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April 24, 2008

BY COURIER (7 COPIES) AND EMAIL

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
P.O. Box 2319
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Toronto, Ontario M4P 1E4
Fax: (416) 440-7656
Email: boardsec@oeb.gov.on.ca

Dear Ms. Walli:

Re: Pollution Probe – Expert Evidence and Expert Scheduling
EB-2007-0905 – Ontario Power Generation – 2008-09 Payments

We write on behalf of Pollution Probe regarding intervenor evidence and potential scheduling of Pollution Probe's experts with respect to the technical conference and hearing.

First, pursuant to Procedural Order No. 4, please find enclosed intervenor evidence on behalf of Pollution Probe's experts, Dr. Roberts and Dr. Kryzanowski.

Second, with respect to potential scheduling for the technical conference, we note that Dr. Roberts is based in Toronto while Dr. Kryzanowski is based in Montreal. Accordingly, after consultation with the experts, it is proposed that only Dr. Roberts attend the technical conference on behalf of both experts in an effort to reduce costs. As part of that effort, it would also be preferable if Dr. Roberts was only required to attend on May 13th instead of both days (i.e. May 13th would ideally deal with at least the evidence filed by both OPG and Pollution Probe). We note that Dr. Roberts will speak to the entirety of the report at the technical conference, but, if required, Dr. Kryzanowski is willing to also attend the technical conference (although he can only attend on May 13th due to previous commitments).

Finally, with respect to potential scheduling for hearing, we can advise that both Dr. Roberts and Dr. Kryzanowski will be attending to testify before the Board as a panel. However, since Dr. Kryzanowski will be coming from Montreal, we request that a fixed date be assigned for their testimony. After consultation with the experts about their schedules (which involves some international commitments), we can advise that the

following dates are currently available for their testimony: May 21 and 22 and June 13, 16, 17, and 18. We accordingly propose that Dr. Roberts and Dr. Kryzanowski commence their testimony on either June 13 or June 16 depending on how long the parties wish for cross-examination.

Please do not hesitate to contact the undersigned if you wish to discuss these matters further.

Yours truly,

Basil Alexander

BA/ba

Encl.

cc: Applicant and Intervenors per Procedural Order No. 1

Before the Ontario Energy Board

In the matter of:

EB-2007-0905 - OPG - 2008-09 Payments

Exhibit M
Tab 12

Evidence on Behalf of
Pollution Probe

On Capital Structure, Return on Common Equity, Automatic Adjustment Formula

Text, Appendices and Schedules

Prepared Testimony of

Dr. Lawrence Kryzanowski and Dr. Gordon S. Roberts

Concordia University Research Chair in Finance, John Molson School of Business, Concordia University, Montreal; and CIBC Professor of Financial Services, Schulich School of Business, York University, Toronto.

April 2008

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1. INTRODUCTION AND SUMMARY

1.1 QUALIFICATIONS

This evidence is the work of Dr. Lawrence Kryzanowski of Concordia University and Dr. Gordon S. Roberts of York University. Dr. Kryzanowski is currently a Full Professor of Finance and Concordia University Research Chair in Finance (previously Ned Goodman Chair in Investment Finance) at Concordia University. He earned his Ph.D. in Finance at the University of British Columbia. Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services at York University's Schulich School of Business. He earned his Ph.D. in Economics at Boston College.

Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for the setting of fair rates for the movement of various products by rail. Together with Dr. Roberts in 1997, he prepared a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. For a group of organizations collectively and most recently referred to as the Consumers Group (formerly UNCA Intervenor Group and FIRM Customers), Drs. Kryzanowski and Roberts provided evidence on the fair return on equity and the recommended capital structure for ATCO Electric Limited in its 2001/2002 Distribution Tariff Application and for Aquila Networks Canada (Alberta) Ltd. ("ANCA") in its 2001/2002 Distribution Tariff Application and its 2002 Distribution Tariff Application (DTA) No. 1250392 before the Alberta Energy and Utilities Board. On behalf of the Province of Nova Scotia, they provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002. They filed evidence and testified before the Régie de l'Enérgie du Quebec for the Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") & Option consommateurs

("OC") in the 2003 application of Hydro Quebec Distribution. Together with Dr. Roberts, and on behalf of Consumers Group, he prepared testimony and testified in Generic Hearing No. 1271597 before the Alberta Energy and Utilities Board in 2003-2004. Most recently, Drs. Kryzanowski and Roberts submitted evidence and testified before the Public Utilities Board of the Northwest Territories in the General Rate Application of Northwest Territories Power Corporation in 2007.

Dr. Roberts is also experienced in preparing evidence for utility rate of return hearings. From 1995-1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. As noted above, together with Dr. Kryzanowski, he has also prepared evidence on rate of return and capital structure considerations and appeared before regulatory boards in Nova Scotia, Quebec and Alberta.

More broadly, Drs. Kryzanowski and Roberts often provide technical expertise and advice on financial policy. Among our consulting clients in recent years are the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation. Our brief *curricula vitae* are attached as Appendix 1.A

1.2 PURPOSE OF EVIDENCE AND GENERAL APPROACH

Pollution Probe has retained us to provide evidence on the fair return on equity, recommended capital structure, and automatic adjustment formula for Ontario Power Generation (OPG) in the present hearing.

In preparing our evidence we considered and used various techniques for determining an appropriate capital structure and for measuring the fair return on

equity for a regulated utility. Although OPG has a single shareholder, the Province of Ontario, we follow the stand-alone principle under which capital structure and the fair return on equity are determined as if each company were "standing alone" as a shareholder-owned entity.

For determining an appropriate capital structure for OPG, we begin with a brief overview of financial theory focused on the practical implications for capital structure. We then review the business risks faced by OPG's hydro assets and nuclear assets separately and compare them with those of other sectors of the utilities industry as well as with selected individual regulated companies. We next conduct an analysis of the bond ratings, capital structures, interest coverage ratios, returns on equity and equity ratios (both actual and those allowed by regulators) for a comparable sample of utilities. To arrive at a recommendation for OPG, we use our business benchmarks for OPG hydro and OPG nuclear to determine appropriate capital structures for each division. Combining these leads to our recommendation for OPG's total regulated assets.

For the determination of the recommended rate of return on equity (ROE), we consider and eliminate various approaches as being unreliable (such as the Comparable Earnings Estimation Method), and formulate our recommended rate of return based on four methods for estimating the market equity risk premium (MERP) and two methods for estimating the risk of an average-risk utility relative to the market. Our MERP estimate is primarily determined by our estimate from the Equity Risk Premium Estimation Method. We assess the directional conservatism of this MERP estimate when it is benchmarked against estimates based on a survey of the estimates published primarily in the peer-reviewed scientific literature, the estimates that we derive using the Discounted Cash Flow (DCF) Estimation Method at the market level, and the return expectations for stocks and bonds of various samples of buy- and sell-side (top-down) investment professionals.

We also address the appropriateness of using an automatic adjustment formula for future rate setting for OPG.

1.3 SUMMARY OF EVIDENCE

1.3.1 Economic and Financial Market Conditions

In Section 2 we examine current economic and financial market conditions in the U.S. and Canada and forecast those economic variables that we use as inputs in the fair rate of return and capital structure tests.

The current global credit crisis has caused increased volatility in equity markets and wider spreads in debt markets and these conditions are likely to continue in the short term. However, there is no reason to believe that the current U.S. crisis will have a material effect on the long-run cost of equity for Canadian utilities beyond 2008.

Turning from trends to our economic forecast, a key factor in predicting Canadian economic fortunes over the next two years is what will happen in the U.S. where the economy is currently in a slowdown and likely a recession. The slower pace of economic growth south of the border is being driven by a crisis in the housing market along with high energy prices and their impact on consumer spending in the U.S. The U.S. economic downturn combined with the strong Canadian dollar, is leading to weaker Canadian exports. Despite the slowdown, Canada's real GDP (Gross Domestic Product) growth is still expected to be positive in 2008 and back to the long-term target of 2% in 2009.

We also discuss the prospects for the economy of Ontario and conclude that growth at a lower rate than the overall rate for Canada is likely due to the strong manufacturing emphasis in the Province.

Turning to interest rates, for rate-making purposes we require a forecast of the rate on 30-year Canada's (i.e., Canadian government bonds with a 30-year term to maturity). We examine forecasts contained in *Consensus Forecasts* (published by Consensus Economics) for 10-year Canada's and adjust upward by an estimated spread. We forecast the rate on 30-year Canada's at 3.85% for 2008 and 4.25% for 2009.

1.3.2 Capital Structure

Section 3 contains our views on the appropriate capital structure for OPG. We begin with a brief overview of the practical implications of capital structure theory. Turning to business risk, we provide our assessment for OPG's regulated hydro generating assets as well as for its nuclear assets. We next examine relevant financial data for a sample of eight traded Canadian utilities. We analyze their bond ratings, capital structures (both actual and allowed), interest coverage ratios and returns on equity. The analysis produces a range of capital structures for distribution and integrated utilities of 39-43%.

Based on these examinations and tests, we arrive at a recommendation for the appropriate equity ratio for each segment of OPG. We assess the business risk faced by OPG Hydro as low to moderate – higher than that of a distribution utility and somewhat above the business risk of an integrated electric utility. This suggests that a fair common equity ratio for OPG Hydro should be at 40%, just below the middle of the range of common equity that we find for our comparisons. In contrast, our analysis rates the business risk of OPG's regulated nuclear assets as moderate and greater than that of OPG Hydro. The higher business risk of OPG Nuclear should translate into a significant increase in its common equity ratio on the order of 5 to 10% over that for OPG Hydro producing a recommended equity ratio for OPG Nuclear of 45 to 50%. In the interests of conservatism and to ensure fairness to the shareholder, we

recommend the higher number of 50% for the equity ratio. In order to achieve an overall recommended capital structure for OPG's rate base we calculate a weighted average of our individual capital structures using the asset breakdown in the Electricity Restructuring Act of Ontario of 2004: 66.47% nuclear and 33.53% hydro. When we apply these weights to our two separate capital structure recommendations, we obtain an overall rounded recommended equity ratio of 47% for OPG's rate base. Thus, our recommended common equity ratio for OPG's total regulated assets is 47%.

1.3.3 Rate of Return on Common Equity

In Section 4, we estimate the fair rate of return for OPG. We assess the expected market risk premium for the average Canadian stock at 5.00% using the Equity Risk Premium Estimation Method, and directional checks and reaffirmation using a survey of the estimates reported in primarily the peer-reviewed scientific literature, the Discounted Cash Flow (DCF) Estimation Method employing historical and future estimates of dividend growth rates for the market proxy, and with comparisons of the long-term return expectations of buy- and sell-side (primarily top-down) investment professionals for equities and bonds. Next, we determine that an average-risk utility is 50% as risky as the S&P/TSX Composite using two estimation methods. We add an adjustment of 10 basis points for flotation costs. Given our point forecast of a long-term Government of Canada bond rate of 3.85% for the first test year and 4.25% for the second, we are recommending a return on equity of 7.10% for 2008 and 7.25% for 2009. Our return on equity recommendation for 2008 allows an average-risk utility a risk premium (with inclusion of adjustments for flotation costs as well as for financial flexibility and integrity) of 325 basis points over our forecast for long Canada yields. For 2009, the risk premium is 300 basis points when we remove the financial integrity adjustment reflecting unsettled market conditions in 2008. We apply this recommended rate of return to OPG leaving it to the capital structure to adjust for higher business risk.

1.3.4 Generic Formula-based Adjustment Mechanism

In Section 5, we review the use of generic adjustment formulas by utilities regulators in Canada. After reviewing the advantages and disadvantages of the use of such formulas, we conclude with our recommendation that the Board implement such a mechanism for OPG.

1.3.5 Critique of Evidence Submitted by Ms. McShane

Section 6 of our evidence contains our critique of key aspects of the evidence dealing with the recommended ROEs and capital structure, and economic/financial market assessments of Ms. McShane, expert witness for OPG.

We focus on three key areas in our critique: the forecast for the 30-year Canada rate, recommended capital structure, and return on equity. Turning to the first area, we find that Ms. McShane arrives at forecasts higher than our own because she uses dated inputs from *Consensus Forecasts*, which is published by Consensus Economics.

On the topic of capital structure, we examine the methodologies employed in determining common equity ratios (ranges) by Ms. McShane and show that they are flawed. As a result, her recommendations are overly generous when viewed in the context of the business risks of the hydro and nuclear businesses of OPG. In particular, we show that Ms. McShane's unsupported view that OPG would require a stand-alone bond rating of at least A- inflates her recommended common equity ratio.

For return on equity, the third area, we document in detail a number of adjustments that Ms. McShane either makes or fails to make to standard

methodologies. We demonstrate that her stance on these adjustments or non-adjustments consistently leads her toward a higher recommended return on equity when compared with our recommendation.

We complete our discussion of the cost of equity with a detailed comparison of recommendations for the returns on equity by Ms. McShane, ourselves, and the results of selected adjustment formulas currently in use by Canadian regulators. We regard the regulatory formulas as generous because they do not reflect the trend toward a lower equity market risk premium or MERP discussed in Section 4 of our evidence and incorporated into our recommendations. With this in mind, we conclude that, should the Board wish to move deliberately in the direction of implementing a lower MERP, it would be appropriate to set the fair rate of return for an average-risk utility somewhere between our recommendations based on a risk premium over 30-year Canada's of 300 to 325 basis points and the average of regulatory formulas bearing an average-risk premium of 431 basis points. The analysis also demonstrates once more the upward biases in the recommended ROE of Ms. McShane.

1.4 SUMMARY TABLE FOR OUR RECOMMENDATIONS FOR RETURN ON EQUITY FOR OPG

The following table provides a summary of our recommendations for return on equity for OPG.

Panel A: Determination of Market Equity Risk Premium (MERP) for S&P/TSX Composite Index

MERP Estimation Method	**Estimate**	**Weight**
Equity Risk Premium Method	5.00%	Primary
Survey of Estimates Reported in the Literature	Risk Premium of 5.00% for S&P/TSX Composite is Conservatively High	Directional for bench-marking purposes
Discounted Cash Flow Estimation Method	Risk Premium of 5.00% for S&P/TSX Composite is Conservatively High	Directional for bench-marking purposes
Survey Expectations of Investment Professionals*	Risk Premium of 5.00% for S&P/TSX Composite is Conservatively High	Directional for bench-marking purposes

Panel B: Determination of Risk of an Average-risk Canadian Utility Relative to the Market (S&P/TSX Composite Index)

Relative Risk Estimation Method	**Estimate**	**Weight**
Beta	0.50	Primary
Standard Deviation of Utilities relative to Large Sample of Industries	Relative Risk of 0.50 for Average-risk Utility is Conservatively High	Directional for bench-marking purposes

Panel C: Determination of Recommended Return on Equity (ROE) for an Average-risk Utility and OPG when risk differences are accounted for by Adjusting the Equity Ratio for OPG

Test Year	**Recommended Market Equity Risk Premium**	**Recommended Relative Risk Adjustment to the MERP**	**Recommended Equity Risk Premium for OPG**	**Recommended Risk-free rate**	**Flotation, Financial Flexibility & Additional Financial Integrity Allowance**	**Recommended ROE for OPG**
2008	5.00%	0.50	5.00% x 0.50 = 2.50%	3.85%	0.10% + 0.40% + 0.25% = 0.75%	7.10%
2009	5.00%	0.50	5.00% x 0.50 = 2.50%	4.25%	0.10% + 0.40% + 0.00% = 0.50%	7.25%

*Includes surveys conducted by W.M. Mercer Limited and Watson Wyatt.

2. ECONOMIC AND FINANCIAL MARKET CONDITIONS

2.1 OVERVIEW OF THIS SECTION

We begin by noting a downward shift in expected market returns relative to ideal capital market conditions in the 1990s.

Next, we present our views on the current global credit crisis and its impact on capital markets. Starting in mid-2007 in the U.S., the crisis is ongoing with turbulence in the U.S. housing market and the collapse of Bear Stearns. Both the Fed (U.S. Federal Reserve Board) and the President have introduced policies to address the crisis. In Canada, the credit crisis manifested itself in the freezing of the market for asset-backed commercial paper. As a result of the credit crisis, equity market volatility remains high and credit spreads wide in both the U.S. and Canada. By next year, however, it is likely that capital market conditions will normalize.

The next topic in Section 2 is the economic outlook for Canada and Ontario. An economic slowdown in the U.S., coupled with the high Canadian dollar and moderating commodity prices are expected to slow the Canadian economy in 2008. Growth in real GDP is predicted to remain positive but just over 1%. In 2008, conditional on a U.S. economic recovery, the Canadian economy should expand at a rate close to the Bank of Canada's target rate of 2%. For Ontario, the negative factors impacting the Canadian economy will have a negative effect magnified by the province's heavy manufacturing emphasis. As a result, growth is expected to be slower than for Canada and unemployment higher than in the western provinces.

We conclude Section 2 with our forecasts of the long Canada rate to be used in our rate of return analysis. Drawing on *Consensus Forecasts* from Consensus Economics, March 10, 2008, we obtain forecasts for 10-year Canada's. Adding

the average spread on 30-year over 10-year Canada's observed over the first quarter of 2008 adjusted downward, we obtain forecasts of the 30-year Canada rate: 3.85% for 2008 and 4.25% for 2009. Using a similar approach we forecast rates on 30-year U.S. Treasury Bonds as 3.95% for 2008 and 4.35% for 2009.

2.2 Capital Market Trend

We begin by noting the trend toward lower expected market returns, as suggested by slowing economic growth rates relative to much of the 1990s. After the recession of the early 1990s, the rest of the decade was an ideal period in capital markets due to a long economic expansion and falling interest rates. As evidence of the economic expansion, note that between January 1990 and December 1999 real GDP in Canada grew by 37.33%.[1] Average real GDP growth in Canada was 2% annually between 1990 and 1998, and was 5.1% in 1999 and 4.4% in 2000. Annual average real GDP growth in the U.S. was 2.9% between 1990 and 1998, and averaged 4.1% in 1999 and 2000. As evidence of falling interest rates, 91-day Canadian T-Bills (i.e., a debt obligation backed by the Canadian government with a maturity of 91 days) decreased from 12.13% in January 1990 to 4.82% in December 1999, while U.S. T-Bills decreased from 7.75% to 5.37%. In brief, most of the 1990s was an ideal period for capital markets characterized by strong and sustained growth for much of the period and falling interest rates.

2.3 Global Credit Crisis

Prior to the global credit crisis, global capital markets enjoyed a period of stability through the first part of 2007. Higher energy and commodity prices fueled by economic growth in China and India led to booms in energy and mining. Combined with the decline of the U.S. dollar, the result was a substantial strengthening of the Canadian dollar and strong equity and debt markets. The

[1] See CANSIM II SERIES V498943, V122484 and V121817.

TSX experienced double-digit returns in 2004, 2005 and 2006. Liquidity was ample and interest rates followed a downward trend.

2.3.1 U.S. Sub-prime Crisis

When the credit market correction came in mid-2007, bringing a sharp increase in the price of risk, the weakest borrowers were forced into default precipitating the U.S. subprime crisis. With the financial system under strain, cracks also occurred in some securitization structures widened by such structures' reliance on bond rating agencies, as opposed to traditional lenders, in assessing credit risk. Unlike bank lenders, rating agencies do not have relationships with borrowers. Further, because bond rating agencies do not pay for their mistakes as severely as do lending officers, this "outsourcing of risk assessment" reinforced the general trend toward underestimating credit risk and contributed to the collapse of some securitization structures most notably collateralized debt obligations (CDOs) supported by subprime mortgages. With this collapse, investors turned away from all securitization products. The crisis also brought on a flight to quality with a widening of spreads on bank debt and corporate bonds.

The credit crisis continues in 2008 fueled by ongoing housing market turmoil in the U.S., which has resulted in global credit concerns and upheaval. This has been further aggravated by the economic recession in the U.S., and the strong possibility that it will cause significant economic slowdowns (if not recessions) in other economies.

Another defining event that has shaken the confidence of investors in the U.S. and globally is the collapse and rescue of Bear Stearns. The collapse started with a run on the investment bank's derivatives counterparty business as market participants lost confidence in the bank's ability to meet potential demands. To prevent an unravelling of risks, JP Morgan Chase bought Bear Stearns for $236

million ($2 per share; subsequently increased to $10 per share) although the shares were valued in the market pre-purchase at $3.5 billion ($30 per share). The Fed facilitated the purchase by providing up to $30 billion financing for the less liquid assets (e.g., mortgage securities) of Bear Stearns and assumed the risk of any decline in the value of those assets. This curtailed a run on Bear Stearns, which was the second-largest underwriter of U.S. mortgage-backed securities.

More recently, U.S. markets have encountered a manifestation of bad economic news. This includes poor U.S. employment numbers, a decline in nonfarm payrolls and a record number of residential mortgage foreclosures with no sign that the upward trend in foreclosures will abate. Consumer confidence has been adversely affected by home price deflation, which is now the highest since WWII and the Great Depression. Investor confidence has been further aggravated by a series of failed margin calls, which drove up credit spreads and resulted in the demise of at least 12 hedge funds.

Reacting to the near-collapse of Bear Stearns discussed earlier and having learned lessons from governmental activities in the U.S. during the Great Depression,[2] the U.S. Fed has flooded the markets with liquidity and cheaper funds. This included bypassing its own emergency-lending policy by allowing 20 primary dealers (such as Lehman Brothers Holdings Inc. and Morgan Stanley) access to the lending window at the same rate as commercial banks using a broad range of investment-grade collateral.[3]

The U.S. government also provided fiscal stimulus of about one percent of U.S. GDP by passing the Economic Stimulus Act of 2008. The bill provides

[2] Some of these lessons were used successfully by Canadian regulators during the Great Depression. See Drs. Kryzanowski and Roberts: Capital forbearance: Depression-era experience of life insurance companies. *Canadian Journal of Administrative Sciences* 15:1 (March 1998), pages 1-16; and Canadian banking solvency, 1922-1940. *Journal of Money, Credit and Banking* 25:3 (August 1993, Part 1), pages 361-376.
[3] Sherry Cooper, Red alert, *The Bottom Line*, BMO Capital Markets, March 17, 2008, page 1.

temporary tax incentives for businesses to make investments and individual tax relief in the form of tax rebates. In addition, numerous measures were undertaken to alleviate problems in the housing sector. These include increasing FHA insurance and allowing Fannie Mae and Freddie Mac (i.e., two U.S. Government-sponsored mortgage funding companies) to purchase larger mortgages by relaxing their capital requirements.

How these policies will impact markets in 2008 remains an open question. On the equity side, the positive changes in the level of the S&P and Nasdaq indices, for example, during 2007 were aided by record buybacks of their own stocks by U.S. nonfinancial corporations. For example, in the fourth quarter of 2007, U.S. nonfinancial corporations bought back a record $1.2 trillion (annualized) of stocks in value. While these corporations appear to still hold sizeable cash positions and the ratios of liquid assets to both short-term liabilities and GDP are historically high, what impact heightened uncertainty will have on their buy-back programs is unknown. Also, there is considerable uncertainty whether there will be write-downs in the values of these “cash” holdings. Turning to debt markets, despite Fed actions credit spreads remain high raising the cost of financing as investors enact a flight to quality.

2.3.2 Canada and the Credit Crisis

Investor confidence in Canadian debt markets has been shaken somewhat during the past year by the ongoing crisis in the asset-backed commercial paper (ABCP) market that required the complete freezing of $33 billion of the most troubled paper via the so-called Montreal accord, and required Canadian court granted bankruptcy protection for 20 ABCP trusts on March 17, 2008. This action was necessary because a standstill agreement that froze the funds was expiring. Investors in the ABCP include some of Canada's biggest pension funds, the National Bank of Canada, numerous large and small corporate entities and individual investors. With the malaise in the ABCP market reinforcing concerns

about counterparty risk in the U.S. and globally, credit spreads remain high in Canada. Debt investors are becoming more risk averse enacting a flight to quality in the form of government bonds and high-grade corporates (i.e., bonds issued by corporations that carry a high bond rating) according to Ted Carmichael, chief economist at J.P. Morgan Securities Canada Ltd.[4]

The loss of investor confidence in corporate credits was also reflected in the imbalance of bond rating downgrades in 2007. In 2007, DBRS (Dominion Bond Rating Service) downgraded 55 bond issuers while upgrading only 36, a ratio of downgrades to upgrades of 1.53. In contrast, in 2004-2006, downgrades were generally somewhat fewer than upgrades.[5]

Turning to the equity side, until the week leading up to Easter, professional market watchers had argued that the Canadian economy had become decoupled to a large extent from economic shocks in the U.S. These market watchers pointed to strong commodity prices (including record oil and gas prices) and noted that any economic fallout would be confined primarily to the financial sector and manufacturing. These professional market watchers also predicted that the impact of any economic contagion from the U.S. would thus be primarily confined to central Canada (Ontario and Quebec).

The sudden decline in commodity prices in which the CRB index fell almost 10% over four sessions followed the “bailout” of Bear Stearns by the U.S. Fed and a less than expected cut of 75 basis points in the discount rate by the U.S. Fed. As one would expect for a commodity-dependent economy like that in Canada, this eliminated much of the relative better performance of the S&P/TSX Composite index and resulted in a slippage of the Canadian dollar so that it traded below par relative to the U.S. dollar.

[4] Allan Robinson, Risk-averse investors flock to government bonds, Report on Business, Globe and Mail, March 24, 2008.
[5] DBRS, Industry study: The 2007 year in review and 2008 outlook for DBRS corporate ratings, DBRS, January 2008.

As in the U.S., uncertainty remains at a high level in Canadian equity markets. The expected volatility of the market over the next month as measured by the Montreal Exchange's MVX has been higher on average but quite volatile itself since July of 2007.[6] In contrast, the Ink insider trading sentiment is neutral. This ratio is calculated by dividing the number of TSX-listed companies with insider buy-only transactions by the number with sell-only transactions (available at: www.inkresearch.ca).

2.3.3 Implications

It should not be surprising that when a major economic power (the U.S.) goes into recession that it creates temporary economic and market uncertainty, and that this has a short-run adverse effect on stock market prices and realized returns along with credit spreads. As long as the crisis is of the magnitude of such crises in the past (i.e., short-run with the exception of the Great Depression), it will not have a long-lasting effect on either the economy or equity markets. Thus, there is no reason to believe that the current U.S. crisis will have a material effect on the long-run cost of equity for Canadian utilities beyond 2008. Furthermore, one must careful consider the logical inconsistent between the argument that the cost of equity has increased because realized returns are lower (when equity prices are lower due to increased uncertainty) and the argument at other times that the cost of equity has increased because realized returns have increased (when times are good and uncertainty has decreased).

Similarly, the current credit crisis in the U.S. should not restrict utilities' abilities to raise debt funding. Given the investment grade rating and plain vanilla character of Canadian utility debt, these issuers should be in a position to benefit from the present flight to quality and away from exotic derivatives.

[6] The MVX is derived from option prices on the S&P/TSX 60 ETF (exchange traded fund).

2.3 Economic Forecasts

2.3.1 Forecasts for the Canadian Economy

A key factor in predicting Canada's economic future over the course of the coming years is what will come of slowing economic activity in the United States, which some reports have recognized as a recession. The slowdown which has gripped the U.S. economy through a combination of significant contractions in housing activity, deterioration in credit markets, inflationary pressures, and a sharp retreat in consumer spending has spilled over into the Canadian economy.[7] The depreciation in the greenback's value relative to the loonie, continuous slowdown in domestic manufacturing, and a fall in net exports have weakened Canada's real GDP growth predictions for 2008.

Looking forward, the Canadian economy should narrowly avoid a recession. Robust consumer spending thanks to firm labour markets and low retail prices as a result of the loonie's strength have had positive impacts on the economy as a whole. Furthermore, corporate earnings will be supported by the recent boom in commodity prices, which while expected to level off, are likely to remain at historic highs. Although residential construction activity is likely to cool in late 2008 and through 2009, the housing market is much healthier than in the U.S. However, downward pressure on the greenback and the continuing strength of the Canadian dollar are expected to continue into the foreseeable future hurting export driven industries such as manufacturing and forestry.

The current year should see the continuation of strong prices for commodities driven by a weak U.S. dollar and rising inflationary expectations. Prices are expected to cool going into 2009. Reports from BMO and TD confirm that the

[7] Our forecast is drawn from TD Economics, *TD Quarterly Economic Forecast*, March 19, 2008, www.td.com/economics; BMO Capital Markets Economics, *Canadian Economic Outlook*, April 4, 2008, www.bmonesbittburns.com/economic; and Scotiabank Group, *Global Economic Research, Forecast Update*, March 28, 2008, www.scotiabank.com.

majority of the gains in 2007 and 2008 are concentrated in agriculture and energy. The predicted fall in the commodities indices between 2008 and 2009 should occur as a result of depreciating agriculture and metals prices brought on by the U.S. recession and a reduction of the global economic growth rate. Forestry products are forecasted to consistently increase in price up to 2009.

Reports by Scotia Capital and BMO Economics predict that the Bank of Canada overnight rate will bottom out at 2.75% in either Q1 or Q2 of 2008 and rebound to 3.00% by Q2 of 2009. The current overnight rate is 3.5%. Rate cuts are predicted as a way for the Bank of Canada to counteract decreased exports and a negative deviation from the target growth rate of 2%. From now until Q4 2009, forecasters expect a 1 to 1.5% spread between the Bank of Canada rate and the Federal Funds rate. With respect to exchange rates, the Canadian dollar is expected to remain close to parity through 2009. It is important to recognize, however, that exchange rate predictions have traditionally been subject to considerable forecasting error.

While the U.S. economy is expected to contract for the first half of 2008, activities are predicted to rebound by the latter half of 2008, resulting in an overall real GDP growth of 1.1% for the year. This resilience is attributed to the combined efforts of the Federal Reserves' aggressive monetary action and the President's economic stimulus package (discussed above) taking hold. The benefits of these initiatives are expected to spillover through 2009, with the real GDP forecasted to grow at around 2%.

In light of a forecasted rebound in the U.S. economy, which will help support Canadian exports, in conjunction with strong domestic demand conditions and historically high commodity prices, the Canadian economy should avoid recession in 2008 and return to modest growth in 2009. In the near future, Canada's real GDP is predicted to grow at approximately 1.35% and 2.13% for 2008 and 2009, respectively.

2.3.2 Forecasts for Ontario

The rising Canadian dollar, high oil prices and slowdowns in the U.S., which accounts for 84% of Ontario's exports, have had negative impacts on Ontario's economy. However, these losses have been mitigated in part by greater commodity exports (gold, nickel, and uranium) to the United Kingdom, and higher manufacturing sales to Japan.[8]

Given Ontario's heavy dependence on manufacturing (particularly the auto sector) and exports, the provincial real GDP will grow more slowly than for Canada as a whole at predicted rates of 1% and 1.4% in 2008 and 2009, respectively, according to Scotiabank Economics. Outside of the Western Provinces, Ontario's unemployment rate is expected to remain the lowest in the country, and is forecasted to be 6.5% for 2008 and 6.7% for 2009. This is half-a-percentage point higher than the national average for both years. The increase in unemployment is expected to be centered around manufacturing, while the services sectors continue to be robust, having added 146,000 jobs in 2007.

Amidst a tightening credit market, Ontario's commercial office properties construction continues to grow. On the housing front, prices increased by 17% year-over-year in December 2007, although housing sales and price growths are expected to cool. In 2008, housing starts are expected to cool to 63,000 units from 68,400 in 2007.

In summary, Ontario's economy has been negatively affected by the fall of the U.S. dollar and slowdowns in the U.S. As a result, the near future does not look

[8] Our forecast is drawn from BMO Capital Markets Economics, *Provincial Monitor*, Winter 2008, www.bmonesbittburns.com/economic; and Scotiabank Group, *Global Economic Research, Provincial Forecast Update*, March 31, 2008, www.scotiabank.com; CIBC World Markets, *Provincial Forecasts*, October 2006, 2007, http://research.cibcwm.com/res/Eco/EcoResearch.html; and RBC Economics, *Provincial Economics*, February 208, http://www.rbc.com/economics/market/hi_provincialeco.html.

particularly optimistic for the province. Nonetheless, the economy will continue to experience positive real growth, and should rebound to a targeted growth rate of 2% within the medium future upon the recovery of the U.S.

2.4 Interest Rate Forecasts for 2008 and 2009

2.4.1 Forecasts for the 30-year Canada Bond Rate

For rate-making purposes we need to forecast the rate on 30-year Canada's for each test year. In developing our forecast, we draw on forecasts from *Consensus Forecasts* (published by Consensus Economics), March 2008, which provides consensus mean forecasts for the end of June 2008 and the end of March 2009. Because these forecasts are for 10-year Canada's we follow the common practice of adding an average spread to obtain a forecast for 30-year Canada's.

Beginning with the 10-year forecasts, Consensus Economics reported in *Consensus Forecasts* on March 10, 2008 that the mean forecast for 10-year Canada's for the end of June 2008 was 3.6%. For the end of June 2009, the mean consensus forecast was 4.1%.

To transform our 10-year forecasts into a prediction for the rate on 30-year Canada's we start with the average spread between these two instruments as observed over the first three months of 2008. Using data from the Bank of Canada we calculate this average spread as 39 basis points in Schedule 2.1. Recognizing that this estimate may be biased upward if markets settle and the yield curve flattens later in 2008 and 2009, we estimate the spread as 25 basis points for 2008 and 15 basis points for 2009.[9] Adding our spread estimate of 25 basis points to 3.6% gives us 3.85% as our 30-year Canada's forecast for test

[9] We will continue to monitor this trend and, if necessary, will file an updated forecast prior to the hearing.

year 2008. Similarly, adding 15 basis points to 4.1% gives 4.25% as the forecast rate for 30-year Canada's for 2009.

2.4.2 Forecasts for the 30-year U.S. Treasury Bond Yield

Our forecast for the 30-year U.S. Treasury bond yield follows the same methodology that we employ for the long-term Canada rate. We obtain consensus mean forecasts for the 10-year U.S. Treasury bond rate from the same issue of *Consensus Forecasts* (published by Consensus Economics) that is used for the Canada forecasts above: 3.7% for the end of June 2008 and 4.1% for the end of March 2009.

Following our practice for Canadian rates discussed earlier, we convert these forecasts for 10-year Treasuries to forecasts for the yield on 30-year Treasuries by adding an estimated average spread. For the U.S. we measure the spread by averaging observed values over the most recent four quarters (Q1 through Q4 2007). For U.S. Treasuries this was 25 basis points based on data from TD Economics. We also examine data for the first quarter of 2008 which show a somewhat higher value. We then add 25 basis points to 3.7% to obtain 3.95% as our forecast for the U.S. 30-year Treasury yield for the end of June 2008. For the end of March 2009, adding 25 basis points to 4.1% gives 4.35% as our forecast for the yield on 30-year U.S. Treasury Bonds.

3. CAPITAL STRUCTURE

3.1 OVERVIEW OF THIS SECTION

We begin with a brief overview of the practical implications of financial theory for our analysis of the appropriate capital structure for OPG. Our main conclusion is that, although no generally accepted formula exists for setting capital structure, the level of equity should increase with the degree of business risk.

To implement this conclusion, we next review the business risks faced by OPG hydro assets (OPG Hydro) and nuclear assets (OPG Nuclear) separately. Our review of market, operational and regulatory risks leads to the conclusion that OPG's regulated hydro business carries low to moderate risk (1.8 on a scale of 5 where 1 is the lowest risk and 5 the highest). In contrast, OPG's regulated nuclear generation has a higher level of business risk which we assess as approaching moderate (2.3 on our 5-point scale).

In order to gain perspective on these measures of business risk, it is useful to compare them against the risks of generic electricity transmission and distribution businesses as well as those of integrated electric utilities. This will allow us to benchmark our recommendations for OPG against capital structures allowed by this Board and by other Canadian regulators for other companies in these categories. Our approach also facilitates comparisons with our own analysis in prior testimony. We assess the average risk for transmission as low (1 on our 5-point scale). We also study the business risk associated with generic distribution and rate it as low to moderate (1.4 on our scale). Based on these inputs, we assess the business risk of an integrated company by taking an asset-weighted average of the risks of OPG hydro, generic transmission and generic distribution. Our analysis sets the business risk of an integrated electricity company at 1.5 on our scale or low to moderate.

We then turn to examining relevant financial data for a sample of eight Canadian gas and electric utilities and pipelines that have publicly traded common shares. We require the included companies to be publicly traded to ensure consistency between our samples here and in later sections where we present our evidence on the fair rate of return. We analyze bond ratings, capital structures, interest coverage ratios and returns on equity for our sample companies.

Drawing on the basic principle that the level of equity in the deemed capital structure of a utility should reflect its business risk and combining our risk assessments, we conclude that being considerably riskier than a generic transmission and somewhat riskier than an integrated company or a generic distribution company, OPG hydro should carry a higher level of equity than any of these three comparators. We assign 40% as the appropriate equity ratio for OPG's hydro assets. Following similar logic, we set 50% as the fair level of equity for OPG's nuclear assets. To achieve a recommendation for OPG's combined regulated assets we take a weighted average of our two recommendations based on regulated MW (megawatts): 6,606 for nuclear (66.47%) and 3,332 MW for hydro (33.53%) to attain an overall recommended capital structure of 47% equity.

3.2 IMPLICATIONS OF FINANCIAL THEORY

Finance theory has several important implications for setting the appropriate level of the equity ratio for a regulated electric utility. First, theory teaches us to be suspicious of attempts to determine an appropriate equity ratio using a formula. Unlike other areas in finance, research on capital structure can offer only qualitative policy advice. To quote a leading, current corporate finance textbook:

"No exact formula is available for evaluating the optimal debt-equity ratio."[10]

While we expect an introductory textbook to contain an element of simplification in order to present material to beginning students, this statement has yet to be superseded by advanced research. We review selected research on capital structure in Appendix 3.A.

This important implication of finance theory has been accepted by Canadian regulators including the Alberta Utilities Commission (formerly the Alberta Energy and Utilities Board). In Decision 2004-052, page 35, it wrote:

> "In the Board's view, setting an appropriate equity ratio is a subjective exercise that involves the assessment of several factors and the observation of past experience. The assessment of the level of business risk of the utilities is also a subjective concept. Consequently, the Board considers that there is no single accepted mathematical way to make a determination of equity ratio based on a given level of business risk."

Although it does not offer a formula, finance theory does highlight key considerations in determining capital structure. In the same textbook we find the following:

> "How should companies establish target debt-equity ratios? While there is no mathematical formula for establishing a target ratio, we present three important factors affecting this ratio:[11]
>
> - Taxes. As pointed out earlier, firms can only deduct interest for tax purposes to the extent of their profits before interest. Thus, highly

[10] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Fifth Canadian Edition, Toronto, McGraw-Hill Ryerson, 2008, p. 500.
[11] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Fifth Canadian Edition, Toronto, McGraw-Hill Ryerson, 2008, p. 502.

profitable firms are more likely to have larger target ratios than less profitable firms.

- Types of assets. Financial distress is costly, with or without formal bankruptcy proceedings. The costs of financial distress depend on the types of assets that the firm has. For example, if a firm has a large investment in land, buildings, and other tangible assets, it will have smaller costs of financial distress than a firm with a large investment in research and development. Research and development typically has less resale value than land; thus, most of its value disappears in financial distress. Therefore, firms, with large investments in tangible assets are likely to have higher target debt-equity ratios than firms with large investments in research and development.
- Uncertainty of operating income. Firms with uncertain operating income have a high probability of experiencing financial distress, even without debt. Thus, these firms must finance mostly with equity. For example, pharmaceutical firms have uncertain operating income because no one can predict whether today's research will generate new drugs. Consequently, these firms issue little debt. By contrast, the operating income of utilities generally has little uncertainty. Relative to other industries, utilities use a great deal of debt [emphasis added]."

Taken together, these three factors are central to establishing the appropriate amount of debt for a utility. If we set aside the second and third factors for a moment, the first factor tells us that a company should use a large proportion of debt financing to reduce its cost of capital. Simply stated, factors 2 and 3 determine the level of business risk which restrains the company's use of debt in order to reduce the cost of financial distress and the probability that it will occur due to low operating income. Turning from speaking in general about any company to focusing on a regulated electric utility, we believe that factors 2 and 3 are largely mitigated by the special features of this industry.

For an electric utility, the costs of financial distress (factor 2) are reduced because its assets make excellent collateral. Further, the regulation process virtually ensures that the company will recover its debt payments and other costs. Further, regulation allows the company to go back to its regulator to apply for relief in the unlikely event that it does not earn its fair rate of return in a given year, and especially if its ability to service its debt were in jeopardy. Additionally, in the extreme event that an electric utility became insolvent, it is highly likely that the regulator (and other governmental bodies) would work with the company to find new investors or a merger partner so that service (and thus, asset usage) would not be interrupted. This is what occurred with the bankruptcy of Pacific Gas and Electric Company in California.[12] As a result, the cost of financial distress is far lower than for a nonregulated firm.

The third factor is the probability of financial distress. As stated in the quotation, this probability is low for utilities because operating income has low variability, which is further diminished if the utilities make extensive use of deferral accounts. In conclusion, we come back to the beginning of our answer to this question. If we set aside factors 2 and 3 (the costs of financial distress and the probability of financial distress), the theory suggests that a company should use a high proportion of debt. Our comments on factors 2 and 3 explain why it makes sense to expect them to carry less importance in practice for this industry. With the focus then on the first factor, taxes, we would expect regulated electric utilities to be among the most highly leveraged industries.

We now turn from electric utilities as an industry to examine the business risk of OPG both on its own and relative to that of other sectors of the industry.

