Written Testimony of
Dr. Mike Sfraga
Chair, United States Arctic Research Commission
House Committee on Transportation and Infrastructure
Subcommittee on Coast Guard and Maritime Transportation (CGMT)

For a hearing on
U.S. Coast Guard's leadership on Arctic safety, security, and environmental responsibility

Before the Committee on Transportation and Infrastructure
Subcommittee on Coast Guard and Maritime Transportation
U.S. House of Representatives

December 7, 2022

Chairman Carbajal, Ranking Member Gibbs, and distinguished members of the Committee, thank you for convening this hearing on the United States Coast Guard's (USGC) leadership on Arctic safety, security, and environmental responsibility. I am Dr. Mike Sfraga and I am honored to appear before you today as the presidentially appointed Chair of the United States Arctic Research Commission (USARC) to discuss these urgent set of issues.

The US Arctic Research Commission

The USARC is an independent federal agency established by the Arctic Research Policy Act of 1984 as amended.

Our agency's mission is to advance Arctic research on behalf of and to the benefit of the U.S.

There are eight commissioners, seven of whom are directly appointed by the President. The eighth is the Director of the National Science Foundation (NSF) who serves as a non-voting *ex officio* member.

The current members of the Commission are:

- Dr. Mike Sfraga, Chair; filling an academic/research seat, the founding director of the Wilson Center's Polar Institute, former director, Global Risk and Resilience Program, Wilson Center, and currently serving as chair and distinguished fellow, Polar Institute, Wilson Center.
- Dr. Nikoosh Carlo; filling an academic/research seat, the founder and chief strategist at CNC North Consulting.
- Elizabeth Qaulluq Cravalho; filling an industry seat, the vice president of lands for NANA Regional Corporation, an Alaska Native Corporation.
- David Kennedy; filling an academic/research seat, the current Global Fellow at the Wilson Center's Polar Institute, Board Member of the World Maritime University, and Chairman of the External Advisory Board of the School of Marine Science and Ocean Engineering at the University of New Hampshire.
- Dr. Mark Myers; filling an industry seat, the principal of Myenergies.
- Dr. Jacqueline Richter-Menge; filling an academic/research seat, a research affiliate with the University of Alaska Fairbanks, 34 years of experience with the U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory.

- Deborah Vo; filling the Indigenous seat, Program Officer with the Rasmuson Foundation.
- Dr. Sethuraman Panchanathan; Director, NSF.

The Commission releases a biennial report to the White House and to Congress on Arctic research goals and objectives to advise the president, Congress, guide the Interagency Arctic Research Policy Committee (IARPC) five-year plan, and to inform overall U.S. Arctic research efforts. The Commission also assists IARPC in establishing a national Arctic research program plan every five years to implement Arctic research policy.

In addition to the above tasks, the Commission's duties, assigned by law, include:

- Facilitating cooperation between the Federal Government and State and local governments with respect to Arctic research;
- Reviewing Federal research programs in the Arctic and recommending improvements in coordination among programs;
- Recommending methods to improve logistical planning and support for Arctic research;
- Recommending methods for improving efficient sharing and dissemination of data and information on the Arctic among interested public and private institutions;
- Offering other recommendations and advice to the IARPC as it may find appropriate;
- Cooperating with the Governor of the State of Alaska and with agencies and organizations of that State which the Governor may designate with respect to the formulation of Arctic research policy; and
- Recommending to the IARPC the means for developing international scientific cooperation in the Arctic.

The USARC is a statutory member of the North Pacific Research Board and the North Slope Science Initiative. The USARC is also a member, participant, liaison, or observer on the IARPC, the Interagency Coordinating Committee on Oil Pollution Research, the National Ocean Council, the Extended Continental Shelf Task Force, the Study of Environmental Arctic Change (SEARCH), the Civil Applications Committee, the Scientific Ice Expeditions Interagency Committee (Navy submarines), the Arctic Icebreaker Coordinating Committee of the University National Oceanographic Laboratory System, the Alaska Ocean Observing System, the Department of State's Arctic Policy Group, the Arctic Research Consortium of the United States, the International Permafrost Association, and the Ted Stevens Center for Arctic Security Studies.

