American Petroleum Institute

Economic Benefits of Onshore Federal Oil and Natural Gas Leasing from FY 2013 – 2022

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Executive Summary

The development of oil and natural gas resources on federal lands yields significant economic benefits. The oil and natural gas industry generates direct benefits via production on federal lands and revenue sharing in which approximately 50 percent of bonuses, rents, and royalties are shared with the state where they occur. These benefits bolster local government services like education and healthcare. Additionally, the oil and natural gas industry also generates indirect economic benefits that arise from the industry's purchases of goods and services, along with induced benefits that result from direct and indirect labor spending the income they earn from the industry.

To analyze these impacts, we utilize the IMPLAN model. This model relies on publicly available "input-output" tables from the US Bureau of Economic Analysis which establishes connections between industries' purchases and their corresponding output. In this study we examine the benefits of onshore federal leasing generated between FY 2013 and FY 2022 with a specific focus on development in New Mexico, Wyoming, North Dakota, Colorado, and Utah. We find that in FY 2022, onshore federal oil and natural gas development supported nearly 250 thousand jobs, generated $19.4 billion in labor income, and contributed $36.7 billion to GDP. Between FY 2013 and FY 2022, we estimate that onshore federal oil and natural gas leasing supported an average of 190 thousand jobs, generated $13.4 billion in labor income, and contributed $24.2 billion to GDP each year.

Economic Benefits of Federal Leasing, FY 2013 – FY 2022

Completion Cost Estimates

Wells Spud

Based on Bureau of Land Management (BLM) data, five states represented 95.5 percent of the 2,063 well bores started on federal lands in FY 2022—New Mexico (59.3 percent), Wyoming (14.5 percent), North Dakota (8.0 percent), Colorado (8.0 percent), and Utah (5.6 percent). Between FY 2013 and FY 2022, 92.2 percent of wells spud were located in the five aforementioned states—see Figure 1. Given that New Mexico, Wyoming, North Dakota, Colorado, and Utah account for the majority of wells spud as well as oil and natural gas production on federal lands, we focus on these five states and combine all other states.

Figure 1. Wells Spud by State and Period

State	Wells Spud, FY 2022	Percent	Well Spud, FY 2013 - FY 2022	Percent
New Mexico	1,223	59.3	7,037	39.2
Wyoming	300	14.5	4,419	24.6
North Dakota	166	8.0	1,771	9.9
Colorado	165	8.0	1,900	10.6
Utah	116	5.6	1,411	7.9
Other	93	4.5	1,408	7.8
Total	2,063	100	17,946	100

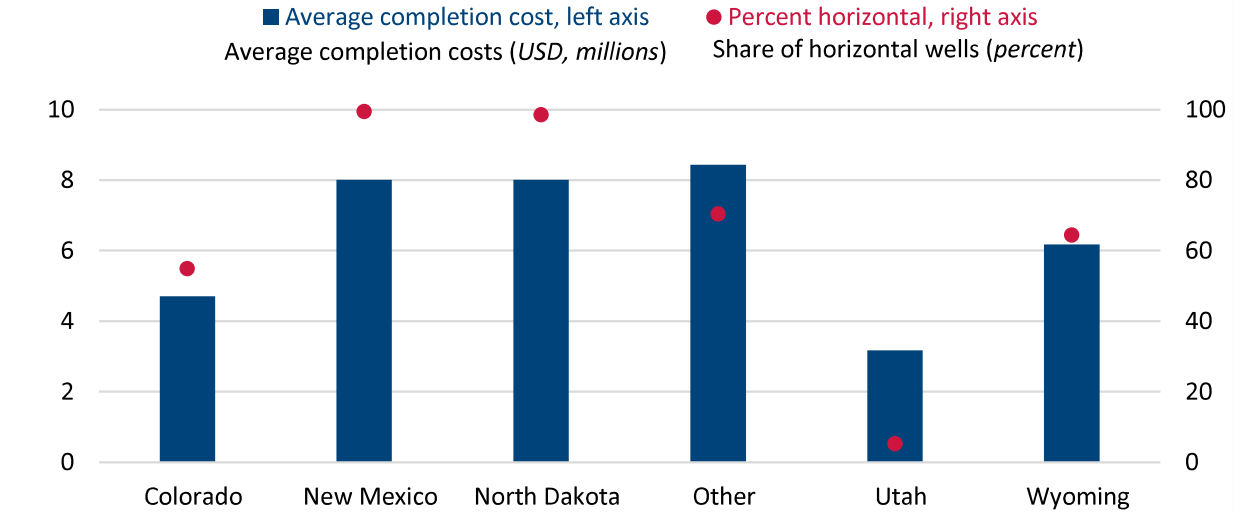
Source: Bureau of Land Management.
Note: This figure does not include "Indian leases."

Average Completion Costs per Well Bore

Rystad Energy collects and estimates completion costs for over 500 thousand wells and separates these costs into ten categories—drilling services, facilities, fuel and power, oil country tubular goods, other completion costs, other drilling costs, proppant, rig, stimulation, and water. We restrict the wells in our sample to those drilled between FY 2013 and FY 2022, that had a BLM lease and were not on Indian land. These restrictions reduce the number of wells spud between FY 2013 and FY 2022 to 16,200, roughly matching BLM's well spud estimates. As in the BLM data the top five federal oil and natural gas producing states, in Rystad's data, represent roughly 95.0 percent of wells spud on federal land between FY 2013 and FY 2022.

