A BRIDGE TOO FAR:
HOW APPALACHIAN BASIN GAS PIPELINE EXPANSION WILL UNDERMINE U.S. CLIMATE GOALS

JULY 2016

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Appalachian Voices

July 2016

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Cover image: Despite Maryland's moratorium on hydraulic fracturing, the pipeline buildout in the state is moving right along. This photo shows the right-of-way of Columbia's 26″ Line MB extension, 21 miles of natural gas transmission line, currently being built through Harford and Baltimore Counties. (FERC Docket CP13-8). ©Sierra Shamer, FracTracker Alliance.

Oil Change International is a research, communications, and advocacy organization focused on exposing the true costs of fossil fuels and facilitating the coming transition towards clean energy.

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EXECUTIVE SUMMARY

"There is such a thing as being too late when it comes to climate change. The science tells us we have to do more."
President Barack Obama, August 2015

This report details the increasing threat to the climate from American natural gas production. We document the emergence of the Appalachian Basin as the key source of projected natural gas production growth in the coming decades. We also identify the proposed pipelines that would enable that growth, and how this gas production would undermine national and global climate goals.

In the early 1990's, many promoted natural gas as a "bridge" to a clean energy future. Despite 25 years of changing economics, technology, and climate science, some in government and industry still believe in this bridge over a gap that no longer exists. This report rebuts the remaining "natural gas as bridge fuel" arguments and recommends constraining gas production by applying a climate test to the permitting of all gas pipeline proposals. Energy policy must align with climate science.

KEY POINTS

- Current projections for U.S. natural gas production – fueled by the ongoing gas boom in the Appalachian Basin – are not aligned with safe climate goals, or the current U.S. long-term climate target.

- Any analysis of the need for gas supply must be premised on national and international climate goals, not business-as-usual.

- Currently there are 19 pending natural gas pipeline projects that will increase the takeaway capacity from the Appalachian Basin and enable a doubling in gas production from the region in the coming decade. Dozens of downstream projects are also planned.

- With the 40-year plus lifespan of gas pipelines and power plants, new pipelines would lock in unsustainable levels of gas production, as investors and operators will have financial incentive to maximize production once initial investment is complete.

- Reducing methane leakage is important, but it does not provide a license to grow production.

- The Obama Administration must work to align FERC and all government agency decisions with safe climate goals. A Climate Test is essential for all decisions regarding fossil fuels: www.climatetest.org

- It doesn't have to be this way. Clean energy technology is here now, affordable, and ready to meet our needs

THE APPALACHIAN BASIN IS THE KEY SOURCE OF POTENTIAL U.S. GAS PRODUCTION GROWTH

In the past decade, natural gas production in the Appalachian Basin has experienced unprecedented growth – particularly in the Marcellus and Utica shale formations in Pennsylvania, West Virginia, and Ohio. As a result of the use of hydraulic fracturing (fracking) and horizontal drilling to access previously inaccessible gas formations, gas production from the Appalachian Basin has growth 13-fold since 2009, reaching over 18 billion cubic feet per day (Bcf/d) in 2015.

It is widely expected that production in the Appalachian Basin region will double over current levels by the early 2030s. In 2010, the Appalachian Basin produced just four percent of U.S. gas production, but by 2030 it could provide around 50 percent.

THE PIPELINE RUSH WOULD UNLOCK NEW GAS

To support this planned huge expansion of production, the industry wants to build infrastructure, and in particular, pipelines. Dozens of proposed pipeline projects in the region are currently being considered for permitting by FERC. Of these, there are 19 key pending pipeline projects that would unlock at least 15.2 Bcf/d of production. Building these pipelines would enable the Appalachian Basin to expand production well beyond current levels. All together, these 19 pending pipeline projects would enable 116 trillion cubic feet of additional gas production by 2050.

U.S. GAS PRODUCTION GROWTH IS OUT OF SYNC WITH CLIMATE GOALS

The potential for further growth in gas production represents a major challenge for U.S. climate policy. The Paris Agreement on climate change, signed by 178 nations as of June 2016, establishes the goal of "holding the increase in global average temperature to well below 2°C above preindustrial levels and pursuing efforts to limit the temperature increase to 1.5°C above preindustrial levels."[1] The current U.S. long-term climate target – which may not be enough to achieve the 'well below 2 degrees' goal set in Paris – is an emissions cut of 83 percent from 2005 levels by 2050.[2]

The U.S. Energy Information Administration's (EIA) latest projection for U.S. gas supply and demand (Annual Energy Outlook 2016) shows a 55 percent increase in production and a 24 percent increase in consumption by 2040. The difference between the greater rise in production than consumption would go to export, making the U.S. a major exporter of natural gas in the coming decades. This projection also sees U.S. energy-related CO_2 emissions declining only around 4 percent from 2015 levels, in stark contrast to the climate leadership this Administration has strived for.

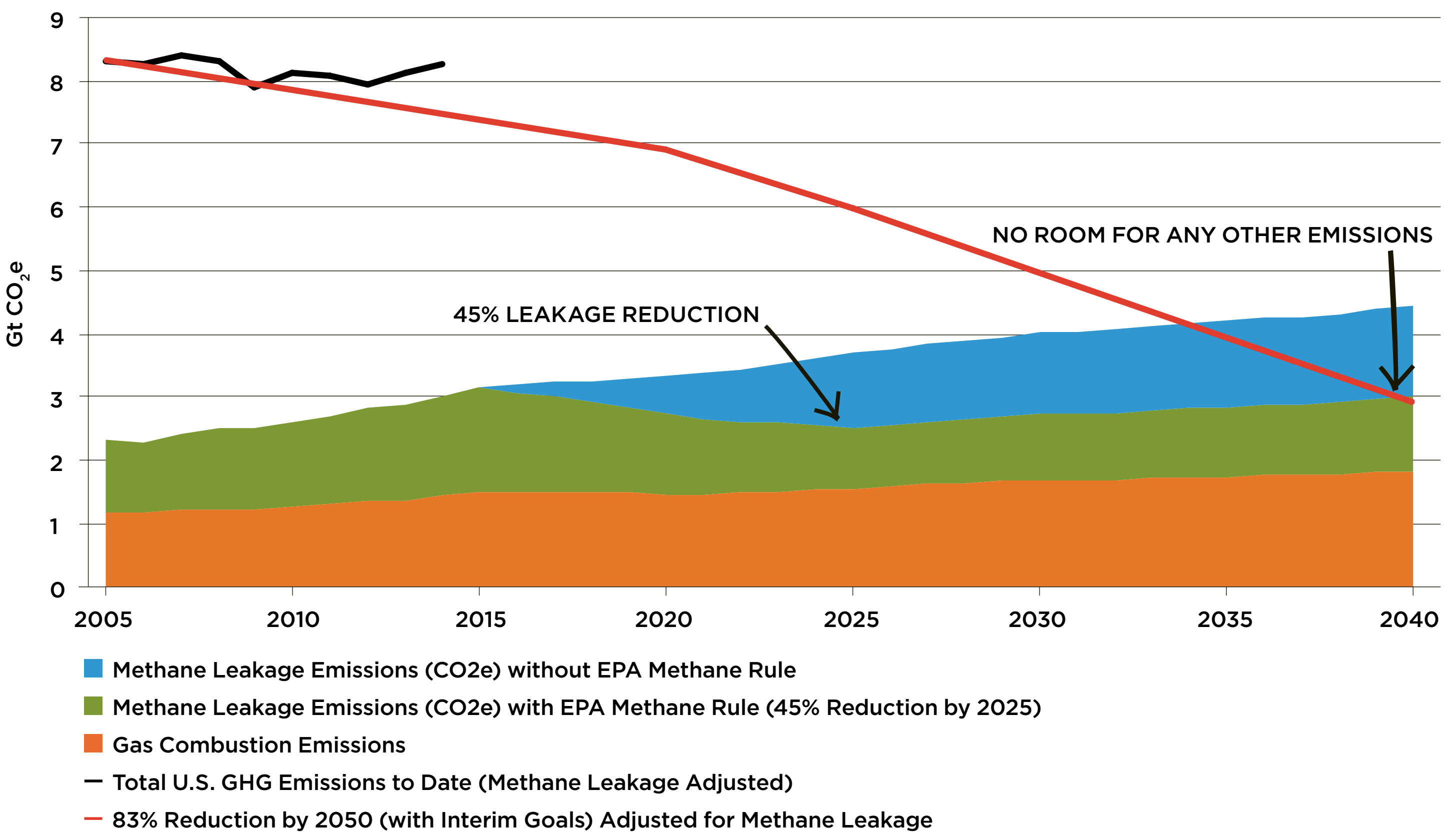
Cross-country pipe being installed. ©Ed Wade, Wetzl County Action Group, FracTracker Alliance

The currently planned gas production expansion in Appalachia would make meeting U.S. climate goals impossible, even if the Administration's newly proposed methane rules are successful in reducing methane leakage by 45 percent. Our calculations show that the rise in gas consumption projected by the EIA would alone lead to emissions that would surpass the current long-term U.S. climate target by 2040, even after accounting for methane leakage cuts. This ignores the emissions from the production (and consumption) of exported gas. In other words, even if gas were the only source of greenhouse gases in 2040, it would still blow the U.S. carbon budget. This makes it clear that the growing use of gas is out of sync with U.S. climate goals (see Figure ES-1).

New gas power plants and pipelines are designed to last at least 40 years. Once the initial capital has been spent on them, they will likely operate even at a loss to the detriment of cleaner sources. It makes more sense to avoid these investments now and instead allow clean energy technologies to fulfill their maximum potential.

When President Obama made the historic decision to deny the Presidential Permit for the Keystone XL pipeline, he did so because, in his words: "America is now a global leader when it comes to taking serious action to fight climate change. And frankly, approving this project would have undercut that global leadership. And that's the biggest risk we face – not acting."[4]

Figure ES-1: Projected U.S. GHG Emissions from Gas Usage & Leakage vs. U.S. 2050 Climate Target
Sources: U.S. Energy Information Administration, Environmental Protection Agency, and the Intergovernmental Panel on Climate Change[3]



RECOMMENDATIONS

Not acting to constrain gas production and consumption to within science-based climate limits is a major risk. The planned gas pipelines in the Appalachian Basin simply cannot be built if the U.S. is to achieve climate goals. Gas pipelines and other fossil fuel projects must be considered in light of climate targets. Specifically:

- All federal government agencies and departments, including FERC, should apply a climate test in the permitting processes of all fossil fuel infrastructure, including in Programmatic Environmental Impact Statements.

- No new natural gas pipeline projects should be considered unless they can pass a climate test. The climate test should be applied to all currently pending and future pipeline applications.

- The EIA should provide detailed guidance in its Outlook reports for U.S. fossil fuel supply and demand under various climate goals, including the nation's long-term climate goal, a 2°C path, and a 1.5°C path.

