
National Petroleum Council Arctic Research Study

Status Update for National Petroleum Council

December 18, 2014

NPC Arctic Research Study Overview

“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?” ... Secretary Moniz, October 2013

- **The objective of the study is to provide DOE with the National Petroleum Council’s perspective on research and technology pursuits that support prudent development in the Arctic**
- **The study will**
 - Support implementation of the U.S. National Strategy for the Arctic Region
 - Provide input to the Quadrennial Energy Review and the Quadrennial Technology Review by the Department of Energy in 2015
 - Provide context to administration as the United States assumes chairmanship of the multi-nation Arctic Council in 2015
- **The target date to complete the Arctic Research study and deliver the report to Secretary Moniz is by end of March 2015**

Study Scope and Outline

'Prudent Development' Scope:

- Provide broad context on prudent development (safety, environmental responsibility, community responsibility, commercial viability)
 - Arctic development history – onshore / offshore; domestic / international – significant experience, enabled by technology
 - Resource assessment by resource type (oil / gas; onshore / offshore; conventional / unconventional)
 - Typical development sequence, by resource type, for continued prudent (commercial) development
 - Development challenges – economics, regulatory, skills, etc.
 - Role of government, domestic and international collaborations

Research and Technology Scope:

- Emphasis given to conventional offshore resources
- Arctic technology & operations (4 research areas)
 - Characterizing and measuring the ice environment
 - Offshore exploration and production technology
 - Logistics and infrastructure
 - Oil spill prevention, control and response
- Arctic ecology and human environment (2 research areas)
 - Characterizing the ecological environment
 - Characterizing the human environment

