

Testimony by Mead Treadwell, Chair
U.S. Arctic Research Commission
“Is America Prepared For An Accessible Arctic?”
Subcommittee on Coast Guard and Maritime Transportation
Rayburn House Office Building Room 2167, Washington, DC
2:00 pm, July 16, 2008

Good afternoon, Mr. Chairman, members of the Committee. My name is Mead Treadwell. Since 2002 I have been a member, and since 2006, I have chaired the U.S. Arctic Research Commission (USARC).¹ As a senior fellow at the Institute of the North, based in Anchorage, Alaska, and in the private sector, I have worked for much of my career on the economics, feasibility, and sustainability of Arctic transportation in shipping, pipelines, railroads, tourism and aviation.²

On behalf of my fellow Commissioners, thank you for your invitation to be here today. My testimony, I need to make clear, represents the view of the U.S. Arctic Research Commission, an advisory body to the Executive Branch and Congress. The Commission formulates its positions in public meetings. The recommendations made by the Commission do not necessarily represent the views of the Administration. Nevertheless, I am proud to report that every relevant office we work with in the White House, and every relevant agency we work with in the Executive Branch is taking the changes that are happening in the Arctic quite seriously. The Administration’s position on the need for new icebreakers, and how it will meet that need if it determines there is one, will be enunciated by an ongoing, comprehensive interagency policy process. Nevertheless, I can and will report, that the tremendous homework to prepare for an accessible Arctic Ocean, the “new Mediterranean” once predicted by Arctic explorer Vilhjalmur Stefansson, has certainly begun.

The Arctic component to this hearing is essential. During this International Polar Year, the United States and other nations are laying down an Arctic Observing Network³ to

¹ Under the Arctic Research and Policy Act of 1984, the seven Commissioners of the USARC are appointed by the President and report to the President and the Congress on goals and priorities for the U.S. Arctic Research Program. That program is coordinated by the Interagency Arctic Research Policy Committee, (IARPC) chaired by National Science Foundation Director Dr. Arden Bement, who is also an *ex-officio* member of the Commission. See www.arctic.gov for Commission publications, including the Commission’s 2007 Goals Report.

² The Institute of the North, www.institutenorth.org, founded by former Alaska Governor and U.S. Interior Secretary Walter J. Hickel, has programs that focus on economics and policy related to management of common resources, onshore and offshore. The Institute’s work in Arctic infrastructure (including energy, transportation and telecommunication) supports the work of the eight-nation Arctic Council and the circumpolar, regional governments of the Northern Forum. The Institute’s defense, security and geography studies stem from Alaska’s unique, strategic location.

³ AON report is found at: <http://www.nsf.gov/od/opp/arctic/iarpc/start.jsp> Pending legislation to support the Integrated Ocean Observing System will help assure that studies of Arctic climate changes will be initialized and maintained. These are important to understand the processes that affect the ice cover and circulation of the Arctic Ocean and thus operational environments for icebreakers and other ships.

better understand, model and predict the vast changes coming to the northern part of the globe. The Arctic Council's eight nations, with indigenous participants and the global shipping industry, are conducting the Arctic Marine Shipping Assessment (AMSA), due to be published in 2009.⁴ While science is finding most of the Arctic Ocean to be suddenly, and surprisingly accessible in summer, our assessment is finding that regular Arctic Ocean shipping in all coastal seas, tied to specific resource development projects, tourism, or serving the needs of Arctic communities, is large now and is growing.⁵ However, winter access remains a challenge except for the most capable of icebreaking ships. New Arctic capable ships are under construction in Southeast Asia and Europe. Research the Commission has supported for AMSA reveals there are approximately 7800 ice class ships in the world today ~ 4.5% of the world fleet. This percentage is expected to increase to 10% as more ships are built for polar use. This trend brings with it the need for new policies – rulemaking, research, and investment – by governments of the Arctic region.

In the United States, it is necessary to recognize that the Alaska Purchase in 1867 made us an Arctic nation. Our ocean boundaries include more than the Atlantic and Pacific. In the 20th century, the advent of aircraft, missiles, and missile defense made the Arctic region a major venue for projection of power and a frontier for protecting the security of North America, Asia and Europe. Great circle air routes through the Arctic currently carry the bulk of travelers and air cargo between these continents. Today's Arctic infrastructure is global infrastructure. In the 21st century, Arctic seaways have the potential to serve as a major venue for shipping between these continents, as explorers envisioned as early as 500 years ago.

