

Potential Economic Benefits of Future Exploration, Development, and Production of Petroleum Resources in Alaska OCS Areas

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Abbreviations

AEO	Annual Energy Outlook
API	American Petroleum Institute
BBL	Billion barrels
BCF	Billion cubic feet
BOEM	Bureau of Ocean Energy Management
CY	Calendar year
E&D	Exploration, Development, and Production Activities
EIS	Environmental Impact Statement
EIA	Energy Information Administration
GOA	Gulf of Alaska
MODU	Mobile Offshore Drilling Unit
NEI	Northern Economics, Inc.
NOAA	National Oceanic and Atmospheric Administration
NPR-A	National Petroleum Reserve-Alaska
NSB	North Slope Borough
OCS	Outer Continental Shelf
PI+	Policy Insight+
QA/QC	Quality Assurance/Quality Control
REMI	Regional Economic Models Inc.
TAPS	Trans-Alaska Pipeline System

Executive Summary

This study quantifies the potential economic benefits of petroleum development in selected Alaska OCS planning areas, particularly the Beaufort Sea, Chukchi Sea, Cook Inlet, and Gulf of Alaska. In order to quantify the potential economic effects of petroleum development, a set of scenarios were developed that reflect possible industry-wide exploration, development, and production activities (E&D scenarios) for each of the planning areas, following the leasing schedule proposed by the Bureau of Ocean Energy Management (BOEM) in their next 5-Year Program. The scenarios represent only a possible picture of the future. It is likely that different activities and timing will occur in the future, as each company operating in these basins would have unique plans about how to identify and recover the hydrocarbon resources. It is difficult to anticipate what the actual development pattern would be, but the scenarios presented here provide a reasonable basis to begin thinking about potential economic effects.

The scenarios in this study reflect the current regulatory structure that is in place for the Alaska OCS areas, which includes the additional environmental regulations governing the Arctic OCS planning areas (Beaufort Seas and Chukchi Sea) that apply to exploratory drilling activities that use mobile drilling units and related operations during open-water season. Some of these additional regulations could significantly increase the costs of exploration activities and could also cause delays in drilling activities, possibly deferring production and reducing the net present value of petroleum production. These additional regulations are considered more stringent compared to the rules that apply to other OCS areas. On April 2017, the current administration issued an Executive Order to implement an America-First Offshore Energy Strategy. The order lifts leasing withdrawals imposed on Alaska's Arctic, directs the Department of the Interior to conduct a review of the areas available for leasing, and directs a review of certain regulations governing offshore development. Specifically for Alaska, the Executive Order includes the following aspects:

- Erases Arctic 12(a) Withdrawals. Nullifies President Obama's indefinite withdrawal of the Chukchi Sea and large areas of the Beaufort Sea from oil and gas leasing.
- Potential for Leasing. Calls for a review of the existing schedule of offshore lease sales (BOEM's outer continental shelf five-year lease sale plan, 2017-2022) and directs the Secretary of the Interior to consider whether new sales should be added for the Beaufort and Chukchi leasing areas. The President has ordered the Department of the Interior to consider revising its lease sale program to include at least one sale per year in each of the Chukchi Sea and the Beaufort Sea.
- More Reasonable Regulation. Requires the reconsideration and potential revision of the Arctic rule, the Well Control Rule, and other regulations imposed by the previous administration.

In the event that the regulatory structure changes consistent with the current administration's intent, it is possible that industry interest and levels of investment in the Alaska Arctic OCS areas could be higher than the levels considered in this analysis and could subsequently lead to more economic benefits.

The scenarios used for this study are based on E&D scenarios considered by BOEM in their environmental analysis of previous lease sales in the Beaufort Sea, Chukchi Sea, Gulf of Alaska and Cook Inlet OCS areas, BOEM's latest resource assessments, as well as information from previous Northern Economics studies related to offshore and onshore petroleum development.

These E&D scenarios are the basis for projecting the level of manpower requirements (direct oil and gas employment) and the level of industry investment or spending. Industry spending associated with E&D activities is projected to generate economic benefits to Alaska and to the rest of the nation. Direct spending also generates stimulus effects (or multiplier effects) in the economy.

The economic benefits of potential petroleum development are measured in terms of employment, income, and government revenues. The timeframe of the analysis covers the proposed 5-year leasing program plus 20 years after the leasing period.

The following are the key findings of the study:

- **Direct Industry Spending**

Table ES-1 shows the projected direct industry spending associated with the exploration, development, and production activities for each of the planning areas. The Chukchi Sea and the Beaufort Sea are high cost areas given the remote location, lack of infrastructure, and the need for a sizable discovery to economically justify the investments in the area. These areas would require more manpower and equipment to support the exploration and development activities. The projected total industry spending over the timeframe considered in this study amounts to about \$53.4 billion.

Table ES-1. Total Projected Direct Industry Spending by Alaska OCS Planning Area, in millions of 2016 \$

Alaska OCS Planning Area	Amount
Beaufort Sea	\$17,500
Chukchi Sea	\$28,240
Gulf of Alaska	\$2,490
Cook Inlet	\$5,170
Total	\$53,400

Source: Northern Economics estimates.

- **Employment and Labor Income Effects**

Table ES-2 summarizes the projected total annual average employment in the U.S. (Alaska and the rest of the U.S.) associated with the potential future petroleum development activities in the selected Alaska OCS planning areas. Petroleum development in these areas could generate up to about 13,500 jobs per year.

Of the total U.S. jobs, about 53 percent of the jobs are projected to be in Alaska and 47 percent are projected to be in the rest of the U.S. These jobs include direct, indirect, and induced jobs. Direct jobs (both on-site and offsite) involve jobs in exploration activities, construction of offshore and onshore production and transportation facilities, spill prevention, logistics, and operations and maintenance activities. Besides the direct jobs in the oil and gas sector, jobs are also projected to be created in other sectors of the economy; these jobs are referred to as indirect and induced jobs. These jobs are projected to be generated as a result of the multiplier effects of industry spending—industry purchases from businesses in and outside of Alaska, government spending of OCS-related revenues, and household spending of wages and salaries.

Table ES-3 shows the projected total annual average labor income associated with the direct, indirect, and induced jobs generated.

Table ES-2. Total Projected U.S. Annual Average Employment Effects by Alaska OCS Planning Area

Alaska OCS Planning Area	Number of Jobs
Beaufort Sea	4,840
Chukchi Sea	6,000
Gulf of Alaska	860
Cook Inlet	1,750
Total	13,450

Source: Northern Economics estimates.

Table ES-3. Total Projected U.S. Annual Average Labor Income Effects by Alaska OCS Planning Area, in millions of 2016 \$

Alaska OCS Planning Area	Amount
Beaufort Sea	\$297.9
Chukchi Sea	\$378.4
Gulf of Alaska	\$50.6
Cook Inlet	\$101.7
Total	\$828.6

Source: Northern Economics estimates.

- **Direct Petroleum Revenues**

Federal, state, and local governments are projected to directly benefit from offshore petroleum development with potential streams of revenue from property tax revenues, corporate income tax revenues, additional state revenues from additional throughput on the Trans Alaska Pipeline System (TAPS), and federal royalty payments.

Property taxes are projected to be generated primarily from new onshore facilities built to support the offshore operations of the industry. The State of Alaska collects a property tax on oil and gas related facilities within its boundaries which it shares with local political jurisdictions where those facilities are located, if the local government chooses to impose a property tax. The State of Alaska also imposes a corporate income tax on petroleum activity within the state. The federal government collects revenues from royalty payments from the offshore activity. Additional volumes of oil (from petroleum production in the Beaufort Sea and the Chukchi Sea) in the TAPS system would lower the pipeline tariff and would therefore result in a higher oil netback price, which is the basis for determining state royalty payments on oil resources extracted from state lands.

Table ES-4 summarizes the projected annual average and total government revenues accrued over the analysis timeframe for the selected planning areas. Total cumulative government revenues could amount to about \$37.5 billion. As noted above, government revenues include royalty payments paid to the Federal government and in certain cases to the state government (for production in the 8(g) zone), state corporate income taxes, and property taxes paid to the State of Alaska and local governments. On an annual average basis, total government take could add up to about \$2.7 billion per year.

Table ES-4. Projected Annual Average & Total Government Revenues by Alaska OCS Planning Area, in millions of 2016 \$

Alaska OCS Planning Area	Annual Average Revenues	Total Revenues
Beaufort Sea	\$569.4	\$9,116.4
Chukchi Sea	\$1,892.7	\$24,738.8
Gulf of Alaska	\$80.6	\$887.2
Cook Inlet	\$161.4	\$2,752.8
Total	\$2,704.1	\$37,495.3

Source: Northern Economics estimates.

