

IN THE MATTER OF

## FORTISBC INC. CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY APPLICATION FOR THE NK'MIP TRANSMISSION AND SUBSTATION PROJECT

# DECISION

JUNE 2, 2006

**Before:** 

L.F. Kelsey, Chairperson A.J. Pullman, Commissioner

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## **COMMISSION ORDER NO. C-1-06**

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## **1.0 BACKGROUND**

The Town of Osoyoos ("Town", "Osoyoos") is situated three kilometers north of the Canada/U.S. border at the junction of Highway 3 and Highway 97, and straddles Osoyoos Lake, which is part of the Okanagan River system. The lake is crossed by a causeway, which divides the town into two parts ("Causeway"), referred to as West Osoyoos and East Osoyoos. Since 2002 the Town has enjoyed considerable economic and population growth, largely based on in-migration, tourism and viticulture.

Electrical service is provided to the Town by FortisBC Inc. ("FortisBC" "Company"). Service is provided by a 63kV radial line ("44 Line") from Oliver, 21 kilometers north of the Town. This line follows Highway 97 and was originally built in the 1930s and was rebuilt at 63kV in 1998 following a Public Hearing and Commission Order No. C-13-98. The Town is served by a single substation (West Osoyoos) which was originally constructed in 1951, and refurbished in 1976 and contains two 15 MVA, step-down transformers. East Osoyoos is served by a single 13kV feeder ("Osoyoos Feeder 2") from the West Osoyoos substation by way of the Causeway.

In its original Application, FortisBC states that the load growth in the area, coupled with the age of the transformers, has created the following issues:

- the load on 44 Line, which serves Osoyoos and the Pine Street Substation, is growing at a rate which would exceed by 2011 the maximum operating capacity for delivering quality power;
- under existing conditions the failure of one of the aged transformers in the West Osoyoos substation will result in load shedding as the remaining transformer would not be capable of carrying the combined load;
- the load on the east side of Osoyoos is expected to exceed the capacity of Osoyoos Feeder 2 in the summer of 2006; and
- the existing substation serves loads as far east as Anarchist Mountain. These loads are fed from a single phase distribution system for a considerable distance resulting in low voltages.

(Exhibit B-1, p. 8)

During the oral public hearing FortisBC revised its position on three of the issues as follows:

- 44 Line is now not expected to exceed its maximum operating capacity within FortisBC's planning horizon (viz after 2020) (T2: 290);
- FortisBC now believes that Osoyoos Feeder 2 can be managed through the summer of 2006 and into 2007 (T2: 289); and
- FortisBC has the approval of the British Columbia Utilities Commission ("Commission") to replace one transformer and refurbish the other in the West Osoyoos substation (T3: 560).

On May 31, 2005 the Commission issued Order No. G-52-05 directing FortisBC to file an application for a Certificate of Public Convenience and Necessity ("CPCN") for its proposed East Osoyoos Substation.

On October 12, 2005 FortisBC filed an application for a CPCN for the Nk'Mip (East Osoyoos) Transmission and Substation Project ("Project", "Application").

On October 25, 2005 FortisBC held a public open house in the Elks Hall in Osoyoos. The meeting was attended by some 50 residents and lasted from 7:30 p.m. to 10:00 p.m.

On November 4, 2005 the Commission issued Order No. G-114-05 which established that the application for the project would be reviewed by an oral public hearing at the Osoyoos Seniors' Centre in Osoyoos on January 21, 2006, and set out a regulatory timetable.

On January 11, 2006 the Commission issued Letter No. L-1-06 advising of its decision to make Intervenor funding available. Following the issue of this letter, on January 13, 2006, two Intervenors requested that the hearing be rescheduled to allow additional time for witnesses to be scheduled. In Order No. G-3-06 the Commission advised that it would proceed with a Pre-hearing Conference on January 21, 2006 followed by a Town Hall meeting, wherein residents would be afforded an opportunity to make presentations to the Commission Panel. The Pre-hearing Conference took place as scheduled but no presentations were made to the Commission Panel. On January 26, 2006 the Commission issued Order No. G-7-06 setting out a revised timetable, and established that an oral public hearing would be held on March 20-21, 2006 in Osoyoos. The oral hearing was well attended and lasted a full two days. Following the oral hearing, Argument was submitted by FortisBC on March 31, 2006 and by Intervenors on April 7, 2006. FortisBC submitted Final Argument on April 18, 2006.

#### 2.0 THE APPLICATION

FortisBC applies to the Commission, pursuant to Sections 45 and 46 of the Utilities Commission Act ("UCA"), for a CPCN for the Project.

#### 2.1 Original Application

FortisBC's original application to the Commission was for a CPCN for the construction of a distribution source substation and associated distribution feeders in East Osoyoos to be connected to the existing West Osoyoos Substation by a 4 km, 63kV transmission line that crosses the Causeway, at a cost of \$8.97 million (Exhibit B-1, pp. 6, 14).

#### **Staging of the Project**

#### Transmission

FortisBC stated that it has planned for the construction of the transmission line in two stages. The first stage involves the section from West Osoyoos Substation via Kingfisher Drive to Lakeshore Drive. This section would be constructed in 2006 to 63kV but will be operated at 13kV in order to meet the 2006 summer peak load in East Osoyoos, which is forecasted to exceed the thermal limit of Osoyoos Feeder 2. FortisBC states this is critical to ensure avoidance of load shedding during the summer peak of 2006. Representatives later testified that FortisBC will be able to "work through the system with the existing infrastructure" though the summer of 2006 and into 2007 (T2: 289).

The second stage, which is scheduled for the fall of 2006, involves the construction of the section from Lakeshore Drive to the proposed Nk'Mip Substation and completion of the 63kV line terminations at the West Osoyoos and Nk'Mip Substations (Exhibit B-1, p. 12).

In addition, FortisBC states that in the 2010-2011 timeframe it will establish a transmission tie between the Nk'Mip Substation and a new (as yet unplanned and unapproved) terminal station at Bentley. The

18 km line will be built entirely on the Osoyoos Indian Band ("OIB") land and will be energized at 138kV (Exhibit B-1, p. 9). FortisBC explained that it had modeled the forecast load on 44 Line and forecast that it would exceed its thermal capacity in the 2011 timeframe. FortisBC testified that it had made an error in its modeling and that it now is not forecasting that 44 Line will exceed its thermal capacity within FortisBC's planning margin – viz until after 2020 (T2: 290-297).

#### Substation

The proposed substation in East Osoyoos ("Nk'Mip") will be located on land managed jointly by the OIB and Indian and Northern Affairs Canada ("INAC"). FortisBC proposes to construct the Nk'Mip Substation in the fall of 2006.

#### Distribution

FortisBC explains that at the present time the customers located on the east side of the Causeway in Osoyoos (East Osoyoos) are served via Osoyoos Feeder 2 from the West Osoyoos Substation. As part of this Project, a section of line was proposed to be constructed across the Causeway to Lakeshore Drive in late 2005 or early 2006. This circuit would be insulated at 63kV; however, it initially will be operated at 13kV level and will be designated as Osoyoos Feeder 4. The East Osoyoos load will be split between Osoyoos Feeder 2 and Osoyoos Feeder 4 to ensure that Osoyoos Feeder 2 does not reach its thermal limit during the summer of 2006.

When the Nk'Mip Substation is constructed in 2006, the new Osoyoos Feeder 4 will be converted to operate at 63kV and become the transmission tie between the East (Nk'Mip) Osoyoos and West Osoyoos Substations. The existing 13kV Osoyoos Feeder 2 will be split and converted into reduced Osoyoos Feeder 2, Nk'Mip Feeder 1, Nk'Mip Feeder 2 and Nk'Mip Feeder 3 and sufficient load will be transferred to the new Nk'Mip Substation to ensure that the operation of the Osoyoos Feeder 2 is below thermal limits.

When the Project is complete, Osoyoos Feeder 2 will be available to serve local load in West Osoyoos and shall provide load transfer capability to support station transformer backup (Exhibit B-1, pp. 12-13).

#### 2.2 Revised Application

On the second day of the hearing, after the noon break, FortisBC altered its position and recommended a modified Option 2 as presented in its Application as its chosen option (T3: 435).

#### Transmission

The construction of a transmission line that "will be approximately 18 km in length and will connect the existing Oliver Terminal Station and the proposed Nk'Mip Substation. The line will be rated at 138kV, but energized initially at 63kV. Upon construction of the Bentley Terminal Station, the transmission line would be transferred from the Oliver Terminal Station" (Exhibit B-1, p. 33). FortisBC identifies this line as 66 Line and its voltage at 63kV (Exhibit B-20, Undertaking No. 10).

During the hearing, FortisBC was questioned on the amount of engineering studies and surveys required for Option 2. FortisBC stated:

"With respect to line routing, we do have preliminary design complete. We would have to go into final design. Based on that preliminary engineering and field checks by our construction people, they have indicated that they don't anticipate there being any problems. But we would have to do the engineering work along there.

Coupled with that, to have the egress coming from Oliver Terminal, we will have to make sure that the engineering is complete as well. Once again, I don't anticipate any problems with that" (T3: 570).

#### Substation

FortisBC proposes that the Nk'Mip Substation will be constructed on a four acre section of land along Highway 3 approximately 2.5 km north-west of Anarchist Mountain. It will be supplied by 66 Line from Oliver Terminal Station. It will consist of one 24/32/40 MVA power transformer to convert the

transmission level power to lower voltage distribution level electricity and five distribution feeders with the associated switching, protection, metering and control systems; three to serve the load of East Osoyoos and two to serve as Trunk Distribution Links to West Osoyoos Substation (Exhibit B-1, p. 33).

#### Distribution

FortisBC proposes that Osoyoos Feeder 2 (the line from West Osoyoos Substation) down Kingfisher Drive to the Causeway will be rebuilt and energized at 13kV (T3: 543).

#### 2.3 **Permits and Licenses**

FortisBC states that the substation and transmission line as proposed in Option 2 are entirely on land that is managed jointly by the OIB and INAC. Since the land is entirely under the jurisdiction of the Government of Canada, all provincial statutes are replaced by their federal equivalents.

Substation location selection priorities were based upon technical feasibility, cost and suitability for construction. The Nk'Mip land parcel was assessed as part of the larger area encompassing the future proposed Bentley terminal and connecting transmission corridor. INAC does not permit the concept of "project splitting" – if proposed projects by a single entity are connected and adjacent, the collective impact of those projects must be assessed at the same time.

FortisBC states that it has discussed this project extensively with the OIB, INAC, the Canadian Wildlife Service ("CWS") and the federal Department of Justice. The Environmental Impact Assessment ("EIA") has been presented to all regulatory agencies, who accepted it without suggesting any change.

FortisBC states that the permits for the Project will be issued by INAC, which represents the interests of all the involved federal agencies. FortisBC states that this approval was expected in late 2005.

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The final detailed construction and environmental management plans for the purpose of tendering the project will include specific prescriptions, procedures and requirements to mitigate a number of potential temporary construction impacts to local residents and Nk'Mip recreational users (Exhibit B-1, p. 23).

FortisBC states that the negotiations with the OIB related specifically to:

- a four acre proposed site for the Nk'Mip station;
- an access road to the station (1.07 acres);
- transmission access from the substation to Highway 3;
- distribution egress from the station to the local distribution network; and
- the transmission lines.

The negotiation parameters are set by INAC and include a need to appraise the land as "highest and best use." This formula was used when the land was appraised by Inland Appraisals (Penticton) and confirmed by Kent McPherson Appraisals (Kelowna) (Exhibit B-3, BCUC IR-1, 8.1).

