IN THE MATTER OF a Consultation by the Ontario Energy Board on the Appropriate Cost of Capital and Incentive Regulation for Electricity Distribution Companies

FINAL WRITTEN TESTIMONY OF DR. ROGER A. MORIN WITH SUPPORT FROM ENERGY AND ENVIRONMENTAL ECONOMICS, INC. (E3)

INTRODUCTION

As requested by Board Staff, the following discussion by Dr. Roger A. Morin, with support from Energy and Environmental Economics, Inc, addresses risk and fairness in the ratemaking process, utility capital structure issues, return on equity calculations, and risk premiums and size for small utilities. We address the issues in four parts, as described below.

In Part One: Risk And Fairness In The Ratemaking Process, we discuss the main types of risks faced by utilities. Changing a regulatory regime without regard to the existing regulatory environment could raise questions regarding regulatory stability. Any change in existing regulatory structures represents a risk to LDCs and their debt and equity investors. A material change in current methods and techniques for determining appropriate capital structures for LDCs, in principle or in the result, or in the financial consequences of deviating from those structures, or a change in what constitutes a fair return on LDCsô debt and equity capital, risks unfairness. Regulatory instability is a form of risk similar to business, financial, or capital budget risk. These elements of risk must be priced into the required return. Part One provides an overview of the significant categories of utility risk, their causes and their relationship to rate of return.

In Part Two: Utility Capital Structure Issues, we provide a primer for the concepts and issues underlying capital structure and the relationships between debt, equity, and the weighted average cost of capital (WACC). We provide expert analysis which supports the position that if an LDC is to be ñdeemedò for rate-making purposes to have a higher debt component than it actually has in its capital structure, then a corresponding increase in the

t also be recognized and allowed. With a deemed (fictitious) capital structure, the cost of equity, the cost of debt, and taxes all must be artificially adjusted so as to be synchronous with the fictitious capital structure adopted.

In Part Three: Roe Calculations Using Staff Assumptions, we provide a validation of the after-tax weighted average cost of capital (WACC) and return on equity (ROE) using the 60-month, all rate regulated example from Appendix A of Staffôs 25 July 2006 document. Using these Staff assumptions, we calculate that an ROE in the range of 9.8% to 10.4% is appropriate. While this does not in any way indicate a position with regard to an independent calculation of the appropriate Return on Equity for this proceeding, it does serve as an independent confirmation of the ROE calculations using the above assumptions provided by the OEB staff. It also confirms that the range of ROE values calculated by E3/Newmarket Hydro is accurate.

In Part Four: Risk Premiums And The Size Effect For Small Utilities, we provide evidence for the size premium for small companies. The phenomenon is well known in capital markets. The US has documented this difference extensively since 1926. In addition, both Alberta and Ontario have recognized the higher business risk associated with small companies through tiered capital structures, ensuring greater equity ñcushionò. California, Florida and Maine have similarly acknowledged a small utility premium in their ratemaking process ï which has been implemented through capital structure, higher ROE or both.

IN THE RATEMAKING PROCESS

Changing a regulatory regime without regard to the existing regulatory environment could raise questions regarding regulatory stability. Regulatory instability is a form of risk similar to business, financial, or capital budget risk. These elements of risk must be priced into the required return. Below is an overview of the significant categories of utility risk, their causes and their relationship to rate of return. For a complete review of all risks, please refer to New Regulatory Finance, Chapter 2.

Summary of points in this section:

Regulated public utilities are entitled to recover through the rates charged to their customers all costs of providing service, including a fair return on capital. In the setting of rates it was stated by the Supreme Court of Canada in Northwestern Utilities vs. City of Edmonton [1929], 2 D.L.R., p. 8 that rate levels should be just and reasonable to the consumer as well as to the utility and in the latter case, the earnings should yield a fair rate of return on money invested. In the U.S., the landmark *Bluefield* and *Hope* cases established the criterion that the fair return be commensurate with those available on alternate investments of comparable risk.

- Required return on investment is determined by the nominal risk-free rate and a risk premium.
- The risk premium is affected by interest rate, business, regulatory, financial, capital budget and liquidity risks - all of these risks increase operating and financial leverage, thus increasing the required rate of return.
- Because of its impact on revenues and earnings, Regulatory risk is a prime determinant of total investment risk and regulators should certainly consider such risks in their assessment of total investment risk. In fact, the US Supreme Courtôs opinion in Duquesne Light Co. et al. v Barasch et al. (109 S. Ct 609, 1989), established that regulatory risk is a special class of risk that must be recognized by regulators when setting the allowed rate of return.
- We also reference the OEB staffôs witness, Dr. Mark Lowry (Pacific Economics Group) 2nd ï Generation Incentive Regulation for Ontario Power Distributors, June 13, 2006, page 10), when discussing Cost of Service Regulation (COSR) vs. Performance Based Ratemaking (PBR). In his report, he states: ñCompared with COSR, PBR will often expose utilities to more conventional business risk. Their situation in this regard is much like an airline that, faced with soaring jet fuel prices, can hope for some relief from market-based fares but is by no means ensured full compensation.ò He goes on to link these risks to rates of return, writing, ñAny

under PBR will ultimately be recognized by capital markets and reflected in the cost that utilities incur to attract funds.ò

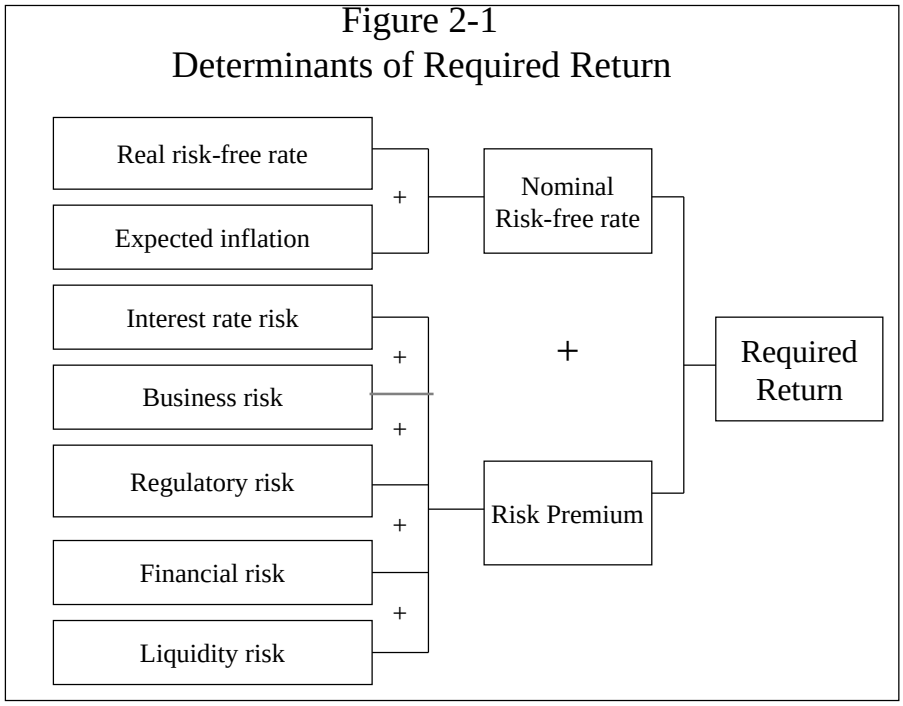
Return Measures Risk

As an aid to understanding the investor's required rate of return, it is useful to conceptualize the required return on any security, for example a share of common stock, as the sum of the risk-free rate of interest and a risk premium as follows:

Required Return = Risk-free Rate + Risk Premium

This relationship isdepicted in figure 2-1 below.

Figure 2-1
Determinants of Required Return



Each of the itemized risks is an element of required return. We believe that OEB staff has evaluated most of these risks, but might wish to more fully consider specific elements of Business, Regulatory Risk and Capital Budget Risk. Please refer to New Regulatory Finance, Chapter 2, for a full discussion of each of the remaining elements.

The components of risk described below are company-specific:

Business Risk

Business risk encompasses all the operating factors that collectively increase the probability that expected future income flows accruing to investors may not be realized, because of the fundamental nature of the company's business.

Business risk is due to sales volatility and operating leverage. Sales volatility, also referred to as demand risk, refers to the uncertainty in the demand for the company's products due in part to external non-controllable factors, such as the basic cyclicality of the demand for the company's products, the productsô income and price elasticity, the degree of competition, the availability of product substitutes, the risk of technological obsolescence, the degreeand quality of regulation, weather variations, and the conditions of the labor and raw materials markets.

Sales volatility is also related to internal or controllable factors. The reactions of a company's management to the business environment, such as the adoption of a particular cost structure, are important dimensions of business risk. If all production costs are variable, then operating income varies proportionately to sales variability. If, as is the case for utilities, a large portion of costs are fixed, then operating income will be far more volatile than sales. This magnification effect of fixed costs on the variability of operating income is referred to as ñoperating leverage.ò

The business risk of utilities is assessed by examining the strength of the long-term demand for utility products and services. Many factors have an impact on business risk, including the size and growth rate of the market, the diversity of the customer base and its economic solidity, the availability of substitutes and degree of competition, and the utility's relative competitive standing in its major markets, including residential, industrial, and commercial markets. The regional economics of a utility's service territory exert a strong influence on the company's risk. One of several factors explicitly scrutinized by bond rating agencies in assigning a quality rating to a utility company's securities is the proportion of total revenues as between industrial, commercial, and residential customers, which measures a utility's dependence on any given class of customers. Within a given class, such as industrial, the concentration of revenues from the top five, ten, or twenty business customers provides a measure of a company's vulnerability and exposure. The proportion of interruptible contracts is an additional dimension of business risk.

