CONTAINS BUSINESS SENSITIVE AND HIGHLY CONFIDENTIAL MATERIAL

FOR INTERNAL MANITOBA HYDRO USE ONLY

Independent Review of Manitoba Hydro Export Power Sales and Associated Risks

September 11, 2009

Submitted to:

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CHAPTER ONE
Executive Summary

1.1 INTRODUCTION

Manitoba Hydro (also referred to in this report as "MH" or "the Corporation") requested that ICF International ("ICF") provide an independent assessment of its export sales and associated risks.

Specifically, MH requested that we provide comments and conclusions with respect to six items contained in the Terms of Reference ("TOR") for the assignment:

I. the appropriateness, from a long-term business strategy and risk exposure perspective, of Manitoba Hydro entering into long-term firm contracts 20 or 30 years into the future;

II. the adequacy of price that Manitoba Hydro derives (or will derive) from export sale transactions (both long-term firm and short-term opportunity sales);

III. the risks assumed by Manitoba Hydro in selling long-term firm energy from dependable resources (in consideration of the requirements to meet firm sale commitments during periods of drought);

IV. the extent to which Manitoba Hydro should be involved in pure merchant energy trading transactions;

V. the reasonableness of Manitoba Hydro's quantification of risk exposure related to an extended (5-year) drought; and

VI. the adequacy of Manitoba Hydro's drought risk mitigation measures.

1.2 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

This section is organized into seven parts, one for each of the six items in the TOR, and in addition, a section briefly summarizing findings for each TOR and a listing of identified areas for improvement. Some of the recommendations for improvement include activities already under way.

1.2.1 The Appropriateness, From A Long-Term Business Strategy and Risk Exposure Perspective, of Manitoba Hydro Entering Into Long-Term Firm Contracts 20 or 30 Years Into the Future

This Term of Reference can be considered in two parts: (1) should MH be in the business of hydroelectric based development and exports, and (2), if so, should it be making long-term commitments 20-30 years into the future?

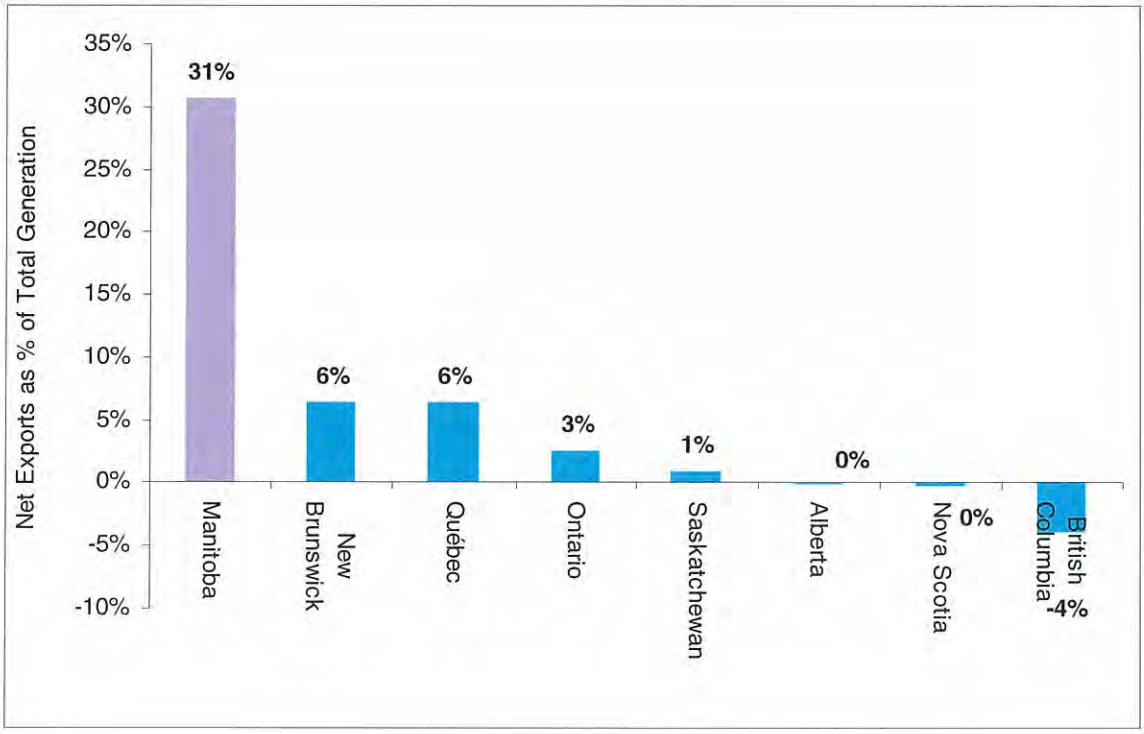
Chapter 5 addresses the second part in greater detail but below we summarize our conclusions with respect to both issues.

1.2.1.1 Should MH Be In the Hydroelectric Based Power Export Business

We conclude that, risks notwithstanding, MH should be in the hydroelectric based power export business based on the benefits provided to ratepayers and the Province. This reflects the following conclusions:

- **Hydroelectric Surplus** – Even without additional investment in hydroelectric power plants, MH will have surplus power for sale, and the only feasible market is the export market. Also, exports are a far larger share of generation for MH compared to other Canadian utilities (see Exhibit 1-1). In other words, the issue is not whether but how to be involved in exports. The fact that hydro surplus is variable, does not change the imperative to maximize value, and dispose of the surplus, but rather complicates the management of the MH export business.

EXHIBIT 1-1
2007 Net Electricity Exports to US as a Percentage of Total Generation

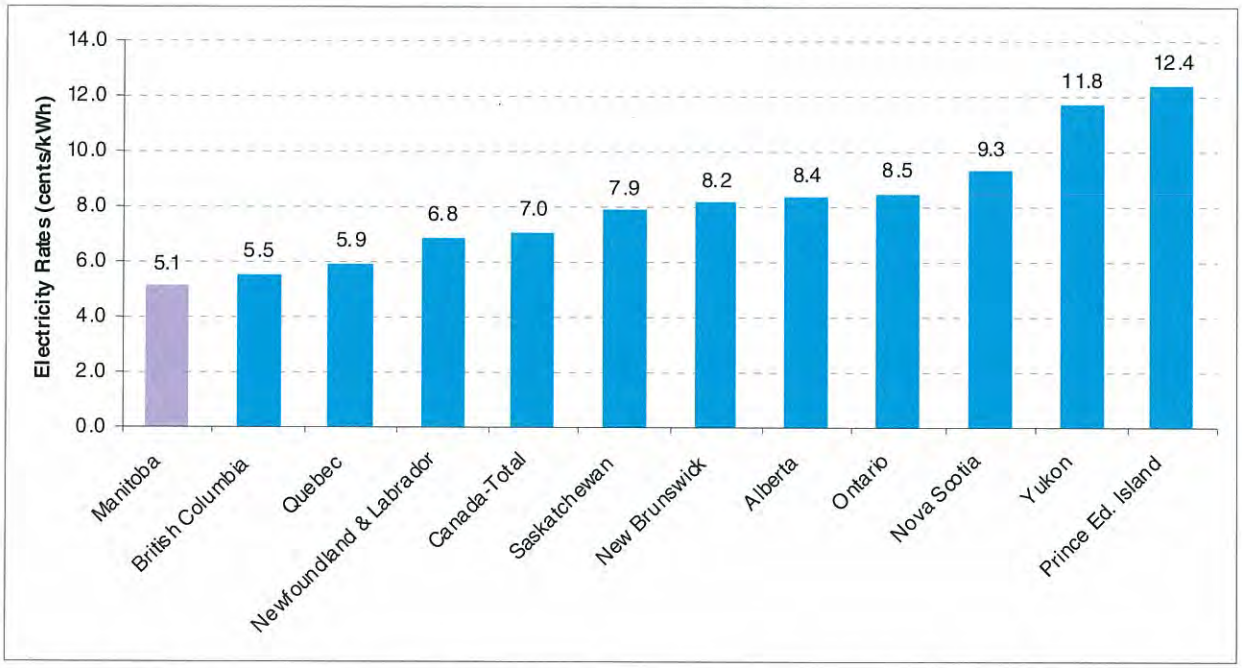


Source: 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada, pp.11-12

- **Corporate Direction** – MH's corporate mandate and stakeholder expectations support the export of surplus power. Indeed, MH has been in this business for many years, and has developed sophisticated structures and capabilities to manage exports and hydro variability; these structures continue to develop and improve.

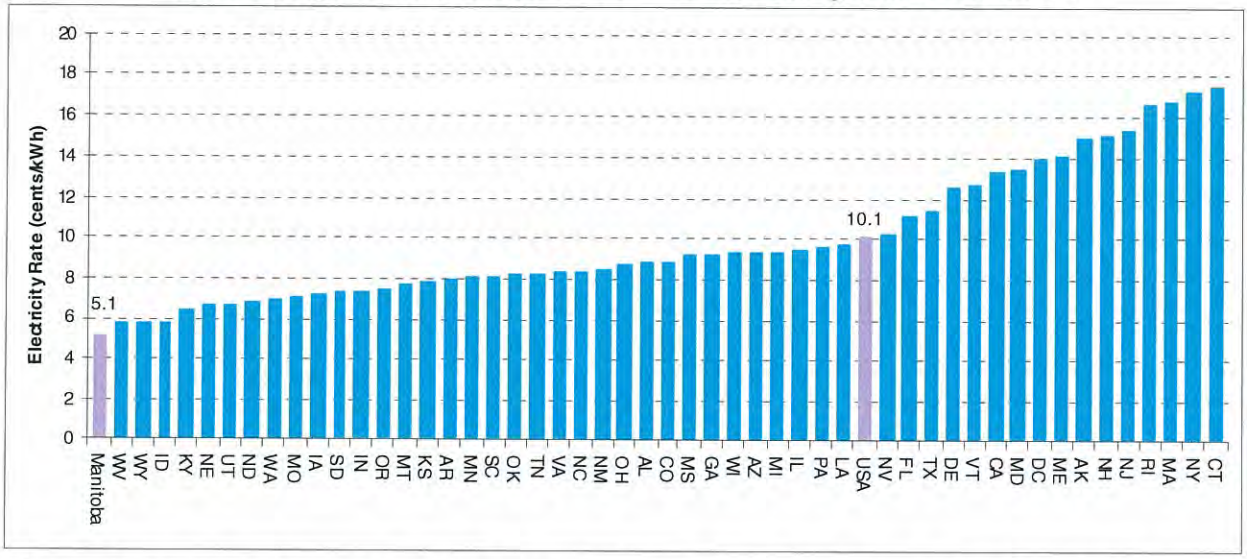
- **Success** – MH has the lowest domestic electricity rates in Canada and North America in part because of exports (see Exhibits 1-2 and 1-3); export prices greatly exceed MH's embedded generation costs, and the revenues are used to decrease domestic rates and/or to provide the financial wherewithal to withstand droughts without rate shocks or heavy use of additional Province backed financing.

EXHIBIT 1-2
2007 Canadian Retail Rates



Source: 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada

EXHIBIT 1-3
2007 Average Domestic Sales Price – Manitoba Hydro vs. US states



Source: US states data from EIA – Retail Sales of electricity by State and by Sector; Manitoba Hydro data from 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada
Note: The exchange rate used for converting currency from US dollars to Canadian dollars is an average of the daily exchange rates from April 2007 to March 2008 i.e., 1.03

- **Lower Rates in the Future** – MH is proposing to enter into new long-term firm contracts to export hydro power backed by the accelerated construction of new hydro facilities. These contracts are expected to provide several types of benefits including lower MH rates than would otherwise be the case without the contracts. The proposed prices are on average above MH costs and average expected spot prices. MH recently estimated that two of the three proposed long-term firm contracts will provide savings of $153 million on a present value basis by 2041.[1] This calculation is very conservative in that it addresses only two of the three long-term firm contracts.[2] It also does not account for the up to $2 billion (Canadian, as expended nominal dollars) in transmission costs that the buying US utilities will expend for the construction of expanded transmission between the utilities and the Canadian border.[3] While such division of transmission construction is a commercially reasonable allocation of costs, MH would likely bear the majority of these costs in the absence of the long-term contracts. These transmission linkages, as discussed below, can be crucial for the Corporation in the event of a drought that is worse than the worst-on-record, or if there are changes in MISO rules. For example, Hydro Quebec is effectively paying for new DC line construction in New England to support its exports. As well, the calculation does not factor in the benefits of lower volatility

[1] Dollars represent Canadian dollars unless otherwise specified.
[2] On a present value basis, discounted to 2008/09, the cumulative reduction in bills could be $153 million by 2041 in the sale case (includes contracts with NSP, MP, and WPS) relative to the no-sale case (considers only the contract with NSP). See Manitoba Hydro 2008/09 Power Resource Plan, p.31.
[3] For an initial assessment of the costs of transmission infrastructure see "MHEB Group TSR System Impact Study Out-Year Analysis; MH to US Requests", prepared for Midwest ISO, March 11, 2009.

of pricing, less risk of rate shocks and the decreased financial stress on MH compared to spot sales.

- **Securing Enhanced Firm Import Capability** – Another important benefit not included in the MH calculation of the benefits of long-term contracts is that US utilities are undertaking the new transmission construction to facilitate MH exports. This export driven addition of new line construction can be used to support imports in the case of a drought worse than the worst-on-record. In such a situation, MH is not obligated to export power, thereby opening up the lines for imports and allowing MH to avoid potential blackouts. In the absence of these lines, it may be necessary for MH to build on its own greater import capability and/or more fossil generation. As mentioned, MH could have to pay up to $2 billion (nominal as expended Canadian $) for new lines. Further, in the event MH does not pursue long-term export contracts, there would be less chance of the transmission expansion; without US utility support MH may not be able to site and permit the lines regardless of the cost. In the risk management literature, such extreme low and unknown probability events (a worse drought than the droughts found in the 97 year hydrological record of MH) with large negative consequences are referred to as "Black Swan" events. We refer to this literature because a key finding is that many of the principal risk management failures derive from not properly addressing Black Swan risks. The long-term firm contracts help prevent this Black Swan event.

- **Securing Firm Export Capability** – Available benefit calculations also do not include the costs to MH if MISO adopts a stricter view of the MH export capability. Since the passage of the US 2005 Energy Policy Act and subsequent regulations, US transmission entities now face enforceable centralized standards for reliability. There is a risk that MISO might conclude that the current transmission system's export capabilities are not robust enough to consider MH exports to be firm. Either export pricing would decrease from firm to non-firm price levels or MH would have to pay for the construction of new lines. As noted, even if MH were willing to make these payments, it is unlikely that MH could get the necessary approvals and permits needed to have the transmission built in the US without the active support of the buying US utilities and it certainly would be much more expensive than having the US utilities paying for construction. In this regard, the construction of the new transmission lines being undertaken by the buying U.S. utilities enhances the Corporation's firm export capability.

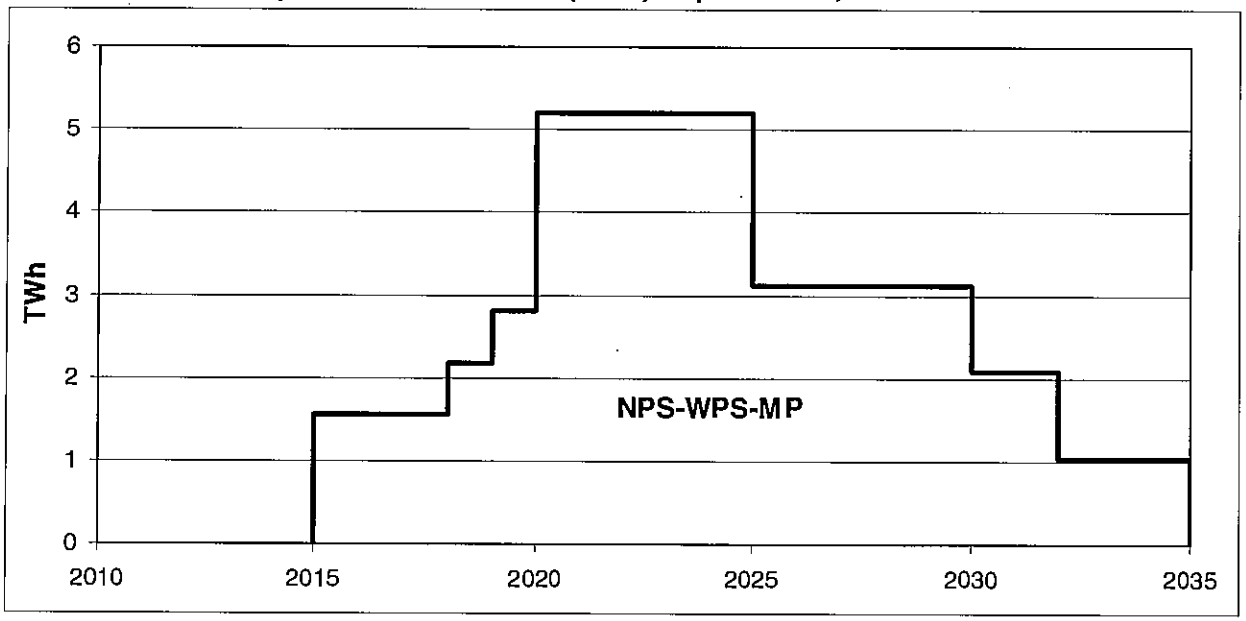
- **Risks of Fossil Power Plants** – Hydroelectric development, combined with long-term firm contracts, is also preferred for Manitoba as it avoids the risks involved in developing fossil power plants. Indeed, there has been strong opposition to and limits on the operation of MH's single coal plant. Were MH to pursue alternative capacity expansion such as fossil plant development, this could only be done subject to the legislative restriction that coal can only be used to support emergency operations, and there is a risk that opposition to and the difficulty of siting and permitting, would eliminate the fossil option entirely. Furthermore, there would be increased exposure to fuel and environmental regulatory risk.

- **Magnitude of Risks / Mitigation** – MH has a reasonable and adequate risk mitigation plan. This mitigation plan causes in part MH to have a reasonable level of risk associated with exports. Even in the event of a five year drought, the company has plans to achieve an equity cushion sufficient to accommodate the reduced cash flow due to drought without having to raise rates. It is actively working to decrease transmission related risks, and has a mixed contract-spot sales strategy designed to limit volatility while still having exposure to market. The risks of exports need to be considered in light of and are outweighed by the significant benefits noted above (i.e., lower and more stable rates for domestic consumers on an expected basis).

1.2.1.2 Should MH have 20-30 Year Commitments Versus Shorter Commitments

ICF concludes that it is appropriate for Manitoba Hydro to enter into long-term firm commitments for 20-30 years in the future in the manner in which the company is proposing – i.e., consistent with its overall plan. For example, MH is entering into a long-term contract with Northern States Power (NSP) between 2015 and 2025 – i.e., a commitment nearly 17 years in the future (though a ten year contract period). It is also entering into two firm long-term contracts with Wisconsin Public Service (WPS) and Minnesota Power (MP) that start later than the NSP contract and are delayed till the new hydroelectric facilities (Keeyask and Conawapa) come on line (see Exhibit 1-4).

EXHIBIT 1-4
Proposed Firm On-Peak (5X16) Export Sales, 2015 – 2035



Source: Potential contract term sheets
Note: The above graph represents approximate illustration of firm on-peak (5X16) energy supply provisions under the potential contracts. For example, supply options are represented for the entire year without consideration of mid year start or end dates.

The conclusion regarding the appropriateness of long-term contracts is based on the following considerations:

- **Price Volatility** – Long-term (i.e., 20-30 year) commitments are very helpful in decreasing the volatility of revenues from export sales. This in turn allows MH to maintain the stability of domestic rates (for example avoid rate shocks) and/or to reduce pressure on the Corporation's balance sheet during episodes of low spot prices such as currently being experienced. Low prices also can coincide, as they do now, with recessions and difficult financial and economic conditions. This increases the value of long-term firm contracts.

- **Reasonable Mix of Commitments** -- Alternatives to long-term sales are short-term and intermediate-term sales, with short-term generally being defined as spot or less than one year sales. Manitoba Hydro plans to supplement long-term sales with significant amounts of shorter-term and spot sales (nearly one half of the expected volume). Indeed, the long-term firm contracts are part of a mixed strategy of both types of sales.

  Spot sales have become more feasible with deregulation in the U.S. making wholesale power markets more liquid and transparent, and creating open access transmission systems. Access is provided to Manitoba Hydro assuming reciprocity of access. Spot sales, also by definition, eliminate the risk that the price ex post will be lower than the spot market price.

  However, under spot sales, the price is determined based on then current supply and demand conditions, and applicable rules and regulations. This by definition creates volatility. Furthermore, over the past five years, the volatility of spot wholesale power prices in the US MISO marketplace (a key export market for MH) has greatly increased. Even more recently, this volatility remains extremely high. While MISO prices reached record high levels in 2007 and 2008, 2009 year-to-date prices (through end of May 18, 2009) have decreased well below (almost down 50 percent) 2008 levels (see Exhibit 1-5). This increasing volatility is driven by the growing linkage between electricity prices (especially on peak power prices) and natural gas prices, and the high volatility of natural gas prices. Full reliance on spot sales creates a potentially adverse scenario, similar to a drought scenario, in which export revenues are very low, not because quantity is lacking, but because prices are very low. When export revenues are significantly less than budgeted, rates for MH customers must rise or equity must be decreased.

EXHIBIT 1-5
Annual MISO Wholesale Power Prices, 1997 – 2009

Year	MISO On Peak Power price (Nominal US$)	MISO Spot Prices (2008 US$/MWh)		
		On-Peak	Off-Peak	All-Hours
1997	22.1	29.0	14.0	21.1
1998	29.2	37.3	15.1	25.5
1999	39.5	49.4	13.6	30.4
2000	39.0	47.6	18.0	31.2
2001	37.5	44.6	18.0	30.5
2002	27.8	32.3	16.4	23.8
2003	44.7	50.6	20.1	34.4
2004	46.6	51.5	22.7	36.2
2005	64.7	69.6	32.3	49.8
2006	59.4	62.4	29.4	51.3
2007	71.3	73.1	30.3	58.8
2008	62.0	62.0	25.3	49.8
2009 YTD	31.9	31.2	22.3	28.2
Standard Deviation	**15.6**	**14.5**	**6.4**	**12.1**
Average Price (1997-2009)	**44.3**	**49.3**	**21.3**	**36.2**
Average 1997 – 2003	**34.3**	**41.5**	**16.4**	**28.1**
Average 2004 – 2008	**60.8**	**63.7**	**28.0**	**49.2**
Average 2004 – 2009 YTD	**56.0**	**58.3**	**27.0**	**45.7**

Source: 1997-2000 MAPP Weekly Index; 2001–2005 Northern MAPP Weekly Index; and 2005-2009 YTD MINN HUB Weekly Index, from Power Market Week

Another alternative to 20 to 30 year commitments are intermediate term commitments. Intermediate term contracts provide some revenue predictability, but are not likely to achieve MH's transmission goals (as discussed below). Importantly, as discussed in Chapter 5, Manitoba Hydro is already planning to sell more than half of its exports under short-term contracts; it is far from "putting all of its eggs in one basket". Also, in one of its proposed long-term firm contracts, one half of the sales are priced at spot market conditions.

Even if MH were to restructure and rely even more than it does on spot markets and intermediate term contracts, it would still be unlikely to facilitate construction of new transmission without long-term commitments. It would also fail to achieve a premium price including avoided capacity costs, i.e., buyers would not be able to fully price these purchases reflecting avoided local generation construction. Also, the restructuring associated with this export model could be significant – for example, increasing the equity target, relying on a greater frequency of domestic changes in rates, increasing collateral and liquidity access for expanded third party hedging, and increasing hedging with non-utility long-term off-takers.

- **Aligning Investment Lead Time and Commitment Durations** - A clear MH objective is to increase the amount of electricity transmission capacity between Manitoba and MISO which is its principal US export market. The goal is to both increase export and import capabilities. Manitoba Hydro would also like to build

or accelerate the construction of new hydro-electric facilities and have its counterparties defer new local supply additions. The contracts that extend 20-30 years from today are consistent with the long lead time for adding hydro-electric generation and transmission facilities (five to ten years). It is also consistent with the long useful lives of electric utility equipment and systems (for example, forty year lifetimes) which allow for low amortization of costs each year, and hence, low rates. It is also consistent with the need for wholesale power buyers to have enough time and cost stability to recover investments in transmission facilities, and to defer their own generation investments.

- **Assuring Transmission Investment** – Manitoba Hydro is relatively isolated from the rest of the North American grid, is heavily reliant on hydroelectric production, and faces relatively high hydroelectric supply variability compared to other hydro oriented companies. Also, electric supply is crucial during the winter peak season. Increasing its ability to import power will increase the reliability of Manitoba Hydro's domestic supply during unexpectedly very extreme events, for example, a historically unprecedented drought, combined with rare internal transmission problems.

  As noted above, achieving increases in transmission capacity is difficult, especially when long new lines are involved in the service territories of other utilities. This can be especially difficult across international boundaries and across state boundaries. This is the case in spite of recent improvements in the US regulatory structure in the ability to request new firm transmission service; however, there is no requirement that systems be expanded. In addition, the US legal structures are problematic in terms of multiple entities having jurisdiction. New transmission can also be very expensive.

- **Financial Hedging Not As Attractive** - Another alternative to long-term firm physical contracts are long-term financial contracts that allow for power price hedges. These suffer from the costs and risks associated with counter party financial distress – i.e., the certainty of known sales prices (or indexed prices) might not be available when needed. They also can greatly and suddenly increase the collateral needs of MH since the contracts would likely have mark-to-market collateral requirements. Thus, the financial position of Manitoba Hydro would increasingly be linked to natural gas prices, a large departure from historic conditions and expectations of rate payers, the Province, financial institutions, etc. The company's financial situation might need to be restructured, i.e., with more equity. Thus, the long-term physical contracts are more likely to successfully perform the hedging function.

- **Standard Industry Practice** - It is standard practice in the utility industry to sell a large portion of power under very long-term contracts in light of the above considerations. This practice is reflected in: (1) past MH contracts, (2) recently proposed Hydro Quebec export sales contracts in ISO NE, (3) the implicit long-term contractual relationship MH has with its domestic customers, (4) the same implicit relationship characterizing most power sales in the US between utilities and ratepayers, and (5) long-term contracts between the great majority of new plants under construction and buyers. Additionally, the counter example is IPPs who sold largely short-term (including spot sales) and subsequently suffered financial distress.

1.2.2 The Adequacy Of Price That Manitoba Hydro Derives (Or Will Derive) From Export Sale Transactions (Both Long-Term Firm And Short-Term Opportunity Sales)[4]

We examined the price adequacy of exports of long-term firm sales from multiple perspectives. These examinations included comparison of proposed contract prices against forecast averages from several forecasts, ICF forecasts available at time of negotiation, historical prices, previous contract prices, domestic rates and costs, etc. We also reviewed the process for determining prices and considerations regarding the timing of MH's decisions to enter into negotiations. In light of these considerations, and as discussed further below, the prices proposed for long-term firm contracts appear reasonable and adequate, and MH pricing processes appear adequate.

- **Historical MISO Spot Prices Versus Existing Contract Prices** – Manitoba Hydro's existing long-term firm contracts (excluding non firm energy and diversity exchange contracts) have prices more than ten percent higher ($56/MWh versus $49/MWh) than 1997-2009YTD average historical MISO spot on peak prices (2008$) even though some of the contracts were signed in the mid 1990s when wholesale MISO prices were lower. This supports our conclusion that MH's pricing strategy has been adequate. Over the last few years, spot prices have exceeded existing contract prices. While on an isolated basis this means the contracts underperform spot, we believe a longer term perspective is more appropriate. This is because the goal of the contracts is in part to decrease volatility. Also, MH's existing contract prices are not only above the long-term average, they are also well above current (i.e., year to date 2009) MISO spot prices.

- **Historical MISO Spot Prices Versus Proposed Contract Prices** – The proposed export contract prices are well above historical spot prices [redacted] versus $49/MWh), and also well above the recent record high spot prices experienced in the MISO market (i.e., the record price is $73/MWh in 2007 for MISO on-peak) (see Exhibit 1-6). Indexing will cause prices to maintain this premium in real terms. The proposed prices are especially attractive compared to 2009 year to date prices which have been very low: on peak prices have been $32/MWh. This supports the view that MH pricing is adequate.

[4] All prices in this section are represented in real 2008 US$.

EXHIBIT 1-6
Comparison of Contract Prices with Historical MISO On-peak Spot Power Prices

Source: 1997-2000 MAPP Weekly Index; 2001-2005 Northern MAPP Weekly Index; 2005-2009 YTD MINN HUB Weekly Index from Power Market Week
Note: Contracted energy price with MP is the average of a fixed price and MHEB nodal price; [redacted] reflects only the fixed component of the contracted price

- **Proposed Contract Prices versus Existing Contract Prices** – Manitoba Hydro's proposed export contract prices are well above average existing contract prices, i.e., more than [redacted] percent higher.

- **Domestic Generation Service Prices** – Manitoba Hydro's proposed export contract prices are well above domestic rates for generation services, i.e., nearly [redacted] times as high. The proposed average export contract price is well above the domestic generation cost of approximately $27/MWh [5] by [redacted] percent.

- **ICF Wholesale Price Forecasts Available at Time of Contract Negotiations** – Our review of contract versus forecast pricing started with ICF forecasts which are provided regularly to MH. This is in part because ICF did not have access to the other forecasts provided to MH due to the confidentiality provisions regarding the forecasts (except two averages discussed further below). Manitoba Hydro's proposed contract prices are above ICF's forecasted prices available at the time contract negotiations were ongoing. [redacted] (see Exhibit 6-12); MH long-term prices are even higher when compared to the average forecasts from all forecasters. It is our understanding that the NSP contract was based on 2006 projections, and the MP and WSP contracts were based on the 2007 projections. Thus, Manitoba Hydro appears to have properly accounted for the then current price forecasts in their negotiations. We believe

[5] This is subsidized domestic generation component of price, based on calculations in Recommended Method under Cost of Service Study, March 2006. Note, the calculations assume subsidy of 20 percent from export sales.

the most important consideration is the information available at the time of negotiations. This supports our conclusion that MH pricing is adequate. We also gave considerable weight to this finding.

- **Consensus Price Forecasts** – As noted, ICF only had access to two averages of consensus forecasts of power prices (2007 and 2008 vintages). Manitoba Hydro contract prices are generally higher than the consensus forecasts available at the time of contract negotiations.

  Specifically, the levelized average price negotiated in the binding terms sheets executed with the U.S. utilities is higher than the 2007 vintage of the consensus forecast. Based on the following two considerations, we presume that the contracted prices are also higher than the 2006 vintage: (1) it is consistent with MH policy, and [redacted][6].

- **Approach to Future Price Forecasting** – The approach of using consensus forecasts available at the time of contract negotiations plus [redacted] for pricing long-term contracts is reasonable. This helps guard against seller's regret, i.e., regret if spot prices turn out to be higher and ensures Manitoba Hydro negotiators have access to up-to-date information. This supports our conclusion that MH pricing of exports for long-term sales is adequate.

- **Incremental Production Costs** – Manitoba Hydro's proposed contract prices are also above the costs of producing the power. This is based on a Manitoba Hydro study which does not account for all the benefits of the export sales, i.e., the premium over costs is larger than estimated. This is a necessary condition for adequacy and MH meets this requirement.

- **Non-Price Benefits** – The export contracts provide significant non-price benefits. These include lower variance in revenues, and transmission construction benefits. Also, as discussed, under some circumstances, the firm sales volumes are not firm. This may make the price achieved even higher than the firm price indices we have used in the comparisons. Specifically, Manitoba Hydro can decrease firm sales during a drought [redacted] contracts. While MH has a business interest in maintaining its reputation for reliability, this provision potentially makes the power less firm than unit contingent firm power trading in the marketplace (depending on a number of factors such as market rules governing capacity contribution, for example, weekend capacity requirements versus weekday, the likelihood of this provision being exercised relative to outages of fossil power plants, and pure capacity prices). This, then, increases the premium over the forecast. The third proposed contract, [redacted] contract, does not have the provision for [redacted] reduction during a drought, but has a call option [redacted] embedded in it. This limits the risk that a drought might be coupled

[6] [redacted].

with higher than [redacted] and higher than [redacted], especially in a [redacted] call option [redacted]). A later chapter discusses long-term contract terms and conditions and associated risks related to these items. We also gave weight to these benefits in reaching our overall conclusion of pricing adequacy.

- **Market Timing and Trends** – ICF believes it has been a reasonable time to enter into long-term contracts. While prices have been trending upward (until this year), and this argues to some degree for waiting for even higher prices (ignoring this year), there are some counter trends and risks to waiting. Put another way, Manitoba Hydro should guard against making pursuit of perfection (i.e., selling at the exact market peak) the enemy of the good (i.e., taking advantage of the strong market that has emerged). Lastly, as discussed elsewhere, there are numerous risk mitigation steps that guard against MH missing out on even greater market price increases including heavy reliance on short-term sales for a large portion of MH's available surplus, one of the three contracts having a [redacted] price setting mechanism, and the potential to renegotiate a portion of the contracts in ten to fifteen years when more information is available on CO_2 controls and other uncertainties.

- **Short-Term Opportunity Sales** – Short-term opportunity prices also appear reasonable (i.e., prices associated with sales months or weeks in advance as opposed to next day sales). Short-term prices, i.e., prices for transactions covering twelve months or less have been above spot prices.

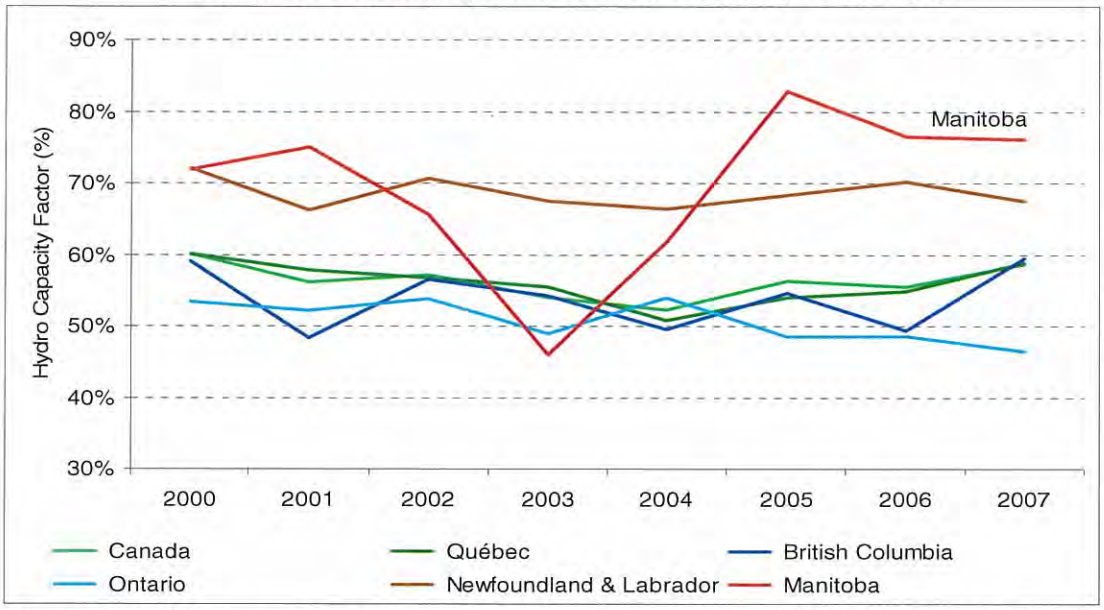
1.2.3 The Risks Assumed By Manitoba Hydro In Selling Long-Term Firm Energy From Dependable Resources (In Consideration Of The Requirements To Meet Firm Sale Commitments During Periods Of Drought)

1.2.3.1 Risk Identification

There are a number of risks assumed in selling long-term firm energy related to the need to sell during periods of drought. These include:

- **Hydrology Risks** - A key risk in making long-terms firm sales commitments that is distinguished from short-term non-firm sales is that in the event of a drought, there are some circumstances in which MH might need to produce fossil power or buy marketplace replacement power to replace the shortfall in hydro power to serve sales obligations (in addition to local demand). MH hydrology is more variable than other Canadian utilities (see Exhibit 1-7). However, as discussed in Section III.2, the proposed contracts have less firmness under some drought circumstances, and thus, MH has greater latitude in the proposed contracts than in existing contracts. Therefore, it is important that the risks of existing and proposed contracts be properly distinguished.

EXHIBIT 1-7
Canadian Utilities Hydro Historical Capacity Factor (%)



Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada

The need to purchase replacement power is in addition to lost revenue from lower sales. This lost revenue risk is similar for firm and non firm sales.

- **Manitoba's Domestic Electricity Demand Risks** – As MH's key export contracts involve firm commitments (with some important exceptions that will be discussed later), lower availability of surplus supply can create risks that do not exist for spot sales. One of the most important source of this risk is the potential for domestic electricity demand growth to exceed expected levels. To the extent demand growth is stronger than expected, there will be less surplus generation to meet export sales obligations.

- **Experience with the 2003-04 Drought, the 2003 Drought Management Plan and Risk Identification** – In the event of a drought of a severity within the historical record, and domestic demand equal to forecast, there is still the potential need to source power over and above that assumed by System Planning for firm export sales from fossil generation or the wholesale power marketplace. This risk arises even though export sales are limited to the amount of MH dependable energy supply (the sum of firm hydro energy, MH fossil energy supply and firm imports of approximately 3 TWh)[7] net of domestic load available under the worst drought on record. This is because in the event of a severe drought, the Drought Preparedness Plan may increase the amount of assumed MH domestic demand that must be supplied (e.g., assume a colder than normal winter) and there may be a desire to displace high cost domestic

[7] For example, in the 2008/2009 Power Resource Plan, Dependable Resources for year 2008/09 includes 21.1 TWh of hydro, 4.3 TWh of thermal, 2.8 TWh of imports, and 0.5 TWh of demand side management and wind. See 2008/2009 Power Resource Plan, February 5, 2009, p.41.

fossil generation. This is in turn associated with the potential for the drought to exceed the worst on record; this potential cannot be ruled out until after the fact.

The drought of 2003-04 was severe (albeit not extending over five or seven years as happened in previous extreme droughts), created financial challenges for the Corporation, and was also associated with the need to meet firm export requirements from the marketplace in excess of that planned by System Planning. Even though Manitoba Hydro took a number of steps to minimize the financial impact of the drought, the Corporation nonetheless suffered a loss in retained earnings of $436 million. This was much larger than the $28 million loss in the previous drought period in 1989. This was, in part, due to the severity of the drought. By June 2003, MH was experiencing the second lowest water inflows since 1912 and was in drought conditions until April 2004. The year 2003 remains one of the three worst single years in MH's hydrological history.[8] These losses were also driven by increases in the company's long-term fixed price export commitments between 1989 and 2003.[9]

As part of the steps taken by the company to ensure reliable supply and to minimize the financial consequences of the 2003-04 drought, Manitoba Hydro put a Drought Management Plan in place in the second quarter of 2003.[10] Manitoba Hydro has not had a drought since 2003.

The basic premise of the 2003 Drought Management Plan was to use thermal generation and imports in addition to river flows to meet domestic load, maintain sufficient hydro reserves in storage such that continued severe drought the following year could be survived even during a severe winter, negotiate bookout[11] agreements with export sales customers, develop an operations planning criteria to determine the energy shortfall in an extended drought[12], and in light of the mean reverting nature of the hydrological flows, delay expenditures to the extent possible to enable them to coincide with better hydro conditions.

To fulfill the long-term sales agreements, the Corporation entered into various bookout agreements with its counterparties and the remaining shortfall was

[8] It wasn't apparent until well into the 2003 drought that it was not going to be the worst on record and that the winter wasn't going to be the 1-10 event. Given the uncertainty, plans and resources were put in place on the basis that the drought would be equivalent to the worst drought and that the winter would be colder than normal. The effect of this was that the cost of the drought was higher than had the magnitude of these events been known in advance. This additional cost can't be avoided as perfect foreknowledge is not possible.

[9] In 1989, the company had 423 GWh of long-term commitments. In 2003, MH had 6,100 GWh of long-term agreements. See Manitoba Hydro 2002-2004 Drought Risk Management Review, January 18, 2005, prepared by RiskAdvisory, p.4.

