

Appendix G – Transmission

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G.2 Common Transmission Project Assumptions

The resource option database entries for transmission have the following common entries. Many of the resource option database fields do not apply to transmission options, which is evident below:

- Variable operation and maintenance – zero (fixed operation and maintenance estimate only).
- Unit Energy Cost – zero (not applicable)
- Annual Dependable Capacity – zero (capacity transfer capability entered instead)
- Installed Capacity – varies (see transmission transfer capacity)
- Average Annual and Firm Energy – zero
- GHG Emission Factor – zero
- Emissions – zero

In addition to the financial assumptions discussed in Appendix A, transmission options had unique treatment and data entry in the resource option database because transmission lines do not represent an actual energy or capacity gain on their own.

PROJECT: Downie 500 kV Station - Timed with Revelstoke 6

Resource Category: Transmission

Level of Study: Conceptual

Region: East Kootenays

PROJECT DESCRIPTION

This project adds a new 500 kV switching station at Downie, about 72 km south of Mica (sectionalising 5L71/72). This reinforcement would increase the transfer capability from Revelstoke and Mica plants enough to accommodate the sixth unit at each.

Required for combination of Revelstoke Unit 6 and Mica Unit 6.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$16,050
Fixed Operating And Maintenance Cost (\$1000s/year)	\$193
Project Life (Years)	30
Project Lead Time (Years)	Unknown

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	Unknown
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These reinforcements are required to deliver the power from Revelstoke Unit 6 and Mica Unit 6 reliably to the bulk transmission system.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

New switching station at Downie to be constructed.

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	High
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Significant new Right-of-way required.

Price Uncertainty	High
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Planning Level estimate based on unit cost values. .

PROJECT: Downie 500 kV Station - Timed with Revelstoke 6

Resource Category: Transmission

Level of Study: Conceptual

Region: East Kootenays

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Mica-Downie line - Timed with Mica 6

Resource Category: Transmission

Level of Study: Conceptual

Region: East Kootenays

PROJECT DESCRIPTION

This project adds a new 500 kV lines to Mica from Downie station. This reinforcement would increase the transfer capability from the Mica plant enough to accommodate the sixth unit.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$48,475
Fixed Operating And Maintenance Cost (\$1000s/year)	\$332
Project Life (Years)	38
Project Lead Time (Years)	Unknown

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	Unknown
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These reinforcements are required to deliver the power from Mica Unit 6 reliably to the bulk transmission system.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	High
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Significant new Right-of-way required.

Price Uncertainty	High
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REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Revelstoke-Downie line - Timed with REV-6

Resource Category: Transmission

Level of Study: Conceptual

Region: East Kootenays

PROJECT DESCRIPTION

The project adds a new 500 kV line to Revelstoke about 60 km in length from Downie Station. This reinforcement would increase the transfer capability from Revelstoke plants enough to accommodate the sixth unit at each.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$40,075
Fixed Operating And Maintenance Cost (\$1000s/year)	\$281
Project Life (Years)	38
Project Lead Time (Years)	Unknown

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	Unknown
---------------------------------	---------

These reinforcements are required to deliver the power from Revelstoke Unit 6 reliably to the bulk transmission system.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	High
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Significant new Right-of-way required.

Price Uncertainty	High
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REFERENCES

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

PROJECT: 5L71/72 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

PROJECT DESCRIPTION

This project would add 33% series compensation to the two 500 kV circuits extending south from Mica to Nicola substation. It would increase the transmission capacity from Mica enough to accommodate Mica #5 (450 MW). There would a new capacitor station added about 50% of the distance from Mica to accomplish this.

Required for the addition of Mica Unit 5. Project previously named MCA-NIC (5L71/72) Series Cap.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$28,884
Fixed Operating And Maintenance Cost (\$1000s/year)	\$347
Project Life (Years)	30
Project Lead Time (Years)	4

The dollars provided are Capital Direct Uninflated (as of Mar 2003), not including overhead and no interest during construction (IDC). OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	~ 450 MW
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Providing series compensation on 5L71 and 5L72 from Mica to Nicola to allow the transfer of the power from Mica Unit 5 to Nicola.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	0
Additional Transmission Right of Way Width (km)	0

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

A single new capacitor station will need to be constructed.

