Possible Federal Revenue from Oil Development of ANWR and Nearby Areas

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Summary

Recent high petroleum prices, and the related economic burden on consumers and energy-intensive industries, has raised the issue of stimulating domestic supplies of crude oil. One possible source is the coastal plain of the Arctic National Wildlife Refuge (ANWR), which is estimated to contain significant quantities of oil and gas. Interest in developing the ANWR oil resources has also focused on the revenues that the federal government could collect should exploration and development be successful. Some observers have suggested using such revenues for purposes such as providing relief to petroleum consumers, further subsidizing energy conservation measures, or reducing federal budget deficits. However, current federal law prohibits the production of oil and gas in ANWR.

Federal revenues would consist primarily of corporate income taxes on profits earned by oil producers from the production and sale of ANWR oil. As landowner, the federal government would also collect royalties from such production on federal lands, which are included in the estimates. If producers were able to recover 10.3 billion barrels of oil over the life of the properties—the United States Geological Survey has estimated there is a 50-50 chance that the ANWR coastal plain contains at least this amount of oil—and if oil prices are $125/barrel, then the federal government might be able to collect $191 billion in revenues over the production period, estimated to be at least 30 years once production commences. This estimate consists of nearly $132 billion in federal corporate income taxes, and about nearly $59 billion in federal royalties. These estimates are subject to major limitations. Estimates of technologically recoverable oil used in this report include the resources from the federal lands, and assume the availability of resources in Native lands in the Refuge and offshore state lands. The Alaska Statehood Act would allot 90% of gross royalties to the state and 10% to the federal government.

The federal government would collect revenues from bonus bids from federal leases, and rents on undeveloped leases. These are not estimated separately by CRS. Independent estimates by the Congressional Budget Office for President Bush's FY2009 budget proposal show estimated bonus bid revenues of $6 billion between FY2011 and FY2018. Finally, income tax revenues from the secondary feedback effects would also increase as a result of the stimulus to general economic activity. However, these revenues are not included here due to the difficulty in estimation over the projection time horizon.

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Recent high petroleum prices, and the economic burden on consumers and energy-intensive industries, has raised the issue of stimulating domestic supplies of crude oil. One possible source is the coastal plain of the Arctic National Wildlife Refuge (ANWR), which is estimated to contain significant quantities of oil and gas. The coastal plain includes areas outside the ANWR boundary, but within the Refuge these areas are (1) the section 1002 area of federal lands;[1] (2) 92,000 acres belonging to Native Alaskan corporations; and (3) several thousand acres of Native allotments in various states of conveyance to individuals.[2] Interest in developing the ANWR oil resources has also focused on the significant revenues that the federal government could collect should exploration and development be successful. Observers have suggested using such revenues for purposes such as providing relief to petroleum consumers, further subsidizing energy conservation measures, or reducing federal budget deficits. However, current federal law prohibits this development.

This report estimates the potential revenues to the United States Treasury from ANWR oil development should Congress approve such development.[3] It has been prepared according to key oil price assumptions. More specifically, estimates of potential federal revenues are based on market oil prices—the price at which the ANWR output would be sold—of $60, $80, $90, $100, and $125 per barrel.[4] This report is not an analysis of the broader ANWR issue.

Key Assumptions and Caveats

These revenue estimates are premised on significant changes in federal legislation, as well as a number of other assumptions. To reach these estimates, the following was assumed: (1) Congress authorizes oil and gas production from ANWR; (2) commercial quantities of oil will be found, currently an unknown; (3) the current revenue division of 90% to Alaska and 10% to the federal government will be modified by Congress to allow a 50-50 split of royalties; (4) other current bidding systems apply such as bonus bidding and ad-valorem royalties of 12.5%; (5) Congress authorizes oil and gas production under Native-owned lands; and (6) all of the coastal plain, including state waters are available for leasing.[5]

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[1] This area of federal lands is referred to as the "section 1002 area" because of a study required in §1002 of the Alaska National Interest Lands Conservation Act (ANILCA, P.L. 96-487) of 1980. The current prohibition on oil and gas development in ANWR is in §1003 of ANILCA.

