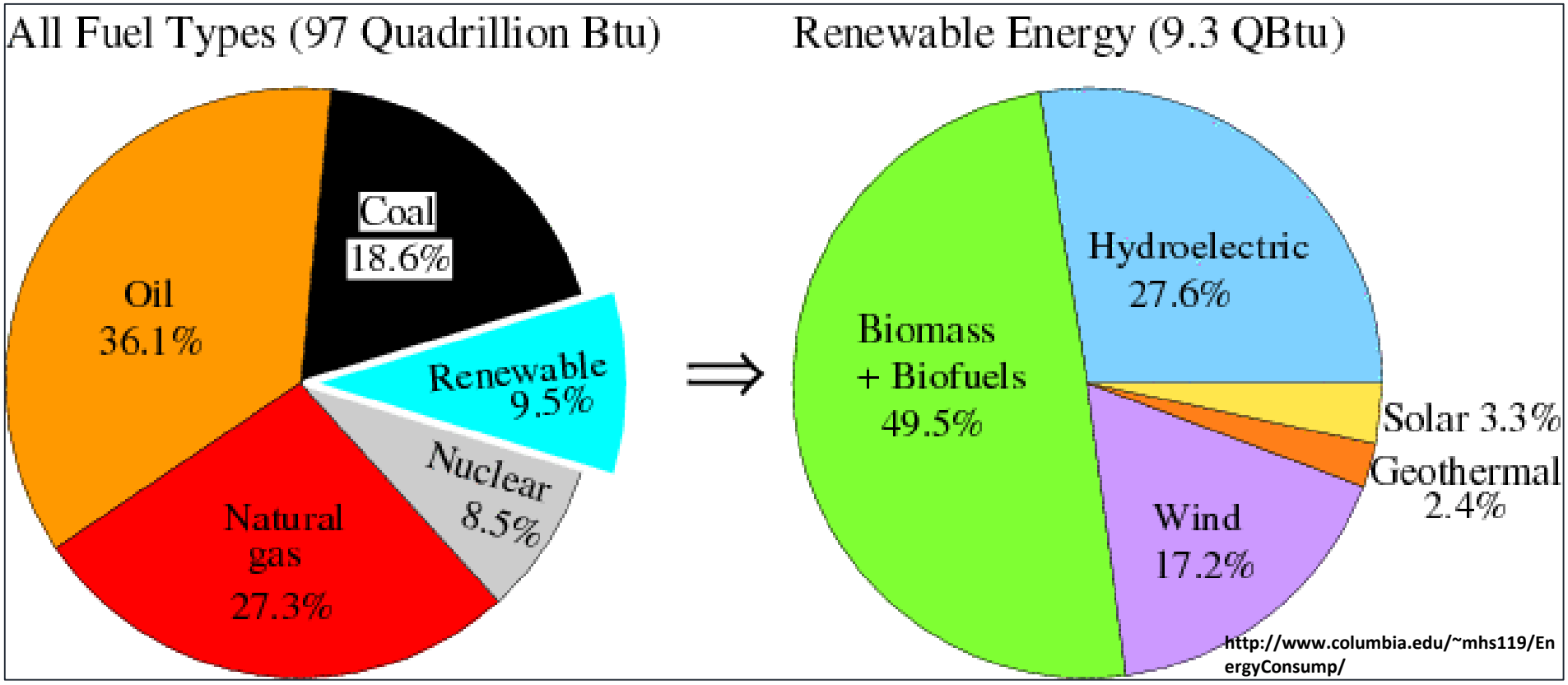
Offshore Energy: Oil/Gas and Wind
A Few "Facts" and Issues
(Resources, Locations, Pros/Cons)

Roger Shew
Depts. of Geography/Geology and Environmental Science

U.S. Energy Consumption by Type



Fossil Fuels = ~80% of energy supply

1 quadrillion = 170,000,000 Barrels of Oil

Major Fuel Type Differences: U.S. uses less Coal and More Nuclear than Global

North Carolina uses more coal and nuclear for electricity but natural gas is growing dramatically at the expense of coal

With the exception of crude oil we are close to energy independence

ELON UNIVERSITY POLL

http://www.elon.edu/elonpoll • facebook.com/elonpoll • @elonpoll

Citizen Perspectives on Energy and the Environment

February 24 – 28, 2013

891 respondents, 3.3% error

Overall Support for Offshore Drilling

Support	66.4%
Oppose	27.1%
Don't Know	6.1%
Refused	0.3%

Note: During BP Macondo Oil Spill or 2010, 51% Supported OCS Drilling

harris INTERACTIVE **POLL**

NC Residents Support Offshore Drilling for Oil and Natural Gas

January 15 – 18, 2015

605 respondents, Telephone Interview, 4.0% error

Overall Support for Offshore Drilling

Support	71%
Oppose	21%
No Opinion	1%
Don't Know or Refused	7%

http://www.api.org/news-and-media/news/newsitems/2013/oct-2013/poll-shows-north-carolina-voters-strongly-support-offshore-drilling

Coastal Energy Summit in Wilmington, N.C., (Oct. 2014)

Gov. McCrory touted the benefits of offshore oil and gas exploration; but also an

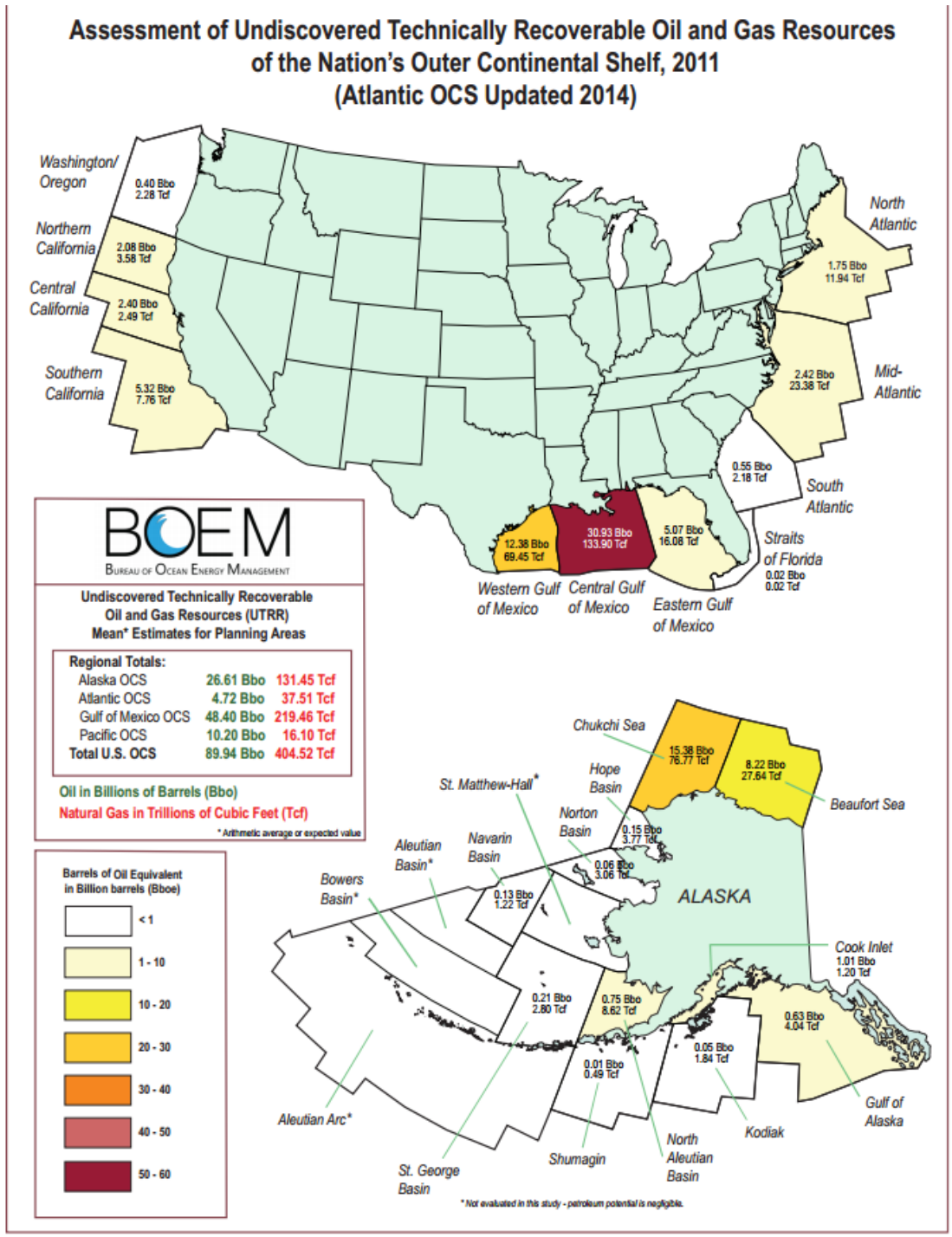
"All of the Above Energy Strategy"

that includes wind, solar, natural gas from hydraulic fracturing, in addition to Oil/Gas from the Outer Continental Shelf

"The debate about offshore drilling has been going for 25 to 30 years in North Carolina in the political environment, but frankly, we don't even know what's out there," he said in remarks covered by the local press. "No one's checked."