RENEWABLE ENERGY IS READY

Renewable energy is already set to become the dominant source of new generation, replacing coal and gas with zero-carbon power. In many parts of the U.S., renewable energy is today the lowest-cost and lowest-impact means to add generation capacity to our electricity system. Battery storage and grid management technology are ready to even out the intermittency of wind and solar. Widely held assumptions about the need for fossil fuel baseload power and limits to renewable energy penetration are unravelling fast. It is increasingly clear that the clean energy sector is poised to transform our energy system.

There is nothing standing in the way of building the renewable energy capacity we need to sustain our electricity needs – except maybe the entrenched interests of the natural gas industry. Renewables are the clear choice for future energy production, and natural gas is simply a bridge too far.

U.S. Climate Goals

The U.S. has made a series of international and domestic climate commitments:

- Paris Agreement (2015): "Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels";

- Intended Nationally Determined Contribution pledge (2015): 26-28% reduction in emissions from 2005 levels by 2025;

- Copenhagen long-term goal (2010): "By 2050, the Obama administration's goal is to reduce U.S. greenhouse gas emissions approximately by 83 percent from 2005 levels".

For the purposes of this report, we have measured against the existing Copenhagen target, which has the virtue of being both long term and specific. Oil Change International believes that the science demands full decarbonization of energy systems as soon as possible, on a trajectory that meets or exceeds internationally agreed upon goals.

INTRODUCTION

On April 22, 2016, over 170 nations signed the Paris Agreement on climate change at the U.N. in New York. Today the number of signatories stands at 178. The U.S. received credit for working with China and other large emitters to seal the deal.

The targets in the agreement aim to keep global temperatures “well below” 2°C and “pursu[e] efforts to limit the temperature increase to 1.5°C above preindustrial levels”. Given the level that emissions have reached in recent years; these targets will require a dramatic effort.

The role of the U.S. in achieving these goals is paramount. As the world’s second largest emitter of greenhouse gases (GHGs) and as one of the most prolific sources of fossil fuels in the world, the U.S. will need to coordinate every level of government to play its role in achieving the world’s climate goals. With a currently stated national goal to cut emissions by 83 percent from 2005 levels by 2050, the U.S. has no time to waste.

To date, such coordination is sorely lacking. Departments and agencies of the federal government that are responsible for permitting fossil fuel infrastructure are pursuing a business-as-usual approach that neglects climate change as a factor in their decision-making. FERC is one such agency.

FERC is responsible for issuing permits for the construction and operation of interstate natural gas pipelines, among other things. As the proliferation of fracking and horizontal drilling has triggered an unprecedented growth in natural gas production, FERC has issued dozens of permits in recent years to expand and redirect existing pipelines, and plow new pipelines across the country to facilitate further expansion.

In the next few years, the Appalachian Basin could become the epicenter of this pipeline buildout, and FERC stands as the gatekeeper to dozens of major projects yet to be permitted. These projects could unleash a massive surge in natural gas production from this region, allowing U.S. natural gas production to aggressively grow at precisely the time that the world needs to constrain fossil fuels of every kind.

At stake is the attainment of U.S. climate goals. Locking in new natural gas infrastructure, with an economic lifespan of at least 40 years, could appropriate all of the U.S. emissions budget for natural gas alone. In other words, far from providing a bridge to clean energy, natural gas could undermine the transition that is required for a safe climate future.

At the core of this issue are two myths that have so far been diligently plied by the natural gas industry: 1) that gas is substantially cleaner than coal, and 2) that relentless gas production growth is integral to the clean energy transition and therefore in the public interest.

Both of these myths are countered in this report.

This report details the following:

- The Appalachian Basin could become the primary source of U.S. gas in the future.
- Proposed pipelines in the Appalachian Basin would unlock substantial growth in U.S. natural gas production.
- The surge in natural gas supply associated with these pipelines is entirely out of sync with U.S. climate goals.
- Renewable energy is ready now to supply U.S. energy needs at competitive cost.

Finally, the report recommends that in order for the U.S. to achieve the climate goals it has set, government agencies must apply a climate test to future infrastructure and policy decisions. The test should be based on prevailing climate science and an understanding of the role of fossil fuel supply on energy markets. In particular, FERC must apply a climate test to gas pipelines and other gas infrastructure that seeks a permit.

Cross-country pipe being installed. ©Samantha Malone, FracTracker Alliance

THE APPALACHIAN BASIN IS THE KEY SOURCE OF POTENTIAL U.S. GAS PRODUCTION GROWTH

The Appalachian Basin is defined by the U.S. Geological Survey as stretching from Alabama to Maine, encompassing the majority of the U.S. eastern seaboard.[5] For the purposes of this briefing, we focus on the centers of natural gas production in the states of Pennsylvania (PA), West Virginia (WV), and Ohio (OH). We use the term Appalachian Basin to encompass the gas production in these three states.

In 2009, dry gas[i] production from these three states was barely 1.7 Bcf/d. This is only slightly more than the capacity of just one of the larger proposed major pipelines, such as the 1.5 Bcf/d Atlantic Coast Pipeline proposed in Virginia by Dominion Resources and Duke Energy. The nearly 13-fold growth in gas production in the Appalachian Basin since 2009 has primarily come from the emergence of fracking and horizontal drilling in two key geological formations: the Marcellus and Utica.

The Marcellus formation has proved to be America's – and one of the world's – most prolific natural gas formations. Production is primarily located in northwest West Virginia and southwestern and northeastern Pennsylvania.[ii] Dry gas production from the Marcellus grew from zero in 2006 to nearly 15 Bcf/d in 2015.[iii] In that time, nearly 18 trillion cf of dry natural gas has been extracted, along with nearly 200 million barrels of natural gas liquids (NGLs). Production could more than double to around 33 Bcf/d by the early 2030s.

The Utica formation lies beneath the Marcellus in certain parts of West Virginia and Pennsylvania but is predominantly located in eastern Ohio. Its exploitation only started to gather pace in 2013. Dry gas production has grown from zero in 2010 to nearly 2.6 Bcf/d in 2015. By the end of that year, over 1.5 trillion cf of dry natural gas and over 120 million barrels of NGLs and oil have been extracted from this formation. Gas production in the Utica could reach over 4.5 Bcf/d by the early 2020s.

In total, over 18 Bcf/d of dry gas is produced from the Marcellus and Utica formations today. Rystad Energy projects that production will double by the early 2030s to over 36 Bcf/d, led by expansion in the Marcellus. Other formations in the region could bring the total dry gas production for the Appalachian Basin to over 37 Bcf/d.

The role of the Appalachian Basin in the potential growth in U.S. gas production cannot be overstated. Figure 2 shows that the region is projected to play an increasingly dominant role in U.S. gas production in the decades ahead. In 2010, the Appalachian Basin produced just four percent of U.S. gas production. At its projected peak in the 2030s, the Appalachian Basin could be supplying around 50 percent.

This production growth cannot be realized without building the pipeline capacity to carry it to market. We calculate that around 15.2 Bcf/d of the anticipated 18.5 Bcf/d production growth cannot go ahead without the pipelines that are currently proposed and under review.

i. This report discusses the impact of dry gas production and dry gas pipelines. While some natural gas liquids (NGLs) are produced in this region, they are beyond the scope of this report. Unless otherwise stated, the figures used refer to dry gas production only. Other sources, such as the EIA Drilling Productivity Report, include data for mixed wet and dry gas production, as production at the well is a combination of these hydrocarbons. Dry gas is separated from liquids in processing plants and transported to market in dedicated pipelines. The expansion of this dry gas pipeline network from the Appalachian Basin is the subject of this report.

ii. The Marcellus formation reaches into New York and Virginia but although pipeline routes travel through these states, there is currently no plan for production in these states.

iii. All gas production data are from Rystad Energy AS.

Figure 1: Dry Gas Production in the Appalachian Basin (Past and Forecast) *Source: Rystad Energy AS*

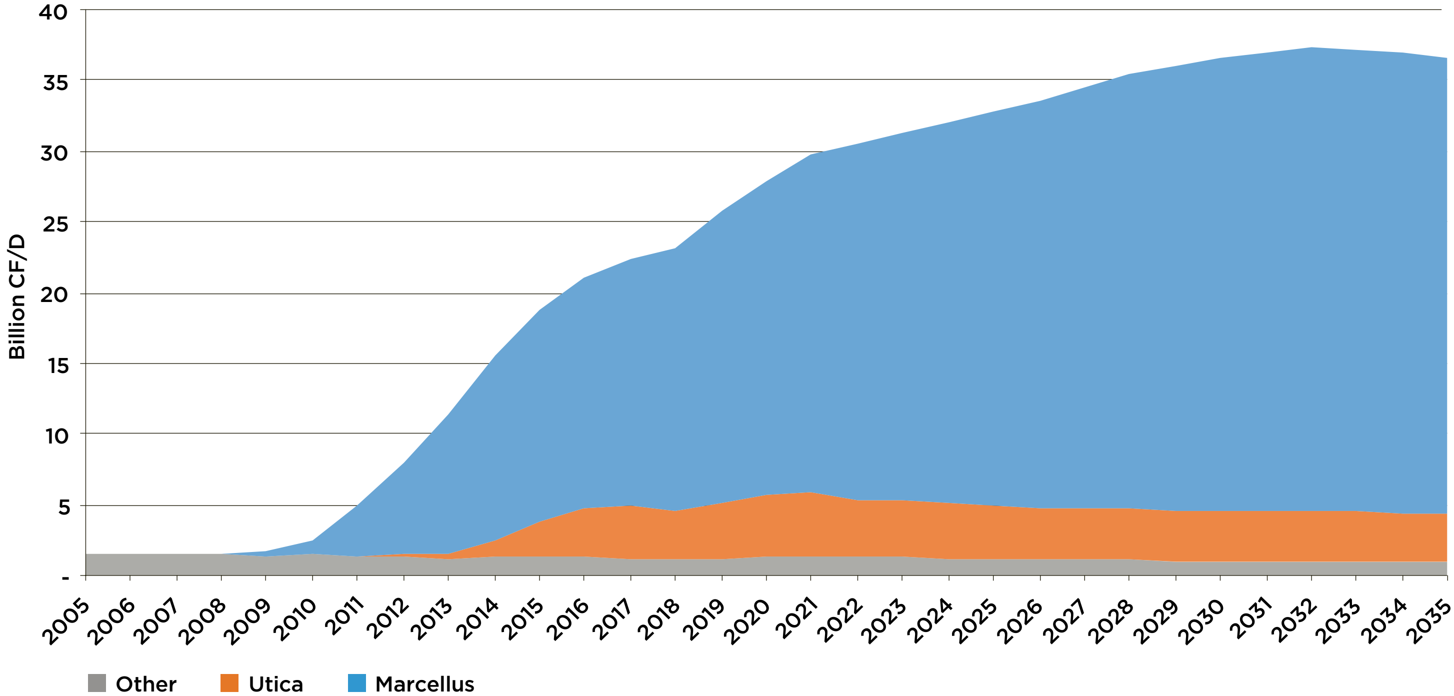
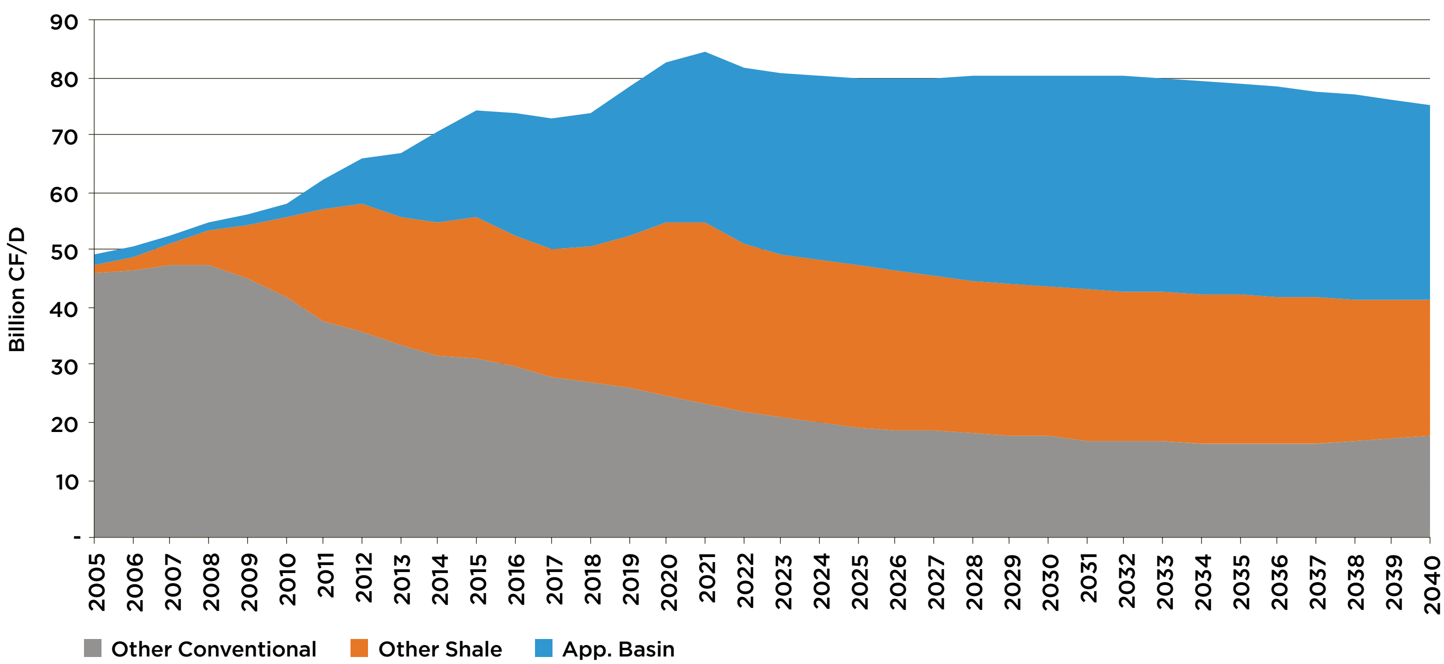