We generate average completion costs by state and fiscal year, using Rystad's cost data based on the well's spud date. In FY 2022, the average cost of a completed well on federal lands was $7.0 million. State well completion costs ranged from $3.2 (Utah) to $8.0 (North Dakota) million—see Figure 2. These cost differences are partly explained by well direction. For example, whereas 94.7 percent of wells spud on federal lands in Utah were either directional or vertical, in North Dakota 98.5 percent of wells spud on federal lands were horizontal. Relative to directional or vertical wells, horizontal wells have higher completion costs. In FY 2022, 82.6 percent of wells spud on federal lands were horizontal. Compared to FY 2013, the percentage of wells spud that are horizontal (34.6 percent) has increased 48 percentage points. While horizontal wells, typically, have higher completion costs than vertical wells, they are generally more productive and reduce oil and natural gas well's surface footprint.

Figure 2. Average Completion Costs and Well Direction by State, FY 2022

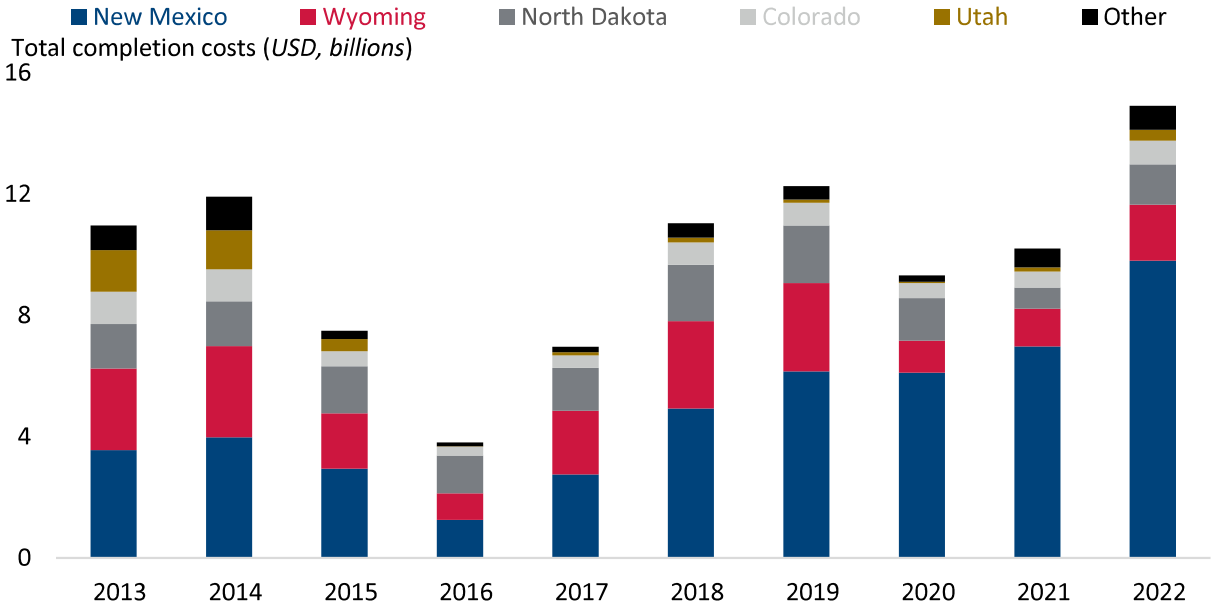


Sources: Rystad Energy; API calculations.

Total Federal Onshore Completion Costs

Having determined average completion costs by state, we estimate total completion costs by multiplying Rystad's well completion cost data by BLM's well spud data. This procedure generates total completion costs by state and fiscal year—see Figure 3. Between FY 2013 and FY 2022, firms spent $98.8 billion on onshore federal well completions or about $9.9 billion per year. Completion costs in New Mexico (49 percent), Wyoming (21 percent), and North Dakota (15 percent) represented 84 percent of total onshore federal well completion expenditures. In FY 2020, completion costs dropped 24 percent year over year but have rebounded thereafter. In FY 2022, total completion costs were roughly $15 billion and were up 46 percent year over year.