Operating efficiency from the standpoint of cost and quality of service is another factor that may influence a utility's competitive risk exposure. Other examples of internal risk factors include the degree of diversification in the company's asset structure, managerial efficiency, growth strategy, research and development policies, and competitive posture.

The size of a utility's construction program is also a source of business risk, to the extent that new construction is to meet projected demand. In addition, projected demand is more

and, and this forecasting risk is compounded by regulatory lag and attrition. Construction factors also impinge on financial risk, as discussed below.

A regulated utility is also subject to forecasting risk to the extent that budgeted forecasts are made one to three years before regulated rates come into effect or expire. And with these rates in effect, potential deviations from expected profitability can occur because of unanticipated increases in costs (interest, O&M, etc.) and/or unanticipated decreases in revenues. Any factor that complicates the investor's ability to assess future prospects will accentuate business risk.

Business risk manifests itself not only through demand uncertainties but also through supply uncertainties. An illustrative case in point is the supply risks of local gas distribution companies (LDCs) that followed the deregulation of natural gas prices. These companies became responsible for making decisions regarding prices, contract differentiation, and supply portfolio composition. The provision of gas supplies to its customers was therefore subject to greater risk of approval by the regulators. The uncertain and evolving roles of LDCs in providing gas supplies to various customer groups who have several supply alternatives in a deregulated market complicated the decision process. Moreover, deregulation brought with it greater ability for producers and other natural gas marketers to sell within the service area of LDCs, creating great uncertainty as to the size of market to be supplied. This risk and the reliance upon other parties for the security of supply and supply planning created a radically different supply risk for LDCs following deregulation.

A distinction is frequently made between short-term and long-term business risks. Short-term business risks involve short-term uncertainties and volatilities that are expected to occur within one year. They are usually business cycle-related. Long-term business risks are longer-term uncertainties over and above short-term risks that involve changes in the structural and chronic supply/demand forces in a given industry. Examples of the latter include the gradual penetration of competitive forces and/or deregulation in a given industry, the emergence of technology-based growth opportunities in an industry (distributed generation for example), impending environmental legislation and its uncertain impact, and the gradual transition to different modes of regulation (performance-based ratemaking, for example).

Regulatory Risk

Regulation for public utilities is a major component of business risk because of its impact on revenues and earnings. Investors certainly consider regulatory risk when making investment decisions, as evidenced by the myriad investment services that evaluate such risks (Value Line, Regulatory Research Associates, bond rating agencies, etc.). Regulatory risk is a

risk and regulators should certainly consider such risks in their assessment of total investment risk.

Decisions of Provincial or federal regulatory agencies, such as the Ontario Energy Board itself while dealing with matters such as the Distribution System Code or the Affiliate Relationships Code, Labour Tribunals, Electrical Safety Authority or the Canadian Standards Association, and others, have a direct impact on utility finances. Regulation can increase business risk if it does not provide adequate returns and/or if it does not provide the utility with the opportunity to earn a fair rate of return. The converse is also true.

The U.S. Supreme Court's opinion in *Duquesne Light Co. et al. v. Barasch et al.* (109 S. Ct. 609, 1989) addressed a number of issues relating to regulatory practices and established that regulatory risk is a special class of risk that must be recognized by regulators when setting the allowed rate of return.[1]

Regulatory risk generally refers to the quality and consistency of regulation applied to a given regulated utility, and specifically to the fairness and reasonableness of rate awards. Regulatory jurisdictions are evaluated on the basis of three major factors: earnable return on equity, regulatory quality, and regulatory technique. In assessing these three factors, several issues are examined, including authorized rates of return and opportunity to earn that return, capital structure and rate base issues, the length of regulatory lag, the inclusion or exclusion of construction work in progress (CWIP), the type of test year employed (whether historical or forward), the normalization of tax timing differences versus flow-through techniques, the proportion of earnings represented by the allowance for funds used during construction[2] (AFUDC), environmental issues, judicial and legislative mandates, and responses to changing conditions.

Regulation can compound the business risk premium if it is unpredictable in reacting to rate hike requests both in terms of the time lag of its response and its magnitude. For example, the absence of a purchased gas adjustment mechanism for a natural gas distribution utility injects regulatory lag. More generally, if the regulatory response to rising operating costs and higher capital costs because of high unanticipated inflation is inadequate or untimely, or if the utility is not given the opportunity to cover higher costs because of political factors or

[1] See Kolbe and Tye (1992) for a further discussion of this issue.

[2] Given the multi-year construction lags involved in building large generation plants and transmission assets, revenues from such assets are several years away. Moreover, regulators are reluctant to include construction work in progress (CWIP) in rate base, given that such plant is not used and useful and given the generational inequity of including the capit al costs of these projects in the current rate base. Instead, the construction costs are offset by a non-cash item called AFUDC (ñAllowance for Funds Used During Constructionò). Whether or not the cost can ultimately be included in the rate base depends on the regulator. Consequently, there is a significant amount of regulatory risk involved. Analysts evaluating the companyôs creditworthiness assess the likelihood of these items being recovered in subsequent rate cases.

sions, disallowances), the regulatory risk premium rises further, along with capital costs.

Regulation can also diminish business risk.Reasonable and consistent rate of return awards, bonded rate increases, adoption of forward test years, the use of deferral and normalization accounts and automatic adjustment mechanisms, such as fuel adjustment clauses, are examples of attempts to lower regulatory risk.

Regulatory lag is an important determinant of regulatory risk. Its presence makes it difficult to earn a reasonable rate of return, especially in an inflationary environment. Moreover, regulatory lag limits the pricing flexibility of the utility, and the company may be unable to respond to competitive pressures. It also creates mismatches between regulatory rates and supply-demand costs so that prices are either too high or too low. Inefficient resource allocation and distorted consumer pricing signals may result.

Financial Risk

Financial risk stems from the method used by the company to finance its investments and is reflected in its capital structure. It refers to the additional variability imparted to income available to common shareholders by the employment of fixed-cost financing, that is, debt and preferred stock capital. Although the use of fixed-cost capital can offer financial advantages through the possibility of leverage of earnings (financial leverage), it creates additional risk due to the fixed contractual obligations associated with such capital. Debt and preferred stock carry fixed charge burdens that must be supported by the company's earnings before any return can be made available to the common shareholder. The greater the percentage of fixed charges to the total income of the company, the greater the financial risk. The use of fixed cost financing introduces additional variability into the pattern of net earnings over and above that already conferred by business risk, and may even introduce the possibility of default and bankruptcy in unusual cases.

One of the most important ideas in finance is that financial risk increases with leverage and that the greater the leverage, the greater the cost of equity. For example, consider a company with a total capitalization of $600,000. The company can be financed either entirely through common equity contributed by the shareholders, or by issuing $300,000 of debt at a 10% rate of interest and having an equity investment of just $300,000. The corporate tax rate is 50% for ease of illustration. The expected earnings before interest and taxes (EBIT) are $100,000. The financial results obtained for the two alternative capital structures are shown in Table 2-1 for three assumed levels of EBIT, $80,000, $100,000, and $120,000.

Table 2-1 Impact of Leverage on Equity Returns

	ll Equity ($000)			50% Debt ($000)		
EBIT	$80	$100	$120	$80	$100	$120
Interest	$0	$0	$0	$30	$30	$30
Profit Before Tax	$80	$100	$120	$50	$70	$90
Taxes (50%)	$40	$50	$60	$25	$35	$45
Profit After Taxes	$40	$50	$60	$25	$35	$45
Return on Equity	6.7%	8.3%	10.0%	8.3%	11.7%	15.0%

At an EBIT level of $100,000, the use of debt financing has increased the return on equity from 8.3% to 11.7%. The shareholders' gain is the result of raising funds on the debt market at an after-tax cost of 5% and investing these funds to yield a return in excess of that cost. But the risk to the shareholders is increased. The earnings available to common shareholders become more volatile, as the relative amount of debt used becomes greater. Note that leverage is a double-edged sword. Just as shareholders' gains are magnified in the case of favorable operating results, potential losses are also magnified in the case of unfavorable results. In this example, the consequences to the shareholders of a 20% variation in EBIT in either direction arecalculated. The return on equity figures of Table 2-1 can be summarized as follows:

Operating Results	Equity Financing	50% Debt Financing
$80,00	6.7%	8.3%
$100,000	8.3%	11.7%
$120,000	10.0%	15.0%

It is clear from these results that variations in operating earnings cause magnified variations in equity returns when debt financing is used. The spread in equity returns is wider in the case of debt financing The greater the leverage, the greater the variability in returns and the greater the cost of common equity.

Prudent management requires that lower financial risks should be used to offset high business risks. Industries with significant variability in revenues (durables, auto, capital goods) generally have low debt ratios to offset the higher business risk. The converse is also true.

ım is required by both bondholders and common shareholders. Common equity holders require compensation for the additional earnings magnification, while bondholders require compensation for the greater risk of default. The expression linking the return on equity (ROE) with capital structure (debt-to-equity ratio D/E) is as follows:

$$ROE = [ROA + (ROA - i)\, D/E]\,(1 - t) \qquad (2\text{-}3)$$

Where:
- ROE = rate of return on common equity
- ROA = rate of return on total assets
- i = interest rate on debt
- D/E = debt to common equity proportion
- t = income tax rate

In words, this expression states that the ROE is directly proportional to the rate of return on assets (ROA), plus a risk premium equal to the excess of the asset rate over the debt rate levered by the debt/equity ratio in book value terms. A given variation in ROA due to business risk is magnified into a larger variation in the return on equity, ROE. The greater the relative proportion of debt, D/E, the greater is the magnification effect.

