NORTH CAROLINA GENERAL ASSEMBLY

LEGISLATIVE RESEARCH COMMISSION ADVISORY SUBCOMMITTEE ON OFFSHORE ENERGY EXPLORATION

REPORT TO THE LEGISLATIVE RESEARCH COMMISSION

MAY 2009

Advisory Subcommittee on Offshore Energy Exploration

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TRANSMITTAL LETTER

TO THE MEMBERS OF THE LEGISLATIVE RESEARCH COMMISSION:

Attached for your consideration is the interim report of the Advisory Subcommittee on Offshore Energy Exploration established by the President Pro Tempore of the Senate and the Speaker of the House of Representatives pursuant to G.S. 120-30.10(c). The Legislative Research Commission Advisory Subcommittee on Offshore Energy Exploration, respectfully submits the following report.

Dr. James Leutze
Co-Chair

Dr. Douglas Rader
Co-Chair

PREFACE

Pursuant to North Carolina General Statute 120-19.6 (a1), the President Pro Tempore of the Senate, Marc Basnight, and the Speaker of the House of Representatives, Joe Hackney, established the Offshore Energy Exploration Study Committee on January 16, 2009. The 24-member committee was composed of members of the public, with 12 appointments made by Senator Basnight and 12 made by Speaker Hackney. On February 11, 2009, the 24 public members of the Committee were re-appointed to the Legislative Research Commission Advisory Subcommittee on Offshore Energy Exploration. Appointments were set to expire upon the filing of the Subcommittee's final report to the Legislative Research Commission or May 1, 2009, whichever occurred first. On April 28, 2009, Senator Basnight and Speaker Hackney extended the duration of this Subcommittee to the filing of its final report or on the convening of the 2010 Regular Session of the 2009 General Assembly, whichever occurred first. At that time, in addition to studying petroleum exploration and development, the Subcommittee received the authority to study the potential impacts of alternative offshore energy projects on the nation's energy supply, including energy generated from wind, waves, ocean currents, the sun, and hydrogen production.

Since its creation, the Subcommittee has held three meetings. The first meeting was held on April 15, 2009 in Raleigh (Jim Graham Building, NC State Fairgrounds), the second was held on April 27, 2009 in Morehead City (Joselyn Hall, Carteret Community College), and the third was held on May 13, 2009 in Raleigh (Legislative Building Auditorium). Based on reports and presentations received by the Subcommittee and comments expressed by citizens, the Advisory Subcommittee on Offshore Energy Exploration presents the recommendations contained in this report.

STATE OF NORTH CAROLINA

LEGISLATIVE RESEARCH COMMISSION

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Legislative Research Commission
Advisory Subcommittee on Offshore Energy Exploration

Section 1. The **Legislative Research Commission Advisory Subcommittee on Offshore Energy Exploration** (hereinafter "Advisory Subcommittee") is established by the President Pro Tempore of the Senate and the Speaker of the House of Representatives pursuant to G.S. 120-30.10(c).

Section 2. The Advisory Subcommittee consists of 24 public members listed below; 12 appointed by the President Pro Tempore of the Senate and 12 appointed by the Speaker of the House of Representatives. The President Pro Tempore of the Senate and the Speaker of the House of Representatives shall each appoint a co-chair from among their respective appointees. Members shall serve at the pleasure of the appointing authority.

President Pro Tempore Appointments	Speaker of the House of Representatives Appointments
James Leutze, Co-chair, New Hanover County	Douglas N. Rader, Co-chair, Wake County
Orlando Hankins, Wake County	Lawrence Cahoon, New Hanover County
Jane Lewis-Raymond, Mecklenburg County	Joel J. Ducoste, Wake County
Christopher S. Martens, Orange County	Edward S. Holmes, Orange County
Mac Montgomery, New Hanover County	Jamie Brown Kruse, Pitt County
Michael K. Orbach, Carteret County	John M. Monaghan, Jr., Wake County
Walter Phillips, Carteret County	Hans W. Paerl, Carteret County
Wayland Sermons, Beaufort County	Jane Smith Patterson, Orange County
Laura O. Taylor, Wake County	M. Paul Sherman, Wake County
Paul Tine, Dare County	W. Hugh Thompson, Wake County
William Weatherspoon, Wake County	Jeffrey D. Warren, Wake County
Nancy White, Dare County	Rob Young, Jackson County

Section 3. The Advisory Subcommittee shall study:

1. The implications of leasing federal waters off North Carolina's coast in the Atlantic Outer Continental Shelf to energy companies for oil and natural gas exploration.
2. Relevant federal law and the legal authority of the State of North Carolina with regard to offshore drilling.

3. The potential impacts on the nation's energy supply, including documenting the best unbiased estimates available for what oil and natural gas might exist.
4. The potential financial impact of proposed exploration on the State of North Carolina, including effects on the economy, tourism, the commercial fishing industry, the impacts of a more industrial coastline, and ensuring a share of State profits.
5. The environmental impacts of exploration on North Carolina's coastline, including possibilities of spills, effects on water quality, air quality, marine life, and contributions to global climate change.
6. The environmental impacts of the infrastructure that would be associated with exploration and drilling for oil and natural gas.

Section 3.1. In addition to topics authorized under Section 3, the Advisory Subcommittee may study the potential impacts of alternative offshore energy projects on the nation's energy supply, including wind energy, wave energy, ocean current energy, solar energy, and hydrogen production.

Section 4. The Advisory Subcommittee shall meet upon the call of its Co-chairs. A quorum of the Advisory Subcommittee is a majority of its members. No action may be taken except by a majority vote at a meeting at which a quorum is present.

Section 5. The Advisory Subcommittee shall hold public hearings in North Carolina's coastal region to solicit feedback from local residents as to the potential impacts of offshore drilling on those communities.

Section 6. The Advisory Subcommittee may establish an advisory group comprised of university faculty and scientific experts to assist in gathering and analyzing data so that the Advisory Subcommittee may provide more informed recommendations to the Legislative Research Commission. The work and membership of the advisory group shall be coordinated through the President of The University of North Carolina, utilizing appropriate resources of the various constituent institutions. The Legislative Services Commission shall allocate funds for the expenses of the advisory group. The allocation may be accomplished by transfer of funds to the University of North Carolina.

Section 7. The Advisory Subcommittee is authorized to solicit testimony and evidence from experts outside of North Carolina and, subject to the approval of the Legislative Services Commission, shall make arrangements to reimburse such experts for their expenses associated with appearing before the Advisory Subcommittee.

Section 8. The Advisory Subcommittee, while in the discharge of its official duties, may exercise all powers provided for under G.S. 120-19 of the General Statutes. The Legislative Services Commission may contract for professional, clerical, or consultant services to be provided to the Advisory Subcommittee, as provided by G.S. 120-32.02.

Section 9. Members of the Advisory Subcommittee shall receive per diem, subsistence, and travel allowance as provided in G.S. 138-5 and 138-6, as appropriate.

Section 10. The expenses of the Advisory Subcommittee shall be considered expenses incurred for the joint operation of the General Assembly. An initial allocation of $100,000 shall be provided to the Advisory Subcommittee from funds appropriated to the General Assembly.

Section 11. The Legislative Services Officer may assign professional and clerical staff to assist the Advisory Subcommittee in its work. The Director of Legislative Assistants of the House of Representatives and the Director of Legislative Assistants of the Senate shall assign clerical support staff to the Advisory Subcommittee.

Section 12. In addition to the required public hearings in North Carolina's coastal region, the Advisory Subcommittee may meet at various locations around the State in order to promote greater public participation in its deliberations. The Legislative Services Commission shall grant adequate meeting space to the Advisory Subcommittee in the State Legislative Building or the Legislative Office Building, subject to the availability of meeting space during the 2009 Regular Session.

Section 13. The Advisory Subcommittee may submit an interim report on the results of this study, including any proposed legislation, to the Legislative Research Commission (hereinafter "LRC") on or before May 15, 2009, by filing a copy of the report with the Cochairs of the LRC. The Advisory Subcommittee shall submit a final report on the results of this study, including any proposed legislation, to the LRC on or before the convening of the 2010 Regular Session of the 2009 General Assembly, by filing a copy of the report with the Cochairs of the LRC. The Advisory Subcommittee shall terminate upon the filing of its final report, or on the convening of the 2010 Regular Session of the 2009 General Assembly, whichever occurs first.

Effective this 11th day of February, 2009 and revised this 28th day of April, 2009.

Marc Basnight
President Pro Tempore of the Senate

Joe Hackney
Speaker of the House of Representatives

Revised April 28, 2009, amending the February 11, 2009 authorization to add section 3.1 and to extend the Subcommittee to the convening of the 2010 Regular Session of the 2009 General Assembly.

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SUBCOMMITTEE PROCEEDINGS

The Legislative Research Commission Advisory Subcommittee on Offshore Energy Exploration (Subcommittee) met three times: April 15, 2009, April 27, 2009 and May 13, 2009.

First Subcommittee Meeting

Agenda - April 15, 2009 – 10:00 AM
Jim Graham Building: Hall of Fame Room
Raleigh, North Carolina

I. Welcome/ Introductions
   Dr. Leutze, Co-Chair
   Dr. Rader, Co-Chair

   Subcommittee Members

II. Review of Authorization/ Approval of Subcommittee Budget

III. History of North Carolina Offshore Drilling
   Michael Lopazanski: Coastal & Ocean Policy Manager -NC Division of Coastal Management

IV. Resources off the Coast of North Carolina
   David Marin: Regional Supervisor for Resource Evaluation, Minerals Management Service

   James Coleman: Director, Eastern Energy Resources Science Center, USGS

V. Technologies for Offshore Drilling
   Michael Saucier: Regional Supervisor of Field Operations, Minerals Management Service

   Andy Radford: Senior Policy Advisor, American Petroleum Institute

VI. Offshore Habitats and Offshore Drilling
   Steve Ross: Research Associate Professor, UNC-W, Center for Marine Science

   Cindy L. Van Dover: Harvey W Smith Professor of Biological Oceanography, Nicholas School of the Environment, Duke University

VII. Other Business

VIII. Adjournment

The Subcommittee held its initial meeting on April 15, 2009 at the Jim Graham Building, NC State Fairgrounds in Raleigh, NC. After reviewing the Subcommittee authorization and charge, the Subcommittee heard from six speakers on the history of

offshore drilling in North Carolina; what sorts of resources are likely off the coast; the technologies associated with offshore drilling; offshore drilling and the marine world; and methane hydrates and their environment.

Mike Lopazanski, Coastal & Ocean Policy Manager, NC Division of Environment and Natural Resources (NC DENR), presented an overview of the history of offshore drilling in North Carolina. He also explained the consistency components and their implications on state and federal action. He talked about what resources might be found and the current prospects for offshore drilling due to the lifting of the presidential and congressional moratoria. He also said that the last official action of the State on the Manteo Plan of Exploration (POE) was a consistency challenge which was upheld by the US Department of Commerce. He also mentioned for historical reference that two other POE's were approved in the 1980's prior to the Manteo consistency challenge.

David Marin, Regional Supervisor for Resource Evaluation, Minerals Management Service (MMS), the bureau within the US Department of the Interior in charge of Outer Continental Shelf (OCS) leasing and management, made a presentation on what sorts of resources might be found off the coast of North Carolina. He described what role MMS played in evaluating the values of the leases and the procedure that companies have to go through to get permits to drill. He then talked about what kinds of resources might be off the coast of North Carolina and the prospects for funding them. Essentially he said we don't know for certain what resources there are, but because of similar formations off the coast of Canada and Africa, he believes the prospects are good.

James Coleman, Director, Eastern Energy Resources Science Center, U.S. Geological Survey (USGS), described what sorts of resources might be found off the nearshore portion of North Carolina's coast. He said that USGS was currently conducting an oil and gas resource assessment for onshore and state waters of the eastern United States. He told the Subcommittee that although there has been no commercial actual recovery accumulation of petroleum, the suggestion that there might be economic quantities, deserves investigation.

Michael Saucier, Regional Supervisor of Field Operations, U.S. Department of the Interior, Minerals Management Service (MMS), talked about the technologies used for offshore drilling. He first gave an overview of the technology currently used for offshore drilling and showed the Subcommittee the different types of oil rigs that are used. He then emphasized that these rigs were safe and can be moved out of the path of hurricanes. He then spoke about horizontal drilling and how with new technologies, they can drill up to one mile from the wellhead.

