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STUDY TITLE: Social and Economic Consequences of Onshore OCS Related Activities in Coastal Alabama

REPORT TITLE: History of Coastal Alabama Natural Gas Exploration and Development, Final Report

CONTRACT NUMBER: 1435-01-CT-96-30829

SPONSORING OCS REGION: Gulf of Mexico OCS Region

APPLICABLE PLANNING AREAS: Central and Eastern Gulf of Mexico

FISCAL YEARS OF PROJECT FUNDING: FY 1996-1997, FY 1997-1998, FY 1998-1999

COMPLETION DATE OF REPORT: April 1999

PROJECT MANAGER: William W. Wade

COSTS: FY 96-97: \$135,910; FY 97-98: \$40, 232; FY 99-98: \$47,151;
CUMULATIVE PROJECT COSTS: \$223,293

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KEY WORDS: natural gas, Norphlet geology, Mobile reserves, Mobile Bay leasing history, Mary Ann field discovery, MOEPSI, Mobil, Exxon, Shell, Chevron, Unocal, Mobile production forecast

BACKGROUND: Following the 1979 discovery of Norphlet gas in Mobile Bay, during the early 1980s the Coastal Alabama region experienced the emergence of a large offshore gas industry. This study is the second in a series of investigations analyzing the social and economic impact of the Coastal Alabama offshore gas industry on Gulf Coast states.

OBJECTIVES: Document the history of leasing, exploration, development and production of natural gas offshore coastal Alabama in state and federal fields and project the likely path of future development and production.

DESCRIPTION: After nine years of regulatory delay, Mobil Oil Exploration and

Production, Inc.'s first well encountered natural gas at 21,113 feet November 28, 1979, having discovered Norphlet formation gas 6,000 feet below the top of the Smackover formation—their original target in 1970. At the apex of the Carter Administration's Energy Crisis, Mobil had discovered a giant gas field in 14 feet of water in America's backyard. The prospect of \$9 per MCF gas after the NGPA passed in 1978 and the Norphlet geology were extraordinarily exciting to petroleum industry professionals, who recognized the potential for discovery of other very large natural gas accumulations. The Coastal Alabama/Panhandle Florida Norphlet trend is one of the most important U. S. gas producing regions. This report discusses the leasing, exploration and development history of discovered Miocene and Norphlet gas fields in state and federal waters offshore Alabama and Florida's Destin Dome.

SIGNIFICANT CONCLUSIONS: Industry bids at the 1981 State of Alabama Lease Sale and the 1982 Federal Lease Sale reveal that Exxon, Mobil and Shell bet heavily on Norphlet geology and high gas prices. Exxon submitted high bids of \$255.9 million for seven of the 13 tracts awarded by the State of Alabama. Between 1981 and 1984 Alabama leased tracts in state waters for bids totaling \$800 million. MMS leased tracts in federal Mobile Bay OCS waters between 1982 and 1985 for bids totaling \$562 million, \$1.36 billion combined. The "gas bubble" dropped prices below \$2 MCF by the time production ultimately came on line.

The State of Alabama set up a perpetual trust fund to ensure that the State would continue to benefit from the interest on the bonus proceeds. At the end of FY 1996, the balance of Alabama's trust funds had grown to \$1.35 billion, having increased with the receipt of royalty payments. Annual interest from the funds has averaged about \$100 million since 1986. The trust funds and interest earnings will continue to grow so long as gas is produced from state and nearby federal 8(g) waters.

Seventeen Norphlet wells were spudded between 1981 and 1984, 13 of which became gas discoveries, an extraordinary accomplishment before 3D seismic. Besides Mobil's Mary Ann discovery, three state Norphlet discoveries and one federal Norphlet discovery subsequently became development projects based on discoveries before year end 1984. Through year end 1997, 75 Norphlet wells have been drilled in state and federal waters off Coastal Alabama, 28 exploration, the balance delineation and development wells. These wells discovered 20 gas fields. Twenty Norphlet discoveries for 28 exploration wells represent a 71 percent success ratio. All but three of discovered fields are producing gas in 1998.

Norphlet gas is a hot, sour, high pressure, corrosive mixture of methane, hydrogen sulfide, carbon dioxide, and free water. Dealing with it is difficult, dangerous and expensive. The frontier nature of the Norphlet geology and the associated production engineering challenges are daunting. Only a few of the major oil and gas companies have risked the billions of dollars and years of lead times necessary to bring the Norphlet into production. Mobil's Mary Ann Field began production in 1988, nine years from first discovery to first production. Shell's Fairway Field started up in late 1991 along

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with Mobil's federal 823 Field, ten years after the lease sales. Exxon started its three fields in late 1993, 12 years after the 1981 lease sale.

Union and Chevron have become the dominant operators in federal acreage developing the eastern and western edges of the Mobile OCS. Chevron took nine years from its first Norphlet discovery in Mobile 861 in 1985 to first production in 1994. Union was able to bring its 904 Field to production in a little over five years, discovering the 904 Field in 1988 and starting production in 1993. But the well failed due to mechanical problems. The field only came back into production three years later, in December 1996.

Mechanical and completion problems have plagued most of the operators. Production has been reduced due to plugging, scaling and water intrusion. Total gas production would have been greater sooner but for these problems. At least 150 MMCFD of production was lost during 1996 and 1997 from failed wells and wells that are only limping along in comparison to start-up rates. Keeping Norphlet wells producing at design rates is more difficult than finding the reservoirs four miles beneath the surface.

Alabama state and federal production surpassed 1 BCFD for the first time February 1997. Forthcoming and planned Alabama wells will take Norphlet and Miocene production to 1.4 BCFD by 2000. Destin Dome production, starting in 2001, will sustain production near 1.6 BCFD through 2004 before production from discovered fields goes into decline. Cumulative production is forecast to total about 9 TCF from discovered Norphlet and Miocene fields by 2015. Operators' remaining discovered reserves show that all but Shell will produce Norphlet for many years into the future. Shell's Fairway Field Reserve/Production ratio ranges up to 8 years.

STUDY RESULTS: See Study Conclusions.

STUDY PRODUCT(S): Wade, W.W., J.R. Plater, and J.Q. Kelley. 1999. History of Coastal Alabama Natural Gas Exploration and Development, Final Report. OCS Study MMS 99-0031. A final report by Foster Associates, Inc., for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico Region, New Orleans, LA. Contract No. 1435-01-97-CT-30829. 214 pp.

Kelley, J.Q. and W.W. Wade. 1999. Social and Economic Consequences of Onshore OCS-Related Activities in Coastal Alabama: Final Baseline Report. OCS Study MMS 98-0046. A final report by Foster Associates, Inc., for the U.S. Department of the Interior, Minerals Management Service Gulf of Mexico Region, New Orleans, LA. Contract No. 1435-01-97-CT-30829. 102 pp.

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