Job Creation

Construction Jobs Created (Person-years)	145
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Very little new Right-of-way needed.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

PROJECT: 5L71/72 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

REFERENCES

BC Hydro System Planning, System Impact Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/systemimpact/pdf/Final_NITS_SIS_2001.pdf, September 2002.

BC Transmission Company System Performance Assessment, Facilities Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/facilities/2003/NITS2001_FSrev017.pdf, August 2003.

PROJECT: 5L76/79 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

PROJECT DESCRIPTION

This project would add 50% series compensation to the two 500 kV circuits extending west from Ashton Creek to Nicola substation. They would increase the transmission capacity from Selkirk by about 440 MW. There would be a new capacitor station added to accomplish this and circuit breaker replacements at the terminal stations to utilise the new capacity. The new station would be midway between Ashton Creek and Nicola on 5L76 and 5L79.

Required for the addition of Revelstoke Unit 6.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$27,247
Fixed Operating And Maintenance Cost (\$1000s/year)	\$327
Project Life (Years)	30
Project Lead Time (Years)	5

The dollars provided are Capital Direct Uninflated (as of Mar 2003) and do not include overhead or interest during construction (IDC). OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	~ 440 MW
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Providing series compensation on 5L76 and 5L79 from Ashton Creek to Nicola is primarily to move the power from Revelstoke Unit 6 towards the Lower Mainland but this capacity can also be used for other resources in the Selkirk area.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	0
Additional Transmission Right of Way Width (km)	0

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

A single new capacitor station will be constructed as part of this project.

Job Creation

Construction Jobs Created (Person-years)	160
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Very little new Right-of-way needed.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

PROJECT: 5L76/79 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

REFERENCES

BC Transmission Company System Performance Assessment, Facilities Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21),
http://www2.bctransco.com/system/studies/facilities/2003/NITS2001_FSrev017.pdf, August 2003.

BC Hydro System Planning, System Impact Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/systemimpact/pdf/Final_NITS_SIS_2001.pdf, September 2002.

PROJECT: 5L91 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

PROJECT DESCRIPTION

This project would add 50% series compensation to the two 500 kV circuits extending west from Selkirk substation. They would increase the transmission capacity from Selkirk by about 270 MW. There would be three new capacitor stations added to accomplish this and circuit breaker replacements at the terminal stations to utilise the new capacity. One would be midway between Selkirk and Ashton Creek on 5L91 and the other two would be 25% from each end of 5L98 between Selkirk and Nicola.

Previously named 5L91/98 Series Compensation, this project has been divided into two individual projects named 5L91 Series Compensation and 5L98 Series Compensation.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$24,456
Fixed Operating And Maintenance Cost (\$1000s/year)	\$293
Project Life (Years)	30
Project Lead Time (Years)	4

The dollars provided are Capital Direct Uninflated (as of Mar 2003), not including overhead and no interest during construction (IDC). OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	~ 270 MW
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The capacity provided by this resource is dependant on the resource portfolio it is part of and its in service date though it will likely fall in the range of 600MW west from Selkirk substation.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	0
Additional Transmission Right of Way Width (km)	0

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

One new capacitor station will need to be constructed.

Job Creation

Construction Jobs Created (Person-years)	325
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Very little new Right-of-way needed.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

PROJECT: 5L91 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

REFERENCES

BC Transmission Company System Performance Assessment, Facilities Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21),
http://www2.bctransco.com/system/studies/facilities/2003/NITS2001_FSrev017.pdf, August 2003.

BC Hydro System Planning, System Impact Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/systemimpact/pdf/Final_NITS_SIS_2001.pdf, September 2002.

PROJECT: 5L98 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

PROJECT DESCRIPTION

This project would add 50% series compensation to the two 500 kV circuits extending west from Selkirk substation. They would increase the transmission capacity from Selkirk by about 270 MW. There would be three new capacitor stations added to accomplish this and circuit breaker replacements at the terminal stations to utilise the new capacity. One would be midway between Selkirk and Ashton Creek on 5L91 and the other two would be 25% from each end of 5L98 between Selkirk and Nicola.