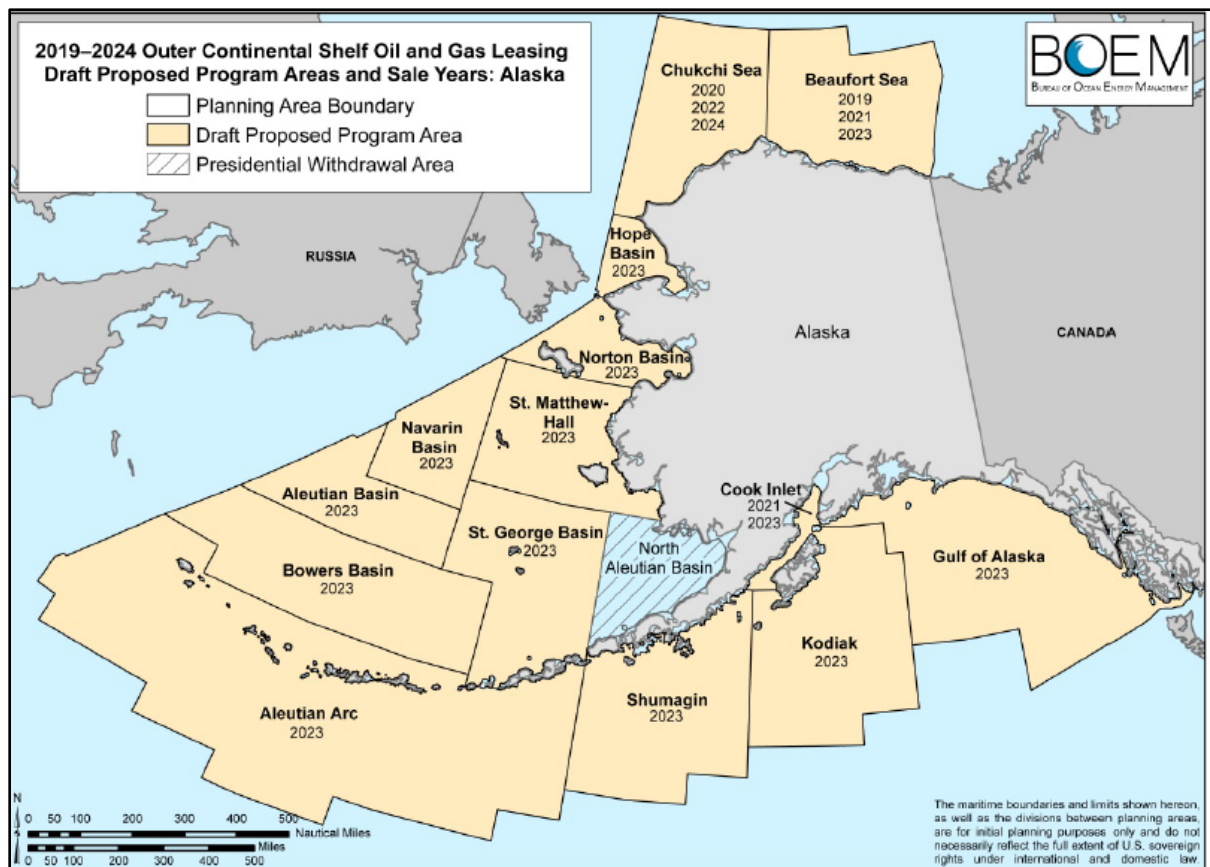
1 Introduction

The Department of the Interior’s Bureau of Ocean Energy Management released its “Draft Proposal on OCS Lease Sales for 2019-2024” in January of this year. This study was requested by the American Petroleum Institute to evaluate the potential economic benefits of future exploration, development, and production of oil and gas resources in the Alaska OCS areas consistent with the Department of the Interior’s proposed Five-Year OCS leasing schedule. The chosen option for the Alaska Region Program includes the following:

- Three sales in the Beaufort Sea Planning Area in 2019, 2021, and 2023;
- Three sales in the Chukchi Sea Planning Area in 2020, 2022, and 2024;
- Two sales in the Cook Inlet Planning Area in 2021 and 2023; and
- One sale each in the other Alaska OCS Planning Areas.

Figure 1 shows the various Alaska Region Planning areas and the proposed leasing schedule.

Figure 1. 2019-2024 Draft Proposed Alaska Region Program Area



Source: Bureau of Ocean Energy Management.

While the draft Five-Year Program includes all the Alaska OCS planning areas, except for the North Aleutian Basin, which is still under moratorium since December 2014, this study focuses only on potential development in the following four OCS planning areas where there has been recent industry interest and where there are estimated to be sizable undiscovered economically recoverable resources: 1) Beaufort Sea; 2) Chukchi Sea; 3) Cook Inlet; and 4) the Gulf of Alaska.

Both the Beaufort Sea and the Chukchi Sea are in the Arctic OCS. Alaska's OCS Arctic region has been estimated to contain vast petroleum resources. According to the U.S. Department of the Interior, the Beaufort and Chukchi seas together are projected to hold 23.6 billion barrels of oil and 104.4 trillion cubic feet of natural gas (BOEM, 2016). Petroleum development in these areas, if conditions allow, could generate substantial economic benefits to Alaska and the rest of the United States. Development in the Alaska Arctic OCS areas however, has proven to be challenging for the petroleum industry due to a variety of reasons including environmental, economic, and regulatory factors. The environmental conditions in the Arctic require special vessels, equipment, and facilities that can withstand severe conditions, and the remoteness of the North Slope region makes it costly to explore and develop. Environmental regulations have also affected access to the areas, increased the timeframe for permit approvals, and increased environmental permitting and compliance costs.

This analysis considers the regulatory structure that currently applies to the Alaska Arctic OCS areas that is deemed more stringent and restrictive relative to other OCS areas as it includes additional restrictions on Arctic OCS exploratory drilling activities that use mobile offshore drilling units (MODUs) and related operations during the open-water drilling season. Of the proposed 14 provisions, 6 items were identified as having the potential to significantly increase costs for exploration activities:

1. The requirement to have a separate mobile offshore drilling unit (MODU) available to drill a same-season relief well in the event of a loss of well control;
2. The shortening of the drilling season to accommodate a 45-day period to complete relief well operations before the expected return of seasonal ice;
3. Requirement of additional source control and containment equipment;
4. Discharge restrictions on petroleum-based mud and cuttings, with the potential for restrictions on water-based mud and cuttings;
5. Mudline cellar requirements to protect the well head from deep keel ice scour in the event the MODU has to move off a well due to ice incursion; and
6. Required blowout preventer (BOP) testing every seven days.

These six items have been incorporated into the modeling effort for this report.

This report projects the economic benefits of potential exploration, development and production of petroleum resources over the timeframe of the analysis which covers the proposed 5-year leasing program plus 20 years after the leasing program in the 4 selected Alaska OCS program areas.

Specifically, this report provides information on the following economic benefits at the local, state, and national levels:

- Projections of potential regional, statewide, and nationwide **direct expenditures** associated with petroleum development;
- Projections of potential direct, indirect, and induced **employment effects** of petroleum development;
- Projections of potential direct, indirect, and induced **income effects** of petroleum development;

- Projections of potential **direct revenues** that could accrue to the local/regional, state, and federal governments resulting from petroleum development;

This report does not include assessments of environmental impacts on air, water, fish, wildlife and vegetation, geological, cultural, and subsistence resources, and other resources that are typically included in an environmental impact statement.

The rest of this report is organized as follows:

Section 2: Description of Scenarios

Section 3: Approach

Section 4: Results

Section 5: Conclusions

Section 6: References

2 Description of Scenarios

E&D scenarios are conceptual views of the future and represent possible scenarios regarding the timing and extent of future petroleum activities. The E&D scenarios developed for this analysis under each regulatory case include a set of assumptions that reflect possible industry-wide exploration, development, and production activities.

Exploration activities are activities conducted to acquire information about the location, size, and characteristics of petroleum prospects within the leased area. Exploration activities include marine seismic surveys, geohazard surveys, geotechnical surveys, exploration and delineation well drilling, and associated logistical activities including environmental monitoring.

Development activities are activities conducted to build the infrastructure needed for production. These activities include installation of the offshore platforms, production well drilling, installation of offshore and onshore pipelines, installation of feeder lines, construction of shorebases such as onshore processing facilities, air support and search and rescue bases, and supply boat and marine terminals.

Production activities include in-fill drilling operations, processing, environmental monitoring, logistics support, and well-workovers. Decommissioning and abandonment are also considered as part of the production phase.

For the Beaufort Sea and Chukchi Sea (Arctic OCS areas), the scenarios reflect a development scenario under the current regulations. This includes the additional restrictions adopted by the Department of the Interior in 2016 that were specifically designed to apply to Arctic OCS exploratory drilling activities that use mobile offshore drilling units (MODUs), ice islands, and related operations during the open-water drilling season. Some of the additional restrictions could significantly increase the costs of exploration activities and could also cause delays in drilling activities, possibly deferring production for two years and reducing the net present value of oil and gas production. This restrictive regulatory framework is more stringent than the regulations that govern other OCS locations.

