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A Discussion on Sustained Advances in Energy Prices

Prepared for:

Long Island Power Authority

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Over the course of the seven short years since the Long Island Power Authority became Long Island's non-profit retail electric utility, domestic and international energy markets have been witness to dramatic change. In May 1998, natural gas traded for just over \$2.00 per million btus, a barrel of crude oil fetched just under \$15.00. Prices today are some 230% higher for both commodities - a situation with potentially tremendous impact to LIPA (see exhibits 1 and 2).

Exhibit 1 – Continuous Prompt Crude Oil Contract Price – Jan 1998 to Current

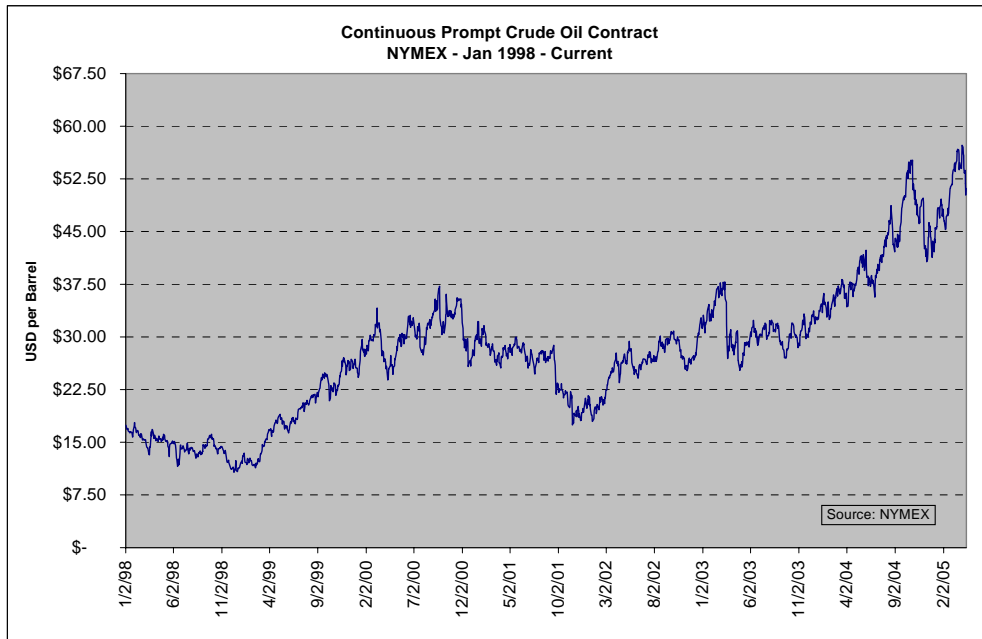
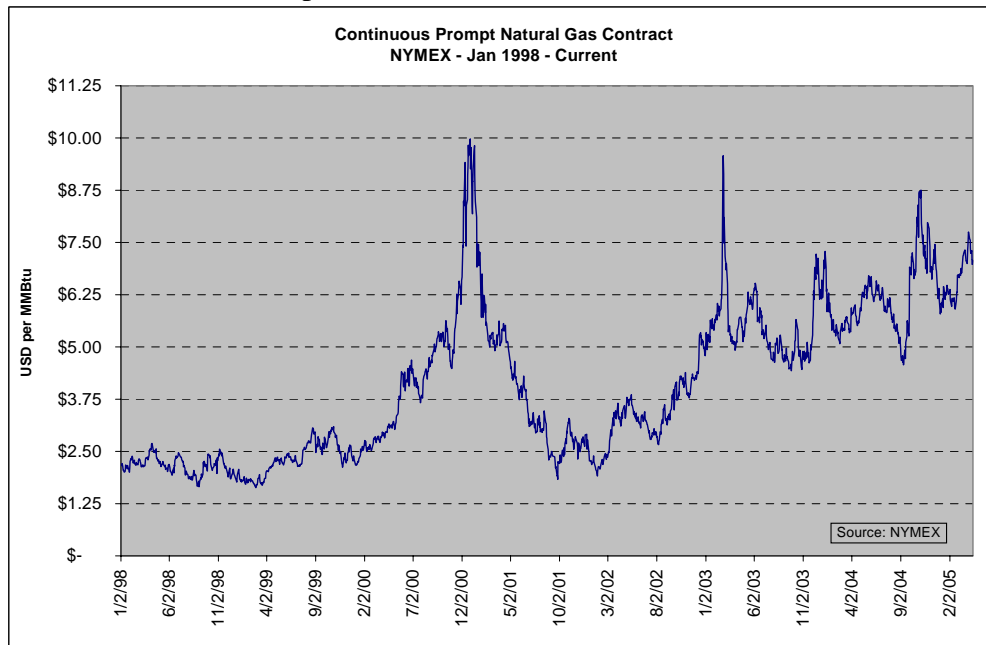


Exhibit 2 – Continuous Prompt Natural Gas Contract Price – Jan 1998 – Current



Economic Impacts of Increased Energy Prices

Unlike other commodities, the level of influence of crude oil to the global economy is without match. The list of finished goods that rely upon crude oil as a raw material seems to be without end: from shampoo to parachutes, from crayons to safety glass. This is on top of the well known reliance of refined crude oil for transport needs, practically fueling the entire global transportation network. The pressures placed upon the world economy in the face of advancing crude oil prices are material. Increases in raw material prices, all else equal, serve to reduce the productive capacity of any economy, as businesses must curb investment in new capital to absorb the increase in operation costs. Eventually, higher production costs, in so far as a lack of competitive forces will allow, will reach consumers as producers pass them on. The ending effect is a reduction in economic growth, as consumers must curtail consumption of other goods in order to facilitate the purchase of fuels and crude-oil based products.

Actual reduction in the growth of aggregate demand, or GDP, is found with countries that rely heavily upon crude-oil imports, e.g. the US (for every 5 barrels of crude oil consumed in the US, 3.2 of them are imported). In so far as a country heavily relies upon foreign sources for crude oil, oil-price increases lead to a transfer of income from the importing to the exporting countries. The Federal Reserve has estimated that the impact of higher crude-oil prices over the course of 2004 reduced GDP growth in the US by as much as $\frac{3}{4}$ of a percentage point¹.

