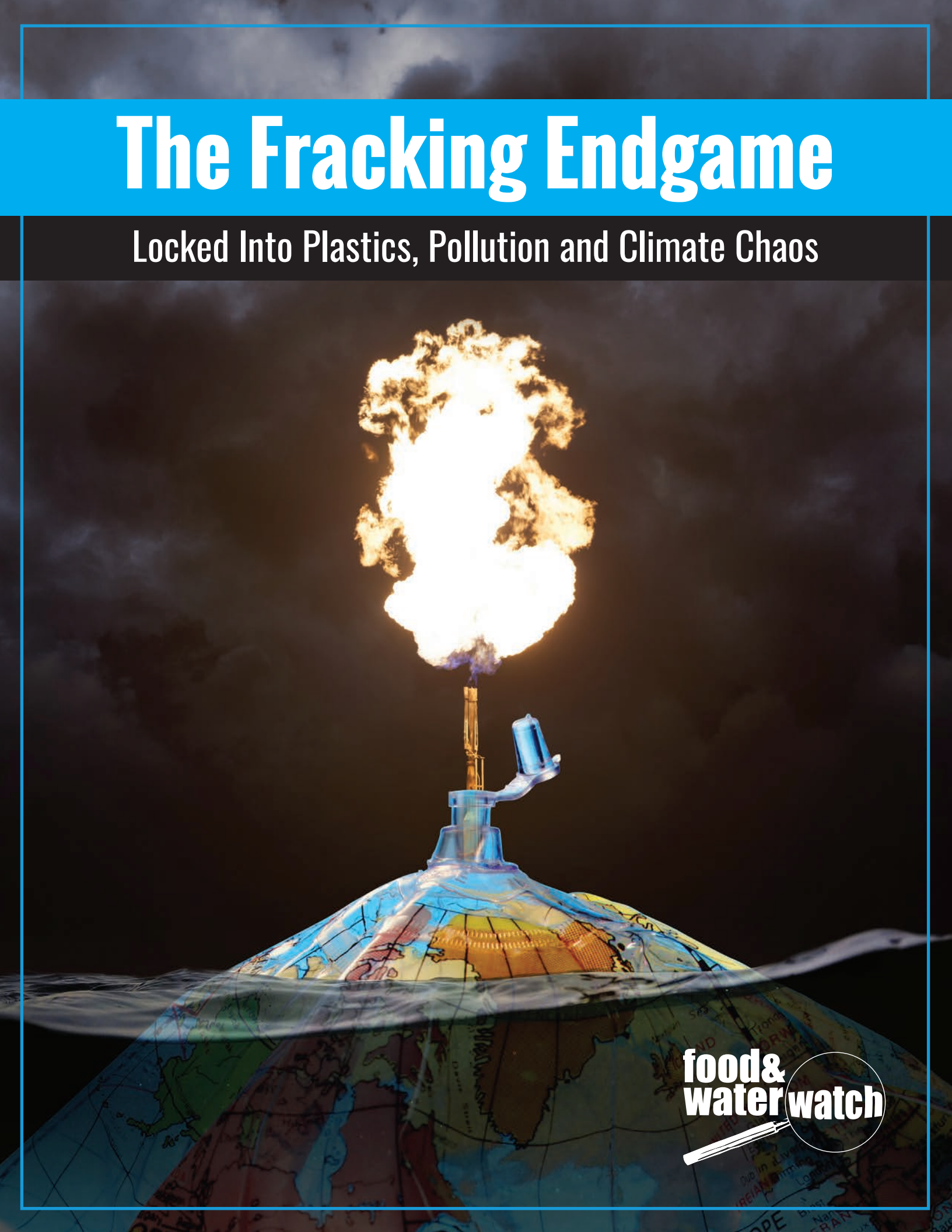
The Fracking Endgame

Locked Into Plastics, Pollution and Climate Chaos



food&water watch

About Food & Water Watch

Food & Water Watch mobilizes regular people to build political power to move bold and uncompromised solutions to the most pressing food, water, and climate problems of our time. We work to protect people's health, communities, and democracy from the growing destructive power of the most powerful economic interests.

Food & Water Watch has state and regional offices across the country to help engage concerned citizens on the issues they care about. For the most up-to-date contact information for our field offices, visit *foodandwaterwatch.org*.

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Fight like you live here.

Letter From Wenonah Hauter

Executive Director, Food & Water Watch

In 2009, when few outside of the fossil fuel industry had heard the term "fracking," we at Food & Water Watch began to receive many questions from our supporters about its impact on water resources. Over the next two years, we took a close look at this burgeoning oil and gas drilling technique that was suddenly reshaping rural landscapes, and reshaping America's energy landscape as well. What we found was startling: fracking posed an immense threat to drinking water, and had already caused serious contamination events and subsequent human health impacts in numerous states across the country. So, in 2011, we did the prudent thing: we called for a ban on fracking everywhere, becoming the first national organization in America to take this bold, uncompromised stand.

By 2015, scores of studies and reports had been published confirming all kinds of hazards and threats associated with fracking: drinking water contamination with cancer-causing chemicals like benzene; air pollution that poses respiratory health risks, especially to children with asthma; accidents and explosions; toxic waste accumulation; and even increased crime rates in areas where fracking was booming. Soon, studies were connecting low-birthweight babies with proximity to fracking sites. But perhaps most alarming was the mounting evidence of fracking's impact on our climate. Natural gas, touted as a "bridge fuel" to a clean energy future, was actually helping to tip the scales of climate stability past the point of no return. Fracked gas was found to be a climate killer.

Now, as a 10-year fracking boom has ebbed and flowed, as countless families and communities have borne the costs of this industry through disruption, displacement, sickness and even death, and as our planet hangs on the precipice of climate catastrophe, fossil fuel corporations and their elected enablers are seeking to turn up the pace of new fracking projects once again.

Our latest research shows that their endgame is a world locked into plastics, pollution and climate chaos. In addition to the buildout of a growing pipeline network, we've discovered that more than 700 new facilities have been built or proposed to capitalize off of a glut of cheap fracked gas.

From petrochemical facilities to gas-fired power plants and liquefied natural gas export terminals, these new projects would commit America to another generation of dependence on fossil fuels. These new projects would bring dangerous air pollutants associated with heightened cancer risks and respiratory illnesses, and would disproportionately affect lower-income communities and communities of color where they are most commonly located.

These projects aren't just associated with health and safety risks: if even a fraction of them come to fruition, they will condemn the planet to a future of climate chaos.

While the influence of the oil and gas industry is immense, and the work ahead will be hard, we can stop this onslaught from the fossil fuel industry. The grassroots movement to reject dirty energy has banned fracking in New York and Maryland and stopped or delayed dozens of fossil fuel infrastructure projects that would have turned frontline communities into sacrifice zones, polluting air, water and the climate.

By 2016, polling showed that more than half of Americans disapproved of fracking. And, as we head into the 2020 presidential elections, climate change is emerging as a top issue among Democratic voters. There is hope for a better world without fracking, and that starts with strong policies that address our systemic dependence on the fossil fuels that are smothering our planet in plastic and pollution. Every day, as people power multiplies, we are working together to stop new fossil fuel development and to promote a rapid transition to a clean, just and equitable renewable energy future. It's time to fight like we live here.

