FORTISBC

2005 Revenue Requirements

9. 2005 Capital Plan

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Appendices

(Titled Capital Plan Appendices)

1. 2005 Capital Expenditure Plan Overview

The 2005 FortisBC Capital Plan of $121.6 million (AFUDC and Loadings included) focuses on customer service, reliability, safety, productivity, and the environment. The most significant areas of expenditures are required to expand and upgrade the bulk transmission and distribution systems to service new customers and the increasing loads that have occurred during the past few years.

The Hydro Electric Plant -- Upgrade and Life Extension (ULE) projects which have been ongoing for several years also have significant expenditures planned for 2005. These projects will increase plant production and will help to maintain a reliable source of supply for the future.

The remaining expenditures are required to sustain the system through the replacement of deteriorated, obsolete and defective components of the power system infrastructure. This is required to maintain service reliability and environmental compliance as well as addressing public and employee safety issues.

The 2005 Plan contains expenditures of $49.4 million (AFUDC and loadings included) for which project approval has been previously received from the BC Utilities Commission. This is associated with the Kootenay 230 kV System Development Project, the South Okanagan Supply Reinforcement Project, the Kelowna Area Upgrade and the Upgrade and Life Extension projects involving Unit 5 and Unit 6 at the Upper Bonnington power plant.

The development of the 2005 capital expenditures requirement for Transmission, Stations, Distribution and Telecom is based primarily on the System Development Plan (2005-2024) which was substantially completed in Q3 2004 and has been filed as Volume 2 of this application. The Plan is a comprehensive document based on loadings for 2003/2004 and projected load growth for the next 20 years. The System Development Plan includes a long-term (20 year) study of the transmission system and a

shorter (5 year) study for the distribution system. Using FortisBC's Transmission and Distribution planning criteria, it identified necessary reinforcements in the bulk transmission system, the regional transmission and distribution system, the telecom and SCADA (System Control and Data Acquisition) networks, and protection and control systems owned and operated by FortisBC. The System Development Plan identifies more than 100 projects to be implemented between 2005 and 2010. A priority matrix was used to ensure the required projects are completed in an orderly manner. The matrix considered safety, public impact, restoration time, thermal capacity, system effect on failures and voltage related. A discussion on the priority matrix can be found in Section 1.1 and Appendix C-5 of the System Development Plan.

The 2005 capital requirement for Generation is primarily a continuation of the Upgrade and Life Extension program that began in 1997 and involved, as a minimum, completing a life extension on eleven of the fifteen units by 2010. The original assignment priority for refurbishing eleven units was done through a condition assessment of each unit's major components. The unit-by-unit sequence is continuously being re-evaluated as new test data and component condition is documented from the annual maintenance activities. The Generation plan also includes small projects necessary to maintain safe and efficient operator of each plant. These projects have been evaluated and prioritized based on several criteria including safety, environment, plant reliability, employee considerations and regulatory compliance.

Regulatory Requirements

The Company is seeking the following Orders related to the System Development Plan and the 2005 Capital Expenditure Plan as contained in this Tab of the 2005 Revenue Requirements Application:

1) An Order that the 2005 System Development Plan meets the requirements of Section 46(6) of the Act

2) An Order that the 2005 Capital Expenditure Plan satisfies the requirements of Section 45 (6.2) (a) & (b), specifically that, with the exception listed below, the capital projects listed in the following tables in the 2005 Capital Expenditure Plan, are in the public interest

Table 9.2.1 Generation
Table 9.3.1 Transmission
Table 9.4.1 Distribution
Table 9.5.1 Telecom
Table 9.6.1 Demand Side Management
Table 9.7.1 General Plant

The only project which is an exception is the Big White Supply Project, which will be the subject of a CPCN Application in 2005

CPCN Criteria

The Company has interpreted Commission Order G-96-04 and directives regarding British Columbia Transmission Corporation's ("BCTC's") Capital Plan Application as a change in practice. As a result FortisBC proposes the following criteria to determine if a project should be the subject of a CPCN application by FortisBC

(1) the total project cost is $20 million or greater; or
(2) the project is likely to generate significant public concerns; or
(3) FortisBC believes for any reason that a CPCN application should proceed; or
(4) after presentation of a Capital Plan to FortisBC stakeholders, a credible majority of those stakeholder express a desire for a CPCN application.

As with BCTC, Criterion 1 ensures the rate impact of the project is less than a one percent rate increase on a levelized basis.

Criterion 2 recognizes that impacts other than economics affect the public interest.

Criterion 3 retains flexibility for the Company to file a CPCN as the result of circumstances that cannot be foreseen at this time.

Finally, Criterion 4 recognizes that there are significant differences in the relationship between FortisBC and its stakeholders, and the relationship between BCTC and its stakeholders. BCTC is a recently formed organization, and as such has not had the opportunity of significant stakeholder consultation. FortisBC, in part because of Annual Reviews which form part of its PBR mechanism, has presented its annual capital plans to stakeholders many times. Based on past experience FortisBC recognizes that there may be expenditures that do not meet the first three criteria, but may be of interest to stakeholders.

FortisBC intends to present workshops on its System Development Plan and Resource Plan in mid-January 2005. Based upon input received at these sessions, the 4 criteria may be modified.

Summary of Expenditures

The following table provides a summary of the 2005 Capital Plan by major categories.

Table 9.1
2005 Capital Expenditure Plan

		2005 Expenditures ($000s)
1	**GENERATION**	
2	Growth	-
3	Sustaining	15,058
4	**Subtotal**	**15,058**
5		
6	**TRANSMISSION AND STATIONS**	
7	Growth	52,381
8	Sustaining	14,670
9	**Subtotal**	**67,051**
10		
11	**DISTRIBUTION**	
12	Growth	11,731
13	Sustaining	8,050
14	**Subtotal**	**19,781**
15		
16	**TELECOM, SCADA, PROTECTION & CONTROL**	
17	Growth	600
18	Sustaining	1,407
19	**Subtotal**	**2,007**
20		
21	**DEMAND SIDE MANAGEMENT**	1,181
22	**Subtotal**	**1,181**
23		
24	**GENERAL PLANT**	
25	Vehicles	2,940
26	Metering	(67)
27	Information Systems	1,545
28	Telecommunications	175
29	Buildings	734
30	Furniture	177
31	Tools and Equipment	711
32	**Subtotal**	**6,215**
33		
34	**Subtotal before AFUDC & Loadings**	**111,293**
35		
36	**AFUDC & Loadings**	**10,274**
37		
38	**TOTAL**	**121,567**
39		
40	**Subtotal Growth**	**64,712**
41	**Subtotal Sustaining**	**39,185**
42	**Subtotal DSM**	**1,181**
43	**Subtotal General Plant**	**6,215**
44	**Subtotal AFUDC & Loadings**	**10,274**
45	**TOTAL**	**121,567**

2. Generation

FortisBC generating plant capital requirements have been categorized into two Capital improvement areas. The major projects that include items such as the upgrade and life extension program and the small sustaining projects that are relatively small in scope and necessary to maintain safe and efficient operation of the plants.

The generating plants, most of which have been in service for more than 60 years, are renewed by either the small capital projects that are primarily addressing the plant systems or the upgrade and life extension program that began in 1997 and was developed to ensure the continued long-term reliability of the aging units and associated systems through implementing a unit-by-unit life extension. When economic, the unit is also "upgraded", which means that the turbine is replaced resulting in an increased generating capability.

The scope of an upgrade and life extension project is to complete a "water to wire" refurbishment of each of the generating unit's systems. The original assignment of the unit-by-unit sequence or priority was done through a condition assessment of each unit's major components such as generator rotor and stator winding, transformer and turbine. The unit-by-unit sequence is continuously being re-evaluated as new test data and component condition is documented from the annual maintenance activities. The schedule for the program was developed at a one unit per year pace that had a completion of the program in 2009. The end date for the schedule has also been revisited and due to various business conditions has been extended by one year to 2010.

FortisBC's four generating plants are comprised of fifteen units of which eleven have been selected for life extension. The remaining four units will be addressed in the scope of the Upper Bonnington (P2) re-powering project.

To date, four units have been completed under the upgrade and life extension program with the fifth unit scheduled for completion in December, 2004.

The major projects in the 2005 Generation Capital plan includes the completion of projects previously approved by a Certificate of Public Convenience and Necessity, the continuation of the unit-by-unit upgrade and life extension program, headgate rebuilds, and Upper Bonnington old plant re-powering.

The following table shows the Generation Capital Plan for 2005.

Table 9.2.1
Generation Capital Plan - 2005
($000)

		2005 Expenditures	Future Expenditures	Total
1	***GENERATION***			
2	**Growth**			
3	**Sustaining**			
4	Upper Bonnington Unit 5 (ULE)	572		572
5	Upper Bonnington Unit 6 (ULE)	614		614
6	Lower Bonnington Unit 1 (ULE)	8,378	2,313	10,691
7	Lower Bonnington Unit 3 (ULE)	790	12,519	13,309
8	South Slocan Unit 1 (ULE)	468	12,182	12,650
9	Upper Bonnington Old Unit Repowering	466	29,534	30,000
10 11	Headgate Rebuild Corra Linn Unit 1, 2, 3 and Lower Bonnington Unit 1	2,480		2,480
12	Generation Sustaining Small projects	1,290		1,290
13	**Subtotal**	**15,058**	**56,548**	**71,606**
14	AFUDC and Loadings	2,714	10,192*	12,906*
15	**Total**	**17,772**	**66,740**	**84,512**

* Estimate based on the ratio of AFUDC to subtotal costs for 2005 expenditures

Listed are further details of the project contained in the 2005 plan.

Sustaining Projects

Upper Bonnington Unit 5 and Unit 6 Upgrade and Life Extension

The Upper Bonnington Unit 5 and Unit 6 Upgrade and Life Extension were previously approved through Certificate of Public Convenience and Necessity No.'s C-9-03 and C-17-03 respectively. These projects are to be completed and closed in 2005 following the

contractual acceptance and warranty inspections. The 2005 expenditure for these projects is estimated at $572,000 and $614,000 respectively.

Lower Bonnington Unit 1 Upgrade and Life Extension

The Lower Bonnington Unit 1 Upgrade and Life Extension project Certificate of Public Convenience and Necessity (CPCN) application has been submitted to the BC Utilities Commission for approval of the sixth unit in the upgrade life extension program. Resulting information requests have led to the creation of an Entitlement agreement between FortisBC and BC Hydro, the approval of the agreement by the respective boards is pending. Once approved, it is anticipated that the Certificate of Public Convenience and Necessity application will be approved. In order to secure the ability for FortisBC to complete the project on schedule in December 2005, some business commitments have been made on long delivery items. This project has an estimated expenditure of $8.378 million for 2005, and $2.313 million forecast for 2006.

Lower Bonnington Unit 3 Upgrade and Life Extension

The Lower Bonnington Unit 3 Upgrade and Life Extension project is scheduled for completion in September 2006. The project has followed the same condition assessment of major unit components and systems as previous upgrade and life extension projects to achieve the scope of work and estimate. The current generator winding was installed in 1945 (59 years old) and normal expected life of a winding is 40 years. The turbine head-cover experienced some damage and was repaired approximately 35 years ago. This project is estimated at $13.309 million with a $790,000 expenditure forecast for 2005.

South Slocan Unit 1 Upgrade and Life Extension

South Slocan Unit 1 Upgrade and Life Extension project is scheduled for implementation in September 2007. The project has followed the same condition assessment of major unit components and systems as previous upgrade and life extension projects to achieve the scope of work and estimate. As a result of the ongoing condition assessment, the Generator step up transformer has been identified as being at risk. In order to mitigate

this risk, procurement of a new transformer has been included in the plan for 2005. The total project is estimated to be $12.650 million with 2005 expenditure estimated to be $468,000.

