

## **Natural Gas: Troubled Water vs. Smooth Sailing**



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## SUMMARY

- Investors and gas markets are nervous and will get more so as the next few months progress.
- Gas storage is likely to end the winter between 1,600 and 1,800 bcf.
- Over the next six months, gas markets have additional downside risk from current levels.
- Gas prices could fall to \$5/mcf, allowing substitution from coal-fired power generation.
- A review of 2001/2002 shows that sloppy gas markets rapidly self correct as low prices impact both demand and supply.
- Well economics for various basins suggest a long-term gas price of \$7 to \$8/mcf is required to keep production flat/growing slightly.
- We are not adjusting our 2006 gas price forecast of \$8/mcf.

### 2006 Gas Market Probabilities:

**Early Trouble (30% probability)** – NYMEX front month gas price falls to \$5/mcf early in the summer and the 12-month strip falls below \$7/mcf. Storage ends winter at/above 1,800bcf and natural gas prices are overwhelmed by record high storage levels.

**Late Trouble (30% probability)** – The prospect of another active hurricane season and continued high oil prices prevent a collapse in natural gas until late September/October when storage reaches full. NYMEX front month gas price falls to \$5/mcf late in the summer. The 12-month strip holds above \$7/mcf as winter demand is just around the corner.

**No Trouble (30% probability)** – Gas prices “grind it out” in the \$7 to \$8/mcf range. In the next two months, a combination of cold weather and demand recovery cause storage to end winter at the low end of our range ~1,600 bcf. Another active hurricane season and a hot summer prevent a fall in gas prices as storage ends the summer near full.

**Improvement (10% probability)** – Gas prices climb back to the \$10/mcf range. It will take underlying demand recovery (which we have not seen yet), another hot summer and another active hurricane season (with meaningful production impacts). High oil prices also help.

### Snapshot

February 22, 2006  
selected data

E&P index - S&P1500	\$404
Oil service index - OSX	\$197
Majors index - XO1	\$1,042
S&P500	\$1,293
Crude oil, NYMEX front month (April)	\$60.77
Crude oil, NYMEX 12-month strip	\$64.46
Crude oil, NYMEX 2009	\$61.93
Natural gas, NYMEX front month (March)	\$7.22
Natural gas, NYMEX 12-month strip	\$8.58
Natural gas, NYMEX 2009	\$7.54

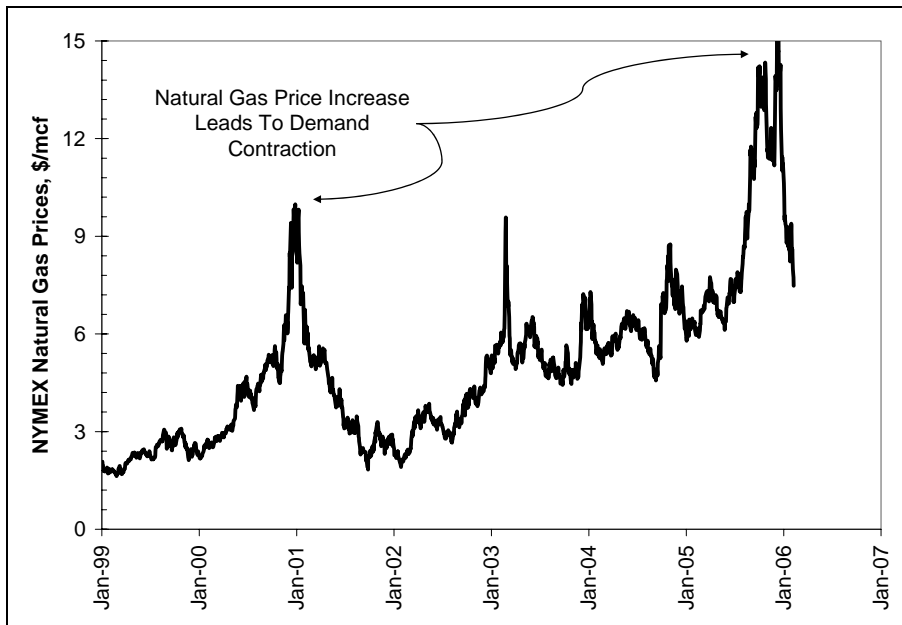
## The Current Situation

Natural gas is forcing investors into a classic short-term versus long-term situation. Gas will likely get worse before it gets better. With only a 10% probability of 2006 gas prices improving from current levels, it is difficult (if not impossible) to be bullish on natural gas in the short term. However, with a quickly self-correcting system and LNG still well out on the horizon, it is difficult to be too bearish on natural gas in the medium/long term.

Natural gas prices have recently fallen from \$15/mcf to \$7/mcf, gas storage levels are 50% above normal levels and the underlying fundamentals continue to look challenging. This report addresses the issues surrounding natural gas (price, demand, supply, inventory, etc) and discusses the variables we are watching over the next few weeks/months to assess the underlying health of the gas market.

The recent reduction of natural gas prices from record high levels has been the result of several factors including extremely mild winter weather, demand destruction and onshore supply growth.

