MSA Report

An Introduction to Alberta's Financial Electricity Market

April 9, 2010

Market Surveillance Administrator

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EXECUTIVE SUMMARY

The purpose of this short paper is to provide some educational background on Alberta's financial electricity market including the types of companies involved, the motivations for trading, the options available to them for trading and some of the mechanics involved. In addition, the report presents the results of an analysis of trade data for the period June 2008 through December 2009.

Alberta's financial market offers a venue for electricity producers and consumers in the province to hedge price risks. Proprietary traders (participants whose activities are not backed by production or consumption of electricity) bring important liquidity to the market as well as assisting in price discovery. The two main platforms available to transact forward are through the Natural Gas Exchange (NGX) or over the counter broker's market (OTC).[1]

The data presented in the report show that the overall financial market trading multiple (the ratio of financial trading volume to the underlying demand) is low compared with other electricity markets, or other commodity markets. The financial crisis over a year ago doesn't appear to have caused a downward trend in trading volumes or participation. However, the concerns of default risk from counterparties appear to have resulted in a higher percentage of OTC transactions being transferred to NGX for settlement.

The development of a strong Alberta electricity financial market is integral to the overall Alberta electricity market. Many observers have said that this should be the 'real' market. A robust forward financial market facilitates risk management and price discovery.

The MSA's jurisdiction over the financial market derives from the *Electric Utilities Act* (EUA) and the *Alberta Utilities Commission Act* (AUCA). The MSA consistently monitors and analyzes the financial market in order to promote fairness, efficiency and open competition in the comprehensive market place that also includes the physical spot market and the retail market.

1 INTRODUCTION

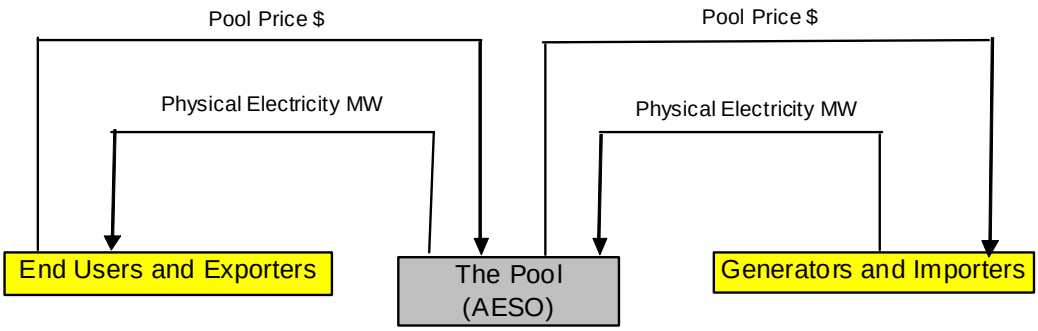
The Alberta electricity market place is comprised of several interlinked markets that all have their own dynamics and prices. The most familiar one for many is the AESO's Pool. In Alberta, the AESO operates a power pool that facilitates electricity flow from the suppliers to the load and also creates an hourly index (Pool price) based on which payments are made from the load to the suppliers (Figure 1). In the Pool, electricity is purchased and sold as it is produced and consumed and the Pool is often referred to as the real time market or the spot market.

In the Pool, generating units are dispatched as required based on a merit order ranked by their offer prices. The generating assets with lower offer prices are

[1] Financial transactions also occur directly between interested parties. More recently, some financial power was auctioned through World Energy. However, at the time of writing, the MSA does not collect data on these transactions.

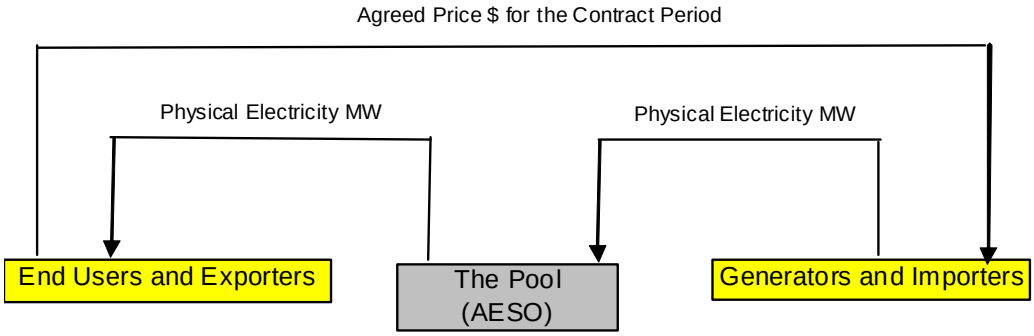
dispatched before those with higher offer prices, until the total dispatched volume equals the demand. The System Marginal Price (SMP) of the Pool is set by the offer of the last megawatt that clears the market. The hourly Pool price is an after-the-fact calculation of the time weighted average of the SMPs in an hour. It serves as an index to settle electricity transactions that occurred in the Pool.

Figure 1: The Pool



However, electricity in Alberta is also transacted before it is produced and consumed through purchases and sales on the forward market. On the forward physical market, the flow of electricity from the sellers to the buyers is still through the Pool in real time, the payment from the buyers to the sellers occurs outside the Pool, as shown in Figure 2.

Figure 2 : Forward Physical Market



The forward market in Alberta also includes the trading of financial contracts 'derived' from the underlying commodity – Alberta electricity. Transactions of these financial contracts form a forward financial market of Alberta electricity. This paper is focused on the forward financial market. The forward physical market is described briefly in Appendix 1.

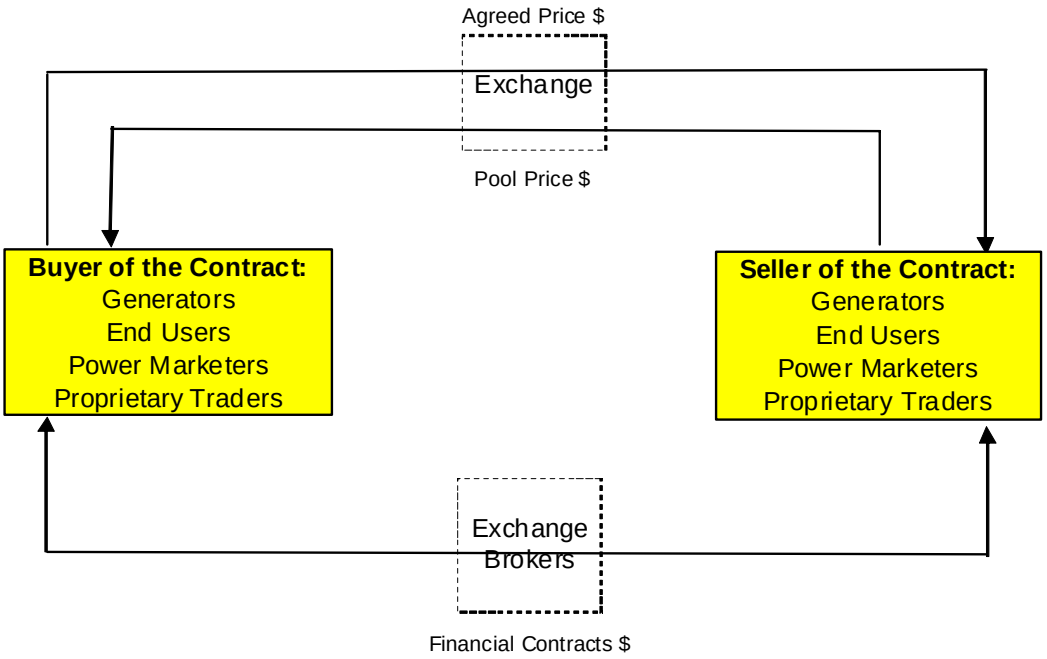
The forward financial market differs from the forward physical market in that it only involves the flow of cash, not the flow (or 'delivery') of electricity. The

financial contracts are also referred to as 'Contracts for Difference' (CFD) or Financial Swaps. At settlement, one party pays the other the difference between the agreed price and the hourly Pool price for the contract period, i.e. the buyer swaps the variable Pool price with the seller for a fixed price. As such, the hourly Pool price also serves as the index to settle financial transactions.

Since there is no 'delivery' of physical electricity, participants in the forward financial market encompass not only power producers (generators) and power consumers (loads), but also those who do not produce or consume electricity, such as power marketers (wholesale marketers and retailers) and proprietary traders (mostly financial intermediaries or hedge funds because of their activity in non-electricity financial markets or affiliation with financial institutions).

Figure 3 depicts a stylized financial electricity market. In the financial electricity market, generators, end users, power marketers and proprietary traders can be on either side of a financial contract. The contract may be facilitated by the exchange or brokers and the settlement may be facilitated by an exchange (indicated by the transparent dotted squares).

Figure 3 : Forward Financial Market



Compared with the physical forward market, the financial market is more liquid and transparent, and therefore more commonly used for hedging and proprietary trading.[2]

[2] The physical transaction volumes are recorded at AESO as Net Settlement Instructions (NSI). The number of transactions and volumes are both much less than in the financial market.

The financial market provides an alternative mechanism for managing price risks faced by producers (generators), power marketers and consumers (loads).

It also provides a collective view on the expectations of future Pool prices. A robust and reliable financial market will yield a forward price curve that can signal the need for investment in generation. Forward prices that are persistently higher than the costs of new generation should prompt appropriate investment.

Alberta electricity financial contracts are settled against Pool price. As a result, financial contracts affect price exposure of a generator in the real-time spot market. In turn, this can influence the offer behaviour of the generators in the spot market.

The MSA began collecting financial trading data from Over the Counter (OTC) brokers in May 2008 in addition to the financial trading data already received from the Natural Gas Exchange (NGX). With more than a year's worth of enhanced financial market data, the MSA believes that it is a good time to take stock of what useful market information may be gleaned from the cumulative data set. The data set used for analysis spans the period June 2008 through December 2009, inclusive.

2 FINANCIAL ELECTRICITY MARKET

The financial electricity market is where financial electricity contracts (or instruments) are traded. A financial transaction usually involves the following elements:

- Transaction date
- Seller
- Buyer
- The underlying commodity
- Size of the contract
- Unit price of the product
- Period covered by the contract
- Method of settlement (e.g. settlement date, settlement currency[3])
- Credit provisions

[3] Occasionally Alberta power financial contracts are settled in US dollars.

