

The Estimated Effects of a Federal Leasing Pause:

A review of the modeling consensus and why a 2020 study by Timothy J. Considine fails to compute

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Authored by Laura Zachary, Managing Director of Apogee Economics & Policy¹

On January 27, 2021, President Biden signed Executive Order (E.O.) 14008, directing a pause on issuing new federal oil and gas leases until a comprehensive review of the program's permitting and leasing practices is complete.² With claims flying around about the harmful impacts of the current leasing pause, it is important to look at what research consensus indicates rather than spreading misinformation. Statements about immediate and severe economic and employment impacts due to a leasing pause often rely on findings from a December 2020 study by Timothy J. Considine, hereafter Considine 2020.³ In this review I first compare findings across published models that make relevant projections about the near-term production impacts of a leasing pause and then take a deeper look at the methods used by the often-cited Considine 2020 report to try to understand why its findings are so out of line with the other models. The Considine 2020 study has numerous weaknesses that exaggerate the potential production and economic impacts of a leasing moratorium by between an estimated 70-85%. While the report highlights the known need for climate policies to be designed in ways that help address fiscal and economic transitions, the report findings quickly unravel when we examine its problematic assumptions and methods.

Modeling Consensus Finds No Negative Impact to US Oil and Gas Production in Year 1 of a Leasing Pause and Negligible Production Impacts in Year 2

Considine 2020 found federal onshore drilling across 8 western states would be cut by 62% within the first year of a leasing moratorium. These conclusions are inconsistent with findings from four other published modeling results. Modeling conducted by the U.S. Energy

¹ I have no relevant or material financial interests related to the research described in this review. All judgments and conclusions of this review are entirely my own. I am grateful to Brian Prest from Resources for the Future for his related research insights and his annual modeling results from RFF Working paper 20-16 to compare findings across available published projections for the impacts of a hypothetical permanent leasing ban. The Wilderness Society provided financial support to conduct an initial review of the Considine 2020 study back in December 2020. In May 2021 I was invited to testify on my investigations into these studies in front of the US House Committee on Natural Resources at a Subcommittee on Oversight and Investigations hearing held on May 19, 2021. This updated review includes the findings of my review of existing modeling results and a more extensive review of the Considine 2020 study. I am available for questions at Laura@apogeeep.com.

² Executive Office of the President. Executive Order (E.O.) 14008 of Jan 27, 2021. Tackling the Climate Crisis at Home and Abroad. 86 FR 7619. <https://www.federalregister.gov/documents/2021/02/01/2021-02177/tackling-the-climate-crisis-at-home-and-abroad>

³ Considine TJ, 2020. The Fiscal and Economic Impacts of Federal Onshore Oil and Gas Lease Moratorium and Drilling Ban Policies. Released by Wyoming Energy Authority in December 2020.

Information Administration (EIA),⁴ an economist at the non-partisan economic think tank Resources for the Future,⁵ economists at the Federal Reserve Bank of Dallas,⁶ and a report by Energy & Industrial Advisory Partners (EIAP)⁷ all estimate no reduction in US production from a leasing moratorium in year 1, and negligible impacts in year 2.⁸ To evaluate the relevance of research findings to claims about expected impacts of the current temporary federal leasing pause, this review focuses on the estimated impacts of a leasing moratorium in the near term. To enable better comparisons across modeling results, I refer to findings of a leasing moratorium compared to the baseline (business-as-usual) scenario by length of time since the pause began (e.g., year one and year two).

- 1) Economist Brian Prest, a fellow at the non-partisan economic think tank Resources for the Future (RFF), found that a permanent end to new federal leasing would not primarily affect production until more than a decade into the future (after 2030).⁹ This decade lag in production impacts occurs because a change in leasing policy will not impact the large stock of existing leases, including the millions of acres recently issued under the Trump administration. Operators typically do not begin development until just prior to expiration of the 10-year initial lease term, and once production begins then federal leases are extended indefinitely.¹⁰

Dr. Prest custom built a detailed model of the US upstream oil and gas industry that specifically differentiates between the economics of federal versus nonfederal oil and gas production. Prest designed the model to simulate the production impacts of potential federal leasing policies and provides breakdowns that enable important comparisons to findings of

⁴ Energy Information Administration. Short Term Energy Outlook (STEO) March 2021. p.14-15. <https://www.eia.gov/outlooks/steo/archives/mar21.pdf> [hereinafter EIA STEO 2021].