Previously named 5L91/98 Series Compensation, this project has been divided into two individual projects named 5L91 Series Compensation and 5L98 Series Compensation.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$42,523
Fixed Operating And Maintenance Cost (\$1000s/year)	\$510
Project Life (Years)	30
Project Lead Time (Years)	Unknown

The dollars provided are Capital Direct Uninflated (as of Mar 2003), not including overhead and no interest during construction (IDC). OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	Unknown
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The capacity provided by this resource is dependant on the resource portfolio it is part of and its in service date though it will likely fall in the range of 600MW west from Selkirk substation.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	0
Additional Transmission Right of Way Width (km)	0

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Two new capacitor stations will need to be constructed.

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Very little new Right-of-way needed.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

PROJECT: 5L98 Series Compensation

Resource Category: Transmission

Level of Study: Feasibility

Region: Kelly / Nicola

REFERENCES

BC Transmission Company System Performance Assessment, Facilities Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21),
http://www2.bctransco.com/system/studies/facilities/2003/NITS2001_FSrev017.pdf, August 2003.

BC Hydro System Planning, System Impact Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/systemimpact/pdf/Final_NITS_SIS_2001.pdf, September 2002.

PROJECT: Ashton Creek 500 kV Substation 250 MVAR MSC

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Kelly / Nicola

PROJECT DESCRIPTION

This project, consisting of a mechanically switched capacitor (MSC) located at the Ashton Creek Substation, 12 km east of Enderby, would provide voltage support during high power transfer periods. This project is required for the addition of Revelstoke Unit 5.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$5,196
Fixed Operating And Maintenance Cost (\$1000s/year)	\$62
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
---------------------------------	-----

The capacitor assists in maintaining the required voltage profile during heavy load periods.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
Price Uncertainty	Medium

BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Kelly Lake 500 kV Substation Reconfiguration

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Kelly / Nicola

PROJECT DESCRIPTION

The Kelly Lake 500/230 kV substation is located approximately 10 km west of Clinton. The project adds additional breakers that are required due to an increase in generation in the Kelly-Nicola region. It will increase the reliability of the power supply.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$7,999
Fixed Operating And Maintenance Cost (\$1000s/year)	\$96
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
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The addition of breakers will increase the reliability of the power supply.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	Unknown
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Medium
Price Uncertainty	Medium

BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Kelly/Nicola 500 kV Transmission Line for CCGT

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Kelly / Nicola

PROJECT DESCRIPTION

The location of this project has not been defined. This project would connect a greenfield combined cycle gas turbine (CCGT) plant with either Kelly or Nicola Substation, depending on CCGT location. The project would consist of two 500 kV single circuit lines of unknown length. Length of line is dependent on location of CCGT.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$9,851
Fixed Operating And Maintenance Cost (\$1000s/year)	\$59
Project Life (Years)	35
Project Lead Time (Years)	3

Project lead time is estimated to range from three to five years.

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	Adequate for generation capacity.
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The double circuit 500 kV transmission line is required to integrate the generating station with the 500 kV Transmission system. The transfer capacity increase is dependent on the generation capacity.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	Unknown
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	High
Price Uncertainty	High

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Nicola 500 kV Reconfiguration - Timed with REV 6

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Kelly / Nicola

PROJECT DESCRIPTION

The project consists of the addition of new breakers and reconfiguration of Nicola 500 kV Substation to improve the reliability due to the addition of Revelstoke Unit 5. The Nicola substation is located near Nicola Lake (close to Merritt).

