

Manitoba Hydro Undertaking #35

Manitoba Hydro to file the Risk Management Review of Power Sales and Operations - Risk Advisory report dated April 2003.

Please see attached report.

Manitoba Hydro

**Risk Management Review of
Power Sales and Operations**

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APRIL 1, 2003

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Introduction

RiskAdvisory is a Calgary-based consulting firm specializing exclusively in the provision of energy risk management advisory services to members of the global energy sector. Since its inception in 1995, RiskAdvisory has worked on advisory mandates with over 160 energy companies in Canada, the United States and New Zealand on a broad range of issues surrounding the management of commodity and foreign exchange market risks.

RiskAdvisory has been retained by the Manitoba Hydro (“Hydro” or “the Company”) to conduct a thorough review of the risk exposures that have arisen from participation in the wholesale electricity markets and fuel procurement activities. Specifically, RiskAdvisory has been retained to complete the following tasks

- Provide a half-day risk management workshop with content determined in consultation with Hydro. The workshop took place on November 12th in Hydro’s offices in Winnipeg;
- Assist in building an internal consensus around the objectives behind the trading/export market activities;
- Assist in the design of appropriate benchmarking tools in order to properly assess the success of any trading/export market activities;
- Advise Hydro on appropriate strategies to optimize the power supply and export market portfolio and fuel purchasing activities.

This report is a preliminary report that sets out the primary risks facing Hydro that are a direct result of their activities in the wholesale power and fuel markets. The report is meant to stimulate further discussion of the magnitude of the risks, as well as determining appropriate benchmarks and implementation strategies. A final report, outlining the risks in greater detail, appropriate benchmarks, and implementation strategies will be completed and delivered to Hydro no later than March 31, 2003.

Background

Manitoba Hydro has been engaging in off-system sales for more than 40 years. Explosive growth in this activity occurred in the late 1990's when export sales increased from under \$300mm in revenue to 2002 when export sales revenue topped \$600mm. Over the past two years the export sales market, as a percentage of electric revenues, has made up over 40% of total electric revenues compared to less than 10% in the early 90's.

Hydro has 5,480 MW's of installed capacity. Of this amount, 4,978 MW's are hydro based, 406 MW's are gas based, and 96 is coal-fired generation. Hydro's peak day occurs in the winter at a maximum of 4,100 MW's leaving ample supply for off system sales to Saskatchewan, Ontario, and/or the U.S. During the summer Hydro's peak is approximately 3,100 MW's. In addition to domestic load, Hydro has over 1800 MW's sold in the forward export market mainly during the summer season to US customers, some of which go out over the next 15 years. With domestic load growth these forward sales gradually will terminate. New generation is not required to serve the domestic demand until around 2020.

The largest unknown in the portfolio is the availability of hydro resources. The risk of a drought is a primary reason that more long-term firm sales have not been consummated. Overselling firm power beyond dependable resources would put Hydro in a riskier position, exposing it to supply shortfalls and to potentially high costs resulting from having to buy wholesale power. Hydro's dependable resources already expose it to the high cost of natural gas fired generation and/or wholesale power purchase costs during extreme drought conditions when power from hydro resources is unavailable. Hydro also has to contend with a risk of lost revenues if they do not make enough firm export sales and the energy is sold in the spot market. In addition Hydro has to contend with the risk of spillage if reservoirs are not drawn down and inflows are above average.

Over the past several years, Hydro's domestic electricity rates have been regulated on a cost of service basis. The Company is also overseen by a Crown Corporation Council that acts on behalf of the shareholders or taxpayers of Manitoba. In 1999, Manitoba Hydro purchased the Manitoba gas LDC, Centra Manitoba ("Centra"). Centra was

previously owned by Westcoast Energy, a private sector company based in Vancouver. Centra was, and still is, regulated differently than Hydro, on a rate-of-return basis.

RiskAdvisory and Hydro met in November 2002 to discuss the risks that Hydro is facing from its activity in the wholesale power markets and from its fuel procurement activities. Based on the information provided to us, we have come to the conclusion that the Power Sales and Operations Division of Manitoba Hydro has a very solid understanding of what risks it faces. The challenge going forward will be to determine the magnitude of the risks, how to benchmark the risks, what instruments are available in the marketplace to manage these risks and how to implement a strategy that optimizes the risk/return of the generating assets.

