

**STUDY OF THE COST OF CAPITAL
and
RATE OF RETURN RECOMMENDATION**

offered for the consideration of
BARBADOS LIGHT AND POWER COMPANY

prepared by:

Robert J. Camfield

with the assistance of:

Bruce R. Chapman

Michael T. O'Sheasy

Christensen Associates Energy Consulting, LLC
Economic Consulting and Strategy

January 7, 2008

Table of Contents

EXECUTIVE SUMMARY	1
INTRODUCTION	7
PART I: FOUNDATIONS FOR THE COST OF CAPITAL.....	7
DEFINITIONS	7
FINANCIAL MARKETS.....	10
PRINCIPLES UNDERLYING FAIR RATE OF RETURN	13
UTILITY REVENUES, WEIGHTED COST OF CAPITAL.....	16
REGULATION, DEMAND FOR CAPITAL, CAPITAL ATTRACTION.....	17
CAPITAL STRUCTURE AND WACC FOR ELECTRIC UTILITIES.....	20
WORLDWIDE CAPITAL MARKETS.....	21
SOVEREIGNTY RISKS	24
METHODOLOGY: ESTIMATION OF THE COST OF EQUITY	26
PART II: ANALYSIS OF COST OF CAPITAL.....	33
BUSINESS AND FINANCIAL RISKS: BARBADOS LIGHT & POWER.....	33
DETERMINING COMPARABLE RISK COMPANIES: COST OF EQUITY	35
EMPIRICAL FINDINGS, COST OF EQUITY	40
<i>Peer Group Estimates of the Cost of Equity</i>	<i>40</i>
<i>Cost of Equity Capital and Firm Size</i>	<i>45</i>
<i>Cost of Equity Capital and Sovereignty Risk</i>	<i>49</i>
<i>Analysis Summary.....</i>	<i>52</i>
WACC AND RATE OF RETURN: BARBADOS LIGHT AND POWER.....	54
REFERENCES	57
TECHNICAL APPENDICES	62

**STUDY OF THE COST OF CAPITAL
and
RATE OF RETURN RECOMMENDATION**

offered for the consideration of:
BARBADOS LIGHT AND POWER COMPANY

prepared by:

Robert J. Camfield

with the assistance of:

Bruce R. Chapman

Michael T. O'Sheasy

**CHRISTENSEN ASSOCIATES ENERGY CONSULTING
ECONOMIC CONSULTING AND STRATEGY**

January 7, 2008

EXECUTIVE SUMMARY

This report presents our analysis of the *Cost of Capital* for Barbados Light and Power Company (“BLPC” or “Company”) and provides recommendations regarding the *Rate of Return* and *Return on Equity*. The report is intended to assist BLPC in its rate review submission to the Fair Trading Commission focused on the required revenue level and retail electricity prices of BLPC.

The report reviews cost of capital principles and theory, discusses the workings of capital markets, and presents the empirical results of cost of capital study. The report concludes with a summary of the study findings, including the rate of return recommendation.

The *Cost of Capital* of BLPC includes the rate of interest on the Company’s outstanding long-term debt, and the cost rate of common equity contributed by investors. Together, the debt interest rate and equity return rate yield the overall *Weighted Average Cost of Capital* (“WACC”), stated on a traditional capital structure basis. When the long-term debt and common equity balances are combined with other contributed capital including *Customer Deposits*, *Accumulated Deferred Income Taxes*, *Deferred Investment Tax Credits* and the *Manufacturers’ Allowance*, the WACC reflects a regulatory capital structure, and can be referred to as the overall *Rate of Return* (“ROR”). Cost of capital

and rate of return are an important part of regulatory governance. Because a utility's rate base often constitutes a large cumulative investment amount, comparatively small changes or adjustments to the allowed rate of return can translate into a significant change in operating income and revenue level.

The analyses and recommendations of the Cost of Capital study are a result of applying well-recognized principles and methods. In particular, the cost of capital approach used herein adheres closely to Fair Rate of Return Principles and takes account of the business context and capital needs of BLPC in order to continue to serve Barbados with reliable power supply. The application of these principles results in *just and reasonable* electricity prices, where the interests of retail consumers and investors who commit capital for the convenience and necessity of the public are appropriately balanced. The main features of Fair Rate of Return principles include:

1. Returns Equivalent to those Realized On Investments of Comparative Risk: As codified in U.S. Supreme Court decisions, capital commitment by investors for the convenience and necessity of the public is entitled to returns equivalent to those realized on investments of comparable risks.
2. Maintenance of Financial Integrity: The process of regulatory governance, as a practical matter, must result in a flow of revenue sufficient to cover all prudently incurred costs associated with providing utility services and an adequate return on the capital committed by investors. In turn, adequate return on capital preserves and maintains the financial integrity of the Company.
3. Ability to Raise Capital On Fair Terms When Needed: The utility and its investors are entitled to adequate returns on capital so that the utility can raise capital as necessary to provide utility services, on fair and equitable terms and conditions—*i.e.*, an acceptable interest rate level.

The application of Fair Rate of Return principles is amply underscored and provided for in the immediate study and its application. To this end, it is useful to highlight key findings, as incorporated within the overall Rate of Return recommendations, as follows:

- Capital Structure: Adopt a regulatory capital structure that includes 40% debt and 60% equity participation, when stated on a traditional capital structure basis. This constitutes a significant departure from the Company's observed capital structure for 2006, with equity participation of 77.3%.
- Regulatory Capital Structure: Develop a regulatory capital structure that includes traditional and non-traditional contributed capital. The regulatory

capital structure includes *customer deposits, accumulated deferred income taxes, deferred investment tax credits, and deferred manufacturers' allowance.*

- Debt Cost Rates: Set the long- and, when present, short-term debt cost rates at the observed interest rates of the outstanding debt of BLPC¹ during a timeframe relevant to that for which retail prices are being set.
- Preserve Tax Incentives: It is important that regulatory policy adhere to and preserve the investment incentives, including the intended strength of incentives, of the taxing authority. This feature is manifested in the cost rate applied to the balances of investment tax credits and manufacturers' allowance included within the regulatory capital structure, where the applicable cost rate is set equal to the WACC of 8.98%, for the traditional capital structure including a policy-based debt/equity ratio of 0.67.
- Return on Equity: Utilize a full complement of cost of capital methods to determine the cost of equity capital for BLPC. Draw upon the experience of capital markets in the U.S., Canada and, if necessary, elsewhere to estimate the cost of capital; and recognize or further investigate the effects of size on the equity cost of capital. Where appropriate, the allowed Return on Equity should incorporate sovereignty risk differences between Barbados and known and established nations with highly developed capital markets.

Overall Rate of Return and Capital Structure.

Shown below is the overall target Rate of Return Recommendation for BLPC, for the year 2006.

(Please see the following page.)

¹ Because retail prices are set for future timeframes, it may be appropriate to utilize estimated interest rates in the future, as the basis for determining interest rates for debt, particularly for short-term debt. Depending on timeframe and circumstances, the expected value of future interest rates can depart significantly from historical rates. However, the observed interest rates of the Company's debt appear to be a close approximation to future interest costs of outstanding debt over the foreseeable future. Estimates of future interest rates can be obtained by deriving future spot rates from observed forward rates.

**RATE OF RETURN RECOMMENDATION:
WEIGHTED AVERAGE COST OF CAPITAL FOR
REGULATORY CAPITAL STRUCTURE
Based on Total 2006 Balances**

Capital Component	Balances (\$ 000)	Capitalization Shares	Cost Rates	Weighted Cost Rates
Long-Term Debt	\$204,070	33.70%	5.19%	1.75%
Short-Term Debt	\$0	0.00%	0.00%	0.00%
Common Equity	\$306,104	50.55%	11.50%	5.81%
Customer Deposits	\$18,732	3.09%	9.18%	0.28%
Accumulaed Deferred Taxes	\$33,253	5.49%	0.00%	0.00%
Accumulated Investment Tax Credits	\$32,171	5.31%	8.98%	0.48%
Manufacturers' Allowance	\$11,170	1.84%	8.98%	0.17%
Total	\$605,500	100.00%		8.49%

As can be observed, the regulatory capital structure includes approximately 34% debt, 51% equity, and non-traditional components totaling 15%. Customer deposits represent 3.1% of contributed capital, with a cost rate of 9.18%, which is the effective rate of interest paid by BLPC to retail deposits retained by the Company. Similarly, balances of deferred ITC and Manufacturers' Allowance carry a cost rate of 8.98% which, as mentioned above, is set at the overall rate of return level, where the capital structure is stated on a traditional basis and includes equity participation of 60%.

Long-Term Debt Cost Rate

The Fair Trading Commission should set the cost rate for the Company's outstanding balance of long-term debt at 5.19%. This cost rate is derived from the observed interest carrying charges on the Company long-term debt, which carried an average balance of \$116 million BBD during 2006.

Short-Term Debt Cost Rate

Within the 2006 timeframe, BLPC carried no short-term debt balances. However, as a matter of policy, the cost rate for short-term debt should be set at the prevailing or expected interest rate(s) associated with the Company's balances of short-term debt, which may consist of credit balances owed to equipment vendors, commercial paper,

promissory bank loans, or lines of credit where often the effective interest rate is linked to the well known London InterBank Offer Rates (“LIBOR”).

Return on Equity

We recommend a rate of return on equity for BLPC of 11.5%. This result comes about from the application of four methods to estimate the cost of capital for samples of U.S. and Canadian utilities and a sample of low-risk comparatively small-sized U.S. non-utility companies. The results of these four methods are supplemented by consideration of the earnings premium that BLPC may likely require in order to fully satisfy the capital costs on investments of comparable risks. The comparatively small size of the Company and its role as the primary supplier of generation and power delivery services to rapidly increasing electricity demand of an island economy both induce providers of funds to financial markets to require an earnings premium relative to larger firms in continental markets.

We recommend that BLPC ask the Fair Trading Commission, in its deliberation of cost of capital issues, to endorse the broad-based approach to cost of equity estimation applied in this study. Specifically, cost of capital cannot be readily estimated precisely, such that it is best, as a matter of policy, to draw upon several well-recognized cost of capital methods, together referred to as the *Cost of Capital Toolbox*. This approach can cover a range of cost of capital methods including the *Capital Asset Pricing Model*, *Discounted Cash Flow*, and *Risk Premium Analysis*.² The *Cost of Capital Toolbox* also includes *Comparable Earnings*, based upon historical realized returns of comparable-risk companies.

The table below summarizes the estimated cost of common equity for each of the four identified methods, as applied to three U.S. samples of comparable risk utilities and non-utility companies or “peer groups”, and to two samples of Canadian utilities listed on the Toronto Stock Exchange (“TSX”). These samples³ provide a broad-based sample of financial and equity market experience of utilities (and comparable low risk non-utilities)

² Other approaches are available including Factor Models and the practical application of *Arbitrage Pricing Theory* (“APT”), and well-known techniques such as the Sharpe Ratio.

³ Samples such as these underlie return on equity estimates incorporated into our studies for other clients.

that operate on the North American continent. The risk levels of the sample companies are roughly comparable to those of BLPC, although Barbados Light and Power is confronted with unique business circumstances and is comparatively small with reference to the companies that comprise the five samples.

**RETURN ON EQUITY ESTIMATES
FOR COMPARABLE RISK COMPANIES**

METHODOLOGY	CANADIAN SAMPLES		U.S. SAMPLES		
	Sample 1	Sample 2	MID-SIZED ELECTRIC UTILITIES	GAS UTILITIES	NON- UTILITIES
Discounted Cash Flow Single-Stage Model			9.15%	9.67%	
Capital Asset Pricing Model Classsical Single-Factor Model	8.65%	8.95%	10.94%	10.95%	9.03%
Risk Premium CAPM-based, Size Premia Adjusted			11.18%	11.51%	10.84%
Realized Market Returns	9.94%	17.94%	10.80%	9.14%	11.30%

Thus, the range of estimates is 8.65% to 11.51%, excluding the aberrational 17.94% in realized returns for the second Canadian sample. The report also considers the impact of BLPC’s small size, smaller than virtually all of the firms used in the utility sample groups above, and its location within a sovereign island nation and thus independent of the meshed integrated nature of the continental energy system within which sample utilities operate. The cost of equity analysis obtains estimates of a combination of factors that affect the cost of equity including issuance cost, size risk, and sovereignty risk. A reasonable range of adjustments to reflect these factors is, we believe, 1.25% to 3.22%. Adding these to the average cost of equity estimated from the broad-based market research yields a BLPC-specific cost of equity in the range of 11.34% to 13.31%. With this range in mind, and given the difficulty in precisely determining an adjustment specific to BLPC, we recommend a common equity rate of return of 11.5%. This estimate of cost of equity represents a conservative and reasonable level of allowed returns on the capital committed by equity investors to the Company and to Barbados.

INTRODUCTION

The *Cost of Capital* is the composite interest rate of the debt and equity contributed by investors to underwrite a utility's rate base, which includes net depreciated capital, inventory and stores, and working capital. The composite cost of capital is the Weighted Average Cost of Capital ("WACC"). For regulatory purposes the WACC is referred to as the overall *Rate of Return* and is expressed as an annual percentage of the rate base, and is set by the regulatory authority. Because a utility's rate base often constitutes a large cumulative investment amount, comparatively small changes or adjustments to the allowed rate of return can translate into a significant change in allowed operating income and revenue level.

This report develops the rate of return recommendation for submission to the Fair Trading Commission in determining the required revenue level and retail prices for Barbados Light and Power Company ("BLPC" or "Company"). The recommendation for the rate of return is based on the Company's cost of capital; estimates of which appear in this report. The report reviews cost of capital principles and theory, discusses the workings of capital markets, and presents the empirical results of the cost of capital study.

PART I: FOUNDATIONS FOR THE COST OF CAPITAL

DEFINITIONS

The *Cost of Capital* is the underlying interest rate used by investors to discount the expected benefit flows of capital resources including returns to financial assets,⁴ and is sometimes referred to as the rate of discount, or simply the discount rate. The cost of capital is the compensation required by investors for postponing consumption, for

⁴ Financial assets are one form of capital. More generally, *Capital* refers to economic resources of a durable nature that contribute to the production of goods and services, or may provide services directly. Capital resources of an economy are readily at hand; examples include manufacturing equipment, software, commercial buildings, residential dwellings, streets and highways, airports and, importantly, the accumulation of skills and knowledge of the workforce. Capital is accumulated savings over time, where savings refers to the proportion of the output of an economy that is not consumed as current goods and services. Essentially, savings is the share of output held back and invested in—*i.e.*, put into—capital resources. The cumulative level of investment over time, covering decades, constitutes the capital stock of an economy and the society that it serves.

expected inflation, and for exposure to capital risks of various dimensions, where such risks are specific to investment vehicles.

The cost of capital is determined by the demand for capital, supply of savings, expectations of inflation, and perceptions of risks harbored by participants in capital markets. The demand for and supply of capital are determined by expectations of future levels of economic activity, while expected inflation is driven largely by monetary policy over the relevant timeframe. Perceptions of risk, in turn, cover many dimensions including uncertain government policy, the effects of natural phenomena such as weather including violent storms, droughts, and floods; and, in some regions of the world, war and civil unrest. The cost of capital—the discount rate stated in nominal terms—increases with rising demand for capital, with expectations of higher rates of inflation, and with heightened perceptions of risk. Arguably, risk is the key contributing factor for the estimation of the cost of capital.

Financial assets include a multitude of debt vehicles, equity, and derivatives, and are tailored to participants of capital markets including household, small business, corporate, and government segments. Participants across these segments—*i.e.*, investors including lenders and holders of common and preferred stock— can supply capital while other participants (such as borrowers and common stock issuing companies) demand capital. Commercial banks, credit unions, finance companies, capital exchanges, and investment banks serve as intermediaries that provide the institutional means that facilitate the interaction and linkage of the supply and demand sides of financial markets. These functions essentially include lending, borrowing, and the issuance of equity vehicles. Banks and credit unions borrow (and store) financial assets that in turn are invested in the form of debt and, to a lesser extent, equity. Household debt vehicles include, for example, personal loans covering appliances, household services, and credit card mechanisms through finance companies and banks, and real estate and so-called home equity loans. Business loans include short-term loans and lines of credit with banks, inventory financing through business wholesalers, and commercial paper of various terms and credit risk ratings. Corporate debt can be in the form of lines of credit with banks,

and mortgage and debenture bonds, while go debt can be in the form of revenue bonds of cities, and short- and long-term debt of various terms.

Equity (or, *Common Equity*) refers to net accumulated value of the contributed capital by investors. Generally speaking, equity is in the form of common and preferred stock including retained earnings, where the investor assumes a share in the ownership of a corporate entity. In some cases, debt instruments can participate in equity returns and have rights of conversion to common stock. Derivatives are financial instruments whose value depends on investor expectations regarding the inherent value of the underlying assets. Derivatives, common forms of which include options and forward contracts, are specifically designed for speculation and risk hedging.

The cost of capital associated with financial assets is determined by investors and, in the large, by individuals and entities (including government entities) that provide savings and thus the accumulation of capital within the economy. In the case of financial assets, expected benefits are in the form of future cash flows including interest payments, dividend payments, market appreciation, and return of principal. When investors supply funds to entities such as utilities and governments, not only are they postponing consumption—giving up the value of alternative expenditures in some other way—they are also exposing funds to the devaluation of ongoing inflation and various uncertainties and risk attending future cash flows. Investors are willing to incur these risk factors only if they are adequately compensated. While the market prices of other inputs including labor, materials, and energy can be easily verified, the cost of capital—essentially, the price of capital—is not easily discerned and, all too often, requires estimation through the cautious application of analytical methods. The cost of capital remains positive in the absence of inflation and risks, as savers require compensation for foregoing the right to use the funds saved for consumption of goods and services—essentially, the time value of money.

In addition to the global risks alluded to above (weather, government policy, etc.) dimensions of risk also cover idiosyncratic factors associated with specific capital resources, such as those of individual entities or companies. Accordingly, financial

markets will re-price downward the bonds of a private company, should the *current* financial condition of the company suddenly decline. Essentially, the decrease in the company's current condition reflected as reduced interest coverage—causes the expectation of the future condition of the company also to decline. Expectations of future financial conditions (possible states) of the specific company are idiosyncratic risks. Because cost of capital rises with increased risks, the price of the bonds declines. Bond prices and discount rates, in the form of the net interest rates or bond yields (and yield to maturity), move in opposite directions; bond yields increase as bond prices decline, and decrease as bond prices rise.

FINANCIAL MARKETS

To facilitate the commitment of capital (investment) by savers and their agents to the firm, the firm offers property rights, including bonds or promissory notes to debt holders and shares of stock to equity investors. These property rights define the commercial terms and conditions under which savers and their agents, as investors, commit capital. Property rights are capital (financial) assets, and are generally tradable in organized financial markets or on an *over-the-counter* basis. Financial assets are claims on the income of the firm as compensation for the commitment of capital, and are the financial obligations of the firm. Shares of stock constitute ownership in the firm.

In the case of long-term debt – *i.e.*, mortgage bonds, debentures, and long-term notes – the interest on the principal (face) amount of a bond (debt) or the coupon rate on the share of preferred stock defines the level of compensation. Often, the interest rate is a predefined annual rate that remains fixed over the term of the debt. However, long-term debt instruments can have a number of other provisions that, in essence, provide for more complete contracting by managing risks through risk sharing between the debt holders and the borrower (the firm). These provisions can include 1) adjustments to the rate of interest to reflect contemporary market conditions *and* rates of inflation, 2) participation in earnings of the firm, 3) conversion rights, and 4) voting rights in the management of the firm.

In the case of short-term promissory notes, agreements with commercial banks define the mechanism by which interest, stated in dollars, is determined. Often, the commercial terms of promissory notes define interest to be paid monthly on the outstanding daily balance (principal outstanding). The rate of interest applied to the outstanding balance is typically tied (indexed) to the interest rate on obligations of some widely known financial market – say, the London Interbank Offer Rate (LIBOR) or Fed Funds – which also varies daily or monthly.

Common stock property rights are somewhat different from other financial obligations because, as owners of the firm, the returns to shareholders are residual amounts following the compensation of other resources employed by the firm including debt obligations. Common equity is essentially compensated last, and bears the burden of much of the business, regulatory, and financial risks of the firm. For this reason, common equity is, in virtually all cases, more costly than other forms of financial instruments.

As with other markets, capital markets have primary and secondary dimensions. Primary markets are the institutions and processes that facilitate the initial sale of the financial obligations of the firm to initial investors, whereas secondary markets are structured market processes that provide the means by which investors can purchase and sell existing rights, including shares of stock and debt obligations. Financial instruments can assume many forms, and debt securities (bonds) and equity shares are actively traded in financial markets, which are generally considered to be highly liquid and competitive. However, to the degree that financial obligations 1) carry specialized and non-common commercial terms, and 2) secondary – and to a lesser extent, primary – markets are less liquid, holders of such obligations assume higher risks, other factors held constant. This is the case where the pool of buyers and sellers is limited and the volume of transactions is comparatively small. Relatively low levels of liquidity imply higher transaction costs and risks to investors, which translates directly into higher costs of capital to the firm.

