UNIVERSITY OF PETROLEUM & ENERGY STUDIES

IMPACT OF DERIVATIVES MARKET ON GAS MARKET

A DISSERTATION REPORT

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of

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CERTIFICATE / DECLARATION

This is to certify that the dissertation report on " Impact of Derivatives market on Gas Market ", submitted to University of petroleum & Energy Studies, Gurgaon, by Gaurvey Pandey, in partial fulfillment of the requirements for the award of degree of Master of Science (Oil Trading), is a bonafide work carried out by him under my supervision and guidance. This work has not been submitted anywhere else for any other degree/ diploma as per my knowledge.

PLACE : GURGAON

DATE : 3/05/07

DR.A.S. Pandey

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GURGAON

GAURVEY PANDEY

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CHAPTER 1

1.1 INTRODUCTION

A derivative contract is a contractual agreement to execute an exchange at some future date. The term "derivative" arises from the fact that the agreement "derives" its value from the price of an underlying asset such as a stock, bond, currency, or commodity. A stock index futures derives its value from an underlying stock index, a foreign currency option derives its value from an underlying exchange rate, and so on. The key feature of the transaction specified in a derivative contract is that it will be executed in the future rather than today.

First, the widespread reliance on natural gas commodity markets to set the price paid by consumers is an extremely recent phenomenon, just over 15 years old. As evidenced by the wild, irrational swings in natural gas prices, these new markets have not worked very well. They are deemed to be 'inefficient' in technical academic studies and have a history of manipulation, abuse and misreporting.

Second, natural gas has supply and demand characteristics that make it vulnerable to abuse and volatility, yet the markets in which wholesale natural gas prices are set are less regulated than many other commodity markets. Many in the industry believe these markets lack transparency and are vulnerable to abuse and manipulation. Regulators have failed to lay these concerns to rest because the vast majority of gas trading is subject to little monitoring or oversight. While regulators and policymakers have been scrambling to reform the market rules for this commodity, they have yet to impose comprehensive oversight and accountability

1.2 LITERATURE REVIEW

Numerous studies on the effects of derivative (futures and options) on the underlying commodity market volatility have been done in the developed markets. The empirical evidence is mixed and most suggest that the introduction of derivatives do not destabilize the underlying market. The studies also show that the introduction of derivative contracts improves liquidity and reduces informational asymmetries in the market.

In contrast, models developed by Danthine (1978) argue that the futures markets improve market depth and reduce volatility because the cost to informed traders of responding to mispricing is reduced. Froot and Perold(1991) extend Kyle's(1985) model to show that market depth is increased by more rapid dissemination of market-wide information and the presence of market makers in the futures market in addition to the cash market. Ross

(1989) assumes that there exists an economy that is devoid of arbitrage and proceeds to provide a condition under which the no arbitrage situation will be sustained. It implies that the variance of the price change will be equal to the rate of information flow. The implication of this is that the volatility of the asset price will increase as the rate of information flow increases. Thus, if futures increase the flow of information, than in the absence of arbitrage opportunity, the volatility of the spot price must change. Overall, the theoretical work on futures listing effects offer no consensus on the size and the direction of the change in volatility. We therefore need to turn to the empirical literature on evidence relating to the volatility effects of listing index futures and options.

1.3 OBJECTIVE

1. To study about the Derivative markets .

2. To know the role of derivatives to judge market efficiency and liquidity of the commodity market

3. To study the gas market

4. To know the Issues, Impacts and concern of Derivative market on Gas Markets

5. To study about the various other factors affecting the gas price .

1.4 PROBLEMATIC AREA

Physical market fundamentals due to tight supply/demand balance – are not adequate to explain either the short-term or long-term behavior of natural gas prices. This does not mean that tight markets do not matter – of course they do – but identifying physical market fundamentals is only the beginning of the story, not the end.

• Tight markets reflect public policies and strategic behaviors, not just Mother Nature. To the extent that Mother Nature is a wild card, policymakers can and should create systems that are less vulnerable and better able to mitigate the impact of supply shocks.

• Natural gas commodity markets have exhibited erratic behavior and a massive increase in trading that contributes to both volatility and the upward trend in prices. The rules can be changed to moderate these effects.

• The incentive structures and distribution of bargaining power in the physical and financial markets for natural gas are unnecessarily tilted against the consumer

1.5 SCOPE

Trader of different commodities (Energy – oil and gas , Metals – copper , nickel, zinc, tin; Rubber , Agri-commodities – rice, wheat, potato etc.) can analyze the result and study how the use of derivative product will benefit them in-terms of protecting them from price risk amid high volatile market. To what extent they should use the derivative tool in hedging their price risk.

1.6 LIMITATION

Final result and suggestion may not be suited or applicable for all kind of commodity in every market. As behavior of different commodity may vary widely from each other. Also behavior of derivative and its impact on commodity market may not be same for an efficient market and less efficient market or undeveloped commodity derivative market

1.7 RESEARCH METHODOLOGY

This paper involves the exploratory technique. Under this the theoretical aspect of commodity market and gas market is taken into account. The prospect of market in India is viewed would be defined in its own focused way. This paper involves the
Quantitative study of methodology. Under this various data from many source have been taken into account to analyze the impact of derivative market on gas markets in U.S. through percentage variation in the data provided. Further this variation is analyzed to frame out the impact on gas markets. As this paper deals with the impact so there is no scope for the testing by various other tools. The graphical representation and percentage variation would bring out the clear picture of the impact on gas markets by derivative markets. The data presented in the paper is also backed up by various other facts and figures from web sources.

CHAPTER 2

2.1 INTRODUCTION TO DERIVATIVES

There is not a single investment bank which does not have a derivatives desk. Moreover, now even some non-financial institutions have their own derivatives analysts. For example oil companies spend quite a lot of money on derivatives research which may seem as an odd activity unrelated to the industry's main business. Why then derivatives are so popular among so many? It turns out that different businesses love derivatives for different reasons.
Banks use derivatives as a powerful instrument to generate profits and hedge their risks. Businesses use derivatives as sources of additional investments and also as risk management instruments. The derivatives users base is extremely large. It even includes pensioners who can now buy options on places at retirement houses. First of all we have to define what are financial derivatives. Generally speaking, a derivative is a financial instrument whose value is derived from the price of a more basic asset called the underlying. The underlying may not necessarily be a tradable product. Examples of underlings are shares, commodities, currencies, credits, stock market indices, weather temperatures, sunshine, results of sport matches, wind speed and so on. Basically, anything which may have to a certain degree an unpredictable effect on any business activity can be considered as an underlying of a certain derivative.

All derivatives can be divided into two big classes:

- Linear
- Non-linear

Linear are derivatives whose values depend linearly on the underlying's value. This includes

- Forwards and Futures
- Swaps

Non-linear are derivatives whose value is a non-linear function of the underlying. This
includes

- Options
- Convertibles
- Equity Linked Bonds

l. Reinsurances

One can add some other instruments to both of the two classes. For example, bonds can be viewed as non-linear derivatives with the interest rate being a non-tradable underlying. During the course we will talk about each of the listed above types of derivative products. Although the main goal of my course is not to teach how to use various derivatives, but rather how to price them, I will try to explain the most common applications of some of the derivatives.