These E&D scenarios are used as inputs for the MAG-Plan Alaska model, the regional economic impact model used by BOEM for planning purposes and for environmental impact assessments.

The scenarios developed for this analysis are based on BOEM's lease sale EIS's, BOEM's 2016 and 2017 resource assessments, and our prior work for industry in the OCS and onshore Alaska.

2.1 Cook Inlet OCS Planning Area

According to BOEM, six lease sales have been conducted in this area since 1977. There are 14 existing leases in the planning area. All of these leases were issued as a result of Lease Sale 244 which was held last year on June 21, 2017. There have not been any commercial discoveries in this planning area although 13 exploratory wells have been drilled on earlier leases. In the upper Cook Inlet, extensive exploration and development in state submerged lands have been occurring during the past 40 years. The State of Alaska offers annual area-wide lease sales in state submerged lands. Annual production from non-OCS leased acreage during calendar year (CY) 2016 totaled approximately 5.7 million barrels of oil (bbl) and about 296 billion cubic feet of natural gas (BOEM 2018). Existing infrastructure in the upper portion of Cook Inlet includes 17 platforms in state waters, associated oil and gas pipelines, and onshore drill pads, processing and support facilities.

BOEM's proposed 5-year Program includes lease sales in years 2021 and 2023 in the Cook Inlet planning area. Under this development scenario, we make the following assumptions: It is assumed that two discoveries would occur, one resulting from each of the future lease sales, with 5 years of marine

seismic, geohazard, and geotechnical surveys occurring in the 2020 to 2026 period. Exploration drilling is assumed to occur over a 4-year period starting in 2023 with a total of 12 wells drilled. Five jack-up rigs would be installed to support the exploration program. Two production towers to support the two assumed discoveries would be installed, one in 2028 and the second tower in 2030. New infrastructure would be limited to offshore (125 miles each for oil and gas) and onshore (75 miles each for oil and gas) pipelines. Existing onshore facilities in the Upper Cook Inlet would support the development and production activities in the new fields. Gas resources are assumed to be associated gas and would follow the same production profile as oil production. The first field is assumed to produce 168 million barrels of oil and 44 billion cubic feet (BCF) of associated gas. The second field is slightly smaller and is assumed to produce a total of 131 million barrels of oil and 34 BCF of associated gas. The assumption is that 22 percent of the estimated remaining Cook Inlet OCS resources are discovered and produced for each of the fields. The remaining resources are estimated based on the 2016 BOEM resource assessment. This assumption is similar to the E&D scenario used by BOEM for the analysis of the Cook Inlet Lease Sale 244. The table below summarizes the activities under this scenario.

Table 1. Summary of Assumed E&D Activities: Cook Inlet Planning Area

Activity	Volume/Number
Marine Seismic Surveys	2
Geohazard Surveys	3
Geotechnical Survey	3
Exploration Base	0
Offshore Exploration Rigs (Jack-up rigs)	5
Exploration/Delineation Wells	12
Offshore Production Platforms (Tower)	2
Production and Service Wells	48
Subsea Wells	0
Subsea Flowlines (# of miles)	250
Onshore pipeline (# of miles)	150
Onshore Production Base	0
Supply Boat Terminal	0
Air Support Base	0
Search & Rescue Base	0

Source: Northern Economics.

2.2 Gulf of Alaska OCS Planning Area

Three lease sales were held from 1976 to 1981 in the Gulf of Alaska. Twelve exploratory wells were drilled, but no commercial discoveries have been found. The lease sale scheduled in the 1997–2002 Program was canceled, primarily due to low prices and low industry interest. There are no existing leases in this planning area.

BOEM’s proposed 5-year Program includes one future lease sale in the Gulf of Alaska planning area which is scheduled in year 2023. For this OCS area, we make the following assumptions: It is assumed that marine seismic survey starts in 2022, a year before the lease sale to enable industry to bid appropriately in the sale. Geohazard and geotechnical surveys would occur in year 2024. A modest discovery is assumed with development occurring after construction of the new Cook Inlet infrastructure south of the existing facilities to tie into and use new Cook Inlet infrastructure. Production from this modest discovery would begin when there is capacity in the new Cook Inlet infrastructure. No new infrastructure is assumed to result from the 2023 GOA lease sale other than 70 miles of offshore pipeline

(35 miles each for oil and gas). The total resources assumed to be produced from this discovery amount to 68 million barrels of oil and 356 BCF of associated gas. First oil (and gas) is assumed to occur in 2034 (10 years after the lease sale). Two exploration platforms (drill ships) would support the exploration program with a total of 4 wells drilled. Production would occur offshore from a semi-submersible production platform with 18 production and service wells. The table below summarizes the activities under this scenario.

Table 2. Summary of Assumed E&D Activities: Gulf of Alaska Planning Area

Activity	Volume/Number
Marine Seismic Surveys	1
Geohazard Surveys	1
Geotechnical Survey	1
Exploration Base	0
Offshore Exploration Rigs (drill ship)	2
Exploration/Delineation Wells	4
Offshore Production Platforms (semi-submersible)	1
Production and Service Wells	18
Subsea Wells	0
Subsea Flowlines (# of miles)	70
Onshore pipeline (# of miles)	0
Onshore Production Base	0
Supply Boat Terminal	0
Air Support Base	0
Search & Rescue Base	0

Source: Northern Economics.

2.3 Chukchi Sea OCS Planning Area

BOEM’s proposed 5-year Program includes 3 future lease sales in the Chukchi Sea program area which are scheduled to occur in years 2020, 2022, and 2024.

The Chukchi Sea area is considered a frontier area and as such is characterized by its remoteness, high costs of doing business, lack or scarcity of existing infrastructure, and lack of production data to inform forecasts of future activity. It is extremely costly to develop the infrastructure required to extract frontier area resources from the ground and transport them to market. Successful development and production of resources from frontier areas has typically been contingent upon successful exploration of an “anchor field” – a large discovery in the course of pioneering exploration that justifies the substantial capital investments required for an initial commercial petroleum development. Because of this, it is assumed that E&D activities in this OCS program area are significantly more extensive compared to the scenarios in the non-Arctic OCS areas.

For the Chukchi Sea scenario, we make the following assumptions: It is assumed that a sizable field will be discovered with total recoverable oil resources amounting to about 2.9 billion barrels of oil with no gas production (it is highly speculative at this point to assume that a gas pipeline or a liquefied natural gas project will be built to transport natural gas to markets or that the sales price would be sufficient to support gas-related infrastructure). The discovery is a result of the 2024 lease sale. First oil occurs in year 2032, 8 years after the 3rd scheduled lease sale. Marine seismic activities start in year 2019 and the geotechnical and geohazard surveys start in 2021. The exploration effort results in 19 wells drilled from a total of 24 offshore exploration rigs (12 of which are drill ships and another 12 semi-submersible

platforms). The drill ships are the primary exploration platform while the semi-submersibles are the backup rigs required under these regulations to drill a relief well if needed. The jack-up rigs during development drilling are for subsea wells. Three gravity-based production platforms will be installed and 8 jack-up rigs will be used during the summer drilling seasons. There will be 187 production and service wells and 24 sub-sea wells. New infrastructure includes 160 miles of subsea oil pipelines and 375 miles of onshore pipelines across the NPR-A to tie into TAPS. A supply boat terminal and an air support base will also be built to support development in this area. The table below summarizes the activities under this scenario.

Table 3. Summary of Assumed E&D Activities: Chukchi Sea OCS Planning Area

Activity	Volume/Number
Marine Seismic Surveys	3
Geohazard Surveys	3
Geotechnical Survey	3
Exploration Base	1
Offshore Exploration Rigs (12 drill ships and 12 semi-submersibles)	24
Exploration/Delineation Wells	19
Offshore Production Platforms (3 Gravity-based and 8 jack-up rigs)	11
Production and Service Wells	187
Subsea Wells	24
Subsea Flowlines (# of miles)	160
Onshore pipeline (# of miles)	375
Onshore Production Base	0
Supply Boat Terminal	1
Air Support Base	1
Search & Rescue Base	0

Source: Northern Economics.

2.4 Beaufort Sea OCS Area

BOEM’s proposed 5-year Program includes three future lease sales in the Beaufort Sea planning area which are scheduled to occur in years 2019, 2021, and 2023.

BOEM conducted a 2017 assessment for the Western Beaufort to update the recent significant discoveries near shore and in state waters for the Nanushuk and Torok geologic plays. These plays extend offshore into the OCS but are generally in shallower waters. Hence, the scenario developed for this analysis includes the use of more ice islands and gravel islands for exploration and production.

Furthermore, since there are still other resources in the western Beaufort this scenario assumes that in deeper water they will be explored and produced from platforms other than ice islands and gravel islands. Shallow water ice islands are drilled in the winter while deeper water exploration platforms are drilled in the summer so there are substantially more total platforms under the current regulatory structure.