Competition is a term that describes some markets, and markets are said to be competitive if certain conditions exist. Markets can be characterized as competitive if they involve: 1) a very large number of buyers and sellers, 2) information relevant to the

determination of prices is readily available, complete, and not costly, and 3) transactions costs are low. Because of the workably competitive nature of financial markets, arbitrage opportunities are more or less exhausted. This means that, for both primary and secondary markets, financial property rights trade at levels (prices) such that perceived risks and opportunities for prospective returns to capital are appropriately balanced and approximate those of other investment opportunities. Thus, above-normal returns, which implicitly include compensation for risks, cannot be seemingly realized by investors over prospective periods in systematic fashion.

Competition inherent in U.S. and worldwide financial markets ensures that the prices of common shares (share prices) and bonds are at a level that reflects the opportunity cost of capital. As an example, assume that the perceived risks attending the returns to common shareholders of Firm A are equivalent to those of Firm B and other firms. If the share prices of Firm A suggest a market return of 10%, while the prices of Firm B and other firms of comparable risks suggest (allow) market returns of 13%, the market price of Firm A will fall to a level that provides a basis for market returns of just 13%, prospectively. A price that allows for a 10% prospective market return is insufficient in the presence of opportunities for a market return of 13% on alternate investments of comparable risk. Essentially, the 13% market rate of return on investment alternatives constitutes the opportunity cost of capital. Most remarkable is the expedience – literally, in minutes for highly liquid financial markets – with which share prices adjust to levels that appropriately balance prospective returns to equilibrium levels *based upon perceptions of risks*. In short, equivalent and comparable risks translate directly into comparable rates of return, which is the cost of capital of common shareholders in – and thus of – the firm.

As mentioned early on, the cost of capital is a function of the demand for and supply of capital, investor expectations of inflation, and investor perceptions of risks. Because the conditions of demand and supply as well as expectations of inflation are more or less common to financial markets at any point in time, financial vehicles are differentiated by risks. Hence, the expected returns and prices of bonds and common shares (normalized

for denomination and size) at any point in time are largely if not exclusively differentiated by perceptions of risk.

In summary, whereas the cost of skilled labor, materials and supplies, purchases of generation and transmission services, or other inputs used in the production process of utilities are expressed in money terms – e.g., purchased power stated as dollars per megawatt hour – the cost of capital is expressed as an interest rate, typically shown as an annual percentage of the principal amount committed by investors. This means that the capital resources employed by BLPC including power delivery systems such as transformers and lines, meters, trucks and vehicles, computer systems, software, office facilities and buildings, inventory and stores, and land—essentially, the rate base of BLPC—are costly, where cost is reflected as the annual carrying charges on capital. The cost of capital for BLPC—or perhaps more accurately, the *cost rate of capital*—is referred to as the *required rate of return* (%) on the capital resources committed by investors to the Company, which can be valued at either original cost or fair value.⁵

PRINCIPLES UNDERLYING FAIR RATE OF RETURN

Legal guidelines for rate of return utility regulation of the North American Continent have been discussed extensively, and are delineated by key decisions of the legal authorities in the U.S. and Canada. As a point of departure, the statutory principles of rate of return for public utilities rest substantially with two decisions of the Supreme Court of the United States. In the *Bluefield Water Works and Improvement Co. v. Public Service Commission of West Virginia* case (262 U.S. 679, 1923), the U.S. Supreme Court set forth its view on fair rate of return, as follows:

“...A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings

⁵ For the determination of setting retail utility prices in the U.S. and elsewhere, the regulatory convention is to value the capital of public utilities at original cost.

which are attended by corresponding risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties. A rate of return may be reasonable at one time and become too high or too low by changes affecting opportunities for investment, the money market and business conditions generally.”

A second landmark decision of U.S. Supreme Court echoed and expanded upon the fair return standard established by the “Bluefield” decision cited above, for capital committed to public utilities. This second decision is the Federal Power Commission v. Hope Natural Gas Company case (320 U.S. 391, 1944); a relevant passage of this latter decision is as follows:

“From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock... By that standard the return to the equity owner should be commensurate with return on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and attract capital.”

These longstanding decisions provide the recognized framework for the fair rate of return on capital committed by investors to public service. In these decisions, the U.S. Supreme Court codified, in clear and readily understandable terms, a statutory benchmark that serves as the basis to set fair and equitable prices for retail public services such as natural gas, while also providing a fair rate of return on the capital provided by investors. Though they reach back many years, these decisions remain to this day the cornerstone

for the determination of rate of return requirements. The challenge for regulators, regulated utilities, and interested parties to regulatory proceedings is to operationalize these principles in contemporary regulatory processes.

As noted by Professor Roger A. Morin in his testimony before the New Hampshire Public Utility Commission:

“Subsequent cases have reaffirmed the standards established by the Bluefield and Hope cases.⁶ In the Permian Basin Area Rate Cases (390 U.S., 747, 1968) the U.S. Supreme Court stressed that:

the court must determine whether the order may reasonably be expected to maintain financial integrity, attract necessary capital, and fairly compensate investors for the risks they have assumed, and yet provide appropriate protection to the relevant public interests, both existing and foreseeable. The court's responsibility is not to supplant the Commission's balance of these interests with one more nearly to its liking, but instead to assure itself that the Commission has given reasoned consideration to each of the pertinent factors.”

Further down this path, the U.S. Supreme Court, in its decision in *Duquesne Light Company et al. v. Barasch et al.* (488 U.S. 299, 1989), explicitly recognized risks associated with changes in regulatory governance. In addition, key decisions in Canada align with the expressed views of the U.S. Supreme Court cited above.⁷

⁶ As discussed in Roger A. Morin, *Regulatory Finance: Utilities' Cost of Capital*, Public Utilities Report Inc., 1994), pp. 10-11, these cases include *Federal Power Commission v. Memphis Light, Gas & Water Division* (411 U.S. 458, 1973), *Permian Basin Area Rate Cases* (390 U.S., 747, 1968) and *Duquesne Light Company et al. v. Barasch et al.* (488 U.S. 299, 1989).

⁷ Specifically, the perspective expressed within the Canadian decisions, *Northwestern Utilities v. City of Edmonton* (S.C.R. 186, 1929) and *British Columbia Electric Railway Co. v. Public Utilities Commission of British Columbia* (S.C.R. 837, 1960) amply demonstrate a similar path and guideline for Canadian regulatory authorities, to that of the U.S. Supreme Court, for the setting of the fair rate of return level for utilities. For a more complete discussion of legal guidelines and landmark court decisions, please reference Roger Morin, *Regulatory Finance*, and Charles F. Phillips, *The Regulation of Public Utilities*, 1988.

UTILITY REVENUES, WEIGHTED COST OF CAPITAL

Public utilities such as BLPC utilize and employ substantial levels of capital resource inputs to provide delivery services. As mentioned, total net invested capital is the basis for setting regulated prices and is the primary component of a utility's rate base.

In general, the flow of revenues less the costs of non-capital inputs to the firm such as operating expenses provides a level of dollar returns to capital, in the form of operating income. If outcomes match expectations, investors realize returns equivalent to the overall cost of capital. As discussed more fully below, the overall cost of capital, often referred to as the *weighted average cost of capital* ("WACC") and expressed in percentage terms, recognizes and is based on the total pool of financing vehicles used by the utility to underwrite the capital that it employs, as reflected as rate base. In summary, the WACC is the composite weighted cost of the financing vehicles including short-term debt, long-term debt such as mortgage bonds, preferred stock, and common stock.⁸ These financing vehicles are property rights and constitute the financial contracts between savers and the firm, including government entities and private companies.

As mentioned above, utilities must compete with all other entities in the free open market for the input factors (labor, materials, and energy inputs). The prices of these inputs are set in the marketplace,⁹ and the costs of these inputs that are incorporated into the total costs and required revenues. Likewise, prices for capital resources such as equipment, facilities, software, inventories, and working capital are also set by markets. Since utilities including BLPC must directly or ultimately attract capital through open financial markets, there exists, without contradiction, a market price to pay for the capital they

⁸ As mentioned earlier, the capital structure and overall rate of return, for purposes of regulation, can also include customer deposits and, under accrual accounting, balances of various deferred accounting items such as income taxes and investment tax credits.

⁹ The discussion recognizes that entities including utilities may not participate in fully or even workably competitive markets for the various inputs that they require. Along this line, however, it is useful to mention that, worldwide, financial markets are generally considered to be relatively competitive, where the notion of competition implies that actions and behavior by individual market participants including buyers and sellers do not have significant impact on market clearing prices or the availability and sale of goods and services.

require—in short, the market cost of capital that implicitly exhausts all opportunities for higher returns, given perceived risks.

REGULATION, DEMAND FOR CAPITAL, CAPITAL ATTRACTION

The cost of capital concept may also be interpreted from the perspective of internal investments and the demand for resources. Regulated utilities accommodate the ongoing and steadily rising demand for services, which involves expanding employment of resources, capital in particular. Senior managers of firms, as agents for the ownership or controlling interest of the entity such as shareholders or a local municipality, are responsible for ensuring that the expected internal returns to and on incremental capital is equivalent to the cost of capital to the firm—investors’ rate of return requirements. The adequacy of the internal returns on incremental investment by electric utilities to fund capital at full opportunity costs, however, is highly dependent upon the soundness of the regulatory governance structure to ensure that the utility has the opportunity to provide sufficient revenues, which in turn can provide adequate returns on new capital.

When the rate of return, as set by regulators, leads to inadequate returns to capital or to the expectation that returns to capital are likely to be insufficient, utility managers are understandably reluctant to make investments in infrastructure. Indeed, when the expansion of capital resources occurs under a regulatory requirement including the obligation to serve, the absence of adequate returns implicitly constitutes the confiscation of the capital. Under these regulatory conditions, the utility is forced to provide services that involve new investment, even though adequate returns are not obtainable. The result is a failure of capital attraction by the utility, and the confiscation of capital of investors—an outcome that comes about from the inherent efficiency of competitive capital markets.

Investors, investment rating agencies, investment banks, and commercial bank lenders follow regulatory developments. Anticipating a shortfall of the internal returns to capital vis-à-vis rate of return requirements, capital markets bid down the prices of the outstanding securities of the utility. The reduced market capitalization of the utility

constitutes, arguably, the confiscation of the existing capital of holders of the utility's securities. Essentially, the utility has failed to (or simply cannot) attract capital on fair terms—terms that do not cause outstanding investors to incur wealth losses.

In summary, the utility and its managers can often find themselves, as a result of service requirements, forced to invest in real physical assets that are uneconomic from the perspective of the firm and its constituent investors, if the return on incremental investments falls short of the cost of capital.¹⁰ The cost of capital is the minimum rate of return that must be earned on physical assets to justify their acquisition, and thus the regulator must be mindful of the allowed rate of return levels and implement regulatory procedures that provide the utility with an acceptable level of opportunity to realize returns, on the margin, that satisfy the cost of capital—*i.e.*, a rate of return equivalent to that realized on investments of comparable risks. In the context of a binding regulatory constraint, and other regulatory requirements such as obligations to serve, it is necessary and sufficient for the required rate of return on incremental investment to adequately satisfy the opportunity cost of funds. The regulator should set the allowed rate of return equal to the cost of capital so that the utility is free to satisfy its capital needs and service customers at fair prices.

The aforementioned principle and accompanying rule can be illustrated by an example. Suppose a utility with a rate base of \$60 million financed 50% through debt and 50% through equity. Assume that the cost rate of the outstanding debt capital is 7.25%, and that the rate of return on equity capital is 12.0%, giving a weighted average cost of capital of 9.63 %. Suppose further that the regulator sets the allowed rate of return at 8.00%, rather than 9.63%. To fully service the property right claims of both bondholders and shareholders, revenues over operating costs should amount to \$5.8 million annually (*i.e.*, $0.0963 \times \$60$ million). An allowed rate of return of only 6.81% on a rate base of \$60 million provides returns to capital equal to just \$4.8 million. The returns to capital are sufficient to service the outstanding debt, \$2.2 million (*i.e.*, $\$60 \text{ million} \times 0.50 \times 7.25 \%$).

¹⁰ The incremental investment is a particular concern to BLPC and other electric utilities in view of aging infrastructure and the on-going replacement of the capital stock, where the incremental cost of the physical resources can be several times greater than the book value of embedded facilities.

However, bondholders have primary claims to the returns to capital, and shareholders residual claims. Hence, the return available to service equity holders is a mere \$2.6 million, allowing for a realized equity rate of return of just 8.8%, a shortfall of 3.2% which translates into a loss to shareholders of \$0.98 million.

As a consequence, share prices are significantly bid down, giving rise to a sharp decline in market capitalization of the firm. The result is a significant wealth transfer from shareholders, as investors, to retail consumers. In short, the capital of investors is confiscated via a failed regulatory governance structure. In addition, the regulatory structure, particularly where the utility has binding service requirements and constraints, causes a breach of fairness criteria and leads to a failure of the utility to satisfy capital attraction standards where capital can be raised at fair and equitable terms. Essentially, the higher cost of debt interest charges is a result of the reduced credit standing in view of the lower levels of interest coverage.

It is useful to pursue this line further and consider the counterfactual case. Specifically, if the allowed rate of return is greater than the cost of capital, the capital investments are undertaken and investors' opportunity costs are more than achieved. Any excess earnings over and above those required to service debt capital accrue to equity holders, resulting in a rise in share prices. In this case, the wealth transfer occurs from electricity consumers to shareholders.

The upshot is that, in the absence of other considerations such as the impact of the incentive properties of a chosen regulatory governance structure, investments and capital expansion are undertaken by the utility without inappropriate and unfair wealth transfers between consumers and shareholders if, and only if, the allowed rate of return is set equal to the cost of capital. In the case of the above example, at an allowed rate of return of 9.63% the expected earnings realized on incremental investments are just sufficient to service both the incremental and outstanding claims of debt and equity holders on the capital returns of the utility, no more, no less. In conclusion, setting the allowed rate of return equal to the cost of capital is the only policy that ensures that necessary

investments are made in order to satisfy utility service requirements while also providing fair and equitable returns to investors.

CAPITAL STRUCTURE and WACC for ELECTRIC UTILITIES

Capital Structure refers to the means—*i.e.*, financial vehicles—by which private and public entities underwrite physical capital and other assets. Capital structure can involve several types of vehicles including long- and short-term debt, preferred and preference stock, common equity, and capitalized leases. These traditional types of financial vehicles, for purposes of economic regulation, are often augmented by other sources of funds including customer deposits, and deferred balances for income taxes, investment tax credits and, in the case of BLPC, manufacturer’s allowance.

The relevant financial policy issue is the level of financial leverage, measured as the ratio of debt to equity that comprises the capital structure stated on a traditional basis. Because debt is generally less costly than equity, it is appropriate for the firm to underwrite its assets with some degree of financial leverage. The appropriate amount of leverage is a matter of operating and business risk, measured by the expected level and variability (mean and variance) in future operating income. In brief, highly stable flows of operating income (and internal cash), which can be interpreted as the total book returns to capital, provide a basis for the firm to employ higher levels of debt. Higher leverage, however, increases the variability of interest coverage and thus the cost of debt, *and the cost of equity* as a result. Thus, the financial policy issue regarding debt leverage is a matter of determining the level of debt that minimizes the weighted average cost of capital (“WACC”). At low levels of debt, the WACC declines as leverage rises. However, beyond a certain point, the expected level and variability of operating income of the firm relative to equity ownership value begin to rise, causing the WACC to increase. In short, the cost rates of debt and equity are sensitive to the debt and equity participation levels within total capital. The relevant question, then, is: what is the appropriate and acceptable level of leverage, given the inherent business and operating risks of the firm?

Decades back, it was common for electric utilities to underwrite assets with upwards of 60-65% debt and corresponding levels of equity of 40-35%. Currently, however, both mid-sized and large electric utility companies typically finance assets with participation shares of 48-58% debt, and 52-42% equity. The gradual evolution favoring lower levels of debt financing is in response to, and is in keeping with, changes in the electricity services industry. Several recent changes in the business environment facing electric utilities have precipitated the reduction in debt financing by electric utilities. These are: market restructuring involving competitive entry for generation and other unbundled services; sharp increases in input costs; closer integration of electricity services and energy markets generally, where energy commodities reveal much higher levels of price variation and volatility; less restrictive regulatory governance structure, including price cap regulation and earnings sharing mechanisms; and uncertain future requirements for environmental compliance.

As a general rule, the governing regulatory authority should adopt the observed historical or projected capital structure, including regulatory (non-traditional) components, where such result is well aligned with least-cost principles. However, where the observed capital structure constitutes a clear departure from least cost—with unusually high concentrations of debt or equity participation—it may be appropriate for the authority consider the adoption of a hypothetical or imputed capital structure. In addition, in the case of isolated service providers such as utilities like BLPC that operate island power systems, or where the utility is unusually small sized and is susceptible to unforeseen business events that cannot be readily diversified or insured, it may be appropriate for regulatory authorities and the utility to employ a higher concentration of equity participation.

WORLDWIDE CAPITAL MARKETS

Arguably, the most significant recent development in capital markets is the globalization of capital flows that, to a substantial extent, has been facilitated by the vast expanse of electronic media. Today, BLPC and entities worldwide compete for capital resources in

the face of vastly expanded opportunities for capital as a result of globalization and reduced barriers to capital flows among nations, and markets with increased return opportunities. As an example of the globalization of the capital markets, net private capital (*i.e.*, debt plus equity) flows to developing countries increased from \$188 billion in 2000 to \$491 billion in 2005 and to \$647 billion in 2006.¹¹ Equity flows in 2006 comprised \$419 billion, nearly 75% of total flows, in sharp contrast to the experience of earlier years. As an example, capital flows into developing countries in 1990 were approximately \$60 billion for debt, and \$40 billion for equity. Equity flows continue to increasingly dominate the share of total flows, in part due to an abatement in official lending flows. For example during 2006 official lending actually declined while total flows increased by 17% from 2005 levels. As the 2006 World Bank Report states:

Demand for emerging market debt and equities remained strong, spurred by improved fundamentals in many developing countries and investors' search for higher yields in an environment where long-term interest rates remain low in major industrial countries, despite higher short-term interest rates.¹²

This trend continues through 2007 and the current period, and it is useful to mention several key findings of the 2007 world bank report cited above, as follows:

- Inflows of capital of developing countries are an increasingly large share of total world capital flows, and their financial positions have steadily improved since the years of very slow growth of 2001-2002. Specifically, equity inflows to developing countries other than China were \$94 billion in 2006, and were \$6 billion 2001-2002.
- Developing countries have reduced external debt, lengthened maturities, and bought back outstanding debt, often using expanded currency reserves. Net lending from the Paris Club of creditors declined sharply in 2006.
- Equity firms located in developing nations have undergone a vast expansion of cross listing of their equity shares on world exchange markets in order to build channels for expanding capital needs, even when doing so implies that they need to satisfy higher accounting and financial reporting standards.

¹¹ Source, The World Bank, “*Global Development Finance: The Development Potential of Surging Capital Flows – Review, Analysis and Outlook, 2006*, and “*Global Development Finance, 2007*”, hereafter referred to as the “*World Bank Reports*”).

¹² The World Bank Report, 2006, p. 18.

- Foreign corporations are increasingly borrowing on international markets as a result of favorable interest rates and declining sovereign risk spreads. Additionally, foreign firms are increasingly utilizing advanced risk management tools in order to hedge currency and commodity risks, necessary as commodity exports, particularly oil and other natural resources, have assumed a much higher share on a value basis of total exports of developing countries.

The development of global capital markets parallels expanded development of economic activity. Indeed, world GDP expanded 5.3% in 2006. Participating in high levels of economic growth are nations in the South American and Caribbean region, which experienced 4.7% and 5.6% expansion of real activity in 2005 and 2006, respectively, with continued growth of 4.3% projected for the 2007-2009 timeframe.¹³

The development of global financial markets parallels and contributes to expanding economic activity. Global markets and the resulting capital flows are much more integrated now than in previous eras and, as a result, investors have a substantially larger set of opportunities to place capital, including investments in utilities in other energy markets and other regulatory jurisdictions. The emergence and development of robust global capital markets over the past decade, in particular since 2001-2002, has placed BLPC and other utilities within the Caribbean region in the position of competing for capital with developed and other developing countries, as well as the complete gamut of industries seeking capital resources. The global nature of capital affects utilities and is relevant for both debt and equity funding.

Global capital markets today are driven to a substantial extent by institutional investors. Institutions are likely to seek to remain fully invested and seek out “undervalued” assets. Finally, strategic institutional investors, like pension funds, life insurance companies, and sovereign wealth funds are growing in importance in worldwide financial markets. The increasing sophistication of these institutional investors means that they are able to differentiate between country- and company-specific investment opportunities. This translates into investment behavior that pays close attention to the risk profiles of opportunities that they face, including utilities and other energy market equities, when making decisions about strategic placement of funds.

