Alan Greenspan: Impact of energy on the economy

Remarks by Mr Alan Greenspan, Chairman of the Board of Governors of the US Federal Reserve System, before the Economic Club of Chicago, Chicago, Illinois, 28 June 2001.

* * *

Of the number of factors that have contributed to the slowing of economic growth in the United States over the past few quarters, the one that has received less attention than it clearly merits is the rise in energy prices. In what may or may not be coincidence, at least the last three recession periods in the United States – those of 1990-91, 1980-82, and 1974-75 – were preceded by spikes in the price of oil. As a consequence, we at the Federal Reserve are especially attentive to developments in energy markets and their effects on the behavior of households and businesses.

Obviously, caution is required in drawing generalizations from only three observations, and indeed many analysts do not place much credence in the link between oil prices and the business cycle. In part, this skepticism arises because the largely linear models that typically economists rely upon to track the ties between energy prices and gross domestic product do not signal a worrisome linkage. When simulated over periods with observed oil price spikes, the models do not show oil prices consistently having been a decisive factor in the subsequent economic downturns. Our heightened wariness about recent developments, however, reflects the possibility that the responsiveness of U.S. gross domestic product to energy prices may be different when households and businesses are confronted with abnormal price hikes. Because economic models typically are fit over both those periods with price spikes and the more predominant periods of moderate price fluctuation, their estimated statistical relationships would not fully capture the effect of sudden and sizable shifts in oil prices on the economy.

Pending the development of far better insights into the actual impact of oil price spikes than currently can be gleaned from macroeconomic models, it is prudent to follow energy markets far more closely than our models would suggest is necessary.

One important channel through which changes in the prices of oil and of other forms of energy unequivocally influence the economy is through their effects on the profitability of non-energy corporations. This effect is particularly important because a stabilization of profit margins and cash flow will be critical to an eventual firming of capital investment. As best we can infer, a substantial part of the rise in the total costs of corporations between the second quarter of last year and the first quarter of this year reflected higher energy costs, only a small part of which companies apparently were able to pass through into higher prices.

Rising natural gas prices, resulting from a significant shortfall in gas storage brought about by growing domestic demand and a limited ability to import, have been a particular concern. But since the start of the year, spot prices for natural gas have fallen significantly as the earlier run-up in prices induced a dramatic rise in drilling, a boost to output, and curtailed demand. Falling spot prices are being reflected, with a lag, in lower contract gas prices paid by U.S. businesses. Electric power costs continued to rise through May, but overall energy prices paid in April and May were down from the levels of the first quarter, suggesting some easing in pressures on profit margins from energy this quarter. We are also experiencing a decline of retail gasoline prices, which also had been rising sharply over the past couple of years. That run-up was of particular concern because in the past steep increases in the price of gasoline have arguably undermined both the real purchasing power and the confidence of consumers. This effect has likely been an avenue through which previous spikes in the price of crude oil have slowed economic activity. The jump in gasoline prices from March through May was wholly the result of a twenty cent per gallon surge in gross refining margins. By contrast, refinery acquisition costs of crude oil changed little over that period. In recent weeks, however, refinery margins have declined noticeably, easing gasoline prices at the pump, especially here in the Midwest.

The widening of refinery margins this spring, in turn, reflected shortfalls in refinery capacity, which had been exacerbated by a number of breakdowns. After rising to a peak in the early 1980s, the capacity of operable refineries fell substantially by the middle of that decade and held about flat from then through most of the 1990s. Upgrades of existing facilities in the 1990s served only to offset a decline of more than 20 percent in the number of refineries.

Accordingly, a refinery operating rate that languished at around 75 percent in the first half of the 1980s has risen to effectively full-capacity operations currently. The pressure on these facilities impeded the conversion of the substantial buildup of crude oil inventories that occurred since early March into gasoline and, as a consequence, gasoline prices at retail continued to increase through early May.