Example #1[4]- A Financial Transaction

On January 2, 2009, Company A agreed to sell 25 MW Q4/09 Alberta flat power[5] to Company B at $50/MWh.

At settlement, for each hour of Q4/09 Company A pays Company B the Pool price and Company B pays Company A the agreed price of $50/MWh for the 25 MW covered under the contract. The payments are in Canadian dollar and made on the 6th business day following the delivery month.

The specifics of the contract laid out the important elements listed above:[6]

- Transaction date: January 2, 2009
- Seller: Company A
- Buyer: Company B
- The underlying commodity: Alberta electricity
- Size of the contract: 25 MW
- Unit price of the product: $50/MWh
- Period covered by the contract: every hour between October 1, 2009 and December 31, 2009. This is the period when the underlying commodity is delivered
- Method of settlement: the 6th business day after each delivery month.

Financial contracts like the one shown in Example #1 are commonly used as instruments to hedge price exposure that is inherent in generating assets.

'Speculation' Inherent to Generating Business

The nature of Alberta's spot market is that the Pool price can be volatile. Generating capacity that is brought to the spot market is essentially 'speculating' that the spot price will provide profit to it. This risk is inherent to the electricity generating business and the generating asset owners may choose to reduce it by selling forward financial contracts.

Many firms in Alberta who own generating assets use the financial market to limit their exposure to Pool price risk.

Hedging

A generator who sells financial contracts is in effect taking a position in the financial market offsetting the price exposure that will be held in the spot market. This process is called hedging. Hedging may also be used by the load or load serving companies. A load or load serving company inherently has a short position (i.e. a need to buy) in the spot market. Therefore, it may take an offsetting position by purchasing financial electricity contracts.

[4] Throughout this section, stylized examples will be provided to explain some of the basic concepts in financial electricity market transactions.
[5] A 'flat' power contract covers every hour each day in the contract period. See Section 2.2.
[6] If it is an Exchange contract, the credit provision is reflected in the Counter Party Agreement with the Exchange. If it is an OTC contract, the contract includes a credit provision that requires the two parties post collateral to each other when a pre-specified adverse move in price occurs.

Financial contracts typically establish a known price level of electricity in advance of the spot market. This provides a means to protect the sellers' revenue or limit the buyers' cost and increase cash flow certainty.

2.1 Trading Platforms of the Financial Electricity Market

Transactions of Alberta electricity financial contracts can be conducted directly by two interested parties. However, many trading activities are facilitated by the Natural Gas Exchange and by brokers. The brokers' market, together with the direct bilateral market, is termed the Over-the-Counter market (OTC).

2.1.1 Natural Gas Exchange

Natural Gas Exchange (NGX) is an electronic trading platform that also provides central counterparty clearing and data services to the North American natural gas and electricity markets. Alberta electricity financial contracts are among many instruments traded on NGX.

There are several features of the contracts traded on NGX:

- Anonymity and transparency

  On NGX, contracts are anonymously quoted and traded. The posted quotes and associated volumes are visible to all NGX participants.

- No counterparty risks

  NGX, as a clearing house, guarantees against counterparty default by taking both sides of the trade.

  To achieve this, NGX requires participants to deposit collateral with NGX to cover all their open positions and sets 'Margin Requirement' for participants. The 'Margin Requirement' is a monetary value that quantifies a participant's potential default risk. In the event a participant's 'Margin Requirements' approaches, equals or exceeds 80% of the collateral, NGX will advise the participant and may request additional collateral, limit or halt the participant's trading activities or even liquidate its positions or close out its account.

  NGX as a central clearing house removes counterparty default risk for each individual participant from the trading of financial electricity contracts.

- Easy to 'offset' a contract

  Because financial contracts traded on NGX do not have counterparty default risk, to offset a contract one just needs to enter a transaction of a reversing trade on NGX. A

'reversing trade' is an exact opposite transaction of the same contract.

2.1.2 OTC Market

The OTC market is facilitated by brokers. A broker is the 'middle man' who brings buyers and sellers of financial electricity contracts together.[7]

Although the financial contracts traded through brokers are very similar to those traded on NGX, there are occasions when brokers may facilitate contracts with odd sizes and/or contract periods. Typically, the identity of buyers and sellers are known to each other after the transaction is completed, as the two parties have to make payments to each other.

Unlike NGX, brokers do not provide the 'central counterparty' service. Therefore, the buyers and sellers who trade financial contracts through brokers are exposed to the default risk of their counterparties. For example, if the financial contract described in Example #1 is facilitated by a broker, either of the traders could potentially refuse to pay the other one in the event that the Pool price moves against its position.

The counterparty default risk associated with the contract makes it harder to terminate a contract on the OTC market compared with one on NGX. On the OTC market a reversing trade may not offset the default risk associated with the original contract. If the reversing position is entered with a third counterparty, default risk may increase.

To manage the default risk, transactions facilitated by the brokers (and in some cases even direct bilateral financial contracts) may be moved to NGX for clearing and settlement purposes. In recent months, increased volumes of OTC transactions have been cleared and settled on NGX.[8]

2.2 Types of Contracts

Typically the financial contracts of Alberta electricity fall into one of the following types:

- Flat: A Flat electricity contract covers every hour each day in the contract period
- On-Peak: An On-Peak electricity contract covers hour ending HE8 to HE23 Monday through Saturday, excluding Sundays and NERC holidays, in the contract period

[7] Brokers may bring the buyers and the sellers together via telephone or electronically.
[8] Details are in Section 3.6.

- Off-Peak: An Off-Peak electricity contract covers HE1 to HE7 and HE24 Monday through Saturday, and all hours on Sundays and NERC holidays in the contract period
- Extended Peak: An Extended Peak contract covers HE8 to HE23 every day in the contract period
- Extended Off-Peak: An Extended Off-Peak contract covers HE1 to HE7 and HE24 every day in the contract period
- Super Peak: Super Peak contract covers HE17 to HE22 each day in the contract period

The data received by the MSA from NGX and the brokers does not include any of the more sophisticated types of trades such as options.[9] We believe they are not frequently traded products and are likely transacted on a direct bilateral basis.

2.3 Participants in the Financial Electricity Market

There are four main types of participants in the financial market.

- Generators
- Loads
- Power Marketers (including retailers)
- Proprietary Traders

In practice individual market participants may operate in more than one category, but the classification allows us to distinguish the different motivations.

Generators

Generators who take their generating assets to the spot market are exposed to risks caused by the volatility of the Pool price. During hours when the Pool price is not enough to cover dispatch cost (costs associated with dispatching the unit), the generating asset will be idled and make no profit. Many firms with generation do not take a fully un-hedged position to real time spot market. They use the financial contracts to manage at least some portion of their exposure to spot price.

[9] An option is a contract that gives the buyer of the contract the right, but not the obligation, to buy or sell power at a fixed price for a specific period of time. The contract also obligates the seller of the contract to meet the terms (selling or buying) if the contract right is exercised by the owner.

Example #2 – Hedging with a Financial Contract by a Generator

A generator with a dispatch cost of $30/MWh may choose to sell a Calendar Year 2011 flat Alberta power contract for 25 MW at $60/MWh.

In 2011, when Pool price is lower than $30/MWh, the generator won't cover its dispatch costs running the unit. Without the financial contract, the generator would receive zero revenue in those hours. With the financial contract, the generator receives $60/MWh revenue in all hours of 2011.

Figure 4 depicts how the generator's hedge works in 2011.

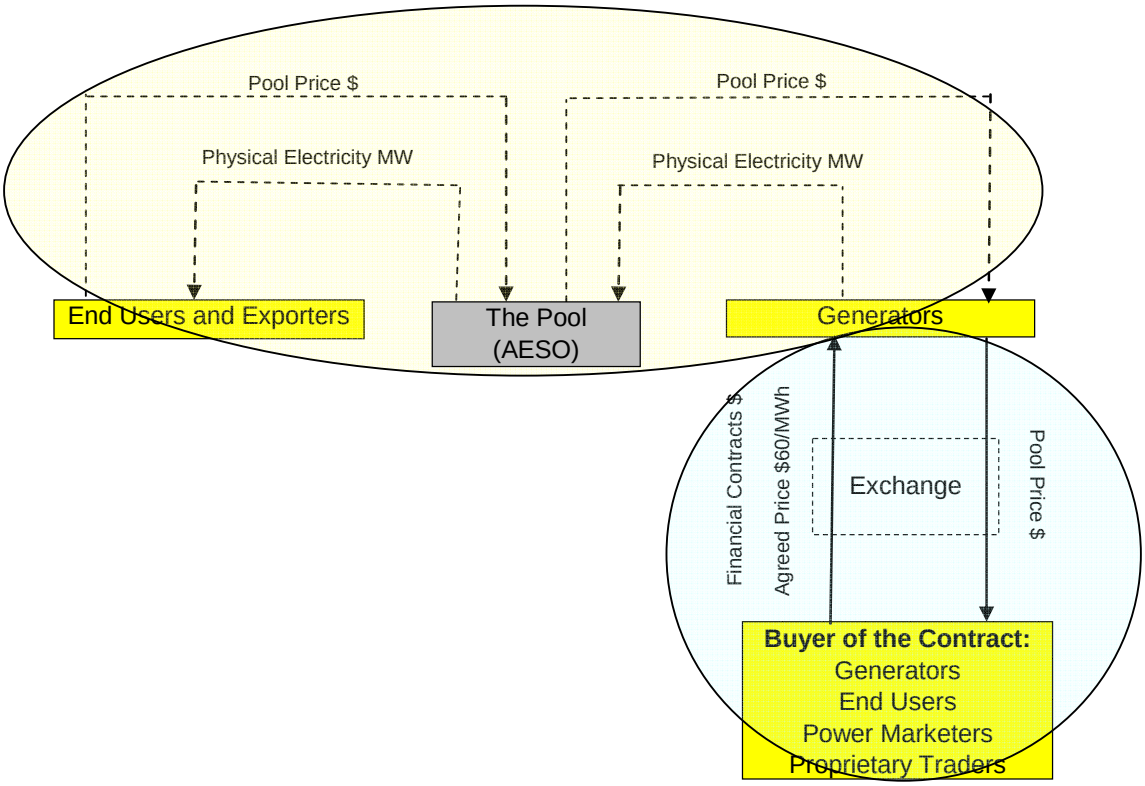
Under the financial contract, the generator pays the Pool price to, and receives the fixed price of $60 from, the buyer of the contract for every hour in 2011 (indicated by the blue bubble in Figure 4).