Wenonah Hauter, Executive Director

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Locked Into Plastics, Pollution and Climate Chaos

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Executive Summary

In the mid-2000s, the oil and gas industry accelerated the use of the controversial hydraulic fracturing ("fracking") technique to extract formerly inaccessible natural gas from shale rock and other geologic formations. Fracking has threatened communities near drilling rigs with water pollution, air emissions and ecosystem degradation.

Despite the risks and ecological destruction, fracking has spread like wildfire. Between 2000 and November 2018, the number of gas wells rose by more than half to approximately 550,000 drilling rigs.[1] Fracked gas production surged more than 15-fold from 2000 to the first half of 2018 when it reached an average of 56.3 billion cubic feet per day.[2] All this additional gas has pushed real, inflation-adjusted natural gas prices to their lowest levels in decades, now 60 percent lower than in 2008.[3]

Persistently low prices have challenged the economic viability of the fracking industry's continuous and steady expansion. Many firms are spending more on exploration and drilling than they earn from gas sales. The business solution to the oversupply and low prices was to find and promote new industry partnerships to absorb the gas glut, tighten up supplies and raise prices enough to keep expanding fracking's footprint.

Three industrial partners stepped up to capitalize on low gas prices: the petrochemical and plastics industries that use natural gas liquids as a key feedstock for their manufacturing; gas exporters building liquefied natural gas (LNG) terminals to ship gas overseas; and natural gas-fired power plants. These industries gain low-priced supplies and form a symbiotically profitable business alliance with the fracking industry. These industries are rapidly expanding:

- **Proliferation of plastics plants to capitalize on fracking:** Industry experts project that the plastics industry will have added 28 million tons of plastic production between 2011 and 2020, and more than $202 billion is slated to be invested in 333 new facilities and expansions to take advantage of fracked gas, including 20 ethylene crackers to turn shale gas into feedstock for plastics manufacturing plants.
- **Pushing natural gas exports to raise domestic prices:** The industry and the Trump administration are promoting LNG exports to reduce the domestic gas supply and raise U.S. natural gas prices. In 2018, there were only 3 active LNG export facilities in the contiguous United States, but 22 more were either already being built or were approved for construction, and another 22 were pending federal review.
- **Wave of new fracked gas-fired power plants:** The power industry has 364 new gas-fired power plants under development for 2018 to 2022, and gas deliveries to power plants rose 57 percent between 2006 (before the fracking boom) and 2017. The gas-fired generation capacity from plants added in 2017 and 2018 alone could power 24 million U.S. households, an expansion that is creating a power surplus in some areas.

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These industries are throwing an economic lifeline to the fracking industry. Without the buildout of fracked gas infrastructure, the fracking industry would likely face more severe economic headwinds and find it more difficult to fund drilling and exploration projects.

But as these industries prop up their mutual profits, they are proliferating pollution. Petrochemical plants, gas liquefaction facilities and gas-fired power plants emit air and climate pollution. Far from being a cleaner power source, natural gas is no climate solution. The power plants emit greenhouse gases and other hazardous air pollutants, and widespread leaks of the potent climate gas methane from gas infrastructure such as pipelines mean that declining power plant emissions are outweighed by increased greenhouse gas emissions from methane leaks.

The United States needs to rapidly shift to 100 percent clean, renewable energy to curb the worst impacts of climate catastrophe. The fossil fuel infrastructure that is currently planned and under construction will have an effective lifespan far longer than the point when experts agree that the world must shed all fossil fuels, meaning that these stranded assets will be wasted economic investments.[4] But the fracking industry's partnership with the triple threat of the plastics industry, gas exporters and power companies is buttressing the climate-destroying expansion of fracking in the United States.

Background: Three Industries Prop Up Financially Faltering Fracking

The rapid expansion of hydraulic fracturing ("fracking") created a gas glut that has driven real gas prices to the lowest levels in decades.[5] Now frackers are producing more gas than can be used — the fracked gas supply exceeds demand.[6] This economic disconnect is bad for business, but fracking has been an even bigger environmental disaster for communities and the planet.

The fracking industry continues to push full steam ahead instead of moving away from the dangerous drilling technique. The solution to the frackers' financial frustrations are new outlets (markets) for fracked gas. Now other industrial partners are riding to the fracking industry's rescue to push for new infrastructure — petrochemical and plastics manufacturing facilities, gas-fired power plants and LNG export terminals — to sop up surplus gas, support fracking and raise gas prices.[7]

Wall Street investor-funded U.S. fracking produced an oversupply of cheap gas and gas byproducts in the past few years.[8] In 2017, $84 billion was sunk into fracking investments, helping the United States produce a record amount of natural gas.[9] Fracked gas production was expected to set new records in 2018, and the U.S. Department of Energy (DOE) predicted that gas production would grow by nearly a third by 2025.[10]

With the help of lax regulators and generous government handouts, natural gas is being turned into wasteful plastics, burned in new gas-fired power plants and dumped into overseas markets. Although conditions appear ripe for another crash, investors continue pumping billions into new drilling and exploration.[11] Some government policies are priming the fracking industry pump by giving gas, petrochemical and pipeline companies new tax breaks and subsidies.[12]

Despite soaring production, shale companies are not reaping huge profits.[13] The last few years have delivered a series of busts for the industry. A decade ago the gas industry was struggling because of shortages, but in 2012 surplus gas sent the industry on a quest for new buyers to soak up its excess gas supplies.[14] In 2014, a large glut began to suppress prices and led to a wave of bankruptcies; by the end of 2015 continued production amid an oversaturated market pushed real, inflation-adjusted natural gas prices to all-time record lows.[15] From 2008 to 2017, the real wholesale price for natural gas fell by 60 percent as total gas production rose.[16]

Persistently low prices have bedeviled the financial success of fracking companies. Yet fracking companies continued to pump gas from wells, even as some companies laid off workers and declared bankruptcy.[17] In the first six months of 2018, the biggest fracking firms lost $3.9 billion — they spent more on new drilling and other projects than they earned selling gas.[18]

In Texas, frackers have called current gas production "unprecedented."[19] In West Texas' Permian Basin, fracking companies profit from the oil they produce, but without a market for the surplus gas, some of it has been disposed of through flaring and venting (burning or just releasing the gas into the atmosphere) or sold at near-zero prices.[20] In the Appalachian Basin, the Marcellus and Utica shale plays are expected to help double U.S. shale gas production by 2040, but regional demand is struggling to keep up.[21] Fracking proponents admit that, "Without infrastructure, you have nothing."[22]

The fracking industry needs new demand sources to absorb excess gas to justify more drilling.[23] Fracking can only expand at its breakneck pace if the overabundance of low-priced gas can become profitable through new markets (exports), new end-users (petrochemical and power plants) or new products (plastics) to drive up gas demand.[24]

These new industrial partners are eager to capitalize on cheap gas supplies. Together, the fracking industry, plastics and petrochemical manufacturers, gas exporters and electric power companies are creating mutually profitable and polluting partnerships. They form a symbiotic business relationship: the fracking industry gets new buyers, and the petrochemical, power plant and exporting firms get new, low-priced supplies.