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$7,999
Fixed Operating And Maintenance Cost (\$1000s/year)	\$96
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
---------------------------------	-----

This project increases the reliability of the power supply.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Nicola 500 kV Substation 122.5 MVAR Shunt Reactor

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Kelly / Nicola

PROJECT DESCRIPTION

This project is located at the Nicola Substation, east of Nicola Lake and would provide voltage support during high power transfer periods. The shunt reactor is required to maintain the required voltage profile during light load conditions.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$5,373
Fixed Operating And Maintenance Cost (\$1000s/year)	\$64
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
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SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
Price Uncertainty	Medium

BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Nicola 500 kV Substation 250 MVAR MSC

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Kelly / Nicola

PROJECT DESCRIPTION

The mechanically switched capacitor (MSC), located at the Nicola Substation, would assist in maintaining the voltage profile and improve the leading reactive support reserve.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$4,979
Fixed Operating And Maintenance Cost (\$1000s/year)	\$60
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
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The capacitor assists in maintaining the required voltage profile during heavy load periods.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: **Ingledow 230 kV Substation 150 MVAR Shunt Reactor**

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Lower Mainland

PROJECT DESCRIPTION

The addition of a shunt reactor would provide voltage support at the Ingledow Substation in Surrey during low load, high voltage conditions.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$3,696
Fixed Operating And Maintenance Cost (\$1000s/year)	\$48
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
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The shunt reactor is required to maintain the voltage profile during light load conditions.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Ingledow 500 kV Substation 250 MVAR MSC

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Lower Mainland

PROJECT DESCRIPTION

A mechanically switched capacitor (MSC) at Ingledow Substation in Surrey would provide voltage support during high power transfer periods.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$4,078
Fixed Operating And Maintenance Cost (\$1000s/year)	\$49
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
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The capacitor assists in maintaining the required voltage profile during peak load periods.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

PROJECT: Lower Mainland - Static VAr Compensators (SVC)

Resource Category: Transmission

Level of Study: Feasibility

Region: Lower Mainland

PROJECT DESCRIPTION

The addition of static VAr compensators in the Lower Mainland helps improve the voltage stability for high Interior to Lower Mainland transfer levels and can be used to replace the voltage support provided currently by Burrard Generating station. The SVC's characterized here are two +300/-200 MVar installations. One connected to the 230kV bus at Meridian substation and one connected to the 230kV bus at Barnard substation.

Although these SVC's are to replace the voltage support role of Burrard they also facilitate operational flexibility and higher flows.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$34,629
Fixed Operating And Maintenance Cost (\$1000s/year)	\$416
Project Life (Years)	30
Project Lead Time (Years)	5

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	Varies with project timing and resource portfolio.
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There are two reasons to add reactive reinforcement in the form of a SVC in the Lower Mainland. Firstly to replace the voltage support role of Burrard Thermal Plant and secondly to facilitate the higher flows from the Interior to Lower Mainland. The particular SVC's characterized here are for the replacement of the Burrard's voltage support role.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	0
Additional Transmission Right of Way Width (km)	0

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

New equipment will be located within existing stations or require minimal expansion.

Job Creation

Construction Jobs Created (Person-years)	25
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Very little new Right-of-way needed.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

PROJECT: Lower Mainland - Static VAr Compensators (SVC)

Resource Category: Transmission

Level of Study: Feasibility

Region: Lower Mainland

REFERENCES

BC Transmission Company System Performance Assessment, Facilities Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/facilities/2003/NITS2001_FSrev017.pdf, August 2003.

BC Hydro System Planning, System Impact Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/systemimpact/pdf/Final_NITS_SIS_2001.pdf, September 2002.

PROJECT: Meridian 500 kV Substation 250 MVAR MSC

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Lower Mainland

PROJECT DESCRIPTION

A mechanically switched capacitor at Meridian Substation in Port Moody would provide voltage profile and improve the leading reactive support reserve.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$4,078
Fixed Operating And Maintenance Cost (\$1000s/year)	\$49
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
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The capacitor assists in maintaining the required voltage profile during peak load periods.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

PROJECT: Nicola to Meridian 500 kV line (5L83)

Resource Category: Transmission

Level of Study: Feasibility

Region: Lower Mainland

PROJECT DESCRIPTION

A 500 kV single circuit delta steel tower (SCST) transmission line, approximately 251 km in length from Nicola substation near Merritt to Meridian substation located in Coquitlam. The proposed route would parallel existing circuit 5L82 for approximately 70% of it's length utilizing existing right-of-way (ROW) previously acquired by B.C. Hydro for 5L83 between Nicola Substation and the Anderson River and between Agassiz and Meridian Substation. Several route options are being considered to traverse the difficult Fraser Canyon section in-between, either parallel to 5L82, 5L41 or a more separate and shorter route to the west.