Although financial risk is unique to a specific company and is distinct from the company's business risk, business and financial risk are interrelated. The overall risk to the common stock investor is a composite of the business and financial risk. The overall risk of two companies may be similar when a high business risk company has assumed less financial risk while a low business risk company has assumed greater financial risk. In general, unregulated companies have greater business risk than regulated utilities, and because of these differences in business risk, utilities have adopted a correspondingly higher amount of financial risk in their capital structures.

Finally, it should be noted that financial risk can arise not only because of variations in capital structure, but also because of the use of financing methods that impart some unpredictability to future earnings. The presence of convertible bonds or convertible preferred shares, or the presence of securities issued with warrants attached create uncertainty as to the exact time at which the rights of those securities will be exercised and as to the impending dilution in earnings per share.

In addition to the above risks, we provide an explanation of Capital Budget risk. This discussion is prompted by Staffôs comments regarding extensive infrastructure investments required in Ontario ï and the associated impacts on utilities of high capital requirements.

Capital Budget Risk

the financial risks caused by the magnitude of a company's capital budget. Capital budget risk is an important component of financial risk. If a company has a large capital budget in relation to its internally generated cash flows, that company will require external financing. It is imperative that the company have access to needed capital funds on reasonable terms and conditions. The return allowed on common equity will play a crucial role in determining those terms and conditions. A regulated utility is even more susceptible to capital budget risk than an unregulated company. This is because an unregulated company has more discretion and latitude in scheduling and deferring capital projects. A utility, because of its mandated obligation to serve, does not possess the same flexibility. The problem is compounded for a regulated company that must secure funds from capital markets in order to fund new construction commitments, irrespective of capital market conditions, interest rates conditions, and quality consciousness of market participants. A regulated company may not be able to earn a return on these assets until they have been placed in service.

On debt markets, capital expenditure is one of several key determinants of credit quality and, hence, of capital costs. A company's future capital expenditure plans are scrutinized by bond rating agencies before assessing credit quality. The capital budget in relation to internal cash generation is a key quantitative determinant of credit quality, along with capital expenditures as a proportion of capitalization. CWIP to capitalization and common equity ratios are also analyzed by investors and become key determinants of capital costs and funds availability. The empirical finance literature has demonstrated clearly that construction is a key determinant of a utility's capital costs[3]

Moreover, if a utility has an impending large capital expenditure program, rate relief requirements and regulatory treatment uncertainty will increase regulatory risks as well, lowering credit quality. Regulatory risks stemming from a substantial capital expenditure program include approval risks, lags and delays, potential rate base exclusions, and potential disallowances. Reviews of the economic and environmental aspects of new construction can be lengthy. Uncertainty of approval increases forecasting and planning risks and complicates the utility's ability to devise an optimum transmission/distribution system. Regulatory approval for financings required for new construction is also required, injecting additional risks.

The risk premium is affected by business, regulatory, financial, and capital budget risk - all of these risks increase operating and financial leverage, thus increasing the required rate of return. One of these risks may also amplify another. For example, regulatory risk is crucial in determining the level of business risk. Capital budget risk also influences the degree of financial risk. Total investment risk results from a multi-dimensional blend of several

[3]See for example the empirical study by Morin (1986A, 1986B), who documents the negative impact of construction variables on common stock market-to-book ratios.

rvice territory, business risks, financial risks, new construction risks, and regulatory risks. It is difficult to quantify the exact impact of any given factor, such as business risk, on the company's total risk, let alone the impact of sub-factors such as demand, supply, operating, and physical risks. Investors examine a number of qualitative and quantitative factors before rendering a risk decision, with such factors being considered both individually andcollectively.

RUCTURE ISSUES

For the purposes of calculating ROE, it is important to understand the relationships between debt, equity and the weighted average cost of capital (WACC). This section serves as a primer for the concepts and issues underlying these relationships and the ROE calculation. It also provides an introduction to treatment of the deemed versus observed capital structure.

Summary of points in this section:

- An estimate of cost of capital on the basis of an observed capital structure is erroneous if the capital structure is expected to change and/or if the regulator imputes a capital structure different from the utilityôs test year capital structure. The cost of equity increases in response to a higher level of debt in the capital structure.

- To the extent that the regulatory process inactivates the tax advantage of debt by passing on the savings to ratepayers, the cost of equity is increased.

- It is a rudimentary tenet of basic finance that the greater the amount of financial risk borne by common shareholders, the greater the return required by shareholders in order to be compensated for the added financial risk imparted by the greater use of senior debt financing and/or debt equivalents. In other words, the greater the effective debt ratio, the greater the return required by equity investors.

- Regulators sometimes assign hypothetical (ñdeemed,ò ñimputedò) capital structures to utility companies for purposes of revenue requirements computation. This procedure is appropriate only if the cost of equity estimated from current investor expectations is revised to take into account the new capital structure prescribed by the regulator.

- If it is assumed for a moment that it is proper to impute a capital structure consisting of substantially more debt, the higher common equity cost rate related to a changed common equity ratio must be reflected in the approach. In ascribing a capital structure different from the company's actual capital structure, which, for example, imputes a higher debt amount, the repercussions on equity costs must be recognized. The greater the debt ratio, the greater is the return required by equity investors. Both the cost of incremental debt and the cost of equity must be adjusted to reflect the additional risk associated with the hypothetical capital structure. The arguments work in reverse if a hypothetical capital structure consisting of less debt than the actual were to be imputed.

- If a proxy group of companies is comparable in risk to a utility then the utility should have the same WACC as the proxy companies.

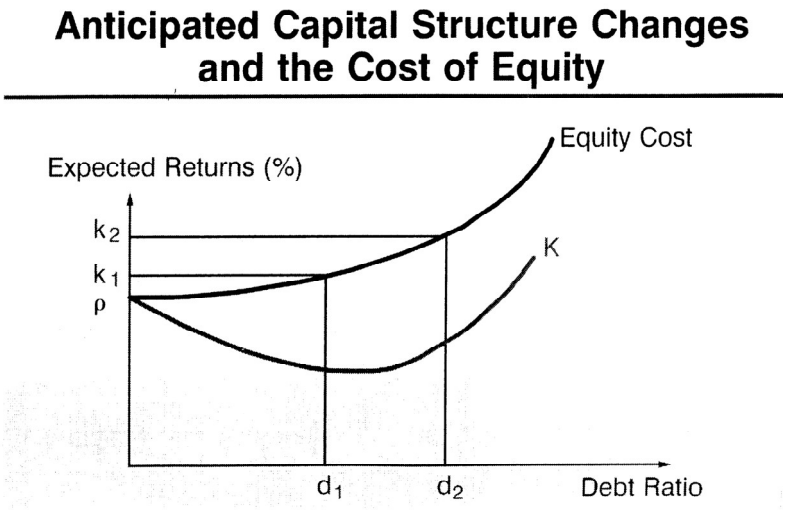
ine a fictitious capital structure with a return on equity estimate that excludes the effects of the proposed capital structure. By omitting the repercussions on equity costs and debt costs, a serious conceptual error would be committed in determining the cost of equity capital. With a deemed (fictitious) capital structure, the cost of equity, the cost of debt, and taxes all must be artificially adjusted so as to be synchronous with the fictitious capital structure adopted.

- The inclusion of short-term debt in the capital structure will impact the return on equity such that the weighted average cost of capital remains constant.

Anticipated Capital Structure Changes

Consideration should be given to changes in leverage when estimating the cost of equity. Suppose that an unexpected change in the debt ratio from d_1 to d_2 is to be effected as per Figure 17-1. If the cost of equity is estimated based on the debt ratio d_1, an estimate of k_1 is obtained. But this understates the true cost of equity of k_2, based on the new debt ratio d_2. Example 17-1 shows a numerical illustration.

FIGURE 17-1



EXAMPLE 17-1

Eastern Power Company's cost of equity is estimated at 10% based on the company's existing capital structure, which consists of 35% debt and 65% equity in market value terms. The current borrowing rate is 6%, and the corporate income tax rate is 40%. The management of Eastern Power Company, perhaps at the urging of the regulatory commission, has decided to alter its capital structure to 40% debt and 60% equity. The revised cost of equity can be obtained by solving the Modigliani-Miller Equation below, using the revised debt ratio:

$$K_e = \rho + (\rho - i)(1 - T)B/S \qquad (17\text{-}1)$$

But in order to solve for K_e, the cost of capital for an all-equity financed firm, ρ, is required. This can be done by solving the above equation for ρ under the old capital structure, and inserting the resulting ρ in the same equation under the new capital structure:

$$10\% = \rho + (\rho - i)(1 - T)B/S$$

$$10\% = \rho + (\rho - .06)(1 - .40)\ .40/.60$$

from which $\rho = 9.0\%$. Inserting the latter value of ρ in the equation and using the new capital structure, the revised cost of equity is obtained:

$$K_e = .09 + (.09 - .06)(1 - .40).40/.60 = .1023 = 10.23\%$$

The cost of equity has increased from 10% to 10.20% in response to the higher degree of leverage. In using Equation 17-1, the market value of equity is easily obtained by multiplying the current stock price by the number of shares outstanding. The market value of debt is obtained by applying orthodox bond valuation formulas. Book values can be used as an approximation if market values are unobservable.[4]

To the extent that the regulatory process inactivates the tax advantage of debt by passing on the savings to ratepayers, the no-tax equivalent of Equation 17-1 should be used instead:

$$K_e = \rho + (\rho - i)B/S \qquad (17\text{-}2)$$

[4] Empirical financial research frequently makes the convenient assumption that book values are useful proxies for market values, especially for regulated companies whose common equity market value is eventually driven to common equity book value under perfect regulation and in t he absence of inflation. As a practical matter, it is computationally prohibitive to measure the market value of debt securities without knowing the maturity, coupon, and risk level of each and every debt security issued by the company.

s numerical example using the latter equation instead, a revised cost of equity of 11.0% is obtained. More generally, given the extreme nature of the no-tax effect assumption, the revised cost of equity probably lies between the two values obtained from the two formulations.