[2] The 92,000 acres belong to the Kaktovik Inupiat Corporation and the Arctic Slope Regional Corporation. The Native lands inside the ANWR boundary fall into three categories: approximately three townships of Native lands within the *geographic* coastal plain of the Refuge but outside the administratively defined 1002 area; one township of Native land also within the *geographic* coastal plain of the Refuge, but administratively part of the 1002 area; and a number of Native allotments scattered through the *geographic* coastal plain, with some concentrations along the coast and in the foothills. Offshore state lands are largely open to development, although the state and the federal governments have disputed precise boundaries. For legal background, see CRS Report RL31115, *Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuge (ANWR)*, by (name redacted). The May 2000 EIA report considered only the 92,000 acres. See *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment.* May 2000, SR/O&G/200-02, op. cit., p. vii.

[3] For background and a discussion of ANWR legislation and surrounding issues, see CRS Report RL33872, *Arctic National Wildlife Refuge (ANWR): New Directions in the 110th Congress.*

[4] S. 2758, introduced by Senator Murkowski on March 13, 2008, would open up ANWR to oil development if oil prices were to equal $125 per barrel or more for five consecutive days.

[5] In past Congresses (e.g., the 109th Congress), some bills have would have restricted ANWR development footprints to 2,000 acres, which might not be sufficient to provide access to the entire coastal plain of the Refuge. This analysis assumes production is permitted from the whole of the Coastal Plain, Native lands, and nearby state waters.

Federal revenues would consist primarily of corporate income taxes on profits earned by oil producers from the production and sale of ANWR oil. As landowner, the federal government would also collect royalties from such production on federal lands, which are included in the estimates. Revenues from bonus bids from federal leases, and rents on undeveloped leases, however, are not estimated separately, although Congressional Budget Office (CBO) estimates of bonus bids are reported. In addition, the federal government would collect income tax revenues from the secondary feedback effects as a result of the stimulus to general economic activity. However, these revenues are not included here due to the difficulty in estimation over an assumed 30-year production horizon. Note that all estimates of future revenues are not discounted to real 2008 dollars due to lack of available data; such discounting would result in much smaller revenue estimates.[6]

Estimates of technologically recoverable oil used in this report include the resources from the federal lands, and assume the availability of resources in Native lands in the Refuge and offshore state lands; however such availability is not within federal control. The estimates are based on a 1999 USGS study of the quantity of technically recoverable oil, and they assume that all technically recoverable oil is also economically recoverable.[7]

The revenue projections below are very long-term forecasts of what might happen, and not what will happen, given the methodology and the posited assumptions. All of the data used in this estimation are provided by the U.S. Energy Information Administration (EIA), as documented in the footnotes. In particular, the oil production data draws from a May 2000 EIA report based on the resource assessment estimated by the U.S. Geological Survey (USGS) in 1998.[8] Note also that, according to the EIA and the USGS, it would take between 7 and 12 years after congressional approval to commence production, if feasible, from the ANWR area. Further, production from the area is assumed to last at least 30 years.[9]

Also, other major uncertainties, in addition to the production feasability starting date and the lands that might be developed, include (1) the size of the underlying reserve base, (2) the underlying field structure, (3) the costs of development, (4) the market price of oil, (5) the average effective tax rate, and (6) the terms of the authorizing legislation. Thus, revenue projections are highly uncertain. Projections of federal revenue represent totals over the entire recovery period, until oil resources are no longer recoverable. Thus, they do not take into account any increased (or decreased) recovery based on changed economic conditions or the annual flow of production.

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[6] Revenue estimates are not discounted because they require annual production data for each year over the entire production time horizon. The 2008 EIA study shows the production profile for some years, but not over the entire production horizon; the May 2000 EIA study shows the production curves for the entire 60-year period but does not provide the raw data. See U.S. Department of Energy. Energy Information Administration. *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment.* May 2000, SR/O&G/2000-02; and U.S. Department of Energy. Energy Information Administration. *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge.* May 2008, SR/OIAF/2008-03.

[7] At very high oil prices, this is likely to be the case. See discussion under "Oil Output," below.

[8] U.S. Department of Interior. U.S. Geological Survey. *Economics of U.S. Geological Survey's 1002 Area Regional Assessment: An Economic Update*, Open File Report 98-34, 1999.

[9] The May 2000 EIA study, which estimates annual production profiles based on USGS's assessment of technically recoverable resources, estimates production schedules over a 60 year time horizon.

Finally, the projections below exclude potentially large revenues from the development of natural gas, which according to probability analysis may exist in large quantities in the ANWR coastal plain (particularly the 1002 federal area[10]). Revenue projections from natural gas development are excluded because there is currently no way to transport the gas to market (no pipeline or other means of transportation).[11]

Projected Total Revenues: Corporate Tax Receipts and Royalties

Table 1 summarizes the results of our estimation procedure, which is described in the remaining sections of this report. It shows a projected increase in corporate income tax revenues and cumulative estimated royalties projected over the estimated life of the ANWR and other nearby properties from the production and sale of the estimated technically recoverable reserves of oil. **Tables 2** and **3** show the corporate tax revenues and royalties separately.