The negotiation included discussion on:

- land price, separate for each of the parcels noted above;
- length of lease (99 years, the maximum allowed by INAC). Federal crown rules do not currently permit sale of reserve lands;
- archaeological and environmental assessments, including damage prevention strategies and mitigation measures;
- use of land; and
- fire protection of facilities.

(Exhibit B-3, BCUC IR-1, 8.1)

The negotiations lasted several months, and successfully concluded in October 2005 with the signing of a Memorandum of Understanding ("MOU").

FortisBC states that as the reserve lands are formally owned by the Federal Government, the Site Lease agreements are signed with INAC and the federal Department of Justice. FortisBC expects that the agreements will be formalized in 2006 (Exhibit B-3, BCUC IR-1, 8.8).

FortisBC reports that the Designation vote of the OIB passed in favour of the FortisBC project. The vote, required by federal law and scrutinized by INAC, passed on the first ballot (Exhibit B-3, BCUC IR-1, 8.2).

FortisBC states that it requires the following permits, licenses and approvals for the Project:

Agency	Purpose of Contact or Required Approval				
I. FEDERAL AGENCIES					
Canadian Wildlife Service	Permit required for activities conducted that might affect species at risk (Species at Risk Act).				
Department of Fisheries &					
Oceans	Obtain permit to construct adjacent to Osoyoos Lake.				
Department of Justice	Review the INAC contract terms to ensure all laws and regulations of Indian Act upheld.				
Indian and Northern Affairs	Permit required to construct within the Reserve as per the Canadian				
Canada	Environmental Assessment Act.				
	Determine the terms of the contract between FortisBC and the Osoyoos				
	Indian Band.				
II. PROVINCIAL AGENC	IES				
Ministry of Environment	Obtain permission to encroach upon Osoyoos Lake riparian habitat				
	(Section 9).				
Interior Heath Authority	Approvals re: Sewage Disposal Field and Waste and notification in the				
	event of a spill (Health Act).				
Ministry of Transportation	Permit for Access to a Controlled Access Highway				
& Highways	Aerial Crossing Permit (Highway Act).				
III. MUNICIPAL GOVER	NMENTS				
Regional District of					
Okanagan Similkameen	Approval to use land in the ALR for a purpose other than farm use.				
Regional District of					
Okanagan Similkameen	Development and Building permits for work at new Nk'Mip Substation.				
(Exhibit B-1, p. 43, Table 10)					

#### 3.0 **PROJECT DRIVERS**

#### 3.1 Load Growth

#### 3.1.1 FortisBC Position

FortisBC sets out a table to show the forecasted peak load trend during the 2004-2010 timeframe and the ultimate loading level in 2020, in the Osoyoos area. The region is forecast to have an average annual load growth rate of 10.5 percent approximately per year until 2010.

#### **Forecasted Peak Load Data**

LOAD								
PARAMETERS	2005	2006	2007	2008	2009	2010	2020	2025
Peak MVA	19.5	21.2	23.0	25.0	27.0	29.2	32.2	36.4
% growth with respect to								
2004 (17.9 MVA)	8.9%	18.4%	28.5%	39.7%	50.8%	63.1%	79.9%	
% average overall load								
growth during 2004-2010	10.5 %							

(Exhibit B-1, p. 29)

FortisBC sets out the historical loading on the West Osoyoos Substation as follows:

2001	14.5 MVA
2002	12.5 MVA
2003	17.3 MVA
2004	17.9 MVA
	11 10 1

(Exhibit B-3, Appendix A3.1)

FortisBC stated that these are winter peaks and that "summer peaks are in the order of 10 to 15 percent higher" (T3: 591).

FortisBC notes that the system load growth in the Osoyoos area, especially East Osoyoos, Spirit Ridge and Lakeside has exceeded the Company's average growth rate during the past few years. The load is forecasted to grow by approximately 9.7 MVA, i.e., by 50 percent over the next five years. The above average rate of load growth in this area is predominantly attributed to the migration from urban centres outside of the Okanagan. FortisBC believes that the new residential and commercial construction in the Osoyoos area is primarily being driven by the following factors:

- Strong British Columbia economy;
- Reasonable interest rates;
- Population demographics;
- Osoyoos' climate and recreation opportunities;
- First Nations development plans on Indian Band lands; and
- B.C.'s growing wine industry. (Exhibit B-3, BCUC IR-1, 12.1, p. 35)

Strong demand is expected and forecasted through 2010. Thereafter, through 2025 demand expectations have been reduced to B.C. statistical average household growth for the South Okanagan region.

#### 3.1.2 Intervenor Positions

None of the Intervenors challenge FortisBC's load forecast. In the words of a witness for Osoyoos Now "...obviously from an economic development point of view it's critical that we have the necessary resources and infrastructure in place to enable controlled growth" (T3: 447).

#### 3.2 Reliability

#### 3.2.1 FortisBC Position

FortisBC cites the following instances where reliability has become an issue in the Osoyoos area.

#### Transmission

FortisBC states that failure of the single transmission line supplying the existing West Osoyoos Substation will result in forced load shedding. Currently, Osoyoos and areas south of Oliver are serviced by West Osoyoos and Pine Street Substations, which are fed radially at 63kV on 44 Line from the Oliver Terminal Station. As a consequence of this configuration, the loss of 44 Line results in complete load shedding of Osoyoos.

FortisBC stated that since 44 Line was rebuilt in 1998 there have been ten outages with a combined duration of less than 30 minutes (Exhibit B-11, Karow IR-2, 9). FortisBC stated that it is happy with that, and that the rebuild of 44 Line has been beneficial for service levels (T3: 594, 595).

On the issue of "looped" service, FortisBC advised that there is no single set of criteria for deciding when a community should receive "looped" service describing it as more of an art than a science adding "...it's also a variable as to how well the existing radial line is performing. And so if the existing radial line is in good condition, and we're not seeing any reliability upsets for those large customers, that would also be a fact that needs to be considered" (T3: 588). Communities of equivalent size to Oliver/Osoyoos which receive "looped service" include Castlegar, Trail/Rossland and Grand Forks. Communities served by a radial line include Creston and Summerland.

FortisBC stated that it has had no discussion with the Okanagan PUD [Public Utility District], the public utility across the International Border to the south of Osoyoos, with a view to a possible interchange of power (T3: 587).

## 3.2.2 Intervenors' Positions

Osoyoos residents did not identify the number of outages being experienced in Osoyoos as a key issue. This can be ascribed to the improved reliability of the rebuilt radial 44 Line.

The Mayor of Osoyoos stated, when asked why Council had supported Option 1:

"...and we knew that a single accident between Oliver and Osoyoos currently leaves Osoyoos completely without power, and of course with our fire protection, the agriculture community needs a consistent supply of water, the emergency services, the hotels, motels and all our restaurants, and as well as of course the residents and visitors that do come to Osoyoos, need a consistent power."

"We supported that initiative because it would give us more consistent power. We didn't get into the actual details of the routing" (T2: 196).

#### Substation

Studies indicate that the 2004 peak demand on the West Osoyoos Substation was 17.9 MVA with 1.6 MVA of additional peak load growth expected in 2005 and future yearly additions of up to 2.1 MVA. The load-forecast studies indicate that the total load in the Osoyoos area is expected to surpass 32 MVA by 2020. This will exceed the existing installed transformer capacity (Exhibit B-1, p. 28).

FortisBC states that the existing transformers in West Osoyoos Substation are both rated as "Condition 4" (immediate rehabilitation required), based on dissolved gas analysis. They are both "Moloney Transformers" which are known for leaking tap-changers (Exhibit B-1, p. 27).

The transformer loading documentation indicates long durations of loading at nameplate ratings and shorter periods of operation, in excess of nameplate rating thus creating an inevitable situation of loss of active operational life. "Presently at this level of operation, the transformer may be considered as grossly de-rated due to degeneration of insulation arising out of thermal stress and may be considered as a safety hazard to the employees, public and the environment" (Exhibit B-1, p. 27).

Additionally, the failure of one of the two existing 63/13kV, 15 MVA transformers in the West Osoyoos Substation will result in load shedding because the remaining transformer does not meet the 80 percent back-up criterion and hence is not capable of carrying the combined area load (T3: 321).

FortisBC states that it has received Commission approval to repair one of the West Osoyoos transformers and to replace the other one. An order has been placed with the manufacturer for the new transformer and FortisBC is planning the repairs, which will be carried out in the fall of 2006 (T3: 560).

The West Osoyoos Substation is considered in greater detail in Section 8 of this Decision.

#### Distribution

The West Osoyoos Substation serves loads through a single phase distribution system as far east as the Anarchist summit. The voltage at the ends of these long single phase distribution lines is presently close to the allowable minimum and customer complaints with respect to low voltage are not uncommon (Exhibit B-1, p. 8).

FortisBC stated that it has located a single phase regulator in East Osoyoos to mitigate voltage issues in the East Osoyoos area (T3: 540).

FortisBC forecasted originally that the load on the east side of Osoyoos would exceed the capacity of Osoyoos Feeder 2 supplying this area in 2006. It revised its position during the hearing stating that "we believe that through some minor operational checks that we will be able to work through the system through to 2007 prior to the summer peak of 2007 with the existing infrastructure" (T2: 289).

FortisBC provides the following data for the duration (SAIDI) and frequency (SAIFI) of outages at Osoyoos Feeder 2.

Osoyoos Feeder 2						
YEAR 2000 2001 2002 2003 2004						
SAIDI (hrs)	0.46	0.23	1.33	1.74	0.30	
SAIFI	0.33	.010	0.12	0.35	0.20	

FortisBC reports the SAIDI for 2005 as 1.48 and the SAIFI as 2.01 and observed that Osoyoos Feeder 2 has preformed better than FortisBC's system average for both SAIDI and SAIFI (T3: 592-3) (Exhibit B-3 BCUC IR-1, 11.2).

FortisBC is unable to state how many complaints it has received concerning low voltage (Exhibit B-3, BCUC IR-1, 11.1).

#### **Intervenors' Positions**

Intervenors did not cite low voltage as a major issue.

#### 4.0 **OPTIONS STUDIED**

FortisBC evaluated three project options in its original application and proposed a fourth option called modified Option 2 during the oral hearing and in argument. In addition other options were suggested by Intervenors.

#### 4.1 FortisBC Proposed Option 1

Option 1 extends the 63kV 44 Line from the West Osoyoos Substation across the Causeway and along Highway 3 to a new substation located on OIB land. This new Nk'Mip Substation would consist of a 63/13kV transformer and three feeders with room to connect a mobile transformer. The three feeders will feed the Anarchist Mountain area load, the East Osoyoos area load and the third feeder will tie the Nk'Mip Substation to the West Osoyoos Substation. Initially, the 63kV line from the West Osoyoos Substation will be energized at 13kV, and by the end of 2006 be converted to 63kV by tapping it to the 44 Line (Exhibit B-1, pp. 8, 9, 16, 17). At a later date (in the 2011 timeframe) the Nk'Mip Substation would be connected to a new Terminal Station (Bentley) near Oliver by a 138kV transmission line and consist of one 138/63kV transformer, two 63/13kV transforms and room for eight feeders (Exhibit B-1, p. 18).

#### **Route Options for Option 1**

To connect the Nk'Mip and West Osoyoos substations FortisBC considered two route options: A and B. Route Option A considered a route which would essentially overbuild the present Feeder 2 from the West Osoyoos Substation, along Kingfisher Drive to Highway 3 (.6 km). This would entail poles having a proposed height of 60 feet, with the 63kV line on top and the 13kV as an underbuild. From Highway 3 the route would cross the Causeway along Highway 3 to Lakeshore Drive (1.4 km) and then from Lakeshore Drive along Highway 3 to 82nd Avenue to the Nk'Mip Substation (2.0 km) (Exhibit B-1, p. 31).

