Scenarios for Energy and Resource Development on the North Slope and Adjacent Seas

Development Infrastructure

Summary

Extraction of hydrocarbons and minerals has taken place on Alaska’s North Slope for almost 40 years. In particular, oil deposits situated along the coast in the vicinity of Prudhoe Bay led to the construction of the Trans-Alaska Pipeline System (TAPS), as well as roads, drilling platforms, and other supporting infrastructure. Mining activities have been concentrated in the western side of Arctic Alaska, primarily the substantial zinc deposits in and around Red Dog mine. Widespread coal reserves exist, but are unlikely to be exploited without shifts in demand that justify investment in additional roads to access these resources.

While overall hydrocarbon extraction has been declining, exploration of oil and gas prospects has continued, focused in NPR-A and the Central North Slope, as well as offshore prospects in the Beaufort and Chukchi Seas. New technologies have reduced the footprint of exploration and extraction, and may make new resources available, such as coal and shale oil and gas deposits. Pursuit of these resources depends on the cost to produce and transport the products, relative to global energy market prices.

Existing energy and resource development infrastructure on the North Slope reflects past expansion into new oil fields. Establishment of new anchor developments would require additional roads, pipelines, and supporting infrastructure. If energy market shifts make other resources more economical, such as gas and coal, or there is a major find on the outer continental shelf, it could trigger additional construction.

Overview

Owing to its unique geologic setting, the North Slope is rich in fossil fuels and other valuable mineral deposits, including oil, natural gas, coal, and zinc. The ongoing challenge is accessing these resources in an economical way, while minimizing environmental impacts that have potential to affect both wildlife and the subsistence practices of the native Inupiat people. In addition, regulations and global energy market fluctuations significantly influence the rate of resource exploration and extraction in the region.

Figure 1. Natural resource development on the North Slope.

Sources:
Alaska DNR Div. of Oil & Gas, Div. of Geological & Geophysical Surveys, BOEM, BLM, USFWS, NPS, NOAA (IBCAO version 3), Geographic Information Network of Alaska (GINA)
Map developed by GeoAdaptive LLC, 2014
As part of the Alaska Native Claims Settlement Act (ANCSA), native corporations have selected lands for which they own both surface and subsurface development rights, including portions of ANWR and NPR-A. Resource extraction and exploration activities are currently occurring on many Alaska Native lands, usually through lease agreements with private companies. The state has also established 3 lease sale regions (see Figure 1), located between ANWR and NPR-A, one of which covers the near shore portion of the Beaufort Sea, another extending from the coast to approximately the same latitude as Umiat, and the Foothills area, which extends to the northern boundary of Gates of the Arctic National Park & Preserve. The federal government has opened some areas of the Beaufort and Chukchi Seas for oil and gas exploration, up to the edge of the US Exclusive Economic Zone (EEZ). The Bureau of Ocean Energy Management (BOEM) manages the energy and renewable energy resources as well as mineral resources seaward from the State of Alaska’s three mile jurisdiction to the EEZ.

Coal & Mineral Resources

In the western portion of the study region, particularly along the coast and in the foothills of the Brooks Range, extensive coal deposits have been identified; however, limited exploration has occurred because the remote location would require significant investment for mining and transportation of the resource. A report on coal in the Seward Peninsula noted that “despite these large deposits, there is no potential for development unless nearby infrastructure were to be developed” (3). Furthermore,
Several oil fields along the coast are also in active production, including Milne Point, Northstar, Endicott, and Badami, which until recently represented the eastern end of the pipeline network. As of winter 2013-2014, an extension of the pipeline has been installed to serve the new Point Thomson site. Since submission of the initial facility designs in 2009, to the start of construction in 2012, most of the gravel pads and pipeline connecting to Badami had been completed by the summer of 2014. Oil production is expected to begin in 2016, and significant natural gas reservoirs also exist in the area (4).

Exploration & Development

Around the village of Barrow, natural gas is extracted and processed for use by the local community (5). A majority of all other extracted hydrocarbons are exported out of the region. As extraction from the North Slope’s primary oil fields slows down (Figure 4), oil companies are searching for new sources in order to maintain a steady rate of flow through TAPS. State and federal leases are being actively explored in the vicinity of Umiat, and recent test wells have been successful. Development and exploration is planned in the Mustang, Shark, and Qugruk fields, as well as surveys of shale oil deposits along Dalton Highway (5). If a significant find is identified and production begins, it could serve as an anchor development for additional satellite wells.

