

Attachment 1

**Report of Philip K. Verleger, Jr.
Regarding MMS Proposed Rule for Valuation of
Crude Oil Lease Production
May 27, 1997**

The Minerals Management Service (MMS) has issued proposed regulations that link the royalty payment for oil taken from federal leases to futures prices reported by the New York Mercantile Exchange. Specifically, MMS proposes to use the average "settlement price" for the "nearby" futures contract for a given month as the base price used to determine the value of oil taken from a lease. MMS apparently believes that these prices represent a superior measure of value to transaction prices in the producing field, which have been used traditionally.

However, in preparing the draft regulation the MMS erred. Futures prices do not provide a dependable measure of the contemporaneous value of volumes of oil being actually delivered to buyers, even in markets away from the field. Instead, futures prices can be distorted by a large number of factors including changing perceptions of risk, activities of speculators, and trader expectations of future events such as wars, droughts or other factors.

Futures prices also provide an inappropriate basis of the price willing buyers would pay for oil in the producing field. These amounts (values) can and often do vary widely from field to field and from the value at a market center such as Cushing, Oklahoma due to unique conditions that influence supply and demand factors at the point of sale.

MMS is also mistaken that the NYMEX index it has selected accurately reflects the prices paid by willing buyers and sellers on the futures market even if one accepts the principle that the NYMEX provides a satisfactory starting point for the

valuation of crude. The MMS proposes to use the "settlement price" from the NYMEX. The settlement price is computed from transactions that occur during the last two minutes of trading.¹ Trading through open outcry on the NYMEX floor lasts from 9:45 am to 3:10 PM (5 hours, 25 minutes). Further, after-hours trading occurs through NYMEX's proprietary computer system, ACCESS, from 4 PM on one day to 8 am on the following day, Sunday night through Friday to allow traders in Asia and Europe to use the market during their normal business hours.² Thus, in a given week, trade on the NYMEX can occur in 104.08 of the 168 available hours during the week. MMS proposes to use trades that occur in only ten minutes of the 104.08 hours, literally 0.16 percent of the time in which the market is open.³

MMS also errs in using a simple average of daily transactions during a month. Activity in markets will vary over the course of a month with the volume of purchases and sales peaking around scheduling or delivery day. Data from the New York Mercantile Exchange frequently reveal a much larger number of transactions occur towards the end of the month. Data from companies' physical transactions also show that the most trades in market centers such as St. James or Cushing occur in the 72-hour period prior to scheduling. Thus, use of a simple weighted average of all transactions during a month creates a biased estimate of the price willing buyers and sellers would want to use.

¹ The NYMEX rules use the weighed average price of all trades occurring during the last two minutes to determine the settlement price of a contract that has more than ten percent of outstanding open interest except on the expiration day for a contract. On the expiration day, the NYMEX uses the weighed average of all trades occurring during the last thirty minutes of trading.

² Access trading starts at 7 pm on Sunday night.

³ The market is open from 7 pm est on Sunday to 8 am Monday through ACCESS, 13 hours. The market is then open from 9:45 am to 3:15 pm for trading on the following on Monday, 5 hours and 25 minutes. The market is then open from Monday afternoon at 4 pm to 8 am Tuesday Morning through Access, 16 hours. This process continues until the market closes at 3:10 pm Friday.

Finally, MMS is also mistaken to rely on prices quoted by *Platt's* or other publications to determine differentials between the NYMEX prices and the prices in a market center. Prices published by *Platt's* and other organizations are labeled "assessments." These assessments are gathered by reporters who call traders to obtain information from traders as to prevailing prices. Research has shown that these assessments are less reliable than arm's-length transactions between willing buyers and sellers.

L The Role of Futures Markets

While futures markets have fulfilled an important function in commerce for centuries,⁴ the particular function of futures prices is frequently misunderstood. Observation reveals that nearby futures prices can, under a variety of circumstances, vary from prices being paid in cash markets. Extraordinarily complicated and esoteric models have been developed to demonstrate the causes of the differences. The fact remains, however, that scholars, practitioners, traders, and investors acknowledge that futures prices differ from the prices a willing buyer will pay a willing seller for a unit of commodity meeting all the specifications of the futures contract in the cash market today.⁵

Peck (1985, pp. 73) provides a succinct summary of the role of futures markets:

"Although futures markets have become the primary pricing markets for many commodities, they have not replaced either spot or forward markets. Both remain important in the marketing of commodities and are *the primary*

⁴ See Williams (1982 or 1986), Hieronymus (1980) or Peck (1985).