⁵ Supplemental annual results from Prest, B. Supply-Side Reforms to Oil and Gas Production on Federal Lands: Modeling the Implications for Climate Emissions, Revenues, and Production Shifts, Resources for the Future, Working paper 20-16 (updated March 2021). <https://www.rff.org/publications/working-papers/supply-side-reforms-oil-and-gas-production-federal-lands/> [hereinafter Prest 2021].

⁶ G. Golding and K. Patel (4 March 2021). Anticipated Federal Restrictions Would Slow Permian Basin Production. Federal Reserve Bank of Dallas. March 2021. <https://www.dallasfed.org/research/economics/2021/0304> [hereinafter Golding and Patel 2021].

⁷ Energy & Industrial Advisory Partners (EIAP). 2020. The Economic Impacts of the Gulf of Mexico Oil and Natural Gas Industry. Prepared for NOIA. <https://www.noia.org/wp-content/uploads/2020/05/The-Economic-Impacts-of-the-Gulf-of-Mexico-Oil-and-Natural-Gas-Industry-2.pdf> [hereinafter EIAP 2020].

⁸ This review compares findings across all models (that I am aware of to-date) that project the oil and gas production impacts of a federal leasing pause or the near-term findings from those that model a hypothetical permanent end to leasing. I do not include results from a 2020 analysis commissioned by the American Petroleum Institute (API) because although it claims to model a leasing moratorium, instead it models an immediate end to all federal oil and gas development – a very different policy scenario from the current leasing moratorium. For a full review of the flawed API analysis, see Prest B. (1 Oct. 2020) Examining the Effects of a Federal Leasing Ban: Drilling into an Industry Study. Resources for the Future. <https://www.resources.org/common-resources/examining-effects-federal-leasing-ban-drilling-industry-study/>

⁹ Prest 2021.

¹⁰ Congressional Budget Office (CBO). 2016. Options for Increasing Federal Income from Crude Oil and Natural Gas on Federal Land. https://www.cbo.gov/default/files/114th-congress-2015-2016/reports/51421-oil_and_gas_options.pdf [hereinafter CBO 2016].

other models that may focus only on onshore, or only offshore, as well as those that look at US-wide production. Prest 2021 finds that there would be no decline from baseline cumulative annual US oil production until year 5 (-0.16%) of a leasing moratorium and no decline from cumulative US gas production until year 9 (-0.08%).¹¹ Prest's model predicts that a leasing moratorium, if anything, may increase total US oil production by as much as 2,000 barrels per day in year 1 (a 0.02% increase) and as much as 20,000 barrels per day in year 2 (a 0.12% increase) because of a slight rise in price.¹² For gas, Prest finds that a leasing moratorium, if anything, may increase total US gas production by as much as 12 million cubic feet per day in year 1 (a 0.01% increase) and by as much as 184 million cubic feet per day in year 2 (a 0.11% increase).

- 2) The US Energy Information Administration (EIA) included the effects of the leasing pause outlined in E.O. 14008 in the Short Term Energy Outlook (STEO) starting in March 2021.¹³ Similar to the RFF modeling results, EIA projects no effects on US production in 2021 and in 2022 expects no more than a 0.83% (0.1 million b/d) average reduction in US crude oil production.¹⁴ EIA explains that “no effects [on US crude oil production] will likely occur until 2022 because there is roughly a minimum eight-to-ten month delay from leasing to production in onshore areas and longer in offshore areas.”¹⁵
- 3) Even when looking at estimates from a model that assumes more rigorous permit reviews than currently in place, the Federal Reserve Bank of Dallas estimates no impact on production due to a leasing pause in year 1.¹⁶ (See Box 1 for review of evidence that the current leasing pause has not impacted issuing new drilling permits.) Focusing specifically on the Permian Basin, the Fed estimates that a leasing pause combined with more rigorous

¹¹ Prest 2021 assumes no changes to drilling approvals on existing leases. For a permanent leasing moratorium Prest finds a long-term 1.9% rise in the price of both oil and gas when using base prices and future prices for WTI and Henry Hub as of June 2020. In a high oil and gas price scenario, Prest finds a permanent leasing moratorium would lead to a 2.4% change in the price of oil and a 2.3% change in the price of gas in the long-term. A short-term impact on price would likely be less than that but still would likely result in a slight increase, if anything, in overall US production due to a temporary leasing pause.

¹² Prest 2021.

¹³ EIA STEO 2021 p. 15. EIA modeling assumes no new federal leases are issued as outlined in EO14008 but that issuing drilling permits continues.