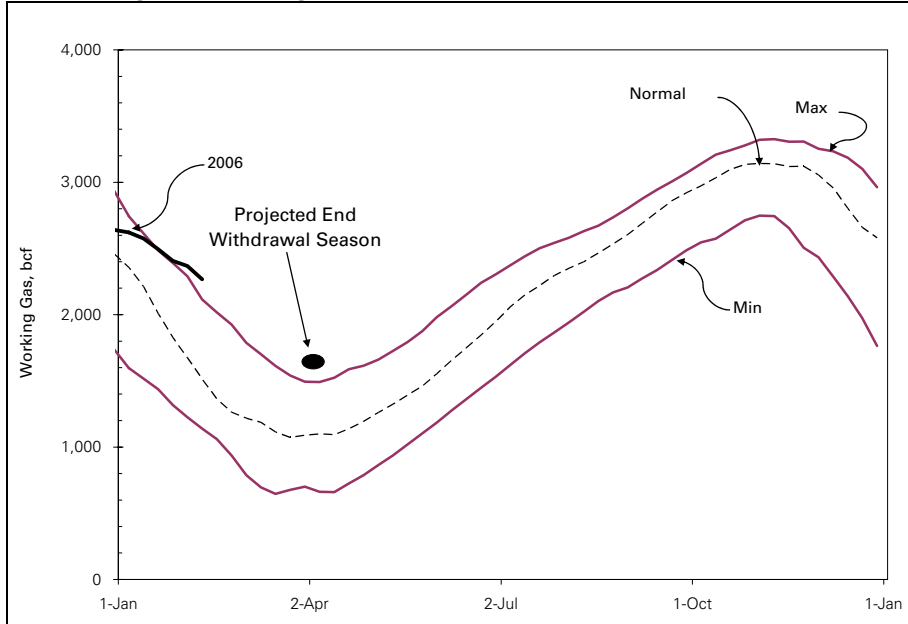
Natural Gas Prices – Volatile



Source: Bloomberg

Current storage levels of 2,266bcf are 50% above normal after starting winter (October 1, 2005) at normal levels. This occurred even though ~1.5bcf/day of GOM production remains off-line due to Hurricanes Katrina and Rita (3% of US total).

### US Working Gas in Storage



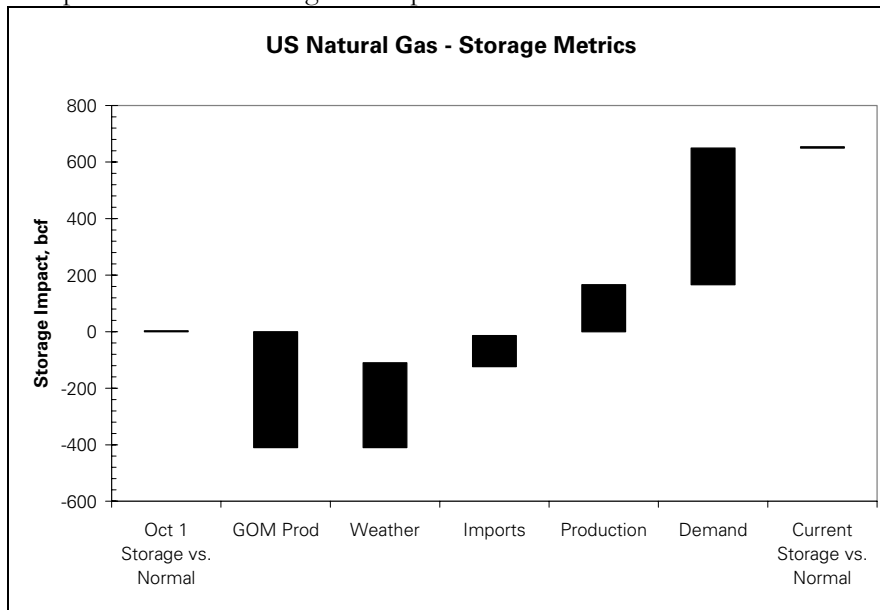
Sources: DOE and Pickering Energy Partners, Inc.

## Inventory Discussion and Analysis

### Components of Storage Underperformance

January 2005 was the warmest January in over 100 years, significantly reducing residential and commercial natural gas demand. However, only a portion of the storage overhang can be attributed to the mild winter weather (see figure below).

Components of Gas Storage Underperformance



Sources: DOE and Pickering Energy Partners, Inc.

*Storage Underperformance (Oct 1, 2005 through Feb 10, 2006) driven by:*

GOM Production off-line	(430) bcf
Mild Winter Weather:	300 bcf
Weak Industrial Demand*:	480 bcf
Growing US Production:	180 bcf
Growing Imports:	<u>100 bcf</u>
<b>Total Underperformance</b>	<b>630 bcf</b>

\* Weak industrial demand a combination of hurricane and price-related impacts.

- *GOM Production* – Since Oct 1, 2005, GOM gas production has been reduced by 430bcf. Currently 1.5 bcf/day (3% of US total) remains off-line, helping alleviate the high inventory situation.
- *Weather* – 4Q'05 and 1Q'06td weather has been 8% warmer than normal, which corresponds to ~300bcf less natural gas demand. Note: we use trailing eight year data to define weather norms, this is consistent with storage data.
- *Imports* – Canadian imports have increased this winter compared to recent years +0.8bcf/day (100 bcf). The increase is most likely due to reduced Canadian demand (weather and high prices) freeing up natural gas for exports. We don't think Canadian production has increased significantly. Compared to normal, LNG imports and Mexico exports have had virtually no net impact on US inventory.

