


Columbia Riverkeeper

Attached please find 5 exhibits to the comments of Columbia Riverkeeper et al.



Untested Assumptions and Unanswered Questions in the Plastics Boom

- The infrastructure to produce new plastics is growing rapidly. Massive investments in new plastics infrastructure rest on two critical but as yet unquestioned assumptions: (1) that demand will increase continuously and (2) that supplies of cheap feedstocks will remain available for decades.
- Demand growth is specifically projected among two segments of the population: millennials and consumers in the Global South.
- Evidence of shifting consumer attitudes against single-use, disposable plastic casts doubt on industry assumptions of indefinite demand growth.
- Because plastic production depends heavily on cheap fossil fuel feedstocks and energy, the coming phase-out of fossil fuels will force plastic producers to bear more of their upstream costs, dramatically altering the investment risk facing their production facilities.
- Alternative plastics, such as bio-based and electricity-based plastics, entail their own economic and environmental challenges, and require distinct production processes not found in investments currently being planned.
- To date, industry assumptions have received little critical attention despite their central importance to the long-term prospects for these investments and for the plastics industry as a whole.
- Investors and analysts should ask whether the current plastics boom poses the same risks to assets that it poses to communities, ecosystems, and the planet.

To address the urgent threat of climate change, the global community must rapidly reduce its use of fossil fuels as a source of energy. Almost all plastics are made from fossil fuels, and the two product chains are intimately linked. Even small changes in the price of oil or gas can have significant consequences for the plastics industry. It should be expected, therefore, that a major shift in fossil fuel markets, and an eventual phase-out of fossil fuels as an energy source, will fundamentally affect the long-term economic prospects of the plastics industry. Moreover, plastic production is itself a carbon-intensive process and is likely to be impacted by regulation that applies a cost to carbon.

Despite these factors, plastics manufacturers are accelerating their investments in new production facilities under the assumption that supplies of their feedstocks and de-

mand for their products will both increase for decades. Recent social, political, and economic changes call these assumptions into question, and the rationale underlying these investments is not being adequately vetted or tested. Stakeholders, including investors in these projects and members of the communities where they are being built, should demand answers to the many questions raised around the viability of these new projects.

Industry Expectations

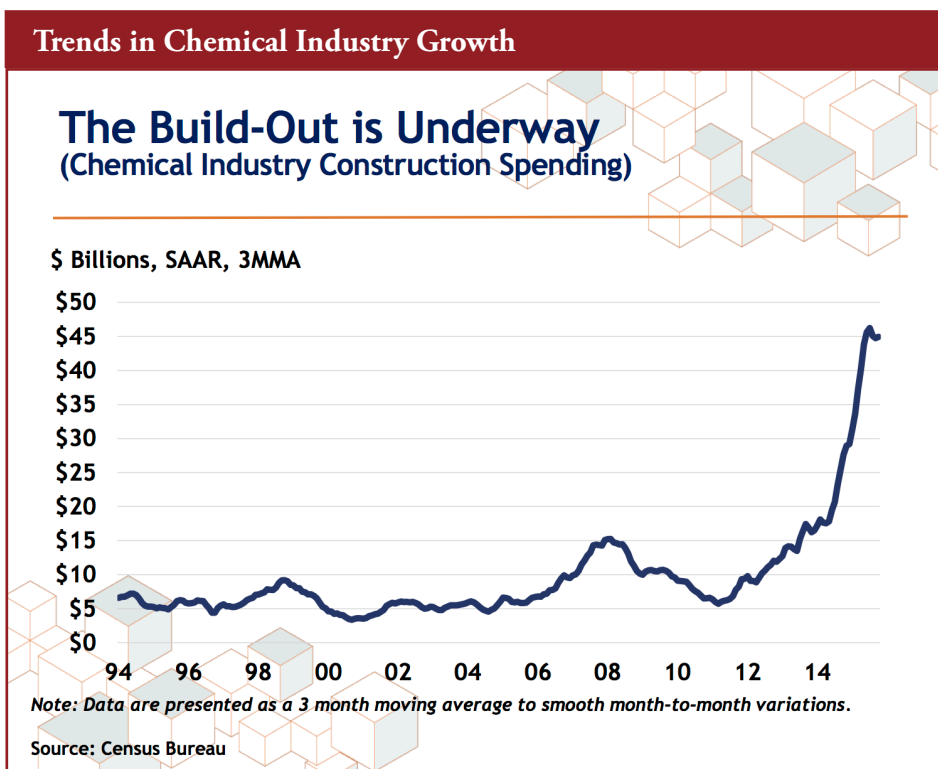
The plastics industry expects continual, unfettered growth in plastic production and consumption over the next several decades. Saudi Aramco is investing heavily in petrochemicals;¹ ExxonMobil projects that naphtha and natural gas liquids will be used primarily as feedstocks

through 2040.² The International Energy Agency's New Policies Scenario — which predicts significant increases in greenhouse gas emissions from oil use for transportation — forecasts that 44% of the increase in crude oil consumption through 2040 will be for petrochemical production.³

Put simply: the natural gas boom in the US has made plastic feedstocks really, really cheap.

The plastics and fossil fuel industries are investing heavily in new capacity to increase ethylene and propylene production over the next several decades. As of December 2017, the chemical industry has already announced over \$185 billion of new investments in the United States alone, mostly in “chemistry and plastics products.”⁴ Other observers “expect China to invest more than \$100 billion in coal-to-chemicals technology in the next five years.”⁵ These investments, as well as those in other parts of the world, lead analysts to expect production capacity for both ethylene and propylene to increase by one-third between 2016 and 2025.⁶ In the United States, producers of polyethylene are expecting to increase production capacity by as much as 75% by 2022.⁷

The petrochemical industry expects two large groups of consumers to create the demand for increasing supplies of single-use, disposable plastics: millennials in the United States and European Union⁸ and consumers in the Global South whose incomes are rising.⁹ These assumptions, however, ignore the proliferation of social and political changes that call into question



American Chemistry Council, Shale Gas and New U.S. Chemical Industry Investment: \$164 Billion and Counting, slide 9 (Apr. 2016), available at <https://www.slideshare.net/MarcellusDN/acc-shale-gas-and-new-us-chemical-industry-investment-164-billion-and-counting>.

industry assumptions of unfettered growth in plastic demand and consumption.

In North America and Europe, action is being taken at the local, national, and supranational level to reduce plastic consumption and waste. Over the past several years, bans on plastic bags,¹⁰ plastic microbeads,¹¹ and plastic buds (the stems of cotton swabs)¹² have multiplied. Moreover, in January 2018, the European Commission announced a Europe-wide strategy to reduce plastic pollution and ensure that all plastic in Europe is recyclable by 2030,¹³ and the United Kingdom pledged to eliminate all avoidable plastic waste by 2042.¹⁴

Importantly, these efforts are not solely being pursued in the United States and Europe, but are also taking place in the very markets the industry hopes to exploit. So far, a dozen African countries have banned, partially banned, or taxed disposable or single-use plastic bags.¹⁵ Taiwan has announced a ban on microbeads beginning in mid-2018,¹⁶ a ban on plastic straws in 2019,¹⁷ and the intent to ban all single-use plastic by 2030.¹⁸ China has banned imports of several kinds of plastic waste.¹⁹

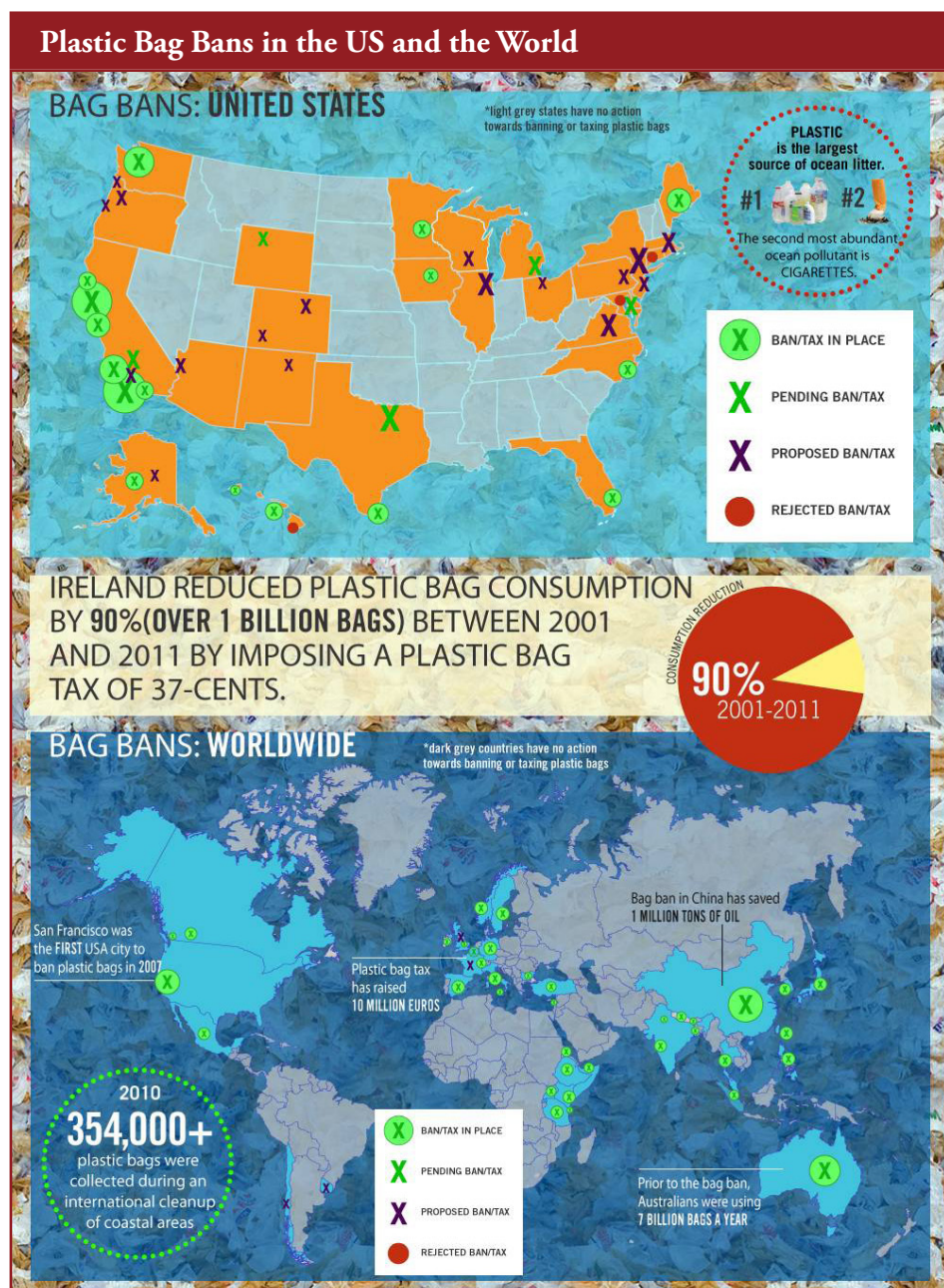
Finally, on the international stage, the plastics crisis is attracting attention and concern.²⁰ As evidence of the pervasiveness and severity of plastics pollution becomes inescapable, nations of the world are demanding — and now actively pursuing — a global response.

From December 4 to 6, 2017, the United Nations Environmental Assembly (UNEA) met in Nairobi, Kenya.²¹ At this meeting, UNEA decided to create an expert group

to look at options to address marine litter and microplastic, including the possibility of a new legally binding agreement.²² Significantly, governments specifically acknowledged “the challenges of addressing marine plastic pollution in the face of increasing production and consumption of plastic in products and packaging.”²³ Accordingly, UNEA urged that all countries and stakeholders

“endeavo[r] to reduce unnecessary plastic use.”²⁴

None of these developments by themselves signal an immediate end to the plastics economy — particularly given the limited control people have over packaging choices in much of the world. Viewed together, however, they demonstrate a growing resistance in many parts of the



Plastic Bag Bans in the World, REUSETHISBAG.COM, <https://www.reusethisbag.com/reusable-bag-infographics/plastic-bag-bans-world.php> (last visited Mar. 14, 2018).



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world, and among the international community, to the continued expansion of plastics use at the scale envisioned and demanded by the current wave of plastic infrastructure investments.

In addition to anticipated increases in demand, the plastics industry expects that plastic feedstocks will remain cheap and abundant for the next several decades. As will be discussed below, however, global efforts to reduce fossil fuel consumption threaten these assumptions and are likely to raise the cost of plastic production significantly. Together, these converging forces raise fundamental questions about the long-term profitability (and viability) of these multi-billion dollar investments.

Relationship between Fossil Fuels and Plastic Production

Fossil fuels (oil, gas, and coal) comprise the primary feedstocks for plastics, with nearly all plastic derived from fossil sources. Typically,

the bulk of the fossil material is processed to become fuel for combustion, and another part is sent for use in chemical production, especially the production of plastics. The production processes of plastics and fossil fuels are therefore closely linked, both in the product chains and in physical location.

Originally, petrochemicals (plastics) were a way for fossil fuel companies to make money from their waste streams. However, when fossil fuel production materials will no longer be used for energy in the not-too-distant future, plastics producers will need to adapt their supply chains and industry economics to be fundamentally different.

Natural Gas is the primary source of chemicals for plastic production in North America and the Middle East.²⁵ Natural gas is composed of mostly methane, as well as ethane, propane, butane, and other chemicals. Typically, the methane is used as fuel, while the remaining chemicals (“natural gas liquids” or NGLs) are separated out. Some of the NGLs

are used for fuel as well, while the ethane and some propane are used to make petrochemicals. Natural gas is typically 90-95% methane, although it can have a greater share of NGLs.²⁶

These materials — natural gas liquids from gas development and naphtha from oil refining — exist in abundance because there is demand for the other components of the gas and oil.