US Coast Guard's statutory Arctic responsibilities include research

The USCG has several statutory responsibilities in the Arctic that are pertinent to USARC's mission, which is to advance Arctic research in support of national Arctic policy and strategy.

I start with the Coast Guard's research-focused Arctic statutory duties.

Of the seven primary duties assigned to the Coast Guard in 14 USC 102[1], three are relevant to today's discussion.

- Section 102(4) directs the Coast Guard to develop, establish, maintain, and operate, with due regard to the requirements of national defense, aids to maritime navigation, icebreaking facilities,

[1] 14 U.S.C. 102, Title 14 – Coast Guard, Subtitle I – Establishment, Powers, Duties, and Administration, Chapter 1 – Establishment and Duties

and rescue facilities for the promotion of safety on, under, and over the high seas and waters subject to the jurisdiction of the United States;

- Section 102(5) directs the Coast Guard to, pursuant to international agreements, develop, establish, maintain, and operate icebreaking facilities on, under, and over waters other than the high seas and waters subject to the jurisdiction of the United States.

- Section 102(6) directs the Coast Guard to engage in oceanographic research of the high seas and in waters subject to the jurisdiction of the United States.

In addition to these duties, the Coast Guard was assigned 11 statutory missions[2] by the Homeland Security Act of 2002 (P. Law 107-296, November 25, 2002). Section 888(a)(1)(F) of that Act includes "ice operations" among the non-homeland security missions.

In light of these responsibilities, I note, as a simple observation, and as a curiosity, that while "oceanographic research" is the sixth statutorily defined "primary duty" of the Coast Guard, "oceanographic research" is not mentioned as a statutorily defined "mission."

I also note, from a historical perspective, that the USCG and its forerunner, the Revenue Cutter Service, led by Captain Michael A. Healy, supported the conduct of natural science and the gathering of environmental observations since soon after the 1867 purchase of Alaska from Russia. This federal activity has long been part of the proud history of the Coast Guard.

And more recently, such as on page 23 of its own 2013 "Arctic Strategy," the Coast Guard astutely recognized that "limited operational resources...underline the need for increasing collaboration in the region," and that "[t]he Coast Guard must also collaborate with academia and non-governmental partners to incentivize Arctic research..."

Research implications of federal policy on Coast Guard operations

As mentioned above, federal policy has implications for the Coast Guard's operational support of Arctic scientific research.

---

[2] 6 U.S.C. 468(a) Definitions, Title 6 – Domestic Security; Chapter 1 – Homeland Security Organization; Subchapter VIII – Coordination with Non-Federal Entities, Inspector General, United States Secret Service, Coast Guard, General Provisions; Part H – Miscellaneous Provisions

The USCG's "non-homeland security missions" include:
(A) Marine safety.
(B) Search and rescue.
(C) Aids to navigation.
(D) Living marine resources (fisheries law enforcement).
(E) Marine environmental protection.
(F) Ice operations.

The USCG's "homeland security missions" include:
(A) Ports, waterways and coastal security.
(B) Drug interdiction.
(C) Migrant interdiction.
(D) Defense readiness.
(E) Other law enforcement.

The foundation for national Arctic policy is the National Security Presidential Directive-66/Homeland Security Presidential Directive-25 (NSPD66/HSPD25, "Arctic Region Policy,"[3] released in January 2009 by President Bush and subsequently reaffirmed by President Obama. A directive of this policy is to "[e]nhance scientific monitoring and research into local, regional, and global environmental issues."

Building upon that policy, the White House recently released an updated NSAR, and the White House Arctic Executive Steering Committee[4] and National Security Council are currently developing an implementation plan for the NSAR that is scheduled for release in 2023.

To fulfill the nation's vision for the Arctic, and to address the strategic pillars of the NSAR, the United States must have the critical infrastructure provided by science-capable polar icebreakers.

Broadly speaking, the role of icebreakers and the relevance of research can be connected to all four pillars, which are:

- Pillar 1 – Security: Develop Capabilities for Expanded Arctic Activity
- Pillar 2 – Climate Change and Environmental Protection: Build Resilience and Advance Adaptation, while Mitigating Emissions
- Pillar 3 – Sustainable Economic Development: Improve Livelihoods and Expand Economic Opportunity
- Pillar 4 – International Cooperation and Governance: Sustain Arctic Institutions and Uphold International Law

Progress on many of the "strategic objectives," beneath each pillar, requires icebreakers and scientific research.