Table 1 presents 15 projections (undiscounted for the time value of money), each corresponding to an oil price and production scenario. For instance, if producers were able to recover 10.3 billion barrels of oil over the life of the area—there is an estimated 50-50 chance that the ANWR coastal plain contains at least this amount of oil—and if oil prices average $90/barrel over the production lifetime of the area, then the federal government is projected to collect nearly $138 billion in revenues over the production period, estimated to be at least 30 years once production commences. This would consist of nearly $95 billion in federal corporate income taxes (**Table 2)**, and nearly $43 billion in federal royalties **(Table 3**). (Tables 2 and 3 are each presented below in the sections on the estimation procedure for corporate income taxes and royalties. These estimates assume that all of the oil that is technically recoverable is also economically recoverable, which is not necessarily the case. The amount of economically recoverable oil depends on unknown variables such as market oil prices and oil finding and transport costs. With regard to oil prices, the higher the price, the more the amount of economically recoverable reserves approaches the magnitude of technically recoverable reserves.

The development of the ANWR coastal plain would also generate federal revenues in the form of bonus bids from the leases on federal lands, and income tax revenues from secondary feedback and multiplier effects from an expanding economy. Bonus bids have been estimated by the Congressional Budget Office for President Bush's FY2009 budget proposal to lease the ANWR coastal plain. According to these estimates, bonus bids could total $6 billion between FY2011 and FY2018.[12] The additional federal income tax revenues (both individual and business) from the secondary economic effects are more difficult to estimate because they would depend on the annual expenditures generated by oil development, the geographic dispersion of those

[10] U.S. Geological Survey. *The Oil and Gas Resource Potential of the Arctic National Wildlife Refuge 1002 Area, Alaska*, op. cit.

[11] Building such a pipeline has been debated. But, even assuming a decision is made, it would take many years—at least 10 years, according to some estimates—to build such a pipeline to bring the gas to market.

[12] See U.S. Congress. Congressional Budget Office. *An Analysis of the President's Budgetary Proposals for Fiscal Year 2009*. March 2008. p. 15. Under the President's proposal, half of the bonus bid revenue would go to Alaska, and half would be retained by the federal government.

expenditures, and the state of the general economy at the time. Neither bonus bids nor income tax revenues from secondary effects are included in **Table 1**.

Table 1. Possible Cumulative Corporate Income Tax Revenue and Royalties from ANWR Coastal Plain Oil

(billions of $)

	Estimated Technically Recoverable Oil (billions of barrels)		
	At least 5.7 (prob. = 0.95)	At least 10.3 (prob.= 0.5)	16.0 or more (prob. = 0.05)
Oil Price per Barrel ($)	**Revenues (billions of $)**		
$125	$105.7	$191.1	$296.8
$100	$84.6	$152.9	$237.5
$90	$76.2	$137.6	$214.2
$80	$67.7	$122.3	$189.9
$60	$48.3	$91.7	$142.5

Source: CRS estimates based on EIA data (see text).

Note: These revenue projections represent values over the production period of approximately 30 years, and are not stated in present value terms, which would be smaller.

Projected Corporate Income Tax Revenues

Increases in federal corporate income taxes (**Table 2**) would most likely represent the single biggest source of revenue for the federal government if oil were found and produced in ANWR. The basic methodology to estimate potential corporate income taxes is to multiply estimated domestic, pre-tax profits from the assumed oil production at ANWR, projected over the lives of the properties, by the estimated effective federal corporate income tax rate for the major integrated companies that would be expected to have an interest in developing ANWR.

Domestic, pre-tax profits are the difference between revenues (price times output) and production costs. Five hypothetical oil price scenarios are assumed here (each in current dollars), reflecting the unpredictability (and volatility) of world crude prices: $125/barrel, $100/barrel, $90/barrel, $80/barrel, and $60/barrel. It is important to underscore that these are hypothetical price scenarios and do not constitute projections of what crude oil prices are likely to be.