Andy Radford, Senior Policy Advisor, American Petroleum Institute, also made a presentation on technologies associated with offshore drilling. He explained how much technology has changed and how the new technology makes offshore drilling more efficient and environmentally friendly. He then talked about future advances in offshore drilling technology and how they will make drilling even safer and more cost effective.

Steve Ross, Research Associate Professor, Center for Marine Science, UNC-W, outlined the effects offshore drilling has on the marine world. He identified the major soft and hard bottom resources of concern in North Carolina and also discussed the deep sea coral habitats. He stated that there is an extensive and diverse amount of sea life off North

Carolina's coast due to the Gulf Stream and other major currents. He said that offshore energy exploration could irreparably damage these sensitive habitats.

Cindy Lee Van Dover, Harvey W. Smith Professor of Biological Oceanography, Nicholas School of the Environment, Duke University, explained Methane Hydrates and where they were formed. She defined methane hydrates as being gas molecules trapped in a crystal lattice of a water ice, with the methane being burnable and sometimes described as "ice that burns." She reported to the Subcommittee that methane hydrates are the largest reserve of organic carbon on the planet. She then talked about some of the characteristics of Blake Ridge, which is where a large reserve of methane hydrates is found off the coast of North Carolina. She concluded by talking about the conservation challenges, which included preserving the habitat of rare and undiscovered species. She told the Subcommittee that the deep sea community needed to start thinking about some of these conservation issues.

The Subcommittee agreed to have its next meeting in Morehead City and to receive public comments on their views of offshore drilling.

Second Subcommittee Meeting

Agenda - April 27, 2009 – 10:00 AM
Carteret Community College, McGee Building, Joselyn Hall
3505 Arendell Street, Morehead City, NC 28557

I. Welcome/ Opening Remarks
   Dr. Leutze, Co-Chair
   Dr. Rader, Co-Chair

II. Subcommittee Business

III. Natural Gas Needs for North Carolina
   Tom Moskitis: Managing Director, External Affairs, American Gas Association

IV. Wind Energy Options
   Bob Leker: Renewables Program Manager, NC Energy Office

V. Implications of Coastal Energy Production for Inshore/ Nearshore Ecosystems
   Charles (Pete) Peterson, Professor, UNC-CH, Institute of Marine Sciences

VI. Managing Inshore Impacts of Coastal Energy Production
   Anne Deaton, Head of the Division of Marine Fisheries' Habitat Protection Section

VII. Discussion: Social, Economic and Community issues related to Coastal Energy Production

VIII. Subcommittee Discussion on Interim Report

IX. Public Comment - [4:00PM – 6:00PM]

X. Other Business

XI. Adjournment

The Subcommittee held its second meeting on April 27, 2009 at Carteret Community College, Morehead City, NC. The Subcommittee heard from four speakers on the natural gas needs of North Carolina, an overview on offshore wind power, the implications of offshore energy has on the ecosystem, and managing inshore impacts for coastal energy production.

Tom Moskitis, Managing Director, External Affairs, American Gas Association, made a presentation on the natural gas needs of North Carolina. He began with a graph on the trends in natural gas prices and how it fits in with the energy needs of the nation. He then talked about the demands for natural gas and how, because of efficient ways of using it, natural gas was more environmentally friendly than oil. He presented graphics identifying where natural gas might be found.

Bob Leker, Renewables Program Manager, NC Energy Office, described wind energy potential off the North Carolina Coast. He started by showing maps on the wind potential off the North Carolina Coast. He then talked about the technology associated with wind power, including how wind turbines are mounted. . He next discussed the benefits of wind power and the permitting process to erect them. He then gave the Subcommittee some project areas that needed further study, including how wind turbines affect birds and aviation, as well as, its visual impact on the communities. He concluded his presentation by presenting some issues that wind power still faces, which range from the uncertainty of turbine siting and permitting to the operational impacts and how energy transmission would work.

Charles (Pete) Peterson, Professor, Institute of Marine Sciences, UNC-CH, gave a talk on the implications of coastal energy production on inshore ecosystems. He began by talking about his experience serving on the NC Environmental Review Science Panel of the US Department of the Interior. He then talked about the environmental impact of oil production around drilling platforms in the Gulf of Mexico. He concluded his talk by presenting his findings on the long-term effects of the Exxon-Valdez spill on shoreline ecology.

Anne Deaton, Head of the NC Division of Marine Fisheries' Habitat Protection Section, spoke on managing inshore impacts for coastal energy production. She started by saying North Carolina has a large and diverse coastal ecosystem with great economic value due to its abundance of resources and the potential impacts of offshore energy development, both onshore and offshore, may be significant. She then moved on to talk about North Carolina's management framework, including the laws and permits required; and the various State agencies that administer them. She concluded her presentation by showing pictures depicting the different facilities that would be needed to produce energy offshore.

The Subcommittee then discussed the types of potential socio-economic impacts of offshore energy exploration and development that need to be understood more fully in order for the Subcommittee to fulfill its charge, facilitated by Dr. Laura Taylor. Subsequent discussion focused on priorities for investigation during the remaining time available to the Subcommittee, and then on what would be in the interim report.

The meeting concluded with the Subcommittee taking public comment. There were a total of 12 people who provided the Subcommittee with statements on their views on offshore energy exploration, with the majority being opposed to drilling.

Third Subcommittee Meeting

Agenda - May, 13, 2009 – 3:00 PM
Auditorium, Legislative Building
16 W. Jones St., Raleigh, NC 27601

I. Welcome/ Opening Remarks
   Dr. Leutze, Co-Chair
   Dr. Rader, Co-Chair

II. Subcommittee Business

III. Discussion/ Adoption of Interim Report

IV. Other Business

V. Adjournment

The Subcommittee held its third meeting on May 13, 2009 in the Auditorium of the Legislative Building in Raleigh, NC. The Subcommittee met, by telephone conference, to approve the Interim Report.

INTERIM FINDINGS

Finding 1. Potentially significant energy resources exist offshore of North Carolina.

Although the best available data are limited and for the most part nearly thirty years old, it is likely that significant petroleum (oil and/or gas) resources may be located in federal Outer Continental Shelf (OCS) waters off North Carolina. Although available evidence suggests that gas is more likely, development of such resources typically involves both liquid and gaseous resources in some mix.

Exploration planning activities during the 1980s and 1990s focused on an area off "the Point" called the Manteo Unit, a Jurassic carbonate margin reef "play" (i.e. geological context) analogous to the producing Deep Panuke field located off Nova Scotia, Both Mobil and Chevron held active leases in the Manteo Unit and had submitted Plans of Exploration (POEs) to drill wildcat wells prior to the Congressional moratorium. In addition, Minerals Management Service (MMS), the bureau within the US Department of the Interior (DOI) that handles OCS leases, has identified two additional "plays" off the southern portion of North Carolina associated with the Carolina Trough Salt Basin (analogous to producing fields located off the west coast of Africa). Both of these areas lie in federal waters, considerably more than nine miles offshore.

Evidence for significant petroleum resources onshore in the coastal zone and in nearshore waters is limited, but continues to be examined by the US Geological Survey and the NC Geological Survey.

In addition, significant wind energy potential exists in both nearshore and offshore waters, especially north of Cape Hatteras. North Carolina is one of only a few states where, in theory, offshore wind development could produce a significant proportion of the State's energy needs.

Other potential energy sources at this point are speculative, pending further investigation. Methane hydrate/clathrate resources probably exist on the slope and rise, but their distribution and extent are unknown. Current information suggests limited exploitability as a potential energy resource.

Finding 2. Ongoing federal activities related to Outer Continental Shelf energy production may affect North Carolina.

Minerals Management Service's (MMS) Five-Year Lease Program consists of a schedule of oil and gas lease sales indicating the size, timing, and location of proposed leasing activity that the DOI determines will best meet national energy needs for the five year period following its approval. Leases are for terms of 5-10 years. MMS determines the fair market value of the lease, and each lease is subject federal consistency review by the affected state(s).

The current 2007-12 five year program includes authorization for a lease sale off the coast of Virginia in 2011.

Currently, MMS is preparing a possible new five year program that would run from 2010-15 and replace the current program for 2007-12. MMS initiated a new five year plan, due to increased energy costs and the lifting of the presidential and congressional moratoria on drilling in many offshore areas. The proposed lease off Virginia will also most likely be included in the 2010-15 five year plan.

The proposed expedited Five-Year Lease Plan (2010-2015) lists two regional lease sales in the Mid-Atlantic region occurring in 2012 and 2015. Although the Draft Proposed Program (2010-2015) refers to regional lease sales, it is not clear whether the format will be a Lease Nomination sale format (i.e., oil companies nominate blocks of interest and request that MMS put them up for auction) or an Area-Wide Leasing (i.e., sale design offers large areas such as the entire east coast and companies would bid on their tracts of interest) format. This likely will become clear as the proposal moves forward.

In addition, MMS licenses seismic surveys to private companies interested in exploring federal waters for potential energy resources. At present, there are considerable numbers of such seismic surveys pending permitting off North Carolina.

Administrative agencies of the State of North Carolina are engaged under existing authorities in commenting on these possible actions, and on information needed to judge prospective impacts of those actions. The commenting period for the proposed Five-Year Lease Plan (2010-2015) ends on September 21, 2009.

Finding 3. North Carolina has a significant opportunity to shape decisions in Outer Continental Shelf (OCS) waters off its coast, but more moderate opportunities to affect federal decisions related to OCS waters off adjacent states.

In the past, the State's consistency authority has been a major leverage point to protect the State's interests in OCS actions in federal waters. Recent clarification of this consistency authority in its application to OCS issues has made clear that North Carolina must make a detailed and compelling showing of prospective impact (as opposed to statements expressing general concerns). The threshold for such showing in OCS areas off neighboring states is even higher. The State may also make comments directly on other federal permits and actions.

North Carolina also has been heavily involved with fish habitat protection efforts, nearshore through the Coastal Habitat Protection Plan (CHPP, completed in December 2004 and currently undergoing revision), and offshore through federal essential fish habitats protection programs, both of which provide opportunities to shape federal decision making.

Finding 4. Existing revenue sharing programs related to federal offshore Outer Continental Shelf (OCS) resources do not allow for North Carolina to share OCS revenues directly.

At present, revenues generated from federal offshore resource developments are dedicated to federal general funds, with the express exception of the states listed in the Gulf of Mexico Security Act of 2006. In order for North Carolina to share directly in whatever OCS revenues might eventually be generated through exploration and development off North Carolina, congressional action would be necessary.

INTERIM RECOMMENDATIONS

Recommendation 1: Continue dialogue with federal agencies regarding ongoing Outer Continental Shelf activities

North Carolina should continue in early and direct engagement with federal planning and permitting processes related to energy exploration off North Carolina and in adjacent waters.

The Governor and General Assembly, along with the appropriate executive agencies, should make comments on the proposed Five-Year Lease Plan (2010-2015) which ends September 21, 2009.

The General Assembly should ensure that adequate resources are available to executive agencies in that regard.

Recommendation 2: Actively pursue Outer Continental Shelf revenue sharing options

The Governor and General Assembly should work with the North Carolina Congressional delegation to explore options for revenue sharing with the federal government. Existing legislation such as the Gulf of Mexico Energy Security Act (GOMESA) of 2006 provides a template for how this might be accomplished.

Recommendation 3: Continued evaluation of key issues through the start of the 2010 Regular Session of the 2009 General Assembly

The Advisory Subcommittee believes further investigation of the following high-priority issues is needed, and will proceed to evaluate them:

1. The federal revenue sharing framework and North Carolina's ability to ensure equitable treatment.
2. A rigorous assessment of potential offshore energy resources, including probable exploration, development and production scenarios.
3. Clarification of offshore and onshore infrastructure needed for each scenario, including where infrastructure is (or is not) likely to be located.
4. Assessment of likely environmental implications of each scenario, including direct, indirect and accumulative impacts.
5. Assessment of likely social and economic implications of each scenario.
6. Economic study or model showing the different tradeoffs.
7. Ability of local governments to offset environmental and socioeconomic impacts, caused by infrastructure development.
8. Authority of North Carolina in the leasing process, both here and in adjacent waters.
9. Better understanding of the major markets and where the product would go.
10. Local government zoning laws as they pertain to the infrastructure needed for offshore energy.
11. Costs for distribution networks after production.

