National Petroleum Council

125th Meeting

March 27, 2015

National Petroleum Council

Arctic Potential

Realizing the Promise of U.S. Arctic Oil and Gas Resources

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Introduction

In October 2013, the Secretary of Energy requested the NPC to conduct a study

- "What research should the Department of Energy pursue and what technology constraints must be addressed to ensure prudent development of Arctic oil and gas resources while advancing U.S. energy and economic security and ensuring environmental stewardship?"
- The Secretary also noted that the Council's perspective would be helpful input to the U.S. chairmanship of the Arctic Council, the Quadrennial Energy Review, and implementing the U.S. National Strategy for the Arctic Region

Context

- Today, there is both increasing interest in the Arctic for economic opportunity, and concern about the culture of the Arctic peoples and the changing environment
- Other countries are moving forward with economic development, in this time of change
- The U.S. has large offshore Arctic oil potential, and the technology exists to safely explore for and develop this potential, while maintaining environmental stewardship
- Development would enhance national, economic, and energy security
- Despite this, there are diverse views on moving forward with Arctic development
- In this context, an integrated work plan and a diverse, experienced study team was needed

Study Scope and Outline

Prudent Development Scope

- Provide broad context on prudent development
- Global and U.S. perspective
- Onshore and offshore included

Research and Technology Scope

- Emphasis given to conventional offshore technology
- Assessed research and technology addressing
  - Current state of technology / research
  - Ongoing research / collaboration
  - Observations / opportunities
  - Recommendations / priorities for U.S. government

4 chapters

Part 1 – Prudent Development

- Arctic Resource Potential and History of Operations
- Development Potential and Challenges
- Implementation of U.S. Strategy for the Arctic Region
- Policy and Regulatory Opportunities to Promote Prudent Development