Figure 3. Total Well Completion Costs by State, FY 2013 - 2022



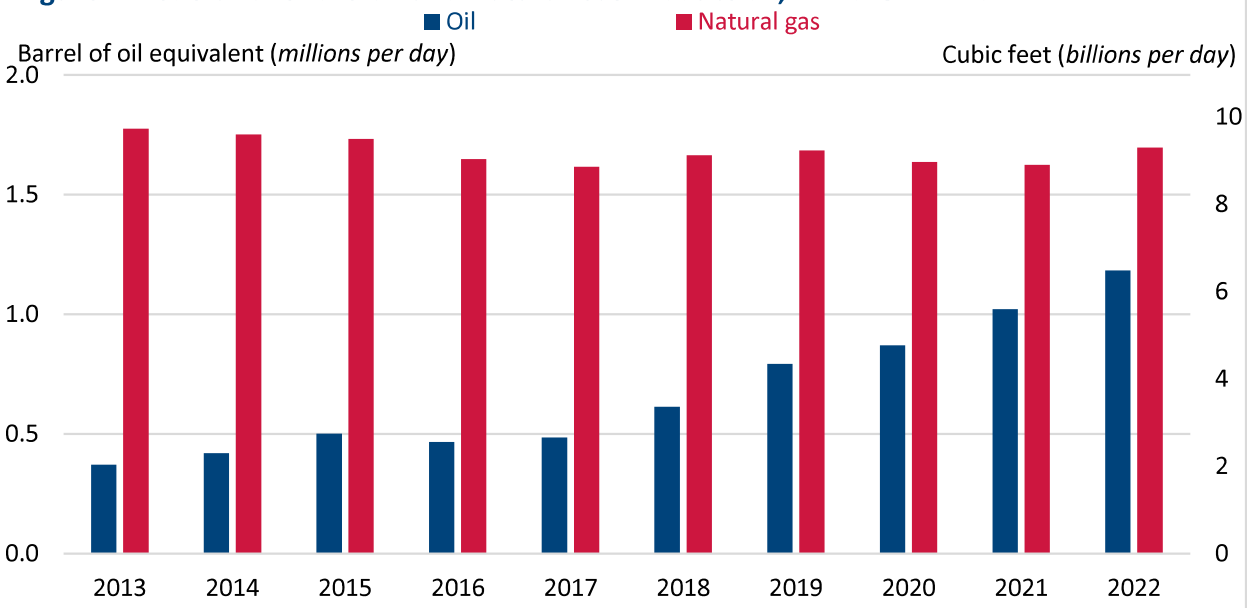
Sources: Rystad Energy; Bureau of Land Management; API calculations.

Production Estimates

Federal Production Estimates

We estimate production expenditures by state and fiscal year using Rystad's per barrel of oil equivalent (BOE) cost estimates and the Office of Natural Resources Revenue's (ONNR) production data. First, we use ONNR's production data to determine onshore federal natural gas and oil production[1] in BOE[2] terms. Between FY 2013 and FY 2022, federal lands produced roughly 1.7 million BOE of natural gas per day and about 672 thousand barrels per day of oil. Over the ten year period, federal lands produced 8.6 billion BOEs of natural gas (6.1 billion) and oil (2.5 billion)—Figure 4. While natural gas production has declined by 4.4 percent between FY 2013 and FY 2022, oil production has tripled. Over the same period, ninety-five percent of production occurred in Wyoming (36 percent), New Mexico (33 percent), Colorado (16 percent), Utah (6 percent), and North Dakota (5 percent).

Figure 4. Federal Onshore Oil and Natural Gas Production, FY 2013 - FY 2022



Sources: Office of Natural Resources Revenue; API calculations.
Notes: Production estimates do not land classes designated as "mixed exploratory" or "Native American."

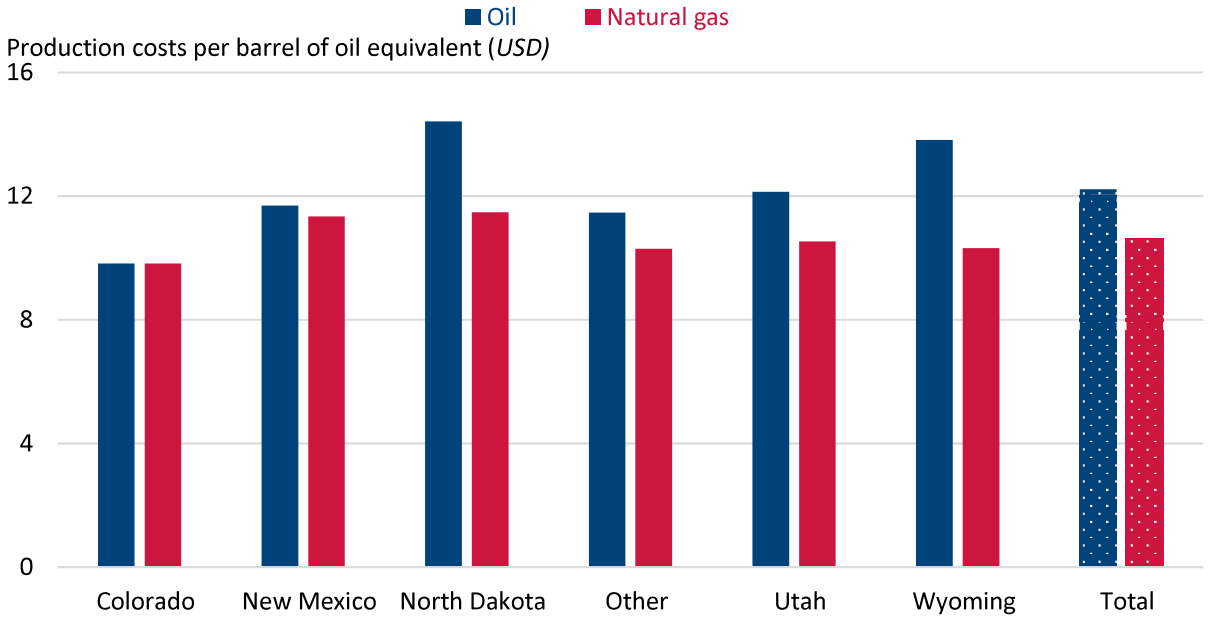
[1] We only include production on the land classes designated "federal" which excludes "mixed exploratory" and "Native American" land classes.
[2] We convert natural gas thousand cubic feet (MCF) to barrel of oil equivalents using a conversion factor of 5.478.