⁵ Among the factors that explain the difference are the time value of money, speculation, and risk premia. A very incomplete list of articles that discuss these factors would include Anderson (1983), Beck (1993), Brennan (1958) and (1991), Chang, Cho and McDougall (1990), Deaves and Krinsky (1995), Frankel (1987), French (1986), Kolb (1992), Williams (1986), and Walton (1991).

means by which ownership is actually transferred from producers to processors and consumers." (emphasis added)

Peck continues. "Futures markets are widely used to complement fundamental purchase and sales prices."

Futures markets provide a mechanism by which a producer can sell units of a commodity for future delivery through a clearing house and buyers can purchase units of a commodity for future delivery through the same organization. To facilitate trade the unit is standardized in terms of specification. While the seller may plan on ultimately offering a unit that has certain unique characteristics and the buyer may want a specialized unit, both will use futures markets to "hedge" their positions because the price prevailing on the futures market is correlated with the price of the unit that they will ultimately deliver. Note that the term correlated does not imply that the futures price today equals the price that the seller will ultimately receive. Nor does the term correlated mean that the futures price today is the price the buyer will actually pay. Rather, the term correlated implies that the price in the futures market converges towards the price that will be paid or received at a specific delivery location. Further, the term correlated implies that any large changes in the physical market will be reflected at least partially in changes in the futures price.

Central to the difference between cash prices and futures prices is the term "expected future cash price." Futures prices reflect current market expectations about what cash prices will be at some time in the future. (Edwards and Ma, pp. 164).

The expectations will depend on a term that has become known as the "risk premium." Risk premiums represent the difference between "the expected spot

price and the prevailing futures price" for delivery at the same time. (Edwards and Ma, pp. 169.)

The term "risk premium" has the sound and feel of an economic phrase that is designed to confuse. The term has had that effect whether or not that was the intent. However, the idea is terribly critical and has an important bearing on the proposed regulation. Thus, a brief exposition is required. As described by almost every review, the risk premium is defined by the simple equation

$$\text{Futures price} = \text{Expected price in the future} \pm \text{risk premia.}$$

Edwards and Ma assert that futures prices quoted today (for example, the price quoted on May 18, 1997 for delivery of crude oil in July 1997) will equal the expected cash price in the future (the cash price that will be paid for crude delivered in July 1997) if, and only if, the risk premium is zero. (Edwards and Ma, pp. 170). Edwards and Ma also suggest that this condition is highly unlikely.

The existence of a risk premium has important implications because the existence of a risk premium implies that futures prices will not be unbiased predictors of future cash prices. Put another way, the existence of a risk premium implies that use of futures prices will either result in underpayment or overpayment to royalty owners if futures prices are substituted for arm's-length cash prices even assuming that other differences (such as transportation, quality, risk and other differences) can be addressed.

The measurement of risk premiums has been the subject of a large number of studies. Most of these studies have focussed on currency markets.⁶ Most of these studies have also identified the existence of a risk premium, meaning that currency futures prices do not provide an unbiased predictor of future exchange rates.

Chang (1985) examines the data for several agricultural products and confirms the existence of a risk premium. Chang also tests for the ability of large speculators to achieve superior results and finds that this group of traders has realized better returns. This success of speculators has important implications which will be noted below.

Kolb (1993) examines data for twenty-nine commodities for the period from 1957-1988. He concludes that most commodities exhibit no risk-premium. However, risk-premiums are identified for heating oil and crude.

Moosa and Al-Loughani (1995) conduct a test of the relationship between cash and future crude oil prices for the period 1986 to 1991. They conclude that speculation affects prices and appear to confirm the existence of a risk premia.

Deaves and Krinsky (1995) examine the variation of risk premia over time. For crude oil and three other commodities they confirm the existence of a risk premium but conclude that it varies over time.