[10] For details of the Drought Management Plan and other actions taken by the Corporation during the 2003 drought, see Manitoba Hydro 2002-2004 Drought Risk Management Review, January 18, 2005, prepared by RiskAdvisory. Storage levels were set weekly and the plan was approved by MH executives in May 2003.

[11] A bookout is a transaction between two counterparties that offsets all or part of a previous transaction. The transaction involves payment of the difference between market or the new price and the original price.

[12] The Operations Planning Criteria assumed a 5 percent worst-case water supply conditions and an extremely cold winter, i.e., 10th percentile winter.

managed through the purchase of power call options. Since these call options were tied to gas prices and the Corporation potentially had to use its gas-fired plant to meet domestic load, Manitoba Hydro was exposed to the risks associated with the rising natural gas prices experienced during this timeframe. The Corporation effectively managed this risk through natural gas hedging arrangements.

Subsequent to the 2003 drought, MH established the Drought Financial Management Working Group. Under its Terms of Reference, established in early 2008,[13] the Group is tasked with updating the 2003 Drought Management Strategies using the PRISM model, and with developing a drought leading indicator or index for the Corporation. The work of this group is continuing. The company does not have a written Drought Preparedness Plan in place at this time, and would benefit from one. However, the expectation is that the key elements of a written plan would include:

- MH load would be served normally at a high level of certainty.
- Water in the reservoirs will be conserved as appropriate, reflecting the potential for droughts of greater severity and duration than the historical record, and MH's lack of interconnection which limits power imports.
- Greater storage in reservoirs in response to a drought does not change the amount of energy available, and has only limited effects on total expected net revenues. Rather, it creates cash flow issues. This is because, on average, the expected prices in one year will be similar to the next, though some additional costs may be undertaken as precautions such as hedging higher wholesale prices. While it is a priority to manage cash flow and maximize the economic benefits of MH operations, as discussed below, it is a lower operational priority than reliability.
- Given the long time lags from reservoir to generation, and the fact the MH system is energy constrained, it is necessary to plan for a severe winter.
- MH water supply is mean reverting, and hence, a gradual approach to purchasing power is required to avoid over purchasing in a drought.

In some cases, these elements are already part of the System Operation Priorities document which establishes the priorities to be followed by the Hydraulic Operations Department in planning system operations. For example, under Priority 1 (Energy Supply), the document states,

> "Maintaining the firm energy supply is the highest priority objective of operations. The consequences of running short are more serious in the winter than in the summer. To ensure that the winter energy demand

[13] Draft Terms of Reference, Drought Financial Management Working Group, March 5, 2008.

can be met under all circumstances resources should be in place to meet the forecast load given the most severe winter weather conditions."[14]

Furthermore, Priority 2 (Energy Reserves) states,

> "Adequate energy reserves in reservoir storage will be maintained as normal operating practice if available resources allow. These reserves must be sufficient to meet firm load requirements given a repeat of the worst historic flow conditions coincident with firm load demands associated with the availability of thermal and import energy supplies. On a contingency basis energy reserves can be used to meet firm load requirements when no alternative resources are available."[15]

Finally, the last priority, Priority 5 (Economic Operation), is concerned with maximizing the financial and economic benefits to the customers of Manitoba Hydro.

In addition, each year, the financial and operational consequences of a drought are examined as part of resource planning and the Integrated Financial Forecasting process.

- **Compounding Risks** – There are two categories of compounding risks related to firm obligations exceeding supply. The first is higher wholesale power prices which make the costs of replacement purchases higher. The second category comprises of other factors which impinge on MH's financial performance and which could coincide with the more direct risks of drought and prices.

Chapter 4 provides a more complete identification and discussion of these risks.

1.2.3.2 Reasonableness of the Risks of Long-Term Firm Commitments – Mitigating Factors and Historical Perspective

The risks assumed by MH in selling long-term firm power appear reasonable in consideration of the firm sales commitments during periods of drought in part due to following features of the proposed contracts:

- **Firm Volume Reduction in the Event of a Drought Within the Historical Record** - In the event of a drought within the historical record in terms of severity, MH can decrease firm energy volumes [redacted] contracts, if necessary, to meet domestic load. This decrease is associated with the flexibility to reduce sales volume to zero on weekends. In the third contract, (the [redacted] contract), this provision does not exist, but there is a potentially valuable call option limiting the risk of very high replacement power costs. In past firm MH contracts, such reductions were not permitted; they were firm system participation sales agreements. Therefore, the situation has

[14] Manitoba Hydro's System Operation Priorities, May 20, 1988
[15] Id.

changed since the 2003-2004 drought in that the proposed contracts mitigate drought impacts in ways previous firm contracts did not. This is especially important if domestic demand growth is greater than expected, or future drought plans are similar to the 2003 drought plan discussed elsewhere, which required MH to assume domestic demand was higher than expected demand.

MH has a history of very reliable supply and is viewed as a reliable source of power by counterparties. Thus, it has a business interest in avoiding use of this and the other mitigating options to its firm obligations. Nonetheless, MH has succeeded in decreasing its exposure to the risks of a drought by decreasing firmness of some of the volume, and therefore, the contract commitments are inherently less risky than existing contracts lacking these provisions.

- **Volume Reduction in the Event of Unprecedented Drought** - Export firm sale volumes in a given year are limited to ensure domestic demand can be met in that year, even during a repeat of the worst recorded drought in the nearly 100 year hydrologic record maintained by the company. Moreover, the curtailment provisions of the proposed contracts give Manitoba Hydro the right to curtail energy supply in the event of an extreme drought to the extent needed to serve high priority domestic load or in the event of catastrophic failure of its DC transmission system. Note that under these adverse conditions, the Corporation will continue to serve its high priority domestic load.

- **Early Construction of New Power Plants** - MH is building facilities with supply matched to the firm sales volumes. Thus, the system is being designed to ensure reliable supply and to minimize problems arising from droughts.

- [redacted] **Volumes** – In the [redacted], MH can set the price high enough such that firm obligations are eliminated. Even if this were not true, delivery is during the [redacted].

1.2.4 THE EXTENT TO WHICH MANITOBA HYDRO SHOULD BE INVOLVED IN PURE MERCHANT ENERGY TRADING TRANSACTIONS

Manitoba Hydro defines pure merchant transactions as sales not involving the sale of Manitoba Hydro's hydroelectric assets (known as asset-backed trading) and/or not directly related to serving or hedging its sales obligations. Pure merchant sales can also include arbitrage transactions, i.e., transactions with known buy and sell prices and without risk except for credit and execution problems. Manitoba Hydro is not involved in merchant non-arbitrage transactions.

We do not believe that MH should engage in shorter term merchant non-arbitrage transactions. This is based in part on public entities generally not being involved in these transactions, and lack of stakeholder support for such activities. MH management is not interested in pursuing non-arbitrage merchant transactions.

Also, over the last several years, there is a proven industry history that merchant transactions can be highly detrimental to corporate earnings, as well substantially increase the volatility of earnings and the potential for rate shocks. This is more prevalent in the case of financial

transactions rather than physical transactions. As well, these transactions absorb a disproportionate share of corporate resources relative to potential benefits.

Lastly, we emphasize that merchant transactions have much greater risks. Under such transactions the company expects that market prices will change in a manner that justifies a non-balanced transaction – for example, acquire transmission, generation, fuel, emission allowances, fixed trading rights without immediately or almost immediately making an offsetting sale for some period of time – e.g., several months.

As noted, arbitrage merchant transactions are an exception to our general views on merchant transactions. The prime example of such a transaction is the purchase of power and/or related products in one market to be delivered to another market via transmission capacity owned or controlled by Manitoba Hydro or controlled on its behalf by others. Under existing MH risk management policy, such transactions need to be converted from merchant to back-to-back non merchant transactions within three days, for example, a sale of power needs to be accompanied by an offsetting purchase of power and transmission within three days. Actual practice more commonly converts these transactions within one day. Such sales can be advantageous, and arise as a consequence of participation in the marketplace. They also are based on an existing set of known prices, i.e., Manitoba Hydro is not taking price risk. Moreover, Manitoba Hydro is not using its hydro-electric assets to facilitate these arbitrage transactions.

In the unlikely hypothetical case that MH decides to initiate and pursue non-arbitrage merchant transactions (for example, unexpected broad based stakeholder interest), MH should pursue them only when it augments and improves its risk management documentation, structures, procedures and systems to support such transactions.

In order to fully mitigate risks during non-drought and drought periods, MH needs to continue to work to bring its risk management infrastructure (documentation, structures, procedures and systems) up to standard industry practices. It should be noted that the Corporation has been taking steps in this direction. For example, it has been developing and expanding the role of its middle office. This is mentioned here although it also relates to mitigation and quantification discussions later. Further improvement will add additional safeguards against execution risks, and expand risk management options.

1.2.5 The Reasonableness of Manitoba Hydro's Quantification of Risk Exposure Related to an Extended (5-Year) Drought

Manitoba Hydro examines several scenarios as part of its quantification of the risk of a drought (for example, droughts spanning five and seven years). However, Manitoba Hydro's risk quantification, in its most recent Integrated Financial Forecast, reflects only the impacts of a five year drought. In its previous assessments, such as the response to PUB Order 117/06, the Corporation has analyzed the financial impact of droughts spanning different durations.

The most recent five year drought analyzed (starting in 2010/11 and extending through 2014/15) results in a $2.7 billion decrease (over the five year period) in retained earnings compared to the base case.[16] This estimate includes financing costs of the drought. The

[16] Note that throughout the report we mention the cost of an extended five year drought to be $2.7/$2.8 billion. The estimate of $2.7 billion is based on Integrated Financial Forecast (IFF08-1), November 2008,

decrease in retained earnings grows to $3.5 billion by 2018/19 relative to the base case due to the compounding effects of interest costs. This scenario results in a near elimination of retained earnings, available cash, and other accumulated equity. Put another way, the targeted equity amount is about equal to the lost net revenue in this scenario.

Our assessment of Manitoba Hydro's quantification of risk focuses on two main issues. First, we assess whether the five year drought scenario is reasonably stressful to account for the financial impacts of an extended drought. Second, we assess whether the quantitative simulation of the scenario is reasonable.

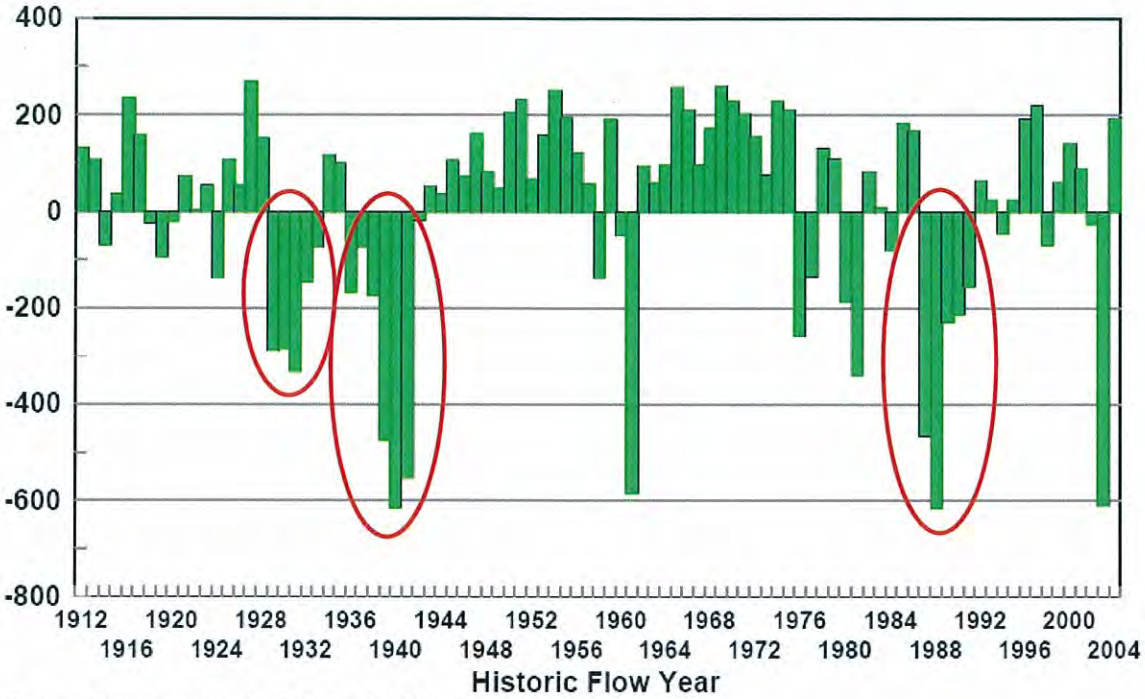
The assessment of the stressfulness is based on the review of: (1) general approaches to characterizing financial risks such as the choice of confidence intervals, (2) the interaction of drought with other risk events such as high wholesale power prices, (3) starting point of adverse event, (4) availability of mitigation strategies, (5) duration of adverse event, and, (6) a comparison of Manitoba Hydro's quantification of risks with those of other organizations.

The assessment of the mechanics of the quantitative simulation is based on our review of Manitoba Hydro's forecasting and simulation tools and a comparison with other approaches. Manitoba Hydro relies primarily on its own system modeling tools such as SPLASH and HERMES, and most recently, a tailored application of PRISM. These models and the company's Integrated Financial Forecasts are employed by the Corporation to quantify the risks associated with an extended drought.

The underlying data is based on 97 years (1912-2008) of hydrological data (see Exhibit 1-8). The approach is based on simulating Manitoba Hydro operations under each year's hydrological conditions including those that occurred before the current Manitoba Hydro system was in place. For example, hydrology data from the early decades of the 20th century is used to forecast what the output would have been if hydroelectric generators had been on-line at the time even if they came on-line much later. This system can model storage as well as thermal and hydroelectric production, and optimizes system operation for a given set of hydrologic circumstances.

p.18 and $2.8 billion is based on Corporation Risk Management report, October 2008, p.1. Both estimates assume no rate increase.

Exhibit 1-8
Variation of Flow Related Revenue ($ million)



Source: Response to PUB Order 117/06, p.1
Notes:
1. The calculations for the graph above assume current generation capability and a single base case for other parameters.
2. The circled time periods indicate extended drought years

The models used by the Corporation are similar to models used by other hydro-electric dependent companies. For example, BC Hydro uses HYSIM (Hydrological Simulation) and SO (System Optimizer) models which are similar in nature. While the HYSIM uses historical hydro data and hydro system constraints to generate forecasts of expected output and generation costs, SO determines the optimal expansion plan using expected generation from HYSIM.

ICF considers Manitoba Hydro's quantification of risk exposure to drought to be reasonable. The scenario examined by the Corporation is reasonably stressful. It is almost equivalent to adopting a 95 percent confidence interval. In any given year there is only a 3.1 percent chance of the onset of a drought equal to or worse than the five year drought examined; a 95 percent confidence interval would have a 2.5 percent chance of occurring or being worse. This is based on the assumption that conditions in any future year are unknown to MH. In most cases, this is a reasonable assumption.

We observe that some other financial stress tests involve more than one risk factor changing simultaneously while Manitoba Hydro's does not. However, these organizations examine more common events than extended droughts, for example, recessions. Hence, they need to examine a broader range of events, including simultaneous changes in more than one variable in order, to reach the confidence levels that Manitoba Hydro reaches when varying only one variable, i.e., is there an extended drought or not. Hence, as a general matter, Manitoba Hydro does not need to simultaneously examine multiple risk events.

The 2003 drought resulted in less of a financial impact than the stress test case. This was one of the three worst single years in MH hydrological history. This supports MH's choice of its stress case.

Moreover, if MH finds itself in a drought, the Corporation can borrow money and/or raise rates more easily than most entities being subject to stress tests. Thus, considerations of the extremity of the stress test and the potential for recapitalization once the chance of equity problems occur, supports the view that stress testing for an event with less than 3 percent chance is too stressful.

While the quantification approach is reasonable, we identify some areas for improvements. For example, once in a drought, quantification using multiple variables may be reasonable, (e.g., Monte Carlo simulation of cash flow at risk), in part to better track risks, and to facilitate communication across the company and with stakeholders regarding the progress of the drought, and the likely efficacy of the Drought Preparedness Plan. This is especially important because the current approach does not model the details of a Drought Preparedness Plan, which may further restrict use of MH hydro resources as was done in the 2003 drought.[17] This would build on ongoing work.

The company has recently developed the PRISM Model which uses a Monte Carlo methodology to calculate probability distributions. This can be another tool particularly suited to the simulation of short-term hedges such as power purchases, options, etc. Additional testing of these options should be pursued including additional examination of short-term (1-2 years forward) hedging tools. Also, some additional examination of the consequences of depleting retained earnings would be useful. This should lead to a drought related financial plan that outlines the mitigation plans, (e.g., rate increases will be sought when there is a predetermined chance that the next 12 months, or some other period, shows an exhaustion of the equity cushion, or the equity cushion will not be allowed to fall below a predetermined percentage, etc.). This will facilitate planning and management of the expectations of stakeholder groups.

1.2.6 The Adequacy of Manitoba Hydro's Drought Risk Mitigation Measures

We conclude that Manitoba Hydro's risk mitigation strategy related to an extended drought is adequate, and helps meet a key goal of avoiding rate shocks. This is based on Manitoba Hydro's risk mitigation measures including: (1) mix of sales types and contracts, (2) contract provisions decreasing required firm sales volumes in a drought that are more favorable than existing firm contracts, (3) policies and contract provisions to address transmission risks, (4) borrowing capacity and retained earnings targets, (5) domestic demand management programs, (6) other risk mitigation features (e.g., number and type of counter parties, etc.), and, (7) drought management structure and procedures.

- **Mix of Sales Commitments** - A drought lowers non-firm export sales revenues compared to budget. Since a large proportion of export power sales will be non-firm, this is an important risk. There is also the chance that a drought

[17] For example, if under a Drought Preparedness Plan, one must assume that the winter will be colder than average, one might expect greater costs than if this requirement were not in place. This might include the need to purchase call options, gas and gas storage, and use of the Corporation's fossil power plants more frequently as insurance against adverse conditions.

induced decrease in export sales will coincide with low wholesale power prices that lower the revenues from the remaining short-term opportunity export sales. Thus, a key risk mitigation structure is the existence of firm or relatively firm prices in the firm contracts that protects the Corporation against even greater downside.

More generally, Manitoba Hydro sells its surplus energy supply after meeting its domestic demand via a mix of long-term contractual sales and short-term opportunity sales. This strategy results in a diversified portfolio of short-term and long-term sales (over the next ten years, these new contracts, in conjunction with the existing contracts, are expected to result in 45 percent of export volume sales from dependable and new proposed sales, and 55 percent from opportunity sales), and offers the Corporation risk protection from over exposure to any single type of export sales strategy.

- **Volume Flexibility with Firm Export Sales** – While long-term firm contracts mitigate the risk of low power prices, they create a risk that during a drought coincident with high power prices, replacement power costs are high. Manitoba Hydro experienced such a scenario during the 2003-04 drought when it negotiated bookout agreements and call options with its counterparties. To minimize such risks, the Corporation has introduced a number of changes to its proposed contracts relative to existing contracts. As discussed previously, this includes the potential [redacted] percent reduction in export sales associated with [redacted] in the [redacted] contracts and a call option embedded in the [redacted] contract to mitigate the price risk. MH is also timing the addition of new plants to provide supply to meet this firm demand and the binding term sheets are subject to in-service of new generation facilities. Therefore, the contracting strategy has changed since the 2003-04 drought in that the proposed contracts mitigate drought impacts in ways previous firm contracts did not. This is especially important if domestic demand growth is greater than expected or future drought plans are similar to the 2003 drought plan

- **Transmission Related Risks** – As discussed, an unprecedentedly severe drought, without more transmission or non-hydro supply, creates a Black Swan Risk. The company's export policy serves as a mitigation strategy to this risk,

- **Equity Cushion** - Regardless of the severity of a drought, it will result in diminished earnings from net exports of electricity. In the extreme event of a severe extended drought, there would be no non-firm sales. As experienced in the 2003-04 drought, the Corporation may also have to arrange for replacement power though arrangements such as bookout deals with export sales customers. Therefore, to protect its financial stability, the Corporation maintains retained earnings and short-term liquidity to tide over the adverse financial consequences of a drought.

  The decrease in the revenue is offset either by Manitoba Hydro's borrowing or liquidity. This ability is heavily tied to its equity if it is to limit its reliance on rate hikes.

  Manitoba Hydro has estimated the cost of an extended five year drought to be approximately $2.7 billion. During the last drought in 2003-04, its retained

earnings fell to $734 million by 2004 from $1.3 billion in 2002. Since then the Corporation has steadily been replenishing its retained earnings, which currently stand at $2.1 billion, and reaching the goal of having retained earnings of $2.7-$2.8 billion appears imminent. To minimize the impact of a severe drought on its financial stability and rate impacts, Manitoba Hydro should maintain at least the cost of an extended five year drought in retained earnings – this is consistent with the Corporation's goal and results in an equity share similar to similarly situated utilities. Also, as discussed above, additional review of financial and rate impacts of droughts may be needed.

- **Other Risk Mitigation Provisions** – These include:

  - **Multiple Counterparties** - Diversification of firm export sales among three different major U.S. utilities (which are the utilities serving the areas closest to Manitoba).

  - **Multiple Pricing Formulas** - Diversification of long-term firm pricing formulas (for example, inflation indices, market price indices, etc.)

  - **Credit Worthiness of Counter-Parties** - Mitigation of credit risk through selling long-term firm power to credit worthy utilities with franchised service territories.

  - **Exchange Rate** - Matching exposure of exchange rate risk on the revenue side and financial obligations via a balance of U.S. and Canadian dominated debt.

  - **Timing Mix** - Diversification of start and stop dates for long-term contracts.

- **Risk Management Plan** – MH has experience with droughts, including the 2003-04 drought, and has an approach to handling such situations (including the 2003 Drought Management Plan). The Corporation also has a structure for managing a drought involving senior management, the Manitoba Hydro Board, and other Provincial stakeholders. Thus, the right level of management is being accessed, given the importance of drought management. In addition, the Corporation has an approach to hedging and purchasing power/gas during a drought, (e.g, staggering purchases of power and gas to provide short-term hedging) which it demonstrated in the last drought.

  With the above said, the Corporation however should adopt a formal, written, Drought Preparedness Plan as a default for severe or extended droughts in the future. In this plan, the Corporation should set a more explicit target probability of meeting load (e.g., 95-99 percent chance), once a drought has been declared, even if it is followed by a drought of predetermined severity, and demand conditions of predetermined severity as in the 2003 Drought Plan exist. This will address the reservoir draw down during droughts and allow for an even better analysis of and communications about what to expect during a drought in terms of market purchases. For example, one analysis could be if the 2003-04 drought were repeated, but the proposed contracts' terms and conditions were in place with the [redacted] decrease in firm volume provisions, what would

have been the loss incurred at the company and how much market purchases would have been required.

Also, Manitoba Hydro may want to further study the issue of what the optimal level of equity is and its impact on the potential for rate shocks. This analysis can be facilitated by having a probabilistic assessment simulation tool as discussed above as well as more formal equity targets during a drought.

1.3 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1.3.1 Summary of Conclusions

Our conclusions with respect to six items contained in the Terms of Reference ("TOR") for the assignment are:

I. **The appropriateness, from a long-term business strategy and risk exposure perspective, of Manitoba Hydro entering into long-term firm contracts 20 or 30 years into the future.** The export business and the associated long-term contracts are appropriate in consideration of MH's overall plan i.e., the pricing, risk mitigation, etc. and are common practice when building new power plants.

II. **The adequacy of price that Manitoba Hydro derives (or will derive) from export sale transactions (both long-term firm and short-term opportunity sales):** The price is adequate, being well above spot and previous contract prices, and above forecasts available at the time of contract negotiations. The proposed contract price is also above the record highest annual spot price. Recent market events have supported the contract price adequacy as 2009 year-to-date spot prices are down fifty percent from the previous year.

III. **The risks assumed by Manitoba Hydro in selling long-term firm energy from dependable resources (in consideration of the requirements to meet firm sale commitments during periods of drought):** There are risks to selling long-term firm; they are identified and discussed. These risks, however, are greatly mitigated in the proposed contracts relative to the existing contracts. This is driven by improved volume flexibility and price provisions. There are also benefits such as lower volatility of revenues. Overall, the risks are reasonable.

IV. **The extent to which Manitoba Hydro should be involved in pure merchant energy trading transactions**: We conclude that MH should not be involved in non arbitrage merchant trading at this time. This is in part because public entities usually do not pursue such high risk transactions, and they create potential for rate shocks. Moreover, MH management is not interested in such transactions. In the counter factual circumstance (e.g., if in the future, circumstances change), MH should pursue them only when the Corporation improves its risk management documentation, structures, procedures and systems to support such transactions.

V. **The reasonableness of Manitoba Hydro's quantification of risk exposure related to an extended (5-year) drought**: The quantification is reasonable. It is based on an adequately stressful event (close to a 95 percent confidence interval stress level), and the quantification is appropriate. MH is involved in activities to further improve quantification, and as discussed below, they should be pursued.

VI. **The adequacy of Manitoba Hydro's drought risk mitigation measures.** The Corporation's drought risk mitigation measures are adequate. The firm contracts provide protection against drought and lower prices. There are protections against the risks related to firm contracts including the ability to decrease firm volumes during droughts. The Corporation also has a reasonable targeted equity cushion. Work in this area should continue.

1.3.2 Recommendations

In addition to the steps currently being undertaken by Manitoba Hydro, we support the following recommendations for improvement, including, in some cases, continuation of already ongoing activities:

- MH should be more explicit with respect to its Drought Preparedness Plan in regards to reservoir drawdown (e.g. draw down of reservoirs should be limited such that even if next year's power is decreased by some amount i.e., the worst drought on record or winter domestic demand exceeds forecasts by some percentage), MH can still meet domestic demand from its own supply or contracted imports with a predetermined probability. This will facilitate improved estimates of the associated risk of firm export sales. This Plan will supplement the System Operation Priorities document, MH's past experience, and the annual system and Integrated Financial Forecast (IFF) planning, and should be similar to the ongoing work of the Drought Financial Management Strategy Working Group.

- MH has been taking steps to improve its risk management structures. For example, it has been developing its middle office and has further developments plans in place. The Corporation should continue to improve its documentation of risk management policies, procedures and systems to further guard against execution risks and bring its risk management infrastructure up to date with standard industry practices.

- While the approach to the quantification of the financial effects of a drought is reasonable, we identify some areas for improvements. For example, once in a drought, quantification using multiple variables may be reasonable (e.g., Monte Carlo simulation of cash flow at risk) in part to better track risks and to facilitate communication across the company and with stakeholders regarding the progress of the drought and the likely efficacy of the Drought Preparedness Plan. This would build on ongoing work. Specifically, the company has recently developed the MH version of the PRISM Model which uses a Monte Carlo methodology to calculate probability distributions. This tool should be used to periodically simulate short-term hedges such as power purchases, options, etc. Testing of these options should include additional examination of short-term (1-2 years forward) hedging tools.

- Some additional examination of the consequences of depleting retained earnings would be useful. This should lead to a drought related financial plan. Some key elements might include, but not be limited to whether rate increases will be sought when there is a predetermined chance that the next 12 months or some other period shows an exhaustion of the equity cushion, or the equity cushion will not be allowed to fall below a predetermined percentage of enterprise book value and rate hikes will likely occur, etc.

1.4 REPORT ORGANIZATION

The report is organized into ten chapters (including this chapter). The remainder of the report is structured as follows:

- Chapter 2 provides background information on Manitoba Hydro and Manitoba Hydro exports.
- Chapter 3 discusses Manitoba Hydro's current and proposed long-term export contracts and selected organizational aspects of Manitoba Hydro's approach with respect to export sales and management of associated risks.
- Chapter 4 identifies the risk factors associated with power exports.
- Chapter 5 analyzes the appropriateness of entering into long-term contracts (Task I of the TOR).
- Chapter 6 analyzes the Adequacy of Exports Sale Transaction Pricing (Task II of the TOR).
- Chapter 7 analyzes the risks in selling long-term firm energy from dependable resources in consideration of the requirements to meet firm sale commitments during periods of drought (Task III of the TOR).
- Chapter 8 analyzes Manitoba Hydro's target involvement in shorter-term merchant trading transactions (Task IV of the TOR).
- Chapter 9 analyzes the reasonableness of Manitoba Hydro's quantification of risk exposure related to extended 5 year drought (Task V of the TOR).
- Chapter 10 analyzes the adequacy of risk mitigation measures related to drought (Task VI of the TOR).

CHAPTER TWO
Background on Manitoba Hydro and Export Sales

2.1 INTRODUCTION

This chapter provides background information on Manitoba Hydro and its export sales. It is organized into 8 remaining sections:

- Background on Manitoba Hydro
- Manitoba Hydro Supply and Demand
- Manitoba Hydro Supply and Demand-Hydroelectric Variability
- Manitoba Hydro Exports
- Manitoba Hydro Export Revenues
- Manitoba Hydro Domestic Rates
- Manitoba Hydro Export Markets
- Manitoba Hydro Transmission and Exports

2.2 BACKGROUND ON MANITOBA HYDRO

Manitoba Hydro is the sole provider of electricity and the largest provider of natural gas in the Manitoba province. The utility is owned by the province, i.e., it's a "Crown" Corporation. Earnings from export sales are used to lower rates and/or maintain an adequate level of retained earnings to keep rates stable.

Operations and investments are reviewed and approved by the Manitoba Hydro Board, which is appointed by the provincial government. Large investments with potential environmental effects are subject to additional review. Financing requirements are subject to review by the Province's financial oversight group, in part, because the Corporation's debt is backed by the Province. Manitoba Hydro's domestic energy rates are regulated by the Public Utilities Board (PUB). Other governmental entities provide additional oversight related to environmental and other issues.

The utility owns electric generation, electric and natural gas transmission and distribution assets with a book value of over 12.5 billion dollars.[18] It provides electric services to a little over half a million customers and natural gas services to more than a quarter million customers in the province.

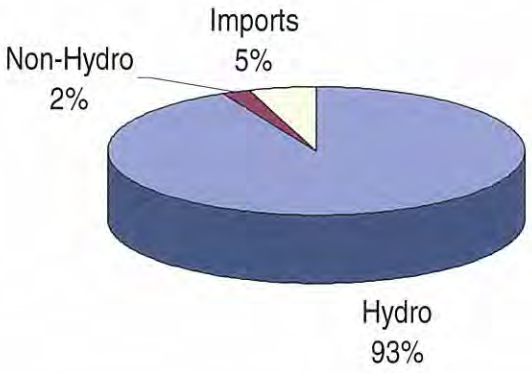
[18] Dollars represent Canadian dollars unless otherwise specified.

2.3 MANITOBA HYDRO SUPPLY AND DEMAND

Nearly all of Manitoba Hydro's generation is hydroelectric: 97 percent of Manitoba Hydro's domestic generation is hydroelectric (see Exhibit 2-1). In comparison, the Canadian average level of hydroelectric generation is 60 percent[19], and the U.S. average is 6 percent.[20]

On average, imports provide five percent of total supply, although, in some years, they are almost zero. In some cases, imported power can be bought at lower off-peak prices and effectively stored for on-peak use. This can be preferable to operating fossil units or further drawing down Manitoba Hydro's reservoirs. Thus, imports are not necessarily a sign that dependable hydro output is less than domestic demand.

EXHIBIT 2-1
Average Supply, 2000-2007 (GWh)



Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada

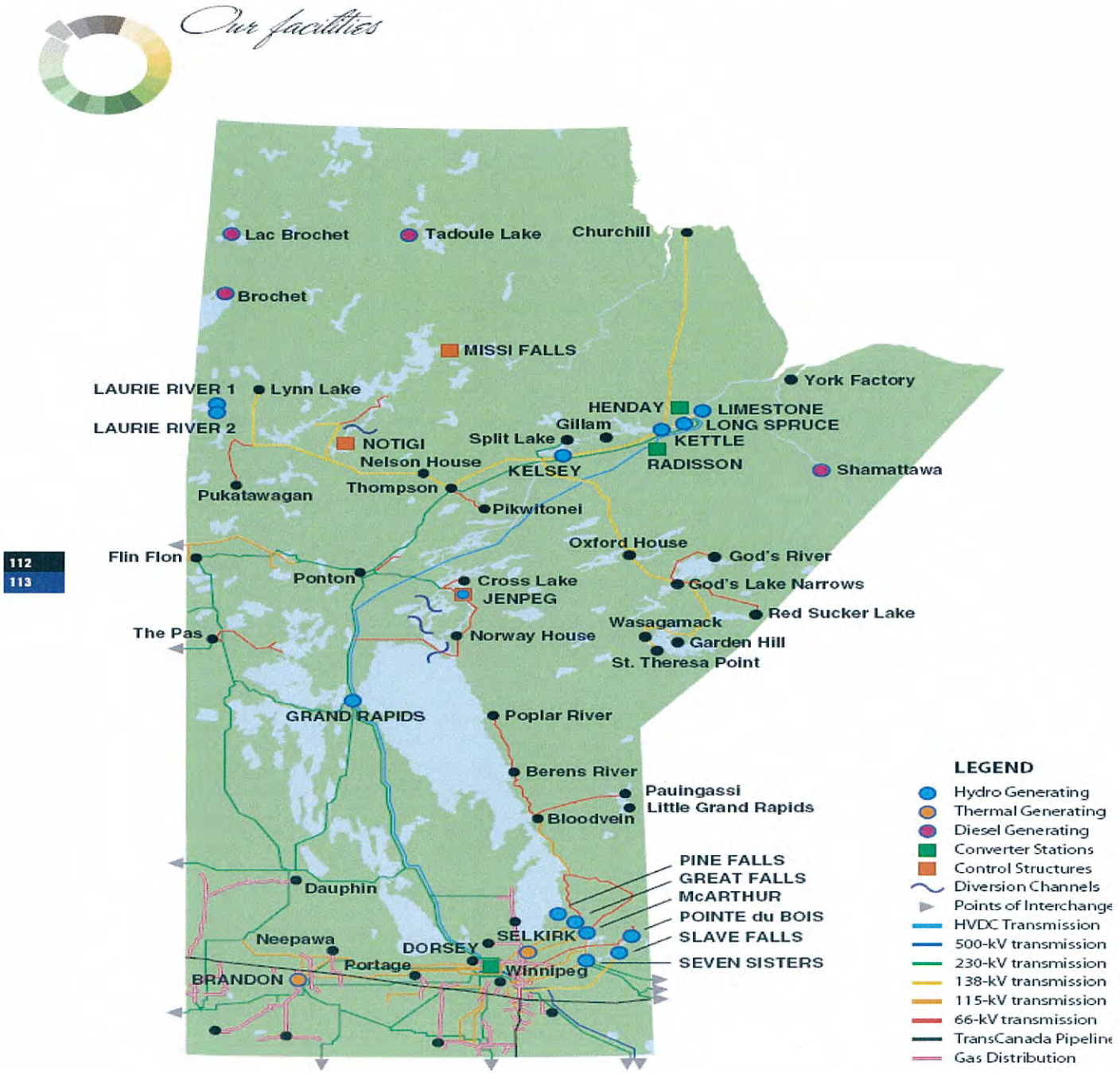
Manitoba Hydro's power plant capacity is comprised mostly of hydroelectric units amounting to around 5,000 MW, about 470 MW of thermal (coal and natural gas) generation, and about 100 MW of wind generation. Coal and gas burning units provide about 1 percent, and wind units provide less than 1 percent of total electric generation in the province.

Manitoba Hydro rarely uses its natural gas generation plants as the generation is most of the time uneconomic. The thermal efficiency of MH's natural gas generation is low compared to other units. The Corporation relies on its coal generation to provide support to hydroelectric and wind generation in meeting export sales commitments. Pursuant to a government directive to mitigate climate change, the Brandon coal-fired generation plant will be removed from full service. It is stated that the availability of the Brandon coal-fired generation plant during the 2003-2004 drought saved Manitoba Hydro approximately $50 million.[21]

[19] 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada, p.6
[20] 2007 Energy Information Administration (EIA) data on Net Generation by Energy Source, Table 1.1, available at http://www.eia.doe.gov/cneaf/electricity/epm/table1_1.html
[21] See Public Utilities Board of Manitoba (PUB) Order 116/08, dated July 29, 2008, p.206

Manitoba Hydro's generation is concentrated on the Province's northern Nelson River which empties into the Hudson Bay (see Exhibit 2-2). Thus, it is very distant from its load center of Winnipeg located near the U.S. border. A direct current (DC) system is used to transmit power from source to sink. Manitoba Hydro uses DC more than any other region in North America on a percentage basis. DC has lower losses at high voltages and is used to supplement alternating current (AC) systems when long distances are involved in transmission.

EXHIBIT 2-2
Manitoba Hydro System



Manitoba Hydro hydroelectric capacity has been essentially static for more than a decade. Recently, the Corporation has planned significant capital expenditure ($14.1 billion over the ten year period from 2009-2018[22]) for new and replacement facilities to meet the growing energy demand in Manitoba, to meet firm energy export commitments, and to export surplus energy on a non-firm basis to capture additional export earnings. The utility is proceeding with many plans – new hydro plants, redevelopment/rehabilitation of existing hydro plants, PPAs with wind units, DSM and new transmission lines – to augment its future generation and transmission capabilities. Of the $14.1 billion planned to be expended from 2009 to 2018, over $10 billion is for new generation and transmission projects, and the remainder is for other refurbishment and upgrades.[23] Construction is underway for Wuskwatim, whereas Keeyask is close to financial closure and plans exist to further increase supply in the 2019 to 2025 period. The following exhibit shows the Corporation's historical as well as projected supply and demand balance.

[22] Source: Public Utilities Board of Manitoba (PUB) Order 32/09, dated March 30, 2009, p.41
[23] Source: Public Utilities Board of Manitoba (PUB) Order 32/09, dated March 30, 2009, p.41

EXHIBIT 2-3
Manitoba Hydro – Supply and Demand Balance (MW)

Year	Winter Peak	Hydro Electric Supply	Thermal Supply	Other Supply	Total Supply	Winter Reserve Margin
1999	3,682					
2000	3,755	5,504	229	0	5,733	53%
2001	3,799	5,504	229	0	5,734	51%
2002	4,039	5,521	361	0	5,882	46%
2003	3,960	5,524	361	0	5,885	49%
2004	4,129	5,529	481	0	6,010	46%
2005	4,118	5,524	479	0	6,003	46%
2006	4,224	5,524	479	0	6,003	42%
2007	4,312	5,529	472	0	6,001	39%
2008	4,354	5,503	472	0	5,975	37%
2009	4,515	5,400	535	46	5,981	32%
2010	4,636	5,411	535	68	6,014	30%
2011	4,745	5,634	535	90	6,259	32%
2012	4,838	5,675	535	109	6,319	31%
2013	4,883	5,674	535	125	6,334	30%
2014	4,927	5,600	535	139	6,274	27%
2015	4,972	5,600	535	153	6,288	26%
2016	5,009	5,718	535	167	6,420	28%
2017	5,062	5,807	535	181	6,523	29%
2018	5,122	5,899	535	189	6,623	29%
2019	5,182	6,261	430	195	6,886	33%
2020	5,242	5,946	430	202	6,578	25%
2021	5,302	5,946	430	209	6,585	24%
2022	5,362	6,463	430	216	7,109	33%
2023	5,421	6,912	430	219	7,561	39%
2024	5,481	7,170	430	222	7,822	43%
2025	5,541	7,170	430	224	7,824	41%

Sources:
1999-2007 winter peak demand data is from Manitoba Hydro Electric Load Forecast 2008/2009 to 2028/2029
2000-2007 supply data is from 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada; also includes 500 MW of diversity agreements
2008 winter peak demand and supply data are from Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, pp. 112-113; also includes additional supply of 500 MW from diversity agreements
2009-2025 winter peak demand and supply data are from Manitoba Hydro 2008/2009 Power Resource Plan Update, Table A.1b: IFF Sequence-Capacity Supply/Demand; 2009-2019 also includes 500 MW of diversity agreements
Notes:
1999-2007 winter peak demand represents weather adjusted numbers
2000-2008 supply represents nameplate capacity of the units
2009-2025 supply represents net dependable resources and includes upgrades to the existing hydroelectric capacity
2000-2019 supply includes 500 MW of diversity agreements

Manitoba Hydro's new large hydro capacity would be only one of the two major hydro capacity expansions in North America. The other is the proposed Hydro Quebec expansions. The following exhibit shows Manitoba Hydro's planned firm builds and other plans to augment generation:

EXHIBIT 2-4
Manitoba Firm Builds

2008 Power Resource Plan	Net Capacity (MW)	In-Service Date
Brandon #5 License Review	105	2018/19
Pointe du Bois	120	2016/17
Wuskwatim	200	2011
Keeyask	630	2018
Conawapa	1300	2022
Kelsey Re-runnering	77	2011/12
Enhancements of Winnipeg River Plants	30	-
HVDC Bipole III Line & 2000 MW of Converter Capability	89	2017/18
Northern AC Enhancements	45	-
Demand Side Management Program	180	2017/18
Total	**2776**	

Source: Manitoba Hydro Integrated Financial Forecast (IFF08-1), November, 2008, p.8

While the capacity expansion is needed for export contracts for the 2015 to 2025 period and beyond, demand growth would ultimately lead to the need for more capacity.