Forwards and Futures

Forward is a contract between two parties agreeing that at certain time in the future one party will deliver a pre-agreed quantity of some underlying asset (or its cash equivalent in the case of non-tradable underlings) and the other party will pay a pre-agreed amount of money for it. This amount of money is called the forward price. Once the contract is signed, the two parties are legally bound by its conditions: the time of delivery, the quantity of the underlying and the forward price.
While the delivery time and the delivery quantity of the underlying asset can be fixed without any problem, the question is how the parties can agree on the future price of the underlying when the latter can change randomly due to market price fluctuations. It turns that in the case of forward contracts there exists what is called the fair future price of the asset.

Futures are standardized forwards which are traded on exchanges. All futures positions are marked to the market at the end of every working day.

Forwards and futures are designed to reduce risks related to the uncertainty of future market prices for both sellers and buyers of underlying assets. By entering this type of contracts, both sides achieve complete certainty about their future positions, which may help them to have a better control over their financial resources.
However, many traders take futures positions for purely speculative reasons. For instance, if we sell an uncovered futures contract (i.e., when we do not have a long position in the underlying asset), then when the asset price goes down, our futures position will gain a profit and vice versa.
In what follows we will be using the following definitions. A long position in an asset is a position that benefits from price increases in that security (an investor who buys a share has a long position, but an equivalent long position can also be established with derivatives). A short position benefits from price decreases in the security. A short position is often established through a short-sale. To sell a security short, one borrows the security and sells it. When one unwinds the short-sale, one has to buy the security back in the market to return it to the lender. One then benefits from the short-sale if the asset's price is lower when one buys it back than it was when one sold it.

Swaps

As the name suggests, are instruments which allow a swap holder to receive a floating interest rate from and pay a fixed interest rate to a swap seller for a certain period of time. The interest rates are paid on the same fixed notional principal.
Swaps can be arranged in various ways. For example, there are swaps between different currencies, in which case the parties swap a domestic and a foreign rates.
A swap can be priced as a combination of bonds.

Bonds

Are securities which pay a certain fixed amount on a certain fixed date in the future. Since we know how much we will get on some future date, we can find the present value of the notional by discounting this amount to the present time with respect to a certain interest rate. If the rate was known in advance, the price of the bond would be very easy to calculate.

However, in reality interest rates are not known in advance, at least, not for very long periods of time. Therefore, the pricing of bonds represents a challenging problem, which involves various assumptions about the behavior of interest rates.

We can now see that a swap from the floating-rate receiver side can be presented as a combination of short positions in bonds with different maturities.
Swaps are extremely liquid instruments and, therefore, their market values can be used to price bonds.

Options

Are the most flexible of all derivatives because they give an option holder a multiple choice at various moments during the life time of the option contract. However,
an option seller does not have such a flexibility and always has to fulfil the option holder's requests. For this reason, the option buyer has to pay a premium to the option seller.
There are three main categories of options: European, American and Bermudan.
European options can be exercised only at expiration time. American options can be exercised at any moment prior to maturity. Bermudan options can be exercised prior to maturity but on certain pre-determined days.
Put options give the right to sell the underlying asset. Calls give the right to buy the underlying assets. There exist also chooser options, when the option holder has the right to chose between call and put payoffs.

2.2 GROWTH OF DERIVATIVE MARKET

The emergence of derivative products most noticeably forward, future and swaps are used by the people to safeguard their risk in the commodity they are trading.
Through the use of derivatives products it is possible to partially or fully transfer the price risk – by locking in asset prices
Through times because of this unique nature of derivatives products the market has become wide as more and more players are joining to gain profit out of their investment.

The growth in derivatives outstanding conceptually tracks the growth in financial system leverage as a whole. The importance of interest rate contracts cannot be overstated. This may sound facetious, but the next time you lever to buy a new house or a new car (collectively speaking, of course), there is an interest rate derivative contract being written somewhere. Although we rant and rave (and will continue to, thank you) about the Greenspan fan club spiking the money and credit supply punch bowl, the financial sector in this country clearly shares the honors. The financial sector includes the banks, the non-bank financial companies, and the obliging brokerage outfits. At the moment, the only clear picture we can get of derivatives usage within the greater financial sector is with the banks. Thanks to our diligent regulators, no one else is obliged to fess up for now. We've heard estimates that have put total system (brokers, hedge funds, other financial companies, etc.) usage of derivatives at over $100 trillion. There's just no way at the current time to prove

CHAPTER 3

3.1 NATURAL GAS AS A COMMODITY

Natural gas is sold as a commodity, much like pork bellies, corn, copper, and oil. The basic characteristic of a commodity is that it is essentially the same product no matter where it is located. Natural gas, after processing, fits this description. Commodity markets are inherently volatile, meaning the price of commodities can change often, and at times drastically. Natural gas is no exception; in fact, it is one of the most volatile commodities currently on the market.

The price of natural gas is set by market forces; the buying and selling of the commodity by market players, based on supply and demand, determines the average price of natural gas. There are two distinct markets for natural gas: the spot market, and the futures market. Essentially, the spot market is the daily market, where natural gas is bought and sold 'right now'. To get the price of natural gas on a specific day, it is the spot market price that is most informative. The futures market consists of buying and selling natural gas under contract at least one month, and up to 36 months, in advance. For example, under a simplified futures contract, one could enter into an agreement today, for delivery of the physical gas in two months. Natural gas futures are traded on the New York Mercantile Exchange (NYMEX). Futures contracts are but one of an increasing number of derivatives contracts used in commodities markets, and can be quite complex and difficult to understand. To learn more about futures and other methods of buying, selling, and trading commodities..

Natural gas is priced and traded at different locations throughout the country. These locations, referred to as 'market hubs', exist across the country and are located at the intersection of major pipeline systems. There are over 30 major market hubs in the U.S., the principle of which is known as the Henry Hub, located in Louisiana. The futures contracts that are traded on the NYMEX are Henry Hub contracts, meaning they reflect the price of natural gas for physical delivery at this hub. The price at which natural gas trades differs across the major hubs, depending on the supply and demand for natural gas at that particular point. The difference between the Henry Hub price and another hub is called the location differential. In addition to market hubs, other major pricing locations include 'citygates'. Citygates are the locations at which distribution companies receive gas from a pipeline. Citygates at major metropolitan centers can offer another point at which natural gas is priced.

3.2 PHYSICAL AND FINANCIAL TRADING

There are two primary types of natural gas marketing and trading: physical trading and financial trading. Physical natural gas marketing is the more basic type, which involves buying and selling the physical commodity. Financial trading, on the other hand, involves derivatives and sophisticated financial instruments in which the buyer and seller never take physical delivery of the natural gas.

