



Telephone: (212) 867-0052

Fax: (212) 682-4498

Petroleum Industry Research Foundation, Inc.

122 East 42nd Street • Suite 516

New York, NY 10168-0012

M E M O R A N D U M

Gasoline Prices: Why They Rose And Where They Are Going

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Recent price moves in crude oil and gasoline markets have again brought petroleum prices into the spotlight. Although not a focus of media attention, gasoline prices had fallen throughout the second half and into 1994, even in the face of the 4.3¢/gallon federal tax increase of October 1993. Only the inflation-watchers noticed, as the lower gasoline prices were a factor in reducing inflationary pressures. Adjusted for inflation, retail prices were at a fifteen-year low. At about \$1.04/gallon average for unleaded regular grade gasoline at the 1993/94 turn of the year (about \$1.00/gallon self-serve), retail prices were at a five-year low in nominal terms. Since there were significant excise tax increases over the period, one must search even further back to find the equal of January 1994 prices excluding tax. The price increases since this 1994 low point, driven primarily by crude oil prices, have, not surprisingly, caught media and public attention much more than the preceding price decline.

This memorandum looks at some of the market factors behind the price swings, and at the outlook for the coming months. Not only will gasoline prices reflect changes in supply and demand, as well as its raw material cost, but the Clean Air Act's next mandate -- the use of so-called reformulated gasoline (RFG) in the most polluted areas -- will add new manufacturing and distribution costs. These would be further increased if a recent rule by the EPA requiring the use of renewable oxygenates (ethanol) in the production of RFG is implemented.

I. The Price Declines

Crude oil accounts for 50-60% of the pre-tax retail price of gasoline. Thus, movements in crude oil markets are a major component -- but not the only element -- in gasoline price trends. As Figure 1 shows, the price decline in crude oil was approximately matched in gasoline markets between the recent high in early 1993 and the recent low in early 1994.

The reasons for the 1993 crude oil price decline were largely a repeat of the factors that have weakened oil markets in the last several years. The oversupply was as much perceived as real, in that a large factor was OPEC's excess productive capacity combined with skepticism about individual members' willingness to support the cartel and, at various points, the threat of Iraq's re-entry into world markets. Kuwait's output continued upward. Furthermore, production levels in many non-OPEC areas rose, excluding Russia's structural decline, the worldwide total rose in 1993 over 1992. A 1 million B/D increase in North

Sea production, while planned and announced in advance, pushed Autumn markets downward. Recessions in Europe and Japan and anemic recovery in the United States also slowed demand, contributing to the oversupply, and leading to a stockbuild that depressed production requirements in the last quarter of 1993.

Pre-tax retail gasoline prices approximately matched this crude oil price decline, about 14¢, bringing the low prices described above. Not since early 1988 had pre-tax prices been as low as 66¢/gallon. Taxes over the period had risen more than 14¢ per gallon, 9.2¢ of it at the federal level. Even so, the January average consumer price for unleaded gasoline reported by the Bureau of Labor Statistics, *including* tax, was at about the January 1990 level, four years before.

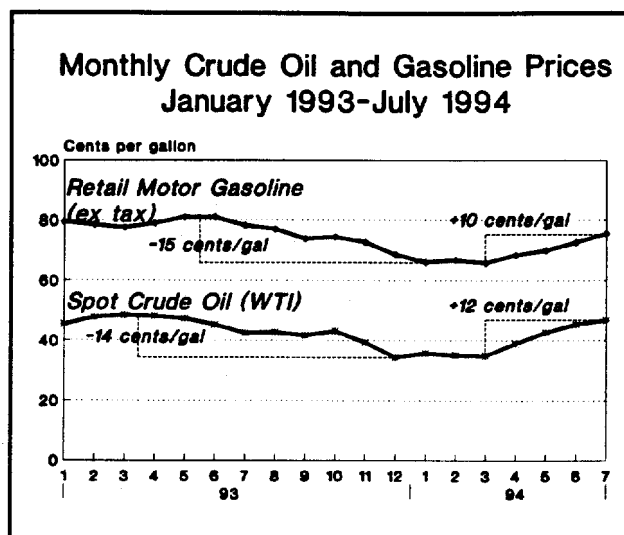


Figure 1

II. The Price Increases to Mid-Year 1994

Markets changed course for a variety of reasons after the first quarter. The reversal in crude markets in the second quarter 1994 like the earlier upward swing, reflects perception as well as reality. The most significant perception was the OPEC meeting in late March at which the existing quota was extended to year-end 1994. The market viewed this as quite positive. Other factors were January's cold which helped to reduce the stock overhang; civil wars and unrest in producing countries (Nigeria, Algeria, Yemen) threatened supply; demand picked up in the U.S. and abroad. By the early July onset of the oil workers' strike in Nigeria, crude oil prices had already risen approximately \$5/barrel (12¢/gallon) from their first quarter 1994 lows. At just over \$19, prices for West Texas Intermediate crude oil were about at year-ago levels.

