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Real Climate Leadership:

Why The Next President Must Prioritize A Fossil Fuel Phase Out

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Executive Summary

The next president and Congress must adopt policies to phase out domestic fossil fuel production as part of any comprehensive climate policy effort like a Green New Deal. This fossil fuel phase out should occur in tandem with policies to boost renewable energy and ensure a just transition for workers, communities and tribal nations. **This report illustrates that if no action is taken to address the climate impacts of fossil fuel production, then a significant fraction of emissions reductions achieved by policies to reduce demand for fossil fuels could be wiped out.**

Scenarios regarding U.S. crude oil production and consumption presented in this report show that:

- If the U.S. is successful at reducing domestic consumption of oil but does not stem the boom in domestic oil production, then the surplus oil will be exported and burned overseas.
- These surplus oil exports will increase carbon emissions beyond our borders, **counteracting roughly half of any domestic emissions reductions.**
- By contrast, policies that align reductions in oil consumption with reductions in oil production can eliminate this emissions leakage and achieve greater overall greenhouse gas emissions reductions.

In order to meet the Paris Climate Agreement's goal of limiting warming to 1.5 degree Celsius, we must limit the production and use of fossil fuels to remain within our carbon budget. Further, humans have discovered far more oil, gas, and coal than we can afford to burn without exceeding this budget. The fossil fuel extraction projects that are already in motion would release enough greenhouse gas emissions to push us beyond safe limits. Continuing to invest in fossil fuel infrastructure or allow production to progress unchecked will undermine our ability to achieve the Paris targets, threatening vulnerable communities and future generations.

This report's findings indicate that climate policies that address both fossil fuel demand and supply can be designed to have lower emissions leakage, and thus more impact, than policies that only address one part of the equation. To illustrate this risk, much of the booming oil and gas production in the Permian Basin could be produced directly for export, thus contributing to global carbon emissions, even if domestic oil demand and emissions were to fall.

Because policies to restrict fossil fuel production have particular relevance to industry workers and frontline communities impacted by extraction, extra care must be

taken to ensure the transition is managed equitably, with an emphasis on centering frontline leadership, implementing strong labor protections, and ensuring family-sustaining jobs.

We call on the next president to:

- Take action on Day One to constrain fossil fuel supply by halting new fossil fuel leasing on federal lands and waters
- Set ambitious targets for a fossil fuel phase out in concert with other climate policies
- Restore, strengthen, and fully enforce public health and clean air and water protections

Current U.S. laws governing energy production are not adequate to the challenges of the 21st century, and the next president and Congress will also need to craft and swiftly enact new legislative tools, such as:

- Ending subsidies and finance for fossil fuels
- Reinstating the crude export ban and extending it to other fossil fuels
- Establishing a climate test mandate for fossil fuel infrastructure

Decades of failed leadership and climate denial have brought us to this moment of crisis. Words are no longer an adequate response — we must have rapid and ambitious action from our elected leaders. For the next president and Congress, real climate leadership means not only saying yes to real solutions like a rapid transition to renewable energy with equitable ownership and participation, but also saying no to the destructive impacts of fossil fuel extraction. A transformative Green New Deal means all of these things, and making it a reality means putting justice and equity for vulnerable workers and communities front and center in the transition to a clean and prosperous future.



Youth Climate March in Washington D.C. © Katie Nelson / Greenpeace

Introduction

The next U.S. president and Congress must take dramatic and effective action to limit global warming to 1.5°C above pre-industrial levels and avoid the most dangerous consequences of climate change. For decades, the federal government has failed to implement adequate policies to cut greenhouse gas emissions — and the latest science tells us that time is nearly up.¹ If we do not act swiftly to put the U.S. and global economy on a new pathway, we will breach the 1.5°C limit that nations agreed to strive for in the Paris Climate Agreement, with devastating consequences for Americans and people around the world.²

Despite the urgency of the crisis, political leaders have shied away from directly addressing the primary source of greenhouse gas emissions — fossil fuels. To the extent that policies to mitigate climate change have been implemented at all, they have largely focused on boosting renewable energy and energy efficiency to reduce demand for coal, oil, and gas — not on addressing fossil fuel production directly.

For example, President Barack Obama enacted policies such as the Clean Power Plan and stronger fuel economy standards

for cars — but he also presided over soaring oil and gas production during his time in office, and signed a bill ending a 40-year ban on crude oil exports.³ The climate platform for Hillary Clinton’s 2016 candidacy set a goal of reducing “American oil consumption by a third” through “cleaner fuels” and energy efficiency, but made no strong commitments regarding production, except that it must be “safe and responsible” and not take place in “sensitive areas.”⁴

Over the past decade, U.S. oil and natural gas production has increased rapidly due to technological developments that have unlocked oil and gas deposits in shale formations, bolstered in part by millions of dollars in federal research and development funding⁵ and support for “all-of-the-above” energy policies.⁶ Crude oil production nearly doubled between 2008 and 2018, exceeding its previous 1970 peak.⁷ Natural gas production also grew by about 51% during this time, exceeding previous peak levels.⁸ In contrast, U.S. coal production has fallen over that same time period,⁹ and around half of coal mines operating in 2008 have now closed.¹⁰



Keep it the Ground Rally at White House in Washington D.C. © Robert Meyers / Greenpeace

This rapid growth of oil and gas drilling, along with the build-out of pipelines, export terminals, and controversial techniques such as hydraulic fracturing (fracking), has sparked grassroots opposition all along the supply chain. This grassroots movement is often led by Indigenous communities or communities of color, and other local groups who are deeply concerned about the climate and are no longer willing to shoulder the burden of local air and water pollution that comes with increased extraction.¹¹

The concept of a Green New Deal has been gaining momentum on Capitol Hill, thanks to a movement driven by young people. The Green New Deal aims to mobilize federal resources to transition the U.S. economy to 100% clean energy and create millions of good jobs, while centering justice and equity for communities bearing the burdens of racial, economic, and environmental injustice.¹²

The excitement and momentum around a Green New Deal has provided a welcome and desperately needed push for urgent action after decades of delay.¹³ However, discourse around a Green New Deal has primarily focused on growing renewable energy and reducing demand for fossil fuels, while largely ignoring the need to phase out fossil fuel production.¹⁴ Several commentators have called for including anti-fossil fuel supply side policies in a Green New Deal in order to improve public health¹⁵ and human rights,¹⁶ end counter-productive subsidies,¹⁷ and focus on the primary driver of the crisis.^{18,19} Research has shown that not only are policies to reduce fossil fuel supply effective at reducing carbon emissions and can complement demand-side policies, but that at this point in time, such policies are an imperative to securing a decent chance of limiting global warming to less severe levels.^{20,21,22}

An intentional plan to phase out fossil fuel production is also critical because extraction disproportionately impacts vulnerable communities, and is closely connected to the labor transitions that will occur with a Green New Deal or any comprehensive climate approach with solutions at the scale and speed necessary to meet our climate targets. Careful planning will be essential to ensure that workers and communities are left better off while transitioning our economy away from fossil fuels.

This report presents new analysis showing why the next president and Congress must include a plan to responsibly manage a fossil fuel phase out as part of any comprehensive policy to fight climate change. Without policies to curtail domestic fossil fuel production alongside policies to reduce fossil fuel demand, any surplus production may simply be exported to global markets. Our analysis finds that without such policies, nearly half the emission reductions from a Green New Deal could be undermined.

For decades, the fossil fuel industry has shown itself to be adept at denying, delaying, and diluting real climate solutions. By advocating for a fossil fuel phase out and confronting the political power of the industry, the next President and Congress can clearly signal that the era of fossil fuels is truly drawing to a close.



Senator's Green New Deal Press Conference in Washington DC © Tim Aubry / Greenpeace

Why We Must Phase Out Fossil Fuel Production

The goal of limiting warming to 1.5°C above pre-Industrial levels sets a limit on the amount of fossil fuels that can be burned. This temperature limit defines a “carbon budget” — a limit on the total amount of greenhouse gases that can be emitted into the atmosphere.²³ Translating this global carbon budget to the level of national contributions from fossil fuel-producing countries, or even individual extraction projects, will involve a complex interaction between financial forces, global and local politics, and demands for justice and equity. What is clear, however, is that humans have discovered far more oil, gas, and coal than we can afford to burn.

