Do Deepwater Activities Create Different Economic Impacts to Communities Surrounding the Gulf OCS?

*By Williams O. Olatubi and David E. Dismukes**

Introduction

According to the Mineral Management Service (MMS), the Gulf of Mexico Outer Continental Shelf (OCS) region accounts for more than a billion offshore acres and collects about $6 billion in mineral revenues annually. The region produces a substantial amount of oil consumed in the United States and about 97 percent of gas production in the country. This large influence does not go unnoticed to the regional economies surrounding the Gulf.

It is, therefore, not surprising that the economic impact of offshore activities has become an increasingly important issue to the MMS. A very large portion of MMS research focus is subsumed within the agency's Environmental Studies Program (ESP) and defined in its National Strategic Plan (NSP).

The socioeconomic studies component of the program includes the following objectives:

- Provides information essential to understanding the consequences of OCS-related activities for the populations, economies, and social and cultural systems in areas where the activities occur;
- Supports the MMS's planning and management processes; and
- Provides information essential for effective interaction with the public about the effects of OCS activities.[1]

The MMS' primary legal mandate to analyze the socioeconomic impacts of natural resource management issues is provided in both the Outer Continental Shelf Lands Act, as amended in 1978 (OCSLAA), and the National Environmental Policy Act of 1969 (NEPA). NEPA requires federal agencies engaged in significant land actions to assess impacts, including those on the human environment, through the process of conducting Environmental Impact Statements (EIS).[2]

Over the past several years, the ESP has become increasingly more engaged in the socioeconomic research of coastal communities in support of its EIS mission. Of the three major MMS regions (Alaska, Pacific, and Gulf of Mexico), the Gulf of Mexico would appear to have a pressing need for continued socioeconomic impact analyses. The Gulf, in addition to providing a significant number of reserves and production, is also undergoing unique developments in both deepwater activity (900 meters and above) and the potential development of frontier areas in the eastern Gulf off the coast of Florida.

As early as the mid-1980s, the MMS Gulf of Mexico region began its efforts to model the implications that offshore development had on coastal communities. For close to 10 years, however, a good portion of these regional modeling initiatives focused more on past consequences of outer continental shelf (OCS) oil and gas development than on predictive methods. This focus is changing and MMS has been supporting and encouraging a more general equilibrium model of the economic impacts of oil and gas development with some predictive abilities.

Section 18 of the OCS Lands Act requires that the Secretary of the Interior prepare, and periodically revise and maintain, a 5-year schedule of lease sales (Five-Year Program). Section 18 also requires that, in deciding whether to approve a new Five-Year program, the Secretary must consider, among other things, "an equitable sharing of development benefits and environmental risks among the various regions." A key consideration in this regard will be an adequate and fair assessment of the economic effect of the leasing activities as oil and gas development follows.

The important analyses for MMS in both its equitable sharing plan and EIS analyses, is not limited to just the direct effects resulting from the spending by the companies working directly on an OCS project. The analysis is also dependent on examining the potential differential economic effects those activities may have on communities depending on how far or near from shore those activities takes place.

More recently, the MMS has examined the economic impact of some coastal communities of oil and gas development activities in the OCS. However, most of these studies have focused on the overall impact on a broad level. Increasingly, due to technological innovations and resource depletion close to the shore, more industry activities are beginning to concentrate in deep waters in the OCS. As pointed out earlier, there are potentially significant differences in the impacts associated with these deepwater activities that could lead to differential impacts on a community's economy – offsetting the equity goals established for MMS by statute.

This paper is a very condensed version of a larger study sponsored by the MMS that examines three fundamental issues for estimating regional economic impacts associated with offshore activities: developing unit costs for each activity; developing expenditure profiles (production functions) for each offshore activity; and developing onshore allocations for the economic impacts associated with each activity. This paper concentrates on the overall methods used to develop these drivers of economic activity. We conclude with an examination of the relative differences between shallow water and deep water for one type of offshore activity: exploratory drilling.

Modelling Issues

Economic impact models that are developed specifically for OCS oil and gas development analyses must be customized to reflect the unique expenditure patterns of OCS-related companies and their employees in order to properly estimate indirect and induced effects. These activities differ from standard onshore oil and gas activities and require a different set of economic drivers to develop a complete economic impact model.