¹⁴ EIA STEO 2021 pp. 15-16. Given total US forecast production for the March 2021 STEO was 12.0 million b/d in 2022, the expected change in production due to a pause would be no more than 0.83% in 2022 $((12-11.9)/12=0.83\%)$. EIA expects U.S. crude oil production to average 11.1 million barrels per day (b/d) in 2021, 0.1 million b/d more than in the February STEO (a 0.91% increase due to higher prices). In general, the increase in EIA's U.S. crude oil production forecast reflects higher expected crude oil prices between when the February and March 2021 STEOs were completed. Forecast production rises to 12.0 million b/d in 2022, which is up 0.5 million b/d from the February STEO (a 4.35% increase).

¹⁵ EIA STEO 2021 p.15-16.

¹⁶ These results are from the hybrid case. The authors assumed there would be no new federal leasing, and that existing leaseholders continue receiving drilling permits. However, they assume that permit reviews are more rigorous than they have been in the past and therefore this leads to “slower approvals and a costlier operating environment beginning in 2022.” They assume an average price of \$50 for benchmark WTI. See Golding and Patel 2021.

permit reviews could lead to an average reduction in Permian oil production by 0.39% (18,000 barrels per day) below baseline if a pause lasts 2 years.¹⁷

- 4) Comparing available annual modeling for offshore production impacts due to a federal leasing moratorium, projections are almost identical. Energy & Industrial Advisory Partners (EIAP) projects no impacts to offshore oil or gas production in the Gulf of Mexico due to a leasing moratorium in the first two years.¹⁸ These results are similar to Prest 2021 findings for offshore. Prest 2021 finds practically zero (-0.00024%) reduction in total US offshore oil production in year 1, and practically no (-0.12%) reduction in total cumulative US offshore oil production by the end of year 2 of a federal leasing moratorium. Looking specifically at offshore natural gas, EIAP projects that there will be no impacts in year 1 or year 2 on offshore gas production in the Gulf due to a leasing moratorium. Prest 2021 finds practically zero (+0.0018%) increase in total US offshore natural gas production in year 1 and practically zero (-0.09%) reduction in total cumulative US offshore gas production by the end of year 2 of a leasing moratorium.

Table 1. Comparing Modeling Results of US Production Impacts of a Federal Leasing Moratorium that Lasts 1 or 2 Years

		Total US (onshore, offshore, federal, non-fed)		US Onshore (federal and non- federal)		US Offshore (federal and non-federal)	
		Prest 2021	EIA STEO 2021	Prest 2021	Golding & Patel 2021- Permian*	Prest 2021- all US offshore	EIAP 2020- Gulf of Mexico
findings for % change in production in Year 1	Oil	0.02% increase	0.91% increase	0.02% increase	0.00%	0.00%	0.00%
	Gas	0.01% increase	N/A	0.01% increase	N/A	0.00%	0.00%
findings for cumulative % change in production by end of Year 2	Oil	0.12% increase	-0.83%	0.17% increase	-0.39%	-0.12%	0.00%
	Gas	0.11% increase	N/A	0.11% increase	N/A	-0.09%	0.00%

*Note, the Golding and Patel study also assumes increased hypothetical restrictions on drilling permits beginning in 2022.

¹⁷ Golding and Patel 2021.

¹⁸ EIAP 2020.

Concerns about Considine 2020 Assumptions and Methods

In contrast to the findings of the other existing models, Considine 2020 estimates that a moratorium on new leases starting in 2021 results in a 62% drop in drilling (wells spud) in the first year, an 81% drop by end of year 2 (2022), and a 95% drop by year 5 (2026).¹⁹ Considine 2020's very different findings on near-term development impacts of a leasing moratorium appear to differ from the modeling consensus at least in part because underlying assumptions do not correspond with known timelines for development on federal lands and waters. (See Figure A). Because those assumptions drive the findings on production impacts and subsequent fiscal, economic, and employment impacts, Considine 2020 findings do not enable reliable conclusions about the impacts of a temporary leasing moratorium in the near-term.

Considine 2020 assumptions do not correspond with minimum delay between when leasing and development of average wells would occur

Considine 2020 findings do not add up when considering the typical lengths of time required for permit approvals, the length of federal lease terms, average time between when permit is obtained and drilling begins, the availability of existing permits, or the fact that a leasing moratorium does not pause issuing drilling permits on the large reserve of existing leases that have yet to be drilled across onshore federal public lands.