[12] K. Gaudette, Bankrupt Pacific Gas and Electric hopes to avoid state laws, Associated Press, *The Nando Times*, January 25, 2002, www.nando.net/business/story/228567p-2199342c.html.

3.3 BUSINESS RISK OF ONTARIO POWER GENERATION

3.3.1 Framework for Analysis

Our assessment of business risk focuses on uncertainty of operating income introduced earlier in our overview of important factors in the determination of capital structure. Factors that increase costs to a utility such as higher fuel prices do not necessarily translate directly into increased business risk. Management can prevent these factors from increasing the uncertainty of operating income in several ways. First, it can forecast their impacts and build them into proposed pricing. In a fair regulatory environment, such costs will be allowed and passed on to customers. Second, management can engage in risk mitigation to control the impact of such factors on operating income. Third, risk can be mitigated by use of deferral accounts. Business risk is only increased to the extent that these three approaches to control risk only work incompletely.

Our analysis of business risk begins with an examination of the risks of hydroelectric and nuclear generation for OPG. Because the two types of generation carry different risks we assess each separately. We introduce each of the three major categories of business risk for utilities: market, operational and regulatory, and discuss each in detail first for the regulated hydro and then for the nuclear operations of OPG. Our discussion presents a detailed breakdown of the components of business risk within each category and a numerical ranking of each on a scale of low (1), moderate (3) or high (5). We create a summary table, Schedule 3.6, displaying the rankings of each of 9 individual risks covering our three categories. Our conclusion is that the regulated hydro generation activities of OPG carry a low to moderate level of business risk (1.8 on our 5 point scale with a score of 1 representing low risk and 5 the highest risk for a utility). The regulated nuclear operations are rated as approaching moderate risk (2.3 on our 5-point scale).

To provide perspective on our business risk rankings, we next use our framework to measure the business risks of other sectors of the utilities industry and explain why we agree with the commonly held view that transmission (wires) carries the lowest business risk followed by distribution and then by generation with the highest business risk. We assess the business risk of transmission utilities as low (score of 1 out of 5) and distribution utilities as somewhat higher at low to moderate (1.4). These assessments form the basis for our capital structure recommendations for OPG Hydro and OPG Nuclear below. The analysis of business risks in the transmission and distribution sectors provides the basis for comparisons with deemed capital structures in those sectors.

3.3.2 Business Risk of OPG's Hydroelectric Generating Assets

3.3.2.1 Market Risk

Market risk is the risk that a hydro generator will not be able to meet its target sales due to weak markets, to competition or to other related factors. OPG is the market leader in Ontario accounting for 71% of the electricity sold in 2007.[13] DBRS expects that the company will retain this position for the near future out to 2014. The Ontario economy is facing slowing growth in the short-run particularly in the manufacturing sector as discussed in Section 2 but residential growth remains steady. The province has experienced long-term growth of around 1% annually in electricity consumption over the period 1998-2007. In the most recent years, growth has displayed a flattening tendency with rates of -3.8% and 0.7% for 2006 and 2007, respectively.[14] Because OPG is a base-load, low marginal cost generator it is not expected to experience a significant level of demand or dispatch risk. Competitive cost structure and transmission limitations protect

[13] Our discussion draws on Ontario Power Generation, Corporate Credit Rating, Standard & Poor's, December 9, 2005 and DBRS Rating Reports, August 3, 2006 and November 30, 2007.
[14] 18 Month Outlook: An Assessment of the Reliability of the Ontario Electricity System From April 2008 to September 2009, Independent Electricity System Operator (IESO), March 12, 2008, www.ieso.ca

OPG from competitive supply threats from Quebec and Manitoba. We assign a rating of low (1 out of 5) for competition / demand risk as shown in Schedule 3.1.

Our view of competition/demand risk agrees with that of Ms. McShane who states: “Nevertheless, dispatch risk for the regulated assets is currently relatively low” (Exhibit C2, Tab 1, Schedule 1, page 59).

A related component of market risk is the credit risk that may arise if a utility’s customers default on their payments. This element of market risk is also low (1 out of 5) for OPG because it does not sell directly to ultimate power users.

With competition/demand risk and customer credit risk both rated low, we conclude that market risk is low (1 out of 5) for OPG’s hydro generation business.

3.3.2.2 Operational Risk

Operational risk represents the risk that OPG will not meet production and profitability targets. We identify four elements of operational risk and discuss them in turn. We also discuss how deferral accounts serve to mitigate the various elements of operational risk. The first component of operational risk is operating leverage which arises when operations such as hydro generation are characterized by a high level of fixed costs which make operating cash flow more sensitive to changes in production. We assess operating leverage as moderate (3 out of 5) in Schedule 3.1. Related to operating leverage, advanced technology also impacts fixed costs as well as making production more sensitive to technical breakdowns. We assign a risk rating of low to moderate (2 out of 5) to technology risk.

Capacity risk relates to forced outages due to unanticipated breakdowns or prolonged maintenance. Hydroelectric generation is typically subject to a low rate of forced outages. Capability factors measure reliability as the ratio of available

energy generation to reference energy generation defined as production under full power. Available energy generation may fall below reference levels due to "limitations within control of plant management, i.e., plant equipment and personnel performance, and work control" according to the International Atomic Energy Agency.[15] In a regulatory perspective, such a shortfall does not constitute a risk for which a utility should be compensated. OPG continues its traditional record of high capability factors for its hydro units.

Further, hydro generating units are not subject to the risk of increasing fuel costs as are fossil fuel and nuclear units. Nor do they fall prey to significantly increased risks of environmental compliance. However, availability of water does create a production risk as lower water levels could reduce output and create unrecovered costs. Historically, water availability has not been a problem for OPG due to its diversification of regulated hydro assets on two river systems, the St. Lawrence and Niagara Rivers.[16]

Further, OPG currently has a deferral account (Water Conditions Deferral Account) which allows the company to collect cost recovery in years with lower water levels and to replenish the account when water levels are above average. The company has applied to the Board to continue this account. Assuming that the Board grants this continuation, the risk to OPG from water variability is low.

Considering all the elements of capacity risk produces a rating of moderate (3 out of 5). The presence of a water deferral account mitigates capacity risk and leads to a rating of low risk (1 out of 5) under deferral accounts.

A further aspect of operational risk arises from costs that can arise from the obligatory retirement of assets and construction of new generation. For its hydro generation, environmental issues related to asset retirement are not a major

[15] www.iaea.org
[16] Corporate Credit Rating, Standard & Poor's, December 9, 2005

concern as they are for coal burning and nuclear units. Hydro generators do face risks with regard to capital expenditures. However, the recovery of fixed capital costs such as depreciation is included in the allowed rate. DBRS believes that these risks will be mitigated by financial structuring:

> "It is expected that OPG will not undertake any major capital projects without having its financing and cost-recovery mechanism in place, thus minimizing the financial risks. It is also expected that OPG will turn to the OEFC for project-style financing in the capital markets to fund these projects. Although OPG may be able to reduce its risks through design-build contracts, some residual risk will remain on significant capital expenditures".[17]

In brief, our assessment of risks associated with asset retirement and construction leads us to conclude that this risk is low to moderate for OPG Hydro.

3.3.2.3 Regulatory Risk

Regulatory risk can arise when costs are disallowed, allowed returns do not fit market expectations or rate design (including allowed capital structures) varies from what is fair and reasonable in view of business risks. Alternatively, regulation can mitigate risks through the introduction of deferral accounts and by allowing generous allowed returns and capital structures as discussed in other parts of this evidence.

We believe that regulation by the Board plays the second, positive role for OPG and assess the regulatory risk as low for a number of reasons. First, as discussed earlier, deferral and variance accounts allowed by the Board in the past and likely to be continued reduce operational risk. Second, as also explained above, we expect that the Board will approve structures that will mitigate the risk of future construction. Third, it is our understanding that the

[17] Ontario Power Generation Inc., DBRS Rating Report, November 30, 2007, page 4.

Board regulates in a fair manner. It follows that it is logically contradictory for the Board to recognize possible future political interference as a risk for which the company should be compensated.

Ms. McShane's evidence offers two, apparently conflicting, views of the regulatory risk faced by OPG. On page 63, she states: "On balance, I view the regulatory risk for OPG as higher than that of the typical regulated utility in Canada and in Ontario". Page 60 contains a contrasting view implying that regulatory risk is low:

> "For purposes of the business risk assessment, I proceed on the assumption that OPG will be treated no differently from any other utility subject to the Board's jurisdiction: OPG will be provided a reasonable opportunity to recover its prudently incurred costs and earn a return that reasonably reflects the risks to which it is exposed."

Pollution Probe Information Request #49 asked Ms. McShane to reconcile these two statements. Her reply was:[18]

> "The first statement [page 60] simply means that the Board would seek to apply the same standards and principles to OPG as to other utilities under its jurisdiction. The second statement needs to be read in conjunction with the paragraph that follows:
>
> 'As the Board suggested in its November 20, 2006 report, the application of cost of service regulation to generation is a relatively unique phenomenon, with no track record upon which to gauge the outcome. The uncertainty of the "end state" is amplified by the fact that OPG will be regulated in a market

[18] Ms. McShane's Response to Pollution Probe Interrogatory #49, EB-2007-0905, Exhibit L, Tab 12, Schedule 49, page 1 of 1.

environment which is a hybrid of regulation and competition, which creates additional pressure on regulated rates in a period of potentially significant cost increases (e.g., decommissioning costs, other post-retirement benefit expenses).' "

Our reading of Ms. McShane's response is that the Board may seek to regulate fairly but, due to the novelty of its task, be unable to achieve that goal. This argument lacks any logical basis. Therefore, for reasons explained above, we agree with her second assessment of regulatory risk associated with OPG's primary regulator as low (1 out of 5).

Regulatory risk may also arise due to unanticipated shifts in environmental or safety regulations or in their enforcement. Because hydro generation does not involve the burning of fossil fuels or the potential dangers of nuclear generation, we rate this element of risk as low to moderate (2 out of 5).

3.3.2.4 Summary on Business Risk for OPG's Hydroelectric Assets

Our review assesses nine dimensions falling within the three main areas of business risk, market, operational and regulatory and the ratings presented above are summarized in Schedule 3.1 in the column marked OPG Hydro. As the Schedule shows, the average-risk rating is 1.8 producing a low to moderate level of business risk for OPG's hydro assets.

3.3.3 Business Risk of OPG's Nuclear Generating Assets

3.3.3.1 Market Risk

Market risk is the same for nuclear as for hydro generation. Therefore, we assess both competition and customer credit risks as low for the reasons explained earlier.

3.3.3.2 Operational Risk

Nuclear technology is more advanced and characterized by a greater degree of fixed costs (operating leverage) and higher technology risk. We rate both as moderate to high (4 out 5). Mitigating risk deriving from operating leverage is the proposed fixed charge covering 25% of the projected nuclear revenue requirement. Nuclear generation is also subject to more intense environmental and safety regulations that create the potential for lengthy unplanned outages. In the case of OPG the greater risk of nuclear generation is magnified by issues related to unplanned maintenance and inspection outages.

As explained above, to the extent that such production shortfalls are due to factors under the control of management, they do not constitute a risk for which a company should be compensated. By comparing unit capability factors supplied by OPG against the industry benchmark of 91% provided by DBRS, we may assess management performance. OPG provided such data on unit capability factors in its response to Pollution Probe Interrogatory #5 (bolding added).[19] Specifically:

> "The table below provides unit capability factor percentages for each of OPG's nuclear units for the period 2005 - 2007. The data are provided as `Unit Capability Factor' consistent with the manner in which OPG has represented unit output in its evidence (please see definition provided at Ex. E2-T1-S1, page 23). `Annual capacity utilization rates' is not a term OPG uses to track generation output.
>
> OPG declines to provide historical information prior to 2005 for the reasons given in L-12-6."

[19] OPG's Response to Pollution Probe Interrogatory #5, EB-2007-0905, Exhibit L, Tab 12, Schedule 5, page 1 of 1.

ONTARIO POWER GENERATION NUCLEAR
Unit Capability Factor (%)

Unit	2005	2006	2007
Darlington			
Unit 1	**96.1**	83.5	**97.0**
Unit 2	79.2	**98.6**	83.0
Unit 3	**98.7**	72.7	**94.2**
Unit 4	85.8	**97.1**	81.0
Pickering A			
Unit 1	**92.7**	77.3	38.9
Unit 4	66.5	66.3	43.7
Pickering B			
Unit 5	53.3	89.7	57.7
Unit 6	64.3	86.5	71.8
Unit 7	**97.9**	59.2	82.0
Unit 8	**94.5**	64.9	87.3

We have added emphasis by marking in bold each plant year in which the capacity factor equals or exceeds the industry benchmark of 91.0%. This occurred in 9 of 30 plant years, i.e. for 30% of the plant years. For 21 of 30 plant years (70% of the cases) the unit capability factor failed to achieve the benchmark level. These data strongly suggest that production shortfalls attributable to management issues (and not constituting a risk to be recognized in regulation) were a major concern for OPG Nuclear in the period 2005-7.[20]

Unpredicted fuel cost increases represent an added potential capacity risk to nuclear generation. Although the price of uranium has increased dramatically in the past from $15.55U.S. per pound in January 2004 to $73U.S. in February 2008, this increase is not expected to continue as new supply comes into the market.[21] Further, this price increase was moderated somewhat by the rise in the Canadian dollar. Analysts surveyed by Reuters in December 2007 predicted that

[20] Data for capability factors for these plants going back to inception are available on the website of the International Atomic Energy Agency. They show a similar pattern of low capacity factors.
[21] www.cameco.com

the average mid-range spot price for uranium will go to $106.90U.S. in 2008 and moderate to $91.90U.S. in 2009.[22] Further, it is only the unexpected component of any price increase that is a source of risk and OPG has two lines of defense against fuel cost risk. First, the company engages in fuel price hedging for both fossil and nuclear fuels. According to Standard & Poor's, OPG hedged 100% of estimated fuel needs for 2005 and 93% for 2006.[23] Second, uranium fuel price risk will be covered by the variance account requested in this proceeding. According to Ms. McShane, "OPG is requesting a variance account to record variances between forecast and actual uranium costs. The proposed variance account would cover the preponderance of OPG's fuel price risk".[24]

As we noted earlier, costs of decommissioning assets and disposing of used fuel are higher for nuclear than for hydro generation. For OPG these risks are mitigated by funding of a Used Fuels Fund and a Decommissioning Fund under the Ontario Nuclear Funds Agreement (ONFA) between OPG and the Province. Under the ONFA the Province and OPG share the risks associated with the assumed rates of return on these funds. According to DBRS, the decommissioning fund was overfunded as of September 30, 2007.

A final aspect of operational risk derives from the need to build new generation assets. Because the largest proportion of OPG's planned future growth is in nuclear, this risk is higher than for hydro generation. As indicated in our discussion of hydro risks, however, this risk is mitigated through project structuring.

Summarizing our discussion of operational risk in OPG's nuclear assets, the company faces moderate to high levels of both operating leverage and technology risks both rated 4 out of 5. Its moderate (3 out of 5) exposure to

[22] Anna Stablum, Strong demand to boost spot uranium price in 2008, Reuters, January 22, 2008, www.reuters.com.
[23] Corporate Credit Rating, Standard & Poor's, December 9, 2005.
[24] McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 73.

capacity risk arises from aspects of nuclear generation outside of management control. The stand-alone principle of regulation implies that costs associated with capacity risk arising from substandard reliability or other causes under management control should not be considered in rate making. Further, OPG faces moderate risk associated with decommissioning and construction. Finally, deferral accounts related to fuel costs and funds supporting used fuel and decommissioning costs mitigate the associated risks leading to a low rating (1) for deferral accounts. In addition, this rating reflects the proposed 25% fixed capacity charge which also serves to moderate operating risk.

3.3.3.3 Regulatory Risk

Regulatory risk associated with the primary regulator is subject to the same factors for nuclear as for hydro assets. The difference is that the stakes are higher due to the higher operational risk of nuclear generation. On this point we agree with Standard & Poor's which states:

> "OPG is likely to be the first and only generator to fall under OEB's (Ontario Energy Board's) regulatory oversight. It remains to be seen whether the capital structure and returns allowed by the regulator post 2008 will reflect the much operating risks associated with electricity generation (including hydrology risk and nuclear technology risk) as compared with the low risk profile of distribution and transmission companies" (Corporate Credit Rating, Standard & Poor's, December 9, 2005, page 6).

Nuclear assets are subject to additional regulatory risks relating to environmental and safety regulation under the supervision of the Canadian Nuclear Safety Commission (CNSC). The CNSC regulates Canada's seven nuclear power plants including those of OPG along with other nuclear reactors.[25] Due to the high level of regulation, it is possible that an enhancement to

[25] www.nuclearsafety.gc.ca.

regulations or an unexpectedly strict interpretation by CNSC could cause unforeseen costs or unplanned outages at one of OPG's plants. Such a closure occurred at the Chalk River nuclear research facility operated by Atomic Energy of Canada Ltd. in November 2007. At issue was the classification of a redundant safety system as either an optional safety enhancement or a necessary condition of licensing.[26] Further, future legislation could impose more onerous safety regulations on OPG.

While we recognize that shifts in environmental and safety regulation do pose a risk to OPG in its nuclear operations, we assess this risk as moderate for several reasons. First, the risk is only a possibility and to date has been overshadowed by management issues as the main cause of capacity shortfalls. Second, should the risk from shifts in environmental and safety regulation materialize, it can be mitigated by a deferral account as documented by Ms. McShane:

> "To the extent that nuclear production is adversely impacted by changes in legislation or regulations related to CNSC compliance or compliance with any other applicable laws, OPG is at risk, with the proviso that it retains the right to request a deferral account to recover related costs if they result in a material financial impact" (Exhibit C2, Tab 1, Schedule 1, page 72).

In brief, our review of OPG's regulatory risk in its nuclear generation rates regulatory risk with respect to the Board as low based on our earlier discussion of regulatory risk. Additional regulatory risk arises from possible shifts in environmental and safety regulations regarding nuclear operations but this is mitigated by the minor role currently played by this risk and the company's right to request a deferral account should the risk become material in the future. Overall, we assign a rating of moderate to this second aspect of regulatory risk arising from OPG's nuclear operations.

[26] Peter Calamai, "Medical isotope power struggle", www.thestar.com , February 25, 2008.

3.3.3.4 Summary of Business Risk of Nuclear Generation

Our review examines the three main areas of business risk (market, operational and regulatory) using nine dimensions. We summarize the ratings presented above in Schedule 3.1 in the column marked OPG Nuclear. As the Schedule shows, the average-risk rating is 2.3 approaching a moderate level of business risk for OPG's nuclear assets.

3.4 RELATIVE RISKS OF ELECTRICITY SECTORS

With our business risk analysis of OPG's hydro and nuclear generation complete, we now turn to an examination of the relative business risks of electricity transmission and distribution. Because there are a number of regulated companies in these sectors in Canada, such a comparison provides a useful perspective.

Market competition risk is low for transmission because of its status as a natural monopoly. While electricity distribution also has the characteristics of a monopoly it carries higher market competition risk due to the possibility of customers switching to natural gas or increasing reliance on co-generation. Further, because distribution companies sell to wholesale and retail customers, they face credit risk to a larger degree than do transmission companies whose sole customer is a distribution firm. More importantly, distribution companies are subject to operating leverage risk as they levy variable charges to cover fixed costs. Our view of the relative risks of electricity distribution vs. transmission is consistent with the opinion of the Alberta Utilities Commission (formerly the Alberta Energy and Utilities Board) in EUB Decision 2004-052 (July 2, 2004), page 48:

> "The Board notes the consensus that electric distribution companies are subject to more business risk than electric transmission companies, principally due to their recovery of a significant amount of fixed costs in variable charges and their greater exposure to credit risks."

Electricity generation carries higher business risk than distribution along a number of dimensions. As explained above, because it is not a natural monopoly, generation faces potential competition from independent electricity producers locally as well as from generating facilities in neighboring provinces or states. Generation also carries a higher degree of operating leverage as a result of a higher level of fixed assets and more complex technology. On the production side capacity risk arises from unplanned outages, fuel costs and water availability. Further electricity generators are subject to risks from unplanned costs of asset retirement and construction of new generating facilities. Both DBRS and Ms. McShane agree that, as an industry sector, electricity generation is the most risky.[27]

3.5 BOND RATINGS AND CAPITAL STRUCTURES FOR CANADIAN UTILITIES

In this section we examine the bond ratings and capital structures, both actual and allowed for a sample of Canadian utilities. Our purpose is to develop benchmarks of capital structures for different segments of the industry. With these benchmarks in hand, we can then draw on our analysis of business risk above to recommend an appropriate equity ratio for OPG Hydro, OPG Nuclear and for OPG's total regulated rate base.

Beginning with bond ratings, Schedule 3.2 displays Dominion Bond Rating Service (DBRS) and Standard & Poor's (S&P) bond ratings in March 2008 for our

[27] Ontario Power Generation Inc., DBRS Rating Report, November 30, 2007, page 4 and Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, pages 77-78.

eight Canadian utilities and their regulated subsidiaries spanning different parts of the industry: gas, electric and pipelines. These companies represent a current sample of utilities with publicly traded shares. In forming this sample we seek to measure ratings and financial ratios for the traded entity associated with the regulated utility. In focusing on traded companies, our goal is to maintain sample consistency throughout our evidence. We recognize, however, that many of the traded companies include nonregulated businesses in addition to the regulated utility. We control for any bias by commenting on the differences as well as comparing our conclusions to those drawn strictly for regulated entities.

The bond ratings are from the websites of DBRS and S&P. Starting with the DBRS ratings, Schedule 3.2 shows that these range from A for Canadian Utilities, Enbridge, Newfoundland Power and TransCanada Corporation down to BBB (low) for Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated A (low) by DBRS. We next turn to the S&P ratings and make a similar comparison. The S&P ratings for the utilities in our sample range from A for Atco and Canadian Utilities down to BBB for Emera, Nova Scotia Power, Maritime Electric and TransAlta. S&P does not rate Pacific Northern Gas or the Fortis subsidiaries. The Schedule shows that the typical Canadian energy utility is rated A- by S&P.

The next step is to examine the actual, long-term capital structures of the companies in our sample for 2005 through 2007, the latest years for which data are available in the *Financial Post Advisor* and company annual reports. These ratios show common equity, long-term debt and preferred shares as percentages of long-term capital excluding short-term debt. Focusing on the 2007 common equity ratios, Schedule 3.3 reveals that there is considerable variation across companies from a high of 57.41% for TransAlta to a low of 31.75% for Atco. The average percentage of common equity was 41.92% in 2007 up slightly from 41.08% in 2005.

In addition, Schedule 3.3 shows the percentages of long-term debt and preferred shares (separated from common equity) in the capital structures of these companies. Again, there was considerable variation in the proportionate use of financing across companies. On average, the companies employed 54.41% long-term debt and 3.66% preferred shares in 2007.

The presentation of ratios for the same group of companies continues in Schedule 3.4. The first three columns show the coverage ratio, EBIT/Interest expense.[28] The average coverage ratio was 2.68X in 2007. The next three columns display cash flow to debt which averaged 21.43X in 2007.[29]

The schedules show that, from the vantage point of DBRS, Canadian Utilities, Enbridge, Newfoundland Power and TransCanada Corporation are the only companies which enjoy an A credit rating. The other companies are all rated A (low) or lower. For S&P, only two companies in our sample (Atco and Canadian Utilities) are rated A. As stated earlier, the typical company is rated on the borderline between A(low) and BBB (high) by DBRS and given a marginally higher A- rating by S&P for its smaller set of ratings. Of the eight traded companies and five subsidiaries in our sample, six received a rating of BBB from at least one of the agencies. Yet, despite their lower ratings, these companies have experienced no difficulties in accessing capital markets to raise long-term financing. This conclusion was not contradicted by Ms. McShane in her responses to Pollution Probe Interrogatory #54.[30] We conclude that the experiences of the companies in Schedules 3.2 - 3.4 suggest that a bond rating of BBB or higher is sufficient to maintain good access to capital markets.

[28] EBIT are earnings before interest and taxes.
[29] Cash flow from operations divided by the sum of long- and short-term debt. The result is expressed as a percentage.
[30] Ms. McShane's Response to Pollution Probe Interrogatory #54, EB-2007-0905, Exhibit L, Tab 12, Schedule 54, page 1 of 1.

Schedule 3.4 also contains data on ROEs for the companies in our sample which support our argument that a bond rating of BBB or above is sufficient for a regulated utility. The ROE figures for 2005 through 2007 show that all of the companies earned positive ROEs in all three years. Further, a 2001 study on the Canadian electric utility industry by DBRS concludes that actual earned ROEs typically exceed ROE targets set by regulators.[31]

In Schedule 3.4 we update this comparison for 2007 and broaden it beyond DBRS' focus on electric utilities to encompass our sample. The update shows that utilities continue to enjoy typical earned ROEs in excess of the target ROEs allowed by regulators. Turning to the details, we conduct our update for 7 of our eight sample companies for which we have data on allowed returns. For two companies, Atco and Fortis, we have allowed returns by divisions giving us a sample of 11 comparisons. The average 2007 allowed return for this sample was 8.75% while the average actual ROE for the consolidated company was 12.03%. The difference, 328 basis points represents the outperfomance of allowed returns. Further, only 1 of our 11 regulated companies failed to achieve an actual ROE higher than its allowed rate. This strongly suggests that having a bond rating of BBB did not impede these companies from profitably conducting their businesses.

3.6 COMMON EQUITY RATIO BENCHMARKS

Our discussion shows that the typical Canadian utility in our sample has a bond rating of A (low) from DBRS and A- from S&P. Further, a number of companies have BBB ratings. While OPG falls into this range with a bond rating of A (low) from DBRS and BBB+ from S&P, its bond rating is enhanced by the support it receives from the Province of Ontario. Further, ownership by the

[31] G. Lavalee, M. Kolodzie and W. Schroeder, The Canadian Electric Utility Industry, Dominion Bond Rating Service, November 2001, p. 49.

Province of Ontario impacts the goals of the company according to The Government Backgrounder (23 February, 2005) which stated:[32]

> "The Ontario government has established prices for electricity produced by Ontario Power Generation (OPG) effective April 1, 2005. These prices are designed to:
>
> a) Better reflect the true cost of producing electricity
>
> b) Ensure a reliable, sustainable and diverse supply of power in Ontario
>
> c) Protect Ontario's medium and large businesses by ensuring rates are stable and competitive
>
> d) Provide an incentive for OPG to contain costs and to maximize efficiencies
>
> e) Allow OPG to better service its debt while earning a rate of return that balances the needs of customers and ensures a fair return"

Under the stand-alone principle of regulation, we must set aside the impact of provincial ownership of OPG and assess a fair capital structure from the standpoint of an investor-owned utility of comparable risk. This standard is provided by our sample in Schedule 3.2. Our analysis establishes that the sample represents a group of companies which, with appropriate adjustments discussed below, can proxy for the risk that would be faced by OPG if it were investor owned. Mindful of the goals set by the province but emphasizing the stand-alone principle, we use this sample to establish an appropriate capital structure for OPG.

3.6.1 Sample Benchmarks

First, we turn to Schedule 3.3 where we observe that the average actual equity ratio for utilities in our sample was 41.92% for 2007, the most recent year for which we have data. This represents one useful benchmark for the equity

[32] Board Interrogatory #10.

ratio for a Canadian utility. Other benchmarks are helpful for two reasons. First, like any sample average, our average equity ratio depends on the sample drawn and can vary somewhat for this reason. Second, as we indicated earlier, the average is based on equity ratios for traded companies which include nonregulated activities which are likely to be more risky than regulated utilities.

As a check on our calculations we examine the equity ratios allowed by various Canadian regulatory bodies for the companies in our sample for which we obtained data from past decisions. The sample includes Atco Electric Transmission and Distribution, Atco Gas and Pipelines, Enbridge Gas Distribution, Emera (Nova Scotia Power), Fortis Alberta, Fortis British Columbia, Maritime Electric, Newfoundland Power, Pacific Northern Gas, TransAlta, and TransCanada Pipelines. In Schedule 3.6, we report the average allowed equity ratio for these 13 companies as 39.40%. The analysis in Schedule 3.5 reinforces our conclusion that the average "generous" equity ratio for our sample of electric and gas utilities is around 39%.

We call this average equity ratio "generous" because it represents the result of a regulatory process in which decisions by regulatory bodies take as input the views of opposing parties each representing its own interest. We already showed how the regulatory process may be regarded as generous as it almost always results in the regulated companies earning an ROE in excess of the allowed return. Focusing the discussion of generosity on the common equity ratio leads to a similar conclusion. Regulated utilities have little incentive to optimize the use of debt in their capital structures. Having a capital structure with insufficient debt increases the weighted cost of capital because equity is the most expensive form of financing. In the case of regulated utilities, this "extra" cost associated with insufficient debt may be recovered through the process of regulation. If the company can persuade its regulator to approve this unwarranted extra equity, there is no cost to the company from a higher cost of capital. If this occurs, then the regulated company has unused debt capacity which can be a benefit to the

parent holding company. The assets of the regulated utility can then serve as collateral to increase the borrowing power of the unregulated part of the holding company adding value for the shareholders. If this occurs, the shareholders gain unfairly at the expense of the customers of the regulated utility who have to pay higher rates to "compensate" the regulated utility for the cost of carrying unwarranted extra equity.

Returning to the discussion of benchmarks, we can develop another benchmark common equity ratio by focusing on one company from Schedule 3.5: ATCO Pipelines. We select ATCO Pipelines because it represents an example of a utility with greater business risk than a relevant set of comparison companies drawn from different segments of the utility industry in Alberta – the eleven utilities included in the AEUB's Generic Decision 2004-052. In that hearing, we recommended a common equity ratio for ATCO Pipelines of 40%, Ms. McShane recommended 50% and the Board awarded 43%. These numbers are drawn from Table 8 on page 35 of the Decision. We also identified AltaGas Distribution as a company with business risk well above the average and recommended an equity ratio of 40%. The Board awarded 41%. Based on these numbers and recalling our earlier discussion of "generosity" in past decisions, we regard 40 to 43% as an appropriate range for a higher risk utility.

We summarize our discussion of utility industry benchmark equity ratios as falling into a range of 39% to 43%. We form three estimates of the appropriate equity ratio for a utility. The first is 41.92% (Schedule 3.2) and represents the average of actual equity ratios for eight traded utility companies. The second estimate is the average equity ratio allowed 13 regulated entities within these companies by their regulatory boards of 39.40% (Schedule 3.5). The third estimate is the range allowed by the AEUB for two high-risk utilities of 40 to 43%. These benchmark equity ratios all fall in a range of 39% to 43%.

3.6.2 Relating the Benchmarks to OPG Hydro

In order to use benchmarks to set a recommended capital structure for OPG's two types of assets, it is necessary to draw on our earlier business risk analysis. Our analysis of the business risk faced by OPG Hydro assesses this risk as low to moderate – higher than that of a distribution utility and somewhat above the business risk of an integrated electric utility. This suggests that a fair common equity ratio for OPG Hydro should be at 40%, just below the middle of our range.

To explore the reasonableness of this conclusion, we reconsider our four benchmarks in turn. Our first benchmark, the average of actual equity ratios for 8 traded utilities is 41.92%. These companies are transmission, distribution or integrated utilities. However, because this measure also includes capital for unregulated activities which tend to be riskier than regulated businesses, we believe that it exceeds the appropriate level of equity for an average-risk utility. We confirm this view when we look next at our second benchmark of 39.40% which we regard as a generous measure of an appropriate capital structure. Given our view that OPG Hydro's level of business risk is above those of transmission, distribution and integrated utilities in our sample, our second benchmark indicates that a level of equity of no less than 39% is required.

We reinforce this view with our third benchmark of 40 to 43% equity allowed by the AEUB for high-risk Alberta utilities. Given, OPG Hydro's level of business risk, we believe that its target equity ratio should fall into this range.

Schedule 3.7 summarizes this discussion and restates our recommendation to set the common equity ratio for OPG Hydro at 40%.

3.6.3 Relating the Benchmarks to OPG Nuclear

We take a similar approach in reaching a recommendation for the equity ratio for OPG Nuclear. As we discuss above and summarize in Schedule 3.7, OPG's nuclear assets carry higher levels of operational risk compared to its hydro assets. Further, regulatory risk associated with environmental and safety issues are also elevated compared to that of OPG Hydro. Our analysis rates the business risk of OPG's regulated nuclear assets as moderate (2.3 on our 5 point scale).

Schedule 3.7 shows that this business risk rating for OPG Nuclear exceeds the rating for OPG Hydro (1.8). It also signals that OPG Nuclear bears higher business risk than generic integrated companies (rated 1.5) or generic distribution utilities rated (1.4). The higher business risk of OPG Nuclear should translate into a significant increase in its common equity ratio on the order of 5-10% over that for OPG Hydro producing a recommended equity ratio for OPG Nuclear of 45 to 50%. In the interests of conservatism and to ensure fairness to the shareholder, we recommend the higher number of 50% for the equity ratio.

3.6.4 Recommended Capital Structure for OPG's Overall Rate Base

In order to achieve an overall recommended capital structure for OPG's rate base we calculate a weighted average of our individual capital structures using the asset breakdown in the Electricity Restructuring Act of Ontario of 2004 which set OPG's prices for electricity for 6,606 MW from regulated nuclear generation and 3,332 MW for hydro generation. These two sources total 9,938 MW of which 66.47% is nuclear and 33.53% hydro. Applying these weights to our two separate capital structure recommendations results in an overall rounded

recommended equity ratio of 47% for OPG's rate base.[33] We summarize our analysis in Schedule 3.7.

3.6.5 Capital Structure Impact of Fixed Charge for Nuclear Assets

As stated earlier, the analysis on which we predicate our recommended capital structure assumes that the Board grants OPG's request for a 25% fixed charge for nuclear assets. Should the Board deny this request the impact would be to reduce risk mitigation. In our framework, this falls under the deferral account category in the OPG Nuclear column Schedule 3.1. Under the scenario in which the Board disallowed OPG's request for a 25% fixed charge, business risk would be increased raising the rating for this category from Low (1) to Moderate (3). As a result the overall business risk ranking for OPG Nuclear would increase to 2.6. Although this ranking is still within the moderate range, we would move our capital structure for OPG Nuclear from 50 to at most 53% to reflect the increase in risk. Using our weighted average approach, the result would be to increase the recommended common equity ratio for OPG's regulated assets to 49%.[34]

3.6.6 Projected Coverage Ratios

Our recommendation for OPG's overall capital structure flows from our analysis of the business risks of its two types of assets as well as from our review of appropriate industry benchmarks. Those benchmarks include bond ratings and we concluded above that a rating of BBB would be sufficient to allow a stand-

[33] In her Response to Pollution Probe Interrogatory #2, Ms. McShane uses different weights: 45% nuclear and 55% hydro based on her analysis of the 2009 forecast rate base. Repeating our calculations with her weights produces a lower overall rounded equity ratio of 45%. We use the higher weight of nuclear assets from the 2004 Act so that our weighted estimate will capture any possible future increase in the percentage of nuclear assets.

[34] Reworking the overall cost of capital for the rate base for 2008 using the increased common equity ratio, shows that the cost of capital would increase by 3 basis points from 6.39% (from Schedule 3.8) to 6.42%. For 2009, the overall cost of capital for the rate base would increase by 2 basis points from 6.55% (from Schedule 3.8) to 6.57%.

alone utility to conduct its business properly and to access capital markets. To show that our recommendation of 47% equity for the rate base is not incompatible with a BBB rating, we calculate the implied coverage ratios for 2008 and 2009 in Schedule 3.8.

To illustrate, we explain our calculations for 2008 in detail. We start with the rate base of $7,400.8 M from Table 3 from EB-2007-0905, Exhibit C1, Tab 2, Schedule 1, Updated 2008-03-14. We also use OPG's estimate of the cost of total debt for 2008 at 5.76%. We fill in our estimate of the fair return on equity from Section 4 of this evidence as 7.10% for 2008. Next we enter our recommended capital structure of 47% common equity and 53% debt. Finally, we use these numbers to calculate the allowed cost of capital for debt and equity. Summing these two amounts, we compute the total allowed cost of capital for the rate base as $472.9M.

To obtain a projected coverage ratio for the rate base, we divide the total allowed cost of capital (allowed earnings on rate base) of $472.9M by the total cost of debt of $225.9M to obtain a projected coverage ratio for rate base of 2.1X. For 2009, we perform a similar set of calculations replacing the inputs we used from Table 3 for 2008 with a similar set of inputs from Table 2 for 2009. We use the same capital structure for 2009 and set the cost of common equity at 7.25% as recommended in Section 4 of this evidence. As Schedule 3.8 shows, the projected coverage ratio for 2009 is 2.1X, the same as for 2008.

In brief, the analysis in Schedule 3.8 shows that our recommended capital structure implies an interest coverage ratio of 2.1X for OPG's rate base. We compare this projected coverage ratio against the actual coverage ratios for traded utilities in our sample. Schedule 3.1 reveals that 4 traded companies in our sample are rated BBB by at least one rating agency: Emera Inc., Fortis Inc., Pacific Northern Gas and TransAlta. In Schedule 3.3 shows that the 2007

coverage ratios for these four companies were 2.91 (Emera), 1.70 (Fortis Inc.), 2.10 (Pacific Northern Gas) and 3.17 (TransAlta).

Comparing these ratios to our projection for OPG's rate base, we conclude that the projected coverage ratio for OPG of 2.1X falls into the middle of the range of observed coverage ratios for these 4 BBB rated companies. As far as it goes, this comparison suggests that there is no reason to believe that OPG as a stand-alone company with our recommended 47% common equity in its capital structure could not achieve a BBB bond rating. We qualify this conclusion by noting that rating agencies consider other factors in addition to coverage ratios in setting ratings. A further qualification arises from our discussion in Section 2 of the shortcomings of bond ratings as a timely measure of risk.

4. RATE OF RETURN ON COMMON EQUITY FOR 2008 AND 2009 TEST YEARS

4.1 OVERVIEW OF THIS SECTION

In this section, we begin with a discussion of the general regulatory principles that are appropriate in conducting our fair rate of return analysis. As discussed in Section 1 of our evidence, our general approach is to determine the appropriate return on equity for a utility of average investment risk (henceforth referred to as the "average-risk utility"), and then to determine a capital structure for the applicant utility (OPG) that accounts for any difference in its business risk from this hypothetical benchmark average-risk utility.

After discussing general regulatory principles, we discuss the two main methodologies for estimating a forward-looking market equity risk premium or MERP. They are *ex post* measurement methodologies that generate a "historical or *ex post* MERP" that leads to the generation of an "*ex ante* MERP", and the *ex ante* methodology that generates an "*ex ante* MERP." Based on the merits of the various estimation methods used under each of these methodologies, we recommend that four of these estimation methods have sufficient validity to be used in our determination of the MERP and/or market return in a forward-looking sense. We then present our implementation of each of these four estimation methods to arrive at an appropriate return on equity (henceforth ROE) for OPG for the 2008 and 2009 test years.

4.1.1 Methods to Estimate the Market Equity Risk Premium (MERP)

The first estimation method is the Equity Risk Premium Estimation Method that generates an *ex ante* MERP estimate from an examination of the historical (*ex post)* MERP and expected future economic and market conditions. To this end, we estimate the required MERP for Canadian equities based on historical estimates for Canada and the U.S., and survey recent evidence that suggests that previously estimates using realized returns as a proxy for expected returns

have produced an upwardly biased estimate of the required MERP. We argue using finance theory that most of the fundamental changes in the Canadian market imply that the MERP has decreased and will remain below that achieved over historical periods that exceed 50 years. We explain why some have argued that the MERP can be low, nil or negative given that the difference between the higher risk (standard deviation of returns) of equities compared to the lower risk of bonds and cash over short holding periods of one year decreases over longer holding periods of ten to twenty years. The conclusion that we draw from this estimation method is that a forward-looking MERP for Canada is no more than 5% after allowing for the estimation error contained in the estimates generated by this estimation method.

The second estimation method also generates an *ex ante* MERP estimate that is based on "historical or *ex post* MERP" estimates using a literature survey method. Based on the forward-looking MERP estimates that follow from this survey of the literature, we again conclude that our MERP estimate from the first estimation method is reasonable, if not conservatively high.

The third estimation method generates an *ex ante* MERP using the Discounted Cash Flow (DCF) Estimation Method. This approach is commonly implemented at the market level using a Dividend Discount Model (DDM) where future estimates of dividend growth rates as proxied by expected growth rates of nominal GDP are used to obtain an alternate estimate of the MERP. For this purpose, we rely on the forecasts from the same survey of investment professionals that is commonly used by Canadian regulators as a basis for their forward-looking yield forecasts for 30-year Canada's; namely, *Consensus Forecasts* published by Consensus Economics. We use our estimates from the DDM to determine what adjustment (if any) is required to our forward-looking MERP estimate from our first estimation method. Based on the estimates from this method, we conclude that our MERP estimate from the first method is reasonable, if not conservatively high.

The fourth estimation method also generates an *ex ante* MERP estimate using survey methods. The surveys are of large and representative samples of investment professionals about their expectations of future returns on the Canadian and U.S. equity and fixed-income markets. These surveys are conducted by reputable consultants (Mercer and Watson Wyatt) of large and representative samples of investment professionals, much like those used by Consensus Economics in its publication *Consensus Forecasts*. Since these samples include representation from both the sell and buy sides of the market and are not expectations for specific companies, we are confident that they do not contain the optimism bias that has been documented in the literature for the earnings expectations of (bottom-up) financial analysts for individual firms. Based on the forward-looking MERP estimates from these surveys, we again conclude that our MERP estimate from the first estimation method is reasonable, if not conservatively high.

