

# CORPORATE AND SOCIAL ACCOUNTING FOR PETROLEUM

BY BERNARDO FERRAN\*

Present national accounting conventions regarding the treatment of flows and stocks in the petroleum sector are considered to be unsatisfactory. But changes in reporting requirements for oil and gas producers open up possibilities for a more satisfactory treatment.

In this article some aspects of the newly adopted requirements are presented and the possible uses of the additional information available for improving social accounts are discussed.

## INTRODUCTION

This paper examines possible impacts of changes in corporate accounting on social accounting. Such changes are presently being introduced in the reporting requirements of oil and gas producers in the United States. Two traditional accounting systems, the "Successful Efforts" system and the "Full Cost" system, are to be replaced by an entirely new one, the "Reserve Recognition Accounting" system, or RRA. The former systems were based on historical cost accounting, while RRA takes into account proved reserves and the discounted present value of the stream of income from them at current prices and costs. It involves, in addition to a change-over from historical cost-accounting to a valuation at current costs and prices, the recognition in the balance sheet as well as in the income statement of additions to proved reserves of oil and gas. This departure from traditional standards in accounting at the company level presents new outlooks for accounting at the national level: some of a conceptual character and others in reference to availability of information and methods.

## A NEW SYSTEM OF ACCOUNTING FOR OIL AND GAS PRODUCERS: RRA

In 1978 the Securities and Exchange Commission of the United States of America released a communication on the adoption of requirements for Financial Accounting and Reporting Practices for Oil and Gas Producing Activities. In this release it was stated that the Commission had come to the conclusion that accounting methods presently in use fail to provide sufficient information on financial position and operating results of oil and gas producers, that for these purposes supplemental information is required, and therefore steps should be taken to develop a method of accounting based on a valuation of proved oil and gas reserves. Accordingly, rules are being adopted which include disclosure of information on estimated future net revenue from production of proved oil and gas reserves.

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The new rules would represent, in the opinion of the Commission, an improvement in the communication of the financial position and operating results of oil and gas producers and would allow a better assessment of their position and results and facilitate comparisons of companies engaged in such activities.

The new rules establish requirements for disclosure of specified *historical information* on oil and gas producing activities and *information relating to future net revenues* from estimated production of proved oil and gas reserves. Based on that information is a method of accounting that provides for recognition in financial statements of proved oil and gas reserves as assets and of changes in proved oil and gas reserves in earnings. The following are listed specifically:

- (a) Proved oil and gas reserves assets in the balance sheet.
- (b) Additions to proved reserves and changes in valuations of proved reserves in the income statement.
- (c) All costs associated with finding and developing additions to proved oil and gas reserves, together with all costs determined to be nonproductive during the current period, in the income statement.

The accounting method to be developed on this basis is called "Reserve Recognition Accounting" or "RRA."

#### IMPLEMENTATION AND IMPLICATIONS

It is admitted that the feasibility of RRA is not assured at the present time because of the inherent imprecision of estimates of proved oil and gas reserves. In order to attain an acceptable degree of reliability, standards of valuation of reserves will have to be established. But on the basis of information presently available to the Commission, and notwithstanding the difficult problems still to be resolved, it considers that the goal is attainable and has initiated a series of steps in order to develop Reserve Recognition Accounting.

Because of such considerations and the difficulties that an abrupt change in accounting procedures would represent for the respondents, the Commission is proposing that during a transitional period a supplemental earnings summary be prepared and disclosed outside the financial statements based on traditional accounting methods. The supplemental earning summary, based on RRA, uses a prescribed methodology and requires disclosure of:

- (a) Quantities and annual changes in quantities of proved oil and gas reserves.
- (b) Cost incurred in exploration, development and production activities.
- (c) Capitalized costs relating to oil and gas producing activities.
- (d) Historical information on cash flow and value of transfers from producing oil and gas.
- (e) Cash flow and value of transfers ("net revenue") from estimated future production of proved oil and gas reserves, calculated on the basis of current economic conditions.
- (f) Present value of net revenue from estimated future production of proved oil and gas reserves using a ten percent discount rate.

The decision taken by the Commission is unique in its own history and constitutes a drastic change in accounting theory as well as practice. It has been prompted by the requirements of the Energy Policy and Conservation Act of 1975 which establishes that information from micro accounting statements should be used for creating a reliable energy data base by the Department of Energy. For this purpose the existing diversity of accounting practices of oil and gas producers is a serious obstacle. Presently various methods exist, although the Successful Effort Method and the Full Cost Method are the two most commonly used. The first capitalized only the costs directly related to productive properties, the other capitalized, within broad cost centers, all costs incurred in finding and developing oil and gas reserves.