Given this context, policies to phase out fossil fuel production are an important, but often underutilized, tool in the climate policy toolkit. Addressing fossil fuel supply can prevent the lock-in of future emissions, prevent leakage, and lower total greenhouse gas emissions.

Carbon Budgets and Carbon Lock-In

Global fossil fuel *resources* (a measure of what fossil fuels are known to exist that could be recovered) and *reserves* (what is economically recoverable with current technology) far exceed the estimated carbon budgets for limiting warming to 1.5°C and 2°C.²⁴ What’s more, the carbon content of oil, gas and coal in already-producing or under-construction fields and mines (known as *developed reserves*)^{25,26} already far exceeds the 1.5°C carbon budget, and would exhaust the 2°C budget.²⁷ In other words, the fossil fuel extraction projects that are already in motion would release enough greenhouse gas emissions to push us beyond safe limits.

Previous research has sought to identify the fraction of reserves, by category and region, which must be left unburned.²⁸ A series of reports by Carbon Tracker Initiative has analyzed individual extraction projects by the breakeven price needed to profitably extract those resources. These reports conclude that a significant share of high-cost reserves would be “unburnable” under a safe carbon budget.²⁹ This methodology can be used to identify certain classes of reserves (such as tar sands or Arctic oil) as likely unburnable,³⁰ and to estimate the share of capital expenditures for fossil fuel companies³¹ that could become stranded.³² We note that using breakeven price as the criteria for which fossil fuels are unburnable, while an instructive tool, does not adequately address concerns around justice and equity. Any plans for phasing out fossil fuel production should also take into account human rights, local environmental pollution, the resiliency of local economies, and other factors.³³

New investments in fossil fuel infrastructure made today can encourage greater fossil fuel demand and “lock in” future emissions. Carbon lock-in can occur as a result of investments in leases, mines, wells, pipelines, as well as downstream infrastructure such as refineries and power plants.³⁴ Such projects often require high upfront investments that can only be recouped over a multi-decade lifetime. The risk of carbon lock-in is that once the upfront investments are made, it can be more difficult — from an economic, legal and political standpoint — to stop the extraction of the resource.³⁵ The incentive to recover the initial investment can facilitate continued production, even if demand and profit margins fall in the future.³⁶ Continuing to invest in fossil fuel infrastructure



Dakota Access Pipeline Day of Action San Francisco © Michael Short / Greenpeace

in the near term will significantly raise the future costs of reaching our climate targets because, as the International Energy Agency (IEA) notes, “much more costly actions are required subsequently to undo the lock-in effect.”³⁷

To illustrate the risk of carbon lock-in from new fossil fuel infrastructure, Figure 1 shows Total Primary Energy from oil for a number of climate-constrained scenarios from global energy models.³⁸ The figure shows four scenarios (Low Energy Demand,³⁹ One Earth,⁴⁰ and two Energy [R] evolution⁴¹ scenarios) that meet the Paris Climate Agreement goals of limiting warming to 1.5° (or well below 2°C) without significant use of unproven carbon capture and storage (CCS) or negative emissions technology. The general trend for these scenarios shows a rapid decline in energy derived from oil by mid-century. In contrast, the black arrow shows a 50-year lifetime for oil infrastructure (such as a producing lease or a pipeline) built in 2020. The rapid decline of oil use in the “climate safe” scenarios over that time period illustrates the risk that those assets would become stranded, or worse, would continue to produce oil and emissions beyond the global carbon budget, and thereby undermine climate goals.

For comparison purposes, the figure also displays the IEA’s Beyond 2 Degree Scenario (B2DS)⁴² although we note that this scenario is not fully “Paris compliant” since it ignores the 1.5°C goal, meets the 2°C with only a 66% probability, and relies heavily on CCS and negative emissions technology.⁴³ Similarly, the figure displays a range of integrated assessment models (IAMs) referenced in the IPCC report on 1.5°C, although many of those scenarios also rely heavily on CCS or feature inequitable regional disparities in emissions reductions.⁴⁴

But despite the stark realities of the carbon budget, new research from Global Witness finds that nearly \$5 trillion of capital investment is planned for new oil and gas production, which would risk even greater carbon lock-in and put climate safe targets out of reach.⁴⁵

Taken together, these studies make it clear that we are on the cusp of a crucial decision. Any permitting of new fossil fuel extraction or infrastructure projects is inconsistent with the Paris Climate Agreement targets and a threat to vulnerable communities. Plans for the expansion of fossil fuel production in the U.S. are incompatible with climate action. The next president and Congress face a choice to embark

on a just transition and a managed phase-out of fossil fuel production — or continue to enable climate catastrophe.

Restricting Fossil Fuel Supply Reduces Emissions

Policies to reduce fossil fuel consumption can either focus on reducing demand for those energy sources (“demand-side” policies) or on restricting their supply (“supply-side” policies).⁴⁶ Continued fossil fuel extraction is inconsistent with action to combat climate change, and policies to restrict fossil fuel supply directly lead to emissions reductions and reinforce demand-side policies. Table 1 gives examples of demand- and supply-side policies.

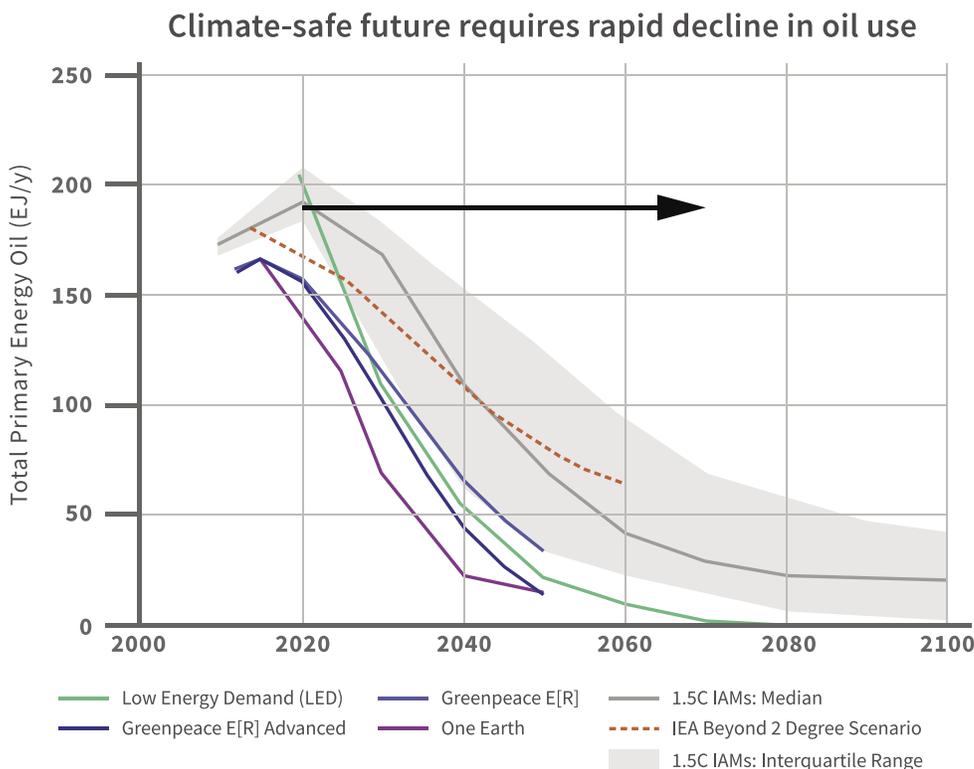


Figure 1: Total primary energy from oil for a range of scenarios from 2000 to 2100. Scenarios shown include: the IEA’s Beyond 2 Degree Scenario (B2DS, red dashed); the Low Energy Demand scenario (LED, green); Greenpeace’s Energy [R]evolution scenarios (blue); and the One Earth scenario (purple). Also shown are the median and interquartile range of 39 scenarios from the 1.5°C integrated assessment model (IAM) database (gray).