The base load forecast used in MH08-1 represents the most likely future electricity requirements within the Province of Manitoba. Recent events suggest that load growth could be lower than forecast, but higher domestic load growth scenarios generally pose a greater financial risk to Manitoba Hydro. This is due to the reduction in high value export sales which are used to keep rates low, as well as the need to ensure that sufficient resources are available to meet the additional load requirements. The utility has achieved 348 MW of DSM savings in the 1991-2004 period.[24] The following exhibit shows the Corporation's historical annual sectoral energy demand.

EXHIBIT 2-5
Manitoba Hydro – Annual Energy Demand (GWh)

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Industrial	5,135	5,579	5,895	5,488	5,747	6,076	6,363	6,056	5,744
Commercial	6,096	6,189	6,292	6,424	6,720	6,825	7,439	6,992	6,742
Residential	5,213	6,387	5,514	5,776	5,941	6,035	6,236	5,654	7,424
Other	3,314	3,896	3,750	4,781	1,048	1,373	1,880	2,365	2,326
Total Domestic Demand	19,757	22,051	21,450	22,470	19,455	20,309	21,918	21,068	22,235
Growth Rate (%)	-	12%	-3%	5%	-13%	4%	8%	-4%	6%

Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada

[24] Public Utilities Board of Manitoba (PUB) Order 116/08, dated July 29, 2008, p. 196

2.4 MANITOBA HYDRO SUPPLY AND DEMAND – HYDROELECTRIC VARIABILITY

During normal weather conditions, Manitoba Hydro's current generation capacity of 5,470 MW is more than adequate to serve its winter peak demand of 4,350 MW. The capacity is especially large in comparison to Manitoba Hydro's summer peak demand of 3,300 MW. The system can also store up to 10 terawatt hours. This further allows the utility to export a considerable portion of its generation outside of the province.

In periods of drought, the potential for non-firm exports is less (see Exhibits 2-6 and 2-7). This decreases export revenues. Dependable hydro energy is based on the flows during the worst year on record[25], and Manitoba Hydro policy is to only sell firm export power to the extent that it is not needed to meet expected domestic demand.

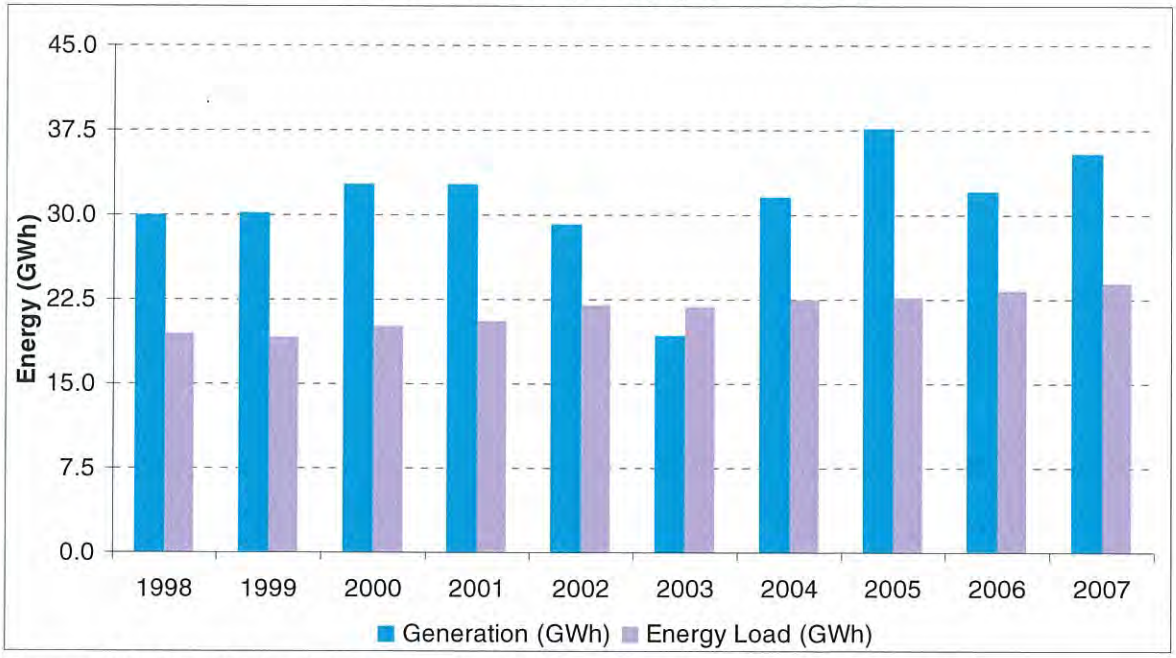
EXHIBIT 2-6
Manitoba Hydro – Annual Energy Supply and Demand (GWh)

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Production	28,691	32,500	33,448	29,437	21,152	27,703	37,049	34,479	34,403
Exports	-8,816	-9,906	-9,495	-7,183	-4,474	-6,781	-12,141	-12,344	-11,093
Imports	2,385	1,220	122	2,243	5,909	2,570	244	829	534
Inter-Regional Transfers	-2,503	-2,763	-2,624	-2,028	-3,132	-3,183	-3,235	-1,896	-1,609
Supply for Domestic Load	19,757	21,051	21,450	22,470	19,455	20,309	21,918	21,068	22,235

Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada

[25] Note that for Manitoba Hydro, 2003-04 was the worst hydro year in the last 30 years with 49 percent capacity factor.

EXHIBIT 2-7
Manitoba Electricity Supply and Demand



Source: Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, p.112
Note: Annual Generation and Energy Load numbers represent the numbers for a financial year; for example, 2007 numbers represent the numbers for year ended March 31, 2008.

2.5 MANITOBA HYDRO EXPORTS

Power produced in excess of Manitoba's domestic requirements is exported to neighboring systems. Export of power to the Midwest Independent System Operator (MISO) power market in the US constitutes the majority of total exported power from Manitoba. This is an outgrowth of Manitoba Hydro's historic membership in MAPP (the Mid-Continent Area Power Pool), the existence of high voltage transmission lines to the US portion of MAPP[26], and the existence of supply diversity (hydro versus coal) and demand diversity (Manitoba Hydro is a winter peaking utility while some parts of MAPP and the neighboring historic Mid American Interconnected Network (MAIN) peak during the summer).

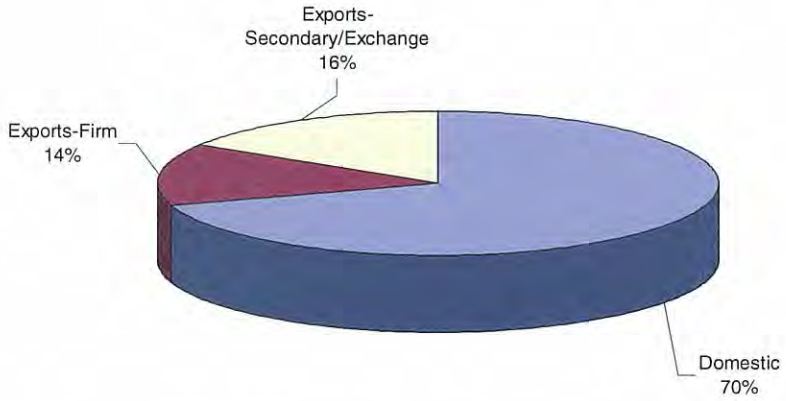
Some power, albeit a smaller percentage of total power, is also exported to neighboring Canadian utilities of Ontario and Saskatchewan. In fiscal year 2007-08, 82 percent of total export revenue was realized from the US market and the remaining 18 percent from the Canadian market.[27]

Manitoba Hydro is a member of the MRO (Midwest Reliability Organization), a region within the North American Electrical Reliability Council (NERC), a non-profit organization dedicated to ensuring the reliability and security of the bulk power system in North America. The utility is also a part of MISO which ensures an open access to the transmission facilities for all of its members and provides the opportunity for Manitoba Hydro to buy and sell energy in one of the largest electric energy markets in North America.

[26] MAPP no longer exists and has been replaced with MRO
[27] Manitoba Hydro website

Over the last nine years approximately 30 percent of Manitoba Hydro's hydroelectric supply has been used for export sales (see Exhibit 2-8). As noted, the potential for export is not fully apparent from Manitoba Hydro's supply of and demand for capacity. In 2007, peak demand was 86 percent of hydroelectric capacity. However, the issue that is critical is energy not capacity supply due to the following factors: (1) average domestic demand was 2,664 MW[28] or 61 percent of peak, (2) Manitoba Hydro's summer peak is significantly lower than its winter/annual peak, (3) the principal export market is summer peaking, and hence, there is potential for diversity exchange, and (4) Manitoba Hydro defines dependable energy capability based on energy output during hydrological conditions associated with the worst hydro year on record. This capability is not based on an average hydro year.

EXHIBIT 2-8
Average Disposition 2000-2007 (GWh)

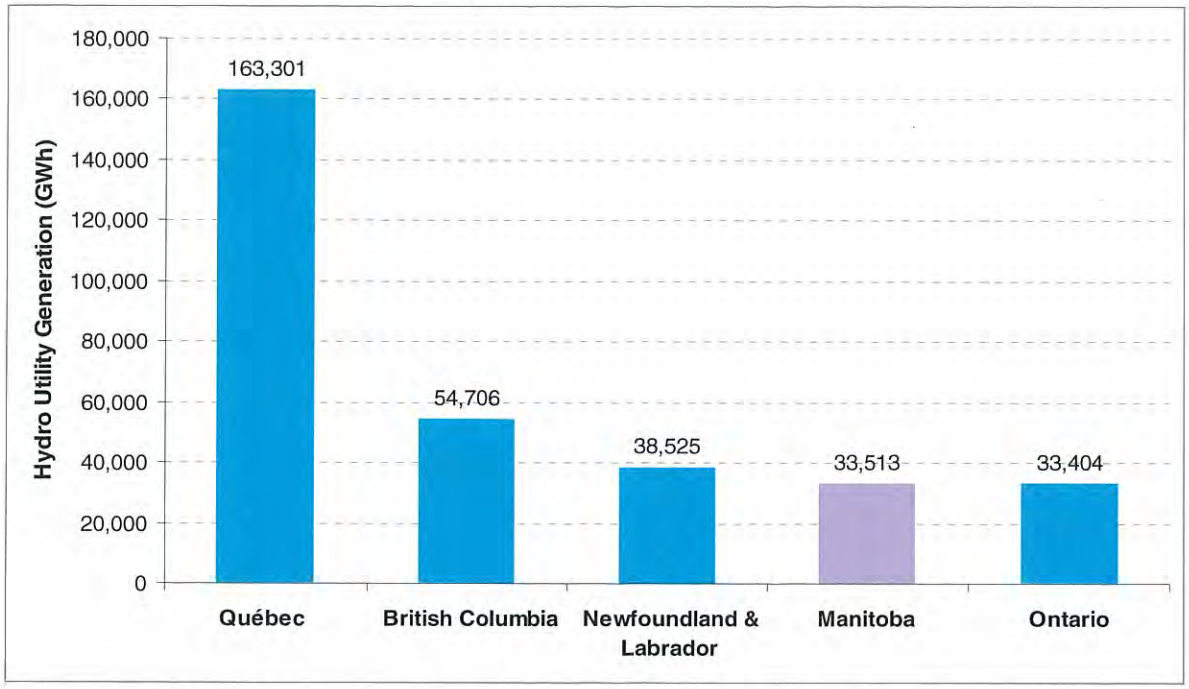


Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada

A comparison of Manitoba Hydro with other Canadian provinces in terms of hydroelectric output and exports is useful. Canada has five provinces with large amounts of hydroelectric output: Quebec, British Columbia, Newfoundland and Labrador, Manitoba, and Ontario. In 2007, Manitoba Hydro was the fourth largest hydroelectric utility in terms of generation (see Exhibit 2-9).

[28] Average Domestic Demand is calculated as Annual Domestic Energy Demand / All Hours.

EXHIBIT 2-9
Canadian Hydro Utilities Generation - 2007

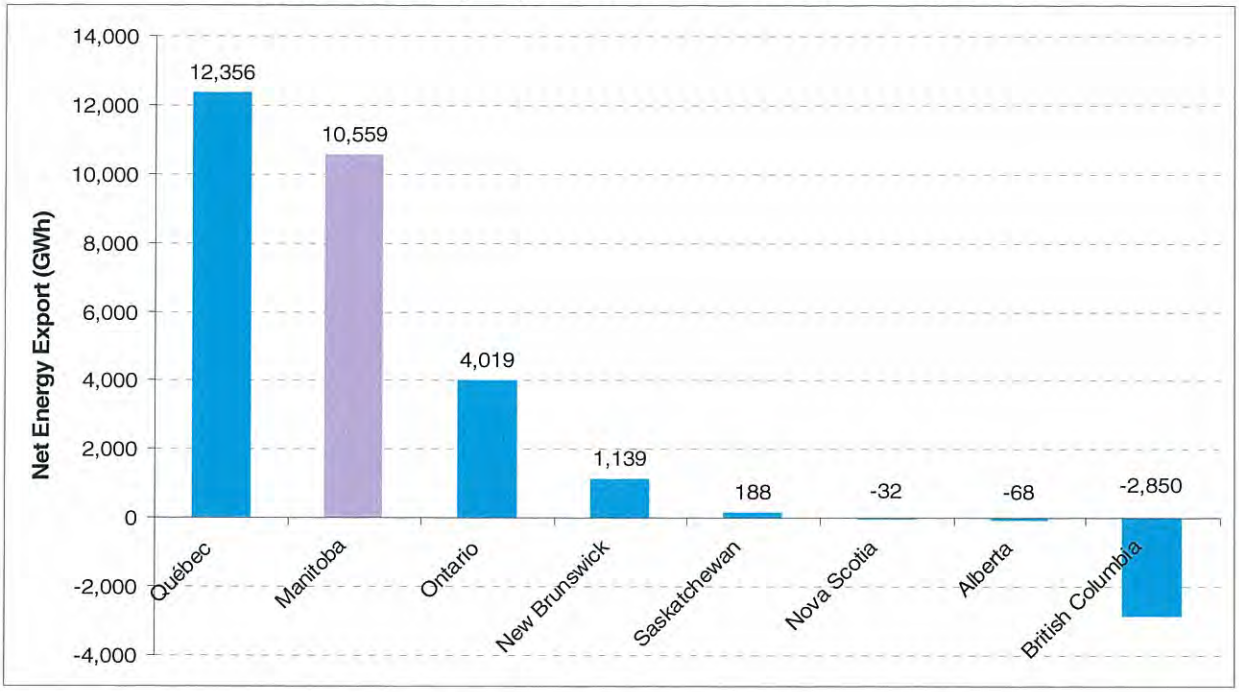


Source: 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada, pp. 11-12

Manitoba and Quebec are the two leading provinces in terms of exports of power to the U.S. on a net basis (net of imports). British Columbia is a large producer, but also a large importer (see Exhibit 2-10).

As noted, Hydro Quebec's practices may be a useful benchmark in the area of contracting. Hydro Quebec is planning new generation, new transmission, and new exports to the U.S.

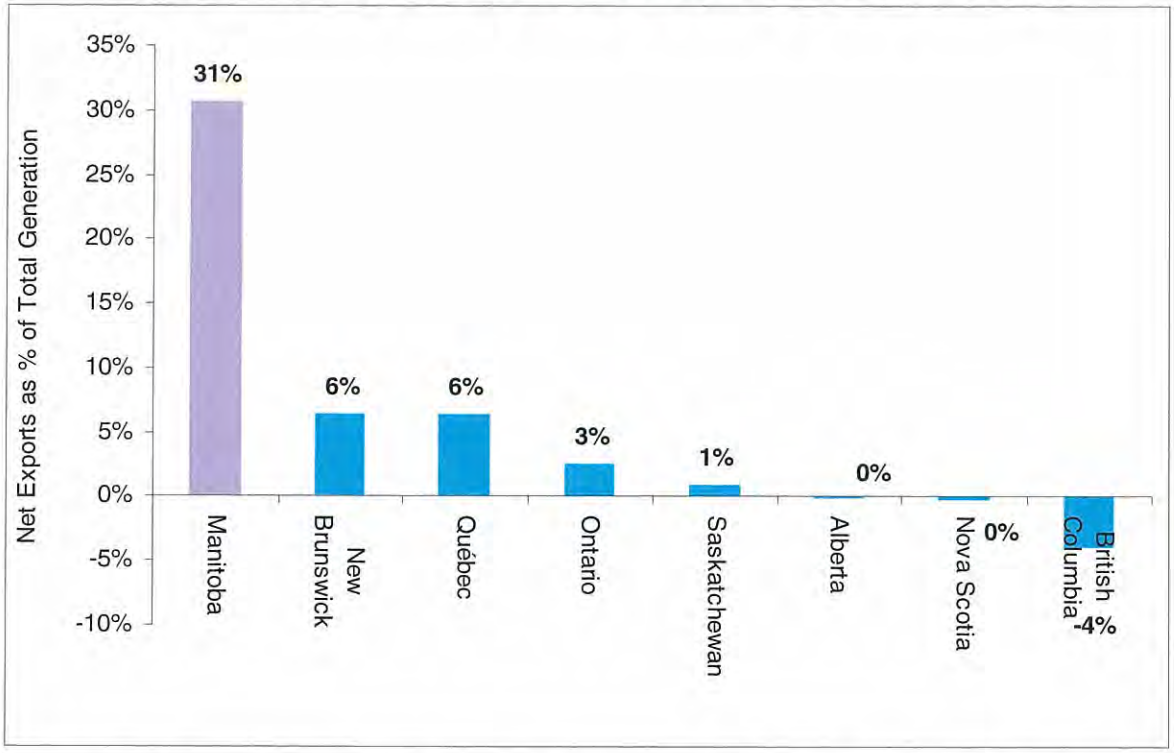
EXHIBIT 2-10
2007 Net Electricity Exports to US from Canadian Provinces



Source: 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada, pp.11-12

Manitoba is unique in terms of the large percentage of exports compared to total provincial generation (see Exhibit 2-11).

EXHIBIT 2-11
2007 Net Electricity Exports to US as a Percentage of Total Generation

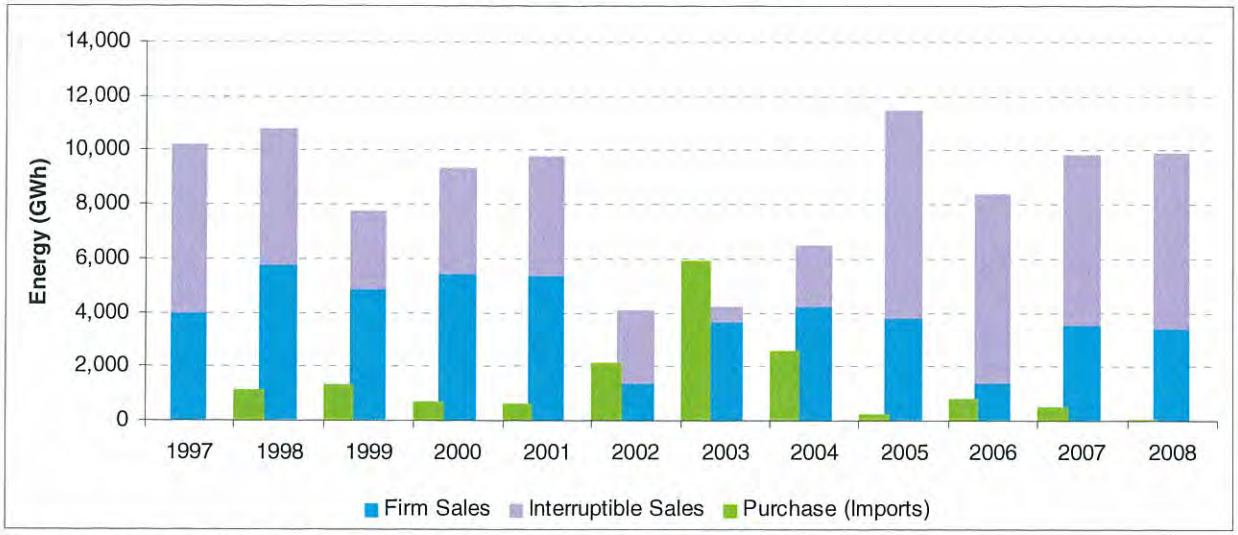


Source: 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada, pp.11-12

Exported energy, net of imports, constitutes, on average, 26 percent of total generation[29] from 1999 to 2008. In 2008, Manitoba Hydro net exports (exports less imports) totaled 10,600 GWh, approximately 30 percent of 2008 generation. In contrast, in 2003-04, Manitoba was a net importer with 2,578 GWh of net imports[30]. These imports were a result of severe drought in Manitoba, which resulted in 18.58 million MWh of generation or a 32 percent decrease from average annual hydro energy generation of around 27.52 million MWh[31], making hydro conditions one of the most critical factors to Manitoba Hydro's energy export capabilities.

[29] Source: Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, p.112
[30] Source: Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, p.113; note, this value represents Net Imports for the financial year April 2003 through March 2004
[31] This value represents the total hydro generation for the financial year period: 1981/82 through 2008/09. Source: Hydraulic Info May2009.xls (received from Manitoba Hydro)

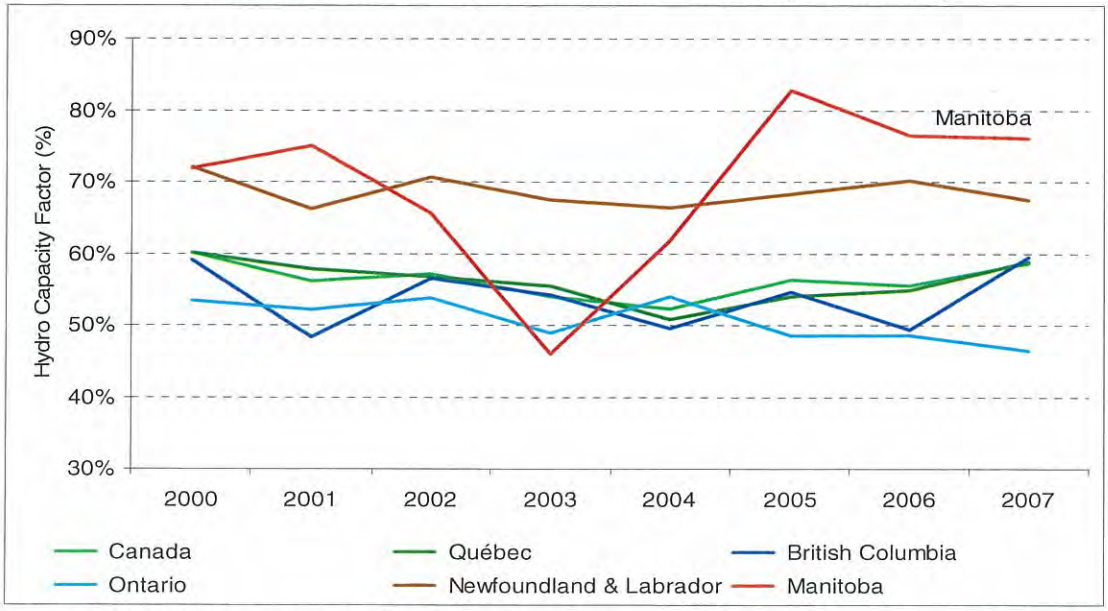
EXHIBIT 2-12
Manitoba Imports and Exports



Source: Canada National Energy Board website
Notes:
1. The annual Energy Import and Export values represent values for a calendar year i.e., January to December.
2. The Export values in the graph do not include exports represented under the 'Non-Revenue' category

The variances in annual hydroelectric generation output are relatively large for Manitoba Hydro compared to other Canadian provinces (see Exhibit 2-13). This is indicative of greater percentage exposure to drought than other Canadian Utilities.

EXHIBIT 2-13
Canadian Utilities Hydro Historical Capacity Factor (%)



Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada

Production in 2003 fell to 21.2 GWh and hydro output was 18.6 GWh.[32] The variance of Manitoba Hydro hydroelectric output was high compared to others in Canada. The variance in 2003 versus the 2000-2007 average was negative 34 percent, while no other province had such variation over the 2000 to 2007 period. This variation in net exports due to drought is in part related to limited storage, but also contract terms and other factors.

2.6 EXPORT REVENUES

Historically (from fiscal year 2003-04 through 2007-08), the average electricity export revenue realized by Manitoba Hydro has contributed about 36 percent to the total revenue realized by the Corporation. This average includes the loss of export revenue for fiscal year 2003-04, a period of severe drought in the history of Manitoba. If 2003-2004 revenue loss is excluded from the average, then the average export revenue rises to 38 percent of total annual revenue.

While exports account for 30 percent of sales, they account for 36 percent of revenues, even though domestic cost includes generation (53 percent), transmission (18 percent) distribution (29 percent)[33] while the export sale price is most closely comparable to the generation component of domestic rates. Put another way, exports pay approximately 1.6 times more per MWh than domestic sales excluding transmission, distribution, etc. which are largely fixed for a given year.

In 2005/2006, export sales totaled $827 million with 79 percent derived from the U.S. market and 21 percent from sales to Canadian markets (see Exhibit 2-14). In 2007/2008, export sales totaled $625 million with 82 percent derived from the U.S. market and 18 percent from sales to Canadian markets. This variation is due largely to hydro output, but also due to variation in natural gas prices, which drive spot wholesale power prices to a degree.

EXHIBIT 2-14
Manitoba Hydro Electricity Revenue, 2003/2004 - 2008/2009 ($million)

	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	Average
Domestic	936	954	1,001	1,040	1,097	1,161	1,032
Export	351	554	827	592	625	623	595
Total Revenue	1,287	1,508	1,828	1,632	1,722	1,784	1,627
Export % of Total Revenue	27%	37%	45%	36%	36%	35%	36%

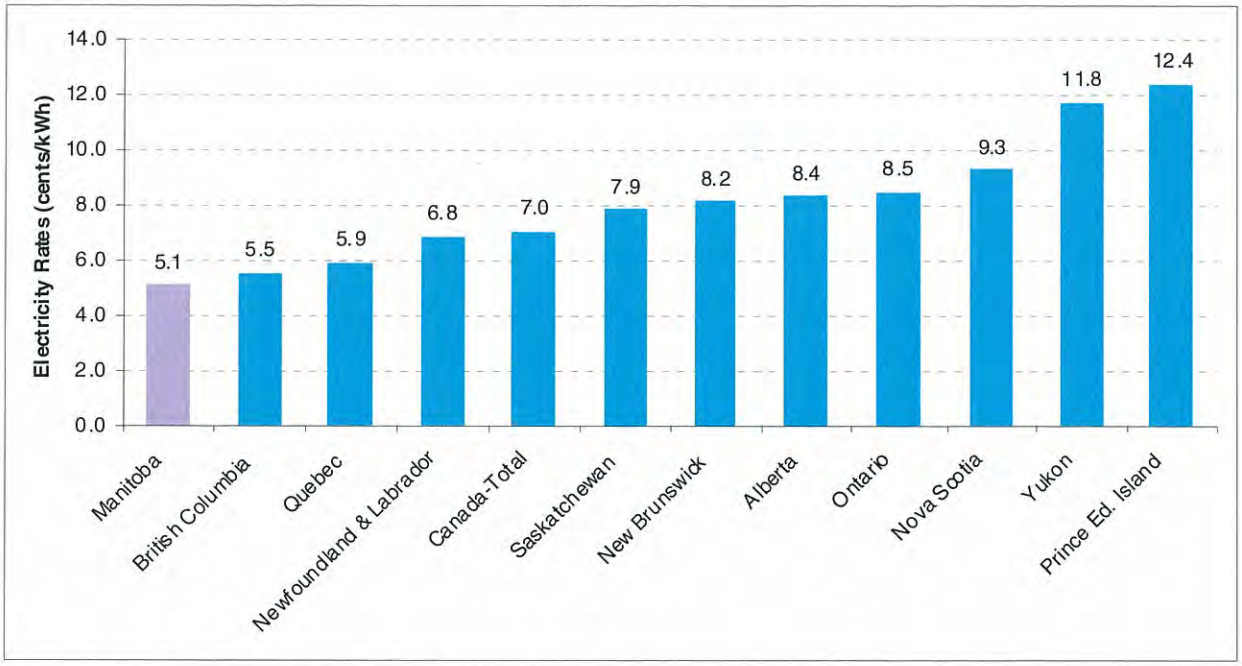
Source: Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, pp.110, 111
Note: The annual values in the table represent values for a financial year; for example, 2003/2004 column represents values for the year ended March 31, 2004.

[32] Source: Hydraulic info May2009.xls (received from Manitoba Hydro)
Note: The 2003/2004 Hydro output represents a sum of the monthly hydro generation from April, 2003 to March, 2004
[33] Source: Prospective Cost of Service Study, for year ending March 31, 2006, p.21

2.7 EXPORT REVENUES AND MANITOBA HYDRO DOMESTIC RATES

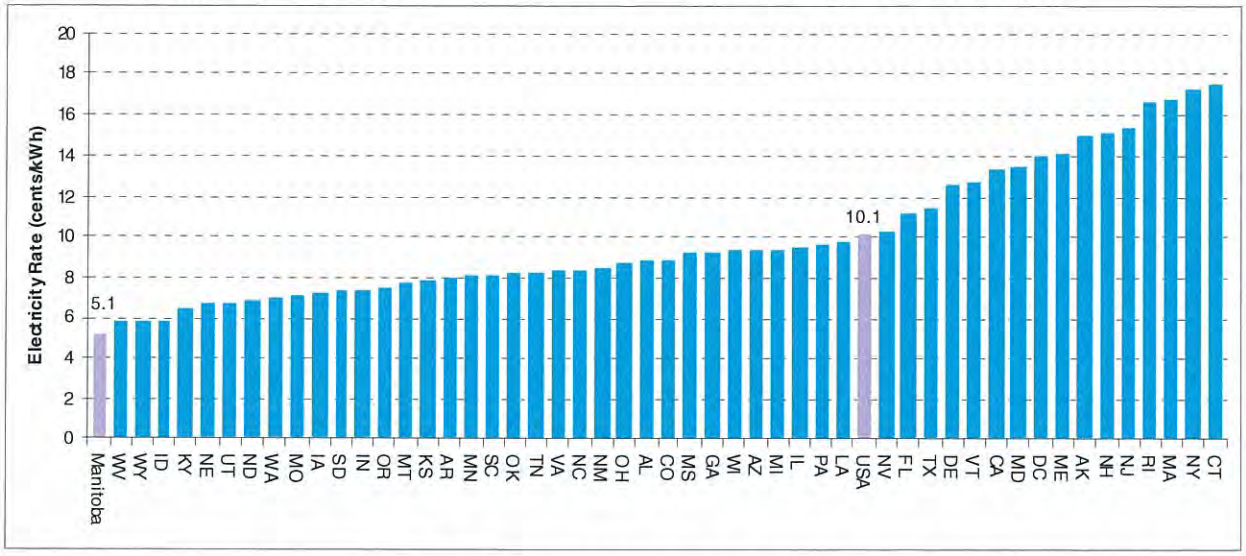
The Corporation has had considerable success in maintaining low rates and using export revenues to lower rates. Manitoba rates are the lowest in Canada (see Exhibit 2-15) and lower than any U.S. rates on average (see Exhibit 2-16).

EXHIBIT 2-15
2007 Canadian Retail Rates



Source: 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada

EXHIBIT 2-16
2007 Average Domestic Sales Price – Manitoba Hydro vs. US states



Source: US states data from EIA – Retail Sales of electricity by State and by Sector; Manitoba Hydro data from 2007 Annual Electric Power Generation, Transmission and Distribution Report, Statistics Canada
Note: The exchange rate used for converting currency from US dollars to Canadian dollars is an average of the daily exchange rates from April 2007 to March 2008 i.e., 1.0325

Low rates encourage consumption and decrease the amount available for export, all else being equal. Manitoba Hydro has programs to offset the effect of low domestic prices on domestic consumption, such as demand side management programs.

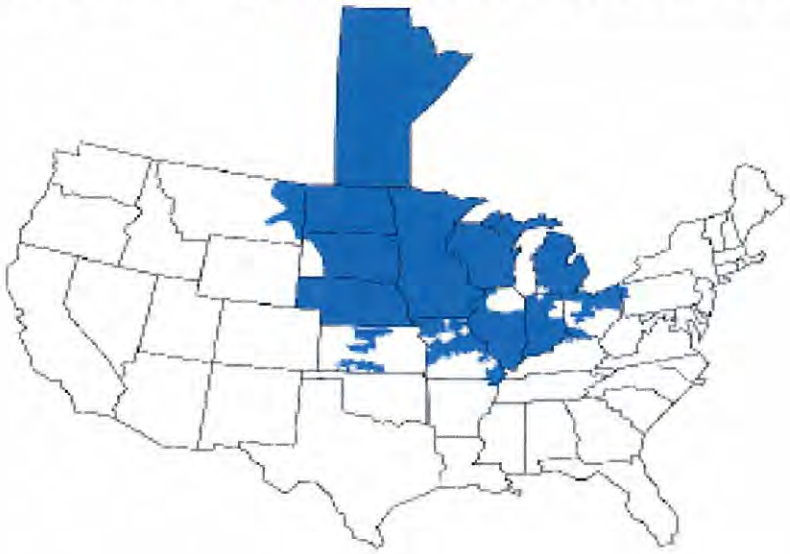
2.8 EXPORT MARKETS

2.8.1 MISO Market

The majority of Manitoba Hydro's energy exports is to the MISO market in the US (Exhibit 2-17 shows the MISO area footprint), either through firm dependable export contracts that reflect the 5x16 peak period, or through opportunity exports that primarily rely on remaining 'Available Transfer Capability' on tie lines during on-peak periods and transfer availability during off-peak periods to maximize the total export energy sales and revenue. Energy exported during on-peak hours is generally displacing natural gas-based generation in the MISO market. Overall, firm contracts engaged about 50 percent of tie-line capacity during the 5x16 peak period in 2007/08.

The U.S. MISO power market has been deregulated and is now a much more liquid, transparent, competitive and, open access market than fifteen years ago. The market also has hourly locational marginal pricing (LMP) which accounts for locational congestion on the power grid. Thus, for a given delivery location, sellers can rely on having a buyer in each hour with pricing subject to known and transparent rules.

EXHIBIT 2-17
Midwest Independent System Operator (MISO) Area Footprint



Within the last two years, MISO has made important strides in further improving the market. These include establishment of a capacity market, a centralized ancillary services markets, consolidation of transmission rights markets, and centralized transmission expansion planning, increased membership in 2008 with U.S. utilities joining MISO, etc.

Manitoba Hydro can sell into MISO, but in the event of a drought will have to purchase power. The recent changes in the MISO market explicitly require two main purchases to make up for unavailable firm supply: (1) electrical energy supply, and (2) capacity. Under contract, Manitoba Hydro is only obligated to purchase energy.

Electrical energy prices are driven heavily by fuel prices, including increasingly by natural gas prices, and are determined location by location using an LMP methodology. Other important drivers are coal prices (Powder River Basin minemouth prices and rail transportation rates), emission allowance prices including the potential for CO_2 emission allowance prices, transmission congestion on the gird, and, renewable portfolio standards.

In light of the consideration of long-term sales, and their potential advantages (lower financing costs, revenue stability and predictability), it is important to note that there exists large potential for the future pricing to be substantially different than recent pricing conditions. This potential derives from: (1) continuing load growth in the US portions of MISO, which, when combined with preference for non-base load incremental supply (i.e., mostly natural gas), can increase the hours in which gas is on the margin, (2) CO_2 emission regulations which could raise prices, and, (3) renewable portfolio standards which could oppose these trends and decrease brown power prices, especially off-peak. This has large implications for Manitoba Hydro's strategy including the potential that future prices can be higher.

Capacity pricing can lead to new risks in the market. MISO has just adopted a system which limits the maximum capacity deficiency charge to approximately US$220/kW–yr on an annual basis, with deficiency charges varying by month. The auction in the first two months resulted

in very low prices in June and high prices in July. However, below this level, prices would be determined by supply and demand balance at the peak, the costs of new equipment, energy prices, etc. Another centralized market available on a more limited basis is Ontario.

2.8.2 Manitoba Hydro and MISO

Manitoba Hydro has been integrated to a degree with MAPP, and more recently with MRO and MISO, and is in compliance with selected FERC and NERC rules or their equivalent. The Corporation's interactions with U.S. regulatory authorities and its market participation are subject to complex tax and sovereignty issues. Thus, Manitoba Hydro does not own generation supply or transmission infrastructure in the U.S. but has or controls limited transmission rights in the U.S.

2.8.3 Background on Environmental Regulations

There are two major new environmental regulatory developments likely to affect the MISO market. First, there is a likelihood of CO_2 emissions controls. Second, there are renewables requirements or renewable portfolio standards.

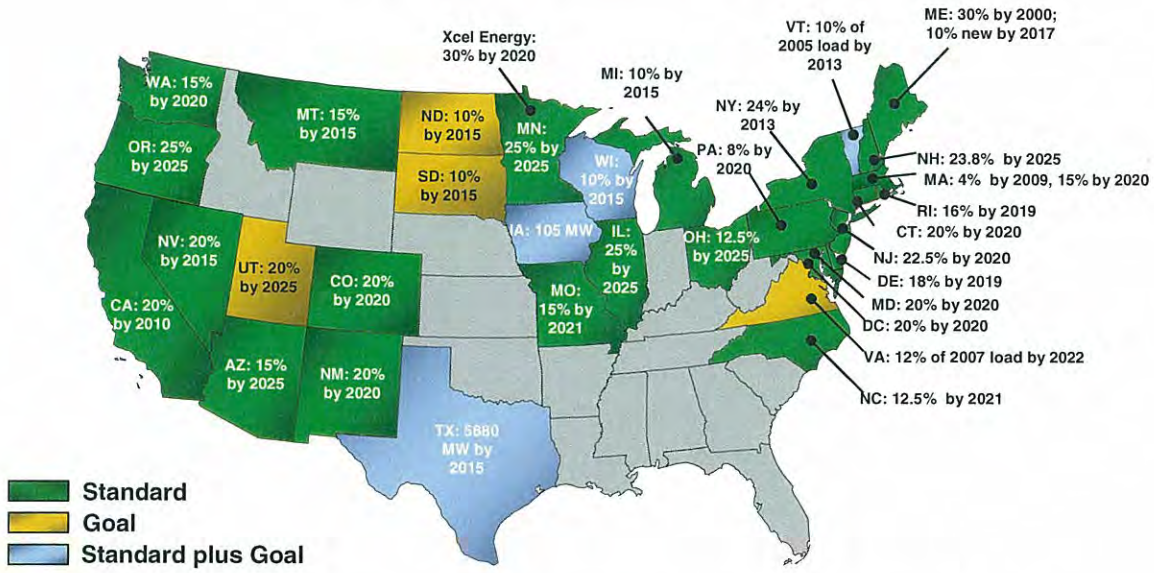
As noted, the potential new CO_2 regulations create significant upside for wholesale power prices. For example, a US$20/ton tax or allowance cost for CO_2 emissions raises the cost of generating power from a coal plant by approximately US$20/MWh. In contrast, the average all-hours price in the MISO market has been approximately US$39.6/MWh (2008$) over the last ten years.[34]

While CO_2 regulations raise prices, but not the costs of hydroelectric generation, renewable portfolio standards can create competition from local options with lower transmission costs, e.g., wind, nuclear, DSM, etc. These options may also have shorter lead times and greater political support. State renewables programs are shown below (see Exhibit 2-18). All states close to Manitoba have Renewable Portfolio Standards (RPS). The availability of Renewable Energy Credits (RECs) for Manitoba Hydro supply has still not been finalized. MISO shows huge potential wind builds in its transmission queue (see Exhibit 2-19).