The proposed delta tower design (phase conductors in delta configuration) is more economic and has less environmental impact than the 500 kV flat tower design (phase conductors in flat configuration) presently used by BC Hydro because it requires less right-of-way and clearing width. Some double circuit steel towers (DCST) would be used in specific areas due to land use or terrain concerns. The proposed project includes series capacitors near the middle of the line to provide 50% series compensation. Depending on the route option selected, series capacitors will be added at either the existing American Creek Station along 5L82, existing Chapmans Station along 5L41 or a new site, possibly at Ruby Creek. This option assumes 50% series compensation at the existing American Creek capacitor station.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$233,919
Fixed Operating And Maintenance Cost (\$1000s/year)	\$1,602
Project Life (Years)	35
Project Lead Time (Years)	9

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	1750 MW to 2350 MW
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5L83 becomes a viable option when new resources in South Interior or import of power from Alberta needs to be accomodated. The installed capacity of 5L83 for 3.3 kA operation will be 2850 MW. The incremental South Interior to Lower Mainland transfer capability will depend on the resource portfolio and may vary between 1750 MW to 2350 MW.

This resource will provide a reduction in system losses varying with generation dispatch and load level. No estimate is available at this point, but will be produced should the reinforcement proceed.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	1255
Additional Transmission Right of Way Length (km)	251
Additional Transmission Right of Way Width (km)	0.05

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

The shortest route option that avoids AMC is expected to have less impact and to cost approximately 5% less (direct \$) than this option, not including station costs.

PROJECT: Nicola to Meridian 500 kV line (5L83)

Resource Category: Transmission

Level of Study: Feasibility

Region: Lower Mainland

Job Creation

Construction Jobs Created (Person-years)	410
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Medium
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Some Right-of-way needed.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Company System Performance Assessment, Facilities Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21),
http://www2.bctransco.com/system/studies/facilities/2003/NITS2001_FSrev017.pdf, August 2003.

Nemethy, Z., 2004 IEP Estimates, BC Hydro Internal Memo, July 18, 2003.

BC Hydro System Planning, System Impact Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/systemimpact/pdf/Final_NITS_SIS_2001.pdf, September 2002.

PROJECT: Nicola to Ruby Creek 500 kV Line (5L80)

Resource Category: Transmission

Level of Study: Conceptual

Region: Lower Mainland

PROJECT DESCRIPTION

A 500 kV single circuit delta steel tower transmission line, approximately 150 km in length from Nicola (NIC) substation near Merritt, following a corridor down the Fraser Canyon to a new 500 kV switching station at Ruby Creek (RYC). The RYC switching station would have seven 500 kV line terminations, one for the new line and two each for the looping into the station of existing 500 kV lines, 5L41 (Kelly Lake - Clayburn), 5L81 (Nicola - Ingledow) and 5L82 (Nicola - Meridian). The routing for the new NIC-RYC 500 kV line would parallel the existing line (5L82) and utilize an existing right-of-way for about 70% of the line.

The proposed line would be provided with 50% series compensation by series capacitors probably located at the line ends. The proposed newer delta towers are (delta phase conductor configuration) narrower and more economic than the existing flat towers (flat phase conductor configuration) resulting in a narrower right-of-way. The earliest in-service date is Fall 2012.

First Nations issues and visibility impact issues with routing along the Fraser Canyon are expected to be significant.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$139,701
Fixed Operating And Maintenance Cost (\$1000s/year)	\$1,109
Project Life (Years)	50
Project Lead Time (Years)	9

Costs are for the line only. Not included are the costs for looping the existing 500kV lines into Ruby Creek or the cost of the station itself. The dollars provided are Capital Direct Uninflated (as of July 2003) without overhead or IDC. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	1750 MW to 2350 MW
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5L80 would become a viable option if sectionalizing 5L41, 5L81 and 5L82 was required. The installed capacity of 5L80 for 3.3 kA operation will be 2850 MW. The incremental South Interior to Lower Mainland transfer capability will depend on the resource portfolios and may vary between 1750 MW and 2350 MW.