Table 1: Examples of Demand- and Supply-Side Policies to Restrict Fossil Fuels

Demand-Side Policies	Supply-Side Policies
Incentivizing electric vehicle purchases	Ending fossil fuel production subsidies
Implementing fuel economy standards for vehicles	Implementing a “climate test” for infrastructure permits
Implementing the Clean Power Plan to reduce emissions from power plants	Ending fossil fuel leasing on federal lands and waters
Investing in public transportation	Increasing “setbacks” to restrict drilling areas
Enacting a carbon tax or cap-and-trade regime	Restricting fossil fuel exports

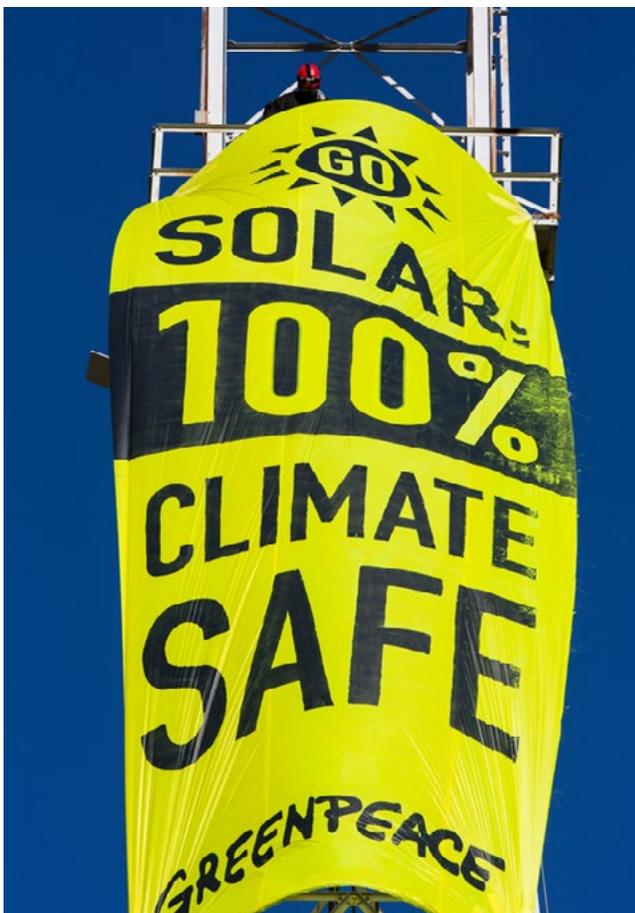
Research by the Stockholm Environment Institute has found that restricting leasing of coal and oil from federal lands and waters would lead to meaningful reductions in global carbon emissions. This emissions reduction is achieved because energy markets respond to a reduction in fossil fuel supply by increasing prices, which leads to lower consumption. The size of this effect is determined by the elasticities of supply and demand for the market, but the range of published elasticity values indicates that decreases in fossil fuel production lead to significant decreases in greenhouse gas emissions.

The same study concluded that ending new or renewed federal leases (which represent about a quarter of U.S. production) would result in a reduction of ~100 million metric tonnes (Mt) of CO₂-equivalent in global emissions in the year 2030. Roughly 30% of this reduction would come from oil and 70% from coal — an emissions savings comparable to the Environmental Protection Agency’s (EPA) fuel economy standards, and nearly half of what would be achieved by the Clean Power Plan in that year if it were fully implemented.⁴⁷ A later study explored options for the state of California to reduce emissions by limiting in-state oil production, finding similar potential for emissions reductions.⁴⁸

A 2016 study of federal coal production found that both increasing royalty rates and managing the phase out of extraction would lead to overall emissions reductions.⁴⁹ Similarly, a recent study from Resources for the Future showed that higher levels of U.S. oil and gas production will lead to higher global emissions in 2030, with a notable impact due to increased oil exports leading to greater oil consumption outside the U.S.⁵⁰

Constraining Domestic Fossil Fuel Supply to Mitigate Emissions Leakage

Recent increases in exports of U.S. oil, gas, and coal are an underestimated threat to the global climate, and in the context of policies to reduce domestic emissions, they represent a source of emissions leakage. Emissions leakage occurs when “sources outside the scope of a greenhouse gas (GHG) emissions reduction system increase emissions as a result of that system,” and it can arise through shifts in production, shifts in investment, or price signals (as discussed in the previous section).⁵¹ In particular, for a globally traded commodity like crude oil, reduction of oil consumption in one region can lead to an increase in oil supply for the rest of the world, which in turn lowers oil prices and boosts consumption elsewhere.



Activists Install Solar Panels on Oil Rig in Alberta © Greenpeace

In 2015, when Congress lifted the 40-year-old ban on crude oil exports, warnings were raised that allowing greater access to oil markets outside the U.S. would spark higher production levels here at home, a surge in exports and ultimately, higher emissions.⁵² The U.S. is currently both an importer and an exporter of crude oil. Since 2015, gross exports have risen rapidly to 2 million barrels per day, and the U.S. Energy Information Administration predicts the U.S. may soon become a net exporter of crude and petroleum products.⁵³ Exports of natural gas by pipeline and liquified natural gas (LNG) shipments have also increased in recent years,⁵⁴ and since 2016 coal exports have nearly doubled, reversing previous declines.⁵⁵ If a conscious effort is not made to phase out fossil fuel production and constrain access to global energy markets as part of any comprehensive climate policy, the U.S. risks undermining hard-won domestic emissions reductions as the pollution is exported overseas.

Building Political Momentum for a Fossil Fuel Phase out

Another reason to include policies to restrict fossil fuel supply in any suite of comprehensive climate policies such as a Green New Deal is that doing so can increase the likelihood of long-term success in addressing climate change.

Policies to restrict the expansion of fossil fuel production have shown broad public support. By a 55% to 38% margin, the American public has opposed “expanding oil, gas, and

coal development on America’s public lands and waters.”⁵⁶ Public subsidies to oil, gas, and coal production are opposed by 70% of Americans⁵⁷ and 73% of small business owners.⁵⁸ One recent poll found that explicit policies to prohibit new fossil fuel infrastructure when clean renewable alternatives are available are supported by 56% of the public, with just 26% opposed.⁵⁹ Another poll found 50% of the public felt such policies were essential or helpful to climate policy.⁶⁰

More importantly, restricting fossil fuel supply is important for withdrawing the social license of the fossil fuel industry and undermining its political and economic power — both of which will be key to winning and maintaining strong climate policies. Successful action to restrict fossil fuel supply will directly diminish the political power of the fossil fuel lobby, while boosting the political power of others — including youth, frontline and Indigenous communities, farmers and landowners, activists, renewable energy interests, and others in favor of a Green New Deal. In addition, research indicates that successful policies in one region can help create conditions to advance similar fossil fuel phase outs elsewhere: “As the number of states banning an activity rises, the social costs of non-conformity (for instance, a tarnished international reputation) increase, making it more likely, all else being equal, that other states will adopt a similar ban.”⁶¹

Because of this, reducing the power of the fossil fuel industry makes it much more likely that comprehensive climate policies like a Green New Deal will be enacted, implemented, and successfully defended from future rollbacks.



Senator’s Green New Deal Press Conference on Capitol Hill © Tim Aubry / Greenpeace

Climate Impacts of a Fossil Fuel Phase Out

In this section we present original analysis of three scenarios to examine the effect of policies to restrict fossil fuel supply along with fossil fuel demand on greenhouse gas emissions. This analysis focuses on the global crude oil market, but future research aims to include coal and natural gas production. **The key conclusion is that if steps are not taken to reduce domestic oil production, roughly half of any reduction in domestic oil consumption will be counteracted by increased oil consumption elsewhere in the world.**

Oil Supply Analysis

Because oil is a globally traded commodity, changes in U.S. production and consumption of oil can impact global oil prices, and hence global oil consumption and the resulting carbon emissions. Oil that the U.S. produces but does not consume can be exported and burned, thereby increasing global carbon emissions. Thus, successful policies to reduce emissions from oil consumption domestically will be undermined by this emission leakage, unless specific policies to restrict domestic oil production are put in place at the same time.