Similar unsavory economic effects occur with an increase in natural gas prices. While potential reductions in GDP growth due to natural-gas-price increases are significantly lower than that for crude oil, as net imports to the US account for only 15% of total consumption, economic growth and productive capacities are stymied in the face of increased natural gas prices. Within the industrial sector, any process requiring significant amounts of heat, such as the smelting of metal or production of chemicals, has typically relied upon natural gas as the fuel for such energy. However, significant and lasting advances in natural gas prices have resulted in a 14.25% decline of industrial consumption since 1997 as industrial companies have elected to either shift production facilities out of North America (prices for natural gas in other countries are often significantly lower than in the United States) or shut them down completely (see exhibit 3). The economic effects of this are clear: reduction in employment opportunities and subsequent income. Additionally, the majority of the electrical generation facilities installed within the United States over the past 6 years depend upon natural gas as their fuel source. Since 1997, the amount of natural gas consumed to produce electricity has increased 31.7% (see exhibit 4). As a result, the cost to power producers to provide electricity to their customers has increased substantially.

¹ Board of Governors of the Federal Reserve System, *Ben S Bernanke: Oil and the economy*, October 21, 2004.

Exhibit 3 – Industrial Consumption of Natural Gas Since 1997 – United States

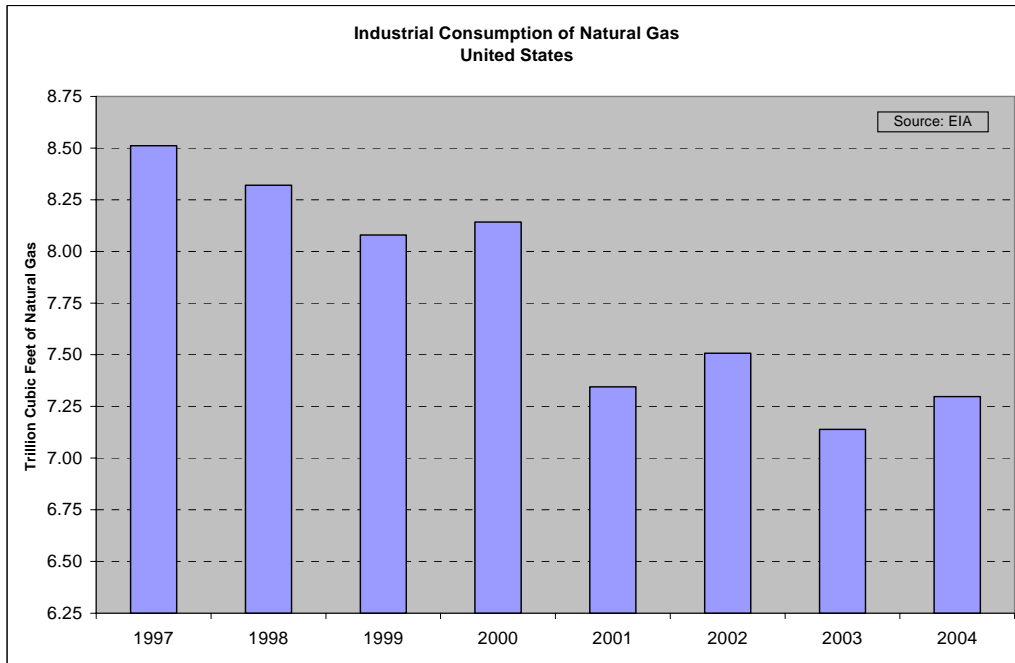
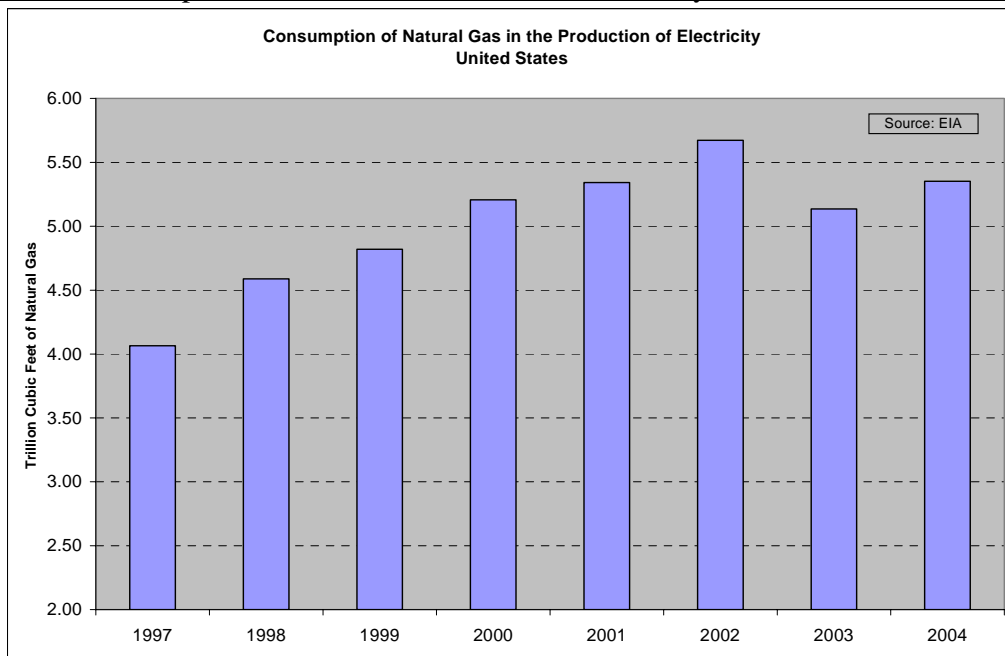
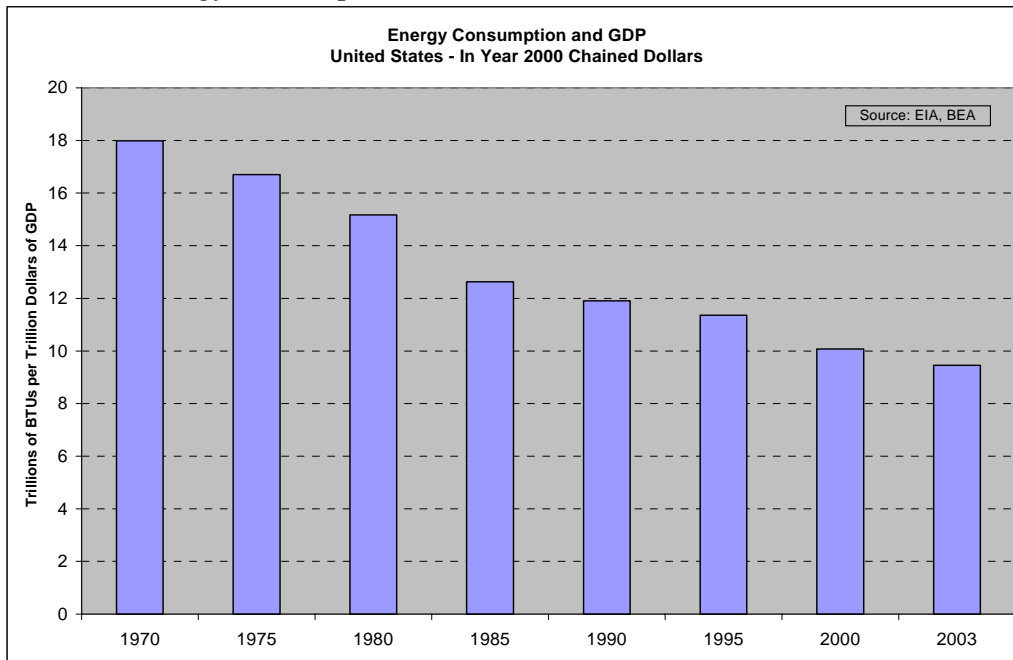