The governor made it clear he thinks the resources are out there, and that he intends for them to be extracted. On Thursday, he said "A fairly large part of [the revenue] should go to the coastal region of the Carolinas, because they're the ones investing in the infrastructure," he said. "I think some of that revenue should be used for beach renourishment and to dredge our ports. The governor is also active in the Outer Continental Shelf Governors Coalition, a group of mostly Republican chief executives who have been pushing Sec. Jewell for offshore oil exploration

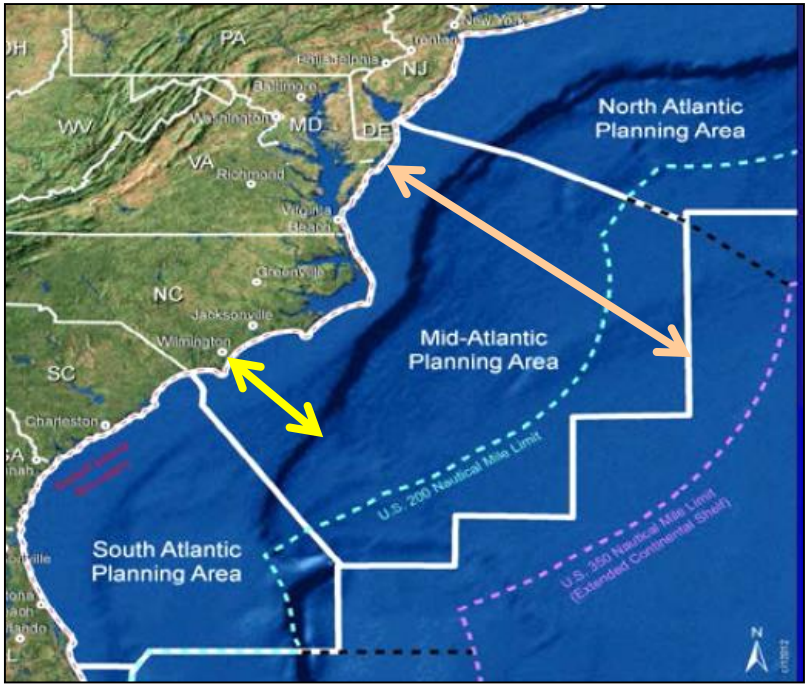
http://www.realclearpolitics.com/2014/10/10/north_carolina039s_changing_energy_mix_343066.html

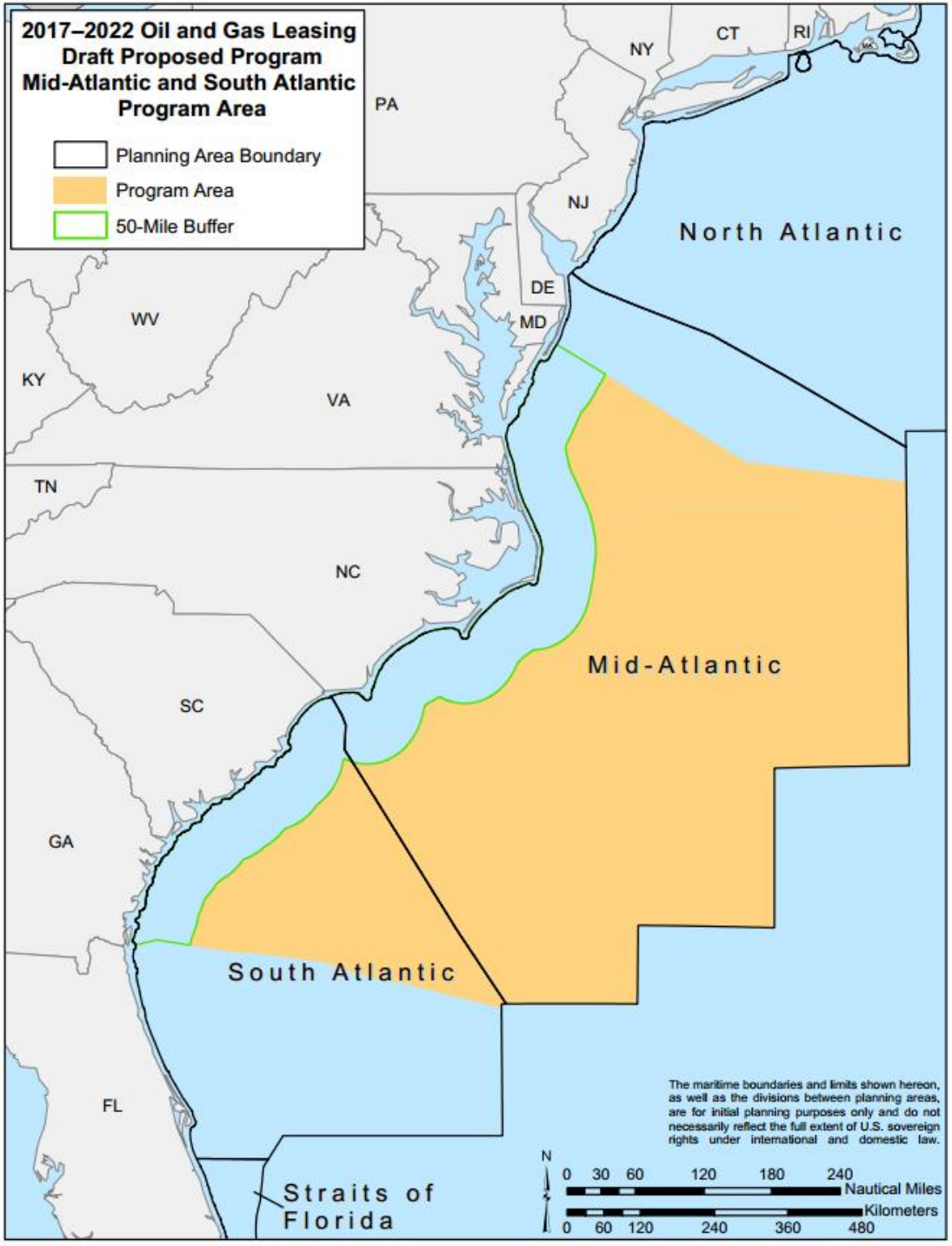


Outer Continental Shelf Areas / Planning Areas

Geologic Continental Shelf is the area from land to shelf slope break – true shelf

Planning Areas (OCS) extend beyond true Continental Shelf to Slope/Rise to 200+ nautical miles





Atlantic OCS
Proposed Geological and Geophysical Activities

Mid-Atlantic and South Atlantic Planning Areas

Final Programmatic Environmental Impact Statement

Volume I: Chapters 1-8, Figures, Tables, and Keyword Index

U.S. Department of the Interior
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region

BOEM
Bureau of Ocean Energy Management

2017-2022 Atlantic Lease Sale Area for Oil/Gas

- **50-mile buffer**
- **VA, NC, SC, GA**
- **No overlap with NC Wind**
- **2021 first possible leasing**

Well Locations in the Atlantic OCS

(DSDP ● and ODP ● wells are Science/Gov't funded wells)

Boston

Washington D.C.

Baltimore Canyon Trough

Georges Bank Basin

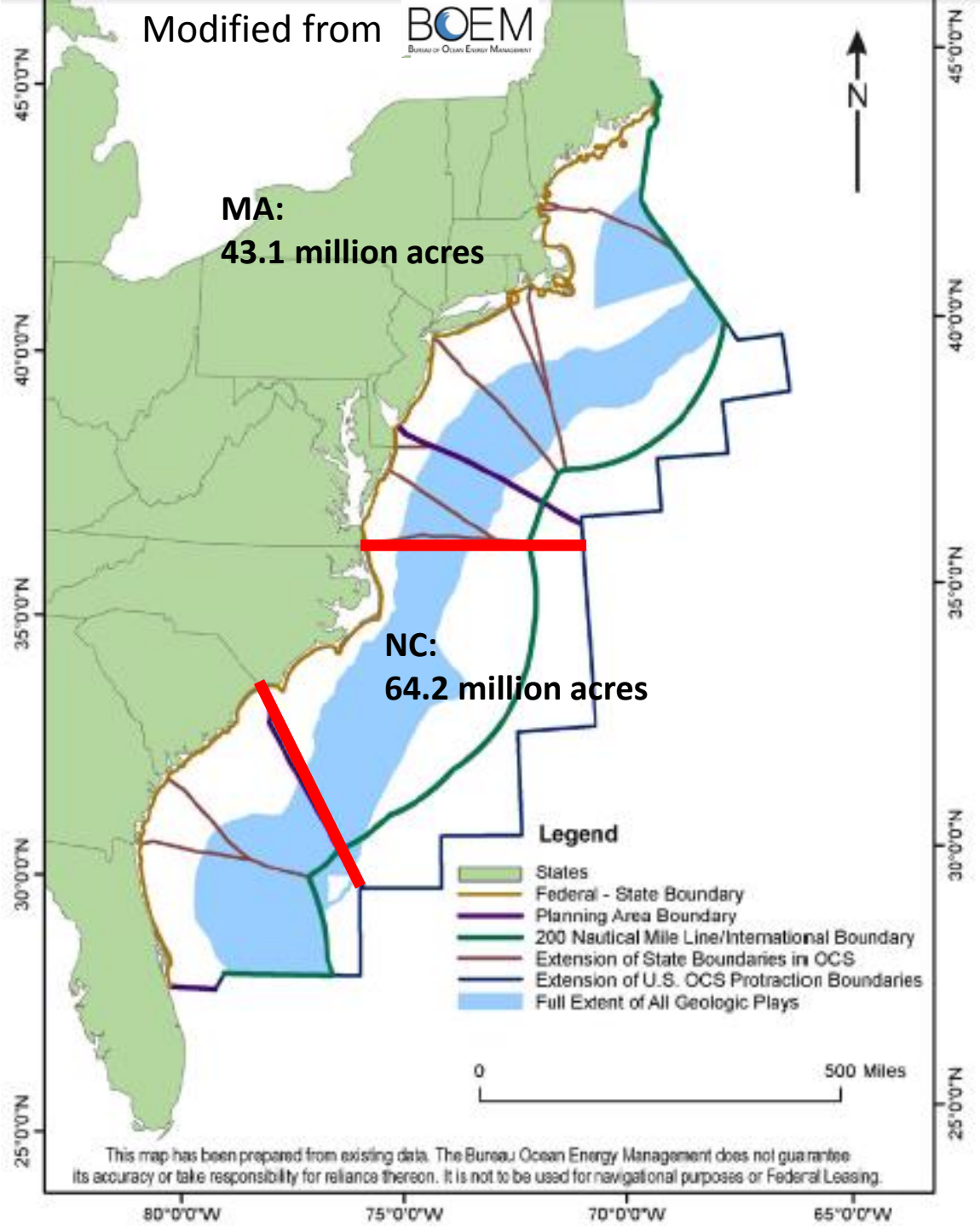
Blake Ridge

SE Georgia Embayment

U.S. Cities
DSDP Wells
ODP Wells
Industry Wells
Fed State Boundary
US EEZ
US States
OCS Planning Area