To illustrate this problem, we consider three scenarios:

- **Business as Usual Scenario** uses oil supply information from the EIA's Annual Energy Outlook 2019 (AEO19) Reference Case for Liquid Fuels.⁶²

- **Domestic Demand Only Scenario** maintains the domestic oil production levels from AEO19, but pairs that with a rapid decline in domestic demand for crude oil. This scenario illustrates the impacts of successful demand-side policies to reduce U.S. oil consumption, but not corresponding policies to limit production.
- **Aligned Policies Scenario** matches the steep decline in domestic demand with a similar decline in domestic production, illustrating the impacts of aligning demand- and supply-side policies in a comprehensive approach.

Full details of the calculations are presented in the Appendix: Research Methods, and we present a summary of the results [here](#).

Business As Usual Scenario

The EIA's Annual Energy Outlook for 2019 forecasts a continuing increase in domestic oil production, rising to over 14 million barrels per day (MMBbl/d) by 2024 in the Reference Case — an increase even from the ~12 MMBbl/d level found in the previous 2018 version of the AEO.⁶³ The EIA also presents an alternate “High Oil and Gas Resource and Technology” (HOG) scenario where oil production rises to over 20 MMBbl/d by 2040.⁶⁴ Industry estimates have indicated that these higher production levels are plausible.⁶⁵ Even under the Reference Case, EIA finds that rising production leads the U.S. to become a net exporter of petroleum and other liquids (although not of crude oil itself).⁶⁶



People's Climate March in Washington D.C. © Amanda J. Mason / Greenpeace

Figure 2 shows U.S. crude oil supply for the year 2030. In that year, the EIA forecasts over 14 MMBbl/d of domestic production plus another 5 MMBbl/d of gross crude imports. Subtracting the volume of U.S. production that is directly exported as crude oil (light gray line) defines EIA's quantity Total Crude Supply (TCS, red line), which is the volume of crude available to U.S. refineries. For this analysis, it is important to distinguish between oil that is consumed in the U.S. and oil that is exported and consumed abroad. However, TCS is not a measure of oil consumed domestically, because some crude that is refined at U.S. refineries is then exported in the form of petroleum products such as gasoline or diesel.

We therefore further divide TCS into crude that is refined and consumed in the U.S. (dark gray line) and crude that is refined in the U.S. but is exported abroad as petroleum products (medium gray line). We estimate the fraction of TCS that is consumed domestically by considering

U.S. crude oil supply: Where it comes from and where it goes

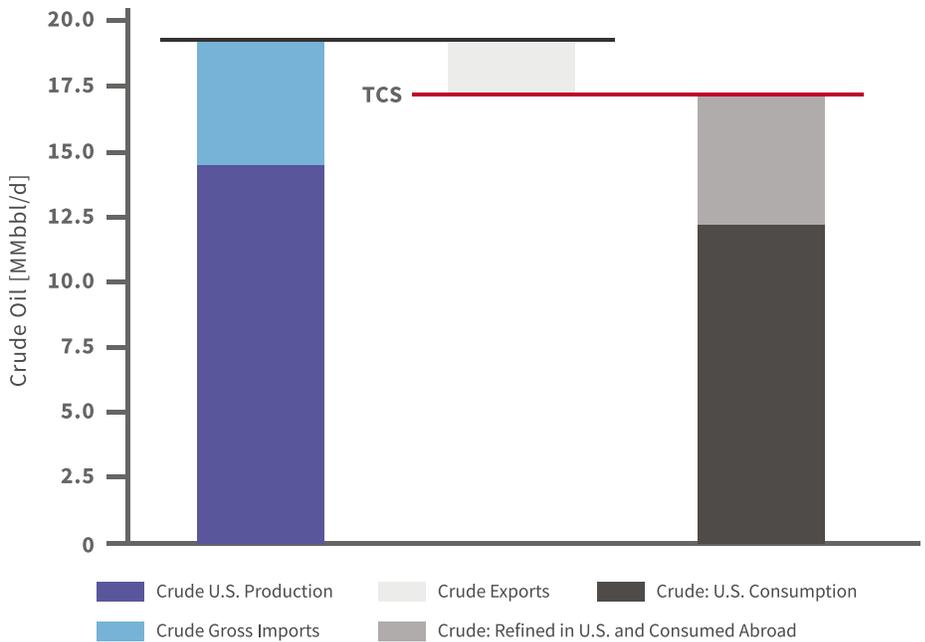


Figure 2: The source and destination for crude oil in the U.S. in the year 2030 under the AEO19 Reference Case. The figure shows domestic crude production (blue), gross crude imports (light blue) and Total Crude Supply (TCS, red line). This total volume of crude is divided into three destination categories: crude that is refined and consumed in the U.S. (dark gray), crude that is refined in the U.S. but consumed overseas (medium gray), and direct crude exports (light gray).

Business as usual means high levels of U.S. crude production

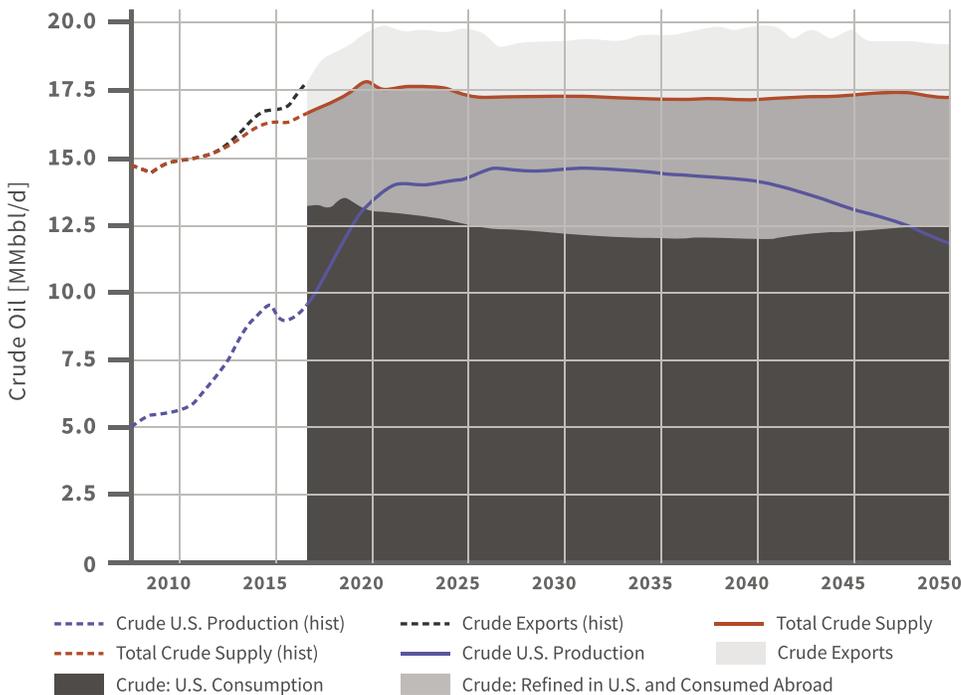


Figure 3: Crude oil domestic production (blue) and Total Crude Supply (red) under the AEO19 Reference Case. Crude oil consumed domestically is shown in dark gray, along with crude refined in the U.S. and consumed abroad (medium gray), and crude exports (light gray). Historical data is shown as dotted lines and forecasts as solid lines.

the AEO Reference Case forecast for the fraction of all refined petroleum products that are consumed in the U.S. (see the Appendix for further details on this calculation).

Figure 3 shows the forecast for these crude oil quantities out to 2050, along with the historical U.S. oil supply through 2017 (dotted lines).

The blue line in Figure 3 shows U.S. domestic crude oil production through 2050. In the recent past, very little U.S. crude was directly exported, but now the U.S. both imports and exports significant volumes of crude oil.⁶⁷ The fact that the blue line (production) remains below the red line (TCS) in Figure 3 indicates that the U.S. remains a net crude importer in this Reference Case. It can also be seen that the U.S. will begin producing more than it consumes sometime around 2020 (where the blue line crosses above the dark gray region).



Rise for Climate, Jobs & Justice March in San Francisco © Michael Short / Greenpeace

Domestic Demand Only Scenario

The Domestic Demand Only Scenario maintains domestic oil production at the AEO19 Reference Case levels, but models a steep decline in domestic demand for oil consistent with limiting warming to 1.5°C. This decline in domestic demand could be the result of successful renewable energy and energy efficiency policies enacted by the next president and Congress, such as strong electric vehicle incentives, fuel economy standards, public investment in public transit and other policies.

