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Tidal Wave

Greenhouse Gas Emissions from the Coming Wave of US Natural Gas Transmission Pipelines

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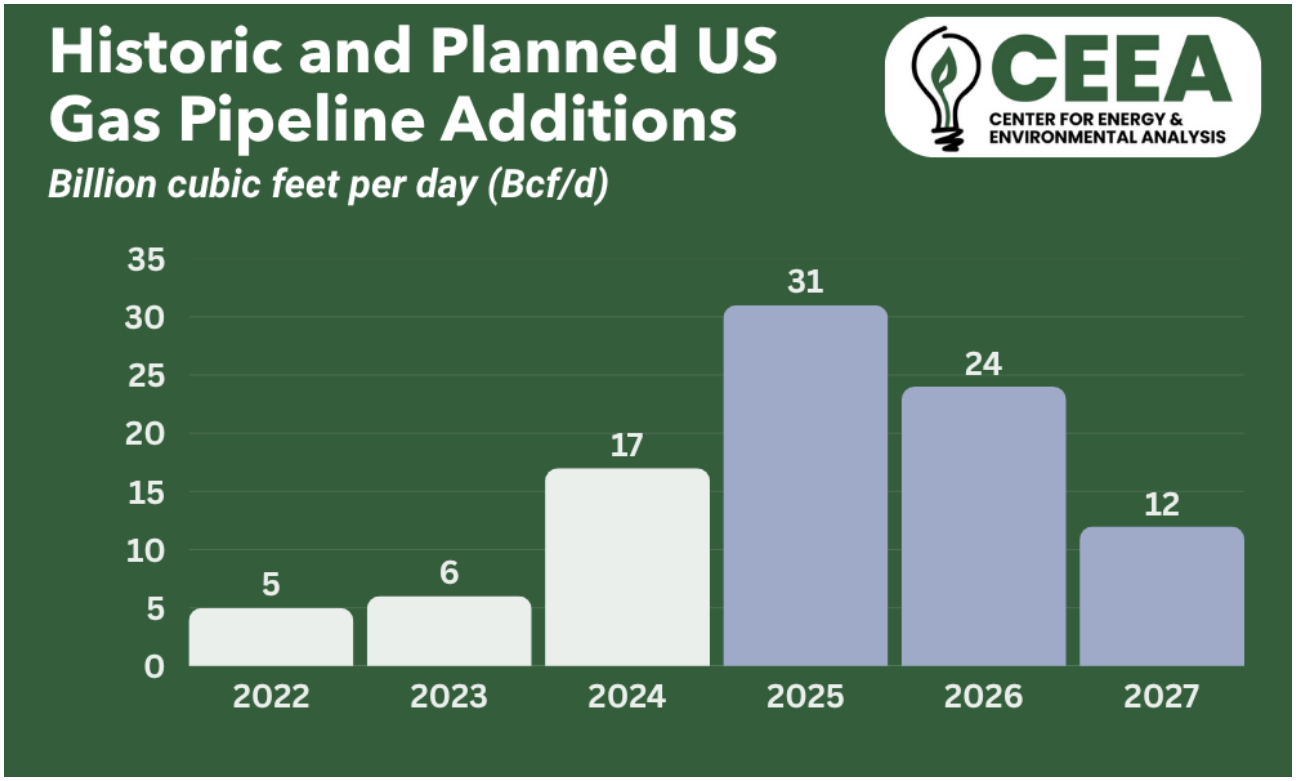
Brief Summary of Findings

1. A tidal wave of new natural gas transmission pipelines throughout the United States could lead to record increases in US natural gas production over the next five years. 104 natural gas transmission pipeline projects are planned or under construction across the United States.
    - The total additional capacity of these planned pipelines – 99 billion cubic feet per day (Bcf/d) – is just shy of the total volume of US natural gas production in 2024 (103 Bcf/d).
    - Sixty-seven Bcf/d of gas pipeline capacity is expected to be added between 2025 and 2027, which would be two and a half times more pipeline capacity than was installed during the past three years (26.9 Bcf/d, 2022-2024).