In the spot market (indicated by the yellow bubble) during the hours when the Pool price is higher than $30/MWh, the generator will produce power and receive the Pool price from AESO. However, since the financial contract requires the generator pay the buyer the Pool price, essentially the cash flow from the AESO is offset by the payment to the financial contract buyer. On a net basis, what the generator receives is the $60/MWh payment from the contract buyer not the Pool price during the hours it runs its unit.

When the Pool price is lower than $30/MWh, it's not profitable to run the unit and the generator receives nothing from the pool. However, the generator receives the $60/MWh payment from the buyer of the financial contract. Meanwhile, the generator has to pay his financial counterparty the Pool price without having collected it from the AESO because the unit does not run. Since the Pool price is below the dispatch cost of $30/MWh, the operating profits for those hours, which are $60/MWh minus the Pool Price, are higher than in the hours when the unit runs.

Effectively, the generating unit receives $60/MWh every hour in 2011. This is the cash flow certainty brought to the generating asset by the financial contract.

Figure 4 : Hedging by a Generator



Load

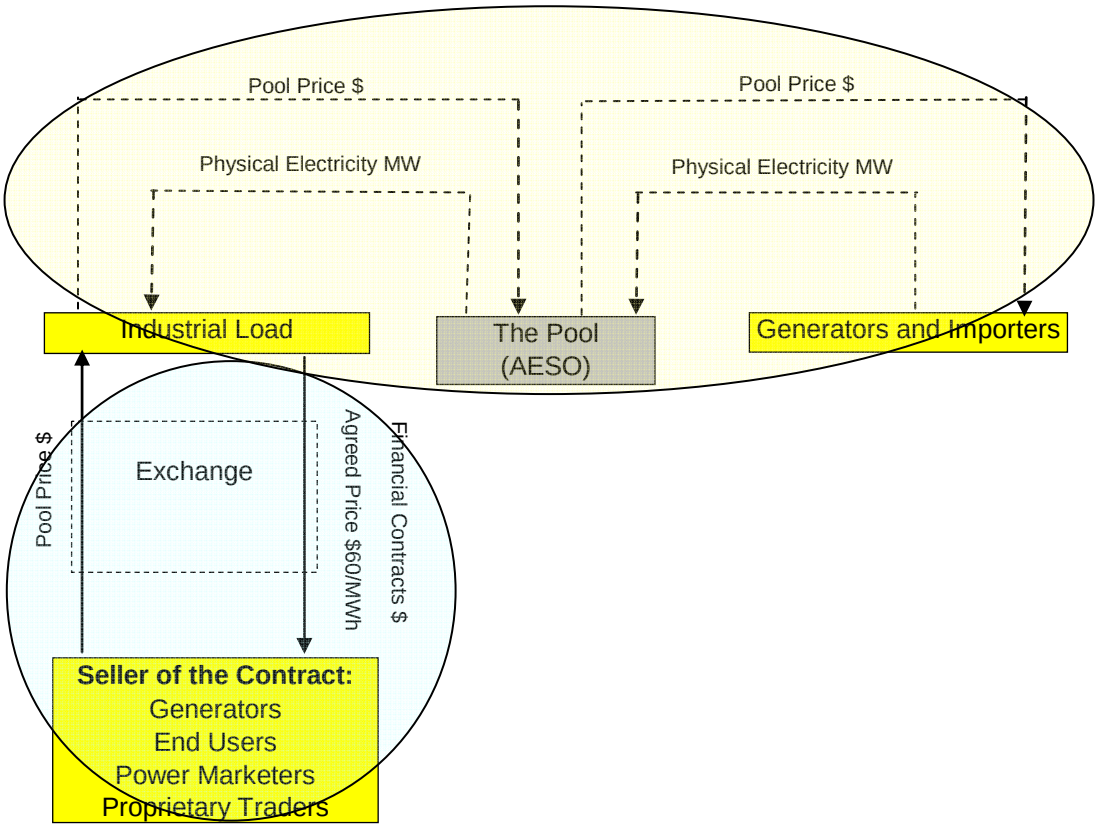
Industrial loads that purchase electricity from the spot market are exposed to risks caused by the volatility of the Pool price. Frequent readers of the MSA's quarterly and price event reports will know that in many cases extremely high Pool prices in Alberta are due to sudden outages of generating units. If forced outages cause price spikes, the cost of electricity to loads may interrupt their business. Financial contracts are tools for loads to hedge price risks in the spot market.

Example #3 – Hedging by an Industrial Load
An industrial load may choose to buy a Calendar Year 2011 flat Alberta power contract for 25 MW at $60/MWh. In 2011, no matter how the Pool prices change, the load will pay $60/MWh for 25 MW of its consumption.

In the spot market, the Pool price may go above $60/MWh. Without the financial contract, the industrial load has to pay the price that is higher than $60/MWh in those hours. With the financial contract, the industrial load pays $60/MWh in all hours of 2011.

Figure 5 depicts how load's hedge works in 2011.

Figure 5: Hedging by an Industrial Load



Under the financial contract, the industrial load receives the Pool price from, and pays the fixed price of $60 to, the seller of the contract for every hour in 2011 (indicated by the blue bubble).

In the spot market (indicated by the yellow bubble) the industrial load will consume power and pays the Pool price to AESO. However, since the industrial load is paid the Pool price from the seller of the financial contract, essentially the cash flow to the AESO is offset by the payment received from the financial contract seller. On a net basis, the industrial load pays the $60/MWh fixed price to the contract seller, not the Pool price when it consumes energy from the Pool.

Effectively, the industrial load pays $60/MWh for the 25 MW electricity consumed every hour in 2011. This is the electricity cost certainty brought to the industrial load by the financial contract.

If the Pool price rises above the level to justify production activity of the industrial load, the industrial load may turn off so that it doesn't have to pay the Pool price to AESO. In a situation like this, the financial contract continues to provide the industrial load with the payment of the Pool price from the contract seller and the load continues to pay the fixed price of $60/MWh to the contract seller, as if the load were selling power bought at $60/MWh into the Pool.

Power Marketers

Power marketers include those who engage in marketing wholesale electricity as well as retailers who provide power to retail customers. Some power marketers do not own generating facilities and have to buy electricity from the Pool in order to fulfill obligations to their customers. This exposes the power marketers to spot price risks. Power marketers may use the financial market to hedge these spot price risks in a similar fashion as loads.

Example #4 – Hedging by a Retailer
A retailer may have signed contracts with retail customers to provide electricity at 9c/kWh ($90/MWh) in 2011. This retailer hedged a portion of its aggregated obligation, e.g. 25 MW, by buying a Calendar Year 2011 flat Alberta power contract for 25 MW at $60/MWh.

In 2011, no matter how the Pool prices change, the retailer will pay $60/MWh for the 25 MW of his total retail obligations. Without the financial contract, if the average Pool price is higher than $90/MWh, the retailer will lose money on his retail obligation. With the financial contract, the retailer is able to lock in a margin of $30/MWh for the 25MW of his retail obligation that are hedged.

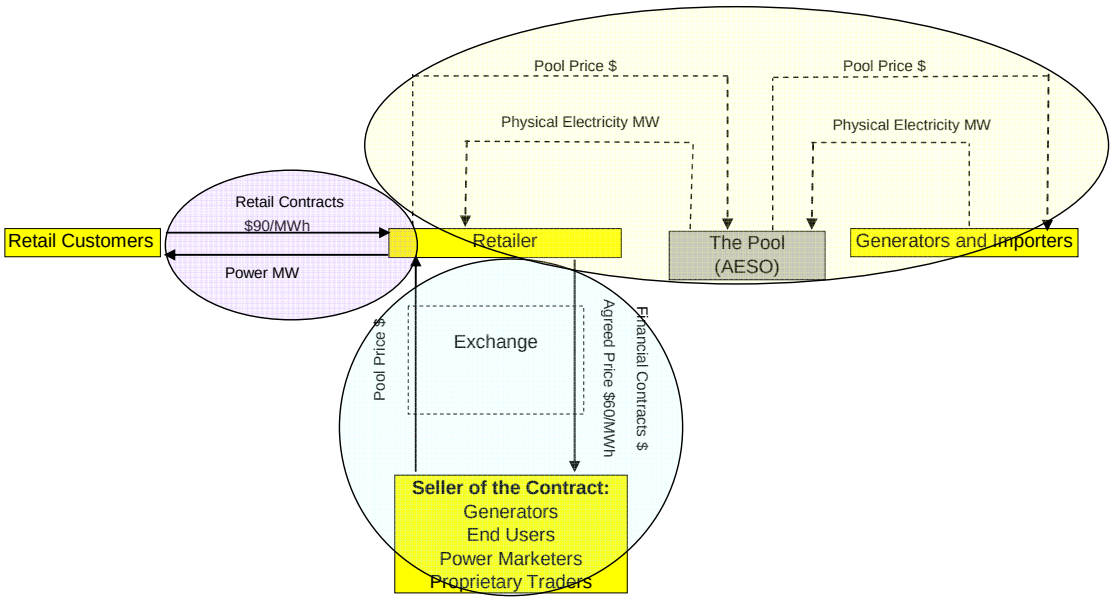
Figure 6 depicts how the retailer's hedge works in 2011.

Under the financial contract, the retailer receives the Pool price from and pays the fixed price of $60/MWh to the seller of the contract for every hour in 2011 (indicated by the blue bubble).

In the spot market (indicated by the yellow bubble) the retailer will purchase power from the spot market and pays the Pool price to AESO. However, since the retailer is paid the Pool price from the seller of the financial contract, essentially the cash flow to the AESO is offset by the payment received from the financial contract seller. On a net basis, what the retailer pays is the $60/MWh fixed price to the contract seller, not the Pool price when it purchases energy from the Pool.

With the retail contract (indicated by the purple bubble), the retail consumers pay the retailer a fixed $90/MWh and the retailer provides power to the consumers.

Figure 6: Hedging by a Retailer



Effectively, the retailer pays $60/MWh for the 25 MW electricity every hour in 2011 and receives $90/MWh from the retail customers. This is the margin certainty brought to the retailer by the financial contract.