- *Onshore Production* – Contrary to popular belief, *onshore gas production is growing* ~1.5bcf/day (+4% y/y)...based on a DOE monthly production survey of 308 companies representing over 90% of supply. This has impacted storage by ~180 bcf.
- *Demand* – By default, the remainder of the storage overhang is a result of weak industrial demand. A combination of post-KatRita and price-sensitive demand destruction has contributed to ~480bcf of the storage overhang.

### Assessment of End of Season Storage

Storage levels at the end of winter will vary depending on how much cold weather occurs in the next few months and the magnitude of demand recovery. We assume that onshore gas production and Gulf of Mexico supply recovery will be little changed in the short term.

Our best estimate of working gas in storage at the end of 1Q'06 is ~1,765 bcf. This assumes 1 bcf/day of demand recovery and 5% colder than normal weather for the remaining six weeks of winter.

Projected Working Gas Levels: End of 1Q06

		Change in Demand, bcf/day			
		Contraction	Now	Recovery	
		-1	0	1	2
Remaining Winter, % Colder Than Normal	-5%	2,044	1,988	1,932	1,876
	0%	1,960	1,904	1,848	1,792
	5%	1,877	1,821	<b>1,765</b>	1,709
	10%	1,793	1,737	1,681	1,625

Source: Pickering Energy Partners, Inc.

Over the last five years, summer injections have averaged 2,100bcf with a range of 1,677bcf (in 2002) to 2,529bcf (in 2003).

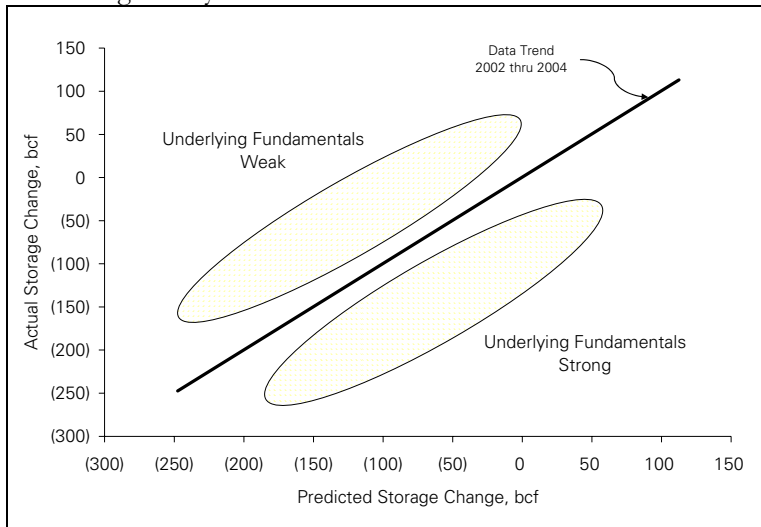
End Winter Storage: 1,765 bcf  
 Typical Summer Injection 2,100 bcf  
**Implied End of Summer Storage 3,865 bcf**

This creates a potential for significant weakness in the gas market as we believe **gas storage is “full” at ~3,500bcf**. In anticipation of/reaction to the scenario where storage fills to the brim, prices will fall enough to attract demand or reduce supply.

## Demand Analysis

We use weekly storage data to analyze natural gas supply and demand fundamentals on a weather-adjusted basis. The solid line on the graph below is the weather-based storage correlation we developed from 2002 thru 2004, a time period of equilibrium in the gas markets. This analysis utilizes both heating and cooling degree days to predict the storage injection (summer) and withdrawal (winter).

### Gas Storage Analysis

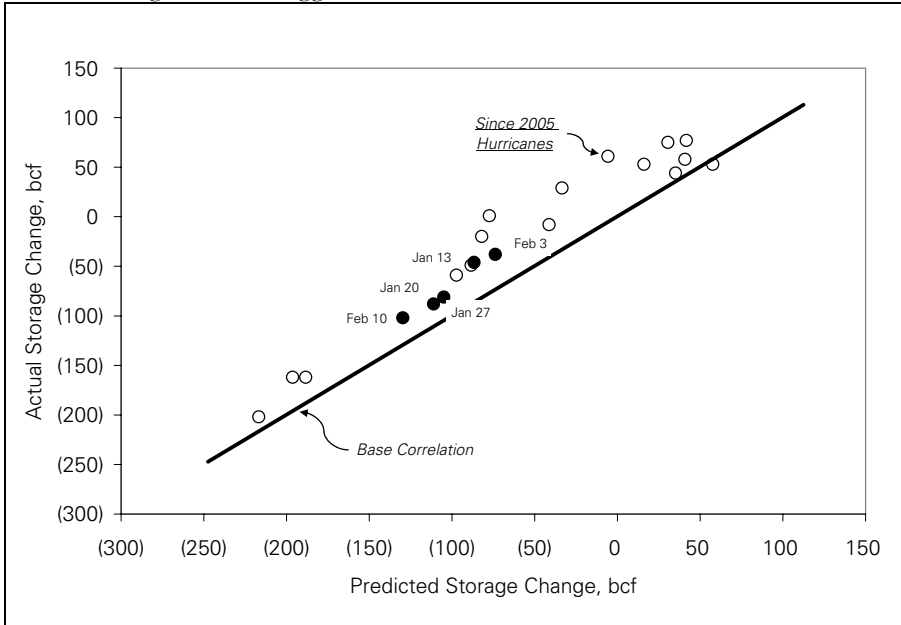


If data points fall consistently above the line in the area labeled “Underlying Fundamentals Weak”, then storage is underperforming. Actual injections are larger than predicted by weather and actual draws are smaller than predicted. Weak demand and/or growing supply will cause storage data points to fall above the line.