Petrochemical Manufacturing and Plastics Production

Fracking has produced an oversupply of cheap ethane, a hydrocarbon present in natural gas that has been a boon for the plastics industry, which relies on petrochemical manufacturing to turn ethane into plastics.[25] More fracking means more low-cost ethane, and more plastics and petrochemical plants can eat up excess gas to justify more drilling.[26] The new partnership has promoted a plastics manufacturing building boom that threatens communities and the environment near the new factories as well as the global ecology.

Natural gas is composed primarily of the greenhouse gas methane, which typically is delivered by utility companies for residential heating and to fuel gas-fired power plants.[27] In addition to this "dry" gas, some shale plays — especially the Utica and Marcellus shale gas reserves underlying vast portions of northeastern Appalachia — contain what the industry calls "wet" natural gas.[28] Wet natural gas contains higher concentrations of natural gas liquids (NGLs) — predominantly ethane but also propane, butane, isobutane and pentanes — which are the raw materials for manufacturing petrochemicals.[29]

Companies process raw natural gas into dry gas and the different constituent NGLs, such as ethane. Once isolated, ethane is transported to a type of petrochemical facility known as a cracker plant that uses steam or heat to "crack" ethane into ethylene, the most frequently produced petrochemical that is converted into the most common type of plastic, polyethylene.[30] Ethylene goes through a chemical procedure called polymerization to convert it into small plastic pellets, or the polyethylene resin used to manufacture plastic products.[31]

In November 2013, representatives from the oil and gas, petrochemical and plastics industries convened a three-day summit — the first of its kind — to address the "opportunities and challenges of a 'coming renaissance' in North American plastics."[32] According to

Plastics News, fracking "represents a once-in-a-generation opportunity" for the plastics industry.[33] A renewed push for plastics manufacturing provides the fracking industry with a polluting partner to absorb the ever-increasing quantity of fracked natural gas.[34]

New investments to turn fracked gas into petrochemicals and plastics

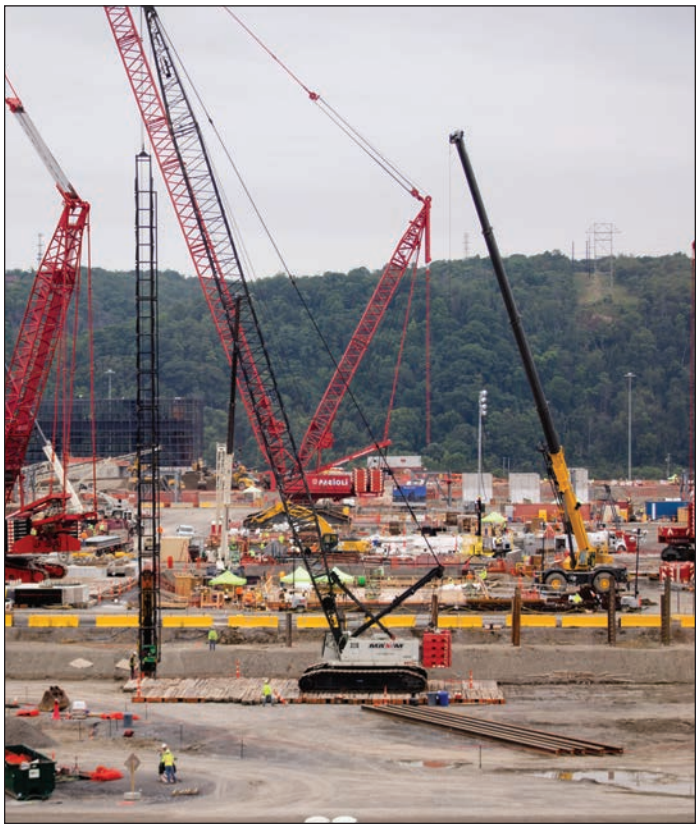
Investors have been lining up to build new factories that transform fracking byproducts into plastics.[35] Beginning in 2012, chemical companies started aggressively investing in petrochemical plants focused on tapping the gas glut.[36] Between 2011 and 2017, U.S. petrochemical production added 14 million tons of production capacity — by 2020, the United States will add another 14 million tons.[37] More than 20 new crackers and ethylene production expansion projects have been proposed in the country because of the natural gas boom.[38]

In 2016, the chemical industry was already slated to spend over $164 billion on 264 new facilities and expansion projects specifically to take advantage of shale gas.[39] By 2018, the numbers had climbed to $202 billion on 333 facilities.[40] This investment is targeted primarily for Appalachia and the Gulf Coast, and is projected to drive a 40 percent increase in global plastics production over the next decade.[41]

Appalachia is targeted to become the new epicenter of petrochemical development

The proposed industrial solution to alleviate the Marcellus and Utica shale gas glut is to turn the Tri-State area of Ohio, Pennsylvania and West Virginia into a petrochemical epicenter. The key proposed facility includes the $10 billion Appalachian Storage and Trading Hub, which would include a large underground NGL storage facility and a web of interconnected pipeline infrastructure to connect to petrochemical plants and plastics factories in the Tri-State region — potentially extending into eastern Kentucky (which sits atop the Rogersville shale gas reserve).[42]

The actual storage facility would be the cornerstone of the entire petrochemical development plan, which could incentivize and draw in additional petrochemical projects to the region.[43] The storage facility would provide a steady stream of ethane to nearby crackers and act as a trading post for exploration and production companies looking to sell their NGLs to



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petrochemical plants (including ethane crackers) and plastics facilities.[44]

The American Chemistry Council (ACC) estimates that chemical industries and plastics industries will invest $35.8 billion for central Appalachia's regional petrochemical and plastic manufacturing facilities and large underground gas storage facility.[45] The combination of shale gas production and petrochemical facilities would create what *Crain's Cleveland Business* called "an ethane tsunami."[46]

The petrochemical push also includes a total of five proposed ethane crackers in West Virginia, Ohio and Pennsylvania, but the ACC suggests that the Appalachian basin could support up to nine crackers.[47] Already under construction in western Pennsylvania is Shell's $6 billion petrochemical facility consisting of an ethane cracker and a polyethylene unit to make plastics.[48] Shell also has proposed a 97-mile Falcon Ethane Pipeline that would run through Ohio, West Virginia and Pennsylvania to deliver ethane to the cracker.[49] A similar investment includes a partnership between a Thai government-owned oil company and a South Korean construction company with petrochemical expertise to build a $10 billion ethane cracker in Belmont County, Ohio.[50]

Expanding the petrochemical and plastics sectors in Texas and Louisiana

Tumbling NGL prices from an overproduction of shale gas in the Gulf Coast has also spurred a huge new wave of investment in Texas and Louisiana, which is already the epicenter of U.S. petrochemical and plastics manufacturing that produces half of the nation's petrochemicals.[51]