Since retail load changes hour over hour, retailers may use a combination of different types of financial contacts in order to make the hedging match retail load profile as closely as possible. For example, buying a 25 MW flat contract and a 15 MW on-peak contract provides 25 MW hedging during off-peak hours and 40 MW hedging during on-peak hours.

Proprietary Traders

Proprietary traders are market participants whose activities are not backed by production or consumption of electricity but seek to make a profit by buying low and selling high based on their market views. A proprietary trader will analyze publicly available information from a wide variety of sources and take a view on the price moves. When its view is consistent with the actual move of the price, a proprietary trader is able to profit from the transaction. Otherwise, it will incur a loss from the transaction.

Example #5 – Proprietary Trading
A trader may form a view that the Calendar Year 2011 flat Alberta power contract is likely to rise from the current price of $60/MWh. Based on this view, the trader may buy a 5 MW Calendar Year 2011 flat Alberta power contract. If at a later date, the price of that contract indeed rises as it expected, e.g. to $65/MWh, it will sell the contract and make a profit of $5/MWh.

Note the scale of the finances involved. 5 MW for Calendar Year 2011 is 43,800 MWh (= 365 d/yr X 24 h/d X 5 MW) and the original purchase cost was some $2.6 million. Further, the assumed profit of $5/MWh equates to $219,000.

Proprietary traders do not necessarily take their financial positions into the spot market. Some of them choose to 'flatten' their positions before real time in order to avoid financial exposure to actual Pool prices.

The value of proprietary traders to the Alberta market is primarily that they provide market liquidity – meaning that they will provide a counter party for those who wish to hedge, and facilitate price discovery.

2.4 Regulatory Framework

The Alberta financial electricity market is subject to the regulatory framework that is set out by the *Electric Utilities Act* (EUA), the *Alberta Utilities Commission Act* (AUCA), the *Alberta Securities Ac*t (ASA) and the *Competition Act*.

The *Competition Act* is a general law of general application regulating anticompetitive conduct and trade practices in Canada. Deference can be shown to other statutes or bodies actively engaged in regulating a particular sector, but the application of the Act to certain conduct in Alberta's financial electricity market cannot be ruled out.[10]

As a result of NGX's primary operations being located in Calgary, the Alberta Securities Commission (the ASC) identifies itself as NGX's lead regulator among the various provincial securities commissions.[11] The mandate of the ASC is specified in the *Alberta Securities Ac*t. In general terms, the ASC establishes an Oversight Program to ensure that the Exchange in question meets appropriate standards for market operation and regulation based on the type of activities carried out by the Exchange.[12]

[10] See the Competition Bureau's "Technical Bulletin on 'Regulated Conduct', June 29, 2006 at http://www.competitionbureau.gc.ca
[11] NGX Regulatory Status: http://www.ngx.com/regulatorylegal.html
[12] For details, refer to the Memorandum of Understanding Respecting the Oversight of Exchanges and Quotation and Trade Reporting Systems among Alberta Securities Commission, British Columbia Securities Commission, Manitoba Securities Commission and Saskatchewan

The trading activities of NGX participants (Contracting Parties) are governed by NGX Contracting Parties Agreement (CPA).

The MSA's oversight of the Alberta financial electricity market derives from both the EUA and AUCA. Subsection 1(ee) of the EUA defines "market participant" as "any person that supplies, generates, transmits, distributes, trades, exchanges, purchases or sells electricity, electric energy, electricity services or ancillary services" or "any broker, brokerage or forward exchange that trades or facilitates the trading of electricity, electricity energy, electricity services or ancillary services". Subsection 1(q) of the EUA includes "making financial arrangements to manage financial risk associated with the pool price" in the definition of "electricity services".

Section 39 of the AUCA empowers the MSA to monitor the activities of market participants and to investigate and sanction conduct that contravenes the EUA. The MSA's oversight of Alberta's forward financial electricity market is focused on the trading activities of market participants that may be of relevance with regard to Section 6 of the EUA.[13]

2.5 Structure of a Typical Trading Operation

A trading operation typically consists of three parts: Front Office, Mid Office and Back Office. The Front Office is where revenue is generated, the Mid Office is responsible for risk control and the Back Office provides administrative support. The activities in the Front Office are often impacted by the Mid Office and the Back Office.

2.5.1 Front Office

The Front Office typically includes sales and trading personnel.[14] In addition to offering energy to the Pool and importing and exporting in real time, the Front Office also uses the electricity financial market to optimize assets and/or to engage in proprietary trading.

Asset Optimization

Asset optimization is focused on generating revenue from physical assets whilst managing the associated risks. The Front Office asset optimizer actively assesses the market situation and adjusts strategies by placing a financial hedge on or removing an existing hedge off the asset. In this way, an asset optimizer with, say, 100 MW asset may sell and buy back up to 100 MW in the financial

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Financial Services Commission: http://www.albertasecurities.com/Insiders/MFDA%20%20OR/MOU%20Re%20Oversight%20of%20Exchanges%20and%20QTRSs%20%20AS%20OF%20JANUARY%201%202010.pdf

[13] Section 6 of the EUA reads: "Market participants are to conduct themselves in a manner that supports the fair, efficient and openly competitive operation of the market."

[14] Some companies also have market analysis and marketing functions in the Front Office.

market several times over before real time, attempting to make profits along the way.

Proprietary Trading

The Front Office of a proprietary trading shop forms views of the market fundamentals and trades around these views.

However, not all transactions are initiated by changes in market views. Some transactions are initiated by having reached a profit target or attempting to limit loss.

Example #6 – Profit Taking
Suppose the Calendar Year 2011 flat Alberta power contract is traded at $60/MWh and a trader believes that the price will go higher, the trader buys the contract at $60/MWh and sets a 'sell target' at $70/MWh. Once the price hits $70/MWh, the trader sells the contract and makes $10/MWh profit.

The selling in this case is initiated by the fact that the contract price has reached the profit target set by the trader, not necessarily because the bullish view on price has changed.

Example #7 – Stop Loss
Suppose the Calendar Year 2011 flat Alberta power contract is traded at $60/MWh and a trader believes that the price will go lower, the trader sells the contract at $60/MWh and sets a 'stop loss' price at $70/MWh. If the price rises to $70/MWh, the trader buys the contract and takes a $10/MWh loss.

The buying in this case is initiated by the fact that the trader attempts to prevent losing more than $10/MWh should the contract price rise to higher than $70/MWh, even if he believes that the price will drop below $60/MWh later.

Proprietary trading can serve as a means not only to generate revenue but also to understand a market. Some companies start proprietary trading and use it to gain knowledge prior to investing physical assets in a new market.

2.5.2 Mid Office

The Mid Office is responsible for risk measurement and risk control. It provides internal reports of profit and losses for the firm's trading books, calculates risk metrics of portfolios on a daily basis[15] and analyzes changes in a portfolio. Some reports produced by Mid Office are passed to the Front Office who then uses them to adjust trading strategies so that the corporate risk policies are followed.

[15] Some companies may produce hourly metrics.

A commonly used risk metric is Value at Risk (VAR), which is a method for predicting possible portfolio exposure by using statistical analysis of historical price trends and volatilities. Traders are given VARs and when they reach the VAR limit they may have to liquidate positions through trading. VAR restricts the size of the position a trader may take and measures a potential exposure of a portfolio. Therefore, transactions in the financial market may be initiated by structural change of a portfolio that is driven by Mid Office risk control.

2.5.3 Back Office

The Back Office provides administration and support functions to the front office. Typically it takes care of settlement and accounting, and may also provide regulatory compliance and contract administration support. An important responsibility of the Back Office is monitoring and managing of counterparty credit risk, which is the risk due to the uncertainty in a counterparty's ability to make payments in a timely fashion. The Back Office sets credit limits that specify the maximum exposure a firm is willing to take with a counterparty. Trading with a counterparty may be halted by this internal control when that counterparty's credit limit is reached.

2.6 Linkage between Forward Financial Market and Real Time Spot Market or Retail Market

Recall that, in Example #1, the buyer of a financial contract pays a fixed price to the seller and the seller pays the Pool price to the buyer. Therefore, the hourly index created by the Pool is the index against which financial contracts are settled. The profitability of a financial contract that is carried to real time is determined by the difference between the fixed price specified in the contract and the Pool price. Therefore, the fidelity of the Pool price and the integrity of the spot market are very important to a healthy financial market.

Example #8 – Increased Incentive to Influence Pool Price by a Generator that Carries Financial Contracts to Real Time
Suppose a generator has a 200 MW unit with a dispatch cost of $30/MWh. Assume that the offers for this generator have some effect on Pool price.

If all 200 MW are offered at dispatch cost, the Pool price will likely be $40/MWh and the generator would make a profit of $2,000 in the hour ([$40-$30] x 200).

If all 200 MW are offered much higher at, say, $500/MWh, Pool price will likely be $200/MWh and all 200 MW will be out of merit. The profit will be $0 since the unit will not be dispatched.

In such a scenario, clearly it is not a profit maximizing strategy to offer the 200 MW at $500/MWh.

However, if the generator has purchased a financial contract and carried it to real time, its financial contract will be able to benefit from the $200/MWh Pool price.

Suppose the fixed price of the financial contract is $60/MWh, the generator will receive the Pool price and pay the fixed $60/MWh to the seller of the contract. A 20 MW financial contract would provide it more profit than offering all its 200 MW at dispatch cost ([$200-$60] x 20MW=$2,800).

In some generating companies, the activities described in Example #8 are avoided or limited by the company's internal risk governance.

A generating company may separate proprietary trading from transactions related to asset optimization. A proprietary trader in such a company does not have the ability to use its assets to influence the Pool price in order to benefit its financial position.

In a company that manages proprietary trading and assets as one 'book', proper risk control may limit the size of the financial positions taken by proprietary traders, and therefore, to some degree limit the incentive and ability to benefit from using assets to influence the Pool price.

A direct link between the forward financial market and the retail market in Alberta occurs because the monthly retail Regulated Rate Option Rates (RRO rates) are priced with the index of qualified quotes and trades of monthly financial contracts on NGX.[16] Also the RRO Energy Price Setting Plans may impact participants'

[16] For details, refer to Section 6 of "NGX Price Index Methodology Guide" (http://www.ngx.com/pdf/NGXPIMG.pdf)

trading behaviours in the financial market. Therefore, a well functioning financial market and a robust RRO scheme are also important to each other.