Production Cost Estimates Per Barrel of Oil Equivalent

Rystad estimates production cost per BOE by product type—i.e., oil and natural gas—and includes costs associated with taxes; selling, general and administrative expenses; transportation; production; and abandonment. Rystad presents their production cost estimates by state and calendar year. Their data does not allow us to derive production cost estimates, specifically, for federal lands as Rystad's per barrel production estimates include all onshore production. However, we believe that the composition of private and federal wells is likely similar and that their production costs do not vary substantially excluding federal royalties which we discuss in the following section.

We find that the average unweighted production cost associated with a barrel of oil is roughly $12 and that the average unweighted production cost associated with a BOE of natural gas is about $11. However, we find that average production costs vary by state—see Figure 5. For example, in California the average production cost per barrel of oil was $22, over the period, which is about 1.6 times higher than the US average unweighted production cost per barrel of oil. Similarly, in California the average natural gas production cost per barrel of oil equivalent was $16, over the period, which is about 1.4 times higher than the national unweighted average production cost per barrel of oil equivalent.

Figure 5. Average Production Costs per Barrel of Oil Equivalent, 2013 - 2022

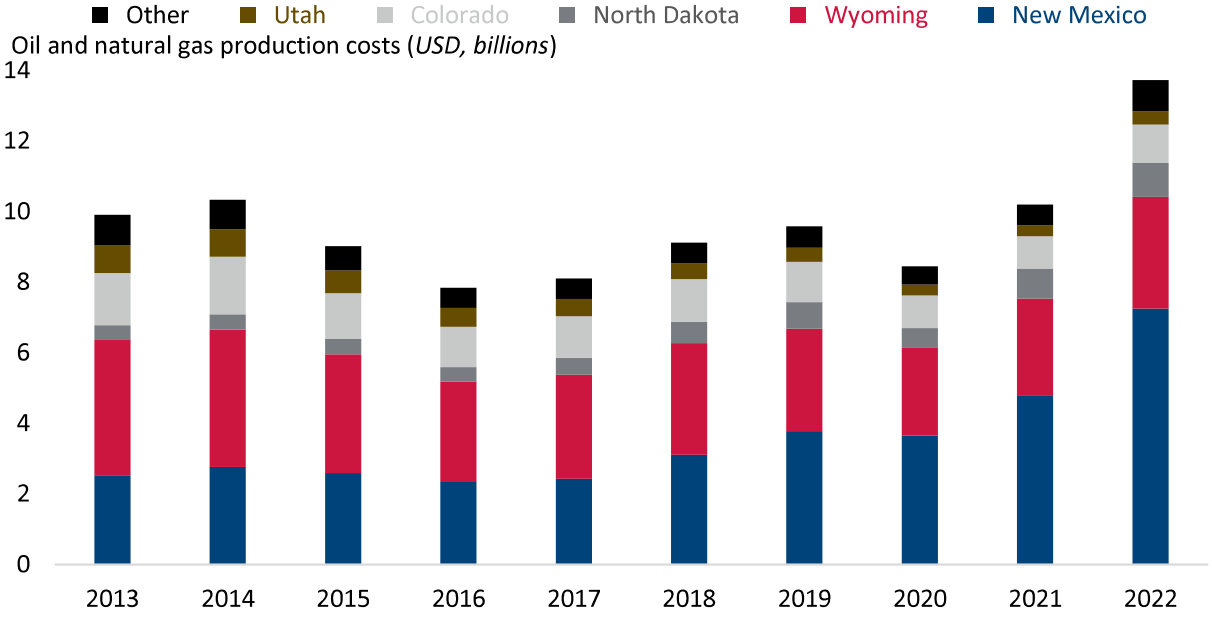


Sources: Rystad Energy; API calculations.

Total Production Costs

We generate total production costs by state and fiscal year, using Rystad's per barrel of oil equivalent production cost data in combination with ONNR's production data.[3] Multiplying Rystad's, respective, per barrel production costs by ONNR's, corresponding, production data generates our total production cost estimates—see Figure 6. We estimate that, between FY 2013 and FY 2022, firms spent $92 billion on production costs, roughly $9.2 billion each year. Production costs were primarily located in Wyoming (35 percent), New Mexico (33 percent), and Colorado (13 percent) representing 82 percent of total expenditures.