But If you Love Natural Gas – It's Hydrates on the Blake Plateau

Industry wells ● cluster in 3 areas ← Blake Plateau is gas hydrate area ←



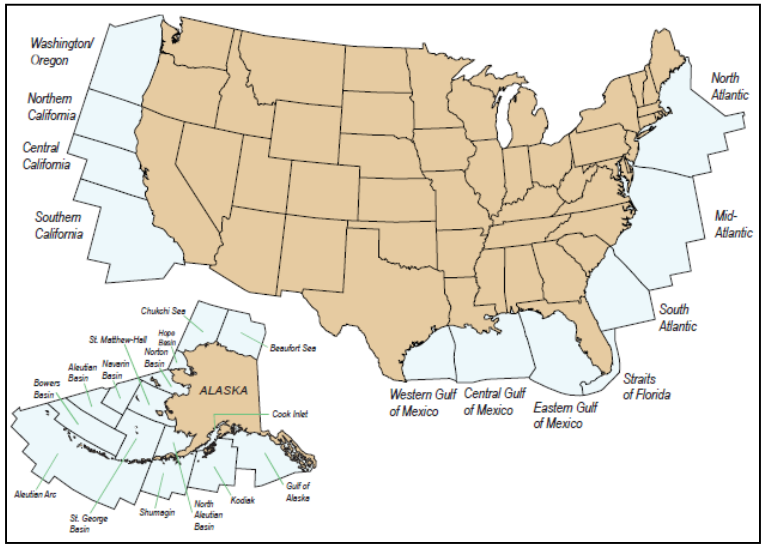
Area	State	MMBOE	Percent of Atlantic Resource
Northern	Maine	83	**0.8%**
	New Hampshire	0	**0.0%**
	Massachusetts	2,977	**28.7%**
	Rhode Island	103	**1.0%**
	New York	950	**9.2%**
	New Jersey	981	**9.5%**
	total	5,094	
Middle	Delaware	11	**0.1%**
	Maryland	690	**6.7%**
	Virginia	405	**3.9%**
	North Carolina	3,072	**29.6%**
	total	4,178	
South	South Carolina	939	**9.1%**
	Georgia	143	**1.4%**
	Florida	11	**0.1%**
	total	1,093	

NC is the "land baron" state of the Atlantic based on boundaries. Acreage and number of geologic "plays" are the reasons for NC having the highest projected reserves:

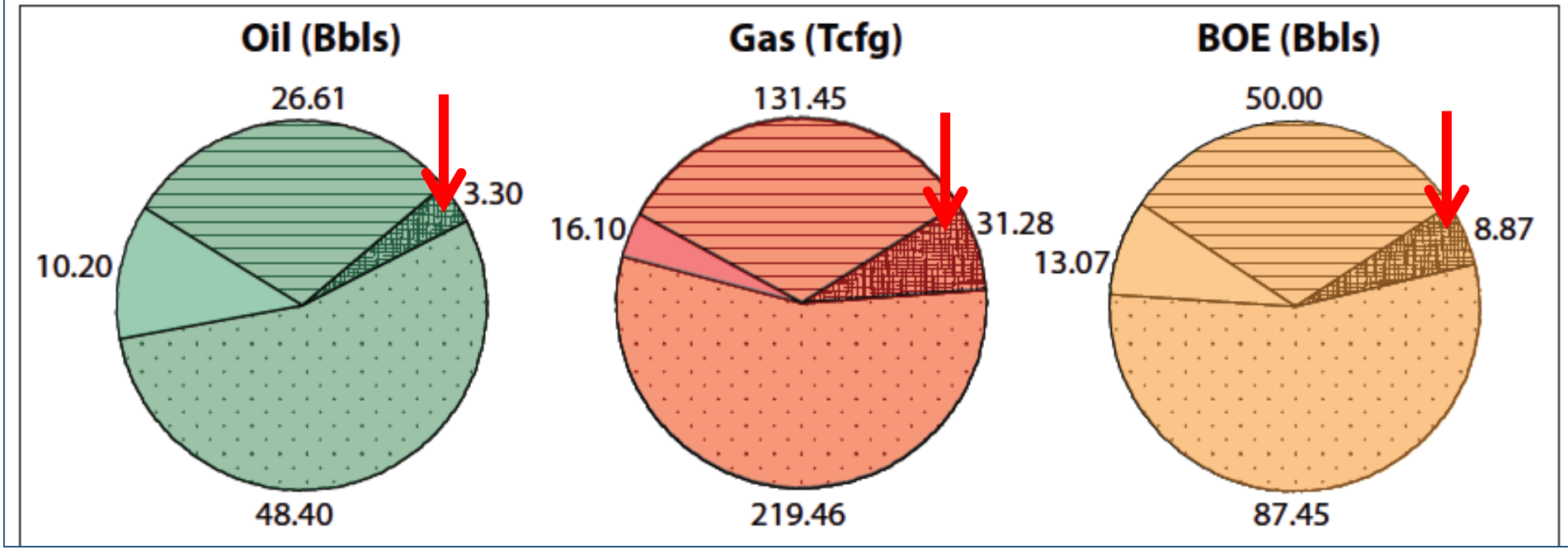
~3.1 MMBOE (30% of total)

~4.8 MMBOE w/ 2014 estimates

Mean Undiscovered Technically Recoverable Resources by Type and Planning Area 2011

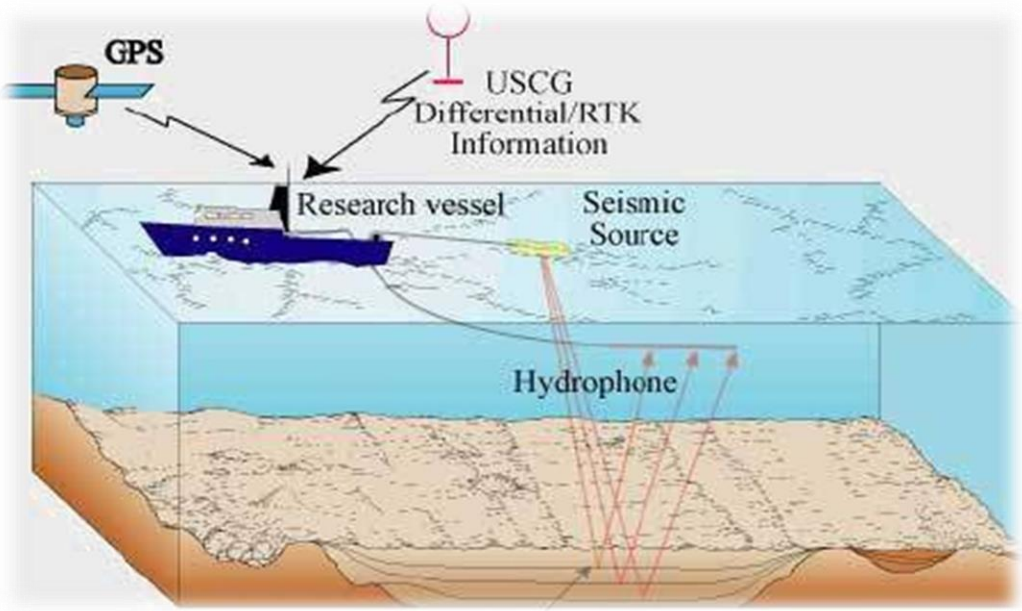


Alaska | Atlantic | Gulf of Mexico | Pacific

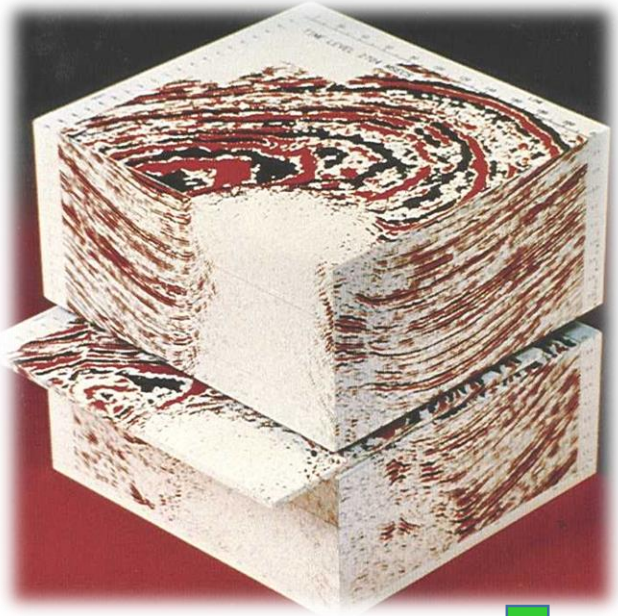


Gulf of Mexico > Alaska > Pacific > Atlantic (except for gas w/ Atlantic > Pacific)

Age of rocks (Jurassic to Early Cenozoic) and depth of burial (maturation of organic matter) lead to Atlantic Planning Area being a more gas-prone province