Like all commodity markets, the inherent volatility of the price of natural gas requires the use of financial derivatives to hedge against the risk of price movement. Buyers and sellers of natural gas hedge using derivatives to reduce price risk. Speculators, on the other hand, assume greater risk in order to profit off of changes in the price of natural gas. Some marketers who actively buy and sell in either the physical or financial markets are referred to as natural gas 'traders'; trading natural gas on the spot market to earn as high a return as possible, and trading financial derivatives and other complex contracts to either hedge risk associated with this physical trading, or speculate about market movements. Most marketing companies have elaborate trading floors, including televisions and pricing boards providing the traders with as much market information as possible

CHAPTER 4

4.1 INTRODUCTION TO GAS MARKET

Natural gas is the world's second most important fossil fuel. Large reserves are located in only a few countries around the globe. Global demand for natural gas continues to grow. Nevertheless, new volumes discovered each year currently exceed world gas consumption.

Market data reflect the growing significance of natural gas for global energy supplies. Forecasting demand growth and determining present consumption, reserves, storage capacities and the growing distance between sources of supply and centres of consumption are the key parameters of the dynamic gas market.

There is intense competition between natural gas and other fuels on the energy market

As the competitive price level is subject to constant fluctuations, supply contracts contain price adjustment clauses that maintain a balance between the gas price and the price of competing energies for the entire duration of the contract.

In most cases, price adjustment clauses are referred to fuel oil, reflecting the competitive situation. Such fuel oil clauses peg the development of gas prices to the development of fuel oil prices.

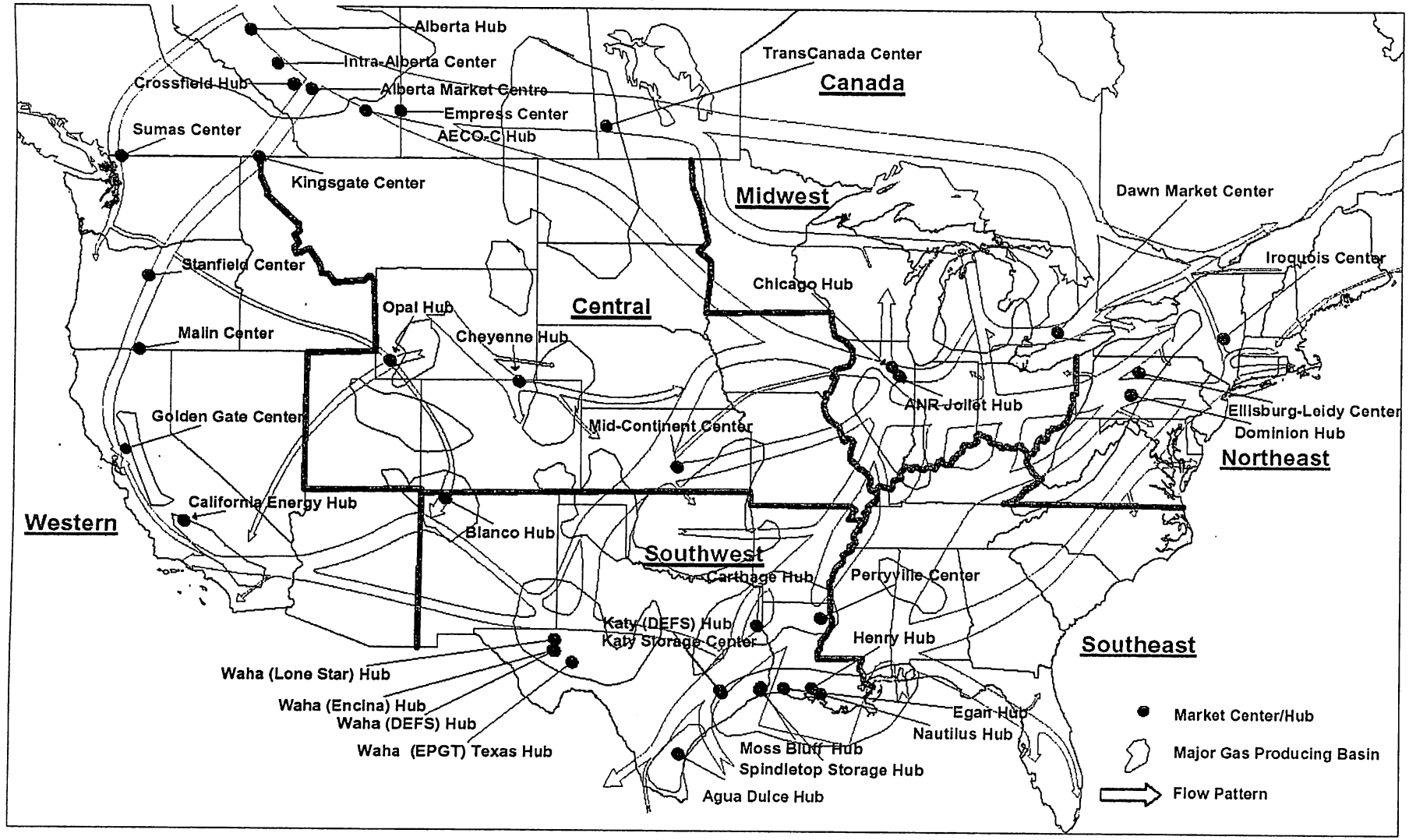
The international world of natural gas

At the beginning of the 21st century natural gas is the world's second most important source of energy. In 2001, natural gas accounted for a 24% share of world primary energy consumption.

Economically recoverable natural gas reserves have risen continuously over the last decades.

The largest reserves are located in the countries of the former Soviet Union and the Middle East.

Figure 1. Natural Gas Centers/Hubs in Relation to Production Basins and Major Flow Corridors



Note: DEFS = Duke Energy Field Services Co; EPGT = EPGT Texas Pipeline Co.
Source: Energy Information Administration, GasTran Gas Transportation Information System, Natural Gas Market Hubs Database, as of August 2003.

4.2 USE OF DERIVATIVES BY FIRMS IN NATURAL GAS INDUSTRY

There is little quantitative information available on the extent to which derivative contracts are used by individual firms and utilities. Some academics have conducted large, voluntary surveys on the use of derivatives, but their results are far from definitive because of a lack of statistical sampling, among other problems. New information about the use of derivatives is just now appearing on firms' SEC 10K filings, but those filings do not provide much in the way of details. The following sections summarize the data that are available from academic research on the benefits that oil and gas producers and natural gas pipelines gain from using derivatives and the newly available data from the SEC Form 10K.

Academic Research

G. David Haushalter has examined the risk management activities of 100 oil and gas producers in 1992, 1993, and 1994.He attempted to relate the extent of different firms' hedging activity to their capital structure (debt/equity ratio, interest coverage, etc.), tax status, compensation policies, ownership structure, and operating characteristics. He found the following:

- The presence of hedging activity increased from 43 percent of the firms in the sample in 1992 to 57 percent in 1994. About one-quarter of the firms surveyed hedged more than 28 percent of their production. Hedgers as a group hedged about 24 percent of their total production.
- Companies with more assets were more likely to hedge.
- Hedgers with larger proportions of debt in their capital structure hedged a greater fraction of their production.
- Hedging was more likely for firms whose local spot market prices closely followed the Henry Hub (natural gas) or Cushing (sweet crude) spot prices used in NYMEX futures. In other words, the lower the basis risk, the more likely a firm was to hedge.