Exhibit 4 – Consumption of Natural Gas to Produce Electricity Since 1997 – United States



Many economists correctly highlight that advances in technologies over the past three decades have significantly increased the efficiencies of fossil-fuel consumption, thereby limiting the total economic impact of advancing energy prices (see exhibit 5). For instance, it takes around half the amount of energy consumption to generate one unit of US GDP as it did in 1970. Nonetheless, the economic impacts, both globally and domestically, from sustained advances in energy prices are substantive and lasting.

Exhibit 5 – US Energy Consumption and US GDP – Chained 2000 Dollars



LIPA’s Response to Advances in Energy Prices

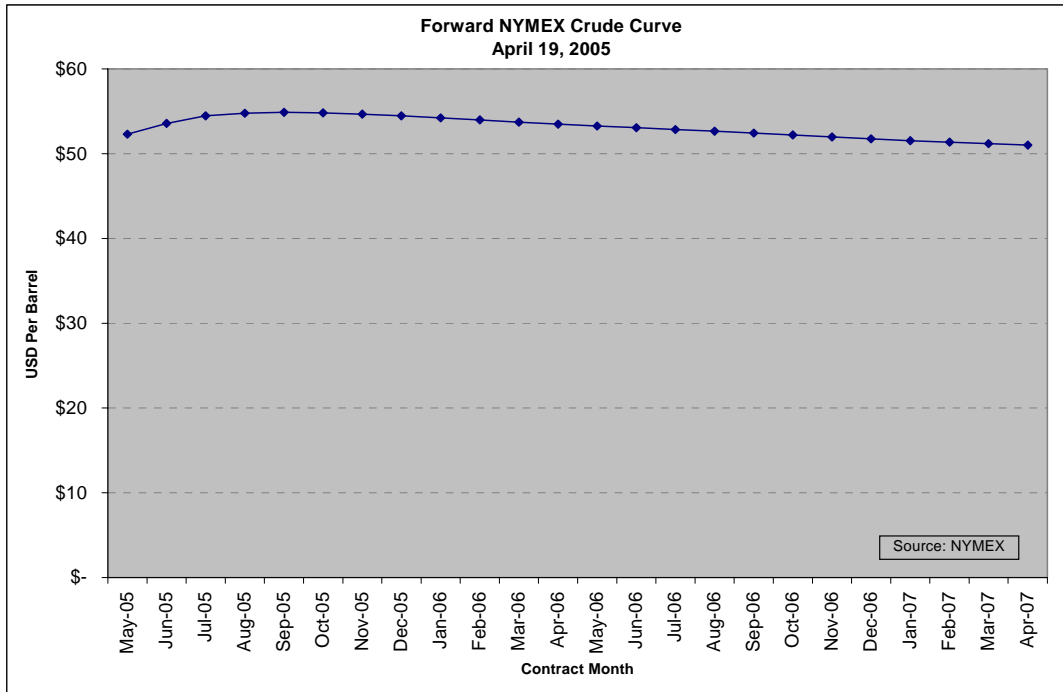
Since 2002, The Authority has been engaged in a robust price risk management program. The program has been designed to contain the financial burden brought about by rising commodity prices, through The Authority contracting portions of future volumes at set prices. By fixing prescribed volumes of anticipated fuel consumption, often times several years in advance, LIPA has been able to defend a budget, positively influence its total cost of consumption, and dramatically limit The Authority’s exposure to intolerable prices. The Authority further recognizes that price risks are not one-sided and, concurrent with upside-price risk management, monitors and manages the risk of falling prices, which could give rise to contracted volumes appearing imprudent. Simply put, The Authority is actively engaged in affecting its fiscal future and eliminating the position of the passive participant, a hostage to fortune.

Financial impacts to LIPA in the face of rising energy costs are real. For 2006, the incremental cost to LIPA for every \$1.00 increase per MMBtu in natural gas is a little over \$45.1 million; for every increase of \$5.00 per barrel of residual fuel oil, the incremental cost to The Authority is a little over \$60.3 million. The power of LIPA’s risk management program is equally real: to date, the combined risk management activities by The Authority have reduced LIPA’s customers’ bills by over \$210 million.