All of the chemicals in NGLs can be combusted, like methane, so their floor price is determined by the relative amount of energy one can create by burning the heavier NGL molecules. Typically, petrochemical producers will buy these NGLs to make plastics and other products, raising the price above the floor value. However, there is so much available natural gas in the United States that some ethane is being sent into the fuel stream with methane (a process called “ethane rejection”) and is

currently trading at its floor heating value. Put simply: the natural gas boom in the US has made plastic feedstocks extremely cheap.²⁷

Oil is the primary source of chemical feedstocks for plastics in Europe and Asia,²⁸ although the importation and use of natural gas liquids is growing.²⁹

During the refining process, oil is heated to different temperatures and separated by boiling point. One of the products of this process is naphtha, which is used to make ethylene, propylene, and gasoline, as well as other petrochemicals.³⁰ Depending on the type of oil, naphtha can represent between one sixth and one third of the total production from a refinery.³¹

Because naphtha is a product of the oil refining process, its price is directly and powerfully linked to the price of oil.³² Currently between 4% and 8% of global oil production is used to make plastic. Business-as-usual projections reflect industry assumptions that, by 2050, plastic's share of global oil use will be around 20%.³³

Europe's reliance on oil as a plastic feedstock is an important reason the shale gas boom has given the US a massive competitive advantage in plastics production in recent years.

Coal can be turned into plastics, although the process is typically more expensive than processes that use naphtha or natural gas liquids. This point is emphasized by a Deutsche Bank report, which states, "China's coal-to-olefins and/or coal-to-urea do not make economic sense in a world awash in low-cost natural gas. Notwithstanding, China continues to grow its coal-to industries;



American Chemistry Council, Shale Gas and New U.S. Chemical Industry Investment: \$164 Billion and Counting, slide 5 (Apr. 2016), available at <https://www.slideshare.net/MarcellusDN/acc-shale-gas-and-new-us-chemical-industry-investment-164-billion-and-counting>.

maybe on the prospect that the world's growing supplies of cheap natural gas could be short-lived. ... The world does not use coal to produce industrial quantities of olefins ... only China uses its coal for these purposes."³⁴

The process of producing olefins (ethylene and propylene) from coal is also extremely carbon-intensive, even when compared to other olefin-producing processes.³⁵ Efforts to reduce, or add a cost to, emissions will make an already expensive process even more so.

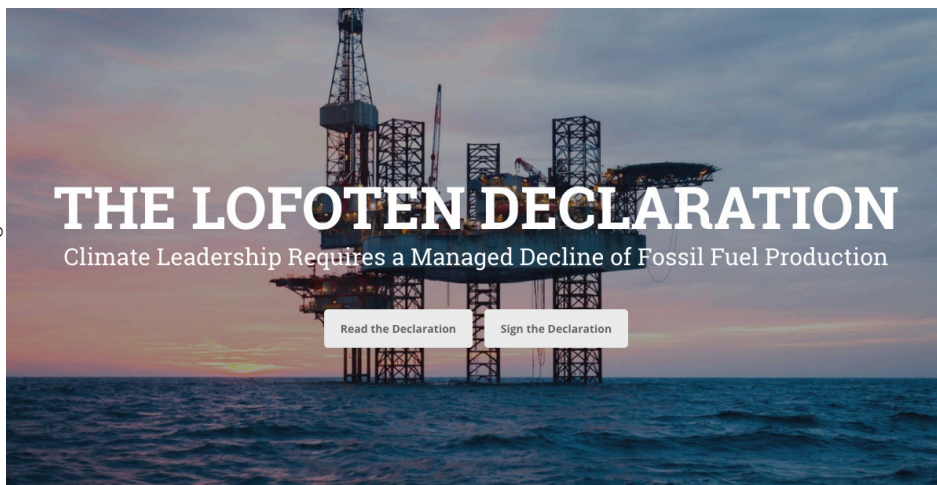
The Phase-Out of Fossil Fuels

In December 2015, over 190 countries signed the Paris Agreement, determined to limit atmospheric warming to well below 2 degrees

Celsius and to strive to keep temperature increases to no more than 1.5 degrees.³⁶ This agreement signaled an understanding by the global community of the need to phase out fossil fuels as an energy source and their commitment to do so.

Despite this commitment, plastic producers and fossil fuel companies, which are often the same companies, are investing heavily in new production capacity, especially in the United States.³⁷ Recent developments, however, cast significant doubt on the assumptions underlying these investments.

To achieve the goals of the Paris Agreement, the transition away from fossil fuels must necessarily be rapid. A 2016 analysis from Oil Change International found that potential future emissions from currently operating oil and gas fields



and coal mines would bring atmospheric warming beyond 2 degrees; reserves of oil and gas alone would take us past 1.5.³⁸

The divergence between what is necessary to achieve the goals of the Paris Agreement and a business-as-usual scenario is stark. Fossil fuel company projections — even those that claim to account for aggressive climate action — predict growth in production and consumption for decades to come.³⁹ These projections, and the assumptions underlying them, are the bedrock upon which new investments in ethane crackers and other petrochemical production capacity are being built.

Public pressure to meet the Paris Agreement’s goals from businesses, public officials, and civil society is growing. In August 2017, hundreds of civil society organizations signed the Lofoten Declaration, calling for a managed decline of fossil fuel production to avoid the worst impacts of climate change.⁴⁰ The United States Conference of Mayors released a statement supporting the Paris Agreement and “vow[ing] that the nation’s mayors will continue their commitment to reduce greenhouse gas emissions.”⁴¹ Over

one hundred major companies have committed, through the RE100 initiative, to transition their operations to 100% renewable energy.⁴² Finally, investors, from individuals to large institutions with total assets of over \$6 trillion, have committed to divest their portfolios from fossil fuels.⁴³

This accelerating pressure does not exist in a vacuum. Recent announcements from governmental and industry actors indicate that the shift away from oil as a fuel for transportation may happen more rapidly than expected. In June 2017, India announced that it would ban the

sale of non-electric cars by 2030.⁴⁴ The following month, France announced that it would ban sales of gasoline- and diesel-powered cars by 2040,⁴⁵ and two weeks later, the United Kingdom announced it would do the same.⁴⁶ Then, in October, Paris, France, announced that it would ban fossil-powered cars ten years sooner, by 2030.⁴⁷ The same month, China announced that it was pursuing a similar ban.⁴⁸ Wang Chaunfu, Chairman of Chinese car manufacturer BYD, expects the electrification of all vehicles in the country to be complete by 2030.⁴⁹ Other countries, including Austria, Denmark, Ireland, Japan, the Netherlands, Portugal, Korea, and Spain, along with eight US states, have also declared goals for electric car sales.⁵⁰ In addition to their direct regulatory impacts, these national targets in major markets will create powerful incentives for automotive manufacturers to reduce their reliance on internal combustion engines.

Not surprisingly, therefore, 2017 also saw a wave of announcements from major car manufacturers about



Joe Brusky/Flickr

their plans to produce electric vehicles. General Motors revealed a plan to introduce 20 all-electric vehicles by 2023, stating that the company “believes in an all-electric future.”⁵¹ Volvo announced that by 2019 all of its new cars would contain an electric motor;⁵² Jaguar Land Rover would do the same by 2020.⁵³ The VW Group announced it would invest \$84 billion in batteries and electric cars;⁵⁴ Daimler will invest another \$10 billion.⁵⁵ Announcements from Ford,⁵⁶ Hyundai,⁵⁷ Renault, Nissan, and Mitsubishi,⁵⁸ as well as Toyota and Mazda,⁵⁹ similarly indicate plans to shift the focus to electric vehicles.



These and other changes are likely to reduce demand for oil below forecast levels in the coming decades. Similarly, changes in the market for natural gas suggest future demand may not simply continue to expand, as many expect.

Due to the shale gas boom in the United States, natural gas has increased in availability and come down in price. However, optimistic assumptions about the future of natural gas are being challenged by changes to energy economics, as well as an evolving understanding of natural gas’s true environmental cost.

A key claim for the necessity of natural gas is that it can be used in peak demand scenarios, responding to a rapid increase in the need for energy. The performance of quick-dispatch batteries serves to undermine expectations about the need for natural gas to serve this function. In December 2017, a major battery installation in South Australia managed to successfully dispatch power milliseconds after a coal plant

outage, thus performing the exact “peaking” function for which gas plants are touted.⁶⁰ The neighboring state of Victoria is now planning to install a similar battery pack.⁶¹

These developments are not restricted to Australia. In the United States, for example, California has already deployed a massive battery pack,⁶² and a new report in Minnesota predicts that grid-scale storage will become cheaper than new natural gas plants beginning in 2019.⁶³

Subsequently, a ruling by the US Federal Energy Regulatory Commission noted that energy storage companies will be able to compete with traditional power plants by 2020.⁶⁴ As noted by business analytics firm IHS Markit: “The question is no longer if batteries will disrupt the power sector ... but rather how much and how fast?”⁶⁵

The significance of these economic changes bears repeating. One of the key arguments for the continued necessity — and success — of natural gas as an energy source is

the ability of “peaker” plants to respond to needs on the electric grids. The fact that batteries and grid-scale storage can serve that same function as cheaply or more cheaply than gas massively undercuts those optimistic projections.

These changes have not gone unnoticed. Continually increasing price competition from renewables has led to a dramatic and unexpected decline in the market for new gas turbines. General Electric, the largest gas turbine installer in the world, is expecting 2018 to be its worst year of turbine installations in 15 years.⁶⁶ Siemens, another major supplier of gas turbines, noted a 30% drop-off in orders in 2017 as well.⁶⁷

Forecasters in 2010 expected global sales of 300 large gas turbines per year.⁶⁸ In 2013, 212 were ordered, and in 2017, just 122.⁶⁹

Many proponents of natural gas also claim that it has a lower greenhouse gas emissions profile than coal and is therefore a climate-friendly fuel option. However, a recent NASA study

confirmed that, when methane leakage is properly accounted for, natural gas is no better — and perhaps much worse — than coal as far as the climate is concerned.⁷⁰ As such, continued and accelerating action to reduce greenhouse gas emissions and combat climate change could further impact the economic viability of natural gas as an energy source.

The foregoing social, political, and economic developments, taken together, undermine the rosy predictions of future fossil fuel use relied on, and promoted by, the fossil fuel and plastics industries.

Effects on the Plastic Supply Chain

As the global community phases out fossil fuels, markets for oil, gas, and coal — the feedstocks for plastics — will necessarily be affected. While it is difficult to predict exactly how this will happen, there are some predictable consequences of such a significant shift in the markets for fossil fuels.

In the short term, sociopolitical and economic changes that reduce demand for fossil fuels may help plastics manufacturers. Dow Chemical (now DowDuPont), an American company that uses natural gas to produce plastics, revealed as much in a statement to the United States Congress.⁷¹ In the statement, Dow made its interests clear: It wanted the price of natural gas as low as possible.⁷²

This potential price decrease only helps plastic manufacturers if the total amount of supplied fossil fuels can satisfy the demand for feedstocks. As stated before, only a fraction of oil and gas is efficient

for use in the production of plastics. These materials — natural gas liquids from gas development and naphtha from oil refining — exist in abundance *because* there is demand for the other components of the gas and oil.

To illustrate this point, it's instructive to compare the capital expenditure for ExxonMobil's upstream (the segment which explores for and drills for crude oil and gas) and chemical segments. In 2016, Exxon's upstream activities earned almost \$200 million in profits, compared to over \$4.6 billion for the chemical segment.⁷³ However, capital expenditures for ExxonMobil's upstream exploration and production amounted to over \$14.5 billion, whereas expenditures for the chemical segment were only \$2.2 billion.⁷⁴ While it is beyond the scope of this paper to attempt to apportion costs of upstream

If the market for burnable fossil fuels diminishes, plastics producers must either absorb all fossil fuel production and disposal costs or change their production processes to use the various components of fossil fuels.

activities to chemical production, the disparity in the scale of expenses for the different segments illustrates the degree to which upstream fossil fuel production subsidizes downstream chemical production.

This dynamic poses a fundamental challenge to plastics producers, as they need demand for fossil fuels to drive the large-scale production

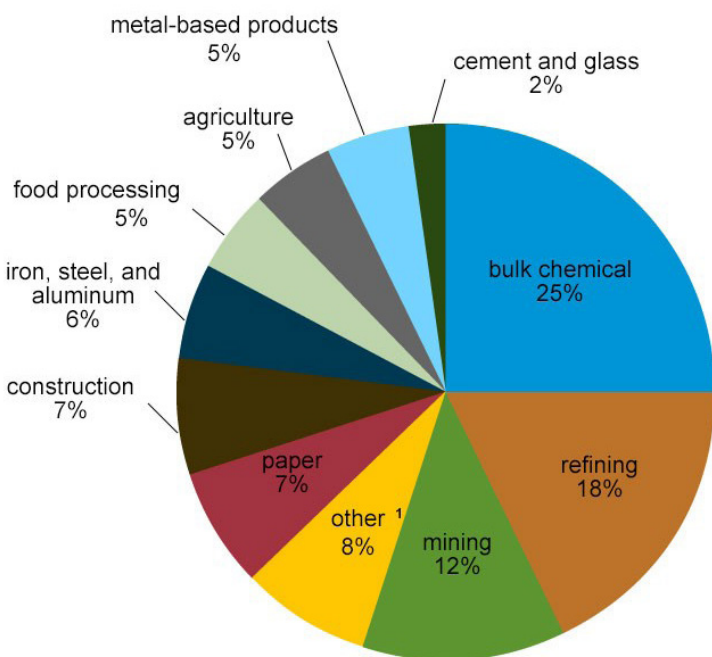
of their preferred feedstocks. As the market for burnable fossil fuels is dramatically reduced, plastics producers have three choices: They must absorb more of the cost of production of fossil fuels *and* the disposal cost of the majority of unused material, change their production processes to use different components of fossil fuels, or switch to alternative feedstocks.

