TESTIMONY OF ROBERT G. MARVINNEY, PH.D.
STATE GEOLOGIST AND DIRECTOR, MAINE GEOLOGICAL SURVEY

BEFORE THE HOUSE COMMITTEE ON NATURAL RESOURCES

HEARING: OFFSHORE DRILLING, STATE PERSPECTIVES
24 FEBRUARY 2009

Chairman Rahall and members of the House Committee on Natural Resources, thank you for this opportunity to provide Maine's perspective on offshore drilling and our nation's energy future. I am Robert Marvinney, State Geologist and Director of the Maine Geological Survey, speaking on behalf of Maine Governor John Baldacci.

My testimony today will focus on these main topics:

- Maine's focus on renewable energy resources. The Governor and Legislature are considering all options in a comprehensive energy plan that focuses on efficiency, renewability, reduction of greenhouse gas emissions, and energy independence. In these areas the Gulf of Maine holds high potential as a source of renewable wind and tidal power.
- Past exploration on the outer continental shelf of the New England states did not discover optimum conditions for hydrocarbon generation and accumulation. Recent assessments by the Minerals Management Service indicate some potential for undiscovered reserves in the North Atlantic Planning Area, but these are small when compared to other parts of the OCS with more favorable conditions.
- Exploitation of hydrocarbons on the OCS may bring economic benefits, but due to the proximity of potential reserves to other parts of the coast, Maine is not likely to be a significant recipient of these benefits.
- The Georges Bank is among the most significant fisheries in the northeastern United States, and supports a significant part of the economy in New England coastal communities. We are concerned about additional stress to this resource.

<u>Renewable Energy Resources</u>

Currently, Maine has the highest per capita dependence on #2 heating oil of any state in the nation. The past several winters have been particularly difficult for low- and middle- income and elderly Mainers who are making very difficult choices between home heating and other vital expenditures. Energy costs have grown from 5% to 20% of a Maine family's budget in just the past 10 years[1].

In response to this crisis and his commitment to a state energy policy focused on efficiency, renewability, greenhouse gas reduction and energy independence, Governor Baldacci established several important groups to focus on segments of the energy market. Maine is the nation's most heavily forested state, and the Governor's Wood to Energy Task Force focused on harnessing the wood supply to meet a significant portion of our energy needs. Maine people use the State's forest resources for cordwood and pellets to heat homes and businesses and as biomass to generate electricity. University of Maine researchers are advancing the process to make cellulosic ethanol from wood.

In 2007, the Governor established a Task Force on Wind Power Development, the recommendations of which have been instrumental in advancing the implementation of onshore wind power in Maine.

In November 2008, Governor Baldacci established the Ocean Energy Task Force[2] to focus primarily on Maine's indigenous and renewable offshore energy potential and its promise to address state and regional energy needs, including increasing our state's energy independence, reducing greenhouse gas emissions, and limiting our vulnerability to the unpredictable costs and supplies of fossil fuels. While ignoring no potential energy option in Maine's offshore environment, this effort will focus in particular on the enormous potential of tides and wind. Tidal power is quickly achieving commercial viability, and one developer has been working with a community and testing its in-stream tidal energy device. It is estimated that the Gulf of Maine holds as much as 150 gigawatts of wind potential in both shallow and deep state and federal waters[3].

Petroleum Exploration History and Oil and Gas Potential of the Georges Bank

The Ocean Energy Task Force will also consider the potential for offshore oil and gas reserves in its comprehensive review of the ocean energy resources of the Gulf of Maine. Most of the Gulf of Maine is underlain with geology that is not suitable to the generation of oil or natural gas. The rocks are basically an extension of the high-grade metamorphic rocks and granite intrusions that characterize the rockbound coast of New England and have been heated well beyond the optimal conditions for hydrocarbon generation.

The area with the highest potential for oil and gas reserves is the Georges Bank, a relatively shallow plateau situated more than 100 miles southeastward from the Maine coast. The oval shaped Bank is approximately 150 miles long, 75 miles wide, and with waters as

shallow as 30 meters along its northwest edge, forms a barrier to the deeper Gulf of Maine waters to the north (Figure 1). The northeastern most portion of the Georges Bank falls within Canada's territorial waters.