The energy data base would provide macro-information needed for facilitating energy policy decisions and for that purpose aggregated financial data have to be correlated with data on overall mineral reserves and operating data. In addition to its traditional obligations of considering issues of public financial reporting in connection with decisions of investors, the Commission in this instance had to take into account considerations of a macro-economic nature affecting reporting to the Department of Energy.

Possible repercussions of the new accounting method on the micro-level have been discussed in business and accounting circles, with differing opinions as to their incidence. It seems that, if calculated over an appropriate period, income before tax over the entire period would not be affected by any of the three accounting systems; however distribution over the period varies considerably from one method to the other—and therefore possibly income after tax. As costs and revenues are distributed over time differently in the three systems, a point under discussion is whether it would affect the flow of financial resources to oil producers via loans or via the behaviour of shareholders.

The new accounting standards will almost certainly increase costs of company accounting, although companies usually do prepare for their internal needs statements very similar to those proposed in the new guidelines, which they use in connection with estimating cost depletion, depreciation and amortization and for internal management and audit in general. For the latter purposes a view somewhat broader than proved reserves is usually accepted, but for such broader estimates, proved reserves will usually serve as a point of departure.

Proved reserves, as the term is used by the oil and gas industry, is clearly distinguished from estimates of ultimately recoverable oil. Proved reserves are calculated as the difference between cumulative discoveries and cumulative production and represent “a very conservative estimate of the amount of oil left to be produced.”<sup>1</sup>

Traditionally estimates of proved reserves of crude oil, natural gas liquids and total liquid hydrocarbons were produced by the American Petroleum Institute which distinguished between “Revisions of previous estimates”, “Extension of old pools” and “New reserves discovered in new fields and in new pools in old fields”. These “new proved reserves” were added to total proved reserves at the

<sup>1</sup>Appraisal of Current Methods of Evaluating Crude Oil Resources, U.S. Energy Research and Development Administration.

end of the preceding year and after subtracting what was called "production during the year" gave the total proved reserves at the end of the year.

The working rules for estimating quantities were given as follows:

Proved reserves are volumes of crude oil which geological and engineering information indicate, beyond reasonable doubt, to be recoverable in the future from an oil reservoir under existing economic and operating conditions. They do not include what are commonly referred to as "probable or possible" reserves.

The proved reserves may be considered as the known and established underground working inventory available for recovery under prevailing conditions. These estimates are subject to future revisions, either downward or upward, even though the presently established "proved" reserves may be accurate in the light of current information.

The proved crude oil reserves estimates do not include:

- (a) Oil whose recovery is subject to reasonable doubt because of uncertainty as to geological conditions, reservoir characteristics or economic factors.
- (b) Oil in untested prospects.
- (c) Oil that may become available by fluid injection or other methods from fields in which such operations have not yet been applied.
- (d) Liquid hydrocarbons that may become available through the processing of natural gas.
- (e) Oil that may be recovered from oil shales, coal or other substitute sources.

Figures for proved reserves change due to new discoveries, extensions and revisions based on new information acquired by development drilling and implementation of new recovery techniques. Thus it is recognized that all such estimates where the future is involved suffer from inability to cope with changing economic circumstances. This is a common feature of all stock valuations.

In spite of such uncertainties, valuations of mineral property, based on present prices and costs, have to be and are being made especially in cases such as the following: change of ownership; appraisal for tax purposes; when funds are to be solicited and last but not least when planning innovations in operating methods or installation of costly long-life equipment.

As far as company accounting is concerned the question that is being raised is whether accounting standards should be set with the purpose of providing useful information to users of financial statements at large or of providing an administrative tool for company management. This question is not being dealt with here. The question that interests here is how these changes are bound to affect in one way or another procedures and aggregates in national accounting.

#### IMPACT OF RRA ON SOCIAL ACCOUNTING

Aspects which are vague in economic thinking are hard to handle in a clear cut way when it comes to social accounting. This might explain the treatment given to mining in SNA and other systems of social accounting.

The questions raised by RRA involve the treatment of costs of exploration and development, increases in reserves and depletion. They refer to classification as well as to valuation as both are affected by the inventory nature of oil and gas production.

Chapter VI of SNA<sup>2</sup> is devoted to definitions and classifications of transactions in respect of supply and disposition of goods and services. No explicit treatment is proposed for additions to mineral reserves—whether they should be considered as part of gross output or not—but it can be deduced from what is said elsewhere regarding this question when discussing the different uses. Outlays on the operation of producing mines are of course considered intermediate consumption, unless these are very significant outlays aimed at the extension and development of these units in which case they are part of fixed capital formation. Costs of oil and gas exploration (as all mineral exploration in general) are considered by SNA as costs of research and classified as intermediate expenses.