Changes in costs such as crude oil and other feedstocks can only be passed through in product markets as allowed by the underlying market supply and demand conditions. Markets resisted passing through the increased crude oil prices in the early second quarter when they began to occur. Refining and marketing margins were squeezed and most companies registered significant reductions in their downstream (refining and marketing) profit margins in the 2nd quarter. Over time, however, as markets firmed, pre-tax gasoline pump prices increased a similar amount as crude oil by mid-July. At about 76¢, they continued to trail year-ago levels.

As gasoline demand strengthens, sellers will seek at a minimum to recover their increased costs: taxes, raw materials, and marketing/distribution costs. These distribution costs will rise in the coming months as the new reformulated gasoline rules take effect, as discussed later in this memorandum.

III. Recent Transient Factors

More recent events in crude oil and gasoline markets have also contributed to the current (August 1994) price levels. The most important of these developments -- the cutback in Nigerian supply -- took place abroad, but it inevitably affects U.S. markets since petroleum markets are global. Hence, a disruption in one region has an impact in every region. The initial impact may be more heavily felt in a particularly dependent region, but this is transitory. World markets efficiently and rapidly redistribute supplies, using prices as the signal for direction.

The upheaval in Nigeria brought an upward flurry to crude oil prices. Nigerian oil workers went on strike in early July, and since then, supply from Nigeria has been uncertain. Producing some 1.9 million B/D before the strike, Nigeria has recently been producing 1.4 million. After an initial price spike, crude oil markets have receded, looking forward to lowered crude oil demand because of refinery maintenance schedules. The Nigerian issue, however, has not gone away. The lightning rod for the strike was the imprisonment of Chief Mashood Abiola, the putative winner of the presidential election in 1993, by military leader Sani Abacha. The underlying conflict between the north and south regions may not be easily solved and supply uncertainty could continue for months. Nigerian crude oil supplies, with their high yield of light products (gasoline and heating oil/diesel), are particularly important in world product markets. Other high quality, close substitute crude oils are produced at capacity. Thus, the crude oil which might become most readily available in the event of a major loss of Nigerian supplies will originate in the Middle East and will carry a quality penalty, since the incremental supplies are likely to be heavier and contain more sulfur than Nigerian crude.

Other recent developments have been direct refinery problems. Fire forced the temporary closure of a 180,000 B/D Texaco refinery in the United Kingdom which had been producing some 90,000 B/D of gasoline, 1/3 of it for shipment to the U.S. A smaller scale problem was the output cutback, also caused by fire, at Chevron's Philadelphia refinery, a key supplier of local markets. These and other events fueled a 6¢/gallon increase in gasoline spot prices between early July and early August. Any increases in gasoline spot prices are immediately felt in wholesale prices; most rack or terminal prices are directly tied to market indicators such as spot prices or futures market prices. These, then, are the drivers behind the most recent retail gasoline price increases, bringing current (early August) prices above year-ago levels for the first time in 1994.

IV. The Market Outlook

Based on the fundamentals of supply and demand, price strength is likely to continue as the year progresses. North Sea maintenance schedules will reduce output by some 500 B/D in August from July, and last year's fourth quarter increase in North Sea volumes will not be repeated. Demand for OPEC oil will exceed the organization's quota in both the fourth quarter 1994 and the 1st quarter of 1995, dictating a strong seasonal stockdraw. Increased consumption in the United States will be an important factor, and continued recovery is expected in Europe and Japan. OPEC does not intend to take up the 1995 quota question until its November meeting. Even at that time, quota increases may not be instituted. Thus, while there are factors that may force prices lower in the coming months, the overall expectation is for fourth quarter 1994 crude oil prices some \$4-5/barrel above fourth quarter 1993 levels continuing into the 1st Q 95.

Gasoline on a year-to-year basis will of course reflect the much higher crude prices in both quarters. However, gasoline prices may also rise during the remainder of this year because of product market factors. Gasoline demand in the second half of 1994 is likely to be about 2% above the comparable 1993 period while current U.S. gasoline inventories are at the lowest level in several years. These are preconditions for a gasoline price increase, unrelated to crude prices.

V. Increased Refining, Marketing and Distribution Costs

While crude oil prices fluctuate up and down and will continue to do so, the new costs imposed by mandated gasoline quality changes can be expected to increase. In recent years, the gasoline quality mandates have resulted in many unique grades:

- Mandated volatility, as measured by RVP, differs Winter and Summer; Summer volatility differs in the North and much of the South.
- Mandated oxygenate content varies Winter and Summer for about 30 cities with high ambient carbon monoxide levels.
- Mandated introduction of reformulated gasoline ("RFG") in the 9 cities with the highest ozone levels, and voluntary ("opt-in") introduction in some 40 additional cities.
- Mandated introduction of renewable oxygenates (ethanol) in 15% of the RFG as of December 1, 1994, moving to 30% on January 1, 1996. More restrictions are imposed on Summer grades.