Figure 2: The Increasing Role of the Appalachian Basin in U.S. Dry Gas Production *Source: Rystad Energy AS*



Differing Projections, Similar Conclusions

In this report, we use data from Rystad Energy's UCube database to provide a breakdown of both historical and projected production by geological formation in order to understand the role of the Appalachian Basin in the potential future of U.S. gas production. We also use EIA outlooks for national-level projections.

There are other sources that offer different projections. The future of any hydrocarbon production depends on many factors, including the size of the hydrocarbon resource in the ground, the development of extraction technology, and market prices and policies that may affect prices or costs of development. All projections are based on different assumptions of these factors and must be viewed as projections rather than predictions. Therefore, we do not endorse any particular outlook as being the most accurate, but view all of them as a guide to what could happen.

To date, production of oil and gas from U.S. shale formations, in particular gas production from the Marcellus, has repeatedly outperformed projections. Figure 3 is from BP's Annual Energy Outlook 2016 and shows the company's repeatedly revised projections for U.S. tight oil and shale gas production.

The latest projection in the chart (2016) suggests continued very steep growth with U.S. shale gas production reaching around 80 Bcf/d in 2035. This is much greater than the 63 Bcf/d that the Rystad data we have used shows as a peak in U.S. shale gas production in the 2030s. BP does not provide a breakdown of formations, but it seems likely that stronger growth from the Marcellus and Utica accounts for a significant part of its bullish forecast.

It should also be noted that EIA projections show a steady increase in U.S. gas production through 2040, the last year of the EIA's outlook range. EIA revised up its gas production projection in its latest annual flagship report, the Annual Energy Outlook (AEO). The AEO 2016 has only been published as a limited early release at this time and does not show a regional breakdown of projected gas production. However, it is remarkable that projected U.S. gas production in 2040 has been revised up nearly 20 percent from the AEO 2015 (see Figure 4). The projection now sees gas production rising 55 percent from 2015 to 2040. Production in 2040 would be some 55 percent higher than in Rystad's projection.

No one really knows what the future will bring, but it is clear that without climate policies, U.S. natural gas production is very likely to grow substantially in the coming decades, and the Appalachian Basin is very likely to be at the heart of that growth.

Figure 3: BP Outlook 2016, Shale Play Forecasts. *Source: BP p.l.c. 2016*[6]

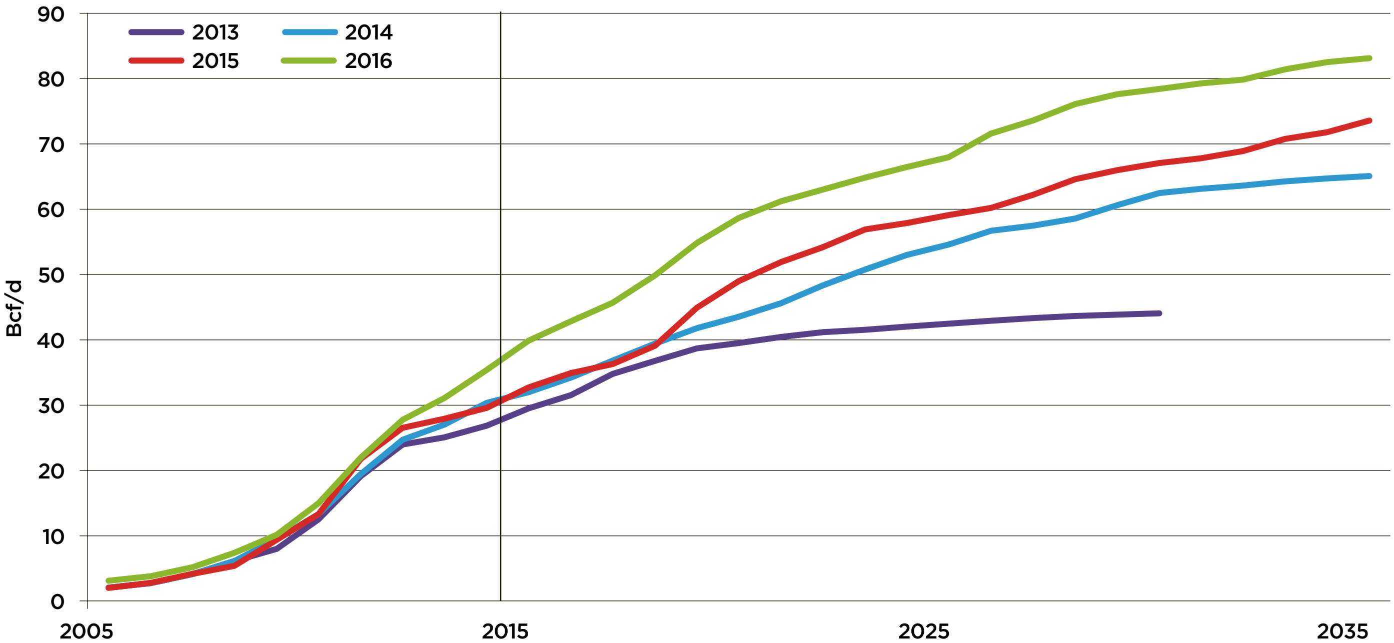
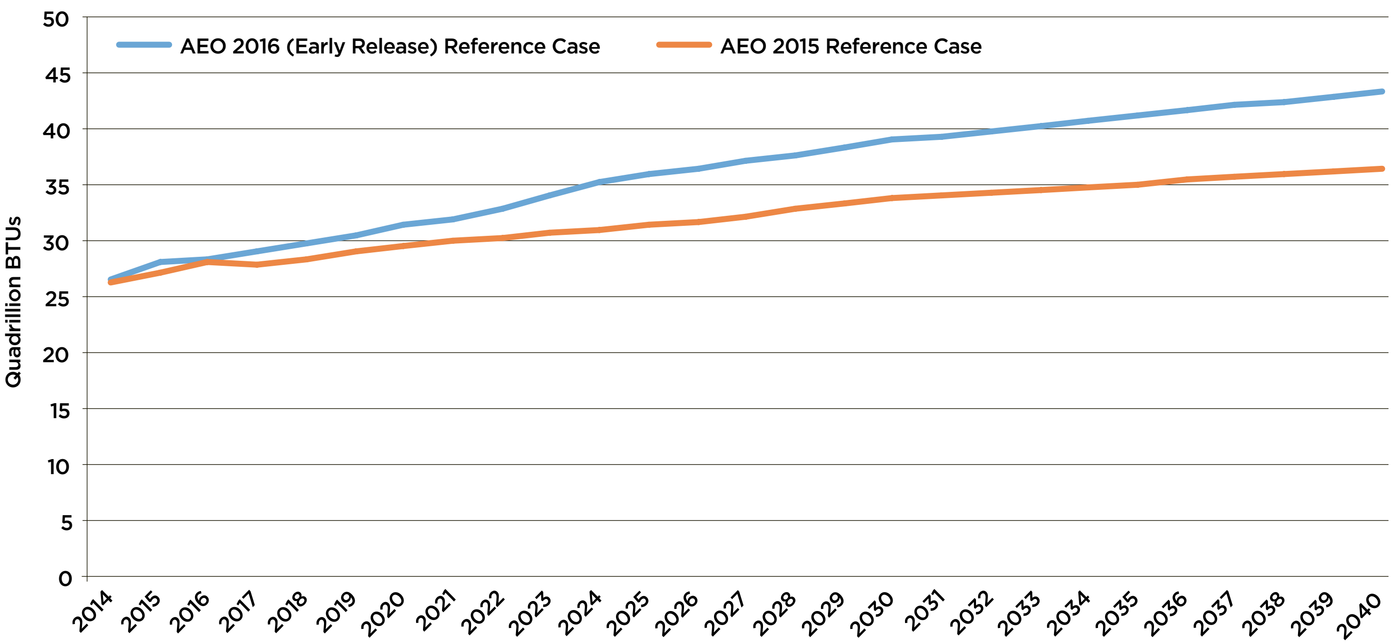


Figure 4: EIA Projected U.S. Gas Production Revised Up in 2016 *Source: U.S. Energy Information Administration*



THE PIPELINE RUSH WOULD UNLOCK NEW GAS

How much new capacity is proposed?

