The Challenge Of Measuring Pipelines' GHG Footprints

By David Harrison (May 22, 2020, 4:15 PM EDT)

Combating climate change promises to be a defining challenge for the U.S. and the world. And reducing the greenhouse gas emissions that lead to climate change means reducing the use of fossil fuels.

This fundamental proposition has led to calls to evaluate the GHG impacts of fossil fuel projects, particularly pipelines that transport natural gas and oil, with the prospect that the projects would be rejected if the GHG impacts indicate they are not in the public interest. Recent examples of calls for such review include the following.

**FERC Reviews**

The Federal Energy Regulatory Commission has been asked in numerous cases to require natural gas pipelines to evaluate effects on GHG emissions, as part of requirements of the Natural Gas Act, or NGA, and the National Environmental Protection Act, or NEPA,[1] with implications for project approval.

In April, for example, environmental groups sued FERC over its approval of a two-mile pipeline and compressor station in Massachusetts, citing concerns about GHG impacts.[2] In the same month, environmental groups urged FERC to reject a request for additional time for certification of a Washington state pipeline to serve a proposed methanol refinery, based on concerns about the refinery's impacts on GHG emissions.[3]

Other recent examples of similar challenges include the Atlantic Coast and Mountain Valley natural gas pipeline projects.[4]

**State Permitting**

In many cases, state permitting agencies have been asked to consider GHG emissions impacts as a precondition to approval of projects. Examples include the Puget Sound Clean Air Agency's decision to approve the construction of a Puget Sound Energy's LNG facility in Tacoma, Washington.[5]

Similar claims are before the Minnesota Court of Appeals, with litigants claiming that an environmental impact statement failed to evaluate the potential impacts of a natural gas pipeline project on upstream and downstream GHG emissions.[6]

**NEPA**

In January, the White House Council on Environmental Quality proposed updates that would significantly narrow the definition of what effects must be considered under NEPA — to exclude the terms "direct," "indirect" and "cumulative" — so that a project's broader impacts on climate change would not be considered.

These changes have been heavily criticized by environmental groups.[7] Much of the discussion has concerned important legal questions.
For instance, what review of GHG impacts is required under the NGA to determine whether a pipeline is consistent with the public interest? What additional review is required under NEPA? Do state permitting regulations require review of impacts on GHG emissions? What is the range of impacts — should indirect impacts on upstream and downstream emissions be included? What is the legal standard to assess the adequacy of any such review?

Such legal questions, of course, are important. But it also is critical to clarify the nature of the potential impacts of these projects on GHG emissions. What is at stake in these decisions?

Some commentators recommend that impacts on GHG emissions be based on simple calculations — calculate GHG emissions impacts from a proposed pipeline as equal to the full combustion potential of the fuel transported, or the full lifecycle GHG emissions, including combustion emissions, as well as total emissions from the supply chain.[8]

Such gross calculations, however, do nothing to clarify what is at stake if a given pipeline were constructed or expanded. But it is possible to use basic facts on the sources of GHG emissions from the lifecycle of energy products, along with basic supply and demand considerations, to provide some clarity on what is at stake in decisions on pipeline projects.[9]

First, it is clear that combustion emissions dominate GHG emissions compared to emissions from the energy supply chain, and thus should be the principal focus of a concern for major GHG impacts.[10] GHG emissions from combustion represent about 94% of GHG emissions from total petroleum production and use.[11] Similarly, GHG emissions from combustion account for about 88% of GHG emissions from total natural gas production and use.[12]

Second, any increases in GHG combustion emissions depend on the effects on demand for final energy products (such as electricity and gasoline). A proposed pipeline would increase GHG combustion emissions only if the pipeline would lead to price decreases for final energy products, which in turn would only occur if the pipeline decreased costs.

Third, with regard to impacts on costs, the costs of transporting oil and gas from production sites to processing and refining facilities — or from processing/refining to final demand centers — account for a small share of the overall costs of providing electricity, gasoline and natural gas.[13]

Moreover, if a proposed pipeline were not available to transport natural gas or oil, the supply system could respond by switching to other transport options (e.g., use another pipeline or rail to transport the same fuel) and/or other fuel supply options (e.g., substitute the fuel with additional domestic production elsewhere or additional foreign supply).

These and other potential supply adjustments suggest that the presence or absence of a given pipeline may have little effect on producers’ costs and thus little effect on the prices consumers pay for natural gas, gasoline, electricity and other final fossil fuel products.