The region exported 7 billion pounds of plastic in 2018, and the abundance of cheap fracked gas will drive an estimated $142 billion in petrochemical investment to the region.[52] By 2017, an estimated $71 billion was plowed into 134 Texas projects alone.[53]

Projects in the Gulf Coast include billions of dollars poured into petrochemical facility expansions in Baytown and Mont Belvieu, Texas.[54] Exxon and the chemical company Sabic are also building a $9.3 billion petrochemical complex in Corpus Christi, which is slated to open in 2021; it would be the biggest in the world, creating nearly 4 billion pounds of ethylene annually.[55] The mega-facility is just one project in a Corpus Christi plastics building boom, with over $28 billion in new projects either planned or under construction during 2015.[56] The additional petrochemical manufacturing will compound local pollution generated by existing large facilities, falling largely on marginalized communities.[57]

Chemical investment, often greased by substantial government handouts, is also flowing into Louisiana to build facilities largely against the wishes of local residents.[58] Formosa Petrochemical Corporation will receive millions of dollars in tax subsidies to build a $9.4 billion, 2,400-acre petrochemical complex in St. James Parish.[59] Additionally, Sasol is building a $11.1 billion ethane cracker in southwest Louisiana.[60] Wanhua Chemical Group has announced plans to locate a $1.12 billion facility in Louisiana.[61] Yunhuang Chemical is in the process of building a $1.85 billion Louisiana chemical complex.[62]

Expanding plastics industry pumps up pollution threats to nearby communities

The development of new petrochemical facilities, crackers and plastics plants will compound the existing pollution problems where the industry is expanding and spread it to new areas where new projects are developed, which would worsen existing air quality and public health problems. The Gulf Coast has some of the

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highest pollution levels and pollution-related illnesses and diseases,[63] and the Tri-State region already faces stark environmental and associated public health challenges from a century of industrial pollution.[64]

Plants that convert natural gas into petrochemicals are known to emit massive amounts of air and climate pollutants including polycyclic aromatic hydrocarbons, carbon dioxide, ozone-creating volatile organic compounds (such as benzene and toluene) and nitrogen oxides.[65] These plants pump out mountains of toxic plastics.[66]

A 2012 Houston Advanced Research Center study of local petrochemical pollution found that "large petrochemical flares lead to very rapid ozone formation that, if properly detected, would make attainment of the current federal ozone standard very difficult in Houston."[67] This petrochemical flaring also can expose nearby communities to high levels of formaldehyde, a carcinogenic air pollutant and ozone precursor.[68]

Prolonged contact with ground-level ozone is linked to asthma and chronic obstructive pulmonary disease. When mixed with particulate matter, which has been linked to various cancers, smog can form.[69] In addition to asthma, long-term exposure to smog has been connected to premature deaths in adults and to low birthweight in babies.[70] Further, chronic exposure to air pollution can cause various illnesses, including cognitive deficits.[71] Several studies have demonstrated that people's exposure to petrochemical facility pollutants is associated with heightened cancer risks, acute irritative symptoms (such as nausea and eye and throat irritation) and respiratory-related illnesses, especially for children.[72]

The Ohio River Valley, where the Appalachian Storage and Trading Hub is proposed, has persistent air pollution problems that threaten the health of residents. The University of Pittsburgh Center for Healthy Environments and Communities identified the Ohio River Valley as having hotspots of criteria air pollutants from the northern West Virginia panhandle to the southern Ohio-West Virginia border.[73] Several Ohio, Pennsylvania and West Virginia communities were ranked among the most polluted areas for ozone and particulate matter by the American Lung Association, including Beaver County where one cracker is being built.[74] Belmont County, Ohio, the proposed site for another cracker, already has been plagued with "intense" emissions from shale gas development.[75]

Industrial pollution, including emissions from chemical and plastics facilities, disproportionately impacts the health of nearby communities that often lack the resources to fight back, including communities of color and lower-income, economically depressed and less educated communities, which already tend to have worse health outcomes than whiter, more affluent communities.[76] The disproportionate location of polluters in communities of color and lower-income areas worsens these toxic health and environmental burdens.[77]

This environmental injustice has been especially pronounced in both Texas and Louisiana. There were 16 chemical plants within a three-mile radius of the Manchester-Harrisburg neighborhood, one of Houston's lower-income communities of color.[78] One study even found that children living within two miles of the Houston Ship Channel, where many petrochemical plants are located, have a 56 percent greater chance of developing leukemia than children living 10 miles away.[79] And Louisiana's historically African-American community of Mossville has been surrounded by 14 industrial facilities — including a coal-fired power plant, oil refinery and several petrochemical facilities — annually releasing millions of tons of toxins into the water, air and land, including high levels of cancer-causing substances.[80]

Plastic pollution has a growing footprint

The petrochemical boom would ramp up plastics production, generating not only industry profits but also mountains of plastic waste. More than half of the new raw plastic resins produced in the United States are slated for export to be manufactured into plastic products.[81] The majority of the plastics industry manufactures packaging, which creates materials that are immediately thrown away.[82] Across the globe, each person discards 110 pounds of plastic annually.[83] Of the 18.3 trillion pounds of plastics produced since 1950, only approximately 9 percent has been recycled — meaning that more than 16 trillion pounds has been tossed into landfills, littered into the environment or incinerated.[84]

In 2010 alone, nearly 200 coastal countries generated over 600 billion pounds of plastic waste, with 11 billion to 28 billion pounds ending up in the oceans.[85] This litter is creating and adding to colossal masses of plastic garbage floating in our oceans. In the central Pacific Ocean, four major ocean currents have brought this

waste into a slow-moving "plastic soup."[86] Dubbed the Great Pacific Garbage Patch, the world's largest dump is four times the size of California.[87]

This pollution is a significant threat to marine biodiversity, impacting over 600 marine species.[88] Plastic debris frequently floats at the ocean's surface — mixing with food sources — where it entangles, chokes or is consumed by wildlife.[89] As plastic breaks into smaller pieces it releases the potent greenhouse gases ethylene and methane.[90] Ingesting resultant microplastics is extremely harmful to aquatic life and seabirds.[91] Studies have found microplastics, tiny plastic fragments degraded from plastic litter, in open oceans, freshwater sources, lake sediments, river beds and the deepest ocean trenches.[92] Between 2007 and 2013, an estimated 538 million pounds of plastic particles was found on the oceans' surface — from coastal Australia to the Mediterranean Sea.[93]

Exporting Fracked Natural Gas

The basic economic problem for the fracking industry is that overproduction has created a gas glut that greatly outpaces the domestic demand. One simple way to tighten up domestic supplies is to export as much gas as possible, offloading excess gas supplies to raise domestic prices. It should be noted that this is a swift reversal of the energy independence justification for environmentally destructive fracking. The industry argued that fracking was necessary to foster energy independence,[94] but now it is promoting exports (even though by 2018 United States remained a net importer of fossil fuels).[95]