¹³ World Bank Report, 2007.

In short, the clear implication is that BLPC and other entities large and small must compete for funds globally. Globalization of capital flows is no doubt manifested in multiple dimensions. For our immediate purposes, however, one salient point matters most: the prospects of future returns and capital risks associated with a capital position in BLPC, as gauged by the holders (investors) of capital, are *benchmarked* with respect to the expected returns obtainable from alternative investment opportunities of comparable risks elsewhere. The universe of opportunities is large, and one can expect that investment opportunities are fairly gauged in terms of risks and potential returns.

SOVEREIGNTY RISKS

Sovereignty risk refers to the risk differences among comparable types of financial assets, including government and corporate bonds and common stocks, according to the country of origin of the asset. Sovereignty risks are evidenced by observed risk premia among financial assets across countries, and are most relevant for developing nations and regions where risk differences with respect to developed economies reflect the inherent level of uncertainty and risks of emerging economies. Emerging markets are typically less developed and complete, are notably more vulnerable to currency risks, and are much less capable of diversifying exports and the effects of widely varying world commodity prices. Similarly, the financial assets sourced in emerging markets are less liquid and may not reflect full information reporting standards. Finally, investors in emerging markets are likely to have less complete information and knowledge regarding the full extent of risks, including political and more general institutional intricacies. Moreover, some regions experience periodic and chronic levels of civil unrest and warfare. Observed market yields suggest, then, that so-called sovereignty risks are real. The relevant question is how best to gauge the risk premia associated with the financial assets of emerging economies, where the focus is common equity.

Under conditions in which the underlying assets are traded within sufficiently competitive and liquid markets, the well known tools of capital valuation, including CAPM and Discounted Cash Flow, provide a basis to develop estimates of the cost of capital. In the case of emerging markets, however, financial markets are often

incompletely developed. The market size (capitalization) of debt obligations and common stocks traded on the exchanges of emerging markets are typically of small scale; the number of listings are often few, and trading activity is thin and often intermittent. In short, the relevant valuation tools, as developed by and actively exploited within the financial markets of the developed economies of the West and the Far East, are not easily applied. Consequently, several sensible though *ad hoc* approaches for determination of sovereignty risks have been and are applied in lieu of formal valuation methods, at least as applied to the within-nation exchange experience. These methods include:

Nation-Specific Equity Market Risk Premia: Using a worldwide equity market index such as Morgan Stanley Capital Index (MSCI) and estimated risk premia, develop CAPM or APT multifactor¹⁴ estimates of the cost of capital specific to the equity markets of the nation of interest.

Observed Risk Premia of Government Debt: This second approach reviews historical bond yields and short-term interest rate differentials of the outstanding debt obligations of sovereign nations. Under this approach, bond yield differences stated in real terms, constitute risk premia, and represent common risk differences that are then applied, in common, to the financial assets sourced to the public and private entities of the nation of interest.

Credit Scores Differences: Entities that provide financial services such as *Institutional Investor* periodically conduct surveys of traders involved in the assessment of capital risks. Through these surveys, a consensus risk assessment and associated credit rating is developed. In turn, the composite credit rating is used as a basis to explain real debt costs and historical market returns. The resulting model provides a basis to estimate risk premia, given the observed credit rating scores obtained from the surveys. The credit scores of global credit rating agencies can be correlated with observed real interest rates.

¹⁴ APT refers to *Arbitrage Pricing Theory*. Originally formulated by Stephen Ross in 1980, APT and multi-factor models are often viewed as extensions of the CAPM framework, within which CAPM Beta constitutes a one-factor approach. Multi-factor models such as the Fama-French 3-factor model have been shown to better explain historical market returns than the now classic CAPM framework.

Relative Risks of Equity Market Returns: Indexes of historical market returns for exchanges of emerging nations are formulated. The statistical variance of the index (market returns) serves as the appropriate risk metric. The variance (or standard deviation) of market returns of the emerging market exchanges is then normalized with respect to the index of a major equity market exchange, such as the S&P500. The result is a relative value of the average equity market for various emerging markets, where the values vary around (are somewhat above) unity. The final step is to multiply the observed equity risk premia for the major exchange by the calculated values of relative statistical variances for the emerging markets. These adjusted equity premia are then coupled with low-risk sovereign debt yields for the markets of interest. In short, there are several plausible ways to potentially address the question of the existence and magnitude of sovereignty risks. While all four approaches are seemingly viable, some methods are likely to provide more reliable estimates of true underlying country risks than others.¹⁵

METHODOLOGY: ESTIMATION OF THE COST OF EQUITY

It is useful to reiterate three essential points that we elaborated upon above. First, the cost of equity of the firm – and of investors in the firm – is a function of perceptions of risk, the demand for and supply of capital, and expectations of inflation. Second, the cost of common equity of the firm is equal to the opportunity cost of capital incurred by common shareholders of the firm contemporaneously, though the experience of long-term history guides the assessment of opportunity costs. Third, the cost of equity of the firm is equal to the expected market rate of return on alternative investments of comparable risks available to shareholders – *i.e.*, the opportunity cost of capital—within a contemporary timeframe.

The determination of the opportunity cost rate for equity capital is challenging for two reasons. In the case of debt, both the market price and future expected cash flow returns to capital are observable by inspection. Thus, the net expected yield to maturity, which

¹⁵ In particular, the nation-specific equity market risk premia approach appears to provide counterintuitive and inconsistent results for some emerging markets and regions.

reflects the opportunity cost of capital to holders of debt, can be determined directly. This *is* the market rate of return, *ex ante*. For purposes of determining the overall utility rate of return, however, the cost rate of long-term debt is that which is set at the time of issuance in primary financial markets.

In contrast, expectations of investors about the prospective cash flows and market returns on common equity cannot be observed directly, and must be inferred with estimation procedures. Also, the allowed equity rate of return is typically set according to the current and expected cost of capital, though much of the equity investment was committed in many years past. That is, the cost of equity may change over time as market conditions change even though the original equity contribution has not changed.

In the determination of cost rate for debt obligations, investors' perceptions of risks are implicit in the primary and secondary market prices of the debt obligations themselves, and need not be known or even estimated. In contrast, the determination of the cost of common equity involves the perceptions of future risks harbored by investors, as a matter of the consensus view. Perceptions of risk are also not observable directly, and thus must be inferred.

In short, the cost of common equity can only be discerned through the proper and careful application of well-established methods that provide the cornerstone for modern finance theory. While the methods employed herein are well-established, the procedures to determine the cost of equity capital require estimation of key parameters.

In order to develop our recommendation for the rate of return on equity for Barbados Power and Light Company, we apply four estimation methods. These procedures include variants of the constant growth *Discounted Cash Flow* model ("DCF"), and the *Capital Asset Pricing Model* ("CAPM"). These classical approaches are commonly recognized within modern finance theory and are readily utilized for purposes of capital valuation. The results of these two formal models of the cost of capital are augmented by an assessment of *Realized Market Returns* for utility and non-utility companies of comparable risks, and estimates of cost of capital inferred through the *Risk-Premium* methodology. These four methods are discussed below.

The constant growth Discounted Cash Flow (DCF) model was originally developed by Myron Gordon in 1957, and was advanced actively during the early 1960s. In its classical form, the derived DCF model defines the cost of capital as the sum of the adjusted dividend yield, and expectations of future growth in cash flows to investors including dividends and future appreciation in share prices. The classical (one-stage) DCF model is as follows:

$$k_{e,j} = D_{0,j}(1+E(g_j))/P_{0,j} + E(g_j)$$

with,

$k_{e,j}$ = cost of equity capital, asset j

$D_{0,j}$ = current dividends per common share, asset j

$E(g_j)$ = expected growth in future cash flow returns to investors in asset j

$P_{0,j}$ = current price per common share, asset j

The one-stage form of the DCF approach is an elegant and intuitively tractable model with two terms, a mathematical result derived from the constant growth present value model. A cursory review of historical returns on equities suggests that, to a substantial extent, differences in the observed internal returns to capital, as well as expectations of future returns as expressed by security analysts, contribute to realized market appreciation as well as total returns to capital. It is plausible that the *expected path* of future returns harbored by investors may assume a pattern of non-constant growth. This means that, at least under some market conditions, the constant growth form of discounted cash flow may not represent investor expectations of growth with sufficient accuracy. Arguably, other forms of DCF may serve as better approximations of investor expectations.

A plausible means to better model expectations of varying growth might be with stochastic models, where the path of returns and growth is a function of time, with a random component. However, stochastic models introduce considerable complexity. As a first-order approximation to stochastic processes, multiple-step constant growth models known as multi-stage DCF can serve nicely. Essentially, multi-stage DCF is a variation of present value theory which postulates that future returns assume a pattern of several growth steps or stages. While any number of stages of constant growth is possible, two

or three stages are typically applied. In stylized fashion, the Three-Stage DCF model is shown below:

$$P_{0,j} = (1+g_j)/(k_{e,j}-g_j)\{D_{0,j}(1 - F^5_j) + D_{5,j}(F^5_j - F^{10}_j) + D_{10,j}(F^{10}_j)\}$$

with,

$$k_{e,j} = \text{cost of equity capital, asset } j$$

$$D_{t,j} = \text{current and future dividends per common share, asset } j$$

$$E(g_j) = \text{expected growth in future cash flow returns to investors in asset } j$$

$$P_{0,j} = \text{current price per common share, asset } j$$

$$F_j = (1+E(g_j))/(1+k_{e,j})$$

As shown in the above formulation for the Three-Stage DCF, discounted prospective cash flows are represented by three terms that incorporate the factor “F”, each of which is differentiated by expected growth ($E(g)$). In the Three-Stage approach—should we say multi-stage approach—investor expectations of future growth are differentiated among time frames. Unlike the single-stage DCF approach, the estimated cost of equity capital solution to the multi-stage model (the discount rate k) is obtained through a mathematical search procedure that iteratively searches for the discount rate that balances the left- and right-hand-sides of the equation. Appendix I provides a step-by-step derivation of the classical and multi-stage discounted cash flow models shown above.

The Capital Asset Price Model (CAPM) was developed by William Sharpe (1961) and John Lintner (1964). CAPM was derived from mean-variation analysis and, in particular, portfolio selection developed by H. Markowitz (1952). The derived CAPM shows how the valuation of a financial asset (price) is based upon two components: risk-free returns and an *adjusted risk-based return*. Surrogates for risk-free returns can be observed directly in capital markets, and include market returns on short- and intermediate-term debt. As a general rule, the cost rates and market returns on government debt obligations serve as appropriate surrogates.

The adjusted risk-based return is based upon three factors: 1) the covariation of the returns to the asset and that of markets for risky assets, 2) the statistical variance of returns of the market for risky assets, and 3) the *difference* between expected overall returns on risky assets, and risk-free returns. The third parameter is referred to as the

excess return, and is equal to the difference between the overall returns to risky assets for the market as a whole, and the risk-free return rate. The CAPM is shown below:

$$k_{e,j} = r_f + B_{jm}*(r_m - r_f) \quad \text{with, } B_{jm} = \sigma_{jm}/\sigma_m^2$$

with,

$k_{e,j}$ = cost of equity capital for risky asset j , stated in percentage terms

r_f = risk-free rate of return

B_{jm} = ratio of the covariation between risky asset j and the market as a whole, σ_{jm} , and the variance of market returns, σ_m^2

r_m = expected rate of return on equity markets, as a whole

Appendix II derives the Capital Asset Pricing Model, as shown above. The derivation is developed by David Luenberger.¹⁶ The efficient market hypothesis plays an essential role in the determination of the cost of capital. Specifically, the working assumption, which is largely though not completely borne out by empirical analysis, is that capital markets are fairly efficient. This means that the supply and demand for risky financial assets, as reflected in bid and asked prices to buy and sell shares, result in financial assets being traded at price levels where *rates of return above the cost of capital cannot be systematically realized*. Above-normal returns – returns above the cost of capital – are realized only randomly. Essentially, the opportunities to systematically realize returns above the underlying cost of capital are exhausted by the competitive market process.

Estimating the cost of capital, though not trivial, can be fairly straightforward, and both the DCF and CAPM approaches provide a useful framework. The risks to investors in various sectors of the energy services industry cannot ever be known directly; risks – and hence the implied cost of capital – can only be inferred. Specifically, the determination of useful estimates of the cost of common equity capital within either framework requires a discerning application of theory through careful analysis, such as that presented herein. In particular, the determination of the cost of equity capital faces two overarching challenges, as follows:

- both approaches are forward looking and thus the results are highly dependent upon useful estimates of investor expectations about future market performance.

¹⁶ David Luenberger, *Investment Science*, 1997.

- The underlying assumptions for DCF and CAPM include, among other things, an efficient market and rational behavior of investors such that all opportunities for above- and below-normal returns to capital are exhausted on an expected value basis. In short, capital markets value financial assets at the implied opportunity costs of capital, given investor perceptions of risk.

It is useful to mention that the notion of *risky assets* can apply to any real or financial asset wherein the prospective returns from holding the asset are uncertain. Risky assets include commodity contracts, financial property rights, financial derivatives, and real assets such as power delivery and generation facilities of electric utilities. Risk assessment and option theory, moreover, can be applied to the analysis of unbundled services, such as electricity transmission development plans. Within the context of this discussion, however, risky assets refers to financial obligations of firms – common stock – and asset values refers to prices of common stock as observed on major stock exchanges.

Measurements of *Realized Market Returns* and risk metrics are increasingly used as a basis to assess plausible returns in the future. As discussed, efficient markets suggest that *all* financial assets are priced at levels such that the *expected* future returns of individual assets are equivalent to the underlying opportunity cost. Thus, if historical returns guide expectations of future returns, historical returns provide a useful benchmark and, within reasonable bounds, reflect the opportunity cost of capital. In this respect, the *Realized Market Returns* methodology can be viewed as a market-based approach of Comparable Earnings, and thus fully satisfies the *Bluefield* and *Hope* criteria. More specifically, realized market return for a period is defined as:

$$R_{j, t-t-1} = (P_{j, t} + D_{j, t-t-1} - P_{j, t-1})/P_{j, t-1}$$

with,

$R_{j, t-t-1}$ = market return realized within the interval $t - t-1$, for financial asset j

$D_{j, t-t-1}$ = dividends paid during the interval $t - t-1$, for financial asset j

$P_{j, t, t-1}$ = market value of financial asset j , at t and $t-1$

The key to successfully applying this third approach is identification and measurement of historical returns in a manner that reasonably reflects expectations of investors about the future outlook.

Observed historical returns and future expected returns of financial assets are ordered according to risks. This ordering according to risks is a natural and inevitable result of competitive financial markets: because risk is costly, higher costs must be offset by higher returns. While it is not based upon an explicit model, the analysis of the risk premia among classes of risky assets provides a means to infer the underlying opportunity cost of capital. The underlying concept of the risk premium approach is that *differences* in perceptions of risks among financial assets such as equities and debt are revealed in differences between the historical market returns. The historical differences between equity and debt returns – *i.e.*, risk premia – can thus serve as a surrogate for the compensation for risk over future timeframes. When combined prospectively with the expected cost of short-term debt, risk premia provide a useful benchmark to gauge the underlying cost of equity capital. The immediate application of the Risk Premium approach is codified as follows:

$$k_{e,j} = r_f^{st} + rp_{it-st} + rp_{m-it} + rp_{y-m}^{CAPM} + rp_j^s$$

with,

$k_{e,j}$ = cost of equity capital for risky asset j , stated in percentage terms

r_f^{st} = risk-free rate of return, for a short-term asset

rp_{it-st} = risk premium, for intermediate-term asset i with respect to a short-term asset s

rp_{m-it} = risk premium, for equity market m with respect to a intermediate-term asset

rp_{y-m}^{CAPM} = risk premium, for industry y with respect to equity market m , where industry is the relevant industry sample

rp_j^s = size-based risk premium for risky asset j ¹⁷

Application of the Risk Premium approach contains two potential pitfalls, as follows:

- the opportunity cost of common equity capital, stated in nominal terms, is sensitive to the demand for and supply of capital;

¹⁷ Size-related risk premia are, as a general rule, relevant within the context of the Capital Asset Pricing Model. Specifically, the CAPM-based estimates of market returns appear to systematically understate the cost of equity capital for small-sized stocks. Size-related risk premia may not be relevant or appropriate in other model contexts.

- risk premia among debt and equity instruments are also quite sensitive to expected inflation. Thus, Risk Premium analysis must account for expected inflation in the future. That is, the underlying rate of inflation and conditions of the historical period over which risk premia are estimated must match those of the expected conditions of the relevant period over which the common equity recommendation is being applied, and over which retail electricity prices are being set.

PART II: ANALYSIS OF COST OF CAPITAL

BUSINESS and FINANCIAL RISKS: BARBADOS LIGHT & POWER

Setting forth recommendations regarding the appropriate rate of return is not a mechanical model-driven result obtained in isolation. An understanding of business context to gauge capital risks is essential. Risk assessment should take account of the generic risks attending entities involved in energy markets and electricity service providers, as well as the idiosyncratic risks unique to BLPC. Accordingly, analysis of the cost of capital, for purposes of setting the rate of return, should be fully informed and sensitive to the facts defining the relevant generic risks and the idiosyncratic risk profile of BLPC.

Generic business risks attending the cost of capital for electricity service providers are strongly interdependent and will be briefly mentioned. In the contemporary environment, electric utilities face rapidly rising costs at a time of general tightening of the supply-demand balance, ongoing advances in electricity demand, and rapidly heightened requirements for environmental compliance. Increased upward cost pressures, in turn, precipitate increased resistance to price increases and scrutiny by stakeholder groups of the prudence of utility resource decisions and the reasonableness of cost levels. All too often, cost pressures from the perspective of investors and utility managers arise as a result of issues of timeliness of rate relief, and less than full recognition by regulators of legitimate costs. The end result is a shortfall of revenue with respect to cost levels, manifest as increased variation in operating income, lower interest coverage on debt, and earnings that may not cover investors' cost of capital.

BLPC is a comparatively small, full service integrated electric utility. On the basis of size alone, BLPC carries an element of risk additional to that of larger utilities delivering

the same full range of services. As discussed at length later, empirical evidence suggests that, within the context of diversifiable financial risks defined by the CAPM framework, the cost of capital rises with small size. Essentially, all other factors constant, small capitalization equities have higher non-diversifiable risks than larger companies.

As an island power system, the Company and its investors are exposed to special dimensions of risks relative to utilities in larger economies. Island electric power systems implicitly harbor higher operating risks. Specifically, BLPC cannot immediately draw upon neighboring power systems in the case of a major equipment failure for either high voltage transmission or for generation reserves. Accordingly, the Company must carry fairly high levels of reserves for generation services. Furthermore, small-sized electric systems enmeshed within larger continental power systems and markets can diversify generation operational risks and costs by carrying a comparatively large number of small-scale ownership shares in multiple facilities. In comparison, BLPC's physical stock of generation resources is comparatively indivisible. Capital indivisibility of generation adds to operational risks in obvious ways. In addition, however, capital indivisibility implies that generation additions, which come about frequently in view of the rapid rates of growth in Barbados' electricity demand, are brought to commercial operation in rather lumpy increments.

In the case of power delivery, the Company is not embedded in highly integrated meshed power systems of the major continents; other factors constant, the implicit level of reserves within power delivery for BLPC must be at higher levels with respect to its counterparts in Continental power systems. Moreover, BLPC is unilaterally exposed to the damaging impacts of large storm systems that, from time to time, can threaten Barbados and the Company's power delivery systems. Similarly, fuel supplies for BLPC cannot be readily diversified across multiple sources and transportation modes, as they can for continental systems.

In summary, then, one must conclude that, from the perspective of investors, the Company is not readily able to diversify operational risks to the same degree as other utilities.

DETERMINING COMPARABLE RISK COMPANIES: COST OF EQUITY

As defined by the “Bluefield” and “Hope” decisions of the U.S. Supreme Court, a public utility (to paraphrase), is entitled to a rate of return on shareholder capital committed for the convenience and necessity of the public equivalent to that realized by companies in other businesses of comparable risk. Thus, the task at hand is comparability: to identify the relevant markets, and to then select companies of comparable business, regulatory, and financial risks to those of BLPC. Estimates of the cost of equity are obtained by applying the cost of equity methods to the sample companies.

The study draws upon the universe of equities of the U.S. and Canadian capital markets as a starting point from which to select comparable risk utilities and companies. Once selected, we estimate the cost of common equity for the sample(s) of comparable companies that, by definition, is the opportunity cost of capital for BLPC. A key distinction regarding comparability is market size, as recent empirical evidence convincingly demonstrates that, predominantly because of information inefficiencies and uncertainty, the cost of capital rises as firm size declines all other factors held constant.