If data points fall consistently below the line in the area labeled “Underlying Fundamentals Strong”, then storage is outperforming. Actual injections are smaller than predicted by weather and actual draws larger than predicted. Strong demand and/or falling supply will cause storage data points to fall below the line.

Our analysis of the recent storage data suggests demand destruction of ~2 bcf/day. This has not significantly changed even as gas prices have fallen into the low \$7/mcf range.

#### Recent Storage Trends Suggest Weak Fundamentals



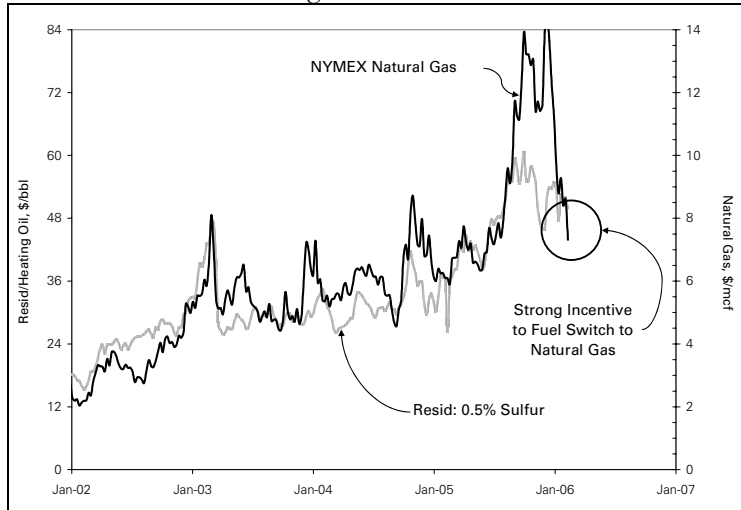
Sources: DOE and Pickering Energy Partners, Inc.

The graph above shows the weekly storage data since the 2005 hurricanes. The data has consistently fallen above the 2002-2004 trend line, indicating the underlying supply and demand fundamentals remain weak. Data for the last five weeks shows little to no improvement (not materially closer to the equilibrium line). This is surprising (and disappointing) given the gas price decline since the first of the year. Even with increased incentive to consume (via lower cost), industrial demand has not yet rebounded. *We are watching this data closely over the next weeks/months to detect demand improvement.*

## Demand Substitution and Price Supports

Some power generation and industrial users have dual fuel capability – the ability to switch between natural gas and residual fuel. Thus, these two fuels compete for the marginal user. As shown below, natural gas prices have now fallen to a level that induces switching (~1.5 bcf/day over the past several weeks).

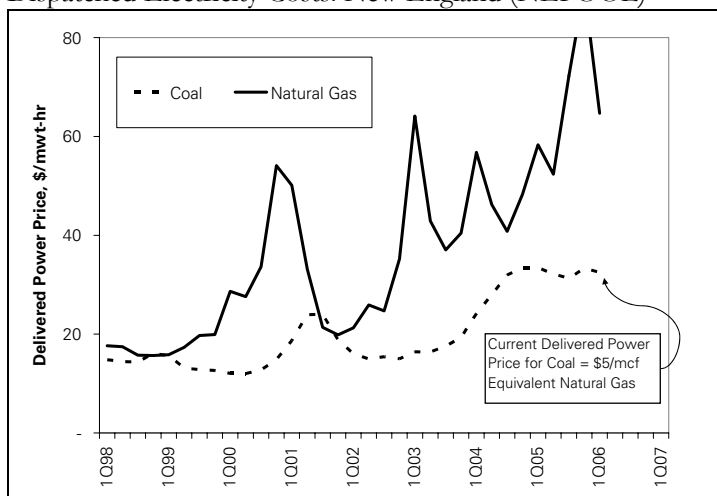
### Natural Gas Fuel Switching Incentive



Sources: Bloomberg and Pickering Energy Partners, Inc.

Coal fired power generation ultimately sets the floor for demand and, therefore the price, of natural gas. Natural gas prices can fall low enough that power from efficient, gas-fueled combined cycle generation (7,000 heat rate) is cheaper than power generated from less efficient coal plants. This occurred in New England, where coal prices are highest, in early 2002 (see Appendix A). Our current estimate is that natural gas prices of ~\$5/mcf makes gas-fired generation competitive with coal in this region and could add 3 to 4 bcf/day of incremental natural gas demand. **Current coal prices set the floor on natural gas at \$5/mcf.**

### Dispatched Electricity Costs: New England (NEPOOL)



Sources: Bloomberg and Pickering Energy Partners, Inc.