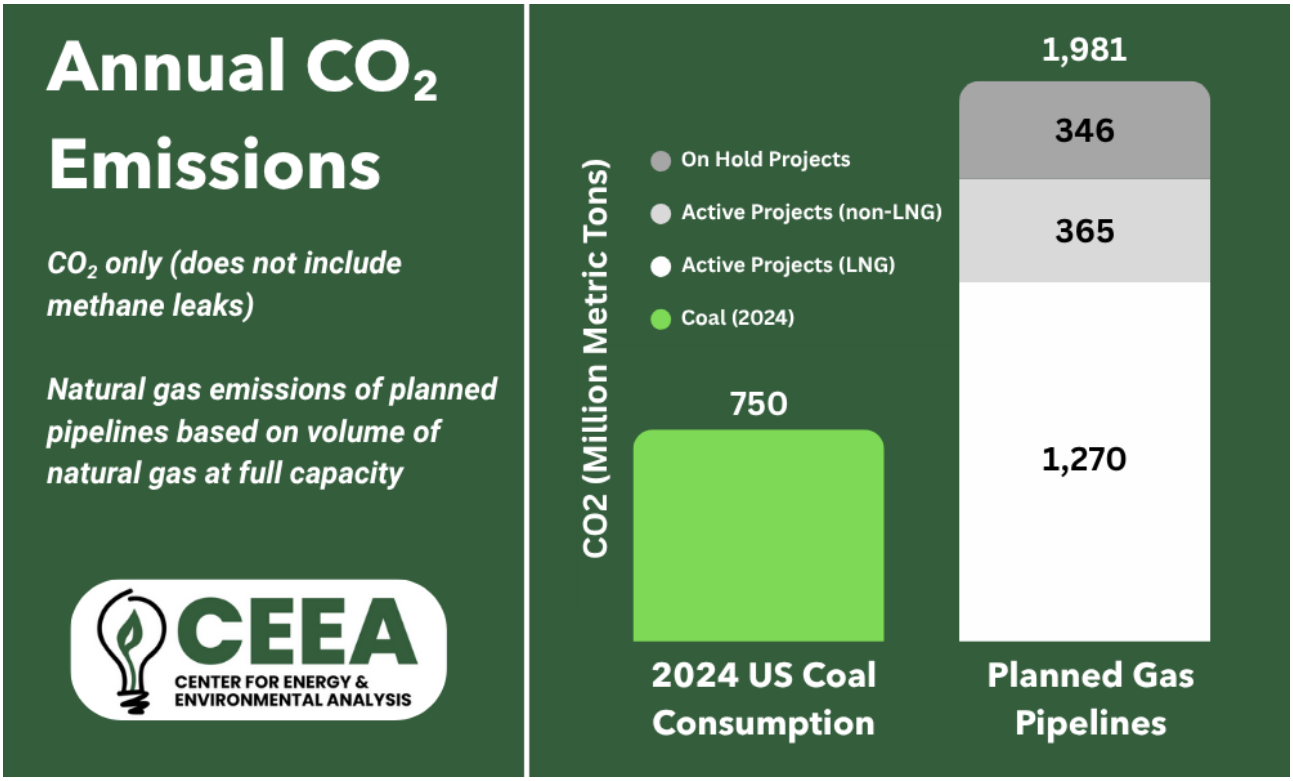
Figure 1. Historic and Planned Gas Transmission Pipeline Additions



2. The wave of planned natural gas transmission pipelines could have a CO2 footprint greater than all US coal consumption, locking in emissions for decades and undermining US and global climate progress (*see Figure 2 and Table 1*).

Figure 2. Comparison of Greenhouse Gas Emissions

Planned Gas Pipelines vs. Total US Coal Use



3. Building new gas transmission pipelines will significantly increase US emissions of methane, a potent greenhouse gas (*see Tables 2 and 3*). The Trump administration's deregulatory agenda will contribute to high methane leak rates from oil and gas operations, resulting in an even higher climate footprint from new transmission capacity and associated production.
    - Most methane leaks occur during gas production, gathering and distribution. Less than 1% of US methane leaks from gas pipelines occurs during transmission.

4. Eighty percent of the natural gas shipped through planned pipelines will be converted to LNG and shipped overseas (*see Table 1*), increasing energy costs for US consumers and businesses.

Table 1. Potential CO_2 Emissions from Planned US Natural Gas Transmission Pipelines

Project Status	Additional Pipeline Capacity	CO_2 from Gas Combustion (at full pipeline capacity)
	million cubic feet/day	million metric tons CO_2 per year
Active	**81,718**	**1,640**
LNG	63,556	1,276
Non-LNG	18,162	365
On Hold	**17,234**	**346**
Total	**98,952**	**1,986**

Table 2. Potential Methane Emissions from Planned US Natural Gas Transmission Pipelines

Project Status	Methane Emissions from Production Basin Feeding Pipeline			
	Average Methane Leak Rate (assumption based on the origin region of each pipeline)	CH_4 (million cubic feet/day)	CO_2-equivalent GWP100 (million metric tons CO_2e/yr)	CO_2-equivalent GWP20 (million metric tons CO_2e/yr)
Active		**1,971**	**433**	**1,199**
LNG	2.5%	1,564	344	951
Non-LNG	2.2%	407	89	247
On Hold	**2.4%**	**394**	**87**	**240**
Total	**2.4%**	**2,365**	**520**	**1,438**

Table 3. Total Potential Greenhouse Gas Emissions from Planned US Natural Gas Transmission Pipelines

Project Status	Total Greenhouse Gas Emissions (methane + CO_2)	
	GWP 100 (million metric tons CO_2e/yr)	GWP 20 (million metric tons CO_2e/yr)
Active	**2,074**	**2,839**
LNG	1,620	2,227
Non-LNG	454	612
On Hold	**432**	**585**
Total	**2,506**	**3,425**

The Increasing Imperative for Independent Energy and Environmental analysis

The Trump administration has taken unprecedented steps to keep the public in the dark about greenhouse gas emissions and climate change data as it fast-tracks permitting of new energy projects, favoring development of "oil, natural gas, coal, hydropower, biofuels, critical mineral, and nuclear energy resources."

