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Remarks by

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Markets for oil and natural gas have been subject to a degree of strain over the past year not experienced for a generation. Increased demand and lagging additions to productive capacity have combined to absorb a significant amount of the slack in energy markets that was essential in containing energy prices between 1985 and 2000.

This tendency has been especially pronounced for oil. Although the recent price of light sweet crude oil is only a bit above the highs of last October, overall market prices of recent weeks, in fact, have been much more elevated.

The prices of heavier, sour grades, which make up a significant part of the world production mix, are notably higher than in October. Dubai crude for instance, at yesterday's close, sold for more than \$12 per barrel above its October price level. Moreover, although the price of six-year futures for light sweet crude did not match the overall run-up of oil prices last fall, in recent weeks it has largely kept pace with spot prices, leading to record levels for contracts maturing in 2011.

Reflecting a low short-term elasticity of demand, higher prices in recent months have slowed the growth of oil demand, but only modestly. The slowdown in the growth of demand coupled with expanded production, which the price firmness has induced, has required markets to absorb an increased pace of inventory investment. The markets' response has been a shift in the spread between spot prices and near-term futures that has facilitated inventory hedging. Futures prices for delivery of both West Texas Intermediate and Brent crudes for the summer exceed spot prices. That will likely support increased inventories of crude oil. If sustained, these market technicals could encourage enough of an inventory buffer to damp the current price frenzy.

Natural gas prices, seasonally adjusted, have not returned to their peak of last October, but remain significantly above the levels at year-end 2004. Working levels of gas inventories are seasonally moderate, but domestic dry gas production plus net imports has not expanded sufficiently over the past few years to prevent a marked rise in price. The inexorable rise in residential and utility use has priced the more marginal industrial gas users partially out of the market and has induced significant gains in gas efficiency among a number of gas users such as petroleum refineries, steel mills, and paper and board mills. Industrial gas use overall in the United States has declined 12 percent since 1998.

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The longer-term outlook for oil and gas is, if anything, more conjectural. Much will depend on the response of demand to price over the longer run. Prices of spot crude oil and natural gas have risen sharply over the past year in the face of constrained supply and the firming of overall demand. But if history is any guide, should higher prices persist, energy use will over time continue to decline, relative to GDP.<sup>1</sup> Long-term demand elasticities have proved noticeably higher than those that are evident short term.

Altering the magnitude and manner of U.S. energy consumption will significantly affect the path of the U.S. economy over the long term. For years, long-term prospects for oil and gas prices appeared benign. When choosing capital projects, businesses in the past could mostly look through

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<sup>1</sup>The energy intensity of the United States economy has been reduced by about half since the early 1970s in response to sharply higher prices. Much of the displacement was achieved by 1985. Progress in reducing energy intensity has continued since then, but at a lessened pace. This more-modest rate of decline in intensity should not be surprising, given the generally lower level of real oil prices that prevailed between 1985 and 2000. With real energy prices again on the rise, more rapid decreases in the intensity of use in the years ahead seem virtually inevitable.

short-run fluctuations in oil and natural gas prices to moderate prices over the longer haul. The recent shift in expectations, however, has been substantial enough and persistent enough to bias business-investment decisions in favor of energy-cost reduction.

Of critical importance will be the extent to which the more than 200 million light vehicles on U.S. highways, which consume 11 percent of total world oil production, become more fuel efficient as vehicle buyers choose the lower fuel costs of lighter or hybrid vehicles.

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Aside from uncertain demand, the resolution of current major geopolitical uncertainties will materially affect oil prices in the years ahead. That, in turn, will significantly influence the levels of investments over the next decade in raising crude oil productive capacity and, only slightly less importantly, investment in refining facilities.