Figure 6. Total Federal Land Production Expenditures by State, FY 2013 - 2022



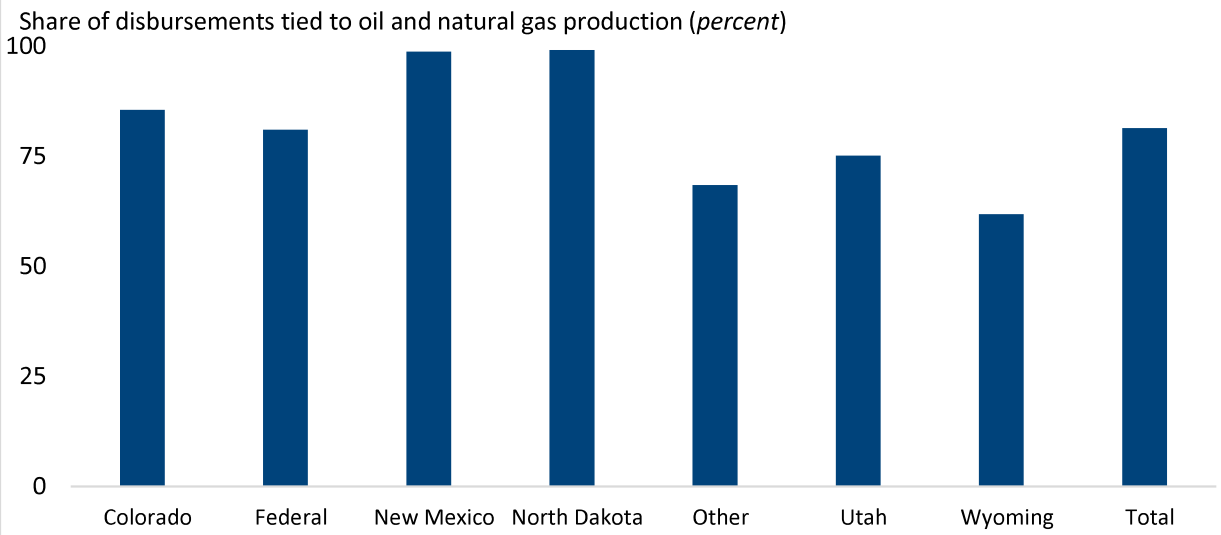
Sources: Rystad Energy; Office of Natural Resources Revenue; API calculations.

[3] Because Rystad presents their data in calendar years and the rest of our study is in fiscal years, we match the nearest calendar year in Rystad's production cost data to the nearest fiscal year in ONNR's production data.

Oil and Natural Gas Disbursements

We estimate disbursements generated by federal onshore oil and natural gas production using ONNR disbursement data.[4] ONNR only offers disbursement data by commodity as of FY 2017. Prior to FY 2017, ONNR did not distinguish disbursements by commodity. We estimate disbursements by commodity between FY 2013 and FY 2016 as follows. First, we use ONNR's FY 2017 – FY 2022 data excluding disbursements tied to offshore production and fund types designated as Native American Tribes & Allottees. Second, we group disbursements into two categories 1) oil and natural gas[5] and 2) other such as wind, sulfur, etc. Finally, we determine the percent of disbursements that were tied to oil and natural gas production by recipient and fiscal year.[6] Between FY 2017 and FY 2022, the percentage of disbursements that were tied to oil and gas production varied by recipient—see Figure 7. For example, in New Mexico and North Dakota almost all disbursements were tied to onshore oil and natural gas production, while in "other" states only 66 percent of disbursements were tied to onshore oil and natural gas production.

Figure 7. Average Share of Onshore Disbursements Tied to Oil and Natural Gas Production by Recipient, FY 2017 - FY 2022

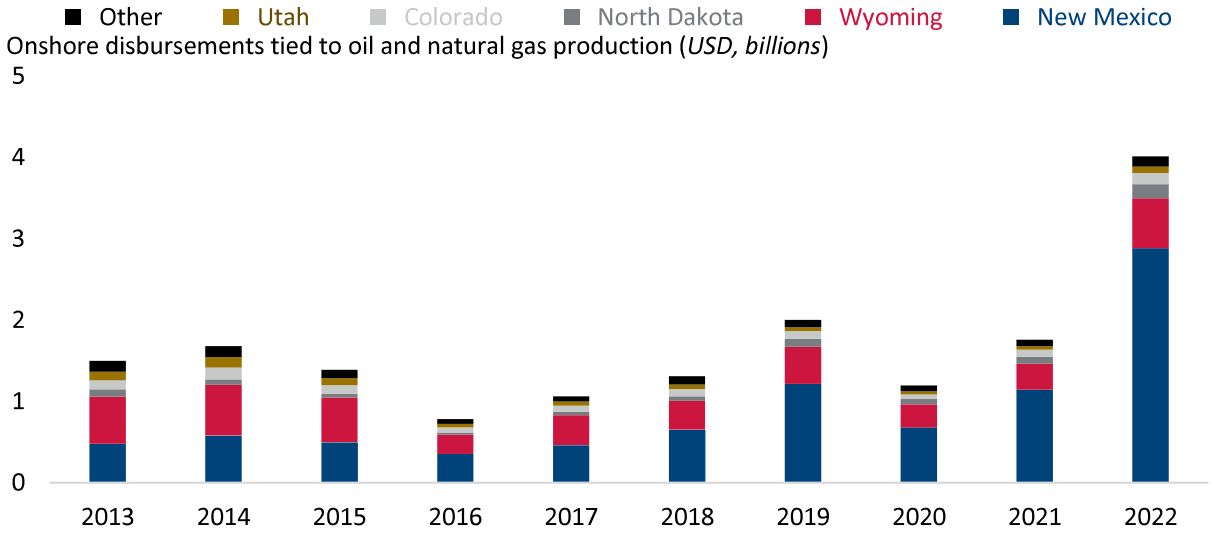


Sources: Office of Natural Resources Revenue; API calculations.
Notes: In New Mexico and North Dakota, the proportion of disbursements allocated to oil and gas, ocassionally, exceeded a 100 percent. We capped disbursements at 100 percent.