After obtaining an onshore federal lease either through a competitive or noncompetitive sale, operators submit an Application for a Permit to Drill (APD) on the lease. On average, the US Bureau of Land Management (BLM) takes 212 days (or 7 months) to approve an APD.²⁰ Surveying New Mexico data on new federal wells that both received an APD and were spud since 2018, an average of 3.5 months passed between when the operator received the APD approval and when it began to drill (spud date).²¹ (This average likely underestimates the length of time between APD approval and commencement of drilling for federal wells in New Mexico because it does not include the 25% of already-approved APDs where operators had yet to start drilling).²² In other words, there is a 10.5 to 17 month minimum delay between onshore federal leasing and drilling on new leases could begin. Once a well is spud (drilling begins), an average of 4 months passes before first production begins.²³ That means at least 14.5 to 21 months pass between when a lease is issued, and an average well could possibly come online and start producing.

¹⁹ Considine 2020 Figure 7.

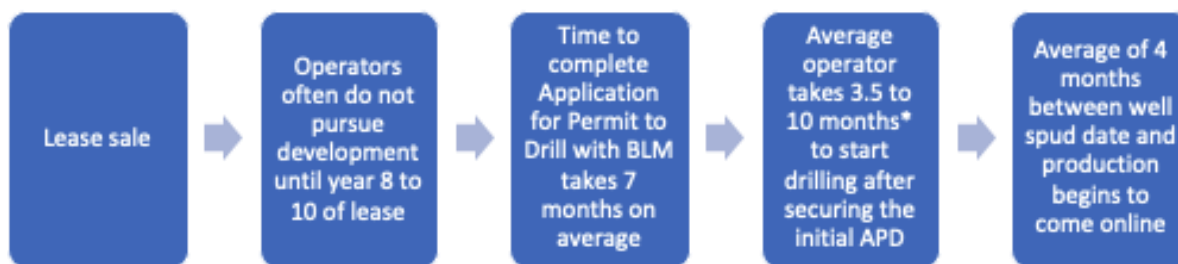
²⁰ The 7-month average time to complete an APD was measured between FY2011 and FY2020. It includes an average of 125.4 days waiting on the operator and an average 86.6 days waiting on BLM. Source: BLM. Table 12 Time to Complete an Application for Permit to Drill (APD) Federal and Indian. Accessed on 17 April 2021. https://www.blm.gov/sites/blm.gov/files/docs/2021-03/Table12_TimetoCompleteAPD_2020.pdf

²¹ State of New Mexico. Oil Conservation Division. Federal APDs New Wells Data. Updated 3 Feb 2021. <http://www.emnrd.state.nm.us/OCD/documents/ExpandedWellsFedNewWells20200203.xlsx>

²² If including the length of time that has passed to date for the more than a quarter of new federal oil and gas wells in New Mexico that have received an APD and have yet to drill, the average time that has lapsed between APDs and spud wells or APD received and now for those that have yet to begin drilling grows to 10 months. This also excludes all wells that have "1/1800" as value for Last Produced.

²³ Prest 2021 p. 51.

Figure A. Typical stages for average onshore federal oil and gas leases.



In practice, operators historically have taken much longer than 10.5 to 17 months to begin drilling after acquiring an onshore federal lease and much longer than 14.5 to 21 months to begin producing after acquiring a lease. In fact, a Congressional Budget Office (CBO) 2016 analysis finds that the bulk of production on federal leases occurs more than 10 years after the lease sale.²⁴ Onshore federal oil and gas leases have an initial 10-year term and operators often do not begin development until between year 8 to 10.²⁵²⁶ Once production begins on a lease, operators can extend that lease indefinitely. To validate the finding that a leasing pause results in a 95% reduction in well spuds by year 5, Considine 2020 asserts that this finding is “consistent with the five-year average term for most oil and gas leases.”²⁷ Considine 2020 does not cite where the 5-year assumption comes from, and it is inconsistent with the fact that onshore federal leases have an initial ten-year term. The CBO 2016 finding further refutes Considine assumptions that onshore federal leases typically last 5 years.

Furthermore, approved drilling permits are valid for two years and unused permits are frequently extended for another two years after that.²⁸ There are over 8,988 existing onshore federal drilling permits that are approved and not yet used and, as discussed in Box 1 below, DOI continues to issue new permits.²⁹ Impacts of a federal leasing pause are particularly small in the near term as operators may continue to drill and extract from the millions of acres of undeveloped lands already under lease.

²⁴ Figure 1-7 from CBO 2016.