If the source of feedstock is natural gas, it is possible to use the methane in natural gas to produce feedstock chemicals for plastics. Their method, called the Fischer-Tropsch process, is similar to the coal-to-olefins process used in China.⁷⁵ However, it is considerably more expensive than using ethane and other larger chemicals.⁷⁶

The non-naphtha components of oil can also be cracked and refined to make precursor chemicals for plastics.⁷⁷ However, as is the case with natural gas, the most efficient processes are the ones already in use, and if the industry is required to use other parts of the oil mix, it will make the process more expensive.

In addition to changes in production costs and processes, changes will also be necessary for plants and equipment. Many facilities that are now operational or are being planned perform specific functions and cannot easily be repurposed. The most extreme examples are the new ethane crackers in the United States, which are designed specifically to produce ethylene from ethane, a process that produces virtually no propylene.⁷⁸ If plastic producers are required to use new feedstocks and new production processes, their production facilities — which require massive investments of time

US Industrial Sector Energy Consumption by Type of Industry, 2016



Note: Together, bulk chemicals and refining account for 43% of US industrial sector energy consumption. Emissions from both sectors are relevant when considering the impacts of plastic production.

Use of Energy in the United States Explained: Energy Use in Industry, ENERGY INFORMATION ADMINISTRATION (last visited Mar. 19, 2018), https://www.eia.gov/energyexplained/index.cfm?page=us_energy_industry.

and capital — will have to change as well.

Because of this need, it is important to note both the enormous size of individual facilities and the risk inherent in their construction. A typical ethane cracker in the US Gulf Coast formerly cost between \$1.5 and \$2 billion to construct.⁷⁹ However, shortages of labor and materials are significantly driving up costs. In 2017, the total project cost of new ethane crackers rose 19% to \$2.5 billion, a nearly 40% increase over projections at the beginning of this wave of US petrochemical construction.⁸⁰

Other estimates place the cost even higher. According to the American Chemistry Council, “[a] new natural gas-based ethane cracker could have an annual capacity of 1.5 million metric tons or more, with a

price tag of well over \$4 billion.”⁸¹ At present, ExxonMobil and Saudi Arabia Basic Industries Corp. are partnering on a \$9.3 billion ethane cracker in Texas.⁸²

The wisdom of constructing new ethane plants in the United States is being questioned by some within the chemical industry itself, who are warning that a supply glut could depress ethylene prices.⁸³ Moreover, swings in oil and gas prices, key determinants of the relative competitiveness of individual crackers, have already caused delays and project cancellations, especially in the Northeastern United States.⁸⁴

Finally, before the industry sees fundamental changes to its supply chain, plastic production may be challenged in the short term as efforts to combat climate change apply a price to carbon. Two thirds

of the cost of plastic production is its energy input,⁸⁵ and the production process itself is enormously carbon-intensive. As noted in an American Chemistry Council report, “The business of chemistry is energy-intensive; in fact, it is the second largest user of energy (fuel and nonfuel) in manufacturing sectors (petroleum and coal products is the largest). Within the chemical industry, this is especially the case for basic chemicals,” including ethylene, propylene, and plastic resins.⁸⁶ Regulations that make greenhouse gas emissions more expensive will make plastic production more expensive as well.

A 2016 report from the Environmental Integrity Project underscores how emission-intensive these new petrochemical projects are.⁸⁷ In 2015 alone, the emissions from 44 planned or permitted petrochemical projects would amount to 19 coal-fired power plants.⁸⁸ The largest ethane cracker in St. James, Louisiana, has projected CO₂-equivalent emissions of more than 10 million tons per year.⁸⁹ By comparison, the average 500-megawatt coal-fired power plant emits 4.6 million tons of carbon dioxide per year when operated continuously.⁹⁰

Additional investigation and analysis are needed to project exactly how the production costs will change as the global community shifts away from fossil fuel combustion as a source of energy. It is well understood, however, that the chemical feedstocks for plastic production are abundant because of fossil fuel development and that the fundamentals of the industry will be radically changed when this is no longer the case. Plastic production will be more expensive as fossil fuels phase out.

Alternative Feedstocks are More Expensive

As the global community begins to phase out fossil fuels, some have suggested that plastics manufacturers switch to alternative, low-carbon methods of plastic production,⁹¹ including recycled plastics, bio-based plastics, and plastics formed from electricity. As a preliminary matter, it bears note that most of these alternative feedstocks require substantially different production processes and technologies than existing fossil-based plastics. Accordingly, these technologies would be unlikely to improve the economic prospects of existing or proposed petrochemical investments even if they were widely deployed. More fundamentally, these purported solutions present several of the same environmental problems as traditional plastics and cost more to produce.

Proponents of bio-based plastic suggest that, by using organic carbon instead of fossil carbon to produce plastics, the industry can wean itself of its dependence on fossil fuels.⁹² These plastics are considerably more expensive to produce, and many (because they are chemically identical to fossil-based plastics) still present the same challenges of waste disposal and plastic pollution.⁹³

Another alternative to fossil-based plastic is to use electricity to form the chemical feedstocks for plastics by pulling carbon dioxide out of the air.⁹⁴ This process requires enormous energy inputs, even when compared to traditional plastic production, which is itself energy-intensive. The plastics produced in this way would be considerably more expensive,

with production costs for ethylene and propylene doubling or tripling. As one observer noted, “Using electricity and carbon dioxide as the main feedstock for ethylene and propylene production will only make sense under a very strict climate policy where fossil feedstock is completely phased out.”⁹⁵

Finally, proponents of recycling — especially in Europe, where the EU has committed to circular economy principles — argue that the industry can increase the share of plastic that gets re-used to reduce its dependence on fossil fuels.⁹⁶ According to a report by GAIA and Zero Waste Europe, however, even the best available recycling technology, fully deployed, could only process a maximum of 53% of the current plastic mix.⁹⁷ (To date, only 9% of plastic has ever been recycled.)⁹⁸ Therefore, it is extremely unlikely that the recycling process could absorb the current plastic waste stream, much less planned increases in plastic production. Recycled plastics also present

other major challenges, such as recirculating various persistent organic pollutants that are banned under international law in the biosphere.⁹⁹ Nevertheless, setting aside concerns about the feasibility of creating a circular plastics economy while maintaining projected levels of output, recycled plastic requires different facilities to produce than virgin plastic,¹⁰⁰ raising further questions about the prudence of building new ethane crackers.

Switching to alternative feedstocks or recycled plastics, even if plausible in the short term, would not solve the industry’s problem of growing opposition to plastic pollution. Plastics made from alternative feedstocks (but with the same chemical properties) would pose many of the same long-term hazards and would likely be subject to the same social and political opposition as modern plastics.

Moreover, and as noted above, the technologies and processes required



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for these alternative feedstocks differ substantially from the technologies used to produce virgin plastic resins from fossil fuels. Accordingly, increased adoption and use of alternative feedstocks would neither benefit nor justify the petrochemical-based plastics infrastructure that is the focus of current investment.

Conclusion

Plastics manufacturers and fossil fuel companies are currently investing hundreds of billions of dollars in new production facilities, with the heaviest investments focused in the Northeastern US and the US Gulf Coast. With plastics production capacity in the US already far exceeding domestic demand, and global capacity exceeding existing global plastics demand, these investments assume producers will reach new and steadily growing markets for their products, and that production processes will be subsidized for the

foreseeable future by steady demand for and supply of fossil fuel feedstocks.

To date, these assumptions have received little critical attention despite their central importance to the long-term prospects for these investments and for the plastics industry as a whole. The foregoing analysis suggests this is a significant oversight, which raises serious questions about whether project proponents and investors are adequately considering the risks of imminent and potentially significant changes in both the supply chains of their feedstocks and the demand for their products.

Plastics manufacturers assume demand for disposable plastics will continue to rise, despite evidence that global awareness of plastic pollution is growing and cultural attitudes are changing. Industry investments reflect a further underlying assumption that supplies of cheap hydrocarbons will remain the norm

for decades to come, even as the global community has begun to phase out the very fossil fuels upon which plastics producers depend. Proposed alternatives to virgin fossil-based plastics, in addition to facing their own economic and environmental challenges, will in no circumstances have positive economic impacts on the current wave of investments in petrochemical-based plastics infrastructure.

Plastics producers are depending on increasing demand and abundant feedstock supply to fuel their industry for the next several decades. These assumptions may be unfounded and unjustified.

There is compelling evidence that the rush to build new plastics infrastructure poses massive risks for communities, ecosystems, and the planet. Investors and analysts need to ask whether the plastics boom is putting assets at risk as well.

Endnotes

1. See Anjali Raval & Andrew Ward, *Saudi Aramco Plans for a Life After Oil*, FINANCIAL TIMES (Dec. 10, 2017), <https://www.ft.com/content/e46162ca-d9a6-11e7-a039-c64b1c09b482>.
2. See EXXONMOBIL, 2018 OUTLOOK FOR ENERGY: A VIEW TO 2040 24 (2018), available at <http://cdn.exxonmobil.com/-/media/global/files/outlook-for-energy/2018/2018-outlook-for-energy.pdf>.
3. See INTERNATIONAL ENERGY AGENCY, WORLD ENERGY OUTLOOK 2017 (2017), <http://www.iea.org/weo2017/#section-1-2>.
4. See Fact Sheet, American Chemistry Council, U.S. Chemical Investment Linked to Shale Gas: \$185 billion and Counting (Dec. 2017), available at https://www.americanchemistry.com/Shale_Gas_Fact_Sheet.aspx. See also American Chemistry Council, Shale Gas and New U.S. Chemical Industry Investment: \$164 Billion and Counting (Apr. 2016), available at <https://www.slideshare.net/MarcellusDN/acc-shale-gas-and-new-us-chemical-industry-investment-164-billion-and-counting>.
5. See Gerald Ondrey, *Methanol-to-Olefins Plant Starts Up in China*, CHEMICAL ENGINEERING (Feb. 22, 2017), <http://www.chemengonline.com/methanol-to-olefins-plant-starts-up-in-china>.
6. See Mitsubishi Chemical Techno-Research, Global Supply and Demand of Petrochemical Products relied on LPG as Feedstock (Mar. 7, 2017), available at http://www.lpgc.or.jp/corporate/information/program5_japan2.pdf.
7. See Katherine Blunt, *Ethane Consumption Surges with Petrochemical Boom*, HOUSTON CHRONICLE (Feb. 24, 2017), <https://www.houstonchronicle.com/business/article/Ethane-consumption-surges-with-petrochemical-boom-12705962.php>.
8. SPI, PLASTICS MARKET WATCH: PLASTIC PACKAGING WRAPS IT UP 14 (3rd ed. 2015), available at <http://www.plasticsindustry.org/sites/plastics.dev/files/2015-03116-SPI-PMW-Packaging-Interactive.pdf>.
9. See Mark Eramo, Global Ethylene Market Outlook: Low Cost Feedstocks Fuel The Next Wave Of Investments In North America and China 10 (2013), available at http://media.corporate-ir.net/media_files/IROL/11/110877/05_Global_Ethylene_Market_Outlook_Eramo.pdf; ExxonMobil Financial & Operating Review http://cdn.exxonmobil.com/-/media/global/files/financial-review/2016_financial_and_operating_review.pdf (“Demand growth for chemical products is expected to continue to outpace GDP growth by nearly 20 percent per year. More than 80 percent of the increased demand is expected to come from developing economies, particularly in Asia, where the middle class is expanding, urbanization is increasing, and the need for sustainable products is growing. These trends are driving increased demand for chemical products serving large end-use segments such as packaging, automotive, consumer goods, and construction.”).
10. See, e.g., *State Plastic and Paper Bag Legislation*, NATIONAL CONFERENCE OF STATE LEGISLATURES (July 5, 2017), <http://www.ncsl.org/research/environment-and-natural-resources/plastic-bag-legislation.aspx>; Ilya Rzhewkiy, *EU Ban on Plastic Bags Making Impact*, EPOCH TIMES (Aug. 31, 2016, 4:19 PM), <http://www.theepochtimes.com/n3/2147559-eu-ban-on-plastic-bags-making-impact/>.
11. See, e.g., Jareen Imam, *Microbead Ban Signed By President Obama*, CNN (Dec. 31, 2015, 12:46 PM), <http://www.cnn.com/2015/12/30/health/obama-bans-microbeads/index.html>; Adam Vaughan, *UK Government to Ban Microbeads From Cosmetics by End of 2017*, THE GUARDIAN (Sept. 2, 2016, 12:49 PM), <https://www.theguardian.com/environment/2016/sep/02/uk-government-to-ban-microbeads-from-cosmetics-by-end-of-2017>; Laura Walters, *Government Bans Production and Sale of All Microbeads*, STUFF.CO.NZ (Dec. 4, 2017, 6:09 PM), <https://www.stuff.co.nz/national/politics/99525500/government-bans-production-and-sale-of-all-microbeads;Canada-Microbead-Ban-Enters-into-Force>, BUSINESS GREEN (Jan. 5, 2018), <https://www.businessgreen.com/bg/news/3023850/canada-microbead-ban-enters-force>; Lucas France, *Banning Microbeads in Cosmetics in France by 2018*, ECOMUNDO (Mar. 22, 2017), <https://www.ecomundo.eu/en/blog/ban-microbeads-cosmetics-france-2018>; Carina Van Uffelen, *Ban on Microbeads in UK, Italy and New Zealand*, PLASTIC SOUP FOUNDATION (Dec. 23, 2017), <https://www.plasticsoupfoundation.org/en/2017/12/ban-on-microbeads-in-uk-italy-and-new-zealand/>.
12. See Libby Brooks, *Scotland to Become First UK Country to Ban Plastic Cotton Buds*, THE GUARDIAN (Jan. 11, 2018, 5:14 AM), <https://www.theguardian.com/uk-news/2018/jan/11/scotland-to-become-first-uk-ban-plastic-cotton-buds>; France, *supra* note 11.
13. See Press Release, European Commission, First-Ever Europe-Wide Strategy on Plastics (Jan. 16, 2018), available at https://ec.europa.eu/commission/news/first-ever-europe-wide-strategy-plastics-2018-jan-16_en.
14. See Elizabeth Piper & Andrew MacAskill, *UK's May Pledges to Cut All Avoidable Plastic Waste by 2042*, REUTERS (Jan. 10, 2018, 5:34 PM), <https://www.reuters.com/article/us-britain-politics-plastic/uks-may-pledges-to-cut-all-avoidable-plastic-waste-by-2042-idUSKBN1EZ2WJ>.
15. See Lily Kuo, *After Issuing the World's Harshest Ban on Plastic Bags, Kenya Adjusts to Life Without Them*, QUARTZ (Aug. 31, 2017), <https://qz.com/1065681/after-issuing-the-worlds-harshest-ban-on-plastic-bags-kenya-adjusts-to-life-without-them/>.
16. See Juvina Lai, *Taiwan to Ban All Cosmetics Containing Microbeads*, TAIWAN NEWS (Aug. 4, 2017, 4:55 PM), <https://www.taiwannews.com.tw/en/news/3225656>.
17. See *Taiwan to Ban Disposable Plastic Items by 2030*, JAPAN TIMES (Mar. 1, 2018), <https://www.japantimes.co.jp/life/2018/03/01/environment/taiwan-ban-disposable-plastic-items-2030/>.
18. See *id.*
19. See Kimiko de Freytas-Tamura, *Plastics Pile Up as China Refuses to Take the West's Recycling*, NY TIMES (Jan. 11, 2018), <https://www.nytimes.com/2018/01/11/world/china-recyclables-ban.html>.
20. See Lili Fuhr, *Why a Global Treaty is Needed to Tackle Our Plastics Problem*, WORLD ECONOMIC FORUM (May 23, 2017), <https://www.weforum.org/agenda/2017/05/we-need-a-global-treaty-to-tackle-the-worlds-plastics-problem-heres-why>; <https://www.unenvironment.org/news-and-stories/press-release/un-declares-war-ocean-plastic>.
21. See United Nations Environmental Assembly, Draft resolution on marine litter and microplastics, UNEP/EA.3/L.20 (Dec. 5, 2017), available at <https://papersmart.unon.org/resolution/uploads/k1709154.docx>.
22. See *id.* ¶ 10(d)(ii).
23. See *id.* at 2.
24. See *id.* ¶ 6.
25. See AMERICAN CHEMISTRY COUNCIL, 2017 ELEMENTS OF THE BUSINESS OF CHEMISTRY 60 (2017), available at <https://www.americanchemistry.com/2017-Elements-of-the-Business-of-Chemistry.pdf>.
26. See AYHAN DEMIRBAS, METHANE GAS HYDRATE 60 (2010).
27. See Andrew Taylor, Abhijit Kodey, Adam Rothman, & Jerry Keybl, *The Feedstock Advantage Continues for North American Chemical Companies*, BCG PERSPECTIVES (July 9, 2015), <https://www.bcgperspectives.com/content/articles/process-industries-feedstock-advantage-continues-north-american-chemical-companies/>.
28. See AMERICAN CHEMISTRY COUNCIL, *supra* note 25, at 60.
29. See Carolyn Davis, *Ineos Inks Agreement to Ship U.S. Ethane to China Cracker*, NATURALGASINTEL.COM (Nov. 21, 2017), <http://www.naturalgasintel.com/articles/112516-ineos-inks-agreement-to-ship-us-ethane-to-china-cracker>.

