

Impact of phasing out federal coal and oil leases on CO₂ emissions and 2°C goals

Avoiding dangerous climate change will require a rapid transition away from fossil fuels, with some scenarios envisioning a complete phase-out within 50 years. Many countries have taken measures to reduce fossil fuel demand – from pricing carbon to promoting low-carbon energy sources – but progress has not been fast enough, and investment in fossil fuel production has continued to grow.

There is thus a growing interest in policies that directly address fossil fuel supply. In the U.S., one option on the table is to reduce or end the issuance and renewals of U.S. government leases for fossil fuel exploration and extraction on federal lands and offshore waters. Indeed, the Obama administration is reviewing federal leasing practices and considering (at least for coal) whether the future fossil fuel production they would enable is consistent with U.S. emission reduction goals.

This policy brief, based on an SEI working paper, examines how ceasing further leases would affect coal, oil and gas production; consumption, and resulting global carbon dioxide (CO₂) emissions. It also explores how such decisions might affect progress towards the Paris Agreement’s goal of keeping warming “well below” 2°C above pre-industrial levels and pursuing efforts to limit the increase to 1.5°C.

A bustling industry faces new questions

The U.S. now produces more fossil fuels than ever. It ranks first in the world in oil and gas production, and second in coal production. Since 2010, U.S. fossil fuel production has grown by 20% in energy terms, due in great part to technology advances in extracting oil and gas from tight and offshore resources. Increased production has helped natural gas eclipse coal as the top fuel for U.S. electricity production, slowing growth in CO₂ emissions.

And despite current low oil prices, investment in fossil fuel extraction and trade infrastructure continues. For example, investments in new U.S. oil exploration and production



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A shovel loads coal into a haul truck, while a dragline uncovers a new stretch of coal seam, at the North Antelope Rochelle mine in Wyoming, the largest coal mine in the U.S.

Key findings

- Since 2010, U.S. fossil fuel production has grown by 20% in energy terms,¹ to record levels. About a quarter of the fuels being extracted, including two-fifths of all coal, come from federal lands and waters leased to producers by the U.S. Department of Interior (DOI).
- To be consistent with the goal of keeping global warming below 2°C, the U.S. would need to cut aggregate fossil fuel production by 40–60% from current levels by 2040. Under current policies, however (including the Clean Power Plan), production is expected to rise by 11%.
- Ceasing to issue new leases for fossil fuel extraction on federal lands and waters, and avoiding renewals of existing leases for resources that are not yet producing, would likely lead to a steady decline in U.S. coal production. Oil and gas extraction would likely drop as well, but more slowly.
- Phasing out federal leases for fossil fuel extraction could reduce global CO₂ emissions by 100 million tonnes² per year by 2030, and by greater amounts thereafter – an impact comparable to that of other major climate policies under consideration by the Obama administration.

infrastructure in 2015 amounted to \$100 billion – down from an all-time high in 2014, but still among record levels, and expected to be surpassed again by 2018. Investments in capital-intensive, high-carbon fuel infrastructure can lock in long-term fuel supplies and tie communities to fossil fuel revenues, making it more difficult and expensive to later shift to a low-carbon pathway.

About a quarter of all U.S. fossil fuels extraction (in energy terms), including two-fifths of all coal, occurs on federal lands and waters.³ Producers obtain leases for these activities from the U.S. Department of Interior (DOI) through bids and auctions, and pay fees, rents and royalties that are shared by the federal government and state and tribal governments.

These leasing systems have been in place for generations and are a significant source of government revenue, including for local communities. Yet in recent years, climate and other concerns have raised new questions about those practices. In his 2016 State of the Union address, President Obama called for a change in how U.S. oil and coal resources are managed, to “better reflect the costs they impose on taxpayers and our planet”.

¹ For ease of comparison, much of the analysis in this paper presents coal, oil and gas production in energy-equivalent terms, as quadrillion British thermal units (QBTU).

² We use “tonnes” to distinguish metric tons, the unit here, from short tons, a commonly used U.S. weight measure.

³ Hereafter we refer simply to “federal lands” to encompass both lands and offshore areas that are subject to federal leasing provisions.

