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Memorandum

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SUBJECT : **Midwest Gasoline Price Increases**

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Summary

Gasoline prices nationwide have risen about 60 cents per gallon since the beginning of 1999. Some localities – notably in Michigan, Illinois, and Wisconsin – have experienced even greater price hikes, often twice as much as the national average. These higher prices can be attributed to five factors. In summary, they are:

Higher Crude Oil Prices. Refiners' crude acquisition costs have risen by the equivalent of 48 cents per gallon during the past year and a half.

Use of Ethanol in Reformulated Gasoline. Reformulated gasoline (RFG) is required in numerous areas designated by EPA as ozone nonattainment areas. About 30% of the gasoline sold in the United States is RFG. Refiners serving the Chicago and Milwaukee areas use ethanol instead of MTBE (the additive used in most other RFG areas) to meet the oxygen requirements of the RFG program. New requirements for Phase 2 of this program, which took effect June 1, 2000, have made it more difficult and costly to make RFG with ethanol. How much more costly is a matter of debate. EPA estimates the impact of Phase 2 requirements at 5-8 cents per gallon. RFG prices in Chicago and Milwaukee are at least 50 cents above RFG prices elsewhere, however. Not all of this difference can be attributed to the RFG requirements or the use of ethanol. In fact, non-reformulated gasoline sold in areas near Chicago and Milwaukee is priced well above comparable gas sold elsewhere.

Pipeline Problems. Two oil pipelines serving the upper Mid West have been experiencing operational difficulties. The Wolverine Pipeline between Chicago area refineries and Michigan had a spill and is slowly being brought up to capacity. It is expected

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to be fully operational on June 17. Meanwhile, ExxonMobil has put its branded gasoline distributors on allocation. The Explorer pipeline serving St. Louis and Chicago is operating at 10% reduced throughput, meaning St. Louis deliveries are reduced by about 50,000 barrels per day (b/d) and Chicago by about 34,000 b/d. In a tight regional market, supply reductions of this magnitude can be extremely disruptive, and lead to significant price increases.

Low Inventories. The EIA reports that crude oil and gasoline inventories are extremely low. There is the equivalent of about 2 days of consumption in working inventory. When stocks get this low, misallocations to the distribution system cannot easily be corrected. And refiners are slow to but extra gasoline on the market when needed because they are unable to replace those barrels with gasoline or extra crude runs at their plants.

Patented RFG Process. Patents by Unocal on an important reformulated gasoline process may have some marginal impact on price and availability of RFG. However, with regional gasoline prices as high as they are, any license fee owed to Unocal once the license fee is ultimately determined would be too small to create a barrier to making RFG or the blending material for ethanol-based RFG.

In summary, some of the increased prices in Chicago/Milwaukee and Detroit can be attributed to these factors. About 48 cents of the current price is likely due to higher crude costs. This impacts gasoline consumers everywhere. It can also be roughly estimated that 25 cents of the regional price increase is due to transportation difficulties and another 25 cents, roughly estimated, could be due to the unique RFG situation in Chicago/Milwaukee. These figures are very rough approximations based on spot market valuations, which do not comprise a complete series of price data. They are intended as rough estimates of each factors contribution to higher prices.

Oil Supply Price Background

Retail prices of petroleum products and motor fuels have risen sharply this year. Volatile oil prices have been driven up largely by production cutbacks by the Organization of Petroleum Exporting Countries (OPEC). The reduced OPEC production quotas have combined with strong world demand to boost crude oil prices from $10 per barrel at the end of 1998 to about $30 per barrel by late 1999.[1]

OPEC output quotas also resulted in reduced petroleum stocks around the world. In the United States, crude oil and gasoline inventories are well below normal levels. Spot shortages of home heating oil and diesel fuel occurred in the eastern part of the nation during winter 2000. Now that gasoline is in seasonally high demand, short supplies and instances of volatile prices are cropping up around the country. The most notable price increases are in the upper Mid West, where pump prices have exceeded $2.00 per gallon.

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[1] All prices cited in this memo are from the U.S. Department of Energy's Energy Information Administration.

Table 1 shows wholesale prices for regular grade reformulated gasoline (RFG) at important spot market trading centers around the nation. These prices do not include taxes or other charges such as transportation and dealer costs. RFG, which is oxygenated to reduce carbon monoxide emissions, must be substituted for regular gasoline in certain urban regions during the warmer months of the year.

Table 1. Wholesale RFG Prices (regular grade), 6/9/00

Location	Price range (cents/gal)
Metro NY	106 to 108
New Jersey	104 to 108
Baltimore	107 to 109
Boston	106 to 111
Norfolk	107 to 116
Philadelphia	104 to 107
Chicago	**161 to 168**
Dallas/Ft. Worth	106 to 110
Houston	104 to 113

Source: *Platt's Oilgram Price Report*, June 9, 2000. Page 5.