30. See NAPHTHA MARKET ANALYSIS BY APPLICATION (CHEMICAL, ENERGY & FUEL) AND SEGMENT FORECASTS TO 2022, GRAND VIEW RESEARCH (Mar. 2015), available at <http://www.grandviewresearch.com/industry-analysis/naphtha-market> [hereinafter NAPHTHA MARKET ANALYSIS].
31. See *Naphtha & Oil Derived Plastic*, PLASTICRUBBISH, <http://plasticrubbish.com/2013/12/21/oil-to-plastic/> (last visited on July 11, 2017).
32. See DUNCAN SEDDON, PETROCHEMICAL ECONOMICS: TECHNOLOGY SELECTION IN A CARBON CONSTRAINED WORLD 12 (Graham J. Hutchings ed., 2010), available at http://vcstudy.ir/wp-content/uploads/2016/06/VCMStudy-Duncan_SeddonPetrochemical-Economics.pdf.
33. See THE NEW PLASTICS ECONOMY: RETHINKING THE FUTURE OF PLASTICS, WORLD ECONOMIC FORUM 7 (2016), available at http://www3.wforum.org/docs/WEF_The_New_Plastics_Economy.pdf.
34. DAVID HURD, SHAWN PARK, & JAMES KAN, DEUTSCHE BANK, CHINA'S COAL TO OLEFINS INDUSTRY 4-5 (2014), available at <http://www.fulltreacymoney.com/system/data/files/PDFs/2014/July/3rd/0900b8c088667819.pdf>.
35. See *id.*
36. Paris Agreement, Dec. 12, 2015, T.I.A.S. No. 16-1104.
37. See generally Center for International Environmental Law, Fueling Plastics: How Fracked Gas, Cheap Oil, and Unburnable Coal are Driving the Plastics Boom (2017), available at <http://www.ciel.org/wp-content/uploads/2017/09/Fueling-Plastics-How-Fracked-Gas-Cheap-Oil-and-Unburnable-Coal-are-Driving-the-Plastics-Boom.pdf>.
38. See OILCHANGE INTERNATIONAL, THE SKY'S LIMIT (2016), available at http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf.
39. See, e.g., EXXONMOBIL, 2018 ENERGY & CARBON SUMMARY 2 (2018), available at <http://cdn.exxonmobil.com/-/media/global/files/energy-and-environment/2018-energy-and-carbon-summary.pdf> ("Even under a 2°C pathway, significant investment will be required in oil and natural gas capacity, as well as other energy sources.").
40. See THE LOFOTEN DECLARATION, <http://www.lofotendeclaration.org> (last visited Mar. 1, 2017).
41. See Press Release, The United States Conference of Mayors, Mayors Strongly Oppose Withdrawal From Paris Climate Accord (June 1, 2017), available at <https://www.usmayors.org/2017/06/01/mayors-strongly-oppose-withdrawal-from-paris-climate-accord/>.
42. See RE100, <http://there100.org/re100> (last visited Mar. 1, 2018).
43. See DIVESTINVEST, <https://www.divestinvest.org/> (last visited Mar. 1, 2018).
44. See Jackie Wattles, *India to Sell Only Electric Cars by 2030*, CNN (June 3, 2017, 5:22 PM), <http://money.cnn.com/2017/06/03/technology/future/india-electric-cars/index.html>.
45. See Angelique Chrisafis & Adam Vaughn, *France to Ban Sales of Petrol and Diesel Cars by 2040*, THE GUARDIAN (July 6, 2017, 9:20 AM), <https://www.theguardian.com/business/2017/jul/06/france-ban-petrol-diesel-cars-2040-emmanuel-macron-volvo>.
46. See Jim Pickard & Peter Campbell, *UK Plans to Ban Sale of New Petrol and Diesel Cars by 2040*, FINANCIAL TIMES (July 26, 2017), <https://www.ft.com/content/7e61d3ae-718e-11e7-93ff-99f383b09ff9>.
47. See Brian Love, *Paris Plans to Banish All But Electric Cars by 2030*, REUTERS (Oct. 12, 2017, 3:26 AM), <https://www.reuters.com/article/us-france-paris-autos/paris-plans-to-banish-all-but-electric-cars-by-2030-idUSKBN1CH0SI>.
48. See Charles Clover, *China Eyes Eventual Ban of Petrol and Diesel Cars*, FINANCIAL TIMES (Sept. 10, 2017), <https://www.ft.com/content/d3bcc6f2-95f0-11e7-a652-cde3f882dd7b>.
49. See David Stanway, *BYD Predicts Ambitious China Shift to Electric Cars by 2030*, REUTERS (Sept. 20, 2017, 11:15 PM), <https://www.reuters.com/article/us-byd-autos/byd-predicts-ambitious-china-shift-to-electric-cars-by-2030-idUSKCN1BW0BQ>.
50. See Alanna Petroff, *These Countries Want to Ban Gas and Diesel Cars*, CNN (Sept. 11, 2017, 8:30 AM), <http://money.cnn.com/2017/09/11/autos/countries-banning-diesel-gas-cars/index.html?iid=EL>.
51. See Fred Lambert, *GM Announces Serious Electric Car Plan: 2 New EVs Within 18 Months, 20 Within 5 Years*, ELECTREK (Oct. 2, 2017, 12:31 PM), <https://electrek.co/2017/10/02/gm-electric-car-commitment-new-models/>.
52. See Stan Schroeder, *Volvo Says Every Car in its Lineup Will Have an Electric Motor by 2019*, MASHABLE (July 5, 2017), <https://mashable.com/2017/07/05/volvo-all-electric/#NnkYsNKn6Pq6>.
53. See Costas Pitas, *All New Jaguar Land Rover Cars to Have Electric Option from 2020*, REUTERS (Sept. 7, 2017, 2:37 AM), <https://www.reuters.com/article/us-jaguarlandrover-tech/all-new-jaguar-land-rover-cars-to-have-electric-option-from-2020-idUSKCN1BI0OL>.
54. See Fred Lambert, *VW Announces Massive \$84 Billion Investment in Electric Cars and Batteries*, ELECTREK (Sept. 11, 2017, 1:46 PM), <https://electrek.co/2017/09/11/vw-massive-billion-investment-in-electric-cars-and-batteries/>.
55. See Mark Kaufman, *Elon Musk Rips Mercedes' Electric Vehicle Goals, Mercedes Hits Back*, MASHABLE (Sept. 26, 2017), <https://mashable.com/2017/09/26/mercedes-responds-to-elon-musk/#OL6wQOil1mqQ>.
56. See Paul Lienert, *Ford Creates Team to Ramp Up Electric Vehicle Development*, REUTERS (Oct. 2, 2017), <https://www.reuters.com/article/us-ford-motor-electricvehicles/ford-creates-team-to-ramp-up-electric-vehicle-development-idUSKCN1C7224>.
57. See Sohee Kim, *Hyundai Bolsters Electric Car Lineup to Narrow Gap With Rivals*, BLOOMBERG (Dec. 12, 2017, 6:00 PM), <https://www.bloomberg.com/news/articles/2017-12-12/hyundai-bolsters-electric-car-lineup-to-narrow-gap-with-rivals>.
58. See Fred Lambert, *Renault, Nissan & Mitsubishi Alliance Will Launch 12 New All-Electric Vehicles Within the Next 5 Years*, ELECTREK (Sept. 15, 2017, 11:18 AM), <https://electrek.co/2017/09/15/renault-nissan-mitsubishi-alliance-12-new-all-electric-vehicles/>.
59. See Brett Williams, *Toyota and Mazda Join Forces to Develop Electric Vehicles*, MASHABLE (Sept. 28, 2017), <https://mashable.com/2017/09/28/toyota-mazda-senso-electric-vehicle-development/#34qDP3B46Oqh>.
60. See John Fitzgerald Weaver, *Tesla Battery Races to Save Australia Grid from Coal Plant Crash - Injecting 7MW in Milliseconds*, ELECTREK (Dec. 19, 2017, 6:07 PM), <https://electrek.co/2017/12/19/tesla-battery-save-australia-grid-from-coal-plant-crash/>.
61. See Fred Lambert, *Tesla is Chosen to Build Another Big Battery in Australia After the First One Proves Impressive*, ELECTREK (Jan. 4, 2018, 9:51 AM), <https://electrek.co/2018/01/04/tesla-powerpack-battery-australia/>.
62. See Diane Cardwell, *Tesla Gives the California Power Grid a Battery Boost*, NY TIMES (Jan. 30, 2017), <https://www.nytimes.com/2017/01/30/business/energy-environment/battery-storage-tesla-california.html>.
63. See Michael Reilly, *Grid Batteries Are Poised to Become Cheaper than Natural-Gas Plants in Minnesota*, MIT TECHNOLOGY REVIEW (July 12, 2017), <https://www.technologyreview.com/s/608273/grid-batteries-are-poised-to-become-cheaper-than-natural-gas-plants-in-minnesota/>.
64. See Mark Chediak, *The Battery Will Kill Fossil Fuels - It's Only a Matter of Time*, BLOOMBERG (Mar. 8, 2018), <https://www.bloomberg.com/news/articles/2018-03-08/the-battery-will-kill-fossil-fuels-it-s-only-a-matter-of-time>.
65. *Id.*
66. See Tom DiChristopher, *GE Warns 2018 Could Be Even Worse than it Expected for its Embattled Power Business*, CNBC (Jan. 24, 2018, 10:58 AM), <https://www.cnbc.com/2018/01/24/ge-warns-2018-could-be-worse-than-expected-for-its-power-business.html>.