4.1.2 Adjusting for Risk Differences between an Average-risk Utility and the Market Proxy used for the MERP Estimate

It is commonly accepted that an average-risk utility is less risky than the market proxy used to obtain the MERP estimate. The debate centers on how much less and what is (are) appropriate method(s) for the determination of how much less risky an average-risk utility is. The premium (or additional return) that equity investors require to bear the investment risk of this average-risk utility is commonly referred to as the own equity risk premium or own ERP for an average-risk utility.

We use two methods for estimating the risk of an average-risk utility relative to the risk of the market proxy used to obtain the MERP estimate. In the first estimation method, we invoke the implicit assumption behind most of the commonly formulated asset pricing models, such as the Capital Asset Pricing Model (CAPM) or Arbitrage Pricing Model (APM), which is that investors are only

compensated for non-diversifiable risk. In these models, the risk of a specific firm relative to the risk of a systematic factor, such as the market factor as proxied by a market index in the case of the CAPM, is given by the estimated regression coefficient (commonly referred to as its "beta") on the market factor when the returns on the specific utility are regressed against the returns on the market factor over some estimation period (generally 60 months).

Using the first method, we estimate the relative investment riskiness of our average-risk utility as being its beta of 0.5, and show that the betas of utilities (and their return correlations with the market proxy) have increased somewhat during the past three years after decreasing over the 1990-98 period. We then demonstrate that the two primary rationales that have been given for using the adjusted- or inflated-beta method when calculating the ROE are not valid.

In the second risk estimation method, we invoke the highly unlikely assumption that investors are compensated for total risk including the part that they can diversify away by holding portfolios that contain two or more financial assets. We find that the relative total riskiness of utilities is less than 50% of the mean total riskiness of various benchmarks consisting of 39 to 47 industries. Thus, even if investors require additional compensation for bearing risk that they can diversify away, we find no contradictory evidence to the relative-risk estimate of 0.50 for an average-risk utility.

4.1.3 Determination of the "Bare-bones" Cost of Equity for an Average-risk Utility

The "bare-bones" ROE is equal to the estimate of the premium (or additional return) that investors (owners) require to bear the risk equivalent to an equity investment in an applicant utility of average risk plus an estimate of the risk-free rate. When we multiply our estimate of the MERP of 5.00% by our estimate of the

relative investment riskiness of our average-risk utility of 0.50, we obtain our estimate of the own ERP for our average-risk utility of 2.50%.

For the estimate of the risk-free rate for each test year, we use the estimates for the yields on 30-year Canada's of 3.85% and 4.25% for 2008 and for 2009, respectively, which were determined earlier in Section 2. These estimates conform to the common practice of estimating a risk-free rate at Canadian regulatory proceedings and Canadian automatic ROE adjustment mechanisms. Specifically, our estimates are based on consensus forecasts from *Consensus Forecasts* (published by Consensus Economics) along with an estimate of the appropriate term premium for 30-year versus 10-year Canada's.

Adding our estimate of the own ERP for an average-risk utility to each of our risk-free forward-looking forecasts yields "bare-bones" costs of equity estimates of 6.35% and 6.75% for 2008 and 2009, respectively.

4.1.4 Determination of the "All-in" Cost of Equity for an Average-risk Utility

Based on the "stand-alone" principle, we add 10 basis points to the "bare bones" cost to compensate the applicant utility (OPG) for potential equity flotation or issuance costs even if it will never incur such costs. Given that it is common regulatory practice in Canada, we add a financial flexibility premium of 40 basis points to further ensure the financial flexibility of OPG for both test years, and a further 25 basis points for the 2008 test year to protect the financial integrity of OPG against any adverse impacts from the possibility of additional turmoil in the capital markets and the economy. This is based on our expectation that capital market conditions will normalize in 2009, as was explained in Section 2.

Putting all the parts together, we end this section of our evidence with our ROE recommendation for an average-risk utility of 7.10% and 7.25% for the 2008 and 2009 test years. Our ROE recommendation allows an average-risk utility to earn a risk premium (including the flotation cost and financial flexibility and

integrity adjustments) of 325 and 300 basis points over our forecast for long Canada yields of 3.85% and 4.25% for the 2008 and 2009 test years.

4.2 DISCUSSION OF GENERAL PRINCIPLES

According to the fair or reasonable return standard, the allowed return on capital should:

- be comparable to the risk-adjusted return available from the re-allocation of the investment to other enterprises in a competitive (non-monopolistic) environment (the "comparable investment" standard);[35]
- enable the regulated enterprise to maintain its financial integrity by being able to meet its financial obligations (the "financial integrity" standard); and
- allow the regulated enterprise to attract incremental capital on reasonable terms and conditions (the "capital attraction" or "financial flexibility" standard).

The shareholders' (owners') interests must be balanced with the interests of the customers who are entitled to safe and reliable service at reasonable rates.

In preparing our testimony, we identified and evaluated the scientific merit of various techniques that are commonly used for measuring the fair rate of return on equity both before the Board and in other jurisdictions. For this purpose, we used the four Daubert criteria for evaluating the admissibility (scientific merit) of expert testimony that has been adopted by federal and many state courts in the U.S. They are: (1) whether the methods upon which the testimony is based are centered upon a testable hypothesis; (2) the known or potential rate of error associated with the method; (3) whether the method has been subject to peer

[35] In financial economics, the first standard for judging the performance of primary or secondary markets is referred to as "allocational efficiency". It is tested by examining whether investments of similar risk offer their investors or owners similar expected returns, and whether investments of higher (lower) risk offer their investors or owners higher (or lower) expected returns. One of the earliest applications of this concept is: Irwin Friend, The SEC, and the economic performance of securities markets, *Conference on Economic Policy and the Regulation of Corporate Securities,* George Washington University, March 1968.

review and publication; and (4) whether the method is generally accepted in the relevant scientific community, particularly in terms of the non-judicial uses to which the scientific techniques are put.[36]

We have based our conclusions regarding the fair rate of return on common equity or ROE primarily on the Equity Risk Premium Estimation Method. Although we consider the DCF Estimation Method to be generally inferior to the Equity Risk Premium Estimation Method, we use the DCF Estimation Method at the market level to provide additional estimates of MERP using both historical and forward-looking estimates of share price or dividend growth. We use these estimates as further inputs for judging the reasonableness of our estimates of the implied MERP using the Equity Risk Premium Estimation Method. Section 6 includes a detailed discussion of why the DCF Estimation Method as commonly employed in the regulatory setting at the firm and industry levels is deemed to be inferior to the ERP Estimation Method, and why the DCF Estimation Method is best applied at the market and not individual firm or industry levels. Similarly, we use survey reviews of peer-reviewed and published articles that estimate MERPs or equity costs, and surveys of investment professionals as further inputs for judging the reasonableness of our estimates of the implied MERP using the Equity Risk Premium Estimation Method.

We do not employ the Comparable Earnings Estimation Method because we believe that it is of dubious scientific merit (using, for example, the Daubert criteria) and thus unsuitable for use in determining a fair ROE for a utility.[37] Section 6 of our evidence includes a detailed discussion of this point.

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[36] For a more extensive discussion of this U.S. Supreme court decision, see, for example: Stephen Mahle, The Impact of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, on Expert Testimony: With Applications to Securities Litigation, April 1999. Available at: http://www.daubertexpert.com/basics_daubert-v-merrell-dow.html.

[37] In testimony before the Public Utilities Board of the Northwest Territories, Ms. McShane has acknowledged that "… a number of regulatory boards in the United States give no weight to the comparable earnings test" (The Public Utilities Board of the Northwest Territories, Board Decision 1-91, page 42. As detailed further in section 6 of our evidence, this is also the case in Canada.

4.3 THE DETERMINATION OF THE REQUIRED RETURN (COST OF EQUITY CAPITAL) FOR AN AVERAGE-RISK UTILITY

We use various methods to estimate the components of the required return (or alternately the cost of equity capital) for utility companies based on the other publicly traded investment opportunities that are available to their owners. The resulting estimate is the risk-adjusted "opportunity cost" for investing in the shares of an average-risk utility. In an allocationally efficient market, this risk-adjusted equity return (or cost) should be comparable using marked-to-market returns across firms.

Our methodology for estimating the required ROE for an average-risk utility uses an explicit or implicit combination of the following inputs as sequenced:

1. a forward-looking risk premium for the S&P/TSX Composite (our domestically diversified market proxy) (input #1);
2. a forward-looking forecast of the investment riskiness of an average-risk utility relative to the market portfolio as proxied by the S&P/TSX Composite or relative to other Canadian industries (input #2);
3. the yield forecasted for 2008 and 2009 for 30-year Canada's (input #3); and
4. an adjustment to cover fees involved with potential equity offerings or issues by an average-risk utility and to ensure its financial flexibility and integrity (input #4).

These four input estimates are subsequently estimated and combined as follows:

[(Input #1) *x* (Input #2)] + (Input #3) + (Input #4) = recommended rate of return on equity or ROE for an average-risk utility.

We now need to detail how we obtained the final estimates of each of the four inputs, and to present the recommended rates of return on equity for an average-risk utility that result from a combination of the final estimates of the four inputs.

4.3.1 Obtaining the Market Equity Risk Premium (MERP) Estimate (Input #1)

As discussed in the overview to this section of our evidence, we use four methods to estimate the market equity risk premium (MERP). We put primary reliance on the first method, and use the estimates from the other three estimation methods to determine if the estimate from the first method should be adjusted.

The MERP reflects equity investors' assessment of the expected (or required) return differential from investing in a portfolio that reflects available investment opportunities as compared to investing in the "risk-free" benchmark security. It indicates the total incremental return that equity investors require for bearing the risk of equities relative to investing in a risk-free benchmark security. In Canada, the S&P/TSX Composite Index is usually chosen as being representative of the equity opportunities that are publicly available for investment. This portfolio is well diversified in a relative sense only when viewed from a domestic-only investment perspective. The equity risk premium occurs because risk-averse investors require a positive reward for bearing each unit of risk, and equities exhibit varying degrees of risk. The reward required for bearing each unit of risk increases as investors become less risk tolerant, and decreases as investors become more risk tolerant. The MERP is the total compensation that investors require to bear the total risk of the chosen market proxy.

4.3.1.1 MERP Estimate: Based on Historical MERPs (First Estimation Method)

As noted earlier, the first estimation method generates an *ex ante* MERP estimate that is based on an examination of "historical or *ex post* MERPs". Because the forward-looking or *ex ante* risk premium is difficult to observe and depends on future estimates that are subject to considerable error and bias depending upon the source, cost of equity studies typically place a heavy weight on measurement of historical or *ex post* risk premiums.

4.3.1.1.1 Measurement errors caused by divergence between realized and expected returns

There are several potential sources of measurement error when the MERP estimates generated from the first estimation method are used as forward-looking estimates.

The first source relates to the occurrence of negative risk premiums. The expected MERP measures the expected return differential of a well-diversified but risky portfolio of equities over risk-free government securities. Since investors are risk averse, they would not invest in equities unless they expected the MERP to be non-negative. However, since realizations can differ from rational expectations, the historical or realized MERP can be negative for any given period of time. To illustrate, the total return (i.e., dividend yield plus investment value change) for the S&P/TSX Composite for 1990 was minus 14.80%. This results in a negative MERP for 1990 when the risk premium is calculated using the return on 30-year Canada's of 3.34%. This negative MERP was not a good proxy of the MERP expectation of equity investors at the beginning of 1990. As of January 2, 1990, those investors holding equities must have expected that equities would outperform 30-year Canada's over the year. Similarly, investors holding equities must not have expected the negative total returns achieved by the S&P/TSX Composite in 1992, 1994, 1998, 2001 and 2002.

To address this potential difficulty with historical data, return on equity studies generally employ periods of at least ten years so that the realized MERP is positive. Also, the difference between the average realized and the average expected MERP should diminish, as the measurement period gets longer if the underlying return distribution is normal and remains unchanged over this longer measurement period. This is commonly referred to as returns being IID normal, or independently and identically and normally distributed, in that they have the same normal distribution at each point in time and returns are independent (not related) over time. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (**not** sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion in stock market prices at longer horizons. For example, Campbell and Viceira (2005, p. 39) find that:[38]

> "At very long horizons, holding long-term nominal bonds is even riskier than holding stocks. At horizons of up to 30 years, stocks are still riskier than bills and bonds but the relative magnitude of these risks changes with the investment horizon."

This means that due to fundamental shifts in economies and/or markets (technically, referred to as regime shifts), the use of too distant time periods may result in the inclusion of time periods that are no longer representative of currently possible market returns and/or market risk premiums in a forward-looking sense. Fundamental changes have occurred over time in the level of market integration across international markets, the level of market frictions (particularly, trade costs), and so forth. For example, much of the impact of the globalization of economies and financial markets, and of financial innovations has occurred over the past 30 to 40 years.

[38] John Y. Campbell and Luis M. Viceira, 2005. The term structure of the risk-return trade-off, *Financial Analysts Journal* 61:1 (January-February), pages 34-44.

A second source of measurement error arises when returns are not IID (i.e., independently and identically distributed) since both the market risk and its equity risk premium then are time-varying. *Ceteris paribus* (everything else held equal), the MERP will change over time, and can change drastically with changes in the risk-free rate, risk tolerance of the representative investor, and the set of available investment opportunities. For example, the set of available investment opportunities has expanded significantly since the 1960's due to the astonishing variety of new risk management securities introduced in the 1980's and 1990's.[39]

A third source of measurement error arises because periods with a declining required MERP are likely to coincide with temporarily increased realized MERPs. Peter A. Diamond, Institute Professor at M.I.T., states this as follows for the U.S. market:[40]

> "It is important to recognize that a period with a declining required equity premium is likely to have a temporary increase in the realized equity premium. This divergence occurs because a greater willingness to hold stocks, relative to bonds, tends to increase the price of stocks. Such a price rise may yield a higher return than the required return. For example, the high realized equity premium since World War II may be in part a result of the decline in the required equity premium. Therefore, it would be a mistake during the transition period to extrapolate what may be a temporarily high realized return."

A fourth source of measurement error arises because the reliability and comparability of the chosen proxy of the market or the risk-free rate varies considerably over time. To illustrate, most experts use the Canadian stock and

[39] For example, see Merton Miller, Financial innovation: Achievements and prospects, pages 385-392, In: Donald H. Chew, Jr. (Ed.), *The new corporate finance* (New York: McGraw-Hill Irwin, third edition, 2001).
[40] Peter A. Diamond, What stock market returns to expect for the future?, *An Issue in Brief*, Centre for Retirement Research at Boston College, No. 2, September 1999, page 2.

Long Canada return series available from the Canadian Institute of Actuaries (CIA) for the period from 1924 onwards. Thus, while the S&P/TSX Composite Total Return Index is used from December 1956, other proxies that are more likely to be contaminated by survivorship and selection biases are used from 1924 to 1957. Similarly, S&P's U.S. dividend yields reported in Ibbotson and Sinquefield (1977) are used for Canada for the period January 1926-December 1933, after adjusting for the 0.17% difference between the S&P and TSX dividend yield index over the period January 1956-December 1965. While the long-term bond series is for bonds with a term-to-maturity of over ten years, the actual average maturity is less than 30 years, and varies over time. Given a positive realized term premium, this results in realized risk premiums that are somewhat too high.

4.3.1.1.2 Based on nominal or real returns

It is preferable to use real returns to estimate the MERP when using historical data, although many experts use nominal returns.[41] The use of real returns is more appropriate for low inflation regimes, such as the present one, because MERP estimates that include high inflation periods include an additional risk premium that grows with the rate of inflation to compensate investors for a loss in the purchasing power of the risk premium.

4.3.1.1.3 The appropriate average of historical annual data

When it is preferable to use the arithmetic or the geometric average historical MERP is discussed more fully in Appendix 4.A. We begin with the observation that the use of the geometric average or some weighted-average of the arithmetic and geometric averages is becoming conventional wisdom. However,

[41] Dr. Booth (1999) identifies the existence of a risk-free rate bias, inflation rate bias and term premium bias in estimating MERPs. He suggests that the MERP forecast should be based on the real equity return combined with the current inflation expectation to minimize such biases. Laurence Booth, 1999, Estimating the equity risk premium and equity costs: New ways of looking at old data, *Journal of Applied Corporate Finance* 12: 1, pages 100-112.

we formulate our recommended MERP by placing no weight on the geometric average.

The arithmetic average is preferred for forward-looking decisions when historical returns are normal IID or independently and identically distributed over the estimation period. As is discussed later, the normal IID assumption is not appropriate for asset returns for investors that have longer term horizons (so-called buy-and-hold investors).

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when the length of the investment horizon exceeds the return measurement interval, and the weight given to the geometric mean in any such weighted average increases as the investment horizon becomes longer. Similarly, the geometric mean or some weighted-average of the geometric and arithmetic mean is preferred when returns are not normal IID due to, for example, long-run mean reversion in the returns for some asset classes, as has been found for stocks, and long-run mean aversion in the returns for other asset classes, as has been found for bonds. Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for 30-year Canada's in rate of return regulation).[42]

Dr. Buckley summarizes the debate on this issue as follows:[43]

> "Particularly important in estimating the equity risk premium is whether excess returns are measured using a geometric or an arithmetic mean return. To a significant extent, this question revolves around mean reversion in stock returns. Evidence of mean reversion is substantial, although it cannot be

[42] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, page 46.
[43] A. Buckley, *The European Journal of Finance* 5: 3 (September 1999), pages 165-180.

proved unequivocally. Given the weight of evidence of mean reversion, there may be a strong case for the use of a geometric mean with an equity premium of between 3% and 5% - or even less."

Dr. John Campbell at a 2001 *Equity Risk Forum* has aptly stated the argument for a weighted average of the two types of means as follows:[44]

"Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.

I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

Drs. Mehra and Prescott, who are the authors who first identified the equity premium puzzle, note that they reported arithmetic averages, since the best available evidence at that point in time indicated that (multi-year) stock returns were uncorrelated over time.[45] They now acknowledge that the arithmetic average can lead to misleading estimates when returns are serially correlated, and that the geometric average may be the more appropriate statistic to use. Drs.

[44] John Campbell, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, page 45.
[45] Rajnish Mehra and Edward C. Prescott, The Equity Premium in Retrospect, forthcoming: G.M. Constantinides, M. Harris and R. Stulz, *Handbook of the Economics of Finance* (Amsterdam: North Holland). Draft of their paper, February 2003.

Mehra and Prescott (p. 57) note that stock returns have been found to be mean reverting.

Furthermore, corporate practice among the leading U.S. corporate entities is to use the geometric mean if a long-term risk-free rate is used (such as long Treasuries) and to use the arithmetic mean if a short-term risk-free rate is used (such as T-Bills). Specifically, the teaching note to the case study, Grand Metropolitan PLC, states:[46]

> "In practice, two combinations of risk-free rates and equity-risk premiums are seen: (1) long-term risk-free rates plus geometric means or (2) short-term risk-free rates plus arithmetic means. Nothing in the theory of the CAPM dictates the use of these parameters; they are artifacts of practice. A recent survey of leading American corporations and financial institutions suggests greater use of the geometric-mean/long-term risk-free rate approach."

While tests for autocorrelation in annual returns are of interest to momentum traders and short-term speculators, they are not relevant to the longer-term investors that invest in utilities. To test how the relative risk of equities and bonds change as the investment horizons of investors get longer, we apply a formal test for mean reversion/aversion, the variance ratio test, to these two asset classes in Canada.

We calculate the variance ratios for holding periods of 5, 10 and 15 years relative to a benchmark holding period of 1 year for stocks, long bonds and risk premiums for Canada. The Canada data are annual from the Canadian Institute of Actuaries (CIA) for the period 1924-2007. The results are reported in Schedule 4.1 and depicted in Schedule 4.2.

[46] The referenced study is: R. F. Bruner, K.M. Eades, R.S. Harris and R. Higgins, 1998, Best practices in estimating the cost of capital: Survey and synthesis, *Financial Practice and Education* (Spring/Summer).

From Schedule 4.2, it is apparent that:

- Equity returns exhibit mean reversion and bond returns exhibit mean aversion in Canada as the investment horizon increases from 1 to 5 to 10 to 15 years; and
- The extent of mean reversion in equity returns and mean aversion in bond returns is more pronounced for the most recent 50 years than for the full time horizon ending with 2007 for Canada.

From these results, we conclude that the use of the arithmetic mean MERP results in an overstatement of the prospective MERP, and that the use of the geometric mean MERP results in an understatement of the prospective MERP. This is likely to be the reason why different groups of professionals use one or the other type of mean in their forward-looking analyses. Many financial economists, especially those associated with buy-side investment entities, have historically used the arithmetic mean MERP. As noted earlier, well-run corporations typically use the arithmetic mean MERP with the T-Bill rate as the risk-free proxy, and the geometric mean MERP with a long Treasury as the risk-free proxy. Although a blended average that consists of 75% of the arithmetic mean and 25% of the geometric mean MERP is preferable, we do not rely on such a blended average or on the geometric mean MERP when subsequently formulating our MERP recommendation. The reason is to further ensure that our MERP recommendation is conservatively high.

4.3.1.1.4 Measured over what time period

For purely statistical reasons, the error in the MERP estimate will decrease (that is, the estimate will become more precise) with longer evaluation periods if returns are IID. However, the statistical niceties of using the longest time period must be balanced against other criteria. First, it is desirable that the chosen time

period have data that are reasonably reliable and are for a somewhat comparable proxy of available market investment opportunities over its duration. Second, it is desirable that the chosen time period be a reasonable match for the regimes that can be expected to be possible in the future.

No time period completely satisfies these criteria. To illustrate using the comparable proxy criterion, the time period since 1956 had reliable data for a comparable market proxy (the S&P/TSX Composite Index) until the two-phase inclusion of income trusts in the S&P/TSX Composite Index in 2005 and 2006. The available Canadian equity market data prior to 1956 are usually obtained by splicing together series for equity portfolios with inconsistent formation characteristics. Because of the existence of interest rate controls and the absence of a Canadian money market to price fixed income securities, the data on fixed income securities are also of poor quality prior to 1956. Furthermore, while the period of time since 1956 incorporates much of the impact of globalization, financial market innovation and trade cost competition on the expected returns for equities and bonds, it does not include regimes that occurred prior to 1956 that are not very likely but are still possible in the future.

4.3.1.1.5 Initial examination of Canadian MERP based on historical data using first estimation method

We begin with an examination of the 57-year time period of 1951-2007 because, although it does not satisfy the longevity criterion, it is based on a time period that is likely to represent the types of regimes and regime shifts most probable to occur in the future and it is not contaminated by the first few years of rapid economic and equity market exuberance resulting from the satisfaction of pent-up consumer demand and very low administered interest rates after World War II. We then examine three shorter periods, 1957-2007, 1965-2007 and 1977-2007, and three longer time periods, 1936-2007, 1924-2007 and 1900-2007. The

examination of the longer periods is required to capture some of the regimes that are not captured in the 1951-2007 time period but have a small chance of occurring in the future. Based on the results reported in Schedule 4.3, the arithmetic annual nominal MERP for the 57-year period of 1951-2006 is 4.52% based on nominal returns, and 4.34%, respectively, based on real returns. The arithmetic average annual MERP based on nominal returns is lower at 3.14%,2.41% and 2.66% for the three shorter time periods, 1957-2007, 1965-2007 and 1977-2007, respectively, and is higher at 5.17%, 5.19% and 5.76% for the three progressively longer time periods, 1936-2007, 1924-2007 and 1900-2007, respectively. The corresponding arithmetic average annual MERP are lower using real returns. To illustrate, the arithmetic average annual MERP for the longest time period drops from 5.76% to 5.02% when we move from nominal to real returns. The major observation that we draw from this analysis is that the MERP has been declining in Canada over time, and that using the historical MERP over the longest available time period as a going-forward MERP estimate is not appropriate.

4.3.1.1.6 Non-Canadian MERP based on historical data using first estimation method

There is some limited value in examining the U.S. or international experience. First, foreign-exchange and risk-adjusted returns become approximately equal across various world markets as markets become more integrated. This is referred to as the “law of one price”. Second, examining other markets provides an imprecise test of how reasonable the Canadian estimates of the MERP are. However, one must be careful not to introduce an *ex post* selection bias when selecting which other market(s) to examine. Choosing the market that has grown to be the largest market or has had an above-average *ex post* performance introduces an *ex post* selection bias. This happens to some extent when the U.S. equity market is chosen for this purpose. We address this issue further in a subsequent part of our evidence.

MERP estimates for the U.S. are commonly based on data from Ibbotson & Associates for the period 1926-2006. Dimson *et al.* use the data series developed by Drs. Wilson and Jones in the data series that they assembled for the 1900-2002 period.[47] The Dimson *et al.* data series are available from Ibbotson Associates, and is referred to as the DMS-Ibbotson data set.

The estimates using the two Ibbotson data sets are summarized in Schedule 4.4. The arithmetic mean MERP for the longest time periods for each data set are 6.47% (nominal returns) and 6.10% (real returns) for the longer DMS-Ibbotson data set time period of 1900-2007 and 6.42% (nominal returns) and 6.18% (real returns) for the shorter Ibbotson data set time period of 1926-2006. While the arithmetic mean MERP is 6.28% (nominal) and 6.12% (real) for the 1951-2007 period, they are less than 5.0% for the three time periods equal to 51 years or less. As noted by Dr. Schwert, any MERP estimates that incorporate stock returns during the Great Depression period are suspect since stock market volatility was abnormally high during this period.[48]

To obtain a forward-looking U.S. MERP from these estimates that can be used in arriving at a recommended forward-looking Canadian MERP, one needs to adjust for the higher risk of the U.S. market, the upward bias caused by unsustainable upward equity revaluations primarily over the more recent time periods,[49] the 1% reduction estimated by Dr. Jones from the reduction of trade costs over the last 100-plus-years, and about a 20 basis point increase due to bond investors obtaining less than they expected. Doing such would reduce the

[47] J.W. Wilson and C. P. Jones, 2002. An analysis of the S&P 500 index and Cowles extensions: Price indexes and stock returns, 1870-1999, *Journal of Business* 75: 3 (July), pages 505-533.
[48] G.W. Schwert, 1990. Indexes of United States stock prices from 1802 to 1987, *Journal of Business*, 63: 3 (July), pages 399–426. The market volatility results are reported in G.W. Schwert, 1989. Why does stock market volatility change over time?" *Journal of Finance*, 44: 5 (December), pages 1115–54.
[49] To illustrate, the removal of equity revaluations over the 103-year period (1900-2002) studied by Drs. Dimson et al reduces the arithmetic mean MERPs for the U.S. and Canadian markets from 6.4% and 5.5%, respectively, to 5.5% and 4.9%, respectively.

forward-looking U.S. MERP to around 5%. In addition, Drs. He and Kryzanowski find that the U.S. market does not make a statistically significant contribution to explaining the portion of the return of Canadian utilities that is not explained by the Canadian market.[50]

Furthermore, we find that the arithmetic mean MERP for the world index of Drs. Dimson *et al.* over the 103-year period 1900-2002 is 4.9% when the revaluation of equities is not removed and is 4.1% when the revaluation of equities is removed using the revaluation estimates of Drs. Dimson *et al*. When an adjustment is made for the lower total risk level of the world index as compared to the Canadian index, the arithmetic mean MERP for the world index becomes 5.0%. However, over most of this 103-year period, the achievement of the rewards associated with international diversification would have been quite high. Thus, the 1% reduction in the MERP for the U.S. due to trade cost reductions would be even higher for the world index.

Thus, the major observation that we draw from the historical international evidence is that the MERP has also been declining internationally over time, and that using the historical MERP over the longest available time period as a going-forward MERP estimate is not appropriate.

4.3.1.2 MERP Estimate Based on Survey of the Literature (Second Estimation Method)

4.3.1.2.1 Survey of Canadian Studies

We examine the MERP estimates reported in two more recent studies. Dr. Booth reports a 3.29% MERP for Canada, and a 5.61% MERP for the U.S. over

[50] Z. He and L. Kryzanowski, Cost of equity for Canadian and U.S. sectors, *North American Journal of Economics and Finance* 18:2 (August 2007), pages 215-229.

the period of 1957–2000.[51] Drs. He and Kryzanowski report annualized estimates of the MERP of 4.32% and 5.88% for Canada and the U.S., respectively, over the longer period of 1956-2005.[52] Two reasons contribute to the higher estimates reported by Drs. He and Kryzanowski. First, they use a longer sample period in which the Canadian and U.S. markets realized lower average returns than those in Dr. Booth's sample. Second, Dr. Booth determines the MERP with respect to long-term bond yields of 8.04% for Canada and 7.32% for the U.S. In contrast, Drs. He and Kryzanowski determine the MERP with respect to the yields of 6.24% for Canada and 5.16% for the U.S. for short-term treasury bills.

4.3.1.2.2 Survey of non-Canadian Studies

A review of the literature on non-Canadian MERP estimates is presented in Appendix 4.B. Two studies estimate realized and expected MERP for 15 countries over more than a century. They find that the expected MERP, when measured **against short-term** government bonds over the 101-year period, is 4.0% and 3.5% for the U.S. and a sample of 15 developed countries including the U.S., respectively. All of the studies reviewed in Appendix 4.B conclude that the U.S. MERP has narrowed substantially, and is expected to be lower in the future. Most of the U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to about 4%. Interestingly, at an equity risk premium forum in November 2001, Dr. Ibbotson made a long-term 4 percent (400 bps) MERP forecast (i.e., geometric return in excess of the long-term government bond yield), under the assumption that the market was fairly valued.[53]

Dr. Jeremy Siegel has conducted extensive studies of the MERP for the U.S. over the past 200 years. Based on his results for the three major sub-periods, which are summarized in Schedule 4.5, the so-called Ibbotson time period, 1926-

[51] L. Booth, 2001, Equity risk premiums in the U.S. and Canada, *Canadian Investment Review 14*(3), pages 34-43.
[52] Z. He and L. Kryzanowski, Cost of equity for Canadian and U.S. sectors, *North American Journal of Economics and Finance* 18:2 (August 2007), pages 215-229.
[53] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, page 108.

2001, has generated the highest arithmetic mean MERP of 6.2%. Dr. Siegel notes that this high MERP is due to real stocks maintaining their long-term historical average real return of almost 7%, while real bond and bill returns were below their long-term historical average real returns. In fact, for the 55 years up to 1982, the real return on bills averaged nearly zero. Dr. Siegel goes on to conclude that *the reason why the MERP is too high for this period is that historical real stock returns are biased upward to some extent and government bond returns are biased downwards over this period*.[54]

Mr. Richard Arnott and Mr. Peter Bernstein reach a similar conclusion that the realized MERP exceeded the expected MERP over this time period.[55] Specifically, equity investors earned 70 basis points annually more than what they expected and bond investors earned 20 basis points annually less than what they expected. According to Mr. Arnott and Mr. Bernstein, one cause of this risk premium windfall was the unanticipated inflation of the late 1960s and 1970s that adversely affected realized bond returns. Another cause was the rise in **price-to-dividend** multiples from 18 to 70 times over the 1926-2001 period, with almost all of this increase occurring in the last 17 years of this period, that favorably affected stock returns. Mr. Arnott and Mr. Bernstein estimate that this rise in the price-to-dividend multiple added about 180 basis points or 1.8% to annual stock returns.[56]

When we examine the arithmetic mean MERP reported in Schedule 4.5 for the major sub-periods that begin prior to World War II and run through 2001, we find that the two sub-periods that predate the Ibbotson time period have a MERP

[54] Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, pages 31-32.
[55] Robert D. Arnott and Peter L. Bernstein. What risk premium is "normal"?, *Financial Analysts Journal* 58:2 (March/April 2002), pages 64-85.
[56] This is higher than the 1% estimate of Drs. Dimson et al. (2003). Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, *Journal of Applied Corporate Finance* 15:4 (Summer 2003), pages 27-38.

of less than 5%. Furthermore, if we adjust the realized MERP for the 1926-2001 sub-period downwards by 90 basis points to reflect the normal expectations of investors, as per Mr. Arnott and Mr. Bernstein, the arithmetic MERP of 6.2% is now 5.3%.

The conclusion that we draw from this literature survey is that a forward-looking MERP for Canada is not more than 5% after allowing for the estimation error contained in the estimates reported in these studies.

4.3.1.3 MERP Estimate Based on the DCF Estimation Method (Third Estimation Method)

As is discussed in more detail in Section 6 of our evidence, Discounted Cash Flow (DCF) Estimation Methods have a number of disadvantages that make them much less reliable for estimating the required rate of return or risk premium on equity, particularly for individual companies. This is likely the reason why Graham and Harvey (2001, 2002) based on a survey of a large sample of U.S. corporations find that "few firms used a dividend discount model to back out the cost of equity".[57] Nevertheless, because the DCF approach represents an alternative method of estimating the MERP, it is useful as a check on the reasonableness of our other MERP estimation methods. With this in mind, we conduct DCF Tests using the constant growth version of the Dividend Discount Model or DDM for the Canadian Market as proxied by the S&P/TSX Composite Index and for the U.S. market as proxied by the S&P500 Index. We use forecasts of future growth as proxied by GDP (Gross Domestic Product). The output of these DCF tests consists of various estimates of the MERP.

[57] John Graham and Campbell Harvey, How do CFOs make capital budgeting and capital structure decisions?, *Journal of Applied Corporate Finance* 15:1 (Spring 2002), page 12. This article was a practitioner version of the following paper that won the Jensen prize for the best *JFE* paper in corporate finance in 2001: John Graham and Campbell Harvey, The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60 (2001).

The required rate of return in the constant growth DDM or Gordon model is given by:

$$k = \frac{D_1}{P_0} + g$$

where D_1 is the expected dividend in the next period, or D_0 (1 + g);

P_0 is the current price or level of the stock or index;

$\frac{D_1}{P_0}$ is the dividend yield; and

g is the growth rate in dividends, which is assumed to be constant until the end of time.

In this version of the model, the growth rates in dividends, earnings, book value and share price are all assumed to be equal.

In the two-stage DDM, dividends are assumed to grow at a fixed rate g_1 or variable rate g_t for an initial period (herein deemed to be up to the first five years), and then to grow at a different fixed rate g_2 thereafter. In this version of the DDM, the implied required rate of return is found by solving for k in:

$$P_0 = \sum_{t=1}^{5} \frac{D_0(1+g_1)^t}{(1+k)^t} + \left(\frac{D_6}{k-g_6}\right)\left(\frac{1}{(1+k)^5}\right);$$

Or: $P_0 = \frac{D_0(1+g_1)^1}{(1+k)^1} + ... + \frac{D_4(1+g_5)^1}{(1+k)^5} + \left(\frac{D_6}{k-g_6}\right)\left(\frac{1}{(1+k)^5}\right)$

Where $D_6 = D_0(1+g_1)^5(1+g_6)$

or $D_6 = D_0(1+g_1)(1+g_2)(1+g_3)(1+g_4)(1+g_5)(1+g_6)$.

The implied MERP is then obtained by subtracting the current or going forward yield on long-term government bonds from the estimate of k derived from the above models.

The commonly held position is that the long-term growth in dividends (earnings) cannot exceed long-term growth in GDP. In the summary comments at an equity risk premium forum, Dr. Leibowitz summarized his viewpoint as follows:[58]

> "I'm very impressed by the level of consensus on the view that earnings can grow only at a somewhat slower rate than GDP per capita and that no one seems to feel it can grow much more – except Roger Ibbotson…"

There are at least five reasons why the long-term growth in the economy is considered to be an upper bound for the long-term growth in the dividends (earnings) of the market. First, since a disproportionate share of the growth in the economy comes from unlisted firms (i.e., private entrepeneurs), these investment opportunities are typically not available to the general public and are not captured by the indexes used to calculate MERPs.[59] Second, a good portion of the growth in the business sector of the economy cannot be financed by retained earnings and, thus, requires the continual issuance of new shares (referred to as seasoned issues). Third, many firms dilute their share base by issuing stock options, which are generally not offset by share repurchases. Fourth, Siegel (p. 15) argues "the returns to technological innovation have gone to workers in the form of higher real wages, while the return per unit of capital has remained essentially unchanged."[60] Fifth, the growth in the economy is usually measured as growth in GDP or in GDP on a per-capita basis.

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[58] Marin Leibowitz, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, page 109.

[59] Jagannathan et al. use the S&P, CRSP and Board of Governors (BOG) portfolios to examine the MERP. The BOG portfolio, which includes stocks that are not publicly traded and all stocks held by U.S. residents, has about two times the value of the CRSP stocks. While they obtain nearly identical MERP estimates using the S&P and CRSP portfolios over the entire sample period and various sub-periods, their estimates using the BOG data are higher on average by roughly two percent. Ravi Jagannathan, Ellen R. McGrattan and Anna Scherbina, 2000, The declining U.S. equity premium, *Quarterly Review of Federal Reserve Bank of Minneapolis*, Fall, pages 3-19.

[60] J. Siegel, 1999, The shrinking equity premium, *Journal of Portfolio Management* 26:1 (Fall), pages 10–17; and W. Reichenstein, 2002, What do past stock market returns tell us about the future?, *Journal of Financial Planning* forthcoming.

In Schedule 4.6, we assume that cash distributions other than dividends (e.g., share repurchases) are offset by stock option issuance. We do this because many observers have shown that completed repurchases are much less than announced repurchases and that stock buybacks are offset by share issuances.[61] We also make no adjustment for the inflation in the dividend yield of the S&P/TSX Composite caused by inclusion of income trusts in that index. In Schedule 4.6, we use consensus estimates of real GDP and inflation obtained from surveys conducted by Consensus Economics (as published in *Consensus Forecasts*) and Watson Wyatt. All of the MERP using the consensus forecasts for both the U.S. and Canadian equity markets are below 5%, except when we use the most optimistic forecasts (e.g., the forecast at the 90th percentile).

We now illustrate how the equity costs in Schedule 4.6 are calculated by detailing how the equity cost of 5.76% for Scenario or Case 1a in panel A is determined. Using the formula, which was described earlier, that states that the cost of equity (*k*) is equal to the dividend yield (D_1 / P_0) plus dividend growth (*g*) as proxied by nominal growth in GDP (i.e., real GDP + inflation), we obtain that *k* is equal to 2.66% + (1.50% + 1.60%) or 5.76%.

The conclusion that we draw from these DCF estimations is that a forward-looking MERP for Canada is not more than 5% after allowing for the estimation error contained in the estimates generated by this estimation method.

4.3.1.4 MERP Estimate Based on the Survey of the Forecasts of Investment Professionals (Fourth Estimation Method)

There are some foreign regulatory jurisdictions that place weight on the surveys of investment professionals for their estimates of MERP. According to a

[61] For examples, see J.C. Bogle, 1995, The 1990s at the halfway mark, *Journal of Portfolio Management* 18:1 (Summer), pages 21–31; and K. Cole, J. Helwege and D. Laster, 1996, Stock market valuation indicators: Is this time different?, *Financial Analysts Journal* 52:3 (May/June), pages 56–64.

report prepared by NERA,[62] U.K. regulatory estimates of the MERP have generally relied heavily on survey evidence of investor expectations with some consideration usually given to evidence on historic average returns. However, U.K. regulators have generally judged that the historic MERP provides an overstatement of the current risk premium.

The forecasts based on two surveys are summarized in Schedule 4.7. We first considered the forecasts by 54 Canadian and global investment managers on the economy and capital markets contained in *2008 Fearless Forecast* authored by Mercer.[63] Based on consensus expectations (mean or median), the expected MERP based on the S&P/TSX Composite and the DEX long-term total return index (DEX Long Bond TR) is 3.5% for the 5-year period ending December 2012. To examine the MERP derived using the most optimistic scenario drawn from this survey (i.e., has only a 5% chance of occurring), we subtract the 95th percentile estimate of the S&P/TSX Composite return (i.e., the return that has a 95% chance of being lower) from its bond index counterpart. Doing such, we subtract the 6.4% value in the last column of Panel A of Schedule 4.7 for the DEX Long Bond TR from the 11.4% value in the same column for the S&P/TSX Composite to obtain a MERP estimate of 5.0% for the 5-year period ending December 2012.

We then consider the survey of the "country's leading business economists and portfolio managers in 42 organizations, such as chartered banks, investment management firms and other corporations" conducted in mid-November 2007 by Watson Wyatt.[64] Based on consensus expectations (median), the expected MERP based on the S&P/TSX Composite and 30-year Canada Bonds is 3.2% mid-term (2009-2012) and 2.8% long-term (2013-2022). To examine the MERP derived using the most optimistic scenario drawn from this survey (i.e., has only a

[62] NERA, UK water cost of capital, *A Final Report for Water UK*, Prepared by NERA, London, July 2003, page 76.
[63] Mercer, *2008 Fearless Forecast, 17th edition.*
[64] Watson Wyatt, Economic Expectations 2008, 27th Annual Canadian Survey.

10% chance of occurring), we subtract the 90th percentile estimate of the S&P/TSX Composite return (i.e., the return that has a 90% chance of being lower) from its 30-year Canada Bond counterpart. Doing such for the mid-term (2009-2012), we subtract the 6.0% value in the last column of Panel B of Schedule 4.7 for 30-year Canada Bonds from the 12.0% value in the same column for the S&P/TSX Composite to obtain a MERP estimate of 6.0%. Doing such for the long-term (2013-2022), we subtract the 6.6% value in the last column of Panel C of Schedule 4.7 for 30-year Canada Bonds from the 10.0% value in the same column for the S&P/TSX Composite to obtain a MERP estimate of 3.4%.

