

Offshore Oil and Gas Activities in the Arctic

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INTRODUCTION

The Arctic Council under the lead of the PAME working group is planning to develop a circum-Arctic strategy for management of marine resources. Part of this plan is defining the areas where oil and gas activities occur and are likely to occur. In a parallel and complimentary effort, AMAP with the assistance of the other working groups will soon embark on an assessment whose goals include “a comprehensive circum-Arctic view of present and possible future oil and gas development in the Arctic”.

In formulating the Arctic Marine Strategic Plan as it relates to oil and gas, there are several Arctic Council projects and products that can contribute to this endeavor. The Arctic Council’s Arctic Offshore Oil and Gas Guidelines and the Arctic Environmental Protection Strategy’s Guidelines for Environmental Impact Assessments in the Arctic can play a part in offering current methods and technologies to mitigate impact and maximize

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safety and environmental protection during exploration and development of oil and gas resources in the Arctic. The EPPR's Field Guide for oil spill response in Arctic waters and Risk Analysis Report No.2 and the AMAP Assessment Report: Arctic Pollution Issues (1998) and State of the Arctic Environment 2002 Report are also efforts that can be applied and consulted.

This paper is not meant to be either a comprehensive analysis of current oil and gas activities in the Arctic—it does not address onshore oil and gas—or a predictor of future activities. What is attempted here is the characterization of petroleum industry activities occurring in the Arctic offshore and possible new activities in near future (10 years) based on national plans. Speculation about future activities is just that, speculation. There are many factors affecting where oil and gas exploration and development might take place such as geology, physical accessibility, government policy, national security, sovereignty issues, international treaties, engineering obstacles beyond current technology, just to name a few. Then there are factors that will determine when and if resources will be developed such as political stability, national economies, international politics, world economy, the price of oil, the cost of operations and transport, infrastructure development, environmental and cultural sensitivity, societal values, engineering and technology developments, and many others. These factors are more complicated and constraining in the Arctic than probably anywhere else on the planet.

Current offshore oil production activities in the Arctic are limited to the Beaufort Sea in Alaska and three fields in the Norwegian and Barents Sea. Areas that are planning to produce in the near future include Prizalomnoye for oil and Shtokman field for gas in the Russian Barents Sea and Norway's Snohvit gas field in the Barents Sea. There are several other areas that have had exploration drilling activities and many that have proven reserves but lack infrastructure for near-term development.

OFFSHORE ACTIVITIES

UNITED STATES

Producing Offshore Oil Fields

Endicott (oil): Production is from an artificial island connected to the onshore Prudhoe Bay oil field via a causeway. It contained 582 mmbbls of recoverable oil and was discovered in 1978. Endicott started producing in 1987.

Point Macintyre (oil): Production is from the East Dock off of the Prudhoe Bay oil field. The field contained 400 mmbbls of recoverable oil, and was discovered in 1986. It started producing in 1992.

NorthStar (oil): Production is from a manmade gravel island in the Beaufort Sea located 12 miles NW of Prudhoe Bay, about 2 miles from shore. The structure contained 176 mmbbls of recoverable oil and was discovered in 1984. Northstar started production in

2001 and is now producing 65,000 bbls a day. Oil is transported to shore by offshore pipelines, which are buried 7-11 feet below the seabed to avoid ice gouging and scour.