Dominguez (1989) finds the peculiar absence of a risk premium in long term futures contract (six month futures contracts) but concludes that shorter term

⁶ Frankel's 1993 book provides an excellent survey of the subject. Section III (pages 185 to 262) focusses on the question "Is there an exchange risk premium."

futures contracts overreact to news.

On balance, then, the academic research appears to conclude that a risk premium exists for the energy complex and particularly in the crude oil market. However, this conclusion would seem to be moderated by the fact that the period of coverage of most of the research ended in 1991 or 1992. There is relatively little published research that encompasses the experience through 1996 when markets appear to have reached maturity. Further research is required to determine the nature, status and behavior of the risk premium for crude oil.

This absence of published research is, however, offset by studies by various investment banks, which have asserted that investors could earn substantial returns by investing in commodities. The research materials circulated in support of these appeals all confirm the existence of a risk premium in oil.

Professor Froot of the Harvard Business School has, for example, written a long paper for Goldman Sachs demonstrating the existence of a risk premium in crude oil. (Froot, 1993). Goldman Sachs has continued to emphasize this fact in reports issued to clients and in public relations releases since. Goldman Sachs' competitor J.P. Morgan advanced a similar conclusion in a 1995 report.

The persistence of a risk premium in commodities and especially oil is explained by the excess of selling over buying hedgers. In English this means simply that there are more traders who use futures markets for commercial purposes who want to sell than there are traders who want to buy. Since the number of sales must always equal the number of purchases, this requires that another group of traders called speculators must generally hold an offsetting long position. The consequence is the risk premium.

The role of speculators is important in the formation of futures prices, and especially oil prices. Verleger (1996) explains the economic motive driving speculators. Kraples (1997) asserts that speculators play a particularly important role in the determination of oil futures prices. Kraples notes

"Speculators, such as commodity funds, move in and out of the oil markets for reasons that may have nothing to do with oil - for example, because a trading program has noted a historical propensity for oil to move one way when pork bellies move another. It is possible that a sudden decline in the demand for paper barrels - occurring because one or more large players suddenly decides to abandon oil as a financial instrument - cause a decline in paper oil prices that quickly reduces the value of physical barrels." (Kraples, 1997 pp. 22).

Kraples presents a table which shows that the correlation between speculative positions and oil prices has increased over time. For example, the correlation from 1986 to the present is only 0.02. For the interval from 1994 to the present, though, the correlation is 0.72.

While others take a more moderate view,⁷ the fact remains that fluctuations in speculative positions do drive prices on futures markets. Daily summaries of activity on commodity markets frequently note that prices were pushed higher or lower by speculative trading. The commodity page of the *Financial Times* will, for example, describe on almost a weekly basis how trading by hedge funds has affected price levels of futures in metals or oil.

In summary, then, futures prices differ from cash prices. The difference is explained by the risk premium in the market. This premium fluctuates over time

⁷ For example, Drolas at the Center for Global Energy Studies has presented results that suggest that speculators are only following market trends.

and is influenced by the activity of speculators and other events. As a consequence, futures prices reflect both conditions of contemporaneous supply and demand and expected conditions of supply and demand. They are not indicators of what a willing buyer would pay a willing seller in the market today for supplies of the commodity delivered today.

II. Locational Differences

Substitution of NYMEX and market center for local, freely negotiated arm's-length prices between willing buyers and sellers also unfairly denies the buyer savings that may result when unique conditions depress prices below prices at the market center. Such conditions are a familiar feature in commodity markets. For example, farmers are often unable to receive higher prices that prevail in a market center if their local grain elevator is full. Under such circumstances one often reads that grain must be stored on the ground and exposed to weather until a sufficient number of freight cars can be obtained. The farmers delivering the last volumes lose out.

The same situation can occur in oil markets when a local refinery is forced to shut down for repairs or the pipeline that moves crude from the field to the nearest market is disrupted. In such circumstances, the price offered for crude in the field may be substantially less than the price offered in the market center.