As a result, the industry and its political allies — including the Trump administration — have been pushing increased shipments of natural gas across the world, enabling frackers to prop up prices and to support continued exploration and overproduction.[96] These exports super-charge additional fracking, as 80 percent of the increased exports will be filled by gas from newly drilled wells — otherwise, that gas would have remained underground.[97] Some gas is exported by pipeline or truck to Mexico and Canada, and the rest is shipped by tanker from export terminals to reach overseas markets.[98]

Natural gas is almost impossible to ship in its gaseous state. Super-cooling natural gas converts it to a liquid that takes up 600 times less volume, making it possible to load the LNG onto tankers; when it is unloaded, it is heated to return it to a gas.[99]

The technical capacity to liquefy and ship natural gas has existed for quite some time, but the energy-intensive and expensive process has been difficult to execute in an often volatile and uncertain gas market. LNG terminals such as Dominion Energy's Cove Point facility in Maryland were originally built to import LNG after the 1970s oil crisis.[100] As domestic gas prices fell, it was not economically viable to import and convert LNG back into a gas. When the fracking boom made imports obsolete, Cove Point was retrofitted to *export* natural gas.[101] The rise of fracking has renewed industry promotion of LNG exports to prop up prices.[102]

The LNG export boom

The U.S. gas industry is promoting exports to maintain fracking's profitability, which would drive additional drilling and gas extraction.[103] The first LNG export shipment from the lower 48 states departed from Cheniere's Sabine Pass terminal in February 2016.[104] The surplus of fracked gas quickly set the stage for an export boom, making the United States a net exporter of natural gas (where exports exceed imports) in 2017 for the first time since 1957 — just a year after the first LNG tanker left port.[105]

The Trump administration has been pushing exports by trying to rush the approvals of new LNG export facilities.[106] Energy Secretary Rick Perry has said that, "My job is to sell a lot of [LNG] around the world" and has called opposition to fossil fuels "immoral."[107]

In 2017, Trump's then top economic adviser, Gary Cohn, called for a new re-review of the proposed Jordan Cove LNG export terminal in Oregon, which was previously rejected by the Federal Energy Regulatory Commission (FERC) in 2016 because the facility would

not fulfill FERC's public need requirement (because the project only benefited the exporting company, not U.S. consumers.)[108] The DOE determines whether LNG export applications to countries that are not part of U.S. free trade agreements are in the public interest based on economic and environmental criteria.[109] FERC has jurisdiction over siting, construction and operation of U.S. facilities and is tasked with performing environmental impact assessments under the National Environmental Policy Act.[110]

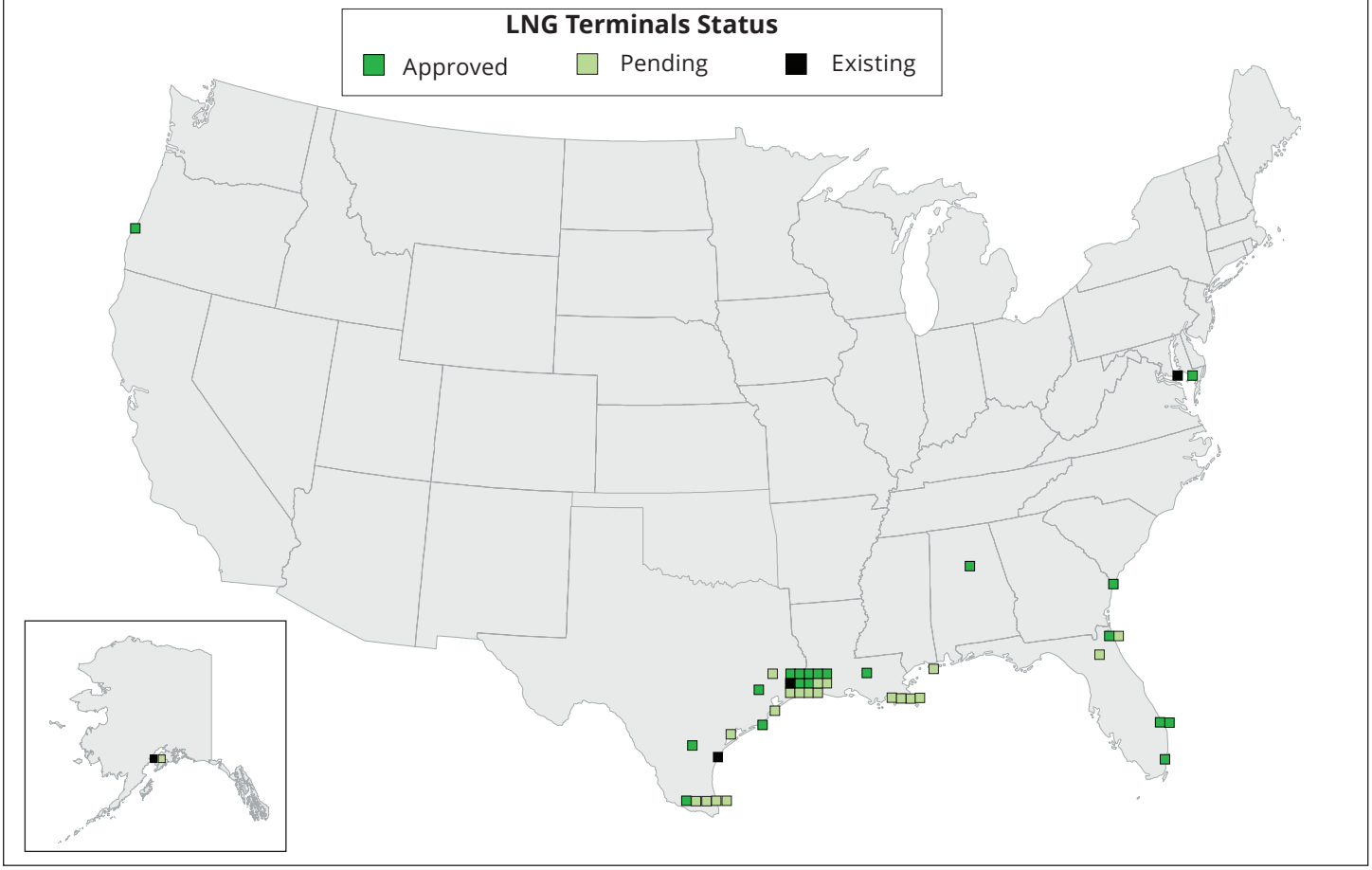
Trade deals such as the North American Free Trade Agreement (NAFTA) can make it easier to rubber stamp exports and facilitate the approval of export terminal projects. The Jordan Cove project needed to demonstrate that it met a public need because the exports were bound for Asian nations that do not have free trade agreements with the United States. Exports destined for countries that are parties to free trade agreements with the United States are exempt from environmental evaluation and presumed to be "in the public interest."[111] According to the American Petroleum Institute, "the current NAFTA agreement works for the oil and gas industry."[112] The Trump-renegotiated NAFTA maintained the pro-petroleum industry perspective, and the *Washington Post* reported that the new NAFTA delivered a "big win" to oil companies.[113]

By 2016, energy companies had proposed over $44 billion worth of new LNG export terminals.[114] In 2018, there were only 3 active LNG export facilities in the contiguous United States, but 22 were either already being built or were approved for construction, and another 22 were pending federal review either with the DOE or FERC (see Map).[115]