Upper Bonnington Old Unit Re-Powering

The Upper Bonnington Old Unit re-powering study is to develop re-powering options for Upper Bonnington Units 1 through 4 and interim remedial actions required to retain the same in service for five years. The project will identify scope, estimate, obtain approval and implement remedial action required to retain Upper Bonnington Units 1 through 4 in service for five years and to mitigate environmental, safety and operational risks. The project will identify options to optimize the FortisBC water license and negotiate optimal actual water flows usage specifically at Upper Bonnington with the City of Nelson and possibly BC Hydro. This project has an estimated expenditure of $466,000 for 2005.

Headgate Re-builds

Corra Linn Units 1, 2, and 3 and the Lower Bonnington Unit 1 Headgate re-build projects have been included in the 2005 plan due to the associated risks that they present; the safety concern raised due to the condition of the gates (primary isolation to protect workers involved in maintaining the generating equipment), age (approximately 70 years old) and operational risk of unit protection from "run away" conditions. Corra Linn Unit 3 Headgate rebuild (Certificate of Public Convenience and Necessity C-1-01 January 2001) has previously been approved by the BCUC. The Corra Linn Units 1, 2 and 3 projects are estimated at $613,000, $612,000 and $685,000 respectively. The Lower Bonnington Unit 1 is estimated at $570,000. The total for this project in 2005 is $2,480,000. For further details see Appendix 1.

Small Generation Projects

FortisBC's four generating plants are comprised of fifteen units. The plants contain turbines, generators, switchgear, civil structures (concrete dams, wooden powerhouse buildings and structure steel assemblies), cranes, gates, and gantries, cooling pumps and

fans, roads and fences. These generating units and support systems range in age from 25 to 60 plus years.

Consistent with previous years, the 2005 Generation Capital plan includes a number of plant sustaining projects that are deemed necessary for the safe and efficient operation of the plants. These are relatively small projects that have been identified based on: Safety, Environmental, Plant Reliability, Employee Considerations, Cost Recovery and Regulatory Compliance assessment. The 2005 planned expenditure for small sustaining projects is $1.290 million.

The following table lists the Generation small sustaining projects planned for 2005.

Table 9.2.2
Generation Small Sustaining Projects - 2005
($000s)

	Generation Small Sustaining Projects)	
1	Lower Bonnington Tailrace Gantry Upgrade	234
2	Lower and Upper Bonnington Potable Water Systems	26
3	Lower Bonnington Unit 3 A & B Gates, Upgrade Roller Trains	88
4	Battery Room Upgrades at Lower Bonnington, Upper Bonnington and South Slocan	112
5	Upper Bonnington Line 33 Upgrade Oil Circuit Breaker	114
6	Upper Bonnington Unit 1 Upgrade Oil Circuit Breaker	18
7	Upper Bonnington Unit 4 Upgrade Oil Circuit Breaker	108
8	Upper Bonnington Power House Roof Upgrade	127
9	Upper Bonnington Unit 5 & Unit 6 Transformer Oil Water Separator Installation	46
10	South Slocan Switchyard Oil Containment & Oil Water Separator Installation	221
11	Head Gate Controls Upgrades at Corra Linn – Units 1,2, & 3	122
12	Head Gate Hoist Wire Rope Upgrades at Corra Linn – Units 1,2, & 3	74
13	**Total**	**1,290**

The following gives an overview of the Generation small sustaining projects planned for 2005:

Lower Bonnington Tailrace Gantry Upgrade

The existing gantry was installed in 1925 and has received no upgrades since that time. Drum controllers are a high maintenance item and replacement parts are limited due to the age of equipment. Exposed Vdc slide wire power feed system is a safety concern.

Tailrace gantries at other generating plants have been upgraded in a similar fashion with good results.

Lower and Upper Bonnington Potable Water Systems

The water at these plants has been tested and confirmed that it does not meet potable water standards.

Lower Bonnington Unit 3 A and B Gates, Upgrade Roller Trains

The present roller trains are original equipment installed in 1926 and are no longer reliable. Occasionally they malfunction and place additional load on the gate lifting mechanisms. The extra loading creates concerns with respect to the reliability of the gate lifting during an emergency situation. The wire rope system has already suffered numerous failures and also must be replaced.

Battery Room Upgrades at Lower and Upper Bonnington and South Slocan

The existing battery rooms at these Plants have had no significant upgrade since they were constructed. The existing natural convection ventilation system does not move sufficient air through the battery room under certain atmosphere conditions. During the winter months, the natural flow moves from the window vent through the battery room, resulting in a cold battery room. The optimum room temperature within the battery room is 25 degrees Celsius. A forced ventilation system will ensure that adequate air movement is maintained and that the air entering the battery room will always be warm air from the power house. A forced ventilation system will comply with the Canadian Electrical Code. As a backup to the ventilation system, a Hydrogen monitoring system is to be installed.

The wood battery room entrance door is to be replaced with a 2 hr fire rated metal door complete with metal door frame.

The battery charger is to be upgraded from 10 Amps to 50 Amps to reduce the battery cycle times. Battery loads have increased dramatically in recent times and the time to

replenish the batteries must be reduced to enable the batteries to be fully charged in the event of back to back power outages. The present battery charger has exceeded its reliable life by over a decade.

Failure to upgrade the battery room may result in explosive accumulations of Hydrogen gas and poor battery recovery periods due to inadequate battery charger capacity.

Upper Bonnington 33 Line Upgrade Oil Circuit Breaker (OCB)

The oil circuit breaker on 33 Line will be replaced with an oil free SF6 breaker. This will remove the possibility of an oil spill into the Columbia River from this breaker.

Upper Bonnington Unit 1 Upgrade Oil Circuit Breaker (OCB)

The existing Oil Circuit Breaker is a three-tank bulk oil breaker installed in 1932. Test results indicate that the Oil Circuit Breaker is no longer reliable. A SF6 breaker was purchased in the fourth quarter of 2004 and will be installed in 2005. This will remove the possibility of an oil spill into the Columbia River from this breaker.

Upper Bonnington Unit 4 Upgrade Oil Circuit Breaker (OCB)

The existing Oil Circuit Breaker is a three-tank bulk oil breaker installed in 1932. Test results indicate that the Oil Circuit Breaker is no longer reliable. This unit will be replaced with an oil free SF6 breaker to remove the possibility of an oil spill into the Columbia River from this breaker.

Upper Bonnington Power House Roof Upgrade

The Inspection Report completed in July 2003 indicated that the roof condition over Units 5 and 6 was poor and membrane replacement was recommended. Roof leaks have the potential to damage the power generating equipment, cause roof structure failure and create employee safety hazards.

Upper Bonnington Unit 5 and Unit 6 Transformer Oil Water Separator Install

The project is to contain any oil spilled at the Upper Bonnington power plant from units 5 & 6 generator step-up transformers by installing concrete containment curbs and a gravity feed oil-water separator. The Oil-Water Separator must be added to meet present day environmental standards.

South Slocan Switchyard Oil Containment and Oil Water Separator Install

At the present time there is no transformer oil spill containment at this plant. Failure of oil filled equipment could result in oil seepage into the Columbia River. Spill containment and an Oil-Water Separator must be added to meet present day environmental standards.

Head Gate Controls Upgrades Corra Linn Units 1, 2 and 3

The upgrade of the Head Gate motor controls involve the replacement of the brake electrical controls, power feed cables and control cabling/wiring. The present controls were installed in 1932. The controls are at a nonstandard voltage of 550 VAC and have deteriorated to such an extent that it presents reliability and safety issues.

Occasionally, when isolating the headgates control circuitry, the 550 Volts remain between the lines even though the switch is supposedly open. Failure to realize this has occurred could result in an electric shock to an employee.

These controls are critical to the safe operation of the plant and failure of the controls to operate during an emergency shutdown would cause damage to generating equipment, which can result in an extended outage of a generating unit.

Head Gate Hoist Wire Rope Upgrades Corra Linn Units 1, 2 and 3

The hoist wire ropes have been in service for approximately 50 years. The industry recommends that hoist wire rope replacement be done at least every 30 years, regardless of wire rope condition. Reliable head gate operation is crucial to the day-to-day operations of the plant.

3. Transmission and Stations

General Description for the Transmission and Stations Capital Requirements

The 2005 capital requirements for Transmission and Distribution are based primarily on a "System Development Plan" (SDP) covering the twenty (20) year period (2005-2024) which was completed in 2004. This plan is a major update of 1998 Master Plan which was issued in November 1998 as the long-term plan for the Transmission and Distribution system.

The 1998 Master Plan was issued just prior to the initiation of the most significant set of reinforcements of the FortisBC bulk transmission system in several decades. That Plan identified the urgent requirement to reinforce the transmission system in both the West Kootenay and South Okanagan regions. In the six years since that planning report was issued the Kootenay 230 kV System Development Project has been completed, and the South Okanagan Supply Reinforcement Project is currently underway. The implementation of these two projects marks substantial completion of the bulk system upgrades identified in the previous planning report, and provides a solid foundation for the next stages of modernizing and improving the adequacy of the bulk transmission system throughout the FortisBC service territory.

This 20 year System Development Plan has a broader focus than the 1998 Master Plan. The new System Development Plan is a more comprehensive plan including protection and control facilities, communication facilities plus analysis of the maintenance requirements. The plan includes a long-term (20-year) study of the transmission system, a shorter (5 year) study for the distribution system, plus a review of the maintenance programs and a detailed assessment of all lines and equipment.

The System Development Plan is based on the expected load growth identified in the load forecast and the 2004 Resource Plan. It identifies necessary reinforcements and upgrades

to the bulk transmission system, the regional transmission and distribution systems, the communications and SCADA (System Control and Data Acquisition) networks, and protection systems owned and operated by FortisBC.

The Okanagan Region consisting of the Kelowna, Penticton, Oliver and Princeton areas is forecasted to experience continued customer growth. The Kelowna area in particular is forecasted to experience increasing growth in the customer base. As this area becomes more of an urban centre there is a need to address the changing requirements of the area. The load growth is driving significant transmission and distribution investments to meet the increasing demand; however, larger load centres often require a review of the total service reliability. The System Development Plan recognizes this need and outlines a transmission system development program to meet both the increasing loads and level of reliability expected in large urban environments.

The Kootenay Region which includes Castlegar, Crawford Bay, Creston, Grand Forks /Boundary, Kaslo, Slocan and Trail Areas has a much lower forecasted load growth than the Okanagan Region. In this area the deterioration of plant and the aging infrastructure is driving the rebuild of much of the system.

The new plan shows a significant shift in the long-term plans for some Areas in this Region. For example, the original plans for the Grand Forks/Boundary area included rebuilding of legacy (older deteriorated) substations and rebuilding of much of the old infrastructure. The current plan is to construct two substations supplied from the high voltage transmission lines and supply the Boundary loads from a new distribution backbone. This plan removes the need to rebuild the sub-transmission lines and associated legacy substations. The overall impact of the new plan is a lower total capital cost, increased ability to serve new customer growth, increased reliability, and fewer facilities to maintain.

The situation in the remainder of the Kootenay Region does not support the elimination of the sub-transmission system as is the case in the Boundary area. The distances between substations are too great to allow a distribution system to replace the sub-transmission system. As a result, rebuilding some of the older transmission facilities plus improving the reliability at the Lambert (Creston area) substation will meet the Region's needs for both capacity and reliability.

A complete review of the maintenance plans and equipment condition was undertaken as part of the System Development planning process. The results of this review showed the current maintenance cycles were appropriate. The plan documents both the age and condition of the facilities and recommends capital spending levels to adequately maintain the safety and reliability of the system. The recommended levels are based on a combination of condition based analysis and criticality of facilities.