While providing a one-day snapshot of RFG prices, these figures are generally representative of current marketplace conditions. They show that Chicago RFG – in round numbers – is about 50 cents per gallon above the eastern half of the nation.

Platt's publishes a wide array of data for regular gasoline prices at terminals around the country. On June 15, 2000, the wholesale price of regular gas was about $1.27 per gallon in Chicago, excluding taxes and other charges. Detroit posted at a range of $1.37 to $1.70, a very wide band typically associated with some sort of market disturbance. The eastern part of the nation (Petroleum Allocation for Defense District 1, or PADD 1) was clustered close to the $1.00 per gallon mark.

With Chicago RFG prices running about 50 cents above the eastern part of the nation – and regular gasoline 27 cents above – a generalized supply shortfall in the Chicago area is strongly suggested. And the fact that RFG prices are above conventional gas suggests that the difference is due to the supply of RFG uniquely. That conventional fuel is above priced above the rest of the nation suggests a shortage in the region resulting from pipeline transport problems. And with regard to Detroit, prices above the rest of the nation–as well as an unusually wide range in price quotes--suggests that there may well be a supply disruption having local impact.

It must be reiterated that this effort to attribute price differentials to the availability of RFG and to pipeline supply difficulties is a simplistic exercise based on incomplete data. It has been undertaken in order to separate the price effects of generalized regional shortage due to transport breakdowns from the tight supply of RFG blending material.

Higher Crude Costs

Gasoline and crude oil reached their lowest prices in recent history in December 1998 and January 1999. In December 1998, crude cost U.S. refiners $9.84 per barrel; in January 1999 crude was $10.47. Similarly, gasoline of all types sold at the pump (including all taxes, etc.) for an average of $1.05 and $1.03 per gallon December and January.

Since that time, petroleum prices have risen consistently; in mid-June of 2000, crude is in the $30 per barrel area, an increase of roughly $20 per barrel or 48 cents per gallon. It is likely that all 48 cents has been included in pump prices.

OPEC has set production quotas that resulted in much higher crude prices than were anticipated. Crude oil on the N.Y. Mercantile Exchange (NYMEX) is trading at about $33 per barrel (bbl) as of mid-June. All petroleum products are affected more or less proportionally by high-priced crude oil, and consumers of all fuels look toward the June 21, 2000, OPEC meeting, at which a production increase is to be discussed.

Chicago-Milwaukee RFG

RFG is a smaller percentage of regional gasoline supply in the mid-continent than in most other regions. Essentially, it is used only in Chicago and Milwaukee; the rest of the region uses conventional fuel. These cities have virtually banned the oxygenate MTBE from RFG sold in their cities. Instead, ethanol is used to increase the oxygen content of RFG to minimize carbon monoxide emissions. In current market conditions, the price of the gasoline base material needed for oxygenate blending (called RBOB) – rather than the cost of ethanol – has become the primary factor in the region's high prices.

The difficulty stems from the fact that RFG volatility (speed of evaporation) is limited by regulation. Ethanol is much more volatile than the major alternative oxygenate, MTBE. In order for the ethanol blend RFG to fall under the overall volatility limit, the volatility of the RBOB to be used in ethanol blending must be low. This is a matter of blending volatile ethanol – a physical fact that cannot be changed – with special reduced-volatility RBOB. The difficulty arises because low-volatility RBOB is very hard to manufacture, and there is very little demand for this material outside the Chicago-Milwaukee gasoline market. Most of the required material is made in the six refineries in Illinois (whose capacity totals nearly 1 million barrels per day). When demand exceeds local refiners' ability to manufacture low-volatility RBOB, supplies are brought in from Gulf coast refiners by pipeline.

Low volatility RBOB is a specialty product; not all refiners can or will manufacture gasoline to such specifications. And shipping presents difficulties stemming from the unique

nature of the product, the need to segregate within the pipeline and the fact that it is usually shipped in relatively small quantities. Additionally, transportation bottlenecks could adversely affect the price and availability of this material in this consuming region.

Troubled Pipelines

Two pipelines that play important roles in supplying gasoline to the upper Mid West are currently suffering operational difficulties. Petroleum is most efficiently transported in large quantities by pipeline. When the pipeline system has capacity problems, it can be supplemented by truck, and/or waterway transport in some cases. But pipelines' ability to move large amounts of fuel is difficult to replicate by supplementary transport, as are the low-costs inherent in pipelining.