New and planned LNG export facilities

The United States now has the capacity to liquefy and export 3.6 billion cubic feet of natural gas per day, about 5 percent of U.S. gas production.[116] If this gas were delivered to power plants, it would be enough to power 21.4 million homes, the equivalent of about 17 percent of U.S. households.[117] Most of the ramped-up

FIG. 1 • Approved, Pending and Existing LNG Export Terminals, as of 2018



SOURCE: Map based on data from U.S. Department of Energy. "Long Term Applications Received by the DOE/FE to Export. Domestically Produced LNG From the Lower-48 States." December 10, 2018; U.S. Federal Energy Regulatory Commission. "North American LNG Import/Export Terminals — Existing." July 2, 2018.

exports came from capacity expansions at Cove Point and at Cheniere Energy's Sabine Pass export facility that helped LNG exports quadruple between 2016 and 2017.[118]

With continued investment in export terminals and LNG shipping to overseas markets, export capacity could nearly triple to 9.6 billion cubic feet per day by 2020, making the United States the third largest LNG exporter, behind Qatar and Australia.[119] By 2040, if industry investments and projections prove accurate, LNG exports could explode to 30.7 billion cubic feet per day, which would amount to more than a quarter of the DOE's projection for the U.S. gas supply.[120] However, exports may be a temporary fix rather than a long-term source of demand; experts are already predicting an oversupply of LNG globally as early as the mid-2020s.[121]

Cheniere Energy's Sabine Pass was the first facility in the lower 48 states to ship LNG overseas, delivering gas to Brazil in 2016.[122] The company had no prior track record in running LNG facilities and repeatedly benefited from close relationships with regulators.[123] Its board has included a former high-level DOE official and a FERC commissioner.[124] In 2017, Cheniere had three top former Obama climate and energy officials in lucrative executive roles at the company.[125]

The facility was whisked through the federal approval process. In 2011, after a short nine-month review, the DOE granted the necessary authorizations, and in 2012 Sabine Pass became the first LNG export project to clear FERC's environmental review.[126] Not only did it benefit from a speedy permitting process, but the project received nearly $1.7 billion in tax subsidies, a large portion of which appears to have gone to executive raises.[127]

Dominion Energy's Cove Point terminal became the second U.S. LNG export facility in 2018, when its first shipment left for Japan.[128] The $4 billion terminal is connected to nearly 15,000 miles of pipeline infrastructure, which supply the terminal with fracked gas.[129] Cove Point threatens more than 830 people living just over a mile from the facility with the risk of accidents from explosive fuels and chemicals.[130]

Some companies are explicitly building their export model around fracking. For example, Tellurian, an LNG exporter run by a former Cheniere executive who helped build the Sabine Pass facility, is planning a $24 billion scheme to combine upstream fracked gas assets with liquefaction export terminals.[131] In mid-2018 New Fortress Energy was in the midst of an initial public offering (IPO) to pump capital into its growing fracking-supplied LNG empire.[132] The company liquefies natural gas at its facility in Miami and intends to build two new liquefaction facilities in northern Pennsylvania to export gas from the Marcellus shale.[133] These facilities link into New Fortress' global ambitions, supplementing the company's active LNG terminals in Jamaica and a planned terminal in Mexico, as well as potentially supplying its planned $581 million LNG import facility in Ireland.[134]

Four additional facilities are slated to come online by the end of 2019.[135] These include Kinder Morgan's Elba Island LNG facility in Georgia, Sempra LNG's Cameron

The globalized market for NGLs is ramping up worldwide plastics manufacturing

The Appalachian and Gulf Coast fracking industries are shipping NGLs to international markets as well. The Gulf is already a known hub for gas exports, which helps sop up surplus gas and boost prices (see "Exports" below).[137] NGL exports, primarily to China and Japan, are currently at record highs.[138] Energy Transfer Partners and Satellite Petrochemical aim to widen the pipeline to China by building a new ethane export terminal on the Gulf Coast capable of transporting at least 6.3 million gallons of NGLs a day by 2020.[139]

Houston-based Enterprise Products Partners LP also is expanding an existing export terminal along the Houston Ship Channel to boost its exports. According to the company's CEO, "The resulting rapid growth in the supply of U.S. ethylene, combined with increased demand from international markets like Asia, creates an ideal scenario in which markets abroad are able to diversify their supply by accessing cost-advantaged feedstocks made possible by the shale revolution in the United States."[140]

While Gulf Coast NGLs are ending up primarily in Asian markets, exports from Appalachia are traveling across the pond. United Kingdom-based chemical giant Ineos has teamed up with the U.S. fracking industry to fuel European plastic factories.[141] The controversial Mariner East pipeline system delivers ethane to the Marcus Hook export terminal in Pennsylvania, then large vessels dubbed "dragon ships" deliver the fracked gas byproducts across the Atlantic Ocean to Ineos' European facilities.[142]

LNG facility in Louisiana, Freeport LNG's Quintana Island facility and Cheniere's Corpus Christi facility — the latter two both located in Texas. Combined, these facilities would export an additional 5.4 billion cubic feet per day, diverting another 7.2 percent of U.S. gas supplies.[136]

Liquefaction and export terminals threaten communities with pollution

Approving more LNG facilities to export natural gas will spur more environmentally damaging drilling and fracking, while building these energy-intensive facilities will generate more greenhouse gas emissions. It takes a lot of energy to supercool natural gas enough to convert it to a liquid.

LNG export facilities and terminals emit large amounts of air pollution, damage marine habitats, release dangerous toxins into the water and emit colossal amounts of methane, locking in decades of climate pollution.[143] For example, Cove Point's carbon dioxide emissions rose by 26.7 percent to 174,500 metric tonnes between 2011 and 2016 as it ramped up to begin exports.[144] Other pollutants rose more steeply. Sulfur dioxide emissions more than tripled, particulate matter emissions rose 34.6 percent, and nitrogen oxides emissions rose 5.9 percent from 2011 to 2014, the latest data available.[145]

The tankers and storage facilities also pose significant risks of potentially catastrophic explosions. In 2014, a pipeline explosion at a Washington state LNG terminal sent shrapnel flying into a 14.6 million gallon storage tank, causing it to leak.[146] The accident injured five workers, forced the evacuation of 1,000 residents within a two-mile radius and caused $72 million in property damage.[147] In 2004, an LNG explosion at the Skikda, Algeria terminal killed 30 and flattened port infrastructure.[148] And in 1944, an LNG explosion in Cleveland, Ohio killed 128 people, injured between 200 and 400 more, and devastated the surrounding area.[149]

A Wave of New Fracked Gas Power Plants

Independent power companies and regulated utilities are building natural gas-fired power plants at a frantic pace. The DOE projects that 364 new gas-fired generators will be built between 2018 and 2022.[150] In 2017 and 2018 alone, new gas plants provided an additional 36.6 gigawatts of energy — an 8 percent increase since

A commemorative plaque memorializes those who suffered in the East Ohio Gas Company's 1944 LNG tank and sewer line explosion. / PHOTO CC-BY © TIM EVANSON / FLICKR.COM