The System Development Plan identifies more than 100 projects to be implemented between 2005 and 2010 at a total estimated cost in excess of $400 million. The plan shows the current expenditure estimates and schedules for the identified projects. In order to ensure appropriate priority, the projects were prioritized and scheduled using the following six categories:

Safety

This category is weighted the highest of the variable categories to demonstrate FortisBC's commitment to worker and public safety. This category demonstrates the ability to improve safety by doing the project.

Public Impact

Public Impact is a measurement of the quantity of customers affected by the project.

Restoration Time

This category demonstrates the reliability improvement value of the project as measured by outage duration or restoration time.

Thermal Capacity

This category demonstrates the risk of equipment failure due to overload as measured by the percentage of overload compared to manufacturer rating of the equipment.

System Effect of Failure

This category demonstrates the consequence to the system if a system element failure were to occur without doing the project.

Voltage Related

This category (similar to the Thermal Capacity category) quantifies the power quality as measured by customer voltage level that is driving the project.

Further details of the prioritization system can be found in Section 1.1 and Appendix C-5 of the System Development Plan.

The following table shows the Transmission and Stations Capital Plan for 2005.

Table 9.3.1
Transmission and Stations Capital Plan - 2005
($000)

		2005 Expenditures	Future Expenditures	Total
1	**TRANSMISSION & STATIONS**			
2	**Growth**			
3	Kootenay 230 kV SDP	(3,133)	-	(3,133)
4	South Okanagan SRP	38,809	3,478	42,287
5	Kelowna Area Upgrade	8,105	2,758	10,863
6	Big White Supply	3,000	21,500	24,500
7	Ellison Distribution Source	250	8,000	8,250
8	Black Mountain Distribution Source	250	7,000	7,250
9	Fault Level Reduction	1,000	1,000	2,000
10	Waterford Upgrade	1,700	-	1,700
11	Naramata Rehabilitation	2,000	1,250	3,250
12	New East Osoyoos Source	250	5,500	5,750
13	Kettle Valley Distribution Source	150	7,500	7,650
14	**Subtotal Growth**	**52,381**	**57,986**	**110,367**
15				
16	**Sustaining**			
17	Transmission Line Urgent Repairs	300	-	300
18	Right of Way Enhancements	250	-	250
19	Right of Way Reclamation	70	-	70
20	Transmission Line Condition Assessment	700	-	700
21	9 Line & 10 Line Rehabilitation	500	-	500
22	18 Line Rehabilitation	50	-	50
23	19 Line Rehabilitation	900	-	900
24	25 Line Rehabilitation	500	-	500
25	29 Line Rehabilitation	100	-	100
26	30 Line Rehabilitation	500	-	500
27	42 Line Rehabilitation	100	-	100
28	43 Line Rehabilitation	250	-	250
29	73 Line Rehabilitation	500	-	500
30	32 Line Rehabilitation	3,500	-	3,500
31	Switch Additions	400	-	400
32	Station Condition Assessment & Minor Projects	950	-	950
33	Ground Grid Upgrades	250	-	250
34	Station Urgent Repairs	300	-	300
35	10/12 MVA Mobile Upgrade	300		300
36	Computerized Maintenance Management System	500	200	700
37	Bulk Oil Breaker Replacement Program	500	-	500
38	Transformer Oil Replacement	250	-	250
39	Transformer Load Tap Changers Oil Filtration Project	150	-	150
40	West Osoyoos Transformer Rehabilitation	100	-	100
41	Grand Forks Terminal Noise Reduction	150	-	150
42	Load Tap Changer Upgrades	600	-	600
43	Kootenay Mobile Station	2,000	-	2,000
44	**Subtotal Sustaining**	**14,670**	**200**	**14,870**
45	**Subtotal**	**67,051**	**58,186**	**125,237**
46	**AFUCD & Loadings**	6,114	5,306[(1)]	11,420
47				
48	**Total**	**73,165**	**63,492**	**136,657**

(1) estimate based on 2005 forecast ratio.

Listed are further details of the project contained in the 2005 plan.

Growth Projects

Kootenay 230 kV System Development Project

The Kootenay 230 kV System Development Project was approved through Certificate of Public Convenience and Necessity G-46-02. The project involved the construction of a 230 kV transmission circuit connecting BC Hydro's Kootenay Canal Generating Station with Columbia Power Corporation's (CPC) new Brilliant Terminal Station (BTS) and the new Warfield Terminal Station (WTS). The project also involved salvage of most of the deteriorated 63 kV transmission lines in the West Kootenay between South Slocan and Trail, along with salvage of the deteriorated Warfield and Tadanac substations. The credit showing in 2005 is the result of the following credits:

- $3.0 million TeckCominco contribution to Warfield Terminal Station and transmission capacity
- $0.4 million Columbia Power Corporation contribution to Brilliant Terminal Station
- $0.8 million in copper credits from salvaged conductor.

These credits are offset by $1.1 million expenditure on 63 kV line consolidation, distribution cleanup and upstream switchyard work.

South Okanagan Supply Reinforcement Project

The South Okanagan Supply Reinforcement Project was approved in 2004 by Certificate of Public Convenience and Necessity No. C-3-04. This system reinforcement is required to address three near-term supply constraints.

- For an outage of 73 Line (which connects the South Okanagan and the North Okanagan) in the winter of 2005/06, load shedding at Penticton would be required.

- For an outage of 11 Line (which connects the South Okanagan and the Kootenay area) in the winter of 2006/07, load shedding at Penticton would be required.

- The inability to supply the Kelowna load center from BC Hydro's Vernon terminal in the winter of 2006/07.

In addition to the items noted, as the load in the North Okanagan region has increased, the supply available for the South Okanagan from BC Hydro's Vernon Terminal Station has decreased, causing supply difficulties in the Penticton area. The central feature of this project is the new 500/230/161 kV Vaseux Lake Terminal Station north of Oliver. The project also contains significant improvements to the Mawdsley Terminal Station in Warfield, the Grand Forks Terminal Station, the Oliver Terminal Station and the RG Anderson Terminal Station in Penticton in order to allow the meshed operation of 11 Line, 40 Line and 76 Line, thereby delivering significant reliability benefits to the Boundary area.

The project was approved in 2004 by Certificate of Public Convenience and Necessity No. C-3-04 for a cost of $75.9 million (AFUDC and loadings included) and will be completed in early 2006. The major elements will be in service for the winter peak of 2005/06. Excluding loading and AFUDC, 2005 expenditure is estimated at $38.8 million for 2005.

Kelowna Area Upgrade

The Kelowna Area Upgrade Project was approved through Certificate of Public Convenience and Necessity No. C-1-04 in 2004. The purpose of the project is twofold: to increase Kelowna area capacity to keep pace with load growth, and to improve area reliability. The entire Kelowna area load is presently supplied by two 230/138 kV terminal transformers, operating in parallel, at the Lee Terminal in the north-east area of Kelowna. This existing capacity will be insufficient by summer of 2005. In addition, reliability is compromised at FA Lee Terminal by the present switchyard configuration

and by inadequate transformer and bus protection, which under certain fault conditions results in momentary outages to the entire city.

A new transformer at the DG Bell Terminal in the South area of Kelowna will achieve the capacity increase. Reliability improvement will be achieved through supply diversity created by the location of the new transformer, and by significant upgrades to the existing 138 kV bus configuration and protection systems at the FA Lee Terminal. This project also addresses miscellaneous safety and condition related issues at both stations.

This project was approved in March 2004 through Certificate of Public Convenience and Necessity No. C-1-04 for a cost of $14.7 million. The cost of the project is distributed over three construction seasons: 2004 ($2.8 million), 2005 ($8.1 million) and 2006 ($2.8 million) AFUDC and Loadings are not shown in the 2005 and 2006 numbers. The DG Bell portion of project is scheduled to be completed by June 2005.

Big White Supply

The Big White Village and Ski Resort is located approximately 60 kilometres southeast of Kelowna and has experienced significant but sporadic development during the last decade. Load growth during the past two years has averaged nearly 20% and this growth resulted in a winter 2003/2004 peak that exceeded the existing feeder capacity. Strong load growth is expected to continue for several years.

Two radial 25 kV distribution feeders, in double circuit configuration, serve the Joe Rich Valley and Big White areas from Joe Rich Substation. The upper circuit has been upgraded in recent years and serves customers along Highway 33 south from the substation to the Idabel and McCullough Lake areas, and to Big White, while the lower 11.3 kilometre circuit supplies the Joe Rich Valley load for that distance from the substation. The capacity of the upper circuit will be exceeded during the 2005-06 winter season due in part to load growth and in part to the distance of Big White from the supply source at Joe Rich Substation. Concurrently, the distribution system at Big White has reached its capacity due to rapid development. The Company is investigating several options to meet the expected demand, including local generation, Demand Side

Management potential, and line options of various voltages. Distribution options are also being considered.

The Project will benefit area customers by assuring supply to meet the immediate and long-term demands of growth at Big White, reducing the frequency and duration of outages, and improving the consistency and reliability of voltage. The cost of the project estimated at $24.5 million is distributed over three years, 2005 ($3 million), 2006 ($5.5 million) and 2007 ($16 million). **An application for a Certificate of Public Convenience and Necessity will be filed for this project in 2005**.

For details refer to Section 3.1.4.1 of the System Development Plan.

Ellison Distribution Source

The northern portion of Kelowna has grown at an unprecedented rate during the past three years creating a capacity shortfall with the present distribution supply. A new substation is required in the area between Sexsmith substation and Lee Terminal station to meet the forecasted distribution demand and to offload these stations.

The Sexsmith distribution substation is a 138/13 kV single 32 MVA transformer station with 4 feeders. The 2004 summer load at Sexsmith was 27 MVA or 84% of transformer rating. This substation supplies a large area of north Kelowna including Glenmore Valley to the west, sections of Hwy 97 including the Okanagan University and Kelowna International Airport to the north, and Old Vernon Road to the east and north.

Residential developments currently underway and planned in the Clifton/Glenmore Highlands and South and North University areas (6,000 residential units) will add approximately 1.6 MW's of load to this substation per year. This does not include the number of units to be developed in the McKinley Landing area which has not been determined at this point. This will result in capacity limits of Sexsmith being reached as early as 2008. In addition, failure of this single transformer would result in unacceptable

long-term outages to over 60% of the load currently fed by this substation based on current backup capabilities.

A feeder tie from Sexsmith to Duck Lake can mitigate the shorter term overload issue (see Appendix 8, page 2), however, the long-term capacity solution requires an additional transformer be installed in the area. Both the long-term capacity and backup limitations at Sexsmith could be addressed by adding a second transformer at Sexsmith itself. However, with the emerging load center in the North/South University area, the recommended solution is to position an additional source at this new load center allowing offloading of some 15 MVA of existing load plus planned development in this area. Sexsmith substation would then be utilized in conjunction with Glenmore substation to address the current load and growth in the Clifton/Glenmore Highlands development area.

The initial substation construction will include a single 32 MVA transformer with four feeder terminations. Two feeders will head south towards Sexsmith, one along Hwy 97 supplying the Airport and University area, and the other south along Old Vernon Road. The third feeder will be the original tie to Duck Lake substation. A future fourth feeder would head west to the McKinley area, then south to create another tie with Sexsmith.

The Ellison Substation project is planned for the 2006/07 budget for $8.25 million. The expenditures of $250,000 in 2005 is for acquisition of property for the new substation.

For details refer to Section 3.1.4.2 and Appendix B of the System Develop Plan.