Table 2. Possible Corporate Income Tax Revenues from Successful ANWR Coastal Plain Oil Development

(billions of $)

	Estimated Technically Recoverable Oil Output (billions of barrels)		
	At least 5.7 (prob. = 0.95)	At least 10.3 (prob. = 0.5)	16.0 or more (prob. = 0.05)
Oil Price per Barrel ($)	**Revenues (billions of $)**		
$125	$72.9	$131.7	$204.6
$100	$58.3	$105.4	$163.7
$90	$52.5	$94.8	$147.3
$80	$46.7	$84.3	$130.9
$60	$32.5	$63.2	$98.2

Source: CRS estimates based on EIA data (see text).

Note: These revenue projections represent values over the production period of approximately 30 years, and are not stated in present value terms, which would be much less.

Oil Output

Estimated oil output is based on a May 2000 report by the EIA, which is based on a 1999 USGS study that estimates the quantity of technically recoverable oil and gas.[13] This report estimates oil (and gas) output for the three areas of the geographic coastal plain (including areas outside the ANWR boundary) expected to be of interest to the oil industry should congressional approval for federal lands be forthcoming. In addition, prospects for development of Alaskan state lands (offshore lands outside the Refuge out to the 3-mile limit) would likely be increased by successful onshore development and were included in this analysis. Under §1003 of the Alaska National Interest Lands Conservation Act (P.L. 96-487), all lands inside ANWR are closed to development unless Congress changes the law. Were oil and gas development authorized for the federal lands in the Refuge, development might also be allowed or become feasible on the nearly 100,000 acres of Native lands in the refuge.

According to the 1999 USGS report assessing possible oil and gas in the three areas described above, there is a 95% probability that there are 5.7 billion barrels or more of technically recoverable crude oil and natural gas liquids in the three areas, and a 5% probability that there are 16.0 billion barrels or more. USGS's mean estimate—50% probability—is 10.3 billion barrels or more. About three-fourths of the possible oil and natural gas liquids[14] are estimated to be under federal lands, and one-fourth under Native Corporation lands and the adjacent offshore state lands.[15] Estimates of technically recoverable oil are those quantities producible using current

[13] Energy Information Administration. *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment*, op. cit.; U.S. Geological Survey. *The Oil and Gas Resource Potential of the Arctic National Wildlife Refuge 1002 Area, Alaska*, op. cit.

[14] For production calculations, natural gas liquids are considered to be equivalent to oil.

[15] U.S. Geological Survey. *Frontier Areas and Resource Assessment: the Case of the 1002 Area of the Alaska North Slope*. USGS Open File Report 02-119. Hereafter referred to as "*Frontier Areas.*"

recovery practices, but without regard to economic viability. The 1999 USGS study and the May 2000 EIA study were conducted when oil prices were much lower than today. As oil prices rise, the fraction of technically recoverable oil that is also economically recoverable rises. At today's record oil prices, most of the technically recoverable oil is likely also economically recoverable, although a precise estimate is not available.[16]

For each recoverable oil quantity and price combination scenario, federal corporate income tax revenue was estimated by (1) multiplying the quantity times the price, (2) subtracting production costs (operating costs plus depreciation, depletion, amortization, and administration), and (3) multiplying the result by the average effective federal corporate tax rate currently applicable to major U.S. energy producers.

Production Costs

Projections of production costs were based upon annual financial data on oil and gas industry operations published by the EIA in its *Performance Profiles* reports covering the major U.S.-based energy producing companies.[17] An eleven-year average (for 1995-2005) was used to remove the volatility of profits over business cycles and fluctuations in volatile market oil prices to reflect the long-term nature of oil development in the ANWR coastal plain, which, if successful, would be expected to produce oil for at least 30 years. Based upon the *Performance Profiles* data, production costs of domestic oil and gas producers averaged 69% of revenues over the 1995-2005 period and, consequently, net pre-tax profits for those companies averaged 31% of revenue.[18] That percentage was used to project net pre-tax profits from ANWR output over the life of the wells. The production cost percentage was based upon cost data for all domestic U.S. operations rather than just for Alaska, which are not available. The costs reflect the consolidated operations of largely major integrated producers, rather than just production operations. Exploration and production costs above the Arctic Circle are far higher than in the lower 48 states, but these are the only available data.[19] It was not possible to analyze factors that may increase production costs, but some may be important: time of year limitations, need for ice roads, the movement of equipment across permafrost and so forth.