For example:

- Strategic Objective 1.1 Improve Our Understanding of the Arctic Operating Environment. This requires scientific research to improve Arctic observing, mapping and charting; weather, water, and sea ice forecasting; and subseasonal and seasonal predictions.

- Strategic Objective 2.3: Expand Research to Better Understand Climate Change and Inform Policy Decisions. Of all the strategic objectives in NSAR, this is most directly related and important to Arctic scientific research, and to the need for icebreaker access to the high Arctic.

The NSAR also emphasizes two guiding principles relevant to today's discussion. They are:

- Plan for Long-Lead Time Investments, which mentions procuring additional icebreakers and investing in scientific research.

- Commit to a Whole-of-Government, Evidence-Based Approach, which emphasizes that responsibilities in the Arctic region extend beyond any single government agency, and that "U.S. Federal departments and agencies will work together, through coordinating bodies like the Arctic Executive Steering Committee and the National Security Council, to provide the resources, support, and expertise required to implement this strategy."

[3] NSPD66/HSPD25, https://irp.fas.org/offdocs/nspd/nspd-66.htm

[4] Arctic Executive Steering Committee, https://www.whitehouse.gov/ostp/ostps-teams/climate-and-environment/arctic-executive-steering-committee-aesc/

Clearly, vessels that are anticipated to cost over $600M to build are significant national investments, requiring long lead-times for planning, construction, and outfitting. The USCG currently has intentions of constructing and operating up to six icebreakers.

Separately, the National Science Foundation is currently developing the design for a Polar Class 3 icebreaker, a new Antarctic Research Vessel[5], which, if fully funded, is expected to be delivered by mid-2031. Should this vessel come to fruition, NSF intends to operate it exclusively in the Southern Hemisphere as a science-dedicated vessel.

Consistent with the NSAR guiding principles of (a) "plan for long-lead time investments", and (b) "commit to a whole-of-government, evidence-based approach," White House leadership, coordination, and guidance of all departments and agencies requiring icebreaker capabilities will be instrumental in ensuring the continued judicious and fiscally responsible use of taxpayer funds.

US Coast Guard's support for polar scientific research

The US Coast Guard is a critically essential and successful partner in advancing scientific understanding of the polar regions for two reasons.

First, the Coast Guard itself supports a broad range of Arctic-relevant basic and applied research, development, testing, and evaluation at the USCG Research and Development Center, the US National Ice Center, the International Ice Patrol, and through partnerships, such as with the Department of Homeland Security's Arctic Domain Awareness Center.[6]

Second, USCG's icebreakers provide direct scientific access to the Arctic. Much of the time that Coast Guard icebreakers are at sea, they are supporting scientific research missions by providing physical access with ships that have scientific and technical capabilities, much of which is funded by other federal agencies.

For example, according to the USCG's annual cruise reports, over 90 percent of the time that USCG Cutter HEALY (WAGB-20) operated at sea over the past 20 plus years, including transit time, it did so in support of scientific research.

The Coast Guard's icebreakers are the only vessels owned and operated by the United States government that enable US scientists and their international collaborators to access and investigate regions at both poles that are infested with multi-year ice. The icebreakers are, in short, essential research infrastructure.

The access provided by icebreakers enables scientists, funded by a wide range of government agencies, to study, understand, and explain how the polar regions serve as "Earth's refrigerators," and how these regions are warming and changing rapidly. For example, scientists now report that Arctic air temperatures are warming four times faster than the global average[7], and Arctic waters are acidifying at three to four times of non-Arctic waters.[8]

[5] https://www.nsf.gov/news/news_summ.jsp?cntn_id=305919&org=OPP
[6] Arctic Domain Awareness Center, https://arcticdomainawarenesscenter.org
[7] https://www.nature.com/articles/s43247-022-00498-3#Sec6
[8] https://www.science.org/doi/epdf/10.1126/science.abo0383

These changes, and their implications on weather, marine ecosystems, food supplies, transportation, tourism, and resource development are critically important to understand as the US advances its priorities noted in the NSAR and NSS. Knowledge and insights gained from basic and applied research: (a) informs responsible stewardship of the Arctic region, the ancestral home of Indigenous Peoples; and (b) advances our understanding of the opportunities to wisely develop America's Arctic renewable resources, such as fish, and timber, and non-renewable resources, such as oil, gas, and minerals.