For illustration, we use the Low Energy Demand (LED) scenario from the Intergovernmental Panel on Climate Change’s Special Report on Global Warming of 1.5°C (also referred to as representative pathway P1). The LED is an example of a scenario that limits warming to 1.5°C without relying on carbon capture and storage.⁶⁸ Under this scenario, global Total Primary Energy from oil declines by 89% from 2020 to 2050. To define the Domestic Demand Only Scenario, we scale U.S. consumption in proportion to this global decline. However we note that while the LED scenario is an example of the ambition necessary on the global level, concerns about global equity would require that the U.S. reduce emissions at an even faster pace than the global average from this scenario.

The LED is not a prediction of what the next president and Congress will do, and furthermore, the findings presented here do not depend on specific features of the LED scenario and hold in general for any specified decline in domestic consumption.

Figure 4 shows oil supply for the Domestic Demand Only Scenario.

This rapid decline in domestic demand must be accommodated by an increase in product exports, a decrease in refinery output, or some mixture of the two.⁶⁹ Because domestic production (blue line) is unchanged in this scenario from the Business as Usual Scenario, a decrease in refinery output also implies a decrease in net crude imports. As can be seen in Figure 4, crude consumed in the U.S. declines rapidly from 2020 to 2050 (dark gray line), but unchanged levels of U.S. crude production results in an increase in exports of both refined petroleum products (medium gray line) and crude (light gray line) in comparison to the Business as Usual Scenario. In this scenario, the U.S. becomes a net exporter of crude oil by 2030 (note where the blue line crosses above the red line) and remains a net exporter through at least 2050.

Reduced domestic crude consumption leads to higher crude exports

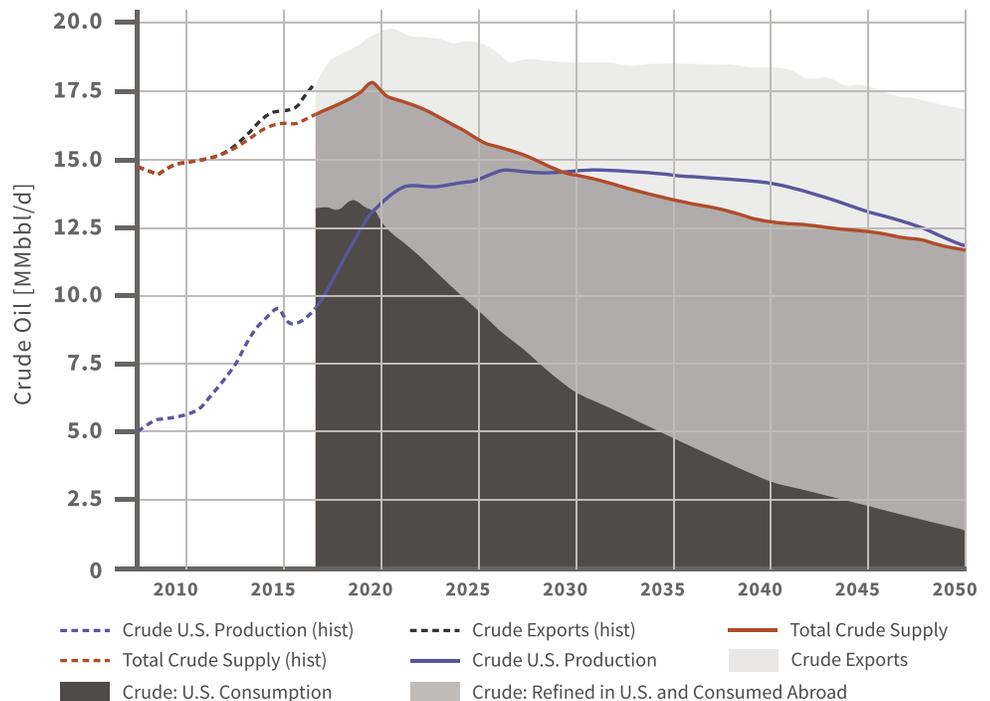


Figure 4: Crude oil domestic production (blue) and Total Crude Supply (red) under the Domestic Demand Only Scenario. Crude oil consumed domestically is shown in dark gray, along with crude refined in the U.S. and consumed abroad (medium gray), and crude exports (light gray). Historical data is shown as dotted lines and forecasts as solid lines.

Phasing out domestic production reduces crude exports

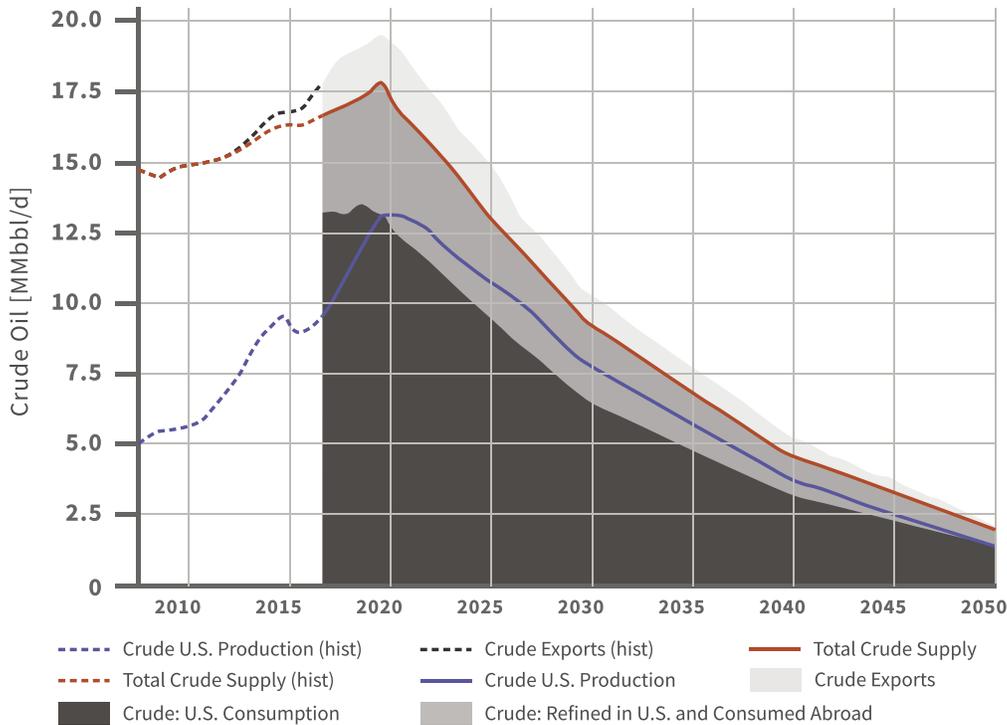


Figure 5: Crude oil domestic production (blue) and Total Crude Supply (red) under the Aligned Policies Scenario. Crude oil consumed domestically is shown in dark gray, along with crude refined in the U.S. and consumed abroad (medium gray), and crude exports (light gray). Historical data is shown as dotted lines and forecasts as solid lines.

Aligned Policies Scenario

The Aligned Policies Scenario applies the LED decline profile to both domestic oil demand (as in the Domestic Demand Only Scenario) and to domestic oil production and refining. Figure 5 shows oil supply for the Aligned Policies Scenario.

The Aligned Policies Scenario is defined by applying the LED decline profile to domestic production, crude imports, and other refinery inputs (see the Appendix for full details). This decline in domestic oil production could be the result of successful supply-side policies to wind down fossil fuel production enacted by the next president and Congress. As Figure 5 shows, domestic crude consumption declines rapidly (identical to the Domestic Demand Only Scenario), but both crude and product exports also decline over time.