[4] We rely on disbursement data instead of revenue data because it allows us to identify the recipient of the disbursement which is required for our IMPLAN calculations.
[5] Oil and natural gas include commodities identified as oil & gas (pre-production), oil, and gas.
[6] In New Mexico and North Dakota, the proportion of disbursements allocated to oil and gas exceeded a 100 percent. We capped disbursements at a 100 percent.

We then apply our ratios of onshore disbursements between FY 2017 and FY 2022 by recipient to ONNR's FY 2013 and FY 2016 disbursement data[7], to approximate the share of disbursements that were likely tied to oil and natural gas production on federal lands—see Figure 8. We find that, between FY 2013 and FY 2022, recipients received a total of $35 billion in oil and natural gas disbursements equal to roughly $3.6 billion a year. Fifty-three percent ($19 billion) of disbursements went to the federal government or programs, while state and local governments received the remaining 47 percent. Of the 47 percent of disbursements that went to state and local governments, New Mexico and Wyoming received 80 percent (roughly $13 billion).

Figure 8. Onshore Disbursements Tied to Oil and Natural Gas Production by Recipient, FY 2013 - FY 2022



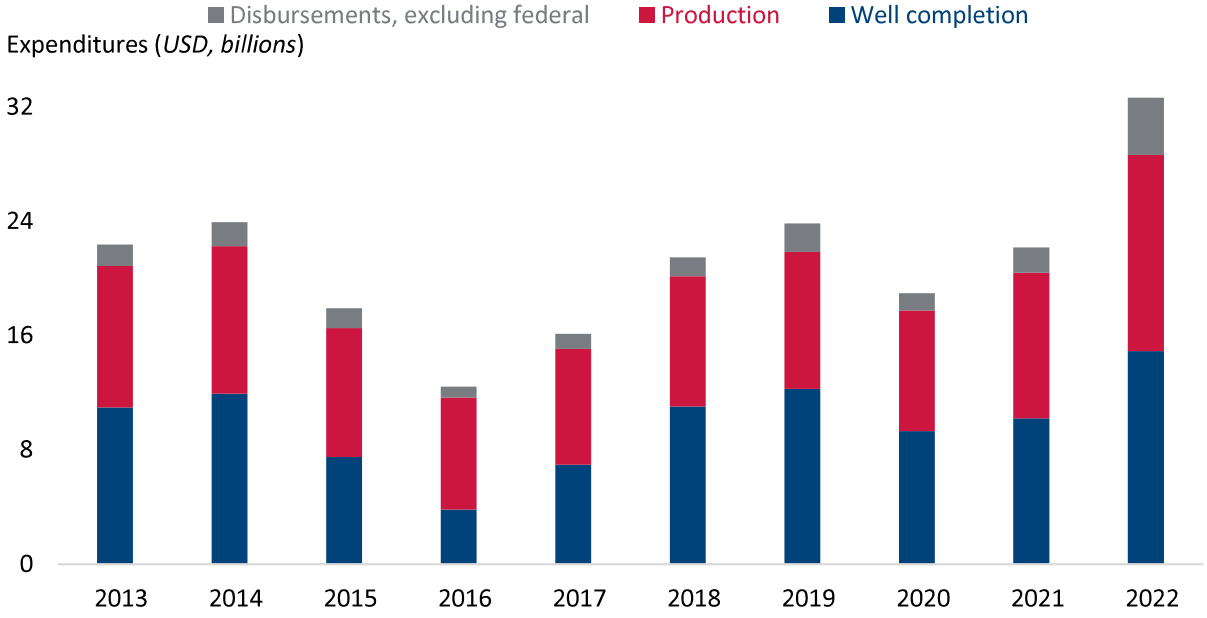
Sources: Office of Natural Resources Revenue; API calculations.
Notes: We estimate FY 2012 to FY 2016 disbursements based on the share of oil and natural gas disbursements between FY 2017 - 2021. This figure does not include disbursements to the federal government or federal programs.

[7] We remove disbursements that are not identified as onshore or that are tied to "Native American tribes and individuals" fund types. These changes align ONNR's FY 2012 – FY 2016 data, with ONNR's FY 2017 – FY 2022 data.

Total Expenditures and Disbursements

Between FY 2013 and FY 2022, firms spent roughly $212 billion on federal onshore oil and natural gas production—disbursements, excluding federal ($16.7 billion), production ($96.2 billion), and well completion ($98.8 billion). Over the period, average expenditures were roughly $21.2 billion per year. Total expenditures were clustered regionally, New Mexico (44 percent), Wyoming (27 percent), North Dakota (10 percent), and Utah (10 percent). To determine these expenditures impact on employment and economic growth we use IMPLAN and allocate total expenditures to impact categories that correspond to the specific expenditures and state where they occurred.[8] We do not include oil and natural gas disbursements received by the federal government in our economic modelling—see Figure 9.