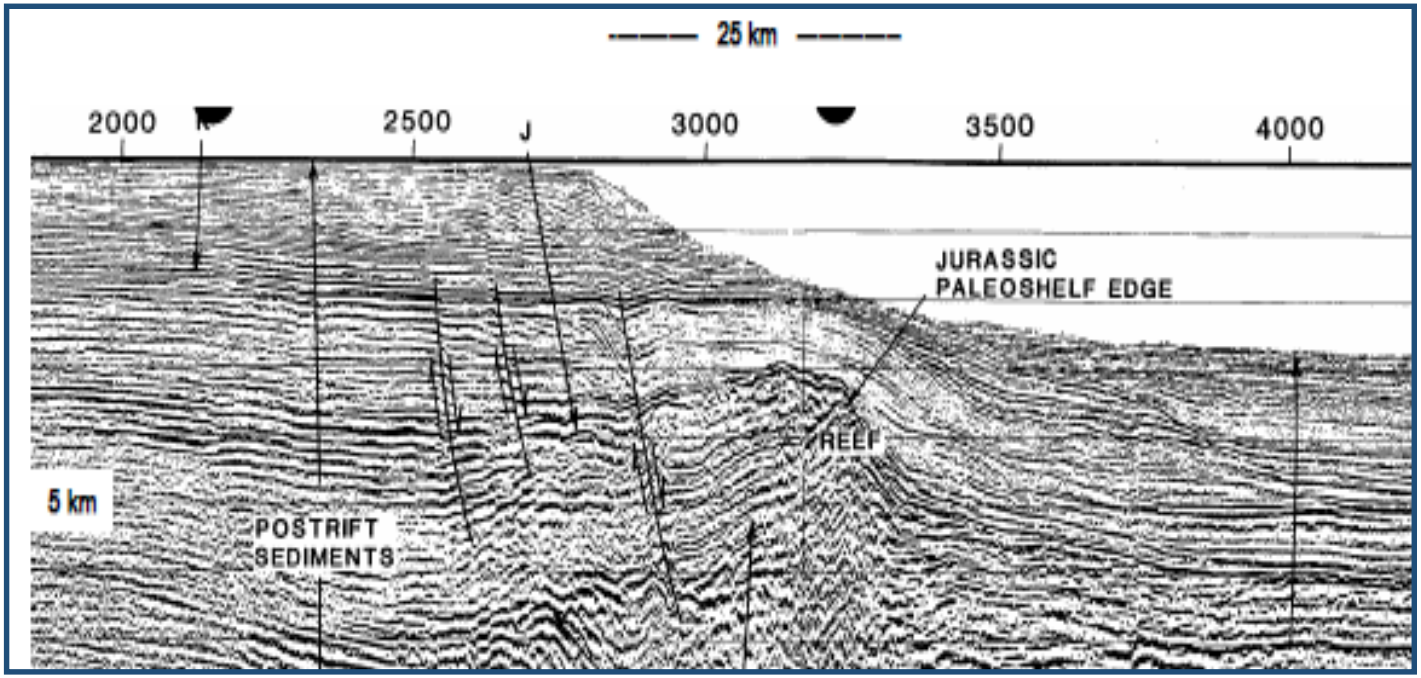
Seismic Acquisition



Reflection Seismic Data

Exploratory Drilling

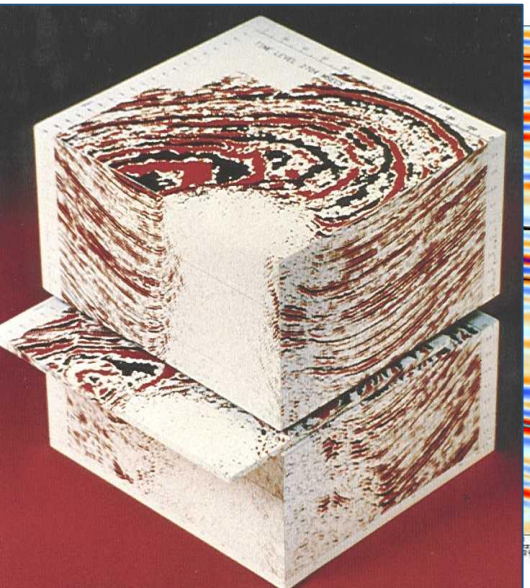
Prospect Exploration and Development

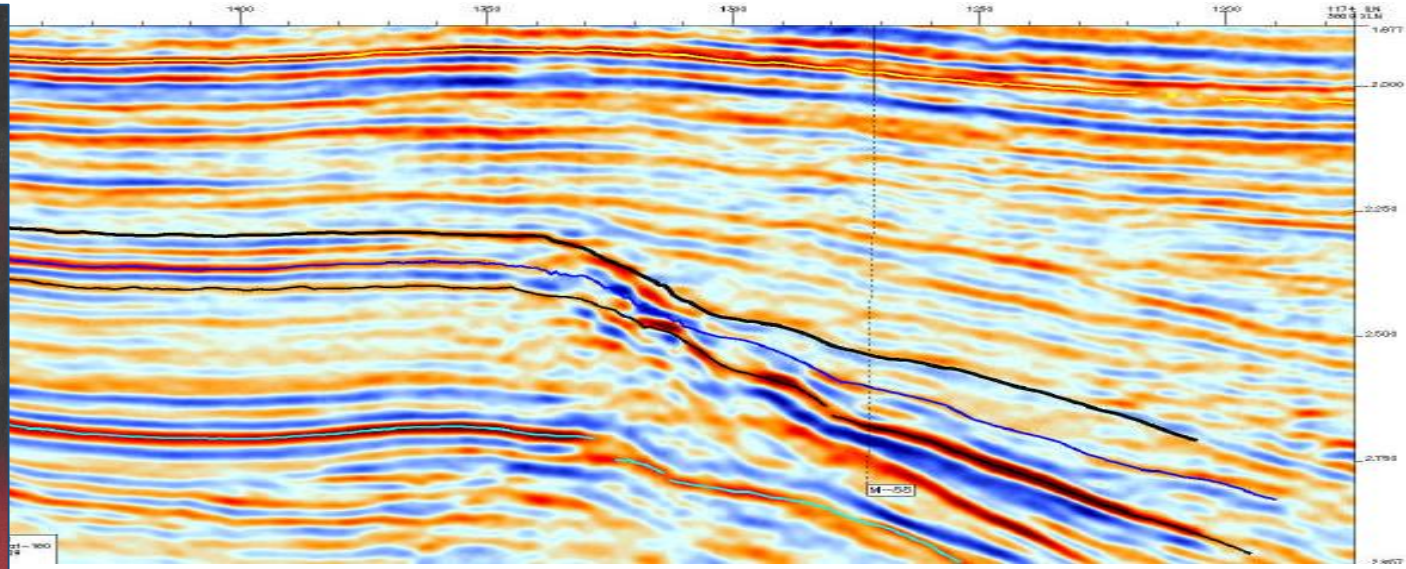


Regional 2-D seismic Line 25 (poor structural and stratigraphic resolution) Baltimore Canyon Trough Area (Grow et al., 1988)

No New Seismic Data since 1980's –

All 2-D, low frequency, shallower penetration, and relatively limited coverage





Spectrum
16225 Park Ten Place, Suite 300 | Houston, TX 77084
Main Line: +1 (281) 647 0602
Fax: +1 (281) 647 0926

January 22, 2015

Braxton C. Davis
Director, North Carolina Division of Coastal Management
Department of Environment and Natural Resources
400 Commerce Avenue
Morehead, North Carolina 28557-3421

Dear Mr. Davis:

Attached is the submission of Spectrum Geo Inc.'s (Spectrum) certification of consistency between its proposed project and the specific enforceable policies of North Carolina's Coastal Management Program (CMP), and the submission meets the standards of the North Carolina CMP for the following reasons.

Spectrum has determined that the proposed project complies with North Carolina's Coastal Management Program, and will be conducted in a manner consistent with the CMP. The attached information contains Spectrum's analysis of the proposed project's consistency with the specific enforceable policies of the North Carolina CMP, including providing the necessary data and information as required in 15 CFR 930.58, and responding to the enforceable policies in the state's CMP as required in 15 CFR 930.57. Consistent with 15 CFR 930.11(g), Spectrum's response to the enforceable policies addresses only the resources that the National Oceanic and Atmospheric Administration's (NOAA's) Office for Coastal Management (OCM) identified as having "reasonable and foreseeable effects."

Sincerely,

Richie Miller
President
Spectrum Geo Inc.
16225 Park Ten Place
Suite 300
Houston, TX 77084

cc: Brian Cameron, BOEM
Kerry Kehoe, NOAA OCM

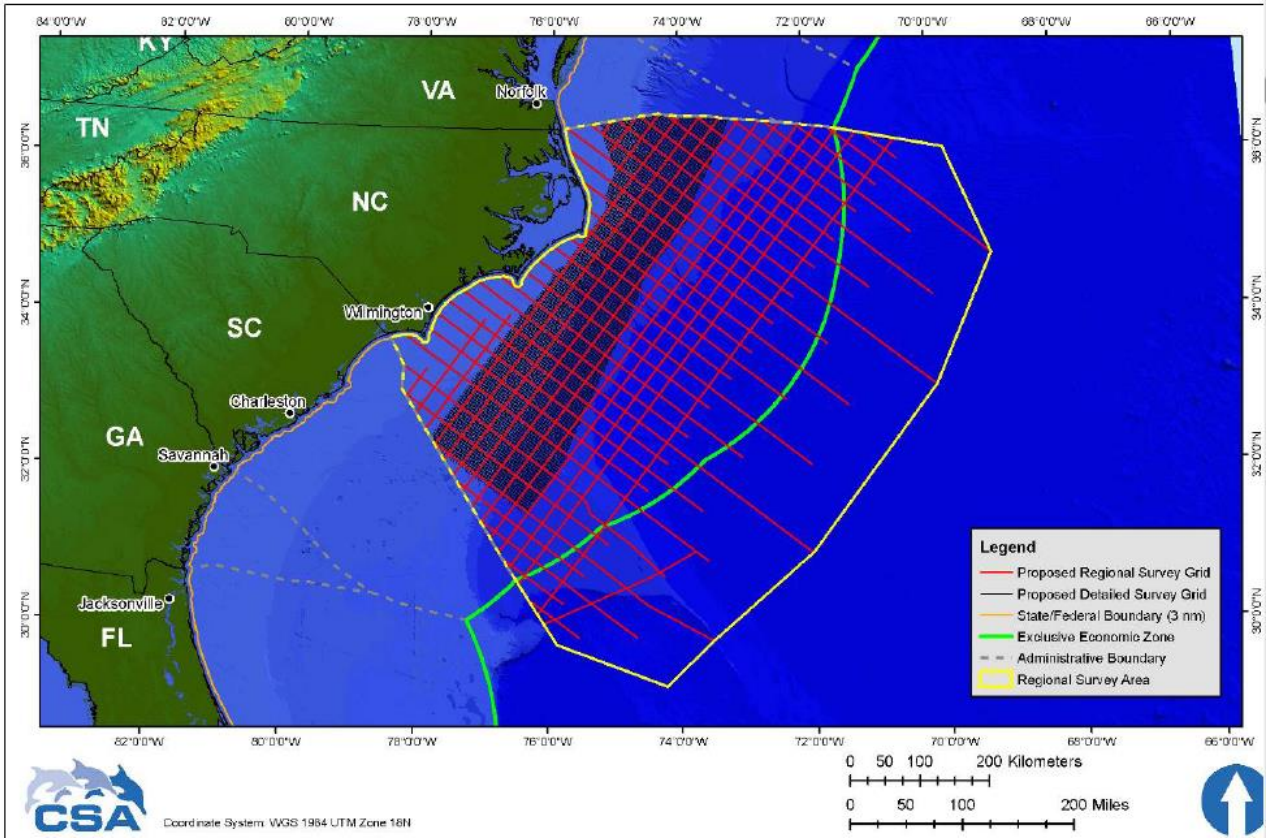
CONSISTENCY CERTIFICATION FOR

SPECTRUM GEO INC.
ATLANTIC 2D GEOPHYSICAL SURVEY
(BOEM APPLICATION E14-006 AND E14-009)

SUBMITTED TO:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

January 2015



Application for conducting seismic surveys off of NC. The grid represents the seismic lines that will be run.