The starting point is the market portfolio; that is, we begin with virtually all common shares traded on U.S. and Canadian equity markets. For the samples of U.S. companies, we have drawn heavily—though not exclusively—from a set of data sources including Value Line data banks and Ibbotson Associates (Morningstar), and web-based services of Yahoo Finance, UBS Financial Services, Zacks Financial Services. With few exceptions, the shares of interest are traded on the New York Stock Exchange and the exchange operated by the National Association of Securities Dealers referred to as NASDAQ. For these equity listings, a wide range of financial data, business descriptions and classifications, historical price experience, and various diagnostic statistics of interest are reported. The sample of Canadian companies is drawn from utility companies listed on the Toronto Stock Exchange, referred to as TSX.¹⁸

¹⁸ The equity listings of NYSE, NASDAQ, and TSX very clearly do not constitute the full set of investment possibilities. Indeed, some 75 stock exchanges currently exist worldwide. Arguably, some combination of

From the U.S. market portfolio we proceed to develop two utility company samples and a comparable risk non-utility sample. The first sample, Mid-Sized Electric Utilities (U.S. sample 1) is limited to retail electricity service providers that have modest yet significant levels of market participation and, with the exception of size-related capital risks, are of comparable risk to that of BLPC. The second U.S. utility sample is referred to as the Moderate-Sized U.S. Gas Distribution Utilities (U.S. sample 2), and is composed of retail natural gas service providers. Our studies demonstrate that, as a practical matter, the level of capital risks and thus the opportunity cost of capital for the two samples, electric utilities and natural gas utilities, is comparable. For purposes of determining the equity rate of return requirements of BLPC, the study also draws a third U.S. sample, referred to as Comparable Risk Non-Utility Companies (U.S. sample 3). Our methods tend to demonstrate that, particularly within contemporary capital markets with high levels of international capital flows, comparable risk is the predominant selection criterion. Line of business appears to have only a modest level of relevance to cost of capital, once the comparable risk criteria are satisfied. Thus, samples can be drawn from a broad range of business fields, generally speaking.

The determination of the first sample, the mid-sized electric utilities, involves two steps. The first step is to conduct an initial screen according to the predefined selection criteria. As mentioned, these criteria are as follows:

- *Liquidity*: companies that are of modest size but yet have sufficient market presence and participation to ensure sufficient market activity and transaction volume;
- *Business Line*: companies whose primary business line is retail electricity services; and,
- *Reasonably consistent financial experience*.

the Morgan Stanley Capital Markets (MSCI) plus exchange indexes of the North American equity markets is a more complete representation, when assessing the performance of equity markets at a summary level, which is necessary in the case of CAPM, Risk Premium, and also Arbitrage Pricing Theory-based methods. However, the North American equity markets, as represented by many listings on these three exchanges, are highly liquid. Accordingly, movements and performance of the indexes for the North American markets closely parallel movements of other world indexes, though differences are observed as a result of exchange rate movements, random regional events, and significant changes in expectations of economic performance. In addition, the North American markets, unlike worldwide exchanges, carry equity listings for numerous utility companies.

To determine U.S. sample 1, the study begins with 30 entities across the U.S. electric utility and electric energy companies. Seventeen electric utility companies are selected from this initial set for analysis, where the criteria for selection are completeness and consistency of reported financial information and market data, and also electric utility services as the primary business line. Some of these 17 electric companies have substantial involvement in non-electric retail business lines including natural gas. It is virtually impossible these days to assemble a sample of companies that are exclusively in the retail electric business – sometimes referred to as a *pure play*. This should not matter, at least on the surface, if the sample is determined on a basis of comparable risks. Indeed, endeavors to diversify risk over alternative business lines tend to reduce variation in earnings, variation in internal cash flow, and variation in market returns, thus reducing overall investment risk and the cost of capital.

From this set of companies, eight electric utilities are selected according to comparable risk criteria including. The second selection step in determining the electric utility sample applies risk criteria. These criteria include five dimensions, or metrics:

- *Equity Participation in Total Capital*;
- *Coefficient of Variation in Internal Cash Flow* per share over five and ten years;
- *CAPM Beta* which, as discussed above, is the ratio of the covariation of the market returns of a specific stock of a company and the market as a whole, and the statistical variance of the returns of the market; and,
- *Variation in Market Returns*, which is measured as the coefficient of variation of monthly market prices—essentially, an index of volatility in market value (market capitalization).

Those eight electric utility companies with risk metrics that generally fall within one standard deviation of the average for the sample of electric utilities as first drawn or are reasonably close to the metrics for BLPC are retained in U.S. sample one (mid-sized U.S. electric utilities). It is these utility companies that, by this arguably objective approach, satisfy the criteria of comparable risks and thus the U.S. Supreme Court guidelines regarding fair rate of return contained within the Bluefield Waterworks and Hope decisions.

The market capitalization of these companies, measured by common shares outstanding and market prices during 2005, ranges from \$77 million for Florida Public Utilities Company to slightly greater than \$4.6 billion for SCANA (South Carolina Electric and Gas). The non-weighted average size of U.S. sample 1, the electric utilities, is \$1.6 billion.¹⁹ CAPM Betas, which are arguably the most significant measure of capital risk, are shown in the adjusted form for 2005 and for 2001-2005 on average. In particular, note that CAPM Betas have risen, suggesting significantly higher capital risks associated energy markets including electric service providers. The mean-variation *theory* on which the Capital Asset Pricing Model is based suggests that risk metrics other than CAPM Beta do not matter for the determination of portfolios that efficiently trade off risks and potential future return levels. However, empirical *evidence* suggests that a) internal financial metrics such as items 1-3 above are also utilized by investors to value equities, and b) CAPM theory (as with other capital market theories) does not necessarily explain historical market returns particularly well. Thus, it appears that, to a substantial degree, information other than CAPM Beta is also relevant to investors in the valuation of equities.

Turning to the moderate-sized U.S. gas distribution utilities (U.S. sample 2) and the comparable risk non-utility companies (U.S. sample 3), the selection process proceeds in similar fashion using criteria equivalent to those employed to determine the U.S. mid-sized electric utility sample (U.S. sample 1). That is, a sample is first drawn on the bases of market liquidity and business line. The selected natural gas utilities and estimates of cost of equity for them are shown on Appendix IV. The selected U.S. natural gas companies range in size, measured by market capitalization, from \$219 million to 2.8 billion in 2005. As with the U.S. electric utilities sample, these companies, although of comparatively modest scale by U.S. benchmarks, are all significantly larger than BLPC, which implies that BLPC has higher capital costs, with other factors held constant. Appropriately in view of BLPC's business context, the Company underwrites its resources with higher equity participation than its U.S. counterparts.

¹⁹ Not shown but available are the compiled profiles of the sample utilities and non-utility companies, including brief reviews of the business, operating revenues, assets, and operating margins.

The Canadian utilities, including samples 1 and 2, cover energy and non-energy companies that are involved in providing utility services such as telecommunications, transportation, renewable energy, natural gas, and transmission services, in addition to conventional integrated electricity services. Implicitly, then, these entities cover a broader range of business and market context that inherently represent arguably higher business and operational risks. Because of the limits in readily available financial information and equity market data, the cost of equity analysis included in the cost of equity study for the Canadian utilities proceeds differently and is less complete²⁰ than the analysis performed for U.S. samples 1-3.

In summary, the estimate of the cost of equity capital of this study involves five samples, including the three U.S. samples—the mid-sized U.S. electric utilities (U.S. sample 1), U.S. gas distribution utilities (U.S. sample 2), and comparable risk non-utility companies (U.S. sample 3); and the two samples of the Canadian utilities (CN samples 1 and 2). The estimate of the cost of capital, and thus the recommended return on common equity, is reflected as an interest rate that, by objective criteria of comparable risks, is the opportunity cost of capital incurred by the common shareholders of BLPC.

Market Liquidity is a necessary selection criterion, as stated above. The selection process results in generally smaller-sized electric and gas utilities that have sufficient liquidity. However, the selected utility companies are substantially larger than BLPC as a general rule. Because the cost of equity capital appears to increase progressively with smaller size, other factors constant, the implication is that the cost of equity capital, as estimated for the two samples, may not fully capture the inherent capital risks incurred by investors of BLPC. Size-related risk premia are discussed more fully in the following section.

²⁰ Financial data reported by U.S. companies listed on the major U.S. equity markets including NYSE and NASDAQ are reported by the listed entities to the Securities and Exchange Commission (“SEC”). By law, the SEC imposes highly specific financial reporting standards. These data, in turn, are compiled by several financial services companies including Compustat, Valueline, Bloomberg, and others. Thus, compiled financial and equity market information can be readily obtained in non-compiled form directly from the SEC or in a compiled form from services such as these. This is not the case for Canadian companies. While compiled financial information is available, such data are much less complete, thus burdening valuation studies such as this with obtaining financial data in non-compiled form from the web sites of the entities of interest, and by other means.

EMPIRICAL FINDINGS, COST OF EQUITY

This section presents the results of the analysis of the cost of equity capital appropriate for the determination of the return on equity for BLPC. The first step is to apply the four methods to estimation of cost for the comparable risk peer groups of BLPC. However, it is difficult to create a peer group for BLPC due to its small size relative to other companies. Because evidence suggests that the cost of capital rises progressively with smaller-sized entities,²¹ the cost of equity estimates derived from the analysis of the peer groups will be systematically low. Also, the estimation procedures, including the selection of the comparable risk peer groups, do not explicitly take account of business context differences—in particular, the isolation associated with the Company’s island power system. This analysis explicitly estimates the likely range of sovereignty risk, which is incorporated into the cost of equity capital recommendation.

Peer Group Estimates of the Cost of Equity

The analysis draws on recent and long-term historical experience as the basis to determine the cost of equity capital, which incorporates capital risks and future prospects for capital returns. While estimates of the cost of capital are inherently forward looking, the process of estimation draws upon historical assessments of risk and the future prospects for market returns—essentially, the realized returns to investors and savers, as holders of property rights claims to capital in the form of financial assets. The tables below summarize the analysis conducted using the four approaches for the U.S. and Canadian²² utilities and U.S. comparable risk non-utility companies. Details appear in Appendices III-VII at the end of the report.

²¹ Size-related risk premia, within the context of CAPM analysis, are reflected in higher levels of CAPM Beta with progressively smaller entities. This empirical result is expected. However, it appears that CAPM Beta for smaller capitalization entities, though higher, systematically understates realized historical returns. This second component of the size premium is explicitly recognized in the Risk Premium cost of equity approach used in this study.

²² The study does not apply the discounted cash flow (“DCF”) methodology to the two samples of Canadian utilities because of the limits of reported financial data for a sufficiently long historical period. DCF is also not applied to the U.S. comparable risk non-utility sample because of non-applicability, in view of the sparse dividend experience of the sample, which is non uncommon for non-utility companies.

DISCOUNTED CASH FLOW ANALYSIS: U.S. Utilities

Mid-Sized Electric Utilities (sample 1)		
Estimated Cost of Equity (%)	Dividend Yield (%)	Expected Growth In Cash Flows (%)
9.15	5.10	4.04
Gas Distribution Utilities (sample 2)		
Estimated Cost of Equity (%)	Dividend Yield (%)	Expected Growth In Cash Flows (%)
9.67	4.02	5.65

CAPM ANALYSIS: Canadian, U.S. Utilities and Non-Utility Companies

Canadian Utilities, Samples 1 and 2			
Estimated Cost of Equity (%)	Risk-Free Rate (%)	Beta	Market Risk Premium (%)
8.65	4.45	0.70	6.00
8.95	4.45	0.75	6.00
U.S. Mid-Sized Electric Utilities (U.S. sample 1)			
Estimated Cost of Equity (%)	Risk-Free Rate (%)	Beta	Market Risk Premium (%)
10.94	4.73	0.75	8.28
U.S. Gas Distribution Utilities (U.S. sample 2)			
Estimated Cost of Equity (%)	Risk-Free Rate (%)	Beta	Market Risk Premium (%)
10.95	4.73	0.75	8.28
Comparable Risk Non-Utilities (U.S. sample 3)			
Estimated Cost of Equity (%)	Risk-Free Rate (%)	Beta	Market Risk Premium (%)
9.03	4.73	0.52	8.28

COMPARABLE EARNINGS²³ (HISTORICAL MARKET RETURNS)

Historical Market Returns	(%)
Canadian TSX Listed Utilities (sample 1)	9.13
Canadian TSX Listed Utilities (sample 2)	17.94
Mid-Sized Electric Utilities (U.S. sample 1)	10.75
Gas Distribution Utilities (U.S. sample 2)	9.14
Comparable Risk Non-Utility Companies (U.S. sample 3)	10.35

RISK PREMIUM ANALYSIS: U.S. Utilities and Non-Utility Companies

Risk Premium for U.S. Utilities, Non-Utilities	
	(%)
Mid-Sized Electric Utilities (U.S. sample 1)	11.18
Gas Distribution Utilities (U.S. sample 2)	11.51
Comparable Risk Non-Utility Companies (U.S. sample 3)	10.84

The estimates of cost of equity capital using single-stage DCF analysis for each of U.S. samples 1 and 2 are quite similar: 9.15% for the sample of U.S. mid-sized electric utilities and 9.67% for the sample of U.S. moderate-sized gas distribution utilities.²⁴ The dividend yields of the DCF analysis utilize the stated dividend rates, as observed during early- to mid-2006, and stock prices sampled from May-June of 2005. The DCF cost of equity results for the electric utilities reflect the slowdown in earnings and cash flow growth during 2004 and continuing in 2005, which is largely a result of rising input costs, particularly for new investment, that is not being recovered in current rates. Expected

²³ *Comparable Earnings* in the context of market-based assessment of realized returns is referred to as *Historical Market Returns* elsewhere in the report including the Appendices.

²⁴ The three-stage DCF model results are very similar in magnitude and are thus not reported.

growth relies on the historical experience for both internal cash flow and earnings per share.

The *CAPM* cost of capital results utilize estimated Betas for two samples of Canadian utilities, which are based on the period 2000 forward, and are estimated monthly.²⁵ In the case of the samples of U.S. companies, including utilities and non-utilities, the *CAPM* analyses are based on and utilize Valueline estimates of *CAPM* Betas, which are estimated on a weekly frequency over a 60-month period. Both the Canadian and U.S. *CAPM* analyses incorporate the Blume adjustment for long-run central tendency of Betas to trend toward unity.²⁶ All U.S. samples draw upon more contemporary Betas, as estimated over the 60-month period ending in 2005, as it appears that the underlying market risks of electric and gas utilities have risen somewhat in the contemporary period. In addition, Betas are also shown as for a five-year average of rolling averages for successive five-year periods ending 2001 (1996-2000); 2002 (1997-2001); and so forth. The *CAPM* analysis of the non-utility U.S. companies, however, utilizes Betas for the period ending 2004. While the study also utilizes the 2004-ending Betas for non-utilities, the non-weighted averages demonstrate little evidence of systematic evolution in Betas for the U.S. non-utilities, unlike the experience of the U.S. utilities.

As can be seen in the attached Appendices, the so-called risk-free or riskless cost rates used within the *CAPM* framework are not consistently drawn. In the case of the Canadian *CAPM* analysis, the risk-free rate is the contemporary 10-year yield on government debt, equal to 4.45%. The U.S. analysis employs the average of 10-year yields on U.S. government bonds sampled from recent periods, which appear to match

²⁵ The analysis that obtains *CAPM* Betas for the Canadian utilities utilizes monthly yields on short-term Canadian government debt as the surrogate for the risk-free rate. These yields are used for the determination of the historical risk premium for estimation of *CAPM* Betas. However, these yields are only an approximation to the risk-free asset which, in fact, is the flow of interest income on the debt vehicles, without inclusion of market appreciation in *ex post* returns.

²⁶ The so-called Blume methodology derives from the work of Marshall Blume, as first presented in the article, "On the Assessment of Risk", *Journal of Finance*, Vol. 26, 1971. The alternative approach to adjust the estimated raw Betas is the so-called Vasicek technique, as proposed by O.A. Vasicek in "A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas," *Journal of Finance*, vol. 28, 1973. Generally speaking, the Vasicek approach is considered the preferred methodology though considerable information is required for implementation. Commercial financial services including Bloomberg, Compustat and Valueline, utilize the Blume approach, whereas Ibbotson Associates employs the Vasicek correction method.

fairly well with investor expectations during mid-year 2006. Specifically, the historically risk-free cost rate used in the CAPM for the three U.S. samples is 4.73%, which is above current government bond yields in view of the recent sharp decline in yields. For reference, the 2006 inflation-indexed U.S. long-term government bond yield resides at 2.53%, suggesting an expected 2.5% rate of overall price inflation, which we find to be best captured historically by the chain-weighted GDP price deflator. The Canadian and U.S. samples obtain very similar results, with the cost of equity estimates ranging from 9.03% for the Comparable Risk Non-Utilities (U.S. sample 3) to 10.95% for the U.S. gas distribution utilities (U.S. sample 2). The Canadian sample 1 and 2 results are 8.65% and 8.95%, respectively.

The *Comparable Earnings* (Historical Returns) approach of our overall framework for estimation of cost of equity capital is in keeping with a market-based analysis. As a matter of interpretation, the Comparable Earnings approach, otherwise known as Historical Market Returns, provides the only relevant basis for determining the realized returns to capital. To a substantial extent, history is the basis upon which investors form expectations. In fact, the historical market returns interpretation of the Comparable Earnings basis is well founded by empirical evidence of capital market experience. For this reason, we draw upon the historical market returns realized by the four samples of Canadian and U.S. utilities as well as the U.S. comparable risk non-utility companies (U.S. sample 3). The realized market returns generally conform to the forward-looking estimates of cost of capital, including DCF, CAPM, and Risk Premium, where the reported realized returns range from 9.14% for Moderate-Sized U.S. Gas Distribution Utilities (U.S. sample 2) to 10.35% for Comparable Risk U.S. Non-Utility Companies (U.S. sample 3). The Canadian Utilities Sample 2 results are unusually high (17.94%) and may substantially overstate the cost of equity capital if accepted in isolation of the valuation results for the other methods and samples. These results do not require explanation, though we wish to mention that the historical returns shown in the Appendices incorporate the combined impact of realized dividends as well market appreciation.

Finally, we wish to note that the interpretation of Comparable Earnings as either book returns to capital or authorized returns, as is so often the case, constitutes a clear example of circular reasoning, where regulators set authorized returns on a basis of book returns set by others. This results in book returns potentially departing from the underlying cost of capital by substantial margins. Thus, we suggest that the Fair Trading Commission, in its deliberation of return on equity employ reasonable caution in the use of realized book returns on equity (as estimates of the cost of equity) as a basis for the determination of the rate-of-return level(s) for BLPC.

The *Risk Premium* approach to valuation draws upon observed historical risk premia across realized market returns for classes of debt and equity vehicles. Risk premia can be calculated in many ways. The analyses, here, draw upon the risk premia reported and published by Ibbotson Associates. The analyses suggest that efficient capital markets demand substantially higher market rates of return on equity vis-à-vis debt of various terms. Specifically, equity risk premia are reported with respect to short-, intermediate-, and long-term government debt. We summarize risk premia in selected pages of Appendices III - V.

Cost of Equity Capital and Firm Size

It is worth noting that extensive analysis of realized returns within U.S. equity markets reveals that progressively higher equity risk premia—and, thus, cost of capital—attend small-sized companies, particularly for micro-sized companies like BLPC. For this reason, our estimated cost of capital results and rate of return recommendations are conservative and, in fact, may understate the underlying cost of capital for BLPC.

Risk premia associated with small size, sometimes referred to as small capitalization risk premia, reflect intuition, well established principles that serve as the foundation of finance theory, and the observed realities of capital markets. First, ordinary common sense would lead one to recognize that small entities face higher business risks than large entities. Higher risks attending small size come about from the principle of large numbers. Specifically, the financial impacts of random business events, which occur over the course of business enterprise, cannot be diversified by small entities as well as by large entities. Essentially, the impacts of business events within larger enterprises get

absorbed within a pool of other events, both positive and negative, with the result that such events are substantially muted in their total impacts on the financial results of the enterprise.

The intuitive idea of diversification of business activity is reflected in portfolio theory. In this regard, the larger entity can be viewed as, essentially, a larger portfolio of individual business activities with the attending diversification effects, providing that individual business activities have less than perfect correlation.

Capital markets reveal that, among other factors, the variability of the returns to capital, reflected as operating income, will typically be higher for smaller entities than larger entities. Second, historical market returns for entities with smaller market capitalization will have higher variation than for entities with higher capitalization levels. Within the context of CAPM theory, the core of modern finance theory, the relevant and well known measure of risk is the covariation of market returns of individual equities with the market as a whole, normalized by the variance of the overall market, referred to as CAPM Beta. Insofar as this notion of risk – *i.e.*, systematic risk – is the only relevant measure of risk given optimal portfolio theory, competitive capital markets would ensure that equities are priced at levels such that the realized market returns of individual equities would be ordered according to CAPM Betas.