Estimated resources on the Outer Continental Shelf off Arctic Alaska

AREA	OIL AND NGL (BBO)			GAS (TCFG)			BOE (BBO)			MPhc
	F95	MEAN	F05	F95	MEAN	F05	F95	MEAN	F05	
ARCTIC SUBREGION										
CHUKCHI SHELF	8.60	15.46	25.03	13.56	60.11	154.31	11.32	26.21	49.60	1.00
BEAUFORT SHELF	3.56	6.94	11.84	12.86	32.07	63.27	6.21	12.64	22.16	1.00
HOPE BASIN	0.00	0.09	0.28	0.00	3.38	11.06	0.00	0.69	2.25	0.61
BERING SHELF SUBREGION										
NAVARIN BASIN	0.00	0.50	1.21	0.00	6.15	18.18	0.00	1.59	4.41	0.88
N. ALEUTIAN BASIN	0.00	0.23	0.57	0.00	6.79	17.33	0.00	1.44	3.62	0.72
ST. GEORGE BASIN	0.00	0.13	0.41	0.00	3.00	9.72	0.00	0.67	2.14	0.94
NORTON BASIN	0.00	0.05 (NGL)	0.15	0.00	2.71	8.74	0.00	0.53	1.70	0.72
ST. MATTHEW-HALL	0.00	<0.01 (NGL)	<0.01	0.00	0.16	0.69	0.00	0.03	0.13	0.44
ARCTIC SUBREGION	14.36	22.49	33.03	35.00	95.56	197.78	21.76	39.54	64.45	1.00
BERING SHELF SUBREGION	0.36	0.91	1.81	6.98	18.80	38.64	1.65	4.26	8.57	1.00

BBO, billions of barrels of oil and natural gas liquids; **TCFG**, trillions of cubic feet; **BOE**, total oil and gas in billions of energy-equivalent barrels (5,620 cubic feet of gas=1 energyequivalent barrel of oil); reported **MEAN**, resource quantities at the mean in cumulative probability distributions; **F95**, the resource quantity having a 95-percent probability of being met or exceeded; **F05**, the resource quantity having a 5-percent probability of being met or exceeded; **MPhc**, marginal probability for hydrocarbons for basin, i.e., chance for the existence of at least one pool of undiscovered, conventionally recoverable hydrocarbons somewhere in the basin. Resource quantities shown are risked, that is, they are the product of multiplication of conditional resources and Mphc. Mean values for provinces may not sum to values shown for subregions or region because of rounding. All liquid resources in Norton basin, St. Matthew-Hall basin, and Shumagin-Kodiak shelf are natural gas liquids that would only be recovered by natural gas production.
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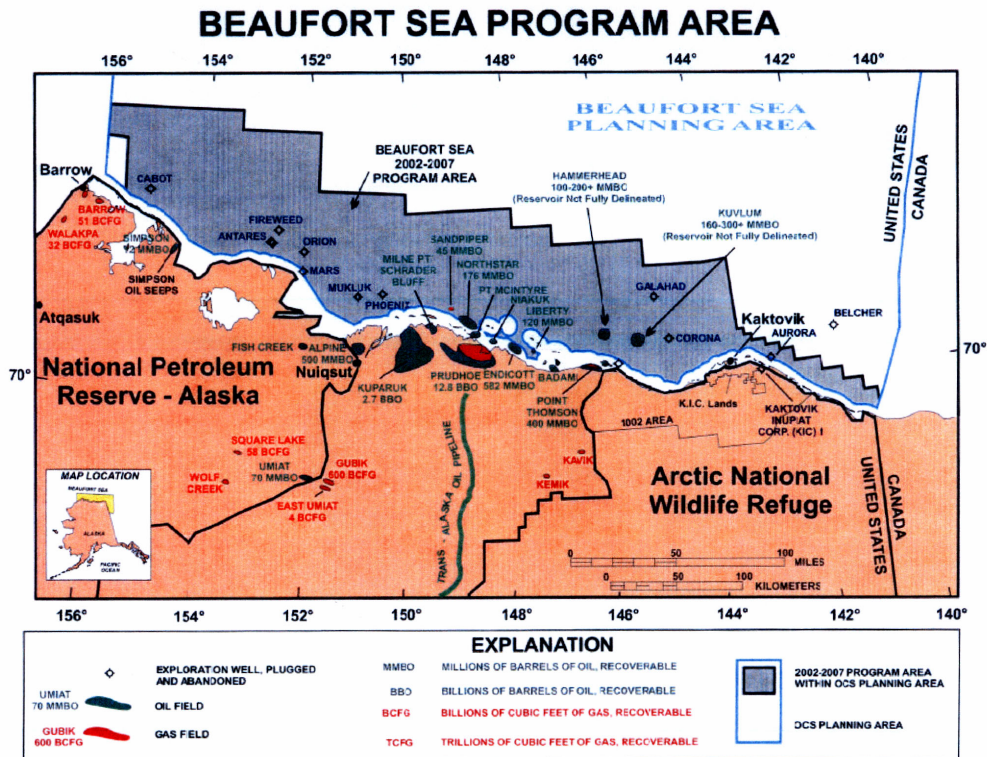
Five Year Leasing Plan to 2007