Route Option B considered a route which would exit the West Osoyoos Substation at the Junction of 87th Avenue and proceed down 68th Avenue past the school and follow the route of existing Feeder 1 along 68th Avenue to Highway 3 and along Highway 3 to Kingfisher Drive. Thereafter, the route would be the same as Route Option A (Exhibit B-1, p. 31).

In addition, in response to Information Requests (Exhibit B-3, BCUC IR-1, 10.3 and 10.2) FortisBC examines the following variants to Option 1:

- Underground transmission from West Osoyoos Substation to Cottonwood Drive and then overhead transmission from Cottonwood Drive to Nk'Mip Substation; and
- Underground transmission from West Osoyoos Substation to the beach near Kingfisher Drive, submarine cable across the lake to the beach beyond the Causeway, underground cable from the beach to Cottonwood Drive and finally by overhead transmission line from Cottonwood Drive to Nk'Mip Substation.

At the Open House, held in Osoyoos in 2005, the attendees proposed two other overhead options described below as Option B and Option C.

- Option B. This alternate route heads north from the West Osoyoos Substation along 89th Street then turns east to parallel the elementary school yard. The line continues in front of the elementary school and east on 68th Avenue, then east on Highway 3 to the Causeway entrance, and would require a significant corner structure in front of the school entrance (Exhibit B-3, BCUC IR-1, 10.23)
- Option C. This proposed route heads north from West Osoyoos Substation along 89th Street and continues to the alley south of Main Street. It parallels Main Street in the alley to Highway 3, then follows the highway to the Causeway entrance (Exhibit B-3, BCUC IR-1, 10.2).

## 4.2 FortisBC Proposed Option 2

Option 2 would proceed in two stages. Stage 1 would entail the construction of a new line built at 138kV but initially energized at 63kV from Oliver Terminal Station across OIB lands to the new Nk'Mip Substation. The substation would have the capacity for three feeders to serve the East Osoyoos load and two feeders to connect the West Osoyoos Substation to serve as a Trunk Distribution Link. Stage 2 would be similar to Option 1 in the 2011 timeframe (Exhibit B-1, p. 33).

#### 4.3 FortisBC Proposed Option 3

Option 3 consists of the construction of a new substation and decommissioning of the present substation in West Osoyoos. The new substation would be built on an existing FortisBC owned industrial site on the northern edge of Osoyoos and would feed East Osoyoos by the construction of three express feeder lines along Highway 3 and across the Causeway (Exhibit B-1, p. 36).

#### 4.4 FortisBC Proposed Modified Option 2

During the hearing and in Argument FortisBC proposed as its preferred option a modified version of Option 2. The above Option 2 was modified to require an immediate upgrade of the existing distribution Feeder 2 (FortisBC Argument, p. 3).

#### 4.5 Intervenors' Variants on the FortisBC Proposed Options

Mr. Wait suggests a variant of Option 1 that would involve the 63kV Line being built underground from the West Osoyoos Substation to Highway 3. To offset the cost of this, he proposes that the Nk'Mip Substation be built with a 20 to 24 MVA transformer, with an allowance for a second transformer of 20 to 24 MVA to be installed when the East Osoyoos emergency load exceeds Feeder 2's ability to carry it (Wait Argument, p. 3).

Mr. Wait also suggests a variant to Option 3 if this option should be approved. Mr. Wait's variant involves a new substation with a 20 MVA transformer in the industrial park, a rehab of the existing West Osoyoos Substation, increasing the capacity of Feeder 2 and multiple feeder work to rearrange the load distribution (Wait Argument, p. 5).

Mr. Karow suggests a variant of Option 2 which would involve tapping 44 Line at the head of Osoyoos Lake near Road 22 on the east side of the river (or installing a switching station) and constructing a transmission line on the east side of the lake to Nk'Mip Substation. In addition, Mr. Karow suggests that Osoyoos Feeder 2 be terminated at the end of Kingfisher Drive and that East and West Osoyoos be entirely separate with no interconnection whatsoever (Karow Argument).

#### 5.0 COMPARISON OF COSTS

#### 5.1 Capital Cost

#### 5.1.1 FortisBC Position

FortisBC filed a comparison of the costs of the three options when each option has been fully built out:

Option	<b>\$ Millions</b>
Option 1	23.89
Option 2	24.25
Option 3	between 22.75 and 27.16

The comparison takes into account the need to rehabilitate one and replace the second transformer under Options 1 and 3: the cost of looping the system in 2012 by constructing a line from Bentley to Nk'Mip in 2012 (Options 1 and 2); and the cost of a new Western Osoyoos Substation in 2020 (Options 1 and 2). The comparison does not include the cost of the new breaker at the Oliver Terminal Station. The dollars are as spent.

FortisBC states that costs for Option 3 are presented as a range due to the preliminary nature of the engineering design and cost estimates (Exhibit B-20, pp. 21-23).

FortisBC compares the cost of the Option 1 variants as follows:

Option 1A	Base case
Option 1B	More expensive than Option 1A
Customer Proposed B	\$.3 million over Option 1A
Customer Proposed C	\$.45 million over Option 1A
Underground	\$1.8 million over Option 1A
Underground underwater	\$3.3 million over Option 1A

(Exhibit B-2, pp. 24-25)

FortisBC estimates that the cost of the Option 2 variant would be \$3.23 million more than Option 1 (Exhibit B-4, Karow IR-1,. A1.1.12).

FortisBC estimates the cost of Mr. Wait's variant of Option 3 would exceed Option 1 by some \$3 million or more (Reply Argument, pp. 17-18).

FortisBC states that the cable related cost of the underwater option would be \$4.2 million (Exhibit B-20, pp. 17-18).

#### 5.1.2 Intervenors' Positions

The Intervenors do not challenge FortisBC's cost estimates.

## 5.2 NPV/Rate Impact

#### 5.2.1 FortisBC Position

FortisBC calculates for each option the net present value of the revenue requirements and the one-time equivalent rate impact as follows:

	NPV of Revenue Requirements	One-time Equivalent Rate Impact
Option 1	\$19.50 million	0.81%
Option 2	\$21.56 million	0.90%
Option 3	\$22.39 – 25.13 million	0.93% - 1.04%
(F. 1.11) D. 00		

(Exhibit B-20, pp. 21-23)

FortisBC calculates these as follows:

## **NPV of Revenue Requirements**

Discounts the incremental revenue requirements over a 50 year period using a 10 percent nominal discount rate (Exhibit B3, BCUC IR-1, 131). FortisBC states that Expenditures incurred after 2007 are updated at 2 percent per annum for NPV and rate impact calculations (Exhibit B-20, p. 21).

## **One-Time Equivalent Rate Impact**

Because the revenue requirements associated with the project result in varying levels of rate increases and decreases over the life of the project, FortisBC also calculates a "One-Time Equivalent" Rate Impact. It is the ratio of the value in the current year of the project revenue stream to the current year value of total revenue requirements over the project life. It is calculated as:

<u>Net Present Value of Project Revenue Requirements over Project Life</u> Net Present Value of total Revenue Requirements over Project Life

In addition, FortisBC calculates the annual incremental rate impact of each option as follows:

The Revenue Requirements Analysis for the proposed project includes a calculation of the rate impact in each year arising from the proposed project, compared to the previous year's rates. It is calculated as:

<u>Project Revenue Requirements Year 1 – Project Revenue Requirement Year 0</u> Total Revenue Requirement in Year 1

The rate impact is generally greatest in the year immediately following completion of the project, and declines in future years (Exhibit B-4, Karow IR-1, IR-2, 1.1.11.2).

5.2.2 Intervenors' Positions

The Intervenors do not challenge FortisBC's calculations.

#### 6.0 RELIABILITY AND OTHER TECHNICAL MATTERS

#### 6.1 Reliability

#### 6.1.1 FortisBC Position

FortisBC claims all options will create adequate capacity for the load in East Osoyoos which is forecast to exceed 15 MVA by 2010 (Exhibit B-1, Chapter 5).

FortisBC claims all options will enable N-1 contingency with transformers; the 80 percent criterion will be met even in year 2010 (Exhibit B-1, Chapter 5).

FortisBC acknowledged that the thermal limit of 44 Line will not be approached within its planning horizon (that is before 2020) (T2: 296-7). Option 1 will not offer full N-1 contingency at the transmission level on the assumption that the Bentley – Nk'Mip line will not be built until it is required. FortisBC claims that under Option 2:

"Under N-1 contingency with transmission lines, supply will remain unaffected due to the interconnectivity of two 13kV trunk feeders interconnecting the West Osoyoos and the Nk'Mip Substations, thus eliminating radial feed and increasing reliability" (Exhibit B-1, p. 34).

FortisBC claims that under Options 1 and 2, voltage profile to end line customers will improve due to reduction in distribution feeder lengths (Exhibit B-1, Chapter 5).

#### 6.2 Other Impacts

FortisBC acknowledged that Option 1 will require the construction of 4.0 km of 63kV transmission line, with 60 foot poles carrying the 63kV lines with the 13kV distribution lines underbuilt. As the line moves along Kingfisher Drive it may be necessary to locate the poles in the roadside rather than on the sidewalk (T3: 392).

So far as undergrounding the transmission line is concerned, FortisBC states:

"In accordance with the Terms and Conditions of its approved Tariff (Section 4.2), FortisBC provides service by way of overhead wire transmission and distribution. The Tariff provides for recovery, in rates, of the costs of overhead services and that enhancements such as underground services are to be paid directly by the customers enjoying the benefit of the enhancements.

If approved by the Commission, an underground installation should be paid, not by all of the customers in FortisBC's service territory, but by the Town of Osoyoos. It is submitted that, in the event the Commission determines that the facilities contemplated by Option 1 or any of the other options as modified should be installed underground, that the Commission should make such an order conditional upon FortisBC receiving satisfactory payment guarantees from the Town of Osoyoos. Otherwise, the facilities should be approved to be constructed as overhead transmission and distribution" (FortisBC Argument, p. 8).

On the matter of laying the transmission line across Lake Osoyoos, FortisBC states:

"It is further submitted that the option to construct a submarine transmission cable in Osoyoos Lake is not a practical option when considered and balanced against the other primary options. It is respectfully submitted that there is inadequate evidence before the Commission to approve a submarine route.

FortisBC does not utilize submarine technology and at present has no internal expertise in its construction or maintenance. The life of a submarine cable is significantly lower than that of an overhead line, and specialized underwater inspection and maintenance procedures are required. In case of a fault in the submarine section of the cable the power outage could run into several weeks with no sustainable alternative supply to East Osoyoos. If this option is chosen to supply the Nk'Mip Substation, the transmission line from Oliver to Bentley to Nk'Mip would need to be commissioned at the same time to ensure dual feed to the new substation. The technical and economic implications render the submarine cable option unacceptable. However, should the Commission order a submarine cable to be installed, the principle set out by the Chair at lines 9 - 20, page 81 of Transcript Volume 2 should apply and the Town of Osoyoos should bear the incremental costs associated with this option. The Commission should make such order conditional upon FortisBC receiving satisfactory payment guarantees from the Town of Osoyoos" (FortisBC Argument, p. 10).

#### 6.3 Electromagnetic Fields

The issue of electromagnetic fields ("EMF") was prominent in this hearing due primarily to the intervention of Hans Karow. However, EMF was also of interest to others, particularly Intervenors residing on Kingfisher Drive. Mr. Karow filed over 40 separate pieces of evidence concerning EMF although no expert witnesses were made available for cross-examination on any of the material filed. FortisBC presented expert witness Dr. Bailey who was cross examined extensively on EMF generally and more specifically, EMF in relation to Option 1. The cross-examination of Dr. Bailey seemed to be helpful to most Intervenors as it provided a background context to EMF, albeit from Dr. Bailey's point of view, and responses to many of the questions posed by Intervenors. Dr. Bailey, in cross-examination offered his explanation of EMF. "I will explain with particular reference to the proposed project. The flow of electricity gives rise to a voltage on the conductor and this is associated with the electric field. The flow of current through the conductor gives rise to the magnetic field, and it is these two fields that are the subject of study in terms of their interactions with people and animals and also with various electronic devices" (T2: 171, 172).