Much of the U.S. Arctic Research Commission's work is to encourage the U.S. government to do its homework – homework that is necessary in response to an accessible Arctic Ocean⁶. Our Commission's purview is determining and recommending goals for U.S. research in the Arctic. Those goals cover a wide range of subjects, ranging from Arctic natural resources, the needs of Arctic people, and the needs of the nation in this region. We look at basic research, applied science, and social research needs. In today's testimony, I will focus on five key points related to changes in the Arctic, discuss the public recommendations we have made regarding icebreakers, and direct the Committee to sources of additional information.

First, the Arctic is more accessible. The observed, historic sea ice cover – sea ice extent and thickness – is receding. The rates of these changes are faster than our

⁴ AMSA is led by the U.S., Canada, and Finland, and is Chaired by Dr. Lawson Brigham, Deputy Director of the U.S. Arctic Research Commission, a former U.S. Coast Guard icebreaker captain. For details on AMSA. See: <http://arcticportal.org/pame/amsa>

⁵ For a review of ice conditions and current views of the shipping industry, see website for June 5, 2008 Arctic Transportation Conference sponsored by DOT/MARAD, <http://www.marad.dot.gov/Arctic%20Conference/Arctic%20index.html>

⁶ See USARC's summary report on goals and objectives for Arctic research 2007 for the U.S. Arctic Research Plan, www.arctic.gov

climate models predict.⁷ This, combined with the advent of more efficient icebreaking technology, and global demand for Arctic resources, works to make Arctic shipping, Arctic fishing, and Arctic resource development more economically feasible and attractive to investors.

Second, Arctic residents, governments and industry are assessing both the opportunities and the challenges of an accessible Arctic.⁸ Within these assessments is a fundamental question: Will trans-Arctic seaways be as important to global shipping as the Panama and Suez Canals? Or, will the Arctic Ocean continue more as venue for shipping in and out of the Arctic itself, for tourism, local needs, and for bringing natural resources to market? Other assessments, domestic and international, are looking at the energy potential of the Arctic, the security and cooperation needs presented by an accessible Arctic, and so forth.

Third, policies are being conceived, developed and implemented toward a goal of ensuring that shipping in the Arctic is, to quote my colleague at the Department of State, Assistant Secretary Dan Sullivan, “safe, secure and reliable.”⁹ To me, those three words have large meaning. Safe refers to protecting human life, and mitigating any ill effects shipping will have on the environment, biodiversity, cultures and traditions of the Arctic. Likewise, navies and coast guards must examine their capacity to ensure security for those ships, particularly those carrying strategic commodities. Finally, the word reliable refers to issues raised by the shipping industry. In AMSA’s workshops as well as conferences convened by maritime organizations such as MARAD, Lloyds, and the U.S. National Ice Center, industry has said the Arctic Ocean is a “patchwork quilt” of tolls and regulations by several coastal nations. Arctic shipping will grow when rules are certain and when products can be delivered competitively with other routes. This means on a time and cost basis, not just on shorter distances.

Mr. Chairman, a regime for safe, secure, and reliable shipping is something our nation can lead in developing, through existing mechanisms like the International Maritime Organization, the Arctic Council, and –when acceded to by the U.S. – via the Law of the Sea convention. The U.S. Arctic Research Commission continues to urge the Senate to accede to this convention.

The United States last revised its Arctic policy in 1994. While environmental protection was then made a principal objective, climate change and growth in Arctic shipping were

⁷ See National Snow and Ice Data Center’s website at: <http://nsidc.org/arcticseaicenews/>

⁸ See AMSA: <http://arcticportal.org/pame/amsa> and Arctic Shuttle Container Link Study conducted for the State of Alaska and the Port of Adak by the Institute of the North and Aker Arctic. See: <http://www.institutenorth.org/servlet/content/studies.html>. Also see the Sept. 2004 Arctic Marine Transport Workshop report here: <http://www.institutenorth.org/servlet/content/reports.html>.

