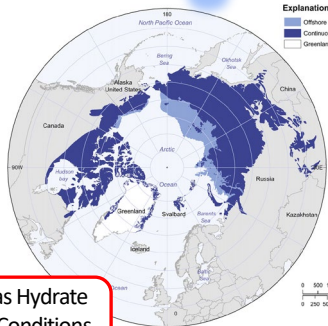
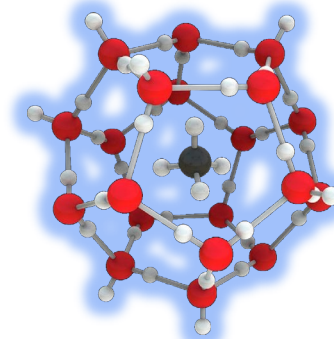


GAS HYDRATES

What are Gas Hydrates?

- **Crystalline solid consisting of gas molecules, usually methane, each surrounded by a cage of water molecules**
 - One volume hydrate typically equivalent to 160–180 volumes methane gas
- **Occur abundantly in nature, under limited range of pressure and temperature conditions**
 - **Arctic regions:** Alaska North Slope, northern Canada, West Siberia, etc. (subsurface depths 300–4000 ft)
 - **Maritime environments:** Gulf of Mexico, Atlantic and Pacific margins of the United States, Gulf of Alaska, Beaufort Sea, Bering Sea, etc. (all of the world oceans at water depths greater than 1,500 ft)



Arctic Gas Hydrate
Stability Conditions
(blue shading)

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2018 USGS ANS Gas Hydrate Assessment

Comparison Alaska Gas Hydrate with Other Gas Resources

- **Arctic Alaska**
 - Undiscovered gas offshore estimated at ~105 TCF (BOEM)
 - Undiscovered gas onshore estimated at ~100 TCF (USGS)
 - **Undiscovered gas hydrate onshore estimated at ~54 TCF (USGS)**
 - Undiscovered shale-gas onshore estimated at ~40 TCF (USGS)
 - Undiscovered coalbed gas onshore estimated at ~18 TCF (USGS)
- **Selected comparison to significant Lower 48 gas assessments**
 - Marcellus Shale, Appalachian Basin estimated at ~84 TCF (USGS)
 - Mancos Shale, Piceance Basin (CO/UT) estimated at ~66 TCF (USGS)

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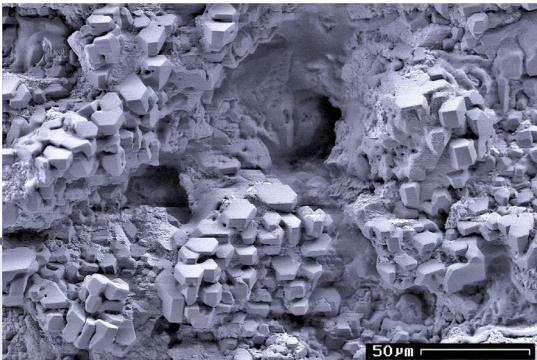
2018 USGS ANS Gas Hydrate Assessment

Assessment Results

Total petroleum system and assessment units (AUs)	AU probability	Accumulation type	Total undiscovered resources							
			Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean
Northern Alaska Gas Hydrate Total Petroleum System										
Nanushuk Formation Gas Hydrate AU	0.9	Gas	0	19,978	46,706	21,511	0	0	0	0
Tuluvak-Schrader Bluff-Prince Creek Formations Gas Hydrate AU	0.9	Gas	0	16,231	38,449	17,608	0	0	0	0
Sagavanirktok Formation Gas Hydrate AU	0.9	Gas	0	13,840	30,475	14,677	0	0	0	0
Total undiscovered conventional resources			0	50,049	115,630	53,796	0	0	0	0

[BCFG, billion cubic feet of gas; NGL, natural gas liquids; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas accumulations, all liquids are included in the NGL category. F95 represents a 95-percent chance of at least the amount tabulated; other fractiles are defined similarly. Fractiles are additive under the assumption of perfect positive correlation. Shading indicates not applicable]

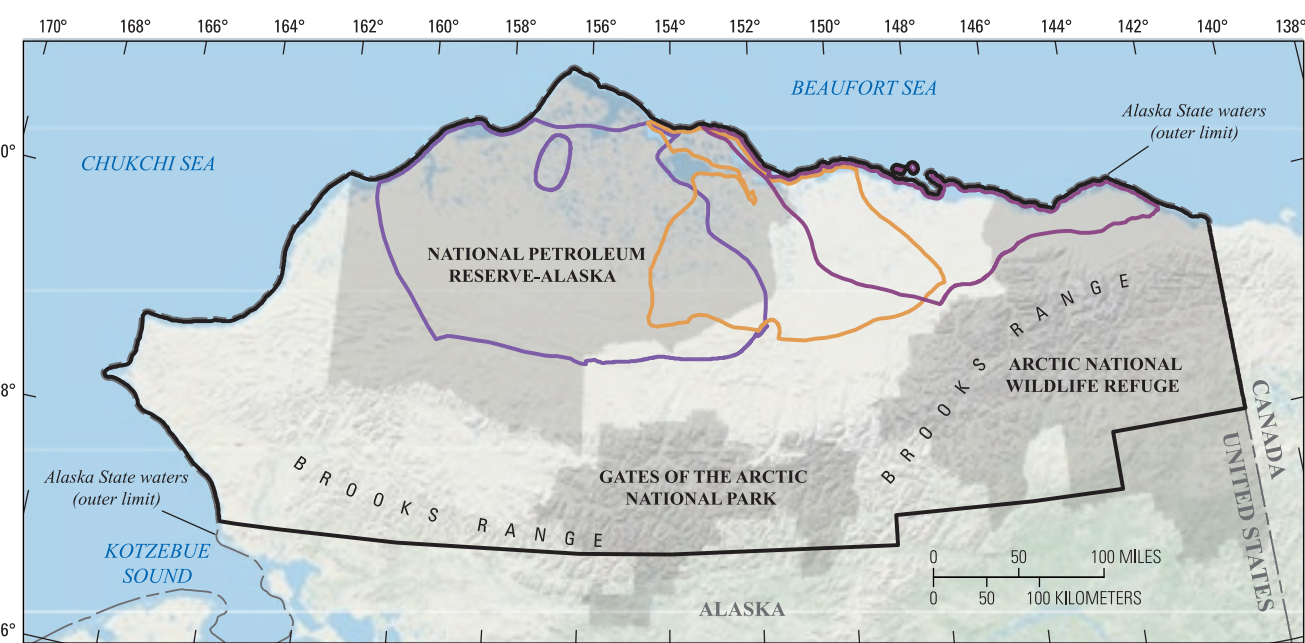
Of the estimated 53.8 TCF of gas within hydrates on the North Slope, 48 percent occurs on federally managed lands, 45 percent on lands and offshore waters managed by the State of Alaska, and 7 percent on Native lands.



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Nanushuk Formation Gas Hydrate Assessment Unit Tuluvak-Schrader Bluff-Prince Creek Formations Gas Hydrate Assessment Unit Sagavanirktok Formation Gas Hydrate Assessment Unit



Base map from U.S. Department of the Interior National Park Service

EXPLANATION

- Nanushuk Formation Gas Hydrate AU
- Tuluvak-Schrader Bluff-Prince Creek Formations Gas Hydrate AU
- Sagavanirktok Formation Gas Hydrate AU
- Northern Alaska Province boundary



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