In its first one hundred days, the Trump administration has taken steps to:

- shut down EPA's mandatory greenhouse gas emissions reporting program that reveals the largest sources of emissions throughout the country
- censor information from the U.S. Energy Information Administration
- fire scientists responsible for congressionally mandated climate assessments
- withhold publication of the official inventory of US greenhouse gas emissions
- terminate all "climate-dominated research, data, and grant programs" at NOAA, and
- shutter EPA's science office.

Considering these developments, we can no longer fully rely on the US government for accurate information when it comes to climate change and energy. Now more than ever, independent analysis is needed to examine how near-term US energy and environmental policies will impact energy and the environment.

Analysis is especially needed to:

(1) Examine how long-lived energy infrastructure and long-term energy production leases on public lands will shape energy production and consumption well beyond any one election cycle, potentially locking in emissions for decades to come.

(2) Place greenhouse gas emissions analysis of energy infrastructure in the proper context of science-based climate goals, global climate agreements, and long-term deep decarbonization pathways.

(3) Examine the greenhouse gas impact of natural gas infrastructure, given (a) the enormous scale of the proposed buildout of long-lived infrastructure, (b) the growing body of peer-reviewed evidence that the climate footprint of US natural gas is far higher than previously believed due to methane leaks, and (c) recent steps taken by the US government to shut down programs and regulations that would have reduced methane leaks from US natural gas.

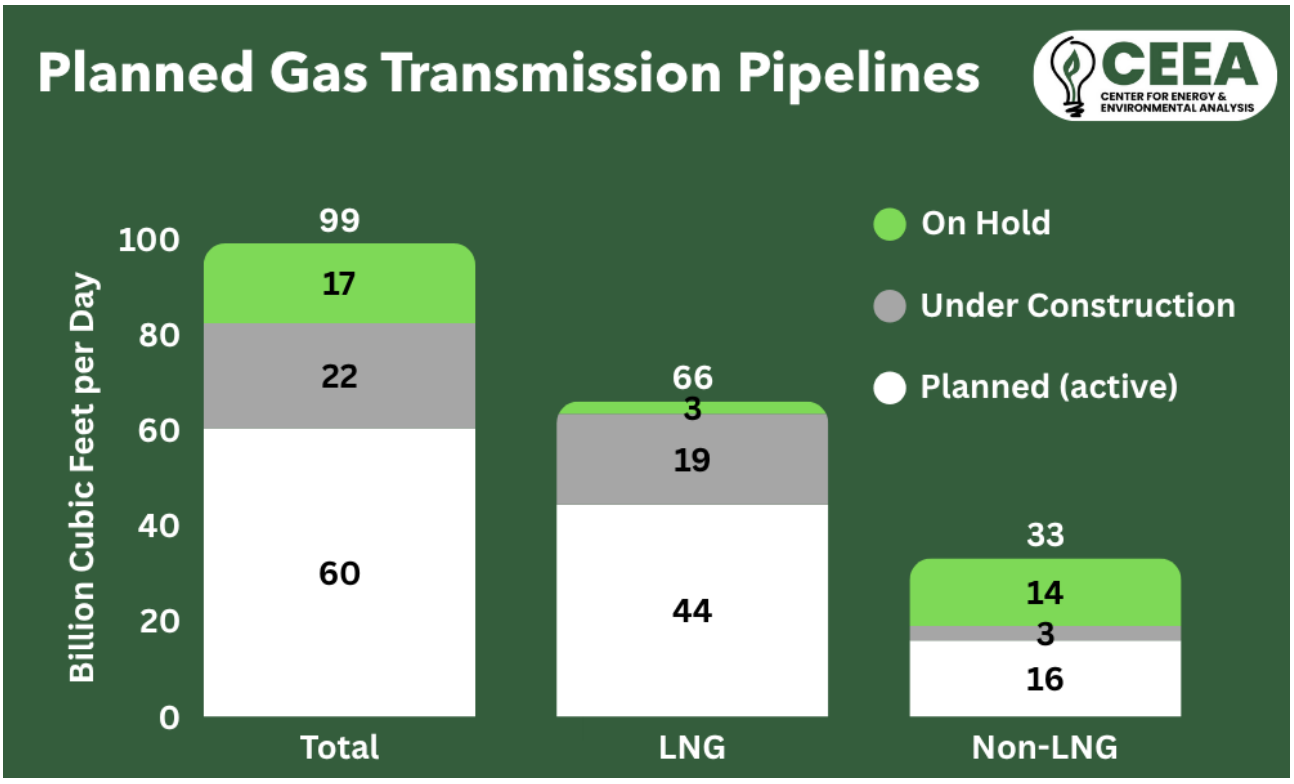
Finding 1: A Tidal Wave of New Pipelines

A tidal wave of new natural gas transmission pipelines throughout the United States could lead to record increases in US natural gas production over the next five years

Key Points

- The scale of the planned buildout of US natural gas transmission pipelines is enormous. As of April 2025, 104 natural gas transmission pipeline projects are planned or under construction across the United States. The total capacity of these planned pipelines – 99 billion cubic feet per day (Bcf/d) – is just shy of the total volume of US natural gas production in 2024 (103 Bcf/d).[1]

Figure 3. Natural Gas Capacity of Planned Transmission Pipelines



[1] Pipeline capacity numbers are additional to any current pipeline capacity that is being replaced or upgraded on the same route, and they have also been adjusted to avoid double counting gas flowing through multiple or alternative projects.