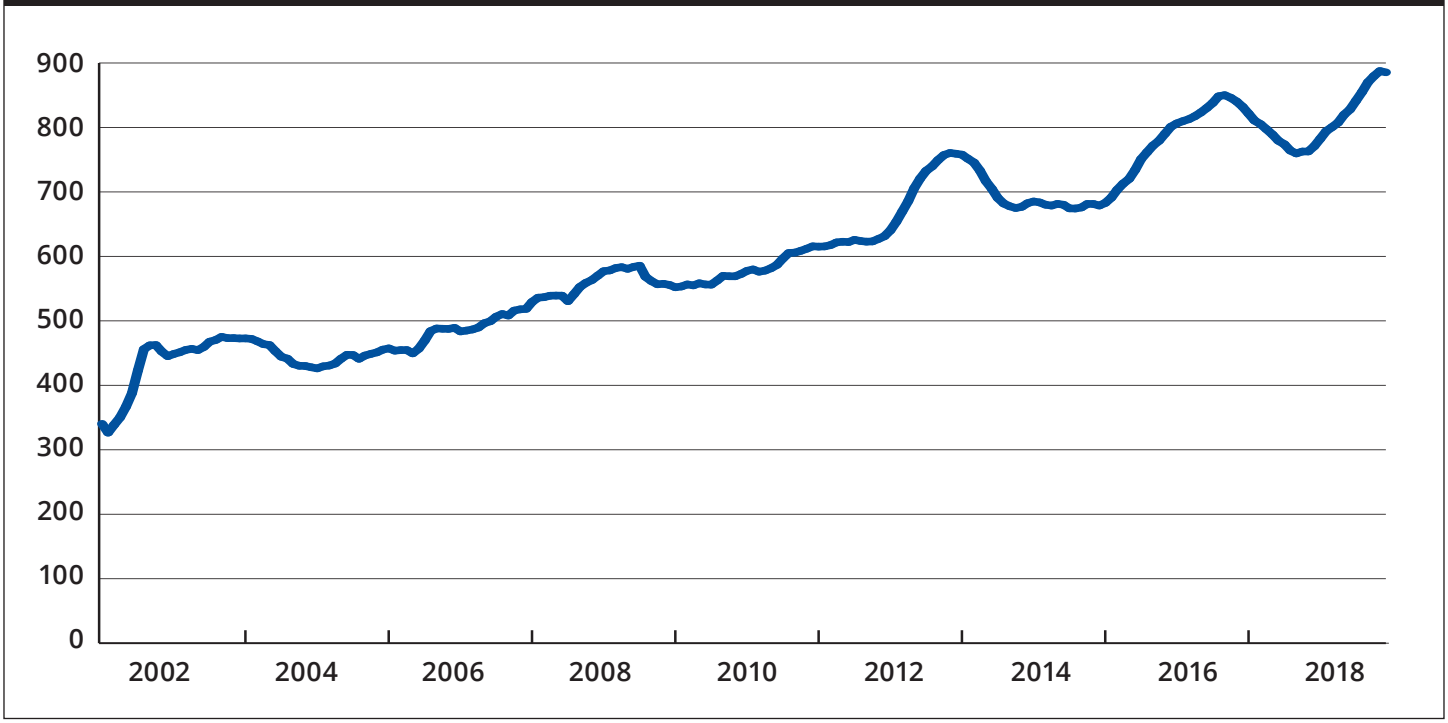
2016.[151] This added gas-fired electric capacity could power 36.6 million homes, about a quarter of U.S. households.[152]

The demand for electricity is not rising as fast as new gas plants are coming online. The scramble to build new gas plants could create a "power supply glut," potentially oversaturating the electricity market.[153] Building more gas power plants also locks us in to a fossil-fueled future. The average gas-fired electric generator is 26 years old; more than 743 generators (13 percent) went online at least 50 years ago, and the oldest operating generator went into service in 1915, over a century ago.[154]

The gas industry promotes gas-fired power plants as a cleaner replacement for coal. But natural gas is no climate solution; the plant's carbon dioxide emissions and widespread leaks of the potent climate gas methane from gas infrastructure like pipelines mean that declining combustion emissions are outweighed by increased methane emissions.[155]

And the new gas plants *supplement* rather than replace coal-fired power plants.[156] Although the prevailing wisdom is that the power industry is switching to gas-fired plants, the reality is that the decline in coal-fired plants is being substantially eclipsed by new gas power plants. The DOE projects that although retiring power generators will reduce coal-fired capacity by a net 21.6 gigawatts between

FIG. 2 • Monthly Gas Deliveries to Power Plants • 12 MONTH ROLLING AVERAGE, BILLIONS OF CUBIC FEET



SOURCE: U.S. Energy Information Administration

2018 and 2022, the net additions of natural gas generators would add 49.7 gigawatts of capacity, and natural gas represents nearly 60 percent of power capacity coming online.[157]

These new gas-fired power plants provide profit opportunities for power companies capitalizing on low gas prices and for fracking companies that hope these new plants will soak up supplies and ultimately raise prices enough to encourage more drilling.[158] New gas plants have already substantially increased prices for natural gas at the wellhead.[159] The gas plants drive additional gas drilling, cement fossil fuel's dominance of our energy grid, lock in greenhouse gas emissions for decades and displace investments in clean renewables like wind and solar.[160] Economic modeling of energy prices over the past two decades shows that increased natural gas production has lowered prices by $0.16 per million Btu, while new gas-powered generation technology has increased natural gas prices by $0.54 per million Btu.[161]

Since 2005, average monthly gas deliveries to the electric power sector have increased by 57 percent (see Figure 2).[162] The proportion of electricity in the United States that came from natural gas was 32 percent in 2017 and is anticipated to increase to 34 percent by the end of 2019.[163] This buildout boosts the exploration and drilling sector's corporate profits by creating new infrastructure to absorb the overabundance of low-priced natural gas, raising the demand and prices for fracked gas.[164]

The gas-fired power plant boom

The natural gas plant boom is a nationwide phenomenon but has been especially concentrated near existing shale plays in Texas, Pennsylvania, Ohio and West Virginia.[165] Texas has added numerous gas plants in the past decade including the largest reciprocating gas plant in the country.[166] But the buildout is particularly pronounced in Appalachia where, according to Moody's Investors Service, the surplus of fracked gas produced by Marcellus and Utica shale reserves has spurred a "rush to build new gas plants."[167]

Since 2011, energy companies have constructed or planned to build 48 new power plants fueled by fracked gas in Pennsylvania, including a massive 1,500 megawatt gas plant that Invenergy wants to build in Jessup.[168] Invenergy's power plant in Jessup is close to existing and proposed transmission lines that can send power to New York City.[169] Pennsylvania does not need the Jessup facility or any other new gas-fired power plants; already, the electricity grid in Pennsylvania is exporting more power to other states than the state's residential customers have used.[170]