Just days later, the DOI announced an environmental review of the federal coal leasing program to, among other goals, consider “adjustments to the scale and pace of leasing”, and “whether the leasing and production of large quantities of coal... is consistent the Nation’s goals to reduce greenhouse gas emissions”. Legislation has also been introduced in Congress to stop all future leasing activity. In addition, royalty regimes are being re-examined, with an eye to eliminating apparent subsidies or possibly applying a carbon charge.

The debate about federal fossil fuel leases is complex, involving not only climate considerations, but also questions about broader environmental protection, government revenue, jobs, and the resilience of regional economies that now depend heavily on fossil fuel production. Our analysis focuses on the climate implications, aiming to fill what we see as a critical knowledge gap.

Specifically, we review recent U.S. fossil fuel production and explore future trends; show how future U.S. fossil fuel extraction might need to decline under a 2°C pathway; analyze how fossil fuel production might be affected if the U.S. government stopped issuing new leases; and estimate the resulting impact on overall energy use, CO₂ emissions and progress towards a 2°C pathway.

Implications of a phase-out of federal leases

Recent U.S. Department of Energy projections show U.S. gas production rising continuously through 2040, oil production peaking within the next 10 years, and coal production dropping as the Clean Power Plan takes effect, then rising slowly again over time. Overall, fossil fuel production would be 11% higher in 2040 than in 2015. We use these projections as our reference case, and contrast it with scenarios from two recent global studies which suggest that under a cost-efficient 2°C pathway, U.S. aggregate fossil fuel production would need to drop by 40–60% from current levels by 2040.

One way to help bring U.S. fossil fuel production more closely in line with a 2°C pathway could be for the DOI to stop issuing new leases for fossil fuel extraction on federal lands and waters, and to end existing leases when they come up for renewal if the resources are not yet producing. As shown in Figure 1, by 2040, about two-thirds (13 quadrillion British thermal units, QBtu) of expected federal fossil fuel production (20 QBtu) will come from lands not yet under lease or under lease but not yet producing. Figure 1 also shows the range of U.S. fossil fuel production under the two 2°C scenarios we considered.

Of the prospective federal fossil fuels from areas not yet leased or producing (orange and dark blue areas in Figure 1), about half is coal, mostly from Wyoming’s Powder River Basin. Indeed, by 2030, the majority of federal coal will come from new leases. As shown in Figure 2, total U.S. coal

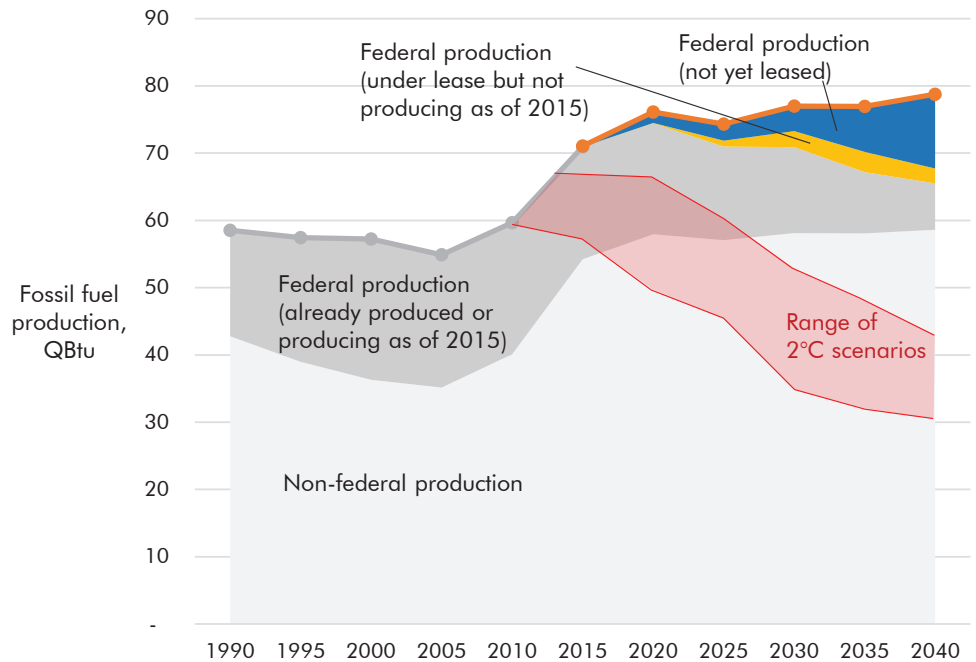


Figure 1: Historical and forecast U.S. fossil fuel production, by status of federal lease, 1990–2040, quadrillion BTU