- Eighty-two Bcf/d of this capacity are active projects in various stages, from pre-permitting though construction, and an additional 17 Bcf/d are currently on hold. One-quarter of the active pipeline projects (22 Bcf/d) are already under construction or partially completed.
- US natural gas production reached record highs in 2024. With additional transmission pipelines, US natural gas production could increase by more than twenty percent over the next decade, according to US Energy Information Administration's (US EIA's) latest "high oil and gas supply" forecast (US EIA, 2025a). US EIA's latest forecast does not include rollbacks to clean energy incentives and environmental regulations that are currently being pursued by the administration, which could push gas demand and production even higher.

- CEEA's data set of projects and their associated greenhouse gas emissions, are available in a separate file that accompanies this report.

Data Sources and Methodology

CEEA built a data set based on US EIA's April 2025 database of natural gas pipeline projects (US EIA 2024). US EIA provides "additional capacity" for each pipeline project in million cubic feet per day. CEEA used data from Oil and Gas Watch to verify some data and fill in data missing from US EIA's database where available (EIP 2025). Capacity amounts were added for two projects: the Delta Express Pipeline Project and the Whistler Martin Country Lateral.

CEEA screened projects for entries that represented potentially duplicative of other entries. We identified three pipeline projects as potentially duplicative: The Saguaro border facility (duplicative of the Saguaro pipeline), the Warrior Pipeline (now the Hugh Brinson Pipeline), and the Alaska Stand Alone Pipeline (which US EIA notes would only proceed if the Alaska LNG pipeline does not). These projects are included in CEEA's data set, but their associated capacity and emissions are removed when calculating totals across multiple projects to avoid double counting.

In many instances, US EIA identified the destination market for a pipeline, including where appropriate an "LNG" tag. CEEA identified three additional pipeline projects (Saguaro Connector Pipeline, Blackcomb Pipeline, and Blackfin Pipeline) as providing US gas for LNG exports.

US EIA categorizes each project status based on the categories defined in the following chart. CEEA removed projects marked as completed, cancelled, or denied from the data set, and we assigned our own categories, as follows:

Table 4. Pipeline Status Categories

US EIA "project status" category	US EIA definition	CEEA category
Cancelled*	Project has been announced as no longer moving forward	*Not Included in Data Set
Denied*	Project has failed to obtain approval from relevant regulatory agency	
Completed*	When the projects is completed or put in service	
Announced	When companies make public announcement about the project	Active (Planned)
Pre-applied	When an interstate pipeline pre-applied with FERC	
Applied	When an interstate pipeline applied with FERC	
Approved	When any pipeline received approval from federal or state regulatory body	
Construction	When the project is under construction	Active (Under Construction)
Part Completed	Portions of project have entered service; however, additional portions of project/capacity have yet to enter operation	
On Hold	Project is not moving forward, but project sponsor has not announced cancelation	On Hold
Announced/On Hold		
Applied/On Hold		
Approved/On Hold		

