the programs and projects which B.C. Hydro plans to pursue during the period 1988 to 2007 in order to meet its growing load.

These projects include demand-side management starting in 1988, coordination with the Bonneville Power Administration ("BPA") beginning in 1989, coordination/purchase agreement with Alcan in 1995, return of Columbia River downstream benefits in 1998, and the Site C, Keenleyside, Murphy Creek and Hat Creek projects in 2001, 2004, 2004 and 2006, respectively. That is, B.C. Hydro does not plan to bring on-line a new high capital cost project until Site C in the year 2001. Major expenditures on Site C will not start until about 1995. The escalation rates of electricity prices necessary to provide the required revenue to support this plan will be very similar to those given in the B.C. Hydro 1987 Load Forecast.

However, it can be seen in Table 4.1 that the B.C. Hydro forecast escalation results in rate increases commencing in 1995. Therefore, BCUC Staff suggested to WKP that a median estimate of B.C. Hydro rates would be characterized by zero escalation in 1988 followed by escalation equal to about general inflation minus 1.5% in all subsequent years. This was approximated by nominal escalation of 3.5% from 1989 through 2007. As a High price

29Sensitivity Case, BCUC Staff suggested using the rates applied in WKP's Primary Assumptions Case (1987 MEMPR rates with 1988 at 0.0%), and as a Low Price Case using the rates projected in the 1987 B.C. Hydro Load Forecast.

Notwithstanding the above, in Exhibit 109, p. 6, it is stated that the Provincial Government would be looking to B.C. Hydro for the payment of dividends. Should this materialize, it is anticipated that B.C. Hydro's escalation would track closely behind inflation for the next several years.

TABLE 4.1

PROJECTED ESCALATION RATES APPLIED TO B.C. HYDRO PRICES

Annual Escalation (%)

				WKP	BCUC
	General Inflation	BCH 1987 Forecast	MEMPR Forecast	Primary Assumptions	(most prob- able) Estimate
1988	4.5	0.0	3.5	0.0	0.0
1989	4.5	0.0	3.5	3.5	3.5
1990	4.6	0.0	3.5	3.5	3.5
1991	4.9	0.0	0.0	0.0	3.5
1992	5.0	0.0	0.0	0.0	3.5
1993	5.2	0.0	5.2	5.2	3.5
1994	5.3	0.0	5.3	5.3	3.5
1995	5.4	5.4	5.4	5.4	3.5
1996	5.5	5.5	5.5	5.5	3.5
1997	5.5	5.5	5.5	5.5	3.5
1998	5.5	5.5	5.5	5.5	3.5
1999	5.5	5.5	5.5	5.5	3.5
2000	5.5	5.5	5.5	5.5	3.5
2001	5.5	5.5	5.5	5.5	3.5
2002	5.5	5.5	5.5	5.5	3.5
2003	5.5	5.5	5.5	5.5	3.5
2004	5.5	5.5	5.5	5.5	3.5
2005	5.5	5.5	5.5	5.5	3.5
2006	5.5	5.5	5.5	5.5	3.5
2007	5.5	5.5	5.5	5.5	3.5

Year

4.5 Demand-Reduction Options

4.5.1 The Applicant's Demand-Reduction Plan (Demand-Side Management)

WKP has investigated initiatives which would reduce its capacity and energy loads by either reducing customer consumption or shifting a component of this consumption from peak to off-peak periods. In its 1987 Resource Study, the Applicant identifies achievable Demand-Reduction Alternatives to be initiated in 1988. These are listed in Table 2.1.2. The only alternatives that are shown to be economic are those listed in Table 2.1.4, namely: 1. Residential Weatherization for electrically heated homes, and 2. Water heater control for homes. Other programs investigated include Seasonal Rates, Time-of-Day Rates and Interruptible Rates, in addition to the promotion of more efficient lighting and equipment.

The Applicant assumed 6,000 electrically heated homes would take advantage of the weatherization campaign yielding 4.7 MW of capacity and 11.1 GW.h of energy per year. This represents a penetration of approximately 26%. With respect to water heaters, the Applicant has assumed 8,000 customers participating or 35% penetration. With regard to the commercial and industrial markets, no significant demand-side potential has been identified.

4.5.2 Economic Tests

In the Resource Study, the Applicant identified the economic considerations applied to demand-side alternatives as follows: "When we embarked upon the study of demand-side alternatives, we aimed to reduce our average customer rates . . . Caution must be taken to ensure that instituting the program does not cause average rates to rise". This is the "no-losers" test, wherein the only demand-side alternatives that can be considered are those that individually, cost no more than the difference between the cost per kW.h for new firm supply and the existing system average cost per kW.h.

Data on WKP's demand-side management, requested by an intervenor, was provided only in part by Exhibit 106. Nevertheless this exhibit allows an understanding of the economics of demand-side management at WKP.

Exhibit 106 only provides the cost per kW.h of the "Weatherization Campaign" demand-side alternatives. Other tested alternatives were not listed, nor was the relevant marginal B.C. Hydro cost data that was applied to qualify the alternatives. However, there is sufficient evidence to demonstrate that the Applicant is applying the most stringent economic test to the demand-side alternatives. The highest cost program that qualified has only a 1¢/kW.h marginal cost, while the actual average system cost is 3.1¢/kW.h. The Applicant appears to be relying solely on the "no-losers" test.

Some evidence suggests that the Applicant may be applying an economic test to demand-side alternatives that exceeds the "no-losers" test, but the Applicant does not appear to have set the upper cost limit of the alternatives equal to the marginal cost of new generation. On balance, the weight of evidence suggests that the "no-losers" test dominates, and that a demand-side alternative that would cause an increase in rates but a decrease in revenue requirements would be rejected. The Applicant is severely limiting the opportunity for demand-side alternatives by requiring such programs be measured against existing average costs rather than by the marginal costs of new supply.

A stated strategy of the Applicant is to maintain its rates, on average, lower than B.C. Hydro. By applying this constraint to its demand-side management potential, the Applicant may be able to maintain lower average rates in the short-term, but the result will be higher aggregate revenue requirements, and consequently higher average customer bills than would be the case if demand-side management was allowed to compete with new generation on the basis of marginal cost alone. By contrast, evidence presented at the hearing suggests that B.C. Hydro and the Northwest Power Planning Council support the use of the marginal cost test rather than the "no-losers" test to qualify demand-side programs.

4.5.3 Relevance of Demand-Side Management to the Okanagan Gas Turbine Project

The Applicant is currently facing a capacity deficit and this undoubtedly influences its perspective of demand-side management alternatives. It is apparent that the Applicant does not yet possess the research results that would clearly identify the full potential of demand-side management. The Commission would therefore encourage the Applicant to re-examine all demand-side alternatives, in all customer classes, whether direct customers or wholesale, and to summarize the results in terms of present value of revenue requirements. The Commission believes that investments in demand-side management (after prior approval by the Commission) which displace existing or future power purchases, on a cost effective basis, should be included in the rate base and expensed to the cost of service over the appropriate time period.

With respect to this project the Commission recognizes that demand-side management initiatives will not eliminate the need for peak shaving generation or energy purchases to back-up non-firm power from Cominco. The Commission believes that there is significant potential for additional demand-side measures available to be pursued by the utility. Therefore the Commission will continue to monitor demand-side management programs of WKP in the course of its ongoing regulation of the utility.

345.0 OLIVER GAS TURBINE PROJECT- ECONOMIC CONSIDERATIONS

5.1 <u>Benefit/Cost Analysis</u>

5.1.1 Project Benefits

The Applicant is advocating that the gas turbine project will realize tangible benefits to its customers in terms of reduced rates, security of supply and quality of service. This case is tested primarily against increased purchases from B.C. Hydro in amounts equivalent to the output of the gas turbines.

The peaking relief that would be afforded by the gas turbines could generate operating savings for WKP if its assumptions on availability and price of interruptible natural gas for the units materialize. The alternative of increased use of fuel oil would adversely affect the economics of the project.

WKP contends that reduced rates would result from reduced B.C. Hydro capacity purchases for peaking, and from the purchase of cheap interruptible energy on the spot market in lieu of additional energy purchases from B.C. Hydro. As discussed previously, potential suppliers of such non-firm energy are Cominco, B.C. Hydro, TransAlta, Independent Power Producers, and U.S. Utilities in the Pacific Northwest.

The gas turbine also has a beneficial aspect in the matter of rate bargaining as it has the facility to "convert" interruptible energy to firm.

Another monetary benefit accruing from installation of the gas turbine would be the deferral of both the \$16 million expenditure for the Vaseux Lake substation from 1991 to 2001, and the \$6 million transmission reinforcement from 1992 to 1996. WKP advised that the present value of this benefit amounted to \$7.64 million at the assumed 12% discount rate. On the subject of security of service, the gas turbines are able to provide back-up service to the Okanagan Valley, during periods of major generator and transmission outages. (see Transcript pp. 35, 36).

Another non-monetary benefit provided by the gas turbines includes their application to synchronous condenser operation for voltage control. WKP advised that this mode of operation would be undertaken on a regular basis. Such quality of service enhancement (voltage control) is particularly valuable where very voltage-sensitive equipment (such as electronic devices) is being supplied.

5.1.2 Project Capital Costs

The original capital cost of the project as presented by WKP (Exhibit 5) for two used (reconditioned) gas turbines was as follows:

Gas Turbines	\$22.0	million
Site Acquisition & Preparation	5.6	million**
Transmission	0.3	million
Gas Line Extension	1.1	million
Permits	0.4	million
Design & Engineering	.3	million
AFUDC *	2.3	million
TOTAL	<u>\$32.0</u>	million

No contingency item was included in this total cost figure.

- * AFUDC: Allowance for Funds Used During Construction
- ** Though not expressly identified, this item appears to include all site structures and services ancillary to the turbines.

Under cross-examination about the need for emission control, the Applicant agreed that such equipment would be provided if required, and that the approximate cost of the necessary water injection equipment would be \$2.3 million.

Information from the Ministry of Environment (Exhibit 58) indicates that environmental control equipment will be a Ministry requirement if the turbines are installed at the Oliver site.

Reference to Exhibit 109, p. 3, shows WKP's latest cost estimate incorporating the above and additional items revised to \$36 million. The latter estimate incorporates the following adjustments:

- Canadian/U.S. exchange rate enhancement to reflect recent rate improvement.
- Inland's decision to absorb the capital cost of extending the gas supply pipeline and to recover this cost by means of a monthly standby charge to WKP.
- A 10% contingency allowance added to the capital cost.
- Inclusion of the cost of a water injection system.

5.1.3 Project Operating Costs

The Applicant initially estimated the annual fuel cost to be in the order of \$800,000/year and annual plant maintenance costs to be \$150,000/year (Exhibit 5). However, those figures were subsequently revised upward to incorporate agreed gas costs from Inland, operation of the water injection system, and an increased number of operating days for the units.

The fuel costs assume a blend of natural gas and fuel oil in which fuel oil would only be used for 5% of the time that the units are operated for peaking, and natural gas for the remaining 95% of the time. WKP assumed 100% operation on natural gas when the units have to be operated for non-firm energy back-up.
5.1.3.1 Natural Gas Prices

Initial Natural Gas Prices

WKP will receive its natural gas service from Inland. Inland gave testimony on the most recent offer made with respect to gas service. This offer formed the basis of a "Letter of Intent" between the parties identified as Exhibit 98 to the proceedings.

Inland will construct and own the gas supply pipeline to the turbine plant gate and recover its investment through a monthly standby charge. At the outset, Inland will provide gas service to WKP from its own utility gas supplies. In future years WKP may have the option to purchase its gas directly from producers and arrange its own transmission with Westcoast Energy Inc. ("Westcoast") and Inland.

The rate offered to WKP inclusive of the commodity cost of gas, Westcoast tolls, franchise fees and Inland margin will vary depending on whether service is taken during off-peak or peak periods. This contract will have to be approved by the Commission or MEMPR depending on when the filings occur.

The 1989 prices are as follows:

Off-Peak _(\$/GJ)_	Peak <u>(\$/GJ)</u>
1.24	2.17
1.15	2.09
	\$20,100
	\$4,000
	Off-Peak <u>(\$/GJ)</u> 1.24 1.15

\$24,100

The peak charges occur when Inland is faced with Tier 1* toll charges from Westcoast. Inland originally expected that these charges would apply for approximately half of the 150 day period between November and the end of March. The WKP final base-case projection provided in Exhibit 109, forecasts that 80% of the natural gas used for peaking will be subject to the Westcoast Tier 1 charge. However, because WKP has a degree of flexibility when operating the gas turbines to back-up interruptible energy, the Applicant predicts that it will be unnecessary to use the turbines to back-up interruptible energy at any time when the peak natural gas charges apply.

The Commission agrees with the WKP hypothesis that the utility's flexibility in its arrangements with B.C. Hydro will allow it to generally use the turbines during non-peak periods to back-up interruptible energy. However, it is not clear that WKP can assuredly avoid the use of the turbines during peak periods for back-up purposes. In the future the Westcoast pipeline system and Inland pipeline system may become more fully utilized so that Tier 1 charges apply for a greater percentage of the winter period. This could constrain WKP's ability to use the turbines for back-up purposes without facing peak charges. Nevertheless, the Commission has not included the potential for additional peak charges in its assessment.

Gas Price Escalations

The project Application by WKP assumed that the cost of natural gas would escalate in accordance with projections made by MEMPR in 1986. WKP also had a consultant's report prepared by ATCOR Ltd. ("ATCOR") to assess the likely price increases. The ATCOR estimates were higher than those of the

^{*} Tier 1: This toll by Westcoast is for interruptible sales - highest priority paid by Inland when the utility exceeds its contract demand with Westcoast.

Ministry and were not relied upon by WKP. During the course of the hearing a partial update of the MEMPR forecast was provided based on information as at December 1987. The Ministry later advised the hearing participants that the full forecast of the Ministry would not be available until the spring of 1989 and the earlier projections made were under review. In testimony, the WKP witnesses revealed a very rudimentary understanding of the natural gas business and future prices of natural gas. It was, in part, for this reason that the Commission required the attendance of Inland to provide additional information on both the base gas price and escalations that could be expected.

In December 1988 the National Energy Board ("NEB") released its most recent forecast of energy supply and demand. The Appendices of the NEB report provided projections of retail natural gas prices in British Columbia under a low and high price scenario.

The components of the retail price of natural gas are made up of the commodity cost of gas, Westcoast tolls, franchise fees and Inland margin. The Westcoast tolls and Inland margin tend to move up at rates less than inflation through time. The Inland price quoted to the Applicant for peak service included a 31¢/GJ charge which has been removed as a result of a recent filing to the NEB. The Commission has therefore reduced the peak charges commensurately in carrying out its evaluations.

The greatest component of the existing charges, and that over which the least control exists, is the field price of natural gas. The base price from Inland assumes that Inland will purchase the gas at \$1.03/GJ. At a future date WKP may wish to purchase its own gas directly from producers and may be able to effect savings compared to the Inland price. However, in a tight, rising price market the gas utility may be able to purchase gas at prices which are better than those offered to industrial consumers. Moreover, in a decontrolled gas price market the use of natural gas during peak periods could command a premium price from producers to reflect the peaking commitment being offered. In such a situation WKP could find itself vulnerable to increased gas prices.

In cross-examination of Inland it was found that even that gas utility has no corporate forecast of future gas prices. However, the future price of natural gas is one of the critical factors in the determination of whether to grant an Energy Project Certificate for the Oliver gas turbine. From the evidence presented at the hearing the only recent, thorough and complete forecast available is that undertaken by the NEB. In looking at the low and high forecasts presented by the NEB the Commission is aware that the principal difference between the two forecasts relates to the forecast of oil prices. In the high price forecast it is expected that oil prices will move up substantially so that the existing "streaming" differential of gas prices will be eliminated. The elimination of the differential between the lower gas prices offered industrial consumers and the higher prices offered to residential consumers may not occur to the extent forecast by the NEB in its high gas price forecast. Existing pricing in British Columbia reflects the load factor characteristics of the consumers so that large industrial complexes which can operate at efficiencies greater than 80% can negotiate direct sales for gas at substantial discounts. The differential between residential and industrial prices is very large at present and may in fact narrow during the upcoming years.

The Commission has also observed how the natural gas volumes have firmed up dramatically in the last few months. Also, the announcement of very substantial increases in capacity on the major natural gas pipelines in Canada will allow for the greater exports of natural gas as forecast by the NEB. All indications are that the large increases in exports which are the bases of the strong price increases in the NEB forecast will come to fruition thereby escalating natural gas prices. The Commission therefore, in its evaluation of the most probable scenario, adopts a middle of the road attitude to the two forecasts prepared by the NEB and adopts the average of the escalation.

5.1.4 Other Costs

The environmental concerns which became a highly debated issue in the hearings, have been determined to be a potential source of additional costs. Apart from the extra cost associated with water injection equipment as mentioned previously, there would be the recurring cost of an on-site operator to monitor and manage the water injection/water treatment system.

Regarding the monitoring of air emissions, the installation, reading and maintenance of air emission monitoring equipment and air quality monitoring stations could be a requirement of the Pollution Control Branch (Ministry of Environment).

Another item not proposed by WKP nor incorporated in its cost estimate would be the cost associated with installation of additional noise suppression equipment. There is also the potential for added costs if structural or other site preparation problems are encountered.

5.1.5 <u>Benefit/Cost Assessment</u>

Cost/Benefit Framework

The Terms of Reference provided the Commission under the heading "2(1) PROJECT JUSTIFICATION", states: "The Commission shall review and assess whether the Project is the preferred new resource to meet forecast load growth given cost, operating conditions, reliability, and safety considerations." Under the heading, "2(3) RESOURCE OPTIONS" the Commission is required to review the Applicant's "1987 Resource Study Supply and Demand Options" and assess the impact of various options on rates. In "3(2) COST OF SERVICE AND RATE IMPACTS" the Commission is required to examine the components of the cost of service and the rate impact of the gas turbine generation plant.

The "preferred new resource" question can be asked from a Provincial perspective or from the perspective of the Applicant's service area. At p. 186 of the transcript a senior executive of the Applicant agreed that from the provincial perspective, the gas turbine may not be needed. If so, it could therefore be considered an inefficient allocation of Provincial resources. At Transcript p. 3450, it was argued by an Intervenor that the contents of the March 24, 1988 letter from B.C. Hydro (Exhibit 12, Part B, Tab 1) make it clear that, from the perspective of B.C. Hydro, the gas turbine is a redundant and unnecessary investment. B.C. Hydro stated:

"In the future if WKPL's rates exceed B.C. Hydro's and it becomes desirable from a Provincial point of view for B.C. Hydro to offer service to WKPL's customers in the Okanagan and Similkameen Valleys at B.C. Hydro rates, B.C. Hydro would reimburse WKPL for the book value of its transmission and distribution plant involved in service to those customers. However, B.C. Hydro would not be prepared to assume the cost of any investment by WKPL in gas facilities in the Okanagan as B.C. Hydro would consider such turbines to be unnecessary and redundant for service of customers in the Okanagan by B.C. Hydro."

A cost/benefit analysis conducted within the context of the Applicant's demand/supply options is, however, necessary to identify the "preferred project" as long as the Applicant's service area is deemed separate and distinguishable from B.C. Hydro's.

In the Applicant's Resource study, (Exhibit 6) on pp. 64 and 65 is presented a summary of the results of its economic analysis of both supply and demandside alternative resources. Although some of the details were amended during the course of the hearing, the ranking and orders of magnitude remained unchanged. The Applicant tested the present value of future revenue requirements under each of the supply-side alternatives by comparison with continued reliance upon B.C. Hydro for the particular amounts of capacity and energy. The present value of the B.C. Hydro purchases avoided, and the present value of postponement of the Vaseux Lake substation, constituted the

benefits. The Applicant's economic evaluation model annualized the capital cost as well as the associated financial costs, including income taxes. Capital, financial and operating costs by year, in nominal amounts, were discounted by 12% to reflect the time value of money. Similarly, benefits were quantified and discounted.

A reconditioned gas turbine of 140 MW located in the Okanagan Valley ranked first, at a benefit/cost ratio of 1.43, in the Applicant's economic evaluation (Table 2.1.3). The second ranking alternative, "Port Mann Gas Turbines", at a benefit/cost ratio of 1.18 would eliminate the deferral of the Vaseux Lake Substation in view of the generating station's Lower Mainland location. All other supply-side options had benefit/cost ratios less than unity.

Section 4.5 of this Decision considers the "Demand-Side Alternatives" issue. The Applicant has identified both residential weatherization and water heater control as economically justified. The weatherization alternative is measured at a 5.7 benefit/cost ratio and the water heater control at 1.2. The Applicant has indicated its intention to proceed with these and other demand-side alternatives that prove to be economic, in parallel with its supply-side solutions.

In making its analysis, the Applicant chose the "Present Value of Revenue Requirements" approach because, in its opinion, this represented the "bottom line" effect upon customers as far as a regulated utility is concerned. Nevertheless, at Transcript Volume 5, p. 871, (paragraph 1), the Applicant agreed that a more conventional approach to economic evaluation of capital investments by a company would be to compare the discounted cash flow, or present value, of the capital cost with the present value of future operating costs and benefits. This approach is portrayed graphically in Exhibits 19A and 19B. This approach would reflect more appropriately the time value of money as well as the inherent uncertainty associated with any future events. The project that has the highest net present value would be the preferred project.

In its amended base case for the Oliver Gas Turbine Project (Exhibit 109), the Applicant presented results of both approaches. The discounted cash flow approach resulted in a higher net benefit because of the use of a 12% mid-point discount rate exclusive of income tax. The difference between the methods of calculating benefit/cost from present value of revenue requirements and benefit/cost by more conventional methods are minor for 12% discount rate.

The Commission is satisfied, in this particular application, that the choice of approach would not change the ranking of the supply-side alternatives because the third and all subsequent ranking alternatives, fail the revenue requirements approach and require significantly higher capital investment than the Oliver Gas Turbine alternative.

The Applicant's Base Case Economic Evaluation of the Oliver Gas Turbines

In Exhibit 109 the Applicant presented an amended "Base Case" economic evaluation of the proposed project over the 20-year test period, 1989-2008. The present value, at 12% discount rate, of the net savings in revenue requirements was measured at \$27 million. On a discounted cash flow basis, excluding income taxes, the net present value, at 12% discount rate, was measured at \$34 million.

The Applicant's base case is predicated upon the following assumptions:

- 1. 1989 gas prices as per the Letter of Intent with Inland (Exhibit 98).
- 2. Gas price escalation from 1989 to 1992 per the Ministry of Energy, Mines and Petroleum Resources document - <u>Update 1987 - 1992</u> British Columbia Energy Supply and Requirements Forecast. Escalation from 1993 per the August 1986 Ministry document -1984-2005 British Columbia Energy Supply and Requirements Forecast. A significant change between the two forecasts was the 21% increase in industrial price for gas in 1992 in the 1987 Update.

- 3. Capital cost is assumed to be \$36 million. This cost includes a water injection system at \$2.3 million and a contingency of \$3.3 million.
- 4. The heat rate of the turbines is assumed to be 12,000 BTU per kW.h, when used for peaking purposes.
- 5. Non-firm electricity supply from Cominco will not be available thirty percent of the time. The gas turbine will be operated to substitute at the lowest (summer) rate for interruptible gas supply.
- 6. Non-firm electricity purchases from sources other than Cominco are assumed to be at 17.52 mills per kW.h at this time and are escalated at the same rate as gas prices per Item 2 above. Fifty percent of the time the non-firm electricity will be unavailable. The gas turbine will be run to substitute and will do so on the lowest (summer) rate for interruptible gas supply.

The 17.52 mills per kW.h 1988 export price for electricity from "Others" is assumed by the Applicant in its Base Case (Exhibit 109), to escalate at the same rate as natural gas.

- 7. Operating and maintenance costs are assumed to be \$270,000 per year, an increase of \$120,000 per year to cover the cost of operating the water injection system and to cover operating and maintenance expenses associated with operation to back-up non-firm electricity purchases.
- 8. Price escalation on B.C. Hydro prices has been assumed at inflation less 1% compounding annually.
- 9. When operating for peaking purposes, the gas turbine would function 95% of the time on gas and 5% on oil. Eighty percent of the gas would be purchased at the most expensive "Tier 1" rate for interruptible supply.

The Commission has utilized the assumptions contained in Item 6 above in all of the alternate benefit/cost scenarios appearing in Table 5.1.

The Applicant included a sensitivity analysis that tested the present value of the revenue requirements by varying the gas price escalation and the B.C. Hydro price escalation. Modifying the B.C. Hydro escalation to 3.5% for 1989, 1990; 0% for 1991 and 1992; then at inflation, resulted in an increase of revenue requirements of roughly \$3 million. Modifying the gas price escalation to the NEB Low case, (Exhibit 99, p. 221), increases revenue requirements a

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further \$11 million and if the NEB High case is used, revenue requirements increase still further until only \$1 million in savings remain.

The Commission generally concurs with the Applicant's base case assumptions except the gas price escalation and the B.C. Hydro price escalation.

Alternative Economic Evaluations of the Oliver Gas Turbines

Table 5.1 (p. 47) depicts the sensitivity of the conclusions to alternative input energy prices. Supporting calculations are provided in Appendix 5.

Based on the evidence presented, the Commission has considered various electricity and natural gas pricing scenarios and their impact on the Applicant's Base Case, with the following results:

- "Most Favourable" assumes B.C. Hydro prices escalating at inflation, natural gas prices at lowest '86 MEMPR; results in a positive net present value of the Gas Turbine Project approximating \$55 million, and a benefit/cost ratio of 1.44.
- "Pessimistic" assumes B.C. Hydro prices escalating at 0% to 1994, inflation thereafter, natural gas prices per NEB high range forecast results in negative net present value of the Gas Turbine Project of \$43 million, and a 0.77 benefit/cost ratio.
- "Most Probable" assumes B.C. Hydro prices escalating at 3.5% (representing a net present value cost of \$9 million), natural gas prices escalating at NEB average (representing a net present value cost of \$31 million); results in a negative net present value of the Gas Turbine Project of \$8 million and a 0.95 benefit/cost ratio.

To illustrate the sensitivity of natural gas price escalation it is necessary to realize that such escalation rate is also applied to the supply of "non-firm electricity from others." Employing the NEB low natural gas escalation in the "Most Probable" case would result in a \$9 million positive net present value of the Gas Turbine Project. This large impact underscores the importance to the Gas Turbine Project of "non-firm electricity purchases from others". The price

TABLE 5.1SENSITIVITY ANALYSIS OF NET PRESENT VALUES

		KEY ASSUMPTIONS	DISCOL CASH F	JNTED FLOW 12%	REVENU REQUIREN PV at	ie /ei 12
			<u>Benefit</u>	B/C	Benefit	Ē
			\$M	Ratio	\$M	F
APPL 1.	Base Case (Exhibit 109)	B.C. Hydro at Inflation less -1% Gas Price at '86/'87 MEMPR	\$34	1.26	\$27	
2.1	Base Case - Revised	As above, but Tier 1 Gas Reduced by 31¢	\$32	1.24	\$25	
2.2	Cominco at 90%	As above, but Cominco Non-firm 90%, Gas 10%	\$35	1.27	\$28	
2.3	Cominco at 50%	As above, but Cominco Non-firm 50%, Gas 50%	\$28	1.21	\$22	
СОМ	MISSION CASES	,			·	
1.	Most Favourable	B.C. Hydo prices @ Inflatio Lowest Gas Prices '86 MEMP	n R \$55	1.44	\$49	
2.1	Most Probable	B.C. Hydro at 3.5% Escalat Gas Prices at NEB Average	tion e (\$8)	0.95	(\$15)	
2.2	Cominco at 90%	As above, but Cominco Non-firm 90%, Gas 10%	(\$3)	0.98	(\$10)	
2.3	Cominco at 50%	As above, but Cominco Non-firm 50%, Gas 50%	(\$14)	0.92	(\$21)	
J.	ressimistic	Gas Price at NEB High	(\$43)	0.77	(\$49)	
4.	MUST PESSITIISTIC	Use Oil 100% for Gas	(\$203)	0.41	(\$210)

Notes:

- All of the above cases escalate the blended non-firm prices: Others 50%, and Gas 50%, at the escalation rate for natural gas (per Applicant's Base Case Treatment - assumption item 6, page 45).
- (2) Motor Fuel Tax ("MFT") at 7% has been added on gas consumption, where applicable, except for the Applicant's Case 1 Base Case.
- (3) Tier 1 Gas price is reduced by 31¢/GJ where applicable, except for the Applicant's Case 1 Base Case.

of such purchases is most difficult to forecast due to the market forces that will exist at the time of such purchases.

Net Present Value of the B.C. Hydro "Special Offer" for 1989 to 1992

During 1988, B.C. Hydro offered the Applicant a short-run special price on its supply of West Kootenay Power's needs. The Applicant measured, (Exhibit 30), the present value of the saving in revenue requirements as almost \$2.0 million.

Conclusions

The Commission concludes on the basis of the evidence that it is likely that the gas turbine net benefit to the Applicant and its customers will be significantly lower than the Applicant has estimated. How much lower, depends mainly upon future trends of natural gas prices and B.C. Hydro pricing. The Commission's most probable scenario indicates a net present value loss of \$8 million and a benefit/cost ratio below unity (see Table 5.1).

5.1.6 Financial, Rate Impact and Risk Assessment

Business Risks of the Proposed Gas Turbine

The \$36 million capital cost of the gas turbines represents an increase in Rate Base of approximately 28% over the 1987 level. The gas turbine investment would also represent a change in the structure of the Applicant's business. The semi-variable operating expense represented by B.C. Hydro power purchases would be reduced in exchange for the fixed expenses of interest, return on equity, depreciation and preventative maintenance plus the variable fuel costs associated with operation of the gas turbines. Trading variable costs for fixed costs increases the operating leverage of the utility.

The Applicant presented the components of the financing method it proposes for the gas turbine project at Exhibit 5, Appendix 4, p. 1. The Applicant was examined upon these assumptions at Transcript Volume 1.

In summary that evidence is:

- 1. A Capital Structure of 55% debt and 45% equity will be employed.
- 2. Interest Rate on long-term debt of 11%; Return on Equity 14% (after income taxes).
- 3. Allowance for funds used during construction (AFUDC) rate set at 10%.

The Applicant testified that the debt would be in Canadian dollars, and that its parent company, Utilicorp would guarantee the obligation. The return on equity is roughly the mid-point between the upper end of the range allowed in the 1987 rate case and the amount applied for in the 1989 rate case. The Applicant stated that the equity will be in the form of reinvested earnings by the existing shareholder.

The Applicant testified that by deferring collection of interest and return on equity until the project goes into service, an erosion of interest coverage will result. However, this would not be a serious problem provided the deferment is of short-run duration. The financial witness for the Applicant stated that the interest coverage ratio required by its current debenture holders is a minimum of 1.75 and at worst, the forecast coverage would fall to 2.3 during the construction of the gas turbine project. The witness went on to say that even if interest rates doubled, they would still meet their financial constraints (Transcript Volume 1, p. 122, paragraph 2).

The Commission is satisfied that the financial assumptions used by the Applicant are not unreasonable for the purposes of this assessment.

50 Rate Implications

The Applicant contended that, over the life of the project, based on its calculations, the gas turbines would result in lower rates than would be the case with B.C. Hydro supplying the same amount of pw er. However, the Applicant also was clear on the pi nt that, during the initial years, the gas turbines would result in higher rates than the B.C. Hydro alternative. The benefit/cost analysis, on a year by year basis, indicates that regardless of the alternative, rate increases are anticipated.