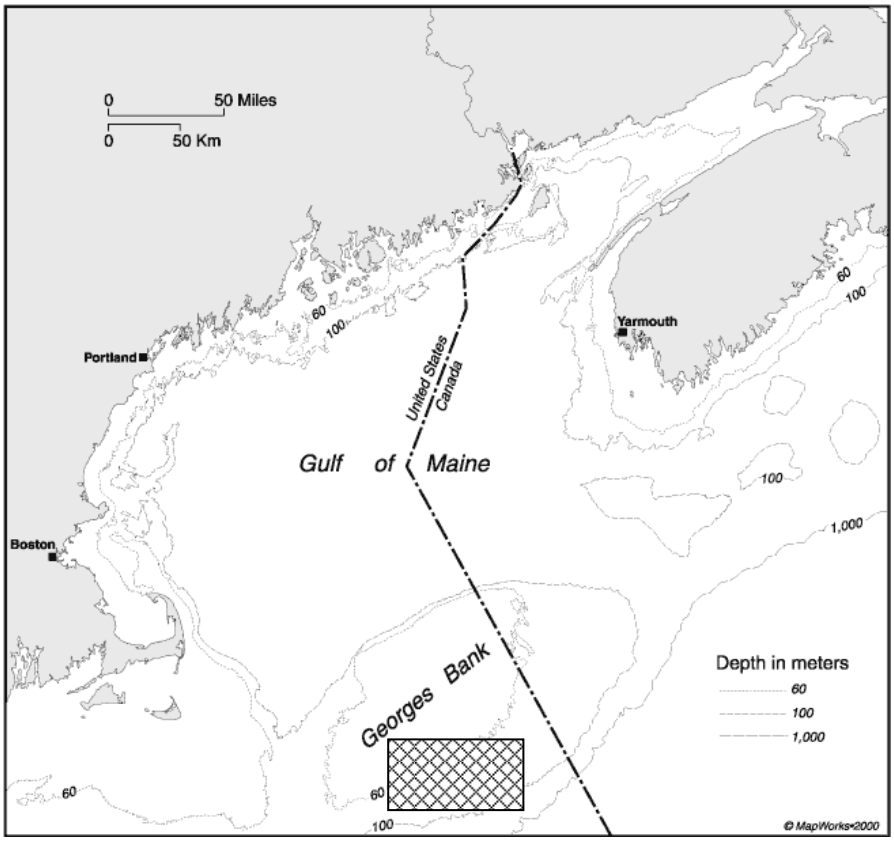

Figure 1. Outline map of the Gulf of Maine and Georges Bank[4]. Cross-hatched box shows the approximate location of leases and exploration wells of the 1970s and 1980s.

The only oil and gas exploration activity on the Georges Bank was conducted during the 1970s and early 1980s when 10 wells were drilled in the most promising areas identified through the best exploration methods then available. In a summary report, the Minerals Management Service indicated that hydrocarbons were not discovered in these wells, that thermally mature source rocks are lean in the organic material necessary to generate hydrocarbons, and that other units lacked adequate porosity to be considered good reservoir rocks[5]. As this Committee is aware, the Georges Bank was under annual congressional moratoria on oil and gas leasing from 1982 to 2008. No wells have been drilled on the Canadian portion of the Georges Bank and a leasing moratorium has also been in effect there since 1988.

Our colleagues in neighboring Nova Scotia, however, have demonstrated that geology similar to that of the Georges Bank can be productive. Since exploration began on the Scotian shelf in the 1950s, 24 significant hydrocarbon discoveries have been made in this part of Canada's outer continental shelf[6]. These have been mostly natural gas discoveries. The most

notable, Sable Island, may eventually produce a total of 2 trillion cubic feet (Tcf) of gas, although estimates vary widely. Since the Sable Island discovery over 30 years ago, a very active exploration program has brought little additional reserve forward. With improved technologies, exploration is advancing toward deeper waters, which may hold the best potential for significant new reserves.

The government of Nova Scotia is actively supporting exploration activities on the Scotian Shelf due, in part, to the revenue sharing agreement with Canada's national government that brings to the province $500 million in royalties annually[6]. In 2010, the governments of Canada and Nova Scotia will decide whether or not to extend the moratorium on Georges Bank leasing which is set to expire at the end of 2012.