There has already been tremendous growth in gas production from the Appalachian Basin. The region was barely producing enough gas to fill one major pipeline in the first decade of the 21st century, and much of this gas was consumed locally. But since 2009, production has grown over 1,000 percent, spawning a wholesale re-plumbing of the pipeline network in the region. In the past, pipelines brought gas into the region, primarily from the Gulf Coast states of Louisiana and Texas. The main interstate pipelines came through the region on their way north, feeding distribution lines on their way.

Our analysis of the pipeline buildout is focused on the climate impact, and therefore we assess only those pipeline projects that add takeaway capacity from the Appalachian Basin. These are sometimes referred to as first mile projects. There are dozens of projects that expand the distribution capacity of the gas pipeline network, but while these broaden the reach of Appalachian Basin gas, these do not in of themselves increase the takeaway capacity from the basin. They therefore may not by themselves enable production growth, which leads to increased climate impact.

There are also proposed pipeline projects for Natural Gas Liquids (NGLs) in this region but we do not deal with these here. Dry gas constitutes the vast majority of the hydrocarbons that are projected to come from the Appalachian Basin.

In 2014 and 2015, eleven major projects, some with multiple phases, were completed, adding around 5.25 Bcf/d of takeaway capacity from the region. All of these involved reversals and/or expansion of existing pipeline systems. Some new pipe was laid, and new compression stations added, but none of these involved creating major new pipeline corridors.

In addition, two projects are currently under construction, and construction on another had started but has since been halted. The larger of the two that are still going forward is the latest expansion of the Rockies Express (REX) pipeline, called the Zone 3 Capacity Enhancement Project. This will add 800 million cf/d by early 2017. The other is a 130 million cf/d supply line that Dominion Transmission Inc. is building to feed southwest Pennsylvania supply into the Lebanon hub in Ohio. This hub supplies gas to various pipelines heading south to the Gulf Coast and west into the Rockies.

The Constitution Pipeline is a new-build project that began construction this spring but stalled when the New York State Department of Environmental Conservation (NYSDEC) denied the project's Section 401 Water Quality Certification.[7] The companies involved, led by pipeline giant Williams, have vowed to continue with the project.[8] If it goes ahead, Constitution will add 650 million cf/d of new takeaway capacity from northeast Pennsylvania.

Waiting on the sidelines are 18 additional major projects that could add nearly 18 Bcf/d to the takeaway capacity from the region. Ten of these projects are expansions and/or reversals of existing pipelines (see Map 1). However, to achieve those expansions some new pipeline will be laid and several new compression stations will be built to increase pressure to enable the flow of additional gas. These ten expansion projects would add over 5.5 Bcf/d of additional takeaway capacity.

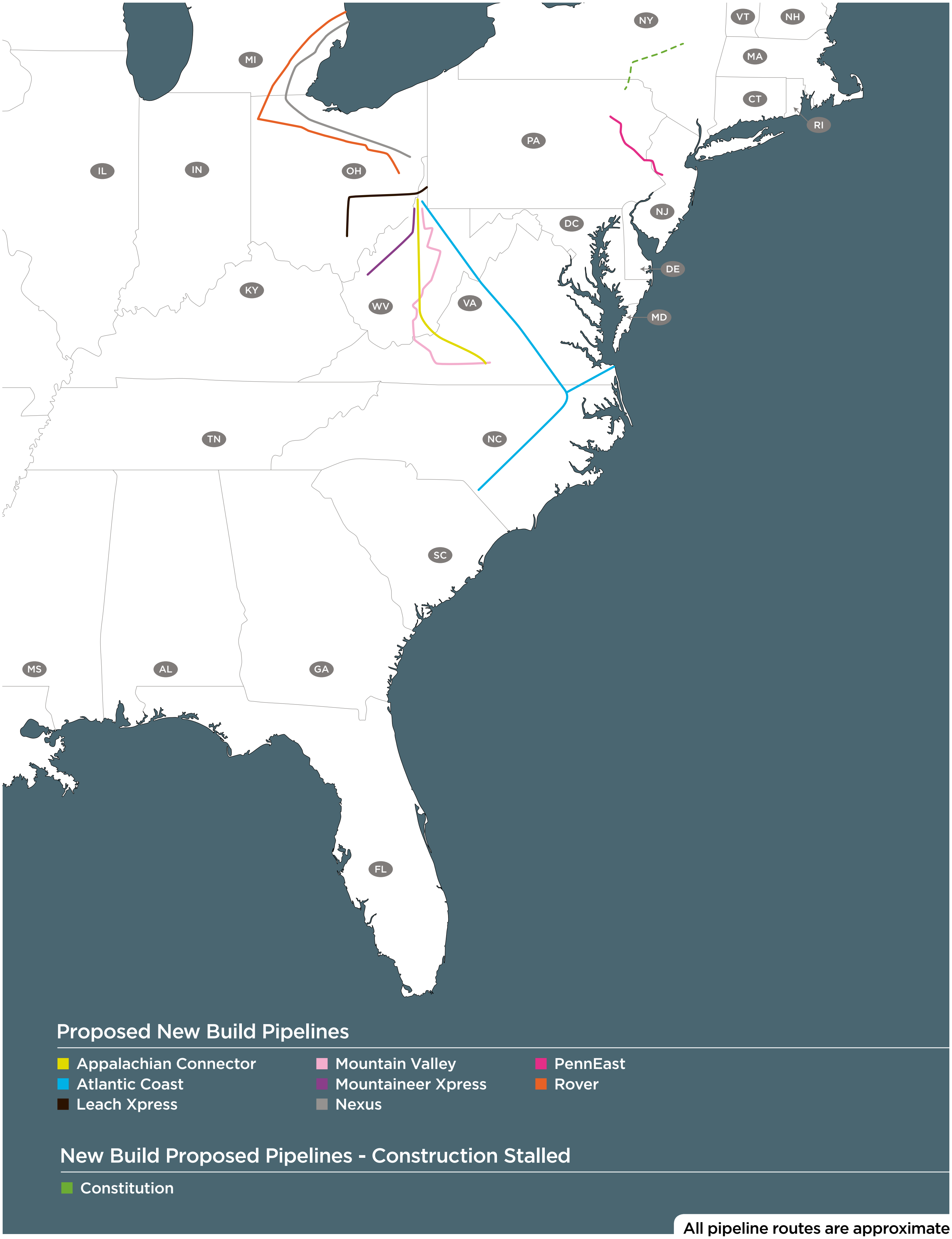
Eight of the proposed pipelines are new-build projects forging new pipeline corridors over hundreds of miles (see Map 2). These would add another 12.9 Bcf/d of takeaway capacity. Together with the Constitution Pipeline, there is over 19.1 Bcf/d of takeaway capacity hanging in the balance. Building these pipelines would enable the Appalachian Basin to expand production to its likely maximum potential (see Figure 5).

Table 1: Proposed Pipeline Expansions

Pipeline	Capacity (Million CF/D)	Destination	Status (FERC Docket No.)
Boardwalk Northern Supply Access	384	Texas	FERC Docket CP15-513
Spectra TEAM Gulf Markets 1	250	Texas	FERC Docket CP15-90
Spectra TEAM Gulf Markets 2	400	Texas	FERC Docket CP15-90
NFGS Northern Access 2016	497	New York & Canada	FERC Docket CP15-115
Williams Transco Atlantic Sunrise	1,700	Serves Entire Mid-Atlantic onto Florida	FERC Docket CP15-138
Spectra TEAM Adair Southwest	200	Kentucky	FERC Docket CP15-3
Spectra TEAM Access South	320	Alabama & Mississippi	FERC Docket CP15-3
NFGS Empire North	300	New York & Canada	FERC Docket CP15-115
KM Broad Run Expansion	200	Tennessee, connects to Georgia & South East	FERC Docket CP15-77
CGT WB Xpress	1,300	Connects to U.S. Gulf Coast Systems and Mid Atlantic Markets	FERC Docket CP16-38
Total Capacity	5,551		

Table 2: Proposed New-Build Pipelines

Pipeline	Capacity (Million CF/D)	Destinations	Status (FERC Docket No.)
Spectra Constitution	650	New York	Construction Stalled
CGT Leach Xpress	1,000	Gulf Coast Markets	FERC Docket CP15-514
ETP Rover	3,250	Michigan & Canada	FERC Docket CP15-93
Spectra PennEast	990	Pennsylvania	FERC Docket CP15-558
Spectra NEXUS	1,500	Michigan & Canada	FERC Docket CP16-22
Dominion Atlantic Coast	1,500	Virginia & North Carolina	FERC Docket CP15-554
EQT Mountain Valley	2,000	Virginia	FERC Docket CP16-10
CGT Mountaineer Express	750	Connects to US Gulf Coast	FERC Pre-filing
Williams Transco Appalachian Connector	1,900	Connects to Atlantic Sunrise - Mid-Atlantic and SE as far as Florida	Preliminary Evaluation
Total Capacity	13,540		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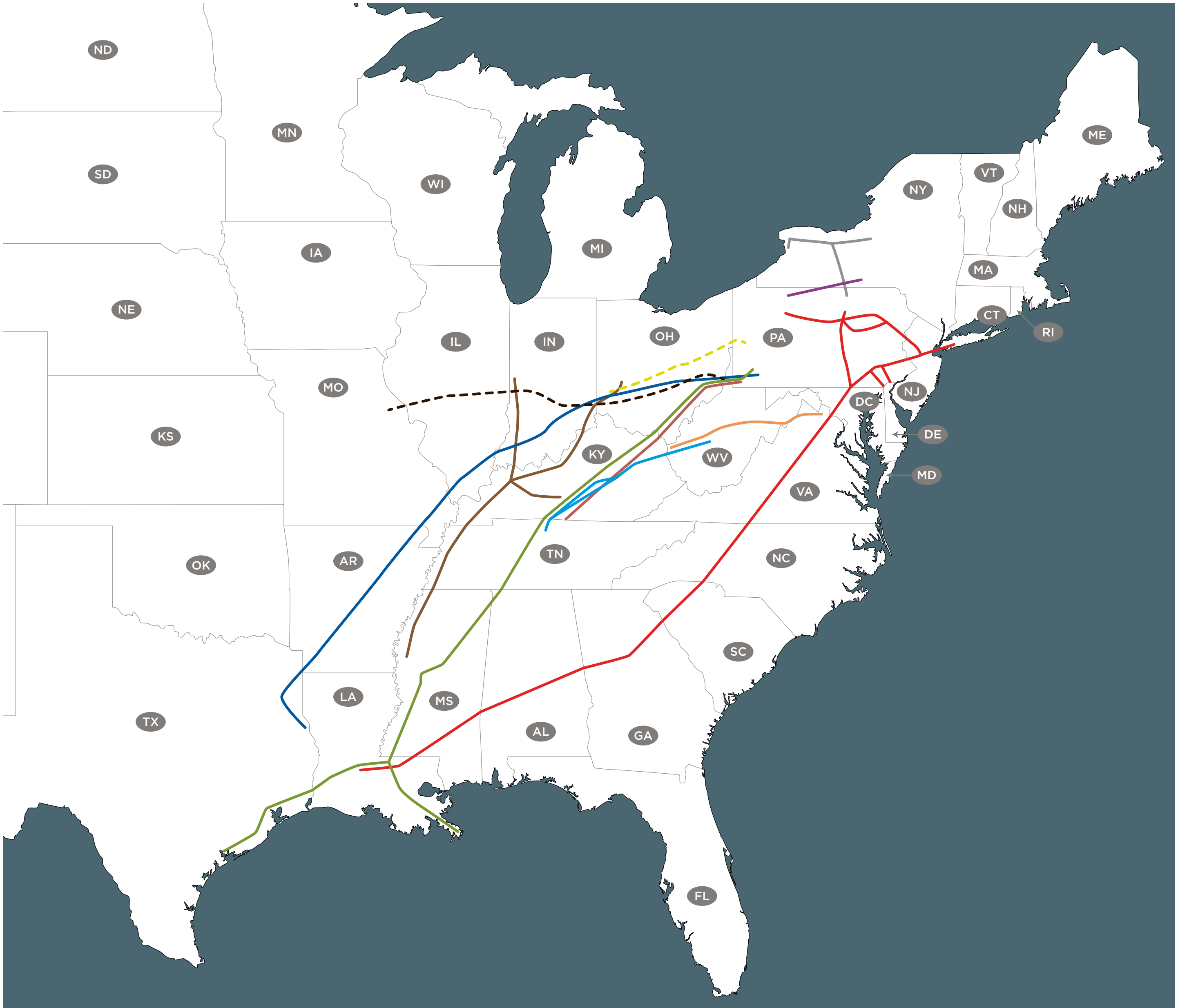
MS
AL
GA
FL
Proposed New Build Pipelines
Appalachian Connector
Atlantic Coast
Leach Xpress
Mountain Valley
Mountaineer Xpress
Nexus
PennEast
Rover
New Build Proposed Pipelines - Construction Stalled
Constitution
All pipeline routes are approximate