If the gas turbine project is to proceed, it is essential that the Commission have reasonable assurance that the predicted level of benefits will in fact flow through to WKP's customers since, once the project is approved, its costs (provided they are prudently incurred) will inevitably become part of the utility's rate base.

The most practical way to ensure an equitable outcome for both consumer and shareholder is for the Commission to apply a suitably conservative test in assessing the probability of consumer rate benefits actually being achieved. The most significant test variable is the long-term price to be paid for gas fuel to operate the turbines.

51 6.0 ENVIRONMENTAL CONSIDERATIONS

Section 2(2) of the Terms of Reference directed the Commission to:

". . . review and assess any detrimental environmental impacts associated with a gas turbine generation plant, and identify mitigation proposals that would reduce environmental impacts to an acceptable level."

Specifically, Section 3(4) "Environmental Impact" identified the scope of the environmental review as follows:

"For each site examined pursuant to section 3(1), the Commission shall review and assess predicted air emissions, the environment's capability to disperse the emissions, and proposals to mitigate detrimental impacts on the environment. The Commission shall also consider and recommend whether approvals under the Waste Management Act for emissions to the environment should be issued.

The Commission shall review and assess the levels of noise emitted by the Project and the Applicant's proposals for noise attenuation.

For each site examined pursuant to section 3(1), the Commission may review and assess other environmental matters deemed by the Commission to be relevant."

This section summarizes the Commission's findings concerning potential environmental impacts of the proposed Gas Turbine project. One of the important issues associated with this project is the effects of turbine exhaust emissions on air quality. As a result, there was considerable liaison with representatives of the B.C. Ministry of Environment ("BCMOE"), Waste Management Branch during the course of the environmental review.

Specific concerns raised by intervenors during the hearing have been addressed in Appendices 3 and 4.

6.1 Environmental Setting

A description of the environmental setting of the project area was prepared by Norecol Environmental Consultants Ltd. <u>et al.</u> (1988) ("Norecol") for WKP. The proposed gas turbine facility would be located on a 5.6 ha site in the Oliver Industrial Park at the southeast boundary of the Village of Oliver. This site is on a floodplain adjacent to the Okanagan River in an area that is zoned heavy industrial.

6.1.1 Aquatic Resources and Water Quality

The Oliver area is part of the Okanagan River Basin in the south central plateau region of B.C. The proposed site is between Vaseux and Osoyoos lakes adjacent to a portion of the Okanagan River that is channelled and dyked for flood control. The Okanagan River flows south and enters the Columbia River in the State of Washington.

Information presented in the Norecol report suggests that this portion of the Okanagan Basin provides important habitat for kokanee, rainbow trout and bass. Spawning habitat for kokanee, rainbow trout and particularly sockeye salmon from the Columbia exists within the Okanagan River between Vaseux and Osoyoos lakes. The former waterbody also supports resident populations of smallmouth bass and rainbow trout, is a rearing area for juvenile sockeye, and is stocked with large and smallmouth bass, black crappie and perch by the BCMOE. Bass are found in two smaller lakes in the region (Deadman and Tugulnuit).

Water quality information presented by WKP's environmental consultants focussed on those parameters that could be directly or indirectly influenced by the turbine exhaust emissions (sulphur dioxide and nitrogen oxides), particularly through acid inputs to local waterbodies. These parameters included pH, sulphates, calcium, alkalinity, nitrogen and phosphorus compounds, and metals.

Environment Canada and the BCMOE have collected water quality data at sampling stations in the Okanagan River Basin. The Environment Canada study indicated considerable spatial and seasonal variability in concentrations of nitrogen and phosphorus compounds (nutrients). This was attributed to inputs of agricultural drainage water and effluent from the Penticton waste treatment plant, and differences in the discharge of the river. Research conducted by the Province indicated that the Okanagan River and Skaha and Osoyoos lakes all have an alkaline pH and high alkalinity and calcium levels. Skaha and Osoyoos lakes were predicted to have a low sensitivity to acid inputs. Such criteria do not exist for flowing waters, but WKP's consultants concluded that the Okanagan River would also be insensitive to acid inputs given the alkalinity and calcium levels recorded over the past decade. Metal concentrations measured in this watershed by BCMOE were compared to federal and provincial guidelines for drinking water, livestock watering and protection of aquatic life by Norecol. Most metal levels were within these established guidelines.

Norecol concluded that, based on alkalinity and calcium levels, overall buffering capacity of the Okanagan/Similkameen watershed was high, and suggested that "the river has sufficient carbonates and hydroxides to neutralize most acidic inputs."

6.1.2 <u>Soils</u>

The environmental description prepared by Norecol for WKP summarized available information on soils both on the site of the proposed facility and within the region surrounding Oliver. On-site soil investigations were completed by Golder Associates (Exhibit 42), while soil maps of the general area were available from the BCMOE.

The soils on the floodplain where the facility is proposed, consist of imperfectly to poorly-drained, fine-textured fluvial deposits overlying fluvial sands and gravels. Granular fill (containing various proportions of silt, sand

and gravel) is also present on parts of the property. The Norecol report stated that this fill contains "pieces of wood, brick, asphalt and pockets of sawdust/wood chips." In test pits drilled on the side, Golder Associates found moderate to heavy groundwater seepage from 0.9 m to 0.3 m below the existing ground surface. After the water table was allowed to stabilize for a few hours, standing groundwater was located 0.5 m to 0.2 m from the ground surface. However, this level would vary seasonally.

Dominant soils throughout the Okanagan Valley vary with elevation and were described in detail in the Applicant's environmental report. Soils are generally alkaline except in some cultivated areas (e.g., apple orchards) where fertilizers have been applied on a regular basis. There is limited leaching of nutrients from most soils in the region. Base saturations vary between 80 and 100% in surface layers and are 100% deeper within the soil.

6.1.3 <u>Vegetation</u>

Agricultural crops and rural/residential land uses have replaced much of the natural vegetation along the valley bottom in this region (see Section 6.1.5). However, natural vegetation generally predominates at elevations above 425 m. Information in the Norecol Report on natural vegetation communities was obtained through discussions with the B.C. Ministry of Forests.

The valley bottom location of the proposed site is within the bunchgrass biogeoclimatic zone. The dominant plant species are knapweed, brome grass and foxtail barley.

Norecol provided a description of the most abundant vegetation species found in each biogeoclimatic zone represented in this region of the province, including species typical of dry and moist sites in each zone. The five biogeoclimatic zones and their elevation range are shown below:

55		
	BIOGEOCLIMA 7200NE	
RAN	GE	

Ponderosa Pine-Bunchgrass (PPBG)

SubalpinEnglemaßpruce-SubalpinFeir(ESSF)

Bunchgrass (BG)

Interior Douglas Fir (IDF)

Montane Spruce (MS)

ELEVATION

up to 600 m 600 - 1060 m 1060 - 1500 m 1500 - 1600 m greater than

1600 m

6.1.4 <u>Wildlife</u>

Over 100 species of wildlife inhabit the rangelands within the southern Okanagan Valley. These include big game animals, furbearers, waterfowl and upland game birds. Big game species include mule and white-tailed deer and a widespread population of moose, while mountain goats and bighorn sheep are found in specific locations. Populations of large predators such as black bears and cougars are also found throughout the region. Other local predators and furbearers include coyote, marten, lynx, beaver, muskrat, mink, squirrel, weasel and skunk. Populations of waterfowl and upland bird species are also present in the southern Okanagan Valley.

6.1.5 Agricultural Land Use

Intensive agricultural use of land occurs within the Okanagan region, but tends to be restricted to the valley bottoms and up to an elevation of 425 m. Grazing and forest lands occur on both sides of the valley at higher elevations. Throughout the south Okanagan and Similkameen valleys, tree fruit production, vineyards, forage crops, grazing and market gardens are the predominant agricultural land uses. Near Oliver, tree fruit production is the primary agricultural land use. Mixed tree fruit crops include pears, peaches, cherries, apricots, plums and apples.

Norecol reported that the Similkameen Valley, the Keremeos Valley north of Keremeos and the Okanagan Valley from the U.S. border to Skaha Lake all lie within a 25-km radius of the proposed turbine site. Approximately 7%

(14,000 ha) of this 196,000 ha area is used for agriculture. Two-thirds of this amount supports cattle grazing and forage production, while the remaining third is used for tree fruit production, vineyards and row crops.

6.1.6 Recreational Land Use

The Okanagan Valley is one of the most important recreational areas in the province. Virtually all waterbodies in the region are used for recreational activities and many local, regional and provincial parks are located in the region. Five provincial parks occur within 20 km of the Oliver Industrial Park.

6.1.7 Residential Land Use

The proposed site of the gas turbine is located within the Village of Oliver, which has a population of 4,273 (1986 Census). Norecol estimated that about 16,700 persons live within a 25-km radius of the Oliver Industrial Park. Single-family dwellings, rural holdings and several trailer parks are the predominant residential land uses in the region.

6.1.8 <u>Other Land Uses</u>

There are several other land uses within a 25-km radius of the proposed facility. These include sand and gravel extraction operations, the Silver Horn mining property in the Similkameen Valley, and various transportation and communication systems such as highways and the airstrip in Oliver. The region supports a limited number of industrial and commercial operations such as fruit packing and storage plants, recreational vehicle fabrication, hotels and motels, shopping areas, and camp grounds. The Dominion Radio Astrophysical Observatory is located near White Lake and Mount Kobau is an area of international reputation as an astronomical observatory site.

6.2 Environmental Assessment

There are four primary areas of environment concern associated with construction and operation of the proposed gas turbine in Oliver, B.C. These are:

- 1. the effects of noise produced by the facility;
- 2. the dispersion and effects of exhaust emissions from the gas turbines;
- 3. concerns related to the stability of the proposed site itself; and
- 4. the risk and potential effects of fuel oil spills.

Each of these issues is discussed separately in the following sections.

6.2.1 Noise

An assessment of the impacts of noise produced by the proposed facilities was conducted on behalf of the Applicant by Barron Kennedy Lyzun & Associates Ltd. The primary noise sources will be the air inlets and the exhaust stacks of the four Pratt & Whitney type FT4-C3F jet engines. Both inlets and exhaust stacks will be fitted with silencer modules. Other paths of noise production will be the walls of the engine and turbine enclosure and the generator room, but these sources are minor compared to noise from the exhaust and inlet stacks. Prospective suppliers of the turbines are prepared to guarantee a maximum sound pressure level of 60 dBA for the combined operation of two Twin Pacs (i.e. four jet engines) at a distance of 122 m (400 feet) from the structure perimeter. Noise measurements taken by WKP's acoustical consultant at the Baysboro Gas Turbine Plant in St. Petersberg, Florida, suggest that this guarantee can be achieved with the silencing technology currently proposed.

Assessment of the spatial distribution and impacts of noise from the proposed facility was based on the assumption that the guaranteed level of 60 dBA at 122 m would be met. Daytime and night-time noise measurements were taken at five locations in Oliver to characterize existing ambient noise levels. Ten-minute average daytime noise levels ranged from 44 to 63 dBA, whereas average noise levels at night varied from 39 to 57 dBA. The two dominant noise sources in the community were traffic on Highway 97 and the water sprinklers used day and night in summer. Because noise radiation from the plant will vary with meteorological conditions, seven thermal and wind conditions were modelled to determine noise contours. Full-power operation of both Twin-Pacs was assumed for this analysis.

The acoustical consultant used two methods to evaluate the impacts of noise produced by the gas turbine. The first involved calculation of long-term energy average levels ("Leq") under different wind and thermal regimes, and comparison of these values to guidelines established by the Canada Mortgage and Housing Corporation ("CHMC") for noise exposure at the exposed face of new residences (Leq = 55 dB). Under worst case operating scenario (24 hours/day; 12 months/year), separation distances required to satisfy the CMHC requirement varied from 175 to 275 m (depending on meteorological conditions). Even given this extremely conservative and unlikely scenario, no impact would be predicted using CMHC criteria because the closest residences are located 300 m or more from the proposed facility.

The second assessment method involved comparison of noise levels expected from the plant with existing ambient conditions. The approach assumes that 5 dBA incremental increases in noise level above background will result in progressively greater responses, on average, from members of a human population exposed to noise. This seven-level public reaction scale ranges from "no observable complaints" (Scale 1) to "group community action completely

integrated and supported community wide . . ." (Scale 7). Generally, in the absence of psychologically or physiologically disturbing attributes (e.g., the presence of discrete tones), a noise source will be viewed as acceptable if it does not exceed ambient conditions by more than five decibels.

WKP's consultants expected that noise from the plant would be judged acceptable in all residential areas if it did not exceed 50 dBA at the receiver during daytime operations and 45 dBA at night (10:00 p.m. to 7:00 a.m.). Two scenarios were assessed: (1) WKP's originally proposed operational scenario of the units, which was subsequently changed to involve a greater number of operational hours per year; and (2) a worst case scenario assuming full-time operation of all four units. Given the present proposal for operation of the turbines, the former would tend to underestimate impacts, while the latter would overestimate impacts. Separation distances necessary to satisfy the 50 dBA daytime criterion for the originallyproposed operational scenario were expected to range from 250 m to 550 m depending on ambient meteorological conditions. For the full-time operational scenario, the separation distances required to achieve the 45 dBA night-time criterion were predicted to range from 350 to 1350 m depending on ambient conditions.

For the originally-proposed operating scenario, WKP estimated the number of residences which could be exposed to noise levels sufficient to cause complaints under various prevailing meteorological conditions. Two residences could be subjected to noise capable of eliciting "a few spontaneous complaints" under lapse conditions (76% of the time in winter months) with the original operational scenario. This number could increase to six residences under neutral wind conditions (10% of the time) and 12 residences under thermal inversion conditions (14% of the time). This assumes the ambient noise level at these residences is not over 45 dBA. The impact would be less when only one or two of the turbines were operating.

The worst case, full-time operating scenario would greatly increase the impacts of noise, both in terms of the number of residences affected and the possible severity of the responses of individuals in the community. This is evident from Table 6.1 where Scale 2 represents "a few spontaneous complaints" and Scale 3 represents "sporadic spontaneous individual complaints". Again, this number of residences would not be affected if ambient night-time noise levels exceed 40 dBA, or if less than 4 turbines were operating.

TABLE 6.1

NOISE IMPACT WORST CASE - 4 TURBINES OPERATING FULL-TIME

	Percent of	Residences Affected*		
<u>Meteorological Conditions</u> <u>Total</u>	Time	Scale 2	Scale	3
Lapse Conditions	66.6	4.8	1.7	6.5
Neutral Conditions	12.2	40.0	6.4	46.4
Thermal inversion conditions	ΖΙ•Ζ	275.0	12.0	20/.0

The results of the analyses conducted by WKP's acoustical consultant suggest that some degree of impact of noise from the proposed facility is probable, although few residences are expected to be affected under most circumstances.

It should be noted that there are no existing regulations to prevent the proposed industrially-zoned turbine site from being used by a non-regulated industry generating higher noise levels than the proposed gas turbines.

* Scale 2 Response - 5 dBA above background level Scale 3 Response - 10 dBA above background level

The Commission concludes that the impact of noise is not a significant health concern, but will be viewed as a source of irritation and annoyance by some residents in Oliver. Under predominant meteorological conditions, most residents of Oliver are unlikely to be bothered by noise from the turbines. However, under thermal inversion conditions, a significant number of residents will almost certainly be exposed to potentially-annoying noise levels under any operating conditions.

Most of the time, when less than four units are operating, and no inversion conditions exist, only 2 to 3 residences would be exposed to noise levels that may result in "spontaneous complaints". However, a larger number of residences could be exposed to such noise levels under thermal inversion and neutral conditions (Table 6.1). If the Application is approved, WKP should establish a mechanism to resolve potential conflicts and complaints through open discussion of concerns and remedial measures (e.g., natural sound barriers) when and where practical.

The Commission believes similarly that the Applicant must assure that noise levels will not exceed the guaranteed 60 dBA at 122 m and that significant discrete tones will not be produced by the turbines either during normal operation or when they are started and stopped. This can be determined satisfactorily by full-spectrum noise analysis of the plant prior to completion of the sales acceptance agreement with the selected turbine supplier.

6.2.2 Air Emissions

The potential effects of NO_X and SO_2 emissions from the proposed turbines on local air quality, soils (through deposition of nitrates and sulphates), vegetation and human health were contentious areas of environmental concern related to this project proposal. Assessment of the impacts of gas turbine emissions on air quality was completed by Cirrus Consultants Inc. Norecol was responsible for evaluation of the potential effects of changes in air quality on soils, vegetation, water quality, wildlife, and human health. Exhaust emissions were evaluated in the context of source emission objectives and ambient air quality guidelines developed by regulatory agencies to protect public health and the environment. Because the BCMOE did not have source emission limits for gas turbines at the time this assessment was conducted, the most relevant objectives were considered to be the "Pollution Control Objectives for Food-processing, Agriculturally Oriented, and Other Miscellaneous Industries of British Columbia (1976)." The Level A objectives shown below were used because the facility would be considered a "new discharge".

Parameter	Level A Emission Objective	Monitoring Method
Total Particulate	229 mg/m ³	Gravimetric analysis
Sulphur Dioxide (as S0 ₂)	300 ppm	Titrimetric analysis
Nitrogen Oxides (as NO_2)	600 ppm	Colorimetric analysis
Hydrocarbons (as CH_4)	150 ppm	Gas chromatography

During the public review of the WKP project, the BCMOE (Waste Management Branch) indicated that the air quality permit for this facility would require that the Applicant meet lower emission rates for NO₂ than indicated above, as Canada was expected to become a signatory to a new International Protocol (Long-Range Transboundary Air Pollution) governing emissions and transport of nitrogen oxides. The source emission levels specified by the BCMOE were 75 ppm and 150 ppm of NO₂ for natural gas and oil-fired operation of the turbine, respectively. In order to achieve these new objectives, the gas turbine will have to be equipped with a water injection system or other emission control equipment to reduce NO_X emission levels. The detailed air quality assessment completed for WKP and presented in the Norecol report did not assume that water injection or other comparable NO_X abatement technology would be necessary. As a result, source emission levels described in the report do not reflect the need to meet these new objectives. Table 6.2, summarized

from Exhibit 9, shows expected emission levels under base and peak load operating conditions of the turbines using natural gas or fuel oil containing either 0.02% or 0.07% sulphur content.

TABLE 6.2

SOURCE EMISSIONS OF THE WKP GAS TURBINE PROJECT UNDER VARIOUS OPERATING CONDITIONS

(Based on 15% oxygen method and data provided by Energy Systems Inc.)

Fuel	Load	NO ₂ (ppm)	Hyd SO ₂ (ppm) C	rocarbons H ₄ (ppm)	Particulate (mg/m3)
Natural Gas	Base	145	0	7	N/A
Natural Gas	Peak	155	0	6	N/A
Oil - 0.02% S	Base	203	4	4	55
0il - 0.02% S	Peak	217	4	3	55
Oil - 0.07% S	Base	203	11	4	55
Oil - 0.07% S	Peak	217	13	3	55

These data indicate that emission levels of NO₂, SO₂, hydrocarbons (as methane) and particulate are all less than the previously described Level A Provincial Objectives. They also indicate, however, that NO₂ emission levels would not meet the new guidelines expected to be applied to the WKP project permit by the Waste Management Branch. During the hearing, the Applicant stated that it would install the water injection equipment necessary to reduce NO₂ emissions to the 75 ppm required by the Branch when the plant is operating on natural gas. Because of concerns related to NO_X emissions, WKP also committed to surpassing the 150 ppm guideline when the plant is operated on fuel oil. It was anticipated that source emissions could be reduced to 111 ppm by using the same amount of water in the injection process with oil as required to bring emissions to 75 ppm with gas.

WKP's consultants also examined emissions of the gas turbine in relation to ambient air quality guidelines developed by the BCMOE and Environment Canada to protect public health and the environment. Following discussions with BCMOE personnel, a combination of both provincial and federal ambient air quality guidelines was used for the assessment. The source of the provincial (SO₂) and federal (NO₂) guidelines were the "Pollution Control Objectives for the Food-Processing, Agriculturally Oriented, and Other Miscellaneous Industries of British Columbia" (Table 3, 1976) and the National Ambient Air Quality Objectives (Federal Clean Air Act), respectively. Table 6.3 summarizes ambient air quality objectives for SO₂, NO₂, oxidants (ozone), and total suspended particulate matter:

TABLE 6.3

AMBIENT AIR QUALITY OBJECTIVES

 $(\text{Units} = \text{ug/m}^3)$

	Time	Fee	deral Obj	ectives	Provinc	cial Obje	ectives
<u>Contaminant</u>	Base	Desire.	Accept.	<u>Toler.</u>	A	<u> </u>	C
Sulphur Dioxide	1 h	450	900	_	450	900	_
	3 h	_	-	_	375	665	-
	24 h	150	300	800	160	260	-
	1 yr	30	60	-	25	75	-
Nitrogen Dioxide	1 h	-	400	1000	_	_	_
	24 h	_	200	300	_	_	-
	1 yr	60	100	-	-	-	-
Oxidants/Ozone	1 h	100	160	300	_	_	_
	24 h	30	50		_	_	-
	1 yr	20	30	-	-	-	-
Total Suspended	24 h	-	120	_	150	200	260
Particulate	1 yr	60	70	-	60	70	75

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Ambient levels of NO_{X} and SO_{2} were predicted for different operating scenarios with natural gas and fuel oil using a Rough Terrain Dispersion Model (RTDM) developed by the U.S. Environmental Protection Agency, and then compared to the above ambient air quality objectives. A number of assumptions were necessary to undertake this modelling in the absence of site-specific air quality and meteorological data. Many intervenors and the Waste Management Branch disagreed with some or many of the assumptions made in the prediction of changes in ambient air guality. The Commission emphasizes that such disagreements could be avoided if, as part of its Application, the Applicant was required to conduct its assessment according to criteria and guidelines established by the BCMOE or other permitting agencies. This would not preclude the Applicant from undertaking additional studies which it believes to have merit. While changes in some assumptions would have increased estimated ambient concentrations of contaminants, others would have decreased these concentration estimates. The Commission anticipates that further modelling will occur to ensure that BCMOE is satisfied that adverse air quality impacts will not result from the project.

The ambient air quality levels were modelled by WKP's consultants for SO_2 , particulate, hydrocarbons and oxides of nitrogen for the WKP gas turbine facility. The following table shows predicted maximum ambient concentrations of sulphur dioxide for various time bases in comparison to guidelines established by the BCMOE.

TABLE 6.4

PREDICTED MAXIMUM AMBIENT SULPHUR DIOXIDE LEVELS <u>RESULTING FROM OPERATION OF THE GAS TURBINES</u> (Units = ug/m³)

Prediction/Guideline Value	<u>1 - h rvalue</u>	<u>24 - h rvalue</u>	<u>Annual</u>
Estimate - 0.02% S Oil	26	3.5	1
Estimate - 0.07% S Oil	92	12	3.6
BCMOE Guideline	450	160	25

It is evident from these data that estimated maximum ambient SO₂ levels are well below the Maximum Desirable guidelines established by the provincial government. In addition, both the WKP study team and the Commission have examined these predicted maximum ambient SO₂ concentrations and probable exposure durations (i.e. contaminant doses) in relation to SO₂ doses known to cause adverse impacts on vegetation and human health. It can be concluded that even maximum sulphur dioxide levels resulting from operation of the proposed gas turbine on 0.07% S content oil will not adversely affect the health of local residents. Similarly, the results of research conducted to date on the toxicity of SO₂ to a wide variety of plant species indicate that SO₂ emissions from the proposed gas turbines will not adversely affect either local or regional vegetation communities, including agricultural crops grown in the South Okanagan Valley.

The data presented in the Norecol report indicate that particulate ambient air quality levels would be well below BCMOE Level A guidelines. Under proposed and worst case operating conditions, predicted 24-hour particulate levels are 6.3 and 12 ug/m³, respectively, compared to a guideline level of 150 ug/m³. On an annual basis, estimated particulate levels are 0.98 and 1.8 ug/m³, relative to the provincial guideline of 60 ug/m³. As a result, there are no environmental concerns associated with the emission of particulate due to the combustion of natural gas or fuel oil in the turbines.

Because ambient air quality guidelines have not been established for hydrocarbons in Canada or the U.S., WKP's consultants compared predicted hydrocarbon emissions to typical background levels in Vancouver (550 ug/m^3) as a conservative assessment approach. Predicted maximum 1-hour concentrations (10 ug/m^3) were a small fraction of the Vancouver background figure and not a concern related to ambient air quality.

As indicated earlier, the detailed assessment conducted on behalf of WKP did not assume that water injection would be incorporated in the design of the gas turbine to reduce NO_X emissions. Modelling of ambient NO₂ levels with water injection was completed, but assumed the EPA source emission standard of 93 ppm NO₂ (at 15% O₂) rather than the anticipated BCMOE requirements. However, during the hearing, the air quality specialist retained by the Applicant was able to estimate the probable effect that this system and lower NO₂ source emissions would have on maximum ambient NO₂ levels predicted by the model. The following table presents a comparison of predicted maximum NO₂ levels (with and without water injection) under various operating scenarios and time scales.

TABLE 6.5

PREDICTED MAXIMUM AMBIENT NITROGEN DIOXIDE LEVELS RESULTING FROM OPERATION OF THE GAS TURBINES

(Units = ug/m^3 ; assumes background of 20 ug/m^3)

Prediction/Guideline	<u>1-hr Value</u>	24-hr Value	Annual Value
Est. Proposed Oper/Gas	131	54	20
Est. Proposed Oper/Oil	158	60	20
Est. Worst Case/Gas	155	72	28
Est. Worst Case/Oil	182	79	29
Est. WC-Gas/W-Injection *	121	63	27
Est. WC-Oil/W-Inj 150 **	157	72	28
Est. WC-Oil/W-Inj 111 ***	138	68	27
Federal Guideline	400	200	60****

- * Worst Case Values with water injection are preliminary estimates only
- ** Based on 150 ppm emission concentration as per anticipated requirement of Waste Management Branch
- *** Based on 111 ppm emission concentration anticipated when using the same amount of water required to achieve 75 ppm with gas
- **** Maximum Desirable Level; 1-hr and 24-hr are Maximum Acceptable Levels

All maximum ambient concentrations of NO₂ predicted by the Applicant are less than Maximum Acceptable or Maximum Desirable (annual) guidelines established by the Federal government. The Applicant's estimated maximum concentrations and exposure times are substantially lower than NO₂ levels and exposure times known to have adverse effects on either vegetation or human health.

Concern was expressed by some intervenors that the simultaneous presence of SO₂ and NO₂ in the airshed could cause synergistic responses that lead to greater damage to plants than would result from exposure to either contaminant by itself. Synergistic effects of SO₂ and NO₂ have been observed in several plants (e.g., soybeans, marigolds, potatoes, tomatoes, and pasture grasses), but generally at combined doses greater than are predicted to result from emissions of the proposed turbine. The risk of combined effects of these gases on natural vegetation or crops is likely to exist only: (1) at times when the turbine is operating on 0.07% S fuel oil and when meteorological conditions do not favour the rapid dispersal and dilution of exhaust gases; (2) during the active growing season (April through October); and (3) with the most sensitive plant species and/or life history/developmental stages.

Other potential impacts of the proposed facility on air quality were discussed by Norecol and are not areas of significant environmental concern based on available scientific evidence. These include:

- The production of photochemical oxidants associated with NO_X emissions such as ozone and peroxyacetyl nitrate (PAN) this is not expected to be significant because of the low release of hydrocarbon precursors required for photochemical processes; and
- The formation of ice fog on airborne particulates under extremely cold (- 28°C) conditions there has been only one observation of an extreme minimum temperature of 28°C or lower since records were maintained in Oliver (i.e. 1924).

Another environmental issue related to emissions from the proposed gas turbine was the deposition of sulphate and nitrate, leading to potential acidification of soils and waterbodies and subsequent effects on terrestrial and aquatic resources. The ADEPT computer screening model (Alberta Deposition Model) was used by WKP's consultants to predict deposition rates in the area surrounding Oliver. Soil acidification and cation-leaching are naturally- occurring processes which are offset by cation exchange so that soil pH remains relatively constant. However, as noted by Norecol, an increase in the hydrogen ion input from either acid precipitation or ammonium fertilizers accelerates the rate of these processes such that a decrease in soluble and exchangeable cations and increase in hydrogen ions will occur over time. Many of the soils in the Okanagan Valley contain high concentrations of exchangeable calcium. Soils with high calcium or other carbonates are not very susceptible to acidification because buffering by carbonates maintains the pH at a relatively constant value.

Total annual nitrate and sulphate deposition around the proposed site were estimated for proposed and worst case (continuous operation on 0.07% S fuel oil) operating scenarios. Although the proposed operating hours have increased substantially from the scenario originally modelled by the consultants, the worst case scenario can still be used to assess the potential implications of nitrate and sulphate deposition. This analysis involved: (1) rating of the dominant soil types in the area in terms of their sensitivity to acid precipitation (total exchangeable bases); (2) determination of the total deposition of nitrate and sulphate onto each soil type; and (3) calculation of the percent loss of exchangeable bases due to replacement by hydrogen ions over a 25-year period. A large number of assumptions were necessary to conduct these analyses and were described in the Norecol report. The WKP consultants concluded that estimated maximum NO3 - and SO_4 ⁻² deposition under the initially proposed operating scenario (now invalid) would be about 350 times less than that resulting from a typical ammonium fertilizer application (150 kg/ha/a).

The potential for acidification of aquatic environments due to project emissions was also examined by Norecol. Sulphate deposition is the primary cause of long-term acidification of surface waters. Pending guidelines by the Water Management Branch of the BCMOE are likely to specify that wet sulphate deposition rates not exceed 9-12 kg/ha/a to protect the most sensitive aquatic environments. Under a worst case scenario with the proposed turbine operating year-round on 0.07% S fuel oil, the predicted sulphate deposition rate is 1.4 kg/ha/a. This rate is well below the anticipated BCMOE guideline. Short-term pH decreases in waterbodies following the introduction of nitrate, which tends to accumulate in snow and is then released to surface waters in the spring, are also not expected to be a significant concern. Most waterbodies in the Okanagan region would also be relatively insensitive to acidification because of their high buffering capacity.

In considering the above, the Commission recognizes the sensitivity of the models to small changes in assumptions required as input variables. For example, stack height and the temperature of exhaust gases influence the dispersion of the plume. Similarly, there was disagreement between the Applicant and BCMOE regarding the most appropriate background NO₂ level to use in evaluation of predicted ambient NO₂ concentrations resulting from project emissions. These and other differences are set forth in Transcript pp. 3211-3226. This matter is further addressed in the Commission's Recommendations.

If the project is approved, the Commission believes that the predicted air emissions associated with the WKP Gas Turbine Project will not cause significant impacts on local air quality, soils and vegetation, water quality and aquatic resources, and human health. This conclusion assumes that the anticipated BCMOE requirement for water injection is included in the project design and that source emission levels of NO₂ are restricted to 75 ppm and 150 ppm for natural gas and fuel oil use, respectively. Notwithstanding the fact that no significant adverse impacts of air emissions are anticipated, the

Commission believes that a monitoring program should be designed and implemented by the Applicant in consultation with the BCMOE to ensure that guidelines for both source emission levels and ambient air quality are not exceeded. Further, the Commission believes that any certificate for this energy project should be conditional on WKP not using 0.07% sulphur oil during the growing season, or on WKP providing sufficient data to the BCMOE to result in the lifting of this condition.

