FASAB's Exposure Draft "Accounting for Federal Oil and Gas Resources": CBO's Alternative View

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Note: The Congressional Budget Office is a member of the Federal Accounting Standards Advisory Board, which sets financial accounting standards for federal agencies.[1] Those standards do not, however, govern budgetary accounting. Members may issue alternative views to the board's proposals. Alternative views discuss the points of disagreement with the majority position. The board issued for public comment "Accounting for Federal Oil and Gas Resources" on May 21, 2007.[2] The following is the Congressional Budget Office's alternative view to that proposal.

Fair Value Is the Appropriate Basis for Valuing Oil and Gas Reserves

Financial accounting is moving toward greater use of fair value estimates for financial assets and liabilities for private sector reporting entities.[3] Fair value is the price that would be received for an asset or paid to transfer a liability in a transaction between market participants at the measurement date. In general, fair value measures provide relevant, timely, and relatively accurate valuations. The desirable attributes of fair values are equally appropriate to valuations of physical resources; where possible, the federal balance sheet should report the fair value of the nation's natural resources, including oil and gas. Establishing appropriate values for oil and gas is particularly important because that methodology may set a precedent for how other federal natural resources, such as coal and timber, are valued on the federal balance sheet.

A standard for recognizing federal oil and gas resources as an asset must distinguish two categories of federal holdings: proved reserves and all other. For proved reserves, the fair value to the federal government is the present value of expected contract royalties.[4] For all other gas and oil holdings, including

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1. The board has 10 members; a majority of which are nonfederal. The other federal members represent the Office of Management and Budget, the Department of Treasury, and the Government Accountability Office. More information about FASAB is available at www.fasab.gov.

2. Federal Accounting Standards Advisory Board, "Accounting for Federal Oil and Gas Resources" (exposure draft, May 21, 2007); available at www.fasab.gov/pdffiles/may07gas_ed.pdf.

3. Financial Accounting Standards Board, Statement of Financial Accounting Standards No. 159, "The Fair Value Option for Financial Assets and Financial Liabilities" (February 2007); available at www.fasb.org/pdf/fas159.pdf.

4. For an analysis of how reserves should be measured, see Cambridge Energy Research Associates, *In Search of Reasonable Certainty: Oil and Gas Reserves Disclosure* (Cambridge, Mass., February 2005); statement of Bala G. Dharan, Professor of Accounting, Rice University, "Improving the Relevance and Reliability of Oil and Gas Reserves Disclosures," before the House Committee on Financial Services, July 21, 2004; and Society of Petroleum Engineers, "Why a Universal Language for Evaluating

unproved resources that have not been offered for lease and resources that might never be tapped, fair value is the present value of expected bonuses, rents, and royalty payments.[5] But for both types of holdings, fair value is the appropriate valuation.

Shortcomings of the Majority Proposal

The board proposal has two shortcomings. First, the board proposes to recognize only proved reserves, even though other properties that the federal government controls may have significant value. The value of proved reserves is thus an underestimate of the resources available from federal lands and offshore areas. Second, the board proposes to value proved reserves using a means other than fair value. Experience with resource prices indicates that the estimated value of proved reserves, using the Board's approach, will typically be overstated, perhaps significantly.

The exposure draft posits that information needed to estimate fair value is not available (paragraph A50). However, several methods are available for estimating the fair value of federal oil and gas reserves, including the value of comparable private market transactions and discounted cash flow valuations of the government's projected receipts from leases on federal lands. Some methods, such as discounted cash flows, appear to be more suitable for arriving at the fair value of proved reserves, while the value of comparable private market transactions may be more suitable for determining the fair value of other holdings.

FASAB proposes to value federal oil and gas resources on the basis of expected federal royalty receipts on current proved reserves. The formula used to calculate those receipts would be: estimated quantity of proved reserves multiplied by the average price at the wellhead multiplied by the average royalty rate (paragraphs 16 through 19).

FASAB's proposed valuation methodology for the federal government's future stream of royalty receipts is a departure from fair value and ignores the available information about the market value of those resources. First, the proposed valuation fails to discount the stream of future royalty payments to the government to reflect the time value of money and thus overstates the present value of those future receipts. The exposure draft acknowledges in principle the desirability of discounting future streams of payments but states that the uncertainty surrounding the average life of a lease, production schedules, and future prices is too great to project cash flows reliably (paragraph A52). The

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Reserves Is Needed" (white paper, February 27, 2006), available at www.spe.org/web/org/Resources_White_Paper.pdf.