Revenue Risks

Manitoba Hydro has sold over one billion dollars (\$1 bln) in exports over the past two years. The customer base has gone from 5 customers to over 90 customers since November 1996. Export sales have accounted for over 40% of total electric revenues with the revenue from one sale to NSP (a large Minneapolis based utility) accounting for about 35% of the total. Manitoba Hydro's current target for net export revenues (export sales minus associated costs) is 26%.

The recent unexpected large increase in export revenues has given the government of Manitoba the ability to put a dividend policy in place. The magnitude of the dividend is such that the export sales are counted on in order to make the dividend payment.

Committed Long Term Firm Contract Revenues

The majority of Hydro's long-term contracts are at a fixed price with an escalator tied to some kind of price index such as PPI or CPI. The risk around the CPI or PPI has been initially estimated at around \$10mm per year¹. Given that Hydro likely has costs that are also associated with a lower price index, the absolute magnitude of this risk is likely small and therefore deserves a lesser focus than other risks within the risk management programme. The main risk tied to the committed long-term firm sales is on the cost side

¹ All figures in this report were provided by Manitoba Hydro for fiscal year 2004/05 and were not independently verified by RiskAdvisory.

of supplying the contract power in a drought year. These risks will be discussed later in the report.

Uncommitted Long Term Firm Contract Revenues

Manitoba Hydro estimates that there is a \$40 million risk to its revenue from its uncommitted long-term firm sales. This calculation is based on a \$15 move from budgeted expectations. While some may see this as an opportunity loss, we believe that Hydro should manage this risk as long as there is a dividend policy set by the shareholder. If the \$40mm risk was left open, the payment of the dividend may be at risk. However, it should be realized that by locking in the sales at current levels, opportunity losses may result in a higher price environment.

The most optimal method of managing this risk would be through the purchase of electricity options. Unfortunately, the market for electricity options is virtually non-existent. Alternatively, this risk can be managed through a natural gas put option programme. Given the high correlation between natural gas and power prices, Hydro could purchase annually settled natural gas puts to protect against a fall in gas prices. The theory is that as gas prices fall, power prices will fall. If Hydro enters into firm power sales in a depressed market, the shortfall in expected revenue should be made up with the payoffs from the put options.

Manitoba Hydro should begin modeling this and other risks through Monte Carlo simulations. While Monte Carlo modeling presents unique and complex problems, most utilities are moving in this direction for their risk assessments. This Monte Carlo quantification will allow Hydro to make decisions as to an appropriate level of long-term firm sales to make given the risk of drought, as well as the optimal amount of put options required to protect the necessary revenue requirement.

Opportunity Sales

Opportunity sales are very short term in nature and are only made when the sales price exceeds the cost of the additional supply needed to make the sale. Manitoba Hydro has estimated \$90 million in risk associated with this activity, which represents the entire amount of opportunity sales in any one year. This level of risk is assuming a drought

year and assumes that no opportunity sales will be made due to poor water conditions. The theory behind this is that all Manitoba generation will go to serve native load.

The Company can manage this risk with weather derivatives or weather insurance. Hydro would pay a premium in exchange for insurance against a major drought. The insurance payout would replace the revenue that would have been received from opportunity sales. Again, the only way to analyze the management of this risk is through a Monte Carlo simulation that analyzes the cost of the insurance relative to the risk of having a \$90 million shortfall.

Credit Risk

Hydro's single largest credit risk is to NSP. Manitoba Hydro has contracts of varying lengths with NSP. Recently a 10-year contract was signed which will commence upon completion of an existing long-term contract that will expire in 2005. Based on peak sales to NSP in the recent past, Hydro has estimated a credit risk of \$45 million, which represents 1.5 months of receivables. We believe this number to be too small. While Hydro may recognize a problem exists as soon as NSP has not paid for the prior months deliveries, it has been our experience that utilities rarely cut off such a significant customer at that point. There may be delays due to discussions around contractual obligations to provide assurances that could extend the delivery period. The Company will more than likely have at least three months of deliveries before it terminates future deliveries. That represents approximately \$90 million in receivables at risk. However, this value is tempered by the fact that a reasonable recovery rate would be anticipated with a load-serving customer. In addition, high recovery rates in excess of 85% have been associated with industries with physical assets, including utilities.