Environmental regulations add to the number of products marketed. It also adds to the complexity of market transactions, increasing both execution risks and opportunities.

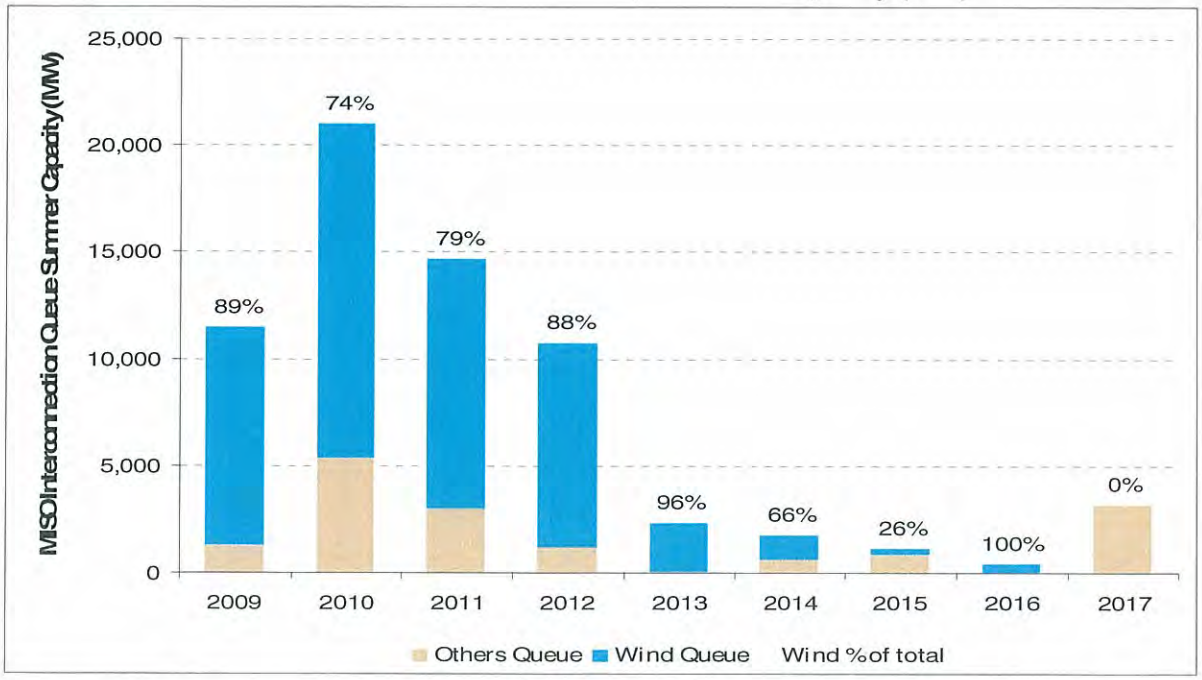
[34] The value represents average MISO price for the period: 1999 to 2008

EXHIBIT 2-18
State Renewable Portfolio Standards



*Renewable energy goals are not considered mandatory or enforceable and are therefore not modeled in IPM (with the exception of Texas, whose goal of 10,000 MW by 2025 is considered

EXHIBIT 2-19
MISO Interconnection Queue, Summer Capacity (MW)



Source: MISO Interconnection Queue, available at http://www.midwestmarket.org/page/Generator+Interconnection+Queue, last accessed May 26, 2009
Note: The interconnection capacity includes capacity represented under the following project statuses: Done, Active, Hold, and Special. However, capacity represented under Inactive project status has been excluded.

2.9 TRANSMISSION AND EXPORTS

The existing transmission interconnections with the other provinces in Canada and states in the U.S. allow Manitoba Hydro to export around 2,175 MW into Minnesota and North Dakota, around 450 MW into Saskatchewan province, and 300 MW into Ontario province. Simultaneous export capability, however, is less than the sum of these individual export capabilities. These same lines have lower import capability and are rated at approximately 1,600 MW in aggregate.

The large connection with the U.S. reflects the geography of Manitoba Hydro. The load center of Winnipeg is approximately 70 miles from the US border and 456 miles from Minneapolis.

Manitoba Hydro also plans to construct a new 500 kV HVDC transmission line west of Lake Winnipeg for an in-service date of 2017. The goal is to increase transfer capability to improve domestic reliability and provide outlet transmission for major new generation.

CHAPTER THREE
Reviewing Manitoba Hydro's Current Approach with Respect to Export Sales and Associated Risks

3.1 INTRODUCTION

This chapter provides an overview of Manitoba Hydro's current approach to export sales. The next section provides a brief introduction to the Corporation's export sales. It also introduces Manitoba Hydro's current as well as potential long-term contracts. These are discussed further in later chapters. The third section provides an overview of the Corporation's risk management and control plan.

3.2 STRUCTURE OF EXPORT SALES

Broadly speaking, Manitoba Hydro participates in two types of export sales: (1) short-term sales, and (2) long-term firm sales. The Corporation's long-term firm sales contracts can further be categorized in two types: (1) System Participation Sales contracts and, (2) Diversity Exchange Agreements. Most, i.e., 57 percent on average from 2000 to 2007 of the Manitoba Hydro's export sales came in the form of long-term agreements with various US based utilities. The following two exhibits show the Corporation's exports, both short-term and long-term, and imports for years 2000-2007.

EXHIBIT 3-1
Manitoba Hydro's Exports by Contracting Arrangement

Year	Long-Term Contract (GWh)	Short-Term – Spot to One Year Contract (GWh)	Long-Term Contract Sales as Percent of Total (%)	Total
2000	8,172	5,159	61%	13,332
2001	7,527	5,517	58%	13,045
2002	6,394	3,159	67%	9,553
2003	7,552	587	93%	8,140
2004	7,277	3,021	71%	10,298
2005	5,746	9,696	37%	15,442
2006	4,851	9,692	33%	14,543
2007	4,800	8,075	37%	12,875
Average	**6,540**	**5,613**	**57%**	**12,154**

Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada
Notes: (1) Exports, in addition to sales to U.S., include sales to other Canadian provinces
(2) All firm and exchange sales are considered under long-term contracts

EXHIBIT 3-2
Manitoba Hydro: Exports and Imports (GWh), 2000-2007

Year	Export			Import	Net	
	Firm	Non Firm	Total	Total	Export-Import	Firm Share of Net Exports (%)
2000	6,829	6,503	13,332	2,089	11,243	61%
2001	7,130	5,915	13,045	1,048	11,997	59%
2002	6,677	2,876	9,553	2,585	6,968	96%
2003	7,320	820	8,140	6,442	1,698	431%
2004	7,146	3,151	10,298	2,821	7,477	96%
2005	5,704	9,737	15,442	310	15,132	38%
2006	4,819	9,724	14,543	1,131	13,412	36%
2007	4,770	8,105	12,875	708	12,167	39%
Average 2000-2007	**6,299**	**5,854**	**12,154**	**2,142**	**10,012**	**63%**

Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada; data on supply and disposition of electric energy
Notes:
(1) All firm generation exported to other provinces or other contracting parties is represented under the firm export category
(2) Non-firm category includes secondary exports and exchange exports
(3) Imported generation includes imports under all categories, i.e., imports from other provinces, short-term imports and long-term imports

3.2.1 Current Manitoba Hydro Contracts

Manitoba Hydro is currently involved in eight long-term export trade agreements with six electric utilities and numerous short-term agreements with a variety of electric utilities and marketers in mid-western U.S., Ontario, and Saskatchewan. Three of the long-term agreements involve seasonal diversity exchanges of energy ranging from 150 MW to 200 MW with two U.S. utilities. Seasonal diversity exchanges are a particularly valuable form of agreement, especially between summer peaking U.S. utilities and winter-peaking Canadian utilities.

By entering into these agreements, Manitoba Hydro attempts to reduce the revenue uncertainty associated with these export sales, and since export revenues constitute a large share of Manitoba Hydro's revenues, they serve as one of the most important risk management control mechanisms of the company. In order to assure that these long-term agreements do not expose Manitoba Hydro to undue risks, the Corporation prescribes a number of rules and processes that guide its contract formation process. These issues are discussed further in later chapters.

The pricing structure of the contracts is designed to provide capacity and energy payments. Manitoba Hydro's existing contracts provide average capacity payment of US$[redacted]/kW-yr and average on-peak energy payment of approximately US$[redacted]/MWh in 2008$.[35] On a levelized

[35] Source: Summary of LT Contracts.doc (received from Manitoba Hydro)
Note: The average contract energy price represents energy weighted average of fixed component of individual contract prices. Annual escalation of 2.5 percent is assumed.

per MWh basis, on-peak firm power price is US$56/MWh. The potential contracts are more profitable with an average US$[redacted]/MWh on-peak energy price and US$[redacted]/kW-yr as capacity price[36]. On a per MWh basis, this results in on-peak firm price of US$[redacted]/MWh or [redacted] percent higher than prices under existing contracts. Prices are discussed at length in Chapter 6.

The existing export contracts supply guaranteed energy to the buyers and have the option to curtail the energy in several cases such as adverse hydro condition, damage to transmission link etc. Potential contracts also have terms and conditions that include curtailment provisions under adverse hydro conditions and specify the curtailment priority. This is discussed further in Chapter 7.

3.2.2 Proposed Manitoba Hydro Contracts

Manitoba Hydro has executed binding term sheets with three U.S. utilities, NSP, WPS, and MP. Based on these contracts, the Corporation expects to increase its commitment in 2018 to approximately 2,400 GWh annually with a commitment to WPS and further increase that commitment in 2020 to over 6,000 GWh annually with a contract signed with Minnesota Power. Details on the export sales volumes are discussed in chapters 7 and 10.

Most of the existing contracts expire by 2014 (see Exhibit 3-3). Thus, the proposed new contracts restore and then grow long-term contract sales in the 2015-2025 period. These contracts are discussed further in later chapters.

[36] Source: Summary of LT contract.doc

EXHIBIT 3-3
Long-Term Contract Exports to U.S. Utilities (MW)

Buyer	Summer Sales (MW)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
MP	50	50	50	50	50	50	50											
NSP	500	500	500	500	500	500	500											
NSP	150	150	150	150	150	150	150											
NSP	200	200	200	200	200	200	200	200	200									
Otter	50	50	50	50	50	50	50											
GRE	150	150	150	150	150	150	150											
MMPA	30	30	30	30														
SMMPA	30	30	30	30	30													
NSP	375-500							375	375	375	375	375	375	500	500	500	500	
NSP	350							350	350	350	350	350	350	350	350	350	350	
MP	250												250	250	250	250	250	250
WPS	150-500										150	300	500	500	500	500	500	500
Total		**1,160**	**1,160**	**1,160**	**1,130**	**1,100**	**1,100**	**925**	**925**	**725**	**875**	**1,025**	**1,475**	**1,600**	**1,600**	**1,600**	**1,600**	**750**

Source: Summary of LT contract.doc (received from Manitoba Hydro)
Notes:
(1) The 'Summer Sales' capacity represents the capacity for the months of June, July and August. Thus, a contract which terminates before the month of June in a year is not considered for calculating the summer sales for that year.
(2) The 3.3 million MWh non-firm energy supply, over the period May 2008 - April 2022, under the potential MP contract is not shown in the table above.

3.3 OVERVIEW OF MANITOBA HYDRO'S RISK MANAGEMENT AND CONTROL PLAN

Manitoba Hydro has developed and instituted a Management Control Plan (MCP) consisting of a portfolio of risk management mechanisms used to protect the Corporation from undue risk resulting from improper business practices. The risk management mechanisms include application of both corporate wide and divisional policies and procedures and control mechanisms covering all power related transactions in both Canada and the U.S. The rest of this section discusses the Corporation's supervisory bodies and the implementation of the control plan, and various transaction controls and reporting requirements that are in place.

3.3.1 Oversight and Plan Implementation

Oversight Bodies. Under the MCP, oversight of various activities and processes is provided by three main supervisory bodies: the Manitoba Hydro Electric Board (MHEB), the Export Power Risk Management Committee (EPRMC), and, the Power Sales and Operations Market Committee (PSOMC).

The MHEB is responsible for the general oversight of the Corporation's wholesale power related activities and provides oversight duties that involve approvals of sales that require new generation, and sales that exceed five year period and are 100 MW or more in size.

The EPRMC provides oversight of the management of the energy supply and financial risks resulting from Manitoba Hydro's participation in the export power market. This supervisory body is primarily responsible for the review and approval of risk mitigation strategies that are associated with both long and short-term export sales.

Oversight for system financial products is provided by the PSOMC. Among its various responsibilities, it approves strategies used to purchase or sell Financial Transmission Rights (FTRs) or Auction Revenue Rights (ARRs), and for the use of call and put options, contracts for differences, and swaps.

Plan Implementation. The Corporation has front, middle, and back offices to facilitate the implementation of its control plan. While the front office is responsible for export marketing strategies, market access long-term contract negotiations and power trading, the middle office is responsible for risk management activities associated with wholesale power transactions, and the back office ensures the integrity of systems and processes for transaction settlements.

3.3.2 Transaction Controls

Manitoba Hydro's system and limited merchant transactions are governed by a number of controls. These are discussed below.

Bilateral Transactions. The Corporation's bilateral transactions are guided by the Master or Interchange Agreement. Under these guidelines transactions are only made with customers who have been deemed creditworthy.

Market Transactions. For transactions involving standard electricity markets, such as MISO or IESO, there is a similar Market Participant Agreement with the market operator that not only defines the market products but also the rules binding both parties.

Transactions through Brokers. Similarly, transactions conducted through brokers or clearing firms are governed by Broker and Clearing Firm Agreements which outline the rules for these transactions.

Verification. All completed transactions are independently verified on a daily or weekly basis. Final verification is achieved through the month end billing process. Moreover, the Corporation also has a number of reporting requirements.

3.3.3 Reporting Requirements

Manitoba Hydro has adopted a number of reporting requirements to ensure the implementation of its control plan. For example, the Energy Resources Review and Outlook summarizes water conditions, recent operating conditions and market experience, and provides an outlook for the immediate future. The Credit Exposure Review summarizes credit exposure by customer and by bond rating. The Corporation also requires reporting of power related sales, purchases and expenses actual activity as well as in comparison to forecasted amounts. Reports are made available to all levels of management including exception reporting to the EPRMC.

Such reporting practices keep the Manitoba Hydro management abreast with all the developments and allow it to detect weaknesses in operations and take necessary actions.

CHAPTER FOUR
Identification of Risk Factors Associated with Export Power Sales

4.1 INTRODUCTION

This chapter is organized into two sections. The first section introduces the chapter. The second section identifies the risk factors and its sub-sections discuss these various factors. The quantification of risks is dealt with in Chapter 9 and the measures adopted to mitigate these risks are discussed in Chapter 10.

As noted previously, given its size, Manitoba Hydro has a very large position in power exports. As such, earnings derived from electricity exports are one of the most critical factors influencing corporate financial performance, and in turn, determine the stability of average domestic electricity rates.

Recent market developments have created large new opportunities for hydro-electric generation and transmission development. In particular, wholesale power prices have been rising, reaching record highs in 2007-2008, and the potential for even greater increases exists since the implementation of new environmental regulations appears more likely due to the emphasis placed on such regulations by the current administration in the U.S.

Given these developments, Manitoba Hydro has planned significant capital expenditures with planned increase in capacity of almost 2,400 MW.[37] Surplus output from the new hydro plants after satisfying the growing domestic demand, are expected to be exported, primarily to the U.S. electricity markets. As the Corporation plans to increase its long-term debt from approximately $7.2 billion in 2009 to approximately $19.4 billion in 2028,[38] identifying risks associated with the export sales is important not only from the perspective of quantifying financial implications of these risks, but also from the perspective of designing and adopting techniques and policies to mitigate these risks.

This chapter discusses the key risk events that can either explicitly or implicitly impact Manitoba Hydro's ability to preserve and grow its export power sales. While the biggest risk facing the Corporation is that of an extended drought, it also faces various other risks which can compound the impact of an extended drought if they were to coincide with its occurrence. The risks directly affecting export power sales are the most important risks to the company and the other risk factors identified are compounding risks. It should also be noted, as will be discussed in the following sections, that some risks affect spot sales positively but contractual sales negatively and vice-versa.

[37] These include the following hydro-electric plants: Wuskwatim, a 200 MW plant, with in service date of 2011/12; Keeyask, a 695 MW plant, with in service date of 2018/19; and Conawapa, a 1,485 MW plant, with in service date of 2022/23.

[38] Public Utilities Board of Manitoba Order 32/09, p.1

4.2 RISK FACTORS

The key risks affecting Manitoba Hydro's export sales can be classified into the following broad categories:

- Hydrology Risks
- Evolving Power Industry and Wholesale Power Market Price Risks
- Environmental Regulatory Risks
- Risks related to Long-Term Contract Terms and Conditions
- Manitoba's Domestic Electricity Demand Risks
- Construction Costs, Infrastructure Damage and Other Volume Risks
- Transmission Risks
- Financial Risks

The rest of this chapter discusses these risks.

4.2.1 Hydrology Risks

Below Average Hydro Conditions or Potential for Periodic Droughts. Droughts pose the biggest risk to the Corporation's annual volume of export sales, and can have a large impact on export revenues. Historically, Manitoba Hydro has faced droughts of varying durations, with the longest drought lasting seven years (1937-43). Based on historic data on water flows in the last one hundred years, one might be able to roughly conclude that Manitoba Hydro has the possibility of facing a lower than average hydro year once every three years.[39] And, on average, Manitoba faces a high likelihood of a drought occurring once every ten years,[40] and a severe drought, of a magnitude similar to the one that occurred in 2003-04, can be expected to occur once every 15 years.[41] The following exhibit shows the variability in the capacity factor of the Corporation's hydroelectric units for the last 29 years. During years of drought the company has witnessed capacity factors in the neighborhood of 50-60 percent while the average capacity factor, excluding drought years of 1987-1991 and 2003, is much higher at 73 percent.[42]

[39] See Manitoba Hydro's response to Public Utilities Board of Manitoba (PUB) Order 117/06, p.1. This is discussed further in chapter 9.
[40] Manitoba Hydro Corporate Risk Management Report (henceforth referred to as "Corporate Risk Management Report"), October 2008, p.1
[41] Public Utilities Board of Manitoba (PUB) Order 32/09, dated March 30, 2009, p.23
[42] Note that this is an approximate representation of the impact of droughts on capacity factor as it does not account for the fact that the drought periods are not exactly bound within calendar years. It nonetheless offers insight into the drought driven variability of capacity factor.

EXHIBIT 4-1
Annual Hydro-electric Capacity Factor – May 1981 to 2009 YTD (Percent)

Year	Off Peak	On Peak	Total
1981	38%	73%	58%
1982	47%	80%	66%
1983	50%	87%	71%
1984	49%	85%	69%
1985	54%	86%	72%
1986	58%	89%	76%
1987	44%	75%	61%
1988	34%	61%	50%
1989	44%	75%	61%
1990	41%	72%	59%
1991	43%	73%	60%
1992	49%	79%	66%
1993	47%	79%	66%
1994	48%	82%	67%
1995	51%	84%	70%
1996	59%	87%	75%
1997	68%	92%	81%
1998	58%	87%	75%
1999	46%	86%	69%
2000	54%	91%	75%
2001	62%	93%	79%
2002	46%	86%	69%
2003	33%	61%	49%
2004	45%	81%	65%
2005	71%	97%	86%
2006	64%	91%	79%
2007	62%	93%	79%
2008	67%	95%	83%
2009 YTD	24%	35%	30%
Average: 1981-2008	51%	83%	69%
Average excluding drought years of 1987-1991, and 2003 (also excludes 2009 YTD)	54%	86%	73%

Source: Hydraulic Info May2009.xls (based on data received from Manitoba Hydro)

In the case of a mild drought, the loss of revenues from diminished exports represents the cost of the drought. As the severity of the drought increases, and depending on the Drought Preparedness Plan, there may be a need to purchase electricity from wholesale markets, first during low cost hours, and eventually during high cost peak hours, to satisfy demand as well as contractual obligations. During periods of reduced import capability or super high import prices, the Corporation may have to supplement power purchases with electricity generated from its inefficient gas-fired power plants. The following exhibit, using data from 1999 through 2007, shows the adverse impact of the drought in 2003 on the Corporation's exports and imports of

power. While power exports fell by over 50 percent, imports increased significantly, by over 350 percent.

EXHIBIT 4-2
Manitoba Hydro Annual Energy Supply and Demand (GWh): Normal Hydro v. Drought Conditions

	Average Normal Hydro Conditions	Drought Conditions	% Change
Production	32,214	21,152	-34%
Exports	-9,720	-4,474	-54%
Imports	1,268	5,909	366%
Inter-Regional Transfers	-2,480	-3,132	26%
Supply for Domestic Load	21,282	19,455	-9%

Source: 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada
Notes:
1. 'Average Normal Hydro Conditions' represents an average for all years from 1999-2007 except 2003
2. 'Drought Conditions' represents values for 2003; this is an approximate representation of the impact of droughts as it does not account for the fact that the drought was not exactly bound within the 2003 calendar year.

Manitoba Hydro designs and operates its facilities, both generation and transmission, to ensure that firm demand can be met even with a repeat of the worst drought since 1912. However, once in the drought, a Drought Preparedness Plan may result in further diminution of hydro supply available to meet exports. Also, in the event of a drought more severe than the worst one on record, Manitoba Hydro may be faced with insufficient supplies to meet firm demand. The inability to provide dependable power to customers may result in curtailed supply for extended durations.

In the 2003-2004 drought period, Manitoba Hydro had to operate its costly natural gas plant (Brandon SCCT) and purchased relatively high cost power from the wholesale power market to meet the local and contractual obligations. In addition to operating inefficient plants and procuring power from the wholesale power markets, the Corporation may have to incur additional costs of drawing on its hydraulic resources. It is estimated that for every year the company faces a severe drought, the retained earnings will be reduced on the order of $500 to $600 million.[43] While the onset and severity of droughts is uncertain, if the attendant risks are not adequately addressed, they can have a large impact on the Corporation's financial strength.

Manitoba Hydro has estimated that the cost of a repeat of the worst five year drought on historic record to be $2.8 billion and warns that the costs could be much higher if the drought were to coincide with a period of high energy prices.[44] Similarly, costs are also dependent upon the timing and magnitude of the rate increases implemented to address the drought impacts.[45]

[43] Public Utilities Board of Manitoba (PUB) Order 116/08, dated July 29, 2008
[44] Corporate Risk Management Report, October 2008, p. 1
[45] Source: Manitoba Hydro Integrated Financial Forecast (IFF08-1), November, 2008, p. 20

Besides the risk of periodic droughts, upstream regulation that affects the timing of inflows can have an adverse impact on the Corporation's ability to optimize operations. Moreover, changes in upstream reservoir water usage patterns can reduce the hydraulic energy available to Manitoba Hydro, thereby impacting the surplus energy available for export sales.

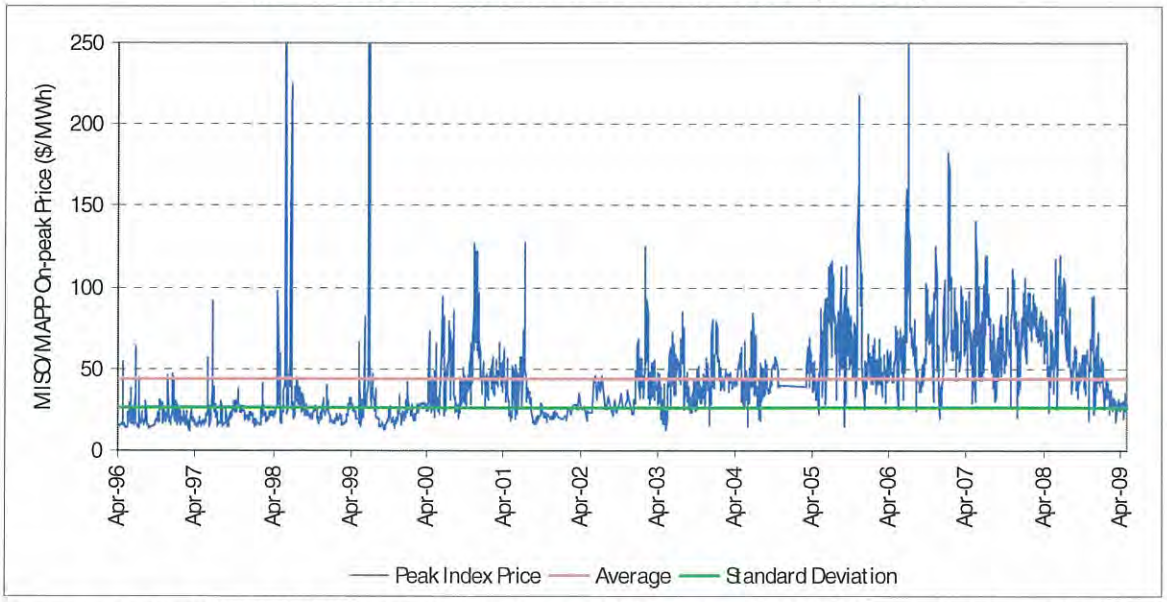
The Corporation takes a number of steps to address these hydrology related risks. The company's mitigation strategies in this regard are discussed in Chapter 10.

4.2.2 Evolving Power Industry and Other Wholesale Power Market Price Risks

Spot[46] Market Volatility. Another large risk to the financial performance of Manitoba Hydro is uncertainty and the associated volatility in wholesale power prices. Thus, the Corporation not only faces volume risk related to a drought, but also price risks with respect to exports.

As noted, Manitoba Hydro's main export outlet is MISO. This market has developed in recent years increasing the extent of open access and liquidity. Thus, all else being equal, reliance on spot sales is more feasible. However, with the deregulation of the market, price volatility is also growing. MISO's greater reliance on natural gas generation has caused prices and related volatility to increase greatly in recent years. The exhibits below show the variability in MISO on-peak power prices. While higher prices translate into higher export earnings in years of good water flow, in years of drought high prices may subject the Corporation to significant price risk on the power it has to procure (through deals such as bookout agreements) to fulfill its contractual obligations.

EXHIBIT 4-3
MISO On-peak Spot Market Power Prices ($/MWh)



Source: 1997-2000 MAPP Weekly Index; 2001-2005 Northern MAPP Weekly Index; 2005-2009 YTD MINN HUB Weekly Index, from Power Market Week

[46] Spot market includes spot or short-term transactions, which are less than one year in duration.

EXHIBIT 4-4
Annual Average MISO On-Peak Power Prices and Minnesota Hub Gas Prices

Year	On-Peak Power Price (2008 US$/MWh)	% Change	Gas Price (2008 US$/MMBtu)	% Change
1997	29.0	-	3.09	-
1998	37.3	29%	2.58	-17%
1999	49.4	32%	2.75	7%
2000	47.6	-4%	5.20	89%
2001	44.6	-6%	4.67	-10%
2002	32.3	-28%	3.67	-21%
2003	50.6	57%	6.01	64%
2004	51.5	2%	6.15	2%
2005	69.6	35%	8.43	37%
2006	62.4	-10%	6.62	-21%
2007	73.1	17%	6.78	2%
2008	62.0	-15%	8.28	22%
Average (1997-2008)	50.8	-	5.4	-

Sources:
1. Power Prices - 1997-2000 MAPP Weekly Index; 2001–2005 Northern MAPP Weekly Index; and 2005-2009YTD MINN HUB Weekly Index, from Power Market Week
2. Gas Prices - 1997-2007: Platts Gas Daily; 2008: FERC website - http://www.ferc.gov/market-oversight/mkt-gas/midwest/ngas-mw-yr-pr.pdf

Notes:
1. Annual escalation of 2.5 percent is assumed for conversion from nominal$ to real 2008$
2. Northern Ventura ticker prices are used to represent gas prices of the Minnesota Hub

Besides market risks, another factor that has the potential to increase the cost of drought is shortage pricing, where sellers extract a premium once they become aware of the Corporation's need for power. This was experienced in the 2003-04 drought.

It should also be noted that while high spot market prices pose a risk to the Corporation's financial stability during periods of drought, falling spot market prices can have adverse financial consequences during non-drought years, given the company's heavy reliance on export sales in the spot market. Prices in the spot market can be driven lower due to various reasons. For example, new energy technologies may lower electricity production costs, and as a result, can exert downward pressure on spot market prices. A 100 percent reliance on spot market prices could therefore result in large annual volatility of earnings and potentially rates. The most common risk management action to this price volatility is to enter into long-term power sales contracts.

Long-Term Contract Price Uncertainty. A risk of long-term power sales, designed in part to lower revenue volatility, can be that they are contracted at power prices that ex post turn out to be too low. These price risks can be caused by uncertainty in fuel markets, environmental regulations, new unit costs, market supply and demand balance (or lack thereof), etc.

Fuel Price Volatility. The price of natural gas is highly volatile. Under drought conditions, Manitoba Hydro may have to generate from its gas fired units and high gas prices could

significantly add to the financial burden of a drought. If gas is the fuel on the margin, it will have a higher price, which will relate into higher spot and immediate term prices.

Lower than Expected Electricity Demand in Export Markets. As noted, under median water flows, Manitoba Hydro currently derives over a third of its revenues from export sales.[47] As it continues on its current capacity expansion path, revenues from export sales are expected to increase significantly. Given such a large stake, lower than expected export demand is a major source of risk for Manitoba Hydro. Lower than expected demand can be caused by various factors such as aggressive adoption of demand side management, depressed demand due to economic conditions, high reliance on other forms of renewables (wind, solar, geothermal), etc. This lower demand can manifest in lower prices, and lesser availability of long-term contracts.

U.S./MISO Market Structure Developments. The North American energy markets have witnessed fundamental changes and have undergone major restructuring in the recent years. While the resulting market based approaches to generation, transmission, and distribution have provided the Corporation with new opportunities to export power, factors such as adequate transmission capabilities, access rules, and regulatory rules and regulations that govern export sales and imports, can play a crucial role in its ability to grow export sales and revenues. Since Manitoba Hydro sells about one third of its output to the MISO market, plans to expand its export capabilities in the coming years, and has to import make-up power during droughts, these factors can play a crucial role in determining the corporate financial strength.

Moreover, execution risks increase as the number and complexity of transactions increase. For example, the increased marketization of MISO markets have contributed to increased complexity.

As stated before, the risk mitigation strategies adopted by Manitoba Hydro are discussed in Chapter 10.

4.2.3 Environmental Regulatory Risks

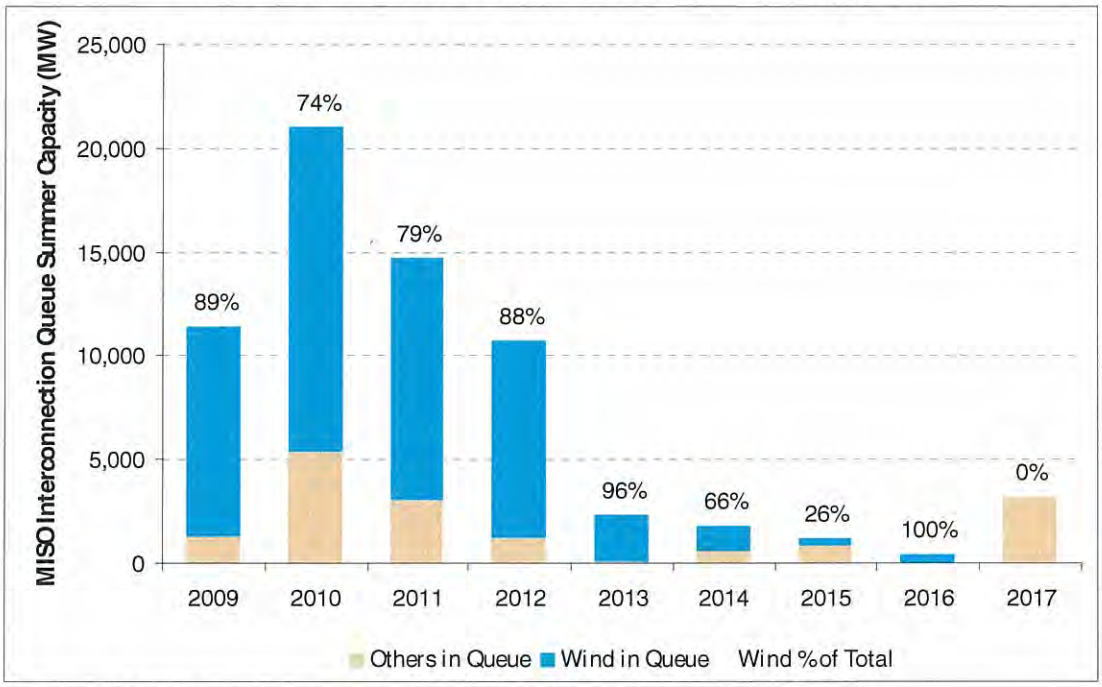
Impact of Potential Regulations on CO_2 Emissions. Environmental regulations can have a large effect on power markets. The current U.S. administration's emphasis on carbon regulation is a favorable development from Manitoba Hydro's perspective. In June 2009, the U.S. House of Representatives passed the Waxman Markey Bill, the first CO_2 emission control measure passed by either house. A CO_2 emission allowance price or tax could raise the market value of the Corporation's power considerably since hydroelectric power does not result in CO_2 emissions. Explicit in the ICF power price forecast is the assumption that Manitoba Hydro will benefit from the environmental price premiums. However, deviations from the assumed CO_2 prices may pose a risk to Manitoba Hydro's revenue inflows. Lower than anticipated carbon prices may impact Manitoba Hydro's financial projections.

Renewables and Competition. While on the one hand Manitoba Hydro is expected to benefit from U.S. carbon regulation (through high resultant power pricing in the U.S.), on the other hand, regulations that impose significant renewable capacity expansion may negatively impact the Corporation's revenues from its net exports. Given the recent push for renewable generation, MISO, having great potential for wind generation, may witness substantial growth in wind capacity. It has greater access to wind than almost any other U.S. regional power market.

[47] Corporate Risk Management Report, October 2008, p.1

The following exhibit shows large amounts of wind generation in MISO's interconnection queue. This may lower the demand for import of energy to MISO, and/or exert downward pressure on power prices, and hence, through a reduction in export revenues, may pose a risk to Manitoba Hydro's ability to maintain financial stability. Since wind generation is limited at this time, a delay in contracting could expose the Corporation to wind related risk. This could especially be the case if there is an overbuild of wind capacity.

EXHIBIT 4-5
MISO Interconnection Queue, Summer Capacity (MW)



Source: MISO Interconnection Queue, available at http://www.midwestmarket.org/page/Generator+Interconnection+Queue, last accessed on May 26, 2009
Note: The interconnection capacity includes capacity represented under the following project statuses: Done, Active, Hold, and Special; capacity represented under inactive project status has been excluded.

4.2.4 Risks Related to Long-Term Contract Terms and Conditions

The contractual terms and conditions of long-term power sales can play an important role in determining the risks Manitoba Hydro faces. On the one hand, the goal of long-term contracts is to decrease power price (and ultimately revenue) uncertainty and facilitate long-term planning and investment. On the other hand, the need to provide firm power from the market, even in the event of a drought, reintroduces some degree of price uncertainty. During droughts, not only are export revenues low, but costs can be high as Manitoba Hydro must purchase power at the market price. Thus, revenues for firm sales are fixed but costs are not. The extent of the risk is directly tied to the contract terms and conditions, and the details of the Drought Preparedness Plan adopted. The terms and conditions in the proposed new firm contracts are different from the terms of the current contracts and more favorable to Manitoba Hydro. For example, under the binding term sheets executed with [redacted] and [redacted], Manitoba Hydro has the right to curtail supply [redacted], thereby reducing supply of firm energy by [redacted] percent.

Such reductions are not permitted under its existing contracts. Provisions related to volume curtailment are discussed in chapters 7 and 10.

4.2.5 Manitoba's Domestic Electricity Demand Risks

Higher than Expected Domestic Electricity Demand. Future generation available for export is a function of native load growth rates because Manitoba's domestic market has priority access to all firm electric supply. Put another way, Manitoba forecasts its export earnings based on forecasted domestic demand for electricity by considering that surplus energy over domestic demand will be exported at higher prices. The forecasted domestic demand represents the most likely future electricity demand scenario. However, higher than forecasted domestic demand would result in lower surplus energy available for export, and thus, lower export earnings and vice versa.

Uncertainty around future domestic demand is caused due to a number of reasons. For example:

- **Higher Economic and Population Growth.** The province may witness higher than forecasted domestic load due to increased population growth and higher economic growth than that assumed in the domestic demand forecast. This could lower the surplus energy available for exports.

- **Weather** – MH has approximately 1,000 MW of potential heating load, so weather, especially during the winter, can affect demand.

- **Competition.** Structural changes, such as introduction of competition enabling domestic customers to have choice of energy supplier, could mean less stability for the Corporation in terms of forecasting its domestic demand. While lower domestic demand may mean greater availability of surplus energy for exports, it may, however, have a negative impact on the Corporation's ability in terms of realizing economies of scale in the domestic market as well as maintaining the image of being the preferred energy supplier in Manitoba.

  Although the electricity market has not yet been opened up to competition, customers have a choice insofar as their primary gas supplier is concerned, and driven by the aggressive marketing efforts by brokers as well as their preference for long-term fixed price products over the volatile natural gas prices, 20 percent of the customers have signed up with brokers for their primary gas needs.

- **Low Industrial Tariff.** Manitoba's electricity rates reflect the cost of its operations less credit for net export revenues. Given that the Corporation is one of the lowest cost producers in North America, and has substantial export sales, rates in Manitoba are much lower than average realized tariff from electricity export. These prices also tend to be lower than the day-ahead or real time locational marginal price in the export markets. These differences may result in increased new industrial load (as energy intensive industries may be attracted to Manitoba) that may threaten export profitability.

- **Fuel Switching.** If gas prices increase above a certain level, electricity space heating may become more economical than gas based space heating. In such a case, electricity space heating can displace gas based heating resulting in increased demand for electricity. This increased demand for electricity may result

in lower export and potentially greater (than current) import of higher cost energy.

- **Uncertainty in Forecasting.** Forecasting electricity demand is uncertain and challenging. Manitoba Hydro demand forecasts were too high between 1987/88 to 2001/02 and have been too low since.

4.2.6 Construction Costs, Infrastructure Damage, and Other Volume Risks

Capital Investment, Inflation Risks, and Cost Overruns. To meet its export obligation and domestic demand, Manitoba Hydro has started large projects such as Wuskwatim, and is planning Keeyask and Conawapa, etc. at a total of close to $18 billion capital expenditure. In 2008, Manitoba Hydro faced a high inflation year, thus increasing the estimated cost of its projects.[48] Hyper inflation has the potential to reduce the expected returns from new projects.

Inflationary risk can not only impact the projects under construction, but also other expenditures that the Corporation routinely makes, such as fuel and power purchases, and operating costs. Increase in water rental rates above those assumed in the forecasted expected case may also pose another element of risk to Manitoba Hydro's financial stability. Prolonged high levels of inflation can have a significant adverse financial impact if the same inflationary trends are not reflected in electricity export prices, and possibly delay the in-service dates of the planned new plants.

As discussed above, Manitoba Hydro's construction plan is capital intensive. In the near-term, the instability of the financial market has raised concerns with respect to its ability to meet the timeline for these projects. Moreover, in the event that the Corporation fails to satisfy its export requirements at reasonable costs under various risky scenarios, its retained earnings can be depleted, resulting in a delay in its construction program, which may then result in further losses.

Delay in Construction. The power purchase agreement term sheets recently executed by the Corporation assume specific operation dates for its hydro expansion projects. Any delay in the construction of these projects once the general civil contracts have been awarded could force Manitoba Hydro to run its fossil-fired units and/or buy from the market to serve local and export requirements thereby weakening its financial position.

Infrastructure Damage and Other Volume Risks. Given the capital intensive nature of Manitoba Hydro's business, it is exposed to the risk of infrastructure damage. These may include dam failure at generating sites, equipment failure, sabotage and/or other property damage. Such damages can not only impose repair costs, but can also impact system reliability, and can limit the Corporation's ability to maximize net revenues from export sales. Unanticipated frequency or severity of such events, especially if they were to coincide with a drought and where the insurance limits are found to be inadequate, may have severe consequences for the Corporation's financial situation and could also pose a threat to public safety due to lack of energy supply.