Greenhouse Gas Emissions

To calculate the difference in carbon impact of climate policies that limit oil demand and supply, we use the Business as Usual Scenario as a baseline and consider the difference between that baseline and the other two scenarios. We calculate greenhouse gas emissions by considering the lifecycle emissions from a barrel of crude oil from “well-to-

wheels.” This value combines emissions from extraction and transportation (upstream), refining (midstream) and consumption of refined products (downstream).⁷⁰

To make this comparison we consider two terms: domestic emissions and rest-of-world (ROW) emissions. The Domestic Demand Only and the Aligned Policies Scenarios are designed so that crude consumed in the U.S. is the same in both models, and the only difference is the amount of crude that is exported. As a result, the decline in *domestic* carbon emissions (from the the Business as Usual Scenario baseline) is the same for the Domestic Demand Only and the Aligned Policies Scenarios (see Table 2, U.S. columns).

However under the Domestic Demand Only Scenario, this domestic emissions reduction is counteracted by an increase in ROW emissions (abroad).

Each barrel of increased oil exports (both crude and refined product) in the Domestic Demand Only Scenario increases the oil supply available to the rest of the world. We follow the methodology used and documented by the Stockholm Environment Institute in calculating the increase in ROW consumption and emissions due to these added exports.⁷¹ For each barrel of increased net exports, we estimate an increase of 0.44 barrels of ROW crude oil consumption. This factor is based on estimates of oil market elasticities and there are naturally uncertainties and caveats about the size of this effect,⁷² but its value is consistent with those used in other recent studies.⁷³

In the Aligned Policies Scenario, the “matching” of supply- and demand-side policies ensures that the countervailing global oil market effect is much smaller than in the Domestic Demand Only Scenario, giving this scenario a much greater total impact on reducing carbon emissions.

Table 2 summarizes two metrics for comparing emissions between the Business as Usual Scenario and the other two scenarios: (1) global carbon emissions in the year 2030, and (2) cumulative global carbon emissions from 2020 to 2050. Under both metrics, ROW emissions (and hence global

Table 2: Change in global carbon emissions under the Domestic Demand Only and the Aligned Policies Scenarios (relative to the Business As Usual baseline), in the year 2030 (left), and cumulative emissions from 2020 to 2050 (right). All emissions reported in million metric tonnes of CO₂ equivalent (Mt CO₂-eq). The percentage column shows the percent emissions leakage (ROW/U.S.) due to global oil market effects.

	Policy Impact on GHG Emissions, 2030 [Mt CO ₂ -eq]				Policy Impact on Cumulative GHG Emissions, 2020-2050 [Mt CO ₂ -eq]			
	U.S.	ROW	Global	leakage %	U.S.	ROW	Global	leakage %
Domestic Demand Only	-1,045.8	485.4	-560.5	46.4%	-38,209.7	17,797.5	-20,412.2	46.6%
Aligned Policies	-1,045.8	-15.0	-1,060.9	-1.4%	-38,209.7	809.1	-37,400.5	2.1%

Aligned policies lead to greater emissions reductions

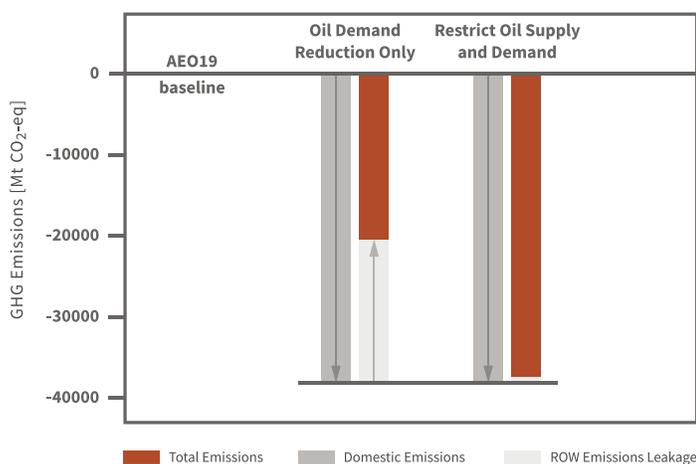


Figure 6: Difference in cumulative global carbon emissions (2020-2050) under the Domestic Demand Only and the Aligned Policies Scenarios (relative to the Business As Usual baseline). Under the Domestic Demand Only Scenario, global oil market effects counteract 46% of the reduction in domestic emissions. Under the Aligned Policies Scenario, this effect is reduced to 2%.

emissions) are much higher in the Domestic Demand Only Scenario than in the Aligned Policies Scenario, eliminating roughly 46% of the domestic emissions reductions benefit.

These metrics illustrate that there is a cost to relying solely on demand-side policies to reduce oil consumption in the U.S. If nothing is done to address production, then nearly 50% of the emissions reductions achieved through demand-side policies could be wiped out. Climate policies that address both demand and supply can be designed to have lower emissions leakage than policies that only address one part of the equation. Figure 6 illustrates the carbon emissions impact of both the Domestic Demand Only Scenario and the Aligned Policies Scenario, relative to the Business as Usual Scenario.

The scenarios presented above capture important aspects of demand- and supply-side policies for crude oil, but remain simplifications of the real-world dynamics. Changes to the supply and demand of crude oil would also have impacts on what substitutes are deployed to replace crude oil demand

(such as electric vehicles or biofuels). Further research is needed to understand the full system response to scenarios such as these, but the core issue of exports and global market impacts is one that policy makers must consider in designing effective policies.

The central conclusion of these scenarios is that allowing fossil fuel production to increase unchecked is a clear risk to the climate. Without restraints on oil supply as part of any comprehensive climate policy approach, increased exports are a natural consequence of reduced domestic consumption, and those exports could undermine roughly half of any domestic emissions reductions. However, by aligning supply- and demand-side policies, policy makers could ensure that the impact of U.S. production on global supply remains neutral, or even has a beneficial impact on global emissions, while also mitigating the other negative impacts of extraction discussed previously, including human health hazards and threats to clean air and water.

Coal and Natural Gas Supply

A key extension of this analysis would be to consider not just emissions from crude oil but all components that make up liquid fuels, primarily including natural gas liquids (NGLs) and biofuels. The current focus on crude oil is presented as an example to illustrate the problem of leakage and its impacts on 100 percent clean energy policies, and is not a full treatment of greenhouse gas emissions from liquid fuels.

The analysis could also be extended to include both natural gas and coal production in the scenarios considered. Natural gas is commonly produced together with crude oil, and so changes to oil production would also have an impact on natural gas production. Because natural gas competes with coal in the electric power market, changes to natural gas production will also have an impact on coal consumption and the adoption of renewables like wind and solar.

Research has found that a global market dynamic likely exists for coal as it does for oil, where changes in supply affect global prices and consumption.^{74,75} The market response for natural gas is less well understood, in part because the market is less global with distinct regional markets and prices, although the recent increase in LNG exports is beginning to change those dynamics.⁷⁶

The electric power market is changing due to rapid declines in the cost of wind and solar power, which has brought renewables to parity with conventional electricity generation.⁷⁷ The EIA does not currently publish a scenario with both low natural gas and low coal production, but the High Oil and Gas scenario shows higher overall power sector emissions (in later years) as compared to the Low Oil and Gas scenario. This increase is driven by higher emissions from natural gas that are not fully compensated by lower emissions from coal.⁷⁸ The High Oil and Gas scenario also leads to lower adoption of renewables in comparison to the Low Oil and Gas

scenario.⁷⁹ This indicates that a coal, oil and gas phase out could have additional benefits from boosting the deployment of renewable energy and reducing emissions from the electric power sector.

Oil and gas production is associated with significant emissions of methane (CH₄) — a greenhouse gas that is 87 times as potent as CO₂ over a 20-year timespan (which aligns with the period in which we must be acting most swiftly and ambitiously to address the climate crisis).⁸⁰ Venting and fugitive leaks of methane from oil and gas infrastructure have been shown to be a significant climate driver that erodes the advantage claimed by natural gas over coal in terms of CO₂ emissions per unit of power generated.⁸¹ This report already considers lifecycle emissions of CO₂, CH₄ and other greenhouse gases from crude oil production (reported as CO₂-equivalent),⁸² but including natural gas and coal production in the analysis would require a more sophisticated analysis of methane emissions.

The Permian Basin

An important case study for understanding the intersection of fossil fuel supply and climate policy in the U.S. is the boom in oil and gas production in the Permian Basin region (see Figure 7). From well to pipe to export, the federal government currently has little authority to put the brakes on unchecked oil and gas production in Texas — which is why comprehensive climate efforts such as a Green New Deal must provide additional tools to constrain fossil fuel extraction and limit exports. Absent this, even if domestic reductions in oil demand are successful, the lack of federal oversight on extraction and transportation of crude oil could accelerate the trend toward crude exports that is already developing along the Gulf Coast.