Prices offered in the field may also not increase with prices in the market center if supplies to the market center are disrupted. The disruption of a major pipeline or shipping artery can cause prices in the market center to rise while prices in the field remain unchanged or fall. Precisely such an event occurred in early April 1997 when the Canadian Interprovincial Pipeline (IPL) was forced to reduce

shipments due to severe weather in Canada. Prices in Cushing were pulled up as refiners sought immediate supplies of oil.⁸

Disruptions of this type occur randomly over the course of the year. A review of several years issues of *Platt's* or the *Petroleum Argus* reveals that such disruptions occur fairly frequently.

III Manipulation

Futures markets have long been vulnerable to manipulation. Markham (1987 and 1991) provide a comprehensive survey of both the history of manipulation in commodity futures markets and the futility of attempts to regulate it. Williams (1995) offers a detailed examination of one of the most famous incidents of manipulation of a commodity futures market: the Hunt silver crisis of 1980.

One manipulation of futures markets described by Markham (1991) demonstrates the increased risk created by the use of futures markets to set oil royalties. In this episode two purchasers of potatoes in Idaho, Messrs. Taggares and Simplot, sold large numbers of contracts in Maine potatoes on the New York Mercantile Exchange (NYMEX). The purpose of the sales was to drive down the price of Maine potato futures because Messrs. Taggares and Simplot had entered into contracts to purchase potatoes in Idaho based on the futures contract. Their sales thus reduced the cost of purchasing Idaho potatoes. Having achieved their goal

⁸ Cite to Platt's when the publication arrives.

Simplot and Taggares ultimately defaulted on their obligations on the NYMEX by failing either to close their positions or take delivery.⁹

Commodity markets for crude oil, while relatively new, have been subjected to various types of manipulation. Verleger (1987) explains how the introduction of the Petroleum Revenue Tax by the government of the United Kingdom caused producers in the North Sea to accelerate trading in cash and forward markets. Mabro et. al. (1986, 1993) provide further details on the operation of the government taxation scheme and its effect on prices. Barrera-Rey and Seymour (1996) describe frequent squeezes in the market for Brent crude and explain the structure of the market that lends its self to easy manipulation. Barrera-Rey and Seymour also describe the economic incentives that cause traders to manipulate the market today.

Notwithstanding claims of its proponents, the NYMEX crude market is not immune to manipulation. Markham makes it clear that the Commodity Futures Trading Commission is almost powerless to deter attempts to manipulate futures prices. Pirrong (1994) suggests that the agency will be unable to prove manipulation until the Commodity Futures Act is amended to define manipulation.

In the current situation the evidence indicates that the substitution of settlement prices from the NYMEX for arm's-length cash prices will increase the exposure of royalty owners to manipulation and loss of revenue.

Futures markets are also relatively small and thus can be affected by apparently small transactions. Verleger (1996) notes that purchases of 180,000 futures contracts (180 million barrels of oil or three days of world consumption) by

⁹ See Markham (1991) pp. 334-338, Markham (1987) pp. 83, and *Leist v. Simplot* 638 F.2d 283 (1980).

the German firm Metallgesellschaft led to a \$ 4/bbl decline in the price of oil. Traders from Lehman Brothers made a presentation at a seminar sponsored by the state of Alaska that a forward sale of 30 million barrels (500,000 barrels a month) would depress prices on the NYMEX by \$1.50/bbl despite the fact that this sale would represent less than 0.02 of daily world production. (Lehman Brothers, 1995).

IV. The Settlement Price

The choice of the settlement price is a mistake. Settlement prices are computed at the end of trading in a given day and represent only a small share of total trade. NYMEX procedures use the weighted average of all transactions that occurred during the last two minutes of trading except on the last day of trading in a contract. On the last day of trading NYMEX procedures require the use of the weighted average of all transactions during the last thirty minutes of trading.¹⁰

Trading in NYMEX contracts can occur during 104.08 hours during any week in which there are no holidays. Assuming a contract is the spot contract for approximately 20 days or four weeks the total number of hours that a contract trades as a spot contract is 424.32 hours. Only 1.13 hours of this trading period (0.3 percent of total trading time) is sampled in the determination of settlement prices.

It should also be noted that traders have frequently been accused of manipulating settlement prices for their own purposes. Barrera-Rey and Seymour (1996) report that dated Brent crude cargo prices are manipulated by traders in

¹⁰ Note that the last day of trading is the day on which a contract expires. For example, trading in the April 1997 crude contract expired on March 20, 1997. Thus on March 20, 1997 the settlement price was computed using a weighted average of all trades that occurred over a period of thirty minutes.