The conclusion that we draw from these survey forecasts is that a forward-looking MERP for Canada is not more than 5% after allowing for estimation error contained in the estimates generated by this estimation method.

4.3.1.5 Other Considerations

In this section, we consider the evolution of a number of factors that affect *ex post* estimates of the MERP. On balance, changes in these factors imply that very long-term estimates of the MERP using historical data will be over-estimates of the forward-looking MERP.

4.3.1.5.1 Survivorship and selection biases

Ex post estimates of the MERP often suffer from survivorship and selection biases. Some examples follow. First, as proposed by Drs. Brown, Goetzmann and Ross (1995),[65] financial economists concentrate on the performance of surviving markets and so-called "winner" markets like the U.S. stock market. Financial economists ignore other markets that have done poorly or even disappeared. Examples given by Drs. Brown *et al.* include the Argentine market

[65] S. Brown, W. Goetzmann and S. Ross, Survival, *Journal of Finance* 50 (1995), pages 853-873. The following examples are drawn from Brown et al. (1995).

that is considered a comparatively less important emerging market because of its long history of poor performance, and the Russian market where investors at one point had all their wealth expropriated during the last 100 years. Second, when a new index is introduced, the index sponsor generally provides historic data on that index. For example, when the S&P/TSX Composite index was introduced in January 1977, historic ("back-fill") data was provided dating back to January 1956. The historic data was for firms in existence as of the date of the index introduction.

4.3.1.5.2 Changes in financial markets

Financial market changes that have had an impact on the MERP include the increased integration of financial markets, the rapid growth of financial innovation, mutual funds, index products, derivative products and exchange-traded funds over the past 30 to 40 years. Since this allows small investors to acquire and manage diversified portfolios at lower cost, the required risk premium is lowered since greater diversification means that these investors attain the same expected returns by bearing less risk. Also, since the reduction in cost has been higher for equity versus fixed income investment vehicles, the MERP relative to historical levels has declined.[66]

4.3.1.5.3 Changes in market frictions

Historical MERP studies are based on gross and not net returns, although investors make decisions between investments of different risk based on net and not gross returns. There are at least two frictions that cause a divergence between gross and net returns from investment.

The first major market friction is taxes. As tax rates increase, investors require higher gross returns from investment to get the same net (after-tax) return, and *vice versa* when tax rates decrease. Similarly, if the tax rate reduction differs by

[66] Similar points are made about mutual funds by Diamond (1999), page 2.

type of asset, then their gross returns will change by different amounts to maintain their same net returns. To illustrate, if the effective tax rate on the return of a non-dividend-paying growth stock declines by more than that on the return of a long-term government bond, then the drop in the gross return of the stock to maintain its after-tax return will exceed the drop in the gross return of the bond. In turn, this will decrease the required MERP, all else held equal. Examples include the introduction of a capital gains tax in Canada in 1972 (increases the MERP), and more recent successive reductions in the capital gains inclusion rate (decreases the MERP).

The second major market friction is trade costs, which include liquidity costs (as measured, for example, by the effective bid-ask spread), brokerage commissions, and so forth. In general, the gap between gross and net returns increases as trade costs increase, and decreases as trade costs decrease. As noted by Dr. Jones, trade costs drive a wedge between gross equity returns and net equity returns. His analysis shows that the average cost to buy or sell stocks has dropped from over 1% of value as late as 1975 (i.e., before the deregulation of brokerage fees) to under 0.18% today. He concludes that, while trade costs account for a small part of the observed equity premium, the gross equity premium is perhaps 1% lower today than it was earlier in the 1900's.[67]

4.3.1.6 The Final Canadian MERP Estimate (Final Input #1)

Based on a subjective consideration of the estimates from the above four estimation methods and balancing the other considerations just discussed above with providing an allowance for estimation error, we are forecasting a MERP of 5.00% for an average-risk utility for 2008 and 2009.

[67] Charles M. Jones, 2001, A century of stock market liquidity and trading costs, working paper presented at an asset pricing workshop, Summer Institute, National Bureau of Economic Research, July 19-20.

4.3.2 Obtaining the Relative Risk Estimate for an Average-risk Utility (Input #2)

4.3.2.1 Conceptual Underpinning

If the market only rewards investors for bearing non-diversifiable risk (the most commonly accepted view), the relative non-diversifiable risk or beta of the average-risk utility relative to the market proxy needs to be estimated because investments in the securities of individual firms (such as stocks in specific utilities) are not by themselves well-diversified portfolios. Under this assumption, the MERP is adjusted upwards or downwards to reflect the relative **non-**diversifiable risk of the average-risk utility relative to the more diversified market portfolio. The lower non-diversifiable risk of our average-risk utility relative to that for the diversified market portfolio necessitates a downward adjustment in the risk premium added to the forecasted long-term risk-free rate to calculate the cost of equity for our average-risk utility.

If most investors do not hold well-diversified portfolios and thus require an additional premium for bearing diversifiable risk, then the total risk or some portion thereof of the average-risk utility needs to be compared to the total risk of average-risk firms in other industries. Under this view of the world, the relative ratio of the total risk of the average-risk utility to that of the mean of average-risk firms across industries can be used as an index to adjust the MERP upwards or downwards to get the appropriate own ERP for an average-risk utility. However, this needs to be done with care because most investment textbooks contain graphs depicting the reduction of total risk with an increase in portfolio size (i.e., the number of securities or firms in the portfolio).

Under the commonly accepted risk pricing viewpoint, the overall (investment) riskiness of an average-risk utility is typically determined by measuring its contribution to the risk of the market proxy. In a risk premium framework, this contribution is typically measured by the market beta of an average-risk utility.

Since market betas vary over time, investment professionals prefer to use only the most recent data in order to capture the firm's current risk even for firms with long trading histories. However, to ensure reasonable statistical precision, beta estimations typically are based on approximately 5 years of monthly observations. The betas used herein are based on 60 months of data, and are only calculated if almost all months have returns based on actual market transactions.

4.3.2.2 Beta Measure of Relative Risk of an Average-risk Utility

It is not possible to estimate a reliable beta for the average-risk utility directly. This hypothetical utility does not trade publicly. However, it is possible to make an approximation. We use the same sample of the publicly traded utilities that we used in our capital structure discussion in Section 3. We presented the rationale for the sample selection there. Here we add Westcoast Energy as this company traded throughout 2001, and as exchange units of Duke in 2002. As shown in Schedule 4.8, the average beta for a group of ten utilities is 0.315 for 1992-2007, a sizeable decrease from 0.583 for 1990-1994. [68] The means of the mean cross-sectional betas for the first four, middle five and the last (most recent) five rolling five-year periods are 0.541, 0.267 and 0.182, respectively.

We also examined whether an average utility was becoming a more desirable investment because of an increase in its potential to diversify investor portfolios. In modern portfolio theory, an asset becomes more desirable for portfolio diversification purposes if its correlations with all the other assets decrease towards zero or even become negative, everything else held constant. This

[68] Betas of 0 and 1 correspond to no market risk and a market risk equal to a well diversified portfolio such as the S&P/TSX Composite index, respectively. Thus, a beta of 0.50 for an average-risk utility indicates that this utility has 50% of the investment risk of the S&P/TSX Composite.

important contribution led to the awarding of a Nobel Prize in Economics to Dr. Harry Markowitz.

Thus, we calculated moving average correlations for our sample of utilities with the S&P/TSX Composite index. These results are summarized in Schedule 4.9. We find that the average correlation between a utility in our sample and the S&P/TSX Composite has declined substantially from the most distant four-year period to the more recent five-year period (0.469 versus 0.104), and is quite low at 0.264 when averaged over the 14 rolling five-year periods. This suggests that an average utility is now more desirable as an investment because of its enhanced potential for portfolio risk reduction. A greater potential for risk reduction leads to a reduction in an asset's own equity risk premium. This reduction in the correlations between the returns of the utilities and the market also contributes to the reduction in the betas of the sample of utilities.[69] The adoption of adjustment mechanisms to automatically adjust ROE on a generic basis by various Canadian regulatory bodies has most likely contributed to this reduction in risk.

4.3.2.3 Total Risk Measure of Relative Risk of an Average-risk Utility

There is some conflicting evidence in the literature on whether or not the own risk of a firm is rewarded in the market. As pointed out earlier, if enough investors do not hold well-diversified portfolios and thus require an additional premium for bearing all or a part of diversifiable risk, then further confidence in the beta measure is obtained by comparing the total risk of the average-risk utility to the total risk of average-risk firms in other industries. Under this view, the relative ratio of the total risk of the average-risk utility to that of the mean of the

[69] The beta coefficient is given by $\beta_i = \left(\sigma_i \rho_{im}\right) / \sigma_m$, where σ_i and σ_m are the standard deviation of returns for utility *i* and the market *m*, respectively; and ρ_{im} is the correlation between the returns for utility *i* and the market *m*, respectively. Thus, if the relative risks of the utility and market remain constant, the beta decreases towards zero as the correlation between their returns moves from 1 to 0.

average-risk firms in various industries can be used as an index to adjust the relative risk index as proxied by beta upwards or downwards to get the appropriate ERP for an average-risk utility.

There are three reasons why it is not appropriate to use a relative risk index that compares the variance of an average-risk utility to the variance of the market proxy. First, a relative risk index should have the property that when one finds the weighted average of the firms or industries that comprise the market index the result is the risk of the market proxy. This does not happen if you use a relative risk index that is obtained by dividing the variance of an industry index by the variance of the market proxy. Second, if investors receive a return premium for bearing nondiversifiable risk, then the capitalization-weighted average return premium will be already reflected in the return of the market proxy. This happens because the return on the market proxy is merely a weighted average of the returns on the firms or industries that compose that market proxy. Thus, the market proxy already incorporates the nondiversifiable risk premium for a firm (or industry) of “average” nondiversifiable risk. Third, how the nondiversifiable risk of an average-risk firm in a particular industry compares to such firms in other industries is best studied using our approach.

We use the indirect decomposition method of Campbell *et al.* to estimate the industry-level monthly variances for 47 industry groups. The specific procedure is detailed in Appendix 4.C. The results for the complete period of 1975-2003 and the most recent 10-year period of 1994-2003 are summarized in Schedule 4.10. We examine various benchmarks that include: (i) the elimination of the three industries with the highest variances, (ii) the elimination of industries with less than 10 firms, and (iii) the elimination of industries with less than 10 firms and the industry with the highest variance after eliminating industries with less than 10 firms. In all cases, we find that the average variance of the utilities is less than 40% of the mean variance of the industry benchmark. Thus, even if we assume

that investors need to be compensated for bearing nondiversifiable risk, the relative risk of utilities compared to all industries is less than 50%.

4.3.2.4 The Relative Risk of an Average-risk Canadian Utility (Input #2)

We conclude that a relative risk index of 0.50 is appropriate whether or not investors receive a return premium for bearing nondiversifiable risk when appropriate benchmarks are chosen. We believe that this estimate is conservatively high, and provides sufficient coverage for any estimation errors.

4.3.2.5 The Non-use of the Adjusted or Inflated-Beta Method

There are two primary arguments that have been given for using the adjusted beta method when calculating the required rate of return on equity.[70] Both rationales are flawed. The first rationale is based on the empirical finding by Dr. Blume (1975) that the betas of individual U.S. equities, for a large sample that is representative of the overall market, tend to regress over the long-run towards the mean beta for the sample.[71] In the case of a large representative sample drawn from all the firms in the market, the mean beta will be the market beta of one.

Dr. Blume regresses the beta estimates obtained over the period 1955-1961 against the beta estimates obtained over the period 1948-1954 for common shares traded on the NYSE. Dr. Blume finds that the betas of firms with values less than one subsequently, on average, tend to increase towards the sample beta of one, and firms with betas of more than one tend to subsequently decrease, on average, towards the market beta of one. The relationship estimated by Dr. Blume suggests that the quality of beta forecasts can be improved, and that a higher quality predictor of an individual firm's beta may be a

[70] Ms. McShane uses one of these arguments to justify the use of adjusted betas in her evidence (EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 35 of 261).
[71] M.E. Blume, Betas and their regression tendencies, *Journal of Finance* 30 (June 1975), pages 785-796.

weighted average of the sample beta and the firm's current beta where the weights are approximately one-third and two-thirds, respectively.[72]

There are at least six substantive reasons for not adjusting betas for utilities based on this rationale. First, Dr. Harrington (1983)[73] shows that the betas that are supplied by commercial vendors that use this adjustment have little predictive accuracy. Her conclusion is based on a comparison of the actual beta forecasts supplied by a number of commercial investment vendors (such as Value Line) with their corresponding benchmark estimates for four forecast horizons.

Second, there appears to be no evidence that the relationship estimated by Dr. Blume for the U.S. market that is over 40 years old applies to other markets, such as the Canadian market, or to more recent time periods. In other words, there appears to be no empirical evidence that the betas of Canadian stocks revert to the sample mean.

Third, if the population average is consistently lower than the market beta, as is the case for the samples of utilities studied herein, the use of the market beta of one will result in an over-prediction of the mean beta in the next period for the sample. This is easily shown by taking a portfolio that is invested 40% in risk-free assets and 60% in the market, and thus, has a constant beta of 0.60 by construction. Its adjusted beta would consistently be 0.73 (i.e., two-thirds of 0.6 + one-third of 1), although its actual or true beta is substantially lower at 0.6.

[72] Also, see O.A. Vasicek, A note on using cross-sectional information vs. Bayesian estimation of security betas, *Journal of Finance* 28 (September 1973), pages 1233-1239.
[73] D.R. Harrington, Whose beta is best?, *Financial Analysts Journal* (July-August 1983), pages 67-73.

Fourth, the previous point has already been documented in a peer-reviewed scientific journal. Drs. Kryzanowski and Jalilvand (1986)[74] test the relative accuracy of six beta predictors for a sample of fifty U.S. utilities from 1969-1979. They find that the best predictors differ only in that they use different weighted combinations of the average beta of their sample of utilities, and that, not unexpectedly, the worst predictor is to use a beta of one or the so-called "long-term tendency of betas towards 1.00".

Fifth, adjusting the beta towards one assumes that the "true" beta for the utility is one. In other words, this adjustment method is based on the implicit assumption that the "true" beta for the utility is the same as that of the market index.

Sixth, based on an examination of dynamic betas estimated using the Kalman filter approach, Drs. He and Kryzanowski find that the trend beta (i.e., the stable part of the beta) has been 0.5 or less since the late 1990s, that dynamic betas significantly increase the explanatory power of the market model (particularly for the utilities sector), and that time-variation (temporary deviations) in the betas is the most important source of variation in the market model for the Canadian utilities sector.[75] They also find that the U.S. market does not make a statistically significant contribution to explaining the portion of the return of Canadian utilities that is not explained by the Canadian market.

The second rationale for using a variant of the adjusted-beta method for utilities is that raw utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the raw and adjusted betas. We provide a detailed criticism of this rationale in Appendix 4.D. This detailed criticism will now be summarized.

[74] L. Kryzanowski and A. Jalilvand, Statistical tests of the accuracy of alternative forecasts: Some results for U.S. utility betas, *The Financial Review* (1986), pages 319-335.
[75] Zhongzhi He and Lawrence Kryzanowski, Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis*, in press.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns to the returns of each of these factors with the premium required by investors to bear market and interest rate risk when investing in utility equities.

When there is only one determinant of utility returns (namely, the market), the Market Risk Premium Estimation Method is implemented by first estimating the utility's beta by running a regression of the returns on the utility against the returns on the market proxy (S&P/TSX Composite index). The utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's beta estimate. The cost of equity for the utility is obtained by adding the equity risk premium estimate for the utility to the estimate of the risk-free rate (as proxied by the yield on 30-year Canada's).

When there are two possible determinants of utility returns (in this case, equity market risk and interest rate risk), the Equity Risk Premium Method now is implemented by first estimating the utility's two betas by running a regression of the returns on the utility against the returns on the equity market proxy (S&P/TSX Composite index) and on the bond market proxy (long Canada's; i.e., Government of Canada bonds with a long term to maturity). The first component of the utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's market beta estimate, and the second component of the utility's required equity risk premium is obtained by multiplying the bond risk premium estimate by the utility's bond beta estimate. The utility's required equity risk premium is the sum of these two components. The cost of equity for the utility then is obtained by adding the equity risk premium estimate appropriate for the level of relative risk for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

While one would expect the estimates of the return on the S&P/TSX Composite index, of the return on long Canada's, and of the return on the S&P/TSX Composite index over the yield on long Canada's to be positive and significant, such is not the case for the return on long Canada's over the yield on long Canada's. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that rates would fluctuate randomly so that returns would be above yields to maturity in some periods and below them in others. Thus, while it is true that utility returns are sensitive to interest rates, it is not true that interest rate risk will have a positive risk premium in an asset pricing implementation over the long run.

To examine the nature of bond market risk premiums, we calculate them over various time periods that correspond to some of those used previously to calculate the MERP. These results are reported in Schedule 4.D2 in Appendix 4D. As expected, over long periods, such as 1965-2002, the mean bond market risk premium is only 30 basis points, and it becomes negative over the three progressively longer time periods of 1957-2002, 1951-2002 and 1936-2002. While it is positive and quite material over the 1980-2002 period at 1.745%, this is offset by the relatively low MERP of 2.797%. Furthermore, according to our expectations, all of the mean bond risk premiums are not significantly different from zero at conventional levels. In contrast, the mean equity risk premiums are significantly different from zero for the two longest time periods of 1936-2002 (at 5% level) and 1951-2002 (at 12% level).

Looking forward we expect MERPs to be low, and we do not expect the bond market risk premium to be material (on the positive side) since interest rates are now at or near historic lows.

4.3.3 Long Canada Yield Estimate (input #3)

As discussed in Section 2, we have forecasted the midpoint of the range of the long-term Government of Canada bond rates to be 3.85% and 4.25% for the 2008 and 2009 test years.

4.3.4 The "Bare-bones" Cost of Equity Capital Recommendation

Based on a MERP estimate of 5.00% and at a relative risk factor of 50% of the S&P/TSX Composite index, the ERP required for our average-risk utility (i.e., our final estimate of input #1 multiplied by our final estimate of input #2) is calculated to be 2.50%. Given our point forecast of a long-term Government of Canada bond rate of 3.85% and 4.25% for the 2008 and 2009 test years (our final estimates of input #3), our "bare-bones" cost of equity capital point estimates are 6.35% and 6.75% for the 2008 and 2009 test years.

4.3.5 Adjustment to the "Bare-bones" Cost of Equity Capital Recommendation for an Average-risk Utility

Past practice in various regulatory jurisdictions considers the need to adjust from a market-value based rate of return to an accounting-based rate of return in order to preserve the financial integrity and financing flexibility of a utility such as our average-risk utility. The idea is that our average-risk utility should be allowed to maintain its market-to-book value ratio sufficiently above unity (the value of one) in order to attract investment and to recoup flotation costs associated with issuing new equity financing instruments.[76] The notion that each company should maintain a market value above book value is somewhat contradictory as it suggests that each company should plan to earn a return on new investments above the allowed rate of return. However, we can accept the notion that an additional premium should be included to preserve financial integrity and financing flexibility, and that an additional temporary premium may be warranted

[76] For example, see G.R. Schink and R.S. Bower, Application of the Fama-French model to utility stocks, in *Financial Markets, Institutions and Instruments; Estimating the Cost of Capital: Methods and Practice* 3:3 (1994), pages 74-95.

during times of heightened volatility in the capital markets and economy. Thus, we add a financial flexibility premium of 40 basis points to further ensure the financial flexibility of OPG for both test years, and a further 25 basis points for the 2008 test year to protect the financial integrity of OPG against any adverse impacts from the possibility of additional turmoil in the capital markets and the economy. This is based on our expectation that capital market conditions will normalize in 2009, as was explained in Section 2.

We also consider flotation costs as a justification for making an adjustment to the "bares bones" cost. While OPG neither has nor is expected to undertake public equity offerings due to its ownership by the Province, we make an adjustment to the "bare bones" cost to compensate the OPG for potential equity flotation costs which it could occur as a stand-alone entity.

We arrive at our flotation cost adjustment as follows. When firms issue or sell new equity to the market, they incur underwriting fees paid for marketing the issue, and other underwriting and issue expenses for legal and accounting services, printing of issuing documents, and applicable registration fees. Research on flotation or issuance costs for new equity issues for utilities in Canada over the five year period ending with 2001 finds that the median fee is 4% of gross proceeds for equity offerings (see Schedule 4.11). When the equity offering fees are amortized over a 50-year period, the annual adjustment needed to compensate the average-risk utility for potential equity flotation costs is about 8 basis points annually, which we round up to 10 basis points to cover other issue costs.

4.3.6 The Final Recommended Cost of Equity Capital for an Average-risk Utility

Putting all the parts together, we end this section of our evidence with our ROE recommendation for an average-risk utility of 7.10% and 7.25% for the 2008 and 2009 test years. Our ROE recommendation allows an average-risk utility to

earn a risk premium (including the flotation cost and financial flexibility and integrity adjustments) of 325 and 300 basis points over our forecast for long Canada yields of 3.85% and 4.25% for the 2008 and 2009 test years.

5. TREND TOWARD USE OF GENERIC FORMULA-BASED ADJUSTMENT MECHANISMS FOR THE ANNUAL RESETTING OF THE ALLOWED ROE

5.1 PURPOSE OF GENERIC FORMULA-BASED ADJUSTMENT MECHANISMS

The primary purpose of generic formula-based adjustment (GFBA) mechanisms for the resetting of return on equity (ROE) is to avoid reviews consisting of formal proceedings of the allowed return on equity on a utility-by-utility basis at a frequency that could be as short as yearly.

5.2 USE OF GENERIC FORMULA-BASED ADJUSTMENT (GFBA) MECHANISMS BY CANADIAN REGULATORS

Six different regulatory jurisdictions in Canada use generic formula-based adjustment mechanisms for the annual resetting of return on equity (ROE) for all or some of the applicant utilities under their jurisdiction. Generic formula-based approaches for the determination of ROE have been in place in Canada since 1994 when the BCUC (British Columbia Utilities Commission) and the NEB (National Energy Board) both adopted them.[77] They also are currently in use in Alberta, Manitoba, Newfoundland and Labrador and Ontario.[78] Nova Scotia currently follows the traditional practice of conducting hearings. In Quebec, the Régie de l'Enérgie adopted a formula for Gaz Metropolitain but not for Hydro Quebec.[79]

[77] British Columbia Utilities Commission, Return on Common Equity Decision, June 10, 1994, Order G-35-94; National Energy Board, Multi-Pipeline Cost of Capital, RH-2-94; National Energy Board's Reasons for Decision, TransCanada Pipelines Limited RH-4-2001, June 2002.
[78] Alberta Energy and Utilities Board, Generic Cost of Capital, Decision 2004-052, July 2, 2004; Manitoba Public Utilities Board Order 49095, p. 50; Newfoundland & Labrador, Orders No. P.U. 16 and 36 (1998-99) and No. P. U. 18 (1999-2000); Ontario Energy Board Draft Guidelines on a Formula-Based Return on Common Equity for Regulated Utilities, March 1997.
[79] Quebec Régie de l'Énergie, D-99-11, R-3397-98, February 10, 1999.

Three of these boards have reviewed and retained their annual ROE adjustment formulas during the past three years. The BCUC reviewed its formula in a March 2006 decision for Terasen Gas in which it lowered its adjustment factor to a 75 basis point adjustment to the allowed return for each one percent change in the long Canada bond yield. The OEB reviewed its formula in December 2006 when it decided to apply its formula for determining the allowed ROE to electricity distributors. In Decision D-2007-116, which was rendered on October 15, 2007, the Quebec Régie on page 10 of an English version of section 4.1 of its decision "renewed the automatic ROE adjustment formula to be in application as of the year 2009, according to the terms and conditions established in Decision D-99-11". However, the Quebec Régie did reset both the risk-free starting rate and marginally increased the own risk premium by 14 basis points due to increased competition from electricity (i.e., for residential space demand from Hydro Quebec).

5.3 TWO APPROACHES FOR ESTABLISHING THE ALLOWED RATE OF RETURN AND ITS ASSOCIATED DEEMED CAPITAL STRUCTURE USED BY CANADIAN REGULATORS

Canadian regulators generally use one of two approaches to determine the allowed return on equity (ROE) and its associated deemed capital structure (equity ratio). The first approach, which is used by the EUB (now called the AUC), NEB and OEB, begins with a determination of the allowed ROE for a benchmark utility of *average* risk that is applicable without any further return adjustment to all applicant utilities. This is followed by a determination of the capital structure (equity ratio) for each applicant utility based primarily on its relative business risk determined by the relative weight and import of various business risk determinants but also on its stand-alone investment grade debt rating (usually chosen from the range of BBB+ to A). This approach approximately equates the total risks of all subject utilities to both themselves

and to the benchmark ROE if it is implemented correctly. Under this approach, regulators can change the deemed capital structure in utility-specific proceedings to reflect changes in business risks, and annually change the allowed ROE for all utilities using a GFBA mechanism.

The second approach, which is used by the British Columbia Utilities Commission (BCUC), begins with a determination of the allowed ROE for a benchmark utility of *low* risk that becomes the starting or base ROE for the determination of the allowed ROE for specific applicant utilities. This is followed by a determination of a ROE adjustment and deemed capital structure (equity ratio) for each applicant utility based primarily on its relative business risk but also on its stand-alone investment grade debt rating (usually chosen from the range of BBB+ to A). This approach is somewhat more difficult to implement since equating the total risks of all applicant utilities to both themselves and to the (low risk) benchmark used to estimate the unadjusted or starting ROE requires the simultaneous determination of both a reasonable equity ratio as well as a ROE adjustment to the starting ROE. The ROE adjustment under this approach is usually a ROE premium or kicker since the applicant's total risk with the chosen deemed capital structure is deemed to be higher than that for the low-risk utility benchmark. Under this approach, regulators can change both the deemed capital structure and ROE in utility-specific proceedings to reflect changes in business and total risks. However, unlike the first approach, the second approach does not eliminate the time and cost involved in preparing testimony on what is an appropriate ROE at each utility-specific regulatory proceeding.

5.4 GENERIC FORMULA-BASED ADJUSTMENT (GFBA) MECHANISMS USED IN CANADA

All of the GBFA mechanisms currently in use in Canada are based on an initial or seed or starting year ROE. This involves the determination of two

components that when added together provide the initial ROE. The first component is the risk-free rate as proxied by the rate on the benchmark long-term (30-year) Government of Canada bond. The second component is the equity risk premium for an average-risk utility in five jurisdictions and a low-risk utility in BC.

The adjustment mechanism then specifies how the ROEs for subsequent years change from the base ROE. The only new input into the adjustment mechanism is a new forward-looking forecast of the risk-free rate. Given this new input, a formula adjustment factor is then used to adjust the ROE on a yearly basis. A 75% adjustment factor is primarily used in the Canadian jurisdictions that rely on this ROE resetting mechanism.[80] If the adjustment factor is set at 0.75, then the annual change in the allowed ROE is 75% of the change in the forecast long-term Government of Canada bond yield.

The actual implementation of a GFBA mechanism can be demonstrated by describing the NEB approach. To obtain the starting ROE, the NEB procedure takes the average 3-month out and 12-month out forecasts of 10-year Government of Canada bond yields as reported in the November issue of *Consensus Forecasts* (Consensus Economics, Inc., London, England.) To this, the NEB adds the average daily spread between 10-year and 30-year Government of Canada bonds as reported in the *National Post* for October to obtain its starting 30-year Canada rate. This procedure provides the starting risk-free rate component of the starting allowed ROE. To get the final starting allowed ROE, an equity risk premium of 300 basis points is added to the determined 30-year Canada rate to get the final starting allowed ROE for the sample of pipeline companies.

[80] In 2006, the BCUC moved from a 100% adjustment for a forecast long Canada yield below 6.0% and a 75% adjustment factor for a forecast long Canada yield above 6%. Terasen Gas Inc./Terasen Gas (Vancouver Island) Inc. – Application to Determine the Appropriate Return on Equity "ROE") and Capital Structure and to Review and Revise the Automatic Adjustment Mechanism (Order Number G-14-06), page 16.

In order to incorporate the belief of the NEB (as is the case for all other regulatory jurisdictions using a GFBA mechanism) that equity risk premiums decrease when rates on 30-year Canada's are rising and increase when rates are falling, the NEB adopted an adjustment mechanism that allows for the ROE to be adjusted upwards or downwards by 75% of the subsequent annual increases in the consensus estimates of the rate on long Canada's (when calculated using the above procedure).

The formulas currently in use work well in reducing ROE volatility with changing risk-free rates and are simple to implement. However, these formulas are grounded on limited old peer-reviewed scientific evidence on what are the determinants of changes in equity risk premiums. In fact, the peer-reviewed scientific literature identifies other variables as being better predictors of changes in risk premia, such as the dividend yield on a market index like the S&P500 or S&P/TSX Composite or the default spread as measured by the yield spread between long corporates and long governments (i.e., sovereign government bonds with a long term to maturity). While these other predictors are superior technically, they are more contentious and technically difficult to implement.

5.5 PROS AND CONS OF GENERIC FORMULA-BASED ADJUSTMENT (GFBA) MECHANISMS

There are three main advantages to the use of a properly formulated and fairly seeded GFBA mechanism. First, such mechanisms reduce the regulatory burden that occurs when ROEs are determined on a utility-by-utility basis for typical rate-setting proceedings. Second, a GFBA mechanism reduces the cost of ROE determination. Since the determination of the unobservable ROE can be subject to wide differences of expert opinion, considerable applicant and intervenor time and cost are incurred in expert testimony preparation, information

requests, cross-examination and preparation of final argument. The process also expends considerable Board resources. Third, a GFBA mechanism increases the predictability and reduces the arbitrariness of allowed returns. All else held constant, this should lower the risk profile of an applicant utility as compared to its risk profile under the old traditional approach to rate setting.

However, if an improperly formulated and/or unfairly seeded GFBA mechanism is used, then the allowed ROE may unfairly advantage either the utility or its customers. If it results in too high of an ROE, this enriches the shareholders of the utility at the expense of its customers. Similarly, if it results in too low of an ROE, it favours the customers over the shareholders of the utility, and may even jeopardize the financial integrity, flexibility and cost at which the utility can raise funds.

5.6 POTENTIAL NEED TO RESEED A GENERIC FORMULA-BASED ADJUSTMENT (GFBA) MECHANISM

Any disadvantages of a GFBA mechanism can be alleviated if provisions are available for either utilities or customers to seek a review of the GFBA mechanism in order to reseed it at a different initial ROE and/or to realign its adjustment factor. For example, if a utility is near a downgrade to speculative grade for its regulated activities, then the utility should have the right to seek a review of the GFBA. Furthermore, concerns about financial flexibility and increased business risk can be addressed by requesting a change in the deemed capital structure at utility-specific proceedings. However, since the process for intervenor intervention is generally reactive and not proactive, there appears to be little opportunity for ongoing oversight by potential intervenors of whether the current ROE is too high until a utility applies to the regulator to reset the allowed ROE.

5.7 RECOMMENDATION FOR A GENERIC FORMULA-BASED ADJUSTMENT (GFBA) MECHANISM FOR OPG

We recommend that the OEB implement a GFBA mechanism for OPG given the three main advantages to the use of a properly formulated and fairly seeded GFBA mechanism discussed above.

6. CRITIQUE OF EVIDENCE SUBMITTED BY MS. MCSHANE

6.1 OVERVIEW

In this section of our evidence, we critique the evidence of Ms. McShane dealing with the 2008 and 2009 recommended ROE and capital structures for OPG. The primary purpose of this critique is three-fold. First, it is to present the similarities and the differences between the recommendations made by Ms. McShane and us for the forecast of the 30-year Canada yield and the rate of return on equity for an average-risk utility, and the equity ratios and ROE for OPG for each of the two test years. Second, it is to show which adjustments made or not made to various standard methodologies by Ms. McShane result in her ROE and equity ratio recommendations being different than ours. We show that these adjustments or non-adjustments consistently inflate the recommended values for the ROE and the equity ratios of Ms. McShane compared to our recommendations. Third, it is to compare the recommendations for the return on equity for OPG against that which would be obtained by using the adjustment formulas presently in use by a number of Canadian regulators.

We begin by comparing the test year forecasts of the 30-year Canada yield advanced by Ms. McShane for OPG and ourselves. We show that her forecasts are higher because they are based on dated inputs. If these lower rates persist, we expect the forecasted long Canada rates to be lower when Ms. McShane files her update prior to the hearing.

We then proceed to the first major area of disagreement, namely, the equity ratio for OPG for the two test years. We examine the methodologies employed in determining common equity ratios (ranges) by Ms. McShane and show that they are flawed. As a result, her recommendations are overly generous when viewed in the context of the business risks of the hydro and nuclear businesses of OPG. In particular, we show that Ms. McShane's unsupported view that OPG would

require a stand-alone bond rating of at least A- inflates her recommended common equity ratio. We also demonstrate that the quantification exercise in her evidence lacks a theoretical foundation and is without merit. Finally, we note the lack of any derivation of the recommended equity ratio from individual ratios for OPG's hydro and nuclear businesses. Without such a foundation, Ms. McShane's recommendation lacks credibility.

We then proceed to the third major area of disagreement, namely, the rate of return on equity or ROE for the two test years. We show that the implementation of various standard methodologies for estimating the ROE by Ms. McShane for OPG consistently lead to inflated ROE estimates. After we demonstrate the impact of introducing or not dealing with known biases in the evidence of Ms. McShane, we conclude that with the correction for all of these biases, the fair rate of return estimates made by Ms. McShane are quite close to our own recommended rates.

This is followed by tests of whether Ms. McShane's control sample of 20 Canadian industrials and whether a sample of Canadian utilities satisfied the comparable return standard based on realized returns. Based on *ex post* tests of risk-adjusted returns, we find that both samples have exceeded the minimum requirements for the comparable return standard in that they have earned abnormal or "free lunches". For this purpose, we use test methodologies that satisfy all four Daubert criteria for evaluating the admissibility (scientific merit) of expert testimony that has been adopted by federal and many state courts in the U.S.

We end this sub-section with a comparison of the recommendations for the ROE for the two test years by Ms. McShane for OPG and ourselves against the estimates that would be obtained if they were calculated using the various adjustment formulas presently in use by some Canadian regulators. Our recommendation reflects the current trend towards a lower MERP.

The comparison indicates that our own recommendations represent a reasonable choice should the Board wish to embrace our argument and adjust to the new market regime. However, if the Board wishes to move more cautiously, it could choose to set the allowed equity return for an average-risk utility in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas and other evidence suggests that the Board should attach little weight to the ROE recommendations of Ms. McShane for OPG.

6.2 RATE FORECASTS FOR 30-YEAR CANADA'S

Ms. McShane uses a methodology similar to ours although there are some differences in the details of implementation.[81] She first obtains a forecast for 10-year Canada's from *Consensus Forecasts* (published by Consensus Economics) and then adds an estimate of the average spread of 30-year Canada's over 10-year Canada's. Her forecasts, 4.7% for the 2007 test year and 5.0% for the 2008 test year, are higher than ours. Ms. McShane indicates that she will update her interest rate forecasts before the hearing.

There are two areas in which Ms. McShane's implementation techniques differ from our own – the forecast used for 10-year Canada's and the spread calculation. Beginning with the 10-year forecast, we draw ours from the March 10, 2008 issue of *Consensus Forecasts* (published by Consensus Economics) while Ms. McShane's forecasts are from the August 13, 2007 issue. Because interest rate forecasts have been reduced, her numbers are higher. As a result, we expect that her updated forecasts will be lower.

The second step involves adding a spread to the forecasts of 10-year Canada's to obtain forecasts for 30-year Canada's for 2008 and 2009. We first

[81] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 24 of 261.

measure this spread as the actual average over the most recent quarter (first quarter 2008) for which data are available. Recognizing that this estimate may be biased upward if markets settle and the yield curve flattens later in 2008 and 2009, we estimate the spread as 25 basis points for 2008 and 15 basis points for 2009. In contrast, Ms. McShane appears to be using the spread over the most recent month (August 2007) for her estimate of zero referring to "a relatively flat yield curve". This tends to reduce her estimate slightly. The difference between Ms.McShane's informal spread estimate and our use of historical numbers has only a minor impact on the forecast. Nonetheless, it is important to note that our approach is more consistent with regulatory practice.

6.3 CAPITAL STRUCTURE

6.3.1 Overview of Critique of Capital Structure Evidence

The framework employed by Ms. McShane for determining a recommended capital structure is similar to ours with regard to the topics covered. First, she assesses the business risks of OPG's hydro and nuclear operations. Second, her analysis addresses an appropriate target bond rating and its implications for capital structure. Third, Ms. McShane's discussion then turns to financial risk and ratio measures. Fourth, her evidence examines the capital structures of other utilities in Canada as well as of generation utilities in the U.S. Fifth, Ms. McShane develops a framework for "quantification of the common equity range … based on the application of two capital structure theories".[82] Sixth, she draws on all five types of analyses to recommend a common equity ratio of 57.5%.

Our evidence on capital structure covers all the same areas with one exception. We omit the fifth area of analysis because it is conceptually flawed. In this section we provide a critique of the second, fourth and sixth steps in Ms. McShane's evidence detailing the errors in analysis. In addition, we address her

[82] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 95 of 261.

fifth step and show why the approach used therein is without merit. We do not address the first step (business risk) and the third (financial risk) as these are critiqued in Section 2 or our evidence.

6.3.2 Target Bond Rating for OPG

Ms. McShane is mistaken when she argues that a rating of A- or higher is necessary for a Canadian utility. In Section 3 of this evidence, we show that BBB ratings are sufficient for the profitable functioning of a number of utilities in Canada. Further support for this view comes from Ms. McShane's reply to Pollution Probe Interrogatory #54 which asks:[83]

> " Ms. McShane expresses the "concern … that a BBB rated utility would, at times, be completely shut out of the long-term (30-year) debt market". In footnote 86 she gives an example of Fortis as a Baa3 rated utility that experienced difficulties. In Schedule 26, Ms. McShane includes 6 additional companies that are rated below A by at least one bond rating agency: EPCOR, Newfoundland Power, Nova Scotia Power, Pacific Northern Gas, Union Gas and Westcoast Energy.
>
> Please provide all evidence/materials of which Ms. McShane is aware of regarding difficulties accessing financing experienced by any of these six additional companies with a rating of BBB."

The response was:

> "Ms. McShane is not aware of any specific financing issues that the referenced companies, other than Pacific Northern Gas, have faced…"

[83] Ms. McShane's Response to Pollution Probe Interrogatory #54, EB-2007-0905, Exhibit L, Tab 12, Schedule 54, page 1 of 2.

Further, it is interesting to note that Ms. McShane creates a sample of U.S. generation utilities for analysis which she describes as follows:[84]

> "The selected sample includes 21 utilities with an average S&P debt rating of BBB (Moody's rating of Baa2), and an average proportion of generation to total assets of 48%. Sixteen of the 21 utilities have nuclear generation."

She goes on to use this sample to derive her estimate of "high generation beta" and to attempt to quantify the appropriate common equity ratio. We explain the fallacy in this methodology below. Here we note that this sample is used without any reference to possible difficulties that might arise due to the average BBB rating. We conclude that such "difficulties" are not material.

Finally, the emphasis on preserving a target bond rating of A- or higher is misplaced in light of the mistakes made by bond rating agencies in the current global credit crisis as discussed in Section 3 above. Ms. McShane confirms these errors in her response to the following Pollution Probe Interrogatory #55:[85]

> "In light of her emphasis on the views of rating agencies, please have Ms. McShane explain if there exists any evidence to suggest that the views of these agencies could be subject to error."

Her response was as follows:

> "Yes, there have been circumstances in which the rating agencies have misestimated the risk of firms or securities; e.g., with respect to the recent sub-mortgage crisis, the rating agencies underestimated the risk of many mortgage-backed securities."

[84] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 92 of 261.
[85] Ms. McShane's Response to Pollution Probe Interrogatory #55, EB-2007-0905, Exhibit L, Tab 12, Schedule 55, page 1 of 1.

6.3.3 Capital Structures of Other Utilities

Ms. McShane conducts two sets of comparisons in her analysis of peer companies. First, she identifies TransAlta Utilities and TransAlta Corporation as Canadian peer generation companies. We question the appropriateness of the comparison to OPG for two reasons. First, as Ms. McShane notes, TransAlta Utilities and TransAlta Corporation are not regulated. Second, they use different fuels in generation. Setting aside the issue of appropriateness of the comparison, we note Ms. McShane's comment on the ratings of these companies and the implications for an appropriate capital structure:[86]

> "Moreover, since the ratings of TransAlta Utilities are split (A(low) by DBRS and BBB+ by S&P) and the ratings of TransAlta Corporation are both in the BBB category, they provide some insight into what would be warranted for a BBB rating, but not for an A rating. For a BBB rating, the TransAlta capital structures are indicative of a common equity ratio (based solely on a debt/equity split) of approximately 50% for a generating company."

Ms. McShane notes that 50% common equity is sufficient for what she regards as a peer company to obtain a BBB rating. Based on our analysis above and in Section 3 showing that a BBB rating is high enough for a utility to function normally, her statement suggests that the common equity ratio of 57.5% that she recommends is unnecessarily high.

6.3.4 Quantification of the Common Equity Ratio

Drawing on her "residual beta model" and two stylized theories of capital structure, Ms. McShane derives a range of common equity ratios.[87] The analysis is misleading for two reasons. First, the two theories vastly oversimplify the state

[86] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 89 of 261.
[87] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, pages 91-96 of 261.

of current research on capital structure as summarized in Appendix 3.A. Second, based on this oversimplification of capital structure theory, Ms. McShane attempts a financial "mission impossible": quantification of the common equity ratio. We discuss each of these reasons in turn.