6.2.3 <u>Site Stability</u>

The proposed gas turbine site is located on a floodplain adjacent to the Okanagan River. As a result, the property is potentially subject to flooding and to a Restrictive Covenant relating to use of floodplain areas. Diversion of an existing drainage ditch which crosses the property is also required.

The Applicant retained a geotechnical consultant who conducted a limited testing program adequate for preliminary site evaluation.

The geotechnical consultant's report recommended replacement of all loose organic silts and sands beneath proposed structures to depths as great as four metres below existing surface levels. Although not explicitly stated in the report, this work should extend to those areas under oil storage tank sites. Excavated material should be replaced with imported, compacted granular fill.

In addition, the report recommended raising the general site elevation to bring it above potential river flood levels.

With the above-mentioned precautions, and with continued evaluation by a qualified geotechnical engineer during detailed design development and construction, the Commission believes the site to be capable of development for the project proposed.

6.2.4 Fuel Oil Spills

The risk and potential effects of fuel oil spills were areas of concern identified by several intervenors during the public review of the WKP gas turbine proposal. The majority of these concerns were the result of the location of the proposed facility on a floodplain proximate to the Okanagan River, or resulted from the proposed delivery of fuel to the site by fuel trucks. The former concern was related to the potential for contamination of both ground and surface water supplies in the event of a spill, while the latter was related to the estimated five or six trucks per day that would be required during peak winter usage, and the risk of spills from the large number of fuel transfers and trips.

It is evident from the detail directed at fuel storage and spill contingency plan requirements in the environmental report prepared by Norecol, as well as WKP's commitment to prepare a thorough emergency response plan, that the Applicant is aware of the risks of oil spills and the various measures necessary to minimize such risks.
737.0 RECOMMENDATIONS

Pursuant to the Terms of Reference applicable to the WKP Application for an Energy Project Certificate to construct and operate a Gas Turbine Generating Plant in the Oliver Industrial Park, the Commission hereby makes its recommendations which are based on evidence adduced at the public hearing thereof.

7.1 Project Justification

The Commission believes that a new resource is required to meet the market requirements of West Kootenay Power. This resource may take the form of increased electric energy purchases from B.C. Hydro or new generation by WKP. In previous proceedings the Commission urged WKP to study all options for a new independent energy resource. The current Application is WKP's response.

On the basis of the evidence presented, the Commission concludes that the most appropriate independent resource would be the gas turbines proposed by the Applicant provided that a long-term gas supply contract with prices generally at or below levels escalated as described in the 1986 MEMPR "B.C. Energy Supply and Requirements Forecast" (as amended in 1987 for the years 1987 to 1992) is negotiated. Without this, the financial risks of the project, and the reduction in environmental quality which would result from it, outweigh the prospective economic benefits. In this connection the Commission is cognizant of the number of intervenors and intervenor groups who testified as to their preference for a modest WKP rate increase rather than the perceived reduction in quality of life resulting from installation of the gas turbines.

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7.0 **RECOMMENDATIONS**

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7.2 Environmental Review

The Commission has reviewed the potential adverse environmental impacts that may be associated with construction and operation of a gas turbine generation plant in Oliver, B.C. There are four primary sources of environmental concern: (1) noise generated by the turbine; (2) emissions of sulphur dioxide and nitrogen oxides and, to a lesser extent, particulates and hydrocarbons; (3) potential site instability because of the floodplain location of the proposed facility; and (4) spills of fuel oil from storage tanks or during transport of oil to the site. Air emissions and noise were the main focus of the Commission's review and public concerns expressed during the hearing. The following are the Commission's conclusions and recommendations related to each of these specific environmental issues, as well as the potential overall environmental and social impact of this project.

7.2.1 <u>Noise</u>

With regard to noise, although it would not present a health hazard, the turbine in its proposed location would clearly be a significant problem for a few residents and, under more adverse meteorological conditions, would affect a much larger number of residents. It would thereby clearly alter the quality of life currently existing in the Village of Oliver. To a large measure this problem results from the low level of background noise currently existing in this rural community. If the facility were to be located in an area with a higher background noise or, alternatively, in a non-urban setting without surrounding residences, significant noise impact would not result.

7.2.2 Air Emissions

The Commission concludes that WKP would be able to comply with source emission objectives and ambient air quality guidelines developed by regulatory agencies to protect public health and the environment. In the case of emissions of nitrogen oxides, new source emission levels of 75 ppm and 150 ppm of NO₂ are to be adopted by the BCMOE and will require the use of water injection or other emission control equipment. Existing source emission objectives for SO₂ can be met by WKP during those periods when the turbines are operated on oil with sulphur content at or below 0.07%.

Ambient air quality levels were modelled for SO₂, particulate, hydocarbons and oxides of nitrogen for the WKP gas turbine facility. Based on the evidence presented, the Commission believes plant emissions will not exceed guideline levels. However, until the Applicant's air emission modelling methodology is harmonized with that of the BCMOE the Commission is unable to recommend granting of an approval under the Waste Management Act. This is because of uncertainties associated with assumptions used during the modelling and lack of agreement between the Applicant and the BCMOE on the most appropriate methods to conduct this impact analysis. If predicted ambient concentrations of emissions derived through modelling conducted by the Applicant are realistic, then the Commission expects that the risk of significant environmental and health impacts would be extremely low. However, it is not possible to unequivocably draw this conclusion until such time as the Ministry and Applicant establish a mutually acceptable series of modelling assumptions and redo the analysis.

7.3 <u>Site Suitability</u>

The proposed gas turbine site is located on a floodplain adjacent to the Okanagan River. For this reason, it will be necessary to raise the general site elevation to bring it above river flood levels. In addition, replacement of all loose organic silts and sands beneath proposed structures with imported, compacted granular fill will be necessary to ensure site stability. The Commission concludes that the site could be capable of development for the proposed project if these precautions are taken and a qualified geotechnical engineer is retained during project design and construction.

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7.4 <u>Oil Spills</u>

Concerns related to the risk and potential effects of oil spills stem from the location of the proposed facility near ground and surface water supplies on a floodplain, as well as the need to transport oil to the site by fuel trucks. The Commission reinforces the need for the Applicant to prepare a thorough emergency response plan and take various measures necessary to minimize the risks of oil spills.

7.5 Environmental and Social Acceptability of the Project

While the Commission believes that no regionally significant environmental impacts will result from construction and operation of the proposed gas turbine power generation facility, it is expected to cause some local impacts by virtue of its location within the Village of Oliver. The most significant source of potential impact is expected to be noise, and annoyance of an unacceptably large number of residents may occur under some combined meteorological and operational conditions. In addition, air emissions are of particular concern to the Commission given that Oliver is a popular retirement community, an area of significant recreational use and an especially attractive area for people with chronic lung disorders.

When these potentials for impact of noise and air emissions are viewed in the wider context of other environmental concerns related to the stability of the site and potential contamination of surface and ground water resulting from oil spills, the Commission concludes that the Oliver Industrial Park is not a suitable or acceptable location for the proposed gas turbine facility.

For the above reasons it is the view of the Commission that if the gas turbine project is to proceed an alternative site is required.

Accordingly the Commission recommends that, subject to the long-term gas fuel contract described in paragraph 7.1, and subject to the environment-related conditions described below, the Application be approved for construction at a site more suitable than that currently proposed in the Village of Oliver.

7.5.1 Approval Conditions

- 1. WKP should specify to the supplier of the gas turbines that it not only meet a guaranteed maximum noise level of 60 dBA at 122 m, but also that the turbines must not produce discrete tones. Adherence to these guaranteed performance specifications should be confirmed by an independent acoustical specialist though a fullspectrum noise analysis prior to completion of the sales acceptance agreement with the gas turbine supplier.
- 2. A thorough emergency response plan should be prepared by WKP and reviewed by relevant government agencies prior to proceeding with operation of the facility.
- 3. WKP must meet emission standards and air quality objectives of the BCMOE and, in application for a permit under the Waste Management Act, should redo their modelling in a manner consistent with Waste Management Branch guidelines and standards.
- 4. A monitoring program should be designed in consultation with the BCMOE to ensure that guidelines for both source emission levels and ambient air quality are not exceeded.
- 5. Fuel oil containing greater than 0.02% S should not be used in the turbines during the growing season (April through October), unless WKP provides sufficient data to the BCMOE to allow lifting of this condition.

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7.5.2 Special Conditions Related to the Oliver Site

In the event that this project is approved for construction in the Oliver Industrial Park, the Commission recommends that the following additional Environmental Terms and Conditions form part of the approval:

- 1. WKP should establish a mechanism to resolve potential conflicts and complaints related to noise in the Oliver community through open discussion of concerns and possible remedial measures when and where practical.
- 2. All loose silts and sands beneath proposed structures to depths of up to 4 m below existing surface levels are to be excavated and replaced with imported, compacted granular fill.
- 3. A geotechnical consultant should be retained to examine all matters related to site stability during the detailed design and construction phases of the project.
- 4. During plant operation, when natural gas supplies are interrupted, fuel oil containing no higher than 0.02% S shall be used.
 - 7.6 <u>Resource Options</u>

The Commission concludes that the Applicant's "1987 Resource Study Supply and Demand Options" is appropriate for its purposes but that greater emphasis should be given to all of the elements outlined in the study so that implementation can occur as soon as possible.

7.7 Energy Project Certificate

If the Applicant is able to secure, in 1989, both a long-term, appropriately priced gas supply contract and a more suitable site, the project should proceed on the basis put forward by the Applicant, as amended to incorporate water injection and subject to compliance with the conditions listed in paragraph 7.5.1. In the alternative, if construction on the proposed Oliver site is approved, the additional conditions listed in paragraph 7.5.2 should also be applied.

In summary, it is clear that the gas turbine proposal, subject to compliance with the aforementioned conditions, provides the highest probability of minimizing rate impact on WKP's customers. It is possible that, once the plant is constructed, it may run only infrequently if additional interruptible power can be purchased at attractive rates. Hence it will have served its purpose by reducing the cost of new purchased resources below what they might have been without the gas turbine. From a broader provincial perspective, it could be argued that B.C. Hydro would benefit from the gas turbine by virtue of reduced demand on its resources and deferral of capital projects which in themselves are likely to impact the environment in some way.

In the alternative, if the above-described conditions cannot be met in a reasonable time period (e.g. by December 31, 1989), the preferred resource for WKP would be continued purchases from B.C. Hydro pursuant to the Terms and Conditions of the 1986 Dispute Decision.

7.9 Cost of the Proceeding

The Commission has considered its cost of the proceeding, the arguments put forward with regard to the Applicant's costs, and the costs of other participants. It is the Commission's belief, without consideration of the equities or the circumstance, that Section 133 of the Utilities Commission Act

clearly prohibits the Commission (Division) from allocating the actual costs incurred by a participant to another participant in the hearing. Similarly, it is equally clear that the Commission has the power to recover its cost from a participant, which has generally meant the Applicant.

What is not clear is whether the Commission has the power to order the recovery of the Applicant's costs from another participant in the proceeding, which participant is also a rate payer.

It would appear that an argument exists as to whether the Applicant is entitled to the opportunity to recover its costs from its rate payers on a prospective basis as part of a rate proceeding. This argument raises practical problems inasmuch as those that heard the Application may not be those that decide the allocation of such costs. This in turn will increase the cost of the rate proceeding to all participants and the only outstanding question is, by how much?

In this proceeding the Commission orders that its costs be recovered from the Applicant and these costs in turn be recovered from the rate payers over a five year period.

With regard to the Applicant's costs, received by letter dated February 20, 1989, the Commission believes additional investigation of the composition of these costs is required, with particular emphasis on the direct environmental assessment costs which amounted to approximately \$450,000 out of a total cost to-date of approximately \$1 million. These WKP costs should be placed in a deferred rate base account until the review is completed and a decision made.

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APPENDIX 1

TERMS OF REFERENCE

(To be inserted)

GLOSSARY OF TERMS

- Average Cost: Total costs of producing electricity divided by the total number of kilowatt hours produced.
- Avoided Cost: The incremental cost of electricity which, but for the purchase from an alternative facility, a utility would generate itself.
- <u>Back-up Power</u>: An alternative source of power which can be readily utilized in the event that the primary source is unavailable.
- Base Load: The minimum load in a power system over a given period of time. Base load resources run continually except for maintenance and scheduled or unscheduled outages.
- <u>Capacity</u>: The amount of electric load (in watts, kilowatts or megawatts) which a device can carry at one time. (Capacity is also used synonymously with capability).
- <u>Discount Rate</u>: The rate at which future values are reduced to comparable present value.

Firm Power (Capacity/Energy):

Interruptible

- apacity/Energy): Electric power which is intended to have assured availability at all times except for reasons beyond the control of the power producer.
- Incremental Cost: The expected change in the total costs to supply one additional unit of output.
- Interconnection: The point at which the transmission systems of two utilities are connected.

Power: Power, which by contract can be interrupted in the event of a capacity deficiency on the supplier's system.

Levelized Cost: The present value of a resource's cost (including capital, interest, and operating costs) converted into a stream of equal annual payments and divided by

<u>GLOSSARY OF TERMS</u> (continued)

- Load Factor: The ratio of average demand, in kilowatts, over a stated period of time, to the maximum demand in kilowatts occurring in that same period of time.
- Marginal Cost: The cost of serving the next increment of new load by:
 - increasing generation output or purchasing capacity deficit on a short-term basis <u>(Short-Run Marginal Cost)</u>; or
 - constructing new generation facilities or executing a long-term firm power purchase contract for the capacity shortfall <u>(Long-Run</u> <u>Marginal Cost)</u>.
- <u>Non-FirmEnergy</u>: Electric energy having limited or no assured availability (also called <u>Secondary Energy</u>).
- <u>Peak Demand</u>: The maximum demand imposed on a power system by customer usage during a specified period of time.
- <u>Present Value</u>: The worth of future returns or costs in terms of their value at the present time.
- Rate Base: The dollar value established by a regulatory agency, of a utility's plant, equipment, and intangible capital assessed as useful in serving the public.
- Rate of Return: The ratio of total earnings on a specified rate base expressed as a percentage of that base.
- <u>Surplus Energy</u>: Firm energy not required to meet the producer's load or contractual commitments.
- Wheeling:An electric operation wherein transmission facilities
of one system are used to transmit power to
another system.

SUMMARY OF NOISE CONCERNS AND RESPONSES

The most frequently expressed or significant noise concerns raised by intervenors and the public-at-large and the response of the Commission's specialist consultants related to each issue are identified below:

- <u>CONCERN</u>: Noise from the gas turbine will disturb residents within the Village of Oliver.
- RESPONSE: Disturbance of residents within 300 500 m of the Industrial Park may occur under a variety of conditions. The potential for disturbance would decrease with increased distance from the site and/or proximity to other existing noise sources such as highway traffic. Nevertheless, under some meteorological and operational conditions (e.g., during thermal inversions and when 3 or 4 turbines are operating), relatively large numbers of residents could be exposed to noise levels capable of causing some degree of annoyance.
- <u>CONCERN</u>: The turbines will emit high-pitched oscillating sounds when they are shutdown or started.
- **RESPONSE:** This phenomenon is extremely unlikely with the proposed sound-attenuating devices.
- <u>CONCERN</u>: Noise from the facility will disturb patients at the local hospital.
- RESPONSE: It is expected that noise produced by the turbines would only be detectable at this distance from the site under thermal inversion conditions and when 3 or 4 turbines are in use.
- <u>CONCERN</u>: The noise assessment did not consider the potential effects of subsonic and ultrasonic sound.
- RESPONSE: Because the sound pressure level of a gas turbine decreases at a frequency of 50 Hz (Hertz), there is no reason to expect that the proposed facility would produce significant subsonic (below 20 Hz) sound. Even if subsonic sound was produced, it would have less effects on humans than the same intensity of sonic frequencies of noise, Ultrasonic (above 20,000 Hz) sounds are very rapidly absorbed in the atmosphere and, therefore, not propagated any significant distance from the source. There is also no evidence that the proposed turbine would produce significant ultrasonic sound.

- <u>CONCERN</u>: Ground vibrations produced by the gas turbines will be detectable in adjacent areas and may affect future users of the industrial park.
- RESPONSE: Because gas turbines operate at high rotational speeds with extremely fine tolerences, vibration would not normally result from such equipment. If the turbines were even slightly out of balance, they would not operate. In addition, they would be mounted on vibration isolators and, as a result, essentially no ground vibration will occur. It is anticipated that airborne noise as opposed to ground vibration will be the primary source of impact, and that very few industrial users would be affected significantly by operation of the turbines.
- <u>CONCERN</u>: Residents located on the bluff to the east of the site will be exposed to higher noise levels than at comparable horizontal distances from the park.
- RESPONSE: It is expected that noise levels at three residences overlooking the plant (maximum angle of 8.4 degrees) would be 1-2 decibels higher than for neighbours living horizontally adjacent to the plant (at the same linear distance) because slightly more noise would be propagated vertically due to the directivity of the stack.
- <u>CONCERN</u>: The presence of significant pure (discrete) tones may increase the impacts of noise on local residents.
- RESPONSE: This concern is valid and WKP has agreed, in its Response to Commission Staff Information Request No. 3 (Volume 7, November 10, 1988, p. 72), to "require that the turbine supplier not only meets a maximum (noise) level for all equipment supplied, but also that discrete tones from the installation be controlled to ensure there is no resulting annoyance."
- <u>CONCERN</u>: Increased noise levels may occur in some areas due to phase addition of noise.
- RESPONSE: Phase addition of noise will not be a significant problem if significant discrete tones do not occur in the noise spectrum of the gas turbines.

SUMMARY OF AIR EMISSION CONCERNS AND RESPONSES

The following points summarize the most frequent or significant concerns raised prior to and during the hearing, and the response of the Commission staff and consultants to each of these issues.

<u>CONCERN</u>: WKP's consultants relied on meteorological and background air quality data available for areas other than the Oliver region.

- RESPONSE: In the absence of site-specific data, it is common and accepted practice to use data from adjacent areas in screening models. The assumptions necessary to conduct the impact analysis should be and were identified in the assessment report. Although not all intervenors and the BCMOE agreed with specific assumptions, they were explicitly stated by the Applicant. As such, independent re-analysis based on different assumptions is possible as deemed appropriate.
- <u>CONCERN</u>: Changes in air quality resulting from operation of the props ed facility will ps e a health risk to members of the local pp ulation with respiratory disorders such as asthma and cardiopulmonary impairment.
- RESPONSE: The predicted maximum ambient concentrations of NO₂ and SO₂ in the local airshed are well below thresholds known to induce adverse health symptoms in even sensitive individuals.
- <u>CONCERN</u>: Operation of the proposed facility will lead to local increases in the ambient concentration of ozone in the atmosphere.
- RESPONSE: The proposed gas turbine will not emit ozone per se. In fact, the conversion of NO to NO₂ will tend to locally decrease ozone concentrations. This will be offset to only a limited degree by photochemical production of ozone because of the low emissions of hydrocarbons from the proposed facility.
- <u>CONCERN</u>: Damage to local crops and rangelands will result from emissions associated with the project.
- RESPONSE: The ambient NO₂ and SO₂ concentrations predicted by WKP, damage to local crops and rangelands due to operation of the proposed facility is considered unlikely. Maximum doses of NO₂ and SO₂ (both singly and in combination) that are projected to result from operation of the facility are less than the majority of concentrations and exposure times known to cause vegetation damage. Predicted maximum ambient concentrations of NO₂ and SO₂ are also below

- <u>CONCERN</u>: Exhaust emissions will impair local visibility due to the presence of visible plume, increased overcast or fog, and reduced sunlight.
- RESPONSE: The exhaust gases from the turbine will have a temperature of over 400° C and a moisture content of about seven percent. Cooling of these gases by mixing will result in a moisture that will have a relative humidity of less than 100 percent, and will not result in the condensation of water droplets that causes visible emissions, fog or haze. It is possible that cooling by adiabatic expansion may cause condensation at high altitudes, but it is unlikely that this high-altitude effect will be noticeable at ground level.
- <u>CONCERN</u>: Some soils in the Okanagan Valley are already acidic because of past and ongoing fertilizer application and may be more sensitive than uncultivated soils to acid inputs resulting from project emissions.
- RESPONSE: The pH of soils in Okanagan apple orchards has declined from that in uncultivated areas because of nitrogen fertilization and herbicide application. The problem has been compounded by over-irrigation and the practice of applying fertilizer in bands near tree trunks. Incremental increases in soil acidification due to sulphate or nitrate deposition are considered unlikely at NO₂ and SO₂ emission rates and ambient concentrations predicted by the Applicant, particularly if lime is added to restore decreased soil cation exchange capacity and farm management practices changed to minimize further fertilizer-related acidification.
- <u>CONCERN</u>: The continued combustion of fossil fuels resulting in production of carbon monoxide and dioxide, as proposed in this project, will contribute to the global greenhouse effect.
- RESPONSE: The contribution of fossil fuel combustion to the greenhouse effect is a serious concern on a global scale. However, emissions resulting from this project are insignificant in comparison to other combustion sources such as automobiles and furnaces, even in a local or regional context. It cannot be disputed that projects of this nature will contribute incrementally to the global greenhouse effect, as well as to acidic precipitation.

APPENDIX 5

BACKGROUND OF INFORMATION ON SENSITIVITY ANALYSIS - TABLE 5.1

(to be inserted)

WEST KOOTENAY POWER LTD. Oliver Gas Turbine Generation Plant Energy Project Certificate

SUMMARY OF ORAL ARGUMENTS January 13, 1989

- 1. <u>G.K. Macintosh, Q.C.</u> (on behalf of the Applicant)
- (3390) (a) <u>Terms of Reference</u>

The Commission is to recommend to the Lieutenant Governor in Council ("LGIC") whether the Energy Project Certificate should be issued, and if so, subject to what conditions.

Having regard to the Terms of Reference, the Commission is to assess whether the project is the preferred new resource to meet forecast load growth.

Having regard to the Environment, the Commission is to assess any detrimental environmental impacts associated with a gas turbine generation plant, and is to identify mitigation proposals that would reduce environmental impact to an acceptable level.

- (3390- Even if there were detrimental environmental impacts, the
- 3391) Commission is not instructed to refuse a Certificate, but instead is instructed to identify mitigation proposals that would reduce them to an acceptable level.

The Commission is always to bear in mind that the Terms of Reference contemplate that some adverse environmental impact is an acceptable thing providing other aspects of the project are viable.

(3392) Political considerations and social and pl icy considerations are outside the jurisdiction of the Commission in this proceeding and should not form part of the Commission's deliberations.

If, in the view of the Commission, the project is acceptable from both an economic and environmental viewpoint, it is the duty of the Commission to recommend that a Certificate be granted.

<u>G.K. Macintosh</u> (cont'd)

(3391- (b) The Project

. 3394)

> The turbines will serve what is called a peaking function. They will enable West Kootenay to increase its capacity for meeting peak demand by 130 megawatts. The peaking function is a natural function for turbines of this design because they are easy and inexpensive to start and to operate intermittently, which makes them ideal for serving peak demand needs.

- (3394- (c) <u>Self-Reliance</u>
- (3397)

Installing these turbines will gain for West Kootenay more autonomy, and more independence from B.C. Hydro. WKP will be more self-reliant.

B.C. Hydro, in its pursuit of more and more of the U.S. market, is simply not going to have capacity that it is going to make available to West Kootenay Power over the next 20 years at rates which are economical in comparison with the turbines.

Construction of hydro-generation is so much more expensive than the turbines it is not economical to even contemplate, and the environmental impact of such construction is of far greater consequence than what is contemplated with the turbines.

- (3397- (d) The Need for the Turbines
- (3399)

The October 1986 Decision of the Commission pertaining to the B.C. Hydro/WKPL Dispute contained certain statements which caused WKP to pursue a course of action which resulted in completion of its 1987 Resource Study, Supply and Demand Options. That document featured "Demand-Side Options" and "Supply-Side Options" inclusive of the potential for a "Gas Turbine - Okanagan".

Reference is made t Commission statements contained in the October 1986 Decision as follows:

- page 1 page 28 page 41 page 62
- (3400- (e) <u>Operational Benefits of the Turbines</u>

3401)

Exhibit 18 illustrates the operation associated with the peaking

<u>G.K. Macintosh</u> (cont'd)

In addition to the peaking function two other advantages are noted:

- (i) the turbines will permit the use of cheap interruptible electricity from Cominco, the back-up function; and
- (ii) the existence of the turbines will enable WKP to defer the construction of the Vaseaux Lake substation, providing a deferral of expenditure of approximately \$7 million.
- (3401- (f) Financial Benefits of the Turbines
- . 3414)

Whereas capital expenditures by a utility to expand its generation capabilities normally results in an adverse impact on customer rates, the turbines provide a favourable impact on customer rates. The original base case of the Application, as set out in Tab 4 of Exhibit 5, portrays a net benefit of \$22.14 million. Various amendments, arising from this hearing, have been taken into account by WKP as witnessed in Exhibit 109 and the result is a net benefit of \$26.65 million.

Appendix A to Exhibit 109 employs a discounted cash-flow model as recommended by Commission staff, indicates a further \$7 million benefit, resulting in a net benefit of \$33.56 million.

The foregoing represents the best judgment of the Applicant but does not take into account various assumptions as to possible pricing of electricity and natural gas put forward by the Ministry of Energy, Mines and Petroleum Resources ("MEMPR") on the one hand, and the National Energy Board ("NEB") on the other. WKP calculates that the employment of the MEMPR projections would result in a net benefit of \$24.3 million, whereas the NEB projections would result in a net benefit of \$28.6 million.

(3419- (g) Environmental Issues

(3427)

The Applicant contends that there is no requirement for a further independent hearing and review process following the conclusion of the Commission's hearing of WKP's Application in respect of an environmental permit.

(i) Sound

WKP observes that the proposed site for the turbines at Oliver, B.C. is in the Oliver Industrial Park, and notes that an unregulated entity attempting to locate therein would not be required to participate in a public hearing before it would be permitted to commence operations. Such entity may produce twice the sound of the turbines. Central Mortgage and Housing Corporation ("CMHC") employs the only sound measurement system that is utilized across Canada. It has an acceptability criteria for housing of 24hour average level of 55 DBA.

WKP states that there is no residence in Oliver that will have an exposure that is that high on a 24-hour average, although one house on the top of the bank is predicted to be 58 DBA and that will only occur when all four turbines are in operation in a period of inversion. Most of the time that the four turbines are operating the sound is 6 DBA lower, or 52 DBA which, if one were indoors, would equate to a soft whisper at 16 feet. WKP does not propose that the turbines will operate after 10:00 p.m. expect in a case of severe emergency.

WKPL notes that 58 DBA may be equated to the sound of a semi-trailer on Highway 97 at a distance of at least one kilometre.

(ii) Emissions

The turbines are environmentally efficient. Particulate emissions are minimal. Sulphur dioxide emissions while natural gas is the fuel are negligible, and with low-sulphur oil are very low. Emissions of oxides of nitrogen are low with either fuels. Water injection in the turbines will provide the following emission results:

J	Provincial Objective	Gas	<u>Turbines</u> <u>Oil</u>
Particulates	229	*	55
Sulphur Dioxide	798	*	8
Nitrogen Oxide	1146	75	150
Hydrocarbons	102	3	3

* (too low to measure)

Ambient air quality resulting from the turbines operation will readily meet provincial and federal guideline levels, which are protective of effects on soil, water, vegetation, materials, animals, visibility, personal compr t and well-being. The computer model employed by WKP was accepted by the Ministry of Environment. It studied an area approximately 25 kilometres in radius from the plant site, from Skaha Lake to the U.S. border. It took into account a wide range of meteorological data for each hour of six years of record. Nearly 180 locations were studied throughout the area with particular attention given to a <u>G.K. Macintosh</u> (cont'd)

number of locations near the plant site. Although concern was expressed as to the impact on orchards it is the contention of WKP that such impact is so small, in comparison with the fertilizers, that it cannot be considered as adverse.

(h) <u>Conditions</u>

WKP stated that conditions are a very serious and substantive part of the hearing process, noting the following for consideration by the Commission:

- (i) Subject to the completion of acquisition of the turbines from Venezuela at an acceptable price.
- (ii) Subject to finalizing a transmission line route to the Oliver Terminal.
- (iii) Subject to resolution of the stack emission limits as between Cirrus Consultants and the Ministry of Environment, based on Exhibit 58.
- (iv) Subject to the satisfactory design of the fuel oil spill containment system.
- (v) Subject to satisfying amendment of the Industrial Park boundary.
- (vi) Subject to the following ancillary permits and approvals:

The <u>Fire Services Act</u> - a permit for storage, handling and use of fuel oil.

The <u>Gas Safety Act</u> - a permit for the installation of a gas system.

The <u>Municipal Act</u> - a permit concerning stack height variances; and

- applications to be finalized concerning water and sewer connections, and variance on the height of the fencing.

The <u>Navigable Waters Protection Act</u> - permits for the electric transmission line and the natural gas pipeline crossing of the Okanagan River.

The <u>Pipeline Act</u> - approval to Inland for construction of a high pressure gas pipeline.

<u>G.K. Macintosh</u> (cont'd)

The <u>Pollution Control Act</u> and the <u>Waste Management</u> <u>Act</u> - permit requirements to be finalized between Cirrus Consultants and the Ministry of Environment. The Water Act - a permit for authorization of the

The <u>Water Act</u> - a permit for authorization of the alteration of stream flow.

In addition to the foregoing, WKP will follow up on requirements to satisfy Federal Fisheries, Bill C-38.

- 2. <u>R.J. Bauman</u> (representing the Cities of Grand Forks, Kelowna, Nelson, Penticton and the District of Summerland)
- (3433- (a) <u>Terms of Reference</u>

3434)

The advisory role of the Commission is directed to take place in light of specified lines of inquiry, the most important of which are:

- Project Justification
- Preliminary Environmental Review
 - Resource Options

The Commission's jurisdiction is to determine whether the gas turbine is justified from the perspective of efficient utilization and allocation of provincial energy resources. It would be to adopt a too-narrow view of the Commission's jurisdiction to analyze the justification for this project simply in the vacuum of West Kootenay's service area.

(3434- (b) Primary Submission

3441)

The Municipal Intervenors strongly oppose the Application for an Energy Project Certificate for a gas turbine plant at Oliver, B.C. and submit that the evidence before the Commission leads to the irresistible conclusion that this project is at least exceedingly marginal as a preferred new resource. The project potentially seriously disadvantages the ratepayers of West Kootenay and the residents of the South Okanagan Valley.

West Kootenay Power is preoccupied with pushing the construction of a new project which it views as distancing it from reliance on B.C. Hydro, and incidentally is representing a good investment in an expanding rate base for the shareholder who will earn a substantial handsome return on its investment in this facility, a return it does not enjoy in respect of purchases from B.C. Hydro.

This preoccupation by WKP with building facilities has blinded them to the risks that the project will not produce the imagined benefits to the ratepayers, and has encouraged them to ignore normal utility prudence in advancing the Application.