Considerable time in the hearing was spent on the EMF impacts of Option One along Kingfisher Drive.

Intervenor Ms. Wonch expressed concern about the health risk associated with proposed transmission line which "runs about 20 feet from our bedroom window" (T2: 166).

Dr. Bailey, in response to Ms. Wonch described how the present current level of EMF on Kingfisher Drive would be reduced by the addition of the proposed transmission line. "I don't know if you've gone through all the details in the application materials, but it may surprise you to find out that the addition of the 63 kV transmission line on top of the distribution line which is there now, will substantially reduce the magnetic fields, and that will be particularly apparent the closer you are to the line" (T2: 167).

Dr. Bailey, in evidence and cross-examination, identified and explained the conversion calculation of the World Health Organization recommendation with respect to the International Committee on NonIonizing Radiation Protection ("ICNIRP"), guidelines which "recommend limiting the magnetic field exposure of the general public to (after conversion) 833 milligauss" (Exhibit B-5, p. 23; T2: 217). Dr. Bailey stated "The limits established by ICNIRP are much higher than any of the field values that have been calculated by FortisBC" (Exhibit B-5, p. 23).

However, concern remained among Intervenors which prompted discussion of prudent avoidance and the precautionary principle. Dr. Bailey offered the following definitions.

Precautionary Principle: "I would say virtually any decision by a regulatory body in which some action was implemented that was designed to have a beneficial effect on the environment, or to reduce exposure, or have some other mitigative action, could be defined as an application of precautionary principle. So in some cases, it's explicitly laid out; in other cases, after the fact, we could look back on it and say, yes, that would be consistent with one or these other definitions of the precautionary principle" (T: 214).

Prudent Avoidance: "I think the one that Granger Morgan came up with is probably the best. And I can't quote it from heart, but it says taking steps to reduce exposures at low or no cost in the absence of information that that reduction in exposure would have a public benefit or not" (T2: 215).

Mr. Karow, who intervened most vigorously in connection with health concerns related to EMF, called for the application of the precautionary principle and therefore the selection of Option 2 over Option 1.

"I appeal to the Commission Panel that the precautionary principle be applied, that possibly affected people's basic human rights be respected, and that in deciding the Commission Panel opts for the alternative safe routes of Option 2" (T2: 236).

#### 6.3.1 Option 1

Distance from Centre	Types of Customers			
Conductor to the Buildings	Residential	<b>Commercial/Othe</b>	Total	
		r		
0 to 5 meters	1	3	4	
6 to 10 meters	5		5	
11 to 15 meters	4		4	
16 to 20 meters	2		2	
21 to 25 meters	6	5	11	
26 to 49 meters	21	6	27	

FortisBC reports that there are 27 customers within 50 metres of the proposed line on Kingfisher Drive.

(Exhibit B-12, ONS IR-I, 2.4.3)

FortisBC filed data comparing the EMF levels for the present and proposed configurations on the 27 buildings affected on Kingfisher Drive at normal and ultimate loading levels. FortisBC describes normal as:

"The term 'Normal' refers to loading conditions of a power line when it is supplying an average demand for electricity. The transmission line between East and West Osoyoos substations is anticipated to carry, an average 10 MVA of power based upon historic and anticipated demand. The term 'Max/Maximum' refers to loading conditions of a power line when it is supplying the peak demand for electricity during normal daily and seasonal fluctuations in power consumption. The transmission line between East and West Osoyoos substations is anticipated to carry a peak power of 16 MVA, based upon historic and anticipated demand" (Exhibit B-12, ONS IR-I, 2.4.2).

FortisBC supplies profiles showing the calculated EMF levels for the present and proposed configurations based on FortisBC's standard designs for 13kV distribution lines and for 63kV/13kV Transmission line with distribution underbuilt. The creation of the EMF profiles is based on a program called CAFÉ (acronym for "Corona and Field Effects") which was developed by Bonneville Power. As can be seen in the table below the calculated magnetic field for the proposed options is less than the calculated field for the present configuration. This is due to the reduced current on the higher voltage transmission line as compared to the present distribution circuit, and also due to the cancellation effect of the opposing magnetic fields between the transmission and under-built distribution lines.

## Calculated Peak EMF Levels at the Centre Line, One Meter above the Ground Level

LINE CONFIGURATION	MAGNETIC FIELD (mG)	ELECTRIC FIELD (kV/M)
Present Normal	17.30	0.047
Present Ultimate Loading	27.10	0.048
Proposed Normal	2.54	0.146
Proposed Ultimate Loading	4.28	0.146
(Exhibit B-3, BCUC IR-I, 10.4)		·

To mitigate EMF levels in the proposed design, FortisBC reports it has:

- configured the Phasing of the Transmission Line and the under-built Distribution Circuit to minimize the EMF levels; and
- used a delta conductor configuration as opposed to a flat conductor configuration in the top tier (transmission) (Exhibit B-3, BCUC IR-I, 10.5).

6.3.2 <u>Option 2</u>

FortisBC describes the transmission line from Oliver to Nk'Mip as crossing uninhabited land. So far as the upgrade of Osoyoos Feeder 2 is concerned, FortisBC states that the level of EMF experienced by residents of Kingfisher Drive will remain the same, or will decline as a result of the lower loading of Osoyoos Feeder 2 (Exhibit B-20, Undertaking No. 4).

Mr. Hull, a resident of Kingfisher Drive, described overhead 13kV distribution lines as a "necessary evil" (T2: 254).

## 6.3.3 <u>Option 3</u>

FortisBC does not examine the impact of EMF created by Option 3.

#### 6.4 **Property Values**

#### 6.4.1 FortisBC Position

FortisBC states that it has queried the BC Assessment Branch to determine the impact of a wood pole transmission line in proximity to residential housing, but states the response has not been decisive. FortisBC submits a US study on transmission lines and industrial property value which indicates that there is minimal effect on valuation of industrial properties that are in close proximity of transmission line (Exhibit B-2, BCUC IR-1, 9.7).

FortisBC retained a consultant, Mr. Pavlakovic of Landswest Property Services Inc. who opined:

"Considering that the Project is replacing existing structures, the developed residential properties are already visually impacted, and the change-out of the poles and the addition of the 60kV lines at the top of the structures does not further impede the visual aesthetics.

Considering that the Project consists principally of a 60kV transmission line upgrade on a 13kV distribution corridor, wherein the corridor is within the road allowance and front yard setback areas of the residences, and there is no impact to the property building envelopes, no diminution in value is estimated as a result of the rebuild of the existing structures on the abutting residential properties."

(Exhibit B-4, Appendix A.6)

6.4.2 Intervenors' Positions

The Major of Osoyoos stated that the BC Assessment Authority had intimated orally that property values on Kingfisher Drive will be devalued "somewhere between 10 and 20 percent" (T2: 186).

In its Argument FortisBC observes that a number of suggestions and unsworn statements were made about the impact on both property values and assessments of real property for taxation purposes caused by proximity to transmission lines. FortisBC argues that most of the evidence was hearsay and could not be tested and thus cannot be relied upon for findings by the Commission Panel.

#### 7.0 COMPARISON OF OPTIONS

#### 7.1 FortisBC Position

FortisBC's first comparison of options found Option 1 to be the most suitable to meet the needs of its customers in Osoyoos. Of the two options, 1A and 1B, it selected Option 1A for the following reasons:

- it impacts fewer landowners than Option B;
- it is a shorter transmission line than Option B;
- it takes the route behind the school and is considered aesthetically superior over Option B which parallels the front of the school ground; and
- it is the lowest cost and has least impact to the town.

(Exhibit B-1, p. 32).

FortisBC claims that Option 1 will:

- create adequate capacity for the load in East Osoyoos which is forecast to exceed 15 MVA by 2020;
- under N-1 contingency with transformers, meet 80% criterion even in the year 2010;
- under N-1 contingency with transmission lines, maintain unaffected supply due to the ultimate looped configuration of the transmission network interconnecting Bentley Terminal Station, Nk'Mip, West Osoyoos Substations and Oliver Terminal Station thus eliminating radial feed and increasing reliability;
- will reduce the 44 Line load upon completion of Stage 2 (looped configuration) in the 2011 timeframe; and
- voltage profile to end line customers improve due to reduction in distribution feeder lengths and load reduction of 44 Line.

(Exhibit B-1, pp. 32-33

FortisBC finds that Option 2 provides similar benefits as Option 1. Nevertheless it has some technical and financial drawbacks, including:

- there will be no transmission level connectivity/transmission loop between West Osoyoos and Nk'Mip Substations. Transmission load transfers are not a possibility;
- the addition of 19.0 km of transmission line will increase the vulnerability of the transmission line network to natural causes of the Oliver Terminal Station – Pine Street – West Osoyoos and Oliver – Nk'Mip network, since there will be no electrical discrimination during fault in between these two circuits. The situation shall remain vulnerable till commissioning of the Bentley Terminal Station and subsequent transfer of Nk'Mip Substation onto Bentley Terminal Station in 2009-2010 timeframe;
- Oliver Terminal Station termination and Bentley to Oliver Terminal 63kV tie will become stranded assets, estimated at \$0.4 million; and
- the one time rate impact for Option 2 is higher than Option 1, where staged development of transmission and substation equipment is possible leading deferment of significant capital cost to 2011.

(Exhibit B-1, pp. 35-36)

Similarly, FortisBC finds that Option 3 provides similar benefits as Option 1, but has some technical and financial drawbacks including:

- the long length of distribution feeders to East Osoyoos will be unable to ensure proper line end voltage at regions around Anarchist Mountain;
- acquiring a right of way / route for the third distribution feeder from West to East Osoyoos and the 138kV transmission line from Bentley to West Osoyoos across the Causeway, will be significantly more challenging than that of acquiring a route from Bentley to Nk'Mip;
- it is the most expensive option in comparison to both Options 1 and 2, considering additional funds in Stage 2, estimated at \$7.35 million will be required during 2011 to commission the transmission loop; and
- the one time rate impact is significantly higher than Option 1.

(Exhibit B-1, p. 37)

FortisBC compares Option 2 with Option 3 and finds Option 3 to suffer from the following shortcomings:

- the total number of property owners that would be potentially impacted by Option 3 by the construction of new distribution feeders, as referenced in FortisBC's argument at page 16, would be approximately 75-100. These property owners, under Option 3, would be impacted by the double circuit configuration similar to the configuration for Option 1 which is opposed by the property owners along Kingfisher Drive (T3: 523). Hence Option 3 would have a much higher potential impact on property owners, compared to Options 1 and 2;
- a new West Osoyoos Substation would not be ideally located near the load centre;
- the long length of distribution feeders from a new substation at the Industrial Park to East Osoyoos would be unable to ensure proper line end voltage and would require voltage regulators on the east Osoyoos distribution feeders. Ms. Barbara Smith, a resident of East Osoyoos, during cross-examination of the FortisBC technical panel, and again in her written argument (wherein she supports Option 2) raised questions about the presence of voltage regulators (T3: 538-541);
- distribution losses would be higher for Option 3 compared to either Option 1 or Option 2;
- the Osoyoos load would be served by a single transmission line in Option 3 and the overall transmission losses would be higher than Option 2;
- under Option 3, the area would be fed by a single transmission line; customer impact due to transmission line failure would be higher, in the absence of N-1 contingency, compared to Option 2;
- acquiring a right of way route for a third distribution feeder from West to East Osoyoos and a transmission line across the Causeway during the 2011/2012 timeframe is likely to be more challenging than the acquisition of the land rights necessary for the route from Bentley to Nk'Mip;
- option 3 is the most expensive of the three options based on a one-time equivalent rate impact and Revenue Requirement basis (Exhibit B-1, p. 38); and
- the increase in the number of feeders required to traverse the Causeway also increases the potential impact to aesthetics in that area, which is the primary stated concern of the Town and many residents (FortisBC Reply, p. 3).