While both Equations 17-1 and 17-2 require the use of market value capital structure, the use of book values is preferable because the equity return obtained is in fact applied to the book value of the equity by the regulator. If the stock is trading at or near book value, no problem arises. But if the stock is trading away from book value, the use of market values will lead to distorted cost of equity estimates.

There are other capital structure frameworks and other guides from financial theory available besides the Modigliani-Miller framework that quantify the effects of a change in capital structure on the cost of equity. Recall that Modigliani-Miller brought only corporate taxes into the analysis, but no personal taxes. Miller introduced both corporate and personal taxes into the analysis and found the following relationship between the cost of equity and financial leverage, which bears a close family resemblance to the Modigliani-Miller version:

$$K_e = \rho + [\rho - i(1-T)]B/S \qquad \text{(17-3)}$$

Returning to our numerical example, the revised cost of equity can be obtained by solving Equation 17-3. But in order to solve for K_e, the cost of capital for an all equity-financed firm, ρ, is required. This can be done by solving the above equation for ρ under the old capital structure, and inserting the resulting ρ in the same equation under the new capital structure:

$$K_e = \rho + [\rho - i(1-T)]B/S$$

$$10\% = \rho + [\rho - .06(1-.40)].35/.65$$

from which ρ = 7.8%. Inserting the latter value of ρ in the equation and using the new capital structure, the revised cost of equity is obtained:

$$K_e = .078 + [.078 - .06(1-.40)].40/.60 = .1050 = 10.5\%$$

The major thrust of this example is that an estimate of cost of capital on the basis of an observed capital structure is erroneous if the capital structure is expected to change and/or if the regulator imputes a capital structure different from the utility's test year capital structure.

Comparable Groups

the previous numerical example can arise when using the cost of equity capital of other companies as a proxy for the subject utility. If the group of comparable companies has been carefully designed using adequate risk filters for both business risk and capital structure differences, this will not be a problem. But if substantial capital structure differences exist between the utility and the reference companies, all else being constant, the same remedial correction employed in the above example is necessary. Equation 17-1 and the average capital structure of the reference group are used to compute the cost of capital for an all-equity firm, and the subject utility's own capital structure is used to compute its cost of capital using the same equation in reverse.

EXAMPLE 17-2

Consider an electric utility with a capital structure consisting of 50% debt capital and 50% common equity capital without any debt equivalents, and whose cost of common equity is 11%. For illustrative purposes, let us assume that long-term purchased power contracts raise the company's effective debt ratio from 50% to 55%, indicating a significant increase in financial risk. An upward adjustment to the initial cost of common equity estimate of 11.0% would be required to reflect this additional risk.

The results of empirical and theoretical studies indicate that equity costs increase from 34 to 237 basis points when the debt ratio increases by ten percentage points. The average increase is 138 basis points from the theoretical studies and 76 basis points from the empirical studies, or a range of 7.6 to 13.8 basis points per one percentage point increase in the debt ratio. The more recent studies indicate that the upper end of that range is more indicative of the effect on equity costs. Since the capital structure difference amounts to 5%, that is, 55% - 50% = 5%, the required upward adjustment to the cost of equity ranges from 7.6 to 13.8 basis points times 5, which equals 38 to 69 basis points. The midpoint of this range is about 55 basis points. Therefore, the initial cost of equity of 11% would have to be adjusted upward by 55 basis points, raising the cost of equity from 11.00% to 11.55%, in order to reflect the weaker effective capital structure engendered by the purchased power contract debt equivalents.

Hypothetical Capital Structures

Another implication of leverage theory is that cost of capital estimates based on a utility's current market data and the capital structure expected by investors cannot be applied to any other capital structure without the adjustment described in previous examples. Regulators sometimes assign hypothetical ("deemed," or "imputed") capital structures to utility companies for purposes of revenue requirements computation. This procedure is appropriate only if the cost of equity estimated from current investor expectations is revised to take into account the new capital structure prescribed by the regulator. The cost of equity estimate based on the actual capital

new capital structure. Of course, the imposition of a hypothetical capital structure presupposes that the existing actual capital structure is not optimal in the first place.

The practical implementation problems associated with a deemed fictitious capital structure are prohibitive. If it is assumed for a moment that it is proper to impute a capital structure consisting of substantially more debt, the higher common equity cost rate related to a changed common equity ratio must be reflected in the approach. In ascribing a capital structure different from the company's actual capital structure, which, for example, imputes a higher debt amount, the repercussions on equity costs must be recognized. The greater the debt ratio, the greater is the return required by equity investors. Both the cost of incremental debt and the cost of equity must be adjusted to reflect the additional risk associated with the hypothetical capital structure. The arguments work in reverse if a hypothetical capital structure consisting of less debt than the actual were to be imputed.

In summary, it is logically inconsistent to combine a fictitious capital structure with a return on equity estimate that excludes the effects of the proposed capital structure. By omitting the repercussions on equity costs and debt costs, a serious conceptual error would be committed in determining the cost of equity capital. With a deemed (fictitious) capital structure, the cost of equity, the cost of debt, and taxes all must be artificially adjusted so as to be synchronous with the fictitious capital structure adopted.

Regulatory Approaches To Determine Capital Structure

Regulators have relied on two broad approaches to determine a utilityôs capital structure. In the first and far most prevalent approach, the utilityôs actual or imputed (deemed, hypothetical) capital structure is accepted for regulatory purposes. The capital structure then becomes the key measure of the utilityôs financial risks. If the total investment (business and financial) risk of the proxy utilities used to determine the cost of capital is higher or lower than that of the subject utility, an adjustment to the cost of equity is required when setting the allowed return on equity using the techniques described earlier.

The second and far less common approach is to assess the subject utilityôs business risks, then establish a capital structure that is consistent with its business risks, allows it to achieve a stand-alone debt rating similar to that of the proxy utilities, and equates the subject utilityôs total (business and financial) risk to that of the proxy companies. With this approach, the proxy utilitiesô cost of equity can then be applied to the subject utility without any adjustment to the return on equity. A good example of this approach is provided by the Alberta Energy and Utilities Board.[5] In that 2004 decision, the Board set different capital structures for eleven electric and gas distribution and transmission utilities, based on their

[5] See Alberta Energy and Utilities Board Decision 2004-052 issued July 2, 2004.

established a common generic return on equity to be applied to each of the utilities under its jurisdiction. In order to compensate each individual utility for its own level of business risk, individual capital structure ratios were imputed so that a single benchmark generic return on equity could be applied across all utilities.

The Decomposition of Return on Book Equity

The following equation, expresses the book return on equity as a function of several underlying explanatory variables, and contains useful analytical properties.

$$r = [R + (R - i)D / E](1 - T) \qquad (17\text{-}4)$$

The expression formaly links book equity returns with leverage. Specfically, the equity return is proportional to the utility's rate of return on assets plus a premium equal to the excess of the asset rate over the debt rate levered by the book value debt/equity ratio net of tax effects. It is highly instructive to apply the expression to a given utility on a historical basis in order to quantify the driving forces behind equity returns and explain the behavior and trends of such returns.

EXAMPLE 17-3

The levered return on book vale of equity is given by:

$$r = [R + (R - i)\,D/E](1 - T) \qquad \text{EQUATION 17-1}$$

If the pre-tax return on total assets, R, is 15%, that is 7.5% after tax, the cost of debt, i, is 10%, the tax rate, T, is 50%, and the utility employs $50 million of equity capital and $50 million of debt capital, the return on book equity is given by:

$$r = [.15 + (.15 - .10)\$50 / \$50](1 - .50)$$

$$= [.15 + (.05)1/1](.50)$$

$$= [.15 + .05](.50) = .10 \text{ or } 10\%$$

Note that after-tax r exceeds after-tax R on account of the magnifying effect of leverage on shareholder returns. After-tax values of r with R = 15% and T = 50% for various degrees of leverage and debt costs are shown in the table below:

		D/E = 0	D/E = 1	D/E = 2

		7.5%	12.5%	17.5%
1	8%	7.5%	11.0%	14.5%
	10%	7.5%	10.0%	12.5%

Finding the Optimal Capital Structure

The management of National Electric Company is of the opinion that the cost of debt is a function of the debt ratio, and that this function is reflected in the schedule shown in the first and second columns of Table 17-1.

The second column shows the after-tax cost of debt, assuming a tax rate of 40%. In an actual situation, such a schedule could be derived from the actual bond yields and debt ratios for utility bonds in different quality rating groups averaged over a number of years[6]

TABLE 17-1
The Relationship Between Leverage And Cost Of Capital

Debt Ratio	After-tax Cost of Debt	Cost of Equity	Overall Cost of Capital
0.00	4.0%	9.00%	9.00%
0.10	4.0%	9.10%	8.59%
0.20	4.0%	9.40%	8.32%
0.30	4.0%	9.90%	8.13%
0.40	5.0%	10.60%	8.36%
0.50	6.0%	11.50%	8.75%
0.60	7.0%	12.60%	9.24%
0.70	9.0%	13.90%	10.47%

The utility's management also believes that the company's cost of equity can be expressed as the sum of the risk-free rate, R_F, a premium for business risk, b, and a premium for financial risk, f, as follows:

$$K_e = R_F + b + f \qquad (17\text{-}5)$$

[6] Knowing any three points on the curved portion of the bond graph, a quadratic function can be fitted to approximate the shape of the graph.

