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Curb Petrochemicals to Unlock a Full Fossil Fuel Phaseout

Ethylene glycol plant area of Sinopec Shanghai Petrochemical Co., Ltd. in east China.

Introduction

Global economic dependence on fossil resources extends beyond their use as fuels to their use in chemicals and other products. As Adam Hanieh writes, petrochemicals are "the means through which oil has become woven into the very fabric of our social existence, yet this ubiquity has made them almost invisible to our everyday consciousness."[1] Moreover, devastating conflicts highlight time and again the world's dependency on fossil fuels. The volatility and unreliability of fossil fuels not only affect energy supply and oil prices but also have crippling effects on petrochemicals products, impacting global food systems and trade.[2]

It is true that petrochemicals are sewn into nearly everything around us — from the fertilizers that go into our food, to our textiles, to our everyday packaging. We use them for medical products, and they are built into the technological infrastructure that powers even our renewable future. Yet what if this "fabric" is not clothing us, but suffocating us? What if the threads that hold much of our modern world together are poisoning us and unraveling at their seams?

The global effort to phase out fossil fuels has, until now, primarily focused on the decarbonization of electricity generation and transport. The term "fossil fuel" itself is incomplete; it obscures the role of oil, gas, and coal as foundational feedstocks for synthetic materials. Understanding this "non-fuel" sector is essential to challenge the industry's primary area of expansion (including, notably, the expansion of petrochemicals into fuel applications) and dismantle the narratives sustaining continued extraction. Left unchecked, petrochemicals present a growing obstacle to a swift and just phaseout of fossil fuels.

This paper will demonstrate four key points about why petrochemicals must be part of the discussion for a truly fossil-free future:

i. Petrochemicals are an actively expanding fossil economy sector that presents a significant lock-in risk for future fossil fuel use.

ii. Petrochemicals are the fossil fuel industry's contingency strategy to remain expansionary and relevant.

iii. The fossil fuel industry uses petrochemicals to delay the phaseout and such false narratives must be challenged in order to establish the conditions for a full transition.