⁹ See Sullivan’s speech to the Arctic Energy Summit quoted in the New York Times: http://www.nytimes.com/2007/10/19/us/19arctic.html?_r=1&scp=1&sq=shipping%20Arctic%20sullivan&st=cs&oref=slogin

not contemplated.¹⁰ As the Executive Branch currently conducts a review of U.S. Arctic policy, the Commission has urged consideration of policies to ensure safe, secure, and reliable shipping.

Fourth, strong research programs are needed in the Arctic Ocean, and some of that research is on deadline. The U.S. Arctic Research Commission has developed a set of research goals related to shipping, and those goals will be included in the report due to the President and Congress in 2009. Decisions to be made by governments on climate issues require understanding of what is happening in the Arctic Ocean, the Greenland icecap, in the changing heat, freshwater and greenhouse gas budgets of the earth. The Commission, at its meeting earlier this month in Fairbanks, decided to press federal agencies to better coordinate research and monitoring of the living ecosystem of the Arctic Ocean as the nation moves to install a moratorium on fishing in the U.S. Arctic Ocean Exclusive Economic Zone, as oil exploration moves further offshore, and as a number of species are considered for listing under the Endangered Species Act.

Several “wild card” issues related to Arctic shipping have been identified through the AMSA process and will be included in the Commission’s goals for shipping research as part of our regular 2009 report to the President and Congress. These shipping research objectives include understanding the effects of air pollution and noise from ships on the Arctic ecosystem. As well, the tradeoff between warming effects of ship emissions in the Arctic and potential reduced emissions from shipping worldwide, due to shorter routes, is a goal of study. Also, the U.S. and Iceland are cooperating on development of hydrogen technologies. The prospect of hydrogen-powered ships, under development by Iceland, is of interest to the entire Arctic community.

The Interagency Arctic Research Policy Committee, acting on the USARC’s recommendation, has commissioned an interagency research plan on Arctic infrastructure, in light of climate change. This will cover many climate impacts on transportation in the Arctic, including roads, maritime transport, and the need for improved oil spill research in ice-covered waters.¹¹

Nations are mustering bathymetric and seismic expeditions to delineate the extended continental shelf of the Arctic region, for new territorial claims allowed under the United Nations Convention on the Law of the Sea (UNCLOS). And as those claims by some nations could make parts of the Arctic Ocean legally less accessible to research, the science community is pressing Arctic states, through the diplomatic community, to ensure greater access for research.¹²

¹⁰ The current State Department summary on Arctic Policy, based on the interagency process completed in 1994, lists the six principal objectives of Arctic Policy See: <http://www.state.gov/g/oes/ocns/arc/>

¹¹ Under the leadership of the U.S. Army Corps of Engineers’ Cold Region Research and Engineering Laboratory, in Hanover, N.H., the plan will cover research and development goals for civil works and housing (including permafrost and shoreline erosion), oil spills, energy use, and marine transportation.

¹² The USARC has been informed by the Department of State that applications from the U.S. to Russia for approval to conduct marine scientific research in Russia’s Exclusive Economic Zone was denied 11 of the

Fifth and finally, the Commission believes that an accessible Arctic will lead the United States and other nations to consider further investment in this region. Those investments have begun, with the observing networks we mentioned previously and the inclusion of the Arctic Ocean in U.S. provision of notices to mariners. This summer operations (seasonal) of the U.S. Coast Guard have moved north and our Arctic neighbors are taking similar actions. Your Committee, Mr. Chairman, has reported legislation which passed the House, calling for a feasibility study that would determine the basic requirements for new icebreaking capacity to support Arctic and Antarctic

13 times requested between 1996 and 2006, and 6 of the 14 times between 1992 and 1995 (Personal communication to the Chair and Executive Director of the USARC, April 7, 2008). While the Commission supports ratification of the Law of the Sea, and has helped initiate and shape the research program to develop a U.S. extended continental shelf claim in the Arctic Ocean, the Commission has also sought greater guarantees of access for research in all waters of the Arctic Ocean, regardless of sovereign jurisdiction of waters or the seabed.

See also this appeal, submitted by the USARC, and others, to the U.S. Department of State.