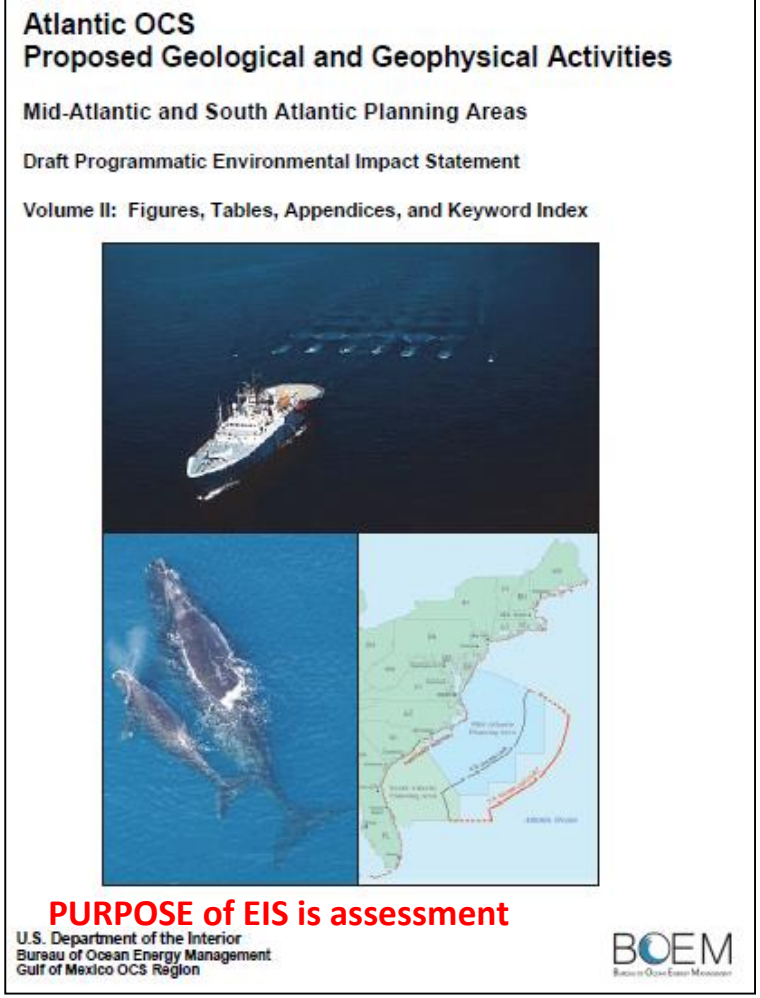
What is the Real Story on Seismic Surveys in Our Oceans

Saying that there is absolutely no possibility of damages from conducting seismic surveys is not helpful

But Neither is using terms like seismic cannons and seismic blasting, and saying it will kill and injure 138,000 animals

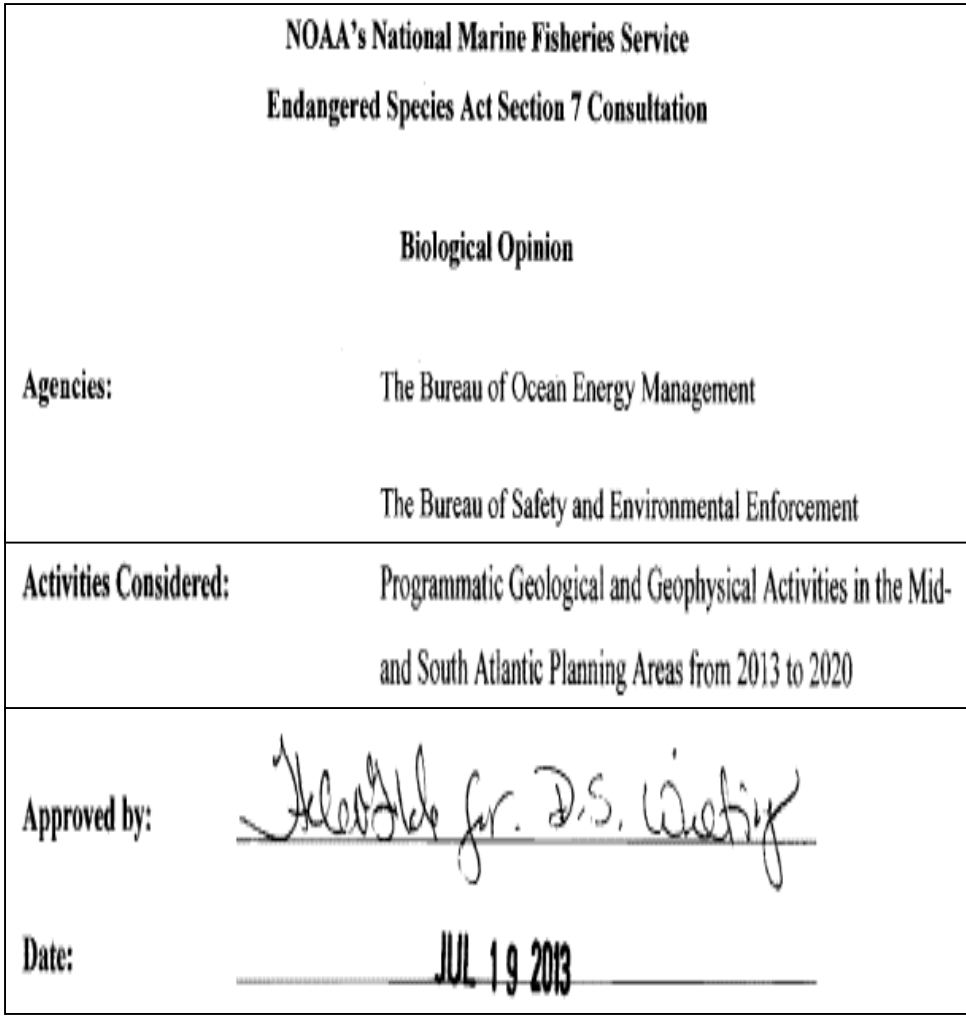
Get the facts, weigh the pros and cons, assess the benefits versus risks.

There are 8 companies wanting to perform seismic surveys; we should try to reduce redundancy for any cumulative effects and use required mitigation techniques



NOAA/NMFS Opinion July 19, 2013

- **NMFS anticipates incidental harassment, but has determined that this level of harassment is not likely to jeopardize the continued existence of the endangered or threatened species….**
- ***"Studies of marine mammals, sea turtles, and seismic show that although the animal's behavioral responses might be disrupted…. The proposed actions and results are expected to be temporary and not affect the reproduction, survival, or recovery of these species."***



NOAA's National Marine Fisheries Service

Endangered Species Act Section 7 Consultation

Biological Opinion

Agencies:	The Bureau of Ocean Energy Management The Bureau of Safety and Environmental Enforcement
Activities Considered:	Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020
Approved by:	for D.S.
Date:	JUL 19 2013