67. See Ed Crooks & Patrick McGee, *GE and Siemens: Power Pioneers Flying Too Far from the Sun*, FINANCIAL TIMES (Nov. 12, 2017), <https://www.ft.com/content/fc1467b8-c601-11e7-b2bb-322b2cb39656>.
68. See *id.*
69. See *id.*
70. See Sharon Kelly, *New NASA Study Solves Climate Mystery, Confirms Methane Spike Tied to Oil and Gas*, DESMOG (Jan. 16, 2018, 10:22 AM), <https://www.desmogblog.com/2018/01/16/nasa-study-resolves-climate-mystery-confirms-methane-spike-ties-oil-gas>.
71. See Statement for the Record, Dow Chemical Company, Hearing on The Future of Natural Gas, before the S. Comm. on Energy and Natural Resources (July 19, 2011), available at https://www.energy.senate.gov/public/index.cfm/files/serve?File_id=42c5c3ee-b9d1-69e2-3307-f3c4fbde9a5a.
72. See *id.*
73. See EXXONMOBIL, 2016 FINANCIAL & OPERATING REVIEW 83 (2017), available at http://cdn.exxonmobil.com/-/media/global/files/financial-review/2016_financial_and_operating_review.pdf.
74. See *id.* at 84.
75. See SEDDON, *supra* note 32, at 201.
76. See Udo Jung et al., *Why the Middle East's Petrochemical Industry Needs to Reinvent Itself*, BCG (Nov. 7, 2016), <https://www.bcgperspectives.com/content/articles/process-industries-energy-environment-middle-east-petrochemical-industry-reinvent-itself/>.
77. See NAPHTHA MARKET ANALYSIS, *supra* note 30.
78. See Jeffrey S. Plotkin, *The Propylene Gap: How Can It Be Filled?*, AMERICAN CHEMICAL SOCIETY (Sept. 14, 2015), <https://www.acs.org/content/acs/en/pressroom/cutting-edge-chemistry/the-propylene-gap-how-can-it-be-filled.html>.
79. See *Infographic: US Ethane Cracker Construction Costs Rise 1-2% Year on Year*, PETROCHEMICAL UPDATE (Apr. 7, 2016), <http://analysis.petchem-update.com/engineering-and-construction/infographic-us-ethane-cracker-construction-costs-rise-1-2-year-year>.
80. See *Squeezed Labor and Materials Hike US Ethane Cracker Construction Costs*, PETROCHEMICAL UPDATE (Feb. 18, 2018), <http://analysis.petchem-update.com/engineering-and-construction/squeezed-labor-and-materials-hike-us-ethane-cracker-construction-costs>.
81. AMERICAN CHEMISTRY COUNCIL, *supra* note 25, at 14.
82. See Rye Druzin, *Exxon Chooses Site Near Corpus for Massive \$9.3B Petrochemical Plant*, MYSANANTONIO.COM (Apr. 19, 2017, 6:38 PM), <https://www.mysanantonio.com/business/eagle-ford-energy/article/ExxonMobil-chooses-site-near-Corpus-for-massive-11083395.php>.
83. See Ed Crooks, *Chemical Industry Split about the Case for More US Plants*, FINANCIAL TIMES (May 2, 2017), <https://www.ft.com/content/28649ac0-2f23-11e7-9555-23ef563ecf9a>.
84. See Anya Litvak, *Waiting Game as Low Oil Prices Have Chemical Cracker Developers Sitting Tight*, PITTSBURGH POST-GAZETTE (Mar. 10, 2015, 12:45 AM), <http://www.post-gazette.com/powersource/companies-powersource/2015/03/10/Low-oil-prices-make-Appalachian-cracker-plant-developers-nervous/stories/201503100013>.
85. See AMERICAN CHEMISTRY COUNCIL, *supra* note 25, at 10.
86. See *id.* at 57.
87. See ENVIRONMENTAL INTEGRITY PROJECT, GREENHOUSE GASES FROM A GROWING PETROCHEMICAL INDUSTRY (2016), available at <https://www.desmogblog.com/sites/beta.desmogblog.com/files/Petrochemical%20Industry%20Pollution.pdf>.
88. See *id.* at 1.
89. See *id.* at 8.
90. See *id.* at 3.
91. See, e.g., Will Beacham, *Circular Economy Will Mean Complete Shift in Feedstocks for Petchems – PwC*, ICIS (Jan. 25, 2018, 10:05 AM), <https://www.icis.com/resources/news/2018/01/25/10186617/circular-economy-will-mean-complete-shift-in-feedstocks-for-petchems-pwcf/>.
92. See, e.g., Barbara Grady, *Bill Gates' \$14 Million Sees a Future in Low-Carbon Plastics*, GREENBIZ.COM (Sept. 15, 2016, 1:05 AM), <https://www.greenbiz.com/article/bill-gates-14-million-sees-future-low-carbon-plastics>.
93. See Daniel Posen, Paulina Jaramillo, Amy E. Landis, & W. Michael Griffin, *Greenhouse Gas Mitigation for U.S. Plastics Production: Energy First, Feedstocks Later*, 12(3) ENVTL. RESEARCH LETTERS (Mar. 16, 2017), available at <http://iopscience.iop.org/article/10.1088/1748-9326/aa60a7/pdf>.
94. See Ellen Palm, Lars J. Nilsson, & Max Ahman, *Electricity-Based Plastics and Their Potential Demand for Electricity and Carbon Dioxide*, 129 J. OF CLEANER PROD. 548 (2016), available at <http://www.sciencedirect.com/science/article/pii/S0959652616302529>.
95. *Id.*
96. See, e.g., Press Release, Plastic Recyclers Europe, 65% plastics packaging recycling target is attainable - New study shows substantial environmental, social and economic benefits (Dec. 13, 2017), available at http://plasticrecyclers.eu/news/65-plastics-packaging-recycling-target-attainable-new-study-shows-substantial-environmental?utm_source=POLITICO.EU&utm_campaign=0ad073e05a-EMAIL_CAMPAIGN_2017_12_22&utm_medium=email&utm_term=0_10959edeb5-0ad073e05a-189654589.
97. See GAIA & ZERO WASTE EUROPE, RECYCLING IS NOT ENOUGH: IT'S TIME TO RETHINK HOW TO SOLVE THE PLASTIC WASTE CRISIS (2018), available at <http://www.no-burn.org/wp-content/uploads/Recycling-is-Not-Enough-online-version.pdf>.
98. Laura Parker, *A Whopping 91% of Plastic Isn't Recycled*, NATIONAL GEOGRAPHIC (July 19, 2017), <https://news.nationalgeographic.com/2017/07/plastic-produced-recycling-waste-ocean-trash-debris-environment/>.
99. See *Toxic Toy or Toxic Waste: Recycling POPs into New Products*, IPEN, <http://ipen.org/documents/toxic-toy-or-toxic-waste-recycling-pops-new-products> (last visited Mar. 14, 2018).
100. See Beacham, *supra* note 91.



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The Long-Term Prospects for the Plastics Boom is the fourth in an ongoing series, *Fueling Plastics*, that examines the links between plastics and fossil fuels.

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INSIGHT: China ban on single use plastics threatens 4m tonnes/year of polymer demand

Author: Amy Yu

2020/01/24

SINGAPORE: China's move to phase out single-use plastics has stirred concern among market players about the growth of plastics demand. The regulations might affect as much as 4m tonnes/year of polymer demand.

The new rules [prohibit](#) the production and use of disposable and non-biodegradable plastic finished products.

The impact on polyethylene (PE) demand is expected by ICIS to be more than 3m tonnes/year because of the widespread use of the polymer to make shopping bags, courier bags (bags that are sealed on one side), and agricultural film.

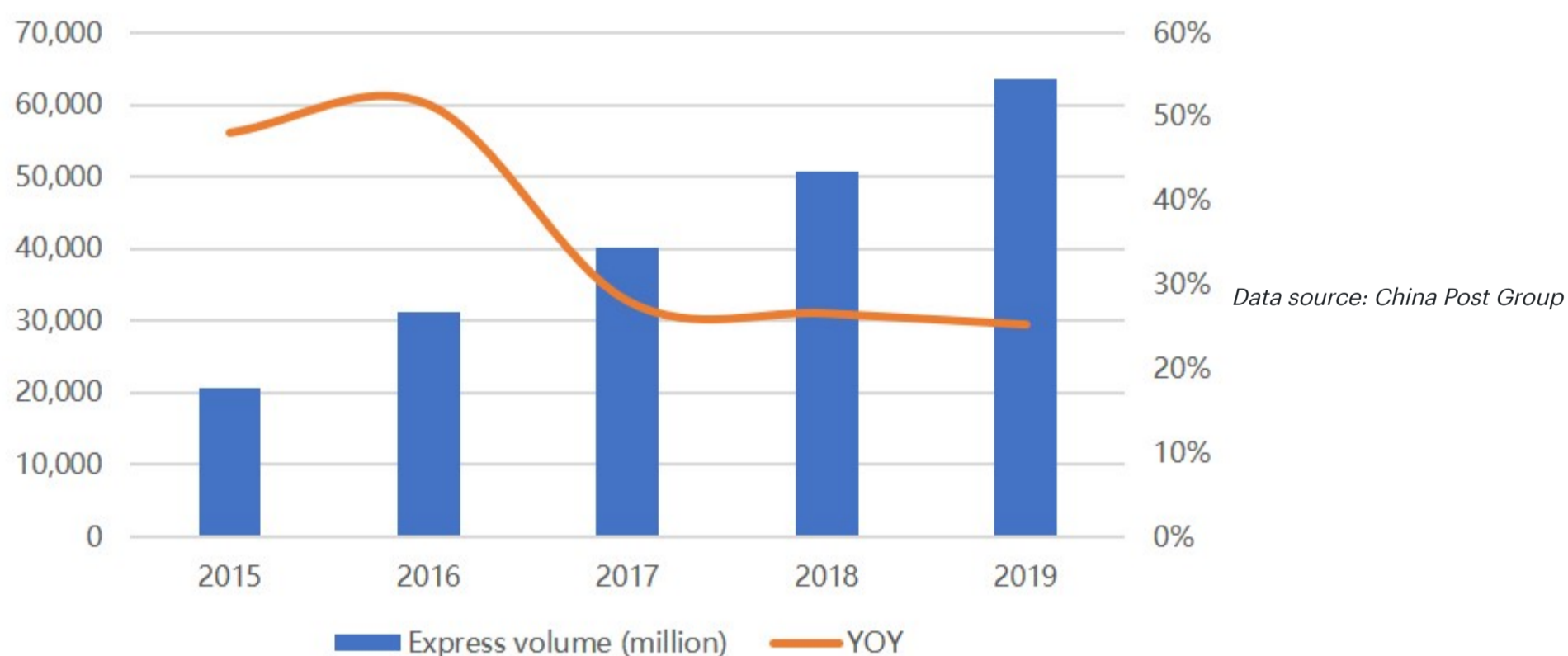
Currently, the costs of degradable plastics are much higher than for non-degradable, and there is insufficient degradable plastics capacity to meet demand.

ICIS believes that the ban of using non-degradable plastic bags in food delivery and express delivery packages will have a major impact on PE demand.

Packaging bags, widely used in emerging industries, such as e-commerce, express delivery and food delivery, underpinned by booming internet business, have become a major driving force for China's rising PE demand.

Data from China's National Bureau of Statistics (NBS) showed that the online sales of physical goods reached yuan (CNY) 8,523.95bn in 2019, up by 19.5% year on year. According to the China Post Group, the total number of express deliveries in China amounted to 63.5bn in 2019, up by 25.3% year on year.

Express deliveries in China grew by 25% in 2019



We expect that the ban on using non-degradable plastic packaging bags in postal and express delivery services might have a considerable impact on PE demand.

Taking 2019 statistics as a reference, the missed demand would be around 880,000 tonnes of PE.

Polyethylene is a major feedstock for plastic packaging bags used in express delivery. But PE consumption in this application is hard to calculate as packaging bags are made in various sizes. Detailed rules for different provinces and cities are unknown as yet, which adds to the uncertainty about PE demand.

ICIS analysis assumptions are based on the total number of China's express deliveries in 2019 of more than 63.5bn.



Considering the plastic packaging bag with the most common specification of 40cm x 50cm for reference, the corresponding PE consumption in 2019 is estimated around 880,000 tonnes.

The number of express deliveries in six provinces and cities, including Beijing, Shanghai and Jiangsu reached 43.8bn in 2019, accounting for 69% of China's total.

The new regulation would affect PE demand in these provinces by around 610,000 tonnes, or 1.7% of China's total PE in 2019.

If the new regulation is implemented across China, around 880,000 tonnes of PE demand may be affected, corresponding to the 2.7% of the total PE demand in China in 2019.

Secondly, non-degradable shopping bags are prohibited from being used in take-away services, shopping malls, supermarkets and marketplaces and the regulation will be implemented in the near future.