APPENDIX

NC Experience with Offshore Oil Exploration and Outer Continental Shelf (OCS) Update

Mike Lopazanski – NC Division of Coastal Management
April 15, 2009

The NC Coastal Management Program

The Division of Coastal Management (DCM) is responsible for administering the NC Coastal Area Management Act (CAMA) and the NC Dredge and Fill Law. The NC Coastal Program was established under the federal Coastal Zone Management Act (CZMA) of 1972 which encouraged states to develop comprehensive planning and resource protection programs for their coastal areas. CAMA was enacted in 1974 to balance competing demands of protecting coastal resources while guiding and managing development in the 20 coastal counties

1) Establishes Coastal Resources Commission (CRC) to set policies and adopt regulations
2) Regulates development in Areas of Environmental Concern (AEC)
3) Requires local land use planning
4) and ensures consistency between state and federal actions.

The NC Coastal Programs is made up of the administrative rules and policies of the CRC as well as local land use plans. The actions of other NC state agencies are also to be consistent with the NC Coastal Program. This is in accordance with Executive Order 15 issued by Governor Hunt.

Federal Consistency

Consistency is a powerful tool made available to the states under the federal CZMA. Not only can consistency be used for local permit decisions but also allows the state to comment on a federal action or permit under the federal consistency provisions. Activities of the Federal government as well federally licensed activities must be consistent to the greatest extent practicable with the state's coastal program. After a coordinated state review, DCM issues either a consistency concurrence or denial (denials can be appealed to the US Secretary of Commerce). The Division of Coastal Management reviews projects associated with a federal activity such as beach nourishment or dredging by the Army corps of Engineers or an activity that requires a federal permit such as offshore oil and gas drilling.

The Role of North Carolina in OCS Decisions

When it comes to offshore energy development, the State has the ability to comment on the project under several authorities - the federal Outer Continental Shelf Lands Act (OCSLA), the NC CAMA and the administrative rules of the CRC. The OCS Lands Act outlines the provisions under which the Governor comments on a POE. The CAMA and the NC Coastal Program provide the authority for making consistency determinations. The CRC's administrative rules (15A NCAC 7M .0400 Coastal Energy Policies) outline the information needs and issues of importance in making the consistency determination under the Federal Coastal Zone Management Act (CZMA). The CZMA gives states the authority to review federal activities, licenses and permits that have reasonably foreseeable effects on any land or water use or natural resources of the coastal zone. This authority is known as a consistency determination. Federal activities must be consistent to the *maximum extent practicable* with the enforceable policies of a coastal state's federally approved coastal management program. North Carolina may review the following stages of oil and gas development under the consistency authority:

1) Development of MMS-5 Year Plan;

2) Lease sale: the "bulk" lease sale that allows companies to bid for particular lease areas;
3) Plan of exploration: the plan of how a company will explore in order to determine if they will develop their lease site;
4) Plan of development and production: this lays out the plan for producing oil or gas from the lease site; and
5) Decommissioning: (federal consistency review may be required, but not in all cases) there is likely to be a review at this stage, especially if the rig is decommissioned as part of a Rigs-To-Reef Program. However, decommissioning might also be included in the Plan of Development and Production in which case those activities are reviewed/approved under 4.

Mobil

The State used the federal consistency provisions of the CZMA to review and comment on Mobil's proposal to drill an exploratory well in the late 1980's. Mobil proposed to drill an exploratory well in block 467 of the Manteo Block. The State found the Plan of Exploration (POE) inconsistent due to inadequate information. Mobil appealed the consistency decision which was upheld by the US Department of Commerce. In 1990, Congress passed the Outer Banks Protection Act which blocked exploration activities off the coast of NC. Mobil sued the federal government for breach of contract, initially losing the lawsuit but wining on appeal to the US Supreme Court in 2000. As a result of winning, Mobil was required to relinquish its leases in the Manteo Lease Block.

Chevron

The State was also prepared to review an OCS exploration proposal when Chevron announced its plans to dill. Chevron engaged the state in discussions much earlier than Mobil had, entering into discussions with the State in 1997 although they were not planning submitting a POE to MMS until 1999. It should be noted that the State did issued a favorable consistency determination for a Chevron proposal on Block 510 in 1982. However, MMS informed Chevron that a new determination would be necessary in light of new scientific information, changes in drilling technology and changes to the State's energy policies. By engaging the State at an early phase, it's likely that Chevron was trying to avoid the controversy faced by Mobil and was also interested in providing some of the information that was lacking from Mobil's proposal. The State's inconsistency determination in Mobil's case was largely based on a lack of complete information.

The experience with Mobil had set some changes in motion (an ocean policy analysis by the Division of Coastal Management) that led the State to be better prepared for the OCS proposal from Chevron. Chevron proposed to drill in Lease Block 467 or 510 in September 1997. A POE was to be submitted in 1999 with plans for an exploratory well in 2000. The State formed an OCS Advisory Committee and a Technical Review Team to focus on the missing information from the Mobil proposal (socio economic impacts, economic importance of "The Point" area, recreational fisheries, larval fish impacts and hydrocarbon monitoring).

The ocean policy analysis undertaken by DCM in the mid-1990's led to a strengthening of the CRC's Coastal Energy Policies. The amendments added "drillships" and "onshore support facilities" to the definition of energy facilities and specified areas that must be avoided when siting energy facilities. Because of the potential action by Chevron, these amendments were enacted by Governor Hunt through an Executive Order. Since a lack of complete information was the basis of the consistency denial, The MMS funded a Technical Workshop in 1998 to identify data gaps and needs in the review of a POE for the NC coast. The MMS also funded several studies, largely based on the workshop, to

better define the importance of the "The Point" area offshore. It was also during this period that the unleased areas of the Atlantic OCS fell under a moratorium through Presidential action. The effect of the President's Executive Order was to remove all unleased areas of the Atlantic OCS from consideration until 2012. With declining oil prices of the late 1990's, and the resolution of the law suit between Mobil and the federal government, all the oil companies eventually relinquished their leases offshore NC.

"The Point"

The focus of attention has been on what's known as the Manteo Unit or lease blocks approximately 40 miles off the coast of NC. There are 21 Blocks in the Manteo Unit, each about 9 square miles in size. Mobil held a lease on Block 467 while Chevron held a lease on block 510. The proposed drill sites in both Blocks were about a mile apart. The area of interest to the oil companies is about 40 miles offshore in 2,200 feet of water. It is a Late Jurassic - Early Cretaceous shelf-edge carbonate reef located 11,000 – 15,000 below the seafloor. The reef structure has the potential for storing hydrocarbons. According to industry estimates, the area has the potential to hold five to six trillion $ft^{3\ of}$ natural gas and could be one of the largest domestic discoveries.

Recent Activities

Renewed interest in the OCS areas of the east and west coast began in 2005. As you will recall in the aftermath of Hurricane Katrina, the nation experienced a dramatic spike in energy prices. However, there was interest in opening these areas that manifested itself in the Energy Policy Act of 2005. While there were no calls for drilling, there were provisions for conducting an inventory of oil and gas reserves. MMS also received authorization to lease the OCS area for alternative energy production much as they do for oil and gas. During the intervening years we saw numerous attempts at legislation which all had varying schemes for royalty sharing and state options for participation in energy production but the one thing they had in common was the lifting of moratoriums.

Federal Moratoriums

The first federal ban related to OCS activities came in 1982 with a Congressional moratorium on pre-leasing activities in CA waters. Due largely to a spill from an oil platform off the coast of Santa Barbara in1969, California was the first state to have its coastal waters come under a ban on leasing activities by the MMS for oil and gas exploration and development. By the 1980's oil and gas drilling began appearing as a ballot issue in California with many coastal communities passing zoning ordinances that prohibited the onshore support facilities for drilling operations. These ballot issues culminated in the State enacting a permanent ban on drilling in California waters not already covered by existing leases. This pre-leasing ban was extended to the North Atlantic in 1983 and precluded MMS from including unleased areas in their 5-Year Leasing Programs. In 1990, President Bush signed an Executive Order banning all leasing activities covered by the legislative ban until 2000. 1990 also saw the OBX Protection Act, which specifically prohibited leasing activities in the NC OCS area. This legislation was in response to the POE submitted by Mobile in 1989 and was later repealed. Finally, President Clinton extended the Presidential Moratorium to 2012 and with existing leasing in the Atlantic expiring, resulted in a ban of all activities on the east coast.

End of the Ban

These bans came under increased scrutiny during the summer of 2008 when gas prices reached $4 per gallon and there were calls for increasing domestic production. President Bush lifted the executive order in June 2008 and at the same time, directed the MMS to begin a new 5-Year Lease Program that would include areas formerly under a moratorium. The Congressional ban remained in place but needed to be renewed annually, usually in the Department of Interior appropriations bill. Despite a flurry of legislative proposals, the ban on leasing activities was allowed to expire on September 30, 2008. The lapse of the Congressional ban did not affect moratorium in the Gulf of Mexico that prevents leasing activities within 100 miles of the FL coast as part of the Gulf of Mexico Energy Security Act until 2022.

Five Year Lease Program

A 5-Year Lease Program consists of a schedule of oil and gas lease sales indicating the size, timing and location of proposed leasing activity the DOI determines will best meet national energy needs for the five year period following its approval. Leases are for terms of 5-10 years, the MMS determines the fair market value of the lease and each lease is subject federal consistency review by the affected state. Lease Program development begins with a Request for Information from MMS through development of Draft Program and draft environmental documents. With the required comment periods and likelihood of extended comment periods, it takes MMS about 1.5 – 2.5 years to finalize a 5-Year Lease Program for a particular area

What's Going On Now

The current 5-Year Lease Program runs from July 2007 to June 2012 and since it was developed under the moratoriums, does not include areas under the ban. The State provided comments during program development citing concerns about fisheries and potential impacts to tourism. At the request of the State of VA, this Program included a special lease sale off the VA coast. Governor Easley objected to the inclusion of this area primarily due to it proximity to the State, 25 miles north of the border. Objections were also made since it included an area that was currently under moratorium and NC was supporting continuation of the moratorium.

Virginia Lease Sale

The MMS has also started the process to move forward with the lease sale off the VA coast by publishing a Notice of Intent (NOI) and Request For Information (RFI) on November 13, 2008. This is the first comment period associated with Lease Sale 220 and deadline for submitting comments was January 13, 2009. NC has submitted comments at this stage, however, the State will need to establish a clear nexus that this proposed activity will have a direct impact upon the coastal resources of the State in order to comment on the actual sale.

New 5-Year Lease Program

Last summer, MMS was directed to begin development of a new 5-Year Lease Program that could take effect in 2010. The intent was to give the new administration a 2-year head start should the decision be made to move forward with expanding energy production to areas formerly under moratoria. MMS cites the effects of recent hurricanes as an example of how the nation relies from a too limited area for energy production. NC has commented on this proposal, again citing concerns for fisheries impacts, tourism and that it does not address the nation's continued dependency on fossil fuels.

Latest Actions

The Department of the Interior (DOI) has made several announcements relative to the new proposed program, including extending the comment period 180 days to Sept 21, 2009; directing MMS to all know information on offshore energy sources; and has held several meetings to solicit public input. In addition to the VA Lease Sale, it is expected that there will be two additional lease sales in the Mid-Atlantic Planning Area in 2012 and 2015. The MMS has also requested comments to evaluate potential environmental effects of multiple Geological & Geophysical (G&G) activities on the Atlantic OCS. These comments will be used to develop a programmatic Environmental Impact Statement (EIS) for multiple seismic studies required as a prelude to any offshore exploration activities. The Division of Coastal Management has submitted technical comments concerning the potential impacts to hard bottom areas and deep water corals as well as sublethal behavioral changes on the part of the fisheries in response to the seismic studies.

Congress will also need to revisit issues such as what areas should remain outside of energy production activities such as National Marine Sanctuaries and changes to royalty provisions as there currently no provisions for royalty sharing beyond three miles. There has been Congressional interest in reviewing the DOI Royalty Collection Program as well. The State will therefore need to remain involved in the process and take advantage of all the opportunities to provide our perspective as things develop.

Resource Methodology and Potential Offshore North Carolina

By David A. Marin, Regional Supervisor for Resource Evaluation, Gulf of Mexico Region, Minerals Management Service, New Orleans, LA 70123

Minerals Management Service (MMS) is currently conducting an oil and gas resource assessment study of the Atlantic Outer Continental Shelf (OCS). The study is in its initial stages and the results will be released in a few months. Resource assessments are performed by the MMS at various scales and for many purposes. Regional assessments may be prepared simply to develop an inventory of potential oil and natural gas resources as part of an evaluation of future supply options. Assessments may be undertaken to analyze the relative merits of oil and gas development proposals and alternatives versus other competing uses. Resource estimates provide critical input to decision makers regarding the virtues of various policy alternatives. Detailed site-specific assessments provide data essential for valuing Federal lands prior to leasing or analyzing industry exploration or development proposals.

