

Energy Outlook: U.S. Arctic Outer Continental Shelf

5th Symposium
on the

Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations

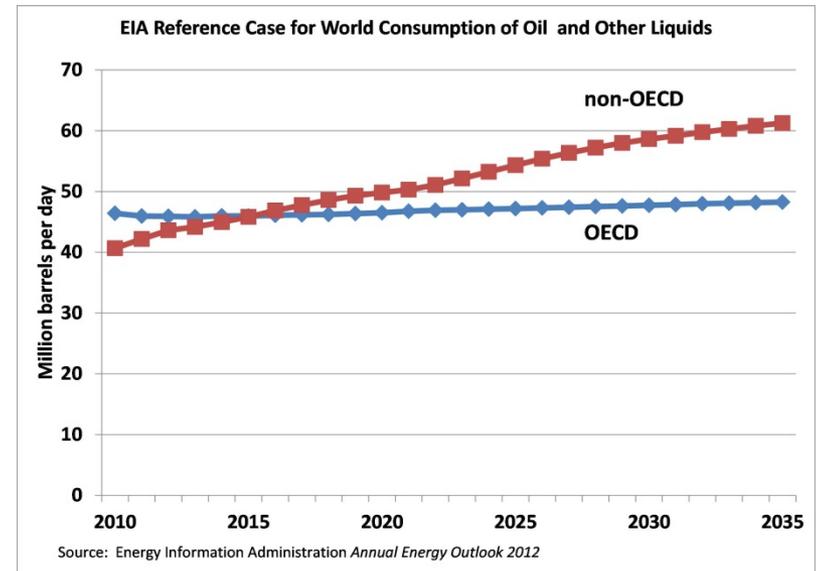
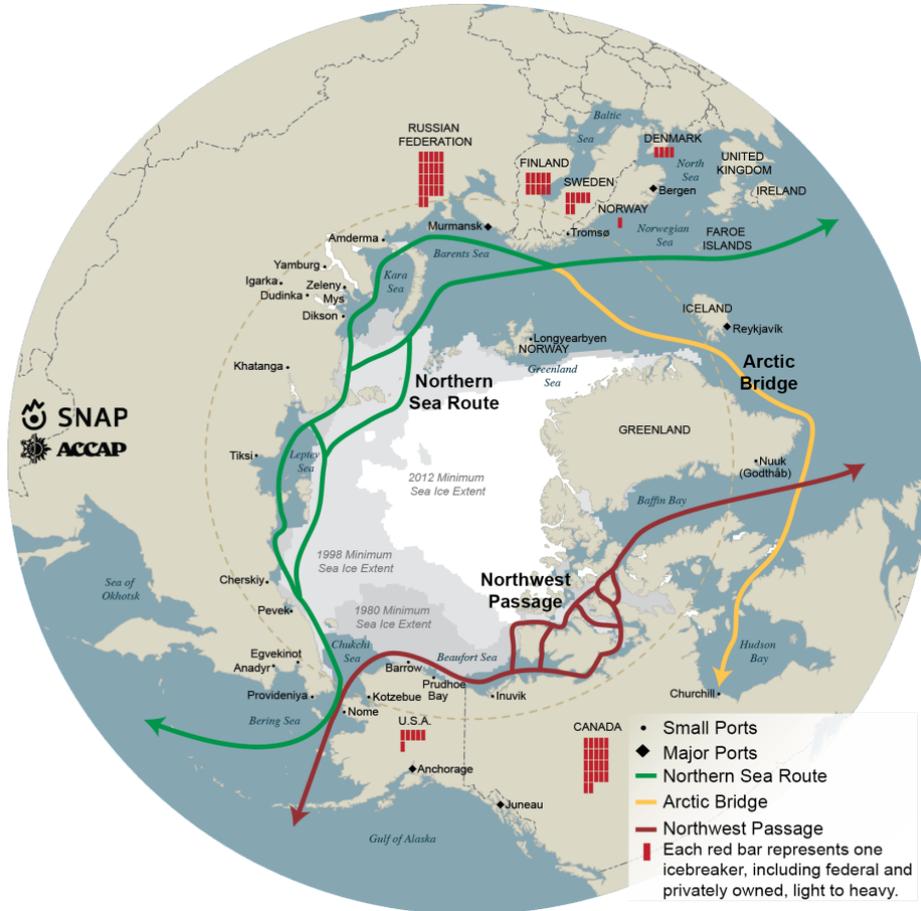
July 16-18, 2013
Washington, D. C.

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Department of the Interior, Bureau of Ocean Energy Management