²⁵ Onshore oil and gas legislation is codified at 30 U.S.C. §226, and the corresponding regulations are at 43 C.F.R. Parts 3100–3120.

²⁶ CBO 2016.

²⁷ Considine 2020 p.11.

²⁸ See BLM, *The Gold Book* Chapter 3, p. 8. <https://www.blm.gov/sites/blm.gov/files/Chapter%203%20-%20Permitting%20and%20Approval%20of%20Lease%20Operations.pdf> (“Approved APDs are valid for 2 years from the date of approval as long as the lease does not expire during that time. An APD may be extended for up to 2 years at the discretion of the BLM and the surface management agency if a written request is filed before the 2-year expiration date”). [hereinafter BLM Gold Book].

²⁹ US Bureau of Land Management (BLM). May 2021. Application for Permit to Drill Status Report: 5/1/2021 to 5/31/2021. Last accessed 16 June 2021. https://www.blm.gov/sites/blm.gov/files/docs/2021-06/FY%202021%20APD%20Status%20Report%20May_Clean.pdf [hereinafter May 2021 BLM APD Status Report].

Box 1. The Current Leasing Pause Does Not Pause Drilling Permits

To evaluate the relevance of research findings to claims about expected impacts of a federal leasing moratorium, we must be clear what the current federal actions do and, in this case, do not do. Expert modeling reviewed for this report repeatedly stresses the difference between a pause on issuing new leases versus a pause on issuing drilling permits. The federal government has not imposed a drilling moratorium. E.O. 14008 does not pause issuing drilling permits on the 13.9 million acres of existing leases that have yet to be drilled across onshore federal public lands.³⁰ The same holds for offshore; E.O. 14008 does not impact drilling permits from being issued on the existing 9.3 million acres already leased offshore in federal waters that have yet to be drilled.³¹

Federal permitting data confirm that there is no drilling moratorium. During the first four full months under the Biden administration, the US Bureau of Land Management approved 1,848 applications for permits to drill on federal lands across nearly all state offices.³² These permitting approval rates appear in-line with past administrations.

Methods appear incapable of predicting drilling when no new leases are issued

Considine 2020 states that a regression analysis was performed to simulate the development impacts of a leasing moratorium, but this premise is problematic for a number of reasons.³³ Considine 2020 is vague about exact datasets used and how the simulation was performed.³⁴ While the methodology is unclear, if a reader takes the Considine 2020 summary of regression results literally (Table 6 of the report), the model is incapable of predicting federal spuds when

³⁰ US Department of the Interior (DOI). 27 Jan 2021. Fact Sheet: President Biden to Take Action to Uphold Commitment to Restore Balance on Public Lands and Waters, Invest in Clean Energy Future. Updated 11 Feb 2021. <https://www.doi.gov/pressreleases/fact-sheet-president-biden-take-action-uphold-commitment-restore-balance-public-lands>

³¹ Id.

³² Calculated total onshore permits “Approved” between February 1st and May 31st, 2021 by combining the 561 calculated “Approved” permits reported by state offices in the APD Status Report from February and March 2021 with the 671 “Approved” across all state offices from the April 2021 BLM APD Status Report, and the 616 “Approved” across all state offices from the May 2021 BLM APD Status Report. BLM. April 2021. Application for Permit to Drill Status Report: 4/1/2021 to 4/30/2021. Last accessed 1 June 2021. https://www.blm.gov/sites/blm.gov/files/docs/2021-05/FY%202021%20APD%20Status%20Report%20April_FINAL.pdf

BLM. March 2021. Application for Permit to Drill Status Report: 2/1/2021 to 3/31/2021. <https://www.blm.gov/sites/blm.gov/files/docs/2021-04/FY%202021%20APD%20Status%20Report%20March.pdf> When using combined February, March, April, and May 2021 numbers from these three documents, I collectively refer to them [hereinafter February thru May 2021 BLM APD Status Reports].

³³ See Considine 2020 p.10, Table 6: Parameter estimates for federal lease effects, and p.11, Figure 7: Simulated reduction in well spuds after a lease moratorium.

³⁴ On p.10, Considine 2020 states “this study uses data from the US Department of Interior on all new federal leases and well spuds, including oil and gas wells combined.” Neither of the two data sets listed in the report’s references that come from offices within DOI include data on new federal leases or well spuds from new federal leases. Instead, the DOI data Considine 2020 references is limited to ONRR revenue data and BLM Average APD Approval Timeframes for FY2005-FY2012.

zero federal leases are issued.³⁵ The study must be doing something else to simulate the effects of no new federal leasing, but it is not clear what is done.

