Briefing on Chemical Conversion Legislation and Facilities

Introduction

Our planet has a plastic problem. Plastic production has increased dramatically worldwide over the last 60 years, passing from 0.5 million tons/yr. in 1960 to almost 300 million tons in 2013 (1). Of all the plastic produced since 1950, 91% has never been recycled (5). The reality is that most of the plastic produced in the United States cannot be recycled and it will ultimately end up in landfills, incinerators, or as pollution in natural areas. As a result of increased awareness of plastic pollution, the plastic and fossil fuel industries are facing growing market constraints and widespread consumer backlash (5). Rather than reduce plastic production, these industries are lobbying for "quick and easy" fixes to address the steadily growing amount of plastic waste. One such fix is chemical conversion.

Overview of Chemical Conversion

- Chemical conversion, also referred to as chemical recycling or "advanced" recycling, encompasses several processes that use heat or catalysts and chemical solvents to turn plastic waste into fuels or reclaimed resin to make new plastic (2). On the most elementary level, the process involves putting shredded waste plastics into an oxygen-free vessel that is then heated until the plastic melts and vaporizes (7).
- Traditional recycling involves transforming used plastics into new plastic products, but chemical conversion includes both plastic-to-plastic (PTP) and plastic-to-fuel (PTF) conversion; with most chemical conversion facilities producing fuels rather than new plastic (5).
- Although the term recycling should only refer to processes that turn plastic back to plastic, the plastic and fossil fuel industries have popularized terms such as chemical recycling or "advanced recycling" that falsely portray PTF conversion as a recycling solution (5). The European Union strictly defines recycling as a recovery operation by which waste materials are reprocessed into products, materials, or substances; and it does not include energy recovery or reprocessing materials into fuels (6). PTF conversion is not considered a true form of recycling because it does not produce new plastic or avoid the environmental harms of plastic production (5).

Chemical Conversion Facilities

- Since 2000, at least 37 chemical conversion projects have been announced in the United States. Most of these projects are still under development, with 14 as mere announcements and 11 at a pilot stage or under construction (5). Only 3 facilities Agilyx, Brightmark, and New Hope Energy, are currently commercially operational.
- Brightmark and New Hope Energy are PTF projects that convert plastics to fuels and do not produce new plastic (5). Agilyx is considered a PTP facility but most of its output is sent for combustion in cement kilns, implying that the recycled products Agilyx produces are either too contaminated or of too low quality to be turned back into plastic (5). In 2016,

Agilyx processed 641 tons of polystyrene, but considering the United States generates 560,000 tons of plastic waste every year, 875 of these facilities would be required to tackle all of the plastic waste produced (6).

- Based on public information, not one of the 37 chemical conversion projects announced in the last 20 years have been proven to successfully recycle plastic at a commercial scale (5).
- Considering these projects are mostly plastic-to-fuel facilites and none of them have successfully produced new plastics, they are far more similar to incinerators than recycling institutions. Like incinerators, they simply break down plastics into harmful waste materials while dramatically increasing the climate impact of plastic disposal (5).
- In 2019 alone, the global production and incineration of plastic accounted for more than 850 million metric tons of greenhouse gases released to the atmosphere, roughly equivalent to the emissions of 189 coal power plants (5). With incineration being the primary source of greenhouse gas emissions in the management of plastic waste, plastic disposal PTF facilites are not the solution to our plastic problem (5).
- Reducing the amount of plastic produced and transitioning to zero waste systems would be far more beneficial than wasting time and resources on incinerators disguised as recycling plants.

<u>Environmental Implications of Chemical Conversion</u>

- Due to the scarcity of fully operational chemical conversion facilities, there are essentially no outside peer-reviewed studies of chemical conversion facilities to fully assess the environmental impacts of PTF processing and its end products (4, 5). Of the three operating facilities in the US, environmental review documents are only available for Agilyx and Brightmark.
- In 2019 alone, the global production and incineration of plastic accounted for more than 850 million metric tons of greenhouse gas emissions, roughly equal to the emissions from 189 five-hundred-megawatt coal power plants (5).
- The process of converting plastic waste to fuel during PTF chemical conversion increases the climate impact of plastic disposal, as it releases carbon stored in the plastic into the atmosphere and requires considerable energy throughout the process, energy that is supplied by burning fossil fuels (5).
- Of the few operational chemical conversion facilities, the Agilyx project in Tigard, Oregon has a huge carbon footprint. In 2018 and 2019, for every 1 kilogram of plastic Agilyx produced, it emitted 3.23 kilograms of carbon dioxide, not including the emissions from burning the styrene itself (5).

<u>Health & Safety Implications of Chemical Conversion</u>

- To make plastic products pliable, flame retardant, durable, and non-reactive to certain oils and chemicals, their polymers are combined with additives such as oxygen, nitrogen, chlorine, fluorine, or silicon some of which are known to be harmful to human health (5).

These additives are filtered out during the chemical conversion process risking exposure to workers, communities near facilities, consumers, and the environment (5).