- There was no clear relationship between managers' compensation and hedging

They also found that hedging was effective:

- Cash holdings, storage, and line-of-business diversification all lowered the sensitivity of stock returns to natural gas price.
- Users of commodity derivatives had smaller and less variable stock price sensitivities than did non-users.
- Storage was used to hedge volume risk. Derivatives were used to manage price risk

4.3TYPES OF CONTRACT IN GAS TRADING

PHYSICAL CONTRACT

Physical trading contracts are negotiated between buyers and sellers. There exist numerous types of physical trading contracts, but most share some standard specifications including specifying the buyer and seller, the price, the amount of natural gas to be sold (usually expressed in a volume per day), the receipt and delivery point, the tenure of the contract (usually expressed in number of days, beginning on a specified day), and other terms and conditions. The special terms and conditions usually outline such things as the payment dates, quality specifications for the natural gas to be sold, and any other specifications agreed to by both parties.

Physical contracts are usually negotiated between buyers and sellers over the phone. However, electronic bulletin boards and e-commerce trading sites are allowing more physical transactions to take place over the internet.

There are three main types of physical trading contracts: swing contracts, baseload contracts, and firm contracts. Swing (or 'interruptible') contracts are usually short-term contracts, and can be as short as one day and are usually not longer than a month. Under this type of contract, both the buyer and seller agree that neither party is obligated to deliver or receive the exact volume specified. These contracts are the most flexible, and are usually put in place when either the supply of gas from the seller, or the demand for gas from the buyer, are unreliable.

Baseload contracts are similar to swing contracts. Neither the buyer nor seller is obligated to deliver or receive the exact volume specified. However, it is agreed that both parties will attempt to deliver or receive the specified volume, on a 'best-efforts' basis. In addition, both parties generally agree not to end the agreement due to market price movements. Both of these understandings are not legal obligations - there is no legal recourse for either party if they believe the other party did not make its best effort to

fulfill the agreement - they rely instead on the relationship (both personal and professional) between the buyer and seller.

Firm contracts are different from swing and baseload contracts in that there is legal recourse available to either party, should the other party fail to meet its obligations under the agreement. This means that both parties are legally obligated to either receive or deliver the amount of gas specified in the contract. These contracts are used primarily when both the supply and demand for the specified amount of natural gas are unlikely to change or drop off.

The daily spot market for natural gas is active, and trading can occur 24 hours a day, seven days a week. However, in the natural gas market, the largest volume of trading occurs in the last week of every month. Known as 'bid week', this is when producers are trying to sell their core production and consumers are trying to buy for their core natural gas needs for the upcoming month. The core natural gas supply or demand is not expected to change; producers know they will have that much natural gas over the next month, and consumers know that they will require that much natural gas over the next month. The average prices set during bid week are commonly the prices used in physical contracts.

THE FINANCIAL MARKET

In addition to trading physical natural gas, there is a significant market for natural gas derivatives and financial instruments in the United States. In fact, it has been estimated that the value of trading that occurs on the financial market is 10 to 12 times greater than the value of physical natural gas trading.

Derivatives are financial instruments that 'derive' their value from an underlying fundamental; in this case the price of natural gas. Derivatives can range from being quite simple, to being exceedingly complex. Traditionally, most derivatives are traded on the over-the-counter (OTC) market, which is essentially a group of market players interested in exchanging certain derivatives among themselves, as opposed to through a market like the NYMEX. Basic types of derivatives include futures, options, and financial swaps.

There are two possible objectives to trading in financial natural gas markets: hedging and speculation. Trading in the physical market involves a certain degree of risk. Price volatility in the natural gas markets can result in financial exposure for marketers and other market players as the price changes over time. Trading financial derivatives can help to mitigate, or 'hedge' this risk. A hedging strategy is created to reduce the risk of losing money. Purchasing homeowner's insurance is a common hedging activity. Similarly, a marketer who plans on selling natural gas in the spot market for the next month may be worried about falling prices, and can use a variety of financial instruments to hedge against the possibility of natural gas being worth less in the future. Countless strategies exist to hedge against price risk in the natural gas market, including natural gas futures, derivatives based on weather conditions to mitigate the risk of weather affecting the supply of natural gas (and thus its market price), etc.

Financial natural gas markets may also be used by market participants who wish to speculate about price movements or related events that may come about in the future. The main difference between speculation and hedging is that the objective of hedging is to reduce risk, whereas the objective of speculation is to take on risk in the hope of earning a financial return. Speculators hope to forecast future events or price movements correctly, and profit through these forecasts using financial derivatives. Trading in the financial markets for speculative purpose is essentially making an investment in financial markets tied to natural gas, and financial speculators need not have any vested interest in the buying or selling of natural gas itself, only in the inherent underlying value that is represented in financial derivatives. While great profits may be made if the expectations of a speculator prove correct, great losses may also be incurred if these expectations are wrong. While the instruments used for hedging and speculation are the same, the way in which they are used determines whether or not they in fact reduce, or increase, the risk of losing money.

Now that some of the basics of the natural gas market have been covered, we can examine the function of natural gas marketer

CHAPTER 5

5.1GAS PRICE HISTORY

Many energy experts believe natural gas will displace oil as the world's most widely used fuel. Consumption of natural gas, a cleaner and more efficient fuel, is rising in the US, Asia and Europe. The major economies are now preparing for greater natural gas usage amid concerns that oil supplies will fail to meet future energy needs.

The commodities futures markets provide a wide range of gas derivative instruments to enhance financial performance in the physical markets. These instruments enable producers and consumers to hedge against price risk. They are also used as speculative investment vehicles.

Gas market professionals, whether buying or selling the physical product, or dealing in gas financial futures, analyse price history to gain market insight. They compare current and historical situations, and the factors that give rise to them, to determine the direction of gas price movements.

Gas market professionals perform a wide range of analyses, powered by real-time price data and price history, to make informed decisions. They examine price history, trading volume history and other information history to look for price trends and trading patterns to help them understand how and why the gas market moves.

They use price history to chart gas price trends against particular developments or to correlate and compare a gas instrument with instruments in the energy or other financial markets. Seasonality is an important factor in energy markets so they also use price history to chart its impact on gas prices.

Gas market professionals also use price history to calculate spreads, the difference between prices, on futures contracts. They may, for instance, want to calculate a spark spread, the difference between a natural gas future and electricity future, to help them hedge against price risk in the power market.

Reuters has a long history of serving the global energy markets. Reuters covers an extensive range of cash energy prices as well as price data on all exchange-traded energy instruments. It also supplies price history and powerful analytical tools.

CHAPTER 6

6.1 HOW DERIVATIVES HELP IN DISCOVERING THE PRICE OF NATURAL GAS

Some analysts of the natural gas market have expressed the view that the futures market is being increasingly and heavily traded by financial institutions that have little direct role in the natural gas industry, and this activity may be one of the causes of high prices. Such institutions may be simply speculating on short-term price movements in the market, or protecting certain short-term positions they may hold, while having little interest in or control over physical assets or the physical natural gas commodity.