Essentially, CAPM theory would then suggest that, to the degree that the higher risks of small capitalization entities can be diversified – *i.e.*, are non-systematic – CAPM Betas would still reflect the most relevant risks. To the degree that higher risks of small capitalization entities cannot be full diversified – *i.e.*, are systematic – higher risks are reflected in higher CAPM Betas.

Empirical evidence suggests that while CAPM Betas are typically higher for smaller-sized equities, CAPM Betas do not explain market returns of small capitalization entities. Indeed, a substantial body of evidence suggests that CAPM underestimates and thus understates historical market returns of small firms. In one interpretation, the difference between the realized market returns of small capitalization firms and the estimated market returns under CAPM constitutes the small-capitalization risk premium. A second

interpretation is that, after accounting for various factors, it appears that size, as reflected in capitalization, is inversely related to historical market returns and that the relationship is systematic – both repeatable and non-random. The magnitude of small capitalization risk premium is large, as best demonstrated by the published analytical work of Ibbotson Associates, Eugene Fama and Kenneth French, Banz, Kaplan, and Roger Ibbotson. In the latest published work, the analyses of Ibbotson Associates²⁷ demonstrate that for entities organized into deciles according to capitalization, as a measure of size, size-related risk premia not captured by CAPM Beta assume the magnitudes presented in the table below.

Size-Related Risk Premia in Excess of CAPM²⁸

Size Decile	Size-Related Risk Premium (%)
1	-0.36
2	0.65
3	0.81
4	1.03
5	1.45
6	1.67
7	1.62
8	2.28
9	2.7
10	6.27

It is useful to mention that, as reported, Decile 9 includes entities with market capitalization of \$265.1 - \$586.4 million, while Decile 10 includes entities with market capitalization of \$1.1 – 265.0 million. Recent studies by Ibbotson Associates have further segmented Decile 10 into larger and smaller entities, with results that confirm the pattern shown above, with the smaller group of entities within Decile 10 demonstrating very high size-related premia not captured within CAPM Beta. Excess market return (and cost of equity capital) not captured by CAPM—*i.e.*, size-related risk premium—

²⁷ *SBBI Valuation Edition 2006 Yearbook* by Ibbotson Associates, 2007.

²⁸ The deciles organize equities into capitalization groups, where the largest entities are within Decile 1, and the smallest entities are within Decile 10.

appears to rise with progressively smaller sized entities. In addition, size premia are specific to industry and, generally speaking, we can infer that the size premium for electric utilities is somewhat smaller than for other industries. For the U.S. samples 1 and 2, industry-specific size-related risk premia are utilized in the study, though the industries are rather broadly defined.

CAPM theory, when used in isolation from other valuation methods, can be challenged for a number of reasons that warrant consideration for purposes of setting the rate of return for BLPC. In terms of size-related risk premia, the reasons for the understatement of market returns by CAPM for small-sized entities are perhaps not widely understood at this time. Our general view, however, is that, for small entities, the cost of acquiring information regarding the prospects for future returns and assessment of risks is unusually high. Because the acquisition of information is costly, less information and knowledge within the investment community about small entities is available. Hence, investors with positions in small entities inherently incur higher risks. For small-sized entities, higher returns are thus the compensation for the assumption of higher risks. It is useful to emphasize that CAPM over long timeframes does reveal higher risk premia and cost rates for smaller entities. However, and as discussed here evidence also suggests that CAPM systematically understates risk premia, and thus the cost of capital, attending comparatively small sized equity listings. The study's Risk Premium analysis, which is based on the CAPM framework and explicitly incorporates sized-related risk premia not captured by CAPM Beta, is incorporated into the analysis for the three U.S. samples, and finds that cost of equity capital ranges from 10.84% to 11.51%. The size premium not captured by CAPM included within this range is estimated at a level of 1.20 – 1.50% for electric utilities, 1.20-1.60% for gas utilities, and 1.90 – 2.20% for comparable risk non-utility companies.²⁹ Size-related premia have been extensively studied, for U.S. equity markets.

²⁹ For the industry segment grouping that includes electric utilities, Ibbotson Associates reports a size premium of 3.20% for small entities relative to large. However, this level incorporates a premium that is captured by CAPM Beta. Second, this size premium level is for a fairly heterogeneous industry group.

Cost of Equity Capital and Sovereignty Risk

The estimates for the cost of equity above do not incorporate any allowance for sovereignty risks. As we have discussed, sovereignty risk refers to risk differences of financial assets sourced across various sovereign countries. Such risks are relevant to the outstanding debt of public and private entities and common stocks that are traded either on exchanges of emerging economies. Sovereignty risks are also relevant to over-the-counter traded securities. To better understand and estimate country risks, the study employs two general methods, referred to as *Credit Score Differences* and *Relative Risks of Equity Market Returns*. The first approach, *Credit Score Differences*, utilizes the surveys of securities traders involved in the assessment of financial markets of global capital markets. The second approach, *Relative Risks of Equity Market Returns* is based on the relative risks (statistical variance or standard deviation) of historical market returns for exchanges of emerging nations, with respect to exchange indexes of developed markets such as the U.S. NYSE Composite or S&P500 equity market indexes.

The *Credit Score Differences* utilizes the 2007 survey of credit scores conducted by *Institutional Investor*,³⁰ where the survey-based study results in credit scores of countries, with 174 countries included in the survey.³¹ The approach estimates the statistical relationship between observed real interest rates among countries and the survey-based credit scores. Once estimated, the statistical relationship is then used as the basis to estimate the likely difference in short-term real interest rates (risk premium) that results from credit score differences, where the U.S. or a group of developed countries with high credit ratings serve as the benchmark.

The credit rating scores range up to a potential score of 100. Worldwide, Switzerland earns the highest survey-based credit score of 96.40, with the lowest score of 4.70 assigned to Somalia. The *Institutional Investor* survey-based credit scores are shown below for selected countries, including Barbados and several neighboring countries.

³⁰ Institutional Investor conducts its survey semi-annually.

³¹ A similar approach would be to utilize the credit ratings assigned by risk assessment and credit rating service entities, such as Moody's, S&P, and Fitch. The credit ratings would need to assigned numeric values that are then used as the basis to gauge real interest rate differences.

The study covers all sovereignties for which positive real short-term interest rates are reported. Of this sample of 73 countries, the statistical analysis is conducted on credit score and interest rate data for 55 countries with credit scores no less than 40.00, with Nigeria having the lowest included credit score. The analysis is conducted using two sets of data, including 1) individual country credit scores and real short-term interest rates, and 2) 10-observation averages of credit scores and interest rates. The analysis results suggest that short-term real interest rates rise by 4.1 to 4.8 basis points for each 1.0 point decline in credit score. With the U.S. serving as the benchmark low credit risk country (credit score 94.10), the estimated sovereignty risk premium for Barbados is from 1.25% to 1.48%. Using the average credit scores for selected Caribbean neighbors of Barbados including Bahamas, Trinidad & Tobago, and Jamaica, the analysis obtains an implied level of sovereignty risk premium for the group ranging from 1.45% to 1.72%.

The *Relative Risks of Market Returns* analysis is based on annual market indexes for three Caribbean stock exchanges including those for Barbados, Trinidad & Tobago, and Jamaica. Of the Caribbean exchanges, the Barbados Stock Exchange has the longest history, with its composite index reaching back to 1989. The index for the Trinidad and Tobago stock exchange is available from 1997, while the index for the Jamaican Stock Exchange is available from 2001. The S&P 500 index is used as the benchmark exchange index in view of its market capitalization and because of its wide recognition as an overall indicator of market performance. The analysis calculates annual market returns for the stock market indexes (without recognition of dividends), and the statistical variance of market returns, as shown below.

(Please see the following page.)

ANNUAL MARKET RETURNS FOR CARIBBEAN STOCK EXCHANGES

Year	Barbados Stock Exchange	Jamaican Stock Exchange	Trinidad & Tobago Stock Exchange	S&P 500 Index
1990	-13.24%			-6.56%
1991	1.58%			26.31%
1992	-15.37%			4.46%
1993	19.92%			7.06%
1994	6.28%			-1.54%
1995	-5.38%			34.11%
1996	-0.03%			20.26%
1997	50.52%			31.01%
1998	47.58%		23.86%	26.67%
1999	-8.37%		-4.32%	19.53%
2000	-14.23%		5.76%	-10.14%
2001	-6.25%		-1.66%	-13.04%
2002	10.55%	34.21%	25.65%	-23.37%
2003	29.04%	48.88%	27.23%	26.38%
2004	26.36%	66.68%	54.82%	8.99%
2005	5.83%	-7.23%	-0.68%	3.00%
2006	-6.77%	-3.67%	-9.20%	13.62%
Cumulative Realized Historical Returns	5.82%	24.38%	11.90%	8.52%
STATISTICAL VARIATION IN MARKET RETURNS				
1990 - 2006	20.57%			16.94%
1998 - 2006			20.84%	18.0%
2002 - 2006		32.46%		18.4%

As expected, the Caribbean exchanges reveal substantially higher risks (variation of returns) than U.S. equity markets, as represented by the S&P 500 index.

Estimates of sovereignty risks are equal to the implied levels of equity market risk premium differences, with respect to the observed level of risk premium associated with the overall index of U.S. equity markets, the S&P 500 index. On average, risk premia with respect to intermediate term debt for the S&P 500 index have ranged from 5.5% to

over 8.0% for the period 1970 forward. Using values of 6.0% and 8.0%, the incremental risk premium associated with the Barbados Stock Exchange is equal to $(20.57\%/16.94\% - 1) * (6.0 \text{ to } 8.0)\%$, or 1.12% to 1.72%. Incorporating the experience of the Trinidad & Tobago Stock Exchange into the analysis yields a similar level of 1.29% - 1.49%.

In summary, the Credit Score Differences and Relative Risks of Equity Market Returns obtain a sovereignty risk premium for Barbados ranging from 1.12% to 1.72%, with an average value of 1.43%.

Analysis Summary

The cost of equity studies described above draw upon the cost of capital tool box and provide reliable and well-grouped estimates for return on equity. The cost of equity estimates result from the application of the valuation methods to two Canadian utility samples and three U.S. samples including two groups of utilities and a group of comparable risk non-utility companies. The results range from 8.65% to 11.51%, notwithstanding the exceptionally high Historical Market Returns (Comparable Earnings) realized for the Canadian utilities, sample 2.

These comparable risk peer group estimates of the cost of equity likely understate BLPC's cost of equity for several reasons. It is essential that several factors not incorporated directly into the cost of equity capital studies, as reviewed above, be presented and fully accounted for, as follows:

- ***Issuance Costs***: The analyses do not incorporate issuance costs which, for very small entities, are likely to be upwards of 5.00 - 6.00% of the realized proceeds from the sale of equity securities. Recognition of issuance costs typically translates into approximately 25 – 30 basis points.
- ***Isolation Associated With An Island System***: As the report discusses, the Barbados Light and Power Company serves an island economy and is thus not part of the larger integrated systems of the major continent. Accordingly, BLPC is exposed to an unusual business context resulting in inherently higher operating

risks than the risks of continental firms making up the peer group of comparable risk entities for which the cost of equity estimates are determined.

- *Size-Related Risk Premium:* Size premia for very small entities are explicitly captured only within the Risk Premium cost of equity capital methodology, as applied to the U.S. sample companies. While, in the absence of further research, we cannot be sure, it is likely that the cost of equity for BLPC is somewhat understated for this reason. As reported, the size-related risk premium appears to be in the range of 1.2 – 1.6% for comparable risk utilities, and somewhat higher for non-utility companies.
- *Sovereignty Risks:* Because the technical estimates of the cost of equity capital are obtained from samples drawn from North America, such estimates do not incorporate sovereignty risks specific to Barbados or its neighbors in the Caribbean region. Based on two methods used in the study—including Credit Score Analysis and Relative Risks of Market Returns—country risks are likely to range from 1.12% to 1.72%, with an average of 1.43%.
- *Quarterly Payment of Dividends:* Where relevant, the quarterly payment of dividends typically yields an upward adjustment of 20 – 30 basis points.

The cost of equity study suggests that the return on equity ranges from 8.65 to 11.51%, as far as the market-based cost estimates are concerned. (The study declines to incorporate the extreme value of 17.94% realized historical returns for Canadian sample 2.) A simple average of the range yields 10.09%.³²

Taking full account of the above factors, in addition, suggests that the cost of equity capital for BLPC resides at a level well above this range. Specifically, adding separately the low and high values for the various factors that have been quantified yields adjustments of 2.77% and 3.92% respectively. Taking a comparatively conservative

³² A simple average of all the estimates except the 17.94% is 10.03%. However we believe that some of the lower estimates from the Canadian samples should carry less weight, as they are based on fewer years of data. As a result, we believe that a simple average is representative of the cost of equity capital prior to adjustment for BLPC-specific factors.

view of the adjustment factors recognizes a portion of the sovereignty risk only, thus realizing a minimal adjustment level of 1.25%. Alternatively, accepting all factors while also recognizing that some factors are accounted for in the market analysis leads to a maximum adjustment level of 3.22%. Applying these values to 10.09% yields an adjusted range of 11.34 to 13.31% for the cost of equity capital. A conservative estimate near the lower end of this range is advisable. Accordingly, we recommend that BLPC adopt, in its filing before the Fair Trading Commission, 11.50% for Return on Equity.

WACC and RATE OF RETURN: BARBADOS LIGHT AND POWER

As mentioned, the weighted average cost of capital incorporating the weighted cost rates for both traditional components and non-traditional elements³³ is the basis for determination of the overall rate of return. For the development of the WACC and the overall rate of return, an appropriate starting point is the observed capital structure stated on a traditional basis. For the test period 2006, BLPC underwrites its assets with the following capital structure, shown with capitalization shares and corresponding cost rates:

**WEIGHTED AVERAGE COST OF CAPITAL FOR
OBSERVED CONVENTIONAL CAPITAL STRUCTURE
Based on Total 2006 Balances**

Capital Component	Implied Bal. (\$ 000)	Capitalization Shares	Cost Rates	Weighted Cost Rates
Long-Term Debt	\$116,034	22.74%	5.19%	1.18%
Short-Term Debt	\$0	0.00%	0.00%	0.00%
Common Equity	\$394,140	77.26%	11.50%	8.88%
Total	\$510,174	100.00%		10.07%

As can be seen, the Company is financing assets with an unusually high concentration of equity participation, resulting in a weighted average cost of capital (overall rate of

³³ Traditional financing vehicles include long- and short-term debt, preferred and preference stock, and common equity. Non-traditional elements include customer deposits, deferred balances of income taxes, investment tax credits and, for Barbados, the manufacturers' allowance.

return), not including income tax effects, of slightly over ten percent. Viewed in the context of the capital structure experience of the industry, the Company's high equity participation may cause the Company's WACC to depart from a least-cost level, although the Company's unusual business context provides reason for equity to remain at a fairly intensive level and above that of the electric power industry as a whole. Accordingly, we recommend that the Company, within its upcoming submission before the Fair Trading Commission, utilize a capital structure that departs from BLPC's observed capital structure. Specifically, we recommend consideration of a policy-based imputed capital structure that contains 60% equity participation. The WACC associated with this policy-based capital structure is shown below:

**WEIGHTED AVERAGE COST OF CAPITAL FOR
POLICY-BASED (IMPUTED) CONVENTIONAL CAPITAL STRUCTURE
Based on Total 2006 Balances**

Capital Component	Implied Bal. (\$ 000)	Capitalization Shares	Cost Rates	Weighted Cost Rates
Long-Term Debt	\$204,070	40.00%	5.19%	2.08%
Short-Term Debt	\$0	0.00%	0.00%	0.00%
Common Equity	\$306,104	60.00%	11.50%	6.90%
Total	\$510,174	100.00%		8.98%

As can be seen, reducing equity participation from 77% to 60% lowers the weighted average cost of capital by over 100 basis points. The imputed capital structure shown above significantly reduces equity participation, while also sustaining sufficient equity and debt-equity balance. This result, we believe, is consistent with the least cost financing mix for the Company's capital resources given its inherent business context and risks, while also providing BLPC with a satisfactory level of interest coverage.

The proposed approach is in keeping with the capital attraction and financial integrity concepts of fair rate of return principles. The 60% participation of equity is plentiful—a level that is above that of most mid-sized and large electric utilities in the U.S., though a number of registered Canadian utilities tend to utilize equity participation levels that are

equivalent to or above those of their U.S. counterparts. This level of equity participation is adequate and desirable, when viewed from the Company’s unusual business context and small size.

The policy-based traditional capital structure with 60% equity participation provides the basis for the regulatory capital structure that, as mentioned, incorporates both traditional and non-traditional capital components, as follows:

**RATE OF RETURN RECOMMENDATION:
WEIGHTED AVERAGE COST OF CAPITAL FOR
REGULATORY CAPITAL STRUCTURE
Based on Total 2006 Balances**

Capital Component	Balances (\$ 000)	Capitalization Shares	Cost Rates	Weighted Cost Rates
Long-Term Debt	\$204,070	33.70%	5.19%	1.75%
Short-Term Debt	\$0	0.00%	0.00%	0.00%
Common Equity	\$306,104	50.55%	11.50%	5.81%
Customer Deposits	\$18,732	3.09%	9.18%	0.28%
Accumulaed Deferred Taxes	\$33,253	5.49%	0.00%	0.00%
Accumulated Investment Tax Credits	\$32,171	5.31%	8.98%	0.48%
Manufacturers' Allowance	\$11,170	1.84%	8.98%	0.17%
Total	\$605,500	100.00%		8.49%

The inclusion of non-traditional elements, when “costed” at the policy-based WACC level, results in a further reduction in the WACC by about 50 basis points. We recommend that BLPC adopt a WACC (and overall rate of return recommendation) of 8.49% within its upcoming submission in the current regulatory proceeding to the Fair Trading Commission, for the purpose of setting retail prices for electricity services provided by BLPC.

REFERENCES

- Artzner, P., F. Delbaen, J-M. Eber, and D. Heath, "Coherent Measures of Risk," (1999), *Mathematical Finance*, 9: 203-228.
- Ball, R., (1978), "Anomalies in Relationship between Securities and Yield and Yield Surrogates," *Journal of Financial Economics*, 6: 103–166.
- Banz, R., (1981), "The Relationship between Returns and Market Value of Common Stocks," *Journal of Financial Economics*, 9: 3–18.
- Bartholdy, J. and Riding, A., (1994), "Thin Trading and the Estimation of Betas: The Efficacy of Alternative Techniques," *Journal of Financial Research*, 17(2): 241-253.
- Basu, S., (1977), "Investment Performance of Common Stocks in Relation to Their Price Earnings Ratios: A Test of Efficient Market Hypothesis," *Journal of Finance*, 32: 663-682.
- Bhandari, L. C., (1988), "Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence," *Journal of Finance*, 43: 507–528.
- Black, F., (1972), "Capital Market Equilibrium with Restricted Borrowing," *Journal of Business*, 45: 444–455.
- Black, F., and M. S. Scholes, (1974), "The Effect of Dividend Yield and Dividend Policy on Common Stocks Prices and Returns," *Journal of Financial Economics*, 1: 1–21.
- Black, F., M. C. Jensen, and M. S. Scholes, (1972), "The Capital Asset Pricing Model: Some Empirical Tests," in M. C. Jensen (ed.) *Studies in the Theory of Capital Markets*. New York: Praeger: 79–121.
- Blume, M. E., and L. Friend, (1973) "A New Look at the Capital Asset Pricing Model," *Journal of Finance* 28:19-33
- Bodurtha, J. N. and N. C. Mark, (1991), "Testing the CAPM with Time Varying Risk and Return," *Journal of Finance*, 66(4): 1485–1505.
- Bolder, D.J., G. Johnson, and A. Metzler, (2004), "An Empirical Analysis of the Canadian Term Structure of Zero-Coupon Interest Rates," Working Paper 2004-48, Bank of Canada.
- Bollerslev, T., (1988), "On the Correlation Structure of Generalised Autoregressive Conditional Heteroscedastic Process," *Journal of Time Series Analysis* 9: 121–131.
- Bollerslev, T., R. F. Engle, and J. M. Woldridge, (1988), "Modelling Asset Pricing Model with Time Varying Covariance," *Journal of Political Economy*, 96:1 116–131.
- Boabang, F., (1996), "An Adjustment Procedure for Predicting Betas when Thin Trading is Present: Canadian Evidence," *Journal of Business Finance and Accounting*, 23(9/10): 1333-1355.
- Bowie, D.C. and D.J. Bradfield, (1998), "Robust Estimation of Beta Coefficients: Evidence from a Small Stock Market," *Journal of Business Finance and Accounting*, 25(3/4): 439-454.