The other potential credit risk lies in the replacement risk of the long-term contract. Hydro is exposed to replacing contract sales if NSP fails to perform its obligations and power prices are lower than contract prices. The long-term sale is escalated by a GDP index and therefore implies a price that is fixed in real terms. The risk of the contract price exceeding market is low unless it is expected that over the long term, electricity prices will decline in real terms. The value of the contract replacement risk would be

equal to the difference between market price and contract price. Again, this risk is best modeled through a Monte Carlo simulation and it is likely to dwarf the accounts receivable risk due to the length of the contract.

NSP is Hydro's largest credit exposure but the Company has potential credit risk with all 90 of its customers. Hydro has been, and should continue to determine its credit exposures to all counterparties. This is especially important given the occurrences over the past 3 years with energy companies.

Credit risk can be managed by a number of tools including margining provisions within contracts and through credit derivatives. Again, the Monte Carlo simulation will assist Hydro in determining the most suitable products at the most reasonable cost.

Cost of Production Risk

Forward sales are also necessary to avoid price volatility in the spot markets or to avoid spillage in high water years. This adds to the complexity of the issue of optimizing the generation resources as the Company cannot make all of its export sales in the short term market so it is forced into selling some of its production long term or run the risk of dumping the energy at depressed prices or spill. On the other hand, selling long-term power opens the Company up to a risk of low water or high domestic loads in which they will need all of their hydro resources to meet native load. In this case, there will likely be buying either natural gas and/or wholesale power to meet their firm sales commitments. This will be at a significantly greater cost than from the hydro resource, and there would be a high probability that the cost would be greater than what Hydro is receiving for their firm sales in that year.

Gas Volumes

In a drought year Manitoba Hydro would have to turn on its gas units in order to meet native load and committed export sales. Without the availability of inexpensive water resources, Hydro might have to use approximately 400MW's of gas-fired generation that would require approximately 110,000 gj's/day of natural gas purchases to meet the firm sales commitments under worse case conditions. Based on a forward gas price of \$US

3.70/Dtm, Hydro has estimated the risk of higher costs from running these gas units at \$175 million.²

Hydro should focus on weather derivatives or insurance to cover this risk. Similar to the discussion on weather insurance earlier in this report, Hydro would pay an insurance premium for this coverage and get paid based on a low water year. Hydro should focus on the Monte Carlo simulation as the basis for any weather insurance acquisition. This will assist Management in making the purchase decision based on sound analytics.

Gas Price

Associated with the gas volume risk is the gas price risk. Hydro's analysis showed a gas volume risk of \$175 million based on a gas price of \$US3.70/Dtm. At the same time, Hydro calculated a risk of \$210 million based on the risk of increasing gas prices. As events over the past few months have shown, this risk is real. Based on the current higher mean and volatility, this risk would be closer to \$350 based on the same 98% confidence level.

Hydro should look at acquiring natural gas call options or costless collars to cover at least a portion of this risk. Again, Monte Carlo analysis will help in determining the proper amount and the cost to acquire these options.

Power Purchase Volume

During the course of a drought year, Hydro will have to purchase power from the wholesale power markets in order to meet its firm load commitments. Similar to the gas volume issue, this power will be much more expensive than the lower cost hydro resources that the Company owns. Hydro has estimated the volume risk to be \$110 million based on current MAPP prices.

Similar to the gas volume risk, this risk can be managed through the use of weather insurance. Again, Monte Carlo simulation software is necessary to properly analyze the cost of the insurance relative to the benefits that the Company will receive.

² Current gas prices of close to \$US6.00/Dtm would put this risk at close to \$300 million.

Power Purchase Price

Similar to the gas price risk discussed earlier, Hydro faces the same risk to increased power prices on the volumes it could need to acquire in a drought year. Natural gas fired generation is the marginal source of electricity in the MAPP region during the peak hours of the day. Under wide spread drought conditions which will affect other MAPP hydro generation, there will be a significant reduction in overall hydro production which will be replaced by a significant increase in gas fired generation exposing Hydro to purchase price risk tied to the volatility of natural gas prices. Based on Hydro's analysis, \$90 million is at risk to increased power prices in a drought year based on the same 98% confidence level used in the gas price analysis above.

The power markets have not developed to the point where a liquid option market exists. As such, in order to properly hedge this risk, Hydro should look towards the liquid natural gas option market to hedge the majority of this risk. During times when gas is setting the market, this will be adequate protection. This protection device will begin to break down in times of shortage pricing in the MAPP market due to the small size of the interconnections between the MAPP region and neighbouring power markets. In times of shortage pricing, the MAPP power price will rise dramatically compared to the gas price. Therefore, gas option protection will not be adequate during these times. Unfortunately, there are not a lot of choices to cover this risk in today's environment.