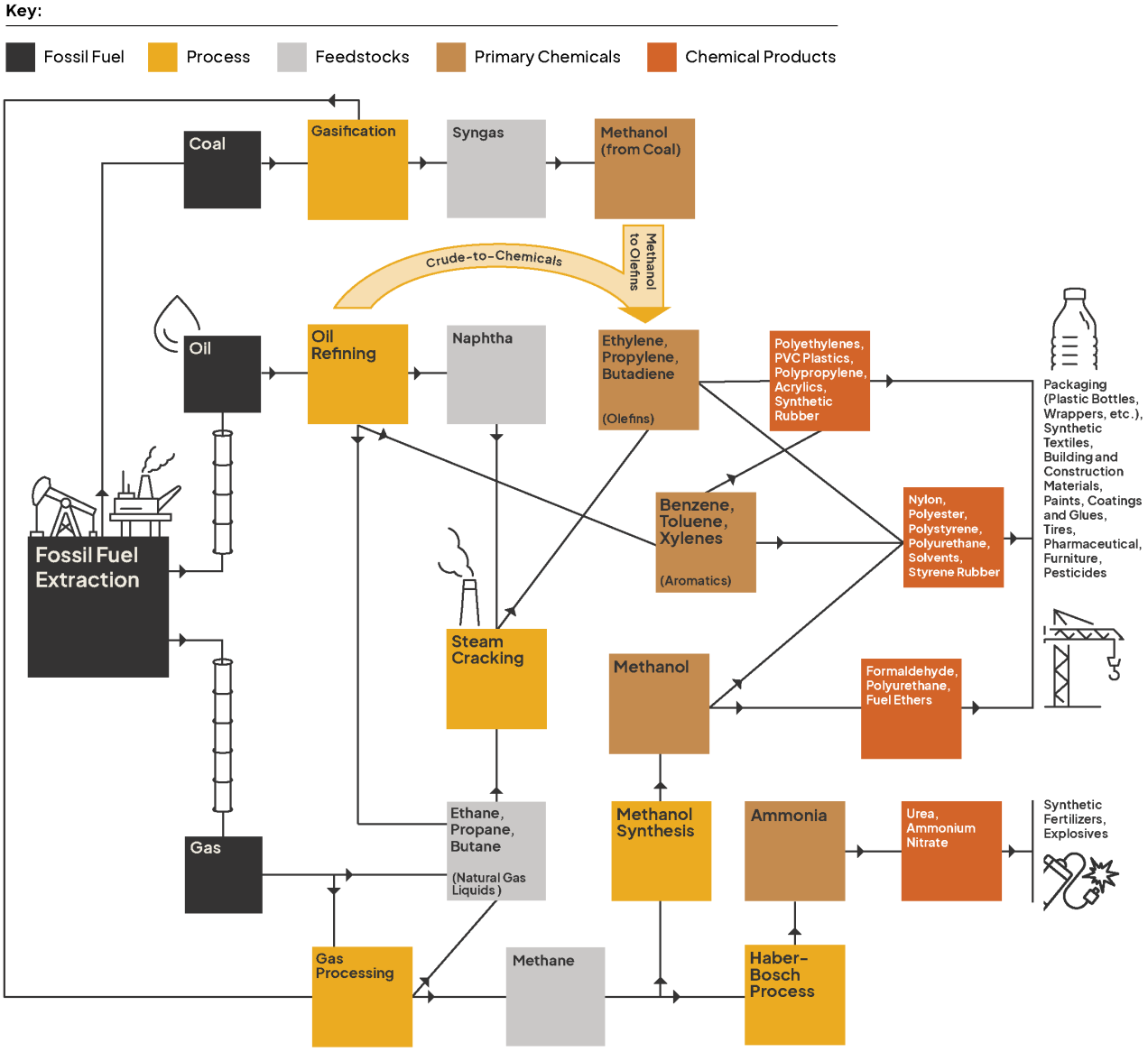
iv. There are unique opportunities to counter petrochemical expansion narratives, including protecting human health and ensuring a just transition.

What Are Petrochemicals?

For fossil fuel phaseout strategies to be successful, they must contend with this large and growing share of fossil hydrocarbon use devoted to petrochemicals. Petrochemicals are chemicals derived from fossil hydrocarbon feedstocks, primarily from oil and gas (petroleum), though coal remains a significant input.[3] Seven major petrochemicals — ethylene, propylene, benzene, toluene, xylene, methanol, and ammonia[4] — feed into a wide array of materials, including plastics, fibers, detergents, explosives, and fertilizers.[5] Despite the large diversity of products, about three-quarters of petrochemical production (by volume) is dedicated to plastics (including synthetic fibers) and nitrogen fertilizers.[6]

From Extraction to Pollution: The Toxic Life Cycle of Petrochemicals

From fossil fuels to everyday products — uncovering the hidden presence of petrochemicals in our lives.



Source: CIEL analysis, simplified diagram, data derived from: https://www.pushbackagainstpetrochemicals.org/intro-to-petrochemicals, https://www.breakfreefromplastic.org/winter-is-coming/, https://www.petrochemistry.eu/wp-content/uploads/2023/02/Petrochemistry-FlowChart2022_V06-FINAL.pdf, https://www.britannica.com/science/petrochemical.

The dominance of petrochemicals today is rooted in a century-long transformation. Since the early twentieth century, oil, gas, and coal have evolved from energy sources to become central to industrial production. Initially rooted in coal-based chemistry in Germany, their dominance was reconfigured by a "petrochemical revolution" during World War II. This evolution established oil and gas as essential inputs for the chemical industry — as well as irreplaceable wartime inputs for explosives, synthetic rubber, and aviation fuels — and solidified the United States (US) as a hegemonic chemical power.[7] In recent decades, China has also expanded its production capacity to become the largest producer of petrochemicals.[8]