It is pointed out however that boundary problems might arise in discriminating between intermediate consumption and fixed capital formation.

“Commodities consumed in the research, developmental and exploratory activities of industries are, in most instances, to be included in intermediate consumption, . . . As the outlays on the commodities used in these activities may not yield concrete benefits and are usually not embodied in tangible assets, the convention is adopted that the expenditure is a form of intermediate consumption . . . .”

The formulation shows clearly that the treatment proposed “in most instances” is based on a convention—which could be altered, in different circumstances.

A special treatment is contemplated for “land and selected intangible assets.” As land includes sub-soil deposits, the treatment proposed for net purchases of land extends to mineral deposits. Such purchases and sales of land are considered to take place between resident institutions only, at the moment when the legal title to land passes. “Where land is purchased by a non-resident, a nominal resident institution is considered to be the owner of the land. The foreign owner will hold the equity of the national resident institution, which will be equivalent to the cost of purchase of the land.” (SNA, p. 131).

There can be a quite substantial difference between that cost and the value of the corresponding sub-soil deposits.

The European System of Integrated Economic Accounts (ESA) published by the Statistical Office of European Communities (revised in 1979) proposes a similar treatment, drawing however a more normative borderline. It classifies as fixed capital formation the value of goods and services incorporated into land, including expenditures on improving the land and preparing it for productive uses and under that heading mentions specifically “expenditures incurred drilling wells or shafts when extracting oil and natural gas.”

<sup>2</sup>United Nations publication, *A System of National Accounts*, Series F, No. 2, Rev. 3, New York 1969.

The demarcation line which separates items to be considered as research—which is classified as intermediate consumption—and those to be classified as fixed capital formation is the decision to exploit the reserves. Prior to that decision the expenses incurred are considered to be intermediate consumption; after that decision, they will be classified as capital formation.

In the last case valuation will be at purchasers' or approximate basic prices according to whether they have been bought in the market or produced on own account. The approximate basic price includes the sum of costs of goods and services used and remuneration of the factors of production necessary to produce the product. However, in the case of own-account production of fixed capital goods and goods put into stock by producers, the producers' profit is not included in the valuation.

In all these instructions, costs incurred on exploration and development are reflected in either fixed capital formation or in intermediate consumption but the purpose and result of such efforts has not been assigned any place. Additions to proved reserves are not being accounted for and consequently, neither is depletion of proved reserves. This violates the classical definition of "maintaining capital intact".

The treatment has frequently been challenged, as many uses are affected by it. In fact, it has repercussions for almost all uses like measurements of growth, long-term projections, determination of income shares in output, etc. The following comments refer to some of them:

- (a) Whereas SNA gives a prominent position to the use of macro-data for productivity measurement, it is evident that the procedure followed in the case of increases of proved reserves of oil and gas is detrimental to such measurements. The reason given for the procedure adopted is the uncertainty of results of all mineral, and particularly oil and gas, explorations. While this is true, it appears that the procedure adopted by RRA represents a great advance towards an appraisal of such activities for accounting purposes.
- (b) One of the most frequent uses of national accounts data is in the field of international comparisons. To make international comparisons more meaningful, non-market transactions such as own-account production for consumption have been introduced in what is otherwise a typical market aggregate. But comparisons of national products without accounting for substantial increases or decreases in their proved reserves can be still less meaningful. Inclusion of such data in national aggregates would considerably improve comparability.
- (c) Establishment of adequate measurement of natural resources in its different aspects is being urged by several new developments in the social sciences. One of these developments is the environmental aspect. Measurements related to natural resources are an indispensable part of studies on protection of the environment. The United Nations *Guidelines on Statistics of Tangible Assets*<sup>3</sup> points out that:

<sup>3</sup>International Guidelines on Statistics of Tangible Assets, Series M, No. 68, United Nations, New York, 1979.

“Changes in natural resources due to depletion in or additions to existing reserves through new discoveries are not covered by the flow accounts. It is therefore the responsibility of the statistics on stocks of tangible assets to provide this information. All positive and negative changes in natural resources have an impact on the environment. It follows that the measurement of the changes in quantitative terms and, if feasible, in value terms is very useful for research on the matters.”