6 chapters

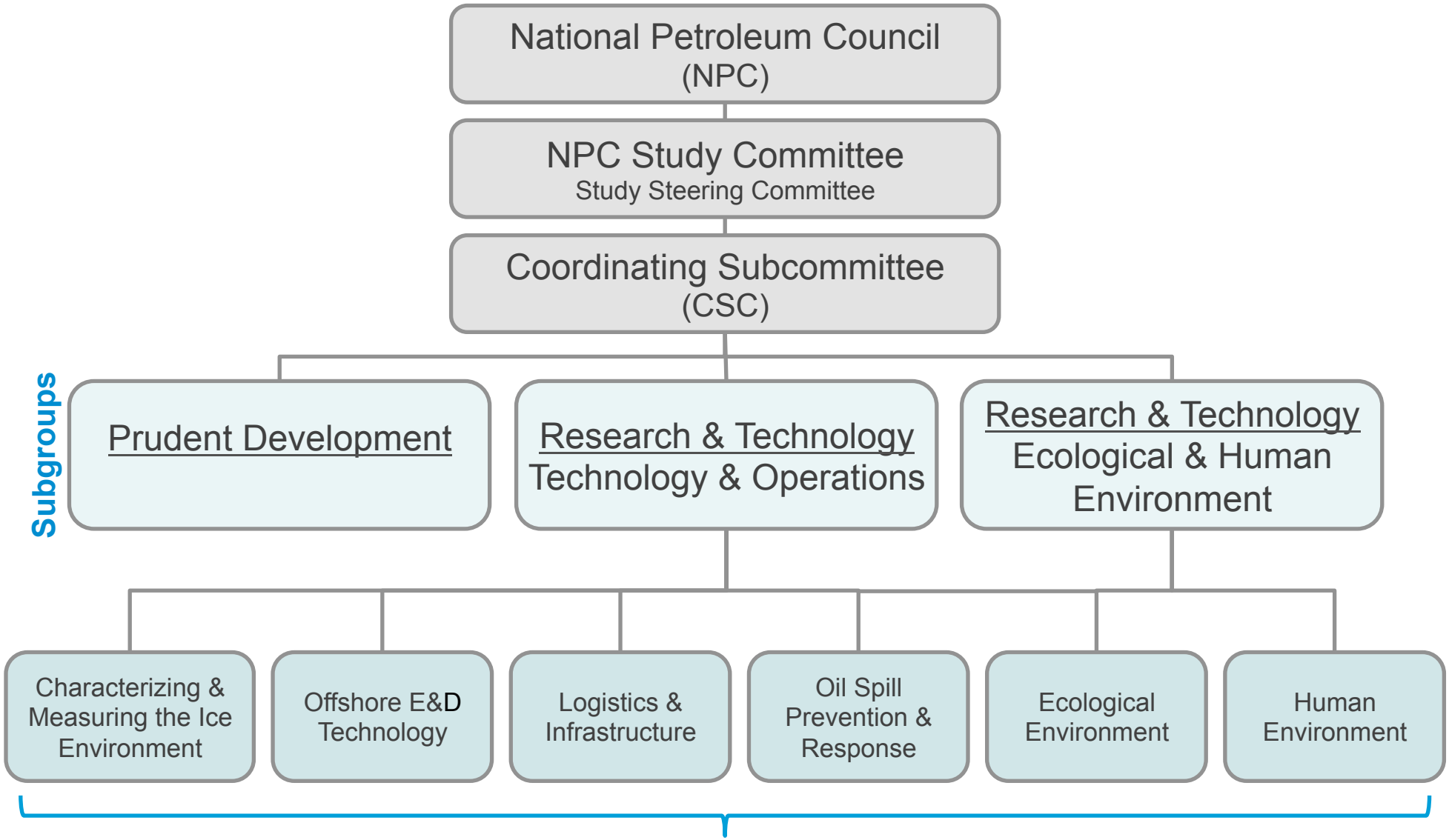
Part 2 – Technology and Operations

- Characterization and Measurement of the Ice Environment
- Offshore Arctic Exploration and Development Technology
- Logistics and Infrastructure
- Arctic Offshore Oil Spill Prevention, Control, and Response

Part 3 – The Environment

- The Ecological Environment
- The Human Environment

Study Organization



emphasis on research and technology that supports Arctic conventional offshore resource development

Study Teams

Study Committee, with members from 30 organizations

- 30 team members: 18 industry, 9 non-industry, 3 government

Coordinating Subcommittee, with participants from 20 organizations

- 23 team members: 7 industry, 9 non-industry, 4 government

Prudent Development led by Chevron

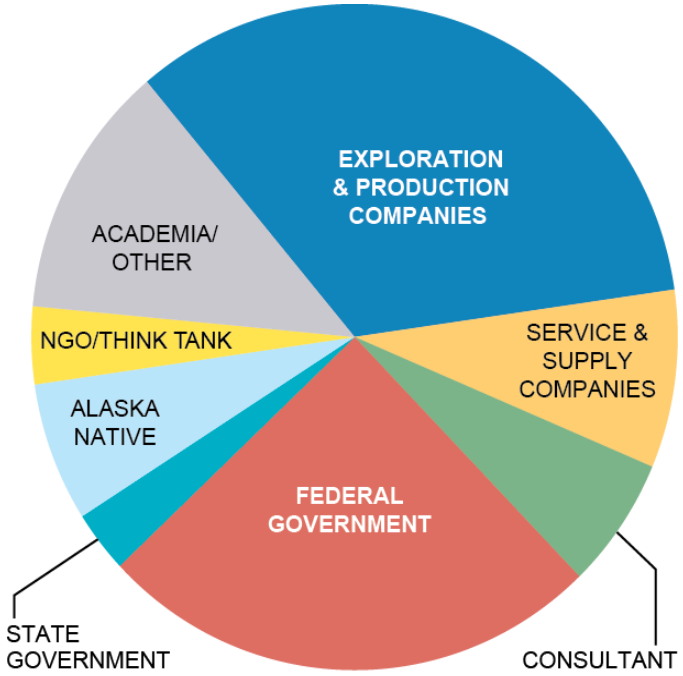
- 47 team members from 20 organizations

Technology and Operations led by ExxonMobil

- 110 team members from 53 organizations

Ecology & Human Environment led by Shell

- 21 team members from 13 organizations



Federal & Alaska Technology Workshops

- 111 participants form industry, government, native, academic, and NGO organizations

External Engagements

Two technology workshops held with government, academia, and Alaskan natives

- Objectives were to brief workshop participants on the study, explore external R&D capability, and identify potential R&D and collaboration opportunities
- Federal workshop held September 23 at Resources for the Future, Washington
  - 54 participants, including 32 from government research organizations
  - Reinforced need for collaborative studies and research, where industry views technology as proven, but regulatory and stakeholder acceptance requires additional information, analysis, and demonstration
- Alaska workshop held November 11 at University of Alaska, Fairbanks
  - 57 participants, including 42 Alaska-based academic, government, and native representatives
  - Validated technology priorities identified in the Washington Workshop