For example, OCS activities require much larger purchases of catering services, disposal services, transport services, and communications services than do onshore activities. In addition, these impacts may vary by how far offshore the development is located. Furthermore, these models will need to be customized to reflect the location of

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[1] See footnotes at end of text.

more specialized activities that may not be common across the entire Gulf region. Customization is necessary because ready-made models such as IMPLAN are calibrated on national production functions, which may not accurately mirror local realities.

There are a number of methodological issues associated with modeling something as complicated and multifaceted as the offshore oil and gas industry. Our research goal has not been to address each and every methodological issue, but concentrate on four of the more important issues that were identified by MMS.

Defining Offshore Expenditure Profiles

The exploration, development, and operation of offshore leases is a considerable logistic challenge. These challenges are often revealed in the types of expenditures that are made by offshore operators. Thus, the first step in the analysis of offshore activities is to define a relevant set of expenditures, taking into account many of the unique expenditures that are required for this special aspect of the oil and gas industry. Some of the expenditure categories that have unique implications for offshore activities include: water and air transportation, food and catering services, water supply, waste disposal, turbines and fuel, and communications, instrumentation and SCADA system.

Defining Offshore Activity Phases

Another important area of examination is defining the relevant phases of offshore activity. Most IO models, as well as National Income and Product Accounts (NIPA), treat oil and gas activities as a highly aggregated activity. In these accounts, and the models utilizing them, onshore and offshore activities are rarely separated, and even then, are aggregated into either drilling or production activities. MMS, however, must consider a range of offshore oil and gas activities over relatively long periods of time in the EIS evaluation. The activities that were defined by MMS as being important for socioeconomic modeling purposes include: exploratory drilling; development drilling; platform fabrication and installation; pipeline fabrication and installation; gas processing facility installation; production; workovers; oil spills; and platform removal and abandonment. For typical EIS analyses, socioeconomic analyses will begin with a forecast of activities (in units) for each of the above activity phases.

Defining the Onshore Allocation of Offshore Activities

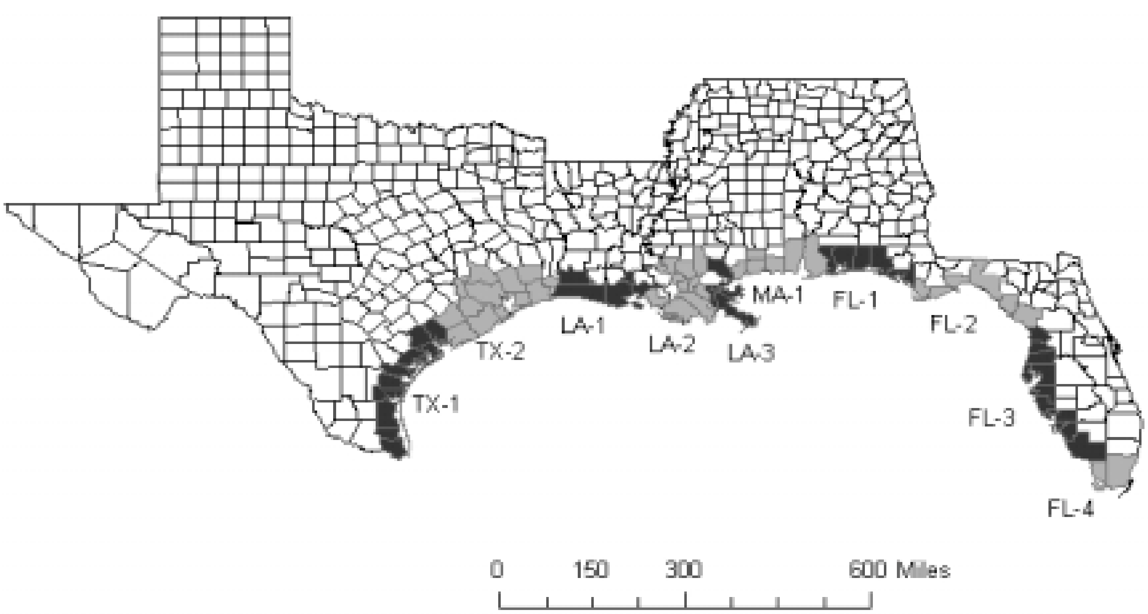
The allocation of expenditures to onshore areas is probably one of the more important factors for determining the region-specific economic impacts associated with offshore activities. These break-outs are important because there are tendencies for certain onshore support activities to be concentrated in particular geographic areas. This concentration has tended to occur in Louisiana and Texas, and has continued despite the movement of offshore activities into deeper water and into the Central-Eastern portions of the Gulf of Mexico.