Federal (3 miles offshore)



Beaufort Sea: Three sales are planned for 2003, 2005, and 2007 with approximately 9.4 million acres offered that lie 3-60 nautical miles offshore and are in 25 to 200 feet of water (with a small area north of Harrison Bay reaching to 3000 feet). Estimated

conventionally recoverable resources are 3.6 to 12 billion bbls of oil with a mean of 6.9 billion bbls, and 13 to 63 tcf, with a mean of 32 tcf of gas (the ranges reflect 95%-5% probabilities). Sale 186 the first lease sale of the current round held on September 24, 2003 resulted in a total of 73, 576 hectares being leased off of Dease Inlet east of Barrow, off of Harrison Bay west of Prudhoe Bay and off of Beechy Point near Prudhoe Bay.



Chukchi Sea: Two sales are scheduled for 2004 and 2007 with 34 million acres being offered. Areas for lease are located 10 to 200 miles from shore in water depths of 32 to 230 feet (with a small part of Barrow Canyon reaching 3000 feet). Conventionally recoverable resources are estimated at 13.6-154 tcf of gas with a mean of 60.1 tcf and 8.6 to 25 billion bbls of oil with a mean of 15.5 billion bbls (ranges reflect 95%-5% probabilities). The first offering in 2003, was cancelled due to lack of industry interest.

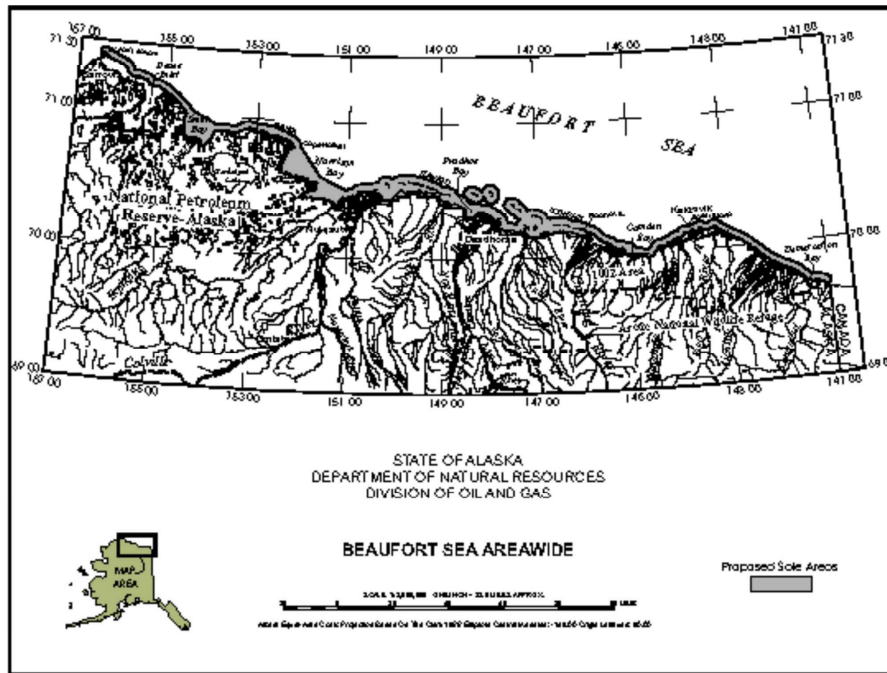
Hope Basin: Two sales are scheduled (with Chukchi) in 2004 and 2007 with 5 million acres being offered. Areas for lease are 3-110 miles offshore in 32-230 feet of water. Conventionally recoverable resources are estimated at 0-11.1 tcf of gas with a mean of 3.4 tcf and 0-300 million bbls of oil with a mean of 100 million bbls (the ranges reflect 95%-5% probabilities).