Proposed Expansion Pipelines

- Access South
- Adair Southwest
- Atlantic Sunrise
- Broad Run Expansion
- Empire North
- Gulf Markets 1 & 2
- Northern Access 2016
- Northern Supply Access
- WB Xpress

Proposed Expansion Pipelines Under Construction

- Rockies Express Pipeline Zone Three Capacity Enhancement
- Lebanon West II

All pipeline routes are approximate

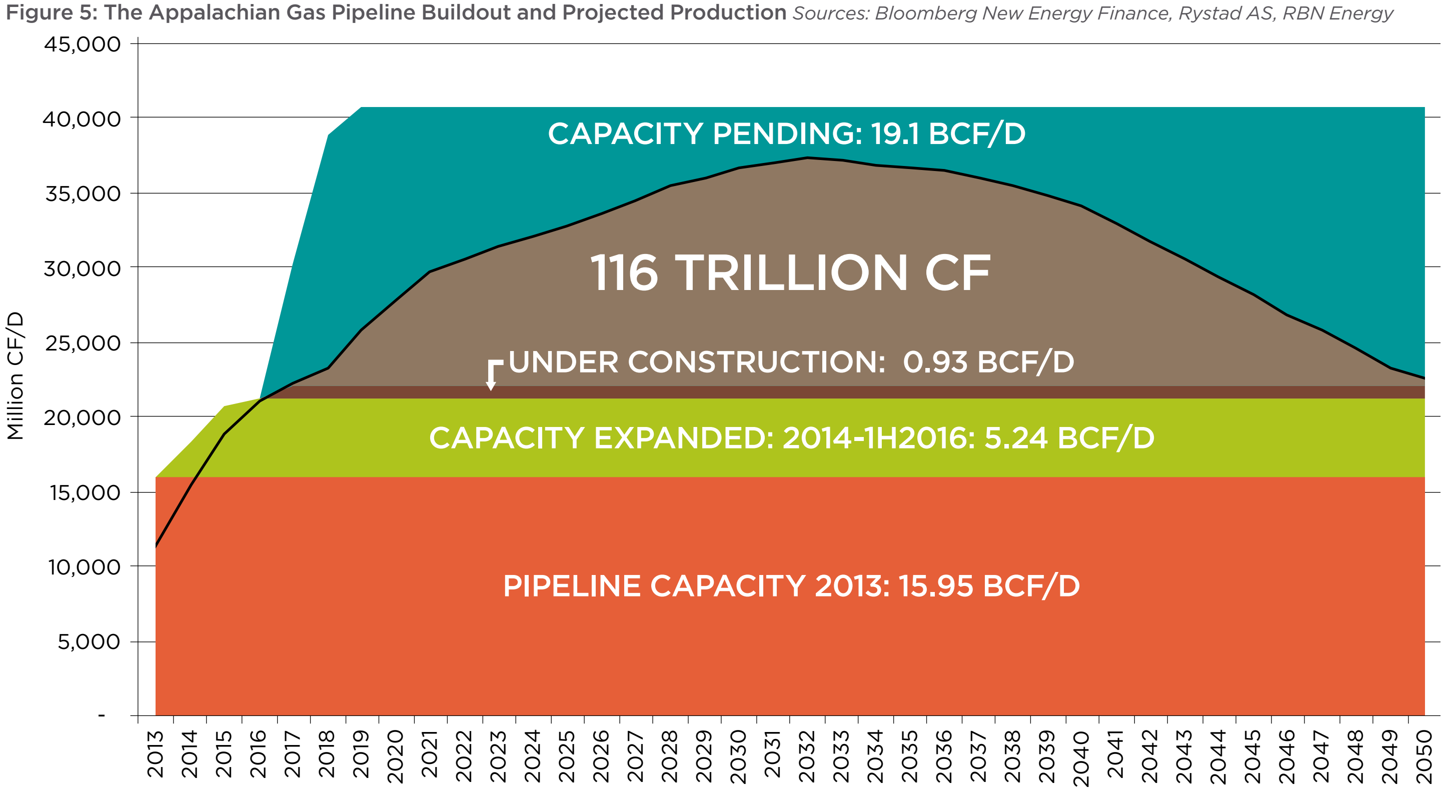
ASSESSING THE CLIMATE IMPACT

A starting point for looking at the climate impact of this pipeline buildout is to estimate how much gas production is enabled by the full realization of all the proposed pipelines.

Figure 5 shows the capacity implications of the region's pipeline buildout, including pipelines that are already built, those that are currently under construction, and those yet to break ground. It also shows the Rystad Energy forecast for Appalachian Basin gas production – in particular, the gray shaded area within the "capacity pending" area shows the total production that would be enabled by the increase in pipeline capacity from currently planned pipelines.

As the chart shows, current pipeline capacity could become full in 2017, constraining projected Appalachian Basin gas production growth to 2050 and beyond. If no new takeaway capacity is built, production of around 116 trillion cubic feet of potential gas production from now through 2050 would be avoided. New gas drilling in the region would only occur as production from existing wells declines to free up pipeline capacity. Avoiding production of the additional gas would dent U.S. gas production growth and, as we will demonstrate in subsequent sections of this report, could help prevent the U.S. from overshooting its climate goals.

Figure 5: The Appalachian Gas Pipeline Buildout and Projected Production *Sources: Bloomberg New Energy Finance, Rystad AS, RBN Energy*



Resistance to Pipelines

Whether these proposed pipelines are new-build projects or expansions of existing infrastructure, many are facing resistance to the appropriation of land for pipeline corridors and/or additional compression stations and other associated equipment. As Map 2 shows, proposed new-build projects are heavily concentrated in West Virginia and Virginia, and resistance is particularly strong in the Allegheny Mountains, where the projects threaten fragile mountain ecosystems, national forests, and the headwaters of the region's rivers.

The threat of eminent domain to force through these pipelines has angered many residents along these proposed routes, and growing resistance to this abuse of a law designed to appropriate land for the public good – not private profit – is increasingly threatening the realization of these plans.

Citizens resisting the proposed Atlantic Coast Interstate Gas Pipeline through West Virginia and Virginia plant Seeds of Resistance in Nelson County Virginia. June 2016. ©Peter Aaslastad, Oil Change International and Bold Alliance.

Completed pipeline installation. ©Photo by Ted Auch.

U.S. GAS PRODUCTION GROWTH IS OUT OF SYNC WITH CLIMATE GOALS

Primarily through the development of fracking and horizontal drilling, the U.S. has become one of the largest global producers of oil and gas, rivaling Saudi Arabia and Russia. The recent oil price crash has slowed growth somewhat, but the expectation of an eventual turn in the price cycle would herald a return to the frantic drilling rates seen in recent years.

This potential for further fossil fuel production growth represents a major challenge for U.S. climate policy. The U.S. cannot continue to supply increasing quantities of oil and gas to both domestic and global markets and strive to achieve the goals set by its climate change commitments.

This section examines U.S. climate goals, and the implications of the increase in U.S. natural gas production spurred by growth in the Appalachian Basin.

U.S. CLIMATE TARGETS

In 2010, the U.S. Department of State set goals for U.S. emissions reductions in its "Fifth National Communication of the United States of America Under the United Nations Framework Convention on Climate Change."[9] The long-term target is for an emissions cut of 83 percent from 2005 levels by 2050.

This goal may not be consistent with keeping warming below 2°C, even if every country cut emissions at equal rates. Equivalent emissions reduction rates raise equity issues given that the U.S. is responsible for the largest share of historical emissions to date. In other words, to balance the responsibility for emissions more equitably, the U.S. would likely need to cut emissions more dramatically than its current goal to play its role in achieving the Paris Agreement goal of keeping warming well below 2°C.

However, as the 83 percent emissions reduction goal is the current commitment of the U.S. government, we use it here to assess whether rising natural gas production and consumption is in sync with U.S. policy.

The emissions reduction goal set out above has guided the Obama Administration's actions on climate change ever since it was put in place. While current policies are not nearly enough to fulfill the 2050 goal of an 83 percent reduction, the 2025 goal of a 28 percent reduction, which was submitted as the U.S. Intended Nationally Determined Contribution (INDC) to the Paris Agreement process,[10] may be within grasp if policies such as the Clean Power Plan (CPP) and vehicle efficiency standards (CAFE) reach their full potential.

However, cheap, abundant natural gas may lead to a lock-in of infrastructure that would undermine attainment of the more dramatic cuts required after 2025.

NATURAL GAS CONSUMPTION AND THE U.S. CLIMATE GOAL

The most commonly used energy forecast in the U.S. is the Reference Case produced by the EIA in its Annual Energy Outlook (AEO). The EIA's Reference Case is based on a model that freezes energy policy at the time the report is produced and has a very cautious approach to technological and behavioral change. In other words, it is not meant as a forecast for how energy flows will necessarily pan out (although it is often treated as such), but rather a projection of how energy flows might look if all current policies and expectations of technology change remain static.[11] As the projections span 25 years, it is extremely unlikely that major changes would not take place.

However, the Reference Case serves a purpose of indicating what the future will look like should we stop innovating both technology and policy. When it comes to addressing climate change, the EIA Reference Case shows how much more we need to do to prevent catastrophe.