- Bartholdy, J. and A. Riding, (1994), ‘Thin Trading and the Estimation of Betas: The Efficacy of Alternative Techniques’, *Journal of Financial Research*, 17(2): 241-253.
- Blume, M.E., (1975), “Betas and their regression tendencies,” *Journal of Finance*, 30, 785-799.
- Chan, K. C., and N. Chen, (1991), “Structural and Return Characteristics of Small and Large Firms,” *Journal of Finance*, 46: 1467–1484.
- Chan, L.K.C. and J. Lakonishok, (1992), “Robust Measurement of Beta Risk,” *Journal of Financial and Quantitative Analysis*, 27: 265-282.
- Chen, N., R. Roll, and S. A. Ross, (1986), “Economic Forces and Stock Market,” *Journal of Business*, 59: 383–403.
- Congressional Research Service, “CRS Report for Congress: United States-Canada Trade and Economic Relationship: Prospects and Challenges,” Updated March 29, 2006.
- Douglas, G. W., (1968), “Risk in the Equity Market: Application of Market Efficiency,” *Yale Economic Essays*, 9: 3–45.
- Draper, P. and K. Paudyal, (1995), ”Empirical Irregularities in the Estimation of Beta: The Impact of Alternative Estimation Assumptions and Procedures,” *Journal of Business Finance and Accounting*, 22(1): 157-177.
- Electricity Distributors Association and Christensen Associates Energy Consulting LLC, “Comments on Draft Staff Report: Cost of Capital and 2nd Generation Incentive Regulation for Ontario’s Electricity Distributors,” submitted to Ontario Energy Board, July 5, 2006.
- Engle, R. F., D. M. Lillen, and R. F. Robins, (1987), “Estimating Time Varying Risk Return in the Term Structure: The ARCH-M Model,” *Econometrica*, 55:381–407.
- Engle, R. F., and T. Bollerslev, (1986), “Modelling the Persistence of Conditional Variance,” *Econometric Review*, 5(1): 1–50.
- Fama, E. F., (1965), “The Behaviour of Stock Market Prices,” *Journal of Business*, 38: 34–10.
- Fama, E. F., (1968), “Risk, Return and Equilibrium: Some Clarifying Comments,” *Journal of Finance*, 23: 29–40.
- Fama, E. F., (1970), “Efficient Capital Markets: A Review of Theory and Imperial Work,” *Journal of Finance*, 25: 383–417.
- Fama, E. F., (1976), *Foundation of Finance*. New York: Basic Books.
- Fama, E. F., and K.R. French, (1992), “The Cross Section of Expected Stock Returns,” *Journal of Finance*, 47: 427–465.
- Fama, E. F., (1999), “Efficient Capital Markets,” *Journal of Finance*, 66(6): 1575–1616.
- Fama, E. F., L. Fisher, M. C. Jensen, and R. Roll, (1969), “The Adjustment of Stock Price to New Information,” *International Economic Review*, 10: 1–21.
- Fama, E. F., and K. R. French (1988) Permanent and Temporary Component of Stock Prices. *Journal of Political Economy* 96: 246–273.

- Fama, Eugene F., and K. R. French, (1988a), "Dividend Yield and Expected Stock Returns," *Journal of Financial Economics*, 22: 3–25.
- Fama, E., and J.D. MacBeth, (1973), "Risk, Return, and Equilibrium: Empirical Tests," *Journal of Political Economy*, Vol. 38, 607-636.
- French, K. R., W. Schwert, and R. Stambaugh, (1987) "Expected Stock Return and Volatility," *Journal of Financial Growth* 19: 3-30.
- Gibbons, Michael R. (1982) "Multivariate Tests of Financial Models: A New Approach," *Journal of Financial Economics* 10: 3–27.
- Harvey, Campbell R., (1989), "Time Varying Conditional Covariance Tests of Asset Pricing Models," *Journal of Financial Economics* 24: 289–317.
- Huberman, G., (1982), "Arbitrage Pricing Theory, A Simple Approach," *Journal of Economic Theory* 28: 183–98.
- Jensen, M. C., (1969), "Risk, the Pricing of Capital Assets and the Evaluation of Investment Portfolios," *Journal of Business* 42: 167–247.
- Kandell, S. and R.F. Stambaugh, (1995), "Portfolio Inefficiency and the Cross Section of Expected Return," *Journal of Finance*.50, 157-184.
- Koenker, R. W. and G. Bassett, Jr, (1978) "Regression Quantiles," *Econometrica*, 46(1): 33-50.
- Kolbe, A.L. and W.B. Tye, (1992), "The Fair Allowed Rate of Return with Regulatory Risk," *Research in Law and Economics*, JAI Press Inc.: 129-169.
- Lam, K.S.K., (1999), "Some Evidence on the Distribution of Beta in Hong Kong," *Applied Financial Economics*, 10: 251-262.
- Lally, M., (1998), "An Examination of Blume and Vasicek Betas," *Financial Review*, 33: 183-198.
- Lazar, F. and E. Prisman, "Calculating the Cost of Capital for LDCs in Ontario," June 14, 2006.
- Lintner, J., (1965) "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," *Review of Economics and Statistics*, Vol. 47: 13-37;
- Luenberger, D., *Investment Science*, Oxford University Press, New York, 1997.
- MacKinlay, A. C., (1987), "On the Multivariate Tests of the CAPM," *Journal of Financial Economics*, 18: 341–371.
- Markowitz, H., "Portfolio Selection," *Journal of Finance*, Vol. 7, 1952, 77-91.
- Markowitz, H., (1959), *Portfolio Selection: Efficient Diversification of Investments*. New York: Wiley.
- Markowitz, H., and M. Scholes, (1978), "Dividends and Taxes," *Journal of Financial Economics*, 6: 333–364.

- Merton, R. C., (1973), "An Intertemporal Asset Pricing Model," *Econometrica* 41: 867–887.
- Morin, Roger A., (1994), *Regulatory Finance: Utilities' Cost of Capital*, Public Utilities Report Inc.
- Murray, L., (1995), "An Examination of Beta Estimation using Daily Irish Data," *Journal of Business Finance and Accounting*, 22(6): 893-905.
- Ng, L., (1991), "Tests of CAPM with Time Varying Covariance: A Multivariate GARCH Approach," *Journal of Finance*, 46(4): 1507–1521.
- Ng, V. K., R. F. Engle, and M. Rothschild, (1992), "A Multi Dynamic Sector Model for Stock Returns," *Journal of Econometrics*, 52: 245–66.
- Ontario Energy Board, "Draft Staff Report: Proposals for Cost of Capital and 2nd Generation Incentive Regulation for Ontario's Electricity Distributors," June 19, 2006.
- Reinganum, M. R., (1981), "Misspecification of Capital Asset Pricing," *Journal of Financial Economics*, 9: 19–46.
- Reinganum, M. R., (1981a), "The Arbitrage Pricing Theory: Some Empirical Results," *Journal of Finance*, 36: 313–21.
- Roll, R. W., (1977), "A Critique of Asset Pricing Theory's Tests, Part 1: On Past and Potential Testability of the Theory," *Journal of Financial Economics* 4: 129–176.
- Roll, R. W., (1981), "A Possible Explanation of Small Firm Size Effect," *Journal of Finance*, 36: 879–888.
- Roll, R. W., and B. S. Solnik, (1977), "A Pure Foreign Exchange Asset Pricing Model," *Journal of International Economics*, 7: 161-179.
- Roll, R. and S. Ross, (1985), "An Empirical Investigation of the Arbitrage Pricing Theory," *The Journal of Finance*: 1073-1103.
- Roll, R. W., and S. A. Ross, (1994), "On the Cross Sectional Relation between Expected Returns and Betas," *Journal of Financial Economics*, 119(1): 101–121.
- Ross, S. A., (1976), "An Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory*, 13: 341–360.
- Sauer, A., and A. Murphy, (1992), "An Empirical Comparison of Alternative Models of Capital Asset Pricing in Germany," *Journal of Banking and Finance* 16, 183-196.
- Scholes, M. and J. Williams, (1977), "Estimating Betas from Non-synchronous Data," *Journal of Financial Economics*, 5: 309-328.
- Shanken, J., (1982), "The Arbitrage Pricing Theory: Is it Testable?" *Journal of Finance*, 40: 1129–1148.
- Shanken, J., (1985), "Multivariate Tests of the Zero-beta CAPM," *Journal of Financial Economics* 14: 327–348.
- Shanken, J., (1992), "On the Estimation of Beta Pricing Models," *Review of Financial Studies* 5: 1–33.

Sharpe, W., (1964), “Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk,” *Journal of Finance*, 19: 425-442.

Stambaugh, R. F., (1982), “On the Exclusion of Assets from Tests of the Two Parameter Model,” *Journal of Financial Economics*, 10: 235–268.

Vasicek, O., (1973), “A Note on using Cross-sectional Information in Bayesian Estimation on Security Betas,” *Journal of Finance*, 28(5): 1233-1239.

Von Neuman, J., and O. Morgenstern, (1953), *Theory of Games and Economic Behaviour*, 3rd ed., Princeton: Princeton University Press.

The World Bank, “Global Development Finance”, 2006 and 2007.

TECHNICAL APPENDICES

APPENDIX I

PRESENT VALUE OF INVESTMENT AND DERIVATION OF THE CONSTANT GROWTH AND MULTI-STAGE DISCOUNTED CASH FLOW MODEL (DCF)

Present Value Theory

As wages are the compensation to labor, interest is the compensation or return to savings and capital. Savings is the share of current income held back to be consumed in later periods. A unit of current consumption has greater value than an equivalent amount of consumption later. Hence, savings must obtain greater consumption later, in order to compensate for its reduced (discounted) value.

The inducement to save is interest; essentially, the accrual of interest on savings offsets the reduction in value of later consumption vis-à-vis current consumption. Without the expectation of interest, savings would be largely exhausted as consumption in the current period. Savings are invested and, over time, give rise to and constitute the accumulation of capital. Savings realize the market rate of interest. Savings and investment—and thus the accumulation of capital—rise as expected interest increases.

Returns to savings, investment, and capital can be viewed as cash flow returns, and can be stated as an annual percentage amount. Cash flows in subsequent periods forego the interest that would have accrued on earlier cash flows. Because of foregone interest, later cash flows are worth less than those of earlier periods by the amount of interest that would have been realized on the earlier flows.

Cash flows over time can be ordered with a discounting procedure commonly known as present value. Present value revalues future cash flows according to the accrual of interest that would have been realized, had they occurred in the present. Specifically, the cash flow within a time step is discounted by a factor equal to the inverse of one plus the market rate of interest, k , compounded by time t — $(1/(1+k))^t$. The present value procedure can be shown more formally as:

$$PV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \frac{CF_3}{(1+k)^3} + \dots + \frac{CF_n}{(1+k)^n} \quad (1)$$

or,

$$\sum_{t=1}^n \frac{CF_t}{(1+k)^t} \quad (2)$$

where,

PV = present value

CF_t = cash flow in time t

k = market cost (rate) of interest.

Hence, $1/(1+k)^t$ is the discount factor by which the cash flows at time t are reduced.

Present value analysis equates cash flows at different points in time to the present, and constitutes a fundamental principle of financial and investment analysis. Essentially, present value normalizes the cash flows at the market rate of discount.

Consider a cash flow occurring at time, $t=0$. Since the cash flow occurs in the present and, unlike the subsequent cash flows shown in (3), below, no interest is foregone and thus it is not discounted:

$$NPV = CF_o + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \frac{CF_3}{(1+k)^3} + \dots + \frac{CF_n}{(1+k)^n}. \quad (3)$$

Presume that a savings agent, a household, invests savings. The purchase of an investment or financial asset such as securities or other liquid assets by the agent constitutes a negative cash flow – an outflow of money. It is the expectation of positive cash flows later that induces the purchase. Positive cash flows prospectively, as expected, tend to balance the negative cash outflow associated with the purchase of the asset. All negative and positive cash flows are contained in net present value, as shown in (4) below:

$$NPV = -CF_o + \sum_{t=1}^n \frac{CF_t}{(1+k)^t} \quad (4)$$

where,

NPV = net present value – *i.e.*, the net of all positive and negative cash flows

If net present value (NPV) is positive, the investment action is “economic” in the sense that the expected positive cash flows, discounted at the market cost of capital, are greater than—or at least equivalent to—the purchase price of the asset, the negative flow.

Competitive capital markets—or the processes of market competition—seek to discover and exhaust all opportunities for positive and negative present values. That is, the *expected* NPV of investment opportunities approximates zero, given the implicit rate of discount harbored by investors. Essentially, the market value of assets is driven to its competitive level prospectively because of arbitrage inherent to competitive markets. Market forces bid prices up in the presence of expected positive returns (NPV), or bid prices down if negative returns are expected. The discounted positive cash flows equate to and balance the purchase cost of the asset, as shown in (5), below:

$$CF_o = \sum_{t=1}^n \frac{CF_t}{(1+k)^t}. \quad (5)$$

In market equilibrium, then:

$$P_o = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \frac{CF_3}{(1+k)^3} + \dots + \frac{CF_n}{(1+k)^n} \quad (6)$$

$$P_o = \sum_{t=1}^n \frac{CF_t}{(1+k)^t} \quad (7)$$

where,

P_o = market price at time $t=0$.

The market cost of capital implicitly incorporates investor's perceptions of risk and expectations about inflation over the life of future cash flows. It is straightforward to solve for the market cost of capital, k , as we are confronted with one equation and one unknown value. For example, to solve for the internal rate of cost of a debt obligation of a borrowing firm, such as bond, simply determine the internal rate of discount that equates the positive cash flow occurring at time zero, CF_o , and the negative flows, $-\Sigma CF_t$, which represent the annual interest cost and retirement of the principle. The discounted negative cash flows from the perspective of the borrowing firm can be shown as $-\Sigma CF_t / (1+k)^t$. The analysis problem for lenders is precisely the same except that the signs attending the cash flows are reversed. Hence, the rate of discount is both the opportunity cost of capital to investors, given market arbitrage, and the cost of capital to the borrowing firm.

Constant Growth Discounted Cash Flow

For equity capital, investors' expected earnings reflect expectations of future cash flows associated with shares of stock, and thus determine the stock price currently. Assume that investors expect earnings, E_t , and dividends, D_t , to grow at some constant rate, g , over the future, such that:

$$\begin{aligned} E_t &= (1+g)E_{t-1} \\ E_1 &= (1+g)E_0 \\ E_2 &= (1+g)E_1 = (1+g)^2 E_0 \\ &\dots \\ &\dots \\ &\dots \\ E_n &= (1+g)^n E_0 . \end{aligned} \quad (8)$$

Dividends of course are a function of earnings and therefore represent, along with price appreciation, the discounted cash flows. Dividends can thus be shown similarly to that of earnings, as below:

$$\begin{aligned} D_t &= (1+g)D_{t-1} \\ \text{i.e., } D_1 &= (1+g)D_0 \\ D_2 &= (1+g)D_1 = (1+g)^2 D_0 \\ &\dots \\ &\dots \\ &\dots \\ D_n &= (1+g)^n D_0 . \end{aligned} \quad (9)$$

Further, assume that dividends, D_t , are a fixed share, m , of earnings, E_t , such that:

$$D_t = mE_t \quad \text{and,} \quad D_t / E_t = m. \quad (10)$$

From equation (8), then:

$$D_t = m(1+g)E_{t-1} \quad (11)$$

$$\text{and,} \quad D_n = m(1+g)^n E_o.$$

Restating equation (7) to represent dividends as a fixed share of earnings which are paid out, provides:

$$\begin{aligned} P_o &= \sum_{t=1}^n \frac{mE_t}{(1+k)^t} \quad (12) \\ &= \frac{mE_1}{(1+k)^1} + \frac{mE_2}{(1+k)^2} + \frac{mE_3}{(1+k)^3} + \dots + \frac{mE_n}{(1+k)^n}. \end{aligned}$$

Observation will disclose that in fact the payout ratio is volatile and tends to offset the volatility in earnings so that dividend growth (realized cash flows) is smoothed.

Equation (12) can be restated to read:

$$\begin{aligned} P_o &= \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \dots + \frac{D_n}{(1+k)^n} \quad (13) \\ &= \sum_{t=1}^n \frac{D_t}{(1+k)^t}. \end{aligned}$$

The relationship between D_{t-1} and D_t is simply $(1+g)$, which is also the relationship between E_{t-1} and E_t defined in (8). And, with an assumed constant payout ratio or share of earnings, the following is obtained:

$$\begin{aligned} P_o &= \frac{D_o(1+g)}{(1+k)} + \frac{D_o(1+g)^2}{(1+k)^2} + \frac{D_o(1+g)^3}{(1+k)^3} + \dots + \frac{D_o(1+g)^n}{(1+k)^n} \quad (14) \\ &= \sum_{t=1}^n \frac{D_o(1+g)^t}{(1+k)^t}. \end{aligned}$$

Now, assume an infinite time horizon:

$$P_o = \frac{D_o(1+g)}{(1+k)} + \frac{D_o(1+g)^2}{(1+k)^2} + \frac{D_o(1+g)^3}{(1+k)^3} + \dots + \frac{D_o(1+g)^\infty}{(1+k)^\infty}. \quad (15)$$

Equation (15) above is simply a geometric series with a growth and discounting parameter, $(1+g)/(1+k)$, that defines the relative value of any two sequential terms.³⁴ Therefore, (15) may be expressed as:

$$P_o = \frac{D_o(1+g)}{(1+k)} \left[\frac{1 - [(1+g)/(1+k)]^\infty}{1 - (1+g)/(1+k)} \right]. \quad (16)$$

And since $[(1+g)/(1+k)]^\infty$ is zero,³⁵ and $(1-(1+g)/(1+k))$ is equal to $(k-g)/(1+k)$, the following form can be obtained:

$$P_o = D_o(1+g)/(k-g). \quad (17)$$

Multiplying through by $(k-g)$ and $1/P_o$, and rearranging gives:

$$k = D_o(1+g)/P_o + g. \quad (18)$$

This is the derived form of the constant growth Discounted Cash Flow model.

In addition, the assumption of an infinite time horizon can be relaxed. Assume that the investor has a finite time horizon, n , with a salvage value equal to P_n and a constant price-earnings ratio. Equation (14) is then restated as:

$$P_o = \sum_{t=1}^n \frac{D_o(1+g)^t}{(1+k)^t} + \frac{P_n}{(1+k)^n}. \quad (19)$$

Since $P_o/E_o = P_n/E_n$, $P_n = P_o(1+g)^n$. Thus, (19) can be restated as:

$$P_o = \sum_{t=1}^n \frac{D_o(1+g)^t}{(1+k)^t} + \frac{P_o(1+g)^n}{(1+k)^n}. \quad (20)$$

The first term on the right may be restated as described above, and incorporated into (20), shown below:

$$P_o = \frac{D_o(1+g)}{(k-g)} \left[1 - (1+g)^n / (1+k)^n \right] + P_o(1+g)^n / (1+k)^n. \quad (21)$$

Rearranging and simplifying terms obtains:

³⁴ With $(1+g) = d$, and $(1+k) = r$, a series of the form:

$$\sum_{t=1}^n a(d/r)^t = a \sum_{t=1}^n (d/r)^t.$$

This may be alternately expressed as:

$$a \frac{d}{r} \left[\frac{1 - (d/r)^n}{1 - (d/r)} \right].$$

³⁵ If $k > g$

$$P_o - P_o(1+g)^n/(1+k)^n = \frac{D_o(1+g)}{(k-g)} [1 - (1+g)^n/(1+k)^n] \quad (22)$$

or,

$$P_o [1 - (1+g)^n/(1+k)^n] = \frac{D_o(1+g)}{(k-g)} [1 - (1+g)^n/(1+k)^n] .$$

Now, dividing both sides by $[1 - (1+g)^n/(1+k)^n]$ gives an equivalent result to (16):

$$P_o = D_o(1+g)/(k-g) . \quad (23)$$

Rearranging terms provides:

$$k = D_o(1+g)/P_o + g . \quad (24)$$

Thus, the constant growth form of Discounted Cash Flow is derived for a finite time horizon.

Multi-Stage DCF

The model of constant growth over the future holding period may not be a fully satisfactory representation of investor expectations under some market conditions. The constant growth form can be generalized to a varying growth path or growth with stochastic elements. Such approach increases complexity.

As a practical matter, a useful extension of the constant growth model known as multi-stage DCF can be easily developed. Arguably, multi-stage DCF presents a platform for a more accurate representation of expectations of growth harbored by investors. A derived form of the multi-stage form is developed below:

Multi-stage DCF can be shown as a restatement of Equation 14 with three patterns or rates of growth applicable to specific forward timeframes or stages:

$$P_o = \sum_{t=1}^5 \frac{D_o(1+g_1)^t}{(1+k)^t} + \sum_{t=1}^5 \frac{D_5(1+g_2)^t}{(1+k)^t} (1/(1+k)^5) + \sum_{t=1}^{\infty} \frac{D_{10}(1+g_3)^t}{(1+k)^t} (1/(1+k)^{10}) . \quad (25)$$

Each stage can be shown in a simplified form. We begin by separating out the first stage, S_1 – i.e., the first rhs term with growth = g_1 – as follows:

$$S_1 = \sum_{t=1}^5 \frac{D_o(1+g_1)^t}{(1+k)^t} . \quad (26)$$

Pulling out the initial rate of dividends, D_o , from the sum,

$$S_1 = D_o \sum_{t=1}^5 \frac{(1+g_1)^t}{(1+k)^t} .$$

Presenting the ratio of the growth and discount factors as a single term, $F = \frac{(1+g_1)}{(1+k)}$,

and incorporating F into the sum, $S_1 = D_o \sum_t^5 F^t$.