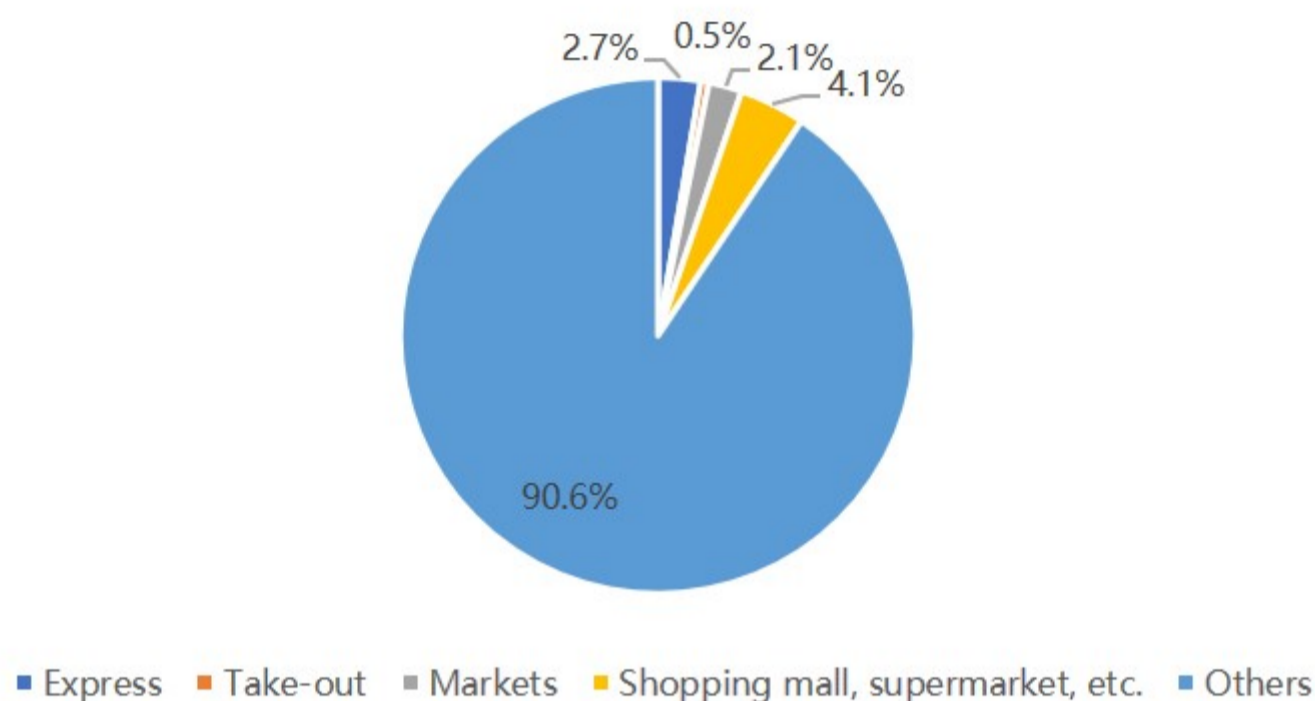
ICIS believes that this move might affect 2.2m tonnes of demand, equivalent to 6.7% of the China total in 2019.

According to media data, the annual take-away order volume of plastic bags in China is at least 20bn.

Assuming that a shopping bag weighs about 8.4 grams (g), PE demand from annual take-way orders is no less than 170,000 tonnes.

Around 1bn plastic bags are used in markets per day. And assuming that one plastic bag used in a market weighs 2g, the related PE consumption is expected to total 690,000 tonnes. Plastic bags are also used in shopping malls, supermarkets, pharmacies and elsewhere.

About 9.4% of total China PE demand will be impacted by the new regulation



The estimates suggest that once non-biodegradable plastic bags are banned in express delivery and takeaway, 3.11m tonnes of PE demand might be affected, which accounts for 9.4% of China's total PE demand in 2019.

In addition, by the end of 2020, China will ban the production and sale of single-use foam plastic tableware, which is made mainly expandable polystyrene (EPS).

The new regulation is estimated to reduce EPS demand by 0.5%. Rough estimates show that 30m foam lunch boxes are used in China every day. The production of 10,000 foam lunch boxes uses 12 kilograms (kg) of plastics, translates into 13,000-15,000 tonnes of EPS demand annually. According to ICIS data, China's EPS consumption will reach at 3.11m tonnes in 2019.

Polypropylene (PP) packaging boxes have overtaken foam lunch boxes to become the mainstream packaging in catering, with the rapid development of take-away services. Therefore, the ban on non-degradable single-use plastic tableware in the new regulation will also weigh on PP demand.

Assuming that every take-away order uses three packing boxes on average, and that one packing box weighs around 20g, the plastic consumption in packing boxes in China totals around 1.2m tonnes.

At present, most packaging boxes are made of PP, and only some cold food boxes use polyethylene terephthalate (PET).

The ban creates great uncertainty because it is unlikely to be completely effective at once. The market is waiting for details on alternative materials and punishment proposals from each regional government.

China's National Development and Reform Commission (NDRC) and Ministry of Ecology and Environment rolled out the new regulations to control plastic pollution on 19 January.

According to the regulations, the production, sale and use of some plastic products will be banned in three stages in 2020, 2022 and 2025. The purpose is to build up a plastic products industry management system and to effectively control plastic pollution.



Low gas prices in Old Orchard Beach, Maine, on March 30. | Derek Davis/Portland Press Herald/Getty Images

Coronavirus stimulus money will be wasted on fossil fuels

Oil and gas companies were already facing structural problems before Covid-19 and are in long-term decline.

By David Roberts | @drvox | david@vox.com | Updated Jun 29, 2020, 3:29pm EDT

Update, June 29: Chesapeake Energy Corp., a massive US oil and gas company that led the fracking boom, has filed for Chapter 11 protection in a bankruptcy court in Texas following the collapse of energy demand in the Covid-19 crisis. The following post, first published April 20, explains why companies like it faced challenges predating the pandemic. (It's not clear whether Chesapeake received stimulus funds before filing for bankruptcy.)

As countries across the world have gone into lockdown in response to **Covid-19**, economies are in free fall. Almost every sector is taking a hit, hemorrhaging jobs and value. And almost every sector will be shaped, for years to come, by the speed, amount, and

nature of public assistance it receives. There is a finite amount of time, resources, and political will available to get economies going again; not every sector will get what it wants or needs.

In short, the decisions legislators make in response to the coronavirus crisis will have an enormous influence on what kind of economies emerge on the other side.

In March, I wrote about **what an ideal recovery and stimulus package would look like**. Then I wrote about how shortsighted it is for Republicans (enabled by learned Democratic passivity) to **reject aid for the struggling clean energy industry**.



In this post, I take a look at why it is equally shortsighted for President Trump and congressional Republicans to remain so devoted to the fossil fuel industry.

The dominant narrative is still that fossil fuels are a pillar of the US economy, with giant companies like Exxon Mobil producing revenue and jobs that the US can't afford to do without. Even among those eager to address climate change by moving past fossil fuels to

clean energy — a class that includes **a majority of Americans** — there is a lingering mythology that US fossil fuels are, to use the familiar phrase, too big to fail.



President Donald Trump, flanked by House Minority Leader Kevin McCarthy, left, and Chevron CEO Mike Wirth, meets with energy sector CEOs at the White House on April 3. | Jim Watson/AFP/Getty Images

But the position of fossil fuels in the US economy is less secure than it might appear. In fact, the fossil fuel industry is facing substantial structural challenges that will be exacerbated by, but will not end with, the Covid-19 crisis. For years, the industry has been shedding value, taking on debt, losing favor among financial institutions and **investors**, and turning more and more to lobbying governments to survive.

It is, in short, a turkey. CNBC financial analyst **Jim Cramer put it best**, back in late January, before Covid-19 had even become a crisis in the US: “I’m done with fossil fuels. They’re done. They’re just done.”

“We’re in the death knell phase,” he said. “The world has turned on [fossil fuels].”

Cramer’s take is not yet conventional wisdom, but he’s right. Evidence in support appears in an April report from the Center for International Environmental Law (CIEL) called “**Pandemic Crisis, Systemic Decline**.” Let’s walk through it.

Fossil fuels are furiously lobbying for, and receiving, largesse from the US government

The UK-based think tank InfluenceMap recently did an **analysis** that tracks corporate lobbying in the face of the Covid-19 crisis. It found that, across the globe, the oil and gas sector has been the most active in lobbying for interventions, seeking, as CIEL summarizes, “direct and indirect support, including bailouts, buyouts, regulatory rollbacks, exemption from measures designed to protect the health of workers and the public, non-enforcement of environmental laws, and criminalization of protest, among others.” In Canada, Australia, and the UK, the industry is arguing that it must be subsidized and deregulated in order to survive.

In the US alone, the industry is seeking access to a range of stimulus funds, relief from a variety of pollution regulations, and use of the strategic petroleum reserve to bolster prices. Journalist Amy Westervelt is tracking **at least a dozen other lobbying efforts**. Recently the Federal Reserve **changed its rules** to allow bigger businesses access to “Main Street loans” (widely seen as a sop to oil and gas companies) and, as Emily Holden **reports for the Guardian**, records show that fossil fuel companies have already gotten \$50 million in loans meant for small businesses.

The petrochemical and plastics industry, which is in large part an extension of the oil and gas industry, is exploiting the crisis as well. It has **lobbied** the federal government to declare an official preference for single-use plastic bags and **suggested** that more fresh produce should be wrapped in plastic.

The virus has not slowed down the Trump administration’s attempts to assist the industry. It is **gutting fuel economy standards**, which, by its own estimation, will increase pollution and **eliminate 13,500 jobs a year**. The EPA has **dramatically eased the enforcement of pollution regulations** and **moved forward with its “secret science” rule**, which will make it more difficult to understand and address the health impacts of air pollution — and more difficult to study the coronavirus.



The petrochemical industry has lobbied the federal government to declare an official preference for single-use plastic bags. | Timothy A. Clary/AFP/Getty Images



President Trump delivers a speech on energy sector jobs at the Shell Chemicals Petrochemical Complex in Monaca, Pennsylvania, on August 13, 2019. | Jeff Swensen/Getty Images

During a supply glut driven by historically low prices, the Interior Department is rushing to lease federal land for oil and gas development, despite an **anemic response**, rock-bottom prices, and **calls from conservative and taxpayer groups** to suspend leasing in the face of the coronavirus.

The administration seems **determined to bail out struggling shale gas companies**, despite that overleveraged, debt-ridden sector being **long overdue for a shakeout**. (For more on that, check out **Amy Westervelt's reporting at Drilled**.)

Trump is **negotiating with Saudi Arabia and Russia** on oil supply cuts, and has the Department of Energy **buying up millions of barrels of oil** for the strategic petroleum reserve, all to try to boost the price of oil to help **struggling oil majors**. A group of GOP senators is **lobbying for fossil fuel companies**, including coal companies, to be eligible for the small business recovery fund.

In April, EPA Administrator Andrew Wheeler announced that the administration, in defiance of an enormous body of evidence and **recommendations from EPA scientists and staff**, will **not tighten restrictions on soot pollution**. And on Friday, Wheeler announced that the EPA will **weaken standards on mercury and other toxic metals** from fossil-fueled power plants, again in opposition to the scientific consensus, based on rigged cost-benefit analysis that **deliberately excluded most benefits**.

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Trump's EPA balks at a chance to save black lives

Across the board, the administration is doing everything it can to help fossil fuels. But it's a mug's game. The industry is faltering for reasons that well predate Covid-19.

Fossil fuels were already facing structural problems before the coronavirus

US coal is in terminal decline, for reasons I've written about **many times before**. No amount of stimulus money or weaker pollution regulations can save it.

But on the surface, things look different for oil and gas. **Thanks to fracking**, production has been booming for the past decade, vaulting the US ahead of Saudi Arabia and Russia to become the the world's leading oil and gas producer.

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Coal left Appalachia devastated. Now it's doing the same to Wyoming.

And the same goes for petrochemicals and especially plastics, which have been **forecast** to be the main drivers of rising petroleum demand in coming years. The industry has issued rosy projections of plastics' growth and invested \$200 billion in new petrochemical and plastics infrastructure.

But dig below the surface and things don't look so good.

First, fracking was a **financial wreck** long before Covid-19 hit. US fracking operations have been losing money for a decade, to the tune of around \$280 billion. Overproduction has produced a supply glut, low prices, and an accumulating surplus in storage.

CIEL reports:

Since 2015, over 200 drillers have gone bankrupt, with 32 declaring bankruptcy in 2019. At the beginning of 2020, the industry continued to struggle as natural gas prices remained low due to sluggish demand growth. By the end of the first quarter, another seven drillers had declared bankruptcy, six additional drillers had their credit outlook downgraded, and several major banks had written down the expected value of many drillers' reserves. A recent analysis from Rystad Energy indicated that, at prevailing oil and gas prices, almost all new fracking wells drilled would lose money.

Even as its prospects grow dimmer, the enormous debt the industry has taken on over the years is coming back to bite it. Some \$40 billion will come due this year alone, and around \$200 billion in the next four years.

Second, both oil and gas prices were persistently low leading into 2019. Due to oversupply and mild winters in the US and Europe, there is a glut of both natural gas and oil, such that the entire world's spare oil storage is in danger of being filled. Many big oil deals in "frontier countries" with as-yet-unexploited reserves, like Guyana, Argentina, and Mozambique, are falling through as low prices drag on.

Third, renewable energy and electric vehicles are threatening oil and gas's dominance in both transportation, which represents 70 percent of global demand, and electricity. Natural gas's status as a "bridge fuel" in the power sector is in **increasing doubt**; since 2014, orders for new gas turbines (to generate power) have **fallen by half**. As for transportation, a **recent report** from the international banking group BNP Paribas concluded that "the economics of oil for gasoline and diesel vehicles versus wind- and solar-powered EVs are now in relentless and irreversible decline."



An electric car at a charging station in Bavaria, Germany, on March 26, 2020. | Sven Hoppe/picture alliance/Getty Images

Fourth, oil and gas majors are revealing their own weakness by writing down assets — effectively conceding that certain reserves cannot be profitably exploited. In 2019, Chevron wrote down \$11 billion worth; Spanish oil company Repsol recently wrote down \$5 billion worth. Exxon Mobil, after adding Canadian tar sands assets to its books in 2017, reversed course and wrote down 3.2 billion barrels last year.