Outreach and input from other interested parties in 21 sessions

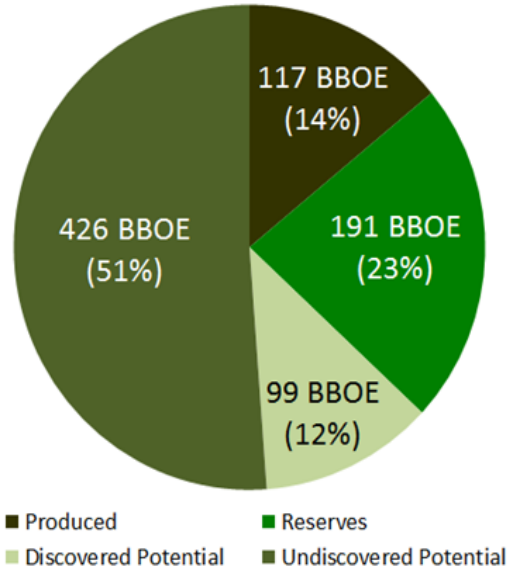
Key Findings

1. Arctic Oil and Gas Resources are Large and Can Contribute Significantly to Meeting Future U.S. and Global Energy Needs
2. The Arctic Environment Poses Some Different Challenges Relative to Other Oil and Gas Production Areas, But is Generally Well Understood
3. The Oil and Gas Industry Has a Long History of Successful Operations in Arctic Conditions Enabled by Continuing Technology and Operational Advances
4. Most of the U.S. Arctic Offshore Conventional Oil & Gas Potential Can Be Developed Using Existing Field-Proven Technology
5. The Economic Viability of U.S. Arctic Development is Challenged by Operating Conditions and the Need for Updated Regulations that Reflect Arctic Conditions
6. Realizing the Promise of Arctic Oil and Gas Requires Securing Public Confidence
7. There Have Been Substantial Recent Technology and Regulatory Advancements to Reduce the Potential for and Consequences of a Spill

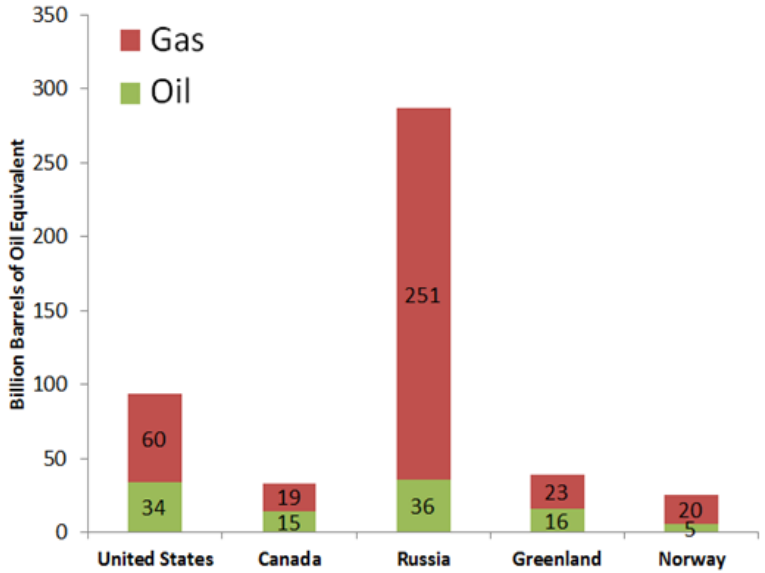
Large Arctic Oil and Gas Potential

Arctic Oil and Gas Resources are Large and Can Contribute Significantly to Meeting Future U.S. and Global Energy Needs

- The global Arctic contains about 25% of remaining undiscovered global conventional resources (USGS), and the U.S. has a large portion of oil potential
- If exploration starts now, offshore Alaskan development could coincide with the expected decline in the lower 48 fields
- National security and economic benefits associated with increased U.S. activity



Global Arctic Conventional Endowment



Global Arctic Conventional Oil and Gas[1] Resource Potential by Country

[1] Natural gas liquids not shown

The Arctic Environment

The Arctic Environment Poses Some Different Challenges Relative to Other Oil and Gas Production Areas, but is Generally Well Understood

- The Arctic has been studied for many years by industry, government, and academia, and much is known about the physical, biological, and human environment
- Key characteristic distinguishing the Arctic is ice: ice type, water depth, open water season
- Experiences from other remote and challenging oil and gas areas applicable
- The climate is changing and there are additional information / monitoring opportunities, such as interaction of key species with oil and gas activities