The risk-free rate, as measured by the yield on long-term Treasury bonds, is currently 5%. The premium for business risk demanded by utility investors is estimated at 4%. The premium for financial risk is an increasing function of the debt ratio; the premium rises slowly at first, and then accelerates rapidly as the debt ratio reaches prohibitive levels. The behavior of the premium for financial risk is assumed to be proportional to the square of the debt ratio, and the proportionality constant[7] is 0.10. Substituting these values in Equation 17-5, the cost of equity function can be expressed as:

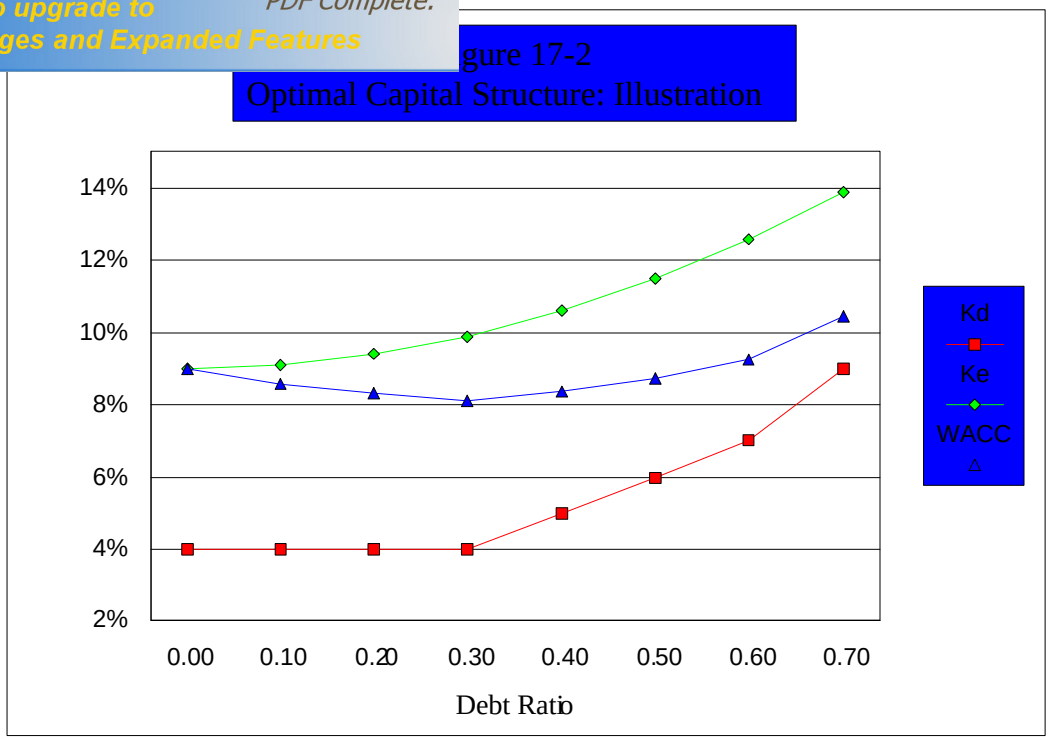
$$K_e = 5\% + 4\% + 0.10\,(D/C)^2$$

$$K_e = 9\% + 0.10\,(D/C)^2$$

This function is shown as a schedule of equity cost for various debt ratios in the third column of Table 17-1.

The weighted average cost of capital for each level of debt ratio is calculated by adding the cost of debt and the cost of equity corresponding to each debt ratio, weighted by their relative proportions. This calculation appears in the fourth column of Table 17-1. The cost of capital plotted in Figure 17-2 reaches a minimum at a debt ratio of 30%. National Electric Company's optimal capital structure thus consists of 30% debt and 70% equity.

[7] Empirical evidence on the shape of the equity graph can be found in Robichek, Higgins, and Kinsman (1973).



This example is purely illustrative. There is no exact scientific method or formula to derive a utility's optimal capital structure. The example is to be regarded as illustrative of the approach rather than a precise prescription for finding the optimal capital structure.

Rate Base and Capital Structure Interrelationship

The meaning and functioning of a utility's weighted cost of capital is interrelated with its companion rate of return on rate base. If the regulator applies the cost of capital to a rate base that deviates from total capital and if authorized returns are achieved, dollar earnings available for common equity will exceed or fall short of the dollars necessary to satisfy the claims of shareholders. For example, if the cost of equity is 12% on book equity of $10 million, the dollars necessary are $1.20 million. If that rate of return is applied to an equity component of $9 million, the result would be equity earnings of $1.08 million, or $0.12 million less than that expected to be achieved by comparable-risk investments.

In general, if there is a discrepancy between the total capital investment and the rate base, the fair return on common equity will not be achieved. The dollars available to service equity capital will deviate from the number of dollars required to provide the earnings that investors require as compensation for the risk capital invested in the utility. Shareholders act as the residual bearers of the gain or loss consequences of rate base–invested capital discrepancies.

erage cost of capital is K, and if investors have supplied C dollars of capital, the total dollar returns required to service capital are K times C, or KC. If the regulator applies the cost of capital to the rate base, W, and if the rate base equals invested capital C, then the net utility income produced to service capital will be K times W, or KW. Since the earnings permitted on assets are equal to the earnings necessary to service the capital put up by investors, then KW equal KC.

But what if the allowed return on the rate base does not equal K? If the regulator allows a return of y, which differs from K, the earnings available to investors are yW. The earnings will equal the requirement of returns to capital so that yW = KC only if the regulator permits it. The allowed return on rate base will then be y = K C/W. Clearly, if the rate base W equals the capital C actually supplied by investors, then y = K.

If the rate base does not equal invested capital, then y cannot equal K. If y is set equal to K but the rate base is less than capital, then yW < KC, meaning that return on capital realized by the utility will be lower than its cost. The integrity of the invested equity capital will not be maintained. The converse is also true.

EXAMPLE 17-4

Cost of debt K_d = 10% Cost of equity K_e = 15%
Debt D = $50 Equity E = $50

The revenue requirement is given by:

$$K_dD = 0.10 \times \$50 = \$5.00$$
$$K_eE = 0.15 \times \$50 = \$7.50$$
$$\text{Revenue Requirement} = \$12.50$$

The weighted average cost of capital is calculated as the dolars required to service investors as a fraction of the capital invested:

$$K = \$12.50/\$100 = 12.5\%$$

or by computing the weighted average cost of each component:

$$K = 0.50 \times 10\% + 0.50 \times 15\% = 12.5\%$$

If the rate base equals invested capital, then K = $100 x 12.50% = $12.50. The return to the equity investor is calculated as folows:

	$12.50
Interest Expense	-$5.00
Return to Equity	$7.50

The return on equity is then $7.50/$50.00 = 15%. The equity investor's return equals the cost of equity of 15%. All is well because the rate base equals invested capital.

If the rate base exceeds invested capital, the equity investor will enjoy a windfall gain. To see this, assume that the rate base is $125 versus the $100 of capital invested. The revenue requirement equals .125 x $125 = $15.625. The return to the equity investor is then:

Revenue	$15.625
Interest Expense	-$5.000
Return to Equity	$10.625

The return on equity is then $10.625/$50.00= 21.25%. The equity investor's return exceeds the cost of equity of 15%.

Conversely, if the rate base is less than invested capital, the equity investor will suffer a loss. To see this, assume that the rate base is $75 versus the $100 of capital invested. The revenue requirement equals 0.125 x $75 = $9.375. The return to the equity investor is then:

Revenue	$9.375
Interest Expense	-$5.000
Return to Equity	$4.375

The return on equity is then $4.375/$50.00 = 8.75%, well short of the cost of equity of 15%.

In practice, it is rarely true that the rate base and total capital are equal. For example, CWIP assets excluded from rate base without the AFUDC offset, or asset investments excluded from the rate base because such investments are not deemed "used and useful" and/or "prudent" by the regulator, clearly violate the equality of rate base and invested capital. A more subtle example is the case of the working capital allowance. The working capital allowance incorporated into rate base in most jurisdictions bears little resemblance to the traditional accounting meaning of net working capital. If capital is equal to a total composed in part of net working capital, and if the working capital component of the rate base equals net working capital only by chance, then rate base and capital can only be equal by coincidence.

NS USING STAFF ASSUMPTIONS

Following is a validation of the after-tax weighted average cost of capital (WACC) and return on equity (ROE) using the 60-month, all rate regulated example from Appendix A of Staff's 25 July 2006 document. Using these Staff assumptions, an ROE range of 9.8% to 10.4% is appropriate. While this does not in any way indicate a position with regard to an independent calculation of the appropriate Return on Equity for this proceeding, it does serve as an independent confirmation of the ROE calculations using the above assumptions provided by the OEB staff. It also confirms that the range of ROE values calculated by E3/Newmarket Hydro is accurate.