Oil Prices – Moving to a New Level

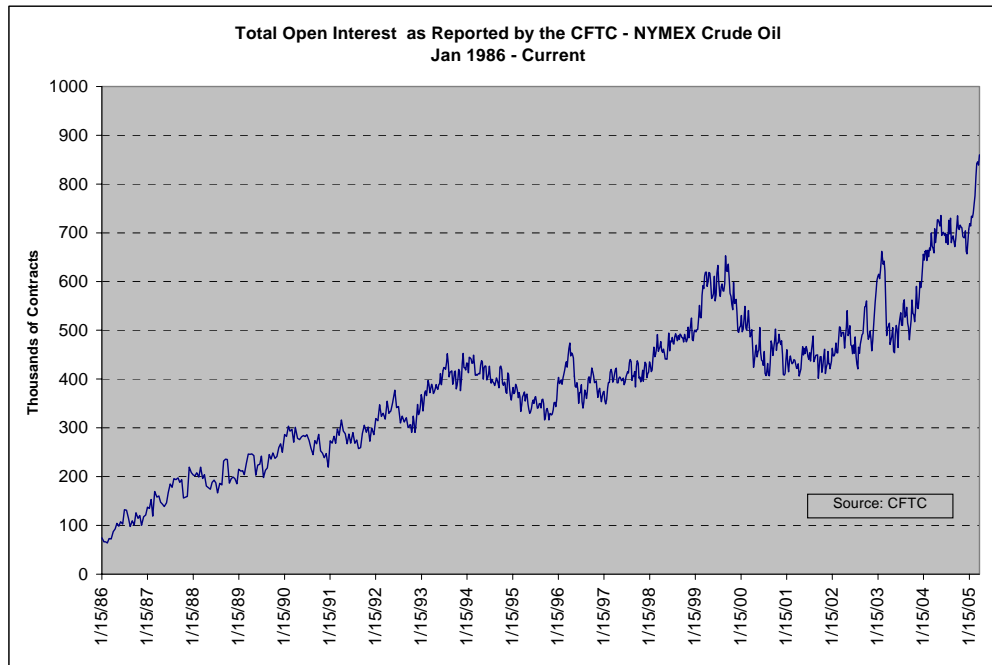
The course of the past 12-months within the global crude-oil space has been astounding. Prices have advanced some \$20/barrel, from a once-thought lofty \$35 to a previously unimaginable \$55 per barrel. For market participants that only 1 year ago believed 40-dollar crude to be an upside aberration with a minimal life span, it has become difficult to fathom a current 24-month forward curve that fails to produce a single month pricing below \$50 (see exhibit 6).

Exhibit 6 – 24-Month Forward Price Curve – Crude Oil



It is natural for some observers to declare a bubble present when any asset class advances 50% in a year's time. The current situation with crude oil is no different, with the culpable in this iteration identified as the hedge funds: the relatively new entrants whom attempt to garner outsized returns via "betting" a future expectation. There is some evidence to support this: current crude-oil futures open-interest, or the amount of outstanding futures contracts and thus participation, has never been higher (see exhibit 7). Is this proof of speculative interests only serving to severely distort prices away from fundamentals? Perhaps. Or are we witnessing a price advance in response to shifting fundamentals, with a marketplace communicating several salient messages?

Exhibit 7 – Total Open Interest – NYMEX Crude Oil Futures



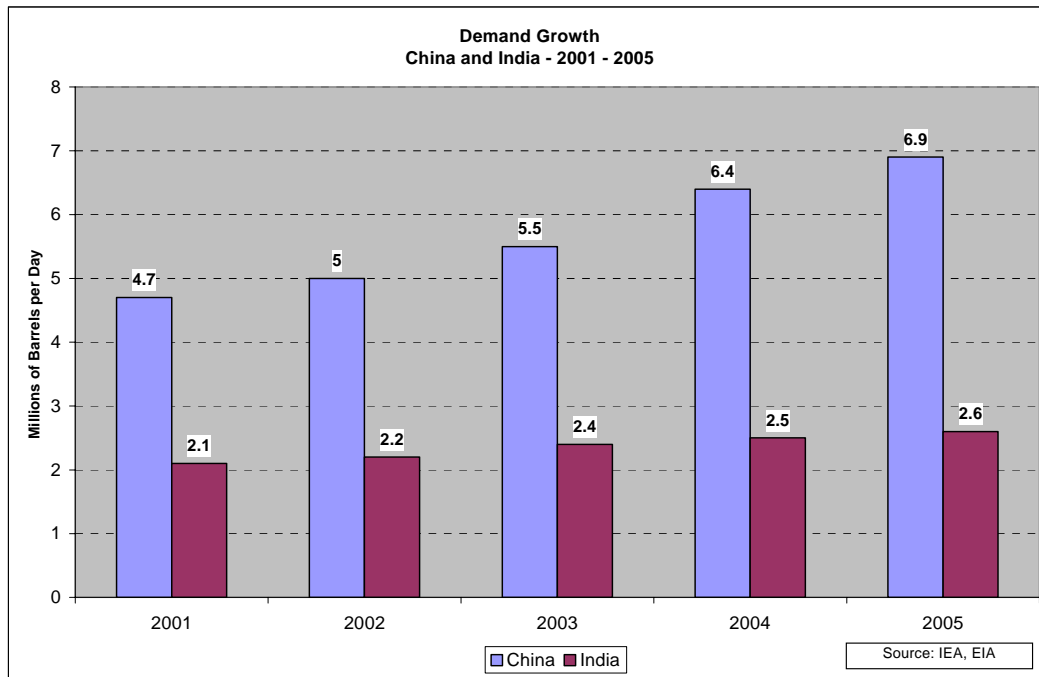
For two decades, the global crude-oil space has been governed by one seemingly supreme influencing factor: the existence of instantly callable spare supply capacity within the Organization of Petroleum Exporting Countries (OPEC). Importantly, this spare capacity existed over this period because this cartel restricted their output to maintain a world price far above their marginal production costs. As a result, OPEC produced less crude each year from 1978 to 2003 than they produced in 1977. This situation changed abruptly in 2004, when surging world demand, particularly from Asia enabled OPEC to produce 5% more crude than they produced in 1977 and find that it was not enough to prevent large price increases.

For over 25 years a handful of dominant crude oil suppliers retained prerogatives that allowed them to influence prices through control of supplies at the margin. Should the OPEC cartel wish prices lower, additional supplies were brought to market through the activation of otherwise dormant production capacity. The opposite proved equally feasible, price support was found through the reigning-in of marginal barrels. In short, the cartel was expected to act in their own best interest, and found that their ability to do so was tremendous; they owned the optionality of supply and could meet demand in a manner they saw fit.

What has changed? A confluence of three elements has surfaced to significantly curb the power of large marginal suppliers. First, recent demand growth was simply not foreseen. The figures coming out of central Asia are astounding: China's consumption is nearly 150% of what it was in 2001; India has posted a 28% gain over the same period (see exhibit 8). Secondly, nations with large proven crude reserves have not responded to

the leaps in global demand since 2001 – while they have brought additional supplies to market, they have done so by approaching the limits of their functional supply capacity. In essence, the decision-matrix of supply once controlled by the likes of OPEC has been compromised vis-à-vis limited capital expenditures. In 2004 OPEC reached the limit of its production capability and still could not meet world demand at the price specified in their official target band. So for the first time in 25 years limited supply required that demand be rationed through the price mechanism.