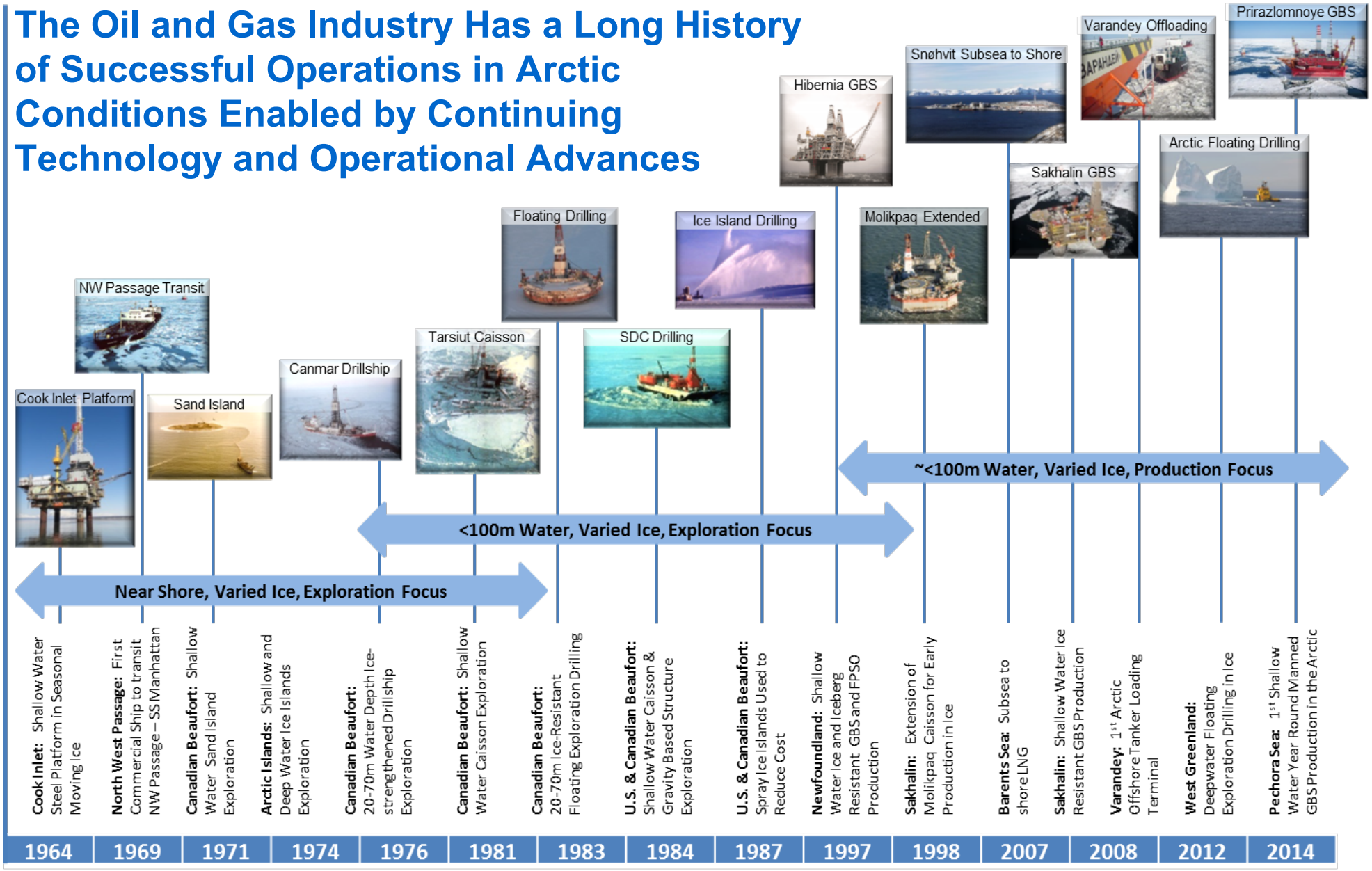
First-year ice with numerous pressure ridges

Multi-year ice ridge in the Canadian Beaufort Sea

Iceberg, ~ 200 meters across, in open water

Long History, Enabled by Technology Advances

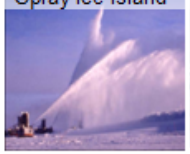
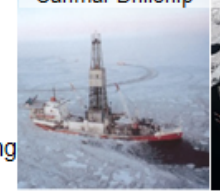
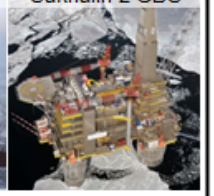
The Oil and Gas Industry Has a Long History of Successful Operations in Arctic Conditions Enabled by Continuing Technology and Operational Advances