Source: SEI analysis based on ONRR (2015), U.S. EIA (2015a; 2015b), assuming implementation of the Clean Power Plan; McGlade and Ekins (2015); International Energy Agency (2015).

production is expected to drop sharply after 2020, partly as the result of the Clean Power Plan, then rebound gradually (as Clean Power Plan targets have yet to be extended beyond 2030). In a cost-efficient 2°C scenario, however, total U.S. coal production would likely need to keep declining rapidly, by between 60% and 98% from 2015 levels, by 2040.

As shown in Figure 2, of all three fossil fuels, gas has the lowest fraction (less than one-fifth) produced from federal lands and waters. About half of this gas is from land in Rocky Mountain states, especially Wyoming and Colorado. About a third is from offshore deposits, almost all in the Gulf of Mexico.

Gas (and oil) projects tend to have longer lead times than coal, as gas companies must first conduct exploratory drilling and put wells or offshore platforms in place. (By contrast, new federal coal leases are often next to existing mines and can be accessed readily with existing equipment.) New leases would produce only a negligible amount of gas before 2030, so a change in leasing practices for gas might take many years to affect production.

Slightly more than one-fifth of current and expected U.S. oil extraction is from federal lands and waters, and most of that (about 70%) is offshore. And as with gas, oil projects have long lead times – especially offshore oil. Thus, a change in leasing practices would not have much impact on oil production until after 2030. However, as production from existing fields declines more rapidly in later years, the importance of new leases grows.

Implications for energy use and global CO₂ emissions

Some argue that reducing production in one location would simply lead to corresponding increases elsewhere – a “whack-a-mole” phenomenon. However, our analysis indicates that increases in other fuels make up only part of the avoided pro-