This resource will provide a reduction in system losses varying with generation dispatch and load level. No estimate is available at this point, but will be produced should the reinforcement proceed.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	715
Additional Transmission Right of Way Length (km)	143
Additional Transmission Right of Way Width (km)	0.05

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

A portion of this line will parallel with the then-constructed 5L83 for about 101 km of its length. For this parallel portion the right of way width will only be 35 m. Footprint in hectares calculated from right of way dimensions.

PROJECT: Nicola to Ruby Creek 500 kV Line (5L80)

Resource Category: Transmission

Level of Study: Conceptual

Region: Lower Mainland

Job Creation

Construction Jobs Created (Person-years)	790
Permanent Jobs Created (Full time equivalents)	Unknown

Jobs created include the construction of both the new line and Ruby Creek switching station.

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Medium
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Some Right-of-way needed.

Price Uncertainty	High
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Planning Level estimate based on unit cost values only. BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

Nemethy, Z., 2004 IEP Estimates, BC Hydro Internal Memo, July 18, 2003.

PROJECT: Williston-Tachick 230 kV Transmission line 2L357

Resource Category: Transmission

Level of Study: Pre-feasibility Region: North Coast

PROJECT DESCRIPTION

This project adds one 230 kV single circuit line approximately 230 km in length connecting the Williston substation near Prince George to the Tachick substation located southwest of Vanderhoof. This new line is required to meet the load growth in the area, improving the reliability of the power supply.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$22,524
Fixed Operating And Maintenance Cost (\$1000s/year)	\$222
Project Life (Years)	30
Project Lead Time (Years)	4

Project lead time is estimated to range from four to six years.

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	300 MW
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SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Medium
Price Uncertainty	Medium

BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

PROJECT: Site C - Peace Canyon 2x500 kV Transmission Line

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Peace River

PROJECT DESCRIPTION

This project adds two new single circuit 500 kV lines connecting Site C to Peace Canyon near Hudson Hope. The approximately 70 kms long lines are required to integrate Site C generating station with the 500 kV transmission system.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$102,340
Fixed Operating And Maintenance Cost (\$1000s/year)	\$760
Project Life (Years)	38
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	Adequate for Site C generation.
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Transfer capacity is assumed to be adequate for Site C interconnection with the 500 kV transmission system.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	High
Price Uncertainty	Medium

BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Selkirk 500 kV Substation 122.5 MVAR Shunt Reactor

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Selkirk Area

PROJECT DESCRIPTION

The addition of a shunt reactor at the Selkirk Substation would provide voltage support during high power transfer periods.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$5,376
Fixed Operating And Maintenance Cost (\$1000s/year)	\$65
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	N/A
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The shunt reactor is required to maintain the desired voltage profile during light load conditions.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
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Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Selkirk Transformer T2 Replacement

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Selkirk Area

PROJECT DESCRIPTION

This project would replace existing 673 MVA transformer T2 with a new 1200 MVA transformer at the Selkirk substation.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$12,804
Fixed Operating And Maintenance Cost (\$1000s/year)	\$154
Project Life (Years)	30
Project Lead Time (Years)	2

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	~400 MW
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The transformer replacement is required to increase the transfer capability in the region.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
Price Uncertainty	Medium

BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: Selkirk Transformer T3 Replacement

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Selkirk Area

PROJECT DESCRIPTION

This project would replace existing 673 MVA transformer T3 with a new 1200 MVA transformer at the Selkirk substation.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$12,734
Fixed Operating And Maintenance Cost (\$1000s/year)	\$153
Project Life (Years)	30
Project Lead Time (Years)	2

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	~400 MW
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The transformer replacement is required to increase the transfer capability in the region.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	Low
Price Uncertainty	Medium

BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.