Because of the geographic concentration of proved reserves, much of the investments in crude oil productive capacity will need to be made in countries where foreign investment is prohibited or restricted. Unless those policies are changed, a greater proportion of the cash flow of producing countries will be needed for oil reinvestment if capacity is to keep up with projected world demand. Concerns about potential shortfalls in investment certainly have contributed to current record-high long-term futures prices.

To be sure, world oil supplies and productive capacity continue to expand. Major advances in recovery rates from existing reservoirs have enhanced proved reserves despite ever-fewer new discoveries of major oil fields. But investment to convert reserves to productive

capacity has fallen short of the levels required to match unexpected recent gains in demand, especially gains in China.

Besides feared shortfalls in crude oil capacity, the status of world refining capacity has become worrisome as well. Of special concern is the need to add adequate coking and desulphurization capacity to convert the average gravity and sulphur content of the world's crude oil to the lighter and sweeter needs of product markets, which are increasingly dominated by transportation fuels that must meet ever-more stringent environmental requirements.

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U.S. natural gas prices have historically displayed greater volatility than prices of crude oil, doubtless reflecting, in part, the less-advanced development of price-dampening global trade in natural gas.

Over the past few years, notwithstanding markedly higher drilling activity, the U.S. natural gas industry has been unable to noticeably expand production, or to increase imports from Canada. Significant pressure on prices ensued. North America's limited capacity to import liquefied natural gas (LNG) has effectively restricted our access to the world's abundant gas supplies.

Because international trade in natural gas has been insufficient to equalize prices across markets, U.S. natural gas prices since late 2002 have been notably higher, on average, than prices abroad, thereby putting significant segments of the North American gas-using industry in a weakened competitive position. Indeed, ammonia and fertilizer plants in the United States have been particularly hard hit as the costs of domestic feedstocks have risen relative to those abroad.

The difficulties associated with inadequate domestic supplies will eventually be resolved as consumers and producers react to the signals provided by market prices. Indeed, the process is already under way. As a result of substantial cost reductions for liquefaction and transportation of LNG, significant global trade in natural gas is developing. This activity has accelerated sharply over the past few years as profitable arbitrage has emerged in natural gas prices across international markets.

At the liquefaction end of the process, new investments are in the works across the globe. In Qatar alone, five large-scale projects have begun construction or are at advanced stages of development. In January, Egypt exported its first LNG cargo. Enormous tankers to transport LNG are being constructed, even without being dedicated to specific long-term delivery contracts. The increasing availability of LNG around the world should lead to much greater flexibility and efficiency in the allocation of energy resources. According to tabulations of BP, worldwide imports of natural gas in 2003 were only 24 percent of world consumption, compared with 59 percent for oil. Clearly, the gas trade has significant margin to exercise its price-damping opportunities.

In the United States, import terminals in Georgia and in Maryland have reopened after having been mothballed for more than two decades. The added capacity led to a noticeable increase in LNG imports last year, but LNG imports still accounted for less than 3 percent of U.S. consumption.<sup>2</sup> Additional import facilities, both onshore and offshore, are being developed. According to the Federal Energy Regulatory Commission, the number of approved and proposed new or expanded LNG import terminals in the United States stood at thirty-two as of last month

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<sup>2</sup>U.S. natural gas consumption in 2004 amounted to 22.3 trillion cubic feet.

with a capacity to import 15 trillion cubic feet annually, far in excess of any pending needs. Clearly, not all of these projects will come to fruition. Some will be abandoned for economic and business considerations, and others will fail because of local opposition, motivated by environmental, safety, and other concerns.

The larger question, of course, is what will increased world trade in LNG and expanded U.S. import capacity do to currently uncompetitive natural gas prices in the United States? During the past couple of years, when U.S. prices of natural gas hovered around \$6 million Btu, import prices of LNG in Europe have ranged between \$2 and \$4 per million Btu, and those in Japan and Korea have generally been between \$3 and \$5 per million Btu. Estimates of production and delivery costs of LNG to North America appear to hover around \$3 per million Btu. In the short run, exporters to the United States are likely to receive our domestic price, currently above \$7 per million Btu. But unless world gas markets tighten aggressively, competitive pressures will arbitrage the U.S. natural gas price down, possibly significantly, through increased imports.