**Appeal to the U.S. Department of State
In anticipation of the meeting of ministers from the five Arctic coastal nations
In Ilulissat, Greenland, on May 28, 2008**

As you, representing the United States, meet with representatives from other Arctic coastal states, to discuss the future of the Arctic Ocean, we, representing the U.S. science community working in this region, make this appeal: please take all necessary effort to enable research to thrive by ensuring free and open scientific access to the Arctic. The open nature of the Antarctic Treaty, and the free support of and exchanges in science, have been the hallmark of international cooperation on that continent for 50 years. The Arctic also would benefit from such openness.

We especially urge the coastal Arctic states to remove obstacles to ship access for research in the Arctic Ocean. In recent years, important scientific expeditions have been cancelled through parts of the Arctic due to the expense and complications of national rules for foreign ships wishing to enter the Exclusive Economic Zone of certain Arctic nations. Further, some ships – whose voyages were solely dedicated to research – have been categorically denied access. We are concerned that Arctic nations' expanded jurisdiction of the ocean floor, that will come about through Law of the Sea claims, threatens to further limit the full range of customary research activities that need to be conducted by scientists in the Arctic. Although it may be useful to ensure rights of inspection for such vessels, there are many benefits to be derived from open access for scientific purposes.

Second, please address the well-documented need for sharing of data that has been, or will be, collected in the Arctic Ocean region. We appeal to nations to continue to make available previously collected data, and to commit to further sharing of new data collected within jurisdictional borders.

Knowledge gained from Arctic research is important to the entire world. Policy decisions on climate change, energy, environment, human health, security, commerce, and other subjects will be made by many nations based on this knowledge. Scientific research should be based on sound conclusions drawn from valid data, unfettered by national borders.

Thank you for your attention to these issues. We wish you a productive meeting.

Signed by the following four organizations:

- **Arctic Research Consortium** of the U.S. (www.arcus.org), representing over 5,000 scientists worldwide from 51 member institutions
- **Consortium for Ocean Leadership** (www.oceanleadership.org) representing over 10,000 scientists from 95 member institutions in the U.S. and Canada
- **Marine Mammal Commission** (www.mmc.gov)
- **U.S. Arctic Research Commission** (www.arctic.gov)

region national needs.¹³ And, we believe all modern icebreaker hull designs and propulsion systems should be fully evaluated in these studies for any new U.S. polar icebreakers.

¹³ See the two different approaches to future icebreaker needs in USCG authorization bills. H.R. 2830 has passed the House; S. 1892 awaits floor action in the Senate.

H.R.2830

To authorize appropriations for the Coast Guard for fiscal year 2008, to amend the Immigration and Nationality Act and title 18, United States Code, to combat the crime of alien smuggling...
(Engrossed as Agreed to or Passed by House)

SEC. 422. ASSESSMENT OF NEEDS FOR ADDITIONAL COAST GUARD PRESENCE IN HIGH LATITUDE REGIONS.

Within 270 days after the date of enactment of this Act, the Secretary of the department in which the Coast Guard is operating shall submit a report to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Transportation and Infrastructure of the House of Representatives assessing the need for additional Coast Guard prevention and response capability in the high latitude regions. The assessment shall address needs for all Coast Guard mission areas, including search and rescue, marine pollution response and prevention, fisheries enforcement, and maritime commerce. The Secretary shall include in the report--

- (1) an assessment of the high latitude operating capabilities of all current Coast Guard assets, including assets acquired under the Deepwater program;
- (2) an assessment of projected needs for Coast Guard forward operating bases in the high latitude regions;
- (3) an assessment of shore infrastructure, personnel, logistics, communications, and resources requirements to support Coast Guard forward operating bases in the high latitude regions;
- (4) an assessment of the need for high latitude icebreaking capability and the capability of the current high latitude icebreaking assets of the Coast Guard, including--
 - (A) whether the Coast Guard's high latitude icebreaking fleet is meeting current mission performance goals;
 - (B) whether the fleet is capable of meeting projected mission performance goals;and
 - (C) an assessment of the material condition, safety, and working conditions aboard high latitude icebreaking assets, including the effect of those conditions on mission performance;
- (5) a detailed estimate of acquisition costs for each of the assets (including shore infrastructure) necessary for additional prevention and response capability in high latitude regions for all Coast Guard mission areas, and an estimate of operations and maintenance costs for such assets for the initial 10-year period of operations; and
- (6) detailed cost estimates (including operating and maintenance for a period of 10 years) for high latitude icebreaking capability to ensure current and projected future mission performance goals are met, including estimates of the costs to--
 - (A) renovate and modernize the Coast Guard's existing high latitude icebreaking fleet; and
 - (B) replace the Coast Guard's existing high latitude icebreaking fleet.