Black Mountain Distribution Source

The east portion of Kelowna around Black Mountain has seen significant growth during the past three years. Current forecasts show a capacity shortfall with the present distribution supply in 2008. A new substation is planned near the existing 138 kV tap to Joe Rich substation on 51 Line from Lee Terminal station to meet the forecasted distribution demand. This substation will offload Lee and Hollywood substations.

The Black Mountain Substation project is planned for the 2008 budget for $7.25 million. The expenditures of $250,000 in 2005 is for acquisition of property for the new substation. The advanced timing for this property acquisition relates to concerns with respect to property availability and cost at some future date.

For details see Section 3.1.4.3 and Appendix B of the System Development Plan.

Fault Level Reduction

Recent system analysis has determined that fault levels on the distribution busses at several Kelowna area substations are greater than 150 MVA and require immediate remedial action to minimize the safety risk to employees and the general public. Once the fault levels exceed the rating of substation and distribution equipment, the risk of catastrophic failure becomes a possibility.

Levels will continue to increase with the completion of the present Kelowna Area Upgrade project that will add sub-transmission capacity at 138 kV to the Kelowna area.

Remedial action will entail installing current limiting reactors at various stations.

The fault level reduction project is required to reduce substation fault levels at various stations in the Kelowna area to reduce safety risk to workers and the public. This project is planned for the 2005/06 budgets for $2.0 million, split over two years with $1.0 million planned for 2005 and $1.0 million planned for 2006. The first year will correct the highest fault levels with the remainder being completed in 2006. This project is planned over two years to minimize the impact of outages to customers. Installation of the reactors will require substation outages affecting some of the customers supplied from each substation.

For details see Section 3.1.4.4 of the System Development Plan and Appendix 2.

Waterford Upgrade

This project involved the replacement of an existing 15 MVA transformer at Waterford Substation with a 25 MVA unit to accommodate the load growth on the 13 kV system in the City of Penticton.

During 2003/04 the load at the substation reached capacity (95% of transformer nameplate rating) as defined in the City of Penticton supply contract. This growth is the result of upgrades by the City of Penticton and conversion of loads from 8 kV to 13 kV.

The Waterford substation upgrade will benefit the City of Penticton customers by assuring supply to meet the immediate and long-term demands of growth in the south area of the city, reducing the frequency and duration of outages, and improving the consistency and reliability of voltage.

The estimated cost for this project is $1.7 million.

Naramata Rehabilitation

Naramata substation has been identified as one of the legacy stations requiring a rebuild at a new site due to deterioration of the equipment and station facilities and lack of property at the site to accommodate further customer load growth. The mobile substation, which is required for station maintenance and emergency supply, cannot be parked at the existing substation and no further property can be acquired at the existing site. The substation needs excessive rehabilitation of the 63 kV switching facilities, 13 kV switchgear, station civil and station security. This rebuild is required in order to minimize customer outages and to reduce risk of personal injury and equipment failure.

This substation project is planned for the 2005/06 budget for $3.25 million, split over two years: with $2 million in 2005 and $1.25 million in 2006. In 2005, land for the substation site will be purchased, engineering completed, and the site will be prepared for transformer delivery. In 2006, the transformer will be delivered and commissioned.

For details see Sections 3.2.4 and 3.2.4.1 of the System Development Plan and Appendix 3.

New East Osoyoos Source

The east side of Osoyoos has grown at an unprecedented rate during the past three years creating a capacity shortfall with the present distribution supply across the causeway. The existing west Osoyoos substation is at capacity but upgrade costs can be avoided with the new east Osoyoos substation installation.

A new substation is required east of the causeway due to the fact the Company cannot increase the feeder capacity across the causeway in order to meet the forecasted demand. This new substation will be supplied from a proposed Bentley Terminal station near Oliver.

This Osoyoos East Substation is required to increase distribution capacity at the east side of Osoyoos. This substation project is planned for 2006/07 with a total budget of $5.75 million. The expenditure of $250,000 in 2005 is for acquisition of property for the new substation.

For details see Sections 3.3.2, 3.3.4.2 and Appendix B of the System Development Plan.

Kettle Valley Distribution Source

This project involves the construction of a new distribution source substation in the Rock Creek area (Kettle Valley). The analysis of the Grand Forks – Boundary Area (see Section 4.4 and 4.4.4 of the System Development Plan) has identified that due to the growing area loads and the deteriorated condition of 9 Line and 10 Line between the South Okanagan and Kootenays and the deteriorated condition of the three 63 kV distribution source substations in the area, significant upgrading is required.

The initial assessment shows that the most cost effective solution over the long-term is to construct two new 161/25 kV distribution sources and retire the existing facilities. One

will require new property in the Rock Creek area (Kettle Valley) while the other will reside at the existing Grand Forks Terminal.

The 2005 planned expenditure of $150,000 is for the acquisition of property for the substation site. The new substation which is estimated to cost approximately $7.65 million in total will be constructed in 2006.

For details see Sections 4.4.2, 4.4.4.1 and Appendix B of the System Development Plan.

Sustaining Projects

Transmission Line Sustaining Projects

FortisBC has approximately 45 transmission lines consisting of 1460 km of line and approximately 16,000 poles. Approximately 65% of these lines are more than 30 years old. The transmission line sustaining projects are required for rehabilitation and ongoing upgrades of the transmission system to ensure safe, reliable service.

Transmission line sustaining programs and projects planned for 2005 include:

Table 9.3.2
Transmission Line Sustaining Programs - 2005
($000s)

1	Transmission Line Urgent Repairs	300
2	Right of Way Easements	250
3	Right of Way Reclamation	70
4	Transmission Condition Assessment	700
5	Transmission Line Rehabilitation	3,400
6	32 Line Rebuild	3,500
7	Switch Additions	400

Transmission Line Urgent Repairs

The urgent repair project is required to replace transmission line facilities that fail in service due to severe weather, vandalism or for other unexpected reasons. The estimate for this project is based on historical information. The following table shows the expenditures for the past four years and plan 2005:

Table 9.3.3
Transmission Line Urgent Repairs
($000s)

Year	**2001**	**2002**	**2003**	**2004F**	**2005**
Cost	102	280	550	174	300

Right of Way Enhancements

This project is required for acquiring rights of ways and easements for power systems that cross over a customer's property. The estimate for this project is based on historical information. This project has historically been used to obtain easements to remove existing trespass situations. Easements for new projects are obtained as part of the new project and are not included in this project. In 2005 we plan to address access issues with respect to existing rights-of-way. Many of the transmission lines have no road access to sections of the right-of-way. Access to these lines is required for operations and maintenance of these lines. The following table shows the expenditures for the past four years and plan 2005:

Table 9.3.4
Right of Way Enhancements
($000s)

Year	2001	2002	2003	2004F	2005
Cost	40	-	153	53	250

Right of Way Reclamation

The reclamation project is required to allow FortisBC to remove trees and expand the tree free zone around the transmission lines. The expanded tree free zones increase clearances improving both safety and reliability of the transmission system. The trees included are ones that FortisBC can economically remove versus cycle trim or brush. The estimate for 2005 is based on historical information. The following table shows the expenditures for the past four years and plan 2005:

Table 9.3.5
Right of Way Reclamation
($000s)

Year	2001	2002	2003	2004F	2005
Cost	47	68	18	53	70

Transmission Line Condition Assessment – Life Extension

The transmission line assessment program is based on an eight-year cycle that patrol and test all of FortisBC's transmission line facilities. The program consists of a pole-testing program involving drilling test holes in each pole to confirm the condition of the pole, addition of a pole treatment to reduce internal rot in the pole, and placement of a pole wrap to reduce surface rot on the pole at ground line. The program extends the life of the pole plus ensures the integrity of the lines as well as employee and public safety. The program is managed in an eight-year cycle to levelize both budgets and resources for testing and treating approximately 2000 poles per year. The estimate for this project is based on historical information. The following table shows the expenditures for the past four years and plan 2005:

Table 9.3.6
Transmission Line Assessment-Life Extension - 2005
($000s)

Year	2001	2002	2003	2004F	2005
Cost	1,705	1045	709	1498	700

Transmission Line Rehabilitation

The specific rehabilitation projects for various lines involve expenditures for structural stabilization of the transmission lines that were identified for rehabilitation in previous year's assessments. Included in the scope of work are replacement of cross-arms and poles, maintenance of structures, and some minor rehabilitation (e.g. insulator changes and guy wire changes).

In 2005 the Company will undertake rehabilitation on ten transmission lines with a planned expenditure of $3.4 million. The budget for each line is based on the condition assessment completed in 2004. For further details on this project see Appendix 4.

32 Line Rehabilitation

The condition assessment on 32 Line has indicated a need to do significant rebuilds for several years. Now that the System Development Plan has clearly shown that 32 Line will remain a 63 kV line the decision to extend the life of the existing line rather rebuild it to a higher voltage allows completion of the condition assessment work. Failure of several poles has increased the safety concerns adding additional drivers to completing this work in 2005.

Inspection of 32 Line has identified that the poles, cross-arms and hardware are in poor condition. This line was built in 1951. In the past four years, FortisBC has spent approximately $1.3 million to rehabilitate sections of the line. This proposed expenditure will complete a major upgrade on the whole line.

The 32 Line rebuild project involves expenditures for structural replacement of the line from Crawford Bay to Wynndel to AA Lambert Terminal station in Creston. Included in the scope of work are replacement of cross-arms, poles and all attached hardware for this line. The conductor is in acceptable condition; however, the sag is excessive in many places and will need to be adjusted.

The cost to rebuild 32 Line in 2005 is estimated at $3.5 million. For further details see Appendix 5.

Switch Additions

This project involves the installation of a vacuum interrupter on Keremeos-43 Line switch at Keremeos and the replacement of the existing disconnect switches along 20 Line/27 Line at Glenmerry, Beaver Park and Ymir Substations.

The disconnect switch at Keremeos is currently not capable of breaking load or interrupting line-charging current and is subjected to arcing problems when the line is de-energized with the circuit breaker open at the Oliver end.

The existing disconnect switches along 20 Line/27 Line are neither capable of switching load nor can they be remotely operated from System Control Centre. Field staff must carry out most circuit switching with the lines de-energized thus increasing the duration of outages.

Installing the vacuum interrupter at Keremeos substation will allow sectionalizing of 43 Line without an outage at the Keremeos substation.

The replacement of the existing disconnect switches along 20 Line/27 Line with new motor operated disconnect switches capable of breaking load will enhance sectionalizing ability and shorten outage duration during contingency conditions by providing remote controlled switching capability.

The cost of this project in 2005 is estimated at $400,000.

Station Sustaining Programs and Projects

The station sustaining projects involve the rehabilitation and ongoing upgrades of the substation system. These projects are necessary to ensure continuous service of the substation system, which includes all equipment (transformers, breakers, batteries, ground grids, etc.)

Table 9.3.7
Station Sustaining Programs and Projects - 2005
($000s)

1	Station Assessments & Minor Planned Projects	950
2	Ground Grid Upgrades	250
3	Station Urgent Repairs	300
4	10/12 MVA Mobile Upgrade	300
5	Computerized Maintenance Management System (CMMS)	500
6	Bulk Oil Breaker Replacement Program	500
7	Transformer Oil Replacement;	250
8	Load Tap Changer Oil Filtration Project	150
9	West Osoyoos Transformer Rehabilitation	100
10	Grand Forks Terminal Noise Reduction	150
11	Load Tap Changer Upgrades.	600
12	Kootenay Mobile Station	2,000

Station Assessments and Minor Planned Projects

The Station condition assessment program reviews the safety and reliability issues at the Company's 63 transmission and distribution stations on a ten year cycle. The work resulting from the condition assessments is then planned for the following year as Station Minor Planned projects.