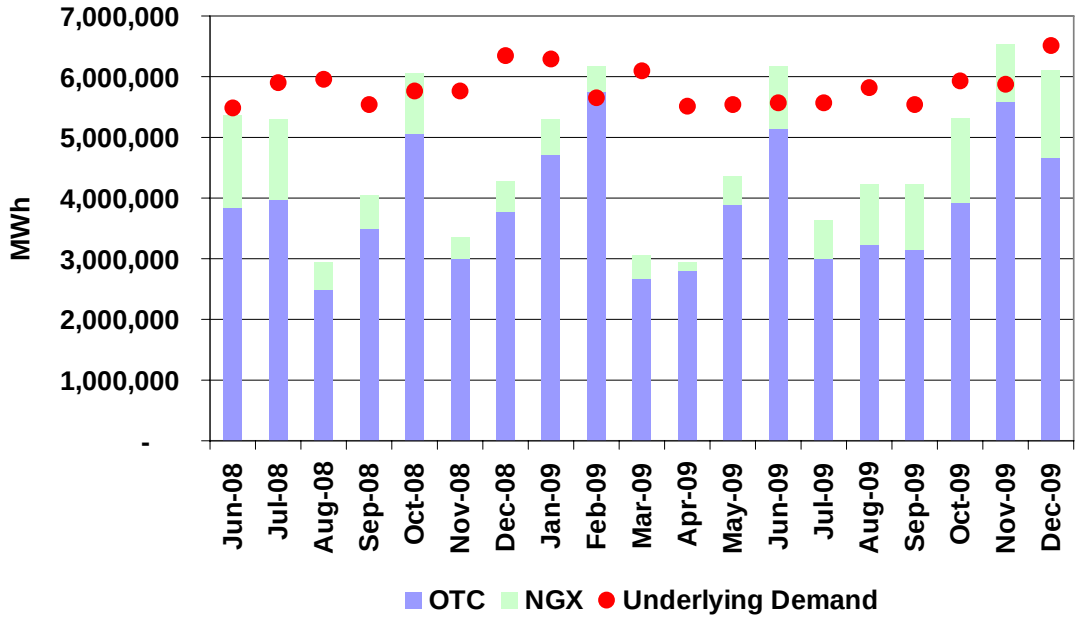
3 ANALYSIS OF ALBERTA FINANCIAL ELECTRICITY MARKET DATA

This section presents a summary of the trading of the financial contracts on NGX and through brokers. The period covered in the data is between June 2008 and December 2009.

3.1 Trading Volumes and Participation

Between June 2008 and December 2009, over 89,000 GWh[17] of financial contracts were traded on the NGX and on the brokers (OTC) market. Figure 7 depicts the monthly trading volumes in the forward market.

Figure 7: Monthly Trade Volumes



The overall trading multiple on NGX and through brokers in the period was 0.81, i.e. the total trading volume on NGX and the broker's market was equivalent to 81% of the underlying demand. The underlying demand is the volume of physical flow of energy in real time. No obvious trends are found in the data.

In 2005, the MSA undertook a survey of market participants to estimate the volume of forward trading after the implementation of the Trading Practices Guideline and Information Disclosure Procedure.[18] In that survey both sides of the trades were counted and the average trade volume was reported as 1.4 times of the underlying demand. Hence the

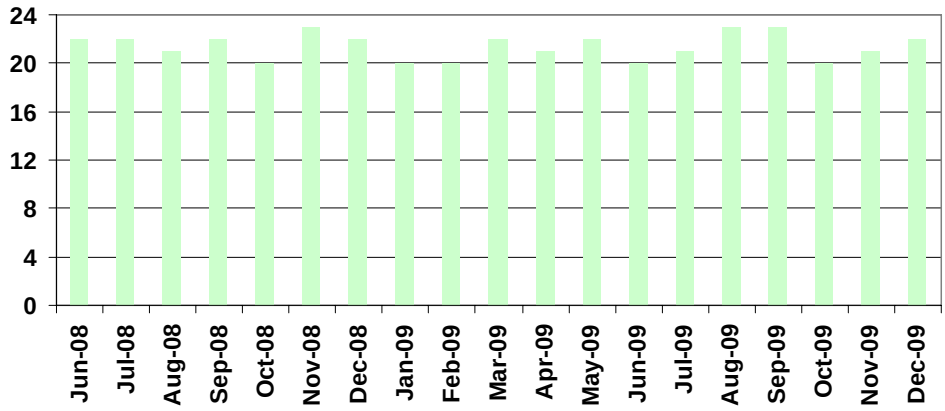
[17] Volumes in this report only include one side of the transactions.
[18] See MSA Report at http://www.albertamsa.ca/files/TPGIDPAssessmentReport091505.pdf

multiple in 2004/5 using one side of the transaction was about 0.7; lower than it is today.

The trading multiple of 0.81 is lower than other electricity markets, such as PJM, New England or Nord Pool, where financial contracts trading multiples on the Exchange only are well above 6.[19] In Australia, the exchange trading multiple for 2008/9 was 3.6. Alberta's financial electricity trading multiple is also significantly lower than other commodities, e.g. natural gas where the multiple is typically above 40. The lower trading multiple is likely due to the fact that compared with other electricity markets and other commodity markets the underlying Alberta electricity market is much smaller in size and less connected with the outside markets. Smaller and less connected markets generally make price discovery through forward trading more difficult.

Typically, at least 20 different companies trade financial contracts each month in Alberta. Many companies trade on both platforms. Figure 8 shows the number of companies who traded on the financial market by month. Although some companies were impacted by the financial crisis and left the market, others replaced them and the number of companies has been steady.

Figure 8: Number of Companies[20]



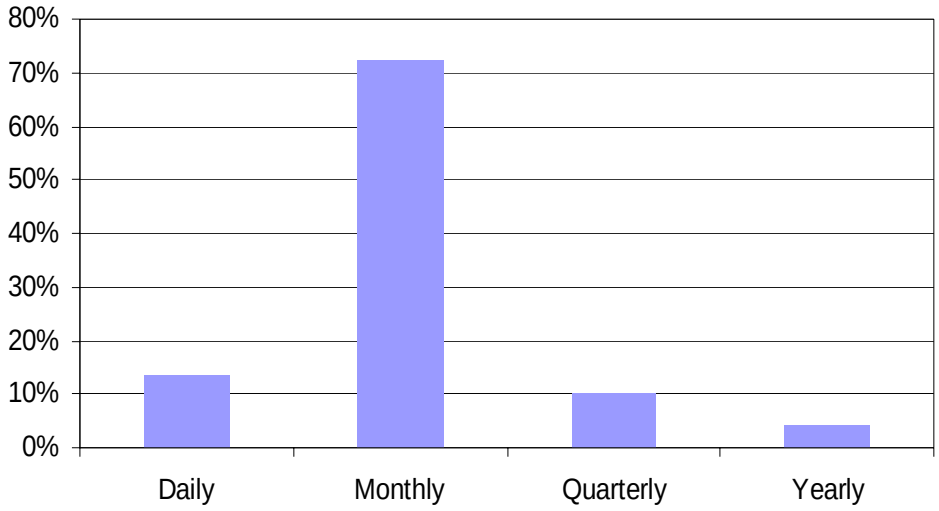
[19] DC Energy, "Can Energy Markets Finance Infrastructure?" (http://www.usaee.org/USAEE2007/submissions/presentations/Dean%20Wilde.pdf)

[20] Figure 8 does not include the companies that do not transact on NGX or via brokers.

3.2 Contract Term Structure

The terms of the financial contracts traded typically include hourly, daily, monthly, quarterly and yearly. Figure 9 depicts the number of transactions of different contract terms and Figure 10 shows the same information except by the percentage of trading volume.[21]

Figure 9: Percentage Transaction by Term



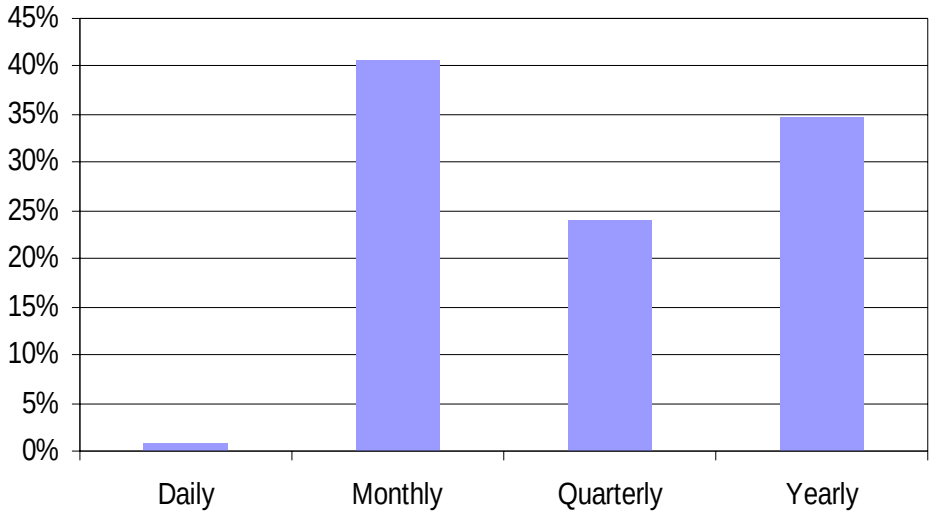
The trading of monthly contracts is highest both in terms of frequency and volume. One reason for the active trading of the monthly contracts is that they are typically traded closer to delivery than the quarterly and calendar year contracts. Therefore more market information is available to prompt the participants to change their views and to adjust their positions via trading. The other reason is that the same sized monthly contracts have smaller price exposure than quarterly and yearly contracts. In addition, some of the RRO regulated rate providers are incented (by their respective Energy Price Setting Plans) to post bids and offers during the RRO pricing window[22] on NGX which has increased the liquidity of the monthly contracts. On NGX the activities are more skewed to the monthly

[21] The hourly contracts are traded directly between the buyers and the sellers, therefore not included in the figures as the figures only include transactions on NGX and through brokers. The Dailies in this report include multi-days unless the contract 'end date' is the last day of a month. Multi-day with the contract 'end date' being the last day of a month is treated as the 'Balance of Month' instrument and classified as 'monthly'. 'Yearly' include both Calendar Year and Balance of Year.