For the purposes of assessing whether we can expand natural gas production and consumption and still meet our climate goals, the EIA Reference Case is useful because it approximately matches growth goals of the gas industry.

Figure 6 shows the AEO 2016 (Early Release)[12] Reference Case projections for natural gas production and consumption in the U.S. Production is expected to increase 55 percent between 2015 and 2040, while consumption is seen increasing 24 percent in the same period. The difference between production and consumption is accounted for by exports. The U.S. was a net zero

Figure 6: Projected U.S. Gas Production and Consumption in the AEO 2016 Reference Case *Source: U.S. Energy Information Administration*

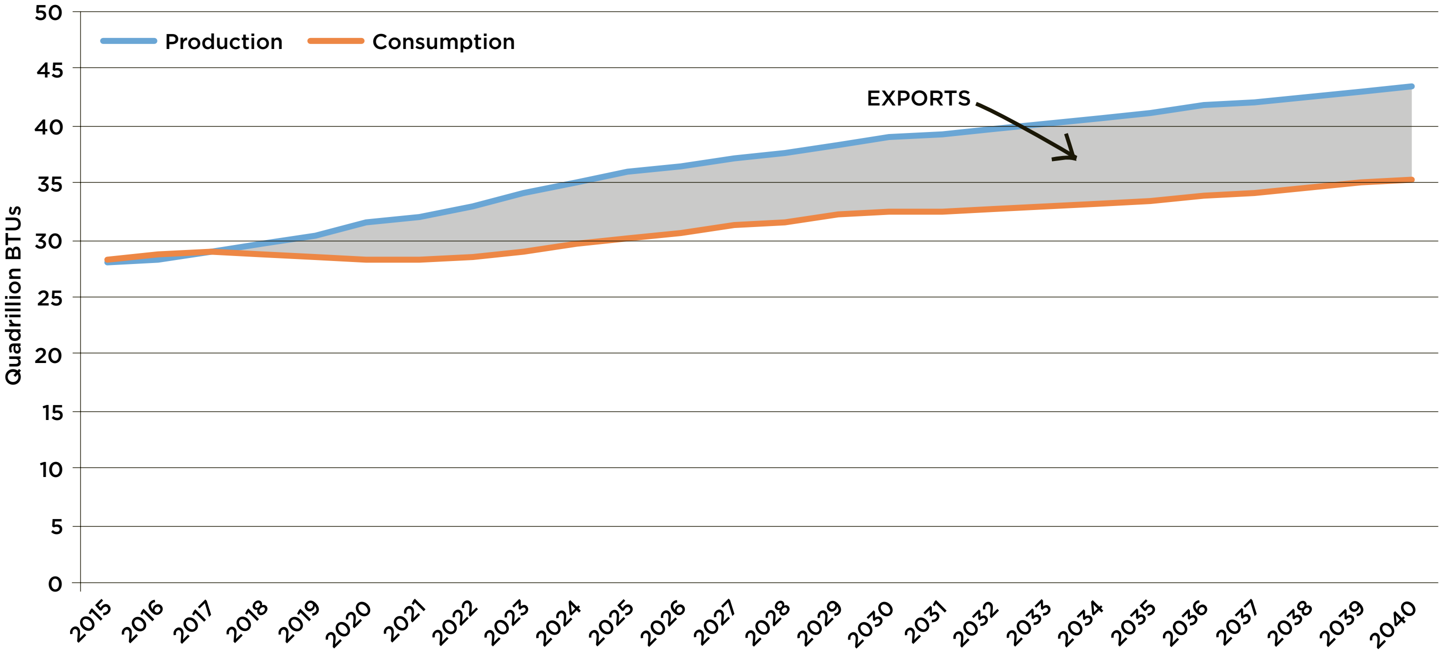
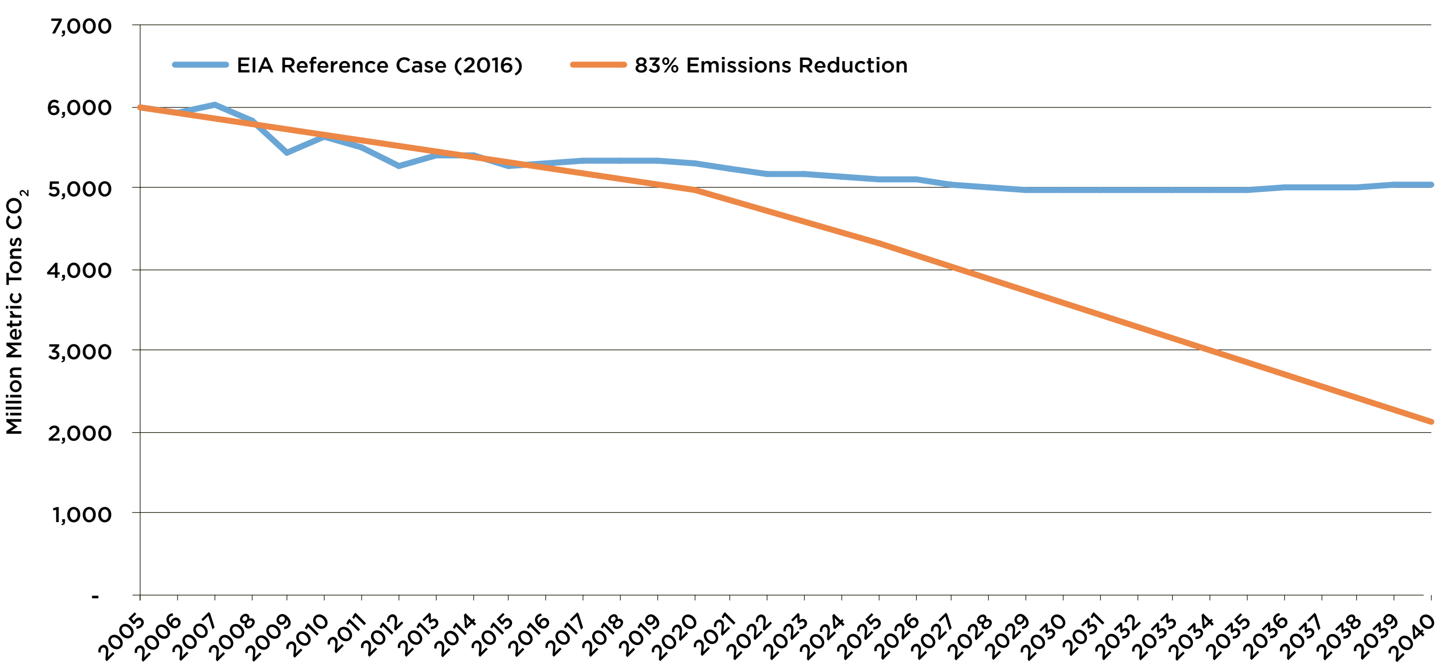


Figure 7: U.S. Energy-Related Greenhouse Gas Emissions in AEO 2016 versus U.S. Climate Goal[iv]
Source: U.S. Energy Information Administration & U.S. Department of State



exporter in 2015, but could be exporting as much as nine trillion cubic feet in 2040, according to these projections.

The Reference Case also shows that if U.S. consumption of fossil fuels does follow the trajectory that the projections suggest, U.S. emissions reductions goals will be missed by an order of magnitude. Using energy-related emissions only, the Reference Case suggests that emissions could be only around 16 percent below 2005 levels in 2040, or around four percent less than in 2015. It is worth noting that the AEO 2016 Reference Case does include the impact of implementing the Clean Power Plan (CPP), the key power sector climate policy being pursued by the current administration. The CPP is projected to reduce emissions in 2040 by around eight percent compared to business as usual. However, as Figure 7 clearly shows, the U.S. would still be dramatically off course in reaching its climate goals. The difference is stark. Emissions in 2040 are nearly 140 percent higher in the Reference Case than they would need to be to stay on course with the 2050 U.S. climate goal.

The increase in natural gas production and consumption is not the only reason emissions in the Reference Case are so far from the U.S. climate goal. But it is one part of a wider failure to reign in fossil fuels that the Reference Case clearly illustrates.

iv. U.S. climate goal percentage reduction is equally applied to energy as to other GHG sources, i.e. 83% from 2005 to 2050.

NATURAL GAS DOES NOT PROVIDE NEEDED CLIMATE BENEFITS

For rising natural gas production and consumption to fit into a scenario of rapidly declining GHG emissions, natural gas would need to be a significant enabler of substantial emissions reductions.

The natural gas industry claims that natural gas replaces coal, leading to reduced emissions. But there is increasing evidence that not only has the past role of natural gas in emissions reduction been exaggerated, but that future natural gas consumption growth could account for more emissions than the U.S. climate goal allows for, even if emissions from all other sources are mitigated.

To assess the climate impacts of new natural gas infrastructure, several facts should be considered:

- When methane leakage is considered, natural gas can be equally or more polluting than coal.
- Reducing methane leakage is very important, but it does not provide a license for production growth.
- Even with zero methane leakage, replacing an old coal plant with a new natural gas plant may reduce emissions in the immediate term, but will lead to a net increase in aggregate CO_2 emissions if the gas plant is still emitting CO_2 decades after the coal plant would have been retired.

THE EFFECTS OF METHANE LEAKAGE ARE SIGNIFICANT

Dry gas is almost pure methane (CH_4). When combusted, the greenhouse gas emitted is carbon dioxide (CO_2), the same as with coal and oil. In general, the CO_2 emissions associated with gas combustion are lower per unit of energy produced than with coal and oil.

But if methane is vented directly to the atmosphere without combustion, the global warming potential of that gas in the atmosphere is pound-for-pound much greater than CO_2. For this reason, methane leaks occurring during the production, processing, transportation, and storage of gas can substantially increase its climate impact.

The fifth report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) updated the global warming potential of methane compared to CO_2. Two figures are most often quoted for the potential – a 100-year figure and 20-year figure – which refer to the potential of the gas to force temperature change over the given time span. Methane has a shorter life span in the atmosphere than CO_2 but a much higher impact. The AR5 put the 20-year impact of methane at 86 times that of CO_2 and the 100-year impact at 36 times.

The methane leakage rate during the production, processing, transportation, and storage of gas is central to assessing the climate impact of gas use. Independent analysis suggests that average US conventional gas leakage are between 3.8% and 5.4 % of total production, while shale gas leaks at roughly 12%. Both rates would put the climate impact of gas on par with, or much greater than, coal.[13]

In recognition that methane leaking from the oil and gas sector is a crucial issue to be addressed, in March 2016 President Obama announced an initiative with Canada to cut methane leakage from the two countries' oil and gas sectors by 45 percent.[14] If it can be implemented – the American Petroleum Institute threatened to sue[15] – this initiative would be a good start to reducing the impact of existing natural gas supply.

However, although crucially important, we will see in the next section that reducing methane leakage does not provide room in the carbon budget to increase natural gas production.