During the hearing, FortisBC was examined on the amount of engineering studies and surveys required for Option 2. FortisBC states:

"With respect to line routing, we do have preliminary design complete. We would have to go into final design. Based on that preliminary engineering and field checks by our construction people, they have indicated that they don't anticipate there being any problems. But we would have to do the engineering work along there.

Coupled with that, to have the egress coming from Oliver Terminal, we will have to make sure that the engineering is complete as well. Once again, I don't anticipate any problems with that" (T3: 570).

On the subject of a new breaker position, FortisBC states:

"To my understanding there is a breaker position, a physical position available there, but we would have to provide a new breaker, yes" (T3: 571).

FortisBC also states that the cost of a new breaker has not been included in the cost estimates. FortisBC states that the cost of a new breaker can be avoided by means of establishing a temporary tap into the existing 44 Line until the construction of the future Bentley Substation. Alternatively, it could tap into 41 Line which feeds Okanagan Falls from Oliver (Exhibit B-20, Undertaking No. 10).

## 7.2 Intervenors' Positions

#### **Osoyoos Now Society**

The Osoyoos Now Society supports the modified Option 2 for the following reasons:

- Option 2 meets the N-1 contingency planning criterion immediately. As soon as the project is completed, both West Osoyoos and East Osoyoos will have two independent routes for supply from the Oliver (or Bentley) substation. Therefore, modified Option 2 is superior to Option 1 and Option 3 in terms of service reliability. Option 2 will ensure adequate voltage support in East Osoyoos, unlike Option 3; and
- Option 2 will avoid the economic, visual and aesthetic impacts of an overhead transmission line along Kingfisher Drive and across the Causeway, and will involve less difficulty with right of way acquisition than Option 1 or Option 3 (ONS Argument, pp. 3-4).

The Society rejects Option 1 on the grounds that it:

- would leave both West Osoyoos and East Osoyoos vulnerable to outages on 44 Line, the existing 44 Line 63kV transmission line from the Oliver substation to the West Osoyoos Substation, until such time as a new transmission line was built from the Oliver Substation, or Bentley Substation, to the Nk'Mip Substation; and
- that a new 63kV transmission line with an underbuilt 13kV distribution line along Kingfisher Drive and across the Causeway – an integral feature of Option 1 – would have an unacceptable economic, visual and aesthetic impact on the Osoyoos community (ONS Argument, p. 3).

The Osoyoos Now Society does not support Option 3, for the following reasons:

- Option 3 does not provide adequate voltage support at the ends of the distribution lines in East Osoyoos;
- it does not meet the N-1 contingency planning criterion; and
- it does not meet the need for a substation in East Osoyoos. It would be inefficient to supply the growing load in East Osoyoos by lengthy distribution-level lines from West Osoyoos (ONS Argument, p. 3).

#### Alan Wait

Mr. Wait argues that the Commission should approve Option 1, as modified in his Argument.

He describes Option 2 as a "cop-out," because FortisBC is getting some flack about building on Kingfisher Drive and across the Causeway. He argues the Causeway transmission line should be put in place now, so that Osoyoos residents know it is there when planning for the future. Further, in his view a transmission voltage line is the only way to ensure that the amount of bulk power required to be moved between east and west Osoyoos can be, to provide the N-1 reliability of looping in the long term (Wait Argument).

#### **Dennis Hull**

Mr. Hull argues that the Commission should approve Option 3. His reasons largely relate to the aesthetic impact of Option 1, and the opportunity presented by Option 3 for FortisBC to relocate its substation to the industrial area (Hull Argument).

#### **Buryl Slack**

Mrs. Slack supports Option 1 and suggests that allowing FortisBC to lay the cable underground or underwater without the Town paying the additional expense would set a "very dangerous precedent" (Slack Argument).

#### **Hans Karow**

Mr. Karow proposes a modified Option 2, with the West Osoyoos Substation relocated and Feeder 2 terminated at the end of Kingfisher Drive (Karow Argument).

## Diane Ball Karen and Colin White Susan and Barry Wonch

These residents argued for Option 3, primarily to relocate the West Osoyoos Substation (Ball Argument; White-Wonch Argument).

#### **Barbara Smith**

Mrs. Smith argues for Option 2 and the relocation of the West Osoyoos Substation (Smith Argument).

#### 8.0 WEST OSOYOOS SUBSTATION

The Commission Panel notes the concerns raised by Intervenors about the condition, safety, esthetic issues, EMF and location of the West Osoyoos Substation. Many Intervenors made submissions at the hearing concerning the West Osoyoos Substation. They include Mr. Hall (T2: 241-258); Mr. Murseli (T2: 267-9); Ms. Ball (T2: 270-6); Mr. Zita (T2: 277); and Mr. Kalmar (T2: 280). These issues were, at least in part, factors in a number of Intervenors favoring Option 3 which would see the West Osoyoos Substation in an industrial facility. Mayor Slater testified:

"...when I was on Council we, the Town did provide Fortis, at their cost, property up in the industrial park for a future west bench substation. We did want to get the substation off its existing property" (T2: 193).

FortisBC acknowledges the current condition of the West Osoyoos Substation and explains, "On safety, FortisBC notes that it has derated the transformers, and that in a safe condition, the transformers are monitored, and a mobile substation can be brought in should additional risk cause them to be shut off" (FortisBC Argument, p. 71).

An approval plan is in place to rehabilitate the West Osoyoos Substation. FortisBC explained, "a project to rehabilitate T1 and replace T2 to ensure safe and reliable operation was approved by BCUC Order No. G-52-05. The estimated expenditure to complete the rehabilitation of T1 and the replacement of T2 in 2006 is \$2.0 million. FortisBC states that the replacement transformer has been ordered and that planning is taking place for the rehabilitation. Both installation and rehabilitation are scheduled for the fall of 2006" (T3: 560).

Ms. Ball complained of the noise from the substation, calling it a loud droning hum (T2: 273). FortisBC states that readings at the fence at the substation have averaged from 48.4 to 76.5 dBA (Exhibit B-3, p. 19). FortisBC explained that Canadian standards require that a transformer in the shop following manufacture should emit noise of no more than 74 dBA at three feet (T3: 399). Following the remedial work at the substation, FortisBC is confident that "the existing noise levels will be reduced much closer to what you see on page 2 here (viz 70 dBA, at three feet from each of the individual transformers)" (T3: 401).

In response to a question from Mr. Kalmar about possible health hazards from living close to the substation, Dr. Bailey replied:

"Based upon the information that I have reviewed of Fortis' calculations, some of which we have confirmed ourselves, I don't believe that the weight of the scientific evidence, as summarized by the panels that I've cited in my testimony, would indicate that there is any substantial health risk" (T2: 173).

On the issue of location, FortisBC explained:

"In all of the municipalities in our service territory we have substations in town, and they are in some cases located in residential area, in some cases not. So the West Osoyoos example, although I can appreciate that certain people would prefer not to have it there, is by no means an exception" (T3: 538).

#### 9.0 COMMISSION PANEL FINDINGS

The Commission Panel accepts the load forecast provided by FortisBC. The Commission Panel recommends that in future applications some confusion could be eliminated if FortisBC forecast both summer and winter peaks for those communities in its service area which have summer peaks.

The Commission Panel accepts that Osoyoos Feeder 2 will approach or exceed its thermal capacity by the summer of 2007. The Commission Panel finds that the construction of a new substation in East Osoyoos will achieve three objectives:

- it will enable service to meet the growth in East Osoyoos;
- based on the evidence presented, it will leave adequate capacity in the West Osoyoos Substation to meet the load growth in the west part of town at least until 2020; and
- it will improve voltage levels to a large area of East Osoyoos which has been served at below the required minimum voltage.

So far as concerns the West Osoyoos Substation, there is no evidence before the Commission Panel that, following the replacement of one transformer and the rehabilitation of the other, the substation will present any danger to the daycare, the elementary school or the nearby residents. Clearly the onus is on FortisBC to communicate with the residents of Osoyoos on the status of the rehabilitation project, and to take whatever steps it may feel necessary to monitor the noise levels and attenuate them, if necessary, and to improve the appearance of the substation.

The Commission Panel is not convinced that service to the Osoyoos area should be looped. The Commission Panel notes that rebuilding 44 Line in 1998 has improved service levels considerably. The Commission Panel doubts that service could be looped other than by the construction of a transmission line across the Causeway. The evidence before the Commission Panel is that the Town would not countenance such a construction above ground and would not contribute to the construction below ground.

The Commission Panel is not persuaded that Option 1 is in the public interest. Construction of a 63kV transmission line along (and on) Kingfisher Drive would not be prudent in terms of its proximity to the traveled portion of the road, esthetic impact, and negotiation of required easements on private property in the face of much public opposition. With respect to EMF, the Commission Panel accepts that electromagnetic field exposure would actually be reduced following construction of the new 63kV with 13kV underbuild. Nevertheless EMF remains a concern for many residents.

So far as concerns reliability, the Commission Panel cannot evaluate the likelihood of the Bentley Terminal Station being constructed or the likelihood of a transmission line connecting Bentley and Nk'Mip Substations.

Other, less intrusive and comparatively priced options are available and in this case, application of a precautionary principle, as defined by Dr. Bailey (T2: 214) was helpful to the Commission Panel in arriving at its decision.

The Commission Panel is not persuaded that Option 3 is in the public interest. The Commission Panel agrees with the Applicant that while Option 3 may solve one issue with certain of Osoyoos' residents, it will not improve the level of reliability and will, by the relocation of the Town's one substation to a point most removed from East Osoyoos, create more line losses and voltage problems for customers in the Anarchist Mountain area. It will also require more landowner negotiations and three circuits crossing the Causeway. Finally, the Commission Panel notes that it does not have the support of Osoyoos Now or the Town of Osoyoos.

In the opinion of the Commission Panel, the Applicant's modified Option 2 offers the most practical long term solutions to the issues facing the Town. Firstly, it creates a substation in East Osoyoos with its own source of supply – 66 Line. The Commission finds that this will:

- enable service to meet the growth in East Osoyoos;
- improve voltage levels in East Osoyoos; and
- enable the West Osoyoos Substation, (following its planned refurbishment) to meet the demand in the West part of the Town in a safe and reliable manner until at least 2020.

The Commission Panel expects that following the reinforcement of Osoyoos Feeder 2 and the construction of 66 Line, and depending on the configuration at the Oliver Terminal Station termination of 66 Line, the level of reliability will increase by virtue of the fact that a fault on 44 Line will not black out the entire town, and that 66 Line will maintain service both to East Osoyoos and by way of Osoyoos Feeder 2 to a portion of West Osoyoos, and vice versa.

No supporting evidence was provided and therefore, the Commission Panel is not persuaded that a supply on 66 Line at 138kV is required. Should it be advisable to construct this line to 63kV specifications, costs may be reduced.

The Commission Panel approves for FortisBC a CPCN in respect of the Project based on FortisBC's Option 2 (as modified) and costs as proposed, and the basis of 66 Line being constructed and energized at 63kV and of 66 Line being terminated at Oliver Terminal Station via its own breaker. The CPCN will be conditional on:

1. FortisBC submitting final engineering configurations of the following:

- Nk'Mip substation;
- Oliver Terminal Substation;
- 66 Line; and
- Osoyoos Feeder 2 replacement.
- 2. FortisBC submitting final cost estimates for the Project
- 3. Receipt by FortisBC of the following:
  - the INAC Permit for the Project;
  - the executed site lease for the Project; and,
  - any other permits and approvals necessary for the Project.