Figure 9. Total Expenditures by Category, FY 2013 - FY 2021



Sources: Bureau of Land Management; Rystad Energy; Office of Natural Resources Revenue; API calculations.

[8] The IMPLAN categories we use for well completion costs are 29 (sand and gravel mining), 35 (drilling oil and gas wells), 36 (support activities for oil and gas operations), 49 (water, sewage and other systems), 216 (Iron, steel pipe and tube manufacturing from purchased steel), 264 (oil and gas field machinery and equipment manufacturing), and 399 (wholesale, petroleum and petroleum products). We group all production expenditures into the IMPLAN category 20 (oil and natural gas extraction). We distribute oil and natural gas disbursements between four IMPLAN categories—539 (state education), 540 (health services), 541 (other state) and 542 (local education)—based on IMPLAN's state level estimates of payroll expenditures. In all cases, we allocate the expenditures to the states that they accrue expect for OCTG costs which we assign to "other" states as little OCTG expenditures occur in the five states where the lion share of oil and natural gas production occurs.

Employment and Economic Benefits

Using the IMPLAN model we find that in FY 2022, onshore federal oil and natural gas development supported nearly 250 thousand jobs, generated $19.4 billion in labor income, and contributed $36.7 billion to GDP—see Figure 10. Notably, drilling and development contributed the most to total jobs and labor income, while extraction resulted in the highest total GDP. While direct benefits primarily accrue to five states with the most federal oil and natural gas development the indirect and induced impacts reach the entire US economy—see Figure 11. The "other" category experiences the highest indirect and induced economic effects, reflecting the widespread influence of supply chain purchases and general induced spending. New Mexico currently leads with the largest economic impact, accounting for approximately 40 percent of the total US impact.

Figure 10. Economic Benefits of Federal Oil & Natural Gas Leasing, Fiscal Year 2022

Source	Employment (*thousands*)			Labor Income (*billions, USD*)			GDP Contributions (*billions, USD*)		
	Direct	Indirect & induced	Total	Direct	Indirect & induced	Total	Direct	Indirect & induced	Total
Extraction	12.1	58.8	71.0	1.5	4.8	6.3	8.6	7.4	16.0
Drilling & Development	35.6	76.9	112.6	3.6	5.2	8.8	6.2	9.0	15.1
Revenue Sharing	48.1	15.8	63.9	3.5	0.8	4.3	4.0	1.5	5.6
Total	95.8	151.6	247.4	8.6	10.8	19.4	18.8	17.9	36.7

Sources: Bureau of Land Management; Rystad Energy; IMPLAN; API calculations.
Notes: US impacts only.

Figure 11. Economic Benefits of Federal Oil & Natural Gas Leasing by State, FY 2022

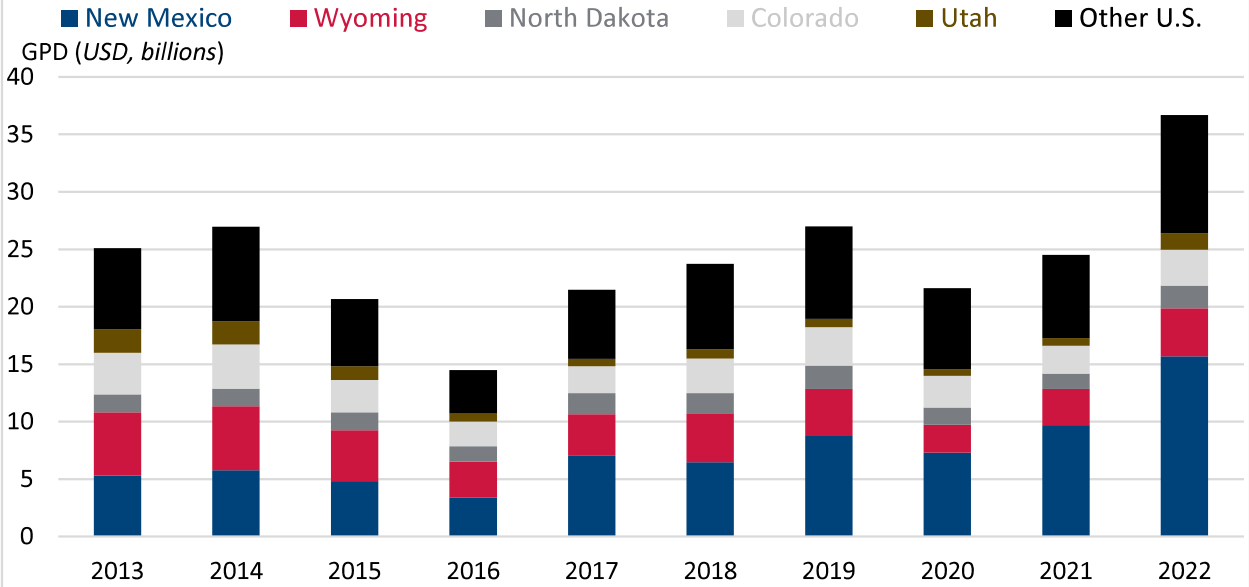
Source	Employment (*thousands*)			Labor Income (*billions, USD*)			GDP Contributions (*billions, USD*)		
	Direct	Indirect & induced	Total	Direct	Indirect & induced	Total	Direct	Indirect & induced	Total
Colorado	4.4	16.6	21.0	0.9	1.4	2.3	1.1	2.1	3.1
New Mexico	64.0	41.3	105.3	5.2	2.2	7.4	11.5	4.2	15.7
North Dakota	5.5	4.5	10.0	0.5	0.3	0.8	1.5	0.5	2.0
Utah	3.0	8.1	11.2	0.2	0.6	0.8	0.6	0.9	1.4
Wyoming	15.1	9.3	24.4	1.3	0.5	1.8	3.2	0.9	4.2
Other	3.8	71.7	75.5	0.5	5.8	6.3	1.0	9.4	10.3
Total	95.8	151.6	247.4	8.6	10.8	19.4	18.8	17.9	36.7