R.J. Bauman (cont'd)

The Municipal Intervenors contend that WKP abandoned prudent business practice in the manner in which they have pursued arrangements to purchase the Venezuela turbines:

- (i) WKP entered into an odd buy-back arrangement with its Texas agents, Energy Service Inc. ("ESI") whereby ESI would agree to repurchase the units from WKP if WKP did not receive required permits, and within 12 months requested ESI to repurchase.
- (ii) The new deal with the Texan turbine procurers was not set down in a consolidated document (Exhibit 77) until December 5, 1988, some three weeks after WKP had instructed ESI to accelerate the purchase.
- (iii) WKP has not secured ESI's ability to repurchase if the repurchase option is exercised by WKP. Prudent business practice would dictate the provision of security by way of a letter of credit, or otherwise to secure ESI's obligation to repurchase.

The Municipal Intervenors are critical of the malaise with which WKP pursued matters with the Village of Oliver concerning use of the site in the Industrial Park. Additionally, they expressed concern with WKP's reliance on an environmental impact report which, when filed, was rife with errors, as noted in Exhibit 9A, detailing pages of errors.

- (3441- (c)<u>Detailed Submissions</u>
- 3452)
- (i) Project Justification in Light of Resource Options

The evidence on this subject falls far short of convincing the Municipal Intervenors that the accuracy of WKP's Cost Benefit Analysis can be relied upon to support the project's viability. There is concern that the B.C. Hydro rates, as employed in the Analysis, are unrealistic as a result of misinterpretation, principally, of the March 23, 1988 letter from B.C. Hydro, and reliance on unsubstantiated escalation factors discussed in a telephone conversation between an employee of WKP and an employee of B.C. Hydro.

Fuel costs included in the analysis are unsatisfactory insofar as predictions for future periods are concerned. Virtually any one of a variety of price scenarios could be inserted in the Analysis, but none can be considered to have credibility sufficient to make a judgment on. The capital cost of the project has been escalated from the values contained in WKP's original Application, taking into account a 10% contingency fee, and an amount of \$5.3 million to add water injection and noise reduction facilities.

Taking note of the foregoing it is concluded that the results of the amended Cost Benefit Analysis reveal the turbine project as purely marginal.

The Municipal Intervenors expressed concern over the manner in which WKP now portrays the Vaseaux Lake substation as an item to be forestalled for about 10 years because of the proposed gas turbine project.

The Municipals note that in the 1987 WKP rate hearing the gas turbines and the Vaseaux Lake substation were stated in evidence by WKP to be independent of one another, not alternatives. Attention is also drawn to the reference in B.C. Hydro's March 24, 1988 letter (Exhibit 12, Page B, Tab 1) stating that Vaseaux Lake is a project which is superior to the gas turbines from a reliability and guality of service point of view. The letter also referred to the potential for B.C. Hydro to offer service at B.C. Hydro's rates to WKPL's customers in the Okanagan and Similkameen Valleys if, in the future, WKP's rates exceeded B.C. Hydro's. B.C. Hydro stated that they would reimburse WKPL for the book value of its transmission and distribution plant involved in service to the Okanagan and Similkameen Valleys, but would not be prepared to assume the cost of any investment by WKPL in gas facilities.

The Municipals expressed concern that the Hydro takeover has a real potential, with the prospect that the gas turbines may become redundant long before the project has run its useful operating life.

(3452-3460) (ii) Environmental Impacts

The Municipal Intervenors do not concur with WKP's counsel in respect of the appropriate Commission action if the project is considered environmentally unsound. The Municipals express the view that in such an instance the Commission is totally justified in recommending against the proposal.

The Municipals also expressed concern that the air quality segment of the environmental evidence was not spoken to by its author with the degree of independence and impartiality normally associated with an expert, but rather as an advocate for WKP thus adversely affecting the reliability of the material presented and discussed. R.J. Bauman (cont'd)

(3460- (d) <u>Conclusion</u>

3461)

The Municipal Intervenors urge that the Commission not recommend that the Energy Project Certificate be issued, stating, "It is wrong, and we say nonsensical, to permit West Kootenay to build a gas turbine with its attendant environmental problems for the Okanagan, when existing provincial resources are adequate to meet the need."

3. <u>Ms. J. Vance</u> (representing the Consumers' Association of Canada (B.C. Branch), the B.C. Old Age Pensioners' Organization, the Federated Anti-Poverty Groups of B.C., the Senior Citizens' Association, and the Council of Senior Citizens' Organizations)

The Consumers' Association of B.C. ("CABC") et al, oppose the Application of West Kootenay Power for an Energy Project Certificate to install and operate a gas turbine because the forecasts of savings are too uncertain and may fail to materialize. It is the position of CABC et al that it would be better for British Columbians and utility customers if West Kootenay Power spent its money purchasing power from B.C. Hydro instead of paying interest charges to the bank and a return on equity to UtiliCorp for the capital cost of the gas turbine.

CABC et al, because of the geographic area affected by the location of the gas turbines, being a home to older persons and others with special health concerns, contends that social costs arising from this hearing are within the jurisdiction of the Commission and must be considered in its decision. CABC et al therefore disagrees with the position of WKP's counsel on that matter.

(3467- (a

(a) Economic Viability of the Gas Turbine Project

3484)

When this project was conceived and planning began, WKP believed that the gas turbine would provide a five percent reduction in levelized rates. At page 1328 of the transcript, WKP agreed that they could now anticipate only a 2.5% reduction in rates. Without the gas turbine there is uncertainty about the cost of B.C. Hydro power to WKP. With the gas turbine there is the uncertainty about the cost of natural gas from Inland.

It is troubling to think that WKP did not consider that a single variable sensitivity analysis was too simplistic to give an accurate forecast of all potential scenarios. We now know that the capital cost has been increased by \$2.3 million for water injection, and Exhibit 60 shows that Ms. J. Vance (cont'd)

low B.C. Hydro escalation compounded with high gas costs, or a reduction in available Cominco non-firm, could bring the benefit cost ratio to less than one and actually increase customer rates.

At page 1236 of the transcript, it was established that the cost of gas turbine fuels for peaking use was \$5.28 million, and for nonfirm back-up the escalation in fuel costs was \$36.31 million. To guestimate that there will be a 30% unavailability for the Cominco and that the "other non-firm" category has only a 50/50 chance of coming through, indicates that this supply could fluctuate wildly and cause a corresponding swing in natural gas and oil costs to WKP.

The concerns about the availability or lack of availability of nonfirm are ones that make it important that the Commission consider that perhaps it is safer for the ratepayers to have certainty.

When this hearing commenced we learned that the B.C. Hydro lowprice scenario, if it materialized, would reduce the benefit cost ratio to 1.05. At the close of this hearing we learned in Exhibit 125 that were the B.C. Hydro low-price scenario to materialize it would devastate the economics of the gas turbine project. The net result could range from \$2.87 million to minus \$12.87 million. This possibility speaks to the complete unworkability of the gas turbine project.

Ms. Vance spoke to the attribution of \$16 million in deferral value of the Vaseaux Lake substation to the gas turbine. Notwithstanding a previous lecture on the subject of WKP sticking to their forecast timetables for capital projects, Mr. Siddall admitted that there had been slippage in the Vaseaux Lake substation capital project and that the deferral after 1992 is attributable to the gas turbine. Ms. Vance submits that there could well be a slight of hand by WKP in completely attributing the value of the deferral to the economics of the gas turbine. She states that the Commission must be cautious, especially in light of the past history and actions of WKP.

Ms. Vance expressed concern over how little WKP has done to identify other potential sources of firm energy for inclusion in the 20-year resource plan. She noted such matters as the late date (July of 1988) at which WKP approached major suppliers to see if they could supply power needs; that WKP had not had discussions with Cominco about wheeling power up the 300 megawatt line at Trail; the potential for WKP participation in the Columbia River downstream benefits; the potential for supply from Pacific Northwest sources to fill the gap if Cominco's non-firm becomes unavailable.

Ms. J. Vance (cont'd)

Ms. Vance noted that if nothing else was available, then, instead of running the gas turbine at a cost of 24 mils per kilowatt hour, WKP could, as a last resort, use the B.C. Hydro reservation fee of 5 mils, purchase back-up from B.C. Hydro at the incremental cost of running Burrard Thermal. For 600 gigawatt hours of reserve requirement the additional cost would be \$3 million a year.

Ms. Vance described a series of options she considered would fill the needs of WKP without the necessity of installing the gas turbine.

(3484- (b) Environmental Problems

3490)

Ms. Vance stated that CABC et al is seriously concerned with the harm that the gas turbine project can cause to the inhabitants of Oliver and the surrounding area. She cautions that there are too many unknowns about the actual levels of emissions that will permeate the air in Oliver. She notes that Mr. Sagert admitted that he didn't know that Oliver had a unique climate, that it was a pocket desert, at the time that he chose to rely on meteorological data from Vernon and Penticton for his modelling.

(3490- (c) Social Environment

3491)

People are part of the environment and their well-being is vital to the concept of environmental health. This community has become united in its opposition to the turbine.

(3491- (d) <u>Costs</u>

3492)

This project had a feature which made it very attractive to the shareholder. While that may not be the motivation for this project, the shareholders should be made responsible for the costs of the hearing, taking the good with the bad.

Whether or not this Application is approved, the shareholders should bear at least a portion of the costs, up to all of it, but at least half of it. In fact, there could be some scrutiny of the financial costs and the possible benefits, and that there could be a proportionate allocation based on that type of calculation. It should be noted that the ratepayers have already paid a tremendous amount in operating and maintenance expenses incurred in the conception, planning, development, modelling, scrutinizing and discussions of WKP personnel on the gas turbine project.

<u>Ms. J. Vance</u> (cont'd)

(3492- (e) Demand-Side Management

3494)

The fundamental issue here is not the gas turbine, it is the best use of resources overall, be that effected by generation or by conservation. It is, therefore, reasonable and in fact highly desirable that the Commission use this opportunity to make a statement about demand-side management, whether or not the gas turbine is approved.

(3494- (f) <u>Conditions</u>

. 3496)

Ms. Vance asks that some innovative thinking be done if it is decided by the Commission that this project should proceed. She would like to see some sort of condition attached that if the gas turbine goes ahead, and if money is lost, which is based on the alternative of what would have been without the gas turbine, and if this is because WKP forecasts are off and intervenors' forecasts are on, or B.C. Hydro's forecasts are on, then these losses should be borne by the shareholders in their return on equity. She made reference to a procedure used by the CRTC in respect of B.C. Tel, involving a deemed rate of return. She suggested that it should be possible to consider a deeming of expenses for this project. If the actual expenses are higher the difference between the deemed and actual expenses would be borne by the shareholders and not by the ratepayers.

4. <u>J. Slack</u> (representing himself)

(3498-

3503) Mr. Slack states that his main objection to the turbines is the site in the Oliver Industrial Park which he describes as a swamp located in the heart of the community. He made reference to petitions presented to the hearing, noting that the Commission should consider them since they represent the views of a fair percent of the residential base of Oliver and rural areas.

Mr. Slack requested that the Commission consider all expenses involved with the plane trip to view turbines in Florida as a cost to be borne by the shareholders of WKP, not the customers.

(3503- <u>B. Slack</u> (representing Slack Electric Ltd. and

3516) Okanagan-Similkameen Cooperative Growers Association)

> Mrs. Slack made reference to numerous matters that she felt illustrated detrimental impacts on the community of Oliver in the operation of a gas turbine as follows:

- noise, particularly as a result of intermittent operation.
- use of oil as fuel for turbine operation.

- concern over environmental review (Exhibit 9).
- safety of airport.
- probability of oil spills in truck transport and delivery.
- unsatisfactory treatment of turbine site.
- impact on sewage system.

Mrs. Slack expressed concern over the change of the corporate name and logo in spite of a promise by an officer of UtiliCorp that it would not occur.

Mrs. Slack expressed her conviction that the Ministry of Environment can indeed assess the situation, after a decision by the Commission.

Mrs. Slack did not, however, state a position, either favourable or in opposition to the WKP Application.

5. <u>Mr. Gilmour</u> (representing himself)

(3516-

3520) Mr. Gilmour stated that he will be providing his primary argument in written form so as to assist in the timely conclusion of the hearing. He expressed his viewpoint on the public interest concept, noting firstly that the prospect of a gas turbine was a significant factor in both the provincial and federal elections which resulted in election of candidates of the official opposition; and secondly, that there is no evidence to indicate that the WKP ratepayers would not be willing to pay a potential increase in customer rates if the WKP Application is rejected.

6.

Dr. Miltimore (representing the Electric Consumers' O- Association ["ECA"])

(3520-

3528)

Dr. Miltimore stated that while their study of related data does not convince them that failure to build the turbine will result in an increase in customer rates he believes ECA members would prefer to pay increased rates rather than endure the turbines. Dr. Miltimore expressed concern that the model provided by the environmental experts was not based on facts pertaining to Oliver but rather on limited and subjective assumptions. He pointed out that there is no attempt to indicate the degree of error that might be expected in the calculated numbers from the models although there was a grudging admission that model predictions could be out by a factor of twofold. He stressed that no estimates were provided of errors inherent in importing data from the weather stations. Dr. Miltimore commented

Dr. Miltimore (cont'd)

on his concern that ozone formation results from a number of interactions and that ozone is a more serious matter than nitrogen dioxides. Dr. Miltimore stated his intention to provide more information in writing at a later date.

Mr. Scarlett

[representing the Kootenay Okanagan Electric Consumers' Association ("ECA")]

7. (3528-3556)

Mr. Scarlett submitted that the reference to "Preferred New Resource" in the Terms of Reference should be interpreted to include resources other than new generation capacity, such as the advantageous purchase agreements with other utilities including B.C. Hydro and demand-side management.

Mr. Scarlett agreed with Mr. Bauman that overall efficiency of use of British Columbia's resources should be taken into account by the Commission in shaping its decision. He noted that if WKP's peaking and non-firm back-up power is purchased from B.C. Hydro the province of British Columbia itself benefits both financially and from the better utilization of water resources which belong to the people of B.C.

Mr. Scarlett states that coordination of B.C. Hydro and WKP is desirable and in the long run necessary, noting that it is unacceptable for one utility in the course of competition to harm the long-term interests of the other, or of each other's customers. Mr. Scarlett commented also that competition between hydro utilities should not create a condition of waste.

The ECA agrees that a utility must have an incentive to make needed capital improvements, but firmly believe that this turbine is not an acceptable project because it fails the test of benefit to the ratepayers or citizens of the province as a whole. Putting a gas turbine into the middle of a hydro-electric system has no precedent in Canada and probably not in North America, and B.C. Hydro clearly has a sufficient amount of secondary (non-firm) energy (Exhibit 12, Table 1). The point is that burning a non-renewable fuel when renewable hydroelectricity is able to be used in a comparable way and it is comparable in price does not make sense. Burning natural gas at a wasteful 25% efficiency and suffering further line losses to distribute it does not compare favourably with utilization of natural gas by gas utility customers using cost-effective furnaces (within a range of 65 to 80%).

Mr. Scarlett is critical of the WKP Application, noting that it appears to have been conducted in haste, and WKP lacks expertise to conduct the project. He made reference to the dyking situation, with drawings

Mr. Scarlett (cont'd)

not properly checked; and no provision for clean-up costs upon decommissioning of the plant. He went on to make reference to the embarassingly unbusiness-like affairs that have gone on between WKP and Energy Services, Inc.

Mr. Scarlett was also critical of the manner in which WKP downplayed the operational requirements of the turbine in backing up of Cominco non-firm to the extent of 600 gigawatt hours per year. He also notes that removal of the benefit claimed by WKP for backing up non-firm Cominco it would essentially bring the turbine project down to a point where it is not economically advantageous.

ECA concur fully with Mr. Bauman and Ms. Vance that multiple sensitivities must be considered in order to arrive at the best model.

ECA expressed concern that WKP does not appear to be pursuing demand-side alternatives with appropriate diligence pointing out that a pilot project in two cities served by WKP has not been brought to the attention of customers beyond those two locations.

Mr. Scarlett proposed that the Commission give consideration to exercising its powers as follows:

- (i) Withholding or withdrawing part of the cost of the project from Rate Base if it is unproductive to the customers.
- (ii) The costs related to WKP's public relations campaign and the excursion to Florida should not be borne by the customers of WKP.
- (iii) If the Application is unsuccessful the hearing costs should be assessed to the shareholders of WKP since the risk should be borne by those who stand to gain.
- (iv) If the Application is successful, that the ratepayers should only be responsible for the originally estimated cost of the project and not for such costs which exceeds those estimates due to any fault of WKP.
- (v) The Commission should consider restricting the use of the turbine to the purposes described by the Application and specifically to deny WKP the right to export power to the United States.

- (vi) The Commission should consider restricting the use of oil in the turbine because it is more damaging to the community and environment than natural gas.
- (vii) The Commission should direct WKP to pursue more meaningful negotiations with B.C. Hydro for the purchase of firm peaking capacity with an energy return clause, coupled with an ongoing purchase agreement for non-firm interruptible energy on an as-needed basis at the then current B.C. Hydro market price in order that WKP may take advantage of Cominco's non-firm energy.
- 8. <u>Mr. Fehr</u> (representing himself)

(3557-

- 3562) Mr. Fehr did not put forward any specific opinion concerning the Application by WKP. He did express concern for the manner in which the environmental evidence was put forward. On the other hand, he was generally complimentary to those who spoke on behalf of WKP.
- 9. <u>Dr. Moyls</u> (representing himself)

(3562-

3566) Dr. Moyls stated that he had prepared a written argument, but thought he would read from a part of it.

Dr. Moyls commented on the environment model utilized in the Application. He is critical of the graph on plume-rise as presented and advised that he has prepared a graph that uses a second equation that he believes represents a more realistic approach.

He referred also to the model estimating No $_2$ concentrations at various location around Oliver, claiming that the model fails to resemble reality.

10. <u>Mrs. Harkness(representing herself and her husband)</u>

(3566-

3567) Mrs. Harkness stated that she is 100 percent opposed to a gas turbine in her backyard. She states that she cannot be convinced that with the installation of the gas turbine in Oliver, their lives will not be changed. Noise levels are her chief concern and she expresses fear that the very peaceful environment surrounding their home will never be the same, noting that they have one of the most beautiful view lots in town but believes that with the turbine in place and operating they will be left with but a house and a piece of land.

- Disagrees with Bauman's suggestion concerning demand-side options on a provincial basis.
- Disagrees with Bauman's interpretation of "the preferred new resource". The evidence does not indicate any alternative new resource as being more appropriate.
- Bauman's concern over the absence of a letter of credit re: ESI is already alleviated by a modification in the letter from WKP to ESI (Exhibit 77) which records, at the bottom of the first page, the fact that ownership of the turbines rests with WKP rather than ESI so that ESI's function is limited to an agency function.
- Dismisses Bauman's concern with the matter of zoning by referring to Exhibits 61 and 15C and noting in paragraph 9 on page 7 of the latter Exhibit "as clear as clear can be that the utilities can exist in any zone and that includes, of course, the industrial park".
- Expresses surprise that Mr. Bauman would regard an addenda sheet as other than a responsible step to ensure that the evidence is precise.
- Proposes that the Commission should refer to his (Macintosh's) argument concerning the March 23, 1988 letter from B.C. Hydro, and then to Exhibit 47, to determine whether or not Bauman's concern is justified.
- Considers as unfair Bauman's reference to an earlier transcript concerning Vaseaux Lake and the turbine and that it in no way takes away from the economics of postponing Vaseaux Lake if it can be postponed in light of developing the turbine.
- States that Mr. Sagert's credibility should not be affected because he did not admit that water injection is necessary. The evidence has not demonstrated that it is. Instead, the government has provided a policy and WKP has clearly indicated its willingness to live with it.
- Draws attention to the fact that the decision of the B.C. Supreme Court ("Murray McDermid Holdings, 42 BCLR 119") which was handed in by Mr. Bauman, has now been considered by Mr. Bauman as not relevant, and that is on the option point, in light of Exhibit 69.

- (ii) Re: Ms. Vance's Argument
- The test with regard to Mr. Sagert's credibility should not be whether he hopes WKP will succeed or fail, but whether his approach was largely upheld in the course of questioning during the lengthy cross-examination against him. Mr. Sagert's testimony revealed that he testifies as the occasion arises for parties of various perspectives on pollution issues.
- Health costs were not factored into the cost of the project primarily because there is no evidence of an adverse impact with regard to health. Reference is made to evidence brought out by Mr. Bauman (testimony of Dr. Bates before the Pollution Control Board, re: Burrard Thermal) that .08 parts per million ozone produced no effects, even on sensitive asthmatics, acknowledging that the effects are not until a higher level, something like .12. There is no evidence of any such probable readings in this case.
- Ms. Vance spoke of an absence of sensitivity studies with regard to gas and electricity. The Commission is referred to Appendix B of Exhibit 109 in that regard. Ms. Vance wanted to rely upon the B.C. Hydro low escalation rates in Exhibit 125. Macintosh refers to his submissions on that during Argument saying that they are highly improbable in light of developments that have occurred since that scenario was developed in the 1987 forecast.
- Ms. Vance urged that WKP should back-up Cominco interruptible in accordance with the B.C. Hydro offer which was a standby charge of 5 mils. Macintosh notes that such a situation would result in a \$3 million annual expense which would escalate as B.C. Hydro rates escalate, and the present value of \$3 million per year would be \$31 million. This indicates a value of the turbines in backing up Cominco alone can be viewed as a \$31 million advantage on that analysis.
- Ms. Vance spoke of the shareholders paying the costs of the hearing if the Application succeeded, and if the Application did not succeed the shareholders should pay at least half. Macintosh proposes that if costs are reasonably and prudently incurred then they should be capitalized and put into Rate Base. To the extent that they are not prudently and reasonably incurred, they should be borne by the shareholders. Macintosh also submits that

Mr. G.K. Macintosh Response (cont'd)

there should be no separate treatment with regard to the

could not have prudently reached a decision without seeing other turbines.

- (iii) <u>Re: Dr. Miltimore's Argument</u>
- In response to Dr. Miltimore's comments on the inappropriateness of the pollution model, Mr. Macintosh advised that for unbuilt operations modelling is the only way to predict ambient air qualities. Emissions can be calculated from drawings and engineering specs but ambient air quality requires modelling as a primary data base. There was no pollution data from Oliver to utilize in the model although the terrain of Oliver was used. It is not uncommon that appropriate weather data would often be hundreds of miles away, or at least at a far greater distance than Penticton is from Oliver.
- (iv) Re: Mr. Scarlett's Argument
- Mr. Macintosh stated that the P.R. publication expenses incurred by WKP were conservative and reasonable for bringing the company's position to the public.
- As to Mr. Scarlett's contention that WKP had not taken adequate steps with regard to Canadian content for the turbines, Mr. Macintosh pointed out that Exhibit 29 proved the difficulty of getting turbines in Canada at good prices, but that WKP had looked to Westinghouse, G.E. and Pratt & Whitney within Canada, who are standard suppliers.
- In respect of Mr. Scarlett's comments concerning the export of electricity to the United States, Mr. Macintosh advised that WKP will not undertake to not ever use the turbines for export, but as noted by Mr. Brook, an account for such operations would be established directing that any funds from export would be directed to the benefit of WKP customers. The need for a provincial certification and a federal review by the NEB are duly noted.
- Mr. Macintosh noted that WKP could not say no to oil use but that water injection can now be stepped up so that emissions are cut down from 150 to 110 parts per million for No_X .
WEST KOOTENAY POWER LTD. Oliver Gas Turbine Generation Plant Energy Project Certificate

SUMMARY OF WRITTEN ARGUMENTS (Received subsequent to January 13, 1989)

 Regional District of Okanagan - Similkameen ("RDOS") (E.J. Lamb, Chairman - letter dated January 11, 1989)

Letter states that the Board of the Regional District of Okanagan Similkameen is comprised of the <u>appointed</u> representatives of six municipalities and eight <u>elected</u> rural area Directors.

The RDOS is a Registered Intervenor in the proceedings and Mr. Lamb as Chairman is authorized to file a submission if it was deemed necessary.

Mr. Lamb wished to clarify that there is no prohibition of individual members of the RDOS Board filing their own submission. He also advised that no further submission from the Regional District will be forthcoming unless authorized by Board resolution.

2. Mr. & Mrs. J. Abrahamsczik (R.R. #3, Oliver, B.C., VOH 1TO - Letter dated January 13, 1989)

Concerned that their property is too close to the proposed site for the Gas Turbine (turbines about 250 metres from their fence and house is approximately 35 feet from the fence). Sound is a concern and they refer to sound bouncing off the Controlled Atmosphere (C.A.) building and the three oil tanks.

They make reference to the "floating top" of the tanks and suggest that this may well create a "bottle/whistle" effect.

They note that their water well has the same water level as the river above the sluice gate (near the "toe" of the site). Express concern over possible contamination resulting from construction and dewatering procedures.

Oil tanks are also a concern. If there should be a "split" the oil will surge over any berm or dyke. If instruments fail, oil could run out and be pumped on the land. Either of the above could cause contamination of soil and/or water. The stacks (hot air columns) may be a problem to helicopters or planes. WKP personnel are reported to have experienced a helicopter accident while investigating the cause for a mid-January, 1989 power outage in the Oliver area.

Concern is also expressed that potential contamination of water (rivers, lakes, etc.) places a heavy burden on the safety of fish and birds (including bald eagles, blue heron, geese and whooping cranes), with a possible threat to bird sanctuaries reserved through government action.

3. Dr. J.E. Miltimore, P. Ag. (on behalf of E.C.A), Site 90, R.R. #4, C.1, Summerland, B.C., VOH 1Z0 (a) January 20, 1989 letter re: WKP Application

Several aspects of the WKP Application appear to have been prepared in haste and without due care:

- Last April, WKP anxious to get a decision from BCUC because of availability of rare turbines at a bargain price. Nine months later, there is no purchase, and turbines still operating in Venezuela.
- NO_X concentrations in Sexsmith Road Application were exactly double those in the Amended Application.
- Original Application made no mention of acidity problems in cultivated (orchard) soils. Acid soil references were included in Amended Application but counsel for the Applicant said there would be little or no acid rain but, whatever did occur would be beneficial since soils in the region are acidic.
- Reference to possible use of waste heat with infrequent and unpredictable hours of operation of the turbine must be considered as "grasping at straws".
- The 1987 Resource Study was not analyzed and reported on in detail at the hearing and E.C.A. concerned as to accuracy. (No generation credit at Waneta for water storage upstream.)

E.C.A. urges BCUC to protect the public interest by taking into account the various petitions, and the local outcome of recent provincial and federal elections.

People must be a primary concern in the BCUC Decision:

- How will the limited Okanagan water, soil and air be affected by the operation of the gas turbine?

- Residents close to turbine site concerned with invasion of their privacy and loss of enjoyment of their homes. Loss in property value is possible and is a legitimate concern requiring consideration of appropriate compensation.
- Residents with respiratory disorders have a special concern in respect of discomfort arising from turbines emissions, but a precedent for possible compensation may not exist.
- Inversions are referred to more frequently in Exhibit 10 (Noise Assessment) than in Exhibit 9 (Environmental Assessment).
- Pilots of private planes report that winds in the Oliver area are erratic and frequently do not follow the North/South pattern assumed by WKP's consultant; also when flying North to Penticton there is virtually no wind until McIntyre Bluff and then, frequently, "white caps" can be seen on Skaha Lake.
- The earlier and warmer growing season at Oliver provides additional proof of the differences between Penticton and Oliver.
- E.C.A. believes the Environmental Consultant seriously underestimated the pollution potential at Oliver because of inversions which are detrimental to benign dispersion of pollutants. Ozone levels depend on a number of interactions and are site specific, making Kelowna ozone levels inappropriate to be considered applicable to Oliver.
- E.C.A. concerned that the local or "native" perspective concerning a healthy environment may not be given appropriate consideration.
- E.C.A. proposes that unless there is irrefutable evidence that the Gas Turbines should be installed without delay, a study be undertaken immediately to determine the most appropriate preferred alternative hydro generation source relative to the best interests of the province of British Columbia, either in the WKP system or the B.C. Hydro system. The study should include a possible sharing of the Columbia River benefits.
- E.C.A. wish to substantially endorse the final arguments of Messrs. Bauman and Gilmour, and Dr. Moyls.
- E.C.A. proposes that no costs of the Applicant be allowed other than for the purpose of the Amended Application for the Oliver site, excluding the costs of the trip to Florida and Texas. E.C.A. also urges that costs incurred in changing public opinion, including legal and consultants fees be not allowed as surely these costs should be deemed part of the investors' risk.

(b) January 26, 1989 letter

E.C.A. now wishes to enter the following further presentation concerning the allocation of hearing costs by the Commission.

E.C.A. is critical of WKP, stating that its Application was premature, illprepared in indelicate haste, and was inadequate in its presentation.

E.C.A. notes the following:

- (i) advance publicity not borne out by evidence at hearing.
- (ii) failure to provide adequate in-depth resource studies, particularly regarding possible hydro generation expansion.
- (iii) failure to provide adequate presentation of B.C. Hydro alternative supply, including reference to 1986 Dispute Decision.
- (iv) failure to have in place, in advance, a proposed agreement for natural gas supply.
- (v) failure to include in documentation adequate pricing data for electricity and natural gas.
- (vi) failure to have adequate purchase arrangements in place concerning gas/oil turbine units.
- (vii) failure to provide adequate evidence and expert testimony concerning gas turbine operation.
- (viii) failure to provide, voluntarily, engineering report on the proposed site.
- (ix) failure to investigate and act following allegations by Intervenors that inadequate or incorrect data were included in evidence respecting environmental considerations.

E.C.A. looks to the Commission to ensure that any costs arising from the hearing be allocated with strict fairness to the ratepayers. It is the respectful opinion of the E.C.A. that WKP on this occasion is not deserving of reimbursement of any but nominal costs.

Finally, the E.C.A. notes that the merit of any claim for costs by WKP could well be affected by the government's decision as to the merits of the proposal. The E.C.A. sees the possibility of the Commission providing for a brief hearing at its Vancouver premises would be useful to deal with the costs, after the government decision, and the disclosure of the Report and Recommendations of the Commission.

(c) January 27, 1989 letter

E.C.A. provides a copy of a Notice of Public Hearing before the Village of Oliver Council, which appeared in the January 25, 1989 "Oliver Chronicle". The hearing relates to the "Oliver Zoning Bylaw No. 460, 1985, Amendment Bylaw No. 535, 1989 to remove floodplain elevation requirements from the Industrial zones", and is to be held at 7:00 p.m. on Monday, February 13, 1989.

E.C.A. contends that if it is intended to allow WKP to build at a significantly lower elevation than stated in their Amended Application then testimony regarding noise will be affected and would need to be revised to take this new situation into account. Aspects of soil, water and general stability of the site would need to be considered.

4. W.A. Gilmour - Summerland (Letter dated January 19, 1989)

Mr. Gilmour is critical of WKP for having not taken the initiative several years ago to seek an appropriate hydroelectric generation project capable of providing for the growing needs of its system.

Mr. Gilmour expresses his concern that the use of natural gas in the turbines project to generate electricity is wasteful of a non-renewable resource which has the potential of enabling the development of a petrochemical industry.

Mr. Gilmour also refers to the unsatisfactory pursuit by WKP of its demand-side options, noting that even at this stage such matters appear to be at the "study" or "early-planning" level.

He points to the NEB electric and natural gas pricing forecasts, recently issued, indicating that they appear to be based on the broadest knowledge of the North American scene.