Appendix 3.A reviews current research on capital structure theory beginning with the trade-off theory, the formal academic terminology for the approach to determining capital structure taken in this evidence. The name describes the central idea of this theory: firms determine a target optimal capital structure by balancing the tax-reduction benefits of debt against the expected costs of financial distress and loss of financial flexibility. The appendix reviews the standing of this theory in the academic literature and its following among financial executives.

The main conclusions of our review are three-fold: first, among academic researchers, the trade-off theory enjoys reasonable support but faces serious challenges from a number of competing theories. Second, while it has moderate support among financial executives, a recent survey in the U.S. shows that executives look outside the implications of this theory when setting capital structures for their firms. Third, and most important, while the trade-off theory can offer useful qualitative guidance, it is a mistake to treat capital structure as if it were amenable to precise analysis by a formula.

These conclusions show that Ms. McShane's quantification of capital structure lacks a valid theoretical foundation as well as any practical justification. In addition, as we show in Section 3, it contradicts the views of Canadian regulators who have accepted that capital structure analysis must be qualitative.

6.3.5 Recommended Capital Structure for OPG

Ms. McShane recommends a common equity ratio in the range of 55 to 60% (midpoint 57.5%) for "OPG's regulated operations".[88] Although she distinguishes between the business risks of OPG's hydro and nuclear generation, her analysis fails to demonstrate how her recommended capital structure is derived from combining appropriate capital structures for each of OPG's regulated businesses. In contrast to the analysis in Section 3 of this evidence, there is no breakdown of capital structures by business segment comparing each against appropriate benchmarks.[89] The lack of such a breakdown, combined with the theoretical and implementation shortcomings detailed above, seriously undermine the credibility of Ms. McShane's capital structure recommendation.

6.4 FAIR RATE OF RETURN ESTIMATES: OVERRIDING COMMENT

We obtain ERP estimates above 30-year Canada's that are substantially lower than those entered into evidence by Ms. McShane for OPG. Ms. McShane arrives at overly generous estimates of both the betas for an average-risk utility, and of the magnitude or size of the ERP required to adequately compensate equity investors for bearing this level of risk. Basically, we find that Ms. McShane:

- adjusts her beta estimates when she should not;
- does not adjust her market equity risk premium (MERP) estimates for its time-series decline due to the significant reduction in trade costs (e.g., commissions and bid-ask spreads), the benefits of easier and less costly diversification both across investment classes and internationally, and the near consensus view that not only is the realized MERP an overestimate of the MERP that investors expected historically, but also that the forward-

[88] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 97 of 261.
[89] Ms. McShane provides some supplementary analysis on this point in her response to Pollution Probe Interrogatory #2, EB-2007-0905, Exhibit L, Tab 12, Schedule 2, pages 1 to 3.

looking MERP is expected to be significantly lower than that realized in the past;

- chooses an inappropriate time period to focus on to calculate *ex post* MERP;[90] namely the post-World War II period whose early years are not representative due to rapid economic and equity market exuberance due to the satisfaction of pent-up demand for consumer goods and infrastructure (e.g., roads, schools and hospitals), the existence of interest rate controls, the absence of a Canadian money market to price fixed income securities, and the rapid growth in exports due to Canada's participation in the U.S.-led reconstruction of a war-ravaged Europe; and
- Recommends a ROE for OPG of 10.5% for the two test years that not only represents a 550 basis points premium over her forecast for 30-year Canada's of 5% but exceeds the average mid-term forecasts of investment professionals of 8% for the expected mid-term total return on the market (as proxied by the S&P/TSX Composite Index) that is reported in the survey results authored by Mercer and by Watson Wyatt.

Ms. McShane uses three methods for estimating the rate of return in her evidence for OPG. They are the Equity Risk Premium Method, Discounted Cash Flow Method and Comparable Earnings Method.[91] As we subsequently discuss, her implementation of the first two approaches has several serious shortcomings, and her use of the Comparable Earnings Method is without scientific justification and cannot be implemented without introducing serious biases.

[90] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 28 of 261.
[91] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 2 of 261.

6.5 FAIR RATE OF RETURN ESTIMATES FROM MS. MCSHANE'S IMPLEMENTATION OF THE EQUITY RISK PREMIUM METHOD

6.5.1 MERP Estimation Problems

6.5.1.1 Choice of Return Series for Determining the MERP

Ms. McShane uses the historic average MERP for Canada, the U.S. and the U.K. over the period 1947-2006. This results in an inappropriate estimate of the MERP going forward. First, the chosen time period results in an inflated estimate of the going-forward likelihood of achieving the high realized returns on equities and low realized returns on bonds that followed World War II. This period began with rapid economic growth due to pent up demand from the war period and administered low interest rates. The MERP that Ms. McShane estimates for Canada for the 1947-2006 period is materially impacted by the first four years of this period. To illustrate, the annual average over the first four years (1947-1950) are 7.69% for the Consumer Price Index, 1.38% for long Canada bonds, 0.46% for 91-day Canadian Treasury Bills and 20.88% for the equity market index. The result is an annual average MERP over this four-year period of 19.50%!

Second, minimal or no weight is placed on the declining trend of MERPs for the three markets over this time period. Third, no adjustments are made for differences in risks across the market proxies used to calculate the MERP in the different countries. Fourth, no adjustments are made for the effect of equity re-valuations over this period of time. Mr. Arnott and Mr. Bernstein (2002) find that a good part of the realized MERP over this period was caused by rising valuation multiples. Specifically, Mr. Arnott and Mr. Bernstein (2002) report that the U.S. price-to-**dividend** multiple increased from 18 to 70 times from 1926 to 2001, with most of the increase in the last 17 years of this period.[92] The most recent (2008) price-to-dividend multiple that reflects the drop in the U.S. market is still over 42

[92] Robert D. Arnott and Peter L. Bernstein, 2002, What risk premium is "normal"?, *Financial Analysts Journal* 58:2 (March/April), pages 64-85.

times. Thus, an adjustment needs to be made unless one believes that price-to-dividend multiples will exhibit a similar two-fold-plus increase over the next 59 years.

While Ms. McShane is correct that the various smoothed annual market returns in the 3 pages of her Schedule 4 have not changed much over time, such is not the case for Long Government Bond Returns and, more importantly, the MERP. Using her 25-year rolling average market returns from page 1 of her Schedule 14, the Canada and U.S. risk premia are 9.8% and 11.7% for 1947-1971, 4.2% and 3.8% for 1962-1986 and -1.0% and 2.8% for 1982-2006, respectively. Using her increasing average market returns from page 2 of her Schedule 4, the Canada and U.S. risk premia are 9.9% and 11.7% for 1947-1971, 7.9% and 8.4% for 1947-1986, and 5.4% and 7.0% for 1947-2006, respectively. Using her increasing market returns from page 3 of her Schedule 4, the Canada and the U.S. risk premia are 5.4% and 7.0% for 1947-2006, 2.5% and 3.8% for 1962-2006, and -1.0% and 2.8% for 1982-2006, respectively. In other words, all of the series she presents indicate a steady decrease in the MERPs in both Canada and the U.S. It also vividly illustrates why the choice of 1947 as the starting point for determining the MERP results in a maximum MERP.

In a subsequent section, we compare each of the three tables in Ms. McShane's Schedule 11 for the Canadian and U.S. market indexes with each corresponding table in Ms. McShane's Schedule 4 for the utility sub-indexes. We show that the returns and risk premia for the S&P/TSX Composite Index are overshadowed by the returns and risk premia for the S&P/TSX Utilities Index for Canada, and the returns and risk premia for either the S&P/Moody's Electric or Gas Distributors Indexes approach the returns and risk premia for the U.S market as proxied by the S&P500 Index.

6.5.1.2 Validity of Using Risk Premia from Other Country Markets

There are at least three major problems with placing some weight on non-Canadian MERP in order to estimate the required Canadian MERP for calculating the required own ERP for an average-risk utility or for OPG. First, this approach ignores the benefits from international diversification. While the expected return of adding markets is linear, the risk is not linear in the risks of the individual markets unless all of the markets are perfectly correlated. In turn, the required MERP for bearing (reduced) domestic risk is reduced in an international context. Second, this approach makes no adjustment for the differences in the non-diversifiable or even in the total risks of the various market proxies used in this process. The reduction in total risk from international diversification is substantially higher for the Canadian market proxy than for the U.S. market proxy given the much smaller size of the Canadian market (i.e., about 2% to 3% of the world market). Third, based on recent empirical evidence published in a peer-reviewed scientific journal by Drs. He and Kryzanowski, the contribution of the U.S. market to the explanation of the returns for the Canadian utilities sector is not statistically significant. Thus, no weight should be placed on U.S. equity returns or risk premiums when estimating the going-forward MERP for Canadian utilities.[93]

6.5.1.3 Validity of Placing Sole Reliance on Arithmetic Mean Returns and MERPs

Although Ms. McShane reports both types of averages, she does not appear to use the geometric mean in any of her estimations of the MERP. Thus, given mixed evidence on which type of average is best in a forward-looking sense, she adopts the polar position that results in the highest going-forward MERP. We also use the arithmetic mean MERP in obtaining our going-forward MERP estimate. However, we also present a weighted-average of the arithmetic and

[93] Z. He and L. Kryzanowski, Cost of equity for Canadian and U.S. sectors, *North American Journal of Economics and Finance* 18:2 (August 2007), pages 215-229.

geometric means as a further benchmark to further demonstrate that our estimate is conservatively high. We do this because there are advocates for three possible approaches; namely, the use of the arithmetic mean only, the use of the geometric mean only, and the use of a weighted average of both types of means. As we noted in Section 4, fairness dictates that some non-zero weight should be placed on both averages when there is no consensus on which polar position is best.

We now discuss the two polar positions. The references that are often cited in terms of the use of the arithmetic mean include the Brealey and Myers' basic finance textbook, *Principles of Corporate Finance*, and the Ibbotson Associates publications. As Dr. Ritter notes in the first paragraph of his article published in a peer-reviewed scientific journal:[94]

> "When I started teaching at the University of Pennsylvania's Wharton School over twenty years ago, I used the very first edition of the Brealey and Myers textbook. The book had some mistakes in it, as almost all books do. For example, the first two editions had an incorrect formula for the valuation of warrants."

Dr. Ritter then goes on to focus on some of the conceptual mistakes that need to be corrected in what some academics teach in introductory finance courses, including the use of arithmetic rather than geometric mean returns. He concludes that the correct average return will be closer to the geometric (compounded) average than the arithmetic (simple) average if there is mean reversion in stock returns and/or mean aversion in bond returns.[95] Furthermore, since the difference between the arithmetic and geometric averages usually is higher for stocks than bonds, this inflates estimates of risk premia based on historical data.

[94] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), page 159.
[95] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), page 160.

In Section 4 and Appendix 4.A of our evidence, we provide numerous reasons why the historical MERP should not be measured using only the arithmetic mean return. We provide a multitude of evidence that concludes that a weighted average of the arithmetic and geometric means should be used. Our evidence includes the more advanced textbook by Drs. Campbell and Viceira, *Strategic asset allocation: Portfolio choice in long-term investors* (2002), articles published in major finance peer-reviewed journals, such as the *Journal of Finance*, *Journal of Financial Research*, and the *Journal of the American Statistical Association*, by Drs. Fama, French, Ritter, Blume, Indro, and Lee, amongst others; and support or non-objection by the participants at the *AIMR Risk Forum* by Drs. Campbell, Siegel, and Ibbotson, amongst others. Nevertheless, **we opt for a very conservative position where we estimate the historical MERP using the arithmetic annual mean MERP and use a weighted-average that favors the arithmetic annual mean MERP over the geometric annual mean MERP as a benchmark for our estimate to provide one measure of how conservatively high our estimate is**.

6.5.1.4 Ms. McShane Provides Evidence in Support of the Use of the Geometric Mean MERP

In section 4.3.1.1.1 of our evidence, we note that recommendations for using the arithmetic mean MERP estimate from historical data as a going-forward estimate depend upon the validity of returns being normal IID or independently and identically distributed over the estimation period, and that the validity of this assumption depends upon the ratio of the standard deviations of equity market returns and long Governments not exhibiting mean reversion or aversion as the return measurement interval gets longer.

Ms. McShane has provided evidence that supports our evidence that Canadian stock returns exhibit mean reversion and long Canada's exhibit mean

aversion. Schedule 6.1 is drawn from her evidence for 25-year holding periods and supplemented by our calculations for one-year holding periods because she does not provide the standard deviations or return ranges for the one-year returns that she reports for the 1947-2006 time period. Based on Schedule 6.1, we find that while stocks are more risky than long government bonds in both the Canadian and U.S. markets for a one-year holding period as shown by ratios greater than one in the fourth column of Schedule 6.1, stocks are less risky than long government bonds in both markets for the 25-year holding periods used by Ms. McShane as shown by ratios less than one in the last (right-most) column of Schedule 6.1. Thus, while Ms. McShane argues that the use of the arithmetic mean is justified based on the one-year forward unpredictability of returns on page 143 of her evidence, she uses the 25-year rolling window data that exhibits mean reversion for equity returns and mean aversion for bond returns to argue that the "historic equity market returns have not exhibited a secular upward or downward trend" and the "total bond returns have experienced an upward trend" on page 147 of her evidence.[96]

6.5.2 Beta Estimation Problems

Ms. McShane argues that unaltered utility betas are not very reliable because they became "decoupled" from the overall equity market.[97] The word decoupling (or its counterpart recoupling) merely describes the strength of the correlation between the returns of utilities and the market when their individual risks remain unchanged and/or the changes in their relative risks when the strength of their correlation remains unchanged. For example in the former case when the returns on utilities become less correlated with the returns on the market (i.e., the correlations move towards zero), Ms. McShane describes this as being a decoupling. However, a lowering of the correlation between the returns of utilities and the market would be expected if regulators are focusing on rate stability

[96] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 147 of 261.
[97] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, pages 33 and 34 of 261.

while all else is held constant. In the extreme case where the returns on utilities did not vary, the correlations and, hence, the betas of the utilities would be equal to zero.

6.5.2.1 The Use of Adjusted (Inflated) Betas in Estimating Own ERP

Ms. McShane uses the Value Line (and not the Merrill Lynch) method to adjust (inflate) her unadjusted betas upwards.[98] Value Line's beta adjustment procedure is quite simple in that it is a weighted average of the firm's unadjusted beta and the market beta of 1, where the weight placed on each is two-thirds and one-third, respectively. Since (Canadian) regulated utilities almost always have unadjusted betas less than one, a Value Line type of adjustment almost always results in an adjusted beta that is higher than its corresponding unadjusted beta, or what is more properly referred to as an "inflated" beta.

6.5.2.1.1 The merits of adjusting (inflating) betas

Adjusted betas were discussed in Section 4 of our evidence, where they were shown to be inappropriate for Canadian utilities. One justification proposed for the use of this adjustment method is the argument that utility betas tend to revert to a hypothesized true value of one (i.e., the market beta) over time.[99] In other words, it is formulated around the belief that an average-risk regulated Canadian utility, which is considered to be of low risk in an overall market context, has the same relative risk as the market index as proxied by the S&P/TSX Composite Index, which is considered to be of average risk in an overall market context.

In section 4.3.2.5 of our evidence, we provide six substantive reasons why this is not the case for a sample of utilities, including evidence that using an

[98] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, starting on pages 35 of 261.
[99] Ms. McShane's Response to Pollution Probe Interrogatory #19, EB-2007-0905, Exhibit L, Tab 12, Schedule 19, page 1 of 1. She also acknowledges that she is not aware of any empirical evidence that supports mean reversion for Canadian betas in the same response.

adjusted beta to forecast future betas results in a substantial over-estimate of actual realized betas. Value Line type betas are based on a dated empirical study that found that the average U.S. equity beta for all the stocks in the U.S. market regresses towards the market's or sample's beta of 1. This has to be true by construction since the market beta itself is by definition equal to one and is by definition equal to the weighted average of the betas of all the stocks in that market. In contrast, utility-specific studies find that a forecast of a U.S. equity utility beta is improved by either reflecting the tendency of utility-specific betas to regress to the sample average for utilities or incorporating estimation error into the derivation of the beta estimate.[100] Mean reversion implies that the mean will be reached at some point in time, and fairly quickly given an assumed reversion rate of one-third. In fact in section 4, we showed that the rolling five-year average beta had become negative and was now positive but not above 0.5 (never mind one) for our sample of utilities since the later 1990s. This is hardly the behavior that would occur if the average sample beta had a tendency to regress towards the market beta of one.

Since Ms. McShane basically uses the sample average utility beta as her estimate of the beta for an average-risk utility, no adjustment is needed to offset the tendency of the beta of a specific utility to regress to that same sample average utility beta. Ms. McShane should not have adjusted (inflated) the unadjusted sample betas. Furthermore, as we have shown in Section 4 of our evidence, Ms. McShane's beta mid-point estimate of 0.675 (range of 0.65-0.70)[101] is higher than the highest five-year mean beta of 0.583 for our sample of utilities (i.e., for the 1990-1994 or 1991-1995 period), and is substantially higher than the five-year mean beta of 0.421 for our sample of utilities for the 2003-2007 period. This period coincides with the time during which Ms. McShane notes that there was a recoupling of utilities with the general market between utility stocks

[100] We refer to a recent study by Drs. He and Kryzanowski using the Kalman filter approach for Canadian sectors. Z. He and L. Kryzanowski, Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis*, in press.
[101] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 36 of 261.

and the S&P/TSX Composite.[102] Thus, while the beta values proposed by Ms. McShane are beyond the upper end of the range of possible beta values based on historical values, we have chosen to use a beta value of 0.5 as our point estimate that is above the longer-term mean of that range, and above the shorter-term mean of that range.

We do not agree with the argument by Ms. McShane that the provision of adjusted betas by various service vendors justifies the use of adjusted betas. We note that many vendors provide products that are devoid of both theoretical and empirical justification. The studies by Drs. Kryzanowski and Jalilvand, Gombola and Kahl, and others cited in Section 4 of our evidence, provide support for the tendency of the betas of utilities to regress toward their grand utility mean and not toward the grand or market average of 1.0. However, since Ms. McShane already effectively uses the grand utility mean for her benchmark utility, properly accounting for the tendency to regress to itself would not change the unadjusted or unaltered beta estimate for the benchmark utility.

Dr. Damodaran, the author of many textbooks, states that "it can be argued that the beta looking forward will be different from the historical beta" even if the latter is well estimated if the firm has changed in terms of business and financial risk. He states that "[o]ne simplistic way of adjusting historical betas is to assume that betas will move towards one in the long term and adjust beta estimates towards one", and then provides what he considers to be more accurate ways of estimating forward looking betas than using historically estimated betas.[103] Once again, it is important to emphasize that this is only for the case where the business and financial risks of the firm have materially changed. It also is important to emphasize that, by extension, Dr. Damodaran would suggest a reduction in the historically estimated beta if the firm has undergone a material

[102] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 33 of 261.
[103] A. Damodaran, Discussion issues and derivations, under his section 4. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3, and accessed on December 11, 2002.

lowering of its business and financial risks and all else remains constant. Thus, using a Value Line adjusted beta in this case would move the historically estimated beta in the wrong direction.

As further support for our position that unadjusted betas should remain unaltered, we note that tests and applications of asset pricing models (like the CAPM) that are published in the peer-reviewed scientific literature do not use Value Line type of adjusted betas. This literature includes numerous studies by Fama and French, amongst others, about whether or not the traditional CAPM is empirically supported.[104] Furthermore, we are not aware of any use of adjusted (inflated) betas in applications of event study methods in academic research or in practice.[105]

6.5.2.1.2 Impact of using adjusted (inflated) betas on the ERP estimates of utilities

After multiplying her inflated beta estimate of 0.65-0.70 with her inflated MERP estimate of 6.5%, Ms. McShane concluded that the "indicated benchmark utility equity risk premium is approximately 4.25-4.50%".[106] Using the corresponding upper end of the range of the corresponding unadjusted or unaltered beta estimate for the benchmark utility of 0.48 yields a revised estimate of the own ERP of the benchmark of 3.1%, or a reduction of over 26% from her estimate of 4.25% using her estimation method. This is assuming, for the moment, that Ms. McShane's estimate of the MERP is not similarly inflated. Of course, we showed previously that Ms. McShane' MERP estimate is also too high.

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[104] Eugene F. Fama and Kenneth R. French, 1996, The CAPM is wanted, dead or alive, *Journal of Finance* 51:5 (December), pages 1947-1958; Eugene F. Fama and Kenneth R. French, 1995, Size and book-to-market factors in earnings and returns, *Journal of Finance* 50:1, pages 131-155; Eugene F. Fama and Kenneth R. French, 1996, Multifactor explanation of asset pricing anomalies, *Journal of Finance* 51:1 (March), pages 55-84; and James L. Davis, Eugene F. Fama and Kenneth R. French, 2000, Characteristics, covariances, and average returns: 1929 To 1997, *Journal of Finance* 55:1 (February), pages 389-406.

[105] Event-study methods are used extensively in class action litigation by expert witnesses for both the plaintiff and the defendant to estimate price inflation due to misrepresentation or fraud.

[106] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 37 of 261.

6.5.2.2 The Validity of the CAPM

6.5.2.2.1 The empirical evidence provided by Ms. McShane against the CAPM

The empirical tests of the CAPM conducted by Ms. McShane are unreliable in that they do not examine the cross-sectional nature of the conditional return-risk relationship postulated by the CAPM, and do not conform to any of the accepted methodologies for testing the CAPM.[107] Ms. McShane could not provide any references to the peer-reviewed literature that provide support for the methodology that she used to test the relationship between beta and return in the Canadian equity market. Specifically, her response to Pollution Probe Interrogatory #34 was:[108]

> "Ms. McShane's analysis was not constructed based on a peer-reviewed methodology. It is a simple correlation between betas and returns which demonstrates that over a long period of time, the betas of lower and higher risk sectors of the economy and the returns they have achieved have not conformed to the relationship predicted by the CAPM, leading to the conclusion that depending on a raw beta to predict the expected return is problematic at best."

Based on a survey of a large sample of U.S. corporations, Graham and Harvey (2001, 2002) find that the:[109]

> "Capital Asset Pricing Model (CAPM) was by far the most popular method of estimating the cost of equity capital: 73.5% of respondents always or almost

[107] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, starting on the bottom of page 154 of 261.
[108] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 34, page 1 of 1.
[109] John Graham and Campbell Harvey, How do CFOs make capital budgeting and capital structure decisions?, *Journal of Applied Corporate Finance* 15:1 (Spring 2002), page 12. This article was a practitioner version of the following paper that won the Jensen prize for the best *JFE* paper in corporate finance in 2001: John Graham and Campbell Harvey, The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60 (2001).

always used it. The second and third most popular methods were average stock returns and a multi-factor CAPM, respectively. Few firms used a dividend discount model to back out the cost of equity."

6.5.2.2.2 The empirical evidence based on tests of the CAPM

Earlier studies that found biases in the CAPM typically used U.S. 90-day Treasury bills as a proxy for the risk-free rate. These studies found that the estimated intercept of the Security Market Line or SML was above this choice of risk-free rate, and that the estimated slope of the SML was smaller than the difference between the mean return on the market proxy and the mean return on T-Bills (i.e., the MERP measured relative to the T-Bill rate). More recent studies find strong support for the zero-beta version of the CAPM where the estimated intercept is the return on the zero-beta portfolio and for conditional forms of the CAPM. The expectation of the CAPM is that the return on the zero-beta portfolio should exceed the return on T-Bills.[110] The use of the higher long Canada rate as the proxy for the risk-free rate instead of the 30- or 90-day Treasury Bill rate is consistent with these empirical findings.

The use of the higher long Canada rate when constructing the SML increases the intercept of the SML and also flattens the slope of the SML. This implies that an over or double adjustment for the same empirical phenomenon if one makes a further adjustment to the beta to account for a flatter-than-expected SML. Thus, this represents another unsupported rationale that some experts use to adjust their beta estimates upwards for a sample of utilities or to attack the validity of the CAPM. In Appendix 6.A, we discuss the type of adjustment that should be made if, for the sake of argument, one accepted that there should be an adjustment for the early empirical evidence of a flatter-than-expected SML.

[110] Robert F. Stambaugh, 1982, On the exclusion of assets from tests of the two-parameter model: A sensitivity analysis, *Journal of Financial Economics*, November, pages 237-268.

Although a number of older studies do not support the unconditional (or single period) version of the traditional CAPM, the empirical evidence for multifactor or conditional CAPM is much stronger.

The U.S. literature includes the study by Drs. Pettengill, Sundaram and Mathur (1995) that explains the not significant beta-return relation that is observed when the unconditional beta is used. [111] When they use a constant beta model that is conditioned on up and down markets, they find significant risk premiums for both types of betas. Drs. Pettengill, Sundaram and Mathur (2002) find significant risk premiums for both types of betas for constant risk and dual beta models that are conditioned on the market return.[112] For up markets, they find an insignificant premium for the Fama and French book-to-market equity factor for both models and a marginally significant premium for the Fama and French size factor for only the constant risk beta model. For down markets, they find significant premiums for both Fama and French factors for both models.

Very recent studies by Drs. Ang, Hodrick, Xing and Zhang (2006 forthcoming) strongly demonstrate that for 23 developed markets (including the U.S.) over a sample period that spans January 1980 to December 2003 that only the market factor is consistently priced.[113] Furthermore, the small-minus-big capitalization factor and the high-minus-low book-to-market factor are often insignificant and often have the wrong sign predicted by Drs. Fama and French (1993).[114]

Drs. He and Kryzanowski (2006) find that the significant beta-return relation that is observed when the unconditional beta is used for Canada is well

[111] G.N. Pettengill, S. Sundaram and I. Mathur, The conditional relation between beta and returns. *Journal of Financial and Quantitative Analysis*, 30 (1995), pages 101–115.
[112] G. Pettengill, S. Sundaram and I. Mathu, Payment for risk: Constant beta vs. dual-beta models, *The Financial Review* 37:2 (May 2002), pages 123-136.
[113] A. Ang, R.J. Hodrick, Y. Xing and X. Zhang, The cross-section of volatility and expected returns. *Journal of Finance*, 61:1 (2006a), pages 259–299; and A. Ang, R.J. Hodrick, Y. Xing and X. Zhang, High idiosyncratic volatility and low returns: International and further U.S. evidence., forthcoming *Journal of Financial Economics*.
[114] E. F. Fama and K.R. French, Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33 (1993), pages 3-56.

explained by the inverse beta-return relation that is expected when the realized market returns are below the zero-beta rate.[115] In particular, while the estimated risk premiums are significant with their expected signs for up- and down-market betas, the estimated risk premium during down-markets dominates the risk premium during up-markets in both magnitude and significance. They also identify significant size and liquidity premiums, although the latter is small in magnitude.

6.5.2.2.3 Implications for determining allowed ROE

It is incorrect to equate the Equity Risk Premium Estimation Method with the CAPM. Although the use of equity risk premiums in finance pre-dates the CAPM, the use of beta as a measure of priced risk can be derived from the CAPM.

However, the intuitions behind the conditional CAPM or one factor asset pricing model are used by many experts in determining the equity rate of return since they provide an updated estimate of the utility-specific measure of risk, MERP and prospective long Canada yield in their successive testimonies. Furthermore, their historical estimates of risks and equity risk premiums are estimated for various time periods in order to assess the time-series movement in these important inputs for determining their recommended ROE. In contrast, Ms. McShane argues that no expert has used a conditional approach in implementing the Equity Risk Premium Estimation Method. Specifically, quoting Ms. Mc Shane's response to Pollution Probe Interrogatory #30:[116]

> "The simple CAPM model used to estimate the cost of equity is a static model. Conditional models of the CAPM essentially hypothesize that betas and risk premiums are time varying. The empirical work that has been done using conditional models suggests that a conditional model may explain more

[115] Z. He and L. Kryzanowski, The cross section of expected returns and amortized spreads, *Review of Pacific Basin Financial Markets and Policies (RPBFMP)* 9: 4 (December 2006), pages 597-638.
[116] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 30, page 1 of 1.

of the cross-section of market returns. However, Ms. McShane is not aware of any practical applications of a conditional CAPM, and has never seen such a model proposed for, or used to, estimate the cost of equity for a regulated company."

6.5.2.2.4 Decisions by regulatory commissions

There are regulatory commissions, boards or régies that have reached a similar conclusion regarding the selective use of the empirical evidence for the CAPM to adjust the beta of the utility upwards. These regulatory entities have addressed the validity of using a model to implement an upward beta adjustment that is commonly referred to as the Empirical CAPM or ECAPM. Specifically, the Public Utilities Commission of the State of California in "D.99-06-057 rejected the ECAPM financial model because it artificially raises the ROE requirement".[117] Similarly, in its decision for Hydro Quebec Distribution, the Régie de l'Enérgie found insufficient support for the use of the ECAPM. It also reaffirmed its earlier decision against the use of adjusted betas, and indicated that it did not support estimates obtained using the comparable earnings method or the DCF for individual firms.[118]

6.5.2.3 No Downward Beta Adjustment with the Use of U.S. MERP

We stated earlier that Ms. McShane not only adjusted betas when she should not have but also did not adjust betas when she should have. Ms. McShane uses the MERP estimates obtained from the Ibbotson Historical return data for the U.S., along with other estimates, to obtain an estimate of the MERP. She then applied her beta estimate of 0.65-0.70 to her MERP estimate to obtain an own

[117] As noted on pages 24 and 33 in the Proposed decision of A.L.J. Galvin (mailed 10/8/2002), Interim opinion on rates of return on equity for test year 2003 before the Public Utilities Commission of the State of California, Application of Pacific Gas and Electric Company for authority to establish its authorized rates of return on common equity for electric utility operations and gas distribution for test year 2003. (U39M), application 02-05-022, filed May 8, 2002. Available at: http://www.cpuc.ca.gov/published/comment_decision/19761.htm.

[118] Régie de L'énergie du Québec, D é c i s i o n, Demande relative à la détermination du coût du service du Distributeur et à la modification des tarifs d'électricité, phase I, D-2003-93, R-3492-2002, 21 mai 2003, pages 71-73.

ERP estimate for an average-risk Canadian utility. Thus, she effectively used the same beta estimate for both her Canadian MERP estimates and her U.S. MERP estimates. Thus, Ms. McShane's use of an implicit scheme for weighting MERP from the U.S. and Canadian markets ignores the fact that the beta of a utility is different for each market proxy, and differs in a domestic-only context from that in an international context. As noted by Dr. René Stulz, a former editor of the *Journal of Finance*, "globalization reduces the beta of all companies whose profits and values are more strongly correlated with their local economies than with the global economy".[119] One would expect this to be the case for the portion of OPG whose ROE is regulated by the Board.

6.6 FAIR RATE OF RETURN ESTIMATES FROM MS. MCSHANE'S IMPLEMENTATION OF THE DCF ESTIMATION METHOD

6.6.1 Optimism Bias in Forecasts of Analysts

Ms. McShane uses the forecasts of analysts in her DCF analyses for individual utilities.[120] Numerous studies show that analysts' forecasts are optimistic. One could argue that the DCF cost of equity will be an unbiased estimate of investors' expected returns if investors believe the forecasts, and price the securities accordingly. However, this would attribute considerably irrationality to investors in that they believe forecasts that they know have an optimistic bias. Such irrationality would invalidate a basic assumption of using the DCF method to estimate the cost of equity; namely, that prices are fair. Fair prices are needed to obtain estimates of fair rates of return for utilities using the DCF method.

[119] René M. Stulz, Globalization, corporate finance, and the cost of capital, *Journal of Applied Corporate Finance* 12:3 (Fall 199), page 12.
[120] E.g., Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 40 of 261.

In support of the relevance of the forecasts, one could refer to a number of dated studies that find that the forecasts of analysts are better than the use of time-series methods to forecast future growth rates. However, this is no longer the case. To illustrate, the most recent study referenced by Ms. McShane was published about 19 years ago.[121] First, the information disclosure playing field has been leveled in both the U.S. and Canada as companies are now restricted from disclosing information first to financial analysts and then to the general public. Second, as has been discussed at length in the press, analysts are generally overly optimistic in their forecasts to facilitate the underwriting side of their business, and, more importantly, to maintain access to the firms that they cover. Third, forecasting accuracy has not been a criterion in retaining analysts, at least in more recent years where the emphasis has been on the revenue they generate for their employers. Fourth, as is discussed next, the optimism bias in analyst forecasts has been significant.

It is well documented in the published literature that the bottom-up market forecasts of financial analysts and top-down market forecasts of market strategists contain an optimism bias, and that the bottom-up forecasts tend to be much more optimistic than their top-down counterparts. We discuss three representative studies next. Chopra (1998)[122] finds that the average consensus earnings per share growth forecasts made by analysts for the S&P500 index over the 1985-1997 time period is almost twice the actual growth rate. Chung and Kryzanowski (2000)[123] find a significant optimism bias in bottom-up and top-down forecasts of earnings per share by analysts for the S&P500 index for the current fiscal year (FY1) and subsequent fiscal year (FY2).[124] They find that the optimism

[121] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 164 of 261.
[122] V. K. Chopra, Why so much error in analysts earning forecasts? *Financial Analysts Journal*, 54:6 (1998), pages 35-42.
[123] R. Chung and L. Kryzanowski, Market timing using strategists' and analysts' forecasts of S&P500 earnings, *Financial Services Review*, 8:3 (2000).
[124] Similarly, Chung and Kryzanowski (1999) find that the quarterly EPS forecasts for the S&P400 and S&P500 are, on average, optimistically biased for the top-down forecasts of market strategists that are reported to I/B/E/S. R. Chung and L. Kryzanowski, Accuracy of consensus expectations for top-down earnings per share forecasts for two S&P indexes, *Applied Financial Economics* 9 (1999), pages 233-238.

bias is significantly higher in the bottom-up forecasts compared to the top-down forecasts on average. They examine the 218 months of such annual forecasts over the period from January 1982 through February 2000. The bottom-up forecasts of financial analysts exhibit a statistically significant mean optimism bias of 17.5% and 30.5% for the next and subsequent fiscal years (FY1 and FY2), respectively.

In a paper published in the *Journal of Finance* in 2003, Drs. Chan, Karceski and Lakonishok conclude that:[125]

> "There is no persistence in long-term earnings growth beyond chance, and there is low predictability even with a variety of predictor variables. Specifically, IBES growth variables are overly optimistic and add little predictive power."

They also observe that (p. 672):

> "Notably, analysts' estimates are quite optimistic over the period 1982 to 1998, the median of the distribution of IBES growth forecasts is about 14.5 percent, a far cry from the median realized five-year growth rate of about 9 percent for income before extraordinary items."

They find that the level of over-optimism in the IBES forecasts varies somewhat but is substantial across all their five quintiles of firms. Based on the results presented in their table IX (p. 673), the over-optimism bias is still high at about 4.0% for quintile 1, which consists of the firms in their lowest growth grouping of firms. The actual and forecasted growth rates for income before extraordinary items are 2.0% and 6.0% for their quintile 1 group, where utilities are 25% of the membership in this quintile. This is a 200% overestimate when measured against the actual annual rate of growth of 2.0% for this quintile of firms.

Analysts have been criticized for the aggressive "hyping" of stocks. The research director of the world's largest securities firm told its analysts to be more

[125] Louis K.C. Chan, Jason Karceski and Josef Lakonishok, 2003, The level and persistence of growth rates, *Journal of Finance* 58:2 (April), page 643.

critical.[126] Charles Hill, director of research at Thomson Financial/First Call noted that only 1.8% of all current stock recommendations are “sells”, even in a bear market. He went on to complain that the compensation packages of many analysts are tied too closely to the performance of the lucrative investment banking operations of the major brokers. The aversion of analysts to make sell recommendations is not confined to one sector or time period, and is ongoing. A recent article published on Bloomberg.com notes that even with a 10% decline in the S&P500, “analysts' recommendations to ”buy” or ”hold'' U.S. shares climbed to 94.5 percent, the highest rate in more than five years”.[127]

6.6.2 Need to Adjust for Optimism Bias in Forecasts of Analysts

Even if the recommendations of analysts influence market prices as Ms. McShane argues, this does not mean that investors do not make decisions after removing some or a great part of the bias inherent in such forecasts. In fact, a number of studies published in peer-reviewed scientific journals report evidence that investors make adjustments for predictable bias (e.g., Freeman and Tse, 1992; Dugar and Nathan, 1995, Han, Manry and Shaw, 2001).[128] Furthermore, the following question comes to mind: Why use earnings growth forecasts of investment analysts who use a “bottom-up” approach to generate extremely noisy and upwardly biased estimates of future return expectations when you can directly obtain the future return expectations of investment professionals from both the buy and sell sides of the market using “top-down” and not “bottom-up”

[126] Dave Ebner, Merrill Lynch tells analysts to be more critical, *Globe and Mail*, March 7, 2002, page B18.
[127] M. Tsang and E. Martin, Schwab Asks Who Needs Analysts After Biggest Flub (Update4), Bloomberg.com, April 7, 2008. Available at: http://www.bloomberg.com/apps/news?pid=20670001&refer=home&sid=aafbjqdWG7pQ.
[128] R. N. Freeman and S.Y. Tse, A nonlinear model of security price responses to unexpected earnings, *Journal of Accounting Research* 30:2 (1992), pages 185-209; A. Dugar and S. Nathan, The effect of investment banking relationships on financial analysts' earnings forecasts and investment recommendations, *Contemporary Accounting Research* 12:1 (1995), pages 131-165; and B. H. Han, D. Manry, and W. Shaw, Improving the precision of analysts' earnings forecasts by adjusting for predictable bias, *Review of Quantitative Finance and Accounting* 17:1 (2001), pages 81-98.

approaches, as we have done in our evidence for the market proxy (our fourth estimation method)?

In response to Pollution Probe Interrogatory #21, Ms. McShane quotes from a decision by the BCUC that concludes that the forecasts by Value Line have no bias since Value Line is an independent research firm that neither buys nor sell securities, and that I/B/E/S forecasts have no bias because their forecasts are similar to those of Value Line.[129] This conclusion suffers from two errors in logic. First, analyst bias depends primarily upon the need for the analyst to maintain access to the management of the firms being covered, and this depends upon being firm-friendly and not upon whether or not the analyst's employer buys or sells securities. Second, the conclusion does not follow from the empirical evidence on analyst bias that has been published in peer-reviewed journals.

Thus, we do not advocate the use of "bottom-up forecasts" for individual firms in the determination of ROE recommendations because such forecasts tend to be optimistic, sometimes excessively optimistic, and the amount of the bias varies in an unknown fashion over time.

6.6.3 Does Ms. McShane Adjust for Optimism Bias in Forecasts of Analysts

Since Ms. McShane does not adjust for optimism in the forecasts of analysts,[130] we conclude that the estimates obtained using the DCF-based risk premium test conducted by Ms. McShane result in ERP estimates for individual firms that are too unreliable to be used as a proxy for the fair required return on equity capital. If the optimism bias is removed, such ERP estimates provide some very noisy indicative (or secondary) information about the fair required return on equity capital.

[129] Ms. McShane's Response to Pollution Probe Interrogatory #21, EB-2007-0905, Exhibit L, Tab 12, Schedule 21, page 1 of 1.
[130] Ms. McShane's Response to Pollution Probe Interrogatory #21, EB-2007-0905, Exhibit L, Tab 12, Schedule 21, page 1 of 1.

6.6.4 Problems with the Use of DCF Estimates of Fair Return from a Sample of Utilities

Ms. McShane generates DCF estimates of a fair return on equity for various samples of utilities.[131] Discounted cash flow (DCF) tests have a number of disadvantages that make them unreliable when applied to specific firms in the same industry. First, the DCF test depends critically on estimating the expected growth rate. Error in capturing the growth rate impacts directly on DCF estimates. Because estimates of the growth rate depend on past growth and/or analyst opinion, it is difficult to achieve any measure of precision. Furthermore, if firms are drawn from the same or similar industries, the growth rate errors will tend to be correlated, and the benefits in terms of forecast precision from an increasing sample size will be greatly reduced. Highly correlated forecast errors across individual firms in the same or similar industries arise due to the fact that analysts specializing in the same industry will make such forecasts.

Second, circularity also causes a problem in applying the DCF approach to individual firms in regulated industries. Analysts base their analysis of the future growth in earnings and dividends on the rate of return allowed by regulatory bodies, which translates into the market price for the shares. If we, in turn, rely solely on the market price and dividend growth rate for our required return on equity, then we are being influenced by the market, which, in turn, is being influenced by the regulator's decision. Thus, by employing the DCF method, we would, in effect, be anticipating what the market is expecting the regulators to do thus introducing circularity.

Third, the DCF model assumes that returns are set competitively, and that no excess returns or "free lunches" are possible. If investors are on average overcompensated for the investment risk they bear for investing in regulated

[131] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, Appendices D and E, starting on page 159 of 261.

utility stocks, then the DCF model will generate implied returns that are too high. Ms. McShane provides evidence of such excess returns to Canadian utility investors. Specifically, she reports an annual arithmetic mean return of 12.6% for Canadian utilities over the 1956-2006 period.[132] This 12.6% mean annual return is materially higher (140 basis points annually) than the arithmetic mean annual return of 11.2 percent for the Canadian market over the same time period based on data from the CIA.