For the Beaufort Sea scenario, we make the following assumptions: A discovery of 5 fields is assumed, ranging in size from 100 million to 380 million barrels of economically recoverable oil resources, producing a total of 980 million barrels of oil. Also, under this scenario, there will be production occurring in the 8(g) zone.

As in the Chukchi Sea scenario, no gas is produced from this OCS area. It is assumed that no new onshore infrastructure would need to be built as existing facilities would be used to support the development.

Exploration activities begin in 2018 and last for 10 years. A total of 17 exploration wells are drilled. Exploration platforms include 18 ice islands and 10 jack-up rigs. Production activities would be supported by 2 gravel islands and 3 gravity-based structures. A total of 252 production and service wells will be drilled. The only new shore-based infrastructure that will be built is 55 miles of offshore and 40 miles of onshore pipelines. The following table summarizes the E&D activities under this scenario.

Table 4. Summary of Assumed E&D Activities: Beaufort Sea OCS Planning Area

Activity	Volume/Number
Marine Seismic Surveys	3
Geohazard Surveys	5
Geotechnical Surveys	3
Exploration Base	0
Offshore Exploration Rigs	28
Exploration/Delineation Wells	17
Offshore Production Platforms	5
Production and Service Wells	252
Subsea Wells	0
Subsea Flowlines (# of miles)	55
Onshore pipeline (# of miles)	40
Onshore Production Base	0
Supply Boat Terminal	0
Air Support Base	0
Search & Rescue Base	0

Source: Northern Economics.

3 Approach

This section describes the major study tasks and the economic modeling methodology used for this analysis.

Task 1: Develop scenarios for OCS development for each of the OCS planning areas.

A set of assumptions that reflect possible industry-wide exploration, development, and production activities were developed. This involved developing reasonable assumptions regarding the timing and activity levels associated with exploration, development, and production of oil and gas resources in the Beaufort Sea, Chukchi Sea, Gulf of Alaska, and Cook Inlet planning areas.

Specifically, these assumptions include the following:

- Time frames for the exploration, development, and production phases;
- Number of marine seismic, geohazard, and geotechnical surveys
- Type and number of exploration drilling rigs and number of exploration and delineation wells by year;
- Type and number of production rigs and number of production wells by year;
- Oil and gas production by year;
- Supply and maintenance modes and facilities, including the number of platforms that can be served by a single supply vessel, ice breaker, and helicopter;
- Onshore facilities.

This work involved a review of previous development scenarios available in the public domain, including exploration and development plans that have been submitted to the Bureau of Ocean Energy and Management (BOEM), recent EIS documents published by BOEM, as well as the previous development scenarios we used in our publicly-available work for Shell in 2009 on the *Economic Analysis of Future Offshore Oil and Gas Development: Beaufort Sea, Chukchi Sea, and the North Aleutian Basin* and in 2011 on the *Potential National-Level Benefits of Alaska OCS Development*. Our previous research work for API that looked at regulations affecting the Beaufort Sea and Chukchi Sea OCS planning areas served as a starting point for developing the scenarios for the Alaska Arctic OCS areas.

The development of the scenarios for the Cook Inlet and Gulf of Alaska planning areas were guided by BOEM's recent analysis of the lease sale in the Cook Inlet area.

Task 2: Calibrate and run the economic impact model for Alaska

The MAG-PLAN Alaska model was used to quantify the economic benefits to Alaska, both at the regional and statewide levels. MAG-PLAN Alaska is a region-specific economic impact model used by BOEM to evaluate potential economic impacts that may result from federal actions such as lease sales in OCS areas, and when it prepares a new 5-year OCS oil and gas program. MAG-PLAN estimates potential employment, income, and economic output effects that could result from any alternative or exploration and development scenario being considered.

In 2010, BOEM commissioned Northern Economics to update the model. The previous model was developed in 2005 using information that was gathered in the late 1990s and early 2000 for two earlier Alaska OCS models. The updated MAG-PLAN Alaska model which was completed in 2012 provides BOEM with an integrated model that provides estimates of Stage 1 and Stage 2 economic impacts of OCS exploration, development, and production. Stage 1 estimates the level and allocation of direct expenditures as well as direct manpower requirements, and government revenues resulting from OCS

oil and gas activities specified in the exploration and development scenarios, while Stage 2 estimates the multiplier effects of spending associated with OCS activities on potentially affected regions in Alaska.

Northern Economics has an ongoing agreement with BOEM whereby we can use the model for work with public or private sector clients as long as we provide BOEM with periodic updates to the model which reflect new or updated information. BOEM is not provided any proprietary data from our other work; rather, the updated model includes new equations that incorporate the additional data points. The MAG-PLAN model is not available to the public.

For this particular study, the MAG-PLAN model was calibrated to fit the development scenarios developed in Task 1. This involved calibrating the model to include additional specific types of activities that have not been considered in our previous work, estimating costs and manpower requirements of the new activities, and updating capital and operating cost data if needed for activities that already exist in the model. Model updates for the Gulf of Alaska and the Cook Inlet planning areas were more extensive since these areas have not been analyzed since the model was developed in 2010.

Updates to the IMPLAN coefficients and the fiscal module that are in the MAG-PLAN model were also done to apply the latest available data. The latest projections on oil and gas prices and transportation costs are incorporated into the model. The latest projections in the Annual Energy Outlook published by the Energy Information Administration for oil and gas prices and in the Revenue Sources Book published by the Alaska Department of Revenue for the transportation costs were applied to the model.

After calibrating the MAG-PLAN model to fit this study, model runs were conducted for all scenarios. A QA/QC of the inputs and outputs of the model was done to ensure reasonable and reliable results.

Task 3: Quantify the economic benefits to the rest of the U.S.

This task involved using the Policy Insight model developed by Regional Economic Models, Inc. (REMI) for Northern Economics. The REMI model can be used to quantify the economic benefits—jobs, income, and economic output of OCS oil and gas activities—to regions outside of Alaska (the rest of the U.S.).

To determine economic benefits of petroleum development on regions outside of Alaska, direct spending and direct jobs associated with the various Alaska OCS activities (exploration, development, and production) that could occur outside of Alaska were determined. This also included spending of wages in other states by direct employees that are not residents of Alaska. These outside spending and jobs associated with the various E&D activities were categorized into different economic sectors such as architectural, engineering, and related services, construction, oil and gas extraction, transportation and logistics sectors, etc. These were used as inputs into the REMI model. A QA/QC of the inputs and outputs of the model were conducted to ensure reasonable and reliable results.

Other tasks conducted for this study included development of a memorandum that describes the proposed scenarios, and preparation of the draft and final report.

4 Results

Petroleum development is expected to generate direct, indirect, and induced jobs and income, as well as revenues to the local, state, and federal governments. The magnitude of these economic benefits would ultimately depend on the volumes of petroleum resources that might be discovered in the OCS areas, the levels of investment that oil and gas explorers, developers, and producers would be willing to spend in these areas, and the fiscal regime or tax structure that would be in effect as OCS petroleum development occurs. Assumptions about all these factors determine the results of the study.

This section presents the quantitative results of the economic impact assessment of potential economic benefits for each of the selected planning areas. The results are based on the reasonable future offshore petroleum development scenarios that were assumed for each of the planning areas described in Section 2 of this report. As noted earlier the scenarios used in this study reflect the current more stringent regulations governing the Arctic OCS areas. In the event that the regulatory structure changes consistent with the current administration's intent, it is possible that industry interest and levels of investment in the Alaska Arctic OCS planning areas could be higher than the levels considered in this analysis and could subsequently lead to more economic benefits.

The following sub-sections present projected total industry expenditures, employment and income effects, and potential government revenues at the local, state, and federal levels for each of the selected program areas.

4.1 Projected Direct E&D Industry Expenditures

Industry spending (level of investment) associated with E&D activities in the selected program areas would directly benefit companies that are operating in and outside of Alaska. In the North Slope Borough (the directly impacted local region for the Beaufort Sea and Chukchi Sea areas), and the Kenai Peninsula Borough (the directly impacted local region for the Cook Inlet and the Gulf of Alaska) there are several companies operating primarily in the petroleum support services sector. These companies provide utilities, camp services including security, cleaning, and food services, environmental monitoring, and other logistics services. The majority of the petroleum support services sector companies are located in other regions of Alaska at the economic and transportation hubs (mostly in Anchorage and Fairbanks). The Municipality of Anchorage is the center of the state's transportation industry, and Fairbanks serves as Interior Alaska's transportation hub.

It is assumed that major material items, such as steel pipe, equipment, and industrial machinery, including major production and camp modules, would be manufactured out-of-state or globally and shipped via marine transport to Alaska ports. It is also assumed that businesses located in Fairbanks and Anchorage would be the sources of most Alaska-sourced supplies because these two cities are the supply centers for the state's construction and oil and gas industries. In addition, while we assume that a large amount of the construction materials needed would be purchased out-of-state, Alaska's water, air, and truck transportation sectors are projected to benefit from these purchases.