When the new RFG/renewable oxygenate rules begin at the end of 1994, a marketer on the East Coast might have to handle a dozen or more *distinct gasolines and/or*

blendstocks, and during most of the year, five to six at a time, again for each octane grade.

Each of the gasolines requires separate transportation, storage and handling. Furthermore, it is important to remember that one gasoline cannot as easily be transformed as today into another by the simple addition (or the omission) of an additive; each product is a unique formulation. Thus, oversupply at the end of a season or undersupply at the beginning of another, or supply imbalances between regions, can no longer be corrected as quickly as they once could. Product from or processed for markets following one set of mandates can no longer be readily diverted to markets following another. The market mechanisms will move more slowly, likely leading to more price fluctuations from season to season, and during supply imbalances, a longer and deeper price response.

According to the National Petroleum Council's *U.S. Petroleum Refining: Meeting Requirements for Cleaner Fuels and Refineries*, RFG will add about 10¢ per gallon (1990 dollars) to the 1989 cost of gasoline. Including the fuel economy penalty for oxygenates, the effective cost to consumers will rise more than 12¢ per gallon. While a small share of these cost increases have occurred over the last several years, most will occur when the RFG mandate begins on December 1, 1994 at the refinery and terminal level, and on January 1, 1995 at the retail level.

The logistics complications will be significantly exacerbated if the Environmental Protection Administration's recent rule on renewable oxygenates is allowed to stand. The controversial rule mandates that 15% of all RFG requirements for oxygenates in RFG include renewable oxygenates -- effectively ethanol or the ethanol-based ether compound ETBE -- during 1995 (moving to 30% in 1996). The rule applies to each supplier. Since ethanol and the gasohol made from it cannot be shipped via pipeline, its market has been centered on its production region, the Midwest. The principal RFG region, however, is the Northeast. In fact, the corridor from Washington, D.C. to Maine includes about half of the total U.S. RFG areas. Furthermore, it is East Coast states -- Delaware, Pennsylvania, Rhode Island and Massachusetts and Maine -- that have opted-in to the program. Getting the ethanol to these markets will require tank truck, rail car and barge delivery, and splash blending at local terminals. Additionally, the volatility of ethanol is

**Increased Costs for Reformulated Gasoline
by 1995**

	1990 cents/gallon
Stationary Source Controls	2.6
Refining Costs (and Oxygenates for Reformulated Gasoline)	4.8
Logistics and Other	1.0
Retail Marketing Regulations	1.5
Total Cost Increase	9.9
Lower Fuel Economy (indirect increase)	2.5
Total Effective Consumer Increase	12.4

Source: National Petroleum Council, *U.S. Petroleum Refining: Meeting Requirements for Cleaner Fuels and Refineries*. Increases are annual averages from 1989 base.

exceptionally high, making it a contributor to the formation of volatile organic compounds ("VOCs"), precursors to ozone. Use of ethanol as an oxygenator is therefore prohibited during the Summer months. During this season, only ETBE can realistically be used as a renewable oxygenate.

Several trade groups have formally filed suit to stay the implementation of this renewable oxygenate standard ("ROS"). The primary argument is that the EPA has no statutory authority for the program: the Clean Air Act Amendments of 1990 prescribed a fuel-neutral approach. Furthermore, the environmental, energy and economic benefits of the ROS are vociferously debated, and many claim, are negative. Thus, whether the ROS will finally be implemented is still in question.

VI. Summary

The recent increase in U.S. gasoline prices must be viewed largely as a corrective reversal of the sharp decline in gasoline prices from early 1993 through the first quarter of 1994. The most important factor in both movements was the fluctuation in world crude oil prices. Crude prices declined substantially in the earlier period and rose substantially in the later period. In the first half of August the average price exceeded last year's comparable level by \$1.45. On a year-to-year basis the differential can be expected to grow as we move into the 4th Q 94 and the 1st Q 95, since crude prices had been very depressed during the corresponding quarters of the preceding year.

Other factors in raising gasoline retail prices are higher federal and state gasoline excise taxes relative to a year ago, an accelerated rise in U.S. gasoline demand and the steadily rising cost of mandated environmental quality changes in U.S. gasoline. These latter costs can be expected to rise further from next December on, as "reformulated" gasoline (RFG) becomes mandatory in most of the major metropolitan regions and throughout California. Mandated introduction of renewable oxygenates, made mainly from grain alcohol, which has recently been ordered by the EPA but is being challenged in Court, would further increase the variety of gasolines that refiners, distributors and marketers would have to handle. This would increase their operating costs, and, hence, their sales price still further. Altogether if we assume crude oil prices will remain at approximately their current level, gasoline cost in the 1st Q 95 could be 15-20¢ above the 1st Q 94 level. Of this 9-10¢ would be due to higher crude prices, the rest to new RFG and ROS regulations. To what extent this cost will be passed on to consumers depends of course on actual market conditions. But over time, prices will, at a minimum, reflect the additional production and distribution costs.