As was the case in 2000, some sharp regional differences in gasoline prices have emerged again this year. At the start of the summer, prices in the Midwest were running well above the national average again. Because regulations prescribe differing grades of gasoline for different regions of the country, gasoline is not as uniform a product as it was in earlier years. Consequently, the ability to move gasoline from areas of surplus to deficit is far more limited than it was a decade ago, and any given degree of overall gasoline price containment requires higher levels of gasoline inventories than would be the case otherwise.

Elevated domestic prices have damped demand and even drawn increased quantities of gasoline from European refineries in recent months. As a consequence, gasoline inventories have risen rapidly in recent weeks. Wholesale prices, as a result, are down substantially from their peaks.

We cannot be certain, of course, that the recent spike in gasoline prices in the United States is behind us, especially when crude oil supplies are never fully secure because of the unpredictability of events in the Middle East. Nonetheless, it is encouraging that in market economies well-publicized forecasts of crises, such as earlier concerns about gasoline price surges this summer, more often than not fail to develop, or at least not with the frequency and intensity proclaimed by headline writers. The reason is that producers and consumers alike react to price signals in ways that help to prevent the predicted disasters.

This phenomenon was also quite evident last winter, when markets worked to help allocate limited supplies of fuel oil and mitigate the problems that many had feared at the outset of the heating season. In response to low inventories of home heating oil, prices went up, demand slowed, and we drew in large amounts of heating oil from Europe. In the event, retail prices for heating oil peaked early in the season and have declined appreciably since.

We even may be beginning to see some indications that responses to market signals are having some effects in California. There is evidence that higher prices for electricity are beginning to damp demand, which is down significantly from a year ago as a consequence of increases in retail prices since December that will reach roughly 40 to 50 percent. Wholesale power supply contract prices for third-quarter delivery have recently fallen to their lowest levels this year. Of course, to assume that California is going to be able to avoid serious problems as the full brunt of demands for energy mount this summer would be foolhardy. The significant additions to capacity currently being planned or under construction will not be in place in time to eliminate the potential for disruption in the months ahead.

No other area of the United States has experienced the potential supply-demand imbalance in electric power that currently confronts California. Historically, public utility commissions, there as elsewhere, set prices in order to deliver a guaranteed rate of return on capacity, whether it was used or not. That capacity "buffer" settled around 15 percent of summer peak loads in many cases. For a variety of reasons – including a failure to expand capacity in response to increased demand – the previous summertime buffer in California has by now largely disappeared.

Because inventory buffers are not feasible for electrical systems, capacity buffers must absorb the full brunt of supply-demand imbalances. Such a system, confronted with relatively inelastic demand, cannot avoid extreme price increases or, alternatively, blackouts when demand for power plus an operationally minimal capacity buffer approaches or exceeds available supply. This would be the case whether power is being generated in a wholly free market or in the wholly controlled markets that in decades past were governed by public utility commissions.

If new capacity is not available in such circumstances, demand must fall. It will fall voluntarily in response to high prices or other forms of conservation that dissuade less essential uses, or it will fall through brownouts, blackouts, or other forms of involuntary rationing.

The recognition of the critical role of adequate capacity buffers has raised interest in deregulated electric power systems in the forward selling of the output of new generating plants. The reduced risk that forward sales provide can increase the incentive to build new capacity. Analogies to the economics of office buildings are evident. Few office buildings would be constructed in the absence of the ability to reach long-term leases. Short-term rental agreements are no more conducive to new office construction than spot prices for electric power are to the building of new power plants. I should note that while much attention is focused on the construction of new generating capacity, questions

related to the adequate capacity for transmission and distribution also loom large in California and elsewhere.

Beyond issues strictly related to the economics of energy production and distribution, the current crisis in California is having profoundly important effects on public and private finance – from pressure on the state budget as billions of dollars are expended to finance power costs to the budget problems of many struggling California businesses and households.