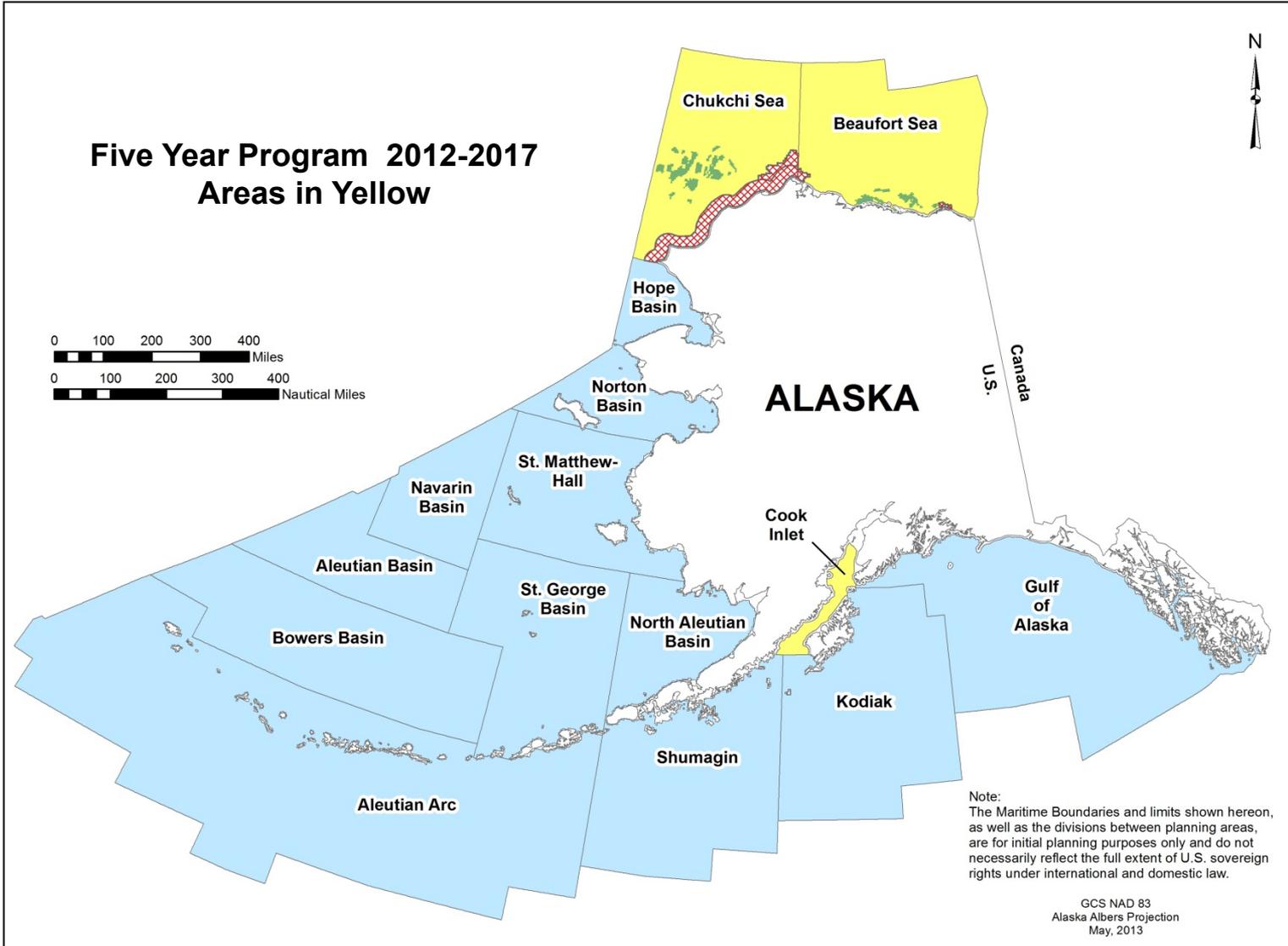


Potential polar marine routes could support efforts to construct new Arctic infrastructure



*The Organization for Economic Co-operation and Development (OECD)

...to meeting rising global demand for petroleum products.



Undiscovered Technically Recoverable Oil & Gas Resources

<u>Planning Areas</u>	<u>Mean Oil (Bbo)</u>	<u>Mean Gas (Tcfg)</u>	<u>Mean BOE (Bbo)</u>
Chukchi Sea	15.38	76.77	29.04
Beaufort Sea	8.22	27.64	13.14
Hope Basin	0.15	3.77	0.82
Norton Basin	0.06	3.06	0.60
Navarin Basin	0.13	3.77	0.82
North Aleutian Basin	0.75	8.62	2.29
St. George Basin	0.21	2.80	0.71
Cook Inlet	1.01	1.20	1.23

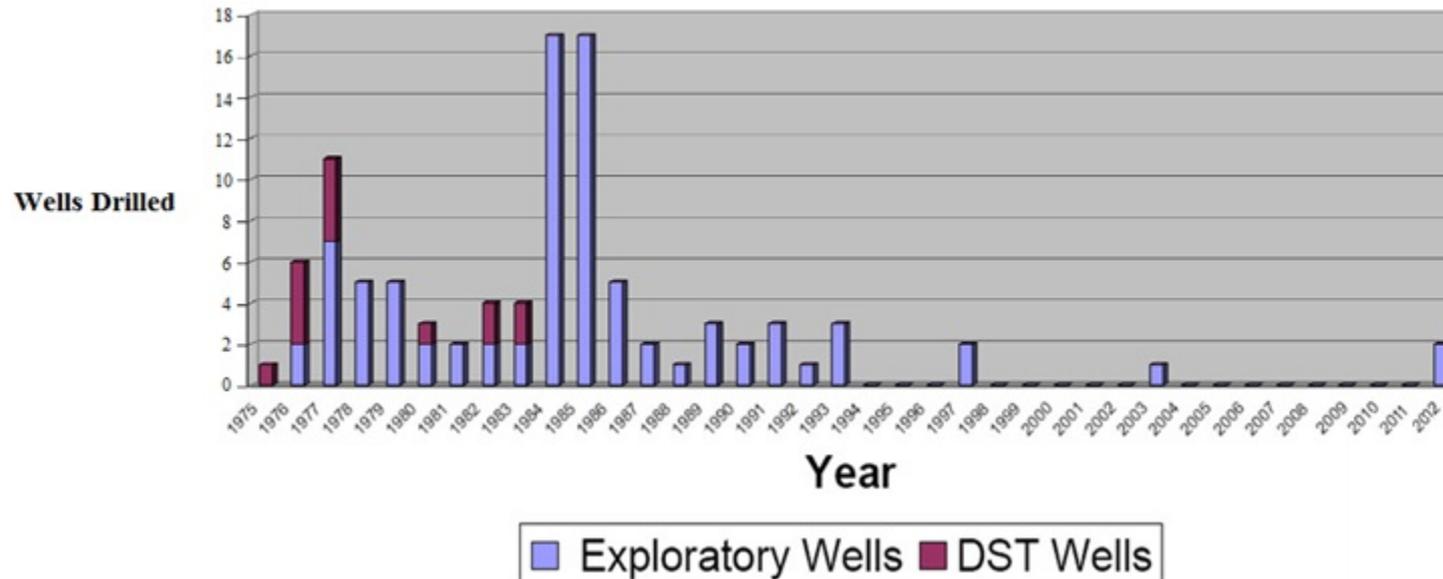
Notes:

1. The Aleutian Arc, Aleutian Basin, Bowers Basin and St. Matthew-Hall Planning Areas in the Alaska OCS Region were not evaluated in this study as their petroleum potential is negligible.
2. Resource values are in billion barrels of oil (Bbo), and trillion cubic feet of gas (Tcfg).
3. Information taken from the BOEM Fact Sheet RED-2011-01a, November 2011.

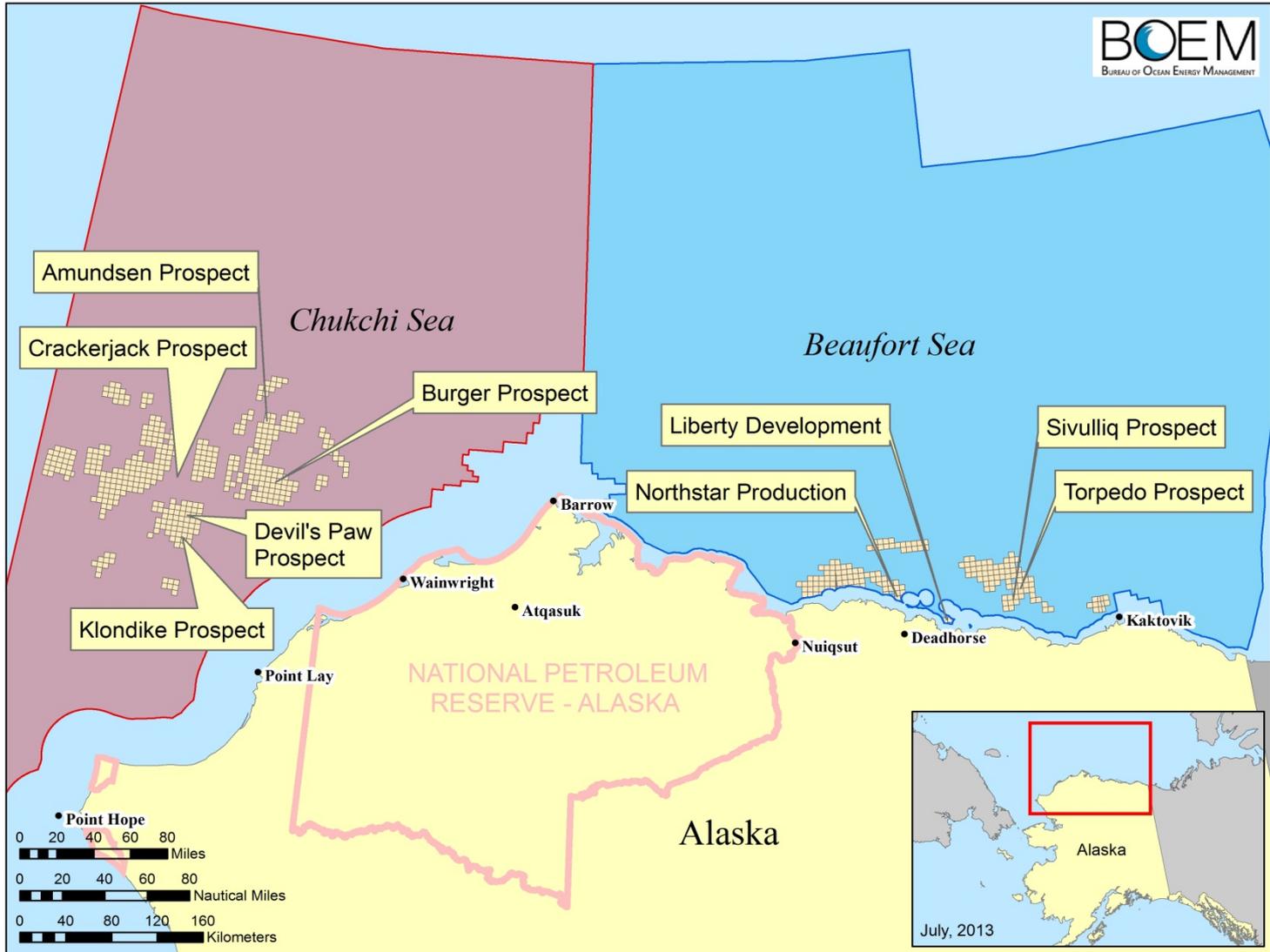
86 Exploration Wells have been drilled on the Alaska OCS