6.7 FAIR RATE OF RETURN ESTIMATES FROM MS. MCSHANE'S IMPLEMENTATION OF THE COMPARABLE EARNINGS METHOD[133]

6.7.1 Deficiencies in the Comparable Earnings Methodology that Make it Unsuitable for ROE Determination

6.7.1.1 Introduction

The Comparable Earnings Estimation Method arises from the notion that capital should not be committed to a venture unless it can earn a return commensurate with that available prospectively in alternative ventures of comparable risk. While capital needs to be allocated efficiently so that the risk-adjusted returns are equivalent across firms and uses, the Comparable Earnings Test does not measure if this is the case. The Comparable Earnings Test measures rates of return but does not compare them with the opportunity cost of capital as is commonly done with measures such as Economic Value Added or the measures used to measure the allocational efficiency of secondary markets. Thus, we conclude that this Method should not be used as a tool to estimate a fair rate of return on equity for a utility.

[132] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, Schedule 10, page 227 of 261.
[133] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, Appendix F, starting on page 168 of 261.

Drs. Brigham, Shome and Vinson state that the comparable earnings method "has now been thoroughly discredited (see Robichek [15]), and has been replaced by three market-oriented (as opposed to accounting-oriented) approaches …".[134] Furthermore, there is widespread agreement among utility and intervenor witnesses and Boards that the Comparable Earnings Test is not appropriate for determining a fair rate of return.[135] For example, in 1999, the Alberta Energy and Utilities Board stated:[136]

> "In the Board's view, the comparable earnings test is sensitive to accounting practices of the sample firms, the sample selection, the selected business cycle and discontinuities caused by mergers, divestiture or restructuring. Given the historical corporate restructuring and economic uncertainty, which may adversely affect the test results, the Board gives little weight to the comparable earnings test in this proceeding for the purposes of determining an appropriate rate of return."

The Alberta Energy Utilities Board has re-iterated its position on the merits of the Comparable Earnings Method in a subsequent decision on the application by AltaLink and TransAlta as follows:[137]

> "Accordingly, for all of the above reasons, the Board continues to consider that the comparable earnings method is not appropriate and, hence, gives no weight to the comparable earnings method in this proceeding for the purposes of determining the appropriate equity rate of return."

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[134] E. F. Brigham, D. K. Shome and Steve R. Vinson, 1985, The risk premium approach to measuring a utility's cost of equity, *Financial Management* (Spring), pages 33-45.
[135] The direct testimony of Dr. M.J. Vilbert for TransAlta Utilities Corporation, May 2000, is an example of a utility witness, and the direct testimony of Drs. L.D. Booth and M.K. Berkowitz for TRANSCO, August 2000, is an example of intervenor witnesses.
[136] Alberta Energy Utilities Board Decision U099099, November 25, 1999, page 326.
[137] Alberta Energy and Utilities Board, August 2003, Decision 2003-061: AltaLink Management Ltd. and TransAlta Utilities Corporation Transmission Tariff for May 1, 2002 – April 30, 2004, TransAlta Utilities Corporation Transmission Tariff for January 1, 2002 – April 30, 2002, page 115.

Despite this widespread agreement against its use, Ms. McShane places a significant weight on the results of applying the Comparable Earnings Method when determining her recommended fair rate of return on common equity for OPG.

6.7.1.2 The Widespread Agreement Against the Use of the Comparable Earnings Estimation Method is Based on a Number of Problems with its Use

The basic problem with the use of the Comparable Earnings Estimation Method is that there is neither a theoretical underpinning nor any empirical support for the comparable earnings approach to estimating a regulated fair rate of return for a utility. As an *ad hoc* approach to estimating a regulated fair rate of return, there are no agreed-upon rules for deciding upon how the Comparable Earnings Estimation Method should be implemented.

Furthermore, the Comparable Earnings Estimation Method does not satisfy any of the four Daubert criteria for evaluating the admissibility (scientific merit) of expert testimony that has been adopted by federal and many state courts in the U.S. They are: (1) whether the methods upon which the testimony is based are centered upon a testable hypothesis; (2) the known or potential rate of error associated with the method; (3) whether the method has been subject to peer review and publication; and (4) whether the method is generally accepted in the relevant scientific community, particularly in terms of the non-judicial uses to which the scientific techniques are put.[138] This is confirmed by Ms. McShane in her response to Pollution Probe Interrogatory #40 as follows:[139]

[138] For a more extensive discussion of this U.S. Supreme court decision, see, for example: Stephen Mahle, The Impact of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, on Expert Testimony: With Applications to Securities Litigation, April 1999. Available at: http://www.daubertexpert.com/basics_daubert-v-merrell-dow.html.

[139] Ms. McShane's Response to Pollution Probe Interrogatory #40, EB-2007-0905, Exhibit L, Tab 12, Schedule 40, page 1 of 1.

> "(a) - (g) The comparable earnings test is specifically applicable to utilities that are regulated on an original cost book value basis, for the specific purpose of adherence to the fairness standard. The limited purpose of the test is in stark contrast to the CAPM or DCF tests, which are more generally applicable across industries, used to estimate the required or expected rate of return on market values. Thus, it would be unlikely that the comparable earnings test has been subject to the types of peer review suggested in the question. Nevertheless, the importance of adherence to the fairness standard in setting the ROE (return on equity) and capital structure for regulated utilities regulated on the basis of original cost warrants giving weight to the comparable earnings test to properly take account of the unique construct."

We will now review some of the problems encountered in implementing a Comparable Earnings Estimation Method.

First, there is no agreement on how long and what time period should be used in the test. Some analysts use a full business cycle while others use a fixed time period of five or ten years. The results tend to be sensitive to the choice of the time period. To illustrate, although Ms. McShane states that "the appropriate period for measuring industrial returns should encompass an entire business cycle",[140] her sample period of 1994-2006 does not cover a complete business cycle. Specifically, in her response to Pollution Probe Interrogatory #26 she states that:[141]

> "The period 1994 - 2006 is not based on an official definition of a business cycle, which traditionally is measured from trough to trough. The most recent trough in the official business cycle in Canada ended in 1992, with 1993

[140] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, Appendix F, page 169 of 261.
[141] Ms. McShane's Response to Pollution Probe Interrogatory #26, EB-2007-0905, Exhibit L, Tab 12, Schedule 26, page 1 of 1.

> continuing to reflect the hang-over of the effects of both the deep recession and the ongoing restructuring of the economy in part arising out of the provisions of NAFTA and thus relatively anemic growth (2.3 percent). The period 1994 - 2006 does not include a year of technical recession, since unlike the U.S., Canada did not experience a recession in 2001. The period does, however, include three years of slowdown, as demonstrated in the annual growth rates provided below, and a balance of years of expansion (above trend growth), economic downturns and growth at approximately trend (average) levels."

Second, samples drawn from the same population vary considerably for the same expert even when they are drawn in close time proximity. To illustrate this bias, four of the 20 firms (i.e., 20%) used by Ms. McShane in her 11/07 sample for OPG were not in her 11/06 sample for the Northwest Territories Power Corporation although none were delisted over the period. This 20% change in the sample over a one-year period highlights the *ex post* selection bias associated with the Comparable Earnings Estimation Method.[142]

Third, there is no agreement on how structural changes in the economy or a number of economic sectors should be dealt with. Furthermore, structural changes may invalidate the usefulness of past rate of return series for predicting future expected rates of return.

Fourth, the predictive usefulness of historical time series of accounting rates of return on equity appears to remain untested. Unlike equity returns that are forward looking in that they incorporate expectations, (accounting) rates of return on equity are backward looking.

[142] Ms. McShane's Response to Pollution Probe Interrogatory #39, EB-2007-0905, Exhibit L, Tab 12, Schedule 39, page 2 of 2.

Fifth, as an accounting-based measure, comparable earnings will only coincide with the investor's opportunity cost (desired rate of return) by accident. There is no conceptual reason to expect that comparable earnings represent a rational expectation of an investor's desired rate of return from investing in the firm.

Sixth, as an accounting-based measure, comparable earnings are subject to variations in the quality of earnings caused by accounting reinstatements, business combinations and divestitures, accounting choice of what is extraordinary, accounting choices of what is expensed and what is capitalized, and managerial choices about accounting practice. The time-varying use of "aggressive accounting" by firms makes earnings numbers not very reliable for determining ERP.

Seventh, Comparable Earnings Tests suffer from survivorship and selection biases since they tend to be retrospective. This tends to inflate the average rates of return found for the comparable sample. For example, none of the firms in the Canadian sample used by Ms. McShane failed to reach the end of the time period that she examined. In reality, even low-risk firms have a material probability of failure over a 13-year period if they are not subject to regulation.

Eighth, the Comparable Earnings Test is very dependent upon the criteria or screens used to select the sample members. Most analysts use accounting-based risk proxies to screen possible candidate firms. These screens are an attempt to identify a sample that is similar in risk to the low risk utilities. These accounting-based risk proxies measure total risk and not the systematic risk which is important to diversified investors. Thus, some firms with a high systematic risk survive the screening process. Some of the screens, such as ones that screen out firms with a high coefficient of variation for book returns, bias performance upwards. The coefficient of variation of book (or accounting) returns measures the uncertainty of returns divided by the mean return. Its

inverse is a Sharpe-like measure of performance that provides the mean return per unit of standard deviation. High Sharpe-like ratios indicate better performance. For example, the CAPM (Capital Asset Pricing Model) assumes that the MERP per unit of standard deviation of return (essentially the Sharpe ratio) is positive and constant.[143] Thus, screening out firms with high coefficients of variation tends to screen out firms with low performance based on the Sharpe-like measure. Stated differently, the coefficient of variation of book returns screen retains firms that are most desired from an investor's viewpoint given their high return-to-variability ratios. Such firms include those with the market power to earn sustainable economic rents. In the sample of Canadian industrials used by Ms. McShane, she fails to screen out dual-class shares. The result is that almost one-half of her sample consists of dual-class shares where the subordinated shareholders' claims to earnings may have been enhanced to compensate for their subordinated voting power.

Ninth, the screens used by some experts produce comparable samples with an average price-to-book ratio and an average price-to-earnings ratio that exceeds that of a typical utility. We know from basic valuation theory that the price-to-earnings ratio increases with increasing return-on-equity, and that the price-to-book ratio also increases with increasing return-on-equity. Thus, given this positive relationship between return-on-equity and both the price-to-earnings ratio and the price-to-book ratio, it should not be surprising that the average return-on-equity for the comparable sample exceeds that of the sample of utilities. A higher price-to-book ratio is an indication that investors think a firm has opportunities to earn a rate of return on their investment that exceeds the market

[143] The literature using the Sharpe ratio to measure portfolio performance using market (not accounting) data is extensive. This literature includes S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using an APT with pre-specified macrofactors and time-varying risk premia," *Journal of Financial and Quantitative Analysis* 32:2 (June 1997), page 205-224; S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using a multivariate intertemporal asset pricing model with one state variable," *Canadian Journal of Administrative Sciences* 11:1 (March 1994), page 75-85; and L. Kryzanowski and A.B. Sim, Hypothesis testing with the Sharpe and Treynor portfolio performance measures given non-synchronous trading," *Economic Letters* 32 (1990), page 345-352.

capitalization rate. While Canadian Boards have appeared to be generous to utilities when viewed in hindsight, there is still an upper cap on how much their rate of return can exceed their true cost of capital. A higher price-to-earnings ratio is an indication that investors think that a firm has considerable and profitable future growth opportunities.

Tenth, while the current cost of new capital is based on current market values and inflation causes deviations between book and market values on the asset side, inflation also decreases the real value of long-term liabilities and part of the interest payment that represents a payment to debt holders for the depreciation of the real value of their holdings (i.e., a return of capital) is tax deductible. Thus, if the comparable earnings test were to be used, one would have to remove the benefit that utilities receive from the decrease in the real value of their liabilities resulting from inflation, and the tax benefit the utilities receive from the "interest" payments which represent a return of capital and not a return on capital. As firms with relatively higher debt ratios, the sum of both of these items is likely to be material.[144] Furthermore, much of the deviation between book and market values of assets for firms, including utilities, is caused by rates of return exceeding the cost of capital. The abnormal returns identified for Canadian utilities support this statement.

Eleventh, unlike the sample of non-utility comparables, regulated utilities are fully compensated for the actual cost of debt through the regulatory process even when they have a high embedded cost of debt.

Twelfth, and finally, as explained in Section 3 of our evidence, the use of regulatory deferral accounts reduces the business risk of utilities below that of comparable non-utilities.

[144] These items are primarily ignored by Ms. McShane in her evidence.

6.7.1.3 The "Free Lunch" Associated with Ms. McShane's Sample of 20 Low Risk Canadian Industrials

We calculated the performance of the sample of 20 low risk Canadian industrials used by Ms. McShane to illustrate the net effect of these problems using one of the samples used by Ms. McShane in her evidence to test whether or not this control sample of 20 Canadian industrials satisfies the comparable return standard based on realized returns.[145] Based on *ex post* tests of risk-adjusted returns, we find that this control sample of 20 Canadian industrials exceeded the minimum requirements for the comparable return standard in that they have earned an abnormal or "free lunch". For this purpose, we use test methodologies that satisfy all four Daubert criteria for evaluating the admissibility (scientific merit) of expert testimony that has been adopted by federal and many state courts in the U.S.

We first calculated the average monthly return and standard deviation of monthly returns for her sample of 20 firms and for the S&P/TSX Composite over the 1994-2006 period that she used for calculating accounting ROEs. Based on the results reported in Schedule 6.2, we find that not only is the annualized mean return of 15.08% for her sample considerably larger than the corresponding value of 11.51% for the S&P/TSX Composite but also that the annualized standard deviation of returns for her sample of 12.14% is considerably smaller than the corresponding value of 15.40% for the S&P/TSX Composite. Thus, Ms. McShane has used a sample that has outperformed the S&P/TSX Composite over her test period both in terms of realized return and risk. In fact, the Sharpe ratio as measured by excess return over the risk-free rate divided by the standard deviation of return of 0.26 for Ms. McShane's sample of 20 low risk Canadian industrials is almost two times the Sharpe ratio of 0.14 for the S&P/TSX Composite Index over the 13-year period she examined.

[145] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, Schedule 17, page 236 of 261.

When we examine the Jensen alpha measure of portfolio performance reported in Schedule 6.2, her sample of 20 firms has once again outperformed the S&P/TSX Composite. The estimated alpha or free-lunch as measured by the **abnormal** market- and risk-adjusted annualized return is 7.73% (i.e., 0.644% times 12) and is highly significant.

6.7.1.4 Recommendation Not to Put Any Weight on the Comparable Earnings Estimation Evidence Submitted by Ms. McShane

We recommend that the Board should not apply any weight to the Comparable Earnings Estimation evidence submitted by Ms. McShane. The method is not only devoid of scientific merit and theoretical underpinnings but its substantive implementation difficulties make it unsuitable to play a role in the determination of a fair rate of return for a utility. Also, the applications of the Comparable Earnings Estimation Method will lead to unfairness in that the allowed ROE of regulated utilities would be far too generous.

6.8 WEIGHTING THE ROE FROM VARIOUS ESTIMATION METHODS

Ms. McShane uses three estimation methods to arrive at her recommended ROE for OPG for the test years 2008 and 2009.[146] She places “some significant weight” on the Comparable Earnings Estimation Method, which we argue both in Section 4 and subsequently in this section of our evidence is inappropriate for arriving at a recommended ROE. She gives primary weight also to the DCF Estimation Method, which we argued earlier in this section is appropriate at the market and not individual utility level, especially when the latter uses the earnings forecasts of financial analysts.

[146] Ms. McShane’s Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, page 6 of 261.

The general theory is that one can reduce estimation error by increasing the number or set of estimation methods provided they are not highly correlated and they do not include methods that are known to be relatively inferior with known bias. Adding the estimates from inferior methods (such as the Comparable Earnings Estimation Method or the DCF Estimation Method applied to individual firms using the forecasts of analysts) to those from superior estimation methods (such as the Equity Risk Premium Estimation Method) will increase estimation error and bias. This notion appears to be well accepted by most Canadian Boards given the weight that they have placed on the estimates generated by experts using various ROE estimation methods.

6.9 ONGOING "FREE LUNCH" FROM INVESTMENT IN CANADIAN UTILITIES

6.9.1 Canadian Utilities

We now test whether or not investors in Canadian gas and electric utilities earned a return that is commensurate with the investment risk borne by such an investment. This is a formal test of whether Canadian utilities satisfied the comparable return standard based on realized returns. Based on *ex post* tests of risk-adjusted returns, we find that Canadian utilities have exceeded the minimum requirements for the comparable return standard in that they have earned an abnormal or "free lunch" or have been unfairly compensated in a generous fashion. For this purpose, we use test methodologies that satisfy all four Daubert criteria for evaluating the admissibility (scientific merit) of expert testimony that has been adopted by federal and many state courts in the U.S.

We arrive at this conclusion using two standard portfolio performance measurement metrics to evaluate the performance of holding the Sector sub-index 55, Utilities, of the S&P/TSX Composite index over the periods, 1988-2007 and 1998-2007 based on data from the TSX. These performance metrics are

commonly used to measure the investment performance of a managed portfolio such as a pension or mutual fund.

As shown in Schedule 6.3, the utilities sector index had both a higher annualized mean return (11.83% versus 10.78%) and a lower standard deviation of return (12.94% versus 14.04%) than the S&P/TSX Composite Index over the period of 1988-2007. Similarly, over the most recent ten-year period, the utilities sector index also had both a higher annualized mean return (12.15% versus 10.38%) and a lower standard deviation of return (14.70% versus 15.96%) than the S&P/TSX Composite Index.

We find that the utilities sector index outperformed the S&P/TSX Composite in terms of both the Sharpe and Jensen alpha measures of performance over the 20- and 10-year periods. The respective Sharpe ratios are 0.49 (utilities) versus 0.38 (index) over the most recent 20-year period and 0.58 (utilities) versus 0.42 (index) over the most recent 10-year period. The utilities index outperformed the market on a risk-adjusted basis by a statistically significant annualized 4.96% over the 1988-2007 period, and by a statistically significant annualized 8.13% over the ten-year period 1998-2007 based on the estimated Jensen alpha measure of abnormal performance. Thus, investors that invested in a portfolio that mimicked this sector achieved an excess return or free lunch of over 8% on an annualized basis over the most recent ten-year period of 1998-2007.

These results show with statistical significance that investors in these utilities have achieved results significantly higher than that intended by regulators when the regulators determined the allowed ROE, and additionally that the allowed returns exceeded what investors required to bear the investment risk of these Canadian utilities.

In other words, providing generous rates of return allowances to enhance the financial integrity and flexibility of these utilities without requiring these utilities to

establish a reserve to account for these insurance premiums, just over-compensates investors given the high dividend payout practices of many Canadian utilities.

6.9.2 U.S. Utilities

Although we do not conduct any tests ourselves, there is similar but not as rigorously conducted evidence that investors in U.S. utilities had a similar superior investment performance from utility investment. In a study that received much media coverage, Mr. Richard Bernstein and Ms. Lisa Kirschner, two prominent strategists at Merrill Lynch in New York, find that the S&P Utility Index outperformed the NASDAQ Index since NASDAQ's inception in 1971.[147] The Utilities outperformed NASDAQ over the 30-year period while incurring less risk. From NASDAQ's inception through the end of September 2001, NASDAQ returned a compound annualized rate of return of 11.2% per year, whereas the S&P Utility Index returned a compound annualized rate of return of 12.0% per year. The authors of this report measure risk using both the standard deviation of rolling 12-month returns (about 26% for NASDAQ versus about 16% for the S&P Utility Index), and alternatively as the percent of the returns that were negative over a 12-month time horizon (over 23% for NASDAQ versus over 15% for the S&P Utility Index).[148]

6.9.3 Implications for Assessing the Statements Made by Buy-side or Otherwise Compensated Professionals

Ms. McShane quotes a number of comments by buy-side or commissioned professionals that the allowed ROE for Canadian utilities is low compared to the

[147] Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.
[148] This is based on a visual estimation of the values depicted on page 2 of Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.

allowed ROE for comparable U.S. utilities.[149] All of these commentators make the implicit but untested assumption that U.S. regulators are better at determining the correct ROE than Canadian regulators so that the awarded rates in the U.S. should be used as the benchmark for comparison purposes. Furthermore, when rates of return are declining, we would expect the Canadian rate of return formulas, since they are implemented annually, to produce a quicker decline in the average rates of return than the case-by-case method used in the U.S., whose implementation timing is generally not annual and is determined by utility applicants and not intervenors. In turn, this would cause any disparity between Canadian and U. S. rates of returns to widen.

Furthermore, at least one Board, the Alberta Utilities Commission (UCA) took the position in its Decision 2004-052 on page 26 that this was an "oranges to apples" comparison:

> "In the Board's view, the Applicants did not demonstrate that the regulatory regimes in the two countries are sufficiently comparable that the Board should place significant weight on the return awards for U.S. utilities. For example, the Board notes differences in legislation, public and regulatory policies, the higher prevalence of longer-term settlement arrangements, the federal/state jurisdictional divisions, the development of RTOs and other differences in the structure of regulated industrial sectors, and differences in national fiscal, tax and monetary policies…"

Our finding of positive abnormal returns or free-lunches for Canadian utilities shows that these opinions are ill informed since the average Canadian utility outperformed the benchmark on a market- and risk-adjusted basis, which is a difficult task that the average Canadian mutual fund manager can only dream about.

[149] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, starting on page 103 of 261.

6.10 COMPARISON OF WITNESSES' RATE OF RETURN EVIDENCE AGAINST ADJUSTMENT FORMULAS

As a further test of the reasonableness of Ms. McShane's recommended ROE we compare the ERP implied in her ROE against the generic formulas used for groups of utilities by two Canadian regulators: the Alberta Utilities Commission (AUC, formerly the Alberta Energy and Utilities Board) and National Energy Board (NEB). In making this comparison, we briefly review the formulas employed by these two regulators drawing on our more complete discussion in Section 5 of this evidence.

In its RH-2-94 Multi-Pipeline Cost of Capital Decision issued in March 1995, the National Energy Board adopted a formula to compute an equity risk premium over the consensus forecast of the rate on long Canada's. While this formula was adopted as an administrative convenience, it has been used by the NEB since 1995. The current version is based on a minor revision in March 1997 to eliminate rounding. The AUC adopted a similar formula in its Decision 2004-052.

As discussed in Section 5, we believe that, despite their limitations, these formulas provide useful benchmarks of the thinking of regulators in Canadian jurisdictions. With these benchmarks, we can assess the extent to which recommendations offered by particular witnesses lie within or beyond what these regulators regard as a reasonable range.

We begin with the NEB formula. This procedure takes the average 3-month out and 12-month out forecasts of 10-year Government of Canada bond yields as reported in the November issue of *Consensus Forecasts* (Consensus Economics, Inc., London, England.) To this is added the average daily spread between 10-year and 30-year Canada's as reported in the *National Post* for October. An equity risk premium of 300 basis points was determined to be appropriate for the particular group of pipeline companies in 1995. This equity

risk premium is added to the determined rate for 30-year Canada's to give a final allowed return on equity.

In order to acknowledge the NEB's belief that equity risk premiums decrease when rates are rising and increase when rates are falling, an adjustment mechanism allows for the cost of capital to be adjusted upwards or downwards by 75% of the increase in the long Canada rate occurring after 1995. The NEB decision also notes that the adjustment mechanism is not restricted to the range of rates in its table.

For calendar 2007, the NEB formula produced a rate of return on common equity of 8.46% based on a long-Canada forecast of 4.22% according to an NEB letter of November 23, 2006, File 4750-A000-11. These figures appear in Schedule 6.4 under Regulatory Boards, 2007 Actual.

However, it should be noted that the NEB acknowledged that the adjustment mechanism which it had approved "... should produce fair results and prove durable during the target period *for at least three years*."[150] [Emphasis added].The NEB reaffirmed its formula in June 2002. The only variable reflected in the adjustment mechanism relates to changes in forecast long-term Government of Canada bond yields. It does not in effect reflect changes in the level of risk premiums and, in particular, the lower levels currently being experienced and forecast into the future.

We can illustrate the workings of the NEB formula using our 2008 forecast of 3.85% for 30-year Canada's. As stated earlier, the NEB's forecasted rate for long Canada's for 2007 was 4.22%, resulting in an allowed return on equity of 8.51%. For our forecast of 3.85% for test year 2008, the new rate is 8.18%. Put into words, the NEB formula states that as rates fall from 4.22% to 3.85% (a drop of 37 basis points), 75% of that drop is reflected by lowering the new rate, and

[150] RH-2-94, p. 31.

the remaining 25% of the drop is added to the risk premium. Following the same logic, inputting our forecast long Canada rate for 2009 of 4.25% into the NEB formula gives a recommended return on common equity of 8.48%. These figures appear in Schedule 6.4 under Regulatory Boards, for 2008 and 2009 projected based on Kryzanowski and Roberts' long-Canada forecast.

Turning to the AUC formula, we see that it follows a similar logic. In its Generic Cost of Capital Decision, the Commission set the return at 9.60% in 2004 when the long-Canada rate was 5.68% for a risk premium of 392 basis points. The determination of the long-Canada forecast and 75% adjustment are similar to the NEB formula. Applying the formula for 2007, the AUC set the long-Canada forecast at 4.22% and its return on equity at 8.51%. This figure is shown in Schedule 6.4 under Regulatory Boards 2007 Actual.

Schedule 6.4 also displays projections for the two test years using our long-Canada forecasts and the AUC formula. For test year 2008, the AUC formula produces an allowed return of 8.23%. For 2009, the allowed return is 8.53%.

In summary, Schedule 6.4 shows that applying the two adjustment formulas for our test years using our interest rate forecasts produces rates in a narrow range from 8.18% to 8.23% for 2008 and 8.48% to 8.53% for 2009.

In our view the NEB formula provides an upwardly biased estimate of the allowed return on equity. The reason is that not only has the forecasted long-Canada rate dropped since 1995 but the current and future expected risk premiums are considerably lower than they were in 1995. The same comment applies to the AUC formula as the risk premium is on the same order of magnitude.

Setting aside our comments on the bias in the regulatory formulas, we draw on their results to benchmark Ms. McShane's recommendations. To do this we

must first establish how the risk of the utilities for which the formulas were designed compares to the risk of OPG. As discussed in detail in Section 3 of this evidence, the risk of OPG lies somewhat above that of an average-risk utility such as those used to establish the NEB and AUC formulas. However, there are two reasons why this difference in risk does not invalidate the NEB and AEUB formulas as useful comparisons. First, as discussed in Section 1 of this evidence, we follow the practice of the AUC in making an upward adjustment in common equity in the capital structure to adjust for this risk. Second, as explained above, the formulas have a built-in upward bias that removes the need for any further adjustment to the rate of return.

Turning to the numbers in Schedule 6.4, it is apparent that the risk premium numbers recommended by the witnesses in this hearing and those resulting from regulatory formulas vary significantly. That said, the schedule reveals that the numbers fall into three distinct sets. At the high end are the recommendations of Ms. McShane, which are clearly substantially higher than the results of regulatory formulas. In the middle, lie the regulatory formulas. Below them are our own recommendations.

Putting these differences in perspective, we note that the regulatory formulas are drawn from the era of significantly higher risk premiums. Our earlier evidence presented a large body of argument showing that the equity risk premium has declined more recently and is expected to be lower in the future. Because they do not take this important trend into account, recommended returns drawn from regulatory formulas should be regarded as a generous upper bound. Our own recommendation reflects the current trend towards a lower equity risk premium. Our recommendation represents a reasonable choice should the Board wish to embrace our argument and adjust to the new market regime. If, however, should the Board wish to move more cautiously, it could choose to set the allowed equity return in the range between our recommendation and the average of the regulatory formulas. Either way, our

examination of the regulatory formulas and other evidence suggests that the Board should attach little weight to the rate of return recommendations of Ms. McShane.

APPENDICES

APPENDIX 1.A

BRIEF CURRICULUM VITAE FOR LAWRENCE KRYZANOWSKI

Dr. Lawrence Kryzanowski is currently a Full Professor of Finance and Concordia University Research Chair in Finance (previously Ned Goodman Chair in Investment Finance) at Concordia University. He was until June 2002 the Co-Director of the Concordia-McGill-Xiamen (CMX) Project of the Canada-China University-Industry Partnership Program in Financial Services. He is currently a member of CIRPÉE, a Principal Researcher at CREF, a scientific committee member of Institut de Finance Mathématique de Montréal (IFM2), and the representative of retail investors on the Regulation Advisory Committee (RAC) of Market Regulation Services Inc. He is a member of the Board of Governors and its Executive Committee, and the Pension Committee at Concordia University. He has been a visiting scholar at the University of British Columbia, a research associate at the University of Rochester, and a resident consultant at the Federal Department of Finance.

Dr. Kryzanowski has extensive experience teaching undergraduates, MBA, MSC and Ph.D. students, and executives for the Institute of Canadian Bankers, Shanghai Banking Institute, CMX, Concordia University, Dalhousie University, McGill University and York University. He has taught “asset allocation and performance measurement” in Concordia’s Goodman Institute Program (a private program at the MBA level). This third year course deals with a major component of the level III curriculum of the CFA program. Dr. Kryzanowski has extensive experience in developing or managing the development of instructional textbooks for the Institute of Canadian Bankers (ICB) and the Canadian Securities Institute (CSI), which includes the *Business Solvency Analysis* and *Investment and Portfolio Management* texts for the ICB, and the *Canadian Securities Course* text for the CSI.

Dr. Kryzanowski is an active educator, mentor, consultant and expert witness in financial economics, including investment management, risk pricing and management,

and regulation and operations of global financial markets, institutions and participants. He is author or co-author of over 100 refereed journal articles, seven books or monographs, and over 180 papers presented at academic conferences. Dr. Kryzanowski is the first recipient of Prix ACFAS/Caisse de dépôt et placement du Québec, which recognizes an exceptional contribution to research in finance. Dr. Kryzanowski was the inaugural recipient, with co-authors, of the BGI Canada Award and OSFI Award (latter with Dr. Roberts) for excellence in research on capital markets and on regulation of financial institutions, respectively. His 13 other paper awards for co-authored work are from the *Multinational Finance Journal* and various North American academic conferences. Dr. Kryzanowski is a former Editor of the *Multinational Finance Journal*, co-editor of finance with Dr. Roberts at the *Canadian Journal of Administrative Studies*, and founding chairperson of the Northern Finance Association. Dr. Kryzanowski is currently an Advisory Editor of the *European Journal of Finance*, an Associate Editor of the *International Review of Financial Analysis* and of *Frontier of Finance and Economics*, and is on the editorial boards of the *Canadian Investment Review* and *Finance India*.

Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for the setting of fair rates for the movement of various products by rail. Together with Dr. Roberts, he prepared a report and briefed counsel on rate of return considerations in the pipeline application in 1997 of Maritimes and Northeast, and prepared evidence on the fair return on equity and the recommended capital structure for the 2001/2002 Distribution Tariff Application (DTA) of Atco Electric and the 2001/2002 DTA and the 2002 DTA (No. 1250392) of Utilicorp Networks Canada (Alberta) Ltd. before the Alberta Energy and Utilities Board. Together with Dr. Roberts, and on behalf of the Province of Nova Scotia, he provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002. Together with Dr. Roberts, and on behalf of the Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") & Option consommateurs ("OC"), he prepared testimony and testified on

capital structure and fair return on equity in the matter of Hydro Québec Distribution before the Régie de l'Energie du Québec in 2003. Together with Dr. Roberts, and on behalf of Consumers Group, he prepared testimony and testified in Generic Hearing No. 1271597 before the Alberta Energy and Utilities Board in 2003-2004. Together with Dr. Roberts, and on behalf of the Hydro Communities (Hay River, Yellowknife and Fort Smith), he prepared testimony and testified in NTPC GRA 2006/07 and 2007/08 before the Public Utilities Board of the Northwest Territories in 2007.

Dr. Kryzanowski is often sought for his technical ability and advice on various matters in financial economics. He has consulted for the Superintendent of Financial Institutions, Federal Department of Finance, CMHC, CDIC, External Affairs Canada, Canada Investment and Savings, Hydro Quebec, the National Bank, Bombardier, and others.

Dr. Kryzanowski received a B.A. in Economics and Mathematics from the University of Calgary and earned his Ph.D. in Finance at the University of British Columbia.

BRIEF CURRICULUM VITAE FOR GORDON S. ROBERTS

Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services at York University's Schulich School of Business. Prior to joining York University, he was Bank of Montreal Professor of Finance at the School of Business, Dalhousie University. Dr. Roberts has held positions as Visiting Professor and Visiting Scholar at the National Institute for Development Analysis (Bangkok, Thailand), the University of Chile, Tilburg University (the Netherlands), Deakin University (Melbourne, Australia), University of Toronto, University of Arizona, Xiamen University (China) and the University of Zimbabwe.

In addition to teaching undergraduates, MBA and Ph.D. students at these universities, Dr. Roberts has extensive experience in executive teaching for the Kellogg–Schulich Executive MBA Program, the Institute of Canadian Bankers and in the Pension Investment Management School sponsored by the Schulich School jointly with pension consulting firms William Mercer Inc. and Frank Russell.

An active researcher in the areas of corporate finance, bond investments and financial institutions, Dr. Roberts is author or co-author of over forty journal articles and three corporate finance textbooks. In 2000, he shared with Dr. Kryzanowski the OSFI award for excellence in research on the regulation of financial institutions. Dr. Roberts is a former co-editor of finance with Dr. Kryzanowski of the *Canadian Journal of Administrative Studies*. He is a former Associate Editor of the *Journal of Banking and Finance*, and currently serves on the editorial boards of *FINECO* and the *Banking and Finance Law Review*.

Dr. Roberts is experienced in preparing evidence for utility rate of return hearings. From 1995–1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers' Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. In 1997, he co-prepared

(with Dr. Kryzanowski) a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. With Dr. Kryzanowski, he filed evidence on three electricity regulatory matters in Alberta in 2001, evidence on regulatory matters before the Alberta Energy and Utilities Board and the Nova Scotia Utility and Review Board in 2002, evidence on regulatory matters dealing with Hydro Quebec Distribution in 2003, evidence in Generic Hearing No. 1271597 before the Alberta Energy and Utilities Board in 2003-2004, and evidence in NTPC GRA 2006/07 and 2007/08 before the Public Utilities Board of the Northwest Territories in 2007.

Often sought for his advice on financial policy, Dr. Roberts has consulted for the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation, among others.

Dr. Roberts received a B.A. in Economics from Oberlin College and earned his Ph.D. at Boston College. He has been listed in the Canadian Who's Who since 1990.

APPENDIX 3.A
RECENT THINKING AND PRACTICE ON CAPITAL STRUCTURE

In formal academic research, the approach to determining capital structure taken in this evidence is called the trade-off theory. The name describes the central idea of this theory: firms determine a target optimal capital structure by balancing the tax-reduction benefits of debt against the expected costs of financial distress and loss of financial flexibility. This appendix reviews the standing of this theory in the academic literature and its following among financial executives.

The main conclusions are three-fold: first, among academic researchers, the trade-off theory enjoys reasonable support but faces serious challenges from a number of competing theories. Second, while it has moderate support among financial executives, a recent survey in the U.S. shows that executives look outside the implications of this theory when setting capital structures for their firms. Third, while the trade-off theory can offer useful qualitative guidance, it is a mistake to treat capital structure as if it were amenable to precise analysis by a formula.

To establish this conclusion, we draw importantly on survey papers by Barclay and Smith (2001) and by Graham and Harvey (2001).[151] Further, in addition to the papers they review, we add a discussion of selected research released after these papers were published. We follow their lead in organizing the discussion around theories or concepts argued to influence capital structure. Our review focuses on the findings for large, investment grade firms, as these are most relevant for the utilities industry.

[151] References cited are listed at the end of this appendix.

3A.1 TRADE-OFF THEORY

As stated earlier, the trade-off theory holds that firms determine their capital structures through a trade-off of the principal benefit of debt, tax deductibility (Modigliani and Miller, 1963) against the costs: increased expected cost of financial distress (Scott, 1976, inter alia) and the tax disadvantage of interest income for investors as compared with dividends or capital gains (Miller, 1977).

A number of researchers find support for the trade-off theory by testing its empirical implications. Bradley, Jarrell and Kim (1984), MacKie-Mason (1990) and Wald (1999), among others, find that riskier firms use less debt as suggested by the theory. Long and Malitz (1985) examine the most and least highly leveraged industries in the U.S. and find that industries with high leverage use fixed assets intensively and are mature and less risky. Barclay, Smith and Watts (1995) and Frank and Goyal (2003) find that higher-growth, riskier firms use less debt. Flannery and Rangan (2006) report that firms do have target capital structures when they use a more general, partial-adjustment model of firm leverage.

There is consensus in the finance literature that leverage exhibits mean reversion. Hovakimian *et al.* (2001) show that firms issue debt when actual debt ratios are below target debt ratios and they reduce debt when actual debt ratios are above the target. Kayhan and Titman (2006) find that, although firms' histories strongly influence their capital structures, they tend to move towards target debt ratios over time, consistent with the tradeoff theory of capital structure. Jalilvand and Harris (1984), Roberts (2001), Frank and Goyal (2003), Leary and Roberts (2005a), Flannery and Rangan (2006) and Alti (2006) all report evidence that firm leverage reverts to its target level, even in the presence of adjustment costs.

On the other side of the ledger, two studies document firm behavior inconsistent with the theory. Graham (2000) finds that firms use considerably less debt than implied by the trade-off theory given observed expected financial distress costs. Opler and Titman (1998) report that when share prices increase, firms tend to issue more equity. In contrast, the theory implies that, with higher prices, smaller or less frequent equity issues are appropriate to maintain a target debt-equity ratio.

The survey by Graham and Harvey (2001) reports similarly mixed results. Four factors central to the trade-off hypothesis received only moderate emphasis as very important by financial executives: volatility of earnings and cash flows (rated as "important" or "very important" by 48.08% of executives), tax deductibility of interest (44.85%), industry average debt ratio (23.40%) and financial distress costs (21.35%). Balancing these responses, credit ratings, which attempt to incorporate all four factors, are the second most important debt factor and are rated as important or very important by 57.10% of executives. When asked whether they have "somewhat strict" target debt-equity ratios, 55% of large firms answer positively. This percentage increases to 64% for investment grade firms and 67% for regulated firms. This is more supportive of the trade-off theory but hardly conclusive.

A recent study by Faulkender and Petersen (2006) shows that, in addition to the firm characteristics which determine a firm's target debt-equity ratio under the trade-off theory, access to capital markets also encourages companies to borrow more. Kisgen (2006) and Kisgen (2007) show that the discrete costs (benefits) associated with credit downgrade (upgrade) directly affect firms' capital structure as firms reduce borrowing to avoid a downgrade. Mittoo and Zhang (2006) demonstrate that this effect is particularly important for Canadian firms particularly those of low credit quality. Rauh and Sufi (2008) examine fallen angels that experienced a downgrade from an investment grade to a speculative (junk) rating. Consistent with the costs of downgrades research, they find that

fallen angels reduce their use of unsecured debt and discretionary sources of debt which include revolving bank credit facilities, commercial paper and medium-term notes. However, they report that such firms increase financing from secured debt and subordinated private placements and convertibles. Their results suggest that prior research underestimates the ability of firms to access debt after a downgrade.

Because the evidence backing the trade-off theory is less than overwhelming, academics have developed a number of competing theories and we review these next.

3A.2 COMPETING THEORIES

3A.2.1 Pecking Order Theory

According to the pecking order theory firms prefer internal financing and raise external funding as a last resort when internal funds are exhausted (Myers and Majluf, 1984; Myers, 1984). Managers have private information about the future prospects of their firms. Assuming that this private information is positive, the firm's securities are undervalued and equity is more undervalued than debt. As a result, firms first draw on internal funds, followed by debt and finally equity as the last choice. Since firms wish to avoid external financing according to this theory, they value financial flexibility. Shyam-Sunder and Myers (1999) find support for the pecking order model. Rajan and Zingales (1995), Titman and Wessels (1998) and Fama and French (2002) show that firms that have been more profitable in the past use less debt. Hennessy and Whited (2005) find that leverage is path dependent and that profitable firms tend to be less highly levered. Frank and Goyal (2007a) also find a negative relation between leverage and dividends. This is consistent with the pecking order theory but not with the trade-off approach.

However, other empirical studies show mixed results or fail to support the pecking order theory. Frank and Goyal (2003) find that large firms use more debt, while small high-growth firms are more likely to use equity financing. Fama and French (2005) show that most firms issue or retire equity each year, and the issues are on average large and not typically done by firms under distress. Leary and Roberts (2005b) find that when firms use external finance, less than 40% of the issues match the pecking order's prediction. Korajczyk et at. (1990), Eckbo and Masulis (1995) and Alti (2006) all find that debt issue does not come before equity issuance.

In their survey of executives, Graham and Harvey discover that financial flexibility and avoiding the sale of undervalued equity are important to financial executives. These factors are central to the pecking order theory. However, the pecking order theory holds that these factors are of greatest importance to firms most likely to have private information, small firms with significant growth opportunities, and this implication is not supported in the survey. Rather the survey reports that firms paying dividends (generally large, well established firms with less private information) are the ones that value the two factors most highly.

In addition, new studies reexamine the argument that when researchers find that more profitable firms use less debt this constitutes evidence against the trade-off theory. Sarkar and Zapatero (2003) point out that high earnings today can be coupled with expected low earnings in the future assuming that earnings follow mean reversion. In this case, we would expect profitable firms to use less debt and the trade-off theory could still hold. Their research supports the conclusions of Hovakimian, Opler and Titman (2001) that pecking order considerations influence firms' short-term adjustments toward target capital structures as envisaged under the trade-off theory.