Comparable Companies Return on Equity (ROE)

The return on equity for the comparable companies associated with their 51:49 D:E capital structure is 7.38%. This can be calculated by using the average equity beta of 0.47 as follows:

ROE = Risk Free Rate + Equity Beta * (Market Return – Risk Free Rate)
ROE = 5.01% + 0.47* (10.06% - 5.01%) = 7.38%

Comparable Companies After Tax Weighted Average Cost of Capital

The after-tax weighted average cost of capital for the comparable companies, incorporating the tax benefits associated with their 51:49 capital structure, is 6.47%. This can be calculated by using the asset beta of 0.29 as follows:

Asset return = Risk Free Rate + Asset Beta * (Market Return – Risk Free Rate)
Asset return = 5.01% + 0.29 * (10.06% - 5.01%) = 6.47%

Comparable Companies Debt Interest Rate

Similarly, the debt interest rate, *i*, associated with the comparable companies' 51:49 capital structure is 8.74%. This can be calculated from the WACC equation:

WACC = Debt rate * (1-T) * Percent Debt + ROE * Percent Equity
6.47% = Debt Rate * .64 * 51% + 7.38% * 49%
Debt Rate = 8.74%

oposed Capital Structure

Ke, the ROE associated with OEBôs proposed 60:40 capital structure, can be obtained by solving the Modigliani-Miller Equation below:

$$K_e = \rho + (\rho - i)(1 - T)B / S$$

But in order to solve for Ke, the cost of capital for an all-equity financed firm, ρ, is required. This can be done by solving the above equation for ρ under the old capital structure, and inserting the resulting ρ in the same equation under the new capital structure:

7.38% = p + (p-0.0874)(1-0.36)* 0.51/0.49

Where B = 0.51, S = 0.49, T = 0.36, i = 8.74%, Ke = 7.38%

Solving for p, we calculate that p = .07925

We can solve for ROE = Ke as follows:

Inserting this value of ρ in the equation and using the new OEB-proposed capital structure, the revised ROE is obtained:

Ke = .07925 + (.07925-0.06)(1-0.36)* 0.40/0.60

Where B = 0.60, S = 0.40, T = 0.36, i = 6% and p = .07925

We calculate that under the OEB-proposed capital structure, ROE = 9.8%.

The cost of equity has increased from 7.38% to 9.8% in response to the higher amount of leverage and the lower cost of debt

The WACC associated with the OEB-proposed capital structure can be calculated from the formula we used above:

WACC = Debt rate * (1-T) * Percent Debt + ROE * Percent Equity
WACC = .06 * 0.64 * 60% + 9.8% * 40%
WACC = 6.2%

If a proxy group of companies is comparable in risk to a utility then the utility should have the same WACC as the proxy companies. If OEB were proposing a capital structure identical to the proxy companies, then the WACC under OEBôs proposed capital structure would be 6.47%. However, OEB is proposing a capital structure with a higher percentage

es. The tax advantages associated with the higher percentage of debt will lower the WACC, however this effect will be offset by increased risk resulting from the increased debt in OEBôs hypothetical capital structure. As more debt is added to the capital structure, the cost of debt will increase to reflect the increased risk to debt: both the cost of incremental debt and the cost of equity must be adjusted to reflect the additional risk associated with OEBôs hypothetical capital structure. The 6.2% WACC does not reflect this increased risk. While there is no exact scientific method or formula to derive a utility's optimal capital structure, an acceptable range for the WACC associated with OEBôs proposed capital structure is in the range of 6.2% to 6.47%.

This means that an acceptable range for ROE under OEBôs proposed capital structure can be calculated using the 6.2% to 6.47% WACC range. The ROE associated with the 6.47% WACC can be calculated using the WACC formula and solving for ROE:
6.47% = Debt rate * (1-T) * Percent Debt + ROE * Percent Equity
6.47% = .06 * 0.64 * 60% + ROE * 40%
ROE = 10.4%

We also note that the OEB expert included a flotation cost of 0.5% to represent which is consistent with cost of equity issuance adopted in other jurisdictions. We concur with this incremental adder to the ROE.

As a result, an acceptable range for the ROE associated with OEBôs proposed capital structure is therefore 10.3% to 10.9%. These results assume that the utility receives the tax advantage of debt. To the extent that the regulatory process inactivates the tax advantage of debt by passing on the savings to ratepayers, the cost of equity should be increased. If OEB mandates the inclusion of short-term debt in its hypothetical capital structure, the return on equity must be adjusted such that the weighted average cost of capital remains constant.

In summary, I have independently validated the after-tax weighted average cost of capital (WACC) and return on equity (ROE) using the 60-month, all rate regulated case from Appendix A of Staffôs 25 July 2006 document. I confirm that the return on equity values generated by E3/Newmarket Hydro is correct.

If the OEB chooses a one-size-fits-all capital structure and concludes that there is no basis for a size-based premium, then we submit that the appropriate calculation of ROE based on the OEB Staff data would lead to a result of between 10.3% and 10.9%.

However, there may be other data available to carry out the analysis and there may be good and valid reasons to depart from the OEB Staff approach to determining ROE that will, generally, result in a greater ROE calculation Furthermore, we do believe there is a strong basis for a size-based risk premium and that will be discussed in the following part to this report. Therefore, it is not our position that the OEB should adopt the staff calculation but,

f proposal, then the proper calculation based on the data provided by Staff results in a higher calculation than what has been recommended by OEB Staff.

D THE SIZE EFFECT FOR SMALL UTILITIES

The size premium for small companies is well known in capital markets. The US has documented this difference extensively since 1926. In addition, both Alberta and Ontario have recognized the higher business risk associated with small companies through tiered capital structures, ensuring greater equity ñcushionò. California, Florida and Maine have similarly acknowledged a smal utility premium in their ratemaking processï which has been implemented through capital structure, higher ROE or both.

Summary of points in this section:

In this section, we address a specific element of business risk that is both well known and acknowledged in empirical studies of the Capital Asset Pricing Model. Specifically, long term market studies have shown that small businesses require a risk premium to attract capital. From an investorôs viewpoint this is stated differently such that there is a significant difference in actual returns to small businesses that are not explained through the CAPM. Studies (Ibbotson Associates) show this to be as much as a 6.4% premium based upon the smallest decile of US companies. Breaking down companies into smaller market capitalization groupings (e.g. 20 groups), extends the pattern and noticeably increases the size premium to the smallest grouping (Ibbotson, page 136). The size premium for the smallest 5% of companies grows to 9.9%. The premium is universally acknowledged and observable. Lenders and investors consider the non-diversifiable risks associated with small companies and require a premium on their capital for accepting the risks.

- Investment risk increases as company size diminishes, all else remaining constant. Overall, for the period 1926-2004, Ibbotson finds that the smaller companies have experienced returns that are not fully explainable by their higher betas, and that the excess return of that predicted by the CAPM increases as size decreases. This suggests that the cost of equity for smal stocks is considerably larger than for large capitalization stocks.
- Smaller companies are less able to deal with significant events that affect revenues and cash flows than large companies. For example, the loss of sales from a few large customers would exert a far greater effect on a smallcompany that on a larger company with a large customer base. Presumably, small stocks provided less utility to the investor, and require a higher return. In short, size is a significant factor that increases both business risk and financial risk and, therefore, the cost of capital.
- Canada and the US adjust returns and capital structure to account for higher risk among small utilities as noted in regulatory decisions and orders for the Province of Alberta and the States of Florida, California and Maine. The rate cases noted below for California

-point adders to small utilities as compensation for the increased risk.

- The implication of the Grabowski and King study is that investors in small-cap stocks should add 0.23 to the CAPM-derived cost of equity when estimating the required return of a company with a market capitalization of about $US 2,000 million. Ibbotsonôs analysis would indicate that the premium rises as size declines.

Size Effect

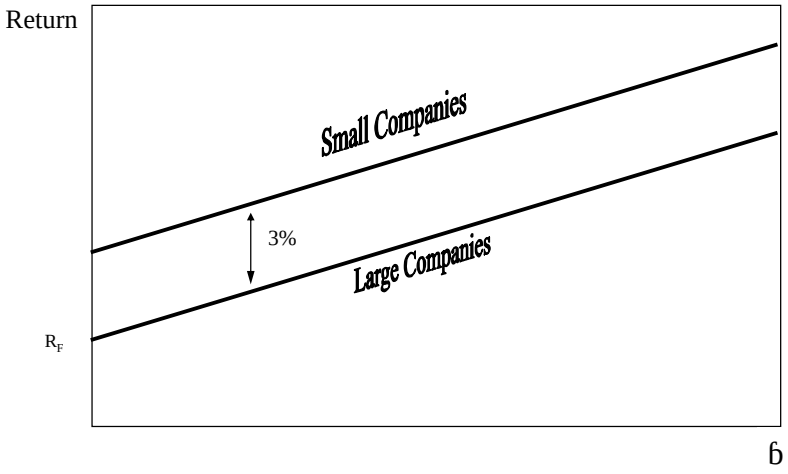
Investment risk increases as company size diminishes, all else remaining constant. Small companies have very different returns than large ones, and on average they have been higher. The greater risk of small stocks does not fully account for their higher returns over many historical periods. The size phenomenon is well-documented in the finance literature. Empirical studies by Banz (1981) and Reinganum (1981A) have found that investors in small-capitalization stocks require higher returns than predicted by the standard CAPM. Reinganum (1981A) examined the relationship between the size of the firm and its P/E ratio, and found that small firms experienced average returns greater than those of large firms that were of equivalent systematic risk (beta). He found that small firms produce greater returns than could be explained by their risks. These results were confirmed in a separate test by Banz (1981) who examined stock returns over the much longer 1936-1975 period, finding that stocks of small firms earned higher risk-adjusted abnormal returns than those of large firms. Fama and French (1992, 1993, 1997) find that company size and the reciprocal of the M/B ratio are significantly related to stock returns (cost of equity). The Fama-French asset pricing model is discussed later in this section.