4.1.1 Cook Inlet OCS Planning Area

Table 5 shows the projected total, annual average, and peak year expenditures associated with the Cook Inlet E&D scenario developed for this study. Total projected U.S. spending under this case amounts to about \$5.2 billion over the timeframe considered in the analysis. Average spending is projected to amount to approximately \$190 million per year with a peak of \$480 million in year 2030.

Table 5. Projected Direct E&D Industry Expenditures: Cook Inlet OCS Planning Area

Category	Direct Expenditures (Millions of 2016\$)				
	Local	Other Alaska	Total Alaska	Rest of U.S.	Total U.S.
Total Expenditures	\$1,030	\$2,260	\$3,280	\$1,890	\$5,170
Annual Average	\$40	\$80	\$120	\$70	\$190
Peak	\$80	\$230	\$300	\$210	\$480

Source: Northern Economics estimates.

4.1.2 Gulf of Alaska OCS Planning Area

Table 6 shows the projected total, annual average, and peak year expenditures associated with the Gulf of Alaska E&D scenario developed for this study. Total U.S. spending under this case is projected to amount to about \$2.5 billion over the timeframe considered in the analysis. Average spending is projected to amount to approximately \$100 million per year with a peak of \$250 million in year 2034.

Table 6. Projected Direct E&D Industry Expenditures: Gulf of Alaska OCS Planning Area

Category	Direct Expenditures (Millions of 2016\$)				
	Local	Other Alaska	Total Alaska	Rest of U.S.	Total U.S.
Total Expenditures	\$510	\$1,020	\$1,540	\$950	\$2,490
Annual Average	\$20	\$40	\$60	\$40	\$100
Peak	\$50	\$150	\$200	\$180	\$250

Source: Northern Economics estimates.

4.1.3 Chukchi Sea OCS Planning Area

Table 7 shows the projected total, annual average, and peak year expenditures associated with the scenario for the Chukchi Sea planning area. Total U.S. spending under this case is projected to amount to about \$28.2 billion over the timeframe considered in the analysis. Average spending is projected to amount to approximately \$1 billion per year with a peak of \$3.1 billion during the development phase.

Table 7. Projected Direct E&D Industry Expenditures: Chukchi Sea OCS Planning Area

Category	Direct Expenditures (Millions of 2016\$)				
	Local	Other Alaska	Total Alaska	Rest of U.S.	Total U.S.
Total Expenditures	\$360	\$8,880	\$9,240	\$19,000	\$28,240
Annual Average	\$10	\$330	\$340	\$700	\$1,050
Peak	\$40	\$1,010	\$1,040	\$2,210	\$3,140

Source: Northern Economics estimates.

4.1.4 Beaufort Sea OCS Planning Area

Table 8 shows the projected total, annual average, and peak year expenditures associated with the scenario for the Beaufort Sea planning area. Total U.S. spending under this case is projected to amount to about \$17.5 billion over the timeframe considered in the analysis. Average spending is projected to amount to approximately \$650 million per year with a peak of \$1.7 billion during the development phase.

Table 8. Projected Direct E&D Industry Expenditures: Beaufort Sea OCS Planning Area

Category	Direct Expenditures (Millions of 2016\$)				
	Local	Other Alaska	Total Alaska	Rest of U.S.	Total U.S.
Total Expenditures	\$330	\$7,230	\$7,560	\$9,940	\$17,500
Annual Average	\$10	\$270	\$280	\$370	\$650
Peak	\$70	\$850	\$860	\$1,490	\$1,740

Source: Northern Economics estimates.

4.2 Projected Employment Effects

Exploring, developing, and producing petroleum resources in the Alaska OCS planning areas requires a substantial effort and is projected to directly employ thousands of people, with additional indirect and induced jobs created in and outside of Alaska. This section presents the projected employment effects resulting from petroleum development in the selected Alaska OCS planning areas.

The projected employment effects include the direct, indirect, and induced jobs at the local level (the North Slope Borough region for the Beaufort Sea and the Chukchi Sea and the Kenai Peninsula Borough for the Cook Inlet and the Gulf of Alaska), the rest of the state, and the rest of the U.S.

Direct jobs include on-site and off-site oil and gas workers. On-site workers are those engaged in E&D activities. Other direct employment is associated with headquarters jobs and pipe coating. The model for estimating direct employment associated with OCS oil and gas activities recognizes about 25 activities from exploration to abandonment. There are three major sources of on-site employment: 1) construction and operation of onshore facilities; 2) operation and drilling of production platforms and wells; and 3) operation and drilling of exploration platforms and wells.

In addition to these on-site jobs, other direct jobs are created at the administrative and operational headquarters for the on-site activities. The headquarters jobs are estimated at 15 percent of total on-site jobs. This percentage is the historical average for Anchorage oil and gas employment compared to statewide oil and gas employment excluding Anchorage. These headquarters jobs are assumed to be located in Anchorage. In addition, jobs are created in Alaska and outside of Alaska for engineering, permitting, and other work prior to and during the construction and development activities.

The number of exploration rigs or production platforms operating in any given year, ongoing construction activities, the number of wells drilled, miles of pipeline laid, and similar assumptions drive the need for helicopters and workboats, maintenance, and similar support activities that are estimated within the model. The vector that is the sum of each activity is then multiplied by the vector for person requirements for each activity and the duration vector to arrive at the total average employment for each activity in each year.

The direct investments (spending) on petroleum development are projected to initiate subsequent rounds of re-spending resulting in additional indirect and induced jobs. These indirect and induced impacts are collectively termed “multiplier effects.” Indirect effects would occur when contractors,

vendors, and manufacturers receiving payment for goods or services required for exploration, development, and production of OCS petroleum resources are, in turn, able to pay others who support their businesses. Indirect jobs are jobs associated with third-party contractors, vendors, and manufacturers that receive payments for goods or services in support of the direct activities.

Induced effects would occur when persons directly employed for exploration, development, and production activities make purchases from retailers and service establishments in the normal course of household consumption. Government spending of revenues generated from OCS activities also create significant multiplier effects and these effects are included in the induced effects. Induced jobs are therefore associated with jobs affected by household and government spending.

Potential employment effects of OCS development in Alaska were generated using the MAG-PLAN Alaska model. As described in Section 3, this model is a region-specific economic impact model used by BOEM to evaluate potential economic impacts that may result from federal actions such as lease sales in OCS areas.

The projected multiplier employment effects of OCS development on the rest of the nation were quantified using the REMI Policy Insight+ model. As noted in the Approach section, this model is a dynamic forecasting and policy analysis model that integrates input-output, computable general equilibrium, econometric, and economic geography methodologies. PI+ was developed by Regional Economic Models, Inc. (REMI) and is widely used by government agencies (including most U.S. state governments), private and public research firms, and utilities. The inputs to the PI+ model were the estimated annual direct jobs associated with the different OCS activities starting from geological survey all the way to abandonment. These direct job estimates were generated using the MAG-PLAN Alaska model.

The tables presented below show the projected annual average jobs generated over the timeframe for this analysis and the peak values. The peak employment usually occurs when construction and development activities are occurring to bring a field into production.

4.2.1 Cook Inlet OCS Planning Area

Table 9 and Table 10, respectively, show the projected potential direct, and indirect and induced annual average and peak year employment effects under the Cook Inlet E&D scenario.

Under this scenario, it is projected that petroleum development in the Cook Inlet OCS planning area could generate about 740 direct jobs and an additional 1,010 indirect and induced jobs in the U.S. on an annual average basis.

Table 9. Projected Direct Employment Effects: Cook Inlet OCS Planning Area

Category	Direct Oil and Gas Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	110	400	510	260	740
Peak	270	2,070	2,260	970	3,230

Source: Northern Economics estimates.

Table 10. Projected Indirect and Induced Employment Effects: Cook Inlet OCS Planning Area

Category	Multiplier Effects: Indirect and Induced Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	130	360	490	520	1,010
Peak	290	890	1,140	2,250	2,860

Source: Northern Economics estimates.

4.2.2 Gulf of Alaska OCS Planning Area

Table 11 and Table 12, respectively, show the projected potential direct, and indirect and induced annual average and peak year employment effects under the Gulf of Alaska E&D scenario.

Under this scenario, it is projected that petroleum development in the Gulf of Alaska OCS planning area could generate about 330 direct jobs and an additional 530 indirect and induced jobs in the U.S. on an annual average basis.

Table 11. Projected Direct Employment Effects: Gulf of Alaska OCS Planning Area

Category	Direct Oil and Gas Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	60	190	240	90	330
Peak	1,340	1,420	1,420	270	1,690

Source: Northern Economics estimates.

Table 12. Projected Indirect and Induced Employment Effects: Gulf of Alaska OCS Planning Area

Category	Multiplier Effects: Indirect and Induced Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	160	210	370	200	530
Peak	290	520	800	540	1,060

Source: Northern Economics estimates.