It is certainly true that trading in the natural gas futures and options markets has grown tremendously since it was first introduced in 1990. For example, the volume of NYMEX traded futures contracts has increased from roughly 20,000 per day in the mid 1990's to roughly 50,000 per day in 2000 to over 100,000 per day currently. Natural gas open interest futures contracts increased from about 200,000 in December 1995, to over 600,000 in 2000, and remained roughly at that level since then. The role of "non-commercial" traders has also increased in recent years. Interest in the natural gas financial market by speculators could be expected as the volatility increased. (Non-commercial traders are speculators, aren't directly involved in the natural gas industry, and are hoping to profit by speculating on price movements.) For example, non-commercial traders held about 18 percent of open interest contracts on December 5, 1995, and 17 percent of open interest contracts on December 5, 2000, but this level has increased to 48.8 percent of open interest futures contracts on December 6, 2005. There are several dozen non-commercial traders holding these latest open interest contracts. In addition, a small number of banks hold a significant portion of the open interest futures contracts. On December 6, 2005, just five U.S. banks held 8.8 percent of total open interest, and another nine non-U.S. banks held 12.1 percent. Although one might assume that banks are non-commercial traders, the CPUC has not confirmed that. (A random check at an earlier date, October 3, 2000, found that banks held about 9 percent of total open interest, so the portion being held by banks may be increasing.)

Although futures prices may or may not be a good predictor of actual cash prices of natural gas, the CPUC believes the futures price of natural gas strongly influences the direction of the cash or physical market. Of course, simply because a large position is held in the futures and options market by speculators does not mean that price manipulation is occurring, even if the activity on the financial market is influencing the physical price of natural gas

6.2 PRICE FORECAST AND PRICE DISCOVERY OF NATURAL GAS

While valid and reasonable factors explain the general, long-term increase in natural gas prices, we cannot yet quantitatively explain why prices are as high and as volatile as they've been. The two types of natural gas price indicators usually accepted by participants in the natural gas markets are the New York Mercantile Exchange (NYMEX)[1] futures prices and fundamental forecasts generated by state/federal organizations, consultant, and industry participants. Price forecasts generated by state/federal organizations, consultants, and industry participants evaluate the long-term fundamentals of the natural gas market while NYMEX futures prices provide market based indications of price magnitude and direction. Both of them serve vital price discovery functions. Differences in forecasting methodology can, however, produce different price trajectories.

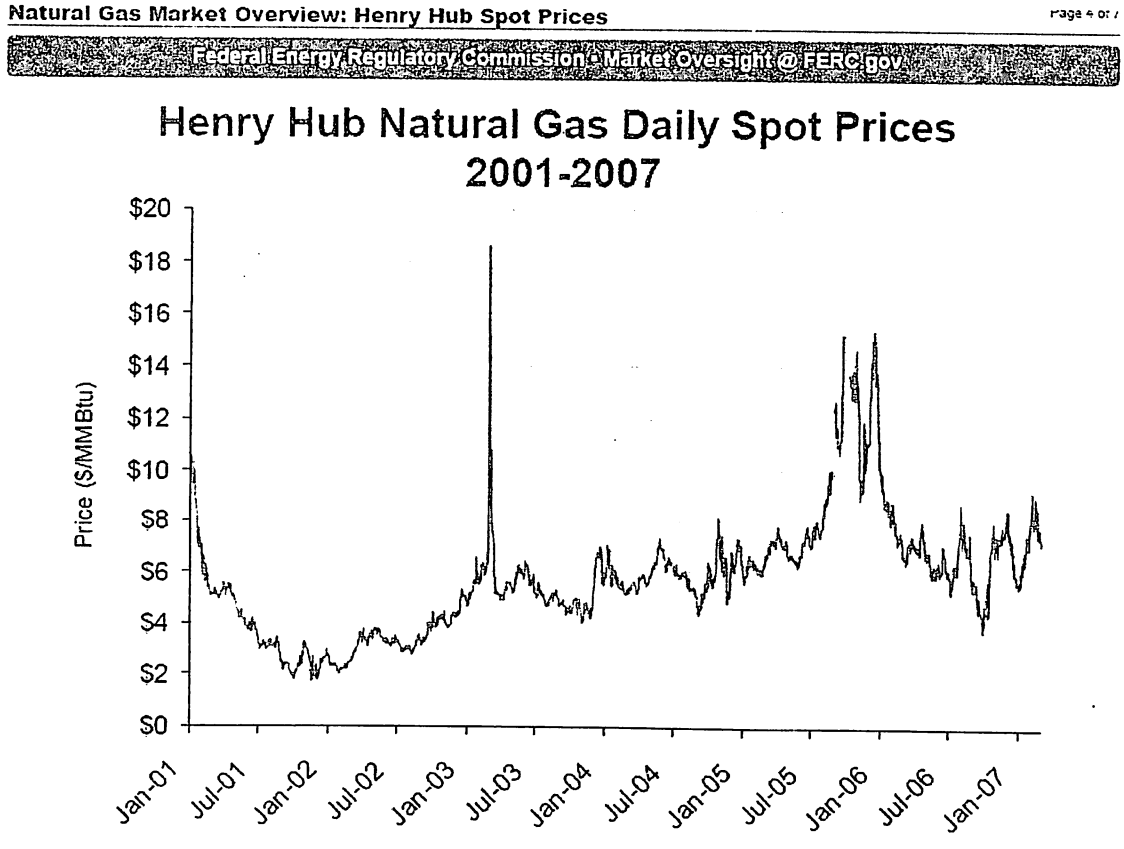
Long-term price forecasts examine underlying fundamentals, such as reserve level, extraction costs, demand expectations, and transportation tariffs. Recent gas price forecasts based on assumptions about fundamental market conditions have been lower than observed prices. However, these prices do not compare nor reflect the short-term futures prices observed on the NYMEX. Market participants analyze long-term market requirements such as infrastructure needs using fundamental forecasts. As a result, short-term changes in market conditions do not influence the forecast outcome.

NYMEX prices, on the other hand, signal short-term market expectations. As a result, factors such as storage levels, weather changes, supply disruptions, and demands shifts can push prices in one direction or the other, sometimes resulting in high levels of volatility. Producers, marketers, consumers, and speculators trade natural gas for delivery in one month or out to sixty months. The prices produced from these transactions represent the interaction of expected supply and demand at the relevant delivery date. All market participants respond to changes in market conditions and execute trades meeting their requirements. Speculators, however, serve a special role. Though not trading for hedging purposes, speculators, according to the Commodity Futures Trading Commission (CFTC), "help...futures markets function better by providing liquidity." This group of traders, thus, assists hedgers (producers, marketers, consumers) with their risk management requirements. These transactions, as a result, promote price discovery, i.e., price expectations for the future months.