Listed are the planned projects for 2005.

Kootenay Stations projects:

- Replace fusing at Creston because the existing ones are difficult to operate and create a safety hazard.
- Replace ground mats under switches at Beaver Park because the existing ones are deteriorated.
- Replace the low voltage structure at Crawford bay because the existing structure is stressed and may break.
- Replace the insulation and transformer bushings at Passmore because they have been vandalized.
- Install a bypass system at Creston for operating one transformer and maintaining the system.
- Stub or replace a number of failed poles in the Creston substation.
- Install a mobile substation connection site for Salmo substation.

Okanagan Stations Projects:

- Replace transformer bushings at Pine Street because they are leaking
- Replace transformer bushings at RG Anderson because they are leaking
- Fix numerous issues at Okanagan falls such as rebuild switches and breaker structures to maintain clearances.
- Replace insulators and switch stops at Hollywood because they are over traveling
- Remove the Capacitive trip device at Kaleden and replace with a battery system because the devices are a safety hazard.
- Install a mobile connection system at Kaleden
- Replace West Bench recloser controllers because the existing ones are failing and obsolete.

The following table shows the expenditures for the past four years and plan 2005:

Table 9.3.8
Okanagan Stations Projects
($000s)

Year	2001	2002	2003	2004F	2005
Cost	2,134	362	628	607	950

Ground Grid Upgrades

During the condition assessment project, the stations have a ground grid assessment completed by a specialized testing group. The ground grid upgrades project is to attend to any grid rehabilitations that were identified in the tests from previous years. The stations included in this project in 2005 are Beaver Park, Waterford and Okanagan Falls. The estimate for this project in 2005 is $250,000.

Station Urgent Repairs

The urgent repair project is required to replace station equipment that fail in service due to severe weather, vandalism, or other unexpected reasons. The estimate for this project is based on historical cost. The following table shows the expenditures for the past four years and plan 2005:

Table 9.3.9
Station Urgent Repairs
($000s)

Year	2001	2002	2003	2004F	2005
Cost	220	244	346	238	300

10/12 (MVA) Mobile Upgrade

This project involves the rehabilitation of the Company's existing 10/12 MVA mobile substation to bring it up to proper electrical and mechanical safety standards, and, to extend its useful life. This rehabilitation is necessary to reduce risk of personnel injury and equipment failure, and minimize outage duration to customers resulting from planned or emergency station work.

The work required on the unit includes the following upgrades:

- The present 63 kV Motor Operated Disconnect (MOD) switches requires replacement.

- Motor operator drive gear shaft is worn resulting in gears not meshing correctly.
- The mechanical isolation lever and associated hardware is beyond repair
- Replacement parts are very difficult to obtain. Machining them was required in some cases.
- Switch pole base bearings are worn to a point where excessive play is present which has resulted in poor inter-pole timing.
- At present the operator is situated mid-span directly under the switch. This poses a potential problem from an operational and safety perspective. The LV breaker should be replaced based on the following:,
- The present KSO breaker is a high maintenance unit.
- The closing mechanism and latching mechanism have been troublesome and replacement parts are basically non existent.
- Because it is a bulk oil breaker, the environmental impact is greater if a spill was to occur during transport. (this unit is not sealed).
- Installing a minimum oil or vacuum type unit would greatly reduce the weight over the front end of the trailer
- There is greater reliability with a new unit.

Existing secondary switching facilities control and metering have reached end of life and require replacement with modern programmable protection to optimize coordination at various FortisBC substation locations.

The estimate for this project in 2005 is $300,000.

Computerized Maintenance Management System (CMMS)

FortisBC has a significant investment in generation, transmission and substation assets. The Company requires an enhanced maintenance management system to properly maintain the equipment and ensure system reliability. FortisBC's current system does not track maintenance notifications, identify deficiencies or schedule maintenance of the assets. The proposed system is a tool that tracks assets and identifies what condition will cause equipment to require maintenance. It stores maintenance history and schedules

future maintenance work accordingly. All analysis techniques, maintenance tasks and maintenance schedules are triggered from the management system. The total estimate for this project is $700,000 with planned expenditure of $500,000 in 2005. For further details see Appendix 6.

Bulk Oil Breaker Replacement Program

The Company has a total of 14 bulk oil circuit breakers that are 1927 to 1968 vintage. All are showing signs of significant wear and deterioration. Replacement parts are no longer available and some breakers are leaking oil that will require lengthy and costly outages to repair.

This program will see the replacement of these breakers over the course of the next ten years with modern SF6 breakers. By replacing two of the most critical breakers, spare parts will be available for the remaining breakers, allowing a timely replacement of the remaining breakers as identified by the condition based program. Planning replacement over a number of years ensures the equipment can be properly assessed and replaced only when the breaker's condition or ratings require replacement.

In 2005 breaker replacement will take place at Coffee Creek Terminal Station. Both breakers have reached the end of their service life. One was acquired in 1950 and the other in 1951. Routine maintenance in 2000 identified that both breakers need to be replaced. The estimate for this project in 2005 is $500,000.

Transformer Oil Replacement

Transformer oil is one of the major insulation components of the power transformer. Under normal loading conditions the transformer oil in an operating transformer will maintain its integrity for 50 percent of the transformer life or approximately 20 years. Transformer oil analysis and replacement or reconditioning is a normal industry practice deemed necessary to maintain reliable service and to maximize the life of the unit. In 2005, the Company will undertake oil replacement or reconditioning at nine transformers at a cost of approximately $250,000.

The condition assessment of transformer oil identified a need to replace or recondition the oil in the following transformers in 2005:

- Pine Street Transformer 2
- Joe Rich Transformer 1
- Hollywood Transformer 3
- Keremeos Transformer 1
- Coffee Creek Transformer 1
- Coffee Creek Transformer 2
- Huth Transformer 7
- Oliver Transformer 1
- Oliver Transformer 2

Transformer Load Tap Changers Oil Filtration Project

The operation of transformer load tap changers result in coke deposits on the contacts and switches. This coking is a result of the carbon deposits caused by the arcing of the connection and disconnection of the contacts. This carbon resides in the oil until it saturates and then forms a high resistance path (coke) on the contacts, which causes heating and pitting of the contacts.

This project involves installation of permanent oil filtration systems on the six tap changers listed, in 2005. This will extend the life of the transformer and increase the cycle time to maintain the tap changer.

Okanagan

- RG Anderson Transformer 1
- Hollywood Transformer 1
- Hollywood Transformer 2
- Trout Creek Transformer 1

Kootenay

- Playmor Transformer 1
- Coffee Creek Transformer 1

The estimated expenditure for this project in 2005 is $150,000.

West Osoyoos Transformer Rehabilitation

The two transformers in the Osoyoos substation were manufactured in the mid 1970s by Moloney. This vintage of transformer is prone to barrier board breaks between the load tap changer and the transformer main tank. This causes arcing gases from the tap changer to migrate to the transformer main tank which may eventually result in transformer failure.

This project involves the rehabilitation of these transformers to correct these defects which will ensure safe and reliable operation. The estimate for this project in 2005 is $100,000.

Grand Forks Terminal Noise Reduction

This project involved the installation of industry proven sound absorbing walls on 2 sides of the 161-63 kV transformer located in the Grand Forks Terminal Station to reduce the transformer's noise level as heard by the surrounding customers.

Verbal and written correspondence from customers expressing concern over the noise levels of the substation escalated in 2003 and resulted in complaints to the BC Utilities Commission. The Commission accepted the conclusion of the acoustical study performed by HFP Acoustical Consultants Corp. on behalf of the company. The study suggested that in comparison with industry standards for noise measurements, the noise levels were not excessive. The Commission further stated that if the developer or community wished to pursue and pay for mitigation measures to lessen the noise that the Commission would encourage FortisBC to work with them to develop a mutually acceptable solution.

In working with the community, FortisBC engaged an engineering firm (PowerNex) to identify alternatives to mitigate the noise. Ongoing consultations have heightened the Company's awareness that the tonal characteristics of the transformer noise can be particularly intrusive to some members of the public. As a result, it is FortisBC's judgment that the noise impact should be mitigated.

The estimate cost of this project for 2005 is $150,000.

Load Tap Changer (LTC) Upgrades

FortisBC has a number of transformers in which the tap changers are high maintenance because the internal contacts are under rated. This is a known manufacturing issue. There are contact replacement kits available for these units which increase the rating of the tap changer from 800 amps to 1,200 amps. This upgrade will significantly reduce the contact wear because they can handle more current flowing through them. FortisBC has had good success installing these upgrades in the past and history proves these retrofits are successful in improving the performance of the equipment and extending the life of the tap changers.

This project involves upgrading four tap changers in 2005 as well as the installation of new piping and level gauges at two other stations. The estimate for this project in 2005 is $600,000.

Listed are the locations where projects will occur in 2005.

- Pine Street Transformer 1 – Upgrade load tap changer to 1200 amps and replace barrier boards.
- TRC Transformer 1 – Upgrade load tap changer to 1200 amps and replace barrier boards.
- Princeton Transformer 2 – Upgrade load tap changer to 1200 amps and replace barrier boards.

- Princeton Transformer 3 – Upgrade load tap changer to 1200 amps and replace barrier boards.
- Lee Transformer 4 – Separate the conservator tanks and install new piping and level gauges.
- Grand Forks Transformer 1 – Separate the conservator tanks and install new piping and level gauges.

Kootenay Mobile Station

Mobile stations are utilized during emergency situations for power restoration by providing a temporary power supply during customer outages, and are also used for maintaining reliability through bypassing existing stations undergoing maintenance.

The existing Kootenay mobile station was purchased in 1957. The 35 foot trailer bed has reached end of life. Trucking firms refuse to haul the unit due to mechanical condition, and Fleet Services will no longer certify it roadworthy. The power transformer was also acquired in 1956 and is past its useful life. Its use is limited because it is too small to handle most of the Kootenay area loads. Existing secondary switching facilities (bulk oil filled) have reached end of life and are unserviceable due to unavailability of spare parts. This creates a high-risk condition for protection coordination failure and switching failure. Existing secondary control and metering equipment is obsolete.

The Kootenay 6.5 MVA mobile will be replaced with a 20/24/30 MVA unit with 63 kV primary and 13 kV/25 kV secondary, and breaker protection. The increasing loads in the Kootenay region require this greater capacity to fully back up the higher loads. Analysis of the regional back up requirements supports the larger mobile to replace the old mobile. This project has an estimated cost of $2.0 million, with completion expected within the fourth quarter of 2005.

For more details on this project see Appendix 7.

4. Distribution

Growth Projects

The 2005 Capital Plan for distribution consists of three major project categories. The first involves projects to provide service to new customers (Customer Connects). During the past few years, increasing economic development in the FortisBC service territory has initiated significant growth in both the residential and commercial customer base.

The second category which is very closely linked to customer connects is designated Distribution Growth. The projects in this category are driven by normal load growth that over a period of time requires capacity upgrades or additions to lines in order to meet acceptable legislated and industry standards.

The third category called Distribution Sustaining Projects are those projects necessary to rehabilitate or upgrade distribution lines in order to ensure employee and public safety and reliable customer service.