CLIMATE IMPACTS OF RISING GAS PRODUCTION OUTWEIGH METHANE MITIGATION

The idea of natural gas as a 'bridge' to a low carbon future is a much-used talking point for the industry and its supporters, but study after study has examined the issue to find that increasing gas-fired power generation can only at best shave a couple of percentage points from overall emissions

Loyalsock State Forest, Flyover - PA 2013. ©Pete Stern.

rates, and may undermine the transition to clean energy entirely. One of the problems is that rising gas use does not only displace coal; it also displaces zero-carbon energy.

For example, a Stanford University study published in 2013 used a variety of modeling tools to estimate the "emissions and market implications of new natural gas supplies."[16] The study found that none of the six modeling systems they sampled showed a significant reduction in U.S. emissions as a result of rising gas use up to 2050. The authors concluded that "[s]hale development has relatively modest impacts on (emissions), particularly after 2020. Over future years, this trend towards reducing emissions becomes less pronounced as natural gas begins to displace nuclear and renewable energy." In general, the models used found that higher gas supplies lowered prices for gas and increased primary energy demand, leading to higher emissions in the 2050 projections than in the lower gas supply scenario.

Contamination caused by an oil and gas well failure. ©FracTracker Alliance

Another study from different researchers at Stanford together with U.C. Irvine found that cumulative U.S. GHG emissions from 2013 to 2055 were a mere 2% lower in a high gas supply scenario compared to a low one.[17] They found that without strict climate policies, increased natural gas supply would not only reduce coal-fired generation but renewable energy generation as well. Similar to the EIA Reference Case, this leads to U.S. power sector emissions in 2050 that are barely less than they are today. They also found that methane leakage rates from zero to three percent made little difference to the overall result. Once again, in this study the effect of higher gas supplies is to reduce renewable energy market share and maintain unsustainable levels of CO_2 emissions.

Most recently, a study out of Oxford University examined the '2°C Capital Stock'

Statoil Kuhn Well Pad, West Virginia. ©FracTracker Alliance

to see how close the world is to building the electricity generation infrastructure that, if utilized to the end of its economic life, would take the world past the 2°C goal.[18] The disturbing conclusion they came to is that we will be there in 2017. Those researchers used a 50-50 chance of staying below 2°C, in the climate model simulations, which we consider highly risky given the consequences of crossing the 2°C threshold.[19] The authors conclude that "[p]olicymakers and investors should question the economics of new long-lived energy infrastructure involving positive net emissions."

The paper raised an important point about replacing coal plants with gas, particularly when the coal plant is due to retire within a decade or so. In the case of a coal plant with ten years of economic life left, shutting the coal plant early and replacing it with a gas-fired generator may cut emissions in half (assuming no methane leakage) for those first ten years. But when the gas plant's economic life is 40 years, the cumulative emissions from the gas plant are in fact double those from ten years of operating the coal plant. This is because the gas plant would emit half as much CO_2 per year, but for forty years rather than ten.

The nature of the climate problem is that it is the total cumulative emissions that matter. Once we have filled the atmospheric space with CO_2, there is no turning back. As we enter a period in which we have just a few decades at best to decarbonize, it is time to seriously question any investment in infrastructure that does not clearly and dramatically reduce emissions.

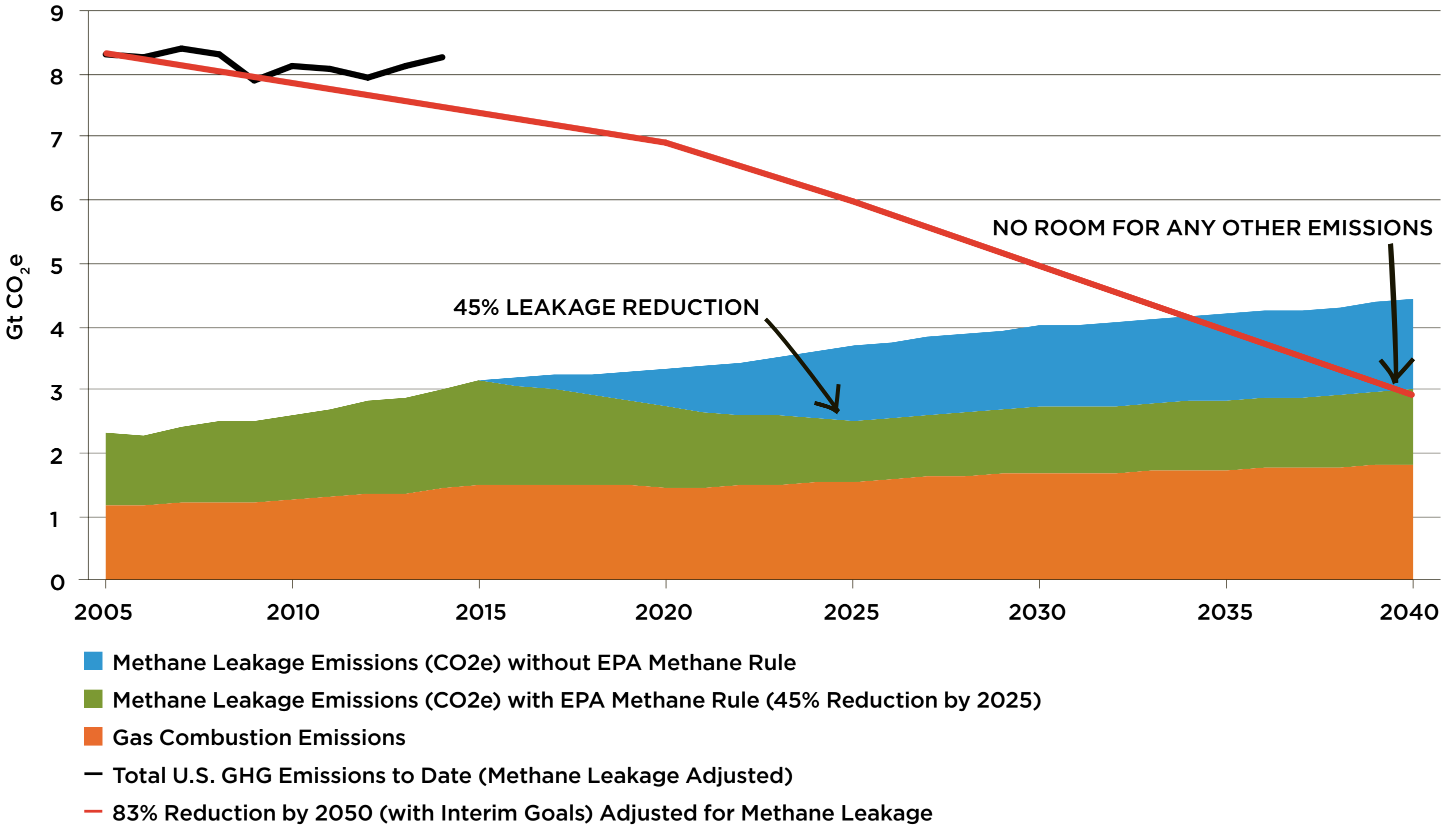
RISING U.S. GAS CONSUMPTION MAKES MEETING U.S. CLIMATE GOALS IMPOSSIBLE

Using the EIA's current Reference Case as a starting point, we calculate that emissions from projected U.S. natural gas consumption growth would more than overshoot U.S. climate goals. In other words, even if the U.S. reduced all coal and petroleum use to zero by 2040, the U.S. would still exceed its climate goals based on natural gas emissions alone.

This is even more concerning in light of the fact that the projections factor in the methane leakage reduction goals recently proposed by the EPA. This means that even under reduced methane leakage rates, U.S. gas demand must decline over the next 25 years in order to meet climate goals. This is in stark contrast to both EIA projections and the ambition of the gas industry, which is focused on massive production growth primarily centered on the Appalachian Basin.

Figure 8 shows our estimate of emissions from gas consumption and methane leakage, together with the trajectory of the U.S. climate goal to cut emissions 83 percent from 2005 levels.[v] It is clear that methane leakage plays a very large role in the emissions associated with gas consumption and that reducing leakage can cut emissions dramatically. However, our calculations show that the rise in gas

Figure 8: Projected U.S. GHG Emissions from Gas Usage & Leakage vs. U.S. 2050 Climate Target *Sources: U.S. Energy Information Administration, Environmental Protection Agency, and the Intergovernmental Panel on Climate Change*[20]



consumption alone projected by the EIA would lead to emissions from gas that would surpass the current long-term U.S. climate target by 2040, even after accounting for methane leakage cuts. This ignores the emissions from the production (and consumption) of exported gas.

Even if natural gas were the only source of greenhouse gas emissions in 2040 (and there were zero emissions from coal, oil, cement, and all other sources), the U.S. would still blow its carbon budget. This makes it clear that the growing use of gas is out of sync with U.S. climate goals.

About Figure 8:

We used leakage rates of 3.8%, which is the low end of estimates of gas leakage in production from Howarth 2015. Those rates are then reduced 45% under the EPA rule, which we treat as phased in on a straight line from 2015 to 2025.

We have adjusted the EPA's GHG totals to be comparable with the natural gas emissions, by replacing its (low) estimates of methane leakage from natural gas production. As well as understating the volumes (compared to other recent assessments), the EPA used the 100-year global warming potential (GWP) of methane, which is much lower than the 20-year GWP because though potent, methane is short-lived.

We have used the 20-year GWP because whereas CO_2 accumulates in the atmosphere over the long-term, the impact of methane is felt in the short term: according to the latest climate science, the impact of short-lived GHGs is related more closely to their annual emissions than their cumulative emissions - and is most significantly felt at the time of peak CO_2 concentrations. In this respect the shorter-range GWP is the relevant measure.

(For further discussion see IPCC 5AR WG1 sec.12.5.4, p.1108, http://ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter12_FINAL.pdf and sec.8.7.1.12, pp.711-712, http://ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf)

RENEWABLE ENERGY IS READY

As renewable energy evolves, natural gas-fired power generation increasingly competes not only with coal, but with renewable energy as well. If the abundance of natural gas locks in natural gas power capacity that renewable energy could have filled, the net increase in GHG emissions is vast. As the world looks for ways to reverse emissions growth and move as rapidly as possible towards zero carbon, building new gas capacity where zero-carbon technology is possible is a clear disaster for our climate.

The idea that we need to increase gas-fired generation now because renewable energy is not yet ready is rapidly losing what little validity it ever had. In many parts of the Unites States and the world, renewable energy is today the lowest cost and lowest impact means to add generation capacity to our electricity system.[21] There is nothing standing in the way of building the renewable energy capacity we need to sustain our electricity needs except the entrenched interests of the natural gas industry.

The past decade has seen an accelerating transformation of the renewable energy sector, and innovation and evolution in the sector is far from over. In the coming decade, we can only expect greater economies of scale and more transformational technology.

The rapid growth in first wind, then solar, and now efficiency and battery storage, suggests an imminent transformation of our energy landscape. There is now little doubt that the future will be powered by clean energy. We now need to accelerate the transformation in line with our climate goals.