Most U.S. Arctic Offshore is Developable Today

Most of U.S. Arctic Offshore Conventional Oil and Gas Resources Can Be Developed Using Existing Field-Proven Technology

Increasing Complexity to Explore & Develop

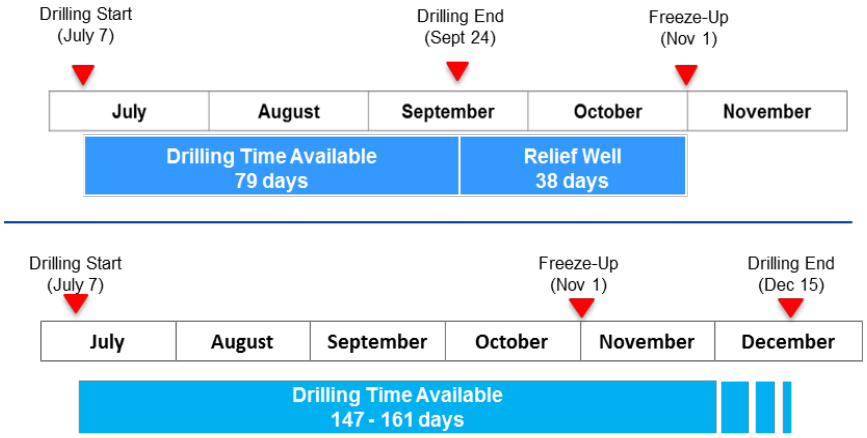
Physical Ice Environment and Water Depth		Technology to Explore & Develop
Description	**Examples**	
Typically ice free, any water depth - *Minor first year ice intrusions, icebergs possible*	- South Barents Sea - Newfoundland	**Exploration & development proven** (Various drilling rigs, floating solutions, GBS, subsea tieback) Snøhvit Subsea  Hibernia GBS 
Any ice conditions, near shore & shallow water - *~<15m water*	- Globally, near shore (including US Beaufort and Chukchi Seas)	**Exploration & development proven** (Ice & gravel islands, concrete & steel structures, extended reach drilling from onshore) Spray Ice Island  Northstar 
Open water > ~2 months, any water depth - *Mainly first year ice, potential for combination of multi-year ice, icebergs and ice islands* - *Water depth determines development concept (greater or less than ~100m is key)*	- Sea of Okhotsk - Pechora Sea - Labrador Sea - US Chukchi & Beaufort Seas - South Kara Sea	**Exploration proven; development proven mainly in ~<100m water** Ice management required ~<100m development by GBS ~>100m development by floating drilling & subsea tieback Canmar Drillship  Sakhalin-2 GBS 
Open water <~2 months, any water depth - *Likely to encounter multi-year ice and/or icebergs, and in some locations ice islands* - *Water depth determines development concept, (greater or less than ~100m is key)*	- Deepwater Beaufort Sea - Deepwater Northern Russian Arctic Seas	**Exploration & development possible with technology improvements** Increased ice management capability and possible new technology
Limited to no open water - *Frequent multi-year ice with embedded icebergs, and ice islands*	- North East Greenland - Deepwater Northern Russian Arctic Seas	**Technology extensions or new technology required** Floating, robust ice managed solutions GBS / Subsea technology extensions or new technologies Difficult to mobilize equipment without open water season

Economics Challenged by Operating Conditions

The Economic Viability of Alaskan Arctic Development is Challenged by Operating Conditions and the Need for Regulations that Reflect Arctic Conditions

- Technical feasibility is not the only consideration
- Arctic exploration and development is more costly than in other areas due to remoteness, challenging climate, short operating seasons, and infrastructure
- Stakeholder alignment and regulatory efficiency also influence economic viability
- Resource opportunities of sufficient size and quality must be found
- Two areas are currently limiting exploration

Drilling Season Length



Lease Length

Country	License / Lease System	Typical Well Count to Retain License / Lease	License / Lease Duration
Canada	Exploration Based	1 - 2	9 years
Greenland	Exploration Based	1 - 2	Up to 16 years
Norway	Exploration Based	1 - 2	Up to 30 years
Russia	Exploration Based	1 - 2	10 years
USA	Development Based	6 - 7	10 years

Securing Public Confidence Required

Realizing the Promise of Arctic Oil and Gas Resources Requires Securing Public Confidence

Industry and government have a shared responsibility to gain and maintain the public trust

- Both must engage the local community

Industry must operate responsibly and continuously improve technology and operations

- Commitment to operate safely and with high environmental standards
- Maintain and continuously improve risk management systems, practices, tools