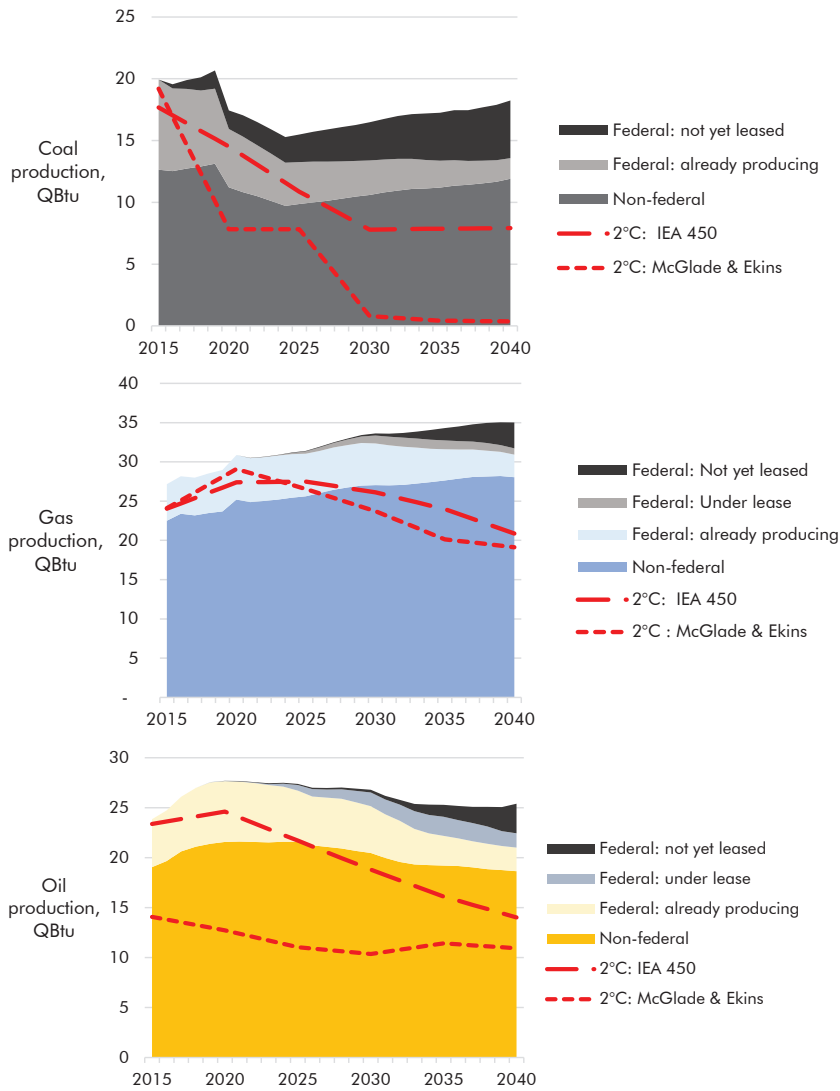


Figure 2: Future U.S. fossil fuel production in reference case (by status of federal lease) and under 2°C scenario, 1990-2040

duction, so a lease restriction policy would likely lead to net CO₂ emission reductions.

To analyze the net CO₂ emissions effects, we use economic analysis tools to consider the effect of reduced production from federal lands on energy prices, and in turn the effect of price increases on energy consumption and the use of substitute resources. This enables us to estimate impacts on overall fuel use and global CO₂ emissions. For example, for a given amount of coal not extracted from federal lands, we estimate how much other (non-federal) coal production would increase, how much natural gas and lower-carbon resources might substitute in power markets, and how much overall energy use might decline.

We focus our analysis on coal and oil, as federal leasing of these resources is likely to have the greatest impact on global CO₂ emissions. The net effect of natural gas supply on CO₂ (or total greenhouse gas) emissions is more uncertain, especially through 2040. We

focus on emissions in 2030, as this is a common reference year for future climate action and commitments under the Paris Agreement.

After accounting for substitution effects, we find that restricting new coal leases would reduce CO₂ emissions from coal in 2030 by about 107 million tonnes (Mt), and increase emissions from gas by about 36 Mt, resulting in a net reduction of 71 Mt CO₂. We estimate that restricting oil leases would reduce CO₂ emissions from oil consumption in 2030 by 54 Mt CO₂ and lead to an increase in CO₂ emissions from other fuels of 23 Mt CO₂, for a net emissions benefit of 31 Mt CO₂. Figure 3 shows each component of our analysis for coal markets.

Overall, annual global CO₂ emissions could drop by about 100 Mt per year by 2030 if the DOI ceased issuance of new and renewed leases for fossil fuel extraction from federal lands and waters. Annual emission reductions could well increase over time, as federal fossil fuel production becomes even more dependent after 2030 on yet-to-be issued leases. Furthermore, over time, consumers are likely to be more responsive to increased fossil fuel prices.

For comparison, recently proposed federal standards for light- and medium-/heavy-duty vehicles are expected to yield 200 Mt and 70 Mt in CO₂ savings, respectively, in 2030. The emission reductions expected from the regulation of oil and gas industry (sector-wide) emissions, or from methane restrictions on oil and gas operations on federal land, are far lower (13 Mt CO₂ and 5 Mt CO₂ respectively). Only the Clean Power Plan would yield substantially greater emission benefits than a change in leasing policy, 610 Mt CO₂. In other words, ceasing to issue and renew federal fossil fuel leases could make an important contribution to U.S. climate efforts.