But We MUST Take steps to Minimize Potential Impacts

1. Spotters 2. Ramp up seismic 3. Exclusion zones

4. Time of year exclusions (breeding) 5. New techniques

6. Passive acoustics to detect species

7. Maintain spacing between surveys

BOEM
Bureau of Ocean Energy Management

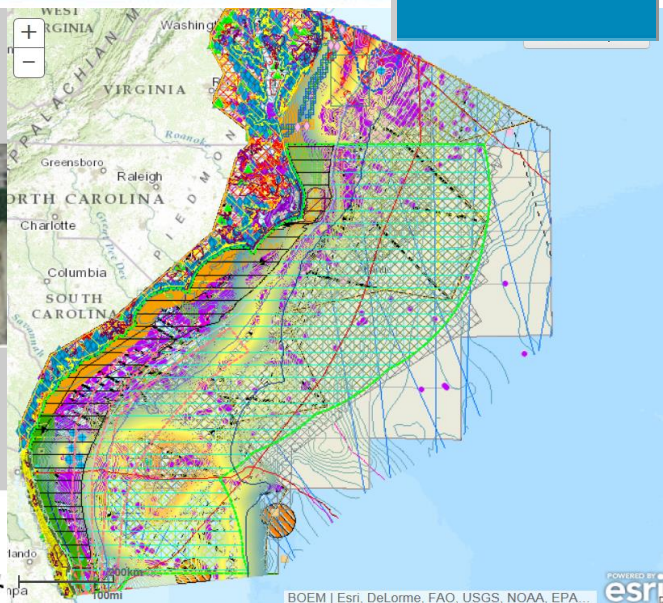
http://boemoceaninfo.com/

Learn Get Involved Contact Us

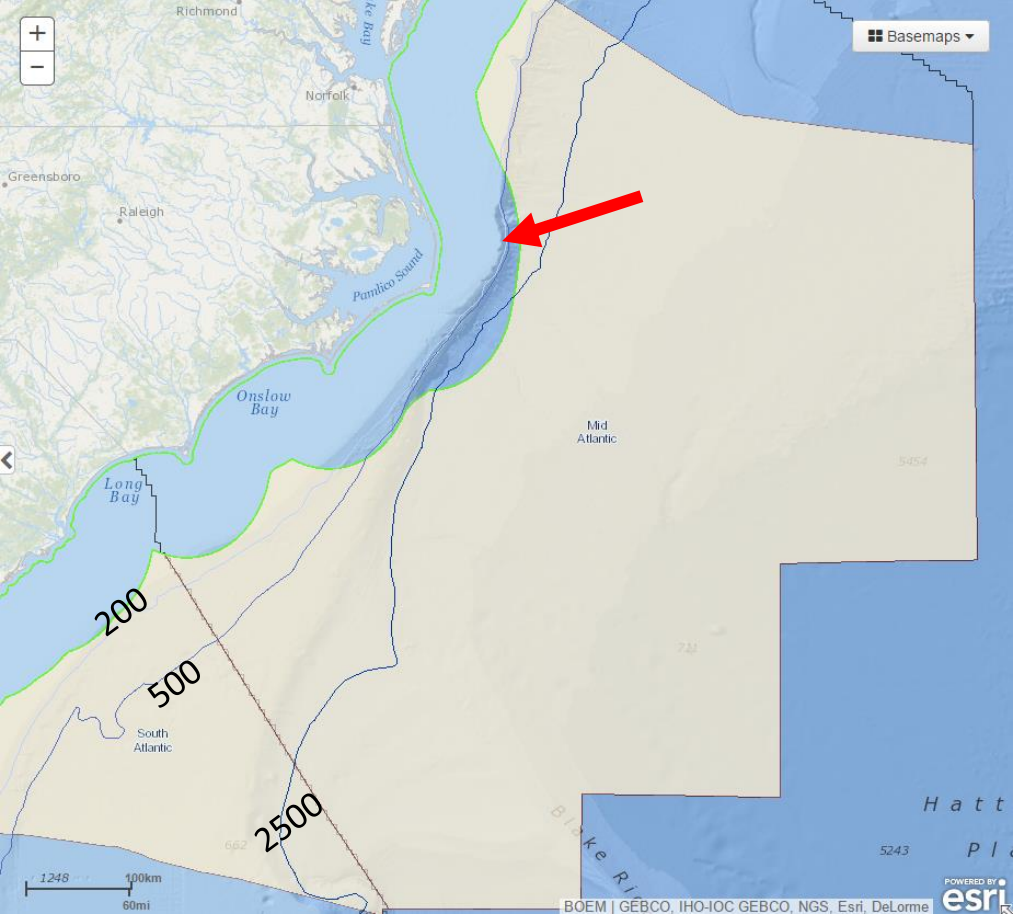
BOEM
Bureau of Ocean Energy Management

SCIENCE NOTES

Applied science for informed decision making



August 22, 2014



Steeply sloping bathymetric feature 45 miles NE of Cape Hatteras known as The Point. In this area, the southward flowing cold water Labrador Current meets the northward flowing, warm water Gulf Stream.

OCS Study
MMS 2002-044

Boating Uses, Economic Significance, and Information Inventory for North Carolina's Offshore Area, "The Point"

Volume I: Characterization of Recreational and Commercial Fisheries

The Point is one of the most valuable and biodiverse areas of the Atlantic.

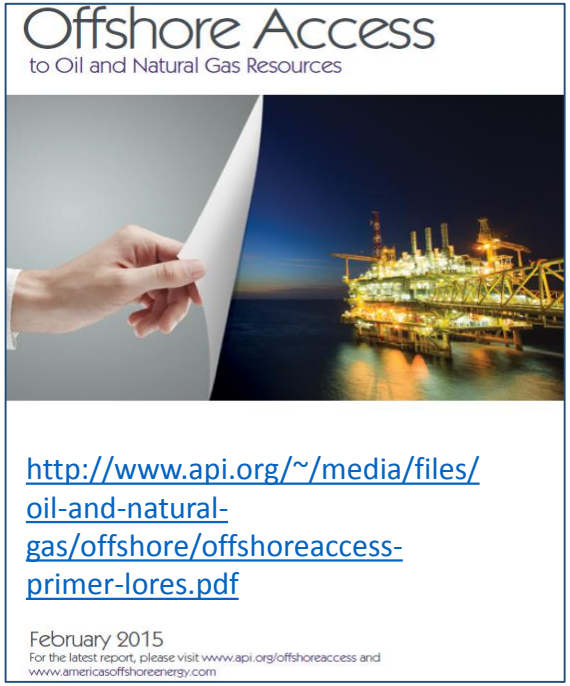
Marine life: swordfish, sharks, endangered sea turtles and large, iconic sea mammals such as dolphins and whales. Rare sea birds dive in the water for food where the upwelling nutrients lead to abundant sea life.

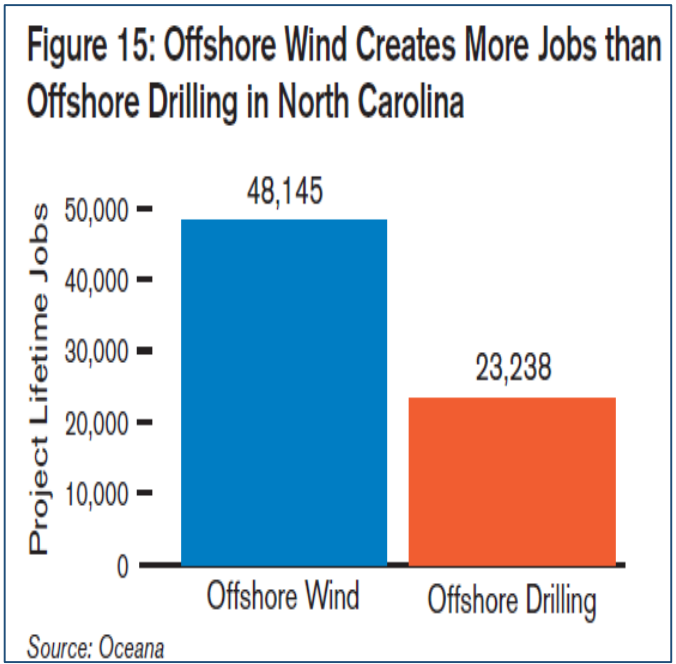
Outer Continental Shelf Drilling: Truths, Lies, and Lots of ½ Truths

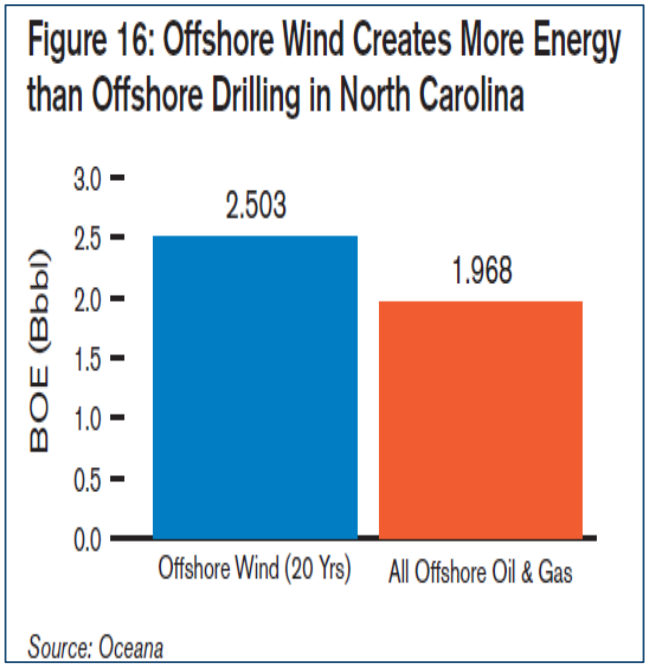
Pros	Cons
Reduce Dependency on Foreign Oil	Oil Spills
Lower Oil Prices	Fishing Industry Impacts
Jobs	PossibleTourism Loss (Aesthetics)
Stimulate the Economy (U.S., N.C.)	Dangers from Hurricanes
Artificial Reef Potential	Contributes to Dirty Fuel Industry
Diversify Supply in Case of Natural Disasters	Ecosystem Damage/Impacts Biodiversity Threatened
Provide State Funding for Other Project	Destruction of Historic Sites
Adding Infrastructure	Time to Drill/Produce/Expensive and Big Upfront Financial Commitment
Newer Technologies (effective)	Piping and Infrastructure Issues
Oil Cheap Relative to Other Transportation	Lubricants/Muds Toxic
Oil; Reliable 24/7 fuel	Natural Gas/Methane Seeps
McCrory, Legislature, NC Voters Want It	Continues Fossil Fuel Dependence and Slows Alternative Energy Efforts

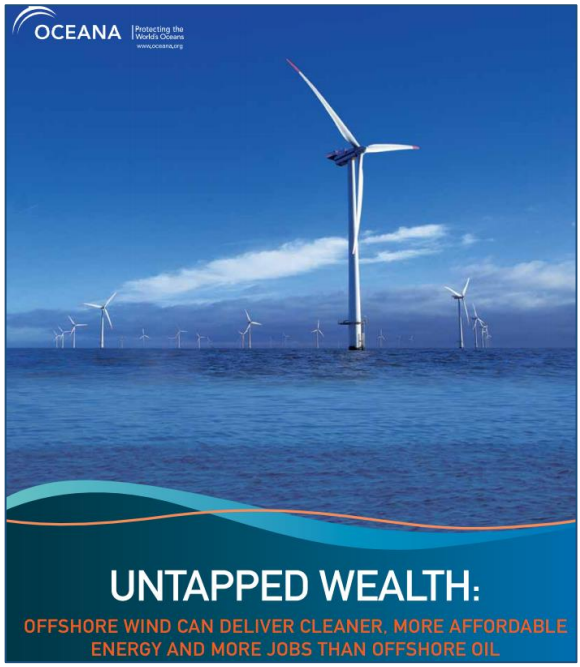
Studies by Quest Offshore Resources, Inc. show that offshore oil and natural gas leasing in the Atlantic OCS, Pacific OCS and Eastern Gulf of Mexico could, by 2035:

- Create nearly 840,000 American jobs
- Raise more than $200 billion in revenue for the government
- Increase U.S. energy production by 3.5 million barrels of oil equivalent per day









Dueling Benefits and Questions

Benefits of Exploration/Production:

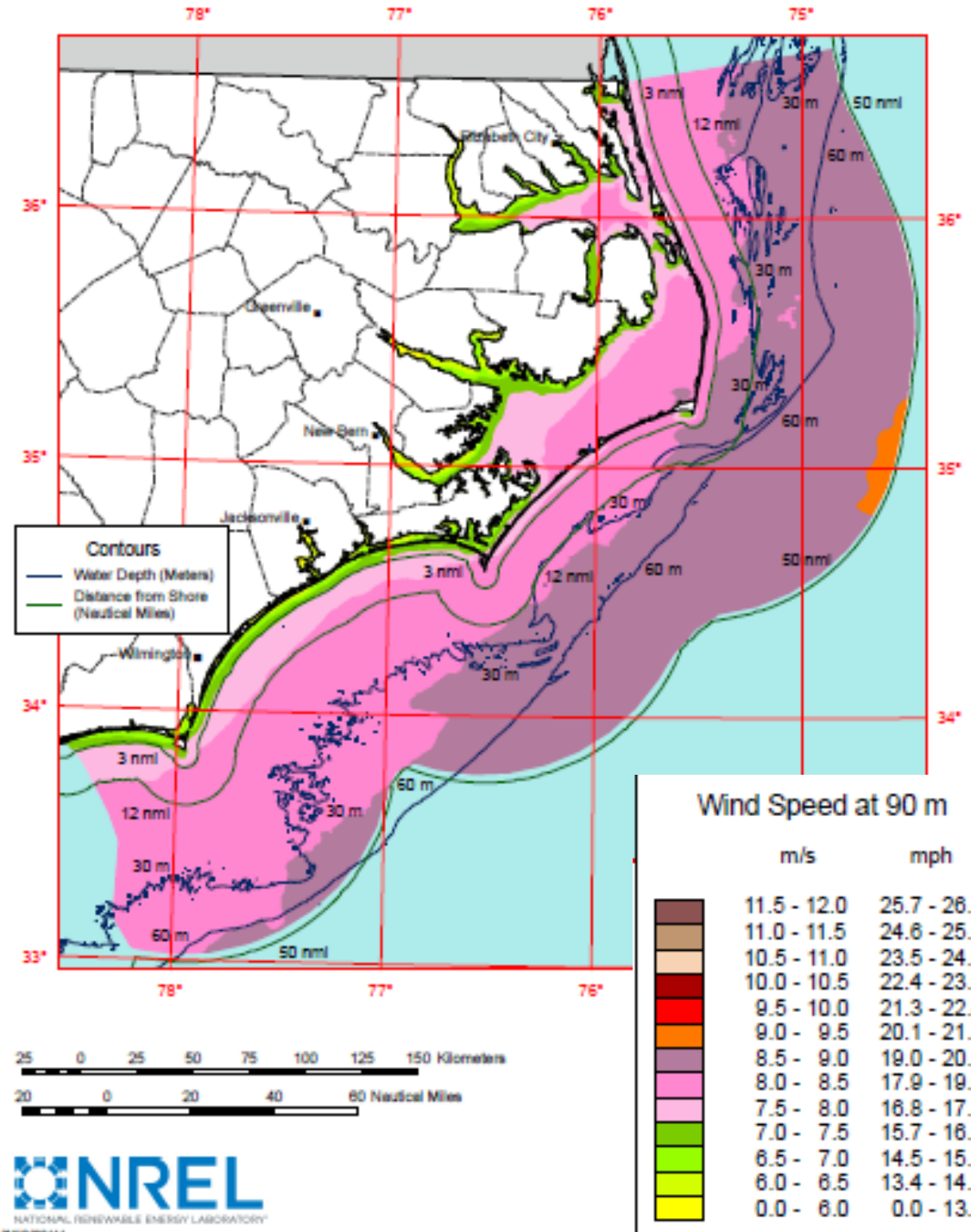
- **Jobs (suggested 6700 new jobs plus construction)**
- **Money (generate $484 – $659 million annually) (Royalties not guaranteed currently)**
- **Development/infrastructure improvements**

Tourism/Fishery $$

- **Tourism annual impact of $478 million in New Hanover County (2013)**
- **5,500 jobs in New Hanover directly related to tourism**
- **Three coastal counties (Dare, New Hanover, Brunswick) in top 10 in tourism $$ w/ $926 (4th), $478 (9th), and $470 (10th) million, respectively)**
- **Coastal Counties have a $3 billion annual tourism income (2013)**
- **Fisheries provide 25,000 jobs and $2.3 billion annually (2012)**

NC Wind Potential for Nearshore and Offshore Areas

- **Excellent for all areas >3 nm**
- **Water Depth is critical for economics; distance doesn't dramatically increase sustained winds but >30 m is much more**



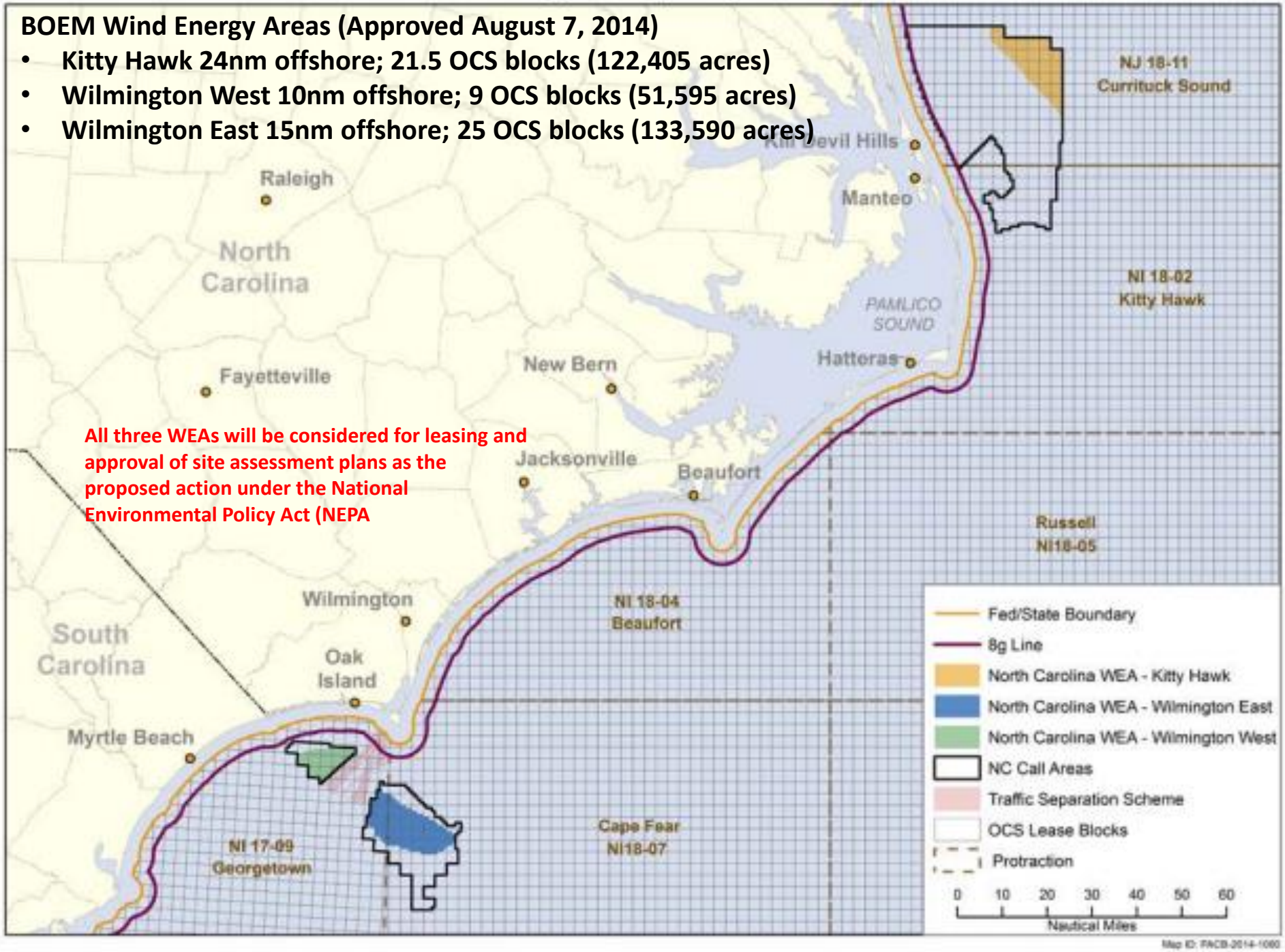
http://apps2.eere.energy.gov/wind/windexchange/windmaps/offshore_states.asp?stateab=nc

Areas with annual average wind speeds of 7 meters per second (m/s) and greater at 90-m height are generally considered to be suitable for offshore development

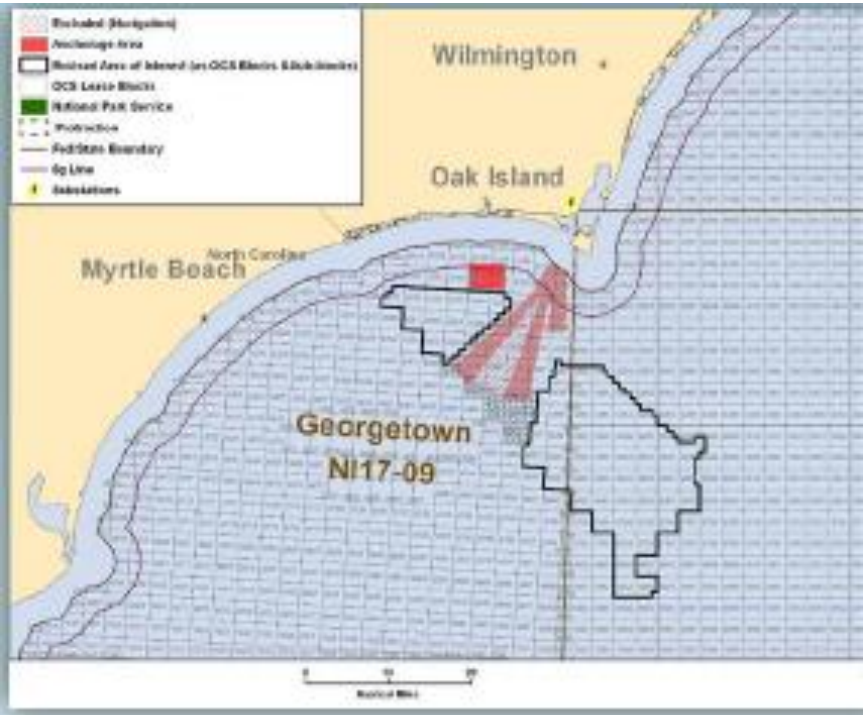
>7 m/s (>15.7 mph)