3A.2.2 Market Timing or "Window of Opportunity"

Managers attempt to issue common shares when the market is high and repurchase their shares in poor markets according to Loughran and Ritter (1995). Rajan and Servaes (1997) also show that firms are more like to issue equity when financial analysts are overoptimistic about the market. Denis and Sarin (2001) provide evidence that firms issue equity when the market overestimates the firm's future earnings performance. Valuation is measured relative to book values or to past levels of the firm's share price. Firms that succeed in timing the market issue equity at high prices and consequently have low leverage ratios. To the extent that it is based on rational factors, such success could arise from waiting until yesterday's private information is reflected in today's stock price (Lucas and McDonald, 1990). Unsuccessful market timers have higher leverage ratios. Baker and Wurgler (2002) measure the relationship between leverage and shifts in market-to-book ratios over time arguing that their results are most consistent with the market timing explanation. Huang and Ritter (2005) show that firms fund a large proportion of their financing deficit with external equity (debt) when the cost of equity is low (high), and past securities issues have strong and long lasting effects on capital structure. On the other hand, Alti (2006) finds that although hot IPO markets induce firms to issue more equity and reduce leverge, the impact of market timing vanishes in two years through debt issue.

Further support for this view is in Graham and Harvey which identifies recent stock price performance as number three in the list of factors explaining when firms issue equity. Stock price performance is particularly highly ranked for less established firms that do not pay dividends.

3A.2.3 Signaling

In a variation on the theme of private information, signaling theory argues that firms with good prospects that are not widely recognized issue debt to create a

credible signal to the market that they will enjoy strong cash flows sufficient to meet their increased debt servicing obligations (Ross, 1977; and Leland and Pyle, 1977). The survey by Graham and Harvey finds little support for this theory.

3A.2.4 Free Cash Flow

Jensen's (1986) free cash flow theory of leverage is rooted in agency conflicts between managers and shareholders. Managers of a firm with plentiful free cash flow enjoy an opportunity to waste the cash in excessive consumption of managerial perquisites, through empire building or other unproductive investments. Under the free cash flow theory, managers take on additional debt using the free cash flow for debt service. In this way, they make a commitment to avoid wasteful uses of the firm's cash flow. This argument is widely advanced in support of leveraged buyouts. By studying firms' operating performance after stock repurchase, Nohel *and* Tarhan (1998) find support for the free cash flow argument, while rejecting the signaling hypothesis. In the survey of financial executives, however, free cash flow received a low rating.

3A.2.5 Product Market and Industry Factors

As stated earlier, the use of leverage varies systematically across industries. While this has been viewed as evidence for the trade-off theory as discussed earlier, researchers have developed alternative theories as well. For example, Titman (1984) argues that prospective product purchasers are concerned with the firm's ability to stay in business and make good on product guarantees. As a result, he holds that firms producing unique products should use less debt. Graham and Harvey report mixed results on this theory. Although high tech firms produce unique products, they do not address such customer concerns in setting debt levels. However, growth firms do report considering such concerns in their debt policies.

3A.3 SYNTHESIS

A number of capital structure theories are supported in academic research and while the trade-off theory enjoys the greatest popularity due to seniority and coverage in textbooks, there are a number of competing theories challenging its conclusions. This disparity is reflected in practice by financial executives. Further, perhaps due to the lack of consensus among researchers, "best practices" managers focus on practical factors only loosely related to theory, such as financial flexibility and credit ratings, when they set capital structures for their firms. Barclay and Smith (2001) provide a clear statement on this point:

> "Empirical methods in corporate finance have lagged behind those in capital markets for several reasons. First, our models of capital structure decisions are less precise than asset pricing models. The major theories focus on the ways that capital structure choices are likely to affect firm value. Rather that being reducible, like the option pricing model to a precise mathematical formula, the existing theories of capital structure provide at best qualitative or directional predictions (p.198)."

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APPENDIX 4.A

SHOULD THE ARITHMETIC OR GEOMETRIC MEAN BE USED TO ESTIMATE IMPLIED RISK PREMIUMS USING HISTORICAL REALIZED RETURNS?

1. The Choice:

It is preferable to use the geometric average (mean) historical risk premium when measuring historical holding period performance. The reason is that the geometric mean exactly represents the constant rate of return that is needed in each year to exactly match actual performance over that past investment period.[152] This is the reason why Canadian mutual funds are required to disclose compound rates of return, which is just a different name for a geometric mean return. Similarly, the annual yield-to-maturity quoted on a long-term bond is an annual geometric return.

It is preferable to use the arithmetic mean historical market equity risk premium (MERP) when making investment decisions for a one-period investment horizon when the investment horizon is identical to the interval of time over which the historical returns are measured. The reason is that the arithmetic mean is an unbiased estimate of an investment's expected future risk premium for a single period investment horizon. Thus, if historical MERPs are measured using annual returns, then the future investment horizon should be one year.

The arithmetic mean also is preferred when historical returns are normal IID or independently and identically distributed over the estimation period. This is the

[152] The superiority of the geometric mean over the arithmetic mean is easily shown using an example drawn from L. Kryzanowski, *Investment and Portfolio Management* (Montreal: Institute of Canadian Bankers, 1996), page 82. The example concerns the investment portfolio of Mr. John Velco whose investment portfolio increases from $200,000 to $400,000 during the first year for an annual return of 100%, and then returns to its original $200,000 value during the second year for an annual return of –50%. The arithmetic and geometric mean annual returns are 25% and 0%. Of course, the correct constant annual return has to be 0% since the beginning and ending portfolio values are identical.

assumption implicitly invoked by the advocates of the use of the arithmetic average, such as Drs. Brealey and Myers, and Drs. Dimson, Marsh and Staunton (2003), and others, when they recommend the use of the arithmetic mean of historical premiums as the looking-forward expected MERP.[153] Unfortunately, the normal IID assumption is not appropriate for asset returns over long estimation periods. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (not sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion in stock market prices at longer horizons. Third, the plausibility of the assumption that returns are IID diminishes as the estimation time period gets longer.

The geometric mean or some weighted-average of the geometric and arithmetic mean is preferred when returns are not normal IID due to, for example, long-run mean reversion in some asset returns (as has been found for stocks) and in MERPs, and mean aversion in others (as has been found for bonds). Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[154]

We provide further empirical support for mean reversion in the Canadian market in section 4 of our evidence based on the variance-ratio test. The test is based on the fact that if returns follow a random walk (are independent), then the variance should be proportional to the return horizon. The Variance-Ratio or VR measure is:

$$VR(T) = Var[r_t(T)] \div N\ Var[r_t] = 1$$

[153] Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003), page 15.
[154] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, page 46.

where T is the multi-year period being examined, Var[r_t(T)] is the variance of a T-period continuously compounded return, and Var[r_t] is the variance of a one-period or benchmark return r_t. A variance ratio of one indicates no aversion or reversion of the mean of the series. A variance ratio greater than one indicates mean aversion. Mean aversion increases as the VR moves towards larger values above one. Thus, a VR of 3 indicates greater mean aversion in the series of returns or risk premiums than a VR of 2. Similarly, a variance ratio less than one indicates mean reversion. Mean reversion increases as the VR moves away from one towards zero.

Dr. John Campbell at an *Equity Risk Forum* has aptly stated this argument as follows:[155]

> "Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.
>
> I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

Similarly, Dr. Damordaran, author of numerous books on valuation, states:[156]

[155] John Campbell, Historical results: Discussion, Equity Risk Premium Forum, November 8, 2001, page 45.
[156] Aswath Damodaran, Discussion issues and derivatives, found on his website at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3.

> "The conventional wisdom is that the arithmetic mean is the better estimate. This is true if
>
> (1) you consider each year to be a period (and the CAPM to be a one-period model)
> (2) annual returns in the stock and bond markets are serially uncorrelated As we move to longer time horizons, and as returns become more serially correlated (and empirical evidence suggests that they are), it is far better to use the geometric risk premium. In particular, when we use the risk premium to estimate the cost of equity to discount a cash flow in ten years, the single period in the CAPM is really ten years, and the appropriate returns are defined in geometric terms.
>
> In summary, the arithmetic mean is more appropriate to use if you are using the Treasury bill rate as your riskfree rate, have a short time horizon and want to estimate expected returns over that horizon.
>
> The geometric mean is more appropriate if you are using the Treasury bond rate as your risk free rate, have a long time horizon and want to estimate the expected return over that long time horizon."

Dr. Jay Ritter in his keynote address at the 2001 meetings of the Southern Finance Association states that "with mean reversion, the multiperiod arithmetic return will be closer to the geometric return".[157] He notes that stock returns show a tendency towards mean reversion and bond returns show a tendency towards mean aversion in the U.S. In turn, based on the standard deviations of returns for data starting in 1802 (the Siegel data set), he shows that stocks are twice as risky as bonds for one-year holding periods, and stocks are less risky than bonds for holding periods of twenty or more years.

[157] Address published subsequently as: Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25:2, Summer 2002, pages 159-168.

The use of the geometric mean is supported empirically. Drs. Fama and French estimate the nominal cost of capital for U.S. nonfinancial corporations for 1950-1996 as 10.72%. Since this is smaller than the nominal return on investment of 12.11%, average corporate investment has been profitable.[158] If the arithmetic mean of the simple annual returns is used instead to obtain an estimate of the nominal cost of capital, the resulting value of 12.12% is about the same as the return of investment of 12.11%. This implies that average investment by corporate U.S. has added no value over the 1950-1996 period, which seems unreasonable to Drs. Fama and French and ourselves given stock market performance over this period of time. Thus, Drs. Fama and French conclude that the geometric mean estimate of the cost of capital is more consistent with the data than the arithmetic mean estimate of the cost of capital over this period of time.

The expected one-period simple return (i.e., the arithmetic mean of the one-period simple return) is only an appropriate return concept for the cost of equity capital for a short future time horizon of one period (usually a year).[159] For multiple-period horizons, expected return estimates enter the present value expressions in a nonlinear manner. Thus, numerous articles have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia.

Other studies have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia, without any reference to mean-reversion.

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[158] These two values are the IRRs on value and on cost, respectively. The geometric mean of simple annual returns on cost is almost identical. Eugene F. Fama and Kenneth R. French, 1999, The corporate cost of capital and the return on corporate investment, *The Journal of Finance* December, pages 1939-1967. As in Copeland et al. (1990), the return on value is an estimate of the cost of capital when the cost of capital is taken to be an expected compound return. Tom Copeland, Tim Koller and Jack Murrin, 1990, *Valuation in measuring and managing the value of companies* (John Wiley and Sons, New York).

[159] Eugene F. Fama, 1996, Discounting under uncertainty, *Journal of Business* 69, pages 415-428.

The first group of studies that examine which type of mean is appropriate for long horizon decision-making examines the biases caused by the fact that discount factors involve powers of the reciprocal of the rate of return. Dr. Blume (1974) and Drs. Indro and Lee (1997) show mathematically that for long-run expected returns and risk premia, the arithmetic average produces an estimate that is upwardly biased, and that the geometric average produces an estimate that is downwardly biased.[160] The simulation results of Drs. Indro and Lee (1997) support the use of a horizon-weighted average of the arithmetic and geometric averages proposed by Dr. Blume (1974). In the Dr. Blume average, the arithmetic average receives all the weight when the time horizon or project life (denoted by N) is one period, and the geometric average receives all the weight when the time horizon is equal to the number of time periods (denoted by T) used to obtain a historical estimate of average returns or risk premia.

To illustrate, if we deem that 30 years constitutes the long-run as is assumed for the cost of debt and we use the longest available time period up to 2002 without serious measurement errors to estimate the market risk premium in Canada (namely, the 45 year period, 1957-2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N - 1) / (T - 1) = (30 - 1) / (45 - 1) = 29 / 44 = .66 \text{ or } 66\%.$$

Similarly, if we use the longest available time period up to 2002 for which we have data in Canada to estimate the MERP from the CIA (namely, the 78 year period, 1924—2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N - 1) / (T - 1) = (30 - 1) / (78 - 1) = 29 / 77 = .38 \text{ or } 38\%.$$

Of course, the long run is longer than 30 years, and we would use it for bonds if such maturities were available.

[160] M.E. Blume, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69:347 (September 1974), pages 634-638; and D.C. Indro and W.Y. Lee, Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia, *Financial Management* 26:4 (Winter 1997), pages 81-90.

The second group of studies that examine which type of mean is appropriate for long horizon decision-making assesses the effect of estimation errors when the estimate is used for multi-period forecasting or decision-making. Drs. Jacquier, Kane and Marcus show that the use of the sample arithmetic mean produces an upward-biased forecast, and that this bias does not disappear, even if the sample mean is computed using long data series and *returns come from a stable distribution with no serial correlation*.[161] They show that, while a weighted-average of the arithmetic and geometric average returns provides an unbiased estimate of long-term returns, the best estimate of cumulative returns is even lower. They conclude that this "further compounds the recent sobering message in Drs. Fama and French (2002) and Drs. Jagannathan *et al.* (2000) who suggest that the equity risk premium is lower than once thought". They further conclude that:

> "Strong cases are made in recent studies that the estimate of the market risk premium should be revised downward. Our result compounds this argument by stating that even these lower estimates of mean return should be adjusted further downward when predicting long-term cumulative returns."

Thus, until the issue is resolved, a weighted-average of the arithmetic and geometric means is best. To err on the side of being conservative, a weighted average that places an equal or greater weight on the arithmetic mean appears to be most reasonable.

[161] Eric Jacquier, Alex Kane and Alan J. Marcus, 2003, Geometric or arithmetic means: A reconsideration, *Financial Analysts Journal* 59: 6 (November-December), pages 46-53; and working paper version of paper.

APPENDIX 4.B
SOME MORE RECENT THINKING AND ESTIMATES OF U.S. AND OTHER COUNTRY EQUITY RISK PREMIA

1. Estimates on a Point-forward Basis:

There are three approaches to estimating the market equity risk premium (MERP) on a point-forward basis. The first approach extrapolates historical returns based on the premise that realized and expected returns are equivalent, and that the future will be like the past. The second approach uses a theoretical model to determine what the MERP should be based on plausible assumptions about investor risk tolerance. The third approach uses forward-looking information on current dividend yields and interest rates to forecast expected MERP.

Reichenstein (2001) summarizes the predictions of several academic and professional scholars that long-run real stock returns will be below historical standards and that the MERP will be well below historical standards, and even negative according to some scholars.[162] The academic studies are by Drs. Jagannathan, McGrattan and Scherbina (2000), Dr. Siegel (1999) and Drs. Fama and French (2001). The practitioner studies are by Mr. Brown (2000) and by Mr. Arnott and Mr. Ryan (2001). The real stock return estimates are 2.9% to 4.4% for Drs. Fama and French, 3.2% for Mr. Arnott and Mr. Ryan, 3.3% for Dr. Siegel, 4.8% for Drs. Jagannathan *et al.*, and 5.2% for Mr. Brown.

Drs. Fama and French (2001) obtain estimates of the U.S. equity MERP of 2.55% and 4.32% for 1951-2000 when they use rates of dividend and earnings growth to measure the expected rate of capital gain. These MERP estimates are much lower than the 7.43% estimate produced by using the average stock return

[162] Cited articles in this appendix are listed in the references found between the text and the tables to this appendix.

over this period of time. They conclude that their evidence shows that the high average realized return for 1951-2000 is due to a decline in discount rates that produces large unexpected capital gains. Their main conclusion is that the stock returns (and realized MERPs) of the last half-century are a lot higher than what was expected by investors *ex ante*. The lower estimates of expected stock returns are less than the income return on investment that suggests that investment by corporate U.S. is on average profitable. In contrast, the much higher estimates of expected stock returns from using the traditional time-series means suggests that investment by corporate U.S. is on average unprofitable (its expected return is less than its cost of capital).

According to Drs. Fama and French (2001), “many papers suggest that the decline in the expected stock return is in part permanent, the result of (i) wider equity market participation by individuals and institutions and (ii) lower costs of obtaining diversified equity portfolios from mutual funds (Diamond, 1999; Heaton and Lucas, 1999; Siegel, 1999)”.

Drs. Jagannathan *et al.* (2000) demonstrate that the U.S. MERP has declined significantly during the last three decades. They calculate the MERP using a variation of a formula in the classic Gordon stock valuation model. While the premium averaged about 7 percentage points during 1926-70, it only averaged about 0.7 of a percentage point after that. They support this result by demonstrating that investments in stocks and consol bonds of the same duration would have earned about the same return between 1982 and 1999, a period over which the MERP estimate is about zero.

There are a number of studies not reviewed by Reichenstein (2001). These are reviewed next.

In a conference presentation on October 15, 2001, Mr. Robert A. Arnott of First Quadrant (and a former editor of the *Financial Analysts Journal*) estimates

the U.S. MERP for the 75 years from December 1925 to be 4.7%, and to have oscillated around zero beginning in the early 1980s.[163] He estimates the forward-looking U.S. MERP from October 2001 to be 0.3%±.

In a study (undated) by Deutsche Asset Management, the expected long-run MERPs are 2.5% over government bonds or 3.0% over cash for the U.S., Euroland, Japan and the U.K. (see Schedule 4.B1). These MERPs are based on two approaches, where the first estimates what equities can return based on free cash flows that they generate, and the second estimates what equities need to return to get investors to hold them instead of less risky assets.

Drs. McGrattan and Prescott (2000) conclude that the case for a positive MERP appears weak based on a model that measures the value of corporate capital. They show that including intangibles reduces corporate profits. Since the values of overall productive assets and equity are nearly equal in the United States, they conclude that the MERP is close to zero percent.

Drs. Claus and Thomas (2001) use the implied risk premium methodology to derive an upper bound for the MERP for Canada, France, Germany, Japan, U.K., and the U.S. over the period from 1985-1998. Drs. Claus and Thomas find that MERP estimates are close to three percent rather than the eight percent MERP that have been reported based on the data from Ibbotson & Associates. They consider their estimates as being an upper bound because they use the earnings forecasts of analysts, which are typically optimistic, to forecast the MERP.

Based on reasonable priors and allowing for structural breaks, Drs. Pastor and Stambaugh (2002) obtain estimates of the U.S. MERP of between 3.9 and 6.0 percent over the period from January 1834 through June 1999. The estimated premium rises through much of the nineteenth century and the first few decades of the twentieth century. It declines fairly steadily after the 1930's except

[163] Specifically, Exhibit 4a on page 21 of Arnott (2001).

for a brief period in the mid 1970s. The estimated MERP exhibits its sharpest decline to 4.8% during the decade of the 1990s.

Drs. Ibbotson and Chen (2001) forecast the MERP through supply side models using historical information. They conclude that "contrary to several recent studies on equity risk premium that declare the forward looking equity risk premium to be close to zero or negative, we find the long-term supply of equity risk premium is only slightly lower than the straight historical estimate". Based on his co-authored paper with Dr. Chen, Dr. Ibbotson concluded that:[164]

> "My estimate of the average geometric equity risk premium is about 4 percent relative to the long-term bond yield. It is, however, 1.25 percent lower than the pure sample geometric mean from the risk premium of the Ibbotson and Sinquefield study (Ibbotson Associates 2001)."

Dr. Ibbotson goes on to state:[165]

> "The 4 percent (400 bps) equity risk premium forecast that I have presented here today is a geometric return in excess of the long-term government bond yield. It is a long-term forecast, under the assumption that today's market is fairly valued."

Hunt and Hoisington (2003, p. 28) conclude that their study "sheds new light on the risk premium of stocks over U.S. Treasury bonds, which indicates most research overstates the advantages of stocks over bonds". They go on to note that:

[164] Roger Ibbotson, Moderator, Implications for asset allocation, portfolio management, and future research: Discussion, *Equity Risk Premium Forum*, November 8, 2001, page 103.
[165] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, page 108.

> "While results may be overstated due to the beginning-period bias, studies based upon past data have conclusively shown that stock returns are superior to bonds over very long time periods. On average, during these time periods, the better performance of stocks is due to inflationary situations, spreads between dividend and bond yields, and P/E ratios that currently do not exist."

Drs. Jacquier, Kane and Marcus (2003) show that, while a weighted-average of the arithmetic and geometric average returns provides an unbiased estimate of expected long-term returns, the best estimate of cumulative returns is even lower. They conclude that:

> "Strong cases are made in recent studies that the estimate of the market risk premium should be revised downward. Our result compounds this argument by stating that even these lower estimates of mean return should be adjusted further downward when predicting long-term cumulative returns."

Using the third approach to estimating MERPs, Dr. Ritter estimates that the MERP is only about 0.7% or 1 percent rounded up. He points out that lower future real stock returns have squeezed the MERP from the top and a higher real return on bonds has squeezed the MERP from the bottom.[166]

2. Actual versus Expected Equity Risk Premiums:

A few studies examine whether or not actual or realized MERPs are a good proxy for expected or required MERPs. The findings of two of these studies are summarized in Schedule 4.B2. The study (undated) by Deutsche Asset Management aptly summarizes these findings as follows:

> "In sum, a wealth of theoretical and empirical evidence suggests that the historical, realized equity premium (5% - 7%) exceeded what equities

[166] Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25: 2, Summer 2002, page 163.

> were expected to deliver in the past, and very likely exaggerates what they should be expected to deliver in the future. An equity premium of 3% - 4% may have been closer to the true, ex-ante premium in the past, and the lower end of that range seems the most that we should anticipate (and that investors will require) now that economic/political conditions are more stable and people are more 'plugged in' to the benefits of equity investing. So we take 3% as an upper bound for the equity premium going forward."

It should also be kept in mind that these equity risk premia are calculated in reference to short-term government bonds (such as T-Bills) and **not long-term government bonds**.

Mr. Arnott and Mr. Bernstein (2002) show that the realized MERP over the last 75 years in the U.S. is overstated due to various accidents. Equity and bond investors obtained returns higher and lower than what they expected, respectively, due to a series of favourable accidents for equity holders and one major unfavourable accident for bondholders.

Mr. Oliver and Mr. Doyle of AMP Henderson Global Investors Limited note:

> "A strong case can be made that favourable forces now justify a lower share-risk premium than the 5% or 6% that prevailed over the past 100 years … The favourable forces include low inflation and a more stable business cycle that are expected to result in higher-quality and steadier earnings and share prices. As well, baby boomers saving for their post-work lives are buying shares. They are arguably less fearful of shares than previous generations and have (hopefully) longer-investment horizons….
>
> Our assessment is that the appropriate risk premium for U.S. shares is about 3% [relative to bonds]. For the Australian shares, fewer opportunities for diversification justify a slightly higher premium of about 4%." [our insertion]

This was re-enforced by Mr. Dyer (2003) of the same firm more recently as follows:

> "For these reasons, **the historically realised ERP of the last 50 years or so is probably an exaggeration of what investors actually require and is absolutely no guide to what the likely ERP will be going forward."** [his emphasis]

Drs. Clarke and de Silva (2003) note that all of the expected MERPs by practitioners from such firms as Frank Russell (3%), Goldman Sachs (3%), Ibbotson (4%) and Alliance Bernstein (4.5%) are lower than the historical experience in the U.S. Drs. Clarke and de Silva conclude their study by noting: "What seems clear from the historical evidence is that a reasonable expectation for the long-run equity risk premium is probably in the 3-6% range." Interestingly, the **expected MERP estimates** of Drs. Clarke and de Silva and the others are based on **geometric means**.

3. Synthesis:

All of the studies conclude that the U.S. MERP has narrowed (most conclude substantially), and is expected to be lower in the future. The U.S. MERP estimates vary from zero or slightly negative (Jagannathan *et al.*, 2000) to about 6% (Ibbotson and Chen, 2001). These studies strongly suggest that any forecast **for the U.S.** over 5% based on T-Bills is in the optimistic tail of the distribution of possible MERP estimates.

The two studies dealing with realized and expected MERP find that the expected equity MERP when measured **against short-term** government bonds in the U.S. has ranged between 3.4% and 4.2% depending on the time period considered, and has averaged 3.5% over 101 years for a sample of 15 developed countries.

4. Relative Risk of Equities Versus Bonds

It would appear on the surface that a zero or negative required MERP going forward is inconsistent with the belief that equities are more risky than bonds. However, some market professionals believe that equities may not be more risky than bonds in terms of investment risk. Studies find that the ratio of the standard deviations of returns on equities to bonds is above one, approaches one, and goes below one as the measurement period over which returns are measured gets longer. The ratio would remain constant, as the measurement period over which returns are measured gets longer, if stock and bond returns did not exhibit mean reversion/aversion.

In a 2001 study, W.M. Mercer evaluated the investment riskiness of Canadian stocks, bonds and cash over varying time horizons.[167] These results confirm existing U.S. results that:[168]

- Stocks are riskier than both bonds and cash over shorter time horizons, such as one year;
- Stock returns exhibit decreasing variability (measured by the standard deviation of returns) over time;[169]
- For 20-year rolling time periods, stocks outperform bonds in terms of returns, and both asset classes have about the same risk;
- For 30-year rolling time periods, stocks outperform both bonds and cash, and stocks are less risky than both bonds and cash.

[167] William M. Mercer Limited, Are stocks riskier than bonds? New Mercer research indicates that stocks become less risky in the long run, news release, February 15, 2001. Available at www.wmmercer.com/Canada/english/resource/resource_news02152001.html.
[168] The historical results reported by the CIA suggest that the standard deviation results are obtainable for periods as short as 5 years. Over 5-year periods, they report standard deviations of returns of 6.75%, 5.69% and 3.53% for stocks, long Canada's and 91-day T-Bills, respectively. Over 10-year periods, the corresponding standard deviations are 2.98%, 4.59% and 3.26%. Canadian Institute of Actuaries, *Report on Canadian Economic Statistics*, 1924-2000, September 2001, Table 2A, page 8.
[169] This is consistent with mean reversion in stock returns.

In their book, Drs. Campbell and Viceira (2002, pp. 108 and 109) provide evidence that the annualized standard deviation of K-period returns is lower for equities than T-Bills (rolled) or long bonds (rolled) for long holding periods in the United States. Drs. Campbell and Viceira (2002, p. 108) state that: "We see that stocks are mean-reverting – their long-horizon returns are less volatile than their short-horizon returns – while bills are mean-averting – their long-horizon returns are actually more volatile than their short-horizon returns." Drs. Campbell and Viceira (2002, p. 108) draw the following inference from their analysis: "These effects are strong enough to make bills actually riskier than stocks at sufficiently long investment horizons, a point emphasized by Siegel (1994)".

Thus, based on the long-run perspective underlying rate-of-return rate-setting, equities may in fact not be more risky than traditional debt instruments from an investment risk perspective. Since the MERP is based on the notion that stocks are riskier than bonds, these results attack the validity of a fundamental notion behind the existence and magnitude of a MERP.

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Schedule 4.B1. Expected long-run returns in local currency terms (annualized, percent)

	Cash		Gov't Bonds		Equities	
	Nominal	Real	Nominal	Real	Nominal	Real
U.S.	4.50	2.00	5.00	2.50	7.50	5.00
Euroland	3.75	2.00	4.25	2.50	6.75	5.00
Japan	3.00	2.00	3.50	2.50	6.00	5.00
U.K.	4.50	2.00	5.00	2.50	7.50	5.00

Source: Deutsche Asset Management, undated, 2.

Schedule 4.B2. Actual versus 'expected' equity risk premium in %[a]

Study	Country	Dates	Actual	Expected
Fama & French (2001)	U.S.	1872-2000	5.6	3.5
Fama & French (2001)	U.S.	1872-1950	4.4	4.2
Fama & French (2001)	U.S.	1951-2000	7.4	3.4
Dimson *et al.* (2000)	U.S.	1900-2000	5.6	4.0
Dimson *et al.* (2000)	15 countries[b]	1900-2000	5.1	3.5

[a]The actual premium is the compound, annualized rate of return less the compound, annualized return on short-term government debt. The expected premium uses dividend growth and earnings growth models to estimate equity returns.
[b]Australia, Belgium, Canada, Denmark (from 1915), France, Germany (ex. 1922/23), Ireland, Italy, Japan, Netherlands, Spain, Sweden, Switzerland (from 1911), U.K. and U.S.

Source: Deutsche Asset Management, undated.

APPENDIX 4.C
INDIRECT DECOMPOSITION METHOD TO ESTIMATE INDUSTRY-LEVEL MONTHLY VARIANCES

An interesting feature of the indirect volatility decomposition method proposed by Drs. Campbell *et al.* (2001) for those that are opposed to using an asset pricing model (APM) is that neither covariances nor betas need to be estimated.[170] In the decomposition, the value-weighted variance for a representative industry *i* for month *t* (i.e., $\sigma^2_{I,t}$) is given by $\sigma^2_{I,t} = \sum_i w_{i,t} \cdot \sigma^2_{\varepsilon_{i,t}}$, where $\sigma^2_{\varepsilon_{i,t}} = \sum_{d \in t} \varepsilon^2_{i,d,t}$ is the aggregation of the daily squared excess returns for industry *i* over those of the market over the days *d* in month *t*; $\varepsilon_{i,d,t} = R_{i,d,t} - R_{m,d,t}$ is the excess return for industry *i* over that of the market for day *d* in month *t*; and $R_{m,d,t}$ is the value-weighted excess return for all stocks for day *d* in month *t*. An interesting feature of this decomposition method is that it minimizes selection and survivorship biases by using all stocks that have at least one month of publicly available trade data.

[170] As in Campbell et al. (2001), the closing numbers of outstanding shares for the previous month are used to compute all market capitalization weights. John Y. Campbell, Martin Lettau, Burton Malkiel and Yexiao Xu, 2001. Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk, *Journal of Finance* 56:1, pages 1-43.

APPENDIX 4.D
BETA ADJUSTMENT TO REFLECT SENSITIVITY TO INTEREST RATE CHANGES

One of the mainly flawed rationales for using a variant of the adjusted beta method for utilities is that unadjusted utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the unadjusted and adjusted (inflated) betas.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns with the premium required by investors to bear market and interest rate risk when investing in utility equities.

In the traditional one-factor CAPM, where the only factor is the market, one measures relative risk by estimating the utility's beta by running the regression $r_i = a_i + b_i R_m + e_i$, where r_i and R_m are the return on utility *i* and the market *m*, respectively; and b_i is the beta coefficient of utility *i*. The utility's required rate of return then is given by $\bar{r}_i = r_f + b_i(\bar{R}_m - r_f)$, where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada; $(\bar{R}_m - r_f)$ is the so-called market equity risk premium; and all the other terms are defined as before.

In a two-factor CAPM, one obtains the relative priced risks for utility *i* by estimating the utility's betas by running the regression $r_i = a_i + b_{1i} R_m + b_{2i} R_b + e_i$, where r_i, R_m and R_b are the return on utility *i*, the equity market *m*, and long

Canada's, respectively; and b_{1i} and b_{2i} are the beta coefficients of utility *i* (i.e., the sensitivities to market and interest rate risk, respectively).[171]

The utility's required rate of return then is given by:

$\bar{r}_i = r_f + b_i(\bar{R}_m - r_f) + b_i(\bar{R}_b - r_f)$, where r_f is the risk-free rate, which is proxied here by the yield on a long Canada's; $(\bar{R}_m - r_f)$ is the so-called market equity risk premium; $(\bar{R}_b - r_f)$ is the so-called interest rate risk (bond market) premium; and all the other terms are defined as before.

While one would expect the estimates of R_m, R_b and $(\bar{R}_m - r_f)$ to be positive and significant, such is not the case for $(\bar{R}_b - r_f)$. Over the long run, we would expect the average return on 30-year Canada's to be equal to the yield on 30-year Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that interest rates would fluctuate randomly so that bond returns would be above yields to maturity in some periods and below them in other periods. Thus, while it is true that utility equity returns are sensitive to interest rate changes, it is not true that interest rate risk will have a materially positive equity risk premium over the long run.

We now illustrate the above by first calculating the betas for the two-factor CAPM for a sample of seven utilities over the 1990-2002 period that have full data. In doing so, we use correct econometric procedures by using the orthogonalized long Canada bond returns. When this correct econometric procedure is used, **the market betas are the same as those obtained using the single-factor CAPM for each utility**, and the interest rate betas are the same as those obtained using the two-factor CAPM (without orthogonalization)

[171] This two-step procedure for testing asset pricing models, such as the CAPM, originates with Eugene Fama and James MacBeth, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 71 (1973), pages 607-636.

for each utility. These results are reported in Schedule 4.D1. As expected, the beta estimates for each factor are positive (and generally) statistically significant at conventional levels.

Next, we calculate the bond market risk premia over various time periods up to 2003 that correspond to those used previously to calculate the MERPs. These results are reported in Schedule 4.D2. As expected, over long periods, such as 1965-2002, the mean bond market risk premium is only 30 basis points, and it becomes negative over the three progressively longer time periods of 1957-2002, 1951-2002 and 1936-2002. While it is positive and quite material over the 1980-2002 period at 1.745%, this is offset by the relatively low MERP of 2.797%. Furthermore, according to our expectations, all of the mean bond risk premiums are not significantly different from zero at conventional levels. In contrast, the mean MERPs are significantly different from zero for the two longest time periods of 1936-2002 (at 5% level) and 1951-2002 (at 12% level).

The two series of risk premiums (i.e., equities and bonds) are essentially uncorrelated at 0.02 over the full time period of 1936-2002. The highest correlation between these two series of risk premiums is 0.04 for the 1965-2002 time period.

Schedule 4.D1

This table provides the market and bond return betas for a sample of seven utilities based on the estimation of a two-factor CAPM over the period, 1990-2002. The three utilities that do not have data for the full time period are eliminated from the sample. They are Emera (Nova Scotia Power), Pacific Northern Gas and Enbridge. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index.

Variable	BC Gas	Cdn Util.	Trans Alta Corp.	Trans Canada	Westcoast Energy	Atco Ltd.	Fortis Inc.	Mean, with Atco: In	Mean, with Atco: Out	Highest, with Atco in
Market beta	0.260	0.345	0.242	0.112	0.197	0.397	0.220	0.253	0.229	0.397
Orthogonalized bond return beta	0.364	0.443	0.568	0.756	0.409	0.494	0.415	0.493	0.493	0.756

Schedule 4.D2

This table provides the equity and bond market premiums over yields on 30-year Canada's (or their proxy) for various time periods. Since the data are drawn from the Canadian Institute of Actuaries, the longest time series with Canada bond data is for the time period, 1936-2002

Time Period	Equity market risk premia	Bond market risk premia	Total risk premia[a]: Atco In	Total risk premia[a]: Atco Out	Total risk premia[a]: Atco In; Highest Individual Beta
1936-2002	4.659	-0.069	1.147	1.035	1.798
1951-2002	3.653	-0.240	0.807	0.719	1.269
1957-2002	2.273	-0.013	0.569	0.515	0.893
1965-2002	1.574	0.301	0.547	0.509	0.852
1977-2002	2.797	1.745	1.568	1.501	2.430

[a]This is calculated using the mean betas for the utility sample given in Schedule 4.D1. For example, 1.147 = (.253 *x* 4.659) + (0.493 *x* -0.069).

APPENDIX 6.A
ADJUSTMENT FOR THE EARLY EMPIRICAL EVIDENCE OF A FLATTER-THAN-EXPECTED SML

In this appendix, we discuss the type of adjustment that should be made if, for the sake of argument, one accepted the argument that there should be an adjustment for the early empirical evidence of a flatter-than-expected SML.

If one was to make an adjustment to account for the empirical evidence for the traditional (static) CAPM, then the slope of the estimated security market line or SML of the traditional CAPM (i.e., MERP) needs to be reduced to account for its "flatter-than-expected" value. In other words, it is the slope of the SML and not the betas of the individual assets or portfolios that need to be adjusted.

We arrive at this recommended adjustment by using first principles, and by adding what we learn from an examination of the more recent evidence on the relationship between the MERP that was realized over past periods and what the MERP expectations of investors were estimated to be. We now detail our argument on this point.

First, one of the major assumptions made when testing the CAPM using realized returns is that realized returns are an unbiased estimate of expected returns. In other words, what happened was what investors expected, at least on average. Based on the assumption that realized returns are unbiased estimates of expected returns, the early empirical evidence is interpreted as showing that the estimated CAPM relationship has an estimated intercept that is higher than expected and has an estimated slope that is lower (or flatter) than expected. These tests generally consist of regressions of the realized returns or realized excess returns on portfolios formed to maximize the spread across portfolios in their betas. The interpretation that the estimated intercept is higher than expected is based on a comparison of the estimate against the average T-Bill

yield over the period. The interpretation that the estimated slope is lower (flatter) than expected is based on a comparison of the estimate against the average realized MERP over the period.

Second, the more recent evidence indicates that realized returns are not unbiased estimates of expected returns, even over very long periods of time. In other words, what happened is not what investors expected, even over very long periods of time. As we discussed in Section 4 and Appendix 4.B of our evidence, the more recent literature concludes that the realized MERP that investors earned exceeded the MERP that investors expected to earn. This is based on the finding that equity investors earned more than what they expected, and bond investors earned less than what they expected.

Third, it then follows that combining the literature referenced in our first and second points leads to the following conclusions:

- The finding that the estimated slope of the CAPM is flatter than expected is what one would expect given that the realized MERP exceeded the expected MERP over the period. This is prior to making any adjustment for the fact that these tests generally use T-Bills and not long Governments as a proxy for the risk-free rate.
- The finding that the estimated intercept of the CAPM is higher than expected is also expected given that using lower MERPs for all the portfolios would shift the SML downwards if we assume that the true expected risk-free rate remains constant, and would result in a lower estimated intercept for the SML. Again, this is prior to making any adjustment for the fact that these tests generally use T-Bills and not long Governments as a proxy for the risk-free rate.

This discussion has a two-fold implication for the determination of the ROE using the MERP method. First, the expected yield on the long Canada should be

used since we have no evidence that it is not an unbiased expectation of the future one-period return for the true risk-free rate. Second, the realized mean MERP needs to be revised or adjusted downwards since the upward bias in mean realized equity returns exceeds the downward bias in mean realized bond returns when each is used as a proxy of investor expectations.

SCHEDULES

Schedule 2.1
Canada Yield Spreads

Date	10 Year Yield (%)	30 Year Yield (%)	Spread (basis points)
01/2008	3.88	4.19	31
02/08	3.81	4.18	37
03/08	3.46	3.96	50
Average			**39**

Source: Bank of Canada, Monthly Series V122543 and V122544.

Schedule 3.1

Electric Utilities Business Risk Rating

Risk	Transmission		Distribution	
Market				
Competition/ demand	Low	1	Low-moderate	2
Credit	Low	1	Low-moderate	2
Operational				
Operating Leverage	Low	1	Moderate	3
Technology	Low	1	Low	1
Capacity	Low	1	Low	1
Asset retirement/construction	Low	1	Low	1
Deferral accounts	Low	1	Low	1
Regulatory				
Primary regulation	Low	1	Low	1
Environmental/safety	Low	1	Low	1
Overall	**Low**	**1**	**Low-moderate**	**1.4**

Schedule 3.1 continued

Electric Utilities Business Risk Rating

Risk	OPG Hydro		Integrated*
Market			
Competition/demand	Low	1	1.3
Credit	Low	1	1.3
Operational			
Operating Leverage	Moderate	3	2.6
Technology	Low-moderate	2	1.5
Capacity	Moderate	3	2
Asset retirement/construction	Low-moderate	2	1.5
Deferral accounts	Low	1	1
Regulatory			
Primary regulation	Low	1	1
Environmental/safety	Low-moderate	2	1.5
Overall	**Low-moderate**	**1.8**	**1.5**

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* Weighted average of transmission 20%, distribution 30% and generation 50% based on Emera 2006 rounded, Annual Report, Note 14.

Schedule 3.1 concluded

Electric Utilities Business Risk Rating

Risk	OPG Nuclear	
Market		
Competition	Low	1
Credit	Low	1
Operational		
Operating Leverage	Moderate-high	4
Technology	Moderate-high	4
Capacity	Moderate	3
Asset retirement/construction	Moderate	3
Deferral accounts	Low	1
Regulatory		
Primary regulation	Low	1
Environmental/safety	Moderate	3
Overall	**Moderate**	**2.3**

Schedule 3.2

Senior Unsecured Debt Ratings for the Sample of Canadian Utilities

Corporate Issuer	DBRS		Standard & Poor's Rating
	Rating	Debt Rated	
Atco Ltd.	A (low)	Corporate	A
Canadian Utilities	A	Corporate	A
Emera Incorporated Nova Scotia Power	BBB (high) A (low)	MTN	BBB BBB
Enbridge Gas Distribution Inc. / Enbridge Inc.	A	MTN and Unsecured Debentures	A-
Fortis Inc. Fortis Alberta Fortis BC Newfoundland Power Maritime Electric	BBB (high) A (low) BBB (high) A --	Unsecured Debentures 1st Mortgage Bonds Corporate	A- -- -- -- BBB
Pacific Northern Gas	BBB (low)	Secured Debentures	--
TransAlta Corp.	BBB	MTN and Unsecured Debentures	BBB
TransCanada Pipelines	A	Unsecured Debentures & Notes	A-
Median	**A (low)**		**A-**

Sources: Dominion Bond Rating Service website: www.dbrs.com, Standard & Poor's website: www.standardandpoors.com, March 27, 2008.

Schedule 3.3

Capital Structure for Utilities 2005-2007 (percentage of long-term capital).