Defining Relevant Water Depths

Another methodological challenge rests with modeling variations in expenditure profiles across water depths. For instance, should, or do, expenditure profiles change as offshore activities move into deeper waters? Conventional wisdom would tend to support the hypothesis that there is a positive, and probably close to linear, relationship between certain relative costs and water depth. Water transportation costs comes to mind, as being a relative cost that should increase as water depth, and hence distance, increases. However, the unique realities of offshore activities, coupled with inconsistencies in data collection and (internal) report-

(continued on page 18)

Figure 1
MMS Gulf of Mexico Coastal Areas



Deepwater Activities *(continued from page 17)*

ing, can lead to significant challenges in what should appear to be an obvious conclusion.

These issues must be addressed within the context of the geographical areas that have been identified by the MMS, and that forms the basis of its planning program in the Gulf. These areas are depicted in Figure 1. Distinct water depths that have been defined by MMS within the context of their planning programs in the Gulf include: 0-60 meters; 60-200 meters; 200-900 meters; and 900 meters and above

The above distinct geographical delineation and water depths are crucial to accurately estimating the levels of spending by activity, location, and to relevant communities in the Gulf coast.

For a specific modeling approach we rely on the Input-output (IO) approach using IMPLAN (Impact Analysis for Planning).[3] A shortcoming with most IO analysis is that the impact drivers (or multipliers) in the model are typically taken from national, as opposed to regional trends and industries. Such an approach assumes, among other things, that industries in any given area will use inputs in the same proportion as the national average.

For oil and gas firms operating in the Gulf OCS, this assumes that input expenditures are made in the same proportion as the national oil and gas industry average. Not only does such an approach assume regional similarities, but it also assumes that onshore and offshore production functions are similar. It is this last problem that causes the most difficulty in using existing regional IO models based on IMPLAN to examine the economic impacts of offshore activities. Because of this and the peculiar nature of this industry, unique methodological and data collection approaches can help remedy this potential problem. By supplementing IMPLAN data with other existing regional data, a more accurate picture of the economy is presented in what is called an hybrid model.[4]

Data and Methods

Data needs of oil and gas development impact analysis are very extensive. Two data collection issues are particularly important:

1. How to identify, locate, and secure reliable sources of information that did not require the use of survey instruments; and
2. How to reconcile accounting classifications to economic classifications.

The first issue was the more problematic of the two and one that plagues ongoing MMS social science research. Our research needed to find a way to collect information that did not use survey or survey-type instruments. Therefore, mailing questionnaires to numerous companies operating offshore was not allowed.[5] Alternatively, relevant data was compiled from a variety of different sources. In general, these sources include government, industry, trade, and academic publications, periodicals, and databases. Some of these publications were readily available and straightforward. For instance, there is considerable information on drilling expenditures and patterns from the *Joint Association Survey of the U.S. Oil and Gas Producing Industry* compiled annually and published (jointly) by the American Petroleum Institute (API), the Independent Petroleum Association of America (IPAA), and the Mid-Continent Oil and Gas Association. Likewise, there is considerable information on pipeline construction costs and expenditures that are filed regularly before the Federal Energy Regulatory Commission (FERC).

For data that are not readily available from these direct "secondary" sources, we rely on industry or trade association information and surveys previously (and independently) compiled. Because of potential bias, these requests were limited, however, and were simply used to "fill-in-the-blanks."

The additional data issue was taking disparate documents and information, most of which were provided in accounting-based formats, and translating them into economic information for modeling purposes. Accounting information, for instance, rarely makes distinctions between fixed and variable costs or clear-cut differentiations between capital and labor. Thus, a process of reviewing accounting information on a line-by-line basis was required. To be consistent with economic principle judgment calls are sometimes necessary.

In some cases judgment calls have to be made with regard to expenditure classification. For example, the process of making judgment calls on some classifications was most apparent in dealing with contracted services. Many costs associated with offshore activities would appear as contracted services from one firm to another, although both were engaged in the same activity. For instance, a company developing an exploratory well(s) would often, particularly in shallow water, contract drilling services out to a separate company. This company, in turn, would have direct expenditures for labor, materials, equipment, and other items that would "escape" our data collection ability. This has led to slight biases (overstatements) in general categories such as IMPLAN sector 38 (oil and gas operations) or 57 (other oil and gas field services).