Wyoming case study further illustrates Considine 2020 dubious near-term projections

A review of existing leases and approved drilling permits in each state illustrates the unlikelihood that a leasing pause will affect production in the near term. In the state of Wyoming operators have active oil and gas leases on over 8.8 million acres of federal land and over 55% of these acres have yet to be developed as of October 2020, providing room for industry to expand into new areas even under a leasing pause.³⁶ As of May 31, 2021 operators had 3,144 Approved and Available to Drill Permits (AAPDs) to develop on federal lands in Wyoming.³⁷ To put this number of drilling permits in perspective, between FY16 and FY20 operators drilled an average of 436 wells each year on federal lands in Wyoming.³⁸ Between February 1st and May 31st, 2021, BLM approved 509 drilling permits in Wyoming.³⁹ At a minimum, these 509 newly issued drilling permits will not expire for at least two years (until at least January 31, 2023). While we do not know when the other 2,635 AAPDs in Wyoming are set to expire, BLM often extends unused drilling permits for an additional two years.⁴⁰

Considine 2020 baseline projects that around 276 well completions would occur on federal lands in Wyoming in 2021 (and around 550 well completions in 2021 and 2022 combined) absent a leasing pause. If so, there are enough permits already issued for operators on federal lands in Wyoming to drill as many as 5 times more wells than Considine 2020 appears to predict would be completed in 2021 and 2022 without a leasing pause.⁴¹

³⁵ See Considine 2020 Table 6. Parameter estimates for federal lease effects. Considine 2020's regression uses log (lagged new leases), which is undefined for new leases = 0. Setting federal leases close to zero would lead to a ~100% reduction in drilling for any positive coefficient on leases. Considine 2020's regression of the coefficient on log(lagged spuds) has a coefficient of 0.754981-0.7608. If we assume that the starting value of leases is above the long run mean implied by the model, then, holding all else constant including leases, the model predicts a 25% drop in log (lagged spuds) every year ($1-0.75=0.25$).

³⁶ BLM, *Oil and Gas Statistics*, Table 1-10 (National Totals by State, Fiscal Year 2001-2020). <https://www.blm.gov/programs-energy-and-minerals-oil-and-gas-oil-and-gas-statistics>. (accessed 17 April 2021). [hereinafter BLM Statistics]. This estimate uses Table 6 (Producing Acres) and Table 2 (Acreage in Effect).

³⁷ May 2021 BLM APD Status Report.

³⁸ BLM Statistics. The wells per year averages use wells spud by state between FY16 and FY20.

³⁹ February thru May 2021 BLM APD Status Reports. Calculated total Wyoming onshore permits "Approved" between February 1st and May 31st, 2021 by combining the 276 "Approved" permits reported by Wyoming State Office in the APD Status Report from February and March 2021 with the 128 "Approved" from the April 2021 BLM APD Status Report, and the 105 "Approved" from the May 2021 BLM APD Status Report.

⁴⁰ BLM Gold Book. Chapter 3, p. 8.

⁴¹ Considine 2020 (p.14) states that there will be 178 projected oil well completions in all of Wyoming in 2021. Visual estimation based on Considine 2020 Figure 10 indicates that the author projects around 170 gas well completions in all of Wyoming in 2021 and that the number of total completions in the state will dip slightly before starting to grow in 2025. Considine 2020 (p.13) assumes that 62.8 percent of oil well completions and 96.8 percent of gas well completions in Wyoming are on federal lands. Based on these assumptions, Considine projects around 276 (or $(178*0.628) + (170*0.968)$) oil and gas well completions to occur on federal lands in Wyoming in 2021 absent a leasing pause. Assuming slightly fewer completions (around 271) in 2022, all combined Considine 2020 appears to project that slightly less than 550 oil and gas wells would be completed on Wyoming federal lands across both 2021 and 2022 combined absent a leasing pause.