Should FortisBC believe that the public interest will be better served by constructing 66 Line at a higher voltage and/or by terminating, by way of a tap, 66 Line to either 44 Line or 41 Line, it is directed to make a submission to the Commission by June 23, 2006. If a submission is received, the Commission

Panel will establish a further Regulatory Timetable following which the Commission Panel will consider amending the CPCN.

So far as concerns the remaining issues identified by the Commission Panel, the Commission Panel's findings are as follows:

#### **Impact on Property Values**

The Commission Panel does not find the evidence put forward by FortisBC to be particularly helpful in this application. Similarly, the assumption by Intervenors and the Mayor of Osoyoos that the threat of a transmission line being erected will reduce assessment values of adjacent properties was not fully tested in the proceedings before the Commission Panel. The Commission Panel finds that the Applicant's chosen Option 2 removes this issue and consequently the Commission Panel will not make any findings in this regard.

#### **EMF Health Issues**

The Commission Panel finds that the potential impacts of EMF on the health and wellbeing of residents were fully examined before it. In the event, the Commission Panel finds that the Applicant's chosen Option 2 did not propose the siting of the transmission line anywhere near any buildings, and as a result the Commission Panel will not make any findings in this regard.

#### **Esthetics**

The Commission Panel finds that, in the absence of compelling safety or engineering arguments, all transmission and distribution service should be provided by FortisBC on an overhead basis. The Commission Panel also finds that should the municipality choose otherwise, it should be prepared to fund the difference by way of a contribution in aid of construction.

Original signed by:

L.F. Kelsey Panel Chair

Original signed by:

A.J. Pullman Commissioner

BRITISH	COLUMBIA
UTILITIES	COMMISSION
ORDER NUMBER	C-1-06

TELEPHONE: (604) 660-4700

BC TOLL FREE: 1-800-663-1385

FACSIMILE: (604) 660-1102

THES COMMISSION

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SIXTH FLOOR, 900 HOWE STREET, BOX 250 VANCOUVER, B.C. V6Z 2N3 CANADA web site: http://www.bcuc.com

#### IN THE MATTER OF the Utilities Commission Act, R.S.B.C. 1996, Chapter 473

and

An Application by FortisBC Inc. for a Certificate of Public Convenience and Necessity for the Nk'Mip (East Osoyoos) Transmission and Substation Project

<b>BEFORE:</b>	<b>RE:</b> L.F. Kelsey, Panel Chair and Commissioner	
	A.J. Pullman, Commissioner	June

## ORDER

2.2006

#### **WHEREAS:**

- A. On October 12, 2005 FortisBC Inc. ("FortisBC") applied (the "Application") to the Commission for a Certificate of Public Convenience and Necessity ("CPCN") for the Nk'Mip Transmission and Substation Project ("the Project"); and
- B. The Commission Panel, by Order No. G-114-05, ordered that an Oral Public Hearing be held to review the Application and set down a regulatory timetable: and
- C. The Commission Panel, by Order No. G-3-06, changed the format for the Oral Public Hearing scheduled for January 21, 2006 to a Pre-hearing Conference and Town Hall Meeting, and proposed an Issues List and a Revised Schedule for the hearing to review the Application; and
- D. The Commission Panel, by Order No. G-07-06, revised the Regulatory Timetable to hold the Oral Hearing on March 20, 2006 in the Town of Osoyoos; and
- E. An Oral Public Hearing was held in Osoyoos on March 20 and 21, 2006.

BRITISH COLUMBIA UTILITIES COMMISSION

ORDER NUMBER

C-1-06

2

#### NOW THEREFORE the Commission orders as follows:

- 1. That all directions given in the Decision, issued concurrently with this Order, shall be followed by FortisBC Inc.
- 2. The Commission approves a CPCN for FortisBC's Option 2 as modified upon complying with the conditions set out in the attached Decision.
- 3. Upon commencement of construction, FortisBC is required to file monthly reports regarding the progress of the project and to advise the Commission of any variances or difficulties that the project may be encountering.

**DATED** at the City of Vancouver, in the Province of British Columbia, this  $2^{nd}$  day of June 2006.

#### BY ORDER

Original signed by:

L.F. Kelsey Panel Chair and Commissioner

#### GLOSSARY

Acronym	Term
44 Line	the 63kV line from Oliver to Osoyoos
BCUC or Commission	British Columbia Utilities Commission
CAFĚ	Corona and Field Effects
Causeway	The causeway crossing the lake dividing the town into two parts
CPCN	Certificate of Public Convenience and Necessity
CWS	Canadian Wildlife Service
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
FortisBC, Company	FortisBC Inc.
INAC	Indian and Northern Affairs Canada
ICNIRP	International Committee on Non-Ionizing Radiation Protection
mG	milliGauss
MOU	Memorandum of Understanding
Nk'Mip	The proposed substation in East Osoyoos
NPV	Net Present Value
OIB	Osoyoos Indian Band
Osoyoos Feeder 2	Single 13kV Feeder
Project, Application	Nk'Mip (East Osoyoos) Transmission and Substation Project
SDP	System Development Plan
Town, Osoyoos	The Town of Osoyoos
UCA	Utilities Commission Act

## LIST OF APPEARANCES

P.R. MILLER	Commission Counsel
R.J. MCDONELL D. BENNETT	FortisBC Inc.
W.J. ANDREWS	Osoyoos Now Society
D. BALL D. HULL H. KAROW A. KALMAR M. MURPHY S. MURSELI M. RYAN J. SLATER B. SLACK B. SMITH A. WAIT S. WELLS K. WHITE P. NEWPORT D. ZITA S. WONCH B. WONCH	For Themselves
W. MURPHY	

R.W. RERIE

**Commission Staff** 

ALLWEST REPORTING LTD.

Court Reporter

#### LIST OF WITNESSES

DOYLE SAM DR. WILLIAM H. BAILEY FortisBC Inc. (EMF Panel)

DOYLE SAM ANDY FERRARO KEITH SONES RON PAVAKOVIC FortisBC Inc. (Technical Panel)

JOHN SLATER (MAYOR)

MICHAEL RYAN ROBIN GUBBY JAN EHLERS GLENN MANDZIUK

BURYL SLACK

Town of Osoyoos

Osoyoos Now

Self

#### **SUBMISSIONS**

Oral Submissions were made by:

D. HULL H. KAROW S. WELLS S. MURSELI D. BALL D. ZITA M. MURPHY A. KALMAR

Written Submissions were received from:

B. SMITH B. SLACK D. ZITA D. BALL A. WAIT H. KAROW D. HULL OSOYOOS NOW K. WHITE/S.&B. WONCH

## Exhibit No.

#### Description

**COMMISSION DOCUMENTS** 

Assistance

A-1 Letter dated November 4, 2005 issuing Order No. G-114-05 and Regulatory Timetable A-2 Letter dated December 2, 2005 issuing Commission Information Request No. 1 A-3 Letter dated December 9, 2005 denying Mr. Karow's request for a reconsideration of the Regulatory Timetable published in Order No. G-114-05 A-4 Letter dated December 13, 2005 regarding Mr. Karow's submissions of evidence A-5 Letter dated December 13, 2005 advising Participants that the Commission Panel will be viewing a number of route options for the project A-6 Letter dated December 14, 2005 to Mr. Helmut Wartenburg responding to his request for an extension to the hearing timetable A-7 Letter dated December 16, 2005 to Mr. Hans Karow requesting a response to Exhibit A-4 by January 6, 2005 A-8 Letter dated December 22, 2005 providing Participants with procedural information for the Public Hearing A-9 Letter dated December 23, 2005 issuing Commission Information Request No. 1 to the Town of Osoyoos A-10 Letter dated December 23, 2005 issuing Commission Information Request No. 2 to FortisBC A-11 Letter dated January 5, 2006 to John and Bess Paleos regarding their objection to the Commission Panel's proposed inspection of the route options without the Applicant or Intervenors A-12 Letter dated January 5, 2006 to Hans Karow regarding his objection to the Commission Panel's proposed inspection of the route options without the Applicant or Intervenors A-13 Letter dated January 11, 2006 to Intervenors regarding Participant

#### Exhibit No.

- A-14 Letter to Hans Karow regarding emails to Chair and Panel Members
- A-15 Letter dated January 17, 2006 and Order No. G-3-06 issuing the Proposed Issues List for the Public Hearing and the Proposed Rescheduling of the Evidentiary Portion of the Public Hearing
- A-16 Letter dated January 25, 2006 and Order No. G-7-06 establishing the Oral Public Hearing, Revised Regulatory Timetable and Issues List
- A-17 Letter dated February 1, 2006 to Mr. Hans Karow confirming that the EMF issue can be discussed as part of Item 7 Environmental impacts and Item 8 EMF health issues
- A-18 Letter dated February 8, 2006 to Mr. H. Karow regarding filing of Information Requests
- A-19 Letter dated February 8, 2006 responding to Mr. H. Karow's Information Request regarding Commissioner Pullman's appointment to the BCUC and a copy of his Curriculum Vitae
- A-20 Letter dated February 8, 2006 directing FortisBC to respond to the Osoyoos Now Society's Information Requests submitted in Exhibit C17-5 on a best efforts basis
- A-21 Letter dated February 21, 2006 response to Mr. H. Karow (Exhibit C1-73)
- A-22 Letter dated February 27, 2006 from Paul Miller, Boughton & Company of new staff members
- A-23 Letter dated March 1, 2006 responding to John and Bess Paleos' Letter of Comment (Exhibit C18-4) regarding the Panel's tour observations of January 20, 2006
- A-24 Letter dated March 14, 2006 responding to Intervenor Information Request and for leave for submission of Evidence from H. Karow
- A-25 Letter dated March 17, 2006 response to Mr. H. Karow e-mail received March 16, 2006
- A-26 Letter dated March 17, 2006 response to Mr. H. Karow's 3 e-mails received March 16, 2006

## Exhibit No.

## Description

#### Counsel Documents

- A2-1 Letter dated March 13, 2006 filing Counsel's regarding the evidentiary portion of hearing and requesting Intervenors to advise if they intend to cross-examine the FortisBC panels
- A2-2 Email dated March 13, 2006 from Counsel responding to Intervenor Information Request (Exhibit C11-9)
- A2-3 Email dated March 14, 2006 from Counsel responding to Intervenor Information Request for clarification (Exhibit C11-10)

#### **APPLICANT DOCUMENTS**

- B-1 Nk'Mip (East Osoyoos) Substation Project Application for CPCN Letter dated October 12, 2005
- B-2 E-mail dated November 30, 2005 Response to Hans Karow e-mail dated November 29, 2005
- B-3 Letter dated December 16, 2005 filing Responses to Commission Information Request No. 1
- B-4 Letter dated January 6, 2006 filing Responses to Commission Information Request No. 2 and Intervenor Information Requests No. 1
- B-5 Letter dated January 9, 2006 filing a report by Dr. W.H. Bailey of Exponent as reference in response to Mr. Karow's Information Requests 3.9, 3.10 and 3.18.1
- B-6 Letter dated January 11, 2006 advising the Commission and Intervenors that in response to Mr. Karow's concerns raised in his evidence, FortisBC will make Dr. William H. Bailey, an expert in EMF issues, available for crossexamination at the January 21, 2006 hearing
- B-7 Letter dated January 13, 2005 responding to Osoyoos Now's request that the public hearing be rescheduled beyond the current date of January 21, 2006 (Exhibit C17-2)