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## *Potential gas market scenarios*

We don't like to say "we don't know" because we get paid to have an opinion. However, the reality of today's gas market forces us to fess up...we don't know! So instead of doing our best turtle imitation, we have laid out four scenarios that bracket our view of the potential outcomes over the next six to nine months. We believe that there is a 60% chance that prompt month gas falls to \$5/mcf. This could occur in the spring/early summer (bad for equities) or later in the year (not as bad for equities).

**Early Trouble (30%)** – NYMEX front month gas price falls to \$5/mcf early in the summer and the 12-month strip falls below \$7/mcf.

- Storage ends winter at/above 1,800bcf and natural gas prices fall early in the summer to compete with coal fired power generation...adding incremental gas demand.
- Mild summer weather and lack of hurricanes disrupting production creates record storage levels during the injection season.
- Physical storage levels overwhelm the cash market in early summer and the 12 month strip falls materially (~\$6/mcf...currently \$8.70/mcf).
- Rig count falls in reaction to several months of low gas prices, but the supply response is insufficient to prevent significant gas-on-gas competition as storage fills well before the end of the injection season.
- The onset of winter weather, the return of price sensitive demand, and falling rigcount puts 2007 gas prices in the \$7 to \$9/mcf range.

**Late Trouble (30%)** – NYMEX front month gas price falls to \$5/mcf late in the summer and the 12-month strip stays firmly above \$7/mcf.

- Storage ends winter ~1,700bcf as a late winter cold spell works off some excess storage and low front month/cash gas prices allow the return of some price sensitive demand.
- Even with record storage levels to start summer, the prospect of another active hurricane season, hot summer weather and continued high oil prices prevents a collapse in natural gas prices until late September/October.
- Storage fills in October and gas-on gas competition creates significant weakness in the cash market/front month NYMEX (\$5/mcf), but with winter just six weeks away the 12-month gas strip remains largely unaffected.
- The onset of winter weather and the return of price sensitive demand yields 2007 gas prices in the \$7 to \$9/mcf range.

**No Trouble (30%)** – Gas prices grind it out in the \$7 to \$8 range.

- In the next two months, a combination of cold weather and some demand recovery cause storage to end winter at the low end of our range at ~1,600 bcf.
- The prospect of another active hurricane season and continued high oil prices allow natural gas markets to grind it out through the summer with little price movement from the current \$7.50/mcf level.
- Increased storage capacity (3,500bcf) prevents significant gas-on-gas competition as storage simply fills (rather than bursts). A natural gas crisis is averted.
- 2007 gas prices in the \$7 to \$9/mcf range...depending on winter weather.

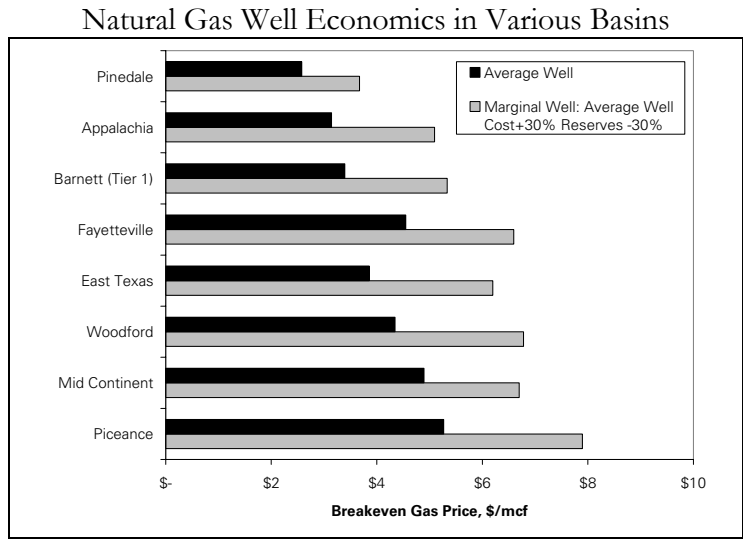
**Improvement (10%)** – Gas prices climb back to the \$10+/mcf range.

- In the next two months, a combination of cold weather and some demand recovery cause storage to end winter at the low end of our range at ~1,600 bcf.
- Dr. Gray (the sultan of storms) correctly predicts another active hurricane season. Significant production disruptions occur.
- Production disruptions and another hot summer combine to prevent storage over-fill and gas-on-gas competition is nothing more than late winter fear-mongering.
- Strong US economy allows price sensitive demand recovery at higher gas prices.
- Oil markets help boost natural gas as international oil tensions persist.
- Natural gas prices trade between \$8/mcf and \$14/mcf.
- Could happen, but not likely...hence, our 10% probability.

**The Case For \$8/mcf Normalized Gas Price**

In our view, until LNG arrives in significant incremental volumes, the marginal cost of supply will set the long-term support for natural gas. Given the intense focus on natural gas fundamentals, we thought it would be interesting to examine the well economics in various basins.

Our approach was to examine the “average” well (typical basin production profile) given 2005 drilling and completion costs, lease operating expense, and the appropriate gas-price differential. We then increased the average well costs by 30% to incorporate expected cost inflation. Finally, we reduced expected reserves by 30% to capture the marginal well in the field. Our implicit assumption is that the \$10+/mcf environment has incentivized some operators to push the envelope and drill marginal prospects.