PROJECT: ARN-VIT 1st 230 kV AC

Resource Category: Transmission

Level of Study: Feasibility

Region: Vancouver Island

PROJECT DESCRIPTION

The existing aging 138 kV Arnott to VIT circuits 1L17 and 1L18 will be replaced by two 230 kV circuits in two stages. This proposed project includes new 230 kV submarine cables using the existing right-of-way, replacing the wood pole/steel lattice transmission towers on land with steel double circuit tower and a phase shifting transformer at VIT for each circuit to regulate the power flow. Both overhead circuits and one submarine cable circuit will be installed in the first stage. The second submarine cable circuit will be installed in the second stage at a later date. In the second stage, two of the Ingledow-Arnott 230 kV lines will be upgraded and an alternate method of supply to Saltspring and Galiano Islands will be required.

The project previously named ARN-VIT 230 kV has been separated into two projects, ARN-VIT 1st 230 kV AC and ARN-VIT 2nd 230 kV AC.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$168,000
Fixed Operating And Maintenance Cost (\$1000s/year)	\$1,146
Project Life (Years)	60
Project Lead Time (Years)	4

The dollars provided are Capital Direct Uninflated without overhead included and no interest during construction (IDC). OMA is based on an assumption of 1.2% of Capital Cost. The earliest in-service date of the 230 kV cables to Vancouver Island is F2009 (by October 2008 in time for the winter peak of F2009).

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	600 MW
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The capacity provided by this upgrade will come in two 600 MW stages. The project characterized here is based on the 1st stage being in service in 2008 and the 2nd stage coming in during 2011.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	0
Additional Transmission Right of Way Width (km)	0

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

The proposed 230 kV cables would run for 25.5 km in the Georgia Strait with approx. 12 km in United States territory. Widening of overhead rights-of-way for increased circuit separation or conductor swing in longer than typical spans would only be required over a few individual spans on both Galiano and Saltspring Islands. Release of unused right-of-way possible. Extensive public consultation would be required, i.e. in Delta where the 230 kV overhead line would run for about 12 km through urban/rural land from Arnott Substation to the terminal station in Tsawassen.

Job Creation

Construction Jobs Created (Person-years)	150
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Primary: 50% to 99%
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Overhead transmission projects could be developed with varying levels of private sector involvement. To be conservative, the higher expectation for private sector involvement (primary) was selected, although the project could have lower private sector involvement. Significant private sector contracts in the cable design, supply and install and phase shifter total approximately \$100 million.

PROJECT: **ARN-VIT 1st 230 kV AC**

Resource Category: Transmission

Level of Study: Feasibility

Region: Vancouver Island

UNCERTAINTY

Development Uncertainty	Medium
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Regulatory approvals required from the British Columbia Utilities Commission Certificate of Public Convenience and Necessity, Canadian Environmental Assessment Agency, US Presidential Permit and other regulatory bodies.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Hydro System Planning, System Impact Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/systemimpact/pdf/Final_NITS_SIS_2001.pdf, September 2002.

BC Transmission Company System Performance Assessment, Facilities Study for BC Hydro Generation Line-of-Business NITS 2001 Part II(2002/03 - 2020/21), http://www2.bctransco.com/system/studies/facilities/2003/NITS2001_FSrev017.pdf, August 2003.

Mumick, J., 230 kV AC Supply to VI- Revision, BC Hydro Internal Memo, October 01, 2003.

PROJECT: ARN-VIT 2nd 230 kV AC

Resource Category: Transmission

Level of Study: Feasibility

Region: Vancouver Island

PROJECT DESCRIPTION

The existing aging 138 kV Arnott to VIT circuits 1L17 and 1L18 will be replaced by two 230 kV circuits in two stages. This proposed project includes new 230 kV submarine cables using the existing right-of-way, replacing the wood pole/steel lattice transmission towers on land with steel double circuit tower and a phase shifting transformer at VIT for each circuit to regulate the power flow. Both overhead circuits and one submarine cable circuit will be installed in the first stage. The second submarine cable circuit will be installed in the second stage at a later date. In the second stage, two of the Ingledow-Arnott 230 kV lines will be upgraded and an alternate method of supply to Saltspring and Galiano Islands will be required.