	Long term debt and debentures			Preferred Shares			Common Equity		
	2005	2006	2007	2005	2006	2007	2005	2006	2007
ATCO LTD.	67.51%	66.97%	65.23%	3.29%	3.13%	3.03%	29.19%	29.90%	31.75%
CANADIAN UTILITIES LTD.	50.20%	50.64%	49.47%	11.04%	10.61%	10.04%	38.57%	38.75%	40.49%
EMERA INC.	50.00%	49.84%	49.70%	8.00%	7.82%	8.07%	42.03%	42.34%	42.23%
ENBRIDGE INC.	58.83%	64.64%	62.98%	1.17%	0.93%	0.85%	40.00%	34.43%	36.17%
FORTIS INC.	58.09%	59.82%	60.31%	8.72%	7.48%	4.17%	33.16%	32.69%	35.52%
PACIFIC NORTHERN GAS LTD.	48.07%	46.16%	45.78%	3.14%	3.18%	3.14%	48.79%	50.67%	51.07%
TRANSALTA CORP.	41.09%	43.09%	42.59%	3.81%	3.83%	0.00%	55.10%	53.08%	57.41%
TRANS CANADA PIPELINES LTD.	55.93%	59.34%	59.25%	2.26%	2.65%	0.00%	41.81%	38.01%	40.75%
Average	**53.72%**	**55.06%**	**54.41%**	**5.18%**	**4.95%**	**3.66%**	**41.08%**	**39.98%**	**41.92%**

Source: Annual reports

Schedule 3.4

Coverage ratios, earned ROEs for selected utilities 2005-2007

Utility	Interest Coverage			Cash Flow to Debt			ROE		
	2005	2006	2007	2005	2006	2007	2005	2006	2007
ATCO LTD.	3.13	3.36	3.31	24.82	21.33	23.71	11.57	14.98	16.69
CANADIAN UTILITIES LIMITED	3.24	3.32	3.25	25.30	19.95	22.46	12.24	14.24	15.96
EMERA INCORPORATED	2.46	2.85	2.91	8.71	19.28	16.85	9.03	9.07	10.93
ENBRIDGE INC.	2.41	2.35	2.37	9.57	12.87	13.19	13.90	14.26	14.53
FORTIS INC.	2.24	2.04	1.70	11.97	8.60	--	12.39	11.83	9.99
PACIFIC NORTHERN GAS LIMITED	2.46	2.06	2.10	12.89	21.53	--	8.34	5.86	5.00
TRANSALTA CORPORATION	2.24	0.84	3.17	22.18	17.75	33.75	7.45	1.81	13.07
TRANS CANADA CORPORATION	3.03	2.58	2.60	15.21	15.05	18.62	17.56	14.10	13.99
Average	2.65	2.43	2.68	16.33	17.05	21.43	11.56	10.77	12.52

Source: Financial Post Advisor. 2007 ratios from Annual Reports for Pacific Northern Gas and Fortis.

Schedule 3.5

Allowed vs. Actual Rates of Return on Equity for 2007

Utility	Allowed Return (%)	Actual ROE for Consolidated Company (%)
ATCO LTD.		16.69
ATCO ELECTRIC TRANSMISSION	8.51	
ATCO ELECTRIC DISTRIBUTION	8.51	
ATCO GAS	8.51	
ATCO PIPELINES	8.51	
CANADIAN UTILITIES LIMITED		
EMERA (NOVA SCOTIA POWER)	9.55	10.93
ENBRIDGE GAS DISTRIBUTION	8.39	14.53
FORTIS INC.		9.99
ALBERTA	8.51	
BRITISH COLUMBIA	8.77	
MARITIME ELECTRIC		
NEWFOUNDLAND POWER		
PACIFIC NORTHERN GAS LIMITED	9.02	5.00
TRANSALTA CORPORATION	8.51	13.07
TRANS CANADA PIPELINES LTD.	9.46	13.99
Average	**8.75**	**12.03**

Sources: Schedule 3.4, Board decisions, Ms. McShane's Statistical Supplement, TransAlta rate is AUC Generic rate for comparison purposes since this company is not regulated.

Schedule 3.6

Allowed Common Equity Ratios

Utility	Allowed	Decision
ATCO LTD.		
ATCO ELECTRIC TRANSMISSION DISTRIBUTION	 33.00 37.00	 EUB 2004-052, U2005-410
ATCO GAS ATCO PIPELINES	38.00 43.00	
CANADIAN UTILITIES LIMITED		
ENBRIDGE GAS DISTRIBUTION EMERA (NOVA SCOTIA POWER)	36.00 40.00	EB-2006-0034 2007-NSUARB-8
FORTIS INC. ALBERTA BRITISH COLUMBIA MARITIME ELECTRIC NEWFOUNDLAND POWER	 37.00 40.00 42.70 44.50	 EUB 2004-052 G-14-06 UE 20934 PU40 (2006)
PACIFIC NORTHERN GAS LIMITED	40.00	G-14-06
TRANSALTA CORPORATION	45.00	U99099
TRANS CANADA PIPELINES LTD.	36.00	RH-2-2004
Average	**39.40**	

Source: Board decisions.

Schedule 3.7

Electric Utilities Business Risk Rating and Capital Structures

	Transmission	Distribution	OPG Hydro	Integrated	OPG Nuclear	OPG Regulated
Business risk[a]	L 1	L-M 1.4	L-M 1.8	L-M 1.5	M 2.3	M 2.1
Equity Component Deemed by Regulators						
EUB 2004	33%	37%				
NSUARB 2007				40%		
OEB 29006, 2007	40%	40%				
Fortis Alberta		37%				
Fortis BC				**40%**		
Maritime Electric				42.70%		
Newfoundland Power				44.50%[172]		
Recommended by Drs. Kryzanowski And Roberts Prior Evidence	30%[173]	35%[174]		35%[175] 42%[176]		
For OPG			**40%**		**50%**	**47%**[177]

[a] L refers to low business risk; L-M refers to low to medium business risk; and M refers to medium business risk. L 1 refers to low business risk based on a business risk rating of 1 to 5 where 5 is the highest numerically business risk rating.

[172] Integrated company, buys 90% of power from Newfoundland and Labrador Hydro.
[173] Generic hearing, Alberta, 2004.
[174] Generic hearing, Alberta, 2004.
[175] NSPI 2002.
[176] Northwest Territories Power Corporation 2007, included business risk premium for size and isolation.
[177] 6,606 regulated MW nuclear (66.47%), 3,332 MW hydro (33.53%).

Schedule 3.8
Capitalization and the Cost of Capital ($M)

December 31, 2008

Capital Structure	Principal	Component (%)	Cost (%)	Cost of Capital ($)
Total Debt	3,922.4	53.0%	5.76%	225.9
Common Equity	3,478.4	47.0%	7.10%	247.0
Rate Base	7,400.8	100.0%	6.39%	472.9
Interest Coverage Ratio	2.1X			

December 31, 2009

Capital Structure	Principal	Component (%)	Cost (%)	Cost of Capital ($)
Total Debt	3,897.5	53.0%	5.92%	230.7
Common Equity	3,456.2	47.0%	7.25%	250.6
Rate Base	7,353.7	100.0%	6.55%	481.3
Interest Coverage Ratio	2.1X			

Source: EB_2007-0905, Exhibit C1, Tab 2, Schedule 1, Tables 2 and 3, Updated 2008003-14

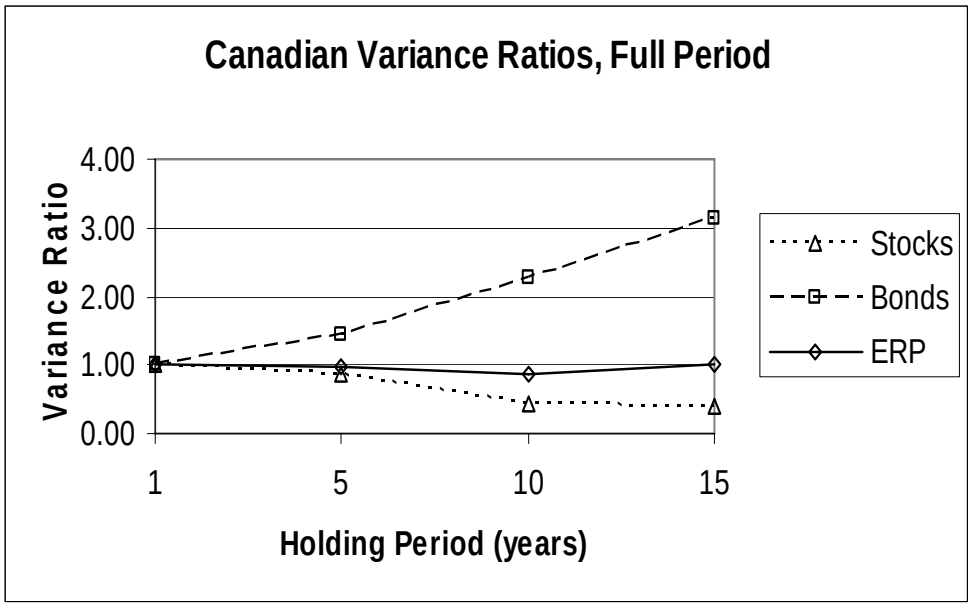
Schedule 4.1

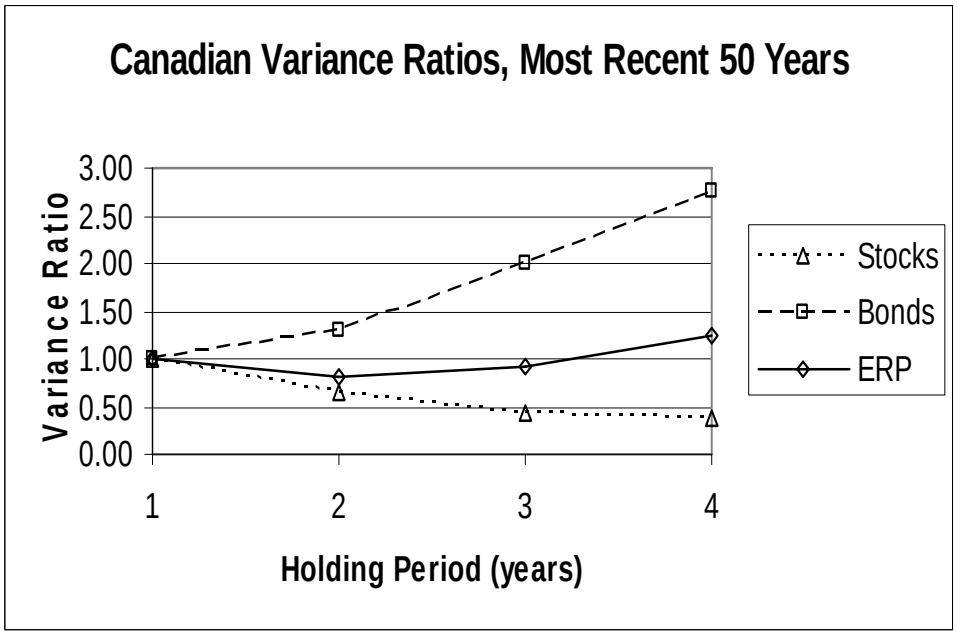
This schedule reports the variance ratios for holding periods of 5, 10 and 15 years relative to a benchmark holding period of 1 year for stocks, long bonds and risk premiums for Canada. The Canada data are annual from the Canadian Institute of Actuaries for the period 1924-2007. A variance ratio of one indicates no aversion or reversion of the mean of the series. Variance ratios less than one indicate mean reversion, and variance ratios greater than one indicate mean aversion. MERP is the market equity risk premium.

	1 year Holding Periods			**5 Year Holding Periods**			**10 Year Holding Periods**			**15 Year Holding Periods**		
	Stocks	**Bonds**	**MERP**	**Stocks**	**Bonds**	**MERP**	**Stocks**	**Bonds**	**MERP**	**Stocks**	**Bonds**	**MERP**
Panel A: CIA data, 1924-2007 (84 years)												
Var.	0.0332	0.0077	0.0393	0.1422	0.0551	0.1937	0.1465	0.1731	0.3457	0.2009	0.3618	0.6047
Var. Ratio				0.8553	1.4372	0.9849	0.4405	2.2576	0.8790	0.4028	3.1452	1.0249
Panel B: CIA data, 1958-2007 (Most recent 50 years ending with 2007)												
Var.	0.0237	0.0106	0.0329	0.0766	0.0681	0.1324	0.1005	0.2100	0.3032	0.1311	0.4377	0.6200
Var. Ratio				0.6475	1.2889	0.8034	0.4245	1.9876	0.9202	0.3691	2.7616	1.2546

Schedule 4.2

The following are plots of the variance ratios presented in Schedule 4.1. A variance ratio of one indicates no aversion or reversion of the mean of the series. Variance ratios greater than one indicate mean aversion, and a variance ratios less than one indicate mean reversion. ERP is the equity risk premium at the market level.





Schedule 4.3

This table contains various estimates of the historical annual risk premiums of stocks over the risk-free rate for various time periods using both nominal and real returns. Stocks are proxied by the returns on the S&P/TSX Composite index or its counterpart for more distant time periods. The risk-free rate is proxied by the returns on 30-year Canada's or its counterpart for more distant time periods.

Time Period	Arithmetic Mean			Geometric mean			Weighted Risk Premium[a]
	Stock Returns	Long Canada Returns	Risk Premium	Stock Returns	Long Canada Returns	Risk Premium	
Panel A: Based on updated Dimson *et al.* data (N for nominal returns; R for real returns)[b,c]							
1900-2007 (107 yrs), N			5.76%			4.27%	5.39%
1900-2007 (107 yrs), R			5.02%			3.45%	4.63%
Panel B: Based on CIA nominal return data[c]							
1926-2007 (82 yrs)	11.64%	6.46%	5.19%	10.07%	6.11%	3.24%	4.70%
1936-2007 (72 yrs)	11.64%	6.48%	5.17%	10.45%	6.11%	3.55%	4.76%
1951-2007 (57 yrs)	11.78%	7.26%	4.52%	10.64%	6.83%	2.88%	4.11%
1957-2007 (51 yrs)	11.09%	7.95%	3.14%	9.94%	7.50%	1.50%	2.73%
1965-2007 (43 yrs)	11.21%	8.80%	2.41%	10.12%	8.31%	0.81%	2.01%
1977-2007 (31 yrs)	13.13%	10.47%	2.66%	12.08%	9.94%	0.98%	2.24%
Panel C: Based on CIA real return data[c]							
1926-2007 (82 yrs)	8.32%	3.38%	4.95%	6.79%	2.94%	3.07%	4.48%
1936-2007 (72 yrs)	7.60%	2.62%	4.99%	6.36%	2.18%	3.52%	4.62%
1951-2007 (57 yrs)	7.69%	3.35%	4.34%	6.53%	2.86%	2.85%	3.96%
1957-2007 (51 yrs)	6.80%	3.80%	3.00%	5.63%	3.29%	1.52%	2.63%
1965-2007 (43 yrs)	6.45%	4.18%	2.26%	5.35%	3.61%	0.83%	1.91%
1977-2007 (31 yrs)	8.63%	6.16%	2.48%	7.63%	5.58%	0.98%	2.10%

[a]The weighted risk premium is found by taking 75% of the arithmetic mean risk premium plus 25% of the geometric mean risk premium.
[b]Updated using data from Ibbotson.
[c]Updated using data from Ibbotson.

Source: Canadian Institute of Actuaries (CIA), *Report on Canadian Economic Statistics, 1924-2007*. DMS module, Ibbotson Associates, 1900-2003.

Schedule 4.4

This schedule reports historical returns (%) for stock and long governments and equity risk premia for the United States for the period, 1900-2007, and various subsets thereof.

Time Period	Arithmetic Mean Returns			Geometric Mean Returns			Weighted Risk Premium [a]
	Stock	Long Gov't	Risk Premium	Stock	Long Gov't	Risk Premium	
Panel A: Based on updated Dimson *et al.* data (N for nominal returns; R for real returns)[b]							
1900-2007 (107 yrs), N			6.47%			4.53%	5.98%
1900-2007 (107 yrs), R			6.10%			4.09%	5.60%
Panel B: Based on nominal return data from Ibbotson Associates							
1926-2007 (82 yrs)	12.26%	5.84%	6.42%	10.36%	5.47%	4.28%	5.88%
1936-2007 (72 yrs)	12.46%	5.94%	6.53%	11.00%	5.54%	4.78%	6.09%
1951-2007 (57 yrs)	12.86%	6.58%	6.28%	11.56%	6.10%	4.56%	5.85%
1957-2007 (51 yrs)	11.78%	7.33%	4.45%	10.52%	6.83%	2.80%	4.04%
1965-2007 (43 yrs)	11.59%	8.10%	3.48%	10.34%	7.55%	1.97%	3.11%
1977-2007 (31 yrs)	13.30%	9.63%	3.67%	12.24%	9.00%	2.17%	3.29%
Panel C: Based on real return data from Ibbotson Associates							
1926-2007 (82 yrs)	9.03%	2.84%	6.18%	7.10%	2.35%	4.09%	5.66%
1936-2007 (72 yrs)	8.50%	2.12%	6.38%	6.89%	1.62%	4.75%	5.97%
1951-2007 (57 yrs)	8.87%	2.76%	6.12%	7.47%	2.21%	4.52%	5.72%
1957-2007 (51 yrs)	7.55%	3.24%	4.31%	6.21%	2.66%	2.79%	3.93%
1965-2007 (43 yrs)	6.88%	3.54%	3.34%	5.56%	2.89%	1.97%	3.00%
1977-2007 (31 yrs)	8.76%	5.33%	3.43%	7.69%	4.58%	2.04%	3.08%

[a]The weighted risk premium is found by taking 75% of the arithmetic mean risk premium plus 25% of the geometric mean risk premium.
[b]Updated using data from Ibbotson.
Source: Ibbotson Associates.

Schedule 4.5

This schedule reports historical real returns and equity risk premia for the United States for the period, 1802-September 2001. “Comp.” refers to the compound or geometric mean annual rate of return; “Arith.” refers to the arithmetic mean annual rate of return; and “Weighted” refers to our equal-weighted average of the geometric and arithmetic mean annual rates of return. The data are drawn from Table 1 in Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, p. 31, available on the AIMR website.

	Real Return				Equity Risk Premium Over Bonds		
	Stocks		Bonds				
Period	**Comp.**	**Arith.**	**Comp.**	**Arith.**	**Comp.**	**Arith.**	**Weighted**
1802-2001	6.8%	8.4%	3.5%	3.9%	3.4%	4.5%	4.0%
1871-2001	6.8%	8.5%	2.8%	3.2%	3.9%	5.3%	4.6%
Major Subperiods							
1802-1870	7.0%	8.3%	4.8%	5.1%	2.2%	3.2%	2.7%
1871-1925	6.6%	7.9%	3.7%	3.9%	2.9%	4.0%	3.5%
1926-2001	6.9%	8.9%	2.2%	2.7%	4.7%	6.2%	5.5%
Post World War II							
1946-2001	7.0%	8.5%	1.3%	1.9%	5.7%	6.6%	6.2%
1946-1965	10.0%	11.4%	-1.2%	-1.0%	11.2%	12.3%	11.8%
1966-1981	-0.4%	1.4%	-4.2%	-3.9%	3.8%	5.2%	4.5%
1982-1999	13.6%	14.3%	8.4%	9.3%	5.2%	5.0%	5.1%
1982-2001	10.2%	11.2%	8.5%	9.4%	1.7%	1.9%	1.8%

Schedule 4.6

This schedule reports the implied market cost of equity for the S&P/TSX Composite and S&P500 index using various forecasts of future growth in dividends based on the one-stage dividend discount model or DDM. The dividend yields (Ylds) for the various indexes are obtained from Bloomberg as of the date of the *Consensus Forecasts* as per the Scenario column. The dividend yields as of November 15, 2007 are used with the predictions from the Watson Wyatt survey to correspond to the mid-November 2007 survey.[a]

Case	Dividend Yield	Real GDP	Inflation	Equity Cost	Scenario
Panel A: Based on the S&P/TSX Composite (Canada)					
1a	2.66%	1.50%	1.60%	5.76%	*Consensus Forecasts* (20080310): mean GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
2a	2.66%	2.30%	1.90%	6.86%	*Consensus Forecasts* (20080310): mean GDP & inflation forecasts for 2009; Dividend Ylds from Bloomberg.
3a	2.66%	2.80%	2.30%	7.76%	*Consensus Forecasts* (20080310): highest GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
4a	2.66%	3.00%	2.30%	7.96%	*Consensus Forecasts* (20080310): highest GDP & inflation forecasts for 2009; Dividend Ylds from Bloomberg.
5a	2.66%	2.93%	2.05%	7.64%	*Consensus Forecasts* (20080310): average annual historical GDP & inflation for 2004-7; Dividend Ylds from Bloomberg.
6a	2.49%	2.8%	2.0%	7.29%	Watson Wyatt (220711mid): median projection for mid-term (2009-2012)
7a	2.49%	2.8%	2.3%	7.59%	Watson Wyatt (220711mid): median projection for long-term (2013-2022)
1b	2.29%	2.80%	2.20%	7.29%	*Consensus Forecasts* (20070611): mean GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
3b	2.29%	3.40%	2.90%	8.59%	*Consensus Forecasts* (20070611): highest GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
5b	2.29%	2.73%	2.18%	7.19%	*Consensus Forecasts* (20070611): average annual historical GDP & inflation for 2004-7; Dividend Ylds from Bloomberg.
6b	2.49%	3.0%	3.0%	8.49%	Watson Wyatt (220711mid): Extremely optimistic scenario (90th percentile) projection for mid-term (2009-2012)
7b	2.49%	3.5%	3.0%	8.99%	Watson Wyatt (220711mid): Extremely optimistic scenario (90th percentile) projection for long-term (2013-2022)

[a]Watson Wyatt, Economic Expectations 2008, 27th Annual Canadian Survey, p. 14. Based on a survey of the "country's leading business economists and portfolio managers in 42 organizations, such as chartered banks, investment management firms and other corporations" in mid-November 2007.

Schedule 4.6 Continued

Case	Dividend Yield	Real GDP	Inflation	Equity Cost	Scenario
Panel B: Based on the S&P 500 (U.S.)					
1a	2.36%	1.40%	3.40%	7.16%	*Consensus Forecasts* (20080310): mean GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
2a	2.36%	2.30%	2.30%	6.96%	*Consensus Forecasts* (20080310): mean GDP & inflation forecasts for 2009; Dividend Ylds from Bloomberg.
3a	2.36%	2.10%	4.40%	8.86%	*Consensus Forecasts* (20080310): highest GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
4a	2.36%	3.50%	3.70%	9.56%	*Consensus Forecasts* (20080310): highest GDP & inflation forecasts for 2009; Dividend Ylds from Bloomberg.
5a	2.36%	2.95%	3.05%	8.36%	*Consensus Forecasts* (20080310): average annual historical GDP & inflation for 2004-7; Dividend Ylds from Bloomberg.
6a	1.93%	2.7%	2.5%	7.13%	Watson Wyatt (220711mid): median projection for mid-term (2009-2012)
7a	1.93%	3.0%	2.5%	7.43%	Watson Wyatt (220711mid): median projection for long-term (2013-2022)
1b	1.79%	2.90%	2.40%	7.09%	*Consensus Forecasts* (20070611): mean GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
3b	1.79%	3.30%	3.30%	8.39%	*Consensus Forecasts* (20070611): highest GDP & inflation forecasts for 2008; Dividend Ylds from Bloomberg.
5b	1.79%	3.23%	2.90%	7.92%	*Consensus Forecasts* (20070611): average annual historical GDP & inflation for 2004-7; Dividend Ylds from Bloomberg.
6b	1.93%	3.2%	3.1%	8.23%	Watson Wyatt (220711mid): Extremely optimistic scenario (90^{th} percentile) projection for mid-term (2009-2012)
7b	1.93%	3.5%	3.2%	8.63%	Watson Wyatt (220711mid): Extremely optimistic scenario (90^{th} percentile) projection for long-term (2013-2022)

Schedule 4.7

This table summarizes the forecasts of two samples of professionals for the yields and total returns on a number of asset classes, and the MERP implied by the total returns on stock indexes and long bonds.

TR Index	5-year Forecast Ending Dec. 2012 from Mercer[a]			
	5th percentile	median	mean	95th percentile
Panel A: Distribution for mid-term return expectations from Mercer[a]				
DEX Long Bond TR	3.2%	4.5%	4.6%	6.4%
S&P/TSX Composite	5.0%	8.0%	8.1%	11.4%
S&P500 ($ Cdn)	6.4%	8.5%	8.6%	11.3%
Implied MERP S&P/TSX[b]	1.8%	3.5%	3.5%	5.0%

Index	Sample size	Percentiles				
		10th	25th	50th (median)	75th	90th
Panel B: Distribution of mid-term (2009-2012) return expectations from Watson Wyatt[c]						
30-yr Canada Bonds	25	4.5%	4.5%	4.8%	5.5%	6.0%
S&P/TSX Composite Index	26	6.0%	7.0%	8.0%	9.0%	12.0%
S&P 500 Index	27	6.0%	7.0%	8.0%	9.0%	10.0%
Implied MERP S&P/TSX		1.5%	2.5%	3.2%	3.5%	6.0%
Panel C: Distribution of long-term (2013-2022) return expectations from Watson Wyatt[c]						
30-yr Canada Bonds	23	4.5%	4.6%	5.2%	6.0%	6.6%
S&P/TSX Composite Index	24	7.0%	7.3%	8.0%	9.8%	10.0%
S&P 500 Index	25	7.0%	7.5%	9.0%	10.0%	10.0%
Implied MERP S&P/TSX		2.5%	2.7%	2.8%	3.8%	3.4%

[a]Mercer, *2008 Fearless Forecast*, 17th edition. This survey captures the views of 54 Canadian and global investment managers on the economy and capital markets.

[b]The DEX long bond index was formerly the SCI Long bond index. It consists of government and corporate bonds with maturities in excess of 10 years.

[c]Watson Wyatt, *Economic Expectations 2008*, 27th Annual Canadian Survey, p. 15. Based on a survey of the "country's leading business economists and portfolio managers in 42 organizations, such as chartered banks, investment management firms and other corporations" in mid-November 2007.

Schedule 4.8

This table provides the rolling five-year betas for our sample of ten utilities. If thin or no trading plagues any five-year period, we do not calculate a beta for that utility. This was the case for Emera for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index. "w/o" refers to without. Although AltaGas Utility Group Inc. became a new, publicly traded corporation on November 17, 2005, it is not included because less than 3 years of market data were available for beta estimation.

Five-year period	Terasen[c]	Cdn Utilities	Emera[a]	Pacific Northern Gas	TransAlta Corp.	Trans Canada Pipe	Duke[b]	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean	Mean, w/o Duke	Mean, w/o Atco	Mean, w/o Duke & Atco	Mean, w/o Terasen & Duke
1990-94	0.608	0.592			0.558	0.574	0.571		0.715	0.462	0.583	0.585	0.561	0.559	0.580
1991-95	0.635	0.498			0.606	0.540	0.557		0.712	0.533	0.583	0.587	0.561	0.562	0.578
1992-96	0.562	0.561			0.585	0.489	0.611	0.498	0.600	0.390	0.537	0.526	0.528	0.514	0.520
1993-97	0.474	0.634	0.405		0.462	0.338	0.531	0.440	0.546	0.310	0.460	0.451	0.449	0.438	0.448
1994-98	0.479	0.616	0.564		0.536	0.544	0.453	0.478	0.623	0.484	0.531	0.540	0.519	0.529	0.549
1995-99	0.352	0.530	0.415		0.265	0.224	0.253	0.237	0.509	0.320	0.345	0.357	0.325	0.335	0.357
1996-00	0.243	0.361	0.276	0.457	0.048	0.170	0.128	0.046	0.377	0.216	0.232	0.244	0.216	0.227	0.244
1997-01	0.168	0.249	0.206	0.437	0.061	-0.068	-0.098	-0.128	0.280	0.133	0.124	0.149	0.107	0.132	0.146
1998-02	0.115	0.184	0.155	0.453	0.082	-0.079	-0.011	-0.199	0.210	0.132	0.104	0.117	0.093	0.106	0.117
1999-03	0.020	0.050	-0.053	0.354	-0.063	-0.377	-0.087	-0.398	0.039	-0.046	-0.056	-0.053	-0.067	-0.064	-0.062
2000-04	-0.007	0.033	-0.015	0.468	0.138	-0.170	0.006	-0.318	0.092	0.031	0.026	0.028	0.018	0.020	0.032
2001-05	0.074	0.112	0.054	0.507	0.417	-0.173	0.094	-0.182	0.282	0.227	0.141	0.146	0.126	0.129	0.156
2002-06		0.210	0.084	0.472	0.427	0.318	0.817	0.221	0.354	0.480	0.376	0.321	0.378	0.316	0.321
2003-07		0.445	0.216	0.235	0.495	0.503	0.112	0.509	0.662	0.611	0.421	0.460	0.391	0.431	0.460
Mean	0.310	0.362	0.210	0.423	0.330	0.203	0.281	0.100	0.429	0.306	0.315	0.318	0.300	0.302	0.318
First four rolling periods											0.541	0.537	0.525	0.518	0.532
Middle five rolling periods											0.267	0.281	0.252	0.266	0.283
Last (most recent) five rolling periods											0.182	0.180	0.169	0.166	0.181

[a]Holding company for Nova Scotia Power. [b]Holding company for Westcoast Energy. [c]Formerly B.C. Gas & bought by Kinder Morgan Inc. in November 30, 2005, and acquired by Fortis as announced on February 26, 2007. The Kinder Morgan family trades as 3 separate firms on the NYSE.

Source: *CFMRC*. Updated using Bloomberg for 2007.

Schedule 4.9

This table provides the rolling five-year correlations (rho) for our sample of ten utilities with the market. If thin or no trading plagues any five-year period, we do not calculate a correlation for that utility. This was the case for Emera for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All correlations (rhos) are calculated using monthly total returns for the utility and the S&P/TSX Composite index. Although AltaGas Utility Group Inc. became a new, publicly traded corporation on November 17, 2005, it is not included because less than 3 years of market data were available for rho estimation.

Five-year period	Terasen	Cdn Utilities	Emera	Pacific North. Gas	Trans Alta Corp.	Trans Canada Pipe	Duke	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean Rho				
											All In	Atco Out	DukeOut	Atco & Duke Out	Terasen & Duke Out
1990-94	0.571	0.581			0.458	0.492	0.407		0.468	0.485	0.495	0.499	0.509	0.517	0.497
1991-95	0.544	0.485			0.523	0.506	0.362		0.447	0.494	0.480	0.486	0.500	0.510	0.491
1992-96	0.513	0.512			0.579	0.481	0.415	0.440	0.439	0.391	0.471	0.476	0.479	0.486	0.474
1993-97	0.476	0.619	0.445		0.456	0.310	0.414	0.325	0.451	0.361	0.429	0.426	0.430	0.428	0.424
1994-98	0.557	0.655	0.605		0.553	0.464	0.440	0.442	0.571	0.603	0.543	0.540	0.556	0.554	0.556
1995-99	0.363	0.554	0.427		0.229	0.171	0.282	0.221	0.480	0.424	0.350	0.334	0.359	0.341	0.358
1996-00	0.238	0.358	0.300	0.289	0.043	0.117	0.114	0.042	0.291	0.311	0.210	0.201	0.221	0.212	0.219
1997-01	0.167	0.274	0.236	0.233	0.050	-0.049	-0.085	-0.110	0.237	0.188	0.114	0.101	0.136	0.124	0.132
1998-02	0.114	0.204	0.180	0.224	0.068	-0.058	-0.008	-0.201	0.173	0.180	0.087	0.078	0.098	0.089	0.096
1999-03	0.042	0.023	-0.074	0.137	-0.036	-0.216	-0.021	-0.289	0.103	0.039	-0.029	-0.044	-0.030	-0.047	-0.039
2000-04	-0.006	0.032	-0.017	0.185	0.106	-0.136	0.003	-0.260	0.064	0.035	0.001	-0.006	0.000	-0.008	0.001
2001-05	0.065	0.062	0.055	0.211	0.300	-0.188	0.049	-0.162	0.230	0.187	0.081	0.064	0.084	0.066	0.087
2002-06		0.089	0.071	0.223	0.300	0.303	0.367	0.201	0.208	0.291	0.228	0.231	0.211	0.211	0.211
2003-07		0.159	0.153	0.138	0.287	0.381	0.051	0.342	0.334	0.319	0.240	0.229	0.264	0.254	0.264
Mean		0.304	0.329	0.217	0.205	0.280	0.184	0.199	0.083	0.321					
First four rolling periods											0.469	0.472	0.480	0.485	0.471
Middle five rolling periods											0.261	0.251	0.274	0.264	0.272
Last (most recent) five rolling periods											0.104	0.095	0.106	0.095	0.105

Source: *CFMRC*. Updated using Bloomberg for 2007.

Schedule 4.10

This schedule reports time-series mean monthly variances (in decimal) at the industry-level using the indirect decomposition method of Campbell *et al.* (2001) based on all firms on the TSX for the 1975-2003 and 1994-2003 periods. The 47 industry groups, which are arranged in alphabetical order, are those used by Fama and French (1997). The number of firms is based on the total period. "Utilities as % of 44-industry mean" results from the elimination of the 3 industries with the highest variances. "40-Industry mean" is the cross-sectional mean of the time-series means of all industries with at least 10 firms in them. "Utilities as % of 39-industry mean" results from the elimination of the industry with the highest variance from the 40-Industry mean.

Industry	# Firms	1973-2003	1994-2003	Industry	# Firms	1973-2003	1994-2003
Agriculture	3	0.0135	0.0259	Nonmetallic Mining	240	0.0022	0.0019
Aircraft	17	0.0062	0.0083	Personal Services	13	0.0114	0.0090
Alcoholic Beverages	26	0.0028	0.0027	Petrol & Natural Gas	656	0.0017	0.0019
Apparel	22	0.0048	0.0055	Pharmaceutical	59	0.0077	0.0064
Automobiles & Trucks	50	0.0032	0.0030	Precious Metals	366	0.0071	0.0098
Banking	98	0.0019	0.0024	Printing & Publishing	26	0.0761	0.2158
Business Services	218	0.0034	0.0034	Real Estate	90	0.0025	0.0018
Business Supplies	52	0.0019	0.0019	Recreational Products	15	0.0092	0.0129
Candy and Soda	6	0.0083	0.0153	Restaurants, Hotel, Motel	34	0.0034	0.0035
Chemicals	44	0.0029	0.0032	Retail	117	0.0015	0.0015
Coal	9	0.0373	0.0853	Rubber & Plastic	13	0.0040	0.0046
Computers	48	0.0036	0.0056	Shipbuilding, Railroad	3	0.0704	0.0124
Construction	23	0.0050	0.0065	Shipping Containers	4	0.0196	0.0290
Construction Materials	42	0.0029	0.0019	Steel Works, Etc.	43	0.0025	0.0037
Consumer Goods	24	0.0034	0.0031	Telecommunications	93	0.0026	0.0039
Defense	1	0.0137	0.0065	Textiles	15	0.0086	0.0118
Electrical Equipment	21	0.0079	0.0154	Tobacco Products	1	0.0881	0.2452
Electronic Equipment	73	0.0064	0.0119	Trading	331	0.0016	0.0010
Entertainment	45	0.0036	0.0045	Transportation	66	0.0019	0.0018
Food Products	34	0.0030	0.0040	Utilities	52	0.0017	0.0020
Healthcare	16	0.0056	0.0056	Wholesale	120	0.0021	0.0018
Insurance	41	0.0019	0.0018	47-industry mean		0.0109	0.0180
Machinery	91	0.0023	0.0018	Utilities as % of 47-industry mean		15.33%	11.19%
Measure & Control Equip.	11	0.0190	0.0199	Utilities as % of 44-industry mean		26.54%	29.51%
Medical Equipment	13	0.0171	0.0160	40-industry mean		0.0065	0.0107
Miscellaneous	11	0.0036	0.0039	Utilities as % of 40-industry mean		25.64%	18.87%
				Utilities as % of 39-industry mean		35.35%	37.16%

Schedule 4.11

This table reports the % issue fees for Canadian utilities based on issues over the five-year period, 1997-2001

Type of financing	Maturity[a]	Number of issues	Median %Fee	Amortization period in years	Annual Amortized % Fee
Debt	< 10 years	52	0.37%		
Debt	> 10 years	52	0.50%	20	0.025%
Preferred		16	3.00%	50	0.06%
Common		15	4.00%	50	0.08%

Issuers with following SIC codes: 4612 (crude petroleum pipelines), 4911 (electric services), 4922 (natural gas transmission), 4923 (natural gas transmission and distribution), and 4924 (natural gas distribution). Debt maturity is measured as maturity date compared to announcement date of the issue.

Source: *Financial Post Data Group*.

Schedule 6.1

This table uses data drawn from the evidence of Ms. McShane to show that stock returns exhibit mean reversion and bond returns exhibit mean aversion in both Canada and the United States over the 1947-2006 period of time. “Stdev.” refers to the standard deviation of returns; and “Range” refers to the difference between the highest and low returns.

	Based on one-year returns[1]			Based on 25-year returns[3]		
Measure of Risk	Stocks	L.T. Bonds	Ratio	Stocks	L.T. Bonds	Ratio
Panel A: Based on Canadian returns for stock and long government (L.T.) bonds						
Stdev.	16.13%	9.75%	1.65	1.10%	3.50%	0.31
Range	74.36%	53.44%	1.39	4.90%	10.00%	0.49
Panel B: Based on U.S. returns for stock and long government (L.T.) bonds						
	Based on one-year returns[2]			Based on 25-year returns[3]		
Measure of Risk	Stocks	L.T. Bonds	Ratio	Stocks	L.T. Bonds	Ratio
Stdev.	16.72%	10.30%	1.62	2.10%	3.50%	0.60
Range	79.09%	49.54%	1.60	8.60%	9.80%	0.88

[1]Ibbotson Associates.
[2]Canadian Institute of Actuaries.
[3] Ms. McShane’s Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 1, Schedule 4, page 218 of 261.

Schedule 6.2

This table provides the market performance of the sample of 20 Canadian companies used by Ms. McShane in her Comparable Earnings Estimation Method. The returns for Ms. McShane's sample are based on equal weights to conform to the equal weights used in implementing her Comparable Earnings Estimation Method. Performance as reported in panel A is measured using annualized monthly returns. The Sharpe ratio is obtained by dividing the mean excess return by the standard deviation of returns. Performance as reported in panel B is measured using monthly excess returns (i.e., actual returns minus the risk-free rate) to obtain the Jensen or Alpha measure of abnormal returns. Performance is measured using monthly (excess) over the period 1994-2006.

Statistic	Annualized Monthly Returns	
	Ms. McShane's Sample	**S&P/TSX Composite**
Panel A: Mean, standard deviations and Sharpe ratios		
Mean	15.08%	11.51%
Standard Deviation	12.14%	15.40%
Sharpe Ratio	0.26	0.14

	Alpha (intercept)	**Beta (of Market)**	**F-test**		**Adjusted R^2**
			Value	**Significance**	
Panel B: Results for regression of excess returns on Ms. McShane's sample with those for the S&P/TSX Composite					
Coefficient	0.0064	0.4462	72.1590	0.0000[a]	0.3146
T-statistic	2.7414	8.4946			
p-value	0.0068	0.0000			

[a]Actual significance is 1.5813E-14.

Schedule 6.3

This table provides the market performance of holding the Sector sub-index 55, Utilities, of the S&P/TSX Composite index over the 20-year period, 1988-2007, and over the 10-year period, 1998-2007, based on trade data from the TSX. Performance as reported in panels A and B is measured using (annualized) monthly returns. The Sharpe ratio is given by the monthly excess returns (i.e., actual returns minus the risk-free rate) divided by the monthly standard deviation of returns. Performance as reported in panels C and D is measured using monthly excess returns (i.e., actual returns minus the risk-free rate) to obtain the Jensen or Alpha measure of abnormal returns.

	Annualized Return	
Statistic	**Utilities**	**S&P/TSX Composite**
Panel A: 20-year period, 1988-2007		
Mean	11.83%	10.78%
Standard Deviation	12.94%	14.04%
Sharpe Ratio	0.49	0.38
Panel B: 10-year period,1998-2007		
Mean	12.15%	10.38%
Standard Deviation	14.70%	15.96%
Sharpe Ratio	0.58	0.42

	Alpha (intercept)	**Beta (of Market)**	**F-test**		**Adjusted R^2**
			Value	**Significance**	
Panel C: 20-year period, 1988-2007					
Coefficient	0.0041	0.2597	20.4619	0.0000	0.0753
T-statistic	1.7633	4.5235			
p-value	0.0791	0.0000			
Panel D: 10-year period,1998-2007					
Coefficient	0.0068	0.0516	0.3721	0.5430	-0.0053
T-statistic	1.7303	0.6100			
p-value	0.0862	0.5430			

Schedule 6.4
Comparison of Witnesses' Rate of Return Evidence Against Selected Adjustment Formulas

Source	Long-Canada Forecast	Recommended Return	Risk Premium (Basis Points)
I. Witnesses			
2008			
Kryzanowski/ Roberts	3.85%	7.10%	325
McShane	5.00%	10.50%	550
2009			
Kryzanowski/ Roberts	4.25%	7.25%	300
McShane	5.00%	10.50%	550
II. Regulatory Boards[a]			
2007 Actual			
AUC	4.22%	8.51%	429
NEB	4.22%	8.46%	424
2008 Projected based on Kryzanowski / Roberts Long-Canada forecast			
AUC	3.85%	8.23%	438
NEB	3.85%	8.18%	433
2009 Projected			
AUC	4.25%	8.53%	428
NEB	4.25%	8.48%	423
Average-risk Premium for Boards			431

[a] "AUC" refers to the Alberta Utilities Commission, and "NEB" refers to the National Energy Board.