Fifth, financial institutions — “institutional and retail investors, banks, insurers, and credit rating agencies” — are catching wind of fossil fuels’ weakness and beginning to back away. Many, like Wells Fargo, BlackRock, the European Investment Bank, and the World Bank Group, are restricting investments in carbon-intensive projects. As of March 2020, asset investors worth \$12 trillion had **declared that they would divest from fossil fuels**.

As financial institutions divest, the ones still invested in carbon-intensive projects face increasing vulnerability to lawsuits charging them with ignoring material risks. “As the risks of investing in the oil and gas sector become ever more apparent,” CIEL writes, “more and more investors subject to fiduciary duties will likely choose to steer clear of these companies.”

Like these other dismal trends, the financial turn from fossil fuels was underway well before Covid-19. Over the past decade, companies in the sector have spent more on stock buybacks and dividends than they have brought in through revenue, leading to a greater

and greater debt burden. Declining confidence in the sector has made it the worst-performing sector on the S&P Index.



The Dow Jones Index (black line) vs. the Dow Jones Oil & Gas Index (blue line), as of April 17, 2020. | S&P Dow Jones Indices

Finally, plastics, the great hope of the oil and gas sector, do not appear to be growing fast enough to justify the industry's optimistic projections. Much of the US plastics industry is geared for export, but countries across the world (127 and counting) are adopting restrictions on single-use plastics. The most recent such restrictions were **adopted by China**, the world's largest plastic producer and consumer. Plastics, like oil and gas, are suffering from the dual malady of overexpansion and underconsumption.

As an example that encompasses all these structural problems, CIEL cites Exxon Mobil. The company's plan for growth involves growth in its petrochemical operations, which is now in doubt; fracking in the Permian Basin, which is now in doubt; and expanding oil production in Guyana, which is now (owing to political instability) in doubt.

All these doubts are converging as Moody's recently revised the company's outlook to negative. It fell out of the S&P's top 10 for the first time, its stock hit its lowest price in a decade, the rapid rise of renewables and electric vehicles rendered billions (and perhaps soon trillions) of dollars of its assets worthless, and it is keeping shareholders happy with debt-financed dividends. The Institute for Energy Economics and Financial Analysis found that over the past decade, Exxon Mobil has **spent \$64.5 billion more on payouts to stockholders than it earned in free cash flow**. That can't go on much longer.

Again: All of these structural trends predate Covid-19. But the global lockdown in response to the virus has accelerated all of them.

Oil and gas are caught in a historic downturn

Into this already dismal situation for fossil fuels came the virus and the subsequent lockdown. The vertiginous plunge in consumer demand has hit every sector of the economy, but oil and gas, already facing oversupply and persistent low prices, were particularly vulnerable.

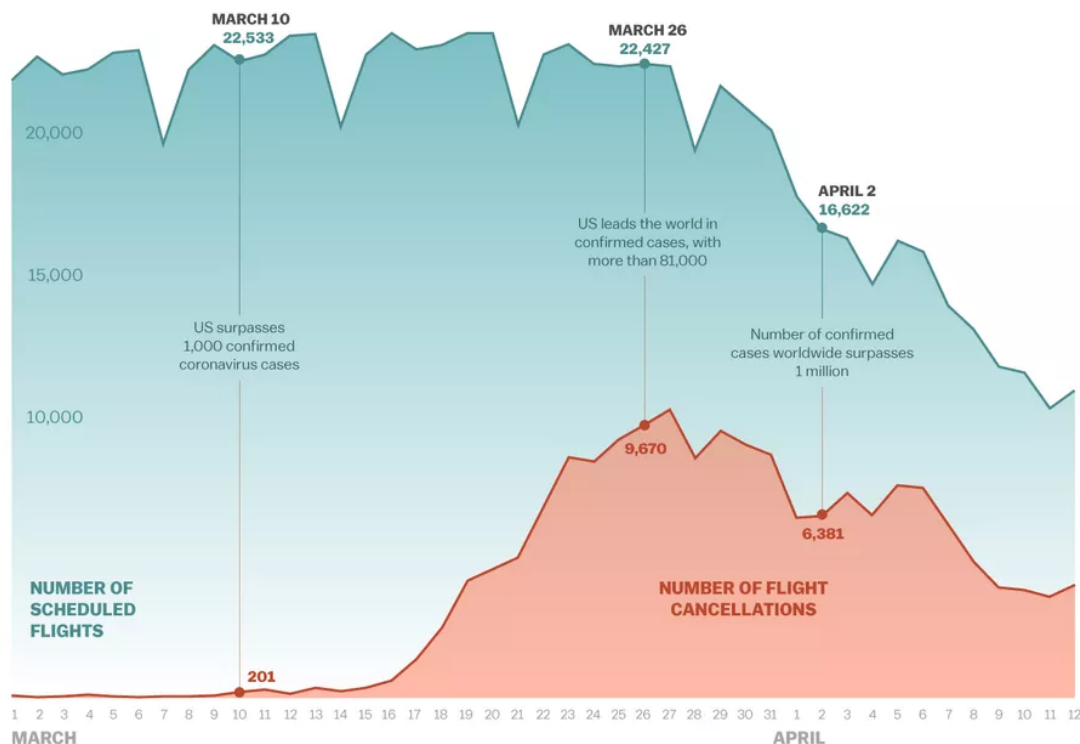
“Oil, gas, and petrochemical stocks have been affected more rapidly and much more deeply than almost any other sector,” CIEL writes. “The oil and gas sector lost more than 45% of its total value from the beginning of January to early April 2020.”

The already declining stocks of Exxon Mobil, Royal Dutch Shell, and Occidental Petroleum were sent tumbling even faster. In July 2014, Exxon stock hit a high of \$107; as of early April 2020, it was at \$42, its lowest level in decades. (On June 29, it was at \$44.)

Transportation represents 70 percent of petroleum consumption, but no one is moving. Rystad Energy **estimates** that as of March 2020, global traffic is down 40 percent. As lockdowns remain, that number will likely drop further.

Air travel has been the fastest-growing source of demand for transport fuels, but **no one is flying**. “In the final week of March 2020,” CIEL writes, “commercial air traffic was almost 63% lower than in 2019.”

Airlines in the US are canceling a staggering number of flights due to Covid-19



Sources: OAG, Center for Systems Science and Engineering at Johns Hopkins University data

Vox

Christina Animashaun/Vox

Public health officials warn that there could be periodic outbreaks for months or even years. Meanwhile, there are rapid advances being made everywhere in the infrastructure, technology, and practices of working remotely from home. It's entirely possible that auto and air travel won't reach their pre-virus levels in the US for years, if ever.

Travel by ship is also taking a hit. Cruise ships, beset by a series of **viral horror stories**, have suspended operations and many analysts doubt they will ever fully recover.

Meanwhile, oversupply, exacerbated by the drop in demand, is taxing the nation's storage capacity — the International Energy Agency says global capacity is about **85 percent full**. "Nearly all observers have concluded that at projected levels of demand destruction," CIEL writes, "the total global capacity for storing unneeded oil and gas will soon be exceeded." At that point, many producers will be forced to simply **shut down operations** and write-downs will accelerate.

On top of all this has come a price war between Saudi Arabia and Russia, competing for the shrinking supply left over by the US supply glut. Global oil prices were at \$69 per barrel in January 2020. The price of a barrel of Canadian tar sands oil appears **headed into negative**

prices, as are **Texas oil** and **natural gas** in some parts of the US, for May futures (**June prices are higher**). The so-called OPEC+ group of oil-producing nations (OPEC + Russia) recently agreed to a 10 million barrel a day cut in production, but **analysts agree** that it is **unlikely to be sufficient to stabilize prices**.

(In the hours after this article was first published on April 20, oil futures for May fell to **negative prices**. Mind-boggling.)



Freight trains filled with oil in Krasnodar, Russia, on April 14. As supply exceeds demand and oil prices fall, oil producers find themselves confronted with storage challenges. | Igor Onuchin/TASS/Getty Images

When storage capacity runs out, producers are forced to pay people to take oil off their hands. (Raise your hand if you had “**negative oil prices**” on your 21st-century bingo card.) Even if storage doesn’t completely run out, it will be close to full, serving to suppress prices, for years. Petrochemicals and plastics don’t have it much better, with major investors delaying or dropping out of projects left and right.

“In the medium term,” CIEL writes, “the prospect of a full recovery for many of these revenue streams is, at best, uncertain, and, in many cases, unlikely.” Fossil fuels and

petrochemicals could struggle for years.

And even if they eventually manage to achieve something like their pre-virus trajectory, that trajectory was sloping downward. As CIEL summarizes: “the pandemic exposes and exacerbates fundamental weaknesses throughout the sector that both predate the current crisis and will outlast it.”

Wasting stimulus money on fossil fuels makes no sense, so Trump will probably do it

Slowly but surely, the world is beginning to take global warming seriously, shifting attention and investment to materials and sources of energy that do not produce greenhouse gas emissions. As more and more jurisdictions, institutions, and investors turn away from fossil fuels, explicitly citing climate change, those left holding carbon-intensive assets will become targets of increasingly intense legal and civic activism holding them responsible for the damages.

CIEL concludes with recommendations to investors, frontier countries, and local communities: Take heed of fossil fuels’ long-term weakness when making decisions about the future. CIEL also argues that public officials “should not waste limited response and recovery resources on bailouts, debt relief, or similar supports for oil, gas, and petrochemical companies.”

Given the well-established inclinations of Trump and congressional Republicans, that recommendation is likely to fall on deaf ears, at least in the US. If Democrats do not muster the courage to stop them — and it **does not seem they will** — the GOP is likely to continue showering the fossil fuel industry with favors while dismissing aid to the clean energy industry as frivolous.



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April 18, 2019

Brian Reissaus
Staff Chairperson
Committee on Foreign Investment in the United States
Office of Investment Security
Room 5012
U.S. Department of the Treasury
1500 Pennsylvania Avenue, NW
Washington, DC 20220

Sent via certified mail and email to: CFIUS@treasury.gov

RE: Potential foreign governmental control of Northwest Innovation Works

Dear Staff Chairperson Reissaus and CFIUS Members:

Northwest Innovation Works is a U.S. limited liability corporation that is owned by parent companies controlled by the Chinese Government. Northwest Innovation Works is currently seeking \$2 billion in financial assistance from the U.S. Government to continue its plans to construct a methanol refinery on the shores on the Columbia River that would make and ship methanol to China. Columbia Riverkeeper, a non-profit conservation organization, submits this letter to the Committee on Foreign Investment in the United States (CFIUS) seeking review, under section 721(b)(2)(E) of the Defense Production Act of 1950 (Section 721), as amended by the Foreign Investment and National Security Act of 2007 (FINSIA), of the Chinese-government parent company's acquisition of a major energy asset that may present national security considerations for our energy supply and transportation infrastructure. If CFIUS finds that the acquisition was a covered transaction under Section 721(d), the President may modify or prohibit the transaction.

Northwest Innovation Works is proposing to construct the nation's largest gas-to-methanol manufacturing and export facility at the Port of Kalama, in southwest Washington State. Relying on proprietary technology, Northwest Innovation Works would use North American natural gas as feedstock to create methanol. Northwest Innovation Works would then export methanol to China for use as fuel or petrochemicals. The proposal is similar to liquified natural gas (LNG) export.

Northwest Innovation Works may soon receive over \$2 billion of financial assistance from the United States government. Specifically, Northwest Innovation Works applied to the U.S. Department of Energy for a federal loan guarantee to finance the proposed methanol

refinery, under Title XVII of the Energy Policy Act of 2005.¹ The U.S. Department of Energy is currently processing the loan guarantee request.

The Chinese government may have legal or actual control over Northwest Innovation Works. Exhibit 1 (attached) is an excerpt from a third-party appraisal that Northwest Innovation Works submitted to the U.S. Department of Energy to support an application for financial assistance. Exhibit 1 shows that Northwest Innovation Works is majority or wholly owned by a U.S. company called Pan-Pacific Energy Corp. (PPE). PPE is majority or wholly owned by a Chinese company called Shanghai Bi Ke Clean Energy Technology Co. Ltd. (commonly called “CECC”). Most shares (45%) of CECC are owned by the Chinese Academy of Sciences Holdings Co. Ltd. (CASH), which is a state-owned company and the investment management arm of the Chinese Academy of Sciences, a Chinese government agency. The other significant (44%) shareholder in CECC—called Double Green Bridge Hong Kong—appears to be composed of managers of CASH.² Moreover, Exhibit 2 (attached) makes clear that the Chinese Academy of Sciences is actually responsible for Northwest Innovation Works’ proposal. Exhibit 2 describes a meeting between the Governor of Washington and senior officials of the Chinese Academy of Sciences and CASH, as well as Northwest Innovation Works employees. The document strongly suggests that the Chinese Academy of Sciences controls the methanol proposal and merely “uses the dba of Northwest Innovation Works.” These and other circumstances suggest that the Chinese government has legal or actual control over Northwest Innovation Works.

Riverkeeper brings these facts to CFIUS’s attention because the transaction(s) that brought Northwest Innovation Works under foreign control may present national security considerations, within the meaning of Section 721(f) and the applicable guidance,³ as described below.

CFIUS review may be appropriate because foreign control of Northwest Innovation Works appears to have resulted from a “foreign government-controlled transaction” within the meaning of Section 721(f)(8). As explained by Section 721(a)(4), 31 C.F.R. § 800.214, and the guidance, a “foreign government-controlled transaction” occurs when a foreign government—or an entity controlled by or acting on behalf of a foreign government, including foreign government agencies and state-owned enterprises—acquires control of a U.S. business. As

¹ Pacific Standard, [Taxpayers may soon be on the hook for a \\$2 billion fracked gas refinery](#) (November 7, 2018).