Large corporations and financial institutions use resource estimates for long-term planning, the analysis of investment options and as a guide in analyzing the future health of the oil and gas industry. Exploration companies use resource assessments to design exploration strategies and target expenditures. Increasingly, resource estimates are being used by the Administration, Congress, and the public to provide objective statements of how much oil and natural gas will be available for future domestic consumption. We are updating our play descriptions and numbers to reflect our current knowledge of the Atlantic OCS and to provide policy makers the best available information for future programs. New data and information from the Canadian Atlantic Margin and from West Africa, as well as further analysis of digitized Atlantic OCS seismic have significantly added to our knowledge of the Atlantic OCS.

APPENDIX

One of the primary functions of MMS geoscientists is to evaluate each OCS block (3 by 3 miles) to ensure fair market value is received when they are leased. In order to achieve this, the geoscientists interpret 2-D and 3-D seismic data to create subsurface maps showing geologic structure, reservoir thickness, and amplitude anomalies. These subsurface maps along with well results and other analog geologic and engineering analyses are used to locate and characterize potential oil and gas accumulation.

Well and seismic data acquired in the Atlantic OCS Region were a direct consequence of the Department of Interior's oil and gas leasing program. There were 10 OCS oil and gas lease sales held in the Atlantic OCS Region from 1959 through 1983. As a result of these sales 433 OCS blocks were leased and over $2.99 billion dollars in high bids were collected by the U.S. Government.

More than 238,000 line-miles of 2-D seismic were acquired by the oil and gas industry. These data are distributed across most of the Atlantic OCS Region and 51 wells were drilled. Currently there are no active leases in the Atlantic OCS Region.

Fifty-one wells were drilled in the Atlantic OCS Region between 1975 and 1984, including five Continental Offshore Stratigraphic Test (COST) wells, and 46 industry drilled oil and gas exploratory wells. COST, or deep stratigraphic test wells were drilled to determine the geological character or stratigraphy of rock strata. These wells, which may be more than 20,000 feet deep, provide information that can be used by Government and industry to evaluate tracts to be offered in a lease sale.

The wells are clustered in three areas that were thought to have high potential for oil and gas accumulations to exist: off Massachusetts, off New Jersey, Delaware and Maryland, and off Georgia. Most of the exploratory wells were considered unsuccessful, but five wells drilled offshore New Jersey had successful flow tests of natural gas and/or condensate. In addition, three other wells in this area discovered hydrocarbons in the same formations but were not tested. This discovered accumulation was ultimately thought to be of non-commercial size, given the technology and commodity prices at the time.

More than 238,000 line-miles of 2-D seismic data were acquired in the Atlantic OCS between 1966 and 1988. In 1976, the government began requiring permits to acquire geophysical data on the OCS. By the terms of these permits, MMS has the right to inspect all OCS seismic and other geophysical and geological data and to acquire any or all of the data for the cost of reproduction. MMS purchased almost 60% of the available seismic data, or 147,000 line-miles. These regulations also require that geophysical data acquired under OCS permits be released to the public 25 years after the date that the particular permit was issued.

Before 1976, the MMS Atlantic OCS seismic database was limited because industry had shown very little interest in leasing this frontier area, although industry had been acquiring geophysical data. During the period 1976 to 1984, the MMS not only acquired most of the industry permit data, but also purchased much of the pre-1976 data. Since 1985, there has been little activity, reflecting both a decrease in industry interest and Congressional and Executive Branch leasing prohibitions. In recent years MMS has also purchased, at market prices, about 23,000 line-miles of relevant seismic data from nearby oil and gas exploration and development projects offshore Nova Scotia and Newfoundland, Canada.

All existing Atlantic OCS seismic data are 2-D and most of it was not available to MMS in digital format that can be analyzed on computer workstations. Data quality ranges from fair to good, and line

spacing ranges between ½ and 2 miles over much of the area, but is sparse to non-existent at distance greater than 100 to 150 miles from shore. The existing seismic data are suitable for regional scale evaluation of large-scale structures, but are not suitable for detailed post-lease prospecting required for Fair Market Value determinations, or to aid in development of oil and gas fields. For these purposes industry (and MMS) in today's market relies on 3-D seismic data. Consequently new digital 3-D data will be needed when Atlantic OCS oil and gas activities resume. The use of modern 3-D data allows us to delineate the subsurface geologic conditions associated with the occurrence of oil and gas in greater detail than could be done with existing 2-D data.

Estimates of undiscovered recoverable resources are presented in two categories, undiscovered technically recoverable resources (UTRR) and undiscovered economically recoverable resources (UERR). The 2006 Resource Assessment estimated UTRR in the Atlantic OCS as 3.82 Billion barrels (Bbbl) of oil and 36.99 Trillion cubic feet (Tcf) of gas. Estimates of UERR are 2.23 Bbbl of oil and 13.70 Tcf of gas.

In the Mid-Atlantic Planning Area, the UTRR estimates are 1.50 Bbbl oil and 15.13 Tcf gas and the UERR estimates are .81 Bbbls of oil and 5.12 Tcf of gas. The administrative boundaries and the play maps would suggest North Carolina to hold most of these resources. Additional evaluation work maintains the area offshore North Carolina as one of the most prospective locations in the Atlantic OCS.

The prospective OCS area offshore North Carolina is one of the largest in the U.S. Atlantic. Hydrocarbon prospectivity could exist on the relatively shallow water shelf, extending into water depths greater than 10,000 feet. Earlier leasing in the near shore segment generated considerable industry interest. Industry plans to drill a prospect, referred to as "Manteo", were submitted with estimates as high as 14 Tcf associated with the structure. Opposition eventually resulted in the government buying back these leases.

Although no wells have been drilled in the North Carolina OCS, available geological and geophysical data and productive analogs permit reasonable speculations about the oil and gas prospectivity of the area. Moving from shallow to deep water, these are summarized below.

1) The shallow-water shelf of the North Carolina OCS contains the shoreward part of the Carolina Trough salt basin. Because salt provides an important mechanism to form structures that could trap oil and gas, the presence of this salt basin significantly enhances the prospectivity of the North Carolina OCS. In similar settings, production has been established in onshore areas of the Gulf of Mexico.

2) The central part of the North Carolina OCS may be prospective for hydrocarbons if trapping styles similar to those encountered in a 1999 natural gas discovery over 1,000 miles away offshore Nova Scotia can be identified.

3) The deeper water part of the Carolina Trough salt basin could host "plays" similar to those found productive by exploratory drilling since 2001 in the West African salt basin conjugate to the Carolina Trough salt basin.

APPENDIX

Status of Investigations into the Oil and Gas Resource Potential of the Onshore Lands and State Waters of North Carolina

by James L. Coleman, Eastern Energy Resources Science Center, U. S. Geological Survey, Reston, VA 20192

The U. S. Geological Survey (USGS) is currently conducting an oil and gas resource assessment study of the Mesozoic basins located in the onshore area and state waters of the eastern United States. For this effort, the state waters are those water bodies within the geographic boundaries of a state plus those coastal waters out to the State – Federal management boundary. In the case of North Carolina, this boundary is three miles offshore. This study is part of the long term National Oil and Gas Assessment (NOGA) project of the USGS (http://energy.cr.usgs.gov/oilgas/noga/) to assess the oil and natural gas endowment and the reserve growth potential of the United States, exclusive of Federal waters.

USGS scientists working on the NOGA project examine the occurrence of oil and natural gas in sedimentary basins in the United States. They seek to identify the source rocks for the oil and gas in a basin and the relation between those source rocks and reservoir intervals in known and potential productive fields. Based on the history of oil and gas discovery and production within a basin, the NOGA project scientists estimate the number and size of yet-to-be-discovered, technically-recoverable resource accumulations. These estimations are presented as a range of possible values and are expressed as 5%, 50% (in essence, most likely), and 95% probability values. The NOGA project scientists identify the total petroleum system (or systems)(TPS), which includes all of the genetically related petroleum (both discovered and undiscovered) generated by a source rock, along with the associated reservoir rocks, sealing intervals, and overburden. By incorporating these geological elements in a limited, but mappable, geologic volume, the essential geologic processes of generation, expulsion, migration, entrapment, and preservation of petroleum are associated in time and space (Charpentier and others, 2001).

Within petroleum systems there are one or more assessment units (AU's), which are mappable volumes of rock that encompass the petroleum fluids, reservoirs, and sealing intervals that make up existing and potential future fields. Assessment units are classified as "conventional" (those accumulations that have a readily identifiable hydrocarbon-water contact) or "continuous" (those accumulations that do not have a readily identifiable hydrocarbon-water contact). Conventional accumulations are those types of accumulations with relatively high porosity and permeability and an identifiable structural, stratigraphic, or combination trap geometry. Continuous accumulations are those types of accumulations with relatively low porosity and permeability and a trap geometry that is difficult to identify. Continuous types of accumulations occur in coal bed methane, shale gas, and tight gas sandstone play types (Schmoker, 1999; Schmoker and Klett, 1999). For national consistency, a minimum accumulation size is set at 0.5 million barrels of oil or 3 billion cubic feet of gas. NOGA project scientists may classify an assessment unit as "hypothetical" if they believe that all of the essential elements of an effective petroleum system may be present, but there are no data to demonstrate clearly that one or more technically-recoverable accumulations above minimum size exist. In this instance, the assessment unit is identified, but no resource volumes are estimated.

The USGS is using these principles to assess the oil and gas resource potential of North Carolina. North Carolina lies within the Blue Ridge, Piedmont, and Atlantic Coastal Plain provinces of the eastern United States. Within the Piedmont and Coastal Plain provinces, narrow Mesozoic rift basins

are known to contain elements of a potential petroleum system. These rift basins are present both as exposed features within the Piedmont province and as buried features beneath the Atlantic Coastal Plain. Over the past decades, research by the USGS, the North Carolina Geological Survey, and several petroleum industry companies have found shows of oil and natural gas in wells and outcrop samples in the exposed rift basins of North Carolina. The USGS and North Carolina Geological Survey continue to study these basins, both in outcrop and boreholes, to understand better the potential extent of any petroleum accumulation (Reid and Milici, 2008; Reid and Taylor, 2008). Research on the buried rift basins has proceeded more slowly, because individual boreholes are needed to sample the target subsurface intervals for possible shows of oil or gas. Examination of previously drilled industry boreholes has yielded some valuable information, yet discovery of previously unknown basins by recent drilling is not uncommon. This is evidenced by the recent discovery of a buried rift basin in Bertie Co., NC, in 2004 (Weems and others, 2007).

The trend of these Mesozoic rift basins runs primarily across eastern North Carolina in a generally SW – NE direction (Figure 1). Beneath these basins are metamorphic and

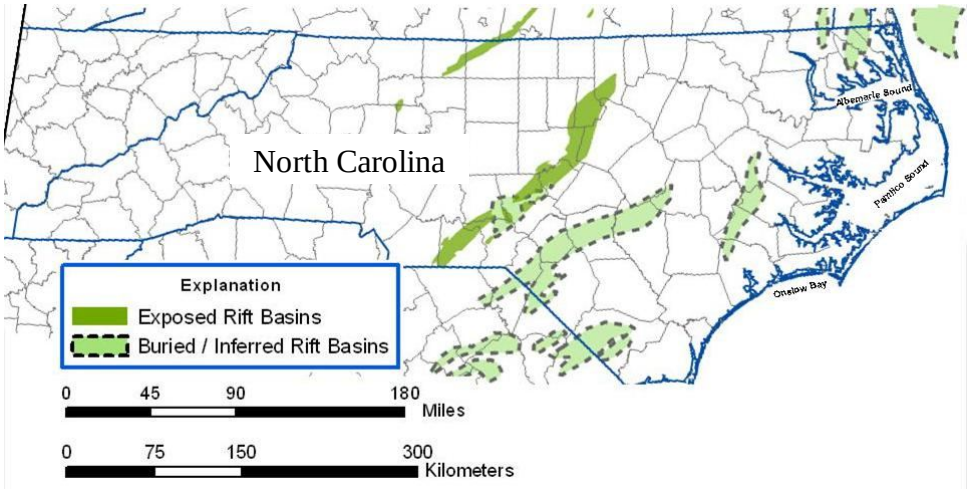

Figure 1. Trend of Mesozoic rift basins in North Carolina (simplified from Benson, 1992; Horton and others, 1991; and Zietz and others, 1984)

igneous rocks that formed during the mountain building events, which formed the Appalachian Mountains. Although some of these rift basins are present offshore of the Atlantic coastline, most are located onshore. Of significance to possible accumulations in state waters, the trend appears to bypass the wetlands, rivers, and bays of Pamlico and Albemarle Sounds and Onslow Bay (Figure 1).