Sources: Bureau of Land Management; Rystad Energy; IMPLAN; API calculations.
Notes: US impacts only.

Examining ten-year trends of employment labor income, and GDP—see Figure 12 and 13—FY 2022 stands out as the year with the most substantial economic impact, largely driven by the growing impacts of the New Mexico portion of the Permian Basin. Colorado, Utah, and Wyoming have generally shown declining economic impacts from federal Leasing over the last decade, with a minor post-COVID-19 economic rebound in 2022. Conversely, North Dakota's economic impacts have exhibited variations over the years, without showing a definitive upward or downward trend. We find that between FY 2013 and FY 2022,

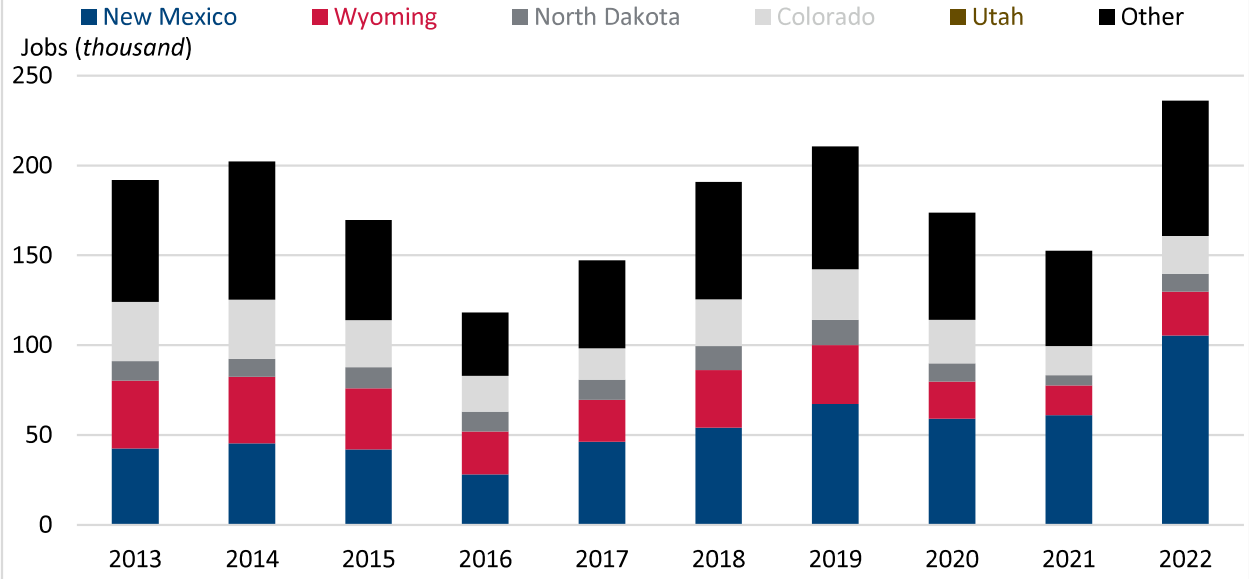
onshore federal oil and natural gas leasing supported an average of 190 thousand jobs, generated $13.4 billion in labor income, and contributed $24.2 billion to GDP each year.

Figure 12. GDP Supported by Onshore Federal Oil & Natural Gas Leasing by FY



Sources: Bureau of Land Manegement; Rystad; IMPLAN; API calculations.
Notes: Includes benefits from production, drilling and development, and Federal revenue sharing. Revenue sharing supports state and local governments.

Figure 13. Jobs Supported by Onshore Federal Oil & Gas Leasing by FY



Source: BLM, Rystad, IMPLAN, API Calculatoins
Notes: Includes benefits from production, drilling and development, and Federal revenue sharing. Revenue sharing supports state and local govenments.

Conclusion

The development of oil and natural gas resources on onshore federal lands yields significant economic benefits. We find that in FY 2022, onshore federal oil and natural gas development supported nearly 250 thousand jobs, generated $19.4 billion in labor income, and contributed $36.7 billion to GDP. Between FY 2013 and FY 2022, we estimate that onshore federal oil and natural gas leasing supported an average of 190 thousand jobs, generated $13.4 billion in labor income, and contributed $24.2 billion to GDP each year.