Norton Basin: One sale is planned with 2 calls for interest in the period 2003-2004 with 25 million acres being offered 3-320 miles from shore in water depths of 25-650 feet. Conventionally recoverable resources are estimated at 0-8 trillion cubic feet of gas with a mean of 2.7 tcf and 0-200 million bbls of oil with a mean of less than 100 million bbls

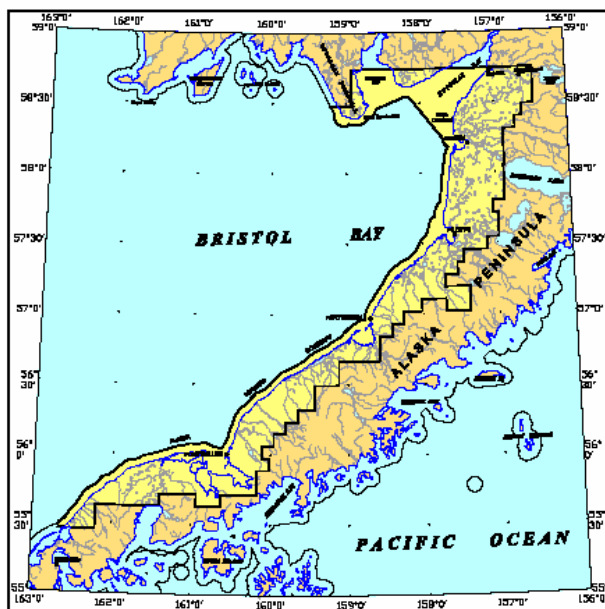
(the ranges reflect 95%-5% probabilities). No response was received to the 2003 call for interest—one more call for interest is scheduled for 2004.

State of Alaska Offshore Lease Sales (less than 3 miles from shore):

Beaufort Sea Areawide State Lease Sale: Scheduled for each October in 2003, 2004, 2005, 2006, and 2007

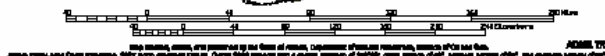


The area for these five proposed sales consists of all unleased state-owned tide and submerged lands lying between the Canadian Border and Point Barrow, and some coastal uplands acreage located along the Beaufort Sea between the Staines and Colville Rivers. The gross proposed sale area is in excess of 2,000,000 acres and is divided into 576 tracts.



Proposed AK Peninsula Areawide Oil and Gas Lease Sale

Proposed Sale Area =



Alaska Peninsula Areawide State Lease Sale: Call for Comments 9/9/03-10/31/03, Preliminary Best Interest Finding August 2004. There is a 60-day Comment Period extending from August - October 2004. The Final Best Interest Finding will be July 2005 and the sale in October 2005.

Leasing and exploration history Federal

Planning Area	Sale	Date	Leases Issued	Blocks Offered	Acres Offered	Acres Leased	High Bid Total \$	Bonus Received \$
Beaufort	BF	12/79	24	46	173,423	85,776	491,728,138	488,691,138
Beaufort	71	10/82	121	338	1,825,770	662,860	2,067,604,786	2,055,632,336
Norton Sound	57	3/83	59	418	2,379,751	335,898	325,267,372	317,873,372
St. George	70	4/83	96	479	2,688,787	540,917	427,343,830	426,458,830
Navarin	83	4/84	163	5,036	28,048,995	927,989	631,228,331	516,317,331
Beaufort	87	8/84	227	1,419	7,773,447	1,207,714	871,131,327	866,860,327
Beaufort	97	3/88	202	3,344	18,277,806	1,110,764	115,261,636	115,261,636
Chukchi	109	5/88	350	4,694	25,631,122	1,976,912	478,177,948	478,032,631
North Aleutian	92	10/88	23	990	5,603,586	121,757	95,439,500	95,439,500
Beaufort	124	6/91	57	3,417	18,556,976	277,004	16,807,025	16,807,025
Chukchi	126	8/91	28	3,476	18,987,976	159,213	7,117,304	7,117,304
Beaufort	144	9/96	29	1,364	7,282,795	100,025	14,572,057	14,429,363
Beaufort	170	8/98	28	203	920,983	86,371	6,239,015	5,327,093

Beaufort Sea: 7 lease sales since 1979, 688 leases on 3.4 million acres, 30 exploratory wells. 54 active leases (all within 3-12 miles from shore), 5 oil fields discovered for total reserves of 512-800 million bbls of oil and oil equivalent. Northstar is the only producing lease.