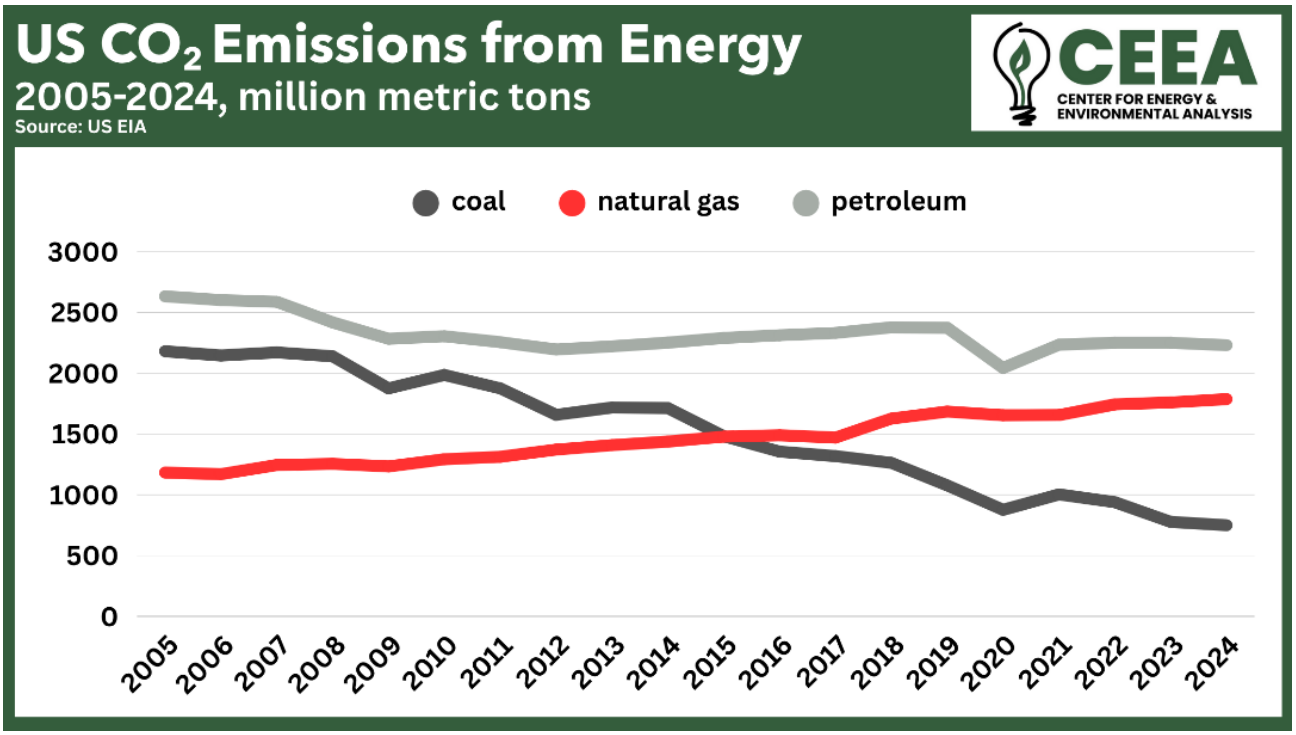
Finding 2: A CO_2 Footprint Greater than All US Coal

The wave of planned natural gas transmission pipelines could have a CO2 footprint greater than all US coal consumption, locking in emissions for decades and undermining US and global climate progress

Key Points

- CO_2 emissions from US natural gas consumption have increased 50 percent over the past 20 years, the fastest growing source of US greenhouse gas emissions.
- If all planned US transmission pipeline projects are built and utilized at full capacity, the CO_2 emissions from the natural gas (1,981 million metric tons CO_2 annually) transported by these pipelines would be twice as large as all CO_2 emissions from every coal-fired power plant and industrial boiler in the United States combined (750 million metric tons in 2024). Even if only half of the capacity of active pipeline projects are built and fully used and if none of the "on hold" projects are built, the CO_2 emissions would still exceed current US coal emissions. *See Figure 2, pg. 3 and Table 1, pg. 4.*
- Methane leaks from natural gas production and distribution add significant greenhouse gas emissions that are additional to the above CO_2 numbers. *See Finding 3.*

Figure 4. US CO_2 Emissions Trends



- The near-term buildout of natural gas pipelines is premised on investor assumptions that additional natural gas capacity will be needed for decades to come. This buildout is therefore designed to "lock in" greenhouse gas emissions well beyond the term of any one president, delaying or preventing the transition to near-zero or zero-emission alternatives.
- Further increases in natural gas production undermine US and global progress toward deep decarbonization pathways needed to stabilize greenhouse gas concentrations in the atmosphere. According to the International Energy Agency, "there is no need for investment in new fossil fuel supply" in net-zero pathways (IEA 2023). Likewise, the Intergovernmental Panel on Climate Change (IPCC) has concluded that "cancellation of plans for new fossil fuel infrastructures" is needed to avoid "significant carbon lock-ins, stranded assets, and other additional costs" (IPCC 2022).

Discussion

The World Meteorological Organization is predicting a 70% likelihood that global temperatures over the next five years (2025-2029) will exceed pre-industrial averages by 1.5 degrees C. If we are serious about stabilizing global climate temperatures, we need to understand how new energy infrastructure will lock in emissions at a time where we need to be rapidly phasing them out.

Investments in new fossil fuel infrastructure are often costly and premised on the assumption that fossil fuel consumption will increase in the decades ahead. That is, they need a guaranteed, long-term source of revenue to justify the upfront costs. Some infrastructure projects, such as LNG liquefaction facilities, depend on securing 20-year contracts from LNG purchasers, guaranteeing revenue streams. Even without such contracts, companies will go to great lengths to influence policy and secure markets for their products. These infrastructure projects "lock in" greenhouse gas emissions by slowing or preventing the transition to alternatives, including reducing energy consumption through energy efficiency and shifting to renewable energy sources (WRI, 2021).

Over the past decade, important scientific frameworks have been developed to help identify how energy projects help or hinder progress toward science-based climate goals. In particular, the concepts of a global carbon budget and deep decarbonization pathways enable a quantitative look at our fossil fuel production and infrastructure so we can identify when we have built enough, and the speed with which we should shift investment towards energy infrastructure that is as close to zero emissions as possible.

In 2013, the IPCC adopted the concept of the "global carbon budget" in its fifth assessment report. That is, only a certain amount of additional carbon dioxide equivalent emissions can be added to the atmosphere before the likelihood of exceeding certain thresholds for stabilizing global temperatures. Their sixth assessment report updated and narrowed the budget.