S.1892

Coast Guard Authorization Act for Fiscal Year 2008 (Reported in Senate)

SEC. 917. ICEBREAKERS.

(a) IN GENERAL- The Secretary of the department in which the Coast Guard is operating shall acquire or construct 2 polar icebreakers for operation by the Coast Guard in addition to its existing fleet of polar icebreakers.

Following a 2006 report delivered by the National Research Council which this Committee requested, the U.S. Arctic Research Commission has urged the President and Congress to move expeditiously in building and maintaining new ships. We have been guided by the NRC's conclusion that two, Polar Class, ships are necessary, and while we have heard witnesses who have conducted some qualitative analysis on issues related to shipping potential in the Arctic, and future ice states, we have not conducted a specific analysis which links those forecasts to exact icebreaker needs and specifications. We are aware of a number of efforts within the government to address those questions and believe such an analysis is timely.

In the end, however, we believe the nation will realize it has a need for this maritime capability. We foresee that U.S. Coast Guard Arctic icebreakers will be used as they are now –as research platforms and as the visible U.S. maritime presence in both polar regions. But the advent of Arctic transportation means we expect the other, more traditional missions of the Coast Guard will take center stage. These national assets, polar icebreakers operated by the Coast Guard, are needed in the future to provide the same protections the Coast Guard affords the rest of the nation: search and rescue, law enforcement, border protection, environmental protection and oil spill response¹⁴.

Aid to commerce is an important mission of our Great Lakes icebreakers. Under a regime worked out with Canada, the St. Lawrence Seaway/Great Lakes system has become an important part of the global transportation network. The Executive Order signed by President Franklin Roosevelt, committing icebreakers to support U.S. maritime commerce is not limited by geography, and while there is not a call at the present time, some observers suggest icebreakers may be needed to support

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- (b) NECESSARY MEASURES- The Secretary shall take all necessary measures, including the provision of necessary operation and maintenance funding, to ensure that--
- (1) the Coast Guard maintains, at a minimum, its current vessel capacity for carrying out ice breaking in the Arctic and Antarctic, Great Lakes, and New England regions; and
 - (2) any such vessels that are not fully operational are brought up to, and maintained at full operational capability.
- (c) REIMBURSEMENT- Nothing in this section shall preclude the Secretary from seeking reimbursement for operation and maintenance costs of such polar icebreakers from other Federal agencies and entities, including foreign countries, that benefit from the use of the icebreakers.
- (d) AUTHORIZATION OF APPROPRIATIONS- There are authorized to be appropriated for fiscal year 2008 to the Secretary of the department in which the Coast Guard is operating such sums as may be necessary to acquire the icebreakers authorized by subsection (a), as well as maintaining and operating the icebreaker fleet as authorized in subsection (b).

<http://www.cbo.gov/ftpdocs/87xx/doc8704/s1892.pdf> is a CBO estimate which projects \$1.525 Billion in additional federal spending to meet the icebreaker construction objectives of the Senate Bill.

The 2006 National Research Council's study "Polar Icebreakers in a Changing World: An Assessment of U.S. Needs" can be accessed here: http://www.nap.edu/catalog.php?recrod_id=11753

¹⁴ See attached letter March 18, 2008 from Alaska Governor Sarah Palin to President Bush. See also the attached memorandum for the Joint Chiefs of Staff that was received by the USARC on June 8, 2008. Both documents refer to national needs for new icebreaker capacity.

commercial shipping in U.S. Arctic waters¹⁵. The U.S. has much at stake from both shipping and resource development in the Arctic, and would be well advised to include the potential for Arctic commerce in any icebreaker needs analysis.

Polar class icebreakers were commissioned to support the essential mission of visible national presence in the Arctic and the Antarctic, both in maintaining our position and in supporting freedom of navigation. A polar class icebreaker gives this nation a unique, year-round maritime capability. Polar class icebreakers are the largest and most capable of ice-going ships. Indeed, an accessible Arctic Ocean also means new or expanded routes for the U.S. military sealift to move assets from one part of the world to another. The Commission believes polar icebreakers are an essential maritime component to guarantee that this U.S. polar mobility exists.