Arctic Offshore Area	Year	Wells Drilled	Producible	Deep Stratigraphic Test Wells (yr)
Beaufort Sea	1981-2002	30	11	no
Chukchi Sea	1989-90	4	no	no
Norton Sound	1984-85	6	no	2 1980 and 1982
Navarin Basin	1985	8	no	1 1983
St. George Basin	1984-85	10	no	2 1976 and 1982
Northern Aleutian Shelf	n/a	0	n/a	1 1982-83
Total	n/a	58	11	6

The areas of western Alaska are largely unexplored and have no developed infrastructure to support oil and gas exploration.

State Arctic Offshore Oil and Gas Lease Sales*

Sale 14 07/14/65, Prudhoe West to Canning R.; offshore/uplands. 403,000 acres; \$6,145,473
Sale 18 01/24/67, Katalla, Prudhoe; offshore/uplands. 43,657 acres; \$1,479,906
Sale 21 03/26/68, Bristol Bay Port Heiden & Port Moller; offshore; 164,961 acres; \$3,009,224
Sale 23 09/10/69, Colville to Canning R.; offshore/uplands; 412,548 acres; \$900,041,605
Sale 30 12/12/79, Beaufort Sea (Joint Federal & State Sale): offshore Milne Pt. east to Flaxman Is. 296,308 acres; \$567,391,497
Sale 36 05/26/82, Beaufort Sea: Pt. Thomson area; offshore/uplands. 56,862 acres; \$32,583,452
Sale 39 05/17/83, Beaufort Sea: Qwydyr Bay to Harrison Bay; offshore/uplands. 211,988 acres; \$20,998,101
Sale 43 05/22/84, Beaufort Sea: Pitt Point east to Harrison Bay; offshore. 281,784 acres; \$32,214,794
Sale 43A 05/22/84, Colville R. Delta/Prudhoe Bay Uplands Exempt: West of Kavik R.; offshore/uplands. 76,079 acres; \$1,612,583
Sale 45A 09/24/85, North Slope Exempt: Canning R. to Colville R.; offshore/uplands. 164,885 acres; \$4,657,478
Sale 48A 02/25/86, Mikkelsen Exempt: Mikkelsen Bay, Foggy Is. Bay; offshore/uplands. 42,053 acres; \$510,255
Sale 50 06/30/87, Camden Bay: Flaxman Is. to Hulahula R.; offshore. 118,147 acres; \$6,621,723
Sale 55 09/28/88, Demarcation Point: Canning R. to U.S./Canadian border; offshore. 96,632 acres; \$14,700,602
Sale 52 01/24/89, Beaufort Sea: Pitt Point to Tangent Point; offshore. 52,463; \$1,737,513
Sale 65 06/04/91, Beaufort Sea: Pitt Point to Canning R.; offshore. 172,865 acres; \$6,993,949
Sale 68 06/02/92, Beaufort Sea: Nulavik to Tangent Point; offshore. No bids
Sale 80 12/05/95, Shaviovik: Sag R. to Canning R., southern Kaparuk Uplands, Gwydyr Bay, Foggy Island Bay, onshore/offshore. 151,587 acres; \$3,337,485
Sale 86A 10/01/96, Colville River Exempt: Colville R, offshore, state/ASRC onshore/offshore. 5,901 acres; \$2,026,247
Sale 86 11/18/97, Central Beaufort Sea: Harrison Bay to Flaxman Island. 323,835 acres; \$27,985,125
Beaufort Sea Areawide 11/15/00, State acreage within the 3-mile limit, between Dease Inlet and Barter Island. 25,840 acres; \$338,922
Beaufort Sea Areawide 10/24/01, State acreage within the 3-mile limit, between Dease Inlet and Barter Island. 38,331 acres; \$3,447,734
Beaufort Sea Areawide 10/24/02, State acreage within the 3-mile limit, between Dease Inlet and Barter Island. 35,240 acres; \$974,487

* acreage is not separated between offshore and onshore for sales that include both.

Potential development activities

Liberty Prospect: 120 million bbls. Discovered in 1983. May be developed by extended reach drilling from shore or by production from an artificial island with a pipeline to shore.