Net-zero pathways provide robust reference points for determining global and country-level encroachment on global climate goals. In 2021, the International Energy Agency (IEA) published the Net Zero report (updated in 2023), which included 400 milestones for global pathways to achieve net-zero emissions by 2050 (IEA, 2023).

Further, pursuant to the 2015 Paris climate accord, 76 nations have submitted strategies to achieve deep decarbonization by mid-century. The United States has submitted two strategies for achieving deep decarbonization by mid-century in 2016 and in 2021. According to the 2021 report:

> "This 2021 Long-Term Strategy represents the next step: it lays out how the United States can reach its ultimate goal of net-zero emissions no later than 2050. Achieving net-zero emissions is how we—and our fellow nations around the globe—will keep a 1.5°C limit on global temperature rise within reach and prevent unacceptable climate change impacts and risks. The Long-Term Strategy shows that reaching net-zero no later than 2050 will require actions spanning every sector of the economy. There are many potential pathways to get there, and all path-ways start with delivering on our 2030 Nationally Determined Contribution. This will put the United States firmly on track to reach net-zero by 2050 and support the overarching vision of building a more sustainable, resilient, and equitable economy."

Studies have found that there is already enough fossil fuel infrastructure in place to exceed net-zero emissions pathways (Tong et al., 2019). According to the International Energy Agency, "there is no need for investment in new fossil fuel supply" in net-zero pathways. Likewise, the Intergovernmental Panel on Climate Change (IPCC) has concluded that "cancellation of plans for new fossil fuel infrastructures" is needed to avoid "significant carbon lock-ins, stranded assets, and other additional costs."

Further, proven fossil fuel reserves already discovered suffice to power that infrastructure and exceed by a factor of 10 the carbon budget consistent with 1.5°C future (Carbon Tracker 2022). In other words, enough coal, oil, and gas has been discovered to keep the power plants, pipelines, and terminals we already have sufficiently busy to exceed our remaining carbon budget many times over.

Data Notes and Methodology

These estimates reflect zero-based greenhouse gas accounting, the appropriate starting place for understanding the impact of new energy infrastructure that will shape emissions for decades to come against net-zero emission goals. The estimates also include global emissions for combustion of exported natural gas.

Zero-based greenhouse gas accounting for energy projects

Understanding how new infrastructure will lock in emissions over time requires analysis based on zero-based greenhouse gas accounting. Just as zero-based budgeting requires that every expense be acknowledged and justified from scratch, rather than being automatically deemed inconsequential based on previous budgets, zero-based greenhouse gas accounting requires a full assessment of the greenhouse gas emissions of any project.

This avoids the common practice of justifying decisions and projects that lock in significant emissions because they are no worse than existing emissions sources (also known as "net" accounting). The fundamental flaw in net accounting for greenhouse gases is that it normalizes actions that will bust a carbon budget and slow the transition to net-zero on the basis that it is only incrementally better or worse than the alternatives.

The practice of net accounting can be usefully deployed to provide additional information if measured against a clear pathway for achieving net-zero emissions, provided it is not used to hide the total emissions footprint. However, the practice is routinely abused by measuring against a business-as-usual pathway that fails to achieve decarbonization goals.

Net-zero studies are often used in place of zero-based accounting to justify new energy infrastructure and hide the true scale of the potential carbon lock-in. The US government has used this practice to make 98% of energy project's greenhouse gas emissions, on average, disappear from the view of decision makers (Symons 2023b).

Global greenhouse gas accounting for energy projects

Global climate agreements have perpetuated a particularly nationalistic set of blinders when it comes to accounting for and assessing greenhouse gas emissions (Symons 2023c). According to convention, nations are only responsible for tracking and reducing GHG emissions that happen within their national borders.

Considering the surge of natural gas and oil exports from the United States, it's more important than ever to account for GHG emissions from US energy infrastructure projects regardless of where the fuel is combusted. There are four primary reasons why the GHG footprint of fossil fuel exports should be included:

- First, the scale of U.S. oil and gas exports has become far too large for the greenhouse gas footprint to be kept out of sight. It should be the goal of analysis to shine the most sunlight possible on where we are heading.

- Second, it makes little difference to the atmosphere where emissions (and emission reductions) take place around the world.

- Third, every tool in the toolbox is needed to combat climate change, and acknowledging the full impact of energy infrastructure decisions shines a light on additional opportunities for action.

- Finally, the shift to global net-zero emissions goals fundamentally challenges prior assumptions that supply policies are not important.