As of 2018, when the International Energy Agency (IEA) published comprehensive figures, petrochemicals accounted for fourteen percent of oil, eight percent of gas, and one percent of global coal consumption.[9] In recent years, petrochemical feedstock use has accounted for almost all of oil demand growth, comprising 15.8 percent of oil demand in 2024 with the IEA projecting demand will increase to 17.4 percent by 2030.[10] The rapid growth of petrochemicals as a component of oil and gas markets is comparatively new and driven by plastics. The production of plastics has increased globally by more than tenfold since 1970, growing nearly sixty percent faster than global gross domestic product (GDP).[11] During this same period, the production of ammonia — a key primary chemical and the chemical base of all nitrogen fertilizers — saw a more modest increase of 3.7 times.[12] Looking ahead, however, ammonia is poised for a massive expansion — one driven less by agricultural demand than by speculative uses, cheap gas access and carbon capture subsidies in the US.[13] By contrast, global oil production has only nearly doubled since 1970[14] while gas production has just over quadrupled.[15]

This results in a sector of the fossil economy responsible for enormous greenhouse gas emissions and toxic pollution. One estimate of the greenhouse gas impact of the petrochemicals industry found petrochemicals production directly responsible for four percent of global emissions.[16] When emissions from inputs to petrochemical production (most notably fossil fuels themselves) were included, the estimate rose to ten percent.[17] The true impact is even greater, as petrochemicals have a significant downstream greenhouse gas impact as well: seventeen percent of plastic waste is estimated to be incinerated,[18] releasing carbon dioxide when burned. Moreover, nitrous oxide, released from field application of nitrogen fertilizer, may account for over one percent of global greenhouse gas emissions as well.[19]

Petrochemicals pollute at every stage of their supply chain. This includes pollution from fossil fuel extraction; pollution released during refining and manufacturing; toxic additives in plastic consumer products, pesticides, or fertilizers,[20] and waste disposal or escape into the environment.[21] These harms are also not isolated, but compound and exacerbate each other, especially in petrochemical hotspots, where a combination of intense industrial clustering, climate impacts, and water pollution can converge.[22]

I. Petrochemicals Drive Fossil Fuel Demand Growth and Lock-in.

Petrochemicals are a key driver of fossil fuel demand growth, effectively anchoring the industry's future even as other sectors transition away from fossil fuels. This central role is underscored by the IEA 2025 *World Energy Outlook*, which highlights that under the Current Policies Scenario (CPS), where no additional policy action is taken to curb fossil fuel consumption, oil use for petrochemical feedstocks and industrial activities will represent among the largest demand increases through 2035.[23] Even when accounting for announced climate pledges, the IEA projects that a surge in petrochemical production, as well as growth in aviation and other industrial activities, will more than offset the reductions achieved in power and passenger vehicle sectors.[24] Critically, when accounting for total energy consumption, not just as feedstock, in its current policies, stated policies, and net zero scenarios, the IEA projects the chemicals sector will increase energy demand by 2035 by more than any other industrial sector, shipping, aviation, or residential buildings.[25] As a result, progress in greening the energy grid and electrifying transport risks being cannibalized by an expanding chemical sector.

This growth is already manifesting in a massive build-out of petrochemical projects across the globe. Despite the challenge to get credible and comprehensive counts of projects, multiple trackers indicate significant expected growth. An October 2025 industry analysis, for example, estimated 127 polyethylene projects will come online between 2025 and 2030.[26] This would create a physical "lock-in" of fossil fuel demand. In the US alone, an analysis by the Center for International Environmental Law (CIEL) indicated that the emissions of over 100 planned projects could increase the country's already-substantial emissions by 2.4 percent.[27] What's more, coal-to-chemicals projects are proliferating, with forty-seven planned globally.[28] This infrastructure represents a critical barrier to phasing out fossil fuels because these projects require high-volume fossil fuel inputs to remain profitable, forcing continued dependence for decades to come.