Sandpiper: 45 mmbbls of oil. Located west of Northstar.

Niakuk: In State waters near Prudhoe Bay.

Kuvlum: 160-300 mmbbls oil.

Hammerhead: 100-200 mmbbls of oil

Minerals Management Service
State of Alaska Department of Natural Resources

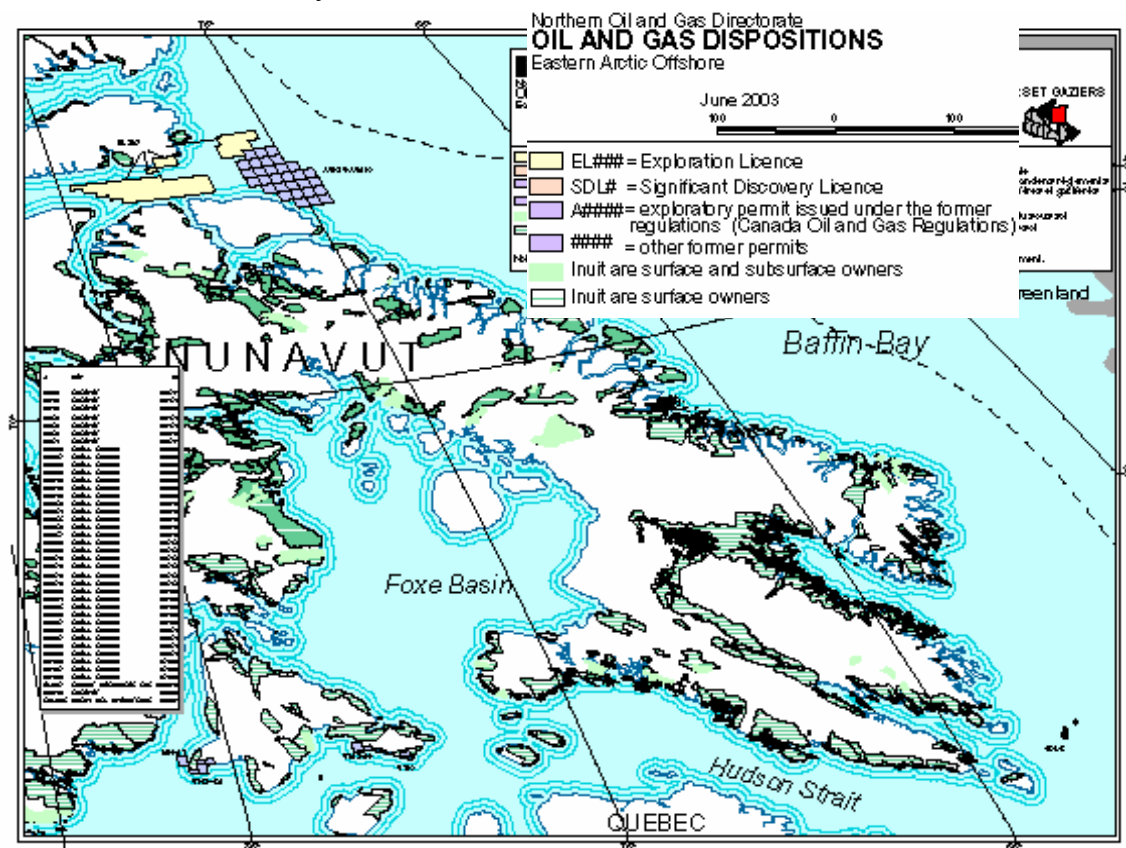
CANADA

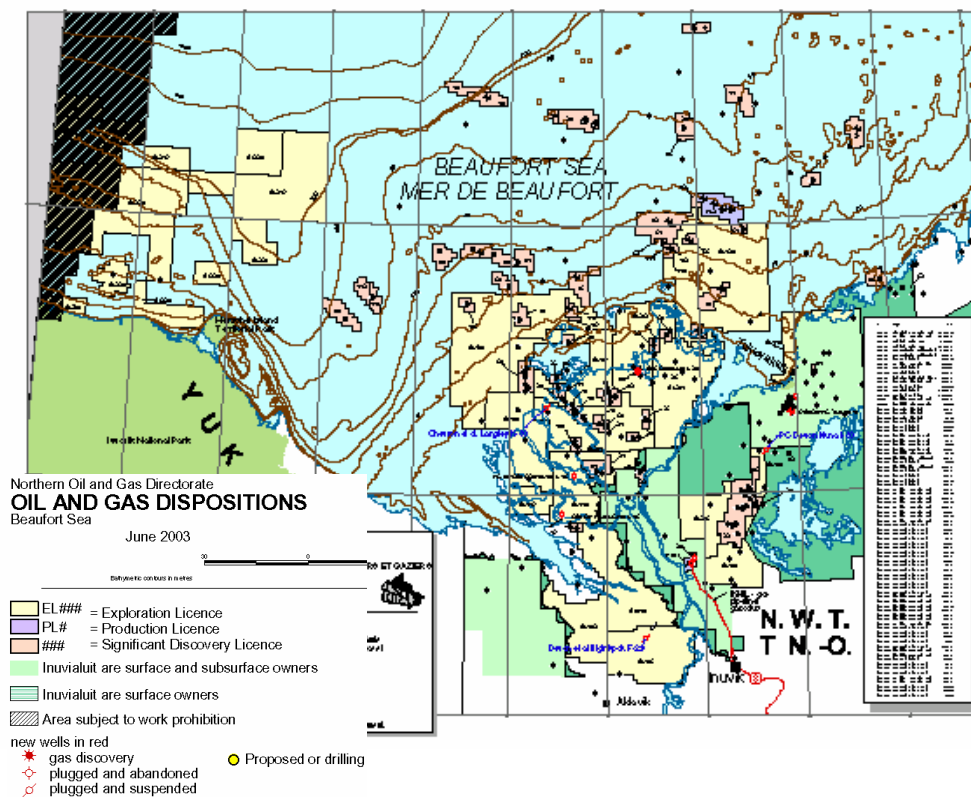
Currently, there is no production in Canada from the offshore Arctic as defined by Canada in the PAME working group.

Licensing and Exploration History

The High Arctic

The first Arctic Island well was drilled in the winter of 1961-62 on Melville Island. In 1969 a significant gas discovery was made at Drake Point on Melville Island. Drilling continued in the Arctic Islands both onshore and offshore on man-made ice-islands. Reserves of 17.5 trillion cubic feet of gas were proven. An oil discovery was made at Bent Horn N72 on Cameron Island (now in the Territory of Nunavut). In 1985 oil production commenced at Bent Horn on Melville Island with a shipment of 100,000 barrels of oil destined for a refinery in Montreal. These shipments continued, sometimes twice annually, until the late 1990's.