² E&E News Energywire, [Enormous Northwest refineries would feed China exclusively](#) (November 17, 2015) (“Originally [CASH’s] partner was the oil company BP. Earlier this year, BP has sold its part to an investor group, called Double Green Bridge, made up of managers of CASH.”).

³ *Guidance Concerning the National Security Review Conducted by the Committee on Foreign Investment in the United States*, 73 Fed. Reg. 74567 (December 8, 2008).

explained above, the Chinese government, acting through the state-owned CASH (and perhaps other persons), appears to have gained control of the U.S. businesses Northwest Innovation Works. According to Section 721(b)(1)(B), if CFIUS “determines that the covered transaction is a foreign government-controlled transaction, the Committee *shall* conduct an investigation of the transaction” (emphasis added). Moreover, past practices of the foreign government at issue implicate national security considerations identified by Congress in the Foreign Investment Risk Review Modernization Act of 2018 (FIRRMA).⁴

CFIUS review also appears warranted because of the potential for foreign control of critical infrastructure, including a major energy asset, as well as the long-term impacts to United States sources of energy. *See* Section 721(f)(6) and (8). Methanol is a versatile, energy-dense product, similar in some ways to gasoline, but easier to distribute than LNG or natural gas. Some energy analysts even suggest transitioning away from crude-oil-derived transportation fuels and towards methanol made from natural gas and other sources. One or more large new sources of methanol could therefore legitimately be considered a “major energy asset” within the meaning of Section 721(f)(6). Additionally, Northwest Innovation Works would consume a regionally significant amount of natural gas; on a per-day basis, one third as much natural gas as the entire state of Washington—and the company has plans for several more similarly sized methanol export refineries. The natural gas consumption required for this and similar projects proposed by Northwest Innovation Works may have long-term impacts on U.S. energy resources. CFIUS has reviewed similar transactions that “involved U.S. businesses in the energy sector at various stages of the value chain: The exploitation of natural resources, the transportation of these resources (*e.g.*, by pipeline), [and] the conversion of these resources to power,” as well as transactions affecting “the nation’s transportation system, including maritime shipping and port terminal operations.”⁵ Northwest Innovation Works’ proposal implicates all of these concerns. As such, foreign control of the project may present national security considerations within the meaning of Section 721(f)(6) and (8), justifying CFIUS review.

The following Northwest Innovation Works officials may be subject to CFIUS’s jurisdiction and possess additional information about foreign control of Northwest Innovation Works: Simon Zhang (Chief Executive Officer); Murray “Vee” Godley III (Chief Development Officer); Kent Caputo (General Counsel); and Richard DeBolt (Director of External Relations).

⁴ [Foreign Investment Risk Review Modernization Act of 2018](#), H.R. 5515, Section 1702(c)(1) – (3) (“It is the sense of Congress that, when considering national security risks, the Committee on Foreign Investment in the United States may consider— (1) whether a covered transaction involves a country of special concern that has a demonstrated or declared strategic goal of acquiring a type of critical technology or critical infrastructure . . . [and] (3) whether any foreign [government] engaging in a covered transaction with a United States business has a history of complying with United States laws and regulations”).

⁵ 73 Fed. Reg. 74567, 74570.

Riverkeeper has little connection to matters of national security but, after becoming aware of the facts and law described above, presents this information to CFIUS out of an abundance of caution. Riverkeeper understands that CFIUS review is typically initiated by a voluntary disclosure, but CFIUS may request information or unilaterally initiate review of any covered transaction, even after that transaction has been concluded.⁶ Please do not hesitate to contact me if Riverkeeper can be of further assistance.

Sincerely,



Miles Johnson
Senior Attorney
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miles@columbiariverkeeper.org

Exhibits:

1. Jacobs Engineering Inc., *Independent Engineers Report for Kalama Methanol Plant* (January 8, 2016) (excerpt).
2. Briefing Memo to Governor Inslee, *Meeting with Representatives of the Chinese Academy of Sciences* (February 12, 2015).

Cc'd via email or U.S. mail:

- Secretary Steven Mnuchin, Department of Treasury
- Attorney General William Barr, Department of Justice
- Acting Secretary Kevin McAleenan, Department of Homeland Security
- Secretary Wilbur Ross, Department of Commerce
- Acting Secretary of Defense Patrick M. Shanahan, Department of Defense
- Secretary Mike Pompeo, Department of State
- Secretary Rick Perry, Department of Energy
- Trade Representative Robert E. Lighthizer, Office of the U.S. Trade Representative
- Director Kelvin Droegemeier, Office of Science & Technology Policy
- Director Mick Mulvaney, Office of Management & Budget
- Senator John Cornyn
- Senator David Perdue
- Senator Tim Scott
- Senator Michael Crapo
- Steven Taracevicz, Satori Partners, Inc.
- media outlets

⁶ Section 721(b)(1)(D)(i); *see also* 31 C.F.R. § 800.401(b), (c); *see also* 73 Fed. Reg. 74567, 74569.



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A plan to build a natural gas–fueled petrochemical plant in Kalama, Washington, ran into a new legal hurdle last week, as a coalition of environmental groups raised new objections to its construction.

The Port of Kalama methanol plant, if built on the Columbia River between Washington and Oregon, would expand North America’s capacity to export products produced by fracked shale gas wells, and is part of a [\\$5.2 billion](https://www.seattletimes.com/business/international-trade/china-staking-52b-methanol-venture-in-state/) (<https://www.seattletimes.com/business/international-trade/china-staking-52b-methanol-venture-in-state/>) plan to develop methanol plants in this corner of the Pacific Northwest. It has applied for funding from a controversial Department of Energy “Advanced Fossil Energy Projects” program — an \$8.5 billion fund offering taxpayer subsidies to the fossil fuel industry.

In July, the Port of Kalama applied for an \$11.5 million U.S. Department of Transportation grant to fund building a dock and improving roads to support the methanol project. On September 16, the Port applied for an additional round of subsidies for the export project, a Port Infrastructure Development Grant.



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If built, the methanol refinery, the environmental organizations wrote, “would consume more fracked gas than all the power plants in Washington state combined” and “would become one of the top causes of greenhouse gas pollution in Washington state.” It would be used to transform raw materials from shale wells in



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The groups also questioned whether the U.S. government should offer any federal subsidies to a project linked to a foreign government.

“The Port is, essentially, asking the American taxpayer to give a private company called Northwest Innovation Works [NWIW] a \$11.5 million handout,” the groups wrote in a separate letter to Secretary of Transportation Elaine Chao. “That company is wholly owned by the Chinese Academy of Sciences, an agency of the Chinese government.”

Officials from NWIW disputed the letter's characterization of ownership, saying that the project involved investment from other organizations.

In an interview, NWIW also disputed the notion that the firm would be the only beneficiaries of the port's improvements, saying that improvements included a road that would be open to the public and that other port customers would be able to use the dock as well. “The claim there, I think is at best an exaggeration,” a spokesperson told DeSmog.

The Port of Kalama did not immediately respond to a request for comment.



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From the cover of the final supplemental environmental impact statement for the Kalamazoo methanol facility. Credit: [Kalamazoo SEIS](https://kalamamfgfacilitysepa.com/)
 (<https://kalamamfgfacilitysepa.com/>)

“As the draft [Department of Energy (DOE)] presentation outlines, the Chinese government is one of the principle backers of NWIW,” Pacific Standard [reported](https://psmag.com/environment/taxpayers-may-soon-be-on-the-hook-for-2-billion-fracked-gas-refinery) (<https://psmag.com/environment/taxpayers-may-soon-be-on-the-hook-for-2-billion-fracked-gas-refinery>) in 2018, in an article about the company's \$1.8 billion federal loan guarantee application. “The majority shareholder in Shanghai Bi Ke Clean Energy Technology is the Chinese Academy of Science Holdings, which the DOE presentation describes as a 'wholly owned state company.' In other words, a significant portion — if not the majority — of NWIW will be owned by the Chinese government, while the risk of financing its construction could be put on U.S. taxpayers.”



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sense because the American taxpayer would assume all of the risk.

Throughout his time in office, President Trump has pursued an aggressive trade war against China — a trade war that has recently been [faulted](#) (<https://www.washingtonpost.com/business/2019/10/01/trump-is-heading-into-re-election-with-deep-manufacturing-recession/>) for driving U.S. manufacturing to a 10 year low in September.

Without expressing a position on the wisdom of the trade war itself, the groups argued that approving the grant would create a situation where the left hand of the federal government was undoing with subsidies what the right hand had done with tariffs.

“A country that cheaply sells off its natural resources, only to buy back expensive goods manufactured elsewhere using those same resources, is unlikely to create a trade surplus,” Columbia Riverkeeper senior attorney Miles Johnson wrote. “If cheap methanol from Kalama is used to manufacture plastic and other products in China, many of those relatively expensive, value-added products would find their way back to China’s primary export market: America.”

'A Carbon Bomb'

The impacts to trade would be in addition to the climate change implications of going forward with the project.

“The proposed Kalama methanol refinery is a major carbon bomb that would lock Washington into decades of fossil fuel use when the state is vigorously moving in the direction of clean energy,” attorneys for EarthJustice wrote. “It is also a project designed to produce more plastic, at a time when plastic garbage is choking our oceans and shorelines.”


In April, an [OPB investigation](#) (<https://www.opb.org/news/article/methanol-plant-kalama-fossil-fuel-china/>) found that NWIW had suggested to investors that methanol could be




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In May, Gov. Jay Inslee [announced \(https://tldr.com/news/local/inslee-changes-tune-opposes-kalama-methanol-project/article_5b1bbb68-e303-5e94-97f0-e54b29fe1662.html\)](https://tldr.com/news/local/inslee-changes-tune-opposes-kalama-methanol-project/article_5b1bbb68-e303-5e94-97f0-e54b29fe1662.html) that he could no longer “in good conscience” support construction of the plant.




Governor Jay Inslee ✓ @GovInslee · May 8, 2019 

Replying to @GovInslee

We've always leaned on science to guide our efforts on [#climatechange](#). The accelerating threat and the emerging science on the damaging impacts of natural gas mean we must focus our efforts on developing clean, renewable, fossil-fuel free energy sources.






Inslee announces opposition to two gas proj...
Gov. Jay Inslee today signed a bill banning hydraulic fracking for oil and natural gas ...
governor.wa.gov



Governor Jay Inslee ✓
@GovInslee

Being committed now to [#100percentclean](#) electricity and signing a bill prohibiting fracking in WA, we want to be consistent to a spirit of progress. I cannot in good conscience support construction of a liquefied natural gas plant in Tacoma or a methanol facility in Kalama.

5:24 PM · May 8, 2019 

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 See Governor Jay Inslee's other Tweets

Climate change is at the center of a larger controversy over Department of Energy funding for fossil fuel projects at a time when the [United Nations warns that the world has just 11 years \(https://www.theguardian.com/environment/2018/oct/08/global-warming-must-not-exceed-15c-warns-landmark-un-report\)](https://www.theguardian.com/environment/2018/oct/08/global-warming-must-not-exceed-15c-warns-landmark-un-report) left to take action to avoid catastrophic harms from a warming climate.



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[advance \(https://www.govtrack.us/congress/bills/116/hr2740\)](https://www.govtrack.us/congress/bills/116/hr2740) in the Senate.

In May, a coalition of 143 environmental groups had [signed onto a letter \(https://www.foodandwaterwatch.org/sites/default/files/organizational_sign_on_letter_opposing_dept_of_energy_backing_petro_hub-2.pdf\)](https://www.foodandwaterwatch.org/sites/default/files/organizational_sign_on_letter_opposing_dept_of_energy_backing_petro_hub-2.pdf) to Congress expressing opposition to Title XXVI funding for a [different petrochemical project \(https://www.prnewswire.com/news-releases/adg-invited-to-submit-part-ii-application-for-19-billion-in-loan-guarantees-under-does-title-xvii-loan-guarantee-program-300577137.html\)](https://www.prnewswire.com/news-releases/adg-invited-to-submit-part-ii-application-for-19-billion-in-loan-guarantees-under-does-title-xvii-loan-guarantee-program-300577137.html), the Appalachian Storage Hub.

A third petrochemical project, the Lake Charles Methanol plant in Lake Charles, Louisiana, was [offered \(https://www.energy.gov/lpo/articles/lpo-announces-first-ever-conditional-commitment-offer-advanced-fossil-project\)](https://www.energy.gov/lpo/articles/lpo-announces-first-ever-conditional-commitment-offer-advanced-fossil-project) \$2 billion in Department of Energy loan guarantees in December 2016. That \$4.4 billion project, not yet under construction, would turn petcoke ([a residue \(https://www.energy.gov/sites/prod/files/2013/05/f0/EIS-0464-DEIS-2013.pdf\)](https://www.energy.gov/sites/prod/files/2013/05/f0/EIS-0464-DEIS-2013.pdf) from refining petroleum) from the Gulf Coast to methanol and use carbon capture and sequestration.

The Lake Charles project, according to its website, would [enable the production \(https://www.lakecharlesmethanol.com/\)](https://www.lakecharlesmethanol.com/) of 4.5 million barrels a year of U.S. oil, using the carbon “sequestered” from the refinery to pump more oil out of the ground. In announcing the loan, the Department of Energy said the Lake Charles project would produce roughly a third less greenhouse gases throughout its lifecycle than a “typical” methanol plant.

In a separate September 27 letter to the Department of Energy, the same environmental groups argued that the Kalama methanol project should not be eligible for the Energy Department's Title XXVI funding because it is “intended for plastics production, not energy,” and because it will not reduce greenhouse gas emissions.

Main image: Proposed site of the Kalama methanol facility. Credit: [Port of Kalama \(https://portofkalama.com/methanol-manufacturing-facility-fseis-released/\)](https://portofkalama.com/methanol-manufacturing-facility-fseis-released/)