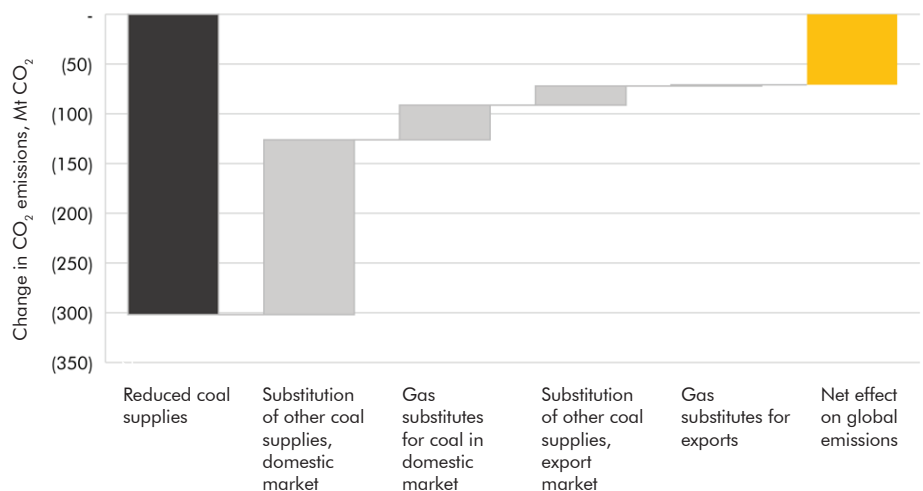


Figure 3: Impacts of decreased coal production on coal and gas markets (assuming Clean Power Plan goes forward) in 2030, in million tonnes CO₂

Policy implications

Federal leasing practices could play an important role in U.S. efforts to achieve its climate protection goals. Should federal leasing continue unabated, the U.S. could be producing 11% more fossil fuel energy by 2040 than it does today – a quarter of it on federal lands. Achieving a cost-effective 2°C pathway, however, would require total U.S. fossil fuel energy production to decline by 40–60% from current levels by 2040.

Ceasing all new federal leases and non-producing lease renewals for fossil fuel production on federal lands and waters would:

- **Send national coal production on a steadily declining pathway**, potentially to levels nearly consistent with a 2°C pathway for U.S. coal extraction.
- **Take longer to play out for oil and gas extraction**, as many oil and gas projects, especially offshore, have substantially longer lead times from lease approval to full production. In that context, most (86%) of the emission reductions from restricted leasing of oil in our analysis in 2030 come from the DOI not issuing offshore oil leases, and most of those are from not renewing existing leases. The impact of ceasing new leases then takes over by 2040.
- **Yield an overall reduction in CO₂ emissions in 2030 of 100 Mt CO₂** (relative to reference case levels), on par with flagship policies of President Obama's Climate Action Plan. Roughly 70 Mt CO₂ of the impact would be from reduced coal use (especially due to cuts in Powder River Basin coal, which is strongly federal), and about 30 Mt CO₂ from reduced oil use (especially due to cuts in offshore oil). These impacts could increase over time, as new, not-yet-issued federal leases comprise an even greater share of national fuel production after 2030.

Alternate scenarios

Several uncertainties underlie our analysis – most prominently, whether the Clean Power Plan will survive legal challenges. We find that, if the Clean Power Plan were not implemented, a phase-out of federal fossil fuel leases would reduce emissions by 270 Mt CO₂ in 2030. This amounts to nearly half the CO₂ savings expected from the Clean Power Plan that year.

Our findings are also sensitive to the response of producers and consumers to changes in energy prices due to reductions in fossil fuel supply. For example, should coal producers respond by more rapidly drawing down their reserves, the impact in 2030 could be smaller, but grow in later years. Conversely, if cessation of federal leasing led to further tightening of finance for the coal industry, then coal production could decline even more rapidly.

The relative ambition of other climate policies also matters. In a world with ever-more fossil fuels available (at low costs) and fewer low-carbon technologies, a change in federal leasing could be mostly offset by other sources of fossil fuels, for a net impact of as little as 4 Mt CO₂ in 2030. By contrast, in a world with shrinking fossil fuel supplies and greater availability of low-cost renewables, the impact of federal leasing policy could be as great as 210 Mt CO₂ in 2030.

In this context, we note that 30% of the estimated emissions reductions in 2030 from a change in leasing policy would

occur outside the U.S. That fraction of the reductions would not be reflected in the U.S. national greenhouse gas inventory, which only includes emissions on U.S. territory, but it would help advance global climate goals. It could also send a strong signal to other countries, encouraging them to take similar steps. And it could put U.S. fossil fuel production on a path more consistent with the Paris Agreement's long-term goal to achieve net zero greenhouse gas emissions from human activities in the second half of the century.

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