 Mr. Harry F. Killough (612 Fernwood Drive, Castlegar, B.C., V1N 3T6 <u>- Letter dated January 12, 1989</u>)

> Mr. Killough is opposed to the Gas Turbines Project because he believes that it presents a threat to the environment that is unnecessary. He expresses a concern that the Oliver project, if approved, could be the first step in a plan by WKP to establish a thermal power generating network in British Columbia.

> Mr. Killouch reviews some of the events related to construction of

He suggests that the people of southeastern B.C. should now be entitled to ongoing access to the "environmentally clean" power which is being produced in surplus as a by-product of the water storage and flood control functions.

Mr. Killough is critical of the Gas Turbine project because of the capital investment and the resultant entitlement of the shareholders to a generous return on equity.

 Mrs. Daphne Malins (R.R. #2, Site, 7, Comp. 25, Oliver, B.C., VOH 1TO <u>- Letter dated January 19, 1989</u>)

> Mrs. Malins is a senior who was unable as a result of injuries sustained in an accident to attend the hearings. She has been following the event through the Oliver Chronicle.

> Mrs. Malins suggests that not even WKP have a real idea if the proposed turbine is going to be what the community wants.

She refers to aging residents who have lung problems and the others who have enjoyed life in Oliver free from pollution. She expresses the thought that the citizens of the community must be considered when a decision is made on the project.

7. Dr. A.L. Moyls, P. Eng., (Summerland, B.C. - Letter dated January 13, 1989)

> Dr. Moyls is opposed to the Gas Turbine Project because of its adverse impact on the environment and the wasteful aspect of the turbine operation. He expresses a wish that B.C. might become a leader in the fight against waste and pollution.

> Dr. Moyls is critical of the presentation of environmental considerations in the Application. He presents a scholarly critique of the modelling utilized in the Application, concluding that from his perspective, when you ask if the conclusion is reasonable, the model fails to resemble reality.

8. Mr. Kurt Rott (R.R. #1, S. 88, C. 9, Oliver, B.C., VOH 1TO - Letter dated January 18, 1989)

Mr. Rott expresses his personal opinion on the subject of wind-speed, direction, and smell.

Mr. Rott notes that the computer models in the environmental assessment report relied on Penticton Airport data which is inappropriate since, from Autumn to Spring, Oliver's general main air current comes from the West, with only occasional unwelcome Arctic outflows scouring the warmer air out of the valleys. Only in Spring and Summer afternoons does Oliver have direct strong winds from the South, while in the morning, wind direction is always from the North.

He notes also that in the Winter, wind direction may change several times a day. Mr. Rott wonders if the results from the models present factual conclusions.

Mr. Rott is adamant in his belief that the smell of the turbine emissions will be unacceptable in the community.

9. Mr. Bruno Sabatini (Box 1462, Oliver, B.C., VOH 1TO - Letter dated January 19, 1989 and enclosures)

> Mr. Sabatini did not present further argument but the enclosures endorse the views he had expressed earlier as being representative of three church groups.

10. Mr. & Mrs. Silbernagel (Letter dated January 12, 1989)

> Mr. & Mrs. Silbernagel are owners of a residential property on River Road, across the river from the Industrial Park at Oliver.

> The Silbernagels maintain a quiet lifestyle and enjoy their home. They express concern that the gas turbines will be a great intrusion and source of irritation in their lives. Of additional concern, is the potential negative effect on the value of their property. They request that the Commission bear their concerns in mind.

 Mrs. Buryl Slack (on behalf of Slack Electric Ltd. and Okanagan-Similkameen Co-op) (R.R. #1, Oliver, B.C., VOH 1TO) (a) Letter dated January 20, 1989

> Mrs. Slack presented a rambling 12-page letter expressing many concerns she has with the quality of the WKP Application, the quality of evidence submitted by the Applicant, the lack of adequate understanding of the local weather conditions by the experts dealing with Environmental Assessment.

> She is concerned that the Village Council have acted without the support of the citizens, but is just as concerned that those residents outside the Village proper will have to live with turbines, if approved.

Mrs. Slack emphasizes her perception of the danger of fire at the turbine site, and notes that a request made by her during the hearing concerning "blast modelling" was not responded to.

Mrs. Slack refers to the potential dangers to agriculture and orchards because of the contamination of the atmosphere resulting from operation of the turbines.

Mrs. Slack also expressed anxiety over the deterioration of the local economy, particularly land values if the turbine project is approved.

(b) Letter dated January 24, 1989

Mrs. Slack provides comment concerning the matter of government interest in the Okanagan River because of the various fish stocks involved, particularly, the spawning area utilized by sockeye salmon.

Mrs. Slack also expresses concern with the current proposal by the Village of Oliver to relax the floodplain regulations on the proposed gas turbines site.

(c) Letter dated January 26, 1989

Mrs. Slack notes her concern over the possibility of any lowering of the turbines' stack height and the resultant change in impact from evidence given during the hearing.

12. Mr. J. Slack (R.R. #1, Oliver, B.C., VOH 1TO) (a) Letter dated January 20, 1989

Mr. Slack emphasized his continuing concern that WKP did not have a full soil study done for the hearing.

(b) Letter dated January 26, 1989

Expresses concern over the possibility that the turbines site may now be altered by virtue of the removal of the floodplain elevation requirements from the Industrial zones.

13. Joint Letter from Mrs. B. Slack and Mr. J. Slack dated January 25, 1989

The matter of allocation of costs related to the WKP Application for an Energy Project Certificate was discussed in Oral Argument by J. Slack when he asked that no part of the trip to Texas and Florida be charged against the consumer or WKP, but only against the shareholders of WKP.

The letter refers to their understanding that the allocation of costs of this proceeding may be part of the WKP Revenue Requirements hearing to take place in late February, 1989.

Mr. & Mrs. Slack ask that the Commission bear in mind the unpreparedness of WKP in preparation of material and giving of evidence related to the Gas Turbine Project hearing.

Mr. Frank Shannon, Fisheries Chairman, Okanagan Region
 B.C. Wildlife Federation
 (Box 1133, Summerland, B.C.
 <u>- Letter dated January 24, 1989</u>)

Mr. Shannon wrote to advise that Mr. Macintosh's January 19, 1989 letter to the Commission is incorrect when he states there are no salmon in the Okanagan River at Oliver, B.C.

He notes the involvement of his organization pertaining to salmon migration. He stresses concern that pollution of any kind into the Okanagan River at Oliver could have a serious effect not only on that river, but further downstream, the Columbia River. He suggests that the situation could have international implications. SUMMARY OF REBUTTAL TO WRITTEN ARGUMENTS per G.K. Macintosh, Q.C. letter dated February 6, 1989

1. Buryl Slack - January 20, 1989

Mr. Macintosh states that Mrs. Slack's argument is irrelevant to the issues before the Commission, which are the economics and the environmental consequences of the gas turbines.

The following points are noted in response to some of Mrs. Slack's comments:

- financial benefits from the turbines will accrue to <u>all</u> customers of WKP and there will be increased security of supply in the Okanagan.
- although the contract between WKP and the Village of Oliver permits 100% use of diesel oil it will be impractical for WKP to use oil except when gas is unavailable since oil is at present about four times more costly than natural gas.
- Mrs. Slack's comments concerning Whicker's testimony indicate confusion on her part since she appears to be ignoring the testimony given during the hearing.
- Mrs. Slack's comments concerning the obsolescence of the turbines are mistaken. Such obsolescence applies to aircraft production. Usefulness for generating energy is unquestioned.
- Mr. Macintosh repeats prior evidence that compressed air will be used to start the turbines.
- 2. <u>J. Slack</u>

Mr. Macintosh states that there is no reasonable evidence of any sort to suggest that the Oliver Industrial Park site is not perfectly appropriate for supporting the turbines.

3. Buryl Slack and J. Slack

Mr. Macintosh advises that WKP will comply with every federal and provincial requirement in connection with fisheries.

4. Dr. Moyls

Mr. Macintosh enclosed a copy of Cirrus Consultants' ten page letter dated February 2. 1989 to him as suitable for response to Dr. Movls. That letter is

5. <u>Mr. & Mrs. Silbernagel</u>

Mr. Macintosh enclosed a copy of Barron, Kennedy, Lyzun and Associates' two page letter dated February 1, 1989 (attached) which responds to the Silbernagel.

Mr. Macintosh states that the Silbernagels bought their property long after the site in question was zoned as heavy industrial. He also notes that the sound level of 50-55 dBA is a "worst case" scenario.

6. Dr. Miltimore

Mr. Macintosh confirms that the WKP 1987 Resource Summary does not allow generation credit at Waneta since there is no guaranteed stream flow at Waneta because of the operation of the Boundary Dam and the Seven Mile Dam, both upstream of Waneta.

Mr. Macintosh suggests that the local outcome of recent provincial and federal election proceedings was not necessarily occasioned by concerns over the gas turbine project, noting that Free Trade was the big issue.

Mr. Macintosh comments that the burning of oil in the turbines is not likely to occur rather than natural gas, as long as gas is available, because of the adverse price of oil in relation to natural gas.

Mr. Macintosh refers to the use of relatively high ozone levels at Kelowna as a "conservative" choice.

Mr. Macintosh advises that the 1987 WKP Resource Study was not challenged in this proceeding and the request for a further study is not warranted.

Mr. Macintosh notes that the earliest possible time for sharing Columbia River benefits is 1998.

7. <u>Mr. Gilmour</u>

Mr. Macintosh states that the mandate of the Commission is to assess the economics and environmental impact of the project and that the political aspect of the matter is for the provincial cabinet to assess.

Mr. Macintosh dismisses the comments by Mr. Gilmour concerning increased hydro generation since that matter does not meet WKP's requirement for peaking capacity.

Mr. Macintosh advises that in response to Mr. Gilmour's argument on future electricity and gas prices, he is content to rely on his oral argument as presented.

8. <u>Mr. & Mrs. Abrahamsczik</u>

Mr. Macintosh confirms the distance from the central point of the turbines to the Abrahamsczik house is 310 metres.

Mr. Macintosh notes that the oil tanks are located in the design in such a way as to shield sound from the house in question.

Mr. Macintosh advises that there is no evidence of the river level lowering as a result of the turbines and that WKP has no intention of causing it to occur.

9. <u>Mr. Sabatini</u>

Mr. Macintosh acknowledges the support statements from the three churches and notes that no response is required by WKP.

10. Mr. Killough

Mr. Macintosh does not quarrel with Mr. Killough's comments concerning costs associated with hydroelectric generation and associated environmental costs. He notes, however, that WKP has no automatic access to short-term excess capacity, but must fend for itself.

Mr. Macintosh stresses that hydro generation is environmentally destructive and that in the long-term there is no excess hydro generation available to WKP.

Mr. Macintosh notes that there is no evidence that the gas turbines are a first step in a plan by WKP to establish a thermal power generating network in southeastern B.C. He also notes that even if that were the case, BCUC would have the duty to assess each such application on its own merits.

Mr Macintosh is not inclined to accept Mr. Killough's assertion that WKP has not seriously approached B.C. Hydro for the purpose of negotiating for longterm power commitments. He refers to B.C. Hydro's recent advice to WKP that they will not commit themselves beyond three years. Mr. Macintosh refers to his oral argument which referred to a long history of WKP trying to negotiate reasonably with B.C. Hydro.

Mr. Macintosh does not accept Mr. Killough's environmental impact of the turbines, and makes reference to the absence of Mr. Killough from attendance at the hearing.

Mr. Macintosh acknowledges Mr. Shannon's comments and notes that WKP is proceeding on the assumption that salmon do use the Okanagan River and is following up on the matter with the appropriate federal fisheries personnel.

REPORT AND RECOMMENDATIONS TO THE LIEUTENANT GOVERNOR IN COUNCIL

IN THE MATTER OF the Utilities Commission Act, S.B.C. 1980, c. 60, as amended and IN THE MATTER OF an Application by West Kootenay Power Ltd. for an Energy Project Certificate to construct and operate a Gas Turbine Generation Plant in the Oliver Industrial Park, Oliver, B.C.

February 24, 1989

Before:

J.D.V. Newlands, Deputy Chairman and Chairman of the Division F.C. Leighton, Commissioner A.C. Michelson, Commissioner February 24, 1989

TO THE LIEUTENANT GOVERNOR IN COUNCIL

May It Please Your Honour:

Pursuant to Sections 19(1)(a) and 20 of the Utilities Commission Act, the Minister of Energy, Mines and Petroleum Resources, with the concurrence of the Minister of Environment and Parks referred the Application of West Kootenay Power Ltd. ("WKP") for an Energy Project Certificate for a Gas Turbine Generation Plant to the British Columbia Utilities Commission ("the Commission") for review. The Commission was directed to hear the Application in public hearing in accordance with Terms of Reference dated March 4, 1988, as amended June 2, 1988.

We, the Division of the Commission with responsibility for such review, have the honour to submit our report and recommendations.

Respectfully,

BRITISH COLUMBIA UTILITIES COMMISSION

J.D.V. Newlands, Deputy Chairman and Chairman of the Division

F.C. Leighton, Commissioner

A.C. Michelson, Commissioner

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TERMS OF REFERENCE

IN THE MATTER OF THE UTILITIES COMMISSION ACT ("the Act") S.B.C. 1980, c. 60

and

IN THE MATTER OF AN APPLICATION BY WEST KOOTENAY POWER AND LIGHT COMPANY, LIMITED ("WKPL") FOR AN ENERGY PROJECT CERTIFICATE FOR THE OKANAGAN GAS TURBINE GENERATION PLANT ("the Project")

DISPOSITION OF APPLICATION AND TERMS OF REFERENCE FOR REVIEW BY THE BRITISH COLUMBIA UTILITIES COMMISSION

WHEREAS, WKPL, pursuant to section 18 of the Act and in conformance with the requirements of B.C. Regulation 388/80, applied for an Energy Project Certificate by way of an Application dated December, 1987 ("the Application");

AND WHEREAS, application may be made to the Provincial Agricultural Land Commission to exclude land for the Project from the land reserve pursuant to the Agricultural Land Commission Act;

AND WHEREAS, applications may be made to the local government having jurisdiction with respect to land use matters;

NOW THEREFORE, pursuant to sections 19(1)(a) and 20 of the Act, the Minister of Energy, Mines and Petroleum Resources, with the concurrence of the Minister of Environment and Parks, refers the Application to the British Columbia Utilities Commission ("the Commission") for review. The Commission shall hear the Application in public hearing in accordance with the following Terms of Reference, and invite comments from interested parties.

1. OBJECTIVE

The Commission shall recommend to the Lieutenant Governor in Council whether the Energy Project Certificate applied for by WKPL should be issued or refused, and, if issued, subject to what conditions.

2. PROJECT JUSTIFICATION AND RESOURCE OPTIONS

2(1) PROJECT JUSTIFICATION

The Commission shall review and assess whether the Project is the preferred new resource to meet forecast load growth given cost, operating conditions, reliability, and safety considerations.

- 2 -

2(2) PRELIMINARY ENVIRONMENTAL REVIEW

The Commission shall review and assess any detrimental environmental impacts associated with a gas turbine generation plant, and identify mitigation proposals that would reduce environmental impacts to an acceptable level.

2(3) RESOURCE OPTIONS

The Commission shall, inter alia, review and assess those sections of WKPL's "1987 Resource Study Supply and Demand Options", attached as Appendix 1 of its Application, which the Commission deems appropriate to its review of Project justification, including demand side options, alternate power sources, wheeling, and their effect on rates.

- з. REVIEW OF OKANAGAN GAS TURBINE GENERATION PLANT
- 3(1) CAPITAL COSTS

The Commission may review and assess WKPL's Project capital cost estimate at its proposed (Kelowna Industrial) site, at two alternative sites (Hiram Walker North and Hiram Walker South) as identified in the Application, or, with the concurrence of the Commission, at other sites. Cost components to be examined shall include, inter alia:

- land acquisition; (a)
- (b) rail spur;
- (c) access road;
- (d) gas line;
- (e) water supply
- (f) transmission to main electric grid;
- (g) gas turbines;
- (h) emission control and noise attenuation equipment;
 (i) design and engineering;
- (j) allowance for funds used during construction;
- (k) contingencies; and
- (1)other capitalized costs.

3(2) COST OF SERVICE AND RATE IMPACTS

For each site examined pursuant to section 3(1) of these Terms of Reference, the Commission shall review and assess annual estimates of cost of service and the components thereof, including, inter alia:

- (a) depreciation expense;
- (b) interest and return on equity;
- (c) corporate taxes;
- (d) costs of fuel (natural gas and #2 fuel oil);
- (e) operating and maintenance costs;
- (f) property taxes; and
- (g) other expenses, taxes, or costs added to the cost of service.

The Commission shall also review and assess impacts of the Project on rates charged for service by WKPL.

3(3) DESIGN AND OPERATION

For each site examined pursuant to section 3(1), the Commission shall review and assess the adequacy of the Project design and operation with respect to safety and reliability of service.

3(4) ENVIRONMENTAL IMPACT

For each site examined pursuant to section 3(1), the Commission shall review and assess predicted air emissions, the environment's capability to disperse the emissions, and proposals to mitigate detrimental impacts on the environment. The Commission shall also consider and recommend whether approvals under the Waste Management Act for emissions to the environment should be issued.

The Commission shall review and assess the levels of noise emitted by the Project and the Applicant's proposals for noise attenuation.

For each site examined pursuant to section 3(1), the Commission may review and assess other environmental matters deemed by the Commission to be relevant.

3(5) PROJECT SCHEDULING

The Commission shall review and assess the reasonableness of WKPL's anticipated Project schedule in meeting the proposed commissioning date of June 1989.



-15-1

3(6) PROCUREMENT

With respect to labour, material and equipment procurement, the Commission shall review WKPL's proposed level of British Columbian and Canadian content, and recommend possible ways to maximize British Columbian and Canadian content, while recognizing the desire to minimize Project costs.

4. OTHER MATTERS

The Commission shall consider any other matters, jointly specified from time to time by the Minister of Energy, Mines and Petroleum Resources and the Minister of Environment and Parks, prior to the conclusion of the hearing, in its review of the Application.

In its review of the Application, the Commission shall take into consideration the decisions, if any, of the provincial Agricultural Land Commission and local governments with respect to land use matters.

5. REPORT AND RECOMMENDATIONS

5(1) TIMING

On conclusion of the public hearing, the Commission shall submit a report and recommendations to the Lieutenant Governor in Council by June 30, 1988, or as soon thereafter as may be practical. In the event that there are impediments to the expeditious review of the Application, the Commission shall advise the Minister of Energy, Mines and Petroleum Resources, and indicate how government may assist in expediting the review process.

5(2) OPTIONAL REPORT FOLLOWING REVIEW OF PROJECT JUSTIFICATION

Notwithstanding section 5(1), the Commission may conclude the hearing and submit a report and recommendations to the Lieutenant Governor in Council following its review and assessment of matters specified in section 2 of these Terms of Reference. By so doing, the Commission shall not hear matters specified in section 3 of these Terms of Reference.
5(3) REPORT CONTENTS

In its report and recommendations, the Commission shall recommend whether the Energy Project Certificate applied for by WKPL should be refused or issued, and if issuance is recommended, the Commission may also recommend conditions it considers advisable for inclusion in an Energy Project Certificate, an Energy Operation Certificate, or both.

5(4) TRANSMITTAL

WKPL's Application for the Project is transmitted to the Commission with this Disposition and Terms of Reference.

Minister of Energy, Mines and Petroleum Resources

Honourable W. Bruce Strachan Minister of Environment and Parks

Dated for this 4th day of March, 1988.

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APPENDIX 1 Page 6 of 6

AMENDMENT NUMBER ONE TO TERMS OF REFERENCE

IN THE MATTER OF THE UTILITIES COMMISSION ACT (the Act) S.B.C. 1980, c.60, as amended

and

IN THE MATTER OF AN APPLICATION (the Application) BY WEST KOOTENAY POWER AND LIGHT CO. LTD. (WKPL) FOR AN ENERGY PROJECT CERTIFICATE FOR THE OKANAGAN GAS TURBINE GENERATION PLANT

WHEREAS, the Minister of Energy, Mines and Petroleum Resources and the Minister of Environment and Parks on March 4, 1988, referred the Application to the British Columbia Utilities Commission (the Commission) for review in accordance with Terms of Reference;

AND WHEREAS, the Commission, by Order Number G-49-88, has granted a request by WKPL for a postponement of the Public Hearing on the Application;

AND WHEREAS, section 5(1) of the said Terms of Reference requires the Commission to submit a report and recommendations to the Lieutenant Governor in Council by June 30, 1988, or as soon thereafter as may be practical;

NOW THEREFORE, the said section 5(1) of the Terms of Reference is hereby amended by deleting the words "by June 30, 1988, or as soon thereafter as may be practical".

Honourable Jack Davis Minister of Energy, Mines and Petroleum Resources

Honourable Bruce Strachan Minister of Environment and Parks

Dated for reference this 📈 day of June, 1988

APPENDIX 2 Page 1 of 2

GLOSSARY OF TERMS

- Average Cost: Total costs of producing electricity divided by the total number of kilowatt hours produced.
- <u>Avoided Cost</u>: The incremental cost of electricity which, but for the purchase from an alternative facility, a utility would generate itself.
- <u>Back-up Power</u>: An alternative source of power which can be readily utilized in the event that the primary source is unavailable.
- Base Load: The minimum load in a power system over a given period of time. Base load resources run continually except for maintenance and scheduled or unscheduled outages.
- <u>Capacity</u>: The amount of electric load (in watts, kilowatts or megawatts) which a device can carry at one time. (Capacity is also used synonymously with capability).
- Discount Rate: The rate at which future values are reduced to comparable present value.
- Firm Power
- (Capacity/Energy): Electric power which is intended to have assured availability at all times except for reasons beyond the control of the power producer.
- Incremental Cost: The expected change in the total costs to supply one additional unit of output.
- Interconnection: The point at which the transmission systems of two utilities are connected.

Interruptible Power:

Power, which by contract can be interrupted in the event of a capacity deficiency on the supplier's system.

Levelized Cost: The present value of a resource's cost (including capital, interest, and operating costs) converted into a stream of equal annual payments and divided by annual kilowatt hours saved or produced.

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GLOSSARY OF TERMS (continued)

Load Factor:	The ratio of average demand, in kilowatts, over a stated period of time, to the maximum demand in kilowatts occurring in that same period of time.
Marginal Cost:	The cost of serving the next increment of new load by:
	 increasing generation output or purchasing capacity deficit on a short-term basis (Short-Run Marginal Cost); or
	 constructing new generation facilities or executing a long-term firm power purchase contract for the capacity shortfall (Long-Run Marginal Cost).
Non-Firm Energy:	Electric energy having limited or no assured availability (also called Secondary Energy).
Peak Demand:	The maximum demand imposed on a power system by customer usage during a specified period of time.
Present Value:	The worth of future returns or costs in terms of their value at the present time.
Rate Base:	The dollar value established by a regulatory agency, of a utility's plant, equipment, and intangible capital assessed as useful in serving the public.
Rate of Return:	The ratio of total earnings on a specified rate base expressed as a percentage of that base.
Surplus Energy:	Firm energy not required to meet the producer's load or contractual commitments.
Wheeling:	An electric operation wherein transmission facilities of one system are used to transmit power to another system.

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SUMMARY OF NOISE CONCERNS AND RESPONSES

The most frequently expressed or significant noise concerns raised by intervenors and the public-at-large and the response of the Commission's specialist consultants related to each issue are identified below:

- CONCERN: Noise from the gas turbine will disturb residents within the Village of Oliver.
- RESPONSE: Disturbance of residents within 300 500 m of the Industrial Park may occur under a variety of conditions. The potential for disturbance would decrease with increased distance from the site and/or proximity to other existing noise sources such as highway traffic. Nevertheless, under some meteorological and operational conditions (e.g., during thermal inversions and when 3 or 4 turbines are operating), relatively large numbers of residents could be exposed to noise levels capable of causing some degree of annoyance.
- CONCERN: The turbines will emit high-pitched oscillating sounds when they are shutdown or started.
- RESPONSE: This phenomenon is extremely unlikely with the proposed sound-attenuating devices.
- CONCERN: Noise from the facility will disturb patients at the local hospital.
- <u>RESPONSE</u>: It is expected that noise produced by the turbines would only be detectable at this distance from the site under thermal inversion conditions and when 3 or 4 turbines are in use.
- CONCERN: The noise assessment did not consider the potential effects of subsonic and ultrasonic sound.
- RESPONSE: Because the sound pressure level of a gas turbine decreases at a frequency of 50 Hz (Hertz), there is no reason to expect that the proposed facility would produce significant subsonic (below 20 Hz) sound. Even if subsonic sound was produced, it would have less effects on humans than the same intensity of sonic frequencies of noise, Ultrasonic (above 20,000 Hz) sounds are very rapidly absorbed in the atmosphere and, therefore, not propagated any significant distance from the source. There is also no evidence that the proposed turbine would produce significant ultrasonic sound.

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- <u>CONCERN</u>: Ground vibrations produced by the gas turbines will be detectable in adjacent areas and may affect future users of the industrial park.
- RESPONSE: Because gas turbines operate at high rotational speeds with extremely fine tolerences, vibration would not normally result from such equipment. If the turbines were even slightly out of balance, they would not operate. In addition, they would be mounted on vibration isolators and, as a result, essentially no ground vibration will occur. It is anticipated that airborne noise as opposed to ground vibration will be the primary source of impact, and that very few industrial users would be affected significantly by operation of the turbines.
- CONCERN: Residents located on the bluff to the east of the site will be exposed to higher noise levels than at comparable horizontal distances from the park.
- RESPONSE: It is expected that noise levels at three residences overlooking the plant (maximum angle of 8.4 degrees) would be 1-2 decibels higher than for neighbours living horizontally adjacent to the plant (at the same linear distance) because slightly more noise would be propagated vertically due to the directivity of the stack.
- CONCERN: The presence of significant pure (discrete) tones may increase the impacts of noise on local residents.
- <u>RESPONSE</u>: This concern is valid and WKP has agreed, in its Response to Commission Staff Information Request No. 3 (Volume 7, November 10, 1988, p. 72), to "require that the turbine supplier not only meets a maximum (noise) level for all equipment supplied, but also that discrete tones from the installation be controlled to ensure there is no resulting annoyance."
- CONCERN: Increased noise levels may occur in some areas due to phase addition of noise.
- <u>RESPONSE</u>: Phase addition of noise will not be a significant problem if significant discrete tones do not occur in the noise spectrum of the gas turbines.

SUMMARY OF AIR EMISSION CONCERNS AND RESPONSES

The following points summarize the most frequent or significant concerns raised prior to and during the hearing, and the response of the Commission staff and consultants to each of these issues.

- <u>CONCERN</u>: WKP's consultants relied on meteorological and background air quality data available for areas other than the Oliver region.
- RESPONSE: In the absence of site-specific data, it is common and accepted practice to use data from adjacent areas in screening models. The assumptions necessary to conduct the impact analysis should be and were identified in the assessment report. Although not all intervenors and the BCMOE agreed with specific assumptions, they were explicitly stated by the Applicant. As such, independent re-analysis based on different assumptions is possible as deemed appropriate.
- <u>CONCERN</u>: Changes in air quality resulting from operation of the proposed facility will pose a health risk to members of the local population with respiratory disorders such as asthma and cardiopulmonary impairment.
- RESPONSE: The predicted maximum ambient concentrations of NO₂ and SO₂ in the local airshed are well below thresholds known to induce adverse health symptoms in even sensitive individuals.
- <u>CONCERN</u>: Operation of the proposed facility will lead to local increases in the ambient concentration of ozone in the atmosphere.
- RESPONSE: The proposed gas turbine will not emit ozone per se. In fact, the conversion of NO to NO₂ will tend to locally decrease ozone concentrations. This will be offset to only a limited degree by photochemical production of ozone because of the low emissions of hydrocarbons from the proposed facility.
- <u>CONCERN</u>: Damage to local crops and rangelands will result from emissions associated with the project.
- RESPONSE: The ambient NO₂ and SO₂ concentrations predicted by WKP, damage to local crops and rangelands due to operation of the proposed facility is considered unlikely. Maximum doses of NO₂ and SO₂ (both singly and in combination) that are projected to result from operation of the facility are less than the majority of concentrations and exposure times known to cause vegetation damage. Predicted maximum ambient concentrations of NO₂ and SO₂ are also below government guidelines established to protect the environment.

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- <u>CONCERN</u>: Exhaust emissions will impair local visibility due to the presence of visible plume, increased overcast or fog, and reduced sunlight.
- RESPONSE: The exhaust gases from the turbine will have a temperature of over 400° C and a moisture content of about seven percent. Cooling of these gases by mixing will result in a moisture that will have a relative humidity of less than 100 percent, and will not result in the condensation of water droplets that causes visible emissions, fog or haze. It is possible that cooling by adiabatic expansion may cause condensation at high altitudes, but it is unlikely that this high-altitude effect will be noticeable at ground level.
- <u>CONCERN</u>: Some soils in the Okanagan Valley are already acidic because of past and ongoing fertilizer application and may be more sensitive than uncultivated soils to acid inputs resulting from project emissions.
- RESPONSE: The pH of soils in Okanagan apple orchards has declined from that in uncultivated areas because of nitrogen fertilization and herbicide application. The problem has been compounded by over-irrigation and the practice of applying fertilizer in bands near tree trunks. Incremental increases in soil acidification due to sulphate or nitrate deposition are considered unlikely at NO₂ and SO₂ emission rates and ambient concentrations predicted by the Applicant, particularly if lime is added to restore decreased soil cation exchange capacity and farm management practices changed to minimize further fertilizer-related acidification.
- <u>CONCERN</u>: The continued combustion of fossil fuels resulting in production of carbon monoxide and dioxide, as proposed in this project, will contribute to the global greenhouse effect.
- RESPONSE: The contribution of fossil fuel combustion to the greenhouse effect is a serious concern on a global scale. However, emissions resulting from this project are insignificant in comparison to other combustion sources such as automobiles and furnaces, even in a local or regional context. It cannot be disputed that projects of this nature will contribute incrementally to the global greenhouse effect, as well as to acidic precipitation.