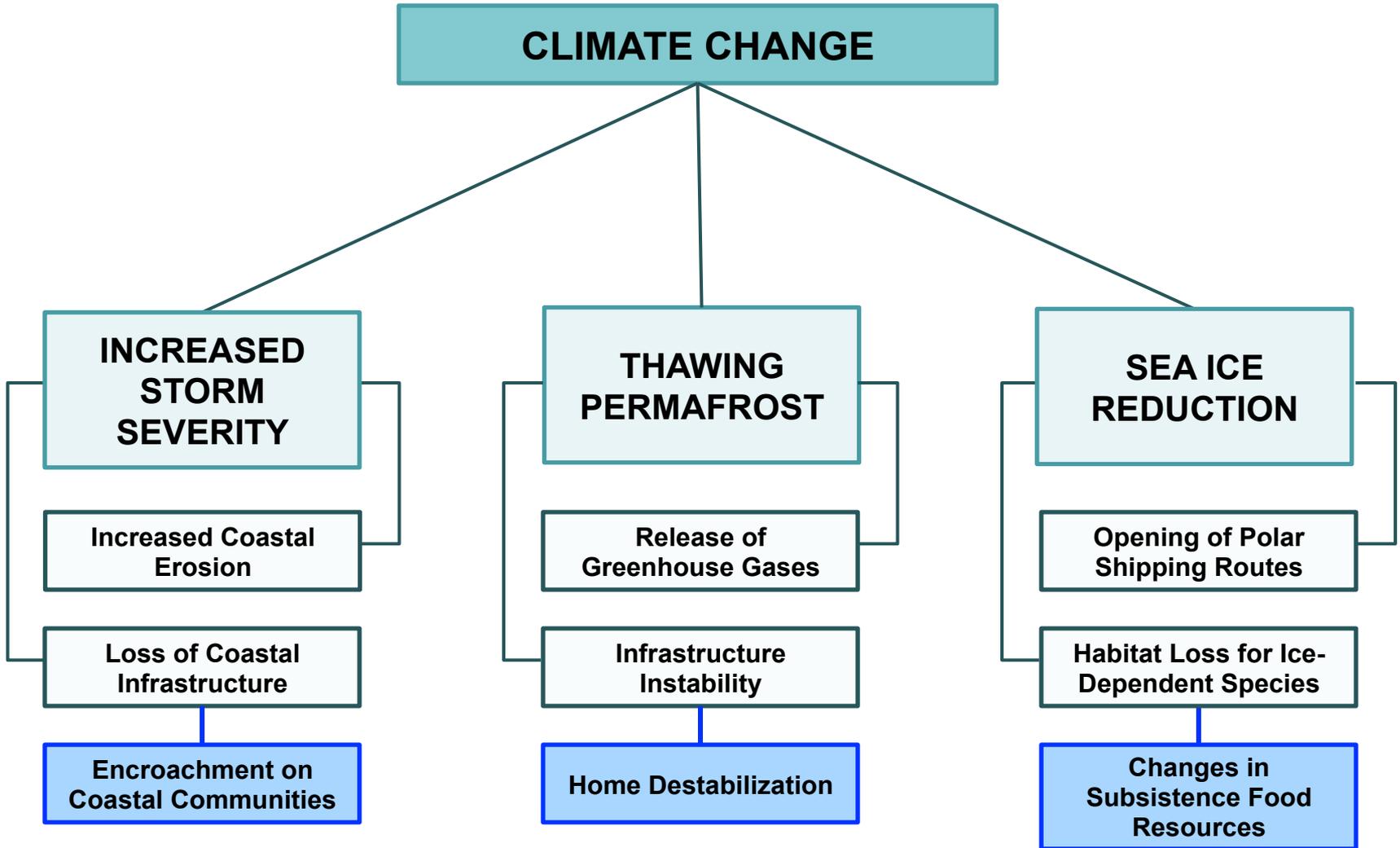
Beaufort Sea	31	St. George Basin	10
Chukchi Sea	6	Cook Inlet	13
Norton Sound	6	Gulf of Alaska	12
Navarin Basin	8		

Number of exploration and 14 deep stratigraphic test wells drilled by year



Alaska OCS Drilling from 1975 - 2012





BOEM's Environmental Studies Program (ESP) develops, conducts and oversees world-class scientific research specifically to inform decisions regarding development of Outer Continental Shelf energy and mineral resources.

BOEM has invested about \$400 million studying the OCS environment offshore Alaska, and developed more than 500 reports since 1973.



BOEM ESP 2011 Beaufort Fish Survey
Source: BOEM Photo Gallery



Over 60 on-going Environmental Studies researching:

- Physical Oceanography,
- Fates and Effects,
- Habitats and Ecology,
- Biological Resources,
- Social Systems,
- Information Management, and
- Integrated Studies.



BOEM actively seeks TK / TEK to complement its use of Western science to make better decisions



Photo by Emily Brown



BOEM OCEAN SCIENCE

THE SCIENCE & TECHNOLOGY JOURNAL OF THE BUREAU OF OCEAN ENERGY MANAGEMENT

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Special Issue on **Traditional Knowledge**