The relationship between firm size and return cuts across the entire size spectrum but is most evident among smaller companies that have higher returns than larger ones on average. Ibbotson Associates' well-known historical return series publication covering the period 1926 to the present reinforces this evidence (Ibbotson Associatesô *2004 Yearbook, Valuation Edition*). To illustrate, the Ibbotson data suggests that under SIC Code 49, *Electric, Gas & Sanitary Services*, the average return for that group over an almost 80-year period was 14.03% for the small-cap company group and 10.86% for the large-cap group, more than a 300 basis point difference. This is true for all industry groups. Overall, for the period 1926-2004, Ibbotson finds that the smaller companies have experienced returns that are not fully explainable by their higher betas, and that the excess return of that predicted by the CAPM increases as size decreases, suggesting that the cost of equity for small stocks is considerably larger than for large capitalization stocks. Ibbotson Associates provides estimates of the size premium required to be added to the basic CAPM cost of equity, shown in the table below. Figure 6-4 portrays the situation graphically.

Ibbotson Estimates of Size Premiums

Size	Smallest Market Cap ($000s)	Premium
Large-cap	4,794,027	0
Mid-cap	1,167,040	0.91%
Low-cap	330,797	1.70%
Micro-cap	0.332	4.01%

Figure 6-4
CAPM and Company Size



Grabowski and King (1999, 2000) examine the historical returns of publicly listed common stocks over the 1963-1998 period, segregated into 25 equal-size portfolios based on various measures of company size, including market value of equity, assets, sales, and number of employees. The results are shown on Table 6-1, based on ranking companies by market value of equity. As was the case from the Ibbotson findings, it is clear from those results that beta is inversely related to company size. The betas range from 0.91 for large-cap companies to 1.39 for small-cap companies. Returns vary inversely to size as well, ranging from 14.2% for large-cap stocks to 22.9% for small-cap stocks over that period. Grabowski and King also find a systematic relationship between the achieved equity premium and size, as shown on Figure 6-5. The data of Table 6-1 strongly suggest that the higher returns realized by small-cap stocks exceed those predicted by the CAPM.

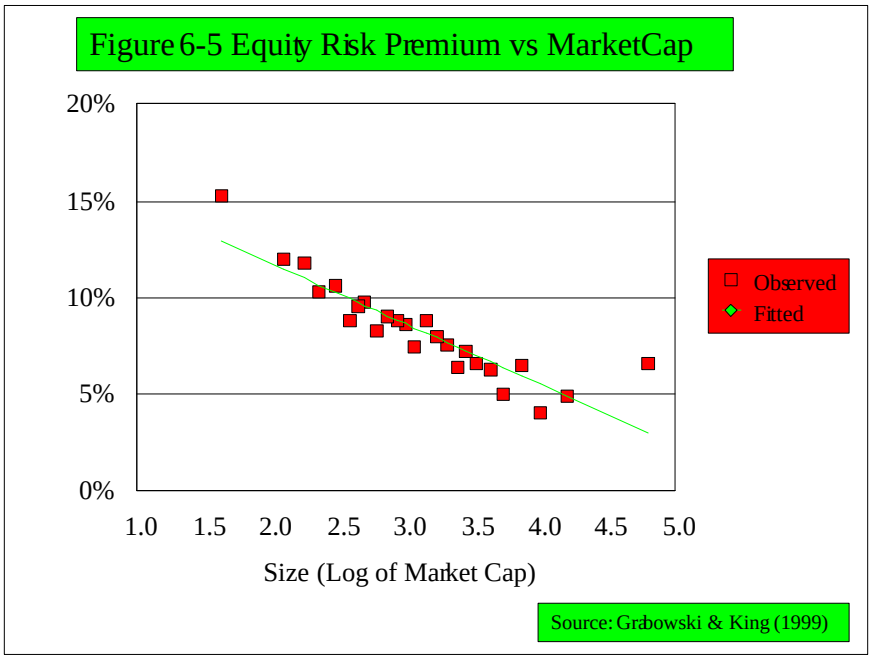
g study is that investors in small-cap stocks should add 0.25% (i.e., 15.17% - 14.54% - 0.25%) to the CAPM-derived cost of equity when estimating the required return of a company with a market capitalization similar to that of portfolio #10, about $2,000 million.[8]

Table 6-1 The Relationship Between Company Size, Return, and Risk

Portfolio rank by size	Average mkt value ($M)	Log of average mkt value	Beta annual since 1963	Standard deviation of returns	Geometric average return	Arithmetic average return	Equity risk premium	Smoothed equity risk premium
1	$64,877	4.81	0.91	15.86%	12.99%	14.17%	6.61%	3.04%
2	$16,054	4.21	0.94	15.98%	11.32%	12.48%	4.92%	4.94%
3	$10,011	4.00	0.89	15.16%	10.58%	11.64%	4.08%	5.58%
4	$7,417	3.87	0.98	16.80%	12.82%	14.07%	6.51%	5.98%
5	$5,357	3.73	0.99	17.37%	11.18%	12.54%	4.98%	6.43%
6	$4,342	3.64	0.99	17.39%	12.55%	13.89%	6.33%	6.71%
7	$3,440	3.54	0.94	16.39%	12.99%	14.22%	6.66%	7.03%
8	$2,816	3.45	1.00	18.04%	13.44%	14.85%	7.29%	7.30%
9	$2,485	3.40	1.03	19.01%	12.99%	13.95%	6.39%	7.47%
10	$2,072	3.32	1.19	20.68%	13.31%	15.17%	7.61%	7.71%
11	$1,733	3.24	1.11	20.05%	13.78%	15.52%	7.96%	7.96%
12	$1,431	3.16	1.05	18.76%	14.84%	16.35%	8.79%	8.21%
13	$1,190	3.08	1.15	21.66%	12.89%	14.99%	7.43%	8.46%
14	$1,015	3.01	1.05	19.95%	14.49%	16.20%	8.64%	8.68%
15	$875	2.94	1.14	20.74%	14.40%	16.38%	8.82%	8.88%
16	$753	2.88	1.19	22.11%	14.48%	16.66%	9.10%	9.09%
17	$616	2.79	1.22	23.10%	13.54%	15.85%	8.29%	9.36%
18	$510	2.71	1.17	23.83%	14.97%	17.35%	9.79%	9.61%
19	$448	2.65	1.28	24.71%	14.46%	17.17%	9.61%	9.79%
20	$386	2.59	1.23	24.94%	13.69%	16.40%	8.84%	9.99%
21	$305	2.48	1.21	24.00%	15.80%	18.20%	10.64%	10.31%
22	$234	2.37	1.26	25.78%	14.98%	17.83%	10.27%	10.67%
23	$179	2.25	1.31	26.24%	16.41%	19.32%	11.76%	11.03%
24	$124	2.09	1.31	26.75%	16.57%	19.61%	12.05%	11.53%

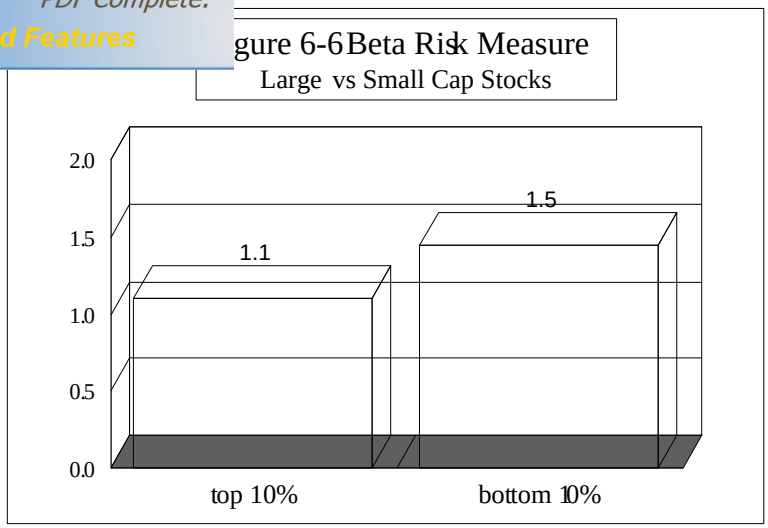
[8] Updates are published annually in the Standard & Poor's Corporate Value Consulting Risk Premium Report by Roger J. Grabowski and David W. King at www.Ibbotson.com

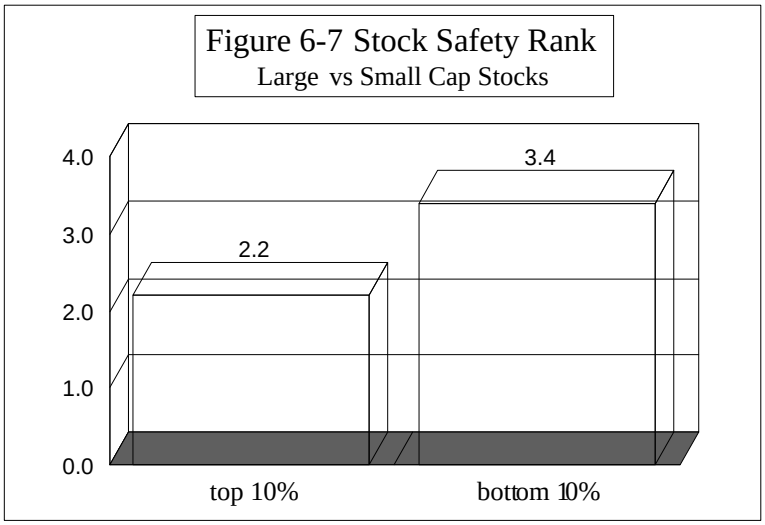
33.24%	18.63%	22.88%	15.32%	12.93%
21.14%	13.92%	15.91%	8.35%	8.35%



In addition to earning the highest average rates of return, small stocks also have the highest volatility, as measured by the standard deviation of returns. Ibbotson defines small stocks as those in the lowest size decile (10%) among NYSE stocks, with size defined as the dollar value of shares outstanding. The size trigger point occurs approximately at a market value of $200 million.