1 chapter
only

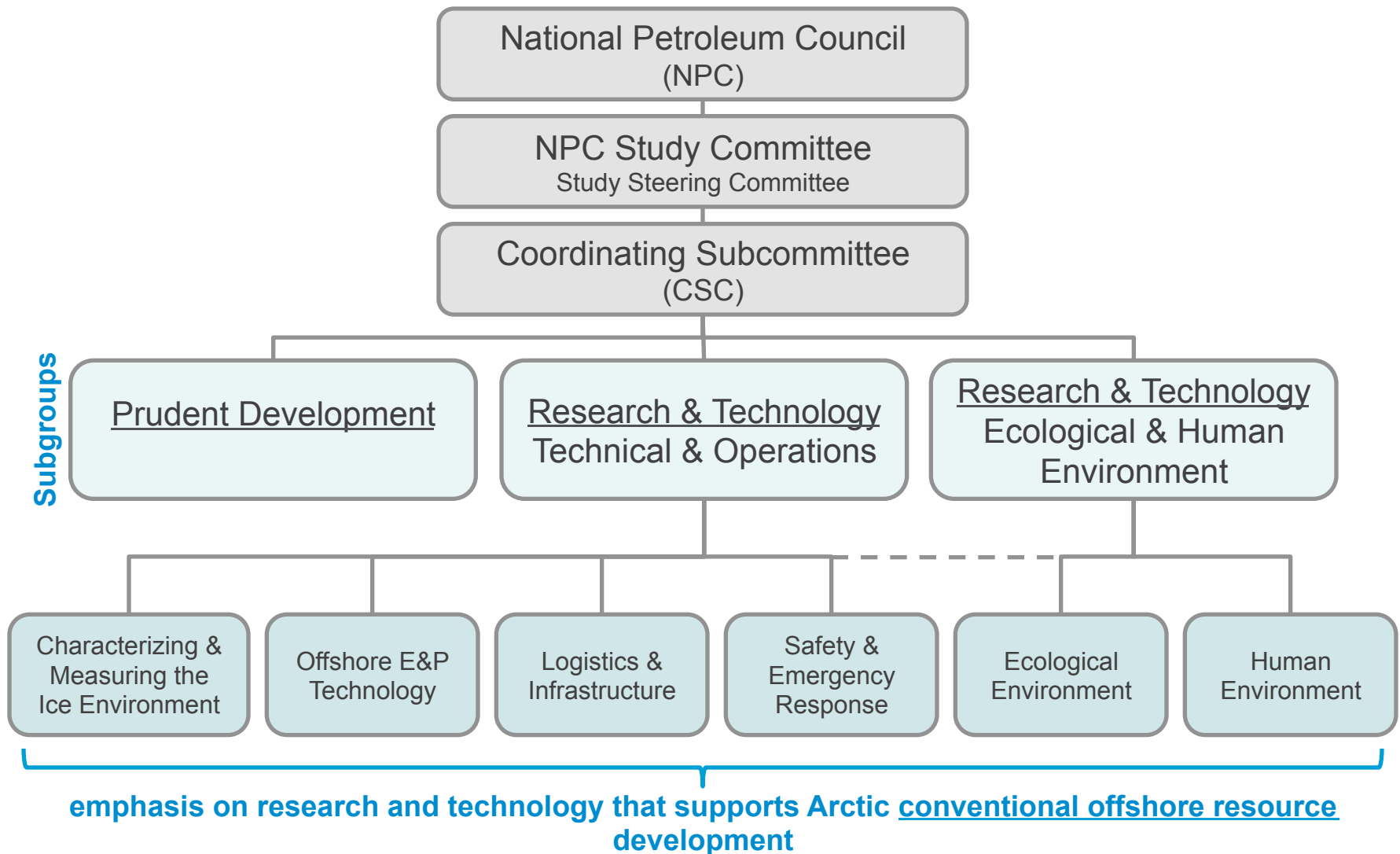
Report Outline

- Introduction / physical ice environment
- Arctic resource potential
 - Makes case to focus research and technology sections on conventional offshore resources
- History of Arctic operating experience and the development of enabling technologies
- Arctic development potential and challenges
- Implementation of U.S. National Strategy for the Arctic Region and considerations for the Arctic Council
- Opportunities and recommended actions to promote prudent development

6 separate chapters
by research
area

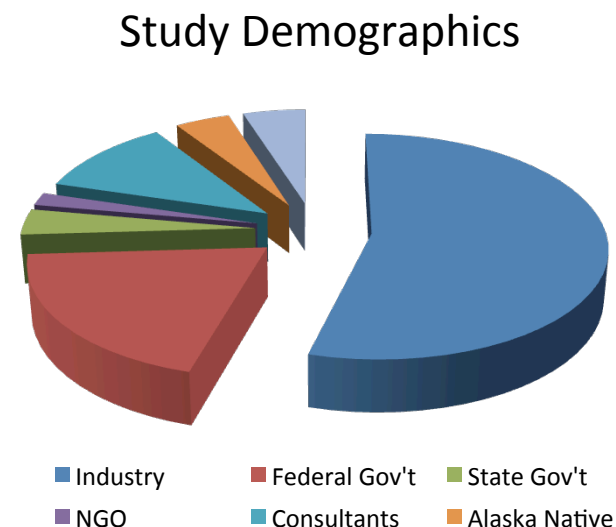
- Overview
- Existing technological constraints
- Current research / collaboration catalog
- Observations / opportunities discussion
- Recommendations / priorities for U.S. government

Study Organization Structure



Study Participation

- **Study Committee, with members from 31 organizations**
 - 20 industry, 9 non-industry, 2 government
 - Led by a Steering Committee of 9 Study Committee members
- **Coordinating Subcommittee, with participants from 22 organizations**
 - 8 industry, 8 non-industry, 6 government
- **Prudent Development led by Chevron**
 - 40 members from 19 companies and government
- **Technology and Operations led by EM**
 - 114 members from 40 companies, government, and academia
- **Ecology & Human Environment led by Shell**
 - 24 team members from 14 different companies, government and academia



Workshop Activities

- **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
 - Attended by 56 participants, including 32 from government research organizations
 - Reinforced need for collaborative studies and research, where industry views technology as mature / proven, but regulatory and stakeholder acceptance requires additional information, analysis, and demonstration
 - Potential opportunities included Quantitative Risk Assessment to assess equivalency of source control options, field demonstration tests of spill response options in ice, remote sensing for tracking oil and species, and satellite measurement of ice thickness
 - Alaska workshop held November 11 at University of Alaska - Fairbanks
 - Attended by 56 participants, including 42 from Alaska-based academic, government (federal, state, local), and native representatives
 - Validated technology priorities identified in the Washington Workshop
- **Study briefings provided to other interested parties in 21 sessions**

NPC Arctic Research Study – Key Findings

- Arctic oil and gas resources are large, and can contribute significantly to meeting global energy needs over the next several decades
- The Arctic poses some different challenges relative to other petroleum production areas
- The petroleum industry has a long history of successful operations in the Arctic, enabled by continued technology advances and operational learnings
- Most of the U.S. Arctic offshore conventional oil resources can be developed using existing field-proven technology
- Realizing the promise of Arctic oil and gas resources requires securing public confidence and using local knowledge
- There have been substantial recent technology and regulatory advancements to reduce the risk and consequences of a spill

The Physical Ice Environment

- **Arctic conditions vary substantially basin to basin, from summer to winter**
- **Ice is the predominant characteristic that differentiates the Arctic from other operating areas**
 - **Open water:** Area not covered by the polar pack ice during the summer. $\leq 1/10$ th ice cover is “open.”
 - **Land fast ice:** Occurs as coastline water freezes, attaches to the shoreline and seafloor and is stable.
 - **Pack ice:** Mobile, concentrated sea ice cover. Compresses to form thickened ridges and rubble fields.
 - First-year: New ice that forms over the open water each winter
 - Second-year: Thickened ice resulting from refreezing of surviving first-year ice from the previous season.
 - Multi-year: Thick ice built up from multiple freeze cycles of previous years of second-, third-, etc. year ice.
 - **Icebergs:** Large pieces of freshwater ice that break off from glaciers and drift with sea current
 - **Ice islands:** Massive tabular pieces of multi-year landfast ice that break off and drift with the pack