European markets. Markham (1991) describes in detail problems experienced by the CFTC in other futures markets.

V. Daily Trading Patterns

MMS is also mistaken to use a simple weighted average of trading over a month. The volume of transactions in both the futures and the spot market increases as a contract approaches expiration. The calculation should reflect this pattern of trading.

VI. Use of the Spot Price

The use of the NYMEX futures price is also wrong because the spot price reference for the NYMEX is a forward price, not a spot price. While the futures price converges on the spot price at Cushing reported by price reporting services (*Platt's*, *The Petroleum Argus*, other) these reported spot prices are forward prices. For example, the *Platt's* cash price is the price that will be paid for oil to be delivered in the next month. (*Platt's*, 1996). This often may not reflect purchases in the field.

Cushing prices reported by *Platt's* are not representative of current prices. The *Argus* (*Petroleum Argus*, 1996) reports:

The bulk of cash WTI trade at Cushing is conducted during *Platt's* 30-minute pricing window, which falls between the close of regular Nymex trading hours and the start of daily Access trade. These deals are widely acknowledge to be done to influence *Platt's* assessments. In order to provide a more accurate end-of-the-day picture, *Argus* assesses its crude prices two hours later each day. Cash WTI trade is also more active towards the end of each month in the three-business-day interval between the expiry of the prompt Nymex futures contract and pipeline scheduling.

In summary, *Platt's* and *Argus* report forward, not spot prices. The prices reported are not the price that would be paid by a willing buyer for crude delivered today by a willing seller. There are few reports of such prices in market centers. However, transactions between willing buyers and willing sellers occur every day in the field.

VII. Summary

NYMEX settlement prices cannot be used to measure the price a willing buyer will pay a willing seller in the field for several important reasons. First, NYMEX prices represent futures prices on forward prices - not futures prices on cash prices. There is, in fact, really no contemporaneous spot market for crude in the United States pipeline market at Cushing. Second, the risk premium in futures prices makes futures prices an inappropriate measure of cash prices. Third, futures markets can and have been manipulated successfully. Finally, settlement prices are measured during a small fraction of the trading period.

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CURRICULUM VITAE

Name: Philip K. Verleger, Jr.

Date and Place of Birth: July 18, 1944
San Francisco, California

Education: A.B. in Economics (cum laude), Cornell University, June, 1966.
Ph. D. in Economics, Massachusetts Institute of Technology, 1971.

Career: Senior Advisor, the Brattle Group, 1997 -
Charles River Associates, Vice President, 1994 - 1997.
Visiting Fellow, Institute of International Economics 1985 - 1994.
Drexel, Burnham, Lambert, Inc., Vice President, 1982 - 1984.
Booz, Allen and Hamilton, Inc., 1981 - 1982.
Yale University School of Organization and Management, Lecturer, 1980 - 1982. Senior Research Scholar, 1979 - 1981.
U.S. Department of the Treasury, Special Assistant to the Assistant Secretary for Economic Policy, 1977 - 1979.
Executive Office of the President, Council of Economic Advisers, Senior Staff Economist, 1976 - 1977.
Data Resources, Inc., Manager, DRI Energy Service, 1971 - 1976.
University of California, Santa Barbara, Acting Assistant Professor of Economics, 1970 - 1971.

Memberships: Econometric Society
American Economic Association
International Association of Energy Economists

Editorial Member, Board of Editors, The Energy Journal, Activities: 1980-

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- "Planning for Energy Futures," Platt's Conference on Energy Futures, January 27, 1983.
- "OPEC and the Oil Market," Middle East Institute's 14th Annual Economic Seminar, May 18, 1984.
- "Energy Implications of a Possible Sharp Decline in the Value of the U.S. Dollar," Carnegie-Mellon University Conference, September 28, 1984.
- "The Next Oil Crisis and How to Prevent It," The Graduate School and University Center of the City University of New York, Energy Forum, January 16, 1985.
- "The Causes of Commodity Price Instability: Is Petroleum an Exception?," The Bergen Conference on Oil and Economics, Bergen, Norway, May 15, 1986.
- "The Economic Impact of Downstream Integration," Asian Petroleum Conference, Singapore, September 1988.