Fourth, even if final product prices were affected, the low price elasticity of demand for gasoline, electricity, natural gas and other final products means little change in the use of final products. The price elasticity for gasoline, for example, is about -0.3, which means that a price decrease of 1% would lead to an increase in gasoline use by about 0.3%.[14]

Fifth, little change in use of final fossil fuel products due to a pipeline means little if any change in global GHG emissions. Put another way, if a given pipeline does not have a significant effect on the costs and prices of natural gas, gasoline, electricity and other final products, its presence or absence is not likely to have a substantial effect on GHG emissions.

Could there be other complications? Yes, of course.[15] Is this logic a complete substitute for an empirical evaluation? No. But these considerations do provide some needed perspective on "what is at stake" from pipeline approval — and these qualitative considerations provide a better starting point than a simplistic calculation of the combustion or lifecycle GHG emissions from the fuel transported by the pipeline.

Moreover, these steps provide a useful framework for developing quantitative estimates. Empirical
models are available to translate the basic steps outlined above — as well as some additional effects that might be relevant — into empirical estimates of the GHG impacts of pipeline projects.

One comprehensive model is the National Energy Modeling System, or NEMS, model developed by the U.S. Energy Information Administration, or EIA.[16] The NEMS model can be used to develop empirical estimates of the effects of a particular natural gas or oil pipeline on overall GHG emissions.[17]

Because assessing GHG impacts can lead to rejection of a proposed pipeline (e.g., because it is not "in the public interest" under requirements of the NGA), it is important to point out that such a rule is a particularly blunt policy instrument, and inevitably much less efficient than a comprehensive market-based approach such as a national cap-and-trade program or carbon tax.

These market-based programs are much more efficient than prohibitions on pipelines or other "command-and-control" approaches, because they create incentives for businesses and households to take actions to reduce emissions without proscribing the precise actions they should take.[18]

Applied to GHG emissions, such policies put a price on carbon either directly, through a carbon tax, or indirectly, through creating a market for tradeable emissions rights (also known as allowances or permits). In contrast to policies such as restrictions on pipelines, putting a price on carbon emissions reduces the overall cost of meeting a target level of GHG emissions.

The many means of reducing GHG emissions can vary greatly; market-based policies give firms incentives to find and apply the lowest-cost method of reducing emissions. Such an approach is not just a theoretical possibility; it has been implemented in major programs in Europe and the U.S.

The European Union Emissions Trading Scheme, or EU ETS, is the oldest and largest program; it was launched in 2005 and regulates large sources of GHG emissions — including power stations, factories and other sources — in a region that spans 31 countries.[19]

The EU ETS has achieved reductions in GHG emissions at a much lower cost (and with much greater certainty on the level of emissions achieved) than if more blunt command-and-control approaches had been adopted.[20]

Over time, the EU ETS has evolved to include different caps, to include noncarbon GHG emissions, and to extend the program to other sources, providing for an even more comprehensive program.[21] The EU ETS provided an important proof of concept for applying the market-based approach to GHG emissions.

This approach that has been extended to regulation of GHG emissions in regions within the U.S.[22] The two major programs are the Regional Greenhouse Gas Initiative, or RGGI, in the Northeast, and California's cap-and-trade system established under A.B. 32, both of which are cap-and-trade programs that limit GHG emissions over large regions, although not the country as a whole.

Proposals for national programs were prominent in the years before the Great Recession. The U.S. Congress considered several major national GHG cap-and-trade programs, including the Waxman-Markey bill that passed the House in 2009.[23] In recent years, there has been considerable interest in a national carbon tax as an effective and cost-effective means of reducing national GHG emissions.[24]

With regard to the key issue raised in this article — what is at stake for climate change from new and expanded natural gas and oil pipelines — implementing a comprehensive national GHG program has an additional important implication. Not only would such an approach be more efficient, but such a policy would eliminate the need to evaluate GHG impacts from pipelines.

Indeed, although analysts routinely point out that cap-and-trade or carbon tax programs are more efficient than command-and-control programs — and they certainly are, as discussed above — the fact that such policies make these other policies redundant has not been as widely noted.

Under a national cap-and-trade GHG program, total GHG emissions depend on the cap that is set; approval or rejection of individual natural gas or oil pipelines may have some effect on how the cap is...
achieved — but not on the level of GHG emissions.

Of course, it is difficult to predict if and when such a carbon tax or GHG cap-and-trade program might be put in place in the U.S., particularly in light of the economic disruption caused by the COVID-19 global pandemic. But some such comprehensive climate change program promises to be on the political agenda at some point, given the wide attention it attracted before the pandemic.[25]

The prospect for a much more desirable approach that would make consideration of GHG emissions from pipelines redundant is one more reason to take a careful look at what is at stake, and avoid using simple calculations that provide no useful information.