In addition to increased supplies from abroad, North America still has numerous unexploited sources of gas production. Significant quantities of recoverable gas reserves are located in Alaska and the northern territories of Canada. Negotiations over the construction of pipelines connecting these northern supplies to existing delivery infrastructure are currently under way.

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To be sure, the dramatic changes in technology in recent years have made existing oil and natural gas reserves stretch further while keeping energy costs lower than they otherwise would

have been. Seismic imaging and advanced drilling techniques are facilitating the discovery of promising new reservoirs and are enabling the continued development of mature fields. But because of inexorably rising demand, these improved technologies have been unable to prevent the underlying long-term prices of oil and natural gas in the United States from rising.

Conversion of the vast Athabasca oil sands reserves in Alberta to productive capacity has been slow. But at current market prices they have become competitive. Moreover, new technologies are facilitating U.S. production of so-called unconventional gas reserves, such as tight sands gas, shale gas, and coalbed methane. Production from unconventional sources has more than doubled since 1990 and currently accounts for roughly one-third of U.S. dry gas production.

According to projections from the Energy Information Administration, the majority of the growth in the domestic supply of natural gas over the next twenty years will come from unconventional sources. In many respects, the unconventional is increasingly becoming the conventional.

In the more distant future, perhaps a generation or more, lies the potential to develop productive capacity from natural gas hydrates. Located in marine sediments and the Arctic, these ice-like structures store immense quantities of methane. Although the size of these potential resources is not well measured, mean estimates from the U.S. Geological Survey indicate that the United States alone may possess 200 quadrillion cubic feet of natural gas in the form of hydrates. To put this figure in perspective, the world's proved reserves of natural gas are on the order of 6 quadrillion cubic feet.

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In the decades ahead, natural gas and oil will compete in the United States with coal, nuclear power, and renewable sources of energy. As the manner in which energy is produced and consumed evolves, it is not unreasonable to expect that, in the long run, the prices per unit of energy from various sources would tend to converge. At present, long-term futures prices for natural gas are, on a Btu-equivalent basis, notably less expensive than those for crude oil.

Clearly, limited substitution possibilities across fuels have resulted in persistent cost differentials, but those very differentials inspire the technologies that, over time, reduce such limitations. A clear example is gas-to-liquids (GTL) technology, which converts natural gas to high-quality naphtha and to diesel fuel. Given the large-scale production facilities that are currently being contemplated (and some that have already begun construction), GTL is poised to become an increasingly important component of the world's energy supply. Current projections of production however remain modest. GTL promises to add a good measure of flexibility in the way natural gas resources are utilized. In addition, given the concerns over the long-term adequacy of liquid production capacity from conventional oil reserves, GTL may provide an attractive, competitively priced, option for making use of stranded gas, which, for lack of access to transportation infrastructure, cannot be brought to market.

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We are unable to judge with certainty how technological possibilities will play out in the future, but we can say with some assurance that developments in energy markets will remain central in determining the longer-run health of our nation's economy. The experience of the past fifty years--and indeed much longer than that--affirms that market forces play the key role in conserving

scarce energy resources, directing those resources to their most highly valued uses. Adequate productive capacity, of course, is driven also by nonmarket and policy considerations.

To be sure, energy issues present policymakers and citizens with difficult decisions and tradeoffs to make outside the market process. But those concerns, one hopes, will be addressed in a manner that, to the greatest extent possible, does not distort or stifle the meaningful functioning of our markets. We must remember that the same price signals that are so critical for balancing energy supply and demand in the short run also signal profit opportunities for long-term supply expansion. Moreover, they stimulate the research and development that will unlock new approaches to energy production and use that we can now only scarcely envision.