Exhibit 8 – Chinese and Indian Crude-Oil Demand Growth



So far there has been little, if any, early indication of a global consumer that is curtailing consumption as a function of these soaring prices. The lack of early data may very well be a function of “stickiness” within the decision process of consumers to reduce demand, i.e. many industrial production processes are large inertia-driven operations that cannot react in “real-time”. Alternatively, this lack of demand destruction could stem from the simple lack of substitutes for petroleum inputs: industrial consumers would ostensibly shed all feasible ancillary costs prior to reducing petroleum demand, for reduction of petroleum inputs, given a lack of substitute for many processes, often means the closing of a process. The prospect of a relatively inelastic demand for petroleum is a primary driver of expectations for potential advances in oil prices from current levels.

Observing the higher level of demand in the world market, and concerned that the dollar has weakened substantially as a world currency in the last three years, OPEC decided the time was right to raise their target price for crude oil. So they cut back production, recreating some spare capacity and driving up oil prices into the \$50-60/barrel range. So currently the cartel has some spare capacity, but not very much. In

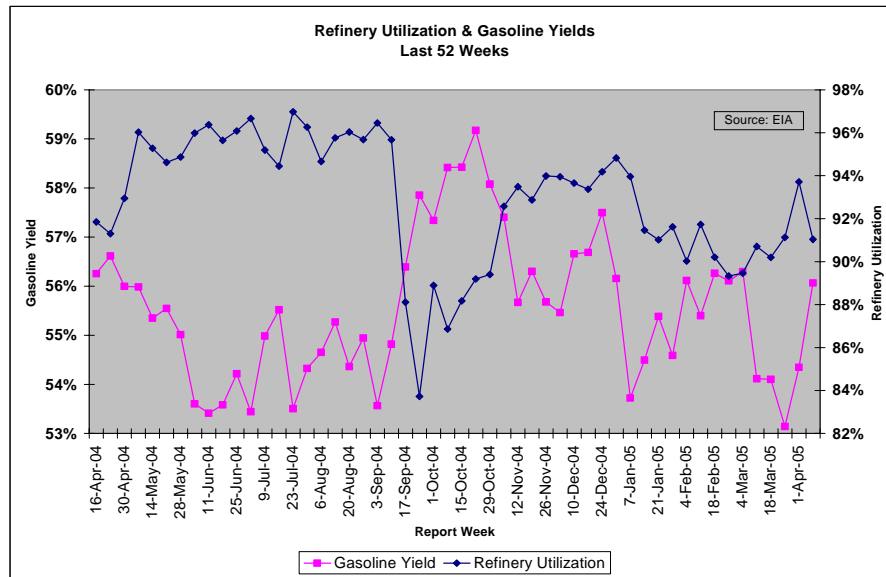
fact, recent evidence has surfaced to suggest that OPEC may perhaps be producing very near to its total estimated capacity.

Over the course of the last 7 weeks, the production output of US Refineries has become interesting. Two elements of refinery activity in particular are worthy of note: US Refinery Utilization and Gasoline Production Yield². Over the given course of a year, refinery utilization will range between 85% and 97%, depending upon the season. The lowest utilizations occur during the spring as units are brought down for repairs prior to the summer season, the peak time for refineries, as gasoline is produced to meet the crest of annual demand. The differential in crude-oil inputs over the past 52 weeks was 1.7 million bpd³, meaning that US refineries consumed this much more crude during times of peak inputs versus times of minimal inputs. Over the past several years, as a general rule, lower utilization rates (less crude consumed) resulted in generally higher gasoline production yields. The supporting logic is the marginal barrel going into US units is a lighter, sweet variety at times of annually low consumptions, which yield higher percentages of products such as gasoline. During times of peak consumption, gasoline yields decline, as the mix of inputs includes heavy, sour varieties, which is the composition of marginal output available from OPEC. Exhibit 9 indicates that since March 11 of this year, gasoline yields have fallen considerably, and achieved their lowest level over the last 52 weeks on March 25th. This was all during a time when utilization rates were at seasonally-low levels. The last time gasoline yields were averaging these levels was during the summer of 2004, when utilization rates were at their highest for the year. As this data is quite recent, and the current behaviour of refiners in the US is not understood, hard conclusions from this data are not available. However, if the marginal barrel going into US refineries over this period was of a heavy, sour variety, (which would be a signal that OPEC production is nearing capacity) this is potentially the signature we would see.

² US Refinery Utilization is the measure of total crude-oil input into domestic refineries over a given period as a percentage of the estimated maximum capacity of the refineries. Gasoline Production Yield is the measure of total finished motor gasoline by US Refineries as a percentage of the amount of crude-oil input into the refineries.

³ Barrels per Day

Exhibit 9 – Gasoline Production Yield and Refinery Utilization – United States



While last week’s recovery in gasoline yield does not lend support to this argument and figures in future weeks will be important to monitor, this is an interesting development that bears monitoring. If the marginal barrel going into US refineries 6 weeks before the onset of peak refining activity is of a heavy, sour variety, there is the potential for price advancement in the short-term as refiners scramble for incremental crude.