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BACKGROUND INFORMATION ON SENSITITY ANALYSIS

1	Table 5.1	
	The second se	
(a)	-	

CASE \$ in 1989 Millions	KEY ASSUMPTIONS	DISCOUNTED CASH FLOW NPV Benefit/Cost		REVENUE REQUIREMENT SAVED PV Benefit/Cost	
		•	Ratio		Ratio
APPLICANT'S CASES	161.0			101-0	
1.BASE CASE-EXHIBIT#109	BC Hydro at Inflation Less 1% Gas Price at '86/'87 MEMPR	\$34	1.26	\$27	1.20
2.1 BASE CASE-REVISED	As above, but Tier 1 gas reduced by 31¢	\$32	1.24	\$25	1.18
2.2 COMINCO AT 90%	Asabove,butCominco Non-Firm 90%, Gas 10%	\$ 35	1.27	\$28	1.20
2.3 COMINCO AT 50%	Asabove,butComInco Non-Firm 50%, Gas 50%	\$28	1.21	\$22	1.15
2.1 MOST PROBABLE	Lowest Gas Prices '86 MEMPR B.C. Hydro at 3.5% escalation	(\$8)	1.44	(\$15)	1.37
2 I MOST PROBABLE	BC Hydro at 3.5% escalation	(\$8)		(\$15)	
(Cominco at 70%)	GasPricesat NEB Average		0.95		0.91
2.2 COMINCO AT 90%	Asabove,butCominco Non-Firm 90%, Gas 10%	(\$3)	0.98	(\$10)	0.94
2.3 COMINCO AT 50%	Asabove,butCominco Non-Firm 50%, Gas 50%	(\$14)	0.92	(\$21)	0.88
3. PESSIMISTIC	BC Hydro 0% Nominal to '94 Gas Price at NEB High	(\$43)	0.77	(\$49)	0.74
4. MOST PESSIMISTIC	BC Hydro 0% Nominal to '94 Use 011 100% instead of Gas	(\$203)	0.41	(\$210)	0.40
NOTES 1. All of the above cases esc at the escalation rate for nation 2. Motor Fuel Tax (MFT) at 79	alate the blended non-firm prices ural gas. [per Applicant's Base Cas & has been added on gas consum!	s, Others 50 se Treatme ption.	0% and (nt]	Gas 50%,	
where applicable, except for t	he Applicant's Case-I-Base Case.				

except for the Applicant's Case-1-Base Case

Benefit/CostScenario of WKPGasTurbine

APPENDIX 5 Page 2 of 11

COST/BENEFIT ANALYSIS \$M Ex109 *BCH INF-1 **ING EX*98, MEMPR ***UpCapO&M	Present Value	Present Value	Present Value
NOMINAL DISCOUNTRATE	8.00%	12.00%	16.00%
COSTS			
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) {NBINCOME TAX EXCLUDED-Use 11% for Debt]	\$36.00	\$36.00	\$36.00
Property Tax	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
Wheeling	2.39	1.43	0.88
FUEL-Gas Turbine	11.98	8.05	5.69
InlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	40.12	28.56	21.05
BCH & Others non-firm energy	77.07	50.45	34.82
TOTAL COSTS	176.64	130.91	103.21
DENEELTE			
	51.01	7407	05 10
REDUCED BCH Capacity Purchases	31.21	100.06	23.12
REDUCED BCH Firm Energy Purchases	1/0.21	122.20	07.77
DEFERRAL OF South Okanagan SOOK V Sub	5.05	7.63	7.01
TOTAL BENEFITS	234.46	164.86	120.50
NET BENEFIT [(-)NET COST]	\$57.82	\$33.95	\$17.28
BENEFIT TO COST RATIO	1.33	1.26	1.17
REQUIRED REVENUE ANALYSIS	Present	Present	Present
EX109 *BCH INF-1 ** ING EX#98, MEMPR *** UpCapO&M	Value	Value	Value

NEI	REQUIRED	REVENUE	((-)REDUCTION]	-\$37.78	-\$27.06	-\$19.29
NET	REQUIRED	REVENUE	(-)REDUCTION	-\$37.78	-\$27.06	-\$19.29
NOPTIC	ALDISCOUN	RAIL		0.00%	12.00%	10.00%

ASSUMPTIONS *Indicate changes to Original Assumptions BY the Applicar
*1. B.C. Hydro rate escalation
(1988: 0%, THEN AT Inflation Minus 1%)
(model-row 279)
**2. Latest Inland Offer Per Ex. #98 and Gas Fuel escalation per UPDATE 1987-1992 MEMPR: including 1992 at 21% to reflect the end of the "supply bubble". 1993 and on per the 1986 MEMPR forecast
(model-rows 44 & 281)
***3. Capital cost at \$36.0 Million; 0&M -\$150K to \$270K p.a. (Ex.#5 p14) (model-rows 19 & 379)
4. Non-firm: 70% Cominco and 30% Gas; 50% Others & 50% Gas SUMMER \$

GT-PER WKP'89\$-CBGT APPLICANT'S CASE 1-BASE CASE-EX # 109

APPENDIX 5 Page 3 of 11

	Benefit/Cost	Scenario of	WKP Gas	Turbine	(REVISED TIER	1,7% MFT)	Page 3	C
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COST/BENEFIT ANALYSIS \$M Ex109:[BCH INF-1][ING EX#98-31¢,MEMPR][UpCabO&M	Present Value	Present Value	Present Value
+ 7% Motor Fuel Tax on Gas			
NOMINAL DISCOUNT RATE	8.00%	12.00%	15.00%
COSTS			
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) [NBINCOME TAX EXCLUDED-Use 11% for Debt]	\$36.00	\$36.00	\$36.00
Property Tax	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
Wheeling	2.39	1.43	0.88
FUEL-Gas Turbine	11.42	7 67	5.43
InlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	41.08	29.25	21.56
BCH & Others non-firm energy	79.42	51.98	35.88
50.1 0. 20.01 2. 0.01 . 0.01 . 0.01 . 0.01			
TOTAL COSTS	179.39	132.75	104.52
BENEELTS			
REDUCED BCH Capacity Purchases	51.21	34.97	25.12
REDUCED BCH Firm Energy Purchases	178.21	122.26	87.77
DEFERRAL of South Okanagan 500KV Sub	5.05	7.63	7.61
TOTAL BENEFITS	234 46	16486	120.50
NET BENEFIT [(-)NET COST]	\$55.07	\$32.10	\$15.98
BENEFIT TO COST RATIO	1.31	1.24	1.15
REQUIRED REVENUE ANALYSIS	Present	Present	Present
Ex109:(BCH INF-1)(ING EX#98-31¢,MEMPR)(UpCapO&M	Value	Value	Value
NOMINAL DISCOUNT RATE	8.00%	12.00%	15.00%
NET REQUIRED REVENUE [(-)REDUCTION]	-\$35.02	-\$25.21	-\$17.99

A S S U M P T I O N S *Indicate changes to Original Assumptions of the Applicant *1. B.C. Hydro rate escalation (1988: 0%, THEN AT Inflation Minus 1%) (model-row 279) **2. Latest Inland Offer Per Ex. *98 less 31¢ Tier 1, +7% and Gas Fuel escal. UPDATE 1987-1992 MEMPR: including 1992 at 21% to reflect the end of the "supply bubble". 1993 and on per the 1986 MEMPR forecast (model-rows 44 & 281) ***3. Capital cost at \$36.0 Million; 0&M -\$150K to \$270K p.a. (Ex.*5 p14) (model-rows 19 & 379) 4. Non-firm: 70% Cominco and 30% Gas; 50% Others & 50% Gas SUMMER \$

BENEFIT TO COST RATIO

APPLICANT'S CASE 2.1-BASE CASE-REVISED

1.18 1.18 1.18

Benefit/Cost Scenario of WKP Gas Turbine (REVISED TIER 1, 7% MFT) APPENDIX 5 Page 4 of 11

COST/BENEFIT ANALYSIS \$M 90%Com(BCH INF-1)(ING EX#98-31¢,MEMPR)(+CapO&	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
COSTS			
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) {NBINCOME TAX EXCLUDED-Use 11% for Debt}	\$36.00	\$36.00	\$36.00
PropertyTax	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
wheeling	2.39	1.43	0.88
FUEL-Gas Turbine	11.42	7.67	5.43
InlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	37.17	26.56	19.64
BCH & Others non-firm energy	79.42	51.98	35.88
TOTAL COSTS	175.49	130.07	102.60
PENEELTS			
	51.01	7407	05.10
REDUCED BCH Capacity Purchases	51.21	100.06	23.12
REDUCED BCH FITTH ENERGY POLICIASES	1/0.21	122.20	07.77
DEFERRAL OF SOUTH OK ANAGAN SOUK V SUD	5.05	7.63	7.01
TOTAL BENEFITS	234.46	164.86	120.50
NET BENEFIT [(-)NET COST]	\$58.98	\$34.79	\$17.90
BENEFIT TO COST RATIO	1.34	1.27	1.17
REQUIRED REVENUE ANALYSIS	Present	Present	Present
90%Com(BCH INF-1){ING EX#98-31¢,MEMPR){+CapO&	Value	Value	Value
NOMINALDISCOUNTRATE	8.00%	12.00%	15.00%
NET REQUIRED REVENUE [(-)REDUCTION]	-\$38.93	-\$27.89	-\$19.90
BENEFIT TO COST RATIO	1.20	1.20	1.20

A S S U M P T I O N S *Indicate changes to Original Assumptions of the Appli	cant
*1. B.C. Hydro rate escalation	
(1988: 0%, THEN AT Inflation Minus 1%)	
(model-row 279)	
**2. Latest Inland Offer Per Ex. #98 less 31¢ Tier 1,+7% MFT and Gas Fuel escalation per UPDATE 1987-1992 MEMPR: including 1992 at 21% to reflect	t
the end of the "supply bubble". 1993 and on per the 1986 MEMPR forecast (model-rows 44 & 281)	
***3. Capital cost at \$36.0 Million; O&M -\$150K to \$270K p.a. (Ex.#5 p (model-rows 19&379)	14)
4. Non-firm: 90% Cominco and 10% Gas; 50% Others & 50% Gas SUMMER	5

GT-WKP-31¢,7%'89\$-90% APPLICANT'S CASE 2.2-COMINCO @ 90%

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APPENDIX 5

Benefit/Cost Scenario of WKP Gas Turbine (REVISED TIER 1, 7%MFT) Page 5 of 11

COST/BENEFIT ANALYSIS \$M 50%Com{BCH INF-1}{ING EX#98-31¢,MEMPR}{+CapO&	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
COSTS		* 3	
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) (NBINCOME TAX EXCLUDED-Use 11% for Debt)	\$36.00	\$36.00	\$36.00
PropertyTax	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
wheeling	2.39	1.43	0.88
FUEL-Gas Turbine	11.42	7.67	5.43
nlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	46.32	32.88	24.17
3CH & Others non-firm energy	79.42	51,98	35.88
TOTAL COSTS	184.63	136.38	107.13
BENEELTS			
REDUCED BCH Capacity Purchases	5121	3497	25.12
REDUCED BCH Firm Epergy Purchases	178 21	122.26	87.77
DEFERRAL of South Okanagan 500KV Sub	5.05	7.63	7.61
TOTAL BENEFITS	234.40		120.50
NET BENEFIT [(-)NET COST]	\$49.83	\$28.47	\$13.37
BENEFIT TO COST RATIO	1.27	1.21	1.12
REQUIRED REVENUE ANALYSIS 50%Com{BCH INF-1){ING EX#98-31¢,MEMPR}{+CapO&	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
NET REQUIRED REVENUE [(-)REDUCTION]	-\$29.79	-\$21.58	-\$15.37

BENEFIT TO COST RATIO 1.15 1.15

ASSUMPTIONS *Indicate changes to Original - Assumptions of the Appli	cant
*1. B.C. Hydro rate escalation	
(1988: 0%, THEN AT Inflation Minus 1%)	
(model-row 279)	Í
**2. Latest Inland Offer Per Ex.*98 less 31¢ Tier1.+7% MFT and Gas Fuel	
escalation per UPDATE 1987-1992 MEMPR: including 1992 at 21% to reflect	the
of the "supply bubble". 1993 and on per the 1986 MEMPR forecast	
(model-rows 44 & 281)	
***3. Capital cost at \$36.0 Million; 0&M -\$150K to \$270K p.a. (Ex.*5 p1	4)
(model-rows 19 & 379)	- 1
4. Non-firm: 50% Cominco and 50% Gas: 50% Others & 50% Gas SUMMER \$	

GT-WKP-31¢7%'09\$-50% APPLICANT'S CASE 2.3-COMINCO @ 50%

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1.15

APPENDIX 5

Benefit/Cost Scenario of WKP Gas Turbine (Revised-Tier 1, 7% MFT) Page 6 of 11

and the second			
COST/BENEFIT ANALYSIS \$M HIGH*BCH INF**ING EX#98, 86MEMPR***UpCapO&M	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
COSTS			
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) {NBINCOME TAX EXCLUDED-Use 11% for Debt}	\$36.00	\$36.00	\$36.00
Property Tax 1	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
Wheeling	2.73	1.54	1.00
FUEL-Gas Turbine	10.33	6.96	4.93
InlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	39.31	28.01	20.66
BCH & Others non-firm energy	70.28	46.15	31.97
TOTAL COSTS	167.73	125.17	99.34
BENEFITS			
REDUCEDBCHCapacityPurchases	56.99	38.50	27.39
REDUCED BCH Firm Energy Purchases	197.91	134.52	95.77
DEFERRAL of South Okanagan 500KV Sub	5.05	7.63	7.61
TAT	050.06	100.55	
TOTAL BENEFITS	259.90	180.66	
NET BENEFIT [(-)NET COST]	\$92.22	\$55.49	\$31.43
BENEFIT TO COST RATIO	1.55	1.44	1.32
REQUIRED REVENUE ANALYSIS HIGH*BCH INF**ING EX#98, '86MEMPR***UpCapO&M	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%

 NET REQUIRED REVENUE [(-)REDUCTION]
 -\$72.18
 -\$48.60
 -\$33.44

 BENEFIT TO COST RATIO
 1.38
 1.37
 1.34

A S S U M P T I O N S *Indicate changes to Original Assumptions of the Applicant *1. B.C. Hydro rate escalation (1988: 0%, THEN AT Inflation) (model-row 279) **2. Latest Inland Offer Per Ex. #98 (less 31¢ Tier 1) +7%MFT and Gas Fuel escalation per 1986 MEMPR-Represents the lowest gas price escalation assumpti (THIS IS THE ORIGINAL PRIMARY ASSUMPTION PLUS THE LATEST ING OFFER) (model-rows 44 & 281) ***3. Capital cost at \$36.0 Million; 0&M -\$150K to \$270K p.a. (Ex.#5 p14) (model-rows 19 & 379) 4. Non-firm: 70% Cominco and 30% Gas; 50% Others & 50% Gas--Summer \$

APPENDIX 5

Benefit/Cost S	cenario of	WKP Gas 1	furbine (REVISED	Tier 1	, 7% MFT)

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COST/BENEFIT ANALYSIS \$M *BC HYDRO@ 3.5%**ING EX*98, NEB AVG.***UpCapO&M	Present Value	Present Value	Present Value
less 31¢ on Tier 1 gas, plus 7% Motor Fuel Tax On Gas			
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
COSTS			
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) {NBINCOME TAX EXCLUDED-Use 11% for Debt]	\$36.00	\$36.00	\$36.00
Property Tax	229	1.62	121
O.&.M	4.05	2.80	204
Wheeling	216	1.30	0.80
FLIEL-Gas Turbine	15.87	10.40	719
InlandCarryingCharges	203	1 48	114
InlandGenera)	0.72	0.51	0.38
	46.82	33.11	24.26
BCH & Others con-firm energy	120.25	76 39	51 22
bert diother short film energy	120.20	10.00	51.22
TOTAL COSTS	230.19	163.61	124.24
BENEFITS			
REDUCED BCHCapacity Purchases	47.64	32.86	23.82
REDUCED BCH Firm Energy Purchases	166.16	115.01	83.20
DEFERRAL of South Okanagan 500KV Sub	5.05	7.63	7.61
TOTAL BENEFITS	218.86	155 50	11463
TOTAL DEALTING	210.00	133.30	
NET BENEFIT [(-)NET COST]	-\$11.33	-\$8.11	-\$9.61
BENEFIT TO COST RATIO	0.95	0.95	0.92
DEQUIDED DEVENUE ANALYSIS	Deseast	Descant	Descont
*BC HYDRO@ 3.5%**ING EX#98. NEB AVG.***UDCabO&M	Value	Value	Value
less 31¢ on Tier 1 gas, plus 7% Motor Fuel Tax			
NOMINAL DISCOUNTRATE	8.00%	12.00%	16.00%
NET REQUIRED REVENUE [(-)REDUCTION]	\$31.38	\$15.00	\$7.60

BENEFIT TO COST RATIO 0.87 0.91

A S S U M P T I O N S *Indicate changes to Original Assumptions of the Applicant *1. B.C. Hydro rate escalation (1988: 0%, THEN AT 3.5% annually) (model-row 279) **2. Latest Inland Offer Per Ex. *98 (less 31¢ Tier 1) +7% and Gas Fuel escal. NEB, AVERAGE OF HIGH AND LOW FOR B.C. INDUSTRIAL PRICE- SEE TABLE 6.1.3 (model-rows 44 & 281) ***3. Capital cost at \$36.0 Million; 0&M -\$150K to \$270K p.a. (Ex.*5 p14) (model-rows 19 & 379) 4. Non-firm at 70% Cominco and 30% Gas--50% Others & 50% gas--Summer 1

GT-3.5-NEBAVG-314+7%'89\$ COMMISSION CASE 2.1-MOST PROBABLE

0.94

APPENDIX 5 Page 8 of

Benefit/Cost Scenario of WKP Gas Turbine (REVISED Tier 1, 7% MFT)

ane	8	of	11
aye	0	01	+ +

COST/BENEFIT ANALYSIS \$M Commission Most Probable BUT 90% Cominco, 10% Gas	Present Value	Present Value	Present Value
NOMINAL DISCOUNT RATE	8.00%	12.00%	16.00%
COSTS			
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) (NBINCOME TAX EXCLUDED-Use 11% for Debt)	\$36.00	\$36.00	\$36.00
PropertyTax	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
wheeling	2.16	1.30	0.80
FUEL-Gas Turbine	15.87	10.40	7.19
InlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	38.74	27.61	20.37
BCH & Others non-firm energy	120.26	76.39	51.22
TOTAL COSTS	222.12	158.11	120.35
BENEFITS			
REDUCED BCH Capacity Purchases	47.64	32.86	23.82
REDUCED BCH Firm Energy Purchases	166.16	115.01	83.20
DEFERRAL of South Okanagan 500KV Sub	5.05	7.63	7.61
TOTAL BENEFITS	218.86	155.50	114.63
NET BENEFIT [(-)NET COST]	-\$3.26	-\$2.61	-\$5.72
BENEFIT TO COST RATIO	0.99	0.98	0.95
DECULDED DEVENUE ANALYSIS	Descont	Drocost	Drocont

REQUIRED REVENUE ANALYSIS Commission Most Probable BUT 90% Cominco, 10% Gas	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
NET REQUIRED REVENUE [(-)REDUCTION]	\$23.30	\$9.50	\$3.71
BENEFIT TO COST RATIO	0.90	0.94	0.97

ASSUMPTIONS *Indicate changes to Original Assumptions of the Applica
*1. B.C. Hydro rate escalation
(1988: 0%, THEN AT 3.5% annually)
(model-row 279)
**2. Latest Inland Offer Per Ex. #98 (less 31¢ Tier 1) + 7% MFT
and Gas Fuel escalation per
NEB, AVERAGE OF HIGH AND LOW FOR B.C. INDUSTRIAL PRICE- SEE TABLE 6.1.3 (model-rows 44 & 281)
***3. Capital cost at \$36.0 Million; O&M -\$150K to \$270K p.a. (Ex.#5 pl- (model-rows 19 & 379)
4. Non-firm at 90% Cominco and 10% Gas50% Others & 50% gasSummer

APPENDIX 5 Page 9 of 11

Benefit/Cost Scenario of WKP Gas Turbine (REVISED Tier 1, 7% MFT)

COST/BENEFIT ANALYSIS \$M Present Present Present Commission Most Probable BUT 50% Cominco, 50% Gas Value Value Value ----------NOMINAL DISCOUNT RATE 8.00% 12.00% 16.00% COSTS CAPITAL COSTS INCLUDING AFUDC (In 1989\$) \$36.00 \$36.00 \$36.00 [NB--INCOME TAX EXCLUDED-Use 11% for Debt] Property Tax 2.29 1.62 1.21 0 & M 4.05 2.80 2.04 wheeling 2.16 1.30 0.80 FUEL-Gas Turbine 7.19 15.87 10.40 InlandCarryingCharges 2.03 1.48 1.14 InlandGeneral 0.72 0.51 0.38 56.06 39.35 COMINCO non-firm energy 28.65 BCH & Others non-firm energy 120.26 76.39 51.22 ---------____ TOTAL COSTS 239.44 169.86 128.63 -------------BENEFITS REDUCED BCH Capacity Purchases 47.64 32.86 23.82 REDUCED BCH Firm Energy Purchases 165.16 115.01 83.20 DEFERRAL of South Okanagan 500KV Sub 5.05 7.63 7.61 -----_____ TOTAL BENEFITS 218.86 155.50 114.63 ---------NET BENEFIT [(-)NET COST] -\$20.58 -\$14.35 -\$14.00 BENEFIT TO COST RATIO 0.91 0.92 0.89 REQUIRED REVENUE ANALYSIS Present Present Present Commission Most Probable BUT 50% Cominco, 50% Gas Value Value Value _____ _____ 12.00% 16.00% NOMINAL DISCOUNT RATE 8.00%

 NET REQUIRED REVENUE [(-)REDUCTION]
 \$40.62
 \$21.25
 \$11.99

 BENEFIT TO COST RATIO
 0.84
 0.88
 0.91

A S S U M P T I O N S *Indicate changes to Original Assumptions of the Applicant *1. B.C. Hydro rate escalation (1988: 0%, THEN AT 3.5% annually) (model-row 279) **2. Latest Inland Offer Per Ex. *98 (less 31¢ Tier 1) +7% MFTand Gas Fuel escalation per NEB, AVERAGE OF HIGH AND LOW FOR B.C. INDUSTRIAL PRICE (model-rows 44 & 281) ***3. Capital cost at \$36.0 Million; 0&M -\$150K to \$270K p.a. (Ex.*5 p14) (model-rows 19 & 379) 4. Non-firm at 50% Cominco and 50% Gas--50% Others & 50% gas--Summer \$

GT-CommMP,7%/50%

2/14/89

COMMISSION CASE 2.3-MOST PROBABLE-COMINCO @50%

APPENDIX 5 Page 10 of 11

Benefit/Cost Scenario of WKP Gas Turbine (REVISED Tier 1, 7%MFT)

COST/BENEFIT ANALYSIS \$M *BCH 0%-'94-Inf**ING EX#98, NEB HIGH***UpCapO&M	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
COSTS			
CAPITAL COSTS INCLUDING AFUDC (In 1989\$) {NBINCOME TAX EXCLUDED-Use 11% for Debt}	\$36.00	\$36.00	\$36.00
PropertyTax	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
Wheeling	1.99	1.18	0.71
FUEL-Gas Turbine	18.70	12.13	8.30
InlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	49.82	35.13	25.68
BCH & Others non-firm energy	147.41	92.54	61.33
TOTAL COSTS	263.00	183.40	135.80
BENEFITS			
REDUCED BCH Capacity Purchases	43.78	29.80	21.37
REDUCED BCH Firm Energy Purchases	151.27	103.41	74.08
DEFERRAL of South Okanagan 500KV Sub	5.05	7.63	7.61
TOTAL BENEFITS	200.10	140.84	103.06
NET BENEFIT [(-)NET COST]	-\$62.90	-\$42.56	-\$33.74
BENEFIT TO COST RATIO	0.76	0.77	0.75
REQUIRED REVENUE ANALYSIS	Present	Present	Present
NOMINALDISCOUNTRATE	8.00%	12.00%	15.00%
NET REQUIRED REVENUE [(-)REDUCTION]	\$82.95	\$49.45	\$31.73

BENEFIT TO COST RATIO 0.71 0.74

 A S S U M P T I O N S *Indicate changes to Original Assumptions of the Applicant *1. B.C. Hydro rate escalation 1989-1994 at 0% nominal, then at inflation-per 87/88 Load Forecast (model-row 279)
 **2. Latest Inland Offer Per Ex. *98 (less 31¢ Tier 1)+7%MFT and Gas Fuel escalation per NEB, HIGH FOR B.C. INDUSTRIAL PRICE- SEE TABLE 6.1.3 (model-rows 44 & 281)
 ***3. Capital cost at \$36.0 Million; O&M -\$150K to \$270K p.a. (Ex.*5 p14) (model-rows 19 & 379)
 4. Non-firm: 70% Cominco and 30% Gas--50% Others and 50% Gas--Summer\$

GT-BCHLF-NEB-HI'89\$-CBGT

0.76

Benefit/CostScenario of WKPGasTurbine

APPENDIX 5 Page 11 of 11

COST/BENEFIT ANALYSIS \$M LOW*BCH 0-'94, INF**OIL FOR GAS, NEB***UpCapO&M	Present Value	Present Value	Present Value
NOMINALDISCOUNTRATE	8.00%	12.00%	16.00%
COSTS			
(NBINCOME TAX EXCLUDED-Use 11% for Debt)	\$36.00	\$36.00	\$36.00
Property Tax	2.29	1.62	1.21
0 & M	4.05	2.80	2.04
wheeling	1.99	1.18	0.71
FUEL-Gas Turbine	52.43	34.81	24.34
InlandCarryingCharges	2.03	1.48	1.14
InlandGeneral	0.72	0.51	0.38
COMINCO non-firm energy	134.46	95.63	70.43
BCH & Others non-firm energy	259.21	170.20	117.90
TOTAL COSTS	493.16	344.24	254.15
	47 70	00.00	01.77
REDUCED BCH Capacity Purchases	43.78	29.80	21.37
REDUCED BCH FITTH Energy Purchases	131.27	767	74.00
DEFERRAL OF South Okanagan SOOK v Sub	5.05	20.7	1.01
TOTAL BENEFITS	200.10	140.84	103.06
NET BENEFIT [(-)NET COST]	-\$293.06	-\$203.39	-\$151.09
BENEFIT TO COST RATIO	0.41	0.41	0.41
REQUIRED REVENUE ANALYSIS	Present	Present	Present
LOW*BCH 0-'94, INF**OIL FOR GAS, NEB***UpCapO&M	Value	Value	Value
NOMINAL DISCOUNT RATE	8.00%	12.00%	16.00%
NET REQUIRED REVENUE [(-)REDUCTION]	\$313.11	\$210.29	\$149.08

BENEFIT TO COST RATIO 0.39 0.40

A S S U M P T I O N S *Indicate changes to Original Assumptions OF the Applicant
*1. B.C. Hydro rate escalation
PER '87-'88 LOAD FORECAST, 0% TO 1994 THEN INFLATION
(model-row 279)
**2. OIL USED FOR GAS AND ESCALATED AT NEB LIGHT OIL RATE FOR COMMERCIAL SECT. (model-rows 44 & 281)
***3. Capital cost at \$36.0 Million; 0&M -\$150K to \$270K p.a. (Ex.#5 p14) (model-rows 19 & 379)
****4. Non-firm at 70% Cominco and 30% Gas Turbines, ON OIL
*****5. Non-Firm Other at 50% Other and 50% Oil

0.41

WEST KOOTENAY POWER LTD.

Oliver Gas Turbine Generation Plant Energy Project Certificate

SUMMARY OF ORAL ARGUMENTS January 13, 1989

- G.K. Macintosh, Q.C. (on behalf of the Applicant)
- (3390) (a) Terms of Reference

The Commission is to recommend to the Lieutenant Governor in Council ("LGIC") whether the Energy Project Certificate should be issued, and if so, subject to what conditions.

Having regard to the Terms of Reference, the Commission is to assess whether the project is the preferred new resource to meet forecast load growth.

Having regard to the Environment, the Commission is to assess any detrimental environmental impacts associated with a gas turbine generation plant, and is to identify mitigation proposals that would reduce environmental impact to an acceptable level.

(3390- Even if there were detrimental environmental impacts, the 3391) Commission is not instructed to refuse a Certificate, but instead is instructed to identify mitigation proposals that would reduce them to an acceptable level.

> The Commission is always to bear in mind that the Terms of Reference contemplate that some adverse environmental impact is an acceptable thing providing other aspects of the project are viable.

(3392) Political considerations and social and policy considerations are outside the jurisdiction of the Commission in this proceeding and should not form part of the Commission's deliberations.

> If, in the view of the Commission, the project is acceptable from both an economic and environmental viewpoint, it is the duty of the Commission to recommend that a Certificate be granted.

(3391- (b) The Project

3394)

The turbines will serve what is called a peaking function. They will enable West Kootenay to increase its capacity for meeting peak demand by 130 megawatts. The peaking function is a natural function for turbines of this design because they are easy and inexpensive to start and to operate intermittently, which makes them ideal for serving peak demand needs.

(3394- (c) Self-Reliance

(3397)

Installing these turbines will gain for West Kootenay more autonomy, and more independence from B.C. Hydro. WKP will be more self-reliant.

B.C. Hydro, in its pursuit of more and more of the U.S. market, is simply not going to have capacity that it is going to make available to West Kootenay Power over the next 20 years at rates which are economical in comparison with the turbines.

Construction of hydro-generation is so much more expensive than the turbines it is not economical to even contemplate, and the environmental impact of such construction is of far greater consequence than what is contemplated with the turbines.

(3397- (d) The Need for the Turbines

(3399)

The October 1986 Decision of the Commission pertaining to the B.C. Hydro/WKPL Dispute contained certain statements which caused WKP to pursue a course of action which resulted in completion of its 1987 Resource Study, Supply and Demand Options. That document featured "Demand-Side Options" and "Supply-Side Options" inclusive of the potential for a "Gas Turbine - Okanagan".

Reference is made to Commission statements contained in the October 1986 Decision as follows:

page	1
page	28
page	41
page	62

(3400- (e) Operational Benefits of the Turbines

3401)

Exhibit 18 illustrates the operation associated with the peaking functions of the turbines and indicates the flexibility of use of the four individual units proposed in the Twin-Pac Turbine Plant.

In addition to the peaking function two other advantages are noted:

- the turbines will permit the use of cheap interruptible electricity from Cominco, the back-up function; and
- the existence of the turbines will enable WKP to defer the construction of the Vaseaux Lake substation, providing a deferral of expenditure of approximately \$7 million.

(3401- (f) Financial Benefits of the Turbines

3414)

Whereas capital expenditures by a utility to expand its generation capabilities normally results in an adverse impact on customer rates, the turbines provide a favourable impact on customer rates.

The original base case of the Application, as set out in Tab 4 of Exhibit 5, portrays a net benefit of \$22.14 million. Various amendments, arising from this hearing, have been taken into account by WKP as witnessed in Exhibit 109 and the result is a net benefit of \$26.65 million.

Appendix A to Exhibit 109 employs a discounted cash-flow model as recommended by Commission staff, indicates a further \$7 million benefit, resulting in a net benefit of \$33.56 million.

The foregoing represents the best judgment of the Applicant but does not take into account various assumptions as to possible pricing of electricity and natural gas put forward by the Ministry of Energy, Mines and Petroleum Resources ("MEMPR") on the one hand, and the National Energy Board ("NEB") on the other. WKP calculates that the employment of the MEMPR projections would result in a net benefit of \$24.3 million, whereas the NEB projections would result in a net benefit of \$28.6 million.

(3419- (g) Environmental Issues

(3427)

The Applicant contends that there is no requirement for a further independent hearing and review process following the conclusion of the Commission's hearing of WKP's Application in respect of an environmental permit.

(i) Sound

WKP observes that the proposed site for the turbines at Oliver, B.C. is in the Oliver Industrial Park, and notes that an unregulated entity attempting to locate therein would not be required to participate in a public hearing before it would be permitted to commence operations. Such entity may produce twice the sound of the turbines.

Central Mortgage and Housing Corporation ("CMHC") employs the only sound measurement system that is utilized across Canada. It has an acceptability criteria for housing of 24-hour average level of 55 DBA.

WKP states that there is no residence in Oliver that will have an exposure that is that high on a 24-hour average, although one house on the top of the bank is predicted to be 58 DBA and that will only occur when all four turbines are in operation in a period of inversion. Most of the time that the four turbines are operating the sound is 6 DBA lower, or 52 DBA which, if one were indoors, would equate to a soft whisper at 16 feet. WKP does not propose that the turbines will operate after 10:00 p.m. expect in a case of severe emergency.