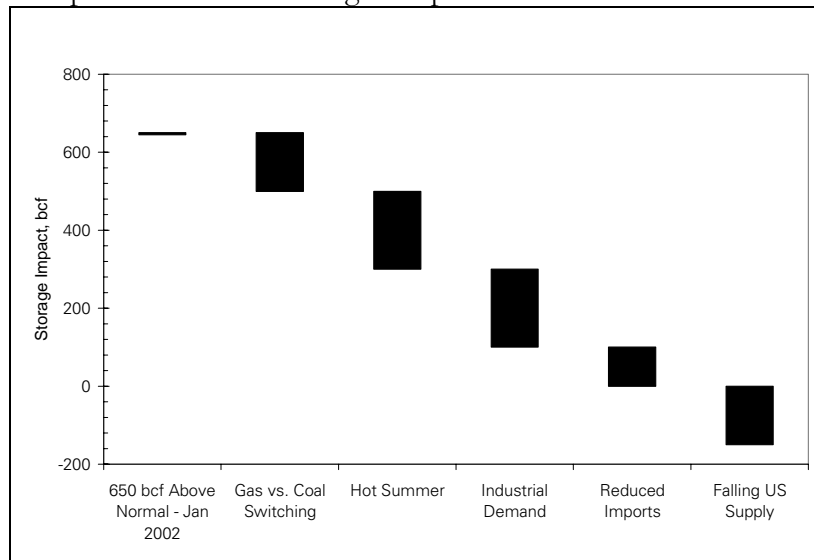
The results support conventional wisdom - average well economics work at \$5/mcf natural gas price. However, as well costs escalate and recovery is reduced, the economic threshold changes materially. Five of the eight basins we examined are uneconomic at ~\$7/mcf gas prices. Thus, in order to enable domestic supply growth (or at least stabilized production), gas prices in the \$8/mcf range will be required.

## Achieving Equilibrium – Anatomy of a Natural Gas Market Recovery: 2002

At the start of 2002, storage levels were 650 bcf above normal with market sentiment decidedly negative. By the end of 2002, storage levels were 150 bcf below normal. Low prices created supply/demand impacts that quickly re-established equilibrium:

- Demand responded first. Low prices caused gas-fired power demand to increase as natural gas could compete with base load coal-fired power in the U.S. Northeast.
- Demand responded as low prices and post-Sept 11<sup>th</sup> economic rebound improved industrial gas demand.
- U.S. supply declined as rig count fell in response to low gas prices. Falling supply slightly lagged the demand recovery.
- See Appendix A for further analysis of the 2002 recovery.

### Components of 2002 Storage Outperformance



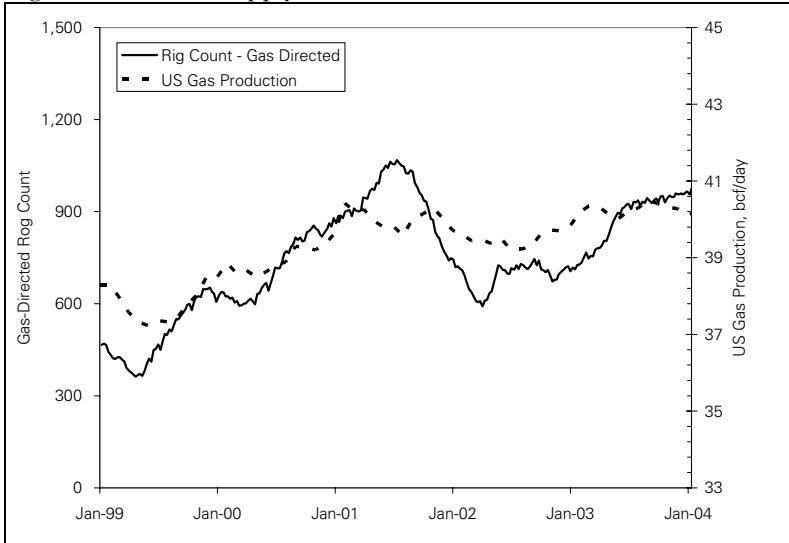
Source: Pickering Energy Partners, Inc.

#### 2002 Storage Outperformance driven by:

Gas vs. Coal Switching:	150 bcf
Hot Summer:	200 bcf
Improving Industrial Demand:	200 bcf
Falling US Production:	150 bcf
Falling Imports (Canada):	100 bcf
<b>Total Outperformance</b>	<b>800 bcf</b>

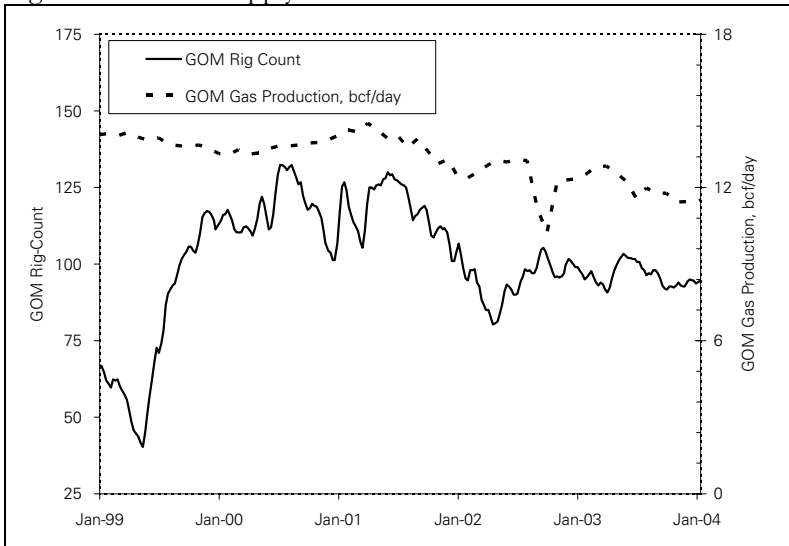
The supply response, both onshore and offshore, lagged the decline in rig count. Our analysis suggests the demand improvement is equally important to supply decline for a gas market recovery.