The Permian is a sedimentary basin located in west Texas and southeast New Mexico that contains some of the nation's largest oil and gas resources. A 2018 resource assessment from U.S. Geological Survey⁸³ increased the total of undiscovered, technically recoverable resources (UTRR) in the Permian to 70.5 billion barrels of oil, 339.8 trillion cubic feet of natural gas and 22.7 billion barrels of natural gas liquids.⁸⁴ The nearby Eagle Ford Group in south Texas contains an additional 8.5 billion barrels of oil and 66 trillion cubic feet of natural gas.⁸⁵

Carbon emissions from Permian oil and gas production through 2050 could alone exhaust nearly 10% of the global 1.5°C carbon budget.⁸⁶

This quantity of oil and gas would be enough to support high production levels for decades to come, and led former Interior Secretary Ryan Zinke to boast in 2018 that “Christmas came a few weeks early this year.”⁸⁷ Oil production in the Permian region has nearly quadrupled from 2010 to today, while natural gas production has more than doubled.⁸⁸ Industry analysts predict that Permian production will continue to rise to as much as 6 million barrels a day (MMBbl/d) by 2022, although a lack of pipeline capacity is currently holding back production growth.⁸⁹ Much of that production will likely be exported and burned overseas, as the Gulf Coast region as a whole flipped to being a net crude exporter in late 2018.⁹⁰ One oil company executive recently noted the trend by saying “every single molecule from here on out has to be exported.”⁹¹

Crude production booming in Texas and New Mexico

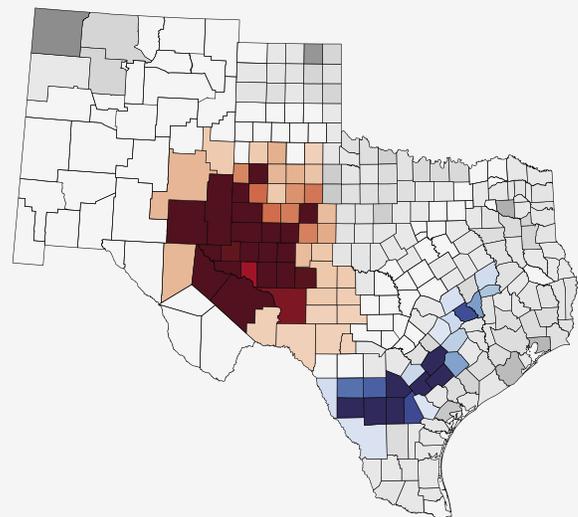


Figure 7: Oil production by county in Texas and New Mexico, 2017. Counties in the Permian Basin are shown in red, while counties in the Eagle Ford Group are shown in blue. Darker colors indicate higher production levels. (Data: Texas Railroad Commission, New Mexico Minerals and Natural Resources Department, U.S. EIA)

The Permian's transportation capacity crunch has sparked several new pipeline proposals. The Cactus II, Gray Oak and EPIC pipelines may all come online in late 2019 to facilitate the transport of crude oil from the Permian to the Corpus Christi region, where marine export terminals and the world's largest ethylene cracker plant have been proposed.⁹² Other major pipeline projects, such as ETP's Permian-Nederland and ExxonMobil's Permian-Gulf Coast, aim to transport crude to Gulf Coast destinations further east and may come online in 2020 or later.⁹³ Apart from locking in future production and constraining the ability of the Gulf Coast's economy to accommodate an equitable labor transition on the timescale needed, these infrastructure projects also come with their own negative impacts on human health, local environments, property rights, and Indigenous sovereignty.⁹⁴



Shale Fracking in Texas © Les Stone / Greenpeace

Given these major developments, it is remarkable how little oversight exists over the Permian boom. Apart from federally owned lands and water, onshore oil and gas drilling and production is facilitated through state-level permitting. In Texas, the vast majority of onshore oil and gas production occurs on private or state land, and only a negligible amount is produced from federal land.⁹⁵ By contrast, in New Mexico, roughly half of all oil production occurs on federal land,⁹⁶ and could therefore potentially be constrained by changes to federal leasing policy.

Due to a quirk in federal law, the Federal Energy Regulatory Commission (FERC) approves the construction and operation of natural gas pipelines, but not oil pipelines. The federal government does regulate rates and tariffs (through FERC) and pipeline safety (through the Pipeline and Hazardous Materials Safety Administration, or PHMSA), and there are a number of required federal permits and processes for major projects. But there is no federal “up or down” approval process for interstate or intrastate oil pipelines, leaving that function to the various states.⁹⁷

In the case of Texas, state approval is also minimal. An FAQ on the website of the Texas Railroad Commission, the primary state regulatory body for the oil and gas industry, states:

“In Texas, pipelines are not required to be permitted before being built. There is no statutory or regulatory requirement that a pipeline operator seek or receive from the Railroad Commission either a determination that there is a need for the pipeline capacity or prior approval to construct a pipeline and related facilities. Additionally, the Railroad Commission does not determine or confer common carrier status for pipelines. The pipeline operator reports to the Railroad Commission the status of a pipeline as a gas utility, common carrier or private line. Commission does not have any authority over a common carrier pipeline’s exercise of its statutory right of eminent domain. Generally, the Railroad Commission has no authority over the routing or siting of intrastate or interstate pipelines. The pipeline route is determined by the pipeline’s owner/operator.”⁹⁸

Texas grants a statutory right of eminent domain for “common carrier pipelines” which includes most oil pipelines. The Railroad Commission does issue T-4 permits that give the right to *operate* the pipelines, but as they note: “A T-4 Permit is essentially a registration process to provide the Railroad Commission (RRC) with information about a pipeline, such as the material it is carrying and whether the pipeline is jurisdictional to the RRC. There is no hearing at the Railroad Commission for T-4 Permits.”

Texas does have a “Landowners Bill of Rights,” but pipeline companies are not greatly constrained in their ability to get common carrier status and take land for pipelines via eminent domain.⁹⁹ A 2011 Texas Supreme Court decision ended the process of simply checking a box to obtain common carrier status, and now pipeline companies have to demonstrate public use when sued in a court of law. However, a recent court ruling clarified this standard and was seen as a win for pipeline companies.¹⁰⁰

To cap it off, the U.S. taxpayers are propping up oil and gas extraction through over \$10 billion in annual federal subsidies to fossil fuel production, many of which are directed at the private corporations expanding extraction in the Permian Basin.¹⁰¹ Research has shown that as much as 40% of Permian oil is only profitable to extract due to direct and indirect subsidies provided to oil and gas companies.¹⁰² Yet despite booming production levels, financial returns in the Permian have been poor and many drillers have yet to turn a profit.¹⁰³

The Permian boom has also brought with it severe local problems such as unpermitted air pollution, widespread gas flaring, unsustainable water use, wastewater disposal, earthquakes, heavy traffic, and stresses on local government services.¹⁰⁴

Taken as a whole, these factors make the Permian an important case study for why more federal oversight and active regulation is needed to constrain the expansion and proactively plan for the phase-out of oil and gas extraction. Potential energy policy changes could give the next president more tools to constrain oil and gas production in the biggest producing region in the U.S., but without these critical changes, this dynamic represents a serious and growing risk to the global climate.



Cattle Grazing near Hydrofracking Installation in Texas © Les Stone / Greenpeace

Policy Recommendations and Conclusions

The science is clear that any further expansion of fossil fuel production is incompatible with the Paris Climate Agreement and risks locking in future emissions. In the U.S., unconstrained fossil fuel production threatens to undermine emission reductions that could be achieved by ambitious demand-side policies and a build-out of renewable energy. The path forward is an immediate halt to new oil, gas, and coal development in the U.S. and a managed phase out of existing fossil fuel production consistent with safe climate limits. The next president and Congress must utilize existing authorities as well as pass new legislation to constrain oil, gas, and coal production. They must also cut off government support for fossil fuels, invest in a just transition for communities, and secure strong labor protections to ensure workers are treated fairly in the transition.