In this sense it is worthwhile to point out that some countries with advanced statistical systems have established plans to prepare accounts and budgets for various national resources.<sup>4</sup>

- (d) The failure to account for increases in proved reserves creates a discrepancy between real and financial aspects as reflected in the flow accounts and the balance sheets. Balance sheets of two consecutive periods will change in response not only to changes in prices but also to changes in the quantity of proved reserves; but these have been omitted in the flow accounts. For this reason a recent publication of the United Nations<sup>5</sup> proposes to substitute for the “Revaluation Account” set up in SNA a “Reconciliation Account” which would take into consideration “net increases in the value of tangible assets not accounted for in the capital finance accounts” and which are not due to price changes.

The treatment proposed for such assets is to relate them to the net purchase of land, as it appears in the capital finance accounts. Under the heading “Net increases in value of tangible assets omitted from capital finance accounts” it is stated:

“The reconciliation accounts furnish the means of recording the value of new finds of subsoil assets reduced by the value of depletions, Revaluations of subsoil assets may also take place for such reasons as the rise in the market price of minerals or the development of more efficient techniques of exploiting the subsoil deposits.”

Though clear conceptually, the distinction between changes in value of these capital assets due to new finds minus depletion and those due to price changes will be difficult to establish in practice.

“This will be so especially when the changes in value of the capital assets under discussion are estimated as the difference between closing balance sheets and the sum of opening balance sheets and the relevant capital transactions. In order to decompose the differences into the two elements it will at least be necessary to have weighted index numbers of the change in prices or in quantities between the opening and closing balance sheets for each of the assets in question.”

<sup>4</sup>See, e.g. Parliamentary Report No. 75 (1976–77), Norwegian Long-Term Programme 1978–79, Royal Norwegian Ministry of Finance.

<sup>5</sup>Provisional International Guidelines on the National and Sectoral Balance Sheet and Reconciliation Accounts of the System of National Accounts, Series M, No. 60, New York, 1977.

Acknowledging findings of proved reserves in the flow accounts and their appearance via increases of stocks in the capital finance accounts would considerably simplify procedures.

#### PROVED RESERVES AND INCREASES IN STOCKS

What is and what is not being accounted for as increases in stocks in national accounting is determined partly by convention. This is clearly observable in the delimitation of stocks as listed in the European System of Integrated Economic Accounts:

“Stocks of goods may refer to harvested agricultural products, cattle of less than two years old, non-breeding pigs, poultry and other small farm animals, nuclear products, industrial products, new immovable products (completed and incomplete) for which no buyer has been found.”

And it emphasizes:

“Stocks of goods do not include the value of reserves of mineral resources, standing timber or standing crops; these reserves enter into the economic system only from the time when the minerals are worked and crops harvested.”

One can only speculate about the reasons. There is the traditional notion that they are not results of a productive process but a free gift of nature. In one of the first documents on national accounting this is said explicitly. But as “finds” of petroleum (and other minerals) have become more and more the outcome of costly efforts, the argument has become rather weak. Another notion is that in any process of production there must be present labour and capital which, it is argued in the case of oil reserves, is not the case in any quantity commensurable with the value of discoveries. This, in fact, is a different formulation of the previous argument. And while it is true that the relationship between inputs and gross output fluctuates around its mean more intensively in reserve creation than in other types of production, this is a difference not of kind but of degree and is connected to the circumstance that accumulation of knowledge not incorporated into fixed capital is in this instance an input of great weight and is not being accounted for separately.

On the other hand a precise demarcation of what is or is not part of the economic system, and what should be accounted for and what not, is clearly indispensable for any accounting system. The question is whether the demarcation line as it has been drawn is the most useful one or if, under present circumstances, it would be more convenient to shift it.

The answer to this question depends of course on the possibility of defining “reserves” in a way that would make them amenable to measurement within an acceptable range of approximation. This excludes highly speculative estimates of “ultimate” reserves and the diverse estimates of “probabilities” and “possibilities,” leaving practically only the “proved reserves”: something that can be measured with an approximation that would allow it to be included in gross output.



## FINAL REMARKS

The time horizon has tended to expand in the economy as well as in economics. This requires inclusion in our perspective of phenomena which otherwise would be omitted from current economic analysis. To include production of proved reserves in gross output would not solve all the problems that the specific nature of mining activities poses to accounting. It would however improve comparability, correspondence between real and financial flows and between flow and stock estimates.

Two arguments stand against such procedure. First, figures are difficult to obtain. Second, it would introduce inaccurate figures into an aggregate of otherwise accurate data. The first objection will be taken care of, once present accounting systems in oil are replaced by RRA. As to the second, there are inaccuracies involved in including additions to proved reserves in gross output, as well as in excluding them. At this stage, inclusion seems a safer bet than omission.