The mitigation strategies adopted by the Corporation to minimize volume risks are discussed in Chapters 7 and 10.

[48] Public Utilities Board of Manitoba (PUB) Order 32/09, dated March 30, 2009, p.23

4.2.7 Transmission Risks

Import and Export Capability. Manitoba Hydro faces transmission risk related to its relative isolation from neighboring areas. It is located at the end of the Eastern Interconnect grid and import capability may be too low to achieve needed imports during a drought. Similarly, more transmission capability is needed to increase on-peak export volumes and prevent low locational prices at the U.S. Canadian border. Construction of transmission lines can be expensive and require the neighboring regions to participate in constructing transmission lines in their regions to connect to Manitoba's grid. Siting costs and other problems can make opportunities to raise connections to the rest of the continent extremely difficult.

Transmission Market Risk. The existence of locational marginal pricing (LMP) in MISO, in combination with the existence of transmission congestion, creates the potential for transmission risk, notably the potential for pricing at different locations to be substantially different. The delivery of power to remote locations in a nodal pricing market like MISO and potentially Ontario, can result in lower revenue, as prices are depressed by transmission congestion to the load center.

As a consequence of its participation in the MISO and Ontario electricity markets, the Corporation utilizes Financial Transmission Rights (FTRs) and Transmission Rights (TRs) to hedge against congestion risks. With the implementation of LMP in MISO, cost of congestion management can become very large and FTRs may not be available to hedge against this risk. Moreover, inappropriate use of these instruments can expose the company to unanticipated costs and risks.

Unforeseen Infrastructure Damage. Manitoba Hydro is also exposed to unforeseen infrastructure damage risks. Severe weather conditions can result in the damage or loss of key transmission infrastructure. These may include extended loss of the HVDC transmission lines. One such event was caused by the 1996 Manitoba wind storms. Such damages, if they occur, may reduce export of energy to the U.S. and result in reduction in high margin export energy revenue.

As discussed later in Chapter 10, Manitoba Hydro actively engages in strategies that minimize transmission related risks. Moreover, the Corporation estimates that the proposed firm contracts will result in $2 billion (nominal Canadian dollars) of additional transmission construction by U.S. utility counterparties leading to enhanced firm import and export capability for the company.

4.2.8 Financial Risks

Various financial risks can adversely affect Manitoba Hydro's financial strength by draining its retained earnings, and can,therefore, also impact rate stability. These risks may also adversely impact the Corporation's ability to meet and maintain the desired 75:25 debt-equity ratio. As the company embarks upon an ambitious construction program that will result in its undepreciated plant in-service increasing from $12 billion (2009) to over $37 billion by the end of 2028, with a concurrent increase in long-term debt from almost $7.2 billion in 2009 to over $19.4 billion,[49] it is critical to evaluate the risks that can potentially impact its objectives and

[49] Public Utilities Board of Manitoba (PUB) Order 32/09, dated March 30, 2009 p. 1

mandates. Like various other risks discussed above, the concurrence of these risk events with a severe drought can compound the financial consequences of the drought.

Exchange Rate Risk. On the one hand, Manitoba Hydro's sale and purchase of electricity and fuel to and from the U.S. are denominated in U.S. dollars, and therefore, bear an exposure to exchange rate fluctuation risk. On the other hand, a large proportion of its debt is also denominated in U.S. dollars. While the U.S. dollar denominated cash inflow from export revenues and the U.S. dollar denominated cash outflow in the form of payment of principal and interest of long-term debt, to a certain degree, offers a natural hedge – i.e., they offset to prevent impacts on the bottom line, Manitoba Hydro, nonetheless faces risks in periods of large fluctuations in exchange rate.

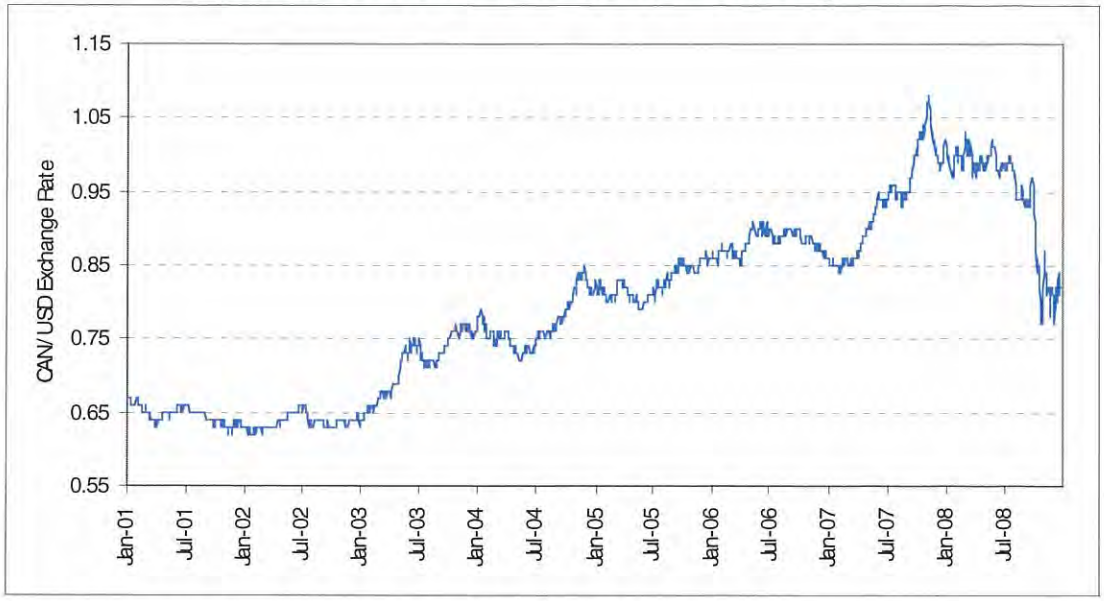
Long-term revenue assumptions for exports to MISO are linked to USD/CDN =1.16 exchange rate, and thus, in the case of appreciation of Canadian dollar relative to the U.S. dollar, the Corporation will face erosion of profit due to exchange rate differentials. Last year the exchange rate was as close as CDN/USD=0.95, and this resulted in loss to Manitoba Hydro.

Manitoba Hydro has estimated that an increase in the Canadian dollar by 10 cents per U.S. dollar decreases its retained earnings by $48 million through 2010/11, $86 million through 2014/15, and $144 million through 2018/19. Conversely, a decrease in Canadian dollar by 10 cents per U.S. dollar increases the retained earnings by $53 million, $126 million and $258 million through similar time-periods.[50]

The following exhibits present the exchange rate fluctuation for the 2001-2008 period. As shown, the Canadian dollar sharply appreciated against the USD from 2003 through middle of 2008 and has since generally depreciated again the USD. To guard against such sharp fluctuations in the exchange rate, the Corporation takes a number of precautions, such as derivative foreign exchange forward contracts. Together, with other mitigation measures adopted by the Corporation, these are discussed in Chapter 10.

[50] Source: Manitoba Hydro Integrated Financial Forecast (IFF08-1), November, 2008, p. 18

EXHIBIT 4-6
Fluctuation in the Canadian-US Dollar Exchange Rate



Source: http://www.bankofcanada.ca/en/rates/exchange.html

EXHIBIT 4-7
Annual Average Exchange Rates (CDN/USD)

Year	Annual Average Exchange Rate (CDN/USD)	Annual Percent Change
2001	0.65	
2002	0.64	-1%
2003	0.72	12%
2004	0.77	8%
2005	0.83	7%
2006	0.88	7%
2007	0.93	6%
2008	0.94	1%
2009 YTD	0.83	-12%

Source: http://www.bankofcanada.ca/en/rates/exchange.html
Note: Annual average exchange rates represent an average of the daily exchange rates

Higher Interest Rates. Manitoba Hydro's current capital structure includes approximately $7.2 billion of long-term debt.[51] Furthermore, its long-term debt is expected to grow to over $19.4 billion by 2028. This exposes the Corporation to interest rate fluctuation risk. Manitoba Hydro has estimated that an increase in interest by one percent would decrease its retained earnings by $115 million through 2018/19.[52] In order to mitigate this risk, the company takes a number of steps that includes the Province executing interest rate swap agreements on the

[51] Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, pp.88-89
[52] Manitoba Hydro Integrated Financial Forecast (IFF08-1), November, 2008, p.18

Corporation's behalf to manage the proportion of fixed and floating interest on its debt obligations. These measures are discussed in Chapter 10.

Capital Structure and Credit Risks. Manitoba Hydro has planned significant capital expenditure of $18 billion over the next 15 years with projected debt to equity ratio of 75:25. This capital structure provides financial protection against adverse consequences of a drought and other risks. An extended drought, or a combination of an extreme drought and high import prices, can impact the equity levels by depleting the Corporation's retained earnings. Such an effect can not only impact the Corporation's financial strength, but can also lead to a need to raise domestic electricity rates.

The Corporation also faces financial risks due to the possibility of counterparties defaulting on contractual terms and the attendant replacement risks of prematurely terminated export sales contracts. As discussed further in chapter 10, to guard against these risks, the Corporation not only enters into contracts with counterparties that it deems creditworthy but, in order to minimize default risks, it also spreads its export sales across a number of buyers.

CHAPTER FIVE
Analysis of the Appropriateness of Entering Into Long-Term Contracts

5.1 INTRODUCTION

Under this task, ICF analyzed the appropriateness, from a long-term business strategy and risk exposure perspective, of Manitoba Hydro entering into long-term firm contracts 20 or 30 years into the future. ICF concluded that it is appropriate for Manitoba Hydro to enter into long-term contracts that meet certain criteria. Later sections address the extent to which the specific proposed new long contracts meet those criteria.

The rest of the chapter is organized as follows: The next section discusses the criteria for assessing the appropriateness of long-term contract. The third and fourth sections discuss the appropriateness of short-term and long-term contracts, respectively. Additional benefits of long-term contracts, such as increase in transmission linkages, are discussed in the fifth section. The sixth section discusses practices at other power companies, and finally, the seventh section provides the conclusions.

5.2 JUDGING THE APPROPRIATENESS OF LONG-TERM CONTRACTS

This chapter addresses the following issues. First, what are the advantages and disadvantages of long versus short-term contracts? Second, what do other organizations do in terms of contract duration? Third, should Manitoba Hydro exports be long-term, short-term or a mix of short and long-term?

While the next chapter addresses whether the proposed prices for new long-term contracts are adequate, Chapter 7 addresses the specific non-price terms and conditions of Manitoba Hydro's proposed long-term contracts and their effects on the risks facing the Corporation. It should be noted that the conclusion that a mix of short-term and long-term contracting is appropriate is predicated on the conclusions in these chapters that the long-term price is adequate, and that the non-price terms and conditions of the contracts are favorable.

5.3 SHORT-TERM CONTRACTS: ADVANTAGES AND DISADVANTAGES

Short-term contracts are usually defined as lasting one year or less. The advantages of short-term contracts are two fold. First, they maximize the extent to which the export price equals the then current market price. This minimizes the chance of the market price being above the sales price. If one is concerned that the market has large upside potential beyond forecasted levels, short-term sales are mechanisms to capture this value. Second, there is less chance that sales obligations will exceed available volumes, even in a drought. Sales volumes can be more closely tailored to available supply based on the latest hydrological information. This reduces the chance that Manitoba Hydro will have to pay more for make-up supply in the market than the sales price.

The main disadvantage of short-term contracts is that short-term wholesale power pricing is very volatile. This makes it difficult to ensure that Manitoba Hydro rates and financial

performance can be stable and creates potential financial risks in adverse market circumstances.

This is especially true since volatility of spot pricing has increased over time in Manitoba Hydro's main export market which is the U.S. MISO region (see Exhibit 5-1). Prior to 2004, annual on-peak spot MISO prices averaged US$34/MWh and prior to 2003 the annual average never exceeded US$40/MWh. Since 2003, they have averaged US$61/MWh and have never been below US$40/MWh. 2007 prices were the highest ever. Historical daily volatility is also high (see Exhibit 5-2).

EXHIBIT 5-1
Annual MISO Wholesale Power Prices, 1997 – 2009

Year	MISO On Peak Power price (Nominal US$)	MISO Spot Prices (2008 US$/MWh)		
		On-Peak	Off-Peak	All-Hours
1997	22.1	29.0	14.0	21.1
1998	29.2	37.3	15.1	25.5
1999	39.5	49.4	13.6	30.4
2000	39.0	47.6	18.0	31.2
2001	37.5	44.6	18.0	30.5
2002	27.8	32.3	16.4	23.8
2003	44.7	50.6	20.1	34.4
2004	46.6	51.5	22.7	36.2
2005	64.7	69.6	32.3	49.8
2006	59.4	62.4	29.4	51.3
2007	71.3	73.1	30.3	58.8
2008	62.0	62.0	25.3	49.8
2009 YTD	31.9	31.2	22.3	28.2
Standard Deviation	**15.6**	**14.5**	**6.4**	**12.1**
Average Price (1997-2009)	**44.3**	**49.3**	**21.3**	**36.2**
Average 1997 – 2003	**34.3**	**41.5**	**16.4**	**28.1**
Average 2004 – 2008	**60.8**	**63.7**	**28.0**	**49.2**
Average 2004 – 2009 YTD	**56.0**	**58.3**	**27.0**	**45.7**

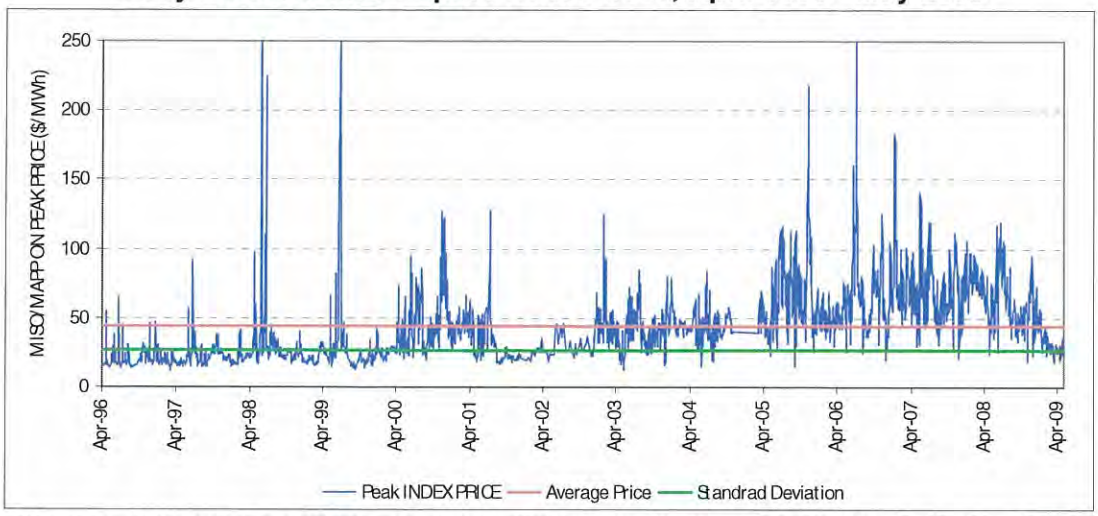
Source: 1997-2000 MAPP Weekly Index; 2001–2005 Northern MAPP Weekly Index; and 2005-2009YTD MINN HUB Weekly Index, from Power Market Week

The rising on-peak prices are primarily due to rising natural gas prices. Prior to 2003, Henry Hub natural gas prices had never been above US$5.24/MMBtu in real 2008$, but between 2003 and 2008, they were never below US$6.21/MMBtu. Thus, short-term power sales tie the Corporation's revenues and budgets very closely to natural gas prices. Natural gas prices are highly volatile in part because they correlate with oil prices to some degree. In 2009 year-to-date (through June 2009), natural gas and MISO on-peak power prices are down 50 percent from 2008 levels highlighting the volatility of short-term sales. Such movements, especially when all sales are short-term, can create large and unexpected budget and financing problems, and lead to stakeholder surprises. The surprise can be largest when changes in staffing occur at oversight boards.

Power price volatility is also driven by the sharp difference between off-peak prices driven by coal and on-peak driven by natural gas. On average off-peak prices were US$28/MWh lower

than on-peak prices between 1997 and 2009, or in other words, they were 43 percent of on-peak prices. In 2007 they were US$43/MWh lower. This gap has grown over time - the difference in 1997 was US$15/MWh. This price gap underscores the importance of selling power on-peak rather than off-peak. Manitoba Hydro needs to have the facilities to maximize on-peak sales including transmission capability.

EXHIBIT 5-2
Daily Northern MISO Spot Power Prices, April 1996 - May 2009



Source: 1997-2000 MAPP Weekly Index; 2001-2005 Northern MAPP Weekly Index; 2005-2009YTD MINN HUB Weekly Index

Another disadvantage of short-term sales is that they are usually not firm enough or of long enough duration to support associated long-term investments such as new transmission lines. Investors will typically want to lower risks before making large long-term capital commitments. Further, short-term sales are not firm enough for buyers to defer investments in their own generation decreasing their willingness to pay.

5.4 LONG-TERM CONTRACTS: ADVANTAGES AND DISADVANTAGES

The advantages of long-term contracts are that in exchange for firm supply, buyers offer to pay prices that are known or at least much less uncertain than short-term prices. This greatly facilitates financial planning, budgeting, and rate stability. Indeed, long-term contracts are considered as one of the main risk management strategies available in the power industry. They can also ensure profits are obtained from future investments and facilitate leveraging investments, and operations.

Another advantage is that the buyers can more easily make long-term investments. These include adding transmission and deferring new generation construction, i.e., in this respect, it is the opposite of short-term sales shortcomings. Also, it should be noted that there are very long lead times for new transmission lines due to the siting, permitting, planning, and construction time required. This can take 5 to 7 years.

One alternative to a physical long-term contract with known quantities and prices is a financial hedge. This option might enable Manitoba Hydro to hedge against the risk of price movements

without the physical delivery obligation. However, financial hedges typically have mark-to-market collateral requirements. That is, as natural gas and power prices increase, one party has to post more or less collateral to ensure performance based on the difference between the contract price and current market prices. These requirements can be very large. In contrast, physical contracts do not have fluctuating collateral terms. Furthermore, there are credit risks not necessarily fully covered by the collateral, e.g., investment grade entities are provided a discount to mark-to-market collateral needs, and they may not be able to post collateral in the event of a downgrade or distress. The traditional counterparties have been financial institutions, and hence, the credit risk is an important negative compared to contracts with creditworthy regulated utilities. Lastly, they do not contribute to solving physical delivery problems (e.g., transmission capacity needs) in the same manner as long-term physical sales.

The principal disadvantages of long-term contracts are two fold. First, they usually involve volume requirements or firm supply requirements. This can be problematic if there is a drought and replacement power has to be purchased. This is discussed further in a later chapter. Second, there exists the potential for seller's regret, i.e., after the fact it may turn out short-term pricing is more favorable than contracted prices.

5.5 ADDITIONAL BENEFITS OF LONG-TERM CONTRACTS

As noted, long-term physical contracts have additional benefits not necessarily related to the pricing terms. The most notable feature of these long-term physical contracts is that they may be the motivating force helping Manitoba Hydro increase its much desired transmission connections, especially with U.S. utilities in the MISO market.

One cause for this desire is the potential that MISO may tighten its definition of what qualifies as firm transmission. This could, in the extreme, convert Manitoba Hydro supply from firm to non-firm unless there is greater redundancy in its transmission delivery system. This threatens to lower revenues because non-firm supply trades at a discount to firm supply. A second desire is to have greater flexibility vis-à-vis on-peak and off-peak sales; transmission could be a limiting element preventing sales of supply power. A third and important driver is that increased transmission decreases the chance that unexpected problems on the Manitoba Hydro system could threaten domestic supply. Manitoba Hydro could import more power in the unexpected event that a drought exceeds the worst on record or that the DC system experiences severe damage.

The construction of new transmission in the U.S. to better interconnect Manitoba Hydro with MISO is both costly and challenging. Ongoing MISO transmission studies estimate that the proposed firm contracts will result in $2 billion of additional transmission construction by U.S. utility counterparties, a large savings relative to Manitoba Hydro paying for this development. Transmission construction and cost allocation are planned as part of the long-term contracting. In addition, the process of building new transmission lines in the U.S. is challenging in terms of siting and permitting. Obtaining U.S. utility support is critical in order to succeed in this process. The proposed long-term contracts are important in terms of getting this support.

5.6 PRACTICES AT OTHER POWER COMPANIES

Hedging and insurance aspect of the long-term power contracts can, in part, be benchmarked against similarly situated companies. While there is no one size fits all solution, a comparison with other companies can nonetheless be a useful exercise.

The utility business is very capital intensive. The only more debt intensive sectors are the mortgage/government, followed by finance companies. This need to access debt reinforces usefulness of long-term contracts to ensure revenue stability to support leverage.

5.6.1 Canadian Electric Utility Contracting

Hydro Quebec (HQ) is the Canadian utility closest to Manitoba Hydro in terms of having a very large amount of hydroelectric generation, net hydro driven export sales, and plans to take advantage of market conditions by adding more hydro generation and transmission for export to the U.S. For decades it has engaged in long-term export sales to ISO-NE and NY-ISO under long-term contracts. HQ has also recently filed with the U.S. FERC a plan for expanding its hydro capacity, transmission to ISO-NE, and power sales. HQ is requesting from FERC the authority to enter into market-based long-term contract sales at negotiated long-term prices as part of this expansion. Thus, they are pursuing a strategy similar to Manitoba Hydro in terms of long-term contracting.

5.6.2 US New Plant Development and Contracting

Manitoba Hydro is accelerating the construction of two new hydroelectric facilities, Conawapa and Keeyask to provide the power under the proposed new contracts, though contract power can be sourced as Manitoba Hydro deems fit. Three models exist for developing new power plants:

- Long-term contracting with known or indexed prices
- Implicit long-term contracting through a regulated utility franchise, and/or government status. This often involves utilities with integrated structures which provide power on a cost plus basis
- Merchant structure with spot sales and primarily short-term contracts (one to five years)

At this time, new power plant construction predominantly is associated with long-term explicit or implicit contracting. Of 38 GW in the U.S. that are under construction, 70 percent are under long-term contract for majority of their output, or are utility owned (see Exhibit 5-3).

EXHIBIT 5-3
Current Long-Term Contracting Practice and Power Plant Development (GW)

Type	Firm U.S. Capacity
Utility Ownership	23
IPP with Long-Term Contract > 50% of Capacity	4
IPP Merchant - < 50% of Capacity	12
Total Under Construction Capacity	38

Source: Ventyx database accessed on May 5, 2009

The trend of long-term contracting is in part a reaction to the problems experienced in the U.S. during the merchant power boom in the U.S. in the 1999 to 2003 period. Three of the six major Independent Power Producers (IPP) in U.S. that pursued the merchant model went into bankruptcy in the last six years and the remaining IPPs have experienced episodes of extreme financial distress. These companies built new units without always having long-term contracts with known or relatively known pricing. Thus, long-term and highly capital intensive commitments, such as building new plants, coupled with reliance on short-term pricing, can be very risky. The following exhibit shows the credit rating of the three IPPs that went bankrupt, before filing for and after emerging from bankruptcy.

EXHIBIT 5-4
US IPP Credit Rating Before and After Bankruptcy

Company Name	Date of Filing in to Bankruptcy	S&P Rating before Bankruptcy	Date of Emerging from Bankruptcy	S&P Rating after Bankruptcy
NRG Energy Inc.	14-May-03	N.A.	23-Dec-03	N.A.
Mirant Corporation	14-Jul-03	D (WR)	20-Jan-05	B+
Calpine Corporation	21-Dec-05	D	1-Feb-08	B

Source: SNL Financial
Note: The ratings quoted in the table represent the ratings that were published closest to the event date.

5.7 PROPOSED MANITOBA HYDRO SALES CONTRACTS

As discussed previously, Manitoba Hydro is proposing to enter into new contracts with three U.S. utilities: (1) NSP, (2) MP, and (3) WPS. Over the next ten years, these new contracts in conjunction with the existing contracts, are expected to result in 45 percent of export volume sales from dependable and new proposed sales, and 55 percent from opportunity sales. On the revenue side, dependable and new proposed sales are expected to provide 30 percent of the revenues with the rest coming from opportunity sales (see Exhibit 5-5). In other words, Manitoba Hydro has diversified its export portfolio.

EXHIBIT 5-5
Manitoba Hydro's Projected Dependable, New Proposed, and Opportunity Sales

	VOLUME (MWh)				REVENUE ($millions)			
Period	Total Export Sales	Dependable Sales	New Proposed Sales	Opportunity Sales	Total Export Revenue	Dependable Sales	New Proposed Sales	Opportunity Sales
2009/10	8,495	3,121		5,374	546	180		443
2010/11	6,129	3,587		2,542	465	166		299
2011/12	7,071	3,570		3,501	477	170		307
2012/13	7,109	3,456		3,653	498	166		332
2013/14	6,927	3,361		3,566	509	164		345
2014/15	6,860	3,361		3,499	524	169		355
2015/16	6,379	[redacted]	[redacted]	[redacted]	624	[redacted]	[redacted]	[redacted]
2016/17	6,432	[redacted]	[redacted]	[redacted]	649	[redacted]	[redacted]	[redacted]
2017/18	6,003	[redacted]	[redacted]	[redacted]	651	[redacted]	[redacted]	[redacted]
2018/19	6,833	[redacted]	[redacted]	[redacted]	800	[redacted]	[redacted]	[redacted]
Average /Total	68,238	[redacted]	[redacted]	[redacted]	5,743	[redacted]	[redacted]	[redacted]

Source: Information provided by Manitoba Hydro

5.8 CONCLUSIONS

Long-term contracts are appropriate and an important part of MH's portfolio of export sales arrangements. They help prevent rate shocks and financial problems. They facilitate transmission investment and allow for prices to reflect the benefits of avoided generation investment. They are widely used in the industry, and failure to use them would be inconsistent with prevailing practice. This is especially true when coupled with risk mitigation strategies pursued by MH discussed elsewhere in the report.

CHAPTER SIX
Analysis of the Adequacy of Export Sale Transaction Pricing

6.1 INTRODUCTION

Under this task, ICF reviewed the adequacy of price that Manitoba Hydro derives (or will derive) from export sale transactions with emphasis on long-term prices. ICF also reviewed the process used to develop a consensus price that forms the basis for price negotiations under long-term contracts. ICF concluded that the pricing is adequate.

ICF based this conclusion on a review of the following considerations:

- **Historical Spot Prices** – Manitoba Hydro's proposed export contract prices are well above historical spot prices, even the recent record high spot prices experienced in the MISO market. Indexing will cause prices to maintain this premium in real terms.

- **Existing Contract Prices** – Manitoba Hydro's proposed export contract prices are well above average existing contract prices, i.e., more than [redacted] percent higher.

- **Domestic Generation Service Prices** – Manitoba Hydro's proposed export contract prices are well above domestic rates for generation services, i.e., nearly [redacted] times as high.

- **ICF Wholesale Price Forecasts Available at the Time of Negotiations** – Manitoba Hydro's proposed contract prices are above [redacted] forecast of prices available at the time contract negotiations were ongoing. Thus, Manitoba Hydro appears to have properly accounted for the then current price forecasts in their negotiations. We believe the most important consideration is the information available at the time of negotiations.

- **Consensus Price Forecasts** – Manitoba Hydro prices are even higher than the consensus forecasts, i.e., the average of forecasts from five independent consultants. [redacted]

- **Approach to Future Price Forecasting** – The approach of using consensus forecasts [redacted] for pricing long-term contracts is reasonable. This helps guard against seller's regret, i.e., regret if spot prices turn out to be higher, and ensures Manitoba Hydro negotiators have access to up-to-date information.

- **Incremental Production Costs** – Manitoba Hydro's proposed contract prices are also above the costs of producing the power. This is based on a Manitoba Hydro study which does not account for all the benefits of the export sales, i.e., the premium over costs is larger than estimated.

- **Non-Price Benefits** – The long-term export contracts provide significant non-price benefits as discussed in the previous chapter. These include lower variance in revenues, and transmission construction benefits. A later chapter discusses long-term contract terms and conditions and associated risks related to these items.

- **Market Timing and Trends** – ICF believes it has been a reasonable time to enter into long-term contracts. While trends have been for increasing prices, which argues for waiting for even higher prices, there are some counter trends and risks to waiting. Put another way, Manitoba Hydro should guard against perfection of selling at the exact market peak being the enemy of the good (i.e., taking advantage of the strong market that has emerged). Lastly, as discussed elsewhere, there are numerous risk mitigation steps that guard against this regret including heavy reliance on short-term sales and the potential to renegotiate a portion of the contracts in ten to fifteen years when more information is available on CO_2 controls and other uncertainties.

As a general matter, ICF believes that the determination of pricing adequacy must be based on a multiplicity of information sources and considerations. For example, it is useful and important to consider available forecasts because these forecasts account for changing marketplace supply and demand fundamentals. The key market uncertainties addressed in the [redacted] forecast include natural gas pricing, potential CO_2 controls, renewable portfolio standards, electricity demand trends, etc. However, some consideration should also be given to historical price data and forward prices.

The determination of how to use the different sources of information, i.e., the weight to give to forecasts, history and forwards, needs to account for the limitations of each source. Forecasts tend to underweight year-to-year volatility and disequilibrium. Forward pricing is usually very thin beyond a few years, and hence, price discovery may be limited to negotiations and feedback from potential buyers. Finally, history may not forecast the future when there are changing supply and demand considerations, for example, potential CO_2 regulations.

In this particular case, most data strongly supports the adequacy of price. Waiting in the hope of achieving even higher prices is not recommended for the following reasons:

- Some of the contract pricing is at spot market prices, and if prices turn out to be higher, Manitoba Hydro will capture this upside [redacted]).

- Further, Manitoba Hydro intends to sell approximately half of its surplus supply at short-term market prices; this is another chance to catch the upside.

- The proposed contracts end in 2025 to 2032 allowing for renegotiation in the 2020-2030 period.

- While the price trend has been mostly upward and is likely to continue to be higher, Manitoba Hydro has pressing needs (transmission upgrades).

- Also, the risks of power prices not meeting expectations is serious as evidenced by the 50 percent drop in MISO prices.

- Prudent decision makers also need to guard against the risks of unexpected developments such as power plant overbuilding, especially of wind, lower natural gas pricing, a decrease in the capital costs of construction of competing sources of power, lower electricity demand due to energy efficiency improvement, and a lower CO_2 price than expected due to greater use of command and control regulations instead of market mechanisms to control CO_2 or less stringent market oriented regulations in response to political pressures in the U.S. and elsewhere.

- Lastly, some weight needs to be given to the emergence of pressure to use local U.S. resources, (e.g., wind) especially those that require less transmission upgrades.

The rest of the chapter explores these issues in further detail and is organized as follows. The next section discusses Manitoba Hydro's process for negotiation of long-term contracts. The third section provides an overview of the prices under long-term export contracts, both existing and potential. The fourth section discusses the adequacy of prices negotiated under long-term contracts, and finally, the fifth section discusses the diversity in pricing terms.

6.2 PROCESS FOR NEGOTIATING LONG-TERM EXPORT CONTRACT PRICES

The process by which Manitoba Hydro determines pricing for long-term contracts is reasonable. The Corporation receives the forecasts of five forecasting firms, including [redacted], and determines an average. It [redacted] average and uses this adjusted average as a [redacted] for potential contracts. Manitoba Hydro attempts to [redacted] and also gives some consideration to the [redacted].

This approach is useful because it allows Manitoba Hydro to keep current with market developments, provides decision makers supplemental information likely available to potential buyers, represents deliberate consideration of market conditions using sophisticated modeling, and helps prevent seller's regret, i.e., that ex-post, the contract sales price is seen to be too low.

6.3 LONG-TERM EXPORT CONTRACTS PRICES

6.3.1 Proposed Contracts

Manitoba Hydro has negotiated binding term sheets with three U.S. utilities. These include: (1) a contract with NSP for delivery of electricity from 2015 through 2025 with both an on-peak annual supply and [redacted] to take advantage of the fact that demand of MISO utilities generally peak in the summer while Manitoba Hydro demand peaks in the winter, (2) a contract with WPS for delivery of electricity from 2018 through 2032, and (3) a contract with MP for delivery of electricity from 2020 through 2035. The prices negotiated between Manitoba Hydro and these utilities provide the Corporation with a fixed payment for the availability of generation capacity, and an energy payment for the actual delivery of electrical energy. The capacity payment allows the Corporation to recover most of its fixed costs while the energy payment is sufficient to recover its operating costs and required margins. However,

in light of the low variable costs on Manitoba Hydro's system, the energy payment primarily gives an added incentive for the Corporation to provide reliable energy supply.

The proposed contracts are summarized in Exhibit 6-1. These contracts will provide the Corporation with [redacted] on average toward capacity payment and approximately [redacted] toward peak energy delivery. On a per MWh basis, these potential contracts are expected to provide an overall on-peak firm price of approximately [redacted] (2008$).[53]

The proposed contract prices reflect the expectation that average price of power is likely to increase in the future from current levels. A primary driver of the increase in projected prices is the expectation surrounding carbon regulation in the near future. Namely, there will likely be a cap and trade program with a CO_2 allowance price or CO_2 tax and that the CO_2 price level will increase over time. The further out the contracts extend, higher are the negotiated prices. The [redacted] contract with delivery through [redacted] has lower levelized prices than the other contracts with delivery [redacted] out into the future. The potential contract with [redacted] with delivery ending in [redacted] has highest firm on-peak price of [redacted] percent higher than prices negotiated with [redacted] with delivery ending in [redacted], and [redacted] percent higher than prices negotiated with [redacted], with delivery ending in [redacted].

[53] The on-peak firm power price is a sum of on-peak energy price and capacity factor levelized capacity payment. All average prices represent generation weighted average prices.

EXHIBIT 6-1
Summary of Potential Contracts (Including Diversity Exchange)

Contract	Contracted Capacity (MW)	Energy Delivery Type	Negotiated On-Peak Firm Price (US$/MWh)	Price Index	Duration
NSP	375 – 500	Guaranteed On-Peak Energy and additional Weekend Energy	[redacted]	[redacted]	2015 to 2025
NSP-Diversity Exchange	350	Summer/Winter Diversity Exchange Energy	[redacted]	[redacted]	2015 to 2025
MP	250	Guaranteed On-Peak Energy, additional Weekend Energy	[redacted]	[redacted]	2020 to 2035
WPS	150 – 500	Guaranteed On-Peak Energy and additional Weekend Energy	[redacted]	[redacted]	2018 to 2032
Total/ Average	**1,125 - 1,600**		[redacted]		

Sources: Summary of LT contract.doc and individual terms sheets of NSP, MP and WPS
Notes:
1. MP contract includes 250 MW System Power Participation Sale for the 2020 through 2035 period and a total of 3.3 million MWh non-firm energy sales for the 2008 through 2022 period. The realized on-peak price ($/MWh) to Manitoba from MP System Participation Sale will be comprised of levelized capacity payment and average of fixed energy price and Minnesota Hub index price applicable to peak hour energy delivery. The on-peak price of [redacted]/MWh represents only the fixed component.
2. Average on-peak price is weighted by generation.
3. Details of the contract terms are shown in Chapter 7

6.3.2 Existing Contracts

Manitoba currently sells 1,470 MW under long-term contracts. Counterparties are in MISO including MP and NSP, two buyers of the proposed new contracts, and several smaller primarily public power entities including GRE, Otter, MMPA, and SMMPA. Only WPS is a new long-term buyer under the proposed contracts. Most of the existing contracts end by 2015[54], when the NSP contract is proposed to start. Note, the MP and WPS proposed contracts start later and are associated with the acceleration of the construction of the Conawapa and Keeyask hydro facilities.

Manitoba Hydro's existing long-term contracts were in effect as early as 1995 (see Exhibit 6-2) when power prices were significantly lower than prices witnessed in spot markets in the recent years and were primarily determined by base load capacity or to a limited extent by natural gas fired power plants as the price setting marginal unit. The average capacity price the Corporation obtains from these contracts is [redacted] and average energy payment is

[54] The NSP diversity exchange contract ends in 2016 but has been extended to continue to 2019 in winters.

approximately [redacted] resulting in on-peak firm power price of US$56/MWh (all prices in 2008 US$).[55] The pricing terms of the existing contracts are summarized in Exhibit 6-3.

EXHIBIT 6-2
Manitoba Hydro's Existing Contracts (Including Diversity Exchange)

Buyer	Capacity (MW)	Start Date	End Date
MP	50	05/01/09	04/30/15
NSP	500	05/01/05	04/30/15
NSP (Diversity Exchange)	150	05/01/95	04/30/15
NSP (Diversity Exchange)	200	11/01/96	10/31/16
Otter	50	05/01/00	04/30/15
GRE (Diversity Exchange)	150	05/01/95	04/30/15
MMPA	60	05/01/00	04/30/09
MMPA	30	05/01/09	04/30/12
SMMPA	30	04/01/08	03/31/13
MP (Non-Firm Energy)	250	05/01/08	04/30/22
Total	1,470	NA	NA

Source: Summary of LT Contract.doc (received from Manitoba Hydro)

EXHIBIT 6-3
Existing Contract Price Summary for System Participation Contracts

Contract Name (Existing Buyer)	Contract (MW)	Capacity Price (2008 US$/KW-yr)	On-Peak Energy Price (2008 US$/MWh)	Average On-Peak Firm Price (2008 US$/MWh)
MP	50	[redacted]	[redacted]	[redacted]
NSP	500	[redacted]	[redacted]	[redacted]
Otter	50	[redacted]	[redacted]	[redacted]
MMPA	60/30	[redacted]	[redacted]	[redacted]
SMMPA	30	[redacted]	[redacted]	[redacted]
MP-NFE	250	[redacted]	[redacted]	[redacted]
Average		[redacted]	[redacted]	**55.7**

Source: Summary of LT Contract.doc (received from Manitoba Hydro)
Notes:
1. Annual escalation of 2.5 percent is assumed
2. Average price represents generation (MWh) weighted average price of individual contract prices
3. Actual capacity factor of each contract is used to levelize the capacity payment
4. The above summary excludes sales categorized under 'Diversity Exchange Agreement'

6.4 ADEQUACY OF PRICES NEGOTIATED UNDER LONG-TERM CONTRACTS

6.4.1 Comparison of Prices of Existing and Potential Contracts

A comparison between the existing and potential contracts shows marked increase in prices likely to be obtained by the Corporation from the proposed future long-term power sales (see

[55] Source: Summary of LT Contracts.doc (received from Manitoba Hydro)
Note: The average contract energy price represents energy weighted average of fixed component of individual contract prices. Annual escalation of 2.5 percent is assumed.

Exhibit 6-4). The proposed contract price is [redacted] percent higher in real terms than the existing average contact price. This is a favorable fact in favor of our overall conclusion that the proposed pricing is adequate.

While the average capacity component of potential contracts is [redacted] than that of the existing contracts, the average energy component of potential contracts is almost [redacted] than that of the existing contracts. The increase in energy prices in the potential contracts reflects a shift toward natural gas fired plant as the price setting marginal unit and the expectation of tighter environmental regulations. As noted, this pricing also increases Manitoba Hydro's incentive to deliver electricity.

EXHIBIT 6-4
Existing and Potential Contract Price Summary for System Participation Contracts

Contract	Capacity	Capacity Price	On-peak Energy Price	Average Price
Existing	**(MW)**	**(2008 US$/kW-yr)**	**(2008 US$/MWh)**	**(2008 US$/MWh)**
MP	50	[redacted]	[redacted]	[redacted]
NSP	500	[redacted]	[redacted]	[redacted]
Otter	50	[redacted]	[redacted]	[redacted]
MMPA	60/30	[redacted]	[redacted]	[redacted]
SMMPA	30	[redacted]	[redacted]	[redacted]
MP-NFE	250	[redacted]	[redacted]	[redacted]
Average		[redacted]	[redacted]	**55.7**
Potential				
NSP	375-500	[redacted]	[redacted]	[redacted]
MP	250	[redacted]	[redacted]	[redacted]
WPS	150-500	[redacted]	[redacted]	[redacted]
Average		[redacted]	[redacted]	[redacted]

Source: Summary of LT Contract.doc (Received from Manitoba Hydro)
Notes:
1. Annual inflation of 2.5 percent has been assumed
2. Average price represents generation (MWh) weighted average price of individual contract prices
3. Actual capacity factor of each contract is used to levelize the capacity payment
4. The above summary excludes sales categorized under 'Diversity Exchange Agreement'
5. For contracts, such as Potential MP (250 MW) contract, wherein energy price is represented [redacted], only fixed price has been considered.