[22] According to the *Regulated Rate Option Regulation*, the price setting period for a calendar month is the period beginning on the 45th day preceding the month and ending on the 5th business day preceding the month.

contracts than OTC – 80% of the NGX contracts and 68% of the OTC contracts are monthly contracts.

Figure 10: Percentage Trading Volume by Term



The daily contract is an effective instrument to hedge very near term price exposure caused by unexpected market events, as it offers the last opportunity to avoid price exposure in the spot market. The number of transactions represents about 14% of all transactions.

Although less actively traded than the monthly contracts, the quarterly contracts are more liquid than the yearly contracts. This is because given the contract size, the calendar year contracts have the largest exposure to price volatility, therefore entail higher financial risks. Also, the yearly contracts can tie up available credit capacity, limiting a trader's ability to make additional transactions.

3.3 Contract by "Months Out"

Figure 11 shows the distribution by number of transactions of the different contract terms by how far ahead the transaction was to the 'delivery' month. Figure 12 shows this information by volume.

Figure 11: Percentage Transaction by Contract Term and by "Months Out"

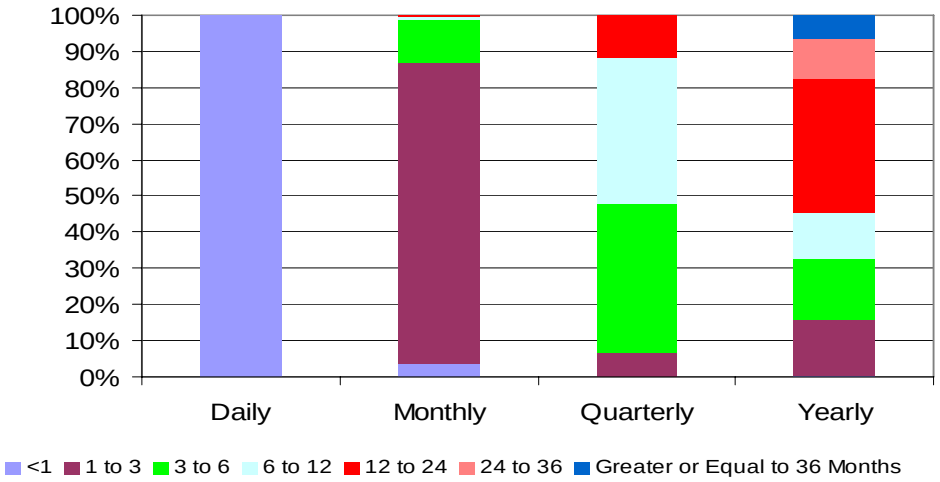
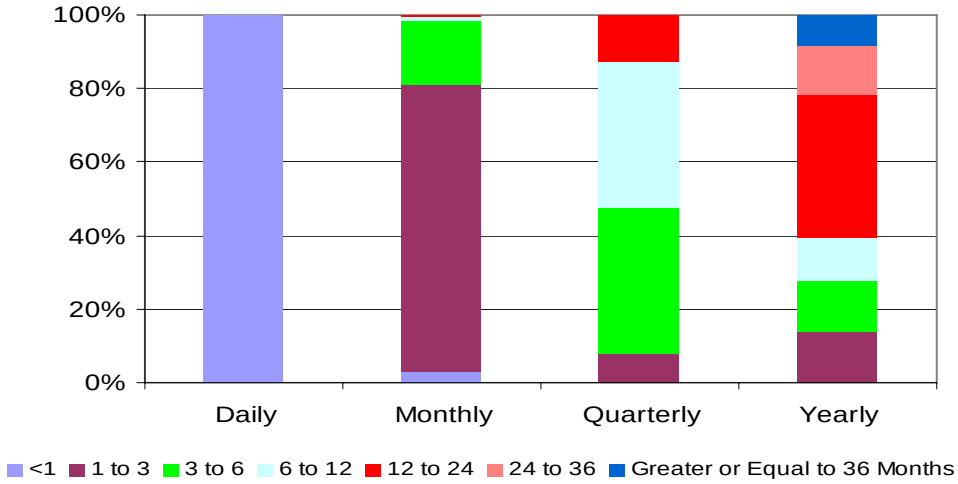


Figure 12: Percentage Volume by Contract Term and by "Months Out"



It is not surprising to see that none of the Dailies are traded beyond one month because the Dailies are generally used to cover the imminent price exposure caused by unexpected market events. The monthly contracts are predominately traded less than 3 months ahead as this trading period contains the RRO pricing window. For the same reason mentioned in section 3.2, the RRO pricing regime to some degree increased the trading activities and volumes of the monthly contracts during the RRO pricing window.

The majority of the quarterly contracts were traded 3 to 12 months ahead whereas the yearly contracts have a more diversified trading pattern. The Balance of Year may be traded less than one month ahead and the Calendar Year trading ranged from 1 month ahead to 48 months ahead.

Figure 13: Percentage Transaction by "Months Out"

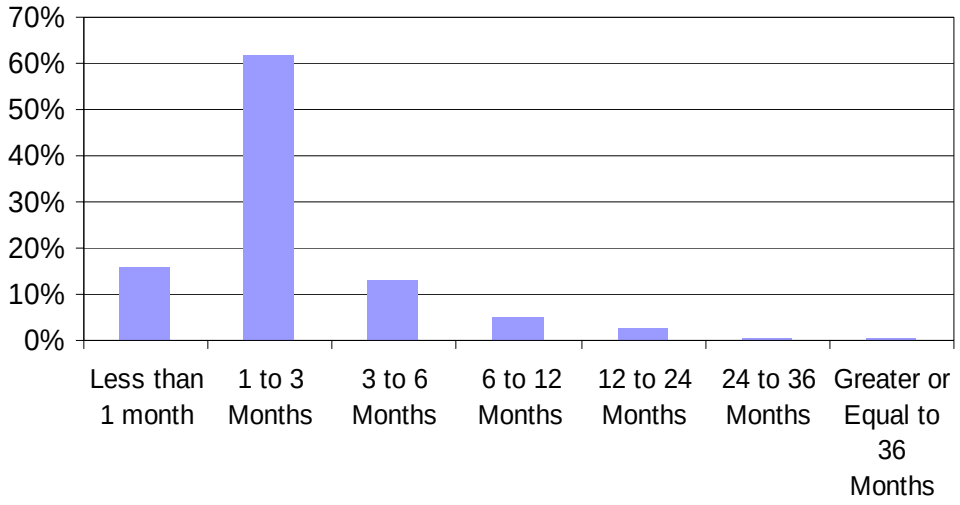
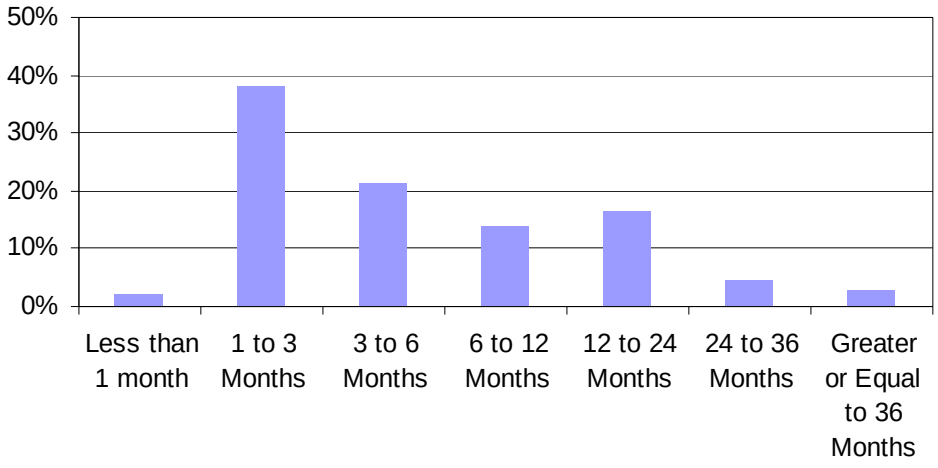


Figure 14: Percentage Trading Volume by "Months Out"



Figures 13 and 14 depict the percentage of total number of contracts and volumes that were traded ahead of the delivery month. These figures show that 91% by number of contracts and 62% by volume were traded less than 6 months ahead.

3.4 Types of Contract

The types of contract traded in the period between June 2008 and December 2009 included all of those listed in Section 2.2. The Flat contract is by far the most liquid contract (Figures 15 and 16), accounting for 85% of the total number of contracts and 93% of the volume. The remainder are spread across the other 5 types of contracts, led by 'Extended Peak' which accounts for 10% of the number of contracts and 4% of the total trading volume.