The Explorer pipeline transports fuel from the Gulf coast to Chicago, traveling south to north and passing through St. Louis. The Explorer had a fire near St. Louis in March 2000. The damage was repaired quickly, and transport resumed. But as a result of the investigation into that incident, the pipeline company and the Department of Transportation entered into a verbal agreement to reduce operating pressure by 20%. This translates into a volumetric reduction (measured in b/d) of 10%. The Department of Energy (DOE) estimates that this has reduced the pipeline's throughput to St. Louis from 550,000 barrels per day to 500,000, creating an extremely tight local gasoline market. After St. Louis the pipeline's diameter becomes narrower to match reduced northbound requirements, although it is probable that the flow reduction in this segment of the pipeline is also 10%.

The other pipeline that is having problems is the Wolverine pipeline, which has a capacity of 186,000 barrels per day and runs eastward from Niles, Illinois, to Jackson, Michigan. A leak in early June has caused an interruption of service. Gasoline is currently being trucked around the break, which is being repaired. The pipeline is scheduled to be back in full service on June 17. While the repairs are being made, Michigan supplies have been disrupted and prices have spiked.

U.S. Crude Oil Inventories

OPEC attempts to set prices by administering the level of supply sent to the world market. When OPEC members met last March, they set quotas that were not high enough for refiners around the world to rebuild crude stocks depleted by winter heating demand. Thus, low inventories are a problem around the world. In the United States, crude oil stocks are presently 20 million barrels under the normal range for this time of year, according to the Energy Information Administration (EIA). They stand at 31 million barrels above the lowest operational inventories ever observed in recent times. This is the equivalent of 2 days of refinery operations.

Gasoline stocks are in similarly tight condition. While U.S. inventories are just below the lower range of normal seasonal stocks, they are only 16 million barrels above the

minimum operational level of 185 million barrels.[2] This means that the amount of readily marketable gasoline in the U.S. production and distribution system is the equivalent of slightly less than two days of current consumption.

When oil inventories get this close to minimum operating level, refiners' flexibility is diminished, and they are less able to deal with such factors as unanticipated demand changes, distribution difficulties, or special requirements. The latter includes such factors as the demand for RBOB suitable for ethanol blending.

The Unocal Patent Issue

Unocal, a large, integrated oil company, has substantial gasoline production in its California refineries. California has special air quality problems, and special gasoline is needed to meet California Air Resources Board (CARB) specifications, which are currently tighter than national Phase II RFG requirements. In 1990, Unocal researchers discovered a unique way of manufacturing gasoline with minimum volatility, as well as some other parameters helpful in meeting clean gasoline requirements. A patent was applied for and in 1994, the U.S. Patent and Trademark Office awarded Unocal its first patent. Four other patents were subsequently awarded to the company.

In 1995, Unocal announced its intention to license the patent to other refiners. Shortly thereafter, six major refiners sued Unocal, challenging the validity of its patents. The U.S. District court found in favor of Unocal, upholding the patent's validity and awarding Unocal damages of 5.75 cents per gallon on the gallons manufactured that infringed on Unocal's patent. In March 2000 the initial verdict was upheld in the U.S. Court of Appeals for the Federal Circuit.

How much gasoline is involved in the Unocal patent? Most gasoline is made by processes other than those patented by Unocal. In California, where CARB gasoline is often made using the Unocal process, the company estimates that only 29% of the gallons produced would involve its patent; 71% fell outside the patent. Around the rest of the nation, an even smaller amount would fall under the patent. Unocal has asserted that the proportion of regular RFG subject to its patent is small, but increases as octane increases. Most gasoline sold nationwide is regular grade.

Refiners have substantial latitude in which to formulate gasoline, and can choose to blend around the patents by changing the mix of ingredients. Refiners contend that, while they can often avoid the patent issue, "blending around" can cost them as much as 5 cents per gallon in higher manufacturing costs. But the patents might be a factor in the manufacture of RBOB suitable for ethanol blending. Because of such RBOB's low volatility, it may well be dependent on Unocal's process.

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[2] Minimum operational levels are the lowest inventory levels that have been observed in the United States in recent times. Such levels have been associated with distributional problems.

At this point, negotiations about licenses and appropriate fees are beginning. There seems to be agreement on both sides that the 5.75 cent-per-gallon judgment handed down in court is too high for future license fees. It is likely that fees may be smaller when the negotiations are complete.

Meanwhile, refiners using the Unocal process without a license operate in an area of uncertainty, because the cost of licensing the Unocal process has not yet been determined. Some contended that this uncertainty created by the court decision has adversely impacted RFG production. However, given the high market prices for gasoline generally, and for RFG and RBOB specifically, prices may already be high enough to cover whatever costs might be incurred when the license fee issue is resolved.