4.2.3 Chukchi Sea OCS Planning Area

Table 13 and Table 14, respectively, show the projected potential direct, and the indirect and induced annual average and peak year employment effects under the Chukchi Sea E&D scenario. It is projected that petroleum development in the Chukchi OCS planning area could generate about 2,430 direct jobs and an additional 3,570 indirect and induced jobs in the U.S. on an annual average basis.

Table 13. Projected Direct Employment Effects: Chukchi Sea OCS Planning Area

Category	Direct Oil and Gas Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	120	1,450	1,560	880	2,430
Peak	330	3,990	4,290	2,220	6,260

Source: Northern Economics estimates.

Table 14. Projected Indirect and Induced Employment Effects: Chukchi Sea OCS Planning Area

Category	Direct Oil and Gas Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	80	1,510	1,580	2,000	3,570
Peak	140	4,530	4,670	5,110	9,400

Source: Northern Economics estimates.

4.2.4 Beaufort Sea OCS Planning Area

Table 15 and Table 16, respectively, show the projected potential direct, and indirect and induced annual average and peak year employment effects under the Beaufort Sea E&D scenario.

It is projected that petroleum development in the Beaufort Sea OCS planning area could generate about 1,760 direct jobs and an additional 3,080 indirect and induced jobs in the U.S. on an annual average basis.

Table 15. Projected Direct Employment Effects: Beaufort Sea OCS Planning Area

Category	Direct Oil and Gas Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	80	920	990	770	1,760
Peak	230	2,270	2,400	2,130	3,920

Source: Northern Economics estimates.

Table 16. Projected Indirect and Induced Employment Effects: Beaufort Sea OCS Planning Area

Category	Direct Oil and Gas Jobs				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	20	1,410	1,430	1,650	3,080
Peak	70	5,060	5,120	6,020	6,960

Source: Northern Economics estimates.

4.3 Projected Labor Income Effects

This section presents the projected labor income effects of OCS petroleum development activities for the selected Alaska OCS planning areas. The labor income effects include the direct, indirect, and induced income generated in the various regions as a result of petroleum development. This labor income is associated with the employment effects discussed above.

4.3.1 Cook Inlet OCS Planning Area

Table 17 and Table 18 summarize the projected direct, and the indirect and induced labor income effects under the Cook Inlet scenario. At the peak level of economic activity, total U.S. direct labor income that would be disbursed in various regions of the U.S. is projected to amount to about \$153 million. The annualized average direct income over the analysis timeframe is projected to be about \$42

million. Additional annual average labor income resulting from the indirect and induced effects is projected to amount to about \$60 million, with a peak annual amount of over \$183 million.

Table 17. Projected Total U.S. Direct Labor Income Effects: Cook Inlet OCS Planning Area

Category	Direct Oil and Gas Labor Income (Millions of 2016\$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$7.7	\$21.9	\$29.7	\$12.4	\$42.0
Peak	\$15.9	\$94.3	\$110.2	\$48.8	\$153.3

Source: Northern Economics estimates.

Table 18. Projected Total U.S. Indirect and Induced Labor Income Effects: Cook Inlet OCS Planning Area

Category	Multiplier Effects: Indirect and Induced Labor Income (Millions of 2016 \$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$5.2	\$19.5	\$24.7	\$35.0	\$59.7
Peak	\$11.1	\$47.8	\$58.0	\$150.4	\$183.3

Source: Northern Economics estimates.

4.3.2 Gulf of Alaska OCS Planning Area

Table 19 and Table 20 summarize the projected direct, and the indirect and induced labor income effects under the Gulf of Alaska scenario. At the peak level of economic activity, total U.S. direct labor income that would be disbursed in various regions of the U.S. is projected to amount to about \$113 million. The annualized average direct income over the timeframe for the analysis is projected to be about \$21 million.

Additional annual average labor income resulting from the indirect and induced effects is projected to amount to about \$29 million, with a peak annual amount of over \$57 million.

Table 19. Projected Total U.S. Direct Labor Income Effects: Gulf of Alaska OCS Planning Area

Category	Direct Oil and Gas Labor Income (Millions of 2016\$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$4.7	\$11.3	\$15.9	\$5.3	\$21.2
Peak	\$9.6	\$84.0	\$89.0	\$23.7	\$112.7

Source: Northern Economics estimates.

Table 20. Projected Total U.S. Indirect and Induced Labor Income Effects: Gulf of Alaska OCS Planning Area

Category	Multiplier Effects: Indirect and Induced Labor Income (Millions of 2016 \$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$4.8	\$8.3	\$13.2	\$13.7	\$29.4
Peak	\$11.8	\$26.6	\$38.5	\$39.1	\$57.2

Source: Northern Economics estimates.

4.3.3 Chukchi Sea OCS Planning Area

Table 21 and Table 22 summarize the projected direct, and the indirect and induced labor income effects under the Chukchi Sea scenario, respectively.

Table 21. Projected Direct Labor Income Effects: Chukchi Sea OCS Planning Area

Category	Direct Oil and Gas Labor Income (Millions of 2016\$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$2.5	\$79.7	\$82.2	\$46.2	\$128.4
Peak	\$6.0	\$218.8	\$224.8	\$116.3	\$341.1

Source: Northern Economics estimates.

Table 22. Projected Indirect and Induced Labor Income Effects: Chukchi Sea OCS Planning Area

Category	Multiplier Effects: Indirect and Induced Labor Income (Millions of 2016 \$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$8.1	\$101.9	\$110.0	\$140.0	\$250.0
Peak	\$15.0	\$312.9	\$327.7	\$392.2	\$688.3

Source: Northern Economics estimates.

4.3.4 Beaufort Sea OCS Planning Area

Table 23 and Table 24 summarize the projected direct, and the indirect and induced labor income effects under the Beaufort Sea scenario, respectively.

Table 23. Projected Direct Labor Income Effects: Beaufort Sea OCS Planning Area

Category	Direct Oil and Gas Labor Income (Millions of 2016\$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$1.2	\$58.3	\$59.5	\$32.0	\$91.6
Peak	\$4.5	\$151.9	\$156.4	\$87.8	\$214.3

Source: Northern Economics estimates.

Table 24. Projected Indirect and Induced Labor Income Effects: Beaufort Sea OCS Planning Area

Category	Multiplier Effects: Indirect and Induced Labor Income (Millions of 2016 \$)				
	Local	Other Alaska	AK Total	Rest of U.S.	Total U.S.
Annual Average	\$1.8	\$96.2	\$98.0	\$108.3	\$206.3
Peak	\$68.3	\$5,050.2	\$5,118.5	\$367.8	\$447.5

Source: Northern Economics estimates.

4.4 Projected Government Revenues

Petroleum development in the Alaska OCS areas could generate significant government revenues through taxes and lease payments. This section presents the projected potential local, state, and federal government revenues from petroleum development. The analysis of potential government revenue effects is focused on the following revenue categories—1) property taxes which accrue to both the local and state governments, 2) state corporate income taxes, 3) additional royalties to the state government due to the increase in TAPS throughput from OCS production, and 4) federal royalty payments.

Property Taxes

Property taxes from oil and gas facilities are a major source of revenue for both the North Slope Borough and the Kenai Peninsula Borough (local government) and the State of Alaska. A local tax is levied on the state's assessed value for oil and gas property within a city or borough, and is subject to the local property tax limitations established in AS 29.45.080 and AS 29.45.100. The state's mill rate is effectively 20 mills minus the local rate, which varies depending on the municipality impacted.

New onshore facilities as well as offshore facilities that are within state waters built to support petroleum development will be subject to property taxes. These facilities could include onshore pipelines, production facilities, marine terminals, search and rescue and air support bases. The various E&D scenarios in this analysis includes several of these facilities.

State Corporate Income Taxes

The state also obtains revenue from the special state corporate income tax on petroleum activity. The tax base is the Alaska share of worldwide income for each corporation. The Alaska income is calculated using a "modified apportionment formula," which averages the Alaska share of corporate worldwide property, sales, and extraction and applies that formula to calculate the Alaska share of worldwide income. The formula used to apportion income for all other types of corporations includes property, sales, and payroll. Consequently, the Alaska tax base for the special corporate income tax on petroleum depends not only on activity within Alaska, but also on activity in other locations, making it difficult to predict. Historically the ratio of tax revenues to the wellhead value of production has averaged 2.6 percent, but ranged from a low of 0.3 percent to a high of 5.1 percent.

For this analysis, the estimate of the direct corporate income tax revenues to the state from OCS activity is based on the wellhead value of OCS production and a modified apportionment formula that reflects the special OCS conditions. First, it is assumed that the sales and extraction components of the formula are zero, because OCS sales and extraction would occur outside the jurisdiction of Alaska (in federal waters). Second, it is assumed that only that share of the property associated with OCS activities which is onshore would be included in the formula. The result is a very small allocation of OCS income to the state petroleum income tax base.