- PTF facilities operate similarly to other industrial facilities that release toxic emissions, produce toxic waste materials, and in some operations, pose a danger to the community from explosion or catastrophic toxic chemical releases. PTF facilities and cement kilns have lower reporting requirements for emissions than other burn facilities, such as coal plants and incinerators, and are often not required to notify nearby communities when emissions occur (5).
- For example, in 2018 the Agilyx facility sent over 49,000 tons of waste styrene, a highly toxic chemical, to burn in cement kilns located in low-income and people of color communities across the country (5). Persistent organic pollutants such as dioxins, heavy metals, and particulate matter are common pollutants emitted from cement kilns; and yet cement kilns have lower reporting requirements for emissions than other burn facilities and are often not required to notify nearby communities when emissions occur (5).
- Additionally, many chemical conversion facilities are being constructed in existing petrochemical corridors, threatening to increase toxic pollution in environmental justice communities (5). Already, 80% of chemical conversion facilities are in low-income communities and communities of color (3).

<u>VA Legislation Regarding Chemical Conversion Facilities</u>

- The American Chemistry Council and the plastics industry has lobbied heavily for legislative and administrative policy changes in 15 states, including Virginia, that reclassify pyrolysis facilities as manufacturing facilities and create markets for non-recyclable plastics that really should be eliminated from the waste stream to make waste management systems truly zero waste (4). By reclassifying chemical conversion projects as manufacturing facilities, these plants will have reduced regulatory oversight compared to other waste-generating facilities (3).
- Virginia Senate Bill 1164 (SB1164), enacted on March 25, 2021, provides that chemical conversion shall not be considered solid waste management. SB1164 gives chemical conversion facilities an exemption from Virginia's Solid & Hazardous Waste law and will hold chemical conversion facilities to less regulation than municipal landfills, coal ash facilities, and similar pollution producers (3).
- The VA Department of Environmental Quality has refused to respond to several inquiries asking for clarification on whether the bill exempts chemical conversion facilities from needing a waste permit from the state to operate (7).

<u>Remaining Questions & Proposed Action</u>

1. This process is referred to as recycling, but how much material is recovered that can be recycled per 10 kilograms of plastic waste processed?

2. How much of the plastic waste processed is produced in the form of fuel (liquid or gas)? What is the yield in terms of gas that can be used to generate electricity? It is worth it?

3. How much of the fuel produced in the chemical conversion process is burned to facilitate the conversion/recycling process? Include all fuel needed to run the entire conversion plant, including lighting, HVAC, office space and office equipment such as phones, computers, etc. Again, how much electricity is wasted to create new recycled plastic?

4. What are the net carbon emissions associated with this process? What are the greenhouse gas emissions associated with the burning of fuel required to drive the chemical conversion process? What toxic gases and particulate matter will be released during the pyrolysis process when heating, melting, and burning plastic waste, including start-up and shut down of the facility or equipment? What are the additional environmental impacts of shipping waste to cement kilns for burning? What is contained in the solid or liquid waste product? Ash? Oils? Gases? How toxic are these materials? How will this waste matter be disposed of? Am an extra-thick industrial landfill liner will be required to protect underlying soil and groundwater due to the toxicity and weight of the waste materials. What are the costs for necessary landfill modifications? Or will the waste need to be shipped to landfills that have the necessary protections?

5. Will the business be self-sustaining and profitable, or will it require funding and subsidies? Have there been any fully successful similar operations in the United States?

6. How will the gases/fuel created be shipped to the incineration site? Will pipelines be requested?

7. Why won't the Virginia Department of Energy issue regulations or answer questions about the environmental impact of reclassifying this process from waste management to manufacturing?

References

1. Avio CG, Gorbi S, Regoli F. 2017. Plastics and microplastics in the oceans: from emerging pollutants to emerged threat. Marine Environmental Research 128:2–11.

2. Brock, J., Volcovici, V., & Geddie, J. (2021, July 29). *The Recycling Myth; Big Oil's Solution for Plastic Waste Littered with Failure.* Retrieved from Reuters Investigates: https://www.reuters.com/investigates/special-report/environment-plastic-oil-recycling/

3. Duimstra, N. (2021, February 16). *Bill of the Day: Oppose Chemical Conversion (SB1164).* Retrieved from Virginia Conservation Network.

4. Global Alliance for Incinerator Alternatives. (2020, July 28). *US Legislation Alert: American Chemistry Council's Effort to Push "Plastic-to-fuel" Bills.* Retrieved from GAIA.

5. Patel, D., Moon, D., Tangri, N., & Wilson, M. (2020). *All Talk and No Recycling: An Investigation of the U.S. "Chemical Recycling" Industry.* Global Alliance for Incinerator Alternatives. Retrieved from https://www.no-burn.org/wp-content/uploads/All-Talk-and-No-Recycling_July-28.pdf

6. Tangri, N. (2021, July 29). Chemical Recycling - A Wolf in Sheep's Clothing . (B. Plastics, Interviewer)

7. Vogelsong, S. (2021, 01 25). *Lawmakers are considering adding 'advanced recycling' to state code. So what exactly is it?* . Retrieved from Virginia Mercury: https://www.virginiamercury.com/2021/01/25/lawmakers-are-considering-adding-advanced-recycling-to-state-code-so-what-exactly-is-it/