#### Exhibit No.

- B-8 Letter dated January 27, 2006 responding to Hans Karow's recent correspondence to FortisBC, regarding his Information Requests and Evidence filings
- B-9 Fax dated February 6, 2006 responding to Intervenor Barbara Smith, Hans Karow and William J. Andrews regarding Information Requests
- B-10 Fax dated February 7, 2006 to BCUC responding to Intervenor Osoyoos Now Society's Counsel, Mr. Andrews regarding his Information Request No. 2 (Exhibit C17-7)
- B-11 Letter dated February 10, 2006 filing responses to Mr. Karow's Information Request No. 2
- B-12 Letter dated February 16, 2006 filing response to Information Requests from Osoyoos Now Society, Ms. Barbara Smith and Mr. Hans Karow
- B-13 Letter dated March 16, 2006 filing response to Mr. Karow's concerns to identifying legal expert on witness panel for cross-examination
- B-14 Submission at Public Hearing Opening Statement of D. Sam
- B-15 Submission at Public Hearing Two graphs, headed "Nk'Mip Transmission & Substation Project, Proposed Normal Load..."
- B-16 Submission at Public Hearing Errata List for FortisBC Application
- B-17 Submission at Public Hearing Graph entitled "Nk'Mip Transmission & Substation Project Transmission Line Radio Interference..."
- B-18 Submission at Public Hearing Cirriculum Vitaes of Mr. Sam, Mr. Ferraro and Mr. Sones
- B-19 Submission at Public Hearing Statement by Mr. Sam Recommending Option 2
- B-20 Letter dated March 30, 2006 filing response to various Undertakings 1 to 4 and 6 to 14, Volume 2 and 3

#### Exhibit No.

#### Description

**INTERVENOR DOCUMENTS** 

- C1-1 **KAROW, HANS** E-mail dated November 8, 2005 requesting Intervenor Status
- C1-2 Letter dated November 16, 2005 commenting on the Application and providing a preliminary Information Request to FortisBC
- C1-3 Evidence dated November 27, 2005
- C1-4 Letter dated November 28, 2005 Evidence No. 2
- C1-5 Letter dated November 29, 2005 Request to Commission
- C1-6 Letter dated November 30, 2005 Request Reconsideration of Order No. G-114-05
- C1-7 E-mail dated November 30, 2005 Reminder to Applicant to respond to Information Request
- C1-8 E-mail dated November 30, 2005 Request clarification of FortisBC's November 30, 2005 Submission
- C1-9 E-mail dated December 1, 2005 Submission of Evidence No. 3 regarding Dr. Cherry's ICNIRP Criticism
- C1-10 E-mail dated December 1, 2005 Submission of Evidence No. 4 regarding paper by Dr. Maxey
- C1-11 E-mail dated December 1, 2005 Submission of Evidence No. 5 regarding paper by Dr. Cherry
- C1-12 E-mail dated December 1, 2005 Submission of Evidence No. 6 Article by Dr. Milham
- C1-13 E-mail dated December 2, 2005 Submission of Evidence No. 7 ISIS Press Release
- C1-14 E-mail dated December 5, 2005 Submission of Evidence No. 8
- C1-15 E-mail dated December 5, 2005 Request Applicant to provide EMF measurements

#### Exhibit No.

- C1-16 E-mail dated December 5, 2005 Information Request No. 1 to Commission regarding Electric Power Research Institute
- C1-17 E-mail dated December 7, 2005 Evidence No. 11a and 11b
- C1-18 Letter dated December 9, 2005 Evidence No. 12 attaching The Draper Study "Childhood cancer in relation to distance from high voltage power lines in England and Wales: a case-control study"
- C1-19 Letter dated December 8, 2005 Evidence No. 9 Book entitled "The Corporation, The Pathological Pursuit of Profit and Power" and Evidence No. 10 – Book entitled "Unequal Protection, The Rise of Corporate Dominance and the Theft of Human Rights"
- C1-20 Letter dated December 12, 2005 excerpts from Evidence 11b -(Exhibit C1-17)
- C1-21 Letter dated December 23, 2005 Chapter 3 excerpt from Evidence 11b and a one page summary/assessment of Evidence 11a
- C1-22 Letter dated December 12, 2005 filing Evidence No. 13 and Information Request No. 2 to FortisBC
- C1-23 Letter dated December 13, 2005 requesting that the Exhibits be made available at the Osoyoos public library and filing an urgent Information Request to FortisBC
- C1-24 Letter dated December 13, 2005 filing Evidence No. 15
- C1-25 E-mail dated December 15, 2005 filing Evidence No. 16
- C1-26 Letter dated December 17, 2005 filing Evidence No. 17
- C1-26A Letter dated December 18, 2005 filing Chapter 2 "Exposure Assessment and Non-Cancer Human Health Studies" pages 2-1 to 2-37 of the Bonneville Power Administration publication – Addendum to Evidence 11b (Exhibit C1-17)
- C1-27 Letter dated December 18, 2005 filing Chapter 4 "Effects of EMF on Animals and Plants" pages 4-1 to 4-26 of the Bonneville Power Administration publication – Addendum to Evidence 11b (Exhibit C1-17)

#### Exhibit No.

- C1-28 Letter dated December 18, 2005 filing Chapter 4 "Effects of EMF on Animals and Plants" pages 4-26 to 4-54 of the Bonneville Power Administration publication – Addendum to Evidence 11b (Exhibit C1-17)
- C1-29 Letters dated December 20, 2005 filing Evidence No. 18, 18b, 18c, 18d, 18f, 18g
- C1-30 E-mail dated December 20, 2005 commenting on the Commission Panel's intention to view a number of route options for the project (Exhibit A-5)
- C1-31 E-mail dated December 23, 2005 filing Information Request No. 1 to FortisBC
- C1-32 Letter dated December 22, 2005 filing Evidence No. 19
- C1-33 Letter dated December 23, 2005 filing Evidence No. 20
- C1-34 Letter dated December 29, 2005 filing Evidence No. 22
- C1-35 Letter dated December 29, 2005 filing Evidence No. 21
- C1-36 Letter dated January 1, 2006 filing Evidence No. 22, 23 & 24
- C1-37 Letter dated January 4, 2006 from Dr. Magda Havas advising that she would be available to provide expert testimony on behalf of Mr. Karow
- C1-38 Letter dated January 3, 2006 filing Evidence No. 25
- C1-39 Letter dated January 3, 2006 filing Evidence No. 26
- C1-40 Letter dated January 5, 2006 filing Evidence No. 27 Testimony and Curriculum Vitae of Dr. Anthony B. Miller
- C1-41 Letter dated January 2, 2006 filing Evidence No. 28 David O. Carpenter, MD
- C1-42 Letter dated January 6, 2006 responding to Exhibit A-7 regarding the calling of expert witnesses
- C1-43 Letter dated January 10, 2006 from Dr. Martin Blank, Associate Professor of Physiology and Cellular Biophysics, Columbia University providing written testimony on behalf of Mr. Karow
- C1-44 Letter dated January 11, 2006 filing Evidence No. 29

#### Exhibit No.

- C1-45 Letter dated January 12, 2006 filing Evidence No. 30
- C1-46 Letter dated January 12, 2006 filing Evidence No. 31
- C1-47 Letter dated January 12, 2006 advising the Commission of Mr. Karow's attempts to locate a legal expert to present evidence at the public hearing
- C1-48 Letter dated January 12, 2006 submitting an article from the Delta Optimist entitled "A Matter of Health"
- C1-49 Letter dated January 13, 2006 regarding expert witnesses
- C1-50 Letter dated January 13, 2006 withdrawing objection to the Panel's proposed inspection of the route options without the Applicant or Intervenors (Exhibit A-12)
- C1-51 Letter dated January 15, 2006 filing Evidence No. 32 the Pre-Filed Evidence of Dr. Robin Gregory
- C1-52 E-mail dated January 15, 2006 to FortisBC Inc. requesting additional information for one of the expert witnesses for a computer program
- C1-53 Letter dated January 16, 2006 filing Evidence No. 32a containing brief citations out of the Kootenay 230 kV Transmission System Expansion Environmental Screening Report (ESR), prepared by Acres International in December 1999
- C1-54 Letter dated January 16, 2006 to Ron Pavlakovic of Lands West Property Services Inc. requesting clarification of his response to FortisBC of December 15, 2005
- C1-55 E-mail dated January 15, 2006 to Commissioner O'Hara from Hans Karow/CORE asking her if she would live near high voltage transmission lines exposing her family to EMF
- C1-56 Letter dated January 17, 2006 to FortisBC Inc. from Hans Karow/CORE requesting amendment to Application for Nk'Mip Substation Transmission Line referencing Exhibit C22-3; additional request to re-open request/response from FortisBC
- C1-57 E-mail dated January 15, 2006 to Commissioner Kelsey from Hans Karow/CORE asking him if he would live near high voltage transmission lines exposing his family to EMF

#### Exhibit No.

- C1-58 E-mail dated January 15, 2006 to Commissioner Hobbs from Hans Karow/CORE asking him if he would live near high voltage transmission lines exposing his family to EMF
- C1-59 Email received January 23, 2006 with article from Delta Optimist "BCUC is urged to reject plan"
- C1-60 Email received January 23, 2006 with article from Delta Optimist "Prudent Decision Required"
- C1-61 Letter dated January 20, 2006 filing Evidence No. 33
- C1-62 Email dated January 23, 2006 filing Evidence No. 34
- C1-63 Letter dated January 24, 2006 filing Evidence No. 35, 35a, 35b, 35c and 35d
- C1-64 Email dated January 26, 2006 to BCUC requesting that the Commission direct Ron Pavlakovic of Lands West Property Services Inc. (Exhibit C1-54) to respond to his January 16 Information Request
- C1-65 Email dated January 28, 2006 with article from Delta Optimist "TRAHVOL hopeful powerline fears heard"
- C1-66 Email dated January 29, 2006 to BCUC requesting the Issues List be amended to include the EMF legal issue
- C1-67 Letter dated February 1, 2006 response to R. McDonell/Farris Vaughan, Wills & Murphy (Exhibit B-8) clarifying his Information Requests and Evidence filings
- C1-68 Letter dated February 3, 2006 filing Information Request No. 2 to FortisBC
- C1-69 Letter dated February 5, 2006 filing request for clarification on Intervenor Information Request No. 2 and Order No. G-7-06
- C1-70 Letter dated February 7, 2006 requesting information regarding Commissioner Pullman's appointment to the BCUC and a copy of his Curriculum Vitae
- C1-71 E-mail dated February 10, 2006 to Robert McDonnell regarding FortisBC's Exhibits B-8 and B-9
- C1-72 Email dated February 13, 2006 filing article as Evidence No. 36

Exhibit N	o. Description
C1-73	Letter dated January 17, 2006 requesting the Application be amended with respect to Option 1 and Exhibit C22-3
C1-74	Letter dated February 15, 2006 filing article as Evidence No. 37
C1-75	Letter dated February 15, 2006 filing article as Evidence No. 38
C1-76	Letter dated February 15, 2006 filing article as Evidence No. 39
C1-77	Letter dated February 15, 2006 filing article as Evidence No. 40a
C1-78	Letter dated February 17, 2006 filing article as Evidence No. 40b
C1-79	Letter dated February 18, 2006 filing article as Evidence No. 40c
C1-80	Letter dated February 18, 2006 filing article as Evidence No. 42
C1-81	Letter dated February 20, 2006 filing article as Evidence No. 43
C1-82	Letter dated March 13, 2006 requesting clarification and requesting CV of Paul Miller, Legal Counsel
C1-83	Letter dated March 14, 2006 requesting CV of Counsel's Dr. Bailey, Doyle Sam, Keith Sones, Andy Ferraro and Ron Pavlakovic
C1-84	Email dated March 16, 2006 requesting information on Panel
C1-85	Submission at Public Hearing – Mr. Karow's Opening Statement
C1-86	Submission at Public Hearing – Copy of 1-page letter dated March 20, 2006 from H. Karow to BCUC, with attached Excerpt from "Rebuttal by Dr. Blank"
C1-87	Letter dated March 27, 2006 referring to outstanding cross-examination response in Transcript Volume 3, page 409, lines 8-24 and page 419, line 11-12
C2-1	WARTENBERG, HELMUT – E-mail dated November 10, 2005 requesting