But there are no financial fixes to the imbalance of supply and demand for power. Until new capacity is put in place or demand is constrained by higher prices, rationing, time-of-day metering, or voluntary restraint, electricity prices will remain unstable and ready availability of power will be uncertain. This is a worrisome situation for Californians, certainly; and because the state comprises one-eighth of our national GDP, it should be a concern for the U.S. economic outlook as well. Fortunately, the overall effects on the California economy, and on those of its neighboring states seems to have been modest, at least to date.

The short-term energy problems we are experiencing for gasoline, natural gas, and electric power will be resolved, one hopes, without any further adverse impact on our economy. Nonetheless, the developments of the past couple of years have brought renewed attention to the longer-run prospects for energy markets in the United States.

In making any assessment of those prospects it is important to recognize the extent to which market mechanisms have helped to overcome earlier apparent limitations on resources. Largely in response to past oil price increases, the energy intensity of the United States economy has been reduced by almost half from the levels of the early 1970s. Much of the energy displacement was accomplished by 1985, within a few years of the peak in the real price of oil. Progress in reducing energy intensity has proceeded further since then but at a lessened pace. This more modest pace should not be surprising, given the generally lower level of real oil prices that has prevailed since 1985, and which carried over into natural gas and electric power prices.

What has changed dramatically in recent years is the production side of the oil and gas markets, where technological changes are taking place that are likely to make existing energy reserves stretch further while keeping long-term energy costs lower than they otherwise would have been. The development of seismic techniques and satellite surveillance to discover promising new oil reservoirs has roughly doubled the drilling success rate for new-field wildcat wells during the past decade. New techniques facilitate far deeper drilling of promising pools, especially offshore. The newer recovery innovations reportedly have raised the proportion of oil reserves eventually brought to the surface from one-third to nearly one-half in recent decades.

One might expect that, as a consequence of what has been a dramatic shift away from the hit-or-miss wildcat oil and gas exploration and development of the past to more advanced technologies, the cost of developing new fields and, hence, the long-term marginal costs of new oil and gas would have declined.

And, indeed, these costs have declined, but by less than might otherwise have been the case; much of the innovation in oil development outside OPEC, for example, has been directed at overcoming an increasingly inhospitable and costly exploratory environment, the consequence of more than a century of draining the more immediately accessible sources of crude oil.

One measure of the decline in the marginal cost of additions to oil availability in recent years is the downdrift in the prices of the most distant contracts for future delivery of Light Sweet crude oil. Spot prices have soared and plunged, but for the most distant futures contracts – which cover a time frame long enough to seek, discover, drill, and lift oil – prices generally have moved lower over the past decade. The most distant futures prices fell from a bit more than $20 per barrel just before the Gulf War to $17 to $18 a barrel a year ago.

The current six-year futures contract has risen, on net, over the past year and has been a little above $20 per barrel in recent days. Arguably, however, this rise is related less to technology and the structure of underlying marginal costs and more to uncertainties about how quickly the new practices will be exploited to expand OPEC's productive capacity. Going forward, there is concern that OPEC may choose not to expand capacity adequately from their large proven reserves.

The long-term marginal cost of extraction presumably anchors the long-term equilibrium price and, thus, is critical to an evaluation of the magnitude and persistence of any current price disturbance. Over time, spot prices are inexorably drawn back to the long-term equilibrium price, as the balance

between underlying supply and demand is restored. A premium over long-term marginal costs doubtless exists for oil because so much of the world's crude oil reserves are in areas where disruptive turmoil is always a latent threat.

The longer-term outlook for natural gas prices is less tied down by history or current practice. Unlike oil, the natural gas consumed in the United States, as you know, is almost solely produced in the United States and in Canada, from which last year we imported 16 percent of our 23 trillion cubic feet of demand. The story of gas supply in the United States, in contrast to oil, is thus largely a domestic one.

Compared to oil, the industry is relatively new. Natural gas is more difficult to transport in its gaseous form through pipelines and particularly challenging in its cryogenic form when transported as a liquid. It's the latter problem that has kept liquefied natural gas imports at negligible levels.