The project previously named ARN-VIT 230 kV has been separated into two projects, ARN-VIT 1st 230 kV AC and ARN-VIT 2nd 230 kV AC.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$145,000
Fixed Operating And Maintenance Cost (\$1000s/year)	\$1,009
Project Life (Years)	60
Project Lead Time (Years)	4

The dollars provided are Capital Direct Uninflated without overhead included and no interest during construction (IDC). OMA is based on an assumption of 1.2% of Capital Cost. Lead time is 3.5 years from the completion of the first 230 kV project.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	600 MW
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The capacity provided by this upgrade will come in two 600 MW stages. The project characterized here is based on the 1st stage being in service in 2008 and the 2nd stage coming in during 2011.

SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	0
Additional Transmission Right of Way Width (km)	0

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

The proposed 230 kV cables would run for 25.5 km in the Georgia Strait with approx. 12 km in United States territory. Widening of overhead rights-of-way for increased circuit separation or conductor swing in longer than typical spans would only be required over a few individual spans on both Galiano and Saltspring Islands. Release of unused right-of-way possible. Extensive public consultation would be required, i.e. in Delta where the 230 kV overhead line would run for about 12 km through urban/rural land from Arnott Substation to the terminal station in Tsawassen.

Job Creation

Construction Jobs Created (Person-years)	100
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Primary: 50% to 99%
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Overhead transmission projects could be developed with varying levels of private sector involvement. To be conservative, the higher expectation for private sector involvement (primary) was selected, although the project could have lower private sector involvement.

PROJECT: **ARN-VIT 2nd 230 kV AC**

Resource Category: Transmission

Level of Study: Feasibility

Region: Vancouver Island

UNCERTAINTY

Development Uncertainty	Medium
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Regulatory approvals required from the British Columbia Utilities Commission Certificate of Public Convenience and Necessity, Canadian Environmental Assessment Agency, US Presidential Permit and other regulatory bodies.

Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

PROJECT: Dunsmuir-Sahtlam 500 kV Transmission Line Upgrade

Resource Category: Transmission

Level of Study: Pre-feasibility Region: Vancouver Island

PROJECT DESCRIPTION

This project upgrades the existing 230 kV line between Dunsmuir and Sahtlam substations to 500 kV. The existing line is currently insulated to the 500 kV voltage level, further upgrade will provide additional power transfer capacity between these two substations.

FINANCIAL INFORMATION

Total Capital Cost (\$1000s of 2003\$)	\$42,134
Fixed Operating And Maintenance Cost (\$1000s/year)	\$506
Project Life (Years)	30
Project Lead Time (Years)	3

Dollars are a unit cost estimate of capital direct uninflated not including overhead or interest during construction. OMA is based on an assumption of 1.2% of Capital Cost.

TECHNICAL INFORMATION

Transfer Capacity Increase (MW)	1100 MW
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SOCIAL AND ENVIRONMENTAL INFORMATION

Greenhouse Gas Emission Factor (Tonnes CO2 equivalent/GWh)	0
Project Footprint (Hectares)	Unknown
Additional Transmission Right of Way Length (km)	Unknown
Additional Transmission Right of Way Width (km)	Unknown

Atmospheric Emissions (Metric Tonnes/GWh)	SOx	NOx	CO	VOC	PM 10	PM 2.5	Hg
	0	0	0	0	0	0	0

Job Creation

Construction Jobs Created (Person-years)	Unknown
Permanent Jobs Created (Full time equivalents)	Unknown

PRIVATE SECTOR INVOLVEMENT

Estimated Level of Private Sector Involvement	Secondary: 25% to 50%
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Transmission projects could be developed with varying levels of private sector involvement. To be conservative, the lower expectation for private sector involvement (secondary) was selected, although the project could have primary private sector involvement.

UNCERTAINTY

Development Uncertainty	High
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Price Uncertainty	Medium
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BCTC has provided a range of -10% to +25% on transmission capital costs.

REFERENCES

BC Transmission Corp., Project Descriptions - Rama Vinnakota, March 2004.

BC Transmission Corp., Project Estimates - Rama Vinnakota, February 2004.