First-year ice with numerous pressure ridges



Multi-year ice ridge in the Canadian Beaufort Sea






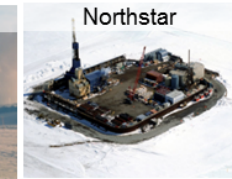


Iceberg, ~ 200 meters across, in open water



6 km ice island embedded in first-year sea ice

Implications for Exploration and Development

Increasing Complexity to Explore & Develop

Physical Ice Environment and Water Depth		Technology to Explore & Develop	
Description	Examples		
Typically ice free, any water depth <ul style="list-style-type: none"> Minor first year ice intrusions, icebergs possible 	<ul style="list-style-type: none"> South Barents Sea Newfoundland 	Exploration & development proven (Various drilling rigs, floating solutions, GBS, subsea tieback)	 
Any ice conditions, near shore & shallow <ul style="list-style-type: none"> ~<15m water 	<ul style="list-style-type: none"> Globally, near shore (including US Beaufort and Chukchi Seas) 	Exploration & development proven (Ice & gravel islands, concrete & steel structures, extended reach drilling from onshore)	 
Open water* > ~2 months, any water depth <ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> Sea of Okhotsk Pechora Sea Labrador Sea US Chukchi & Beaufort Seas South Kara Sea 	Exploration proven Development proven, in in ~<100m water Ice management required ~<100m by GBS ~>100m by floating drilling & subsea tieback	 
Open water <~2 months, any water depth <ul style="list-style-type: none"> 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) 	<ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Frequent multi-year ice with embedded icebergs, and ice islands 	<ul style="list-style-type: none"> North East Greenland Deepwater Northern Russia 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	

Forward Plans

- **Target to complete the Arctic Research study and deliver the report to Secretary Moniz by end of March 2015**
- **Upcoming key activities**
 - January / February – Steering Committee review of report
 - February – Study Committee review of report
 - March – Council meeting to review / approve report

Back up

Study Committee Membership

First Name	Last Name	Organization	Organization Type	Steering Committee	Comments
Rex	Tillerson	Exxon Mobil Corporation	Major Integrated	x	Committee Chair
Liz	Sherwood-Randall	Department of Energy	Government	x	Committee Government Cochair
Jim	Hackett	Retired Executive	Industry		Ex Officio - NPC Chair
Chuck	Davidson	Noble Energy, Inc	Large Independent		Ex Officio - NPC ViceChair
Marshall	Nichols	NPC	N/A	x	Committee Secretary
John	Minge	BP America Inc.	Major Integrated		
John	Watson	Chevron Corporation	Major Integrated	x	Chevron leading "Prudent Development" Subgroup
Paolo	Scaroni	ENI S.p.A.	Major Integrated		
Marvin	Odum	Shell Oil Company	Major Integrated	x	Shell leading "Ecology & Human Environment" Subgroup
Bill	Maloney	Statoil ASA	Major Integrated		
Michel	Bénézit	Total S.A.	Major Integrated		
R.A.	Walker	Anadarko Petroleum Corporation	Large Independent		
Ryan	Lance	ConocoPhillips Company	Large Independent		
Jack	Moore	Cameron	OSC		
David	Seaton	Fluor Corporation	OSC	x	
John	Grempe	FMC Technologies, Inc.	OSC		
Dave	Lesar	Halliburton Company	OSC		
David	Williams	Noble Corporation	OSC		
Kevin	McEvoy	Oceaneering International, Inc.	OSC		
Paal	Kibsgaard	Schlumberger Limited	OSC	x	
Bernard	Duroc-Danner	Weatherford International Ltd.	OSC		
James	Hail	DeGolyer and MacNaughton Corp.	Financial & Consulting		
Neal	Anderson	Wood Mackenzie Inc.	Financial & Consulting		
Rebecca	Ranich	Executive Consultant	Financial & Consulting		Wilson Center Arctic involvement
David	Goldwyn	Goldwyn Global Strategies, LLC	Financial & Consulting		Former State Department & DOE
Frank	Verrastro	Center for Strategic & International Studies	Non-Industry	x	Former White House, DOE, and Industry executive
Phil	Sharp	Resources for the Future Inc.	Non-Industry		Former Chair US House Energy Subcommittee
Ganesh	Thakur	Society of Petroleum Engineers	Non-Industry		c/o Chevron Technology Company
Elliot	Gerson	The Aspen Institute	Non-Industry		
Bert	Stedman	The Energy Council	Government		Alaska State Senator
Mark	Myers	University of Alaska, Fairbanks	Non-Industry	x	Vice Chancellor, Research