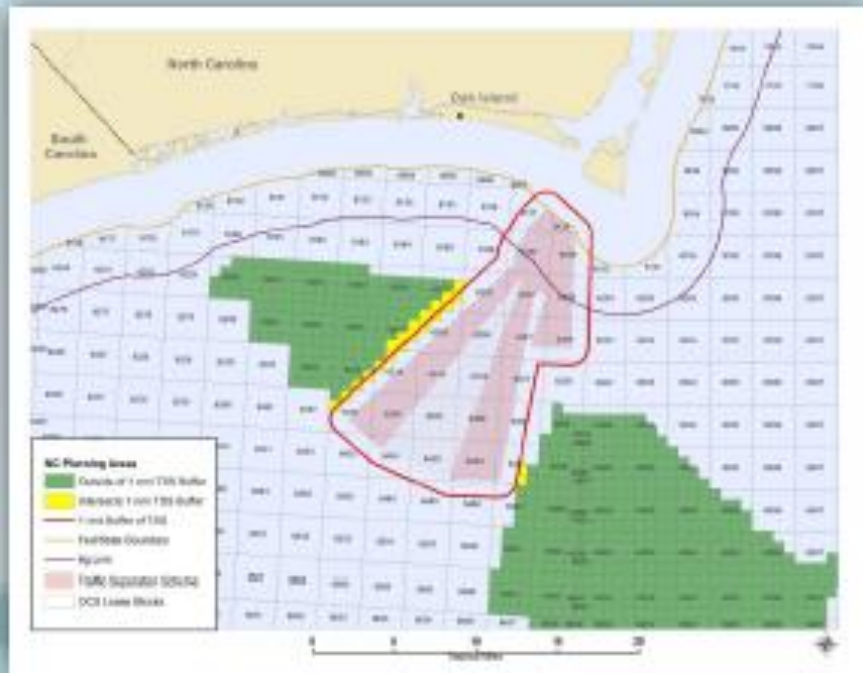
BOEM Wind Energy Areas (Approved August 7, 2014)

- **Kitty Hawk 24nm offshore; 21.5 OCS blocks (122,405 acres)**
- **Wilmington West 10nm offshore; 9 OCS blocks (51,595 acres)**
- **Wilmington East 15nm offshore; 25 OCS blocks (133,590 acres)**



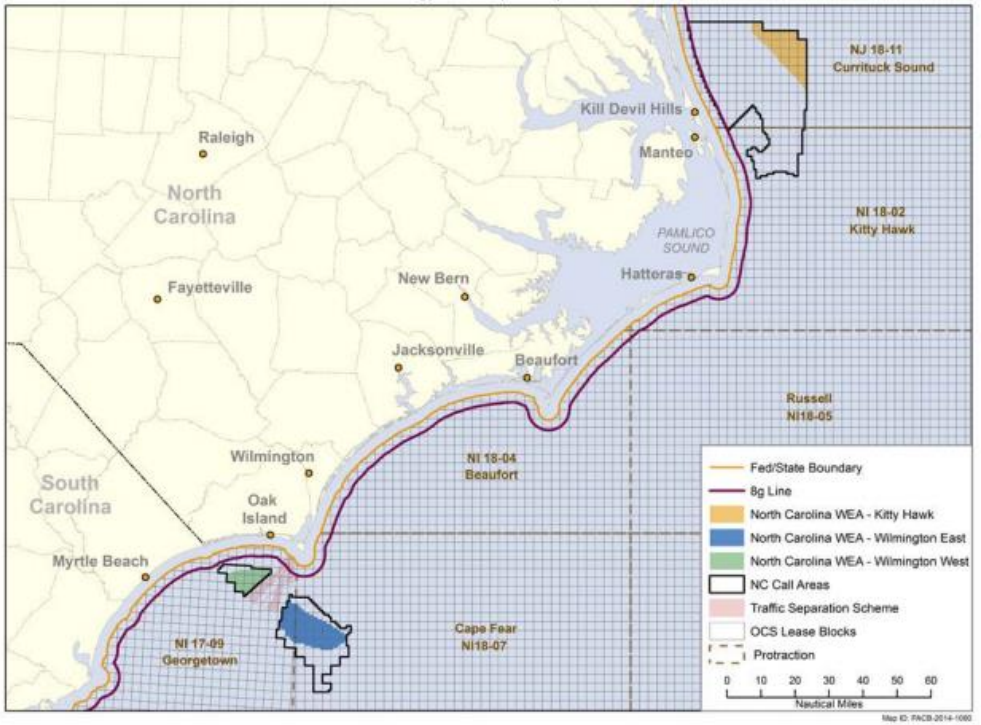
All three WEAs will be considered for leasing and approval of site assessment plans as the proposed action under the National Environmental Policy Act (NEPA





DENR Head Van der Vaart has written a letter to BOEM requesting that all turbines be located 24 nm from the coast, similar to what has been done off of Kitty Hawk.
Viewshed, fisheries, navigation, etc.

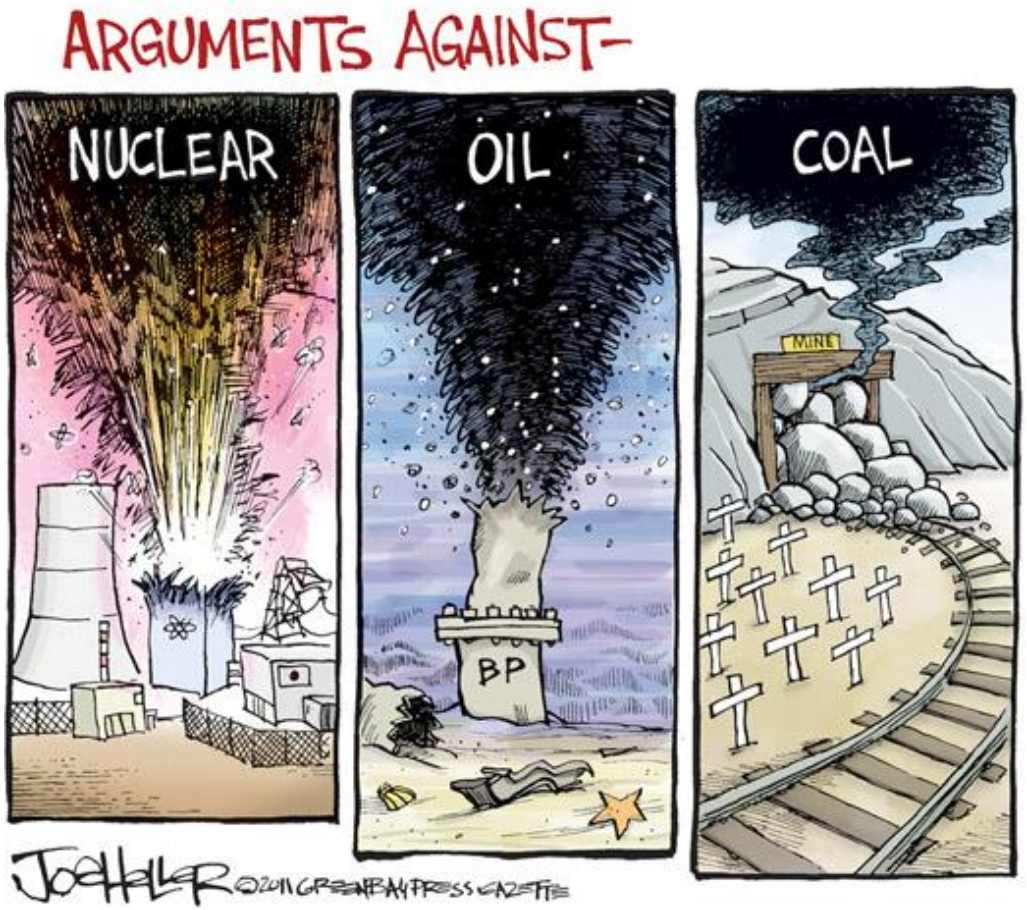
However, this distance would remove all of the Wilmington West WEA and much of the Wilmington East WEA



T. J. Boyle Associates
landscape architects • planning consultants

VISUALIZATION STUDY FOR OFFSHORE NORTH CAROLINA
016 Oak Island Simulation, Late Afternoon, Vestas V164-7.0 MW, 20 nm

Visualizations have been done as in this image of Oak Island. Visualizations include: 200 Turbines; monopole design; Afternoon; Seimens 3.5 MW; Total Height 481 ft Vestas 7.0 MW; Total Height 656 ft and Turbine views at 10, 15, 20 nm for each design)



Arguments for:
- **24/7 Base Load**
- **Cheap**
- **Oil only current large volume for transportation**

Arguments Against:
- **Polluting**
- **Large water user**
- **Ecosystem damage/health**

Arguments for:
- **Large supply**
- **Clean**
- **Widely available**

Arguments Against
- **Not 24/7**
- **Not available everywhere**
- **Costly? Storage?**

Aesthetics!!! It's Ugly

BOEM
Bureau of Ocean Energy Management

SCIENCE NOTES

Applied science for informed decision making

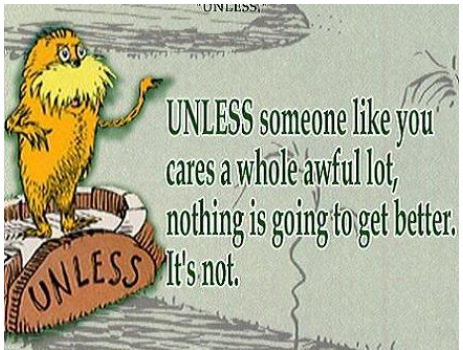
August 22, 2014

The Science Behind the Decision

Answers to Frequently Asked Questions about the Atlantic Geological and Geophysical Activities Programmatic Environmental Impact Statement (PEIS)

What do we need?

- Better efficiency cars, machines, appliances
- Better batteries (storage and life)
- Conservation (you, me, government, industry)
- Use a mix of fuels with a more rapid transition to cleaner fuels
- Make sure that rules/regulations are followed and that emissions are captured
- No we can't snap our fingers and say wind and solar but we can move faster
- Do your part like



How can you save energy?

Home

1. Raise thermostat in summer, lower in winter (Each 1°F lower or higher saves 3% of the energy bill)
2. Hotwater Heater: for each 10°F lowering save 3-5%
3. Insulate
4. Energy efficient appliances
5. Lighting (CFLs)
6. Cut out the lights, unplug or use power strips – Reduce Vampire Energy Drain
7. Possibly solar energy or hot water heater
8. Food: one meat-free day per week = removing 8 million cars

Car

1. Drive less, walk, carpool, bike, Eco-Drive
2. Tire inflation, maintenance (tune-up)
3. Efficiencies

Curiosity ??s

How many have checked tires lately?

How many have power strips and turn off their chargers, computers, etc. at night?

How many reduce shower time or keep thermostat at a saving T?