This zone of apparent bypass has been delineated by many wells and some seismic profiling. 120 of the 129 oil and gas exploration wells drilled in North Carolina were drilled within the coastal plain and bays of eastern North Carolina. Of these 120 coastal plain wells, all but one failed to drill through the entire sedimentary section and tag metamorphic or igneous basement at the end of drilling. Only nine of these wells reported shows of oil or natural gas. None were completed as commercial producers.

The relatively paucity of oil and gas shows in eastern North Carolina can possibly be explained by the apparent absence of an effective source rock interval within the drilled, sedimentary section. A petroleum source rock may be present, however, to the east and southeast (offshore), but the migration

pathways necessary to charge reservoirs beneath the coastal plain from these potential, deeper source rocks were probably not present at the time of a hypothetical phase of petroleum generation and migration.

Although no commercial accumulations of petroleum have been found to date under the coastal plain and state waters, the suggestion that there might be economic quantities of oil or natural gas present in the eastern part of the state in the vicinity of the nine wells that reported shows deserves an investigation. If it can be determined that the oil and gas shows are valid reports, then the ongoing study will seek to explain the origin of these shows.

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Drilling Technology

Presented to the
North Carolina Subcommittee on Ocean Energy Exploration
April 15, 2009

By
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Over the years drilling technology has greatly improved. We have moved from drilling with bottom supported drilling rigs in just a few feet of water to drilling with large semi-submersible and drill ship units operating in water depths in excess of 10,000 feet. Deepwater drilling rigs have moved from anchored systems to Dynamically Positioned (DP) using Global Positioning Systems (GPS) in which no anchor is needed. The GPS system is capable of holding the drilling unit within 2 to 4 feet of its intended location. These systems are usually DP 2 or DP 3 systems. This means that there are either 2 or 3 independent GPS systems on board that have to agree on position. If any one of the systems disagrees, a warning is initiated to verify the location. Dynamically positioned drilling units avoid bottom disturbances that would occur if they were using anchors. This type of system is advantageous in areas where there are environmentally sensitive resources.

When it comes to the operation of the drilling rig, technological advances have been many. On the rig floor, for example, in lieu of having people handling equipment to screw pipe together industry now has the Iron Roughneck. This piece of mechanized equipment can grip hold of both pieces of pipe and screw them together with preset torque without anyone having to be near the operation. Stabberless systems remove the need for a person to be in the derrick to help align pipe. The drill floors of modern rigs are much safer than those of rigs without the rig floor mechanization.

As we proceed into the actual drilling, one of the most important pieces of equipment is the Blowout Preventer (BOP) Stack and system. This piece of equipment is used to ensure, in the unlikely event the operator would have well control problems, the well remains under control. The BOP generally consists of an annular preventer, pipe rams and blind/shear rams. The annular preventer is usually the first preventer to be used and the internal element expands around the drill pipe. The rig can still move pipe through the annular preventer. The pipe rams seal tightly around the drill pipe. Both the annular and ram preventers prevent fluids from flowing on the outside of the drill pipe. The blind/shear ram completely closes the well. If the drill pipe is in the well, the shear ram can completely shear the pipe and seal the well. For bottom supported rigs, the BOP stack is on the surface and called a surface stack. For floating rigs, the BOP stack is on the sea floor and called a subsea stack.

Many wells are not drilled vertically, but are offset from the surface location. These wells are called directional wells. Directionally drilled wells allow multiple wells from one surface location. One well can penetrate multiple reservoirs by drilling directionally. They can also contact more reservoir surface area. A major advantage of a directional well is that one can drill under sensitive environmental

seafloor areas from a surface location far away from the area of concern. The largest offset from the surface location to the bottom hole location is 26,000 feet.

Another technology that has greatly improved the drilling of wells is measurement while drilling (MWD) tools. These tools are located on the drill pipe within 50 feet of the bit and gives the driller instant downhole information. These tools measure directional information, bottom hole pressure, bottom hole temperature, formation properties, pipe torque, etc. This greatly improves well control, as one knows downhole data, real time.

Subsea tiebacks are an important part of deepwater development. Many wells can be drilled from multiple locations and the production from those wells can be tied back to one surface facility. In the Gulf of Mexico (GOM) this is a common field development plan. The longest gas well tieback in the GOM is 62 miles and the longest oil well tieback in the GOM is 29 miles.

During the initial exploratory drilling phase there needs to be some onshore support. There will need to be port facilities for supply vessels to use to bring out supplies and personnel. There also would be a need for helicopter bases to transport personnel to the rigs. In the GOM there are bases along the Louisiana and Texas coast for these purposes. Additionally approximately 42,000 people work offshore in the GOM, in addition to the thousands for onshore support. Depending what the exploratory wells uncover, development of offshore oil and gas could lead to onshore infrastructure expansion to pipeline facilities, fabrication yards, shipyards, etc.

In summary, the industry has the technology to safely explore the Outer Continental Shelf (OCS) in a safe and pollution free manner. In doing so, the OCS can help supply the nation with domestic oil and gas resources. For the State of North Carolina jobs and industries would be created to help stimulate the economy.

Andy Radford, American Petroleum Institute

Importance of Increased Domestic Production

Although the share of non-fossil fuels is growing rapidly, fossil fuels – oil, natural gas and coal – will continue to play leading roles through 2030. The U.S. Energy Information Administration (EIA) forecasts U.S. energy demand will grow by 11 percent between 2007 and 2030, with more than half of the energy demand expected to be met by oil and natural gas, as is the case today. Increasing access to domestic sources of oil and natural gas would create new high paying jobs, bring billions of dollars to federal and state treasuries, reduce our balance of payments and enhance America's energy security.

With energy consumption expected to grow in the coming decades, America needs access to its untapped domestic resources. These resources can replace output from maturing fields and strengthen our energy security. According to the U.S. Minerals Management Service (MMS), the Atlantic and Pacific Outer Continental Shelf (OCS) that had been subject to moratoria contain an estimated 14.3 billion barrels of oil and 55 trillion cubic feet of natural gas. All areas of the OCS should be available without buffer zones, since these areas can be developed in an environmentally safe manner with a minimal impact on coastal communities. Advances in drilling and production technology have allowed the industry to develop fields close to existing infrastructure without the installation of additional platforms. In some cases production is transported directly to shore without the need for a production platform.

APPENDIX

Production of oil and natural gas on federal lands has brought billions of dollars of revenue into federal and state treasuries. These royalties are one of the largest sources of income to the federal government. According to the Department of the Interior, in fiscal year 2008, the agency distributed a record $23.4 billion to the federal government, states and American Indian tribes from onshore and offshore energy production. Nearly $22 billion of that amount came from oil and natural gas production. A part of this revenue included $10 billion in bonus bids paid by companies to lease tracts for offshore energy exploration on the Outer Continental Shelf in the Gulf of Mexico and Alaska. A total of 35 states received $2.6 billion from these revenues. According to an ICF International study commissioned by API, developing America's vast domestic oil and natural gas resources that were kept off-limits by Congress for decades could generate more than $1.7 trillion in government revenue, including $1.3 trillion in revenues from offshore development alone. These revenues would be earned over the life of the resource. Increased federal leasing could bring additional high paying jobs to Americans. Our industry directly employs 1.8 million Americans, with another four million jobs supported by the industry. Oil and natural gas industry exploration and production wages in 2006 were more than double the national average. New manufacturing jobs would be created to develop and install the infrastructure to bring new resources to market. Local employment also would benefit with the addition of construction jobs as well as service and support positions.

Environmental Protection and Technology

Protecting the environment is a national imperative and oil and natural gas operations have established an impressive record of protecting our coastal waters. The roughly 3,800 oil and natural gas platforms operating in U.S. waters have an outstanding safety and environmental record. U.S. offshore exploration and production are among the most heavily regulated activities in this country and meet some of the world's most stringent government regulations and industry standards. Offshore operators operate under 17 major permits and must follow 90 sets of federal regulations. The U.S. oil and gas industry has integrated an environmental ethic into its business culture and operations. The industry has come to recognize that high environmental standards and responsible development are good business, and it is demonstrating its commitment to protecting the environment in research and technology investments, policies and practices, and participation in a host of voluntary environmental protection programs. Industry's use of smarter, more efficient technology complements these trends.

Continuous innovation has characterized the oil and gas industry throughout its history. In recent decades, new technologies have been key to finding and extracting recoverable oil and gas resources – located in more challenging geologic formations, in smaller pockets, and in deeper waters far out at sea. Hand-in-hand with overcoming tough geologic and geographic conditions, the industry has also developed new technology and management techniques for enhanced protection of our environment. Today's exploration technology, for example, is boosting industry success rates in discovering new resources. The results: fewer dry holes, reduced waste volumes, and less environmental disruption. Across the E&P spectrum, new cutting-edge technology is delivering.

Well control technology has several key elements, beginning with the design of the well "casing", lengths of pipe that are cemented to the surrounding rock, and set to depths below the surface depending upon a conservative forecast of the subsurface pressures expected to be encountered in the well. Downhole pressures are managed during drilling by circulating a material called "drilling mud" through wellbore. Drilling muds have various properties, but in terms of well control, their primary purpose is to provide a constant fluid weight to offset pressures and fluids (oil, gas condensate or formation water) encountered downhole. Blowout preventers (BOPs) are installed at the wellhead to control pressures in the annular space between the casing and the drill pipe (or tubing) during drilling, completion of the well, and certain workover operations. Some BOPs can close over an open wellbore. Some are designed to seal around tubular components in the well (drill pipe, casing or tubing) and

others are fitted with hardened steel shearing surfaces that can actually cut through drill pipe. The ability in real time to monitor and measure temperatures, pressures and other conditions occurring downhole where the drill bit is advancing is another area of continuous improvement in technology and operational performance.

Following are additional technologies that aid in safe and environmentally sound operations:

- **Subsurface Safety Valves -** Platforms use sophisticated high-pressure valves that close automatically to prevent oil spills when sensors detect an unusual event.
- **Seismic and Remote Sensing technology -** Improvements in 3-D seismic and 4-D time-lapse visualization, remote sensing, and other exploration technology allow companies to target higher-quality prospects and to improve success rates by as much as 50% or more. The result: fewer wells need to be drilled to find a given target and production per well is increased. Also, shallow hazard surveys allow companies to identify and develop contingency plans for shallow pockets of high pressure gas that might be encountered during drilling operations.
- **Directional drilling -** These techniques enable producers to reach reservoirs that are not located directly beneath the drilling rig, a capability that is particularly useful for offshore development and results in the need for fewer platforms.
- **Subsea Completion Equipment -** By completing a well on the sea floor and tying it back to a host platform or directly to shore, industry has eliminated the need for platform to drain very pocket of oil and gas discovered.

Oil Spill Prevention and Preparedness

Oil spill prevention and preparedness are key elements of industry's successful performance. Well planning and engineering, drilling practices and standards, the design of offshore rigs and other facilities, and the training of personnel help achieve spill prevention. Owners or operators of offshore facilities are responsible under federal regulations for properly instructing their personnel in the operation and maintenance of equipment to prevent spills. Operators conduct spill prevention briefings for their personnel at frequent intervals. MMS requires all offshore operators to have under contract the capability to remove a worst case discharge of oil that may occur. Spill plans also require that operators address the risk of small spills from the offshore operations such as those from fuels and lubricants. All sources of small spills on offshore platforms are designed to catch the oil before it can enter the water.

MMS conducts approximately 20 drills each year that involve both tabletop exercises and deployment of equipment. Each drill tests the operator's ability to make the required notifications to agencies, to initiate response actions of its contractors and employees, and to make decisions and respond with tactical approaches appropriate to the situation. Many states also conduct their own drills and inspections, and work closely with MMS/USCG. Overall, the number of spill drills and exercises has increased from 669 conducted in 2000 to 1584 in 2007. MMS and USCG also conduct thousands of inspections related to off-shore facilities each year.