Most of this research has been sponsored (i.e., financially supported) by a wide range of federal partners and stakeholders, such as the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), the Office of Naval Research (ONR), the National Aeronautics and Space Administration (NASA), Department of Interior entities, such as the Bureau of Ocean Energy Management (BOEM), the Bureau of Safety and Environmental Enforcement (BSEE), and the U.S. Geological Survey (USGS), and the Department of State, among others.

These agencies have reimbursed Coast Guard many millions of dollars for "ship time" on icebreakers for the scientists, engineers, researchers, and investigators that these federal partners support.

Here are a few scientific highlights of Arctic research conducted aboard HEALY:

- Over many oceanographic expeditions, NOAA, USGS, and State Department supported the seafloor and sub-seafloor mapping of the US's Extended Continental Shelf (ECS) in the Arctic region, consistent with international law. This has been a critically important process in determining US sovereign rights on and beneath this seabed, beyond the US's 200-mile Exclusive Economic Zone. Based on the scientific results, the size of the US's entire ECS is about two times the size of California, and half of that area surrounds Alaska.

- HEALY recently returned from an extended and highly successful expedition, partially funded by the NSF, that reached the North Pole. Academic scientists collected data as part of an internationally coordinated, multi-ship sampling campaign during 2020-2022, named "Synoptic Arctic Survey," to study pan-Arctic ocean circulation, biogeochemical cycles and marine ecosystems. Notably, this research cannot be conducted from remote sensing platforms, or from electronic moored or autonomous devices. Physical presence, provided by icebreakers, is required. This research can also be considered an early US contribution toward our treaty obligation to help establish a "Joint Program of Scientific Research and Monitoring" by June 2023 as per the international Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean.

- NOAA has been the primary sponsor of multiple HEALY expeditions in support of US participation in an international initiative referred to as the "Distributed Biological Observatory," which consists of a series of eight sampling locations, spanning from the Bering Sea to the Beaufort Sea, offshore Alaska. These sites serve as a "change detection array" where scientists can observe variations in physical and oceanographic conditions, such as biodiversity, productivity and food webs, which impact Alaska's fisheries. According to a report from the Alaska Seafood Marketing Institute, Alaska produces more seafood than all other U.S. states combined and provides two-thirds of the nation's wild-caught fish and shellfish. Alaska seafood is sold in 100 countries and is the State's top export, in excess of $3 billion, annually. Food web changes also impact walruses, seals, and ducks, which, in turn, are harvested by US citizens living in small, vulnerable Indigenous communities in Alaska's coastal areas. As a result, icebreakers are essential to understand food web changes which are linked to food security issues.

- The Office of Naval Research has funded both basic and applied Arctic research conducted aboard HEALY that directly support US Navy operations, and concurrently addresses USCG missions associated with homeland and national security and domain awareness. Examples include the "Stratified Ocean Dynamics of the Arctic Ocean" (SODA) initiative, and an "Innovative Naval Prototype program aimed at engineering a networked Arctic Mobile Observing System (AMOS). These research programs require access to the ice-covered central Arctic, some of which contain "multi-year" (thick and old) accessible only with "medium" and "heavy" icebreakers.

- One of the important steps in addressing the NSAR strategic objective of mitigating greenhouse gas emissions in the Arctic is to observe and understand the natural exchanges of carbon dioxide between the Arctic Ocean and overlying atmosphere that is associated with physical processes and the marine ecosystem. While gas exchange can be monitored remotely, and on broad scales, by satellites, detailed *in situ* measurements, aboard oceanographic vessels, fill a critical gap in observations and improve efforts to quantify ocean uptake of carbon dioxide, and hence our ability to model and predict future climate scenarios. To that end, NSF has funded research programs to equip HEALY and use the vessel as a "ship of opportunity," on a not-to-interfere basis, to make such measurements and contribute them to global databases.[9] Additional measurements, of other needed atmospheric and surface ocean observations (long and short wave radiation, air temperature, wind speed, humidity, sea surface temperature, etc.) could also be collected, and would also help inform domain awareness and the global forecast system.