The beta risk measures are typically higher, and the stock quality ratings of small firms are typically less than those of large firms. Figures 6-6 and 6-7 contrast the betas and Value Line Safety Ranks of small versus large capitalization stocks. Large-cap stocks (first decile of companies ranked in descending order of market value of equity) have an average beta of 1.10 versus 1.5 for the small-cap stocks (bottom decile). As far as financial strength is concerned, the large cap category has an average Value Line Safety Rank of 2.2 (on a scale of 1 to 5, with 1 being the highest quality), versus 3.4 for the small-cap category. A similar pattern is observed for bond ratings.





Although much research effort has gone into investigating the size effect, the economic rationale for the size effect is difficult to unravel.[9] Smaller companies are less able to deal with significant events that affect revenues and cash flows than large companies. For example, the loss of sales from a few large customers would exert a far greater effect on a small company that on a larger company with a large customer base. Presumably, small stocks provided less utility to the investor, and require a higher return. The size effect may be a statistical mirage, whereby size is proxying for the effect of different economic variables. Small firms may have low price-earnings ratios or low market prices, for example. The size effect is most likely the result of a liquidity premium, whereby investors in small stocks demand greater returns as compensation for lack of

[9] See Roll (1981).

fer high to low liquidity, and demand higher returns from less liquid investments, holding other factors constant. Another plausible explanation for the size effect is the higher information search costs incurred by investors for small companies relative to large companies. In short, size is a significant factor that increases both business risk and financial risk and, therefore, the cost of capital.

Cost of Equity and Size Premium

Given the evidence of a small firm premium, that is, small market-cap stocks experience higher returns than large market-cap stocks with equivalent betas, the CAPM understates the risk of smaller utilities, and a cost of equity based purely on a CAPM beta will therefore produce too low an estimate for these small companies. This has led some analysts to add a premium to the estimated cost of equity for smaller companies. For example, let us say that small-cap stocks have earned about 2% more than large stocks over the past decade. In order to estimate the cost of equity for a small-cap stock with a beta of 0.80, a risk-free rate of 5% and a market risk premium (ñMRPò) of 7%, you would perform the following calculation:[10]

$$\begin{aligned} K &= R_F + \beta (MRP) + \text{Small size premium} \\ &= 5\% + 0.80 (7\%) + 2\% \\ &= 12.6\% \end{aligned}$$

EXAMPLE 6-4

Example 6-4 is adapted from an actual 2005 rate case. The sample of comparable risk vertically integrated electric utilities consists of 33 companies. The first four columns display the coefficients of the Fama-French regression equation for each company. The risk-free rate R_f is 5%, the market risk premium (MRP) is 7%, the SMB factor is 2.74%, and the HML factor is 4.9%. The factor premiums are commercially available from the Ibbotson Associates Web site.

[10] This procedure opens the door to a whole series of similar adjustments reflecting numerous market inefficiencies (e.g. dividend yield, skewness, low M/B ratio, etc.). In order to resist this temptation, a superior alternative to considering the size premium explicitly is to identify the economic reasons for the premium and develop more direct measures of risk. For example, if the higher risk of small water utilities comes from the higher operating leverage associated with their operations relative to larger utilities, the betas could be adjusted for operating leverage and use these higher betas for small-cap utilities.

EXAMPLE 6-4
Fama-French Estimates
Comparable Risk Integrated Electric Utilities

Ticker	a	Coefficient b	Estimates s	h	E(r)
AEE	0.0045	0.4304	-0.0917	0.6516	10.96%
CHG	0.0050	0.4545	-0.0416	0.4259	10.16%
CIN	0.0032	0.4554	0.0280	0.8620	12.49%
CV	0.0049	0.1712	0.4748	0.6849	10.86%
D	0.0031	0.6382	-0.0656	0.8671	13.54%
DQE	-0.0027	0.4813	0.0118	0.0411	8.60%
DTE	0.0032	0.3194	-0.1170	0.5735	9.73%
EAS	0.0040	0.6106	-0.0007	0.3663	11.07%
ED	0.0029	0.1882	-0.2782	0.5867	8.43%
EDE	-0.0020	0.3405	0.0717	0.5257	10.16%
EE	-0.0050	0.3748	0.4399	1.0116	13.79%
EIX	-0.0014	0.2715	0.4240	0.6345	11.17%
ETR	0.0119	0.3101	-0.2365	0.7729	10.31%
EXC	0.0056	0.4768	0.1279	0.9711	13.45%
FE	0.0106	0.2980	-0.5049	0.5861	8.58%
FPL	0.0068	0.5658	-0.2176	0.6489	11.55%
GXP	0.0142	0.7472	-0.5316	0.1652	9.59%
HE	0.0120	0.3798	-0.1423	0.4481	9.47%
IDA	0.0032	0.6613	-0.1602	0.5618	11.95%
ILA	-0.0193	0.8015	-0.0908	0.7885	14.23%
MDU	0.0050	0.8094	0.0199	0.8677	14.98%
MGEE	0.0090	0.3165	0.1152	0.2874	8.94%
NST	0.0015	0.5163	0.0328	0.5342	11.32%
NU	-0.0068	0.6852	0.0124	0.6237	12.89%
OGE	-0.0002	0.6772	0.0509	0.8690	14.14%
OTTR	-0.0021	0.2294	0.3836	0.6504	10.84%
PGN	-0.0008	0.5875	0.0675	0.9324	13.87%
PSD	0.0046	0.3709	-0.1298	0.4561	9.48%
SCG	0.0026	0.5146	-0.0536	0.6006	11.40%
SRE	0.0077	0.5087	0.0505	0.7194	12.23%
VVC	0.0091	0.6086	-0.5790	0.3698	9.49%
WEC	0.0029	0.3450	-0.0093	0.7473	11.05%
WPS	0.0095	0.3554	-0.0824	0.5504	9.96%

Average	11.23%
High	14.98%
Low	8.43%
Midpoint	11.70%

The regression coefficients and risk premium factors are substituted in the Fama-French equation to produce the cost of equity capital shown in the last column of the table. For

wn on the table, ticker symbol AEE (Ameren Corporation), the estimate is:

$$K = R_f + \beta_i \, MRP + s_i \, SMB + h_i \, HML$$
$$K = 5.0\% + 0.4304 \times 7.0\% - 0.0917 \times 2.74\% + 0.6516 \times 4.9\%$$
$$= 10.96\%$$

Ibbotson Associates in their annual survey of capital market returns compare the Fama-French results with the CAPM results. For large capitalization companies, the results are virtually indistinguishable. For small-cap companies, adding a size premium produces a higher return estimate as would be expected.

Regulatory Decisions and Orders related to Small Utilities

There are examples of Provincial and State Commissions responding the increased business risk associated with small utilities through adders to the adopted ROE or capital structure. Alberta relied on capital structure tiers equating stand alone utility debt ratings to proxy utilities. Maine referenced capital structure as well, while California and Florida provided 30 to 50 basis-point adders to small utilities as compensation for the increased risk.

In ***Alberta Energy and Utilities Board Decision 2004-052 issued July 2, 2004***, the Board set different capital structures for eleven electric and gas distribution and transmission utilities, based on their different business risk profiles, and then established a common generic return on equity to be applied to each of the utilities under its jurisdiction. In order to compensate each individual utility for its own level of business risk, individual capital structure ratios were imputed so that a single benchmark generic return on equity could be applied across all utilities. The subject utilityôs business risks were assessed, then capital structure established consistent with its business risks. This allowed the utility to achieve a stand-alone debt rating similar to that of the proxy utilities, and equated the subject utilityôs total (business and financial) risk to that of the proxy companies. With this approach, the proxy utilitiesô cost of equity could then be applied to the subject utility without any adjustment to the return on equity.

The ***State of Maine Public Utilities Commission, 9/26/2000 ORDER (Part 2) Docket No. 2000-96 and Docket No. 2000-175*** chose not to include short-term debt in the capital structure for two reasons, an existing conservative capital structure and the higher business risk that small firms. They felt that therisk could be offset through a lower debt ratio that reduced financial risk.ñé [S]econdly, to the extent that smaller firms may confront higher business risk than their larger counterparts, a lower debt ratio (and thus a higher equity ratio) can offset an increase to total risk by reducing financial risk (because total risk equals the sum of business and financial risk).ò

established a leverage formula in ***Order No. PSC-05-0787-PAA-WS*** on June 15, 2005, whereby a small utility risk premium of 50 basis points is added to reflect that the average Florida WAW [water] utility is too small to qualify for privately placed debt.

> ñStaff Analysis: Section 367.081(4)(0, Florida Statutes, authorizes the Commission to establish a leverage formula to calculate a reasonable range of returns on equity for WAW utilities. The Commission must establish this leverage formula not less than once a year. Staff notes that the leverage formula depends on four basic assumptions:
>
> 1) Business risk is similar for all WAW utilities;
> 2) The cost of equity is an exponential function of the equity ratio;
> 3) The marginal weighted average cost of investor capital is constant over the equity ratio range of 40% to 100%; and,
> 4) The cost rate at an assumed Moody's Baa3 bond rating, plus a 50 basis point private placement premium and a 50 basis point small utility risk premium, represents the average marginal cost of debt to a Florida WAW utility over an equity ratio range of 40% to 100%.ò

Finally, the California Public Utilities Commission also adopted, per ***D.99-03-032 and D.05-12-020***, a 30 basis point adder to a small utility ROE as a risk premium. Each of the Province and State Commissions understand that small utilities face risks and obstacles that are size related.

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