The result of these efforts can be shown by reviewing the MMS statistics. The data show that production operations are the source of only 0.5 percent of hydrocarbons in the Gulf of Mexico. In 2000, MMS data show that for the roughly 3,800 platforms in the Gulf of Mexico, there were only 12 platform spills, for a total of 323 barrels of oil spilled. Similarly, U.S. Coast Guard data say that the amount of oil spilled in all U.S. waters in 1999, the last year for which complete figures are available, was about two hundred-thousandths (0.000024) of one percent of all the oil consumed in the United States. That means that more than 99.9 percent of the oil is safely produced and transported. Currently,

OCS leases produce about 1.3 million barrels of oil per day, and MMS calculates that since 1980 less than 0.001% of the oil produced in the OCS has spilled.

Exploration and Development Timeline

Companies are required under government leasing regulations to develop a lease expeditiously (between five- and 10-year terms depending on the area and water depth) or return it to the government. In general, leases not producing by the end of their term are relinquished back to the government, which can then re-lease them. All the capital spent by the company to acquire and keep the lease is lost if the lease is returned to the government.

The time line from lease to production in the OCS can vary from four to ten years depending on water depth at the lease location, the drilling depth needed to reach the target reservoir, the distance from shore and from infrastructure, the geological characteristics of the reservoir and complexity of production facilities design. In general for deepwater leases, from purchase of the lease to first production can take anywhere from 7 to 10 years in areas that have existing infrastructure. In this context, the timeline for OCS exploration and production can include:

- Six months to a year for MMS administration and execution of lease sales in unleased areas.
- One year for preliminary geological investigation and selection of areas of interest for additional seismic data acquisition.
- One year to two years to acquire and to process 3D (and new wide azimuth) seismic data, and to identify drillable prospects from this data.
- As much as a year or more to contract and schedule a drilling rig.
- Six to 10 months for drilling and completion of an exploratory well.
- Six months to a year for follow up evaluation of drilling results, which can include drilling a sidetrack well.
- Another two to three years for additional delineation drilling, and formulation of a plan for reservoir development if the exploratory well proves successful. During this time, the company also is working on pre-permit studies, permitting, and design and procurement for production facilities, including surface and subsurface equipment and systems,
- One year or more for facilities installation, followed by development drilling, which may take from one to two additional years. During this period, the company is involved in design, permitting, engineering, procurement and installation of a pipeline or offshore mooring system to bring the production to market.

THE MARINE WORLD OF NORTH CAROLINA AND HYDROCARBON EXPLORATION

Steve W. Ross, 15 April 2009
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5600 Marvin Moss Ln., Wilmington, NC 28409

North Carolina Marine Ecosystems

No short summary can do justice to a marine ecosystem as large and diverse as that within and off of North Carolina. North Carolina's placement in moderate latitudes facilitates mixing of a great variety of northern and southern biota. The state also has a very long and complicated coastline, especially if the numerous convoluted bays, rivers, and estuaries are counted. Within this large estuarine and marine system is a huge diversity of habitat types, such as reefs, oyster beds, grass beds, a wide variety of soft substrata bottoms, Sargassum, corals, and even artificial structures (wrecks, pilings, jetties). The numerous habitats, large rivers and estuaries, long coastlines, and moderate climate all

combine to support the highest aquatic biological diversity along the US East coast (excluding Florida). For example, there are at least 800 species of fishes occurring within and off of North Carolina from the estuaries offshore to a depth of 200 m, and this is more fish species than any other US coastal state except Florida.

The Gulf Stream is a major influence on the region's marine biology and ecology, but also on regional climate and commerce. This river of warm water brings moderate climates to the US East coast and to northwestern Europe. It is a complicated current that displays many types of eddies and spin off rings, undulations or meanders, and it can have an influence on the water column or bottom as deep as 300-400 m. Large numbers of larval animals ride the Gulf Stream north and settle in more inshore habitats. Some larger animals use the Gulf Stream as a migratory corridor. Near Cape Hatteras the Gulf Stream veers northeastward, and also in this area it encounters several other major currents (see Fig. 1). This happens near an area that has become known as "The Point," and the complicated oceanography and rugged canyon bottom topography make this a unique region. It is known as one of the best recreational fishing spots on the East coast. The physics around this area causes a high deposition of organic carbon to the bottom, and there is periodic upwelling of nutrient rich waters here which attracts a wide array of animals from pelagic seabirds, to marine mammals, and fishes. Buried features on the bottom around The Point region were also of interest previously for oil exploration.

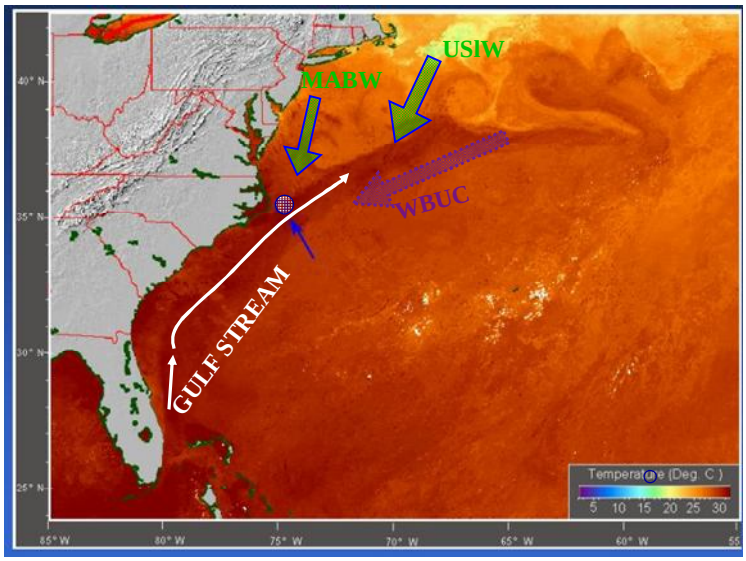


Fig.1. Summer satellite view of the Gulf Stream (darkest red), and a few water masses, the Mid-Atlantic Bight water (ABW) and Upper slope water (USLW). The Western Boundary Undercurrent (WBUC) flows underneath the Gulf Stream in the opposite direction. These currents converge near "The Point" (blue circle, arrow).

APPENDIX

Continental shelf (beach to 200 m) and slope (200-2000 m) bottom habitats off North Carolina are an interesting mixture of several types of soft sediment bottom (sands, muds, shells), hard bottom (reef) and canyon habitats. The farther offshore the stronger the influence of Gulf Stream waters. While the soft sediment bottoms may appear uniform and lacking in diversity (Fig. 2a), in fact these are the habitats used by the most important commercial and recreational fishes in NC. Important benthic species using sand/mud bottoms include flounders, spot, croaker, seatrouts, sea mullets, mullets, menhaden, red drum, crabs, shrimps, scallops, clams, whelks, oysters, and many others. The dominant members of this group of soft substrata or water column using animals spawn in cold weather in offshore waters and their larvae drift and swim huge distances to eventually occupy shallow estuarine nursery areas. Other members of this group spawn in the estuaries and their larvae travel less far to reach estuarine nursery areas. In North Carolina most of the primary and secondary nursery areas receive regulatory protection. While we have good knowledge about the locations and uses of estuarine nurseries, we know almost nothing of the adult spawning grounds. One of the biggest issues facing these organisms is declining habitat quality and overfishing.

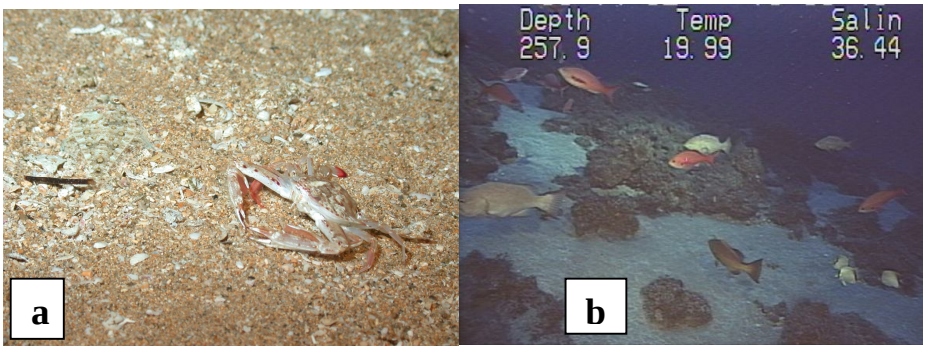


Fig. 2a. Soft substrate on the outer shelf off NC, with a flounder (upper left) and a crab. 2b. Shelf edge reef off Cape Fear with several typical reef fishes.

The continental shelf off North Carolina has a large amount of hard bottom, reef, or as sometimes called "live bottom" habitat (Fig. 2b). This extensive reef ecosystem supports a wide diversity of largely subtropical animals, and it supports the economically important snapper, grouper, porgy fisheries. Reef animals are highly tied to the this habitat, thus damage to the habitat generally leads to severe impacts to the associated fauna. The biggest issue facing these resources appears to be overfishing. Degradation of inshore juvenile habitats may also be of concern. In response to concern about these fisheries the South Atlantic Fishery Management Council recently created a series of Marine Protected Areas (one is off Southern NC), to help restore these fisheries. One of the biggest impediments to assessing and understanding the offshore hardbottom resource is a lack of good habitat maps. Some maps have been attempted but these are inadequate for research or good management.

Multibeam sonar is a tool that is just beginning to provide the types of bottom data needed to locate and understand benthic habitats. Using two deep-sea areas of great concern to North Carolina (Fig. 3), The Point, and Deep Coral Banks, it is noteworthy that only a few days of multibeam mapping gave more bottom detail than years of work using older methods. New deep coral banks were discovered, and details of topography could now facilitate ocean current interpretations and allow mapping of animal distributions. The rugged canyon system at The Point and the three major areas of deep-sea coral (mostly *Lophelia pertusa*) concentrations are of great environmental concern. Both of these deep-sea areas harbor a unique and diverse fauna, including species new to science.

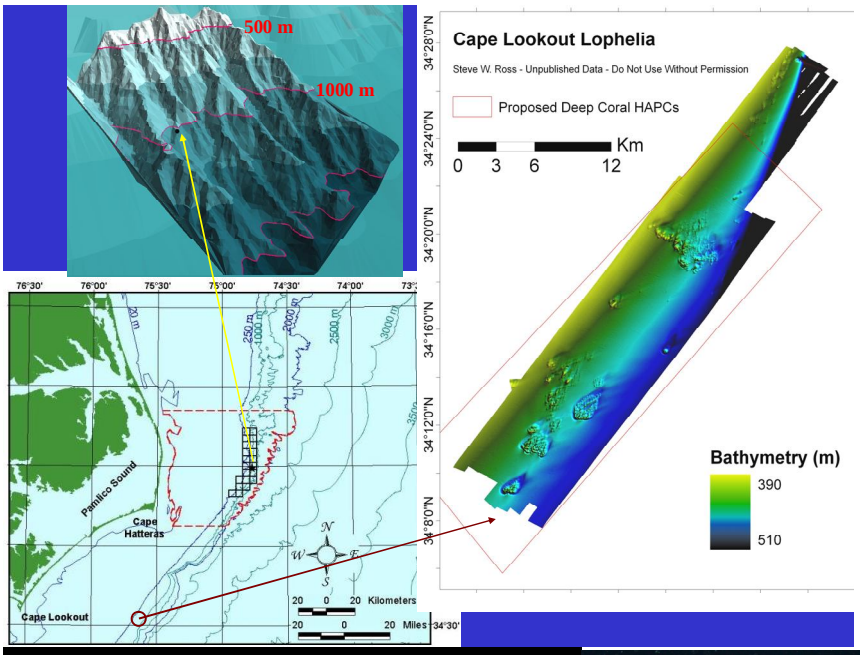


Fig. 3. Multibeam maps of The Point area (upper left inset) and the deep-sea coral banks off Cape Lookout (right inset). Data from S.W. Ross.