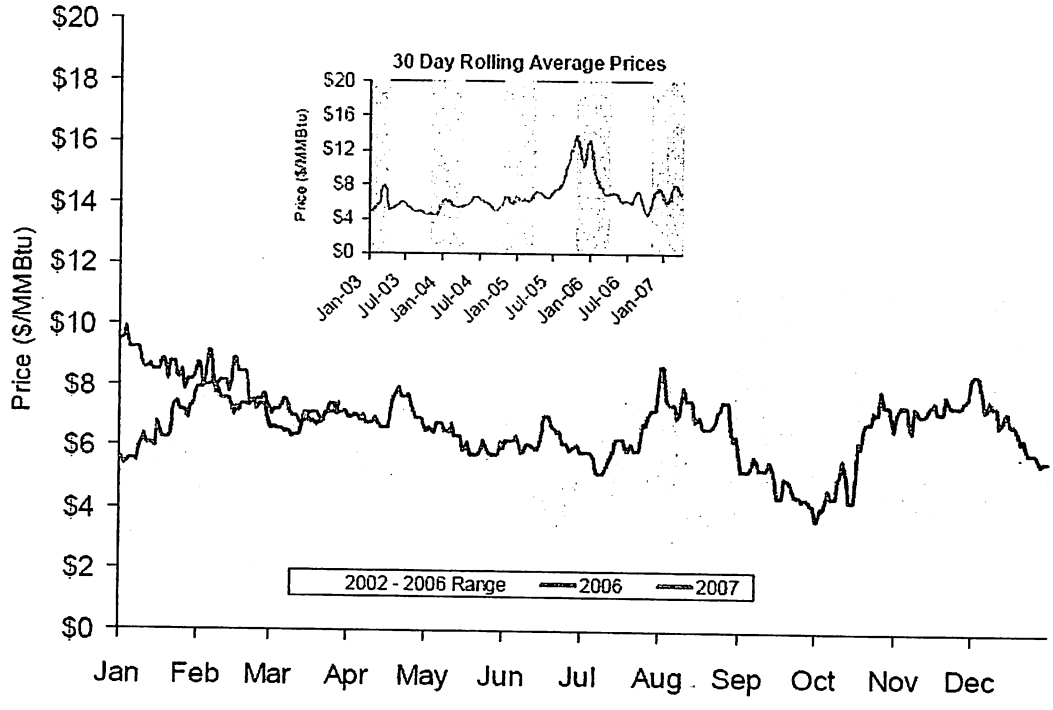
Some industry observers believe that the high degree of volatility in natural gas prices increase the likelihood of manipulation. Speculators, who may have no ownership stake in the natural gas industry, play a large role in the futures and options markets, and some believe that this phenomenon increases the possibility of price manipulation. However, the Energy Commission and the CPUC currently have no evidence of any such actual manipulation. The national interaction of expected supply and demand produces the

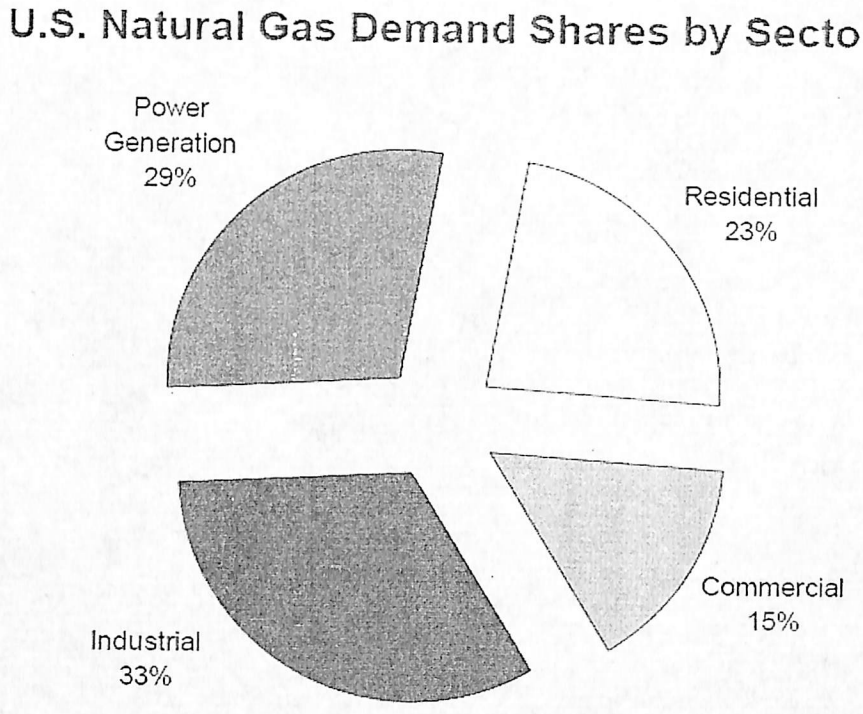
observed price movements, but, as long as the possibility of price manipulation can't be excluded, regulators must continue the vigilant monitoring of natural gas markets.

In order to determine if price manipulation is actually occurring, an agency would need to have access to detailed transaction records related to purchases and sales between parties. The CPUC only has access to records where a regulated California utility is involved in a transaction. The FERC has the needed regulatory jurisdiction to obtain physical transaction data from market participants, and the CFTC has the regulatory jurisdiction to obtain financial data related to transactions in the futures and options markets that occur on exchanges. These two agencies would be appropriate to conduct such an investigation



Henry Hub Natural Gas Daily Spot Prices
2006, 2007 and 2002-2006 Year Range





Different sectors in u.s. has different demand for natural gas consumption according to their respective uses. Therefore, their demand very accordingly that could be seen from the above graph.

6.3 PRICING OF GAS – CASE STUDY

At first, buying high and selling low seems an impossible task. However,with the basis of swaps and futures or fixed-for-floating swaps a trader can profit by buying gas at a higher fixed price and selling at a lower fixed price.
Infact it is one of the best strategies for trading natural gas .it is often easier to sell gas at a fixed price when the market is trading at a relatively low level and buying gas at a fixed prices when the market is trading at relatively high level.

Suppose futures prices have been trading at dollar 2 but suddenly break out to the upside and trade upto $2.25.using the Permian basin as an example, lets assume prices there have risen from $1.75 to $1.95 during the same upside break out . A trader knows a producer that likes to sell its supply at a fixed price instead of index, so he calls the producer and bids $1.95 for the producers Permian supply. Because of the recent price increase, the producer decides to sell to the trader at $ 1.95 .

To hedge the fixed price risk the trader immediately sells futures at $ 2.25, thereby converting the fixed price into a -$0.30 differential to futures, a differential the trader feels is at the low, or wide end of its recent trading range.

The following week futures prices fall back to $ 2.00 and the Permian prices again fall back to $1.75. Now, the trader calls an end user he knows that likes to buy gas at fixed prices and offers to sell Permian at $1.75 . Because the end user thinks the Permian prices will go back to the level of $ 1.95, it agrees to pay $1.75 to the trader for the gas. Again, to hedge the fixed price risk and unwind its current long differential position, the trader immediately pays $ 2 for futures, thereby converting the fixed sale price into a -$0.25 differential to futures, which closes out the -$0.30 long position. The trade is done and the trader has made a $ 0.05 margin

The trader converted the fixed price risk into less volatile basis risk and was successful at selling the gas at a tighter differential than the purchase. However, if the basis market had widened between the time the trader bought the gas and the time it was sold the trader would have been at risk of loosing money.

To hedge against any adverse movements in basis, natural gas traders will typically use basis swaps to hedge that risk, thereby converting the basis differential to futures into an index related price because it is less volatile, as they wait for the right time to close the physical position.