In Ohio, investors are funneling $10 billion into nearly a dozen gas-fired power plants.[171] These 11 Ohio mega-plants would represent 10,000 megawatts of dirty generation powered by the nearby Marcellus and Utica shale plays.[172] The largest of the Ohio plants is a 1,650 megawatt plant with a $1.45 billion price tag.[173]

At the same time, a sprawling web of pipeline infrastructure traversing the northeastern United States has made it possible for unnecessary power plant proposals to pop up in states where gas is not being drilled.[174] In Burriville, Rhode Island, for example, Invenergy proposed a 1,000 megawatt gas-fueled power plant that has been stalled by a protracted legal battle to use water from the local reservoir.[175]

Diamond Generating Corp. plans to build a 1,200 megawatt gas plant in North Bergen, New Jersey. Shale gas from the Appalachian basin will likely fuel the facility, which is sited to be built near sensitive wetlands.[176] The proposed Meadowlands project would pollute local communities and the environment but is designed to deliver electricity into the grid and to export power to New York City through an underground transmission line running below the Hudson River.[177] It would be built near an existing, large 1,229 megawatt gas-fired power plant in Ridgefield,[178] potentially compounding regional air pollution.

Fracking has led to the construction of several pipelines to bring natural gas to Florida.[179] The largely fracked gas is driving a huge rise in Florida's gas-fueled electricity production.[180] The state's electric grid is set to have the nation's largest share of gas generation by 2021.[181] These new plants are not just replacing coal-fired plants, but are replacing older gas plants and supplementing service to some areas of the state.[182] A labyrinth of pipelines will be needed to service these facilities, like the proposed 685-mile Southeast Market Pipelines Project that aims to deliver natural gas to Florida power plants.[183] When all is done, the Sunshine State will also be home to a 1,640-megawatt power plant.[184]

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Economic headwinds suggest that these power plants are not the result of inevitable market forces. In 2018, General Electric scaled back its gas power plant equipment business, but it tripled some incentives for its salespeople to market new power plant equipment.[185] Meanwhile, renewable power and storage technology exists to support a low-cost transition from fossil fuels.[186] In California, regulators approved and utilities built unnecessary and expensive gas power plants.[187] However, more affordable renewable options are leading some utilities to reconsider the economic wisdom of building out more gas-fired power plants.[188]

Natural gas plants are no climate solution

The gas power plant boom will boost energy consumption, lock-in fossil fuel dependence and commit us to unacceptable levels of carbon dioxide emissions.[189] The proposed gas plants would increase the climate-destroying emissions both from the plants and from the widespread methane leaks from connecting infrastructure, meaning that natural gas cannot be considered a low-carbon fuel.[190] These infrastructure projects will remain part of the energy landscape for decades — some U.S. pipelines were built more than 70 years ago, and gas-fired power plants can operate for more than 50 years.[191]

Natural gas-fired plants are major emitters of nitrogen oxides, contribute to ground-level ozone and smog, and threaten the environment and human health.[192] Natural gas-fired power plants can also release radon,[193] a naturally occurring radioactive material that is the second leading cause of lung cancer in the United States, after smoking.[194]

Air pollution from power plants disproportionately affects lower-income communities and communities of color, where power plants are most commonly located.[195] A 2017 analysis found that half of California's gas-fired power plants were located in communities designated as disadvantaged — and only 9 percent of the plants were in the least disadvantaged areas.[196] A 2018 Food & Water Watch study found that Pennsylvania's buildout of new natural gas plants fueled by the Marcellus and Utica shale plays were more likely to be sited near lower-income and less-educated communities, reinforcing the long-standing existing pattern of environmental injustice.[197]

Ultimately, the sunk investment costs in these new greenhouse gas emitters not only discourage investments in clean, renewable energy,[198] but they also magnify the demand for natural gas, encouraging more fracking, pipelines and the associated methane leaks.[199] Even if public pressure forces the early retirement of these power plants, their costs would still be passed on to ratepayers.[200]

Conclusion: Stopping Dirty Infrastructure Now Is the Only Way to Avoid a Fracked Future

The new wave of fracked gas infrastructure investments — petrochemical facilities, plastics plants, LNG export facilities and gas-fired power plants — are symbiotic profiteering opportunities for the shale gas industries and their new industrial partners. The growing expansion and new construction of these gas-consuming facilities locks in more demand for drilling and fracking, and cements decades more of climate pollution.

These industries do not produce products of real value or need. Encouraging the use of plastics, preserving antiquated electricity generation, and supercooling gas loaded at potentially explosive export terminals and mega-tankers endangers human health, the environment and the future of the planet.

These industries are proving an economic lifeline to a fracking industry that is spending more on capital investments (exploration, drilling and infrastructure) than it is earning from gas sales because of persistently low prices. The new petrochemical factories, LNG exports and power plants will cushion the fracking industry by sopping up the gas glut, tightening the supply and raising prices. Without the buildout of fracked gas infrastructure, the industry would likely face more severe economic headwinds and be unable to reinvest in more drilling and exploration.

Instead of doubling down on new fossil fuel facilities, we must invest in clean, renewable energy. Technology for a large-scale transition to renewables has existed for over 20 years[201] — we just need strong government policies backed by political will to see them through. Food & Water Watch recommends:

- **Banning fracking everywhere.** We must act to immediately ban fracking and associated activities, such as sand mining and waste disposal that support fracking, and fully investigate claims of environmental contamination from drilling and fracking.
- **Stopping fossil fuel exports and the construction of infrastructure to support these exports.** We must halt the rapid expansion of dirty infrastructure and stop the unloading of dirty fuels in overseas markets.
- **Restricting the sale of plastic products that prop up the oil and gas industry**. We must restrict the sale of unnecessary petrochemical products, particularly single-use packaging and made-for-disposal products.
- **Enacting aggressive energy conservation policies.** Large investments in public transportation and widespread deployment of other energy-saving solutions will reduce demand for fracking and support a transition to clean energy.
- **Transitioning to 100 percent clean, renewable energy by 2035.** We must establish ambitious programs for deploying and incentivizing existing renewable energy and energy efficiency technologies, in order to slash fossil fuel demand and reach 100 percent clean, renewable energy by 2035.
- **Modernizing electrical grids to cater to distributed renewable power generation.** Creating resilient, local, renewable-powered grids will reduce dependence on dirty generation and increase resilience to climate chaos.
- **Increasing investments in research to support the next generation of efficiency and energy technologies.** Making investments in research and development to overcome technological barriers to the next generation of clean energy and energy efficiency solutions will lower prices and further help clean technologies compete with long-subsidized dirty power.
- **Refusing to bail out stranded dirty infrastructure investments.** As climate chaos damages petrochemical investments and the clean energy transition requires closing expensive assets early, the burden must fall on the investors and not on the public ratepayers or taxpayers.
- **End eminent domain for private gain.** Refusing shaky interpretations of the "public interest" that include private plunder via state power would undermine the economic basis for dangerous pipeline and export infrastructure.

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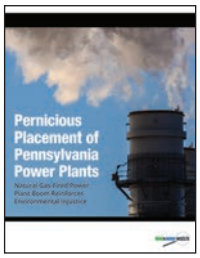

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