5. Some federal oil and gas resources are currently restricted from development by law. This alternative view does not take a position on whether to report those resources on the balance sheet.

standard's approach to valuation, however, does not address that uncertainty or risk. The aggregate cash flow stream for each region could be estimated from reserve levels and historic and forecast levels of economic aggregates such as oil prices and production rates.[6] Second, the valuation relies on current prices and hence ignores expected changes in energy prices over time.

Under some circumstances, these two flaws in the majority's valuation approach—the lack of discounting and the use of current rather than future prices—will tend to offset each other. In particular, the majority's valuation method would be reasonably accurate if future oil and gas prices are expected to increase over time at a rate equal to the appropriate risk-adjusted discount rate. Such a relationship between prices and the discount rate could occur, but only if resource prices follow one well-known theoretical model of resource prices, the Hotelling model. Unfortunately, current oil and gas markets do not appear to satisfy the specific conditions that are assumed in the Hotelling model.[7] Moreover, the Hotelling model has performed poorly in explaining the actual time path of resources prices. [8] It is therefore unlikely that the majority approach—which ignores both discounting and the potential for resource prices to change in the future—will, by happenstance, provide valuation estimates that approximate fair value. A more accurate assessment of the value of oil and gas reserves thus requires projecting the nominal value of future oil and gas royalties and discounting those royalties to determine the fair value of the resources.

Fair Value Measures

When market transactions are available, fair value is the same as market value. In the absence of active trading markets that would provide a current quote for identical assets, the Financial Accounting Standards Board has proposed a

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6. In general, production rates from developed fields are relatively stable, varying only little with current prices. Government rules and standard engineering practices specify production rates and development paths for a field that will maximize total output over time.

7. The Hotelling model implies that the net price (sales price less extraction costs) of an exhaustible resource, such as oil and natural gas, will increase over time at the rate of interest (if this relationship did not hold, producers would have an incentive to increase or decrease their current production in such a way that would equate the growth of net prices with the rate of interest). This model relies on numerous assumptions—for example, that extraction costs are constant, there is no market uncertainty and market participants have perfect foresight, the amount of the resource is fixed in supply, and markets are perfectly competitive—that do not apply in current oil and gas markets. Moreover, even if these conditions did hold, the model would imply that sales prices would grow more slowly than the rate of interest as long as extraction costs are significant.

8. Differences between the Hotelling valuation and reserve prices can be significant and persist over long periods. For example, one analysis estimates that the Hotelling valuation was more than double the estimated reserve price in 2003. M.A. Adelman and G.C. Watkins, *Oil and Natural Gas Reserve Prices: Addendum to CEEPR WP 03-016 Including Results for 2003 and Revisions to 2001*, Working Paper No. 20015-013(Cambridge Mass.: MIT Center for Energy and Environmental Policy Research, March 2005), available at http://web.mit.edu/ceepr/www/2005-013.pdf.

hierarchy of fair value measurement methodologies.[9] Estimates can be based on observable prices from transactions involving comparable assets. In the absence of comparable prices, reporters may estimate fair value by converting future cash flows to present values by discounting. It will be up to preparers (and then the auditors) to decide how to best estimate fair value.

Private Market Transactions

Prices from private market transactions have the potential to serve as fair value estimates of oil and gas reserves.[10] Oil and gas producers regularly exchange individual properties and leases that include proved reserves, reservoirs that have been found and are being developed, or merely "probable" reserves. The market values for those properties reflect the present discounted value of future earnings—including the cost and levels of production over time, expected changes in oil and gas prices, and discount rates that encompass appropriate risks. Those transactions totaled over $600 billion for existing oil and gas fields between 1979 and 2003.[11]

Sales of oil and gas reserves indicate that energy resources in the ground are worth much less than the wellhead prices because the reserves cannot be produced and delivered to a buyer immediately. Expectations about production costs and future wellhead price changes also affect valuations. On average, proved oil and gas reserves have sold for only about 20-25 percent and 30-40 percent of their respective wellhead prices for the 1991-2001 period. About 15 percent of the change in oil prices at the wellhead is reflected in proved reserve prices.[12]

Discounted Cash Flow Models

Discounting the government's expected receipts from bonus bids, royalty

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9. Financial Accounting Standards Board, Statement of Financial Accounting Standards No. 157, "Fair Value Measurements" (September, 2006); available at www.fasb.org/pdf/fas157.pdf.