In short

□Pay to producer	$1.95
□Future sold (+)	$2.25
□Receive from end-user (+)	$1.75
□Futures bought (-)	$2.00
□Profit / loss on trade	$0.05* no. of contracts

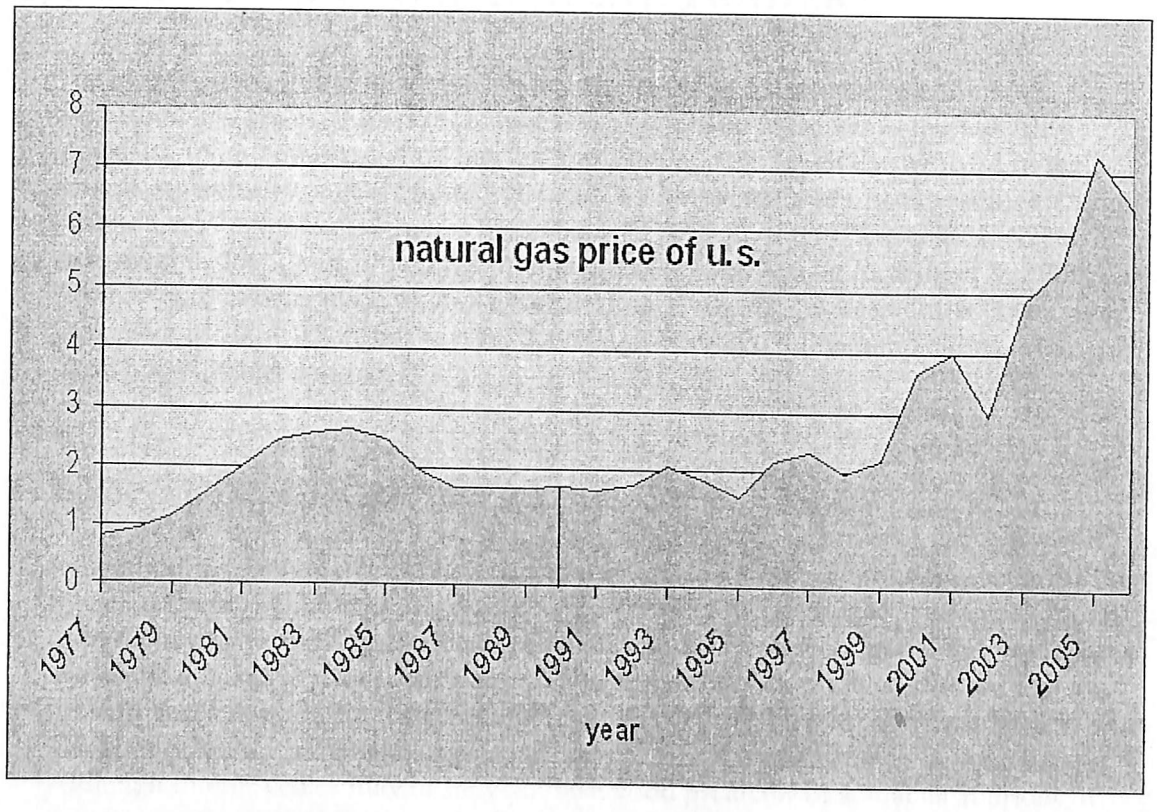
The following data shows the wellhead price of natural gas in U.S.

Year	price (dollars per thousand cubic feet)
1977	0.79
1978	0.91
1979	1.18
1980	1.59
1981	1.98
1982	2.46
1983	2.59
1984	2.66
1985	2.51
1986	1.94
1987	1.67
1988	1.69
1989	1.693
1990	1.707
1991	1.64
1992	1.74
1993	2.044
1994	1.853
1995	1.546
1996	2.167
1997	2.32
1998	1.96
1999	2.19
2000	3.68
2001	4
2002	2.95
2003	4.88
2004	5.46
2005	7.33
2006	6.42

SOURCE : eia .org (prices of U.S. wellhead oil)

6.4 IMPACT ON NATURAL GAS PRICES DUE TO EMERGENCE OF DERIVATIVES MARKET.

This is graph plotted using the above data.



Derivatives market came in into in the year in 1990 in u.s. The delivery of natural gas took place in the same year. The above graph shows the impact of derivatives market in the price of natural gas which somehow remains consistent in the near years.

The above graphical representation shows the variation in prices of gas in the later years which was due to various other factors. Those factors are justified in the later chapters followed thereafter.

CHAPTER 7

7.1 OTHER FACTORS BEHIND THE PRICE RISE OF NATURL GAS

A) ROLE OF NON COMMERCIAL TRADERS

The role of "non-commercial" traders has also increased in recent years. Interest in the natural gas financial market by speculators could be expected as the volatility increased. (Non-commercial traders are speculators, aren't directly involved in the natural gas industry, and are hoping to profit by speculating on price movements.) For example, non-commercial traders held about 18 percent of open interest contracts on December 5, 1995, and 17 percent of open interest contracts on December 5, 2000, but this level has increased to 48.8 percent of open interest futures contracts on December 6, 2005. There are several dozen non-commercial traders holding these latest open interest contracts.

B) BANKS INVOLVEMENT

In addition, a small number of banks hold a significant portion of the open interest futures contracts. On December 6, 2005, just five U.S. banks held 8.8 percent of total open interest, and another nine non-U.S. banks held 12.1 percent. Although one might assume that banks are non-commercial traders, the CPUC has not confirmed that. (A random check at an earlier date, October 3, 2000, found that banks held about 9 percent of total open interest, so the portion being held by banks may be increasing.) Although futures prices may or may not be a good predictor of actual cash prices of natural gas, the CPUC believes the futures price of natural gas strongly influences the direction of the cash or physical market. Of course, simply because a large position is held in the futures and options market by speculators does not mean that price manipulation is occurring, even if the activity on the financial market is influencing the physical price of natural gas.

C) NATURAL CALAMITIES

Due to various natural calamities taking place around year 2005 the demand for natural gas increased drastically during that time. Giving rise to hike in gas prices as the supply did not change so rapidly as compared to increase in demand of gas. The price on the contrary started to increase and nearly jumped to $ 70 from $50 in the past years.

D) SHORT RUN FACTORS

The impact of the hurricanes on Gulf Coast production has been the focal point of the price increase story in the short-term. Interestingly, projections of a severe hurricane season were reported to have driven the price up prior to the occurrence of the actual hurricanes.

Year-over-year prices were up over one-third even before the hurricanes arrived.

At its height, the loss of production was about 10 percent of national capacity, although it has been noted that at the height of the production loss there was also a great deal of demand destruction on the Gulf Coast. Thus, the loss of gas available to the market was considerably smaller than the loss of output in the Gulf. Some estimates put this figure as high as a third of the total loss of production.