6.4.2 Export Contract Prices Versus Domestic Generation Prices

Manitoba Hydro exports its surplus energy to the MISO market both under contracted long-term sales as well as short-term opportunity sales. Over the last nine years, on average, it has exported 30 percent of its energy to MISO and has derived approximately 37 percent of its revenue from these export sales. The generation component of domestic Manitoba Hydro rates is approximately $27/MWh[56] Canadian versus existing contract prices of $[redacted]/MWh U.S., and proposed prices of [redacted] U.S. This is a favorable finding supporting the adequacy of price.

[56] Manitoba Hydro Prospective Cost of Service Study (for year ended March 31, 2006)

The export sales, in combination with reliance on long lived legacy hydro supply, have helped enable Manitoba to achieve the lowest electricity rates in North America and have helped postpone construction of several large power plants in the MISO market.

6.4.3 Existing Long-Term Contract Prices Are Adequate With Respect To Historical Spot Market Prices

Historical spot on-peak prices in northern MISO have averaged US$ 51/MWh (2008$) for years 1997 through 2008. The average firm on-peak price for the existing long-term system participation contracts is approximately US$56/MWh in real 2008$ (see Exhibit 6-4), or roughly 10 percent higher than the average historical spot prices at $51/MWh. As is discussed later, because proposed prices are [redacted] than existing, the premium to historic spot is even greater.

Disaggregation of the existing contracts and their pricing also reveals the effects of market trends on contract pricing (see Exhibit 6-5). The oldest vintages, i.e., mid-1990s have the lowest prices of around [redacted]/MWh. Later vintages, i.e., 1998 – 2003, respond to U.S. capacity shortages in the late 1990s. The latest vintages reflect the high natural gas prices and increasing reliance on natural gas generation during the on-peak due to the lack of construction of base load power plants in MISO. On average, 1997-2003 northern MISO on-peak power prices were 25 percent lower than the average existing contract prices. Put another way, driven by shortages and high natural gas prices, spot market electricity on-peak prices increased and exceeded the average long-term prices of the Corporation's older existing contracts during 2005 through 2008. The more recent existing contract prices are higher as Manitoba Hydro proactively kept pace with the market.

EXHIBIT 6-5
Existing Contracts of Manitoba Hydro (Including Diversity Exchange)

Buyer	Capacity (MW)	Start Date	End Date	Contract On-Peak Firm Price (2008 US$/MWh)
MP	50	5/1/2009	4/30/2015	[redacted]
NSP	500	5/1/2005	4/30/2015	[redacted]
NSP (Diversity Exchange)	150	5/1/1995	4/30/2015	[redacted]
NSP (Diversity Exchange)	200	11/1/1996	10/31/2016	[redacted]
Otter	50	5/1/2000	4/30/2015	[redacted]
GRE (Diversity Exchange)	150	5/1/1995	4/30/2015	[redacted]
MMPA	60	5/1/2000	4/30/2009	[redacted]
MMPA	30	5/1/2009	4/30/2012	[redacted]
SMMPA	30	4/1/2008	3/31/2013	[redacted]
MP (Non-Firm Energy)	250	5/1/2008	4/30/2022	[redacted]
Total	1,470			[redacted]

Source: Signed contracts and term sheets
Note: Average price represents generation weighted average price of individual contracts

Most recently, the MISO pricing trend has dramatically reversed, albeit temporarily, in ICF's opinion. Year-to-date on-peak MISO spot prices have fallen dramatically (by approximately 50 percent) in response to the recessionary market conditions which include very low natural gas

prices. Off-peak prices, which reflect the costs of coal-fired generation, have been much more stable.

Historical MISO spot market electricity prices are shown in the following two exhibits. Thus, while the spot market has witnessed significant volatility in prices, the long-term contracts have provided the Corporation with a more stable revenue source.

EXHIBIT 6-6
Historical MISO Energy Price (Real 2008 US$/MWh)

Year	On-Peak	Off-Peak	All-Hours
1997	29.0	14.0	21.1
1998	37.3	15.1	25.5
1999	49.4	13.6	30.4
2000	47.6	18.0	31.2
2001	44.6	18.0	30.5
2002	32.3	16.4	23.8
2003	50.6	20.1	34.4
2004	51.5	22.7	36.2
2005	69.6	32.3	49.8
2006	62.4	29.4	51.3
2007	73.1	30.3	58.8
2008	62.0	25.3	49.8
2009 YTD	31.2	22.3	28.2
Standard Deviation	**14.5**	**6.4**	**12.1**
Average Price (1997-2009 YTD)	**49.3**	**21.3**	**36.2**
Average 1997 – 2003	**41.5**	**16.4**	**28.1**
Average 2004 – 2009 YTD	**58.3**	**27.0**	**45.7**

Source: 1997-2000 MAPP Weekly Index; 2001-2005 Northern MAPP Weekly Index; 2005-2009 YTD MINN HUB Weekly Index from Power Market Week

EXHIBIT 6-7
MISO Spot Pricing (Nominal US$/MWh)

Year	On-Peak	Off-Peak	All-Hours
1997	22.1	10.7	16.0
1998	29.2	11.8	19.9
1999	39.5	10.9	24.3
2000	39.0	14.7	25.6
2001	37.5	15.1	25.6
2002	27.8	14.1	20.6
2003	44.7	17.8	30.4
2004	46.6	20.5	32.8
2005	64.7	30.0	46.3
2006	59.4	28.0	48.9
2007	71.3	29.5	57.4
2008	62.0	25.3	49.8
2009 YTD	31.9	22.8	28.9
Standard Deviation	15.6	7.1	13.3

Source: 1997-2000 MAPP Weekly Index; 2001-2005 Northern MAPP Weekly Index; 2005-2009 YTD MINN HUB Weekly Index from Power Market Week

6.4.4 Existing Export Contract Prices Are Also Adequate With Respect To The Corporation's Cost of Production

According to the Corporation's most recent cost of service study (for year ending March 31, 2006), whereas costs attributable to export sales constituted approximately 13 percent of total costs, these sales provided 32 percent of total revenues. While these statistics do not necessarily reflect the price adequacy of long-term contractual export sales per se, they do underscore the profitability of export sales in general.

The net export revenues are used to lower domestic rates and constitute one of the primary reasons for the rates in Manitoba being not only well below prices in wholesale deregulated markets in which it sells its surplus output, but also well below rates in all major Canadian and U.S. jurisdictions. The above referenced study indicates that export sales provided a 19 percent overall cost reduction to domestic rates. Also, current ratepayers are benefiting from past investments in hydroelectric dams made by earlier Manitoba Hydro ratepayers and partly paid for by export sales.

Hydroelectric power plants have the longest lifetimes of major power plants. The average age of U.S. power plants is approximately 32 years versus 55 years for U.S. hydroelectric plants (on a capacity weighted average basis). Thus, plants accelerated to serve exports can have very long service and create a legacy endowment to the Province.

The lifetime of hydro plants can be further enhanced to the extent CO_2 emission regulations are enacted, i.e., CO_2 regulations increase the value of hydroelectricity. It should be noted on June 26, 2009, the U.S. House of Representatives passed the Waxman Markey cap and trade CO_2 control bill. This Bill has not been approved by the U.S. Senate. However, it is the first time a legislative proposal controlling CO_2 has passed either chamber of the U.S. Congress. Also, this

Bill contains stringent CO_2 controls which progressively tighten. By 2050, CO_2 emissions are required to be 83 percent below baseline levels, an unprecedentedly stringent legislative requirement. While ICF expects moderation in final legislation, and accounts for CO_2 controls in its forecasts, the existence of Manitoba Hydro's current opportunity owes much to CO_2 concerns. At the same time, Manitoba Hydro faces competition from other generation sources including wind, nuclear, biomass, and solar. In many cases, these sources require less transmission and have what some authorities believe is an advantage of being located in the U.S.

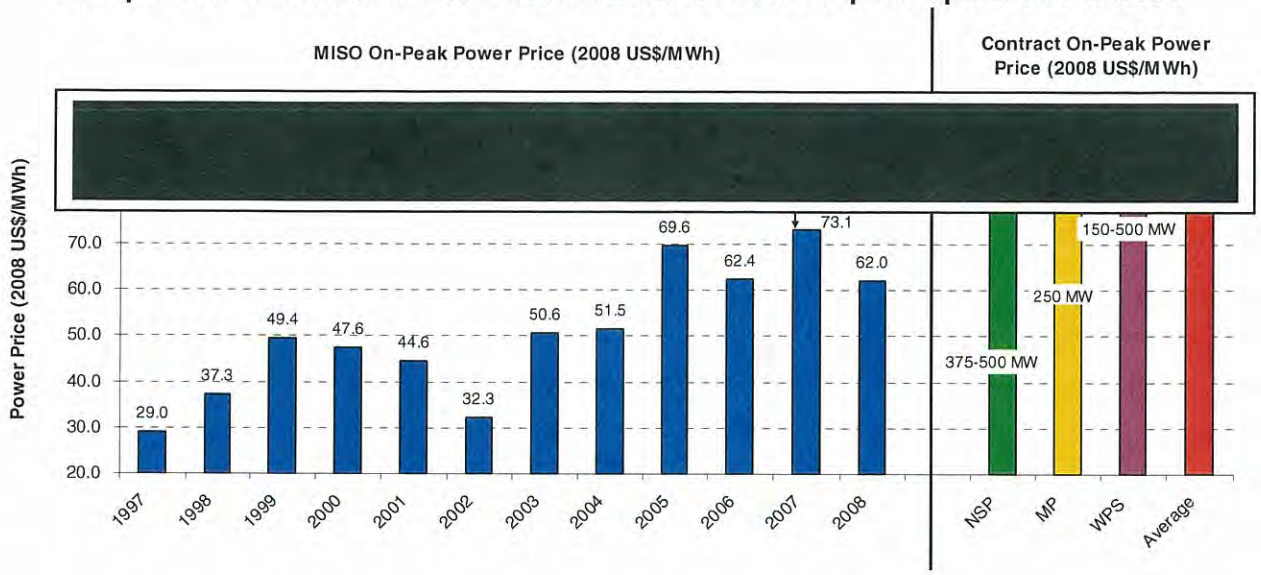
Thus, in summary, the existing long-term contracts negotiated by the Corporation have and continue to provide the company with a premium over domestic costs. Also, these long-term contracts help shield the company from the volatility of the spot markets and provide a steady stream of revenues well above the average market prices. These contracts, therefore, not only help lower the domestic rates for Manitoba customers but also increase the stability of these rates.

6.4.5 Potential Long-Term Export Contract Prices Are Adequate With Respect To Historical Spot Market Prices

The average proposed contract on-peak firm power price is [redacted] percent higher than 1997-2008 MISO on-peak spot prices. *As well, the proposed contract prices are [redacted] percent higher than 2007 MISO on-peak price, the highest on-peak prices ever recorded in MISO (see Exhibit 6-8).*

Both the [redacted] and the [redacted] contracted prices are significantly higher than the historical MISO spot market prices. Specifically, the firm price negotiated with [redacted] is [redacted] percent higher than 1997-2008 MISO prices, and [redacted] price is [redacted] percent higher than 1997-2008 MISO prices. Unlike the [redacted] and [redacted] contracts which include a fixed price, the [redacted] contract has a [redacted] component of price, and a component [redacted]. This provision links the contract more closely to [redacted]. As well, the [redacted] component is [redacted] percent higher than historical 1997-2008 MISO prices. Thus, the potential long-term contract prices are adequate with respect to historical spot market prices. The following exhibit compares the average on-peak price of the potential contracts with the MISO spot on-peak prices.

EXHIBIT 6-8
Comparison of Contract Prices With Historical MISO On-peak Spot Power Prices



Source: 1997-2000 MAPP Weekly Index; 2001-2005 Northern MAPP Weekly Index; 2005-2009 YTD MINN HUB Weekly Index from Power Market Week
Note: Contracted energy price with [redacted] is the average of a [redacted] price; [redacted] reflects only the fixed component of the contracted price

6.4.6 Potential Long-Term Export Contract Prices Are Also Adequate With Respect To [redacted] Price Forecasts Available At The Time Of Contract Negotiations

As discussed previously, Manitoba Hydro typically negotiates long-term prices based in part on projections from a number of independent consultants, including [redacted]. To factor in the premium for long-term stability of prices, it [redacted] to the average projections it receives from five consultants and considers the resulting [redacted] negotiating prices for long-term contracts.

Due to issues of disclosure limitations, ICF does not have the individual projections from [redacted] consultants. Rather, ICF has two sets of published averages of the five forecasts plus [redacted] forecasts. The following exhibit shows two vintages of [redacted] forecasts provided to Manitoba Hydro. These forecasts together with forecasts from [redacted] independent consultants formed the bases for prices contracted in the binding term sheets negotiated by the Corporation with the U.S. utilities.

EXHIBIT 6-9

[redacted] Forecast, On Peak Firm Power Price[redacted] (2008 US$/MWh)

****CONFIDENTIAL****

Year	MRO (North) Mar-06	MAPP (North) Mar-07
2005	[redacted]	[redacted]
2006	[redacted]	[redacted]
2007	[redacted]	[redacted]
2008	[redacted]	[redacted]
2009	[redacted]	[redacted]
2010	[redacted]	[redacted]
2011	[redacted]	[redacted]
2012	[redacted]	[redacted]
2013	[redacted]	[redacted]
2014	[redacted]	[redacted]
2015	[redacted]	[redacted]
2016	[redacted]	[redacted]
2017	[redacted]	[redacted]
2018	[redacted]	[redacted]
2019	[redacted]	[redacted]
2020	[redacted]	[redacted]
2021	[redacted]	[redacted]
2022	[redacted]	[redacted]
2023	[redacted]	[redacted]
2024	[redacted]	[redacted]
2025	[redacted]	[redacted]
2009-2025 Average	[redacted]	[redacted]
2015-2025 Average	[redacted]	[redacted]

Source: ICF Forecasts

Note: Annual escalation of 2.5 percent is assumed

[redacted]

While the overall trend is important, Manitoba Hydro's implementation based on the information available at the time of the negotiation is also very important. The binding term sheet with [redacted] was negotiated in [redacted] and was based on the projections the Corporation received in [redacted] The other two binding term sheets, negotiated with [redacted] and [redacted], were negotiated in

[redacted] and were based on the projections the Corporation received in [redacted]. As Exhibit 6-10 shows, the prices negotiated by Manitoba Hydro are [redacted] percent to [redacted] percent higher than the ICF forecast of prices available at the time the contract prices were negotiated. Note that the contracted prices do not factor in the other benefits from the long-term contracts such as U.S. utilities paying for transmission upgrades on their side of the border. A more complete comparison of the contracted prices with ICF forecasts is provided in Exhibit 6-11. It should be noted that the comparison of contracted prices associated with existing contracts and [redacted] vintage forecasts is for illustrative purposes only; most of the existing contracts were negotiated much earlier.

EXHIBIT 6-10
Comparison of Contracted and [redacted] Projected On-Peak Firm Power Prices

Counterparty of Potential Contract	Contract Duration	Relevant Vintage of [redacted] Forecast	Contracted Firm Price (2008 US$/MWh)	[redacted] 2015-2025 Average Projected Firm Price (2008 US$/MWh)	Contract Price Premium Over [redacted] Forecast
NSP	2015-2025	[redacted]	[redacted]	[redacted]	[redacted]
MP	2020-2035	[redacted]	[redacted]	[redacted]	[redacted]
WPS	2018-2032	[redacted]	[redacted]	[redacted]	[redacted]

Sources:
1. Contract term sheets executed with potential counterparties
2. [redacted] forecasts of firm power prices

Note: Since [redacted] forecasts are available only up till 2025, we have compared all contracted firm prices with the average [redacted] projections for the 2015-2025 period.

EXHIBIT 6-11
Comparison of Export Contract Prices with [redacted] Forecasts – Existing and Potential

Buyer	Capacity (MW)	Start Date	End Date	Contract On Peak Firm Price (2008 US$/MWh)	2006 [redacted] Forecast On Peak Price (2008 US$/MWh)	2007 [redacted] Forecast On Peak Price (2008 US$/MWh)
Existing Contracts						
MP	50	5/1/2009	4/30/2015	[redacted]	[redacted]	[redacted]
NSP	500	5/1/2005	4/30/2015	[redacted]	[redacted]	[redacted]
NSP	150	5/1/1995	4/30/2015	[redacted]	[redacted]	[redacted]
NSP	200	11/1/1996	10/31/2016	[redacted]	[redacted]	[redacted]
Otter	50	5/1/2000	4/30/2015	[redacted]	[redacted]	[redacted]
GRE	150	5/1/1995	4/30/2015	[redacted]	[redacted]	[redacted]
MMPA	60	5/1/2000	4/30/2009	[redacted]	[redacted]	[redacted]
MMPA	30	5/1/2009	4/30/2012	[redacted]	[redacted]	[redacted]
SMMPA	30	4/1/2008	3/31/2013	[redacted]	[redacted]	[redacted]
MP	250	5/1/2008	4/30/2022	[redacted]	[redacted]	[redacted]
Average of existing contracts				[redacted]	[redacted]	[redacted]
% change over existing contract price					[redacted]	[redacted]
Potential Contracts						
NSP	375	5/1/2015	4/30/2025	[redacted]	[redacted]	[redacted]
NSP	125	5/1/2021	4/30/2025	[redacted]	[redacted]	[redacted]
NSP	350	5/1/2015	4/30/2025	[redacted]	[redacted]	[redacted]
MP	250	5/1/2020	4/30/2035	[redacted]	[redacted]	[redacted]
WPS	150	6/1/2018	5/31/2019	[redacted]	[redacted]	[redacted]
WPS	300	6/1/2019	5/31/2020	[redacted]	[redacted]	[redacted]
WPS	500	6/1/2020	5/31/2030	[redacted]	[redacted]	[redacted]
WPS	250	6/1/2030	5/31/2032	[redacted]	[redacted]	[redacted]
Average of potential contracts				[redacted]	[redacted]	[redacted]
% change over potential contracts					[redacted]	[redacted]

Sources:
1. Summary of LT Contracts.doc (received from Manitoba Hydro)
2. [redacted] Forecasts, 2007-2009 vintages
Note: The [redacted] forecasted on-peak power prices represent an average of the forecasted on-peak prices for a period from 2009 till the termination year of the contract.

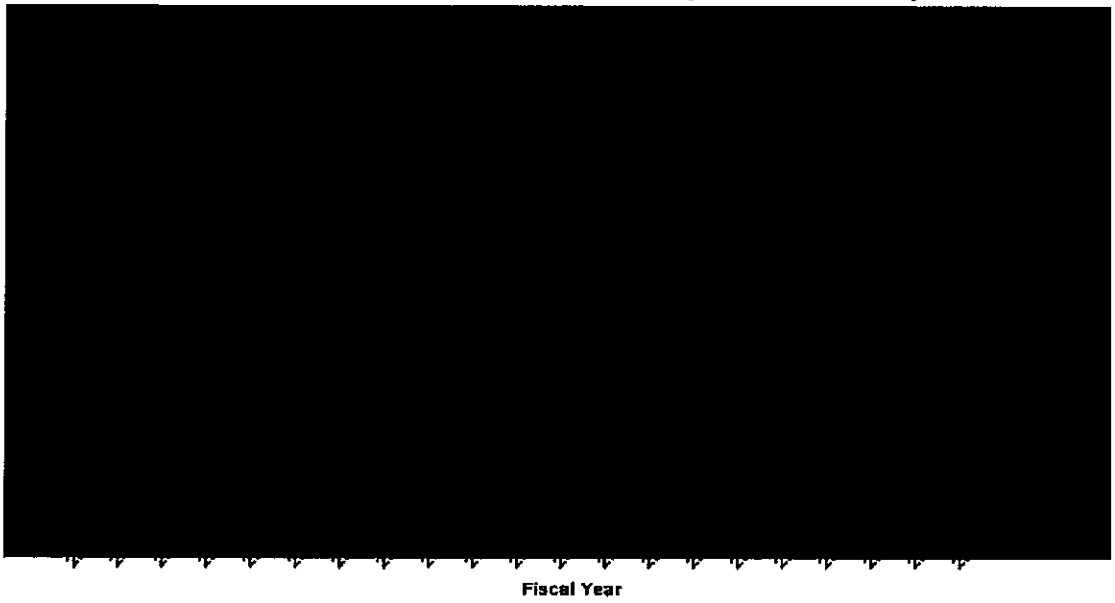
6.4.7 Potential Long-Term Export Contract Prices Also Appear Adequate with Respect to Consensus Forecast

As mentioned previously, [redacted] only had access to two averages of consensus forecasts of power prices (2007 and 2008 vintages). Compared to premium over [redacted] forecasted prices, Manitoba Hydro prices are generally even higher than the consensus forecasts available at the time of contract negotiations. [redacted].

The levelized average price negotiated in the binding terms sheets executed with the U.S. utilities is higher than the 2007 vintage of consensus forecast; [redacted] (since the average 2007 vintage is likely to be higher than the 2006 vintage, and the contracted prices are based on these two vintages), consistent with MH policy.

Specifically, while the 2007 average consultant forecasts start at about US[redacted]/MWh in 2010 and gradually increase to US[redacted]/MWh by 2025[redacted] forecasts range between [redacted] and US[redacted]/MWh (real 2008 USD[redacted], the premium of the contract price to the average forecast price of the five consultants appears to be even greater. The 2007 and 2008 vintages of consensus forecasts are presented in Exhibit 6-12. Exhibit 6-13 compares [redacted] 2007 vintage forecast with the consensus forecast from the similar period.

EXHIBIT 6-12
Comparison of 2007 and 2008 Forecast of Expected Electricity Prices



Source: Manitoba Hydro 2008/09 Power Resource Plan, p.13

EXHIBIT 6-13
Comparison of [redacted] On-Peak Firm Power Price Projections with the Consensus Forecasts
(2008 US$/MWh)

Year	March 2007 Vintage	2007 Consensus	Difference
2010	[redacted]	[redacted]	[redacted]
2011	[redacted]	[redacted]	[redacted]
2012	[redacted]	[redacted]	[redacted]
2013	[redacted]	[redacted]	[redacted]
2014	[redacted]	[redacted]	[redacted]
2015	[redacted]	[redacted]	[redacted]
2016	[redacted]	[redacted]	[redacted]
2017	[redacted]	[redacted]	[redacted]
2018	[redacted]	[redacted]	[redacted]
2019	[redacted]	[redacted]	[redacted]
2020	[redacted]	[redacted]	[redacted]
2021	[redacted]	[redacted]	[redacted]
2022	[redacted]	[redacted]	[redacted]
2023	[redacted]	[redacted]	[redacted]
2024	[redacted]	[redacted]	[redacted]
2025	[redacted]	[redacted]	[redacted]
Average	[redacted]	[redacted]	[redacted]

Sources:
1[redacted] 2007 vintage forecast
2. '2007 Consensus' read approximately from Exhibit 6-13
Note: Annual '2007 Consensus' values are read from the '2007 On-Peak Long-Term Dependable' power price series from Exhibit 6-12.

6.5 CONTRACT APPROACH AND DIVERSITY IN PRICING TERMS

Not only does the Corporation base its contracted prices upon projections from market experts, but it also diversifies the terms and conditions of the contracts it negotiates. Such an approach protects the company from large variations from benchmark market prices. This is discussed further in the last chapter.

CHAPTER SEVEN
Analysis of the Risks in Selling Long-Term Firm Energy in Consideration of Drought

7.1 INTRODUCTION

ICF analyzed the risks assumed by Manitoba Hydro in selling long-term firm energy from dependable resources (in consideration of the requirements to meet firm sale commitments during periods of drought). The risks assumed by the Corporation in selling long-term firm power appear reasonable in consideration of the firm sales commitments during periods of drought. The benefits from these sales and the mitigation undertaken are discussed in Chapter 10. We, however, recommend the adoption of a more explicit Drought Preparedness Plan.

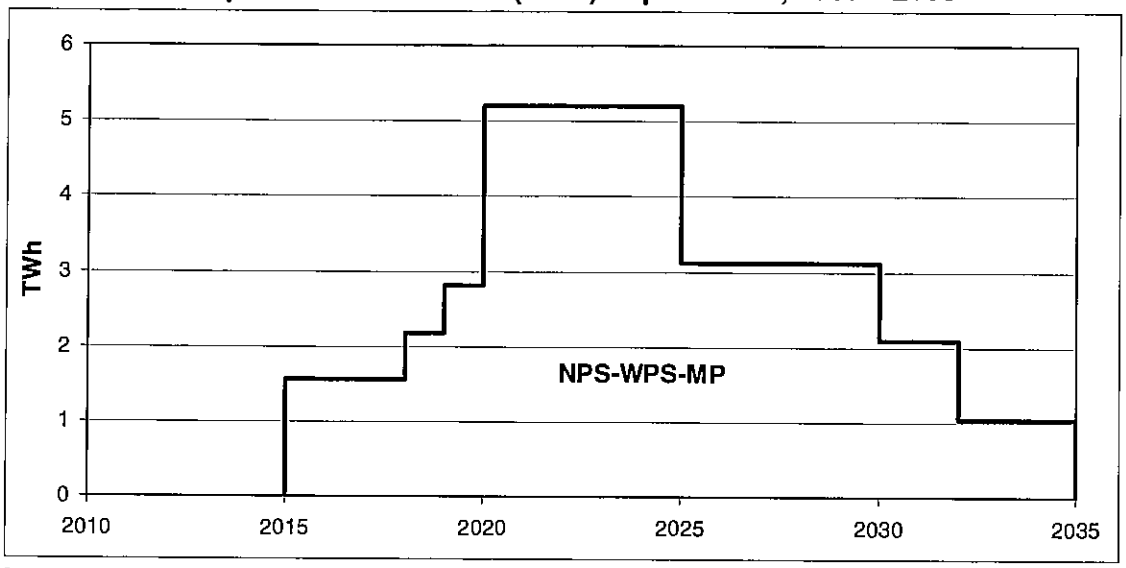
7.2 DESCRIPTION OF PROPOSED FIRM EXPORT SALES

Between 2015 and 2035, Manitoba Hydro is proposing to make long-term firm export sales of power starting in 2015 to three U.S. electric utilities located in MISO: (1) Northern States Power, (2) Wisconsin Public Service, and (3) Minnesota Power. The sales are made on-peak (5x16) all year. The start dates, end dates and sales levels vary considerably over this period. The firm sales start at 1.6 terawatt hours in 2015 and start rising in 2018 (see Exhibit 7-1). Sales peak at 5.2 terawatt hours by 2020-2022. Manitoba Hydro has the option to delay part of the ramp up by up to two years, and hence, the 2020 to 2022 firm sales level can vary (though this variance is not shown). Firm sales start to fall in 2026 by approximately 40 percent once the NSP sales end. All three sales end in 2035. The binding term sheets with MP and WPS also have must-take energy supply provisions during the on-peak hours over weekends (2X16). Exhibit 7-2 illustrates the total on-peak guaranteed as well as weekend must-take energy sale under the binding term sheets.

Note, we do not include diversity exchange as firm obligation. While Manitoba Hydro must sell 350 MW to NSP at a capacity factor of 20 percent, Manitoba Hydro can [redacted]. The price can be [redacted], and hence, can effectively convert firm to non-firm. In any case, Manitoba Hydro's sales to NSP are scheduled for the six month summer season when MISO peaks. Manitoba Hydro peaks during the winter.

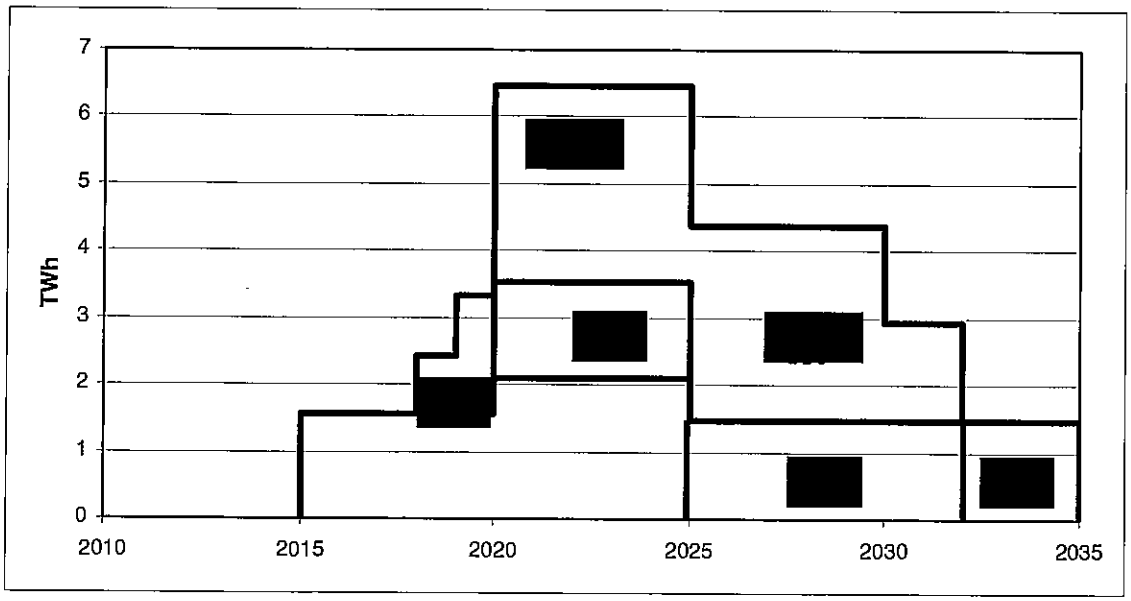
The timing and level of the firm export sales is based on bringing on-line new hydroelectric facilities earlier than required for domestic load. Namely, Manitoba Hydro has plans to bring on-line Conawapa in 2021 and Keeyask in 2018. After the contracts expire, Manitoba Hydro can use the added power for non-firm sales and/or for meeting domestic demand as it grows.

EXHIBIT 7-1
Proposed Firm On-Peak (5X16) Export Sales, 2015 – 2035



Source: Potential contract term sheets
Note: The above graph represents approximate illustration of firm on-peak (5X16) energy supply provisions under the binding term sheets executed with three U.S. utilities. For example, supply options are represented for the entire year without consideration of mid year start or end dates.

EXHIBIT 7-2
Proposed Firm On-Peak (5X16) Guaranteed and Weekend Must-take Export Sales, 2015 – 2035



Source: Potential contract term sheets
Note: The above graph represents approximate illustration of firm on-peak (5X16) and weekend must-take energy supply provisions under the binding term sheets executed with three U.S. utilities. For example, supply options are represented for the entire year without consideration of mid year start or end dates.

A summary of the contract terms is provided in Exhibits 7-3 to 7-5. For proposed contracts with MP and WPS, in the event of a drought, Manitoba Hydro can decrease firm energy volumes by [redacted] percent[57]. In existing firm Manitoba Hydro contracts, such reductions are not permitted to large extent[58]; these are firm system participation sales agreements. .

While the binding term sheets executed with MP and WPS allow Manitoba Hydro to curtail weekend and supplemental energy under adverse water conditions (defined as inability to meet firm energy commitments), the potential contract with NSP, in event of adverse water conditions, gives the Corporation the right to reduce guaranteed energy during winter (Nov - Apr [redacted]

It is emphasized that this chapter on the risks of firm long-term export sales is to be read in conjunction with Chapter 10.

[57] Source: Term sheets of NSP, MP and WPS contracts

[58] The curtailment criteria are not uniform across all existing contracts. In some contracts provision of dispatching later is permitted or reducing energy delivery to some extent is allowed. Hence, for this reason, the IFF sequence (2008/09 Power Resource Plan) energy delivery under each contract is close to the contracted energy.

EXHIBIT 7-3
Potential System Participation Power Sales – Counterparty: NSP

Duration	Contracted Capacity	Energy Supply	Capacity Price (2008US$/kW-year)	Energy Price (2008US$/MWh)	Escalation	Curtailment
May 2015 - April 2025	375 MW	[1] On-peak guaranteed (must-take): 5X16 i.e., 6000 MWh each day [2] Additional: such that total hourly energy does not exceed 375 MWh	[redacted]	[1] On-peak guaranteed: [redacted] [2] Additional: mutually agreed upon price	Both energy and capacity price escalate at [redacted]	In event of adverse water conditions (unable to meet firm load), right to reduce guaranteed energy during winter (Nov -Apr) in [redacted] ---- Energy can be curtailed under following circumstances: (1) unavailability of any portion of MH's generation and/or transmission system, (2) transmission service curtailment between Manitoba Hydro and MP, (3) Force Majeure reasons, and (4) other general rights of curtailment ---- Manitoba Hydro follows a curtailment priority criteria in which firm power delivery takes priority over system participation power sales
May 2021 - April 2025	Additional 125 MW	[1] On-peak guaranteed (must-take): 5X16 i.e., 8000 MWh each day [2] Additional: such that total hourly energy does not exceed 500 MWh				

Source: Executed Contract Term Sheets
Notes: (1) For conversion to real 2008 dollars, annual escalation of 2.5 percent is assumed; (2) the contract capacity is subject to in-service of new generation

EXHIBIT 7-4
Potential System Participation Power Sales – Counterparty: MP

Duration	Contracted Capacity	Energy Supply	Capacity Price (2008US$/kW-year)	Energy Price (2008US$/MWh)	Escalation	Curtailment
May 2008 - April 2022		3.3 million MWh (non firm) over contract term -- categorized into three types of products		Linked to market prices		[redacted] --- Can be curtailed under following circumstances: (1) unavailability of any portion of MH's generation and/or transmission system, (2) transmission service curtailment between Manitoba Hydro and MP, (3) Force Majeure reasons, and (4) other general rights of curtailment --- Manitoba Hydro follows a curtailment priority criteria in which firm power delivery takes priority over system participation power sales
May 2020 - April 2035	<u>May 2020 - April 2022</u> 0 - 250 MW (to be determined at discretion of MH; advice MP six months prior to start of delivery) <u>May 2022 - April 2035</u> 250 MW	<u>May 2020 - April 2022</u> [1] On-peak guaranteed (must-take): 5X16 [2] Weekend (must-take): 16 hrs a day [3] Supplemental: such that total hourly energy does not exceed 250 MWh <u>May 2022 - April 2035</u> [1] On-peak guaranteed (must-take): 5X16 i.e., 4000 MWh each day [2] Weekend (must-take): 16 hrs a day i.e., 4000 MWh each day [3] Supplemental: such that total hourly energy does not exceed 250 MWh	[redacted]	[redacted] [redacted] [3] Supplemental: mutually agreed upon price	Capacity price: [redacted] Energy Price: [redacted]	[redacted] Energy (guaranteed, weekend, and supplemental) can be curtailed under following circumstances: (1) unavailability of any portion of MH's generation and/or transmission system, (2) transmission service curtailment between Manitoba Hydro and MP, (3) Force Majeure reasons, and (4) other general rights of curtailment --- Manitoba Hydro follows a curtailment priority criteria in which firm power delivery takes priority over system participation power sales

Source: Executed Contract Term Sheets
Note: For conversion to real 2008 dollars, annual escalation of 2.5 percent is assumed; (2) the contract capacity is subject to in-service of new generation

EXHIBIT 7-5
Potential System Participation Power Sales – Counterparty: WPS

Duration	Contracted Capacity	Energy Supply	Capacity Price (2008US$/kW-year)	Energy Price (2008US$/MWh)	Escalation	Curtailment
Jun 2018 - May 2019	150	[1] On-peak guaranteed (must-take): 5X16 [2] Weekend (must-take): 16 hrs a day [3] Supplemental: such that total hourly energy does not exceed applicable capacity	[redacted]	[1] On-peak guaranteed [redacted] [2] Weekend [redacted] [3] Supplemental: mutually agreed upon price	Capacity price: [redacted] --- Guaranteed Energy Price: [redacted]	[redacted] --- Energy (guaranteed, weekend, and supplemental) can be curtailed under following circumstances: (1) unavailability of any portion of MH's generation and/or transmission system, (2) transmission service curtailment between Manitoba Hydro and WPS, (3) Force Majeure reasons, and (4) other general rights of curtailment --- Manitoba Hydro follows a curtailment priority criteria in which firm power delivery takes priority over system participation power sales
Jun 2019 - May 2020	300					
Jun 2020 - May 2030	500					
Jun 2030 - May 2032	250					

Source: Executed Contract Term Sheets
Note: For conversion to real 2008 dollars, annual escalation of 2.5 percent is assumed; (2) the contract capacity is subject to in-service of new generation

7.3 DESCRIPTION OF THE RISKS OF FIRM SALES IN CONSIDERATION OF DROUGHT

7.3.1 Drought Outside Historical Record

In the event of a drought worse than the worst year on record, the term sheets executed with MP and WPS have curtailment clauses that give Manitoba Hydro the right to curtail supply of firm energy as needed to meet domestic load, i.e., the Corporation is protected against the need to buy replacement power adding costs to the loss in revenues. Of course, Manitoba Hydro would lose firm as well as non-firm revenues. In the case of the potential contract negotiated with [redacted], however, the company has the right to reduce guaranteed energy during winter in [redacted].

The right to curtail firm energy is paralleled by provisions in the event that the Manitoba Hydro transmission system fails, or there is another system related problem that causes the Corporation not to be able to deliver. Under such circumstances Manitoba Hydro is not required to deliver firm energy under the term sheets executed with MP and WPS if it means not meeting firm domestic load. Again, revenues related to these export sales would be lost. Under the terms negotiated with NSP, the Corporation can use the [redacted] discussed above.

Specifically, the curtailment terms under the binding term sheets allow Manitoba Hydro to curtail energy (guaranteed, weekend, and supplemental) under the following circumstances: (1) unavailability of any portion of MH's generation and/or transmission system, (2) transmission service curtailment between Manitoba Hydro and the counterparty, (3) Force Majeure reasons, and (4) other general rights of curtailment. Such terms and conditions have the effect of significantly reducing the drought related risks faced by the Corporation.

It should, however, be noted that under all circumstances Manitoba Hydro will continue to fulfill its obligation to supply domestic demand.

7.3.2 Drought With Severity Within Historical Record

Manitoba Hydro executes firm contracts with US utilities based on its forecasted dependable energy. Dependable Energy is the energy that is expected to be available to Manitoba Hydro in the event it faces the worst drought it has experienced in the last almost one hundred years. This includes supply from firm imports and domestic fossil generation.[59] If the only event occurring is a drought with severity less than or equal to the worst on record, the Corporation will be able to supply enough energy to meet its firm export commitments as well as its expected domestic demand. However, if expected domestic demand is higher than forecast, or if a Drought Preparedness Plan or System Operations Priorities further curtails exports as it did in the 2003 Drought Management Plan by requiring consideration of the potential for a colder than average winter and higher winter demand than expected, or to protect against a drought worse than in the historical record, there still could be a need to source additional power from the market or to make arrangements with US buyers that decreases the need to deliver power. This power could be used to decrease use of high cost fossil generation.

[59] For example, in the 2008/2009 Power Resource Plan, Dependable Resources for year 2008/09 includes 21.1 TWh of hydro, 4.3 TWh of thermal, 2.8 TWh of imports, and 0.5 TWh of demand side management and wind. See 2008/2009 Power Resource Plan, February 5, 2009, p.41.

Manitoba Hydro's long-term contracted energy supply and curtailment provisions under drought conditions are shown in Exhibit 7-6.

7.3.2.1 Storage Drawdown – Drought Management Plan

According to the Corporation's System Operation Priorities:

> "[a]dequate energy reserves in reservoir storage will be maintained ... These reserves must be sufficient to meet firm load requirements given a repeat of the worst historic flow conditions coincident with firm load demands associated with severe winter weather conditions recognizing the availability of thermal and import energy supplies."[60]

In this regard, the model assumptions adopted by the Corporation during the 2003-04 drought prescribed that the company required sufficient water storage to last another year assuming that an extremely cold winter coincided with a 5 percent worst case water supply.[61]

It should be noted that during the 2003-04 drought, Manitoba Hydro imported purchase power to meet firm obligations and conducted book-outs with customers. This adheres to the Corporation's plan that power is imported or equivalently sourced to serve firm load during drought conditions. Indeed, some imports are considered a part of MH dependable energy supply. It is also our understanding that some of the importing was done to avoid draining fully Manitoba Hydro storage, and to avoid the use of high cost thermal generation. The concern was that until the drought ended, it was possible that the drought could be followed by an adverse drought outside the record or close to the historical record, and/or higher than expected winter demand could occur. Therefore, to prepare for these contingencies, hydro supply had to be husbanded.