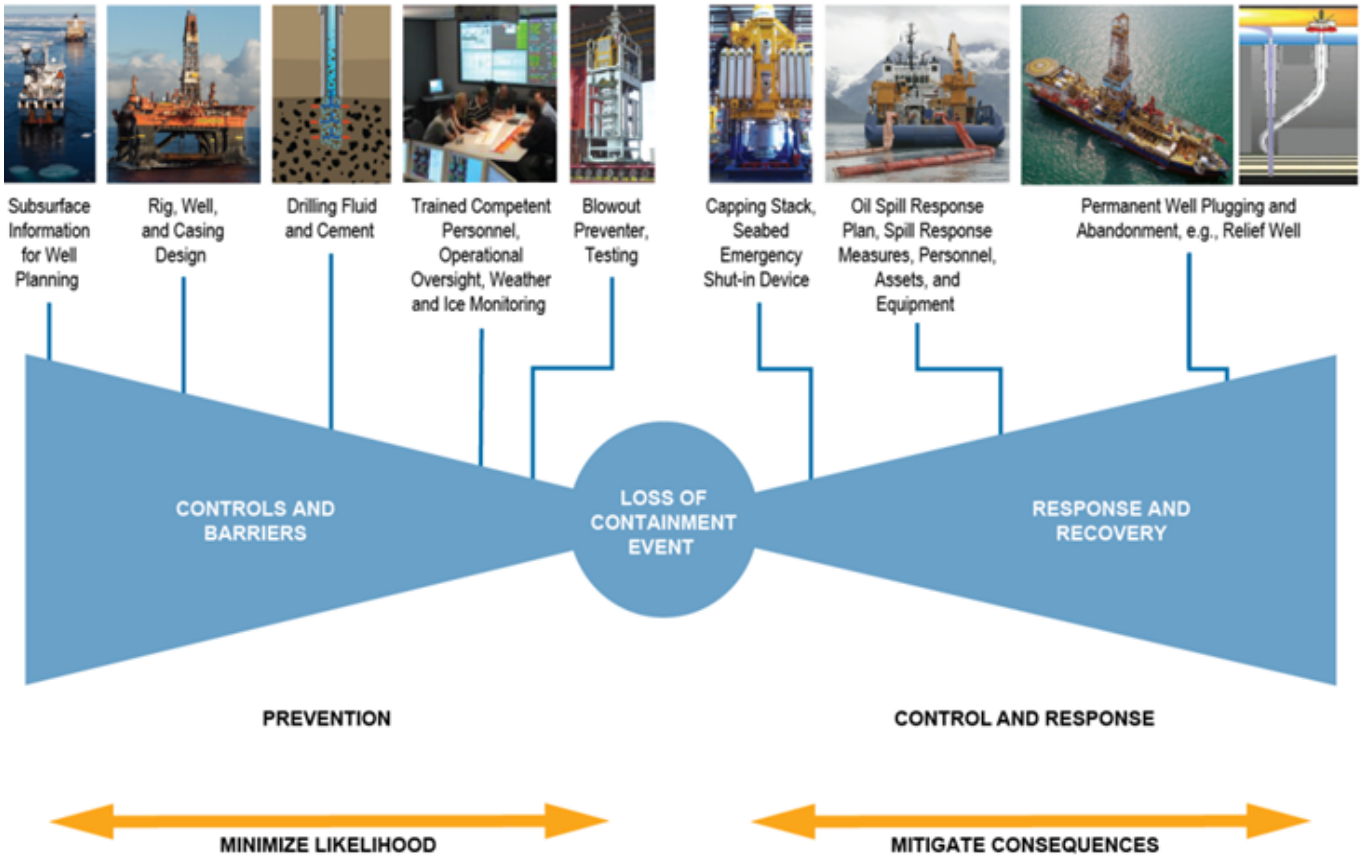
Government must maintain / continuously improve policies and regulations that ensure public safety and environmental protection, and support development

- Long history of Arctic policy and regulations
- Coordination / role clarity essential
- 39 agencies in the Arctic Policy Group
- 27 agencies / groups in the Implementation Plan for the National Arctic Strategy
- 22 members of the Arctic Executive Steering Committee

Well Control Technology Improvements

There Have Been Substantial Recent Technology and Regulatory Advancements to Reduce the Risk and Consequences of a Spill

- The greatest reduction of environmental risk comes from preventing a spill
- Recently developed control and mitigation technologies should be assessed



Recommendations

Although the technology exists today to explore and develop the majority of U.S. offshore oil and gas potential, additional research opportunities are recommended to:

- Validate recently developed technology for use in the U.S. offshore
- Pursue technology extensions that could lead to improved safety, environmental, or cost performance

Policy and regulatory recommendations are included where they enable the application of best technology and practices

Total 32 recommendations (13 research, 3 regulatory, 16 leadership/policy), in the Executive Summary

- Additional 60 research recommendations in the report

Recommendations grouped into themes: Environmental Stewardship; Economic Viability; Government Leadership and Policy Coordination

Environmental Stewardship

The NPC recommends:

- Industry and regulators should work together to perform the analysis, investigations and any necessary demonstrations to validate technologies for improved well control
- Government agencies should participate in ongoing and future industry collaborative research programs for oil spill response in ice, such as the Arctic Response Technology Joint Industry Programme that has been underway since 2012
- Regulators should continue to evaluate oil spill response technologies in Arctic conditions, and all spill response technologies should be pre-approved to enable selection of the appropriate response technology to achieve the greatest reduction in environmental impacts

Subsea Isolation Device

Capping Stack

Environmental Stewardship, continued

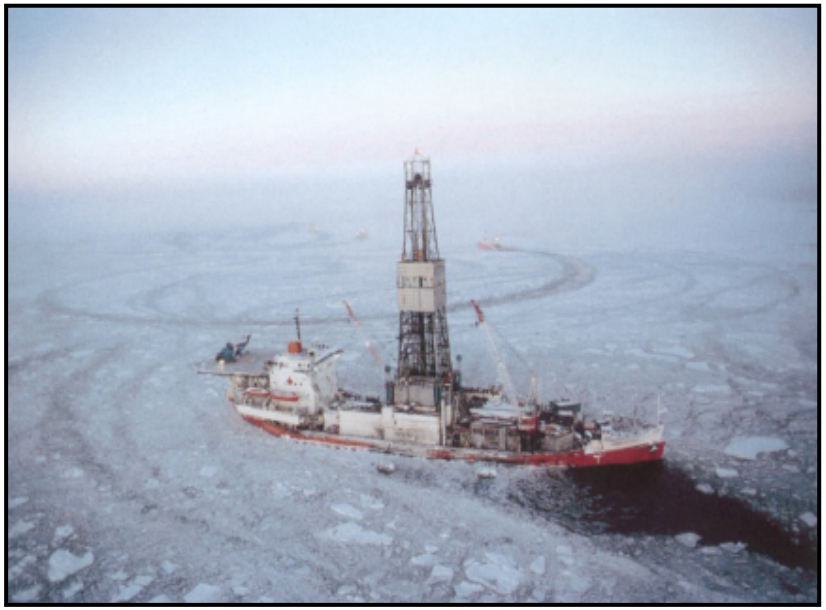
The NPC recommends:

- Long term population estimates and understanding of the interactions of key species with oil and gas activities should be enhanced, to improve efficiency of exploration and environmental stewardship
- Collaboration and coordination of ecological and human environment research should be improved
- An updated Socioeconomic Impact Assessment protocol is needed

Economic Viability

Considering economic viability, the NPC recommends:

- Industry, government, and regulators should perform the analysis, investigations and necessary demonstrations to validate technologies / capabilities to safely extend the drilling season
- The Department of Energy and the Department of the Interior should assess the timelines to progress an offshore exploration and development program, compared with current U.S. lease durations and practices in other jurisdictions
- Policies, regulations, and implementation practice should encourage innovation and enable use of technology advances



Government Leadership and Policy Coordination

Considering domestic leadership and policy coordination, the NPC recommends:

- The Arctic Executive Steering Committee should reaffirm U.S. commitment to prudent Arctic oil and gas development, assess alignment across federal agencies, and clarify the process by which it will collaborate with Alaskans
- The Arctic Executive Steering Committee as part of its mandated gap analysis should request regulators to compile a comprehensive and integrated inventory of regulatory requirements, and assess the interagency working group for lessons learned and improvement opportunities
- The Department of Energy should designate a senior advisor to support DOE's representative on the Arctic Executive Steering Committee and be a focal point for Arctic policy

Considering the Arctic Council, the NPC recommends:

- As Arctic Council members implement the two international agreements on search and rescue (2011) and on oil pollution preparedness and response (2013), the U.S. government should engage with the energy industry on response exercises
- The U.S. government should strengthen the Arctic Economic Council's interaction and engagement with the Arctic Council

Forward Plans

Digital Publications and Communications

- Report website ready to go live this afternoon
- Digital copy of executive summary and related materials
- Council webcast
- Schedule of forward events
- 'Social Media' friendly
- Other useful links