Table 9.4.1
Distribution Projects
($000s)

		2005 Expenditures	Future Expenditures	Total
1	**DISTRIBUTION**			
2	**Growth**			
3	New Connects	4,561	-	4,561
4	Creston Distribution Upgrade	2,000	2,000	4,000
5	Duck Lake to Sexsmith Tie	450	-	450
6	Glenmore to Sexsmith Tie	85	-	85
7	Quail Development Loopfeed	200	-	200
8	Dilworth Development Loopfeed	200	-	200
9	Extend Okanagan Feeder	600	-	600
10	Kelowna Feeder Protection Upgrades	150	-	150
11	West Bench - Voltage Regulators	85	-	85
12	Osoyoos - 02 Upgrade	350	-	350
13	East Osoyoos Feeder 4	650	-	650
14	Convert Baldy Distribution	650	-	650
15	West Trail Conversion	300	-	300
16	Passmore Feeder 2 Capacity Increase	950	-	950
17	Unforeseen Capacity Issues	500	-	500
18	**Subtotal Growth**	**11,731**	**2,000**	**13,731**
19	**Sustaining**			
20	Distribution Line Condition Assessment and Rehabilitation	1,950	-	1,950
21	ROW Reclamation	565	-	565
22	Distribution Line Rebuilds	750	-	750
23	Small Planned Capital	535	-	535
24	Forced Upgrades and Line Moves	500	-	500
25	Distribution Urgent Repair	1,000	-	1,000
26	PCB Program	750	-	750
27	Glenmerry Underground Rebuild	2,000	-	2,000
28	**Subtotal Sustaining**	**8,050**	**-**	**8,050**
29	**Subtotal**	**19,781**	**2,000**	**21,781**
30	AFUDC and Loadings	1,276	129[(1)]	1405
31	**TOTAL**	**21,057**	**2129**	**23,186**

(1) estimate based on the ratio of AFUDC to subtotal cost for 2005 expenditures.

New Connects System-Wide

This project is required to fund the installation of new electric services requiring additions to FortisBC overhead and underground facilities. These capital expenditures allow FortisBC to meets its obligations to serve customers in its service area.

All costs except the transformer, drop service and metering equipment (as set out in Section 74 of FortisBC's terms and conditions of service) are charged to the customer as a Contribution In Aid of Construction. This project will also fund any "forced upgrade" costs associated with upgrading FortisBC facilities to provide service for the extension or drop service.

The cost of new connects is based on projected customer growth, average CIAC and historical forced upgrade costs.

Table 9.4.2
New Connects System-Wide
($000s)

1	Estimated total cost	9,123
2	CIAC (Contribution in Aid of Construction)	(4,562)
3	**Net of CIAC**	**4,561**

Creston Distribution Upgrades Related to Lambert Terminal

The Creston area consists of the towns of Creston and Wynndel, with approximate populations of 8,000 and 900 respectively. Each has its own substation fed from Lambert, a 230 kV to 63 kV terminal. The Wynndel station needs major renovations, and the Creston station's two transformers and four feeders are loaded to the extent that load cannot be shifted during scheduled maintenance or outages. The Creston station is also vulnerable to a complete outage if its single transmission feed from Lambert is severed.

The Creston Distribution Feeder Upgrade Project involves two areas of focus. The first requirement for the project is to provide support to the Creston Central substation, which no longer meets the area planning criteria for capacity. This will be accomplished by transferring a portion of existing Creston Central load onto the new Lambert distribution source. The second requirement is to off-load the Wynndel Substation so that it can be salvaged due to the fact that it is in an advanced state of deterioration. This will be accomplished by constructing two feeders from the Lambert distribution source to the Wynndel Substation load.

As a result of the complete reconfiguration of the distribution system in the area, protection upgrades for Creston Central Substation are also included in this project.

This project is estimated at $4.0 million, with expenditures of $2.0 million in 2005 and $2.0 million in 2006.

For details see Sections 4.3 and 4.3.5.1 of the System Development Plan.

Distribution Small Growth Projects

Normal load growth on the distribution system requires that capacity upgrades or additions to lines are implemented to provide acceptable standards of service. The detailed planning criteria and priority matrix in the System Development Plan create the justification and ranking for these projects. Standards include operation of facilities at or below normal continuous thermal limits, voltage consistent with CSA recommended levels and short circuit levels in a range to allow for safe operation of the electrical system. This item also includes projects that are necessary to maintain acceptable levels of supply during planned and unplanned outages on the distribution system. For more information on FortisBC's distribution planning criteria, see Distribution Planning Manual contained in Appendix E of the System Development Plan.

The following table outlines the distribution growth projects proposed for 2005, and the estimated expenditures: For more details on this project see Appendix 8.

Table 9.4.3
Distribution Small Growth Projects
($000s)

	Issue	Preferred Options	Cost
1	Sexsmith Capacity	Duck Lake to Sexsmith Feeder Tie	450
2	Sexsmith Capacity	Complete Glenmore Feeder 5-Sexsmith Feeder 2 Tie	85
3	Quail Capacity	Quail development loopfeed	200
4	Dilworth Capacity	Dilworth development loopfeed	200
5	OK Mission /Glenmore Capacity	Extend OK Million Feeder 5	600
6	Kelowna general tap thermal loading	General feeder protection upgrades	150
7	West Bench WEB1 Capacity	Voltage Regulator	85
8	Anarchist Mountain Capacity	Three phase, 4.4 km rebuild of OS.02	350
9	East Osoyoos Capacity	New Osoyoos Feeder 4 to East Osoyoos	650
10	Baldy Supply	Convert Baldy Distribution and supply from Rock Creek at 25 kV	650
11	West Trail Voltage Conversion	West Trail voltage conversion completion	300
12	Passmore Feeder Capacity	Passmore Feeder 2 capacity increase	950
13	Unforeseen Capacity Issues	Small Capacity improvements	500
14		**TOTAL**	5,170

Sustaining Projects

Distribution Sustaining Programs and Projects

The distribution line sustaining projects are for rehabilitation and ongoing upgrades of the distribution system to ensure safe, reliable service.

Table 9.4.4
Distribution Line Sustaining Programs and Projects - 2005
($000s)

1	Distribution Condition Assessment and Rehabilitation	1,950
2	Distribution Right of Way Reclamation	565
3	Distribution Line Rebuilds	750
4	Small Planned Capital	535
5	Forced Upgrades and Line Moves	500
6	Distribution Urgent Repairs	1,000
7	PCB Program	750
8	Glenmerry Underground Rebuild	2,000

Distribution Pole Condition Assessment and Rehabilitation

The distribution system requires a proactive program to manage the risk of employee and public safety, and ensure an acceptable level of service.

The distribution line assessment program is based on an eight-year cycle that patrol and test all of FortisBC's distribution line facilities. The program consists of a pole-testing program involving drilling test holes in each pole to confirm the condition of the pole,

addition of a pole treatment to reduce internal rot in the pole, and placement of a pole wrap to reduce surface rot on the pole at ground line. The program extends the life of the pole plus ensures the integrity of the lines as well as employee and public safety. The estimate for this project is based on historical cost. The program is managed in an eight-year cycle to levelize both budgets and resources for testing and treating the poles in the distribution system.

Extending the life of poles limits the number of new poles required and costs associated with replacement. A wood pole management program facilitates economic life extension of the wood poles in the system. The proper combination of replacement, stubbing, wrapping, and internal treatment of poles significantly reduces the incidence of rot and can extend the life of the poles from 7 to 30 years depending on the type of treatment. Pole testers condemn poles because of severe internal decay, surface rot or damage near or below ground line.

The following table shows the expenditures for the past four years and plan 2005.

Table 9.4.5
Distribution Pole Condition Assessment and Rehabilitation
($000s)

Year	2001	2002	2003	2004F	2005
Cost	1759	2750	1284	2013	1950

The condition assessment project will include the following lines in 2005.

Table 9.4.6
Distribution Line Condition Assessment Projects - 2005

	Area	Feeder Location	Poles	U/G units	O/H units
1	Kaslo	Coffee Creek 1	286	0	188
2	Trail	Cascade 2	353	5	213
3	Trail	Cascade 3	326	0	127
4	Kelowna	DG Bell 3	461	40	238
5	Salmo	Fruitvale 2	197	1	143
6	Grand Forks	Grand Forks 1	1,392	3	631
7	Kelowna	Glenmore 5	176	115	87
8	Trail	Glenmerry 1	90	0	36
9	Trail	Glenmerry 2	338	44	217
10	Trail	Glenmerry 3	122	6	74
11	Salmo	Hearns 1	8	0	4
12	Kaslo	Kaslo 2	485	2	215
13	Penticton	Naramata 2	538	5	192
14	Penticton	Okanagan Falls 1	506	15	266
15	Kelowna	Okanagan Mission 4	226	226	90
16	Trail	Paterson 1	202	0	69
17	Penticton	RG Anderson 1	229	0	90
18	Greenwood	Rock Creek 2	844	0	188
19	South Slocan	Slocan 1	6		
20	South Slocan	Tarrys 2	295	1	179
21		**TOTAL UNITS**	**7,080**	**463**	**3247**

The lines listed will be rehabilitated in 2005 based on the condition assessment completed in 2004.

Table 9.4.7
Distribution Line Rehabilitation (2005)
based on 2004 condition assessment

		Replace Pole	Stub Pole	Wrap Pole	Fixes Service Truck	Fixes Crew
	Feeder Circuit	**Qty**	**Qty**	**Qty**	**Qty**	**Qty**
1	Castlegar 1	18	10	147	0	45
2	Crawford Bay 4	0	0	0	0	1
3	Wyndell 1	1	1	0	0	0
4	Wyndell 2	1		0	1	2
5	Kaslo 1	19	20	31	20	11
6	Kaslo 2	19	0	0	37	35
7	Coffee Creek 1	8	0	0	55	21
8	Grand Forks 1	0	0	0	1	0
9	Ruckles 1	0	0	0	0	1
10	Ruckles 5	25	4	510	21	77
11	Princeton 4	1	0	0	0	0
12	Trout Creek 1	2	1	0	0	0
13	Keremeos 1	0	2	0	0	0
14	Keremeos 2	1	0	0	0	0
15	Hedley 2	1	4	16	0	3
16	Hedley 3	0	0	0	0	1
17	Hedley 4	1	0	0	8	12
18	Kelowna Open	0	0	0	1	0
19	Kelowna Pod Tie	0	0	0	1	0
20	Kelowna Blanks	1	3	0	0	0
21	Glenmore 1	2	3	0	6	14
22	Glenmore 2	0	0	0	8	8
23	Glenmore 7	0	0	0	7	0
24	Hollywood 2	0	0	0	1	0
25	Hollywood 5	1	0	0	0	0
26	Okanagan Mission 4	0	0	0	2	0
27	DG Bell 1	2	10	0	0	0
28	**2004 Patrol Totals**	**103**	**58**	**704**	**169**	**231**
29	2004 Carry Over	27	0	0	1,145	100
30	**Total Units**	**130**	**58**	**704**	**1,314**	**331**

Distribution Right of Way Reclamation

The reclamation project is required to allow FortisBC to remove trees increasing the tree free zone around the distribution lines. The increased tree free zones improve clearances improving both safety and reliability of the distribution system. The trees included are ones that FortisBC can economically remove versus cycle trim or brush. The estimate for 2005 is based on historical cost

The following points influence the distribution Right of Way reclamation program:

- The beetle problem in BC is increasing the number of dead trees that need to be removed.
- Trees are the cause of 12.6 % of outages is BC.
- Forest fires can result from a failure of one of these trees.
- Removal of these trees is considered due diligence in the industry.

The planned expenditures for 2005 are based on historical information. The following table shows the expenditures for the past four years and plan 2005:

Table 9.4.8
Distribution Line Right-of-Way Reclamation – 2005
($000s)

Year	2001	2002	2003	2004F	2005
Cost	200	555	394	432	565

Distribution Line Rebuilds

This project is required to rebuild specific safety and reliability deficiencies on the distribution system. Items include rebuilding failing conductor, replacing rotted platforms, replace leaking transformers, and installing ground grids at ungrounded services. These were identified through site assessments and normal day-to-day operations. The following table shows the expenditures for the past four years and planned 2005:

Table 9.4.9
Distribution Line Rebuilds – 2005
($000s)

Year	2001	2002	2003	2004F	2005
Cost	871	1073	1634	2486	750

The items associated with this project are listed in the following table.