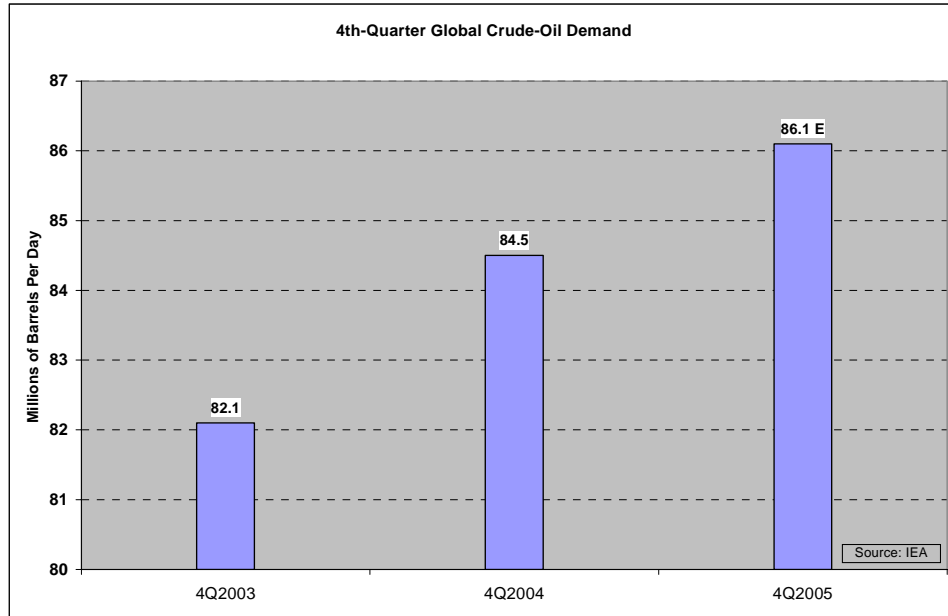
The bottom line with respect to price drivers appears to be the following combination: 1) a global economic engine that is demanding substantially more crude oil than was forecasted even 2 years ago and 2) the potential that world demand, even in the \$50-60/bbl price range, will outstrip the functional aggregate supply infrastructure within 12 months. If it were to occur that the marginal barrel of demand were unmet by supply at this price level, it would become incumbent upon the price-rationing mechanism to price that marginal barrel to the point of demand destruction. Such demand destruction is typically not clearly visible until sometime after rising prices tip the balance, but to be sure, we have not seen evidence of this effect yet.

Recently total crude-oil stocks for all OECD⁴ countries have risen 96 million barrels, or 26 thousand bpd (kbpd), for the year ending February 28th. All things equal, this is indicative of a global supply that is meeting, and slightly exceeding, demand at the current price level. However, current forecasts indicate that by the 4th quarter of this year, global demand will reach 86.1 mbpd, up 1.6 mbpd and 4.0 mbpd for the one and two year periods, respectively (see exhibit 10). It is further forecast that the call upon OPEC capacity, the only source of spare global supply, will reach 92% of the theoretical OPEC maximum crude supply capacity of 32 mbpd by the 4th quarter of this year. This

⁴ Organisation for Economic Co-operation and Development

leaves a forecasted OPEC margin of 2.5 mbpd of theoretical capacity. If demand does indeed achieve these levels, even moderate supply disruptions in countries historically known for volatile crude-oil flows (evidence Nigeria and Iraq) will cause large price responses and greatly enhanced price volatility. Essentially, the influence of geopolitical and natural events has the potential to be greatly magnified in the relatively short term.

Exhibit 10 – 4th-Quarter Global Crude-Oil Demand



Additionally, the response by leading oil producers wishing to install new supply capacity will not be, by definition, timely. The lead-time to install additional infrastructure varies greatly by regions, but it could be reasonably surmised that no participant can bring material supply to market within 18 months, or the end of 2006.

The key determining factor seems then to be the behaviour of future demand. Several items threaten the demand forecasts given above, including cooling global economic demand on the heels of less accommodative central bank policies and the very influence of nominally record-high crude oil prices. Should demand fail to reach forecasted levels, the concern for future imbalances will ease, and prices should moderate. Nonetheless, crude-oil prices are currently communicating the alarm that in the very near future it may become increasingly difficult to meet potential demand and that the resulting shrinking supply cushion is simply a threat to the vitality of the global economy. The message is seemingly clear: the globe cannot operate comfortably under an evaporating supply cushion that is a real possibility within 12 months.

Now the question arises, is this current detachment from long-term prices an aberration? Will consumers and non-OPEC producers respond to the high prices over the next few years in a way that brings world oil supply and demand back into balance at the lower prices common over the last 20 years? Perhaps, but three elements of the current

market condition almost certainly represent a permanent change in the global environment:

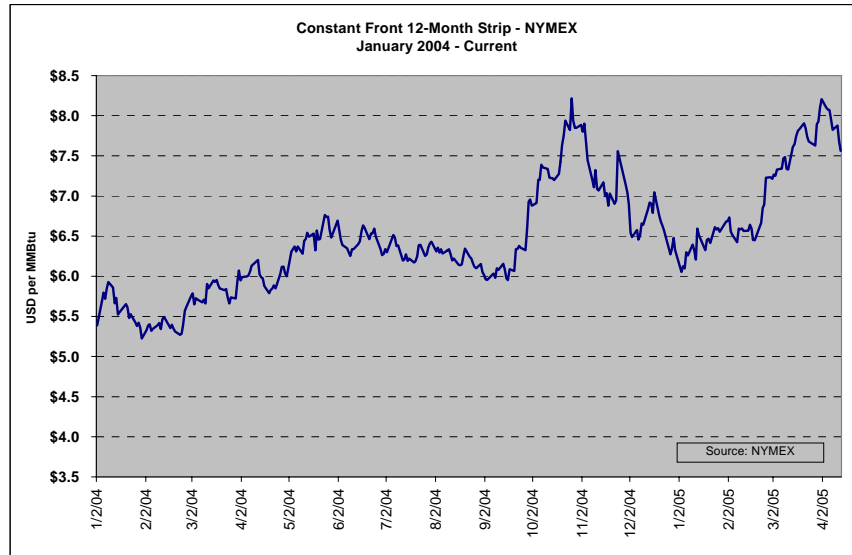
1. The U.S. dollar has weakened and is likely to weaken further. Due to a variety of causes, the U.S. has developed an enormous trade deficit. The dollar will have to fall to bring this situation back into balance. As the dollar falls in value, the price of oil measured in dollars will rise.
2. The surging demand for oil in Asia is part of a revolutionary change in the global economy as nations that were traditionally very poor begin to compete for the world's limited fossil energy resources. Since U.S. per capita oil consumption is 20 times the average level in India and China, the growth in global demand for oil is likely to be much higher than in the past.
3. The world's remaining oil resources are largely located outside the Western market economies, and they are largely under the control of government entities. Even as oil prices surge, the major oil companies have a limited ability to gain access to these resources.

So while there are aspects of the current oil market situation that are representative of a temporary construct—the unexpected surge in demand that cannot be met immediately with new supply—other developments seem more permanent. So the best assumption for the future is that prices in U.S. dollars will be permanently higher. In the U.S. this means that consumers should consider permanent changes in oil use that are appropriate for a continuing higher oil price level.