Issues with Considine 2020 Estimated Fiscal and Economic Impacts

Considine 2020's overestimation of drilling and production impacts from a leasing pause drive the report's fiscal and economic impact findings as well. Much of revenue from oil and gas taxes are pegged to production. For example, most of the onshore program's revenue (87%) comes from royalties on producing leases.⁴² A CBO analysis found that less than 6% of annual revenue from the onshore oil and gas program comes from parcels that were leased in the previous decade.⁴³ Contrary to Considine 2020's conclusions, a leasing pause may actually result in as much as a 1.2% rise (or an increase of around \$11 million) in the total estimated state share of federal onshore royalty revenue for 2021. This is because modeling indicates a leasing pause may result in a slight increase in the price of oil and gas.⁴⁴ A leasing pause that lasts two years may result in an estimated \$21 million increase in the total state share of federal onshore royalty revenue for years 2021 and 2022 combined.⁴⁵

Author admits base methods may overestimate impacts by between 60 to 75%

Considine 2020 further overestimates the economic impacts on value added, employment, and income due to a leasing moratorium by using multipliers that estimate impacts 60 to 75% higher than when the author uses multipliers based on historical data.⁴⁶ Instead of using the historic-based multipliers to estimate economic impacts, Considine 2020 uses input-output multipliers that fail to account for how markets work in reality by assuming fixed prices and no substitution between factor inputs.

Input-output models consistently overestimate actual economic impacts. Economist Jeremy G. Weber found that a study led by Timothy Considine in 2010 estimated 20 times greater employment impacts when using input-output models compared to historic-based estimates.^{47,48} When using empirical estimates based on historic employment data, Weber 2012 estimated that the shale gas boom in Pennsylvania led to 2,183 new jobs in 2009.⁴⁹ In contrast, when using an input-output model Considine et al 2010 estimated that the boom led to 44,098 new jobs in

⁴² US DOI. ONRR Calendar Year Revenue Data. (Accessed January 2021).
https://revenue.data.doi.gov/downloads/revenue/calendar_year_revenue.xlsx.

⁴³ CBO 2016. Figure 1-8.

⁴⁴ This estimate uses annual projections for onshore federal royalty revenue changes due to a pause from analysis completed by Prest 2021 and approximates the portion of state revenue changes by assuming that 49% of this revenue is disbursed to the states in which the lease is located as codified by the Mineral Leasing Act of 1920 (MLA), P.L. 66-146, codified at 30 U.S.C. §§181 *et seq.* Note that this estimate is specific to changes only in the estimated state share of royalty rate revenues (not in bonus bids, rents, and other federal oil and gas revenues). However, since royalties are the majority (87% nationwide between 2010-2019) of the federal onshore revenues, the estimate gives a good sense for the overall fiscal impacts of a pause in leasing.

⁴⁵ *Id.*

⁴⁶ Considine 2020 p.46.

⁴⁷ Weber J.G. The Effects of a Natural Gas Boom on Employment and Income in Colorado, Texas, and Wyoming. *Energy Economics*, 34(5), 1580–1588, (2012). at 1587. <https://doi.org/10.1016/j.eneco.2011.11.013> [hereinafter Weber 2012]

⁴⁸ Considine, T., Watson, R., Entler, R., Sparks, J. The Economic Impacts of the Pennsylvania Marcellus Shale Natural Gas Play: An Update. Penn State University Department of Energy and Mineral Engineering. (2010). [hereinafter Considine et al 2010]

⁴⁹ Weber 2012 p.1587.

Pennsylvania in 2009.⁵⁰ Weber 2012 explains that when using input-output models to project how development and extraction will affect state economies, “the results of [input-output] models hinge on assumptions about economic multipliers and may deviate substantially from actual effects.”⁵¹

Economists warn that multipliers derived from input-output models, such as those relied on by Considine 2020, often result in misleading and biased claims. A 2015 review of research methods to estimate the socioeconomic impacts of the shale boom led by David Fleming reports that “although a very popular method employed by industry and governments to measure economic impacts, [input-output] models can easily provide misguided results, especially in the context of resource extraction activity.”⁵² Conducting statistical analysis based on historic data from after the 2010 production moratorium in the Gulf of Mexico, Joseph Aldy found that economic and employment projections made by industry, government, and academics during the moratorium that used regional employment multipliers overestimated the economic and employment impacts by many magnitudes.⁵³ Aldy warns that multiplier analyses “may be uninformative and potentially biased for policy deliberations.”⁵⁴

Top Concerns with Considine 2020 Projected Long-term Impacts

Considine 2020 fails to account for partial shifts in production to state and private lands

In the longer term, the Considine 2020 study does not account for the potential spillover impact of a permanent leasing moratorium, which would likely increase oil and gas production from private and state lands (where state fiscal revenue will be higher).⁵⁵ Prest 2021 estimates that over the longer term around 25% of production reduced from onshore federal lands as a result of supply side policies would be offset by corresponding increases in oil and gas production on state and private lands.⁵⁶ That shift to state or private lands will further reduce any lost investment and tax revenue.⁵⁷

⁵⁰ Id.