31 Study Committee Members / 9 Steering Committee Members

Coordinating Subcommittee (CSC) Membership

CSC Members

First Name	Last Name	Organization	Organization Type	Study Committee	Steering Committee	Comments
Carol	Lloyd	Exxon Mobil Corporation	Major Integrated	x	x	CSC Chair; Engineering VP, ExxonMobil Upstream Research
Doug	Hoyt	Exxon Mobil Corporation	Major Integrated	x	x	CSC Assistant Chair; Materials Engineering Manager, ExxonMobil Development Company
Paula	Gant	Department of Energy	Government	x	x	CSC Government Cochair; Deputy Assistant Secretary, O&G, Fossil Energy
Nancy	Johnson	Department of Energy	Government	x	x	CSC Assistant Government Cochair
John	Guy	NPC	N/A	x	x	CSC Secretary
Tim	Winter	Chevron Corporation	Major Integrated	x	x	Manager, Frontier Development
Ann	Pickard	Shell Oil Company	Major Integrated	x	x	Arctic Executive Vice President
Foster	Wade	Statoil ASA	Major Integrated	x		Manager US Regulatory Affairs
John	Vicic	ConocoPhillips Company	Large Independent	x		Manager, Deepwater and Arctic Technology
Jerry	Stone	Fluor Corporation	OSC	x	x	Senior VP, Offshore Solutions
Dan	Domeracki	Schlumberger Limited	OSC	x	x	VP Government & Industry Relations
Drue	Pearce	Crowell & Moring	Financial & Consulting			Senior Policy Advisor, prior senior level Federal and State of Alaska experience
David	Goldwyn	Goldwyn Global Strategies, LLC	Financial & Consulting	x		International consulting experience
Rebecca	Ranich	Executive Consultant	Financial & Consulting	x		International consulting experience; Wilson Center Arctic Experience
Heather	Conley	Center for Strategic & International Studies	Non-Industry	x	x	Senior Fellow and Director, Europe Program
Jan	Mares	Resources for the Future Inc.	Non-Industry	x		Senior Policy Advisor; participated on Scoping Subcommittee
Charley	Ebinger	Brookings Institution	Non-Industry			Director, Energy Security Initiative
Henry	Huntington	PEW Charitable Trust	Non-Industry			Senior Officer, International Arctic
Richard	Glenn	Arctic Slope Regional Corporation	Non-Industry			Executive VP, Lands and Natural Resources
Richard	Westerdale	Department of State - Bureau of Energy Resources	Government			Director - Public Diplomacy and Policy Analysis
John	Payne	North Slope Science Initiative	Government			Director, North Slope Science Initiative
Mark	Fesmire	Department of Interior	Government			Alaska Region Director, BSEE
Robert	Swenson	State of Alaska	Government			Deputy Commissioner, Alaska Department of Natural Resources

Subgroup Leads

Jed	Hamilton	Exxon Mobil Corporation
Bill	Scott	Chevron Corporation
Michael	Macrander	Shell Oil Company

CSC Support Resources

Tom	Eizember	Exxon Mobil Corporation
Rick	Elliot	Department of Energy
Jim	Slutz	NPC

Outreach Sessions

COMPLETED

<u>Date</u>	<u>Contacted Party</u>
Jun 21	Energy Council
Jul 1	Arctic Research Commission Staff
Jul 7	Department of the Interior Senior Staff
Jul 7	Executive Office of the President
Jul 7	Interagency Arctic Research Policy Committee (IARPC) Staff
Jul 8	National Academy of Science Staff
Jul 23	Canadian Embassy Staff
Jul 24	NSC Sub-Interagency Policy Committee
Aug 4	Interagency Arctic Research Policy Committee (IARPC) Staff
Aug 7-8	Steering Committees for Shell NSB/NWAB Baseline collaboration
Aug 25	API Staff
Aug 25	North Pacific Research Board Science Committee

COMPLETED

<u>Date</u>	<u>Contacted Party</u>
Sep 10	Arctic Council Task Force on Pollution Prevention (TFOPP)
Sep 11-12	Alaska Briefings: <ul style="list-style-type: none"> – State of Alaska officials – DOI / Federal Interagency Group – Co-chairs of the Alaska Arctic Policy Committee and AEC Reps – Energy Sector Leaders
Sep 23-24	North Slope Science Initiative (NSSI): <ul style="list-style-type: none"> – Science Technical Advisory Panel (STAP) – Executive Session
Oct 2	Inupiat Community of the Arctic Slope (ICAS)

PLANNED

TBD	Norwegian Petr. Safety Authority (PSA)
TBD	NSF Center on Arctic Challenges