Science in Transformation

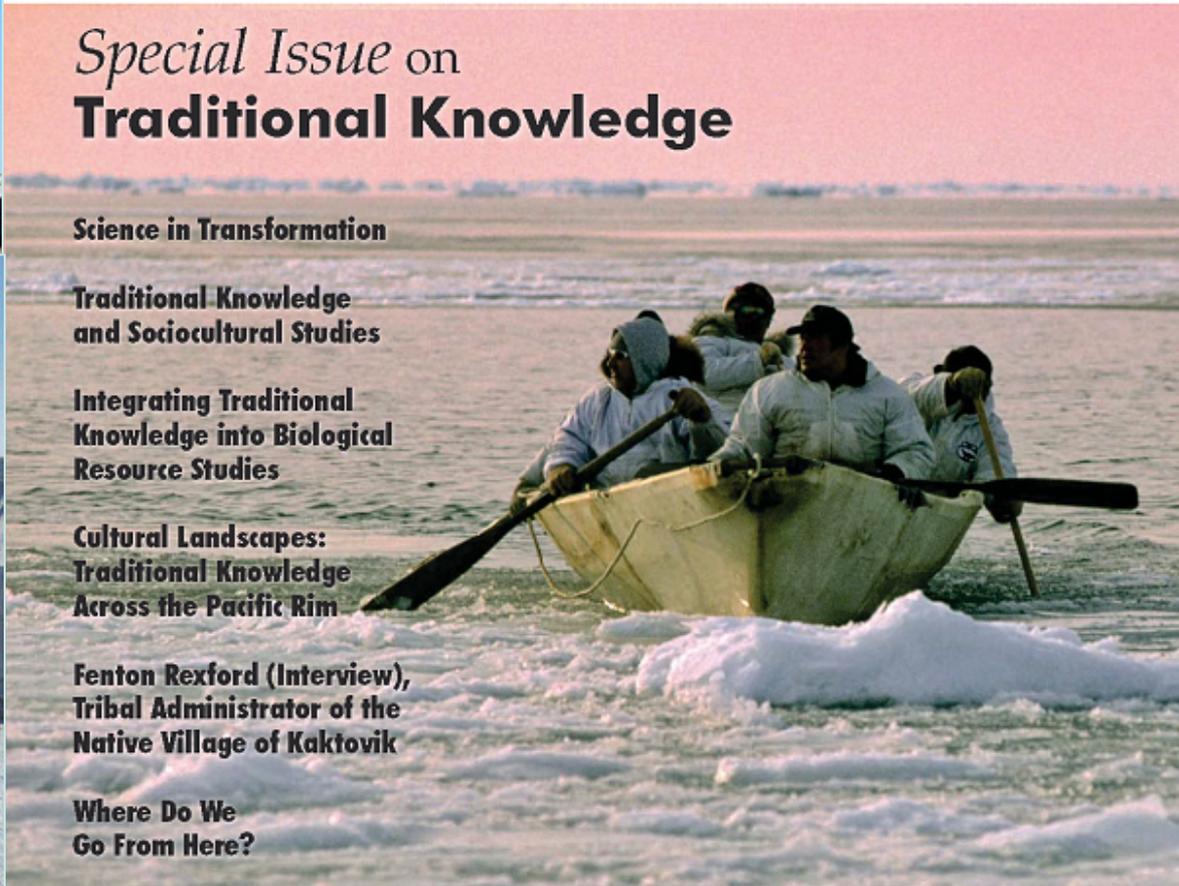
Traditional Knowledge and Sociocultural Studies

Integrating Traditional Knowledge into Biological Resource Studies

Cultural Landscapes: Traditional Knowledge Across the Pacific Rim

Fenton Rexford (Interview), Tribal Administrator of the Native Village of Kaktovik

Where Do We Go From Here?



BOEM's Environmental Studies Program (ESP) develops, conducts, and oversees research specifically to encourage informed decisions.

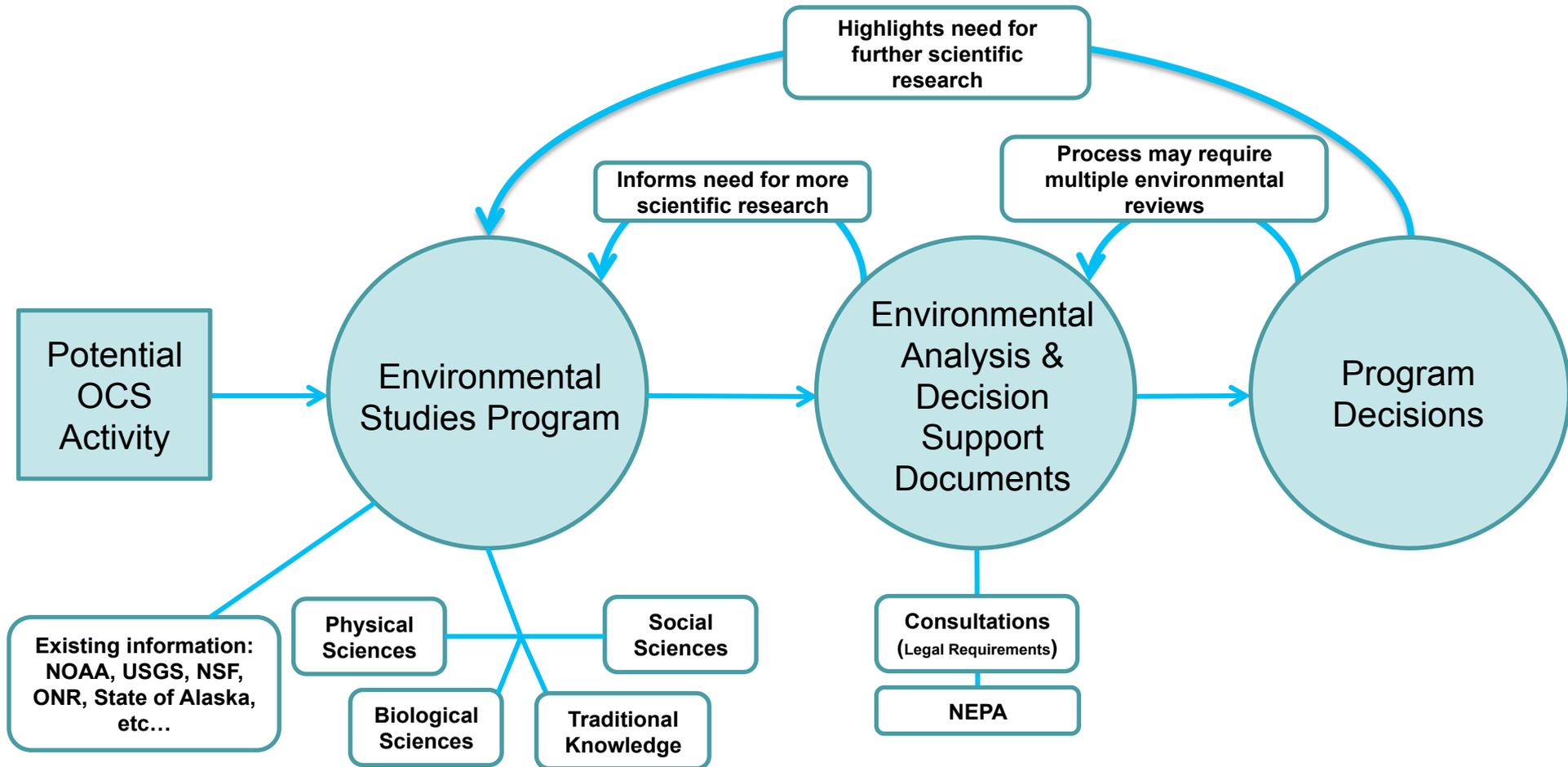
Current ES Research Partners:



ADF&G
AMAP
AOOS
USGS
CMI
DFO
USFWS
NOAA/NMFS/NMML

NOPP
NPRB
NSF
NSSI
NOAA/PMEL
TA&R (BSEE)
UAA/UA
UT Austin





Case Study: Drilling Hiatus in the Chukchi Sea

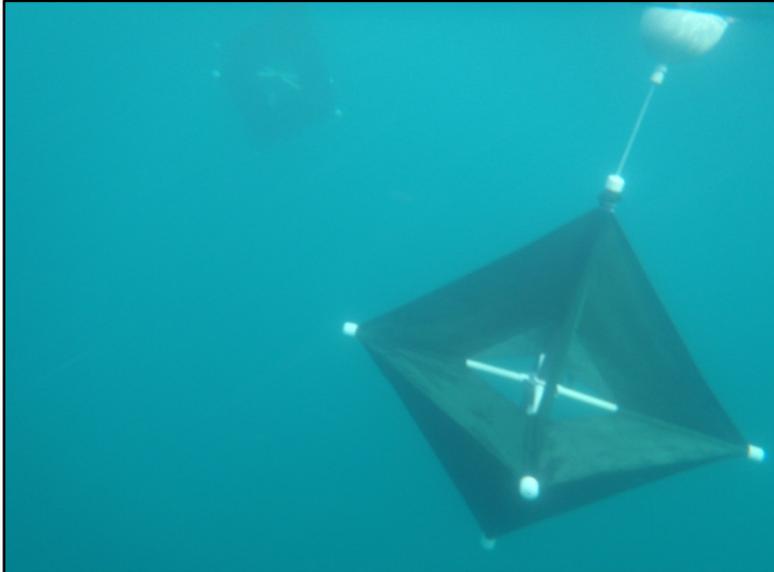


- BOEM limited drilling into hydrocarbon zones just prior to freeze-up in the Chukchi Sea
- Each year, BOEM estimates freeze-up using hindcasting techniques, and establishes a “trigger date” for the drilling hiatus
- Consistent with adaptive management, BOEM may refine the “trigger date” in light of real time sea ice forecasting

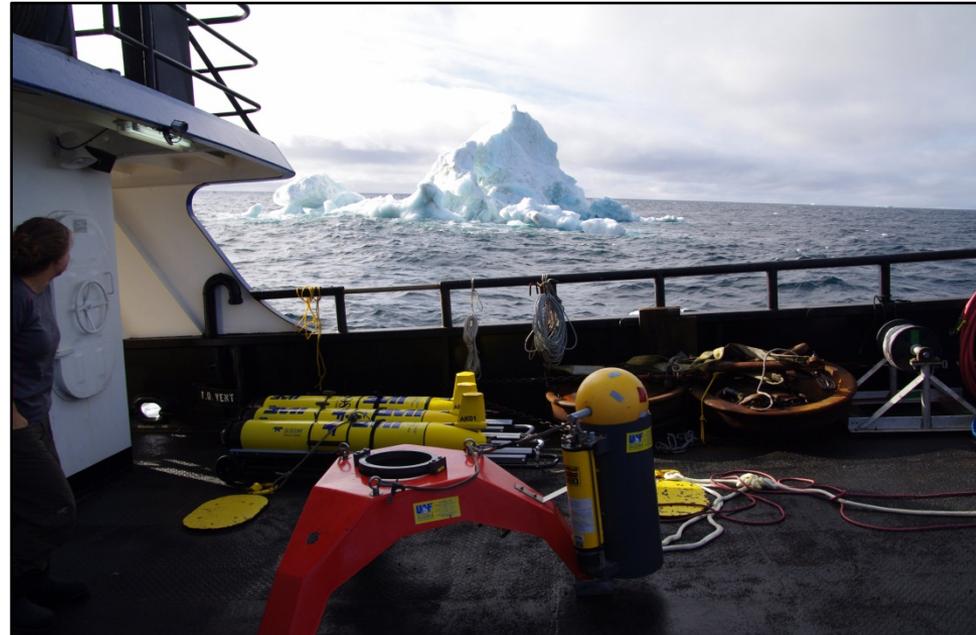


What's new from BOEM studies?

- Numerical improvements to ice/ocean general circulation model (better resolution, better landfast ice algorithms)
- Improved understanding of landfast ice (dynamics and seasonal timing)
- Improved model input (*mesoscale meteorology model*)
- More ocean/meteorology observations (sensitivity and model validation)
- Better understanding of oil in ice (Oil in Ice Joint Industry Program)



Microstar drifters in the Chukchi Sea.
Source: Hank Statscewich (8/26/12)



UAF oceanographic equipment on the back deck of the Norseman II.
Source: Hank Statscewich (8/25/12)

- Integrated **ecosystem dynamics & monitoring** (physics, chemistry, biology, social) through coordinated **observational & modeling** efforts.
- MARES (**Beaufort Sea**) in coordination with NPRB's PAGES (**Chukchi Sea**).
- MARES's relevant to: ecosystem dynamics, environmental protection, climate change and monitoring, oil spill risk analysis, and exploration and discovery.
- MARES's aligned with the National Ocean Policy, the Interagency Arctic Research Policy Committee's 5-year research priorities, and several of the recommendations of the USGS Arctic report.