Current and future challenges and opportunities

Increasing demand for HEALY

The demand for HEALY to conduct missions prioritized by the Department of Homeland Security (DHS) has increased significantly over the last few years, thereby reducing HEALY's availability for scientific research missions, which are also increasing.

Greater demand for the vessel, and prioritization of DHS missions, has had an outsized impact on Arctic research because HEALY is the only asset in the US fleet capable of providing access to the high Arctic Ocean. The rebalancing of HEALY's mission profile toward security and international search and rescue efforts provide few options to US researchers other than to rely on foreign icebreakers for support, which will impact both the amount and the nature of science that US investigators can achieve. In addition, federal science agencies remain responsible for ongoing operational costs for the scientific and technical equipment and capabilities they have installed on HEALY, even when such capabilities are not being used.

HEALY replacement

Commissioned in 1999, USCGC HEALY is now 23 years old, and has a designed service life of 30 years, with an anticipated five-year Service Life Extension Project beginning in FY 2026. A replacement will be needed for the HEALY by about 2034, suggesting that construction of the new vessel will need to begin no later than 2031, which is the same year that NSF anticipates delivery of the Antarctic Research Vessel.

In short planning for the HEALY replacement, to operate in the Arctic Ocean, must start in the next couple of years, if not now.

[9] https://www.socat.info

This situation raises many questions, such as:

- How will the US government provide that icebreaker, which is essential to meet our obligations and needs in the North?

- Will the USCG provide one of its three "medium" icebreakers, referred to as an "Arctic Security Cutter" – consistent with the Coast Guard's "High Latitude Mission Analysis Report recommending three "medium" and three "heavy" vessels, as part of USCG's "Polar Security Cutter" Program?[10]

- If so, will that vessel be designed and constructed in a manner that reflects the requirements of multiple missions, including scientific research?

- How will the requirements for those various missions, from other agencies, be identified, coordinated with the USCG, and incorporated into the overall design requirements?

- What government entities will be provided with the responsibilities and necessary budgets to identify, procure, install, operate and maintain the scientific and technical capabilities and equipment of the vessel, such as with multibeam sonar systems?

- Will there be White House leadership and coordination, including of budgets (e.g., from Office of Management and Budget (OMB), National Security Council (NSC), and Office of Science and Technology Policy (OSTP)) to ensure a whole-of-government approach to this process?

Other U.S. government vessels that operate in ice-infested waters

R/V Sikuliaq

The *R/V Sikuliaq*, owned by the NSF and operated by the College of Fisheries and Ocean Sciences at the University of Alaska Fairbanks, with support from the NSF, provides excellent scientific access to waters covered with thin ice, up to 2.5 feet thick. This vessel, commissioned in 2015, is outfitted with a wide range of modern science capabilities and has proven most successful in addressing key research questions. The Sikuliaq, however, is not an icebreaker, and is not capable of accessing large regions of the Arctic, where thicker ice is encountered.

Antarctic research vessel

Last year, the NSF announced[11] funding for the design of an Antarctic Research Vessel (ARV)[12], which would essentially serve as a replacement for the *R/V Nathanial B. Palmer* and possibly also the *R/V Laurence M. Gould* that NSF charters from Edison Chouest Offshore, Inc.

The ARV will be designed as a modern, world-class, ice-breaking research vessel outfitted with first-rate scientific equipment and enhanced capabilities. If the project is approved by NSF for construction and

[10] Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress, https://s3.documentcloud.org/documents/22275439/coast-guard-polar-security-cutter-polar-icebreaker-program-background-and-issues-for-congress-aug-30-2022.pdf
[11] https://future.usap.gov/new-antarctic-vessel-approved/
[12] https://www.nsf.gov/news/news_summ.jsp?cntn_id=305919&org=OPP

fully funded by Congress, the ARV is expected to be delivered to the NSF by mid-2031, only three years before HEALY is anticipated to be decommissioned.