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"Prepared Statement on the Impact of Future Energy Crisis" to the Energy Resources Conservation and Development Commission of the State of California, November 13, 1989.

"The Outlook for Energy Policy," speech to Bankers Association for Foreign Trade, Boca Raton, Florida, fall 1991.

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"Energy Taxes," Speech to the Center for Global Energy Studies, London, April 1993.

Important Media Appearances

CBS Face the Nation, September 2, 1991

PBS McNeil-Lehrer Newshour: August 2, 1990, October 17, 1991, 3 times.
ABC Nightly News: Interview with Peter Jennings October 17, 1991

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Activities as an Expert Witness

I.A.M. vs. OPEC: Expert witness for Judge Andrew H. Hauk, U.S. District Court Judge, Los Angeles, California. Appeared in court on August 18, 1979 (date approximate)

Shepherd Oil vs. Arco: Expert witness for ARCO in case relating price charge for oil sold under the mandatory buy sell program. Employed by Ball, Hunt, Brown and Baerowitz. Case settled before reaching trial. Fall 1981 to Spring 1982.

Hunt Oil vs. DOE: Expert witness in the "V factor matter." Prepared memorandum for attorneys Shank, Irwin, Dallas (Karen Bidel was partner in charge).

Shell Oil vs. Newport News and Drydock Co. Expert for Shell's attorney Cadwallader, Wickersham and Taft (H. Clayton Cook). Prepared information of oil price forecast. Case settled on courthouse steps.

Champlin Petroleum vs. Union Oil Company. Expert witness for Champlin Petroleum in arbitration with Union Oil over a contract to supply products from Champlin's refinery to Union Oil's Los Angeles Refinery. Appeared for Champlin's attorney Paul, Weiss, Rifkind, Wharton and Garrison (Robert Montgomery). Appeared in February 1984.

APEX vs. DiMauro. Expert witness for four companies in a Sherman Act/Commodity Futures Act dispute relating to certain events that occurred on the New York Mercantile Exchange in February 1982. I was retained by Michael Lesch of Shea and Gould. In addition, I worked for Nutter, McLennen & Fish, attorneys for Northeast Petroleum, Katten, Muchin & Zavis, attorneys for Stinnes Interoil; and Brenner, Saltzman, Wallman & Goldman, attorneys for G.E. Warren. Deposed in 1986.

Alaska Department of Revenue vs. Exxon. Expert witness for Exxon concerning the appropriate price to use for Alaskan crude oil in Exxon's 1978 income tax. Worked with Tom Foster, Exxon's in house tax counsel.

State of Alaska vs. Exxon. Expert consultant for Exxon concerning the appropriate price to use to value royalty oil taken in kind by Exxon. Worked with John Held of Baker and Bots and Exxon lawyers.

Exxon vs IRS. Expert consultant for Exxon concerning conditions in the world oil market in 1979 and 1980 and their relationship to the price that prevailed for term as opposed to spot supplies of oil.

Massachusetts Refusetech Inc. vs. North East Solid Waste Committee: Expert consultant for North East Solid Waste Committee on the predictability of the oil price decline.

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Castle Oil vs. Castle Energy: Expert witness for Castle Oil in a litigation over name confusion. Testified in U.S. Federal court on April 22, 1992. Substance of testimony was on the structure of the world oil industry.

Aerochem vs. Johnston: Expert consultant to major stockholders for Aerochem concerning the trading practices of the president of Aerochem.

Tecumseh Pipeline vs. Laketon Refining: Expert consultant to major owners of Tecumseh Pipeline (Arco, Ashland and Unocal) in litigation related to the antitrust implications of shutdown of the pipeline.

Metallgesellschaft vs. Benson: Expert consultant and witness to Metallgesellschaft in arbitration with W.A. Benson concerning the latter's management of Metallgesellschaft's refining and marketing company. Testified for three days for MG in the fall of 1995.

Thorton vs. Metallgesellschaft: Expert witnesses for Metallgesellschaft concerning Metallgesellschaft's risk management practices. Testified in the fall of 1994 and spring of 1995.