CHAPTER 8

8.1 Why Are the Natural Gas Prices Rising and Staying at High Levels?

Strong underlying "fundamental" market conditions and "seasonal" events help to explain why natural gas prices have been increasing and staying relatively high since early 2003. These factors include:

· The flat level of natural gas production in the U.S. and Canada despite very high levels of drilling

· A significant increase in the demand for natural gas for electrical generation

· Significantly increased costs of drilling since the mid-1990s

· Record high oil prices

· Seasonal events that changed the production and processing of natural gas in the largest gas producing region in North America, the Gulf of Mexico, due to hurricanes

The last factor is a major cause of recent and current high prices. Hurricanes Katrina, Rita, and Wilma have impacted natural gas production in the U.S. significantly. Never in the history of hurricane seasons have hurricanes disrupted natural gas production to this extent. In 2005, the hurricanes followed an abnormally warm summer (which caused prices to escalate due to high gas use for electricity production), and severely exacerbated the already tight natural gas supply-demand balance by removing more than 10 Bcfd of production. This is roughly 20 percent of the natural gas produced in the entire U.S. and caused the price of natural gas to dramatically increase in the weeks after the hurricanes. However, even though some Gulf production continues to remain off-line, adequate natural gas storage availability and warm weather have contributed to the price of natural gas dropping back to levels prior to the hurricanes ranging between $8 to $10 per Mcf. Normally, in the past, such disruptions due to hurricanes have caused price spikes but conditions have returned to normal within two to four weeks of the event. However, the damage caused by the hurricanes this season has followed a different trend. It is anticipated that the impact of the hurricanes may last over a longer period of time, as much as one year.

Even before the occurrence of the hurricanes, natural gas prices were high in all regions of the U.S. The first four factors listed above have been the major reason for nationwide high prices. Unlike the energy crisis of 2000-2001, when California was hit particularly

hard by skyrocketing gas prices at the California border, California has actually enjoyed lower average prices than the rest of the U.S. over the past couple of years for a variety of reasons. The cost of interstate transportation is not currently a problem, nor is there a hugely-inflated differential between the price at the California border and the price in the basin. In fact, the border price does not currently reflect the full tariff cost of firm interstate transportation.

The consistent high prices across the continent are due to the inability to find new sources of gas, high costs of drilling, and growing maturity of basins in the U.S. and Canada.

In addition, another change in the world natural gas market has caused prices to rise. For the past several years, liquefied natural gas (LNG) brought in by ships from foreign countries provided a cheaper source of natural gas. However, increasing global demand for LNG has now made it more competitive, providing more choices to the LNG marketers to take their LNG to the highest priced market. Thus, the LNG coming to the U.S. is also priced higher than in the past.

CHAPTER 9

THE SHORT, TROUBLED HISTORY OF NATURAL GAS TRADING

Physical markets provide the context for financial markets; they do not explain the behavior of those markets. Factors that make markets vulnerable to a narrow range of strictly manipulative behaviors, like corners and squeezes, also make them vulnerable to a broader range of suspicious activities identified in the literature as abusive – front running, wash trading, rumor mongering, etc. Also, they make markets prone to volatility and, under some conditions subject to upward pressures on prices. The characteristics of energy markets make it easy for traders to exploit physical problems. Under these circumstances, the lack of transparency and oversight in the natural gas commodity markets is an open invitation to behavior that makes matters worse.

Given the vulnerability of the market, it is not surprising to see a price spiral. The history of trading in energy commodities, especially natural gas, has been wild and painful, to say the least. The behavior of this market gives rise to a pervasive suspicion, which is well justified. What has been documented has been limited to written complaints settled at the Commodities Futures Trading Commission (CFTC) or in federal court cases. While regulators and law enforcement scramble to catch up, consumers pay the inflated price.
Catching abuse after the fact is not enough. Energy commodity markets need more transparency and more oversight so that problems can be prevented.

A. Act One: Planting The Seeds of Dysfunction

1. Trading Spins Out of Control

The setting of wholesale natural gas prices through trading in commodity markets is a recent phenomenon. The first natural gas market center, known as the Henry Hub, was set up in 1988, soon after deregulation of "old gas" in 1985. Hubs are locations where natural gas pipelines meet and the services necessary to physically exchange natural gas are located for traders who want to take delivery. The wellhead price of natural gas was not fully decontrolled until 1989. Early in 1990, the first natural gas futures were traded on the New York Mercantile Exchange (NYMEX).
A close look at the timing of the changes in trading activities and the movement of prices shows a coincidence that is just too striking to ignore. Exhibit III-1 overlays key points in the short history of natural gas commodity markets on the price history.
Natural gas prices were stable throughout the 1990s. While there were a couple of

spikes in spot markets in the 1990s, spot and futures prices generally tracked the wellhead price closely in a narrow range of $2 - $3 per thousand cubic feet (mcf). After a slow start,these markets were said to be efficient in a technical sense.

This pattern came to a dramatic end in the spring of 2000. In the spring of 2000, natural gas prices at the wellhead began a sustained period above $3 that lasted for 16 months.
The average price of natural gas in 2000-2001 was about twice the price of the previous decade. Spot market prices peaked at four times the average of the previous decade. Coincidentally, this was the period in which, it later came to light, a number of companies were manipulating or attempting to manipulate the market. This was the period during which the Enron-style merchant traders engaged in abusive practices. Electricity deregulation emerged in the mid-1990s while the Federal Energy Regulatory Commission pressed deregulation and unbundling of natural gas pipeline markets, particularly in California. The California electricity crisis, which was interrelated with natural gas prices, had put pressure on these commodity markets.

Simultaneously, Enron launched its Enron Online trading platform in November 1999. It had moderate levels of trading (about $50 billion) through the first half of 2000. Subsequently, Enron's total trading exploded. In the first half of 2001, it did over ten times as much (half a trillion dollars). Prices skyrocketed as well. Volumes escalated sharply and Enron played a key role. As a recent *New York Times* article noted, "Some traders have said that Enron Online was dominant enough to enable Enron to set market prices."
While the Western electricity markets attracted the most headlines and revealed the most blatant abuses in terms of withholding of physical supplies and bogus trades, natural gas

CONCLUSION

Unlike oil and coal markets, natural gas has yet to play a significant role in global markets. Some 20 percent of global gas crosses borders before reaching final consumers. About 75 percent of that gas is traded by pipe between essentially neighbouring countries. Hence natural gas trade has developed primarily at the regional level or between adjacent regions.

Pipeline transmission is capital-intensive and allows little flexibility in the choice of buyers and sellers. Still, pipeline gas is traded between production and consumption sites more than 4,000 kilometres apart. Three major regional gas trade markets have emerged:

The almost fully integrated North American market, characterized by accelerated growth of Canadian exports to the U.S. market (from 26 Mtoe in 1990 to 79 Mtoe in 1998). There have also been minor exchanges between Mexico and the United States. The European market, with the following principal suppliers: the former Soviet Union (with a pipeline producing 108 Mtoe in 1998), Norway (pipeline producing 38 Mtoe), and the Netherlands (pipeline producing 33 Mtoe), and Algeria with minor liquefied natural gas supplies from Libya (pipeline and liquefied natural gas producing 47 Mtoe). Gas trade expanded by 2.7 percent a year in 1990–98.

The Asian gas market is dominated by liquefied natural gas (which increased from 47 Mtoe in 1990 to 77 Mtoe in 1998). The main suppliers are Indonesia, Malaysia, Australia, Brunei, the United Arab Emirates, and Qatar. Japan, the Republic of Korea, China, and Taiwan (China) are the main customers. A gas market has also begun to develop in Latin America, with exports from Bolivia to Argentina and Argentina to Chile.

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