Printed Report Publication

- Executive Summary volume available mid April
- Full report available end May

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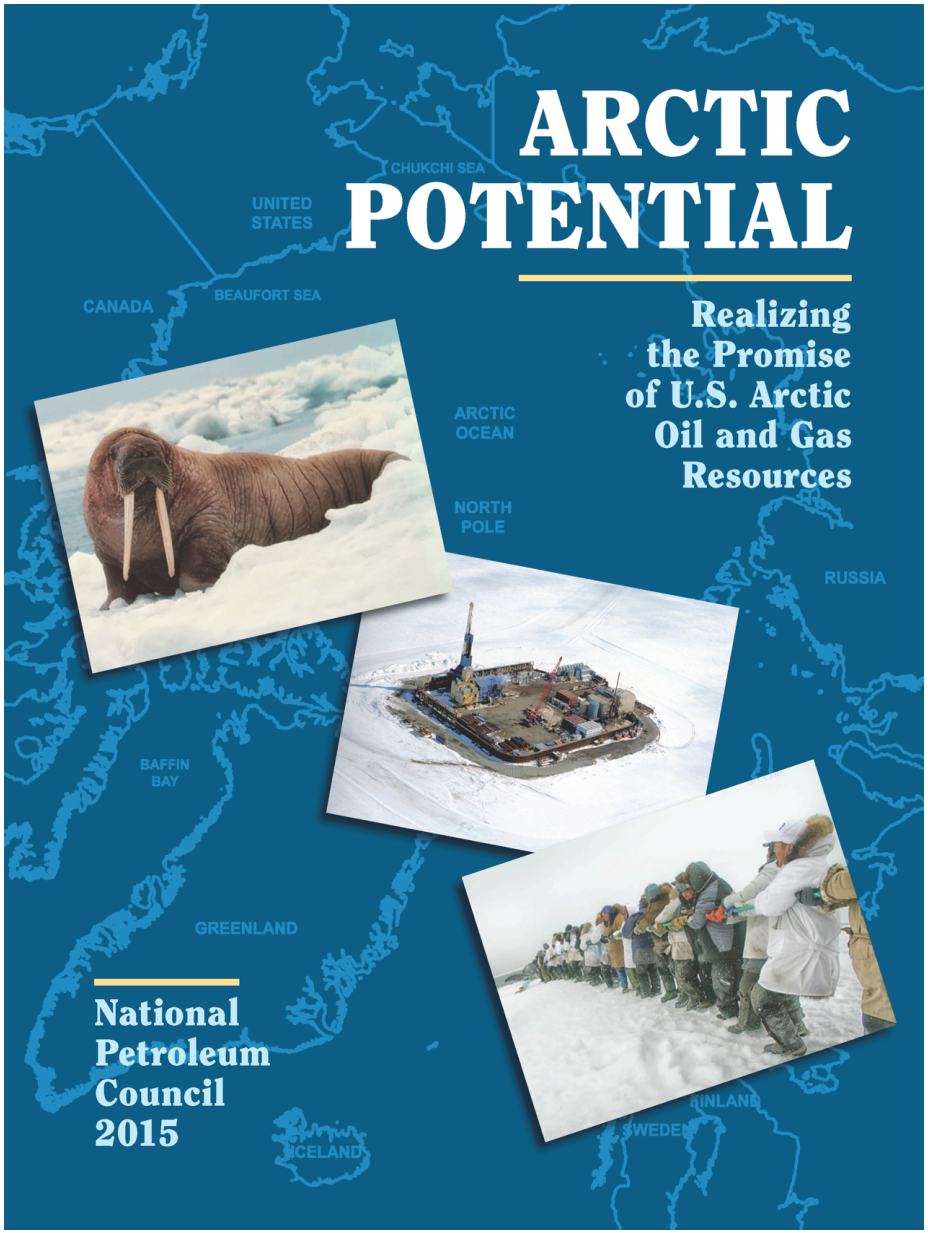

Communications

Communications Events

- Alaska briefings, April 7-10
- Arctic Panel Discussion hosted by CSIS, April 17
- Other Washington and Alaska Communications, during April
- Energy Council, June 18-20

Protocol for Ongoing Communications

- Any individual or organization may use the NPC Arctic Research report in expressing their own views, provided that it is properly cited
- If the request did not originate from the NPC, please inform the NPC staff, and provide the name of the presenter, the audience, and a copy of the presentation or report
- Presenters are to be mindful of the purpose of the Council, and the prohibition against lobbying

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