C2-2 Letter dated November 30, 2005 – Request extension of Regulatory Timetable

Intervenor Status

Exhibit No. Description	
C2-3	Letter dated December 9, 2005 – Second request for extension of Regulatory Timetable
C2-4	Letter dated January 18, 2006 requesting information on the in-camera meeting of January 9, 2006 between FortisBC and the Town of Osoyoos
C3-1	HULL, DENIS – E-mail dated November 14, 2005 requesting Intervenor Status
C3-2	Final Summary of Objections and Recommendations dated December 8, 2005
C3-3	Letter dated February 6, 2006 filing verbatim response to the proposed Issues List (Exhibit A-15)
C4-1	SLACK, BURYL – Letter dated November 17, 2005 requesting Intervenor Status
C4-2	Fax dated January 24, 2006 – Letter of Submission
C5-1	<b>ORAN, MIKE</b> – Web Registration dated November 16, 2005 requesting Intervenor status
C6-1	WELLS, STEWART – Email dated November 19, 2005 requesting Intervenor status
C7-1	<b>WONCH, SUSAN &amp; BARRY</b> – Web Registration dated November 20, 2005 requesting Intervenor status
C7-2	Letter of Comment dated November 22, 2005 from Susan & Barry Wonch
C7-3	E-mail dated December 19, 2005 filing Information Request No. 1 from Susan & Barry Wonch and Colin & Karen White
C8-1	SCHOOL DISTRICT NO. 53 (OKANAGAN SIMILKAMEEN) – E-mail dated November 24, 2005 requesting Intervenor status from Mr. Terry Killough, Secretary-Treasurer

Exhibit No	D. Description
C8-2	Letter of Comment dated December 21, 2005 from the Okanagan- Similkameen School District No. 53, from June Harrington
C9-1	TURNER, JULIE (OSOYOOS TIMES) – Letter dated November 24, 2005 requesting Intervenor status
C10-1	WILLSON, JOAN – E-mail dated November 24, 2005 requesting Intervenor status
C11-1	<b>SMITH, BARBARA &amp; WILLIAM –</b> Notice of Intervention dated November 23, 2005
C11-2	Email commenting on the proceeding process dated December 22, 2005
C11-3	E-mail dated January 12, 2006 commenting on the Commission's decision to allow participant assistance funding
C11-4	Letter of Comment regarding the Pre-Hearing Conference in Osoyoos dated January 22, 2006
C11-5	Letter dated January 27, 2006 to BCUC filing Information Request on conduit safety issues and West Substation on 89th Street in Osoyoos
C11-6	Email dated February 6, 2006 filing Information Request on East Bench platform
C11-7	Email dated February 15, 2006 from Barbara Smith filing inquiry into C11-5 and C11-6
C11-8	Email dated February 20, 2006 from Barbara Smith filing response to FortisBC's Information Request (Exhibit B-12)
C11-9	Email dated March 11, 2006 from Barbara Smith filing comments to Commission's Exhibit A-22 and filing request for Mr. Miller's CV
C11-10	Email dated March 14, 2006 from Barbara Smith Information Request for clarification
C12-1	MOFFAT, DAVID – Notice of Intervention dated November 22, 2005
C12-2	Letter of Comment received November 28, 2005 from David Moffat

#### Exhibit No.

- C13-1 **DOLO, Tom** Notice of Intervention dated November 24, 2005
- C14-1 **KOLE, ANNA AND ALFRED** Notice of Intervention dated November 24, 2005
- C14-2 Letter of Comment dated November 28, 2005
- C15-1 **LEGGE, IAN AND SHARON** Notice of Intervention dated November 27, 2005
- C16-1 MARSHALL, Rex G. Notice of Intervention dated November 25, 2005
- C-16-2 Submission received January 17, 2006
- C17-1 **THE OSOYOOS NOW SOCIETY** Notice of Intervention dated November 23, 2005
- C17-2 Letter dated January 13, 2006 requesting that the Osoyoos public hearing be rescheduled to a later date
- C17-3 E-mail dated January 16, 2006 advising that Osoyoos Now would be relying on Mr. Karow's expert witnesses and reiterating its request that the public hearing be rescheduled to a later date
- C17-4 Letter of Comment dated January 16, 2006 from M. Ryan
- C17-5 Letter dated February 3, 2006 from William Andrews on behalf of the Osoyoos Now Society responding to Information Request No. 2
- C17-6 Letter dated February 3, 2006 from William Andrews on behalf of the Osoyoos Now Society filing Notice of Counsel
- C17-7 Letter dated February 6, 2006 to BCUC requesting that the Commission direct FortisBC to respond to his February 3, 2006 Information Request No. 2 (Exhibit C17-5)
- C17-8 Letter dated February 8, 2006 to BCUC in reply to FortisBC's response submission (Exhibit B-10) and request that the Commission direct FortisBC to respond to the Intervenors' Information Request No. 2 of February 6, 2006 (Exhibit C17-7)

## Exhibit No. Description C17-9 Letter dated February 21, 2006 to BCUC filing evidence C17-10 Submission at Public Hearing – Presentation by Mr. Mandziuk C17-11 Submission at Public Hearing -Osoyoos Now Opening Statement C18-1 PALEOS, BESS AND JOHN – Notice of Intervention dated November 27, 2005 C18-2 Letter dated December 15, 2005 commenting on the Panel's intention to view the route options at an unspecified time C18-3 Letter dated January 12, 2006 withdrawing objection to the Commission Panel's proposed inspection of the route options without the Applicant or Intervenors C18-4 Letter dated February 20, 2006 filing evidence C19-1 WAIT, ALAN – Notice of Intervention C20-1 WHITE, COLIN AND KAREN - Notice of Intervention dated November 22, 2005 C21-1 **ZITA, D.** – Notice of Intervention dated November 25, 2005 C22-1 TOWN OF OSOYOOS – Notice of Intervention dated November 22, 2005 from Elsie Lemke, Chief Administrative Officer C22-2 Letter dated January 3, 2006 filing Information Responses to Commission Information Request No. 1 (Exhibit A-9) C22-3 Letter dated January 9, 2006 providing additional information in response to Commission Information Request No. 1 (Exhibit A-9) C23-1 FORSHAW, Mrs. L. - Notice of Intervention dated November 25, 2005 C24-1 RYAN, Michael – Notice of Intervention dated November 28, 2005

#### Exhibit No.

- C25-1 **MURSELI, Sy** Notice of Intervention dated November 29, 2005
- C25-2 Letter dated January 16, 2006 filing an information request regarding pages 4, 5, and 13 of FortisBC's CPCN application and responses to Commission Information Requests
- C25-3 Fax dated January 31, 2006 Letter of Comment
- C25-4 Fax dated March 14, 2006 Letter of Comment and confirmation of attendance at Public Hearing
- C25-5 Submission at Public Hearing Copies of a group of newspaper articles
- C26-1 **MURPHY, Wallace and Marilyn** E-mail dated November 29, 2005 requesting Intervenor Status
- C27-1 WILLIAMS, Duncan and Cindy E-mail dated November 30, 2005 requesting Intervenor Status
- C28-1 **SCHWEDTFEGER, Ulrike and Horst** E-mail dated November 30, 2005 requesting Intervenor Status
- C29-1 **KALMAR, Andy** Facsimile dated November 30, 2005 requesting Intervenor Status
- C30-1 **KUBRYN, Shirley** Facsimile dated November 30, 2005 requesting Intervenor Status
- C31-1 **MILLER, Larry** Facsimile dated November 30, 2005 requesting Intervenor Status
- C32-1 **WONG, James** Facsimile dated November 30, 2005 requesting Intervenor Status
- C33-1 **WINCHESTER, Rick** Web registration dated December 2, 2005 requesting Intervenor Status

#### Exhibit No.

- C34-1 **SEXTON, Debbie** Web registration dated December 2, 2005 requesting Intervenor Status
- C34-2 Letter of comment dated November 27, 2005 from Gordon and Debbie Sexton
- C35-1 **OSOYOOS INDIAN BAND** Web registration dated December 2, 2005 requesting Intervenor Status from Chris Scott
- C36-1 **McPHERSON, Brenda and George** Web registration dated December 2, 2005 requesting Intervenor Status
- C37-1 **BLACK, Robert** Web registration dated December 2, 2005 requesting Intervenor Status
- C38-1 **BLACK, Norma** Web registration dated December 2, 2005 requesting Intervenor Status
- C39-1 **BALL, Diane** Web registration dated December 2, 2005 requesting Intervenor Status
- C40-1 **JOHNSON, Robert** Letter dated November 25, 2005 requesting Intervenor Status
- C41-1 **TOLLEY, CHRISTOPHER AND BEATA** E-mail dated February 24, 2006 requesting Intervenor Status
- C41-2 Letter of Comment dated March 2, 2006
- C42-1 **BORGES, ROGER** Web registration dated March 3, 2006 requesting Intervenor Status
- C42-2 Email received March 10, 2006 filing Letter of Comment

## Exhibit No.

## Description

INTERESTED PARTY DOCUMENTS

# D-1 SEXTON, Deborah – Web registration dated November 27, 2005

\*Request change to Intervenor Status

LETTERS OF COMMENT

E-1	HULL, Denis – Letter dated October 20, 2005
	Letter dated October 26, 2005 – Further objections and recommendations
E-2	ASPE, G.M. – Letter dated November 4, 2005
E-3	WARTENBERG, Helmut – E-mail dated November 9, 2005 regarding timetable scheduling
E-4	IDLE, Marilyn – E-mail dated November 8, 2005 regarding timetable scheduling
E-5	WHITE, Colin & Karen – Letter of Comment dated November 22, 2005
E-6	<b>SMITH, Barbara &amp; William</b> – Letter of Comment dated November 23, 2005 Change in status to Intervenor – see Exhibit C11-1
	Article from the Osoyoos Times
E-7	NEWPORT, Peter – Letter of Comment dated November 27, 2005
E-8	LOWE, Randy – Letter of Comment dated November 28, 2005
E-9	BLACK, N. & R. – Letter of Comment Dated November 21, 2005
E-10	BALL, Diane – Letter of Comment dated November 20, 2005
E-11	LAHAISE, Carley – Letter of Comment dated November 21, 2005
E-12	SEVY, Mr. and Mrs. J Letter of Comment dated November 30, 2005
E-13	SIMPSON, E. and SPAIN, L.&C. – Letter of Comment dated December 7, 2005
E-14	PECK, B & L – Petition dated December 18, 2005

## Exhibit No.

#### Description

- E-15 MARTIN, Thomas B Letter of Comment received December 16, 2005
- E-16 **BERQUIST, Ida & ROBINSON, D.** Petition dated December 19, 2005
- E-17 HARRINGTON, June Letter of Comment dated December 21, 2005 from the Okanagan-Similkameen School District No. 53

## **Reassigned as Exhibit C8-2**

- E-18 GARGUS, Dwayne & Debbie Letter of Comment dated January 2, 2006
- E-19 **MUELLEDER, N.** Letter of Comment dated December 1, 2005
- E-20 **CARPENTER, David** Letter of Comment dated January 4, 2006
- E-21 MILLER, Anthony B, FRCP Letter of Comment dated January 5, 2006
- E-22 **KUBRYN, Shirley** Letter of Comment dated February 8, 2006