While past exploration has not uncovered notable reserves, nor found conditions generally favorable for hydrocarbon accumulation, there is some potential for petroleum discoveries on Georges Bank and elsewhere in the North Atlantic. The Minerals Management Service periodically conducts assessments of undiscovered hydrocarbon reserves of the outer continental shelf nationwide, most recently in 2006[7]. These assessments take into account past exploration data and information for new discoveries in areas with analogous geology, which for the Georges Bank include the Scotian Shelf. The assessment of undiscovered, technically recoverable reserves for the entire North Atlantic Planning Area, which extends from the border with Nova Scotia in the Gulf of Maine to the Delaware border, is a mean of 2 billion barrels of oil and 18 Tcf natural gas (Table 1). The greater proportion of this potential is probably in the southern part of this region near New Jersey where earlier exploration wells discovered gas. For comparison purposes, this same assessment indicates that the Gulf of Mexico area contains undiscovered reserves of 45 billion barrels of oil and 230 Tcf of gas – over 20 times more oil and 12 times more gas than the entire North Atlantic Planning Area. Additionally, Gulf of Mexico states already have in place the infrastructure necessary to support exploration and development activities.

Oil and gas exploration and development techniques have improved dramatically in the past 30 years, and if applied to the Georges Bank could possibly generate new discoveries, but these would likely be small compared to other areas of the Outer Continental Shelf.

Table 1. Estimates of undiscovered oil and gas for the Atlantic and Gulf of Mexico planning areas[7].

Region / Planning Area	Undiscovered Technically Recoverable Oil and Gas Resources (UTRR)									Undiscovered Economically Recoverable Oil and Gas Resources (UERR)					
	Oil (Bbo)			Gas (Tcfg)			BOE (Bbo)			$46/Bbl $6.96/Mcf		$60/Bbl $9.07/Mcf		$80/Bbl $12.10/Mcf	
										Oil (Bbo)	Gas (Tcfg)	Oil (Bbo)	Gas (Tcfg)	Oil (Bbo)	Gas (Tcfg)
	95%	Mean	5%	95%	Mean	5%	95%	Mean	5%	Mean		Mean		Mean	
Atlantic OCS	**1.12**	**3.82**	**7.57**	**14.30**	**36.99**	**66.46**	**3.67**	**10.40**	**19.39**	**2.23**	**13.70**	**2.57**	**17.28**	**2.84**	**20.75**
North Atlantic	0.57	1.91	3.80	7.18	17.99	32.17	1.85	5.12	9.52	1.15	6.91	1.32	8.65	1.45	10.32
Mid-Atlantic	0.43	1.50	2.96	5.44	15.13	27.53	1.39	4.19	7.85	0.81	5.12	0.94	6.60	1.06	8.05
South Atlantic	0.13	0.41	0.81	1.67	3.86	6.76	0.43	1.10	2.01	0.27	1.67	0.30	2.04	0.33	2.38
Gulf of Mexico OCS	**41.21**	**44.92**	**49.11**	**218.83**	**232.54**	**249.08**	**80.15**	**86.30**	**93.43**	**35.79**	**162.83**	**38.20**	**184.79**	**40.21**	**201.55**
Western Gulf of Mexico	9.80	10.70	11.80	62.65	66.25	70.17	20.95	22.49	24.28	8.69	51.86	9.25	56.47	9.71	59.87
Central Gulf of Mexico	28.41	30.32	32.77	134.49	144.77	156.56	52.33	56.08	60.62	24.23	101.00	25.82	114.98	27.16	125.67
Eastern Gulf of Mexico	2.76	3.88	5.51	18.06	21.51	25.98	5.97	7.71	10.13	2.85	9.96	3.11	13.32	3.33	16.00
Straits of Florida	0.01	0.02	0.03	0.01	0.02	0.02	0.01	0.02	0.04	0.01	0.01	0.01	0.01	0.01	0.01

Potential benefits of oil and gas development at Georges Bank

Georges Bank oil and gas development could provide benefits to the state of Maine, the Northeast region, and the U.S. Although a substantial period of time is necessary for exploration and development activities, eventually, new hydrocarbon resources could be brought on line that, in small measure, reduce dependence on unstable foreign sources. In addition to the exploration and development jobs themselves, such activities would generate on-shore support jobs. However, I think we need to be clear about the limited extent to which such development has potential to directly benefit Maine. The proximity of the Georges Bank is such that any support base for exploration and development activities there would likely be situated in Massachusetts or Rhode Island. That said, Maine has a track record of benefiting from petroleum exploration. One Maine corporation recently constructed two semi-submersible platforms for petroleum development; their work would certainly be enhanced by Georges Bank development. However, this corporation has also demonstrated that they can compete globally since those two rigs were deployed in waters off Brazil.