II. Petrochemicals: The Fossil Industry's 'Plan B'.

Petrochemicals are not just a general growth area for fossil fuel companies, but rather the industry's lifeline — a deliberate and pivotal strategy to ensure that even as the world stops burning fossil fuels for transportation and energy, it remains dependent on fossil resources for materials.

This pivot has been openly discussed for years. In 2018, Chief Executive Officer (CEO) of TotalEnergies, Patrick Pouyanné, remarked that thanks to plastic "the oil industry still has a bright future ahead of it."[29] In 2025, Exxon Mobil CEO Darren Woods noted that the oil and gas industry will play a critical role for a long time to come, but that they may continue to be used as materials rather than fuel.[30] Likewise, Saudi Aramco is deliberately expanding its own chemicals capacities, with several projects and a "goal to increase its capacity in petrochemical producing complexes to up to four million barrels per day by 2030."[31]

To take advantage of petrochemical production as its contingency plan, the fossil fuel industry is reconfiguring its assets, particularly in oil refining with greater crude-to-chemicals integrations. According to Wood Mackenzie, "more than 30% of the world's refineries are now integrated with commodity petrochemicals."[32] The interest in further crude-to-chemicals integration is noted by both industry analysts[33] and oil companies themselves.[34] This crude-to-chemicals integration creates a more entrenched fossil economy capable of surviving the global transition away from a fossil fuel-based energy system.

We are also seeing an entirely new infrastructure and supply chain emerge for trading ethane (used to produce ethylene for plastic) globally. Fracking in the US has created a surplus of ethane that led to a dramatic expansion of domestic production capacity,[35] and that suppliers started shipping overseas in 2016.[36] In the past decade, ethane exports from the US alone have grown to approximately half a million barrels per day,[37] further ensuring that fossil feedstocks remain integral to the global economy despite the energy transition.

III. False Narratives Impede the Phaseout of Fossil Fuels.

Petrochemical companies often present narratives that position their fundamentally fossil-fuel-based products as part of the transition away from fossil fuels — conflating the source of the problem with its solution. As Tilsted and Bauer describe, petrochemical companies present themselves as "realizers of sustainability" by promoting the comparative environmental benefits of their products, as "breakthrough technology pioneers" who hold the keys to the new technologies and materials that will enable a sustainable future, or as "already well underway" companies that are already transitioning and even leading the way.[38]

LG Chem Ltd. plant in Yeosu, South Korea.

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However, several of the largest petrochemical companies are owned by or operating as a part of major oil companies that have incorporated petrochemicals into their corporate structures.[39] This deep integration suggests that — despite capitalizing on sustainability narratives — the sector itself is resistant to transitioning from fossil fuels, especially as existing assets and infrastructure, as well as corporate connections and relationships, help "maintain and reproduce commitments to fossil fuels."[40]

The future of the chemicals sector itself is currently the subject of debate, and therefore susceptible to being overlooked. Proposals for decarbonization, defossilization, and detoxification compete, complement, and overlap. From the perspective of a fossil fuel phaseout, all fossil fuel inputs into petrochemical production — as both a feedstock and an energy source — need to be eliminated and not repurposed or rebranded.[41]

For example, presenting ammonia with carbon capture ("blue ammonia") as a potential 'zero-carbon' fuel for shipping provides cover for the maintenance and expansion of fossil infrastructure.[42] Despite being a dangerous fossil-based chemical,[43] shipping companies are increasingly ordering "ammonia-ready" vessels[44] — ships that currently run on fossil fuels, but could use ammonia as fuel in the future. One company describes how its ammonia-ready ship is the next stage in the "bridge solution" to zero-emission vessels.[45] A liquified natural gas (LNG) import terminal recently approved in Germany uses the same theory of ammonia-readiness to justify building new fossil fuel infrastructure that will one day be turned over for ammonia use.[46]