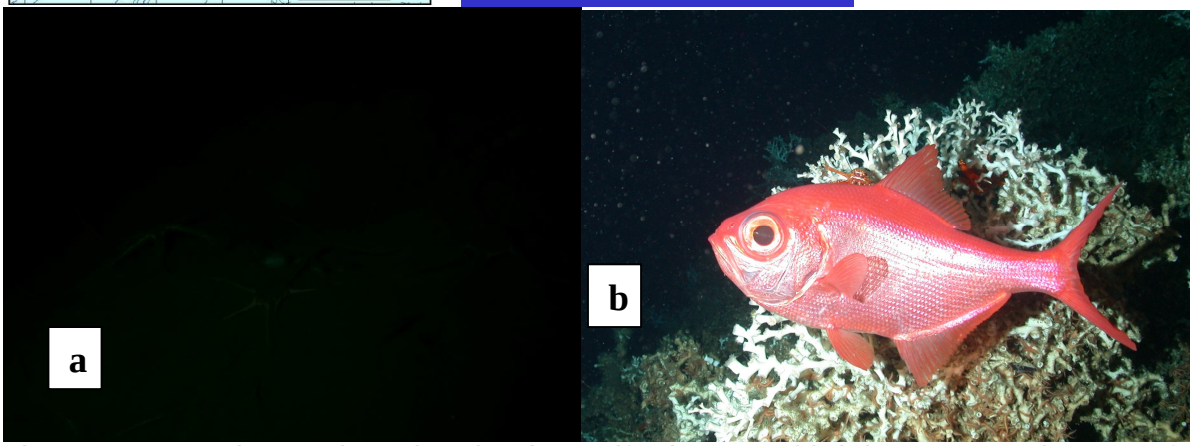


Fig. 4a. Bottom view at The Point, showing wolf eelpouts and brittle sea stars. 4b. Scene from a deep coral mound off Cape Lookout, NC with alphonsino in the foreground and living Lophelia coral in the background.

Since The Point (Fig. 4a) has been within the area targeted as a strong interest area for oil and gas exploration (as part of the Manteo Lease track), the following bullets review some relevant data. During the coarse of evaluating this region (late 1980s – 1990s), this region went from being virtually unknown to being one of the best studied areas of the continental slope. However, there are still very important research questions remaining to be answered (see study recommendations).

The Point

- Dynamic, variable surface currents, upwelling present, but
- Below 200 m region of no net motion
- Nepheloid layer present
- Rugged bottom topography, mud canyons
- High organic deposition to the bottom
- Very high infaunal biomass
- Great abundance of macrofauna, but low species richness
- Abnormally small size structure in fish community

- Great productivity and biological activity in surface waters

The deep coral banks may be hundreds of thousands of year old, and if destroyed may never be replaced. Data are rapidly accumulating on this relatively recently studied resource, and it is becoming clear that deep-sea coral reefs and other deep hardgrounds are very important slope habitats. There are probably over 110 species of deep-sea corals off the southeastern US, and these plus the sponges, rocks and other fauna combine to form oases of biodiversity in the deep-sea (Fig. 4b). Because of the importance and vulnerability of deep coral habitats, the SAFMC has suggested a huge area in four blocks to be designated as Habitat Areas of Particular Concern. Some bullets about these deep coral habitats follow:

- Coral banks heavily influenced by Gulf Stream dynamics, maybe unrealized small scale variability
- Banks widely scattered but more common on SEUS slope than thought
- Extremely rugged topography
- High species richness, high numbers of species new to science
- Provide shelter, feeding areas, and possibly spawning areas to many species

Based on past experience with evaluation of environmental issues related to energy exploration the list below notes some topics to consider.

- Storms, currents, geology (slumps) in and around areas of interest
- Spills (location & timing), modeling ocean currents
- Sensitive habitats (estuarine nurseries, shelf hardgrounds, deep-sea corals, spawning grounds)
- Endangered/threatened species (1 fish, sea turtles, marine mammals, seabirds)

As noted above the region around The Point has been well studied in the last 10-15 years, and other parts of offshore NC have also continued to be important research area. While our knowledge has improved significantly, there are still (and always will be) important gaps that hinder best management of important biological and economic resources. The list below represents some suggested study topics that are relevant to offshore energy exploration.

- Severe lack of biological data > 200 m, basic surveys needed
- Multibeam mapping of interest/target areas
- Strong need for better habitat descriptions and how they are utilized
- Trophodynamic studies
- Complete trophodynamic study started at “The Point”, add other locations
- Interaction of physical oceanography and biology
- larval transport, genetic continuity, dispersal barriers or conduits
- Population structure & connectivity studies
- Marine larvae dynamics
- distributions, seasonality, movements
- Locate ocean spawning areas for important species
- Sociological/economic impact studies

APPENDIX

Legislative Research Commission Advisory Subcommittee On Offshore Energy Exploration Morehead City, NC April 27, 2009

American Gas Association
U.S. Domestic Natural Gas Supply Outlook

Will natural gas supply be sufficient to satisfy future natural gas demand? We believe the answer is yes, based on the abundance and diversity of the natural gas resource base as well as the ability of gas to deliver "now". However, we caution that abundance is meaningless without access, as is diversity. Further, technological developments will continue to bring new sources of gas to the market – consistent with past experience.

- The outlook for natural gas supply is very positive, given the development of new onshore (both conventional and unconventional) and offshore resource plays, the potential for pipeline natural gas from the arctic, LNG, underground and aboveground storage and other pipeline infrastructure. There is no question that the natural gas resource base is capable of meeting existing and new market demands. However, recognizing the abundance of the resource is not sufficient – there must also be access to the resource. This distinction often leads to confusion among policymakers.

- It is absolutely critical that national policy supporting the energy economy in the U.S. is one that emphasizes supply diversity and, particularly for natural gas, supply source diversity. Domestic natural gas supply must not be sidetracked to a belief that one supply source will cure all requirements for the gas supply future.

- Natural gas is *now*. The technologies to find, develop and consume natural gas efficiently, economically and to the benefit of the consumer and the environment are here today. This is a fact not often given full recognition by policymakers.

A. Domestic Production and Resources

Current Environment

- U.S. gas supply is decidedly more domestic today than two years ago

- Domestic natural gas reserves and estimates of undiscovered resources have grown significantly, in great part due to the emergence of less conventional sources of gas supply

    - Proved reserves grew 45 percent during the ten-year period 1998 to 2007, from 164 Tcf to 238 Tcf

Market Outlook

- Production from key onshore and offshore natural gas resource areas can be a viable part of long-term domestic energy policy, but significant economic and policy hurdles exist that may impede efficient development

- Portions of the natural gas resource base located in federal waters offshore or on federally owned multi-use lands, particularly in the intermountain west

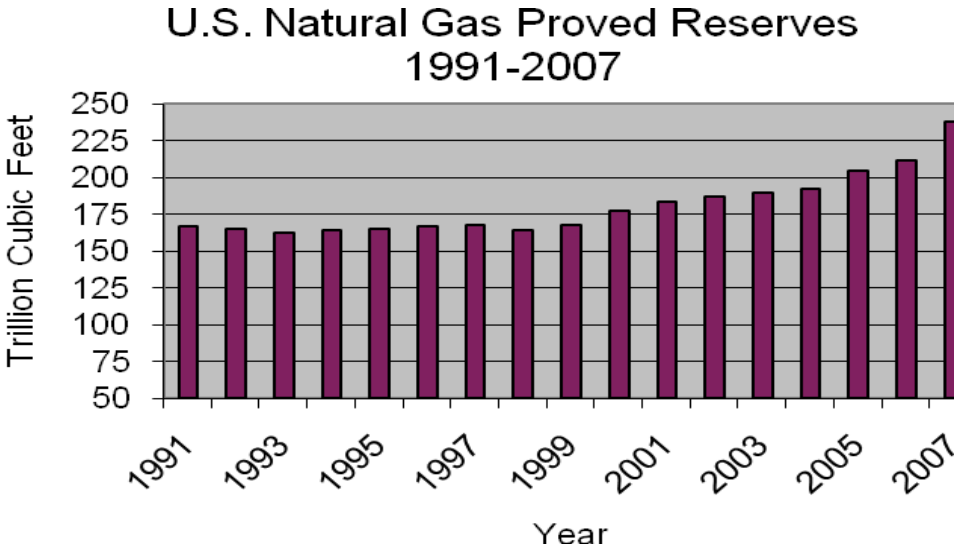
  - Uneven public policy decisions that restrict access to public lands slow development of these resources

  - Baker Institute for Public Policy at Rice University points out that twenty years ago 75 percent of federal lands were available for oil and gas leasing; today, only about 17 percent

- Modeling from the Baker Institute indicates that lifting the offshore moratoria could increase Lower 48 states production by 1.5 Tcf annually by 2015 and 3.1 Tcf annually thereafter through 2030

- Current *Annual Energy Outlook 2009-2030* from the Energy Information Administration (EIA) now estimates that 96 percent of U.S. net natural gas supply in 2030 could be from domestic sources

- Current threats to resource development include issues surrounding downhole fracture treatments of reservoirs (water resources and chemical components) and other footprint impacts



Prospects for 2020

- Abundance of the domestic natural gas resource base is not generally understood

- Continued technological advances will continue to "grow the resource"

- Natural gas can play a larger role in the terms of a domestic energy source and serve new or expanded markets

- Realizing the full potential of the abundant domestic natural gas resource base is dependent on an enlightened policy that provides adequate access

- Environmental responsibility in production will help promote adequate access

IMPLICATIONS OF COASTAL ENERGY PRODUCTION ON IN-SHORE AND NEAR-SHORE ECOSYSTEMS

April 27, 2009 Presentation to
The Advisory Committee on Offshore Energy Exploration

by Charles H. (Pete) Peterson
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I. Relevant Experience of CH Peterson:
(1) One of 5 Members of North Carolina Environmental Sciences Review Panel of U.S. Dept. of Interior (MMS) – 1990-1991
(2) Collaborator in GOOMEX – an MMS study of the long-term environmental impacts of decades of oil production around drilling platforms in the Gulf of Mexico – 1993-1996
(3) Scientific Review Panel Member for the Exxon Valdez Oil Spill Trustees – 1989- 2009
(4) Currently a Principal in legislatively mandated UNC Study of the Potential for Development of Wind-Over-Water Power in NC

II. North Carolina Environmental Sciences Review Panel of U.S. Dept. of Interior (MMS)

A. Panel members – John Costlow (Duke), Mike Ohrbach (ECU-Duke), Kenneth Brink (Woods Hole Oceanographic Institution = WHOI), John Teal (WHOI), Charles Peterson (UNC-CH)
B. Panel Charge from DOI
    a. Did MMS follow the legally proscribed procedures in offering oil-and-gas leases for sale off the NC Outer Continental Shelf (OCS)
    b. What does the panel recommend as remedies in the case of some deficiency in environmental science knowledge
C. Panel Answers
    a. Three areas of environmental science required by law to conduct sufficient risk assessment to support leasing decisions
        i. Physical transport models – adequate to assess risk of transport of spilled oil to shore
        ii. Biological resources – characterization of important and valued biological resources potentially at risk

iii. Socio-economic characterization of coastal communities potentially influenced by oil-and-gas development

b. Panel conclusions

i. All risk assessment needs to be conducted up front before lease sales because despite additional environmental review before MMS approval is granted for production phase drilling has never been denied at that stage only conditioned

ii. Information then (1990-1991) available is insufficient to conduct proper risk assessments in all three areas of environmental science required before leasing even though leases had already been offered and purchased on the NC OCS

1. Physical transport modeling – existing models were inadequate because they were based on monthly mean flows, which failed to include Gulf Stream eddies and rings that spun off and result in transport to shore (exemplified by the red tide outbreak in 1987 that was transported from SW Florida via the Gulf Stream to Bogue, Back, Core Sounds in NC via eddies in waters offshore of NC)
2. Biological resources at risk – existing information was inadequate on the unique biotic communities associated with "The Point" area off Cape Hatteras, where the tropical Gulf Stream and boreal Labrador Currents meet and mix, resulting in high productivity, density, and diversity, and on the communities and valuable organisms, including many threatened and endangered species, associated with the floating *Sargassum* weed
3. Socio-economic character of NC coast – existing information on social and economic nature of NC coastal communities that may be influenced by oil and gas development was seriously incomplete, making any dependent impact analysis unreliable

c. Outcome of the panel

i. Expression of need for more research to fulfill legal obligations for each of the three areas of environmental science

ii. Ultimately contributed to congressional moratorium on oil-and-gas exploration and development on the NC OCS

iii. Clearly resulted in additional new research (eg, NOAA NURC studies by Steve Ross of biological resources around The Point and deep-water corals at the shelf break) , but unclear to me if the additional research is sufficient to address all deficiencies

III. GOOMEX study (1993-1996) of environmental impacts of decades of oil production around drilling platforms in the Gulf of Mexico

A. MMS study headed by Chuck Kennicutt of Texas A&M University

B. Synthesis paper -

Peterson, C. H., M. C. Kennicutt, II, R. H. Green, P. Montagna, E. N. Powell, and P. Rosigno. 1996. Ecological consequences of environmental perturbations associated with offshore hydrocarbon production: a perspective from study of long-term exposures in the Gulf of Mexico. Canadian Journal of Fisheries and Aquatic Sciences 53: 2637-2654.