Drilling technologies for natural gas have mirrored those for oil, and through much of its history you could not tell whether a successful drilling hit would turn up valuable crude oil or natural gas, which was often flared for lack of transport facilities.

But with many of the transportation hurdles surmounted, demand has surged over the past two decades, reflecting the myriad new uses for natural gas in industry and as a clean-burning source of electric power.

At times in recent years, supply has not kept pace with the growth of demand. The inventories of natural gas held in underground storage caverns were drawn down to record low levels late last year. As a consequence, spot prices of gas quadrupled, engendering a huge surge in domestic drilling.

But the very technologies that have improved our drilling success rates have also enabled us to drain newly discovered gas reservoirs at an increasingly faster pace. Data for Texas, for example, show that in recent years more than 50 percent of recoverable reserves were extracted from wells in the first year of operation, compared with roughly 25 percent in the 1980s. As a consequence, to achieve a rise in net marketed gas, gross new discoveries, and the drilling activity associated with them, have had to accelerate.

The combination of demand for environmentally superior gas in our power plants – virtually all new electric power facilities now on the drawing board are gas fired or dual-fired – and continued expansion of household and industrial use is putting significant pressure on the reserve base. To meet those needs, the always-present tradeoff between our energy requirements and environmental concerns will doubtless be heightened in the years ahead.

Such inevitable tradeoffs have stimulated renewed interest in a greater expansion of coal, nuclear power, and nonconventional sources of energy. For example, the nation has large reserves of coal, and, in terms of thermal equivalents, we produce more of it than either natural gas or petroleum. Moreover, rapid technological improvements in coal mining have resulted in productivity gains in this industry that have exceeded those for the economy as a whole by a wide margin and led to sizable declines in the relative price of coal.

Still, the use of coal has been restrained by environmental concerns over emissions from coal-burning power plants. Technology has already alleviated some of these concerns and, given the realistic range of alternatives, coal is likely to remain a significant factor in to our energy future.

An obvious major alternative to coal in electric power generation is nuclear power. Low prices for competing fuels and concerns about safety have been a drag on this industry. Still, its share of electricity production in the United States has increased from less than 5 percent in 1973 to about 20 percent in 2000. Given the steps that have been taken over the years to make nuclear energy safer and the obvious environmental advantages it has in terms of reducing emissions, the time may have come to consider whether we can overcome the impediments to tapping its potential more fully. Up front, of course, is the challenge of finding an acceptable way to store spent fuel and radioactive waste. If this problem can be resolved and if some of the long-deferred research and development efforts to make nuclear power more economical were to bear fruit, the potential for nuclear power could doubtless be enlarged.

The remainder of our domestic energy production comes from a variety of renewable energy sources, the most prominent of which are hydroelectric power from dams and the energy generated through the recycling of waste and byproducts from industry and agriculture. Solar and wind power have proved economical in some small-scale and specialized uses, but together they account for only a tiny fraction of renewable energy.

More broadly, substantial experimentation and exploration is under way in the application of advanced technologies to alternative approaches to energy production and conservation. Improvements in fuel cell technology, for example, hold considerable promise in a wide variety of commercial applications. With rapid scientific advances, it is not inconceivable that technological breakthroughs will allow nonconventional energy sources to play a larger role in meeting our demand for energy than is currently the case.

In closing, I would like to stress again the importance of developments in energy markets for both the near-term and longer-run health of our nation's economy. In the short run, energy markets must be monitored closely for their potential effects on the cyclical behavior of the macroeconomy. Over the longer haul, the experience of the past fifty years – and indeed much longer than that – suggests the central role that can be played by market forces in conserving scarce energy resources, directing those resources to their highest valued uses, and ultimately ensuring adequate productive capacity for the future.

To be sure, energy issues present policymakers and citizens with difficult decisions and tradeoffs to make outside the market process; as always, national security and environmental concerns need to be addressed in setting policy. But those concerns should 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 the allocative process 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. I look forward to a future that is bright in more ways than one.