

Legislative Science and Technology Note

Chemical Recycling of Plastics and West Virginia

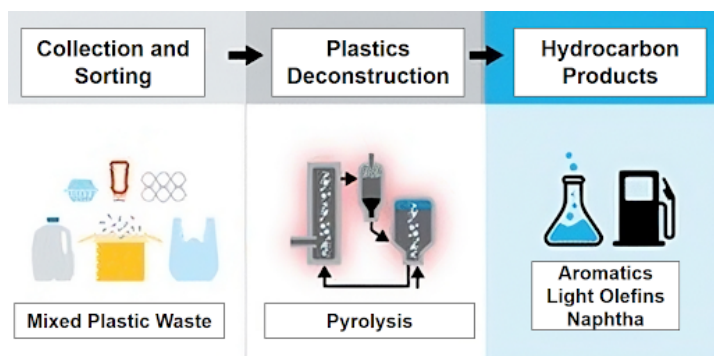
July 2024

Plastic waste is a growing problem for West Virginia and the world; global plastic waste is [on track to triple](#) by 2030. Plastics can take [thousands of years](#) to degrade, and release toxic chemicals that enter the [water, soil and ultimately, the food supply](#). Conventional plastic recycling (mechanical recycling) shreds high-quality used plastics and reforms them into new plastic products. In part because only the highest quality plastics can be mechanically recycled, [approximately 9%](#) of plastic waste is recycled annually.

Chemical recycling (also called advanced recycling or molecular recycling) refers to a number of technologies that use heat and chemical reactions to break used plastic down into fuels and the building blocks of new plastics. New efforts seek to commercialize chemical recycling of plastics as a complement to mechanical recycling. This Science and Technology Note considers existing chemical recycling policies, and opportunities and challenges for chemical recycling in West Virginia.

West Virginia Opportunities and Challenges

Chemical recycling seeks to produce fuels (plastic-to-fuel), chemicals, and new plastic components (plastic-to-chemicals) from existing plastic waste. It has the potential to give new life to plastics that can't be effectively recycled today. Unlike mechanical recycling, chemical recycling may be able to process different types of plastic waste (like water bottles, plastic films and packaging) together, presenting the potential to reduce plastic waste while providing jobs for West Virginians.



Modified from [Yadav Et. Al. \(2023\). Plastic-to-chemicals and fuel.](#)

Research Highlights

- Advanced (chemical) recycling has the potential to recycle plastics that can't currently be recycled. Two chemical recycling facilities are [planning to open](#) in West Virginia, providing employment opportunities for West Virginians. Tax incentives and laws classifying advanced recycling as manufacturing aided this development.
- West Virginia resident groups have formed to oppose the planned chemical recycling plants in their communities, expressing concerns about the effects of pollution on local communities and pointing to [similar project failures](#) and [accidents](#).
- Policy options include modifying the definition of advanced recycling to include mechanical recycling and to exclude plastic-to-fuels from the definition of advanced recycling.

In 2023, Clean-Seas announced plans to build a [\\$50 million plastics-to-chemicals \(pyrolysis, see next page\) facility in Quincy, West Virginia](#). The facility is expected to leverage more than [\\$12 million in state incentives](#) and create at least 40 full time jobs. Initially set to process 100 tons of plastic waste per day, Clean-Seas will create plastic components and fuels like hydrogen. Clean-Seas secured a [\\$15 million loan guarantee](#) from the West Virginia Economic Development Authority (WVEDA) in 2024. [Projected to begin operation in 2024](#), no construction announcements or updates were public as of July 2024.

In 2023, Empire Diversified, in partnership with WVEDA, announced a [\\$40 million pyrolysis plastics-to-fuel facility at the Port of West Virginia](#) in Follansbee which will supply fuels to a nearby port. The plant is expected to [directly employ 25 people](#). Some local residents formed the [Ohio Valley Environmental Advocates \(OVEA\)](#) to oppose the facility. OVEA is concerned about residents' health and [accidents](#) at similar facilities, especially in light of plans to chemically recycle PVC in Follansbee. Company spokesperson responded that the facility will operate within allowed emissions standards. The Follansbee facility is expected to [begin operation in July 2024](#) and aims to process 70 tons of waste per day.