Oil discoveries in the Beaufort-Mackenzie Region (mmbbls)

	500-100 mmbbls	100-25 mmbbls	25-10 mmbbls	< 10 mmbbls
Offshore	Amauligak J-44 (1983)T Adlartick (1985) Kopancor (1976)	Havik (1983) Issungnak (1980) Koekoek (1979) Nipierk L-19 (1984) Pitsiulak (1983) Tarslut (1978) Kingark (1987)	W. Atkinson (1982)P Nektoralik (1976) Amauligak O-86 (1988) Nipierk P-32 (1989)	Amak (1986) Iityok (1982) Nerlerk (1977)

Gas discoveries in the Beaufort-Mackenzie Region (bcf)

>2000 bcf	1000-2000 bcf	500-1000 bcf	100-500 bcf	10-100 bcf	<10 bcf
Taglu (1971)T	Parson (1971)K	Nigintagak (1972)	Adgp (1973) Garry N. (1975) Garry S. (1978) Hansen (1986) Tuk L-09 (1983)K YaYa S. (1972)	Ikhiil (1986) Mallik (1972) Pelly (1974) Reindeer (1973) Titilik (1972) YaYa N. (1974)	
	Amauligak (1983) Issungnak (1980)	Kenalook (1979)	Netserk (1975) Ukalerk (1977) Kingark (1987)	Amerk (1984) Amak (1986) Isserk (1977) Iityok (1982) Kadluk (1983) Kiggavik (1982) Nektoralik (1976) Minuk (1985)	Nerlerk (1977)