10. This is one of several methods approved for use by the Department of the Interior; see Bureau of Land Management, *Economic Evaluation of Oil & Gas Properties*, available at www.blm.gov/nhp/efoia/wo/handbook/h3070-2.html.

11. See James L. Smith, *Petroleum Property Valuations*, Working Paper No. 2003-11 (Cambridge, Mass.: MIT Center for Energy & Environmental Policy Research, June 2, 2003), available at http://web.mit.edu/ceepr/www/2003-011.pdf. (Note: this paper was published as James L. Smith, "Petroleum Property Valuation," *Encyclopedia of Energy*, Cutler J. Cleveland, ed., Academic Press (March 2004).)

12. Transaction prices for oil and gas reserves tend to be less volatile than wellhead prices. See Smith (June 2, 2003), pp. 6-8 and Figure 3. For natural gas, about 10 percent of the change in field prices would be reflected in proved reserve prices. See M.A. Adelman and G.C. Watkins, *Oil and Natural Gas Reserve Prices: Addendum to CEEPR WP 03-016 Including Results for 2003 and Revisions to 2001*, Working Paper No. 2005-013 (Cambridge, Mass.: MIT Center for Energy & Environmental Policy Research, March 2005), available at http://web.mit.edu/ceepr/www/2005-013.pdf. For a detailed discussion of the data sources see, M.A. Adelman and G.C. Watkins, *Oil and Natural Gas Reserve Prices: 1982-2002: Implications for Depletion and Investment Cost*, Working Paper No. 2003-016 (Cambridge, Mass.: MIT Center for Energy & Environmental Policy Research, October 2003), pp. 11-1, available at http://web.mit.edu/ceepr/www/2003-016.pdf.

payments, and rents is an alternative approach to estimating fair market values when comparable transactions are unavailable. That approach has been used by the Department of the Interior. Discounted cash flow models require estimates of risk-adjusted discount rates, future prices, and production flows.[13] Risk-adjusted discount rates rather than Treasury rates are appropriate because of uncertainty about future prices and production flows.[14] Texas assesses property taxes on the fair value of oil and gas reserves and provides guidance on acceptable risk-adjusted discount rates of future cash flows.[15]

The expected future prices of oil and gas can be observed in the futures market.[16] While most trading is for contracts for delivery in less than a year, contracts for delivery in December 2012 are also currently available.[17] Prices for the period beyond 2012 could be projected using economic models.

To project flows, the Energy Information Administration and others generally assume in their forecasts that the ratio of production to proved reserves will remain constant, which is consistent with historical data. Thus, the current production to reserve ratio can be used to represent a constant rate of decline for future production.

13. An alternative approach would be to use a (real) options-pricing model. That approach, which requires an estimate of the market price of reserves and its volatility, recognizes that management can decide whether and when to develop an energy field and at what production rate. These strategic decisions affect the risk of production cash flows over time, which means that a constant risk-adjusted rate is not appropriate. Options-pricing methods provide a systematic method for discounting cash flows when risks change over time. See Smith (June 2, 2003), p. 11

14. See Smith (June 2, 2003), pp. 3-4. For an analysis of the relevance of market risk to the government, see Congressional Budget Office, *Estimating the Value of Subsidies for Federal Loans and Loan Guarantees* (August 2004), available at www.cbo.gov/ftpdocs/57xx/doc5751/08-19-CreditSubsidies.pdf.

15. For a discussion of Texas's guidelines, see www.window.state.tx.us/taxinfo/proptax/ogman/index.html.

16. Researchers have found that spot market prices are much more volatile than longer term futures contracts. See Miguel Herce, John E. Parsons and Robert C. Ready, *Using Futures Prices to Filter Short-Term Volatility and Recover a Latent, Long-Term Price Series for Oil*, Working Paper No. 2006-005 (Cambridge, Mass.: MIT Center for Energy and Environmental Policy Research, April 2006), available at http://web.mit.edu/ceepr/www/2006-005.pdf.

17. Oil and natural gas futures trade on the New York Mercantile Exchange; see www.nymex.com/lsco_fut_csf.aspx?product=CL and www.nymex.com/ng_fut_csf.aspx?product=NG.