WKPL notes that 58 DBA may be equated to the sound of a semi-trailer on Highway 97 at a distance of at least one kilometre.

(ii) Emissions

The turbines are environmentally efficient. Particulate emissions are minimal. Sulphur dioxide emissions while natural gas is the fuel are negligible, and with low-sulphur oil are very low. Emissions of oxides of nitrogen are low with either fuels. Water injection in the turbines will provide the following emission results:

	Provincial	Turbines		
	Objective	Gas	Oil	
Particulates	229	*	55	
Sulphur Dioxide	798	*	8	
Nitrogen Oxide	1146	75	150	
Hydrocarbons	102	3	3	

* (too low to measure)

Ambient air quality resulting from the turbines operation will readily meet provincial and federal guideline levels, which are protective of effects on soil, water, vegetation, materials, animals, visibility, personal comport and well-being. The computer model employed by WKP was accepted by the Ministry of Environment. It studied an area approximately 25 kilometres in radius from the plant site, from Skaha Lake to the U.S. border. It took into account a wide range of meteorological data for each hour of six years of record. Nearly 180 locations were studied throughout the area with particular attention given to a

number of locations near the plant site. Although concern was expressed as to the impact on orchards it is the contention of WKP that such impact is so small, in comparison with the fertilizers, that it cannot be considered as adverse.

(h) Conditions

WKP stated that conditions are a very serious and substantive part of the hearing process, noting the following for consideration by the Commission:

- Subject to the completion of acquisition of the turbines from Venezuela at an acceptable price.
- Subject to finalizing a transmission line route to the Oliver Terminal.
- (iii) Subject to resolution of the stack emission limits as between Cirrus Consultants and the Ministry of Environment, based on Exhibit 58.
- Subject to the satisfactory design of the fuel oil spill containment system.
- Subject to satisfying amendment of the Industrial Park boundary.
- (vi) Subject to the following ancillary permits and approvals:

The <u>Fire Services Act</u> - a permit for storage, handling and use of fuel oil.

The <u>Gas Safety Act</u> - a permit for the installation of a gas system.

The <u>Municipal Act</u> - a permit concerning stack height variances; and

- applications to be finalized concerning water and sewer connections, and variance on the height of the fencing.

The <u>Navigable Waters Protection Act</u> - permits for the electric transmission line and the natural gas pipeline crossing of the Okanagan River.

The <u>Pipeline Act</u> - approval to Inland for construction of a high pressure gas pipeline.

The <u>Pollution Control Act</u> and the <u>Waste Management</u> <u>Act</u> - permit requirements to be finalized between Cirrus Consultants and the Ministry of Environment.

The <u>Water Act</u> - a permit for authorization of the alteration of stream flow.

In addition to the foregoing, WKP will follow up on requirements to satisfy Federal Fisheries, Bill C-38.

- <u>R.J. Bauman</u> (representing the Cities of Grand Forks, Kelowna, Nelson, Penticton and the District of Summerland)
- (3433- (a) Terms of Reference

3434)

The advisory role of the Commission is directed to take place in light of specified lines of inquiry, the most important of which are:

- Project Justification
- Preliminary Environmental Review
- Resource Options

The Commission's jurisdiction is to determine whether the gas turbine is justified from the perspective of efficient utilization and allocation of provincial energy resources. It would be to adopt a too-narrow view of the Commission's jurisdiction to analyze the justification for this project simply in the vacuum of West Kootenay's service area.

(3434- (b) Primary Submission

3441)

The Municipal Intervenors strongly oppose the Application for an Energy Project Certificate for a gas turbine plant at Oliver, B.C. and submit that the evidence before the Commission leads to the irresistible conclusion that this project is at least exceedingly marginal as a preferred new resource. The project potentially seriously disadvantages the ratepayers of West Kootenay and the residents of the South Okanagan Valley.

West Kootenay Power is preoccupied with pushing the construction of a new project which it views as distancing it from reliance on B.C. Hydro, and incidentally is representing a good investment in an expanding rate base for the shareholder who will earn a substantial handsome return on its investment in this facility, a return it does not enjoy in respect of purchases from B.C. Hydro.

This preoccupation by WKP with building facilities has blinded them to the risks that the project will not produce the imagined benefits to the ratepayers, and has encouraged them to ignore normal utility prudence in advancing the Application.

R.J. Bauman (cont'd)

The Municipal Intervenors contend that WKP abandoned prudent business practice in the manner in which they have pursued arrangements to purchase the Venezuela turbines:

- (i) WKP entered into an odd buy-back arrangement with its Texas agents, Energy Service Inc. ("ESI") whereby ESI would agree to repurchase the units from WKP if WKP did not receive required permits, and within 12 months requested ESI to repurchase.
- (ii) The new deal with the Texan turbine procurers was not set down in a consolidated document (Exhibit 77) until December 5, 1988, some three weeks after WKP had instructed ESI to accelerate the purchase.
- (iii) WKP has not secured ESI's ability to repurchase if the repurchase option is exercised by WKP. Prudent business practice would dictate the provision of security by way of a letter of credit, or otherwise to secure ESI's obligation to repurchase.

The Municipal Intervenors are critical of the malaise with which WKP pursued matters with the Village of Oliver concerning use of the site in the Industrial Park. Additionally, they expressed concern with WKP's reliance on an environmental impact report which, when filed, was rife with errors, as noted in Exhibit 9A, detailing pages of errors.

- (3441- (c)Detailed Submissions
- 3452)
- Project Justification in Light of Resource Options

The evidence on this subject falls far short of convincing the Municipal Intervenors that the accuracy of WKP's Cost Benefit Analysis can be relied upon to support the project's viability. There is concern that the B.C. Hydro rates, as employed in the Analysis, are unrealistic as a result of misinterpretation, principally, of the March 23, 1988 letter from B.C. Hydro, and reliance on unsubstantiated escalation factors discussed in a telephone conversation between an employee of WKP and an employee of B.C. Hydro.

Fuel costs included in the analysis are unsatisfactory insofar as predictions for future periods are concerned. Virtually any one of a variety of price scenarios could be inserted in the Analysis, but none can be considered to have credibility sufficient to make a judgment on.

R.J. Bauman (cont'd)

The capital cost of the project has been escalated from the values contained in WKP's original Application, taking into account a 10% contingency fee, and an amount of \$5.3 million to add water injection and noise reduction facilities.

Taking note of the foregoing it is concluded that the results of the amended Cost Benefit Analysis reveal the turbine project as purely marginal.

The Municipal Intervenors expressed concern over the manner in which WKP now portrays the Vaseaux Lake substation as an item to be forestalled for about 10 years because of the proposed gas turbine project.

The Municipals note that in the 1987 WKP rate hearing the gas turbines and the Vaseaux Lake substation were stated in evidence by WKP to be independent of one another, not alternatives. Attention is also drawn to the reference in B.C. Hydro's March 24, 1988 letter (Exhibit 12, Page B, Tab 1) stating that Vaseaux Lake is a project which is superior to the gas turbines from a reliability and quality of service point of view. The letter also referred to the potential for B.C. Hydro to offer service at B.C. Hydro's rates to WKPL's customers in the Okanagan and Similkameen Valleys if, in the future, WKP's rates exceeded B.C. Hydro's. B.C. Hydro stated that they would reimburse WKPL for the book value of its transmission and distribution plant involved in service to the Okanagan and Similkameen Valleys, but would not be prepared to assume the cost of any investment by WKPL in gas facilities.

The Municipals expressed concern that the Hydro takeover has a real potential, with the prospect that the gas turbines may become redundant long before the project has run its useful operating life.

(3452- (ii) Environmental Impacts

3460)

The Municipal Intervenors do not concur with WKP's counsel in respect of the appropriate Commission action if the project is considered environmentally unsound. The Municipals express the view that in such an instance the Commission is totally justified in recommending against the proposal.

The Municipals also expressed concern that the air quality segment of the environmental evidence was not spoken to by its author with the degree of independence and impartiality normally associated with an expert, but rather as an advocate for WKP thus adversely affecting the reliability of the material presented and discussed.

R.J. Bauman (cont'd)

(3460- (d) Conclusion

3461)

The Municipal Intervenors urge that the Commission not recommend that the Energy Project Certificate be issued, stating, "It is wrong, and we say nonsensical, to permit West Kootenay to build a gas turbine with its attendant environmental problems for the Okanagan, when existing provincial resources are adequate to meet the need."

 Ms. J. Vance (representing the Consumers' Association of Canada (B.C. Branch), the B.C. Old Age Pensioners' Organization, the Federated Anti-Poverty Groups of B.C., the Senior Citizens' Association, and the Council of Senior Citizens' Organizations)

The Consumers' Association of B.C. ("CABC") et al, oppose the Application of West Kootenay Power for an Energy Project Certificate to install and operate a gas turbine because the forecasts of savings are too uncertain and may fail to materialize. It is the position of CABC et al that it would be better for British Columbians and utility customers if West Kootenay Power spent its money purchasing power from B.C. Hydro instead of paying interest charges to the bank and a return on equity to UtiliCorp for the capital cost of the gas turbine.

CABC et al, because of the geographic area affected by the location of the gas turbines, being a home to older persons and others with special health concerns, contends that social costs arising from this hearing are within the jurisdiction of the Commission and must be considered in its decision. CABC et al therefore disagrees with the position of WKP's counsel on that matter.

(3467- (a) Economic Viability of the Gas Turbine Project

3484)

When this project was conceived and planning began, WKP believed that the gas turbine would provide a five percent reduction in levelized rates. At page 1328 of the transcript, WKP agreed that they could now anticipate only a 2.5% reduction in rates. <u>Without</u> the gas turbine there is uncertainty about the cost of B.C. Hydro power to WKP. <u>With</u> the gas turbine there is the uncertainty about the cost of natural gas from Inland.

It is troubling to think that WKP did not consider that a single variable sensitivity analysis was too simplistic to give an accurate forecast of all potential scenarios. We now know that the capital cost has been increased by \$2.3 million for water injection, and Exhibit 60 shows that

Ms. J. Vance (cont'd)

low B.C. Hydro escalation compounded with high gas costs, or a reduction in available Cominco non-firm, could bring the benefit cost ratio to less than one and actually increase customer rates.

At page 1236 of the transcript, it was established that the cost of gas turbine fuels for peaking use was \$5.28 million, and for non-firm back-up the escalation in fuel costs was \$36.31 million. To guestimate that there will be a 30% unavailability for the Cominco and that the "other non-firm" category has only a 50/50 chance of coming through, indicates that this supply could fluctuate wildly and cause a corresponding swing in natural gas and oil costs to WKP.

The concerns about the availability or lack of availability of non-firm are ones that make it important that the Commission consider that perhaps it is safer for the ratepayers to have certainty.

When this hearing commenced we learned that the B.C. Hydro low-price scenario, if it materialized, would reduce the benefit cost ratio to 1.05. At the close of this hearing we learned in Exhibit 125 that were the B.C. Hydro low-price scenario to materialize it would devastate the economics of the gas turbine project. The net result could range from \$2.87 million to minus \$12.87 million. This possibility speaks to the complete unworkability of the gas turbine project.

Ms. Vance spoke to the attribution of \$16 million in deferral value of the Vaseaux Lake substation to the gas turbine. Notwithstanding a previous lecture on the subject of WKP sticking to their forecast timetables for capital projects, Mr. Siddall admitted that there had been slippage in the Vaseaux Lake substation capital project and that the deferral after 1992 is attributable to the gas turbine. Ms. Vance submits that there could well be a slight of hand by WKP in completely attributing the value of the deferral to the economics of the gas turbine. She states that the Commission must be cautious, especially in light of the past history and actions of WKP.

Ms. Vance expressed concern over how little WKP has done to identify other potential sources of firm energy for inclusion in the 20-year resource plan. She noted such matters as the late date (July of 1988) at which WKP approached major suppliers to see if they could supply power needs; that WKP had not had discussions with Cominco about wheeling power up the 300 megawatt line at Trail; the potential for WKP participation in the Columbia River downstream benefits; the potential for supply from Pacific Northwest sources to fill the gap if Cominco's non-firm becomes unavailable.

Ms. J. Vance (cont'd)

Ms. Vance noted that if nothing else was available, then, instead of running the gas turbine at a cost of 24 mils per kilowatt hour, WKP could, as a last resort, use the B.C. Hydro reservation fee of 5 mils, purchase back-up from B.C. Hydro at the incremental cost of running Burrard Thermal. For 600 gigawatt hours of reserve requirement the additional cost would be \$3 million a year.

Ms. Vance described a series of options she considered would fill the needs of WKP without the necessity of installing the gas turbine.

(3484- (b) Environmental Problems

3490)

Ms. Vance stated that CABC et al is seriously concerned with the harm that the gas turbine project can cause to the inhabitants of Oliver and the surrounding area. She cautions that there are too many unknowns about the actual levels of emissions that will permeate the air in Oliver. She notes that Mr. Sagert admitted that he didn't know that Oliver had a unique climate, that it was a pocket desert, at the time that he chose to rely on meteorological data from Vernon and Penticton for his modelling.

(3490- (c) Social Environment

3491)

People are part of the environment and their well-being is vital to the concept of environmental health. This community has become united in its opposition to the turbine.

(3491- (d) Costs

3492)

This project had a feature which made it very attractive to the shareholder. While that may not be the motivation for this project, the shareholders should be made responsible for the costs of the hearing, taking the good with the bad.

Whether or not this Application is approved, the shareholders should bear at least a portion of the costs, up to all of it, but at least half of it. In fact, there could be some scrutiny of the financial costs and the possible benefits, and that there could be a proportionate allocation based on that type of calculation. It should be noted that the ratepayers have already paid a tremendous amount in operating and maintenance expenses incurred in the conception, planning, development, modelling, scrutinizing and discussions of WKP personnel on the gas turbine project.

Ms. J. Vance (cont'd)

(3492- (e) Demand-Side Management

3494)

The fundamental issue here is not the gas turbine, it is the best use of resources overall, be that effected by generation or by conservation. It is, therefore, reasonable and in fact highly desirable that the Commission use this opportunity to make a statement about demand-side management, whether or not the gas turbine is approved.

(3494- (f) Conditions

3496)

Ms. Vance asks that some innovative thinking be done if it is decided by the Commission that this project should proceed. She would like to see some sort of condition attached that if the gas turbine goes ahead, and if money is lost, which is based on the alternative of what would have been without the gas turbine, and if this is because WKP forecasts are off and intervenors' forecasts are on, or B.C. Hydro's forecasts are on, then these losses should be borne by the shareholders in their return on equity. She made reference to a procedure used by the CRTC in respect of B.C. Tel, involving a deemed rate of return. She suggested that it should be possible to consider a deeming of expenses for this project. If the actual expenses are higher the difference between the deemed and actual expenses would be borne by the shareholders and not by the ratepayers.

J. Slack (representing himself)

(3498-

3503) Mr. Slack states that his main objection to the turbines is the site in the Oliver Industrial Park which he describes as a swamp located in the heart of the community. He made reference to petitions presented to the hearing, noting that the Commission should consider them since they represent the views of a fair percent of the residential base of Oliver and rural areas.

> Mr. Slack requested that the Commission consider all expenses involved with the plane trip to view turbines in Florida as a cost to be borne by the shareholders of WKP, not the customers.

- (3503- B. Slack (representing Slack Electric Ltd. and
- 3516) Okanagan-Similkameen Cooperative Growers Association)

Mrs. Slack made reference to numerous matters that she felt illustrated detrimental impacts on the community of Oliver in the operation of a gas turbine as follows:

- noise, particularly as a result of intermittent operation.
- use of oil as fuel for turbine operation.
- operation of turbines after 10:00 p.m.

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B. Slack (cont'd)

- concern over environmental review (Exhibit 9).
- safety of airport.
- probability of oil spills in truck transport and delivery.
- unsatisfactory treatment of turbine site.
- impact on sewage system.

Mrs. Slack expressed concern over the change of the corporate name and logo in spite of a promise by an officer of UtiliCorp that it would not occur.

Mrs. Slack expressed her conviction that the Ministry of Environment can indeed assess the situation, after a decision by the Commission.

Mrs. Slack did not, however, state a position, either favourable or in opposition to the WKP Application.

5. Mr. Gilmour (representing himself)

(3516-

3520) Mr. Gilmour stated that he will be providing his primary argument in written form so as to assist in the timely conclusion of the hearing.

He expressed his viewpoint on the public interest concept, noting firstly that the prospect of a gas turbine was a significant factor in both the provincial and federal elections which resulted in election of candidates of the official opposition; and secondly, that there is no evidence to indicate that the WKP ratepayers would not be willing to pay a potential increase in customer rates if the WKP Application is rejected.

6. Dr. Miltimore (3520-

(representing the Electric Consumers' Association ["ECA"])

3528)

Dr. Miltimore stated that while their study of related data does not convince them that failure to build the turbine will result in an increase in customer rates he believes ECA members would prefer to pay increased rates rather than endure the turbines. Dr. Miltimore expressed concern that the model provided by the environmental experts was not based on facts pertaining to Oliver but rather on limited and subjective assumptions. He pointed out that there is no attempt to indicate the degree of error that might be expected in the calculated numbers from the models although there was a grudging admission that model predictions could be out by a factor of twofold. He stressed that no estimates were provided of errors inherent in importing data from the weather stations. Dr. Miltimore commented

Dr. Miltimore (cont'd)

on his concern that ozone formation results from a number of interactions and that ozone is a more serious matter than nitrogen dioxides. Dr. Miltimore stated his intention to provide more information in writing at a later date.

7.	Mr. Scarlett	[representing the Kootenay Okanagan
(3528-	28-	Electric Consumers' Association ("ECA")]
3556)		

Mr. Scarlett submitted that the reference to "Preferred New Resource" in the Terms of Reference should be interpreted to include resources other than new generation capacity, such as the advantageous purchase agreements with other utilities including B.C. Hydro and demand-side management.

Mr. Scarlett agreed with Mr. Bauman that overall efficiency of use of British Columbia's resources should be taken into account by the Commission in shaping its decision. He noted that if WKP's peaking and non-firm back-up power is purchased from B.C. Hydro the province of British Columbia itself benefits both financially and from the better utilization of water resources which belong to the people of B.C.

Mr. Scarlett states that coordination of B.C. Hydro and WKP is desirable and in the long run necessary, noting that it is unacceptable for one utility in the course of competition to harm the long-term interests of the other, or of each other's customers. Mr. Scarlett commented also that competition between hydro utilities should not create a condition of waste.

The ECA agrees that a utility must have an incentive to make needed capital improvements, but firmly believe that this turbine is not an acceptable project because it fails the test of benefit to the ratepayers or citizens of the province as a whole. Putting a gas turbine into the middle of a hydro-electric system has no precedent in Canada and probably not in North America, and B.C. Hydro clearly has a sufficient amount of secondary (non-firm) energy (Exhibit 12, Table 1). The point is that burning a non-renewable fuel when renewable hydroelectricity is able to be used in a comparable way and it is comparable in price does not make sense. Burning natural gas at a wasteful 25% efficiency and suffering further line losses to distribute it does not compare favourably with utilization of natural gas by gas utility customers using cost-effective furnaces (within a range of 65 to 80%).

Mr. Scarlett is critical of the WKP Application, noting that it appears to have been conducted in haste, and WKP lacks expertise to conduct the project. He made reference to the dyking situation, with drawings

Mr. Scarlett (cont'd)

not properly checked; and no provision for clean-up costs upon decommissioning of the plant. He went on to make reference to the embarassingly unbusiness-like affairs that have gone on between WKP and Energy Services, Inc.

Mr. Scarlett was also critical of the manner in which WKP downplayed the operational requirements of the turbine in backing up of Cominco non-firm to the extent of 600 gigawatt hours per year. He also notes that removal of the benefit claimed by WKP for backing up non-firm Cominco it would essentially bring the turbine project down to a point where it is not economically advantageous.

ECA concur fully with Mr. Bauman and Ms. Vance that multiple sensitivities must be considered in order to arrive at the best model.

ECA expressed concern that WKP does not appear to be pursuing demand-side alternatives with appropriate diligence pointing out that a pilot project in two cities served by WKP has not been brought to the attention of customers beyond those two locations.

Mr. Scarlett proposed that the Commission give consideration to exercising its powers as follows:

- Withholding or withdrawing part of the cost of the project from Rate Base if it is unproductive to the customers.
- (ii) The costs related to WKP's public relations campaign and the excursion to Florida should not be borne by the customers of WKP.
- (iii) If the Application is unsuccessful the hearing costs should be assessed to the shareholders of WKP since the risk should be borne by those who stand to gain.
- (iv) If the Application is successful, that the ratepayers should only be responsible for the originally estimated cost of the project and not for such costs which exceeds those estimates due to any fault of WKP.
- (v) The Commission should consider restricting the use of the turbine to the purposes described by the Application and specifically to deny WKP the right to export power to the United States.

Mr. Scarlett (cont'd)

- (vi) The Commission should consider restricting the use of oil in the turbine because it is more damaging to the community and environment than natural gas.
- (vii) The Commission should direct WKP to pursue more meaningful negotiations with B.C. Hydro for the purchase of firm peaking capacity with an energy return clause, coupled with an ongoing purchase agreement for non-firm interruptible energy on an as-needed basis at the then current B.C. Hydro market price in order that WKP may take advantage of Cominco's non-firm energy.
- Mr. Fehr (representing himself)
- (3557-
- 3562) Mr. Fehr did not put forward any specific opinion concerning the Application by WKP. He did express concern for the manner in which the environmental evidence was put forward. On the other hand, he was generally complimentary to those who spoke on behalf of WKP.
- 9. Dr. Moyls (representing himself)
- (3562-
- 3566) Dr. Moyls stated that he had prepared a written argument, but thought he would read from a part of it.

Dr. Moyls commented on the environment model utilized in the Application. He is critical of the graph on plume-rise as presented and advised that he has prepared a graph that uses a second equation that he believes represents a more realistic approach.

He referred also to the model estimating No₂ concentrations at various location around Oliver, claiming that the model fails to resemble reality.

10. Mrs. Harkness (represe

(representing herself and her husband)

(3566-

3567) Mrs. Harkness stated that she is 100 percent opposed to a gas turbine in her backyard. She states that she cannot be convinced that with the installation of the gas turbine in Oliver, their lives will not be changed. Noise levels are her chief concern and she expresses fear that the very peaceful environment surrounding their home will never be the same, noting that they have one of the most beautiful view lots in town but believes that with the turbine in place and operating they will be left with but a house and a piece of land. Mr. G.K. Macintosh (Response to Arguments)

(3568-

3587) (i) Re: Bauman Argument

- Disagrees with Bauman's suggestion concerning demand-side options on a provincial basis.
- Disagrees with Bauman's interpretation of "the preferred new resource". The evidence does not indicate any alternative new resource as being more appropriate.
- Bauman's concern over the absence of a letter of credit re: ESI is already alleviated by a modification in the letter from WKP to ESI (Exhibit 77) which records, at the bottom of the first page, the fact that ownership of the turbines rests with WKP rather than ESI so that ESI's function is limited to an agency function.
- Dismisses Bauman's concern with the matter of zoning by referring to Exhibits 61 and 15C and noting in paragraph 9 on page 7 of the latter Exhibit "as clear as clear can be that the utilities can exist in any zone and that includes, of course, the industrial park".
- Expresses surprise that Mr. Bauman would regard an addenda sheet as other than a responsible step to ensure that the evidence is precise.
- Proposes that the Commission should refer to his (Macintosh's) argument concerning the March 23, 1988 letter from B.C. Hydro, and then to Exhibit 47, to determine whether or not Bauman's concern is justified.
- Considers as unfair Bauman's reference to an earlier transcript concerning Vaseaux Lake and the turbine and that it in no way takes away from the economics of postponing Vaseaux Lake if it can be postponed in light of developing the turbine.
- States that Mr. Sagert's credibility should not be affected because he did not admit that water injection is necessary. The evidence has not demonstrated that it is. Instead, the government has provided a policy and WKP has clearly indicated its willingness to live with it.
- Draws attention to the fact that the decision of the B.C. Supreme Court ("Murray McDermid Holdings, 42 BCLR 119") which was handed in by Mr. Bauman, has now been considered by Mr. Bauman as not relevant, and that is on the option point, in light of Exhibit 69.
Mr. G.K. Macintosh Response (cont'd)

- (ii) Re: Ms. Vance's Argument
- The test with regard to Mr. Sagert's credibility should not be whether he hopes WKP will succeed or fail, but whether his approach was largely upheld in the course of questioning during the lengthy cross-examination against him. Mr. Sagert's testimony revealed that he testifies as the occasion arises for parties of various perspectives on pollution issues.
- Health costs were not factored into the cost of the project primarily because there is no evidence of an adverse impact with regard to health. Reference is made to evidence brought out by Mr. Bauman (testimony of Dr. Bates before the Pollution Control Board, re: Burrard Thermal) that .08 parts per million ozone produced no effects, even on sensitive asthmatics, acknowledging that the effects are not until a higher level, something like .12. There is no evidence of any such probable readings in this case.
- Ms. Vance spoke of an absence of sensitivity studies with regard to gas and electricity. The Commission is referred to Appendix B of Exhibit 109 in that regard. Ms. Vance wanted to rely upon the B.C. Hydro low escalation rates in Exhibit 125. Macintosh refers to his submissions on that during Argument saying that they are highly improbable in light of developments that have occurred since that scenario was developed in the 1987 forecast.
- Ms. Vance urged that WKP should back-up Cominco interruptible in accordance with the B.C. Hydro offer which was a standby charge of 5 mils. Macintosh notes that such a situation would result in a \$3 million annual expense which would escalate as B.C. Hydro rates escalate, and the present value of \$3 million per year would be \$31 million. This indicates a value of the turbines in backing up Cominco alone can be viewed as a \$31 million advantage on that analysis.
- Ms. Vance spoke of the shareholders paying the costs of the hearing if the Application succeeded, and if the Application did not succeed the shareholders should pay at least half. Macintosh proposes that if costs are reasonably and prudently incurred then they should be capitalized and put into Rate Base. To the extent that they are not prudently and reasonably incurred, they should be borne by the shareholders. Macintosh also submits that

Mr. G.K. Macintosh Response (cont'd)

there should be no separate treatment with regard to the plane trips to Florida for the Village Council since the Council could not have prudently reached a decision without seeing other turbines.

(iii) Re: Dr. Miltimore's Argument

- In response to Dr. Miltimore's comments on the inappropriateness of the pollution model, Mr. Macintosh advised that for unbuilt operations modelling is the only way to predict ambient air qualities. Emissions can be calculated from drawings and engineering specs but ambient air quality requires modelling as a primary data base. There was no pollution data from Oliver to utilize in the model although the terrain of Oliver was used. It is not uncommon that appropriate weather data would often be hundreds of miles away, or at least at a far greater distance than Penticton is from Oliver.

(iv) Re: Mr. Scarlett's Argument

- Mr. Macintosh stated that the P.R. publication expenses incurred by WKP were conservative and reasonable for bringing the company's position to the public.
- As to Mr. Scarlett's contention that WKP had not taken adequate steps with regard to Canadian content for the turbines, Mr. Macintosh pointed out that Exhibit 29 proved the difficulty of getting turbines in Canada at good prices, but that WKP had looked to Westinghouse, G.E. and Pratt & Whitney within Canada, who are standard suppliers.
- In respect of Mr. Scarlett's comments concerning the export of electricity to the United States, Mr. Macintosh advised that WKP will not undertake to not ever use the turbines for export, but as noted by Mr. Brook, an account for such operations would be established directing that any funds from export would be directed to the benefit of WKP customers. The need for a provincial certification and a federal review by the NEB are duly noted.
- Mr. Macintosh noted that WKP could not say no to oil use but that water injection can now be stepped up so that emissions are cut down from 150 to 110 parts per million for Nox.

WEST KOOTENAY POWER LTD.

Oliver Gas Turbine Generation Plant Energy Project Certificate

SUMMARY OF WRITTEN ARGUMENTS

(Received subsequent to January 13, 1989)

 Regional District of Okanagan - Similkameen ("RDOS") (E.J. Lamb, Chairman - letter dated January 11, 1989)

Letter states that the Board of the Regional District of Okanagan Similkameen is comprised of the <u>appointed</u> representatives of six municipalities and eight <u>elected</u> rural area Directors.

The RDOS is a Registered Intervenor in the proceedings and Mr. Lamb as Chairman is authorized to file a submission if it was deemed necessary.

Mr. Lamb wished to clarify that there is no prohibition of individual members of the RDOS Board filing their own submission. He also advised that no further submission from the Regional District will be forthcoming unless authorized by Board resolution.

Mr. & Mrs. J. Abrahamsczik (R.R. #3, Oliver, B.C., VOH 1T0 - Letter dated January 13, 1989)

Concerned that their property is too close to the proposed site for the Gas Turbine (turbines about 250 metres from their fence and house is approximately 35 feet from the fence). Sound is a concern and they refer to sound bouncing off the Controlled Atmosphere (C.A.) building and the three oil tanks.

They make reference to the "floating top" of the tanks and suggest that this may well create a "bottle/whistle" effect.

They note that their water well has the same water level as the river above the sluice gate (near the "toe" of the site). Express concern over possible contamination resulting from construction and dewatering procedures.

Oil tanks are also a concern. If there should be a "split" the oil will surge over any berm or dyke. If instruments fail, oil could run out and be pumped on the land. Either of the above could cause contamination of soil and/or water. The stacks (hot air columns) may be a problem to helicopters or planes. WKP personnel are reported to have experienced a helicopter accident while investigating the cause for a mid-January, 1989 power outage in the Oliver area.

Concern is also expressed that potential contamination of water (rivers, lakes, etc.) places a heavy burden on the safety of fish and birds (including bald eagles, blue heron, geese and whooping cranes), with a possible threat to bird sanctuaries reserved through government action.

 Dr. J.E. Miltimore, P. Ag. (on behalf of E.C.A), Site 90, R.R. #4, C.I, Summerland, B.C., VOH 1Z0 (a) January 20, 1989 letter re: WKP Application

Several aspects of the WKP Application appear to have been prepared in haste and without due care:

- Last April, WKP anxious to get a decision from BCUC because of availability of rare turbines at a bargain price. Nine months later, there is no purchase, and turbines still operating in Venezuela.
- NO_X concentrations in Sexsmith Road Application were exactly double those in the Amended Application.
- Original Application made no mention of acidity problems in cultivated (orchard) soils. Acid soil references were included in Amended Application but counsel for the Applicant said there would be little or no acid rain but, whatever did occur would be beneficial since soils in the region are acidic.
- Reference to possible use of waste heat with infrequent and unpredictable hours of operation of the turbine must be considered as "grasping at straws".
- The 1987 Resource Study was not analyzed and reported on in detail at the hearing and E.C.A. concerned as to accuracy. (No generation credit at Waneta for water storage upstream.)

E.C.A. urges BCUC to protect the public interest by taking into account the various petitions, and the local outcome of recent provincial and federal elections.

People must be a primary concern in the BCUC Decision:

 How will the limited Okanagan water, soil and air be affected by the operation of the gas turbine?