Similar to the other risks discussed, a Monte Carlo simulation will be necessary to properly analyze this risk.

"Made in Manitoba Risks"

Examples of risks that exist from within the province of Manitoba are risks from higher than forecast domestic load and maintenance of water reserves. These risks may require Hydro to purchase additional power in the MAPP market. Although Hydro will receive additional income from the additional domestic sales, it is unlikely to cover the purchase costs. Hydro has estimated these risks at \$150 million.

In addition there is also the risk of increased water rental payments and interest/guarantee fees to the Province. It is unclear at this point whether these payments to the Province are

risks that should be hedged as they might actually benefit other parts of the Manitoba economy or tax base. Therefore, further analysis is required. Hydro has calculated these risks to a total of between \$110-130 million.

Again, weather insurance may be the appropriate method to cover this risk if indeed they are risks that Hydro needs to manage.

Coal

Hydro also has a small amount of risk to coal and has estimated this risk to be under \$15 million. The majority of this risk is tied to volume which can be covered with weather insurance.

Regulatory and Political Risk

RiskAdvisory's work in other jurisdictions has caused us to recommend to many clients that they approach their respective regulator to present a proposed risk management programme and effectively take a collaborative approach to gain approval to proceed. This serves to eliminate, to the degree possible, any negative hindsight review. The fundamental concept here is that Hydro is acting in effect as agent on behalf of the ratepayers with respect to the implementation of a risk management programme around its risk portfolio. The Regulator should play a role in examining any proposed risk management initiative and determine if it is in the best interest of the ratepayer. It is imperative therefore that there be a strong collaborative effort between all interested parties to share their views on the risk management programme parameters in order for the programme to have any chance of long-term success.

Manitoba Hydro believes and RiskAdvisory concurs that more analysis is required to refine the estimated magnitude of the risk elements in its portfolio described throughout this report and to examine the availability and appropriateness of the various derivative instruments that could potentially be used to manage these exposures. This will determine if a comprehensive risk management programme is viable. If this determination is reached, Senior Management approval would be sought and Hydro staff would work to educate themselves to be equipped to manage such a programme. Once this stage is reached Hydro would approach the MPUB to educate them on the magnitude of the risks

and the various options to manage these exposures on behalf of the ratepayer. The objective would be to have the MPUB approve the programme parameters in principle *ex ante* and avoid the potential for negative hindsight review to the degree possible. This approach is consistent with Hydro's historical relationship with the Board and RiskAdvisory's experience in a number of different regulatory jurisdictions.

RiskAdvisory cannot over-emphasize the importance of documenting the risk management programme parameters, establishing monitoring practices and reporting capabilities as the potential magnitude of hedge losses and opportunity costs could be substantial. It would be our further recommendation that Hydro contemplate the following:

- undertake to conduct periodic workshops with MPUB staff and ratepayer representatives to enhance the understanding of the risk profile faced by Manitoba's ratepayers;
- provide MPUB staff with periodic updates on the status of Hydro's long-term risk position and its potential impact on rate volatility.

Agency Relationship with Affiliate

If Manitoba Hydro determines that a risk management programme involving derivatives is a viable course of action it will need to decide on the relative benefits of developing the required skill set to implement and maintain the programme internally or to outsource this activity. The requisite skill set for natural gas transactions, at least, is already in place at Hydro's wholly-owned subsidiary Centra Manitoba and since gas options would seem to be the primary means of hedging much of the Company's drought year exposures to price, it would seem to make more sense to use Centra's existing infrastructure. Front Office (execution), Middle Office (monitoring and reporting) and Back Office (settlements) are in place at Centra and could be utilized by Hydro on some kind of service arrangement.

RiskAdvisory also got the sense that there is a desire on the part of Manitoba Hydro to break down any lines of distinction between the Company and Centra and a service arrangement between the two entities could assist this goal.

Summary and Next Steps

The next steps that Hydro should consider in contemplation of going forward with a risk management programme initiative are as follows:

- develop a Monte Carlo simulation capability that will facilitate both the quantification of the various exposures as well as the potential costs of the instruments used to hedge the exposures;
- review and determine the optimal instruments to employ in the risk management programme;
- establish criteria for benchmarking the risk management activities to properly assess the success of the programme (this will not be easy);
- develop an implementation strategy;
- develop policies and procedures with appropriate guidelines to ensure best industry practices are adopted for the programme.