⁵¹ Weber 2012 p.1580.

⁵² Fleming D., Komarek K., Partridge M., Measham T. The Booming Socioeconomic Impacts of Shale: A Review of Findings and Methods in the Empirical Literature, MPRA Paper No. 68487, at 16 (Dec. 2015), <https://mpra.ub.uni-muenchen.de/68487/>

⁵³ Aldy J. The Labor Market Impacts of the 2010 Deepwater Horizon Oil Spill and Offshore Oil Drilling Moratorium, Resources for the Future DP 14-27, at 26 (Aug. 2014), <https://bit.ly/3c0QXuQ>

⁵⁴ Id. p.26

⁵⁵ US Government Accountability Office. 24 Sept. 2019. Table 1. Federal and State Lease Terms and Practices for Onshore Oil and Gas Leases, as of September 2019. From GAO-19-718T. <https://www.gao.gov/products/gao-19-718t>

⁵⁶ Prest. 2021.

⁵⁷ Golding and Patel 2021. Golding and Patel also note that over time because of restrictions that apply only to federal lands, production and employment will gradually shift from federal lands in New Mexico to private and state lands in both New Mexico and Texas.

Huge uncertainty in Arctic Wildlife Refuge

Between 33 and 45% of Considine's findings of economic impacts after 2031 hinge on a supposed surge of development in the Alaskan region of the Arctic Wildlife Refuge, and yet there is fundamentally a lack of data to consistently model this production with any degree of certainty.

Cost of emissions reductions are misleading

The report finds that the cost of emissions reductions range from \$58 to \$72/ton of carbon dioxide (CO₂) when using the author's econometrically derived estimates and Considine 2020 states that this cost is expensive relative to California's auction price of \$16/ton. This comparison is misleading and inappropriate for several reasons. First, the author fails to include the methodology used or even the results of what he estimates for emission reductions that would stem from these policies. Even if we assume that the author's emissions reduction estimates are accurate, the California auction price is not an appropriate comparison. The California program is not designed to yield cost-effective emissions reductions. California's auction prices are lower than the social cost of carbon because the state can reduce emissions cheaply.

A more appropriate comparison is the social cost of carbon (SCC) developed by the Interagency Working Group (IWG) on Social Cost of Greenhouse Gases.⁵⁸ This cost, estimated at roughly \$51 (and up to \$152) per metric ton, approximates the cost to society of the damages caused by each additional ton of carbon dioxide (CO₂) emitted to the atmosphere.⁵⁹ The IWG has developed monetary estimates for the value to society of changes in carbon, methane, and nitrous oxide emissions resulting from regulations and agency actions. The IWG comprised multiple federal agencies and White House economic and scientific experts, and the estimates were developed with the best available science and methodologies.

Even the SCC is arguably a conservative comparison as it does not account for all societal damages from oil and gas production. Additional costs include climate damages from greenhouse gases that are more potent in the short-term such as methane and nitrous oxide that have a social cost of \$1,500 and \$18,000 per metric ton respectively as well as dangerous impacts to local health including from damages to air quality.⁶⁰ These three interim estimates

⁵⁸ Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide, Interim Estimates under Executive Order 13990 (2021), available at: https://www.whitehouse.gov/wpcontent/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf [hereinafter, IWG 2021 Report].

⁵⁹ For the SCC, the current IWG interim estimates that each additional ton of carbon oxide emitted in 2020 will cost between \$14 and \$152 with a central value of \$51 per metric ton of CO₂ (measured in 2020 dollars). The complete set of annual, unrounded interim estimates for 2020-2050 for all three SC-GHGs in 2020 dollars are available on OMB website. Available at: <https://www.whitehouse.gov/omb/information-regulatoryaffairs/regulatorymatters/#scghgs>.

⁶⁰ In August 2016, IWG also published estimates of the social cost of methane (SCM) and nitrous oxide (SCN). The IWG estimated that each additional ton of methane emitted in 2020 will cost between \$670 and \$3,900 dollars, with a central value of \$1,500 per metric ton of CH₄ (measured in 2020 dollars). For the SCN, the current IWG interim estimates that each additional ton of nitrous oxide emitted in 2020 will cost between \$5,800 and \$4,800 with a central value of \$18,000 per metric ton of N₂O.

remain the best to use in evaluating the monetary value of emission reductions to society until the IWG releases revised final estimates in January 2022.