The [most common](#) chemical recycling process is [pyrolysis](#): plastic waste is heated in the absence of oxygen, producing fuel and chemical products (see figure). The resulting pyrolysis oil, if treated, can be used to make new plastic components. However, due to impurities this oil can only substitute for part ([usually not exceeding 20%](#)) of the fossil-fuel derived feedstock when producing new plastic and fuel. Most chemically recycled plastic is [ultimately burned as fuel](#). Other chemical recycling processes include [solvolysis](#), [gasification](#), and [depolymerization](#), each with different pros and cons.

Barriers to commercial-scale chemical recycling [include](#) project [vulnerability to plastic contamination](#) and energy requirements. Advanced waste sorting and characterization technologies could [improve recycling efficiency](#). Plastic-to-fuel and chemicals applications are [more polluting on most measures](#), including carcinogenics and ecotoxicity, than existing fuel and chemical manufacturing processes. Studies often examine environmental benefits [compared to incineration](#) of plastic waste.

West Virginia and Other State Policies

In 2022, West Virginia defined advanced (chemical) recycling, categorizing it as a manufacturing rather than a waste management process ([HB 4084](#)). This makes chemical recycling facilities eligible for manufacturing tax incentives in [West Virginia](#) and [other states](#), changing their [regulation and oversight](#). Proponents say this could help new technologies and enterprises, and more closely describes the process of chemical recycling. In a move that could support the chemical recycling value chain, which starts with waste collection and sorting, West Virginia passed a law ([SB 603](#)) in 2023 exempting solid waste facilities which consolidate waste for transport to a recycling or disposal facility from a “commercial” solid waste facility designation.

As of March 2024, [24 other states](#) have passed laws defining chemical recycling as manufacturing, including [Pennsylvania](#), [Ohio](#), [Kentucky](#), [Tennessee](#), [South Carolina](#), and [Georgia](#). In contrast to West Virginia's [definition](#), [Kentucky](#) and [Arkansas](#) explicitly exclude plastic-to-fuel processes from the definition of advanced plastics recycling. In doing so, Arkansas makes a distinction between recycling (“material recovery”) and energy recovery. Arkansas also includes mechanical recycling in the definition of advanced recycling. In 2024, Maine [passed a law](#) treating chemical recycling as [waste processing](#), [prohibiting any advanced recycling facility](#)

unless they recycle at least 50% of the plastic they process. Vermont's [H.602](#) (2024) would ban all forms of chemical recycling if passed. Youngstown, Ohio passed a [one-year moratorium](#) on chemical recycling after residents' significant concerns about a planned facility.

Commercialization Efforts

Major companies like [Unilever](#), [Dow](#), and [ExxonMobil](#) are [investing millions](#) annually into chemical recycling efforts, and demand for chemical recycling services is [likely to grow](#). Nine commercial plants are [currently operating](#) at modest scale in the United States (with two [recent closures](#)), limiting real-world process data. [Most](#) are located in economically disadvantaged communities, and are [considered “large quantity hazardous waste generators”](#) under federal law. Chemical recycling plants and programs have [experienced delays and failures to scale](#). Shell has quietly [backed away from advanced recycling](#), calling previous plans “unfeasible”. In April 2024, a planned \$1.1 billion plastics-to-chemicals facility slated to be built in Point Township, Pennsylvania [was canceled](#). A \$680 million planned plastics-to-fuels plant in Georgia was [canceled in 2022](#) after failing to meet commercial deadlines.

West Virginia Benefits and Risks

Possible chemical recycling benefits for West Virginia include job creation and potential reductions in plastic waste. Reusing plastic waste as fuel could [reduce landfill use](#) while contributing to the local economy. One risk is that subsidies and tax incentives will [artificially support](#) an industry which may not succeed on its own while [not significantly helping](#) to reduce West Virginia's plastic waste. Additionally, chemical recycling may increase pollution in West Virginia communities without creating large numbers of new jobs.

Policy Options for West Virginia

One policy option for West Virginia involves including mechanical recycling in the definition of advanced recycling, allowing traditional recycling facilities the same legal status and advantages as chemical recycling. Another option is excluding plastic-to-fuel conversion from the definition of advanced recycling, as done in Kentucky and Arkansas, to clearly distinguish between recycling (material recovery) and energy recovery. Policies to categorize chemical recycling based on the [technology](#) or the amount of waste that becomes new plastic (as in [Maine](#)) could also be considered.