The historical ratio of revenues to the value of production is adjusted downward and is used to estimate future corporate petroleum revenues to the state from OCS production. The percentages are applied to the value of production to determine the corporate income tax estimates.

Additional State Royalties due to TAPS Pipeline Tariff Reduction Effect

It is assumed that OCS oil from the Beaufort Sea and the Chukchi Sea would be transported to market through the existing TAPS oil pipeline from the North Slope to Valdez. The TAPS pipeline is currently operating at about one-third of its capacity of 2 million barrels per day, and may be carrying less oil in the future as North Slope production continues to decline. The pipeline tariff, based on the cost of its operation, is sensitive to the volume of oil and tends to increase as the volume falls. If OCS oil were

added to the TAPS pipeline it would increase the throughput, and this would tend to reduce the tariff on all the oil flowing through the line.

Because the price of oil at the wellhead is a “netback” price based on the market price net of transportation costs, a lower pipeline tariff would increase the wellhead value of North Slope oil. Since the royalty on oil from state lands and the production tax are based on the wellhead value of the oil, a lower tariff would increase the revenues to the state from the royalties and the production tax. The maximum tariff reduction is projected to only be \$1 (nominal \$). In other years, the tariff reduction would be less because the incremental throughput would be less. The tariff reduction is projected based on the relationship between projected TAPS throughput in future years and the TAPS tariff.

Federal Royalty Payments

A royalty is a share of the minerals produced from a lease. It is a percentage of production paid either in money or in kind that a federal lease is required to pay. On the Alaska OCS, typically a 12.5 percent royalty rate is applied for OCS leases that are in production. A minimum royalty payment is typically established as part of the lease agreement. The lessee pays a minimum royalty at the expiration of each lease year with a credit applied for actual royalty paid during the lease year.

Under certain circumstances, a royalty relief or suspension is granted by the Secretary of the Interior to promote increased oil and gas production. The royalty suspension is prorated by lease acreage and is subject to price thresholds. This analysis assumes that no royalty suspension would apply to any of the Alaska OCS leases.

For the purpose of this analysis, royalties from production in the Beaufort Sea and Chukchi Sea were projected based on projected Brent oil prices from the publicly available long-term price projections for oil generated by the Energy Information Administration (Annual Energy Outlook 2018). The Annual Energy Outlook presents a projection and analysis of U.S. energy supply, demand, and prices through 2050. The projections are based on results from the Energy Information Administration's National Energy Modeling System. To calculate the royalties, netback prices for oil and gas were used. The netback price reflects the price of the resource at the point of production (market price less transportation costs). The transportation costs used in this analysis were obtained from the latest Revenue Sources publication issued by the Alaska Department of Revenue. For royalties from production in the Cook Inlet and the Gulf of Alaska, the prevailing royalty oil prices in the region were used and future prices were extrapolated following the year-over-year change in real prices as projected by the EIA.

4.4.1 Cook Inlet OCS Planning Area

The projected government revenues that could accrue to local, state, and federal governments resulting from potential development in the Cook Inlet scenario are shown in Table 25. The total projected government take under this scenario is approximately \$2.7 billion over the timeframe considered in the analysis.

Table 25. Projected Local, State, and Federal Government Revenues: Cook Inlet OCS Planning Area

Category	Direct Revenues (Millions of 2016\$)						
	Local Property Taxes	State Property Taxes	State Corporate Income Tax	State (TAPS Effect)	Federal Royalty Payments	State Royalty Payments	Total Revenues
Total	\$73.82	\$102.57	\$26.52	--	\$2,549.92	--	\$2,752.82
Annual Average	\$4.10	\$5.70	\$1.56	--	\$150.00	--	\$161.35
Peak	\$4.79	\$6.66	\$3.84	--	\$369.60	--	\$384.89

Source: Northern Economics estimates.

4.4.2 Gulf of Alaska OCS Planning Area

The projected government revenues that could accrue to local, state, and federal governments resulting from potential development in the Gulf of Alaska scenario are shown in Table 26. The total projected government take under this scenario is approximately \$900 million over the timeframe considered in the analysis.

Table 26. Projected Local, State, and Federal Government Revenues: Gulf of Alaska OCS Planning Area

Category	Direct Revenues (Millions of 2016\$)						
	Local Property Taxes	State Property Taxes	State Corporate Income Tax	State (TAPS Effect)	Federal Royalty Payments	State Royalty Payments	Total Revenues
Total	\$4.48	\$6.23	\$9.02	--	\$867.51	--	\$887.24
Annual Average	\$0.37	\$0.52	\$0.82	--	\$78.86	--	\$80.58
Peak	\$0.41	\$0.57	\$1.84	--	\$177.33	--	\$180.15

Source: Northern Economics estimates.

4.4.3 Chukchi Sea OCS Planning Area

The projected government revenues that could accrue to local, state, and federal governments resulting from potential development in the Chukchi Sea scenario are shown in Table 27. There are no state royalty payments under this scenario since there is no production assumed to occur on 8(g) areas (areas where the Federal royalty is shared with the state). Total projected government take over the analysis timeframe is approximately \$24.7 billion. The majority of the revenues would accrue to the Federal government in the form of royalty payments.

Table 27. Projected Local, State, and Federal Government Revenues: Chukchi Sea OCS Planning Area

Category	Direct Revenues (Millions of 2016\$)						
	Local Property Taxes	State Property Taxes	State Corporate Income Tax	State (TAPS Effect)	Federal Royalty Payments	State Royalty Payments	Total Revenues
Total	\$526.51	\$42.69	\$241.39	\$717.44	\$23,210.80	--	\$24,738.83
Annual Average	\$30.97	\$2.51	\$18.57	\$55.19	\$1,785.45	--	\$1,892.68
Peak	\$36.80	\$2.98	\$32.63	\$79.47	\$3,137.48	--	\$3,289.36

Source: Northern Economics estimates.

4.4.4 Beaufort Sea OCS Planning Area

The projected government revenues that could accrue to local, state, and federal governments resulting from potential development in the Beaufort Sea scenario are shown in Table 28. The total projected government take under this case is approximately \$9.1 billion over the timeframe considered in the analysis.

Table 28. Projected Local, State, and Federal Government Revenues: Beaufort Sea OCS Planning Area

Category	Direct Revenues (Millions of 2016\$)						
	Local Property Taxes	State Property Taxes	State Corporate Income Tax	State (TAPS Effect)	Federal Royalty Payments	State Royalty Payments	Total Revenues
Total	\$82.08	\$6.66	\$88.72	\$407.78	\$8,216.27	\$314.88	\$9,116.39
Annual Average	\$4.83	\$0.39	\$5.55	\$25.49	\$513.52	\$19.68	\$569.45
Peak	\$7.02	\$0.57	\$14.35	\$55.22	\$1,359.29	\$58.23	\$1,494.68

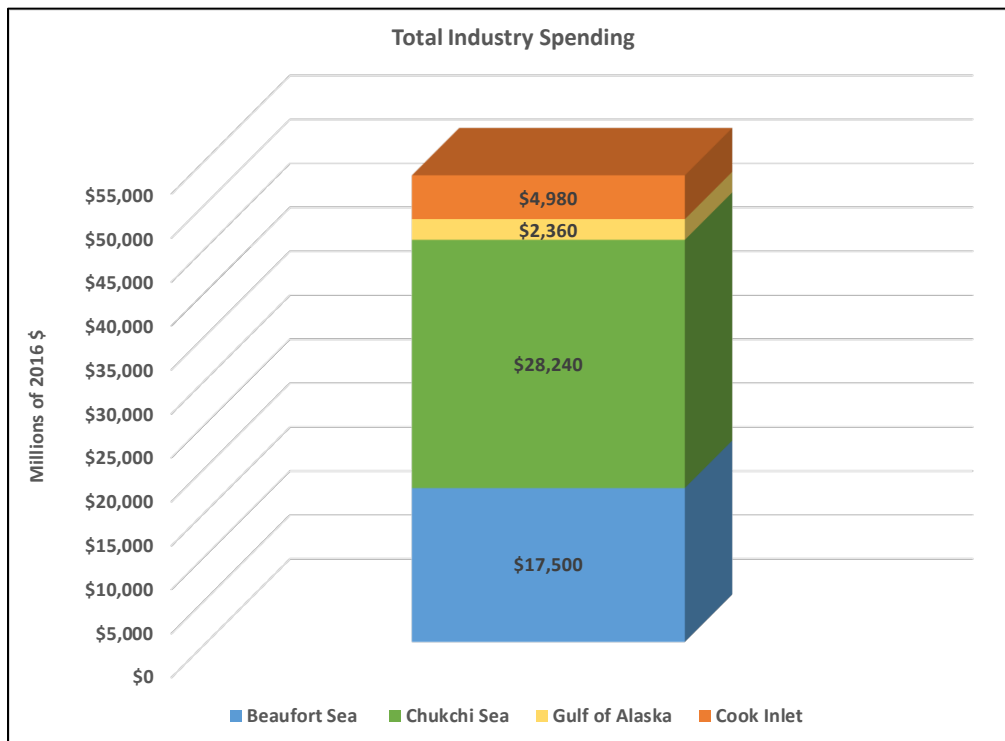
Source: Northern Economics estimates.