7.3.2.2 Domestic Demand Uncertainty

In the event that domestic demand growth is greater than expected, or weather is colder than expected, there is a risk that during a drought within the historical record, Manitoba Hydro cannot meet firm sales requirements. In this case, all else being equal, Manitoba Hydro will have to purchase power in the market or produce required supply using fossil supply to meet its firm obligations. Thus, in addition to losing firm and non-firm revenues, Manitoba Hydro can have higher costs than expected.

Manitoba Hydro has been under forecasting domestic demand growth over the past several years. This follows a period of over forecasting. The cause of the under forecasting has been stronger than projected industrial growth. The risks associated with higher than projected domestic demand and the steps taken by MH to reduce these risks are discussed in greater detail in Chapters 4 and 10.

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[60] See Manitoba Hydro's System Operation Priorities, May 20, 1988.

[61] Manitoba Hydro 2002-2004 Drought Risk Management Review, January 18, 2005, prepared by RiskAdvisory, p.10

7.3.3 Droughts Combined With Other Risks

Extended droughts could occur coincident with other risk events (as discussed in Chapter 4). Most notably, power prices could be higher than expected. Also, other costs could increase such as higher new unit construction costs. Other problems could also occur which exacerbate the financial impact of the drought – e.g., a falling exchange rate which makes it more expensive in Canadian dollars to purchase the replacement power, higher interest rates which increase borrowing costs, etc. The quantification of these risks is discussed in Chapter 9.

Manitoba Hydro has taken steps to mitigate these risks. For example, compared with the existing contracts, Manitoba Hydro's binding term sheets executed with three U.S. utilities are more flexible in terms of curtailing energy. Specifically, the proposed contracts allow for approximately [redacted] percent of energy curtailment and the forecasted dependable energy is sufficient to meet the remaining [redacted] percent of proposed contract energy sales in future years. In addition, in the MP and WPS term sheets, during droughts with severity greater than the worst on record, Manitoba Hydro is not required to purchase energy or run its gas-fired units during on-peak hours to fulfill its supply obligations. Such contract design, contingent on the construction of new hydro plants, substantially mitigates the company's risk related to an extended drought. Various other mitigation policies adopted by the Corporation are further discussed in Chapter 10. Put another way, this chapter is intended to be read in conjunction with Chapter 10.

EXHIBIT 7-6
Potential Long-Term Contract Quantities and Curtailment Provisions under Drought Conditions

Year	[redacted]			[redacted]			[redacted]		
	Firm Contracted Volume (GWh)	Unable to Meet Firm Requirements (GWh)	Minimum Volume During Unprecedented Drought after curtailment	Firm Contracted Volume (GWh)	Unable to Meet Firm Requirements (GWh)	Minimum Volume During Unprecedented Drought after curtailment	Firm Contracted Volume (GWh)	Unable to Meet Firm Requirements (GWh)	Minimum Volume During Unprecedented Drought after curtailment
2015	1,045	1,045	1,045						
2016	1,564	1,564	1,564						
2017	1,564	1,564	1,564						
2018	1,564	1,564	1,564				511	365	0
2019	1,564	1,564	1,564				1,382	987	0
2020	1,564	1,564	1,564	976	697	0	2,429	1734	0
2021	1,912	1,912	1,912	1,460	1042	0	2,920	2,085	0
2022	2,085	2,085	2,085	1,460	1042	0	2,920	2085	0
2023	2,085	2,085	2,085	1,460	1042	0	2,920	2085	0
2024	2,085	2,085	2,085	1,460	1042	0	2,920	2085	0
2025	680	680	680	1,460	1042	0	2,920	2085	0
2026				1,460	1042	0	2,920	2085	0
2027				1,460	1042	0	2,920	2085	0
2028				1,460	1042	0	2,920	2085	0
2029				1,460	1042	0	2,920	2085	0
2030				1,460	1042	0	2,052	1,465	0
2031				1,460	1042	0	1,460	1,042	0
2032				1,460	1042	0	604	431	0
2033				1,460	1042	0			
2034				1,460	1042	0			
2035				476	340	0			
Average	1,610	1,610	1,610	1,368	977	0	2,315	1,653	0

Sources: Summary of LT Contracts.doc, Term sheets of NSP, MP and WPS contracts

Notes:

1. NSP contract has penalty criterion for on-peak energy delivery; hence, the minimum volume during unprecedented drought is the amount of energy on which penalty will be applied
2. WPS and MP contracts are contingent on a new interconnection and 1800 MW of new hydro generation in Manitoba

CHAPTER EIGHT
Analysis of Manitoba Hydro's Involvement in Shorter-Term Merchant Trading Transactions

8.1 INTRODUCTION AND CONCLUSIONS

ICF analyzed the extent to which Manitoba Hydro should be involved in short-term pure merchant energy trading transactions. ICF concluded that Manitoba Hydro should not engage in shorter term merchant non-arbitrage transactions. This is based in part on public entities generally not being involved in these transactions, and lack of stakeholder support for such activities. MH management is not interested in pursuing non-arbitrage merchant transactions.

Also, over the last several years, there is a proven industry history that merchant transactions can be highly detrimental to corporate earnings, as well substantially increase the volatility of earnings and the potential for rate shocks. This is more prevalent in the case of financial transactions rather than physical transactions. As well, these transactions absorb a disproportionate share of corporate resources relative to potential benefits.

Lastly, we emphasize that merchant transactions have much greater risks. Under such transactions the company expects that market prices will change in a manner that justifies a non-balanced transaction – for example, acquire transmission, generation, fuel, emission allowances, fixed trading rights without immediately or almost immediately making an offsetting sale for some period of time – e.g., several months.

As noted, arbitrage merchant transactions are an exception to our general views on merchant transactions. The prime example of such a transaction is the purchase of power and/or related products in one market to be delivered to another market via transmission capacity owned or controlled by Manitoba Hydro or controlled on its behalf by others. Under existing MH risk management policy, such transactions need to be converted from merchant to back-to-back non merchant transactions within three days, for example, a sale of power needs to be accompanied by an offsetting purchase of power and transmission within three days. Actual practice more commonly converts these transactions within one day. Such sales can be advantageous, and arise as a consequence of participation in the marketplace. They also are based on an existing set of known prices, i.e., Manitoba Hydro is not taking price risk. Moreover, Manitoba Hydro is not using its hydro-electric assets to facilitate these arbitrage transactions.

In the unlikely hypothetical case that MH decides to initiate and pursue non-arbitrage merchant transactions (for example, if in the future, circumstances change), MH should pursue them only when it augments and improves its risk management documentation, structures, procedures and systems to support such transactions.

In order to fully mitigate risks during non-drought and drought periods, MH needs to continue to work to bring its risk management infrastructure (documentation, structures, procedures and systems) up to standard industry practices. It should be noted that the Corporation has been taking steps in this direction. For example, it has been developing and expanding the role of its middle office. This is mentioned here although it also relates to mitigation and quantification discussions later. Further improvement will add additional safeguards against execution risks, and expand risk management options.

8.2 ICF REVIEW OF MH RISK MANAGEMENT

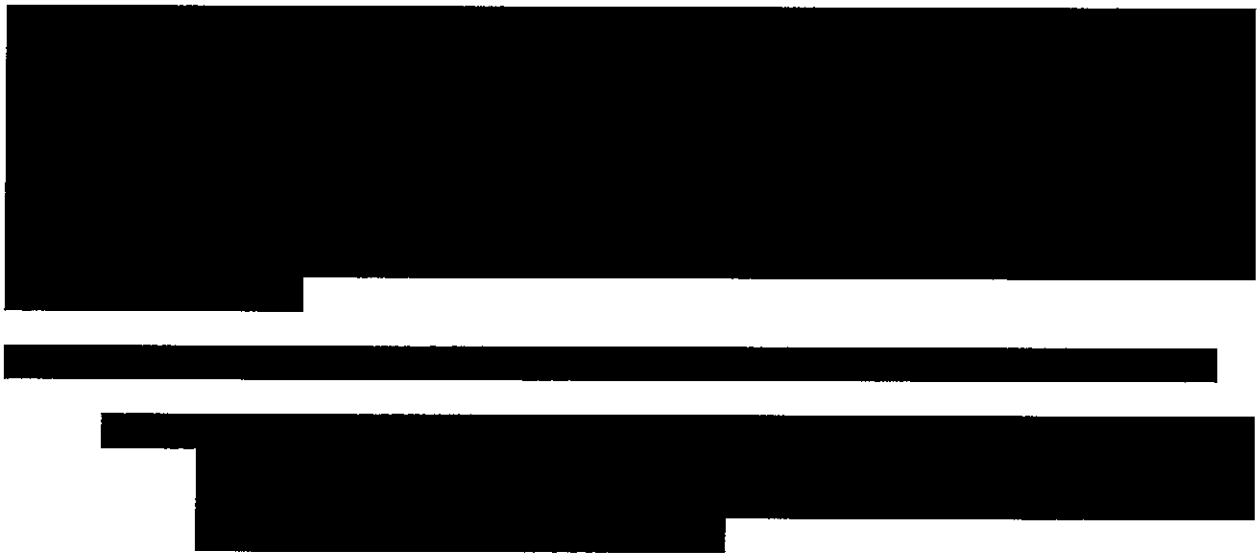
Most power producers include a combination of contracts (long-term and short-term) and merchant (open) positions as well as combinations of commodities in their risk portfolio. The risk portfolio is continuously adjusted based on current and expected market conditions – e.g., delta hedging for some period of time. This policy, if implemented properly, can maximize revenues while keeping risk at acceptable levels.

There is no single solution for all parties since tolerance of volatility varies. However, utilities are often expected to minimize volatility more than many other businesses. Thus, in most cases the financial benefits from a well managed risk portfolio outweighs the implementation and running costs for portfolio management. For Manitoba Hydro, though, one should consider the fact that there are significant capabilities for storage of excess energy that can be used as a (partial) hedge for periods of short droughts.

One of the guiding documents used by ICF in formulating its response to this section is the Management Control Plan (MCP). The scope of this MCP covers all power related transactions in both the United States and Canada, including energy and financial products, for both system and merchant use, as well as associated transactions for related products including transmission, fuel, ancillary services and environmental attributes such as emission credits or allowances, and renewable energy credits.

Manitoba Hydro's MCP consists of a portfolio of risk management mechanisms used to protect the Corporation from unnecessary risk or harm as a result of improper business practices. These mechanisms include application of both corporate wide and divisional policies and procedures, control mechanisms through signing authority requirements and segregation of duties, sophisticated computerized systems, use of budgets and reporting and review.

8.3 MCP – DEFINITIONS AND OBJECTIVES



[redacted]

MERCHANT TRANSACTION OBJECTIVES

[redacted]

8.4 IDENTIFICATION OF RISK FACTORS

Some of the factors that create risk for Manitoba Hydro are considered in the product offerings. These risks include:

- Foreign exchange rates – Contract prices are usually denominated in $US. The resulting contract revenue results in a hedge against the cost of the majority of Manitoba Hydro's debt which is also in $US. Manitoba Hydro manages an ongoing hedging program to manage the risk of unfavorable movements in foreign exchange.
- Curtailment and force majeure – During periods when delivery is not possible, due to severe drought (worse than historic), generation and transmission outages, etc., Manitoba Hydro has the right to curtail in order to protect delivery to Manitoba customers and is not exposed to the cost of providing replacement energy.
- Credit and Legal – Manitoba Hydro is implementing industry best practices in determining appropriate contract provisions through the use of internal and external subject matter experts.

8.5 GOVERNANCE STRUCTURE

The MCP incorporates, subject to updating and other expected changes related to merchant transactions, the existing policies and processes of the Corporation into its framework. Where these policies and processes are invoked during the import and export of power, the oversight required by the Manitoba Hydro-Electric Board and the Export Power Risk Management Committee would also be invoked. As described herein exceptions to the MCP must be reported to the EPRMC.

Manitoba Hydro-Electric Board

MHEB oversight specific to the import and export of power would be related to the following areas:

- Approval of sales requiring new generation, in concert with approving new generation,
- Approval of long-term sales exceeding 5 years and 100 MW,
- Existing oversight activities through current processes and through Executive Management reporting to the MHEB.

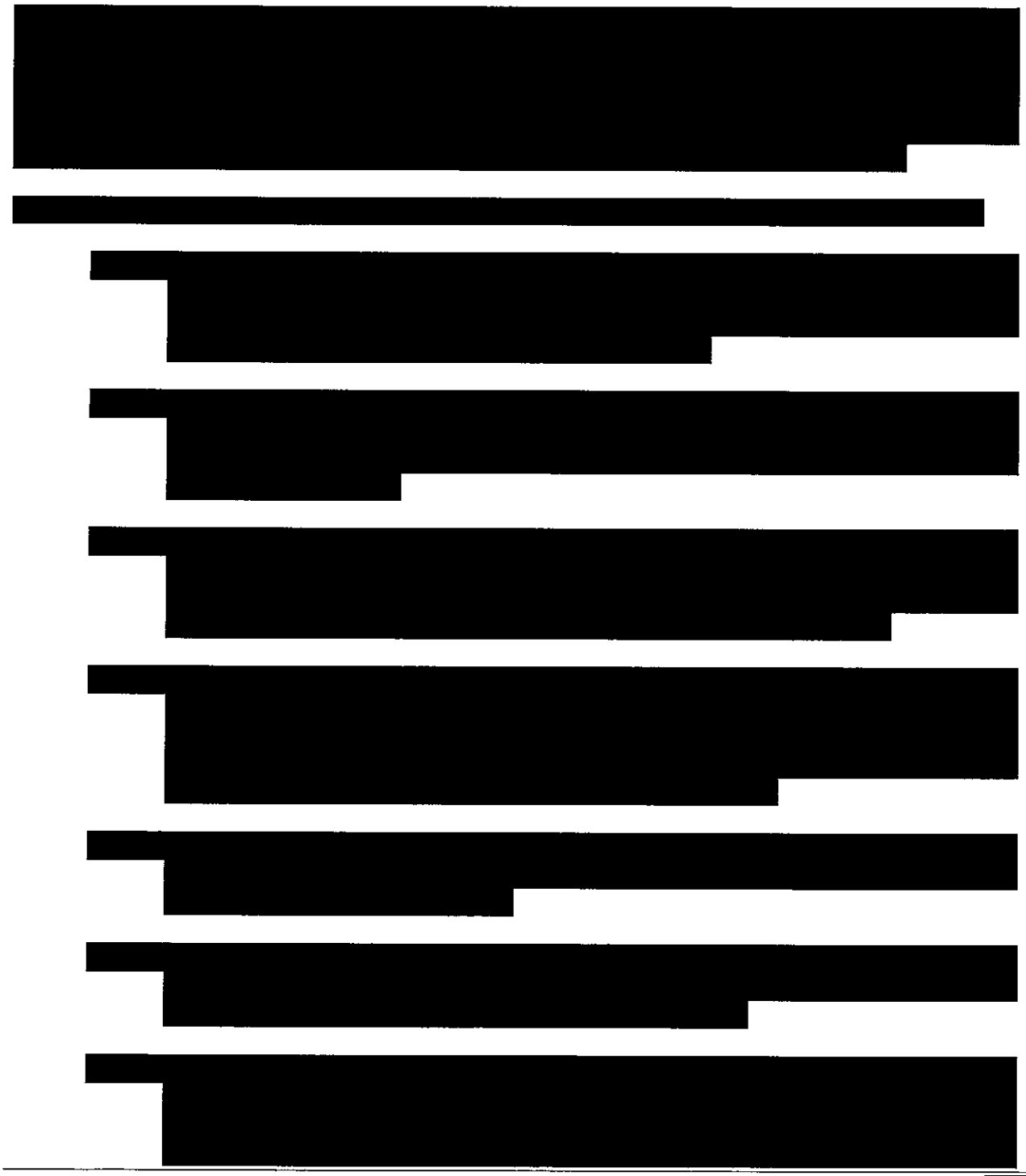
Export Power Risk Management Committee

The scope of the EPRMC is to provide oversight of the management of the energy supply and financial risks resulting from Manitoba Hydro's participation in the export power market. The primary responsibilities of the EPRMC are:

- Review and approve criteria for managing risks associated with energy planning and operations;
- Review and approve criteria for managing risks associated with short-term marketing transactions;

- Review and approve general drought management strategies;
- Review and approve export market policies;
- Receive and review audits and quarterly reports of market activities and transactions;
- Review and approve exceptions to the MCP.

8.6 TRANSACTION AND RISK CONTROLS



[redacted]

8.7 NEXT STEPS

ICF's analysis concludes that MH should improve its risk management documentation, structures, policies and procedures and systems, to further guard against execution risks, expand risk management options, to align merchant trading activities with ICF recommendations and management's own strongly held views on non-arbitrage merchant transaction and bring its risk management infrastructure up to date with standard industry practices in the very near future. This is needed both during droughts and non-drought periods.

CHAPTER NINE
Analysis of Reasonableness of Manitoba Hydro's Quantification of Risk Related to an Extended Drought

9.1 INTRODUCTION

This chapter discusses ICF's review of the reasonableness of Manitoba Hydro's quantification of risk exposure related to an extended drought. Manitoba Hydro examines several scenarios as part of its quantification of the risk of a drought (for example, droughts spanning five and seven years). However, Manitoba Hydro's risk quantification in its most recent Integrated Financial Forecast, reflects only the impacts of a five year drought. In its previous assessments, such as the response to PUB Order 117/06, the Corporation has analyzed the financial impact of droughts spanning different durations.

The most recent five year drought analyzed (starting in 2010/11 and extending through 2014/15) results over a five year period in a $2.7 billion decrease in retained earnings compared to the base case. This estimate includes financing costs of the drought. The decrease in retained earnings grows to $3.5 billion by 2018/19 relative to the base case due to the compounding effects of interest costs. This scenario results in a near elimination of retained earnings, available cash, and other accumulated equity. Put another way, the targeted equity amount is about equal to the lost net revenue in this scenario.

Our assessment of Manitoba Hydro's quantification of risk focuses on two main issues. First, we assess whether the five year drought scenario is reasonably stressful to account for the financial impacts of an extended drought. Second, we assess whether the quantitative simulation of the scenario is reasonable.

The assessment of the stressfulness is based on review of: (1) general approaches to characterizing financial risks such as the choice of confidence intervals, (2) the interaction of drought with other risk events such as high wholesale power prices, (3) starting point of adverse event, (4) availability of mitigation strategies, (5) duration of adverse event, and (6) a comparison of Manitoba Hydro's quantification of risks with those of other organizations.

The assessment of the mechanics of the quantitative simulation is based on our review of Manitoba Hydro's forecasting and simulation tools and a comparison with other approaches. Manitoba Hydro relies primarily on its own system modeling tools such as SPLASH and HERMES, and most recently, a tailored application of PRISM. These models and the company's Integrated Financial Forecasts are employed by the Corporation to quantify the risks associated with an extended drought.

ICF considers Manitoba Hydro's quantification of risk exposure to drought to be reasonable. The scenario examined by the Corporation is reasonably stressful. It is almost equivalent to adopting a 95 percent confidence interval. In any given year there is only a 3.1 percent chance of the onset of a drought equal to or worse than the five year drought examined;[62] a 95 percent confidence interval would have a 2.5 percent chance of occurring or being worse. This is based

[62] The available historical record indicates that in any given year, assuming that each future year has the same chance of being the first year, there is a 3/97, or 3.1 percent chance that the year will be the first of a drought of five years duration or longer. This is discussed further in Section 9.3.

on the assumption that conditions in any future year are unknown to MH. In most cases, this is a reasonable assumption.

We observe that some other financial stress tests involve more than one risk factor changing simultaneously, while Manitoba Hydro's does not. However, these organizations examine more common events than extended droughts, e.g., recessions. Hence, they need to examine a broader range of events including simultaneous changes in more than one variable in order to reach the confidence levels that Manitoba Hydro reaches when varying only one variable, i.e., is there an extended drought or not. Hence, as a general matter, Manitoba Hydro does not need to simultaneously examine multiple risk events.

While the quantification approach is reasonable, we identify some areas for improvements. For example, once in a drought, quantification using multiple variables may be reasonable (e.g.,, Monte Carlo simulation of cash flow at risk) in part to better track risks and to facilitate communication across the company and with stakeholders regarding the progress of the drought and the likely financial impacts of the Drought Preparedness Plan. This would build on ongoing work and also facilitate additional examination of short-term (1-2 years forward) hedging tools. Also, some additional examination of the consequences of depleting retained earnings would be useful in terms of impact on rates.

The rest of the chapter is organized as follows. The next section discusses the Corporation's quantification of risk associated with a five year drought. The third section discusses Manitoba's historical experience with droughts and the Corporation's choice of a representative extended drought. The fourth section discusses the criteria for stress cases and practices elsewhere related to the quantification of the risks associated with an extended drought. The fifth section discusses the forecasting and simulation tools employed to quantify the risk. Finally, the sixth section provides some concluding remarks.

9.2 QUANTIFICATION OF RISK ASSOCIATED WITH A FIVE YEAR DROUGHT

The onsets of droughts are very unpredictable and their impacts can be significant. The Corporation conducts and regularly updates rigorous analyses to quantify the risks associated with droughts. Simulating the recurrence of water flows of the historic five year drought between April 1987 and March 1992 beginning in the forecast year 2010/11 and extending through 2014/2015, the Corporation has assessed the financial consequences of an extended five year drought relative to its base case in the 2008 Integrated Financial Forecast.

Specifically, this cost was derived by comparing the expected annual net revenues from all the historical flow conditions with the net revenue from a five year drought period on a yearly basis. The difference between the net revenues under average conditions and those during the drought constitutes the cost of the drought. Under this methodology of assessment of the impact of an extended drought, expected market conditions were assumed for thermal and import costs as well as for other parameters of the models. Also, the consequences were examined assuming no adjustment to the base case domestic electricity rates.

Based on this methodology, the Corporation has estimated that over the five year drought period, net export revenue would be reduced by $2.2 billion (excluding financing costs) compared to the base case considered in the 2008 Integrated Financial Forecast. Such a drought has the potential to deplete the Corporation's baseline retained earnings by 20 percent in its first year. If this drought continues to persist till 2014/15, it has the potential to reduce the

baseline retained earnings by nearly 90 percent. Including the cost of financing, the estimate of impact on net revenue is $2.7 billion. It is estimated that an annual rate increase of 3.8 percent in addition to the rate increase assumed in the base case would be required to offset the risk and achieve the same level of retained earnings in 2018/19 as in the base case. The following exhibit shows Manitoba Hydro's historical level of retained earnings, short-terms assets and average domestic rates.

EXHIBIT 9-1
Manitoba Hydro – Retained Earnings and Domestic Rates

Year	Cumulative Retained Earnings (Million $)	Retained Earnings as Share of Equity and Other Contributions (%)	Average Domestic Rates ($/MWh)
1999	666	71%	45.8
2000	818	75%	46.6
2001	1,088	79%	46.8
2002	1,302	82%	46.3
2003	1,170	82%	46.2
2004	734	73%	47.5
2005	870	75%	47.5
2006	1,285	81%	49.3
2007	1,407	83%	49.8
2008	1,822	86%	50.9
2009	2,120	88%	53.0

Source: Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, pp.110-111; 2009 data provided by Manitoba Hydro
Notes:
1. All annual values in the table are represented for the year ended March 31; for example, 1999 represents values for year ended March 31, 1999
2. Equity and Other Contributions represents the sum of retained earnings and contributions in aid of construction
3. Average domestic rates have been calculated as follows: (Residential Revenue + General Service Revenue)/Manitoba System Demand. Note that transmission and distribution charges should be netted from these rates before comparing them to contract prices
4. Cumulative retained earnings are comparable to 'Retained Earnings' that are represented in financial statistics of the annual report.

The impact of an extended drought is dependent upon the timing and magnitude of the rate increases, if any, implemented to address the resulting financial consequences. Moreover, if a drought of this magnitude (or even larger, such as the 1937-1943 drought) were to coincide with a period of high prices for import purchases, high natural gas prices, or any of the other compounding risks identified in Chapter 4, the impact of an extended drought would be even greater. Thus, it is crucial to identify whether the Corporation's assessment of risk related to an extended drought is stressful enough to be deemed reasonable.

9.3 MANITOBA'S HISTORICAL EXPERIENCE WITH DROUGHTS AND THE CHOICE OF A REPRESENTATIVE EXTENDED DROUGHT

Manitoba Hydro is fortunate to have a large amount of data upon which to base its quantitative assessment of extended droughts. The Corporation bases its assessment of hydrological conditions on the 97 years of available hydrological information between 1912 and 2008. The analysis of most financial risks by most other organizations uses less data.

Manitoba Hydro is also sensitive to the fact that while records have only been kept for the last 97 years, the Corporation nonetheless faces the risk of droughts of potentially even longer duration or greater severity than those experienced since hydrological records have been maintained, for example, a once in 500 year event that is significantly more severe than the seven year episode experienced during the 1937-1943 period. In this light, the Corporation has considered the use of paleo-climatic and other information to extend the historical record. However, efforts have failed to create the needed information for the modeling.

Over the last nearly one hundred year period during which hydrological records have been maintained, droughts of varying severity and duration have occurred in Manitoba. Based on this historical record, the frequency of below average hydro output is approximately once every three years. And, it is estimated that a drought approximately as severe as the one experienced during 2003/04 is expected to occur every 15 years.

Using 2008/09 as the sample load year, the figure below shows the variation in revenues driven by the annual differences in hydro conditions (see Exhibit 9-2). Specifically, it depicts for each year's hydro condition the cost variation relative to the average of the historical water flow conditions if they occurred in 2008/09, all else being equal.[63] It can be seen that in the recent past, a five year drought occurred from 1987 through 1992. Another five year drought occurred starting in the late 1920s. A more severe drought spanning seven years occurred from 1937 through 1943. In comparison, the 2003/04 drought, while severe in strength, had its financial impact concentrated in just one year. During that event, the Corporation lost approximately $436 million as the company's retained earnings fell from $1,170 million to $734 million or a drop of 37 percent in a single year.[64]

Based on this record, when choosing an extended drought event for its base line quantification, there are three principal choices: the two five and one seven year droughts. The next longest period of drought is only three years in a row. The historical record indicates that in any given year, assuming that each future year has the same chance of being the first year in one of the 97 records available[65], there is a 3/97 or 3.1 percent chance that the year will be the first of a

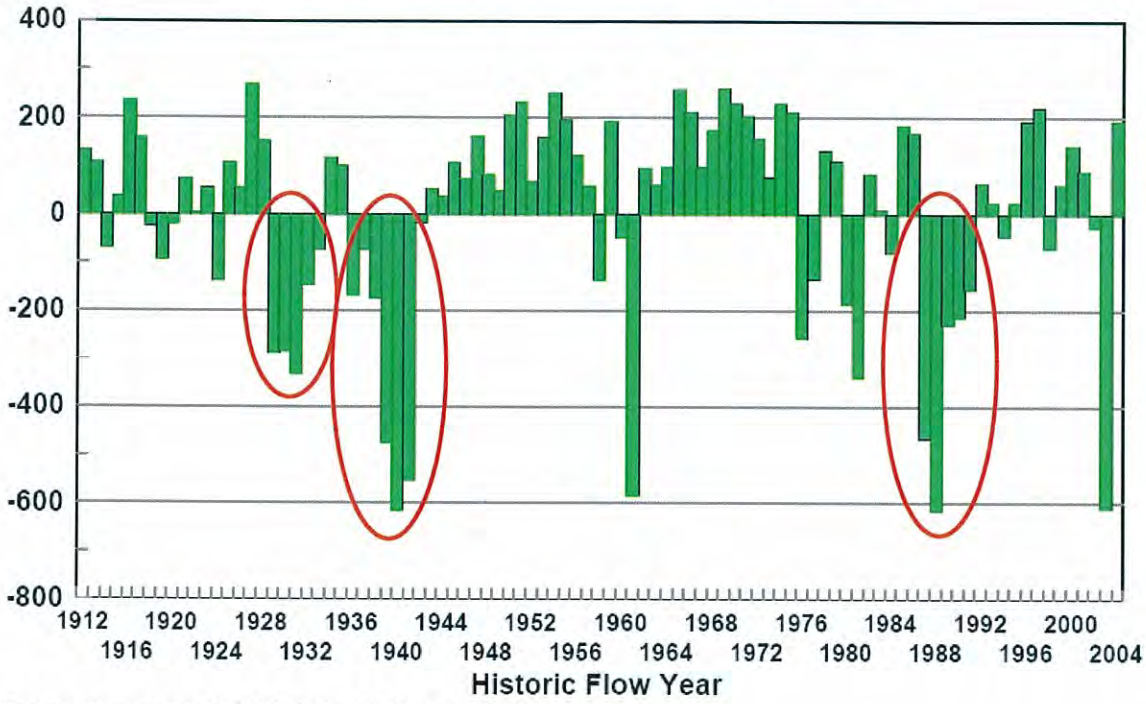
[63] This analysis assumes that each of the historic flow years could occur in 2008 and the potential financial consequence of each flow occurrence is then analyzed. The net revenue for each year is derived as the sum of all export revenues offset by the cost of import energy, the variable costs of fuel and operations for thermal generation, and the cost of water rental. All other costs and revenues are fixed such that they do not vary with flow conditions, and are therefore excluded from consideration in the analysis.

[64] See Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, pp.110-111. See also 2002-2004 Drought Risk Management Review, report prepared by RiskAdvisory, January 2005, p.4.

[65] There are two aspects of this assumption. First, to create sequences of 97 years, one assumes that that last year 2008 is followed by the first year which is 1912 and thereafter, etc. Second, the data exhibits serial correlation, i.e., a drought year is more likely to be followed by another drought. The correlation coefficient between years is approximately 60 percent. However, several years in the future, the influence of recent events attenuates. This supports the assumption that any future year can see any of the historical sequence of hydrological outcomes. As discussed later, in some cases, this assumption may be less appropriate.

drought of five years duration or longer. The historical record also shows there is a 1/97 or approximately one percent chance that any given year will be the first of a seven year drought.

Exhibit 9-2
Variation of Flow Related Revenue ($ million)



Source: Response to PUB Order 117/06, p.1
Notes:
1. The calculations for the graph above assume current generation capability and a single base case for other parameters.
2. The circled time periods indicate extended drought years

The corporation also uses this historical hydrological record to limit firm power sales to a level that does not threaten, in a given year, its ability to supply domestic load. This is achieved by basing the firm export sales on its dependable energy net of domestic load, where dependable energy is defined as the Corporation's system energy under the worst recorded water flow conditions with its reservoirs at full supply at the onset of a drought.

In part, the Corporation bases its overall export policy on considerations that help it better prepare for a drought that exceeds the most severe drought on record. This concern has contributed to Manitoba Hydro's desire to increase transmission import capability with other regions so that the Corporation can increase imports in the event of a rare but extreme event (for example, one in a five hundred year drought). Planned expansions of its hydroelectric capacity, together with the binding term sheets negotiated with the U.S. utilities, provide the Corporation with the opportunity to expand its transmission capability. Such a strategy is prudent since Manitoba Hydro is highly dependent on its hydro electric supply and a drought threatening domestic supply would have very high costs for its domestic customers and the Province.

An event outside the historic record has a low and unknown probability, but a potentially large impact. In the risk management literature such an event, for example, the possibility of a worse

drought than in the historical record, is referred to as a "Black Swan" event. This is based on a book entitled "The Black Swan: The Impact of the Highly Improbable" by Nassim Taleb. The probability of seeing a black swan was considered in Europe as zero until Australia was settled, since all swans seen to that point were white. But a black swan was discovered in Australia. Given the adverse consequences of an event worse than has ever been recorded or seen, Manitoba Hydro is wise to consider Black Swan events and plan for it as it has done.

9.4 CONDITIONS CONSIDERED FOR BASE CASE QUANTIFICATION OF DROUGHT-RELATED RISK

Our determination of how stressful the Base Case quantification of drought and related risk should be is based on the following considerations.

Likelihood of Event. As a general matter, many analyses focus on a 90 percent confidence interval which means there is a five percent chance of an event as stressful or more stressful.[66] Another common alternative is a 95 percent confidence interval implying the event studied or worse events have a 2.5 percent chance of occurring. A 99 percent confidence interval is much less frequently used.

As discussed previously, in the last 97 years since Manitoba's hydrology records have been maintained, two droughts of five year duration and one of seven year duration have occurred insofar as extended droughts are concerned. Thus, based on data over the last almost one hundred years, there is only a 3 percent probability that a given year is the first year of an extended drought of five years or more. Therefore, Manitoba Hydro's Base Case consideration of an extended drought is already close to the 95 percent confidence interval.[67] Also, a seven year drought is closer to a 99 percent confidence interval.[68]

Number of Variables Examined. Another consideration is whether any other risk should also be jointly considered during the quantification of an extended drought. The largest concern is the potential for a combination of drought and high prices for wholesale power. This would increase the cost of purchases to meet firm sales commitments. Other events could also occur including higher interest rates, higher construction costs, etc. Thus, in determining how stressful Manitoba Hydro's main stress test should be, one must consider the extent to which the occurrence of risk events should be combined.

In Manitoba Hydro's case, the problem is that examination of almost any additional variable lowers the probability to beyond the 95 percent confidence interval. If one were to combine the occurrence of an extended drought with treating electricity prices as uncertain (for example, instead of assuming the Base Case price is fixed, one could examine high and low price scenarios, each with 50 percent chance, such that the expected price is the same), it would further decrease the probability that this extreme stress case would actually occur to approximately 1.5 percent, i.e., there would be only a 1.5 percent probability of drought and high prices. This is below the 95 percentage confidence level and close to the 99 percent confidence interval. We believe that such a case would be too stressful for a baseline stress test, though as an alternative sensitivity, one could examine such a case or the seven year

[66] A 90 percent confidence interval has five percent probability of events on either side of the interval. A 95 percent confidence interval has 2.5 percent probability on either side of the interval.
[67] If over the next 23 years, there is no scenario wherein a drought spans for a period of 5 years or more, then the probability will be exactly 2.5 percent, i.e., 3/120 = 0.025.
[68] A 99 percent confidence interval has only 0.5 percent chance of an unfavorable event.

drought (see Exhibit 9-3). Manitoba Hydro regularly examines two of the four cases identified in Exhibit 9-3.

EXHIBIT 9-3
Quantifying an Extended Drought

Case	Description	Probability (%)	Equivalent Confidence Interval (%)
Baseline Stress Case	5 Year Drought	3.1	93.8
Sensitivity Case – Longer Drought	7 Year	1.0	98
Sensitivity Case – Base Case Plus Higher Power Prices	5 Year Drought and High Power Prices	1.5[A]	97
Sensitivity Case – Longer Drought Plus High Power Prices	7 Year Drought and High Power Prices	0.5	99

Note: (A) This probability is part of the following four outcomes: (1) five year drought and high prices (1.5%), five year drought and low prices (1.5%), no drought and high prices (48.5%), and no drought with low prices (48.5%).

Starting Point of Adverse Event. The nature of the stress test may need to change depending on circumstances, especially the starting point. For example, once it is clear that Manitoba Hydro is in the second year of below average water conditions, there is a 1 in 8 or 12.5 percent chance that it faces an additional five years of drought. In such a situation, it may be more appropriate to explore a combination of events – e.g., a five year drought and unexpectedly high power prices, e.g., a 25th percentile price on average during the five year period.[69] This would yield close to a 95 percent confidence interval.

Availability of Mitigation Strategies. The degree of stress should be related to the consequences. In the event that the Corporation's retained earnings decrease by even more than $2.7 billion, Manitoba Hydro has the ability to increase capital at fairly low cost compared to other organizations. This is because of lack of competition in the domestic market combined with provincial financial backing. Thus, its base line quantification should not be a 99 percent confidence interval since it could result in over-insurance, e.g., even higher retained earnings.

As a general matter, Manitoba Hydro should further consider in more detail the consequences of different events, especially those related to a five year drought. For example, the Corporation should estimate the decrease in net revenues that would trigger the need for higher domestic rates, the impact of various misses on debt rating and interest cost changes, and the extent to which prospects of a miss causes a change in the amount of retained earnings it should keep in cash or high liquidity instruments, etc. Unless this shows the consequences are more adverse than expected, and/or there is a very high aversion by stakeholders to raising rates during extended drought events, the current Manitoba Hydro confidence interval chosen is reasonable since it is in the 90 – 95 confidence interval range.

Duration of Adverse Event. Manitoba Hydro has chosen a five year drought to represent an adverse event. This provides the corporation time to adjust its financial position. In contrast, most other financial stress tests examine events lasting no more than two years. This is closely related to the fact that one of the risks examined in these tests has a higher probability of

[69] 0.25 x 0.125 = 0.03

occurring, e.g., recession, and hence, to approach a 90 to 95 percent confidence interval it is necessary to examine more than one risk event simultaneously (discussed next).

Practices Elsewhere: the S&P Liquidity Test. To provide perspective, we reviewed other financial stress tests and compared them to Manitoba Hydro's stress test. While Manitoba Hydro's situation is unique in many respects, this comparison supports the approach the Corporation takes as being reasonable.

In one stress test, the S&P liquidity test for power trading companies, the effects of a downgrade to sub-investment grade and a 30 percent change in annual prices following the downgrade are tested in the first year. The effect of a debt rating downgrade to sub-investment grade has effects somewhat similar to a drought. Power trading companies have less access to financing which is similar to less export sales. Further, they need more cash because under some trading agreements, a downgrade requires more collateral. This is roughly analogous to a reduction in liquidity and the possible need to borrow.

In a recent study by S&P related to power trading, the chance of a downgrade to sub-investment grade from the 'BBB' category during a recession was approximately 20-30 percent. Since recessions occur every 5 years[70], this results in approximately 4-6 percent probability of a downgrade to sub-investment grade from the 'BBB' category, assuming most downgrades to sub-investment level are concentrated during recessions.[71]

S&P also combines the downgrade event with changes in prices of 30 percent (changes of natural gas and power prices) that according to the study done by S&P have an approximately fifty percent chance of occurring in the first year. Combining these events, the price change and the downgrade, assuming independence, results in a 2-3 percent probability of the combined event for the first year. In the subsequent period, S&P's market event considers the change in price is 20 percent. The probability of a 20 or more percent movement in power prices given a 30 or more percent change in the first year is approximately 67 percent in MISO (see Exhibit 9-4). This yields roughly a combined probability of closer to 1.3-2 percent if the events are independent. However, as one can see, MISO power price decreases correlate with recessions. Hence, the probability is approximately in the 1.3 to 3 percent range.

All else being equal, downgraded energy trading companies are much less likely to be able to raise equity than Manitoba Hydro. Thus, one would expect even more stressful events to be tested in the baseline. In fact, S&P does examine even more stressful events, but S&P is not entirely clear on what weight it gives to the full range of scenarios.[72] However, the main event, the downgrade, has a higher chance than a five year drought, and hence, they examine more than one variable to increase the stressfulness and move it to a 95 percent confidence interval range.

[70] Between 1919 and 2006, a period spanning 88 years, there were 16 business cycles according to NBER.
[71] Electric trading companies, if they have investment grade rating, tend to be in the BBB category.
[72] This includes examining combinations of 30 percent lower power and 30 percent higher gas prices. This is a rare combination.