Ammonia itself is being proposed directly for power generation, particularly in Japan and Korea, where plans involve co-firing ammonia with coal as an alleged means of reducing emissions from coal plants without retiring them.[47] This remains a nascent technology, unproven at commercial scale and unlikely to yield any climate benefits.[48] Moreover, incorporating ammonia into coal power plants could prolong their lifespan, further delaying the transition to renewable energy.[49]

In summary, as Tilsted and Bauer note, "[d]espite relying on fossil feedstock and being solidly placed in the fossil economy, petrochemical majors increasingly focus on repositioning themselves proactively as transition enablers. The argument illustrates the work of downstream actors to legitimize the existing energy order."[50] This framing of petrochemicals as central to the energy transition (rather than a target of the fossil fuel phaseout) attempts to impede the imagination of alternative, more transformative changes.

IV. Opportunities to Curb Petrochemical Expansion

While petrochemicals present an obstacle to fossil fuel phaseout, they also offer a strategic lever. It took the climate movement far too long to recognize that we cannot solve the problem of emissions without turning off the tap and leaving fossil fuels in the ground. We cannot afford more delay and deception. For an honest conversation on a just transition away from fossil fuels, petrochemicals need to be part of the story.

Below are five strategic angles to limit the expansion of the petrochemicals sector and accelerate the overall phaseout of fossil fuels.

Financial Strain: Over the past decade, companies have overbuilt plastics production capacity, leading to low-capacity utilization rates, slim margins, and plant closures.[51] Proposed projects are on shaky foundations and should not be considered a done deal. This financial strain provides a strategic entry point for managed decline pathways.

Market Uncertainty: Similarly, the massive proposed build-out of the ammonia industry — driven in large part by access to gas and carbon capture subsidies in the US[52] — can be prevented before facilities are constructed and production is locked in. The major new market for this ammonia — as an alternative shipping fuel — simply does not yet exist.[53] The entire edifice of a new market for fossil-based ammonia can be challenged and discredited, undermining a huge source of growth for the industry.

Greenwashing: Discrediting the false narrative of petrochemicals as 'clean' energy — or as key to the transition — can help prevent lock-in of petrochemical production and fossil infrastructure. The companies behind LNG projects and coal plants claim that fossil infrastructure is consistent with climate-compatible pathways to justify their continued operation. Eliminating this greenwash will not on its own force the phaseout but will preclude one of the chief ways fossil interests escape from transition pressure.

Human Health Impacts: Since the health impacts of fossil fuel production and use[54] are increasingly understood as both important problems to solve on their own and inextricably linked to climate action, the same is true of their petrochemical progeny. Petrochemicals present a massive threat to public health, with estimates of the health costs of chemicals in plastics[55] and nitrogen pollution[56] in the hundreds of billions or trillions of US dollars annually. Including a lens on the health harms of petrochemicals can magnify the salience and impact of interventions to protect health, establish liability, and build public pressure and political accountability.

A Just Transition: Petrochemicals are a key driver of fossil fuel growth, yet they have been vastly absent from the conversation on fossil fuels overall, and on phaseout in particular. At the same time, without pursuing a carefully managed transition away from petrochemicals, rapid and disruptive successes in fossil fuel phaseout could have unintended consequences elsewhere in the economy. We must grapple with petrochemicals as an essential part of the fossil fuel phaseout, while also considering the deep systemic transformations that must be at the heart of any just transition happening at

a speed and scale commensurate with human rights and global welfare. Managed decline and transition pathways must both disrupt global systems *and* protect the people who depend on them. For example, the food system alone accounts for at least fifteen percent of fossil fuel and forty percent of petrochemical consumption,[57] and must be reimagined in ways that protect the right to food while sunsetting linear consumption and disposal economies dependent on plastic, especially single-use plastic.

The scale of transformation needed to untangle fossil fuels from our social fabric is massive, but curbing petrochemical expansion and production presents a strategic lever to advance the phaseout at a pivotal moment. Only when the petrochemical sector is included in fossil fuel discussions and phaseout plans can we uproot the fossil economy in earnest and entirely, offering a pathway to a vibrant, just, peaceful, and regenerative future.

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