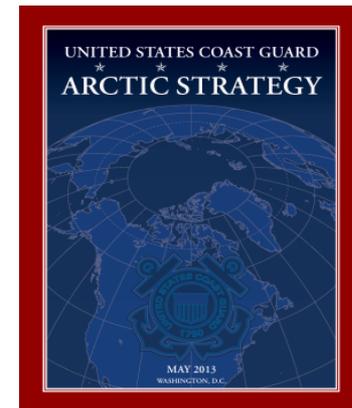
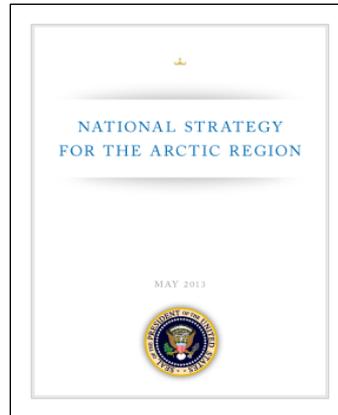
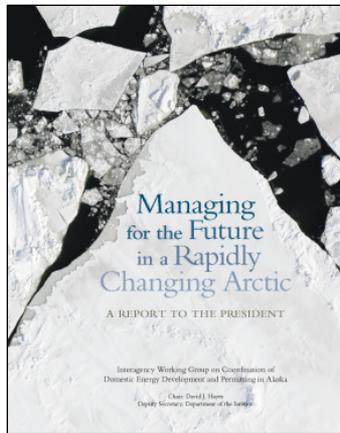
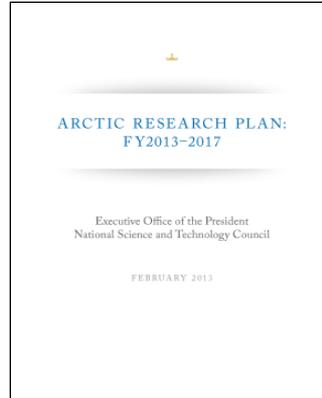
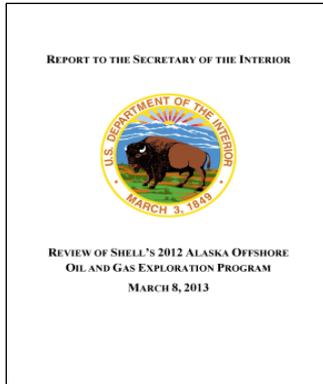
- Identify a potential window for safe drilling operations based upon historical sea ice, oceanographic and atmospheric data.
- Improve operational forecasts to better assist the transit of drill ships and support vessels to and from proposed drill sites.
- Assist the transit of research ships and other government and non-government operations.
- Assist in search and rescue operations.
- Assist NOAA, and the U.S Coast Guard in the event of a pollutant spill.



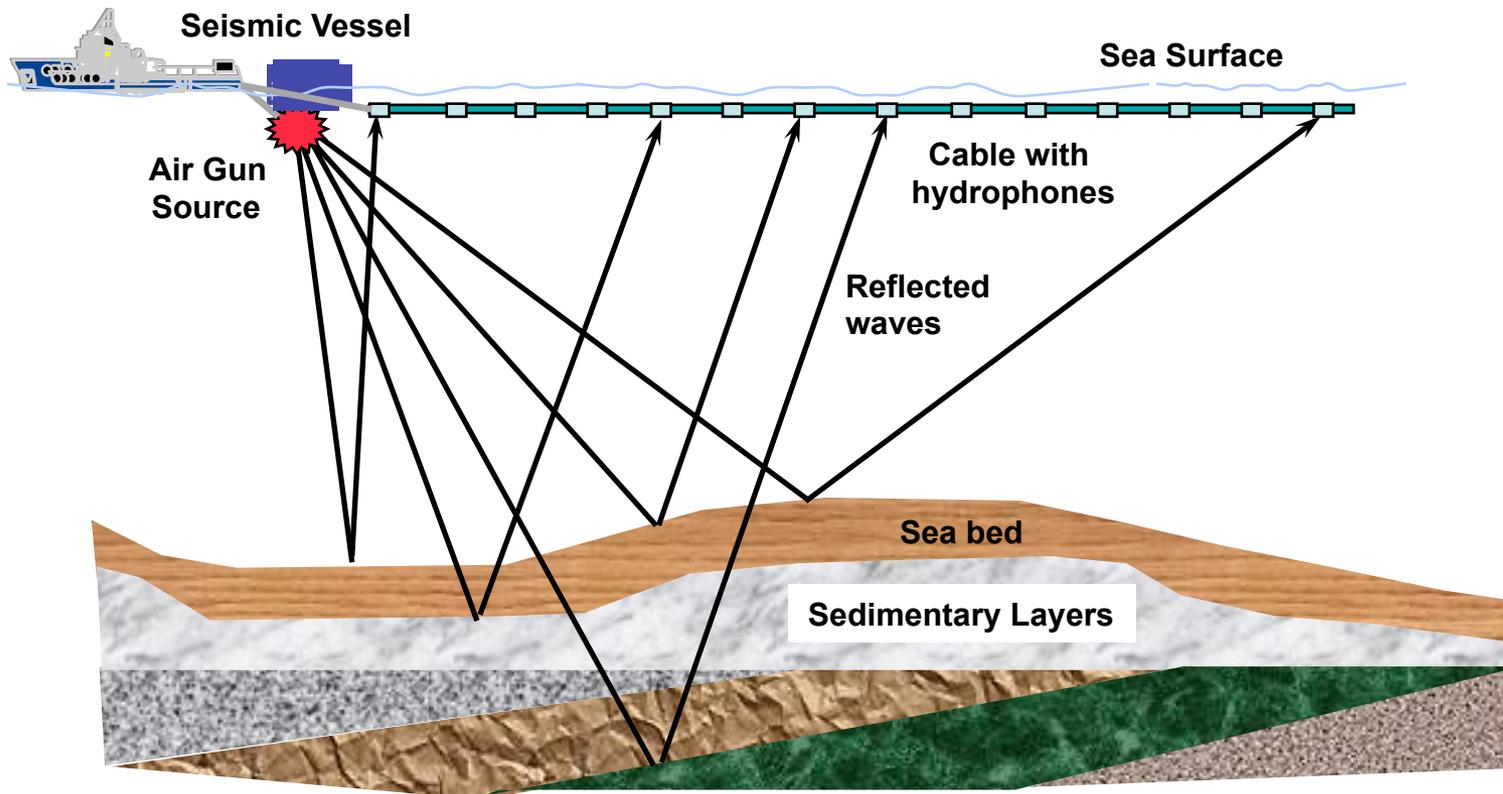
*UAF owned autonomous underwater glider waits on the surface of the Chukchi Sea for commands from the pilot.
Source: Hank Statscewich (8/28/12)*