Relative Differences in Shallow versus Deepwater Activities

Using these expenditure profile drivers to model economic impacts show that, in general, deepwater development impact is at least 1.4 times as great as those of shallow waters considering overall total effects. Unfortunately, space limitations for this paper do not allow us to examine total economic impacts associated with our deep and shallow water models. Nevertheless, this order of magnitude difference should be of no surprise to anyone associated with offshore development and operations. Clearly the scope and scale of deep-water activities is considerable relative to its shallow water counterpart.

What is of importance, however, is the relative differences in the expenditure patterns for deepwater activities relative to shallow water. One question that can be raised is whether deepwater is just a more "massive version" of shallow water (i.e., large total impacts, few relative differences). As can be seen in Table 1, this does not appear to be the case. This table presents the estimated differences in expenditure profiles for exploratory drilling in both shallow water (0-60 meters) and deep water (900 and above).

Summary and Conclusions

The process of trying to create real world models for offshore oil and gas activities in the Gulf of Mexico can yield meaningful difference from just standard "canned" approaches contained in generalized IO models. The MMS motivation for moving forward with creating these custom-

Table 1
Relative Differences in Exploratory Drilling Expenditures by Water Depth[6]

		Average Production Function 0-60 Meters	Average Production Function 60-200 Meters	Average Production Function 200-900 Meters	Average Production Function 900+ Meters	Total Average Production Function All Depths
38	Oil & Gas Operations	0.6773	0.6741	0.7331	0.7322	0.7042
57	Other Oil & Gas Field Svcs	0.0343	0.0342	0.0292	0.0292	0.0317
210	Petroleum Fuels	0.0283	0.0283	0.0242	0.0241	0.0262
232	Hydraulic Cement	0.0669	0.0695	0.0580	0.0593	0.0634
258	Steel Pipe and Tubes	0.0619	0.0628	0.0441	0.0438	0.0531
403	Instrumentation	0.0408	0.0407	0.0346	0.0346	0.0377
436	Water Transport	0.0828	0.0827	0.0701	0.0701	0.0764
437	Air Transport	0.0078	0.0078	0.0066	0.0066	0.0072
	Total	1.0000	1.0000	1.0000	1.0000	1.0000

ized approaches appears to be justified. Table 2 presents a summary of the IMPLAN output for the LA-2 region identified in Figure 1. Two columns have been provided that present the economic output from shocking both the generalized IMPLAN model and the IMPLAN model using our specialized expenditure profiles and onshore allocations.

The differences in output, for instance, are 8 percent lower using our revised method of measuring economic impacts, than the canned approach included in IMPLAN. Labor income, however, is about 42 percent higher in our analysis relative to standard approaches. Value added is 14 percent higher in our model, while employment opportunities, represented by the number of jobs created by new exploratory wells, is 62 percent higher in our model than the standardized approach. These results, at minimum, support the notion that there are unique economic differences in the offshore industry and that further research should be conducted to better understanding those differences and the impacts they have on human communities of the Gulf of Mexico.

Footnotes

[1] LTG Associates, Inc. 2000. *Report on the 1999 Minerals Management Service Social and Economic Studies Conference.* OCS Study MMS 2000-016. Department of the Interior Minerals

(continued on page 20)

Table 2
Estimated Economic Impacts for Exploratory Drilling, LA-2 Region

Estimated Annual Impact -- Standard Analysis (1998 Dollars)

	Direct	Indirect	Induced	Total
Output	179,502,016	16,454,092	15,543,905	211,500,011
Labor Income	14,524,824	3,839,397	5,936,279	24,300,500
Total Value Added	49,131,317	8,382,280	9,560,596	67,074,189
Employment (Number)	273	111	246	629

Estimated Annual Impact -- Modified, Gulf-Specific Analysis (1998 Dollars)

	Direct	Indirect	Induced	Total
Output	178,219,407	29,111,563	21,800,854	229,131,826
Labor Income	17,490,114	8,875,273	8,325,832	34,691,221
Total Value Added	47,687,687	15,538,328	13,409,060	76,635,075
Employment (Number)	391	278	345	1,014

Deepwater Activities *(continued from page 19)*

Management Service, Environmental Studies Program: 4

[2] U.S. Department of the Interior, Minerals Management Service, 1996. *Outer Continental Shelf Oil & Gas Leasing Program: 1997-2002: Final Environmental Impact Statement.* Washington, D.C.: U.S. Department of the Interior, August:I-1

[3] IMPLAN is one of the ready-made input-output databases for impact analysis. Originally developed by the U.S. forest service, it has become one of the most utilized approaches to modeling economic impacts of projects in the U.S. It is underlined by a demand-driven general model of an economy, assuming fixed prices and no resource constraints.