The effective federal corporate income tax rate also was estimated using EIA's *Performance Profiles*. Based upon data in those reports, the average effective tax rate for the years 1998-2005 was 33%. This was derived by subtracting from the U.S. federal tax any foreign tax credit (which would not be claimed on income from ANWR operations), and dividing by U.S. pre-tax income.[20]

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[16] In another study of ANWR oil and gas resources, the USGS estimated that at a $30/barrel oil price, between 72% and 82% of the technically recoverable oil is also economically recoverable; at a $55/barrel oil price more than 90% of the technically recoverable oil becomes economic. See U.S. Department of Interior. U.S. Geological Survey. *Economics of 1998 U.S. Geological Survey's 1002 Area Regional Assessment: And Economic Update.* Open-File Report 2005-1359.

[17] Energy Information Administration. *Performance Profiles of Major Energy Producers (Issues 2005, 2004, 2002, 2000, 1998, and 1996).* Data used are in the table that reports Income Components and Financial Ratios in Oil and Natural Gas Production for Financial Reporting System Companies.

[18] Ibid.

[19] The May 2008 EIA report provides some data indicating that production costs above the Arctic Circle are much higher than production costs elsewhere. It estimates the costs of drilling the average deep well with the costs of drilling a deep well in Alaska's North Slope. See EIA's. *Analysis of Crude Oil Production in the Arctic National Wildlife Refuge.* Op. cit., p. 7.

[20] The effective tax rates were based upon both non-vertically integrated companies and vertically integrated companies. The EIA data are not disaggregated.

This effective tax rate probably is an upper bound; and the actual effective tax rate over the production horizon might end up being lower due to substantial industry investments in ANWR oil and gas development. Also, the estimation of the effective tax rate assumes that current tax legislation remains unchanged. Any future amendments to current tax laws could, of course, either lower or raise effective tax rates.

Federal Royalties

Landowners typically collect royalties on minerals extracted from their lands by mineral operators and producers. Likewise the federal government earns royalties from production of oil and gas on federal lands, generally 12.5% of the oil and gas value. The federal lands in ANWR have been estimated by the USGS to contain 74% of the estimated technically recoverable reserves. (The remaining 26% of estimated total recoverable oil resides in state and Alaska Native Corporation lands.)[21]

The Alaska Statehood Act allocates 90% of the royalties from oil and gas production on federal lands to Alaska; the federal government retains the remaining 10%.[22] However, our revenue projections assume a 50-50 split of all royalties, which is consistent with most current legislation.[23] Many, but not all, bills that would approve development of ANWR provide for a 50-50 division of the royalties. Some bills (e.g., H.R. 39 in the 109th Congress) have been silent on revenue distribution; thus, the current 90-10 split would retained. Obviously, a 90-10 division of the royalty revenues means that less revenue would remain for federal government use.

Table 3 shows the projected total royalties accruing to the federal government over the expected productive lifetime of the ANWR federal leases assuming a 50-50 split with the state. The same amount of revenues are projected to accrue to the State of Alaska. There would also be income to the State of Alaska regardless of whether economically recoverable oil is found. This is because even if no commercially recoverable oil were found, the State of Alaska would likely share in the bonus bids and rents over the short term (5-10 years) while the oil industry is searching for the oil.

[21] *Frontier Areas*, op. cit.

[22] The manner is which royalties are split between other states and the federal government differs. For all states except Alaska, direct royalties under the Mineral Leasing Act (MLA) are divided equally (50-50) between the state in which the deposits are located and the federal government. The MLA also provides that all states except Alaska also get back 40% from the Reclamation Fund (established by the Reclamation Act of 1902), in effect giving each state 90% of the royalties and the federal government 10%. Alaska does not receive allocations from the Reclamation Fund, so to equalize royalty treatment among the states, the Alaska Statehood Act and the Federal Land Policy and Management Act provide that Alaska's royalty share is 90% of the direct royalties (rather than 50%).

[23] For more information see CRS Report RL33523, *Arctic National Wildlife Refuge (ANWR): Controversies for the 109th Congress*, by (name redacted), (name redacted), and (name redacted).

Table 3. Projected Federal Royalties from Possible ANWR Oil on Federal Land Alone

(billions of $)

	Estimated Technically Recoverable Oil from Federal Lands (billions of barrels)		
	At least 4.2 (prob. = 0.95)	At least 7.6 (prob. = 0.5)	11.8 or more (prob. = 0.05)
Oil Price per Barrel ($)	**Revenues (billions of $)**		
$125	$32.8	$59.4	$92.2
$100	$26.3	$47.5	$73.8
$90	$23.7	$42.8	$66.9
$80	$21.0	$38.0	$59.0
$60	$15.8	$28.5	$44.3

Source: CRS estimates based on EIA data (see text).

Note: These revenue projections represent values over the production period of approximately 30 years, and are not stated in present value terms, which would be smaller.

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