Georges Bank Fisheries[8]

Georges Bank is the most westward of the great Atlantic fishing banks - those now-submerged portions of the North American mainland that extend from the Grand Banks of Newfoundland to Georges Bank. They rank among the world's most productive fisheries. Lying adjacent to New England's famous seaports, Georges Bank is single-handedly responsible for the development of coastal fisheries in towns such as Gloucester, Massachusetts and Portland,

Maine. The varied nature of sedimentary environments on Georges Bank is a key element in the development of the biological community. Seafloor sediment originally was transported to the bank by glaciers. During and after glacial retreat, the rise of sea level and the action of tidal and storm currents marked the start of an erosional episode on the bank that continues today. Gravel formed through this process is an important habitat for the spawning and survival of several fishery species[9]. For instance, distribution patterns of juvenile cod indicate that the gravel habitat is where they are best able to avoid predators and to find food sources. The topography and position of the bank result in upwelling of nutrient-rich waters circulating in the Gulf of Maine. These nutrients, introduced into the sunlit waters over the bank, and interaction with warm Gulf Stream currents on the southern edge of the Banks, support exceptional rates of productivity, including many species of commercial importance. These are important spawning, juvenile and feeding grounds for cod, haddock, herring, and other commercial species. The scallop resource on Georges Bank is also very productive and valuable. In Maine, a substantial portion of the fishing fleet is dependent on the Georges Bank, and the largest dollar value of the commercial catch brought to Maine ports comes from this location.

Certainly, there are issues with over-fishing the Georges Bank, but government efforts focus on managing the fishery to rebuild stocks. Under current conditions, the fishery resources of Georges Bank are important to the economy of Maine and New England. With rebuilding of these resources, their economic value will be increased very significantly.

Summary

1) We are not opposed to offshore drilling in general and recognize that for the near term, the nation needs sources of oil and gas that are not vulnerable to foreign ownership and control. However, oil and gas development efforts should be focused in the areas with the greatest potential, and where infrastructure is already in place to support the activity.
2) Wherever additional areas of the Outer Continental Shelf are accessed for oil and gas development, states should benefit directly through revenue sharing, as occurs with states around the Gulf of Mexico and in Canada.
3) The Georges Bank has great economic value as a fishery. In spite of the troubled nature of the fishery, it supports a substantial portion of the New England economy. We are concerned about potential negative impacts of oil and gas development on the fishery.

4) Oil and gas development could bring additional jobs to the region, but these would most likely be in southern New England.
5) We believe the resources of the Gulf of Maine are most suitable to renewable energy development, with tidal and offshore wind power being the primary resources. Renewable wind power may provide manufacturing and support employment and contribute to a sustainable, secure energy future.

Notes

1. Daghar, H., as presented to Ocean Energy Task Force: http://www.maine.gov/spo/specialprojects/OETF/Documents/Dagher%2012%2017%2008.pdf
2. Ocean Energy Task Force website: http://www.maine.gov/spo/specialprojects/OETF/index.htm
3. Dagher, H., Director, University of Maine Advanced Structures and Composites Center: http://www.aewc.umaine.edu/072208Dagher.pdf
4. Gulf of Maine times, 2000, Vol. 4, No. 1, map copyright MapWorks 2000.
5. Edson, G.M., Olson, D.L., and Petty, A.J., 2000, Georges Bank Petroleum Exploration: Minerals Management Service OCS Report 2000-031, 20 p.
6. Canada-Nova Scotia Offshore Petroleum Board: http://www.cnsopb.ns.ca/
7. Minerals Management Service, 2006, Planning Area Resources Addendum to Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf, 2006
8. Fisheries information in this section compiled from discussions with George Lapointe, Commissioner, Maine Department of Marine Resources.
9. USGS Fact Sheet, Geology and the fishery of Georges Bank, http://pubs.usgs.gov/fs/georges-bank/