FINDING 3: SIGNIFICANT WARMING FROM METHANE LEAKS

Building new transmission pipelines will significantly increase US emissions of methane, and the Trump administration's deregulatory agenda will contribute to high methane leak rates from oil and gas operations

Key Points

- Measurements from peer-reviewed studies based on one million aerial measurements show that leak rates during production in some regions are sufficiently high that the overall climate footprint for natural gas is as bad as coal (Sherwin et al 2024, Gordon et al 2023).
- Methane leak rates are especially high in the Permian Basin (spanning large sections of Texas and New Mexico), which is the point of origin for many of the planned transmission pipelines identified in this analysis.
- Despite readily available technologies and practices that can significantly reduce methane leaks from oil and gas production, US leak rates are unlikely to improve significantly in the coming years because a key program to reduce oil and gas methane emissions has recently been disapproved by Congress and President Trump, and because EPA has halted enforcement of its 2024 regulations that limit methane emissions from oil and gas operations.
- When methane leaks are added to the CO2 emissions from natural gas combustion, the total potential greenhouse gas emissions attributable to active pipeline buildout are:
    - 2.1 gigatons CO_2-equivalent annually (GWP100) and 2.8 gigatons (GWP20), assuming full pipeline capacity utilization.
    - 1 gigaton CO_2-equivalent annually (GWP100) and 1.4 gigatons (GWP20), assuming 50% pipeline capacity utilization.

Table 5. Potential GHG Emissions from Planned US Natural Gas Transmission Pipelines

Project Status	Additional Pipeline Capacity	CO2 from Gas Combustion (at Full Pipeline Capacity)	Methane Emissions from Production Basin Feeding Pipeline				Total Greenhouse Gas Emissions (Methane + CO2)	
	million cubic feet/day	million metric tons CO2 per year	Average Methane Leak Rate (based on gas basin of pipeline origin)	CH4 (million cubic feet/day)	CO2-equivalent, GWP 100 (million metric tons CO2e/yr)	CO2-equivalent, GWP 20 (million metric tons CO2e/yr)	GWP 100 (million metric tons CO2e/yr)	GWP 20 (million metric tons CO2e/yr)
Active	**81,718**	**1,640**	**2.4%**	**1,971**	**433**	**1,199**	**2,074**	**2,839**
LNG	63,556	1,276	2.5%	1,564	344	951	1,620	2,227
Non-LNG	18,162	365	2.2%	407	89	247	454	612
On Hold	**17,234**	**346**	**2.3%**	**394**	**87**	**240**	**432**	**585**
Total	**98,952**	**1,986**	**2.4%**	**2,365**	**520**	**1,438**	**2,506**	**3,425**

Note: See Tables 1-3 on pages 4-5 for more readable versions of the data summarized in this table.

Discussion

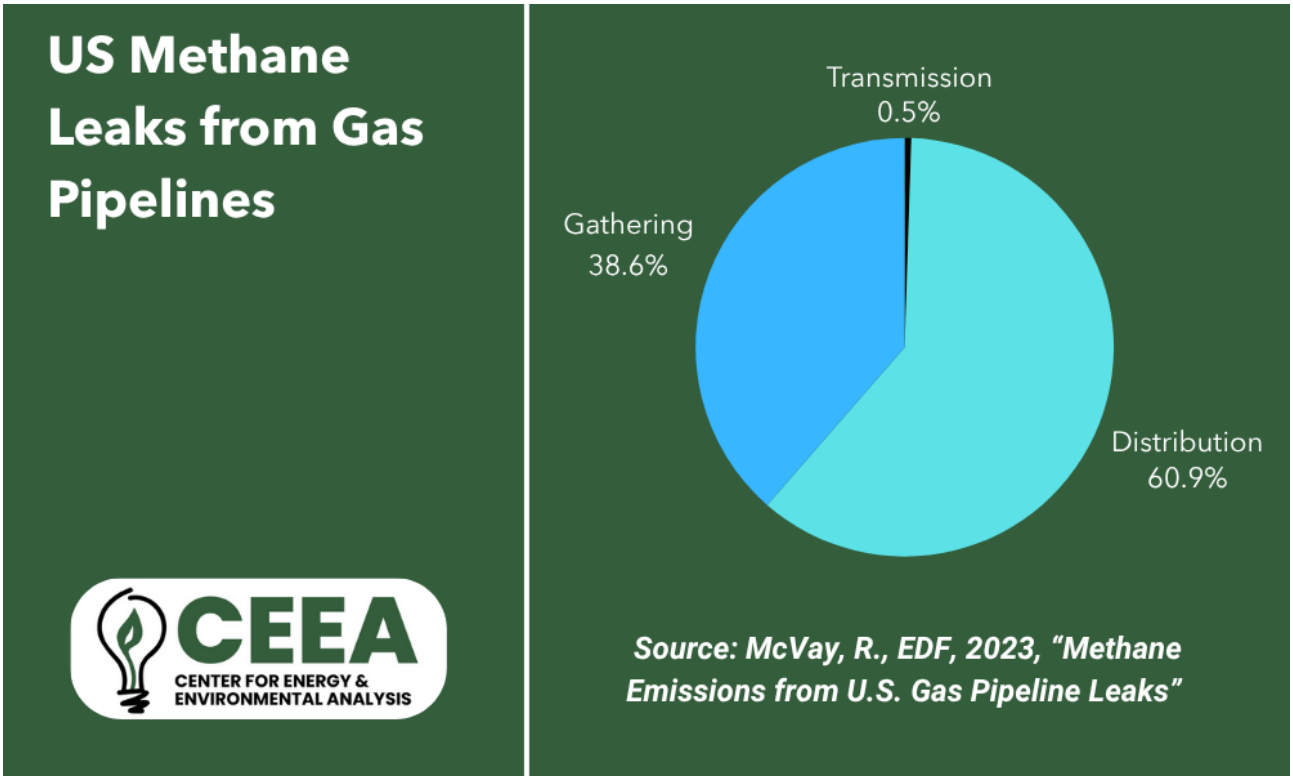
Methane, the primary component of natural gas, is an especially potent greenhouse gas when leaked into the atmosphere. When its warming effects are evaluated over a 100-year timespan ("GWP_{100}"), methane leaked into the atmosphere has an impact 30 times higher than when combusted, at which point it is converted into CO_2. When evaluated over a shorter 20-year timespan ("GWP_{20}"), the impact of leaked methane is 83 times higher than when combusted.