[4] Of course, there are other ways to collect IO data. One is to use surveys, however, these are prohibitively expensive for a large region, and as a consequence, are rarely used.

[5] This restriction on data collection is placed on MMS by the Paper Work Reduction Act of 1980, and reauthorized in 1995.

[6] Only the relevant sectors identified in our analysis are presented in this table.

Aberdeen Program *(continued from page 5)*

Queries: (excluding Social Tours)	Social Tours:
Professor Alex Kemp	Pam Wells
Department of Economics	Corporate Events
University of Aberdeen	Gowanbank
Edward Wright Building	Station Road South
Dunbar Street, Old Aberdeen	Peterculter
AB24 3QY Scotland, UK	Aberdeen
Phone: +44 (0) 1224-272168	AB14 0LL Scotland, UK
Fax: +44 (0) 1224-272181	Phn/Fax:+44(0)1224-735733
Email: a.g.kemp@abdn.ac.uk	wellspj@compuserve.com

**** CONFERENCE SPONSORS TO-DATE**: Shell, BP, UK Department of Trade and Industry, Aberdeen City Council, Scottish Power, Conoco, TotalFinaElf, Ernst & Young.

Sam Schurr

Sam Schurr, one of Resources for the Future's leading scholars and a pioneer in energy and mineral economics, died peacefully in his sleep on March 4 from cardiac arrest. He was 83.

"Though it's been a long time since Sam Schurr served on the research staff at RFF, his impact is felt every day," says RFF President Paul Portney. "Not only was he a leading light in the fields of energy and minerals economics, but he helped establish the tradition here of even-handed and empirically grounded policy analysis. "

Schurr joined RFF in 1954, where he was among the first to focus on the role of energy in economic activity. He gained national recognition in 1960 for the groundbreaking work, *Energy in the American Economy*, which he co-authored with the late Bruce Netschert. The book provided an exhaustive account of the production and consumption of U.S. energy from the mid-19th century, along with an assessment of future energy-use trends several decades into the future.

Together with another RFF luminary, the late Hans Landsberg, he co-authored the 1968 book *Energy in the United States: Sources, Uses, and Policy Issues*. He is also well known for co-authoring *Energy in America's Future: The Choices Before Us* (1979).

Joel Darmstadter, RFF senior fellow and a frequent collaborator with Schurr, notes, "it is easy to forget just how fundamental the collective collaboration of Schurr, Netschert, and Landsberg was to gaining insight into the pivotal importance of fuels and power as part of technological progress and economic growth.

"Few economic historians and energy analysts - in the private sector or in government - have failed to exploit *Energy In The American Economy* and other such works to inform their own research," says Darmstadter.

Schurr was born in 1918 in Youngstown, Ohio, and moved to New Jersey as a youth. After earning degrees at Rutgers and Columbia Universities, Schurr began his professional career in 1939 at the National Bureau of Economic Research. During World War II, he worked as a research economist for the Office of Strategic Services (Europe-Africa division), and later with the U.S. State Department commission on German reparations. In 1950, he joined the U.S. Department of the Interior's Bureau of Mines, where he worked as chief economist until 1953. After a year as chief of the economics division at Rand Corporation, he joined RFF in 1954 as director of the independent research institute's energy and mineral resources program. He continued at RFF until 1973, when he became the director of the energy systems, environment, and conservation division at the Electric Power Research Institute (EPRI) in Palo Alto, CA. He rejoined RFF as a senior fellow and co-director of its Center for Energy Policy Research in 1976, before once more joining EPRI as the deputy director of its Energy Study Center. He retired in 1989, but continued as a consultant to the institute.

Throughout his professional career, Schurr served on a number of distinguished advisory panels for the National Academy of Sciences and the Federal Power Commission, among others. He also was a member of the President's Task Force on Natural Resources (1965), a consultant to the International Monetary Fund on international oil problems (1970), and a member of the international editorial board of *Energy Policy*.

The American Institute of Mining, Metallurgical and Petroleum Engineers honored Schurr with its 'Mineral Economics Award' in 1968. He also received a special award for his contributions to the literature of energy economics and for service to his profession by the International Association of Energy Economists (IAEE) in 1981. He also served as IAEE President (1978-79).

He was married for 50 years to Beatrice Gray Schurr until her death in 1992. He leaves his second wife, Sally N. Schurr, and his many friends and colleagues who enjoyed his intellectual insights and wisdom, and who share this loss.