The sum can then be expanded as follows:

$$S_1 = D_o (F^1 + F^2 + \dots + F^5). \quad (27)$$

Defining a new term equal to unity, $\frac{(1-F)}{(1-F)}$, and including the term into the rhs of

Equation 27:

$$S_1 = D_o (F^1 + F^2 + \dots + F^5) \left(\frac{(1-F)}{(1-F)} \right), \text{ and then expanding,}$$

$$S_1 = D_o ((F^1 + F^2 + \dots + F^5) - (F^2 + F^3 + \dots + F^6)) / (1-F). \quad (28)$$

Canceling terms of Equation 28 provides, $S_1 = D_o (F^1 - F^6) / (1-F)$, and then collecting common terms gives a simplified result, as follows:

$$S_1 = D_o F^1 (1 - F^5) / (1-F). \quad (29)$$

Expanding F in Equation 28 provides,

$$S_1 = D_o \left(\frac{(1+g_1)}{(1+k)} \right) \left(1 - \left(\frac{(1+g_1)}{(1+k)} \right)^5 \right) / \left(\frac{(1+k) - (1+g_1)}{(1+k)} \right).$$

Finally, canceling terms to simplify Equation 29 provides the result,

$$S_1 = D_o (1+g_1) \left(1 - \left(\frac{(1+g_1)}{(1+k)} \right)^5 \right) / (k - g_1). \quad (30)$$

The above result for Stage 1 can be stated as follows,

$$S_1 = D_o \left(\frac{(1+g_1)}{(k-g_1)} \right) \left(1 - \left(\frac{(1+g_1)}{(1+k)} \right)^5 \right). \quad (31)$$

Note that this outcome for Stage 1 is identical to Equation 22, above.

Stage 2 of Equation 24 is:

$$S_2 = \sum_{t=1}^5 \frac{D_5 (1+g_2)^t}{(1+k)^t} (1 / (1+k)^5).$$

The derived form of Stages 2 and 3 are obtained through application of the same procedures as above, and need not be reviewed. The derived result for Stage 2 is as follows:

$$S_2 = D_5 \left(\frac{(1+g_2)}{(k-g_2)} \right) \left(1 - \left(\frac{(1+g_2)}{(1+k)} \right)^5 \right) (1/(1+k)^5). \quad (32)$$

Stage 3 of Equation 25 is:

$$S_3 = \sum_{t=1}^{\infty} \frac{D_{10}(1+g_3)^t}{(1+k)^t} (1/(1+k)^{10}).$$

Similarly, the derived form of Stage 3 is:

$$S_3 = D_{10} \left(\frac{(1+g_3)}{(k-g_3)} \right) \left(1 - \left(\frac{(1+g_3)}{(1+k)} \right)^{\infty} \right) (1/(1+k)^{10}). \quad (33)$$

Note that in Stage 3, the second term in the second bracket of the rhs vanishes as a result of, by assumption, $k > g$.

APPENDIX II

Capital Asset Pricing Model (CAPM)³⁶

The Sharpe-Lintner Capital Asset Pricing Model (CAPM)—William Sharpe (1964) and John Lintner (1966)—is an extension of the one-period, mean-variance portfolio model of Markowitz (1959) and Tobin (1958), which in turn is built on the expected utility model of von Neumann and Morgenstern (1953). The Markowitz mean-variance analysis is concerned with how the investor should allocate wealth among the various assets available in the market, given that the investor is a one-period utility maximizer.

The derived CAPM shows how the valuation of a financial asset (price) is based upon two components: risk free returns and an *adjusted risk-based return*. Surrogates for risk free returns can be observed directly in capital markets, and include market returns on short- and intermediate-term debt. As a general rule, the cost rates and market returns on government debt obligations serve as appropriate surrogates.

The CAPM defines the market rate of return of asset j as a combination of the risk free return, R_f , and the product of a risk factor and the excess return above the risk free return, $\beta_{jm}(R_m - R_f)$. Excess return is determined as the difference between the return of the market as a whole, R_m , and the risk free return. The relevant risk factor is the well known market beta, which is defined as, the covariation of the market return of individual assets and equity markets as a whole

$$\beta_{jm} = \sigma_{jm} / \sigma_m^2 \tag{1}$$

Start with an investment amount, I , where the share, α , is invested in asset j , and the share $(1 - \alpha)$ is invested in the market portfolio, m . The rate of return on the portfolio is,

$$R_\alpha = \alpha R_j + (1 - \alpha) R_m \tag{2}$$

The measure of variation I the portfolio returns is defined as,

$$\sigma_\alpha = [\alpha^2 \sigma_j^2 + 2\alpha(1 - \alpha)\sigma_{jm} + (1 - \alpha)^2 \sigma_m^2]^{(1/2)}. \tag{3}$$

If the portfolio share coefficient, α , is equal to zero, then the return on the portfolio is equal to R_m . This return point within rate of return – risk space is equivalent to the tangency point of market portfolio with the well-known market line.

Taking the relevant derivatives,

³⁶ As derived by and shown in *Investment Science*, by David Luenberger, 1998.

$$dR_\alpha/d\alpha = R_j - R_m \quad (4)$$

$$\sigma_\alpha/d\alpha = [\alpha\sigma_j^2 + (1 - 2\alpha)\sigma_{jm} + (\alpha - 1)\sigma_m^2] / \sigma_\alpha. \quad (5)$$

For $\alpha=0$, the solution to (5) is,

$$\sigma_\alpha/d\alpha = (\sigma_{jm} - \sigma_m^2) / \sigma_m. \quad (6)$$

Defining a key relationship:

$$dR_\alpha/d\sigma_\alpha = (dR_\alpha/d\alpha) / (d\sigma_\alpha/d\alpha). \quad (7)$$

For $\alpha=0$, the above result obtains,

$$dR_\alpha/d\sigma_\alpha = (R_j - R_m)\sigma_m / (\sigma_{jm} - \sigma_m^2). \quad (8)$$

The result in (8) defines a rate of change with respect to σ_α , which must be equivalent to the slope of the capital market line. Therefore,

$$(R_j - R_m)\sigma_m / (\sigma_{jm} - \sigma_m^2) = (R_m - R_f) / \sigma_m. \quad (9)$$

Now solving for R_j obtains the capital asset pricing model, stated in its well-known form,

$$R_j = R_f + [(R_m - R_f) / \sigma_m^2] \sigma_{jm} = R_f + \beta_{jm}(R_m - R_f) \quad (10)$$

where β_{jm} is defined as above.

In summary, the CAPM can be shown in the context of the general and well known formulation (as model (referred to in footnote 27 of the report text), where the expected rate of return is a function of risk:

$$R_j = f[E(F)] = R_f + \beta(R_m - R_f).$$

In this formulation, R_j and $f[E(F)]$ are shown to be equivalent. As denoted in (3), R_f is the risk-free rate of return, R_M is the market rate of return and $(R_m - R_f)$ is the market price of risk, making β the risk premium attached to holding asset j in the (market) portfolio. The essential issue, then, is whether or not the relevant risk parameter (β) adequately captures all risks, as perceived by investors. As we discuss below, recent empirical evidence suggest that it may not.

Theoretical and Empirical Issues Associated with Use of CAPM to Estimated the Equity Risk Premium

The results of the early studies of CAPM have suggested that a significant positive relationship existed between realized return and systematic risk, as measured by β , and that the relationship between risk and return appeared to be linear. However, the prediction of Sharpe-Lintner version of the model – that a portfolio or asset uncorrelated

with the market should have an expected return equal to the risk-free rate of interest, have not done well, and the evidence has suggested that the average return on “zero-beta” portfolios are higher than the risk-free rate.

The first tests of CAPM on individual stock in the excess return form have been conducted by Lintner (1965) and Douglas (1968) who found that the estimated intercept is significantly different from the risk-free rate r_f and the estimate of β is statistically significant but takes a small value and the residual risk has effect on security returns. Thus, their results appear to contradict the CAPM model. However, the Douglas and Lintner studies appear to suffer from various statistical weaknesses that might explain their anomalous results. The measurement error that might be present in estimated betas in their studies could be explained by the fact that the assumptions of the regression model are not satisfied in practice.³⁷

With regard to the test of CAPM in terms of stock portfolios, one classic test was performed by Fama and MacBeth (1973), who used a combined time series-cross sectional estimation to investigate whether the risk premia of the factors are non-zero. Their results showed that the beta coefficient was statistically insignificant and remained small for many sub-periods. In addition, the estimated intercept term was significantly greater than the risk-free rate, once again implying that the predictions of the CAPM might not hold.

Black, Jensen, and Scholes (1972) (Black *et al*) tested CAPM by using time series regression analysis. The results again showed that the intercept term is significantly different from zero and is time varying. They found that when $\beta > 1$, the intercept is negative and conversely when $\beta < 1$, the intercept is positive. Thus the findings of Black *et al* suggest the predictions of CAPM are not supported empirically. Stambaugh (1982) employed a slightly different methodology to test CAPM and found support for Black’s version but not for the Sharpe-Lintner version. Gibbons (1982) has used a similar method as the one used by Stambaugh but instead was led to reject both standard and zero-beta CAPM formulations.

One of the principal arguments against the one-factor CAPM that uses only the market to explain excess returns is that it fails to capture the impact of other economic factors that influence investors’ expected return (i.e., risk premium). Thus, another avenue of attack on the Sharpe-Lintner-Black CAPM formulations includes studies that have identified variables other than market β to explain a cross-section of expected returns. For example, Basu (1977) showed that the earnings-to-price (E/P) ratio has marginal explanatory power after controlling for β and expected returns appear to be positively related to E/P. Banz (1981) found that a stock’s size (i.e., price times share) could help explain expected returns, which means that in the Sharpe-Lintner-Black framework, allowing for market β , expected returns on small stocks are too low and expected returns on large stocks are too high. Bhandari (1988) found that leverage is positively related to expected stock returns,

³⁷ The violations of the standard model assumptions are that the error terms are not normally distributed, not independently distributed and may be correlated with the excess market return (i.e., the explanatory variable in the regression) perhaps due to omitted variables.

and Fama and French (1992) found that higher book-to-market ratios are associated with higher expected returns in their tests that also include market β .

These anomalies of the Sharpe-Lintner-Black CAPM formulations are stylized facts that can be explained by a multifactor asset pricing model, of the type considered by Merton (1973) and Ross (1976) and discussed in Section 3.5 below. For example, Ball (1978) argued that E/P is a catch-all proxy for omitted factors in asset pricing tests and one can expect it to have explanatory power when an asset pricing model is expanded to include multiple factors but all relevant factors are not included in the estimated model. Chan and Chen (1991) argued that the “stock size” effect is due to the fact that small stocks include depressed firms whose performance is sensitive to business conditions.³⁸ Fama and French (1992) have shown that since leverage and book-to-market equity are also largely driven by market value of equity, they may also be used as proxies for risk factors that are related to market judgments about the relative prospects of firms. One can expect when asset pricing models allow for multiple factors and, at least in theory, when all relevant factors are included in the asset pricing tests, the anomalies found in earlier work would be resolved.

The alternate approach in Chen, Roll, and Ross (1986) is to look for economic variables that are correlated with stock returns and then to test whether the loading of these economic factors describe the cross section of expected returns. This approach provides insight into how the factors relate to uncertainties about consumption and portfolio opportunities that are of concern to an investor. They examined a range of business condition variables that might be related to return because they are related to shocks to expected future cash flows or discount rates. The most powerful variables are the growth rate of industrial production and the difference between the return on long-term, low-grade corporate bonds and long-term government bonds. The unexpected inflation rate and the difference between the return on long and short government bonds are found to be less significant.

Merton (1973) has constructed a generalized inter-temporal asset pricing model in which factors other than market uncertainty are priced. In Merton’s formulation, individuals are solving a lifetime consumption decision in a multi-period setting. He has shown that expected return on assets depends not only on the covariance of the asset with the market but also with the covariance of the asset with changes in the investment opportunity set. Therefore, Merton’s formulation can be interpreted as another form of arbitrage pricing theory model. Fama and French (1992) demonstrated that two variables—size and book-to-market-equity—combine to capture the cross-sectional variation in average stock return associated with market beta, size, leverage, book-to-market ratio, and earning-to-price ratio.

In addition to the theoretical problems associated with the application of the CAPM to estimating risk premia, there are also statistical issues to be addressed. The problems of estimating and forecasting systematic risk, (i.e., beta) in the CAPM have been studied by

³⁸ The presence of depressed firms or firms highly sensitive to the business cycle introduces what is known as a martingale effect in expected returns.

several authors such as Lam (1999), Lally (1998), Bowie and Bradfield (1998), Boabang (1996), Draper and Paudyal (1995), Murray (1995), and Bartholdy and Riding (1994). The classical estimator for β is the well-known ordinary least squares (OLS) estimator, but several authors have shown that this estimator suffers from several deficiencies. For example, it has a mean reversion tendency, it is inefficient when return distributions are non-normal, and has significant bias problems when shares are thinly traded.

Several alternatives to OLS have been proposed in the literature. Included among these are Vasicek (1973) and Blume (1973) who both proposed estimators to improve the mean reversion tendency of the OLS estimator of β , Chan and Lakonishok (1992) proposed robust estimators to ensure more efficient estimation of β , and Scholes and Williams (1977) proposed estimators to deal with the bias problem when shares are infrequently traded. A host of empirical studies have been carried out in order to evaluate the performance of the estimators under various conditions including studies by Draper and Paudyal (1995), Murray (1995), Boabang (1996), and Lally (1998). Of the above-mentioned estimators, the Vasicek-estimator and the robust estimators seem to perform well over a wide range of empirical studies.

APPENDIX III

ESTIMATES OF COST OF EQUITY: U.S. Electric Utilities (U.S. sample 1)

CAPM

Mid-Sized U.S. Electric Utilities	Ticker	Adjusted Beta		Unadjusted Beta, Inferred	
		2005	5 Year Average, 2005 Ending	2005	5 Year Average, 2005 Ending
Hawaiian Elec.	HE	0.70	0.59	0.55	0.39
MGE Energy	MGEE	0.65	0.55	0.48	0.33
Otter Tail Corp.	OTTR	0.55	0.56	0.33	0.34
Cen. Vermont Pub. Serv.	CV	0.50	0.49	0.25	0.24
Energy East Corp.	EAS	0.80	0.71	0.70	0.57
Florida Public Utilities	FPU	0.65	0.57	0.48	0.36
SCANA Corp.	SCG	0.75	0.61	0.63	0.42
G't Plains Energy	GXP	0.85	0.71	0.78	0.57
	Average	0.68	0.60	0.52	0.40
	S. D.	0.12	0.08	0.18	0.11
	Weighted Average	0.75	0.64	0.63	0.46
CAPM ESTIMATES: Mid-Sized U.S. Electric Utilities					
	Cost of Equity Capital, Unadjusted	Risk-Free Rate	Market Beta, Adjusted	Expected Market Return	Risk Free Rate
Low	8.97%	3.96%	0.72	10.91%	3.96%
High	12.99%	5.49%	0.78	15.10%	5.49%
Weighted Average	10.94%	4.73%	0.75	13.00%	4.73%

DISCOUNTED CASH FLOW

Mid-Sized U.S. Electric Utilities	Ticker	Quarter Dividends Declared Per Share	Effective Annual Dividend Rate	Average Market Price Per Share, May - June '06	Adjusted Dividend Yield	Expected Growth	Single Stage DCF Estimates of Cost of Equity Capital
Hawaiian Elec.	HE	0.31	\$1.26	\$26.15	4.81%	1.48%	6.29%
MGE Energy	MGEE	0.35	\$1.43	\$29.79	4.82%	3.94%	8.76%
Otter Tail Corp.	OTTR	0.29	\$1.17	\$25.74	4.57%	3.98%	8.54%
Cen. Vermont Pub. Serv.	CV	0.23	\$0.96	\$17.55	5.48%	4.48%	9.96%
Energy East Corp.	EAS	0.29	\$1.18	\$22.74	5.21%	4.25%	9.47%
Florida Public Utilities	FPU	0.10	\$0.42	\$12.55	3.38%	2.97%	6.35%
SCANA Corp.	SCG	0.42	\$1.70	\$36.97	4.60%	5.22%	9.83%
G't Plains Energy	GXP	0.42	\$1.72	\$26.42	6.52%	3.79%	10.31%
DCF ESTIMATES: Mid-Sized Electric Utilities							
				Dividend	Growth	Cost Rate	
Average				4.92%	3.76%	8.69%	
S. D.				0.89%	1.12%	1.58%	
Range							
Low				4.48%	3.20%	7.90%	
High				5.37%	4.32%	9.48%	
Weighted Average				5.10%	4.04%	9.15%	

HISTORICAL MARKET RETURNS, AVERAGE PER ANNUM

Mid-Sized U.S. Electric Utilities	1996 - 2001	1997 - 2002	1998 - 2003	1999 - 2004	2000 - 2005
Hawaiian Elec.	8.55%	11.23%	8.99%	15.39%	16.55%
MGE Energy	7.73%	12.59%	12.56%	14.95%	0.00%
Otter Tail Corp.	15.63%	16.90%	12.73%	10.20%	9.76%
Cen. Vermont Pub. Serv.	13.50%	16.04%	17.55%	19.53%	17.88%
Energy East Corp.	20.41%	19.66%	3.92%	4.27%	9.44%
Florida Public Utilities	16.03%	17.71%	12.62%	11.62%	14.81%
SCANA Corp.	6.01%	8.21%	6.37%	12.22%	13.30%
G't Plains Energy	5.20%	1.78%	6.04%	11.42%	10.72%
Sample Average	11.63%	11.72%	8.20%	11.38%	10.87%
Weighted Average	10.79%	11.50%	6.92%	10.62%	11.61%

HISTORICAL MARKET RETURNS, 5-YEAR AVERAGE PER ANNUM

Mid-Sized U.S. Electric Utilities	1996 - 2001	1997 - 2002	1998 - 2003	1999 - 2004	2000 - 2005
Hawaiian Elec.	8.55%	11.23%	8.99%	15.39%	16.55%
MGE Energy	7.73%	12.59%	12.56%	14.95%	0.00%
Otter Tail Corp.	15.63%	16.90%	12.73%	10.20%	9.76%
Cen. Vermont Pub. Serv.	13.50%	16.04%	17.55%	19.53%	17.88%
Energy East Corp.	20.41%	19.66%	3.92%	4.27%	9.44%
Florida Public Utilities	16.03%	17.71%	12.62%	11.62%	14.81%
SCANA Corp.	6.01%	8.21%	6.37%	12.22%	13.30%
G't Plains Energy	5.20%	1.78%	6.04%	11.42%	10.72%
Sample Average	11.63%	11.72%	8.20%	11.38%	10.87%
Weighted Average	10.79%	11.50%	6.92%	10.62%	11.61%

HISTORICAL MARKET RETURNS, CUMULATIVE

Mid-Sized U.S. Electric Utilities	1996 - 2001	1996 - 2002	1996 - 2003	1996 - 2004	1996 - 2005
Hawaiian Elec.	8.55%	11.23%	8.99%	15.39%	16.55%
MGE Energy	7.73%	12.59%	12.56%	14.95%	0.00%
Otter Tail Corp.	15.63%	16.90%	12.73%	10.20%	9.76%
Cen. Vermont Pub. Serv.	13.50%	16.04%	17.55%	19.53%	17.88%
Energy East Corp.	20.41%	19.66%	3.92%	4.27%	9.44%
Florida Public Utilities	16.03%	17.71%	12.62%	11.62%	14.81%
SCANA Corp.	6.01%	8.21%	6.37%	12.22%	13.30%
G't Plains Energy	5.20%	1.78%	6.04%	11.42%	10.72%
Sample Average	11.63%	11.72%	9.89%	11.74%	11.17%
Weighted Average	10.79%	11.50%	6.92%	10.62%	11.61%

RISK PREMIUM

Equity Market Return			Cost Rate Adjustments, Small-Sized U.S. Utilities		
Cost Rate Components	Market Return Requirements		Adjustment Component	Lower Bound	Upper Bound
	Lower Bound	Upper Bound			
1-Year Treasuries	2.0%	4.6%	Diversifiable Risks	-2.6%	-2.1%
1-Yr - 10-Yr Spread	1.2%	1.6%	Small Capitalization Equities	1.2%	1.6%
Equity - T. Debt Risk Premia	7.5%		Cost of Capital, Small U.S. Electric Utilities		
				Lower Bound	Upper Bound
Expected Overall Market Return	11.4%	13.0%	w/o issuance Costs	10.0%	12.4%
			Average:	11.18%	