What do these various considerations mean for the proper evaluation of the GHG impacts of a natural gas or oil pipeline? I draw three major conclusions.

**It is important to focus on what is at stake for GHG emissions.**

Clarifying what is at stake from approval of individual pipelines is critical to a productive discussion of the role of climate change considerations in these decisions. Simplistic calculations of the GHG potential from transported fuel are not useful.

**Economic/market considerations are critical in assessing what is at stake.**

Principles of demand and supply suggest that the impacts on GHG emissions of an individual project may well be small — dramatically smaller than the GHG potential of the transported fuel — although there could be exceptions (and thus empirical assessments could be useful).

**A comprehensive national program to regulate GHG emissions would eliminate the need to consider impacts from individual pipelines.**

Comprehensive market-based programs — such as the EU ETS, as well as RGGI and A.B. 32 — are not only much more efficient than command-and-control measures such as denying pipeline permits, but they would eliminate the need to consider GHG emissions impacts of these transport infrastructure decisions.

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[8] See Berger and Wentz, pp. 178–179. See also P. Erickson and M. Lazarus, "Assessing the Greenhouse Gas Emissions Impact of New Fossil Fuel Infrastructure," Stockholm Environment Institute, 2013. Erickson and Lazarus refer to the gross emissions as the "literalist approach," which they contrast to the "economist approach." Berger and Wentz acknowledge the alternative of a "net emissions analysis" based upon economic analysis, but they indicate a concern that the economic approach is "both resource-intensive and easily manipulated" and "[f]or these reasons, courts may hold that it is indeed appropriate for an agency to take a 'literalist' approach when preparing an indirect emissions inventory."

[9] This comment focuses on the effects of a pipeline proposal on fossil fuel markets, in terms of potential supply and demand effects. Because energy markets are embedded in an overall economic system, there are of course additional "general equilibrium" effects of a proposed pipeline beyond those summarized here, although such effects are likely to be of "second order" in terms of their quantitative significance. As noted below, the EIA NEMS model could be used to evaluate general equilibrium effects as well as energy market effects.

[10] Descriptions of the energy supply chain usually distinguish "upstream" (exploration and production), "midstream" (transportation and storage) and "downstream" (production of finished products) as the three major elements. Emissions from combustion of the finished products are often referred to as "downstream" emissions in the legal commentary on what GHG impacts should be considered in reviews of pipeline proposals. See, e.g., Berger and Wentz.


[12] Id.


[15] Additional economic complications include "general equilibrium" effects due to interactions of energy prices with other markets within the overall economy. For a general description of general equilibrium modeling, see, e.g., Truman F. Bewley, "General Equilibrium, Overlapping Generations Models, and Optimal Growth Theory," Harvard University Press, 2007. Noneconomic theoretical complications include the possibility that denial of fossil fuel pipelines would lead to broader policies
(both by companies and governments) to restrict the use of fossil fuels. See, e.g., Paul Collier and Anthony J. Venables, "Closing coal: economic and moral incentives," Oxford Review of Economic Policy, Vol. 30(3), 2014, pp. 492–512; and Fergus Green, "The logic of fossil fuel bans," Natural Climate Change, Vol. 8, June 2018, pp. 444–453. Note that these papers refer to bans on the use of fossil fuels, rather than bans on their transport. Moreover, no real-world examples are provided of bans on fossil fuel use, much less on fossil fuel transportation. Thus, there does not appear to be any evidence to support a claim that denying fossil fuel pipelines would lead to broader policies to restrict uses of fossil fuel.


[17] As an example of a similar analysis, the Surface Transportation Board commissioned the EIA to prepare an analysis of changes in national and regional coal consumption and emissions resulting from adjustments in railroad transportation rates for Wyoming's Powder River Basin coal using the National Energy Modeling System. See https://www.eia.gov/outlooks/analysispaper/stb/pdf/stb.pdf.


[23] See "Senate Unveils Cap-And-Trade Emissions Bill," Law360, Oct. 26, 2009, available at https://www.law360.com/articles/130443/senate-unveils-cap-and-trade-emissions-bill. Many commentators expected a national cap-and-trade program to be passed by the Senate as well and signed by the president, had the Great Recession not occurred. The current economic downturn due to COVID-19 may similarly prevent a national program to regulate GHG emissions in the near term, although the consideration of national climate policies could take place sooner if recovery from the COVID-19-related downturn were faster than for the Great Recession.


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