Rig Count and US Supply - Onshore



Sources: Bloomberg, Baker Hughes, and Pickering Energy Partners, Inc.

Rig Count and US Supply – Gulf of Mexico



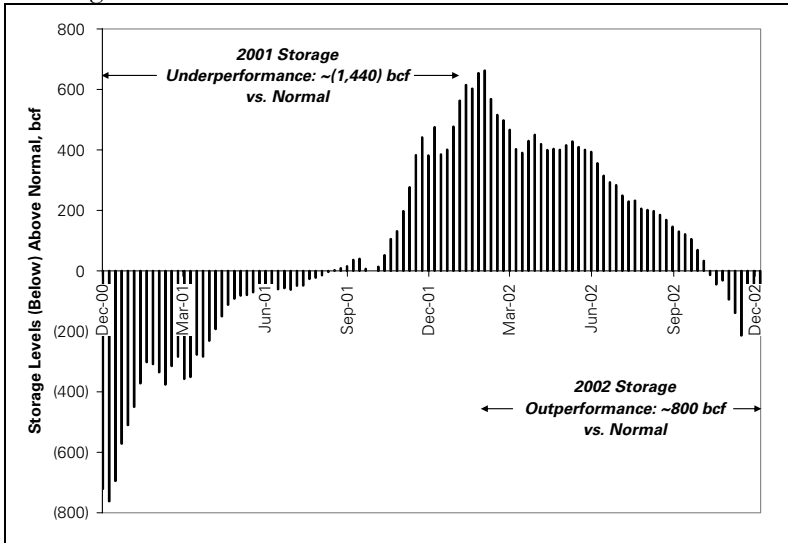
Sources: Bloomberg, Baker Hughes, and Pickering Energy Partners, Inc.

# Appendix A

## 2001/2002 A case study in Natural Gas.

- 2001 Storage Underperformance – working gas started 2001 ~750 bcf below normal and ended the year ~650 bcf above normal...a whopping 1,400 bcf underperformance.
- 2002 Storage Outperformance – by the end of 2002, storage levels were below normal as the market rapidly took care of the “overhang”.

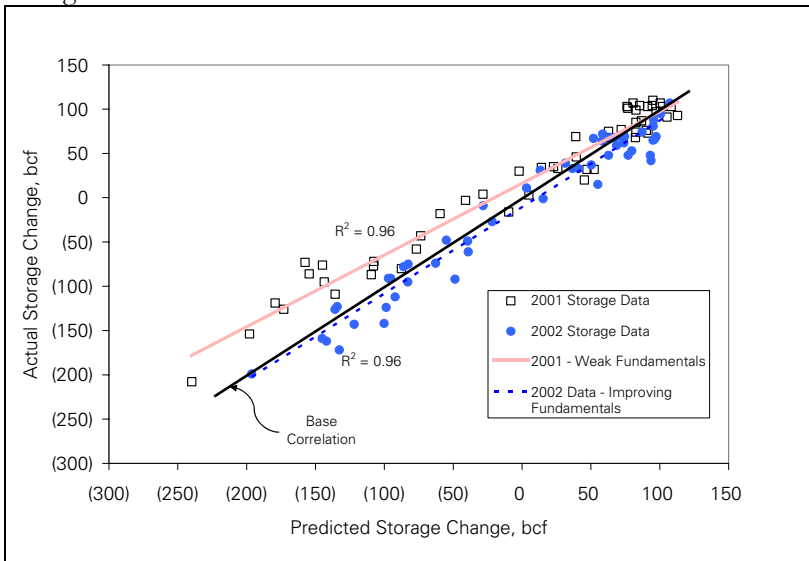
Working Gas Levels vs. Normal: 2001 and 2002



Sources: DOE and Pickering Energy Partners, Inc.

- The 2001 Underperformance & 2002 Outperformance can clearly be seen on the following graph.

Storage Trends 2001 and 2002



Sources: DOE and Pickering Energy Partners, Inc.

- The following table summarizes the components of storage under/out performance.