5 Conclusions

Petroleum development would generate industry investment; direct, indirect, and induced jobs and income; and revenues to the local, state, and federal governments. The magnitude of these economic benefits ultimately depends on the volumes of petroleum resources that might be discovered in the OCS areas, the levels of investment that oil and gas explorers, developers, and producers would be willing to spend in these areas, and the fiscal regime or tax structure that would be in effect as OCS petroleum development occurs. Assumptions about all these factors determine the results of the study.

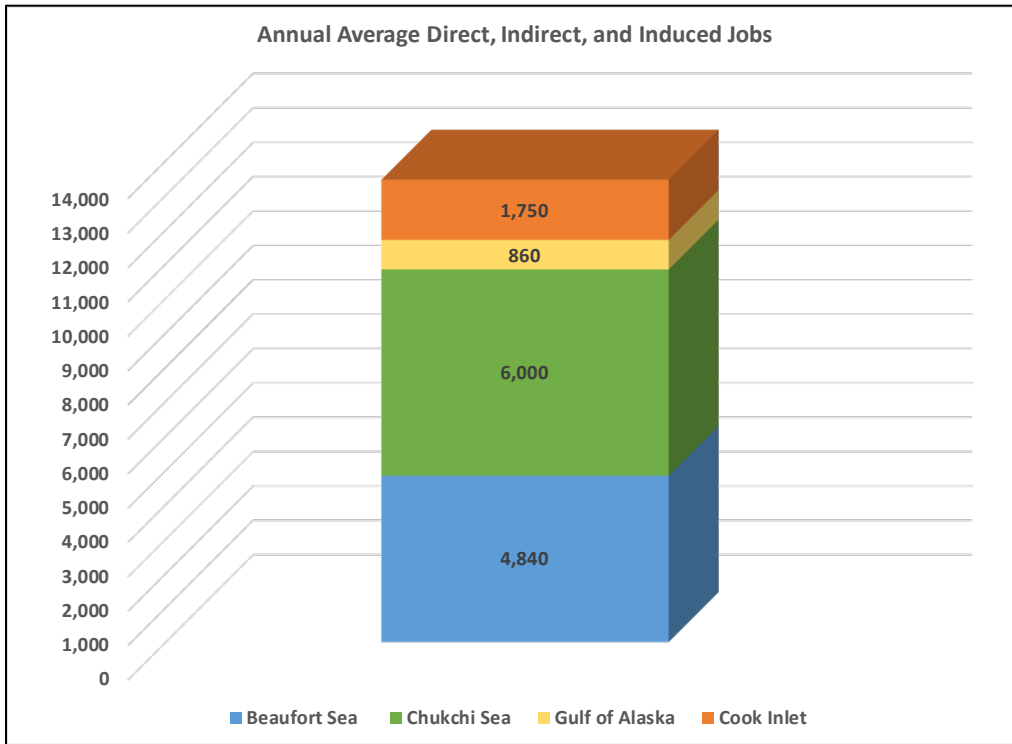
The following figures summarize the total potential economic benefits that could result from petroleum development over the timeframe of the analysis in the four selected Alaska OCS areas.

Figure 2. Projected Potential Total Industry Expenditures on Petroleum Development



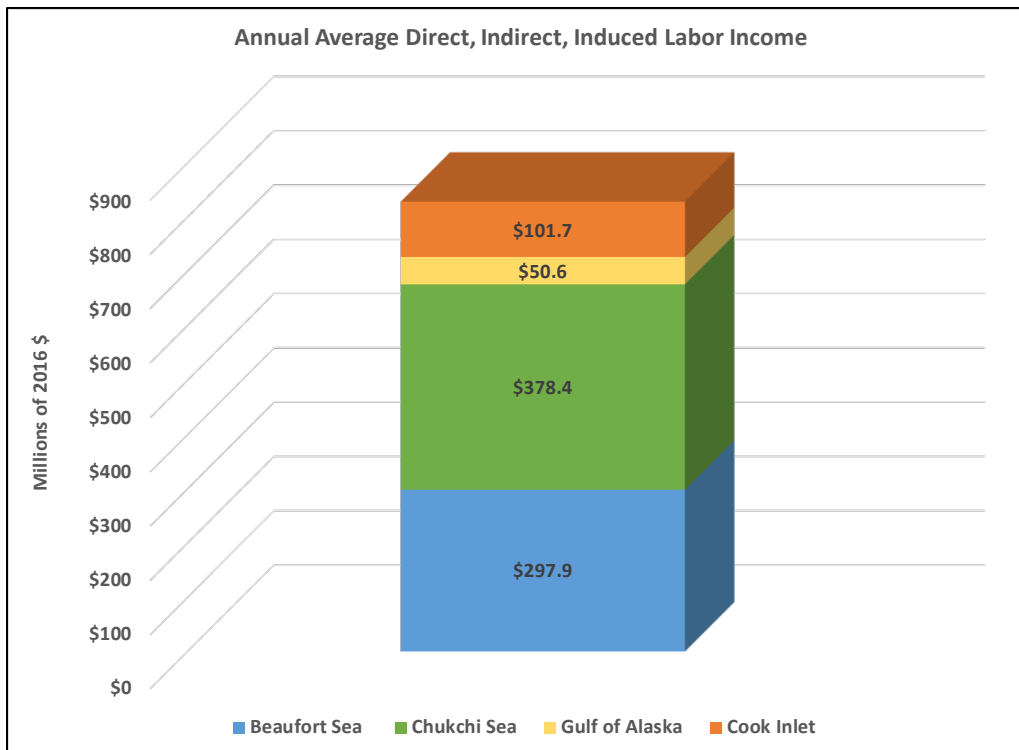
Source: Northern Economics estimates.

Figure 3. Projected Potential Total U.S. Annual Average Jobs



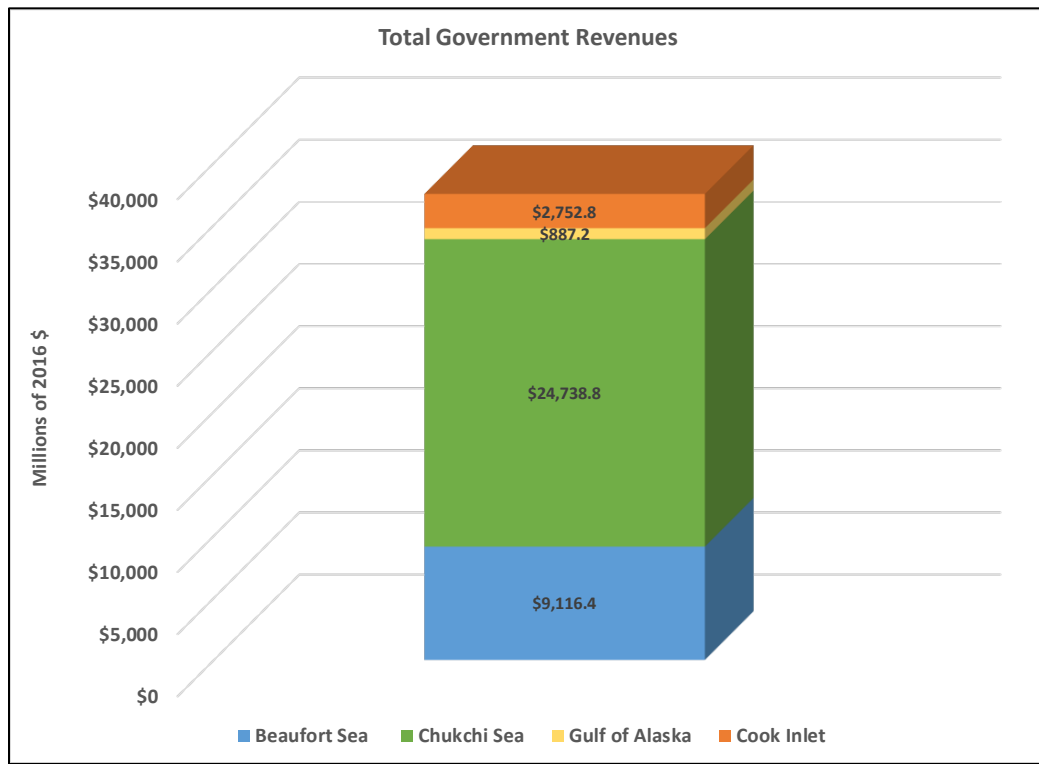
Source: Northern Economics estimates.

Figure 4. Projected Potential Total U.S. Annual Average Labor Income Effects



Source: Northern Economics estimates.

Figure 5. Projected Total Government Revenues



Source: Northern Economics estimates.

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