In the right circumstances, replacing existing gathering and distribution pipelines with newer pipes can not only provide good jobs but also reduce methane leaks and improve safety. However, the wave of new transmission pipelines analyzed in this report are designed to increase transmission capacity and gas production. These projects will not significantly reduce methane leaks, for the following three reasons:

- First, the vast majority (99%) of methane leaks from gas pipelines occur during oil and gas production and gathering before being transmitted by long-distance pipelines, and from distribution pipelines near the final destination. Less than one percent of pipeline leaks occurs during transmission (EDF 2023). *See Figure 5.*

- Second, most of the pipelines assessed in this report are new pipelines designed to support increased natural gas production. Natural gas production and gathering are leading contributors of methane emissions and the basis for the leak rates used in this analysis.

Figure 5. Portion of US Methane Leaks from Different Gas Pipelines Stages



- Finally, increased production for LNG will entail additional leaks when liquefying, shipping, degasifying, and distributing the gas at the destination. These additional emissions from LNG are substantial, but have not been incorporated into this analysis (Howarth 2024, Symons 2023a, McKenna/Aldhous 2025).

Data Sources and Methodology

Methane leaks assumptions for this analysis are estimated based on observed aerial measurements compiled in a 2024 peer-reviewed study published in *Nature* (Sherwin et al, 2024), which assessed nearly one million aerial measurements. This study is consistent with other published peer-reviewed studies of observed US methane leak rates. The report concluded that nationwide average methane emissions from oil and gas operations are 2.95%, "roughly three times the national government inventory estimate." The study covers emissions from production and midstream (pipeline) emissions within the production basin (primarily gathering lines).

Observed methane leak rates from aerial and satellite measurements vary across US regions. One factor correlated with emission rates is the relative mix of oil and gas within any given formation, since production wells produce both oil and gas. Methane emissions are especially high (up to 9.6%, with an average of 4.1%) in the oil-rich Permian Basin (West Texas and southeastern New

Mexico), where wells produce 40% gas and 60% oil on average (energy-weighted), and significantly lower in the gas-dominant Appalachian Basin (0.78%), which produce 98% gas (in Pennsylvania).

For this analysis, methane leak rates have been reduced to subtract a share of the production emissions equivalent to the energy-weighted share of oil production. The remaining production emissions are used to arrive at a weighted leak rate attributable to natural gas. The following leak rates are assigned based on the point of origin for each pipelien:

- Permian: 2.8%
- Appalachia: 0.7%
- Other regions (based on national average): 2.3%

Finding 4: 80 Percent Destined for Export

Most of the natural gas shipped through new pipelines will be converted to LNG in Texas and Louisiana and shipped overseas

Key Points

- Eighty percent (66 Bcf/d) of the capacity of active pipeline projects, including the ten largest planned pipelines across the country, are intended to export gas overseas via liquefied natural gas (LNG) facilities.

- Rising LNG export volumes will significantly increase costs of domestic natural gas for US consumers (CEEA 2025).

- Nine of the 10 largest pipelines go through Texas and/or Louisiana, impacting communities that are already heavily burdened with unhealthy levels of oil and gas pollution.

Discussion

As previous reports have shown, LNG export quantities and proposed infrastructure:

- Would greatly exceed the needs of our existing allies (particularly those in Europe affected by the shut-off of Russian gas following their invasion of Ukraine)
- Are incompatible with net-zero pathways envisaged by the US's NDC
- Would raise energy costs for Americans

When LNG facilities are built in a community, that community can expect increased emissions from construction equipment, truck traffic, and natural gas flaring once the LNG facility is up and running. The flares are particularly concerning when there is incomplete combustion of the natural gas.

Communities near existing and planned LNG export terminals in Texas and Louisiana are already bearing a heavy environmental burden. According to a comprehensive 2024 report (Bullard Center 2024):

> "The numerous, extensive impacts and health and safety risks of LNG development are particularly concerning to historically-marginalized communities that have suffered from decades of pollution and ecological destruction from oil and gas and petrochemical industries—communities on the frontline of struggles for environmental justice, health, and safety. LNG development forces citizens and policymakers alike to consider its implications for a clean energy transition domestically and globally."

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