*2001 Storage Underperformance driven by:*

Mild Winter Weather:	200 bcf
Weak Industrial Demand:	800 bcf
Growing US Production:	350 bcf
Growing Imports:	<u>50 bcf</u>
<b>Total Underperformance</b>	<b>1400 bcf</b>

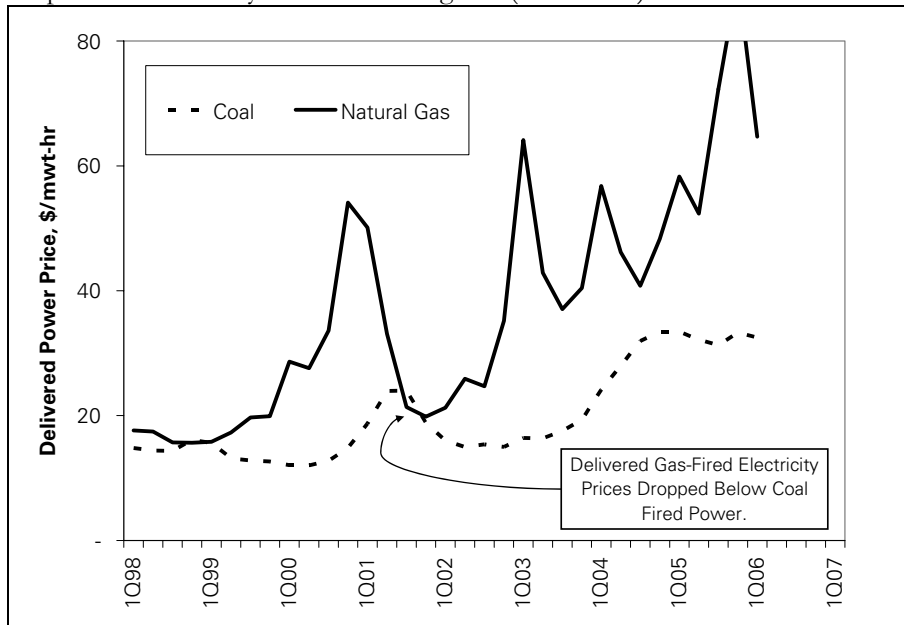
*2002 Storage Outperformance driven by:*

Electricity Demand *:	350 bcf
Improving Industrial Demand:	200 bcf
Falling US Production:	150 bcf
Falling Imports:	<u>100 bcf</u>
<b>Total Outperformance</b>	<b>800 bcf</b>

\*Electricity demand includes warmer summer weather (200 bcf) and increases gas usage in winter as gas replaced coal (150 bcf).

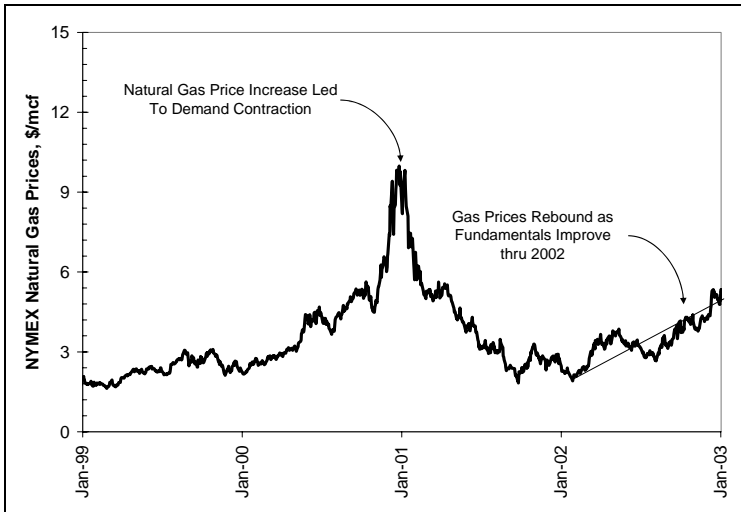
Gas fired power generation competed with coal generation – yielding an unexpected increase in natural gas demand ~3 bcf/day.

Dispatched Electricity Costs: New England (NEPOOL)



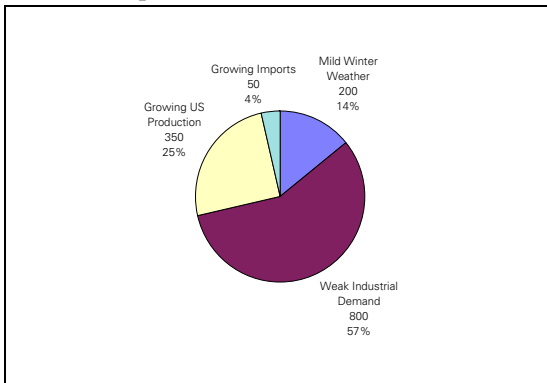
Sources: Bloomberg and Pickering Energy Partners, Inc.

## Natural Gas Prices: 1999-2002

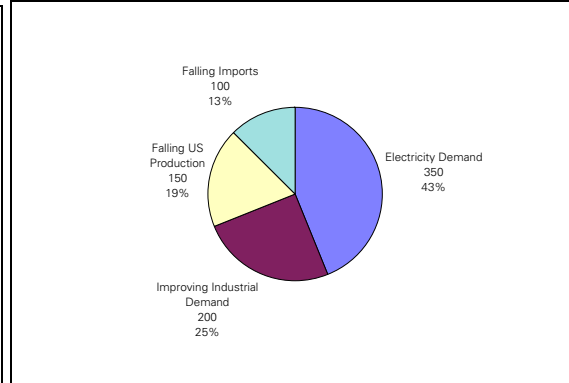


Sources: Bloomberg and Pickering Energy Partners, Inc.

## Components of Storage Change 2001 Underperformance



## 2002 Outperformance



Source: Pickering Energy Partners, Inc.

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