Table 9.4.10
Distribution Line Rebuilds / Drivers - 2005

		Project #	Driver: (Safety, Compliance, Capacity, Reliability, Other)
1 2	Reconductor portion of Oliver Feeder 1 - small copper, mechanically stressed - 4.5 km	Oliver 1	Safety
3	Castlegar rebuild two blocks per year 2004 - 2009	Castlegar 2	Safety / Reliability
4 5	Rebuild 1 phase along 10th and 11th Ave, Keremeos between Boundary Road and 5th Street	Keremeos 2	Safety / Reliability
6	Oliver - salvage unused circuit of double circuit in downtown	Oliver 1	Safety
7	Creston - reconductor two blocks- Canyon St.	Creston 3	Safety / Reliability
8	Creston - Goat River area - The step up transformers require replacement of the structure	Creston 4	Safety / Reliability
9	Rebuild one block of single phase at Twin Bays	Wynndel 2	Safety / Reliability
10	Replace poles & upgrade structures - Sanca Creek	Wynndel 2	Reliability
11	Rebuild two blocks - 1 phase along Wynndel Road, Elsie Holmes Road to Olson Road	Wynndel 2	Safety / Reliability
12	Reconductor primary and secondary Glenmerry Feeder 2-2 -two blocks	Glenmerry 2	Reliability
13	Rebuild seven blocks in Glenmerry sub.	Glenmerry 3	Reliability

Small Planned Capital

This project is very similar to the "Distribution Condition Assessment and Rehabilitation" projects except it captures off cycle work required to keep the distribution lines safe and reliable. This project applies the same criteria with the information being developed from the field personnel between the normal eight-year condition assessment cycles. The distribution system has many external factors affecting the lines throughout the year. Each year operational and safety concerns are identified on the distribution system as a result of storm damage, clearance problems, aging equipment, reports by linemen and other inspections, or inadequate design due to standards changes. Repairs to address these concerns are required to maintain a safe and reliable power system.

An annual plan is established, with the required work prioritized according to its impact on the reliability of the system in the event of a failure, safety of employees and the public, and the likelihood of a failure / occurrence. The repairs are generally non-urgent in nature and are performed within one year of the initial request. The following table shows the expenditures for the past four years and plan 2005:

Table 9.4.11
Small Planned Capital
($000s)

Year	2001	2002	2003	2004F	2005
Cost	325	235	157	246	535

Forced Upgrades and Line Moves

This project captures capital upgrades driven by third party requests. Requests are received each year from BC Transportation, Municipalities and customers, to relocate distribution lines to accommodate road widening or improvements. Relocation of distribution lines due to highway/road widening or improvements will be initiated based on requests from BC Transportation and/or Municipalities. Miscellaneous customer line move requests where FortisBC does not have sufficient land rights for the facilities located on customer property, are included in this project.

In 2003 the FortisBC capital work generated from new customer connects was removed from this project. A decrease in the Forced Upgrades and Line Moves was offset by an increase in the New Customer Connects. This change was driven from an operational and accounting need to reduce multiple work orders being issued for each new connect. With the new connects work all budgeted under one category the need to issue multiple work orders for each new connect was eliminated creating less administrative and reporting thus improving overall efficiencies. The following table shows the expenditures for the past four years and plan 2005:

Table 9.4.12
Forced Upgrades and Line Moves
($000s)

Year	2001	2002	2003	2004F	2005
Cost	1031	2178	106	525	500

Distribution Urgent Repairs

Component failures on the distribution system (e.g. due to inclement weather, defective equipment, animal intrusions, vandalism, abnormal operating conditions, vehicle collisions, human error,) can cause outages or present risks that must be addressed in an expedient manner to ensure that employee and public safety is not at risk and electrical service continuity is maintained.

This project is for capital expenditures for repair or replacement of failed equipment. This project ensures provision of a safe, reliable distribution system. The planned expenditures for this project are based on historical information. The following table shows the expenditures for the past four years and plan 2005:

Table 9.4.13
Distribution Urgent Repairs
($000s)

Year	2001	2002	2003	2004F	2005
Cost	330	1,146	1,164	823	1,000

PCB Program

FortisBC has approximately 32,000 in-service, oil filled distribution apparatus that do not undergo oil testing as part of regular maintenance. Draft legislation, expected to be enacted within a few years, will require that all remaining in service equipment containing PCB concentrations greater than 50 ppm must be inventoried and reported annually. There is also a requirement to label any equipment that is found to contain concentrations greater than 50 ppm. To meet these requirements, FortisBC must first determine the concentrations in each device.

The gathering of equipment data and identification of sensitive locations will be undertaken as part of a scheduled line patrol over an eight-year period. This project is expected to cost approximately $750,000 annually, beginning in 2005, with the commencement of oil sampling, lab testing and any necessary mitigation measures taken on in-service, oil-filled distribution apparatus.

Glenmerry Underground Rebuild and Kiosk Replacements

FortisBC has approximately 500 kilometers of underground cable in its service territory. Many of these cables were installed during the 1970s using the present industry standard of cross-linked polyethylene design, and exhibit very high reliability.

The Glenmerry subdivision in Trail, however, was built circa 1965, and the majority of the underground distribution system serving this subdivision was installed using direct-buried, rubber-insulated cables. This cable has been obsolete for years and has a record of breaking down as the rubber ages, hardens and cracks. Several failures have been experienced in the Glenmerry subdivision in recent years. As the cable ages, failures will become more frequent and most utilities have either replaced their rubber primary cables or have a program to replace them. The rebuild of the primary distribution will include the installation of a looped system improving the reliability and operating flexibility for the Glenmerry subdivision.

There are approximately 64 kiosks Company-wide, including 27 locations in the Glenmerry subdivision, where pole-mounted transformers are enclosed in metal cabinets set on a cement pad. Kiosk installation was common in early underground construction, but these locations are difficult to maintain and pose a safety hazard for the linemen. Replacements of these kiosks for safety reasons, has been occurring since 1999; the replacement of these remaining kiosks will remove the significant safety and operating hazards associated with these installations. This project will remove the last remaining kiosks in the service territory.

Expenditures of $2.0 million are planned for this project in 2005.

5. Telecom, SCADA, and Protection and Control Projects

FortisBC operates a telecommunications system to support protection, control and monitoring for the power system, as well as operations and business communications requirements. Some 106 locations are presently or potentially served by the telecommunications system, including some 59 distribution locations, 11 generation, 12 transmission, and 6 office locations. The telecommunications system also connects to other utilities for the exchange of protection signals and operating voice communications.

The following table shows the telecommunication planned expenditures for 2005.

Table 9.5.1
Telecom, SCADA, and Protection and Control Projects
($000s)

		2005 Expenditures	Future Expenditures	Total
1	**Telecom, SCADA, Protection & Control**			
2	**Growth**			
3	Distribution Substation Automation	600	5,600	6,200
4	**Subtotal Growth**	**600**	**5,600**	**600**
5	**Sustaining**			
6	Narrow Spectrum Conversion	255		255
7	Harmonic Remediation	100		100
8	Relay Test and Maintenance System	150		150
9	Communication Test / Maintenance System	150		150
10	Protection Upgrades	572		572
11	Communications Upgrades	180		180
12	**Subtotal Sustaining**	**1,407**		**1,407**
13	**Subtotal**	**2,007**		**2,007**
14	AFUDC and Capital Overhead	170		170
15	**TOTAL**	**2,177**		**2,177**

Growth Projects

Distribution Substation Automation, Metering and Communications

In 2005, the Company plans to undertake two pilot projects to determine the feasibility of extending remote monitoring and control to distribution level substations, including the quality monitoring of lines, transformers and feeders, fault recording and locating, and equipment condition monitoring. The projects involving a rural and an urban substation,

which are described below, will be used to develop the standards and establish the estimating criteria for future automation work. Using the results of the detailed study, engineering and construction of these two projects, will determine the feasibility of expanding the project.

Rural Location: **Crawford Bay**

- The station is in a remote location with long distribution feeders that experience many faults.
- Low fault levels in the area can result in long clearing times for some faults. Improved protection with multiple (remotely controllable) setting groups could help reduce the hazards from slow-clearing faults.
- No line crews are stationed in the immediate area so response times can be long.
- The System Control Centre has only minimal control and monitoring at this station.
- There have been numerous cases during storms where it has been difficult to re-energize feeders. This has been due to a combination of cold-load pickup problems and poor information from the relays regarding the cause of the fault.

Urban Location: **Hollywood Substation**

- This is a large distribution station with many feeders that serves some large high-profile customers (Orchard Park mall) as well as fairly dense residential areas.
- The station protection is almost entirely based on aging electromechanical relays.
- Only one feeder has any data logging capabilities; this presents difficulties for system planning, as there is no historical loading information on a per-feeder basis.
- During major outages it can be difficult to access the substation due to traffic problems caused by traffic light outages. Remote control and alarming could help improve response times during outages.
- Installation of modern relaying will provide a significant reduction to the hazard from the high bus fault levels. This is especially important as this station uses indoor metal clad switchgear.
- Feeder automation could be extended to the field distribution devices. This would allow for development of auto-transfer schemes for critical loads.

The expenditure in 2005 is estimated to be $600,000 dependent on the outcome of the pilot projects. The Distribution Substation Automation Project could be initiated in 2006 for a five year period at an estimated cost of $5.6 million.

Sustaining Projects

This is a multiyear project that includes narrow spectrum conversion, harmonic remediation, relay test/maintenance process, communication equipment test/maintenance process and protection and communication upgrades. It will enhance the protection, control and monitoring of the FortisBC power system as well as operations and business communications requirements.

Narrow Spectrum Conversion

Industry Canada is rearranging the VHF mobile communications band, with deadlines over the period 2004 – 2010. Where interference occurs, FortisBC could be required to comply or stop using the affected frequency within 90 days. It is prudent to begin narrow banding or replacing at this time. Some equipment can be modified to comply and some equipment will need to be replaced. These systems will encounter small but increasing risk of interference from other users over the next few years. It was determined the best approach was to define the project and complete it in one year. The alternative was to slowly complete the changes with radio upgrades and as other users required the bandwidth.

Harmonic Remediation

The production and transmission of electrical energy occasionally produces harmonic signals that interfere with the operation of customer owned equipment. This project provides for investigating and resolving harmonic problems as they arise. Investigation involves installing test equipment for a period of time, then engaging a consultant for detailed analysis. Resolving harmonic problems typically involves the installation of harmonic filters, or replacing defective transmission equipment.

Relay Test and Maintenance System

This project involves the development of a Relay Test and Maintenance System. The primary requirement to establish a system for relay testing and maintenance is to ensure proper operation of the protection system ensuring the safety of both the public and FortisBC employees. A second requirement is to ensure compliance with the WECC operating requirements for interconnected utilities. In order to comply with these requirements FortisBC must create an inventory of all the protection relays in the system and the maintenance cycle requirements for each type of relay in each type of application. The inventory will include the individual relay testing history, environmental situation, manufacturer recommended tests and maintenance cycle, and the operating history. This inventory will permit FortisBC to set system-wide standards for a maintenance program for relays. This process and documentation will ensure the continuing protection upgrades required to ensure the safe reliable operation of the system are defined and completed on a timely and efficient manner.