Figure 15: Percentage of Transactions by Contract Type

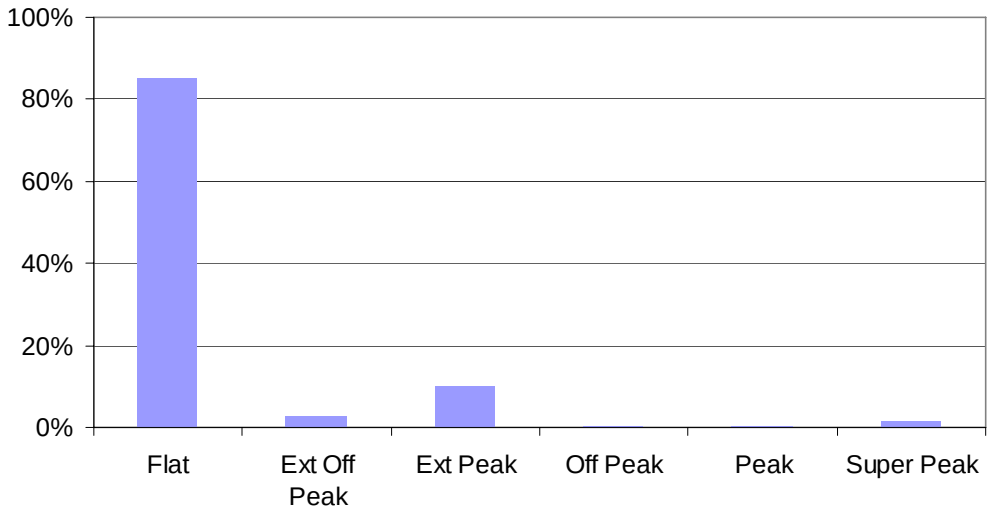
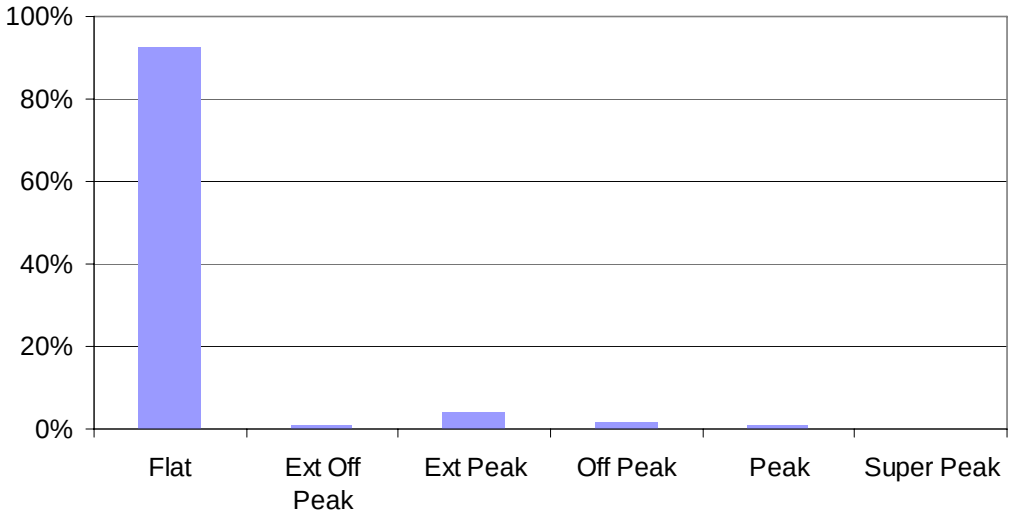


Figure 16: Percentage of Trading Volume by Contract Type



The flat contracts were the predominantly traded instruments, as they satisfy the needs to hedge the exposures of all hours. The active trading of the flat contracts may also be enhanced by the existence of NGX Alberta Flat Electricity RRO Index. For the same reason, the existence of RRO indices caused the Extended Peak, Extended Off Peak and Super Peak contracts to be more heavily traded than On Peak and Off Peak contracts.

3.5 Market Shares

As mentioned in Section 2.3, companies that are involved in the electricity financial market may be engaged in more than one of the following activities: production, consumption, marketing and proprietary trading.

Based on whether the core activities in the financial electricity market is propriety trading, the financial intermediaries are separated from other companies for the purpose of measuring market share, and labeled as 'Banks/Funds' in this section.

The other companies that use electricity financial market are further divided into two categories:

- Those who own generating assets, labeled as 'Generating Companies' (although some of them also engage in marketing and proprietary trading); and,
- Those who do not own generating assets but either manage their own loads or other companies' loads, or have load serving obligations (e.g. loads and power marketers, including retailers), labeled as 'Loads/Marketing Companies'.

Measured by trading volume, over 90% of the market share is taken by 'Generating Companies' and 'Banks/Funds'. 'Banks/Funds' lead 'Generating Companies' only by a small margin (Figure 17).

Figure 17: Market Shares by Volume by Type of Participant

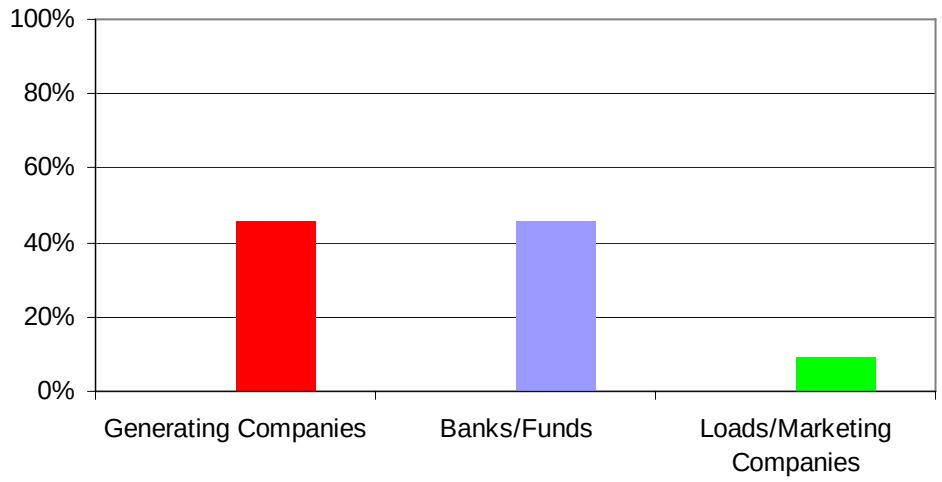


Figure 18 shows market shares by volume and by contract term. Across most contract terms, both 'Banks/Funds' and 'Generating Companies' lead 'Loads/Marketing Companies' by significant margins. While 'Generating Companies' take the largest market share in the Daily and Monthly contracts and 'Banks/Funds' lead in trading quarterly contracts, they are about even in the yearly contracts trading.

Figure 18: Market Shares by Volume by Contract Term

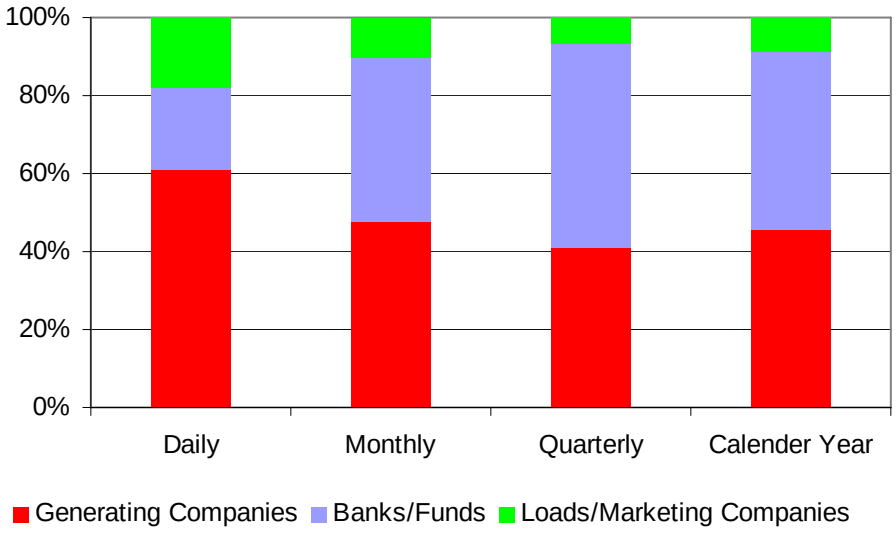


Figure 19 shows market shares by volume by the number months ahead of the delivery month when the contracts were traded. Once again, 'Loads/Marketing Companies' have the lowest share. While 'Generating Companies' have greater market shares in transactions less than 3 months ahead, 'Banks/Funds' traded more volumes more than 3 months ahead.

Figure 19: Market Shares by Volume by "Months Out"

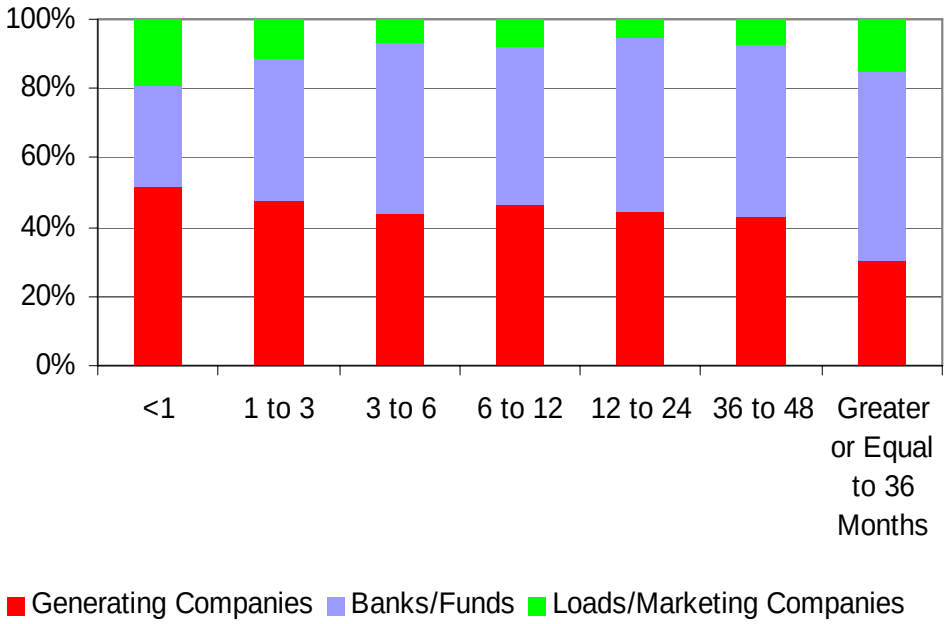
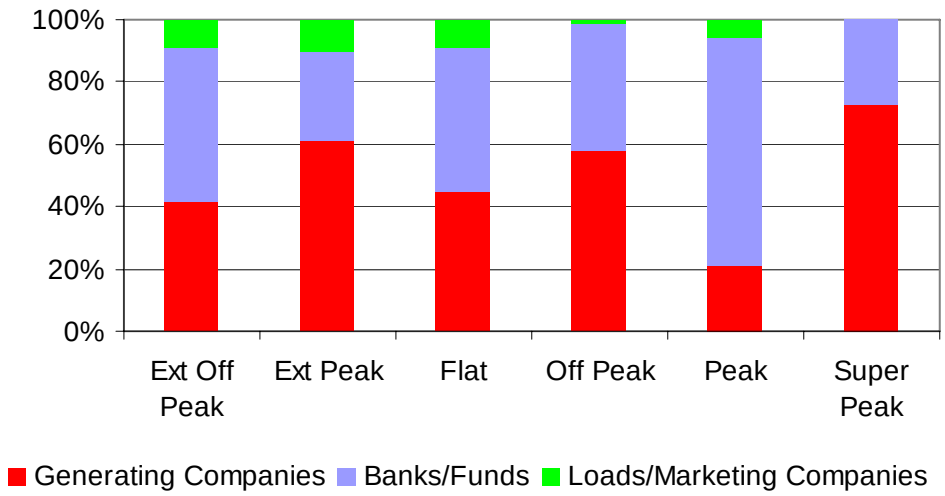