Notably, the NSF would operate the ARV exclusively in the Southern Hemisphere, in support of Antarctic research. To my knowledge, the NSF has no current plans for a similar icebreaking research vessel for the Arctic region, and I also don't know whether the NSF is in discussion with the US Coast Guard regarding the opportunities to outfit Coast Guard vessels, beyond HEALY (i.e., the "commercially available polar icebreaker" USCG has requested in its FY23 budget request, or any of the three heavy icebreakers considered in the Polar Security Cutter program), with scientific research tools and capabilities to advance scientific research objectives in the Arctic region. Regardless, my overarching recommendation is that, consistent with the NSAR's guiding principle of a "whole-of-government" approach, any icebreaker owned and operated by the US government should consider mission requirements of the broader interagency user community, not just one department or agency.

Autonomous platforms

While ship-based observing will remain a critical pillar of Arctic research, the use of autonomous platforms will continue to expand, providing access to remote regions and to spatial and temporal scales that have previously been impractical or impossible to sample. Research-capable icebreakers could support new networks of autonomous instruments - both to deploy and recover instruments and to service critical supporting infrastructure, such as acoustic beacons that will provide 'underwater GPS' for accurately geolocating assets operating under sea ice.

Soft power diplomacy

Finally, I would also like to highlight the soft power diplomacy advanced by Arctic scientific research that is often associated with international scientific parties aboard icebreakers both domestic and foreign.

Over many decades, USCG icebreakers (HEALY, POLAR STAR and POLAR SEA) provided platforms for international science collaboration that allowed key interactions by scientists to move forward even when political differences of various countries strained relations in other areas. Ongoing climate change issues warrant continued and expanded international research programs and USCG icebreakers are essential assets for such activities.

Let me provide some specifics. In the recently released "State of Arctic Science,"[13] the International Arctic Science Committee refers to the Distributed Biological Observatory and the Synoptic Arctic Survey research programs, of which, as mentioned above, US leadership has been a central element. These programs require icebreaker access to the high North. The UN Decade for Ocean Science and Sustainable Development will have a focus on the Arctic Ocean.

By addressing common problems and data sharing where appropriate, the US builds constructive relationships with, Canada, Iceland, the Kingdom of Denmark (Greenland and the Faroe Islands), our Nordic partners, and scientists and research organizations in non-Arctic nations in Europe and Asia. The US benefits through access to new ideas, technologies, and data bases, research partnerships, and it encourages, supports, and reinforces the international rules-based order. Enabling joint international research, international search and rescue operations, ensuring interoperability with vessels and crews from other nations, and working closely with other Arctic and non-Arctic nations in areas such as the North

[13] https://iasc.info/about/publications-documents/state-of-arctic-science

Atlantic and Barents Sea, also serves to reinforce the transatlantic alliance at a time of geopolitical uncertainty; specifically, as this uncertainty ripples globally to include the Arctic.

And looking even longer term, Russia's presence in the Arctic cannot be ignored. Because of Russia's war on Ukraine, relations with Russia are the worst they have been since the Cold War. We do not know when the war will end, or when relations with Russia will begin to rebalance. But at some point in the future, scientific research in the Arctic region could be one step forward in rebuilding a more comprehensive understanding of the region and perhaps serve as a foundational effort to rebuild relations between Russia and the West.[14]

Summary of recommendations

On behalf of the U.S. Arctic Research Commission, I recommend:

1. Federal agencies should continue to, where feasible, ensure that icebreakers procured by the United States, consider the broad mission sets of several agencies.

2. Multibeam sonar systems on icebreakers that reveal the depth and shape of the seafloor can provide information critical to safe navigation, economic development, weather prediction, coastal hazard assessment, coastal change analysis, habitat studies, and resource development, among many other activities. It is a requirement before declaring any potential marine protected areas, or the United States' extended continental shelf. As called out on page 4 of the US Arctic Research Commission's last "Goals report," Arctic marine charts are suboptimal in that only 4.1 percent of the US maritime Arctic is charted to modern international standards.[15]

Mr. Chairman and Ranking Member Gibbs, thank you again for the opportunity to testify before you and this Subcommittee on the United States Coast Guard's leadership in the Arctic. As I have stated, the US Coast Guard is a critically essential and successful partner in advancing scientific understanding of the polar regions and advancing our nation's interests in the region. It must continue to be so even with increasing and competing demands for icebreaker missions. I am confident the recommendations offered in this testimony will help achieve that.

###

[14] https://www.tandfonline.com/doi/full/10.1080/2154896X.2022.2137091
[15] https://www.arctic.gov/uploads/assets/usarc_goals_2019-2020_low.pdf