

Manitoba Hydro

Risk Management Review of
Power Sales and Operations

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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 the past 30 years. The explosive growth in this activity occurred in late 1990's when export sales accounted for under \$300mm in revenue compared 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 approximately 4,100 MW's leaving ample supply for off system sales to Saskatchewan, Ontario, and/or the U.S. A typical day for Manitoba Hydro would have a peak of approximately 2,500 MW's. There is also over 1000 MW's sold in the forward export market, most of which goes out over the next 15 years. This oversupply situation was primarily brought upon from an expansion in the 1970's that was based on a growth forecast of 7% annually. The growth over the past numbers of years has been closer to 3%.

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 sales have not been consummated. Overselling would put Hydro in a riskier position than if it had not sold anything due to a potential large increase in costs that would result from having to buy natural gas or wholesale power rather than generate the power from hydro resources. Hydro also has to contend with a risk of spill if they do make enough export sales and reservoir levels are above 120% of normal.

Over the past several years, Hydro has been regulated on a cost of service basis that can best be described as light-handed. The Company is also overseen by a Crown Corporation Council that acts on behalf of the shareholders or taxpayers of Manitoba. In 2001, 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. Centra, for legitimate reasons in the past, is regulated on a rate-of-return basis and the regulation can

be described as more heavy-handed than Hydro – especially when it comes to trading and risk management policies.

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 Risk

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. The export sales have accounted for over 40% of total electric revenues, while the target is 26%. The majority of the revenues come from 1 sale to NSP – a large midwestern utility based in Minneapolis.

The staggering amount of revenues has given the government of Manitoba the ability to put a dividend policy in place so that a large cash surplus does not accrue at Hydro. 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 fixed with an escalator tied to some kind of price index such as PPI or CPI. The risk around the CPI or PPI is likely around \$10mm per year¹. Given that Hydro likely has costs that are 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

¹ All figures in this report were calculated by Manitoba Hydro and not independently verified by RiskAdvisory.

committed long-term firm sales is on the cost side of supplying the power in a drought year. These risks will be discussed later in the report.

Uncommitted Long Term Firm Contract Revenues

Manitoba Hydro feels 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 and the Company is also opening itself up to risks tied to an extended drought.

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 assumed \$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 of the water 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. The contract runs for fourteen more years and the underlying volumes are substantial. Hydro has calculated a credit risk of \$75 million, which represents 1.5 months of receivables. We believe this number to be 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 a customer on such a large deal at that point. There may be delays due to discussions around financial remedies 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 \$150 million in receivables at risk.

The other potential credit risk lies in the replacement cost of the contract. Hydro is exposed to replacing that contract if NSP fails to perform its obligations and power prices are lower than the price in the contract. 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 should be rigorously determining its credit exposures to all counterparties – especially given the occurrences over the past 3 years with energy companies.

Credit risk can be managed by having margining provisions within the 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 for balancing the hydro system. As discussed earlier, Hydro will have to spill water if the reservoirs reach 120% of average. 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 spill. On the other hand, selling long-term power opens the Company up to a risk of a drought year 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.

Gas Volumes

In a drought year Manitoba Hydro would have to turn on its gas units in order to meet native load and committed long term export sales. Without the availability of inexpensive water resources, Hydro would 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 native load. Based on forward price of \$3.70, Hydro has estimated the risk of higher costs from running the 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.

² Current gas prices of close to \$6.00/gj would put this risk at close to \$300 million.

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 \$3.70/gj. 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 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 committed firm export sales. Similar to the Gas volume issue, this power will be more expensive than the cheaper 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.

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. Based on Hydro's analysis, \$90 million is at risk to increased power prices in a drought year.

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 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 electricity market. In times of shortage pricing, the

power price will rise dramatically compared to the gas price. Therefore, the 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 to native load, water reserves, water rentals, and interest/guarantee fees. It is unclear at this point whether these risks should be hedged, or if they are risks at all. 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 \$260-280 million.

Again, weather insurance may be the 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. The Company has measured this risk to be under \$15 million. The majority of this risk is tied to volume and 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.

In the interviews held in November, it was clearly stated that Manitoba Hydro would not approach the MPUB for pre-approval of any risk management programme activity as the Company believes that the MPUB's jurisdiction is limited to rate setting issues. It was indicated that despite an unwillingness to seek approval up front it would be the Company's strong intention to carefully document and monitor all risk management activity and to always be prepared to report on and defend Hydro's risk management activities to the extent required by the regulator.

While we respect the Company's knowledge of their own regulatory environment and how to best proceed on the matter of pre-approval we would suggest that there is an onus on Hydro to provide a basic level of understanding of the risks and risk management concepts to the MPUB. Many utilities conduct extensive statistical analysis to assign probabilities to potential risk factors. This provides the Regulator and interveners with a better understanding of the magnitude of risk in the portfolio. The analysis can also include the effect of proposed hedging strategies with respect to mitigating risk.

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 is a viable course of action it will need to determine the 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.

Weather derivatives are insurance products that Centra may be unfamiliar with and Hydro would have to develop its competencies in this area internally if, in fact, these tools prove to be a viable option for the Company to pursue.

It was earlier stated that Hydro's relationship with the Regulator has been more light-handed than has been the case with Centra Manitoba. There could be some concern that a service arrangement with Centra could negatively impact Hydro's existing relationship with the regulator. RiskAdvisory is of the opinion, however, that Hydro's reasonable risk management objectives to optimize revenues while defending against drought years and the mechanistic and defensive programme in place at Centra, would not cause any deterioration in the regulatory environment. In fact we are inclined to believe that the regulatory environment could well improve overall. This assumes, of course, that the adheres to the hedge implementation guidelines as set out in the risk management programme.

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.