Shipping and research activities in the Arctic depend today on a strong system to predict ice conditions, provided by satellites above, and analysis by our Navy/NOAA/Coast Guard National Ice Center, near here in Suitland, Maryland. Current activity in the Arctic depends on good meteorology, developed in cooperation with our neighbors. Throughout the Arctic, spill response and search and rescue capabilities may need to be improved. My predecessor, George Newton, as Chair of the USARC has spoken of the necessity for an "Arctic 911" capability, and led the effort to encourage the National Geospatial Intelligence Agency (NGA) to add the Arctic region to the oceans of the world supported by notices to mariners. The question of where we need new port facilities, as safe harbors and transshipping points, is yet to be fully addressed.

At the same time the icebreaker question is being studied throughout the government, the U.S. is preparing to embark on construction of the long-sought Alaska Region Research Vessel, through the National Science Foundation. The Commission received a briefing on the status of this work in Fairbanks earlier this month from Dr. Denis Wiesenburg, Dean of the School of Fisheries and Ocean Sciences at the University of Alaska. The University of Alaska is completing a process of design review with the National Science Board, and the Commission is hopeful that review will allow the project, long on the drawing boards, to move forward next year. All indications tell us that a changing Bering Sea and Arctic Ocean means changing fish stocks, and research into fisheries will certainly be part of the requirements of this new vessel.

¹⁵ See: <http://www.conservativeusa.org/eo/1936/eo7521.htm>

EX. ORD. NO. 7521. USE OF VESSELS FOR ICE-BREAKING OPERATIONS IN CHANNELS AND HARBORS. Ex. Ord. No. 7521, Dec. 21, 1936, 1 F.R. 2527, provided: 1. The Coast Guard, operating under the direction of the Secretary of the Treasury, is hereby directed to assist in keeping open to navigation by means of ice-breaking operations, in so far as practicable and as the exigencies may require, channels and harbors in accordance with the reasonable demands of commerce; and to use for that purpose such vessels subject to its control and jurisdiction or which may be made available to it under paragraph 2 hereof as are necessary and are reasonably suitable for such operations. 2. The Secretary of War (Army), the Secretary of the Navy, and the Secretary of Commerce are hereby directed to cooperate with the Coast Guard in such ice-breaking operations, and to furnish the Coast Guard, upon the request of the Commandant thereof, for this service such vessels under their jurisdiction and control as in the opinion of the Commandant, with the concurrence of the head of the Department concerned, are available and are, or may readily be made, suitable for this service.

To summarize, changing ice conditions do not obviate the advantages of having polar class icebreakers. First, while scientists are reporting that Arctic sea ice is becoming scarcer and thinner over time, they are also predicting tougher operating conditions and higher sea states due to the absence of ice and changing wind/weather patterns. Further, as year-round activities such as oil exploration and production proceed in many parts of the Arctic Ocean, difficult ice ridges and moving pack ice will certainly continue as a hazard.

Second, we believe that broad Coast Guard missions will be necessary. While the primary uses of the Polar class icebreakers in the past 40 years have been logistics support (icebreaking escort) to the U.S. Antarctic program and research missions in both polar regions, it is unlikely that the next 40 years in the Arctic will see activity so limited. Already, we see a number of Arctic-capable commercial ships planned or in operation. National needs, from research to national presence to law enforcement, environmental protection, and national/homeland security will continue to call for an all-hazards, all-Ocean, all-seasons national icebreaker capability. While some of these national research needs can be met by other vessels than those of the U.S. Coast Guard, the Commission believes there will be times that the nation itself wants to be sure it commands and controls that capability.¹⁶

Third, Arctic icebreakers are nothing if not expensive – to build and to operate. Mr. Chairman, against that expense are national interests in the Arctic which the Commission believes total billions, if not trillions of dollars in revenue to the U.S. budget and economic activity of our nation. The subsea land we stand to acquire in the Arctic is part of a claim under the Law of the Sea that the State Department estimates to be larger than the State of California; the value of the energy and mineral resources alone in the potential U.S. claim will likely be huge.¹⁷ The energy potential of the Arctic Region is again being assessed by the U.S. Geological Survey. While the results are forthcoming, here is what is known today: the eight Arctic nations' today, from their Arctic regions, produce and export energy as a mainstay of the economies of northern Russia, Norway, Alaska, and Canada. Iceland, with geothermal and hydro energy used to smelt aluminum, gains close to a third of its exports from that activity, and is now looking offshore for oil and gas. Terms of self-governance for Greenland being established by the Danish Parliament likewise are expecting that region to realize major oil and gas potential. By any estimate, energy development in the North, including