EXHIBIT 9-4
MISO Wholesale Power and Henry Hub Natural Gas Prices

Year	MISO On-peak Power Price (2008$/MWh)	% Change	Henry Hub Natural Gas Price (2008$/MMBtu)	% Change
1991	N/A	N/A	2.23	
1992	N/A	N/A	2.61	17%
1993	N/A	N/A	3.06	17%
1994	N/A	N/A	2.70	-12%
1995	N/A	N/A	2.36	-12%
1996	N/A	N/A	3.59	52%
1997	29.0	N/A	3.26	-9%
1998	37.3	29%	2.66	-18%
1999	49.4	32%	2.84	7%
2000	47.6	-4%	5.24	85%
2001	44.6	-6%	4.71	-10%
2002	32.3	-28%	3.91	-17%
2003	50.6	57%	6.21	59%
2004	51.5	2%	6.51	5%
2005	69.6	35%	9.58	47%
2006	62.4	-10%	7.07	-26%
2007	73.1	17%	7.14	1%
2008	62.0	-15%	8.89	25%
2009 YTD	31.2	-50%	4.07	-54%
Average 1997-2009YTD	**49.3**		**5.5**	

Sources: Power Prices - 1997-2000 MAPP Weekly Index, 2001- 2005 Northern MAPP Weekly Index, 2005-2009YTD Minnesota Hub Weekly Index from Power Markets Week
Gas Prices - NYMEX Henry Hub natural gas prices
Note: N/A represents Not Available or Not Applicable

Practices Elsewhere: U.S. Bank Stress Tests. In another example, the U.S. government recently required U.S. banks to examine their capital adequacy to withstand Base and Adverse two year stress cases. These stress cases are defined in terms of three variables: (1) unemployment rate, (2) real GDP changes, and (3) change in housing prices (see Exhibit 9-5).

We assessed the likelihood of these events by examining data from the 1930 to 2008 period. Over this period spanning 79 years, in 19 percent of the years, unemployment has exceeded 8.4 percent (base case in 2009) and in 16 percent of the years, unemployment has exceeded 8.9 percent (adverse case in 2009) – both primarily driven by the great depression. Over these last 79 years, GDP has been lower than the base or adverse 2009 case only 6 percent of the years. And in the last 79 years, the combined base case effect (including unemployment and GDP) has occurred in 5 percent of years and the adverse effect has occurred in 4 percent of years. Thus, unemployment and GDP are not enough to create stresses that have probabilities associated with or very close to the 95 percent confidence interval. In order to reach closer to the 95 percent confidence interval, a third variable, decrease in housing prices, is needed. Note that while the combined base or adverse 2009 stress event, one that combines all three events, has never occurred in the last 79 years, it is primarily due to the wide swing in the housing index in recent years. Such a stress test, one that includes extreme housing downturn,

is largely driven by the fact that an extreme decline in the housing market is already under way. Stressing for such a combination of events in this case is analogous to a situation where the Corporation finds itself in a drought and it happens to coincide with another risk event such as extremely high wholesale power prices. In such a situation, as discussed previously it will be prudent for Manitoba Hydro to consider a combination of risk factors in its stress test.

Two other issues are important in this regard. First, from a power supply perspective, does Manitoba Hydro adequately address consequences of a combination of adverse events? Second, from a contractual perspective, does the Corporation take necessary steps to protect its financial health? From the power supply standpoint, the Corporation is not only planning to build three large hydro electric facilities but also, being cognizant of the need for enhanced transmission, is negotiating contracts with U.S. utilities that will enable such transmission to get built. Over a long run this is in Manitoba Hydro's best strategic interest. From the contractual perspective, the Corporation has negotiated mitigation clauses that will enable it to curtail energy supply in the event of an adverse drought (details discussed in Chapter 7). Such strategies, to an extent, provide Manitoba Hydro with insurance against extreme stress events.

In light of the above discussion, the bank stress case seems roughly comparable to the Manitoba Hydro test. While the period of stress is shorter (2 years not 5 years) and multiple variables are considered, the probabilities seem similar. As well, it is important to note that in recent U.S. stress testing of banks, banks are analyzing their liquidity under difficult but not worst market conditions – for example, 8.5 percent to 10.3 unemployment is considered, not the depression level of 15 to 25 percent unemployment (see Exhibit 9-5).

EXHIBIT 9-5
U.S. Bank Stress Test Assumptions (Percent)

Scenario	Year	Unemployment Rate	Real GDP Change	House Price Decrease
Base	2009	8.4	-2.0	-14
Base	2010	8.8	-2.1	-4
Adverse	2009	8.9	-3.3	-22
Adverse	2010	10.3	+0.5	-7

Source: FAQs of Capital Assessment Program available at
http://www.federalreserve.gov/newsevents/press/bcreg/bcreg20090225a1.pdf

Recapitalization Potential. If the Corporation finds itself in year two or three of the drought, it can raise more capital and/or raise rates more easily than most entities. Thus, considerations of the extremity of the stress test and the potential for recapitalization once the event occurs, supports the view that stressing for an event with approximately 3 percent chance of starting in any given year is reasonable. The following exhibit presents a comparison of Manitoba Hydro's stress event with that of the S&P liquidity test and recent U.S. bank stress test.

EXHIBIT 9-6
Stress Test Comparison

	Manitoba Hydro	S&P Power Trading Liquidity Test	U.S. Bank Test
Duration (years)	5	2	2
Recapitalization Potential	High	Low	Low
Number of Variables	1	2 – 3[1]	3[2]
Probability	3%	Similar	Similar

Notes: [1] Variables include downgrade, and lower power and gas prices
[2] Variables include unemployment, GDP change, and house price decrease

Examination of Financial Consequences of Other Risk Events. It should also be noted that the Corporation not only estimates the financial consequences related to an extended drought but has also estimated impact of other risk events such as variations in interest rates and exchange rates, and fluctuations in domestic demand, capital expenditures and export prices. The details of the financial impact of these risk events on the Corporation's retained earnings and rates are shown in the following exhibit.

EXHIBIT 9-7
Impact of Risk Events on Retained Earnings and Rates

Scenario	Incremental Increase/(Decrease) in Retained Earnings (in $Million)			Incremental Annual Rate (Increase/ Decrease)	
	2010/11	2014/5	2018/19	Electric	Gas
IFF08-1 Baseline	2,493	3,037	4,198	-	-
+1% Interest Rates	32	27	-115	0.18%	0.04%
-1% Interest Rates	-26	13	214	-0.17%	-0.04%
Cdn $ down $0.10 US	53	126	258	-0.20%	N/A
Cdn $ up $0.10 US	-48	-86	-144	0.20%	N/A
Low Export Prices	-64	-408	-936	0.90%	N/A
High Export Prices	55	369	1,026	-1.18%	N/A
5 Year Drought	-485	-2,651	-3,488	3.81%	N/A
+$100M & +$10M Capital Expenditures	-3	-122	-448	0.54%	0.11%
Medium High Electric Load Forecast	-23	-14	-58	0.13%	N/A

Source: Manitoba Hydro Integrated Financial Forecast (IFF08-1), November, 2008, p.18
Note: The rate increases represent the additional annual percentage (incremental to the base case annual rate increases) required to achieve the same level of retained earnings in 2018/19 as in the base MANITOBA HYDRO08-1 and CGM08-1.

9.5 HERMES, SPLASH, and PRISM MODELING SYSTEMS

Manitoba Hydro uses the HERMES and SPLASH computer modeling systems to quantify the probabilities of the Corporation's future hydroelectric production. The underlying data is based on 97 years (1912 – 2008) of historical hydrological data. This system is based on simulating the Corporation's operations under each year's hydrological conditions including those that

occurred before the current Manitoba Hydro system was in place. For example, hydrology data from the early decades of the 20th century is used to forecast what the output would have been if hydroelectric generators had been on-line at the time even if they came on-line much later. This system can model storage as well as thermal and hydroelectric production, and optimizes system operation for a given set of hydrologic circumstances.

The two systems vary with respect to the time frame they are used to analyze. The SPLASH system is used to forecast output in the long run - for greater than two years, and calculates system performance across the full historical record. The closely related HERMES system, simulates in more detail, production for the near-term - for up to two years. This system employs statistical relations between data describing current conditions such as the latest snow pack, precipitation, temperatures, etc., to determine the likely near-term hydrological system operation.

In summary, these models produce the Corporation's generation plan, i.e., they simulate the operation of the system of hydroelectric plants and reservoirs with the objective of meeting firm load requirements while maximizing net export revenues. These systems also simulate production costs including costs associated with fossil fuel production and imports. They are then linked to Manitoba Hydro's financial modeling. This has been used in the IFF process to simulate the financial performance of the company under a range of scenarios including droughts spanning one, five, and seven years.

The models used by the Corporation are similar to models used by other hydroelectric companies. For example, BC Hydro uses HYSIM (Hydrological Simulation) and SO (System Optimizer) models which are similar in nature. While the HYSIM uses historical hydro data and hydro system constraints to generate forecasts of expected output and generation costs, SO determines the optimal expansion plan using expected generation from HYSIM.

In addition to the HERMES and SPLASH models, the Corporation uses the PRISM (Power RIsk System Model) model developed by RiskAdvisory to simulate the financial impact of variations in various parameters such as water flow conditions, domestic load, gas and electricity prices, export sales, transmission access, and wind energy generation. The model utilizes the Monte Carlo simulation technique to identify range of outcomes associated with well defined scenarios. While the model was initially developed by RiskAdvisory, it is now an in-house model, and therefore, offers the Corporation with the flexibility of its use.

PRISM uses key inputs such as domestic load, hydro generation, and gas and electricity prices from sources approved by Manitoba Hydro. Many of these inputs come directly from the Corporation. Each simulation requires 1,000 iterations and for the various distributions assumed for the inputs, the model produces distributions for outputs such as net revenue. In a recently completed analysis the model estimated the mean net revenue from exports during a year with drought (of a magnitude similar to that of year 1939) to be negative $345 million. By way of comparison, under the base case the model estimated the mean net revenue to be $150 million, implying the impact of the one year drought to be $495 million. In addition to the mean, the model also provides a distribution of net income highlighting the 90 percent confidence interval. It provides results in similar format for other scenarios as well, such as high electricity and gas prices.[73]

[73] For details on the PRISM model and estimations using this model, see presentation titled, "Risk Analysis Using PRISM", December 16, 2008, presented by Lindsay Melvin and Kelly Hunter.

The PRISM model may particularly be suited to the simulation of short-term hedges such as power purchases, options, etc. This model can also be useful in the event that Manitoba Hydro is in a drought, e.g., in the second year of drought. Additional testing of these options should be pursued. For example, the model's treatment of correlations should be examined.

9.6 CONCLUSION

The current methodology of assessment and systems employed by the Corporation to develop the financial estimate of risks associated with an extended drought are reasonable. They reflect a sustained commitment of the organization to quantification of the risks related to droughts, especially related to the amount of hydroelectric power likely to be available and the resulting financial impact from decreased hydroelectric supply. As well, the stress case examined by the Corporation is comparable to practices adopted by other industries.

CHAPTER TEN
Adequacy of Risk Mitigation Related to an Extended Drought

10.1 INTRODUCTION

Droughts can adversely impact the net export revenues of Manitoba Hydro. Moreover, these effects, can be compounded by other risk factors as identified in Chapter 4. Therefore, to protect its financial stability, the Corporation must not only consider mitigating the direct impacts of a drought, but must also simultaneously monitor and manage other risk factors that can threaten its financial situation. In other words, the Corporation must pursue a multi-pronged strategy to effectively treat the various risk factors. These risk mitigation strategies have the potential to significantly impact corporate financial stability.

This chapter concludes that Manitoba Hydro's risk mitigation strategy related to an extended drought is adequate. This is based on Manitoba Hydro's risk mitigation measures including: (1) mix of export sales types and contracts, (2) contract provisions allowing MH to decrease required long-term firm sales volumes in a drought that are more favorable than existing long-term firm contracts, (3) policies and contract provisions to address transmission risks, (4) borrowing capacity and retained earnings targets, (5) additional contracting measures including multiple counterparties and diverse terms, (6) domestic demand management programs, (7) drought management structure and procedures, and (8) financial risk management.

However, there are some recommendations for additional research and improvement in this area. They include: (1) recommendations in Chapter 8, (2) a written Drought Preparedness Plan, (3) additional studies of the financial consequences of droughts including the consequences of lower retained earnings such as rate hikes, and (4) additional quantitative studies of likely outcomes once in a drought and hedging mentioned in Chapter 9.

10.2 EXPORT SALES MIX

An extended drought lowers non-firm export sales revenues compared to budget. Since most export power sales will be non-firm (see Exhibit 10-1), this is an important risk. There is also the chance that a drought induced decrease in export sales will coincide with low wholesale power prices that lower the revenues from the remaining export sales. Thus, a key risk mitigation structure is the existence of firm or relatively firm prices in the firm contracts that protect the Corporation against even greater revenue downside.

More generally, Manitoba Hydro sells its surplus energy supply after meeting its domestic demand via a mix of long-term contractual sales and short-term opportunity sales. This strategy results in a diversified portfolio of short-term and long-term sales (over the next ten years these new contracts in conjunction with the existing contracts are expected to result in 45 percent of export volume sales from dependable and new proposed sales, and 55 percent from opportunity sales), and offers the Corporation risk protection from over exposure to any single type of export sales strategy.

EXHIBIT 10-1
Manitoba Hydro's Dependable, New Proposed, and Opportunity Sales

	VOLUME (MWh)				REVENUE ($millions)			
Period	Total Export Sales	Dependable Sales	New Proposed Sales	Opportunity Sales	Total Export Revenue	Dependable Sales	New Proposed Sales	Opportunity Sales
2009/10	8,495	3,121		5,374	546	180		443
2010/11	6,129	3,587		2,542	465	166		299
2011/12	7,071	3,570		3,501	477	170		307
2012/13	7,109	3,456		3,653	498	166		332
2013/14	6,927	3,361		3,566	509	164		345
2014/15	6,860	3,361		3,499	524	169		355
2015/16	6,379	[redacted]	[redacted]	[redacted]	624	[redacted]	[redacted]	[redacted]
2016/17	6,432	[redacted]	[redacted]	[redacted]	649	[redacted]	[redacted]	[redacted]
2017/18	6,003	[redacted]	[redacted]	[redacted]	651	[redacted]	[redacted]	[redacted]
2018/19	6,833	[redacted]	[redacted]	[redacted]	800	[redacted]	[redacted]	[redacted]
Average /Total	**68,238**	[redacted]	[redacted]	[redacted]	**5,743**	[redacted]	[redacted]	[redacted]

Source: Information provided by Manitoba Hydro

10.3 FIRM EXPORT QUANTITIES

10.3.1 Export Quantity – Drought Outside the Historical Record

In order to mitigate risks associated with droughts, the Corporation designs and operates its facilities, both generation and transmission, to ensure that firm demand can be met even with a repeat of the worst drought since 1912. The Corporation limits firm export sales in any given year such that even during a repeat of the worst drought on record, these contractual obligations can be met from dependable energy supply net of Manitoba's expected domestic load. And, based on the terms and conditions of its binding term sheets, Manitoba Hydro is relieved of its firm export obligations in the event of a drought worse than the worst on record.

As discussed elsewhere, a drought, as guided by the Drought Preparedness Plan, may affect the ability to serve net firm export demand even if the drought is within the historical record. The binding term sheets have curtailment clauses that give the Corporation the right to curtail energy delivery under the following circumstances:

(i) in the event of the unavailability of any portion of MH's generation and/or transmission system, including MH's HVDC system;
(ii) due to a transmission service curtailment which results in the loss of the capability in the transmission path between MH and the counterparty;
(iii) due to Force Majeure reasons; and
(iv) other general rights of curtailment.[74]

Also, as discussed in section 10.3.2, the binding term sheets also provide additional flexibility in terms of meeting firm export demand.

[74] See, for example, term sheet of the potential contract negotiated with MP, December 2007, p.14

10.3.2 Weekend Energy Sales to [redacted] and [redacted]

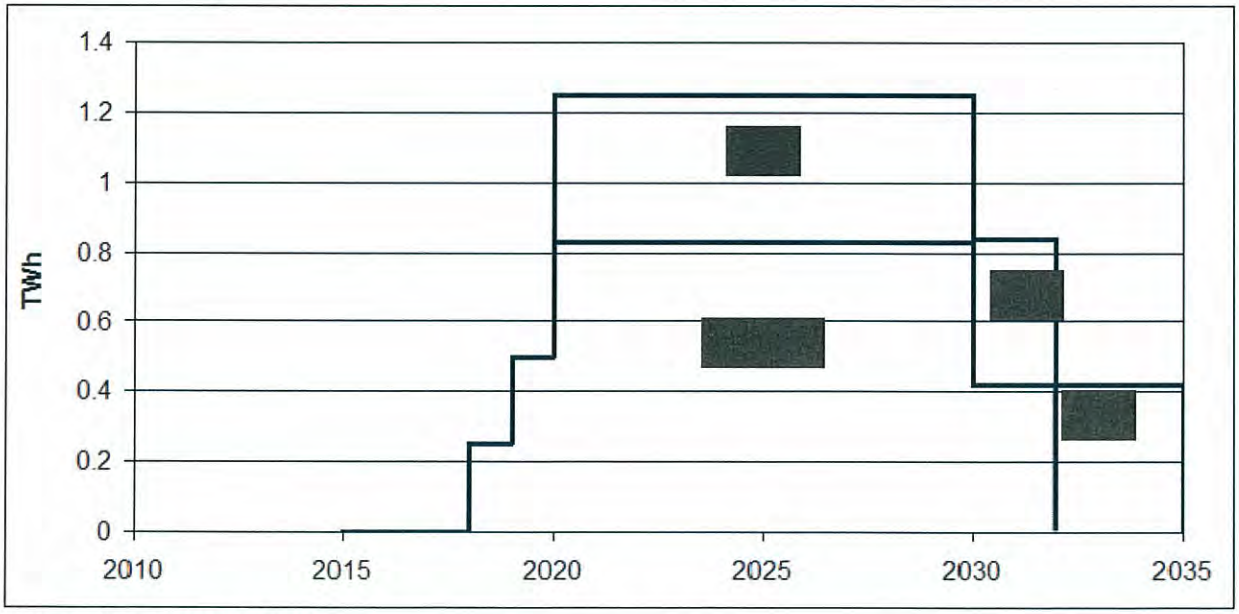
In the [redacted] and [redacted] contracts, under a drought, Manitoba Hydro has the option to not supply firm energy during the weekend peak hours. Specifically, the terms of the contracts are as follows:

[redacted]

This option, therefore, allows for a diminution of the firm sales obligation volumes by [redacted] percent [redacted] (see Exhibit 10-2). Since these contracts, on average, account for approximately [redacted] of the 2020-2025 volume, this results in [redacted]) total flexibility (see Exhibit 10-3). After 2025, the only firm sales are to [redacted] and [redacted] and hence, there is a full [redacted] percent flexibility. This is valuable in decreasing the chance that Manitoba Hydro would run out of power, and experience a combination of lost revenues, and the need for replacement power purchases at market prices.

EXHIBIT 10-2

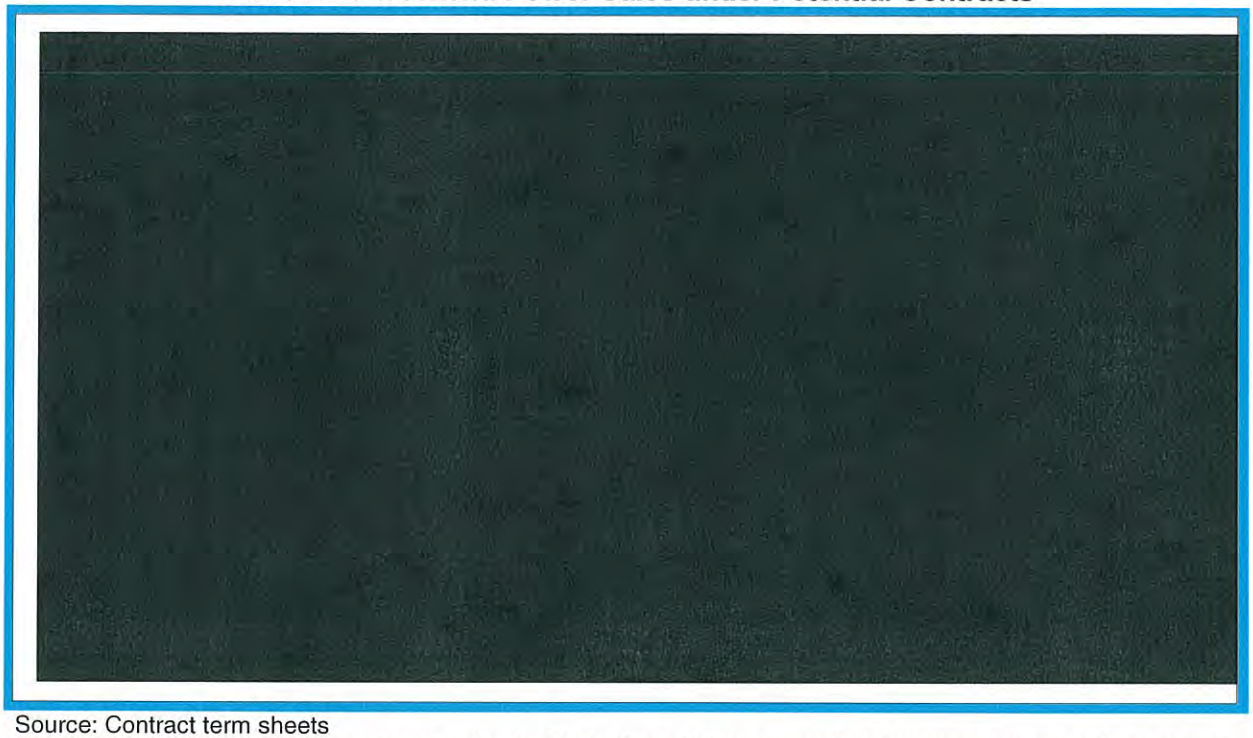
[redacted]



Source: Contract term sheets
Note: The above graph represents approximate illustration of weekend energy savings option under the binding term sheets. For example, savings options are represented for the entire year without consideration of mid year start or end dates.

[75] See term sheet of the potential contract negotiated with [redacted], p.14. Similar terms have been negotiated with [redacted]

EXHIBIT 10-3
Weekend Energy Savings as a Percentage of Manitoba Hydro's On-peak Guaranteed and Must-Take Weekend Power Sales under Potential Contracts



Source: Contract term sheets
Note: The above graph represents approximate illustration of share of weekend energy savings option under the binding term sheets. For example, share of savings options are represented for the entire year without consideration of mid year start or end dates.

Manitoba Hydro's existing long-term export sale contracts do not have similar flexibility to decrease firm sales in the event of a drought within the historical record. *Thus, the company has succeeded in decreasing its exposure to the risks of a drought by decreasing the firmness of some volumes.*

The weekend sales reduction option would only be exercised if the market price for power exceeds the price of the sales to these utilities. For example, if the energy price under these contracts is roughly $70/MWh, and the market price is less than $70/MWh, even if hydro was not available, Manitoba Hydro could buy the power in the market and sell at a profit. However, the profit level would be below budget.

While Manitoba Hydro has been successful in negotiating flexible terms under its binding term sheets, it should be noted that the Corporation has had a history of very reliable supply, and is thus viewed as a reliable source of power by counterparties. Therefore, it has a business interest in avoiding a disruption of firm energy supply. The Corporation expects to make efforts to maintain its reputation for reliability. Nonetheless, Manitoba Hydro has succeeded in decreasing its exposure to the risks of a drought by decreasing firmness and the contract commitments are inherently less risky. The weekend reduction option decreases the chance that unexpected domestic demand growth or reluctance to fully drain reservoirs during a drought will cause Manitoba Hydro to meet firm demand by buying in the market. This protects against the combination of lost revenues (lost non-firm sales) and higher costs (replacement power) especially during unexpectedly high price periods.

There is no evidence of customers willing to accept even less firmness in exchange for predictable long-term prices.

10.3.3 [redacted] Option

The [redacted] contract does not have a weekend energy decrease clause. However, under this potential contract, Manitoba Hydro has the right to [redacted].

[redacted].

10.3.4 Building New Supply to Meet Demand

Manitoba Hydro is tailoring the ramp up in firm power sales to coincide with the Corporation's plans to significantly increase the supply of its hydroelectric generation capacity. In its latest resource plan it has incorporated three new hydro plants in its base case. These include Wuskwatim, a 200 MW plant, with in service date of 2011/12; Keeyask, a 695 MW plant, with in service date of 2018/19; and Conawapa, a 1,485 MW plant, with in service date of 2022/23. It is also diversifying its portfolio and plans to expand its wind capacity by 300 MW. These new plants increase the likelihood of meeting firm sales without relying on the market, thus reducing the financial exposure during drought conditions.

10.4 TRANSMISSION RISK

10.4.1 Imports - Drought Outside the Historical Record

Manitoba Hydro currently has limited import capability. If the Province were to experience a drought outside the historical record, domestic supply could be threatened. In the extreme, this could be catastrophic, especially during the winter. As noted in an earlier chapter, this is a "black swan" event – i.e., an event of low and unknown probability, but with a large consequence. The most notable risk management failures often involve decision makers not adequately preparing for these black swan events. However, almost ironically, export contracts are the key to getting more access to imports in the event of an emergency as discussed elsewhere. Thus, the binding terms sheets negotiated by MH with the three U.S. utilities help the Corporation address this risk.

10.4.2 Current Exports and Firmness of Transmission

A key compounding risk to that of drought would be even greater revenue loss due to revised MISO view of the adequacy of Manitoba Hydro's transmission export system. MISO could treat imports from Manitoba Hydro as non-firm lowering the price and revenue. Non-firm prices are

below firm prices. The new transmission capability to be built associated with the long-term firm contracts offers risk mitigation in this case.

10.4.3 Transmission System Failure

Under the terms and conditions of the binding term sheets being negotiated by the Corporation, Manitoba Hydro's firm export sales obligations are eliminated in the event of transmission system failure thus offering the company risk mitigation under such an event.

10.5 EQUITY CUSHION AND DOWNSIDE REVENUE PROTECTION

10.5.1 Retained Earnings

Regardless of the severity of a drought, it will result in diminished earnings from net exports of electricity. In the extreme, in the event of a severe extended drought, there would be no non-firm sales. As experienced in the 2003-04 drought, the Corporation may also have to arrange for replacement power though arrangements such as bookout deals with export sales customers. Therefore, to protect its financial stability, the Corporation maintains retained earnings and short-term liquidity to tide over the adverse financial consequences of a drought.

The decrease in the revenue is offset either by Manitoba Hydro's borrowing or liquidity. This ability is tied to its equity if it is to limit its reliance on rate hikes.

Manitoba Hydro has estimated the cost of an extended five year drought to be approximately $2.7 billion. During the last drought in 2003-04, its retained earnings fell to $734 million by 2004 from $1.3 billion in 2002. Since then the Corporation has steadily been replenishing its retained earnings which currently stands at $2.1 billion (see Exhibit 10-4) and reaching the goal of having retained earnings of $2.7-$2.8 billion appears imminent. To minimize the impact of a severe drought on its financial stability and rates, Manitoba Hydro should maintain at least the cost of an extended five year drought in retained earnings – this is consistent with the Corporation's goal.

EXHIBIT 10-4
Manitoba Hydro – Retained Earnings and Short-Term Assets

Year	Cumulative Retained Earnings (Million $)	Retained Earnings as Share of Equity and Other Contributions (%)	Average Domestic Rates ($/MWh)
1999	666	71%	45.8
2000	818	75%	46.6
2001	1,088	79%	46.8
2002	1,302	82%	46.3
2003	1,170	82%	46.2
2004	734	73%	47.5
2005	870	75%	47.5
2006	1,285	81%	49.3
2007	1,407	83%	49.8
2008	1,822	86%	50.9
2009	2,120	88%	53.0

Source: Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, pp. 110-111; 2009 data provided by Manitoba Hydro
Notes:
1. All annual values in the table are represented for the year ended March 31; for example, 1999 represents values for year ended March 31, 1999
2. Equity and Other Contributions represents the sum of retained earnings and contributions in aid of construction
3. Average domestic rates have been calculated as follows: (Residential Revenue + General Service Revenue)/Manitoba System Demand. Note that transmission and distribution charges should be netted from these rates before comparing them to contract prices
4. Cumulative retained earnings are comparable to 'Retained Earnings' that are represented in financial statistics of the annual report.

Moreover, as discussed in Chapter 9, quantification and hence mitigation of drought related risks can benefit from simulation and evaluation of alternative strategies by modeling the uncertain outcomes of each strategy and then choosing the best alternative among the different options available.

10.5.2 Potential Capital Structure Modification

Manitoba Hydro's equity target of 25 percent is overall in the medium range for comparable companies (see Exhibit 10-5). This supports the view that MH's equity level is reasonable. However, MH has more reliance on export sales and greater variability of hydro than other Canadian utilities.

It should be noted that with the attainment of $2.1 billion in retained earnings for the year ending March 31, 2009, the Corporation has nearly reached its target equity share of 25 percent. As shown in the following exhibit, for the year ended March 31, 2008, the equity share was 23 percent.

EXHIBIT 10-5
Equity Share of Debt Plus Equity

Company	Equity Share of Debt Plus Equity (%)
Manitoba Hydro	23
BC Hydro	20
Hydro Quebec	37.7
New Brunswick Power	8
Sask Power	39.3
U.S. Utilities	45

Sources:
Manitoba Hydro-Electric Board 57th Annual Report, March 31, 2008, pp.110-111;
British Columbia Annual Report, March 31, 2008, p.14;
Hydro Quebec Annual Report, March 31, 2008, p.54;
NB Power Group Annual Report, March 31, 2008, p.23;
Sask Power Annual Report, December 31, 2008, p.1

As a general matter, to the extent book value exceeds debt – i.e., there is equity – borrowings can be increased. However, as borrowing increases, there may be pressure to raise rates. Manitoba Hydro has very little short-term liquidity, i.e., cash and cash equivalents on the balance sheet. ICF did not review lines of credit, and assumes that the issue is the Province seeking a balance between borrowing and rate hikes; the greater the retained earnings, the less pressure on rates.

MH may want to conduct additional examination of the consequences of approaching a 100 percent debt share as it borrows its way through a drought. The probability of reaching critical debt levels should be calculated as a drought progresses. The extent this is necessary will depend in part on the extent of stakeholder concerns regarding MH borrowing and rate increases.

10.6 ADDITIONAL RISK MITIGATION IN CONTRACTING

10.6.1 Multiple Terms

A risk of long-term power sales, designed in part to lower revenue volatility, can be that they are contracted at power prices that ex post turn out to be too low. To address the uncertainty in long-term contract prices, Manitoba Hydro staggers the expiration dates of its long-term contracts so as to not have to renew all contracts at the same time and potentially lock in unfavorable prices.

The firm contracts end at different times. The end dates and major supply step down dates are 2025, 2030, 2032, and 2035. This mitigates the risk that all contracts expire at once and renegotiations occur during a down market. This in turn provides some protection against low non-firm sales revenues and low firm revenues.

10.6.2 Multiple Buyers: Protection Against Default Risk

In the event of a drought and the loss of the non-firm sales, low power prices can further strain Manitoba Hydro's financial situation. The existence of three buyers rather than one decreases the chance that they will default in order to take advantage of low wholesale prices. Multiple

buyers protects against an even greater loss from having to rely on the unexpectedly low prices.

10.6.3 Multiple Buyers: Execution Risk

Execution risk refers to the failure of the utilities to meet their initial obligations such as obtaining the necessary regulatory approvals and to add the necessary transmission facilities. This is similar to default risk. If default were combined with a drought, there would be less protection against lost revenues. Having multiple buyers decreases this risk.

10.6.4 Creditworthy Buyers

All three buyers under Manitoba Hydro's potential contracts are creditworthy utilities with retail franchises. These companies have been in business for decades. This lowers the default risk which could exacerbate the financial consequences of a drought.

10.6.5 Diverse Pricing Terms – Lower Revenue Variance in Drought

Manitoba Hydro not only diversifies its firm export sales among three different major U.S. utilities, but also diversifies its long-term firm pricing formulas. For example, while some might be indexed to market prices, others are indexed to inflation and so on. Such a strategy has the effect of minimizing financial variance under volatile conditions and offers the Corporation financial stability.

In a situation with drought and high power prices, the existence of the contracts can exacerbate the effect of the lost revenues from lost non-firm sales. However, under the [redacted] contract, a portion of the power is sold [redacted]. This provides at least some access to these high prices and mitigates the effect of that scenario.

In order to guard against risks related to general inflation, the pricing terms of the long-term firm contracts, to an extent, are indexed to inflation. Most terms adjust fully with general inflation or GDP price deflator. However, in the NSP contract, a partial adjustment is allowed in the event of [redacted]. In the event of [redacted]. Details on price escalation terms are presented in chapter 7.

10.7 MANITOBA DOMESTIC ELECTRICITY DEMAND

Higher than expected domestic electricity demand lowers the ability to make export sales, firm and non-firm, and vice versa. The Corporation takes adequate measures to annually update its forecast to reflect potential changes as a result of changes in factors that influence demand, such as electricity prices etc.

During the last five years Manitoba Hydro has under-forecasted its domestic electricity demand. One of the primary causes of this under-forecasting has been the growth in industrial load driven by low industrial tariff. To ensure that increased new industrial load does not threaten export profitability, efforts are underway to change the tariff structure to limit new large loads from gaining access to Manitoba's low rates that would result in higher rates to other domestic

customers after export profitability. For instance, the Corporation is proposing to charge marginal cost to load expansions which exceed a certain percentage.[76]

The company also has also instituted DSM programs. ICF did not review these programs in detail.

10.8 DROUGHT MANAGEMENT

Drought management is part of MH's overall Management Control Plan (MCP). Currently a fully written Drought Preparedness Plan does not exist. However, as discussed elsewhere in the report, during the 2003-04 drought, the company adopted a plan. Also, MH has a System Operations Priorities statement which has elements similar to those contained in the 2003 plan, and a Drought Financial Management Strategy Working Group. Manitoba Hydro's Management Control Plan is discussed elsewhere. A key element is oversight because of the important potential effects of a drought. Under the MCP oversight of various activities and processes is provided by three main supervisory bodies, the MHEB, the EPRMC, and the PSOMC.

The MHEB is responsible for the general oversight of the Corporation's wholesale power related activities and provides oversight duties that involve approvals of sales that require new generation, and sales that exceed five year period and are 100 MW or more in size.

The EPRMC provides oversight of the management of the energy supply and financial risks resulting from Manitoba Hydro's participation in the export power market. This supervisory body is primarily responsible for the review and approval of risk mitigation strategies that are associated with both long and short-term export sales.

Oversight for system financial products is provided by the PSOMC. Among its various responsibilities, it approves strategies used to purchase or sell FTRs or ARRs, and for the use of call and put options, contracts for differences, and swaps.

The Corporation has front, middle, and back offices to facilitate the implementation of its control plan. While the front office is responsible for export marketing strategies, market access long-term contract negotiations and power trading, the middle office is responsible for risk management activities associated with wholesale power transactions, and the back office ensures the integrity of systems and processes for transaction settlements.

Manitoba Hydro has adopted a number of reporting requirements to ensure the implementation of its control plan. For example, the Energy Resources Review and Outlook summarizes water conditions, recent operating conditions and market experience, and provides an outlook for the immediate future. The Credit Exposure Review summarizes credit exposure by customer and by bond rating. The Corporation also requires reporting of power related sales, purchases and expenses actual activity as well as in comparison to forecasted amounts. Reports are made available to all levels of management including exception reporting to the EPRMC.

Such reporting practices keep the Manitoba Hydro management abreast with all the developments and allow it to detect weaknesses in operations and take necessary actions.

[76] Manitoba Hydro Corporate Long Form Risk Profiles, October 2008, p. 6

In past droughts, Manitoba Hydro has taken various steps to manage the volume risk from a severe drought. To stay informed about the supply conditions, it constantly monitored hydro conditions, updated inflow forecasts, and reviewed available market and financial information. During the 2003-2004 drought, MH instituted a Drought Management Plan for that event and spread purchased power and fuel hedges over time to minimize risks and kept oversight and other provincial authorities informed.

As discussed elsewhere, a formal written Drought Preparedness Plan should be prepared especially with respect to reservoir management.

Besides identifying and mitigating the risks associated with a severe drought, the Corporation also addresses various other hydrological risks. For example, to address the risk of upstream regulation that affects the timing of water inflows into the Province, the Corporation closely monitors the inflows as part of its resource planning process. As well, to monitor long-term inflow trends and evaluate future implications, it participates in a number of research initiatives, both involving statistical techniques as well as techniques that employ indicators of past extremes such as tree-rings and lake sediments.[77]

The Corporation also considers various climate scenarios in its future projects. It has developed these scenarios in collaboration with various research organizations, such as Ouranos, École de Technologie Supérieure, University of Manitoba, Canadian Electricity Association Technology Inc., and the International Institute for Sustainable Development. This work has not allowed extension of the hydro record to before 1912 suitable for detailed modeling, but has contributed to addressing concerns about Black Swan risks, i.e., drought more severe than in the 1912 to 2008 record.

10.9 FINANCIAL RISKS AND MITIGATION

Exchange Rate Risks. Due to its large export position, the Corporation has exposure to financial risks associated with wide fluctuations in the exchange rate. While the U.S. dollar denominated cash inflow from export revenues and the U.S. dollar denominated cash outflow in the form of payment of principal and interest of long-term debt, to a certain degree, offers a natural hedge, Manitoba Hydro nonetheless faces risks in periods of large fluctuations in exchange rate.

In order to assess the impact of such risks Manitoba Hydro considers sensitivity analyses relative to its base integrated financial forecasts. The Corporation has estimated that an increase in the Canadian dollar by 10 cents per U.S. dollar decreases its retained earnings by $48 million through 2010/11, $86 million through 2014/15, and $144 million through 2018/19. Conversely, a decrease in Canadian dollar by 10 cents per U.S. dollar increases the retained earnings by $53 million, $126 million and $258 million through similar time-periods.[78]

While the exchange rate risk cannot be fully mitigated, the Corporation, in order to bridge temporary timing differences between inflows and outflows to future years' U.S. dollar requirements, utilizes derivative foreign exchange forward contracts. Moreover, currency swap arrangements transacted by the Province of Manitoba on the Corporation's behalf are utilized to manage exchange rate exposures.

[77] Manitoba Hydro Corporate Long Form Risk Profiles, October 2008, p. 21
[78] Integrated Financial Forecast (IFF08-1), November 2008, p.18

Interest Rate Risks. The Corporations' current debt as well as debt required to finance its construction plan expose it to risks associated with fluctuations in interest rate. In order to mitigate this risk, the Province of Manitoba executes interest rate swap agreements on the Corporation's behalf to manage the fixed and floating interest[79] rate mix of the total debt portfolio, and generally to overall reduce the cost of borrowing. The Corporation also considers interest rate sensitivity analyses relative to its base integrated financial forecasts. The exhibit below shows Manitoba Hydro's liabilities over the 2000-2007 period.

EXHIBIT 10-6
Manitoba Hydro Liabilities

Year	Long-Term Debt		Short-Term Debt		Other Liability		Total	
	U.S. $	CDN $	U.S. $	CDN $	U.S. $	CDN $	U.S. $	CDN $
2000	4,128	6,161	496	741	611	912	5,235	7,814
2001	4,579	7,269	635	1,008	583	925	5,797	9,202
2002	4,363	6,925	481	764	767	1,217	5,611	8,906
2003	5,479	7,115	506	657	1,000	1,299	6,985	9,071
2004	5,850	7,048	403	485	1,166	1,405	7,419	8,938
2005	6,064	7,051	349	406	1,374	1,598	7,787	9,055
2006	5,867	6,822	774	900	1,498	1,742	8,139	9,464
2007	7,289	7,217	714	707	1,634	1,618	9,637	9,542

Sources:
1. 2000-2007 Annual Electric Power Generation, Transmission and Distribution Reports, Statistics Canada; data on assets and liabilities at end of year
2. Exchange rates from http://www.bank-banque-canada.ca/en/rates/exchform.html

Notes:
1. The annual values in table have been represented for a calendar year i.e., January through December
2. Short -Term Debt includes accounts payable & accrued liabilities, loans & notes payable, and accrued interest on long-term debt
3. Exchange rates for year ending December 31 have been used

The Province of Manitoba issues long-term debt directly on behalf of Manitoba Hydro. Both long and short-term borrowings are guaranteed by the Province. Generally 15 percent to 25 percent of Manitoba Hydro's debt is held in floating rate instruments in order to minimize debt costs without undue interest rate exposure.[80] Currently, about 21 percent of Manitoba Hydro's debt is in floating rate instruments. Such a strategy helps shield the Corporation from the potentially adverse consequences of wide fluctuations in interest rates.

[79] Notes to Consolidated Financial Statements for the year ended March 31, 2008, pp. 106-107.
[80] Manitoba Hydro Corporate Long Form Risk Profiles, October 2008, p. 25