Solar: The U.S. solar energy sector grossed over $22.6 billion in 2015, a 21 percent increase over 2014, and 174 percent greater than in 2011.[22] This revenue growth is all the more remarkable given that costs have declined 80 percent since 2008.[23] Installed solar capacity totaled 27 GW in 2015, and is expected to grow at least fourfold by 2022.[24] Small-scale solar could attract around $10 billion of investment per year over the next 25 years in the U.S. alone.[25]

Globally, the amount of electricity produced by solar power has doubled seven times since 2000.[26] As Tom Randall at Bloomberg Business puts it, "(t)he reason solar-power generation will increasingly dominate: It's a technology, not a fuel. As such, efficiency increases and prices fall as time goes on."[27]

Wind: U.S. wind enjoyed revenue growth of 75 percent in 2015 despite tax structure uncertainty that was finally resolved at the end of the year. Costs have fallen 50 percent since 2009.[28] Onshore wind is at cost parity with new-build gas in many parts of the country and is set to reach cost parity in all parts of the country by 2025.[29]

The CEO of wind generator giant Vestas recently told investors in London that the next wave of growth for the sector will be in 'repowering' retiring equipment with new more powerful and efficient turbines.[30] This signals a maturing industry set to increase market share through technology improvements.

Efficiency and Flattening Demand: Increasing energy efficiency is reducing the demand for electricity in America. Bloomberg New Energy Finance (BNEF) recently reported that, "The past five years in the US have seen a fundamental decoupling between electricity demand, on the one hand, and population and GDP, on the other. Looking across the next 25 years, we anticipate this trend to continue." The BNEF New Energy Outlook 2016 projects that U.S. electricity demand will likely peak in 2022, even with robust electric vehicle growth providing one of the few remaining drivers of power demand growth. This means that new generation capacity will in most cases replace retiring capacity, providing an opportunity to dramatically reduce emissions through switching from coal and gas to renewable energy.

Storage and Batteries: The U.S. energy storage sector grew tenfold in 2015, generating over $730 million in revenues.[31] All indications are that energy storage is poised to change the energy sector forever. Primarily driven by demand for electric vehicles, lithium-ion battery costs fell 65 percent from 2010 to 2015.[32] Further cost declines and performance improvements are widely expected, with some estimating a further 60 percent cost decline by 2020.[33]

The next areas of market penetration are likely to be utility-scale storage as well as residential- and commercial-scale applications for both supporting solar generation and balancing demand from the grid. Tesla's PowerWall battery is likely to be just one of many products on the market designed for storing energy for use in buildings by the early 2020s. The company's 'Gigafactory' is soon to be followed by several others already under construction in the U.S. and China. According to Navigant Research, global new installed energy storage systems for renewable energy integration power capacity is expected to grow from 196.2 MW in 2015 to 12.7 GW in 2025, a 65-fold increase in ten years.[34]

BNEF projects exponential growth in what it calls 'behind-the-meter' storage – batteries supporting solar energy systems and demand balancing in homes and commercial buildings. Globally, this use of batteries could grow from 400 megawatt-hours today to 760 gigawatt-hours by 2040.[35]

Clean Energy Jobs: The clean energy sector is also breaking barriers when it comes to

Solar voltaic panels. ©Associated Press job creation. The International Renewable Energy Agency reported that 2015 saw clean energy jobs surpass oil and gas for the first time. The global clean energy workforce grew 5 percent in 2015 to reach 8.1 million workers, and is expected to triple to 24 million by 2030.[36]

AVOIDING LOCK-IN

Looking ahead, it is increasingly clear that renewable energy will be the least-cost option for new generation capacity, with costs continuing to decline while the cost of gas-fired power increases. In other words, expanding gas-fired power today threatens to lock in an increasingly expensive source of power when cheaper, cleaner renewable energy will be available to meet our energy needs. The latest data and projections from BNEF illustrate this point.

According to BNEF's New Energy Outlook 2016, wind and solar power are already competitive with low-priced gas in certain markets in the U.S., where both renewable resources are abundant and state polices are favorable.[37]

However, as we move into the next decade, the unsubsidized cost of clean power across the country will become cheaper than new-build gas power, which requires new capital, but it will not yet be cheaper than the cost of existing gas-fired power plants where capital has already been sunk.[38] This demonstrates the danger of locking in more gas-fired power than is optimum in the coming decade.

Existing power plants are in a position to reduce their selling price to compete, even if it means making a long-term loss on capital. This is because once capital is sunk, it is better to keep operating as long as revenue covers operating costs. Any additional revenue generated above operating cost reduces the loss on capital. Therefore, new utility-scale renewable energy projects will face stiff competition from existing gas-fired power plants until installation capital costs become low enough that they can undercut existing gas plants and still provide a return on capital.

As natural gas prices are likely to rise over time (gas being a finite resource), renewable energy plants will eventually reach a point when they will price out even existing plants. However, when it comes to meeting climate goals, it is imperative to keep in mind the urgency of the problem and the danger of locking in polluting infrastructure now.

As gas-fired power plants and pipelines built today generally have a design life of around forty years, gas infrastructure built over the next decade could be operating in the 2050s and beyond. It is imperative that we avoid locking in emissions today that we cannot afford to emit in the later part of the infrastructure's economic lifespan.

INTERMITTENCY, BASELOAD, AND STORAGE ARE NOT BARRIERS TO RENEWABLE ENERGY GROWTH

Much is made by fossil fuel proponents of the intermittency of wind and solar and the need for some breakthrough in energy storage before we can give up on fossil fuels and substantially increase levels of renewable energy generation. These solutions are sometimes said to be decades away. These arguments do not reflect either the reality of renewable energy today or where it is heading.

Wind and solar energy provided 6.2 percent of total power generated in the U.S. in the past year.[39] All renewable generation, including wind, solar, geothermal, biomass, and hydro, hit close to 15 percent of generation.[40] A 2012 report by the National Renewable Energy Laboratory that extensively examined high-penetration renewable energy scenarios for the U.S. found that by better managing existing dispatchable power and storage capacity, the U.S. grid can handle as much as 50 percent wind and solar penetration and still keep the grid balanced.[41]

Advances in grid management are reducing intermittency issues associated with increasing wind and solar penetration. Wind and solar tend to have complimentary cycles of power availability. Solar power obviously tracks the sun in peaking around the middle of the day. Offshore wind tends to log higher generation during the day as well, whereas onshore wind tends to ramp up around dusk and peaks during the night. Greater penetration of diverse renewable energy technologies is a solution to intermittency rather than a source of it.

One analyst explains this using the Law of Large Numbers, in which a larger number of variables –in this case weather and diurnal dynamics at widely dispersed locations – tend to result in less volatility across the whole.[42] Sophisticated algorithms, similar to those used to manage online advertising, are increasingly being used to predict wind and solar dynamics and facilitate grid management in areas of high renewable energy penetration.[43]

The increasing ability to manage grid dynamics with high renewable energy penetration has also undermined another standard talking point of fossil fuel proponents: that renewable energy cannot provide reliable baseload power, which can only be supplied by fossil fuel and nuclear

Solar voltaic panels. ©Associated Press

plants. Earlier this spring, top executives at the world's largest grid operator, China State Grid Corp., told a stunned audience of fossil fuel executives at an industry conference in Houston that, "coalfired generators could only serve as "reserve power" to supplement renewables", and that "[t]he only hurdle to overcome is 'mindset'. There's no technical challenge at all."[44]

Evidence from China and Australia shows that coal is indeed increasingly serving as reserve power. Some coal plants in those countries are running at barely 50 percent utilization, and in some cases even less.[45] Grid operators are increasingly using thermal power plants, where operating costs are relatively high due to fuel costs, to supplement other sources rather than as baseload. Sven Teske, an analyst with the Institute for Sustainable Futures in Sydney states that "[b]ase load is not a technical concept, it is an economic concept and a business concept of the coal industry that is no longer feasible."[46] According to Teske, the focus of grid operators will move toward renewable energy, flexible generation, demand management, and energy efficiency.

These factors point to the ability of the U.S. electricity system to absorb increasing levels of renewable energy penetration before a substantial increase in storage will be needed. Nevertheless, the development of affordable storage solutions is happening at a rapid pace. As detailed above, both utility-scale and 'behind-the-meter' storage solutions are set to exponentially increase their market penetration over the next decade. The age of affordable power storage is upon us.[47]

Essentially, the issue of how much renewable energy can be absorbed into the grid has been solved. It is now up to the industry to invest in genuine clean energy and for government to forge policies that support the speediest transition possible.

CONCLUSION AND RECOMMENDATIONS

The development of new and expanded gas pipelines out of the Appalachian Basin could unlock significant new flows of natural gas. These pipelines would drive an increase in U.S. gas production that would be incompatible with achieving stated climate goals.

Enabling U.S. gas demand to follow the current projection in the EIA Reference Case (2016) would lead to emissions from gas alone that would surpass the U.S. emissions goal by 2040. In other words, the current trajectory of gas production and demand is out of sync with the nation's climate goals and must be constrained.

Data presented in this report shows that the vast majority of projected gas production growth would likely come from the Appalachian Basin, but this can only happen if the pipeline projects listed in this report go ahead. That should not be allowed to happen.

The surge in gas-fired power generation that would accompany this production growth is not an inevitable or needed feature of our nation's future power market. Clean energy technologies are surging ahead at this time and are projected to become a leading source of energy in the coming decade. Our electricity grid is set to be transformed into a system based on diverse and flexible generation sources, storage solutions, and advanced grid management. Total power demand is set to decrease even as electric vehicles grow to become a major new source of demand. Now is the time to question the need and impact of new fossil fuel infrastructure and plan an energy future that is in sync with climate science.

When President Obama made the historic decision to deny the Presidential Permit for the Keystone XL pipeline, he did so because, in his words: "America is now a global leader when it comes to taking serious action to fight climate change. And frankly, approving this project would have undercut that global leadership. And that's the biggest risk we face – not acting."[48]

Not acting to constrain gas production and consumption to within science based climate limits is a major risk we face. This and future administrations have the ability to apply the same standard to gas infrastructure what was applied to the Keystone XL pipeline. That means applying a climate test to these proposed gas pipelines and all proposed fossil fuel infrastructure. A climate test would assess the need for new fossil fuel infrastructure against science-based climate goals.

The challenge to meet the Paris Agreement's goals of keeping average global warming well below 2°C and pursuing a 1.5°C target cannot be met if a business-as-usual policy continues to permit an expansion of fossil fuel supply. For this reason, every government agency should apply a climate test if it is faced with any decision that could increase fossil fuel supply. FERC, which authorizes the construction and expansion of interstate natural gas pipelines, cannot be exempt from this requirement.

Recommendations:

- All federal government agencies and departments, including FERC, should apply a climate test in the permitting processes of all fossil fuel infrastructure, including Programmatic Environmental Impact Statements.

- No new natural gas pipeline projects should be considered unless they can pass a climate test. The climate test should be applied to all currently pending and future pipeline applications.

- The EIA should provide detailed guidance in the form of alternative cases in its Outlook reports for U.S. fossil fuel supply and demand under various climate goals, including the nation's long-term climate goal, a 2°C path, and a 1.5°C path.

Rig PA. ©Schmerling, FracTracker Alliance

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July 2016