¹⁶ The Commission has worked with federal agencies and the science community to support an Arctic Icebreaker Coordinating Committee to schedule science missions in conjunction with other missions of Coast Guard vessels. Similarly, we have worked to reinvigorate the SCICEX Committee, a similar interface, to allow instruments to be placed aboard U.S. submarines operating in the Arctic. We are working with the Navy on declassification of data collected on U.S. Arctic submarine missions. We are encouraging agencies of the U.S. and the research community to take advantage of Arctic ice camps established in the Beaufort Sea, next scheduled by the Navy for 2009. We work to support international cooperation in Arctic Ocean research, including NOAA's joint work with Russia, and international ocean drilling programs or research missions with icebreakers of several nations.

¹⁷ According to testimony received in 2007 by the Commission from the co-chair of the U.S. Extended Continental Shelf Task Force, an interagency initiative, the entire extended continental shelf includes energy and mineral resources with an estimated value in excess of \$1 trillion. See <http://www.ngdc.noaa.gov/mgg/ecs/unclos.html> and <http://www.doi.gov/initiatives/oceanfr.html> for further information.

renewable energy, is a major economic, environmental and security issue. If Arctic seaways become a venue for global trade, the economic impact again is in the billions of dollars. Mineral developments on the drawing board in Alaska and Canada, and current developments in northwest Russia, may already reach that magnitude.¹⁸ Food production in the U.S. Arctic and Bering Sea, where fishing vessels operate in or near the seasonal sea ice edge, is a billion dollar industry.

To that, Mr. Chairman, are the costs our nation and others are expected to incur in responding to global climate change. The potential of the Arctic's natural system to contribute – through a process scientists call feedback – is itself a trillion dollar issue for those planning the means and methods to meet our climate goals. Finally, Mr. Chairman, the Arctic has resources and values we cannot put a price tag on. Humans live in the Arctic and maintain a subsistence lifestyle practiced by these cultures for thousands of years. The need to understand and protect the marine mammals of this region is well established in U.S. law. To support research in all polar conditions, the United States Arctic Research Commission has urged this nation to maintain polar class icebreaking capability.

We understand it is this nation's goal –expressed with other nations – to reverse the trend of climate change caused by humans. In the Arctic, research to support adaptation to and mitigation of climate change is high on our agenda. But as more forces than climate are working to produce an accessible Arctic, it is essential that our nation act now. Baseline marine studies (in response to expanded Arctic marine development), basic research, policies and coordinated investment in infrastructure will ensure safe, secure, and reliable Arctic shipping. Under the principle of freedom of navigation, global shipping can come to our doorstep whether we invite it or not. Whether you envision the Arctic Ocean as a new seaway, for trans-Arctic shipping, competitive with the Panama and Suez Canals, or only foresee an expansion of the current shipping in and out of the Arctic, the time to prepare is now.

Thank you very much.

¹⁸ The Western Arctic Coal Project is assessing the potential for coal exports from Northwestern Alaska, under a joint agreement between BHP Billiton and Arctic Slope Regional Corporation <http://bhpbilliton.com/bb/ourBusinesses/energyCoal/westernArcticCoalProject.jsp>. See also www.baffinland.com for information about Nunavut, Canada's \$C4.1 billion proposed Mary River Project, which from 2014. would mine and ship iron ore on a year round basis to European markets. According to the website, "A comprehensive review of ice conditions and the results of site specific bathymetry studies have been used to establish appropriate shipping lanes, and to recommend the required "ice class" for the dedicated ore carriers. Fednav has designed a cape-size ore carrier, Polar Class 4, of 135,000 dead weight tonnes (dwt) capacity, suitable for dedicated operations between Steensby Port and Europe over a 12-month operating period each year. A fleet of eight vessels will be required to fully service the project requirements, according to the results of detailed ice transit simulation studies."