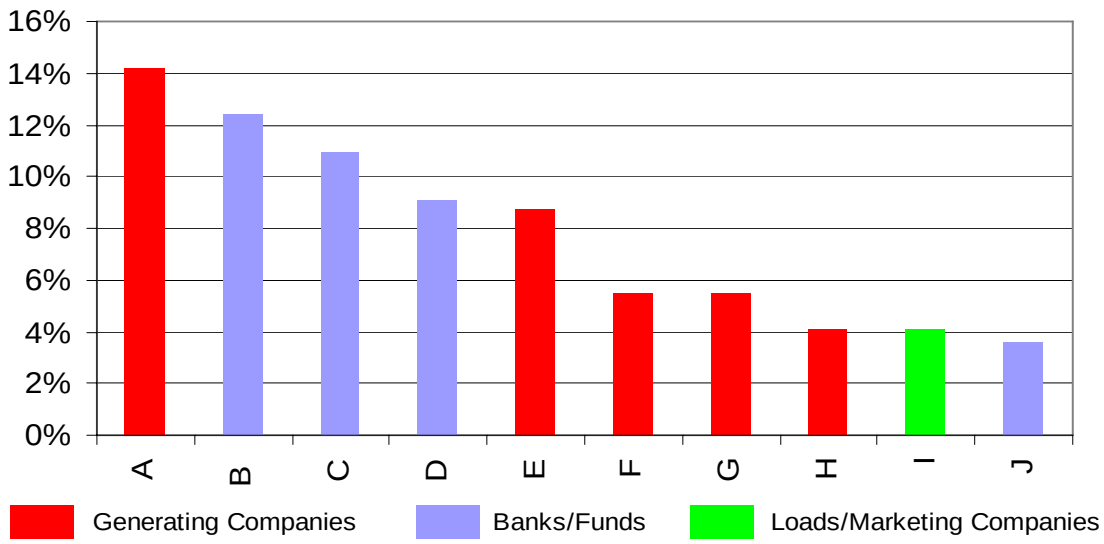
Figure 20 depicts market shares by volume by different contract type. Of note is that Super Peak contracts are predominately traded by 'Generating Companies'.

Figure 20: Market Shares by Volume by Contract Type



Overall, between June 2008 and December 2009, the top 10 companies transacted 78% of the total volumes. The top 10 companies include those from all three categories (Figure 21). While the biggest market share is taken by a company from 'Generating Companies', four 'Banks/Funds' and one 'Loads/Marketing Companies' are among the top 10. By this measure, the overall financial market of Alberta Electricity does not appear to be highly concentrated. The financial market is fairly balanced between those who own generating assets and those who do not.

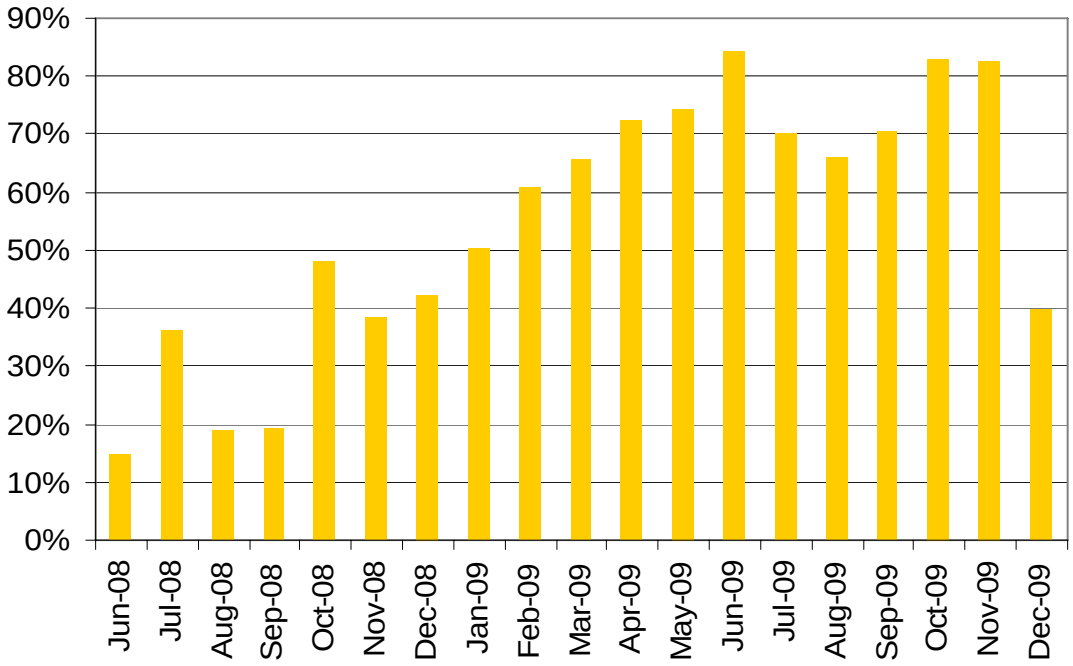
Figure 21: Market Shares of Top 10 Participants by Percentage of Total Volume



3.6 Broker Facilitated Transactions Settled through NGX

Figure 22 shows the percentage of transaction volumes facilitated by brokers but settled through NGX. An obvious upward trend is observed in the data. This is evidence that the financial crisis and credit tightening increased the concern of counterparty default risk.

Figure 22: Percentage of Transactions Facilitated by Brokers and Settled on NGX



4 CONCLUSION

This report has provided a description of the Alberta electricity financial market, presented trade data from NGX and the brokers over the past year and a half and has summarized key aspects.

The financial market of Alberta Electricity offers a venue for electricity producers and consumers in the province to hedge price risks. The proprietary traders bring important liquidity to the market.

The data presented in the report show that the overall trading multiple was low compared to other markets but the financial crisis over a year ago doesn't appear to have caused a downward trend in trading volumes or participation. However, the concerns of counterparty default risk appear to have caused a higher percentage of OTC transactions to transfer over to NGX for settlement.

The Alberta electricity financial market is integral to the overall Alberta electricity market. A robust forward market facilitates risk management and price discovery. The MSA will continue to monitor and analyze the financial market in order to better fulfill its mandate.

APPENDIX 1: FORWARD PHYSICAL MARKET

In addition to the financial market, the forward physical market also offers a venue to hedge price risks. The forward physical market is where physical power is bought and sold ahead of production and consumption. Forward physical transactions eventually involve 'delivery' on the spot market.

In Alberta, the 'delivery' by the seller of forward sold physical contract takes the form that the seller either has to generate power or purchase from the Pool. 'Taking delivery' of a forward sold physical contract requires that the buyer either consume power or sell to the Pool. AESO's Net Settlement Instruction assists forward physical power contract parties to separate the forward transactions from their other transactions in the spot market.

Net Settlement Instruction (NSI)[23]

NSIs are registered by participants with the AESO and allow them to net forward physical transaction volume out of the actual metered volume when calculating power pool settlements.

Example #9 – Hedging with a Forward Physical Transaction Registered with NSI

Assume a generator has sold 80 MW forward physical energy out of a 100 MW asset to a load at $60/MWh and registered this transaction with AESO via a NSI.

For a given hour within the contract period, if the metered volume of the generating asset is 100 MW and that of the load is 90 MW, in the power pool settlement the generator only gets paid the Pool price for 20 MWh (100 MWh-80 MWh) it generated and the load only gets charged the Pool price for the 10MW (90 MWh-80 MWh) it consumed.

Outside the Pool, the load would pay $4800 (= 80 MW X $60/MWh) to the generator for the hour of which the energy registered in the NSI.

In Example #9, the 'delivery' of the forward physical transaction occurred in the Pool as the generating asset generated (and delivered) and the load consumed (and took delivery of) the 80 MWh agreed in the contract. Since the Pool netted this volume out of the settlement volume, although the generating asset delivered 100 MWh into the Pool and the load consumed 90 MWh from the Pool, only the volumes above 80 MWh had an exposure to the Pool price. The 80 MW volume agreed in the forward contract was 'immunized' from the Pool price in that hour. Payment from the buyer to the seller of the forward contract for the volume specified in the contract, i.e. the 80 MW, was settled outside the Pool, between the seller and the buyer.

[23] For details, refer to AESO Rule 4 (http://www.aeso.ca/downloads/Part_Two_-_ISO_Rules_September_17-09.pdf and AESO "Your Guide to the Wholesale Electricity Market Settlement Process (http://www.aeso.ca/downloads/August_2009_Settlement_How_to_Guide.pdf)

However, the ‘delivery’ in real time does not have to involve actual generation and consumption in real time. This is because under the terms of a NSI, if a seller generated less volume than the NSI amount, the difference is considered a purchase from the spot market at the Pool price and is billed by the AESO. If a buyer consumed less volume than the NSI amount, the difference is considered a sale to the spot market at the Pool price and paid by AESO.

Example #10 – Forward Physical Transaction between Parties without Generating Assets or Loads

Trader A sold 80 MW forward physical power to Trader B at $60/MWh and registered this transaction with AESO via a NSI.

Assume that, in real time, Trader A generated 0MWh and Trader B consumed 0MWh.

For Trader A, the actual generation was 80 MWh less than the NSI amount, therefore, Trader A was deemed to have purchased 80 MWh from the spot market at the Pool price.

For Trader B, the actual consumption was 80MWh less than the NSI amount, therefore, Trader B was deemed to have sold 80 MWh to the spot market at the Pool price.

In Example #10, the ‘delivery’ of the forward contract is accomplished by the offsetting transaction on the spot market, where the seller of the forward contract became a buyer and the buyer of the forward contract became a seller on the spot market. Example #10 is a stylized one that is rarely observed in reality.

Like the financial contracts, physical transactions can be used for both hedging and proprietary trading, hedgers and proprietary traders may exclusively participate in only one of them because of corporate policies. Some companies have corporate policies that prevent them from engaging in active financial trading and others have corporate policies that prevent them from engaging in physical trading.

However, some firms participate in both. Generally market participants favor financial contracts because they are more standardized and have an active secondary market. Also trading financially can avoid certain AESO required fees, such as trading charge and/or DDS payment, etc. As a result, Example #9 is not as widely used as financial contracts as a hedging tool, and Example #10 are very rarely observed.