Natural Gas – Matching Record Pricing

The robustness within the crude-oil space has not been lost on the natural-gas market. On April 1st, the front 12-month strip tied the all-time price record of \$8.21 / MMBtu originally set back in late October of last year (see exhibit 11). The primary difference between then and now, and apparent to all witnessing, was the categorical lack of any factor threatening supply at the beginning of April 2005. The principal catalyst for the run up last fall was the extensive damage brought upon the Gulf-of-Mexico production fleet by Hurricane Ivan.

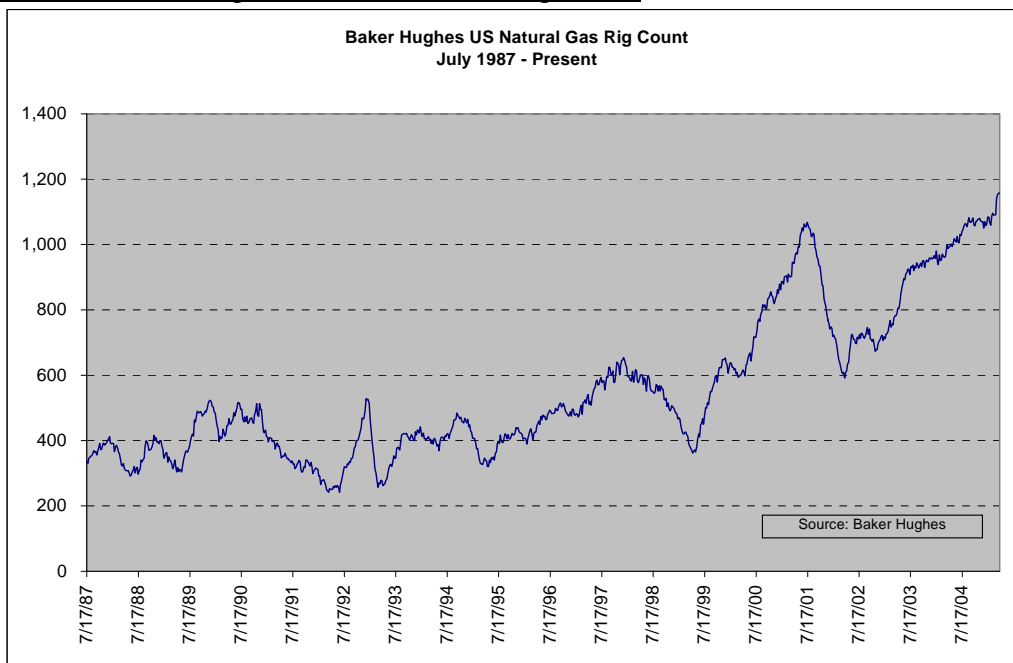
Exhibit 11 – Constant Front 12-Month Strip – Natural Gas



It would prove a difficult position to assert that the latest test of record prices are not a direct result of crude-oil prices. The current fundamentals are relatively bearish when considering a forward time span of two months, some highlights:

- US natural gas inventories have averaged 121% of last year's levels since the beginning of 2005.
- The EIA reported this week that domestic production averaged 0.55 BCF/Day lower this winter than last, or 1.1%, arguably statistically no different than 0%.
- Nuclear generation currently sits at 76% of capacity, a seasonal norm, and only 2.6% below this time last year.
- The Baker Hughes US Natural Gas Rig Count, currently at 1,157 rigs, is 169 rigs higher than last year, and at its highest level since the mid-1980s (see exhibit 12).

Exhibit 12 – Baker Hughes US Natural Gas Rig Count



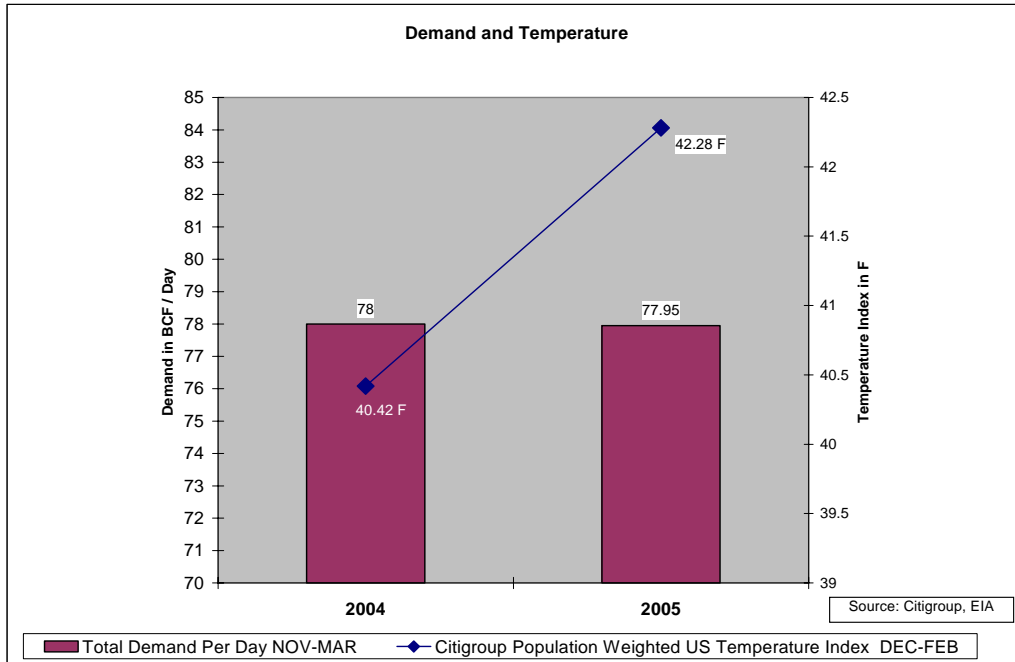
Nonetheless, there are elements within the domestic natural-gas space that command attention, especially when considering horizons beyond 60 days. There is a substantial fear that a back-to-back extreme summer and winter coupled with a working domestic storage capacity that remains around 3.4 TCF would yield highly volatile prices, as many consider 3.4 TCF unsuitable to meet demand needs, without a substantial upward ramping in pricing. In essence, a major constraint within the domestic natural-gas space, over the medium two-year term, is working storage capacity: the US can only go into a winter, irrespective of how mild a summer may have been, with a maximum deliverability of around 3.4 TCF, or 43.5 cover days of demand (assuming that the US consumes, on average, 78 BCF per day during the winter (Nov – Mar)). Should the summer prove hot, natural gas volumes that were slated for injection into storage caverns will compete with fuel needs at natural-gas fired generators; a hot summer would yield an ending storage figure potentially considerably lower than 3.4 TCF. If a brutally cold winter were to follow, pricing activity that would generate rationing could likely result.