C. Environmental and ecological impacts of oil production processes

i. Bottom invertebrate community is modified out to a distance of 100-200 m from the drilling platform, with effects caused both by heavy metal toxicity from impurities in barite drilling mud and organic contamination from low-

level hydrocarbon releases and organic materials shed from fouling growth on the platform

ii. Oxygen depression is evident in the water column and increased benthic respiration is persistent near the platform, driven by microbial decomposition of increased organic loading

iii. Produced waters discharged during separation of product from water may induce some toxicity

iv. No detectable influence on fish community, but fish mobility prevents a strong test and bottom trawling is inadequate to test for an "artificial reef" effect

IV. Long-term effects of the Exxon Valdez oil spill on shoreline ecology

A. Multi-million dollar study of the long-term (up to 20 years) effects of oil contamination of coastal environments after the 1989 Exxon Valdez oil spill

B. Synthesis papers –

Peterson, C.H. 2001. A synthesis of direct and indirect or chronic delayed effects of the Exxon Valdez oil spill. Adv. Mar. Biol. 39: 1-103.

Peterson, C.H. S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey, and D.B. Irons. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. Science 302: 2082-2086.

C. Acute impacts of the oil spill

a. Killed unprecedented numbers of seabirds and waterbirds because feathers were oiled and lost their insulating capacity plus preening led to ingestion of toxic oil

b. Killed hundreds of marine mammals, including over 800 sea otters, and many killer whales, and harbor seals because fur was oiled and insulation capacity was lost plus preening led to ingestion of toxic oil

c. Shoreline algae and invertebrates suffered high mortality from smothering by oil and toxicity

d. Oil clean-up activities used pressurized application of water jets killed more shoreline invertebrates than the spilled oil itself

e. Fisheries were closed because of contamination of the product and public perception that Alaskan fish was contaminated

f. Terrestrial species like eagles and bears were killed by ingesting oiled carcasses and by preening oiled feathers or fur

D. Chronic impacts of the oil spill

a. Oil in shoreline sediments that were protected from physical disturbance and oxygenation remained without weathering in toxic form for two decades and continued to contaminate bottom invertebrates and cause elevated mortality for at least a decade in the diving ducks, sea otters, oystercatchers, and other vertebrate predators that fed upon them

b. The diving ducks and marine mammals feeding in contaminated sediments suffered chronic mortality for over a decade

c. Fishes that laid eggs in sediments also showed population losses over several years as oil penetrated egg membranes and killed the eggs and as oil limited growth rate of small fish which led to high mortality and fewer fish returning as adults to reproduce and to be harvested in fisheries

d. Toxicity testing on the partially weathered oil demonstrated that this residual oil in chronic exposures was far more toxic and at lower concentrations when in

dispersed in water than fresh oil, implying that much greater loss of eggs and other susceptible life stages of fishes and invertebrates is routinely happening from even small oil spills and repeated exposures in stormwater than had been assumed before

E. Implications for oil-and-gas development in North Carolina
    a. Including small spills, the EPA reports that an oil spill occurs in the U.S. at a rate of 70 times per day
    b. Most of these spills occur during transport of the oil, although the largest are associated with accidents like storms or collisions or explosions
    c. Double-tanking of oil tankers promised as a precautionary remedy after the Exxon Valdez spill is incomplete
    d. The analogous shoreline environments at risk to long-term contamination leading to fish and wildlife mortality in NC are estuarine salt marshes, oyster reefs, and seagrass beds because oil floats, then penetrates into sediments when stranded during low tide, where it can become protected from oxygenation and weathering
        i. The salt marsh is the environment of greatest concern because it is (1) entirely intertidal in elevation where oil will come readily to reside, (2) physically quiescent such that sediments are unoxygenated and thus ideal reservoirs for persistent oil contamination, and (3) the coastal habitat of greatest significance of all for fish and wildlife production, water quality maintenance, shoreline stabilization, and other ecosystem services
        ii. Impacts of oil on salt marshes persist for decades to centuries, as discussed in the classic review by Teal & Howarth (1984):

Teal, J., and R. Howarth. 1984. Oil spill studies: a review of ecological effects. Environmental Management 8: 27-44.

        iii. Follow-up study of Cape Cod salt marshes oiled 40 years ago by a spill from the barge *Florida* demonstrated that a layer of toxic PAHs was still evident at soil depths of 1-20 cm, the most important animal of the marsh, fiddler crabs, which dig burrows into the soils and process organic matter and energy, were still depressed in abundance, dug burrows only half as deep as normal, and exhibited abnormal sluggish behavior. The marsh plants themselves were also still dwarfed in size.

        iv. Estuarine oyster reefs, which are also at intertidal elevations south of Cedar Island and thus experience coating by oil as the tide recedes, are now targets of active restoration in recognition of their ecosystem services to water quality, fish habitat, as a fishery themselves, and as shoreline stabilizers. They stand at risk from development of local oil development.

        v. Seagrass beds (SAV) represents a vital nursery habitat for shrimp, bay scallops, and numerous fishes, one that has already suffered great decline and is aggressively protected from further injury and loss in coastal management programs. This shallow habitat is also at risk from spilled oil and studies show multi-year losses of natural function of SAV after oil spills.

e. Ocean beaches represent the other major shoreline habitat at high risk from any oil spill off the NC coast

   i. This habitat could be considered the economic engine for the entire coastal economy of North Carolina

   ii. Ocean beaches represent a high-energy environment such that natural clean-up of spilled oil occurs rapidly – within a year

   iii. Nevertheless, beaches are typically closed for any public use for months after an oil spill, commercial fishing is closed, and economic effects are huge

f. On-shore development of petrochemical industry where oil pipe lines come ashore is incompatible with existing NC coastal economies based on tourism, retirement, and fishing

   i. Air pollution potentially leading to ozone violations

   ii. Water pollution from cumulative effects of small spills

   iii. Truck traffic increased on the local roads

V. Potential for Wind Power development over water in coastal North Carolina is favorable and could help enhance production of domestic energy by using a renewable source with minimal release of greenhouse gasses

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Managing Inshore Impacts of Coastal Energy Production

North Carolina has a comprehensive process established to manage coastal development, in a manner that protects the natural coastal resources while balancing economic development. North Carolina's coastal ecosystem is unique and of great value to the public because:

- It is the largest estuarine system of any single Atlantic coast state (2.3 million acres)
- Is located at convergence of South Atlantic and Mid Atlantic biogeographic provinces
- Supports diverse coastal fish habitats
- Supports a strong heritage of commercial and sport fishing and tourism
- The commercial fishery had an ex-vessel value of $82 million in 2007
- The total economic recreational fishery was valued at $2.5 billion

- Additional value from tourism and residential development associated with fishing and recreating along the coast

The foundation of the permit process is based on the Public Trust Doctrine, that states:
All public trust lands, waters, and living resources are held by the State in trust for the benefit of all people. Federal and state agencies are authorized through statute (GS 113-131…) to review & comment on habitat alteration permit applications- over 12 state agencies review permit applications.

Major laws that drive how NC manages inshore resources include:

- Clean Water Act
- Dredge and Fill Law
- Coastal Area Management Act
- Fisheries Reform Act / Magnuson-Stevenson Act

State Dredge and Fill Law

§ 113-229….before any excavation or filling project is begun in any estuarine waters, tidelands, marshlands, or State-owned lakes, the party or parties desiring to do such shall first obtain a permit from the Department.

Coastal Area Management Act

§ 113A-102(a) The public's opportunity to enjoy the physical, aesthetic, cultural, and recreational qualities of the natural shorelines of the State shall be preserved to the greatest extent feasible; water resources shall be managed in order to preserve and enhance water quality and to provide optimum utilization of water resources; land resources shall be managed in order to guide growth and development and to minimize damage to the natural environment; private property rights shall be preserved in accord with the Constitution of this State and of the United States.
Resources managed by Division of Coastal Management (DCM) include water, fisheries, wildlife, cultural, air, energy, economic, and recreational resources. DCM manages coastal resources through designation of Areas of Environmental Concern, including the Estuarine and Ocean System, Ocean Hazard System, Public Water Supplies, and Natural and Cultural Resource Areas.

Fisheries Reform Act

This law, passed in 1997, requires DMF to develop Fishery Management Plans for important fishery species and for DENR to develop a Coastal Habitat Protection Plan. (CHPP) The goal of the CHPP is: ***"...long-term enhancement of coastal fisheries associated with each habitat" (G.S. 143B-279.8.)*** The CHPP was completed and approved by the three environmental regulatory committees in December 2004. Any actions taken by the Coastal Resource Commission (CRC), Environmental Management Commission (EMC), and Marine Fisheries Commission (MFC) must be consistent with the goals and recommendations of the Coastal Habitat Protection Plan, which include protection and enhancement of coastal fish habitat and water quality.
If an oil and/or gas facility or infrastructure were proposed in North Carolina waters or within a CRC Area of Environmental Concern, a State Environmental Policy Act (SEPA) or National Environmental Policy Act (NEPA) review process would have to be followed to coordinate review. First an Environmental Assessment and/or Environmental Impact Statement would need to be

prepared to determine if there would be significant environmental impacts associated with the project, followed by submission of appropriate permit applications. These could include DWQ 401 Certifications, CAMA Major permits, DWQ Coastal Stormwater, CAMA Federal Consistency, DLR Mining permits, DWQ NPDES permits, Public Water Supply permits, and COE 404/Public Notices.

Applicable CRC rules:

15A NCAC 07H .0207(d) Use Standards Development may be acceptable within public trust areas, provided that such uses shall not be detrimental to the public trust rights and the biological and physical functions of the estuary.

15A NCAC 07H .0208(a)(2)
…..Before being granted a permit by the CRC, there shall be a finding that the applicant has complied with the following standards:

- that no suitable alternative site outside of the AEC exists;
- the applicant selected a site and design that will have a minimum adverse impact upon the productivity and biologic integrity of coastal marshland, shellfish beds, beds of submerged aquatic vegetation, spawning and nursery areas, important nesting and wintering sites for waterfowl and wildlife, and important natural erosion barriers (cypress fringes, marshes, clay soils).

  When reviewing an application for an oil and gas facility or infrastructure such as incoming pipelines or docking facilities, agencies will assess direct, indirect and cumulative impacts. The Division of Marine Fisheries (DMF) will be considering impacts to fish, habitat, fishing activities and navigation. Significant adverse impacts to MFC Designated Primary Nursery Areas, Anadromous Fish Spawning Areas, Submerged Aquatic Vegetation Habitat, Shellfish Beds, and SA Waters with Open Shellfish Harvest classification would most likely result in a recommendation for denial of the project unless it could be modified to avoid or further minimize impacts.

  Impacts to estuarine resources from a refinery or other infrastructure or drilling in offshore waters include:

  - dredging for incoming pipelines through important fish habitat such as SAV, shell bottom, nursery areas, hard bottom, or spawning areas
  - dock construction, requiring dredging through shallow fish habitat
  - wetland filling for upland infrastructure. Reduces fish habitat and ecosystem services provided by that habitat.
  - inadequate stormwater runoff control can result in degraded water quality.
  - wastewater discharge, potentially degrading water quality
  - new roads, rail, etc. would have associated impacts such as stormwater runoff, wetland filling.
  - oil/gas spills from pipes or offshore rigs, if carried to intertidal habitats, could cause mortality of associated invertebrates or other fauna. Areas with hi tide range would potentially have more intertidal habitat threatened by spills. The three dimensional structure of oyster beds, forested wetlands, marshes, and submerged grass beds would make cleaning up a spill extremely difficult.

APPENDIX

North Carolina's diverse and low-lying coastline would make siting a refinery in a location that would not impact any coastal resources extremely difficult. In addition, siting an incoming pipeline or navigational channel for large vessels would also be extremely difficult to do without causing significant impacts to shallow water habitats. Since over 90% of North Carolina's fisheries are dependent on these estuarine habitats, the impacts would most likely be significant to fisheries. The Fishery Reform Act does require that the environmental regulatory commissions be consistent with the goals and recommendations of the NC Coastal Habitat Protection Plan. Permitting of intense industrial development along the coast would have to show that the activity was not inconsistent with the CHPP.