Resource Extraction

In addition to the array of gravel drilling pads around Greater Prudhoe Bay, the pipeline network has expanded to the east and west to connect satellite developments to the Trans Alaska Pipeline System (Figure 5). Approximately 28 miles from Pump Station 1 on the pipeline, the Kuparuk oil field has been in production since 1981, and several satellite fields are in active operation. Further west, production began at the Alpine oil field in 2000, and Environmental Impact Assessments have been submitted to expand operations into NPR-A, in order to increase access to the Colville River unit and begin development of the Greater Moose’s Tooth unit.

The 1976 Naval Petroleum Reserves Production Act made the NPRA off-limits to coal leasing.

Along the southwestern border of the study region, large zinc deposits are being mined, particularly at Red Dog mine (Figure 2). The DeLong Mountain Transportation System (DMTS) was built for the specific purpose of transporting ore by truck from the mine to a port facility south of Kivalina. Other mineral deposits in the region would likely connect to the DMTS, in order to use the existing infrastructure.

Figure 3. Exploration and development expenditures (8).

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Figure 4. North Slope oil production (barrels per day) (1).

Figure 5. North Slope oil and gas facilities (5).
Offshore, in the Beaufort Sea, the Liberty field contains an anticipated 146 million barrels of oil, and a Development and Production Plan is expected to be submitted in December 2014. Exploratory wells are also planned for the Sivulliq and Torpedo prospects, Smith Bay, and the Burger prospect in the Chukchi Sea (5). An offshore anchor development would also serve to attract additional exploration and infrastructure in the OCS region.

In the vicinity of Red Dog Mine, mineable zinc deposits have been found at the Su-Lik and Drenchwater sites. Coal exploration has been conducted in the Deadfall Syncline area along Cape Beaufort, however it was not found to be economically feasible to develop the resource at this point (3). Permits for coal prospecting have also been issued near the eastern edge of the Nanusuk Formation, in the vicinity of Toolik Lake, which is more accessible due to the proximity to the Dalton Highway.

Projected Changes & Trends

Oil and gas development will continue to influence infrastructure expansion on the North Slope. A road has been proposed from Umiat to the Dalton Highway, which could allow further expansion into the foothills region. Increases in natural gas prices would highlight the need for a natural gas pipeline in the region. Additional gas extraction infrastructure would likely follow in the wake of new pipeline construction.

There is potential for further mineral and coal mining to occur north of Red Dog mine, which could lead to construction of new roads connecting to the existing Delong Mountain Transportation System (3). There has also been a proposal to build a road to the Ambler mining district, outside of the study region, which could have some influence on transportation infrastructure on the North Slope.

Based on long-term projections of OCS drilling in the Beaufort and Chukchi Seas, BOEM has made estimates of infrastructure needs, which could include dozens of platforms and hundreds of miles of pipeline. Tanker ships are an unlikely, though possible, alternative to new pipelines for transporting oil from offshore platforms. More ports may be necessary to serve additional ship traffic, as well.

Other supporting infrastructure that has been proposed in the region includes local power generation facilities and transmission lines, in addition to fiber optic cables that would provide high speed internet connections to Asia.

Monitoring

Numerous scientific efforts have been undertaken to monitor the impacts of resource extraction and associated infrastructure on the people, wildlife, and landscape of the North Slope. In addition, oil and gas companies, as well as state and federal agencies, are required to monitor and report on the potential effects of existing and proposed resource extraction activities.

Uncertainties

In addition to the factors already discussed, including advances in technology related to exploration, extraction, and processing of hydrocarbon resources, as well as the fate of proposed infrastructure investments, many other uncertainties exist. These include global oil, gas, and coal markets, taxation and regulation of hydrocarbon production, and the discovery of previously unidentified or unavailable resource deposits.

References


Note about this Fact Sheet

This fact sheet has been produced with the goal of providing a general description of the infrastructure associated with mineral and hydrocarbon extraction on Alaska’s North Slope, as part of the project: Scenarios for Energy and Resource Development on the North Slope and Adjacent Seas.

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