Communication Equipment Test and Maintenance System

This project involves the development of a Communication Equipment Test and Maintenance System. Similar to the requirements to develop a relay test and maintenance system the primary requirement to develop a system for communication equipment testing and maintenance is to ensure proper operation of the protection system ensuring the safety of both the public and FortisBC employees. A second requirement is to ensure compliance with the Western Electricity Coordinating Council ("WECC") operating requirements for interconnected utilities. In order to comply with these requirements FortisBC must create an inventory of the existing communications systems and required maintenance cycles to continue providing adequate communications service. The inventory process will utilize test records, environmental factors, manufacturer recommended tests and maintenance cycles and operational history for existing circuits and equipment. This process and documentation will ensure the continuing communication upgrades required to ensure the safe reliable operation of the system are defined and completed on a timely and efficient manner.

Protection Upgrades

This project will upgrade protection and control equipment in several substations. Much of the FortisBC protection is near or beyond its designed operational life, some being up to 40 years old. It is no longer reliable, and the manufacturers no longer supply spare parts. In some extreme cases, equipment can no longer be tested and adjusted regularly because it fails when test systems are operated, and cannot be put back into service in a timely manner. The impact is that this equipment can cause failure of the transmission and distribution systems it supports, or prevent restoration efforts, exposing the system to possible equipment damage, extended outage times, or possibly causing public safety issues. FortisBC plans to pursue a two-fold strategy to address this issue: upgrade parts of the protection and control systems regularly over several years, and prepare an emergency response plan and acquire new standby systems that may be used in emergency restoration.

Specifically, in 2005 there is a project to upgrade the protection at Rosemont substation, as the existing protection and communication equipment is obsolete and does not have the capability to provide fault locating and fault recording. This project will not only increase the safety of the system but will also reduce outage times by assisting the field personnel to more quickly get to the location of the problem.

Communication Upgrades

This project will upgrade telecommunications routes in the West Kootenay region, and will improve emergency response capability. Much of the FortisBC telecom equipment is near or beyond its designed operational life. It is no longer reliable, and the manufacturers no longer supply spare parts. In some extreme cases, equipment can no longer be tested and adjusted regularly because it fails when test systems are operated, and cannot be put back into service in a timely manner. This equipment can cause failure of the transmission and distribution systems it supports, or prevent restoration efforts, exposing the system to possible equipment damage, extended outage times, or possibly causing public safety issues.

6. Demand Side Management

The demand side management expenditures of $1.2 million (net of tax) planned for 2005 involve initiatives that provide information, engineering studies and rebates that promote energy efficiency. Through this initiative, the Company supports such programs as air and ground source heat pumps, energy efficiency lighting, etc. The expenditures planned for 2005 are consistent with previous years.

Table 9.6.1
Demand Side Management
($000s)

		2005 Expenditures	Future Expenditures	Total
1	Demand Side Management	1,181		1,181
2	AFUDC & Loadings	-		-
3	**TOTAL**	**1,181**		**1,181**

7. General Plant

General plant consists of vehicles, metering, information systems, telecommunications, buildings, furniture and fixtures, and tools and equipment.

The following table shows the 2005 Capital Plan for General Plant.

Table 9.7.1
General Plant - Capital Plan - 2005
($000s)

	General Plant	2005 Expenditures	Future Expenditures	Total
1	Vehicles	2,940		2,940
2	Metering	(67)		(67)
3	Information Systems	1,545		1,545
4	Telecommunications	175		175
5	Buildings	734		734
6	Furniture	177		177
7	Tools and Equipment	711		711
8	**Subtotal**	**6,215**		**6,215**
9	AFUDC & Loadings	-		-
10	**TOTAL**	**6,215**		**6,215**

The following sections provide a brief description of the general plant requirement for 2005.

Vehicles

FortisBC has 293 vehicles in its fleet, 157 of these units are leased and 136 are owned.

The Company has determined that it would be advantageous from a cost perspective to buy-out the lease of approximately 42 units in 2005. The units have either reached the end of the lease term or have carried over the lease term on the same terms as the original lease. The analysis contained in Appendix 9 of this Capital Plan shows that the lease buy-out (assumed to be January 1, 2005) would cost approximately $2.74 million and would reduce operating lease costs by a corresponding $975,000 per year. The transaction would yield a net decrease in revenue requirements in 2005 of approximately $800,000. The advantage decreases each subsequent year as the tax depreciation impact drops but will still yield a net decrease in requirements of over $600,000 in 2009.

In addition to the lease buy-out of these 42 units, the Company also plans expenditures of $200,000 to replace three service vehicles, one forklift and two trailers of its owned fleet. These units exceed the Company's guidelines for equipment replacement which is listed below.

Service Vehicle	5 years or 160,000 kilometers
Forklift	10,000 or as required (condition/application)
Trailer	15 years or as required by condition

Changes to Uninstalled Meter Inventory

This program determines the final change to inventory at year-end 2005 taking into consideration the following activities:

- Meter Purchases
- Meter Retirements

- Impact of returns and issues of meters from the field
- Issue of meters, Current Transformers and Potential Transformers to the field for new connects.

The 2005 change to uninstalled meters inventory is planned at ($88,000) offset by meter re-test costs of $21,000 for a net of ($67,000).

Information Systems

Desktop Infrastructure Upgrade

The Desktop infrastructure upgrade includes Microsoft Office Suite and other job specific hardware and software upgrades for FortisBC's PC environment. It is a phased approach to keeping approximately 420 PCs current and supportable, rather than replacing all PC equipment and software every 5 years. The phased strategy avoids the resourcing issues that happen with large wholesale changes. The total value of all the PCs, and related peripherals, in FortisBC is approximately $2.5 million.

This project also includes the cost necessary to keep over 450 telephone handsets, and over 50 faxes and photocopiers up to date. Again this is a staged approach based on 5 to 10 year lifecycles.

An asset management tool is used to track the age of all technology assets in BC, to ensure they are changed in timely manner to realize maximum life expectancy without jeopardizing productivity.

The estimated expenditure for this project in 2005 is $480,000.

Data Centre Infrastructure Upgrade

The data centre infrastructure upgrade project includes replacing outdated hardware (16 Microsoft servers and 3 UNIX servers) and software (operating systems and related server software) in the data centre and supporting infrastructure (switches and routers that

tie the Wide Area Network together). There is approximately $1.0 million worth of hardware and software in the data centre in Trail.

Equipment and software eligible for upgrades include servers incapable of running current software, disk drives that have passed maximum life expectancy (over 3 terabytes of disk space in the data centre), unsupported minor operating system (Microsoft Windows Server) and minor database upgrades.

Microsoft server and related equipment upgrades account for approximately $80,000. Switches and routers $25,000, data backup equipment $35,000, and labour $45,000.

In 2005 this project will also include $40,000 for hardware necessary to extend the LAN form Warfield to South Slocan. This will result in a savings of approximately $24,000 annually to FortisBC's operating costs, as this does not require additional internal resources to support. The savings is due to the fact that the Telus managed network connections to South Slocan and Brilliant, which cost approximately $2000 per month for both, would no longer be required.

The total estimated expenditure for this project in 2005 is $225,000.

Generation Job Order Conversion to Java with Oracle Database

This project is required to convert the existing Generation Job Order system (GenJo) from its current Microsoft Access database platform, to the FortisBC standard web access platform based on a Java front end and Oracle database.

This System was developed in 1996, in Microsoft Access, by ViewPoint System Corp. to manage equipment maintenance.

Approximately 25 employees currently use GenJo, unfortunately, Microsoft Access is not intended to handle the GenJo requirements for multi-user access or to manage large amounts of data. Currently, it is experiencing weekly data corruption issues. The

Information Technology group cannot resolve these corruption issues without porting GenJo to more suitable Web/Oracle platform.

The estimated cost for this project is $60,000

UNIX 4.3 to 5.2 and Oracle 8 to 9 Upgrade

The Customer Information System in BC (CIS+), legacy PeopleSoft data, legacy customer data, Primavera project data and Aspen database all reside on two IBM UNIX systems in the Trail data centre. One system is for production, the other for test and development. Many components of the production UNIX server have passed the end of their life expectancy, and have become highly susceptible to failure (two hard disks and one controller failed in 2004).

The operating system and database versions must be upgraded when support for a version is stopped. This is the case now, and the current hardware will not support the new versions of UNIX and Oracle.

The total estimate expenditure for this project in 2005 is $250,000. Approximately $200,000 is hardware cost to replace the equipment to support the UNIX operating system and Oracle database version upgrades. The remaining cost is for labour to perform the upgrade. There are no software costs, as our maintenance agreements cover that.

This project is over and above the normal infrastructure upgrades we do on an annual basis as described above, and has not been done for over 5 years.

Plotter Replacement

The existing E-size print copier at the Benvoulin office in Kelowna requires replacement. This plotter is failing on a regular basis, outdated and incapable of plotting directly from a computer.

The estimated expenditure for this project in 2005 is $70,000.

Call Centre Infrastructure - Telephony

This project is necessary to purchase and install the equipment required to establish the Customer Call Centre. This also includes the equipment to accommodate call logging and distributed Call Centre functionality which will allow anyone in the organization to respond to customer inquiries. This will be utilized during peak call volumes to support the primary callcentre and improve customer service.

The planned expenditures for this project are $460,000.

Telecommunications

The Telecommunications capital budget is used to purchase new or replacement communications equipment.

This equipment includes landline equipment, VHF field communications equipment, microwave substation controls and the installation of isolation equipment when installing Telus lines into substations. These installations will provide voice as well as data and control communications as required.

The communications budget also covers upgrades and or replacement of equipment that is used for remote control and operation of field devices from our System Control Center.

The telecommunication budget for 2005 is $175,000.

Buildings

FortisBC has 14 sites (ranging in age from 2 to 80 years) throughout the West Kootenay and Okanagan Valley regions totaling approximately 195,000 square feet of office, shop, and warehouse space and approximately 35 acres of yard. Of this, 115,000 square feet are owned and 51,000 square feet are leased.

This project is required to carry out property upgrades and building repairs deemed necessary to meet operational requirements.

The estimate for building expenditures in 2005 is $734,000.

Table 9.7.2
Buildings - 2005
($000s)

	Location	Description	Cost
1	Trail Office	Replace Flooring	50
2	Warfield	Install Security System	35
3	Warfield	Upgrade Yard - Drainage required	150
4	System Control Centre	Upgrade Parking Lot and Building	14
5	Castlegar	Replace HVAC unit and Install Security System	45
6	Creston	Replace Flooring	5
7	South Slocan Office	Replace HVAC unit and Upgrade Facilities	20
8	South Slocan Warehouse	Renovate Storage Areas	35
9	Penticton	Replace Flooring	5
10	Kelowna	Replace Roof	7
11	Salmo	Upgrade Office	40
12	All Locations	Urgent Repairs	128
13	South Slocan	Townsite and Shop Upgrades	165
14	All Locations	Warehouse Racking	35
15		**Total**	734

Furniture and Fixtures

This project is required for the replacement of deteriorated furniture and the addition of new furniture to accommodate new employees.

In 2003, the Company undertook an inventory of furniture at all sites. At that time the condition of the furniture was assessed placing it in one of three categories (disposal, poor, and good). Using this process, together with our Environment, Health and Safety standards, we update our capital requirements each year. Typically chairs are replaced every five year and workstations reviewed for functionality every eight to ten years.

The estimated expenditure for this project in 2005 is $177,000.

Tools and Equipment

This project involves the purchase of tools and equipment necessary to construct, operate, and maintain the generation, transmission, and distribution system in BC. This budget

covers all capital expenditures for tools and equipment in excess of $500. The project includes replacement tools that have reached the end of their service life and additional tools that are more appropriate for the various trades from an ergonomic and/or safety perspective.

The tools and equipment expenditure plan for 2005 is $711,000. For Further details on this project see Appendix 10.