Existing laws and regulations give the president authority to constrain some fossil fuel production and to protect communities from air and water pollution — and the next president should exercise those powers to their fullest extent. To begin with, the president has clear authority over fossil fuel leasing on federal lands and waters,¹⁰⁵ which accounts for roughly 24% of U.S. greenhouse gas emissions.¹⁰⁶ The next president should put an end to new fossil fuel leases on their first day in office. The next president should also take

aggressive action to reinstate, strengthen, and fully enforce regulations to reduce air and water pollution from existing fossil fuel-based infrastructure.

Congress must also lead by taking new legislative actions to reverse laws designed to support fossil fuels, and to provide new policy tools for the federal government to wind down fossil fuel production and secure a just transition for workers and communities. Such new legislation should work towards eliminating all subsidies and public finance for fossil fuels, implementing a “climate test” for the permitting and construction of new infrastructure, and halting exports of crude oil and other fossil fuels. At the same time, Congress must secure large-scale federal investments and protections to ensure that the transition to a 100% renewable economy improves the lives of all workers, communities, and tribal nations (for more details see Box 2: Fossil Fuel Phase Out Requires a Just Transition).

Winding down an industry as entrenched as the fossil fuel industry at the pace and scale that science and justice demand will also require a new realm of bold policy actions, beyond those typically discussed in the halls of power. In particular, federal policymakers must take meaningful action to address and redirect the hundreds of billions of dollars in private finance being poured into the expansion of oil, gas, and coal.¹⁰⁷



Break Free Action in Washington D.C. © Tim Aubry / Greenpeace

Fossil Fuel Phase Out Requires a Just Transition

Engaging with workers, communities, and tribal nations in the transition away from fossil fuels to a 100% renewable energy economy must be a central ingredient of any climate platform pursued by the next president and Congress. Plans to phase out fossil fuel production and consumption will necessarily impact workers in those industries and communities across the U.S. A participatory process should be put in place to ensure those workers, communities, and tribal nations are left better off through the transition. While not a focus of this report, a wide range of groups have highlighted both the promise of a just transition, as well as components of what a successful plan might look like. The recent momentum around a Green New Deal, which centers strong labor protections as a core ingredient, has also sparked important conversations about the scale of investment needed and the scope of protections necessary to uplift all workers.

Numerous analyses have noted that the energy transition needed to address climate change also holds the potential to create large numbers of new, well-paying jobs in sustainable industries, both in the United States¹⁰⁸ and around the world.¹⁰⁹ But this outcome is far from guaranteed, and in practice the renewable energy sector has often produced non-unionized jobs with weaker wages and benefits than the fossil fuel jobs they claim to be replacing. Policymakers must strengthen labor standards and protections for the clean energy sector, while also providing sufficient investment in social programs to facilitate the transition.

Purely economic solutions will not be enough without a process that empowers people and strengthens communities. Accordingly, a just transition should focus not solely on job creation, but also on reorienting toward a regenerative economy rather than an extractive one,¹¹⁰ one that promotes self-determination, redistributes power and resources, retains culture and tradition,¹¹¹ and moves us toward “Buen Vivir,” or “good living.”¹¹²

In practice, this will involve setting up processes to foster dialogue between stakeholders, as well as committing significant funding and resources to specific programs and policies. Just transition policies that have been identified include social protection programs, strong labor standards and labor market policies, job training, income support, pension guarantees, and targeted investments for specific communities.^{113,114} The Green New Deal has begun a process to turn these ideas into policies, but the next president and Congress will have a great responsibility to ensure that the transition ahead of us is imbued with justice and equitable participation.

Below, we lay out some specific actions the next president and Congress should take to meaningfully constrain U.S. fossil fuel production while supporting workers, communities, and tribal nations in the transition to a renewable energy-based economy. This is not a comprehensive list of climate policies or just transition recommendations, but rather a selection of actions focused on limiting the growth of the U.S. fossil fuel industry — and managing a wind-down of fossil fuel production — that the next president and Congress should champion as part of an ambitious Green New Deal to mobilize the U.S. economy toward 100% renewable energy.

Executive Actions for the Next President

- **End federal fossil fuel leasing by executive action on Day One.** The president has clear executive authority to regulate fossil fuel leasing on federal lands and waters. A policy of no new leasing of coal, oil and gas on public lands is an essential down payment on the fossil fuel phase out that is needed to limit warming to 1.5°C.
- **Set ambitious targets for a fossil fuel phase out.** A critical step in achieving restrictions on fossil fuel production is measuring and reporting the scale of the problem. The president should clearly identify the climate risks associated with continued fossil fuel production and set national targets, with regular milestones, for a production phase out in concert with other climate policies.
- **Fully account for the costs of climate change in federal permitting and decision-making.** The president should also issue guidance requiring a full consequential lifecycle analysis of greenhouse gas emissions and impacts under the National Environmental Policy Act for all significant federal actions.
- **Make strong appointments to critical federal agencies.** The next president will need to appoint strong leaders to positions at the Department of the Interior, Environmental Protection Agency, the Department of Energy, Council on Environmental Quality, FERC, and other federal energy agencies who understand the need for a fossil fuel

phase out and can effectively marshal all existing federal authorities to implement it. A designated ‘climate czar’ or an interdepartmental commission on fossil fuel phase out could be useful coordinating structures.

- **Restore, strengthen and fully enforce public health and clean air and water protections.** The Trump administration has sought to systematically erode existing federal regulations to protect our environment and ensure healthy communities. The next president should restore, strengthen, and fully enforce regulations to reduce air and water pollution in line with health-based standards, which are critical to protect vulnerable communities at the frontlines of fossil fuel extraction and consumption. In addition, the next president should restore and strengthen critical regulations to limit methane leakage and flaring from oil and gas infrastructure, in order to mitigate additional climate harms while fossil fuel infrastructure is being phased out.

Cutting Off Government Support for Fossil Fuel Production

The next Congress and president should work together to:

- **End subsidies and finance for fossil fuel production.** It is unconscionable that federal and state governments continue to provide more than \$20 billion a year in production subsidies to the fossil fuel industry through direct subsidies, tax giveaways, and public finance for fossil fuels.¹¹⁵ The next president and Congress should swiftly eliminate subsidies for coal, oil, and gas production and ensure that federal agencies such as the Overseas Private Investment Corporation and the Export-Import Bank end financing for fossil fuel projects.
- **Restore the crude oil export ban, and expand it to other fossil fuels.** As this report has illustrated, fossil fuel exports undermine emissions reductions earned from domestic climate policies. Unrestricted exports of crude oil are a climate threat of Congress’s own making. Congress should reinstate this ban, and impose additional bans on the export of liquified natural gas, coal, and other fossil fuel products.
- **Establish a new climate test mandate.** Congress should ensure that federal regulatory agencies have the authority to disapprove new fossil fuel infrastructure such as pipelines, refineries, and export terminals that would increase greenhouse gas emissions. Congress should mandate that regulatory agencies apply a “climate test” to those projects.¹¹⁶ Application of a meaningful climate test would demonstrate that new pipelines and export

terminals are not in the national interest — as they would facilitate greater carbon emissions that would harm Americans — and federal regulatory agencies should be given the authority to reject those projects.

Actions for Governors and State Legislatures

We call on state governors and legislatures to address fossil fuel extraction permits within their purview. States should enact policies to phase out fossil fuel permitting, consistent with national targets, in a manner that addresses environmental justice and just transition concerns. One initial step would be to apply a minimum buffer zone, or setback, around homes, schools and hospitals where oil and gas production should be phased out.

Decades of failed leadership have brought us to this moment of crisis. Words are no longer an adequate response — we demand rapid and ambitious action from our elected leaders. For the next president and Congress, real climate leadership means not only saying yes to real solutions like a rapid transition to renewable energy with equitable ownership and participation, but also saying no to the destructive impacts of fossil fuel extraction. A transformative Green New Deal means all of these things, and making it a reality means putting justice and equity for vulnerable workers and communities front and center in the transition to a clean and prosperous future.



Wind Energy Farm in Colorado © Robert Meyers / Greenpeace

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Appendix: Research Methods

Available for download [here](#).

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