APPENDIX IV

ESTIMATES OF COST OF EQUITY: U.S. Gas Utilities (U.S. sample 2)

CAPM

Moderate-Sized U.S. Gas Distribution Utilities	Ticker	Adjusted Beta		Unadjusted Beta, as Inferred	
		2005	5 Year Average, 2005 Ending	2005	5 Year Average, 2005 Ending
AGL Resources	ATG	0.85	0.73	0.78	0.60
Atmos Energy	ATO	0.70	0.63	0.55	0.45
Cascade Natural Gas	CGC	0.75	0.67	0.63	0.51
EnergySouth Inc	ENSI	0.55	0.50	0.33	0.25
New Jersey Resources	NJR	0.75	0.66	0.63	0.49
Northwest Nat. Gas	NWN	0.70	0.62	0.55	0.43
Piedmont Natural Gas	PNY	0.75	0.68	0.63	0.52
South Jersey Inds.	SJI	0.60	0.52	0.40	0.28
Southwest Gas	SWX	0.75	0.71	0.63	0.57
WGL Holdings Inc.	WGL	0.80	0.69	0.70	0.54
	Average	0.72	0.64	0.58	0.46
	S. D.	0.09	0.08	0.13	0.11
	Weighted Average:	0.75	0.67	0.63	0.50

CAPM ESTIMATES: Moderate-Sized U.S. Gas Distribution Utilities

	Cost of Equity Capital, Unadjusted	Risk-Free Rate	Market Beta, Adjusted	Expected Market Return	Risk Free Rate
Low	9.03%	3.96%	0.73	10.91%	3.96%
High	12.93%	5.49%	0.77	15.10%	5.49%
Weighted Average	10.95%	4.73%	0.75	13.00%	4.73%

DISCOUNTED CASH FLOW

Moderate-Sized U.S. Gas Distribution Utilities		Quarter Dividends Declared Per Share	Effective Annual Dividend Rate	Average Market Price Per Share, May - June '06	Adjusted Dividend Yield	Expected Growth	Single Stage DCF Estimates of Cost of Equity Capital
AGL Resources	ATG	0.37	\$1.53	\$37.82	4.04%	6.68%	10.72%
Atmos Energy	ATO	0.32	\$1.28	\$30.41	4.21%	2.16%	6.37%
Cascade Natural Gas	CGC	0.24	\$1.03	\$20.29	5.09%	7.53%	12.62%
EnergySouth Inc	ENSI	0.22	\$0.91	\$30.88	2.95%	6.04%	8.99%
New Jersey Resources	NJR	0.36	\$1.49	\$44.66	3.34%	7.39%	10.73%
Northwest Nat. Gas	NWN	0.35	\$1.39	\$34.76	4.01%	2.05%	6.06%
Piedmont Natural Gas	PNY	0.24	\$0.97	\$23.54	4.12%	4.35%	8.48%
South Jersey Inds.	SJI	0.23	\$0.95	\$26.41	3.61%	7.82%	11.43%
Southwest Gas	SWX	0.21	\$0.96	\$29.55	3.23%	16.48%	19.71%
WGL Holdings Inc.	WGL	0.33	\$1.35	\$27.65	4.88%	2.62%	7.50%
DCF ESTIMATES: Moderate-Sized U.S. Gas Distribution Utilities							
				Dividend Yield		Expected Growth	Unadjusted Cost Rate
				Average	3.95%	6.31%	10.26%
				S. D.	0.69%	4.23%	3.97%
				Range			
				Low	3.61%	4.19%	8.28%
				High	4.29%	8.43%	12.25%
				Weighted Average	4.02%	5.65%	9.67%

HISTORICAL MARKET RETURNS, AVERAGE PER ANNUM

Moderate-Sized U.S. Gas Distribution Utilities	1996 - 2001	1996 - 2002	1996 - 2003	1996 - 2004	1996 - 2005
AGL Resources	9.32%	9.23%	10.67%	11.66%	13.00%
Atmos Energy	6.24%	5.43%	6.06%	7.11%	8.00%
Cascade Natural Gas	10.95%	10.76%	8.86%	9.48%	8.82%
EnergySouth Inc	12.62%	15.06%	14.77%	17.08%	17.04%
New Jersey Resources	13.43%	13.73%	13.56%	14.43%	
Northwest Nat. Gas	6.64%	8.84%	8.15%	9.23%	10.40%
Piedmont Natural Gas	13.49%	12.60%	12.34%	13.10%	13.48%
South Jersey Inds.	12.47%	12.01%	12.56%	14.34%	16.25%
Southwest Gas	10.53%	10.30%	8.49%	9.07%	9.44%
WGL Holdings Inc.	10.55%	8.82%	7.83%	8.75%	9.55%
Sample Average	10.62%	10.68%	10.33%	11.42%	11.78%
Weighted Average	8.51%	8.26%	8.29%	9.13%	8.66%

HISTORICAL MARKET RETURNS, 5-YEAR AVERAGE PER ANNUM

Moderate-Sized U.S. Gas Distribution Utilities	1996 - 2001	1997 - 2002	1998 - 2003	1999 - 2004	2000 - 2005
AGL Resources	9.32%	8.70%	11.92%	14.66%	20.32%
Atmos Energy	6.24%	4.49%	2.00%	5.25%	12.89%
Cascade Natural Gas	10.95%	10.64%	9.09%	9.86%	10.18%
EnergySouth Inc	12.62%	12.79%	9.55%	17.65%	21.48%
New Jersey Resources	13.43%	13.86%	11.51%	13.47%	
Northwest Nat. Gas	6.64%	7.47%	5.84%	10.23%	15.20%
Piedmont Natural Gas	13.49%	12.45%	8.03%	10.36%	15.31%
South Jersey Inds.	12.47%	12.30%	11.20%	15.83%	20.08%
Southwest Gas	10.53%	9.99%	5.18%	2.48%	9.86%
WGL Holdings Inc.	10.55%	7.39%	4.11%	7.07%	8.77%
Sample Average	10.62%	10.01%	7.84%	10.68%	14.90%
Weighted Average	8.51%	7.74%	6.36%	8.55%	11.47%

HISTORICAL MARKET RETURNS, CUMULATIVE

Moderate-Sized U.S. Gas Distribution Utilities	1996 - 2001	1996 - 2002	1996 - 2003	1996 - 2004	1996 - 2005
AGL Resources	8.68%	11.86%	12.89%	13.59%	14.68%
Atmos Energy	4.70%	8.70%	8.86%	9.54%	10.15%
Cascade Natural Gas	10.64%	12.66%	10.35%	10.78%	9.96%
EnergySouth Inc	11.62%	17.21%	16.60%	18.56%	18.36%
New Jersey Resources	13.30%	18.69%	17.79%	18.13%	18.07%
Northwest Nat. Gas	6.19%	11.14%	10.10%	10.91%	11.86%
Piedmont Natural Gas	12.61%	15.59%	14.89%	15.32%	15.46%
South Jersey Inds.	12.31%	15.26%	15.35%	16.72%	18.28%
Southwest Gas	8.76%	12.21%	9.99%	10.38%	10.61%
WGL Holdings Inc.	10.37%	12.16%	10.64%	11.20%	11.72%
Sample Average	9.92%	13.55%	12.75%	13.51%	13.91%
Weighted Average	7.86%	10.81%	10.46%	11.01%	11.51%

RISK PREMIUM

Equity Market Return			Cost Rate Adjustments, Small-Sized U.S. Utilities		
Cost Rate Components	Market Return Requirements		Adjustment Component	Lower Bound	Upper Bound
	Lower Bound	Upper Bound			
1-Year Treasuries	2.0%	4.6%	Diversifiable Risks	-2.3%	-1.9%
1-Yr - 10-Yr Spread	1.2%	1.6%	Small Capitalization Risk Premia	1.2%	1.5%
Equity - T. Debt Risk Premia	7.5%		Cost of Capital, Moderate-Sized U.S. Gas Utilities		
				Lower Bound	Upper Bound
Expected Overall Market Return	11.5%	13.0%	w/o issuance Costs	10.3%	12.7%
			Average:	11.51%	

APPENDIX V

ESTIMATES OF COST EQUITY: U.S. Non-Utilities (U.S. sample 3)

CAPM

Comparable Risk U.S. Non-Utility Companies		Adjusted Beta		Unadjusted Beta, as Inferred	
Company Name	Ticker	2004	5 Year	2004	5 Year
			Average, 2004		Ending
Amer. Pacific	APFC	0.50	0.53	0.25	0.30
Andres Wines Ltd. 'A'	ADW/A.TO	0.60	0.56	0.40	0.34
Atlantis Plastics	ATPL	0.60	0.56	0.40	0.34
Atrion Corp	ATRI	0.70	0.68	0.55	0.52
Koss Corp	KOSS	0.35	0.44	0.03	0.16
Marsh Supermarkets 'B'	MARSB	0.45	0.49	0.18	0.24
Max & Erma's Restaurants	MAXE	0.50	0.48	0.25	0.22
NAPCO Security Systems Inc.	NSSC	0.45	0.54	0.18	0.31
New Brunswick Scientific Co	NBSC	0.60	0.60	0.40	0.40
Patriot Transportation Holdin	PATR	0.45	0.00	0.18	-0.49
Peerless Mfg.	PMFG	0.70	0.66	0.55	0.49
Rocky Mountain Choc Factory	RMCF	0.65	0.68	0.48	0.52
S&K Famous Brands	SKFB	0.45	0.48	0.18	0.22
Span-America Medical Systems	SPAN	0.50	0.54	0.25	0.31
Tasty Baking	TSTY	0.65	0.52	0.48	0.28
Village Super Market 'A'	VLGEA	0.55	0.57	0.33	0.36
	Average	0.54	0.52	0.32	0.28
	S. D.	0.10	0.16	0.15	0.23
	Weighted Average	0.52	0.46	0.29	0.19
CAPM ESTIMATES: Comparable Risk U.S. Non-Utility Companies					
	Unadjusted Cost of Equity	Risk-Free Rate	Market Beta, Adjusted	Expected Market Return	Risk Free Rate
Low	7.38%	3.96%	0.49	10.91%	3.96%
High	11.21%	5.49%	0.60	15.10%	5.49%
Weighted Average	9.06%	4.73%	0.52	13.00%	4.73%

RISK PREMIUM

<u>Equity Market Return</u>			<u>Cost Rate Adjustments, Small-Sized U.S. Equities</u>		
<u>Cost Rate Components</u>	<u>Market Return Requirements</u>		<u>Adjustment Component</u>	<u>Lower Bound</u>	<u>Upper Bound</u>
	<u>Lower Bound</u>	<u>Upper Bound</u>			
1-Year Treasuries	2.0%	4.6%	Diversifiable Risks	-3.8%	-3.1%
1-Yr - 10-Yr Spread	1.2%	1.6%	Small Capitalization Equities	1.9%	2.2%
Equity - T. Debt Risk Premia	7.5%		<u>Cost of Capital, Small-Sized U.S. Equities</u>		
				<u>Lower Bound</u>	<u>Upper Bound</u>
Expected Overall Market Return	11.4%	13.0%	w/o issuance Costs	9.5%	12.1%
			Average:	10.84%	

HISTORICAL MARKET RETURNS, AVERAGE PER ANNUM

Low Risk Small-Sized U.S. Non-Utility Companies	1995 - 2000	1995 - 2001	1995 - 2002	1995 - 2003	1995 - 2004
Amer. Pacific	2.28%	-1.30%	6.63%	4.87%	4.64%
Andres Wines Ltd. 'A'	8.82%	12.08%	14.84%	16.22%	17.31%
Atlantis Plastics	10.08%	-0.72%	3.98%	12.38%	23.84%
Atrion Corp	2.67%	16.67%	16.49%	17.72%	20.07%
Koss Corp	12.53%	24.21%	25.09%	22.99%	22.88%
Marsh Supermarkets 'B'	3.70%	6.53%	5.35%	4.28%	5.40%
Max & Erma's Restaurants	1.92%	4.67%	9.85%	10.36%	9.85%
NAPCO Security Systems Inc.	5.91%	8.02%	12.25%	17.36%	18.03%
New Brunswick Scientific Co	9.88%	3.68%	9.73%	6.09%	7.69%
Patriot Transportation Holdin	2.49%	-0.75%	5.38%	5.02%	7.25%
Peerless Mfg.	7.54%	13.19%	26.53%	17.10%	17.81%
Rocky Mountain Choc Factory	-17.93%	5.54%	8.84%	8.76%	19.73%
S&K Famous Brands	2.01%	5.79%	9.13%	11.63%	11.62%
Span-America Medical Systems	0.80%	6.21%	11.59%	13.87%	16.97%
Tasty Baking	8.79%	15.88%	12.14%	6.09%	5.51%
Village Super Market 'A'	13.59%	12.46%	23.05%	19.10%	19.81%
Sample Average	4.69%	8.26%	12.55%	12.11%	14.28%
Weighted Average	5.11%	8.03%	12.71%	12.38%	14.69%

HISTORICAL MARKET RETURNS, 5-YEAR AVERAGE PER ANNUM

Low Risk Small-Sized U.S. Non-Utility Companies	1996 - 2000	1997 - 2001	1998 - 2002	1999 - 2003	2000 - 2004
Amer. Pacific	2.28%	0.00%	7.68%	1.63%	4.13%
Andres Wines Ltd. 'A'	8.82%	9.15%	4.42%	11.26%	20.72%
Atlantis Plastics	10.08%	-1.56%	2.08%	15.77%	24.14%
Atrion Corp	2.67%	14.96%	18.82%	30.71%	38.97%
Koss Corp	12.53%	35.85%	36.09%	29.48%	33.90%
Marsh Supermarkets 'B'	3.70%	7.23%	0.98%	1.04%	6.90%
Max & Erma's Restaurants	1.92%	8.24%	17.18%	18.79%	18.60%
NAPCO Security Systems Inc.	5.91%	7.69%	8.69%	14.51%	24.55%
New Brunswick Scientific Co	9.88%	3.06%	9.36%	1.54%	7.63%
Patriot Transportation Holdin	2.49%	-1.42%	3.08%	-1.86%	7.90%
Peerless Mfg.	7.54%	16.81%	34.99%	22.79%	28.71%
Rocky Mountain Choc Factory	-17.93%	16.28%	29.32%	28.26%	50.53%
S&K Famous Brands	2.01%	5.59%	2.42%	5.94%	16.04%
Span-America Medical Systems	0.80%	3.60%	14.75%	10.74%	25.81%
Tasty Baking	8.79%	19.98%	6.48%	-4.58%	1.56%
Village Super Market 'A'	13.59%	13.84%	27.34%	20.82%	20.49%
Sample Average	4.69%	9.96%	13.98%	12.93%	20.66%
Weighted Average	5.11%	9.83%	13.47%	12.12%	20.00%

HISTORICAL MARKET RETURNS, CUMULATIVE

Low Risk Small-Sized U.S. Non-Utility Companies	<u>1995 - 2000</u>	<u>1995 - 2001</u>	<u>1995 - 2002</u>	<u>1995 - 2003</u>	<u>1995 - 2004</u>
Amer. Pacific	1.69%	8.63%	4.89%	3.03%	3.01%
Andres Wines Ltd. 'A'	6.85%	23.77%	14.03%	15.65%	16.90%
Atlantis Plastics	4.43%	8.20%	-5.50%	2.87%	12.83%
Atrion Corp	0.05%	5.95%	13.68%	15.41%	18.11%
Koss Corp	11.03%	18.12%	23.90%	21.54%	21.59%
Marsh Supermarkets 'B'	3.40%	4.07%	5.21%	3.96%	5.20%
Max & Erma's Restaurants	1.84%	1.47%	10.24%	10.76%	10.12%
NAPCO Security Systems Inc.	4.42%	3.52%	11.68%	16.83%	17.63%
New Brunswick Scientific Co	11.76%	9.30%	8.77%	4.20%	6.11%
Patriot Transportation Holdin	0.80%	0.64%	3.36%	3.24%	5.74%
Peerless Mfg.	8.78%	6.96%	26.46%	11.12%	12.59%
Rocky Mountain Choc Factory	-25.60%	-21.06%	-2.14%	-0.72%	8.87%
S&K Famous Brands	-2.52%	-2.02%	6.44%	9.42%	9.68%
Span-America Medical Systems	-4.24%	-3.41%	8.28%	11.12%	14.56%
Tasty Baking	6.36%	5.05%	9.63%	1.47%	1.39%
Village Super Market 'A'	16.25%	12.80%	24.03%	18.74%	19.56%
Sample Average	2.83%	5.12%	10.19%	9.29%	11.49%
Weighted Average	3.42%	5.86%	10.51%	9.81%	12.12%

APPENDIX VI

ESTIMATES OF COST OF EQUITY: Canadian Utility Companies³⁹ (CN sample 1)

CAPM

TSX LISTED UTILITIES (Sample 1)					
	Ticker	CAPM Beta, 2000 - Current			
		Adjusted	Unadjusted		
Altek Power	APK	1.599	1.83		
TransCanada Pipelines preferred	TCA-PX	0.537	0.25		
Nova Scotia	NSI-PD	0.464	0.14		
Pacific Northern Gas	PNG	0.606	0.35		
Gax Metro	GZM-UN	0.669	0.44		
Boralex	BLX	1.053	1.02		
TransCanada Pipelines	TRP	0.631	0.39		
Sierra Geothermal	SRA	0.055	-0.47		
	Average	0.70	0.49		
	S. D.	0.45	0.68		
CAPM ESTIMATES: Canadian Utilities (sample 1)					
	Capital,	Rate	Adjusted	Market Return	Rate
Low	6.98%	3.98%	0.61	8.89%	3.98%
High	11.40%	4.93%	0.79	13.09%	4.93%
Average	8.66%	4.45%	0.70	10.45%	4.45%

³⁹ These entities are identified as “utilities” by the Toronto Stock Exchange (TSX).

HISTORICAL MARKET RETURNS

TSX LISTED UTILITIES (Sample 1)	Ticker	Realized Total Market Returns	
		Average, 2002- 2005	Variation (S.D.)
Altek Power	APK	16.73%	106.86%
TransCanada Pipelines preferred	TCA-PX	8.08%	2.02%
Nova Scotia	NSI-PD	6.40%	9.90%
Pacific Northern Gas	PNG	-2.69%	0.00%
Gax Metro	GZM-UN	7.23%	10.83%
Boralex	BLX	8.66%	48.68%
TransCanada Pipelines	TRP	19.60%	7.51%
Sierra Geothermal	SRA	9.06%	57.23%
	Average	9.13%	30.38%
	S. D.	6.76%	

APPENDIX VII

ESTIMATES OF COST OF EQUITY: Canadian Utility Companies⁴⁰ (CN sample 2)

CAPM

TSX LISTED UTILITIES (Sample 2)					
	Ticker	CAPM Beta, 2000 - Current			
		Adjusted	Unadjusted		
Canadian Utilities	CU	0.688	0.47		
Coast Mountain Power Corp.	MW	0.53	0.23		
Enbridge Inc.	ENB	0.56	0.28		
Maxim Power Corp	MXG	0.62	0.36		
Pacific Northern Gas	PNG	0.61	0.35		
TransCanada Pipelines	TRP	0.62	0.38		
Fortis Inc.	FTS	0.73	0.54		
Transalta Power	TPW	0.70	0.49		
Canadian Hydro Developers Inc.	KHD	1.02	0.97		
Manitoba Telecom Services Inc.	MBT	0.58	0.32		
Telus Corp		1.56	1.77		
	Average	0.75	0.56		
	S. D.	0.30	0.45		
CAPM ESTIMATES: Canadian Utilities (sample 2)					
	Cost of Equity Capital, Unadjusted	Risk-Free Rate	Market Beta, Adjusted	Expected Market Return	Risk Free Rate
Low	7.35%	3.98%	0.69	8.89%	3.98%
High	11.51%	4.93%	0.81	13.09%	4.93%
Weighted Average	8.93%	4.45%	0.75	10.45%	4.45%

⁴⁰ These entities are identified as “utilities” by the Toronto Stock Exchange (TSX).

HISTORICAL MARKET RETURNS

TSX LISTED UTILITIES (Sample 2)	Ticker	Realized Total Market Returns	
		Average, 2002- 2005	Variation (S.D.)
Canadian Utilities	CU	19.2%	21.5%
Coast Mountain Power Corp.	MW	27.2%	
Enbridge Inc.	ENB	-0.9%	27.9%
Maxim Power Corp	MXG	33.4%	66.2%
Pacific Northern Gas	PNG	-2.7%	
TransCanada Pipelines	TRP	19.6%	7.5%
Fortis Inc.	FTS	22.7%	14.1%
Transalta Power	TPW	12.7%	13.7%
Canadian Hydro Developers Inc.	KHD	33.4%	35.3%
Manitoba Telecom Services Inc.	MBT	7.7%	16.7%
Telus Corp		25.1%	36.0%
	Average	17.9%	26.5%
	S. D.	12.5%	