2

- Residents close to turbine site concerned with invasion of their privacy and loss of enjoyment of their homes. Loss in property value is possible and is a legitimate concern requiring consideration of appropriate compensation.
- Residents with respiratory disorders have a special concern in respect
 of discomfort arising from turbines emissions, but a precedent for
 possible compensation may not exist.
- Inversions are referred to more frequently in Exhibit 10 (Noise Assessment) than in Exhibit 9 (Environmental Assessment).
- Pilots of private planes report that winds in the Oliver area are erratic and frequently do not follow the North/South pattern assumed by WKP's consultant; also when flying North to Penticton there is virtually no wind until McIntyre Bluff and then, frequently, "white caps" can be seen on Skaha Lake.
- The earlier and warmer growing season at Oliver provides additional proof of the differences between Penticton and Oliver.
- E.C.A. believes the Environmental Consultant seriously underestimated the pollution potential at Oliver because of inversions which are detrimental to benign dispersion of pollutants. Ozone levels depend on a number of interactions and are site specific, making Kelowna ozone levels inappropriate to be considered applicable to Oliver.
- E.C.A. concerned that the local or "native" perspective concerning a healthy environment may not be given appropriate consideration.
- E.C.A. proposes that unless there is irrefutable evidence that the Gas Turbines should be installed without delay, a study be undertaken immediately to determine the most appropriate preferred alternative hydro generation source relative to the best interests of the province of British Columbia, either in the WKP system or the B.C. Hydro system. The study should include a possible sharing of the Columbia River benefits.
- E.C.A. wish to substantially endorse the final arguments of Messrs. Bauman and Gilmour, and Dr. Moyls.
- E.C.A. proposes that no costs of the Applicant be allowed other than for the purpose of the Amended Application for the Oliver site, excluding the costs of the trip to Florida and Texas. E.C.A. also urges that costs incurred in changing public opinion, including legal and consultants fees be not allowed as surely these costs should be deemed part of the investors' risk.

3

(b) January 26, 1989 letter

E.C.A. now wishes to enter the following further presentation concerning the allocation of hearing costs by the Commission.

E.C.A. is critical of WKP, stating that its Application was premature, ill-prepared in indelicate haste, and was inadequate in its presentation.

E.C.A. notes the following:

- advance publicity not borne out by evidence at hearing.
- (ii) failure to provide adequate in-depth resource studies, particularly regarding possible hydro generation expansion.
- (iii) failure to provide adequate presentation of B.C. Hydro alternative supply, including reference to 1986 Dispute Decision.
- (iv) failure to have in place, in advance, a proposed agreement for natural gas supply.
- (v) failure to include in documentation adequate pricing data for electricity and natural gas.
- (vi) failure to have adequate purchase arrangements in place concerning gas/oil turbine units.
- (vii) failure to provide adequate evidence and expert testimony concerning gas turbine operation.
- (viii) failure to provide, voluntarily, engineering report on the proposed site.
- (ix) failure to investigate and act following allegations by Intervenors that inadequate or incorrect data were included in evidence respecting environmental considerations.

E.C.A. looks to the Commission to ensure that any costs arising from the hearing be allocated with strict fairness to the ratepayers. It is the respectful opinion of the E.C.A. that WKP on this occasion is not deserving of reimbursement of any but nominal costs.

Finally, the E.C.A. notes that the merit of any claim for costs by WKP could well be affected by the government's decision as to the merits of the proposal. The E.C.A. sees the possibility of the Commission providing for a brief hearing at its Vancouver premises would be useful to deal with the costs, after the government decision, and the disclosure of the Report and Recommendations of the Commission.

(c) January 27, 1989 letter

E.C.A. provides a copy of a Notice of Public Hearing before the Village of Oliver Council, which appeared in the January 25, 1989 "Oliver Chronicle". The hearing relates to the "Oliver Zoning Bylaw No. 460, 1985, Amendment Bylaw No. 535, 1989 to remove floodplain elevation requirements from the Industrial zones", and is to be held at 7:00 p.m. on Monday, February 13, 1989.

E.C.A. contends that if it is intended to allow WKP to build at a significantly lower elevation than stated in their Amended Application then testimony regarding noise will be affected and would need to be revised to take this new situation into account. Aspects of soil, water and general stability of the site would need to be considered.

 W.A. Gilmour - Summerland (Letter dated January 19, 1989)

Mr. Gilmour is critical of WKP for having not taken the initiative several years ago to seek an appropriate hydroelectric generation project capable of providing for the growing needs of its system.

Mr. Gilmour expresses his concern that the use of natural gas in the turbines project to generate electricity is wasteful of a non-renewable resource which has the potential of enabling the development of a petrochemical industry.

Mr. Gilmour also refers to the unsatisfactory pursuit by WKP of its demand-side options, noting that even at this stage such matters appear to be at the "study" or "early-planning" level.

He points to the NEB electric and natural gas pricing forecasts, recently issued, indicating that they appear to be based on the broadest knowledge of the North American scene.

 Mr. Harry F. Killough (612 Fernwood Drive, Castlegar, B.C., VIN 3T6 - Letter dated January 12, 1989)

Mr. Killough is opposed to the Gas Turbines Project because he believes that it presents a threat to the environment that is unnecessary. He expresses a concern that the Oliver project, if approved, could be the first step in a plan by WKP to establish a thermal power generating network in British Columbia. Mr. Killough reviews some of the events related to construction of dams involved in the Columbia River Treaty and the effects thereof on the public.

He suggests that the people of southeastern B.C. should now be entitled to ongoing access to the "environmentally clean" power which is being produced in surplus as a by-product of the water storage and flood control functions.

Mr. Killough is critical of the Gas Turbine project because of the capital investment and the resultant entitlement of the shareholders to a generous return on equity.

 Mrs. Daphne Malins (R.R. #2, Site, 7, Comp. 25, Oliver, B.C., VOH 1TO - Letter dated January 19, 1989)

Mrs. Malins is a senior who was unable as a result of injuries sustained in an accident to attend the hearings. She has been following the event through the Oliver Chronicle.

Mrs. Malins suggests that not even WKP have a real idea if the proposed turbine is going to be what the community wants.

She refers to aging residents who have lung problems and the others who have enjoyed life in Oliver free from pollution. She expresses the thought that the citizens of the community must be considered when a decision is made on the project.

 Dr. A.L. Moyls, P. Eng., (Summerland, B.C. - Letter dated January 13, 1989)

Dr. Moyls is opposed to the Gas Turbine Project because of its adverse impact on the environment and the wasteful aspect of the turbine operation. He expresses a wish that B.C. might become a leader in the fight against waste and pollution.

Dr. Moyls is critical of the presentation of environmental considerations in the Application. He presents a scholarly critique of the modelling utilized in the Application, concluding that from his perspective, when you ask if the conclusion is reasonable, the model fails to resemble reality.

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 Mr. Kurt Rott (R.R. #1, S. 88, C. 9, Oliver, B.C., VOH 1T0 - Letter dated January 18, 1989)

Mr. Rott expresses his personal opinion on the subject of wind-speed, direction, and smell.

Mr. Rott notes that the computer models in the environmental assessment report relied on Penticton Airport data which is inappropriate since, from Autumn to Spring, Oliver's general main air current comes from the West, with only occasional unwelcome Arctic outflows scouring the warmer air out of the valleys. Only in Spring and Summer afternoons does Oliver have direct strong winds from the South, while in the morning, wind direction is always from the North.

He notes also that in the Winter, wind direction may change several times a day. Mr. Rott wonders if the results from the models present factual conclusions.

Mr. Rott is adamant in his belief that the smell of the turbine emissions will be unacceptable in the community.

 Mr. Bruno Sabatini (Box 1462, Oliver, B.C., VOH 1T0 - Letter dated January 19, 1989 and enclosures)

Mr. Sabatini did not present further argument but the enclosures endorse the views he had expressed earlier as being representative of three church groups.

 Mr. & Mrs. Silbernagel (Letter dated January 12, 1989)

Mr. & Mrs. Silbernagel are owners of a residential property on River Road, across the river from the Industrial Park at Oliver.

The Silbernagels maintain a quiet lifestyle and enjoy their home. They express concern that the gas turbines will be a great intrusion and source of irritation in their lives. Of additional concern, is the potential negative effect on the value of their property. They request that the Commission bear their concerns in mind. Mrs. Buryl Slack (on behalf of Slack Electric Ltd. and Okanagan-Similkameen Co-op) (R.R. #1, Oliver, B.C., VOH 1TO) (a) Letter dated January 20, 1989

Mrs. Slack presented a rambling 12-page letter expressing many concerns she has with the quality of the WKP Application, the quality of evidence submitted by the Applicant, the lack of adequate understanding of the local weather conditions by the experts dealing with Environmental Assessment.

She is concerned that the Village Council have acted without the support of the citizens, but is just as concerned that those residents outside the Village proper will have to live with turbines, if approved.

Mrs. Slack emphasizes her perception of the danger of fire at the turbine site, and notes that a request made by her during the hearing concerning "blast modelling" was not responded to.

Mrs. Slack refers to the potential dangers to agriculture and orchards because of the contamination of the atmosphere resulting from operation of the turbines.

Mrs. Slack also expressed anxiety over the deterioration of the local economy, particularly land values if the turbine project is approved.

(b) Letter dated January 24, 1989

Mrs. Slack provides comment concerning the matter of government interest in the Okanagan River because of the various fish stocks involved, particularly, the spawning area utilized by sockeye salmon.

Mrs. Slack also expresses concern with the current proposal by the Village of Oliver to relax the floodplain regulations on the proposed gas turbines site.

(c) Letter dated January 26, 1989

Mrs. Slack notes her concern over the possibility of any lowering of the turbines' stack height and the resultant change in impact from evidence given during the hearing.

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 Mr. J. Slack (R.R. #1, Oliver, B.C., V0H 1T0) (a) Letter dated January 20, 1989

Mr. Slack emphasized his continuing concern that WKP did not have a full soil study done for the hearing.

(b) Letter dated January 26, 1989

Expresses concern over the possibility that the turbines site may now be altered by virtue of the removal of the floodplain elevation requirements from the Industrial zones.

 Joint Letter from Mrs. B. Slack and Mr. J. Slack dated January 25, 1989

The matter of allocation of costs related to the WKP Application for an Energy Project Certificate was discussed in Oral Argument by J. Slack when he asked that no part of the trip to Texas and Florida be charged against the consumer or WKP, but only against the shareholders of WKP.

The letter refers to their understanding that the allocation of costs of this proceeding may be part of the WKP Revenue Requirements hearing to take place in late February, 1989.

Mr. & Mrs. Slack ask that the Commission bear in mind the unpreparedness of WKP in preparation of material and giving of evidence related to the Gas Turbine Project hearing.

 Mr. Frank Shannon, Fisheries Chairman, Okanagan Region B.C. Wildlife Federation (Box 1133, Summerland, B.C. - Letter dated January 24, 1989)

Mr. Shannon wrote to advise that Mr. Macintosh's January 19, 1989 letter to the Commission is incorrect when he states there are no salmon in the Okanagan River at Oliver, B.C.

He notes the involvement of his organization pertaining to salmon migration. He stresses concern that pollution of any kind into the Okanagan River at Oliver could have a serious effect not only on that river, but further downstream, the Columbia River. He suggests that the situation could have international implications.

ACM:ac 537A/1-9

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SUMMARY OF REBUTTAL TO WRITTEN ARGUMENTS

per G.K. Macintosh, Q.C. letter dated February 6, 1989

1. Buryl Slack - January 20, 1989

Mr. Macintosh states that Mrs. Slack's argument is irrelevant to the issues before the Commission, which are the economics and the environmental consequences of the gas turbines.

The following points are noted in response to some of Mrs. Slack's comments:

- financial benefits from the turbines will accrue to all customers of WKP and there will be increased security of supply in the Okanagan.
- although the contract between WKP and the Village of Oliver permits 100% use of diesel oil it will be impractical for WKP to use oil except when gas is unavailable since oil is at present about four times more costly than natural gas.
- Mrs. Slack's comments concerning Whicker's testimony indicate confusion on her part since she appears to be ignoring the testimony given during the hearing.
- Mrs. Slack's comments concerning the obsolescence of the turbines are mistaken. Such obsolescence applies to aircraft production. Usefulness for generating energy is unquestioned.
- Mr. Macintosh repeats prior evidence that compressed air will be used to start the turbines.

2. J. Slack

Mr. Macintosh states that there is no reasonable evidence of any sort to suggest that the Oliver Industrial Park site is not perfectly appropriate for supporting the turbines.

3. Buryl Slack and J. Slack

Mr. Macintosh advises that WKP will comply with every federal and provincial requirement in connection with fisheries.

4. Dr. Moyls

Mr. Macintosh enclosed a copy of Cirrus Consultants' ten page letter dated February 2, 1989 to him as suitable for response to Dr. Moyls. That letter is attached rather than attempt to interpret technical responses.

5. Mr. & Mrs. Silbernagel

Mr. Macintosh enclosed a copy of Barron, Kennedy, Lyzun and Associates' two page letter dated February 1, 1989 (attached) which responds to the Silbernagel.

Mr. Macintosh states that the Silbernagels bought their property long after the site in question was zoned as heavy industrial. He also notes that the sound level of 50-55 dBA is a "worst case" scenario.

6. Dr. Miltimore

Mr. Macintosh confirms that the WKP 1987 Resource Summary does not allow generation credit at Waneta since there is no guaranteed stream flow at Waneta because of the operation of the Boundary Dam and the Seven Mile Dam, both upstream of Waneta.

Mr. Macintosh suggests that the local outcome of recent provincial and federal election proceedings was not necessarily occasioned by concerns over the gas turbine project, noting that Free Trade was the big issue.

Mr. Macintosh comments that the burning of oil in the turbines is not likely to occur rather than natural gas, as long as gas is available, because of the adverse price of oil in relation to natural gas.

Mr. Macintosh refers to the use of relatively high ozone levels at Kelowna as a "conservative" choice.

Mr. Macintosh advises that the 1987 WKP Resource Study was not challenged in this proceeding and the request for a further study is not warranted.

Mr. Macintosh notes that the earliest possible time for sharing Columbia River benefits is 1998.

7. Mr. Gilmour

Mr. Macintosh states that the mandate of the Commission is to assess the economics and environmental impact of the project and that the political aspect of the matter is for the provincial cabinet to assess.

Mr. Macintosh dismisses the comments by Mr. Gilmour concerning increased hydro generation since that matter does not meet WKP's requirement for peaking capacity.

Mr. Macintosh advises that in response to Mr. Gilmour's argument on future electricity and gas prices, he is content to rely on his oral argument as presented.

8. Mr. & Mrs. Abrahamsczik

Mr. Macintosh confirms the distance from the central point of the turbines to the Abrahamsczik house is 310 metres.

Mr. Macintosh notes that the oil tanks are located in the design in such a way as to shield sound from the house in question.

Mr. Macintosh advises that there is no evidence of the river level lowering as a result of the turbines and that WKP has no intention of causing it to occur.

9. Mr. Sabatini

Mr. Macintosh acknowledges the support statements from the three churches and notes that no response is required by WKP.

10. Mr. Killough

Mr. Macintosh does not quarrel with Mr. Killough's comments concerning costs associated with hydroelectric generation and associated environmental costs. He notes, however, that WKP has no automatic access to short-term excess capacity, but must fend for itself.

Mr. Macintosh stresses that hydro generation is environmentally destructive and that in the long-term there is no excess hydro generation available to WKP.

Mr. Macintosh notes that there is no evidence that the gas turbines are a first step in a plan by WKP to establish a thermal power generating network in southeastern B.C. He also notes that even if that were the case, BCUC would have the duty to assess each such application on its own merits.

Mr Macintosh is not inclined to accept Mr. Killough's assertion that WKP has not seriously approached B.C. Hydro for the purpose of negotiating for long-term power commitments. He refers to B.C. Hydro's recent advice to WKP that they will not commit themselves beyond three years. Mr. Macintosh refers to his oral argument which referred to a long history of WKP trying to negotiate reasonably with B.C. Hydro.

Mr. Macintosh does not accept Mr. Killough's environmental impact of the turbines, and makes reference to the absence of Mr. Killough from attendance at the hearing.

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11. Mr. Frank Shannon

Mr. Macintosh acknowledges Mr. Shannon's comments and notes that WKP is proceeding on the assumption that salmon do use the Okanagan River and is following up on the matter with the appropriate federal fisheries personnel.

CERRUS CONSULTANTS

5532 Calfindge Place North Vancouver, B.C. Canada V7R 4S2

Tel: (604) 980-0949

February 2, 1989

Mr. G. K. Macintosh, Q.C. Farris, Vaughan, Wills & Murphy P.O. Box 126, Pacific Centre 700 West Georgia Street Vancouver, B.C. V7Y 1B3 Your File: 05497-035 Our File: 564.5

3

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Dear Mr. Macintosh:

Re: WKP-Gas Turbine Application - Dr. Moyls' Argument

The written response to Dr. Moyls' "Argument Regarding the Proposed WK9 Turbine Installation in Oliver B.C." follows in accord with your request of 23 January 1989.

The Argument, as presented by Dr. A. L. Moyls, P.Eng., is a combination of argument, new evidence and professional opinion. The Argument is not acceptable on all three counts.

1.0 ARGUMENT AND NEW EVIDENCE

Argument should be a presentation of the position of the advocate at the Hearing. It should not contain new evidence as that part of the Hearing Process was completed in Oliver.

For convenience in commenting on the Argument, our comments have been separated by page number and paragraph of the Argument to assist in the preparation of your response.

1.1 Page 1, Paragraph 1

The fact that the use of a refined atmospheric dispersion model would produce a lower concentration for the Oliver site than would a simpler preliminary model applied at the Kelowna site is reasonable, acceptable and not unexpected. While Dr. Moyls found it "difficult to accept" perhaps the following analogy will belp to explain it. When a civil engineer is required to calculate the stress on a beam, he may first do a simple calculation which approximates the stress but over estimates it to demonstrate that it is below any safety requirement. Then if he is required to determine the precise stress, he applies a more detailed sophisticated calculation. This is the approach which was taken for WKP with the more detailed assessment predicting lower concentrations than the very conservative preliminary approach.

1.2 Page 1, Paragraph 2

Dr. Moyls raises reactive plume models, biogenic hydrocarbons in summer and plume rise in this paragraph. These aspects are addressed as three separate points.

Reactive Plume Models

Dr. Moyls states:

"An attempt was made to make the EPA's RTDM model handle a chemically reacting plume even though the consultant's reference (Cole and Summerhays 1979) warn against doing this. This is because the model's Gaussian dispersion coefficients are inappropriately large and grossly overestimate the amount of intimate mixing of plume NO and ambient ozone. The

intimate mixing is required of course before the conversion reaction to NO₂ can take place."

Dr. Moyls is correct that the reference warns against the use of a reactive plume model. We did not use a reactive plume model or modify RTDM to make it a reactive plume model. What we did was to use the RTDM model to calculate the dispersion of NO_x and then used the Ozone Limiting Method to convert the NO_x to NO_2 as recommended in the quoted reference.

Specifically, Cole and Summerhays recommend in their conclusions that:

"The models discussed in this paper are more appropriate for cases in which a single point source [i.e., the gas turbine] contributes a substantial portion of the ambient NO_x , either in a rural or in an urban setting.

"In estimating the impact of NO_x point sources or ambient NO_2 concentrations we recommend a two step procedure. The first step is to use an appropriately conservative screening technique. As discussed previously, we recommend the Ozone Limiting Method over total or partial conversion techniques. The Ozone Limiting Method objectively incorporates the oxidizing potential of the atmospheric O₃.

The RTDM model is recognized by the U.S. Environmental Protection Agency and others as a conservative screening model. The RTDM model, as modified by CIRRUS Consultants, added the Ozone Limiting Method and parameters derived from plume measurement.

Total or partial conversion of the plume was not used for Oliver. Rather, we used measurements from plumes for the conversion rate of NO to NO₂ as recommended by Cole and Summerhays. Cole and Summerhays state that "A sounder method [than total or partial conversion] for considering the time

dependency of the NO_2/NO_x ratio in plumes is to use curves derived from plume measurement". This latter approach is one way for conservatively accounting for increased NO_2 (above the Ozone Limiting Method) during periods when photochemical reactions could conceivably occur (i.e., spring, summer and fall daytime).

Biogenic Hydrocarbons

Cole and Summerhays note that "the Ozone Limiting Method provides a first approximation of estimating the impact of urban point sources, the method does not consider the effect of organic reactions on NO_2 formation". The use of the measurements from plumes allows the NO_2 levels to rise above the maximum value from the Ozone Limiting Method during spring, summer and fall daytime when these chemical reactions could occur from natural or man-made emissions of hydrocarbons. However, daytime also means increased dispersion which lowers ambient NO_2 concentrations. Both factors were considered in Exhibit 9 but only the first factor is considered by Dr. Moyls in this part of his Argument.

During the Burrard Thermal Generating Plant Appeal, the Environmental Appeal Board noted that NO_x emissions can actually reduce ozone concentrations.

The Oliver area has been referred to by many of the ECA interveners as a "pocket desert". Mr. Gilmour, an ECA member, noted that Dr. Moyls was another ECA intervener and we note the fundamental conflict between their arguments that Oliver is both an evergreen forest and a pocket desert.

Plume Rise

For higher surface wind speeds (i.e., >>1.0 m/s), there is a greater correlation of wind speed at the surface to that at plume height. However, this correlation disappears at very low surface wind speeds. When the

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Farris, Vaughan, Wills & Murphy Mr. G.K. Macintosh, Q.C. February 2, 1989 Page 5

surface wind speeds are less than 1.0 m/s, the wind speeds at greater heights above ground level will still be substantial. For lower wind speeds (i.e., < 1.0 m/s), an alternate equation is used to provide a conservative lower limit to the plume rise. The recommended method in the RTDM manual is precisely the method used in the study.

Exhibit 103 was clearly stated to be for neutral conditions which represent the "normal" conditions for dispersion. The values used in Exhibit 103 were calculated by the plume rise subroutine of the RTDM model. The RTDM manual states "for stable conditions RTDM calculates plume rise using both the stable (equations 6 and 8) and the neutral (equation 5) formulas, and the conservative assumption is made, (following Briggs, 1975) that the effective plume rise is the smallest value given by the various formulas". To make a valid comparison between the stable and neutral formulas, it is essentialthat a minimum 1.0 m/s wind speed be used as stated in the RTDM manual.

At the plume beights expected from gas turbines, the wind speeds should be much greater than 1.0 m/s. If the wind speeds at plume height were used in the dispersion calculation, (as is done in some dispersion models) the concentrations would have been substantially less than those reported in the studies.

1.3 Page 2, Paragraph 1

An experienced modeller always asks the question "Is it reasonable?" that Dr. Moyls has raised in his presentation. Dr. Moyls states "a fundamental check of the accuracy of any such model is determined when the maximum NO₂ concentration occurs, i.e., during the day or during the night. If it is predicted to occur during the day, then the model is on the right track because it agrees with common knowledge - namely that NO₂ concentrations peak during the day. If the peak is predicted to occur at night, then the methodology is seriously flawed because, as the consultant recognizes, the

conversion of NO to NO₂ is minimal at night. We can make the check on this model from its prediction of when its <u>hourly</u> maximum NO₂ values occur".

As previously noted, ambient concentrations are the result of two factors, dispersion and the rate of conversion of NO to NO_2 . Although conversion rates may be higher during daytime, the modelling studies indicated that the rate of dispersion is the primary reason for low NO_2 concentrations during daytime.

The U.S. EPA document entitled "Technical Basis for Developing Control Strategies for High Ambient Concentrations of Nitrogen Dioxide" (U.S. EPA No. EPA-450/4-80-017) shows that the maximum concentrations of NO₂ may occur during the late afternoon or early evening (i.e., called "night" under the scenarios discussed in the Norecol report.) The report also notes that "the physical location of a site which primarily experiences high NO₂ concentrations, due to photochemical synthesis, is one within several (e.g., 1-4 hours) hours travel time of where heavy NO_x and VOC emissions occur. These areas are usually located in urbanized or larger industrialized areas where primary emissions of NO_x and VOC are both plentiful."

Argonne National Laboratory, in a November 1980 study for the U.S. Department of Energy also illustrates that stable atmospheric conditions, which occur at night in the Okanagan, can result in high ambient NO₂ levels. The report states noted that "high-level hourly concentrations of NO₂, unlike O₃ occur most frequently during winter [November through February], possibly due to combined effects of more stagnant meteorological conditions [i.e., winter nights] limiting the dilution of precursors and product pollutant, weaker solar radiation and lower temperature slowing the photo-dissociation of NO₂ formed, and increased NO_x emissions from space beating using natural gas. The association between the daily traffic cycle and the hourly fluctuations of high-level NO₂ concentrations, and the simultaneous occurrence of NO₂ concentrations at many monitoring sites suggest that area

source emissions due to motor vehicles are the principle approximate cause of the high-level NO_2 concentrations in the (urban) area". (Motor vehicles emit significant amounts of NO_x near ground level which is different from the substantial plume rise for a gas turbine).

As presented in Exhibit 9, the stable conditions primarily occur at night and these conditions lead to the maximum predicted ambient 1 hour NO_2 levels for the gas turbine at Oliver.

1.4 Page 2, Paragraph 2

The use of maximum ozone values measured in Kelowna at night, as used in Exhibit 78, shows that this approach still results in NO_2 levels well below the 1 hour NO_2 guideline of 400 ug/m³. Daytime is not a constraint whether the Ozone Limiting Method or the 40%/hour conversion rate is used.

The approach to use Ozone Limiting at night and for daytime during winter and a 40% per hour conversion rate of NO to NO_2 during spring, summer and fall daytime were intended to produce more conservative results that favoured the environment rather than the Applicant. Use of lower conversion rates at night would have resulted in lower concentrations during that period (i.e., nighttime all year and winter daytime). Use of the 40% conversion rate during spring, summer and fall daytime allowed the conversion of NO to NO_2 to rise above the upper limit placed by the Ozone Limiting technique and should thereby produce a higher (more conservative) concentration. The Alberta Acid Deposition Research Program noted conversion rates of 0.2 to 12%/hour in power plant plumes, which are much lower than the 40%/hour that we used, further illustrates the conservative nature of our approach (Acidic Deposition and the Environment A Literature Overview, Legge, A.H., Crowther, R.A., November 1987).

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The increase in maximum one hour predicted NO_2 from Exhibit 9 to Exhibit 78 was due to the higher background ozone limits assumed during nighttime.

1.5 Page 3, Paragraph 2

Specific emission estimates, rather than the literature, are more precise for modelling of air quality. If the literature is used, care must be taken that the type of turbine cited is representative of the type used for the WKP facility.

Exhibit 102 was used to illustrate that 260 ppm of NO_x emissions was far closer to those stated by WKP and their consultants than the 2000 ppm used by Dr. Moyls. The specific emission criteria presented in Exhibit 9 still applies.

1.6 Page 3, Paragraph 3

It is not reasonable to estimate meteorological conditions based on the plume dispersing evenly throughout the valley. Inversions do not start breaking down on a valley wide basis but break down initially in isolated areas. The hot gas turbine plumes will cause an updraft even under the most severe stable atmospheric conditions. This in turn would result in a downdraft near the plume and breakdown of the inversion in the immediate vicinity of the plume.

The scenario of the extreme low temperature measured at Oliver being the average temperature and the warm air from the coast entering all but the lowest 120 meters of the valley bottom is extremely unlikely. The lack of air flow in and out of his box model cannot be justified based on the surface meterological (wind) data measured in the Okanagan.

The paper entitled "Ozone Air Quality Models; A Critical Review" published in Journal of the Air Pollution Control Association, May 1988 (pages 616-639), stated that:

"Fundamental to the box model concept is the assumption that pollutant concentrations in a volume of air, a "box", are spatially homogeneous and instantaneously mixed. Under this assumption, pollutant concentrations can be described by a simple balance among the rates at which they are transported in and out of the air volume, the rates of emission from sources within the volume, the rate at which the volume expands or contracts, the rates at which pollutants flow out of the top of the volume, and the rates at which pollutants react chemically or decay (emphasis ours).

"Clearly, box models cannot be used to assess the effectiveness of emissions controls strategy that lead to spatially inhomogeneous emissions. Likewise, they cannot be used to predict the magnitude and location of the maximum concentrations of photochemical products in a given region. Box models can aid in calculating a material balance over an entire region, to determine the relevant contributions of sources, initial conditions and inflow to a region's air quality."

If one accepted Dr. Moyls' analogy, carbon monoxide emissions from motor vehicles and houses would also build to unacceptable levels with the result that the population may have had to leave the valley. Since this is not the case, it only serves to illustrate the inappropriateness of his argument.

2.0 PROFESSIONAL OPINION

When a Professional Engineer renders a professional opinion that is critical of the work of another engineer, he is obligated to contact the other engineer and ensure that he has obtained all necessary information to render that opinion. In addition, unless this opinion is an area of general knowledge for a Professional Engineer, he has to be qualified to render that opinion.

Dr. Moyls did not contact myself and review the points for which we have been unjustly criticized. In addition, Dr. Moyls testified at the Hearing (pages 2828 and 2829) that:

- He was not a meteorologist;

- He did not have experience in emission inventories;

- He did not have expertise including modelling "for the purposes of studying air quality".

Therefore, there is little basis to believe that his Argument should be considered as a professional opinion.

Yours sincerely,

- Jugit

Peter Sagert, P. Eng. Principal

cc H. A. Dube, WKP H. Warren, Norecol J.R. Pitts, CIRRUS Consultants

PS:bf

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Barron Kennedy Lyzun & Associates

File: 1218.58103

Farris, Vaughan, Wills & Murphy 2600 - 700 West Georgia Street VANCOUVER, B.C. V7Y 1B3

Attention: G.K. Macintosh, Q.C.

Dear Mr. Macintosh:

F.e: WKP - Okanagan Gas Turbine Generation Plant Silbernagal Argument dated January 12, 1989

I have reviewed the Silbernagel argument and wish to offer the following comments:

1) The ambient noise levels referred to in their argument were measured in the front yard of the Harkness residence which is at the top of the bank (major bench east of the Okanagan River) to the northeast of the Silbernagel residence. Those were sound measurements made on December 8, 1988, and documented in my written response to the questions posed by Mr. Rice. However, measurements made on December 6, 1988 at a location on the road below the Harkness residence and read into the hearing record the following day, indicated nighttime ambient noise levels of 40.4 dBA and daytime ambient noise levels of 47.5 dBA. As the site of these measurements was closer to the Silbernagel residence, and generally at the same elevation, I believe that they more closely represent the ambient levels to which the Silbernagels are exposed.

The difference between the sound levels on the road below the Harkness residence and the levels in their yard is likely due to the shielding that the bank offers to noise from local activity in the community below.

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Mr. G.K. Macintosh

- 2) It should be noted that the Silbernagel's use of my response to Mr. Rice's first question (Page 2 of my response) has been taken out of context. The distance of 1265 feet in that response referred to a basic geometric spreading model. However, the response then went on to qualify that several additional attenuation factors would modify this distance. These factors were all considered in the analysis used to develop the information for Exhibit 10, and are shown on the first column of table 7 in that report.
- 3) Regarding the reference to Exhibit 10, Page 15, last paragraph:

"Generally it can be said...., a noise source introduced into the environment will be judged acceptable if it does not exceed ambient conditions by more than 5 dccibels."

It should be noted that the converse of this statement is not a sharp line. There is a significant range to peoples' reaction to noise. This range, as shown on figure 12 in Exhibit 10, is generally considered to be at least +5 dBA.

I trust that this information will be of use to the Commission.

Yours very truly,

BARRON KENNEDY LYZUN & ASSOCIATES LTD.

Douglas J. Whicker, P.Eng.

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