Additionally, evidence of expanding US demand continues to mount. The EIA reported this month that demand for the Nov 04 – Mar 05 period averaged 77.9 BCF/Day, or statistically flat to last winter of 78.0 BCF/Day. Innocuous data alone but combine it with population-weighted temperature data, and the situation is telling: the US consumed substantially more natural gas on a temperature-adjusted basis⁵ this year than last year: 3.43 BCF/Day per HDD in the Dec 2004-Mar 2005 versus 3.17 BCF/Day per

⁵ Adjust the Dec-Feb Citigroup population weighted temperature index for Heating Degree Days, by subtracting 65 from the index. The result is 22.72 and 24.58 HDDs for 2005 and 2004, respectively. Take the BCF/Day demand and divide it by the HDD adjusted index, to find the BCF/Day consumed for each HDD: 3.43 for 2005, 3.17 for 2004, considerable growth in temperature-adjusted demand.

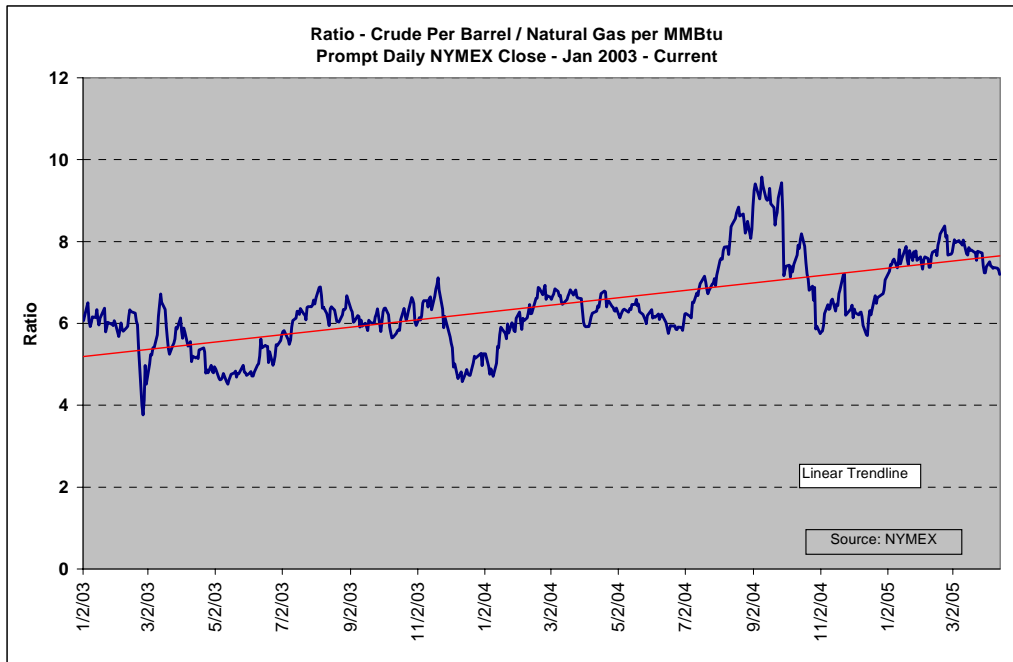
HDD in the Dec 2003- Mar 2004 (See footnote and exhibit 13). Couple these figures with a 20-year high in the Baker Hughes rig count yielding actual declines, (US Production declined 0.55 BCF/Day this winter compared with last, according to the EIA) and the supply/demand balance picture in the US appears to continue to deteriorate.

Exhibit 13 – Citigroup Population-Weighted Temperature and US Demand



Natural gas prices exhibit, for reasons debated, a relationship with domestic crude oil prices. A standard measure used in the market place is the simple ratio of crude oil price, in dollars-per-barrel, over natural gas price, in dollars-per-MMBtu (see exhibit 14). As the ratio works, the lower the ratio, the more expensive natural gas is with respect to crude oil, and vice versa. Exhibit 14 shows that since January of 2003, the ratio has seemed to oscillate around 6, but trend upwards over the period, to a reading currently around 7.3. This upward trend, and recent readings in the upper 7s to above 8, actually indicates that natural gas has been under-priced with respect to crude oil; the market has been seemingly reluctant to bid-up natural gas to establish a ratio more in-line with medium-term averages. Should anything begin to threaten natural gas supply this summer, this reluctance would likely evaporate, and given the potential increases in crude-oil prices over the next 12 months, there would be little impeding upward price progress.

Exhibit 14 – Ratio of Crude Oil – to – Natural Gas



Furthermore, as the US begins to compete for initial LNG shipments, the propensity for a strong relationship to crude-oil will increase. Global LNG shipments are priced at indices to global crude-oil prices. As the US bids for these cargoes, our bidding will need to attract suppliers who have paid for their shipments at crude-oil-based indices. Marginal volumes landing with crude-oil based pricing will serve to strengthen the relationship between crude-oil and US natural gas.

With the cause for increasing pricing influence from a potentially volatile crude-oil space, increasing temperature-adjusted US demand, declining US production in the face of 20-year highs in deployed rigs, and a relatively static working storage capacity figure, the risk for natural gas prices, over the next 12-months, is to the upside. Much will depend upon the weather patterns this summer and especially this winter, but the past two mild seasons, summer 2004 and winter 2004/2005, have served, at least partially, to mask the potential risks that exist should the weather wax uncooperative.

Conclusion

High energy prices are here to stay. The propensity for prices to achieve more absurd levels will depend much upon the state of demand over the course of the next 12 months. Current crude-oil prices are reflective of an anticipated demand that will test the global capacity to service incremental consumption. Any deviation in realized demand levels will serve to either ease, in the case of lower actual demand, or exacerbate upside price movements, should demand growth be greater than anticipated. Subsequently, volatility will continue to remain painful, as the consequence of any and all exogenous shocks will be magnified in this tight market. LIPA will continue to manage the risks borne by the current energy marketplace with the same interest and purpose that has defined our risk containment to date: executions to restrain upward price migration while keeping a prudent eye on the level of our fixed commitments.