*UAF owned autonomous underwater glider waits on the surface of the Chukchi Sea for commands from the pilot onboard the Norseman II.
Source: Hank Statscewich (8/28/12)*



- Open water marine survey program in Chukchi Sea (July - October)
- Winter Geotechnical & Seabottom Investigation in Beaufort Sea
- Open water 2D G&G Seismic Survey in the Chukchi Sea
- Ocean Bottom Node Seismic Survey in the Beaufort Sea/Colville River Delta

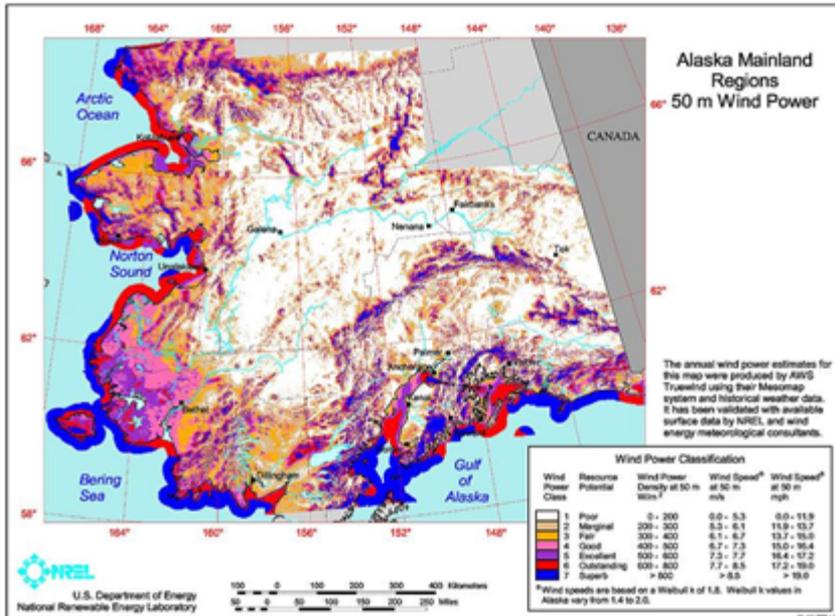


Continuing Challenges in the Alaska OCS:

- Harsh weather
- Unproven technology
- Remote location
- Limited demand for energy

Wind Energy

- Alaska has excellent wind power resources.
- Several areas have been rated as a “superb” potential location.



Wave Energy

- Best wave energy resource of the entire U.S. according to reports by the Electric Power Research Institute (EPRI).
- Wave energy resources estimated to be 1,570 TWh/y for the Alaska OCS.

TOTAL AVAILABLE WAVE ENERGY RESOURCE BREAKDOWN BY REGION

Coastal Region	EPRI 2004 Estimate (TWh/yr)	EPRI 2011 Estimate (TWh/yr)
West Coast (WA, OR, CA)	440	590 (34% increase)
East Coast (ME through NC)	110	200 (82% increase)
East Coast (SC through FL)	NOT ESTIMATED	40
Gulf of Mexico	NOT ESTIMATED	80
Alaska (Pacific)	1,250	1,360 (9% increase)
Alaska (Bering)	NOT ESTIMATED	210
Hawaii	300	130 ²
Puerto Rico	NOT ESTIMATED	30
TOTAL	2,100	2,640

Source: EPRI. *Mapping and Assessment of the United States Ocean Wave Energy Resource: 2011 Technical Report*. December 2011.

Notes:

1. All TWh/yr estimates are rounded to the nearest '10'.
2. The 2004 estimate included the Midway Islands. The 2011 estimate encompasses the Hawaiian Islands only.

Exploration Activities in the Chukchi Sea:

- Shell, ConocoPhillips Statoil have interest in exploration activities
- Geological and Geophysical Activities
- Ancillary Activities

Development and Production Activities

- If the exploration activities prove to be successful, development and production activities will be considered by industry.
- Considered to be a vital replenishment of the oil needed in the Trans-Alaska Pipeline System

ESP Research Activities – ongoing studies

OCS Lease Sales

- Chukchi Sea proposed oil and gas lease sale scheduled for 2016.
- Beaufort Sea proposed oil and gas lease sale scheduled for 2017.

Exploration Activities in the Beaufort Sea:

- Shell has plans to conduct exploration activity
- Geological and Geophysical Activities
- Ancillary Activities

Development and Production Activities in the Beaufort Sea:

- Development – Liberty Project is being considered to be in production by 2020. This will be the first production on the OCS.
- Production – Northstar is a Production Unit with BOEM and State of Alaska. Northstar has been producing since 2001.



View of Tor Viking II from the Discoverer
Source: BSEE



Polar Bears
Source: USFWS (2005)